

Power and sensing

Selection guide 2023-2024

www.infineon.com



Adam White,
Division President of
Power and Sensor Systems
电源与传感系统事业部总裁

Dear customer,

Semiconductors are essential building blocks for a climate-neutral and digitalized world. Both are global challenges. Both are strong motivators for us to contribute to a better future. Never before have our technological possibilities been as great as they are today: Using technology as an enabler for decarbonization; leveraging the great potential of digitalization; innovations enabling growth and prosperity for billions of people in harmony with nature and our planet.

The great importance of semiconductors as a basic technology for entire economic sectors is now recognized everywhere. The attention paid to our industry has grown significantly. This is another strong motivation for us to continue our leadership in power and sensor systems and an offering for our customers of leading products with the highest quality and delivery reliability.

Our “Product to System”-approach is a differentiator. It goes beyond thinking in terms of technologies and products. Derived from our system knowledge, we holistically understand our customers’ problems: their applications, future roadmaps and use cases, supply chain demands, and the resulting challenges and opportunities. This way, we can offer the right solutions – from stand-alone products to system solutions or supply-security and other services.

Infineon has the broadest portfolio of ambient sensors for consumer, smart homes, IoT, and automotive. Sensors are essential for digitalization and decarbonization, for example, through reducing device and building energy consumption with the help of our radar solutions. Following the “Product to System”-approach Infineon offers optimized solutions comprising hardware, software, and algorithms.

To further expand our leadership in power systems, we are accelerating our wide bandgap offering and therefore strengthening our market position by adding significant manufacturing capacities for SiC and GaN in Kulim, Malaysia. Such innovative technologies will further lead to solutions addressing decarbonization and digitalization. These semiconductors offer added value to our customers because of better system performance in terms of efficiency, size and cost compared to silicon-based solutions. In 2024, the first wafer for our customers will leave this fab.

In order to answer the structurally growing demand for semiconductors, we are expanding our manufacturing capacities. In May 2023, we have broken ground for a new plant in Dresden, Germany, to strengthen our manufacturing basis for the semiconductors that drive decarbonization and digitalization from 2026 onwards. These analog/mixed-signal components are used in power supply systems, for example, in energy-efficient charging systems, in data centers or in applications for the Internet of Things (IoT). The interaction of power semiconductors and analog/mixed-signal components makes it possible to create particularly energy-efficient and intelligent system solutions.

This Power and Sensing Selection Guide 2023-2024 catalog is the most comprehensive consolidated overview of our products and the latest advancements in power and sensing technology designed to cater to your unique needs. I strongly believe that this digital catalog can support you to stay ahead of the competition and make your projects more successful. Please feel free to contact our talented teams to provide personal support on any product-related questions.

Let’s drive decarbonization and digitalization. Together.

尊敬的客户，

低碳化和数字化是我们共同面临的全球性挑战，这些促使我们为更美好的未来做出更大贡献，而半导体则是其中重要组成部分。我们可以实现的技术潜能从未像今天这样强大，技术进步能够实现更大程度的低碳化，可充分利用数字化带来的巨大潜力，并通过创新使数十亿人与自然和地球和谐相处，实现可持续的增长和繁荣。

半导体作为一项基础技术，对整个经济的重要性已经在世界各地得到充分认可，社会对我们这个行业的关注度也在显著增加，这些不仅不断促使我们继续在电源与传感器领域保持领先地位，还是我们为客户提供具有更高质量和更高可靠性的领先产品的又一强大动力。

我们的“从产品到系统”策略在业内具有与众不同的领先优势，它不再局限于技术和产品的范畴。基于我们深厚的系统知识，我们能够对客户遇到的问题有更全面的了解，包括他们的应用、未来发展路线图和用例、供应链需求以及由此带来的挑战和机遇。通过这种方式，我们能够为客户提供更加正确的解决方案，不论是提供从独立产品到系统解决方案，还是提供安全保障和其他服务。

英飞凌能够为消费电子、智能家居、物联网和汽车等行业提供更广泛的环境传感器产品组合。传感器技术对低碳化和数字化至关重要，例如通过我们的雷达解决方案，能够进一步降低设备和建筑物能耗。通过实施“从产品到系统”策略，英飞凌可提供包括硬件、软件和算法在内的整体优化解决方案。

为了进一步扩大我们在电源系统方面的领先优势，我们正在加快向市场提供宽禁带产品，通过在马来西亚库林（Kulim, Malaysia）大幅增加SiC和GaN的产能，我们的市场领先地位将会得到进一步加强。与硅基解决方案相比，这些创新半导体技术在效率、尺寸和成本方面具有更好的系统性能，能够为我们的客户提供更多附加价值，将会成为有效应对低碳化和数字化挑战的解决方案。2024年，我们客户的第一块晶圆将会从这家晶圆厂成功出货。

为了从布局上满足不断增长的半导体需求，我们正在扩大各地产能。2023年5月，我们位于德国德累斯顿（Dresden, Germany）的一家新工厂破土动工，目标是在2026年后加强我们的半导体制造能力，推动全球的低碳化和数字化进程，这些模拟/混合信号组件可用于高能效的充电系统、数据中心或物联网（IoT）等应用的电源系统。功率半导体和模拟/混合信号组件的优化组合将极大地促进构建更高能效和更加智能的系统解决方案。

这份《2023-2024电源与传感选型手册》是我们最全面的产品综合概述，同时也体现了电源与传感技术的最新进步，能够满足您具体应用的独特需求。我坚信，该手册可以帮助您在激烈的市场竞争中保持领先地位，并使您的项目更加成功。如果您有任何与产品相关的问题，请随时联系我们优秀的团队，您将会得到满意的支持和服务。

让我们一起推动低碳化和数字化进程。



Adam White,
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Solutions

SMPS, battery management systems, motor control, UPS, contactless power and sensing

- SMPS - server power supply
- SMPS - telecom power supply
- SMPS - industrial SMPS
- SMPS - PC power supply
- SMPS - TV power supply
- Power over Ethernet (PoE)
- Fast/wireless EV-charging
- Wireless charging for consumer/industrial
- USB-C chargers and adapters
- Condition monitoring and predictive maintenance
- Battery chargers for mobile appliances
- Battery protection
- Battery monitoring & control
- Relay replacement
- Low-voltage low-power motor drive and control
- HP LV motor drive and control
- UPS
- Contactless power and sensing

Server

Server SMPS

Highly efficient server power supply

The trend in the field of data center and enterprise servers is to deliver more power per rack. Meanwhile, the rising cost of energy and environmental concerns make SMPS efficiency optimization a key requirement across the entire load range for server and data center designs. This challenging task is combined with the requirement for higher power, higher power density, and cost effectiveness.

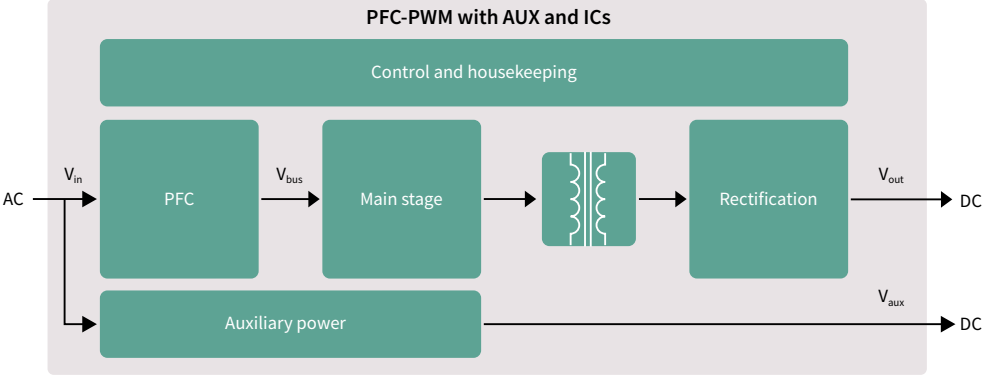
In the PFC stage and generally in hard-switching topologies used in server applications, Infineon recommends its 600 V CoolMOS™ C7 and G7 families offering the lowest FOM $R_{DS(on)}$*Q_G and $R_{DS(on)}$*E_{oss}. These MOSFET series provide the lowest switching losses, which is necessary in fast-switching-frequency operations in high-end server SMPS. With Infineon's C7 and G7 series, the efficiency is optimized already from a very light-load operation. Available in compact SMD packages such as ThinPAK, DDPAK, and TOLL, these SJ MOSFETs offer benefits in space usage and power density. The 600 V CoolMOS™ C7 and G7 products are best used with Infineon's industry benchmark, the non-isolated EiceDRIVER™ 2EDN752x and the isolated EiceDRIVER™ Compact 1ED AF gate driver families.

Complementary to the 600 V CoolMOS™ C7 in high efficiency PFC are the CoolSiC™ Schottky diodes. The 600 V CoolMOS™ P7 family offers a good compromise between price and performance. This is valuable in both PFC and HV DC-DC stages where low Q_G and turn-off losses are important benefits, especially in case of high-switching-frequency operations and high light-load efficiency requirements.

As high power (2-6 kW and above) requires ultrahigh efficiency (96-98 percent peak) and high power density, Infineon's CoolGaN™ GIT HEMT 600 V family with totem-pole PFC controls deliver the highest efficiency and power density in the world. Using the 600 V CoolMOS™ S7 devices with active bridge circuit fulfills the Titanium® requirement at the lowest cost. Operating expenses (OPEX) and capital expenditures (CAPEX) are both reduced through simplified topologies and the power density in the server PSU is doubled.

In applications with low output voltage and high output current, further efficiency improvements are enabled by the continuous reduction of on-resistance. This can be achieved by using Infineon's low-voltage OptiMOS™ MOSFET series in the synchronous rectification stage. Infineon's low-voltage products are complemented by StrongIRFET™ devices that are optimized for lower switching frequencies and highest system robustness. Infineon's EiceDRIVER™ gate-driver IC family perfectly matches the CoolGaN™ and CoolSiC™ wide-bandgap products, and CoolMOS™ and OptiMOS™ MOSFET products.

In addition, ISOFACE™ digital isolators, based on the Infineon's coreless transformer (CT) technology, provide robust galvanic isolation for safety requirements.



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For more details on the product, click on the part number, visit infineon.com or contact our product support.

Recommended products

Functional block	Product category	Topology	Product family	Benefits
PFC	High-voltage MOSFETs	CCM/interleaved PFC; TTF	600 V/650 V CoolMOS™ C7 650 V CoolMOS™ G7 600 V CoolMOS™ S7	Best FOM $R_{DS(on)}$*Q_G and $R_{DS(on)}$*E_{oss} Lowest $R_{DS(on)}$ per package Low dependency of switching losses from $R_{g,ext}$
	High-voltage GaN	Totem-pole PFC	CoolGaN™ GIT HEMT 600 V	Enable the highest efficiency and highest power density
	High-voltage SiC MOSFET	Totem-pole PFC	CoolSiC™ 650 V	Highest power handling capability Highest temperature handling
	SiC diodes	CCM/interleaved PFC	CoolSiC™ Schottky diode 650 V G5	Low FOM V_F*Q_G
	Control ICs	CCM PFC ICs	ICE3PCS0xG	Ease of use
	GaN gate driver ICs	Totem-pole PFC	EiceDRIVER™ 1EDF5673F and 1EDF5673K	Negative V_{GS} voltage to avoid false triggering Differential output for GIT technology based GaN driving
	SiC MOSFET gate driver ICs	Totem-pole PFC	EiceDRIVER™ 2EDF9275F/1EDB9275F*	37 ns/45 ns typical propagation delay time Functional isolation 1.5 kV
	Gate driver ICs	Interleaved PFC	EiceDRIVER™ 2EDN852x/1EDN8511B EiceDRIVER™ 1EDN8550B for Kelvin-source CoolMOS™	Source and sink driver capability: - 5 A for 2EDN - 4 A/8 A for 1EDN 17 ns (45 ns for 1EDN8550B) propagation delay precision for fast MOSFET and GaN switching (-)10 V input robustness (1EDN8550B has true differential inputs for ground-shift robustness CMR up to ±150 V)
			EiceDRIVER™ low side: 2ED24427N01F	Dual-channel, 10 A low-side driver in DSO-8 with power-pad Integrated UVLO protection and enable (EN) function High frequency, high power operation with BOM savings
		Totem-pole PFC	EiceDRIVER™ level-shift: 2ED2181S06F, 2ED21814S06J	650 V half-bridge SOI driver with integrated bootstrap diode Superior –VS transient voltage immunity High frequency switching (500 kHz)
			EiceDRIVER™ level-shift: IRS2186S, IRS21864S	4 A/4 A high- and low-side gate driver
			EiceDRIVER™ Compact: 1EDI60N12AF, 1ED3124MU12F	Isolated gate driver, up to 14 A, 100 ns propagation delay
		Boost PFC	EiceDRIVER™ low side: 1ED44173N01B	Single-channel with fast, accurate (± 5%), integrated overcurrent protection (OCP)
Main stage	High-voltage MOSFETs	ITTF	600 V CoolMOS™ C7/P6	Fast switching speed for improved efficiency and thermals Low gate charge for enhanced light-load efficiency and low power consumption at no-load condition Optimized V_{GS} threshold for lower turn-off losses Rugged body diode which prevents device failure during hard commutation
		LLC, half-bridge below 1 kW	600 V CoolMOS™ P7, CFD7	Low turn-off losses Low Q_{oss} Low Q_G
		LLC, phase-shift full-bridge below 1 kW	600 V CoolMOS™ CFD7, 650 V CoolMOS™ CFD2	Fast and rugged body diode Optimized low Q_G and soft commutation behavior to reach highest effciency Highest reliability for 650 V_{DS}
		ZVS PS FB, LLC, TTF	650 V TRENCHSTOP™ IGBT F5	Improved ruggedness and high efficiency in low inductance designs
	Control ICs	HB LLC ICs	ICE1HS01G-1 ICE2HS01G	High efficiency and low EMI
	Gate driver ICs	LLC, ZVS phase-shift full-bridge, TTF	EiceDRIVER™ 2EDS8165H, 2EDS8265H	37 ns typical propagation delay time Reinforced (safe) isolation 6 kV, CMTI > 150 V/ns
			EiceDRIVER™ Compact: 1EDI60N12AF, 1ED3124MU12F	Isolated gate driver, up to 14 A, 100 ns propagation delay
			EiceDRIVER™ 2EDN8524F with pulse transformer	5 A source and sink driver capability 17 ns propagation delay precision for fast MOSFET and GaN switching
			EiceDRIVER™ low side: 2ED24427N01F with pulse transformer	Dual-channel, 10 A low-side driver in DSO-8 with power-pad Integrated UVLO protection and enable (EN) function High frequency, high power operation with BOM savings
			EiceDRIVER™ level-shift: 2ED2181S06F, 2ED21814S06J	650 V half-bridge SOI driver with integrated bootstrap diode Superior –VS transient voltage immunity High frequency switching (500 kHz)
			EiceDRIVER™ level-shift: IRS2186S, IRS21864S	4 A/4 A high- and low-side gate driver
Sychronous rectification	Low-voltage MOSFETs	HB LLC and center tap	OptiMOS™ 40 V	High efficiency over whole load range, layout tolerance
		ITTF	OptiMOS™ 60 V	High efficiency, low thermals, low V_{DS} overshoot
		ZVS PS FB and center tap	OptiMOS™ 80 V	High efficiency over whole load range, low V_{DS} overshoot and oscillations
	Gate driver ICs	Synchronous rectification	EiceDRIVER™ 2EDF7275K/2EDF7235K 2EDL811x/2EDL801x for bridge rectifier	EiceDRIVER™ 2EDF72x5K Functional isolation up to 650 V_{DC} channel-to-channel isolation Compact solution available in LGA-13 5x5 mm package EiceDRIVER™ 2EDL8x1x Level-shift half-bridge gate driver up to 120 V isolation
			Low side: EiceDRIVER™ 2EDN75xx/2EDN85xx, 1EDN751x/1EDN8511B	5 A source and sink driver capability for 2EDN (4A/8A for 1EDN) 17/19 ns propagation delay precision for fast MOSFET and GaN switching (-)10 V input robustness
			EiceDRIVER™ low side: 2ED24427N01F	Dual-channel, 10 A low-side driver in DSO-8 with power-pad Integrated UVLO protection and enable (EN) function High frequency, high power operation with BOM savings
			EiceDRIVER™ level-shift: 2ED2181S06F, 2ED21814S06J	650 V half-bridge SOI driver with integrated bootstrap diode Superior –VS transient voltage immunity high frequency switching (500 kHz)
			EiceDRIVER™ level-shift: IRS2186S, IRS21864S	4 A/4 A high- and low-side gate driver
			EiceDRIVER™ 1EDNx550B	True differential inputs for ground shift robustness CMR up to ±150 V
Auxiliary power supply	Control ICs	QR/FF flyback CoolSET™	700 V - ICE5xR0070xx 800 V - ICE5xR0080AG 800 V - ICE5QRxx80BG	Low standby power, high efficiency and robustness An integrated 700 V/800 V superjunction power MOSFET with avalanche capability Burst mode entry/exit to optimize standby power at different low load conditions
Isolation	Digital isolator	-	ISOFACE 2DIB0400F; ISOFACE 2DIB0410F	2+0 digital isolator with TTL input threshold and fail-safe default low output state 3 kV_{RMS} isolation voltage (UL 1577) in DSO-8 package High common mode transient immunity > 100 kV/us
Housekeeping	Microcontrollers	-	XMC1xxx	Flexibility, HR PWM, digital communication Arm®-based standard MCU family and wide family
Conversion	Microcontrollers	-	XMC4xxx	Flexibility, HR PWM and digital communication

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* Coming soon

For more details on the product, click on the part number, visit infineon.com or contact our product support.

Telecom

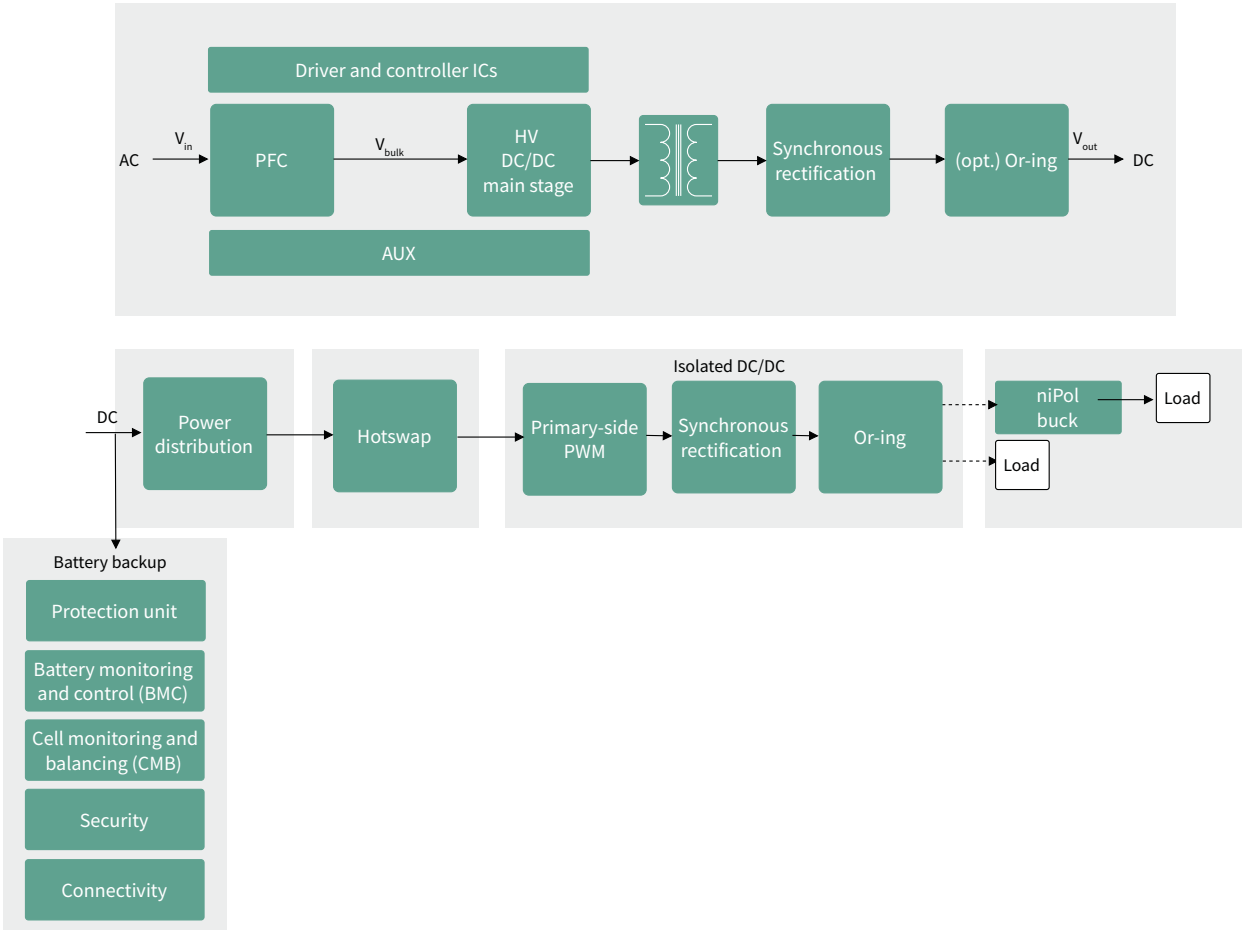
SMPS

Full system solution for telecom power supply

The ever-increasing data consumption, coupled with new levels of virtualization and complexity of the 5G telecom infrastructure, is bringing its demanding requirements into the telecom power sector. Semiconductor technologies are key for enabling telecom SMPS performance.

The remarkable improvements in telecom SMPS performance in the past resulted from the dramatic reduction of the on-resistance achieved in high-voltage MOSFETs, thanks to the revolutionary superjunction principle introduced by Infineon at the end of the nineties with its CoolMOS™ series. To achieve today's demanding energy efficiency targets, synchronous rectification has become popular to take advantage of the unique properties of medium-voltage power MOSFETs. Infineon's low- and medium-voltage OptiMOS™ MOSFET product family – which has gained terrific popularity in DC-DC brick solutions – coupled with gate-driver ICs and microcontrollers efficiently powers the BBUs, RRUs and AAUs of macro and small cells.

Infineon's wide bandgap technologies, such as the CoolGaN™ GIT HEMT 600 V (gallium-nitride-based) and the CoolSiC™ 650 V (silicon-carbide-based) for the primary side and the upcoming CoolGaN™ SG HEMT 100 V/200 V* complement the wide portfolio of silicon-based switches, enabling higher system and electrical conversion efficiency at an attractive system costs. Infineon's EiceDRIVER™ gate driver IC family perfectly matches the CoolGaN™ and CoolSiC™ wide bandgap products, as well as CoolMOS™ and OptiMOS™ MOSFETs.



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* in development

For more details on the product, click on the part number, visit infineon.com or contact our product support.

Recommended products

Functional block	Product category	Topology	Product family	Benefits
PFC	High-voltage MOSFETs	Classic CCM/interleaved PFC/Dual-boost PFC	600 V/650 V CoolMOS™ C7	– Best FOM $R_{DS(on)}$*Q_G and $R_{DS(on)}$*Eoss – Lowest $R_{DS(on)}$ per package – Low dependency of switching losses form $R_{g,ext}$
			600 V CoolMOS™ P7	– Low turn-off losses – Low Q_{oss} – Low Q_G
			600 V CoolMOS™ S7	– The lowest $R_{DS(on)}$ MOSFET for line frequency rectification
	High-voltage GaN	CCM totem-pole PFC	CoolGaN™ 600 V	– Switching at high frequencies (> Si) – Enables high power density
	High-voltage SiC MOSFET	CCM totem-pole PFC	CoolSiC™ 650 V	– Enable very high efficiency with ease of use
	SiC diodes	Classic CCM/interleaved PFC/Dual-boost PFC	CoolSiC™ Schottky diode 650 V G6	– Low FOM V_F * Q_C
	Control ICs	CCM PFC ICs	ICE3PCS0xG	– High PFC and low THD
	GaN gate-driver ICs	Totem-pole PFC	EiceDRIVER™ 2EDF9275F/1EDB9275F	– Negative V_{GS} voltage to avoid false triggering GaN driving – Differential output for GIT technology based – CMTI > 200 V/ns
	SiC MOSFET gate-driver ICs	Totem-pole PFC	EiceDRIVER™ 2EDF9275F/1EDB9275F	– 37 ns/45 ns typical propagation delay time – Functional isolation 1.5 kV – CMTI > 150 V/ns
	Gate-driver ICs	Totem-pole PFC	EiceDRIVER™ 2EDFx275F/1EDBx275F	– 37 ns/45 ns typical propagation delay time – Functional isolation 1.5 kV – CMTI > 150 V/ns
			EiceDRIVER™ Compact: 1EDI60N12AF, 1ED3124MU12F	– Isolated gate driver, up to 14 A, 100 ns propagation delay
			EiceDRIVER™ level-shift: 2ED2304S06F, 2EDL23N06PJ, 2ED2182S06F	– Integrated bootstrap diode using Infineon SOI technology, low level-shift loss – Excellent ruggedness against negative transient voltages on VS pin
		Interleaved dual-boost PFC	EiceDRIVER™ 2EDN852x/1EDN851x	– 5 A source and sink driver capability for 2EDN – 8 A sink and 4 A source driver capability for 1EDN – 17 ns propagation delay precision for fast MOSFET and GaN switching
			EiceDRIVER™ 1EDN8550B for Kelvin-source CoolMOS™	– 8 A sink and 4 A source driver capability – 45 ns for propagation delay precision for fast MOSFET and GaN switching – True differential inputs for ground shift robustness (CMR up to ±150 V)
			EiceDRIVER™ low side: 2ED24427N01F	– Dual-channel, 10 A low-side gate driver in PG-DSO-8 package with power-pad – UVLO and enable (EN), high frequency, high power operation with BOM savings
HV DC-DC main stage	High-voltage MOSFETs	TTF, ITTF	600 V CoolMOS™ C7/P7	– Fast-switching speed for improved efficiency and thermals – Low gate charge for enhanced light load efficiency – Optimized V_{GS} threshold for lower turn-off losses – Rugged body diode which prevents device failure during hard commutation
		HB/FB LLC	600 V CoolMOS™ P7	– Low turn-off losses – Low Q_{oss} – Low Q_G
		HB/FB LLC, ZVS PSFB	600 V, 650 V CoolMOS™ CFD7	– Best-in-class Q_g and trr level – Significantly reduced Q_G previous CoolMOS™ fast-body-diode series improved efficiency over
	Gate-driver ICs	HB LLC, ZVS phase-shift full-bridge	EiceDRIVER™ 2EDS8x65H	– 37 ns typical propagation delay time – Reinforced isolation 8 kVpk – CMTI > 150 V/ns
			EiceDRIVER™ 2EDN8524F with pulse transformer	– 5 A source and sink driver capability – 17 ns propagation delay precision for fast MOSFET and GaN switching – (-)10 V input robustness
			EiceDRIVER™ Compact: 1EDI60N12AF, 1ED3124MU12F	– Isolated gate driver, up to 14 A, 100 ns propagation delay
			EiceDRIVER™ level-shift: 2ED2304S06F, 2EDL23N06PJ, 2ED2182S06F	– Integrated bootstrap diode using Infineon SOI technology, low level-shift loss – Excellent ruggedness against negative transient voltages on VS pin
	Control ICs	HB LLC	ICE1HS01G-1, ICE2HS01G	– High efficiency and low EMI
	GaN gate-driver ICs	LLC, ZVS phase-shift full-bridge	EiceDRIVER™ 1EDS5663H	– Negative V_{GS} voltage to avoid false triggering GaN driving – Differential output for GIT technology based – CMTI > 200 V/ns
	High-voltage GaN	LLC, ZVS phase-shift full-bridge	CoolGaN™ GIT HEMT 600 V	– Enables the highest efficiency and highest power density
Synchronous rectification	Low-voltage MOSFETs	Synchronous rectification MOSFET	OptiMOS™ 80-200 V	– Industry's lowest FOM ($R_{DS(on)}$*Q_G) leading to high efficiency at good price/performance – Low voltage overshoots enabling easy design-in – Industry's lowest $R_{DS(on)}$ – Highest system efficiency and power density – Outstanding quality and reliability – Reduces the need for a snubber circuit
	Gate-driver ICs	Synchronous rectification	EiceDRIVER™ 2EDF7275K	– Functional isolation up to 650 VDC channel-to-channel isolation – Compact solution available in LGA-13 5x5 mm package
			EiceDRIVER™ 2EDL811x/2EDL801x	– Level-shift half-bridge gate driver up to 120 V isolation
			Low side: EiceDRIVER™ 2EDN75xx/2EDN85xx, 1EDN751x/1EDN851x	– 5 A source and sink driver capability for 2EDN – 8 A sink and 4 A source driver capability for 1EDN – 17/19 ns propagation delay precision for fast MOSFET and GaN switching – (-)10 V input robustness
			EiceDRIVER™ level-shift: IRS2186S, IRS21864S	– 4 A/4 A high- and low-side gate driver
			EiceDRIVER™ low side: 2ED24427N01F	– Dual-channel, 10 A low-side gate driver in PG-DSO-8 package with power-pad – UVLO and enable (EN), high frequency, high power operation with BOM savings
Auxiliary power supply	Control ICs	5th generation QR/FF flyback CoolSET™	QR 800 V - ICE5QRxx80BG FF 800 V - ICE5xRxx80AG	– Quasi-resonant-switching operation for high efficiency and low EMI signature – Fixed-frequency-switching operation for ease of design – 100 KHz and 125 KHz – Fast and robust start-up with cascode configuration – Robust protection with adjustable line input overvoltage protection, V_{CC} and CS pin short-to-ground protection – Optimized light-load efficiency with selectable burst mode entry/exit profile – Frequency reduction for mid- and light-load condition to reduce switching losses and increase efficiency – Direct feedback and regulation with integrated error amplifier for non-isolated output – High power delivery of up to 42 W with 800 V CoolSET™ in heatsink-free SMD package
Communication	4-channels digital isolator	Data transmission between the primary side and secondary side	ISOFACE™ 4DIR1400H	– SOIC-16 WB package – Data rates up to 40 Mbps – Operating supply voltage: 2.7 V – 6.5 V (abs. max 7.5 V) – VISO of 5700 V_{RMS} (UL1577, VDE 0884-17) – CMTI: 100 kV/µs (min)
Housekeeping	Microcontrollers	-	XMC1xxx	– Flexibility, HR PWM, digital communication – Arm®-based standard MCU family and wide family
Power conversion	Microcontrollers	-	XMC1xxx, XMC4xxx	– Flexibility, HR PWM, digital communication – Arm®-based standard MCU family and wide family
Isolated DC-DC	Microcontrollers	-	XDPP1100	– Optimized for 48 V telecom isolated conversion – Highly flexible digital core – State-of-the-art dedicated AFE – State-machine based fast loop control – Pre-programmed peripherals in ROM – Negligible internal power consumption – Industry smallest digital power controller

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Recommended products

Functional block	Product category	Topology	Product family	Benefits
Or-ing	Low-voltage MOSFETs	Or-ing MOSFET	OptiMOS™ 60-200 V	– Industry's lowest FOM ($R_{DS(on)}$*Q_G) leading to high efficiency at good price/performance – Low-voltage overshoots enabling easy design-in
Battery management and protection	Low- and medium-voltage MOSFETs	Back-to-back disconnect	OptiMOS™ 60-200 V OptiMOS™ 80-200 V StrongIRFET™ 80-200 V	– Industry's lowest Low $R_{DS(on)}$ – Wide SOA – Perfect match of robust and excellent price/performance
	Gate-driver ICs	protection switch drivers	EiceDRIVERTM	– Faster reaction time (~ 10 µs) – Integrated bidirectional high or low-side current sense amplifiers – High current source or sink support (1 A pull down, 0.3 A pull up) – Robust against under/overvoltage in the board-net – Flexible configuration of protection features plus accessibility of diagnosis information via SPI
	Microcontroller	Battery Monitoring and controlling	PSoC™ 4	– 32-bit MCU Subsystem CPU – 48-MHz Arm® Cortex®-M0+ – Flash: Up to 256 kB flash – RAM: 32 kB SRAM – Up to 2 CAN serial channels – USB/Up to 4
	Memory	Datalogging	SEMPER™ EXCELON™	– Energy efficient – High density – Reliable data logging memories
	Current sensing	Current measurement	XENSIV™ TLI4971	– Ultralow-power loss due to minimal resistance of the current rail – Reliable current measurement over the lifetime (no re-calibration) – Functional isolation for high-voltage application design – Easy and compact package allows high power density
	Battery management IC	Cell monitoring and Balancing	TLE9012	– Robust communication without the need for transformers or common-mode chokes – Best-in-class voltage measurement accuracy even after soldering thanks to stress sensor technology – Integrated diagnosis easing functional safety design Integrated UART communication for systems with a microcontroller on local ground
	Small signal N/P channel MOSFET	Cell balancing	OptiMOS™ 20-30 V StrongIRFET™ 20-30 V	– Wide range of packages – Suitable for space constraints between 0.5 A to 2.5 A – Suitable equalizing current PCB footprint – Compact solution with smalle
	Communication	Wired and wireless interface	Lin CAN	– Low quiescent current – ISO11898 compliant – Excellent EMI performance – Standby/sleep mode – Wake and failure detection – High ESD robustness
			AIROC™	– Bluetooth® – Bluetooth® Low Energy – Wi-Fi® – Wi-Fi® and Bluetooth® combos – Reduced power consumption, including very low sleep
	Security	-	OPTIGA™ Authenticate S	– High-end CC EAL6+ (high) certified security controller: ECC, RSA®, AES, SHA, TLS, HKDF – Full turnkey solution traction layer – Host code with an abstraction layer – Customer-specific certification provided for zero-touch provisioning
	Digital Isolator	Isolators	ISOFACE™ Digital Isolators	– 2/4-channel digital isolators – Max. supply voltage: 6.5 V – Benchmark highest CMTI: 100 kV/us min. – CMOS and TTL input thresholds – Wide operating temperature range – Low power consumption – Accurate timing performance
Isolated DC-DC	Microcontrollers		XDP™	– Optimized for 48 V telecom isolated conversion – Highly flexible digital core AFE – State-of-the-art dedicated control – State-machine-based fast loop ROM – Pre-programmed peripherals in – Negligible internal power consumption – Industry smallest digital power controller
	Medium and Low-voltage MOSFETs	Primary-side PWM MOSFETs	OptiMOS™ 80-200 V StrongIRFET™ 80-200 V Small-signal MOSFETs 60-200 V	– Industry's lowest $R_{DS(on)}$ and power density – Highest system efficiency reliability – Outstanding quality and circuit – Reduces the need for a snubber
		Synchronous-rectification MOSFET	OptiMOS™ 40-100 V StrongIRFET™ 40-100 V	
		Or-ing MOSFET	OptiMOS™ 25-30 V StrongIRFET™ 25-30 V	
		Active snubber	OptiMOS™ power MOSFET 60 V/100 V/150 V	
	Gate-driver ICs	Primary side	EiceDRIVER™ 2EDF7275K	– Functional isolation up to 650 V_{DC} channel-to-channel isolation – Compact solution available in LGA-13 5x5 mm package
			EiceDRIVER™ 2EDL811x/2EDL801x	– Functional isolation up to 650 V_{DC} channel-to-channel isolation – Compact solution available in LGA-13 5x5 mm package
		Synchronous rectification	EiceDRIVER™ 2EDF7275K	– Functional isolation up to 650 V_{DC} channel-to-channel isolation – Compact solution available in LGA-13 5x5 mm package
			EiceDRIVER™ 2EDL811x/2EDL801x	– Level-shift half-bridge gate driver up to 120 V isolation
			Low side: EiceDRIVER™ 2EDN75xx/2EDN85xx, 1EDN751x/1EDN851x	– 5 A Source and Sink driver capability for 2EDN – 8 A sink and 4 A source driver capability for 1EDN and GaN switching – 17/19 ns propagation delay precision for fast MOSFET (-)10 V input robustness
			EiceDRIVER™ level-shift: IRS2186S, IRS21864S	– 4 A/4 A high- and low-side gate driver
			EiceDRIVER ™ low side: 2ED24427N01F	– Dual-channel, 10 A low-side gate driver in PG-DSO-8 package with power-pad UVLO and Enable (EN), high frequency, high power operation with BOM savings
	Digital Isolator	Isolators	ISOFACE™ Digital Isolators	– 2/4-channel digital isolators – Max. supply voltage: 6.5 V – Benchmark highest CMTI: 100 kV/us min. – CMOS and TTL input thresholds Wide operating temperature range – Low power consumption – Accurate timing performance

Click here for more information on ICT solutions.

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Industrial SMPS

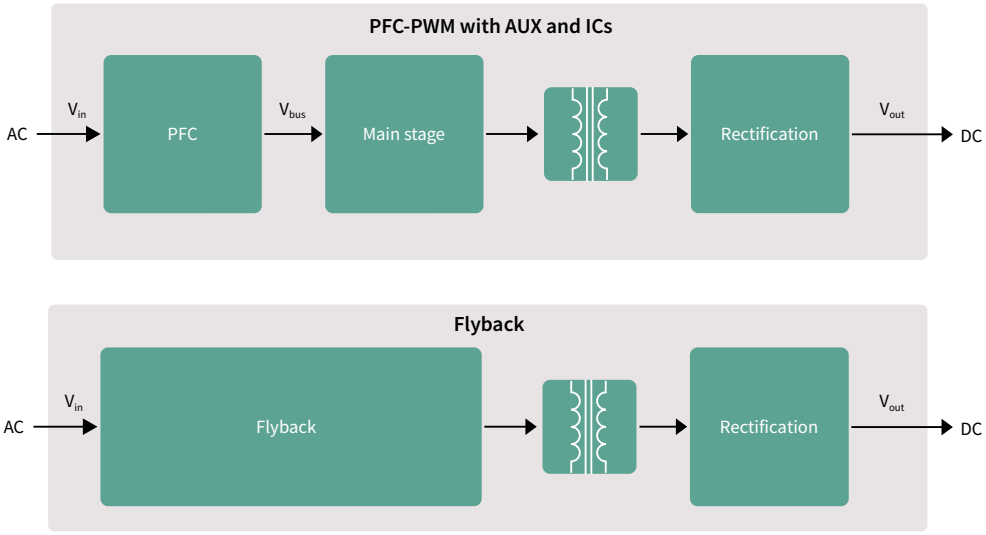
Industrial SMPS

Reliable and robust

Industrial SMPS powers a wide range of devices from industrial automation robots to medical equipment and vending machines. With the expansion of the Internet of Things (IoT) and the adoption of Industry 4.0, the demand for industrial SMPS is on the rise. Industrial switch-mode power supplies (SMPS) are mostly operated in outdoor environments without air conditioning or systems without fans. Such operating conditions make reliability and robustness the key requirements for the industrial SMPS, especially when it comes to high-temperature operations, outdoor use, line surges, load jumps, short circuit, and so on. In addition to quality, reliable supply and long-term product availability are also some of the key customer concerns. Industrial SMPS life cycle goes beyond 10 years and it takes 3 to 5 years to ramp. Hence, not only do customers need high-quality products, but also stable and reliable supply over the industrial SMPS life cycle (10 to 20 years).

Infineon meets all of these requirements with its CoolMOS™, OptiMOS™, StrongIRFET™ and EiceDRIVER™ gate-driver product families. Infineon's products offer the best price/performance ratio along with the highest efficiency and reliability. For new designs, we recommend our CoolMOS™ P7 600 V/800 V/950 V parts, as well as the latest generation of OptiMOS™ 30 V/40 V/60 V/80 V/100 V/150 V and 250 V products. For high-power designs with convection cooling and high power supplies, our CoolMOS™ S7 in active bridge configuration will reduce the power losses to enable fanless operation. In addition, the ISOFACE™ digital isolators, based on the Infineon's coreless transformer (CT) technology, provide robust galvanic isolation for safety requirements.

Application diagrams



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Product portfolio

Functional block	Product category	Topology	Technology	Benefits
PFC/Main stage	High-voltage MOSFETs	CrCM/DCM PFC	600 V/800 V/950 V CoolMOS™ P7	Best thermal performance Rugged body diode ESD enhancement for production line Wide $R_{DS(on)}$ portfolio including both THD and SMD packages
			600 V CoolMOS™ P6	Fast-switching speed for improved efficiency and thermals Low gate charge for enhanced light-load efficiency and low power consumption at no load condition Optimized V_{GS} threshold for low turn-off losses
			600 V CoolMOS™ S7	PFC efficiency boost ~1% Lowest $R_{DS(on)}$ in SMD packages
	High-voltage SiC MOSFET	Totem-pole PFC	CoolSiC™ 650 V	Highest power handling Best thermal capability
	Boost diodes	DCM PFC	650 V EC7	Improved diode softness and humidity rugged. Allows a more reliable design with lower failure rates
		CCM PFC	650 V EC7	
	Control ICs	CCM PFC ICs	ICE3PCS0xG	High PFC and low THD
Main stage	Control ICs	HB LLC ICs	650 V – ICE1HS01G-1/ICE2HS01G	High efficiency and low EMI
Synchronous rectification	Medium-voltage diodes	HB LLC + center-tap	OptiMOS™ 30 V/40 V/60 V/80 V/150 V/250 V	Optimized cost/performance and low thermals
PFC/Main stage/ Synchronous rectification	Gate driver ICs	Boost PFC	EiceDRIVER™ low side: 1ED44173N01B	Single-channel with fast, accurate (± 5%), integrated over-current protection (OCP)
		Totem-pole PFC/ HB LLC	EiceDRIVER™ Compact: 1EDI60N12AF, 1ED3124MU12F	Isolated gate driver, up to 14 A, 100 ns propagation delay
			EiceDRIVER™ level-shift: 2ED2181S06F, 2ED21814S06J	650 V half-bridge SOI driver with integrated bootstrap diode Superior –VS transient voltage immunity High-frequency switching (500 kHz)
			EiceDRIVER™ level-shift: IRS2186S, IRS21864S	4 A/4 A high- and low-side gate driver
		Interleaved PFC/ HB LLC	EiceDRIVER™ low side: 2ED24427N01F	Dual-channel, 10 A low-side driver in DSO-8 with power-pad Integrated UVLO protection and enable (EN) function High frequency, high power operation with BOM savings
Flyback	Control ICs	QR flyback	ICE5QSBG	High efficiency and low standby power
	High-voltage MOSFET	Flyback	700 V/800 V CoolMOS™ P7	Best price-competitive CoolMOS™ family Lower switching losses versus standard MOSFET Controlled dV/dt and di/dt for better EMI
Auxiliary power supply	Control ICs	QR/FF flyback CoolSET™	700 V/800 V ICE5QRxx70/80A(Z)(G)	Low standby power, high efficiency and robustness
Isolation	Digital isolator		2DIB0410F	2+0 digital isolator with TTL input threshold and fail-safe default low output state 3 kV_{RMS} isolation voltage (UL 1577) in DSO-8 package High common mode transient immunity > 100 kV/µs

PC power

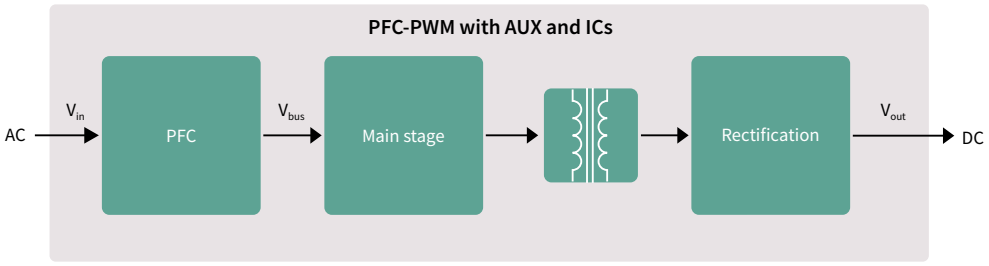
SMPS

More efficient PC power supply

The PC power market is divided into high-end gaming PC and better cost-performance sectors to achieve a better price/performance for desktop SMPS. The PC OEMs are implementing the desktop SMPS by removing the AUX power block to save the cost of having a flyback circuit.

Due to the new structure of the CPU and GPU, higher and higher peak power is needed (1.5 to 2 times higher than normal power). In addition to the needed CCM PFC, Infineon 600 V CoolMOS™ P7 and OptiMOS™ 40 V/60 V offer the best price/performance and reliability to meet the design requirements, as well as to achieve the highest efficiency enabled by semiconductors available in the market.

For CPU and GPU power-hungry gaming PCs, the ICE3PCS0xG CCM PFC IC provides high efficiency over the whole load range and low count of external components, besides that, the ICE3PCS0xG CCM PFC IC offers fast output dynamic response during load jump. In addition to PGFC IC, Infineon's LLC IC ICE2HS01G support customers to minimize the external component count.



Recommended products

Functional block	Product category	Topology	Technology	Benefits
PFC/main stage	High voltage MOSFETs	CrCM/DCM PFC	600 V CoolMOS™ P7	Best thermal performance Rugged body diode ESD enhancement for production line Wide $R_{DS(on)}$ portfolio including both THD and SMD packages
			600 V CoolMOS™ P6	Fast switching speed for improved efficiency and thermals Low gate charge for enhanced light-load efficiency and low power consumption at no load condition Optimized V_{GS} threshold for low turn-off losses
			500 V CoolMOS™ CE	Optimized cost/performance Lower transition losses versus standard MOSFET
	Boost diodes	DCM PFC	650 V EC7	Improved diode softness and humidity rugged. Allows a more reliable design with lower failure rates
		CCM/interleaved PFC	CoolSiC™ Schottky diode 650 V G6	Low FOM V_F*Q_G
	Control ICs	CCM PFC ICs	ICE3PCS0xG	High PFC and low THD
Main stage	Control ICs	HB LLC ICs	650 V – ICE1HS01G-1/ICE2HS01G	High efficiency and low EMI
Synchronous rectification	Medium voltage diodes	HB LLC + center-tap	OptiMOS™ 40 V	Optimized cost/performance and low thermals
			OptiMOS™ 60 V	Layout tolerance and low thermals

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TV

SMPS

Diversify TV power supply with cost, performance, and ease of use

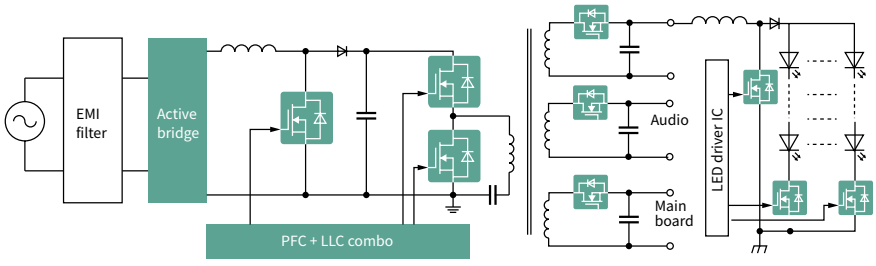
In addition to their outstanding image quality, new generation TVs gain attention for their user interface, low power consumption and slim design. This requires the power supply unit (PSU) either to keep a low profile to maintain the slim appearance of a TV and a low thermal dissipation image or to have an external adapter. In addition, a growing number of TV manufacturers use external adapters to deliver DC power to the TV. Infineon products based on digital power technology have been designed to meet the challenges of efficiency and standby power requirements for the IoT-enabled TVs (both embedded PSU and adapter).

Thanks to digital power, our customers can reduce the number of TV power supplies by easily and flexibly adapting the digital IC parameters to different TV and screen models. Infineon's digital-based flyback controllers are ideal for low-power adapters for TVs and monitors. With digital soft switching, the adapter power density can significantly be improved.

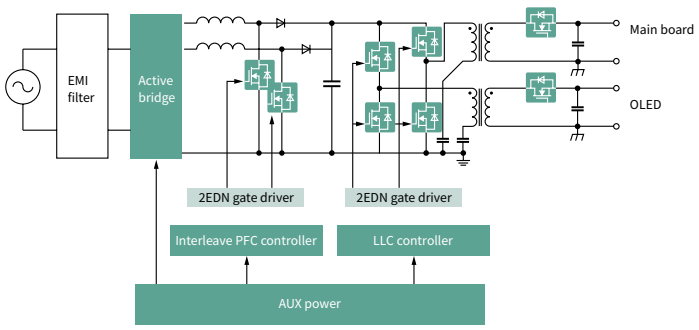
The 600 V CoolMOS™ P7 power MOSFET series has been developed to cover a broad spectrum of different applications where excellent performance and perfect ease of use are required. The rugged body diode enables the use of hard-switching topologies, such as power factor correction (PFC), boost, and two-transistor forward (TTF) and resonant topologies such as LLC, where the technologies lead to high efficiency in both hard-switching and resonant circuits.

For higher on-state resistance ($R_{DS(on)}$) classes, a new feature of an integrated ESD diode helps to improve the quality in manufacturing. At the same time, the low $R_{DS(on)}$ and gate charge (Q_G) enable high efficiency in the various topologies. The 600 V CoolMOS™ P7 with a wide variety of $R_{DS(on)}$ and packages on consumer-grade for TV power. Infineon developed a family of packages specifically for TV power supplies, characterized by short lead, SOT-223 mold stopper, and wide creepage distance, which enable low-cost and reliable manufacturing for our customers.

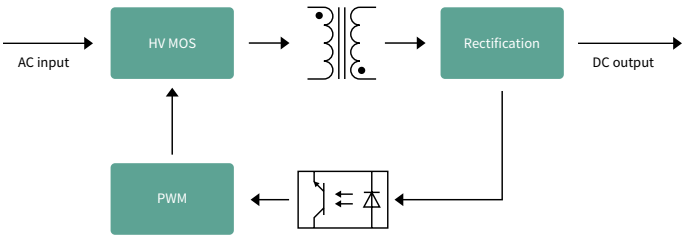
Non-AUX digital solution for large screen size



High-power solution for larger screen size



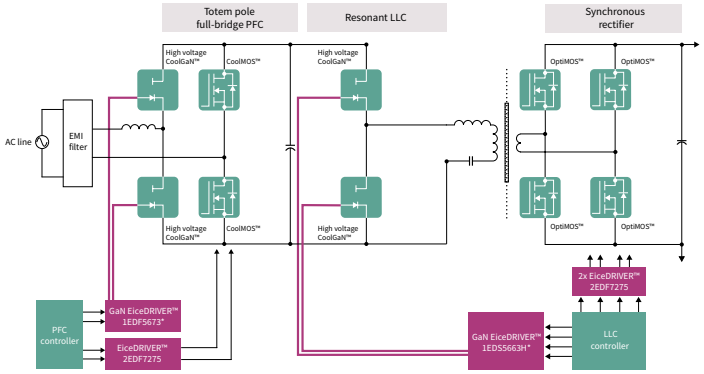
Flyback solution for small screen size



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High-power solution for larger screen size



Recommended products

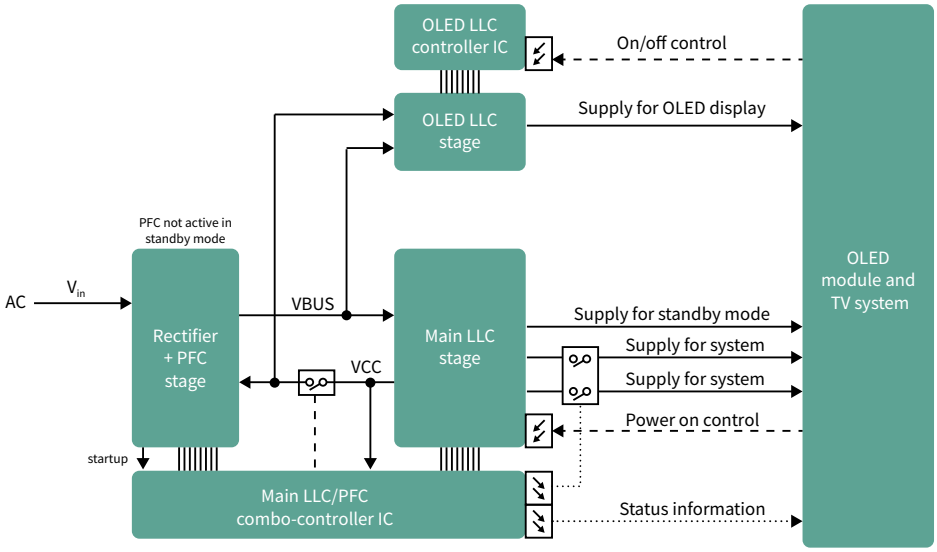
Functional block	Product category	Topology	Product family	Benefits
Main stage/PFC combo non-AUX	High-voltage MOSFETs	Active bridge	600 V CoolMOS™ S7	– Body diode robustness at AC line commutation – Improved thermal resistance – Absolute lowest $R_{DS(on)}$ in the market – Enables top-side cooling with DDPAK and QDPAK – Ideal fit for solid-state and hybrid relays and circuit breakers
		Active bridge DCM PFC HB LLC	600 V CoolMOS™ P7	– Fast-switching speed for improved efficiency – Low gate charge for enhanced light-load efficiency and low power consumption at no-load condition – Optimized V_{GS} threshold for lower turn-off losses – Rugged body diode for HB LLC application
		DCM PFC, HB LLC	600 V CoolMOS™ PFD7	– Robustness and reliability with integrated robust, fast body diode and up to 2 kV ESD protection in gate – Reduced gate charge for enhanced light-load efficiency, and lower hysteresis loss
	Gate-driver IC	HB LLC	EiceDRIVER™ level-shift: 2ED2181S06F, 2ED21814S06J	– 650 V half-bridge SOI driver with integrated bootstrap diode – High-frequency switching (500 kHz)
	Control ICs	IDP2308	PFC-LLC non-AUX digital IC for TV embedded PSU	– Low BOM count/system cost due to high integration – Low standby power – High system reliability – Shorter development cycles and higher design and production flexibility
		IDP2303A	PFC-LLC non-AUX digital IC for TV adapter	– Low BOM count/system cost due to high integration – Low standby power – Small form factor designs – High system reliability
Synchronous rectification	Low-voltage MOSFETs	Synchronous rectification	OptiMOS™ 5 100-150 V StrongIRFET™ 2 100 V	– Low conduction losses, reduced overshoot – FullPAK package available
PFC	Boost diodes	DCM PFC	650 V Rapid diode	– Low conduction losses
	Control ICs	CCM PFC ICs	ICE3PCS0xG	– High PFC and low THD
	WBG	PFC	CoolGaN™ 600 V e-mode HEMTs	– Highest efficiency contribution via less parasitic parameter – Space saving with SMD smaller package
	Gate-driver IC	PFC	1ED44173N01B	– Single-channel with fast, accurate (± 5%), integrated over-current protection (OCP)
High voltage MOSFETs	Active bridge DCM PFC HB LLC		600 V CoolMOS™	– Fast switching speed for improved efficiency – Low gate charge for enhanced light load efficiency and low power consumption at no-load condition – Optimized V_{GS} threshold for lower turn-off losses – Rugged body diode for HB LLC application
Main stage	Control ICs	HB LLC ICs	ICE1HS01G-1/ICE2HS01G	– High efficiency and low EMI
	WBG	HB LLC	CoolGaN™ 600 V Integrated Power Stage	– Highest efficiency, highest power density – High reliability – Isolated gate driver integrated
	High-voltage MOSFETs	HB LLC	600 V CoolMOS™ P7	– Fast-switching speed for improved efficiency – Low gate charge for enhanced light-load efficiency and low power consumption at no-load condition – Optimized V_{GS} threshold for lower turn-off losses – Rugged body diode for HB LLC application
Auxiliary power supply	Control ICs	QR/FF flyback CoolSET™	QR CoolSET™ - ICE5QRxx80BG FF CoolSET™ - ICE5xRxxxxXX	– Low standby power, high efficiency and robustness
Flyback	Control ICs	QR flyback	ICE2QS03G	– Forced resonant ZVS control reduces the switching loss – Multilevel protection enables the robust design – Flexible firmware provides more differentiation for OEMs
	High-voltage MOSFETs	Flyback	700 V CoolMOS™ P7	– Optimized for flyback topologies – Best price competitive CoolMOS™ SJ MOSFET family – Lower switching losses versus standard MOSFET – Controlled dV/dt and di/dt for better EMI

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OLED TV power block diagram



OLED TVs improve user experience as they can be thinner, lighter, more flexible and consume less power than LCD/LED TVs.

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PoE

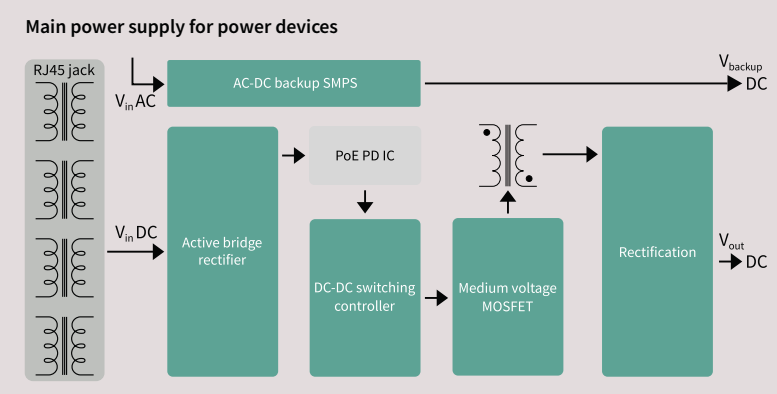
Power over Ethernet (PoE)

Designing reliable and power-efficient PoE power supplies

The latest IEEE 802.3bt standard for Power over Ethernet (PoE) not only increased the available power via PoE but also changed requirements for its power supply. Power sourcing equipment (PSE) now provides up to 100 W per port via a twisted pair of Ethernet cabling, whereas powered devices (PD) have up to 71 W available. Adopting this new PoE standard also largely depends on the capability to increase the power density on the PSE side while maintaining the same form factor as wide load conditions and higher power budgets change requirements. Infineon has long-standing expertise in switched-mode power supply (SMPS) designs and offers a highly reliable, rugged and efficient high-quality MOSFET portfolio for your PoE PSE and PD designs.

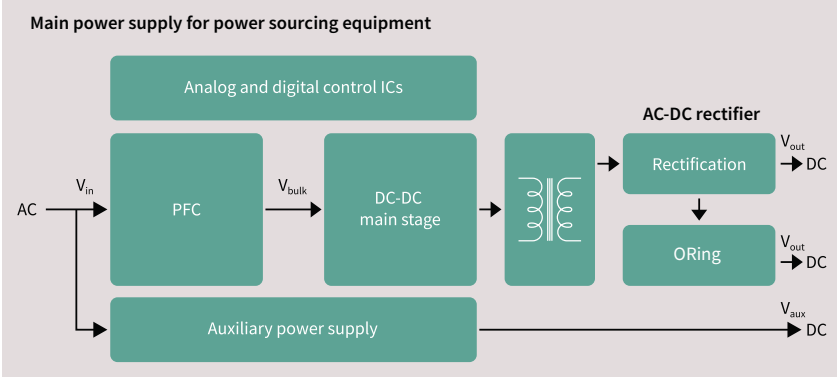
Powered devices

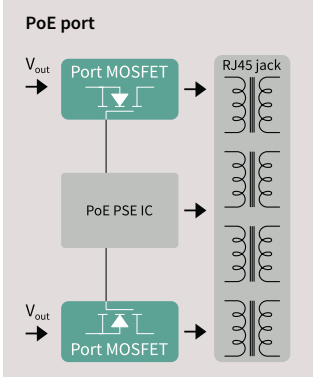
Powered devices (PD) include devices powered by PoE such as wireless access points, 5G small-cell radio units, IP cameras, conference systems, thin clients or public address systems. DC-DC SMPS designs need to be power efficient to maximize the available power for the PD itself with the simultaneous increase of power density. Moreover, PDs need to function reliably in the field, even under potentially rough conditions for a long time.



Power sourcing equipment

Power sourcing equipment (PSE) is any equipment that is able to provide and source power on the twisted pair Ethernet cable, such as PoE switches, PoE extenders and PoE injectors. PSE needs to be highly reliable to prevent device failure and ensure uninterruptible operations of connected power devices. With IEEE 802.3bt PoE, the power demand for PoE switches significantly increases with highest efficiency over wide load conditions. For example, to fully enable a switch with twenty-four 802.3bt compliant PoE ports, up to 2.4 kW of available PoE power budget is required. Fulfilling these requirements makes modifications in AC-DC SMPS designs necessary.





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Recommended product portfolio for power sourcing equipment

Functional block	Product category	Topology	Product family	Benefits
PFC	High-voltage MOSFETs	DCM, CrCM, CCM,	600 V/650 V CoolMOS™ C7 600 V CoolMOS™ P7	– Best FOM $R_{DS(on)}$ x Q_G and $R_{DS(on)}$ x E_{oss} – Lowest $R_{DS(on)}$ per package – Lowest dependency of switching losses from $R_{g,ext}$ – Low turn-off losses, low Q_{oss} and low Q_G
	Control ICs	DCM, CrCM, CCM	ICE3PCS0xG	– Simple external circuitry – High PFC and low THD
	High-voltage GaN	CCM totem-pole	CoolGaN™ GIT HEMT 600 V	– Highest efficiency and highest power density
	GaN driver ICs	CCM totem-pole	EiceDRIVER™ 1EDF5673Fx/1EDS5663H	– Low driving impedance (on-resistance 0.85 Ω source, 0.35 Ω sink) – Input-output propagation delay accuracy: ± 5 ns – Functional and reinforced isolation available
	SiC Schottky diode	DCM, CrCM, CCM	CoolSiC™ Schottky diode 650 V G5/G6	– Low FOM V_F x Q_C
	Silicon power diode	DCM, CrCM, CCM	650 V EC7	– Improved diode softness and humidity rugged. Allows a more reliable design with lower failure rates
DC-DC main stage	High-voltage MOSFETs	Flyback (ACF), HB LLC, FB LLC, ITTF, ZVS	600 V CoolMOS™ P7/C7/CFD7 650 V TRENCHSTOP™ F5	– Best FOM $R_{DS(on)}$ x Q_G and $R_{DS(on)}$ x E_{oss} – Lowest $R_{DS(on)}$ per package – Lowest dependency of switching losses from $R_{g,ext}$, – Low turn-off losses, low Q_{oss} and low Q_G
	Low- and medium-voltage MOSFETs	Isolated DC-DC primary-side PWM	OptiMOS™ 60 V-200 V StrongIRFET™ 60 V-200 V Small-signal MOSFETs 60 V-200 V	– Industry's lowest $R_{DS(on)}$ and power density – Highest system efficiency – Outstanding quality and reliability – Reduces the need for a snubber circuit
	Gate-driver ICs	-	EiceDRIVER™ 1EDNx/1EDi/2EDN7x/2EDLx/2EDFx/2EDSx	– Broadest portfolio in terms of isolation, channels, and protection
	Control ICs	HB LLC PWM-QF PWM-FF	ICE2HS01G ICE2QS03G/ICE5QSBG ICE5ASAG/ICE5GSAG	– High efficiency and low EMI
	High-voltage GaN	Flyback (ACF), HB LLC, FB LLC, ZVS	CoolGaN™ GIT HEMT 600 V	– Highest efficiency and highest power density
	GaN driver ICs	-	EiceDRIVER™ 1EDF5673Fx/1EDS5663H	– Low driving impedance (on-resistance 0.85 Ω source, 0.35 Ω sink) – Input-output propagation delay accuracy: ± 5 ns – Functional and reinforced isolation available
PFC-main stage combo	High-voltage MOSFETs	HB LLC	600 V CoolMOS™ P7	– Low turn-off losses, low Q_{oss}, and low Q_G and thermals – Fast-switching speed for improved efficiency
Synchronous rectification	Low- and medium-voltage MOSFETs	Synchronous rectification	OptiMOS™ 100 V-150 V OptiMOS™ 40 V-120 V StrongIRFET™ 40 V-100 V	– Industry's lowest $R_{DS(on)}$ and power density – Highest system efficiency – Outstanding quality and reliability – Reduces the need for a snubber circuit
	Gate-driver ICs	-	EiceDRIVER™ 1EDNx/1EDi/2EDN7x/2EDLx/2EDFx/2EDSx	– Broadest portfolio in terms of isolation, channels, and protection
ORing	Low- and medium-voltage MOSFETs	ORing MOSFETs	OptiMOS™ 25 V-200 V	– Industry's lowest FOM ($R_{DS(on)}$ x Q_G) – Highest system efficiency and power density
Auxiliary power supply	AC-DC integrated power stage	Fixed-frequency (FF) Quasi-resonant (QR)	CoolSET™ ICE5xRxx80AG CoolSET™ ICE5QRxx80BG	– Quasi-resonant switching operation for high efficiency and low EMI signature – Fixed-frequency switching operation for ease of design
Analog and digital control IC	32-bit XMC™ industrial microcontroller based on Arm® Cortex®-M	-	32-bit XMC1000 32-bit XMC4000	– Flexibility, HR PWM, digital communication – Arm® based standard MCU family and wide family
Port MOSFET	Medium-voltage MOSFETs	-	OptiMOS™ 100 V OptiMOS™ Linear FET StrongIRFET™ 100 V	– Wide SOA and outstanding reliability for PoE ports – Low $R_{DS(on)}$ – Space-saving 3.3 x 3.3 S3O8/PQFN package

Recommended product portfolio for powered devices

Functional block	Product category	Topology	Product family	Benefits
Active bridge rectifier	Medium-voltage MOSFETs	Active bridge rectifier	OptiMOS™ 100 V-150 V StrongIRFET™ 100 V	– Industry's lowest $R_{DS(on)}$ – Highest system efficiency and power density
Synchronous rectification	Low- and medium-voltage MOSFETs	Synchronous rectification	OptiMOS™ 25 V-100 V OptiMOS™ 40 V IR MOSFET™ 20 V-100 V	– Industry's lowest $R_{DS(on)}$ and power density – Highest system efficiency – Outstanding quality and reliability
DC-DC switching stage	Medium-voltage MOSFETs	Flyback (ACF)	OptiMOS™ 100 V-150 V	– Low conduction losses, reduced overshoot – Logic level switching
AC-DC backup SMPS	High-voltage MOSFETs	Flyback (ACF)	600 V to 950 V CoolMOS™ P7	– Fast-switching speed for improved efficiency and thermals – Reduced gate charge for enhanced light load efficiency – Optimized gate-to-source voltage (V_{GS}) threshold for lower turn-off losses
	AC-DC integrated power stage	Fixed-frequency (FF) Quasi-resonant (QR)	CoolSET™ 800 V ICE5GRxx80AG, 800 V ICE5ARxx80BZS, 700 V ICE5ARxx70AG, 700 V ICE5ARxx70BZS CoolSET™ 700 V ICE5QRxx70A(Z) (G), 800 V ICE5QRxx80A(Z)(G), 800 V ICE5QRxx80BG	– Quasi-resonant switching operation for high efficiency and low EMI signature operation for ease of design – Fixed-frequency switching

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For more details on the product, click on the part number, visit infineon.com or contact our product support.

EV charger

Fast/wireless EV-charging

Advanced solutions for DC EV-charging

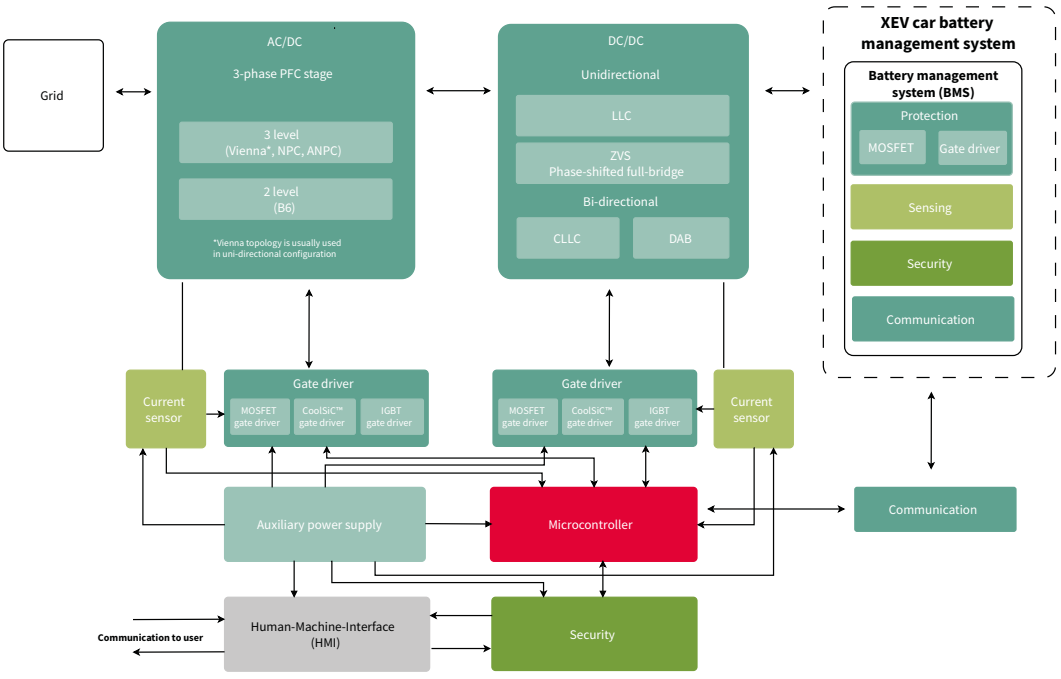
As e-mobility increasingly becomes part of daily life, there is a growing need for more efficient charging solutions. Fast electric vehicle (EV) charging stations equipped with powerful DC chargers are the answer. DC EV-chargers are an attractive choice because they allow much faster charging than the standard AC EV ones that many EV owners have at home. Today, a DC charger with 150 kW can put a 200 km charge on an EV in around 15 minutes. As fast charging and battery technologies continue to evolve and improve in the near future, experts anticipate the charging time to drop even further.

As a market leader and the global front-runner in power electronics, Infineon enables you to bring energy-efficient DC EV-charger designs to life, with our highly efficient components and in-depth technical support. We cover power ranges from kilowatts to megawatts in our broad portfolio of high-quality power semiconductors, microcontrollers, gate drivers, security, safety, and authentication solutions. Our CoolMOS™ and CoolSiC™ MOSFETs, together with EiceDRIVER™ gate drivers, for example, are ideal in a wide range of DC EV-charging designs. Their matchless advantages include high-frequency operation, high power density and reduced switching losses, allowing you to reach high efficiency levels in any battery charging system.

Infineon offering and customer benefits

Infineon offering	Customer benefits
– CoolMOS™ and CoolSiC™ discrete and power module semiconductor solutions	– Highly efficient power conversion for reducing system size by up to 50 percent and reduced cooling efforts – Scalability across various platforms for upgrading system power charger levels on demand
– EiceDRIVER™ gate driver and XMC™ microcontroller	– Safe drive, advanced protection and ease of control
– XENSIV™ magnetic current sensor	– Bidirectional high precision current sensing
– OPTIGA™	– Identity protection against fake devices and protection against the manipulation of the data
– Power supply ICs (LDO, DC-DC) – Communication (CAN transceiver)	– Robust quality and easy to use implementation shorten time to market – and guarantee long operation

Application diagram

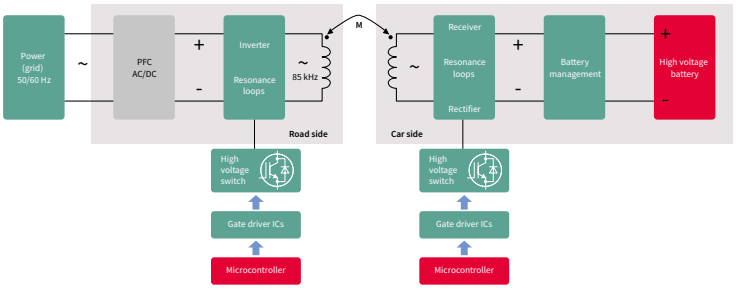


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Wireless EV-charging

Wireless methods for power transfer to charge the batteries of electric vehicles are gaining attention. Several concepts for wireless power transfer systems have been proposed, which in general seek to compensate the significant stray inductances on primary and secondary sides of the magnetic couplers by adaptive resonant methods. At the end of 2013, SAE announced a new standard for inductive charging which defined three power levels at 85 kHz. Infineon's CoolMOS ™ CFD7, C7, and P7 series along with TRENCHSTOP™ 5 IGBTs, CoolSiC™ diodes, and EiceDRIVER™ gate-driver ICs are perfectly suited for driving inductive power transfer systems on the road side which operate inside the 80 to 90 kHz band.



Infineon's solution recommendation for DC EV-charging system blocks

Our solutions have been designed for harsh environmental conditions and long lifetime thanks to Infineon's deep understanding of quality requirements. Take the next step by exploring our product portfolio for DC EV-charging systems.

PFC stage (3-phase input)

Product category	Product family	Product	Additional information
High-voltage MOSFET/ SiC MOSFET/IGBT	650 V CoolMOS™ C7	IPW65R019C7	650 V, 19 mΩ, TO-247
	600 V CoolMOS™ C7	IPW60R017C7	600 V, 17 mΩ, TO-247
	600 V CoolMOS™ P7	IPW60R024P7	600 V, 24 mΩ, TO-247
		IPW60R037P7	600 V, 37 mΩ, TO-247
	CoolSiC™ MOSFET 650 V	IMW65R027M1H	650 V, 27 mΩ, TO-247-3
		IMZ65R027M1H	650 V, 27 mΩ, TO-247-4
		IMWA65R027M1H	650 V, 48 mΩ, TO-247-3
		IMZA65R027M1H	650 V, 48 mΩ, TO-247-4
	650V TRENCHSTOP™ 7 H7	IKZA50N65EH7	650 V, 50 A, TO-247-3/4
		IKZA75N65EH7	650 V, 75 A, TO-247-3/4
	EasyPACK™ hybrid module 650 V HighSpeed IGBT H3	FS3L50R07W2H3F_B11	650 V, 50 A, Easy 2B, three-level
	EasyPACK™ hybrid module with 650 V TRENCHSTOP™ 5 H5	FS3L40R07W2H5F_B11	650 V, 40 A, Easy 2B, three-level
		FS3L40R07W2H5F_B67	650 V, 40 A, Easy 2B, three-level
	EasyPACK™ hybrid module with 650 V TRENCHSTOP™ 5 H5 and CoolSiC™ Schottky diode	F3L200R07W2S5FP_B55	650 V, 200 A, Easy 2B, three-level
		F3L200R07W2S5FP_B56	650 V, 200 A, Easy 2B, three-level
		F3L200R07W2S5F_B11	650 V, 200 A, Easy 2B, three-level
	EasyPACK™ module with 650 V TRENCHSTOP™ 5 S5	F3L200R07W2S5_B11	650 V, 200 A, Easy 2B, three-level
	CoolSiC™ MOSFET 1200 V	IMW120R045M1/IMZ120R045M1	1200 V, 45 mΩ, TO-247-3/4
		MW120R030M1H/IMZ120R030M1H	1200 V, 30 mΩ, TO-247-3/4
	EasyPACK™ modules with CoolSiC™ 1200 V	F3L11MR12W2M1_B74	1200 V, 11 mΩ, Easy 2B, ANPC
		FF6MR12W2M1(P)_B11*	1200 V, 6 mΩ, Easy 2B, half-bridge
		FF8MR12W2M1(P)_B11*	1200 V, 8 mΩ, Easy 2B, half-bridge
		FF11MR12W1M1(P)_B11*	1200 V, 11 mΩ, Easy 1B, half-bridge
		FF23MR12W1M1(P)_B11*	1200 V, 23 mΩ, Easy 1B, half-bridge
SiC diodes	CoolSiC™ Schottky diodes 1200 V G5	IDW15G120C5B/IDWD15G120C5	1200 V, 15 A, TO-247-3/2
		IDW20G120C5B/IDWD20G120C5	1200 V, 20 A, TO-247-3/2
		IDW30G120C5B/IDWD30G120C5	1200 V, 30 A, TO-247-3/2

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For more details on the product, click on the part number, visit infineon.com or contact our product support.

HV DC-DC main stage

Product category	Product family	Product	Additional information
High-voltage MOSFET/ SiC MOSFET	600 V CoolMOS™ CFD7/CSFD	IPW60R018CFD7	600 V, 18 mΩ, TO-247
		IPW60R024CFD7	600 V, 24 mΩ, TO-247
		IPW60R037CSFD	600 V, 37 mΩ, TO-247
		IPW60R040CFD7	600 V, 40 mΩ, TO-247
	600 V CoolMOS™ C7	IPW60R040C7	600 V, 40 mΩ, TO-247
	650 V CoolMOS™ CFD7	IPW65R018CFD7/IPZA65R018CFD7	650 V, 29 mΩ, TO-247-3/4
		IPW65R029CFD7/IPZA65R029CFD7	650 V, 29 mΩ, TO-247-3/4
		IPW65R041CFD7	650 V, 41 mΩ, TO-247
	CoolSiC™ MOSFET 650 V	IMW65R027M1H/IMZA65R027M1H	650 V, 27 mΩ, TO-247-3/4
		IMW65R048M1H/IMZA65R048M1H	650 V, 48 mΩ, TO-247-3/4
	CoolSiC™ MOSFET 1200 V	IMW120R040M1H/IMZA120R040M1H	1200 V, 40 mΩ, TO-247-3/4
		IMW120R030M1H/IMZ120R030M1H	1200 V, 30 mΩ, TO-247-3/4
	EasyPACK™ module with CoolSiC™ 1200 V	FF6MR12W2M1(P)_B11*	1200 V, 6 mΩ, Easy 2B, half-bridge
		FF8MR12W2M1(P)_B11*	1200 V, 8 mΩ, Easy 2B, half-bridge
		FF11MR12W1M1(P)_B11*	1200 V, 11 mΩ, Easy 1B, half-bridge
		FF23MR12W1M1(P)_B11*	1200 V, 23 mΩ, Easy 1B, half-bridge
		FF45MR12W1M1(P)_B11*	1200 V, 45 mΩ, Easy 1B, half-bridge
		F4-45MR12W1M1(P)_B76*	1200 V, 45 mΩ, Easy 1B, four-pack
		F4-23MR12W1M1(P)_B76*	1200 V, 23 mΩ, Easy 1B, four-pack
		F4-15MR12W2M1(P)_B76*	1200 V, 15 mΩ, Easy 2B, four-pack
		F4-11MR12W2M1(P)_B76*	1200 V, 11 mΩ, Easy 2B, four-pack
		FS45MR12W1M1_B11	1200 V, 45 mΩ, Easy 1B, sixpack
SiC diodes output rectification diodes	CoolSiC™ Schottky diode 1200 V G5	IDW15G120C5B/IDWD15G120C5	1200 V, 15 A, TO-247-3/2
		IDW20G120C5B/IDWD20G120C5	1200 V, 20 A, TO-247-3/2
		IDW30G120C5B/IDWD30G120C5	1200 V, 30 A, TO-247-3/2
		IDWD40G120C5	1200 V, 40 A in TO-247-2
		IDW40G120C5B	1200 V, 40 A in TO-247-3
	EasyBRIDGE™ module with CoolSiC™ Schottky diode 1200 V G5	DDB2U20N12W1RF(P)_B11*	1200 V, 20 A, Easy 1B, rectifier bridge
		DDB2U40N12W1RF(P)_B11*	1200 V, 40 A, Easy 1B, rectifier bridge
		DDB2U60N12W1RF(P)_B11*	1200 V, 60 A, Easy 1B, rectifier bridge
	CoolSiC™ Schottky diode 650 V G5	IDW10G65C5	650 V, 10A, TO-247-3
		IDW12G65C5	650 V, 12 A, TO-247
		IDW16G65C5	650 V, 16 A, TO-247
		IDW20G65C5	650 V, 20 A, TO-247
		IDW20G65C5B	650 V, 10 A, TO-247
		IDW30G65C5	650 V, 30 A, TO-247
		IDW32G65C5B	650 V, 32 A, TO-247
		IDW40G65C5	650 V, 40 A, TO-247
		IDW40G65C5B	650 V, 40 A, TO-247
	CoolSiC™ Schottky diode 650 V G6	IDH20G65C6	650 V, 20 A, TO-220
		IDH16G65C6	650 V, 16 A, TO-220 real 2-pin
		IDH12G65C6	650 V, 12 A, TO-220 real 2-pin
		IDH10G65C6	650 V, 10 A, TO-220 real 2-pin
		IDH08G65C6	650 V, 8 A, TO-220 real 2-pin
		IDH06G65C6	650 V, 6 A, TO-220 real 2-pin
		IDH04G65C6	650 V, 4 A, TO-220 real 2-pin
		IDDD16G65C6	650 V, 16 A, DDPAK
		IDDD12G65C6	650 V, 12 A, DDPAK
		IDDD08G65C6	650 V, 8 A, DDPAK

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* For more information on the product, contact our product support
(P): Module with pre-applied thermal interface material (TIM)

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Gate driver and galvanic isolation

Product category	Product family	Product	Additional information
Gate-driver ICs	EiceDRIVER™ (non-isolated)	1EDN family, 2EDN family	– Single-channel/dual-channel, non-isolated low-side gate driver ICs
		1ED4417xN01B	– Single-channel with fast, accurate (± 5%), integrated overcurrent protection (OCP)
		2ED24427N01F	– Dual-channel, 10 A low-side gate driver in DSO-8 package with power-pad – Integrated UVLO and enable (EN) function – Suitable for high frequency, high power operation w/BOM savings
	EiceDRIVER™ level-shift gate driver	2ED2184S06F 2ED2110S06M	– 650 V half-bridge gate driver for IGBTs and MOSFETs with SOI technology – Integrated bootstrap diode – High-frequency switching (500 kHz) and superior – VS transient voltage immunity
		IRS2186S, IRS21864S	– 600 V, 4 A high- and low-side gate driver
		IR2114SS, IR2214SS	– 600 V/1200 V half-bridge gate driver with DESAT, 2L SRC, soft-SD
		IR2213S	– 1200 V high- and low-side gate driver
	EiceDRIVER™ 2EDi/S isolated gate driver	2EDF7175F, 2EDF7275F	– Dual-channel functional isolated (1,5 kV)
		2EDS8265H, 2EDS8165H	– Dual-channel reinforced (safe) isolated (6 kV)
	EiceDRIVER™ compact isolated gate driver	1EDI20I12MF, 1EDI20N12AF, 1EDI60N12AF, 1EDI60I12AF	– 1200 V single-channel, cost-effective functional isolated driver with Miller clamp/separate output
		1ED3122MU12H, 1ED-3124MU12H, 1ED3125MU12F, 1ED3124MU12F	– 5.7 kV/3 kV single-channel isolated driver with Miller clamp or separate output, UL 1577 certification
	EiceDRIVER™ enhanced isolated gate driver	1ED3491MU12M, 1ED3890MU12M	– 5.7 kV single-channel isolated driver with analog/digital configurability, DESAT, Miller clamp, and Soft-off, UL 1577 certification
		1ED3321MC12N	– 1200 V, single-/dual-channel, functional isolated driver with DESAT and Miller clamp

Current sensor

Product category	Product family	Product	Additional information
Magnetic current sensor	XENSIV™	TLI4971-A120T5-E0001	–
		TLI4971-A120T5-U-E0001	UL certified

Microcontroller

Product category	Product family	Product	Additional information
Microcontroller	XMC™	XMC1400 family (PFC stage)	Arm® Cortex® M0 based microcontroller
		XMC4500/XMC4700 (HV DC-DC/PWM stage)	Arm® Cortex® M4F based microcontroller
	AURIX™	TC26X/TC27X TC36X/TC37X	TriCore™ AURIX™ 32-bit microcontroller HSM (hardware secure module) full EVITA compliance

Internal power supply

Product category	Product family	Product	Additional information
AC/DC power conversion	Fixed-frequency/ quasi-resonant CoolSET™	ICE5QR0680BG	800 V, 42 W, 710 mΩ, PG-DSO-12
		ICE5AR0680AG	800 V, 42 W, 710 mΩ, PG-DSO-12
	Quasi-resonant CoolSET™ PWM controller	ICE5QSBG and IPP80R360P7	800 V, 360 mΩ, TO-220
		ICE5QSBG and IPA95R450P7	950 V, 450 mΩ , TO-220 FP
	CoolMOS™ SJ MOSFETs	IPN95R1K2P7	950 V, 450 mΩ, SOT-223
		IPN80R1K4P7	800 V, 1.4 Ω, SOT-223
DC-DC power conversion	Low power LDOs	TLS805/TLS810/TLS820	50 mA/100 mA/200 mA ultralow quiescent current linear voltage regulator with a wide input voltage range
		TLS202	150 mA LDO in a small-footprint package
		TLS203/TLS205	300/500 mA low noise LDO
		TLS850	500 mA wide input voltage LDO
	Buck converter	TLE8366E	1.9 A DC-DC buck converter
	Safety PMIC for AURIX™ MCU	TLF35584/TLF35585	Multichannel power supply IC, optimized for AURIX™ MCU, up to ASIL-D rated

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Authentication and encryption

As embedded systems are increasingly becoming targets of attackers, Infineon offers OPTIGA™ - a turnkey security solution.

Product category	Product family	Product	Additional information
Security	OPTIGA™ Trust B	SLE952500000XTSA1	Asymmetric ECC authentication with individual certificate key pair and an extended temperature range of -40 to 110°C
	OPTIGA™ Trust TPM	SLB9670XQ2.0	Fully TCG TPM 2.0 standard compliant module with the SPI interface
	SLC37	SLC37ESA2M0, SLI97CSIFX1M00PE	New class of performance and security cryptocontroller adhering to CC EAL6+ high targeted and EMVCo targeted certifications for payment and eSIM applications

Communication

Product category	Product family	Product	Additional information
CAN transceiver	Automotive CAN transceiver	TLE9350, TLE9351, TLE9252	High-speed automotive CAN transceiver with 5 Mbps

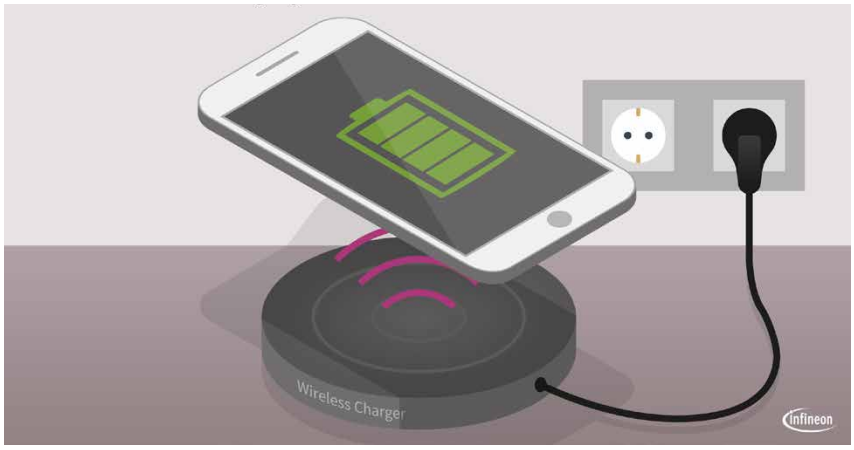
Wireless charging

Wireless charging

Cost-effective and secure system solutions for consumer, industrial and automotive applications

Infineon offers a broad portfolio of efficient, high-quality products and solutions to serve the key requirements of the dominant market standards: inductive (Qi (WLC)) and resonant (AirFuel) in consumer, industrial and automotive.

Overcome common design challenges with Infineon



- Compatibility issues
- Safety issues
- Smart heat management
- Increasing efficiency and reducing charging times
- Preventing device and battery damage

Applications that benefit from wireless charging

Mobile phone · Wearables · Notebook · Tablet · Power tools · Multicopter · Service robots · Electric toys · Medical · In cabin charging · Small home appliance · Smart home

Infineon's key enabling products for wireless charging

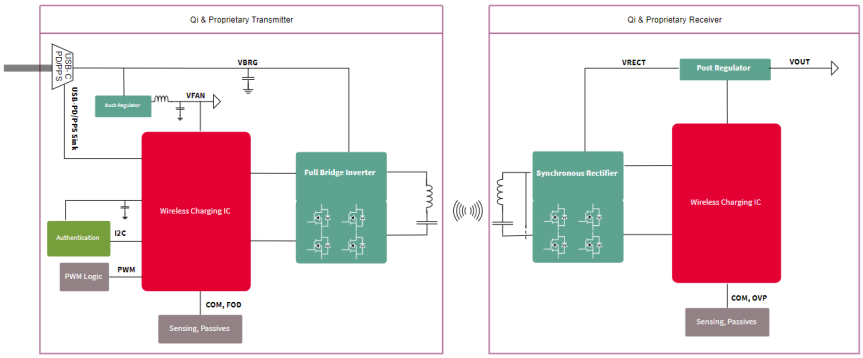
- Wireless charging ICs (WLC)
- Power MOSFETs – OptiMOS™, StrongIRFET™ and CoolMOS™
- P-channel and N-channel small signal power MOSFETs
- Gate-driver ICs – EiceDRIVER™: MOTIX™ 3-phase gate-driver IC
- Authentication - OPTIGA™ Trust Automotive, OPTIGA™ trust auto
- XMC™, XMC™-SC (including software IP), TRAVEO™ MCU Automotive, AURIX ™, PSoC™
- USB-C and power delivery (PD): EZ-PD™ CCG3PA and EZ-PD™ PAG1
- PWM/flyback controllers and integrated power stage ICs – CoolSET™
- GaN GIT HEMT - CoolGaN™
- Voltage and buck regulators for component and bridge supply
- Reverse Conducting IGBTs R5/R6 - 650 V

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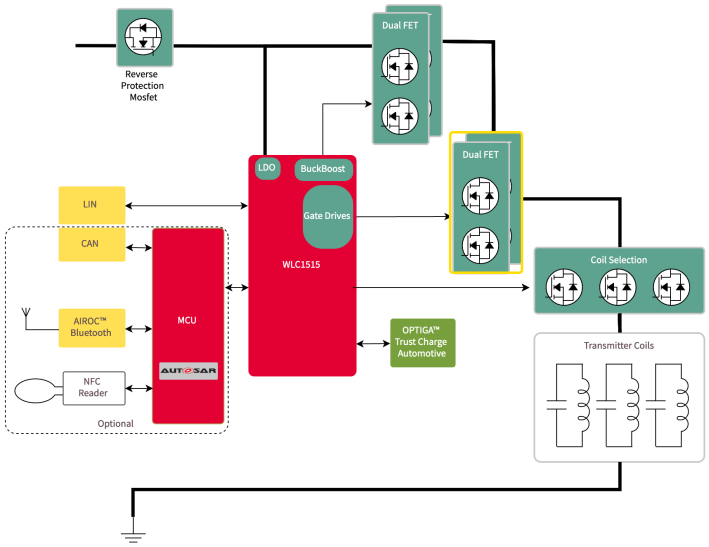
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Inductive wireless charging for consumer and industrial

Example: 50 W inductive system solution



Inductive wireless charging for automotive



Key components for inductive designs for consumer, industrial and automotive

Wireless charging product portfolio for inductive

Sub-application	Products	
Wireless charging IC	WLC1115-68LQXQ transmitter IC WLC1150-68LQXQ transmitter IC WLC1250 receiver IC** WLC1515-68LQXQ transmitter IC for automotive	
MOSFETs*	30 V	BSC0996NS, BSC0993ND, BSZ0909NS, BSZ0909ND, BSZ0910ND, IRFHS8342
	40 V	BSZ097N04LS, BSZ063N4LS6, BSC035N04LSG, BSC072N04LD
	60 V	BSZ099N06LS5, BSZ065N06LS5, BSZ040N06LS5
	80 V	IRL80HS120
	100 V	IRL100HS121, BSZ146N10LS5, BSZ096N10LS5
Driver IC	WCDSC006, PX3519, IRS2301S, 1EDN7512B, 1ED44173N01B, 1EDI60N12AF, 2EDN7524G, IRS2007M, 2ED2182S06F, 6EDL7141	
Microcontroller	XMC™, AURIX™ XMC™-SC (including software IP), PSoC™ family 4, TRAVEO™ (automotive)	
Voltage regulators	TLE4296G V33, TLF50211EL, TLE8366EV	
MCU + BLE controller	PSoC™ 4 Bluetooth® Low Energy (Bluetooth® Smart): CY8C4248LQI-BL573 (QFN)	
AIROC™ Bluetooth® LE and Bluetooth®	CYW20719B2 / CYW20721B2	
USB-C and power delivery (PD)	EZ-PD™ PAG1, EZ-PD™ CCG3PA, EZ-PD™ CCG3, EZ-PD™ PMG1, EZ-PD™ barrel connector replacement (BCR)	
Small-signal MOSFETs	See the portfolio on our webpage small-signal MOSFETs	
Authentication	SLS32AIA020Ux – OPTIGA™ Trust Charge (USON10 3x3 package) OPTIGA™ Trust Charge automotive	
Reverse conducting IGBTs R5/R6 - 650 V	Package TO-247 IHW30N65RS (30 A), IHW40N65R5 (40 A), IHW50N65R5 (50 A)	
Reference designs and kits	REF_WLC_TX15W_C1 – 15 W Qi power transmitter solution REF_WLC_TX50W_N1 – 50 W transmitter solution REF_WLCAUTO_TX15W_C1	

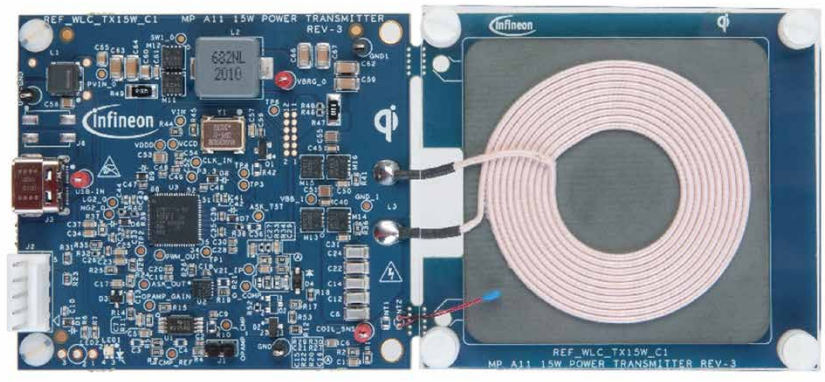
www.infineon.com/wirelesscharging

* Explore more MOSFET offerings at our webpage
** Coming soon

For more details on the product, click on the part number, visit infineon.com or contact our product support.

15 W Qi transmitter solution with Infineon's wireless charging IC WLC1115

The REF_WLC_TX15W_C1 MP A11 power transmitter solution board, is an highly integrated, Qi v1.3 compliant extended power profile (EPP) transmitter design. This reference board is powered using a USB PD 3.0-compliant USB-C power adapter and can support DC connector input of 9 V - 20 V through firmware option. Combined with the OptiMOS™ power MOSFETs and OPTIGA™ Trust Charge, this solution offers a highly efficient and secure wireless charging platform. The solution board supports firmware upgrades using USB-C or I²C interface along with the included dongle and the wireless charging configuration graphical user interface (GUI). There are additional options provided for firmware updates using serial wire debug (SWD) while using the ModusToolBox™ and programmer.



Key components

- Wireless charging IC – WLC1115-68LQXQ
- OptiMOS™ power MOSFETs – BSZ0910LS
- OPTIGA™ Trust Charge – SLS32AIA020Ux
- Small Signal MOSFETs



Features and benefits

Key features	Key benefits
– Qi v1.3 compliant transmitter	– Compliant Qi stack with library support
– UDB-PD/legacy protocol input >9 V_{DC}	– Programmable solution for evolving Qi standard
– Peak system efficiency >83%	– Zero voltage switching for high efficiency
– Typical active charging area ±10 mm	– Configurable gate drivers for EMC
– Serial communication ports: I²C, UART	– Configurable thresholds for FOD, protection
– Programming, EXT clock option	
– Foreign object detection with LEDs	
– Configurable using wireless charging GUI	

Explore more details:
www.infineon.com/REF_WLC_TX15W_C1

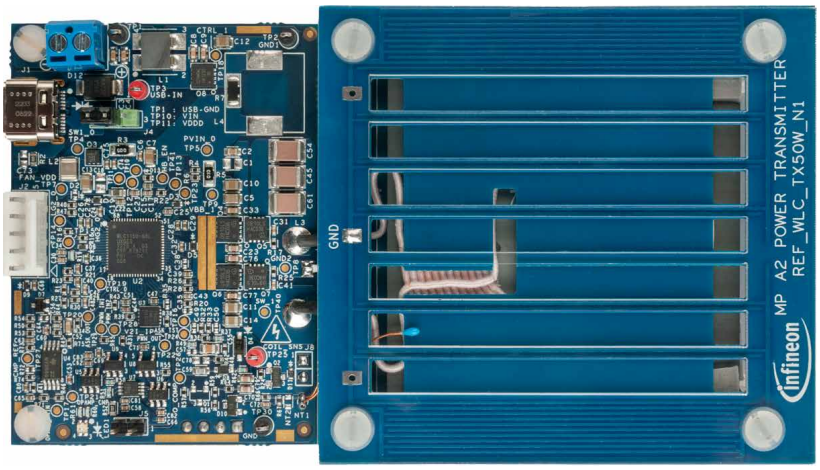
A **new reference design supporting Qi2 MPP** protocol is coming soon:
learn more here!

www.infineon.com/wirelesscharging

For more details on the product, click on the part number, visit infineon.com or contact our product support.

50 W transmitter solution with Infineon's wireless charging IC WLC1150

The REF_WLC_TX_50W_N1 transmitter solution board using WLC1150 enables high performance and low-cost wireless charging solutions for various applications up to 50 W output power. The configurable WLC1150 solution, with Infineon's OptiMOS™ power devices, offers highly efficient charging with flexible thermal management options. Combined with Infineon's USB-C charger solutions, it offers a complete product package that can help meet stringent regulatory and compliance requirements. The WLC1150 uses Infineon high power proprietary protocol to deliver 50 W power and is also compatible to Qi 1.3.x specification with extended power profile (EPP), basic power profile (BPP) and proprietary power delivery extension (PPDE). The controller is offered with both configuration utility and ModusToolbox™ software options to develop your wireless charging solutions for proprietary charging protocols as well as Qi latest specification.



Key components

- Wireless charging IC – WLC1150-68LQXQ
- OptiMOS™ power MOSFETs – BSZ0910LS
- OPTIGA™ Trust Charge – SLS32AIA020Ux (optional)
- Small signal MOSFETs



Features and benefits

Key features	Key benefits
– High power proprietary charging up to 50 W	– 50 W transmitter with software included
– Qi v1.3.x compliant transmitter (MP-A2 and similar)	– Adaptive foreign object detection (FOD)
– Integrated USB-PD/PPS sink functionality	– Adjustable protection – OVP, OCP, OTP
– Integrated DC/DC controller for fan that enables thermal management	– Graphical utility tool for ease of configuration, debug without code
– Integrated gate drivers for buck-boost, inverter	– ModusToolbox™ Software Library for Infineon Proprietary, Qi Stack
– Input voltage range: 4.5 V - 24 V	
– Communication ports: I²C, UART	
– Temperature range: -40°C - 105°C	
– Packing type: tray	

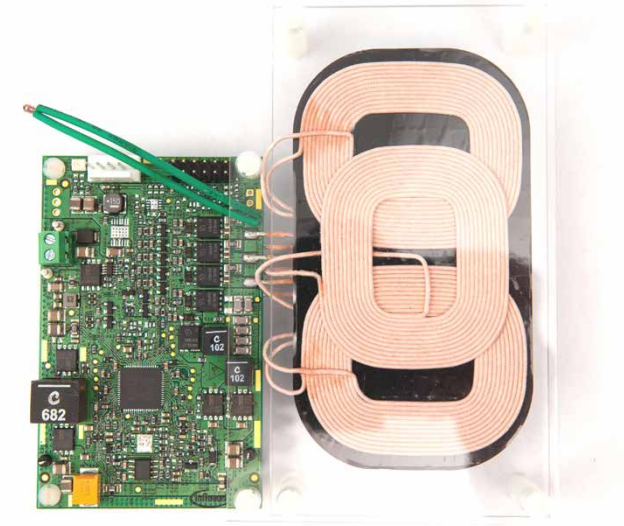
Explore more details:
www.infineon.com/ref_wlc_tx50w_n1

www.infineon.com/wirelesscharging

For more details on the product, click on the part number, visit infineon.com or contact our product support.

15 W automotive transmitter solution with Infineon's wireless charging IC WLC1515

The REF_WLCAUTO_TX15W_C1 MP A13 power transmitter solution board using WLC1515 is a highly integrated, Qi v1.3 compliant Extended Power Profile (EPP) transmitter design ideal as a scalable platform for automotive in-cabin charger. It can also support basic power profile (BPP), Proprietary power delivery Extensions (PPDE) and custom protocols. This reference board operates with variable automotive battery input voltage of 9 V-18 V, supporting reverse polarity protection and auto transients. Its integrated buck-boost controller enables low EMI fixed frequency mode of operation. On chip LIN or serial communication are used to interface with the Host system for additional functionality. With an optional external automotive MCU such as Traveo™ II, it is possible to add AUTOSAR, CAN and NFC interface functionality. The solution board supports firmware updates using Serial Wire Debug (SWD) while using the ModusToolbox™ and programmer.



Key components

- Wireless charging IC - WLC1515-68LDXS
- OptiMOS™ automotive MOSFETs
- OPTIGA™ Trust Charge auto

Features and benefits

Key features	Key benefits
– Integrated Qi controller	– Qi stack with library support
– Input voltage range: 4.5 V – 24 V (40 V tolerant)	– Fixed frequency operation for low EMI
– Output power: 15 W Qi EPP free position	– Configurable gate drivers for EMC
– Programmable high-side current sense amplifier	– Configurable thresholds for FOD, protections
– Gate drivers for full-bridge inverter	– ModusToolbox™ code examples
– Coil selection control	
– Integrated buck-boost controller	
– 150 kHz –600 kHz switching frequency for synchronous buck-boost	
– Integrated gate drivers with slew rate and dithering controls	
– Comprehensive protection: UVLO, OVP, OCP and OTP	
– LIN and Host Interface	
– In-built LIN interface to LIN transceiver	
– Interface for external MCU over I2C	
– Configurable firmware registers	

www.infineon.com/wirelesscharging

For more details on the product, click on the part number, visit infineon.com or contact our product support.

Key components for resonant designs for consumer and industrial

Wireless charging product portfolio for resonant

Sub-application	Products	
MOSFETs**	30 V	IRLHS6376PBF, BSZ0909ND, BSZ0910ND, IRLML0030PBF
	40 V	IRLML0040
	60 V	IRLML0060
	80 V	IRL80HS120
	100 V	IRL100HS121
	150 V	BSZ900N15NS3, BSZ520N15NS3
	200 V	BSZ900N20NS3, BSZ22DN20NS3, BSZ12DN20NS3
	250 V	BSZ42DN25NS3
Driver ICs	EiceDRIVER™ 2EDL71*, 1EDN7512, 2EDN7524, 2ED2182S06F, 2ED24427N01F, 1EDI60N12AF, 1ED44173N01B	
	EiceDRIVER™ for CoolGaN™ GIT HEMTs 1EDS5663H, 1EDF5673F, 1EDF5673K	
GaN e-mode HEMTs	CoolGaN™ GIT HEMT 600 V IGT60R190D1 (HDSOF-8-3)	
Microcontroller	XMC™, AURIX™ MCU and wireless power controller XMC™-SC (including software IP), PSoC™ family 4	
MCU + BLE Controller	PSoC™ 4 Bluetooth® Low Energy (Bluetooth® Smart): CY8C4248LQI-BL573 (QFN)	
AIROC™ Bluetooth® LE & Bluetooth®	CYW20719B2 / CYW20721B2	
USB-C and power delivery (PD)	EZ-PD™ PAG1, EZ-PD™ CCG3PA, EZ-PD™ CCG3, EZ-PD™ PMG1, EZ-PD™ barrel connector replacement (BCR)	
Voltage regulators	TLE4296G V33, TLE4296G V50, TLE4296-2G V33, TLE4296-2G V50, TLF50211EL, TLE8366EV, TLE8366EV33, TLE8366EV50	
Small signal MOSFETs	See the portfolio on our webpage small-signal MOSFETs	

Are you searching for a turnkey solution for your application?



Wireless power becomes an important part of our connected lifestyles. Infineon puts an emphasis on the development of the next-generation technologies and standards that allow easy charging without the limitation of wires. What started out with phones will quickly evolve - applications such as tablets, laptops, robots, drones, power tools, handheld gaming devices, medical devices, infrastructure, and applications around Industry 4.0 will have wireless charging included. For more information, please get in contact with us via www.infineon.com/support to get your customized system solution.

www.infineon.com/wirelesscharging

*coming soon
** Explore more MOSFET offerings at our webpage.

For more details on the product, click on the part number, visit infineon.com or contact our product support.


USB PD charger

USB-C chargers and adapters

Outstanding solution offering for mobile chargers and laptop adapters

USB-C power delivery (USB-PD) has become the standardized solution for unified. Furthermore, from smartphones to laptops, smart speakers to TVs - USB-PD is now the go-to power supply and the enabler of fast charging. USB-C power delivery (USB-PD) has revolutionized the way we charge our mobile devices, providing a unified and speedy charging experience. The implementation of USB-C technology has significantly enhanced the convenience for end-users. In addition, with the incorporation of GaN HEMTs and higher switching frequencies, it is now possible to produce chargers and adapters that are both compact and lightweight.

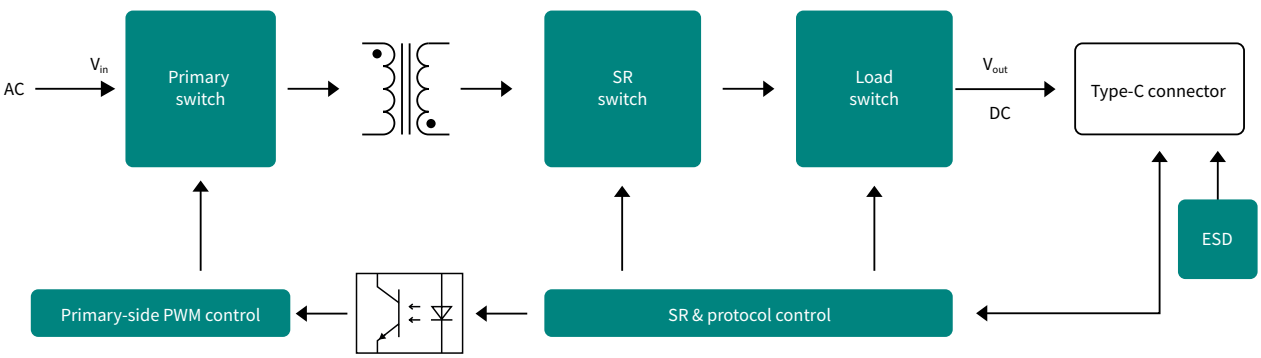
Infineon offers a leading portfolio of power controllers, flexible and programmable USB Type-C controllers, high-voltage CoolMOS™ superjunction MOSFETs, medium- and low-voltage OptiMOS™ MOSFETs as well as CoolGaN™ discretes and integrated power stages.

Our USB-C reference and demo designs are based on quasi-resonant (QR), zero-voltage switching (ZVS) and hybrid flyback (HFB) operation for different power levels and power density requirements and for single- and dual-output chargers.

Features and benefits

Key features	Key benefits
– Ready-to-use reference designs – Comprehensive offering of power and protocol controllers, high- and low-voltage switches and TVS diodes allow customers to source all components from a single supplier – Highly integrated solutions	– Ease-of-use and reduced complexity
– Smallest form factor, low $R_{DS(on)}$ and low parasitic capacitances, Kelvin-source engaged ThinPAK and PQFN packages – Digital controllers enabling high-efficiency designs	– High-efficiency designs
– Fully programmable USB-C PD port controllers – Configurability and upgradability	– Differentiation and short time to market
– Infineon has the largest installed in-house power semiconductor capacity with 12” wafer production for discretes for maximum supply security – Dedicated supply chain programs to secure capacity and enable flexibility to demand fluctuations	– Secured supply chain

Application diagram



www.infineon.com/USB-PD

For more details on the product, click on the part number, visit infineon.com or contact our product support.

Recommended products

Functional block	Product category	Topology	Product family	Benefits
Flyback converter	High-voltage power devices (Si MOSFETs and GaN HEMTs)	Quasi-resonant flyback (QR)	600 V/700 V/800 V CoolMOS™ P7	– Fast switching speed for improved efficiency and thermals – Reduced gate charge for enhanced light-load efficiency – Optimized gate-to-source voltage (VGS) threshold for lower turn-off losses
			600 V/650 V CoolMOS™ C7	– High switching performance enabling highest efficiency – Ease of use level high – Optimized devices for highest efficiency switched-mode power supplies
		Active-clamp flyback (ACF) Hybrid flyback (HFB)	600 V CoolMOS™ PFD7	– Robustness and reliability with integrated robust fast body diode and up to 2 kV ESD protection – Reduced gate charge for enhanced light-load efficiency – Lower hysteresis loss
		Flyback (QR, ZVS, ACF, HFB)	CoolGaN™ GIT HEMTs 600 V	– Highest efficiency – Highest power density
	Controller	Hybrid flyback controller	XDPS2201	– Asymmetrical half-bridge ZVS control to maximize efficiency – Supports a wide range of configurable parameters – Supports ultra-high power density (20 W/in3) design
		QR flyback controller	EZ-PD™ PAG1P/S	– Secondary-side-controlled flyback solution – Dual-chip flyback solution with integrated SR+PD controller
	Gate-driver IC	Active-clamp flyback (ACF)	IRS25752L	– High-side gate driver enables active clamp mode of operation – Cost-effective, 600 V, single-channel driver in SOT23 package
			IRS21271S	– High-side gate driver enables active clamp mode of operation – 600 V, single-channel driver with over-current protection (OCP)
PFC DC-DC	High-voltage power devices (Si MOSFETs and GaN HEMTs)	DCM PFC	600 V CoolMOS™ P7	– Fast switching speed for improved efficiency – Reduced gate charge for enhanced light load efficiency – Optimized gate-to-source voltage (VGS) threshold for lower turn-off losses
		DCM/CCM PFC	CoolGaN™ GIT HEMTs 600 V	– Highest efficiency contribution via less parasitic parameter – Space saving with SMD smaller package
	Boost diode	DCM/PFC	650 V Rapid 1 diodes	– Low conduction losses
	Controller	PFC/LLC combo	IDP2308	– Digital multimode PFC and LLC combined controller with a floating – High-side driver and a startup cell – Comprehensive and configurable protection features – Wide set of configurable parameters
	Controller	PFC/HFB combo	XDPS2221	– Digital multimode PFC and HFB combined controller – High-side driver and a 600 V startup cell – Integrated gate drivers supporting GaN switches – Configurability for protections and system performance
	High-voltage power devices (Si MOSFETs and GaN HEMTs)	HB LLC	600 V CoolMOS™ P7	– Fast switching speed for improved efficiency and thermals – Reduced gate charge for enhanced light load efficiency – Optimized gate-to-source voltage (VGS) threshold for lower turn-off losses
			CoolGaN™ IPS 600 V	– Highest efficiency and highest power density – Isolated gate driver integrated
	Gate-driver IC	HB LLC	EiceDRIVER™ Compact: 1EDI60N12AF, 1ED3124MU12F	– Isolated gate driver, up to 14 A, 100 ns propagation delay
Synchronous rectifier	Low-voltage MOSFETs	Synchronous rectification	OptiMOS™ PD 60-150 V	– Low conduction losses, reduced overshoot – Adapter-oriented synchronous rectification MOSFETs
	Control ICs	Synchronous rectification	EZ-PD™ PAG1S	– Integration of synchronous rectification and PD controller – Configurable protection, like OTP, OCP, OVP, UVP, short circuit, etc.
Protocol controller	USB-C ICs	Protocol controller	EZ-PD™ PAG1S	– Supports USB PD 2.0, PD 3.0 with PPS, QC4+, QC 4.0, QC 3.0,QC 2.0, Samsung AFC, Apple charging, and BC v1.2 charging protocols
			EZ-PD™ CCG3PA-NFET	– Supports USB PD 3.0 with Programmable Power Supply (PPS) – Independent constant current (CC) and constant voltage (CV) modes – Configurable OVP, OCP, and OTP – Integrates NFET gate driver to drive the load switch 64 kB flash memory
			EZ-PD™ CCG3PA	– Supports USB PD 3.0 with PPS, QC4, Apple 2.4 A charging, AFC, – BC1.2 etc. – Supports 1C and 1A port – 64 kB flash memory
		Multi-port controller	EZ-PD™ CCG7DC multi-port controller	– Integrates 2 USB-C PD controllers + 2 DC-DC controllers in one single chip – Supports latest USB-C PD v3.0 with PPS, QC4+, QC4.0, Samsung AFC, Apple 2.4A, Cv1.2 – Configurable switching frequency of 150 kHz - 600 kHz – Arm® Cortex®-M0 with flash allows users to implement custom features
Connector	ESD	ESD protection	Multi-purpose diodes for ESD protection	– Small packaging to support minimum board space consumption – High linearity - reducing harmonic generation/enabling suppression EMC problems – Exceptional quality and reliability

www.infineon.com/USB-PD

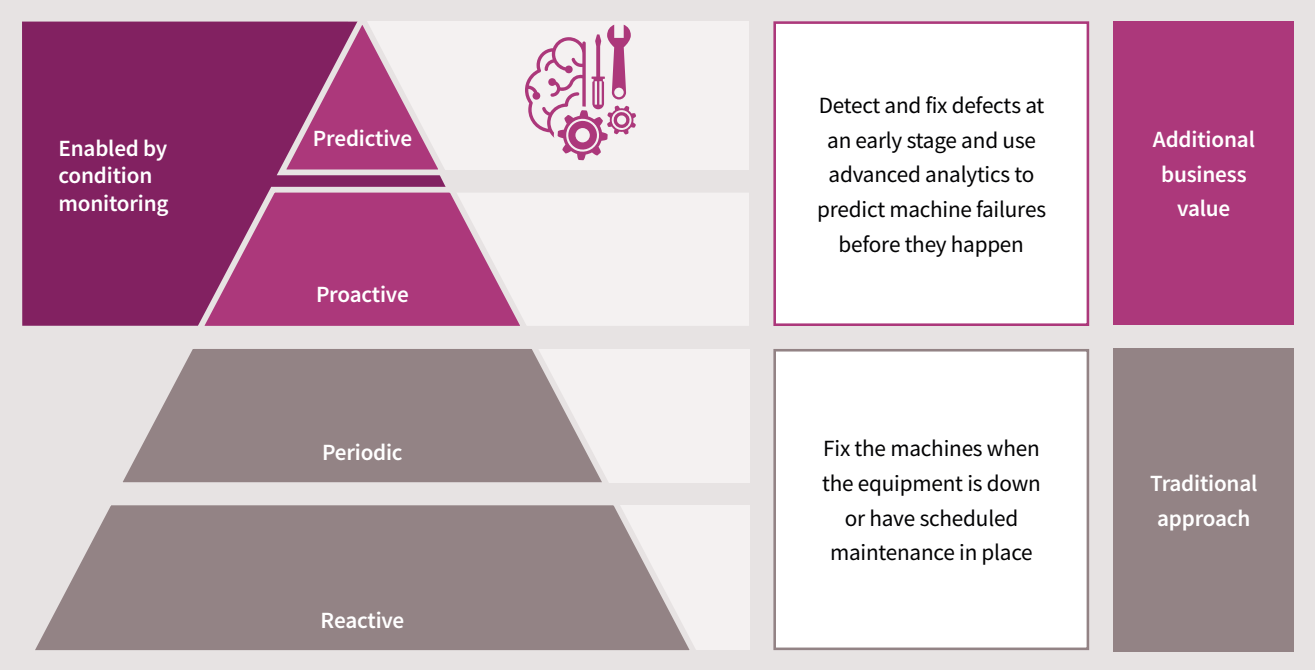
For more details on the product, click on the part number, visit infineon.com or contact our product support.

Predictive maintenance

Condition monitoring and predictive maintenance

Accurate and reliable data collection and processing for condition monitoring and predictive maintenance

Smart Building and Industry 4.0 must answer the needs of our connected business and optimize its operations to anticipate maintenance before it becomes urgent and critical. This enables an innovative maintenance strategy that predicts system failures and aims to prevent them. Various parameters are constantly monitored, and the collected data is analyzed to make the new scheme possible. As soon as function anomalies become apparent, maintenance or repairs can be planned around the regular operation of intelligent buildings, infrastructure, or industry-critical equipment, reducing downtime and costs. Infineon's sensors, microcontrollers, connectivity, security and memory solutions offer all you need to leverage predictive maintenance's full potential. Thanks to our partner network, you can use advanced analytics and artificial intelligence to predict machine failures before they happen or to anticipate maintenance needs before they become urgent – on the Edge or in the Cloud.

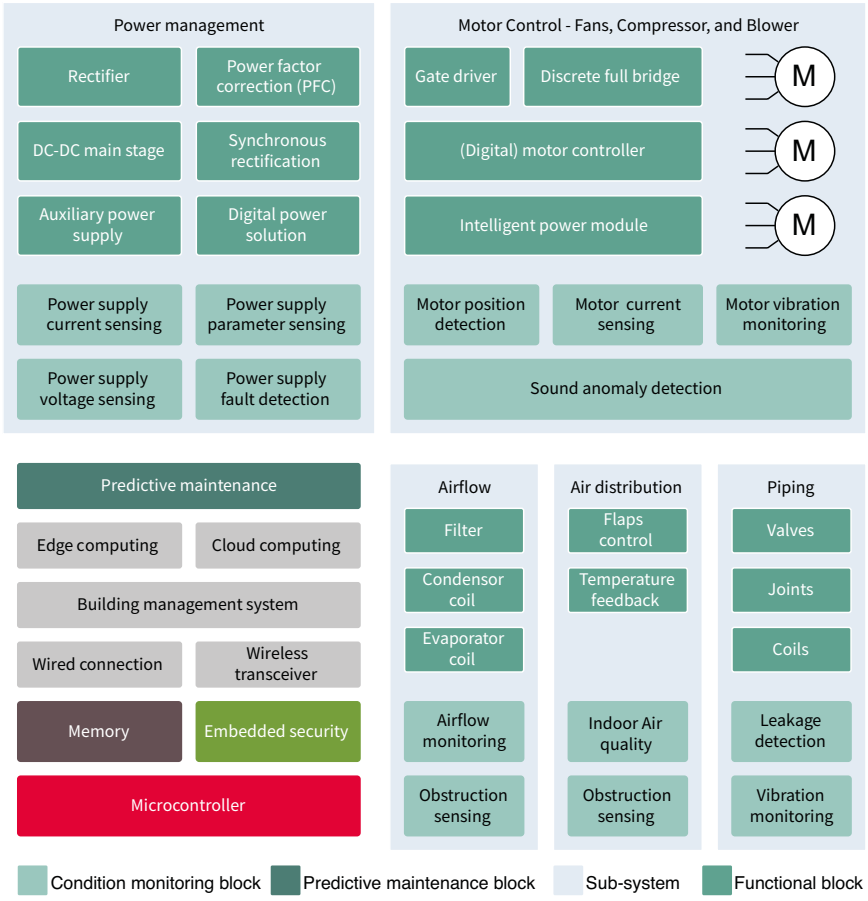


Benefits		
	- Reduced downtime	- Increased transparency over building operations
	- Reduced maintenance costs	- Opportunity for value-adding services (e.g. maintenance)

www.infineon.com/predictivemaintenance

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Application diagram



XENSIV™ Predictive Maintenance Evaluation Kit

Our latest XENSIV™ Predictive Maintenance Evaluation Kit* lets you quickly and efficiently evaluate various condition monitoring and predictive maintenance use cases. This kit utilizes Infineon's broad XENSIV™ sensor portfolio along with the FreeRTOS XMC4700 Arm® Cortex®-M4F XMC™ qualified device to monitor the condition of most crucial elements such as filters, compressors, motors, or fans, for example, in HVAC. Based on the collected sensor data, e.g., of current consumption, airflow, and many other upcoming systems combined with the power of algorithms and deep learning techniques, failures can be detected.

Features and benefits

Key features	Key benefits
– Extension for the XMC4700 XMC™ Relax Kit	– Current monitoring (up to 120 A), e.g. for overall current anomaly detection
– Full software support of the FreeRTOS kernel	– Vibration and position sensing, e.g., for drives and compressor
– AWS Cloud integration	– Airflow and pressure measurement, e.g., for filters
– Full AWS CloudFormation template and software application stack	– Open/closed lid detection, e.g., for detecting status of service lids
– On-board Wi-Fi and ethernet connectivity	– Hall speed sensors, e.g., for blocked fan and fan speed monitoring
– mikroBUS™ ClickBoard interface for extending connectivity	– Sound anomaly detection, e.g., for gears and joints
– XENSIV™ sensor satellite boards with a broad range of sensors for data collection and condition monitoring	
– Multi-account registration support with OPTIGA™ Trust M	

www.infineon.com/predictivemaintenance

For more details on the product, click on the part number, visit infineon.com or contact our product support.

Recommended products portfolio

Functional block	Product category	Product family	Benefits
Sensing	XENSIV™ sensors	XENSIV™ DPS368 pressure sensor	Ultrasmall waterproof pressure sensor, environmentally protected against water (IPx8), dust and humidity, ideal for harsh environments
		XENSIV™ TLI4971 magnetic current sensor	Magnetic current sensor for AC and DC measurements in industrial applications with an analog interface and dual fast over-current detection outputs
		XENSIV™ TLI493D-W2BW 3D magnetic sensor	Small WLB-5 package with low current consumption of 7 nA in a power-down mode for compact system designs
		XENSIV™ IM69D128S MEMS microphone	Ultra-low power digital XENSIV™ MEMS microphone for building automation and IoT devices with high sensitivity
		XENSIV™ TLE4997E Hall sensor	Hall sensor for highly accurate rotation and position detection, ideally suited to analog-to-digital (A/D) conversion with the supply voltage as a reference
		XENSIV™ TLE4964-3M Hall effect magnetic switch	Hall effect switch dedicated for position detection applications highly accurate applications with superior supply voltage capability
		XENSIV™ TLI4966G double Hall switch	Double Hall switch with two output pins for industrial applications with a rotating pole wheel
Security	OPTIGA™	OPTIGA™ Trust M	A high-end security solution that provides an anchor of trust for connecting IoT devices to the cloud
		OPTIGA™ Trust M Express	Offered with CIRRENT™ Cloud ID – Infineon's cloud service automates IoT device certificate registration and device provisioning in the product cloud at scale with zero manual intervention
Control	XMC™ microcontrollers	XMC4800 microcontroller	32-bit first-ever EtherCAT® node on an ARM® Cortex®-M microcontroller with on-chip flash and analog/mixed-signal capabilities
		XMC4700 microcontroller	32-bit optimized solution to meet the performance challenges of today's embedded control applications, ideal for motor control and SMPS
	PSoC™ microcontrollers	PSoC™ 6 series	Dual-core Arm® Cortex®-M4 and Cortex-M0+ architecture with ultra-low power consumption purpose-built for IoT applications
		PSoC™ 4 series	32-bit microcontroller tackling some of the complex portions of embedded system design, making it easier and more flexible
Connectivity	Wireless connectivity	AIROC™ Wi-Fi + Bluetooth® Combos	IEEE 802.11a/b/g/n/ac/ax Wi-Fi and Bluetooth® 5.2 in a single-chip for small-factor IoT designs

www.infineon.com/predictivemaintenance

For more details on the product, click on the part number, visit infineon.com or contact our product support.

Charger

SMPS

Battery chargers for mobile appliances

Infineon's solutions for battery chargers are designed to fit the large variety of topologies and power ratings for applications like e-bike or cordless power tools. Whether the design requires ultra-high efficiency or a cost-performance oriented implementation, we help you simplify the design process and accelerate time-to-market.

REF_ICC80QSG_84W1_BPA proposes flyback topology for chargers that require an output power level between 65 and 130 W with minimized bill of material. By taking advantage of the ICC80QSG controller, this design achieves a high efficiency of 90.8 % at full load and supports a wide output voltage of 9 – 21 V. The controller IC and the 700 V CoolMOS™ P7 MOSFET (IPN70R450P7S) are offered in compact wave-solderable SMD packages. With a small heat sink and no fan being required, the design offers additional flexibility.

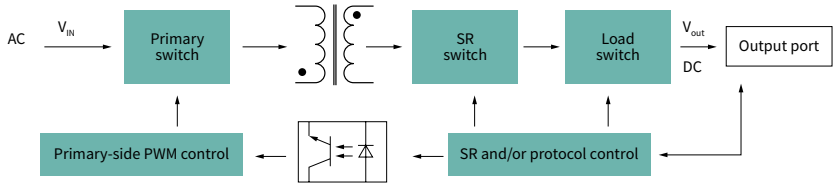
REF_XDPS2201_170W_BPA combines the XDPS2201 digital controller and two 600 V CoolMOS™ P7 MOSFETs (IPA60R280P7S) in a half-bridge configuration. XDPS2201 is based on an asymmetrical half-bridge control and operates directly from rectified mains with no PFC input stage. The solution demonstrates a wide output voltage range of 18 V to 42 V at 95 % peak efficiency.

For output power of up to 240 W, Infineon offers a variety of USB-C PD solutions that feature a comprehensive portfolio of USB-PD power and protocol controllers.

Features and benefits

Key features	Key benefits
– Wide output voltage range	– Scalable design to support different battery cell configurations
– High efficiency (>90 % for flyback, >94 % for hybrid flyback)	– Fewer heatsinks and fanless operation for outdoor use
– High level of integration	– Ease of design and BOM cost reduction
– Externally configurable parameters	– Flexible system parameterization
– Inrush current, reverse polarity protection	– Robust operation
– No auxiliary voltage supply, no PFC stage	– Suitable for cost-conscious designs

Application diagram



Product portfolio

Application	Topology	Product type	Product/product family	Package
Chargers for battery-powered applications	QR flyback	QR flyback controller	ICC80QSG	DSO-8
		High-voltage MOSFETs	700 V CoolMOS™ P7	SOT-223
	Hybrid flyback	Standalone digital controller	XDP™ digital power XDPS2201	DSO-14
		Combo digital controller	XDP™ digital power XDPS2221	DSO-14
		High-voltage MOSFETs	600 V CoolMOS™ P7	TO-220-FP
		Medium-voltage MOSFETs	OptiMOS™ 5 60 V/80 V/100 V	Multiple
		Medium-voltage MOSFETs	OptiMOS™ 5 150 V	SuperSO8
		AC/DC integrated power stage	CoolSET™ Gen 5	DIP-7

eBike Power tools Gardening tools Multicopter Vacuum cleaner

www.infineon.com/charging

For more details on the product, click on the part number, visit infineon.com or contact our product support.

Battery protection

Battery protection

Solutions that allow easy design-in ensuring safe charging/discharging

The high-power density of lithium-ion batteries has made them very popular. However, the unstable behavior of lithium-ion cells under critical conditions requires them to be handled with care. That means a battery management system (BMS) is needed to monitor the battery state and ensure safe operation. BMS is typically equipped with an electronic switch that disconnects the battery from the charge or load under critical conditions that can lead to dangerous reactions. A battery protection unit (BPU) prevents possible damage to the battery cells and the failure of the battery.

Such critical conditions include:
- Over-charge that occurs when the battery is charged over the allowed maximum capacity
- High and low temperature when the internal temperature of the battery cells exceeds their safe operational temperature range
- Over-discharge when the battery is discharged under the allowed minimum capacity
- Overcurrent when the battery is exposed to a short circuit condition or a high inrush turn-on current
- Reverse polarity when the battery terminals are wrongly plugged into the device

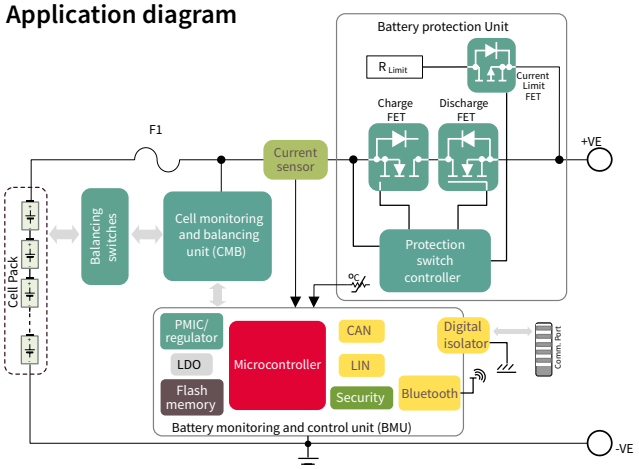
Failing to disconnect the battery during such conditions can lead to the following problems:
- Thermal runaway often due to over-charging or overheating of the battery. The overheating event can be due to a rise in the ambient temperature or due to charging/discharging the batteries with high current rates. Thermal runaway damages the battery cells and can lead to fires
- Death of the cell often due to the discharge of batteries below its specified thresholds
- Damage of load device often due to either improper inrush current management or reverse polarity

In order to prevent these failures, Infineon offers a wide range of battery protection solutions that increase the lifetime and efficiency of lithium-ion batteries under stressful conditions.

Features and benefits

Key features	Key benefits
– $R_{DS(on)}$ and safe operating area (SOA)	– Higher performance with lower $R_{DS(on)}$ and wider safe operating area (SOA)
– Compact bill of material (BOM)	– Cheaper solutions with a more compact bill of material and more effective parallelization solutions
– Short circuit protection	– Short circuit protection with higher peak current rates to withstand higher current values
– Turn-on and turn-off capabilities	– Turn-on and turn-off solutions tailored to applications needs
– All voltage class solutions	– Up to 600 V MOSFET protection solutions (including single- and multi-module)

Application diagram



www.infineon.com/battery-protection

For more details on the product, click on the part number, visit infineon.com or contact our product support.

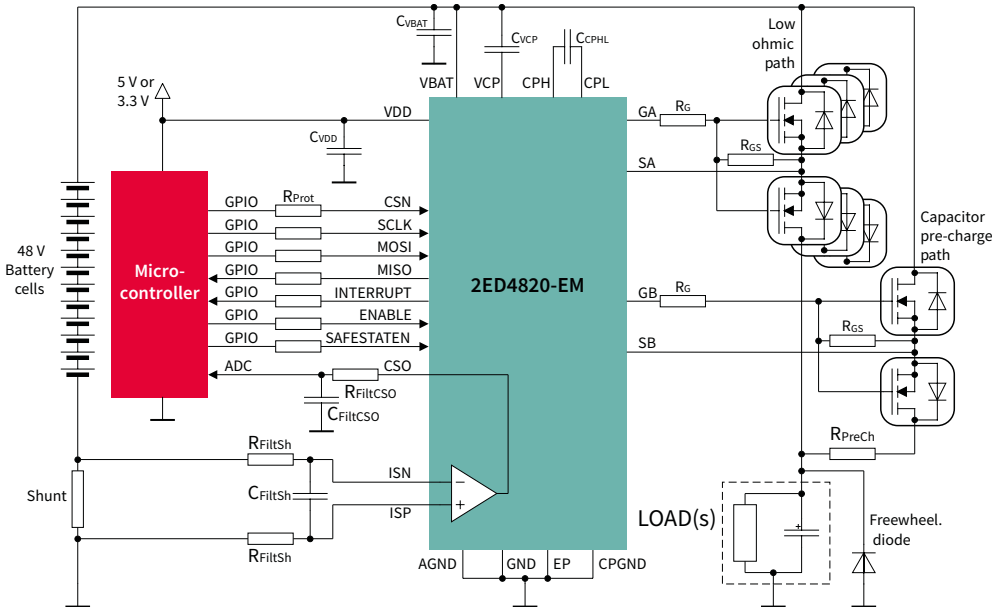
Product portfolio

Battery voltage	Application	Recommended power MOSFETs				
18 V	Charge and discharge MOSFET	IST007N04NM6 40 V, 0.7 mΩ, sTOLL	IRPB011N04NF2S 40 V, 1.15 mΩ, D²PAK	BSC005N03LS5I 30 V, 0.55 mΩ, SuperSO8	IQE008N03LM5CG 30 V, 0.85 mΩ, PQFN 3.3x3.3 Source-Down Center-Gate	BSZ0500NSIATMA1 30 V, 1.5 mΩ, PQFN 3.3x3.3
	Balancing MOSFET	ISK024NE2LM5 25 V, 2.4 mΩ, PQFN 2x2	IRLML6244 20 V, 21 mΩ, SOT-23	IRLHS6376 30 V, 63 mΩ, PQFN 2x2-Dual	IRLML2244 -20 V, 54 mΩ, SOT-23	IRFHS9301 -30 V, 37 mΩ, PQFN 2x2
	Pre-charge MOSFET	BSC084P03NS3 G -30 V, 8.4 mΩ, SuperSO8	IRFH9310 -30 V, 4.6 mΩ, SuperSO8	SPD50P03L G -30 V, 7.0 mΩ, DPAK	BSZ180P03NS3E G -30 V, 18 mΩ, PQFN 3.3x3.3	BSZ120P03NS3 G -30 V, 12 mΩ, PQFN 3.3x3.3
24 V	Charge and discharge MOSFET	IST007N04NM6 40 V, 0.7 mΩ, sTOLL	IRPB011N04NF2S 40 V, 1.15 mΩ, D²PAK	ISC007N04NM6 40 V, 0.7 mΩ, SuperSO8	IQE013N04LM6CG 40 V, 1.35 mΩ, PQFN 3.3x3.3 Source-Down Center-Gate	BSZ018N04LS6 40 V, 1.8 mΩ, PQFN 3.3x3.3
	Balancing MOSFET	ISK024NE2LM5 25 V, 2.4 mΩ, PQFN 2x2	IRLML6244 20 V, 21 mΩ, SOT-23	IRLHS6376 30 V, 63 mΩ, PQFN 2x2-Dual	IRLML2244 -20 V, 54 mΩ, SOT-23	IRFHS9301 -30 V, 37 mΩ, PQFN 2x2
	Pre-charge MOSFET	ISC240P06LM -60 V, 24 mΩ, SuperSO8	ISC800P06LM -60 V, 80 mΩ, SuperSO8	IPD900P06NM -60 V, 90 mΩ, DPAK	ISZ810P07LM -60 V, 81 mΩ, PQFN 3.3x3.3	ISP25DP06LM -60 V, 125 mΩ, SOT-223
36 V	Charge and discharge MOSFET	IPT007N06N 60 V, 0.75 mΩ, TOLL	IPTG007N06N 60 V, 0.75 mΩ, TOLG	IPF010N06NF2S 60 V, 1.05 mΩ, D²PAK 7pin	IPB013N06NF2S 60 V, 1.3 mΩ, D²PAK	IST011N06NM5 60 V, 1.1 mΩ, sTOLL
	Balancing MOSFET	ISK024NE2LM5 25 V, 2.4 mΩ, PQFN 2x2	IRLML6244 20 V, 21 mΩ, SOT-23	IRLHS6376 30 V, 63 mΩ, PQFN 2x2-Dual	IRLML2244 -20 V, 54 mΩ, SOT-23	IRFHS9301 -30 V, 37 mΩ, PQFN 2x2
	Pre-charge MOSFET	ISC240P06LM -60 V, 24 mΩ, SuperSO8	ISC800P06LM -60 V, 80 mΩ, SuperSO8	IPD900P06NM -60 V, 90 mΩ, DPAK	ISZ810P07LM -60 V, 81 mΩ, PQFN 3.3x3.3	ISP25DP06LM -60 V, 125 mΩ, SOT-223
48 V	Charge and discharge MOSFET	IPT012N08N5 80 V, 1.2 mΩ, TOLL	IPTG011N08NM5 80 V, 1.1 mΩ, TOLG	IPT010N08NM5 80 V, 1.0 mΩ, TOLT	IPB016N08NF2S 80 V, 1.65 mΩ, D²PAK	IST019N08NM5 80 V, 1.9 mΩ, sTOLL
	Balancing MOSFET	ISK024NE2LM5 25 V, 2.4 mΩ, PQFN 2x2	IRLML6244 20 V, 21 mΩ, SOT-23	IRLHS6376 30 V, 63 mΩ, PQFN 2x2-Dual	IRLML2244 -20 V, 54 mΩ, SOT-23	IRFHS9301 -30 V, 37 mΩ, PQFN 2x2
	Pre-charge MOSFET	ISC750P10LM* -100 V, 75 mΩ, SuperSO8	IPD19DP10NM -100 V, 186 mΩ, DPAK	ISZ24DP10LM* -100 V, 245 mΩ, PQFN 3.3x3.3	ISP16DP10LM -100 V, 250 mΩ, SOT-223	BSP322P -100 V, 800 mΩ, SOT-223
72 V	Charge and discharge MOSFET	IPT030N12N3 G 120 V, 3.0 mΩ, TOLL	IPT039N15N5 150 V, 3.9 mΩ, TOLL	IPB044N15N5 150 V, 4.4 mΩ, D²PAK 7pin	IPB048N15N5 150 V, 4.8 mΩ, D²PAK	IPT111N20NFD 200 V, 11.1 mΩ, TOLL
	Balancing MOSFET	ISK024NE2LM5 25 V, 2.4 mΩ, PQFN 2x2	IRLML6244 20 V, 21 mΩ, SOT-23	IRLHS6376 30 V, 63 mΩ, PQFN 2x2-Dual	IRLML2244 -20 V, 54 mΩ, SOT-23	IRFHS9301 -30 V, 37 mΩ, PQFN 2x2
	Pre-charge MOSFET	ISC16DP15LM -150 V, 160 mΩ, SuperSO8	ISZ56DP15LM -150 V, 560 mΩ, PQFN 3.3x3.3	ISZ75DP15LM -150 V, 750 mΩ, PQFN 3.3x3.3	IPD42DP15LM -150 V, 420 mΩ, DPAK	ISP14EP15LM -150 V, 1380 mΩ, SOT-223
96 V	Charge and discharge MOSFET	IPT039N15N5 150 V, 3.9 mΩ, TOLL	IPB044N15N5 150 V, 4.4 mΩ, D²PAK 7pin	IPB048N15N5 150 V, 4.8 mΩ, D²PAK	IRF135SA204 135 V, 5.9 mΩ, D²PAK 7pin	IPT111N20NFD 200 V, 11.1 mΩ, TOLL
	Balancing MOSFET	ISK024NE2LM5 25 V, 2.4 mΩ, PQFN 2x2	IRLML6244 20 V, 21 mΩ, SOT-23	IRLHS6376 30 V, 63 mΩ, PQFN 2x2-Dual	IRLML2244 -20 V, 54 mΩ, SOT-23	IRFHS9301 -30 V, 37 mΩ, PQFN 2x2
	Pre-charge MOSFET	ISC16DP15LM -150 V, 160 mΩ, SuperSO8	ISZ56DP15LM -150 V, 560 mΩ, PQFN 3.3x3.3	ISZ75DP15LM -150 V, 750 mΩ, PQFN 3.3x3.3	IPD42DP15LM -150 V, 420 mΩ, DPAK	ISP14EP15LM -150 V, 1380 mΩ, SOT-223
144 V	Charge and discharge MOSFET	IPT111N20NFD 200 V, 11.1 mΩ, TOLL	IPTG111N20NM3FD 200 V, 11.1 mΩ, TOLG	IPT210N25NFD 250 V, 21.0 mΩ, TOLL	IPTG210N25NM3FD 250 V, 11.1 mΩ, TOLG	IPB107N20N3 G 200 V, 10.7 mΩ, D²PAK
	Balancing MOSFET	ISK024NE2LM5 25 V, 2.4 mΩ, PQFN 2x2	IRLML6244 20 V, 21 mΩ, SOT-23	IRLHS6376 30 V, 63 mΩ, PQFN 2x2-Dual	IRLML2244 -20 V, 54 mΩ, SOT-23	IRFHS9301 -30 V, 37 mΩ, PQFN 2x2
	Pre-charge MOSFET	BSP317P -250 V, 4000 mΩ, SOT-223	BSP92P -250 V, 12000 mΩ, SOT-223	BSR92P -250 V, 12000 mΩ, SC59	BSS192P -250 V, 12000 mΩ, SOT-89	

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Gate drivers



Main reasons to use 2ED4820-EM in dependable 48 V power supplies

- Faster reaction time (~ 10 µs)
- Integrated bidirectional high or low side current sense amplifier
- High current source or sink support
- Robust against under-/overvoltage in the board-net
- Flexible configuration of protection features plus the accessibility of diagnosis information via SPI

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Battery monitoring

Battery monitoring and control

Optimize system performance by cell balancing and monitoring key battery parameters

Dedicated cell monitoring controllers are being used to keep lithium-ion cells within their allowed operational ranges regarding voltages, currents, and temperatures. They monitor the state of each cell according to pre-adjusted voltages and temperatures using high-precision ADCs. Synchronizing the distributed measurements across all cells inside a battery is key to achieving the best possible insights into the battery's dis-/charging state (SOD/SOC) and overall battery health (SOH). The critical battery state assessment becomes less precise if these measurements are spread across wider time windows and if the measurement accuracy for each parameter is not high enough. A robust high-speed communication link across multiple daisy-chained monitoring devices supports complex cell topologies for a battery. For additional robustness, the daisy-chaining realizes a redundant ring, which keeps communication up between all connected ICs in case of a broken link. CRC-protected data frames complement communication robustness. To achieve extremely low-power dedicated housekeeping functions such as periodically scheduled cell measurements and state analysis required for functional safety, the cell controller can perform independently from the master controller of the BMS. Safety features for signaling over-/undervoltage, thermal stress, etc., including emergency alarms, are triggered autonomously. When the number of cells increases, a reliable transfer of information from the cell balancing IC to the BMS controller becomes very important. Digital isolators can be used to ensure that the right data is transferred reliably by isolating the low-voltage side (BMS controller) from the high-voltage battery side.

TLE9012DQU – Li-ion battery monitoring and balancing IC

PRO SIL ISO 26262 compliant

RoHS

AEC Qualified

Features

- Voltage monitoring of up to 12 battery cells connected in series
- Hot plugging support
- Dedicated 16-bit delta-sigma ADC for each cell with selectable measurement mode
- High accuracy measurement for SOC and SOH calculation
- Integrated stress sensor with digital compensation algorithm and temperature-compensated measurements
- Secondary ADC with the same averaging filter characteristics as an advanced end-to-end safety mechanism
- Five temperature measurement channels for external NTCs
- Internal temperature sensors
- Integrated balancing switch allows up to 200 mA balancing current
- Differential robust serial 2 Mbit/s communication interface
- Additional four GPIO pins to e.g., connect an external EEPROM
- Internal round-robin cycle routine triggers the majority of diagnostics mechanisms
  - Automatic balancing over- and undercurrent detection scheme
  - Automatic open load and open wire detection scheme
  - Automatic NTC measurement unit monitoring scheme
- End to end CRC secured iso UART/UART communication
- Emergency mode for communication
- ISO 26262 safety element out of context for safety requirements up to
- Automotive safety integrity level D
- Green product (RoHS compliant)



www.infineon.com/battery-monitoring

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TLE9015QU – BMS transceiver IC - UART to iso UART

RoHS

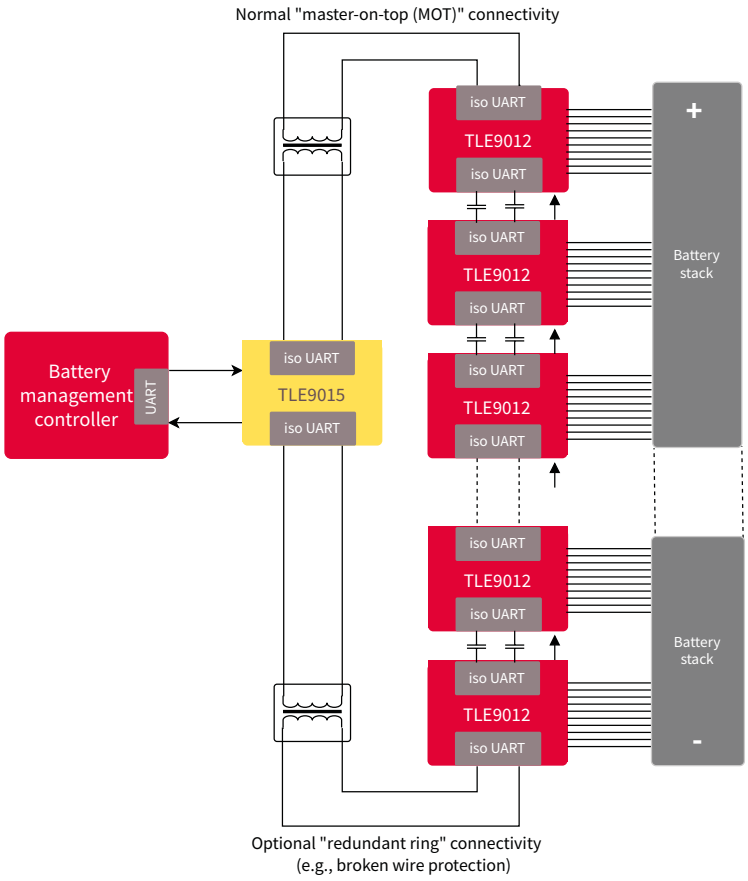
AEC Qualified



Features

- General
  - Two UART ports for serial communication to host microcontroller
  - Two iso UART interfaces for communication to other BMS ICs
  - 2 Mbit/s data rate for fast communication
  - Fully transparent communication scheme from UART to iso UART
  - Ring mode topology compatible
- Communication ports
  - Integrated internal logic to minimize pin count on the UART side
  - Differential current edge triggered iso UART communication interface
  - High robustness against external noise
- General purpose error pin
  - Two external fault inputs (EMM and ERRQ_ext)
  - Latching error output pin to trigger external microcontroller
- Supporting diagnosis features
  - Internal supply monitoring
  - Green product (RoHS compliant)

Application diagram



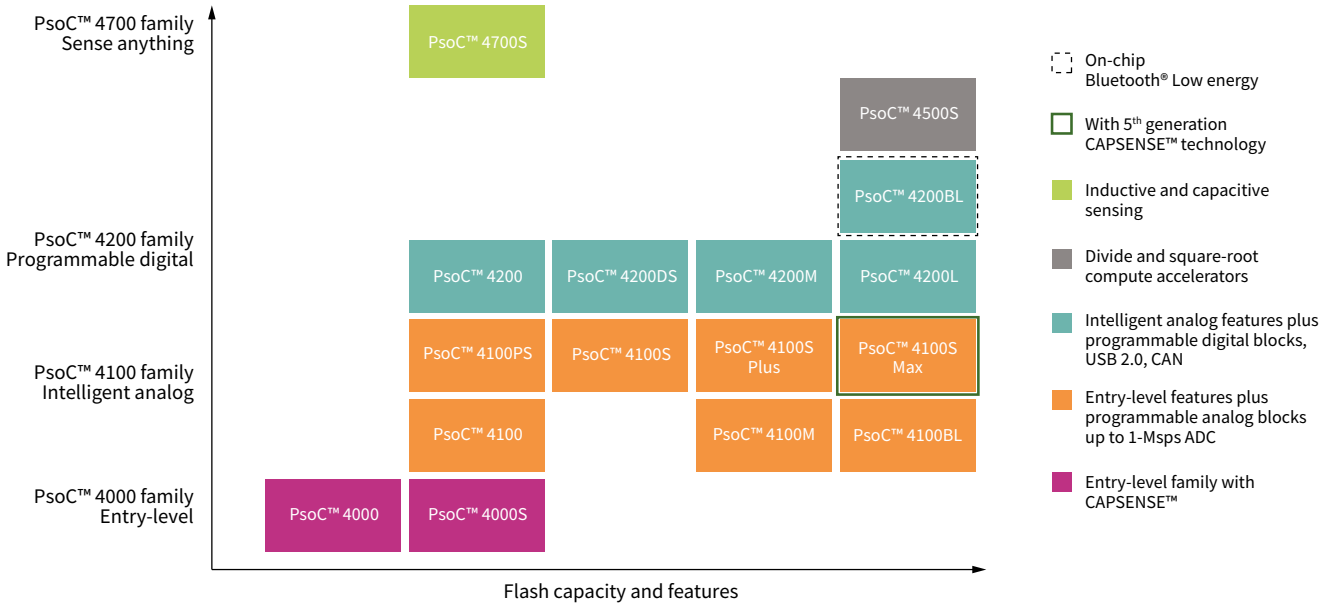
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Digital isolators for battery monitoring

Part number	Isolation ring	Safety certifications	Channel configuration [1]	Input thresholds	Default output state	Package
2DIB0400F	V_{ISO}=3000 V_{RMS} (UL1577 Ed. 5)	UL1577 (Ed. 5) VDE 0884-11 VDE 0844-17 IEC 62368-1 IEC 60601-1 IEC 61010-1 GB4943.1	2 forward 0 reverse (2+0)	Variable (CMOS)	Low	PG-DSO-8 5 x 4 mm
2DIB0401F					High	
2DIB1400F			1 forward 1 reverse (1+1)		Low	
2DIB1401F					High	
2DIB0410F			2 forward 0 reverse (2+0)	Fixed (TTL)	Low	
2DIB0411F					High	
2DIB1410F			1 forward 1 reverse (1+1)		Low	
2DIB1411F					High	

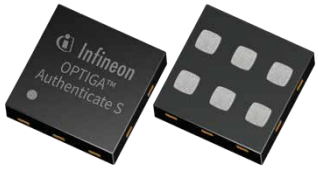
Microcontrollers for BMS



Battery security and authentication

OPTIGA™ Authenticate S provides enhanced device authentication to protect against counterfeits

Rich set of customization options	Effortless implementation	Security to rely on
– 4 authentication modes – 4 separate life cycle counters to prevent manipulation – 3 temperature ranges – 2 communication profiles – 3 sets of memory	– Full turnkey solution – no security know-how required – Full system integration support including embedded software, host software and advanced ecosystem support tools	– Enhanced HW security with an extended key length – Asymmetric cryptography – Protection against reverse engineering – Provisioning in a common criteria certified environment



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1)Certifications planned

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Super solid state solutions

FET-based high-voltage solid-state relays

Best-in-class $R_{DS(on)}$ x A enables unprecedented low losses in combination with advanced control and protection features

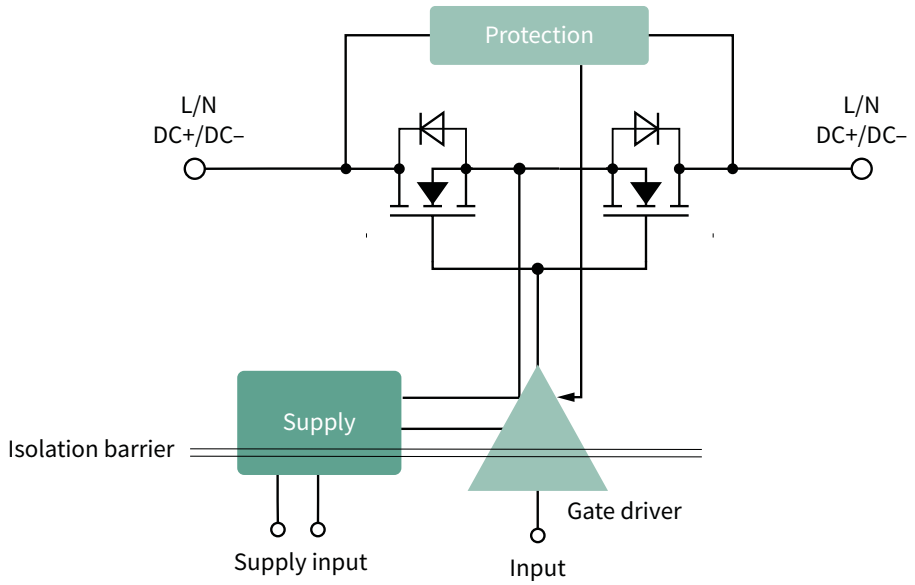
Electromechanical relays are a mature and well-established technology. However, they suffer from some inherent weaknesses. The mechanical movement of metal contacts causes noise. The high voltages can arc before the contacts are completely opened or closed, which leads to contact degradation. An increase in contact resistance over the lifetime causes the behavior to become less predictable. Triacs (or silicon-controlled rectifiers, SCRs) are widely used as solid-state relays in AC applications. However, their controllability is limited and they suffer from high power dissipation in the range of 1 W/A.

FET-based solid-state solutions offer many benefits in relay applications. This includes significantly faster switching while eliminating arcing and the noise associated with electromechanical devices. Inherently, this results in higher reliability and more stable performance. When considering the maintenance, repair and operations (MRO) cost, a strong argument can be made for using solid-state relays. Compared to triacs, a FET-based solution offers advanced control and protection methods. The significantly lower power dissipation minimizes the cooling effort in the application. The latest CoolMOS™ S7(A) technology is a perfect match for solid-state relay applications. It offers an unprecedentedly low $R_{DS(on)}$ x A figure of merit that will meet the needs of customers and their end markets.

Features and benefits

Key features	Key benefits
– Operational lifetime: tens of millions of operations	– Maintenance-free (no degradation of contacts), MRO cost savings
– No mechanical parts	– Arcing-free operation, no contact bounce, clicking noise is eliminated
– Significantly faster switching	– Advanced control and protection methods
– No increasing resistance vs. lifetime	– Stable performance, predictable behavior
– Lowest $R_{DS(on)}$ x A in class	– Highest power density, minimized cooling effort, parallelization and scalability

Application diagram



www.infineon.com/ssr
www.infineon.com/S7

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Product portfolio

Product	Product family	Voltage class [V_{DS} max]	$R_{DS(on)}$	Package	Part number
MOSFETs	CoolMOS™ S7 industrial	600 V	22 mΩ to 65 mΩ	TO-220	IPP60R022S7, IPP60R040S7, IPP60R065S7
				TOLL	IPT60R022S7, IPT60R040S7, IPT60R065S7
			10 mΩ to 65 mΩ	QDPAK top-side cooled	IPDQ60R010S7, IPDQ60R022S7, IPDQ60R040S7, IPDQ60R065S7
			10 mΩ to 65 mΩ	QDPAK bottom-side cooled	IPQC60R010S7, IPQC60R040S7, IPDQ60R017S7
	CoolMOS™ S7A automotive		10 mΩ to 40 mΩ	QDPAK top-side cooled	IPDQ60R010S7A, IPDQ60R017S7A, IPDQ60R022S7A IPDQ60R040S7A
			10 mΩ to 40 mΩ	QDPAK bottom-side cooled	IPQC60R010S7A, IPQC60R017S7A, IPQC60R040S7A, IPQC60R017S7

Product	Product family	Output voltage	Output current [typ.]	Isolation type	Part number
Gate drivers	EiceDRIVER™	20 V	5 A/9 A	functional/basic isolation	1EDB6275F, 1EDB8275F, 1EDB9275F
			5 A/9 A	non-isolated	1EDN6550B, 1EDN8550B, 1EDN9550B, 1EDN8511B
			±2 A to ±6 A	functional isolation	1EDI10I12MF, 1EDI20I12MF, 1EDI30I12MF
		25 V	±2.6 A	non-isolated	1ED44173N01B
		40 V	±3 A to ±6 A	functional isolation	1ED3431MU12M, 1ED3461MU12M
				reinforced isolation	1ED3431MC12M, 1ED3461MC12M

Product	Product family	Load voltage	Output/load current	Isolation voltage	Part number
Integrated solid-state relays	Photovoltaic isolators (PVI)	-	2 x 5 µA	3.75 kV	PVI5033R
				2.5 kV	PVI1050N
	Photovoltaic relays (PVR)	60 V	2 A	4 kV	PVG612A
		400 V	1 A	3.75 kV	PVX6012

www.infineon.com/ssr
www.infineon.com/S7

For more details on the product, click on the part number, visit infineon.com or contact our product support.

Motor control

Low-voltage motor drive and control

Low-power battery applications

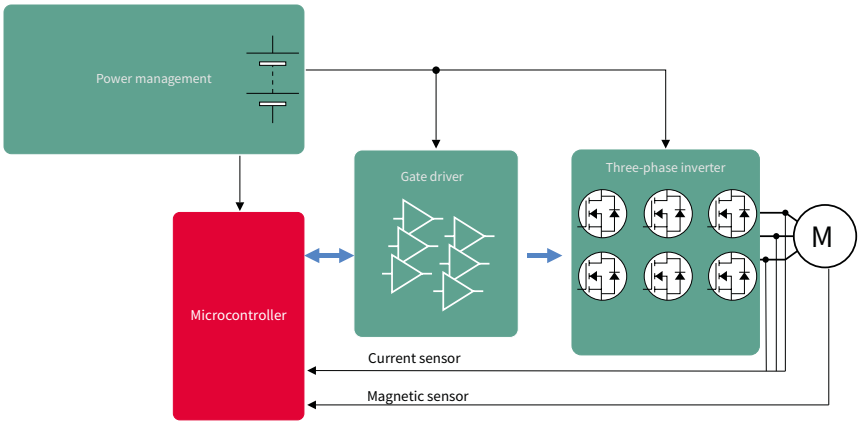
When it comes to increased efficiency and durability, brushless DC (BLDC) motors offer the ideal solution for power electric motor applications. Compared to traditional brushed motors, brushless DC motors are quieter, lighter, and offer an overall smaller design footprint while providing increased reliability. These improvements, however, come with an increased need for monitoring and control, requiring significantly more complex electronics and supporting algorithms. This move toward BLDC motors occurs in concert with a continuous push towards higher energy efficiency, resulting in trade-offs between power delivery and battery lifetime. This, in turn, puts a significant burden on semiconductor technologies to deliver high performance in motor control applications. In parallel, shortening life cycles and increased product diversity put an additional burden on suppliers to provide that same high performance, cost-efficient solutions across an increasing variety of use cases.

With industry-leading technology and reliability, Infineon's extensive portfolio of discrete and integrated circuits offers the breadth and depth of solutions necessary to meet the demands across a wide spectrum of motor control needs.

Features and benefits

Key features	Key benefits
– A complete eco-system of simulations, documentation and demonstration boards	– Fast time-to-market
– Comprehensive portfolio of products and solutions	– Broad portfolio allows for right product fit to meet application needs
– Best in class MOTIX™ gate drivers for OptiMOS™ and StrongIRFET™ MOSFETs offering high efficiency and protection	– Extended battery life and product life span
– World-class broad and deep portfolio of LV FETs with SMD packaging improves capability and reliability while reducing assembly cost	– Reduction overall system size and cost
– Components featuring small form factor and compact design offering highest power density and BOM savings thanks to lowest $R_{DS(on)}$	
– High reliability of Infineon components results in prolonged product life spans	

Application diagram



Key enabling products

- Power MOSFETs – OptiMOS™, StrongIRFET™
- MOTIX™ low-voltage motor control solutions
- XMC1000 microcontrollers
- XMC4000 microcontrollers
- PSoC™ 4100 microcontrollers
- PSoC™ 62 microcontrollers
- XENSIV™angle sensor
- XENSIV™ magnetic sensor
- XENSIV™ current sensor
- XENSIV™ Hall switch

Target end applications

Service robots · Collaborative robots · Power tools · Gardening tools · Home & garden · Multicopter · Warehouse / logistics robots · Air purifier

www.infineon.com/bldc
www.infineon.com/bdc

For more details on the product, click on the part number, visit infineon.com or contact our product support.

Product portfolio

Product category	Product family	Package options	Battery voltage support [V]	Voltage class [V_{DS} max.]	Representative part numbers
Inverter/MOSFETs	StrongIRFET™ OptiMOS™	SuperSO8 SuperSO8 SC PQFN 3x3 DirectFET™ S/M/L-Can PQFN 5x6 Source Down TOLL TOLG TOLT TO-220 TO-247 DPAK D^2PAK D^2PAK 7-pin	12-16	25-30	BSC005N03LS5, IQE006NE2LM5, IPT004N03L, IQE006NE2LM5CGSC, ISZ019N03L5S, IQE008N03LM5,
			18	40	IRL40DM247, BSC010N04LS, IST011N06NM5, IRF40SC240, IPB011N04NF2S,IPB023N04NF2S, IPF013N04NF2S, ISC012N04NM6
			36-48	60	IST011N06NM5, BSC012N06NS, BSZ100N06NS, IPT007N06N, IRFS7534, BSC014N06NS, IPTC007N06NM5, IPB013N06NF2S, IPB015N06NF2S, IRF60DM206, IQE030N06NM5SC
			48-60	75-80	BSC021N08NS5, BSC030N08NS5, IPT010N08NM5, IPTG011N08NM5, IPP040N08NF2S, IPB049N08N5, IPB016N08NF2S, IPB040N08NF2S, IPB024N08NF2S, IPF017N08NF2S, IQE050N08NM5, BSC023N08NS5SC
			60-72	100-120	BSC035N10NS5, ISZ080N10NM6, IPT015N10NF2S, IPTC015N10NM5, IPP050N10NF2S, IPB018N10N5, ISC030N12NM6, IPP018N10N5, IPT014N10N5, IPTC017N12NM6
			72-96	150	BSC074N15NS5, BSC110N15NS5, BSC110N15NS5SC, BSC093N15NS5SC, IPTG039N15NM5, IPTG044N15NM5, IPTC054N15NM5, IPTC039N15NM5,
			96-144	200	BSC220N20NSFD, IPTG111N20NM3FD, IPT111N20NFD, IRFP4127, IRF200P222, IRF6785, IRFP4668, IRFH5020

Product category	Voltage class [V]	Configuration	Part number	Current source/sink	Comment
Gate drivers	25	Low-side	1ED44173	2.6 A/2.6 A	Integrated fast over-current protection, fault re- porting and enable functionality, SOT-23 package
	60	Three-phase	6EDL7141	1.5 A/1.5 A	Fully configurable gate driver for battery operated motor control applications, integrated power management and current sense amplifiers, VQFN-48 package. >50 SPI programmable parameters. Highly integrated with MOSFET slew rate control, 3 OpAmps, Buck+LDO, dual charge pump
	70	Three-phase	6EDL7151*	1.5 A/1.5 A	High performance, highly integrated, programmable, PSU integrated, space saving, slew rate control, MOSFET optimizations, >50 SPI programmable parameters, slew rate control, 3 OpAmps, Buck+LDO, dual charge pump, and VDS sensing for hardware system protection
	135	High-Side	1EDL8011*	1 A sink	1EDL8011 high-side gate driver provides a simple and highly robust solution to drive a high side disconnect switch to protect battery operated systems, OCP protection, adjustable current setting threshold, time delay, safe start, UVLO.
	160	Three-phase	6ED2742S01Q NEW	1 A/2 A	160 V SOI process product for superior NPSOA with Bootstrap diodes. Support multi protection features. Pre-regulated three phase SOI gate driver with integrated charge pump, current sense amplifier, over-current protection& Fault out report in 5x5 VQFN-32 pacakge. 2K HBM ESD.
	160	High- and low-side	2ED2732S01G NEW	1 A/2 A	160 V SOI process product for superior NPSOA with Bootstrap diodes. Separate VSS/COM, thermal pad, DFN10 package, high side/ low side's own dead-time, 2 kV HBM ESD, smaller footprint, cost effective, simple, easy to use
	160	Half-bridge	2ED2742S01G NEW	1 A/2 A	160 V SOI process product for superior NPSOA with Bootstrap diodes. Separate VSS/COM, thermal pad, DFN10 package, integrated shoot-through protection logic, 2 kV HBM ESD, smaller footprint, cost effective, simple, easy to use
	160	Half-bridge	2ED2748S01G NEW	4 A/8 A	160 V SOI process product for superior NPSOA with Bootstrap diodes. High current drive for parallel MOSFET applications. Separate VSS/COM, thermal pad, DFN10 package, integrated shoot-through protection logic, 2 kV HBM ESD, smaller footprint, cost effective, simple, easy to use
	160	High- and low-side	2ED2738S01G NEW	4 A/8 A	160 V SOI process product for superior NPSOA with Bootstrap diodes. High current drive for parallel MOSFET applications. Separate VSS/COM, thermal pad, DFN10 package, high side/ low side's own dead-time, 2 kV HBM ESD, smaller footprint, cost effective, simple, easy to use
	200	Three-phase	6EDL04N02	0.165 A/0.375 A	SOI, integrated BSD, OCP, enable, fault reporting, TSSOP-28 package
	200	High- and low-side	IRS2005S	0.29 A/0.6 A	V_{CC} and V_{BS} UVLO, matched propagation delay, DSO-8 package
	200	Half-bridge	IRS2007S	0.29 A/0.6 A	V_{CC} and V_{BS} UVLO, matched propagation delay, DSO-8 package
	200	Low- or high-side	1EDN7550	4 A/8 A	Low propagation delay, differential input, high common-mode input, UVLO, SOT23-6 and TSNP-6 package options
	600	Half-bridge	IRS21867S	4 A/4 A	High current level-shift gate driver with low V_{CC} operation, DSO-8 package
	600	Three-phase	6EDL04N06PT	0.165 A/0.375 A	SOI, integrated BSD, tolerant to –VS up to 100 V, OCP, enable, fault reporting, DSO-28W package
	650	Half-bridge	2ED2304S06F	0.36 A/0.7 A	SOI, integrated BSD, tolerant to –Vs up to 100 V, DSO-8 package

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Category	Product name		Description
Integrated devices	MOTIX™	IFX9201SG	Integrated brushed DC motor driver
		TLE9140EQW NEW	3-Phase BLDC motor gate driver IC, voltage to 110 V, 24 V/48 V systems, gate driving capability: ~230 nC/MOSFET up to 20 kHz, gate-shaping, diagnostics and protections, developed acc. to ISO26262 achieving ASIL-B
		IMD701A	Fully programmable motor controller integrating XMC1404 microcontroller with MOTIX™ 6EDL7141 3-phase gate driver IC in one package. Include hardware MATH Co-Processor (96 MHz) for FOC algorithms, includes PWM timers, position interface (POSIF) or serial communication modules including CAN
Microcontrollers	XMC™	XMC1300 XMC1400	ARM™ Cortex® -M0 core. 32/48 MHz core, math coprocessor, peripherals up to 96 MHz peripherals, CCU4/CCU8 PWM timers, 2x serial channels, hall and encoder interface, analog comparators, 12-bit ADC, up to 200 kB flash/16 kB RAM 16-64 pins
		XMC4400	ARM™ Cortex® -M4F core, up to 144 MHz, up to 512 kB flash/80 kB RAM, 4xCCU4/2xCCU8/2xPOSIF timers, serial channels, up to 4x 12-bit ADC/2x DAC, 4xΔΣ demodulator, 64-100 pins
	PSoC™	PSoC™ 4100	ARM™ Cortex® -M0/M0+ CPU with DMA controller, up to 384 kB flash/32 kB SRAM, cryptographic coprocessor, 12-bit ADC/13-bit DAC, configurable amplifiers, 16-bit PWM timers, configurable serial communication blocks, up to 84 GPIO, 28-100 pin packages
		PSoC™ 62	Dual-core 150 MHz ARM™ Cortex® -M4 and 100 MHz M0/M0+, ultra-low power and low-power operation modes, up to 2 MB flash, 1 MB SRAM with DMA, 24x16-bit and 8x32-bit timer blocks, USB 2.0, up to 104 GPIOs
Sensors	Hall switches	XENSIV™ TLI4963	3-5.5 V operation, active error compensation, high stability magnetic thresholds, low jitter
	Angle sensor	XENSIV™ TLI5012	Integrated angle calculation, incremental interface, SPI with 8 Mbit/s, ≤ 1.9o angle error over-t emperature/life, integrated giant magnetoresistance-based angle sensor, 15-bit representation of angle value with 0.01o resolution, bi-directional SSC interface
	3D magnetic sensor	XENSIV™ TLI493D	± 50 mT to ± 160 mT ranges, up to 30.8 LSB12/MT sensitivity, low-power mode, low offset and match drift, wake up function
	Magnetic coreless current sensor	XENSIV™ TLI4971	25 A to 120 A measurement range, 240 kHz bandwidth, low sensitivity error over temperature, galvanic functional isolation up to 1150 V, differential sensing, two independent over current detection outputs

Evaluation platforms

Category	Product name	Description
Application	DEMO-PTOOL-300W-M	This design kit for cordless power tools uses the DirectFET™ ME/MF and firmware developed using the XMC1300 family
	KIT_MOTOR_DC_250W_24V	Three-phase DC motor control power card (V_{DC} 24 V, 250 W motor drive power card for XMC1000 and XMC4000)
	Stepper motor control shield with IFX9201 and XMC1300	The stepper motor control shield based on Infineon's H-bridge IFX9201 and XMC1300 microcontroller can drive the two coils in a stepper motor featuring a dual-H-bridge configuration. This current stepper motor control board is compatible with Arduino microcontroller boards and Infineon's XMC™ microcontroller kits using the Arduino form factor
	KIT_XMC1X_AK_MOTOR_001	XMC1000 motor control application kit
Product	CY8CKIT-037	The CY8CKIT-037 is used for PSoC™ 4 solution evaluation for motor control application. The kit supports BLDC motors, PMSM (permanent magnetic synchronous motors), and stepper motors. We provide example projects including single-shunt and sensorless FOC (field-oriented control), sensored BLDC control, sensorless BLDC control, and stepper motor control example projects
	EVAL_6EDL7141_TRAP_1SH	The EVAL_6EDL7141_TRAP_1SH features fully configurable operating parameters with an on-board debugger ready for direct USB connection to PC. The BLDC motor drive board uses trapezoidal commutation based on the MOTIX™ 6EDL7141 smart three-phase driver and XMC1400 series micro-controller
	EVAL_6EDL7141_FOC_3SH	The EVAL_6EDL7141_FOC_3SH features fully configurable operating parameters with an on-board debugger ready for direct USB connection to PC. The BLDC motor drive board uses sensor-less FOC based on the MOTIX™ 6EDL7141 smart three-phase driver and XMC1400 series micro-controller
	EVAL_IMD700A_FOC_3SH	The EVAL_IMD700A_FOC_3SH features fully configurable operating parameters with an on-board debugger ready for direct USB connection to PC. The BLDC motor drive board uses sensor-less FOC based on the MOTIX™ IMD700/1A integrated XMC1400 series microcontroller with 6EDL7141 smart three-phase driver in a single package
	EVAL_TOLT_DC48V_3KW	The evaluation board features a motor drive inverter power stage using high efficiency, OptiMOS™ 5 100 V power MOSFETs in top-side cooling TOLT package. The top-side cooled MOSFET solution for 3-phase BLDC motor drive leads to increase power handling capability. The power board operates with Infineon's XMC1300 Drive Card (KIT_XMC1300_DC_V1). Firmware is provided with trapezoidal control for 48 V BLDC motor with hall sensors
	S2GO_CUR-SENSE_TLI4971	For evaluation purposes of the latest XENSIV™ current sensor TLI4971, we rely on our proven evaluation concept of Shield2Go and 2GO Kits – therefore the TLI4971 evaluation environment is also offered in those two configurations: – TLI4971 MS2GO: 2GO Kit version – TLI4971 S2GO: Shield2Go version

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Drives

HP LV motor drive and control

Powering light e-mobility and material handling

High-power low-voltage motor drives power both personal light e-mobility vehicles such as e-bikes, e-scooters, e-motorcycles, micro EVs, as well as material handlers such as e-forklifts, delivery vehicles (xDVs), autonomous mobile robots (AMR), automated guided vehicles (AGV), and commercial, construction and agricultural vehicles (CAV). These applications can be collectively referred to as light electric vehicles (LEVs). LEVs have an ever-growing need for highly efficient, intelligent, and powerful motor-drive systems to address requirements such as high speed, high peak and continuous torque, safety, reliability, and most of all, long battery lifetime. Infineon offers a comprehensive, end-to-end solution for every segment and variation of this diverse market with power levels ranging from 200 W to even greater than 50 kW. The OptiMOS™ and StrongIRFET2™ MOSFET families form a powerful yet efficient muscle of the system, while the EiceDRIVER™ and MOTIX™ gate driver families offer a broad range of both isolated and non-isolated gate drivers. An array of motor control MCUs such as iMOTION™, XMC™, PSoC™, TRAVEO™ T2G and AURIX™ along with their software/tools ecosystem, enable quick, easy, and tailor-made implementations of advanced motor control algorithms while meeting increasing safety requirements. The XENSIV™ current and angle/position sensors enable accurate closed-loop control. Along with an extensive product portfolio, Infineon simplifies and accelerates the design process by offering demonstration, evaluation, and reference boards, simulation models, application notes, comprehensive technical support, and a vibrant developer community.

Features and benefits

Key features	Key benefits
– MOSFETs with best FOMs for drives with low $R_{DS(on)}$; low Q_{rr}; low $\Delta_{VGS(th)}$	– Extended range/increase in battery life
– Broad and deep microcontroller portfolio enabling varied design approaches (plug n-play, optimized custom design), S/W tool libraries, hall and encoder I/F MATH Co-processor, ΔΣ de-modulator, functional safety	– Precise motor control
– Gate drivers with robust isolation, TDI, high/programmable output current, active miller clamp	– Enable compact motor drive design
– Current sensors having high current range, coreless sensing, high resolution, noise immunity and programmability	– Quick and easy system design enabling fast time-to-market
– Hall switches, angle/position sensors and 3D angle sensors with high accuracy, low jitter and low power consumption	– Rugged, reliable and safe motor drives

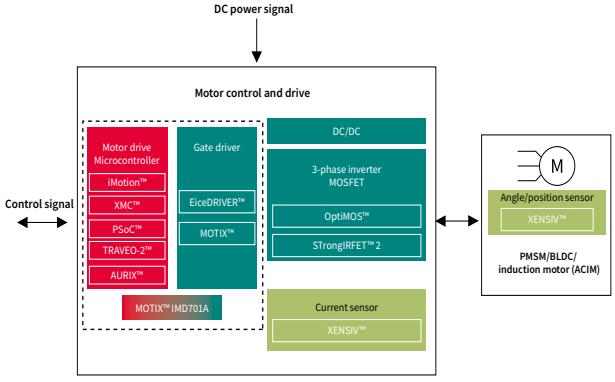
Personal e-mobility

eBike | eScooter | eMotorcycle | LSEV

Material handling

eForklift | Warehouse / logistics robots | CAV

Application diagram



Product	Product family
3-phase inverter (MOSFETs)	OptiMOS™, StrongIRFET™
Microcontroller	iMOTION™ IMC 300, XMC™, PSoC™, TRAVEO™ T2G, AURIX™
Gate driver	EiceDRIVER™, MOTIX™
Position/speed sensor	XENSIV™ angle sensors and Hall switches
Current sensor	XENSIV™ current sensor
Software and Design Enablement	IPOSIM, ModusToolbox™, AURIX™ Development Studio, DAVE™ Drive

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Typical power level of the inverter system: 200 W-4 kW

Component	Product family	Battery voltage (V)	Voltage class (V_{DS} max)	Package options	Battery voltage support (V)	Voltage class (V_{DS} max)	Representative part numbers	Features
MOSFETs	StrongIRFET™ 2 OptiMOS™	24-36	60	TOLL TOLG TOLT D^2PAK 7-pin D^2PAK TO-220 TO-247 SuperSO8	24-36	60	IPTC007N06NM5*, IPTC012N06NM5*, ISC015N06NM5LF*, IPF010N06NF2S, IPF012N06NF2S, IPF016N06NF2S, IPB029N06NF2S, IPB018N06NF2S, IPB015N06NF2S, IPB013N06NF2S, IPP040N06NF2S, IPTG007N06NM5, IPT008N06NM5LF, BSC014N06NSSC, IPP030N06NF2S, IPP019N06NF2S, IPP016N06NF2S, IPP014N06NF2S, IQD009N06NM5CG, IQDH88N06LM5CG	Low $R_{DS(on)}$ and low conduction losses, tight $V_{GS(th)}$ spread for efficient paralleling, low Q_{rr}, soft body diode, innovative packages Catering to diverse application mission profile requirements with OptiMOS™ (industrial grade) and StrongIRFET™ 2 (standard grade and grade with broad availability from distribution partners)
		36-48	80		36-48	80	IPTG011N08NM5, IPTC012N08NM5, IPT012N08NM5, IPT010N08NM5, IPB015N08N5, IPB017N08N5, BSC019N08NS5, IPP024N08NF2S, IPB024N08NF2S, IPP016N08NF2S, IPP040N08NF2S, BSC037N08NS5, IPB049N08N5, IPTC011N08NM5*, IPTC014N08NM5*, ISC025N08NM5LF*, IPT009N08NM6*, IPF011N08NM6*, ISC015N08NM6*, IQD016N08NM5CG*, IPF023N08NF2S, IPF039N08NF2S, IPT012N08NF2S, IPF017N08NF2S, IPF014N08NF2S, IPB055N08NF2S, IPB040N08NF2S, IPB024N08NF2S, IPB019N08NF2S, IPB016N08NF2S	

Component	Voltage class (V)	Configuration	Part number	Source/sink	Package	Features
Gate drivers	60	Three-phase	6EDL7141	1.5 A/1.5 A	VQFN48	Configurable smart gate driver, integrated power management, 3 x current sense amplifiers (CSA)
	70	Three-phase	6EDL7151*	1.5 A/1.5 A		Configurable smart gate driver, integrated power management, 3 x current sense amplifiers (CSA) and VDS sensing for hardware system protection
	90	Three-phase	TLE9140EQW	0.48 A	DSO32	Active LS freewheeling during overvoltage, ASIL-B functional safety, automotive grade 0 qualified
	90	Three-phase	TLE9180D-32QK	2 A/2 A	LQFP64	3 x current sense amplifiers (CSA), ASIL-C Functional safety, automotive grade 1 qualified
	160	Three-phase	6ED2742S01Q	1 A/2 A	QFN32	SOI, integrated BSD, trickle charge pumps, power management and current sense amplifiers, RFE
	160	Half-bridge	2ED2742*	1 A/2 A	DFN10	SOI, integrated BSD, integrated shoot-through protection logic, 2 kV HBM ESD
	160	High- and low-side	2ED2732*	1 A/2 A	DFN10	SOI, integrated BSD, integrated shoot-through protection logic, 2 kV HBM ESD
	200	Three-phase	6EDL04N02PR	0.165 A/0.375 A	TSSOP-28	SOI, integrated BSD, OCP, enable, fault reporting, UVLO enable
	200	High- and low-side	IRS2005S	0.29 A/0.6 A	DSO-8	V_{CC} and V_{BS} UVLO, matched propagation delay
	200	High- and low-side	IRS2011S	1/1 A	DSO-8	UVLO, MTON/OFF, max =20 ns, 3.3 - 5 V input
	600	High- and low-side	2EDL05N06PF	0.36/0.7 A	DSO-8	SOI, UVLO, MTON/OFF, max=60 ns, 3.3 - 15 V input, BSD
	600	Single high-side	IRS21271S	0.2/0.42 A	DSO-8	UVLO, OCP, 3 - 15 V input, fault reporting
	600	Three-phase	6EDL04N06PT	0.165 A/0.375 A	DSO-28	SOI, integrated BSD, OCP, enable, fault reporting, UVLO enable

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Typical power level of the inverter system: 4 kW-11 kW

Component	Product family	Package options	Battery voltage support (V)	Voltage class (V_{DS} max)	Representative part numbers	Features
MOSFETs	StrongIRFET™ 2 OptiMOS™	TOLL, TOLG TOLT D²PAK 7-pin D²PAK TO-220 TO-247 SuperSO8 SuperSO8 SourceDown	48-72	100-120	IPTG014N10NM5, IPTC014N10NM5, IPT015N10N5, IPT015N10NF2S*, IPB020N10N5, ISC022N10NM6, IPB017N10N5, IPT030N12N3-G, IPB036N12N3 G, IPP039N10N5, IPP050N10NF2S, IPT017N12NM6, IPTC017N12NM6, IPF019N12NM6, IPT030N12N3-G, IPTC030N12NM3, IPB055N08NF2S, IPF016N10NF2S, IPF050N10NF2S, IPF042N10NF2S, IPF024N10NF2S, IPP082N10NF2S, IPP026N10NF2S, IPP050N10NF2S, IPT022N10NF2S, IPT017N10NF2S, IPT015N10NF2S, IQD020N10NM5CG	Low $R_{DS(on)}$ and low conduction losses, tight $V_{GS(th)}$ spread for efficient paralleling, low Q_{rr}, soft body diode, innovative packages Catering to diverse application mission profile requirements with OptiMOS™ (industrial grade) and StrongIRFET™ 2 (standard grade and with broad availability from distribution partners)
			72-96	135-150	IRF150P220, IPT039N15N5, IPTG039N15NM5, IPTC039N15NM5, IPB044N15N5, IPT044N15N5, IPB048N15N5, IPT054N15N5, IQD063N15NM5CG, BSC093N15NS5, IRFP4568, IPT063N15N5, IPB073N15N5, IRF7779L2, IPP076N15N5, IRFS4115	

Component	Voltage class (V)	Configuration	Part number	Source/sink	Package	Features
Gate drivers	160	High- and low-side	2ED2738S01G*	4/8 A	DFN10	SOI, integrated BSD, integrated dead time, integrated shoot-through protection logic, 2 kV HBM ESD
	160	Half-bridge	2ED2748*	4/8 A	DFN10	Truly differential input, high-side and low-side driver, high common mode rejection capability (TDI), 8 V UVLO
	200	1-ch non-isolated	1EDN8550B	4/8 A	SOT23-6	Truly differential input, high-side and low-side driver, high common mode rejection capability (TDI), 8 V UVLO
	200	1-ch non-isolated	1EDN7550U	4/8 A	TSNP	Compact package, truly differential input, high-side and low-side driver, high common mode rejection capability (TDI), 4 V UVLO
	250	Half-bridge	2EDF5215F	5/9 A	DSO-8	Dual channel, 7 V UVLO, functional isolation gate driver, in compact package
	500	High- and low-side	IRS2110S	2/2 A	DSO-16W	MTON/OFF, max=10 ns, separate power and logic ground, SD pin, 3 - 20 V input
	600	High- and low-side	2EDL23N06PJ	2.3/2.8 A	DSO-14	3.3 V - 15 V input, -100 V transient, PGND, SOI, integrated BSD, OCP, UVLO, enable, fault reporting
	600	High- and low-side	IRS21867S	4/4 A	DSO-8	High current level shift gate driver with low V_{CC} operation
	600	1-ch isolated	IR2127	0.25/0.5 A	DIP8	Over current protection and fault reporting
	650	High- and low-side	2ED2181S06 F/J	2.5/2.5 A	DSO-8 (F) DSO-14 (J)	SOI, integrated BSD, 3.3 - 15 V input, MTON/OFF, max=35 ns, -100 V transient, separate logic and power ground (only J version)

Note: The MOSFET parts listed under various power-levels in the above tables is only for guidance purposes; higher power levels can be achieved even with lower voltage class MOSFETs through paralleling.

Typical power level of the inverter system: >11 kW

Component	Product family	Package options	Battery voltage support (V)	Voltage class [V_{DS} max]	Representative part numbers	Features
MOSFETs	StrongIRFET™ 2 OptiMOS™	TOLL TOLG TOLT D²PAK 7-pin D²PAK SuperSO8 TO-220 TO-247	96-144	200	IRF200P222, IPB107N20N3G, IPTG111N20NM3FD, IRFP4668, IRFS4127, IPT067N20NM6*, ISC119N20NM6*, IPT129N20NM6*, IPP319N20NM6*, IPP069N20NM6*, IPF067N20NM6*, IPB068N20NM6*	Low $R_{DS(on)}$ and low conduction losses, tight V_{GSth} spread for efficient paralleling, low Q_{rr}, soft body diode, innovative packages Catering to diverse application mission profile requirements with OptiMOS™ (industrial grade) and StrongIRFET™ 2 (standard grade and with broad availability from distribution partners)
			144-200	250-300	IRF250P224, IRF300P226, IPT210N25NFD, IPTG210N25NM3FD, IPB407N30N, IPB600N25N3 G, IRFP4868, IRFB4229, IRFS4229	

Component	Voltage class (V)	Configuration	Part number	Source/sink	Package	Features
Gate drivers	650	1-ch isolated	1EDB8275F	5/9 A	DSO-8	3 kV basic isolation with CT technology, (UL1577), separate SRC/SNK output, UVLO (4 types), CMTI > 300 V/ns
	1200		1EDI60N12AF	10/9 A		Short circuit clamping, active shut-down, UVLO, separate SRC/SNK output, 3.3 - 15 V input
	1200	2-ch isolated	2EDB8259F/ 2EDB8259Y	5/9 A	DSO16/ DSO14	3 kV basic isolation w. CT technology, (UL1577), 8 V UVLO (4 types), DIS, STP/DTC, CMTI > 300 V/ns
	1200	2-ch with reinforced isolation	2EDR8259X	5/9 A	DSO-14	Dual-channel, 8 V UVLO, gate driver with increased ch to ch creepage
	1200	2-ch with reinforced isolation	2EDR7259X	5/9 A	DSO-14	Dual-channel, 4 V UVLO, gate driver with increased ch to ch creepage

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Microcontrollers and sensors for precision control and accurate sensing (power-level agnostic)

Component	Product family	Core/MaxClock speed	Representative parts	Package	Features
Microcontroller	iMOTION™	Arm® Cortex® M0, 48 MHz	IMC301A-F048, IMC301A-F064	LQFP-48, LQFP-64	UART, SPI, I²C, LIN, MATH, 2x ACMP, CCU4
	XMC™	Arm® Cortex® M0, 32 MHz	XMC13xx	TSSOP-16/28/38, VQFN-24/40,	UART, SPI, I²C, I²S, POSIF, MATH, 3x ACMP, CCU8
		Arm® Cortex® M0, 48 MHz	XMC14xx	TSSOP-38, VQFN-0/48, LQFP-64	UART, SPI, I²C, I²S, CAN, POSIF, MATH, 4x ACMP, 2x CCU8
		Arm® Cortex® M4F, up to 144 MHz	XMC4xxx	VQFN-48, TQFP-64	UART, SPI, I²C, I²S, CAN, POSIF, HRPWM, CCU8, Ethernet, EtherCAT
		Single and dual core Arm® Cortex®-M7 and Cortex®-M0+	XMC7100, XMC7200	TQFP-100/176, LFBGA-272	TCPWM timers of 102 ch 16 bit and 16 ch 32-bit, cryptography engine support, CAN-FD
	TRAVEO™ T2G	Single and Dual Arm® Cortex® M7 and M0+ Arm® Cortex® M4F and M0+	TRAVEO™ T2G	LQFP-64/100/176	ASIL-B functional safety, 16-bit dedicated motor TCPWM and 32-bit TCPWM, clock extension peripheral, CAN-FD, cryptography engine support, SOTA support
	AURIX™	up to 6x TriCore™ at 300 MHz +	AURIX™ TC3xx	LQFP-144/176, LFBGA-292/516	ASIL-D functional safety with up to 4-lockstep cores, CAN-FD, cryptography engine support, support high PWM (5 ns @ 200 MHz), SOTA support
Motor Control IC	MOTIX™	Arm® Cortex® M0, 48 MHz	IMD701A	VQFN-64	XMC1404 microcontroller integrated with 6EDL7141 3-ph smart gate driver in a single package

Component	Product family	Representative parts	Features
Angle/position sensors	XENSIV™ Hall switches (end of shaft/out of shaft)	XENSIV™ TLx4961/68	3 - 32 V operation, active error compensation, high stability magnetic thresholds, low jitter
	XENSIV™ angle sensor (end of shaft)	XENSIV™ TLI5012	Integrated angle calculation, incremental interface, SPI with 8 Mbit/s, ≤ 1.9° angle error over temperature/life, integrated giant magneto resistance-based angle sensor, 15-bit representation of angle value with 0.01° resolution, bi-directional SSC interface
		XENSIV™ TLE5501	Sin/cos output via analog interface, precise rotation sensing (typ. angle error of 1 deg), very-low current consumption (~2 mA), extended magnetic field range up to 100 mT, ISO-26262 (functional safety) compliant option
	XENSIV™ 3D magnetic sensor (end of shaft/out of shaft)	XENSIV™ TLI493D	Enables out-of-shaft angular sensing, ±50 mT to ±160 mT ranges, up to 30.8 LSB12/MT sensitivity, low power mode, low offset and match drift, wake up function; recommended for motors with max-speed up to 3000 rpm
Current sensor	XENSIV™ magnetic coreless current sensor	XENSIV™ TLI4971	±25 A, ±50 A, ±75 A and ±120 A measurement range, 240 kHz bandwidth, low sensitivity error over temperature, galvanic functional isolation up to 1150 V, differential sensing, two independent over current detection outputs, user programmable parameters
		XENSIV™ TLE4972	Analog output, up to ±2000 A measurement range, 210 kHz bandwidth, fast overcurrent detection output with programmable threshold, differential sensing, galvanic isolation between current rail and sensor, user programmable parameters

Design resources

Low-voltage drives scalable power demoboard platform
XMC™ demonstration and eval boards
ModusToolbox™
TRAVEO™ T2G Motor Control

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System specification example

V_{bat} = 36 V, 250 W (continuous power) PMSM motor with configurable controller and smart gate driver

BoM Exemplar

Component	Part Numbers	Description
MOSFETs	BSC012N06NS	Small form-factor in a SuperSO8 package, low $R_{DS(on)}$, low Q_{rr}, soft body diode
Microcontroller	IMC301A-F048	Configurable (No-Code) motor control IC; communication: UART, SPI, I^2C, LIN Motor control peripherals: MATH, 2x ACMP, CCU4
Gate driver	6EDL7141	3-phase configurable gate driver with >50 configurable parameters (slew rate, output voltage etc.); fully integrated programmable buck (7,9,10,15 V) + LDO (3.3,5 V) power supply; 3* integrated current sense amplifiers (CSA)
Position/speed sensor	TLI49611MXTMA1	Bipolar Hall latch with 3.0 V to 32 V operating supply voltage, active error compensation, low jitter (typ. 0.35 µs), high ESD performance
Current sensor	TLI4971-A120T5-U-E0001	120 A measurement range with integrated current rail, high bandwidth of 240 KHz, high robustness to voltage slew rates up to 10 V/ns, two independent fast over-current detection (OCD) pins with configurable thresholds





System specification example

V_{bat} = 48 V, 250 W (continuous power) PMSM motor with dedicated motor control MCU

BoM Exemplar

Component	Part Numbers	Description
MOSFETs	BSC019N08NS5	Small form-factor in a SuperSO8 package, low $R_{DS(on)}$, low Q_{rr}, soft body diode
Microcontroller	XMC1302-T038X-0032	Core: 32 MHz Arm® Cortex® M0, peripherals clock: 64 MHz; communication: UART, SPI, I^2C, motor control peripherals: POSIF, MATH, 1x CCU8
Gate driver	6ED2742S01Q	3-phase gate driver built on silicon on insulator (SOI) technology with integrated BSD, trickle charge pumps, power management and current sense amplifiers
Position/speed sensor	TLI49611MXTMA1	Bipolar Hall latch with 3.0 V to 32 V operating supply voltage, active error compensation, low jitter (typ. 0.35 µs), high ESD performance
Current sensor	TLI4971-A120T5-U-E0001	120 A measurement range with integrated current rail, high bandwidth of 240 KHz, high robustness to voltage slew rates up to 10 V/ns, two independent fast over-current detection (OCD) pins with configurable thresholds





System specification example

V_{bat} = 36 V, 250 W (continuous power) PMSM motor with functional safety requirement

BoM Exemplar

Component	Part Numbers	Description
MOSFETs	BSC016N06NS	Small form-factor in a SuperSO8 package, low $R_{DS(on)}$, Low Q_{rr}, soft body diode
Microcontroller	CYT4BB5CEBQ0AESGS	Core: One/two Arm® Cortex® M7 at 250MHz + Arm® Cortex® M0+ at 100 MHz, 4 MB flash, Up to 12 16-bit counters for motor control, Up to 220 programmable I/Os
Gate driver	TLE9180D-32QK	3-phase gate driver with 3 x current sense amplifiers (CSA), ASIL-C functional safety; automotive grade 1 qualified
Position/speed sensor	TLI49611MXTMA1	Bipolar Hall latch with 3.0 V to 32 V operating supply voltage, active error compensation, low jitter (typ. 0.35 µs), high ESD performance
Current sensor	TLI4971-A120T5-U-E0001	120 A measurement range with integrated current rail, high bandwidth of 240 KHz, high robustness to voltage slew rates up to 10 V/ns, two independent fast over-current detection (OCD) pins with configurable thresholds

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System specification exemplar

V_{bat} = 48 V, 3 kW PMSM motor

Component	Part Numbers	Description
MOSFETs	IPTC012N08NM5	OptiMOS™ 5 80 V power MOSFET in TOLT package enabling top-side cooling, high current rating >300 A, low Q_G of 175 nC
Microcontroller	XMC1403-Q048X0200 AA	Core: 48 MHz arm cortex M0, peripherals clock: 96 MHz; communication: UART, SPI, I^2C, 2*MultiCAN; motor control peripherals: POSIF, MATH, 4x ACMP, 2x CCU88
Gate driver	2ED2738S01G	2-channel (half-bridge) gate driver with SOI isolation, integrated BSD, UVLO, separate V_{SS}/COM, thermal pad
Position/speed sensor	TLE5012B E1000	Gian magneto resistive (GMR) based analog sensor with a high magnetic field range of 20 mT to 100 mT; Max. 1.0° angle error over lifetime, discrete bridge with differential sine and cosine output
Current sensor	TLI4971-A120T5-U-E0001	120 A measurement range with Integrated current rail, high bandwidth of 240 KHz, high robustness to voltage slew rates up to 10 V/ns, two independent fast over-current detection (OCD) pins with configurable thresholds







System specification exemplar

V_{bat} = 48 V, 20 kW PMSM motor

Component	Part Numbers	Description
MOSFETs	IPTG014N10NM5	OptiMOS™ 5 100 V power MOSFET in TOLG (TO-Leaded with gullwing) package, high current rating >300 A, low Q_G of 169 nC
Microcontroller	SAK-TC377TX-96F300S AB	AURIX™ TC377TX 3 * Tricore @ 300 MHz; functional safety ASIL - D; HSM (hardware security module); communication: 12-ch CAN-FD, 128-ch DMA
Gate driver	2EDB8259F	Half-bridge gate driver with 3 kV basic isolation based on coreless transformer (CT) technology, (UL1577), UVLO (4 types), DIS, STP/DTC, CMTI > 300 V/ns
Position/speed sensor	TLE5014(D)	Giant magneto resistive (GMR) angle sensors with a wide range of selectable interfaces (SPC, SENT, PWM, SPI), low error rate < 1.0°, easy-to-use pre-configured sensors with high flexibility
Current sensor	TLE4972-AE35S5	High-precision coreless current sensor with full-scale up to 31 mT for high current applications; two independent fast over-current detection (OCD) pins with configurable thresholds



System specification exemplar

V_{bat} = 48 V, 3 kW PMSM motor

Component	Part Numbers	Description
MOSFETs	IPT039N15N5	OptiMOS™ 5 150 V power MOSFET in TOLL package, high current rating >190 A, low Q_G of 78 nC
Microcontroller	XMC4700-F100K1536 AA	Core: ARM® Cortex ®-M4 @ 144 MHz Communication: channel USIC (configurable to SPI, UART, IIC, IIS) Motor Control Peripherals: 2 x POSIF, 4-channel ΔΣ Demodulator, 4 x 12-bit ADC, 18 input channels, 4 x parallel sampling and conversion
Gate driver	2EDB8259F	Half-bridge gate driver with 3 kV basic isolation based on coreless transformer (CT) technology, (UL1577), UVLO (4 types), DIS, STP/DTC, CMTI > 300 V/ns
Position/speed sensor	TLE5501	Tunnel magneto resistive (TMR) based pre-calibrated sensor with 360° angle measurement; Max. 1.0° (1.9°) angle error over lifetime, 16-bit representation of sine/cosine values
Current sensor	TLE4972-AE35S5	High-precision coreless current sensor with full-scale up to 31 mT for high current applications; two independent fast over-current detection (OCD) pins with configurable thresholds

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UPS

UPS

Attractive solutions for highest efficiency and power density

Today's uninterruptible power supply systems introduce a wide range of challenges. Overcoming them requires an increase in output power, energy efficiency and power density. We offer complete system-level solutions and high-quality products for diverse uninterruptible power supply applications. Equipped with our semiconductors, UPS applications can achieve the best-possible power-conversion efficiency and cutting-edge power density. The benefits are cost reduction and fewer passive components – regardless of the topology used.

Our solutions and products for UPS applications fulfill the latest market requirements. This includes the trend of modularization of UPS brick units due to scalable power demand from data centers, as well as the topology shift from two-level to three-level to achieve higher efficiency. Our products are suitable for any kind of uninterruptible power supplies in telecom, data center, server or industrial automation environments. Our microcontroller solutions fulfill the control and power conversion requirements to enable UPS market needs. Finally, Infineon's portfolio of Wi-Fi / Bluetooth combos enables UPS proper connectivity for monitoring.

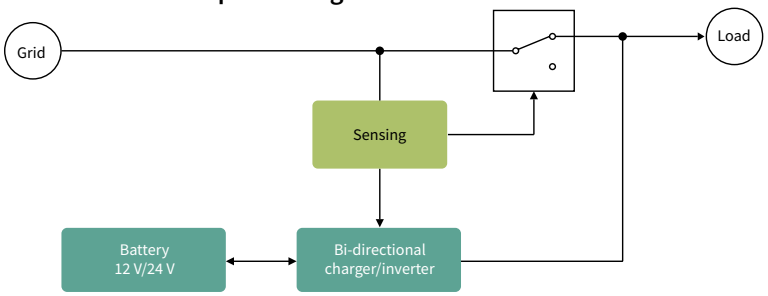
	Offline UPS	Online UPS
MOSFETs	OptiMOS™ and StrongIRFET™ 20-300 V	CoolSiC™ MOSFETs
	CoolMOS™ SJ MOSFETs 500-950 V	
SiC diodes		CoolSiC™ Schottky diode
IGBTs		TRENCHSTOP™ IGBT7 TRENCHSTOP™ 5
		HighSpeed 3 H3
Power module and stack		EasyPACK™
Driver ICs	EiceDRIVER™ 1EDi EiceDRIVER™ 2EDi	EiceDRIVER™ X3 Compact
Auxiliary power supply		CoolSET™ 650-800 V
Microcontrollers	XMC1300 series / PSoC™ 4 series	XMC1000 and XMX4000 series PSoC™ 4 series
Connectivity	AIROC™ Wi-Fi/Bluetooth® combos	

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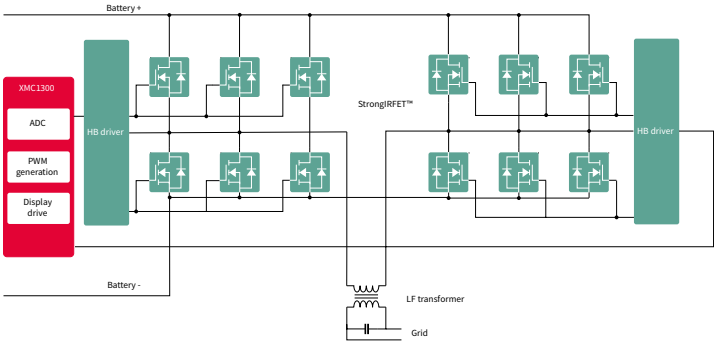
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Offline UPS

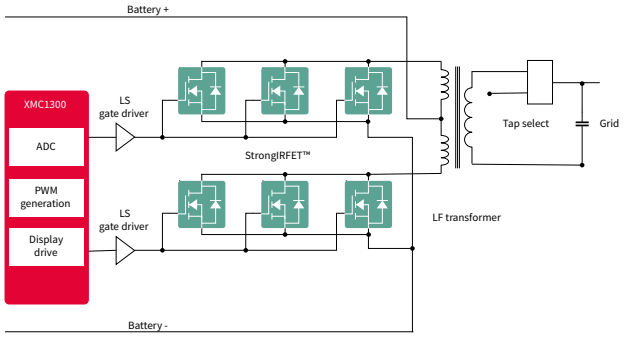
Bi-directional UPS power stage



Full-bridge bi-directional power stage



Push-pull bi-directional power stage



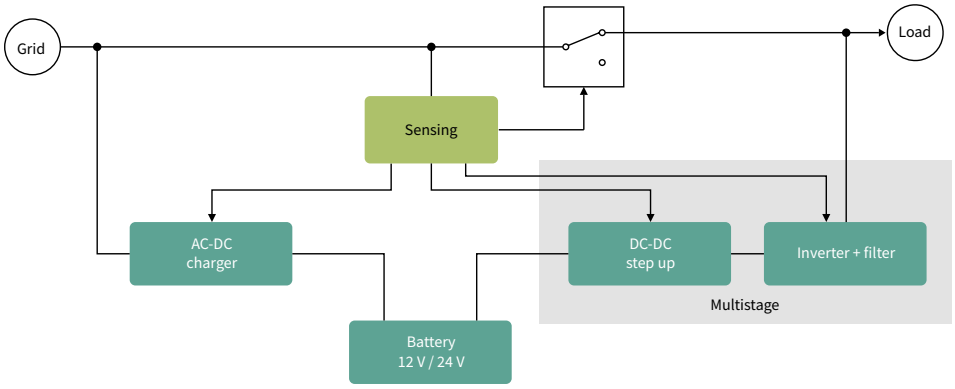
Functional block	Battery voltage	Topo-logy	MOSFET voltage class	Through hole devices TO-220 and TO-247	Standard SMDs D²PAK and D²PAK-7	Advanced SMDs TOLL, TOLG, TOLT, sTOLL	Gate drivers
Inverter/charger MOSFETs	12 V	Push-pull	60 V	IRFB7530/IRFB7534/ IRFB7540/IRFB7537 IRFP3006/IRFP7530/IRFP7537	IPB011N04NF2S IRFS7530	IPT012N06N IPTG007N06NM5 IPTC012N06NM5	IRS44273/IRS4427 1EDN7512B/2ED2181S06J 2ED2184S06J
		Full-bridge	30 V 40 V	IRLB3813/IRLB8314/IRLB8743 IRFB7430/IRFP7430/IRLB4132	IPF010N04NF2S IRFS7430	IPT004N03L IST006N04NM6	IRS2110/IRS2186 2EDL8114G/1EDN7550B 1EDN8550B
	24 V	Push-pull	80 V 100 V	IPP023N08N5/IPA083N10N5 IRFB3077/IRFB3207/ IRFB7730/IRFB7734 IRFP4468/IRF100B201/ IRF100B202	IPB017N10N5/IPB017N08N5 IRFS7430/IRFS7734/IRF3610S	IPT014N08NM5/IPT015N10N5 IPTG011N08NM5/ IPTG014N10NM5 IPTC011N08NM5/ IPTC014N10NM5	IRS44273/IRS4427 1EDN8511B/2EDN852X 2ED2181S06J/2ED2184S06J
		Full-bridge	40 V 60 V	IRFB7430/IRFB7434/IRFB7545 IRF60B217/IRFP7530/ IRFP3006 IRFP7537	IPB011N04NF2S IRFS7430/IRFS7530	IPT012N06N IPTG007N06NM5 IPTC012N06NM5	1EDN7550B/2EDL811X 2ED2181S06J/2ED2184S06J IRS2186/1EDN8550B
	48 V	Push-pull	150 V	IPP046N15N5/IRFB4321 IRFB4228/IRFB4019/IRFB4115 IRFP4568/IRFP4321/ IRF150P220	IPB048N15N5/IPB044N15N5 IRFS4321/IRFS4115/IRFS4615	IPT039N15N5 IPTG039N15NM5 IPTC039N15NM5	1EDN851X/2EDN852X IRS44273/IRS4427
		Full-bridge	100 V	IPP030N10N5/IPP039N10N5 IPP030N10N/IRFB4110/ IPP086N10N3G IRFB4510/IRF100P218/ IRF100P219	IPB020N10N5/IPB017N10N5 IRF3710S/IRF8010S/IRFS4510	IPT015N10N5 IPTG014N10NM5 IPTC014N10NM5	1EDN8550B IRS2186 2EDL811X
	72 V	Push-pull	200 V	IPP110N20N3/IRFB4127 IRFB4227/IRF200P223	IPB110N20N3LF IRFS4127	-	1EDN851X/2EDN853X IRS44273/IRS4427
		Full-bridge	150 V	IPP046N15N5/IRFB4321 IRFP4568/IRF150P220	IPB048N15N5/IPB044N15N5 IRFS4321	IPT039N15N5 IPTG039N15NM5 IPTC039N15NM5	2EDL811X IRS2186
		Full-bridge	200 V	IPP110N20N3 IRFB4227 IRF200P222 IRFP4668	IPB110N20N3LF IRFS4127	-	2EDL811X IRS2186
Microcontrollers	12-72 V	XMC1300 series/PSoC™ 4 series					

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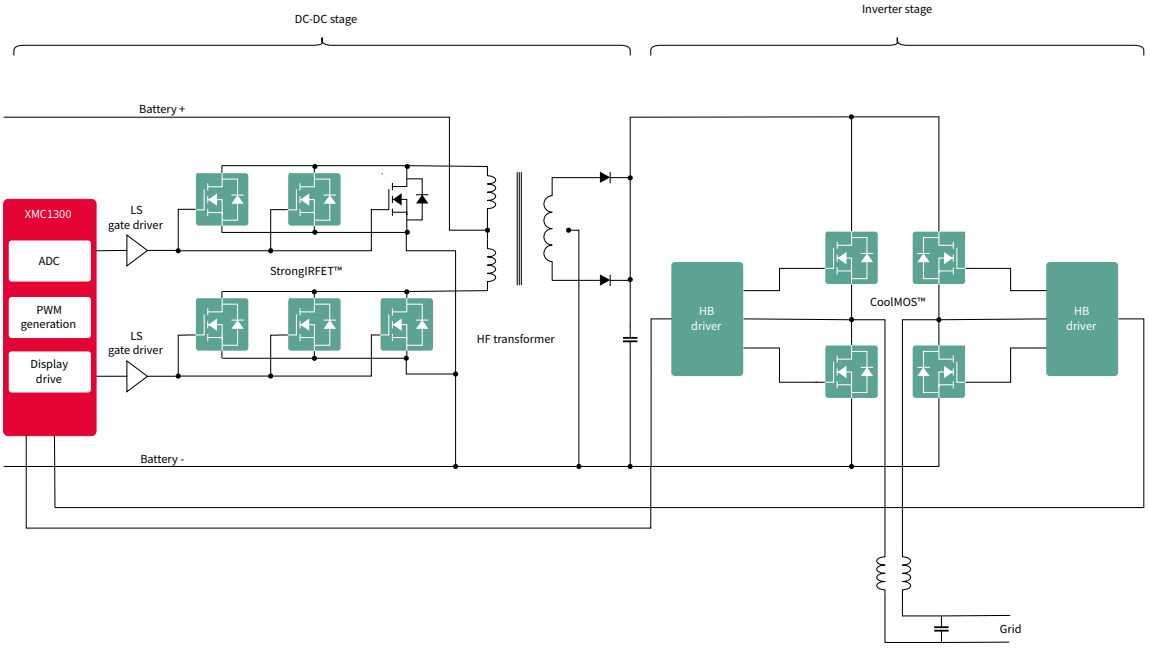
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Unidirectional



Unidirectional power stage (output stage)



Unidirectional DC-DC stage

Battery voltage	Topology	MOSFET breakdown voltage	TO-220	TO-247	D²PAK and D²PAK-7	Gate drivers
12 V	Push-pull	40 V	IRFB7430/IRFB7434 IRLB4132/IRFP7718	IRFS7430/IRFS7430	IPT004N03L IST006N04NM6	IRS44273/IRS4427 1EDN851X/2EDN853X
		60 V	IRFB7540 IRFB7545 IRF60B217	IPB011N04NF2S IRFS7530	IPT012N06N IPTG007N06NM5 IPTC012N06NM5	2ED2181S06J 2ED2184S06J 2EDF5215 2EDL23N06PJ 2ED2182S06F
		80 V	IRFP7718 IRFP7718	IPB017N08N5 IPB016N08NF2S IPF014N08NF2S	IPT014N08NM5 IPTG011N08NM5 IPTC011N08NM5	2EDF5215 2EDL23N06PJ 2ED2182S06F
24 V	Push-pull	80 V	IPP023N08N5 IRFB3077/IRFB3207 IRFB7730/IRFB7734	IPB017N08N5 IRFS7730 IRFS7734	IPT014N08NM5 IPTG011N08NM5 IPTC011N08NM5	2ED2181S06J 2ED2184S06J
		100 V	IPP030N10N5/ IPP039N10N5 IRF100P218/IRFP4468	IPB020N10N5 IPB017N10N5 IRFS4010 IRF3610S	IPT015N10N5 IPTG014N10NM5 IPTC014N10NM5	2ED2181S06J 2ED2184S06J 2EDF5215 2EDL23N06PJ 2ED2182S06F
		150 V	IPP046N15N5 IRFB4115/IRFB4321 IRFB4019/IRF150P220	IPB044N15N5 IRFS4321/IRFS4115 IRFS4615	IPT039N15N5 IPTG039N15NM5 IPTC039N15NM5	IRS2186 2EDL811X
Microcontrollers		XMC1300 series/PSoC™ 4 series				

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Unidirectional inverter stage

Battery voltage	Topology	MOSFET voltage class	Through hole devices TO-220 and TO-247	Standard SMDs D²PAK and D²PAK-7	Gate drivers
200 V	Full-bridge inverter 120 V_{AC}	300 V	IPP410N30N / IRFB4137 IRF300P226 / IRF300P227	- IPB60R180P7 / IPB60R080P7	1EDB8275F / 2EDB825x IRS2186
400 V	Full-bridge inverter 220 V_{AC}	500 V 600 V	IPP50R190CE / IPW50R190CE IPP60R180P7 / IPW60R099P7	- IPB60R180P7 / IPB60R080P7	2EDN7524F 2EDR825x
Microcontrollers		XMC1300 series / PSoC™ 4 series			

Unidirectional charger

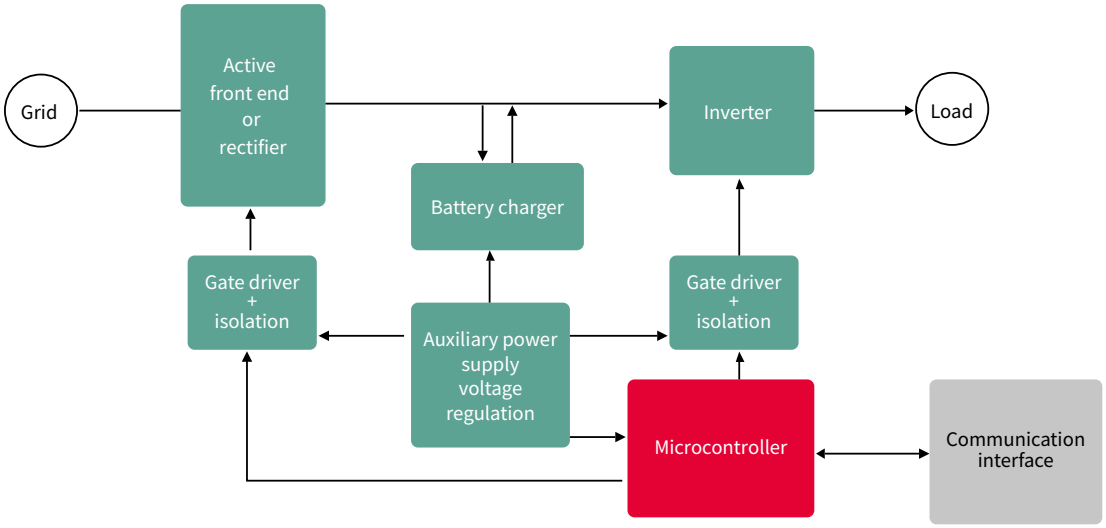
Battery voltage	Topology	MOSFET Voltage class	Through hole devices TO-220 and TO-220 FP	Standard SMDs D²PAK and DPAK
12-72 V	Flyback	600 V	IPP60R180P7 / IPA60R180P7	IPB60R280P7 / IPD60R600P7
		800 V	IPP80R280P7 / IPA80R280P7	IPD80R360P7
		950 V	IPA95R450P7	IPD95R450P7
Control ICs		ICE3AS03LJG, ICE3BS03LJG, XDPS2201		

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Online UPS

Online UPS power stage



Stage	Topology	Voltage class	Technology	Power transistor part number	Gate driver
Rectifier	Three-phase	800 V/1600 V	EasyBRIDGE, EconoBRIDGE™	DDB6U144N16R/DDB6U104N16RRP_B3	1ED3122MC12H 1ED3124MC12H
PFC	Boost PFC/ Vienna "T-type"	1200 V	TRENCHSTOP™ H7	IKW40N120CH7/IKW40N120CH7	1ED020I12-F2
		1200 V	CoolSiC™ MOSFET	F3L15MR12W2M1_B69	1ED020I12-F2
		650 V	TRENCHSTOP™ H7	IKWH50N65EH7/IKWH75N65EH7	1EDI60I12AH
		650 V	TRENCHSTOP™ 5 WR5	IKW40N65WR5	-
	Boost PFC	650 V 1200 V	CoolSiC™ Schottky diode	IDH10G65C6/IDK10G65C5 IDWD40G120C5/IDH20G120C5/IDK10G120C5	-
		600 V	CoolMOS™ P7	IPP60R060P7/IPB60R060P7	1EDB7275F
		600 V	CoolMOS™ C7	IPW65R019C7/IPB65R045C7	1EDB7275F
Inverter	NPC 1	650 V	TRENCHSTOP™ H7	IKWH50N65EH7, IKWH75N65EH7/IKZA50N65EH7, IKZA75N65EH7	2EDF7275F
		650 V	TRENCHSTOP™ HighSpeed3 IGBT Rapid diode	FS3L50R07W2H3F_B11	2EDF7275F
	NPC 2	1200 V	TRENCHSTOP™ H7	IKW40N120CH7/IKQ75N120CH7	2ED020I12-F2
		1200 V	TRENCHSTOP™ HighSpeed3 IGBT Rapid diode	FS3L25R12W2H3_B11/F3L200R12W2H3_B11	-
		650 V	TRENCHSTOP™ H7	IKWH50N65EH7, IKWH75N65EH7	2EDF7275F
	Two-level	1200 V	EconoPACK™ , EasyPACK™	FS75R12W2T4_B11/FS200R12KT4R_B11	2ED020I12-F2
		1200 V	EconoDUAL™	FF600R12ME4_B11	2ED020I12-F2
	Three-level NPC1	600 V/1200 V	EconoPACK™	F3L300R07PE4	2ED020I12-F2
Battery charger	Half-bridge	1200 V	TRENCHSTOP™ H7	IKW40N120CH7/IKQ75N120CH7	2ED020I12-F2
		1200 V	CoolSiC™ MOSFET	FF6MR12W2M1_B11	2ED020I12-F2
		650 V	TRENCHSTOP™ H7	IKWH50N65EH7/IKWH75N65EH7	2EDF7275F
Aux. supply		650-800 V	CoolSET™	ICE5AR4770BZS	
Digital isolator			ISOFACE™	1ED3122MC12H/1ED3124MC12H	
Microcontroller			XMCTM PSoC™	XMC1000 ARM® Cortex® M0/XMC4000 ARM® Cortex® M4 PSoC™ 4	
Connectivity			AIROC™	Wi-Fi 4/Wi-Fi 5/Wi-Fi 6	

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Smart devices with NFC interface

NFC-based configuration, actuation and sensing applications

Near-field communication (NFC) is a mature technology for contactless exchange of data over short distances. Besides the data exchange, NFC technology itself can also transfer power from the polling device to the receiver devices. Due to the working principle of resonant coupling, power transmission via NFC is efficient and user-friendly because it is less sensitive to antenna/coil alignment. The combination of data exchange and energy transfer in one interface and the availability in billions of smartphones make NFC an exciting enabler for the following novel use cases:

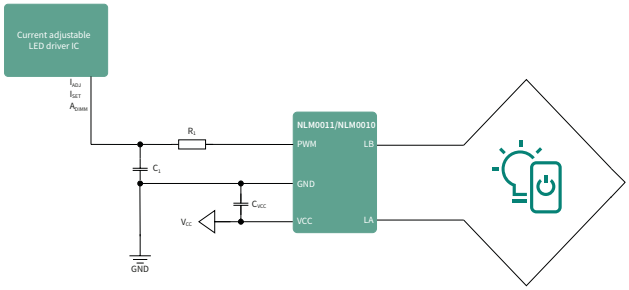
Passive device parameter configuration: Programming or configuring product operation parameters is sometimes complicated because of access problems or equipment requirements. Using an NFC interface, contactless or even passive operation can be performed anywhere. Modern LED power supplies are already equipped with the NFC interface to enable output current configuration in production, sales channel, and the field. Infineon's NLM product series supports customers to enable NFC configuration functions effectively.

Smart actuator and sensing devices: In the IoT age, smart devices help people make their life easier and more sustainable. NFC technology provides an option to develop battery-less smart devices that operate when the NFC reader device, like a mobile phone, is present. As a complement to mainstream active IoT technology, passive NFC technology is suitable for use cases like a passive smart lock, passive sensor inlay, medical care patch, etc.

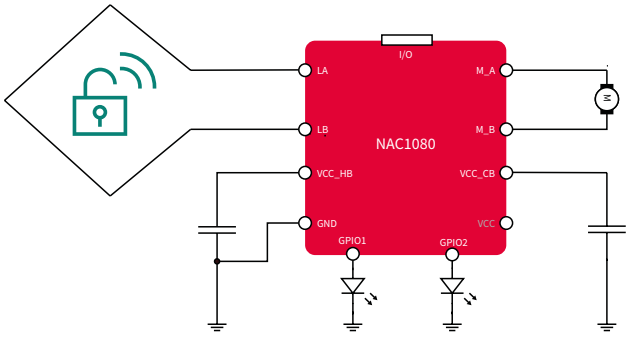
With Infineon's new NFC tag-side controller family a single-chip solution is available to develop cost-effective, miniaturized, actuation or sensing applications operating in either passive or active mode. The NAC1080, with integrated H-bridge and energy harvesting modules, enables cost-effective development of passive smart actuators like passive locks. AC1081 is a package variant in VQFN32 package.

The NGC1081 is a low-power controller with ADC/DAC unit, integrated temperature sensor, and sophisticated analog and digital I/Os. It is the ideal solution for contactless sensing applications like temperature logger, gas detector, sensor inlay, medical patch, etc. Furthermore, both sensing and actuation control capability make the NGC1081 a unique product in the market, ideally suited for applications that require these functions – for example, radiator thermostats.

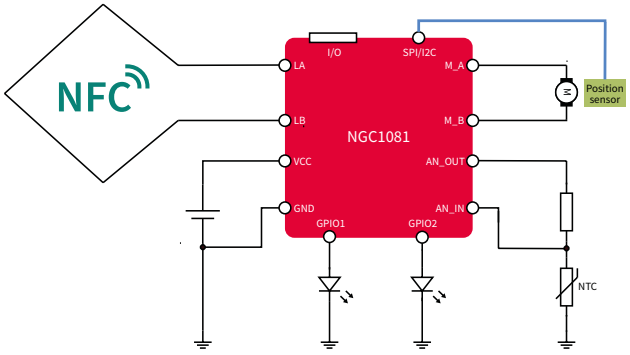
Example: NFC LED power supply



Example: NFC passive lock



Example: Smart radiator thermostat



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NFC configuration – NLM series

Type	Description	Package	Ordering code
NLM0011	Dual-mode NFC configuration IC with PWM output and CLO function	SOT23-5	NLM0011XTSA1
NLM0010	Dual-mode NFC configuration IC with PWM output, without CLO function	SOT23-5	NLM0010XTSA1

See LED lighting chapter for more information.

NFC actuation and sensing – NAC1080 and NGC1081

Highly integrated single-chip solution

The low-power Arm® Cortex®-M0 based microcontroller with integrated NFC frontend, sensing unit, motor driver, and energy harvesting function enables customers to develop smart actuation and sensing devices with minimum system BOM requirement.

Full flexible software-defined functions

The flexible IC architecture and the smart partitioning between hardware and software enable customers to maximize the utilization of software-defined functions.

Build-in security functions to meet the application requirements

These ICs include hardware security functions such as secure area in flash, 128 bit AES accelerator and true random generator. A separate secure element can be connected via the digital interface on demand.

Type	NFC	Processor	RAM	NVM	ADC	DAC	I2V	H-Bridge	I²C	SPI	UART	GPIO	Analog-in	Package
NAC1080	ISO14443A	32-bit Arm® Cortex®-M0	16 kB	60 kB	no	no	no	yes	no	yes	yes	7x	no	PG-DSO-16
NAC1081	ISO14443A	32-bit Arm® Cortex®-M0	16 kB	60 kB	no	no	no	yes	no	yes	yes	7x	no	PG-VQFN-32
NGC1081	ISO14443A	32-bit Arm® Cortex®-M0	16 kB	60 kB	12 bit	10 bit	yes	yes	yes	yes	yes	16x	X4	PG-VQFN-32



Applications

Appliances and consumer electronics, ITC infrastructure, renewables, robotics, e-mobility

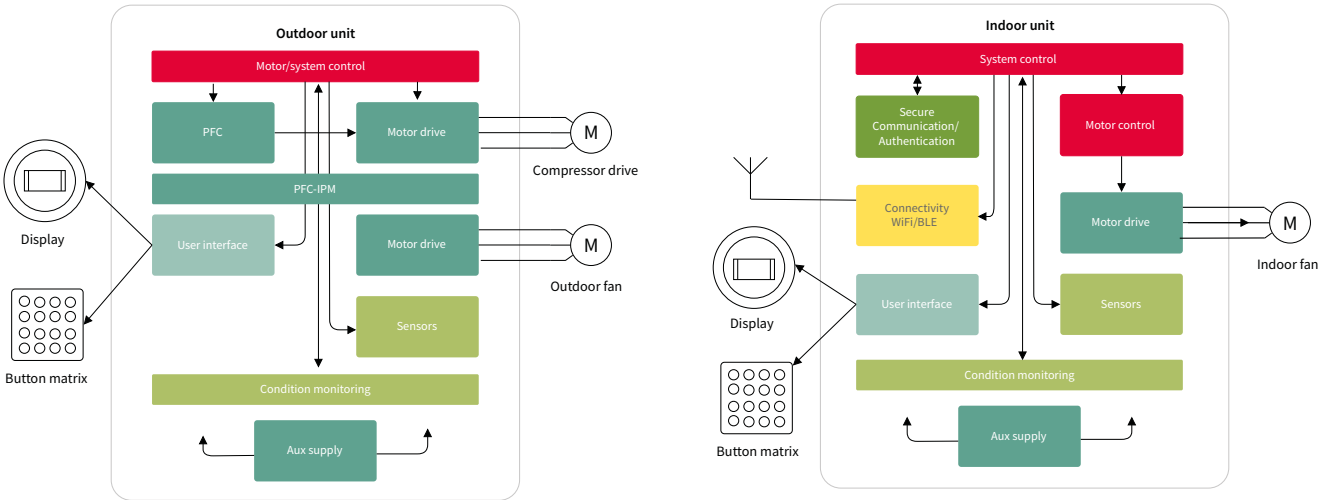
- Major home appliances
- Small home appliances
- Cordless Power Tools, Cordless Gardening Tools and OPE
- Wrist-worn devices
- Class D audio
- Smart speaker
- Security camera and video doorbell
- LED lighting
- Plug & LEDs play solutions
- Smart lighting solutions
- Smart conference solutions
- ICT solutions
- DC-DC power solutions für data center, edge, enterprise, telecom and datacom
- DC-DC enterprise power solutions for data processing applications
- Solar
- Energy storage systems
- Robotics
- Onboard chargers for xEV appliactions
- Light electric vehicles and electric forklift

Aircon

Major home appliances

Innovative approach for air conditioning systems

Product designers are facing the daunting challenge of developing smaller, smarter, more powerful, and more energy-efficient appliances. Based on industry-leading technology and manufacturing expertise, Infineon's line of innovative components for household appliances meets and exceeds even the most rigorous requirements for reliability and quality. The block diagram of an air conditioning system shown below, together with the product selection table, provides an effective recommendation for engineers to select the right component for each power management stage inside major home appliances.



In addition to efficiency gain through power solutions, Infineon's XENSIV™ sensor portfolio also enhances major home appliances' operation through advanced sensor-enabled use cases such as condition monitoring and predictive maintenance to detect potential device failures before they occur. Furthermore, integration of voice control or presence detection in those appliances increases user convenience and results in even more efficient devices.

Product category	Product family	Benefits
Sensors	Pressure sensor	Airflow and water pressure monitoring
	MEMS microphone	Noise monitoring and voice control
	Radar sensor	Motion sensing and people tracking
	Magnetic current sensor	Current sensing
	3D magnetic sensor	Vibration and position monitoring
	Linear Hall sensor	Vibration monitoring in predictive maintenance
	Hall sensors and switches	Opened and closed lid detection
	Double Hall sensor	Speed and direction measurement
	32-bit XMC4000 industrial microcontroller Arm® Cortex®-M4	Data processing, sensor system management, cloud connection management and ethernet connectivity
	OPTIGA™ embedded security solutions	Data and cloud security

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For more details on the product, click on the part number, visit infineon.com or contact our product support.

Recommended products

Functional block	Product family	Voltage class	Technology/product family	Selection/benefit
Outdoor unit (ODU) PFC	iMOTION™ controller	-	IMC302A-F064	Motor/PFC controller incl. software
	Non-isolated EiceDRIVER™	25 V	1ED44175N01B	Integrated over-current protection
	Non-isolated EiceDRIVER™	25 V	1ED44171N01B	Cost/performance
	Level-shift EiceDRIVER™	600 V	6EDL04I06PT	Infineon SOI with integrated bootstrap diode
	TRENCHSTOP™ 5 IGBT WR5/WR6	650 V	IKW30N65WR5, IKWH30N65WR6	Recommended
	TRENCHSTOP™ 5 IGBT advanced isolation	650 V	IKFW40N65DH5	Easy to use
	TRENCHSTOP™ IGBT7	650 V	IKW30N65ET7	Recommended
	EC7	650 V	IDWD60E65E7	Recommended
	CIPOS™ Mini	600 V	CIPOS™ Mini PFC interleaved IPM series IFCM20T60GD/ IFCM20U60GD/IFCM30T60GD/IFCM30U60GD CIPOS™ Mini PFC integrated IPM series IFCM10P60GD/ IFCM10S60GD/IFCM15P60GD/IFCM15S60GD IM564-X6D	Easy to use/system size saving
	CoolMOS™ SJ MOSFETs	600 V	IPP60R120P7	Recommended
ODU motor drive (compressor)	iMOTION™ controller	-	IMC302T-F064	Motor/PFC controller incl. software
	CIPOS™ IPM	-	CIPOS™ Mini	Easy to use/system size saving
	Level-shift EiceDRIVER™	600 V	6EDL04I06PT	Infineon SOI with integrated bootstrap diode
	RC-D2 IGBT	600 V	IKD15N60RC2	Recommended
ODU motor drive (out-door fan)	iMOTION™ controller	-	IMC101T-T038	Motor controller incl. software
	CIPOS™ IPM	600 V	CIPOS™ Micro IM241 series	Easy to use/system size saving
	Level-shift EiceDRIVER™	600V	6EDL04I06PT	Infineon SOI with integrated bootstrap diode
	RC-D2 IGBT	600 V	IKD06N60RC2	Recommended
	CoolMOS™ SJ MOSFETs	600 V	IPD60R1K0PFD7S	Recommended
Condition monitoring and predictive maintenance	XENSIV™ Hall switches	-	TLI4963-2M	Recommended
	XENSIV™ pressure sensor	-	DPS368	Recommended
	XENSIV™ MEMS microphone	-	IM69D130	Recommended
	XENSIV™ Hall sensors	-	TLE4961, TLE4964, TLE4913, TLI4966G	Recommended
	XENSIV™ 3D magnetic sensor	-	TLI493D-W2BW	Vibration and position monitoring
	XMC4000 microcontroller	-	XMC4700	Recommended
Indoor unit (IDU)	XMC™ microcontroller	-	XMC1400, XMC4100	Recommended
	iMOTION™ controller	-	IMC302A-F064	Motor/PFC controller incl. software
	PSoC™ 6	-	CY8C62x4/5	Recommended
IDU motor control	XMC™ microcontroller	-	XMC1300, XMC1400	Recommended
	iMOTION™ controller	-	IMC101T-T038	Motor controller incl. software
	CIPOS™ IPM	600 V	CIPOS™ Nano	Easy to use/system size saving
IDU motor drive	iMOTION™ IPM	-	IMI111T-026H, IMI111T-046H	Motor controller incl. software, driver and power stage
	Level-shift EiceDRIVER™	-	6EDL04I06PT	Infineon SOI with integrated bootstrap diode
	RC-D2 IGBT	600 V	IKN03N60RC2, IKD04N60RC2	Recommended
	CoolMOS™ SJ MOSFETs	600 V	IPN60R1K5PFD7S	Recommended
Security	OPTIGA™ Trust family	-	OPTIGA TRUST M SLS32AIA	Recommended
Connectivity Wi-Fi/BLE	AIROC™	-	CYW43439	Recommended
User interface	PSoC™ 6	-	CY8C62x4/5	Recommended
Sensors	XENSIV™ radar	-	BGT60LTR11AIP	Recommended
	XENSIV™ PAS CO_2	-	PASCO2V01	Recommended
	XENSIV™ MEMS microphone	-	IM69D130	Recommended
	XENSIV™ Hall switches	-	TLI4963-2M	Recommended
Auxiliary supply	CoolMOS™ SJ MOSFETs	800 V	IPN80R4K5P7	Recommended
	CoolSET™	700 V	ICE5AR4770BZS	Flyback with error amplifier
UV-C LED for health	LED driver ICs	42 V	BCR43x	Recommended

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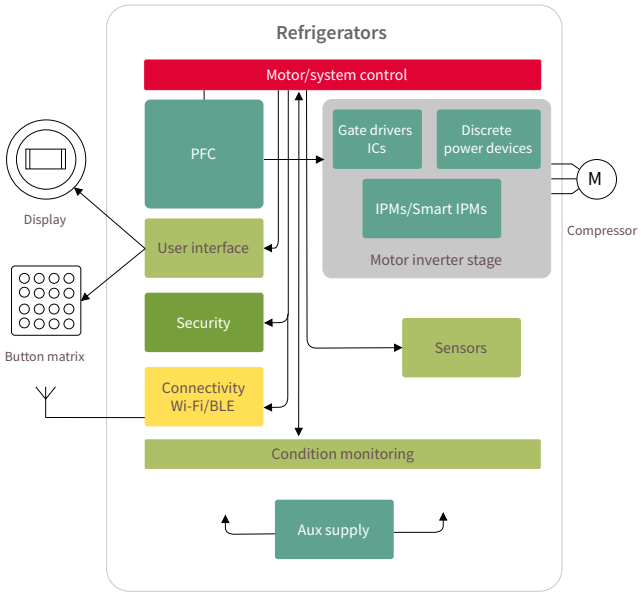


Fridge

Refrigerators

Higher efficiency at lower cost

Today, consumers are not only looking at energy consumption and noise levels. Compact design coupled with maximum storage space is also playing an increasingly important role. In addition, there is a desire for intelligent appliances that can be easily integrated into the home network. From the manufacturer's point of view, the challenge is to meet the stricter regulations on energy efficiency while at the same time ensuring the form factor and a reduction in costs. Thus, intelligent, compact, energy- and cost-efficient drive solutions for refrigerators and freezers meet the high customer requirements.



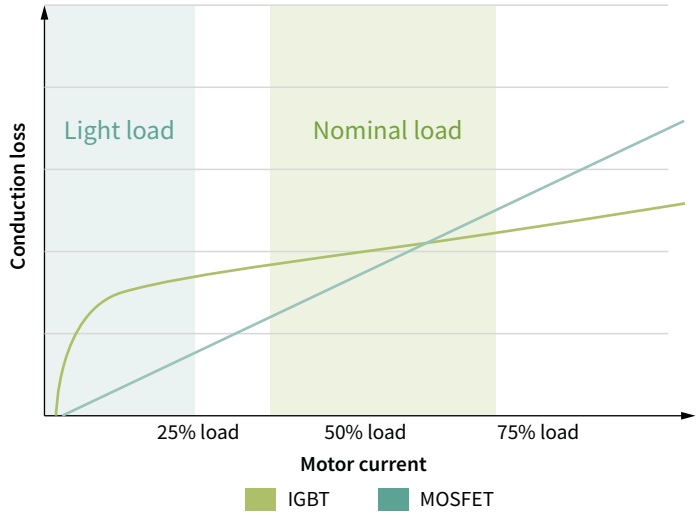
Infineon offers a comprehensive portfolio for refrigerator compressors. Whether you choose the highest level of integration with our intelligent power modules (IPM) or aim for the best price/performance ratio with discrete components, our IGBTs, MOSFETs, gate drivers, and microcontrollers are designed to work together seamlessly. CIPOS™ family of IPMs is the optimal solution for highly integrated compressor drives whilst discrete solutions like the 600 V RC-D2 IGBT or the CoolMOS™ PFD7 SJ MOSFET along with EiceDRIVER™ 600 V are the best choice whenever layout flexibility and thermal performance optimization are the key design targets. If full-load operation and EMI performance are key for the design, the 600 V RC-D2 is the best choice. The diode is monolithically integrated and its current rating has been optimized for price and performance. The RC-D2 is the first IGBT family to introduce the SOT-223 package to further improve the price with a smaller package that is pin-to-pin compatible and substitutable with the DPAK package. They can all be combined with iMOTION™ products for dedicated motor control. For the auxiliary power supply, the CoolSET™ family rounds up our power portfolio by offering increased robustness and performance. Our PSoC™ microcontroller family, AIROC™ Wi-Fi + Bluetooth® Combos connectivity products and XENSIV™ sensors complete the portfolio needed for a truly smart refrigerator. The energy-efficient CIPOS™ modules integrate various power and control components to increase reliability, optimize board size and reduce system costs. This simplifies power supply design and shortens time-to-market. Infineon offers the OPTIGA™ Trust hardware security solution and enables secure access to all major cloud providers.

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CoolMOS™ PFD7 for next-level energy saving

Although both MOSFETs and IGBTs can be used in refrigerator compressor drives, as most of the time, the refrigerator operates under light load, the MOSFET is highly recommended due to its lower conduction loss, thus reducing overall power loss at this condition.

The 600 V CoolMOS™ PFD7 high-voltage MOSFET series, shaped by Infineon's experience of more than twenty years in pioneering in superjunction SJ technology innovation, sets a new benchmark in 600 V SJ technologies. This product family combines best-in-class performance with state-of-the-art ease of use, features an integrated fast body diode ensuring a robust device and allowing for reduced BOM for the customer.



Smart, connected and secured – system solutions for the new home appliance era

Modern refrigerators can sense their environment by being smart and connected. They provide data to their users as well as to the manufacturer (who can remotely analyze the performance data and suggest preventive maintenance). In this data exchange, secure communication systems play a crucial role.

Components and system solutions from Infineon enable you to build smart home appliances while providing secure data acquisition, control, and device connectivity. Furthermore, they enable the highest device efficiency, smallest form factors, and improved carbon footprint with smart power supply designs. Benefit from one of the most comprehensive, out-of-the-box product and design portfolios on the market to best meet your unique application needs.

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Recommended products

Functional block	Product family	Voltage class	Technology/product family	Selection/benefit
PFC	iMOTION™ driver	-	IMD112T-6F040	Motor/PFC controller incl. software and integrated driver
	Non-isolated EiceDRIVER™	25 V	1ED44171N01B	Integrated over-current protection
		25 V	1ED44175N01B	Cost/performance
	CoolMOS™ SJ MOSFETs	600 V	IPP60R120P7	Recommended
	CoolSiC™ Diodes	650 V	IDW30G65C5	Recommended
Inverter	Level-shift EiceDRIVER™	600 V 650 V	6EDL04N06PT 2ED2304S06F	Infineon SOI with integrated boot strap diode
	XMC™ microcontroller	-	XMC1400; XMC1300	Recommended
	iMOTION™ controller	-	IMC102T-F048	Motor/PFC controller incl. software
	iMOTION™ driver	-	IMD111T-6F040	Motor controller incl. software and integrated driver
	iMOTION™ IPM	-	IMM101T-046M	Motor/PFC controller incl. software, driver and power stage
	CIPOS™ IPM	-	CIPOS™ Mini IM523-S6A CIPOS™ Micro IM241 series	Easy to use/system size saving
	RC-D2 IGBT	600 V	IKN04N60RC2 IKD06N60RC2	Recommended
	CoolMOS™ SJ MOSFETs	600 V	IPN60R1K5PFD7S IPN60R600PFD7S	Recommended
User interface	PSoC™ 6	-	CY8C62x4/5	Recommended
Connectivity Wi-Fi/BLE	AIROC™	-	CYW43439	Recommended
Auxiliary supply	CoolMOS™ SJ MOSFETs	800 V	IPN80R4K5P7	Recommended
	CoolSET™	700 V	ICE5AR4770BZS	Flyback with error amplifier
Security	OPTIGA™ Trust family	-	OPTIGA TRUST M SLS32AIA	Recommended
Sensors	XENSIV™ radar sensor	-	BGT60LTR11AIP	Recommended
	XENSIV™ pressure sensor	-	DPS368	Recommended
	XENSIV™ MEMS microphones	-	IM69D130	Recommended
	XENSIV™ PAS CO_2 sensor	-	PAS CO_2	Recommended
	XENSIV™ magnetic position sensors	-	TLV493D-A1B6	Recommended

XENSIV™ sensor solutions for smart refrigerators

Product category	Product family	Benefits
Sensors	XENSIV™ MEMS microphones IM69D130	High-performance microphone with low self-noise (high SNR) and low distortions enables noise monitoring for advanced predictive maintenance analytics
	XENSIV™ digital barometric pressure sensors DPSxxx	Advanced predictive maintenance analytics are enabled based on highest precision and relative accuracy over a wide temperature range to detect anomalies in airflow
	XENSIV™ TLV493D-A1B6 3D magnetic sensor	Accurate three-dimensional sensing with extremely low power consumption in a small 6-pin package to enable vibration and position monitoring of the compressor
	XENSIV™ TLI4970 current sensor	Fully digital solution featuring high precision and ease of use, significantly reduces overall implementation efforts as well as PCB space to enable cost fan and compressor current measurement
	XENSIV™ 60 GHz radar sensor	Accurate presence detection and vibration detection based on ability to track sub-millimeter motion at high speed and accuracy, in both stand-alone chip as well as system solution available

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Ceiling Fan

Ceiling fan

Energy-efficient and cost-effective with high integration for system size reduction

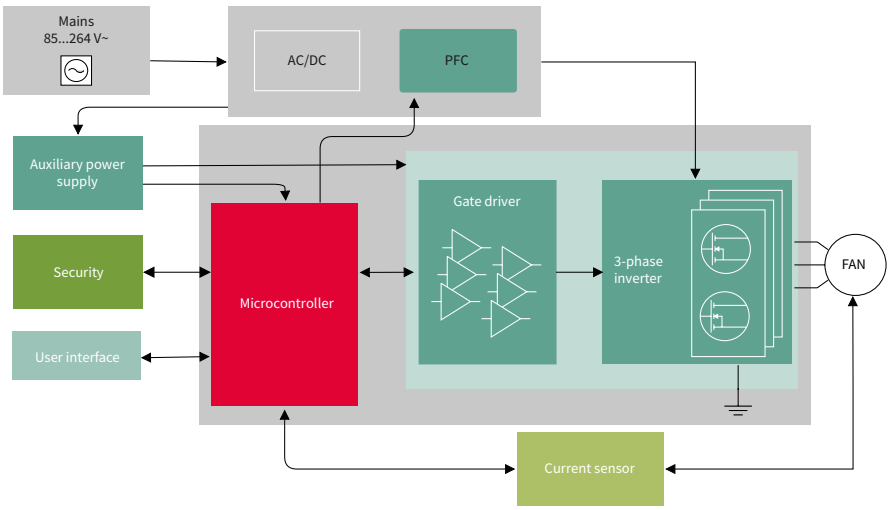
Ceiling fan manufacturers currently face more stringent regulations of the appliance's form factor and are under constant pressure to reduce costs. Infineon is here to provide compact, energy-efficient, cost-effective motor drive solutions. We propose a competitive solution with an extensive portfolio, high integration for system size reduction, and low cost.

Infineon is your ideal partner for all ceiling fan designs. In our portfolio, you'll find a wide range of solutions for inverterized fan motor control – whether your priority is achieving the highest level of integration using our IPMs or showcasing ultimate flexibility with the right price-performance ratio using our discrete IGBTs or MOSFETs. No matter your target, our power semiconductors, drivers, IPMs, and iMOTION™ motor controllers are designed to work together seamlessly. This means you can effortlessly realize smoother-running, quieter systems with low energy consumption and a smaller form factor.

Features and benefits

Key features	Key benefits
– Reference design for ready-to-copy PCB	– Compact and cost-effective system solution
– Turnkey PFC and motor control with MCE	– Eliminate the need for motor control software development
– Integrated infrared remote control	– Easy evaluation and system verification
– Suitable for single-sided PCB assembly process	– Reduce design-in effort and speed up time to market
– Compatible with low- and high-voltage motors	– Achieve maximum system cost-performance
– MCU design option for higher flexibility	– Higher system reliability
– IEC61000-4-5 4 kVs surge compliant and EN55032 class B EMI compliant	– One-stop-shop

Application diagram



By selecting components from Infineon, you get parts engineered for best-in-class performance that upholds the highest quality standards for long-term reliability. Moreover, our excellent supply chain allows you to both build the most cost-effective, energy-efficient inverterized ceiling fan and meet the changing supply demands of the fluctuating consumer market. Explore our selection of semiconductor solutions now to find the best-fit components for your designs.

www.infineon.com/ceiling-fan

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Induction

Induction cooking

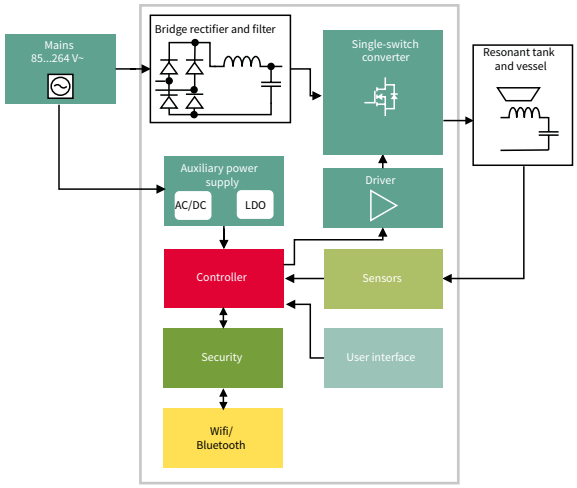
Enabled by Infineon's high-efficiency power switches, secured connectivity, and touch sensor technology for the best cooking experience

The huge global market for induction cooking appliances, such as induction ranges, microwave ovens, and rice cookers, is characterized by great competition and price pressure. Along with this, manufacturers must meet rising consumer expectations and produce more reliable, energy-efficient appliances that offer more and more functions. Benefits such as faster cooking, advanced functionalities, easy cleaning, and safety features play a crucial role.
At Infineon, we are well equipped to help you overcome all the challenges common to induction cooking appliances. Our solutions target the increased consumer expectations regarding modern home appliances: appliances must be energy-efficient and fully integrable, ensuring a high levels of safety and reliability. An intelligent, user-friendly, and secure user interface is essential. We support you in creating intuitive devices with an intelligent touch interface.

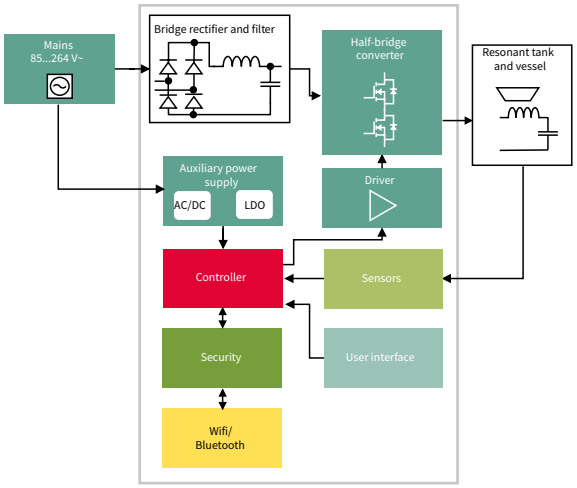
Features and benefits

Key features	Key benefits
– Complete system solution offerings for inverter, system control, auxiliary power, HMI, connectivity, sensor, security blocks	– Faster time-to-market and saving system design efforts
– Highly reliable and market-proven Infineon products	– One-stop-shop
– Evaluation and reference boards	– Extend system lifetime and product life spans
– Innovative reverse conducting IGBT technology	– Fast prototyping and system verification
– Cutting-edge touch-sensing technologies	– Higher efficiency and better reliability
	– "Just work" and deliver robustness and intelligence

Induction heating inverter (voltage resonance)
Single-switch



Induction heating inverter (current resonance)
Half-bridge



www.infineon.com/induction-cooking

For more details on the product, click on the part number, visit infineon.com or contact our product support.



Product portfolio

Functional block	Product	Product family	Specification	Benefits
Inverter (half-bridge/ quasi-resonant)	IGBT discretes	Reverse conducting R6	650 V up to 75 kHz	– High performance and low losses
		Reverse conducting R5	650 V/1100 V/1200 V/1350 V/1600 V up to 60 kHz	– High performance and low losses
		Reverse conducting R5L	1400 V up to 60 kHz	– High performance and lower losses
	Gate driver	EiceDRIVER™ 1ED44173N01B, 1ED44175N01B,	Low-side gate driver/25 V	– 1ED integrated with overcurrent- protection fault and enable functions
		EiceDRIVER™ 1ED44171N01B		– Cost-effective
		EiceDRIVER™ 2ED2304S06F, 2ED2182S06F, 2EDL23I06PJ	Half-bridge gate driver/650 V/600 V	– SOI with integrated bootstrap diode
		EiceDRIVER™ 1EDI20I12AF, 1EDI20I12MF, 2ED020I12-F2	Isolated gate driver/1200 V	– Galvanic isolation, separate sink/source output, DESAT, Miller clamp
System control	Microcontroller	XMC™ 1000 series	32-bit Arm® Cortex®-M0	– #1 choice to bring traditional 8-bit designs to the next level
		XMC™ 4000 series	32-bit Arm® Cortex®-M4	– Successor to traditional DSP/DSC and 32-bit MCU solutions.
		PSoC™ 4 series	32-bit Arm® Cortex®-M0	– Tackled some of the complex portions of embedded system design making it easier
		PSoC™ 6 series	32-bit Arm® Cortex®-M4	– Dual-core Arm® Cortex®-M4 and Cortex-M0+ architecture
Connectivity	Wireless connectivity	AIROC™ Wi-Fi + Bluetooth® combo	IEEE 802.11a/b/g/n/ac/ax Wi-Fi and Bluetooth® 5.2 in a single-chip	– Technical support through our global network of IoT partners
Aux power	CoolSET™	ICE5AR4770BZS	Up to 15 W flyback controller with integrated 700 V MOSFET	– Higher switching frequency to take advantage of smaller magnetics
HMI (Human-machine interface)	Microcontroller	PSoC™ 4 series	CAPSENSE™ technology	– Most flexible and scalable low-power mixed-signal architecture
Security	OPTIGA™ Trust	OPTIGA™ Trust M SLS32AIA	High-end security solution for connected consumer devices	– The OPTIGA™ Trust M is a high-end security solution that provides an anchor of trust for connecting IoT devices to the cloud

www.infineon.com/induction-cooking

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Power tools

Cordless power tools, cordless gardening tools and OPE

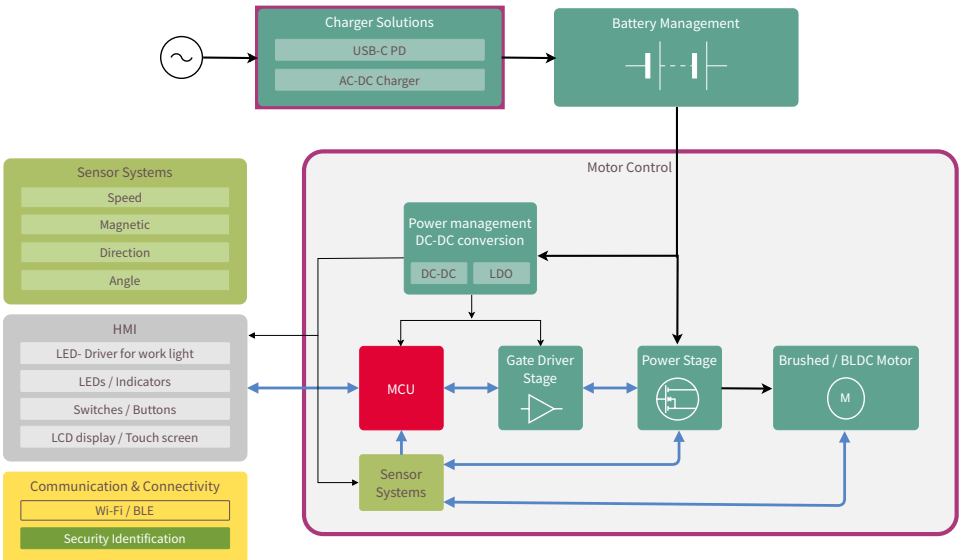
Battery-powered devices for home and professional applications

Millions of households worldwide rely on power tools to complete daily tasks or creative projects around the home. Consumers want robust, reliable, and easy-to-use portable power tools with low prices and long battery life as key selection criteria. High quality standards to earn the trust of the consumer also require diagnostic and safety features. Infineon's product portfolio is made to bring performance, safety and reliability to consumer projects. We help our customers meet all consumer needs at a reduce total costs. In addition to the extensive product portfolio, we offer wireless-charging reference designs. They deliver high performance and are easily optimized in our DAVE™ development platform. Configure your BOM and exceed expectations with Infineon components in your cordless power tool designs.

Features and benefits

Key features	Key benefits
– Comprehensive product and solution portfolio, easy to tailor to any design specification	– Convenient selection of the right fit products thanks to broad portfolio and
– Infineon offers complete solutions for power supplies, chargers and motor drives	– Complete solutions
– Best-in-class EiceDRIVER™ level-shift driver for OptiMOS™ and StrongIRFET™, offering high efficiency and protection	– Extended battery lifetime and product life span
– High reliability of Infineon components	– Increased production capability
– Offering LV FETs with SMD packaging improves the productive capability by automatic production, improves reliability and reduces assembly cost	– Overall system size and cost reduction
– Components featuring small form factor and compact design offering highest power density and BOM savings thanks to lowest $R_{DS(on)}$	– Security, quality, and safety
– Trustworthy hardware-based security	– Authentication
– Highest quality standards and a safety-certified development process	– Short time to market
– Proven track record and outstanding partner network for embedded security	
– OPTIGA™ Trust enables authentication of components connected to the system (e.g., battery pack recognition to avoid second-party batteries etc.)	
– Evaluation and demonstration boards for fast prototyping	
– Available simulations, documentation, and system support to reduce development time and cost	

Application block diagram example: cordless power tools



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Product portfolio

Functional block	Topology	Product category	Product family	Part number
Motor control	12 V, 15 V, 18 V, 22 V	MOSFET	OptiMOS™ 5 OptiMOS™ 6 StrongIRFET™	BSC005N03, IQE006NE2, IPT004N, IPP055N
				IRL40DM2, BSC010N04, IST011N06, BSZ097N04, IRF40SC, IPB011N04, IRL40B215
		Gate drivers	MOTIX™	6EDL6171, IDM700A, 2ED2742S01G, ED2744S01G, ED2748S01G, ED2732S01G, ED2734S01G, ED2738S01G
			EiceDRIVER™	1ED44173N01B
		Microcontroller	XMC™ series	XMC1400. XMC1400, XMC4400
			PSoC™	PSoC™ 4100, PSoC™ 62
		Sensor systems	Hall switches	TLV4963
			Angle	TLI5012
			3D magnetic	TLV493D
			Magentic coreless current	TLI4971
	36 V	MOSFET	OptiMOS™ 5 OptiMOS™ 6 StrongIRFET™	IRL40DM2, BSC010N04, IST011N06, BSZ097N04, IRF40SC, IPB011N04, IRL40B215, IPT009N08NM6, IPB016N08NF2S
		Gate drivers	MOTIX™	6EDL7141, IDM 700A, 6ED2742 NEW, 2ED2742 NEW, 2ED2732 NEW
			EiceDRIVER™	1ED44173N01B
		Microcontroller	XMC™ series	XMC1400, XMC1400, XMC4400
			PSoC™	PSoC™ 4500S
				PSoC™ 6
		Sensor systems	Hall switches	TLV4963
			Angle	TLI5012
			3D magnetic	TLV493D
			Magnetic coreless current	TLI4971
	48 V, 56 V, 72 V	MOSFET	OptiMOS™ 3 OptiMOS™ 5 OptiMOS™ 6 StrongIRFET™	BSC021N08N, BSC030N08N, IPT010N08N, IPTG011N08N, IPP040N08N, IPB049N08N, IPT009N08NM6, IPB016N08NF2S
				BSC035N10N, ISZ080N10N, IPT015N10N, IPTC030N12N, IPB036N12N, IPP050N10N
		Gate drivers	MOTIX™	TLE9140EQW, 1EDN755X, 6ED2742, 2ED2732, 2ED2734, 2ED2748
		Microcontroller	XMC™ series	XMC1400, XMC1400, XMC4400
			PSoC™	PSoC™ 4500S
				PSoC™ 6
		Sensor systems	Hall switches	TLV4963
			Angle	TLI5012
			3D magnetic	TLV493D
			Magnetic coreless current	TLI4971
Charging		MOSFET	CoolMOS™ P7	IPA60R280P7S, IPD60R080P7, IPD60R280P7S, IPD60R360PFD7S, IPN70R450P7S
		Controller IC	-	ICC80QSG, XDPS2201, XDPS2221, ICE3PCS01G
		HEMTs	CoolGaN™	IGI60F1414A1L IGI60F200A1L, IGLD60R190D1
		Gate drivers	EiceDRIVER™	1EDB9275F, 2EDB7259Y, 2EDF9275F, 2EDL05N06PF, 2EDR8259X, 2EDS9265H
		Schottky diodes	CoolSiC™ G5 CoolSiC™ G6	IMZA65R027M1H, IMZA65R048M1H, IMW65R027M1H, IMW65R048M1H
		SR switch	OptiMOS™ 5	BSC040N10NS5, BSC160N15NS5, IPP200N15N3
		Load switch	OptiMOS™ 5	BSC040N10NS5, BSC0902NSI, IPP034N08N5
		USB-PD	EZ-PD™ PMG1-B1	CYPM1115-48LQXI, CYPM1116-48LQXI
			EZ-PD™ PAG1	PAG1P, PAG1S
			EZ-PD™ BCR	CYPD3177-24LQXQ, CYPD3177-24LQXQT
		Microcontroller	XMC™	XMC1400
BMS	12 V	Protection MOSFET	OptiMOS™ StrongIRFET™	BSC004NE2LS5, IQE006NE2LM5, BSB008NE2LX, BSZ009NE2LS5, IRFH6200, IRF6200, IRF1324
	18 V			IPT004N03L, BSC005N03LS5, BSZ0500NSI, IRF6726M, IRLS3813, IRLB3813, BSC079N03LSCG
	24 V			IRL7472L1, IRL40SC228, BSC007N04LS6, IRL40T209, IRFS7430, IRL40B209, BSZ018N04LS6
	36 V			IPT007N06N, IRF60SC241, BSC014N06NS,IRF7749L1, IRL60B216, IRL60S216
	48 V			IPT012N08N5, IPP020N08N5, BSC025N08LS5, BSB044N08NN3G, BSZ070N08LS5, BSZ096N10LS5,
	72 V			IPP041N12N3G, BSC077N12NS3G, BSZ240N12NS3G, IRF135SA204, IRF135S203, IRF135B203
		Monitoring balancing IC	-	TLE9012
		Cell balancing MOSFETs	StrongIRFET™	IRLML9303, IRFTS9342, IRLML9301
		Microcontrollers	XMC™, PSoC™	XMC1100, XMC1200, XMC1400, XMC1400, XMC4100, CY8C41x4/5/65, CY8C41x6/75, CY8C4147-S5
Communication and HMI		Authentication/security	OPTIGA™ Trust	SLE 95250, SLS 32AIA010MH
		Bluetooth®	AIROC™	CYBT-213043-02, CYW20736,CYW20706, CYW20704
		Wi-Fi	AIROC™	CYW43907, CYW43439, CYW954907
		Pressure sensor	XENSIV™	DPS368

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For more details on the product, click on the part number, visit infineon.com or contact our product support.


Smartwatch

Smartwatches, sports watches, fitness bands and medical wrist-worn devices

All in one marketplace for wrist-worn devices with Infineon's excellent RF, sensing, connectivity, power, memory and security solutions

With its broad product portfolio, Infineon helps manufacturers of wearables to overcome the following design challenges across all device categories:

- the need for reliable device and data security to protect personal and sensitive information,
- accurate sensor readings for precise location tracking and recognition between everyday movements and a fall event,
- longer battery lifetimes and small form factors for elegant, unobtrusive designs.

Infineon's widely-deployed AIROC™ Wi-Fi and Bluetooth® Combo ICs portfolio offers the industry's best interoperability and RF performance. Infineon also helps customers to differentiate their offerings with highly efficient, secured and innovative solutions supporting the integration of additional use cases such as smart payment and ticketing, notifications and voice calls, Bluetooth® audio streaming, smart access or different ways of charging (wireless, NFC, USB).


Smartwatch

A smartwatch provides a two-way connection via Bluetooth®, cellular baseband or Wi-Fi to a smartphone. It receives electronic communications like texts or voice calls, must display the time and have a glance-able display. These lifestyle devices monitor health and make communication (text, calls) more convenient.


Sports watch

A sports watch is a highly functional, robust and usually water-resistant device. Leisure or professional athletes mainly monitor their health conditions, fitness and sleep activities. Sports watches have fewer features compared to smartwatches as their main focus is on sports tracking.


Wristbands

A wristband or fitness band offers limited functionalities. Compared to a smartwatch, it just covers a selected amount of use cases (e.g. step counting, sleep monitoring, location tracking, access control, etc.).


Sports watch

A medical wrist-worn device measures and analyzes the physical activity and body functions of the wearer. These wristbands are used for elderly care, safety, connected health and much more.

Key enabling products

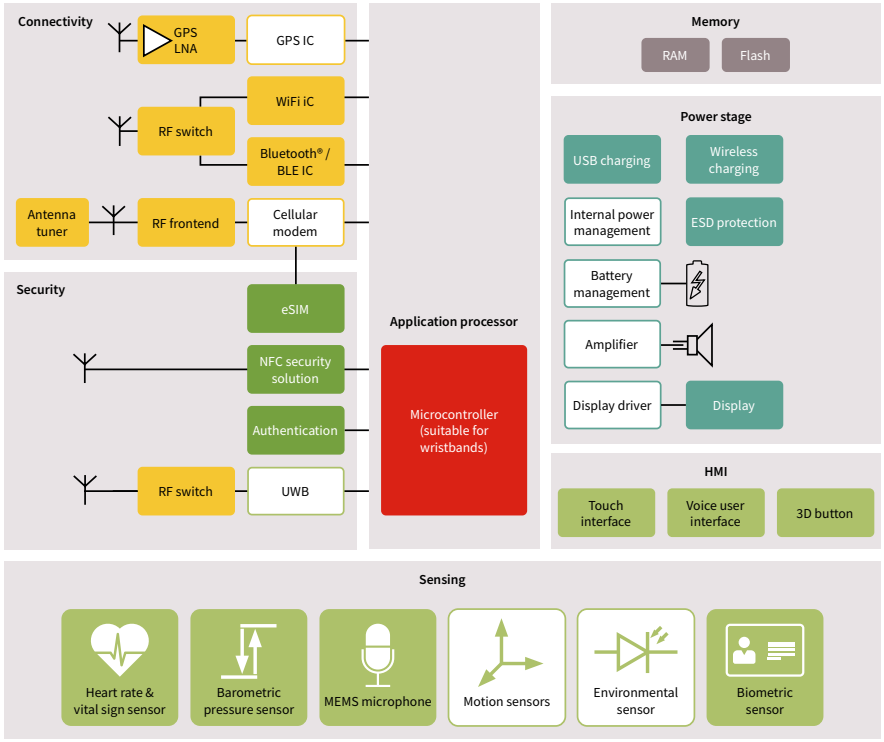
- XENSIV™ 3D magnetic sensor
- XENSIV™ 60 GHz radar sensor
- XENSIV™ pressure sensor
- XENSIV™ MEMS microphones
- XENSIV™ Multigas sensor
- Wireless charging
- AIROC™ Wi-Fi and Combos
- AIROC™ Wi-Fi
- AIROC™ Bluetooth® LE and Bluetooth®
- AIROC™ Bluetooth® 5.0 SOC for Audio
- Wi-Fi MCUs
- SECORA™ Connect
- PSoC™ 6 Microcontrollers
- PSoC™ 4 Microcontrollers
- PSoC™ 4 Bluetooth® Low Energy (Bluetooth® Smart)
- PSoC™ including CAPSENSE™ technology
- RF switches
- OPTIGA™ Connect Consumer eSIM solution
- OPTIGA™ Authenticate S
- NOR flash/F-RAM
- GPS LNA
- ESD protection
- Antenna tuners
- 4G/5G LTE LNAs

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Block diagram for smartwatch, sports watch and wristband

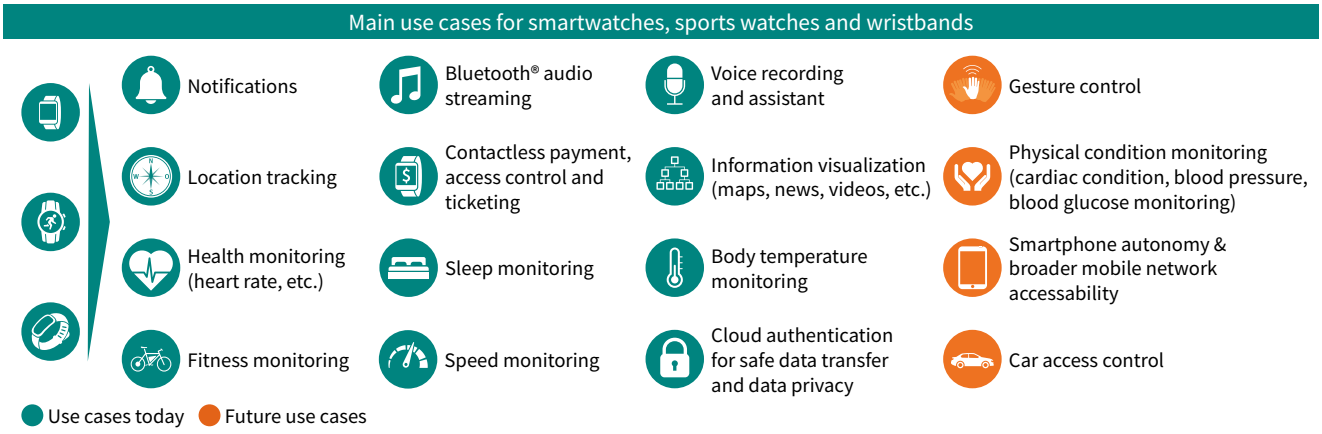


Functional block	Product family	Functional block	Recommended products and solutions
Security	– OPTIGA™ Authenticate S (e.g., SLE95401) – OPTIGA™ Connect Consumer eSIM solution (OC1120) – SECORA™ Connect (boosted SiP or MCP, passive NFC) – RF switch (e.g., BGS12WN6, BGS14WMA9)	Power stage	– USB type-C controller (e.g., EZ-PD™ CCG2) – ESD protection (e.g., ESD119-B1, ESD131-B1, ESD307-U1) – Wireless charging
Human-machine interface	– XENSIV™ 3D magnetic sensor (e.g., TLI493-W2BWAO) – XENSIV™ MEMS microphones (e.g., IM69D120/D130/D130) – PSoC™ 6 MCU + BLE (e.g., CY8C68237FM-BLE)	Memory	– SEMPER™ Nano NOR flash / F-RAM
Sensing	– XENSIV™ pressure sensor (e.g., DPS368/DPS310) – XENSIV™ MEMS microphones (e.g., IM69D120/D130/D128S) – XENSIV™ MEMS packaging partners	Connectivity	– 4G / 5G LTE LNAs (e.g., BGA5x1BN6 family) – GPS LNA (e.g., BGA123L4, BGA524N6) – AIROC™ Wi-Fi (e.g., CYW43362, CYW43364) – AIROC™ Wi-Fi and combos (e.g., CYW43439, CYW43012) – AIROC™ Bluetooth® 5.0 SoC for audio(e.g., CYW20719/21) – Antenna tuners (e.g., BGSA12UGL8, BGSA14GN10) – RF switches (e.g., BGS12WN6, BGS14WMA9)

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Main use cases for wrist-worn devices



Infineon the right partner to solve your design challenges

Highest accuracy and fast signal pick-up for location tracking and altitude measurement

Secure cellular network connection

Products with smallest form factors enable high functional integration

Integrated lowest power compute, BLE connectivity and most robust capacitive touch

Bluetooth® audio streaming with BT/BLE Combo SoC

Precise detection of single steps, body motions or fall events

Best performance for voice call and voice assistant with MEMS microphones

Reliable and low-power code and data storage in a tiny footprint

Easy, convenient and secure data transmission by NFC

Device protection to enable high user experience

High reliability and data throughput with Wi-Fi/BT connectivity

Low power consumption to increase battery lifetime

www.infineon.com/wearables

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Audio amplifier

Class D audio

No compromise on quality – products for exceptional audio performance

At Infineon, we manufacture power-efficient class D audio amplifier solutions that maintain best-in-class audio quality, without heating up the surroundings. We believe smaller and lighter is better as well as that the amplifier embedded in your product should be heard but not seen. Our amplifier solutions help you design robust, flexible products that meet the needs of your customers and the market. Choose from our high-performance class D audio amplifier solutions for all power ranges and application requirements, from the smallest fully integrated single-chip solutions to the highly scalable driver and power MOSFET combinations (for a full portfolio, see Audio amplifier ICs).

Design with Infineon's solutions to benefit from:



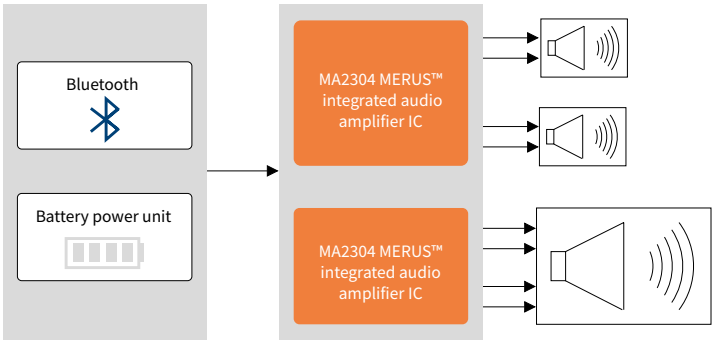
Exceptional audio performance | Maximized power efficiency | Maximized output power | Design freedom | Fast time to market

Portable/battery powered audio applications	Home audio applications	Professional audio applications	Car & marine audio applications
Battery powered speakers: – On-the-go Bluetooth® speakers – Docking speakers – Boom boxes – Wearable speakers	– Multiroom systems – Audio hub – TVs – Sound bars – Home theater systems – Smart speakers	– Power-over-ethernet (PoE) – Audio systems – Touring amplifiers – Active speakers – Public announcement 70-100 V systems – Music instrument amplifiers	– After-market car audio – Marine audio – Motorcycle audio

Home audio

Modern home audio products vary in shape, size and configuration, but a common requirement is a great sound in combination with outstanding industrial and acoustic design. In addition to producing exceptional sound quality, MERUS™ amplifiers from Infineon can completely eliminate the need for bulky and expensive LC output filters and heatsinks. This allows the design of new innovative and great-sounding home audio products in form factors and shapes that were previously unthinkable.

Solution example: 2.1 configuration (2xBTL + 1xPBTL)

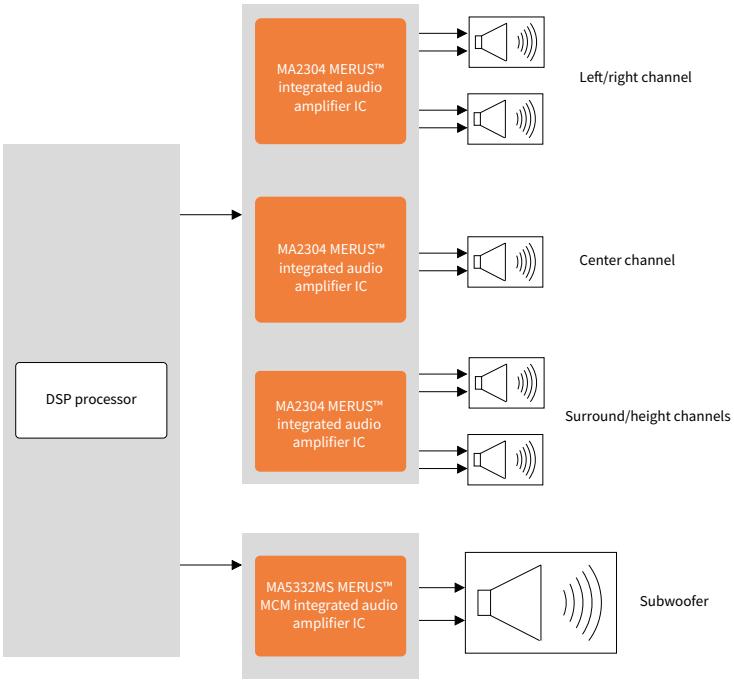


Solution specification
Number of audio channels: 2 bridge-tied load (BTL) and 1 parallel BTL channel
Peak power output: 2x37 W @ 4 Ω, 10% THD and 74 W @ 2 Ω, 10% THD
Featured audio ICs: MA2304DNS or MA2304PNS

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www.infineon.com/audio
www.infineon.com/audiosolutions

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5.1/3.1.2 configuration soundbar example

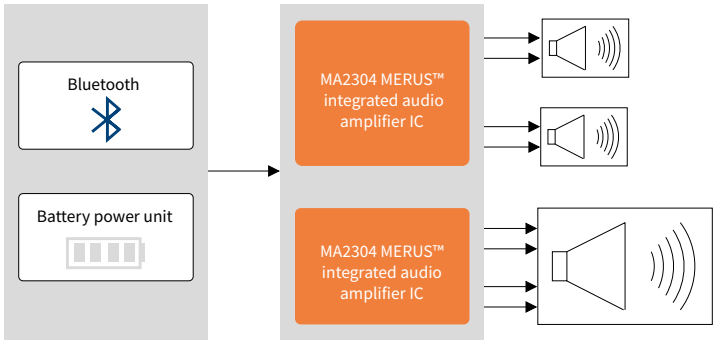


Solution specification
Number of audio channels: 5 bridge-tied load (BTL) + 1 BTL Subwoofer
Peak power output:
5x37 W @ 4 Ω, 10% THD; 400 W @ 8 Ω, 10% THD
Featured audio ICs: MA2304DNS, MA2304PNS, MA5332MS, MA5342MS *

Portable audio

When designing portable/battery-powered audio devices, it is essential to maximize battery playback time, and at the same time, maintain excellent audio performance. Infineon's MERUS™ amplifiers provide up to twice as long battery playback time in combination with the best-in-class audio performance and unsurpassed sound quality.

Solution example: 2.1 configuration (2xBTL + 1xPBTL)



Solution specification
Number of audio channels: 2 bridge-tied load (BTL) and 1 parallel BTL channels
Peak power output: 2x37 W @ 4 Ω, 10% THD and 74 W @ 2 Ω, 10% THD
Featured audio ICs: MA2304DNS or MA2304PNS

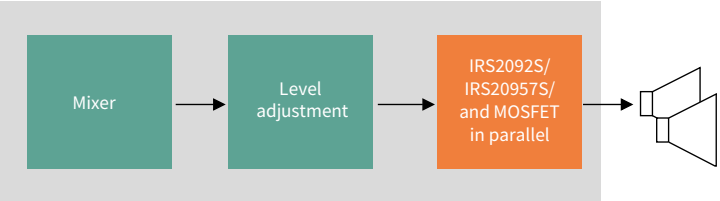
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www.infineon.com/audio
www.infineon.com/audiosolutions

*Coming soon

Professional audio

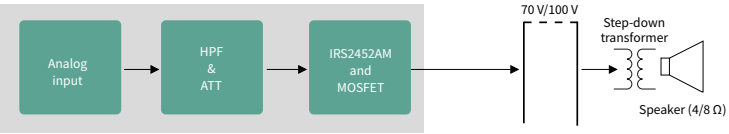
Professional audio equipment is all about maximizing output power and power density. With the conception of Infineon's MERUS™ multilevel class D technology and GaN-based CoolGaN™ GIT HEMTs, it is now possible to conceive both amplifiers and power supply units with great audio performance and high efficiency in a very compact design. For engineers developing amplifiers, Infineon offers varied chip-set solutions with versatile MOSFET combinations for the scaling of output power.

Solution example: active speakers



Solution specification
Number of audio channels: 2 half-bridge channels
Peak power output: >500 W @ 4 Ω, 1% THD
Featured audio ICs: IRS2092S, IRS20957S, IRS2461S, IRS2452AM

Solution example: public announcement 70-100 V system

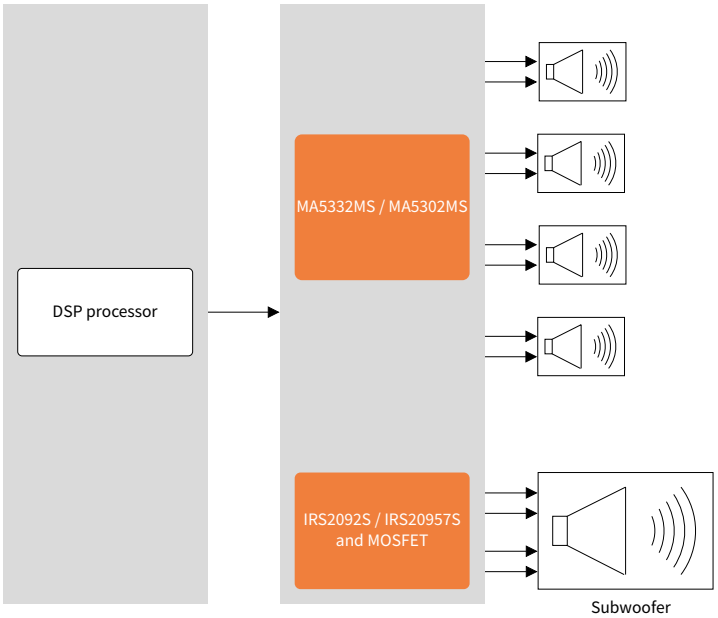


Solution specification
Number of channels: 2 half-bridge channels
Peak power output: 500 W, 70 V_{RMS}/100 V_{RMS}, 1% THD
– **Featured audio IC:** IRS2452AM

Car and marine audio

Car and marine audio systems need to generate powerful and great sound while limiting the system size and heat generation to a minimum level. Infineon's MERUS™ multi-chip module integrated class D amplifiers and class D controller + MOSFETs combinations enable high-level power density and design flexibility to deliver the best music listening experience regardless of where you are, whether it's in your car, on your motorcycle, or on the water.

Solution example: 5 channel car audio amplifier



Solution specification
Number of audio channels: 5 half-bridge channels
Peak power output: 150 W @ 4/2 Ω, 1% THD; 500 W @ 4 Ω, 1% THD
Featured audio ICs: MA5332MS, MA5302MS*, IRS2092S, IRS20957S

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Smart speaker

Smart speaker

Speakers for an intuitive and outstanding user experience

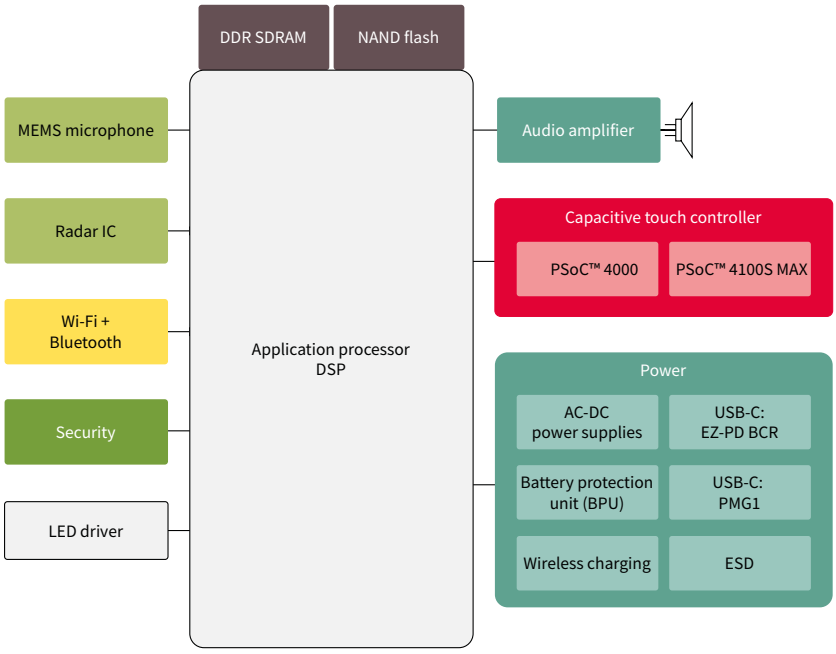
Once a novelty in households, smart speakers are more and more becoming increasingly commonplace. Rising user expectations accompany this rapid adoption. However, frustration with devices that do not understand or hear commands leads to lower user adoption. Consequently, growth rates for smart speakers are failing to reach their full potential. Components such as MEMS microphones, touch controllers, and new technologies such as radar are vital in improving the user experience in the smart speaker segment.

Infineon has long-standing expertise in sensors, connectivity and power solutions that fulfill the consumer market requirements in terms of outstanding performance, reliability and energy efficiency.

Features and benefits

Key features	Key benefits
– High sensitivity, low self-noise (high SNR) and distortion, wide dynamic range, and high acoustic overload point with XENSIV™ MEMS microphones	– Improved audio input and thus voice command recognition, especially in extended use cases such as whispering or longer distances to the speaker for a better user experience
– Multilevel switching technology at fully rated power in a wide range of ME-RUS™ class D amplifiers	– Best-in-class audio quality and lowest power consumption enable the class D audio amplifier to be used in filterless configurations
– Ultralow-power AIROC™ Wi-Fi and Bluetooth® combo in a single-chip solution enables small-form-factor IoT designs	– Connectivity for high interoperability and performance without dropouts anywhere in the home, extended battery playback time, or the reduction of battery size without compromising on battery playback time to save cost
– Reliable, elegant and durable CAPSENSE™ touch controller with advanced capacitive touch sensors	– Noise immunity, water resistance, and sleek, futuristic user interfaces and gesture recognition
– XENSIV™ 60 GHz radar sensor brings innovative, intuitive sensing capabilities	– Precise presence detection for more contextual awareness to ease interaction, sub-millimeter motion tracking to capture movement at high speed accurately, vital sensing for monitoring health status such as respiratory and heart rate
– Highly efficient and power-dense SMPS solutions	– Highly efficient charger in a small form factor
– Highly integrated EZ-PD™ USB-C controller supports all USB-PD profiles	– USB-IF certified with market-proven USB-PD stack, ensuring specification compliance and interoperability, requiring no firmware development
– IoT security controller OPTIGA™ Trust M maintains the unique identity and integrity of the speaker	– Easy and secure cloud provisioning services

Application diagram



www.infineon.com/smart-speaker

For more details on the product, click on the part number, visit infineon.com or contact our product support.



Recommended products

Functional block	Product family		Product	Benefits
Audio input	Microphones		XENSIV™ MEMS microphones	– High-performance microphone with low self-noise (high SNR) and low distortions, setting a the new performance benchmark for a superior user experience
Audio output	Class D amplifier		MERUS™ class D audio amplifiers MA2304DNS	– Cooler, smaller and lighter amplifiers designed to maximize power efficiency and dynamic range while providing best-in-class audio performance in the product form factors for great-sounding audio products – Extended battery playback time or the reduction of battery size without compromising on battery playback time to save cost
Connectivity	Wi-Fi + Bluetooth® combos		AIROC® Wi-Fi + Bluetooth combos	– Best-in-class interoperability to the widest deployed wireless IP – Whole Home Range with high throughput for multi-channel audio and RSDB (Real Simultaneous Dual Band) for speaker sub-networks – Ultralow-power technology designed with battery operation in mind
Sensing	Capacitive sensing touch controller		CAPSENSE™ capacitive touch sensing controller	– State-of-the-art noise immunity (SNR > 100:1) & water rejection have made CAPSENSE™ the industry leader – Advanced inductive touch sensors make possible sleek, futuristic user interfaces with metallic overlay
	Radar sensor		XENSIV™ 60 GHz radar sensor	– Accurate presence detection and vibration detection based on ability to track sub-millimeter motion at high speed and accuracy, – Both stand-alone chip as well as system solution available
	CO_2 sensor		XENSIV™ PAS CO_2 sensor	– Superior accuracy, providing a direct readout of the real CO_2 level, not simply a correlation – Size and cost advantages
Security	IoT security controller		OPTIGA™ Trust M	– Easy & secure provisioning services with OPTIGA™ Trust M for maintaining speaker's unique identity & integrity – Unify different products under unified PKI architecture
Power	USB-C PD controller		EZ-PD™ USB-C controller	– USB-IF certified with market-proven USB-PD stack, ensuring spec compliance and interoperability – Supports all USB-PD profiles commonly used in USB-C power adapters and requires no firmware development – A highly-integrated solution that minimizes incremental BOM costs
	ESD protection		ESD111, ESD245	– Outstanding low capacitance devices for best signal integrity – High protection performance by ultralow clamping voltage
	Wireless charging		15 W inductive wireless power transmitter	– Powerful and cost-effective wireless charging solutions for high performance, smart and secure charging solutions supported by Infineon's unique wireless power controllers
	High-voltage MOSFETs	Flyback	700 V CoolMOS™ P7 (standard grade)	– Best price-competitive CoolMOS™ SJ MOSFET family – Lower switching losses than a standard MOSFET
		ACF, FMCI	600 V CoolMOS™ PFD7	– Lower Q_{rr}, lower hysteresis loss, low $R_{DS(on)}$
	SMPS Flyback converter Control ICs	QR flyback ICs	ICE5QSAG	– High efficiency and low standby power
		FFR flyback IC	XDPS21071	– High power density and ideal for USB-PD
	SMPS synchronous rectification	Low-voltage MOSFETs	OptiMOS™ PD	– Low conduction losses and reduced overshoot – Logic level switching / S308 / PQFN 3.3x3.3 packages available
		Control ICs	IR1161LTRPBF	– High efficiency – Simple external circuitry
	SMPS load switch	Low voltage MOSFETs	OptiMOS™ 30 V	– Low conduction losses – S308 / PQFN 3.3x3.3 packages available

www.infineon.com/smart-speaker

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Security camera

Security camera and video doorbell

Make your wire-free camera smarter

Advancements in video surveillance technology take indoor and outdoor security solutions to the next level. Smart cameras that are connected to management systems and cloud platforms detect intruders more easily and alarm you in case of danger. By equipping cameras and doorbells with reliable connectivity and accurate sensor solutions, safety-enhancing IoT features can be implemented, significantly improving intrusion detection, and other unusual behavior. Camera hardware improvement enables differentiated features to move from the cloud to the edge. Cameras become an active component in smart homes, not just passive observers. Wire-free cameras and doorbells often demand low power with high integration features.

Infineon offers a broad range of products to make security cameras and video doorbells smart and connected. The AIROC™ wireless connectivity solution portfolio for Wi-Fi, Bluetooth® and Matter offers stable connections to cloud and management systems, making cameras and doorbells linked with the whole smart home. Sensors such as Infineon's XENSIV™ radar sensors can help overcome bandwidth limitations, for example, by the waking-up function and reducing false positives when motion near the camera is detected. And XENSIV™ MEMS Microphone enables sound/voice-triggered recording and notification. At the same time, Infineon's embedded security solutions make connected cameras more robust against cyberattacks. Infineon's best-in-class low-power MCU and wireless support wire-free cameras and doorbells which are usually battery-operated.

Features and benefits

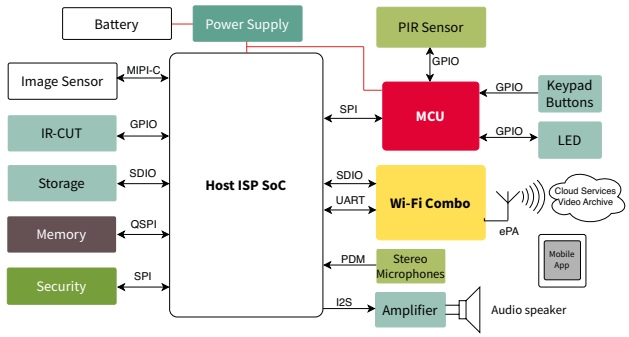
Key features	Key benefits
– Reliable and robust connectivity with Wi-Fi6/E	– Improvement in coverage, deploy density, latency, throughput, etc.
– Low power Wi-Fi and MCU	– Longer battery life
– Connectivity processor in wireless solution	– Offloading host burden for power saving; BOM reduction
– Infineon leading solution of Matter	– Interoperability between devices in smart home
– Highly accurate set of sensors with low power consumption	– Accurate data collection for new use cases, e.g. wake-up functions with radar sensor
– Turnkey embedded security solutions	– Ensuring device integrity and robust design against cyber attacks

www.infineon.com/doorbell-camera

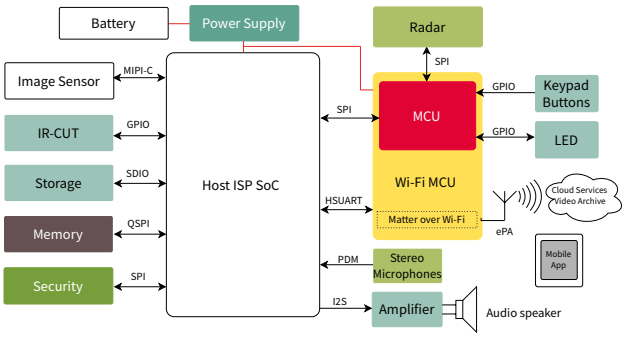
For more details on the product, click on the part number, visit infineon.com or contact our product support.



Current generation block diagram – battery powered



Next generation block diagram – battery powered



Sensing		Security	MCU	Memory	Software service
MEMS Microphone – IM73D122 – IM69D128S – IM70D122 – IM72D128 – IM68A130 – IM70A135	**Radar IC** – BGT60LTR11AIP (60 GHz) – BGT60UTR11AIP (60 GHz) – BGT60TR13C (60 GHz) – BGT60UTR13D (60 GHz) – BGT24LTR11 (24 GHz) – BGT24MTR11 (24 GHz)	**OPTIGA™ Trust M** – M5271SLS32AIA010MS / MH – M5271SLS32AIA010MK / ML **OPTIGA™ TPM** – SLB 9670 TPM 2.0	– PSoC™ 4 M0/M0+ processor – PSoC™ 6 M4-M0+ processor – Next-gen edge compute processor	– SEMPER™ Nano flash – ULTREON™ RRAM	– IoT Network Intelligence (INI) – Mobile App Intelligence (MAI)

Wi-Fi			
Good	**Better**	**Best**	**Wi-Fi 6/6E**
CYW43439 – Single band, 1x1 11 n, iPA. SDIO – Low power – BT/BLE 5.0 UART – TCP/IP keep alive – WPA3 – Antenna diversity – Cost-effective connectivity	**CYW4373** – 1x1 11 ac dual-band, USB and SDIO – TCP/IP keep alive – WPA3 – Antenna diversity – External PA for long range **CYW43012 for low power** – Ultra-low-power, 28 nm – 802.11a/b/g/n-compliant, dual-band – TCP/IP keep a live – High volume production, field-proven in battery cameras – No capacity constraints	**CYW5459x for high performance** – RSDB, MU-MIMO, 2x2 11 ac – 80 MHz channel, up to 867Mbps – PCIe3.0 and SDIO 2.0 Wi-Fi – BT/BLE 5.1 – 2- and 3-antenna configurations **CYW43022 for ultra-low power** – 43012 pin-compatible “drop-in” replacement with no RBOM change – New Deep Sleep mode enabling improved DTIM power states – ROM update frees up run-time RAM space for features & patches	**CYW5557x for High performance** – 2x2 11 ax, tri-band capable – Integrated high-power front end – Highest throughput -1.2 Gbps max. – Advanced Coexistence – Novel long-range extension modes for devices **CYW55x13 for ULP and offloading** – 1x1 11 ax, Tri-band, 20 MHz for IoT – Ultra low power, extended battery life – WiFi MCU with connectivity processor for system-level power saving and BOM reduction – Software compatible with 55572

www.infineon.com/doorbell-camera

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LED

LED lighting

Solutions for cost-sensitive applications as well as for smart lighting

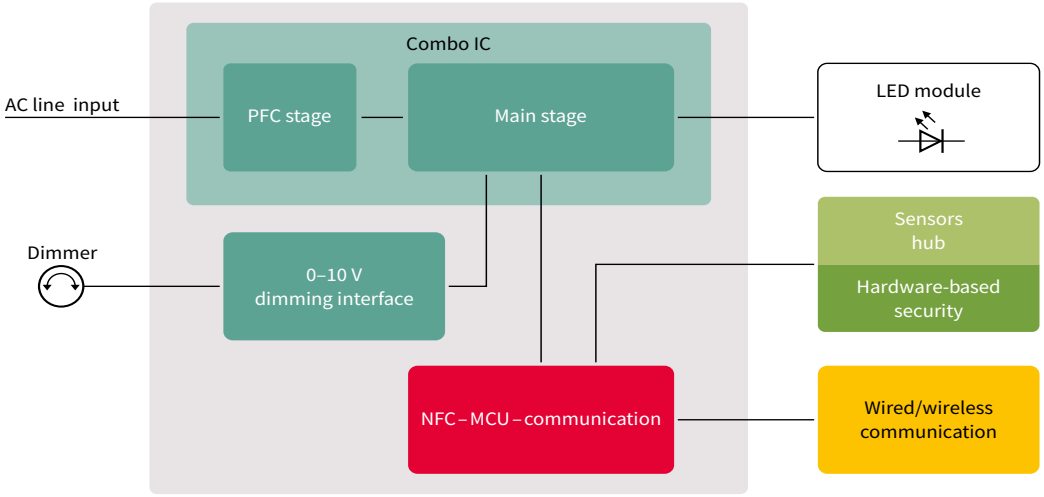
Infineon supplies tailored products for LED drivers, LED strips, horticultural, and smart lighting. Our broad portfolio of LED lighting comprises LED driver ICs, MOSFETs, and microcontrollers suited for LED drivers as well as sensors and dedicated ICs for secure communication. In addition to offering products of proven quality, a competent global lighting team supports our lighting customers in designing LED lighting products and systems in collaboration with our channel partners.

Key trends and challenges in LED lighting and our offering:



- Human-centric lighting (HCL)
  - The lowest cost implementation of tunable white with single-stage flyback constant voltage and smart linear regulators with advanced headroom control ensuring high efficiency – BCR601
- Configuration of output current and some further parameters
  - Our NFC controller allows the configuration of the output current without the need for an additional microcontroller
  - Our XDPL lighting IC family allows, besides output current, also adjustment of other features like protection, dimming curves, etc.
- Cost reduction combined with efficiency increase
  - Integration of resonance inductor for PFC + resonant topology enables highest efficiency at low cost
  - Integration is enabled by the coreless transformer technology that enables high switching frequencies

LED drivers



www.infineon.com/lighting

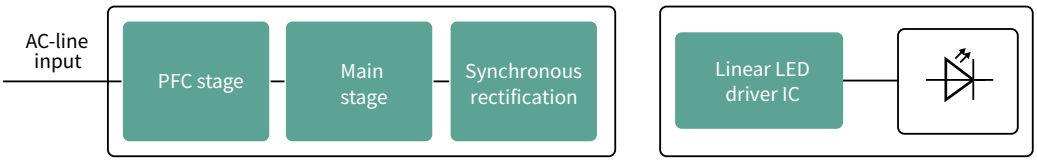
For more details on the product, click on the part number, visit infineon.com or contact our product support.



Recommended LED driver products

Functional block	Product type	Product family	MOSFET technology	Voltage class
PFC stage	PFC	IRS2505	CoolMOS™ P7	600 V/700 V/800 V/950 V [1]
Main stage	PFC + LCC (constant current) PFC + LLC (constant current)	ICL5102 [2]	CoolMOS™ P7 (up to 600 mΩ) CoolMOS™ PFD7	600 V/600V
			CoolMOS™ CE (above 600 mΩ)	600 V
		ICL5102HV [3]	CoolMOS™ PFD7	950 V
	PFC + flyback (dual-stage)	XDPL8221 [2]	CoolMOS™ P7	800 V/950 V
	PFC/flyback (single-stage constant current)	XDPL8105	CoolMOS™ P7	800 V/950 V
	PFC/flyback (single-stage constant voltage)	XDPL8219	CoolMOS™ P7	800 V/950 V
	PFC/flyback (single-stage constant voltage)	ICL8800/ICL8810/ ICL8820	CoolMOS™ P7	800 V/950 V
	PFC, flyback low-side gate driver	1EDN7550B	any CoolMOS™ SJ MOSFETs	-
		2EDN8524F	any CoolMOS™ SJ MOSFETs	-
	Half-bridge LLC gate driver	2ED2101S06F	any CoolMOS™ SJ MOSFETs	650 V (SOI)
		1EDI20N12AF	any CoolMOS™ SJ MOSFETs	1200 V (coreless transformer/CT)
		2EDF7275F	any CoolMOS™ SJ MOSFETs	650 V (coreless transformer/CT)
Buck/linear solutions	Secondary buck (single-channel) Secondary buck (multichannel)	ILD8150	integrated	80 V
	High-side buck gate driver	1EDB8275F	any CoolMOS™ SJ MOSFETs	650 V
	Low-side buck gate driver	1EDN8511B	any CoolMOS™ SJ MOSFETs	-
	Secondary linear controller with feedback	BCR601	small-signal MOSFETs	75 V/100 V
	Tunable white with linear LED driver	BCR601, BCR602	small-signal MOSFETs	75 V/100 V
Dimming	0-10 V dimming interface IC	CDM10V	-	-
		CDM10VD	-	-
NFC	NFC configuration IC	NLM0010/NLM0011 [4]	-	-
Microcontroller	XMC™ microcontroller	XMC1100	-	-

LED driver with constant voltage output and linear/switch mode LED driver ICs



Linear LED driver IC product portfolio

Functional block	Topology	IC product family	MOSFET technology
Lowest cost LED driver IC	Linear	BCR400W series	Integrated
Low voltage drop LED driver IC		BCR430U/BCR431U	
Robust LED driver IC		BCR40xU/BCR42xU	

For additional portfolio, take a look at Lighting ICs.

www.infineon.com/lighting

1) 700 V, 800 V and 950 V CoolMOS™ P7 are optimized for PFC and flyback topologies. 600 V CoolMOS™ P7 is suitable for hard as well as so switching topologies (flyback, PFC and LLC)

2) PFC and resonant combo controllers
3) Higher input voltage
4) In addition to current configuration also constant lumen output (CLO) feature is included.

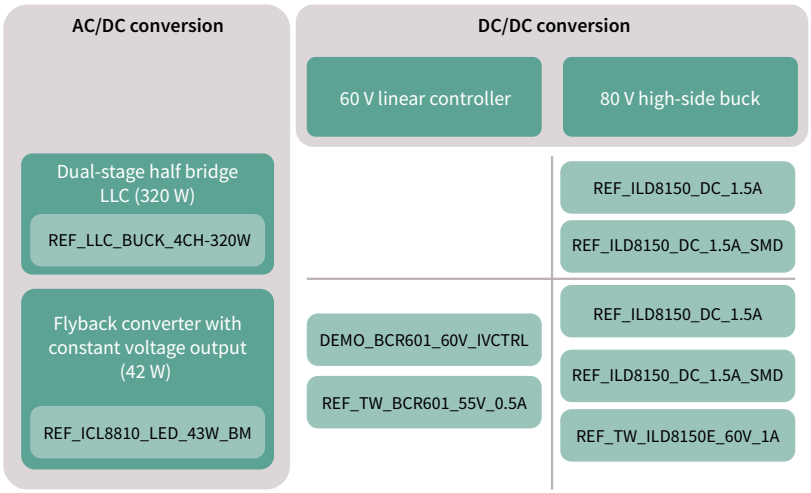
For more details on the product, click on the part number, visit infineon.com or contact our product support.

LEDs plug & play

Plug & LEDs play solutions

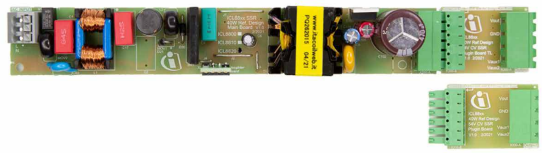
Modular LED lighting reference designs for LLC, buck and PFC flyback topologies

LED lighting has become a mature technology with stringent requirements on light quality. In order to achieve high light quality, there is a strong trend towards two-stage topologies. These two-stage topologies ensure that the light flicker or, also called light ripple, remains at low levels according to the IEEE 1789 standard and other new upcoming regulations. Primary constant voltage output, followed by a DC-DC buck, enables dimming, efficiency, cost, and scalability benefits. Infineon has solutions for both the primary AC-DC stage as well as for the secondary DC-DC buck stage. These solutions can be combined in a plug & play concept. In other words, depending on the requirements, the suitable AC-DC stage and the best fitting DC-DC stage can be selected and tested.



Our solutions include but are not limited to:

Low to medium power platform promising tunable white at low cost



REF_ICL8810_LED_43W_BM



REF_TW_BCR601_55V_0.5A

320 W DCM PFC cost-effective and scalable platform design with up to 4 DC-DC channels



REF_LLC_BUCK_4CH_320W



REF_ILD8150_DC_1.5A

Discover more solutions on
www.infineon.com/leddriver-reference-solutions

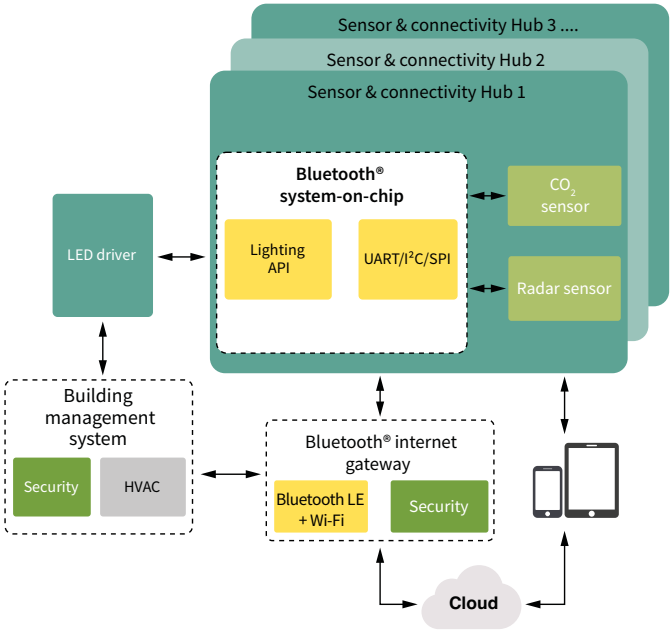
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LEDs
plug & play

Smart lighting solutions

Connectivity and sensor solutions for connected and smart lighting to facilitate everyday life

In the last few years, connected and smart lighting has gained high momentum in the lighting industry. In this application field, sensing and connectivity play an essential role. Besides helping realize energy savings, they also enable new use cases beyond lighting controls.

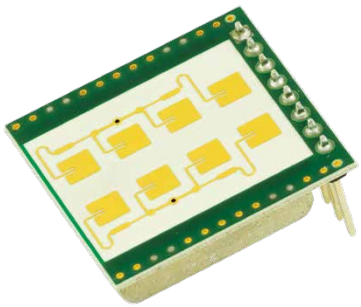


Radar sensor solutions

For energy saving, passive infrared (PIR) sensors are used. Novel sensors like radar can overcome weaknesses of PIR sensors like poor design, limited detection of micro-movements, and limited area coverage, to name a few. Radar sensors can be seamlessly integrated into the luminaires enabling nice design as well as platform design of luminaires since there is no need for drilling holes as in the case of PIR sensors. Advanced use cases like people counting and people tracking can also be ensured with radar technology. In order to add more intelligence to the entire system, connectivity is a key element.

Our partners:
Our system design house partners deliver both standard products and customized solutions to fit specific lighting applications from movement detection through automatic light activation to person counting. In addition, they offer all levels of support to get your intelligent lighting system up and running as quickly and efficiently as possible. See below a list of some of our partner solutions and check our Lighting brochure for more.

Functional block	Topology	IC product family
RF Beam	K-LD2	Presence detection including slight movements
	K-LD7	
InnoSent	INS-313x	Motion detection range up to 5 m
	INS-333x	Motion detection range up to 10 m
Novelic	RIOT100 – NRM302	Turnkey motion and presence sensor solution up to 15 m



Additionally, Infineon provides numerous radar solutions.
Please find out more about them in Radar sensor for IoT chapter.

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www.infineon.com/makeradar

For more details on the product, click on the part number, visit infineon.com or contact our product support.

Bluetooth® Mesh devices and modules for connected and smart lighting applications

Embedding Bluetooth® Mesh networking in lighting systems, including luminaires, fixtures, and wall switches, opens a range of system applications to manage lighting brightness or color, efficiency based on occupancy movements, and correlation of lighting ecosystem components. The range and coverage of Bluetooth® Mesh devices allow for low latency, whole building coverage of automation and occupancy interaction via smartphone and tablet applications, as well as cloud applications for building management. Infineon provides a range of Bluetooth® Mesh MCUs and certified modules that enable lighting control functionality, safety and occupancy sensor management and robust, secure, reliable networked managed solutions.

Bluetooth® Mesh SoCs and certified modules: solutions and benefits

Bluetooth® Mesh system-on-a-chip (SoCs) and certified modules offer a range of efficient and future-proof upgradeable solutions:

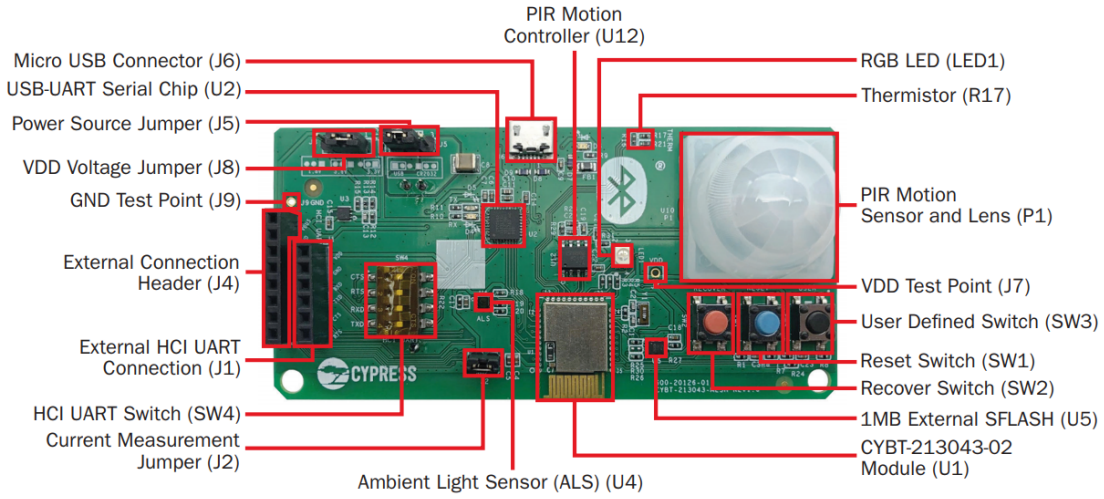
Solutions	Benefits
– Module diversity with integrated components ranging from the basic battery-powered sensor to the most sophisticated detection and safety devices	– Accommodating different needs now and in future
– Fully-integrated modules	– Accelerate time-to-market – Reducing development and manufacturing costs
– Ultra-high-transmit power designs with integrated antennas	– Enabling long range and unfailing node-node connections
– Integrated CPU, memory (flash and RAM) and I/O	– Suiting all foreseeable applications hosting

Bluetooth® Mesh evaluation kit CYBT-213043-MESH

The Bluetooth® Mesh evaluation kit (CYBT-213043-MESH) enables you to evaluate SIG Mesh functionality and features using the CYBT-213043-02 module. The CYBT-213043-02 module is an integrated, fully certified, 12.0 mm x 16.61 mm x 1.70 mm, programmable Bluetooth® Smart Ready module designed to reduce your time-to-market.

Utilized device: CYW20819

Kit contents:
4x mesh evaluation boards
4x USB A to micro-B cables
1x quick-start guide



Info

Bluetooth® Mesh Networking - An Introduction for Developers
Bluetooth®-Mesh-Paving-the-Way-for-Smart-Lighting
Bluetooth®-Mesh specifications:
www.bluetooth.com/specifications/mesh-specifications

Tools

Getting Started with Bluetooth® Mesh (AppNote AN227069)

www.infineon.com/smart-lighting
www.infineon.com/makeradar

Mesh-enabled, silicon, dual-mode Bluetooth® 5.0 AIROC™ MCUs

	CYW20706	CYW20735	CYW20819	CYW20820	CYW20719
Product features					
TBA Processor	CM3	CM4 w/FPU	CM4	CM4	CM4 w/FPU
TBA Radio	–	ULP RF	ULP RF	ULP RF	ULP RF
Operating temperature	105 C	85 C	125 C planned	125 C planned	85 C
Transmit power	10 dBm Tx	10 dBm Tx	4 dBm Tx	10 dBm Tx	4 dBm Tx
Memory	–	–	256 kB flash	256 kB flash	1 MB flash

Features/Integration

Interested in more? We offer a broad silicon portfolio to support your Bluetooth® Mesh design.

Fully-certified Bluetooth® modules (FCC, ISED, MIC, CE)



Load range
Up to 20 dBm transmit power

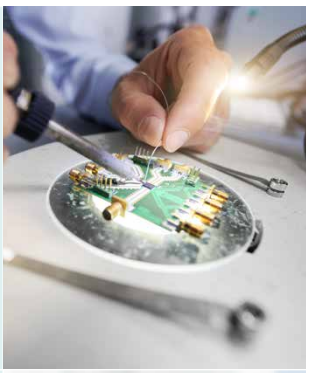


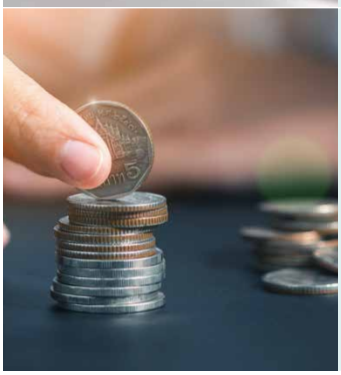
CYBT-483056-02

Size and simplicity
EZ-Serial support enables fast time to market and 9x9 size for small form factor application



CYBT-353027-02





Value
Balance of features for cost sensitive applications



CYBT-343052-02

Integration
Fully integrated SoC with lowest power and extended range



CYBT-273063-02



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Wi-Fi enterprise networking and internet connectivity

Wi-Fi networking is the backbone of enterprise, retail, and home internet connectivity. Wi-Fi is the bridging medium for Bluetooth® Mesh networks to enterprise networks and cloud applications capturing messaging from across the lighting installation for secure enterprise building management applications. Wi-Fi can also connect sensors and fixtures directly to enterprise or home access points for long-range solutions or integrated solutions including security lighting and cameras. Infineon offers a range of secure, high-performance enterprise-ready Wi-Fi solutions that can be added to switches, panels, and lighting bays. These solutions can be stand-alone network nodes or offer Bluetooth® Mesh Gateway services bridging Mesh-networked devices to cloud applications.

IoT Wi-Fi portfolio

Technology	Wi-Fi	Wi-Fi + MCU	Wi-Fi + Bluetooth® Combos
Wi-Fi 4 (802.11n)	CYW43364 SB 1x1 11n | SDIO		CYW43439 SB 1x1 11n + BT5.2 SDIO/SPI
		CYW43903 SB 1x1 11n + 160-MHz R4	CYW43012 ULP DB 1x1 11n + BT5.1 SDIO/SPI WLBGA/WLCSP
		1x1 DB 11n + 320-MHz R4	
Wi-Fi 5 (802.11ac)		1x1ac DB + 320-MHz R4	CYW54590** DB 2x2 11ac + BT 5.1 PCIe/SDIO
			CYW4373/89373 DB 1x1 11ac + BT5.0 USB/SDIO/PCIe
			CYW54591 DB 2x2 11ac, RSDB, BT5.1 PCIe/SDIO

Infineon's Wi-Fi portfolio provides high-performance, flexible connectivity for Linux, Android, and RTOS.
Many of the Wi-Fi + Bluetooth® combos are supported on Infineon's WICED Wi-Fi and ModusToolbox™ Software Development Kits (SDK) which provide code examples, tools and development support.

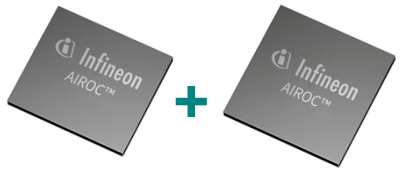
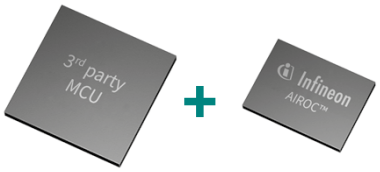
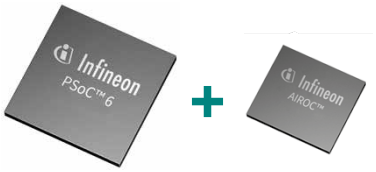
Infineon's Wi-Fi and Bluetooth® combos use production-ready, fully-certified Wi-Fi + Bluetooth® combo modules based on both Linux and RTOS based platforms. Many of the Wi-Fi + Bluetooth® combos are supported on Infineon's WICED Wi-Fi and ModusToolbox™ Software Development Kits (SDK) which provide code examples, tools and development support for **easier and faster development.**

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*Coming soon
**For more information on this product, contact our product support.

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Wi-Fi enterprise networking and internet connectivity

		
CYW43907: MCU + Wi-Fi	PSoC™: PSoC™ running RTOS 3rd-party SoC running Linux OS	P/N: CY8CKIT-06S2-43012 PSoC™ 6: Ultralow-power dual-core MCU
CYW20719: Dedicated Bluetooth® 5.1 MCU	CYW43439*: 1x1n Wi-Fi + Bluetooth® combo SoC	CYW43012 (Murata Type 1LV): Dedicated low-power Wi-Fi + Bluetooth® 5 combo SoC

We offer a broad platform portfolio to support your Bluetooth® Mesh gateway.

IoT Wi-Fi portfolio

A global Wi-Fi module partner ecosystem enables support and development for your IoT application.

Design, build and sell RF Modules
with limited software and hardware
certification support

Module makers

muRata INNOVATOR IN ELECTRONICS

AzureWave

USI

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Conference system

Smart conferencing systems

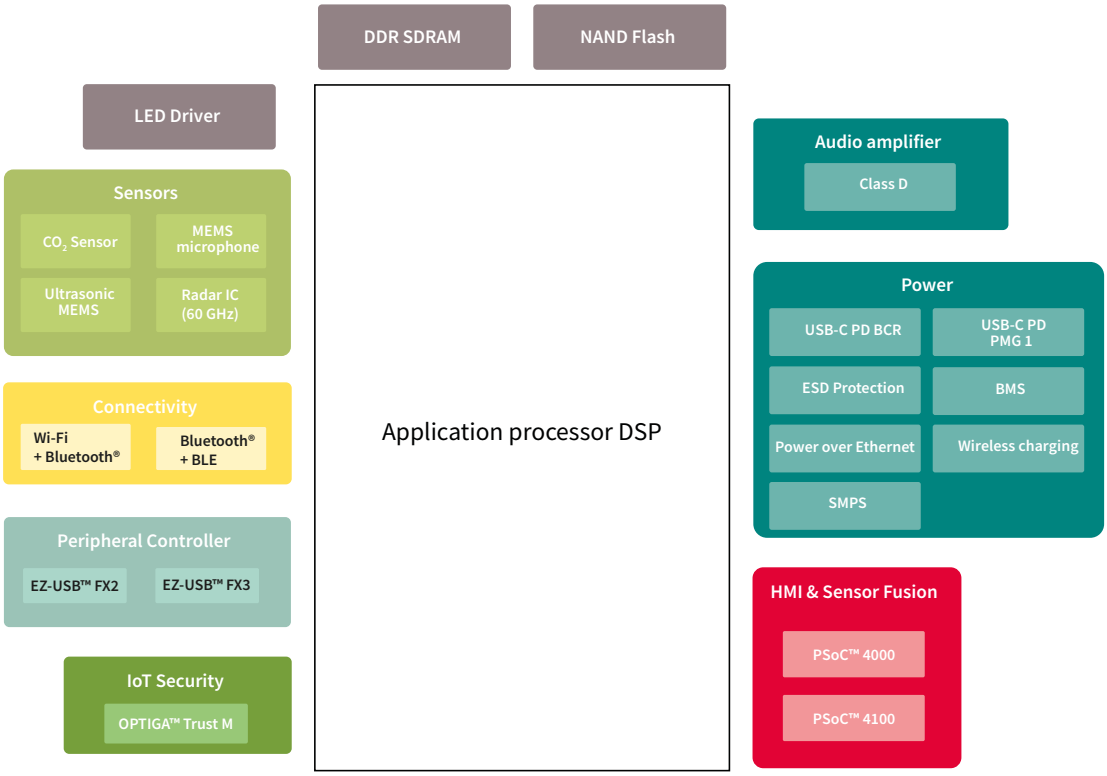
Design conference phones and video conferencing systems for exceptional performance and user experience

The last few years have changed how we interact with our colleagues in the workspace. With the rise of remote work and flexible office spaces new challenges arise – new soft skills, but more importantly, new technology is needed to meet the hybrid way of working. In this changing environment, conferencing systems and speakerphones are essential to enhance the productivity of remote teams and serve customers effectively. The user experience and functionality are further enhanced by smart features, including voice assistants for businesses, user tracking, and new connectivity technologies. Infineon's portfolio provides exceptional performance, user experience, and energy efficiency for the next generation of conferencing systems and speakerphones.

Features and benefits

Key features	Key benefits
– Best-in-class figures of merit	– Lower system power consumption and energy savings and enablement of deep sleep modes
– Reliable connectivity and power solutions	– Less failure and increased up-time with stable connectivity of surveillance camera to cloud and management platforms
– Co-processor in connectivity solutions	– Keep-alive feature in connectivity solutions
– Small footprints of components	– Sleeker designs and space savings
– Turnkey embedded security solutions	– More robust designs against cyberattacks in connected eco-systems
– Highly accurate set of sensors with low power consumption	– Accurate data collection for IoT use cases, e.g. wake-up functions with radar sensors

Application diagram



www.infineon.com/smart-conference-systems

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Product portfolio

Functional block	Product family		Product	Benefits
Audio input	Microphones		XENSIV™ MEMS microphones	– High-performance microphone with low self-noise (high SNR) and low distortions, setting a new performance benchmark for a superior user experience
Audio output	Class D amplifier		MERUS™ class D audio amplifiers	– Cooler, smaller and lighter amplifiers designed to maximize power efficiency and dynamic range while providing best-in-class audio performance in product form factors for great-sounding audio products – Extended battery playback time or the reduction of battery size
Connectivity	Bluetooth® modules and Wi-Fi + Bluetooth® Combos		AIROC™ Wi-Fi + Bluetooth® combos and Bluetooth® modules	– Best-in-class interoperability to the widest deployed wireless IP – Whole Home Range with high throughput for multi-channel audio and RSDB (Real Simultaneous Dual Band) for speaker sub-networks – Ultra-low-power technology designed with battery operation in mind
Sensing	Capacitive sensing touch controller		CAPSENSE™ capacitive touch sensing controller	– State-of-the-art noise immunity (SNR > 100:1) and water rejection have made CAPSENSE™ the industry leader – Advanced inductive touch sensors make possible sleek, futuristic user interfaces with metallic overlay
	Radar sensor		XENSIV™ 60 GHz radar sensor	– Accurate presence detection and vibration detection based on the ability to track sub-millimeter motion at high speed and accuracy, both stand-alone chip as well as system solution available
	CO_2 sensor		XENSIV™ PAS CO_2 sensor	– Along with size and cost advantages, the sensor delivers superior accuracy, providing a direct readout of the real CO_2 level
Security	IoT security controller		OPTIGA™ Trust M	– Easy and secure provisioning services with OPTIGA™ Trust M for maintaining the speaker's unique identity and integrity – Unify different products under unified PKI architecture
Data communication	USB peripheral controllers		EZ-USB™ FX SuperSpeed controllers	– Most versatile USB peripheral controller which can add a USB 5 Gbps connectivity to any system
Power	USB-C PD controller		EZ-PD™ USB-C controller	– USB-IF certified with market-proven USB PD stack, ensuring spec compliance and interoperability – Supports all USB PD profiles commonly used in USB-C power adapters – A highly-integrated solution that minimizes incremental BOM costs
	ESD protection		ESD111, ESD245	– Outstanding low capacitance devices for best signal integrity – High protection performance by ultra low clamping voltage
	Wireless charging		15 W inductive wireless power transmitter	– Powerful and cost-effective wireless charging solutions for high performance, smart and secure charging solutions supported by Infineon's unique wireless power controllers
	High-voltage MOSFETs	Flyback	700 V CoolMOS™ P7 (standard grade)	– Best price-competitive CoolMOS™ SJ MOSFET family – Lower switching losses than a standard MOSFET
		ACF, FMCI	600 V CoolMOS™ PFD7	– Lower Q_{rr}, lower hysteresis loss, low $R_{DS(on)}$
	SMPS flyback converter control ICs	QR flyback ICs	ICE5QSAG	– High efficiency and low standby power
		FFR flyback IC	XDPS21071	– High power density and ideal for USB-PD
	SMPS synchronous rectification	Low-voltage MOSFETs	OptiMOS™ PD	– Low conduction losses and reduced overshoot – Logic-level switching/S308/PQFN 3.3 x 3.3 packages available
		Control ICs	IR1161LTRPBF	– High efficiency/simple external circuitry
	SMPS load switch	Low-voltage MOSFETs	OptiMOS™ 30 V	– Low conduction losses – S308/PQFN 3.3 x 3.3 packages available

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DC-DC

DC-DC power solution for data center, edge, enterprise, telecom and datacom

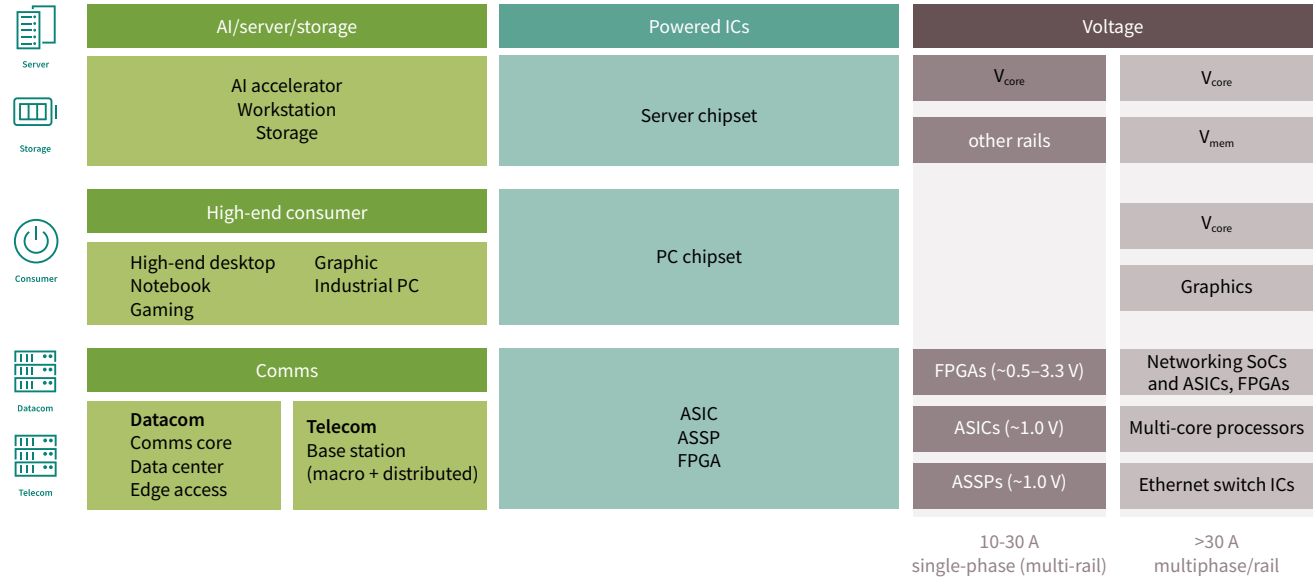
Digital multiphase and point-of-load DC-DC solution

As an industry leader in digital power management, Infineon delivers solutions for the next-generation data center, edge, enterprise, server and telecom applications, storage and client computing applications. Infineon offers a complete portfolio including digital multiphase controllers, integrated power stages, integrated point-of-load (POL) voltage regulators and discrete MOSFETs. These proven technologies offer full flexibility to our customers to optimize a complete system solution for space, performance, ease-of-design and cost to meet critical design goals. In addition, our latest software tools help simplify design, shorten design cycles, and improve time-to-market.

Features and benefits

Key features	Key benefits
– Best-in-class efficiency	– Digital multiphase controller and power stage provide industry's highest efficiency of more than 95 percent
– Multi-protocol support	– Intel SVID, AMD SVI2/3, NVIDIA PWM VID, parallel VID (up to 8 bits) , PMBus Rev1.3, AVS Bus (PMBus Rev1.3)
– Complete system solution	– A broad portfolio of fully integrated point-of-load, integrated power stage and digital controller solutions in addition to discrete drivers and MOSFETs offers full flexibility to optimize complete system solutions ranging from 1 A to 1000+ A
– Digital controller flexibility	– Industry's benchmark for feature richness and low-quiescent power
– Ease-of-design	– Intuitive GUI enables faster optimization, thereby reduces design cycle time
– Smallest solution size	– Best-in-class OptiMOS™ MOSFETs combined with advanced packaging technologies enable high power density at high efficiency, and superior control engine with digital multiphase controllers help minimize output capacitance significantly

Multiphase DC-DC system solution



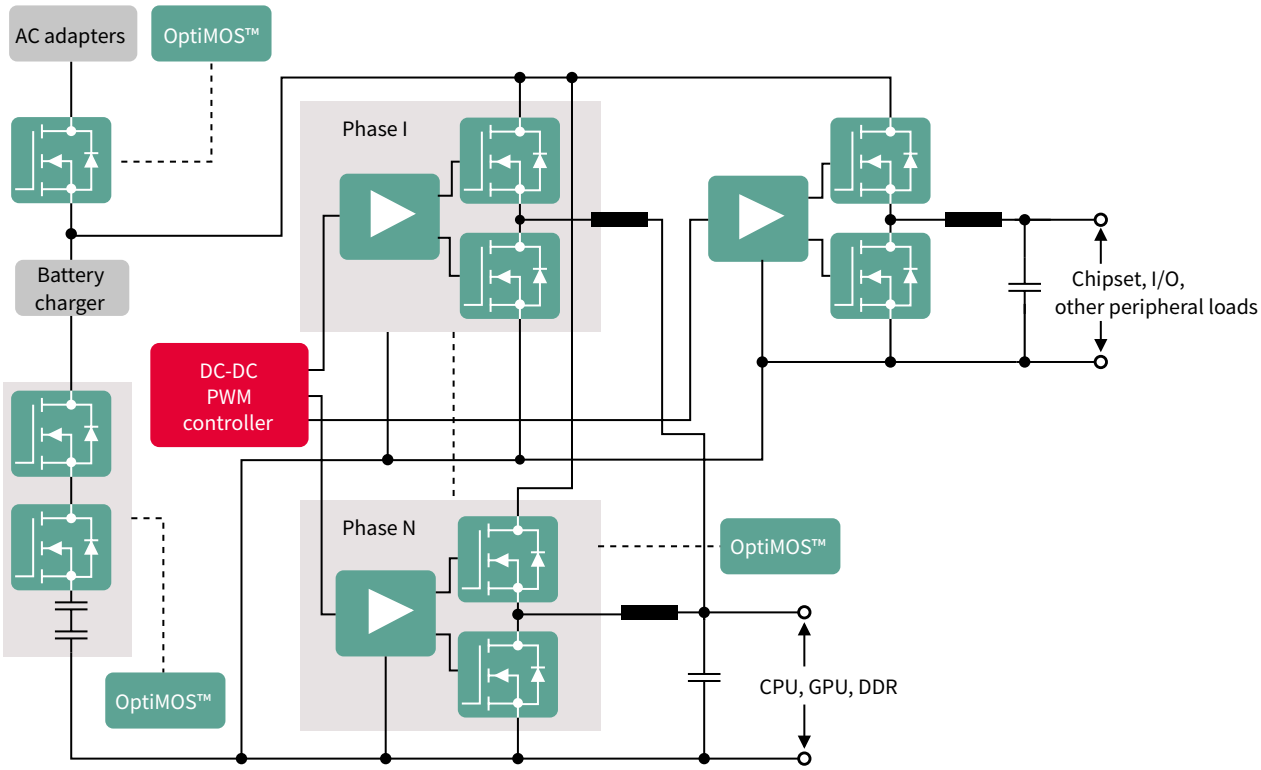
Click here for more information on server SMPS and telecom SMPS solutions.

www.infineon.com/dataprocessing

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Multiphase DC-DC system solution



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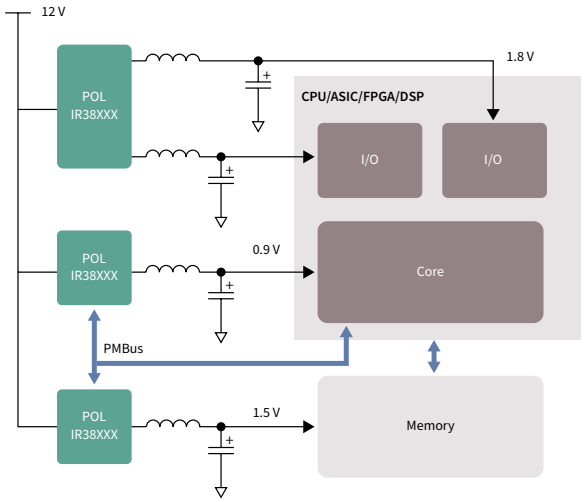
DC-DC

DC-DC enterprise power solution for data processing applications

Integrated point-of-load (IPOL) converters

Infineon's IPOL converters integrate a PWM controller, a driver, and MOSFETs into a small PQFN package for ease of use. The patented PWM modulation scheme allows greater than 1 MHz switching frequencies to deliver ultracompact layouts and the smallest bill of materials (BOM). A PMBus interface is available for monitoring and control in systems that use advanced CPUs, ASICs and FPGAs.

Block diagram



Key features

- Input voltage range 4.5-21 V
- Output current 1-40 A
- Operating temperature range of -40 to 125°C

Key benefits

- Integrated controller, driver, MOSFETs for small footprint
- High-efficiency MOSFETs and thermally enhanced packages for operation without heat sinks

Di-PoL

DC-DC IPOL portfolio

Digital interface IPOL

I²C PMBus, telemetry, margin, faults, SVID PVID Digital control/configuration, telemetry and diagnostic					
Part number	Max. current [A]	Package size [mm]	Max. V_{in}	Max. f_{sw}	Distinctive features
IR38064MTRPBF	35	5 x 7	21 V	1500 KHz	PMBus
IR38063M	25	5 x 7	21 V	1500 KHz	
IR38062M	15	5 x 7	21 V	1500 KHz	
IR38060M	6	5x6	16 V	1500 KHz	
IR38163M	30	5 x 7	16 V	1500 KHz	OptiMOS™ 5, SVID + PMBus
IR38165M	30	5 x 7	16 V	1500 KHz	OptiMOS™ 5, SVID
IR38363M	15	5 x 7	16 V	1500 KHz	OptiMOS™ 5, SVID + PMBus
IR38365M	15	5 x 7	16 V	1500 KHz	OptiMOS™ 5, SVID
IR38263M	30	5 x 7	16 V	1500 KHz	OptiMOS™ 5, PVID + PMBus
IR38265M	30	5 x 7	16 V	1500 KHz	OptiMOS™ 5, PVID
IR38164M	30	5 x 7	16 V	1500 KHz	OptiMOS™ 5, SVID + PMBus, enhanced Imon
IRPS5401M	4+4+2 +2+0.5	7 x 7	14 V	1500 KHz	5 output PMIC, PMBus

Analog IPOL

„Performance" voltage-mode PWM Ultralow jitter and noise, high accuracy and low ripple					
Part number	Max. current [A]	Package size [mm]	Max. V_{in}	Max. f_{sw}	Distinctive features
IR3823AMTRPBF	3	3.5 x 3.5	17 V	2000 KHz	Constant-on-time (COT)
IR3899AMTRPBF	9	4 x 5	17 V	2000 KHz	
TDA38820	20	4 x 5	17 V	2000 KHz	
IR3888MTRPBF	25	5x6	17 V	2000 KHz	
IR3447AMTRPBF	25	5x6	17 V	600 KHz	
IR3887MTRPBF	30	4 x 5	17 V	2000 KHz	
IR3889MTRPBF	30	5x6	17 V	2000 KHz	
TDA38840	40	5x6	17 V	2000 KHz	
IR3846AMTRPBF	40	5 x 7	17 V	600 KHz	

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Solar

High efficient solutions for photovoltaic energy systems

Infineon provides a comprehensive portfolio to deliver the best efficiency and reliability for solar applications. Cutting-edge technologies such as CoolMOS™ SJ MOSFETs, CoolSiC™ Schottky diodes, CoolSiC™ MOSFETs, CoolGaN™ HEMT and TRENCHSTOP™ IGBTs. All these power transistors can be safely operated by EiceDRIVER™ coreless transformer gate drivers. Beyond power stage with the rich experience and highest quality ensure Infineon's unique supplier position, which enables one-stop-shop for solar applications. ARM® Cortex®-M4 and Arm® Cortex®-M0 MCU families enable easy and high-efficiency design for power conversion blocks. Additionally, our Arm® Cortex-M0-PSoC™ 4 entry-level family can also be used for PLC (Power Line Communication). Wi-Fi connectivity can be provided by our AIROC™ family of devices.

	Power optimizer 250 W - 1300 W	Micro inverter 250 W - 1500 W	String inverter 1 kW - 200 kW	Central inverter 500 kW - 5000 kW
Si MOSFETs	OptiMOS™ SuperSO8/TOLL/TOLT 60 V - 200 V	OptiMOS™ SuperSO8/TOLL 60 V - 150 V	OptiMOS™ 150 V - 300 V	-
	-	CoolMOS™ TOLL/D²PAK 600 V - 950 V	CoolMOS™ TO-247-3/TO-247-4/D²PAK/TOLL/QDPAK 600 - 950 V	-
SiC MOSFETs - discrete	-	CoolSiC™ MOSFET discrete D²PAK-7/TOLL 650 V/1200 V	CoolSiC™ MOSFET discrete TO-247-3/TO-247-4/D²PAK-7 650 V/1200 V/1700 V/2000 V	CoolSiC™ MOSFET discrete TO-247-3/TO-247-4/D²PAK-7 1200 V/1700 V/2000 V
SiC MOSFETs - power modules	-	-	CoolSiC™ hybrid modules 650 V to 1200 V	Silicon Carbide CoolSiC™ MOSFET Modules 1200 V
GaN HEMT	-	CoolGaN™ DSO-20/TOLL 600 V	CoolGaN™ DSO-20/TOLL 600 V	
IGBTs - discrete	-	-	650 V/1200 V TRENCHSTOP™ 7 H7 TO-247-3/TO-247-4/TO-247PLUS 600 V/650 V/1200 V	CoolSiC™ hybrid modules 650 V to 1200 V
IGBTs - power modules	-	-	Easy 1B/2B	PrimePACK™ EconoDUAL™ 3/62 mm
Gate driver ICs	EiceDRIVER™ 2EDi/1ED Compact/2EDL/1EDN	EiceDRIVER™ 2EDi/1EDB/2EDL/ 1ED Compact(1ED-AF) 650 V SOI/1EDB	EiceDRIVER™ 2EDi/650 V SOI/ X3 Compact(1ED31xx) X3 Analog(1ED34xx) 1ED-F3/1EDB/IRS2011	EiceDRIVER™ X3 Compact(1ED31xx)/ X3 Analog(1ED34xx)/ 1ED-F3/1EDB 2ED24427N01F/650 V SOI
SiC diodes	-	CoolSiC™ Schottky diodes DPAK/D²PAK 650 V/1200 V	CoolSiC™ Schottky diodes TO-220/TO-247/D²PAK 650 V/1200 V	-
	-	-	BAT165 Schottky diode	
Si diodes			650 V EC7 diode	
Connectivity	AIROC™ Wi-Fi + Bluetooth® Combos/PLC	AIROC™ Wi-Fi + Bluetooth® Combos/PLC	AIROC™ Wi-Fi + Bluetooth® Combos	AIROC™ Wi-Fi + Bluetooth® Combos
Auxiliary power supply	-	CoolSET™ 800 V	CoolSET™ 800 V	CoolSET™ 800 V
Memory	F-RAM	F-RAM	F-RAM/Asynchronous SRAM	F-RAM/Asynchronous SRAM
Current sensing	XENSIV™	XENSIV™	XENSIV™	XENSIV™
Microcontrollers	XMC1000 Arm® Cortex®-M0	XMC1000 Arm® Cortex®-M0	XMC1000 Arm® Cortex®-M0	XMC1000 Arm® Cortex®-M0
	XMC4000 Arm® Cortex®-M4	XMC4000 Arm® Cortex®-M4	XMC4000 Arm® Cortex®-M4	XMC4000 Arm® Cortex®-M4



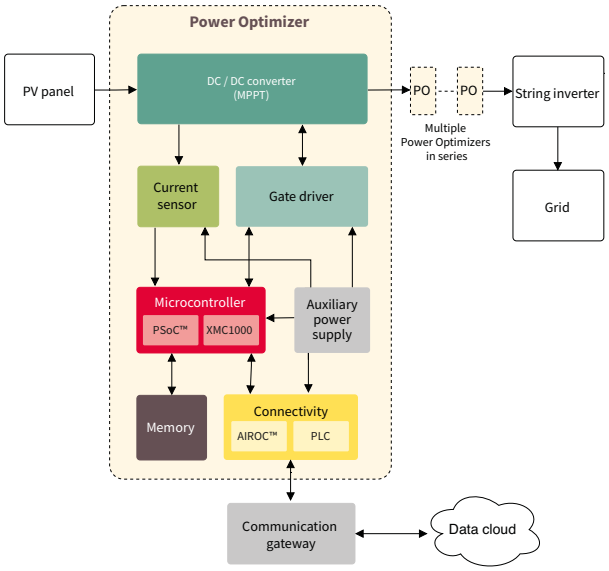
Infineon's product portfolio supports full solar ecosystem including energy storage and EV-charging. Solar power optimizers and micro inverter find their place on the roof right under PV panels. They are exposed to very high ambient temperatures, high thermal cycling and have to meet 25 years life-time, which is equivalent to PV panels. With Infineon's stringent quality measures and production screening processes all these can be met.

We see on the picture string inverter installed on the wall. Its product offering is shown below for single-phase and three-phase configurations. Energy Storage Solutions (ESS) and EV-charging solutions are placed in respective application chapters in this selection guide.

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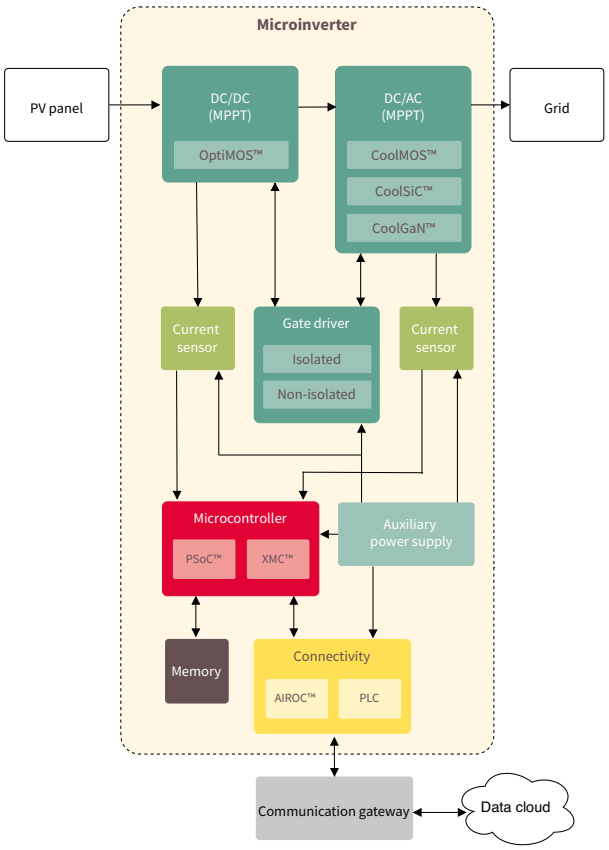
For more details on the product, click on the part number, visit infineon.com or contact our product support.

Power optimizer



Functional block	Product family	Voltage class [V_{DS} max]	Package*	Part number*	$R_{DS(on)}$
DC-DC converter	OptiMOS™	60 V	SuperSO8	ISC058N04NM5	5.8 mΩ
				ISC060N06NM6*	6.0 mΩ
			SuperSO8 SC	BSC028N06NSSC	2.8 mΩ
		80 V	SuperSO8	BSC021N08NS5	2.1 mΩ
				ISC031N08NM6*	3.1 mΩ
		100 V	SuperSO8	ISC060N10NM6	6.0 mΩ
			SuperSO8 SC	BSC040N10NS5SC	4.0 mΩ
		120 V	SuperSO8	ISC030N12NM6	3.0 mΩ
		150 V	SuperSO8	BSC093N15NS5	9.3 mΩ
			TOLT	IPTC044N15NM5	4.4 mΩ
		200 V	SuperSO8	ISC119N20NM6*	11.9 mΩ
			TOLL	IPT067N20NM6*	6.7 mΩ
Gate driver	EiceDRIVER™	Single channel	PG-SOT23-6	1EDN8550	
			SON-10	1EDN7116G	
		Dual channel	SON-8	2EDL8024G	
			DSO	IRS2011	
				2EDL8034F5B*	
Microcontroller	XMC™ / PSoC™	XMC1000 for control loop / PSoC™ 4 for PLC communication			
Memory	EXCELON™	CY15B102QN-50SXE (F-RAM)			
Auxiliary power supply	-	TLE8366EV (PWM step-down DC/DC converter)			
Connectivity	AIROC™	CYW43439 (Wi-Fi 4) / CYW4373 (Wi-Fi 5)			
	PLC	CY8CPLC20-48LTXIT			
Current sensor	XENSIV™	TLI4971-A025T5			

Microinverter



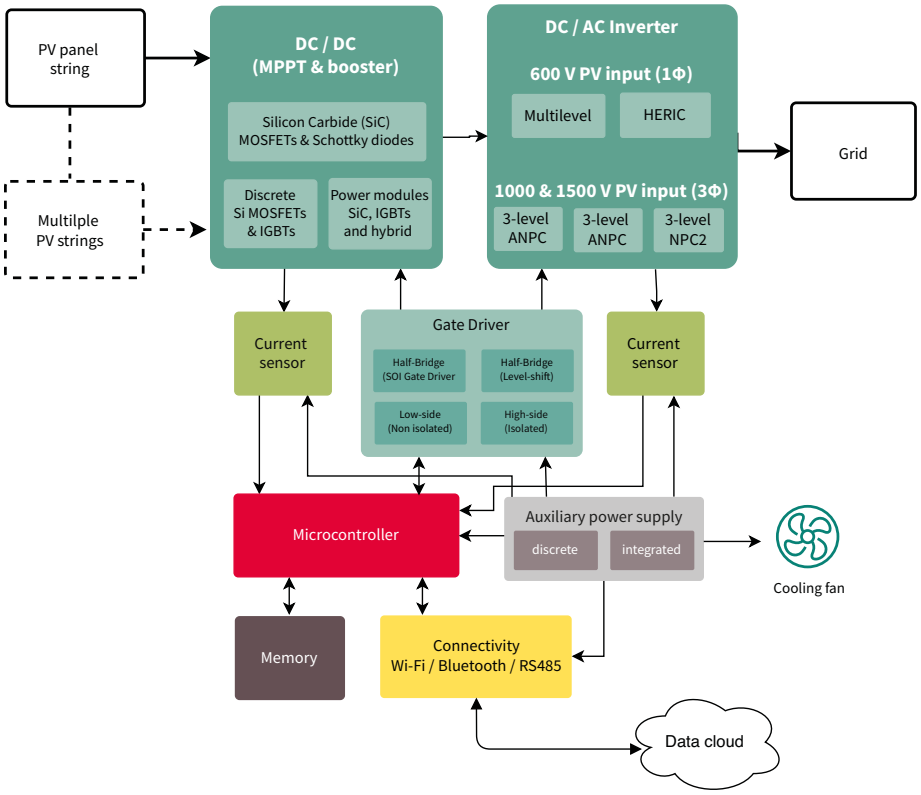
Functional block	Product family	Voltage class [V_{DS} max]	Package*	Part number*	$R_{DS(on)}$
MPPT – Boost stage	OptiMOS™	60 V	SuperSO8	BSC066N06NS	6.6 mΩ
				ISC060N06NM6*	6.0 mΩ
			SuperSO8 SC	BSC028N06NSSC	2.8 mΩ
		80 V	SuperSO8	BSC026N08NS5	2.6 mΩ
				ISC031N08NM6*	3.1 mΩ
		100 V	SuperSO8	ISC060N10NM6	6.0 mΩ
			SuperSO8 SC	BSC040N10NS5SC	4.0 mΩ
		120 V	SuperSO8	ISC030N12NM6	3.0 mΩ
		150 V	SuperSO8	BSC093N15NS5	9.3 mΩ
			TOLT	IPTC044N15NM5	4.4 mΩ
		200 V	SuperSO8	ISC119N20NM6*	11.9 mΩ
			TOLL	IPT067N20NM6*	6.7 mΩ
	CoolSiC™ Schottky diode	1200 V	DPAK	IDM02G120C5	2 A
				IDM05G120C5	5 A
	Gate driver: EiceDRIVER™		VDSON-8	2EDL81xx	
			DSO	2EDN7524F	
				2ED24427N01F	
				IRS2011S, IRS2005S, IRS2007S, IRS2008S	
				2EDL8034F5B*	
Inverter stage	CoolMOS™	600 V	TO-Leadless	IPT60R102G7	102 mΩ
			D^2PAK	IPB60R145CDF7	145 mΩ
			DDPAK	IPDD60R105CFD7	105 mΩ
		650 V	D^2PAK	IPB65R125CFD7	125 mΩ
			D^2PAK	IPB65R041CFD7	41 mΩ
	CoolGaN™	600 V	DSO-20-87	IGOT60R070D1	70 mΩ
			TO-Leadless	IGT60R070D1	70 mΩ
	CoolSiC™ MOSFET	650 V	TO-Leadless	IMT65R163M1H*	163 mΩ
			D^2PAK-7	IMBG65R163M1H	163 mΩ
		1200 V	D^2PAK-7	IMBG120R140M1H	140 mΩ
	Gate driver: EiceDRIVER™	650 V	DSO	2EDS8165H	
				2EDRx258X	
				2EDS9265H	
		1200 V		1EDI60I12AF, 1EDI30I12MF	
Microcontroller	XMC™ / PSoC™	XMC1000 for control loop / PSoC™ 4 for PLC communication			
Memory	EXCELON™ F-RAM	CY15B102QN-50SXE			
Auxiliary power supply	CoolSET™	ICE5QR4780BG (800 V, 15 W, Quasi-Resonant)			
		ICE5GR4780AG (800 V, 15 W, Fixed-Frequency)			
Connectivity	AIROC™	CYW43439 (Wi-Fi 4) / CYW4373 (Wi-Fi 5)			
	PLC	CY8CPLC20-48LTXIT			
Current sensor	XENSIV™	TLI4971-A025T5			

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Single- and three-phase string inverter



Inverter type	Functional block	Product category	Product technology	Voltage	Package	Part number	$R_{DS(on)}$	[A]
Single-phase	MPPT – Boost stage	Si MOSFET	CoolMOS™ C7	650 V	TO-247-3	IPW65R019C7	19 mΩ	-
					TO-247-4	IPZ65R019C7	19 mΩ	-
		SiC MOSFET	CoolSiC™ MOSFET	650 V	TO-247-4	IMZA65R027M1H	27 mΩ	-
					TO-263-7	IMBG65R022M1H	22 mΩ	-
					TO-Leadless	IMT65R022M1H*	22 mΩ	-
		IGBT	TRENCHSTOP™ 7 H7	650 V	TO-247-3	IKWH50N65EH7	-	50 A
					TO-247-4	IKZA50N65EH7	-	50 A
		Diode	CoolSiC™ diode	650 V	TO-247	IDW20G65C5	-	20 A
						IDW32G65C5B	-	32 A
	Invverter 5-level	Si MOSFET	OptiMOS™ 5	150 V	SuperSO8	BSC093N15NS5	9.3 mΩ	-
	Inverter 2-level, e.g. Heric	Si MOSFET	CoolMOS™ CFD7	650 V	TO-247-3	IPW65R018CFD7	18 mΩ	-
					TO-247-4	IPZA65R018CFD7	18 mΩ	-
					TO-247-4	IPZA65R029CFD7	29 mΩ	-
					QDPAK	IPDQ65R017CFD7	17 mΩ	-
		SiC MOSFET	CoolSiC™ MOSFET	650 V	TO-247-4	IMZA65R027M1H	27 mΩ	-
					TO-247-3	IMW65R048M1H	48 mΩ	-
					TO-263-7	IMBG65R022M1H	22 mΩ	-
					TO-Leadless	IMT65R022M1H*	22 mΩ	-
		IGBT	TRENCHSTOP™ 7 H7	650 V	TO-247-4	IKZA50N65EH7	-	50 A
					TO-247-3	IKWH50N65EH7	-	50 A
Three-phase	MPPT – Boost stage	IGBT	TRENCHSTOP™ 7 H7	1200 V	TO-247-3	IKW40N120CH7	-	40 A
					TO-247PLUS-3	IKQ75N120CH7	-	75 A
						IKQ100N120CH7	-	100 A
		SiC MOSFET	CoolSiC™ MOSFET	1200 V	TO-247-3/-4	IMW120R030M1H, IMZ120R030M1H	30 mΩ	-
						IMW120R040M1H, MZA120R040M1H	40 mΩ	-
						IMW120R060M1H, IMZ120R060M1H	60 mΩ	-
		Silicon carbide MOSFET module	CoolSiC™ MOSFET	2000 V	Easy 3B	DF4-19MR20W3M1HF_B11	19 mΩ	120 A
	Inverter	IGBT	TRENCHSTOP™ 7 H7	1200 V	TO-247-3	IKW40N120CH7	-	40 A
					TO-247PLUS-3	IKQ75N120CH7	-	75 A
			TRENCHSTOP™ 7 H7			IKQ140N120CH7	-	140 A
		SiC MOSFET	CoolSiC™ MOSFET	1200 V	TO-247-3/-4	IMW120R030M1H, IMZ120R030M1H	30 mΩ	-
						IMW120R040M1H, MZA120R040M1H	40 mΩ	-
						IMW120R060M1H, IMZ120R060M1H	60 mΩ	-
				1700 V	D^2PAK-7	IMBF170R650M1	650 mΩ	-
				2000 V	TO-247-4-PLUS	IMYH200R012M1H	12 mΩ	-
		Silicon carbide MOSFET module	CoolSiC™ MOSFET	1200 V	Easy 2B	IF3L8MR12W2M1HP_B11	8.1 mΩ	-
Gate-driver ICs		EiceDRIVER™		25 V	SOT23-6	1ED44175/3N01B		
				650 V	DSO-16	2EDS7165H		
				650 V		2ED2181S06F		
				1200 V		IR2214SS, IR2213S		
				1200 V		1EDI60I12AF, 1EDI30I12MF		
				2300 V		1ED3124MU12H, 1ED3122MU12H		
				2300 V		1ED3322MC12N, 2ED020I12-F2		
				2300 V		1ED3491MU12M, 1ED3890MU12M		
		EiceDRIVER™ 2EDN family, EiceDRIVER™ 1EDB						
Microcontroller		XMC4000 and PSoC™ 6						
Memory		F-RAM / Asynchronous SRAM						
Auxiliary power supply		Integrated: CoolSET™ Quasiresonant (QR) / CoolSET™ with Fixed Frequency (FF)						
		Discrete: CoolSET™ (QR or FF) + CoolMOS™ P7						
Connectivity		AIROC™ CYW43439 (Wi-Fi 4) / CYW4373 (Wi-Fi 5)						
		ISOFACE™ digital isolators for RS485						
Sensing		XENSIV™ TLI4971						

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Battery

Energy storage systems

Make energy storage systems the backbone of the new energy era with our semiconductor system solutions

Facing diminishing fossil reserves, the world nonetheless needs to manage the rising demand for electrical energy while meeting the growing call for urgent climate action. The transition to renewable energies has become inevitable.

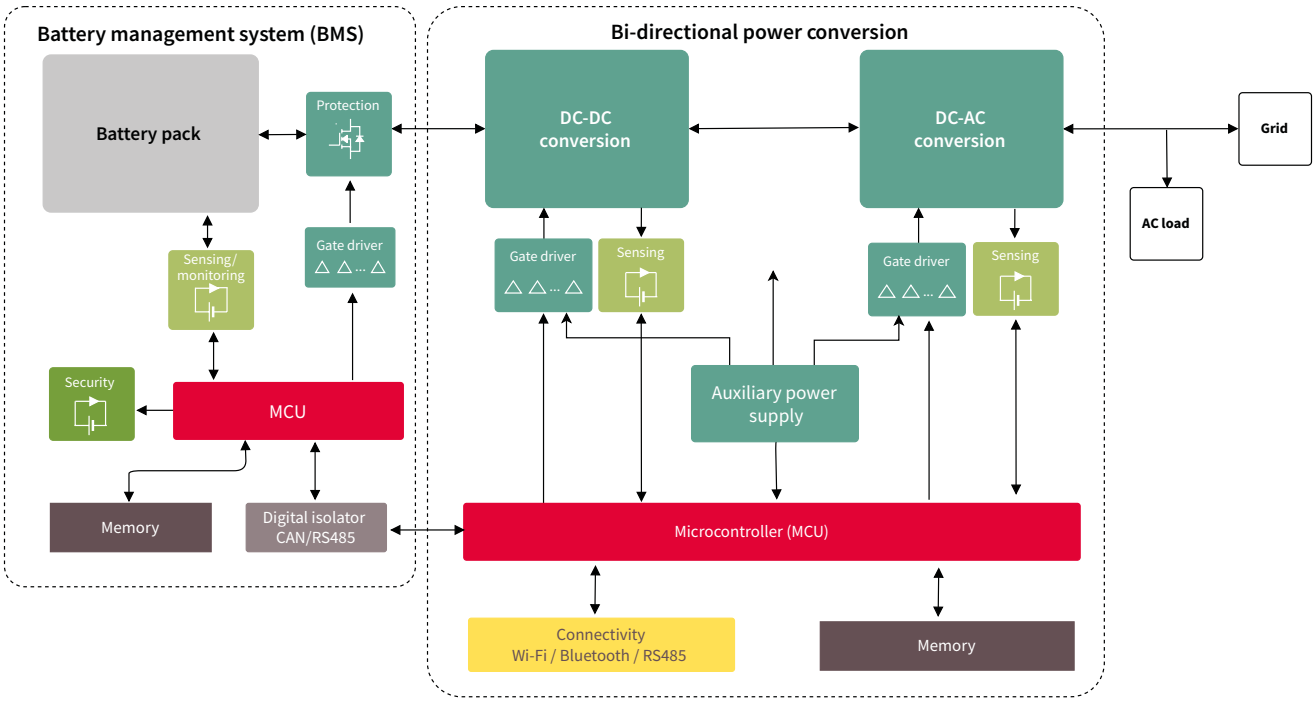
Energy storage systems play a vital role in managing this transition successfully. Our system solutions help to make energy storage the backbone of the new energy era. Our unique application expertise and comprehensive offering make us the natural choice to advance energy storage solutions in efficiency, performance, optimal cost, and innovation.

Features and benefits

Key features
– Efficient power conversion in DC-DC and AC-DC stage
– Power-dense design
– Bi-directional power flow
– Safe operation of Li-ion battery
– Long battery lifetime
– Wide range of Micro Controller Solutions
– Safe data transfer is essential

Key benefits
– Improvement of system performance with industry-leading semiconductor
– offering such as OptiMOS™, CoolMOS™, CoolSiC™ MOSFETs, CoolGaN™ HEMT but also best-in-class modules and matching EiceDRIVER™ gate drivers
– Reduction of design efforts and faster time to market
– Trust in a true partnership during the whole system's lifetime
– Full system provider form power conversion stage (PCS) to the battery management system (BMS), monitoring of battery's SOC, SOH and cell capacity through constant logging of critical parameters to measure the battery health
– OPTIGA™ Trust family protects BMS against cyber attacks
– Ultra-low-energy data-logging of key battery health parameters in F-RAM
– XMC7000, XMC4000 and XMC1000 ARM® Cortex®-M7, ARM® Cortex®-M4 and Cortex®-M0 MCU families enable easy-to-design and stable control over the system
– ISOFACE™ digital isolators, AIROC™ Wi-Fi + Bluetooth® Combos

Application diagram



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Highlight/recommended product portfolio

Functional block	Power/battery voltage	Voltage class [V_{DS} max]	Product family	Package	Benefits
Power conversion systems (PCS)	< 10 kW	40 V to 300 V	OptiMOS™ and StrongIRFET™	SuperSO8, TOLL, TOLT, TO-220, D^2PAK	– High power density and system cost reduction
		600 V/650 V	CoolMOS™ CFD7	TO-220/247, TOLL, QDPAK	– Highest efficiency, enabling increased power density/more compact and easier design
		650 V	CoolSiC™ Schottky diode	TO-220, D^2PAK, DDPAK	– Improved system efficiency and extremely fast switching
		650 V	CoolSiC™ MOSFET	TO-247. D^2PAK, TOLL*	– Combination of high performance, high reliability and ease of use
		600 V	CoolGaN™ HEMT	DSO-20/TOLL	– Ultra high-power density and efficiency
		650 V	TRENCHSTOP™ 5 H5/ CoolSiC™ hybrid devices	TO-247	– Conventional designs, high current operations
	10-100 kW	40 V to 300 V	OptiMOS™ and StrongIRFET™	TOLL, TOLT, TO-220, D^2PAK	– High power density and system cost reduction
		600 - 950 V	CoolMOS™ C7/P7	TO-247, QDPAK, TOLL	– Ease of use and fast design-in
		650 V	CoolSiC™ MOSFET	TO-247, D^2PAK, TOLL*	– Combination of high performance, high reliability and ease of use
		650 V	TRENCHSTOP™ 7 H7	TO-247, TO-247PLUS, TO-247-HCC, TO-247-asymetric (3 &4 pin)	– Best-in-class performance and controllability
		650 V	CoolSiC™ Schottky diode C6	TO-220, D^2PAK, DDPAK	– Higher frequency and increased power density
		1200 V - 2000 V	CoolSiC™ MOSFET	TO-247, TO-247-HCC	– Highest efficiency and increased power density
		1200 V	TRENCHSTOP™ 7 H7	TO-247, TO-247PLUS, TO-247-HCC, TO-247-asymetric (3 &4 pin)	– Best-in-class performance and controllability
	101-250 kW	40 V to 300 V	OptiMOS™ and StrongIRFET™	TOLL, TOLT, TO-220, D^2PAK	– Enables and simplifies the setup of 2nd life batteries – Lower switching voltage enables higher inverter efficiency
		1200 V - 2000 V	CoolSiC™ MOSFET	D^2PAK-7, TO-247-HCC	– Enables efficient auxiliary supply
		1200 V	EasyPACK™ 2B	Modules	– Highest efficiency for reduced cooling effort
		1700 V	PrimePACK™ / EconoDUAL™	Modules	– High power density – Easy and most reliable assembly
	> 0.25 MW	1200 V	PrimePACK™/EconoDUAL™	Modules	
		1700 V	PrimePACK™/EconoDUAL™	Modules	
		200 V	EiceDRIVER™ 1EDN gate driver	PG-SOT23-6/ PG-SOT23-5 WSON-6 / TSNP-6	– Single-channel non-isolated
		650 V	EiceDRIVER™ 2EDR gate driver	PG-DSO-14-WB	– Dual-channel reinforced (safe) isolated
		650 V	EiceDRIVER™ 2EDB gate driver	PG-DSO-14-NB	– Dual-channel functional isolated
		2300 V	EiceDRIVER™ Compact gate driver	DSO-8	– Single-channel isolated driver with Miller clamp/sep-out
		1200 V/2300 V	EiceDRIVER™ Enhanced gate driver	DSO-16	– Single-channel isolated driver with DESAT and Miller clamp
BMS – battery protection	40 - 100 V	60 V to 200 V	OptiMOS™ Linear FET	TOLL, D^2PAK	– Minimize parallelization of MOSFETs – Market-leading MOSFETs with lowest $R_{DS(on)}$ enabling low conduction losses – Widest SOA area with LinearFET™
	150 - 400 V	600 V	CoolMOS™ S7	TOLL, QDPAK	– Lowest $R_{DS(on)}$ MOSFET
BMS Monitoring and balancing	-	-	Battery management IC (TLE9012DQU)	PG-TQFP-48	– ASIL-D compliant – Cell balancing with integrated switches with up to 150 mA using external resistors to reduce chip power consumption – 12x delta-sigma ADCs ensure that the voltage of all cells is measured synchronously – ISO UART includes an 8-bit CRC to ensure data integrity until microcontroller register
BMS transceiver	-	-	Battery management IC (TLE9015QU)	PG-TQFP-48	– UART to ISO UART communication – General purpose error pin – Support diagnosis feature
Digital isolators	-	-	ISOFACE™ digital isolators 2DIB/4DIR	PG-DSO-8-8 PG-DSO-8-16	– Isolated CAN/UART communication – Support diagnosis feature, general purpose error pin
Current sensors	-	-	XENSIV™ - high-precision coreless current sensors	PG-TISON-8	– High accuracy of current sensing – Noise robustness
Auxiliary power supply	-	650 V to 950 V	CoolSET™	DSO-12	– Compact, robust and easy to use solution
Microcontroller	-	-	XMC™ families XMC1000/ XMC4000/XMC7000 PSoC™ 4	PG-VQFN-40 PG-VQFN-56 PG-TSSOP-16 PG-TSSOP-38	– 32-bit MCU subsystem – 48/144/350MHz Arm® Cortex®-M0+ CPU – Up to up to 8 MB flash – 32 kB SRAM – Up to 2 CAN – USB/up to 4 serial channels
Memory	-	-	Serial SPI F-RAM EXCELON™ F-RAM	PG-DSO-8	– Zero-delay writes – 1014 read/write cycles – 10-year data retention at +85°C temperature – 200x lower energy than EEPROM – No complex wear-leveling overheads
Security	-	-	OPTIGA™ Trust family	PG-USON-10-2	– The OPTIGA™ Trust family includes turnkey products for smaller platforms as well as programmable solutions
Connectivity	-	-	AIROC™ Wi-Fi + Bluetooth® Combos	WLBGA	– High integration, quick implementation – It supports Wi-Fi 4, Wi-Fi 5

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*Coming soon

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Service robots

Collaborative robots

Robotics

Superior solutions for smart and safe robots

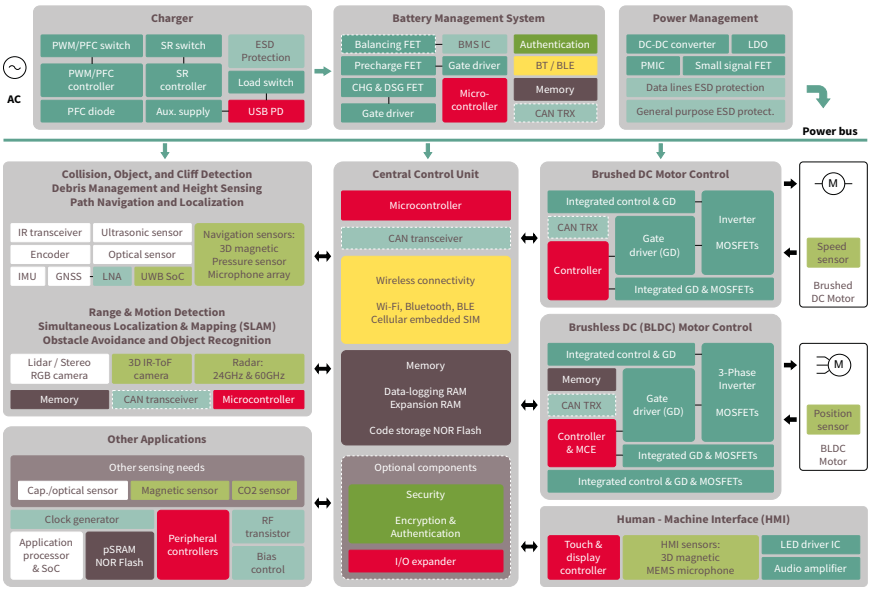
Disruptive technologies have significantly changed our lifestyle in the past few decades. Now a new era is on the horizon – the age of robots. Today's robots can identify and navigate through surroundings, work alongside and even interact with humans. All this would not be possible without the recent advancements in semiconductor solutions. Drawing on Infineon's insights into all facets of the robotics field and with a comprehensive portfolio of power products and sensors on offer, Infineon provides reliable system solutions that address the latest trends in robotics, whether it is Artificial Intelligence, Internet of Things, smart home, cloud-based services, human-machine interface, or any robotics-related field.

Features and benefits

Key features	Key benefits
– Fast time to market	– A complete ecosystem of simulations, documentation, and demonstration boards enable faster time to market
– Complete solutions – broad portfolio from power to connectivity (Wi-Fi and Bluetooth®) and sensors	– Whatever design specification, Infineon has the answer thanks to its comprehensive portfolio of products and solutions which you can easily tailor to your needs
– Extended battery lifetime and product life spans	– High reliability of Infineon components results in prolonged product life spans
– Overall system size and cost reduction	– Reduction of overall system size and cost thanks to small form factor and compact design of components, both of which are required for highest power density
– Security, quality, and safety	– BOM savings thanks to the lowest $R_{DS(on)}$
– Authentication	– Trustworthy hardware-based security
	– As a security market leader with a proven track record and outstanding partner network for embedded security, Infineon provides the highest quality standards and a safety-certified development process
	– OPTIGA™ Trust enables authentication of components connected to the system (e.g., battery pack recognition to avoid second-party batteries)

Domestic robots - simplifying everyday life and work

Structural system overview: domestic robots



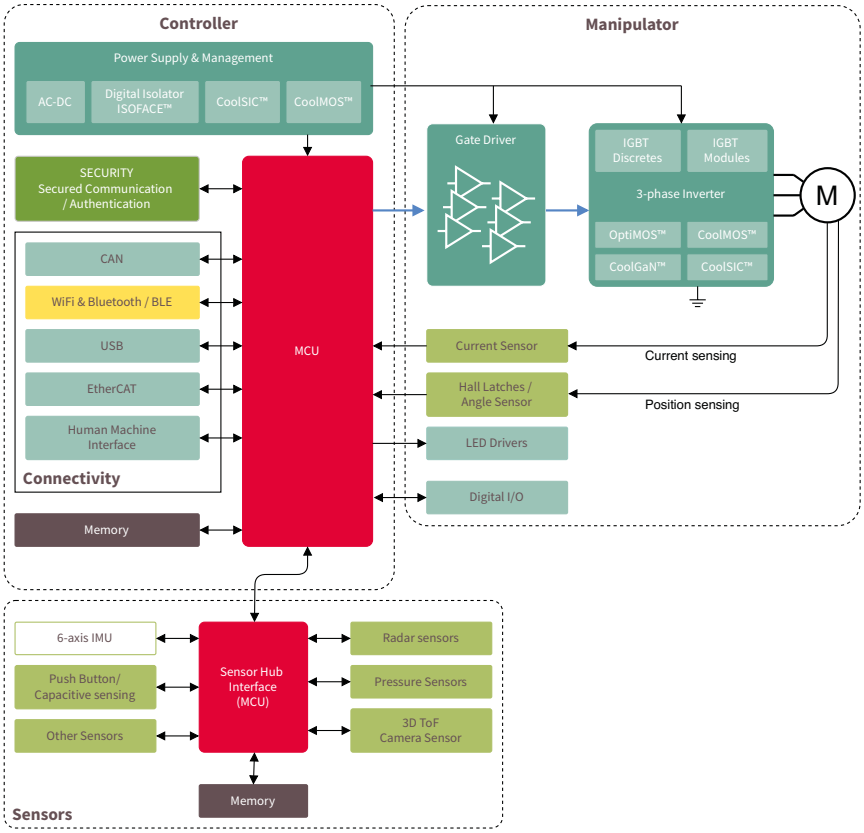
The latest generation of domestic robots, e.g. vacuum, lawn or pool robots, provide a new level of assistance and simplicity in homes and professional environments. They directly interact with humans, which imposes unique design challenges, especially in domestic environments. Energy efficiency, long battery life, security, sensing capabilities, and intelligent mind are key to user-friendly and safe designs. By choosing Infineon, you get a one-stop semiconductor shop for all your robot design needs.

www.infineon.com/robotics

For more details on the product, click on the part number, visit infineon.com or contact our product support.

Industrial robots and cobots – advance through collaboration

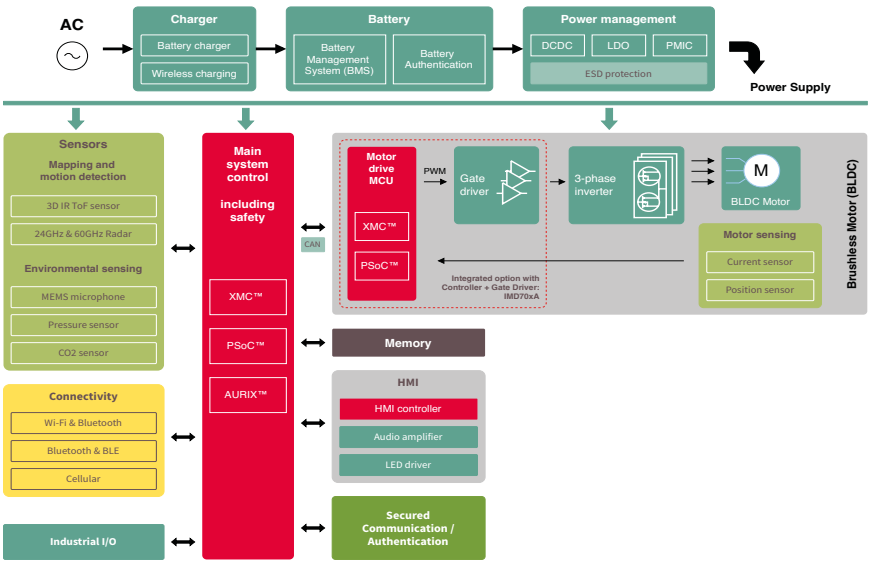
Structural system overview: industrial robots and cobots



With the experience we gained by serving industrial robot manufacturers with the best system solutions for years, Infineon is well set to provide the right fit products for the next generations of collaborative robots. Cobots, as they are shortly called, work outside the limitation of a safety cell, directly interacting with humans. This setup requires a precise set of design features, especially for the sake of workplace safety. With Infineon's semiconductors for cobot systems, you benefit from the expertise of an experienced and reliable partner.

Mobile robots – driving production and automation forward

Structural system overview: Mobile robots (AGV, AMR)



Autonomous mobile robots (AMRs) are a self-driving force behind automated processes and offer the highest degree of flexibility within working environments due to battery-powered systems. With its complete product portfolio for robotics applications- from the power supply to motor drives and sensors for navigation and environment scanning -Infineon makes it possible for mobile robots to find their way through nearly all environments.

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Recommended products

		Industrial robots		Cobots	Mobile robots (AMR, AGV)	Domestic robots
Common system power		**> 5 KW**	**< 5 KW**	**100 – 1000 W**	**200- 500 W**	**10 – 100 W**
Common operating/battery voltage		**3 V ~ 400V$_{AC}$**	**1 v~ 110 V-220 V$_{AC}$**	**1 V~ 110 V-220 V$_{AC}$/48 V$_{DC}$ Bus**	**24 V – 48 V$_{DC}$**	**12 V - 36 V$_{DC}$**
Power supply and charger	Power switch	650 V and 1200 V CoolSiC™ MOSFET 600 V/650 V IGBT HighSpeed 5 650 V IGBT TRENCHSTOP™ 7 IGBT7 T7 and H7 650 V and 1200 V EasyPACK™ Module		600 V/650 V CoolMOS™ 650 V CoolSiC™ 20 V - 200 V OptiMOS™ and StrongIRFET™	600 V/650 V CoolMOS™ 650 V CoolSiC™ 20 V - 200 V OptiMOS™ and StrongIRFET™	600 V/650 V CoolMOS™ 650 V CoolSiC™ 20 V - 200 V OptiMOS™ and StrongIRFET™
	PFC power diodes	650 V CoolSiC™ Schottky diode				
	Gate driver EiceDRIVER™ family	low-side single-channel: 1EDN7550B, 1EDN8550B, 1ED44175N01B, 1ED44173N01B low-side dual-channel: 2ED24427N01F, 2EDN7523G				
		1200 V single-channel isolated: 1ED3124MU12F, 1EDI60N12AF	650 V half-bridge: 2EDF9275F, 2EDF7175F, 2ED2304S06F, 2ED2182S06F, 2ED2110S06M 650 V high-side: 1EDB9275F, 1EDB6275F, 1EDB8275F			
	ISOFACE Digital Isolators ISOFACE Isolated Industrial Interface	ISO1I813T, ISO1H816G 2DIB0410F				
	Microcontroller (MCU)	Arm® Cortex®-M0: XMC1100 or XMC1300 Arm® Cortex®-M4: XMC4200				
Motor control and drive	Power switch	1200 V IGBT 7 S7 1200 V CoolSiC™ MOSFET 1200 V CoolSiC™ Easy1B Module	600V/650V CoolMOS™ 650 V and 1200 V CoolSiC™ CoolGaN™ GIT HEMT 600 V 600 V/650 V/1200 V TRENCHSTOP™ 600 V EasyPIM™ and EasyPACK™ 600 V CIPOS™ (full integration)	60 – 100 V OptiMOS™ and StrongIRFET™ Recommended packages: PQFN 3 x 3 (space savings) Super SO8 (price/performance) TOLL (high current)	60 – 150 V OptiMOS™ and StrongIRFET™ Recommended packages: PQFN 3 x 3 (space savings) Super SO8 (price/performance) TOLL (high current)	25 – 60 V OptiMOS™ and StrongIRFET™ single- and dual-channel MOSFETs Recommended packages: PQFN 3 x 3 (space savings) Super SO8 (price/performance) TOLL (high current)
	Gate driver EiceDRIVER™ family	1200V single-channel isolated Compact: 1ED31xx and 1ED-MF 1200 V single-channel isolated Enhanced: 1ED34xx and 1ED-F2 1200 V half-bridge IR2214SS 1200 V three-phase: 6ED2230S12T	650 V half-bridge: 2EDF9275F, 2EDF7275F, 2EDF7175F, 2ED2304S06F, 2ED2182S06F, 650 V high-side: 1EDB8275F, 1EDB9275F, 1EDB6275F 650 V three-phase: 6EDL04N06PT	600 V half-bridge: IRS21867S, IRS2186S 200 V half-bridge: IRS2005S, IRS2007S, IRS2008S, 2EDF7275K 200 V three-phase: 6EDL04N02 160 V three-phase: 6ED2742S01 200 V high-side: 1EDN7550B & 1EDB8550B 160 V half-bridge: 2ED2748S01G, 2ED2738S01G 120 V half- bridge: 2EDL8124G 60 V three-phase programmable: 6EDL7141 25 V low-side: 1ED44173N01B, IRS44273L		
	Microcontroller (MCU)	PSoC™: Arm® Cortex® M4F+M0 → CY8C61x8 XMC™: Arm® Cortex® M4F → XMC4800, Arm® Cortex® M0 → XMC1000 TRAVEO II™: Arm® Cortex® M7 Dual Core + Arm® Cortex® M0+ → CYT4BF8CD AURIX™: TriCore → TC337				
	ISOFACE Digital Isolators ISOFACE Isolated Industrial Interface	2DIB0410F ISO1I813T, ISO1H816G				
	Hall switch	XENSIV™ TLx496x				
	Current sensor	XENSIV™ TLI4971				
	Angle sensor	XENSIV™ TLE/TLI5012B, TLE5014SP				
Battery management system (BMS)	Microcontroller (MCU)				XMC™: XMC4x00 (Arm® Cortex® - M4F) PSoC™: PSoC™ 4 (Arm® Cortex®M4F+M0)	
	Protection switches				100 V – 150 V OptiMOS™ or StrongIRFET™ IPT015N10N5, IRFS4115	30 V – 80 V LinearFET™ Gen.2 OptiMOS™, StrongIRFET™ BSC007N04LS6, IRL40T209, IRFS7430
	Balancing switches (small signal)				20 V or 30 V N/P MOSFETS in SOT23, TSOP6 or SOT363 dual-channel	
	Monitoring and balancing IC				TLE9012AQU (sensing IC), TLE9015QU (transceiver IC)	
	Battery authentication				OPTIGA™ Authenticate S	
Sensing (e.g., room mapping, HMI, collision avoidance, air quality)	Radar	XENSIV™ 60 GHz: BGT60LTR11AIP XENSIV™ 24 GHz: BGT24LTR11 or BGT24MTR11				
	ToF (Time-of-Flight) 3D image sensors	XENSIV™ REAL3™ 3D image sensor: IRS1125A, IRS2877AS (functional safety ISO26262) XENSIV™ VCSEL Driver: IRS9100C, IRS9102C				XENSIV™ REAL3™ 3D image sensor: IRS2381C, IRS2875C, IRS2877C XENSIV™ VCSEL Driver: IRS9100C, IRS9102C
	MEMS microphones	XENSIV™ MEMS microphones: IM72D128 (digital interface), IM68A130 (analog interface)				
	Other sensors	Pressure sensor: XENSIV™ DPS368 (e.g., airflow control) CO_2 Sensor: XENSIV™ PAS CO_2				
Connectivity and human-machine interface (HMI)	Wi-Fi	CYW43439 (1x1 2.4GHz Wi-Fi 4) CYW4373 (1x1 dual-band Wi-Fi 5) CYW55571 (1x1 Tri-band Wi-Fi 6)				
	HMI	PSoC™ 4000 - entry-level PSoC™ 4100 - more touch buttons PSoC™ 4700 - inductive sensing				
	Main control MCU	Single or dual core Arm® Cortex®-M7 and Cortex®-M0+				
Security	Authentication and protection	OPTIGA™ Trust M, OPTIGA™ TPM				
Memory	NOR flash	S25FL-L serial NOR flash memories Densities 64 MB to 256 MB				
Others	Voltage regulator	DC-DC voltage regulator 12 V/5 V or 3.3 V, watchdog, error monitoring, safe state control, BIST, etc.				
	LED Driver	Driving currents from 10 mA to 250 mA – linear driver ICs: BCR3xx, BCR4xx Support currents from 150 mA to 3 A – DC-DC switch-mode: ILD4xxx, ILD6xxx				

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eMobility

On-board charger for xEV appliactions

Best solutions for electrified powertrain in xEV applications: on-board chargers and HV/LV DC-DC converter

The electrification of the powertrain enables local emission-free mobility and driving pleasure. The needed energy is stored and delivered from a battery. Infineon's semiconductor solutions do not only enable core functionalities in the electrification but also extend the driving range, reduce charging times and energy transfer between the high voltage systems with the traditional 12 V domain.

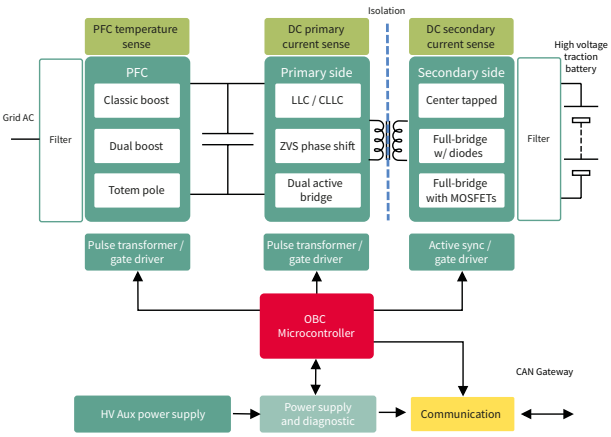
On-board chargers

All plug-in hybrid electric vehicles (PHEV) and pure electric cars are equipped with at least one on-board charger, allowing battery recharge from any standard AC power outlet. Available power depends on regional regulations and installation base, typically providing up to 7.4 kW for PHEVs and up to 22 kW maximum power. System designers face the challenge of supporting the varied voltage and current levels while increasing the power density. When it comes to on-board charging, the key success factors involve efficiency and a high power density for a small form factor. The long-term trend is moving towards bidirectional charging, where the charger also feeds power from the car to the smart grid.

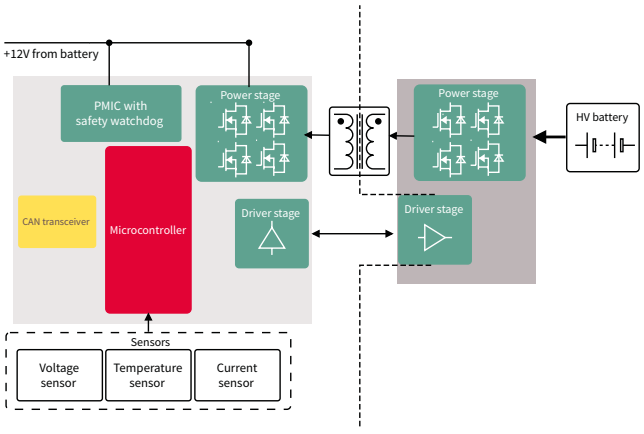
High-voltage DC-DC converter

The architecture of electric vehicles comprises at least one low-voltage sub-network with low-voltage energy storage and multiple electrical loads and one high-voltage sub-network with high-voltage energy storage. The auxiliary HV/LV DC-DC converter's function is to enable the bidirectional energy flow between these two electrical subnets. Typical design challenges are achieving the greatest possible efficiency and keeping the overall system costs under control. The space required for the DC-DC converter should also be kept to an absolute minimum. Infineon's portfolio is specially designed to help overcome these barriers easily.

On-board chargers: functional blocks



HV/LV DC-DC converter: functional blocks



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For more details on the product, click on the part number, visit infineon.com or contact our product support.

Product portfolio for on-board charger and HV/LV DC-DC applications

Infineon's comprehensive portfolio of semiconductors (sensors, microcontrollers, power semiconductors, etc.) lends itself perfectly to designing compact units for on-board, off-board, and wireless EV-charging. Infineon products in this sector support high-switching frequencies at lowest possible on-state resistance ($R_{DS(on)}$) to enable compact and efficient designs. The power offering includes MOSFETs such as CoolMOS™, IGBTs such as TRENCHSTOP™ 5 , SiC Schottky diodes such as the CoolSiC™ Schottky diode 650 V, the CoolSiC™ Hybrid discrete (integrated IGBT and SiC diode), and easy module solutions. In addition, integrated MOSFET and IGBT drivers, controller ICs for active CCM PFC high-performance microcontroller solutions, and highly accurate current sensors complete the product portfolio. For more information about off-board chargers, refer to the Fast/wireless EV-charging chapter.

Automotive products for on-board charger units

Product family	Part number	Description
CoolMOS™ 650 V	IPx65RxxxCFD7A	650 V MOSFETs with integrated fast body diode
TRENCHSTOP™ 5 AUTO IGBT	AIKW50N, AIKW40N, AIGW40	IGBT discrete dedicated to automotive applications
CoolSiC™ 1200 V	AIMW120Rx	Automotive 1200 V discrete SiC MOSFET
Level shifter	AUIRS2191S, AUIRS2113S	Automotive high and low side driver
EiceDRIVER™ Automotive	2ED020I12FA	Dual-channel isolated driver for 650 V/1200 V IGBTs and MOSFETs
AURIX™ microcontroller	TC23xL, TC26xD , TX36x*, TC37X*	32-bit lockstep microcontroller
OPTIREG™ PMIC	TLF35584, TLF35585	ISO 26262 – system-supply optimized for AURIX™
CAN FD transceiver	TLE9350, TLE9351, TLE9252	High-speed automotive CAN transceiver with 5 Mbps
OPTIREG™ SBC	TLE9461, TLE9471	High integrated solution for microcontroller supply and communication
OPTIREG™ linear	TLS810, TLS850, TLS105, TLS820	Automotive linear voltage regulators
XENSIV™ current sensor	TLI4971	Coreless magnetic current sensors

Modules for on-board charger units

Product family	Part number	Description
CoolMOS™ Easy module 650 V	F4-35MR07W1D7S8_B11/A*	650 V MOSFET in H-bridge configuration with integrated capacitor in Easy 1B package
CoolMOS™ Easy module 650 V	F4-35MR07W2D7S8_B13/A*	650 V MOSFET in H-bridge configuration with IGBT H5, rapid diode & integrated capacitor in Easy 2B package
CoolMOS™ Easy module 650 V	F4-xxMR07WxD7_Bxx/A	650 V MOSFET in H-bridge configuration in Easy package
CoolMOS™ Easy module 650 V	FSxxMR07WxD7_Bxx/A	650 V MOSFET in SixPACK configuration in Easy package
CoolMOS™ Easy module 650 V	FFxxMR07WxD7_Bxx/A	650 V MOSFET in half-bridge configuration in Easy package
CoolSiC™ Easy module 1200 V	F4-xxMR12WxM1H_Bxx/A	1200 V SiC MOSFET in H-bridge configuration in Easy package
CoolSiC™ Easy module 1200 V	FSxxMR12WxM1H_Bxx/A	1200 V SiC MOSFET in SixPACK configuration in Easy package
CoolSiC™ Easy module 1200 V	FFxxMR12WxM1H_Bxx/A	1200 V SiC MOSFET in half-bridge configuration in Easy package

For more information about off-board chargers, refer to the Fast/wireless EV-charging chapter.

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* Coming soon

For more details on the product, click on the part number, visit infineon.com or contact our product support.

Automotive products for the car side**

Product family	Part number	Description
EiceDRIVER™ Automotive	1ED020I12FA2	Single-channel isolated driver for 650 V/1200 V IGBTs and MOSFETs
EiceDRIVER™ Automotive	1ED020I12FTA	Single-channel isolated driver, two-level turn-off for 650 V/1200 V IGBTs
EiceDRIVER™ Automotive	2ED020I12FA	Dual-channel isolated driver for 650 V/1200 V IGBTs and MOSFETs
CoolMOS™	IPx65RxxxCFD7A	650 V MOSFET with integrated fast body diode
AURIX™	TC23xL, TC26xD, TX36x*, TC37X*	32-bit lockstep microcontroller
OPTIREG™ PMIC	TLF35584 , TLF35585	ISO 26262 – system-supply optimized for AURIX™
CAN FD transceiver	TLE9350, TLE9351, TLE9252	High-speed automotive CAN transceiver with 5 Mbps
OPTIREG™ SBC	TLE9461, TLE9471	High integrated solution for microcontroller supply and communication
OPTIREG™ linear	TLS810, TLS850, TLS105, TLS820	Automotive linear voltage regulators

Industrial products for the road side**

Product family	Part number	Description
CoolMOS™ CFD7 SJ MOSFET	IPW60R031CFD7	600 V MOSFET, 31 mΩ, TO-247
CoolMOS™ C7 SJ MOSFET	IPW60R040C7	600 V MOSFET, 40 mΩ, TO-247
CoolMOS™ P7 SJ MOSFET	IPW60R037P7	600 V MOSFET, 37 mΩ, TO-247
TRENCHSTOP™ 5 IGBTs	IKW40N65F5	Fast IGBT with Rapid 1 diode, 40 A, TO-247
TRENCHSTOP™ 5 IGBTs	IGW40N65F5	Fast IGBT, single, 40 A, TO-247
CoolSiC™ Schottky diode	IDW40G65C5	650 V SiC Schottky diode generation 5, 40 A, TO-247
XMC™ microcontroller	XMC4000	32-bit Arm® Cortex® -M4F microcontrollers, up to 125 °C ambient temperature
Linear voltage regulators	TLS805, TLS820, TLS850	Scalable Linear regulator family from 50mA to 500mA with robust design and feature sets
Current sensor	TLI4970	600 V functional isolation, ± 50 A
EiceDRIVER™ SOI gate driver	2ED21xxS06F	650 V half-bridge gate driver for IGBTs and MOSFETs
EiceDRIVER™ 1ED Compact gate-driver IC	1EDxxxI12AF/MF, 1ED31xxMU12H	1200 V, single-channel, isolated driver with Miller clamp or separate output

Industrial products for the road side

Part number	Product family	Description
EasyPACK™ module with CoolSiC™ 1200 V	F3L11MR12W2M1_B74	1200 V SiC MOSFET in three-level configuration in Easy 2B package
EasyDUAL™ 1B module CoolSiC™ 1200 V	FF45MR12W1M1(P)_B11*	1200 V SiC MOSFET in half-bridge configuration in Easy 1B package
EasyDUAL™ 1B module with CoolSiC™ 1200 V	FF23MR12W1M1(P)_B11	1200 V SiC MOSFET in half-bridge configuration in Easy 1B package
EasyPACK™ 1B module with CoolSiC™ 1200 V	F4-45MR12W1M1(P)_B76*	1200 V SiC MOSFET in H-bridge configuration in Easy 1B package
EasyPACK™ 1B module with 1200 V CoolSiC™	F4-23MR12W1M1(P)_B76*	1200 V SiC MOSFET in H-bridge configuration in Easy 1B package
EasyBRIDGE™ module with 1200 V CoolSiC™	DDB2U20N12W1RF(P)_B11	1200 V SiC diode in rectifier bridge configuration in Easy 1B package
EasyBRIDGE™ module with 1200 V CoolSiC™	DDB2U40N12W1RF(P)_B11	1200 V SiC diode in rectifier bridge configuration in Easy 1B package
EasyBRIDGE™ module with 1200 V CoolSiC™	DDB2U60N12W1RF(P)_B11	1200 V SiC diode in rectifier bridge configuration in Easy 1B package

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* For more information on the product, contact our product support
** Available in different current ratings

For more details on the product, click on the part number, visit infineon.com or contact our product support.

LEV

Light electric vehicles and electric forklift

eBike, eScooter, eMotorcycle, eRickshaw, eMicroCar, eForklift

As a leader in power semiconductors, Infineon strives to enable the most efficient, reliable, and smart solutions for the e-mobility, Minimobility, and Micromobility markets. Keeping up with the latest market trends worldwide, Infineon prepares for the ramp-up of all forms of light electric vehicles (LEVs).

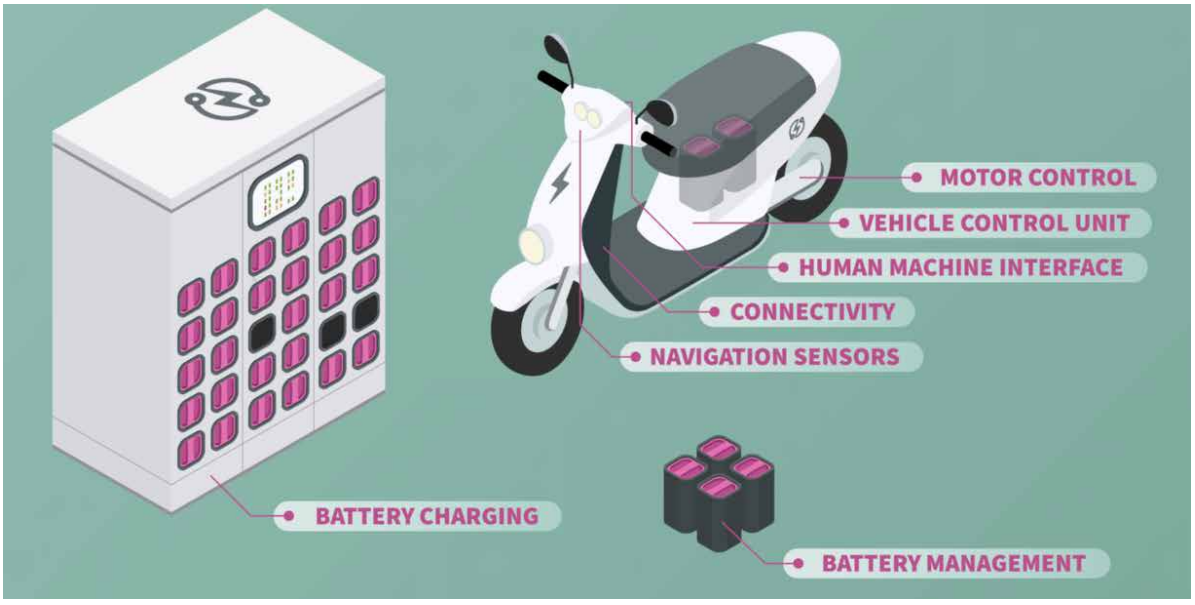
- Micromobility - electric bicycle (e-bike), electric kick-scooter
- Electric powered 2/3 wheelers (ePTW) - e-moped, e-scooter, e-rickshaw, e-motorcycle
- MicroEV – electric microcars, low-speed electric vehicles (LSEV), neighborhood EV (NEV), electric quadricycle
- Other electric transporters (e.g. e-forklift, e-golf cart, e-ATV) with less than 200 V batteries

Contrasting to automotive (passenger car) requirements, L-category (light) vehicles (though often also on-road) require different sets of safety and qualification standards. As an example, the newest motorcycle standards place more responsibility on the operator rather than the vehicle itself to mitigate risks. Infineon considers mission profiles of different end applications and offers suitable non-automotive and automotive components for this wide range of use cases. Different from the traditional vehicles with internal combustion engines, these types of vehicles are powered by battery technology with bus voltage ranging from 28 V to 168 V. The commonalities among these different types of LEVs are motor inverters/drives, battery management systems, battery chargers/battery charging stations/battery swapping stations. Additionally, LEVs house increasingly popular smart features and electronics made possible due to their larger battery sizes.

Features and benefits

Key features	Key benefits
– Leading power MOSFET technology	– Highest power density and increased battery operating time
– Track record of reliability and quality	– Prolonged lifetime and low failure rate
– Complete portfolio for driver, microcontroller, and sensors	– One-stop shop for designers
– Broad connectivity products compliant with various standards	– Enabling smart features
– Complete design support with simulations, documentation, and demonstration boards for high-end solutions	– Shortened development cycle

Application diagram



www.infineon.com/lev

6 kW motor drive with 96 V bus voltage

Functional block	Topology	Product category	Product family	Part number
Motor drive	3-phase half-bridge (B6)	LV MOSFETs	OptiMOS™ 5	IPT039N15N5
		Microcontrollers MSIL-relevant	AURIX™	SAK-TC334LP-32F200F MSIL-ready
		Gate driver MSIL-relevant	EiceDRIVER™	2EDB8259F, 2ED2738S01G
		Position/speed sensor MSIL-relevant	XENSIV™	TLE5501 E0002
		Current sensor MSIL-relevant	XENSIV™	TLE4972-AE35S5 MSIL-ready

For additional configurations, please refer to High power low voltage drives.

Swappable 48 V 1.2 kWh battery

Functional block	Topology	Product category	Product family	Part number
BMS	Back-to-back with pre-charge	LV MOSFETs (charge)	OptiMOS™ TOLT	IPTC015N10NM5
		LV MOSFETs (discharge)	OptiMOS™ TOLT	IPTC015N10NM5
		LV MOSFETs (pre-charge)	OptiMOS™	BSC070N10NS5
		Microcontrollers MSIL-relevant	PSoC™	CY8C4146/7AZI-S463
		Gate driver MSIL-relevant	EiceDRIVER™	2ED4820 MSIL-ready
		Current sensor MSIL-relevant	XENSIV™	TLE4972 MSIL-ready
		Cell balancing IC MSIL-relevant	TLE	TLE9012 MSIL-ready
		Memory (RAM)	NOR flash	S25FL256LAGMFB001
		Bluetooth®	AIROC™	CYW20719B1KUMLG
		Security	OPTIGA™ Authenticate S	SLE95401TSNP6XTSA1

For additonal configurations, please refer to Battery management systems.

3 kW AC-DC rectifiers in swapping battery stations

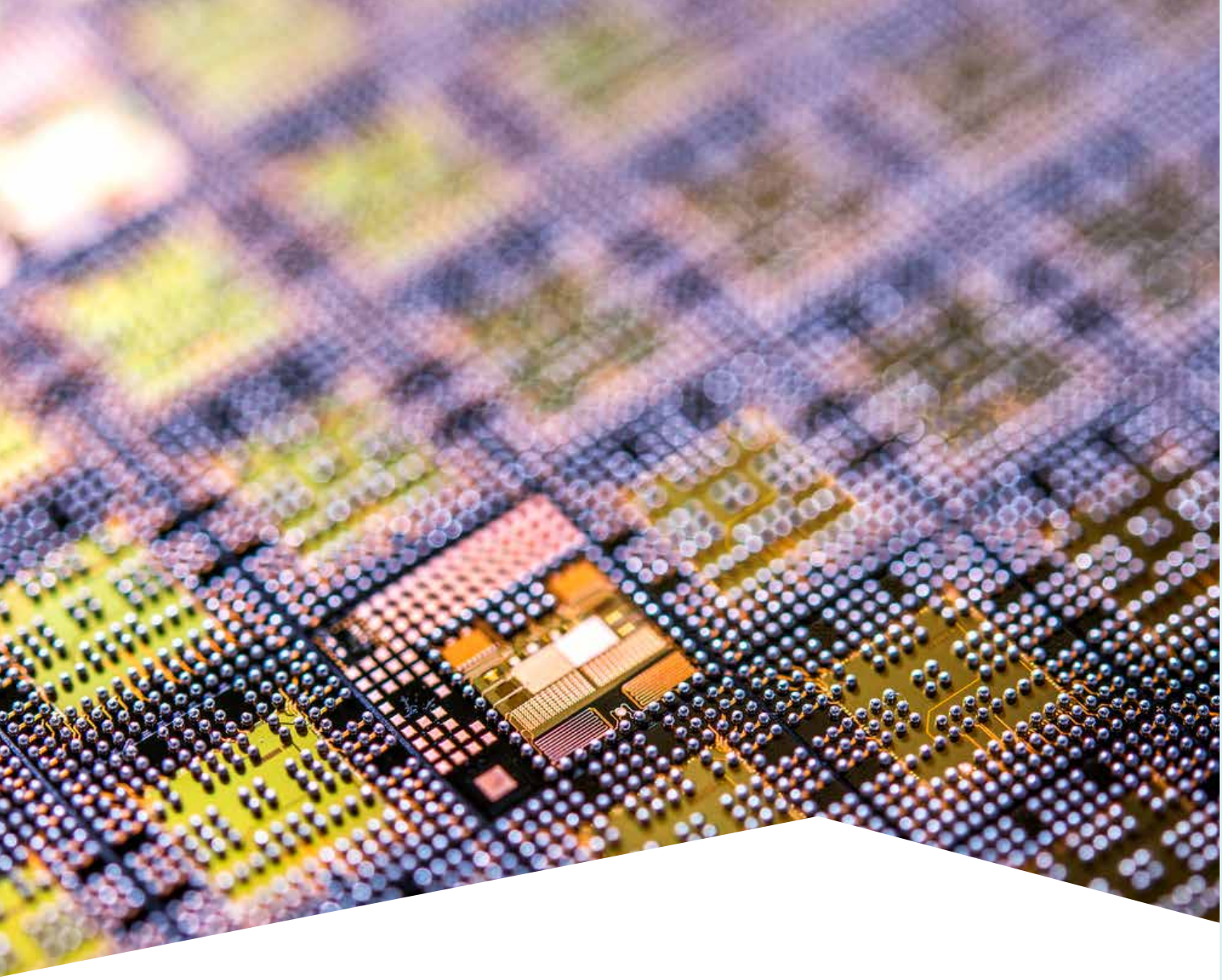
Functional block	Topology	Product category	Product family	Part number
Battery charging	CCM PFC	PFC switch	CoolMOS™ P7	IPW60R037P7
		Gate driver	EiceDRIVER™	1EDN8511B
		PFC controller	ICE3x family	ICE3PCS01G
	Resonant HB LLC	LLC switch (primary side)	CoolMOS™ CFD7	IPW60R031CFD7
		Gate driver	EiceDRIVER™ 2-ch functional-isolated gate drivers	2EDS8265H
		FBSR switch	OptiMOS™ 5	BSC040N10NS5
		FBSR gate driver	EiceDRIVER™ non-isolated driver IC	2EDF7275F
		MCU	XMC™ industrial microcontroller family	XMC4200-F64k256BA
	QR flyback	Aux power controller	CoolSET™	ICE5QR2280AZ

For additional configurations, please refer to Battery chargers.

250 W AC-DC offline charger

Functional block	Topology	Product category	Product family	Part number
Battery charging	PFC	Controller	XDP™	XDPS2222
		PFC switch	CoolMOS™ P7	IPA60R099P7
	LLC HV DC-DC	HB switch	CoolMOS™ P7	IPA60R280P7
		SR switch	OptiMOS™	BSC074N15NS5
	QR flyback controller	Aux power IC	CoolSET™	ICE5AR4770AG

For additional configurations, please refer to Battery chargers.



Products

- 15-300 V MOSFETs
- 500-950 V MOSFETs
- Gate-driver ICs
- Digital Isolators
- Discrete IGBTs and silicon power diodes
- Intelligent power switches and modules
- Microcontrollers
- USB-C controllers and peripherals
- Power management ICs
- Wide bandgap semiconductors
- XENSIV™ sensor technologies for automotive, industrial and consumer applications
- Packages

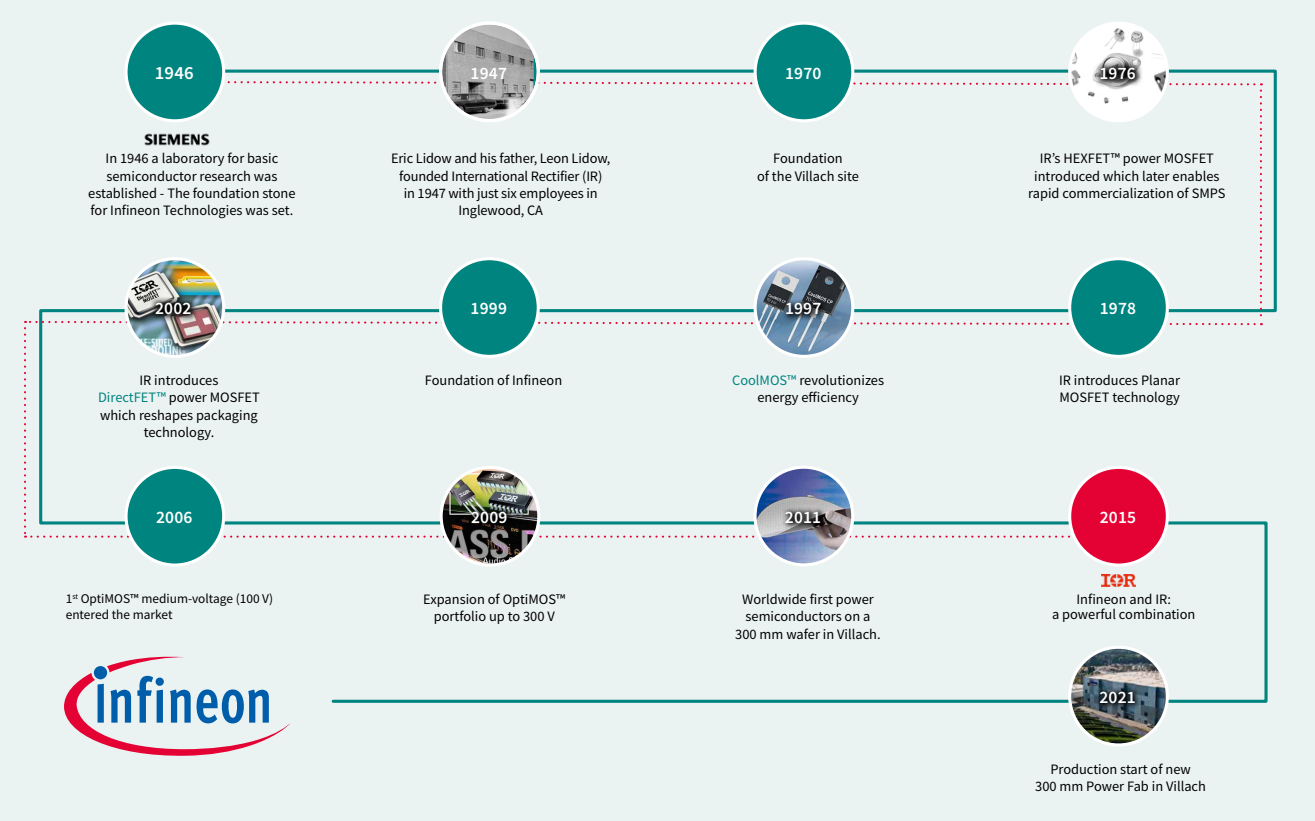


15-300 V MOSFETs

- 15-300 V MOSFETs N-channel power MOSFETs - Technology development and product family positioning
- Guidance for applications and voltage classes
- Space-saving and high-performance packages
- Discrete packages
- OptiMOS™ 40 V and 60 V in PQFN 8x6
- Small-signal/small power MOSFETs -250 to 600 V
- OptiMOS™ power MOSFETs 15-150 V Source-Down
- OptiMOS™ 6 power MOSFETs 100 V
- OptiMOS™ PD
- StrongIRFET™ 2 MOSFETs 40 V/60 V/80 V/100 V
- TOLx family
- Product portfolio
- Nomenclature

Infineon shapes power for growth through MOSFET innovation

With more than 40 years of experience in power MOSFET innovation, Infineon has led the way in solving the challenges design engineers face on a daily basis while enabling them achieve their targets. Although these targets may have changed over the years, the innovative spirit behind Infineon's product offering has persisted – from device design, technology, package and product development through manufacturing. Looking at the evolution of MOSFETs in the industry, numerous advancements in MOSFET technology have enabled the applications and trends that have become an indispensable part of our lives. Infineon power MOSFET innovation has proven that optimization at the component level brings significant system-level performance advantages and contributes to an easier, safer and greener future.



www.infineon.com/powermosfet-12V-300V

OptiMOS™ and StrongIRFET™

15-300 V N-channel power MOSFETs

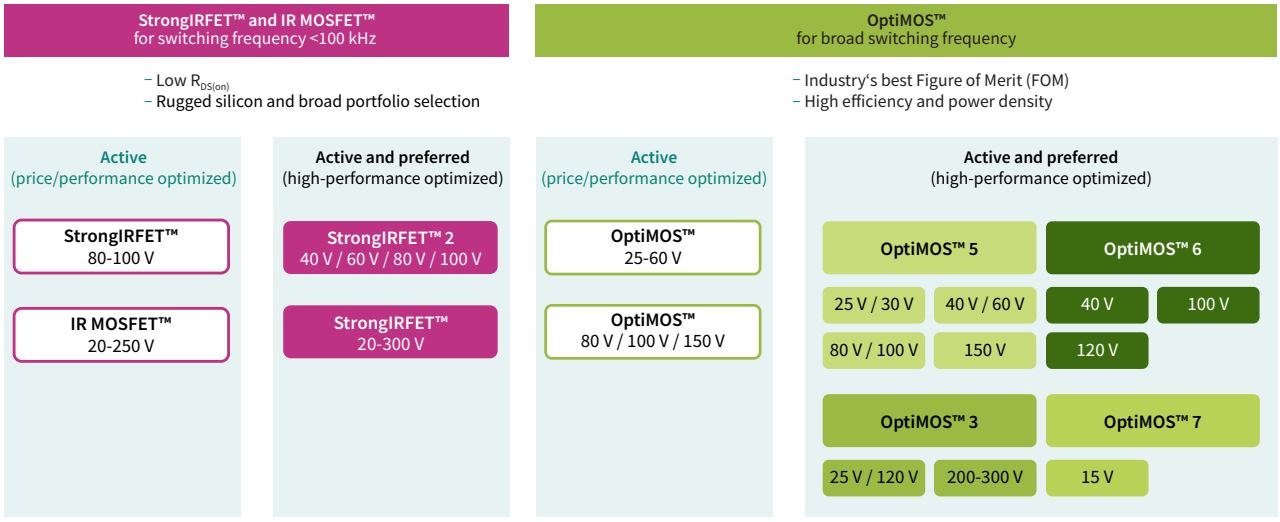
Infineon's semiconductors are designed to bring greater efficiency, power density and cost-effectiveness. The full range of OptiMOS™ and StrongIRFET™ power MOSFETs enables innovation and performance in applications such as switch mode power supplies (SMPS), battery powered applications, motor control, drives, inverters, and computing.

Infineon's highly innovative OptiMOS™ and StrongIRFET™ families consistently meet the highest quality and performance demands in key specifications for power system designs such as on-state resistance ($R_{DS(on)}$) and figure of merit (FOM).

OptiMOS™ power MOSFETs provide best-in-class performance. Features include ultra low $R_{DS(on)}$, as well as low charge for high switching frequency applications. StrongIRFET™ power MOSFETs are designed for drives applications and are ideal for designs with a low switching frequency, as well as those that require a high current carrying capability.

Technology development and product family positioning

StrongIRFET™	OptiMOS™
Robust and excellent price/performance ratio – Optimized for switching frequency < 100 kHz – Designed for industrial applications – High current carrying capability – Rugged silicon	**Best-in-class technology** – Optimized for broad switching frequency – Designed for high performance applications – Industry's best figure of merit – High efficiency and power density



www.infineon.com/powermosfet-12V-300V



With more than 40 years of experience in power MOSFET innovation, Infineon offers a broad portfolio of products. The product portfolio is divided into “active and preferred”, referring to the latest technology available offering best-in-class performance, and “active”, consisting of well-established technologies which complete this broad portfolio.

StrongIRFET™ 2 power MOSFETs are the latest generation to be added to the family. Available in 40 V, 60 V, 80 V and 100 V , this family offers broad availability and excellent price/performance ratio and are suitable for a broad range of applications.

Building on its legacy of innovation, Infineon now unveils the industry’s premier 15 V trench power MOSFETs, using the brand-new OptiMOS™ 7 technology. The OptiMOS 7 15 V series primarily targets optimized DC-DC conversion for servers, computing, datacenter, and artificial intelligence applications.

OptiMOS™ 6 power MOSFETs 40 V, 80 V, 100 V and 120 V are the newest addition to the OptiMOS™ product family. They are the perfect solution when best-in-class (BiC) products and high efficiency over a wide range of output power are required. For other voltage classes, from 15 V up to 150 V, OptiMOS™ 5 represents the latest generation in the market, offering low conduction losses and high switching performance.

For high and low frequency applications OptiMOS™ 3 power MOSFETs is our largest OptiMOS™ family and complements our existing product portfolio as well as providing additional options when best-in-class is not required. StrongIRFET™ is recommended for 20-300 V applications when the high performance is not essential and the cost is a more significant consideration.

www.infineon.com/powermosfet-12V-300V

For more details on the product, click on the part number, visit infineon.com or contact our product support.

Guidance for applications and voltage classes

OptiMOS™ and StrongIRFET™ portfolio, covering from 15 up to 300 V MOSFETs, can address a broad range of needs from low to high switching frequencies. The tables below provide a guidance on the recommended OptiMOS™ or StrongIRFET™ products for each major sub-application and voltage class.

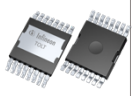
Recommended voltage			15 V to 30 V	40 V	60 V	75 V to 80 V	100 V	120 V to 150 V	200 V	250 V	300 V
Battery powered	Low power Power tools, multicopter, battery, industrial drives	OptiMOS™	✓	✓	✓	✓					
		StrongIRFET™	✓	✓	✓	✓					
	High power (LEV, LSEV)	OptiMOS™			✓	✓	✓	✓	✓		
		StrongIRFET™			✓	✓	✓	✓	✓		
Inverters	Solar	OptiMOS™			✓	✓	✓	✓			
		StrongIRFET™			✓	✓	✓				
	Online UPS	slow switching									
		OptiMOS™	✓	✓	✓	✓	✓	✓	✓	✓	✓
		StrongIRFET™	✓	✓	✓	✓	✓	✓	✓	✓	✓
		fast switching									
		OptiMOS™	✓	✓	✓	✓	✓	✓	✓	✓	✓
		StrongIRFET™	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Offline UPS	OptiMOS™		✓	✓						
		StrongIRFET™		✓	✓						
SMPS	Adapter / Charger	OptiMOS™		✓	✓	✓	✓				
		StrongIRFET™		✓	✓	✓	✓				
	PC Power	OptiMOS™		✓	✓						
		StrongIRFET™		✓	✓						
	LCD TV	OptiMOS™			✓	✓	✓				
		StrongIRFET™			✓	✓	✓				
	Server	OptiMOS™		✓	✓	✓					
		StrongIRFET™	✓	✓	✓	✓					
	AC-DC	OptiMOS™				✓	✓	✓	✓		
		StrongIRFET™				✓	✓				
	Telecom	OptiMOS™	✓	✓	✓	✓	✓	✓			
		StrongIRFET™	✓	✓	✓	✓	✓				

StrongIRFET™ recommended
StrongIRFET™ available

OptiMOS™ recommended
OptiMOS™ available

www.infineon.com/powermosfet-12V-300V

Space-saving and high-performance packages

	TO-247	TO-220	TO-220 FullPAK	D²PAK	D²PAK 7-pin	TO-Leadless	TOLT (Top-side cooling)	TOLG (Gullwing leads)
								
	Optimized for high power applications and high current capability							
Special features	–						Optimized for top-side cooling	Optimized for TCoB[1] robustness
Height [mm]	5.0	4.4	4.5	4.4	4.4	2.3	2.3	2.3
Outline [mm]	40.15 x 15.9	29.5 x 10.0	29.5 x 10.0	15.0 x 10.0	15.0 x 10.0	11.7 x 9.9	15.0 x 9.9	11.7 x 9.9
Thermal resistance R_{thJC} [K/W]	2.0	0.5	2.5	0.5	0.5	0.4	0.4	0.4

	sTOLL	SuperSO8	SuperSO8 dual-side cooling (DSC)	Power Block	PQFN 3.3x3.3 Source-Down	PQFN 3.3x3.3	PQFN 2x2	DirectFET™
								
	Optimized for high power in small form factor	**For highest efficiency and power management**	**Optimized for dual-side cooling**	**Significant design shrink**	**Highest power density per area**	**High efficiency in small form factor**	**Enables significant space saving**	**Optimized for dual side cooling**
Height [mm]	2.3	1.0	0.75	5.0 x 6.0: 1.0 6.3 x 6.0: 0.9 6.3 x 6.0 DSC: 0.7	1.0	1.0	0.9	Small: 0.65 Medium: 0.65 Large: 0.71
Outline [mm]	8.0 x 7.0	5.15x6.15	5.0 x 6.0	5.0 x 6.0 6.3 x 6.0	3.3 x 3.3	3.3 x 3.3	2.0 x 2.0	Small: 4.8 x 3.8 Medium: 6.3 x 4.9 Large: 9.1 x 6.98
Thermal resistance R_{thJC} [K/W]	0.6	0.8	0.5	1.5	1.4	3.2	11.1	0.5

www.infineon.com/powermosfet-12V-300V

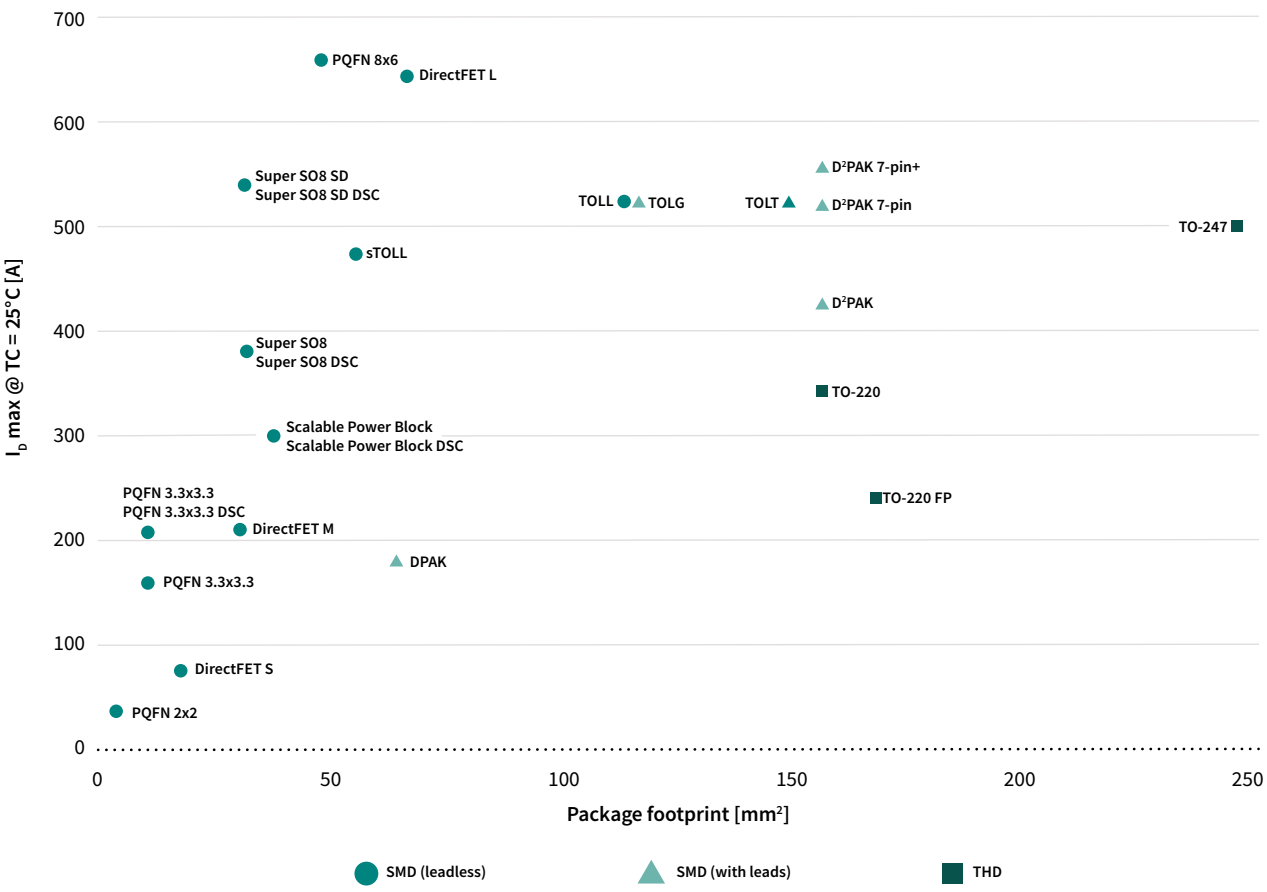
1) Temperature cycling on board

Discrete packages

Infineon has been making an impact in the MOSFET industry with innovation in MOSFET manufacturing techniques and processes as well as pioneering new packages to meet the changing demands of cutting-edge designs in various applications. OptiMOS™ and StrongIRFET™ technologies are available in different packages to address demands for high current carrying capability and significant space saving. The broad portfolio enables footprint reduction, boosted current rating and optimized thermal performance. While the surface mount leadless devices are enabled for footprint reduction, through-hole packages are characterized by a high-power rating.

Infineon offers innovative packages such as DirectFET™ and TO-Leadless (TOLL). DirectFET™ is designed for high frequency applications by offering the lowest parasitic resistance. This package is available in three different can sizes: small, medium and large. TO-Leadless is optimized to dissipate power up to 375 W, increasing power density with a substantial reduction in footprint.

New package innovations include the SuperSO8 Source-Down package offering high power density and performance; the TOLG (Gullwing leads) optimized for TCoB (Thermal cycling on board) robustness; TOLT (top-side cooling) optimized for superior thermal performance; sTOLL optimized for high power in small form factor; and the SuperSO8 dual-side cooling (DSC) optimized for dual-side cooling in a standard 5x6 mm² footprint.



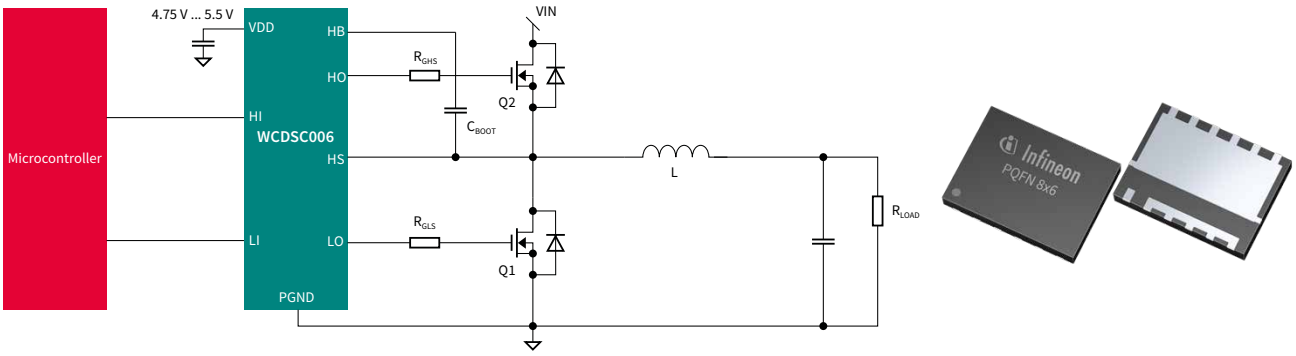
www.infineon.com/powermosfet-12V-300V

For more details on the product, click on the part number, visit infineon.com or contact our product support.

OptiMOS™ 40 V and 60 V in PQFN 8x6

A high-power density package family

Infineon's family of OptiMOS™ N-channel power MOSFETs in PQFN 8 x 6 packages are benchmark products optimized for very low $R_{DS(on)}$ and high-current capability, alongside Infineon's renowned quality standard for robust industry designs. This makes the PQFN 8 x 6 MOSFET package the ideal solution for various battery powered, battery protection, and battery formation applications requiring low package resistance and high-current handling MOSFETs. The PQFN 8 x 6 family of MOSFETs is available in a small 8x6 mm leadless package to reduce the physical footprint and overall BOM of end products. The improved $R_{DS(on)}$ and I_D ratings, continuous and pulsed, enable increased battery run time and higher power density.



Features and benefits

Key features	Key benefits
– >50% reduction in footprint compared to TOLL	– Power density increase enabling higher power designs while maintaining the space contraints
– Best-in-class continuous current rating and competitive avalanche energy rating	– Good design martin in worst case conditionals (e.g. in-rush motor stall/short)
– Excellent package area utilization	– Ultra low $R_{DS(on)}$ with good thermal resistance R_{thJC}
– Ultra low package parasitics	– EMI improvement due to lower device parasitics
– Footprint compatability with SuperSO8 5x6	– Simple PCB design change based on SuperSO8 provides scalability across varying power requirements

www.infineon.com/optimos

For more details on the product, click on the part number, visit infineon.com or contact our product support.

Small-signal/small-power MOSFETs -250 to 600 V

Combining latest high-performance silicon technology with small and innovative packaging

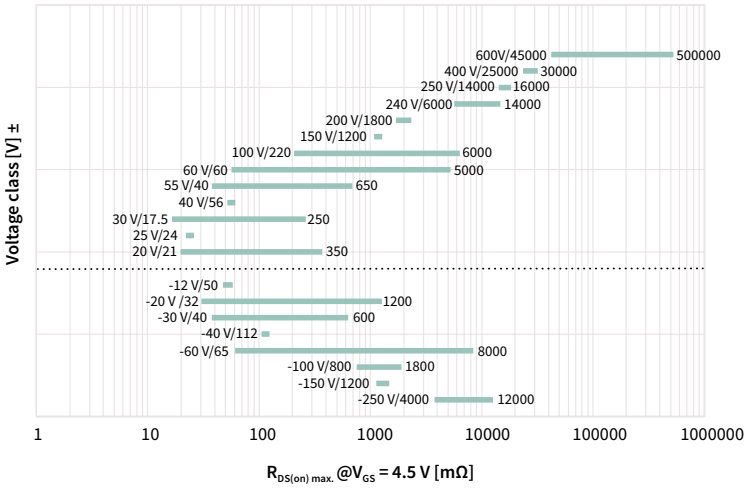
Small-signal/small power products are ideally suited for space-constrained automotive and non-automotive applications. With an optimal price/performance ratio and small footprint packages, Infineon's small-signal and small-power MOSFETs are the best fit for a wide range of applications and circuits. These include low-voltage drives, linear battery charger, battery protection, load switches, DC-DC converters, reverse polarity protection and many more.

The entire family includes different packages:
SOT-223, SOT-23, SOT-323, SOT-363, SOT-89, TSOP-6 and SC59

The product portfolio covers N-channel and P-channel enhancement mode MOSFETs as well as N-channel depletion mode products:

- -250 V to -12 V P-channel enhancement mode (available in single and dual configurations)
- 20 V to 600 V N-channel enhancement mode (available in single and dual configurations)
- -20/+20 V and -30/+30 V complementary (P + N channel) enhancement mode
- 60 V to 600 V N-channel depletion mode

Key features	Key benefits
– Products available in Automotive, Industrial and Standard qualification levels	– Suitable for automotive and high quality demanding applications
– Four $V_{GS(th)}$ classes available for 1.8 V, 2.5 V, 4.5 V, and 10 V gate drives	– Easy interface to MCU
– ESD protected P-channel parts	– Reduction of design complexity
– V_{DS} range from -250 V to 600 V	– Wide selection of products available
– RoHS compliant and halogen free	– Environmentally friendly



Small-signal/small-power MOSFETs are available in seven industry-standard package types ranging from the largest SOT-223 to the smallest SOT-323.

Products are offered in single, dual and complementary configurations and are suitable for a wide range of applications, including battery protection, LED lighting, low-voltage drives and DC-DC converters.

SOT-363	SOT-323	SOT-23	TSOP-6	SC59	SOT-89	SOT-223
						

www.infineon.com/smallsignal
www.infineon.com/smallpower

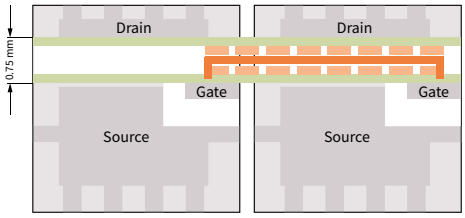
For more details on the product, click on the part number, visit infineon.com or contact our product support.

OptiMOS™ power MOSFETs 15 -150 V Source-Down

An innovative PQFN 3.3 mm x 3.3 mm product family

Once again, Infineon is setting a new standard in MOSFET performance with the new Source-Down package to support the requirement for high power density and optimized system-level efficiency. In comparison with a normal Drain-Down device, in the Source-Down technology, the source potential is connected to the thermal pad. The OptiMOS™ power MOSFET 3.3x3.3 mm² Source-Down packages are now available in 15 V-150 V in BSC (bottom-side cooling) and in DSC (dual-side cooling). The latest addition to the family is the OptiMOS™ power MOSFET 5x6 mm² Source-Down, available in BSC. Optional Center-Gate footprint is also available for both families. Here the gate pin is moved to the center supporting easy parallel configuration of multiple MOSFETs. With the larger drain-to-source creepage distance, it is possible to connect the gates of multiple devices on a single PCB layer.

	Standard Drain-Down	New Source-Down Bottom-Side Cooling	New Source-Down dual-side cooling
			
	PQFN 3.3 x 3.3 mm standard Drain-Down footprint	PQFN 3.3 x 3.3 mm Available in Standard and Center-Gate Source-Down footprint	PQFN 3.3 x 3.3 mm Available in Standard and Center-Gate Source-Down footprint
R_{thJC} [C/W]	1.8°C/W	1.4°C/W	1.4°C/W



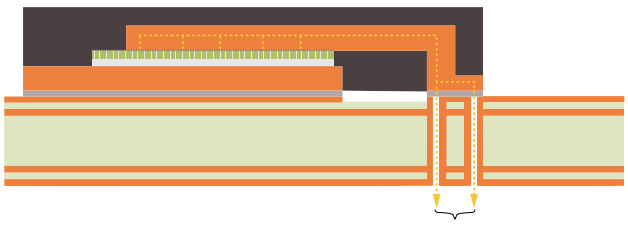
Features and benefits

Key features	Key benefits
– Major reduction in $R_{DS(on)}$, up to 30% due to larger silicon die in same package outline	– Enabling highest power density and performance
– Improved R_{thJC} overcurrent PQFN package technology	– Superior thermal performance
– High power density	– Form factor reduction
– Standard-Gate and Center-Gate footprint options	– Optimized layout possibilities
– Available in standard and logic level options	– Simplifying parallel configuration of multiple MOSFETs with Center-Gate footprints
	– Simplified gate drive

Optimized thermal management

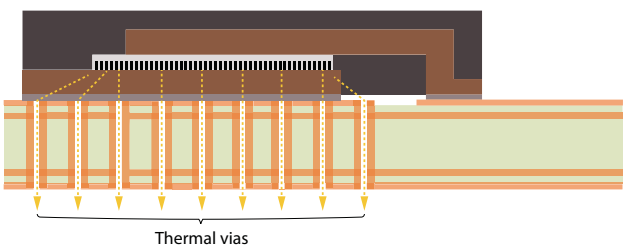
Drain-Down

PQFN 3.3x3.3



Source-Down

PQFN 3.3x3.3



In the Source-Down package technology, the heat is dissipated directly into the PCB through a thermal pad instead of over the bond wire or the copper clip. The package significantly improves the thermal resistance (R_{thJC}) of this product family. In most cases, thermal vias cannot be used on the thermal pad if it is connected to the noisy switch node potential. With Source-Down, the thermal pad of the low-side MOSFET is now on the ground potential enabling the use of thermal vias right underneath the device. This considerably improves the thermal performance and the power density in the end application.

Drives Server Telecom SMPS BMS

www.infineon.com/PQFN-3-source-down

For more details on the product, click on the part number, visit infineon.com or contact our product support.

OptiMOS™ 6 power MOSFETs 100 V

Next generation of cutting-edge MOSFETs

OptiMOS™ 6 100 V devices are setting a new technology standard in the field of discrete MOSFET devices. Compared to alternative products, Infineon's leading thin wafer technology enables significant performance benefits compared to OptiMOS™ 5:

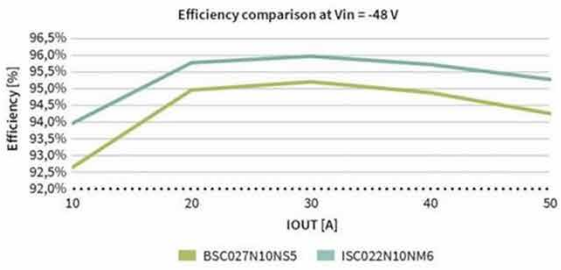
- $R_{DS(on)}$ reduced by 22%
- Improved FOM Q_G x $R_{DS(on)}$ by 37%
- Improved FOM Q_{Gd} x $R_{DS(on)}$ by 38%

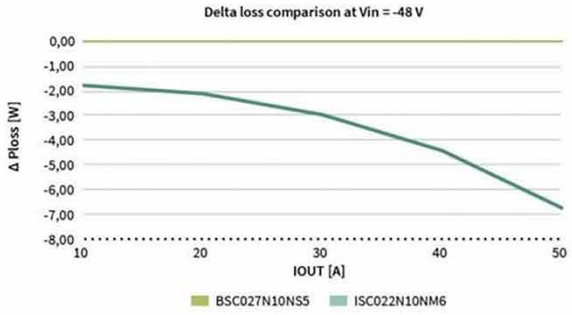
Infineon's OptiMOS™ 6 power MOSFET 100 V family offers an optimized solution for synchronous rectification in switched mode power supplies (SMPS) in servers, desktop PCs, wireless and quick chargers. The improved performance in on-state resistance ($R_{DS(on)}$) and figure of merits (FOM - $R_{DS(on)}$ x Q_G and Q_{Gd} x $R_{DS(on)}$) yields an efficiency improvement, allowing easier thermal design and less paralleling, leading to system cost reduction. In addition, the best-in-class $R_{DS(on)}$ and high switching performance makes these devices suitable for telecom applications.

Infineon's market-leading OptiMOS™ 6 power MOSFETs 100 V are available in two different packages:

- SuperSO8 – 5x6 mm² with $R_{DS(on)}$ ranging from 23 mΩ down to 2.2 mΩ
- PQFN 3x3 – 3.3 x 3.3 mm² with $R_{DS(on)}$ ranging from 23 mΩ down to 8 mΩ







Target applications include a ZVS inverting buck-boost -(36...60) V to 12 V DC-DC converter. In this topology, an active clamp circuit recovers, in a lossless way, Q_{rr} from the SR switch towards the output, while achieving zero-voltage switching for the control switch.

Best-in-class products in the newly released OptiMOS™ 6 technology (ISC022N10NM6) are compared to OptiMOS™ 5 (BSC027N10NS5) in SuperSO8 (PQFN 5x6) package in this application. The result is stunning: OptiMOS™ 6 in 2.2 mΩ achieves roughly 1% better efficiency across all the line and load conditions, compared to the 2.7 mΩ product in OptiMOS™ 5.

The improvement in efficiency is explainable as the joint contribution of the lower driving losses (thanks to approximatively 20% lower (typ) Q_G) lower turn-off losses (due the lower Q_{Gd} – an improvement just shy of 40%) and lower conduction losses with a 18% lower $R_{DS(on)}$. The improvement in efficiency lowers the total losses by 7 W, a remarkable improvement allowing easier thermal management and increased power density. ISC022N10NM6 represents the lowest $R_{DS(on)}$ available in the market for SuperSO8 (PQFN 5x6) package in 100 V.

www.infineon.com/optimos-6-100v

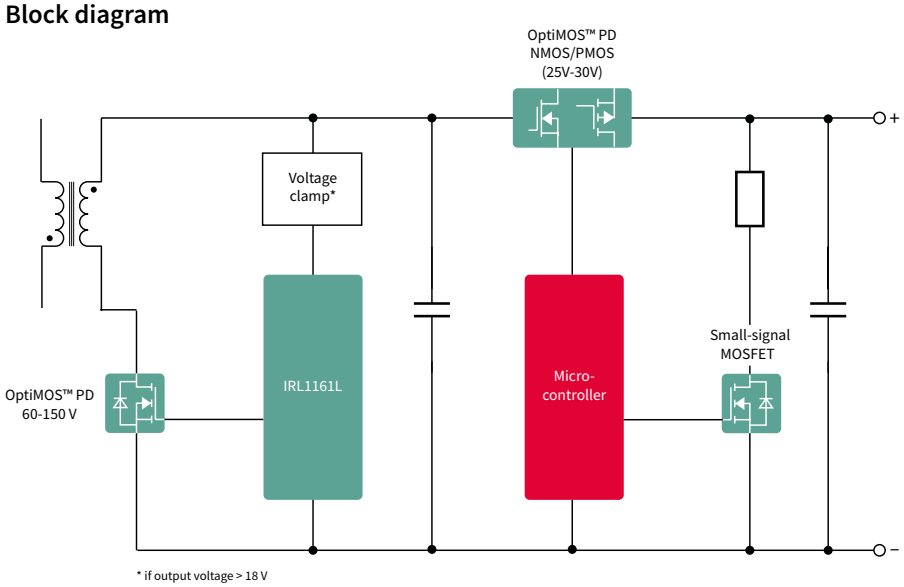
For more details on the product, click on the part number, visit infineon.com or contact our product support.

OptiMOS™ PD

The best fit for USB-PD and fast charger designs

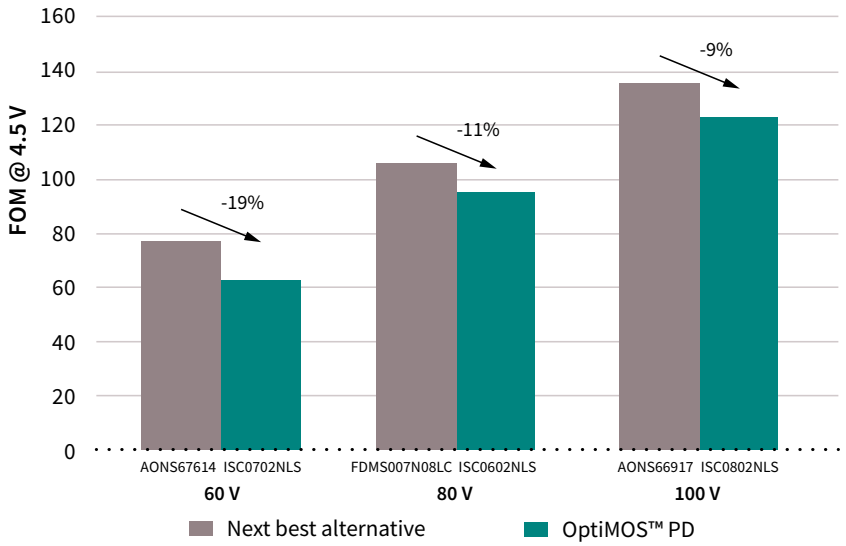
OptiMOS™ PD is Infineon's new MOSFET portfolio representing the best fit for USB-PD and fast charger designs and is available in 2 small standard packages: PQFN 3.3x3.3 and SuperSO8. Logic level availability enables parts to be fully driven from 4.5 V or directly from microcontrollers resulting in a lower part count in the application. The portfolio ranges from 25 V up to 150 V MOSFETs where 25 V and 30 V products represent the fit as load switch and 60-150 V parts are the optimal choice to function as synchronous rectification FETs in charger and adapter designs.

Block diagram





OptiMOS™ PD comparison of $R_{DS(on)}$ in 60 V, 80 V and 100 V



The OptiMOS™ PD family features MOSFETs offering a low on-state resistance ($R_{DS(on)}$), less switching losses as well as low gate-, output- and reverse-recovery charges. The reduction in overall losses results in an excellent price/performance ratio leading to a decrease in total system BOM cost.

USB PD charger | Adapter | Consumer | Smartphone charger

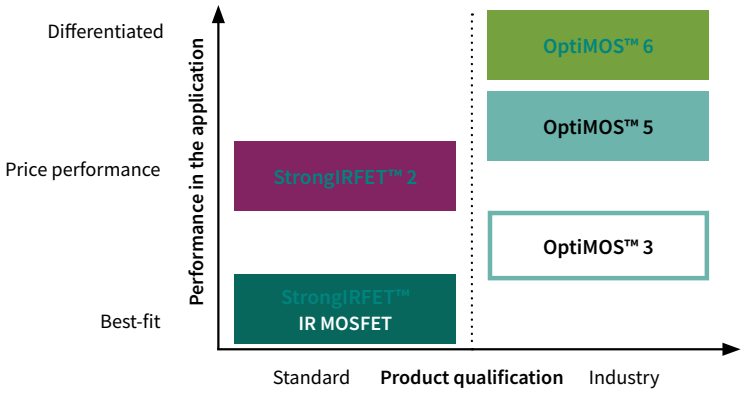
www.infineon.com/optimos-pd

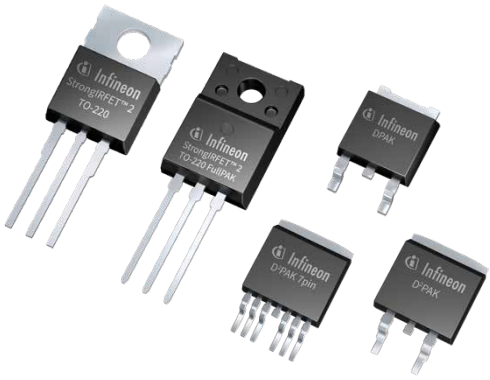
For more details on the product, click on the part number, visit infineon.com or contact our product support.

StrongIRFET™ 2 MOSFETs – 40 V/60 V/80 V/100 V

Right-fit products for a broad range of applications

The new StrongIRFET™ 2 power MOSFETs are the latest generation of MOSFET technology addressing a wide range of applications such as adapters, motor drives, e-scooters, battery management systems, light electric vehicles, robotics, power and gardening tools. Featuring broad availability and excellent price/performance ratio, this new technology offers right-fit products with an easy choice for designers interested in convenient selection and purchasing. Optimized for both low- and high-switching frequencies, the family supports a broad range of applications enabling flexibility in design.

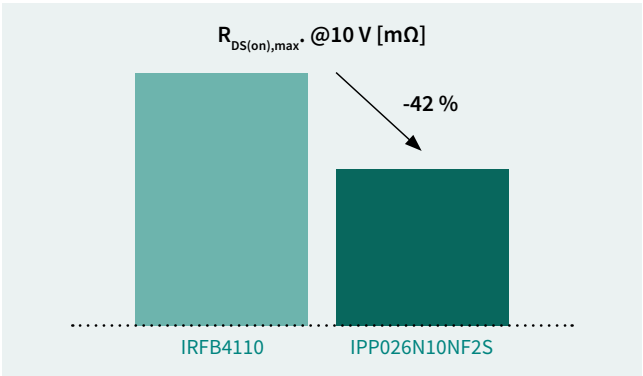


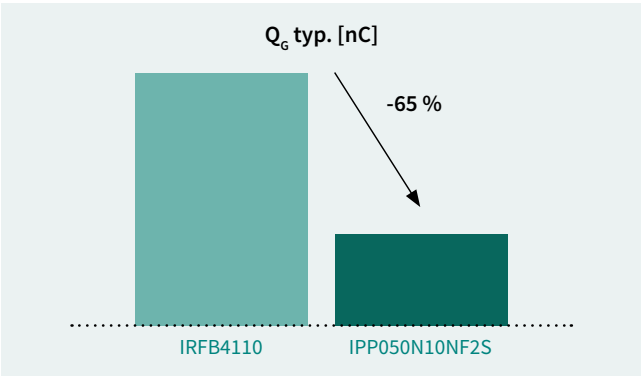


Features and benefits

Key features	Key benefits
– Broad availability from distribution partners	– Increased security of supply
– Excellent price/performance ratio	– Right-fit products
– Ideal for high and low switching frequency	– Supports wide variety of applications
– Industry standard footprint	– Standard pin out allows for drop-in replacement
– High current rating	– Increased product ruggedness

StrongIRFET™ 2 vs. previous generation 100 V performance comparison





Compared to the previous StrongIRFET™ generation in 100 V TO-220 package, StrongIRFET™ 2 shows significant improvements such as ~40% lower $R_{DS(on)}$ and ~65% reduced Q_G. This results in better efficiency and longer life time.

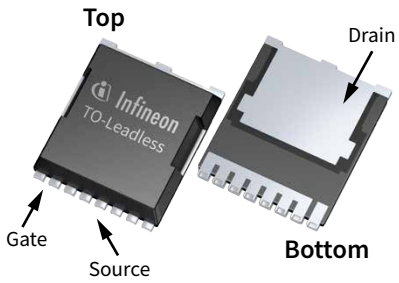


www.infineon.com/strongirfet2

For more details on the product, click on the part number, visit infineon.com or contact our product support.

TOLx family

TO-Leadless (TOLL)

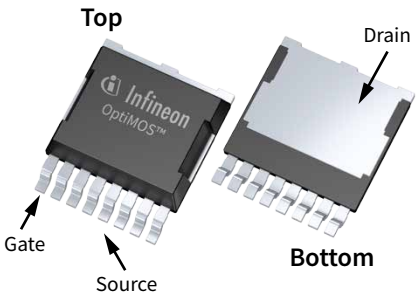


Optimized for high power applications

TO-Leadless is optimized to handle currents up to 500 A, increasing power density with a substantial reduction in footprint. A footprint reduction of 30% compared to D²PAK, together with a height reduction of 50%, results in an overall space saving of 60% enabling much more compact designs.

Key features	Key benefits
– Best-in-class technology	– High performance capability
– High current rating > 500 A	– High system reliability
– 60% space reduction compared to D²PAK 7-pin	– Optimized board utilization

TOLG (Gullwing leads)

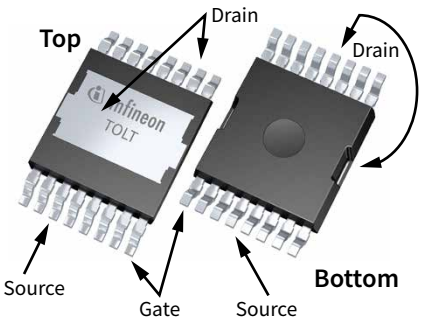


Optimized for better TCoB robustness

TOLG package offers a compatible footprint to the TO-Leadless with the additional feature of Gullwing leads resulting in two times higher TCoB performances compared to TO-Leadless. This package is excellent on aluminum insulated metal substrate boards (Al-IMS).

Key features	Key benefits
– Best-in-class technology	– High performance capability
– High current rating > 450 A	– High system reliability
– Low ringing and voltage overshoot	– High efficiency and lower EMI
– 60% space reduction compared to D2PAK 7-pin	– Optimized board utilization
– Gullwing leads	– High thermal cycling on board performance

TOLT (Top-side cooling)



Optimized for superior thermal performance

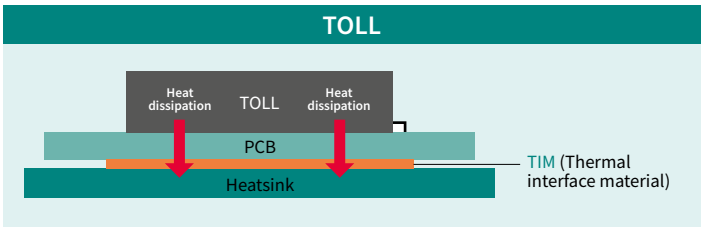
TOLT is the new top-side cooling package within the TOLx family. With top-side cooling, the drain is exposed at the surface of the package allowing for 95 percent of the heat to be dissipated directly to the heatsink, achieving 20 percent better R_{thJA} and 50 percent improved R_{thJC} compared to the TOLL package. With bottom-side cooling packages, like the TOLL or the D²PAK, the heat is dissipated via the PCB to the heatsink resulting in high power losses.

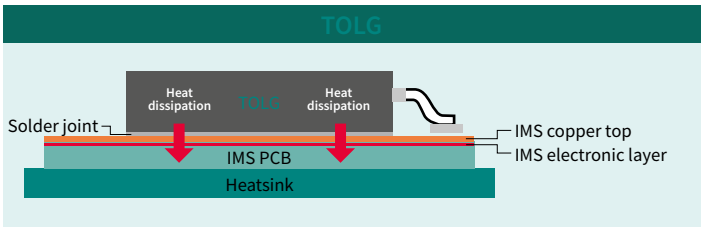
Key features	Key benefits
– Low $R_{DS(on)}$	– Reduction in conduction losses
– High current rating	– Increased product ruggedness
– Top-side cooling	– Superior thermal performance
– Negative standoff	– Minimize thermal resistance to heatsink

www.infineon.com/toll
www.infineon.com/tolg
www.infinon.com/tolt

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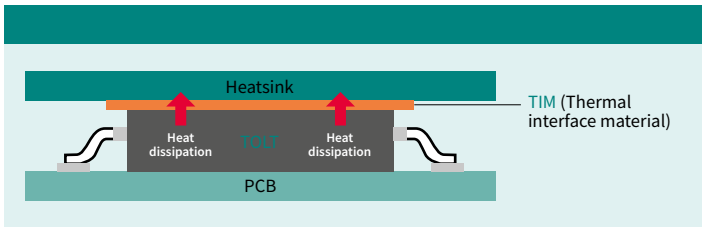
TOLx family – Cooling concept





With TOLL/TOLG, board mounting, the heat is dissipated through the PCB to the heatsink.
Due to the PCB thermal resistance, power losses occur.

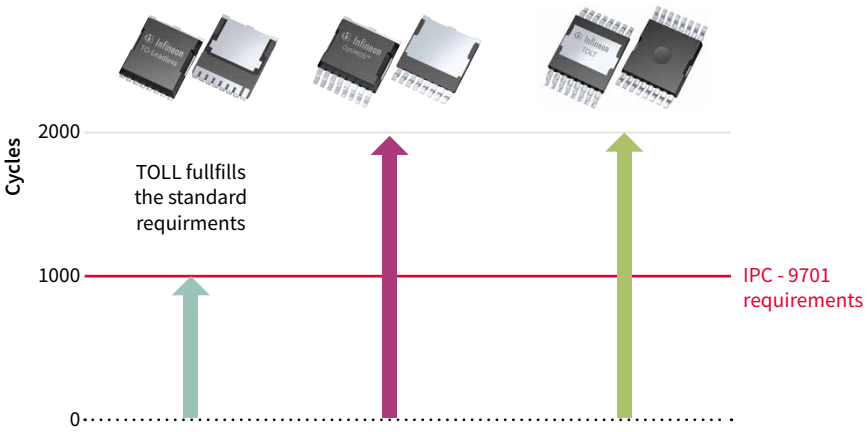




With top-side cooling setup, the drain pad is exposed on the top of the package allowing the majority of the heat to be dissipated into the top-mounted heatsink. This pulls heat away from the PCB resulting in at least 20 percent better R_{thJA} compared to standard over-molded TOLL.



Thermal cycling on IMS board (TCoB) performance



www.infineon.com/optimos-tolg
www.infineon.com/optimos-tolt

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OptiMOS™ 7 15 V logic level



$R_{DS(on),max}$ @ V_{GS}=4.5 V [mΩ]	Source-Down PQFN 3.3x3.3	Source-Down PQFN 3.3x3.3 dual-side	PQFN 2x2
< 1	IQE004NE1LM7 $R_{DS(on)}$=0.57 mΩ	IQE004NE1LM7SC $R_{DS(on)}$=0.57 mΩ	
	IQE004NE1LM7CG $R_{DS(on)}$=0.57 mΩ	IQE004NE1LM7CGSC $R_{DS(on)}$=0.57 mΩ	
2-4			ISK018NE1LM7 $R_{DS(on)}$=2.15 mΩ

OptiMOS™ and StrongIRFET™ 20 V (super) logic level



$R_{DS(on),max}$ @ V_{GS}=4.5 V [mΩ]	PQFN 2x2	PQFN 3.3x3.3	SuperSO8
< 1			IRFH6200TRPBF [1] $R_{DS(on)}$=0.99 mΩ
2-4		IRLHM620TRPBF** [1] $R_{DS(on)}$=2.5 mΩ	
> 10	IRLHS6242TRPBF $R_{DS(on)}$=11.7 mΩ		
	IRLHS6276TRPBF $R_{DS(on)}$=45 mΩ		

OptiMOS™ and StrongIRFET™ 25 V logic level



$R_{DS(on),max}$ @ V_{GS}=10 V [mΩ]	DirectFET™	PQFN 2x2	PQFN 3.3x3.3	SuperSO8	Source-Down PQFN 3.3x3.3	Source-Down PQFN 3.3x3.3 dual-side cooling (DSC)	Source-Down PQFN 5x6
< 1				BSC004NE2LS5 $R_{DS(on)}$=0.45 mΩ	IQE006NE2LM5 $R_{DS(on)}$=0.65 mΩ	IQE006NE2LM5CGSC $R_{DS(on)}$=0.58 mΩ	IQDH29NE2LM5CG $R_{DS(on)}$=0.29 mΩ
				BSC009NE2LS5 $R_{DS(on)}$=0.9 mΩ	IQE006NE2LM5CG $R_{DS(on)}$=0.65 mΩ	IQE006NE2LM5SC $R_{DS(on)}$=0.58 mΩ	
	IRF6717MTRPBF $R_{DS(on)}$=0.95 mΩ			BSC009NE2LS $R_{DS(on)}$ = 0.9 mΩ			
			BSZ009NE2LS5 $R_{DS(on)}$=0.9 mΩ	BSC009NE2LS5I* $R_{DS(on)}$=0.95 mΩ			
1-2			BSZ010NE2LS5 $R_{DS(on)}$=1.0 mΩ	BSC010NE2LS $R_{DS(on)}$=1.0 mΩ			
			BSZ011NE2LS5I $R_{DS(on)}$=1.1 mΩ	BSC010NE2LSI* $R_{DS(on)}$=1.05 mΩ			
				BSC014NE2LSI* $R_{DS(on)}$=1.4 mΩ			
			BSZ013NE2LS5I* $R_{DS(on)}$=1.3 mΩ				
			BSZ014NE2LS5IF** $R_{DS(on)}$=1.45 mΩ	BSC015NE2LS5I* $R_{DS(on)}$=1.5 mΩ			
			BSZ017NE2LS5I* $R_{DS(on)}$=1.7 mΩ	BSC018NE2LS $R_{DS(on)}$=1.8 mΩ			
			BSZ018NE2LS $R_{DS(on)}$=1.8 mΩ				
2-4		ISK024NE2LM5 $R_{DS(on)}$=2.4 mΩ	BSZ031NE2LS5 $R_{DS(on)}$=3.1 mΩ	BSC024NE2LS $R_{DS(on)}$=2.4 mΩ			
			BSZ033NE2LS5 $R_{DS(on)}$=3.3 mΩ	BSC026NE2LS5 $R_{DS(on)}$=2.6 mΩ			
			BSZ036NE2LS $R_{DS(on)}$=3.6 mΩ	BSC032NE2LS $R_{DS(on)}$=3.2 mΩ			
4-10			BSZ060NE2LS $R_{DS(on)}$=6.0 mΩ	BSC050NE2LS $R_{DS(on)}$=5.0 mΩ			
> 10							

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* Optimized for resonant applications (e.g. LLC converter)
** Monolithically-integrated Schottky-like diode
*** $R_{DS(on),max}$ @ V_{GS}=4.5 V

1) 2.5 V_{GS} capable

For more details on the product, click on the part number, visit infineon.com or contact our product support.

OptiMOS™ 25 V in Power Block 5x6

Consumer Mainboard Notebook Server

Part number	Package	Monolithically-integrated Schottky-like diode	BV_{DSS} [V]	$R_{DS(on),max.}$ [mΩ] @ V_{GS}=4.5 V max.		Q_G [nC] @ V_{GS}=4.5 V typ.	
				High-side	Low-side	High-side	Low-side
BSG0810NDI	SuperSO8	✓	25	4.0	1.2	5.6	16.0
BSG0811ND	SuperSO8	–	25	4.0	1.1	5.6	20.0
BSG0813NDI	SuperSO8	✓	25	4.0	1.7	5.6	12.0

OptiMOS™ 25/30 V symmetrical and asymmetrical dual N-channel MOSFETs in 5x6 and 3x3 PQFN

Integrates the low-side and high-side MOSFET of a synchronous DC-DC converter into a single package.
The small outline and the interconnection of the two MOSFETs within the package minimize the loop inductance which boosts efficiency.

Part number	Package	Monolithically-integrated Schottky-like diode	BV_{DSS} [V]	$R_{DS(on),max.}$ [mΩ] @ V_{GS}=4.5 V max.		Q_G [nC] @ V_{GS}=4.5 V typ.	
				High-side	Low-side	High-side	Low-side
BSC0911ND*	asymmetrical dual 5x6	–	25	4.8	1.7	7.7	25
BSC0921NDI*	asymmetrical dual 5x6	✓	30	7	2.1	5.8	21
BSC0923NDI*	asymmetrical dual 5x6	✓	30	7	3.7	5.2	12.2
BSC0924NDI*	asymmetrical dual 5x6	✓	30	7	5.2	5.2	8.6

OptiMOS™ 40 V, 60 V and 100 V in Symmetrical Power Block 6.3x6.3

Part number	Package	Dual-side cooling	BV_{DSS} [V]	$R_{DS(on)}$ [mΩ] @ V_{GS} = 10 V max	Q_G [nC] @ V_{GS} = 10 V typ.
ISG0613N04NM6H 1)	Power Block 6.3x6.0	–	40V	0,88	69
ISG0613N04NM6HSC 1)	Power Block 6.3x6.0	✓	40V	0,88	69
ISG0614N06NM5H 1)	Power Block 6.3x6.0	–	60V	1,61	68
ISG0614N06NM5HSC 1)	Power Block 6.3x6.0	✓	60V	1,61	68
ISG0616N10NM5HSC 1)	Power Block 6.3x6.0	✓	100V	3,4	52

OptiMOS™/StrongIRFET ™ 30 V - 100 V dual N-channel MOSFETs

Integrates two independent N-channel MOSFETs into a single package for high power density and compact design.
Ideal for DC motors with power rating < 200 W

Part number	Package	Monolithically integrated Schottky like diode	BV_{DSS} [V]	$R_{DS(on),max.}$ [mΩ] @ V_{GS}=10 V max.		Q_G [nC] @ V_{GS}=10 V typ.	
				High-side	Low-side	High-side	Low-side
IRLHS6276*	symmetrical dual PQFN 2x2	–	20	45**	45**	3.1**	3.1**
IRF7907*	asymmetrical dual SO8	–	30	16.4	11.8	6.7**	14**
IRLHS6376*	symmetrical dual PQFN 2x2	–	30	63**	63**	2.8**	2.8**
BSC072N04LD*	symmetrical dual 5x6	–	40	7.2	7.2	39	39
BSC076N04ND	symmetrical dual 5x6	–	40	7.6	7.6	28	28
BSC112N06LD*	symmetrical dual 5x6	–	60	11.2	11.2	41	41
BSC155N06ND	symmetrical dual 5x6	–	60	15.5	15.5	21	21
IRF7351	symmetrical dual SO8	–	60	17.8	17.8	24	24

Dual N-channel audio MOSFETs

Digital audio MOSFET half-bridges are specifically designed for class D audio amplifier applications.
They consist of two power MOSFET switches connected in half-bridge configuration.

Part number	Package	Monolithically-integrated Schottky like diode	BV_{DSS} [V]	$R_{DS(on),max.}$ [mΩ] @ V_{GS}=4.5 V max.		Q_G [nC] @ V_{GS}=4.5 V typ.	
				High-side	Low-side	High-side	Low-side
IRFI4212H-117P	half-bridge in TO220FP	–	100	72.5	72.5	12	12
IRFI4019H-117P	half-bridge in TO220FP	–	150	95	95	13	13
IRFI4020H-117P	half-bridge in TO220FP	–	200	100	100	19	19

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* Logic level (capable of 4.5 V gate drive)
** $R_{DS(on)}$ at V_{GS}=4.5V
1) Coming soon

For more details on the product, click on the part number, visit infineon.com or contact our product support.

OptiMOS™ and StrongIRFET™ 30 V logic level

DC-DC | Mainboard | Motor control | Notebook | Onboard | VRD/VRM

$R_{DS(on),max.}$ @ V_{GS}=10 V [mΩ]	TO-252 (DPAK)	TO-220
1-2		IRLB3813PBF $R_{DS(on)}$=1.95 mΩ
	IRLR8743TRPBF $R_{DS(on)}$=3.1 mΩ	
		IRLB8743PBF $R_{DS(on)}$=3.2 mΩ
4-10		IRLB8748PBF $R_{DS(on)}$=4.8 mΩ
		IRLB8721PBF $R_{DS(on)}$=8.7 mΩ

OptiMOS™ and StrongIRFET™ 30 V logic level

DC-DC | Mainboard | Motor control | Notebook | Onboard | VRD/VRM

$R_{DS(on),max.}$ @ V_{GS}=10 V [mΩ]	DirectFET™	PQFN 3.3 x 3.3 Source-Down	PQFN 3.3 x 3.3 Source-Down Dual-side cooling (DSC)	PQFN 5x6 Source-Down	PQFN 3.3 x 3.3	SuperSO8
< 1		IQE008N03LM5 $R_{DS(on)}$=0.85 mΩ	IQE008N03LM5CGSC $R_{DS(on)}$ = 0.85 mΩ	IQDH35N03LM5CG $R_{DS(on)}$ = 0.35 mΩ		BSC005N03LS5 $R_{DS(on)}$=0.55 mΩ
		IQE008N03LM5CG $R_{DS(on)}$=0.85 mΩ	IQE008N03LM5SC $R_{DS(on)}$ = 0.85 mΩ			BSC005N03LS5I* $R_{DS(on)}$=0.5 mΩ
1-2						ISC011N03L5S $R_{DS(on)}$=1.1 mΩ
						IRFH8303TRPBF $R_{DS(on)}$=1.1 mΩ
						BSC011N03LS $R_{DS(on)}$=1.1 mΩ
						BSC011N03LSI* $R_{DS(on)}$=1.1 mΩ
					BSZ0500NSI* $R_{DS(on)}$=1.5 mΩ	
	IRF6727MTRPBF $R_{DS(on)}$=1.7 mΩ				BSZ019N03LS $R_{DS(on)}$=1.9 mΩ	
					ISZ019N03L5S $R_{DS(on)}$=1.9 mΩ	
						ISC019N03L5S $R_{DS(on)}$=1.9 mΩ
					BSZ0501NSI* $R_{DS(on)}$=2.0 mΩ	BSC0901NS $R_{DS(on)}$=1.9 mΩ
						BSC0501NSI** $R_{DS(on)}$=1.9 mΩ

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*Monolithically-integrated Schottky-like diode
**For more information on the product, contact our product support

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OptiMOS™ and StrongIRFET™ 30 V logic level

DC-DC | Mainboard | Motor control | Notebook | Onboard | VRD/VRM

$R_{DS(on),\ max.}$ @V_{GS}=10 V [mΩ]	PQFN 3.3x3.3	SuperSO8	SO8	PQFN 2x2
2-4	BSZ0901NSI** $R_{DS(on)}$=2.1 mΩ	IRFH8311TRPBF $R_{DS(on)}$=2.1 mΩ		ISK036N03LM5 $R_{DS(on)}$=3.6 mΩ
		IRFH5302TRPBF $R_{DS(on)}$=2.1 mΩ		
		BSC0502NSI* $R_{DS(on)}$=2.3 mΩ		
	BSZ0902NS $R_{DS(on)}$=2.6 mΩ	ISC026N03L5S $R_{DS(on)}$=2.6 mΩ		
	BSZ0902NSI* $R_{DS(on)}$=2.8 mΩ	BSC0902NS $R_{DS(on)}$=2.6 mΩ		
	BSZ0502NSI* $R_{DS(on)}$=2.8 mΩ	BSC0902NSI* $R_{DS(on)}$=2.8 mΩ	IRF8788TRPBF $R_{DS(on)}$=2.8 mΩ	
	BSZ0503NSI* $R_{DS(on)}$=3.4 mΩ	IRFH8318TRPBF $R_{DS(on)}$=3.1 mΩ		
	IRLHM630TRPBF** $R_{DS(on)}$= 3.2 mΩ	BSC0503NSI* $R_{DS(on)}$=3.0 mΩ		
	IRFHM830 $R_{DS(on)}$= 3.8 mΩ	BSC0504NSI* $R_{DS(on)}$=3.7 mΩ	IRF7862TRPBF $R_{DS(on)}$=3.3 mΩ	
	BSZ0904NSI** $R_{DS(on)}$=4.0 mΩ			
	ISZ040N03L5IS $R_{DS(on)}$=4.0 mΩ	ISC037N03L5IS $R_{DS(on)}$=3.7 mΩ		
4-10		IRFH8324TRPBF $R_{DS(on)}$=4.1 mΩ		
	BSZ0506NS $R_{DS(on)}$=4.4 mΩ	ISC045N03L5S $R_{DS(on)}$=4.5 mΩ		
	BSZ0589NS $R_{DS(on)}$=4.4 mΩ	BSC0906NS $R_{DS(on)}$=4.5 mΩ		
	ISZ065N03L5S $R_{DS(on)}$=6.5 mΩ	BSC052N03LS $R_{DS(on)}$=5.2 mΩ		
	BSZ065N03LS $R_{DS(on)}$=6.5 mΩ			
		IRFH8334TRPBF $R_{DS(on)}$=9.0 mΩ		

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** Monolithically-integrated Schottky-like diode
*** $R_{DS(on)}$, max. @V_{GS}=4.5 V
****For more information on the product, contact our product support

1) 2.5 V_{GS} capable

For more details on the product, click on the part number, visit infineon.com or contact our product support.



OptiMOS™ and StrongIRFET™ 40 V normal level

$R_{DS(on),max.}$ @V_{GS}=10 V [mΩ]	TO-252 (DPAK)	TO-263 (D^2PAK)	TO-263 (D^2PAK 7-pin)	TO-220	PQFN 5.x6 Source-Down	TO-247	DirectFET™	sTOLL	SuperSO8	TO-220 FullPAK
<1			IRF40SC240 $R_{DS(on)}$=0.65 mΩ		IQD005N04NM6CG $R_{DS(on)}$ = 0.5 mΩ			IST006N04NM6 $R_{DS(on)}$=0.6 mΩ	ISC007N04NM6 $R_{DS(on)}$=0.7 mΩ	
					IQD005N04NM6 $R_{DS(on)}$ = 0.5 mΩ			IST007N04NM6 $R_{DS(on)}$=0.7 mΩ	ISC010N04NM6 $R_{DS(on)}$=1.0 mΩ	
			IPF009N04NF2S $R_{DS(on)}$ = 0.9 mΩ					IST010N04NM5 $R_{DS(on)}$=1.0 mΩ		
1-2		IPB011N04NF2S $R_{DS(on)}$ = 1.15 mΩ				IRFP7430PBF $R_{DS(on)}$=1.3 mΩ			ISC012N04NM6 $R_{DS(on)}$=1.2 mΩ	
		IPB012N04NF2S $R_{DS(on)}$ = 1.25 mΩ	IPF010N04NF2S $R_{DS(on)}$ = 1 mΩ	IPP011N04NF2S $R_{DS(on)}$ = 1.15 mΩ			IRF7739L1TRPBF $R_{DS(on)}$=1.0 mΩ		IRFH7084TRPBF $R_{DS(on)}$=1.25 mΩ	
			IRFS3004TRL7PP $R_{DS(on)}$=1.25 mΩ	IPP013N04NF2S $R_{DS(on)}$ = 1.3 mΩ			IRF7480MTRPBF $R_{DS(on)}$=1.2 mΩ		IRFH7004TRPBF $R_{DS(on)}$=1.4 mΩ	
		IPB014N04NF2S $R_{DS(on)}$ = 1.45 mΩ	IPF013N04NF2S $R_{DS(on)}$ = 1.35 mΩ	IPP015N04NF2S $R_{DS(on)}$ = 1.5 mΩ			IRF7946TRPBF $R_{DS(on)}$=1.4 mΩ		ISC015N04NM5 $R_{DS(on)}$=1.5 mΩ	
		IRFS3004 $R_{DS(on)}$=1.75 mΩ		IRFB3004PBF $R_{DS(on)}$=1.75 mΩ					ISC017N04NM5 $R_{DS(on)}$=1.7 mΩ	
									ISC019N04NM5 $R_{DS(on)}$=1.9 mΩ	
2-4	IPD023N04NF2S $R_{DS(on)}$ = 2.3 mΩ	IPB023N04NF2S $R_{DS(on)}$ = 2.35 mΩ							IRFH7440TRPBF $R_{DS(on)}$=2.4 mΩ	IPA028N04NM3S $R_{DS(on)}$=2.8 mΩ
				IPP026N04NF2S $R_{DS(on)}$ = 2.6 mΩ						
	IPD029N04NF2S $R_{DS(on)}$ = 2.9 mΩ								ISC028N04NM5 $R_{DS(on)}$=2.8 mΩ	
				IPP033N04NF2S $R_{DS(on)}$ = 3.3 mΩ					IRFH7446TRPBF $R_{DS(on)}$=3.3 mΩ	
									ISC036N04NM5 $R_{DS(on)}$=3.6 mΩ	
4-10									ISC046N04NM5 $R_{DS(on)}$=4.6 mΩ	
	IRF40R207 $R_{DS(on)}$=5.1 mΩ			IRF40B207 $R_{DS(on)}$=4.5 mΩ					ISC058N04NM5 $R_{DS(on)}$=5.8 mΩ	

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OptiMOS™ and StrongIRFET™ 40 V logic level

$R_{DS(on),\ max.}$ @V_{GS}=10 V [mΩ]	TO-252 (DPAK)	TO-263 (D2PAK)	TO-263 (D2PAK 7-pin)	PQFN 5x6 Source-Down	PQFN 2x2	PQFN 3.3x3.3 Source-Down	PQFN 3.3x3.3 Source-Down dual-side cooling (DSC)	TO-220	TO-247	DirectFET™	PQFN 3.3x3.3	SuperSO8	SuperSO8 dual-side cooling (DSC)
<1				IQDH45N04LM6CG $R_{DS(on)}$ = 0.45 mΩ						IRL7472L1TRPBF $R_{DS(on)}$=0.45 mΩ		BSC007N04LS6 $R_{DS(on)}$=0.7 mΩ	BSC007N04LS6SC $R_{DS(on)}$ =0.7 mΩ
													BSC009N04LSSC $R_{DS(on)}$ = 0.94 mΩ
1-2						IQE013N04LM6 $R_{DS(on)}$ = 1.35 mΩ	IQE013N04LM6CGSC $R_{DS(on)}$ = 1.35 mΩ			IRL40DM247 $R_{DS(on)}$ =1.0 mΩ		BSC010N04LS $R_{DS(on)}$ =1.0 mΩ	
	IRLS3034TRLPBF $R_{DS(on)}$ =1.7 mΩ	IRLS3034TRL7PP $R_{DS(on)}$ =1.4 mΩ				IQE013N04LM6CG $R_{DS(on)}$ = 1.35 mΩ	IQE013N04LM6SC $R_{DS(on)}$ = 1.35 mΩ	IRLB3034PBF $R_{DS(on)}$ =1.7 mΩ	IRLP3034PBF $R_{DS(on)}$ =1.7 mΩ	IRL7486MTRPBF $R_{DS(on)}$ =1.4 mΩ		BSC010N04LS6 $R_{DS(on)}$ =1.0 mΩ	
	IRL40S212 $R_{DS(on)}$ =1.9 mΩ												
												BSC010N04LSI $R_{DS(on)}$ =1.05 mΩ	
												BSC010N04LSC* $R_{DS(on)}$ = 1.05 mΩ	
												ISC012N04LM6 $R_{DS(on)}$ =1.2 mΩ	
												BSC014N04LS $R_{DS(on)}$ =1.4 mΩ	
											BSZ018N04LS6 $R_{DS(on)}$=1.8 mΩ	BSC014N04LSI $R_{DS(on)}$ =1.45 mΩ	
												BSC019N04LS $R_{DS(on)}$ =1.9 mΩ	
												BSC019N04LST $R_{DS(on)}$ =1.9 mΩ	
2-4										IRF6613TRPBF $R_{DS(on)}$=3.4 mΩ	BSZ021N04LS6 $R_{DS(on)}$ =2.1 mΩ	BSC022N04LS $R_{DS(on)}$ =2.2 mΩ	
											BSZ024N04LS6 $R_{DS(on)}$ =2.4 mΩ	BSC022N04LS6 $R_{DS(on)}$ =2.2 mΩ	
											BSZ025N04LS $R_{DS(on)}$ =2.5 mΩ	BSC026N04LS $R_{DS(on)}$ =2.6 mΩ	
											BSZ028N04LS $R_{DS(on)}$ =2.8 mΩ		
											BSZ034N04LS $R_{DS(on)}$ =3.4 mΩ	BSC032N04LS $R_{DS(on)}$ =3.2 mΩ	
	IPD036N04L G $R_{DS(on)}$=3.6 mΩ												
4-10	IRLR3114ZTRPBF $R_{DS(on)}$ =4.5 mΩ				ISK057N04LM6 $R_{DS(on)}$ = 5.75 mΩ								
											BSZ063N04LS6 $R_{DS(on)}$ =6.3 mΩ		
												BSC059N04LS6 $R_{DS(on)}$ =5.9 mΩ	

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* Increased creepage distance
1) Coming soon



OptiMOS™ and StrongIRFET™ 60 V normal level

$R_{DS(on),max.}$ @V_{GS}=10 V [mΩ]	TO-252 (DPAK)	TO-263 (D^2PAK)	TO-263 (D^2PAK 7-pin)	TO-262 (I^2PAK)	PQFN 5x6 Source-Down	TO-220	TO-220 FullPAK	TO-247	SuperSO8 DSC (dual side cooling)
>1					IQD009N06NM5CG $R_{DS(on)}$ = 0.9 mΩ				
1-2			IPB010N06N [2] $R_{DS(on)}$ =1.0 mΩ						
			IPF010N06NF2S $R_{DS(on)}$ = 1.05 mΩ						
			IPF012N06NF2S $R_{DS(on)}$ = 1.2 mΩ						
		IPB013N06NF2S $R_{DS(on)}$ = 1.3 mΩ							
						IPP014N06NF2S $R_{DS(on)}$=1.4 mΩ			BSC014N06NSSC $R_{DS(on)}$ = 1.4 mΩ
						IPP016N06NF2S $R_{DS(on)}$=1.6 mΩ			BSC016N06NSSC $R_{DS(on)}$ = 1.6 mΩ
						IPP019N06NF2S $R_{DS(on)}$=1.9 mΩ			
		IPB015N06NF2S $R_{DS(on)}$ = 1.5 mΩ							
			IPF016N06NF2S $R_{DS(on)}$ = 1.7 mΩ						
		IPB018N06NF2S $R_{DS(on)}$ = 1.8 mΩ							
						IPP020N06N [2] $R_{DS(on)}$ =2.0 mΩ		IRFP7530PBF $R_{DS(on)}$ =2.0 mΩ	
2-4	IPD025N06N [2] $R_{DS(on)}$ =2.5 mΩ								BSC028N06NSSC $R_{DS(on)}$ = 2.8 mΩ
	IPD028N06NF2S $R_{DS(on)}$ = 2.85 mΩ			IPI029N06N [2] $R_{DS(on)}$ =2.9 mΩ					
		IPB026N06N [2] $R_{DS(on)}$ =2.6 mΩ				IPP029N06N [2] $R_{DS(on)}$ =2.9 mΩ			
		IPB029N06NF2S $R_{DS(on)}$ = 2.9 mΩ					IPA029N06N [2] $R_{DS(on)}$ =2.9 mΩ		
						IPP030N06NF2S $R_{DS(on)}$=3.05 mΩ			
	IPD033N06N [2] $R_{DS(on)}$=3.3 mΩ								
	IPD038N06NF2S $R_{DS(on)}$ = 3.85 mΩ	IRFS7537TRLPBF $R_{DS(on)}$ =3.3 mΩ				IPP040N06NF2S $R_{DS(on)}$=4.00 mΩ		IRFP7537PBF $R_{DS(on)}$ =3.3 mΩ	
							IPA040N06N [2] $R_{DS(on)}$ =4.0 mΩ		
4-10						IPP040N06N [2] $R_{DS(on)}$ =4.0 mΩ			
		IRFS7540TRLPBF $R_{DS(on)}$ =5.1 mΩ							
	IPD053N06N [2] $R_{DS(on)}$ =5.3 mΩ								
		IPB057N06N [2] $R_{DS(on)}$ =5.7 mΩ				IRFB7545PBF $R_{DS(on)}$ =5.9 mΩ			
	IRFR7546TRPBF $R_{DS(on)}$ =7.9 mΩ						IPA060N06N [2] $R_{DS(on)}$ =6.0 mΩ		
	IRF60R217 $R_{DS(on)}$ =9.9 mΩ								

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1) Coming soon
2) 6 V rated ($R_{DS(on)}$ also specified @ V_{GS}=6 V)

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OptiMOS™ and StrongIRFET™ 60 V normal level

$R_{DS(on),max.}$ @V_{GS}=10 V [mΩ]	PQFN 3.3x3.3	PQFN 3.3x3.3 Source-Down	SO8	SuperSO8	TOLT	TO-Leadless	sTOLL
<1					IPTC007N06NM5 $R_{DS(on)}$ = 0.7 mΩ	IPT007N06N [1] $R_{DS(on)}$ =0.7 mΩ	IST011N06NM5 $R_{DS(on)}$ = 1.1 mΩ
						IPT009N06NM5 $R_{DS(on)}$ = 0.9 mΩ	
1-2				ISC010N06NM5 $R_{DS(on)}$ =1.05 mΩ	IPTC012N06NM5 $R_{DS(on)}$ = 1.2 mΩ		IST015N06NM5 $R_{DS(on)}$ = 1.5 mΩ
				BSC012N06NS $R_{DS(on)}$ =1.2 mΩ		IPT012N06N [1] $R_{DS(on)}$ =1.2 mΩ	
				BSC014N06NST [1] $R_{DS(on)}$ =1.45 mΩ		IPT008N06NM5LF $R_{DS(on)}$ = 0.8 mΩ	
				ISC015N06NM5LF $R_{DS(on)}$ =1.55 mΩ			
				BSC016N06NST [1] $R_{DS(on)}$ =1.6 mΩ			
				BSC019N06NS [1] $R_{DS(on)}$ =1.9 mΩ			
2-4		IQE030N06NM5CG $R_{DS(on)}$ = 3 mΩ		BSC028N06NS [1] $R_{DS(on)}$ =2.8 mΩ			
	BSZ039N06NS $R_{DS(on)}$ =3.9 mΩ	IQE030N06NM5 $R_{DS(on)}$ = 3 mΩ					
				BSC034N06NS [1] $R_{DS(on)}$ =3.4 mΩ			
				BSC039N06NS [1] $R_{DS(on)}$ =3.9 mΩ			
	BSZ042N06NS [1] $R_{DS(on)}$ =4.2 mΩ		IRF7855TRPBF $R_{DS(on)}$ =9.4 mΩ	IRFH7545TRPBF $R_{DS(on)}$ =5.2 mΩ			
				BSC066N06NS [1] $R_{DS(on)}$ =6.6 mΩ			
	BSZ068N06NS [1] $R_{DS(on)}$ =6.8 mΩ			BSC097N06NS [1] $R_{DS(on)}$ =9.7 mΩ			
	BSZ100N06NS [1] $R_{DS(on)}$ =10.0 mΩ						

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1) 6 V rated ($R_{DS(on)}$ also specified @ V_{GS} = 6 V)

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OptiMOS™ and StrongIRFET™ 60 V logic level

$R_{DS(on),max.}$ @V_{GS}=10 V [mΩ]	TO-252 (DPAK)	PQFN 5x6 Source-Down	PQFN 3.3x3.3 Source-Down	TO-263 (D^2PAK 7-pin)	TO-220	PQFN 2x2	PQFN 3.3x3.3	SuperSO8
< 1		IQDH88N06LM5CG $R_{DS(on)}$ = 0.88 mΩ						ISC009N06LM5 $R_{DS(on)}$ = 0.9 mΩ
1-2								ISC011N06LM5 $R_{DS(on)}$ = 1.1 mΩ
								ISC015N06NM5LF* $R_{DS(on)}$ = 1.5 mΩ
				IRLS3036TRL7PP $R_{DS(on)}$ =1.9 mΩ			ISZ034N06LM5 $R_{DS(on)}$ = 3.4 mΩ	
2-4			IQE022N06LM5 $R_{DS(on)}$ = 2.2 mΩ		IRLB3036PBF $R_{DS(on)}$ =2.4 mΩ			BSC027N06LS5 $R_{DS(on)}$ =2.7 mΩ
			IQE022N06LM5CG $R_{DS(on)}$ = 2.2 mΩ					
			IQE022N06LM5SC $R_{DS(on)}$ = 2.2 mΩ					
			IQE022N06LM5CGSC $R_{DS(on)}$ = 2.2 mΩ					
4-10	IPD048N06L3 G $R_{DS(on)}$ = 4.8 mΩ						BSZ040N06LS5 $R_{DS(on)}$ =4.0 mΩ	BSC065N06LS5 $R_{DS(on)}$ =6.5 mΩ
	IRLR3636TRPBF $R_{DS(on)}$ =6.8 mΩ						BSZ065N06LS5 $R_{DS(on)}$ =6.5 mΩ	BSC094N06LS5 $R_{DS(on)}$ =9.4 mΩ
	IPD079N06L3 G $R_{DS(on)}$ = 7.9 mΩ						BSZ099N06LS5 $R_{DS(on)}$ =9.9 mΩ	
>10	IPD220N06L3 G $R_{DS(on)}$ = 22 mΩ					IRL60HS118 $R_{DS(on)}$ =17.0 mΩ		

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* Linear FET

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OptiMOS™ and StrongIRFET™ 75 V normal level

$R_{DS(on),\ max.}$ @V_{GS}=10 V [mΩ]	TO-252 (DPAK)	TO-263 (D^2PAK)	TO-263 (D^2PAK 7-pin)	TO-220	TO-247
1-2			IRFS7730TRL7PP $R_{DS(on)}$ =2.0 mΩ		
					IRFP4368PBF $R_{DS(on)}$ =1.85 mΩ
2-4		IRFS7730TRLPBF $R_{DS(on)}$ =2.6 mΩ			IRFP3077PBF $R_{DS(on)}$ =3.3 mΩ
				IRFB7730PBF $R_{DS(on)}$ =2.6 mΩ	
		IRFS7734TRLPBF $R_{DS(on)}$ =3.5 mΩ			
				IRFB7734PBF $R_{DS(on)}$ =3.5 mΩ	
		IRFS3307ZTRLPBF $R_{DS(on)}$ =5.8 mΩ		IRFB3307ZPBF $R_{DS(on)}$ =5.8 mΩ	
	IRFR3607PBF $R_{DS(on)}$ =9.0 mΩ	IRFS3607TRLPBF $R_{DS(on)}$ =9.0 mΩ			

OptiMOS™ and StrongIRFET™ 80 V normal level/logic level

$R_{DS(on),\ max.}$ @V_{GS}=10 V [mΩ]	TO-252 (DPAK)	TO-263 (D^2PAK)	TO-263 (D^2PAK 7-pin)	TO-220	TO-220 FullPAK	SuperSO8 DSC (dual-side co-oling)	PQFN 5x6 Source-Down	PQFN 3.3x3.3 Source-Down	PQFN 2x2	PQFN 3.3x3.3	SuperSO8	TO-Leadless
1-2							IQD016N08NM5CG $R_{DS(on)}$ = 1.6 mΩ					
		IPB016N08NF2S $R_{DS(on)}$ = 1.65 mΩ	IPB015N08N5 $R_{DS(on)}$ =1.5 mΩ	IPP016N08NF2S $R_{DS(on)}$ =1.6 mΩ								
			IPF014N08NF2S $R_{DS(on)}$ = 1.4 mΩ	IPP019N08NF2S $R_{DS(on)}$ =1.9 mΩ								IPT010N08NM5 $R_{DS(on)}$ =1.0 mΩ
		IPB019N08NF2S $R_{DS(on)}$ = 1.95 mΩ	IPF017N08NF2S $R_{DS(on)}$ = 1.7 mΩ									IPT012N08N5 $R_{DS(on)}$ =1.2 mΩ
												IPT012N08NF2S $R_{DS(on)}$ = 1.23 mΩ
2-4		IPB020N08N5 $R_{DS(on)}$ =2.0 mΩ	IPB019N08N5 $R_{DS(on)}$ =1.95 mΩ	IPP024N08NF2S $R_{DS(on)}$ =2.4 mΩ		BSC023N08NS5SC $R_{DS(on)}$ = 2.3 mΩ						IPT013N08NM5LF $R_{DS(on)}$ = 1.3 mΩ
			IPF023N08NF2S $R_{DS(on)}$ = 2.3 mΩ	IPP023N08N5 $R_{DS(on)}$ =2.3 mΩ		BSC033N08NS5SC $R_{DS(on)}$ = 3.3 mΩ					BSC025N08LS5 $R_{DS(on)}$ =2.5 mΩ	IPT014N08NM5 $R_{DS(on)}$ =1.4 mΩ
											ISC025N08NM5LF* $R_{DS(on)}$ = 2.55 mΩ	
		IPB024N08NF2S $R_{DS(on)}$ = 2.4 mΩ	IPF039N08NF2S $R_{DS(on)}$ = 3.9 mΩ								BSC026N08NS5 $R_{DS(on)}$ =2.6 mΩ	IPT019N08N5 $R_{DS(on)}$ =1.9 mΩ
					IPA030N10NF2S $R_{DS(on)}$ = 3 mΩ						BSC030N08NS5 $R_{DS(on)}$ =3.0 mΩ	
		IPB031N08N5 $R_{DS(on)}$ =3.1 mΩ		IPP034N08N5 $R_{DS(on)}$ =3.4 mΩ								
4-10		IPB040N08NF2S $R_{DS(on)}$ = 4 mΩ		IPP040N08NF2S $R_{DS(on)}$ =4.0 mΩ				IQE046N08LM5 $R_{DS(on)}$ = 4.6 mΩ			BSC037N08NS5 $R_{DS(on)}$ =3.7 mΩ	
	IPD046N08N5 $R_{DS(on)}$ =4.6 mΩ	IPB049N08N5 $R_{DS(on)}$ =4.9 mΩ			IPA040N08NM5S $R_{DS(on)}$ =4.0 mΩ			IQE046N08LM5CG $R_{DS(on)}$ = 4.6 mΩ			BSC040N08NS5 $R_{DS(on)}$ =4.0 mΩ	
	IPD040N08NF2S $R_{DS(on)}$ = 4 mΩ	IPB055N08NF2S $R_{DS(on)}$ = 5.5 mΩ			IPA052N08NM5S $R_{DS(on)}$ =5.2 mΩ			IQE046N08LM5SC $R_{DS(on)}$ = 4.6 mΩ			BSC052N08NS5 $R_{DS(on)}$ =5.2 mΩ	
	IPD055N08NF2S $R_{DS(on)}$ = 5.5 mΩ			IPP055N08NF2S $R_{DS(on)}$ =5.5 mΩ	IPA082N10NF2S $R_{DS(on)}$ = 8.2 mΩ			IQE046N08LM5CGSC $R_{DS(on)}$ = 4.6 mΩ		BSZ070N08LS5 $R_{DS(on)}$ =7.0 mΩ		
										BSZ075N08NS5 $R_{DS(on)}$ =7.5 mΩ	BSC061N08NS5 $R_{DS(on)}$ =6.1 mΩ	
											BSC072N08NS5 $R_{DS(on)}$ =7.2 mΩ	
										BSZ084N08NS5 $R_{DS(on)}$ =8.4 mΩ		
>10											BSC117N08NS5 $R_{DS(on)}$ =11.7 mΩ	
									IRL80HS120 $R_{DS(on)}$ =32.0 mΩ	BSZ110N08NS5 $R_{DS(on)}$ =11.0 mΩ		

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*Linear FET

OptiMOS™ and StrongIRFET™ 80 V normal level/logic level



$R_{DS(on),max.}$ @V_{GS}=10 V [mΩ]	TOLT (TO-Leaded top-side cooling)	sTOLL	PQFN 3.3x3.3 Source-Down	PQFN 3.3x3.3 Source-Down DSC (dual-side cooling)
1-2	IPTC011N08NM5 $R_{DS(on)}$ = 1.2 mΩ	IST019N08NM5 $R_{DS(on)}$ = 1.9 mΩ		
	IPTC014N08NM5 $R_{DS(on)}$ = 1.4 mΩ			
5			IQE050N08NM5 $R_{DS(on)}$ = 5 mΩ	IQE050N08NM5SC $R_{DS(on)}$ = 5 mΩ
			IQE050N08NM5CG $R_{DS(on)}$ = 5 mΩ	IQE050N08NM5CGSC $R_{DS(on)}$ = 5 mΩ

OptiMOS™ and StrongIRFET™ 100 V normal level



$R_{DS(on),max.}$ @V_{GS}=10 V [mΩ]	TO-252 (DPAK)	TO-263 (D^2PAK)	TO-263 (D^2PAK 7-pin)	TO-220	TO-220 FullPAK	TO-247
1-2			IPF015N10N5 $R_{DS(on)}$ =1.53 mΩ	IPP018N10N5 $R_{DS(on)}$ = 1.8 mΩ		IRF100P218 $R_{DS(on)}$ =1.1 mΩ
			IPF016N10NF2S $R_{DS(on)}$ =1.6 mΩ			IRF100P219 $R_{DS(on)}$ =2.1 mΩ
			IPB017N10N5 $R_{DS(on)}$ =1.7 mΩ			
			IPB017N10N5LF $R_{DS(on)}$ =1.7 mΩ			
2-4		IPB018N10N5 $R_{DS(on)}$ = 1.8 mΩ				
		IPB020N10N5 $R_{DS(on)}$ =2.0 mΩ		IPP023N10N5 $R_{DS(on)}$ =2.3 mΩ	IPA030N10NF2S $R_{DS(on)}$ =3.0 mΩ	IRFP4468PBF $R_{DS(on)}$ =2.6 mΩ
		IPB020N10N5LF $R_{DS(on)}$ =2.0 mΩ	IPB024N10N5 $R_{DS(on)}$ =2.4 mΩ	IPP026N10NF2S $R_{DS(on)}$ =2.6 mΩ		
		IPB026N10NF2S $R_{DS(on)}$ = 2.65 mΩ	IPB032N10N5 $R_{DS(on)}$ =3.2 mΩ	IPP030N10N5 $R_{DS(on)}$ =3.0 mΩ		
		IPB027N10N5 $R_{DS(on)}$ =2.7 mΩ	IRFS4010TRL7PP $R_{DS(on)}$ =4.0 mΩ	IPP039N10N5 $R_{DS(on)}$ =3.9 mΩ		
4-10	IPD050N10N5 $R_{DS(on)}$ =5.0 mΩ	IPB033N10N5LF $R_{DS(on)}$ =3.3 mΩ	IPF042N10NF2S Rds(on) = 4.25 mΩ	IRF100B201 $R_{DS(on)}$ =4.2 mΩ		IRFP4110PBF $R_{DS(on)}$ =4.5 mΩ
	IPD052N10NF2S $R_{DS(on)}$ = 5.2 mΩ	IPB043N10NF2S $R_{DS(on)}$ = 4.35 mΩ	IPF050N10NF2S Rds(on) = 5.05 mΩ	IRFB4110PBF $R_{DS(on)}$ =4.5 mΩ	IPA050N10NM5S $R_{DS(on)}$ =5.0 mΩ	IRFP4310ZPBF $R_{DS(on)}$ =6.0 mΩ
		IRFS4010TRLPBF $R_{DS(on)}$ =4.7 mΩ		IPP050N10NF2S $R_{DS(on)}$ =5.0 mΩ		
		IPB050N10NF2S $R_{DS(on)}$ = 5.05 mΩ		IRFB4310ZPBF $R_{DS(on)}$ =6.0 mΩ	IPA082N10NF2S $R_{DS(on)}$ =8.2 mΩ	
		IRFS4310ZTRLPBF $R_{DS(on)}$ =7.0 mΩ		IPP082N10NF2S $R_{DS(on)}$ =8.2 mΩ	IPA083N10N5 $R_{DS(on)}$ =8.3 mΩ	
				IPP083N10N5 $R_{DS(on)}$ =8.3 mΩ	IPA083N10NM5S $R_{DS(on)}$ =8.3 mΩ	
				IRF100B202 $R_{DS(on)}$ =8.6 mΩ		
		IRFS4410ZTRLPBF $R_{DS(on)}$ =9.0 mΩ				
				IRFB4410ZPBF $R_{DS(on)}$ =9.0 mΩ		
10-25	IPD130N10NF2S $R_{DS(on)}$ = 13 mΩ			IPP129N10NF2S $R_{DS(on)}$ =12.9 mΩ		
	IRFR4510TRPBF $R_{DS(on)}$ =13.9 mΩ	IRFS4510TRLPBF $R_{DS(on)}$ =13.9 mΩ		IRFB4510PBF $R_{DS(on)}$ =13.5 mΩ	IPA126N10NM3S $R_{DS(on)}$ =12.6 mΩ	
>25	IPD78CN10N G $R_{DS(on)}$ =78.0 mΩ					

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OptiMOS™ and StrongIRFET™ 100 V normal level

$R_{DS(on),\ max.}$ @V_{GS}=10 V [mΩ]	DirectFET™	PQFN 3.3x3.3	PQFN 3.3x3.3 Source-Down	PQFN 3.3x3.3 Source-Down DSC (dual-side cooling)	PQFN 5x6 Source-Down	SuperSO8	SuperSO8 DSC (dual-side cooling)	SO8	TO-Leadless	TOLT (TO-Leaded top-side cooling)	sTOLL
1-2		ISZ080N10NM6 $R_{DS(on)}$= 8.0 mΩ							IPT014N10N5 $R_{DS(on)}$ = 1.4 mΩ	IPTC015N10NM5 $R_{DS(on)}$ = 1.5 mΩ	
						ISC022N10NM6 $R_{DS(on)}$= 2.2 mΩ			IPT015N10N5 $R_{DS(on)}$ =1.5 mΩ		
						ISC027N10NM6 $R_{DS(on)}$= 2.7 mΩ			IPT015N10NF2S $R_{DS(on)}$ = 1.5 mΩ		
						ISC030N10NM6 $R_{DS(on)}$= 3.0 mΩ			IPT017N10NF2S $R_{DS(on)}$ = 1.75 mΩ	IPTC019N10NM5 $R_{DS(on)}$ = 1.9 mΩ	
2-4					IQD020N10NM5CGSC $R_{DS(on)}$ = 2 mΩ	BSC027N10NS5 $R_{DS(on)}$ = 2.7 mΩ	BSC030N10NS5SC $R_{DS(on)}$ = 3 mΩ		IPT020N10N5 $R_{DS(on)}$ =2.0 mΩ		
						ISC035N10NM5LF [1] $R_{DS(on)}$ = 3.55 mΩ			IPT022N10NF2S $R_{DS(on)}$ = 2.25 mΩ		
	IRF7769L1TRPBF $R_{DS(on)}$ =3.5 mΩ					BSC035N10NS5 $R_{DS(on)}$ =3.5 mΩ	BSC040N10NS5SC $R_{DS(on)}$ =4.0 mΩ		IPT026N10N5 $R_{DS(on)}$ =2.6 mΩ		IST026N10NM5 $R_{DS(on)}$ = 2.6 mΩ
						ISC035N10NM5LF $R_{DS(on)}$ = 3.55 mΩ					
						BSC040N10NS5 $R_{DS(on)}$ =4.0 mΩ					
4-10			IQE065N10NM5 $R_{DS(on)}$ = 6.5 mΩ	IQE065N10NM5SC $R_{DS(on)}$ = 6.5 mΩ		BSC050N10N5 $R_{DS(on)}$ =5.0 mΩ					
			IQE065N10NM5CG $R_{DS(on)}$ = 6.5 mΩ	IQE065N10NM5CGSC $R_{DS(on)}$ = 6.5 mΩ		ISC060N10NM6 $R_{DS(on)}$= 6.0 mΩ					
						BSC070N10NS5 $R_{DS(on)}$ =7.0 mΩ	BSC070N10NS5SC $R_{DS(on)}$ =7.0 mΩ				
		BSZ097N10NS5 $R_{DS(on)}$ =9.7 mΩ				ISC080N10NM6 $R_{DS(on)}$= 8.0 mΩ					
		ISZ113N10NM5LF $R_{DS(on)}$ =11.3 mΩ				BSC098N10NS5 $R_{DS(on)}$ =9.8 mΩ					
10-25	IRF6644TRPBF $R_{DS(on)}$ =13.0 mΩ	ISZ230N10NM6 $R_{DS(on)}$= 23 mΩ									
						IRFH5210TRPBF $R_{DS(on)}$ =14.9 mΩ					
						ISC230N10NM6 $R_{DS(on)}$ =23 mΩ		IRF7853TRPBF $R_{DS(on)}$ =18.0 mΩ			
>25	IRF6645TRPBF $R_{DS(on)}$ =35.0 mΩ										

OptiMOS™ and StrongIRFET™ 100 V logic level

$R_{DS(on),\ max.}$ @V_{GS}=10 V [mΩ]	TO-252 (DPAK)	TO-263 (D^2PAK)	TO-220	PQFN 2x2	PQFN 3.3x3.3	SuperSO8
2-4						BSC034N10LS5 $R_{DS(on)}$ =3.4 mΩ
4-10		IRLS4030TRLPBF $R_{DS(on)}$ =4.3 mΩ	IRLB4030PBF $R_{DS(on)}$ =4.3 mΩ		BSZ096N10LS5 $R_{DS(on)}$ =9.6 mΩ	BSC070N10LS5 $R_{DS(on)}$ =7.0 mΩ
						IRLH5030TRPBF $R_{DS(on)}$ =9.0 mΩ
						BSC096N10LS5 $R_{DS(on)}$ =9.6 mΩ
10-25					BSZ146N10LS5 $R_{DS(on)}$ =14.6 mΩ	
	IRLR3110ZTRPBF $R_{DS(on)}$ =14.0 mΩ					BSC146N10LS5 $R_{DS(on)}$ =14.6 mΩ
>25				IRL100HS121 $R_{DS(on)}$ =42.0 mΩ		

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1) Coming soon



AC-DC Adapter Consumer DC-DC LED
Motor control SMPS Solar Telecom

OptiMOS™ and StrongIRFET™ 120 V normal level/logic level

$R_{DS(on),\ max.}$ @V_{GS}=10 V [mΩ]	TO-263 (D^2PAK 7-pin)	PQFN 3.3x3.3	SuperSO8	TO-220	TO-263 (D^2PAK)	TOLG (TO-Leaded Gullwing)	TO-Leadless (TOLL)	TO-Leaded Top-side Cooling (TOLT)
1-2	IPF019N12NM6 $R_{DS(on)}$ = 1.9 mΩ					IPTG017N12NM6 [1] $R_{DS(on)}$ = 1.7 mΩ		IPTC017N12NM6 $R_{DS(on)}$ = 1.7 mΩ
2-4			ISC030N12NM6 $R_{DS(on)}$ = 3.04 mΩ	IPP022N12NM6 [1] $R_{DS(on)}$ = 2.2 mΩ	IPB022N12NM6 [1] $R_{DS(on)}$ = 2.2 mΩ		IPT017N12NM6 $R_{DS(on)}$ = 1.7 mΩ	IPTC028N12NM6 [1] $R_{DS(on)}$ = 2.8 mΩ
			ISC032N12LM6 [1] $R_{DS(on)}$ = 3.2 mΩ		IPB035N12NM6 [1] $R_{DS(on)}$ = 3.5 mΩ			
			ISC037N12NM6 $R_{DS(on)}$ = 3.7 mΩ				IPT030N12N3 G $R_{DS(on)}$=3.0 mΩ	
4-10			ISC037N12NM6 [1] $R_{DS(on)}$ = 3.7 mΩ					
			ISC073N12LM6 $R_{DS(on)}$ = 7.3 mΩ					
			ISC078N12NM6 [1] $R_{DS(on)}$ = 7.8 mΩ					
			BSC080N12LS $R_{DS(on)}$ = 8 mΩ					
10-25		ISZ106N12LM6 $R_{DS(on)}$ = 10.6 mΩ	ISC104N12LM6 $R_{DS(on)}$ = 10.4 mΩ		IPB133N12NM6 [1] $R_{DS(on)}$ = 13.3 mΩ			
		ISZ330N12LM6 $R_{DS(on)}$ = 33 mΩ	ISC110N12NM6 [1] $R_{DS(on)}$ =11 mΩ					
			BSC120N12LS $R_{DS(on)}$ =12 mΩ					
			ISC320N12LM6 [1] $R_{DS(on)}$ = 32 mΩ					

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* logic level devices
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OptiMOS™ and StrongIRFET™ 135-150 V normal level

$R_{DS(on),\ max.}$ @V_{GS}=10 V [mΩ]	DirectFET™	PQFN 3.3x3.3	PQFN 5x6 Source-Down	SuperSO8 dual-side cooling (DSC)	SuperSO8	TO-Leadless
4-10			IQD063N15NM5CGSC $R_{DS(on)}$ = 6.3 mΩ	BSC093N15NS5SC $R_{DS(on)}$ = 9.3 mΩ	ISC037N13NM6 [1] $R_{DS(on)}$ =3.7 mΩ	IPT020N13NM6 [1] $R_{DS(on)}$ = 2.0 mΩ
					ISC046N13NM6 [1] $R_{DS(on)}$ =4.6 mΩ	IPT039N15N5 $R_{DS(on)}$ = 3.9 mΩ
					BSC074N15NS5 [2] $R_{DS(on)}$ =7.4 mΩ	IPT044N15N5 $R_{DS(on)}$ = 4.4 mΩ
					BSC093N15NS5 $R_{DS(on)}$ =9.3 mΩ	IPT054N15N5 $R_{DS(on)}$ = 5.4 mΩ
						IPT063N15N5 $R_{DS(on)}$ = 6.3 mΩ
10-25	IRF7779L2TRPBF [2] $R_{DS(on)}$ =11.0 mΩ	ISZ143N13NM6 [1] $R_{DS(on)}$ =14.3 mΩ		BSC110N15NS5SC $R_{DS(on)}$ = 11.0	BSC110N15NS5 $R_{DS(on)}$ =11.0 mΩ	
				BSC160N15NS5SC $R_{DS(on)}$ = 16.0 mΩ	BSC160N15NS5 $R_{DS(on)}$ =16.0 mΩ	
>25		BSZ300N15NS5 $R_{DS(on)}$ =30.0 mΩ			IRFH5015TRPBF $R_{DS(on)}$ =31.0 mΩ	
	IRF6643TRPBF $R_{DS(on)}$ =34.5 mΩ					
	IRF6775MTRPBF $R_{DS(on)}$ =56.0 mΩ					



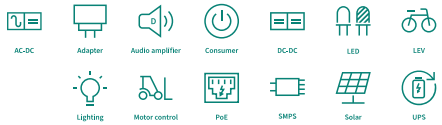
OptiMOS™ and StrongIRFET™ 135-150 V normal level

$R_{DS(on),\ max.}$ @V_{GS}=10 V [mΩ]	TO-252 (DPAK)	TO-263 (D^2PAK)	TO-263 (D^2PAK 7-pin)	TO-262 (I^2PAK)	TO-Leaded top-side cooling (TOLT)	TO-Leaded Gullwing (TOLG)	TO-220	TO-247
4-10		IPB048N15N5 $R_{DS(on)}$=4.8 mΩ	IPF021N13NM6 [1] $R_{DS(on)}$ = 2.1 mΩ	IPI051N15N5 $R_{DS(on)}$=5.1 mΩ	IPTC020N13NM6 [1] $R_{DS(on)}$ = 2.0 mΩ	IPTG020N13NM6 [1] $R_{DS(on)}$ = 2 mΩ	IPP051N15N5 [2] $R_{DS(on)}$=5.1 mΩ	IRF150P220 $R_{DS(on)}$=2.5 mΩ
		IPB048N15N5LF $R_{DS(on)}$=4.8 mΩ	IPF031N13NM6 [1] $R_{DS(on)}$= 3.1 mΩ		IPTC039N15NM5 $R_{DS(on)}$ = 3.9 mΩ	IPTG029N13NM6 [1] $R_{DS(on)}$ = 2.9 mΩ	IPP073N13NM6 [1] $R_{DS(on)}$=7.3 mΩ	IRF150P221 $R_{DS(on)}$=4.8 mΩ
			IPB044N15N5 $R_{DS(on)}$=4.4 mΩ		IPTC044N15NM5 $R_{DS(on)}$ = 4.4 mΩ	IPTG039N15NM5 $R_{DS(on)}$ = 3.9 mΩ		IRFP4568PBF $R_{DS(on)}$ =5.9 mΩ
		IPB073N15N5 $R_{DS(on)}$=7.3 mΩ	IPB060N15N5 $R_{DS(on)}$=6.0 mΩ	IPI076N15N5 $R_{DS(on)}$=7.6 mΩ	IPTC054N15NM5 $R_{DS(on)}$ = 5.4 mΩ	IPTG044N15NM5 $R_{DS(on)}$ = 4.4 mΩ	IPP076N15N5 $R_{DS(on)}$=7.6 mΩ	
		IPB083N15N5LF $R_{DS(on)}$=8.3 mΩ			IPTC063N15NM5 $R_{DS(on)}$ = 6.3 mΩ	IPTG054N15NM5 $R_{DS(on)}$ = 5.4 mΩ		
						IPTG063N15NM5 $R_{DS(on)}$ = 6.3 mΩ	IRF135B203 [2] $R_{DS(on)}$ =8.4 mΩ	
10-25							IRFB4115PBF $R_{DS(on)}$ =11.0 mΩ	
		IRFS4321 $R_{DS(on)}$ =15.0 mΩ					IRFB4321PBF $R_{DS(on)}$ =15.0 mΩ	IRFP4321PBF $R_{DS(on)}$ =15.5 mΩ
		IRFS4115TRLPBF $R_{DS(on)}$ =12.1 mΩ					IRFB4228PBF $R_{DS(on)}$ =15.0 mΩ	
>25		IRFS4615PBF $R_{DS(on)}$ =42.0 mΩ						
	IRFR4615 $R_{DS(on)}$ =42.0 mΩ						IRFB5615PBF $R_{DS(on)}$ =39.0 mΩ	
							IRFB4019PBF $R_{DS(on)}$ =95.0 mΩ	

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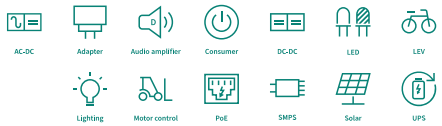
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2) 135 V

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OptiMOS™ and StrongIRFET™ 200 V normal level

$R_{DS(on),\ max.}$ @V_{GS}=10 V [mΩ]	TO-252 (DPAK)	TO-263 (D^2PAK)	TO-263 (D^2PAK 7-pin)	TO-220	TO-220 FullPAK	TO-247
4-10		IPB068N20NM6 [1] $R_{DS(on)}$ = 6.8 mΩ	IPF067N20NM6 [1] $R_{DS(on)}$ = 6.7 mΩ	IPP069N20NM6 [1] $R_{DS(on)}$ = 6.9 mΩ		IRF200P222 $R_{DS(on)}$=6.6 mΩ
						IRFP4668PBF $R_{DS(on)}$=9.7 mΩ
10-25		IPB107N20N3 G $R_{DS(on)}$ =10.7 mΩ		IPP110N20N3 G $R_{DS(on)}$ =11.0 mΩ		IRF200P223 $R_{DS(on)}$=11.5 mΩ
		IPB110N20N3LF $R_{DS(on)}$=11.0 mΩ				
		IPB117N20NFD $R_{DS(on)}$ =11.7 mΩ		IPP120N20NFD $R_{DS(on)}$ =12.0 mΩ		IRFP4127PBF $R_{DS(on)}$ =21.0 mΩ
				IRFB4127PBF $R_{DS(on)}$ =20.0 mΩ		IRFP4227PBF $R_{DS(on)}$ =25.0 mΩ
		IRFS4127TRLPBF $R_{DS(on)}$ =22.0 mΩ				
>25		IRFS4227TRLPBF $R_{DS(on)}$ =26.0 mΩ		IRFB4227PBF $R_{DS(on)}$ =26.0 mΩ	IPA320N20NM3S $R_{DS(on)}$ =32.0 mΩ	
	IPD320N20N3 G $R_{DS(on)}$ =32.0 mΩ	IPB320N20N3 G $R_{DS(on)}$ =32.0 mΩ		IPP319N20NM6 [1] $R_{DS(on)}$ = 31.9 mΩ		
				IPP320N20N3 G $R_{DS(on)}$ =32.0 mΩ		
	IRFR4620TRLPBF $R_{DS(on)}$ =78.0 mΩ	IRFS4620TRLPBF $R_{DS(on)}$ =78.0 mΩ		IRFB5620PBF $R_{DS(on)}$ =72.5 mΩ		
				IRFB4020PBF $R_{DS(on)}$ =100.0 mΩ		



OptiMOS™ and StrongIRFET™ 200 V normal level

$R_{DS(on),\ max.}$ @V_{GS}=10 V [mΩ]	DirectFET™	PQFN 3.3x3.3	SuperSO8	SO8	TO-Leadless	TOLG (TO-Leaded Gullwing)
10-25			ISC119N20NM6 [1] $R_{DS(on)}$ = 11.9 mΩ		IPT067N20NM6 [1] $R_{DS(on)}$ = 6.7 mΩ	
			ISC151N20NM6 [1] $R_{DS(on)}$ = 15.1 mΩ		IPT111N20NFD $R_{DS(on)}$=11.1 mΩ	IPTG111N20NM3FD $R_{DS(on)}$ = 11.1 mΩ
			BSC220N20NSFD $R_{DS(on)}$=22.0 mΩ		IPT129N20NM6 [1] $R_{DS(on)}$ = 12.9 mΩ	
>25			BSC320N20NS3 G $R_{DS(on)}$=32.0 mΩ			
			BSC350N20NSFD $R_{DS(on)}$=35.0 mΩ			
			BSC500N20NS3G $R_{DS(on)}$=50.0 mΩ			
		ISZ520N20NM6 [1] $R_{DS(on)}$ = 52 mΩ	IRFH5020 $R_{DS(on)}$ =55.0 mΩ			
		BSZ900N20NS3 G $R_{DS(on)}$ =90.0 mΩ	BSC900N20NS3 G $R_{DS(on)}$ =90.0 mΩ	IRF7820TRPBF $R_{DS(on)}$ =78.0 mΩ		
	IRF6785TRPBF $R_{DS(on)}$ =100.0 mΩ		BSC12DN20NS3 G $R_{DS(on)}$ =125.0 mΩ			
		BSZ22DN20NS3 G $R_{DS(on)}$ =225.0 mΩ	BSC22DN20NS3 G $R_{DS(on)}$ =225.0 mΩ			

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OptiMOS™ and StrongIRFET™ 250 V normal level

$R_{DS(on),max.}$ @V_{GS}=10 V [mΩ]	TO-252 (DPAK)	TO-263 (D^2PAK)	TOLG (TO-Leaded Gullwing)	TO-220	TO-220 FullPAK	TO-247	PQFN 3.3x3.3	SuperSO8	TO-Leadless
10-25		IPB200N25N3 G $R_{DS(on)}$ =20.0 mΩ	IPTG210N25NM3FD $R_{DS(on)}$ = 21 mΩ			IRF250P224 $R_{DS(on)}$=12.0 mΩ			
				IPP220N25NFD $R_{DS(on)}$ =22.0 mΩ		IRFP4768PBF $R_{DS(on)}$ =17.5 mΩ			IPT210N25NFD $R_{DS(on)}$=21.0 mΩ
						IRF250P225 $R_{DS(on)}$=22.0 mΩ			
>25								BSC430N25NSFD $R_{DS(on)}$=43.0 mΩ	
		IRFS4229TRLPBF $R_{DS(on)}$ =48.0 mΩ		IRFB4332PBF $R_{DS(on)}$ =33.0 mΩ		IRFP4332PBF $R_{DS(on)}$ =33.0 mΩ		BSC600N25NS3 G $R_{DS(on)}$ =60.0 mΩ	
	IPD600N25N3 G $R_{DS(on)}$ =60.0 mΩ	IPB600N25N3 G $R_{DS(on)}$ =60.0 mΩ		IRFB4229PBF $R_{DS(on)}$ =46.0 mΩ				BSC670N25NSFD $R_{DS(on)}$=67.0 mΩ	
				IPP600N25N3 G $R_{DS(on)}$ =60.0 mΩ	IPA600N25NM3S $R_{DS(on)}$=60.0 mΩ	IRFP4229PBF $R_{DS(on)}$ =46.0 mΩ	BSZ16DN25NS3 G $R_{DS(on)}$ =165.0 mΩ		
							BSZ42DN25NS3 G $R_{DS(on)}$ =425.0 mΩ	BSC16DN25NS3 G $R_{DS(on)}$ =165.0 mΩ	

OptiMOS™ and StrongIRFET™ 300 V normal level



$R_{DS(on),max.}$ @V_{GS}=10 V [mΩ]	TO-263 (D^2PAK)	TO-220	TO-247	SuperSO8
0-25			IRF300P226 $R_{DS(on)}$=19.0 mΩ	
>25	IPB407N30N $R_{DS(on)}$=40.7 mΩ	IPP410N30N $R_{DS(on)}$=41.0 mΩ		
			IRF300P227 $R_{DS(on)}$ = 40 mΩ	
				BSC13DN30NSFD $R_{DS(on)}$=130.0 mΩ

Power MOSFETs complementary



Voltage [V]			PQFN 3.3x3.3	SO8
Complementary	-20/20	>50 mΩ	BSZ15DC02KD H*/** N: 55 mΩ, 5.1 A P: 150 mΩ, -3.2 A	
			BSZ215C H*/** N: 55 mΩ, 5.1 A P: 150 mΩ, -3.2 A	
	-30/30	27-64 mΩ		IRF9389 N: 27 mΩ, 6.8 A P: 64 mΩ, -4.6 A

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*Products are qualified to Automotive AEC Q101
**$R_{DS(on)}$ specified at 4.5 V

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Power P-channel MOSFETs

Automotive | DC-DC | eMobility | Motor control | Notebook | Onboard

	Voltage [V]	TO-252 (DPAK)	TO-263 (D²PAK)	TO-220	PQFN 3.3x3.3	SuperSO8	SO8	PQFN 2x2
P-channel MOSFETs	-20						BSO201SP H $R_{DS(on)}$ =7.0 mΩ	
								IRLHS2242TRPBF** $R_{DS(on)}$ =31.0 mΩ
	-30					BSC030P03NS3 G $R_{DS(on)}$ =3.0 mΩ	IRF9310 $R_{DS(on)}$ =4.6 mΩ	
		IPD042P03L3 G $R_{DS(on)}$ =4.2 mΩ				BSC060P03NS3E G $R_{DS(on)}$ =6.0 mΩ; ESD	IRF9317 $R_{DS(on)}$ =6.6 mΩ	
					BSZ086P03NS3 G $R_{DS(on)}$ =8.6 mΩ	IRFH9310 $R_{DS(on)}$ =4.6 mΩ	IRF9321 $R_{DS(on)}$ =7.2 mΩ	
		SPD50P03L G 1)* $R_{DS(on)}$ =7.0 mΩ			BSZ086P03NS3E G $R_{DS(on)}$ =8.6 mΩ			
						BSC084P03NS3 G $R_{DS(on)}$ =8.4 mΩ		
					BSZ120P03NS3 G $R_{DS(on)}$ =12.0 mΩ		BSO301SP H $R_{DS(on)}$ =8.0 mΩ	
							IRF9388TRPBF $R_{DS(on)}$ =11.9 mΩ	
							IRF9358 $R_{DS(on)}$ =16 mΩ; dual	
					BSZ180P03NS3 G $R_{DS(on)}$ =18.0 mΩ			
					BSZ180P03NS3E G $R_{DS(on)}$ =18.0 mΩ; ESD			
								IRFHS9301TRPBF $R_{DS(on)}$ =37.0 mΩ
							IRF9362 $R_{DS(on)}$ =21 mΩ; dual	
							IRF9335 $R_{DS(on)}$ =59 mΩ	
	-60	IPD380P06NM $R_{DS(on)}$ = 38 mΩ	IPB110P06LM $R_{DS(on)}$ = 11 mΩ	SPP80P06P H* $R_{DS(on)}$ =23.0 mΩ	ISZ810P06LM $R_{DS(on)}$ = 81 mΩ	ISC240P06LM $R_{DS(on)}$ = 24 mΩ		
		IPD650P06NM $R_{DS(on)}$ = 65 mΩ	SPB80P06P G* $R_{DS(on)}$ =23.0 mΩ			ISC800P06LM $R_{DS(on)}$ = 80 mΩ		
		SPD30P06P G* $R_{DS(on)}$ =75.0 mΩ						
		IPD900P06NM $R_{DS(on)}$ = 90 mΩ						
		SPD18P06P G* $R_{DS(on)}$ =130.0 mΩ						
		SPD09P06PL G* $R_{DS(on)}$ =250.0 mΩ						
		IPD25DP06NM $R_{DS(on)}$ = 250 mΩ						
		SPD08P06P G* $R_{DS(on)}$ =300.0 mΩ						
		IPD40DP06NM $R_{DS(on)}$ = 400 mΩ						
	-100	SPD15P10PL G* $R_{DS(on)}$ =200.0 mΩ	IPB320P10LM $R_{DS(on)}$ = 32 mΩ		ISZ24DP10LM $R_{DS(on)}$ = 245 mΩ	ISC750P10LM $R_{DS(on)}$ =75 mΩ		
		SPD15P10P G* $R_{DS(on)}$ =240.0 mΩ	IPB330P10NM $R_{DS(on)}$ = 33 mΩ	IPP330P10NM $R_{DS(on)}$ =33 mΩ				
		SPD04P10PL G* $R_{DS(on)}$ =850.0 mΩ	IPB19DP10NM $R_{DS(on)}$ = 185 mΩ					
		IPD11DP10NM $R_{DS(on)}$ =111 mΩ						
		IPD18DP10LM $R_{DS(on)}$ = 178 mΩ						
		IPD19DP10NM $R_{DS(on)}$ = 186 mΩ						
	-150	IPD42DP15LM $R_{DS(on)}$ = 420 mΩ	IPB720P15LM $R_{DS(on)}$ = 72 mΩ		ISZ56DP15LM $R_{DS(on)}$ = 560 mΩ	ISC16DP15LM $R_{DS(on)}$ = 160 mΩ		
					ISZ75DP15LM $R_{DS(on)}$ = 750 mΩ			
					ISZ15EP15LM $R_{DS(on)}$ = 1500 mΩ			

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** $R_{DS(on)}$ specified at 4.5 V
1) 5-leg

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Small-signal/small-power N-channel

Automotive · Consumer · DC-DC · eMobility · Industrial drives · Motor control · Notebook · Onboard · Telecom

	Voltage [V]	SOT-223	TSOP-6	SOT-89	SC59	SOT-23	SOT-323	SOT-363
N-channel	20 V		BSL202SN [4] 36 mΩ, 7.5 A, SLL		BSR802N [5] 32 mΩ, 3.7 A, ULL		BSS816NW [5] 240 mΩ, 1.4 A, ULL	BSD214SN [4] 250 mΩ, 1.5 A, SLL
			IRLMS2002 [1] [4] 45 mΩ, 6.5 A, SLL		BSR202N [4] 33 mΩ, 3.8 A, SLL	IRLML6244 [1] [4] 27 mΩ, 6.3 A, SLL	BSS214NW [4] 250 mΩ, 1.5 A, SLL	BSD840N [5] 560 mΩ, 0.88 A, ULL, dual
			BSL806N [5] 82 mΩ, 2.3 A, ULL, dual			IRLML6246 [1] [4] 66 mΩ, 4.1 A, SLL		BSD235N [4] 600 mΩ, 0.95 A, SLL, dual
						IRLML2502 [1] [4] 80 mΩ, 4.2 A, SLL		
						BSS806N [5] 82 mΩ, 2.3 A, ULL		
						BSS806NE [5] 82 mΩ, 2.3 A, ULL, ESD		
						BSS205N [4] 85 mΩ, 2.5 A, SLL		
						BSS214N [4] 250 mΩ, 1.5 A, SLL		
	25 V					IRFML8244 [1] [3] 41 mΩ, 5.8 A, LL		
	30 V		IRLTS6342 [1] [4] 22 mΩ, 8.3 A, SLL			IRLML6344 [1] [4] 37 mΩ, 5.0 A, SLL		BSD316SN [3] 280 mΩ, 1.4 A, LL
			IRFTS8342 [1] [3] 29 mΩ, 8.2 A, LL			IRLML0030 [1] [3] 40 mΩ, 5.3 A, LL		
			IRLMS1503 [1] [3] 200 mΩ, 3.2A, LL			IRLML6346 [1] [4] 80 mΩ, 3.4 A, SLL		
						BSS306N [3] 93 mΩ, 2.3 A, LL		
						IRLML2030 [1] [3] 154 mΩ, 2.7 A, LL		
						BSS316N [3] 280 mΩ, 1.4 A, LL		
						IRLML2803 [3] 400 mΩ, 1.2 A, LL		
	40 V					IRLML0040 [1] [3] 78 mΩ, 3.6 A, LL		
	55 V	IRFL024Z [1] [2] 57.5 mΩ, 5.1 A, NL				BSS670S2L [3] 825 mΩ, 0.54 A, LL		
		IRLL2705 [1] [3] 65 mΩ, 3.8 A, LL						
		IRFL4105 [1] [2] 45 mΩ, 3.7 A, NL						
		IRLL024N [1] [3] 100 mΩ, 3.5 A, LL						
		IRLL014N [1] [3] 280 mΩ, 2.0 A, LL						
		IRFL014N [1] [2] 160 mΩ, 1.9 A, NL						
	60 V	BSP295 [3] 500 mΩ, 1.8 A, LL	BSL606SN [3] 95 mΩ, 4.5 A, LL	BSS606N [3] 90 mΩ, 3.2 A, LL		IRLML0060 [1] [3] 116 mΩ, 2.7 A, LL	BSS138W [3] 4 Ω, 0.28 A, LL	2N7002DW [3] 4 Ω, 0.3 A, LL, dual
						IRLML2060 [1] [3] 640 mΩ, 1.2 A, LL	SN7002W [3] 7.5 Ω, 0.23 A, LL	
						2N7002 [1] [3] 4 Ω, 0.3 A, LL		
						BSS138I [1] [3] 4 Ω, 0.23 A, LL		
						BSS138N [3] 4 Ω, 0.23 A, LL		
						SN7002I [1] [3] 7.5 Ω, 0.2 A, LL		
						SN7002N [3] 7.5 Ω, 0.2 A, LL		
						BSS159N [6] 8 Ω, 0.13 A, depletion		
	100 V	BSP373N [2] 240 mΩ, 1.8 A, NL				IRLML0100 235 mΩ, 1.6 A, LL		
		BSP372N [3] 270 mΩ, 1.8 A, LL				BSS119N [3] 10 Ω, 0.19 A, LL		
		BSP296N [3] 800 mΩ, 1.2 A, LL				BSS123I [1] [3] 10 Ω 0.19 A, LL		
						BSS123N [3] 10 Ω 0.19 A, LL		
						BSS169I [1] [6] 12 Ω, 0.09 A, depletion		
						BSS169 [6] 12 Ω, 0.09 A, depletion		
	150 V	IRFL4315 [1] [2] 185 mΩ, 2.6 A, NL	IRF5802 [1] [2] 1.2 Ω, 0.9 A, NL					
	200 V	BSP297 [3] 3 Ω, 0.66 A, LL	IRF5801 [1] [2] 2.2Ω, 0.6 A, NL					
		BSP149 [6] 3.5 Ω, 0.14 A, LL, depletion						
	240 V	BSP88 [3] 7.5 Ω, 0.35 A, LL		BSS87 [3] 7.5 Ω, 0.26 A, LL		BSS131 [3] 20 Ω, 0.11 A, LL		
		BSP89 [3] 7.5 Ω, 0.35 A, LL						
		BSP129 [6] 20 Ω, 0.05 A, LL, depletion						
	250 V					BSS139I [1] [6] 30 Ω, 0.10 A, LL, depletion		
						BSS139 [6] 30 Ω, 0.10 A, LL, depletion		
	400 V	BSP324 [3] 22 Ω, 0.17 A, LL						
	600 V	BSP125 [3] 60 Ω, 0.12 A, LL		BSS225 [3] 45 Ω, 0.09 A, LL		BSS127I [1] [3] 600 Ω, 0.021 A, LL		
		BSP135I [1] [6] 60 Ω, 0.02 A, LL, depletion				BSS127 [3] 600 Ω, 0.021 A, LL		
		BSP135 [6] 60 Ω, 0.02 A, LL, depletion				BSS126I [1] [6] 700 Ω, 0.021 A, LL, depletion		
						BSS126 [6] 700 Ω, 0.021 A, LL, depletion		

www.infineon.com/smallsignal

1) not qualified to Automotive AEC-Q101
2) $R_{DS(on)}$ specified at 10 V
3) $R_{DS(on)}$ specified at 4.5 V
4) $R_{DS(on)}$ specified at 2.5 V
5) $R_{DS(on)}$ specified at 1.8 V
6) $R_{DS(on)}$ specified at 0 V

For more details on the product, click on the part number, visit infineon.com or contact our product support.

Small-signal/small-power P-channel

Automotive · Consumer · DC-DC · eMobility · Industrial drives · Notebook · Onboard

Voltage [V]		SOT-223	TSOP-6	SOT-89	SC59	SOT-23	SOT-323	SOT-363
P-channel MOSFETs	-250 V	BSP317P [3] 5 Ω, -0.43 A, LL		BSS192P [3] 15 Ω, -0.19 A, LL	BSR92P [3] 13 Ω, -0.14 A, LL			
		BSP92P [3] 15 Ω, -0.26 A, LL						
	-150 V	ISP14EP15LM [1] [3] 1.4 Ω, -1.29 A, LL						
	-100 V				BSR316P [3] 2.2 Ω, -0.36 A, LL			
		BSP322P [3] 1 Ω, -1.0 A, LL						
		BSP316P [3] 2.3 Ω, -0.68 A, LL						
		ISP16DP10LM [1] [3] 190 mΩ, -3.9 A, LL						
		ISP98DP10LM [1] [3] 1.05 Ω, -1.55 A, LL						
		ISP20EP10LM [1] [3] 2.2 Ω, -0.99 A, LL						
	-60 V	ISP650P06NM [1] [2] 65 mΩ, -3.7 A, NL			BSR315P [3] 1.3 Ω, -0.62 A, LL	ISS17EP06LM [1] [3] 2.2 Ω, -0.3 A, LL	BSS84PW [3] 12 Ω, -0.15 A, LL	
		ISP12DP06NM [1] [2] 125 mΩ, -2.8 A, NL						
		ISP13DP06NMS [1] [2] 125 mΩ, -2.8 A, NL				BSS83P [3] 3 Ω, -0.33 A, LL		
		BSP613P [2] 130 mΩ, -2.9 A, NL				ISS55EP06LM [1] [3] 7 Ω, -0.18 A, LL		
		ISP25DP06NM [1] [2] 250 mΩ, -1.9 A, NL				BSS84P [3] 12 Ω, -0.17 A, LL		
		ISP26DP06NMS [1] [2] 260 mΩ, -1.9 A, NL						
		BSP170P [2] 300 mΩ, -1.9 A, NL						
		ISP25DP06LM [1] [3] 310 mΩ, -1.9 A, LL						
		ISP25DP06LMS [1] [3] 310 mΩ, -1.9 A, LL						
		BSP171P [3] 450 mΩ, -1.9 A, LL						
		ISP75DP06LM [1] [3] 1 Ω, -1.1 A, LL						
		BSP315P [3] 1.4 Ω, -1.17 A, LL						
	-40 V		IRF5803 [1] [2] 112 mΩ, -3.4 A, NL					
	-30 V		IRFTS9342 [1] [2] 40 mΩ, -5.8 A, NL			IRLML9301 [1] [3] 103 mΩ, -1.3 A, LL		
			BSL307SP [3] 74 mΩ, -5.5 A, LL			BSS308PE [3] 130 mΩ, -2.1 A, LL, ESD		
			BSL308PE [3] 130 mΩ, -2.1 A, LL, dual, ESD			IRLML5203 [1] [3] 165 mΩ, -3.0 A, LL		
						BSS314PE [3] 230 mΩ, -1.5 A, LL, ESD		
						BSS315P [3] 270 mΩ, -1.5 A, LL		
						IRLML9303 [1] [4] 270 mΩ, -2.3 A, LL		
						IRLML5103 [1] [3] 1000 mΩ, -0.76A, LL		
	-20 V		BSL207SP [4] 41 mΩ, -6.0 A, SLL			IRLML2244 [1] [4] 95 mΩ, -4.3 A, SLL	BSS209PW [4] 900 mΩ, -0.58 A, SLL	BSV236SP [4] 285 mΩ, -1.5 A, SLL
			IRLTS2242 [1] [4] 55 mΩ, -6.9 A, SLL			IRLML6402 [1] [4] 135 mΩ, -3.7 A, SLL	BSS223PW [4] 2.1 Ω, -0.39 A, SLL	BSD223P [4] 2.1 Ω, -0.39 A, SLL, dual
			IRLMS6802 [1] [4] 100 mΩ, -5.6 A, SLL			IRLML2246 [1] [4] 236 mΩ, -2.6 A, SLL		
			BSL211SP [4] 110 mΩ, -4.7 A, SLL			BSS215P [4] 280 mΩ, -1.5 A, SLL		
	-12 V					IRLML6401 [4] 125 mΩ, -4.3 A, ULL		

Small-signal/small-power complementary

Automotive · Consumer · DC-DC · Industrial drives · Notebook · Onboard

Voltage [V]		TSOP-6	SOT-363
Complementary	-20/20	BSL215C [4] N: 250 mΩ, 1.5 A, SLL P: 280 mΩ, -1.5 A, SLL	BSD235C [4] N: 600 mΩ, 0.95 A, SLL P: 2.1 Ω, -0.53 A, SLL
	-30/30	BSL308C [3] N: 93 mΩ, 2.3 A, LL P: 130 mΩ, -2.0 A, LL	
		BSL316C [3] N: 280 mΩ, 1.4 A, LL P: 270 mΩ, -1.5 A, LL	

www.infineon.com/smallsignal **www.infineon.com/small power**

1) not qualified to Automotive AEC-Q101
2) $R_{DS(on)}$ specified at 10 V
3) $R_{DS(on)}$ specified at 4.5 V
4) $R_{DS(on)}$ specified at 2.5 V
5) $R_{DS(on)}$ specified at 1.8 V
6) $R_{DS(on)}$ specified at 0 V

For more details on the product, click on the part number, visit infineon.com or contact our product support.

Nomenclature

OptiMOS™



Package type
BSB = DirectFET™ (M Can)
BSC = SuperSO8
BSF = DirectFET™ (S Can)
BSK = PQFN 2x2
BSO = SO-8
BSZ = PQFN 3.3x3.3
IPA = FullPAK
SPB/IPB = D²PAK
IPC = Chip product
SPD/IPD = DPAK
IPI = I²PAK
SPP/IPP = TO-220
IPS = IPAK Short Leads
IPT = TO-Leadless

$R_{DS(on)}$ [mΩ]
Divide by 10 to get $R_{DS(on)}$ value e.g. 014 = 1.4 mΩ

However, if the sixth character is a C, the fourth and the fifth character indicate the $R_{DS(on)}$
e.g. 12C = 12 mΩ
For chip products chip area in mm² multiplied by 10

N = N-channel
P = P-channel
C = Complementary

Breakdown voltage [V]
Multiply by 10 to get voltage class e.g. 03 = 30 V
E = Extended, +5 V, e.g. E2 = 25 V

RoHS compliant

Features
F = Fast switching
R = Integrated gate resistor
E = ESD protection
A = Qualified according to Automotive AEC Q101

3 = Technology generation
I = Monolithically-integrated Schottky-like diode
FD = Fast diode
LF = Linear mode capability

Package options
SO-8/SuperSO8/PQFN 3.3x3.3/PQFN 2x2
S = Single chip
D = Dual chip

DirectFET™
X = MX footprint
N = MN footprint
Z = MZ footprint
Q = SQ footprint
T = ST footprint
H = SH footprint
J = SJ footprint

Level

		to be used from V_{GS}
N = Normal level	(NL)	10.0
M = Logic level 5 V opt.	(LL)	4.5
L = Logic level	(ELL)	4.5
K = Super logic level	(SLL)	2.5
J = Ultra logic level	(ULL)	1.8

OptiMOS™ 30 V



Package type

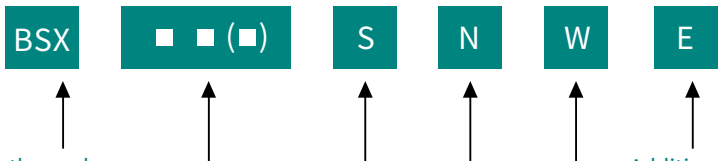
Consecutive number
without any correlation to product specification

Channels
N = N-channel
P = P-channel

I = Monolithically-integrated Schottky-like diode

D = Dual
E = ESD
S = Single

Small signal



"X" indicates the package
D = SOT-363
P = SOT-223
R = SC59
S = SOT-89, SOT-23, SOT-323
L = TSOP-6

2-3 digits product identifier
meaning dependent on
product generation

Only present in following case
S = Single (only for packages which
are also used for multichip products)

Additional features
E = ESD-protected MOSFET

Only present in following case
W= to distinguish SOT-323 from SOT-23

Polarity
N = N-channel
P = P-channel
C = Complementary
(N-ch + P-ch)

StrongIRFET™ (from May 2015 to 2019)



3 sequential digits
3 digits issued sequentially

Drive voltage
F = 4.5 V_{GS} capable for BV ≤ 30 V
L = 2.5 V_{GS} capable for BV ≤ 30 V, 4.5 V_{GS} capable for BV ≥ 40 V

2 to 3 digit voltage
For example:
25 = 25 V
135 = 135 V

Package
1 or 2 letters
B = TO-220
BA = Super220
C = Bare die or wafer
DL = DirectFET™ 1.5 Large Can
DM = DirectFET™ 1.5 Medium Can
Can DS = DirectFET™ 1.5 Small Can
Can FF = TO-220 FullPAK
H = PQFN 5x6
HB = Power Block 5x6
HM = PQFN 3.0x3.0 or 3.3x3.3
HS = PQFN 2x2
I = TO-220 FullPAK
K = SO-8
L = SOT-223
ML = SOT-23
P = TO-247
PS = Super247
R = DPAK
S = D^2PAK
SL = TO-262
SA = D2 7-pin with pin 2 void
SN = D2 7-pin with pins void
SC = D2 7-pin with pin 4 void
T = TollFET
TS = TSOP-6
U = IPAK

New nomenclature for OptiMOS™ and StrongIRFET™ MOSFETs (2019 onward)

I	SC	010	N	25	L	I

Infineon

Package type
SC = SuperSO8
SD = SOT-363
SL = TSOP-6
SK = PQFN 2x2
SA = SO8
SP = SOT-223
SQ = CE2
SR = SC59
SS = SOT-89, SOT-23, SOT-323
ST = sTOLL
SZ = PQFN 3.3x3.3
PA = TO-220 FullPAK
PB = D²PAK
PC = Chip Product
PD = DPAK
IPF = D²PAK-7-pin
PI = I²PAK
PP = TO-220
PS = IPAK Short Leads
PT = TO-Leadless
PW = TO-247
QA = PQFN 5x6
QB = PQFN 3x2
QC = PQFN 3x5
QD = PQFN 5x6 Source-Down
QE = PQFN 3.3x3.3 Source-Down
WS = DirectFET™ (S)
WM = DirectFET™ (M)
WL = DirectFET™ (L)
QF = PQFN 8x6

$R_{DS(on)}$ [mΩ]
Divide by 10 to get $R_{DS(on)}$ value
e.g. 012 = 1.2 mΩ

However, if the sixth character is D or E the fourth and the fifth characters indicate the $R_{DS(on)}$ e.g.
12D = 120 mΩ
12E = 1200 mΩ
For chip products chip area in mm² multiplied by 10

Version
N = N-channel
P = P-channel
C = Complementary
G = GaN

M|F = Product brand – family
(M = OptiMOS™, F = StrongIRFET™)

Features
D = Dual
H = Half-bridge
3 = Marketing generation with branding strategy
CG = Center gate
E = ESD protection
F = Fast switching
FD = Fast diode
SC = Dual-side cooling
I = Monolithically-integrated Schottky-like diode
LF = Linear mode
R = Integrated gate resistor

Last letter – requirement category:
A = Qualified according to AECQ 101
S = Standard
None = Industrial

Level to be used for V_{GS}

N = Normal level	(NL)	10.0 V
L = Logic level	(LL)	4.5 V
M = Logic level 5 V opt.	(ELL)	4.5 V
K = Super logic level	(SLL)	2.5 V
J = Ultra logic level	(ULL)	1.8 V

Breakdown voltage [V]
Divide by 10
e.g. E2 = 25 V
10 = 100 V
25 = 250 V



Infineon support for low voltage MOSFETs

Useful links and helpful information

Further information, data sheets and documents
www.infineon.com/powermosfet-12V-300V
www.infineon.com/smallsignal
www.infineon.com/pchannel
www.infineon.com/depletion
www.infineon.com/complementary

MOSFET Cross Reference
www.infineon.com/cms/en/product/search/cross-reference

Evaluation boards and simulation models
www.infineon.com/powermosfet-simulationmodels

Die support
www.infineon.com/baredie

MOSFET Community
community.infineon.com/t5/Power-MOSFET/bd-p/MOSFET

For more information regarding StrongIRFET™ and OptiMOS™ power MOSFET bare die products, please contact the Infineon Service Center or your local sales counterpart.

Support | Evaluation board | Tools | Simulation



500-950 V MOSFETs

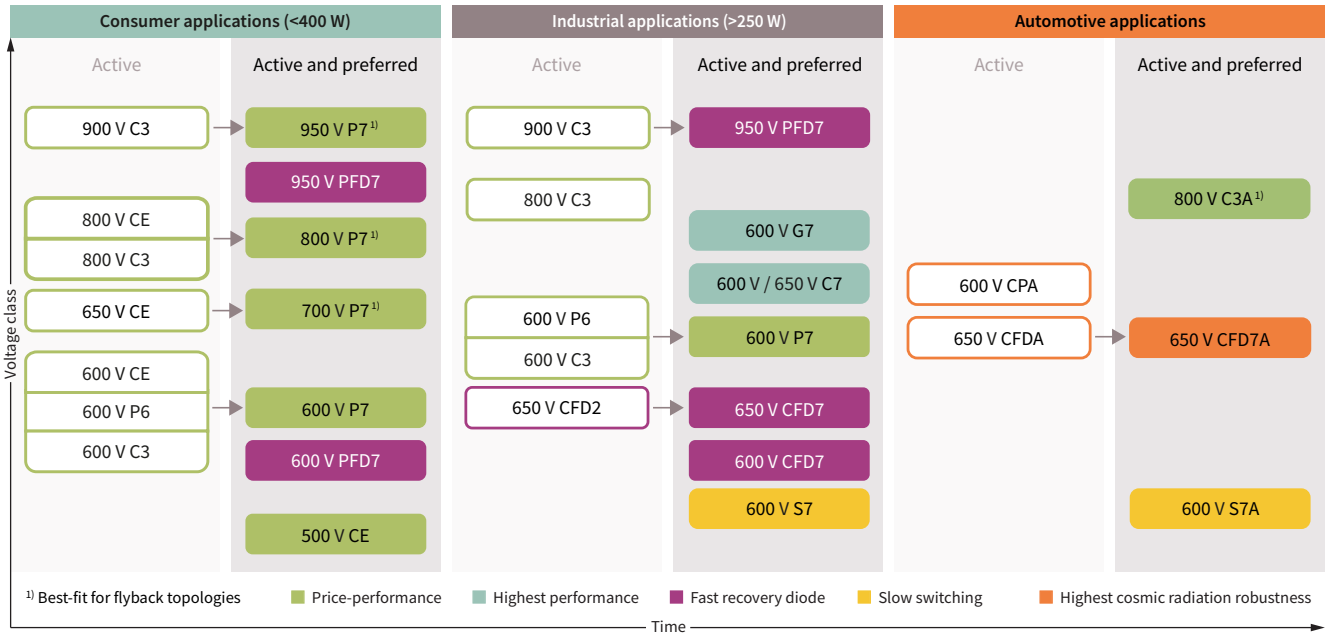
- CoolMOS™ SJ MOSFETs
- 950 V CoolMOS™ P7 SJ MOSFETs
- 950 V CoolMOS™ PFD7 SJ MOSFETs
- 800 V CoolMOS™ P7 SJ MOSFETs
- 700 V CoolMOS™ P7 SJ MOSFETs
- 600 V CoolMOS™ P7 SJ MOSFETs
- 600 V CoolMOS™ PFD7 SJ MOSFETs
- 600 V and 650 V CoolMOS™ C7 and 600 V C7 Gold (G7) SJ MOSFETs
- 600 V CoolMOS™ S7 SJ MOSFETs
- 600 V CoolMOS™ CFD7 SJ MOSFETs
- 650 V CoolMOS™ CFD7 SJ MOSFETs
- CoolMOS™ CE SJ MOSFETs
- CoolMOS™ SJ MOSFETs for automotive
- CoolMOS™ SJ MOSFET package innovations
- 500-950 V MOSFETs product portfolio
- 500-950 V MOSFETs nomenclature

CoolMOS™ SJ MOSFETs

Trusted leader in high-voltage MOSFETs

Infineon's CoolMOS™ products offer a significant reduction of conduction, switching and driving losses, and enable high power density as well as efficiency for superior power conversion systems.

CoolMOS™ SJ MOSFETS overview*



CoolMOS™ low power package innovations
Click to learn more

CoolMOS™ high power package innovations
Click to learn more

High-voltage superjunction MOSFETs address consumer applications, such as home appliance drives, smartphone/tablet chargers, notebook adapters, LED lighting, PC power, as well as audio and TV power supplies. Customers are increasingly replacing standard MOSFETs with superjunction MOSFETs to benefit from higher efficiency and lower power consumption for end users. CoolMOS™ P7 sets a benchmark by offering high performance and competitive price all at once. The CoolMOS™ PFD7 series is a state-of-the-art solution for high density chargers/adapters, lighting applications as well as home appliance drives (e.g., refrigerator compressors).

Also for industrial applications such as server, telecom, PC power, solar, ESS, UPS, EV-charging and others, Infineon's CoolMOS™ 7 superjunction MOSFETs with the C7, G7, CFD7, P7 and S7 product families offer what you need - from highest efficiency to best price performance. The S7 product family specifically addresses slow switching applications such as solid state relay and solid state circuit breaker offering the best-in-class $R_{DS(on)}$ within the industry. Complementary to the silicon CoolMOS™ portfolio, Infineon offers a broad wide bandgap (WBG) portfolio of CoolGaN™ GIT HEMTs, CoolGaN™ IPS and CoolSiC™ MOSFETs to further optimize efficiency and system cost (see Wide bandgap semiconductors).

Infineon's industrial- and consumer-qualified CoolMOS™ superjunction MOSFET offering is complemented by the automotive-qualified series 600 V CPA, 650 V CFDA, 800 V C3A and the latest 650 V CFD7A as well as 600 V S7A. Infineon's excellent-performing automotive series address on-board chargers, DC-DC converters, active pre-charge and discharge function, insulation monitor, HV eFuse, and HV eDisconnect with proven outstanding quality standards going well beyond the AEC-Q101, supporting customers to gain momentum in the rapidly growing xEV market.

www.infineon.com/coolmos

* Subject to change and exceptions possible.
For more details on product status check out the individual product pages online.

For more details on the product, click on the part number, visit infineon.com or contact our product support.

950 V CoolMOS™ PFD7 SJ MOSFETs

Perfect fit for soft- and hard-switching topologies

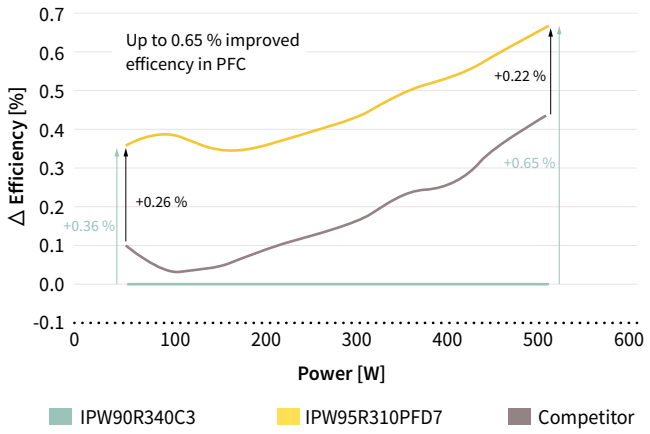
The 950 V CoolMOS™ PFD7 is a revolutionary superjunction technology for high-voltage power MOSFETs, with an integrated fast body diode to address lighting and industrial SMPS applications. The new series is tailor-made for usage across several topologies, such as PFC, LLC, and flyback.

Features and benefits

Key features
– Integrated ultra-fast body diode with BiC Q_{rr}
– Best-in-class FOM $R_{DS(on)}$ x E_{oss}; reduced Q_G, C_{iss} and C_{oss}
– BiC $R_{DS(on)}$ in various packages like 450 mΩ in DPAK and 60 mΩ in TO-247
– $V_{(GS)th}$ of 3 V and smallest $V_{(GS)th}$ variation of ±0.5 V
– ESD protection up to class 2 (HBM)
– Offering the highest quality and reliability
– Price competitiveness over previous CoolMOS™ families

Key benefits
– Hard commutation ruggedness that enables the usage of PFD7 in different circuit topologies
– Improved efficiency and thermal behavior over internal and external comparable products
– Enabling higher power density designs and BOM savings
– Easy to drive and design-in
– Improved production yield by reducing ESD-related failures and reduced field returns
– Cost-competitive designs with superjunction

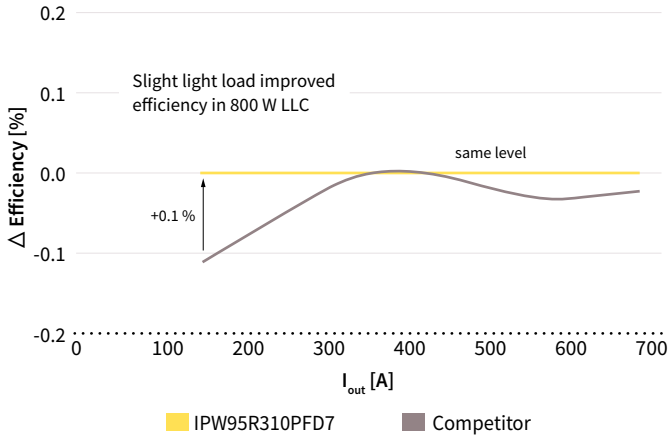
Efficieny measurements for 310 mΩ devices at 90 V_{AC} ($R_{g,ext}$ = 10 Ω)



950 V CoolMOS™ PFD7 outperforms previous CoolMOS™ families as well as the main competition concerning PFC efficiency:

- Improvement of 0.26 percent in light-load and 0.22 percent in full-load efficiency compared to the main competition
- Improvement of 0.36 percent in light-load and 0.65 percent in full-load efficiency compared to 900 V CoolMOS™ C3

Efficieny measurements for 310 mΩ in 880 W ZVS FB set up



950 V CoolMOS™ PFD7 closes the gap and matches the performance of the main competition regarding LLC efficiency:

- Improvement of 0.1 percent in light-load efficiency compared to the main competition

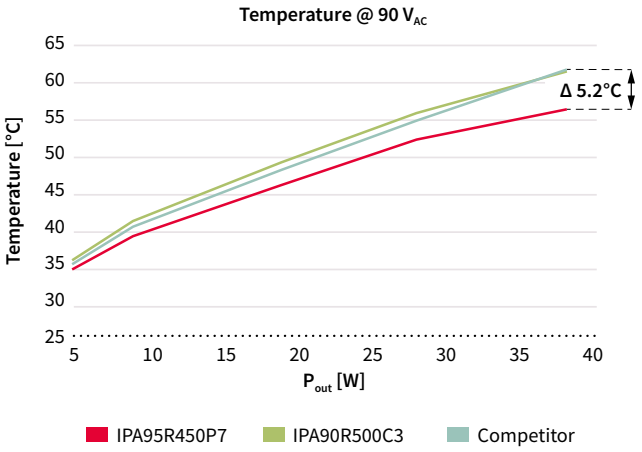
www.infineon.com/950v-pfd7

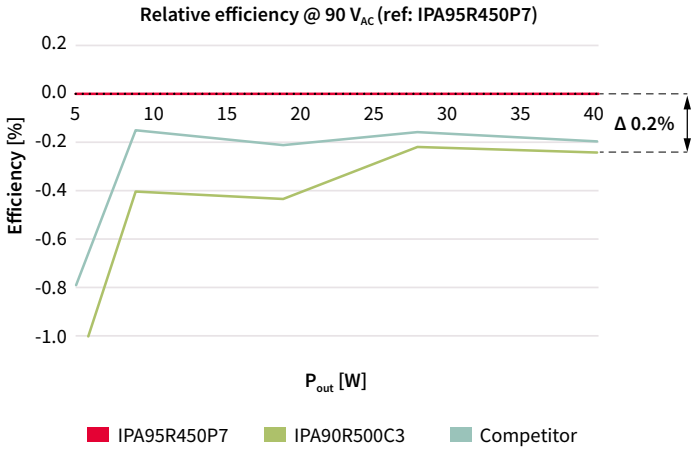
For more details on the product, click on the part number, visit infineon.com or contact our product support.

950 V CoolMOS™ P7 SJ MOSFETs

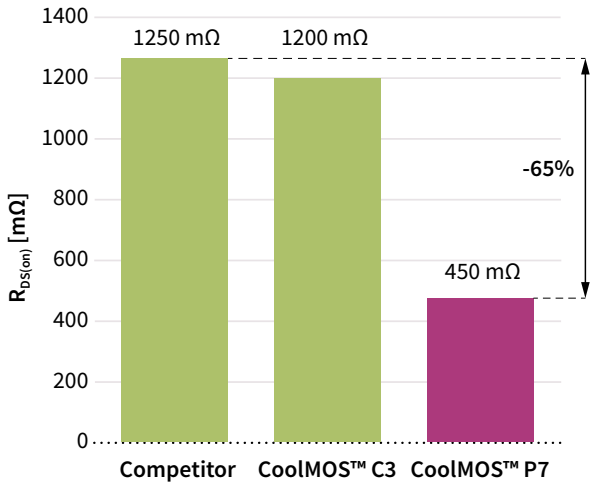
Perfect fit for PFC and flyback topologies

Designed to meet the growing consumer needs in the high-voltage MOSFETs arena, the 950 V CoolMOS™ P7 technology focuses on the low-power SMPS market. The P7 family addresses applications ranging from lighting, smart meter, mobile phone charger, notebook adapter, to AUX power supply and industrial SMPS. Offering 50 V more blocking voltage than its predecessor 900 V CoolMOS™ C3, the 950 V CoolMOS™ P7 series delivers outstanding performance in terms of efficiency, thermal behavior, and ease of use. As all other P7 family members, the 950 V CoolMOS™ P7 series comes with an integrated Zener diode ESD protection. The integrated diode considerably improves ESD robustness, thus reducing ESD-related yield loss and reaching exceptional ease-of-use levels. CoolMOS™ P7 is developed with a best-in-class threshold voltage ($V_{GS(th)}$) of 3 V and a narrow tolerance of only ± 0.5 V, which makes it easy to drive and design-in.





Compared to competition, the 950 V CoolMOS™ P7 delivers best-in-class efficiency and thermal performance. Plug-and-play at 90 V_{AC} in a 40 W adapter reference design, featuring the snubberless concept, demonstrates excellent efficiency gains of up to 0.2 percent and lower MOSFET temperature of up to 5.2°C compared to similar competitor technology. With over 20 years of experience in superjunction technology, Infineon introduces 950 V CoolMOS™ P7 with best-in-class DPAK on-resistance ($R_{DS(on)}$). This SMD device comes with the $R_{DS(on)}$ of 450 mΩ - more than 60 percent lower $R_{DS(on)}$ compared to the nearest competitor. Such low $R_{DS(on)}$ value enables higher density designs while decreasing BOM and assembly cost.



Best-in-class DPAK $R_{DS(on)}$

Customer benefits:

- Possible change from leaded to SMD packages
- High power density
- Lower BOM cost
- Lower production cost

Lighting · Smart metering · Charger · Adapter · AUX power · Industrial SMPS

www.infineon.com/950v-p7

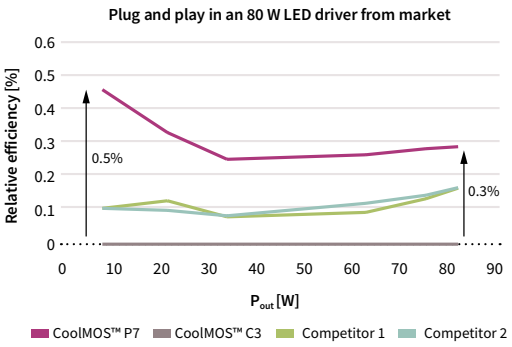
For more details on the product, click on the part number, visit infineon.com or contact our product support.

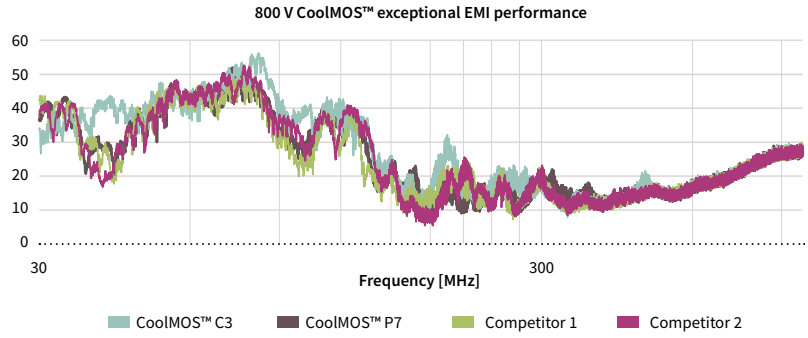
800 V CoolMOS™ P7 SJ MOSFETs

A benchmark in efficiency and thermal performance

With the 800 V CoolMOS™ P7 series, Infineon sets a benchmark in 800 V superjunction technologies and combines best-in-class performance with the remarkable ease of use. This product family is a perfect fit for flyback-based consumer and industrial SMPS applications. In addition, it is also suitable for PFC stages within consumer, as well as solar applications, fully covering the market needs in terms of its price/performance ratio.

The technology offers fully optimized key parameters to deliver best-in-class efficiency as well as thermal performance. As demonstrated on an 80 W LED driver, bought on the market, the >45 percent reduction in switching losses (E_{oss}) and output capacitance (C_{oss}) as well as the significant improvement in input capacitance (C_{iss}) and gate charge (Q_G), compared to competitor technologies, lead to 0.5 percent higher efficiency at light load which helps to reduce standby power in the end application. At full load, the observed improvement is up to 0.3 percent higher efficiency and 6°C lower device temperature.

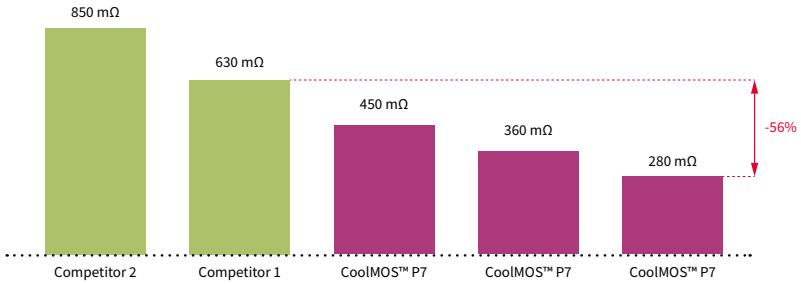




EMI is a system level topic, and the optimization needs to be done on the system level only. Nevertheless, a pure plug-and-play measurement on Infineon's 45 W adapter reveals that 800 V CoolMOS™ P7 shows similar EMI performance to Infineon's previous technologies as well as to competitors' technologies.

Compared to competition, the 800 V CoolMOS™ P7 technology allows to integrate much lower $R_{DS(on)}$ values into small packages, such as a DPAK. This finally enables high power density designs at highly competitive price levels.

Overview of lowest DPAK $R_{DS(on)}$ for 800 V superjunction MOSFET



CoolMOS™ P7 sets a new benchmark in best-in-class DPAK $R_{DS(on)}$

Customer benefits:

- High power density
- Lower BOM cost
- Lower production cost

The complete P7 platform has been developed with an integrated Zener diode that is used as an electrostatic discharge (ESD) protection mechanism, which increases the overall device ruggedness up to human body model (HBM) class 2 level.

Adapter · Lighting · Audio · Industrial SMPS · AUX power

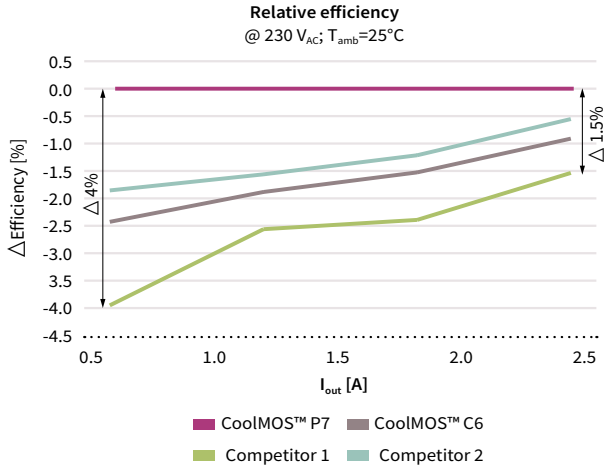
www.infineon.com/800V-p7

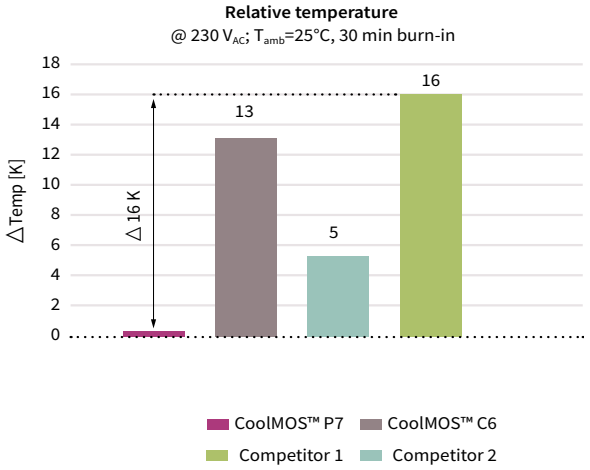
For more details on the product, click on the part number, visit infineon.com or contact our product support.

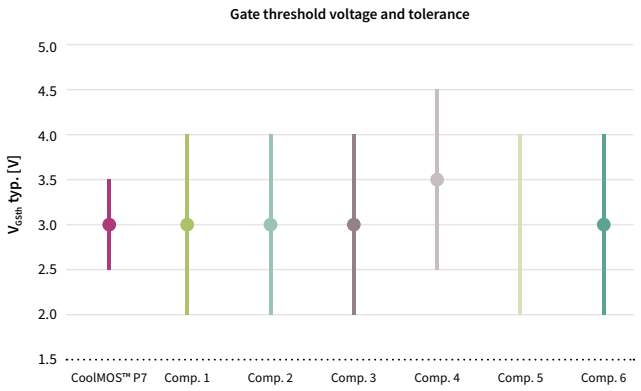
700 V CoolMOS™ P7 SJ MOSFETs

Infineon's solution for flyback topologies

The 700 V CoolMOS™ P7 family has been developed to serve today's and, especially, tomorrow's trends in flyback topologies. The products address the low-power SMPS market, mainly focusing on mobile phone chargers and notebook adapters, but are also suitable for power supplies, used within lighting applications, home entertainment (TV, game consoles or audio), and auxiliary power supplies. 700 V CoolMOS™ P7 achieves outstanding efficiency gains of up to 4 percent and a decrease in device temperature of up to 16 K compared to the competition. In contrast with the previous 650 V CoolMOS™ C6 technology, 700 V CoolMOS™ P7 offers 2.4 percent gain in efficiency and 12 K lower device temperature, measured at a flyback-based charger application, operated at 140 kHz switching speed.







Keeping the ease of use in mind, Infineon has developed the technology with a low threshold voltage ($V_{GS(th)}$) of 3 V and a very narrow tolerance of ±0.5 V. This makes the CoolMOS™ P7 easy to design-in and enables the usage of lower gate source voltage, which facilitates its driving and leads to lower idle losses. To increase the ESD ruggedness up to HBM class 2 level, 700 V CoolMOS™ P7 has an integrated Zener diode. This helps to support increased assembly yield, leads to reduction of production related failures and, finally, manufacturing cost savings on customer side.

Features and benefits

Key features
– Highly performant technology - Low switching losses (E_{oss}) - Highly efficient - Excellent thermal behavior
– Allowing high-speed switching
– Integrated protection Zener diode
– Optimized $V_{GS(th)}$ of 3 V with very narrow tolerance of ±0.5 V
– Finely graduated portfolio

Key benefits
– Cost-competitive technology
– Further efficiency gain at higher switching speed
– Supporting less magnetic size with lower BOM costs
– High ESD ruggedness up to HBM class 2 level
– Easy to drive and design-in
– Enabler for smaller form factors and high power density designs
– Excellent choice in selecting the best-fitting product

Charger Adapter TV Lighting Audio AUX power

www.infineon.com/700V-p7

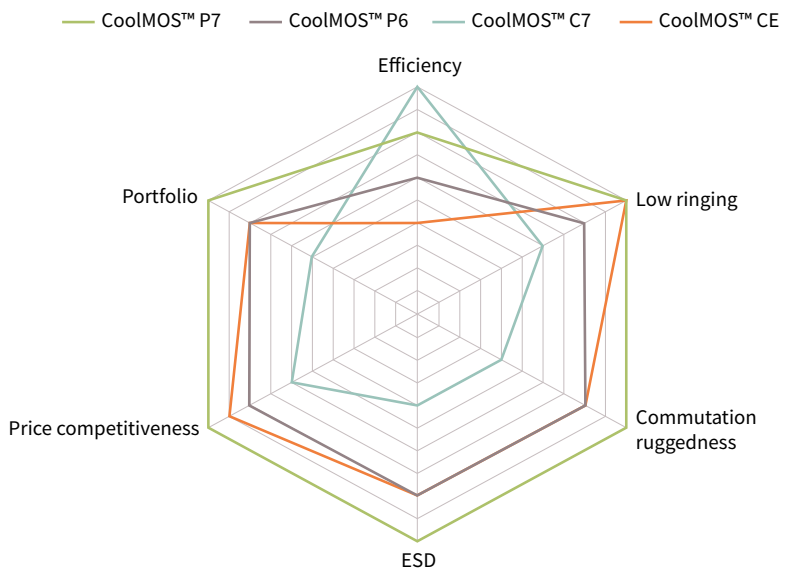
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600 V CoolMOS™ P7 SJ MOSFETs

Perfect combination of high efficiency and ease of use

The 600 V CoolMOS™ P7 is a general purpose series, targeting a broad variety of applications, ranging from low-power SMPS up to the highest power levels. In the low-power arena, it is the successor of the 600 V CoolMOS™ CE, and for high-power SPMS applications, it is the replacement for the 600 V CoolMOS™ P6, which makes it the perfect choice for applications such as chargers, adapters, lighting, TV and PC power supplies, solar, small light electric vehicles, server and telecom power supplies, and electric vehicle (EV) charging.

The 600 V CoolMOS™ P7 is Infineon's most well-balanced CoolMOS™ technology in terms of combining ease of use and excellent efficiency performance. Compared to its predecessors, it offers higher efficiency and improved power density due to the significantly reduced gate charge (Q_G) and switching losses (E_{OSS}) levels, as well as optimized on-state resistance ($R_{DS(on)}$). The carefully selected integrated gate resistors enable very low ringing tendency and, thanks to its outstanding robustness of body diode against hard commutation, it is suitable for hard as well as soft-switching topologies, such as LLC. In addition, an excellent ESD capability helps to improve the quality in manufacturing. The 600 V CoolMOS™ P7 family offers a wide range of on-resistance ($R_{DS(on)}$)/package combinations, including THD, as well as SMD devices, at an $R_{DS(on)}$ granularity from 24 to 600 mΩ and comes along with the most competitive price/performance ratio of all 600 V CoolMOS™ offerings.



Features and benefits

Key features	Key benefits
– Suitable for hard and soft switching (PFC and LLC) due to an outstanding commutation ruggedness	– Ease of use and fast design-in through low ringing tendency and usage across PFC and PWM stages
– Optimized balance between efficiency and ease of use	– Improved efficiency and simplified thermal management due to low switching and conduction losses
– Significant reduction of switching and conduction losses leading to low MOSFET temperature	– Higher manufacturing quality due to >2 kV ESD protection
– Excellent ESD robustness >2 kV (HBM) for all products	– Increased power density solutions enabled by using products with smaller footprint
– Better $R_{DS(on)}$/package products compared to competition	– Suitable for a wide variety of applications and power ranges
– Large portfolio with granular $R_{DS(on)}$ selection qualified for a variety of industrial and consumer applications	

Charger Adapter Lighting TV PC power Solar LSEV Server Telecom EV charger

www.infineon.com/600V-p7

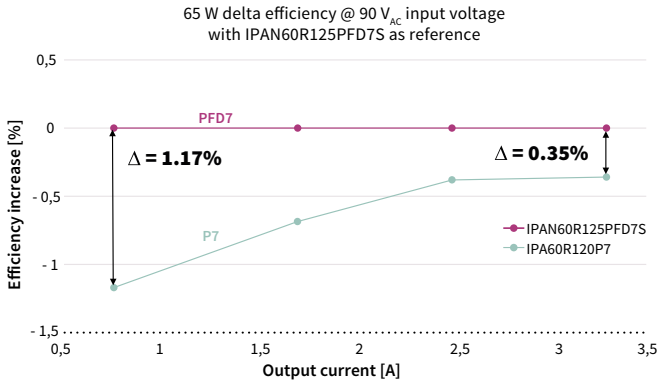
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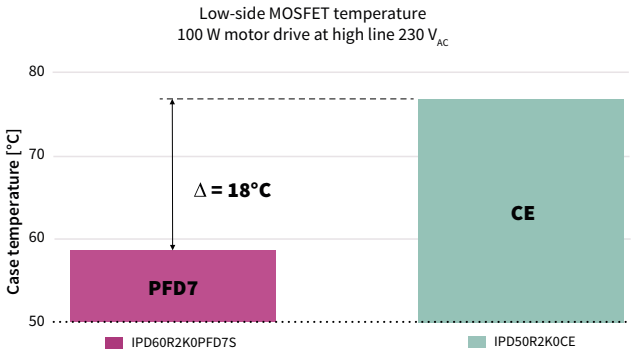
600 V CoolMOS™ PFD7 SJ MOSFETs

The next level for ultrahigh power density designs and energy-efficient home appliance drives

The 600 V CoolMOS™ PFD7 MOSFET series sets a new benchmark in 600 V superjunction (SJ) technologies, shaped by Infineon's experience of more than 20 years in pioneering in superjunction technology innovation. The series combines best-in-class performance with state-of-the-art ease of use and features an integrated fast body diode ensuring a robust device and in turn reduced BOM for the customer. This product family offers up to 1.17 percent efficiency increase compared to the CoolMOS™ P7 technologies, which leads to a power density increase of 1.8 W/in^3. CoolMOS™ PFD7 pushes the SJ MOSFET technology to new limits leading to outstanding improvement of lower conduction and charge/discharge losses as well as a reduced turn-off and gate-driving losses.

A broad range of $R_{DS(on)}$ values in combination with a variety of packages helps in selecting the right part to optimize designs. Furthermore, an integrated ESD protection of up to 2 kV eliminates ESD-related yield loss. Infineon's industry-leading SMD package offering contributes to bill-of-material and PCB space savings and simplifies manufacturing. This unique set of product features and their resulting benefits, position the CoolMOS™ PFD7 superjunction MOSFET family exceptionally well for ultrahigh density applications like chargers and adapters, USB power delivery but also for home appliance drives (e.g. refrigerator compressors) and specific lighting SMPS applications.





600 V CoolMOS™ PFD7 increases efficiency in light- and full-load conditions. This results in a power density increase of 1.8 W/in^3 for ultrahigh power chargers and adapters.

600 V CoolMOS™ PFD7 provides up to 2 percent higher efficiency at 100 W, which results in an 18°C thermal improvement. Its excellent commutation ruggedness makes it the perfect fit for low-power drives.

Features and benefits

Key features	Key benefits
– Very low FOM $R_{DS(on)}$ x E_{oss}	– Minimized switching losses
– Integrated robust fast body diode	– Power density improvement compared to latest CoolMOS™ charger technology
– Ultra-low Q_{rr} and industry's fastest recovery time (T_{rr})	– Increased efficiency (especially at light-load operation) and improved thermal behavior compared to CoolMOS™ CE technology for home appliance motor drives
– Up to 2 kV ESD protection (HBM class 2)	– BOM cost reduction and easy manufacturing
– Wide range of $R_{DS(on)}$ values and broad package portfolio	– Robustness and reliability
– Excellent commutation ruggedness	– Easy to select right parts for design fine-tuning

Consumer Charger Adapter Pumps Fans Fridge

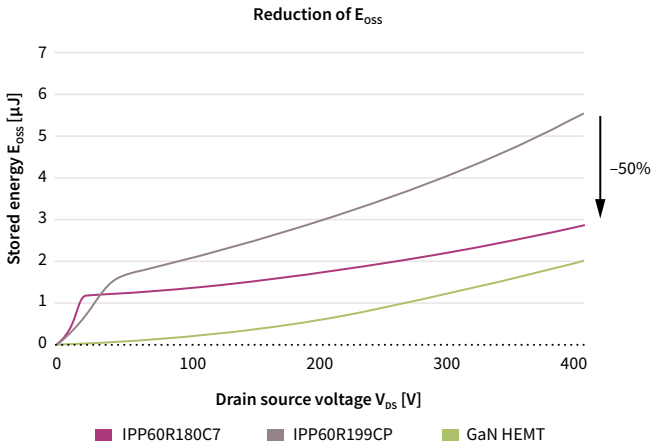
www.infineon.com/600V-PFD7

For more details on the product, click on the part number, visit infineon.com or contact our product support.

600 V and 650 V CoolMOS™ C7 and 600 V C7 Gold (G7) SJ MOSFETs

Infineon's superjunction MOSFET series for highest efficiency

The 600 V and 650 V CoolMOS™ C7 and and 600 V C7 Gold (G7) superjunction MOSFET series are designed to achieve record level efficiency performance – they offer substantial efficiency benefits over the whole load range in hard-switching applications compared to previous series and competition. This is achieved by minimizing switching losses via ultralow levels of switching losses (E_{OSS}) (approximately 50 percent reduction compared to the CoolMOS™ CP), reduced gate charge (Q_G) and a careful balance of other relevant product key parameters. The low E_{oss} and Q_G also enable operation at higher switching frequency and related size reduction of the circuit magnetics.

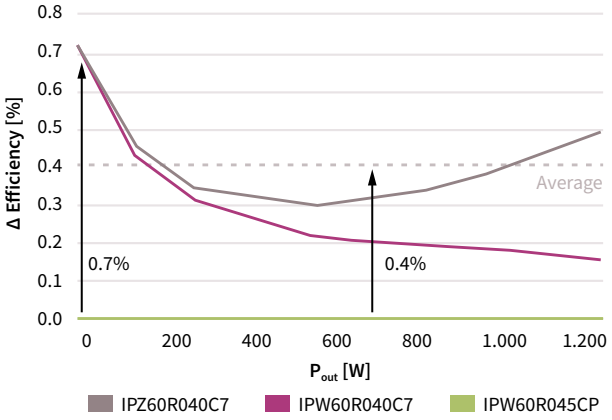


The outstanding figures of merit (FOM) and the best-in-class on-state resistance ($R_{DS(on)}$) offerings make the CoolMOS™ C7 and C7 Gold series key enablers for highest efficiency and power density. While the 650 V CoolMOS™ C7 and 600 V C7 Gold (G7) superjunction MOSFETs are solely designed for hard-switching applications such as PFC, the 600 V version is also well suited for high-end LLC stages due to its rugged body diode that withstands slew rates up to 20 V/ns. The product portfolio contains TO-247 4-pin, ThinPAK 8x8, TO-Leadless and top-side cooled Double DPAK (DDPAK) packages which come with additional Kelvin source contacts enabling further efficiency advantages over the classical 3-pin approach.

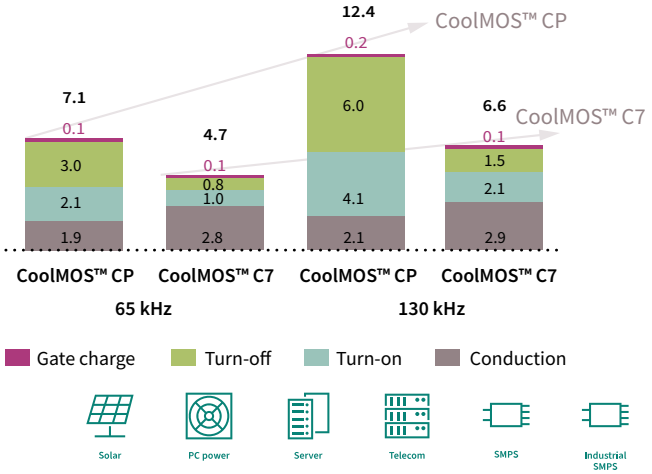
Features and benefits

Key features	Key benefits
– Reduced switching loss parameters such as Q_G and C_{oss}, enabling higher switching frequency	– Increased efficiency in hard-switching topologies such as PFC and TTF
– 50 percent E_{oss} reduction compared to older CoolMOS™ CP	– Reduced size and cost of magnetic components by increased switching frequency (e.g. 65 -130 kHz)
– Suitable for hard-switching topologies (650 V and 600 V)	– Increased power density by smaller packages for the same $R_{DS(on)}$
– Suitable for high-end resonant (600 V only) topologies	

PFC CCM 1200 W efficiency difference for 90 V_{AC} (PFC CCM, 1.150 W @ 65 kHz)



MOSFET losses [W]
IPW60R045CP vs. IPZ60R060C7, highline 2.5 kW



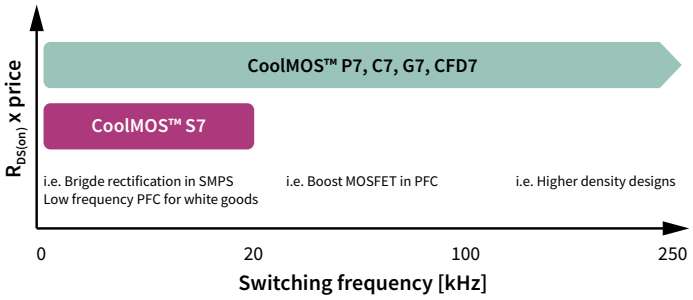
www.infineon.com/c7

For more details on the product, click on the part number, visit infineon.com or contact our product support.

600 V CoolMOS™ S7 SJ MOSFETs

The best price/performance SJ MOSFET for low frequency switching applications

The 600 V CoolMOS™ S7 superjunction MOSFET is the perfect fit for applications where MOSFETs are switched at low frequency, such as active bridge rectification, inverter stages, in-rush relays, PLCs, power solid state relays and solid state circuit breakers. The new MOSFET design with the best conduction performance allows the CoolMOS™ S7 to offer cost-optimized distinctively low on-resistance ($R_{DS(on)}$) values, ideally suited for applications looking to minimize conduction losses at the best price.



The CoolMOS™ S7 leads the way for power density, uniquely fitting a 22 mΩ $R_{DS(on)}$ chip into an innovative small TO-Leadless (TOLL) SMD package.

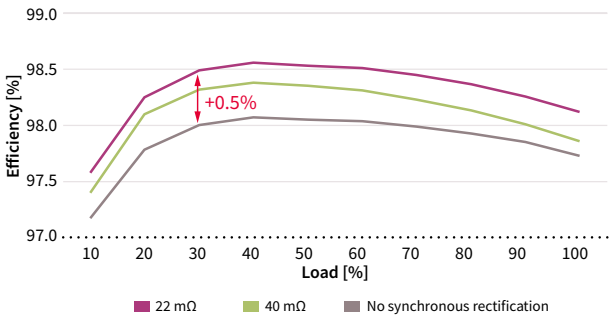
Use cases

Typically, CoolMOS™ S7 is used in active rectification bridges, where diodes are replaced or paralleled with MOSFETs, obtaining an increase in efficiency without the need for extensive system redesign. In this application, the TO-leadless (TOLL) package in low $R_{DS(on)}$ allows the most efficient and compact modular design based on daughter cards.
The CoolMOS™ S7 delivers also tremendous value to solid state relay (SSR) and solid state circuit breaker (SSCB) designs, by bringing the superjunction MOSFET advantages to a system level cost comparable to other silicon alternatives. In addition, any socket or topology switching at low frequency can greatly benefit from the leading low $R_{DS(on)}$ x price.

Features and benefits

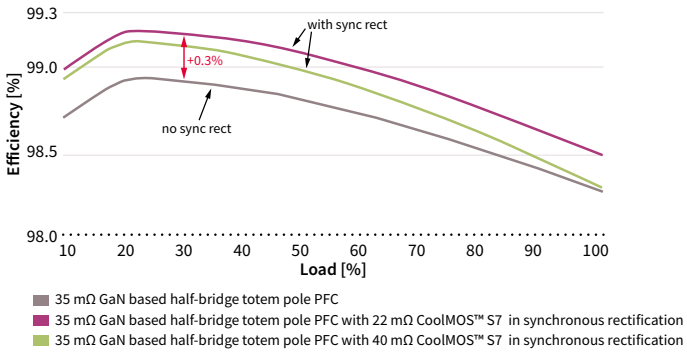
Key features	Key benefits
– Best-in-class $R_{DS(on)}$ in SMD packages	– Minimizes conduction losses
– Optimized for conduction performance, reaching the lowest $R_{DS(on)}$ values	– An easy step into Titanium level SMPS
– High pulse current capability	– Modular, more compact and easier designs
– Improved thermal resistance	– Eliminates or reduces heat sink in solid state relays and circuit breakers
	– Lower TCO cost or BOM cost

Efficiency in 2400 W PFC at V_{in} = 230 V_{AC}
Difference between using or not using the active-bridge rectification



CoolMOS™ S7 brings more efficiency to power supplies when used in an active rectification bridge.

3 kW GaN-based totem pole PFC efficiency calculation with and without synchronous rectification when V_{in} = 230 V_{AC}, V_{out} = 400 V, f_{sw} = 65 kHz



CoolMOS™ S7 is the perfect complement for CoolSiC™ MOSFETs and CoolGaN™ GIT HEMTs in totem pole PFC topologies.

SMPS Solar UPS LSEV PLC

www.infineon.com/s7

For more details on the product, click on the part number, visit infineon.com or contact our product support.

600 V CoolMOS™ CFD7 SJ MOSFETs

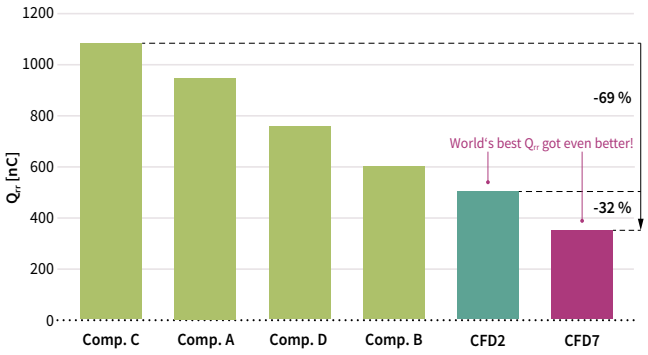
Infineon's solution for resonant switching high-power applications

The 600 V CoolMOS™ CFD7 is one of Infineon's high-voltage superjunction MOSFET series with an integrated fast body diode. It is the ideal choice for resonant topologies, such as LLC and ZVS PSFB, and targets the high SMPS market.

As a result of significantly reduced gate charge (Q_G), improved turn-off behavior, a reverse recovery charge (Q_{rr}) of up to 69 percent lower compared to the competition, as well as the lowest reverse recovery time (t_{rr}) in the market, it combines the highest efficiency and best-in-class reliability in soft-switching applications, without sacrificing the easy implementation in the design-in process.

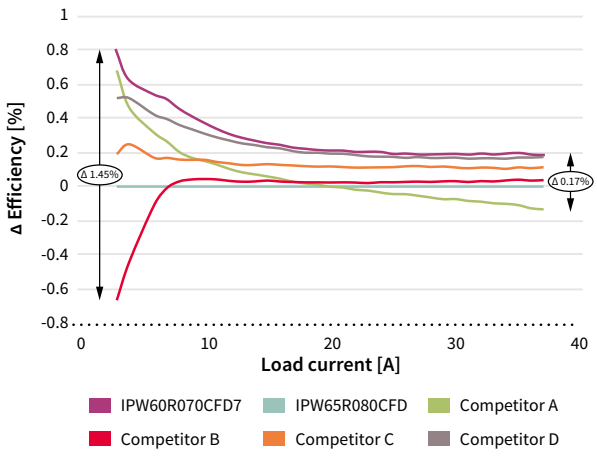
In addition, the 600 V CoolMOS™ CFD7 enables higher power density solutions by offering the best-in-class on-state resistance ($R_{DS(on)}$) package combinations in through-hole devices, as well as in surface mount devices. In ThinPAK 8x8 and TO-220 with CoolMOS™ CFD7, a $R_{DS(on)}$ of around 30 percent below the next best competitor offering can be achieved. All this together makes CoolMOS™ CFD7 the perfect fit for server and telecom applications, and it is also suitable for EV-charging stations.

Q_{rr} comparison of 170 mΩ CFD vs. 190 mΩ range competition*



*Comparison based on datasheet values

Efficiency comparison of CFD7 vs. CFD2 and competition in 2 kW ZVS



Features and benefits

Key features	Key benefits
– Ultrafast body diode	– Best-in-class hard commutation ruggedness
– Best-in-class reverse recovery charge (Q_{rr})	– Highest reliability for resonant topologies
– Improved reverse diode dv/dt and dif/dt ruggedness	– Highest efficiency with outstanding ease of use/performance trade-off
– Lowest figure of merit ($R_{DS(on)}$ x Q_G x E_{oss})	– Enabling increased power density solutions
– Best-in-class $R_{DS(on)}$/package combinations	

Solar SMPS Server Telecom EV charger

www.infineon.com/cfd7

For more details on the product, click on the part number, visit infineon.com or contact our product support.

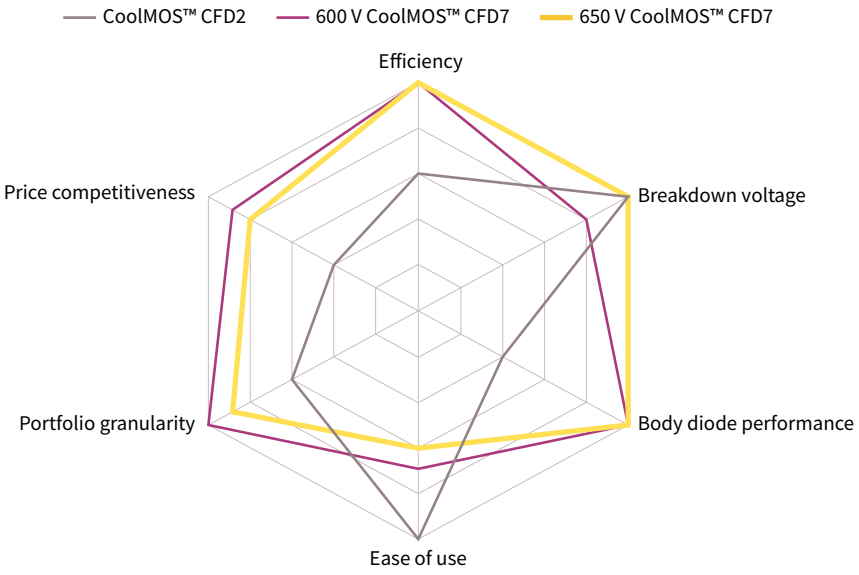
650 V CoolMOS™ CFD7 SJ MOSFETs

Tailored to win in resonant topologies

The need for improved efficiency and higher power density in industrial SMPS applications is driven by the megatrends of the 21st century such as big data, digitalization and e-mobility. Furthermore, over the last few years, due to the higher nominal input voltages in the US, a trend towards 450 V bus voltage, and the need for worldwide applicable designs, the demand for 650 V breakdown voltage has increased significantly - also for resonant topologies.

The 650 V device family is the voltage-range extension of Infineon's renowned CoolMOS™ CFD7 family, the successor to the well-established CoolMOS™ CFD2. It comes along with an additional 50 V breakdown voltage, integrated fast body diode, improved switching performance (compared to previous generations), and excellent thermal behavior. Thanks to these features, the 650 V CoolMOS™ CFD7 allows for the highest efficiency and power density levels in soft-switching applications such as LLC and ZVS phase-shift-full-bridge.

The best-in-class $R_{DS(on)}$ in TO-247, TO-220, and D²PAK enables customers to increase the power density level of their designs primarily addressing telecom, server, solar, and (off-board) EV-charging applications.



Features and benefits

Key features	Key benefits
– 650 V blocking voltage	– 50 V extra margin for increased bus voltage
– Ultrafast body diode	– Excellent hard commutation ruggedness
– Reduced switching losses	– Outstanding light load efficiency
– Low $R_{DS(on)}$ dependency over temperature	– High full load efficiency

Telecom Server EV charger Solar

www.infineon.com/650v-cfd7

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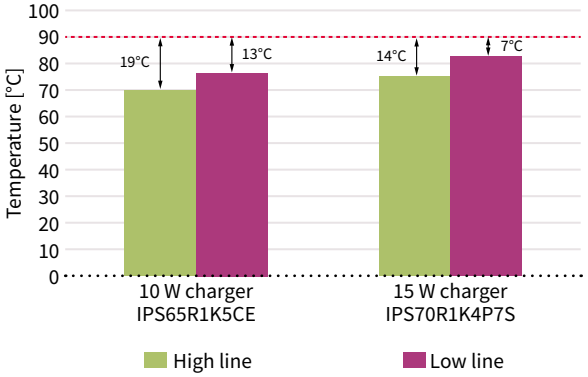
CoolMOS™ CE SJ MOSFETs

High-voltage superjunction MOSFETs for consumer applications

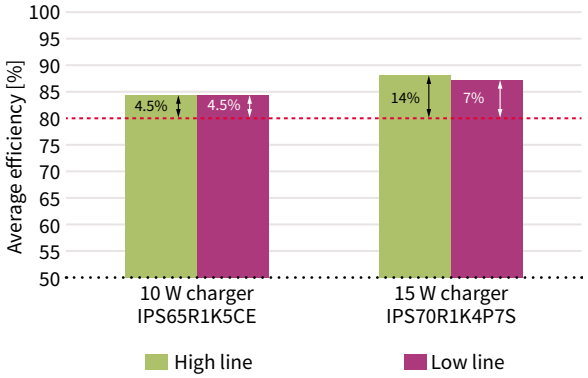
Infineon's CoolMOS™ CE is a product family that addresses consumer and lighting applications. It offers benefits in efficiency and thermal behavior versus standard MOSFETs and is optimized for ease of use and cost-competitiveness, while delivering the right-fit performance and excellent Infineon quality.

Application example: 10 W and 15 W smartphone charger

CoolMOS™ CE meets typical MOSFET case temperature requirements in charger applications



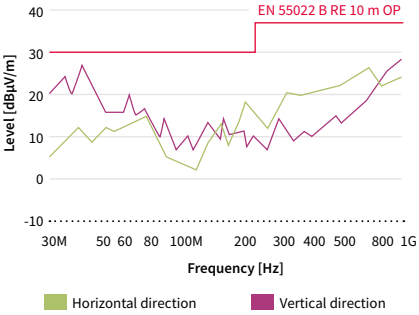
CoolMOS™ CE meets the standard efficiency requirements in charger application



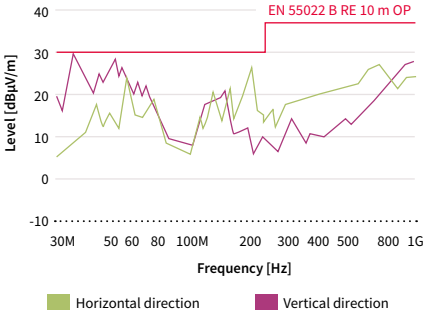
CoolMOS™ CE case temperature:
The maximum MOSFET case temperature is required to be below 90°C. CoolMOS™ CE meets this requirement and offers enough margin required for design-in flexibility.

CoolMOS™ CE efficiency performance:
CoolMOS™ CE meets the 80 percent standard efficiency requirement and offers enough margin required for design-in flexibility.

10 W design: IPS65R1K5CE
EN 55022 B radiated HF-field
30 MHz – 1 GHz position



15 W design: IPS65R1K0CE
EN 55022 B radiated HF-field
30 MHz – 1 GHz position



The performance of CoolMOS™ CE in the 10 W and 15 W design demonstrates that the series meets common EMI requirements for charger applications and thus, is also offering design-in flexibility.

CoolMOS™ CE customer benefits	
Product portfolio	Broad portfolio covering five voltage classes in both through-hole and SMD packages
Quality	Field failure rates are as low as 0.1 DPM
Design-in support	Large field application engineering team to provide professional and flexible support for your design

Consumer · Lighting · LCD TV · LED · Adapter · Charger · PC power

www.infineon.com/ce

For more details on the product, click on the part number, visit infineon.com or contact our product support.

CoolMOS™ SJ MOSFETs for automotive

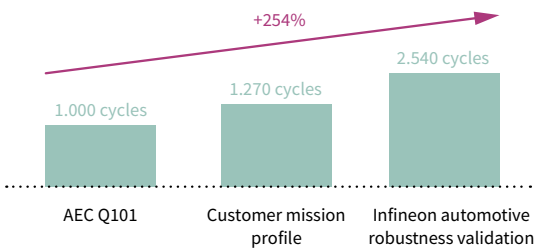
600 V CoolMOS™ CPA, 650 V CoolMOS™ CFDA, 800 V CoolMOS™ C3A, 650 V CoolMOS™ CFD7A – on the fast lane in automotive applications

The highest system performance in a size and weight constrained environment, outstanding and proven product quality and reliability, as well as 100 percent reliable delivery, are key requirements for manufacturers in the automotive market. With the high-voltage automotive MOSFET series 600 V CoolMOS™ CPA and 650 V CoolMOS™ CFDA, 800 V CoolMOS™ C3A and 650 V CoolMOS™ CFD7A, Infineon is perfectly prepared to take the challenges in the strongly growing automotive market.

Product series	Key features	Applications	Quality
600 V CoolMOS™ CPA	**Best choice for demanding hard-switching applications** – Lowest $R_{DS(on)}$ per package – Lowest gate charge value Q_G	– Hard-switching topologies (with SiC diode) – PFC boost stages in on-board charger	**Quality level well beyond the formal requirements of the AEC Q101 standard through** Special screening measures in front end, back end Mission-profile based qualification procedures
650 V CoolMOS™ CFDA	**Easy implementation of layout and design** – Integrated fast body diode – Limited voltage overshoot during hard commutation – self-limiting dI/dt and dV/dt – Low Q_{rr} at repetitive commutation on body diode and low Q_{oss}	– Resonant-switching topologies – DC-DC stage of OBC – LLC or full-bridge phase shift (ZVS) in DC-DC converter – HID lamp – Active DC link discharge – Pre-charge	
800 V CoolMOS™ C3A	– Outstanding performance in terms of efficiency, thermal behavior and ease-of-use – High blocking voltage	– Flyback low-power auxiliaries – On-board charger – HV-LV DC-DC converter – Battery disconnect unit – Traction inverter auxiliaries – DC-link pre-charge – DC-link active discharge – Isolation monitoring	
650 V CoolMOS™ CFD7A	– Improved 650 V CoolMOS™ CFDA – Higher application voltage possible (at the same proven reliability level) – D²PAK 7-pin with increased creepage distance and Kelvin source – Considerable improvement in key parameters (higher efficiency)	– On-board charger – Hard-switching topologies (with SiC diode) – PFC boost stages – DC-DC stage of OBC – HV-LV DC-DC converter – LLC or full-bridge phase shift (ZVS) – Auxiliary power supplies	

CoolMOS™ SJ MOSFET automotive – benchmark in quality and reliability

Robustness validation – example for thermal cycling test



Focus on top-notch quality and reliability without any compromise – that is the principle Infineon applies during development and qualification of all CoolMOS™ superjunction technologies. For our automotive grade derivatives, the great quality levels of the industrial-based technologies are further boosted by special screening measures in front- and back-end, as well as by extended qualification procedures. The Infineon robustness validation approach with extended stress-test procedures, doubling the real application requirements, is one of our key measures to ensure a quality level well beyond the formal requirements of the AEC Q101 standard. Aside from extended stress times on standard qualification tests, it comprises test procedures, specially developed by Infineon to ensure highest quality of e.g., the power metallization of our devices. Usage of robust package technologies, 100 percent gate oxide screening, and top-notch production monitoring, including yield screening measures, part average testing (PAT), statistical bin alarm (SBA), and pattern recognition procedures, complete our package to guarantee highest automotive quality. This holistic approach results in an unrivalled quality position of Infineon's CoolMOS™ SJ MOSFETs for automotive..

www.infineon.com/cfd7a
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On-board charger · eMobility · HV-LV DC-DC converter · Lighting

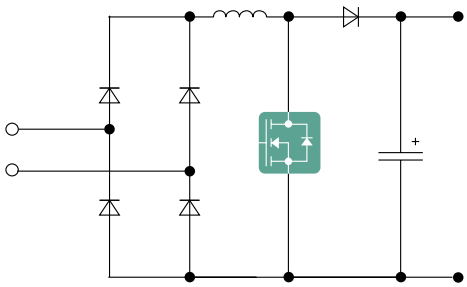
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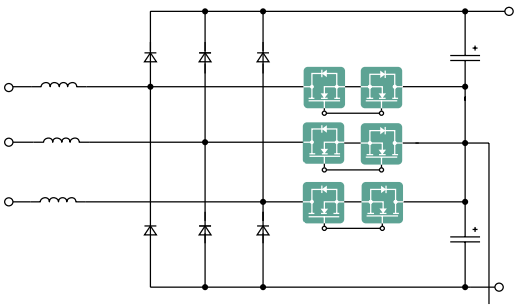
CoolMOS™ SJ MOSFET automotive – ready to support future application trends

Driven by the carbon dioxide (CO_2) reduction initiatives, the market of plug-in hybrid PHEV and pure EV is strongly growing. Higher ranges of the electric vehicles are realized by increasing the battery capacity and the energy efficiency of the used electric components. The used battery voltage classes tend to become standardized at approximately 450 V with a trend towards the higher voltages, as this supports faster charging times and enables lighter cabling within the vehicle. Discrete high-voltage components are widely used for on-board charger (OBC) and DC-DC converter (LDC) applications, as price pressure increasingly displaces module-based solutions. The trend towards fast charging impacts on the power range demanded from OBC topologies. Presently, as well as in the past, a vast majority of OBC topologies have been found in the range up to 7.2 kW, whereas the future tends to stir the trend towards 11 kW or even up to 22 kW. This development, paired with a demand for high efficiency and power density at low system cost, is a strong driver for the usage of three-phase solutions.

Classic PFC stage for OBC



OBC Vienna rectifier for three-phase PFC in OBC



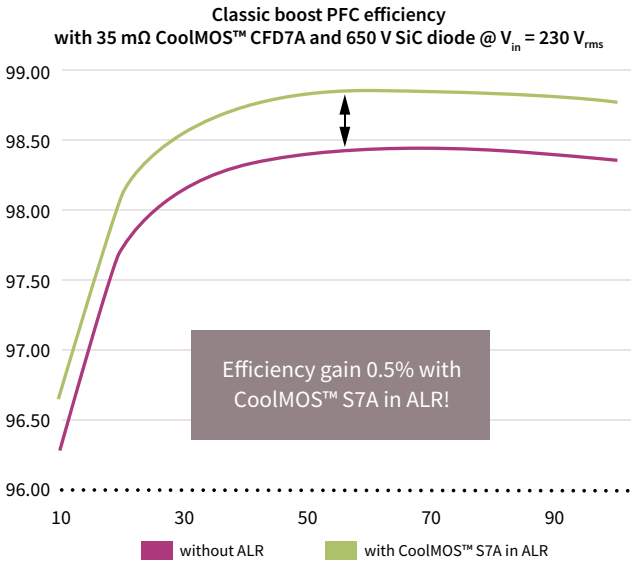
While for the lower power OBC solutions classic PFC approaches are the well-established approaches in the market, the Vienna rectifier is the optimal solution for the higher power levels. As a true three-phase topology, it delivers full power if attached to a three-phase input but is flexible enough to run on a single-phase if required. The three-level topology minimizes the filter effort compared to other solutions. By using the doubled frequency on the magnetic components, it also helps to significantly reduce the size of the passives. As a three-level topology, the Vienna rectifier, followed by two paralleled DC-DC stages, furthermore leads to a relaxed voltage stress level on the power MOSFETs. This way, it enables to handle upcoming higher battery voltage levels. The $R_{DS(on)}$, required to yield a desired efficiency level in a Vienna Rectifier, is a function of applied switching frequency and demanded power level. With our 600 V CoolMOS™ CPA and 650 V CoolMOS™ CFDA portfolio, covering an $R_{DS(on)}$ range from 45 to 660 mΩ, we are well-prepared to support your next-generation three-phase Vienna rectifier design. With CoolMOS™ you are ready to seize your share in the emerging high-power on-board charger markets.

www.infineon.com/coolmos-automotive

600 V CoolMOS™ S7A

Best-in-class $R_{DS(on)}$ x A SJ MOSFET for slow-switching automotive applications

The automotive-grade 600 V CoolMOS™ S7A superjunction MOSFET addresses xEV applications where MOSFETs are switched at low frequency, such as HV eFuse, HV eDisconnect, and on-board charger in the slow-switching leg of the PFC stage. The more stringent requirements for increased power density, safety, and reliability in these applications are met by combining the superior robustness and performance of the S7A MOSFET with the innovative package concept offered by the QDPAK TSC. The new MOSFET design offers a cost-optimized, distinctively low on-resistance $R_{DS(on)}$ of 10 mΩ, enabling increased power density and minimized conduction losses. The top-side cooled QDPAK package offers increased efficiency and controllability thanks to its intrinsic Kelvin source, high power dissipation capability, and innovative cooling concept.

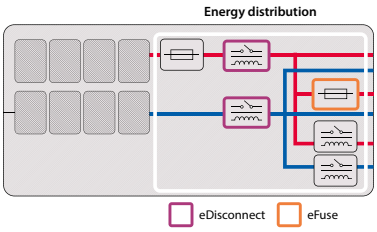


CoolMOS™ S7A is the ideal device for the ALR active line rectification in a classic boost PFC topology, which offers a power loss reduction up to 30 percent and an overall PLC efficiency improvement of 0.5 percent.

CoolMOS™ S7A is the semiconductor solution for HV eDisconnect and HV eFuse. It answers e-mobility needs with respect to reliability (maintenance-free), flexible and cost-optimized system integration, scalability, and minimized failure propagation.

HV power distribution unit





Features and benefits

Key features	Key benefits
– Best-in-class $R_{DS(on)}$: 10 mΩ	– Minimized conduction losses
– Smallest $R_{DS(on)}$ in SMD packages	– Increased energy efficiency
– Optimized for conduction performance	– More compact and easier designs
– Industry‘s leading heat-sinking capability	– Increased power density
– High pulse current capability	– Lower TCO cost or BOM cost
– Body diode robustness at AC line commutation	– Flexible system integration
– Kelvin-source concept	– Variable cooling strategy

On-board charger · eMobility · Battery disconnect · Fuses and relay

www.infineon.com/s7a

For more details on the product, click on the part number, visit infineon.com or contact our product support.

CoolMOS™ SJ MOSFET high-power package innovations

Space-saving and high performance packages



An SMD package for high efficiency and controllability in automotive applications

TO-263-7 (D²PAK-7-pin)

The TO-263-7-pin package is a SMD package addressing automotive-specific requirements including high efficiency and controllability. The Kelvin source pin leads to reduced switching losses. Furthermore, the 7-pin design increases the creepage distance at the PCB and therefore helps to improve the manufacturability.



Innovative top-side cooled SMD solution for high-power applications

Top-side cooled Double & Quadruple DPAK (DDPAK + QDPAK)

These top-side cooled surface mount device (SMD) packages address high-power SMPS applications such as PC power, solar, server and telecom as well as automotive applications like HV eDisconnect, HV eFuse and on-board charger. SMD-based SMPS designs support fast switching and help to reduce the parasitic inductance associated with long leaded packages such as the common TO-220 and TO-247 package. In today's SMD-based designs, the output power is restricted by the thermal limit of the PCB material because the heat must be dissipated through the board. Thanks to the top-side cooling concept of DDPAK and QDPAK, the thermal decoupling of board and semiconductor is possible, enabling higher power density or improved system lifetime.



Innovative bottom-side cooled SMD solution for high-power applications

Bottom-side cooled QDPAK

The bottom-side cooled surface mount device (SMD) packages address high-power SMPS applications such as solar, server, telecom as well as automotive applications. SMD-based SMPS designs support fast switching and help to reduce the parasitic inductance associated with long leaded package. Furthermore, SMD packages simplify assembly and reduce cost, while minimizing space requirements for the overall packages. The bottom-side cooled variant of QDPAK allow designers to benefit from these advantages, while implementing a more traditional cooling scheme for high power switches compared to the novel top-side cooled variants. Tried and tested PCB materials and assembly can be used, while improving the power path routing thanks to multiple source pins, as well as benefiting from advanced features such as multiple gate pins for safety applications.



For highest efficiency and controllability in high-power SMPS markets

TO-247 4-pin with asymmetric leads

The TO-247 4-pin package with asymmetric leads is an optimized version of the standard TO-247 4-pin and enables highest efficiency and controllability in the high-power SMPS market. The fourth pin acts as a Kelvin source. The main current of the switch is placed outside of the gate loop and the feedback is eliminated. This leads to less switching losses, especially at high currents. Secondly, the EMI will be reduced due to cleaner waveforms. In addition, the asymmetric leads further improve the ease of use in the design-in process. Compared to the standard TO-247 4-pin the distance between the critical pins has been increased to enable simplified wave soldering and reduced board yield loss.



Enabling significant space savings

ThinPAK 8x8

With a very small footprint of only 64 mm² (vs. 150 mm² for the D²PAK) and a very low profile with only 1 mm height (vs. 4.4 mm for the D²PAK) the ThinPAK 8x8 leadless SMD package for high-voltage MOSFETs is a first choice to decrease system size in power-density driven designs. Low parasitic inductance and a separate 4-pin Kelvin source connection offer best efficiency and ease of use. The package is RoHS compliant with halogen-free mold compound.



Optimized for high-power applications

TO-Leadless

Combined with the CoolMOS™ C7 Gold (G7) technology, the TO-Leadless (TOLL) package is Infineon's flagship SMD package for high power/high current SMD solutions. Compared to D²PAK 7-pin, TO-Leadless shows a 30 percent reduction in footprint, yet offers improved thermal performance. This, and the 50 percent height reduction result in a significant advantage whenever highest power density is demanded. Equipped with 4-pin Kelvin source connection and low parasitic inductances the package offers best efficiency and ease of use. The package is MSL1 compliant and reflow solderable.

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For more details on the product, click on the part number, visit infineon.com or contact our product support.

CoolMOS™ SJ MOSFET low-power package innovations

Addressing today's consumer needs



Cost-effective drop-in replacement for DPAK

SOT-223

The SOT-223 package without middle pin is a cost-effective alternative to DPAK, addressing the need for cost reductions in price-sensitive applications. It offers a smaller footprint, while still being pin-to-pin compatible with DPAK, thus, allowing a drop-in replacement for DPAK and second sourcing. Moreover, SOT-223 achieves comparable thermal performance to DPAK and enables customers to achieve improved form factors or space savings in designs with low power dissipation.



Solution for slim and small adapters and chargers

ThinPAK 5x6

ThinPAK 5x6 reduces the PCB area by 52 percent and height by 54 percent when compared to the DPAK package which is widely used in chargers and adapters. ThinPAK 5x6 is the right device to replace DPAK and meet the market demands of slimmer and smaller designs. Also, ThinPAK 5x6 enables a reduced charger and adapter case hot spot temperature by increasing the space between the MOSFET and the charger and adapter case.



Solution for height reduction in adapters and chargers

TO-220 FullPAK Narrow Lead

Infineon's TO-220 FullPAK Narrow Lead addresses customer needs with regards to height reduction requirements in adapter and charger applications. By offering an optimized standoff width and height and improved creepage distance, the package can be fully inserted into the PCB without any production concerns and, therefore, is especially suitable for slim and semi-slim adapter solutions.



Improved creepage distance for open frame power supplies

TO-220 FullPAK Wide Creepage

This package solution has an increased creepage distance between the pins to 4.25 mm compared to 2.54 mm of a TO-220 FullPAK package. It targets open frame power supplies such as TV sets and PC power, where dust can enter the case through air vents. Dust particles can reduce the effective creepage between pins over time, which may lead to high voltage arcing. The package meets the requirements of open frame power supplies without any additional measures. Thus, it reduces system cost by offering an alternative to frequently used approaches to increase creepage distance.

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For more details on the product, click on the part number, visit infineon.com or contact our product support.

950 V CoolMOS™ PFD7



$R_{DS(on)}$ [mΩ]	TO-220 FullPAK	TO247	TO252 (DPAK)	TO263 (D^2PAK)
60		IPW95R60PFD7		
130	IPA95R130PFD7	IPW95R130PFD7		IPB95R130PFD7
310	IPA95R310PFD7	IPW95R310PFD7		IPB95R310PFD7
450	IPA95R450PFD7		IPD95R450PFD7	IPB95R450PFD7

950 V CoolMOS™ P7



$R_{DS(on)}$ [mΩ]	TO-220	TO-220 FullPAK	SOT-223	TO-251 Long lead	TO-252 (DPAK)
450		IPA95R450P7			IPD95R450P7
750		IPA95R750P7		IPU95R750P7	IPD95R750P7
1200		IPA95R1K2P7	IPN95R1K2P7		IPD95R1K2P7
2000					IPD95R2K0P7
3700			IPN95R3K7P7	IPU95R3K7P7	

900 V CoolMOS™ C3



$R_{DS(on)}$ [mΩ]	TO-220	TO-262 (I^2PAK)	TO-263 (D^2PAK)	TO-220 FullPAK	TO-247	TO-252 (DPAK)
120					IPW90R120C3	
340	IPP90R340C3	IPI90R340C3	IPB90R340C3	IPA90R340C3	IPW90R340C3	
500		IPI90R500C3		IPA90R500C3	IPW90R500C3	
800	IPP90R800C3			IPA90R800C3		
1200						IPD90R1K2C3

800 V CoolMOS™ P7



$R_{DS(on)}$ [mΩ]	TO -220	TO-220 FullPAK	TO-247	TO-252 (DPAK)	TO-251 (IPAK)	SOT-223	TO-220 FullPAK narrow lead	ThinPAK 5x6
280	IPP80R280P7	IPA80R280P7	IPW80R280P7	IPD80R280P7				
360		IPA80R360P7	IPW80R360P7	IPD80R360P7			IPAN80R360P7	
450	IPP80R450P7	IPA80R450P7		IPD80R450P7				
600		IPA80R600P7		IPD80R600P7	IPU80R600P7	IPN80R600P7		IPLK80R600P7
750		IPA80R750P7		IPD80R750P7				IPLK80R750P7
900	IPP80R900P7	IPA80R900P7		IPD80R900P7	IPU80R900P7	IPN80R900P7		IPLK80R900P7
1200				IPD80R1K2P7				IPLK80R1K2P7
1400	IPP80R1K4P7	IPA80R1K4P7		IPD80R1K4P7	IPU80R1K4P7	IPN80R1K4P7		IPLK80R1K4P7
2000				IPD80R2K0P7	IPU80R2K0P7	IPN80R2K0P7		IPLK80R2K0P7
2400				IPD80R2K4P7		IPN80R2K4P7		
3300				IPD80R3K3P7		IPN80R3K3P7		
4500				IPD80R4K5P7	IPU80R4K5P7	IPN80R4K5P7		

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800 V CoolMOS™ CE



$R_{DS(on)}$ [mΩ]	TO-220 FullPAK	TO-252 (DPAK)
310	IPA80R310CE	
460	IPA80R460CE	
650	IPA80R650CE	
1000	IPA80R1K0CE	IPD80R1K0CE
1400	IPA80R1K4CE	IPD80R1K4CE
2800		IPD80R2K8CE

800 V CoolMOS™ C3



$R_{DS(on)}$ [mΩ]	TO-220	TO-263 (D^2PAK)	TO-220 FullPAK	TO-247	TO-252 (DPAK)
85				SPW55N80C3	
290	SPP17N80C3	SPB17N80C3	SPA17N80C3	SPW17N80C3	
450	SPP11N80C3				
650	SPP08N80C3		SPA08N80C3		
900	SPP06N80C3		SPA06N80C3		SPD06N80C3
1300	SPP04N80C3				SPD04N80C3
2700					SPD02N80C3

700 V CoolMOS™ P7



$R_{DS(on)}$ [mΩ]	TO-251 (IPAK Short Lead)	TO-220 FullPAK	TO-252 (DPAK)	TO-220 FullPAK narrow lead	SOT-223	ThinPAK 5x6
360		IPA70R360P7S	IPD70R360P7S		IPN70R360P7S	
450					IPN70R450P7S	
600	IPS70R600P7S	IPA70R600P7S	IPD70R600P7S	IPAN70R600P7S	IPN70R600P7S	IPLK70R600P7
750				IPAN70R750P7S		IPLK70R750P7
900			IPD70R900P7S		IPN70R900P7S	IPLK70R900P7
1200						IPLK70R1K2P7
1400	IPS70R1K4P7S		IPD70R1K4P7S		IPN70R1K4P7S	IPLK70R1K4P7
2000					IPN70R2K0P7S	IPLK70R2K0P7

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650 V CoolMOS™ C7



$R_{DS(on)}$ [mΩ]	TO-220	TO-263 (D^2PAK)	TO-220 FullPAK	TO-247	TO-247 4-pin	TO-252 (DPAK)	ThinPAK 8x8
19				IPW65R019C7	IPZ65R019C7		
45	IPP65R045C7	IPB65R045C7	IPA65R045C7	IPW65R045C7	IPZ65R045C7		
65	IPP65R065C7	IPB65R065C7	IPA65R065C7	IPW65R065C7	IPZ65R065C7		
70							IPL65R070C7
95	IPP65R095C7	IPB65R095C7	IPA65R095C7	IPW65R095C7	IPZ65R095C7		
99							IPL65R099C7
125	IPP65R125C7	IPB65R125C7	IPA65R125C7	IPW65R125C7			
130							IPL65R130C7
190	IPP65R190C7	IPB65R190C7	IPA65R190C7	IPW65R190C7		IPD65R190C7	
195							IPL65R195C7
225	IPP65R225C7	IPB65R225C7	IPA65R225C7			IPD65R225C7	
230							IPL65R230C7

650 V CoolMOS™ CE



$R_{DS(on)}$ [mΩ]	TO-220 FullPAK	TO-252 (DPAK)	TO-220 FullPAK Narrow Lead
400	IPA65R400CE	IPD65R400CE	
650	IPA65R650CE	IPD65R650CE	IPAN65R650CE
1000	IPA65R1K0CE		

650 V CoolMOS™ CFD2



$R_{DS(on)}$ [mΩ]	TO-220	TO-262 (I^2PAK)	TO-263 (D^2PAK)	TO-220 FullPAK	TO-247	TO-252 (DPAK)	ThinPAK 8x8
41					IPW65R041CFD		
80					IPW65R080CFD		
110	IPP65R110CFD		IPB65R110CFD	IPA65R110CFD	IPW65R110CFD		
150	IPP65R150CFD		IPB65R150CFD	IPA65R150CFD	IPW65R150CFD		
165							IPL65R165CFD
190	IPP65R190CFD	IPI65R190CFD	IPB65R190CFD	IPA65R190CFD	IPW65R190CFD		
210							
310	IPP65R310CFD		IPB65R310CFD	IPA65R310CFD			
420	IPP65R420CFD					IPD65R420CFD	
660						IPD65R660CFD	
950						IPD65R950CFD	

650 V CoolMOS™ CFD7



$R_{DS(on)}$ [mΩ]	TO-220	TO-263 (D^2PAK)	TO-247	TO-247 4-pin	TO-Leadless (TOLL)	ThinPAK 8x8	QDPAK BSC	QDPAK TSC
17							IPQC65R017CFD7*	IPDQ65R017CFD7
18			IPW65R018CFD7	IPZA65R018CFD7				
29			IPW65R029CFD7	IPZA65R029CFD7				IPDQ65R029CFD7
40					IPT65R040CFD7		IPQC65R040CFD7*	IPDQ65R040CFD7
41	IPP65R041CFD7	IPB65R041CFD7	IPW65R041CFD7					
60	IPP65R060CFD7		IPW65R060CFD7		IPT65R060CFD7			IPDQ65R060CFD7
65						IPL65R065CFD7		
80					IPT65R080CFD7			IPDQ65R080CFD7*
90	IPP65R090CFD7	IPB65R090CFD7	IPW65R090CFD7					
95						IPL65R095CFD7		
99					IPT65R099CFD7			IPDQ65R099CFD7
110	IPP65R110CFD7	IPB65R110CFD7	IPW65R110CFD7					
115						IPL65R115CFD7		
125		IPB65R125CFD7	IPW65R125CFD7		IPT65R125CFD7			IPDQ65R125CFD7
130						IPL65R130CFD7		
155	IPP65R155CFD7	IPB65R155CFD7	IPW65R155CFD7		IPT65R155CFD7			
160						IPL65R160CFD7		
190	IPP65R190CFD7				IPT65R190CFD7			
200						IPL65R200CFD7		

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www.infineon.com/c7
www.infineon.com/cfd2
www.infineon.com/ce

*Coming soon

For more details on the product, click on the part number, visit infineon.com or contact our product support.

600 V CoolMOS™ PFD7



$R_{DS(on)}$ [mΩ]	TO-220 FullPAK Narrow Leads	TO-252 (DPAK)	SOT-223	ThinPAK 5x6
125	IPAN60R125PFD7S			
210	IPAN60R210PFD7S	IPD60R210PFD7S		
280	IPAN60R280PFD7S	IPD60R280PFD7S		
360	IPAN60R360PFD7S	IPD60R360PFD7S	IPN60R360PFD7S	IPLK60R360PFD7
600		IPD60R600PFD7S	IPN60R600PFD7S	IPLK60R600PFD7
1000		IPD60R1K0PFD7S	IPN60R1K0PFD7S	IPLK60R1K0PFD7
1500		IPD60R1K5PFD7S	IPN60R1K5PFD7S	IPLK60R1K5PFD7
2000		IPD60R2K0PFD7S	IPN60R2K0PFD7S	

600 V CoolMOS™ P7 industrial grade



$R_{DS(on)}$ [mΩ]	TO -220	TO-220 FullPAK	TO-247	TO-252 (DPAK)	ThinPAK 8x8	TO-263 (D^2PAK)
24			IPW60R024P7			
37			IPW60R037P7			
45			IPW60R045P7			IPB60R045P7
60	IPP60R060P7	IPA60R060P7	IPW60R060P7			IPB60R060P7
65					IPL60R065P7	
80	IPP60R080P7	IPA60R080P7	IPW60R080P7		IPL60R085P7	IPB60R080P7
99	IPP60R099P7	IPA60R099P7	IPW60R099P7			IPB60R099P7
105					IPL60R105P7	
120	IPP60R120P7	IPA60R120P7	IPW60R120P7			IPB60R120P7
125					IPL60R125P7	
160	IPP60R160P7	IPA60R160P7				
180	IPP60R180P7	IPA60R180P7	IPW60R180P7	IPD60R180P7		IPB60R180P7
185					IPL60R185P7	
280	IPP60R280P7	IPA60R280P7		IPD60R280P7		IPB60R280P7
285					IPL60R285P7	
360	IPP60R360P7			IPD60R360P7		IPB60R360P7
365						
600	IPP60R600P7	IPA60R600P7		IPD60R600P7		

600 V CoolMOS™ P7 standard grade



$R_{DS(on)}$ [mΩ]	TO-220 FullPAK	TO-220 FullPAK Narrow lead	TO-252 (DPAK)	SOT-223
180	IPA60R180P7S	IPAN60R180P7S	IPD60R180P7S	
280	IPA60R280P7S		IPD60R280P7S	
360	IPA60R360P7S		IPD60R360P7S	IPN60R360P7S
600	IPA60R600P7S		IPD60R600P7S	IPN60R600P7S

600 V CoolMOS™ CFD7



$R_{DS(on)}$ [mΩ]	TO-220	TO-263 (D^2PAK)	TO-220 FullPAK	TO-247	TO-252 (DPAK)	ThinPAK 8x8	DDPAK	TO-Leadless (TOLL)	QDPAK
15									IPDQ60R015CFD7*
18				IPW60R018CFD7					
20									IPDQ60R020CFD7*
24				IPW60R024CFD7					
25									IPDQ60R025CFD7*
31/35				IPW60R031CFD7				IPT60R035CFD7	IPDQ60R035CFD7*
40/45		IPB60R040CFD7		IPW60R040CFD7			IPDD60R045CFD7	IPT60R045CFD7	IPDQ60R045CFD7*
55		IPB60R055CFD7		IPW60R055CFD7			IPDD60R055CFD7	IPT60R055CFD7	IPDQ60R055CFD7
60						IPL60R060CFD7			
70	IPP60R070CFD7	IPB60R070CFD7		IPW60R070CFD7					
75						IPL60R075CFD7	IPDD60R075CFD7	IPT60R075CFD7	IPDQ60R075CFD7*
90/95	IPP60R090CFD7	IPB60R090CFD7		IPW60R090CFD7		IPL60R095CFD7	IPDD60R090CFD7	IPT60R090CFD7	
105/115	IPP60R105CFD7	IPB60R105CFD7		IPW60R105CFD7		IPL60R115CFD7	IPDD60R105CFD7	IPT60R105CFD7	
125/140	IPP60R125CFD7		IPA60R125CFD7	IPW60R125CFD7			IPDD60R125CFD7	IPT60R125CFD7	
145/160	IPP60R145CFD7				IPD60R145CFD7	IPL60R160CFD7	IPDD60R145CFD7		
170	IPP60R170CFD7		IPA60R170CFD7		IPD60R170CFD7		IPDD60R170CFD7		
185						IPL60R185CFD7			
210/225	IPP60R210CFD7								
280	IPP60R280CFD7		IPA60R280CFD7						
360									

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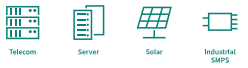
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600 V CoolMOS™ S7



$R_{DS(on)}$ [mΩ]	TO -220	TO-Leadless (TOLL)	TO-Leadless (TOLL) incl. temperature sensor	QDPAK BSC incl. temperature sensor	QDPAK TSC incl. temperature sensor	QDPAK TSC	QDPAK BSC
10				IPQC60T010S7*	IPDQ60T010S7*	IPDQ60R010S7	IPQC60R010S7
17				IPQC60T017S7*	IPDQ60T017S7*	IPDQ60R017S7	IPQC60R017S7
22	IPP60R022S7	IPT60R022S7	IPT60T022S7*	IPQC60T022S7*	IPDQ60T022S7*	IPDQ60R022S7	
40	IPP60R040S7	IPT60R040S7	IPT60T040S7*			IPDQ60R040S7	IPQC60R040S7
65	IPP60R065S7	IPT60R065S7	IPT60T065S7*			IPDQ60R065S7	

600 V CoolMOS™ C7 Gold (G-series)



$R_{DS(on)}$ [mΩ]	TO-Leadless (TOLL)	TO-252 (Double DPAK)
28	IPT60R028G7	
50	IPT60R050G7	IPDD60R050G7
80	IPT60R080G7	IPDD60R080G7
102	IPT60R102G7	IPDD60R102G7
125	IPT60R125G7	IPDD60R125G7
150	IPT60R150G7	IPDD60R150G7
190		IPDD60R190G7

600 V CoolMOS™ C7



$R_{DS(on)}$ [mΩ]	TO-220	TO-263 (D^2PAK)	TO-220 FullPAK	TO-247	TO-247 4-pin	TO-252 (DPAK)	ThinPAK 8x8
17				IPW60R017C7	IPZ60R017C7		
40	IPP60R040C7	IPB60R040C7		IPW60R040C7	IPZ60R040C7		
60	IPP60R060C7	IPB60R060C7	IPA60R060C7	IPW60R060C7	IPZ60R060C7		
65							IPL60R065C7
99	IPP60R099C7	IPB60R099C7	IPA60R099C7	IPW60R099C7	IPZ60R099C7		
104							IPL60R104C7
120	IPP60R120C7		IPA60R120C7	IPW60R120C7			
125							IPL60R125C7
180	IPP60R180C7	IPB60R180C7	IPA60R180C7	IPW60R180C7		IPD60R180C7	
185							IPL60R185C7

600 V CoolMOS™ P6



$R_{DS(on)}$ [mΩ]	TO-220	TO-220 FullPAK	TO-263 (D^2PAK)	TO-247	TO-247 4-pin	TO-252 (DPAK)	ThinPAK 5x6	ThinPAK 8x8
41				IPW60R041P6				
70				IPW60R070P6				
99	IPP60R099P6	IPA60R099P6		IPW60R099P6	IPZ60R099P6			
125	IPP60R125P6	IPA60R125P6		IPW60R125P6				
160	IPP60R160P6	IPA60R160P6	IPB60R160P6	IPW60R160P6				
180								
190	IPP60R190P6	IPA60R190P6		IPW60R190P6				
210								IPL60R210P6
230		IPA60R230P6						
255								
280		IPA60R280P6	IPB60R280P6					
330/360							IPL60R360P6S	
380		IPA60R380P6				IPD60R380P6		
600		IPA60R600P6				IPD60R600P6		
650							IPL60R650P6S	

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600 V CoolMOS™ CE



$R_{DS(on)}$ [mΩ]	TO-220 FullPAK	TO-252 (DPAK)	TO-251 (IPAK)	SOT-223	TO-220 FullPAK Narrow Lead
190					
280					
380					
400	IPA60R400CE	IPD60R400CE			
460					
600					
650	IPA60R650CE	IPD60R650CE			
800		IPD60R800CE			
1000	IPA60R1K0CE	IPD60R1K0CE		IPN60R1K0CE	
1500		IPD60R1K5CE	IPU60R1K5CE	IPN60R1K5CE	
2100		IPD60R2K1CE	IPU60R2K1CE	IPN60R2K1CE	
3400		IPD60R3K4CE		IPN60R3K4CE	

500 V CoolMOS™ CE



$R_{DS(on)}$ [mΩ]	TO-220	TO-220 FullPAK	TO-252 (DPAK)	SOT-223
190	IPP50R190CE	IPA50R190CE		
280	IPP50R280CE	IPA50R280CE	IPD50R280CE	
380	IPP50R380CE	IPA50R380CE	IPD50R380CE	
500		IPA50R500CE	IPD50R500CE	
650				
800		IPA50R800CE		
950		IPA50R950CE	IPD50R950CE	
1400				IPN50R1K4CE
2000			IPD50R2K0CE	IPN50R2K0CE
3000			IPD50R3K0CE	

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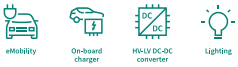
CoolMOS™ SJ MOSFET automotive

800 V CoolMOS™ C3A



$R_{DS(on)}$ @ T_J = 25°C V_{GS} = 10 V [mΩ]	TO-247	TO-252 (DPAK)	TO-263 (D^2PAK)
290	IPW80R290C3A		IPB80R290C3A
2700		IPD80R2K7C3A	

650 V CoolMOS™ CFDA



$R_{DS(on)}$ @ T_J = 25°C V_{GS} = 10 V [mΩ]	TO-220	TO-247	TO-252 (DPAK)	TO-263 (D^2PAK)
48		IPW65R048CFDA		
80		IPW65R080CFDA		
110	IPP65R110CFDA	IPW65R110CFDA		IPB65R110CFDA
150	IPP65R150CFDA	IPW65R150CFDA		IPB65R150CFDA
190				IPB65R190CFDA
310				IPB65R310CFDA
420			IPD65R420CFDA	
660			IPD65R660CFDA	IPB65R660CFDA

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650 V CoolMOS™ CFD7A



$R_{DS(on)}$ @ T_J = 25°C V_{GS} = 10 V [mΩ]	TO-220	TO-247	TO-247 Short leads	TO-263-3 (D^2PAK 3-pin)	TO-263-7 (D^2PAK 7-pin)	QDPAK BSC	QDPAK TSC
17						IPQC65R017CFD7A	IPDQ65R017CFD7A
22		IPW65R022CFD7A	IPWS65R022CFD7A				
29							
35		IPW65R035CFD7A	IPWS65R035CFD7A				
40						IPQC65R040CFD7A	IPDQ65R040CFD7A
50	IPP65R050CFD7A	IPW65R050CFD7A	IPWS65R050CFD7A	IPB65R050CFD7A	IPBE65R050CFD7A		
60							
75	IPP65R075CFD7A	IPW65R075CFD7A	IPWS65R075CFD7A	IPB65R075CFD7A	IPBE65R075CFD7A		
80							
99	IPP65R099CFD7A	IPW65R099CFD7A		IPB65R099CFD7A	IPBE65R099CFD7A		
115	IPP65R115CFD7A	IPW65R115CFD7A		IPB65R115CFD7A	IPBE65R115CFD7A		
125						IPQC65R125CFD7A	IPDQ65R125CFD7A
145	IPP65R145CFD7A	IPW65R145CFD7A		IPB65R145CFD7A	IPBE65R145CFD7A		
190	IPP65R190CFD7A	IPW65R190CFD7A		IPB65R190CFD7A	IPBE65R190CFD7A		
230				IPB65R230CFD7A	IPBE65R230CFD7A		

600 V CoolMOS™ CPA



$R_{DS(on)}$ @ T_J = 25°C V_{GS} = 10 V [mΩ]	TO-247	TO-263 (D^2PAK)
45	IPW60R045CPA	
75	IPW60R075CPA	
99	IPW60R099CPA	IPB60R099CPA

600 V CoolMOS™ S7A



$R_{DS(on)}$ @ T_J = 25°C V_{GS} = 10 V [mΩ]	QDPAK TSC	QDPAK BSC
40	IPDQ60R040S7A	IPQC60R040S7A
22	IPDQ60R022S7A	
17	IPDQ60R017S7A	IPQC60R017S7A
10	IPDQ60R010S7A	IPQC60R010S7A

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CoolMOS™ SJ MOSFETs – packages



SOT-223

		$R_{DS(on)}$ [mΩ]									
Voltage [V]	Series	0-59	60-89	90-149	150-199	200-299	300-400	401-600	601-899	900-1500	>1500
500	CE								650/800	950/1400	2000/3000
600	P7						360	600			
	CE									1000/1500	2100/3400
	PFD7						360	600		1000/1500	2000
700	P7						360	450/600	750	900/1200/1400	2000
	CE									1500	
800	P7								600/750	900/1200/1400	2000/2400/ 3300/4500
950	P7									1200	2000/3700



TO-247

		$R_{DS(on)}$ [mΩ]									
Voltage [V]	Series	0-59	60-89	90-149	150-199	200-299	300-400	401-600	601-899	900-1500	>1500
600	P7	24/37/45	60/80	99/120	180						
	C7	17/40	60	99/120	180						
	P6	41	70	99/125	160/190	280					
	CFD7	18/24/31/37/40/55	70	90/105/125/145	170						
	CPA	45	75	99							
	C3		70	100	160/190						
650	CFD7	18/29/37/41	60	90/110/125	155						
	C7	19/45	65	95/125	190						
	CFD2	41	80	110	150/190			420			
	CFDA	48	80	110	150/190						
	CFD7A	22/35/50	75	99/115/145	190	230					
800	P7					280	360				
	C3		85			290					
900	C3			120			340	500			
950	PFD7		60	130*			310				



TO-247 short leads

		$R_{DS(on)}$ [mΩ]									
Voltage [V]	Series	0-59	60-89	90-149	150-199	200-299	300-400	401-600	601-899	900-1500	>1500
650	CFD7A	22/35/50	75								



TO-247 4-pin

		$R_{DS(on)}$ [mΩ]									
Voltage [V]	Series	0-59	60-89	90-149	150-199	200-299	300-400	401-600	601-899	900-1500	>1500
600	C7	17/40	60	99							
	P6			99							
650	C7	19/45	65	95							



TO-247 4-pin asymmetric leads

		$R_{DS(on)}$ [mΩ]									
Voltage [V]	Series	0-59	60-89	90-149	150-199	200-299	300-400	401-600	601-899	900-1500	>1500
600	P7	24/37/45	60/80	99/120	180						
650	CFD7	18/29									

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IPAK

		$R_{DS(on)}$ [mΩ]									
Voltage [V]	Series	0-59	60-89	90-149	150-199	200-299	300-400	401-600	601-899	900-1500	>1500
600	CE									1500	2100
800	P7							600	750	900/1200/1400	2000/2400 3300/4500
950	P7							450	750	1200	2000/3700



IPAK Short Lead

		$R_{DS(on)}$ [mΩ]									
Voltage [V]	Series	0-59	60-89	90-149	150-199	200-299	300-400	401-600	601-899	900-1500	>1500
700	P7						360/600			900/1400	



I²PAK

		$R_{DS(on)}$ [mΩ]									
Voltage [V]	Series	0-59	60-89	90-149	150-199	200-299	300-400	401-600	601-899	900-1500	>1500
600	CPA			99/125	165/199						
	C6				190						
650	CFD2				190						
	C6				190		380				
900	C3						340	500			



DPAK

		$R_{DS(on)}$ [mΩ]									
Voltage [V]	Series	0-59	60-89	90-149	150-199	200-299	300-400	401-600	601-899	900-1500	>1500
500	CE					280	380	500	650/800	950	3000
600	P7				180	280	360	600			
	C7				180						
	CE						400		650/800	1000/1500	2100/3400
	P6						380	600			
	CFD7			145	170	210/280	360				
	PFD7					210/280	360	600		1000/1500	2000
650	C7				190	225					
	CE						400		650		
	CFD2							420	660	950	
	CFDA							420	660		
700	P7						360	600		900/1400	
800	P7					280	360	450/600	750	900/1200/1400	2000/2400 3300/4500
	C3									900/1300	2700
	C3A										2700
	CE									1000/1400	2800
900	C3									1200	
950	P7							450	750	1200	2000
	PFD7							450			

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D²PAK

		$R_{DS(on)}$ [mΩ]									
Voltage [V]	Series	0-59	60-89	90-149	150-199	200-299	300-400	401-600	601-899	900-1500	>1500
600	C7	40	60	99/120	180						
	P7	45	60/80	99/120	180	280	360				
	CPA			99							
	CFD7	40 55	70	90/105 125/145	170	210 280	360				
650	CFD7	41		90/110/125	155						
	C7	45	65	95/125	190	225					
	CFD2			110	150/190		310				
	CFDA			110	150/190		310		660		
	CFD7A	50	75	99 /115/145	190	230					
800	C3A					290					
900	C3						340				



D²PAK 7-pin

		$R_{DS(on)}$ [mΩ]									
Voltage [V]	Series	0-59	60-89	90-149	150-199	200-299	300-400	401-600	601-899	900-1500	>1500
650	CFD7A	50	75	99 /115	145/190	230					



Double DPAK (DDPAK)

		$R_{DS(on)}$ [mΩ]									
Voltage [V]	Series	0-59	60-89	90-149	150-199	200-299	300-400	401-600	601-899	900-1500	>1500
600	CFD7	45/55	75	90/105/ 125/145	170						
	G7	50	80	102/125	150/190						



QDPAK TSC

		$R_{DS(on)}$ [mΩ]									
Voltage [V]	Series	0-59	60-89	90-149	150-199	200-299	300-400	401-600	601-899	900-1500	>1500
600	S7	10/17/22/40	65								
	S7A	10/17/22/40									
650	CFD7	17*/29*/40*	60*/80*	99*/125*							
	CFD7A	17*/29*/40*	60*/80*	99*/125*							



QDPAK BSC

		$R_{DS(on)}$ [mΩ]									
Voltage [V]	Series	0-59	60-89	90-149	150-199	200-299	300-400	401-600	601-899	900-1500	>1500
600	S7	10/17*/22*/40*									
	S7A	10/17*/22*/40*									
650	CFD7	17*/29*/40*	60*								
	CFD7A	17*/40*		125*							

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TO-220 FullPAK

		$R_{DS(on)}$ [mΩ]									
Voltage [V]	Series	0-59	60-89	90-149	150-199	200-299	300-400	401-600	601-899	900-1500	>1500
500	CE				190	280	380	500	800	950	
600	P7		60/80	99/120	160/180	280		600			
	C7		60	99/120	180						
	CE						400		650	1000	
	CFD7			125	170	280	360				
	P6			99/125	160/190	230/280	380	600			
	C3				190	280	380	600			
650	C7	45	65	95/125	190	225					
	CE						400		650	1000	
	CFD2			110	150/190		310	420	660		
700	P7						360	600		900	
800	P7					280	360	450/600	750	900/1400	
	C3					290			650	900	
	CE						310	460	650	1000/1400	
900	C3						340	500	800	1000/1200	
950	P7							450	750	1200	
	PFD7			130*			310	450			



TO-220 FullPAK Narrow Lead

		$R_{DS(on)}$ [mΩ]									
Voltage [V]	Series	0-59	60-89	90-149	150-199	200-299	300-400	401-600	601-899	900-1500	>1500
600	CE								650		
	P7				180						
	PFD7			125		210/280	360				
650	CE								650		
700	P7						360	600	750		
800	P7					280	360	450			



TO-Leadless

		$R_{DS(on)}$ group [mΩ]									
Voltage [V]	Series	0-59	60-89	90-149	150-199	200-299	300-400	401-600	601-899	900-1500	>1500
600	CFD7	35/45/55	75	90/105/ 125/145							
	G7	28/50	80	102/125	150						
	S7	22/40	65								
650	CFD7	40*	60*/80*	99*/125*	155*/190*						

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TO-220

		$R_{DS(on)}$ [mΩ]									
Voltage [V]	Series	0-59	60-89	90-149	150-199	200-299	300-400	401-600	601-899	900-1500	>1500
500	CE				190	280	380				
600	P7		60/80	99/120	160/180	280	360	600			
	C7	40	60	99/120	180						
	P6			99/125	160/190						
	CFD7		70	90/105/ 125/145	170	280	360				
	S7	22									
	C3			160	190	280	380	600			
650	CFD7	41	60	90/110	155	190					
	C7	45	65	95/125	190	225					
	CFD2			110	150/190		310	420			
	CFDA			110	150						
	CFD7A	50/75*		99 /115 /145*	190						
800	P7					280	360	450/600	750	900/1200/1400	
	C3					290		450	650	900/1300	



TO-220 FullPAK Wide Creepage

		$R_{DS(on)}$ [mΩ]									
Voltage [V]	Series	0-59	60-89	90-149	150-199	200-299	300-400	401-600	601-899	900-1500	>1500
600	P7					280	360	600			
	CE				190	280	380	600			
700	CE							600		950	



ThinPAK 5x6

		$R_{DS(on)}$ [mΩ]									
Voltage [V]	Series	0-59	60-89	90-149	150-199	200-299	300-400	401-600	601-899	900-1500	>1500
600	PFD7						360	600		1000/1500	
700	P7							600	750	900/1200/1400	2000
800								600	750	900/1200/1400	2000



ThinPAK 8x8

		$R_{DS(on)}$ [mΩ]									
Voltage [V]	Series	0-59	60-89	90-149	150-199	200-299	300-400	401-600	601-899	900-1500	>1500
600	P7		65/85	105/125	185	285					
	C7		65	104/125	185						
	CFD7		60/75	95/115/140	160/185	225					
	P6				180	210					
650	CFD7		65	95/115/130	160	200					
	C7		70	99/130	195	230					
	CFD2				165		340				

www.infineon.com/coolmos-latest-packages

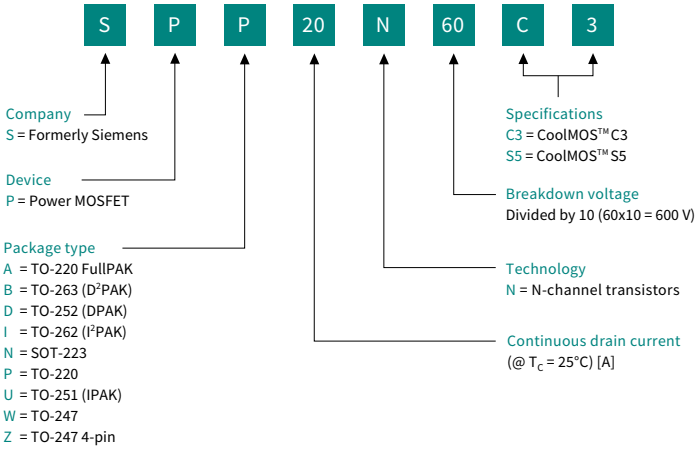
*Coming soon

ACTIVE & PREFERRED

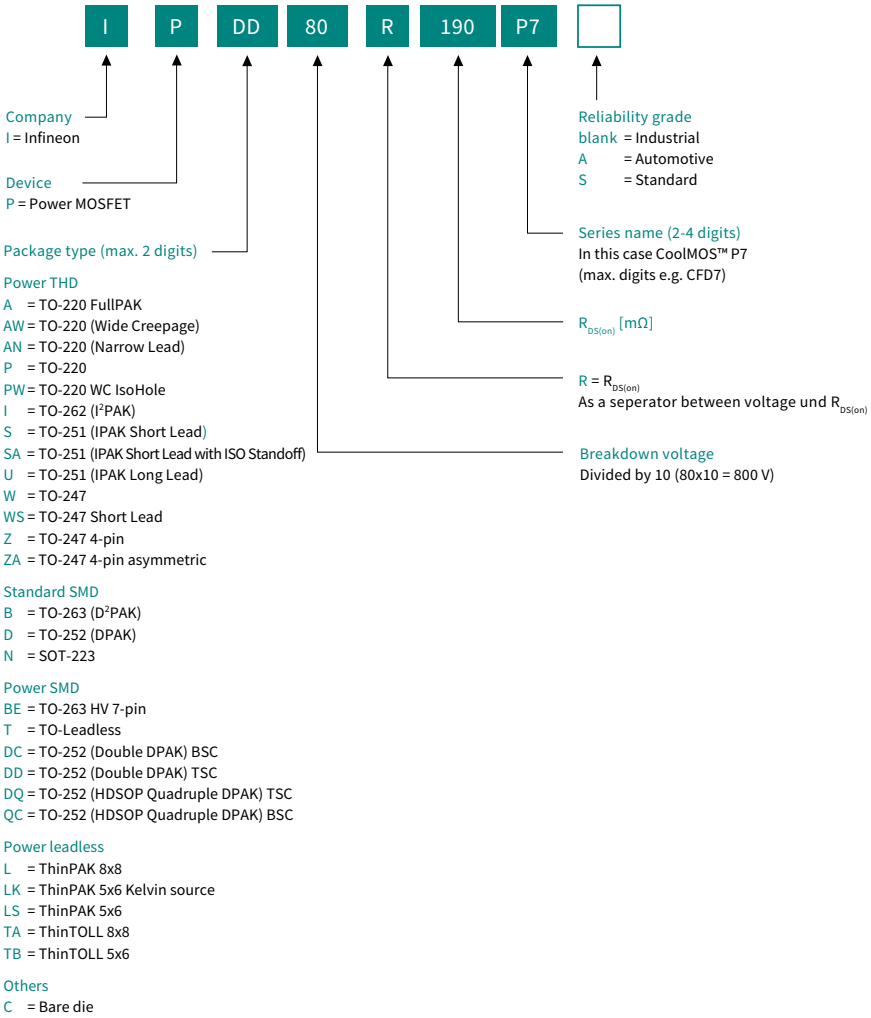
For more details on the product, click on the part number, visit infineon.com or contact our product support.

Nomenclature

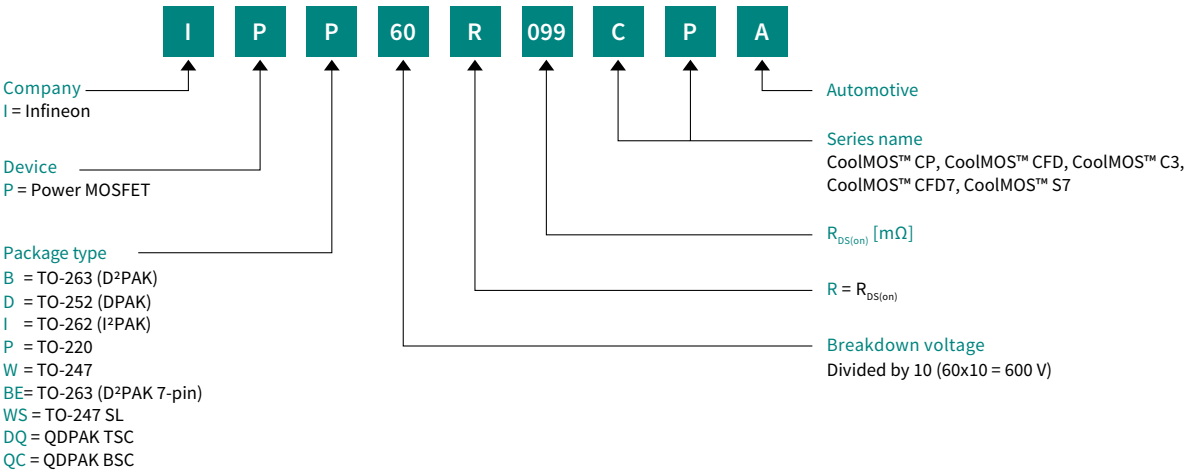
Power MOSFETs (until 2005)



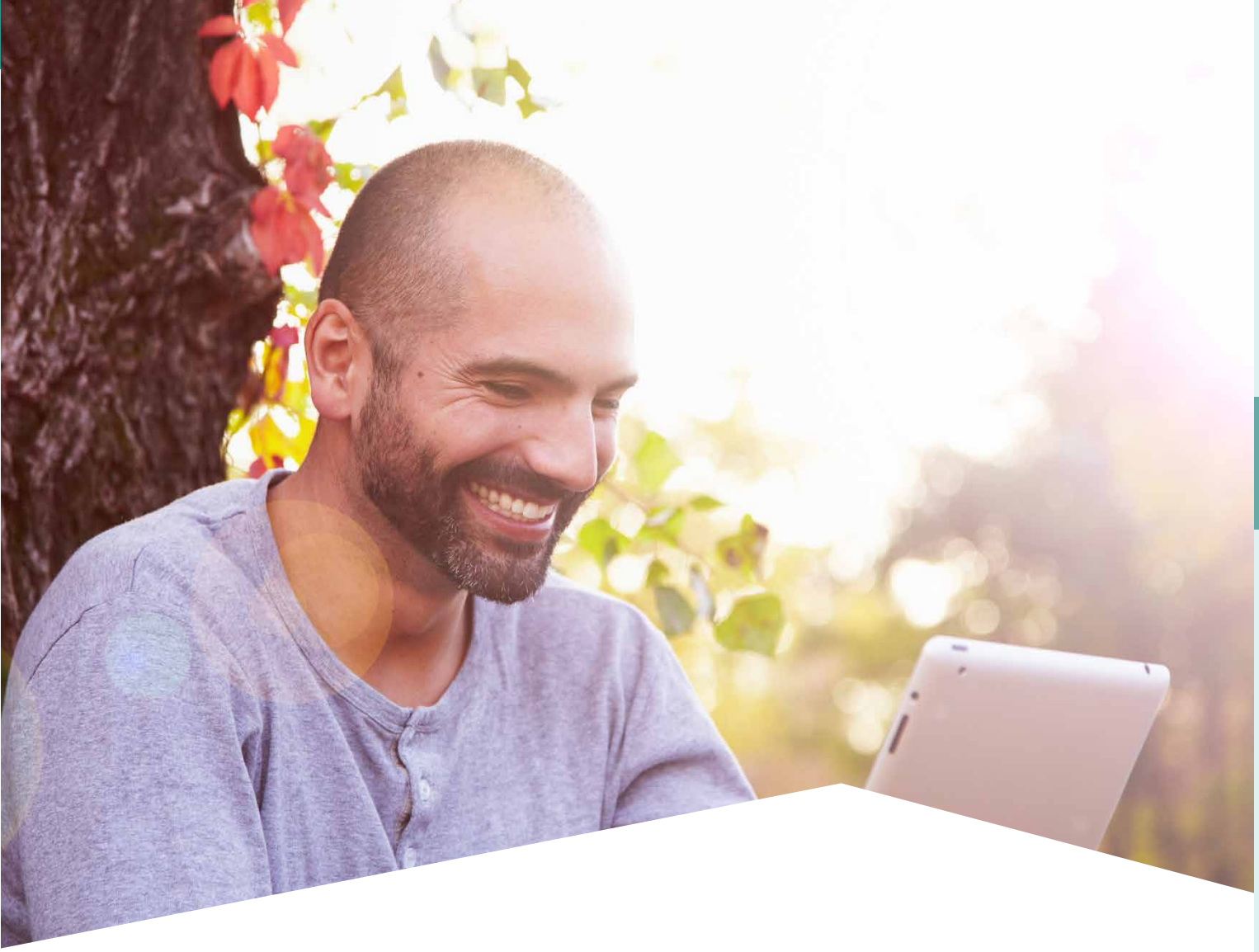
Power MOSFETs (from October 2015 onwards)



Automotive MOSFETs



For more details on the product, click on the part number, visit infineon.com or contact our product support.



Infineon support for high-voltage MOSFETs

Useful links and helpful information

Further information, datasheets and documents

www.infineon.com/coolmos
www.infineon.com/coolmos-latest-packages
www.infineon.com/coolmos-automotive
www.infineon.com/gan

Evaluationboards and simulation models
www.infineon.com/coolmos-boards
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Support | Evaluation board | Tools | Simulation

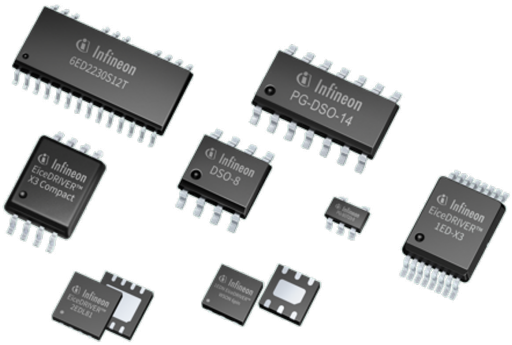


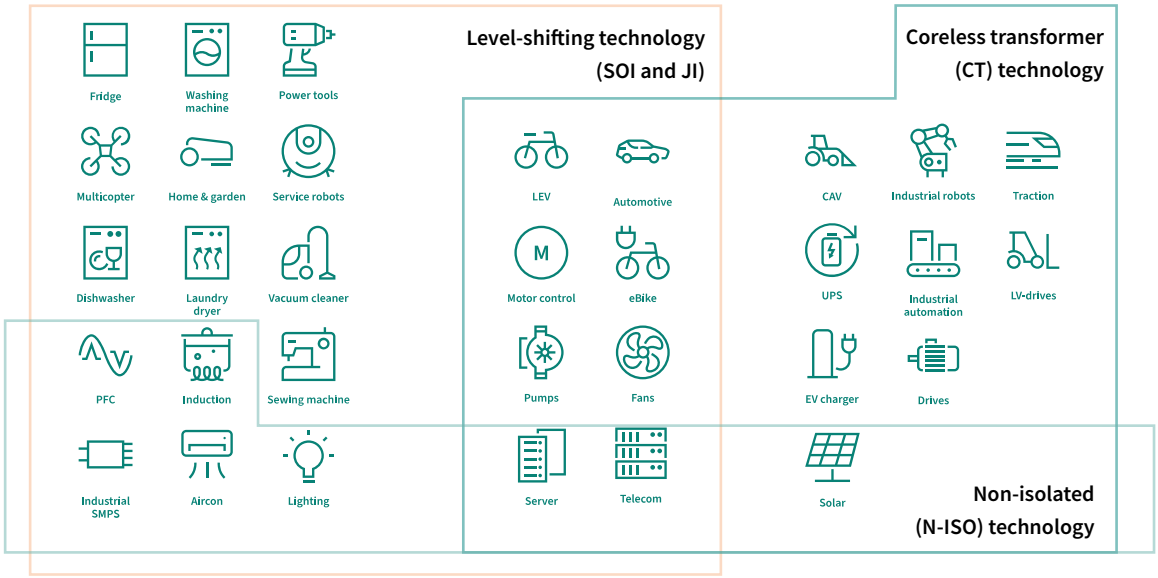
Gate-driver ICs

- Infineon gate-driver IC applications
- Driver configuration overview
- Infineon gate-driver IC technologies
- How to choose a gate driver
- Infineon gate driver IC package options
- Gate-driver ICs for GaN HEMTs
- Gate-driver ICs portfolio
- Infineon solid-state relay package options
- Gate-driver ICs for SiC MOSFETs
- EiceDRIVER™ non-isolated low-side gate drivers
- 2EDN EiceDRIVER™ family
- EiceDRIVER ™ 1EDN71x6G/U family
- EiceDRIVER™ 1EDL8011, 135 V high-side driver
- EiceDRIVER™ 2EDL8x2x family
- MOTIX™ 6EDL7141 high performance motor control
- MOTIX™ 3-phase smart gate drive controller IC
- MOTIX™ 160 V SOI gate-driver family
- EiceDRIVER™ 650 V level-shift SOI gate driver family
- EiceDRIVER™ 1200 V level-shift SOI gate driver family
- 2EDi EiceDRIVER™ family
- EiceDRIVER™ X3 Compact and 2L-SRC Compact
- EiceDRIVER™ Enhanced 1ED-F3 and X3 Analog
- EiceDRIVER™ Enhanced X3 Digital
- EiceDRIVER™ APD 2ED4820-EM
- EiceDRIVER™ 1EDI302xAS/1EDI303xAS
- Infineon solid-state relays (SSR) technologies
- Gate driver nomenclature

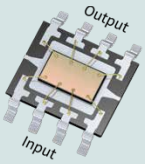
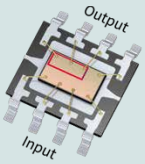
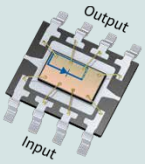
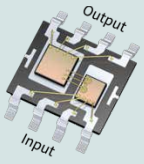
Infineon gate-driver IC applications

Leveraging the application expertise and advanced technologies of Infineon and International Rectifier, EiceDRIVER™ gate-driver ICs are well-suited for many applications such as industrial motor drives, home appliances, solar inverters, automotive applications, EV-charging, UPS, switch-mode power supplies (SMPS), high-voltage lighting, battery-powered applications, and so on.





Infineon gate-driver IC technologies

Non-isolated GD	Level-shift GD		Isolated GD
Non-isolated (N-ISO)	Junction isolation (JI)	Silicon on insulator (SOI)	Coreless transformer (CT)
			
Monolithic construction of ground-reference gate drivers for 20 V to 35 V supply voltage applications Comprehensive families of single- and dual-low-side drivers with flexible options for output current, logic configurations and UVLOs (plus non-isolated TDI) Uses rugged and high-performance technologies of HVIC process or state-of-the-art 130 nm process	Monolithic construction of one to six gate drive channels up to 1200 V rating Industrial pioneering high-voltage IC (HVIC) technology used in all high-voltage gate drive applications Gen 2 technology (IR prefix): Industrial pioneering HVIC process Gen 5 technology (IRS prefix): Cost-effective pin-to-pin versions of Gen 2	Monolithic construction of 2 to 6 gate drive channels up to 1200 V rating Built-in PN-based bootstrap diode (36 Ω typ.) for simplified bootstrap operation & reduced PCB area Negative transient immunity to prevent latch-up: -100 V for 300 ns >50 percent lower level-shift losses for higher efficiency, higher frequency operation, smaller heat sinks, and higher reliability	Two separate chips solution with magnetic coupling providing galvanically isolated single- and dual channel gate drivers VDE 0884-11 isolation technology providing isolation up to 8 kVpk V_{IOTM} and up to ±2300 V functional isolation CMTI of more than 300 V/ns Strongest gate-drive output currents (up to ±18 A) reducing need for external booster

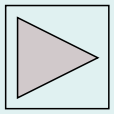
www.infineon.com/gatedriver

For more details on the product, click on the part number, visit infineon.com or contact our product support.

Driver configuration overview

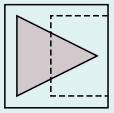
1-channel low-side driver

Allows low offset of the voltage between input and output



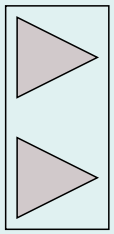
1-channel high-side driver

Allows high voltage offset between input and output



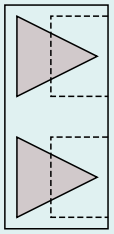
2-channel low-side driver

Both channels allow individual low voltage offsets, no interlock



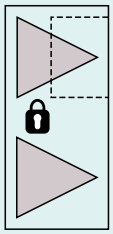
2-channel high-side driver

Both channels allow individual high voltage offsets, no interlock



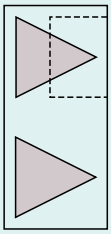
Half-bridge driver

Two interlocked channels for shoot through protection where one of the channels allows a high voltage offset.



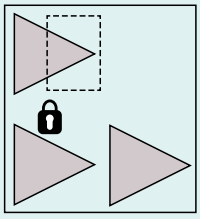
High- and low-side driver

Two non-interlocked channels, one for high voltage, one for low voltage offsets. The industry may also refer this as half-bridge.



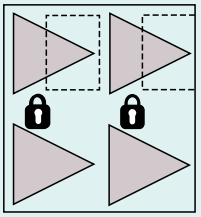
Half-bridge plus single low-side driver

Half-bridge with one additional low-side driver.



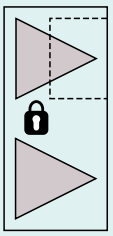
Full-bridge driver

Four channels in a package with two independent half bridges.



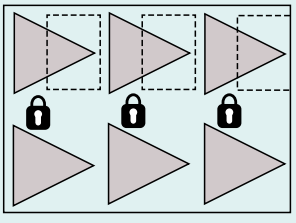
Synchronous-buck drivers

High speed drivers for dual high side and low side MOSFETs in synchronous rectified buck converters.



Three-phase bridge

Six channels in a package with three independent half bridges



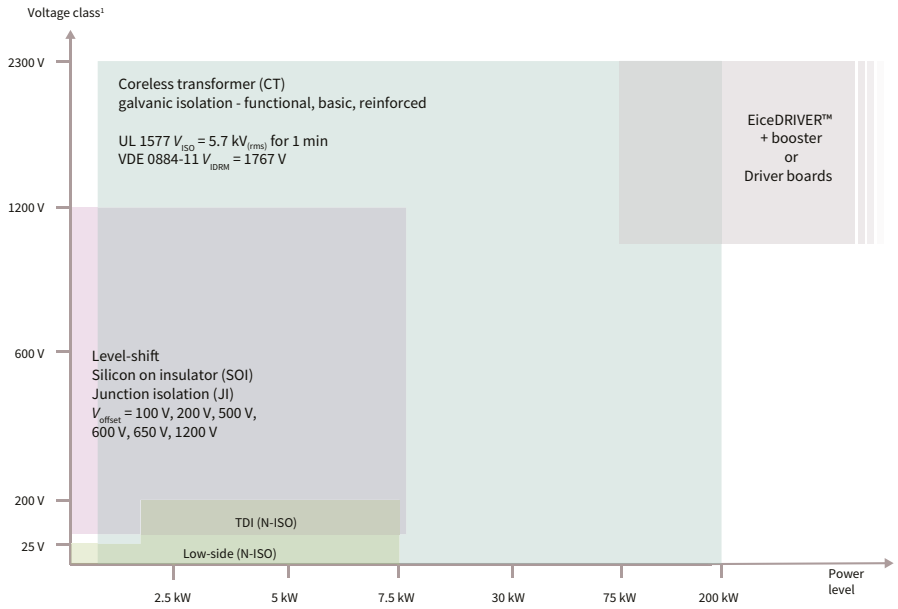
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EiceDRIVER™ and MOTIX™ gate-driver IC

Gate-driver ICs serve as the interface between control signals (digital or analog controllers) and power switches (IGBTs, MOSFETs, SiC MOSFETs, and GaN HEMTs). Integrated gate driver solutions reduce design complexity, development time, bill of materials (BOM), and board space while improving reliability over discretely-implemented gate-drive solutions.

Every switch needs a driver, the right driver makes a difference. Infineon offers a comprehensive portfolio of EiceDRIVER™ gate-driver ICs with a variety of configurations, voltage classes, isolation levels, protection features, and package options. EiceDRIVER™ gate-driver ICs are complementary to Infineon IGBT discretes and modules, silicon (CoolMOS™, OptiMOS™ and StrongIRFET™) and silicon carbide MOSFETs (CoolSiC™), gallium nitride HEMTs (CoolGaN™), or as part of integrated power modules (CIPOS™ IPM and iMOTION™ IPM).

In addition, MOTIX™ gate driver is part of the MOTIX™ scalable product portfolio for low-voltage motor control solutions including MOTIX™ Driver, MOTIX™ Bridge, MOTIX™ SBC, and MOTIX™ MCU.



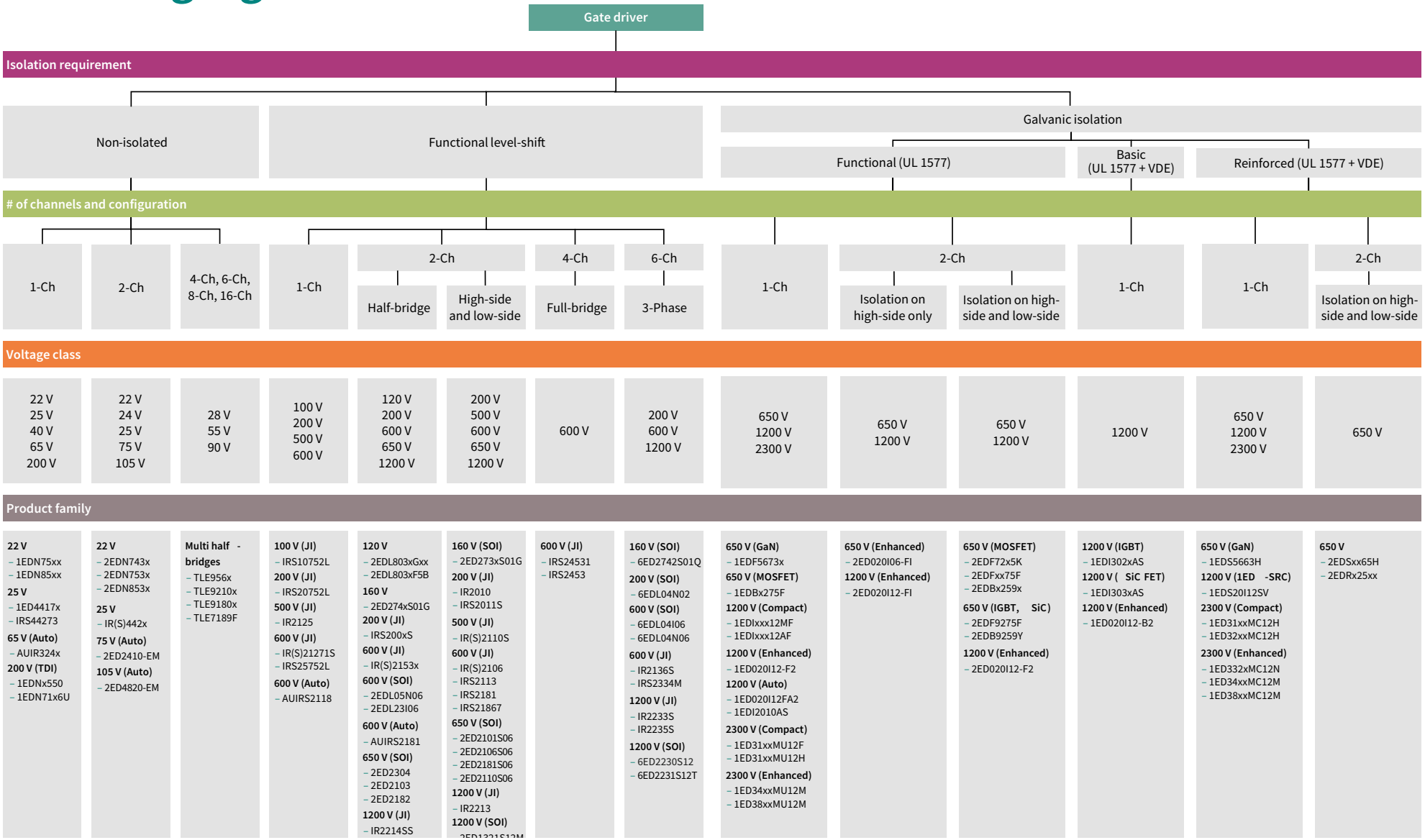
Gate driver configuration			25 V	25 - 105 V	200 V	500 V	600 V	650 V	1200 V	2300 V
Gate drivers	1-Channel	Isolated						●	●	●
		High-side		● ●	● ●	●	●			
		Low-side	●							
	2-Channel	Isolated			●			●	●	
		High-side		●						
		Low-side	●							
		High-side + Low-side			● ●	●	● ●	●	●	
		Half-bridge		●	● ●		● ●	●	●	
	4-Channel	Half-bridge		●			●			
	6-Channel	Three-phase			●		● ●		● ●	

● Non-isolated (N-ISO) ● Junction isolation (JI) ● Silicon on insulator (SOI) ● Coreless transformer (CT)

Note 1 Voltage class on the top row is defined base on different driver configurations for the maximum Voltage class.
1. For single high-side, high-side and low-side, half bridge and three phase gate drivers, voltage class is defined as switch break down voltage in applications.
2. For low side drivers (N-ISO), voltage class is defined as maximum operating range supply voltage.
3. For special cases as 1EDNx550 (1EDN-TDI, N-ISO), voltage class is defined as maximum bus voltage (highest floating voltage it can manage).

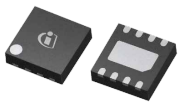
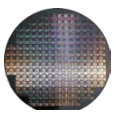
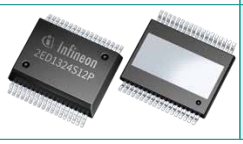
www.infineon.com/gatedriver

Choosing a gate-driver IC



www.infineon.com/gatedriver

Infineon gate-driver IC package options

DSO-8 (SOIC-8N)		DSO-24 (DSO-28 without 4 pins)		TSSOP-8	
DSO-8 with power pad		DSO-28 (SOIC-28WB)		TSSOP-28	
DSO-8 300-mil (SOIC-8WB)		DSO-36		VDSON-8	
DSO-14 (SOIC-14N)		LCC-32 (PLCC-44)		VQFN-14 (MLPQ 4X4 14L)	
DSO-14 150mil		LQFP-64		VQFN-28 (MLPQ 5x5 28L)	
DSO-14 300mil		MQFP-64		VQFN-32 5x5 mm	
DSO-16		SOT23-5		VQFN-34 (MLPQ 7Xx7 48L)	
DSO-16 300-mil (SOIC-16WB)		SOT23-6		VQFN-48	
DSO-16 (fine pitch)		SSOP-24		VSON-10 3x3 mm	
DSO-18		TFLGA-13		WSON-6	
DSO-19		TQFN-48		WSON-8	
DSO-20 (SOIC-20WB)		TSDSO-24		CHIP	
DSO-20 (fine pitch)		TSNP-6			
DSO-20 WB		TSNP-7			

Gate-driver ICs for GaN HEMTs

GaN HEMTs represent a key technology for modern power electronics systems, providing high efficiency and power density. Infineon's CoolGaN™ HEMT families and EiceDRIVER™ gate-driver ICs are designed to provide the best possible performance in GaN-based systems, minimizing R&D effort and cost. Infineon offers a broad range of EiceDRIVER™ gate-driver ICs optimized for driving GaN GIT (gate injection transistor) and SG (Schottky gate) HEMTs.

Recommended drivers for GaN GIT HEMTs and 650 V GaN HEMTs

Infineon's CoolGaN™ GIT technology is based on a hybrid-drain HEMT with p-GaN gate resulting in a robust normally-off power switch. To deal with the particularities of this concept, an innovative differential gate-drive concept has been implemented in tailor-made gate driver ICs of the EiceDRIVER™ 1EDx56x3 product family optimized for CoolGaN™ GIT HEMTs. These drivers ensure robust and highly efficient operation of the high-voltage GaN switch, and at the same time concurrently minimizing R&D efforts and shortening time-to-market. Infineon's EiceDRIVER™ 1EDx56x3 provide negative V_{GS} voltage, which leads to safe off-states during switching transients. Additionally, it protects the GaN switch against spurious turn-on, even for the first pulse or after a burst mode operation. Thanks to the integrated galvanic isolation, Infineon's EiceDRIVER™ GaN gate-driver ICs are best suited to drive high-voltage GaN HEMTs in hard-switching half-bridge applications, such as the totem-pole PFC topology. If the PWM signals have to cross the safe isolation barrier, such as in the resonant LLC with secondary-side control, the 1EDS5663H with reinforced isolation is the right choice. Nevertheless, in many applications, standard gate-driver ICs with right fit UVLO protection can also be employed when coupled to an RC circuit to generate both the required small steady-state current and the turn-on/turn-off peak currents. Dual-channel drivers of the EiceDRIVER™ 2EDxx259 product family feature dead-time control (DTC) and shoot-through protection (STP) to ensure safe operation in half-bridge topologies using a single IC. A hybrid gate driving configuration for half-bridge topologies, composed of two single-channel gate driver ICs of the EiceDRIVER™ 1EDBx275F and 1EDNx550B, allows optimizing the driver IC placement on the PCB in order to minimize the gate loop parasitic inductances. This results in a PCB area saving (compared with a dual-channel gate-driver IC) and it comes with a highly competitive bill-of-material (BOM).

To summarize, the 1-channel and 2-channel gate-driver ICs of the EiceDRIVER™ family are the best choices to match with Infineon's CoolGaN™ GIT HEMTs and other 650 GaN HEMTs technologies (e.g., Schottky gate, Cascode) to achieve an optimum combination of efficiency, power density, and robustness in high-performance power conversion applications.

Product family	Part number	Current peak sink/ source	VCC2 (-Vee2)	UVLO*	Prop delay	CMTI	Other features	Package
1EDi-G1	1EDF5673K	4 A / -8 A	20 V	5 V	37 ns	200 V/ns	Gate driver ICs for high-voltage GaN power switches (CoolGaN™, GIT technology based products), functional isolation	LGA-13 5x5mm
	1EDF5673F							DSO-16 150 mil
	1EDS5663H						Gate driver ICs for high-voltage GaN power switches (CoolGaN™, GIT technology based products), reinforced isolation, UL 1577	DSO-16 300 mil
1EDB	1EDB7275F	5 A / -9 A	20 V	4 V	45 ns	300 V/ns	Separate source/sink outputs, fast start-up times and fast recovery, basic isolation, UL 1577	DSO-8 150 mil
	1EDB8275F			8 V				
1EDN-TDI	1EDN7550B	5 A / -9 A	20 V	4 V	45 ns	n. a.	Truly differential inputs to provide high common-mode robustness	SOT23 6-pin
	1EDN8550B	5 A / -9 A		8 V				
2EDB	2EDB7259Y	5 A / -9 A	20 V	4 V	38 ns	150 V/ns	fast start-up times and fast output clamping, basic isolation, UL 1577	DSO-14 150 mil
	2EDB8259Y			8 V				
2EDR	2EDR7259X	5 A / -9 A	20 V	4 V	38 ns	150 V/ns	fast start-up times and fast output clamping, reinforced isolation, UL 1577, VDE 0884-17, IEC 60747-17	DSO-14 300 mil
	2EDR8259X			8 V				

www.infineon.com/driver-gan
www.infineon.com/driver-gan-sg
www.infineon.com/driver-gan-git

* 8 V UVLO parts recommended for bipolar driving or for unipolar driving with $V_{DD} \geq 10V$

For more details on the product, click on the part number, visit infineon.com or contact our product support.

Evaluation boards with gate-driver ICs for GaN GIT HEMTs and 650 V GaN HEMTs

Our evaluation board helps you to set up and test GaN driving solutions quickly and easily.

EVAL_1EDF_G1B_HB_GAN	EVAL_2EDB_HB_GAN	KIT_1EDB_AUX_GAN
		
High-frequency half-bridge evaluation board featuring EiceDRIVER™ 1EDi-G1.	CoolGaN™ GIT HEMT half-bridge evaluation board with EiceDRIVER™ 2EDB.	Complete driving solution for GaN HEMTs including an isolated gate driver IC with a configurable floating auxiliary supply supporting unipolar and bipolar driving.
www.infineon.com/cms/en/product/evaluation-boards/eval_1edf_g1b_hb_gan/	www.infineon.com/cms/en/product/evaluation-boards/eval_2edb_hb_gan/	www.infineon.com/cms/en/product/evaluation-boards/kit_1edb_aux_gan/

Recommended drivers for GaN SG HEMTs

The 1EDN71x6Gx is a single-channel gate-driver IC product family optimized for driving Infineon CoolGaN™ SG HEMTs, as well as other GaN SG HEMTs and Si MOSFETs. This gate driver includes several key features that enable a high-performance system design with fast-switching transistors, including truly differential input (TDI), four driving strength options, active Miller clamp, bootstrap voltage clamp, and with or without adjustable charge pump in PG-SON-10 and PG-TSNP-7 package respectively.

Product family	PN	Current peak sink/ source	CMR_{static} / $CMR_{dynamic}$	UVLO	Prop delay	CMTI	Other features	Package
1EDN71x6x	1EDN7116G	2.0A/2.0	150 V/200 V	4 V	55 ns	100 V/ ns	Negative charge pump, miller clamp	PG-VSON-10
	1EDN7126G	1.5A/1.5A			75 ns			
	1EDN7136G	1.0A/1.0A			105 ns			
	1EDN7146G	0.5A/0.5A			125 ns			
	1EDN7116U	2.0A/2.0	150 V/200 V	4 V	55 ns	100 V/ns	Miller clamp	PG-TSNP-7
	1EDN7126U	1.5A/1.5A			75 ns	100 V/ns		
	1EDN7136U	1.0A/1.0A			105 ns	100 V/ns		
	1EDN7146U	0.5A/0.5A			125 ns	100 V/ns		

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www.infineon.com/driver-gan-sg
www.infineon.com/driver-gan-git

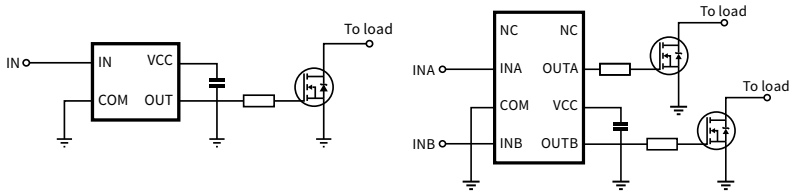
For more details on the product, click on the part number, visit infineon.com or contact our product support.

Product overview

Infineon's gate-driver IC solutions are the expert's choice. With more than 400 reliable and efficient gate driver solutions, we provide a comprehensive portfolio for virtually any application. To ease the selection process, this overview is structured along the configurations of the gate-driver ICs, as opposed to application topology.

Non-isolated low-side gate-driver IC

Typical connection



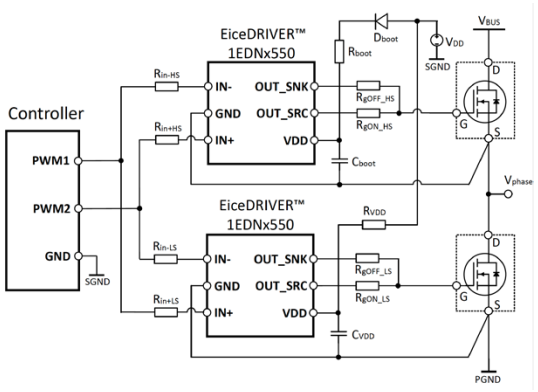
Configu-ration	Voltage class [V]	I_{o+}/I_{o-} typ. [A]	UVLO on/off typ. [V]	Prop delay off/on typ. [ns]	Base PN		Technology	Features					Package								
								Enable	Fault reporting	Over-current protection	Programmable fault clear time	Separate sink/source outputs	DSO-8	DSO-8 (with power-pad)	DIP-8	SOT23-5	SOT23-6	WSON-6	WSON-8	TSSOP-8	TSNP-6
1-channel	25	2.6/2.6	8.0/7.3	34/34	1ED44173N01B	NEW	N-ISO	✓	✓	✓							✓					
		2.6/2.6	11.9/11.0	50/50	1ED44175N01B	NEW	N-ISO	✓	✓	✓							✓					
		0.8/1.75	11.9/11.4	50/50	1ED44176N01F	NEW	N-ISO	✓	✓	✓	✓		✓									
		2.6/2.6	11.9/11.0	50/50	1ED44171N01B	NEW	N-ISO	✓	✓							✓						
		1.5/1.5	10.2/9.2	50/50	IRS44273L		N-ISO									✓						
	22	4/8	4.2/3.9	19/19	1EDN7511B		N-ISO					✓					✓					
		4/8	4.2/3.9	19/19	1EDN7512B		N-ISO									✓						
		4/8	4.2/3.9	19/19	1EDN7512G		N-ISO											✓				
		4/8	8.0/7.0	19/19	1EDN8511B		N-ISO					✓					✓					
	5	1.6/3.3	8.9/8	200/150	IR2121		N-ISO		✓	✓				✓								
2-channel	25	2.3/3.3	10.2/9.2	50/50	IRS44262S		N-ISO						✓									
		2.3/3.3	N.A.	50/50	IRS4426S		N-ISO						✓									
		2.3/3.3	N.A.	50/50	IRS4427S		N-ISO						✓									
		2.3/3.3	N.A.	65/85	IR4426S		N-ISO						✓									
		2.3/3.3	N.A.	65/85	IR4427S		N-ISO						✓									
	22	5/5	4.2/3.9	19/19	2EDN7523F		N-ISO	✓					✓									
		5/5	4.2/3.9	19/19	2EDN7523G		N-ISO	✓											✓			
		5/5	4.2/3.9	19/19	2EDN7523R		N-ISO	✓												✓		
		5/5	4.2/3.9	19/19	2EDN7524F		N-ISO	✓					✓									
		5/5	4.2/3.9	19/19	2EDN7524G		N-ISO	✓											✓			
		5/5	4.2/3.9	19/19	2EDN7524R		N-ISO	✓												✓		
		5/5	8.0/7.0	19/19	2EDN8523F		N-ISO	✓					✓									
		5/5	8.0/7.0	19/19	2EDN8523R		N-ISO	✓												✓		
		5/5	8.0/7.0	19/19	2EDN8524F		N-ISO	✓					✓									
		5/5	8.0/7.0	19/19	2EDN8524R		N-ISO	✓												✓		
		4/4	4.2/3.9	19/19	2EDN7424F		N-ISO	✓					✓									
		4/4	4.2/3.9	19/19	2EDN7424R		N-ISO	✓												✓		
		4/4	4.2/3.9	19/19	2EDN7434F	NEW	N-ISO	✓					✓									
		4/4	4.2/3.9	19/19	2EDN7434R	NEW	N-ISO	✓												✓		
		5/5	4.2/3.9	19/19	2EDN7533B	NEW	N-ISO										✓					
		5/5	4.2/3.9	19/19	2EDN7533F	NEW	N-ISO	✓					✓									
		5/5	4.2/3.9	19/19	2EDN7533R	NEW	N-ISO	✓												✓		
		5/5	4.2/3.9	19/19	2EDN7534U	NEW	N-ISO															✓
		5/5	4.2/3.9	19/19	2EDN7534B	NEW	N-ISO										✓					
		5/5	4.2/3.9	19/19	2EDN7534F	NEW	N-ISO	✓					✓									
		5/5	4.2/3.9	19/19	2EDN7534R	NEW	N-ISO	✓												✓		
		5/5	4.2/3.9	19/19	2EDN7534G	NEW	N-ISO	✓											✓			
		5/5	8.0/7.0	19/19	2EDN8533F	NEW	N-ISO	✓					✓									
		5/5	8.0/7.0	19/19	2EDN8533R	NEW	N-ISO	✓												✓		
		5/5	8.0/7.0	19/19	2EDN8534F	NEW	N-ISO	✓					✓									
		5/5	8.0/7.0	19/19	2EDN8534R	NEW	N-ISO	✓												✓		

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Non-isolated TDI gate-driver IC

Typical connection



Configura-tiuon	Voltage class [V]	I_{O+}/I_{O-} typ. [A]	UVLO on/off typ. [V]	Prop delay off/on typ. [ns]	Base PN		Technology	Features				Package			
								Adustable Negative charge pump	Active Miller clamp	Separate sink/source outputs	Truly differential inputs	SOT23-6	TSNP-6	TSNP-7	VSON-10
1-channel	200	4/8	4.2/3.9	45/45	1EDN7550U		N-ISO			✓	✓		✓		
		4/8	4.2/3.9	45/45	1EDN7550B		N-ISO			✓	✓	✓			
		4/8	8.0/7.0	45/45	1EDN8550B		N-ISO			✓	✓	✓			
		4/8	12.2/11.5	45/45	1EDN6550B	NEW	N-ISO			✓	✓	✓			
		4/8	14.9/14.4	45/45	1EDN9550B	NEW	N-ISO			✓	✓	✓			
		2/2	3.85/3.75	55/55	1EDN7116G	NEW	N-ISO	✓	✓		✓				✓
		2/2	3.85/3.75	55/55	1EDN7116U *		N-ISO		✓		✓			✓	
		1.5/1.5	3.85/3.75	75/75	1EDN7126G	NEW	N-ISO	✓	✓		✓				✓
		1.5/1.5	3.85/3.75	75/75	1EDN7126U *		N-ISO		✓		✓			✓	
		1/1	3.85/3.75	105/105	1EDN7136G	NEW	N-ISO	✓	✓		✓				✓
		1/1	3.85/3.75	105/105	1EDN7136U *		N-ISO		✓		✓			✓	
		0.5/0.5	3.85/3.75	125/125	1EDN7146G	NEW	N-ISO	✓	✓		✓				✓
		0.5/0.5	3.85/3.75	125/125	1EDN7146U *		N-ISO		✓		✓			✓	

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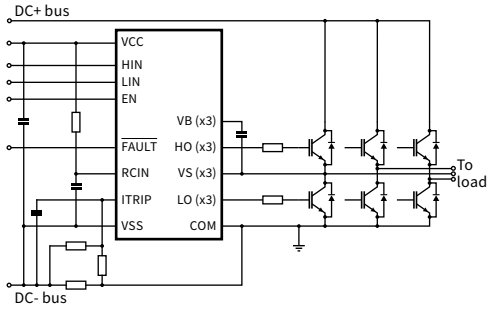
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* Coming soon

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Three-phase gate-driver ICs

Typical connection



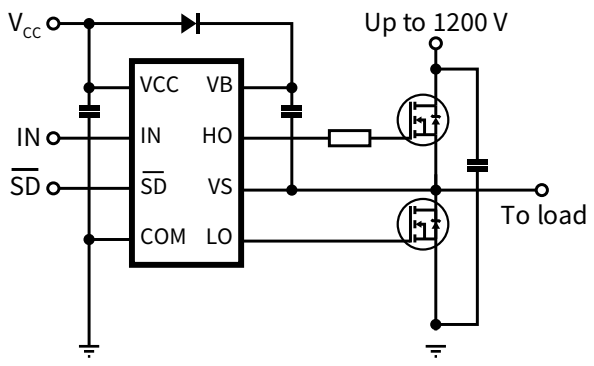
Voltage class [V]	I_{o+}/I_{o-} typ. [A]	UVLO on/off typ. [V]	Prop delay off/on typ. [ns]	Base PN	Tech-nology	Features															Package									
						Brake chopper	Desaturation protection	Enable	Fault reporting	Integrated bootstrap diode	Operational amplifier	Over-current protection	Power Management Unit	Programmable dead time	Programmable Fault Clear/Reset	Programmable OCP Reference Threshold	Programmable Op-amp Voltage Gain	Trickle Charge Pumps (100% duty cycle)	Separate pin for logic ground	Shoot-through protection	Shutdown	Two stage turn on	DSO-20 WB	DSO-24	DSO-28 WB	LCC-32	MQFP-64	TSSOP-28	VQFN-28	VQFN-32	VQFN-34	VQFN-48	CHIP
1200	0.35/0.65	12.2 / 11.3	600/600	6ED2231S12T	SOI			✓	✓	✓		✓			✓				✓	✓				✓								✓
	0.35/0.65	11.4/10.4	600/600	6ED2230S12T	SOI			✓	✓	✓		✓			✓				✓	✓				✓								✓
	0.25/0.5	8.6/8.2	700/750	IR2233S	JI				✓		✓	✓							✓	✓	✓				✓								
	0.25/0.5	8.6/8.2	700/750	IR2233J	JI				✓		✓	✓							✓	✓	✓					✓							
	0.25/0.5	10.4/9.4	700/750	IR2235S	JI				✓		✓	✓							✓	✓	✓				✓								
	0.25/0.5	10.4/9.4	700/750	IR2235J	JI				✓		✓	✓							✓	✓	✓					✓							
	0.35/0.54	11.2/10.2	550/550	IR2238Q	JI	✓	✓		✓			✓		✓					✓		✓	✓						✓					
	0.165/0.375	11.7/9.8	490/530	6EDL04I06NT	SOI			✓	✓	✓		✓							✓						✓								✓
	0.165/0.375	11.7/9.8	490/530	6EDL04I06PT	SOI			✓	✓	✓		✓							✓						✓								✓
	0.165/0.375	9/8.1	530/530	6EDL04N06PT	SOI			✓	✓	✓		✓							✓						✓								✓
	0.2/0.35	8.9/8.2	400/425	IR2136S	JI			✓	✓			✓							✓						✓	✓							✓
	0.2/0.35	11.1/10.9	400/425	IR21363S	JI			✓	✓			✓							✓						✓								✓
	0.2/0.35	10.4/9.4	530/500	IR21364S	JI			✓	✓			✓							✓						✓								✓
	0.2/0.35	11.1/10.9	530/530	IRS2334M	JI																						✓					
	0.2/0.35	11.1/10.9	530/530	IRS2334S	JI																	✓										
	0.2/0.35	8.9/8.2	530/530	IRS2336DJ	JI			✓	✓	✓		✓							✓							✓							✓
	0.2/0.35	8.9/8.2	530/530	IRS2336DM	JI			✓	✓	✓		✓							✓												✓		✓
	0.2/0.35	8.9/8.2	530/530	IRS2336DS	JI			✓	✓	✓		✓							✓						✓								✓
	0.2/0.35	8.9/8.2	530/530	IRS23364DS	JI			✓	✓	✓		✓							✓						✓								✓
	0.2/0.35	8.9/8.2	530/530	IRS23365DM	JI			✓	✓	✓		✓							✓												✓		
	0.25/0.5	9/8.7	425/675	IR2130S	JI				✓		✓	✓							✓						✓								✓
	0.25/0.5	9/8.7	425/675	IR2130J	JI				✓		✓	✓							✓							✓							✓
	0.25/0.5	9/8.7	425/675	IR2132S	JI				✓		✓	✓							✓						✓								✓
	0.25/0.5	9/8.7	425/675	IR2132J	JI				✓		✓	✓							✓							✓							✓
	0.25/0.5	8.6/8.2	700/750	IR2133S	JI				✓		✓	✓							✓		✓				✓								
	0.25/0.5	8.6/8.2	700/750	IR2133J	JI				✓		✓	✓							✓		✓					✓							
	0.25/0.5	10.4/9.4	700/750	IR2135J	JI				✓		✓	✓							✓		✓					✓							✓
200	0.165/0.375	11.7/9.8	490/530	6ED003L02-F2	SOI			✓	✓			✓							✓								✓					
	0.165/0.375	9/8.1	530/530	6EDL04N02PR	SOI			✓	✓	✓		✓							✓	✓							✓					
160	1/2	7.5/6.8	100/100	6ED2742S01Q NEW	SOI			✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓										✓			
60	1.5/1.5	5.8/4.5	140/140	6EDL7141	SOI			✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓										✓	

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Half-bridge and high- and low-side gate-driver IC

Typical connection



Voltage class [V]	I_{O+}/I_{O-} typ. [A]	UVLO on/off typ. [V]	Prop delay off/on typ. [ns]	Base PN	Technology	Features																Package										
						Comparator	Operational amplifier	Desaturation protection	Enable	Fault reporting	Integrated bootstrap diode	Over-current protection	Programmable dead time	Programmable Fault Clear/Reset	Programmable shutdown	Self-oscillating	Separate pin for logic ground	Shoot-through protection	Shutdown	Soft over-current shutdown	Two stage turn-on	DSO-8	DSO-14	DSO-16	DSO-16 WB	DSO-18	DSO-20WB (20 fine pitch leads)	SSOP-24	VDSON-8	VSON-10	VQFN-14	CHIP
1200	1.5/2.5	12.2/11.2	85/85	2ED020I12-FI	CT	✓	✓										✓	✓							✓							
	2/2.5	10.2/9.3	225/280	IR2213S	JI											✓		✓						✓								✓
	2/3	10.2/9.3	440/440	IR2214SS	JI			✓		✓				✓			✓	✓	✓	✓	✓								✓				✓
	2.3/2.3	12.2/11.3	500/500	2ED1324S12P NEW	SOI				✓	✓	✓	✓		✓			✓	✓									✓						
	2.3/2.3	12.2/11.3	350/350	2ED1323S12P NEW	SOI				✓	✓	✓	✓		✓			✓								✓		✓						
	2.3/4.6	12.2/11.3	500/500	2ED1322S12M NEW	SOI				✓	✓	✓	✓		✓			✓	✓							✓								
	2.3/4.6	12.2/11.3	350/350	2ED1321S12M NEW	SOI				✓	✓	✓	✓		✓			✓								✓								
650	0.29/0.7	8.9/8.0	90/90	2ED2101S06F NEW	SOI						✓											✓											
	0.29/0.7	8.9/8.0	90/90	2ED2103S06F NEW	SOI						✓							✓				✓											
	0.29/0.7	8.9/8.0	90/90	2ED2104S06F NEW	SOI						✓							✓	✓			✓											
	0.29/0.7	9.1/8.2	200/200	2ED2106S06F	SOI						✓											✓											✓
	0.29/0.7	9.1/8.2	200/200	2ED21064S06J	SOI						✓												✓										✓
	0.29/0.7	9.1/8.2	200/200	2ED2108S06F	SOI						✓							✓				✓											✓
	0.29/0.7	9.1/8.2	200/200	2ED21084S06J	SOI						✓		✓				✓	✓					✓										✓
	0.29/0.7	9.1/8.2	200/200	2ED2109S06F	SOI						✓							✓	✓			✓											✓
	0.29/0.7	9.1/8.2	200/200	2ED21094S06J	SOI						✓		✓				✓	✓	✓				✓										✓
	0.29/0.7	9.1/8.2	200/200	2ED21091S06F	SOI						✓		✓					✓	✓			✓											✓
	0.36/0.7	9.1/8.3	300/310	2ED2304S06F	SOI						✓							✓				✓											✓
	2.5/2.5	9.1/8.2	200/200	2ED2181S06F	SOI						✓											✓											✓
	2.5/2.5	9.1/8.2	200/200	2ED21814S06J	SOI						✓												✓										✓
	2.5/2.5	9.1/8.2	200/200	2ED2182S06F	SOI						✓							✓				✓											✓
	2.5/2.5	9.1/8.2	200/200	2ED21824S06J	SOI						✓		✓				✓	✓					✓										✓
	2.5/2.5	9.1/8.2	200/200	2ED2183S06F	SOI						✓							✓				✓											✓
	2.5/2.5	9.1/8.2	200/200	2ED21834S06J	SOI						✓		✓				✓	✓					✓										✓
	2.5/2.5	9.1/8.2	200/200	2ED2184S06F	SOI						✓							✓	✓			✓											✓
	2.5/2.5	9.1/8.2	200/200	2ED21844S06J	SOI						✓		✓				✓	✓	✓				✓										✓
	1.5/2.5	12.2/11.2	85/85	2ED020I06-FI	CT	✓	✓										✓	✓							✓								
600	0.078/0.169	8.9/8.2	220/220	IR2304S	JI												✓					✓											
	0.078/0.169	8.9/8.2	220/220	IR25601S	JI												✓					✓											
	0.18/0.26	9/8	N.A.	IR21531S	JI									✓	✓		✓	✓				✓											✓
	0.18/0.26	9/8	N.A.	IR25603S	JI									✓	✓		✓	✓				✓											
	0.18/0.26	11/9	N.A.	IRS2153DS	JI						✓			✓	✓		✓	✓				✓											✓
	0.18/0.26	11/9	N.A.	IRS21531DS	JI						✓			✓	✓		✓	✓				✓											✓
	0.2/0.35	8.9/8.2	200/220	IR2106S	JI																	✓											
	0.2/0.35	8.9/8.2	200/220	IR21064S	JI											✓							✓										
	0.2/0.35	8.9/8.2	200/220	IR2108S	JI												✓					✓											
	0.2/0.35	8.9/8.2	200/220	IR21084S	JI								✓			✓	✓						✓										
	0.2/0.35	8.9/8.2	200/750	IR2109S	JI												✓	✓				✓											
	0.2/0.35	8.9/8.2	200/750	IR21094S	JI								✓			✓	✓	✓					✓										
	0.2/0.35	8.9/8.2	200/220	IR2308S	JI												✓					✓											
	0.2/0.35	8.9/8.2	200/220	IR25606S	JI												✓					✓											
	0.2/0.35	8.9/8.2	200/220	IR25604S	JI																	✓											
	0.2/0.35	4.1/3.8	200/220	IR2301S	JI																	✓											
	0.2/0.35	4.1/3.8	200/220	IRS2301S	JI																	✓											
	0.2/0.35	4.1/3.8	200/750	IR2302S	JI												✓	✓				✓											
	0.21/0.36	8.9/8.2	150/160	IR2101S	JI																	✓											✓
	0.21/0.36	8.9/8.2	150/160	IRS2101S	JI																	✓											✓
	0.21/0.36	8.9/8.2	150/160	IR2102S	JI																	✓											
	0.21/0.36	8.9/8.2	150/680	IR2103S	JI												✓					✓											
	0.21/0.36	8.9/8.2	150/680	IR2104S	JI												✓	✓				✓											
	0.21/0.36	8.9/8.2	150/680	IR25602S	JI												✓	✓				✓											
	0.21/0.36	8.9/8.2	200/220	IRS2106S	JI																	✓											✓
	0.21/0.36	8.9/8.2	200/220	IRS21064S	JI											✓							✓										✓
	0.22/0.48	8.9/7.7	500/500	IRS2890DS	JI					✓	✓	✓					✓						✓										
	0.25/0.5	8.6/8.2	150/750	IR2111S	JI												✓					✓											✓
	0.25/0.5	8.6/8.2	105/125	IR2112S	JI													✓						✓									
	0.25/0.5	8.6/8.2	130/135	IRS2112S	JI											✓		✓						✓									✓
	0.29/0.6	8.9/8.2	150/680	IRS2103S	JI												✓					✓											✓
	0.29/0.6	8.9/8.2	150/680	IRS2104S	JI												✓	✓				✓											✓
	0.29/0.6	8.9/8.2	200/220	IRS2108S	JI												✓					✓											✓
	0.29/0.6	8.9/8.2	200/750	IRS2109S	JI												✓	✓				✓											✓
	0.29/0.6	8.9/8.2	200/750	IRS21091S	JI								✓				✓					✓											
	0.29/0.6	8.6/8.2	150/750	IRS2111S	JI												✓					✓											✓
	0.29/0.6	8.9/8.2	150/150	IRS2304S	JI												✓					✓											✓
	0.29/0.6	8.9/8.2	200/220	IRS2308S	JI												✓					✓											✓
	0.36/0.7	9.1/8.3	300/310	2EDL05N06PF	SOI						✓						✓					✓											
	0.36/0.7	9.1/8.3	300/310	2EDL05N06PJ	SOI						✓						✓						✓										
	0.36/0.7	12.5/11.6	400/420	2EDL05I06PF	SOI						✓						✓					✓											
	0.36/0.7	12.5/11.6	400/420	2EDL05I06PJ	SOI						✓						✓						✓										
	0.36/0.7	12.5/11.6	400/420	2EDL05I06BF	SOI						✓											✓											
	1.9/2.3	8.9/8.2	220/180	IRS2181S	JI																	✓											✓
	1.9/2.3	8.9/8.2	220/180	IR2181S	JI																	✓											
	1.9/2.3	8.9/8.2	220/180	IR21814S	JI											✓							✓										
	1.9/2.3	8.9/8.2	220/180	IRS21814S	JI											✓							✓										
	1.9/2.3	8.9/8.2	220/180	IRS21814M	JI											✓															✓		
	1.9/2.3	8.9/8.2	220/180	IRS2183S	JI												✓					✓											✓
	1.9/2.3	8.9/8.2	220/180	IR2183S	JI												✓					✓											
	1.9/2.3	8.9/8.2	220/180	IR21834S	JI								✓			✓	✓						✓										
	1.9/2.3	8.9/8.2	220/180	IRS21834S	JI								✓			✓	✓						✓										
	1.9/2.3	8.9/8.2	270/680	IRS2184S	JI												✓	✓				✓											✓
	1.9/2.3	8.9/8.2	270/680	IR2184S	JI												✓	✓				✓											
	1.9/2.3	8.9/8.2	270/680	IR21844S	JI								✓			✓	✓	✓					✓										
	1.9/2.3	8.9/8.2	270/680	IRS21844S	JI								✓			✓	✓	✓					✓										
	1.9/2.3	8.9/8.2	270/680	IRS21844M	JI								✓			✓	✓	✓													✓		
	2.5/2.5	8.6/8.2	94/120	IR2113S	JI											✓		✓						✓									✓
	2.5/2.5	8.6/8.2	94/120	IR25607S	JI											✓		✓						✓									
	2.5/2.5	8.5/8.2	120/130	IRS2113S	JI											✓		✓						✓									✓
	2.5/2.5	8.5/8.2	120/130	IRS2113M	JI											✓		✓													✓		✓
	2/3	10.2/9.3	440/440	IR2114SS	JI			✓		✓						✓	✓		✓							✓							
	2.3/2.8	9.1/8.3	300/310	2EDL23N06PJ	SOI				✓	✓	✓	✓				✓	✓					✓											
	2.3/2.8	12.5/11.6	400/420	2EDL23I06PJ	SOI				✓	✓	✓	✓				✓	✓					✓											
	4/4	8.9/8.2	170/170	IRS2186S	JI																	✓											✓
	4/4	8.9/8.2	170/170	IRS21864S	JI											✓							✓										
	4/4	6/5.5	170/170	IRS21867S	JI																	✓											
500	2.5/2.5	8.6/8.2	94/120	IR2110S	JI											✓		✓						✓									
	2.5/2.5	8.5/8.2	120/130	IRS2110S	JI											✓		✓						✓									✓
200	0.29/0.6	8.9/8.2	150/160	IRS2005S	JI																	✓											
	0.29/0.6	8.9/8.2	150/160	IRS2005M	JI																											✓	
	0.29/0.6	8.9/8.2	150/160	IRS2007S	JI												✓					✓											
	0.29/0.6	8.9/8.2	150/160	IRS2007M	JI												✓															✓	
	0.29/0.6	8.9/8.2	150/680	IRS2008S	JI												✓	✓				✓											
	0.29/0.6	8.9/8.2	150/680	IRS2008M	JI												✓	✓														✓	
	1/1	9/8.2	75/80	IR2011S	JI																	✓											
	1/1	9/8.2	60/60	IRS2011S	JI																	✓											✓
	3/3	8.6/8.2	65/95	IR2010S	JI											✓		✓						✓									
160	1/2	5/4.5	50/50	2ED2732S01G *	SOI						✓					✓															✓		
	1/2	5/4.5	50/50	2ED2742S01G *	SOI						✓					✓	✓															✓		
	2/4	5/4.5	65/65	2ED2734S01G *	SOI						✓					✓															✓		
	2/4	5/4.5	65/65	2ED2744S01G *	SOI						✓					✓	✓															✓		
	4/8	5/4.5	65/65	2ED2738S01G NEW	SOI						✓					✓															✓		
	4/8	5/4.5	65/65	2ED2748S01G NEW	SOI						✓					✓	✓															✓		
120	3/6	7/6.5	47/47	2EDL8033G4B*	JI						✓																		✓				
	4/6	7/6.5	47/47	2EDL8034G4B*	JI						✓																		✓				
	3/6	7/6.5	47/47	2EDL8033G4C*	JI						✓																					✓		
	4/6	7/6.5	47/47	2EDL8034G4C*	JI						✓																					✓		
	3/6	7/6.5	47/47	2EDL8033G3C*	JI						✓																					✓		
	4/6	7/6.5	47/47	2EDL8034G3C*	JI						✓																					✓		
	3/6	7/6.5	47/47	2EDL8033F5B*	JI						✓											✓											
	4/6	7/6.5	47/47	2EDL8034F5B*	JI						✓											✓											

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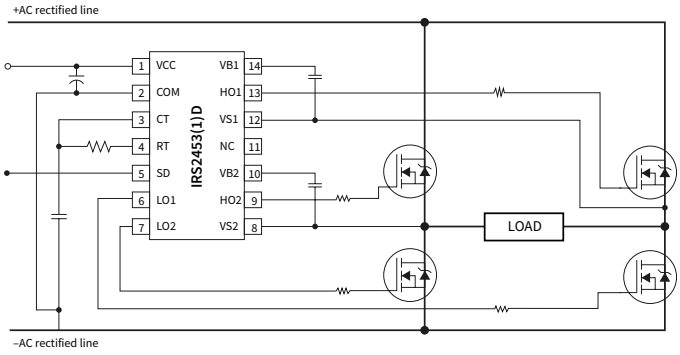
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* Coming soon

For more details on the product, click on the part number or contact our product support.

Full-bridge gate-driver ICs

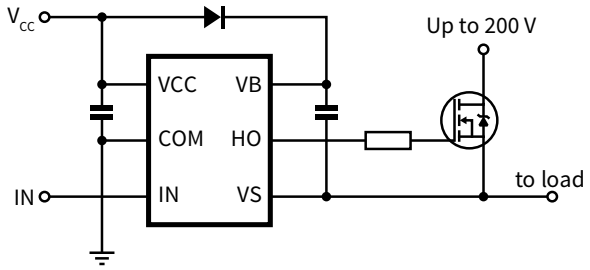
Typical connection



Voltage class [V]	I_{o+}/I_{o-} typ. [A]	UVLO on/off typ. [V]	Base PN	Technology	Features			Package
					Integrated bootstrap diode	Shoot-through protection	Shutdown	DSO-14
600	0.18/0.26	11/9	IRS2453DS	JI	✓	✓	✓	✓

Single high-side gate-driver ICs

Typical connection

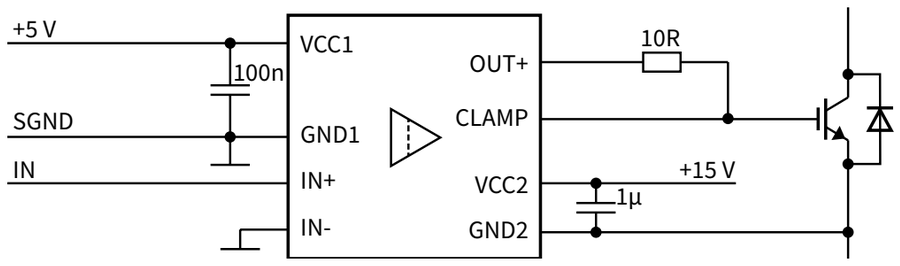


Voltage class [V]	I_{o+}/I_{o-} typ. [A]	UVLO on/off typ. [V]	Prop delay off/on typ. [ns]	Base PN	Technology	Features		Package			
						Fault reporting	Over-current protection	DSO-8	DSO-16 WB	SOT23-6	TSNP-6
600	0.16/0.24	9/8	215/140	IRS25752L	JI					✓	
	0.25/0.5	8.6/8.2	105/125	IR2117S	JI			✓			
	0.25/0.5	8.6/8.2	105/125	IR2118S	JI			✓			
	0.25/0.5	10.3/9	150/200	IR2127S	JI	✓	✓	✓			
	0.25/0.5	10.3/9	150/200	IR2128S	JI	✓	✓	✓			
	0.25/0.5	7.2/6.8	150/200	IR21271S	JI	✓	✓	✓			
	0.29/0.6	8.6/8.2	105/125	IRS2117S	JI			✓			
	0.29/0.6	8.6/8.2	105/125	IRS2118S	JI			✓			
	0.29/0.6	10.3/9	150/150	IRS2127S	JI	✓	✓	✓			
	0.29/0.6	7.2/6.8	150/150	IRS21271S	JI	✓	✓	✓			
500	1.6/3.3	9.2/8.3	200/170	IR2125S	JI	✓	✓		✓		
200	0.16/0.24	9/8	215/140	IRS20752L	JI					✓	
	4/8	4.2/3.9	5/45	1EDN7550B	TDI					✓	
	4/8	8/7	45/45	1EDN8550B	TDI					✓	
	4/8	12.2/11.5	45/45	1EDN6550B	TDI					✓	
	4/8	14.9/14.4	45/45	1EDN9550B	TDI					✓	
	4/8	4.2/3.9	45/45	1EDN7550U	TDI						✓
100	0.16/0.24	9/8	215/140	IRS10752L	JI					✓	

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Galvanic isolated gate-driver ICs



Configuration	Voltage class [V]	Isolation type	Isolation rating	I_{O+}/I_{O-} typ. [A]	UVLO on/off typ. [V]	Prop delay off/on typ. [ns]	Base PN	Technology	Features																				Package													
									Active Miller clamp	Analog configurability (Desat, soft-off)	Comparator	Deadtime control	Desaturation protection	Digital I²C configurability	Disable	Enable	Fast output clamping for supply below UVLO	Fault reporting	Fault reset	Operational amplifier (OPAMP)	Over-current protection	Separate pin for logic ground	Separate sink/source outputs	Shoot-through protection	Shutdown	Soft off	Two-level turn-off	Two-level Slew rate control	UL 1577	VDE 0884-10/11	DSO-8 150mil	DSO-8 300mil	DSO-14 150mil	DSO-14 300mil	DSO-16 150mil	DSO-16 fine pitch 300 mil	DSO-16 300 mil	DSO-18	DSO-36	TFLGA-13 (4x4)	TFLGA-13 (5x5)
		Reinforced	V_{IORM} = 1.7 kV(rms); V_{IOTM}=8 kV; V_{ISO} = 5.7 kV(rms)	5.5/5.5	10/8	90/90	1ED3120MC12H NEW	CT														✓	✓					✓	✓		✓										
		Functional	V_{ISO} = 5.7 kV(rms)	5.5/5.5	10/8	90/90	1ED3120MU12H NEW	CT														✓	✓					✓			✓										
		Reinforced	V_{IORM} = 1.7 kV(rms); V_{IOTM}=8 kV; V_{ISO} = 5.7 kV(rms)	5.5/5.5	12.5/10.5	90/90	1ED3121MC12H NEW	CT														✓	✓					✓	✓		✓										
		Functional	V_{ISO} = 5.7 kV(rms)	5.5/5.5	12.5/10.5	90/90	1ED3121MU12H NEW	CT														✓	✓					✓			✓										
		Reinforced	V_{IORM} = 1.7 kV(rms); V_{IOTM}=8 kV; V_{ISO} = 5.7 kV(rms)	5.5/5.5	12.5/10.5	280/280	1ED3131MC12H NEW	CT														✓	✓					✓	✓		✓										
		Functional	V_{ISO} = 5.7 kV(rms)	5.5/5.5	12.5/10.5	280/280	1ED3131MU12H NEW	CT														✓	✓					✓			✓										
		Reinforced	V_{IORM} = 1.7 kV(rms); V_{IOTM}=8 kV; V_{ISO} = 5.7 kV(rms)	10/9	10/8	90/90	1ED3122MC12H NEW	CT	✓													✓						✓	✓		✓										
		Functional	V_{ISO} = 5.7 kV(rms)	10/9	10/8	90/90	1ED3122MU12H NEW	CT	✓													✓						✓			✓										
		Functional	V_{ISO} = 3 kV(rms)	10/9	12.5/10.5	90/90	1ED3125MU12F NEW	CT	✓													✓						✓		✓											
		Functional	V_{ISO} = 3 kV(rms)	10/9	12.5/10.5	90/90	1ED3127MU12F NEW	CT	✓													✓						✓		✓											
		Reinforced	V_{IORM} = 1.7 kV(rms); V_{IOTM}=8 kV; V_{ISO} = 5.7 kV(rms)	13.5/14	10/8	90/90	1ED3123MC12H NEW	CT														✓	✓					✓	✓		✓										
		Functional	V_{ISO} = 5.7 kV(rms)	13.5/14	10/8	90/90	1ED3123MU12H NEW	CT														✓	✓					✓			✓										
		Reinforced	V_{IORM} = 1.7 kV(rms); V_{IOTM}=8 kV; V_{ISO} = 5.7 kV(rms)	13.5/14	12.5/10.5	90/90	1ED3124MC12H NEW	CT														✓	✓					✓	✓		✓										
		Functional	V_{ISO} = 5.7 kV(rms)	13.5/14	12.5/10.5	90/90	1ED3124MU12H NEW	CT														✓	✓					✓		✓											
		Functional	V_{ISO} = 3 kV(rms)	13.5/14	12.5/10.5	90/90	1ED3124MU12F NEW	CT														✓	✓					✓		✓											
		Functional	V_{ISO} = 3 kV(rms);	6/6.5	8.5/9.3	45/45	1ED3140MU12F NEW	CT														✓	✓					✓		✓											
		Functional	V_{ISO} = 3 kV(rms);	6/6.5	11/12	45/45	1ED3141MU12F NEW	CT														✓	✓					✓		✓											
		Functional	V_{ISO} = 3 kV(rms);	6/6.5	12.5/13.6	45/45	1ED3142MU12F NEW	CT														✓	✓					✓		✓											
	2300	Reinforced	V_{IORM} = 1.7 kV(rms); V_{IOTM}=8 kV; V_{ISO} = 5.7 kV(rms)	10/10	12.5/10.4	110/110	1ED3240MC12H NEW	CT														✓						✓	✓	✓		✓									
		Reinforced	V_{IORM} = 1.7 kV(rms); V_{IOTM}=8 kV; V_{ISO} = 5.7 kV(rms)	10/10	12.5/10.4	110/110	1ED3250MC12H NEW	CT														✓						✓	✓	✓		✓									
		Reinforced	V_{IORM} = 1.7 kV(rms); V_{IOTM}=8 kV; V_{ISO} = 5.7 kV(rms)	18/18	12.5/10.4	110/110	1ED3251MC12H NEW	CT	✓													✓						✓	✓	✓		✓									
		Reinforced	V_{IORM} = 1.7 kV(rms); V_{IOTM}=8 kV; V_{ISO} = 5.7 kV(rms)	18/18	12.5/10.4	110/110	1ED3241MC12H NEW	CT	✓													✓						✓	✓	✓		✓									
		Reinforced	V_{IORM} = 1.7 kV(rms); V_{IOTM}=8 kV; V_{ISO} = 5.7 kV(rms)	3.3/6	12.6/10.4	86/80	1ED3320MC12N NEW	CT	✓				✓					✓	✓			✓	✓			✓			✓	✓											
		Reinforced	V_{IORM} = 1.7 kV(rms); V_{IOTM}=8 kV; V_{ISO} = 5.7 kV(rms)	6/8.5	12.6/10.4	86/80	1ED3321MC12N NEW	CT	✓				✓					✓	✓			✓	✓			✓			✓	✓											
		Reinforced	V_{IORM} = 1.7 kV(rms); V_{IOTM}=8 kV; V_{ISO} = 5.7 kV(rms)	6/8.5	14.2/11.9	86/80	1ED3322MC12N NEW	CT	✓				✓					✓	✓			✓	✓			✓			✓	✓											
		Reinforced	V_{IORM} = 1.7 kV(rms); V_{IOTM}=8 kV; V_{ISO} = 5.7 kV(rms)	6/8.5	12.6/10.4	86/80	1ED3323MC12N NEW	CT	✓				✓					✓	✓			✓							✓	✓											
		Reinforced	V_{IORM} = 1.7 kV(rms); V_{IOTM}=8 kV; V_{ISO} = 5.7 kV(rms)	3.8/2.5	12.6/10.4	236/244	1ED3431MC12M NEW	CT	✓	✓			✓					✓	✓			✓	✓			✓			✓	✓							✓				
		Functional	V_{ISO} = 5.7 kV(rms)	3.8/2.5	12.6/10.4	236/244	1ED3431MU12M NEW	CT	✓	✓			✓					✓	✓			✓	✓			✓			✓							✓				
		Reinforced	V_{IORM} = 1.7 kV(rms); V_{IOTM}=8 kV; V_{ISO} = 5.7 kV(rms)	3.8/2.5	Adjustable	236/244	1ED3830MC12M NEW	CT	✓				✓	✓				✓	✓			✓	✓			✓	✓		✓	✓							✓				
		Functional	V_{ISO} = 5.7 kV(rms)	3.8/2.5	Adjustable	236/244	1ED3830MU12M NEW	CT	✓				✓	✓				✓	✓			✓	✓			✓	✓		✓	✓							✓				
		Reinforced	V_{IORM} = 1.7 kV(rms); V_{IOTM}=8 kV; V_{ISO} = 5.7 kV(rms)	7.5/5	12.6/10.4	236/244	1ED3461MC12M NEW	CT	✓	✓			✓					✓	✓			✓	✓			✓			✓	✓							✓				
		Functional	V_{ISO} = 5.7 kV(rms)	7.5/5	12.6/10.4	236/244	1ED3461MU12M NEW	CT	✓	✓			✓					✓	✓			✓	✓			✓			✓							✓				
		Reinforced	V_{IORM} = 1.7 kV(rms); V_{IOTM}=8 kV; V_{ISO} = 5.7 kV(rms)	7.5/5	Adjustable	236/244	1ED3860MC12M NEW	CT	✓				✓	✓				✓	✓			✓	✓			✓	✓		✓	✓							✓				
		Functional	V_{ISO} = 5.7 kV(rms)	7.5/5	Adjustable	236/244	1ED3860MU12M NEW	CT	✓				✓	✓				✓	✓			✓	✓			✓	✓		✓	✓							✓				
		Reinforced	V_{IORM} = 1.7 kV(rms); V_{IOTM}=8 kV; V_{ISO} = 5.7 kV(rms)	11/7.5	12.6/10.4	236/244	1ED3491MC12M NEW	CT	✓	✓			✓					✓	✓			✓	✓			✓			✓	✓							✓				
		Functional	V_{ISO} = 5.7 kV(rms)	11/7.5	12.6/10.4	236/244	1ED3491MU12M NEW	CT	✓	✓			✓					✓	✓			✓	✓			✓			✓							✓				
		Reinforced	V_{IORM} = 1.7 kV(rms); V_{IOTM}=8 kV; V_{ISO} = 5.7 kV(rms)	11/7.5	Adjustable	236/244	1ED3890MC12M NEW	CT	✓				✓	✓				✓	✓			✓	✓			✓	✓		✓	✓							✓				
		Functional	V_{ISO} = 5.7 kV(rms)	11/7.5	Adjustable	236/244	1ED3890MU12M NEW	CT	✓				✓	✓				✓	✓			✓	✓			✓	✓		✓	✓							✓				
1-channel		Basic	V_{IORM} = 1.4 kV; V_{IOTM}=6 kV; V_{ISO} = 3.7 kV(rms)	2/2	12/11	165/170	1ED020I12-B2	CT	✓				✓					✓	✓			✓							✓	✓		✓								✓		
		Basic	V_{IORM} = 1.4 kV; V_{IOTM}=6 kV; V_{ISO} = 3.7 kV(rms)	2/2	12/11	1750/1750	1ED020I12-BT	CT	✓				✓					✓	✓			✓				✓			✓	✓									✓		
		Functional	V_{ISO} = ± 1.2 kV	2/2	12/11	165/170	1ED020I12-F2	CT	✓				✓					✓	✓			✓																	✓		
		Functional	V_{ISO} = ± 1.2 kV	2/2	12/11	1750/1750	1ED020I12-FT	CT	✓				✓					✓	✓			✓				✓													✓		
		Reinforced	V_{IORM} = 1.4 kV(rms); V_{IOTM}=8 kV; V_{ISO} = 5.7 kV(rms)	4/8	5.0/4.5	37/37	1EDS5663H	CT						✓			✓						✓				✓			✓	✓								✓			
		Functional	V_{IOTM} = 4.2 kV(peak); V_{ISO} = 3 kV(rms)	5.4/9.8	12.2/11.5	45/45	1EDB6275F	CT						✓		✓							✓						✓		✓										
		Functional	V_{IOTM} = 4.2 kV(peak); V_{ISO} = 3 kV(rms)	5.4/9.8	4.2/3.9	45/45	1EDB7275F	CT						✓		✓							✓						✓		✓										
		Functional	V_{IOTM} = 4.2 kV(peak); V_{ISO} = 3 kV(rms)	5.4/9.8	8/7	45/45	1EDB8275F	CT						✓		✓							✓						✓		✓										
		Functional	V_{IOTM} = 4.2 kV(peak); V_{ISO} = 3 kV(rms)	5.4/9.8	14.9/14.4	45/45	1EDB9275F	CT						✓		✓							✓						✓		✓										
		Functional	V_{IOWM} = 510 V(rms); V_{ISO} = 1.5 kV(rms)	4/8	5/4.5	37/37	1EDF5673F	CT						✓									✓													✓					
		Functional	V_{IOWM} = 460 V(rms); V_{ISO} = 1.5 kV(rms)	4/8	5/4.5	37/37	1EDF5673K	CT						✓									✓													✓					✓
		Functional	V_{ISO} = ± 1.2 kV	1.3/0.9	12/11.1	300/300	1EDI05I12AF	CT														✓	✓									✓									
		Functional	V_{ISO} = ± 1.2 kV	1.3/0.9	12/11.1	300/300	1EDI05I12AH	CT														✓	✓										✓								
		Functional	V_{ISO} = 2.5 kV(rms)	1.3/0.9	12/11.1	300/300	1EDC05I12AH	CT														✓	✓								✓		✓								
		Functional	V_{ISO} = ± 1.2 kV	2.2/2.3	12/11.1	300/300	1EDI10I12MF	CT	✓													✓										✓									
		Functional	V_{ISO} = ± 1.2 kV	2.2/2.3	12/11.1	300/300	1EDI10I12MH	CT	✓													✓											✓								
		Functional	V_{ISO} = 2.5 kV(rms)	2.2/2.3	12/11.1	300/300	1EDC10I12MH	CT	✓													✓									✓			✓								
		Functional	V_{ISO} = ± 1.2 kV	4/3.5	9.1/8.5	120/115	1EDI20N12AF	CT														✓	✓									✓									
		Functional	V_{ISO} = ± 1.2 kV	4/3.5	12/11.1	125/120	1EDI20H12AH	CT														✓	✓										✓								
		Functional	V_{ISO} = 2.5 kV(rms)	4/3.5	12/11.1	125/120	1EDC20H12AH	CT														✓	✓								✓			✓							
	1200	Functional	V_{ISO} = ± 1.2 kV	4/3.5	12/11.1	300/300	1EDI20I12AF	CT														✓	✓									✓									
		Functional	V_{ISO} = ± 1.2 kV	4/3.5	12/11.1	300/300	1EDI20I12AH	CT														✓	✓										✓								
		Functional	V_{ISO} = 2.5 kV(rms)	4/3.5	12/11.1	300/300	1EDC20I12AH	CT														✓	✓								✓			✓							
		Functional	V_{ISO} = ± 1.2 kV	4.4/4.1	12/11.1	300/300	1EDI20I12MF	CT	✓													✓										✓									
		Functional	V_{ISO} = ± 1.2 kV	4.4/4.1	12/11.1	300/300	1EDI20I12MH	CT	✓													✓											✓								
		Functional	V_{ISO} = 2.5 kV(rms)	4.4/4.1	12/11.1	300/300	1EDC20I12MH	CT	✓													✓									✓			✓							
		Functional	V_{ISO} = ± 1.2 kV	5.9/6.2	12/11.1	300/300	1EDI30I12MF	CT	✓													✓										✓									
		Functional	V_{ISO} = ± 1.2 kV	5.9/6.2	12/11.1	300/300	1EDI30I12MH	CT	✓													✓											✓								
		Functional	V_{ISO} = 2.5 kV(rms)	5.9/6.2	12/11.1	300/300	1EDC30I12MH	CT	✓													✓									✓			✓							
		Functional	V_{ISO} = ± 1.2 kV	7.5/6.8	12/11.1	300/300	1EDI40I12AF	CT														✓	✓									✓									
		Functional	V_{ISO} = ± 1.2 kV	7.5/6.8	12/11.1	300/300	1EDI40I12AH	CT														✓	✓										✓								
		Functional	V_{ISO} = 2.5 kV(rms)	7.5/6.8	12/11.1	300/300	1EDC40I12AH	CT														✓	✓								✓			✓							
		Functional	V_{ISO} = ± 1.2 kV	10/9.4	9.1/8.5	120/115	1EDI60N12AF	CT														✓	✓									✓									
		Functional	V_{ISO} = ± 1.2 kV	10/9.4	12/11.1	125/120	1EDI60H12AH	CT														✓	✓										✓								
		Functional	V_{ISO} = 2.5 kV(rms)	10/9.4	12/11.1	125/120	1EDC60H12AH	CT														✓	✓								✓			✓							
		Functional	V_{ISO} = ± 1.2 kV	10/9.4	12/11.1	300/300	1EDI60I12AF	CT														✓	✓									✓									
		Functional	V_{ISO} = ± 1.2 kV	10/9.4	12/11.1	300/300	1EDI60I12AH	CT														✓	✓										✓								
		Functional	V_{ISO} = 2.5 kV(rms)	10/9.4	12/11.1	300/300	1EDC60I12AH	CT														✓	✓								✓			✓							
		Reinforced	V_{IORM} = 1.4 kV(rms); V_{IOTM}=8 kV; V_{ISO} = 5 kV(rms)	SRC/2	11.9/11	460/460	1EDS20I12SV	CT				✓		✓		✓	✓		✓	✓			✓	✓			✓	✓									✓			
		Functional	V_{ISO} = 5 kV(rms)	SRC/2	11.9/11	460/460	1EDU20I12SV	CT				✓		✓		✓	✓		✓	✓			✓	✓			✓										✓			
		Functional	V_{ISO} = ± 1.2 kV	SRC/2	11.9/11	460/460	1EDI20I12SV	CT				✓		✓		✓	✓		✓	✓			✓	✓													✓			
		Functional	V_{ISO} = ± 1.2 kV	2/2	12/11	165/170	2ED020I12-F2	CT	✓				✓					✓	✓			✓																	✓		
		Reinforced	V_{IORM} = 1.4 kV(rms); V_{IOTM}=8 kV; V_{ISO} = 5.7 kV(rms)	1/2	4.2/3.9	37/37	2EDS7165H	CT						✓		✓													✓	✓								✓			
		Reinforced	V_{IORM} = 1.4 kV(rms); V_{IOTM}=8 kV; V_{ISO} = 5.7 kV(rms)	1/2	8/7	37/37	2EDS8165H	CT						✓		✓													✓	✓								✓			
		Reinforced	V_{IORM} = 1.4 kV(rms); V_{IOTM}=8 kV; V_{ISO} = 5.7 kV(rms)	4/8	8/7	37/37	2EDS8265H	CT						✓		✓													✓	✓								✓			
		Reinforced	V_{IORM} = 1.4 kV(rms); V_{IOTM}=8 kV; V_{ISO} = 5.7 kV(rms)	4/8	14.9/14.4	37/37	2EDS9265H	CT						✓		✓													✓	✓								✓			
		Reinforced	V_{IOTM} = 4.2 kV(peak); V_{ISO} = 5.7 kV(rms)	5/9	4.2/3.9	38/36	2EDR7259X	CT				✓		✓		✓							✓						✓	✓				✓				✓			
		Reinforced	V_{IOTM} = 4.2 kV(peak); V_{ISO} = 5.7 kV(rms)	5/9	8/7	38/36	2EDR8259H	CT				✓		✓		✓							✓						✓	✓							✓	✓			
		Reinforced	V_{IOTM} = 4.2 kV(peak); V_{ISO} = 5.7 kV(rms)	5/9	8/7	38/36	2EDR8259X	CT				✓		✓		✓							✓						✓	✓					✓						
		Reinforced	V_{IOTM} = 4.2 kV(peak); V_{ISO} = 5.7 kV(rms)	5/9	14.9/14.4	38/36	2EDR9259X	CT				✓		✓		✓							✓						✓	✓					✓						
		Reinforced	V_{IOTM} = 4.2 kV(peak); V_{ISO} = 5.7 kV(rms)	5/9	8/7	38/36	2EDR8258X	CT				✓			✓	✓							✓						✓	✓					✓						
		Reinforced	V_{IOTM} = 4.2 kV(peak); V_{ISO} = 5.7 kV(rms)	5/9	12.2/11.5	38/36	2EDR6258X	CT				✓			✓	✓							✓						✓	✓					✓						
		Reinforced	V_{IOTM} = 4.2 kV(peak); V_{ISO} = 5.7 kV(rms)	5/9	14.9/14.4	38/36	2EDR9258X	CT				✓			✓	✓							✓						✓	✓					✓						
		Basic	V_{IORM} = 800 V(rms); V_{IOTM}=3.5 kV; V_{ISO} = 2.5 kV(rms)	5/9	4.2/3.9	38/36	2EDB7259K	CT				✓		✓		✓							✓						✓												✓
		Basic	V_{IORM} = 800 V(rms); V_{IOTM}=3.5 kV; V_{ISO} = 2.5 kV(rms)	5/9	8/7	38/36	2EDB8259K	CT				✓		✓		✓							✓						✓												✓
		Basic	V_{IORM} = 1 kV(rms); V_{IOTM}=4.2 kV; V_{ISO} = 3 kV(rms)	5/9	8/7	38/36	2EDB8259F	CT				✓		✓															✓												
		Basic	V_{IORM} = 1 kV(rms); V_{IOTM}=4.2 kV; V_{ISO} = 3 kV(rms)	5/9	4.2/3.9	38/36	2EDB7259Y	CT				✓		✓																✓											
		Basic	V_{IORM} = 1 kV(rms); V_{IOTM}=4.2 kV; V_{ISO} = 3 kV(rms)	5/9	8/7	38/36	2EDB8259Y	CT				✓																		✓											
		Basic	V_{IORM} = 1 kV(rms); V_{IOTM}=4.2 kV; V_{ISO} = 3 kV(rms)	5/9	14.9/14.4	38/36	2EDB9259Y	CT				✓																		✓											
		Functional	V_{IOWM} = 510 V(rms); V_{ISO} = 1.5 kV(rms)	1/2	4.2/3.9	37/37	2EDF7175F	CT				✓		✓																	✓										
		Functional	V_{IOWM} = 510 V(rms); V_{ISO} = 1.5 kV(rms)	4/8	4.2/3.9	37/37	2EDF7275F	CT				✓		✓																	✓										
		Functional	V_{IOWM} = 460 V(rms); V_{ISO} = 1.5 kV(rms)	4/8	4.2/3.9	37/37	2EDF7275K	CT				✓		✓																											✓
		Functional	V_{IOWM} = 460 V(rms); V_{ISO} = 1.5 kV(rms)	4/8	4.2/3.9	37/37	2EDF7235K	CT				✓		✓							✓																			✓
		Functional	V_{IOWM} = 510 V(rms); V_{ISO} = 1.5 kV(rms)	4/8	8/7	37/37	2EDF8275F	CT				✓		✓																					✓						
		Functional	V_{IOWM} = 510 V(rms); V_{ISO} = 1.5 kV(rms)	4/8	14.9/14.4	37/37	2EDF9275F	CT				✓		✓																					✓						
	650**	Basic	V_{IORM} = 500 V(rms); V_{IOTM}=3.2 kV; V_{ISO} = 2.3 kV(rms)	5/9	4.2/3.9	38/36	2EDB7259E	CT				✓		✓		✓							✓						✓											✓	
		Basic	V_{IORM} = 500 V(rms); V_{IOTM}=3.2 kV; V_{ISO} = 2.3 kV(rms)	5/9	8/7	38/36	2EDB8259E	CT				✓		✓		✓							✓						✓											✓	
2-channel (Isolation on high-side only)	1200	Functional on high side	V_{ISO} = ± 1.2 kV	1.5/2.5	12.2/11.2	85/85	2ED020I12-FI	CT			✓						✓			✓			✓	✓													✓			
	650	Functional on high side	V_{ISO} = ± 650 V	1.5/2.5	12.2/11.2	85/85	2ED020I06-FI	CT															✓	✓													✓			
	250	Functional on high side	V_{ISO} = ±250 V (high-side to low-side)	5.2/9.2	7/6.4	37/37	2EDF5215F *	CT									✓														✓										

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* Coming soon

** Isolation between primary and secondary. If the driver is used in half-bridge configuration, the channel-to-channel will limit the working voltage

SRC = Turn on slew rate control

For more details on the product, click on the part number or contact our product support.

Automotive gate-driver ICs

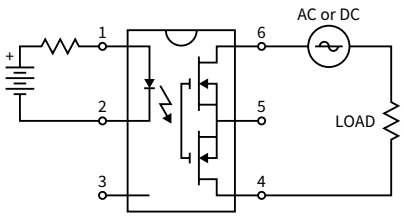
Configuration	Voltage class [V]	I_{o+}/I_{o-} typ. [A]	UVLO on/off typ. [V]	Prop delay off/on typ. [ns]	Base PN	Technology	Features																			Package							
							Buffer	Desaturation protection	Enable	Fault reporting	Operational amplifier	Over-current protection	Programmable frequency	Programmable dead time	Self-oscillating (Oscillator)	Separate pin for logic ground	Shoot-through protection	Shutdown	SPI Interface	Synchronous rectification	Two-level turn-off	UL 1577	VDE 0884-11	ISO 26262 ready	ISO 26262 compliant	DSO-8	DSO-14	DSO-16 NB	DSO-16 WB	DSO-20 (sine pitch)	DSO-28	DSO-36	TSDSO-24
1-channel isolated	1200	12/12	12.6/11.8	60/60	1EDI3020AS	CT	✓	✓	✓	✓		✓				✓				✓	✓	✓		✓					✓			
		12/12	12.6/11.8	60/60	1EDI3021AS	CT	✓	✓	✓	✓		✓				✓				✓	✓	✓		✓					✓			
		12/12	12.6/11.8	60/60	1EDI3023AS	CT	✓	✓	✓	✓		✓				✓				✓	✓	✓		✓					✓			
		12/12	12.6/11.8	60/60	1EDI3030AS	CT	✓	✓	✓	✓		✓				✓				✓	✓	✓		✓					✓			
		12/12	12.6/11.8	60/60	1EDI3031AS	CT	✓	✓	✓	✓		✓				✓				✓	✓	✓		✓					✓			
		12/12	12.6/11.8	60/60	1EDI3033AS	CT	✓	✓	✓	✓		✓				✓				✓	✓	✓		✓					✓			
		2.1/2.1	12/11	165/170	1ED020I12FA2	CT		✓		✓											✓	✓							✓			
		2/2	12/11	1900/1750	1ED020I12FTA	CT		✓		✓										✓	✓	✓							✓			
		2/2	12.5/11.7	215/215	1EDI2004AS	CT		✓	✓	✓		✓				✓				✓	✓	✓		✓							✓	
		2/2	12.5/11.7	215/215	1EDI2002AS	CT		✓	✓	✓		✓				✓				✓	✓	✓	✓								✓	
		2/2	12.5/11.7	215/215	1EDI2010AS	CT		✓	✓	✓		✓				✓				✓	✓	✓									✓	
2-channel isolated	1200	2/2	12/11	165/170	2ED020I12FA	CT		✓		✓							✓					✓	✓								✓	
Half-bridge	100	1/1	7.3/6.8	N.A.	AUIR2085S	JI			✓			✓	✓	✓	✓										✓							
High-side and low-side	600	1.9/2.3	8.9/8.2	135/135	AUIRS21811S	JI																			✓							
		1.9/2.3	8.9/8.2	200/160	AUIRS21814S	JI										✓										✓						
		1.9/2.3	8.9/8.2	200/160	AUIRS2181S	JI																			✓							
		3.5/3.5	8.9/8.2	90/90	AUIRS2191S	JI										✓										✓						
		0.2/0.35	4.1/3.8	200/220	AUIRS2301S	JI																			✓							
Single high-side	65	0.3/0.3	10/6.5	2500/2500	AUIR3241STR	N-ISO			✓	✓															✓							
	65	0.3/0.3	10/6.5	2500/2500	AUIR3242STR	N-ISO			✓	✓															✓							
Dual high-side	75	0.3/1.4	12.5/10.0	4000/7000	2ED2410-EM NEW	N-ISO			✓	✓		✓											✓									✓
	105	0.3/1.0	7.0/6.6	3000/3000	2ED4820-EM NEW	N-ISO			✓	✓		✓						✓					✓									✓
Single low-side	200	3/6	10.2/9.3	60/90	AUIRS1170S	N-ISO													✓						✓							

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Complementary: Opto-isolated solid state relays

Typical connection



Microelectronic relays (MER) are power MOSFET or IGBT output photovoltaic relays where the output switch is controlled by radiation from a Ga-Al-As light emitting diode (LED) optically isolated from the output. MERs are a good choice to replace mechanical relays.

Load voltage [V]	Load current [mA]	$R_{DS(on)}$ [Ω]	Isolation voltage [V_{RMS}]	Base PN	DIP-6	SMT-6	DIP-8	SMT-8	DIP - 4	SMT-8 (with 4 pins)
	140 AC-DC	27/7	4000	PVU414		✓				
	120 AC-DC	35/9	4000	PVT412L	✓			✓		
	240 AC-DC	6/2	4000	PVT412A	✓	✓				
	140 AC-DC	27/7	4000	PVT412	✓	✓				
	120 AC-DC	35	4000	PVT422			✓	✓		
300	150 AC-DC	24	4000	PVA3354N					✓	✓
				PVA3324N					✓	
	50 AC-DC	160	4000	PVA3055N					✓	✓
				PVA3054N					✓	✓
250	170 AC-DC	15/4.25	4000	PVT312L	✓	✓				
	190 AC-DC	10/3	4000	PVT312	✓	✓				
	170 AC-DC	8	4000	PVT322A				✓		
	170 AC-DC	10	4000	PVT322			✓	✓		
200	150 AC-DC	24	4000	PVA2352N					✓	
150	550 AC-DC	0.7/0.25	4000	PVT212		✓				
100	550 DC	1.5	4000	PVD1354N					✓	✓
				PVD1352N					✓	✓
	375 AC-DC	5	4000	PVA1354N					✓	✓
				PVA1352N					✓	✓
60	1500 DC	0.25	4000	PVDZ172N					✓	✓
	1000 AC	0.5	4000	PVAZ172N					✓	✓
	2000 AC/4000 DC	0.1/0.035	4000	PVG612A	✓	✓				
	1000 AC/2000 DC	0.5/0.15	4000	PVG612	✓	✓				
20	2500 AC/4500 DC	0.1/0.04	4000	PVN012		✓				

www.infineon.com/SSR

For more details on the product, click on the part number, visit infineon.com or contact our product support.

Infineon solid-state relay package options

DIP-6



DIP-8 (with 4 pins)



DIP-8



SMT-6



SMT-8 (with 4 pins)

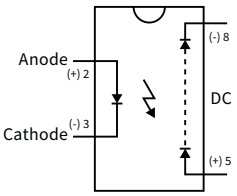


SMT-8



Complementary: Opto-isolated solid state relays

Typical connection



Photovoltaic isolators generate an electrically isolated DC voltage upon receipt of a DC input signal and are capable of directly driving MOSFET or IGBT gates. The output is controlled by radiation from a GaAlAs light emitting diode (LED) optically isolated from the output

Output voltage DC [V]	Short current [µA]	Nominal control current (DC) [mA]	Isolation voltage [V_{RMS}]	Base PN	Package			
					DIP-8	SMT-8	DIP-8 (with 4 pins)	SMT-8 (with 4 pins)
5/10	10/5	5	3570	PVI5033R	✓	✓		
5/10	10/5	10	2500	PVI1050N	✓	✓		
5	8	10	4000	PVI5080N			✓	✓
5	5	10	4000	PVI5050N				✓

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For more details on the product, click on the part number, visit infineon.com or contact our product support.

Features

Addressing various application requirements, Infineon delivers solutions with an assortment of features intended to optimize performance, minimize size and reduce cost. Below is a table of additional gate-driver IC features available in the current portfolio.

Features	Abbreviation	Benefits
Active Miller clamp	M-CLAMP	Protection against inadvertent dynamic turn-on because of parasitic Miller effects
Active shutdown	SD-ACT	Ensures a safe IGBT off-state in case the output chip is not connected to the power supply or an undervoltage lockout is in effect
Brake chopper	BRAKE	Integrated brake IGBT driver with protection
Comparator	CMP	General purpose comparator included
Desaturation protection	DESAT	Protects the IGBT at short circuit
Enable	EN	Dedicated pin terminates all outputs
Fault reporting	FAULT-RPT	Indicates an overcurrent or under-voltage shutdown has occurred
Fault reset	FAULT-RST	Dedicated pin resets the DESAT-FAULT-state of the chip
High-voltage start-up	HVSTART	Provides easy and fast circuit start-up while enabling low circuit standby losses
Integrated bootstrap diode	BSD	Integrated bootstrap reduces BOM
Operational amplifier	OPAMP	An independent op-amp for current measurement or overcurrent detection
Oscillator	OSC	Integrated front end oscillator
Over-current protection (ITRIP)	OCP	Ensures safe application operation in case of overcurrent
Programmable dead time	DT-PROG	Dead time is programmable with external resistor for flexible design
Programmable fault clear time	FLTC	The length of the fault clear time period (t_{FLTC}) is programmed by external capacitor which connected between FLTC and V_{ss} (C_{FLTC}).
Programmable shutdown	SD-PROG	A shutdown feature has been designed into a pin
Separate pin for logic ground	SEP-GND	Dedicated pin or logic ground for improved noise immunity
Separate sink/source outputs	SEP-OUT	Simplifies gate resistor selection, reduces BOM, and improves dV/dt control
Shoot-through protection	STP	Additional shoot-through protection logic such as interlock
Short-circuit clamping	SC-CLAMP	During short circuit the IGBT's gate voltage tends to rise because of the feedback via the Miller capacitance. An additional protection circuit connected to OUT+ limits this voltage to a value slightly higher than the supply voltage.
Shutdown	SD	Dedicated pin disables the IC outputs
Soft overcurrent shutdown	SD-SOFT	Dedicated pin turns off the desaturated transistor, preventing overvoltages
Truly Differential Inputs	TDI	Control inputs independent from gate driver GND, robust against ground shifts from power MOSFET switching
Two-level turn-off	TLTO	Lowers VCE overshoots at turn-off during short circuits or overcurrent events
UL 1577	UL	Double galvanic isolation certification
Undervoltage lockout	UVLO	Ensures safe application operation by avoiding unexpected driver behavior at low voltages
VDE 0884-10 or VDE 0884-11	VDE	Reinforced galvanic isolation certifications for non-optical couplers

www.infineon.com/gatedriver
www.infineon.com/gdfinder

Gate-driver ICs for SiC MOSFETs

Ultra-fast switching 650 V to 2000 V power transistors such as CoolSiC™ SiC MOSFETs can be more easily handled by isolated gate driver solutions.

The following EiceDRIVER™ gate driver ICs incorporate the most important key features for driving SiC MOSFET such as tight propagation delay matching, precise input filters, wide output supply voltage range, negative gate voltage capability, extended CMTI capability, Miller clamp, and DESAT protection.

Product family	Part number	Typ. current	V_{CC2} -V_{EE2}	UVLO	Prop. delay (accuracy)	CMTI	Isolated	Other key features	Package
Achieve high efficiency and power density: take advantage of low propagation delay and high CMTI									
EiceDRIVER™ 1EDB 1-channel family	1EDB9275F 1EDB6275F	5/9 A	20 V	14.9/14.4 V 12.2/11.5 V	45 ns (+6/-4 ns)	300 V/ns	✓	Separate source/sink outputs, fast start-up times and fast recovery, basic isolation, UL 1577	DSO-8, 150 mil
EiceDRIVER™ 2EDi 2-channel family	2EDR9259X 2EDR9258X 2EDR6258X	5/9 A	20 V	14.9/15.4 V 14.9/15.4 V 12.5/11.5 V	38 ns (+9/-5 ns)	150 V/ns	✓	2EDi Gen 2, dead-time control, disable/enable, reinforced isolation, UL 1577, VDE-11, IEC 62368-1, GB4943.1	DSO-14, 300mil
	2EDB9259Y			14.9/15.4 V			✓	2EDi Gen 2, dead-time control, basic isolation, UL 1577, GB4943.1	DSO-14, 150 mil
EiceDRIVER™ 1EDN-TDI 1-channel family	1EDN6550B 1EDN9550B	4/8 A	20 V	12.2/11.5 V 14.9/14.4 V	45 ns (+10/-7 ns)	N/A	–	Separate source/sink outputs	SOT23-6
Avoid parasitic turn-on: take advantage of Miller clamp options									
EiceDRIVER™ 1ED Compact 1-channel family	1EDI20I12MF	4 A	20 V	12.7/10.5 V	300 ns	100 V/ns	✓	Miller clamp, functional isolation	DSO-8, 150 mil
	1EDI60N12AF	10 A	35 V	10/8 V	125 ns	100 V/ns	✓	Separate source/sink outputs, functional isolation	
EiceDRIVER™ X3 Compact 1-channel family	1ED3124MC12H 1ED31xxMU12F	5.5/10/14 A	35 V	12.5/10.5 V 14.2/12 V	90 ns (+/- 7 ns)	200 V/ns	✓	Miller clamp, reinforced isolation, UL 1577 and VDE-11	DSO-8, 300 mil DSO-8, 150 mil
EiceDRIVER™ 2L-SRC Compact 1-channel family	1ED32xxMC12H	10/18 A	35 V	12.5/10.4 V	110 ns (+/- 15 ns)	200 V/ns	✓	Two-level slew-rate control, Miller clamp, reinforced isolation, UL 1577 and VDE-11	DSO-8, 300 mil
Short-circuit protect your CoolSiC™: take advantage of the fast and accurate DESAT protection									
EiceDRIVER™ 1ED-F3 1-channel family	1ED332xMC12N	3/6 A	35 V	12.6/10.4 V 13.6/12.6 V	85 ns	300 V/ns	✓	Miller clamp, short circuit protection, soft-off, reinforced isolation, UL 1577 and VDE-11	DSO-16, 300 mil
EiceDRIVER™ X3 Analog 1-channel family	1ED34x1MC12M	3/6/9 A	35 V	12.6/10.4 V	244 ns (+/- 30 ns)	200 V/ns	✓	Analog configurable, fast and accurate short circuit protection and soft turn-off Miller clamp, reinforced isolation, UL 1577 and VDE-11	DSO-16, 300 mil
EiceDRIVER™ X3 Digital 1-channel family	1ED38x0MC12M	3/6/9 A	35 V	12.6/10.4 V default, but adjustable	244 ns (+/- 30 ns)	200 V/ns	✓	Digital configurable (I^2C), fast and accurate short circuit protection, rich monitoring functionality (predictive maintenance) Miller clamp, reinforced isolation, UL 1577 and VDE-11	DSO-16, 300 mil
EiceDRIVER™ 2ED-F2 2-channel family	2ED020I12-F2	2 A	28 V	12.6/10.4 V	170 ns	50 V/ns	✓	Miller clamp, short circuit protection	DSO-36, 300mil

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For more details on the product, click on the part number, visit infineon.com or contact our product support.

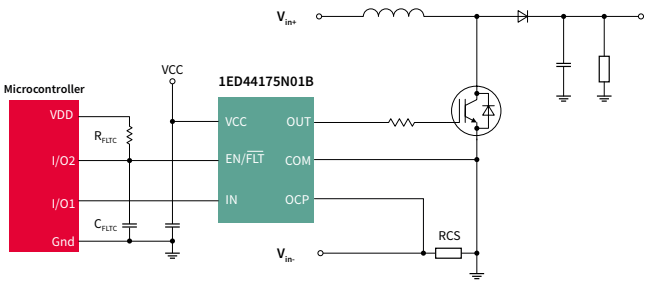
EiceDRIVER™ non-isolated low-side gate drivers

1ED4417x, 1-ch, low-side drivers with integrated protection features

EiceDRIVER™ 1ED4417x family are 25 V, 1-channel low-voltage, non-inverting, low-side gate drivers designed for ground-referenced applications such as power-factor correction (PFC) circuits. Typically, over-current protection (OCP) is implemented by a current measurement with a comparator and multiple resistors and capacitors. The 1ED44176N01F, 1ED44175N01B, and 1ED44173N01B provides up to 20 percent cost and 50 percent space savings by integrating a fast and accurate over-current protection feature (OCP). The new family of low-side gate drivers utilize Infineon's proprietary latch immune CMOS technologies to enable a rugged monolithic construction while realizing best-in-class fault reporting accuracy with OCP threshold tolerance of +/-5 percent. In addition, Infineon's IC technology enables a tiny PG-SOT23 package (or DSO-8 for 1ED44176N01) by combining the fault output and enable functions into a single pin.

The family also includes 1ED44171N01B, a cost-effective, simple driver with enable and fault reporting functions. With a single PCB layout, 1ED44171N01B can be used as a second source option to the popular" IRS44273L. Enabling a single-supplier, dual sourcing strategy for fast-reacting supply flexibility.

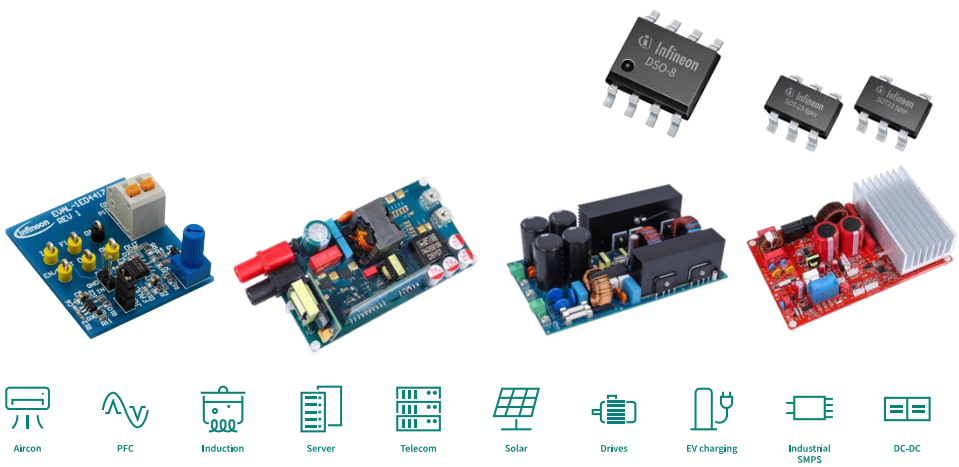
Simplified application diagram



Part Number	Package	$I_{O\pm}$ [A]	UVLO [V]	V_{OCTH} [mV]	$T_{on/off}$ [ns]	Ground pins	Feature
1ED44171N01B	SOT23-5	2.6/2.6 A	11.9/11.4 V	N/A	50/50 ns	COM	Enable, Fault, cost-effective
1ED44173N01B	SOT23-6	2.6/2.6 A	8/7 V	-250 mV	34/34 ns	COM	OCP (negative current sensing), Enable, Fault
1ED44175N01B	SOT23-6	2.6/2.6 A	11.9/11.4 V	-250 mV	50/50 ns	COM	
1ED44176N01F	DSO-8	0.8/1.75 A	11.9/11.4 V	500 mV	50/50 ns	V_{SS}/COM	OCP (positive current sensing), Enable, Fault, Programmable fault clear time

Evaluation and reference board

- EVAL-1ED44176N01F
- EVAL-1ED44175N01B
- EVAL-1ED44173N01B
- EVAL-PFC5KIKWWR5SYS
- REF-SHA35WRC2SYS
- REF-AIRCON-C302A-IM564



www.infineon.com/1ED4417x

For more details on the product, click on the part number, visit infineon.com or contact our product support.

2EDN EiceDRIVER™ family

Rugged, fast, dual-channel low-side 4 A/5 A gate-driver ICs

EiceDRIVER™ 2EDN family overview

Dual-channel driver ICs are the crucial link between control ICs and powerful MOSFET, wide band gap (WBG) switching devices. Driver ICs enable high system level efficiencies, excellent power density and consistent system robustness.

EiceDRIVER™ 2EDN family: Fast, precise and compatible

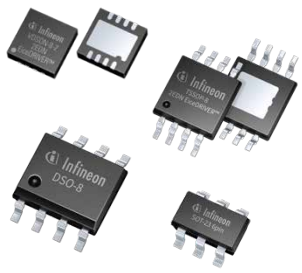
- Highly efficient SMPS enabled by 19 ns propagation delay and 2 ns channel-to-channel mismatch precision for fast MOSFET and WBG switches
- Diversified applications driven by strong output current 4 A/5 A per channel
- Unique designs are supported by the availability of numerous packages

EiceDRIVER™ 2EDN family: The new reference in ruggedness and low power dissipation

- 4 V and 8 V UVLO (undervoltage lock out) options for instant FETs protection under abnormal conditions, further improved with active output voltage clamping
- -10 V robustness of control and enable inputs provides crucial safety margin when driving pulse transformers or driving FETs in various packages
- 5 A reverse output current robustness eliminates the need for Schottky switching diodes and reduces bill-of-material
- Cool driver ICs from true rail-to-rail low impedance output stages

Applications

- Server
- Telecom
- DC-DC Converters
- Power tools
- Industrial SMPS
- Low speed electrical vehicles
- Solar power inverter
- LED lighting



Key features	Product benefits	System benefits
– 5 A source/sink current – 2 ns channel-to-channel mismatch – 10 ns minimum input pulse width	– Fast Miller plateau transition – Precise timing	– High power efficiency – in hard switching PFC with SiC diode – in half-bridges and synchronous rectifications
– True rail-to-rail low impedance output stages	– Low power dissipation in driver IC	– Cooler driver IC operation – Higher FETs drive capability
– 4 V and 8 V UVLO options, with active output voltage clamping – 19 ns propagation delay for both control and enable	– Fast and reliable FETs turn-off, independent of control IC	– Instant FETs protection under abnormal operation
– -10 V robustness of control and enable inputs	– Increased GND-bounce robustness	– Crucial safety margin to drive pulse transformer
– 5 A reverse output current robustness	– Saves switching diodes	– Increases power density – BOM savings
– 2 independent channels	– Option to increase drive current by truly concurrent switching of 2 channels	– One IC covering many applications
– Industry standard pinout and packages	– Straight forward design upgrades	– Short time to market

SMPS · Server · Telecom · Motor control · Power tools · Solar · Lighting

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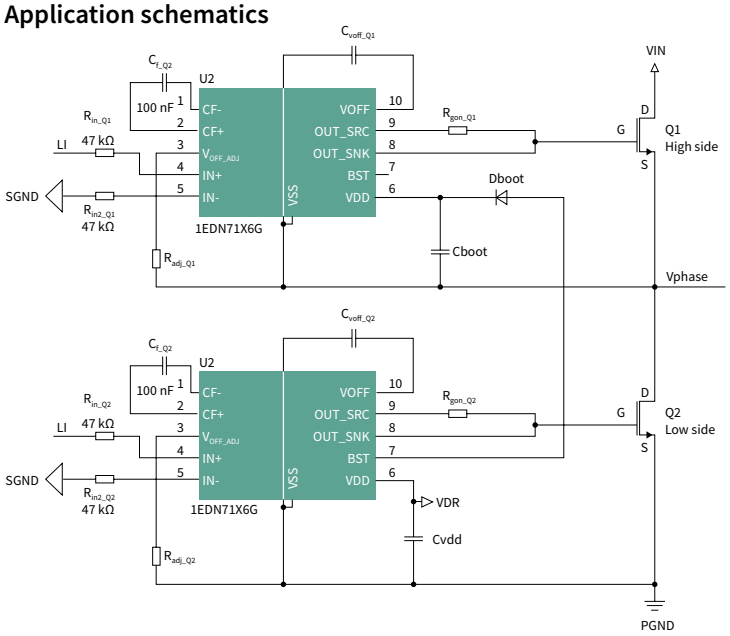
For more details on the product, click on the part number, visit infineon.com or contact our product support.

EiceDRIVER ™ 1EDN71x6G/U family

200 V 1-ch gate drivers with truly differential input (TDI)

The 1EDN71x6G/U is a 1-channel gate driver family optimized for Infineon CoolGaN™ Schottky-gate (SG) HEMTs, and also compatible with other GaN SG HEMTs and silicon MOSFETs. The TDI feature eliminates the risk of false triggering due to ground bounce in low-side applications and enable 1EDN71x6G/U to address even high-side applications. The TDI feature works by controlling the gate driver output state exclusively by the voltage difference between the two inputs, completely independent of the driver's reference (ground) potential as long as the common-mode voltage is below 150 V (static) and 200 V (dynamic).

Application schematics

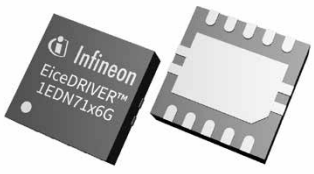


Features and benefits

Product features	Product benefits
– Truly differential logic input (TDI)	– High-side driving and low-side ground bounce immunity
– Four driving strengths	– Optimize switching speed without external gate resistors
– Active Miller clamp	– Prevent induced turn-on
– Optional negative charge pump	– Additional induced turn-on immunity
– Active bootstrap capacitor	– No overcharging the bootstrap capacitor during deadtime

Product family

Product	Ourput current	Source/sink resistance	Input pulse blanking time	Package
1EDN7116G	2 A	0.8 Ω	20 ns	VSON-10
1EDN7126G	1.5 A	1.0 Ω	40 ns	VSON-10
1EDN7136G	1 A	1.5 Ω	60 ns	VSON-10
1EDN7146G	0.5 A	3.0 Ω	80 ns	VSON-10
1EDN7116U*	2 A	0.8 Ω	20 ns	TSNP-7
1EDN7126U*	1.5 A	1.0 Ω	40 ns	TSNP-7
1EDN7136U*	1 A	1.5 Ω	60 ns	TSNP-7
1EDN7146U*	0.5 A	3.0 Ω	80 ns	TSNP-7



DC-DC · Server · Telecom · Artificial intelligence · Collaborative robots · Multicopter · Audio

www.infineon.com/1edn

* Coming soon

For more details on the product, click on the part number, visit infineon.com or contact our product support.

EiceDRIVER™ 1EDL8011, 135 V high-side driver

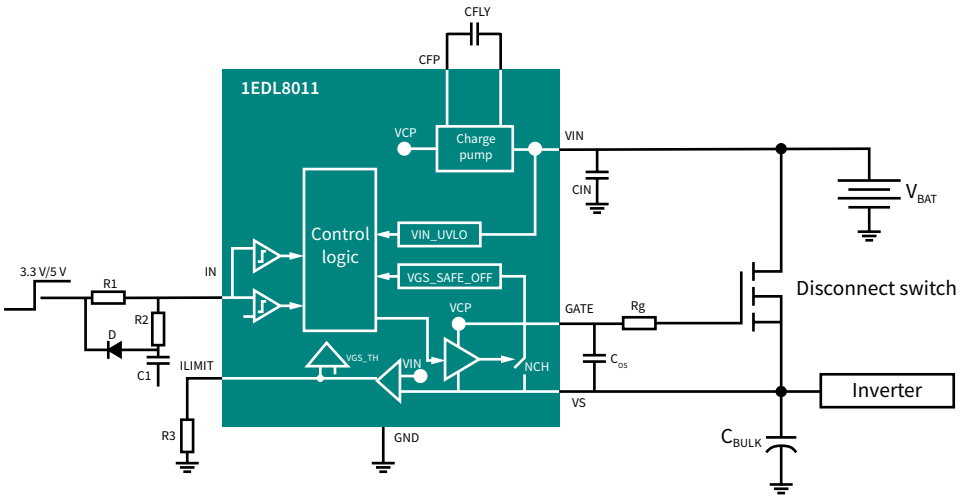
Integrated high-side driver with strong gate drive and integrated charge pump

Infineon's upcoming EiceDRIVER™ 1EDL8011 high-side gate driver provides a simple and highly robust solution to drive a disconnect switch to protect battery operated systems during potential short conditions. 1EDL8011 enables fast turn on/off control of high side N-channel MOSFETs due to the powerful internal gate sourcing and sinking current capabilities. It consists of an integrated charge pump with an external capacitor to provide support for strong start-up and turn-off and scalable FETs in parallel application scenarios. The internal charge pump provides proper MOSFET gate voltage during low operating input voltage conditions. High-side protection avoids faulty shorting conditions in the load and the dangerous presence of in-rush currents for battery-powered applications.

1EDL8011 features include OCP protection, the adjustable current setting threshold, time delay as well as a safe start-up mechanism with flexible blanking during MOSFET turn-on transition. Input voltage under-voltage lockout (UVLO) avoids operation under hazardous conditions and ensures the right level of gate voltage to fully enhance the MOSFET.

The 1EDL8011 gate driver addresses two main use cases in battery operated systems:

- In-rush current control: allows controlled turn-on of the disconnect switch by using an external R_g combined with a safe start-up and blanking mechanism.
- Short circuit protection: whenever a short occurs at the load side, it allows disconnecting the load from the source by quickly turning off the disconnect switch. This is made possible by the strong pull-down inside the 1EDL8011, therefore protecting the whole system.





Features and benefits

Product features	Product benefits
– Operating voltage: 7V – 135V	– Wide voltage operating range
– Powerful gate sinking current up to 1A	– Fast turn off for proper protection
– Off-mode quiescent current 1µA	– Efficiency and long battery life

Product family

Product	Package	Voltage [A]
1EDL8011*	DSO-8	7 – 135 V

Power tools · Gardening tools · Multicopter · Service robots · eBike · Vacuum cleaner

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* Coming soon

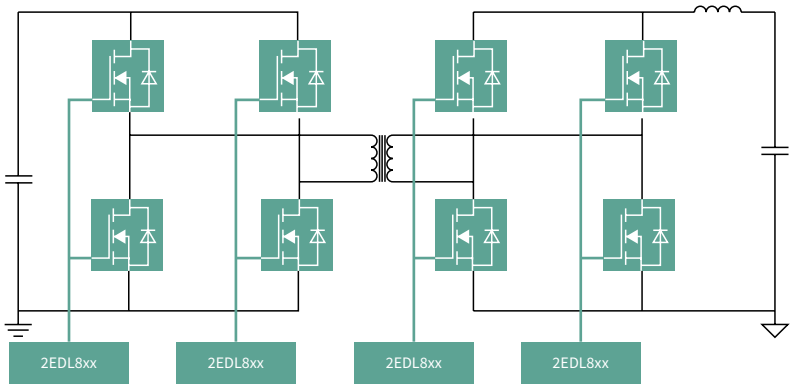
For more details on the product, click on the part number, visit infineon.com or contact our product support.

EiceDRIVER™ 2EDL8x2x family

120 V, 3/4 A, junction-isolated high- and low-side gate drivers

The 2EDL8x2x is a family of high- and low-side gate driver designed for advanced switching DC-DC converters. The 2EDL802x takes in independent inputs while 2EDL812x takes in differential inputs with both having built-in hysteresis for enhanced noise immunity. The gate-driver family comes in two packages: VDSON-8 4x4 mm and VSON-10 3x3 mm.

Application schematics





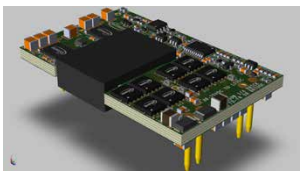
Features and benefits

Product features	Product benefits
– 120 V integrated boot-strap diode with 10 ns reverse recovery time	– Drive strength for fast Miller plateau transition
– 2 A to 4 A output source currents	– Fast and robust
– 6 A output sink currents	– Immunity against false triggering from ground bounce
– -8 V/+ 15 V differential input robustness	– No need for Schottky clamping diodes
– 5 A reverse current output robustness	
– ±1 ns (typ.) channel-to-channel delay matching	

Product family

Part nu	Input	Source current	Sink current	Min. input pulse width	Propagation delay (typ.)	Matching delay (typ)	ESD	Package
2EDL8123G	Differential	3 A	6 A	40 ns	45 ns	2 ns	2 kV	VDSON-8 4x4 mm
2EDL8124G		4 A						
2EDL8023G	Independent	3 A						
2EDL8024G		4 A						
2EDL8123G3C*	Differential	3 A						VSON-10 3x3 mm
2EDL8124G3C*		4 A						
2EDL8023G3C*	Independent	3 A						
2EDL8024G3C*		4 A						

Evaluation board:
EVAL_HB_2EDL8x2xG*
REF_600W_FBFB_QB*



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* Coming soon

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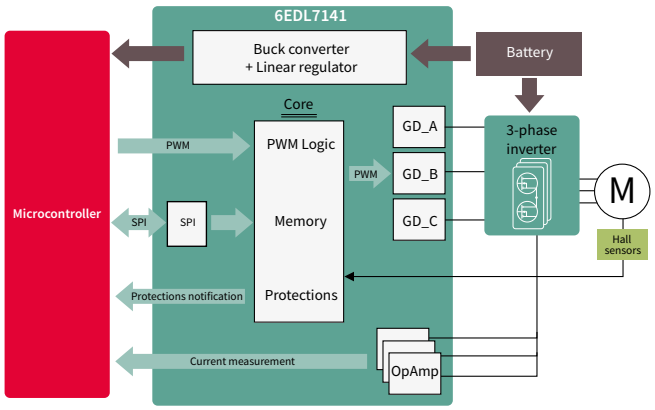
MOTIX™ 6EDL7141 high performance motor control

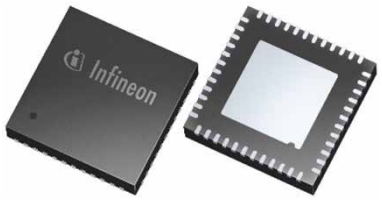
Next-generation fully programmable three-phase gate driver

6EDL7141, Infineon's latest three-phase motor control gate-driver IC allows our customers to develop their next generation of high performance battery operated products using BLDC or PMSM motors. Ideal applications include cordless power tools, gardening products, and automated guided vehicles. With over 50 fully programmable parameters using built-in digital SPI interface, 6EDL7141 is fully configurable to drive a wide range of MOSFET's to yield the best possible system efficiency. The integrated buck regulator provides the power for both the microcontroller and the Hall sensors in the motor, further reducing peripheral components and required PCB area. In addition, with a full suite of system protection features such as OCP, UVLO, over-temperature, and locked rotor detection, this dedicated motor controller will increase reliability and robustness in severe operating fault conditions.

Block diagram

Three-phase BLDC battery-powered motor control





Features and benefits

Key features	Key benefits
– Integrated power supply	– Reduced external components and PCB area
– Programmable slew rate	– Optimized efficiency and EMI
– Programmable gate drive supply	– Maximum flexibility to use different inverter FETs
– 3x current shunt amplifier	– Highly accurate current sense while saving external components
– ADC ref. of 5 V	– Higher dynamic range to increase signal resolution
– Complete dedicated motor control protection suite	– Improve reliability and fault detection



EVAL_6EDL7141_TRAP_1SH

BC 1 shunt evaluation board

Parallel 40 V OptiMOS™5 PQFN

XMC1404 MCU

On-board programming dongle

Featured module IC: 6EDL7141

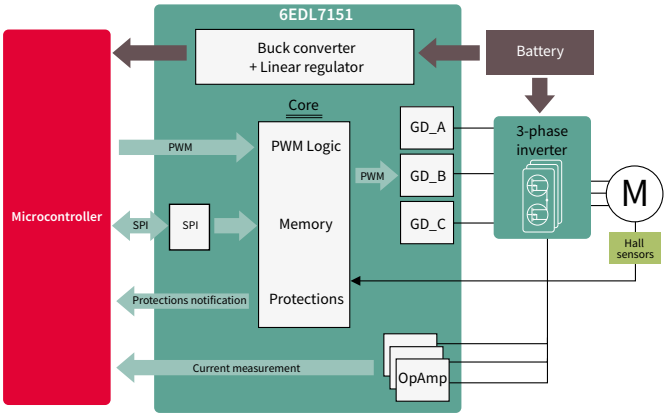
www.infineon.com/6edl7141

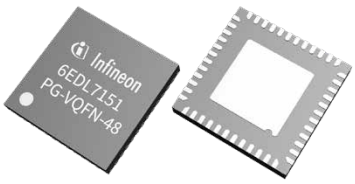
For more details on the product, click on the part number, visit infineon.com or contact our product support.

MOTIX™ 6EDL7151 3-phase smart gate drive controller IC

Three-phase motor control gate-driver IC for battery supplied BLDC motor control

The 6EDL7151 is Infineon's latest 3-phase gate driver which includes added V_s sensor to allow additional hardware system protection for battery supplied motor control products. Ideal applications include cordless power tools, gardening products, and automated guided vehicles. With over 50 programmable parameters using built-in digital SPI interface, 6EDL7151 is fully configurable to drive a wide range of MOSFET's to yield the best possible system efficiency. 6EDL7151 is also designed for maximum performance. Features include programmable dead time delays for preventing current shoot through between HS and LS switches in normal operation and separate charge pumps for low and high side gate drivers support 100 percent duty cycle and low voltage supply operation. Supplies for the gate drivers are programmable to one of the following levels: 7 V, 10 V, 12 V or 15 V. Additionally, the slew rate of the driving signal can be programmed with fine granularity to reduce EMI emissions. An integrated synchronous buck converter provides an efficient supply of current to the rest of the system. The 6EDL7151 also integrates a linear voltage regulator (up to 300 mA), powered by the buck converter to supply the MCU and other sensitive components in the system. 6EDL7151 includes three current sense amplifiers for accurate current measurements that support bi directional low side current sensing with programmable gain. $R_{DS(on)}$ sensing is supported through internal connection of the phase nodes to the current sense amplifiers inputs. Temperature compensation if needed shall be provided by the user application. 6EDL7151 also includes highly programmable V_{DS} sensors for inverter MOSFET protection. In addition, 6EDL7151 provides numerous protections features for improving application robustness during adverse conditions like monitoring of power supply voltages as well as system parameters. The failure behavior, threshold voltages and filter times of the supervisions of the device are adjustable via SPI. Monitored aspects include inverter currents, gate drive voltages and currents, device temperature, and rotor locked.





Features and benefits

Product features	Product benefits
– Integrated power supplies	– Reduced external component count and PCB area
– Adjustable slew rate	– Lower voltage overshoots and EMI reduction
– 3x current shunt amplifier	– Maximum flexibility to use different inverter MOSFET's
– Complete dedicated motor control protection suite	– Highly accurate integrated current sense saves external components
– V_{DS} sensing	– Improved reliability and fault detection

Product family

Product	Package	Voltage [V]	DVDD regulator output [V]
6EDL7151*	VQFN 48 7mm x 7mm	5.5 – 70 V	5.0 V

Power tools · Gardening tools · Multicopter · Service robots · eBike · Vacuum cleaner

www.infineon.com/6edl7151

* Coming soon

For more details on the product, click on the part number, visit infineon.com or contact our product support.

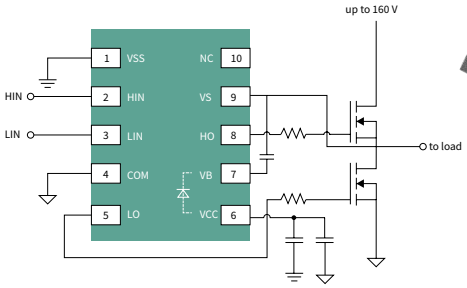
MOTIX™ 160 V SOI gate-driver family

2ED27xxS01G half-bridge and high- and low-side gate-driver family with integrated bootstrap diode
6ED2742S01Q three-phase driver with charge pump, current sense amplifier, OCP and bootstrap diode

MOTIX™ 160 V SOI gate-driver family is designed for the BLDC motor drive applications. The SOI technology enables integrated bootstrap diodes, which can be used to supply the external high-side bootstrap capacitor. The output drivers feature a high-pulse current buffer stage designed for minimum driver cross-conduction. MOTIX™ 2ED27xxS01G family consists of three half-bridge and three high- and low-side 160 V SOI gate drivers. The UVLO protection is on both V_{CC} and V_B pins. Fast propagation delays (50 ns) are suitable for motor drive and power conversion applications in VSON-10 (3x3 mm) package with exposed ground pad. MOTIX™ 6ED2742S01Q is a 160 V three-phase SOI gate driver, which supports 100% duty cycle operation by a trickle charge pump. Protection features include UVLO, OCP with configurable threshold, fault and automatic fault clear. A current sense operational amplifier (CSA) with selectable gain is integrated between the V_{SS} and COM.

Simplified application diagram

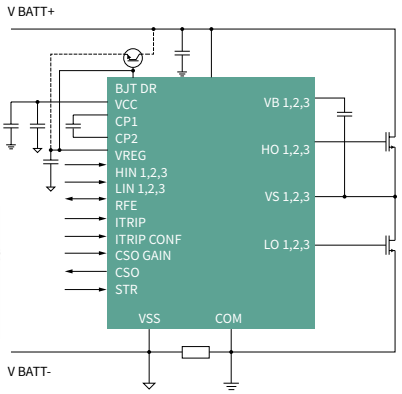
2ED27xxS01G





6ED2742S01Q





Product	Package	Output current	Configuration	Deadtime	Propagation delay
2ED2732S01G*	VSON-10 3x3 mm	1/2 A	High- and low-side (HS+LS)	None	50 ns
2ED2734S01G*		2/4 A			65 ns
2ED2738S01G NEW		4/8 A			65 ns
2ED2742S01G*		1/2 A	Half-bridge	50 ns	50 ns
2ED2744S01G*		2/4 A			65 ns
2ED2748S01G NEW		4/8 A			65 ns
6ED2742S01Q	VQFN-32 5x5 mm	1/2 A	Three-phase	100 ns	100 ns

Applications for MOTIX™ 160 V SOI gate driver family

- Servo/stepper drives in robotics and factory automation
- General purpose low-voltage drives
- Battery-operated small home appliances (SHA)
- Professional and consumer service robotics
- Logistics vehicles (e-forklifts, autonomous warehouse robotics)
- Commercial and agricultural drones
- Hand-held battery-operated power tools
- Garden or outdoor power equipment (OPE) tools
- e-scooters, e-bikes, and other e-vehicles that do not require automotive qualification (LSEV)

6ED2742S01Q key features

- Integrated power management with charge pump and pre-regulator supports wide input voltage range of 6 V to 140 V
- Integrated over-current protection comparator for single-shunt low side operation with programmable +/-5% reference threshold
- Integrated current sense amplifier with programmable voltage gain and ability to read output voltage offset during zero phase current
- Always positive output voltage offset to reduce need for +/- V_{REF} for downstream ADC in microcontroller.
- Integrated, per phase, high-side trickle charge pumps to enable 100% duty cycle operation
- Integrated, multi-function RFE pin combines FAULT, FAULT Clear, and Enable functionality

www.infineon.com/SOI

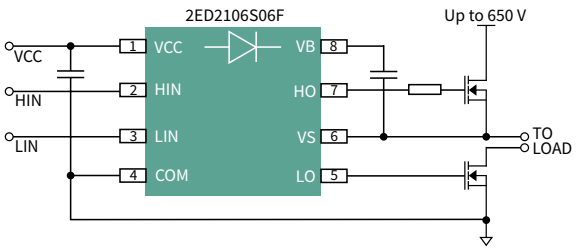
* Coming soon

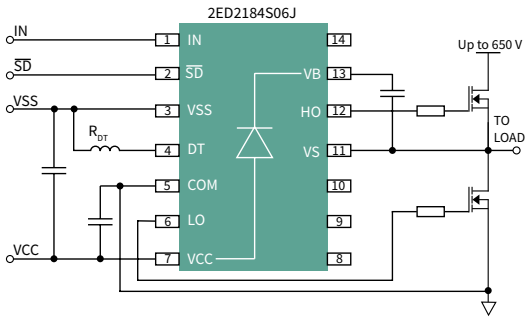
EiceDRIVER™ 650 V level-shift SOI gate driver family

2ED2101/3/4 and 2ED2110: EiceDRIVER™ fast level-shift SOI family with 90 ns prop delay
2ED2106/8/9 and 2ED2181/2/3/4: EiceDRIVER™ general purpose SOI family

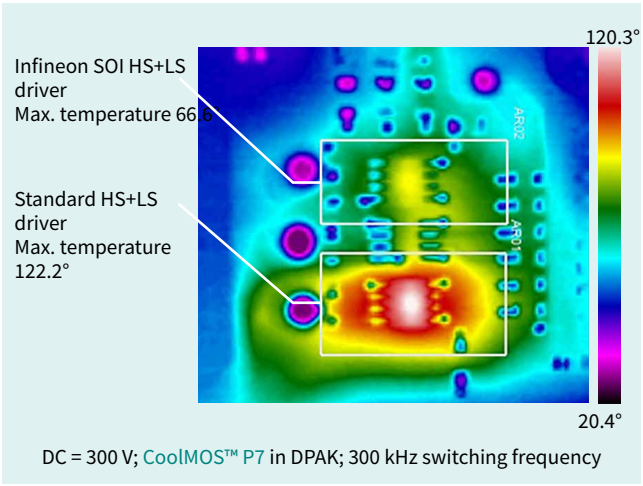
EiceDRIVER™ 650 V SOI is a family of high-voltage, high-speed MOSFET and IGBT gate drivers. Based on Infineon's SOI technology, this family features an integrated, ultra-fast, low $R_{DS(on)}$ bootstrap diode and offers excellent ruggedness and noise immunity with tolerance to negative transient voltages of up to -100 V. The absence of parasitic thyristor structures ensures superior latch up immunity. The level-shift loss is significantly reduced on the EiceDRIVER™ SOI gate drivers compared to other technologies.

Simplified application diagrams





Power dissipation of Infineon SOI



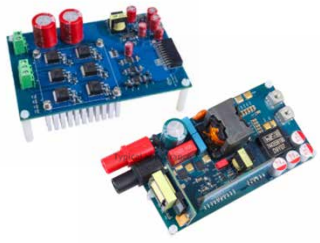
DC = 300 V; CoolMOS™ P7 in DPAK; 300 kHz switching frequency



Evaluation board

EVAL-M1-2ED2106S

EVAL-2ED2101 HB-LLC



Product family	Part number	Output current	Prop. delay	Input logic	Configuration	Package
EiceDRIVER™ fast level-shift SOI	2ED2101S06F	0.29/0.7 A	90 ns	HIN, $\overline{\text{LIN}}$	High- and low-side	DSO-8
	2ED2103S06F			HIN, $\overline{\text{LIN}}$	Half-bridge	
	2ED2104S06F			IN, SD	Half-bridge	
	2ED2110S06M	2.5/2.5 A		HIN, LIN	High- and low-side	DSO-16 WB
EiceDRIVER™ general purpose SOI	2ED2106S06F	0.29/0.7 A	200/200 ns	HIN, LIN	High- and low-side	DSO-8
	2ED21064S06J			HIN, LIN		DSO-14
	2ED2108S06F			HIN, LIN	Half-bridge	DSO-8
	2ED21084S06J			HIN, LIN		DSO-14
	2ED2109S06F		740/200 ns	IN, SD		DSO-8
	2ED21094S06J			IN, SD		DSO-14
	2ED21091S06F			IN, DT/SD		DSO-8
	2ED2181S06F	2.5/2.5 A	200/200 ns	HIN, LIN	High- and low-side	DSO-8
	2ED21814S06J			HIN, LIN		DSO-14
	2ED2182S06F			HIN, LIN	Half-bridge	DSO-8
	2ED21824S06J			HIN, LIN		DSO-14
	2ED2183S06F			HIN, LIN		DSO-8
	2ED21834S06J			HIN, LIN		DSO-14
	2ED2184S06F		600/200 ns	IN, SD		DSO-8
	2ED21844S06J			IN, SD		DSO-14

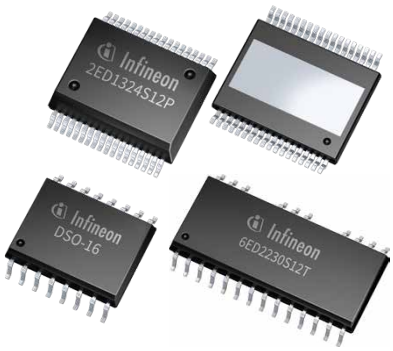
www.infineon.com/SOI

For more details on the product, click on the part number, visit infineon.com or contact our product support.

EiceDRIVER™ 1200 V level-shift SOI gate driver family

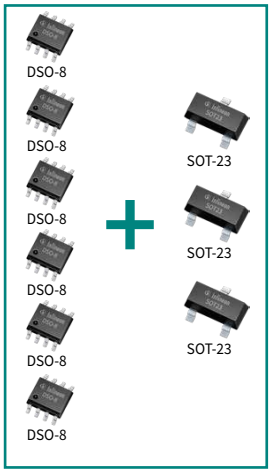
6ED223x: 1200 V three-phase SOI driver with OCP, bootstrap diode
2ED132x: 1200 V half-bridge and high- and low-side SOI driver with OCP, Miller clamp and bootstrap diode

The 6ED2231S12T is a 1200-V three-phase SOI gate driver, with 0.35 A/0.65 A current in DSO-24 package (DSO-28 with 4 pins removed). The 2ED132x family consists of four 1200 V SOI gate drivers, in half-bridge or high- and low-side configurations. 2ED132x family offers 2.3 A output current in high creepage (8 mm)/clearance DSO-20 wide body package or higher sink option (4.6 A) in DSO-16 wide body package. Both 6ED2231S12T and the 2ED132x family integrates ultra-fast over-current protection (OCP) with ± 5% accuracy, and bootstrap diode. In addition, the 2ED132x family also integrates active Miller clamp.



Current solutions

6 x opto-isolated drivers +
3 x 1200 V bootstrap diodes



- Space savings
- Cost savings
- Easy to design
- Higher reliability
- Faster time to market

New 6ED2231S12T

Integrates 6x gate-driver functionality and
3x boot-strap diodes
Over-current protection
IGBT/SiC MOSFET UVLOs



6ED2231S12T easily fits within EasyPIM™ 1B module footprint



EVAL-M1-6ED2231-B1

Features and benefits

Key features	Key benefits	Customer value
– Leading negative VS immunity	– Increased robustness and reliability resulting in reduced manufacturing and field failures	– Increased profitability from lower lifecycle costs
– > 50% lower level-shift switching losses	– Reduced power dissipation, lower temperature	– Faster time to market for higher share capture
– Integrated bootstrap diode	– Faster frequency switching	– Enables new applications
– 1200 V breakdown voltage	– Smaller PCB footprints	– Increased flexibility
– Integrated input filters	– Reduced BOM costs	– Increased reliability
	– Improved noise sensitivity	
	– Latch-up immunity	

Product Name		Configuration	Package	Output current	Key features	Deadtime	T_{ON}/T_{OFF}
6ED2231S12T	NEW	Three-phase	DSO-24 (DSO-28 with 4 pins removed)	0.35/0.65 A	OCP, RFE	460 ns	700/650 ns
2ED1324S12P	NEW	Half-bridge	DSO-20WB (20 fine pitch leads)	2.3/2.3 A	OCP, SOFF, AMC, RFE	380 ns	500 ns
2ED1323S12P	NEW	HS+LS	DSO-20WB (20 fine pitch leads)	2.3/2.3 A	OCP, SOFF, AMC, RFE	None	350 ns
2ED1322S12M	NEW	Half-bridge	DSO-16WB (300mil)	2.3/4.6 A	OCP, SOFF, RFE	400 ns	500 ns
2ED1321S12M	NEW	HS+LS	DSO-16WB (300mil)	2.3/4.6 A	OCP, SOFF, RFE	None	350 ns

www.infineon.com/SO
www.infineon.com/1200VHVIC
www.infineon.com/6ED2230

For more details on the product, click on the part number, visit infineon.com or contact our product support.

2EDi EiceDRIVER™ family

Fast, robust, dual-channel galvanic isolated gate-river ICs

Galvanic isolated EiceDRIVER™ family overview

The 2EDi is a family of dual-channel isolated gate driver ICs designed to drive Si MOSFETS, SiC MOSFETs and GaN power switches. Isolation is achieved by means of Infineon's coreless transformer (CT) technology which guarantees robust operation and industry benchmark common-mode rejection (CMTI). The high propagation delay accuracy and low channel-to-channel mismatch makes the product ideal for use in fast-switching power system. In addition, high CMTI, high reverse current capability and fast clamping of the output below UVLO guarantees reliable operation in the application.

2EDi Gen 2: What is new?

- DSO-14 packages with increased channel-to-channel creepage to easier the layout or enable the use with higher working voltages or worst pollution layout
- New LGA 4 mm x 4 mm package enabling 70 percent space saving
- Fulfills the latest component standard for magnetic couplers (IEC 60747-17)
- Programmable dead-time and shoot-through functionality

Applications

- Server
- Telecom
- DC-DC converters
- Power tools
- Industrial SMPS
- Low speed electrical vehicles
- Solar power inverter
- LED lighting



Features and benefits

Key features	Key benefits	Customer value
– Fast power switching with accurate timing – 5 A/9 A source/sink currents – Propagation delay typ. 38 ns with 6 ns channel-to-channel precision	– Efficiency gain and lower losses – Strong driving enables reduced switching losses – Accurate timing enables deadtime optimization or synchronized driving in case of parallel MOSFETs	– Enabling higher system efficiency and higher power density designs
– Optimized for area and system BOM – < 1 Ω source and sink output resistance – Output stages with 5 A reverse current capability	– Improved thermal behavior at smaller form factor – Most of the driving power is dissipated externally with reduced thermal stress on the driver – Eliminates two costly protection diodes on the gate driver outputs	– Improving long term competitive cost position, integration and mass manufacturability
– Robust – CMTI >150 V/ns – Under voltage lockout function for switch protection – Deadtime control and shoot through protection	– Protection and safe operation – Reliable driver operation against fast switching transients – MOSFET is protected from thermal stress in abnormal conditions – Protection against noise and spurious pulses	– Extending end-product lifetime – by improving safe operation of power switches in normal and abnormal field (grid) conditions
– Output-to-output channel isolation – Functional level galvanic isolation	– Flexible configurations – High-side + low-side, high-side + high-side, low-side + low-side	– Lower EMI by ground isolation
– Input-to-output channel isolation – Functional, basic and reinforced galvanic isolation	– Regulatory safety – Functional for level-shifting and ground bounce immunity – Reinforced for control of primary-side MOSFETs from secondary-side controller	– Simplified safety approval – through component standards (UL1577, IEC60747-17) and system standards (IEC62368) certificates

SMPS · Server · Telecom · Motor control · Power tools · Solar · Lighting

www.infineon.com/2edi

EiceDRIVER™ X3 Compact and 2L-SRC Compact

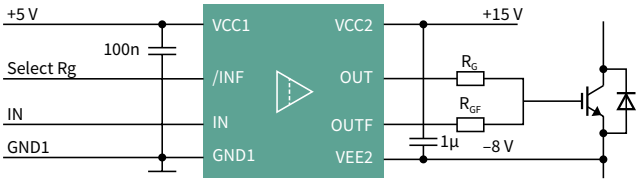
5.7 kV, 18 A, 1-ch, isolated drivers with Miller clamp and two-level slew rate control

The EiceDRIVER™ X3 Compact family (1ED31xx) provides Miller clamp or separate output options with up to 14 A current, in DSO-8 150 mil and 300 mil package. The EiceDRIVER™ 2L-SRC Compact family (1ED32xx) provides Miller clamp or 2-level slew rate control options with up to 18 A current, in DSO-8 300 mil package. The Miller clamp function is highly recommended for SiC MOSFET 0 V turn off and TRENCHSTOP™ IGBT7 against parasitic turn on. The two-level slew rate control function allows customers to change the output current on the fly. It is highly recommend for industrial drives application, where customer suffer from the EMI and switching loss optimization. Both EiceDRIVER™ X3 Compact and 2L-SRC Compact families are rated up to 2300 V functional isolation and 200 kV/µs CMTI. They are ideal for IGBTs, Si MOSFETs, and SiC MOSFETs in applications like solar inverter, EV-charging, industrial drives, CAC, industrial induction cooking, CAV, UPS, server and telecom SMPS, etc.

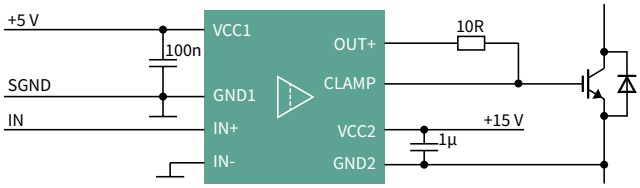


Simplified application diagram

Two-level slew rate control (1ED3241MC12H)



Active Miller clamp (1ED3122MC12H)



Evaluation board

EVAL-1ED3121MX12H
EVAL-1ED3122MX12H
EVAL-1ED3124MX12H
EVAL-1ED3241MC12H
EVAL-1ED3251MC12H
REF-22K-GPD-INV-EASY3B





Family	Part number	Typ. output current	Feature	Prop. delay	Input filter	UVLO	Prop.delay matching	Package	Isolation rating
EiceDRIVER™ X3 Compact	1ED3127MU12F	10 A	Miller clamp	90 ns	30 ns	12 V	7 ns	DSO-8 150mil	UL 1577: VISO = 3 kV_{RMS}
	1ED3125MU12F	10 A				10.5 V			
	1ED3140MU12F	6.5 A	Separate output	45 ns	15 ns	8.5 V			
	1ED3141MU12F	6.5 A				11 V			
	1ED3142MU12F	6.5 A				12.5 V			
	1ED3124MU12F	14 A		90 ns	30 ns	10.5 V			
	1ED3131MC12H	5.5 A		270 ns	180 ns	10.5 V		DSO-8 300mil	UL 1577: V_{ISO} = 5.7 kV_{RMS}
	1ED3120MC12H	5.5 A		90 ns	30 ns	8 V			VDE 0884-11: V_{IORM} = 1767 V (reinforced)
	1ED3121MC12H	5.5 A				10.5 V			
	1ED3122MC12H	10 A	Miller clamp			8 V			
	1ED3123MC12H	14 A	Separate output			8 V			
	1ED3124MC12H	14 A				10.5 V			
EiceDRIVER™ 2L-SRC Compact	1ED3240MC12H	10 A	Turn-on and turn-off slew rate control	110 ns	30 ns	10.5 V	15 ns		
	1ED3241MC12H	18 A				10.5 V			
	1ED3250MC12H	10 A	Turn-on slew rate control and Miller clamp			10.5 V			
	1ED3251MC12H	18 A				10.5 V			

www.infineon.com/gdcompact
www.infineon.com/src

Server SMPS +SiC Telecom Drives EV charger CAV Industrial robots Solar UPS

For more details on the product, click on the part number, visit infineon.com or contact our product support.

EiceDRIVER™ Enhanced 1ED-F3 and X3 Analog

5.7 kV, 9 A, 1-ch, isolated drivers with DESAT, Miller clamp and soft-off

The EiceDRIVER™ Enhanced 1ED-F3 family (1ED332x) provides DESAT, Miller clamp and soft-off features with up to 6 A current, in DSO-16 300 mil package. The EiceDRIVER™ Enhanced X3 Analog family (1ED34xx) provides Miller clamp, resistor configurable DESAT and soft-off function with up to 9 A current, in DSO-16 300 mil fine pitch package.

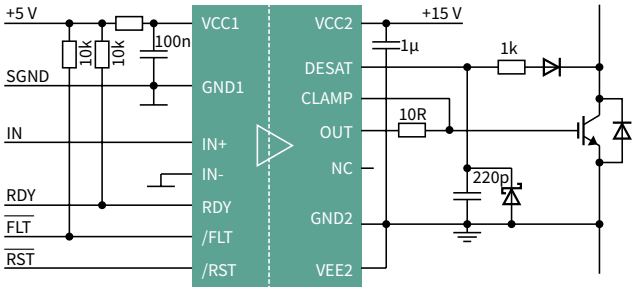
The 1ED-F3 family (1ED332x) is pin-to-pin with our previous generation 1ED020I12-F2 (1ED-F2), with higher current, shorter propagation delay, higher isolation ratings and additional soft-off function. The X3 Analog family (1ED34xx) offers best-in-class DESAT protection accuracy with the resistor configurability on DESAT filter and leading edge blanking time and soft-off current.

Both EiceDRIVER™ Enhanced 1ED-F3 and X3 Analog families are rated up to 2300 V functional isolation and 200 kV/µs CMTI. They are ideal for IGBTs, Si MOSFETs, and SiC in applications like solar inverter, EV-charging, industrial drives, CAC, industrial induction cooking, CAV, UPS, server and telecom SMPS, etc.

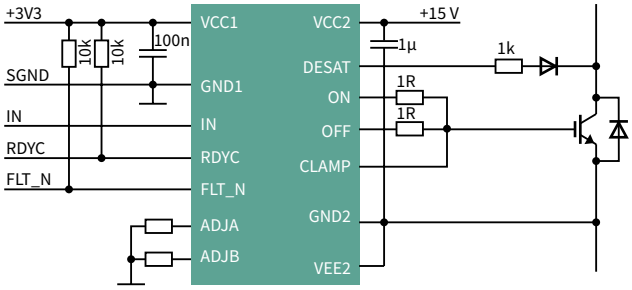


Simplified application diagram

1ED-F3 (1ED332x)



X3 Analog (1ED34xx)



Evaluation board



EVAL-1ED3321MC12N
EVAL-1ED3491MX12M

Family	Part number	Typ. output current	Feature	Prop. delay	Input filter	UVLO	Prop.delay matching	Package	Isolation rating
EiceDRIVER™ Enhanced 1ED-F3	1ED3320MC12N	3/6 A	Miller clamp, DESAT, soft-off	80 ns	35 ns	10.5 V	15 ns	DSO-16 300mil	UL 1577: V_{ISO} = 5.7 kV_{RMS} VDE 0884-11: V_{IORM} = 1767 V (reinforced)
	1ED3321MC12N	6/8.5 A				10.5 V			
	1ED3322MC12N	6/8.5 A	Miller clamp, DESAT			12 V			
	1ED3323MC12N	6/8.5 A				10.5 V			
EiceDRIVER™ Enhanced X3 Analog	1ED3431MC12M	3 A	Miller clamp, resistor adjustable DESAT and soft-off	236 ns	100 ns	10.5 V	30 ns	DSO-16 300mil fine pitch	
	1ED3461MC12M	6 A	Clamp driver, resistor adjustable DESAT and soft-off			10.5 V			
	1ED3491MC12M	9 A				10.5 V			

+SiC

Industrial robots · CAV · EV charger · Drives · Solar · UPS

www.infineon.com/gdenhanced

For more details on the product, click on the part number, visit infineon.com or contact our product support.

EiceDRIVER™ Enhanced X3 Digital

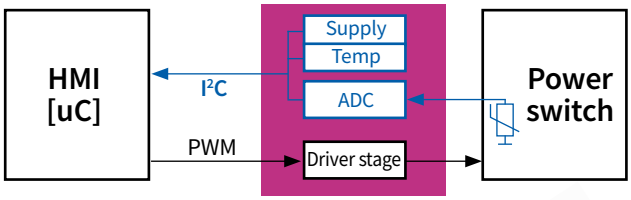
5.7 kV, 9 A, 1-ch, isolated drivers with I²C configurability for DESAT, Miller clamp, soft-off and many more

The EiceDRIVER™ Enhanced X3 Digital family (1ED38xx) provides I²C configurability for DESAT, soft-off, UVLO, Miller clamp, two-level turn off (TLTO), and fault function to simplify the design of highly reliable systems. All adjustments are done from the input side via the I²C interface (pin SDA and SCL). The 1ED38xx offers up to 9 A current, in DSO-16 300 mil fine-pitch package.

The EiceDRIVER™ Enhanced X3 Digital family is rated up to 2300 V functional isolation and 200 kV/µs CMTI. They are ideal for IGBTs, Si MOSFETs, and SiC MOSFETs especially due to the configurability of DESAT and UVLO. This family is recommended in applications like solar inverter, EV-charging, industrial drives, CAC, industrial induction cooking, CAV, UPS, server and telecom SMPS, etc. Two noticeable advantages of the digitally configurable approach for customers are predictive maintenance in sophisticated industrial systems and rapid prototyping for fast solution development.

Predictive maintenance

Using the I²C interface, the 1ED38xx is able to register the counts of UVLO spikes, monitor the supply voltage and temperature increase. With the long-term analysis of the collected data, customers are able to decide when is the best time to schedule a maintenance cycle before the system fails.



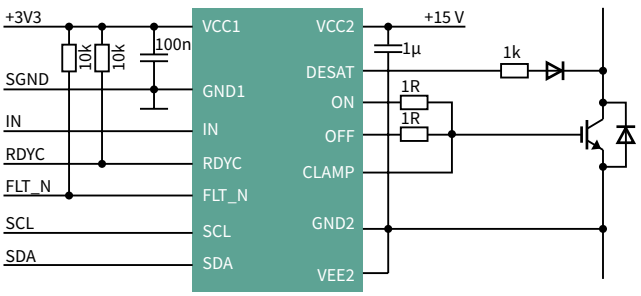
Evaluation board

EVAL-1ED3890Mx12M
EVAL-1ED38x0DCT



Simplified application diagram

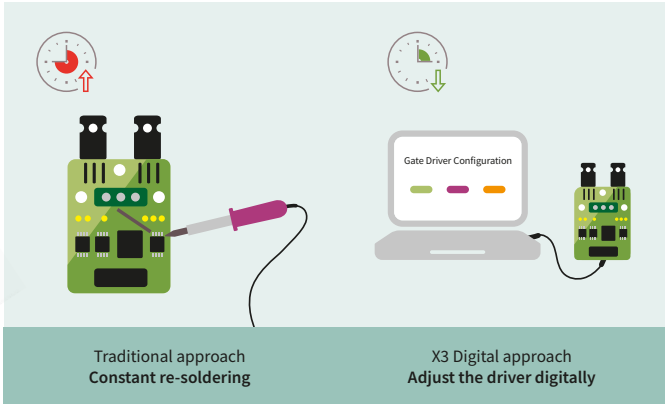
X3 Digital (1ED38xx)



www.infineon.com/gdenhanced

Rapid prototyping

The I²C interface enables rapid prototyping without hardware changes. Using a traditional gate driver, customers have to first design an initial PCB board, and then adjust and replace the components on the board during evaluation. However, with the 1ED38xx I²C interface, customers can configure up to 27 parameters to optimize the board without replacing the components. This feature extremely shortens the development flow.



Family	Part Number	Typ. output current	Feature	Isolation rating
EiceDRIVER™ Enhanced X3 Digital	1ED3830MC12M	3 A	I²C configurability, Miller clamp, DESAT, soft-off, two-level turn-off, integrated ADC	UL 1577: VISO = 5.7 kV_{RMS} VDE 0884-11: VIORM = 1767 V (reinforced)
	1ED3860MC12M	6 A		
	1ED3890MC12M	9 A		

Predictive maintenance · +SiC · Industrial robots · CAV · EV charger · Drives · Solar · UPS

For more details on the product, click on the part number, visit infineon.com or contact our product support.

EiceDRIVER™ APD 2ED4820-EM

48 V smart high-side MOSFET gate driver with SPI for automotive applications

The EiceDRIVER™ 2ED4820-EM is a smart high side N-channel MOSFET gate driver with two outputs controlled via SPI. The integrated powerful charge pump allows external MOSFETs to stay continuously on. Thanks to the enhanced turn-on and turn-off ability of the driver, the number of MOSFETs could be easily scaled up to manage large currents in the order of several hundred amps, while ensuring fast switch on and off. The MOSFETs could be controlled in a back to back configuration either common mode or common source. The integrated current sense amplifier supports high-side and even load-side current measurement with a dedicated monitoring output. The 2ED4820-EM comes along with several latching failure detections, to implement protections for the external MOSFETs, the load and the power source. Parameters can be adjusted by SPI; monitoring data, configuration, warning and failure detection registers can be read.

Summary of features

- Extended supply voltage range: 20 - 70 V
- Two independent high-side gate driver outputs with 1 A pull down, 0.3 A pull up for fast switch off/on
- Low supply current in sleep mode IBAT_Q < 5 µA
- Device control, configuration and diagnostic via SPI
- Configurable overcurrent/short circuit protection
- Configurable Drain-Source overvoltage protection
- Gate undervoltage lockout (V_{GS})
- Ground loss detection
- AEC-Q100 qualification

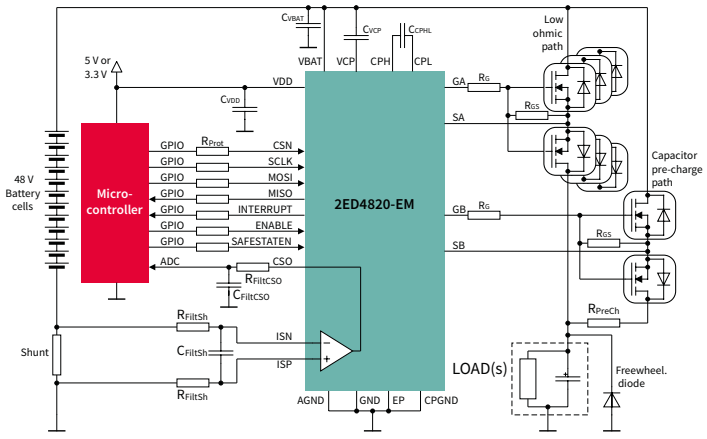
Pb Hal RoHS

Benefits

- Supports back-to-back MOSFET topologies (common drain or common source)
- SAFESTATEN input to trigger safe state mode in case of µC failure
- One bidirectional high or low side analog current sense interface with configurable gain to optimize power losses
- Robust against V_{bat} voltages up to 105 V and V_{source} voltages versus V_{bat} of -90 V

Potential applications

- Battery protection switch
- Input protection switch
- Static load and supply switch for high currents





Products and evaluation boards

Product	Description	Ordering code	Package
2ED4820-EM	48 V smart high-side MOSFET gate driver with SPI	SP005629911	PG-TSDSO-24
2ED4820 EB2 2HSV48	2ED4820 dual high-side switch – 48 V evaluation board	SP005353778	BOARD
R 48V BATT Switch10	48 V battery disconnect switch - reference design	SP005595834	BOARD

www.infineon.com/eicedriver

For more details on the product, click on the part number, visit infineon.com or contact our product support.

EiceDRIVER™ 1EDI302xAS/1EDI303xAS

1200 V galvanically isolated automotive gate-driver IC family

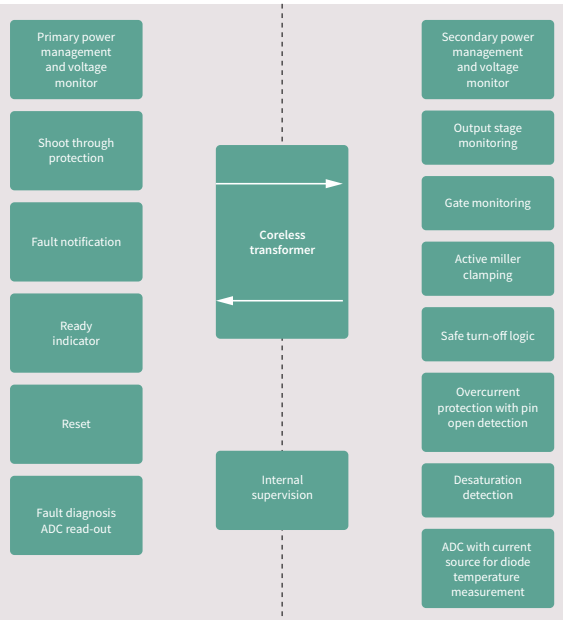
The EiceDRIVER™ 1EDI302xAS/1EDI303xAS is a family of automotive qualified single-channel high-voltage gate drivers optimized for IGBT and SiC technologies. The robust Infineon coreless transformer (CT) technology is used to provide bi-directional signal transfer across the galvanic isolation barrier. Comprehensive safety features and ISO26262 compliance enable ASIL D classification on the system level. Accompanying safety documents ease and speed-up FMEDA analysis in the application. The compact package design and the high level of feature integration save valuable PCB space and system cost, while the pre-configured settings reduce design efforts. Pin-compatible product variants make it easy to switch between variants and swiftly adjust ECUs to different application needs (i.e., SiC MOSFET vs. IGBT).

Product features

- Single-channel isolated IGBT driver
- For IGBTs up to 1200 V
- High CMTI up to 150 V/ns
- 8 kV basic insulation according to DIN VDE V 0884-11:2017-01
- Basic insulation according to UL 1577
- Min. 12 A peak current rail-to-rail output
- Propagation delay 60 ns typical
- Typ. 10 A integrated active Miller clamp supports unipolar switching
- Integrated, accurate 12 bit ADC for temperature measurements
- Integrated safety features to support ASIL B(D):
  - DESAT and differential OCP protection
  - Gate and output stage monitoring
  - Shoot-through protection
  - Primary/secondary supply monitoring
  - Internal supervision
- Advanced driver diagnosis with duty cycle coded DATA pin
- AEC-Q100 qualified
- Compact DSO-20 fine pitch package

RoHS

Simplified block diagram



Potential applications

- Traction inverters for HEV and EV
- Auxiliary inverters for HEV and EV
- High-power DC-DC converters

Evaluation board

1EDI30XXAS EVALBOARD
1EDI303XAS EVALBOARD
1EDI302XAS EVALBOARD



Product family overview

Product variant	Driver support	Additional functionality
1EDI3020AS	IGBT	ADC for temperature Diode
1EDI3021AS	IGBT	Active short circuit
1EDI3023AS	IGBT	ADC for NTC and DC-link
1EDI3030AS	SiC	ADC for temperature diode
1EDI3031AS	SiC	Active short circuit
1EDI3033AS	SiC	ADC for NTC and DC-link



www.infineon.com/eicedriver

For more details on the product, click on the part number, visit infineon.com or contact our product support.

Infineon solid-state relays (SSR) technologies

Using Infineon power-switch technologies, Infineon solid-state relays (SSRs) are remotely controlled switches (on/off) with complete galvanic isolation from input to output. No power supply is needed on the output.

Two main sub-groups:

- Photovoltaic isolators (PVI)
  - Isolated, low-power DC voltage sources capable of driving MOSFET or IGBT gates directly
- Photovoltaic relays (PVR)
  - PVI plus internal power MOSFET

Main benefits of Infineon SSR technology:

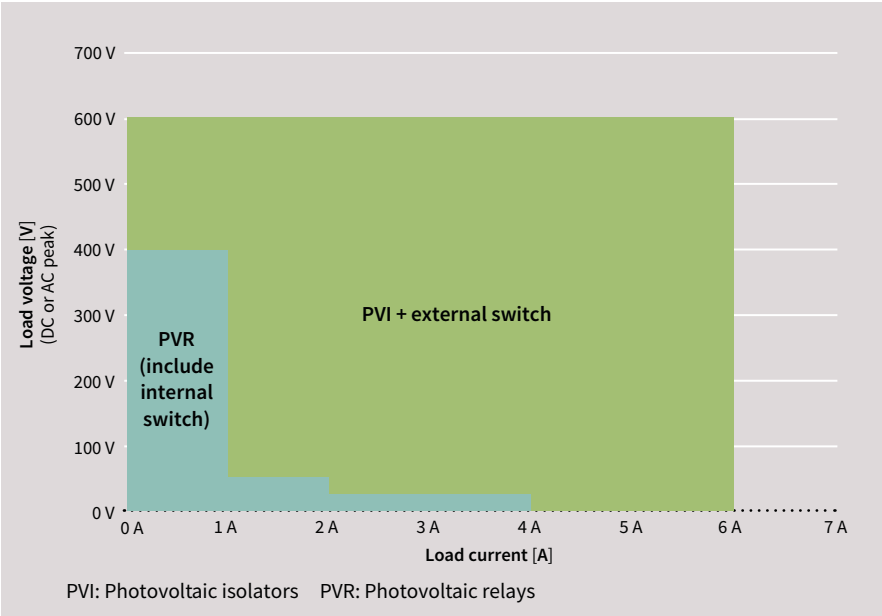
- Optically isolated technology provides galvanic isolation for safety applications
- Wide range of applications from industrial automation to test equipment
- Established and reliable products with over 20 years of history

Key advantages over electromechanical relays:

- Silent operation
- No contact bounce
- Compact solution
- Fast response time
- High input sensitivity
- High reliability with long operational life
- Insensitivity to stray EMF, shock and vibration
- Stable contact resistance over life

Infineon SSRs can be used in a wide range of applications:

- Electro-mechanical relay (EMR) replacement
- Battery management systems
- UPS
- Automatic test equipment
- Instrumentation systems
- Industrial automation
- Thermostats
- Programmable logic controllers



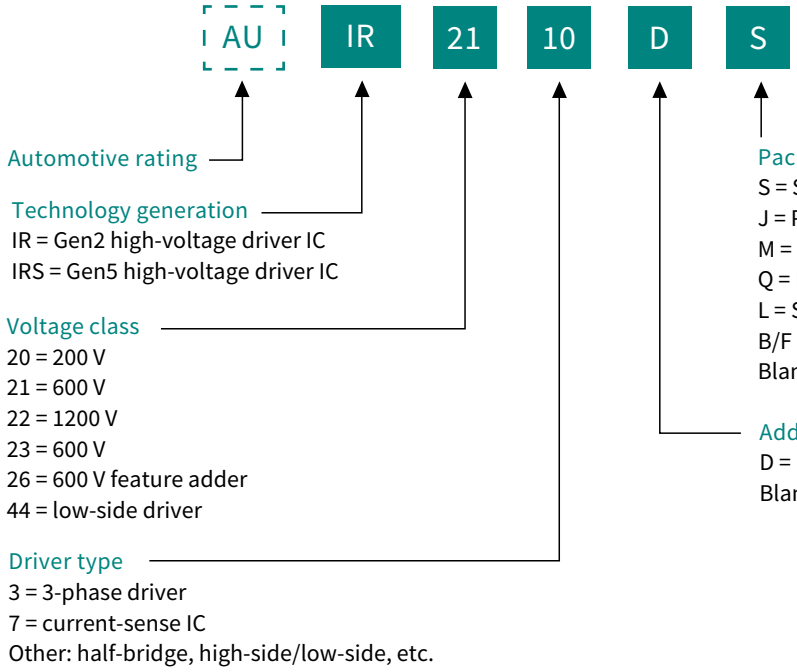
PVI: Photovoltaic isolators PVR: Photovoltaic relays

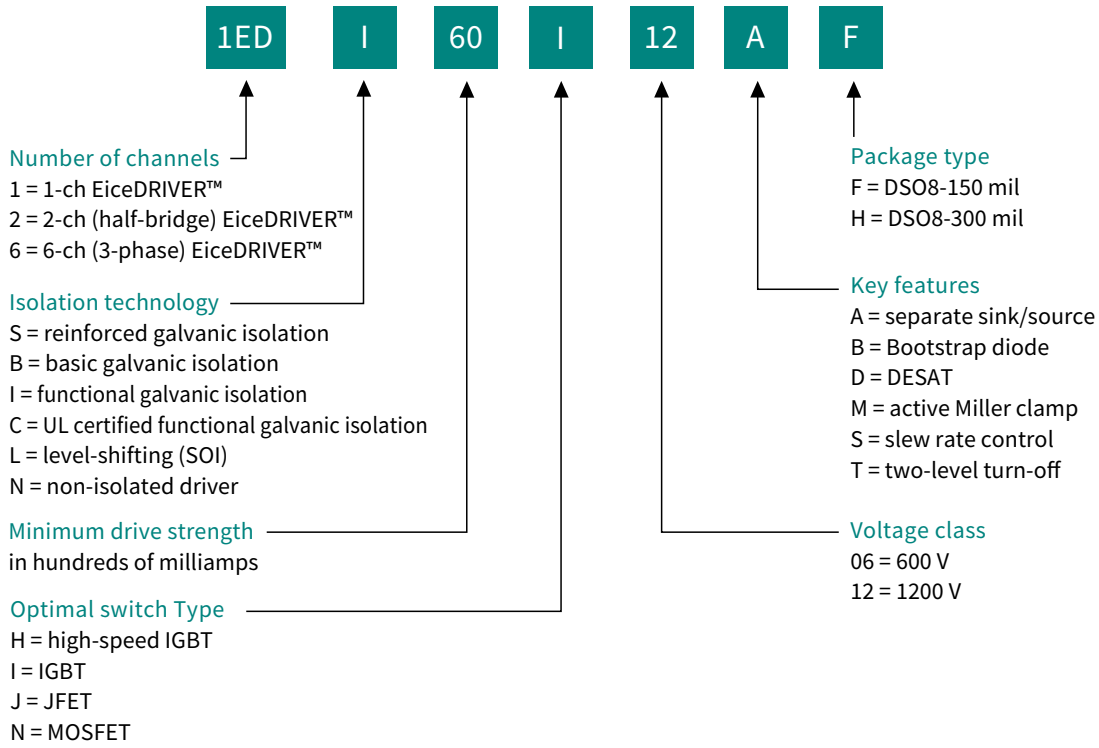
www.infineon.com/SSR

For more details on the product, click on the part number, visit infineon.com or contact our product support.

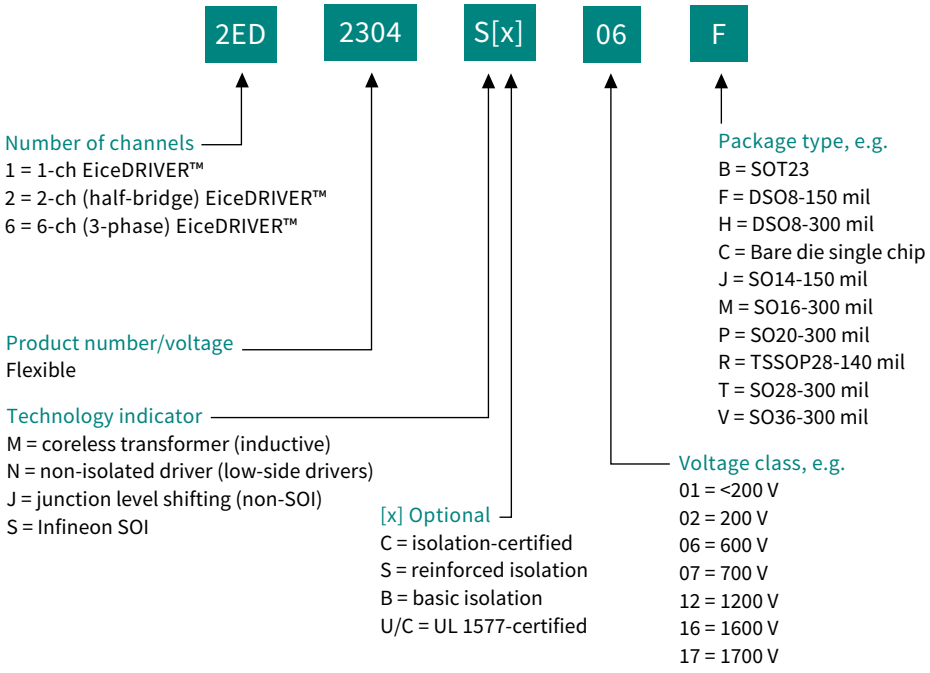
Nomenclature

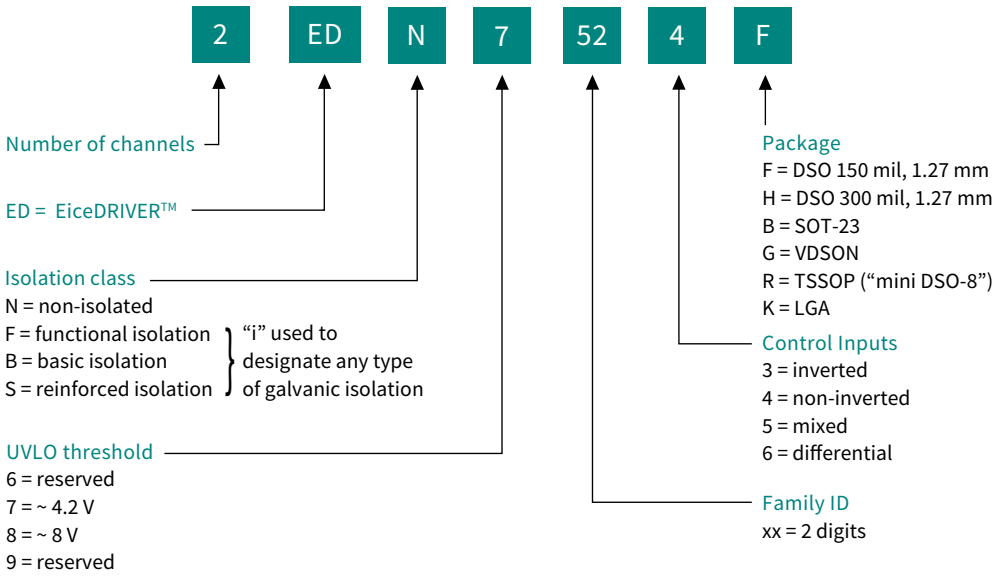
Naming convention for existing families of gate-driver ICs



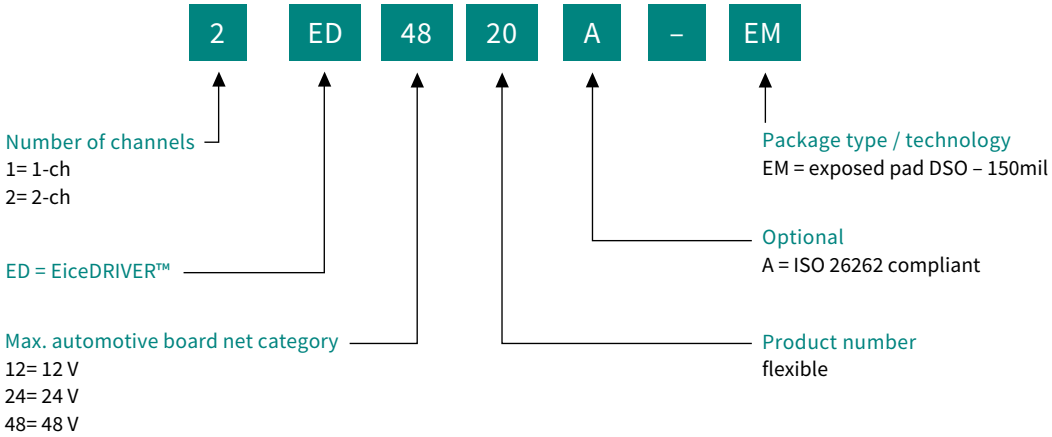


Naming convention for existing and upcoming families of gate-driver ICs





Naming convention for existing and upcoming families of gate-driver ICs





Infineon support for gate-driver ICs

Useful links and helpful information

Further information, datasheets and documents

www.infineon.com/200vhvic
www.infineon.com/700vhvic
www.infineon.com/1200vhvic
www.infineon.com/gdsic
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www.infineon.com/gdlowside
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www.infineon.com/2EDN
www.infineon.com/TDI
www.infineon.com/2EDL8
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www.infineon.com/gatedriver-cn (CN)
www.infineon.com/ifxdesigner
www.infineon.com/gdevalboards
www.infineon.com/gdlowside

Gate driver IC community FAQs
www.infineon.com/gdforum

Gate driver selection tools
www.infineon.com/gdfinder

Gate driver simulation (SPICE) models
www.infineon.com/gdmodel

Cross reference tool
www.infineon.com/crs

Support
Evaluation board
Tools



Digital isolators

- ISOFACE™ dual-channel digital isolators
- ISOFACE™ quad-channel digital isolators

ISOFACE™ dual-channel digital isolators

Robust digital isolators with precise timing and low power consumption

ISOFACE™ digital isolators are based on Infineon's coreless transformer (CT) technology and provide robust isolation for high voltage applications. They are the preferred choice for isolated gate signal transfer in high-density power designs and isolated communication such as UART or CAN.

The 2DIBx4xxF family features

- Dual-channel digital isolators with eight variants and data rates up to 40 Mbits/s
- 3 kV_{RMS} isolation voltage
- CMOS/TTL input thresholds
- High common-mode transient immunity (CMTI)
- Accurate timing performance
- Wide operating supply voltage from 2.7 V to 6.5 V

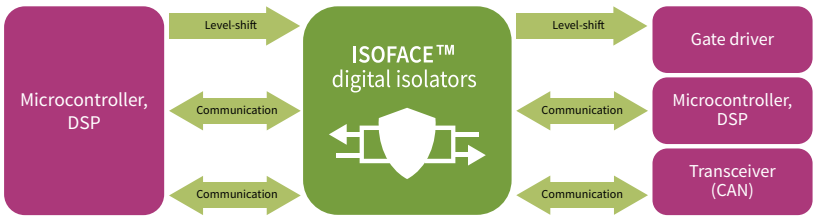


Product variants

Part number	Isolation rating	Channel configuration	Input thresholds	Default output state	Package
2DIB0400F	V_{ISO} = 3000 V_{RMS} (UL1577 Ed. 5)	2 forward 0 reverse (2+0)	Variable (CMOS)	Low	PG-DSO-8 5 x 4 mm
2DIB0401F				High	
2DIB1400F		1 forward 1 reverse (1+1)		Low	
2DIB1401F				High	
2DIB0410F		2 forward 0 reverse (2+0)	Fixed (TTL)	Low	
2DIB0411F				High	
2DIB1410F		1 forward 1 reverse (1+1)		Low	
2DIB1411F				High	

Features and benefits

Key features	Key benefits
– High CMTI > 100 V/ns	– High immunity against system noise or high dv/dt
– Wide supply voltage range 2.7 V ~ 6.5 V (abs. max. 7.5 V)	– Reliable performance in SMPS with switching noise on IC power supply
– TTL or CMOS input threshold	– Optimized noise margin for different applications
– Typical propagation delay 26 ns with -4/+6 ns spread	– For high system power efficiency
– Both high and low fail-safe default output state	– Reliable high or low default output state in case of failures
– Both component and system level certification	– Simplified system certification process
– Pin-to-pin compatibility	– For easy device replacement and alternative sourcing



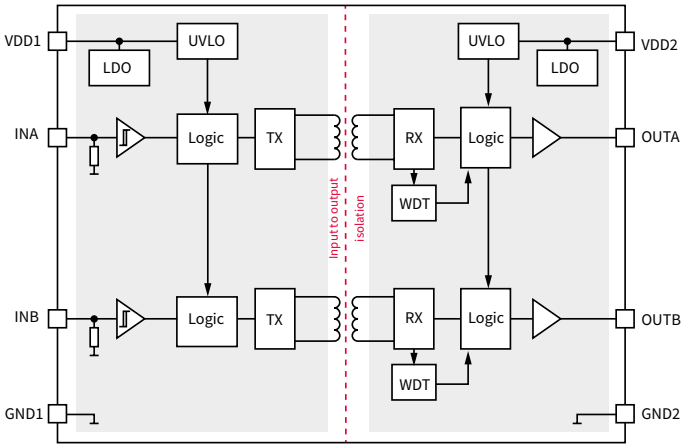
Infineon ISOFACE™ dual-channel digital isolators are used to transfer gate driving and communication signals like CAN and UART over the isolation barrier. With high robustness and accurate switching characteristics, they are suitable for high power density designs and isolated communication systems.

www.infineon.com/digitalisolators

Dual-channel digital isolator 2DIB0410F in SOIC-8 narrow body package

Infineon ISOFACE™ dual-channel digital isolator 2DIB0410F (with 2 forward channels) provides robust isolation for high voltage applications. With a wide supply voltage range, TTL input thresholds and default output state low, it is the perfect fit for high-power density DC-DC brick applications.

Block diagram of 2DIB041xF with two forward data channels

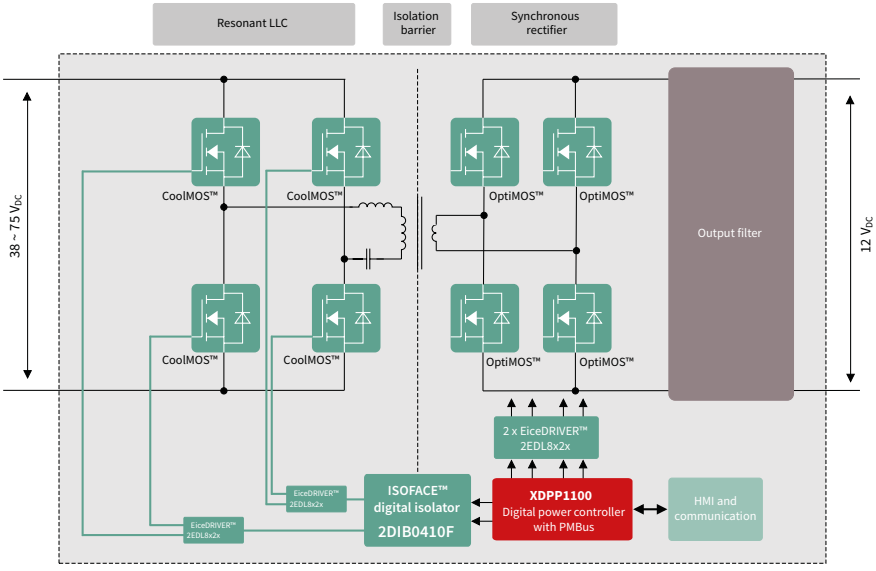




Features and benefits

Key features	Key benefits
– High CMTI > 100 V/ns	– High immunity against system noise
– Wide operating supply voltage range 2.7 V ~ 6.5 V (abs. max. 7.5 V)	– Reliable performance in SMPS with switching noise on IC power supply
– TTL input threshold	– Optimized noise margin for SMPS applications
– Integrated glitch filter	– Effective noise suppression in SMPS applications
– Default low fail-safe output state	– Reliable low output state in case of failures
– Both component and system-level certification	– Simplified system certification process

2DIB0410F used in isolated DC-DC brick application



Infineon ISOFACE™ dual-channel digital isolator 2DIB0410F is a perfect fit for isolated DC-DC brick applications to transfer half- or full-bridge gate driving signals. The two-channel configuration allows transfer of low- and high-side gate-signals over the isolation barrier.

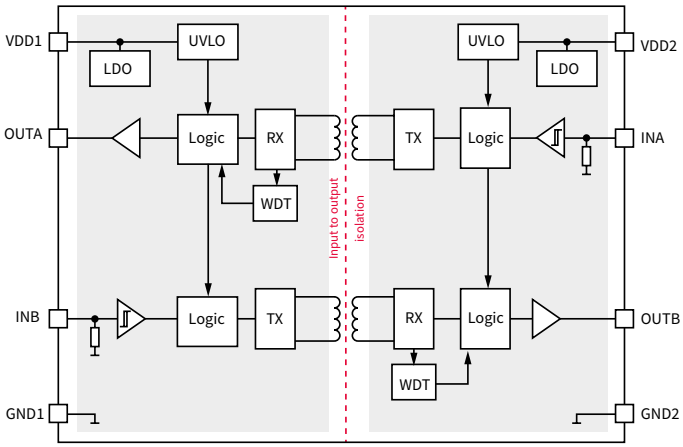
EV charger · Server SMPS · Telecom DC-DC brick · Telecom SMPS

www.infineon.com/digitalisolators

Dual-channel digital isolator 2DIB1410F in SOIC-8 narrow body package

Infineon ISOFACE™ dual-channel digital isolator 2DIB1410F (with one forward and one reverse channel) provides robust isolation for high voltage applications. With high common-mode transient immunity (>100 V/ns), TTL input threshold, and default low output state, it is the perfect match for GaN-IPS with high dv/dt in high-density power designs (GaN with integrated non-isolated gate driver).

Block diagram of 2DIB14xxF with one forward and one reverse data channel

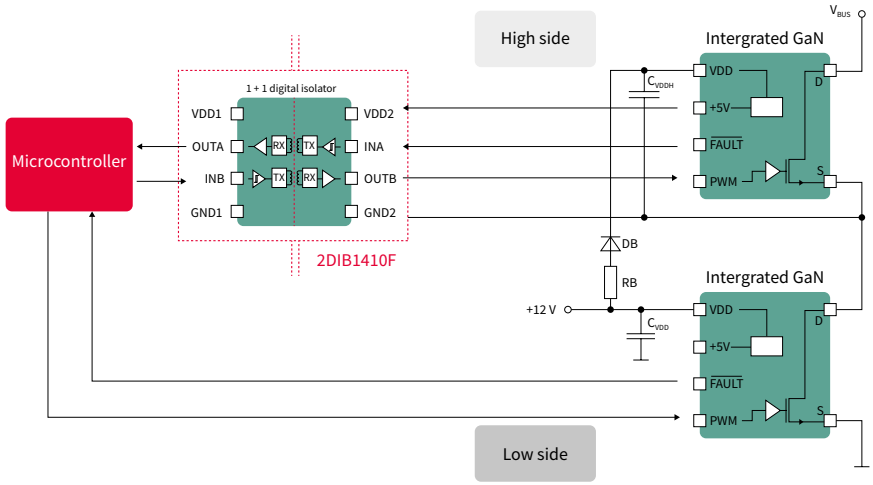




Features and benefits

Key features	Key benefits
– High CMTI > 100 V/ns	– For GaN with integrated non-isolated gate driver with high dv/dt
– Wide supply voltage range 2.7 ~ 6.5 V (abs. max. 7.5 V)	– Reliable performance in SMPS with switching noises on IC power supply
– TTL input threshold	– Optimized noise margin for SMPS applications
– Integrated glitch filter	– Effective noise suppression in SMPS applications
– Default low fail-safe output state	– Reliable low output state in case of failures
– Both component and system-level certification	– Simplified system certification process

2DIB1410F used in totem-pole PFC with GaN IPS



Infineon ISOFACE™ dual-channel digital isolator 2DIB1410F can be used together with GaN IPS for high-side floating drive. One forward channel is used to transfer the gate signal. The reverse channel can be used for protection signal.

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www.infineon.com/digitalisolators

ISOFACE™ quad-channel digital isolators

Robust digital isolators with precise timing and low power consumption

ISOFACE™ digital isolators are based on Infineon's coreless transformer (CT) technology and provide reinforced isolation for high-voltage applications. They are the preferred choice for isolated gate signal transfer in high-density power designs and isolated communication such as UART/CAN and SPI. The quad-channel digital isolators also offer AEC-Q variants to meet even stringent customer application requirements.

The 4DIRx4xxH family features

- Quad-channel digital isolators with eight variants and data rates up to 40 Mbits/s
- 5.7 kV_{RMS} isolation voltage
- Active high or low enable logic level for the output on Side 1
- High common-mode transient immunity (CMTI)
- Accurate timing performance
- Wide operating supply voltage from 2.7 V to 6.5 V

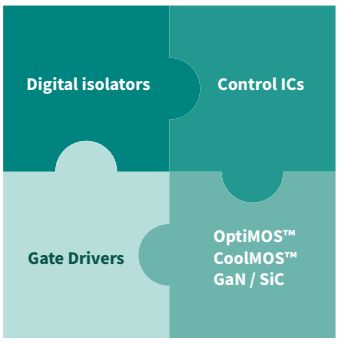


Product variants

Part number	Channel configuration	Output enable	Default output state	Package
4DIR0400H	4 forward 0 reverse (4+0)	Active-high	Low	PG-DSO-16 300 mil
4DIR0401H(A) [1]			High	
4DIR1400H(A) [1]	3 forward 1 reverse (3+1)		Low	
4DIR1401H(A) [1]			High	
4DIR2400H(A) [1]	2 forward 2 reverse (2+2)		Low	
4DIR2401H(A) [1]			High	
4DIR1420H(A) [1]	3 forward 1 reverse (3+1)	Active-low	Low	
4DIR1421H(A) [1]			High	

Features and benefits

Key features	Key benefits
– High CMTI > 100 V/µs	High immunity against system noise and high dv/dt
– Wide supply voltage range 2.7 V ~ 6.5 V (abs. max. 7.5 V)	Reliable performance in UART/CAN and SPI communication
– Active high or low enable logic level for the output on Side 1	Compatible with chip select function in SPI communication
– Typical propagation delay 26 ns with -4/+6 ns spread	For high system power efficiency
– Both high and low fail-safe default output state	Reliable high or low default output state in case of failures
– Both component- and system-level certification	Simplified system certification process
– Pin-to-pin compatibility	For easy device replacement and alternative sourcing



Infineon ISOFACE™ quad-channel digital isolators transfer gate driving and communication signals like CAN/UART and SPI over the isolation barrier.

Industrial automation · Telecom SMPS · Motor control · Industrial SMPS · Server · EV charging

www.infineon.com/digitalisolators

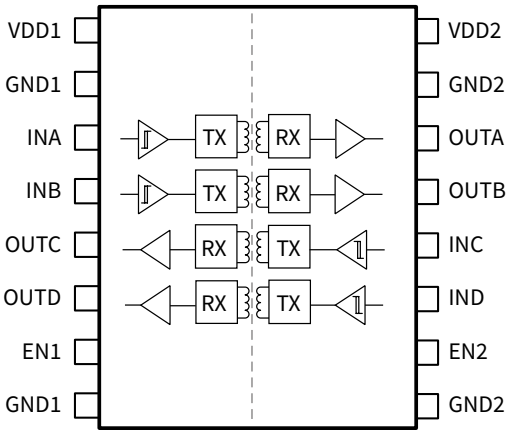
1) (A)* = AEC-Q100 qualified

For more details on the product, click on the part number, visit infineon.com or contact our product support.

Quad-channel digital isolator 4DIR2401H in SOIC-16 wide body package

Infineon ISOFACE™ quad-channel digital isolator 4DIR2401H (with 2 forward and 2 reverse channels) provides robust isolation for high-voltage applications. With a wide supply voltage range, CMOS input threshold, and default output state high, it is the perfect fit for a wide range of SMPS applications and isolated communication like UART/CAN.

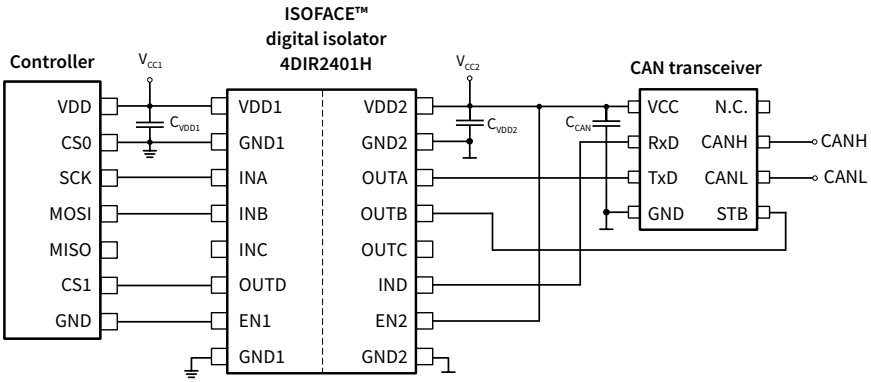
4DIR240xH with 2 forward and 2 reverse data channels





Features and benefits

Key features	Key benefits
– High CMTI > 100 V/µs	– High immunity against system noise
– Wide supply voltage range 2.7 V ~ 6.5 V (abs. max. 7.5 V)	– Reliable performance in UART/CAN and SPI communication
– Active high enable logic level for the output on Side 1	– Output enable function for system-level protection
– Typical propagation delay 26 ns with -4/+6 ns spread	– For high system power efficiency
– Low fail-safe default output state	– Reliable low default output state in case of failures
– Both component- and system-level certification	– Simplified system certification process
– Pin-to-pin compatibility	– For easy device replacement and alternative sourcing



Infineon ISOFACE™ quad-channel digital isolators 4DIR2401H can be used in SMPS applications for inter-board communication and other isolated communication like UART/CAN.

Industrial automation · Telecom SMPS · Motor control · Industrial SMPS · Server · EV charging

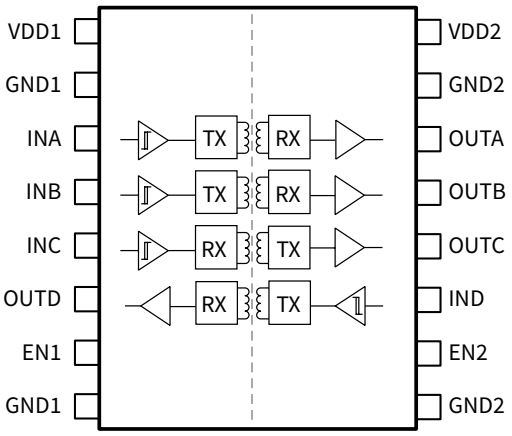
www.infineon.com/digitalisolators

For more details on the product, click on the part number, visit infineon.com or contact our product support.

Quad-channel digital isolator 4DIR1421H in SOIC-16 wide body package

Infineon ISOFACE™ quad-channel digital isolator 4DIR1421H (with 3 forward and 1 reverse channels) provides robust isolation for high-voltage applications. With a wide supply voltage range, active-low enable logic level for the output on side 1 and default output state low; it is the perfect fit for isolated SPI communication.

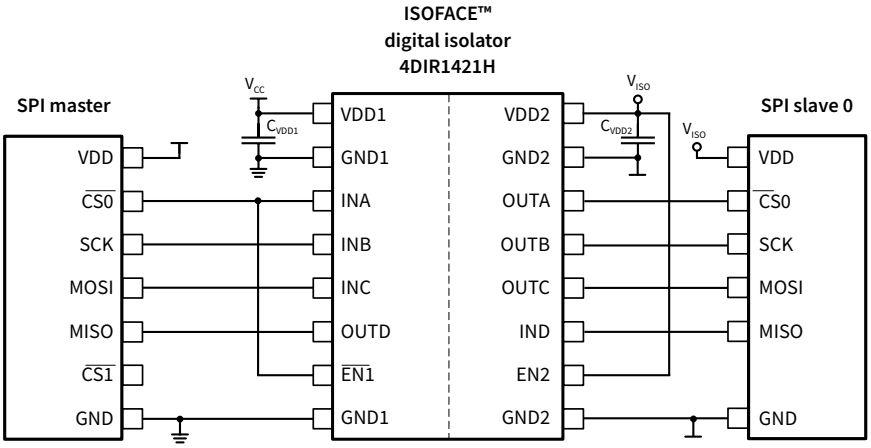
4DIR142xH with 3 forward and 1 reverse data channels





Features and benefits

Key features	Key benefits
– High CMTI > 100 V/µs	– High immunity against system noise
– Wide supply voltage range 2.7 V ~ 6.5 V (abs. max. 7.5 V)	– Reliable performance in SPI communication
– Active low enable logic level for the output on Side 1	– Compatible with chip select function in SPI communication
– Typical propagation delay 26 ns with -4/+6 ns spread	– For high system power efficiency
– High fail-safe default output state	– Reliable high output state in case of failures
– Both component- and system-level certification	– Simplified system certification process
– Pin-to-pin compatibility	– For easy device replacement and alternative sourcing



Infineon ISOFACE™ quad-channel digital isolator 4DIR1420H is designed for isolated SPI communication. The negative enable logic level for output on side 1 is compatible with the chip select function of SPI communication controllers. The default high output state is designed not to block the SPI communication bus in case of failure on the input side.

Industrial automation · Telecom SMPS · Motor control · Industrial SMPS · Server · EV charging

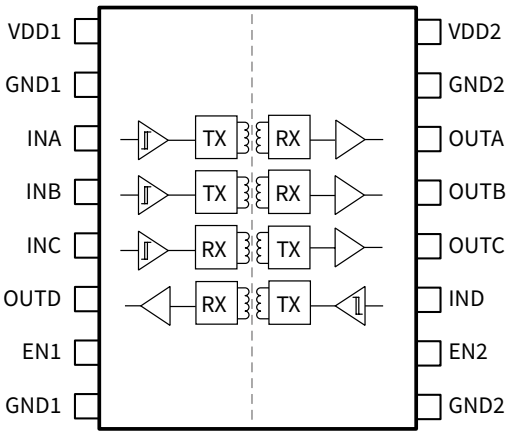
www.infineon.com/digitalisolators

For more details on the product, click on the part number, visit infineon.com or contact our product support.

Quad-channel digital isolator 4DIR1400H in SOIC-16 wide body package

Infineon ISOFACE™ quad-channel digital isolator 4DIR1400H (with 3 forward and 1 reverse channels) provides robust isolation for high-voltage applications. With a wide supply voltage range, active-high enable logic level for the output on side 1 and default output state low. It is the perfect fit for a wide range of applications, including telecom/server PSU, industrial SMPS, EV-charging, and industrial drives.

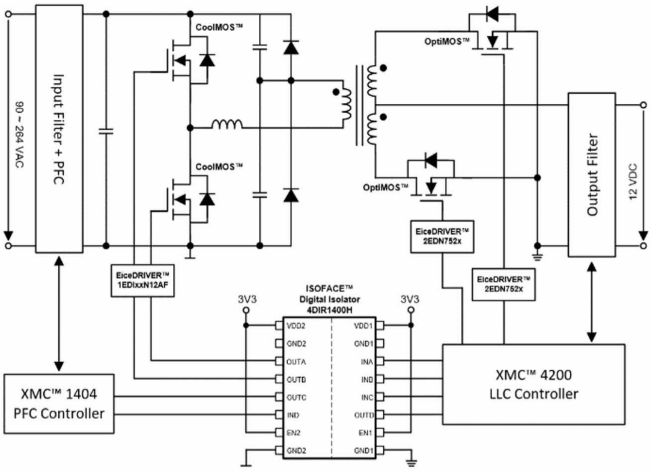
4DIR140xH with 3 forward and 1 reverse data channels





Features and benefits

Key features	Key benefits
– High CMTI > 100 V/µs	– High immunity against system noise
– Wide supply voltage range 2.7 V ~ 6.5 V (abs. max. 7.5 V)	– Reliable performance in UART/CAN and SPI communication
– Active high enable logic level for the output on Side 1	– Output enable function for system level protection
– Typical propagation delay 26 ns with -4/+6 ns spread	– For high system power efficiency
– Low fail-safe default output state	– Reliable low default output state in case of failures
– Both component and system-level certification	– Simplified system certification process
– Pin-to-pin compatibility	– For easy device replacement and alternative sourcing



Infineon ISOFACE™ quad-channel digital isolators 4DIR1400H can be used for HV DC-DC Converter in PSU for telecom and server. The quad-channel digital isolator controls the primary LLC converter indirectly and communicates with the PFC controller through the reinforced isolation barrier. Two data channels are used to transfer the half-bridge PWM control signals (HS and LS). The remaining two data channels are used for UART communication between the primary-side PFC controller and the secondary-side LLC controller. The default low output state ensures the safe turn-off of the half-bridge MOSFETs in any fault condition.

Industrial automation · Telecom SMPS · Motor control · Industrial SMPS · Server · EV charging

www.infineon.com/digitalisolators

For more details on the product, click on the part number, visit infineon.com or contact our product support.



Infineon support for digital isolators

Useful links and helpful information

Further information, datasheets and documents

www.infineon.com/digitalisolators

Support

Evaluation board

Tools



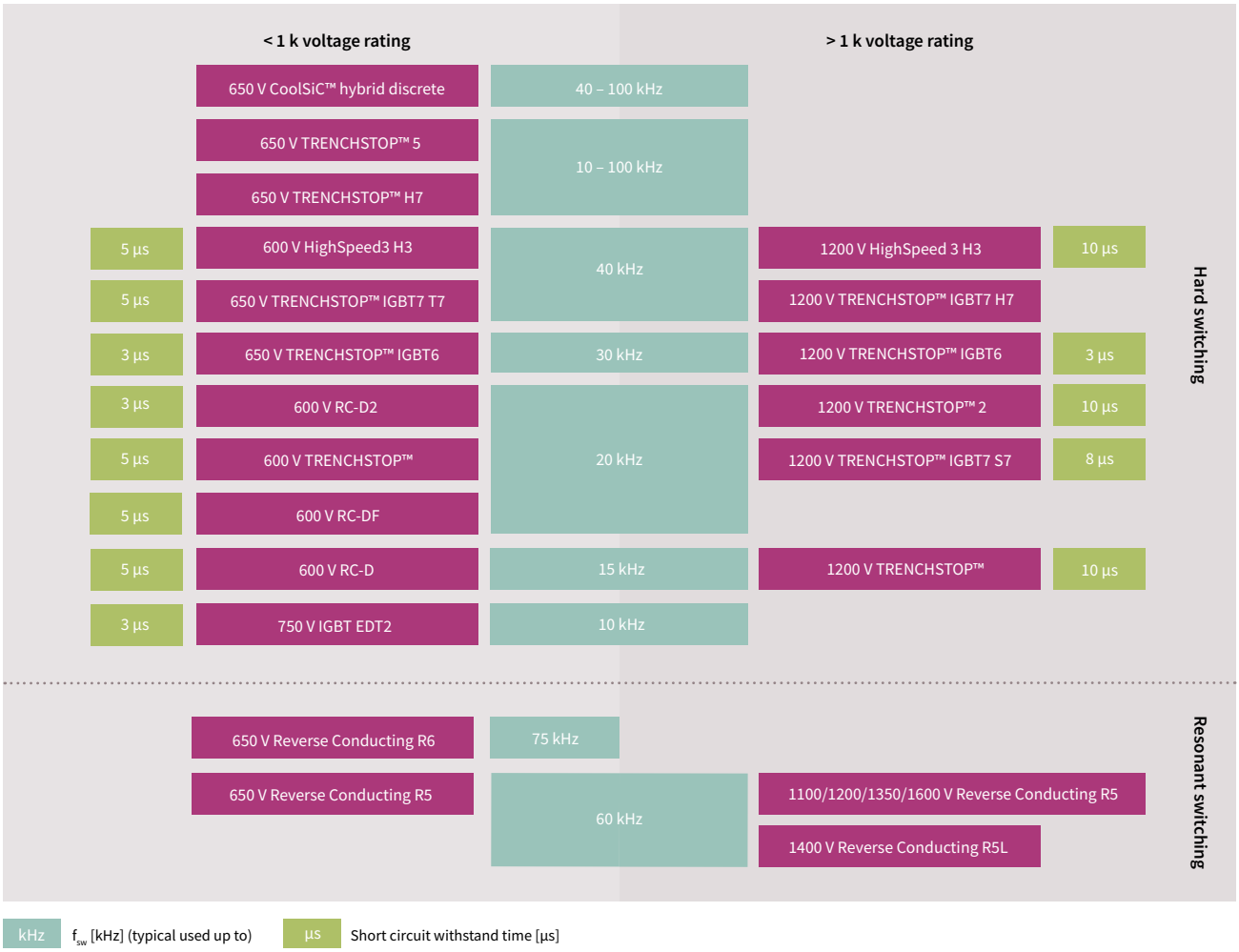
Discrete IGBTs and silicon power diodes

- Discrete IGBTs
- 650 V - 1200 V TRENCHSTOP™ IGBT7 T7, H7 and S7
- 1200 V and above IGBT families
- 650 V TRENCHSTOP™ IGBTs
- Lower power drive IGBT portfolio
- 650 V Reverse Conducting R6 IGBT
- TRENCHSTOP™ 5 advanced isolation
- TRENCHSTOP™ 5 selection tree
- IGBT selection tree
- Discrete IGBTs product portfolio
- Silicon power diodes
- CoolSiC™ hybrid devices portfolio
- Discrete IGBT nomenclature
- Silicon power diodes nomenclature

Discrete IGBTs

Market leadership through groundbreaking innovation and application focus

Resolute to achieve the highest standards in performance and quality, Infineon offers a comprehensive portfolio of application-specific discrete IGBTs. From 600 V up to 1600 V, we offer a wide range of IGBT voltage classes to meet different voltage requirements in each application.



www.infineon.com/igbtdiscretes
www.infineon.com/gatedriver

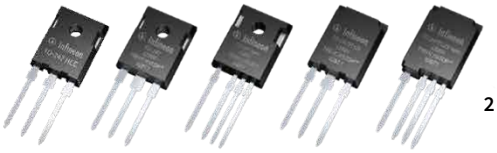
It’s time to SWITCH!

Infineon has revolutionized the world of IGBTs with the 7th generation of TRENCHSTOP™ IGBTs, designed with the latest micro-pattern trench technology. This advanced technology offers unparalleled control and performance, resulting in significant loss reduction, improved efficiency, and increased power density in your applications.

650 V - 1200 V TRENCHSTOP™ IGBT7 T7, H7 and S7

The 7th generation of TRENCHSTOP™ IGBTs sets a new benchmark in the world of discrete IGBT and diode technology. With its outstanding performance, it is the fastest IGBT on the market and boasts the highest power density with current rating devices up to 150 A. For the first time ever, this technology is now available in the 650 and 1200 V discrete IGBT market.

Fulfilling the needs of decarbonization and industry 4.0



IGBT7

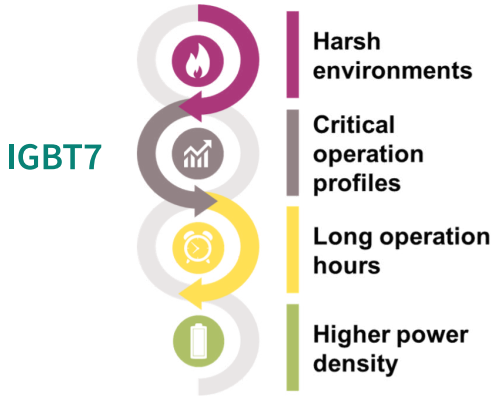
2 voltage classes 650 V and 1200 V
3 flavours T7, H7 and S7
5 Packages



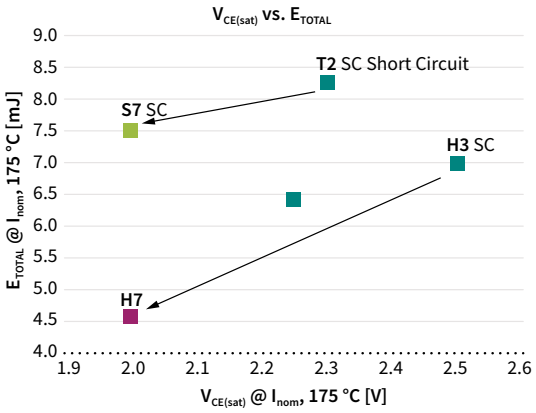
Produced in 300 mm fab
Enabling future growth

The extensive portfolio of 650 V/1200 V TRENCHSTOP™ IGBT7 T7, H7 and S7 is specifically designed to meet the demands of various applications, including solar photovoltaic, uninterruptible power supplies, battery chargers, and industrial drives. This unique discrete offering provides a high current rating portfolio up to 150 A in four different package types, with conduction parameter $V_{(CE)sat}$ 50% lower compared to previous generations and switching losses up to 84% lower.

Dynamic requirements



1200 V IGBTs key parameters



Make the switch today and revolutionize your applications!

Don’t miss out on this opportunity to upgrade your applications with the latest and greatest in IGBT technology. The 7th generation of TRENCHSTOP™ IGBTs offers unparalleled performance and efficiency, making it the perfect choice for any application looking to take their power awnd performance to the next level. Make the switch today!

www.infineon.com/discreteIGBT7
www.infineon.com/igbtdiscretes
www.infineon.com/gatedriver

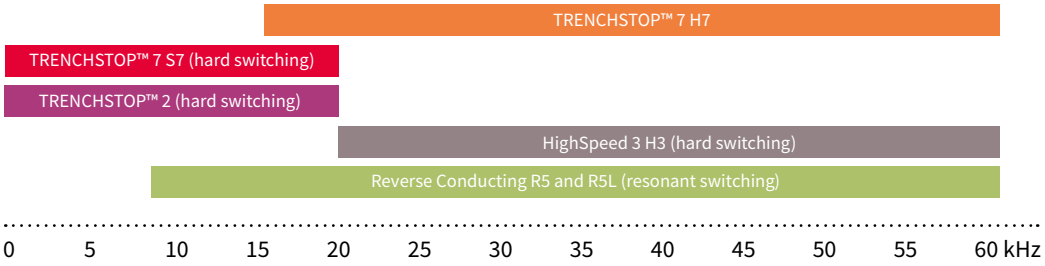
For more details on the product, click on the part number, visit infineon.com or contact our product support.

1200 V and above IGBT families

The 7th generation of TRENCHSTOP™ IGBTs, known as 650 V IGBT T7 and H7 and 1200 V IGBT7 H7 and S7, are setting new standards in the market. With its unparalleled speed, it is the fastest IGBT currently available. Furthermore, the IGBT7 boasts a remarkable power density, making it a top performer in terms of efficiency and performance. As a direct replacement for all previous industrial IGBT generations, including the high-voltage TRENCHSTOP™ T2 and HighSpeed 3 H3 series, these devices are an excellent choice for those looking to upgrade their technology and improve their system's overall performance.

The Reverse Conducting R5 and R5L are the latest generations in the RC-H series of reverse conducting IGBT. With a monolithically integrated diode, they offer optimized performance for resonant switching applications such as induction cooking. R5 devices are available in 1100 V, 1200 V, 1350 V and 1600 V blocking voltage while R5L devices are available in 1400 V blocking voltage.

EiceDRIVER™ isolated gate driver like X3 Compact family and EiceDRIVER™ 1200 V level shift gate driver family are perfect match for the 1200 V IGBT in motor control, general purpose inverter, solar, and UPS applications. EiceDRIVER™ low-side gate driver with over current protection is widely used in induction cooking application.



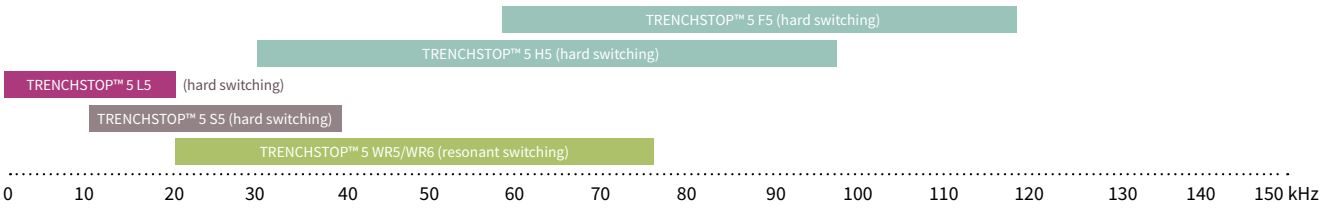
Reverse Conducting R5 and R5L	**World-class Reverse Conducting RC-H products** – High performance and low losses	**Induction cooking Resonant switching** – Medium to high frequency converters
TRENCHSTOP™ 7 H7	– High speed/high power IGBT – First tailless/low-loss IGBT on market – Market proven and recognized quality leader	**Solar, ESS, UPS, welding** – Medium frequency converters
TRENCHSTOP™ IGBT7 S7	– New low switching losses and high power IGBTs – Optimized for operation up to 20 kHz – Best-in-class $V_{CE(sat)}$ and low switching losses	– Industrial drives, solar, HVAC – Low/medium frequency converters

www.infineon.com/rch5
www.infineon.com/discreteigbt7

For more details on the product, click on the part number, visit infineon.com or contact our product support.

650 V TRENCHSTOP™ 5 IGBT

Ideally suited for customers who are looking for outstanding efficiency and power density, the TRENCHSTOP™ 5 is optimized to comprehend various switching frequencies. Wafer thickness has been reduced by more than 25 percent, which enables a dramatic improvement in both switching and conduction losses while providing an increased breakthrough voltage of 650 V. Based on the TRENCHSTOP™ 5 IGBT technology, Infineon has developed six different product families targeting specific applications, allowing designers to optimize for high efficiency, system cost or reliability demands of the market. The quantum leap of efficiency improvement provided by the TRENCHSTOP™ 5 IGBT families opens up new opportunities for designers to explore. EiceDRIVER™ isolated gate driver such as the X3 Compact family which is perfect for 650 V IGBTs in solar and UPS applications. EiceDRIVER™ low side gate driver with overcurrent protection is widely used in induction cooking application and PFC stage.



TRENCHSTOP™ 5 L5	**Best-in-class IGBT** **low $V_{CE(sat)}$ IGBT** – $V_{CE(sat)}$ IGBT – 1.05 V – Best trade-off $V_{CE(sat)}$ V_{SS} E_{ts} for frequencies below 20 kHz	**Solar, UPS, welding** – Ultra-low frequency converters – Three-level inverter type I NPC 1 and NPC 2 – Modified HERIC inverter – AC output (aluminum/magnesium welding)
TRENCHSTOP™ 5 S5	**Best-in-class ease-of-use IGBT** Elimination of: – Collector-emitter snubber capacitor and gate capacitor in low inductance designs (<100 nH) – Softer switching than TRENCHSTOP™ 5 H5	**UPS, battery charger, solar, welding** – Medium frequency converters – Multilevel inverter stages – Output stages – PFC
TRENCHSTOP™ 5 H5/F5	**Best-in-class high frequency IGBT** – Bridge to SJ MOSFET performance – Highest efficiency, especially under light load conditions	**UPS, solar, welding** – High frequency converters – Multilevel inverter stages – Output stages – PFC
TRENCHSTOP™ 5 WR5	**Price optimized reverse conducting TRENCHSTOP™ 5 with an optimized monolithically integrated diode tailored for specific hard switching applications** – Monolithic diode optimized for PFC and welding applications – Excellent R_G controllability – Perfect fit to mainstream design for 20 kHz < fsw < 60 kHz	**Air conditioning, welding** – RAC/CAC PFC outdoor compressor – Compact/portable welding – Light-medium industrial welding
TRENCHSTOP™ 5 WR6	**Outstanding price/performance ratio with the latest 650 V reverse-conducting IGBT in the new high creepage TO-247-3 package** – Very low $V_{CE(sat)}$ of 1.45 V @25°C – High creepage and clearance TO-247 package – Optimized for full-rated hard switching turn-off	**Air conditioning, welding** – RAC/CAC PFC outdoor compressor – Compact/portable welding – Light-medium industrial welding

www.infineon.com/trenchstop5
www.infineon.com/gatedriver

For more details on the product, click on the part number, visit infineon.com or contact our product support.

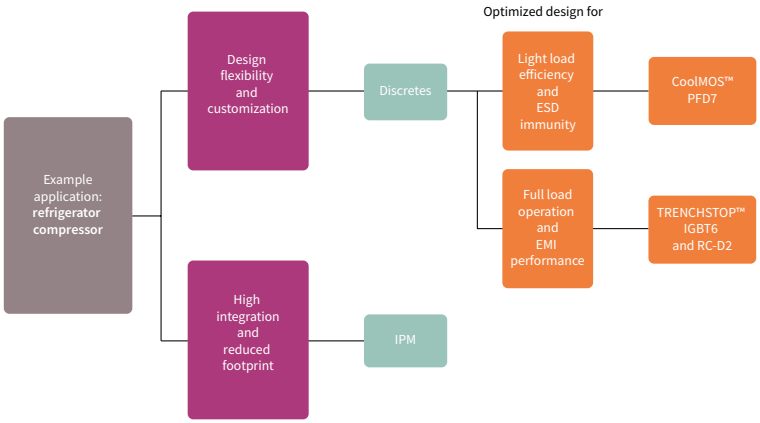
Lower power drive IGBT portfolio

650 V TRENCHSTOP™ IGBT6 and 600 V RC-D2

Motor drives up to 1 kW are used in a wide variety of applications, from home appliance fans and compressors to pumps. The market for these products demands design flexibility, EMI performance, and easy controllability. Therefore, these compact motors require power electronics with the lowest losses and best thermal performance. The TRENCHSTOP™ IGBT6 family of discrete devices has been designed for the lowest switching losses, which is particularly important in systems with higher switching frequencies (up to 30 kHz). Additionally, the IGBTs are co-packed with the soft, fast-recovery Rapid 1 anti-parallel diodes for the lowest total losses. With a higher blocking voltage at 650 V, and short-circuit rating, TRENCHSTOP™ IGBT6 is a key contributor to robust motor designs.

The new RC-D2 family of discrete devices has been cost-optimized in surface-mounted packages. The device contains a monolithically integrated diode and has HV-H3TRB ruggedness capability. With a blocking voltage at 600 V, and 3 µs short-circuit rating , the RC-D2 is a key contributor to cost-effective motor designs.

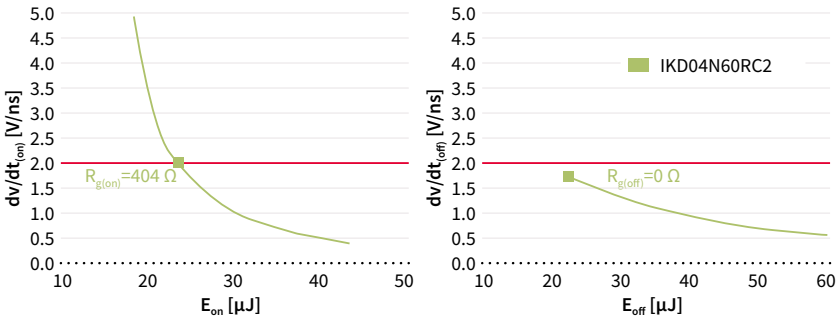
Switch selection for low power drives < 300 W



Features and benefits

Key features	Key benefits
– Available in surface-mounted packages	– Enable space limited application
– IGBT6 co-packed with and without diodes (DPAK, TO-220FP)	– Performance improvement
– RC-D2 monolithically integrated diode (DPAK, SOT-223)	– Cost-optimized solution
– SC rating up to 3 µs	– SC protection
– Low EMI due to easy controllability	– No need for additional components on PCB

EMI performance



- $R_{g(on)}$ and $R_{g(off)}$ are selected to meet dv/dt of 2 V/ns at 500 mA and T_j of 100°C
- IGBTs (IKD04N60RC2) are easily controllable by optimizing R_g values
- EMI performance can be enhanced with additional passive components

www.infineon.com/IGBT6
www.infineon.com/rcd2
www.infineon.com/gatedriver

For more details on the product, click on the part number, visit infineon.com or contact our product support.

Reverse Conducting for soft-switching applications

650 V Reverse Conducting R6 IGBT in TO-247 package

The 650 V R6 IGBT offers the lowest $V_{CE(sat)}$ and optimized E_{off} for best efficiency, minimized power losses and cooling effort. The good EMI behavior simplifies filtering design, reduces system costs and effort for the designers.
Thanks to the best system performances and high compatibility with the existing gate driver solution, 650 V R6 IGBT represents the optimal choice for soft switching topologies.

Features and benefits

Key features	Key benefits
– Very low $V_{CE(sat)}$ and low E_{off}	– Lowest losses on IGBT, high system efficiency for higher power output
– High ruggedness and stable temperature behavior	– Fast and easy replacement of predecessor R5 portfolio
– Maximum operating T_j of 175 °C	– High device reliability
	– Good EMI behavior

Package innovations

Discrete IGBT package overview

Infineon discrete IGBT package portfolio contains SMD (surface mount device) packages, for example, D2PAK, DPAK, SOT-223, and through-hole packages, for example, TO-220, TO-220 FP, TO-247, TO-247-3-HCC, TO-247-4, TO-247-4 asymetric (650V, 1200V; 76-136 A), TO-247PLUS, TO-247PLUS-4, and TO-247 advanced isolation packages. It provides discrete IGBTs solutions with and without anti-parallel diode, which is an excellent fit to use in industrial, home appliance, and automotive applications.

	SOT-223 SMD	TO-252 (DPAK)	TO-263 (D2PAK)	TO-220	TO-220 FullPAK	TO-247	TO-247 4-pin	TO-247PLUS	TO-247PLUS 4-pin	TRENCHSTOP™ advanced isolation TO-247	TO-247-3-HCC
Package options											
Voltage class	600 V, 650 V, 1100 V, 1200 V, 1350 V, 1600 V									600 V, 650 V	650 V
Configuration	DuoPack (with diode), single IGBTs									DuoPack IGBTs with diode and single diodes	
Continuous collector current T_c = 100°C	3-120 A									40-90 A	20 -70 A

www.infineon.com/rch6
www.infineon.com/latest-discrete-packages

For more details on the product, click on the part number, visit infineon.com or contact our product support.

TRENCHSTOP™ advanced isolation

Fully isolated TO-247 package with industry leading IGBTs

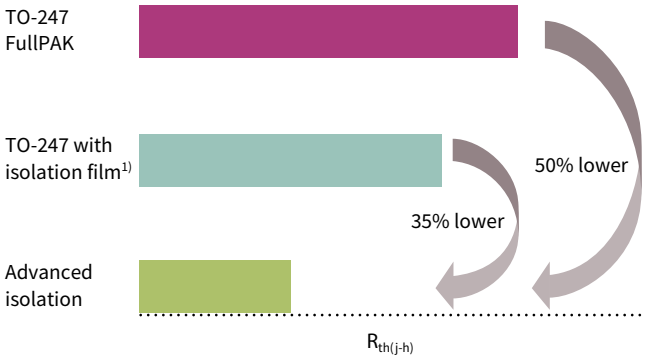
TRENCHSTOP™ advanced isolation solution breaks the limits reached by traditional packaging and isolation techniques. This new isolated package enables the highest power density, the best performance and the lowest cooling effort thanks to an effective and reliable thermal path from the IGBT die to the heatsink.

In addition to providing 100 percent electrical isolation, TRENCHSTOP™ advanced isolation also eliminates the need for thermal grease or thermal interface sheets. The new package delivers at least 35 percent lower thermal resistivity, helping designers to increase power density, as well as lower system complexity and assembling costs.
This new package solution allows industrial and home appliance designs to fully utilize the high performance of TRENCHSTOP™ IGBTs without compromises for isolation and cooling.

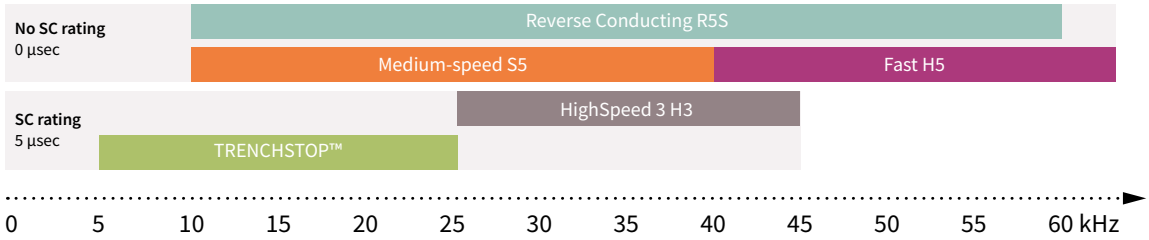
Features and benefits

Key features	Key benefits
– 2500 V_{RMS} electrical isolation, 50/60 Hz, t = 1 min	– Up to 35 percent reduction in assembly time reduces manufacturing cost
– 100 percent tested isolated mounting surface	– Increased power density
– Lowest $R_{th(j-h)}$	– Improved reliability from higher yield and no isolation film misalignment
– Low coupling capacitance, 38 pF	– Less EMI filter design effort
– No need for isolation film or thermal interface material	– Decreased heatsink size

Thermal resistivity of package and isolation types

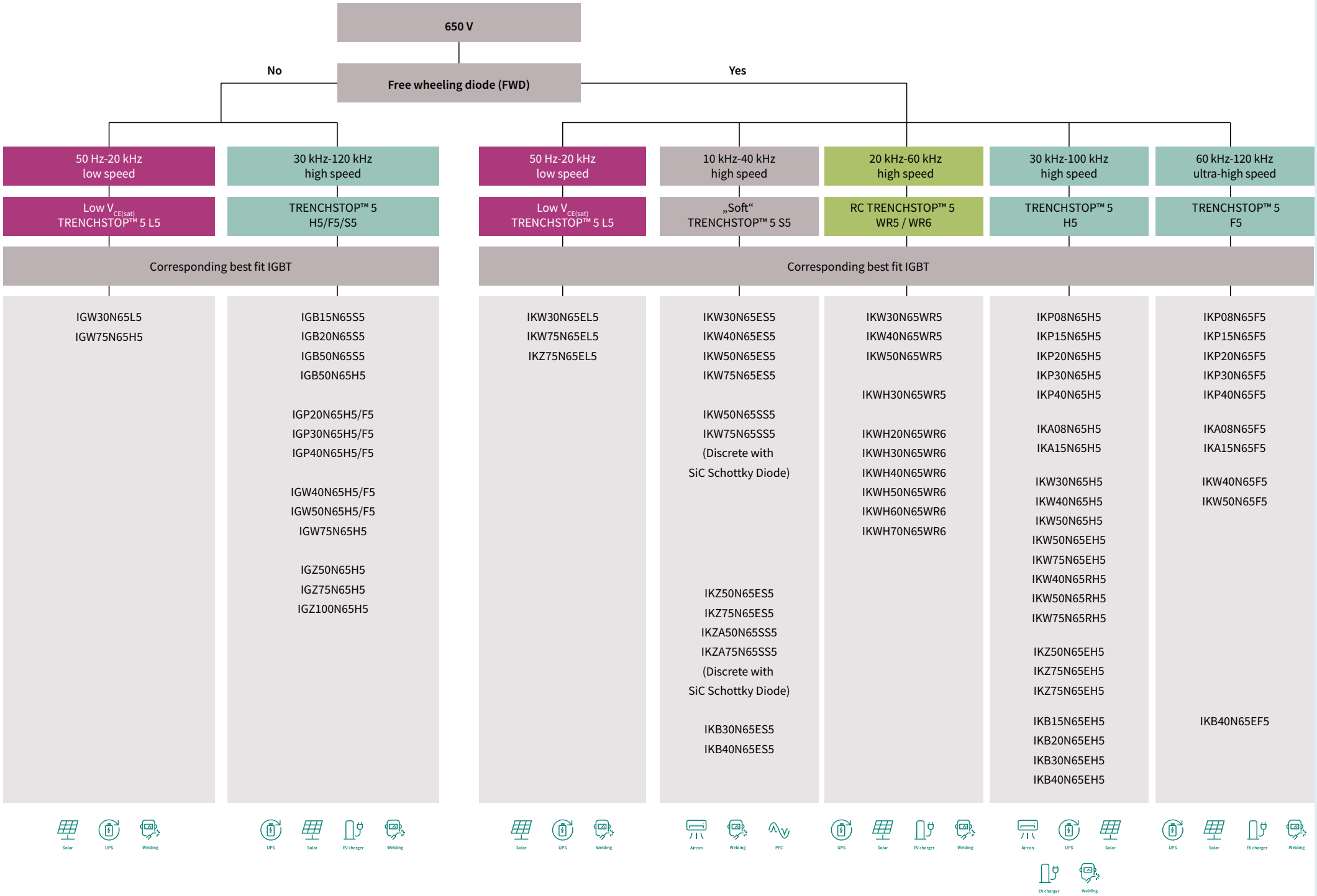


1) Isolation material: standard polyimide based reinforced carrier insulator film with 152 µm thickness, 1.3 W/mK thermal conductivity



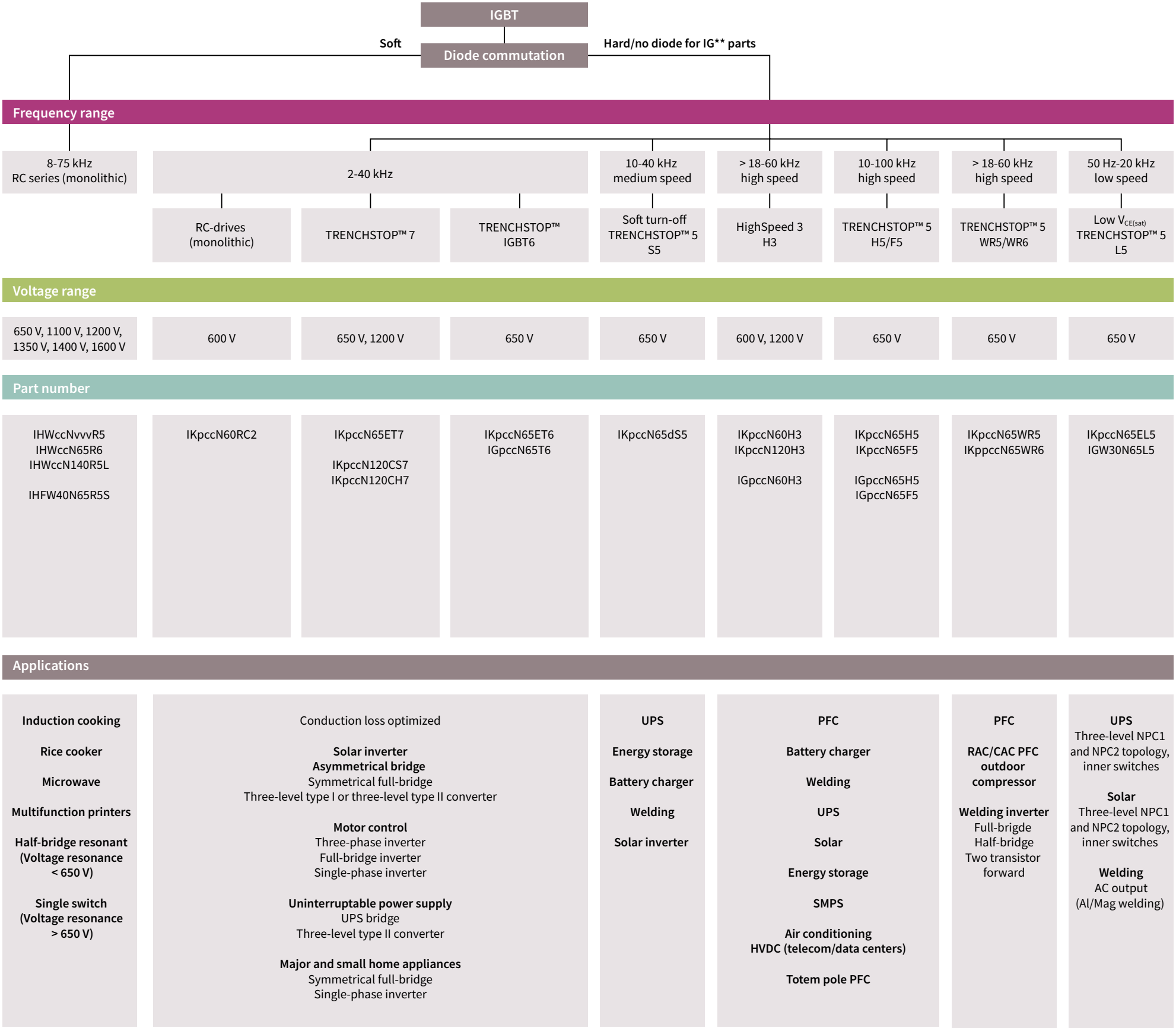
www.infineon.com/advanced-isolation
www.infineon.com/gatedriver

TRENCHSTOP™ 5 selection tree



www.infineon.com/trenchstop5
www.infineon.com/gatedriver

IGBT selection tree



www.infineon.com/igbtdiscretes
www.infineon.com/gatedriver

TRENCHSTOP™ and RC-D2 drives

600 V/650 V product family together with 650 V SOI gate driver family



Continuous collector current @ T_c=100°C [A]		TO-251 (IPAK)	TO-252 (DPAK)	TO-263 (D^2PAK)	TO-220	TO-247 advanced isolation	TO-220 FullPAK	TO-247	TO-247PLUS/ Super 247 (TO-247AA)	SOT-223
Single IGBT	4	IGU04N60T								
	6		IGD06N60T IGD06N65T6		IGP06N60T					
	10		IGD10N65T6	IGB10N60T	IGP10N60T					
	15		IGD15N65T6	IGB15N60T	IGP15N60T					
	30			IGB30N60T				IGW30N60T		
	40									
	50			IGB50N60T	IGP50N60T			IGW50N60T		
	75							IGW75N60T		
IGBT and diode	1									IKN01N60RC2
	3									IKN03N60RC2
	4		IKD04N60RC2		IKP04N60T					IKN04N60RC2
	6		IKD06N60RC2 IKD06N65ET6	IKB06N60T	IKP06N60T		IKA06N60T			IKN06N60RC2
	8		IKD08N65ET6							
	10		IKD10N60RC2	IKB10N60T	IKP10N60T		IKA10N60T			
	15		IKD15N60RC2	IKB15N60T	IKP15N60T		IKA15N60T			
	20			IKB20N60T	IKP20N60T			IKW20N60T		
	30							IKW30N60T		
	40									
	50					IKFW50N60ET		IKW50N60T		
	75					IKFW75N60ET		IKW75N60T		
	100								IKQ100N60T	
	120								IKQ120N60T	

www.infineon.com/600V-1200V-trenchstop

For more details on the product, click on the part number, visit infineon.com or contact our product support.

TRENCHSTOP™ IGBT6

650 V product family together with 650 V SOI gate driver family



Continuous collector current @ Tc=100°C [A]	TO-252 (DPAK) Hal	TO-220 FullPAK Hal
6	IKD06N65ET6 IGD06N65T6	
8	IKD08N65ET6	IKA08N65ET6
10	IGD10N65T6	IKA10N65ET6
15	IGD15N65T6	IKA15N65ET6

TRENCHSTOP™ IGBT7 S7

1200 V product family together with isolated driver and 1200 V level-shift driver family



Continuous collector current @ T_c=100°C [A]		TO-247 Hal	TO-247PLUS 3-pin Hal	TO-247 4-pin Hal
Single IGBT	40			IKZA40N120CS7
	75		IGQ75N120S7	
	100		IGQ100N120S7	
	120		IGQ120N120S7	
DuoPack	8	IKW08N120CS7		
	15	IKW15N120CS7		
	25	IKW25N120CS7		
	40	IKW40N120CS7		
	50	IKW50N120CS7		
	75		IKQ75N120CS7	
	100		IKQ100N120CS7	
	120		IKQ120N120CS7	

TRENCHSTOP IGBT7 T7

Together with isolated driver, 650 V SOI driver, and low-side driver family



Continuous collector current @ Tc=100°C [A]		TO-247-3 Hal
DuoPack	20	IKW20N65ET7
	30	IKW30N65ET7
	40	IKW40N65ET7
	50	IKW50N65ET7
	75	IKW75N65ET7

TRENCHSTOP™ IGBT7 H7

1200 V product family together with isolated driver and 1200 V level-shift driver family



Continuous collector current @ Tc=100°C [A]	TO247-3 Hal	TO-247 4-pin assymetric Hal	TO-247PLUS 3-pin Hal	TO-247PLUS 4-pin Hal
40	IKW40N120CH7	IKZA40N120CH7		
50	IKW50N120CH7	IKZA50N120CH7	IKQ50N120CH7	IKY50N120CH7
75	IKW75N120CH7	IKZA75N120CH7	IKQ75N120CH7	IKY75N120CH7
100			IKQ100N120CH7	IKY100N120CH7
120			IKQ120N120CH7	IKY120N120CH7
140			IKQ140N120CH7	IKY140N120CH7

www.infineon.com/igbt6

www.infineon.com/discreteigbt7

For more details on the product, click on the part number, visit infineon.com or contact our product support.

Reverse Conducting IGBTs

Microwave Induction

Continuous collector current @T_c=100°C [A]	TO-247 advanced isolation (Hal)	TO-247 (Hal)					
		650 V	1100 V	1200 V	1350 V	1400 V	1600 V
20		IHW20N65R5*				IHW20N140R5L	
				IHW20N120R5	IHW20N135R5		
25						IHW25N140R5L	
30		IHW30N65R6 IHW30N65R5	IHW30N110R5	IHW30N120R5	IHW30N135R5	IHW30N140R5L	IHW30N160R5
40	IHFW40N65R5S	IHW40N65R6 IHW40N65R5		IHW40N120R5	IHW40N135R5	IHW40N140R5L	
50		IHW50N65R6 IHW50N65R5					

600 V HighSpeed 3 H3

Aircon PFC Welding Solar UPS

Together with isolated driver, 650 V SOI driver, and low-side driver family

Continuous collector current @T_c=100°C [A]		TO-263 (D^2PAK) (Hal)	TO-220 (Hal)	TO-247 advanced isolation (Hal)	TO-247 (Hal)
IGBT	20	IGB20N60H3	IGP20N60H3		IGW20N60H3
	30	IGB30N60H3	IGP30N60H3		IGW30N60H3
	40				IGW40N60H3
	50				IGW50N60H3
	60				IGW60N60H3
	75				IGW75N60H3
	100				IGW100N60H3
Duo-Pack	20	IKB20N60H3	IKP20N60H3		IKW20N60H3
	30				IKW30N60H3
	40			IKFW40N60DH3E	IKW40N60H3
	50			IKFW50N60DH3E IKFW50N60DH3	IKW50N60H3
	60			IKFW60N60DH3E IKFW60N60EH3	IKW60N60H3
	75				IKW75N60H3
	90			IKFW90N60EH3	

CoolSiC™ hybrid discrete

Continuous collector current @T_c=100°C [A]			TO-247 3-pin	TO-247-4pin
DuoPack	TRENCHSTOP™ 5 H5 + „half“ rated diode	40	IKW40N65RH5	IKZA40N65RH5
		50	IKW50N65RH5	IKZA50N65RH5
		75	IKW75N65RH5	IKZA75N65RH5
	TRENCHSTOP™ 5 S5 + „full“ rated diode	50	IKW50N65SS5	IKZA50N65SS5
		75	IKW75N65SS5	IKZA75N65SS5

For the CoolSiC™ MOSFET portfolio and our broad WBG offering, please check the Wide bandgap semiconductors chapter.

www.infineon.com/rch5
www.infineon.com/rch6
www.infineon.com/coolsic-hybrid-discretes
www.infineon.com/advanced-isolation

For more details on the product, click on the part number, visit infineon.com or contact our product support.

TRENCHSTOP™ 5 F5, H5 and S5

Aircon PFC UPS Solar Welding Charger SMPS Corded power tools

Together with isolated driver, 650 V SOI driver, and low-side driver family

Continuous collector current @ T_c=100°C [A]		TO-263 (D^2PAK) (Hal)	TO-220 (Hal)	TO-247 advanced isolation (Hal)	TO-220 FullPAK (Hal)	TO-247 (Hal)	TO-247 4-pin (Hal)
IGBT	15	IGB15N65S5					
	20	IGB20N65S5	IGP20N65F5/IGP20N65H5				
	30		IGP30N65F5/IGP30N65H5				
	40		IGP40N65F5/IGP40N65H5			IGW40N65F5/IGW40N65H5	
	50	IGB50N60H5				IGW50N65F5/IGW50N65H5	IGZ50N65H5
		IGB50N60S5					
	75					IGW75N65H5	IGZ75N65H5
	100						IGZ100N65H5
DuoPack	8		IKP08N65F5/IKP08N65H5		IKA08N65F5/IKA08N65H5		
	15	IKB15N65EH5	IKP15N65F5/IKP15N65H5		IKA15N65F5/IKA15N65H5		
	20	IKB20N65EH5	IKP20N65H5/IKP20N65F5				
	28		IKP28N65ES5				
	30	IKB30N65EH5	IKP30N65H5/IKP30N65F5			IKW30N65H5	
		IKB30N65ES5				IKW30N65ES5	
	39		IKP39N65ES5				
	40	IKB40N65ES5	IKP40N65F5/IKP40N65H5	IKFW40N65DH5		IKW40N65F5/IKW40N65H5	
		IKB40N65EH5				IKW40N65ES5	
		IKB40N65EF5					
	50			IKFW50N65ES5		IKW50N65F5/IKW50N65H5	IKZ50N65EH5
				IKFW50N65DH5 IKFW50N65EH5		IKW50N65EH5 IKW50N65ES5	IKZ50N65ES5
	60			IKFW60N65ES5			
	75			IKFW75N65ES5		IKW75N65EH5	IKZ75N65EH5
				IKFW75N65EH5		IKW75N65ES5	
	90			IKFW90N65ES5			

TRENCHSTOP™ 5 L5 low $V_{CE(sat)}$

Solar UPS Welding

650 V product family together with low-side driver family

Continuous collector current @ T_c=100°C [A]		TO-251 (IPAK)	TO-252 (DPAK) (Hal)	TO-263 (D^2PAK) (Hal)	TO-220 (Hal)	TO-262 (I^2PAK) (Hal)	TO-220 FullPAK (Hal)	TO-247 (Hal)	TO-247 4-pin (Hal)
IGBT	30							IGW30N65L5	
Duo-Pack	30							IKW30N65EL5	
	75							IKW75N65EL5	IKZ75N75EL5

TRENCHSTOP™ 5 WR5/WR6

Aircon PFC Welding

650 V product family together with low-side driver family

Continuous collector current @ T_c=100°C [A]		TO-247 (Hal)	TO-247 HCC (Hal)
DuoPack	20		IKWH20N65WR6
	30	IKW30N65WR5	IKWH30N65WR5/IKWH30N65WR6
	40	IKW40N65WR5	IKWH40N65WR6
	50	IKW50N65WR5	IKWH50N65WR6
	60		IKWH60N65WR6
	70		IKWH70N65WR6

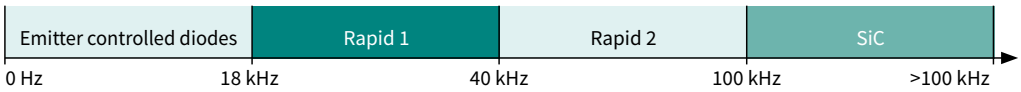
www.infineon.com/trenchstop5

For more details on the product, click on the part number, visit infineon.com or contact our product support.

Silicon power diodes

Filling the gap between SiC diodes and emitter controlled diodes

The Rapid diode family complements Infineon's existing high-power 600 V/650 V diode portfolio by filling the gap between SiC diodes and previously released emitter controlled diodes. They offer a perfect cost/performance balance and target high-efficiency applications switching between 18 and 100 kHz. Rapid 1 and Rapid 2 diodes are optimized to have excellent compatibility with CoolMOS™ and high speed IGBTs (insulated gate bipolar transistor) such as the TRENCHSTOP™ IGBT7 and TRENCHSTOP™ 5.



The Rapid 1 diode family

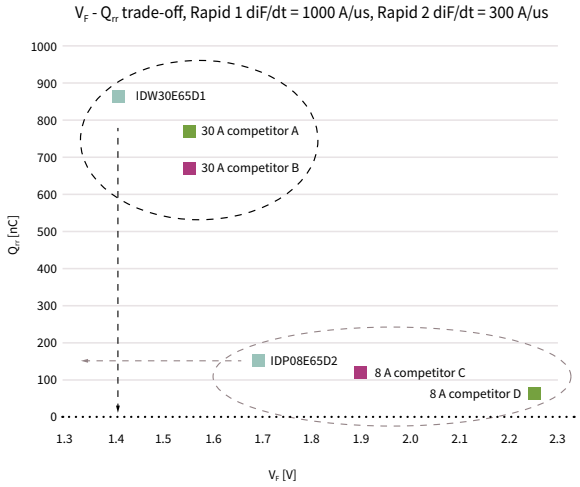
Rapid 1 is forward voltage drop (V_F) optimized to address low switching frequency applications between 18 kHz and 40 kHz, for example, air conditioner and welder PFC stages.

- 1.35 V temperature-stable forward voltage (V_F)
- Lowest peak reverse recovery current (I_{rrm})
- Reverse recovery time (t_{rr}) < 100 ns
- High softness factor

The Rapid 2 diode family

Rapid 2 is Q_{rr}/t_{rr} optimized hyperfast diode to address high-speed switching applications between 40 kHz and 100 kHz, typically found in PFCs in high efficiency switch mode power supplies (SMPS) and welding machines.

- Lowest reverse recovery charge (Q_{rr}): V_F ratio for best-in-class performance
- Lowest peak reverse recovery current (I_{rrm})
- Reverse recovery t_{rr} < 50 ns
- High softness factor



www.infineon.com/rapiddiodes
www.infineon.com/ultrasoftdiodes

For more details on the product, click on the part number, visit infineon.com or contact our product support.

Rapid 1 diodes

650 V product family



Continuous current I_F @T_C=100°C [A]	TO-220	TO-220 FullPAK	TO-247	TO-247 common cathode	TO-247 advanced isolation
8	IDP08E65D1				
15	IDP15E65D1				
20		IDV20E65D1			
30	IDP30E65D1		IDW30E65D1	IDW30C65D1	
40			IDW40E65D1		IDFW40E65D1E
60				IDW60C65D1	IDFW60C65D1
75				IDW75D65D1	
80				IDW80C65D1	IDFW80C65D1

Rapid 2 diodes

650 V product family



Continuous current I_F @T_C=100°C [A]	TO-220	TO-220 FullPAK	TO-220 common cathode	TO-247	TO-247 common cathode
8	IDP08E65D2	IDV08E65D2			
15	IDP15E65D2	IDV15E65D2		IDW15E65D2	
20	IDP20E65D2		IDP20C65D2		IDW20C65D2
30	IDP30E65D2	IDV30E65D2	IDP30C65D2		IDW30C65D2
40	IDP40E65D2			IDW40E65D2	
80					IDW80C65D2

Emitter controlled diodes

600 V and 1200 V product families



Continuous current I_F @T_C=100°C [A]		TO-263 (D^2PAK)	TO-220 Real 2-pin	TO-247
600 V	30			IDW30E60
	50			IDW50E60
	75			IDW75E60
	100			IDW100E60
1200 V	12		IDP12E120	
	18		IDP18E120	
	30	IDB30E120	IDP30E120	

www.infineon.com/rapiddiodes

www.infineon.com/ultrasoftdiodes

For more details on the product, click on the part number, visit infineon.com or contact our product support.

Nomenclature

IGBT (after 03/2013)



Company
I = Infineon
S = Formerly Siemens

Device
E = Enhanced
G = Single IGBT
H = Reverse conducting
K = DuoPack

Package type
A = TO-220-3 FullPAK
B = TO-263-3 (D^2PAK)
D = TO-252-3 (DPAK)
N = SOT-223
P = TO-220-3
Q = TO-247PLUS
QB = TO-247PLUS 3-pin SMD
U = TO-251-3 (IPAK)
W= TO-247-3
Y = TO-247PLUS 4-pin
Z = TO-247-4
FW = TO-247-3 advanced isolation
WH =TO-247-3 high creepage
WS = TO-247 6-pin
ZA = TO-247 4-pin asymmetric

Nominal current
[A] @ 100°C
[A] Equivalent collector current for Advanced Isolation

Technology
N = N-channel
P = P-channel

E = replacement for TO-247 with medium performance insulator or FullPAK
Blank = best in class, replacement for TO-247 with high performance insulator or FullPAK

Optimization
CP2 = EDT2™ series
E1 = Reverse conducting E-series
F5 = TRENCHSTOP™ 5 ultra fast
H3 = HighSpeed 3
H5 = TRENCHSTOP™5 fast
H6 = 1200 V TRENCHSTOP™ IGBT6
H7 = TRENCHSTOP™ IGBT7 H7
IPD = Integrated Power Device Protect
L5 = TRENCHSTOP™ 5 low $V_{CE(sat)}$
R = Reverse conducting Drives (RC-D)
R3 = Reverse conducting R3 series
R5 = Reverse conducting R5 series
R5L = Reverse Conduting R5L series
R6 = Reverse conducting R6 series
RC2 = Reverse conducting Drives Gen2
RF = Reverse conducting Drives Fast
S5 = TRENCHSTOP™ 5 medium speed
S6 = 1200 V TRENCHSTOP™ IGBT6
S7 = 1200 V TRENCHSTOP™ IGBT7
T = TRENCHSTOP™
T2 = TRENCHSTOP™ 2
T6 = 650 V TRENCHSTOP™ IGBT6
T7 = TRENCHSTOP™ IGBT7
TP = TRENCHSTOP™ Performance
WR5 = TRENCHSTOP™ 5 WR5
WR6 = TRENCHSTOP™ 5 WR6

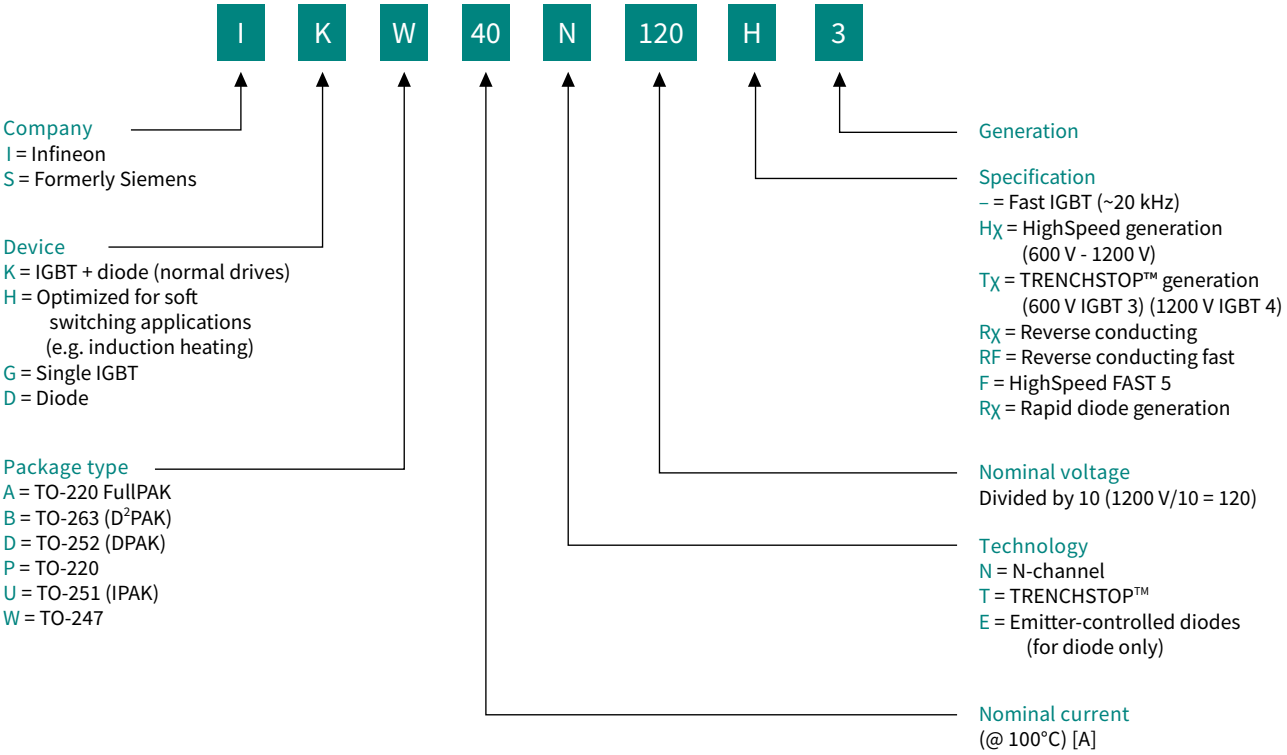
Diode (for DuoPack only)
B = Emitter controlled 1200 V half rated diode
C = Emitter controlled 1200 V full rated diode
D = Rapid 1 650 V half rated diode
E = Rapid 1 650 V full rated diode
R = CoolSiC™ 650 V half rated diode
S = CoolSiC™ 650 V full rated diode

Nominal voltage
Divided by 10 (650 V/10 = 65)

www.infineon.com/igbtdiscretes

* Only for advanced isolation

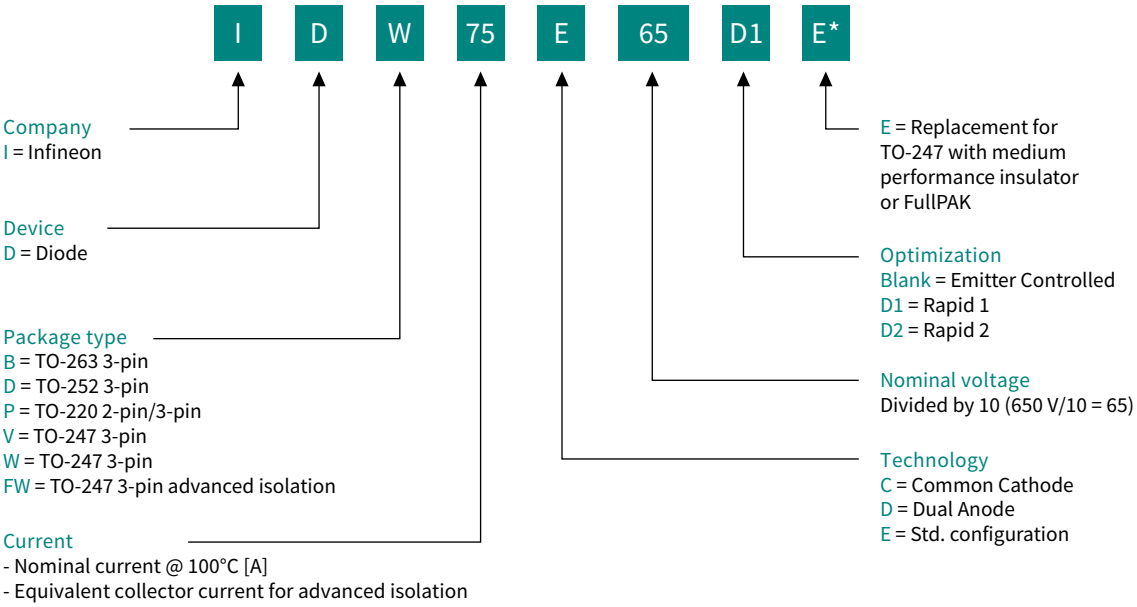
IGBT (before 03/2013)



www.infineon.com/igbtdiscretes

Nomenclature

Silicon power diodes



www.infineon.com/rapiddiodes

* Only for advanced isolation



Infineon support for discrete IGBTs and silicon power diodes

Useful links and helpful information

Further information, datasheets and documents

www.infineon.com/igbt
www.infineon.com/igbtdiscretes
www.infineon.com/rapiddiodes
www.infineon.com/discreteIGBT7
www.infineon.com/ultrasoftdiodes
www.infineon.com/discrete-automotive-igbt
www.infineon.com/latest-discrete-packages

Evaluationboards and simulation models

www.infineon.com/eval-TO-247-4pin
www.infineon.com/igbtdiscrete-simulationmodels

Support | Evaluation board | Tools | Simulation



Intelligent power switches and modules

- CIPOS™ IPM family
- iMOTION™ IPM
- ISOFACE™ isolated industrial interface
- ISOFACE™ galvanic-isolated digital input ICs
- Industrial PROFET™
- HITFET™
- CIPOS™, iMOTION™, ISOFACE™, industrial PROFET™ and HITFET™ product portfolio

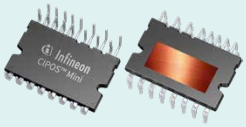
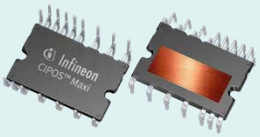
CIPOS™ IPM family

CIPOS™ intelligent power modules in different packages, voltage and current classes

Infineon has a broad portfolio of intelligent power modules (IPMs) with different semiconductors combined in various packages in varying voltage and current classes. These IPMs are separated into Compact, Standard and Performance families.

Part of the IPMs is divided into CIPOS™ Nano, CIPOS ™ Micro, CIPOS ™ Mini and CIPOS™ Maxi families. CIPOS™ IPMs are families of highly integrated, compact power modules designed to drive motors in applications ranging from home appliances, fans, pumps, HVAC to industrial drives. These energy-efficient intelligent power modules integrate the latest power semiconductor and ICs technologies from Infineon.

CIPOS™ product overview

CIPOS™ Nano	CIPOS™ Micro	CIPOS™ Mini	CIPOS™ Maxi
MOSFET 40/100/250/500/600 V	IGBT: 600 V, 2/4/6 A	IGBT: 600 V, 4-30 A MOSFET: 600 V	IGBT: 1200 V, 5/10/15 A CoolSiC™ MOSFET: 1200 V, 20 A
			
7 x 8 x 0.9 mm 8 x 9 x 0.9 mm 12 x 10 x 0.9 mm 12 x 12 x 0.9 mm	29 x 12 x 2.9 mm	36 x 21 x 3.1 mm	36 x 23 x 3.1 mm

Compact IPM → Standard IPM → Performance IPM

Motor current

0.1 A_{peak} ——————————→ 30 A_{peak}

Key benefits

- Fast time-to-market
- Increased reliability
- Reduced system design complexity
- Improved manufacturability

www.infineon.com/ipm

For more details on the product, click on the part number, visit infineon.com or contact our product support.

CIPOS™ Nano

Smallest IPM in the world with various topology, voltage options

The ultra-compact CIPOS™ Nano is a family of highly integrated power modules for high-efficiency consumer and light industrial applications. CIPOS™ Nano is designed for the rectifier, converter, and inverter stage in power management circuits and motor drives for applications like fans, hair dryers, air purifiers, and circulation pumps. By implementing an innovative Power QFN package, which utilizes PCB copper traces to dissipate heat from the module, CIPOS™ Nano family delivers a new benchmark in device size, offering up to a 60 percent smaller footprint than existing three-phase motor control power IPMs.

The family is comprised of a series of fully integrated three-phase, half-bridge and H-bridge surface-mount motor control circuit solutions. The new alternative approach utilizes PCB copper traces to dissipate heat from the module, providing cost savings through a smaller package design and even eliminating the need for an external heat sink.

Features and benefits

Key benefits	Key advantages
– Various switch technologies such as HEXFETs, Trench FREDFETs, Trench MOSFETs, CoolMOS™ and OptiMOS™ apply to motor drivers	– Smallest modules in the market
– Multiple package platforms with various topologies to suitable for a variety of application scenarios	– Cost savings from smaller footprint and reduced PCB space
– Integrated bootstrap functionality and gate drivers	– Easy implementation of 2 or 3-phase motor drives
– Realize a variety of protection (overcurrent protection, under-voltage lockout, over-temperature protection, fault reporting and etc.)	– Half bridge configuration enables more flexible board design w/better thermal performance
– Accessible for heat sink-less operation	– Same PCB footprint to address multiple application markets (100 VAC – 230 VAC)

Key applications

- Hair dryer
- Fan motor
- Pump
- Air conditioner Indoor Unit
- Air purifiers
- Small kitchen appliances
- CPAP machine

Package overview

QFN 7x8 7 x 8 x 0.9 mm	QFN 8x9 8 x 9 x 0.9 mm	QFN 12x10 12 x 10 x 0.9 mm	QFN 12x12 12 x 12 x 0.9 mm
			

www.infineon.com/ipm

For more details on the product, click on the part number, visit infineon.com or contact our product support.

CIPOS™ Micro

Solution for low power motor drive applications

CIPOS™ Micro is a family of compact, three-phase IPMs (intelligent power modules) for low-power (i.e., up to 500 W with heatsink) motor drive applications, including ventilation fans, circulation pumps, air purifiers, dish washer and refrigerator compressor drives. CIPOS™ Micro has several protection features, including precise overcurrent protection and a UL-certified temperature sensor. Available in both surface mount and through-hole configurations, the family features rugged and efficient high voltage IGBTs specially optimized for variable frequency drives with a 600 V rating. Also, these IPMs utilize high-voltage gate drivers tuned to achieve an optimal balance between EMI and switching losses.

Features and benefits

Key features	Key benefits
– Wide range of product coverage	– Save system space and cost through the enhanced power capability
– Optimized dv/dt for loss and EMI trade offs	– Offer application-optimized solution for both fast switching and low EMI version
– HV H3TRB qualified	– Improve system ruggedness thru enhanced protection features and isolation voltage
– Compatible with mass-market TO-2xx heat sinks and clips	
– Power capability up to 500 W at isolation 2000 V_{RMS}, 1 min	

Key applications

- RAC outdoor fan
- Dish washer
- Fan motor and pump
- Washing machine
- Refrigerator
- General purpose drive

Package overview

DIP 29x12 29 x 12 x 3.1 mm	SOP 29x12 29 x 12 x 3.1 mm
	

www.infineon.com/ipm

For more details on the product, click on the part number, visit infineon.com or contact our product support.

CIPOS™ Mini

Broad range of configurations from PFC to inverter

CIPOS™ Mini is a family of highly efficient intelligent power modules that has the highest power density with 4 A to 30 A rated products built into a single package platform. It integrates various power and control components to increase reliability, and optimize PCB size and system costs. Utilizing multiple configurations, CIPOS™ Mini IPMs apply to a wide range of applications to control variable speed drives, such as air conditioners, washing machines, refrigerators, vacuum cleaners, compressors, and industrial drives up to 3 kW.

The configurations offered within the CIPOS™ Mini family are IGBT 3-phase inverter, integrated PFC, and 2-phase and 3-phase interleaved PFC. All options include an integrated gate driver and a built-in temperature sensor. CIPOS™ Mini provides optimized performance for power applications, which need good thermal conduction and electrical isolation, but also EMI-safe control, innovative FAULT indication, and overload protection.

Infineon's TRENCHSTOP™ IGBTs and reverse-conducting IGBTs are combined with newly optimized Infineon SOI gate driver IC for excellent electrical performance. Also, CIPOS™ Mini family offers IPMs with DCB substrates, improving heat dissipation to provide higher power capability.

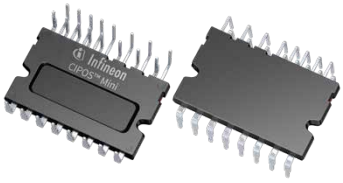
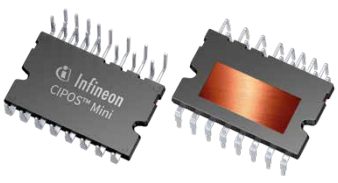
Features and benefits

Key features	Key benefits
– Wide range of current rating: 4 A to 30 A	– Lower PCB size and system cost
– High integration (bootstrap circuit, thermistor, single boost PFC)	– Easy power extension from 300 W to 3 kW
– Optimized for target application requirements (separate version for washing machine and air conditioner)	– Optimized performance for each application
	– UL certified package and temp sensor

Key applications

- Refrigerator
- Washing machine
- Room air conditioning
- Fans and pumps
- HVAC outdoor fan
- General purpose drives

Package overview

DIP 36x21 36 x 21 x 3.1 mm	DIP 36x21D 36 x 21 x 3.1 mm
	

www.infineon.com/ipm

For more details on the product, click on the part number, visit infineon.com or contact our product support.

CIPOS™ Maxi

Smallest package in 1200 V IPM class while still offering high power density and best performance

The high-performance CIPOS™ Maxi intelligent power modules (IPMs) integrate various switching devices and control components to increase reliability, optimize PCB size and system costs. CIPOS™ Maxi IPMs are designed to control three-phase AC motors and permanent magnet motors in variable speed drive applications such as low-power industrial motor drives, pumps, fan drives, and active filters for HVAC (heating, ventilation, and air conditioning). The product concept is specially adapted to power applications, which need excellent thermal performance and electrical isolation as well as meeting EMI requirements and overload protection.

The existing IGBT-based portfolio IM818 series offers 5 A and 15 A in 1200 V class up to 3.0 kW power rating, while the newly released IM828 series offers superior efficiency up to 99% and optimal reliability up to 4.8 kW power rating through the 6 revolutionary CoolSiC™ MOSFETs with an optimized 1200 V 6-channel SOI gate driver. IM828 series provides the exceptional power density with a wide switching speed range up to 80 kHz to adapt to fast-switching applications with superior lower power losses.

Features and benefits

Key benefits
– Fully isolated dual in-line molded module with DCB
– 1200 V TRENCHSTOP™ IGBT 4
– 1200 V CoolSiC™ MOSFET
– Rugged 1200 V SOI gate driver technology
– Integrated booststrap functionality
– Overcurrent shutdown
– Under-voltage lockout at all channels
– All of six switches turn-off during protection
– Cross-conduction prevention
– Independent NTC for temperature monitoring
– Allowable negative VS potential up to -11 V for signal transmission at V_{BS} of 15 V
– Low side emitter pins accessible for all phase current monitoring (open emitter)
– Programmable fault clear timing
– Enable input

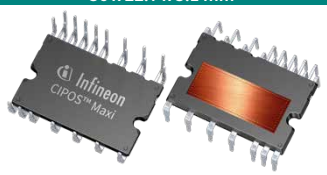
Key advantages
– The smallest package size in 1200 V IPM class with high power density and best performance
– Enhanced robustness of gate driver technology for excellent protection
– High efficiency
– Adapted to high switching application with lower power loss
– Simplified design and manufacturing
– Time-to-market

Key applications

- Fan and pump
- HVAC outdoor fan
- Low-power general purpose drives (GPI, servo drive)
- Active filter (active power factor correction) for HVAC

Package overview

DIP36x23D
36 x 22.7 x 3.1 mm



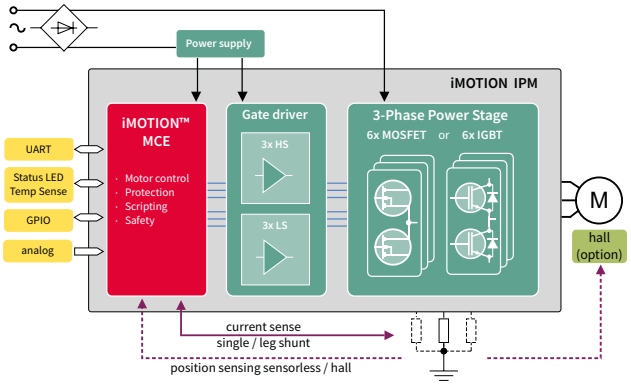
www.infineon.com/ipm

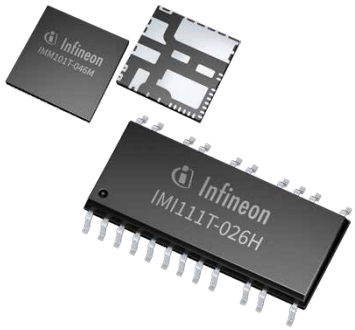
For more details on the product, click on the part number, visit infineon.com or contact our product support.

iMOTION™ IPM

Fully integrated iMOTION™ IPM for BLDC motor control

iMOTION™ IPM is a family of fully integrated modules for the control of three-phase motors, optimized for low-power devices. Within the iMOTION™ IPM family, there are two different series: The IMM100 and IMI110, which combine the motor controller IC and a three-phase inverter stage in a single package, minimizing external components count and PCB area. The three-phase inverter stage is based either on six MOSFETs or six IGBTs. These iMOTION™ IPMs offer the highest integration level by making use of the field-proven iMOTION™ Motion Control Engine (MCE) in combination with providing all required hardware functions: From single shunt current sensing to bootstrap capability, signal filtering and several hardware protections like dead-time insertion and shoot through prevention. An iMOTION™ IPM does not require a heatsink and addresses motor drives with a rated output power between 30 W and 80W with 600 V maximum DC blocking voltage, depending on the chosen product variant. All IMM100 and IMI110 devices support the functional safety requirements according to the IEC/UL 60730-1 (“class B”).





Features and benefits

Key benefits	Key advantages
– Completely self-sustaining Motion Control Engine with identical feature set as the IMC100 series	– Fastest time-to-market with easy parametrization and tuning of motor and PFC control
– Up to 80 W without heatsink	– Applicable for fans and small pumps
– Support for IEC 60335-1 (‘Class B’)	– Support for functional safety integrated
– Controller, gate driver and power stage in one package	– Minimizing BOM count and PCB area
– IMI in DSO-22 package with single layer layout option	– Reducing PCB and production costs



EVAL-IMM101T-046 is a Starter Kit for iMOTION™ IMM101T-046M IPMs. Together with the iMOTION™ Solution Designer the board can be used for an easy system configuration, controlling, tuning and monitoring. EVAL-IMM101T-046 enables rapid prototyping of various inverterized motor control systems, for example fans, pumps and compressors.

Product portfolio

Product	Function	Integration	Description	Package
IMI111T-026H	Motor inverter	MCE incl Scripting, gate driver, IGBT based inverter	Output rating: 600V/2 A, single shunt sensorless operation	PG-DSO-22-1
IMI111T-046H	Motor inverter	MCE incl Scripting, gate driver, IGBT based inverter	Output rating: 600V/4 A, single shunt sensorless operation	PG-DSO-22-1
IMM101T-046M	Motor inverter	MCE incl Scripting, gate driver, MOSFET based inverter	Output rating: 600 V/1.4 Ω $R_{DS(on)}$, single/leg shunt, sensorless/hall	PG-IQFN-38-1
IMM101T-056M	Motor inverter	MCE incl Scripting, gate driver, MOSFET based inverter	Output rating: 600 V/0.95 Ω $R_{DS(on)}$, single/leg shunt, sensorless/hall	PG-IQFN-38-2
IMM102T-056M	Motor inverter + PFC control	MCE incl Scripting, gate driver, MOSFET based inverter	Output rating: 500 V/6 Ω $R_{DS(on)}$, single/leg shunt, sensorless/hall	PG-IQFN-38-3
IMM102T-046M	Motor inverter + PFC control	MCE incl Scripting, gate driver, MOSFET based inverter	Output rating: 600 V/1.4 Ω $R_{DS(on)}$, single/leg shunt, sensorless/hall	PG-IQFN-38-4
IMM102T-056M	Motor inverter + PFC control	MCE incl Scripting, gate driver, MOSFET based inverter	Output rating: 600 V/0.95 Ω $R_{DS(on)}$, single/leg shunt, sensorless/hall	PG-IQFN-38-5

www.infineon.com/IMM100

www.infineon.com/IMI110

For more details on the product, click on the part number, visit infineon.com or contact our product support.

ISOFACE™ isolated industrial interface

Galvanic-isolated output switch and digital input ICs offers unmatched system uptime, high reliability and up to 50% shortened product launch time

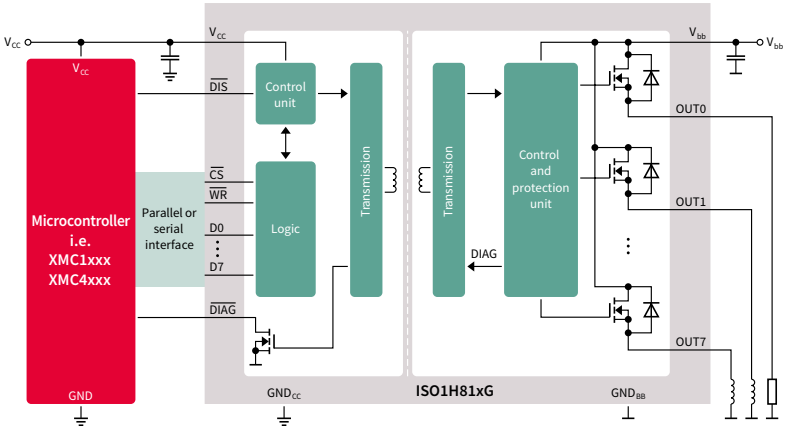
The ISOFACE™ product family provides robust and intelligent galvanic-isolation for various industrial control application such as programmable logic controllers, sensor input modules, distributed control systems, control panels and general control equipment. The output switches are compact in design, enabling robust and reliable operation at low system cost. The input ICs are equally robust, offers reliable operation in a compact form factor and offers industry leading superior EMI robustness setting a new standard in diagnostics.

ISOFACE™ galvanic-isolated 8-channel output switches

The ISO1H81xG(A) [1] product family integrates:

- Robust galvanic isolation (UL508 and C22.2 NO14 certified) to protect the 3.3 V/5 V control domain of an industrial control system from the harsh 24 V process side
- 8-channel high-side power-switching capabilities of up to 1.2 A per channel
- Active current limitation and overtemperature protection
- Common diagnostic feedback for overtemperature and for V_{bb} undervoltage

Isolated output switch block diagram



Isolated output switches



Features and benefits

Key features	Key benefits
– Integrated galvanic isolation (500 V_{AC})	– Robust and reliable
– Eight channels (0.6 or 1.2 A, each)	– Compact system solution
– Inductive load switching	– Lower system cost
– Diagnostic feedback (overtemperature, overload)	– System status feedback
– Serial and parallel MCU interface	– Directly interfacing with all MPUs and MCUs

Industrial automation

PLC

www.infineon.com/isoface

1) (A)* = AEC-Q100 qualified

For more details on the product, click on the part number, visit infineon.com or contact our product support.

ISOFACE™ galvanic-isolated 8-channel high-side switch with 10-fold diagnostics

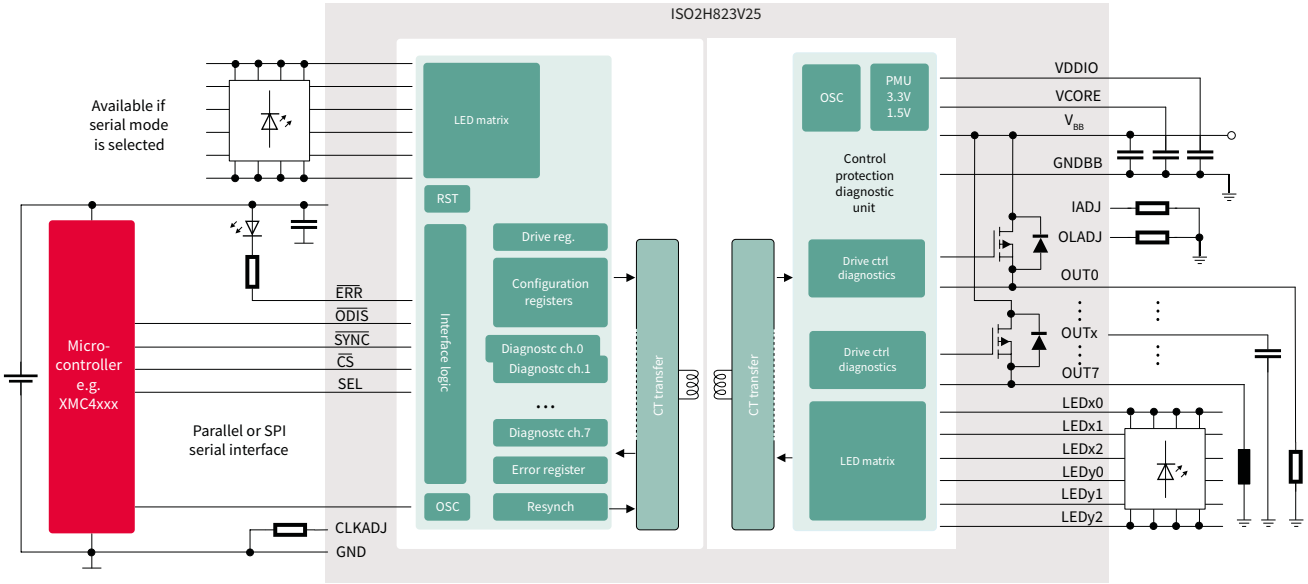
The ISO2H823V establishes a new standard in diagnostics for industrial control applications. For example, in industrial plants with capital-intensive single-tool equipment at work or with time-critical chemical processes running, obtaining in real-time differentiated feedback from the factory floor enables both, preventive maintenance and drastic reduction of the time to fix a problem. This is why the ISO2H823V is a highly desirable system solution. System designers benefit from the ISO2H823V through short time to market, reduced PCB area and uncompromised product reliability.

The ISO2H823V integrates:

- Robust 2.5 kV AC galvanic isolation:
  - UL508 and CSA C22.2 No.14 certified
  - Protecting the 3.3 V control domain of an industrial control system from the harsh 24 V process side
  - Exceeding the IEC 61131-2 requirements for reinforced isolation
- 8-channel high-side power-switching capabilities of up to 0.6 A per channel with active current limitation and overtemperature protection
- 10-fold diagnostic feedback
  - 5 types of feedback which are available individually for each of the eight outputs
  - 5 types of IC-level feedback
- Common diagnostic feedback for overtemperature and for V_{bb} undervoltage



Typical application



Features and benefits

Key features	Key benefits
– Robust 2.5 kV AC galvanic isolation	– Reliable and UL certified
– Eight channels (up to 0.6 A per channel)	– Small form factor solution
– 10-fold diagnostic feedback (over-temperature, overload)	– Preventive maintenance and short down-times

Industrial automation

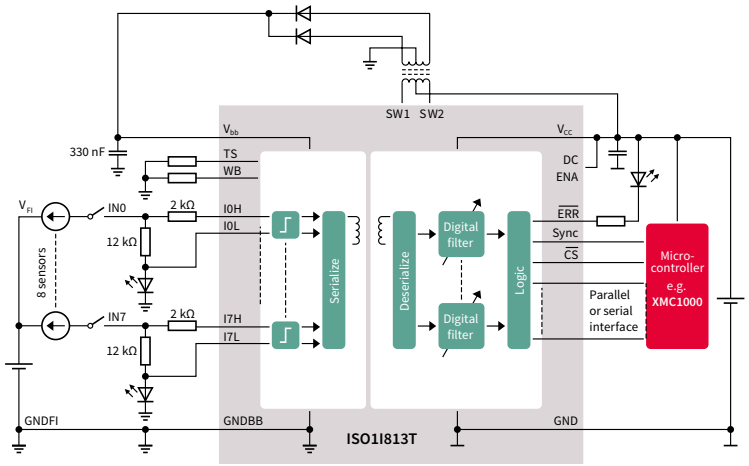
PLC

www.infineon.com/isoface

ISOFACE™ galvanic-isolated digital input ICs

The UL1577 certified ISO1I81xT digital input IC family is an intelligent system solution offering robust galvanic isolation between the microcontroller on the “control side” and the 24 V factory floor environment, frequently referred to as the “process side”.

Digital input switch block diagram



Galvanic-isolated digital input ICs



Features and benefits

Key features	Key benefits
– Integrated galvanic isolation (500 VAC)	– Robust and reliable
– Eight channels (IEC type 1/2/3)	– Compact system solution
– Up to 500 kHz sampling speed	– High-speed applications
– Programmable input filters	– Superior EMI robustness
– Channel-specific diagnostics (wire-break, undervoltage)	– System status feedback
	– Valuable maintenance support

www.infineon.com/isoface

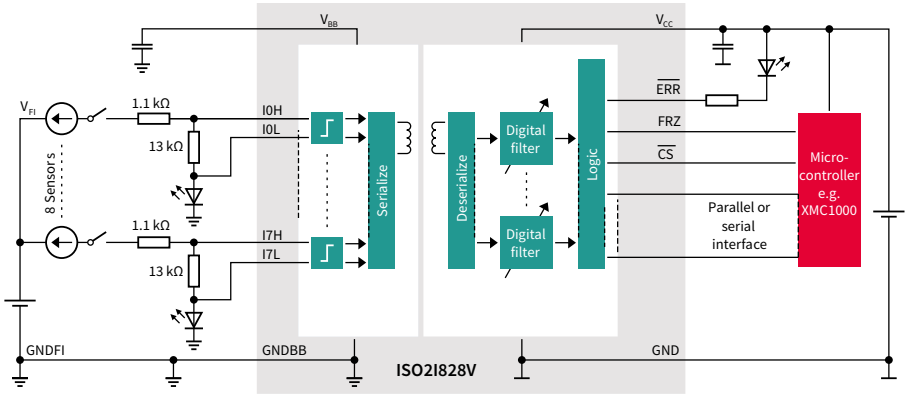
Industrial automation

PLC

ISOFACE™ galvanic-isolated digital input ICs

Galvanic-isolated sink input ICs

The ISOFACE™ ISO2I828V digital input IC family complements Infineon's portfolio of well-established digital input ICs. The latest generation offers enhanced performance with state-of-art low power consumption and a wide range of diagnostic capabilities. The input ICs are UL1577 certified and offer de facto industry standard isolation. The user can benefit from a smaller package size leading to PCB area saving and a compact design.





Features and benefits

Key features	Key benefits
– Integrated industry-standard galvanic isolation (2500 V_{rms})	– Improved reliability and robustness
– IEC type 1, 3: 8 x 24 V and 4 x 48 V	– Improved sensor compatibility
– Glitch filter per channel	– Superior EMI robustness
– Interrupt on change	– Reduces communication traffic
– Overtemperature and overvoltage alarm	– System status feedback
– Robust SPI serial communication	– Full register access in daisy chain
– Low power consumption	– Excellent performance with lower power dissipation

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Industrial automation · PLC · Robotics

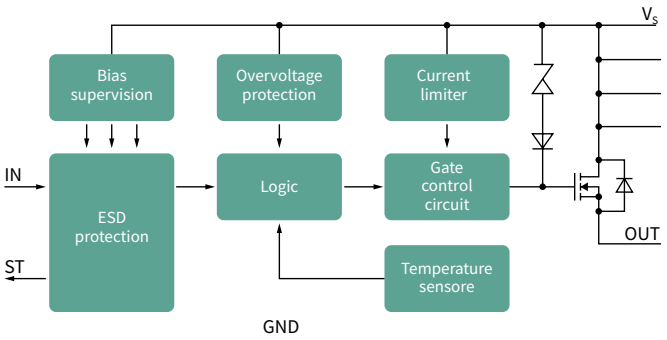
For more details on the product, click on the part number, visit infineon.com or contact our product support.

Industrial PROFET™

Protected high-side switches

Infineon's market-proven high-side switch Industrial PROFET™ products have been designed to target various industrial applications that drive all types of resistive, inductive and capacitive loads. Due to their outstanding energy robustness, they are perfectly suitable for switching challenging inductive loads and driving relays. Their main application areas include high-voltage and (V_{supply} up to 60 V) and PWM applications up to 1 kHz. Industrial PROFET™ can be applied to drive any kind of sensor units, indicators, displays, LEDs, relays, valves and magnetic actuators or replace electromechanical relays, fuses and discrete circuitry. Industrial PROFET™ products are also perfect for applications with long wiring or any other kind of inductive loads or applications with space constraints. Failsafe systems do make use of them as well.

PROFET™ typical block diagram





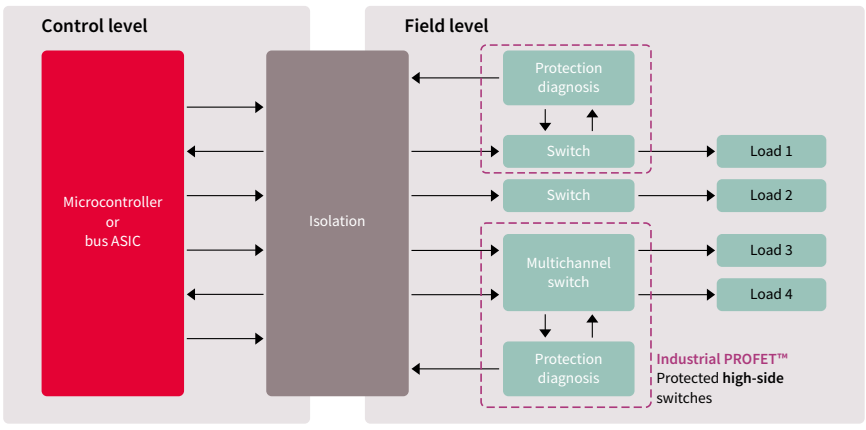
Key applications

- Industrial automation
- Programmable logic controller (PLC)
- Digital DCS and PC I/O modules
- Robotics
- Building and home automation
- Solar applications
- Wind energy systems
- Failsafe systems
- Smart grid
- Motor control and drives
- Power supplies

Features and benefits

Key features	Key benefits
– Right fit for digital output modules, motor or robot control, protected switching of decentralized loads like sensors or auxiliary supply	– Small system form factor
– Outstanding robustness and reliability as required by industrial mission profiles	– No/little downtime of system in operation
– Thermally optimized products with low $R_{DS(on)}$ to deal with the high ambient temperatures in applications with limited or even no cooling	– Low heating up of a system
– Diagnosis and protection for safe system operation	– System cost saving by built-in protection and tailored featureset
– Small and compact design for higher integration and applications with space constraints	– Reduced system maintenance efforts by providing optimized diagnostics

PLC – programmable logic controller digital output modules



PROFET™ as actuators typically address I/O modules supplying nominal currents of 2 A or 0.5 A. However, PROFET™ portfolio also provides devices for lower and higher currents. PROFET™ parts are suitable for switching resistive, capacitive and, by featuring high EAS, inductive loads.

Corresponding PROFET™ evaluation boards are available on request.

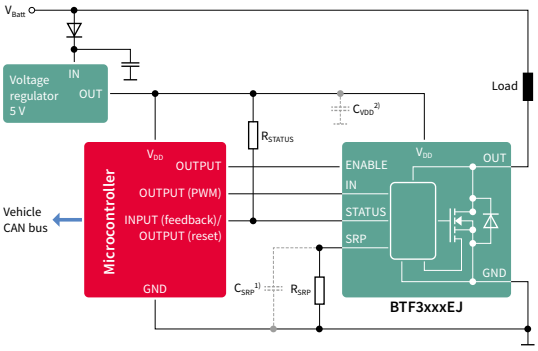
www.infineon.com/industrial-profet

HITFET™

Low-side smart protected switches

HITFET™ stands for highly-integrated temperature-protected MOSFET. These well-established low-side switches offer a compelling feature set with protection against overtemperature, short circuit and overload conditions as well as ESD robustness. The HITFET™ + family is the new generation based on new technology, enabling a significant shrink compared to the existing Classic HITFET™ portfolio (up to 50 percent shrink). This novel generation consists of standard and fully-featured protected low-side switches (11 to 125 mΩ) in the TO-252-3 DPAK/TO-252-5 DPAK and TDSO-8 packages. Classic HITFET™ and HITFET™ + devices address a wide range of applications, including resistive, inductive and capacitive loads.

Application diagramm example for HITFET™ +



1) C_{SRP}-GND < 100 pF – maximum permittet parasitic capacitance at the SRP-pin
2) Filter capacitor on supply, recommended 100 nF

Key applications

- Industrial automation*
- Programmable logic controller (PLC)**
- Digital I/O modules
- Building and home management
- All kind of solenoid or valve driving
- Power modules
- Solar power inverters

Features and benefits

Key features	Key benefits
– Low-side switches with integrated protection features	– High design flexibility with scalable $R_{DS(on)}$ and package
– Scalable in $R_{DS(on)}$ ranges from 800 mΩ down to 11 mΩ	– Driving applications with high switching speed requirements up to 25 kHz (e.g. valve, solenoid)
– Adjustable slew rate control (BTFxxx and BTT30xxEJ)	– Easy to design-in
– Thermal shutdown with auto restart or latch behavior	– Choice of packages to match individual application needs
– Status feedback via – Increased input current (HITFET™ +12 V/24 V) – Digital readout via SRP (BTF3050TE) – Via status pin (BTF3xxxEJ)	

Low-side switch shield with BTF3050TE for Arduino



Featured products: Three BTF3050TE low-side switches of the HITFET™ +12 V family
Combatible with: Microcontroller boards using the Arduino form factor and the corresponding Infineon's kits with Arm® powered XMC™ microcontroller
Orderable part number: SHIELDBTF3050TETOBO1

Evaluation board based on BTT3050EJ



Featured products: One single-channel low-side switch of BTT3050EJ a device of the HITFET™ +24 family
Combatible with: Can be used as single stand and is also pin-compatible with microcontroller boards using the Arduino form factor (e.g. XMC1100 Boot Kit, Arduino Uno)
Orderable part number: BTT3050EJDEMOBOARDTOBO1

www.infineon.com/hitfet
www.infineon.com/shields-for-arduino

*See block diagram on page 278
** See block diagram on page 279

For more details on the product, click on the part number, visit infineon.com or contact our product support.

ISOFACE™ product portfolio

ISOFACE™ output switches

Product overview		ISO1H801G	ISO1H811G	ISO1H812G	ISO1H815G	ISO1H816G	ISO2H823V
Switch	V_{bb} operational range: 11 V to 35 V	✓	✓	✓	✓	✓	✓
	Max. continuous load current per channel	0.6 A	0.6 A	0.6 A	1.2 A	1.2 A	0.6 A
	Load current increase by using outputs in parallel	✓	✓	✓	✓	✓	✓
	Inductive clamping energy per channel: 1 Joule	✓	✓	✓	✓	✓	150 mJ
Microcontroller interface	Type	Parallel	Parallel	Serial	Parallel	Serial	Serial/Parallel
	Nominal voltages	5 V	3.3 V/5 V	3.3 V/5 V	3.3 V/5 V	3.3 V/5 V	3.3 V
Safety features	Isolation voltage: V_{ISO} = 500 VAC UL508 and EN 61131-2 certified	✓	✓	✓	✓	✓	2.5 kV AC
	Active current limitation	✓	✓	✓	✓	✓	✓
	Thermal shutdown	✓	✓	✓	✓	✓	✓
	Common output disable pin	✓	✓	✓	✓	✓	✓
Diagnostics feedback	Overtemperature		✓	✓	✓	✓	✓
	V_{bb} undervoltage		✓	✓	✓	✓	✓
Package DSO-36 (16x14 mm)		✓	✓	✓	✓	✓	VQFN-70
Ordering code		ISO1H801GAUMA1	ISO1H811GAUMA1	ISO1H812GAUMA1	ISO1H815GAUMA1	ISO1H816GAUMA1	ISO2H823V25XUMA1

ISOFACE™ digital input IC

Product overview		ISO1I811T	ISO1I813T
Input characteristics	IEC type: I, II, III	✓	✓
	Input status LED	✓	✓
	Max. sampling frequency	125 kHz	500 kHz
	Deglitching filter setting	Hard wired	Software, individual per channel
	Synchronous data acquisition	–	✓
µC interface	3.3 V/5 V	✓	✓
	Serial and parallel	✓	✓
Safety features	500 VAC isolation voltage	✓	✓
Diagnostic feedback	Wire break, channel-specific	–	✓
	V_{bb} undervoltage	✓	✓
Support for external V_{bb} supply		–	✓
Package TSSOP-48 (8x12.5 mm)		✓	✓
Ordering code		ISO1I811TXUMA1	ISO1I813TXUMA1

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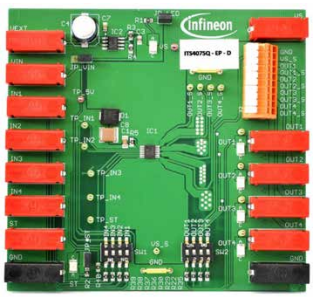
For more details on the product, click on the part number, visit infineon.com or contact our product support.

Industrial PROFET™ product portfolio

Load current Typical, per channel	1-channel	2-channel	4-channel	8-channel
7 A	ITS428L2 ● 7 A, 60 mΩ, TO-252-5			
3 A	ITS4060S-SJ-N, ISP772T 3.1 A, 60 mΩ DSO-8			
2 A … 3 A	ITS4100S-SJ-N, ISP762T 2.4 A, 100 mΩ, DSO-8			
1 A … 2 A	ITS4200S-ME-P, ITS4142N 1.4 A, 200 mΩ, SOT223	ITS4040D-EP-D ● 2.6 A, 40 mΩ, TSDSO14	ITS4075Q-EP-D ● 2.6 A, 75 mΩ, TSDSO14	
	ISP752T 1.3 A, 200 mΩ, DSO-8	ITS5215L ● 2 A, 90 mΩ, DSO-12	ITS724G ● 2 A, 90 mΩ, DSO-20	
	ITS4200S-SJ-D, ISP752R ● 1.2 A, 200 mΩ, DSO-8		ITS716G ● 1 A, 140 mΩ, DSO-20	
	ITS6035S-EP-K** 2A, 27 mΩ, TSDSO14		ITS711L1 ● 1 A, 200 mΩ, DSO-20	
0.5 A … 1 A	ITS4200S-ME-N, ISP452 0.7 A, 200 mΩ, SOT223		ITS4090Q-EP-D ● 0.7 A, 90 mΩ, TSDSO14	ITS42008-SB-D, ITS4880R ● 0.6 A, 200 mΩ, DSO-36
	ITS4200S-ME-O, ITS4141N 0.7 A, 200 mΩ, SOT223		ITS4130Q-EP-D ● 0.65 A, 130 mΩ, TSDSO14	
< 0.5 A	ITS4300S-SJ-D, ISP742RI ● 0.4 A, 300 mΩ, DSO-8	ITS42K5D-LD-F ● 0.25 A, 2.5Ω, TSON-10		
	ITS41k0S-ME-N, ITS4140N 0.2 A, 1Ω, SOT223			

● = With diagnosis

Product	Number of channels	$R_{DS(on)}$ (typ) [mΩ]	Nominal load current [A]	E_{AS} [mJ]	Recommended operating voltage range [V]	$I_{L(SC)}$ (typ) [A]	Diagnosis	Package
ITS6035S-EP-K**	1	27	1.38 … 5	350 @ 2.0 A	8.0 … 36.0	3.02 … 13.2	Digital and analog	TSDSO-14
ITS4060S-SJ-N	1	50	3.10	900 @ 1.50 A	5.00 … 34.00	17.0	n/a	DSO-8
ISP772T	1	50	2.60	900 @ 1.50 A	5.00 … 34.00	17.0	n/a	DSO-8
ITS428L2	1	60	7.00	190 @ 7.00 A	4.75 … 41.00	22.0	Digital	TO252-5
ITS4100S-SJ-N	1	70	2.40	870 @ 1.00 A	5.00 … 34.00	10.0	n/a	PG-DSO-8
ISP762T	1	70	2.00	870 @ 1.00 A	5.00 … 34.00	10.0	n/a	DSO-8
ITS4200S-ME-O	1	150	1.10	700 @ 0.50 A	11.00 … 45.00	1.4	n/a	SOT-223-4
ITS4141N	1	150	1.10	700 @ 0.50 A	12.00 … 45.00	1.4	n/a	SOT-223-4
ITS4200S-ME-P	1	150	2.20	160 @ 1.00 A	11.00 … 45.00	3.0	n/a	SOT-223-4
ITS4142N	1	150	2.20	160 @ 1.00 A	12.00 … 45.00	3.0	n/a	SOT-223-4
ITS4200S-ME-N	1	160	1.20	500 @ 0.50 A	5.00 … 34.00	1.5	n/a	DSO-8
ISP452	1	160	1.20	500 @ 0.50 A	5.00 … 34.00	1.5	n/a	SOT-223-4
ITS4200S-SJ-D	1	150	1.70	125 @ 1.00 A	6.00 … 52.00	6.5	Digital	DSO-8
ISP752R	1	200	1.70	125 @ 1.00 A	6.00 … 52.00	6.5	Digital	DSO-8
ISP752T	1	200	1.70	125 @ 1.00 A	6.00 … 52.00	6.5	n/a	DSO-8
ITS4300S-SJ-D	1	250	0.80	800 @ 0.30 A	5.00 … 34.00	1.2	Digital	DSO-8
ISP742RI	1	350	0.80	800 @ 0.30 A	5.00 … 34.00	1.2	Digital, inverted	DSO-8
ITS41K0S-ME-N	1	1000	0.55	1000 @ 0.15 A	4.90 … 60.00	0.9	n/a	SOT-223-4
ITS4140N	1	1000	0.55	1000 @ 0.15 A	4.90 … 60.00	0.9	n/a	SOT-223-4
ITS4040D-EP-D	2	40	2 x 2.00	185 @ 2 A	5.00 … 45.00	4.1	Digital	TSDSO-14
ITS5215L	2	90	2 x 2.00	178 @ 3.50 A	5.50 … 40.00	15.0	Digital	DSO-12
ITS4075Q-EP-D	4	75	4 x 2.00	60 @ 2 A	5.00 … 45.00	4.1	Digital	TSDSO-14
ITS4090Q-EP-D	4	90	4 x 0.50	410 @ 0.5 A	5.00 … 45.00	1.5	Digital	TSDSO-14
ITS724G	4	90	4 x 2.00	120 @ 3.30 A	5.50 … 40.00	15.0	Digital	DSO-20
ITS4130Q-EP-D	4	130	4 x 0.50	380 @ 0.5 A	5.00 … 45.00	1.25	Digital	TSDSO-14
ITS716G	4	140	4 x 1.00	76 @ 2.30 A	5.50 … 40.00	9.0	Digital	DSO-20
ITS711L1	4	200	4 x 1.00	150 @ 1.90 A	5.00 … 35.00	7.5	Digital	DSO-20
ITS42008-SB-D	8	200	8 x 0.60	10,000 @ 625 mA	11.00 … 45.00	3.0	Digital	DSO-36
ITS4880R	8	200	8 x 0.60	10,000 @ 625 mA	11.00 … 45.00	3.0	Digital	DSO-36



Evaluation board

- ITS4040D-EP-D
- ITS4075Q-EP-D
- ITS4090Q-EP-D
- ITS4130Q-EP-D

www.infineon.com/industrial-profet

* Per one channel
** Coming soon

For more details on the product, click on the part number, visit infineon.com or contact our product support.

HITFET™ product portfolio

Product type	Product family	Channels	$R_{DS(on)}$ @ 25°C [mW]	Nominal load current [A]	EAS [mJ]	Operating voltage range [V]	$I_{L(lim)}$ (typ) [A]	$I_{L(lim)_TRIGGER}$ (typ) [A]	Diagnosis	Package
BTS3011TE	HITFET™ +	1	10.7	10	300 @ 5 A	up to 28	35	70	Status pin	TO-252-5 (DPAK 5-leg)
BTT3018EJ	HITFET™ +	1	16	7.0	150	up to 36	45	–	Status pin	TDSO-8
BTS3035EJ	HITFET™ +	1	28	5.00	105 @ 5 A	up to 31	20.00	–	Status pin	TDSO-8
BTS3035TF	HITFET™ +	1	30	5.00	106 @ 5 A	up to 31	20.00	–	–	TO-252-3 (DPAK 3-leg)
BTF3035EJ	HITFET™ +	1	28	5.00	95 @ 5 A	up to 32	14.00	41.00	Status pin	TDSO-8
BTF3050TE	HITFET™ +	1	40	3.00	120 @ 3 A	up to 28	8.00	30.00	Through SRP pin	TO-252-5 (DPAK 5-leg)
BTS3050EJ	HITFET™ +	1	40	4.00	62 @ 3 A	up to 31	15.00	–	Status pin	TDSO-8
BTS3050TF	HITFET™ +	1	44	4.00	64 @ 4 A	up to 31	15.00	–	–	TO-252-3 (DPAK 3-leg)
BTF3050EJ	HITFET™ +	1	40	4.00	62 @ 4 A	up to 32	10.00	29.00	Status pin	TDSO-8
BTS3060TF	HITFET™ +	1	50	3.00	55 @ 3 A	up to 35	10.50	–	–	TO-252-3 (DPAK 3-leg)
BTS3080EJ	HITFET™ +	1	64	3.00	35 @ 3 A	up to 31	10.00	–	Status pin	TDSO-8
BTS3080TF	HITFET™ +	1	69	3.00	38 @ 3 A	up to 31	10.00	–	–	TO-252-3 (DPAK 3-leg)
BTF3080EJ	HITFET™ +	1	64	3.00	33 @ 3 A	up to 32	7.00	18.00	Status pin	TDSO-8
BTS3125EJ	HITFET™ +	1	100	2.00	30 @ 2 A	up to 31	7.00	–	Status pin	TDSO-8
BTS3125TF	HITFET™ +	1	108	2.00	24 @ 2 A	up to 31	7.00	–	–	TO-252-3 (DPAK 3-leg)
BTF3125EJ	HITFET™ +	1	100	2.00	23 @ 2 A	up to 32	5.00	12.00	Status pin	TDSO-8
BTS3018TC	Classic HITFET™	1	14	6.00	1900	up to 36	30.00	–	Through input pin	TO-263-3-2 (TO-220-3 (SMD))
BTS141TC	Classic HITFET™	1	25	5.10	4000	up to 36	25.00	–	Through input pin	TO-263-3-2 (TO-220-3 (SMD))
BTS3028SDL	Classic HITFET™	1	28	5.00	350	up to 36	18.00	–	Through input pin	TO-252-3 (DPAK 3-leg)
BTS3028SDR	Classic HITFET™	1	28	5.00	350	up to 36	18.00	–	Through input pin	TO-252-3 (DPAK 3-leg)
BTS133TC	Classic HITFET™	1	40	3.80	2000	up to 36	21.00	–	Through input pin	TO-263-3-2 (TO-220-3 (SMD))
BTS3046SDL	Classic HITFET™	1	46	3.60	140	up to 36	10.00	–	Through input pin	TO-252-3 (DPAK 3-leg)
BTS3046SDR	Classic HITFET™	1	46	3.60	140	up to 36	10.00	–	Through input pin	TO-252-3 (DPAK 3-leg)
BTS117TC	Classic HITFET™	1	80	3.50	1000	up to 36	7.00	–	Through input pin	TO-263-3-2 (TO-220-3 (SMD))
BTS3104SDL	Classic HITFET™	1	104	2.00	50	up to 36	6.00	–	Through input pin	TO-252-3 (DPAK 3-leg)
BTS3104SDR	Classic HITFET™	1	104	2.00	50	up to 36	6.00	–	Through input pin	TO-252-3 (DPAK 3-leg)
BTS3408G	Classic HITFET™	2	480	0.55	800	up to 36	1.00	–	Through input pin	DSO-8
BSP75N	Classic HITFET™	1	490	0.70	550	up to 36	1.00	–	Through input pin	SOT-223

www.infineon.com/hitfet

For more details on the product, click on the part number, visit infineon.com or contact our product support.

CIPOS™ IPM product portfolio

MOSFET based CIPOS™ IPMs					
Product family	Voltage [V]	Configuration	$R_{DS(on),max}$, [Ω]	Package	Product name
CIPOS™ Nano	40	Half-bridge	0.005	QFN 7x8	IRSM005-800MH
	100	Half-bridge	0.021	QFN 7x8	IRSM005-301MH
	250	H-bridge	0.063	QFN 12x10	IM111-X3Q1B
		Half-bridge	0.15	QFN 8x9	IRSM808-204MH
		3-phase inverter	0.45 ~ 2.40	QFN 12x12	IRSM836-024MA/IRSM836-044MA IRSM836-084MA
	500	Half-bridge	0.80/1.70	QFN 8x9	IRSM808-105MH/IRSM807-045MH
		3-phase inverter	1.70 ~ 6.00	QFN 12x12	IRSM836-015MA/IRSM836-025MA/IRSM836-035MA IRSM836-045MA
	600	H-bridge	0.28	QFN 12X10	IM111-X6Q1B
CIPOS™ Maxi	1200	3-phase inverter	0.055	DIP 36x23D	IM828-XCC

IGBT based CIPOS™ IPMs					
Product family	Voltage [V]	Configuration	Rated current [A]	Package	Product name
CIPOS™ Micro	600	3-phase inverter	2.0/4.0/6.0	DIP 29x12	IM241-S6T2B/IM241-M6T2B/IM241-L6T2B IM241-S6T2J/IM241-M6T2J
			2.0/4.0/6.0	SOP 29x12	IM241-S6S1B/IM241-M6S1B/IM241-L6S1B IM241-S6S1J/IM241-M6S1J
CIPOS™ Mini	600	PFC integrated	10.0 ~ 20.0	DIP 36x21D	IFCM10S60GD/IFCM10P60GD IFCM15S60GD/IFCM15P60GD IM564-X6D
		3-phase inverter	4.0 ~ 30.0	DIP 36x21	IGCM04F60GA/IGCM04G60GA/IGCM06F60GA/IGCM06G60GA IGCM10F60GA/IKCM10H60GA/IKCM10L60GA IGCM15F60GA/IKCM15L60GA/IKCM15F60GA/IKCM15H60GA IGCM20F60GA/IKCM20L60GA IKCM30F60GA IM523-S6A/IM523-M6A/IM523-L6A/IM523-X6A
			15.0 ~ 30.0	DIP 36x21D	IKCM15L60GD/IKCM20L60GD/IKCM30F60GD IM535-U6D
		Single boost PFC + inverter	10.0 ~ 20.0	DIP 36x21D	IKCM15L60GD/IKCM20L60GD/IKCM30F60GD IM535-U6D
	650	3-phase interleaved PFC	20.0/30.0	DIP 36x21D	IFCM20T65GD/IFCM30T65GD
		2-phase interleaved PFC	30.0	DIP 36x21D	IFCM30T65GD/IFCM30U65GD
CIPOS™ Maxi	1200	3-phase inverter	5.0 ~ 15.0	DIP 36x23D	IM818-SCC/IM818-MCC/IM818-LCC

www.infineon.com/ipm

* Coming soon

For more details on the product, click on the part number, visit infineon.com or contact our product support.



Infineon support for intelligent switches and modules

Useful links and helpful information

Further information, datasheets and documents

www.infineon.com/isoface
www.infineon.com/hitfet
www.infineon.com/industrial-profet
www.infineon.com/shields-for-arduino

Support
Evaluation board
Tools



Microcontrollers

- XMC™ microcontrollers
- XMC™ ecosystem, enablement and partners
- XMC™ digital power explorer kit
- XMC™ starter kits
- XMC™ peripherals
- AURIX™ - 32-bit microcontrollers
- AURIX™ TC2xx family system architecture
- AURIX™ TC3xx family system architecture
- AURIX™ starter and application kits
- Application example: Industrial robotics
- Microcontroller PDH partner
- TRAVEO™ II portfolio
- MOTIX™ Embedded Power ICs
- BLDC Motor Control Shield for Arduino
- CAN-FD transceivers

XMC™

One microcontroller platform – countless solutions

Infineon's XMC™ 32-bit industrial microcontroller portfolio is designed for efficiency and demanding industrial applications.

XMC™ MCU portfolio

- RAM: 8 kB up to 1 MB
- Flash: 16 kB up to 8 MB
- Accurate analog mixed-signal peripherals
- Fast timer/PWM peripherals
- Rich communication interfaces
- 16-pin to 272-pin count packages

XMC1000 family

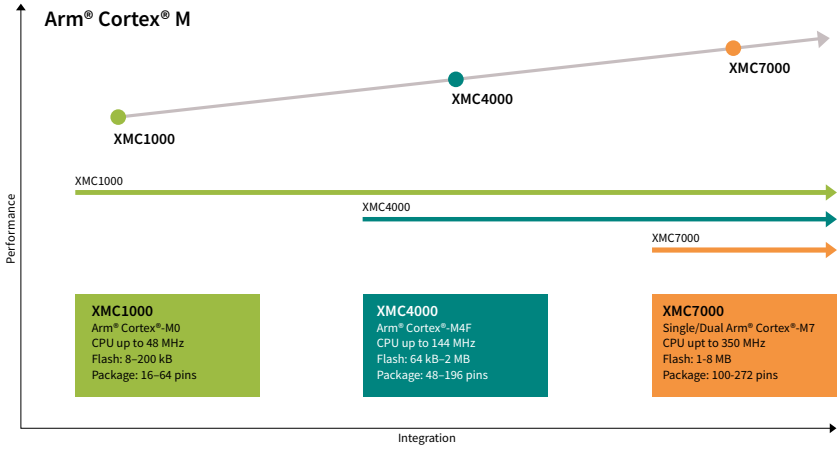
- Arm® Cortex®-M0 up to 48 MHz
- Peripherals up to 96 MHz
- One-time event request unit (ERU)
- V_{DD}: 1.8 to 5.5 V
- $T_{Ambient}$: -40°C to 105°C

XMC4000 family

- Arm® Cortex®-M4 up to 144 MHz
- Built-in DSP, SFPU
- EtherCAT
- Event request unit (ERU)
- $T_{Ambient}$: -40°C to 125°C

XMC7000 family

- Single or dual core Arm® Cortex®-M7 and Cortex®-M0+
- Up to 8 MB flash
- Up to 10x CAN FD and 2x Ethernet
- $T_{Ambient}$: -40°C to 125°C

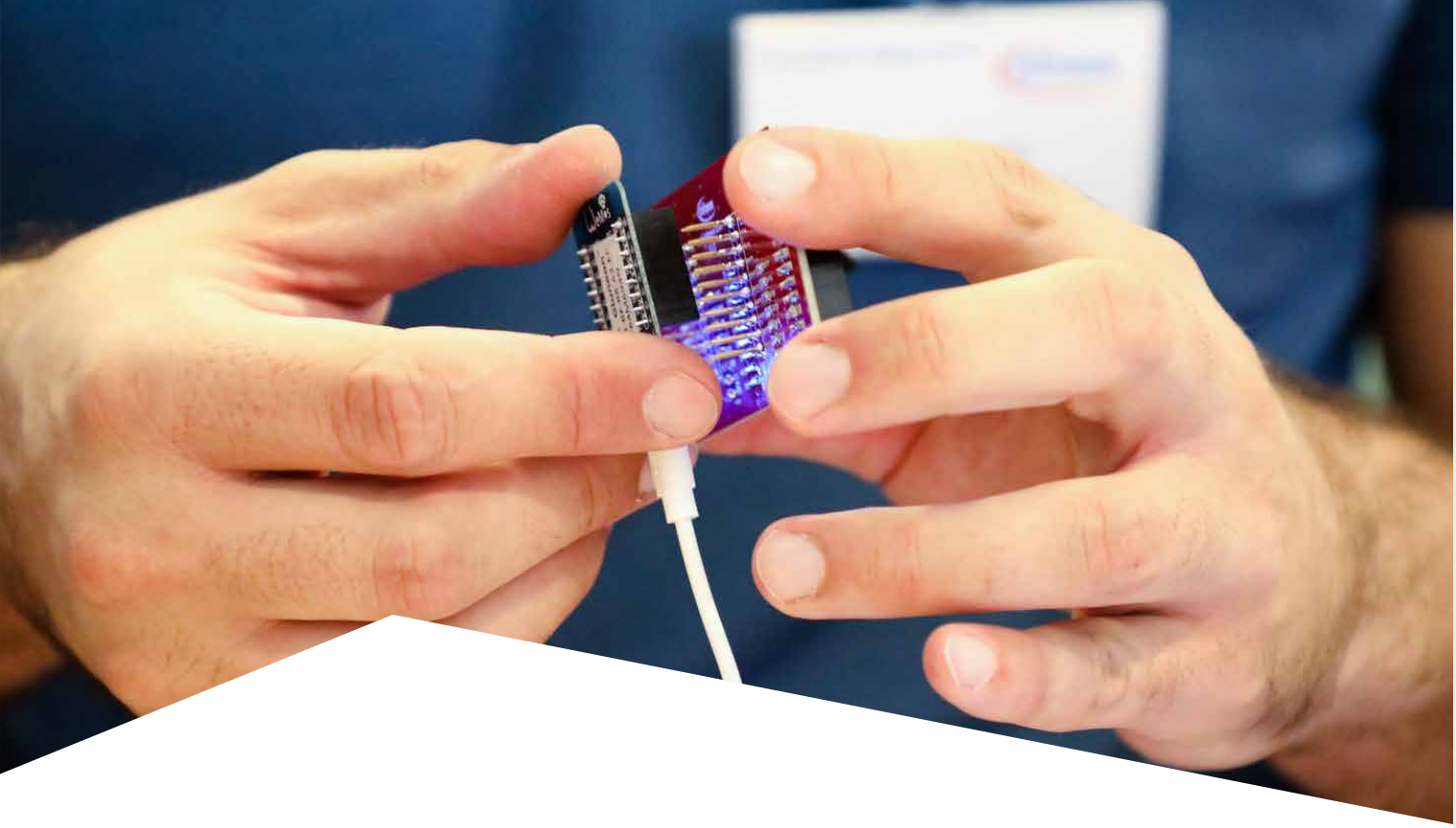




XMC7000 Dual ARM® Cortex®-M7 up to 350MHz core, 1MB - 8MB flash, up to 125°C Tamb 2,7V-5.5V	**XMC7100** Basic control & Connectivity single core @ 250MHz TQFP-100/144		**XMC7100/7200** EV-Charging, TCPWM, CAN-FD TQFP-144/176, LFBGA-272	**XMC7100/7200** Industrial Drives, TCPWM, CAN-FD, up to 125°C Tamb TQFP-176, LFBGA-272	**XMC7200** GB Ethernet, ADCs with 1Msps, TCPWM, CAN-FD TQFP-176, LFBGA-272
XMC4000 Arm® Cortex®-M4F up to 144 MHz core 64 kB-2 MB flash up to 125°C				**XMC4700/4800** Industrial drives, Hall and encoder I/F, ΔΣ demodulator, LQFP-100/144 LFBGA-196	**XMC4800, XMC4300** EtherCAT, +drives MultiCAN - 6 nodes LQFP-100/144 LFGBGA-196
	XMC4100 Basic control and connectivity VQFN-48 LQFP-64		**XMC4200** Server power 150 ps HRPWM LQFP-64/100	**XMC4100/XMC4400** Industrial drives, Hall and encoder I/F, ΔΣ demodulator, LQFP-64/100/144 LFBGA-144	**XMC4500** MultiCAN - 3 nodes, Ethernet, +drives ext. memory, SD/MMC LQFP-100/144 LFBGA-144
XMC1000 Arm® Cortex®-M0 up to 48 MHz core/ 96 MHz peripheral 8-200 KB flash up to 105°C 1.8-5.5 V		**XMC1400** Flicker-free, 4-Ch LED, SMPS, connectivity VQFN-40/64 LQFP-64	**XMC1400** SMPS control, connectivity VQFN-40/64 LQFP-64	**XMC1400** Hall and encoder I/F, MATH co-processor, CAN VQFN-40/64 LQFP-64	**XMC1400** Multi CAN - 2 nodes VQFN-48/64 LQFP-64
	XMC1100 Basic control and connectivity TSSOP-16/38 VQFN-24/40	**XMC1200, XMC1300** Flicker-free, 4-Ch LED, SMPS, connectivity TSSOP-16/28/38 VQFN-24, -40	**XMC1300** SMPS control, connectivity, TSSOP-16/38 VQFN-24/40	**XMC1300** Hall and encoder I/F, MATH co-processor, TSSOP-16/38 VQFN-24/40	
	XMC™ entry	LED lighting	Digital power	Motor control	Industrial I/O

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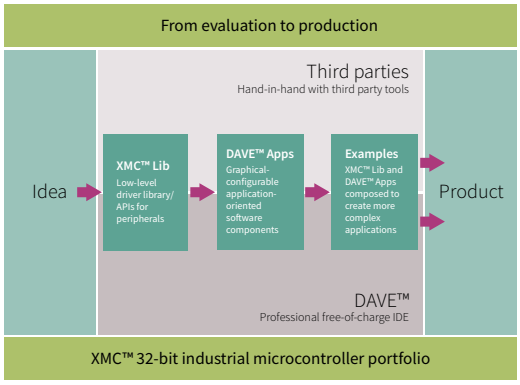
For more details on the product, click on the part number, visit infineon.com or contact our product support.



XMC™ ecosystem, enablement and partners

A comprehensive set of tools, products, components, and services are available for fast and efficient design with XMC™ microcontrollers.

Infineon enablement for XMC™ MCUs
ModusToolbox™ Software – www.infineon.com/mtb
Modern and extensible development enviroment supporting a wide range of Infineon microcontroller devices
DAVE™ – www.infineon.com/dave
Professional and free-of-charge development platform
XMC™ **library for Embedded Coder®** – www.infineon.com/matlab
Model-based design from MATLAB® and Simulink® environment, download free of charge
IEC60730 class B library for XMC™ – www.infineon.com/iec60730
Available for XMC™ industrial microcontrollers free of charge
Microcontroller/Probe™ XMC™ – www.infineon.com/ucprobexmc
Free-of-charge version of microcontroller/Probe™ for XMC™ MCUs to build user interfaces for visualizing, observing, and control of the internals of XMC™ MCUs
XMC™ **link** – www.infineon.com/xmclink
Functional isolated debug probe, based on SEGGER J-Link technology



In addition to a rich third party ecosystem and enablement landscape, which support the entire development cycle from evaluation to production.
For more click here.

www.infineon.com/xmc

Infineon's XMC™ 32-bit industrial microcontroller portfolio is designed for system cost and efficiency for demanding industrial applications. It comes with the most advanced peripheral set in the industry. Fast and largely autonomous peripherals can be configured to support individual needs.

Highlights include analog mixed-signal, timer/PWM and communication peripherals powered by either an Arm® Cortex®-M0 core (XMC1000 family) or an Arm® Cortex®-M4 core with a floating point unit (XMC4000 family).

Arm® Cortex®-M0	Co-processor	Clocks		Memory		Analog			Timer/PWM				Connectivity		Package
		Frequency	Peripherals			ADC1 2-bit/S&H	Number of channels	Analog comparators	CCU4 (4 ch)	CCU8 (4 ch)	POSIF	BCCU	US IC	CAN 2.0B	
XMC11x	-	32	64	Flash	8-64 kB	1/1	Up to 12	-	1x	-	-	-	2x	-	VQFN 24/40 TSSOP 16/38
				RAM	16 kB										
XMC12x	-	32	64	Flash	16-200 kB	1/2	Up to 12	Up to 3	1x	-	-	✓	2x	-	VQFN 24/40 TSSOP 16/28/38
				RAM	16 kB										
XMC13x	✓	32	64	Flash	8-200 kB	1/2	Up to 12	Up to 3	1x	1x	✓	✓	2x	-	VQFN 24/40 TSSOP 16/38
				RAM	16 kB										
XMC14x	✓	48	96	Flash	32-200 kB	1/2	Up to 12	Up to 4	2x	2x	✓	✓	4x	✓	VQFN 40/48/64 LQFP 64
				RAM	16 kB										
Supply voltage range 1.8-5.5 V															
Temperature range -40°C … 85°C/105°C															

Arm® Cortex®-M0	Frequency [MHz]	Memory		Analog			Timer/PWM					Connectivity					SDIO/SD/MMC	External BUS Unit (EBU)	Package
				ADC1 2-bit/S&H	Number of channels	DAC1 2-bit	CCU4 (4 ch)	CCU8 (4 ch)	HRPWM (150 ps)	POSIF	Σ Demodulator	US IC	CAN 2.0B	USB	Ethernet	EtherCAT®			
XMC41x	80	Flash	64-128 kB	2/2	Up to 9	2 ch	2x	1x	✓	✓	-	4x	Up to 2	✓	-	-	-	-	VQFN 48 TQFP 64
		RAM	20 kB																
XMC42x	80	Flash	256 kB	2/2	Up to 9	2 ch	2x	1x	✓	✓	-	4x	2x	✓	-	-	-	-	VQFN 48 TQFP 64
		RAM	40 kB																
XMC43x	144	Flash	256 kB	2/2	14	2 ch	2x	1x	-	-	-	4x	2x	✓	✓	✓	✓	-	LQFP 100
		RAM	128 kB																
XMC44x	120	Flash	256-512 kB	4/4	Up to 18	2 ch	4x	2x	✓	2x	4 ch	4x	2x	✓	✓	-	-	-	TQFP 64 LQFP 100
		RAM	80 kB																
XMC45x	120	Flash	512 kB-1 MB	4/4	Up to 26	2 ch	4x	2x	-	2x	4 ch	4x	Up to 3	✓	✓	-	✓	✓	LQFP 100/144 LFBGA 144
		RAM	128-160 kB																
XMC47x	144	Flash	1.5-2 MB	4/4	Up to 26	2 ch	4x	2x	-	2x	4 ch	6x	6x	✓	✓	-	✓	✓	LQFP 100/144 LFBGA 196
		RAM	276-352 kB																
XMC48x	144	Flash	1-2 MB	4/4	Up to 26	2 ch	4x	2x	-	2x	4 ch	6x	6x	✓	✓	✓	✓	✓	LQFP 100/144 LFBGA 196
		RAM	276-352 kB																
Supply voltage range 3.1-3.6 V																			
Temperature range -40°C … 85°C/125°C																			

Arm® Cortex®-M7	Frequency [MHz]	Memory		Analog		Timer/TCPWM			Connectivity					Package
				ADC 12bit	Number of Channels	16 bit motor-control	16 bit general-purpose	32 bit general-purpose	SCB	CAN-FD	Ethernet	Gb Ethernet	SDHC (eMMC, SD, SDIO)	
XMC71xx	250	Flash	4 MB	3	18 ch	12 ch	63 ch	8 ch	up to 11 ch	up to 8	✓	-	✓	QFP-100, QFP-144, QFP-176, BGA-272
		RAM	768 kB											
XMC72xx	350	Flash	8 MB	3	18 ch	15 ch	87 ch	16 ch	up to 11 ch	up to 10	✓	✓	✓	QFP-176, BGA-272
		RAM	1 MB											
Supply voltage range 2.7-5.5V														
Temperature range -40 ...125°C														

www.infineon.com/xmc
www.infineon.com/mtb

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XMC™ 7000 microcontrollers

High-quality grade MCU platform for industrial applications

The XMC7000 is the latest entry in Infineon's industrial microcontroller portfolio, equipped with peripherals such as CAN-FD, TCPWM and Gb Ethernet, which increase flexibility and offer added value. The XMC7000 architecture is built on a low-power 40-nm process technology and the MCUs offer best-in-class compute performance addressing high-end industrial applications.

The XMC7000 offers both single and dual-core Arm® Cortex®-M7 options, supported by an Arm® Cortex®-M0+ enabling designers to optimize their end products to meet the dynamic and demanding business conditions of industrial applications. The advanced peripheral set and robust security features make it attractive to customers, who need a high-quality MCU platform. The MCU can operate in harsh environments with a temperature range of -40°C to 125°C, and it is ideal for power-critical applications based on its low-power modes, which go down to 8 µA. The flexible XMC7000 comes in four package/pin types with 17-part number variants to meet many design requirements.

XMC7100/7200
4 MB flash / 768 kB RAM,
250 MHz single/dual core
100 – 272 pin (QFP/BGA)

XMC7200
8 MB flash / 1 MB RAM,
350 MHz single/dual core
176 – 272 pin (QFP/BGA)

- Single or dual core Arm® Cortex®-M7 and Cortex®-M0+
- M7 CPU core Frequency up to 350 MHz
- Temperature range: Ta = -40 to 125°C
- Memory Up to 8 MB flash, 1 MB RAM
- TCPWM timers of 102Ch 16 bit and 16Ch 32 bit
- Cryptography Engine support
- Interfaces such as CAN-FD, Gb Ethernet
- SMIF and SDHC interface supported
- Extended voltage operating range: 2.7 to 5.5V
- low power modes(LP/deep sleep, hibernate)
- Add. timer, ADC and Serial COM. Chs
- Read While Write (RWW) flash capability



BGA-272



QFP-176

Features and benefits

Key benefits
– Best-in-class computing performance
– Low power to support electrification and digitization
– Optimal solution for motor control & power conversion applications
– Advanced security options
– Ability to operate in high ambient environments
– XMC7000 is easy to adapt to existing PCB
– Different core/memory/package combinations

www.infineon.com/xmc7000

For more details on the product, click on the part number, visit infineon.com or contact our product support.

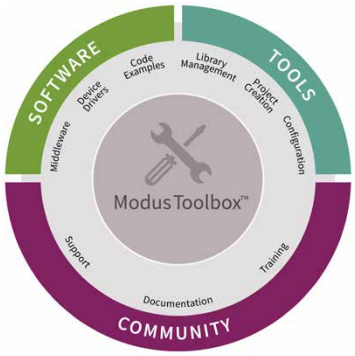
XMC™ 7000 part numbers

Type	Description
XMC7100-F100K1088AA	Single Core Arm® Cortex® M7 (+Arm® Cortex®-M0+), TQFP 100 pins, 1 MB flash
XMC7100-F100K2112AA	Single Core Arm® Cortex® M7 (+Arm® Cortex®-M0+), TQFP 100 pins, 2 MB flash
XMC7100-F100K4160AA	Single Core Arm® Cortex® M7 (+Arm® Cortex®-M0+), TQFP 100 pins, 4 MB flash
XMC7100D-F100K2112AA	Dual Core Arm® Cortex® M7 (+Arm® Cortex®-M0+), TQFP 100 pins, 2 MB flash
XMC7100D-F100K4160AA	Dual Core Arm® Cortex® M7 (+Arm® Cortex®-M0+), TQFP 100 pins, 4 MB flash
XMC7100-F144K2112AA	Single Core Arm® Cortex® M7(+ Arm® Cortex®-M0+), TQFP 144 pins, 2 MB flash
XMC7100-F144K4160AA	Single Core Arm® Cortex® M7(+ Arm® Cortex®-M0+), TQFP 144 pins, 4 MB flash
XMC7100D-F144K2112AA	Dual Core Arm® Cortex® M7 (+Arm® Cortex®-M0+), TQFP 144 pins, 2 MB flash
XMC7100D-F144K4160AA	Dual Core Arm® Cortex® M7 (+Arm® Cortex®-M0+), TQFP 144 pins, 4 MB flash
XMC7100-F176K4160AA	Single Core Arm® Cortex® M7(+ Arm® Cortex®-M0+), TQFP 176 pins, 4 MB flash
XMC7100D-F176K4160AA	Dual Core Arm® Cortex® M7 (+Arm® Cortex®-M0+), TQFP 176 pins, 4 MB flash
XMC7100-E272K4160AA	Single Core Arm® Cortex® M7(+ Arm® Cortex®-M0+), LBGA 272 pins, 4 MB flash
XMC7100D-E272K4160AA	Dual Core Arm® Cortex® M7(+ Arm® Cortex®-M0+), LFBGA 272 pins, 4 MB flash
XMC7200-F176K8384AA	Single Core Arm® Cortex® M7 (+Arm® Cortex®-M0+), TQFP 176 pins, 8 MB flash
XMC7200D-F176K8384AA	Dual Core Arm® Cortex® M7 (+Arm® Cortex®-M0+), TQFP 176 pins, 8 MB flash
XMC7200-E272K8384AA	Single Core Arm® Cortex® M7 (+Arm® Cortex®-M0+), LFBGA 272 pins, 8 MB flash
XMC7200D-E272K8384AA	Dual Core Arm® Cortex® M7 (+Arm® Cortex®-M0+), LFBGA 272 pins, 8 MB flash

Software

ModusToolbox™ Software Environment





ModusToolbox™ software supports application development using the XMC7200 evaluation kit by providing board support package (BSP) and validated code examples to help you get started. To download the latest version of the software, please visit the ModusToolbox™ webpage.

www.infineon.com/xmc7000

For more details on the product, click on the part number, visit infineon.com or contact our product support.



XMC™ digital power explorer kit

The new digital power explorer kit is designed with the particular goal of making it easy for engineers to take the first steps into digital power control with XMC™ microcontrollers. It showcases both XMC™ families Arm® Cortex-M microcontrollers: XMC4000 and XMC1000, 30 V dual n-channel OptiMOS™ MOSFETs and IRS2011S gate drivers. The kit includes two different control card options, XMC1300 control card (Arm® Cortex®-M0) and XMC4200 control card (Arm® Cortex®-M4F), which allow designers to evaluate both XMC™ microcontroller families and make the right price/performance choice for their application.

Features and benefits

Key features	Key benefits
– Synchronous buck converter evaluation kit controlled with XMC4200 or XMC1300 Arm® Cortex®-M MCUs	– Easy entry in digital power control applications
– Onboard resistive load banks	– Understand the details of voltage/peak current control and how to extract the maximum of XMC™ devices
– Featuring BSC0924NDI dual n-channel OptiMOS™ MOSFET and IRS2011S high- and low-side gate driver	– DAVE™ v4 APPs for buck converter and many more example
– Different control schemes possible – Voltage mode control – Peak current mode control (with slope compensation)	

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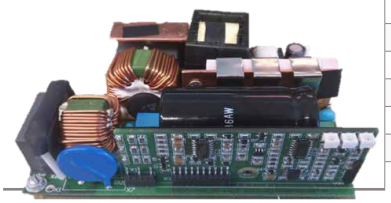
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High power density 800 W 130 kHz platinum server design with XMC1300

The 800 W PFC CCM evaluation board demonstrates design and practical results of an 800 W 130 kHz platinum server PFC evaluation board based on Infineon devices, in terms of power semiconductors, non-isolated gate drivers, analog and digital controllers for the PFC converter, as well as flyback controller for the auxiliary supply. This evaluation board verifies the performance of the latest 600 V CoolMOS™ C7 superjunction MOSFET technology working at 130 kHz in a PFC CCM boost converter along with EiceDRIVER™ ICs and CoolSiC™ Schottky diode 650 V G5 using digital control.

Features and benefits

Key features	Customer benefits
– Classic PFC boost stage digitally controlled with XMC1302 including voltage and current loops	– High efficient PFC stage with a complete system solution from Infineon
– Protections, including cycle-by-cycle current protection	– HW and SW available
– Run time debug with isolated UART to PC interface and PC software	– Higher switching frequency permits higher power density

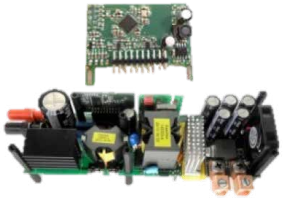
800 W PFC CCM with XMC1300	Specification		Infineon components	
	V_{in}	90-265 V_{AC}	MCU	XMC1302 (TSSOP38)
	V_{out_nom}	380 V_{DC}	MOSFET	600 V CoolMOS™ C7
	I_{out}	2 A	MOSFET driver	EiceDRIVER™ 2EDN7524F non-isolated
	PWM frequency	130 kHz	Diode	CoolSiC™ Schottky diode 650 V G5
	THD	<10%	Auxiliary PSU	ICE2QR4780Z
	Power factor	>0.9 from 20% load		
	Efficiency	97% (peak)		

600 W half-bridge LLC evaluation board with 600 V CoolMOS™ C7 SJ MOSFET with digital control

The 600 W LLC digital control evaluation board shows how to design the half-bridge LLC stage of a server SMPS with the target to meet 80+ Titanium standard efficiency requirements. For this purpose, the latest CoolMOS™ technologies, 600 V CoolMOS™ C7 or P6 superjunction MOSFETs have been used on the primary side, and OptiMOS™ low-voltage power MOSFET in SuperSO8, BSC010N04LS, in the synchronous rectification secondary stage in combination with QR CoolSET™ ICE2QR2280Z, high- and low-side driver 2EDL05N06PF, low-side gate driver 2EDN7524F and a XMC4200 microcontroller.

Features and benefits

Key features	Customer benefits
– 600 W LLC half-bridge stage with synchronous rectification (SR)	– Learn LLC topology with a complete system solution from Infineon – HW and- SW available
All controlled with XMC4200 including: – Start up (PWM to PFM) and burst-mode algorithms – Adaptive dead time and capacitive-mode detection – No hard commutation at any condition	– Close to customer solution – High efficiency → 97.8% – Reliability and power density

600 W LLC digital control	Specification		Infineon components	
	V_{in}	350-410 V_{DC}	MCU	XMC4200 (VQFN48)
	V_{out_nom}	12 V_{DC}	MOSFET SR	BSC010N04LS
	I_{out}	50 A	HB driver	2EDL05N06PF
	P_{out}	600 W	LLC HB MOSFET	CoolMOS™ IPP60R190P6
	f_{res}	157 kHz	Auxiliary PSU	ICE2QR2280Z

www.infineon.com/xmc **www.infineon.com/800w-pfc-eval** **www.infineon.com/600w-llc-eval**

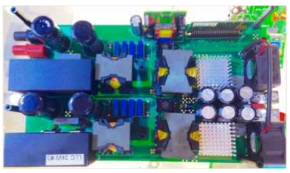
For more details on the product, click on the part number, visit infineon.com or contact our product support.

3 kW dual-phase LLC converter using XMC4400

The 3 kW dual-phase LLC demonstration board is an example of a high efficiency isolated DC-DC converter using the state-of-the-art Infineon components, both power devices and controller/driver ICs. The use of an advanced digital control using the XMC4400 microcontroller, together with the latest generation of CoolMOS™ and OptiMOS™ devices, allows achieving a very flat efficiency curve in the entire load range. The demonstration board is targets the high voltage DC-DC stage of high-end telecom rectifiers.

Features and benefits

Key features	Customer benefits
– Full digital control by XMC4400 on the secondary side	– Full digital control by XMC4400 on the secondary side
– Digital current sharing with phase shedding	– Efficiency peak 98.5% and more than 97.2% in the entire load range
– Accurate algorithm able to prevent hard commutation and capacitive load mode in LLC operation	– Easy monitoring and parameter setting via a graphic user interface

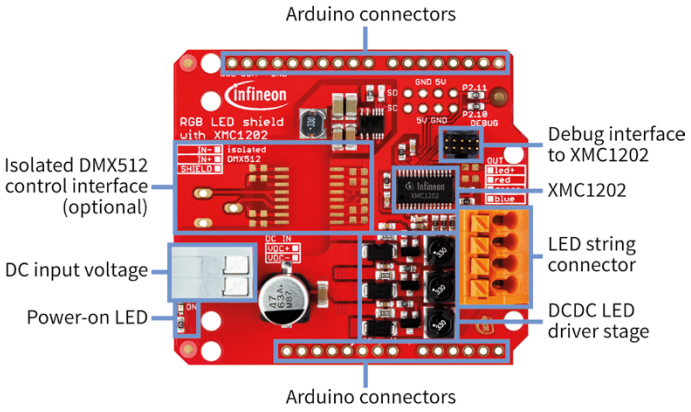
3 kW dual-phase LLC converter using XMC4400	Specification		Infineon components	
	V_{in}	350-410 V_{DC}	MCU	XMC4400 (LQFP64)
	V_{out_nom}	54.3 V_{DC}	SR MOSFET	OptiMOS™ BSC093N15NS5
	I_{out_max}	55 A	Drivers	1EDI60N12AF 2EDN7524R
	P_{out}	3000 W	LLC Half-bridge MOSFET	CoolMOS™ P6 IPW60R041P6
	f_{range}	90-200 kHz	Auxiliary PSU	ICE2QR2280Z
	Peak efficiency	>98.4%		

RGB LED lighting shield with XMC1202 for Arduino

The RGB LED lighting shield with XMC1202 for Arduino uses a DC-DC buck topology and is able to drive up to three LED channels with constant current. The shield itself is powered by a programmable XMC™ 32-bit Arm® MCU with embedded brightness color control unit (BCCU, XMC1200 MCU series), for flicker-free LED dimming and color control.

Features

- Compatible with Arduino Uno R3 and XMC1100 boot kit from Infineon
- Easily configurable for various light engines and any input voltage (within operating conditions)
- Wide DC input voltage range
- Simple I^2C interface



Operating conditions

- Nominal: 12-48 V input voltage (max. 6-60 V)
- Average LED current up to 700 mA (max. peak current 1 A)

The Infineon shields mentioned above are hardware compatible with Arduino and Infineon's XMC™ boot and relax kits.

www.infineon.com/shields-for-arduino

For more details on the product, click on the part number, visit infineon.com or contact our product support.

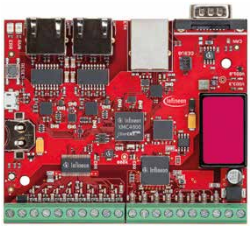
3 kW dual-phase LLC converter

XMC4800 automation board V2 – explore XMC4800 microcontroller based on Arm® Cortex®-M4

The XMC4800 automation board V2 uses Infineon's industry leading XMC™ Arm® Cortex®-M4 microcontroller in combination with Infineon's supply, interface, communication and safety products. The XMC4800 automation board V2 is designed to evaluate the capabilities of the XMC4800 microcontroller especially in EtherCAT® slave applications and can be used with a wide range of development tools including Infineon's free-of-charge Eclipse based IDE, DAVE™.

Features and benefits

Key features	Customer benefits
– XMC4800-E196 MCU based on Arm® Cortex®-M4 at 144 MHz	– Complete automation kit gateway
– EtherCAT® slave controller, 2 MB flash and 352 kB RAM	– Combined MCU with EtherCAT slave application
– OPTIGA™ Trust E embedded security solution (CC EAL6+)	– Isolated interfaces with diagnose
– Real time clock crystal	– Ethernet connectivity with software examples available
– SPI FRAM (64 kB non-volatile memory)	– 24 V supply
– EtherCAT® slave node (2 EtherCAT® PHY and RJ45 Jacks)	– CAN connectivity
– 24 V ISOFACE™ 8-channel inputs and 8-channel outputs CAN transceiver	– Full software DAVE™ examples
– CAN transceiver	

XMC4800 automation board V2	Type	Description	OPN
	KIT_XMC48_AUT_BASE_V2	The XMC4800 automation board V2 utilizes Infineon's industry leading XMC™ Arm® Cortex®-M4 microcontroller in combination with Infineon's supply, interface/communication and safety products	KITXMC48AUTBASEV2TOBO1
	XMC4800-E196K2048	Arm® Cortex®-M4 microcontroller	XMC4800E196K2048AAXQMA1
	ISO2H823V2.5	24 V 8-channel isolated output	ISO2H823V25XUMA1
	ISO1I813T	24 V 8-channel isolated input	ISO1I813TXUMA1
	SLS 32AIA020A4 USON10	OPTIGA™ Trust E – embedded security solution	SLS32AIA020A4USON10XTMA2
	TLE6250GV33	Infineon CAN transceiver	TLE6250GV33XUMA1
	IFX54441LDV	Infineon voltage regulator	IFX54441LDVXUMA1

www.infineon.com/automationkit

For more details on the product, click on the part number, visit infineon.com or contact our product support.

XMC™ wireless power controller – enabling wireless charging transmitter applications

Infineon's XMC™ wireless power controller, based on the Arm® Cortex®-M0 core, provides a powerful and cost-effective platform for high performance, smart and safe wireless charging applications. The XMC™ wireless power controller helps the next-generation wireless charging systems to meet strict safety, environmental and regulatory requirements, while still enabling industry-leading charging performance and efficiency. This controller works seamlessly with Infineon's power devices in a scalable architecture to provide a complete charging solution for everything from a fast-charge smartphone, to a 20 W robot, or a 60 W drone and beyond.

Features and benefits

Key features	Customer benefits
– Supports inductive and resonant charging methods	– Supports 15 W charging and existing standards, including fast charging of smartphones
– Power levels up to 60 W	– Full power 15 W without exotic thermal management
– Multiple industry standard and custom charging profiles using the same hardware architecture	– Achieves charging rates equivalent to wired charging
– Single- and multi-coil transmitters	– Supports custom-charging profiles and industry standards on the same hardware
– Half- and full-bridge support	– Foreign object detection (FOD) with improved accuracy quality-factor monitoring
– Variable and fixed-frequency transmitter types	– Foreign object detection capability can be extended beyond existing standards to improve detection
– Buck and boost topologies	– Supports custom coils, and greater than three coils
– Integrated flash for parameter storage	
– Voltage supply 1.8-5.5 V	
– Space saving VQFN-40 package	

For a detailed overview of Infineon's wireless charging solutions, check the Wireless charging chapter.

www.infineon.com/wirelesscharging

XMC™ starter kits

Kits and evaluation boards

Xtreme2Go

Order number: KIT_XMC_2GO_XTR_ XMC1400

› XMC1400 family kit with ADAFRUIT, MikroE and Shields2Go connectivity. Extension for IoT and other cloud applications.
› The XMC1400 series devices are optimized for motor control, power conversion and LED Lighting applications and Human-Machine Interface (HMI)

For more information on this product, please contact our product support.

Platform2Go XMC4400

Order number: KIT_XMC_PLT_2GO_XMC4400

› Equipped with an Arm® Cortex®-M4 based XMC™ microcontroller, the XMC4400 Platform2Go is designed to evaluate the capabilities of Infineon's XMC4400 microcontroller. It can be used with a wide range of development tools including Infineon's free of charge Eclipse based IDE DAVE™
› This kit has the XMC4400 device with debugger plus Ethernet, CAN, Arduino, MikroBUS and Shields2Go form factor.

Click on the following to find/purchase the kit:
www.infineon.com/XMC4400patform2go

XMC1400 Arduino

Order number: KIT_XMC1400_ARDUINO

› This kit utilizes Infineon's industry leading Arm® Cortex® M0 microcontroller in combination with Arduino form factor.
› It can be used with a wide range of development tools including Infineon's free of charge Eclipse based IDE, DAVE™ and much more.

Click on the following to find/purchase the kit:
www.infineon.com/xmc1400_ARDUINO

Platform2Go XMC4200

Order number: KIT_XMC_PLT 2GO_XMC 4200

- Equipped with an Arm® Cortex®-M4 based XMC™ microcontroller from Infineon Technologies AG, the XMC4200 Platform2Go is designed to evaluate the capabilities of Infineon's XMC4200 microcontroller.
- It can be used with a wide range of development tools including Infineon's free of charge Eclipse based IDE DAVE™
- This kit has the XMC4200 device with debugger plus CAN, Arduino, MikroBUS and Shields2Go form factor.

Click on the following to find/purchase the kit:
www.infineon.com/XMC4200patform2go

RGB LED Lighting Shield

Order number: KIT_XMC_LED_DALI_20_RGB



- One of the first intelligent evaluation boards compatible with Arduino as well as Infineon's XMC1100 BOOT KIT.
- Designed to be easily configurable and combinable for different LED light engines and lamps, for fast prototyping and in-expensive evaluation of LED lighting applications.
- The RGB LED lighting shield with XMC1302 uses a DC-DC buck topology.

Click on the following to find/purchase the kit:
www.infineon.com/cms/en/product/evaluation-boards/kit_xmc_led_dali_20_rgb/

XMC™ peripherals

IEC60730 class B library for XMC™

Supporting the XMC1xxx and XMC4xxx families

In collaboration with the consultancy Hitex, Infineon developed the IEC60730 – class B software library for XMC™ industrial microcontrollers for household electrical appliances. This is a dedicated software library for XMC™ MCUs with routines for internal supervisory functions and for self-diagnostics.

Extended documentation and pre-certified software libraries to XMC™ Cortex® Arm® based controllers are free of charge. For more information, please check: www.hitex.com/classb

Documentation	Consultancy
Safety application note Failure mode report FMEDA tool by Infineon, revised in workshops by TÜV Süd	hitex EMBEDDED TOOLS & SOLUTIONS Implementation support by Hitex

Embedded security for XMC™ MCUs

Infineon and its partners provide solutions which support with data protection, allowing authentication and encryption and securing firmware file updates to prevent cloning and downtimes.

Security solutions		
Software	**Hardware**	
Secure bootloader by Infineon, XMC1000	**OPTIGA™ family by Infineon** Hardware-based security solutions	
CodeMeter µEmbedded by WIBU, XMC4000 exclusive	**OPTIGA™ Trust family**	OPTIGA™ TPM family
KMS/CycurKEYS by ESCRYPT, XMC4000		
emSecure by SEGGER	Turnkey and programmable security solutions	Standardized certified turnkey solution

www.infineon.com/xmc

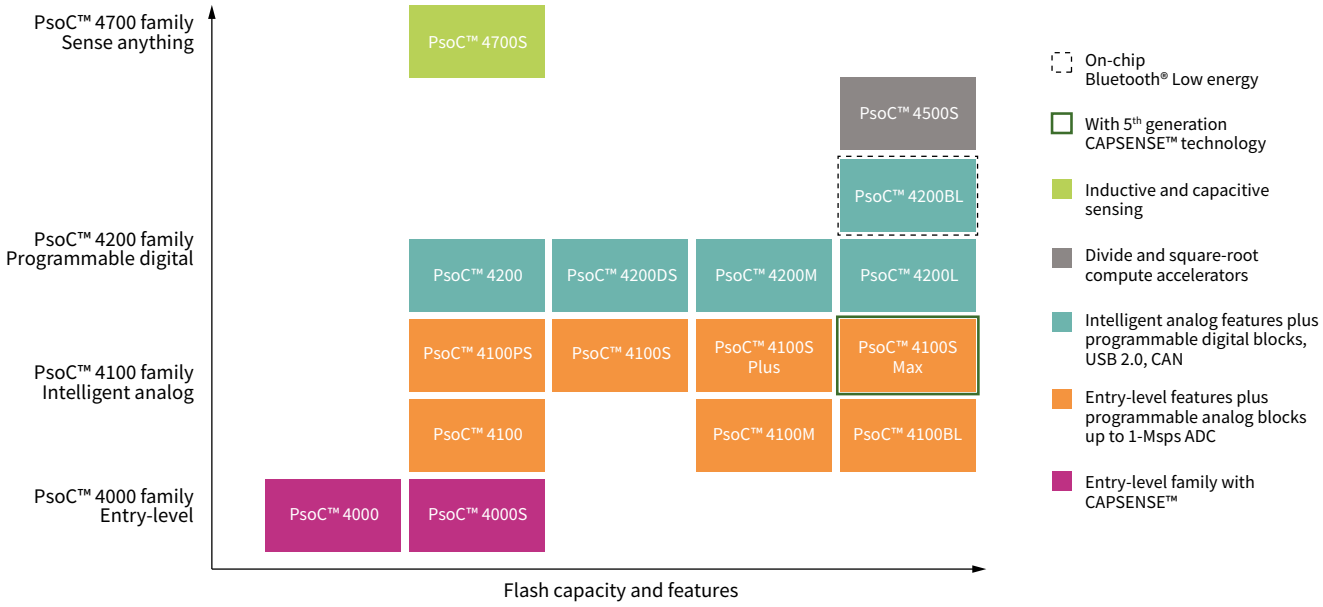
For more details on the product, click on the part number, visit infineon.com or contact our product support.

PSoC™ 4 microcontrollers

Your problem solver on chip

PSoC™ 4 has tackled some of the complex portions of embedded system design making it easier for you to get your product to market. Functions such as analog sensor integration, capacitive touch, and wireless connectivity have been integrated and optimized in PSoC™ 4 to just work.

The PSoC™ 4 portfolio consists of several families of Arm® Cortex®-M0 and Cortex-M0+ microcontrollers. Most devices in the portfolio include Infineon's CAPSENSE™ technology for capacitive-sensing applications. Other key features in the PSoC™ 4 portfolio include a customizable analog front end through programmable analog blocks as well as wired and wireless connectivity options such as USB, CAN, and Bluetooth® Low Energy. These unique features make PSoC 4 the industry's most flexible and scalable low-power mixed-signal architecture.



Features and benefits

Sense anything

Programmable analog and digital blocks in PSoC 4 enable you to customize your analog-front-end, apply simple glue logic and easily integrate intelligent analog sensors into an application

Intelligent sensor integration

Easy-to-use HMI

PSoC 4 simplifies complex HMI interfaces such as capacitive and inductive sensing enabling sleek, robust, and easy-to-use interfaces

Capacitive and inductive sensing

Connected

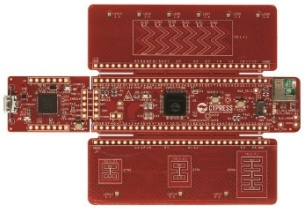
Bluetooth® Low Energy (BLE) integrated into some PSoC 4 devices simplifies RF design. Additional wired interfaces such as USB and CAN are also available

Wired and wireless connectivity

www.infineon.com/psoc4

For more details on the product, click on the part number, visit infineon.com or contact our product support.

Evaluation kits

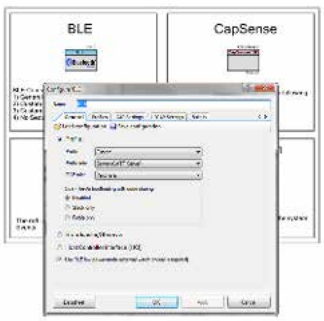
Make it smarter	Make it connected	Make it easy to use
 PSoC™ 4100S Plus prototyping kit (CY8CKIT-149)	**Bluetooth® Low Energy kits**  CY8CKIT-143-A  CY8CKIT-141	**HMI kits for capacitive/inductive sensing**  PSoC™ 4000S prototyping kit (CY8CKIT-145-40xx)
 PSoC™ 4100PS prototyping kit (CY8CKIT-147)	**PSoC™ 4 Bluetooth® LE modules* with PCB or external antenna**  PSoC™ 4 Bluetooth® LE Pioneer kit (CY8CKIT-042-BLE-A)	 PSoC™ 4700S Inductive Sensing Evaluation kit (CY8CKIT-148)
 PSoC™ 4100S Max pioneer kit (CY8CKIT-041S-MAX)	 CySmart BLE USB Dongle (CY5677)	

Software

ModusToolbox™ Software Environment



PSoC™ Creator IDE with graphical front ends



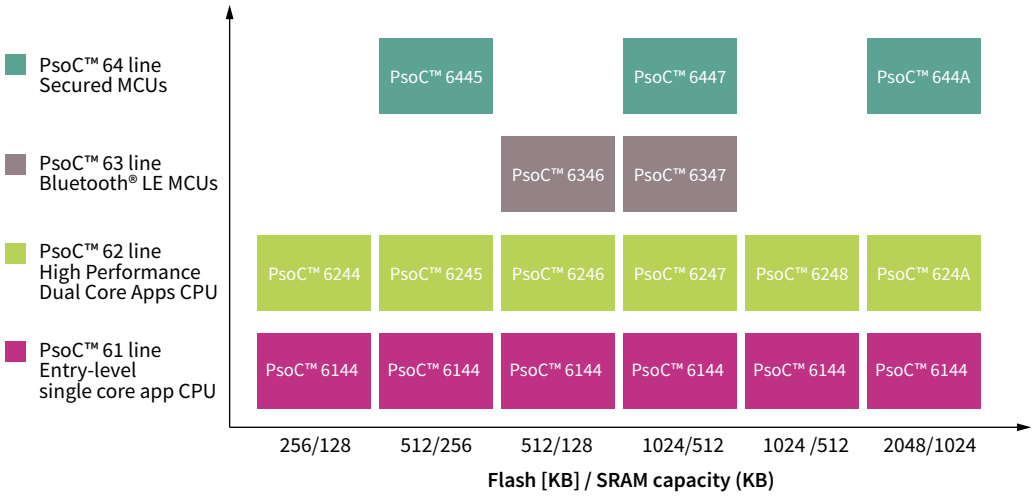
www.infineon.com/psoc4

For more details on the product, click on the part number, visit infineon.com or contact our product support.

PSoC™ 6 microcontrollers

Purpose-Built for IoT

The PSoC™ 6 family is built on an ultra-low-power architecture, and the MCUs feature low-power design techniques that are ideal for battery-powered applications. The dual-core Arm® Cortex®-M4 and Cortex-M0+ architecture let designers optimize for power and performance simultaneously. Using its dual cores combined with configurable memory and peripheral protection units, the PSoC™ 6 MCU delivers the highest level of protection defined by the Platform Security Architecture (PSA) from Arm. Designers can use the MCU's rich analog and digital peripherals to create custom analog front ends (AFEs) or digital interfaces for innovative system components such as MEMS sensors, and electronic ink displays. The PSoC™ 6 MCU features the latest generation of industry-leading CAPSENSE™ capacitive-sensing technology, enabling modern touch and gesture-based interfaces that are robust and reliable. PSoC™ 6 MCU, paired with Infineon's AIROC™ Wi-Fi, AIROC™ Bluetooth®, or AIROC™ combos radio modules, is the perfect solution for secure, low-power, feature-rich IoT products.



Features and benefits

Lowest power

IoT devices are often portable, making battery life a critical factor. The PSoC™ 6 MCU architecture is built on a cutting-edge, ultra-low-power, 40-nm process technology with a dual Arm® Cortex®-M core architecture. Active power consumption is as low as 22-µA/MHz for the M4 core, and 15-µA/MHz for the M0+ core. PSoC™ 6 delivers extended battery life without sacrificing performance.

Most flexibility

The PSoC™ 6 MCU architecture's best-in-class flexibility enables the addition of new features and addresses the need for unique IoT products with multiple connectivity options, such as USB and BLE. PSoC™ 6 also offers software-defined peripherals to create custom analog and digital circuits, and the industry's best capacitive-sensing solution, CAPSENSE®. In addition, a flexible dual-core architecture is used to optimize for system power consumption and performance. The possibilities are endless.

Built-in security

The PSoC™ 6 MCU architecture supports multiple, simultaneous secure environments without the need for external memories or secure elements, and offers scalable secure memory for multiple, independent user-defined security policies, preventing your IoT device from becoming a security liability. PSoC™ 6 provides you with a new standard for IoT security.

www.infineon.com/psoc6

PSoC™ 6 Kits

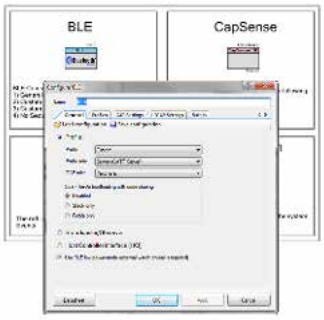
Product family	Kit type	Kit MPN	Selection factors
PSoC™ 61, PSoC™ 62 product family			
PSoC™ 62xA, 62x8, 61xA, 61x8	Prototyping	CY8CPROTO-062-4343W	Highest-end MCU, single-band Wi-Fi
	Pioneer	CY8CKIT-062S2-43012	Highest-end MCU, machine learning, graphics, dual-band/low power Wi-Fi, Arduino shield capability
	Evaluation	CY8CEVAL-062S2	Highest-end MCU, machine learning, graphics, flexible M.2 card-based Wi-Fi module evaluation (single-band, dual-band), Arduino shield capability, mikroBUS interface
PSoC™ 62x7, 62x6, 61x7, 61x6	Pioneer	CY8CKIT-062-WIFI-BT	Standalone MCU, graphics, single-band Wi-Fi, analog rich, Arduino shield capability
PSoC™ 62x5, 61x5	Prototyping	CY8CPROTO-062S3-4343W	Standalone MCU, single-band Wi-Fi connectivity processor, industrial (CAN-FD)
PSoC™ 62x4, 61x4	Pioneer	CY8CKIT-062S4	Standalone MCU, low power analog, sensor coprocessor, Arduino shield capability
PSoC™ 64 Product Family			
PSoC™ 64xA	Pioneer	CY8CKIT-064B0S2-4343W	Standalone secured MCU, trusted firmware-M, single-band Wi-Fi, Arduino shield capability
PSoC™ 64x7	Prototyping	CY8CPROTO-064S1-SB	Standalone secured MCU
PSoC™ 64x5	Prototyping	CY8CPROTO-064B0S3	Standalone secured MCU, industrial (CAN-FD)

Software

ModusToolbox™ Software Environment



PSoC™ Creator IDE with graphical front ends



www.infineon.com/psoc6

For more details on the product, click on the part number, visit infineon.com or contact our product support.



AURIX™ – 32-bit microcontrollers

32-bit multicore TriCore™ – safety joins performance

AURIX™ is Infineon's family of microcontrollers serving the needs of industrial applications in terms of performance and safety. Its innovative multicore architecture, based on up to six independent 32-bit TriCore™ CPUs at 300 MHz, has been designed to meet the highest safety standards while increasing the performance at the same time. Using the AURIX™ scalable platform, developers will be able to implement applications such as motor control and drives, PLC or any other automation application. Developments using AURIX™ require less effort to achieve the SIL/IEC61508 standard based on its innovative safety concept and multiple HW safety features. Furthermore, AURIX™ has enhanced communication capabilities to support communication between CAN, LIN, FlexRay and Ethernet buses.

Features and benefits

Key features	Customer benefits
– TriCore™ with DSP functionality	– High scalability gives the best cost-performance fit
– Best-in-class real-time performance: up to six TriCore™ with up to 300 MHz per core	– High integration leads to significant cost savings
– Supporting floating point and fix point with all cores	– High integration leads to reduced complexity
– Up to 6.9 MB of internal RAM, up to 16 MB of flash	– Innovative supply concept leads to best-in-class power consumption
– Innovative single supply 5 V or 3.3 V	
– IEC61508 conformance to support safety requirements up to SIL 3	
– Embedded EEPROM	
– Advanced communication peripherals: CAN FD, LIN, SPI, FlexRay, Ethernet	

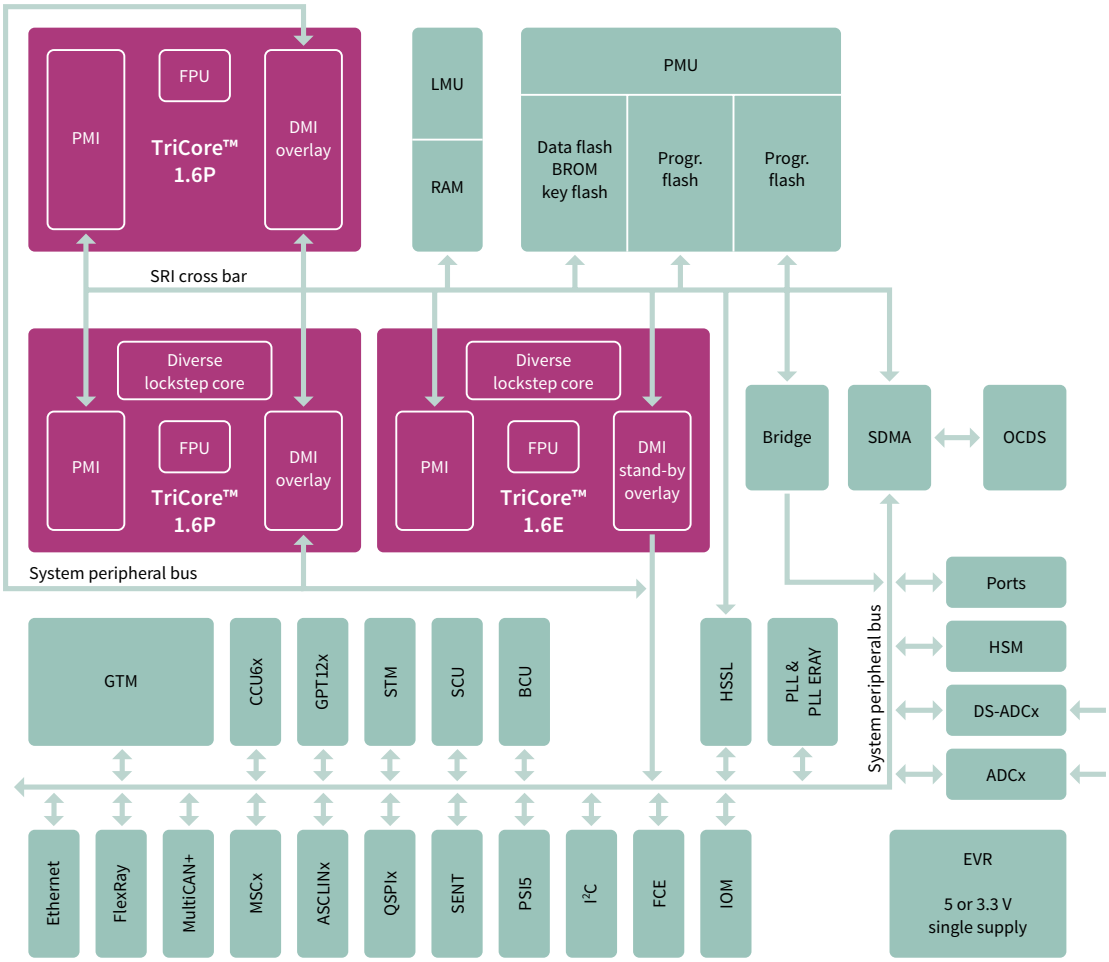


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AURIX™ TC2xx family system architecture

Powerful 1st generation AURIX™ TC2xx system architecture



AURIX™ TC2xx family package scalability

Flash \ Package	TQFP-80	TQFP-100	LQFP-144 TQFP-144	LQFP-176	LFBGA-292	BGA-416	LFBGA-516
9x series up to 8 MB					TC297 300 MHz	TC298 300 MHz	TC299 300 MHz
7x series up to 4 MB				TC275 200 MHz	TC277 200 MHz		
6x series up to 2.5 MB			TC264 200 MHz	TC265 200 MHz	TC267 200 MHz		
3x series up to 2 MB		TC233 200 MHz	TC234 200 MHz		TC237 200 MHz		
2x series up to 1 MB	TC222 133 MHz	TC223 133 MHz	TC224 133 MHz				
1x series up to 512 KB	TC212 133 MHz	TC213 133 MHz	TC214 133 MHz				

↕ Upgrade/downgrade with pin-compatible packages

www.infineon.com/aurix

AURIX™ TC2xx portfolio

Product type	Max. clock frequency [MHz]	Program memory [kB]	SRAM (incl. cache) [kB]	Co-processor[1]	Cores/lockstep	Timed I/O	Number of ADC channels	External bus interface	CAN nodes	Communication interfaces[2]	Temperature ranges[3]	Packages	Additional features/remarks[4]
TC299TX	300	8000	2728	FPU	3/1	263	84/10 DS	yes	6	4xASCLIN, 6xQSPI, 3xMSC, 2xI²C, 15xSENT, HSSL, 5xPSI5, 2xFlexRay, Ethernet, CAN FD	K	LFBGA-516	EVR, STBU, HSM
TC299TP	300	8000	728	FPU	3/1	263	84/10 DS	yes	6	4xASCLIN, 6xQSPI, 3xMSC, 2xI²C, 15xSENT, HSSL, 5xPSI5, 2xFlexRay, Ethernet, CAN FD	K	LFBGA-516	EVR, STBU, HSM
TC298TP	300	8000	728	FPU	3/1	232	60/10 DS	yes	6	4xASCLIN, 6xQSPI, 3xMSC, 2xI²C, 15xSENT, HSSL, 5xPSI5, 2xFlexRay, Ethernet, CAN FD	K	LBGA-416	EVR, STBU, HSM
TC297TA	300	8000	2728	FPU, FFT, CIF	3/1	169	60/10 DS	no	6	4xASCLIN, 4xQSPI, 3xMSC, 2xI²C, 15xSENT, HSSL, 5xPSI5, 2xFlexRay, Ethernet, CAN FD	K	LFBGA-292	EVR, STBU, HSM
TC297TX	300	8000	2728	FPU	3/1	263	60/10 DS	no	6	4xASCLIN, 4xQSPI, 3xMSC, 2xI²C, 15xSENT, HSSL, 5xPSI5, 2xFlexRay, Ethernet, CAN FD	K	LFBGA-292	EVR, STBU, HSM
TC297TP	300	8000	728	FPU	3/1	169	60/10 DS	no	6	4xASCLIN, 4xQSPI, 3xMSC, 2xI²C, 15xSENT, HSSL, 5xPSI5, 2xFlexRay, Ethernet, CAN FD	K	LFBGA-292	EVR, STBU, HSM
TC277TP	200	4000	472	FPU	3/2	169	60/6 DS	no	4	4xASCLIN, 4xQSPI, 2xMSC, HSSL, 2xI²C, 10xSENT, 3xPSI5, FlexRay, Ethernet, CAN FD	K	LFBGA-292	EVR, WUT, HSM
TC275TP	200	4000	472	FPU	3/2	112	60/6 DS	no	4	4xASCLIN, 4xQSPI, 2xMSC, HSSL, 2xI²C, 10xSENT, 3xPSI5, FlexRay, Ethernet, CAN FD	K	LQFP-176	EVR, WUT, HSM
TC267D	200	2500	240	FPU	2/1	169	50/3 DS	no	5	4xASCLIN, 4xQSPI, 2xMSC, 2xI²C, 10xSENT, 3xPSI5, HSSL, FlexRay, Ethernet, CAN FD	K	LFBGA-292	EVR, STBU
TC265D	200	2500	240	FPU	2/1	112	50/3 DS	no	5	4xASCLIN, 4xQSPI, 2xMSC, 2xI²C, 10xSENT, HSSL, 3xPSI5, FlexRay, Ethernet, CAN FD	K	LQFP-176	EVR, STBU
TC264DA	200	2500	752	FPU, FFT, CIF	2/1	88	40/3 DS	no	5	4xASCLIN, 4xQSPI, 2xMSC, 2xI²C, 10xSENT, HSSL, 3xPSI5, FlexRay, Ethernet, CAN FD	K	LQFP-144	EVR, STBU
TC264D	200	2500	240	FPU	2/1	88	40/3 DS	no	5	4xASCLIN, 4xQSPI, 2xMSC, 2xI²C, 10xSENT, HSSL, 3xPSI5, FlexRay, Ethernet, CAN FD	K	LQFP-144	EVR, STBU
TC237LP	200	2000	192	FPU	1/1	120	24	no	6	2xASCLIN, 4xQSPI, 4xSENT, FlexRay, CAN FD	K	LFBGA-292	EVR, WUT, HSM
TC234LA	200	2000	704	FPU, FFT	1/1	120	24	no	6	2xASCLIN, 4xQSPI, 4xSENT, FlexRay, Ethernet	K	TQFP-144	EVR, WUT, HSM
TC234LX	200	2000	704	FPU	1/1	120	24	no	6	2xASCLIN, 4xQSPI, 4xSENT, FlexRay, Ethernet	K	TQFP-144	EVR, WUT, HSM
TC234LP	200	2000	192	FPU	1/1	120	24	no	6	2xASCLIN, 4xQSPI, 4xSENT, FlexRay, CAN FD	K	TQFP-144	EVR, WUT, HSM
TC233LP	200	2000	192	FPU	1/1	78	24	no	6	2xASCLIN, 4xQSPI, 4xSENT, FlexRay, CAN FD	K	TQFP-100	EVR, WUT, HSM
TC224L	133	1000	96	FPU	1/1	120	24	no	3	2xASCLIN, 4xQSPI, 4xSENT, CAN FD	K	TQFP-144	EVR, WUT
TC223L	133	1000	96	FPU	1/1	78	24	no	3	2xASCLIN, 4xQSPI, 4xSENT, CAN FD	K	TQFP-100	EVR, WUT
TC222L	133	1000	96	FPU	1/1	59	24	no	3	2xASCLIN, 4xQSPI, 4xSENT, CAN FD	K	TQFP-80	EVR, WUT
TC214L	133	500	96	FPU	1/1	120	14	no	3	2xASCLIN, 4xQSPI, 4xSENT, CAN FD	K	TQFP-144	EVR, WUT
TC213L	133	500	96	FPU	1/1	78	24	no	3	2xASCLIN, 4xQSPI, 4xSENT, CAN FD	K	TQFP-100	EVR, WUT
TC212L	133	500	96	FPU	1/1	59	24	no	3	2xASCLIN, 4xQSPI, 4xSENT, CAN FD	K	TQFP-80	EVR, WUT

[1] CIF = camera and external ADC Interface, FFT = fast fourier transform accelerator, FPU = floating point unit, PCP = peripheral control processor
[2] ASC = asynchronous serial channel, ASCLIN = asyn/synchronous local interconnect network, HSSL= high-speed serial link, I²C = inter-integrated circuit, LIN = local interconnect network, MLI = micro link interface, MSC = micro second channel, PSI5 = peripheral sensor interface 5, QSPI = queued serial peripheral interface, SENT = single edge nibble transmission, SSC = synchronous serial channel, CAN FD ISO11898-1:2015
[3] Ambient temperature range: A = -40°C ... 140°C, B = 0°C ... 70°C, F = -40°C ... 85°C, H = -40°C ... 110°C, K = -40°C ... 125°C, L = -40°C ... 150°C, X = -40°C ... 105°C
[4] EVR = embedded voltage regulator, HSM = hardware security module, STBU = stand-by control unit, WUT = wake-up timer

Evolution from TC2xx to TC3xx - Easy migration with focus on reuse

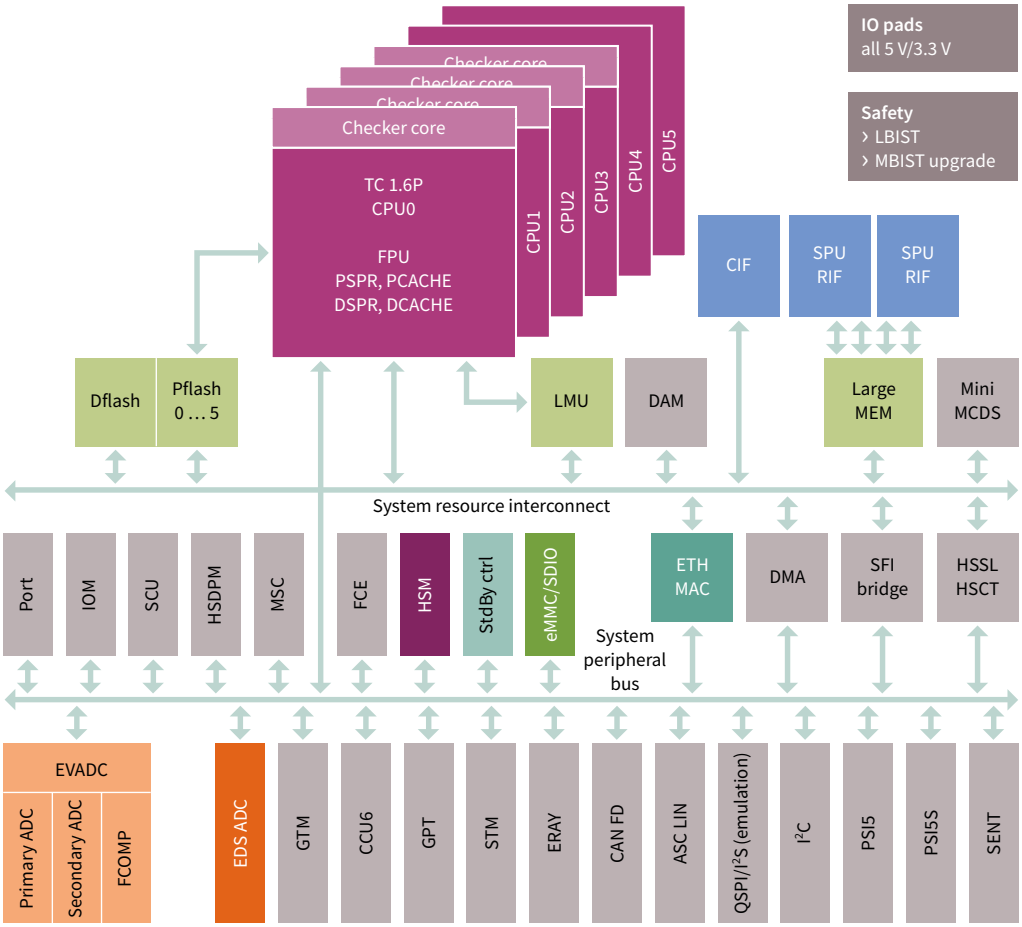
- Fast conversion of existing AURIX™ TC2xx designs
  - Backwards compatibility
  - High AURIX™ TC3xx compatibility to pinout of existing QFP100/144/176 and BGA packages
- Flexibility - scalability within the AURIX™ TC3xx family
  - Up-/Downgrade paths for devices in identical packages
  - Compatible pin-out of QFP/BGA package options enabling combination designs
- Pin-to-pin compatibility between the devices of AURIX™ TC2xx/TC3xx and from generation to generation
- A high scalability with a very large portfolio for both AURIX™ TC2xx and TC3xx

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AURIX™ TC3xx family system architecture

AURIX™ TC3xx – scalable family - from low-cost to high-performance applications



Performance
› New TriCore™ 162 generation
› New instructions
› Up to 6 CPUs at 300 MHz
› New direct flash access path

HSM: Full EVITA compliance
› New accelerators ECC256/SHA256
› Available on all devices

ADAS
› LVDS IF
› Signal processing unit

ADC
› Improvement of existing ADC
› Reduction of capacitive load

Delta-sigma
› Enhanced concept

Memories
› Larger SRAM
› SRAM/flash ratio increased
› Enhanced MPU
› A/B swap support

Stand-by control unit
› Low-power modes

Ethernet
› 1 Gbit/s ETH
› QoS services
› Remote DMA

eMMC/SDIO
› External NAND flash IF

AURIX™ TC3xx provides an upgrade on key parameters with focus on SW and HW reuse

Performance increase and reduction of power	Increased from 3 to 6 cores Developed in 40 nm for power consumption reduction
Scalable and backwards compatible with TC2xx	Fully compatible devices with focus on HW & SW reuse
Functional safety	IEC61508 compliant enabling SiL-3 level
Enhanced security	Upgraded to Full EVITA support
Improved networking	Richer peripheral set
SOTA	Full support of SOTA A/B swap

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AURIX™ TC3xx package scalability

		TQFP-80	TQFP-100	T/LQFP-144	BGA-180	LQFP-176	BGA-233	LFBGA-292	LFBGA-516
6x 300 MHz	9x A series 16 MB							TC397XA 300 MHz	
6x 300 MHz	9x series 16 MB							TC397x 300 MHz	TC399x 300 MHz
4x 300 MHz	Ex series 12 MB							TC387Qx 300 MHz	
4x 300 MHz	8x series 10 MB							TC387Q 300 MHz	TC389Q 300 MHz
3x 300 MHz	7x X series 6 MB							TC377TX 300 MHz	
3x 300 MHz	7x series 6 MB					TC375T 300 MHz		TC377T 300 MHz	
2x 300 MHz	6x series 4 MB			TC364D 300 MHz	TC366D 300 MHz	TC365D 300 MHz		TC367D 300 MHz	
4x 300 MHz	Ax series 4 MB						TC3A8Q 300 MHz	TC3A7Q 300 MHz	
3x 300 MHz	5x A series 4 MB				TC356TA 300 MHz			TC357TA 300 MHz	
2x 300 MHz	3x A series 2 MB				TC336DA[1] 200 MHz			TC337DA[1] 200 MHz	
1x 300 MHz	3x series 2 MB	TC332L[1] 200 MHz	TC333L[1] 200 MHz	TC334L[1] 200 MHz	TC336L[1] 200 MHz			TC337L[1] 200 MHz	
1x 300 MHz	2x series 1 MB	TC322L 160 MHz	TC323L 160 MHz	TC324L 160 MHz				TC327L 160 MHz	

Flash / Package

L – Single lockstep core D – Dual core T – Triple core Q – Quadruple core X – Sextuple core

1) An option of 300 MHz is also available

Control and actuate | Sense and compute

– Advanced package technologies deliver the best price/performance ratio
– Customers can choose between different devices in the same pin-compatible package

MCU scalability
› Performance and flash
› Pin compatibility
› Binary-compatible cores

Safety/security concept
› ISO 26262 compliance
› IEC61508 compliant

AURIX™ TC3xx

Power consumption
› On-chip SC DC-DC high-efficiency power supply
› Integrated standby controller

Connectivity
› Ethernet: up to 2x1 GB
› CAN FD: up to 12 channels
› eMMC IF

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AURIX™ TC3xx portfolio

Product type	Cores/lockstep	Max clock frequency [MHz]	Program memory [kB]	SRAM (incl. cache) [kB]	Radar accelerator/ radar interface [1]	CAN/CAN FD nodes	Ethernet 100/1000 Mbit	External bus interface [2]	Communication interfaces	HSM	Temperature ranges	Packages	Additional features/ remarks [3]
AURIX™ TC3xx family													
TC399XX	6/4	300	16000	6912	no	12	1	EBU, eMMC, 2x HSSL	6x SPI, 2x FlexRay, 12x LIN, 25x SENT, 4x PSI5, 2x I²C, 4x MSC	EVITA full	K, L	LFBGA-516	5 V/3.3 V EVR, 8-bit SCR
TC399XP	6/4	300	16000	2816	no	12	1	EBU, eMMC, 2x HSSL	6x SPI, 2x FlexRay, 12x LIN, 25x SENT, 4x PSI5, 2x I²C, 4x MSC	EVITA full	K, L	LFBGA-516	5 V/3.3 V EVR, 8-bit SCR
TC397XX	6/4	300	16000	6912	no	12	1	eMMC, 2x HSSL	6x SPI, 2x FlexRay, 12x LIN, 25x SENT, 4x PSI5, 2x I²C, 4x MSC	EVITA full	K, L	LFBGA-292	5 V/3.3 V EVR, 8-bit SCR
TC397XP	6/4	300	16000	2816	no	12	1	eMMC, 2x HSSL	6x SPI, 2x FlexRay, 12x LIN, 25x SENT, 4x PSI5, 2x I²C, 4x MSC	EVITA full	K, L	LFBGA-292	5 V/3.3 V EVR, 8-bit SCR
TC397XA	6/4	300	16000	6912	2x SPU/ 8x 400 Mbit/s LVDS	12	1	2x HSSL	6x SPI, 2x FlexRay, 12x LIN, 25x SENT, 4x PSI5, 2x I²C, 4x MSC	EVITA full	K, L	LFBGA-292	5 V/3.3 V EVR, 8-bit SCR
TC389QP	4/2	300	10000	1568	no	12	1	HSSL	5x SPI, 2x FlexRay, 24x LIN, 25x SENT, 4x PSI5, 2x I²C, 3x MSC	EVITA full	K, L	LFBGA-516	5 V/3.3 V EVR, 8-bit SCR
TC387QP	4/2	300	10000	1568	no	12	1	HSSL	5x SPI, 2x FlexRay, 24x LIN, 25x SENT, 4x PSI5, 2x I²C, 3x MSC	EVITA full	K, L	LFBGA-292	5 V/3.3 V EVR, 8-bit SCR
TC377TX	3/3	300	6000	4208	no	12	2	eMMC, HSSL	5x SPI, 1x FlexRay, 12x LIN, 15x SENT, 2x PSI5, 1x I²C, 2x MSC	EVITA full	K, L	LFBGA-292	5 V/3.3 V EVR, 8-bit SCR
TC377TP	3/2	300	6000	1136	no	8	1	HSSL	5x SPI, 1x FlexRay, 12x LIN, 15x SENT, 2x PSI5, 1x I²C, 2x MSC	EVITA full	K, L	LFBGA-292	5 V/3.3 V EVR, 8-bit SCR
TC375TP	3/2	300	6000	1136	no	8	1	HSSL	5x SPI, 1x FlexRay, 12x LIN, 15x SENT, 2x PSI5, 1x I²C, 2x MSC	EVITA full	K, L	LQFP-176	5 V/3.3 V EVR, 8-bit SCR
TC367DP	2/2	300	4000	672	no	8	1	HSSL	4x SPI, 1x FlexRay, 12x LIN, 10x SENT, 2x PSI5, 1x I²C, 1x MSC	EVITA full	K, L	LFBGA-292	5 V/3.3 V EVR, 8-bit SCR
TC366DP	2/2	300	4000	672	no	8	1	HSSL	4x SPI, 1x FlexRay, 12x LIN, 10x SENT, 2x PSI5, 1x I²C, 1x MSC	EVITA full	K, L	LFBGA-196	5 V/3.3 V EVR, 8-bit SCR
TC365DP	2/2	300	4000	672	no	8	1	HSSL	4x SPI, 1x FlexRay, 12x LIN, 10x SENT, 2x PSI5, 1x I²C, 1x MSC	EVITA full	K, L	LQFP-176	5 V/3.3 V EVR, 8-bit SCR
TC364DP	2/2	300	4000	672	no	8	1	HSSL	4x SPI, 1x FlexRay, 12x LIN, 10x SENT, 2x PSI5, 1x I²C, 1x MSC	EVITA full	K, L	TQFP-144	5 V/3.3 V EVR, 8-bit SCR
TC364DP	2/2	300	4000	672	no	8	1	HSSL	4x SPI, 1x FlexRay, 12x LIN, 10x SENT, 2x PSI5, 1x I²C, 1x MSC	EVITA full	K, L	LQFP-144	5 V/3.3 V EVR, 8-bit SCR
TC357TA	3/2	300	4000	3664	2x SPU/ 8x 400 Mbit/s LVDS	8	1	no	4x SPI, 1x FlexRay, 4x LIN	EVITA full	K, L	LFBGA-292	5 V/3.3 V EVR, 8-bit SCR
TC356TA	3/2	300	4000	3664	2x SPU/ 8x 400 Mbit/s LVDS	8	1	no	4x SPI, 1x FlexRay, 4x LIN	EVITA full	K, L	LFBGA-196	5 V/3.3 V EVR, 8-bit SCR
TC337DA	2/1	200	2000	1568	1x SPU/ 4x 400 Mbit/s LVDS	8	1	eMMC	4x SPI, 1x FlexRay, 12x LIN, 6x SENT	EVITA full	K, L	LFBGA-292	5 V/3.3 V EVR, 8-bit SCR
TC336DA	2/1	200	2000	1568	1x SPU/ 4x 400 Mbit/s LVDS	8	1	eMMC	4x SPI, 1x FlexRay, 12x LIN, 6x SENT	EVITA full	K, L	LFBGA-196	5 V/3.3 V EVR, 8-bit SCR
TC337LP	1/1	200	2000	248	no	8	no	no	4x SPI, 1x FlexRay, 12x LIN, 6x SENT	EVITA full	K, L	LFBGA-292	5 V/3.3 V EVR, 8-bit SCR
TC336LP	1/1	200	2000	248	no	8	no	no	4x SPI, 1x FlexRay, 12x LIN, 6x SENT	EVITA full	K, L	LFBGA-196	5 V/3.3 V EVR, 8-bit SCR
TC334LP	1/1	200	2000	248	no	8	no	no	4x SPI, 1x FlexRay, 12x LIN, 6x SENT	EVITA full	K, L	TQFP-144	5 V/3.3 V EVR, 8-bit SCR
TC333LP	1/1	200	2000	248	no	8	no	no	4x SPI, 1x FlexRay, 12x LIN, 6x SENT	EVITA full	K, L	TQFP-100	5 V/3.3 V EVR, 8-bit SCR
TC332LP	1/1	200	2000	248	no	8	no	no	4x SPI, 1x FlexRay, 12x LIN, 6x SENT	EVITA full	K, L	TQFP-80	5 V/3.3 V EVR, 8-bit SCR
TC327LP	1/1	160	1000	96	no	8	no	no	4x SPI, 6x SENT, 6x LIN	EVITA full	K, L	LFBGA-292	5 V/3.3 V EVR, 8-bit SCR
TC324LP	1/1	160	1000	96	no	8	no	no	4x SPI, 6x SENT, 6x LIN	EVITA full	K, L	TQFP-144	5 V/3.3 V EVR, 8-bit SCR
TC323LP	1/1	160	1000	96	no	8	no	no	4x SPI, 6x SENT, 6x LIN	EVITA full	K, L	TQFP-100	5 V/3.3 V EVR, 8-bit SCR
TC322LP	1/1	160	1000	96	no	8	no	no	4x SPI, 6x SENT, 6x LIN	EVITA full	K, L	TQFP-80	5 V/3.3 V EVR, 8-bit SCR

1) SPU – Signal processing unit
2) HSSL – High-speed serial link
3) 8-bit SCR – Standby controller for low power modes
4) EVR – Embedded voltage regulator

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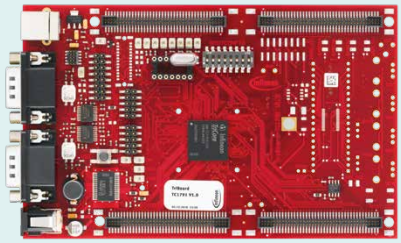
AURIX™ starter and application kits

Infineon starter kits – 32-bit microcontrollers

AURIX™ Triboards Kits

- Full evaluation board for development to write and debug your 1st programs
- Includes getting started advice, free TriCore™ entry tool chain, technical documentation, compiler and debugger
- TriBoard available for all productive silicon

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AURIX™ TFT Kits

- Low cost board for early evaluation with limited access to signals
- Additional touchscreen display for convenient handling
- TFT board available for every silicon

Click on the following to find/purchase the kit:

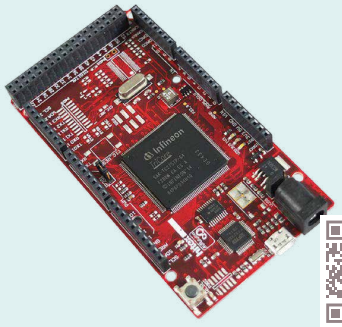
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Arduino AURIX™ TC275 ShieldBuddy Kit

- The Hitex TC275/TC375 ShieldBuddy follows the Arduino standard
- Compatible with hundreds of Arduino application shields
- Evaluation licenses available
- Ideal for getting started on a high-end real time embedded industrial or automotive application as well as students and hobbyists

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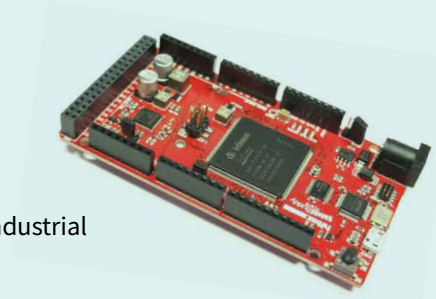


Arduino AURIX™ TC375 ShieldBuddy Kit

Order number: KIT_A2G_TC375_ARD_SB

- Compatible with hundreds of Arduino application shields
- Evaluation licenses available
- Ethernet
- Ideal for getting started on a high-end real time embedded industrial or automotive application as well as students and hobbyists

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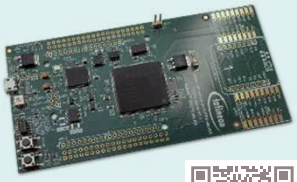
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AURIX™ TC275 Lite kit

- AURIX™ TC275 device in LQFP-176 package
- FTDI based debugger with micro USB
- Use of Arduino Uno/compatible platform

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AURIX™ TC375 Lite kit

- AURIX™ TC375 device in LQFP-176 package
- Ethernet PHY
- FTDI based debugger with micro USB
- Use of Arduino Uno/compatible platform

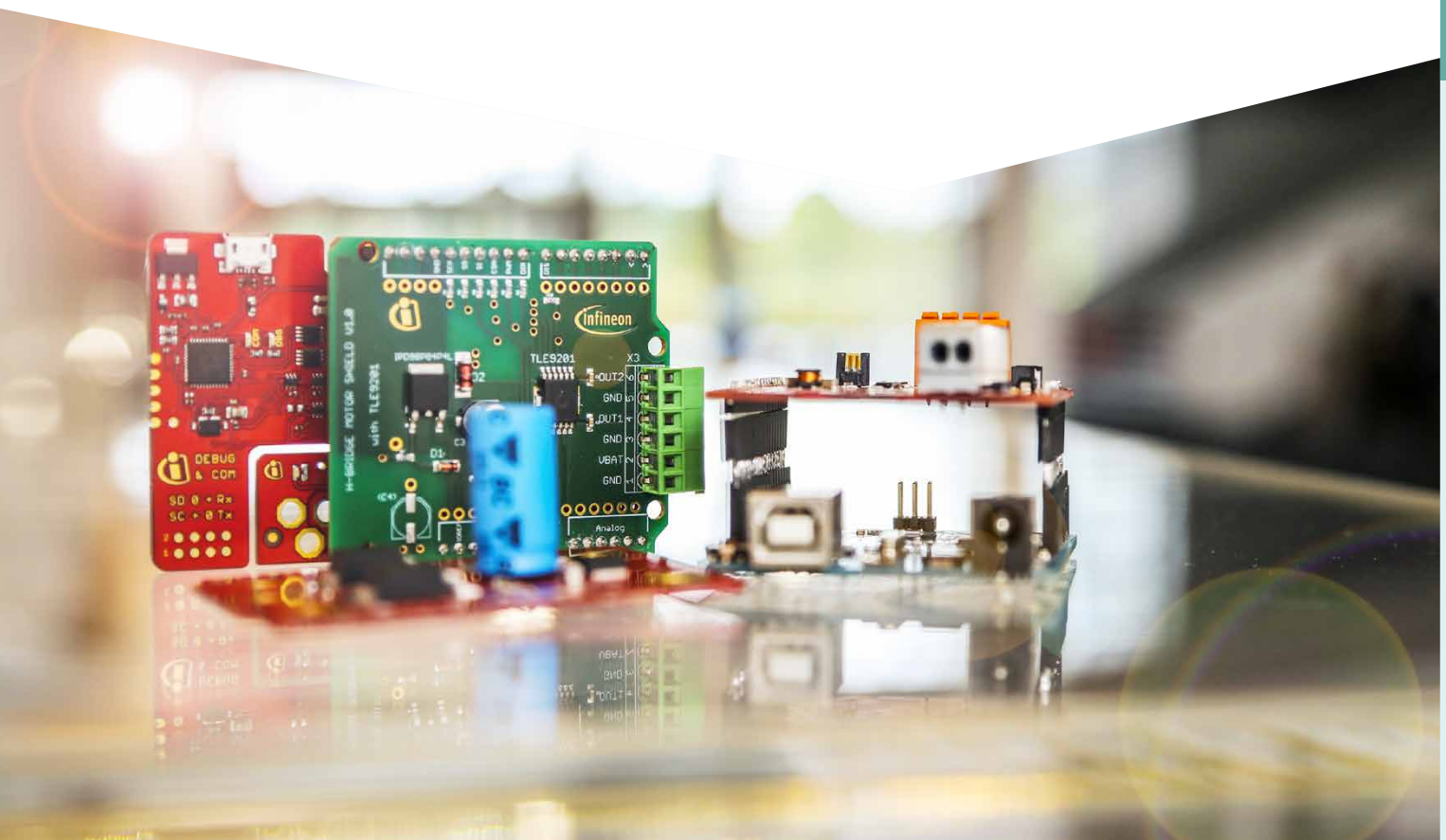
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Infineon application kits – 32-bit microcontrollers

24 GHZ Radar

Based on the Infineon AURIX™ and MMIC BGT24A families

- BGT24A transceiver MMIC family, e.g. BGTA24ATR12,
- 2-bit radar microcontroller family, e.g. SAK-TC264DA- 40F200
- FFT acceleration engine and extended memory for radar image storage
- Ethernet as measurement interface

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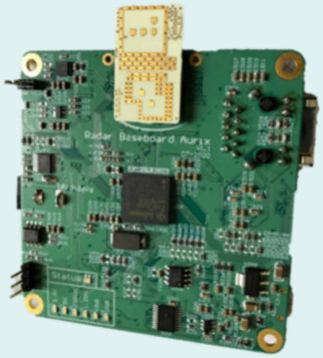


60 GHZ Radar

XENSIV™ BGT60ATR24C
+ AURIX™ TC356TA
+ OPTIREG™ TLS4120D0EPV33/TLS715B0EJV50

- Modular architecture
- Automotive qualified components
- Virtual array processing (TDM MIMO)
- Ultra-wideband operation of 4 GHz
- Optimized performance versus power with SPU

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Motor control

Order number: KIT_AURIX_TC234_MOTORCTR

- TC234 application kit with TFT display incl. safety supply TLF35584
- Driving of a 3-phase PMSM/BLCD (12 V/max. 50 W)
- BLDC motor from Nanotec integrated
- Software available with flexible configuration

www.infineon.com/aurixapplicationkits



Motor control board AURIX™ TC387

Order number: KIT_AURIX_TC234_MOTORCTR

- TC387 Application Kit with TFT Display incl. safety supply TLF35584
- eMotor Power board: 3-phase motor control power board with TLE9180D-31QK 3-phase gate driver IC, MOSFET power stage, and auxiliary components
- Commands and monitoring via TFT touch screen
- Field oriented control (FOC) algorithm using 3-phase current sensing (EVADC) encoder as position sensor (GPT12) and AURIX™ GTM as PWM generator

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Infineon application kits – 32-bit microcontrollers

Wireless charging: the beast 1.0

- WPC Qi v1.2.4 certified
- Support fast charging enabled devices (7.5W and 9W)
- AUTOSAR support
- Improved accuracy Foreign Object Detection (FOD)

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Wireless charging: the beast 2.0

- Beast 2.0 is powered by the high-performance Infineon AURIX™ or Traveo™ II
- Latest WPC Qi functionality
- Supports 15W charging for Qi-certified devices
- Improved accuracy Foreign Object Detection (FOD)
- Supports future products and standards with field-upgradeable Pantheon™ software

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Industrial robotics

Application example

Application features

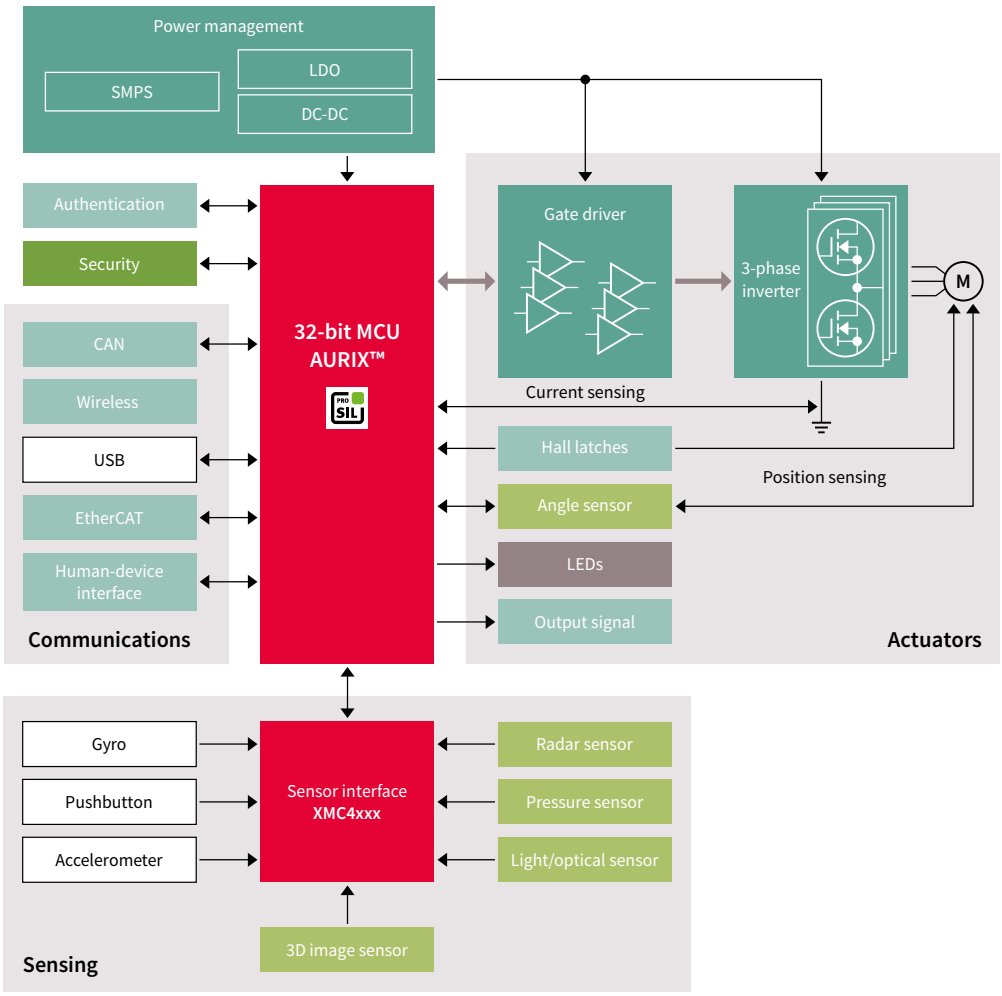
- High computing performance
- High level of accuracy, integration and efficiency
- Safety management in line with current norms
- Various topologies for axis, joints and motors
- Security features that protect intellectual property from counterfeiting

System benefits

- High computing performance: up to 6x 300 MHz
- High flexibility thanks to tailored peripherals
- Integrated safety support (EN ISO 10218 and ISO/TS15066)
- Integrated security with hardware security module
- Robust 3 V-, 5 V-, LVDS – PortPins
- Large portfolio with long-term availability

Suggested products

- TC23x
- TC33x
- TC36x
- TC37x
- TC38x
- TC39x
- XMC4xxx



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Microcontroller PDH partner

Preferred Design Houses (PDH) and software resellers – AURIX™ Traveo and PSoC™, AURIX™ tools and software

AURIX™ Tools and Software

To enable customers to achieve optimal performance when using the powerful AURIX™ architecture, Infineon has built a network of strong partnerships with companies highly specialized in multicore software development. Infineon's multicore partners can offer the best multicore expertise and tools on the market for each stage of the software design process, covering everything from the initial multicore knowledge acquisition phase right up to final optimization of the multicore software.

AURIX™ Embedded Software



- AURIX™ Applications software
- Autosar
- Non-Autosar OS/RTOS
- Middleware
- Communication and connectivity
- Bootloader/OTA
- Safety

AURIX™ Tools



- AURIX™ Free Tools
- Calibration/Measurement/Prototyping
- Compilers
- Debugger, Test Tools
- Flash Tools
- Simulation/Modelling
- SW Automation/Autocoding

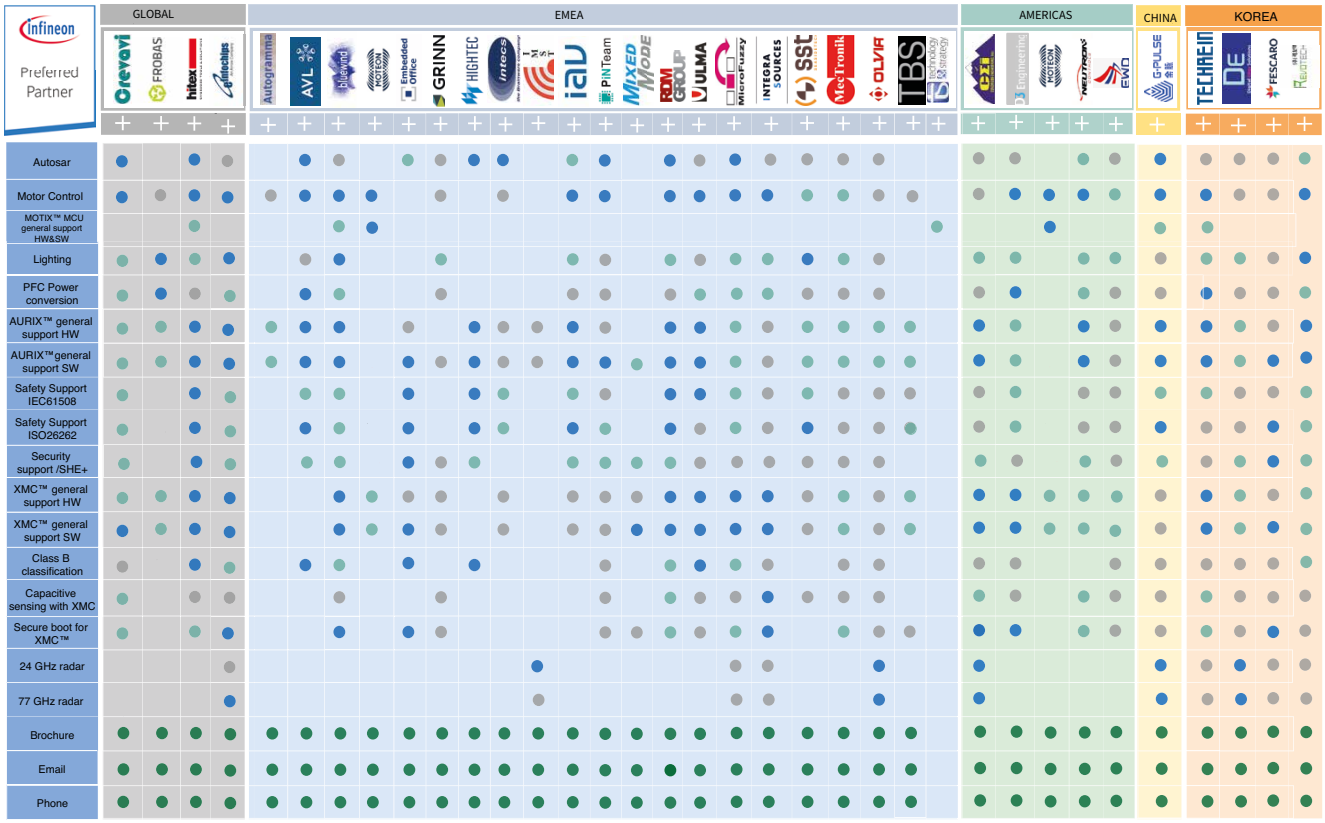
Discover our new AURIX™ Tools and Software ecosystems where you can find everything you need within easy reach **www.infineon.com/aurixtools and www.infineon.com/aurixsoftware**

www.infineon.com/aurix

Classic (Free of charge)	– 1st level customer support covering Infineon products/solutions – Technical interface and support to the customer	– Driving design at customer – Basic training for design teams at customer – 24 h response time to the customer
Premium (Consultancy mode) To be agreed between customers and PDH	– Project management and project-specific application support – Specification of general software architecture, defining required layers, control and data flow structure etc. – Specification and implementation of custom device drivers – Optimization of software components with regard to speed/code size	– Software testing – Support for project-specific functional safety engineering – Project-specific support for security solution – Safety support – Security support – Multicore support

Preferred Design Houses (PDH)

The preferred design house extends the support force by specifying and customizing the know-how. Furthermore, it brings an additional value for customer service. The preferred design house supports the set up for systems using AURIX™ and XMC™, including software and other Infineon products. Our partners are trained to use AURIX™ and XMC™.



Basic ●
Essential principles and elementary know-how to support a customer; provision of basic training for design teams

Advanced ●
High-level project-specific application support/consulting

Expert ●
Extensive knowledge and ability to fully support development

www.infineon.com/aurix

TRAVEO™ II portfolio

Thanks to its special features the Traveo™ II family is the perfect match for industrial applications. With processing power and network connectivity built into a single Arm® Cortex®- M4F and dual Cortex®- M7F, the Traveo™ II family comes up with an enhanced performance up to 1500 DMIPS and a high-performance CPU operating up to 350 MHz.



Product type	Supply Voltage [V]	Main Core frequency [MHz]	Flash (Code + Work) [kB]	SRAM [kB]	GPIO	ADC Channels	CAN/CAN FD Channels	Ethernet 100/1000 Mbit	SCB Channel	CXPI Channel	SMIF (SPI/HyperBus)	LIN Channel	I²S Channel	eMMC Channels	HSM	Temperature ranges	Packages	SIL Level
TRAVEO™ T2G CYT2B7 series																		
CYT2B75CADQ0AZEGS	2,7 to 5,5	160	1088 + 96	128	78	39	6	no	8	0	-	7	-	0	Yes	E	100-LQFP	ASIL-B
CYT2B78CADQ0AZEGS	2,7 to 5,5	160	1088 + 96	128	152	64	6	no	8	0	-	8	-	0	Yes	E	176-LQFP	ASIL-B
TRAVEO™ T2G CYT2B9 series																		
CYT2B95CACQ0AZEGS	2,7 to 5,5	160	2112 + 128	256	78	39	8	no	8	4	-	9	-	0	Yes	E	100-LQFP	ASIL-B
CYT2B98CACQ0AZEGS	2,7 to 5,5	160	2112 + 128	256	152	64	8	no	8	4	-	12	-	0	Yes	E	176-LQFP	ASIL-B
TRAVEO™ T2G CYT4BF series																		
CYT3BB8CEBQ0AESGS	2,7 to 5,5	250	4160 + 256	768	148	64	8	1	10	0	1	16	TX 3ch, RX 3ch (3 instances)	1	Yes	S	176-TEQFP	ASIL-B
CYT3BBBCEB-Q0BZEGS	2,7 to 5,5	250	4160 + 256	768	220	72	8	1	11	0	1	16	TX 3ch, RX 3ch (3 instances)	1	Yes	E	272-BGA	ASIL-B
TRAVEO™ T2G CYT4BF series																		
CYT4BF8CEDQ0AEEGS	2,7 to 5,5	350	8384 + 256	1024	148	81	10	1	10	0	1	17	TX 3ch, RX 2ch (3 instances)	1	Yes	E	176-TEQFP	ASIL-B
CYT4BFCCJDQ0BZEGS	2,7 to 5,5	350	8384 + 256	1024	240	86	10	2	11	0	1	20	TX 3ch, RX 2ch (3 instances)	1	Yes	E	320-BGA	ASIL-B

www.infineon.com/traveo

For more details on the product, click on the part number, visit infineon.com or contact our product support.

TRAVEO™ II kits

CYTVII-B-E-BB



- The CYTVII-B-E-BB is a generic base board that can be connected to compatible Traveo™ II entry or high-end evaluation boards so as to extend its functionality
- Connects to most CYTVII-B-E-xxx and CYTVII-B-H-xxx evaluation boards

www.infineon.com/cms/en/product/evaluation-boards/cytvii-b-e-bb

CYTVII-B-E-176-SO



- The CYTVII-B-E-176-SO evaluation board is based on the Traveo™ II entry family of devices.
- Traveo™ II is CYT2B78CADES

www.infineon.com/cms/en/product/evaluation-boards/cytvii-b-e-176-so

CYTVII-B-E-1M-SK



- The CYTVII-B-E-1M-SK is a low-cost easy to use evaluation board based on the Traveo™ II entry family of devices.
- Traveo™ II CYT2B75CADES MCU
- Designed in an Arduino form factor so that users can connect many off-the-shelf Arduino shields to it, to expand its functionality

www.infineon.com/cms/en/product/evaluation-boards/cytvii-b-e-1m-sk

CYTVII-B-H-8M-320-CPU



- The CYTVII-B-H-8M-320-CPU evaluation board is based on the Traveo™ II high-end family of devices.
- Traveo™ II CYT4BFCCHCES MCU
- Audio, Ethernet, SD Card, SMIF

www.infineon.com/cms/en/product/evaluation-boards/cytvii-b-h-8m-320-cpu

www.infineon.com/traveo

For more details on the product, click on the part number, visit infineon.com or contact our product support.

MOTIX™ MCU – Embedded Power ICs

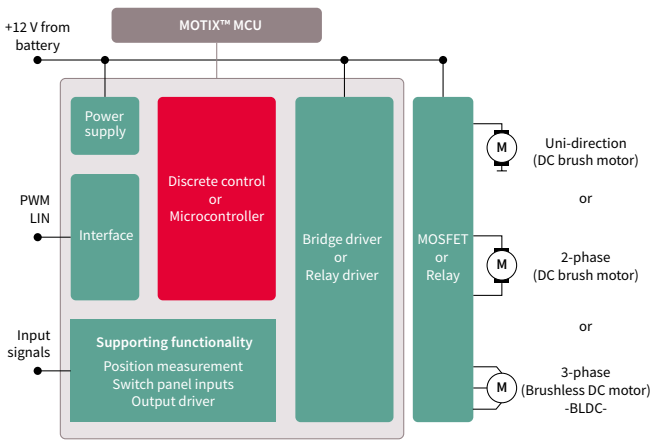
System-on-chip solution for motor control applications

Infineon's MOTIX™ Embedded Power ICs include a 32-bit Arm® Cortex®-M microcontroller, a voltage regulator, the communication interfaces, along with the driving stages for motor control applications. These system-on-chip solutions offer an unmatched level of integration of all functions required to sense, control and actuate a motor. They save space and energy, improve the overall system reliability through advanced diagnosis features and reduce the overall cost due to a minimum number of external components. They perfectly fit with a range of motor control applications where a small package form factor and a minimum number of external components are essential.

Criteria	TLE984x	TLE9845	TLE9850/1	TLE985x	TLE986x	TLE987x
Controller	Arm® Cortex®-M0				Arm® Cortex®-M3	
Core frequency	25-40 MHz	40 MHz			24-40 MHz	
Flash size	36 KB – 64 KB	48 KB	48/64 KB	48 KB – 96 KB	36 KB – 256 KB	
Driver stage	Relay	Half-bridge		H-bridge		B6-bridge
	Relay	PN FET half-bridge	NN FET half-bridge	N FET H-bridge		N FET B6-bridge
HV monitor inputs	4-5	5	4		0-1	
Junction temperature levels	150°C	150°C	150°C and 175°C	150°C and 175°C	150°C and 175°C	
Packages	VQFN-48-31		VQFN-48-31 VQFN-48-29	VQFN-48-31 VQFN-48-29	VQFN-48-29 and VQFN-48-31 TQFP-48-10	

Features and benefits

Key features	Customer benefits
– Extensive diagnostics and protections embedded within the system-on-chip	– High levels of system reliability
– Minimum number of external components needed	– Reduced cost
– Platform based approach with compatible software between the product families	– Support multiple and flexible designs with minimal effort
– Data processing, actuation and sensing integrated into the product with 32-bit Arm® Cortex®-M	– Space saving
– Compact package with 7x7 mm footprint (VQFN-48/TQFP-48)	– Energy saving
– Intelligent power saving modes including stop and sleep mode and energy management for external sensors (on demand)	



› MOTIX™ Embedded Power ICs enable mechatronic motor control solutions for either relay, half-bridge or full-bridge DC and BLDC motor applications

› They are supported by a complete development tool chain provided by Infineon and third party vendors. The tool chain includes compilers, debuggers, evaluation boards, LIN low level drivers and configuration tools as well as variety of example software code.

Infineon Developer Center

www.infineon.com/embeddedpower

For more details on the product, click on the part number, visit infineon.com or contact our product support.

BLDC Motor Control Shield for Arduino

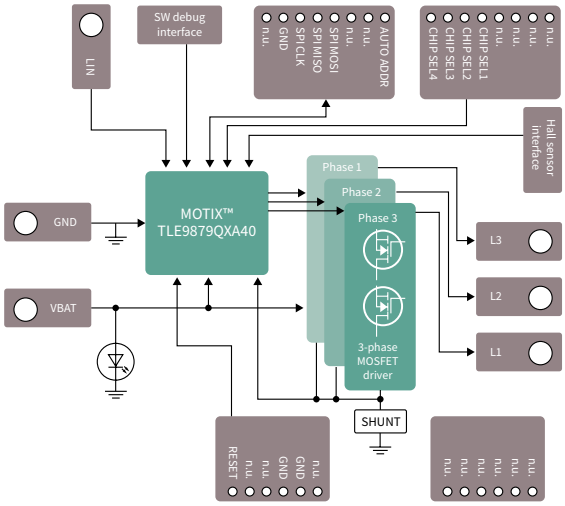
3-phase motor control shield with MOTIX™ TLE9879QXA40

The BLDC Shield for Arduino uses TLE9879QXA40, which is a part of the MOTIX™ TLE987x family of the Infineon MOTIX™ MCU portfolio. It enables the shield to drive 3-phase BLDC motors with a variety of different features. One Arduino base board can control up to four BLDC shields via SPI. The BLDC Shield firmware provides an auto-addressing functionality. Every shield in the stack can be controlled independently and run completely different motor control algorithms if desired.

The shield implements three different advanced motor control algorithms:

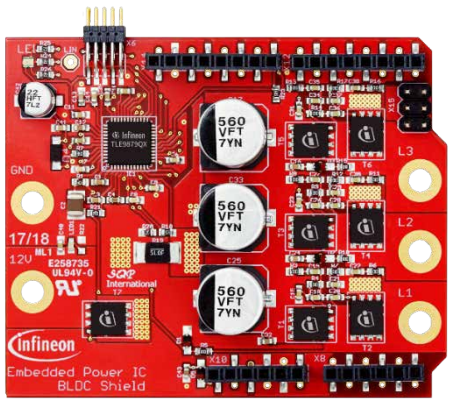
- Sensorless field-oriented control (FOC),
- Block commutation with back EMF (BEMF)
- Hall based block commutation (HALL)

The firmware can be changed using the SWD Interface Additional connectors for voltage supply, motor-phases and hall sensors speed up the evaluation.



Features and benefits

Key features	Customer benefits
– Implemented motor control algorithms (FOC, BEMF, Hall)	– Easy to use API, allowing the user to quickly setup an application
– Controlled over Arduino via SPI	
– Compatible with the Arduino Uno or the Infineon XMC™ baseboard	– High performance BLDC motor control in form of the TLE987x chip
– Up to four shields can be used simultaneously	
– Each shield can be controlled independently	
– Motor parameters can be set for each shield individually	



Our BLDC Shield for Arduino comes with a library which includes a collection of code that makes it easy for you to run your project. The Arduino library offers an intuitive API to quickly setup and configure an application.

www.infineon.com/bldcmotorshield
www.infineon.com/shields-for-arduino

Motor control · Pumps · Fans · Multicopter · Power tools · Vacuum cleaner

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CAN-FD transceivers

High- and low-speed CAN-FD Transceivers for automotive and many other applications

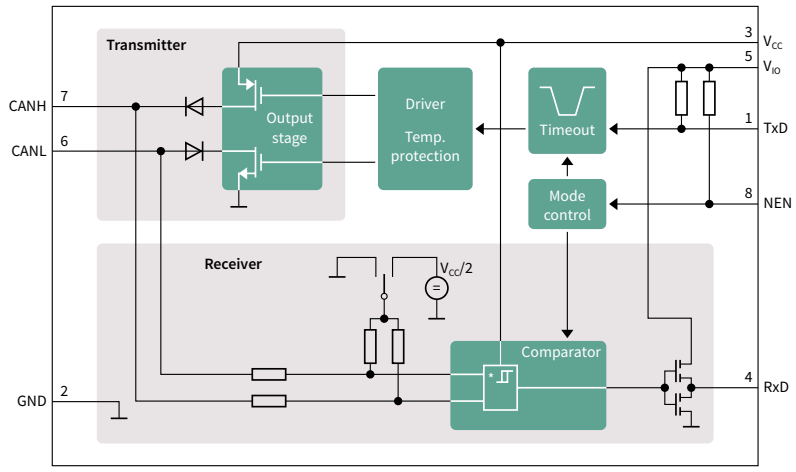
Recently the automotive industry newly established the CAN-FD (Flexible Data-rate) protocol for faster CAN communication up to 5Mbit/s and CAN PN (Partial Networking) for improved energy efficiency.

Dependent on the respective network architecture and the related ECU supply path, different transceiver types are used. Infineon transceivers ensure reliable communication and help minimizing the current consumption.
The products provide the best value by its high performance, ruggedness and reliability.

Features and benefits

Key features	Key benefits
– Transmission rates up to 5 Mbit/s ISO11898 compliant	– Low current consumption
– Low-power modes	
– Receive-only mode	– Excellent EMI performance & robustness
– Standby/sleep mode	
– Bus wake up	– Pin-to-pin replacements for industry-standard parts
– Thermal protection	
– CAN FD compliance	

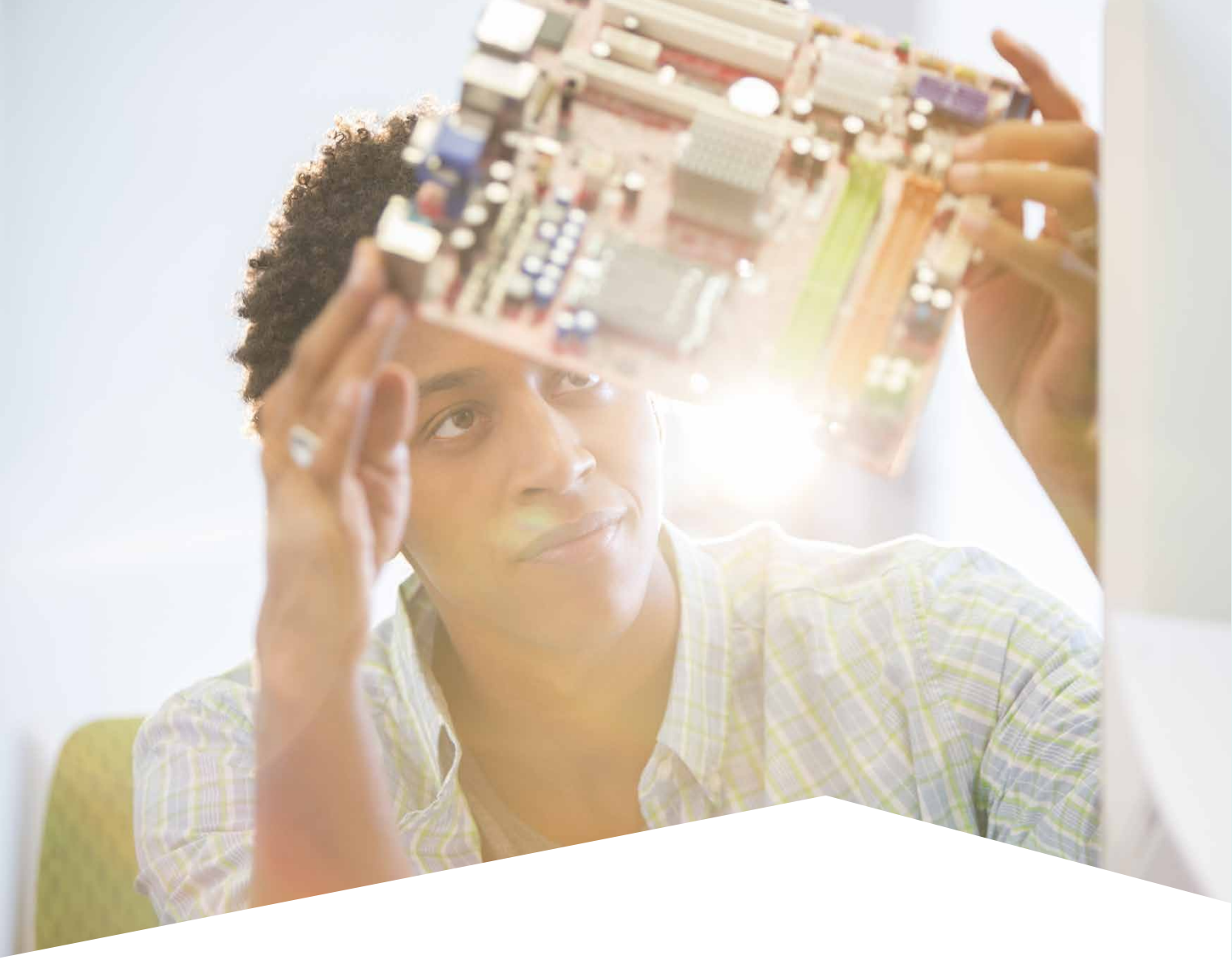
Block diagram TLE9250V



PG-DSO-8-65	PG-TSON-8-1
TLE9250SJ_GRN	TLE9250LE_GRN
TLE9250VSJ_GRN	TLE9250VLE_GRN
TLE9250XSJ_GRN	TLE9250XLE_GRN
TLE9251SJ_GRN	TLE9251LE_GRN
TLE9251VSJ_GRN	TLE9251VLE_GRN
	TLE9251VLE

www.infineon.com/can-transceivers

For more details on the product, click on the part number, visit infineon.com or contact our product support.



Infineon support for industrial microcontrollers

One platform, countless solutions



Further information, datasheets and documents

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XMC SC Wireless power controller:

www.infineon.com/xmcscwirelesspowercontrollers

XMC™ MCUs ecosystem and enablement – kits, board, tools and software

Boards and kits:

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www.infineon.com/connectivitykit
www.infineon.com/ethercat

Ecosystem and tools:

www.infineon.com/xmc-ecosystem

DAVE™ IDE:

www.infineon.com/dave

Evaluation board

Tools



USB-C controllers and peripherals

- Moving to USB-C with EZ-PD™ family
  - USB-C charging port controllers
  - USB-C high voltage microcontrollers
- USB-C power delivery controllers
  - EZ-PD™ CCG8 – USB-C PD controller
  - EZ-PD™ CMG2 – USB-C EMCA controller
- USB-C AC-DC and DC-DC charging solutions
  - EZ-PD™ CCG7DC – USB-C PD and DC-DC controller
  - EZ-PD™ PAG1 – USB-C PD and DC-DC controller
- Peripheral controllers for USB 5Gbps
  - EZ-USB™ CX3 - MIPI CSI-2 to USB 5Gbps camera controllers
  - EZ-USB™ FX3 - USB 5Gbps peripheral controllers
  - EZ-USB™ SX3 - FIFO to USB 5Gbps controllers
- USB 2.0 peripheral controllers
  - EZ-USB™ serial bridge controller
- USB hub and USB Type-C port controllers
  - EZ-USB™ HX3
  - EZ-USB™ HX2LP and HX2VL
  - EZ-USB™ HX3PD

Moving to USB-C with EZ-PD™ family

A wide portfolio for your easy transition to the new universal connector

More and more products in consumer, industrial, and communications segments are adopting USB-C ports to source power. Infineon offers dedicated solutions to integrate USB-C ports into customers' embedded applications. Typical use cases include smart speakers, cameras, headphones, game consoles, power tools, VR headsets, and other portable electronics and home appliances. As the leader in USB-C end-to-end solutions, Infineon also provides a comprehensive portfolio of solutions for USB-C chargers and power adapters.

System approach:

- Market-proven USB-C power delivery stack (USB-C PD)
- Complete and easy-to-use design portfolio to build robust, efficient and cost-effective system solutions
- Robust evaluation kits for quick prototyping

The EZ-PD™ portfolio includes two different families of solutions to help you easily integrate USB-C into your embedded application: EZ-PD™ PMG1 (Power Delivery Microcontroller Gen 1) and EZ-PD™ BCR (Barrel Connector Replacement).

Are you looking for a plug-and-play solution to replace an old barrel connector or legacy USB connector with USB-C?

EZ-PD™ BCR

Or do you need additional control and want to add some extra functions to your device with a USB-C port controller + MCU in a single-chip solution?

EZ-PD™ PMG1

www.infineon.com/ez-pd-pmg1
www.infineon.com/ez-pd-bcr



For more details on the product, click on the part number, visit infineon.com or contact our product support.

USB-C charging port controllers

EZ-PD™ BCR: the easiest solution for moving to USB-C

EZ-PD™ BCR is a highly-integrated pre-programmed USB Type-C charging port controller targeting all electronic devices with legacy barrel connectors up to 100 W or USB micro-B connectors. It easily adds USB-C power consumer capability to a device, allowing it to be powered by any USB-C power source including USB-C chargers, power adapters, power banks, and in-wall or in-car charging ports.

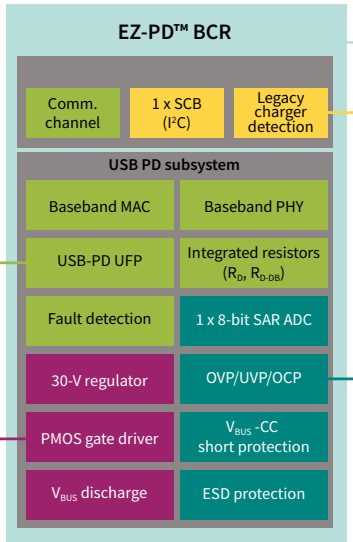
EZ-PD™ BCR is compliant with the latest USB Type-C and USB power delivery standards, it allows designers to quickly convert their devices' power input from a barrel connector to a USB-C connector without invasive changes to their existing designs. It contains a market-proven, fully-automated USB power delivery policy manager that interoperates with virtually any USB-C power source. To safeguard against system-level fault conditions, EZ-PD BCR™ controllers integrate various protection circuitries including VBus-to-CC short, overvoltage, overcurrent and ESD.
No expert knowledge of the USB-C and power delivery standards or firmware development is required to develop a robust USB-C powered system with EZ-PD™ BCR.

Features and benefits

Key features	Key benefits
– Highly integrated one-chip solutions	– Area and BOM saving
– No firmware programming required	– Shorter development cycle, faster time to market
– Market-proven solution with mature design tools	– No implementation risk
– Availability of software utilities	– Configurability, product differentiation
– USB-IF compliant and certified	– Pre-certified silicon to support USB logo certification
– No expert knowledge of USB-C or USB-PD required	– No steep learning curve
– Extended industrial temperature -40°C to 105°C	– Suitable for virtually any commercial or industrial application

A complete USB-C subsystem – transceiver, protocol stack, USB-PD policy manager – runs autonomously without a need to develop firmware

High-power analog components included on chip – LDO, gate driver, discharge FET – save BOM cost and reduce solution footprint



Offered in a space-saving 16-mm² package and supports extended temperature -40°C to 105°C

Optional legacy charger detection and host programming interface offer additional solution value and design flexibility

All protection circuity integrated – overvoltage, undervoltage, overcurrent, VBus-short, ESD – provide a robust, vault-tolerant USB-C system solution

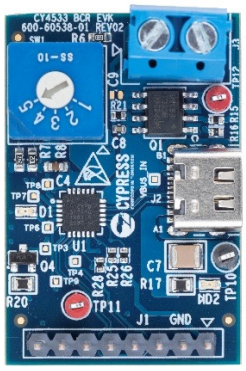
www.infineon.com/ez-pd-bcr

The wide portfolio offers different combinations of flash/RAMs sizes and features to address all possible needs:

Features	EZ-PD™ BCR family		
Product name	EZ-PD™ BCR-Plus	EZ-PD™ BCR	EZ-PD™ BCR-Lite
Part number	CYPD3176-24LQXQ CYPD3176-24LQXQT	CYPD3177-24LQXQ CYPD3177-24LQXQT	CYPD3178-24LQXQ CYPD3178-24LQXQT
USB PD role	UFP (power sink)	UFP (power sink)	–
Programmable power supply (PPS)	✓	–	–
USB Type-C charging (5V @ 0.5 A, 0.9 A, 1.5 A, 3 A)	✓	✓	✓
Legacy charging support (BC 1.2 and others)	✓	–	✓
USB data compatible	✓	✓	✓
VBUS gate driver	PFET	PFET	PFET
Supply voltage	3.0 V – 24.5 V	3.0 V – 24.5 V	3.0 V – 24.5 V
VBUS to CC short protection (20 V)	✓	✓	✓
OVP/UVP	✓	✓	✓
OCP	✓	–	–
ESD protection on CC, D+/D-, ±8 kV (contact), ±15 kV (air)	✓	✓	✓
I²C Interface	1	1	1
EZ-PD BCR HPI utility	✓	✓	✓
EZ-PD configuration utility	✓	–	–

Boards

Once the preferred characteristics are identified, it is possible to get started with the product of choice by utilizing the available evaluation kits: they provide a USB Type-C receptacle to consume power from a charger and then supply it over a terminal block. A barrel connector can be attached to this block using wires to convert a barrel input to USB-C. In addition, selective GPIOs and I²C interface are available on headers to easily control or monitor the BCR chip from an external microcontroller.

EZ-PD™ BCR-Lite EVK CY4535	EZ-PD™ BCR EVK CY4533	EZ-PD™ BCR-Plus EVK CY4534
		

www.infineon.com/ez-pd-bcr

For more details on the product, click on the part number, visit infineon.com or contact our product support.

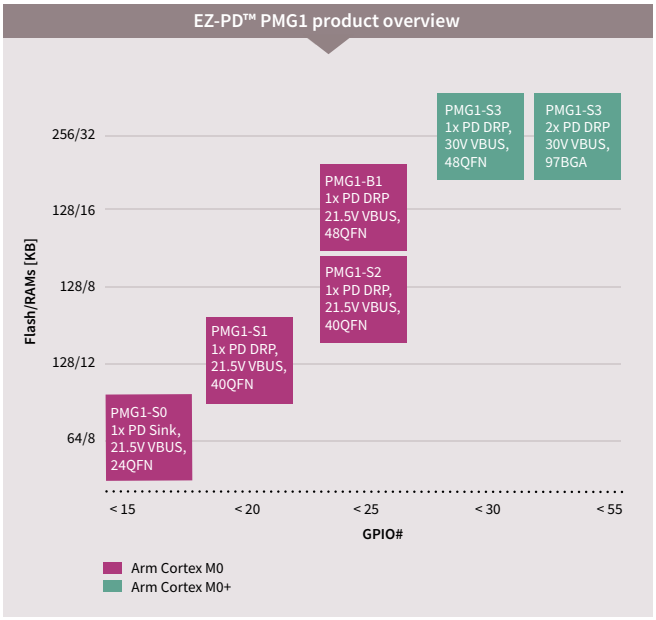
USB-C high voltage microcontrollers

EZ-PD™ PMG1: the single-chip solution for moving to USB-C

Power Delivery Microcontroller Gen 1 (EZ-PD™ PMG1) is a high-voltage USB-C power delivery microcontroller (PD MCU) targeted to any embedded system that provides/consumes power to/from a high-voltage USB-C PD port and leverages the microcontroller to provide additional control capability.

The EZ-PD™ PMG1 family of devices has a market-proven USB power delivery stack, ensuring spec compliance and interoperability. It's the only high-voltage, programmable USB power delivery solution on the market today, and comes with an integrated ARM® Cortex®-M0/M0+, up to 256 kB flash and 32 kB RAM, a USB full-speed device, and analog and digital peripherals. With an SDK supported in ModusToolbox™, EZ-PD™ PMG1 family provides customers with a unified firmware view, facilitating seamless migration between all EZ-PD™ PMG1 devices.

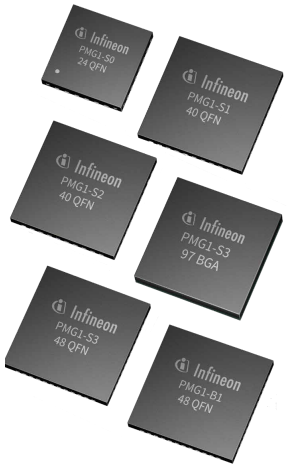
The wide portfolio offers different combinations of flash/RAMs sizes and features to address all possible needs:



Features

- USB, Crypto, LDO NFET Gate Drivers, CAPSENSE™, 12-bit ADC, SCB, TCPWM
- Buck Boost, LDO, NFET Gate Drivers, 12-bit ADC, SCB, TCPWM
- USB, Crypto, LDO NFET Gate Drivers, 8-bit ADC, SCB, TCPWM
- LDO, PFET Gate Drivers, 8-bit ADC, SCB, TCPWM
- LDO, PFET Gate Drivers, 8-bit ADC, SCB1, TCPWM[2]

[1] SCB stands for Serial Communication Block
[2] TCPWM stands for Timer Counter Pulse Width Modulator



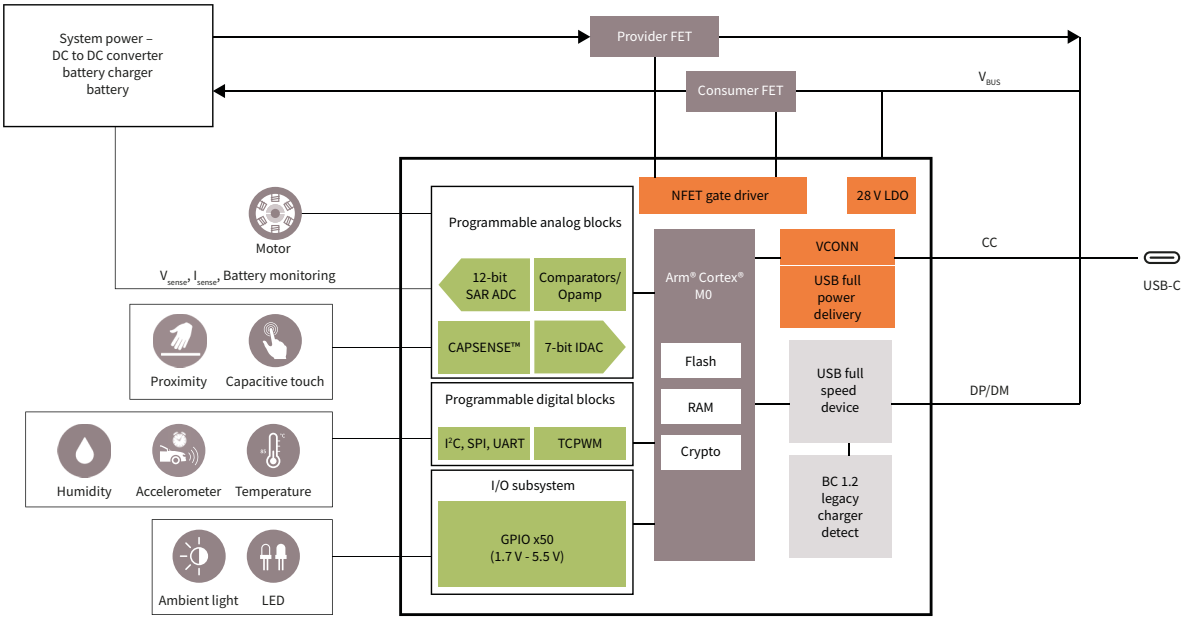
Features and benefits

Key features	Key benefits
– Highly-integrated single-chip solution, included high-voltage protection	– Area and BOM saving
– Configuration utility and wide support material available	– Faster time to market
– Market-proven solution with mature design tools	– No implementation risk
– Integrated flash/MCU	– Programmability, product differentiation
– USB-IF compliant and certified	– Interoperability
– Extended industrial temperature -40°C to 105°C	– Suitable for virtually any commercial or industrial application

www.infineon.com/ez-pd-pmg1

For more details on the product, click on the part number, visit infineon.com or contact our product support.

Block diagram



Product portfolio

Part number	Product name	CPU	Flash [kB]	GPIOs	I/O Pins	Operating temperature range [°C]	Operating voltage min [V]	Operating voltage max [V]	Serial communication blocks	Termination resistor	Type-C ports
CYPM1011-24LQXI	PMG1-S0	Arm® Cortex®-M0	64	12	12	-40 to 85	2,7	5,5	2	Rd, Rd-db	1
CYPM1011-24LQXIT	PMG1-S0	Arm® Cortex®-M0	64	12	12	-40 to 85	2,7	5,5	2	Rd, Rd-db	1
CYPM1111-40LQXI	PMG1-S1	Arm® Cortex®-M0	128	17	17	-40 to 85	2,7	5,5	4	Rp,Rd, Rd-db	1
CYPM1111-40LQXIT	PMG1-S1	Arm® Cortex®-M0	128	17	17	-40 to 85	2,7	5,5	4	Rp,Rd, Rd-db	1
CYPM1115-48LQXI	PMG1-B1	Arm® Cortex® -M0	128	21	21	-40 to 105	4	24	3	Rp, Rd	1
CYPM1115-48LQXIT	PMG1-B1	Arm® Cortex® -M0	128	21	21	-40 to 105	4	24	3	Rp, Rd	1
CYPM1116-48LQXI	PMG1-B1	Arm® Cortex® -M0	128	21	21	-40 to 105	4	24	3	Rp, Rd, Rd-db	1
CYPM1116-48LQXIT	PMG1-B1	Arm® Cortex® -M0	128	21	21	-40 to 105	4	24	3	Rp, Rd, Rd-db	1
CYPM1211-40LQXI	PMG1-S2	Arm® Cortex®-M0	128	20	20	-40 to 85	2,7	5,5	4	Rp,Rd, Rd-db	1
CYPM1211-40LQXIT	PMG1-S2	Arm® Cortex®-M0	128	20	20	-40 to 85	2,7	5,5	4	Rp,Rd, Rd-db	1
CYPM1211-42FNXI	PMG1-S2	Arm® Cortex®-M0	128	20	20	-40 to 85	2,7	5,5	4	Rp, Rd	1
CYPM1211-42FNXIT	PMG1-S2	Arm® Cortex®-M0	128	20	20	-40 to 85	2,7	5,5	4	Rp, Rd	1
CYPM1311-48LDXI	PMG1-S3	Arm® Cortex®-M0+	256	26	26	-40 to 85	2,7	5,5	7	Rp,Rd, Rd-db	1
CYPM1311-48LDXIT	PMG1-S3	Arm® Cortex®-M0+	256	26	26	-40 to 85	2,7	5,5	7	Rp,Rd, Rd-db	1
CYPM1321-97BZXI	PMG1-S3	Arm® Cortex® -M0+	256	50	50	-40 to 85	4	30	8	Rp, Rd, Rd-db	2
CYPM1321-97BZXIT	PMG1-S3	Arm® Cortex® -M0+	256	50	50	-40 to 85	4	30	8	Rp, Rd, Rd-db	2
CYPM1322-97BZXI	PMG1-S3	Arm® Cortex®-M0+	256	50	50	-40 to 85	2,7	5,5	8	Rp,Rd, Rd-db	2
CYPM1322-97BZXIT	PMG1-S3	Arm® Cortex®-M0+	256	50	50	-40 to 85	2,7	5,5	8	Rp,Rd, Rd-db	2

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Boards

Once the preferred characteristics are identified, it is possible to get started with the product of choice by utilizing the available evaluation kits: they provide a USB Type-C receptacle to consume power from a charger and then supply it over a terminal block. A barrel connector can be attached to this block using wires to convert a barrel input to USB-C. In addition, all the GPIOs and serial interfaces (UART, I^2C, SPI) are available on connectors to easily integrate external sensors and test the microcontroller functions.

EZ-PD™ PMG1-S0 CY7110 EVK	EZ-PD™ PMG1-S1 CY7111 EVK	EZ-PD™ PMG1-S2 CY7112 EVK	EZ-PD™ PMG1-S3 CY7113 EVK	EZ-PD™ PMG1-B1 EVAL_PMG1_B1_DRP
				

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USB-C power delivery controllers

Leading the industry with over one billion USB-C devices shipped

USB-C is the universal connector of choice and has gained rapid industry support thanks to its flexibility to transmit multiple data protocols such as USB4, Thunderbolt, HDMI, and simultaneously provide up to 240 Watts of power via USB PD, the possibility to enable slim industrial designs and its easy-to-use connectors and cables. Its adoption also has a significant impact on the environment, dramatically reducing the e-waste produced by the more than one million tons of proprietary chargers that get shipped every year. Infineon's EZ-PD™ portfolio is the industry's most complete portfolio of USB-C power delivery solutions, enabling more robust end-to-end power delivery and charging solutions for laptop and mobile devices. USB-C power delivery standard supports fast charging up to 240 watts, USB4 data speeds and DisplayPort connectivity over an industry-standard USB-C connector for transmitting both data and power on a single cable.

Infineon also offers AEC-Q100 certified versions of its controllers for automotive-grade performance.
As the leader in USB-C end-to-end solutions, Infineon also provides a comprehensive portfolio of solutions for USB-C adapters and chargers.

Features and benefits

Key features	Key benefits
– Supports latest USB-C power delivery protocols	– Interoperability
– Offers programmable USB-C PD solution	– Easy customization using software development kit (SDK)
– Offers firmware upgradability with in-built flash	– Easy integration into your application
– Support secure firmware update with hardware crypto	– Programmability for higher flexibility and shorter time to market
– Integrates high-voltage circuits	– Highly integrated dual/single port USB-C PD controllers for optimized are and BOM
– Integrates VBUS fault protections	
– Offered in QFN, BGA and WLCSP packages	

Power source	Power source (auto)	Cable	Dock	Notebook/PC	Broad market electronics
USB-PD controllers: EZ-PD™ CCG3PA EZ-PD™ CCG3PA-NFET USB-PD + DC-DC controllers: EZ-PD™ CCG7DC EZ-PD™ CCG7SC USB-PD + AC-DC controllers: EZ-PD™ PAG1 EZ-PD™ PAG2 (coming soon)	EZ-PD™ CCG3PA USB-C PD controller EZ-PD™ CCG7D Dual-port USB-C PD + DCDC controller EZ-PD™ CCG7S Single-port USB-C PD + DCDC controller Wireless charging: WLC1515	EZ-PD™ CCG2 USB-C port controller (active cable) EZ-PD™ CMG1 USB-C EMCA controller EZ-PD™ CMG2 USB-C EMCA controller with EPR (passive cable)	EZ-PD™ CCG3 USB-C PD port controller EZ-PD™ CCG4 Two-port USB-C & PD EZ-PD™ CCG5 Two-port USB-C PD EZ-PD™ CCG5C One-port USB-C PD EZ-USB™ HX3PD 10 Gbps hub controller with USB PD EZ-PD™ PMG1-S3	EZ-PD™ ACG1F Dual-single port USB-C PD EZ-PD™ CCG5 Two-port USB-C & PD EZ-PD™ CCG5C One-port USB-C PD EZ-PD™ CCG6DF Dual-port USB-C PD EZ-PD™ CCG6SF Single-port USB-C PD EZ-PD™ CCG8 Dual-single port controller	Move to USB-C: EZ-PD™ BCR EZ-PD™ PMG1 Wireless charging: WLCx

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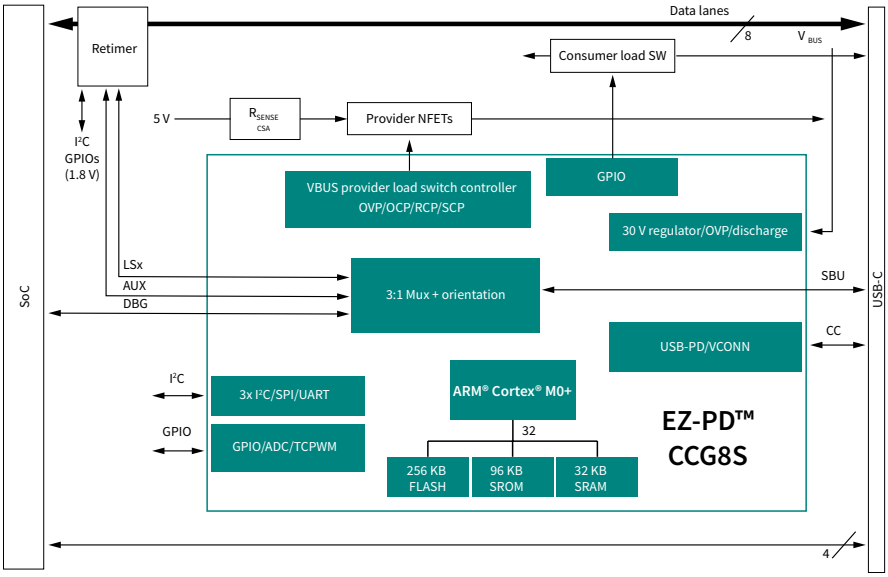
For more details on the product, click on the part number, visit infineon.com or contact our product support.

EZ-PD™ CCG8 – USB-C controller

USB-C power delivery solution for PC host with EPR

EZ-PD™ CCG8 is the first in the industry dual/single-port USB Type-C controller complying with the latest USB-C and power delivery (PD) specifications that offers a complete USB-C and PD port control solution for PCs and notebooks. It integrates a discrete N-channel field effect transistor (NFET) gate driver with fault protection and slew rate, a 32-bit 48 MHz Arm® Cortex®-M0 Plus processor and a complete Type-C transceiver including termination resistors Rp, Rd, and dead battery Rd. While EZ-PD™ CCG8D (dual port) is available in a 97-BGA package, EZ-PD™ CCG8S (single port) is only available in a 48-pin QFN package. Both can be requested in tray or tape and reel packing options, and support extended power range (EPR) up to 28 V without needing external components.

Block diagram



Features and benefits

Key features	Key benefits
– USB-C and PD 3.1 with EPR up to 28 V supporting USB3 and USB4, Thunderbolt, display port alternate mode platforms	– Reduced area and BOM thanks to the high degree of integration
– 32-bit, 48 MHz Arm® Cortex®-M0+ processor	– Ideal for EPR-based DRP solutions
– Integrates a complete Type-C transceiver and a load switch controller for driving NFETs on VBus provider path	– Programmable solution which allows the implementation of custom features
– Slew rate controller to turn on the VBUS provider path	
– Configurable hardware-controlled VBus overvoltage, undervoltage, overcurrent, short circuit, reverse current protection, and thermal shutdown	
– Integrated 3:1 SBU Muxes for alternate modes and closed chassis debug	
– Integrated digital and analog blocks	

Desktop Notebook

www.infineon.com/ez-pd-ccg8

For more details on the product, click on the part number, visit infineon.com or contact our product support.

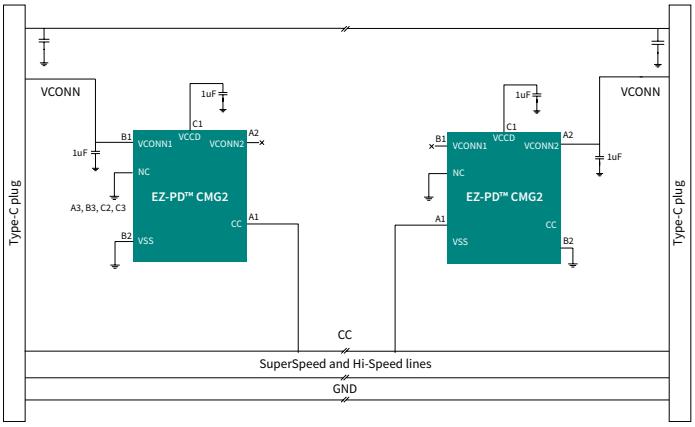
EZ-PD™ CMG2 – USB-C EMCA controller

EMCA controller with VBUS to CC short protection for passive USB-C cables

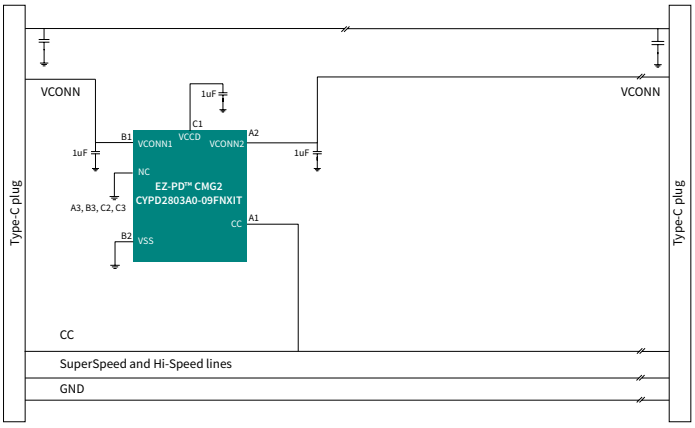
EZ-PD™ CMG2 is Infineon's dedicated electronically marked cable assembly (EMCA) controller targeting passive non-Thunderbolt and Thunderbolt Type-C cables. It offers integrated VBus-CC short protection up to 54 V, VBus-VCONN short protection up to 54 V, power delivery 3.1, Type-C 2.1, and ESD protection, all these in a compact 9-ball WLCSP package. EZ-PD™ CMG2 has a 47-byte storage space for vendor- and cable-specific configuration data and is designed to operate from a 2.7 to 5.5 V VCONN supply range.

Block diagram

Passive EMCA application - Single EZ-PD™ CMG2 chip per plug:



Passive EMCA application - Single EZ-PD™ CMG2 chip per cable:



Features and benefits

Key features	Key benefits
– Supports USB PD 3.1 specification and USB Type-C specification version 2.1	– No programming required
– Supports USB4, TBT4 and extended power range (EPR)	– Easy to use, faster design cycle
– PD protocol	– Robust solution with short protection up to 54 V
– Integrated high-voltage protection on CC, VCONN1, and VCONN2 pins to protect against accidental shorts to the VBus pin on the Type-C connector up to 54 V	
– Integrated 47 bytes for storing vendor- and cable-specific configuration data termination resistor RA on VCONN1 and VCONN2	
– IEC ESD protection on VCONN and CC	
– Package: 9-ball WLCSP	

www.infineon.com/ez-pd-cmg2

For more details on the product, click on the part number, visit infineon.com or contact our product support.

USB-C AC-DC and DC-DC charging solutions

The one-stop shop for charger and adapter designs

Infineon offers a one-stop shop for a wide variety of USB PD AC-DC and DC-DC conversion solutions for charger adapters from 18 W to 140 W. The portfolio includes a scalable PD controller architecture to support both single-port and multi-port charger configurations. Our reference designs allow the quick and easy development of prototypes, meaning customers can benefit from new, fast-charging adapter technology while reducing development costs and time to market. Moreover, the high degree of programmability and the ability to support custom protocols and updates enables a high degree of flexibility for customers. With decades of experience in the electronics industry, Infineon drives the trend of adapter miniaturization without compromising product efficiency and performance.

As the leader in USB-C end-to-end solutions, Infineon also provides a comprehensive portfolio of solutions for USB-C adapters and chargers.

Product	Category	Product family	CPU	Flash [kB]	SRAM [kB]	GPIOs	Serial communication blocks	#Type-C ports	Operating temperature range [°C]
CYPAP111A3-10SXQ	Primary PWM startup controller	PAG1P	N/A	N/A	N/A	0	N/A	N/A	-40 to 105
CYPAP111A3-10SXQT	Primary PWM startup controller	PAG1P	N/A	N/A	N/A	0	N/A	N/A	-40 to 105
CYPAP112A3-10SXQ	Primary PWM startup controller	PAG1P	N/A	N/A	N/A	0	N/A	N/A	-40 to 105
CYPAP112A3-10SXQT	Primary PWM startup controller	PAG1P	N/A	N/A	N/A	0	N/A	N/A	-40 to 105
CYPAS111A1-24LQXQ	USB-PD + SR + PWM controller	PAG1S	Arm® Cortex®- M0	64	4	6	0	1	-40 to 105
CYPAS111A1-24LQXQT	USB-PD + SR + PWM controller	PAG1S	Arm® Cortex®- M0	64	4	6	0	1	-40 to 105
CYPD3184A1-24LQXQ	USB-PD + SR + PWM controller	PAG1S	Arm® Cortex®- M0	64	4	6	0	1	-40 to 105
CYPD3184A1-24LQXQT	USB-PD + SR + PWM controller	PAG1S	Arm® Cortex®- M0	64	4	6	0	1	-40 to 105
CYPD3135-32LQXQ	USB-PD controller	CCG3	Arm® Cortex®- M0	128	8	14	4	1	-40 to 105
CYPD3135-32LQXQT	USB-PD controller	CCG3	Arm® Cortex®- M0	128	8	14	4	1	-40 to 105
CYPD3135-40LQXI	USB-PD controller	CCG3	Arm® Cortex®- M0	128	8	20	4	1	-40 to 105
CYPD3135-40LQXIT	USB-PD controller	CCG3	Arm® Cortex®- M0	128	8	20	4	1	-40 to 105
CYPD3135-40LQXQ	USB-PD controller	CCG3	Arm® Cortex®- M0	128	8	20	4	1	-40 to 105
CYPD3135-40LQXQT	USB-PD controller	CCG3	Arm® Cortex®- M0	128	8	20	4	1	-40 to 105
CYPD3171-24LQXQ	USB-PD controller	CCG3PA	Arm® Cortex®- M0	64	8	12	2	1	-40 to 105
CYPD3171-24LQXQT	USB-PD controller	CCG3PA	Arm® Cortex®- M0	64	8	12	2	1	-40 to 105
CYPD3172-24LQXQ	USB-PD controller	CCG3PA-NFET	Arm® Cortex®- M0	64	4	6	0	1	-40 to 105
CYPD3172-24LQXQT	USB-PD controller	CCG3PA-NFET	Arm® Cortex®- M0	64	4	6	0	1	-40 to 105
CYPD3172P-24LQXQ	USB-PD controller	CCG3PA-NFET	Arm® Cortex®- M0	64	4	6	0	1	-40 to 105
CYPD3172P-24LQXQT	USB-PD controller	CCG3PA-NFET	Arm® Cortex®- M0	64	4	6	0	1	-40 to 105
CYPD3173-24LQXQ	USB-PD controller	CCG3PA-NFET	Arm® Cortex®- M0	64	4	6	0	1	-40 to 105
CYPD3173-24LQXQT	USB-PD controller	CCG3PA-NFET	Arm® Cortex®- M0	64	4	6	0	1	-40 to 105
CYPD3173P-24LQXQ	USB-PD controller	CCG3PA-NFET	Arm® Cortex®- M0	64	4	6	0	1	-40 to 105
CYPD3173P-24LQXQT	USB-PD controller	CCG3PA-NFET	Arm® Cortex®- M0	64	4	6	0	1	-40 to 105
CYPD3174-16SXQT	USB-PD controller	CCG3PA	Arm® Cortex®- M0	64	8	6	1	1	-40 to 105
CYPD3174-24LQXQ	USB-PD controller	CCG3PA	Arm® Cortex®- M0	64	8	12	2	1	-40 to 105
CYPD3174-24LQXQT	USB-PD controller	CCG3PA	Arm® Cortex®- M0	64	8	12	2	1	-40 to 105
CYPD3175-24LQXQ	USB-PD controller	CCG3PA	Arm® Cortex®- M0	64	8	12	2	1	-40 to 105
CYPD3175-24LQXQT	USB-PD controller	CCG3PA	Arm® Cortex®- M0	64	8	12	2	1	-40 to 105
CYPD7271-68LQXQ	USB-PD + DCDC controller	CCG7DC	Arm® Cortex®- M0	128	16	19	4	2	-40 to 105
CYPD7271-68LQXQT	USB-PD + DCDC controller	CCG7DC	Arm® Cortex®- M0	128	16	19	4	2	-40 to 105

www.infineon.com/usb-charging-solutions

For more details on the product, click on the part number, visit infineon.com or contact our product support.

EZ-PD™ CCG7DC – USB-C PD and DC-DC controller

Industry's first dual-port PD and DC-DC integrated controller

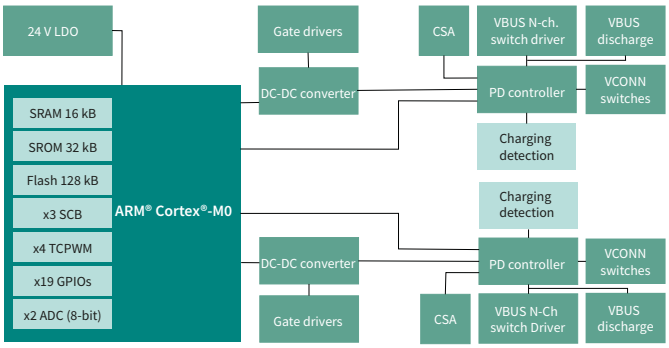
Infineon's EZ-PD™ CCG7DC is a highly integrated dual-port USB Type-C power delivery (PD) solution with built-in buck-boost controller; it is designed for multi-port consumer charging applications and complies with the most recent USB Type-C and PD specifications. With an on-chip 32-bit Arm® Cortex®-M0 processor, 128 kB flash, 16 kB RAM, and 32 kB ROM, EZ-PD™ CCG7DC is the most programmable USB-PD solution, leaving the majority of flash available for user application´s use. Custom system management features, like dynamic load sharing and temperature monitoring, can be implemented thanks to the inclusion of this fully programmable MCU with analog and digital peripherals. EZ-PD™ CCG7DC also integrates gate drivers for VBus NFET on the provider path and hardware-controlled protection features on the VBus. The high degree of integration provided by EZ-PD™ CCG7DC not only lowers the BOM, but also provides a footprint-optimized solution to support higher power density designs. A single-port USB-C PD and DC-DC controller is also available: EZ-PD™ CCG7SC.

Features and benefits

Key features
– Two USB-C PD controllers + DC-DC controllers
– Supports latest USB-C PD 3.0 with PPS, QC4+, Samsung AFC, Apple 2.4 A, BCv1.2
– Arm® Cortex®-M0 with flash for custom features implementation
– Integrated VBus NFET gate drivers, buck-boost NFET gate drivers, VCONN FETs and high-side current sense amplifier (HSCSA)
– Protection features: OVP, UVP, SCP, OCP, OTP and VBus-CC short
– DC-DC controller: configurable switching frequency of 150 kHZ – 600 kHZ, PSM/FCCM mode of operation, wide input voltage range of 4 – 24 V (40 V tolerant), and programmable spread spectrum frequency for low EMI
– Advanced features: dynamic load sharing, signed field firmware upgrade, and optimized buck input voltage for higher efficiency

Key benefits
– Enables high power density designs by integrating two DC-DC controllers + two USB-C PD controllers in one single chip
– Dynamic load sharing enables intelligent redistribution of power between two ports
– Optimized buck input voltage using TL431 provides optimized efficiency for AC-DC designs
– Supports USB-C PD3.0 with PPS and other legacy protocols including Apple 2. 4A, Samsung AFC, QC4.0, BC1.2 at no additional BOM cost

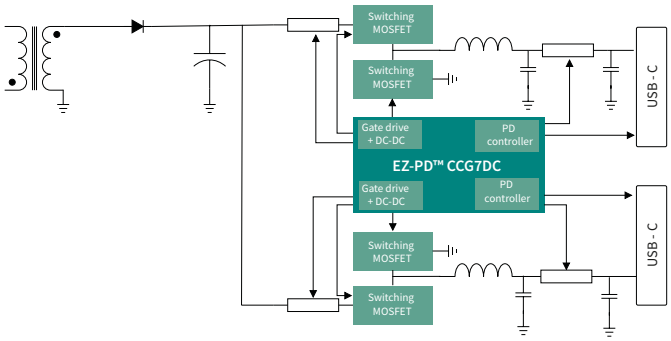
Block diagram





Application example

Two-port USB-C charger using EZ-PD™ CCG7DC



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For more details on the product, click on the part number, visit infineon.com or contact our product support.

EZ-PD™ PAG1 - USB-C PD, SR and PWM controller

USB-C PD charger and adapter complete solution

EZ-PD™ PAG1 is a complete AC-DC charger and adapter solution with integrated USB PD. It is a dual-chip solution with EZ-PD™ PAG1P and EZ-PD™ PAG1S in a secondary side controlled quasi-resonant (QR) flyback topology with ZVS. This highly integrated dual-chip power adapter solution includes SR, PD and PWM controller, all necessary protection circuitry, and FET drivers to drive the primary, SR - primary and VBus switch. This allows a reduced BOM and a better-optimized area. EZ-PD™ PAG1 solution is built with Arm® Cortex™-M0 and offers the flexibility to program the device as per the customer's needs, configure the parameters across multiple platforms as well as upgrade the firmware on the field.

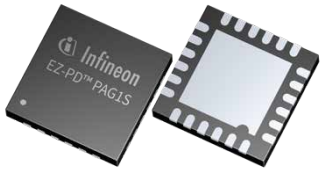
EZ-PD™ PAG1P



The PAG1P is a primary start-up controller for AC-DC applications. It is designed to work with PAG1S in a secondary side-controlled AC-DC flyback converter topology where the voltage and current regulation is performed by PAG1S, and PAG1P provides the start-up function, drives the primary switch and responds to the fault condition. The PAG1P switch supports both x-cap and non x-cap discharge mode.

Key features
– Works across universal AC main input 85 V_{AC} to 265 V_{AC}
– Synchronizes to PWM from the secondary side using a pulse edge transformer
– Integrated low-side gate driver to drive primary side FET
– Integrated high-voltage start-up and shunt regulator
– Supports X-cap discharge mode for enhanced efficiency
– Integrated line UV, OCP, and secondary OVP
– Fixed auto-restart timer for fault recovery
– Programmable soft-start configurable with an external capacitor

EZ-PD™ PAG1S



The PAG1S is a single-chip, secondary-side controller that integrates the synchronous rectification driver, PD controller, and PWM controller. The controller works as well secondary controlled flyback architecture by pairing with primary startup controller PAG1P.

Key features
– Works with both primary-side and secondary-side controlled flyback designs
– Integrates secondary-side regulation, synchronous rectifier (SR), and charging port controller
– Supports quasi-resonant (QR) or critical conduction mode (CrCM), valley switching, discontinuous conduction mode (DCM), and burst mode for light load operations
– Switching frequency range of 20 kHz to 150 kHz
– Higher efficiency across the line and load levels with independent CC/CV loop control
– Supports USB PD 3.0 with PPS (USB-IF certified, TID:1475), QC4+
– Supports legacy charging protocols: BC v1.2, AFC, and Apple charging
– Integrates low-side current sense amplifier and VBUS NFET gate drivers

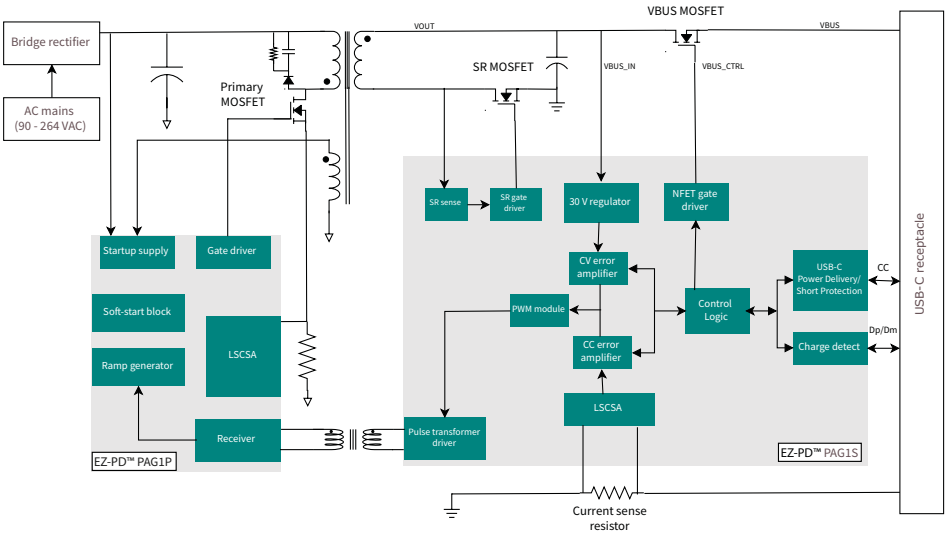
Notebook Communication Charger

www.infineon.com/ez-pd-PAG1

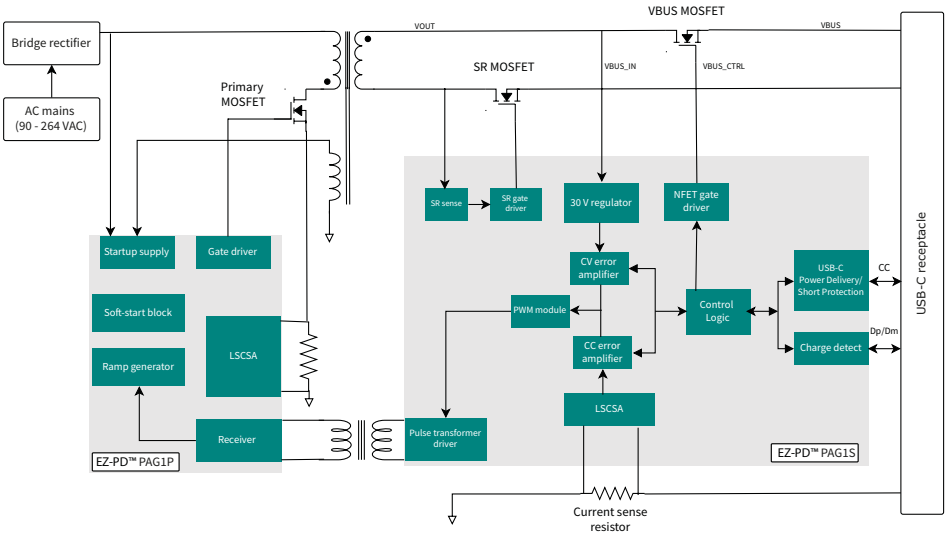
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Application diagram

Design example using EZ-PD™ PAG1S - primary-controlled flyback solution:



Design example using EZ-PD™ PAG1 secondary-side controlled QR flyback solution



Primary PWM startup controller

Product	Product family	Fault protection	High voltage startup	Gate driver	X-cap/non X-Cap mode
CYPAP111A3-10SXQ	PAG1P	Line UV, VBUS, OVP, OCP	Yes	Low-side	Non X-cap
CYPAP112A3-10SXQ	PAG1P	Line UV, VBUS, OVP, OCP	Yes	Low-side	X-cap

Secondary USB-PD, SR, and PWM controller

Product	Product family	Fault protection	Operating voltage [V]	SR gate driver	PWM controller type	PD compliance revision
CYPAP111A1-24LQXQ	PAG1S	VBUS OCB, OVP, UVP, SCP and OTP	3.3-21	Low-side	QR flyback	PD3.0 PPS

www.infineon.com/ez-pd-PAG1

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Peripheral controllers for USB 5Gbps

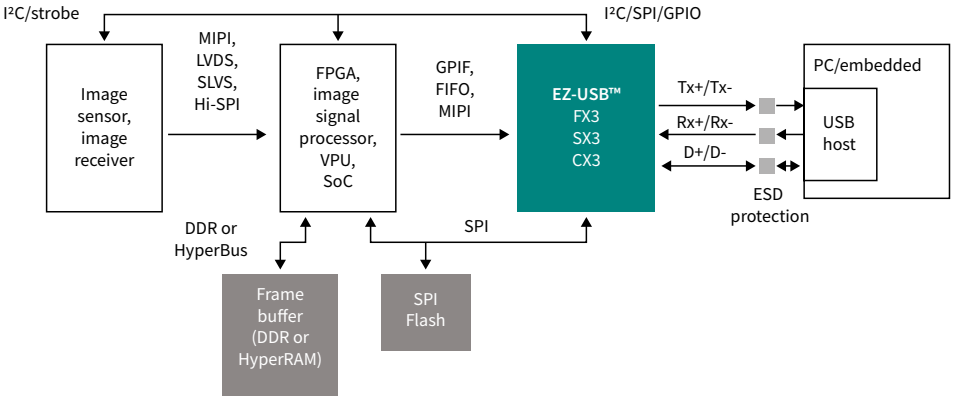
From USB 1.1 to USB 5Gbps innovation, heading towards 20Gbps

Infineon's EZ-USB™ peripheral controllers family offers the most comprehensive USB product portfolio in the industry. Since 1996, EZ-USB™ has set the industry's standard by improving the capabilities of programmable USB peripheral controllers, enabling designers to build USB devices that can handle the most demanding performance requirements in industrial and medical imaging applications. Machine vision, medical imaging, 3D scanners, biometric scanners, and many other applications requiring safe and dependable high-speed plug-and-play connectivity can benefit from the high-performance EZ-USB™ 5 Gbps controllers.

Infineon's EZ-USB™ peripheral controllers provide 5Gbps bandwidth today, and will soon move forward to 10 and then 20 Gbps.

	EZ-USB™ FX3	EZ-USB™ CX3	EZ-USB™ SX3
Function	Programmable peripheral	MIPI CSI-2 to USB3 bridge	FIFO-USB3 bridge
Part numbers	CYUSB3011 CYUSB3012 CYUSB3013 CYUSB3014	CYUSB3064 CYUSB3065	CYUSB3015 CYUSB3016 CYUSB3017
Transfer rate	5Gbps	5Gbps	5Gbps
System interface	32-bit GPIF, 100 MHz	4x MIPI CSI-2	32-bit FIFO, 100 MHz
USB-C Mux	-	-	-
Processor	ARM9	ARM9	ARM9
RAM / flash	512 KB / 0 KB	512 KB / 0 KB	512 KB / 0 KB
USB endpoints	32	2	2
Hardware DVK	SuperSpeed Explorer Kit	CX3 Camera RDK	SX3 Explorer it
SDK	EZ-USB™ FX3 SDK	EZ-USB™ FX3 SDK	-
Configuration utility	-	-	EZ-USB™ SX3 configuration utility

Block diagram



The block diagram shows a typical USB3 Vision-based machine vision camera. An image sensor using one of many different interface standards is connected to an FPGA or an image signal processor (ISP), which processes and optimizes the image and translates data into parallel data (or MIPI CSI-2) connected to an EZ-USB™ controller (FX3, SX3 or CX3). The EZ-USB™ controllers transfer uncompressed video in USB3 Vision standard to a PC or an embedded system via a standard USB cable.

www.infineon.com/superspeed-usb

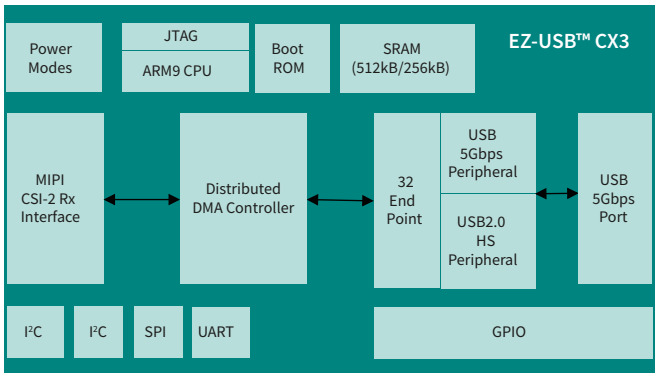
For more details on the product, click on the part number, visit infineon.com or contact our product support.

EZ-USB™ CX3 - MIPI CSI-2 to USB 5Gbps camera controllers

Adding USB 5Gbps connectivity to image sensors with MIPI CSI-2 interface

Infineon's EZ-USB™ CX3 enables USB 5Gbps connectivity to any image sensor compliant with the mobile industry processor interface (MIPI) camera serial interface Type 2 (CSI-2) standard. It is based on the proven EZ-USB™ FX3 platform and comes with a 200 MIPS fully accessible ARM9 CPU and 512 kB SRAM. For configuring image sensors, EZ-USB™ CX3 also supports camera control interface (CCI). Pan, tilt, and zoom functions, as well as other camera control functions, can be supported by programming the EZ-USB™ CX3's numerous peripheral interfaces, including I²C, SPI, and UART.

Block diagram





Features and benefits

Key features
– Capable of streaming uncompressed video, including: – 4K UHD video at 15 fps – 1080p video at 30 fps – 720p video at 60 fps
– Connectivity: MIPI CSI-2 to USB 5 Gbps bridge controller with an integrated USB 5 Gbps PHY
– Bandwidth: 4x CSI-2 lanes, 1 Gbps per lane
– Color format support: RAW8/10/12/141, YUV422/4442, RGB888/666/5653
– Camera protocol: UVC or proprietary
– Programmability: fully accessible ARM9 CPU with 200 MHz operation and 512 kB SRAM

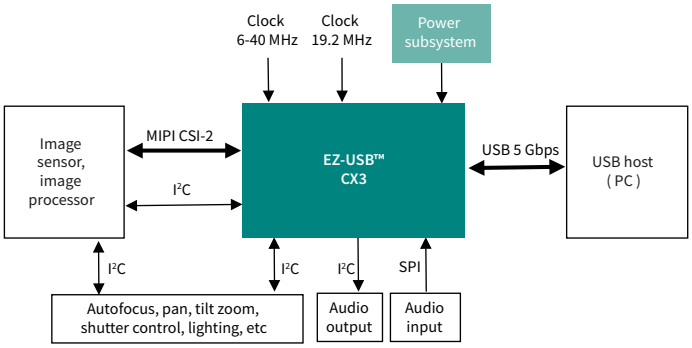
Key benefits
– Adds USB 5Gbps connectivity to any MIPI CSI-2 based camera
– Turnkey solutions on industrial standards
– Quick time-to-market with low development costs

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www.infineon.com/ez-usb-cx3

For more details on the product, click on the part number, visit infineon.com or contact our product support.

Application diagram



In the block diagram a typical EZ-USB™ CX3-based camera is depicted. The EZ-USB™ CX3 is connected to an image sensor with a MIPI CSI-2 (up to four lanes) interface. A standard USB cable is then used by the peripheral controller to transfer uncompressed video in compliance with the USB video class standard to a PC or an embedded system.

Product portfolio

Product	USB standard	USB speed [GBit/s]	I/O type	Operating temperature range [°C]	Operating voltage min [V]	Operating voltage max [V]
CYUSB3064-BZXC	USB 3.0	5	2/4-Lanes MIPI CSI-2, GPIO, I²C, SPI, I2S, UART	0 to 70	1.15	1.25
CYUSB3064-BZXI	USB 3.0	5	2/4-Lanes MIPI CSI-2, GPIO, I²C, SPI, I2S, UART	-40 to 85	1.15	1.25
CYUSB3065-BZXC	USB 3.0	5	2/4-Lanes MIPI CSI-2, GPIO, I²C, SPI, I2S, UART	0 to 70	1.15	1.25
CYUSB3065-BZXI	USB 3.0	5	2/4-Lanes MIPI CSI-2, GPIO, I²C, SPI, I2S, UART	-40 to 85	1.15	1.25

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For more details on the product, click on the part number, visit infineon.com or contact our product support.

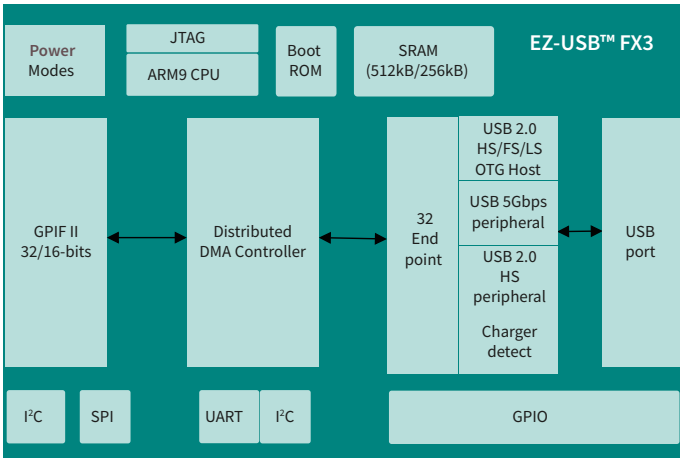
EZ-USB™ FX3 - USB 5Gbps peripheral controllers

USB 5Gbps to 32-bit data bus with ARM9

Infineon's EZ-USB™ FX3 is the industry's most adaptable USB peripheral controller which can add USB 5Gbps connectivity to any system. A processor, an image sensor, an FPGA, or an ASIC can all be connected using the EZ-USB™ FX3's second-generation general programmable interface (GPIF II). Users can configure the general programmable interface (GPIF) to operate like a FIFO, an asynchronous SRAM, an address/data multiplexed interface, a CompactFlash, or a custom interface.

EZ-USB™ FX3 will enable applications like machine vision and medical imaging to achieve higher quality at a lower cost because USB 5Gbps and USB-C are now standard connectivity in all PCs.

Block diagram





Features and benefits

Key features
– Full accessible 32-bits, 200 MHz, ARM9 core with up to 512 kB of embedded SRAM
– Hi-speed on-the-go (HS-OTG) host and peripheral compliant with on-the-go Supplement Version 2.0
– USB 2.0 OTG compliance
– Compliant with USB BC v1.1
– Additional connectivity to peripherals
– Improved battery charging capabilities

Key benefits
– Adds USB 5Gbps capability to any system
– Quick time-to-market with low development costs
– Turnkey solutions on industrial standards
– Easy code development and integration
– Easy connectivity to peripherals such as I²C, I2S, UART, SPI and GPIOs

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For more details on the product, click on the part number, visit infineon.com or contact our product support.

Application diagram

EZ-USB™ FX3 HD video / 3D imaging

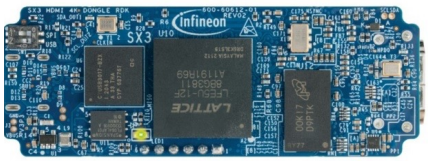


USB 3.0 provides 5Gbps bandwidth and supports the streaming of HD video without the need for compression. EZ-USB™ FX3 connects directly with a variety of image sensors, enabling USB 5 Gbps camera and 3D imaging designs while saving bill-of-material cost and PCB footprint.

Product portfolio

Product	USB standard	USB speed [GBit/s]	I/O type	Operating temperature range [°C]	Operating voltage min [V]	Operating voltage max [V]
CYUSB3011-BZXC	USB 3.0	5	8/16-bit GPIF, DMA, GPIO, I²C, UART, I2S, SPI	0 to 70	1.7	3.6
CYUSB3012-BZXC	USB 3.0	5	8/16/32-bit GPIF, DMA, GPIO, I²C, UART, I2S, SPI	0 to 70	1.7	3.6
CYUSB3013-BZXC	USB 3.0	5	8/16-bit GPIF, DMA, GPIO, I²C, UART, I2S, SPI	0 to 70	1.7	3.6
CYUSB3014-BZXC	USB 3.0	5	8/16/32-bit GPIF, DMA, GPIO, I²C, UART, I2S, SPI	0 to 70	1.7	3.6
CYUSB3014-BZXCT	USB 3.0	5	8/16/32-bit GPIF, DMA, GPIO, I²C, UART, I2S, SPI	0 to 70	1.7	3.6
CYUSB3014-BZXI	USB 3.0	5	8/16/32-bit GPIF, DMA, GPIO, I²C, UART, I2S, SPI	-40 to 85	1.7	3.6
CYUSB3014-BZXIT	USB 3.0	5	8/16/32-bit GPIF, DMA, GPIO, I²C, UART, I2S, SPI	-40 to 85	1.7	3.6

Boards

EZ-USB™ FX3 DEMO_FX3_U3V_CAM01	EZ-USB™ FX3 CY-RB4111	EZ-USB™ FX3 CYUSB3KIT-003
		
The EZ-USB™ FX3 DEMO_FX3_U3V_CAM01 Camera Kit is based on the EZ-USB™ FX3. The kit includes a MIPI CSI-2 camera module connected to an FPGA on one PCB mounting on an updated EZ-USB™ FX3 Explorer kit.	The EZ-USB™ FX3 CYRB4111 USB3 vision solution demo kit is based on the EZ-USB™ FX3. This kit enables users to stream 4K 30 fps videos from an external HDMI source to PC via USB-C interface in USB3 Vision standard.	The EZ-USB™ FX3 CYUSB3KIT-003 is an easy-to-use and inexpensive development platform enabling developers to add USB 3.0 device functionality to any system.

www.infineon.com/ez-usb-fx3

For more details on the product, click on the part number, visit infineon.com or contact our product support.

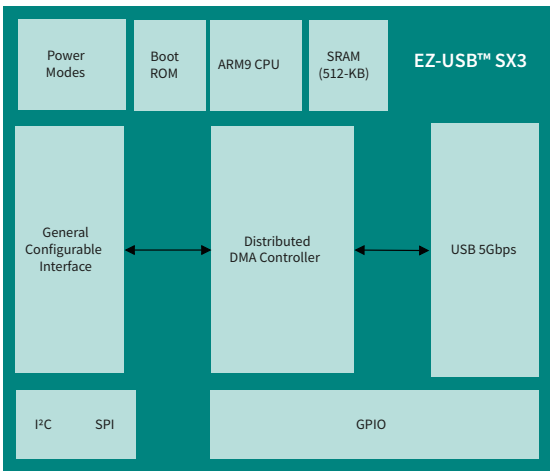
EZ-USB™ SX3 - FIFO to USB 5 Gbps controllers

USB 5Gbps easily configured for UVC/UAC or USB3 Vision applications

Infineon's EZ-USB™ SX3 can be configured by tuning a wide range of parameters such as VID/PID, product strings, serial numbers, FIFO settings, GPIOs, USB endpoints and auxiliary interface via its easy-to-use Graphic User Interface (GUI) utility. The utility can also produce USB video class (UVC) and USB audio class (UAC) configurations that are specification compliant without the need for firmware development, significantly shortening the time-to-market for end products. In addition to the configurable parameters, developers can also utilize the integrated 32-bit ARM9 processor to further customize their devices, differentiating in the market and gaining a competitive advantage.

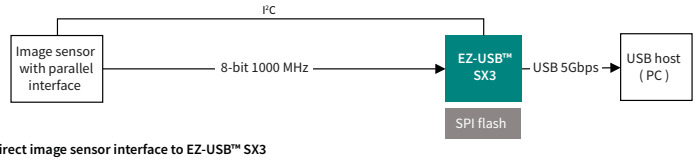
Additionally, Infineon provides a wide range of USB Type-C port controllers that can be used with the EZ-USB™ SX3 to enhance cameras, video capturing, and other data acquisition applications with USB-C and USB power delivery features.

Block diagram

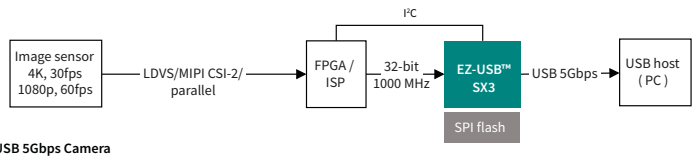




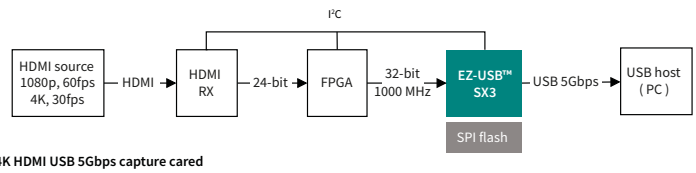
Application diagram



Direct image sensor interface to EZ-USB™ SX3



USB 5Gbps Camera



4K HDMI USB 5Gbps capture cared

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For more details on the product, click on the part number, visit infineon.com or contact our product support.

Features and benefits

Key features

- Universal Serial Bus (USB) integration
  - USB 3.2, Gen 1 and USB 2.0 peripherals compliant with USB 3.2 specification revision 1.0
  - 5 Gbps PHY compliant with USB 3.2 Gen 1
  - Three physical endpoints
  - Supports UVC, UAC, and USB vendor class protocol
- 32 bit CPU ARM926EJ core with 200 MHz operation with 512 kB embedded SRAM
- General configurable interface (supports up to 100 MHz; 8-, 16-, 24-, and 32 bit data bus; slave FIFO, parallel camera interface)
- Additional connectivity to SPI boot flash and I²C slaves at 100/400 kHz and 1 MHz
- Firmware ready for USB video class (UVC), USB3 Vision, and many standard USB class applications
- Less than 60 µA with V_{BATT} on and 20 µA with V_{BATT} off

Key benefits

- Lowest total cost (bandwidth per dollar) solution for any high-speed system
- Turnkey solutions on industrial standards
- Quick time-to-market with low development costs
- Industry gold standard with highly integrated features
- Easy customization via configuration utility

Product portfolio

Product	USB standard	USB speed [GBit/s]	I/O type	Operating temperature range [°C]	Operating voltage min [V]	Operating voltage max [V]
CYUSB3015-BZXC	USB 3.0	5	8/16/24/32-bit GPIF, DMA, GPIO, I²C, SPI	0 to 70	1,7	3,6
CYUSB3015-BZXCT	USB 3.0	5	8/16/24/32-bit GPIF, DMA, GPIO, I²C, SPI	0 to 70	1,7	3,6
CYUSB3015-BZXI	USB 3.0	5	8/16/24/32-bit GPIF, DMA, GPIO, I²C, SPI	-40 to 85	1,7	3,6
CYUSB3015-BZXIT	USB 3.0	5	8/16/24/32-bit GPIF, DMA, GPIO, I²C, SPI	-40 to 85	1,7	3,6
CYUSB3016-BZXC	USB 3.0	5	8/16/24/32-bit GPIF, DMA, GPIO, I²C, SPI	0 to 70	1,7	3,6
CYUSB3016-BZXCT	USB 3.0	5	8/16/24/32-bit GPIF, DMA, GPIO, I²C, SPI	0 to 70	1,7	3,6
CYUSB3016-BZXI	USB 3.0	5	8/16/24/32-bit GPIF, DMA, GPIO, I²C, SPI	-40 to 85	1,7	3,6
CYUSB3016-BZXIT	USB 3.0	5	8/16/24/32-bit GPIF, DMA, GPIO, I²C, SPI	-40 to 85	1,7	3,6
CYUSB3017-BZXC	USB 3.0	5	8/16/24/32-bit GPIF, DMA, GPIO, I²C, SPI	0 to 70	1,7	3,6
CYUSB3017-BZXCT	USB 3.0	5	8/16/24/32-bit GPIF, DMA, GPIO, I²C, SPI	0 to 70	1,7	3,6
CYUSB3017-BZXI	USB 3.0	5	8/16/24/32-bit GPIF, DMA, GPIO, I²C, SPI	-40 to 85	1,7	3,6
CYUSB3017-BZXIT	USB 3.0	5	8/16/24/32-bit GPIF, DMA, GPIO, I²C, SPI	-40 to 85	1,7	3,6

Boards

CY-SD4210 EZ-USB™ SX3 HDMI 4K to USB 5 Gbps demo kit



EZ-USB™ SX3 HDMI 4K to USB 5Gbps demonstartion kit is based on Infineon's EZ-USB™ SX3. An FPGA captures a video stream from the HDMI interface and transfers it via USB 5Gbps connection to a PC. The kit can be configured as a USB video class (UVC) device or a USB3 Vision device easily via EZ-USB™ SX3 Configuration Utility and supports up to 4K 30 frame-per-second video stream.

www.infineon.com/ez-usb-sx3

For more details on the product, click on the part number, visit infineon.com or contact our product support.

USB 2.0 peripheral controllers

Solutions for low-speed, full-speed and high-speed devices

Since 1996, EZ-USB™ has been setting the standard for the industry by enhancing the capabilities of programmable USB peripheral controllers, this has enabled developers to design USB devices that can meet the most stringent performance requirements in industrial and imaging applications. More significantly, Infineon's first-rate customer service and long-term supply guarantee your successful product life cycles last for more than ten years. The complete portfolio of USB programmable peripheral controllers supports low-speed and full-speed options with EZ-USB™ encore and high-speed options with EZ-USB™ FX2LP and EZ-USB™ FX2G2.

EZ-USB™ FX2LP/FX2G2 are highly integrated USB microcontrollers that serve as the basis for any USB high-speed peripheral device. To take full advantage of the USB 2.0 480-Mbps signaling rate, EZ-UBS™ FX2LP and EZ-USB™ FX2G2 contain specialized hardware to buffer USB data and to connect seamlessly to a variety of high-bandwidth external devices such as MCUs, ASICs, and FPGAs.

EZ-USB™ encore is a family of full-speed USB controllers based on Infineon's flexible PSoC™ architecture. These USB controllers have configurable analog and digital blocks, allowing you to customize the part based on your target application. Moreover, EZ-USB™ encore also integrates components such as RAM, clock generator and USB termination resistors reducing the overall system cost and area.

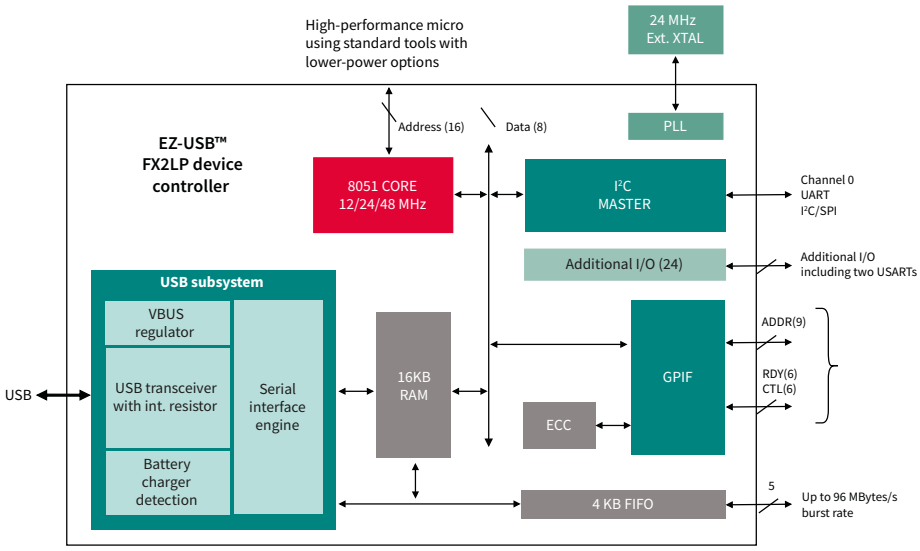
	EZ-USB™ encore	EZ-USB™ FX2LP	EZ-USB™ FX2G2
Function	Device controller	Device controller	Device controller
USB Spec (Speed)	USB2.0 Full speed (12 Mbps)	USB2.0 High speed (430 Mbps)	USB2.0 High speed (430 Mbps)
Interfaces	I²C, SPI, UART, PS/2, ADC	Parallel 8/16-bit GPIF* [48 MHz) I²C, USART	Parallel 16/32-bit GPIF* (100 MHz) I²C, UART, SIN
MCU subsystem	M8C	8051	ARM9
RAM	1 kB	16 kB	512 kB
Hardware DVK	NA	CY3539	CYUSB3KIT-003
Software SDK	SuiteUSB	SuiteUSB	EZ-USB™ FX3 SDK
Package	28-SOP/32-QFN/56-QFN/16-COLQFN	56-SSOP/VFBGA/QFN, 100-TQFP/128-TQFP	121-BGA
Temperature	0°C to 70°C -40°C to + 85°C	0°C to 70°C -40°C to + 105°C	0°C to 70°C -40°C to + 85°C

www.infineon.com/usb-2.0-peripheral-controllers

* general programmable interface

For more details on the product, click on the part number, visit infineon.com or contact our product support.

Block diagram





Features and benefits

Key features
– USB 2.0 USB IF high speed certified (TID # 40460272)
– GPIF supports 8-bit/16-bit external data interface
– Ultra-low power: ICC no more than 85 mA in any mode
– Ideal for bus- and battery-powered applications
– Configurability for VID/PID using EPROM
– Single-chip integrated USB 2.0 transceiver, smart SIE, and enhanced 8051 microprocessor
– Integrated FIFOs, integrated I²C controller
– Commercial and industrial temperature grade

Key benefits
– Wide portfolio of peripheral controllers supporting low-speed, full-speed, and high-speed options
– Quick time-to-market with hardware and software development kit
– Market-proven solutions since 1996
– Premium customer support and long-term supply commitment

www.infineon.com/usb-2.0-peripheral-controllers

For more details on the product, click on the part number, visit infineon.com or contact our product support.

EZ-USB™ serial bridge controller

Discover a wide portfolio of full-speed bridge controllers with configurable and fixed functions

EZ-USB™ serial bridge controller is a family of full-speed bridge controllers offering both configurable and fixed-function options that provides connectivity between USB and serial interfaces UART, SPI, I²C. With the lowest power consumption in standby mode (5 µA), these bridge controllers are the first in the market to offer programmable serial channels for UART/I²C/SPI interfaces. With the latest addition of fixed-function controllers, they can be easily configured to work as USB to UART, USB to I²C, or USB to SPI bridges without requiring any firmware development by the user. The EZ-USB™ Serial Bridge Controller family integrates the industry-leading CAPSENSE™ capacitive-touch sensing technology (for touch-sensitive key switches) and battery charger detection compliant with USB-IF battery charging specification ver. 1.2 to detect the source of power on the USB port.

Features and part numbers	USB-UART bridge controller		USB-I²C bridge controller	USB-SPI bridge controller	USB-Serial configurable bridge controller		USB-billboard controller	
	CY7C65213-28PVXI CY7C652133-32LTXI CY7C65213A-28PVXI CY7C65213A-32LTXI	CY7C65223 CY7C65223D	CY7C65216 CY7C65216D	CY7C652148 CY7C65214D	CY7C65211 CY7C65211A	CY7C65215 CY7C6215A	CY7C65210 CY7C6210A	CY7C65217 CY7C6217A
Function	USB UART	USB UART	USB I²C	USB SPI	USB UART, USB SPI, USB I²C	USB UART, USB SPI, USB I²C	USB billboard	USB billboard
UART channels	1	2			1	2		2
UART protocols	RS232/RS422/ RS4852	RS232/RS422/ RS485			RS232/RS422/ RS4852	RS232/RS422/ RS4852		RS232/RS422
UART pins	8	4			2/4/2006	2/4/6/82		2
Speed/baud rate	3 Mbps	3 Mbps			3 Mbps	3 Mbps		3 Mbps
SPI channels	-	-	-	1/1/2002	1	2	-	-
SPI width	-	-	-	4Bit/8Bit/4Bit	4-16 bit	4-16 bit	-	-
SPI master/slave	-	-	-	Master	Master or slave	Master or slave	-	-
I²C master/slave	-	-	Slave/master	-	Master or slave	Master or slave	Master	Master
Battery charge detection (BCD)	Yes	Yes	Yes	Yes	Yes	Yes	No	No
CAP SENSE buttons					8	5		
GPIOs	8	7	6	8	17	10	9/11	7/9
JTAG		No	No	No	No	Yes/No		
Software flow control	No	Yes			No	No	No	No
USB suspend supply current (typical)	5 µA	5 µA	5 µA	5 uA	5 µA	5 µA	5 µA	5 µA
Packages	32 QFN/28 SSOP	24 QFN/32 QFN	24 QFN/32 QFN	24 QFN/24 QFN/ 32 QFN	24 QFN/32 QFN	24 QFN/32 QFN	24 QFN	24 QFN
Footprint	5x5 mm/ 10x7.5x1.65 mm	4x4 mm/5x5 mm	4x4 mm/5x5 mm	4x4 mm/ 4x4 mm/ 5x5 mm	4x4 mm/5x5 mm	4x4 mm/5x5 mm	4x4 mm	4x4 mm

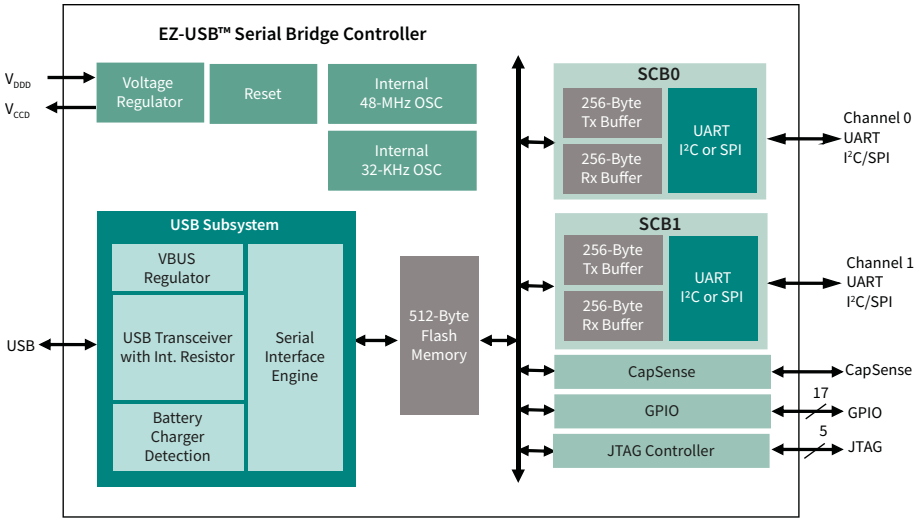
www.infineon.com/ez-usb-serial-bridge-controller

Biometric payment

NFC

For more details on the product, click on the part number, visit infineon.com or contact our product support.

Block diagram





Features and benefits

Key features	Key benefits
– Dual-channel UART, I²C or SPI to USB bridge	– Easy to design, without firmware nor software development
– Supports up to 8 CAPSENSE™ buttons	– Industry's lowest power consumption in standby mode
– Configurable and fixed function options	– Ideal for low-power devices
– BCD compliant to USB-IF battery charging revision 1.2	– Compatibility
– Integrated regulator, oscillator and termination resistors	– Minimization of switching costs
– Driver support for major operating systems	
– Configuration utility for VID/PID and serial interfaces	
– Support multiple USB device classes: CDC, PHDC, HID and vendor specific device classes	

Boards

EZ-USB™ serial bridge controller CYUSBS234	EZ-USB™ serial bridge controller CYUSBS236	EZ-USB™ serial bridge controller CYUSBS232
		
CYUSBS234 development kit (DVK) helps evaluate the features of the single-channel EZ-USB™ Serial Bridge Controller CY7C65211. The kit provides a copper pad on PCB to test CAPSENSE™ feature, a set of EEPROMs to test I²C and SPI interfaces, a RS232 line driver to test UART interfaces.	CYUSBS236 development kit (DVK) helps evaluate the features of the dual-channel EZ-USB™ serial bridge controller CY7C65215. The kit provides two copper pads on the PCB to test CAPSENSE™ feature, two pairs of EEPROMs to test I²C and SPI interfaces, two RS232 line drivers to test UART interfaces.	CYUSBS232 reference design kit (RDK) is a low-cost kit to evaluate EZ-USB™ serial bridge controller CY7C65213. The kit, along with its hardware documentation, serves as a reference design for applications like USB-to-UART cables.
Kit based on CY7C65211-24LTXI	Kit based on CY7C65215-32LTXI	Kit based on CY7C65213-32LTXI

www.infineon.com/ez-usb-serial-bridge-controller

For more details on the product, click on the part number, visit infineon.com or contact our product support.

USB hubs and USB Type-C port controllers

Robust interoperability, extensive charging support, and full configurability

Infineon offers a wide portfolio of hub controllers supporting USB 2.0, USB 3.x 5 Gbps, 10 Gbps and USB Type-C ports with robust backwards interoperability with legacy USB speeds. The USB 3.x hub controllers provide advanced USB-PD and battery charging capabilities, featuring up to eight downstream ports for full configurability and flexible design.

The wide portfolio offers different combinations of features to address all possible needs for notebook PCs, docking stations, TV, STB, DVR, gaming, home gateways, Wi-Fi routers and automotive and industrial applications:

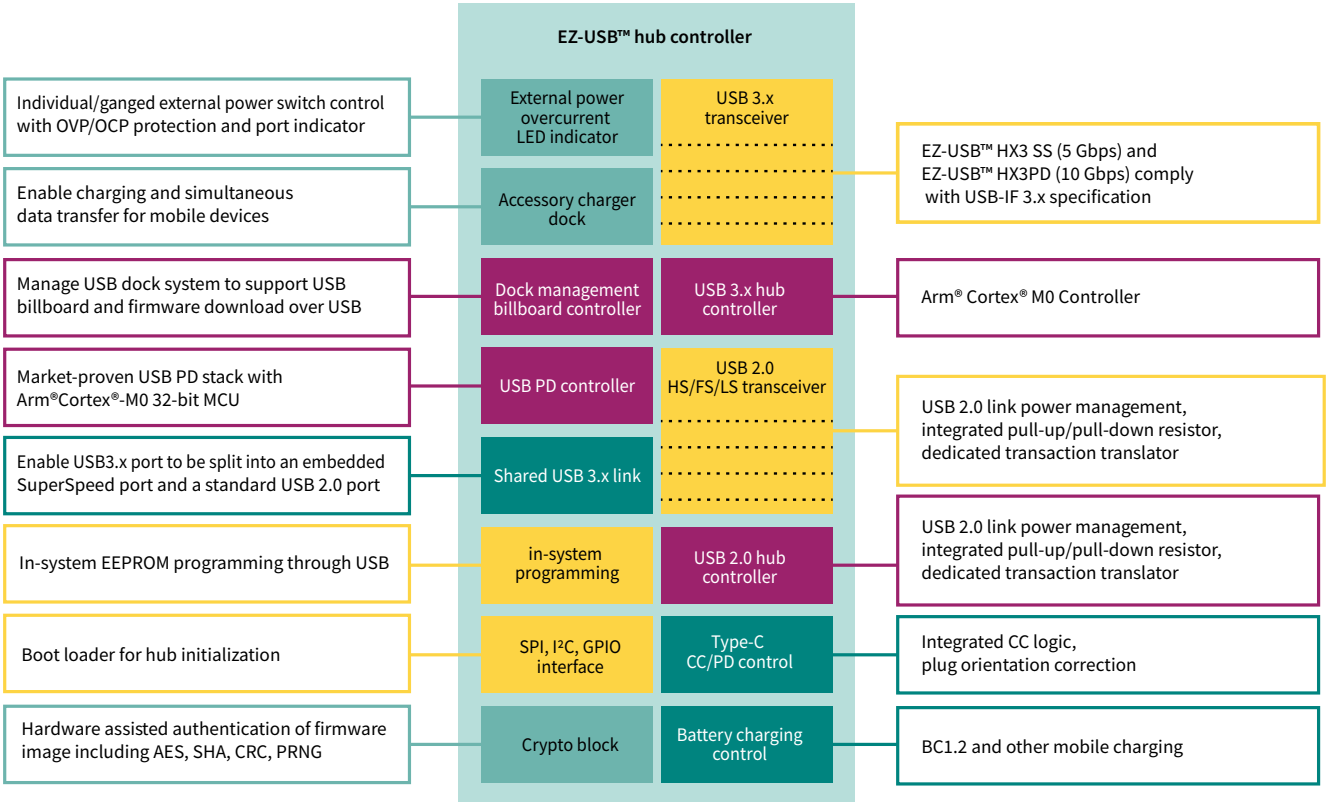
USB hub family		EZ-USB™ HX2LP	EZ-USB™ HX2VL	EZ-USB™ HX3	EZ-USB™ HX3 automotive*	EZ-USB™ HX3PD
USB standard		USB 2.0 480 Mbps	USB 2.0 480 Mbps	USB 3.x 5 Gbps	USB 3.x 5 Gbps	USB 3.x 10 Gbps
Part numbers		CY7C6562x CY7C6563x	CY7C6563x CY7C65642	CYUSB330X CYUSB331X CYUSB332X CYUSB230X	CYUSB332x CYUSB330x	CYUSB4347 CYUSB4357
Nr. of downstream ports		2/4	2/4	2/4	2/4	7 (5x SS, 2x USB 2.0)
USB Type-C						✓
USB power delivery						2 PD ports
Battery charging v1.2				✓	✓	✓
ACA-dock				✓	CYUSB3324	
USB billboard						✓
Dock management controller (DMC)						✓
Multi-TT (one TT per port)			✓	✓	✓	✓
Serial interface		SPI	SPI/I²C	I²C	I²C	2x I²C/SPI
MCU				Arm® Cortex®-M0	Arm® Cortex®-M0	Arm® Cortex®-M0
Flash						2x 128KB
Multi-TT (one TT per port)			✓	✓	✓	✓
In system programming (ISP)		✓	✓	✓	✓	✓
Configurable USB PHYs				✓	✓	✓
Shared link				✓	✓	✓
Vendor command				✓	✓	
External power switch control	Individual			CYUSB3326		✓
	Ganged			CYUSB330x	CYUSB3304	
	Both			CYUSB3324	CYUSB3324	
Pin-strap				CYUSB332x	CYUSB3324	
Port indicator				CYUSB3324	CYUSB3324	
Packages		56QFN	48TQFP, 28QFN	88QFN, 68QFN	100BGA	192BGA
Temperature (-40°C - 85°C)		✓		✓	Automotive	✓

www.infineon.com/ez-usb-hubs

* Coming soon

For more details on the product, click on the part number, visit infineon.com or contact our product support.

Features



www.infineon.com/ez-usb-hubs

For more details on the product, click on the part number, visit infineon.com or contact our product support.

EZ-USB™ HX3

USB 3.x 5Gbps 4-port hub controller with SS/USB 2.0 PHY shared link, DS ports charging and automotive grade

EZ-USB™ HX3 is Infineon's USB-IF-certified 4-port hub controller. It has been repeatedly tested at every USB plug-fest and in independent labs, demonstrating compatibility with all recognized host controllers, device classes, and operating systems. It supports most USB charging standards, including battery charging specification v1.2, Apple charging standard, YD/T 1591-2006 and ACA-dock. This last feature of the EZ-USB™ HX3 enables simultaneous use of USB devices connected to the downstream ports and charging of a smartphone or tablet that supports USB OTG. Without a host attached to the upstream port, it also supports battery charging on the downstream ports.

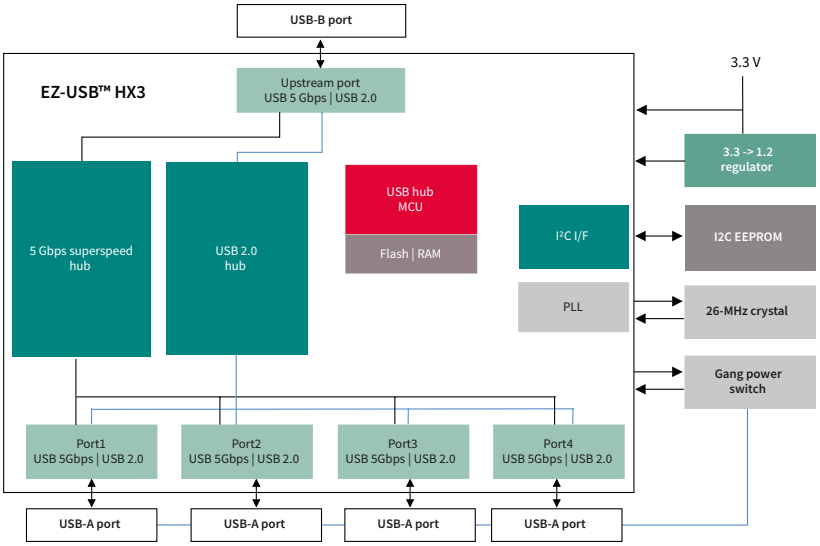
The configurable USB 5 Gbps and USB 2.0 PHY of the EZ-USB™ HX3 enhance signal quality, giving board designers more flexibility and simplifying USB-IF compliance. EZ-USB™ HX3 also supports shared USB link, a proprietary feature that doubles the number of USB ports, creating 8 ports from a 4-port hub controller.

Features/Part	CYUSB3302	CYUSB3304	CYUSB3312	CYUSB3314	CYUSB3324	CYUSB3326	CYUSB3328	CYUSB2302	CYUSB2304
Number of DS ports	2 (USB 3.0)	4 (USB 3.0)	2 (USB 3.0)	4 (USB 3.0)	4 (USB 3.0)	6 (2 USB 3.0, 2 SS, 2 USB 2.0)	8 (4 SS, 4 USB 2.0)	2 (USB 2.0)	4 (USB 2.0)
Number of shared link ports	0	0	0	0	0	2[1]	4	0	0
BC v1.2	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ACA-dock	No	No	No	No	Yes	No	Yes	No	No
External power switch control	Ganged	Ganged	Individual and ganged	Individual and ganged	Individual and ganged	Individual	Individual	Ganged	Ganged
Pin-strap support	No	No	Yes	Yes	Yes	Yes	Yes	No	No
I^2C	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vendor command	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Port indicators	No	No	Yes	Yes	Yes	No	No	No	No
Packages[2]	68-QFN, 100-ball BGA	68-QFN, 100-ball BGA	88-QFN, 100-ball BGA	88-QFN, 100-ball BGA	88-QFN, 100-ball BGA	88-QFN, 100-ball BGA	88-QFN, 100-ball BGA	68-QFN, 100-ball BGA	68-QFN, 100-ball BGA
Temperature range	Industrial and commercial	Industrial and commercial	Industrial and commercial	Industrial and commercial	Industrial and commercial	Industrial and commercial	Industrial (88-QFN only) and commercial	Industrial and commercial	Industrial and commercial

www.infineon.com/ez-usb-hx3

For more details on the product, click on the part number, visit infineon.com or contact our product support.

Block diagram





Features and benefits

Key features	Key benefits
– Compliance with USB 3.2 Gen 1 (USB-IF and WHQL certified)	– Supports up to 4 USB 3.0 compliant DS ports
– Shared link feature (supports simultaneous USB 2.0 and SuperSpeed USB devices on the same port)	– Enables extra downstream (DS) ports for on-board connections in embedded applications
– Enables USB charging while the hub is disconnected from a hub host	– Enables charging of devices connected to the DS ports when no host is connected on the upstream (US) port
– Supports BC v1.2 and Apple charging	– Easy-to-customize configuration parameters
– Allows firmware upgrades using I²C EEPROM or an external I²C master	– High quality and reliability
– Integrated ARM® Cortex® M0 CPU	
– LED status indicators – suspend, SS, and USB 2.0 operation	

Boards

EZ-USB™ HX3 CY4613	EZ-USB™ HX3 CY4609	EZ-USB™ CY4603
		
It's a development kit aimed to demonstrate EZ-USB™ HX3 ´s shared link feature in a 6-port configuration supporting ACA-dock functionality.	It's a reference design kit that can be used as a reference design for standalone USB 3.0 hub applications.	It's a development kit that demonstrates EZ-USB™ HX3's application in a 4-port 3.0 USB hub.

www.infineon.com/ez-usb-hx3

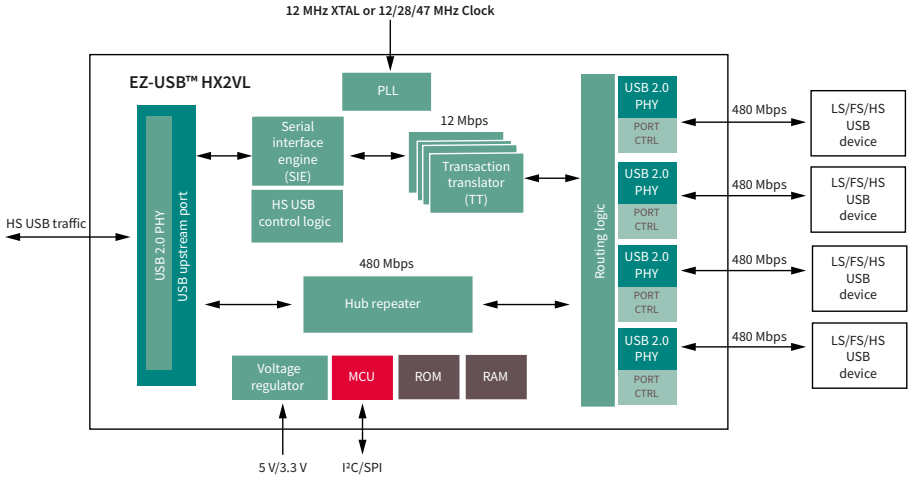
For more details on the product, click on the part number, visit infineon.com or contact our product support.

EZ-USB™ HX2LP and HX2VL hub controllers

4-port single- and multi-TTs hub USB controllers

Infineon's EZ-USB™ HX2LP and HX2VL are Infineon's first-generation high-speed hub controllers available in 2-port and 4-port versions. These USB 2.0 hub controllers have integrated upstream and downstream transceivers, a USB serial interface engine (SIE), USB hub control and repeater logic, and TT logic. Many of its external passive components such as pull-ups and pull-down resistors are integrated into the chip, significantly reducing the overall bill of materials required to implement a hub design.

Family	Part number	Number of ports	Number of TTs	I/O options	Temperature grade
EZ-USB™ HX2VL	CY7C65634	2	Single	SPI, I²C, GPIO	Commercial
	CY7C65632	4	Single		
	CY7C65642	4	Multi		
EZ-USB™ HX2LP	CY7C65620/1	2	Single	SPI	Commercial, industrial
	CY7C65630/1	4	Single		



Features and benefits

Key features
– Up to 4 downstream ports
– Very low power consumption (82 mA)
– Integrated internal regulator, pull-up and pull-down resistors for all downstream ports
– Selectable XTAL/CLK inputs, power switch polarity, EEPROM interface
– VID, PID configurable through external EEPROM
– Integrated ARM® Cortex® M0 CPU
– LED status indicators – suspend, SS, and USB 2.0 operation

Key benefits
– Reduced area
– Reduced BOM

www.infineon.com/ez-usb-hx2vl-hx2lp

For more details on the product, click on the part number, visit infineon.com or contact our product support.

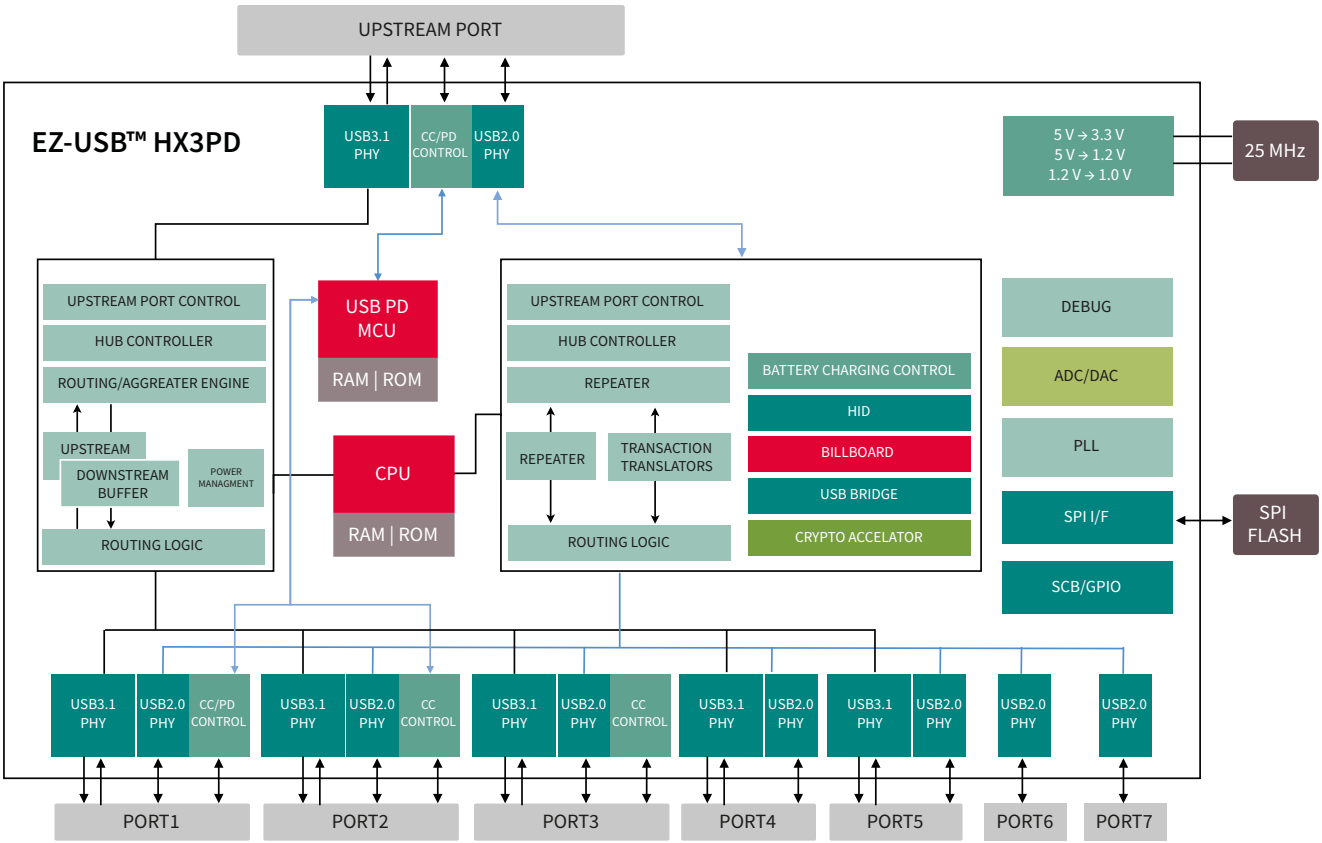
EZ-USB™ HX3PD

Industry's first 7-port USB 10Gbps hub controller with power delivery

EZ-USB™ HX3PD is the industry's first 7-port USB 10Gbps Type-C hub controller with power delivery, supporting two USB-C + PD ports (one upstream and one downstream), and five downstream USB 10Gbps ports.

With five chips (two 4-port USB hub controllers, two USB PD controllers, and a dock management controller) integrated into one, EZ-USB™ HX3PD is the most integrated USB 10Gbps hub in the market. This leads to a significant reduction of BOM component cost and PCB footprint, which makes EZ-PD™ HX3PD a perfect fit for USB-C dongles, docks, and monitors. Configurable shared USB 10 Gbps and USB 2.0 PHY functionality can improve USB 10Gbps signal transmission quality, allowing board designers more freedom and simplifying USB-IF compliance.

Block diagram



www.infineon.com/ez-usb-hx3pd

For more details on the product, click on the part number, visit infineon.com or contact our product support.

Features and benefits

Key features

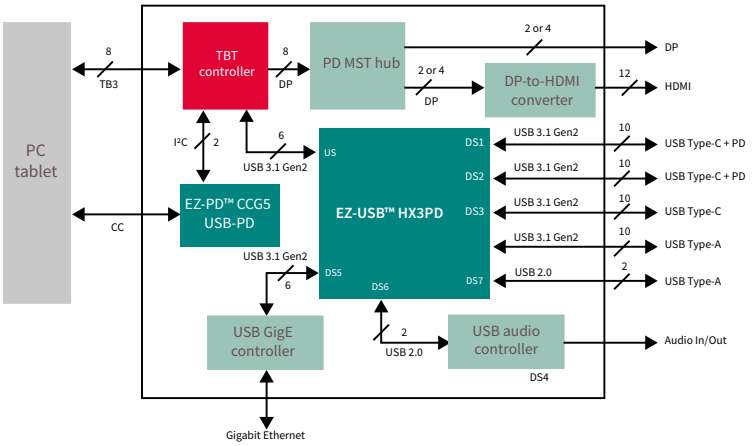
– Compliant with USB 3.1 gen 2
  – Upstream (US): 10 Gbps; Type-A or Type-C plus PD
  – Downstream (DS): 7 ports; 5x 10 Gbps, 2x 480 Mbps; 1 Type-C Plus PD, 2 Type-C only and 4 Type-A ports

– Integrated DFP (RP) and UFP (RD) termination resistors
– Integrated billboard controller
– Charging support: BC v1.24, Apple Charging standard
– PD policy engine configures power profiles dynamically
– Charging DS without US connection
– Optional signed firmware upgradable via dock management controller (DMC)

Key benefits
– USB-IF compliant 2x4-port USB hubs with 2x USB-PD 3.0
– Integrated total five chips into a single chip for BOM components and PCB board size reduction
– Integrated Crypto AES/SHA/CRC blocks for secured firmware upgrades via dock management controller
– Intel USB4 / Thunderbolt 4 Dock reference design available
– Support USB PD 3.0, BC1.2, Apple, Samsung, and QC 4.0 charging standards
– Provides USB PHY configurability to compensate signal loss over PCB traces

Application diagram

Thunderbolt4 Dock



EZ-USB™ HX3PD allows to solve several challenges in the development of Thunderbolt docs designs such as:

- Thunderbolt dock design is complex, requiring many discrete components
- Thunderbolt dock requires pre-approved USB-PD controller and a large BOM
- USB-C dock must support USB PD and all legacy charging standards
- USB 3.1 Gen2 signal integrity is difficult to handle at 10 Gbps
- USB 3.1 Gen2 and PD need FW upgrade to keep pace with USB spec changes

Boards

EZ-USB™ HX3PD CY6611

This evaluation kit is based on the CYUSB4347-BZXC, a 7-port evaluation kit designed to demonstrate the USB 3.1 Gen 2 hub, USB PD 3.0 and USB battery charging (BC 1.2) functionalities.



www.infineon.com/ez-usb-hx3pd

For more details on the product, click on the part number, visit infineon.com or contact our product support.



Infineon support for USB-C controllers and peripherals

Useful links and helpful information

Further information, datasheets and documents

www.infineon.com/universal-serial-bus
community.infineon.com
mycases.infineon.com

Support
Evaluation board
Tools



Power management ICs

- XDP™ SMPS controllers
- DC-DC digital multiphase controllers
- AC-DC power management ICs
- PFC controllers
- PWM controllers and climate saver systems
- Resonant LLC half-bridge controller ICs
- NFC tag-side controllers
- OptiMOS™ integrated power stages
- Switching regulators
- Voltage regulators
- Digital power controller
- Audio amplifier ICs
- AC-DC LED driver ICs
- DC-DC LED driver ICs
- iMOTION™ integrated motor control solutions
- MOTIX™ controllers and control ICs

XDP™ SMPS

IDP2308 and IDP2303A – digital multimode PFC+LLC combo controller

The IDP2308 and IDP2303A are high-performance digital combo controllers with integrated drivers and a 600 V depletion cell designed for boost PFC and half-bridge LLC targeting switched mode power supplies (SMPS) from 75 to 300 W.

- Support non-AUX operation with the lowest standby performance and start-up cell
- Support multimode PFC operation for optimized efficiency curve
- Configurable frequency setting for LLC soft-start and normal operation
- Synchronous PFC and LLC burst mode control with soft-start to prevent acoustic noise
- Excellent dynamic response by adaptive LLC burst mode
- Configurable and comprehensive protections for PFC/LLC/IC temperature
- IEC62368-1 certified active X-cap discharge function
- Flexible IC parameter setting with digital UART interface supports PSU platform approach

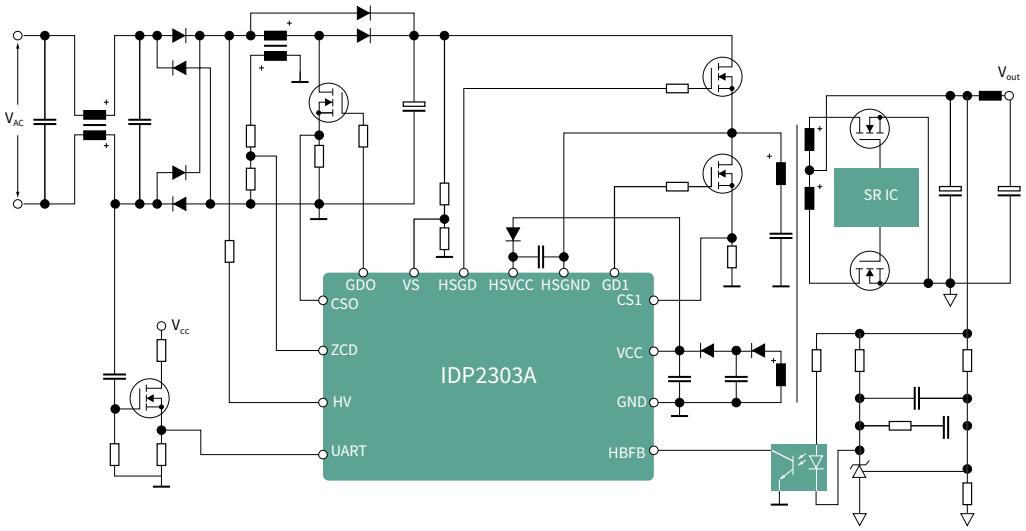


Key benefits

- Low BOM count due to high integration of digital control
- No auxiliary power supply needed
- Easy design of system schematic and PCB layout
- Small form factor design
- Higher system reliability
- Shorter development cycles and higher design and production flexibility

Product	Target application	Major difference	Package
IDP2308	TV embedded PSU	2nd redundant PFC output overvoltage protection	DSO-14 (with enhanced HV creepage distance)
IDP2303A	Adapter, general SMPS	Constant output voltage	DSO-16

IDP2303A – power adapter

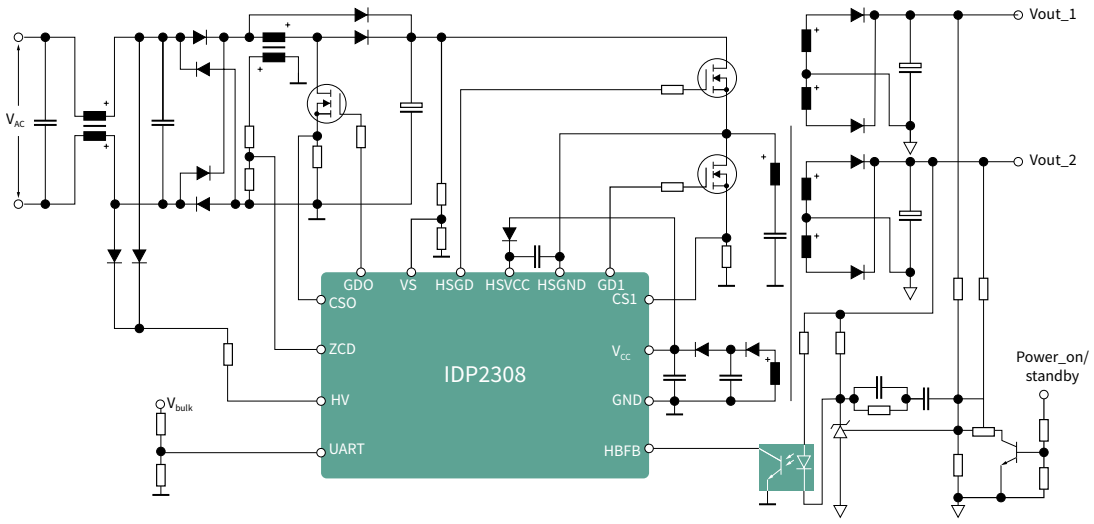


www.infineon.com/xdp-smps

For more details on the product, click on the part number, visit infineon.com or contact our product support.



IDP2308 – embedded PSU



Target applications

- LCD TV power supply
- General SMPS
- Power adapter

www.infineon.com/xdp-smps

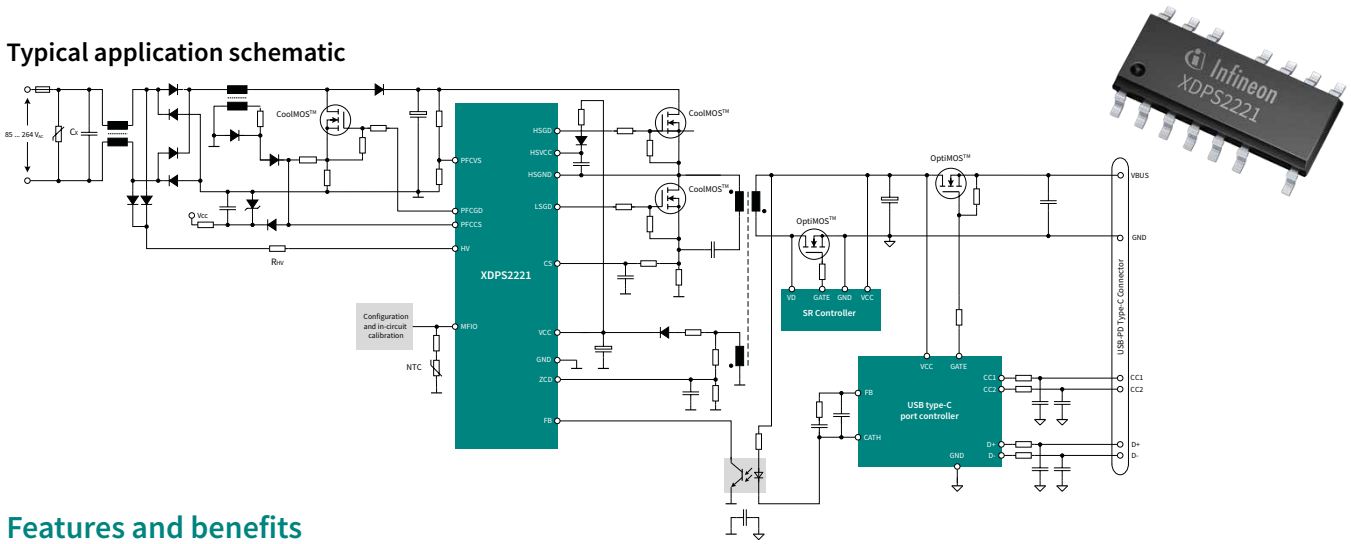
For more details on the product, click on the part number, visit infineon.com or contact our product support.

XDP™ SMPS

XDPS21081 – digital FQR flyback controller

The XDP™ digital power XDPS2221 is a highly integrated device combining both PFC boost and hybrid flyback (HFB) (asymmetrical half-bridge as from literature) conversion features. The high level of integration allows for seamless operation as well as optimal control of the two conversion stages, delivering class-leading performance. This innovative controller enables high power density designs and high system efficiency meeting international regulatory standards on power efficiency (such as EU CoC Version 5 Tier 2 and DoE Level VI) as well as an effective control of the wide output voltage for the latest USB-PD extended power range (EPR) standard V3.1. It is very well suited to drive GaN-based devices, such as Infineon's CoolGaN™ switches.

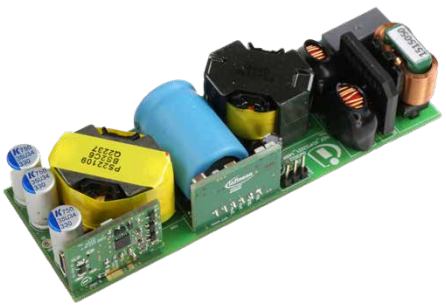
Typical application schematic



Features and benefits

Key features	Key benefits
– IEC62368-1 certified active X-cap discharge function	– Low no-load input standby power performance
– High-performance multi-mode PFC with critical conduction mode operation	– Low BOM cost and count
– High efficiency multi-mode hybrid-flyback topology with adaptive resonant period	– Low standby and high efficiency across various line/load conditions
– Supports USB-PD standard V3.1 extended power range (EPR) with wide output voltage up to 28 V (36 V/48 V to be covered by XDPS2222 available in Q2/2023)	– High power density and high switching frequency
– Highly integrated combo controller for the PFC and hybrid flyback topology, including a 600 V start-up cell with X-cap discharge functionality	– Easily configurable
– DSO-14 (150-mil) package	– Optimization via GUI tools

REF_XDPS2221_140W1



For design support material, please click here.

140 W reference design with PFC + hybrid flyback combo IC XDP™ XDPS2221 and CoolGaN™ GIT HEMTs:

This is a 140 W USB-PD type-C charger reference design. It demonstrates the high performance of the PFC + hybrid flyback combo controller XDP™ digital power XDPS2221 together with CoolGaN™ switches for wide input AC and wide output voltage applications. Besides the combo IC XDPS2221, it features three CoolGaN™ 600 V e-mode GIT HEMTs (IGLD60R190D1) as PFC and HFB main switches, OptiMOS™ BSC040N10NS5 as SR switch, the EZ-PD™ CCG3PA controller CYPD3175 serves as the USB-PD controller, and the HEXFET™ IRF7240 as load switch.

Ordering code: REFXDPS2221140W1TOBO1

Target applications:

- Adapters and chargers
  - with ultra-high power density
  - with extended power range (EPR)

Adapter

Smartphone charger

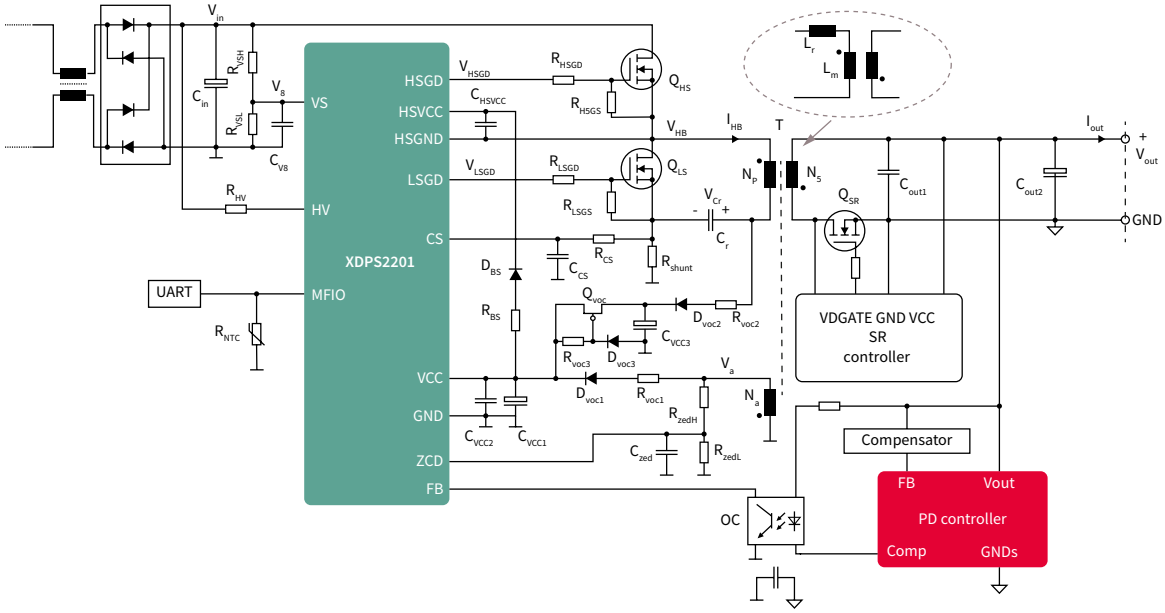
www.infineon.com/XDP

For more details on the product, click on the part number, visit infineon.com or contact our product support.

XDP™ SMPS

XDPS2201 – digital hybrid flyback controller

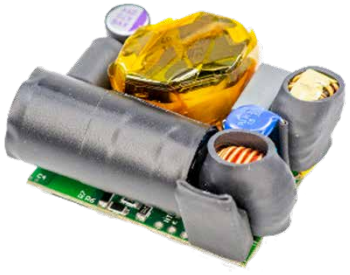
XDPS2201 is a multimode, digital configurable hybrid flyback controller that combines the simplicity of a traditional flyback topology with the performance of a resonant converter. By utilizing two high-voltage MOSFETs, such as CoolMOS™, the controller can drive both high- and low-side MOSFETs in an asymmetric half-bridge flyback topology. Both zero voltage and current switching are achieved through means of regulating the polarity of the magnetizing current to increase efficiency. Also, transformer leakage energy is recycled, thereby further increasing efficiency.



Features and benefits

Key features	Key benefits
– Zero voltage and current switching across all line and load conditions	– Reduce switching loss and achieve high efficiency
– Multimode operation (active burst mode, DCM, ZV-RCS, and CRM)	– Optimize efficiency across various line/load conditions
– Integrated high-side driver and 600 V start-up cell	– Optimize light and no-load efficiency
– Single auxiliary transformer winding and resonant cap to supply power to IC	– Save BOM count and cost with no messy external driver
– Comprehensive suite of protection feature sets	– Easy to drive, low cost, and widely available off the shelf 60 V MOSFET
– Digital platform with configurable parameters	– Fail-safe mechanism to limit output power in the event of PD controller failure
	– Avoid CCM operation and no potential of shoot-through with SR MOSFET

DEMO_XDPS2201_65W1



65 W USB-PD PPS Type-C demo board in a miniature form factor based on XDPS2201.

- Up to 65 W output power with 31 W/in^3 power density
- Universal input range 90~264 V_{AC}
- Supported output: 5 V/3 A, 9 V/3 A, 12 V/3 A, 15 V/3 A and 20 V/3.25 A, 5~20 V/3 A
- Peak efficiency of more than 93.8 percent
- Low no-load standby input power of less than 75 mW OR Low no-load standby input power (less than 75 mW)

Ordering code: DEMOXDPS220165W1TOBO1

www.infineon/xdps2201

For more details on the product, click on the part number, visit infineon.com or contact our product support.

DC-DC digital multiphase controllers

Point-of-load power management

Infineon's digital multiphase and multi-rail controllers provide power for today's medium- and high-current POL applications used in telecom/datacom, server, and storage environments. Infineon's digital controller family enables OEMs and ODMs to improve efficiency and total cost of ownership while increasing power density and optimizing the total system footprint of the voltage regulator. The products highlighted in the table below represent our fifth-generation digital controller family and support up to two rails with 1-6 phases on individual rails. The I²C/PMBus interface connects the digital controllers to the application system and provides real-time telemetry information, monitoring, and control capabilities. The digital controllers are fully configurable through our PowerCode and PowerClient graphical user interfaces that allow for easy-to-use and simplified design optimization.

Multiphase configurations are supported for best power optimization

Feature		Controller family							
Configurable output rails		Dual rail	Dual rail	Dual/single rail	Dual/single rail	Dual rail	Dual/single rail	Dual/single rail	Dual rail
Part number	PMBus	PXE1610C*	IR35212	XDPE10280B*	XDPE10281B*	IR35204MTRPBF	IR35201MTRPBF	IR35223*	XDPE132G5C*
Phase configuration	Main	7 ph	7 ph	8 ph	8 ph	4 ph	8 ph	10 ph	16 ph
	Subconfigurations	6+1	6+1	8+0, 6+2, 4+4	8+0, 6+2, 4+4	3+1	8+0, 7+1, 6+2	10+0, 5+5	8+8
V_{out_max}		2.5 V	3.3 V	3.04 V	3.04 V	3.3 V	3.3 V	3.3 V	3.3 V
Switching frequency		Up to 2 MHz	Up to 2 MHz	Up to 2 MHz	Up to 2 MHz	Up to 2 MHz	Up to 2 MHz	Up to 2 MHz	Up to 2 MHz
Operating temperature range		- 5°C to 85°C	- 40°C to 85°C	- 40°C to 85°C	- 40°C to 85°C	- 40°C to 85°C	- 40°C to 85°C	- 40°C to 85°C	- 40°C to 120°C
VQFN package		48-lead (6x6) 0.4 mm pitch	48-lead (6x6) 0.4 mm pitch	56-lead (7x7) 0.4 mm pitch	56-lead (7x7) 0.4 mm pitch	40-lead (5x5) 0.4 mm pitch	56-lead (7x7) 0.4 mm pitch	48-lead (6x6) 0.4 mm pitch	56-lead (7x7) 0.4 mm pitch
Typical application		Intel server, high-end desktop	Intel server, workstation, high-end desktop	Intel server, workstation, high-end desk-top	AMD server, workstation, high-end desk-top	AMD server, memory and SOC	AMD server, CPU	Phase redundant based server systems	AMD server, GPU, ASIC, networking ASSP

Advantages of a digital controller

The protection features include a set of sophisticated overvoltage, undervoltage, overtemperature, and overcurrent protection. Each of the controllers in the table above also detects and protects against an open circuit on the remote sensing inputs. These attributes provide a complete and advanced protection feature set for microprocessor, DSP, FPGA, or ASIC power systems. Accurate current sense telemetry achieved through internal calibration that measures and corrects current sense offset error sources upon start-up. Programmable temperature compensation provides accurate current sense information even when using DCR current sense.

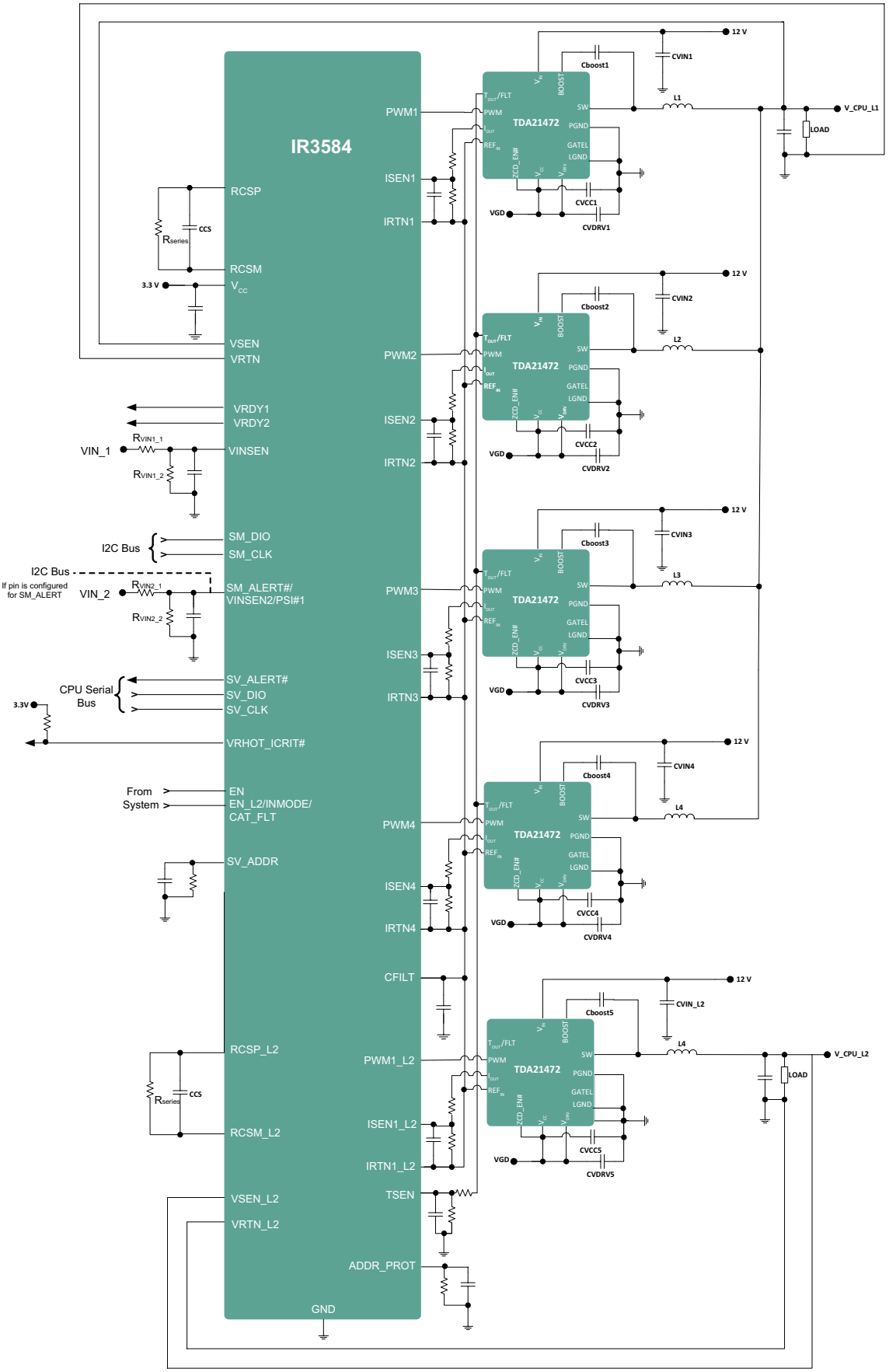
Telecom Server

www.infineon.com/digital-controller

*For more information on the product, contact our product support

For more details on the product, click on the part number, visit infineon.com or contact our product support.

Typical multiphase application circuit



AC-DC power management ICs

Technology leadership in power supply

By offering a wide variety of highly efficient control ICs, we enable our customers to meet new demands like PFC regulations and ultralow standby power requirements in a very cost-effective way. A comprehensive array of safety features helps to minimize the number of external components, reduces design in time, and improves the reliability of the SMPS.

AC-DC power management ICs

PFC controller

Continuous conduction mode (CCM) PFC

Fixed-frequency
ICE2PCS02G (65 kHz)
ICE2PCS03G (100 kHz)

Adjustable frequency
ICE2PCS01G (50-250 kHz)
ICE2PCS05G (20-250 kHz)
ICE3PCS01G (OVP+brown-out)
ICE3PCS02G (OVP)
ICE3PCS03G (Brown-out)

Critical conduction mode (CrCM) PFC

IRS2505L

PWM controller

Stand-alone PWM

Fixed-frequency
ICE5GSAG (125 kHz)
ICE5ASAG (100 kHz)
ICE3AS03LJG (100 kHz)
ICE3BS03LJG (65 kHz)

Quasi-resonant
ICE5QSBG
ICE2QS02G
ICE2QS03G
ICC80QSG

Half-bridge and LLC resonant
ICE1HS01G-1
ICE2HS01G
XDPS2201
XDPS2221
XDPS2222

Fixed-frequency (FF) CoolSET™

650 V F3/F3R CoolSET™
ICE3Axx65ELJ
ICE3RBRxx65JZ
ICE3RBRxx65JG

700 V Gen5 CoolSET™
ICE5AR4770AG
ICE5AR4770BZS

800 V CoolSET™
ICE5A/GRxx80AG
ICE5xRxx80xZ
ICE3A/BRxx80JZ
ICE3ARxx80CJZ
ICE3ARxx80VJZ
ICE3ARxx80JG

950 V CoolSET™
ICE5xR3995xZ

Combi (PFC+PWM)

CrCM + LLC
XDP™ SMPS IDP2308 (DSO-14)
XDP™ SMPS IDP2303A (DSO-16)

Quasi-resonant (QR) CoolSET™

650 V CoolSET™
ICE2QRxx65(Z)/(G)

800 V CoolSET™
ICE2QRxx80Z/G
ICE5QRxx80BG

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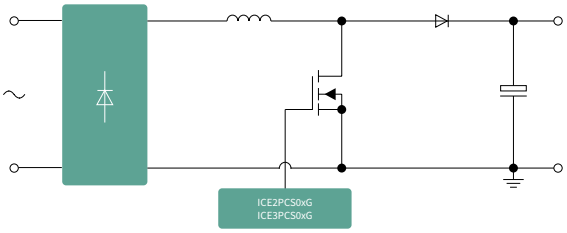
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Continuous conduction mode (CCM) PFC ICs

High efficiency and very low system cost

Compared to the first generation of ICE1PCS01/02, the second generation of CCM PFC controller ICs, ICE2PCS01/02, have lower internal reference trimmed at 3 V. They also have other advantages such as wider V_{CC} operating range, an improved internal oscillator, and additional direct bulk capacitor overvoltage protection. Compared to the first and second generation of ICE1PCS0x and ICE2PCS0x, the third generation of CCM PFC has the lowest internal reference trimmed at 2.5 V and integrated digital control voltage loop. The third generation also features low peak current limit at 0.2 V, an adjustable gate switching frequency range from 21 kHz to 100 KHz, and is able to synchronize with an external frequency range from 50 kHz to 100 kHz. The third generation is now able to achieve 95 percent efficiency at full load for the entire input voltage range.

Application diagram



2nd generation continuous conduction mode PFC IC features

- Fulfills class D requirements of IEC 61000-3-2
- Lowest count of external components
- Adjustable and fixed switching frequencies
- Frequency range from 20 to 250 kHz
- Versions with brown-out protection available
- Wide input range supported
- Enhanced dynamic response during load jumps
- Cycle-by-cycle peak current limiting
- Integrated protections OVP, OCP
- DIP-8 and DSO-8
- Lead-free, RoHS compliant

3rd generation continuous conduction mode PFC IC features

- Fulfills class D requirements of IEC 61000-3-2
- Integrated digital voltage loop compensation
- Boost follower function
- Bulk voltage monitoring signals, brown-out
- Multi protections such as double OVP
- Fast output dynamic response during load jump
- External synchronization
- Extra-low peak current limitation threshold
- SO8 and SO-14
- Lead-free, RoHS compliant

	ICE2PCS01G ICE2PCS05G	ICE2PCS02G ICE2PCS03G	ICE3PCS03G	ICE3PCS02G	ICE3PCS01G
Digital control voltage loop	–		✓	✓	✓
Variable frequency	✓	–	✓	✓	✓
Synchronous frequency	–		✓	✓	✓
Open loop protection	✓	✓	✓	✓	✓
Low peak current limit	-1 V	-1 V	-0.4 V	-0.4 V	-0.2 V
Brown-out protection	–	✓	✓	–	✓
Overvoltage protection	✓	✓	✓	✓	✓
Second overvoltage protection	–			✓	✓
PFC enable function	–				✓
Boost follower mode	–				✓
5 V regulator	–				✓

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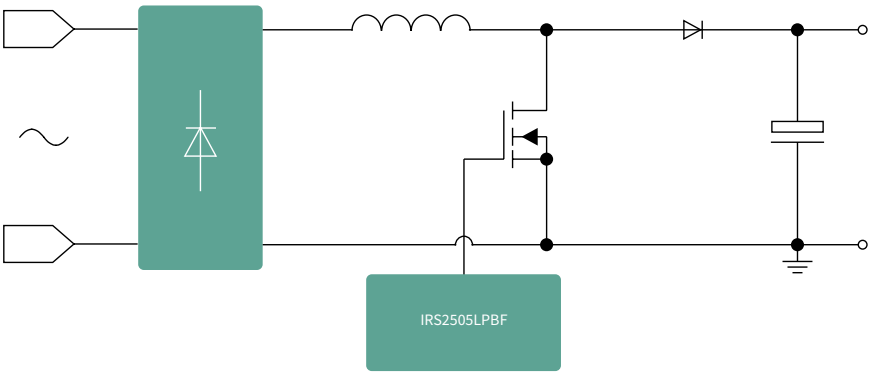
For more details on the product, click on the part number, visit infineon.com or contact our product support.

Critical conduction mode (CrCM) PFC

Easy design and lowest system cost

Fully compatible with the world standard, these devices are optimized to offer extremely compact and cost-effective PFC solutions for electronic ballast and offline SMPS.

Application diagram



IRS2505LPBF

- Critical conduction mode PFC control
- High power factor and ultralow THD
- Wide load and line range
- Regulated and programmable DC bus voltage
- No secondary winding required
- MOSFET cycle-by-cycle overcurrent protection
- DC bus overvoltage protection
- Low EMI gate drive
- Ultralow start-up current
- 20.8 V internal Zener clamp on V_{CC}
- Excellent ESD and latch immunity
- RoHS compliant
- 5-pin SOT-23 package

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PFC controller portfolio

Critical conduction mode (CrCM) PFC IC portfolio

Product	V_{cc} min.	V_{cc} max.	Package
IRS2505L	9 V	20.8 V	SOT-23

Continuous conduction mode PFC ICs

2nd generation continuous conduction mode PFC IC product portfolio

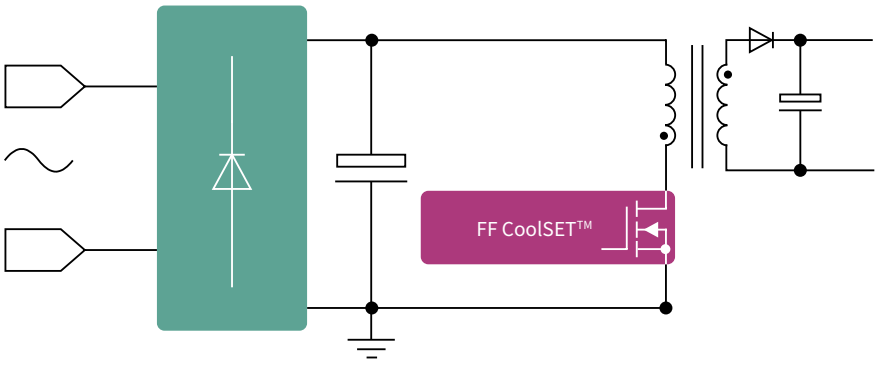
Product	Frequency – f_{sw}	Current drives	Package
ICE2PCS01G	50-250 kHz	2.0 A	DSO-8
ICE2PCS02G	65 kHz	2.0 A	
ICE2PCS03G	100 kHz	2.0 A	
ICE2PCS05G	20-250 kHz	2.0 A	

3rd generation continuous conduction mode PFC IC product portfolio

Product	Frequency – f_{sw}	Current drives	Features	Package
ICE3PCS01G	Adjustable	0.75 A	OVP+brown-out	SO-14
ICE3PCS02G		0.75 A	OVP	SO-8
ICE3PCS03G		0.75 A	Brown-out	SO-8

For more details on the product, click on the part number, visit infineon.com or contact our product support.

5th generation fixed-frequency PWM IC and CoolSET™



- Integrated CoolMOS™ in 700 V, 800 V, and 950 V MOSFETs
- Cascode configuration for brown-in protection, fast and robust start-up
- Available in 65 kHz, 100 kHz, and 125 kHz fixed switching frequency
- Frequency reduction in tandem with load reduction to increase efficiency
- Selectable active burst mode entry/exit profile to optimize standby power and ability to disable
- Supports CCM flyback operation with built-in slope compensation
- Integrated error amplifier for direct feedback non-isolated flyback and buck
- Adjustable line input overvoltage protection (only ICE5xRxxxxAG and ICE5xRxxxxCZ)
- V_{CC} pin short-to-ground protection
- Auto restart protection mode to minimize interruption of operation
- DSO-8 package (stand-alone controller), DIP-7 and DSO-12 package for CoolSET™

Hal RoHS

5th generation fixed-frequency CoolSET™

Output power[1] 85 V_{AC}~300 V_{AC} T_a=50°C		15 W	17 W	23 W	27 W	40 W
$R_{DS(on),max.}$		5.18 Ω	4.05 Ω	2.35 Ω	1.75 Ω	0.80 Ω
700 V	DIP-7	ICE5AR4770BZS				
	DSO-12	ICE5AR4770AG				
800 V	DIP-7	ICE5AR4780BZS ICE5BR4780BZ		ICE5AR2280CZ ICE5BR2280BZ		ICE5AR0680BZS
	DSO-12	ICE5GR4780AG		ICE5GR2280AG	ICE5GR1680AG	ICE5AR0680AG
950 V	DIP-7		ICE5AR3995BZ ICE5BR3995BZ ICE5BR3995CZ			

3rd generation fixed-frequency CoolSET™

Output power[1] 85 V_{AC}~300 V_{AC} T_a=50°C		10~15 W	19~21 W	23~26 W	30~34 W	37~41 W
$R_{DS(on),max.}$		11.1~5.44 Ω	3.42~2.62 Ω	1.96~1.71 Ω	1.11~1.05 Ω	0.75~0.71 Ω
650 V	DIP-7	ICE3RBR4765JZ		ICE3RBR1765JZ		ICE3RBR0665JZ
	DIP-8	ICE3BR4765J	ICE3A1065ELJ	ICE3BR1765J	ICE3A2065ELJ	ICE3BR0665J
	DSO-12	ICE3RBR4765JG		ICE3RBR1765JG		ICE3RBR0665JG
800 V	DIP-7	ICE3AR4780JZ	ICE3AR2280JZ	ICE3AR1580VJZ	ICE3AR1080VJZ	ICE3AR0680JZ
		ICE3AR4780VJZ	ICE3BR2280JZ			ICE3BR0680JZ
		ICE3AR4780CJZ	ICE3AR2280VJZ			ICE3AR0680VJZ
		ICE3AR10080CJZ	ICE3AR2280CJZ			
	DSO-12	ICE3AR4780JG	ICE3AR2280JG		ICE3AR1080JG	

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1) Calculated DCM maximum output power in an open-frame design based on T_a=50° C and T_j=125°C without copper area as heatsink

For more details on the product, click on the part number, visit infineon.com or contact our product support.



Fixed-frequency PWM IC

	Gen5		Gen3	
FF PWM IC	ICE5ASAG	ICE5GSAG	ICE3AS03LJG	ICE3BS03LJG
Package	DSO–8		DSO–8	
Switching frequency	100 kHz	125 kHz	100 kHz	65 kHz
Operating temperature	-40°C~129°C		-25°C~130°C	
Start-up cell	Cascode		✓	
V_{cc} on/off threshold	16 V/10 V		18 V/10.5 V	
Soft-start time	12 ms		10 ms	20 ms
Frequency jittering	✓		✓	
Modulated gate drive	✓		✓	
Active burst mode	✓ (3-level selectable)		✓	
Slope compensation for CCM	✓		–	
Frequency reduction	✓		–	
Integrated error amplifier for direct feedback	✓		–	
Adjustable line input overvoltage protection	✓ with auto restart		–	
Adjustable brown-in protection	✓ with auto restart		–	
V_{cc} pin short-to-ground protection	✓ (no start–up)		–	
V_{cc} undervoltage protection	✓ with auto restart		✓ with auto restart	
V_{cc} overvoltage protection	✓ with auto restart		✓ with latch–up	
Overload/open loop protection	✓ with auto restart		✓ with auto restart	
Overtemperature protection	✓ with auto restart and hysteresis		✓ with latch–up	
External blanking time extension	–		✓ with auto restart	
External protection enable pin	–		✓ with latch–up	

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Fixed-frequency CoolSET™

	700 V CoolSET™	650 V CoolSET™		
	Gen5 ICE5ARxx70AG(BZS)	Gen3 ICE3Axx65ELJ	Gen3R ICE3BRxx65J	Gen3R ICE3RBRxx65JZ(G)
Package	DIP-7, DSO-12	DIP-8		DIP-7, DSO-12
Output power range	15 W	19 W~34 W	15 W~41 W	14 W~39 W
Operating temperature range	-40°C~129°C	-25°C~130°C		-40°C~130°C
Switching frequency	100 kHz	100 kHz	65 kHz	65 kHz
Frequency reduction	✓	–		
Integrated error amplifier	✓	–		
Slope compensation for CCM mode	✓	–		
V_{cc} on/off threshold	16 V/10 V	18 V/10.5 V		
Soft-start time	12 ms	20 ms		
Active burst mode selection	3 level	1 level		
V_{cc} pin short-to-ground protection	No start-up	–		
V_{cc} overvoltage protection	Auto restart	Latch	Auto restart	
Overtemperature protection	Auto restart with hysteresis	Latch	Auto restart	
External protection enable pin	-	Latch	Auto restart	
Adjustable brown-in/-out protection	Brown-in only	–		
Adjustable line input overvoltage protection	Only ICE5ARxx70AG	–		
Fast AC reset	–			
Product available	ICE5AR4770AG ICE5AR4770BZS	ICE3A1065ELJ ICE3A2065ELJ	ICE3BR4765J ICE3BR1765J ICE3BR0665J	ICE3RBR4765JZ ICE3RBR1765JZ ICE3RBR0665JZ ICE3RBR4765JG ICE3RBR1765JG ICE3RBR0665JG

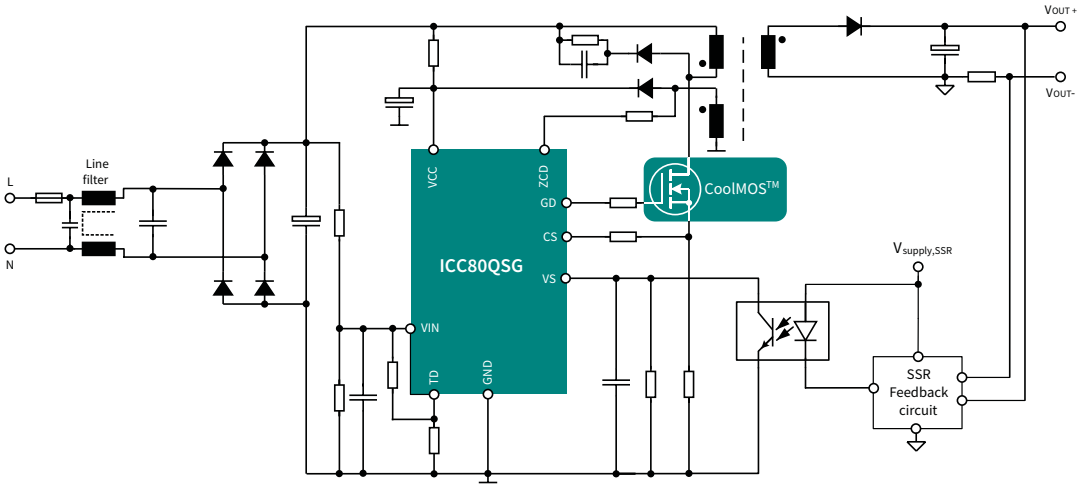
	800 V CoolSET™							950 V CoolSET™	
	Gen3R ICE3A(B)Rxx80JZ	Gen3R ICE3ARxx80CJZ	Gen3R ICE3ARxx80JG	Gen3R ICE3ARxx80VJZ	Gen5 ICE5BRxx80BZ	Gen5 ICE5ARxx80AG(BZS)	Gen5 ICE5GRxx80AG	Gen5 ICE5BRxx95xZ	Gen5 ICE5ARxx95xZ
Package	DIP–7		DSO–12	DIP–7	DIP-7	DIP–7, DSO–12	DSO–12	DIP-7	
Output power range	10 W~40 W	11 W~23 W	14 W~30 W	15 W~39 W	15 W~22 W	15 W~40 W	15 W~27 W	17 W	
Non-isolated buck output current range					450 mA~700 mA			550 mA	-
Operating temperature range	–25°C~130°C		–40°C~130°C		–40°C~129°C			-40°C~129°C	
Switching frequency	100 kHz/65 kHz	100 kHz	100 kHz		65 kHz	100 kHz	125 kHz	65 kHz	100 kHz
Frequency reduction	–				✓			✓	
Integrated error amplifier	–				✓	✓ (except ICE5ARxx80CZ)		Only ICE5BRxx95BZ	✓
Slope compensation for CCM mode	–	✓	–		✓			✓	
V_{cc} on/off threshold	17 V/10.5 V				16 V/10 V			16 V/10 V	
Soft-start time	10 ms				12 ms			12 ms	
Active burst mode selection	4-level	3-level	4-level		3-level			3-level	
V_{cc} pin short-to-ground protection	–				No start–up			No start-up	
V_{cc} overvoltage protection	Auto restart							Auto restart	
Overtemperature protection	Auto restart with hysteresis							Auto restart with hysteresis	
External protection enable pin	Auto restart	Latch	Auto restart	–				-	
Adjustable brown-in/-out protection	Auto restart			–	Brown-in only			Brown-in	
Adjustable line input overvoltage protection	–			Auto restart		Yes (except ICE5ARxx80BZS)	Auto restart	Only ICE5BRxx95CZ	-
Fast AC reset	–	✓	–					-	
Product available	ICE3AR10080JZ ICE3AR4780JZ ICE3AR2280JZ ICE3AR0680JZ ICE3BR2280JZ ICE3BR0680JZ	ICE3AR10080CJZ ICE3AR4780CJZ ICE3AR2280CJZ	ICE3AR4780JG ICE3AR2280JG ICE3AR1080JG	ICE3AR4780VJZ ICE3AR2280VJZ ICE3AR1580VJZ ICE3AR1080VJZ ICE3AR0680VJZ	ICE5BR4780BZ ICE5BR2280BZ	ICE5AR0680AG ICE5AR4780BZS ICE5AR2280CZ ICE5AR0680BZS	ICE5GR4780AG ICE5GR2280AG ICE5GR1680AG	ICE5BR3995BZ ICE5BR3995CZ	ICE5AR3995BZ

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ICC80QSG

Single-stage flyback controller IC for battery charging

The ICC80QSG is a PWM controller for flyback topologies operating in quasi-resonant mode and valley-switching DCM, to achieve high efficiency of power transfer across wide operating range. For battery charging applications, the IC offers a wide power range as well as a comprehensive set of protections. The IC is easy to design in and requires a minimum number of external components. The gate driver current enables reasonable designs up to 130 W with state-of-the-art MOSFETs. The system performance and efficiency can be optimized using Infineon CoolMOS™ P7 power MOSFETs.





Features and benefits

Key features	Key benefits
– Quasi-resonant mode (QRM) operation with continuous conduction mode (CCM)-prevention and valley-switching discontinuous conduction mode (DCM) in mid to light load	– Ideal for battery charging current control
– Secondary-side regulation (SSR)	– BoM cost reduction
– Burst mode for very light loads	– High efficiency and low electromagnetic interference (EMI)
– Adjustable maximum on-time	– Low power consumption in stand-by mode
– Comprehensive set of protections	– Design flexibility with adjustable maximum switching frequency and configurability of brown-in and brown-out
– Externally configurable hysteresis of brown-in and brown-out	– Protection of primary components from overheating and saturation with higher brown-out level at higher input/output power
– Soft start	– Safe, robust, and reliable operation

Applications

The ICC80QSG is tailored for battery charger applications up to 130 W, such as cordless appliances, e-bike chargers, power tools, consumer drones, and gardening tools.

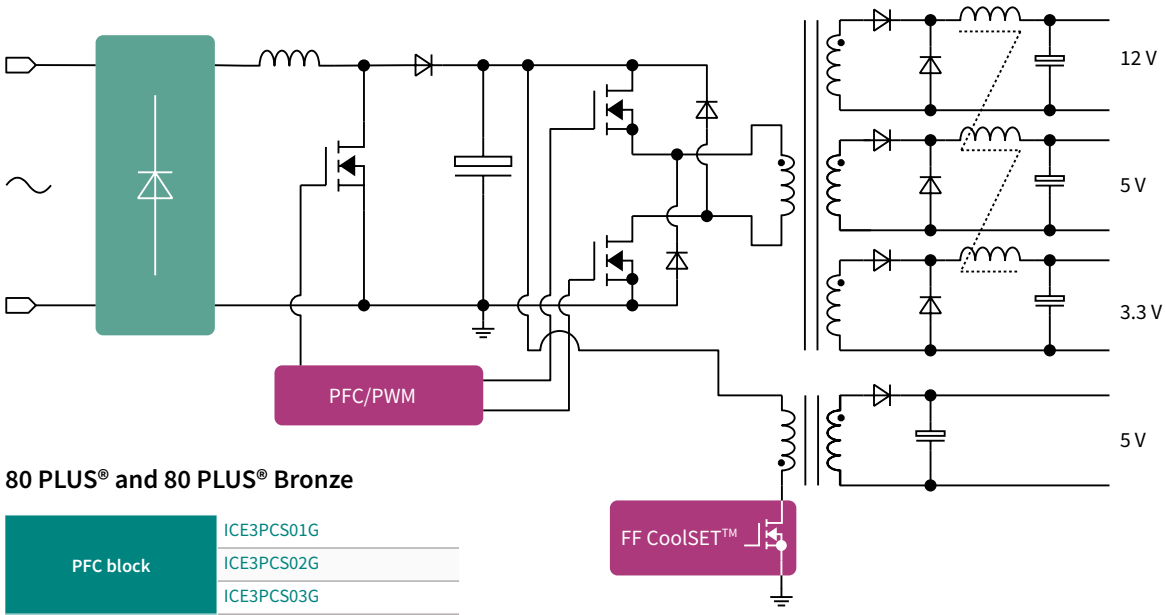
eBike | Power tools | Gardening tools | Cordless vacuum cleaner | Multicopter

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Climate saver systems

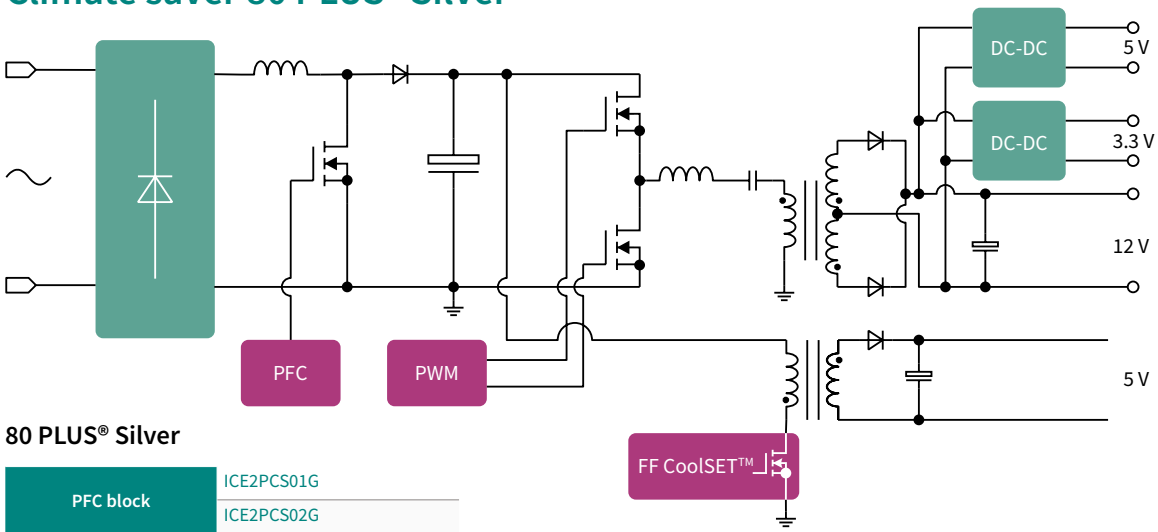
Climate saver 80 PLUS® and 80 PLUS® Bronze



80 PLUS® and 80 PLUS® Bronze

PFC block	ICE3PCS01G
	ICE3PCS02G
	ICE3PCS03G
PWM block	ICE2HS01G
Standby block FF CoolSET™	ICE5GR4780AG
	ICE5GR2280AG
	ICE5GR1680AG
	ICE3AR1080JG
	ICE5AR0680AG

Climate saver 80 PLUS® Silver



80 PLUS® Silver

PFC block	ICE2PCS01G
	ICE2PCS02G
PWM block	ICE1HS01G-1
Standby block FF CoolSET™	ICE5GR4780AG
	ICE5GR2280AG
	ICE5GR1680AG
	ICE3AR1080JG
	ICE5AR0680AG

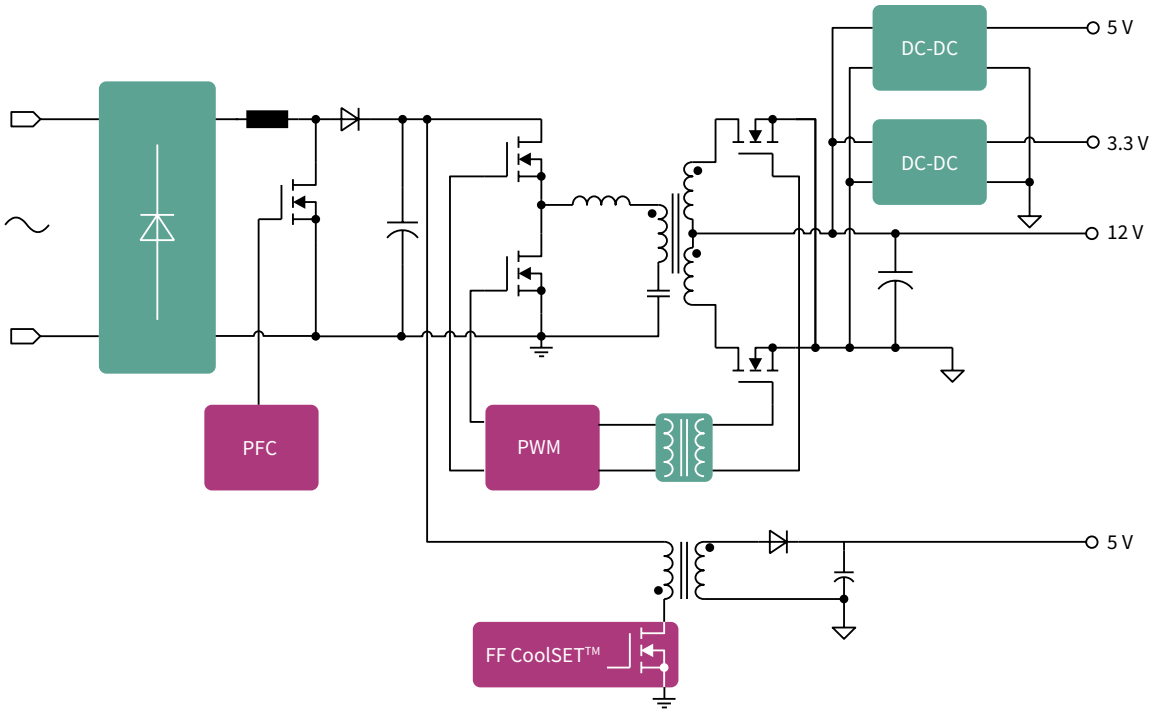
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www.infineon.com/coolset

For more details on the product, click on the part number, visit infineon.com or contact our product support.

Climate saver 80 PLUS® Gold

Climate saver 80 PLUS® Platinum

Certification for Infineon's PC power reference design



80 PLUS® Gold

PFC block	ICE3PCS01G
	ICE3PCS02G
	ICE3PCS03G
PWM block	ICE2HS01G
Standby block FF CoolSET™	ICE5GR4780AG
	ICE5GR2280AG
	ICE5GR1680AG
	ICE3AR1080JG
	ICE5AR0680AG

80 PLUS® Platinum

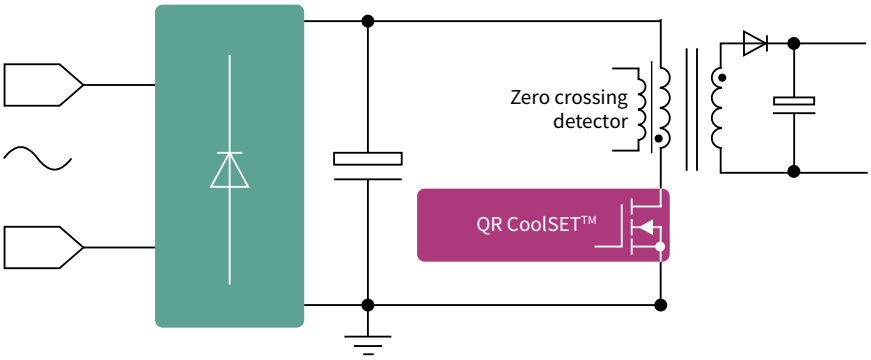
Certification for Infineon's PC power reference design

PFC block	ICE3PCS01G
	ICE3PCS02G
	ICE3PCS03G
PWM block	ICE2HS01G
Standby block QR CoolSET™	ICE5QR4780BG
	ICE5QR2280BG
	ICE5QR1680BG
	ICE2QR1080G
	ICE5QR0680BG

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For more details on the product, click on the part number, visit infineon.com or contact our product support.

5th generation quasi-resonant PWM IC and CoolSET™



- Integrated CoolMOS™ in 800 V MOSFET with cascode configuration
- Digital frequency reduction with reduced load
- Novel quasi-resonant to minimize the spread of switching frequency between low- and high-line AC input
- Selectable active burst mode entry/exit profile
- Auto restart mode for line overvoltage protection
- Auto restart mode for brown-out protection
- Auto restart mode for V_{CC} under-/overvoltage protection
- Auto restart mode for open loop and output overload protection
- Auto restart mode for overtemperature protection with hysteresis
- Auto restart mode for output overvoltage
- Limited charging current during V_{CC} pin short-to-ground protection
- Peak power limitation with input voltage compensation
- Minimum switching frequency limitation (no audible noise on power units on/off)
- DSO package (controller) and DSO-12 (CoolSET™)

Hal RoHS

5th generation quasi-resonant CoolSET™

Output power[1] 85 V_{AC}~300 V_{AC} T_a=50°C		15 W	22 W	27 W	41 W~42 W
$R_{DS(on),max.}$		5.18 Ω	2.35 Ω	1.75 Ω	0.80 Ω
800 V	DSO-12	ICE5QR4780BG	ICE5QR2280BG	ICE5QR1680BG	ICE5QR0680BG

2nd generation quasi-resonant CoolSET™

Output power[1] 85 V_{AC}~300 V_{AC} T_a=50°C		14 W~15 W	20 W~21 W	23 W~26 W	31 W	38 W~42 W
$R_{DS(on),max.}$		5.44 Ω~5.18 Ω	2.62 Ω	1.96 Ω	1.11 Ω	0.75 Ω~0.71 Ω
650 V	DIP-7	ICE2QR4765Z		ICE2QR1765Z		ICE2QR0665Z
	DIP-8	ICE2QR4765		ICE2QR1765		ICE2QR0665
	DSO-12	ICE2QR4765G		ICE2QR1765G		ICE2QR0665G
800 V	DIP-7		ICE2QR2280Z			ICE2QR0680Z
	DSO-12	ICE2QR4780G	ICE2QR2280G ICE2QR2280G-1		ICE2QR1080G	

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[1] Calculated maximum output power in an open-frame design at T_a=50°C, T_j=125°C and without copper area as heat sink

For more details on the product, click on the part number, visit infineon.com or contact our product support.

Quasi-resonant PWM IC

Feature	ICE5QSBG	ICE2QS02G	ICE2QS03G
Package	DSO-8	DSO-8	DSO-8
Switching scheme	Novel QR with 10 zero crossing counters	QR with 7 zero crossing counters	QR with 7 zero crossing counters
Operating temperature	-40°C~129°C	-25°C~130°C	-25°C~130°C
Start-up cell	Cascode	–	✓
V_{CC} on/off	16 V/10 V	12 V/11 V	18 V/10.5 V
Power saving during standby	✓ active burst mode in QR switching 2-level selectable burst mode entry/exit level	–	✓ active burst mode 52 kHz
Digital frequency reduction for high average efficiency	✓	✓	✓
OLP blanking time	Fixed	Adjustable	Fixed
Auto restart timer	Through V_{CC} charging/discharging	Setting with external components	Through V_{CC} charging/discharging
Maximum input power limitation	V_{in} pin voltage dependent	Adjustable through ZC resistor	Adjustable through ZC resistor
V_{CC} undervoltage protection	✓ with auto restart	✓ with latch	✓ with auto restart
Adjustable output overvoltage protection	✓ with auto restart	✓ with latch	✓ with latch
Adjustable line input overvoltage protection	✓	–	–
Brown-out feature	✓	✓	–
V_{CC} pin short-to-ground protection	✓	–	–
Target application	Home appliances, set-top-box, AUX SMPS	AUX power supply to V_{CC} eg., LCD TV multi/main, audio main, PDP TV multi/address	Self-power supply to V_{CC} eg., smart meter, industrial applications

Quasi-resonant CoolSET™

Feature	2nd generation ICE2QRxxxxZ/G	2nd generation ICE2QRxx80G-1	5th generation ICE5QRxx80BG
Switching scheme	QR with 7 zero crossing counters		Novel QR with 10 zero crossing counters
Integrated MOSFET	650 V and 800 V	800 V	800 V
High-voltage start-up cell	✓		Cascode
Power saving during standby	Active burst mode f_{SW} at 52 kHz		2 level selectable active burst mode quasi-resonant
V_{CC} on/off threshold (typ.)	18 V/10.5 V	18 V/9.85 V	16 V/10 V
Adjustable output overvoltage protection	✓ with latch		✓ with auto restart
V_{CC} over/undervoltage protection	✓ with auto restart		✓ with auto restart
Overload/open loop protection	✓ with auto restart		✓ with auto restart
Overtemperature protection	✓ with auto restart		✓ (Auto restart with hysteresis)
Adjustable line input overvoltage protection	–		✓ with auto restart
Brown-out	–		✓ with auto restart
V_{CC} pin short-to-ground	–		✓ (No start-up)
Package	DIP-7 DIP-8 DSO-12	DIP-7 DSO-12	DSO-12

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For more details on the product, click on the part number, visit infineon.com or contact our product support.

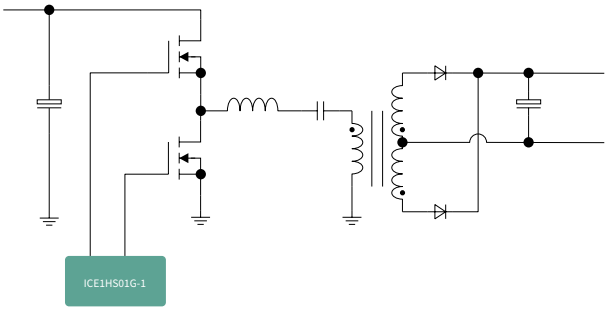
Resonant LLC half-bridge controller ICs

Best-in-class converters and controllers to support LLC HB resonant mode topology

Resonant mode power supplies are a variation over SMPS circuits where the switching losses are significantly reduced by adapting zero-voltage or zero-current switching techniques, also known as soft-switching techniques. In non-resonant mode SMPS circuits, the switches are subjected to hard switching. LLC HB resonant operates in ZVS mode, whereby switching loss is reduced to operate the converter at a higher switching frequency. In addition, the converter can be further optimized at a high input voltage. This topology allows to eliminate the secondary filter inductor, adopt better rectifier diodes, and reduce secondary conduction loss. The converter utilizes the leakage and magnetizing inductance of a transformer. With the magnetic integration concept, all the magnetic components can be built in one magnetic core.

LLC resonant (no SR)

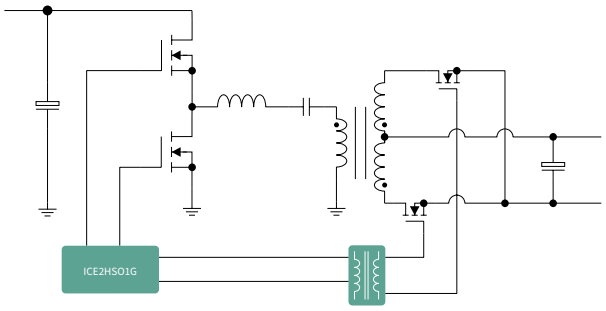
Application diagram – LLC resonant (no SR)



- Novel and simple design (12 components + HB driver)
- Minimum operating frequency is adjustable externally
- Burst mode operation for output voltage regulation during no load and/or bus overvoltage
- Multiple protections in case of fault
- Input voltage sense for brown-out protection
- Open loop/overload fault detection by FB pin with auto restart and adjustable blanking/restart time
- Frequency shift for overcurrent protection
- Lead-free, RoHS compliant package
- DSO-8 package

Resonant LLC half-bridge controller IC with integrated synchronized rectifier control

LLC resonant + SR



- Novel LLC/SR operation mode and controlled by primary-side controller controller
- Multiple protections for SR operation
- Tight tolerance control
- Accurate setting of switching frequency and dead time
- Simple system design
- Optimized system efficiency
- Multiple converter protections: OTP, OLP, OCP, latch-off enable
- External disable for either SR switching or HB switching
- Lead-free, RoHS compliant package
- DSO-20 package

Audio amplifier | Notebook | Projector | TV | PC power | Server | Telecom

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LLC half-bridge controller IC	ICE1HS01G-1	ICE2HS01G
Package	DSO-8	DSO-20
Switching frequency range	up to 600 kHz	up to 1 MHz
LLC soft-start	✓	✓
LLC burst mode	✓	✓
Adjustable minimum frequency	✓	✓
Overload/open loop protection	✓	✓
Mains undervoltage protection with hysteresis	✓	✓
Overcurrent protection	2-level	3-level
Drive signal for synchronous rectification	–	✓
Adjustable dead time	–	✓
External latch-off and OTP	–	✓
Target application	LCD-TV, audio, etc.	Server, PC, LCD-TV, etc.

Product		Frequency – f_{sw}	Dead time	Current drives	Package
ICE1HS01G-1	LLC resonant (no SR)	30 kHz~600 kHz	380 ns	1.5 A	DSO-8
ICE2HS01G	Resonant LLC half-bridge controller IC with integrated synchronized rectifier control (LLC resonant + SR)	30 kHz~1 MHz	100 ns~1000 ns	0.3 A	DSO-20

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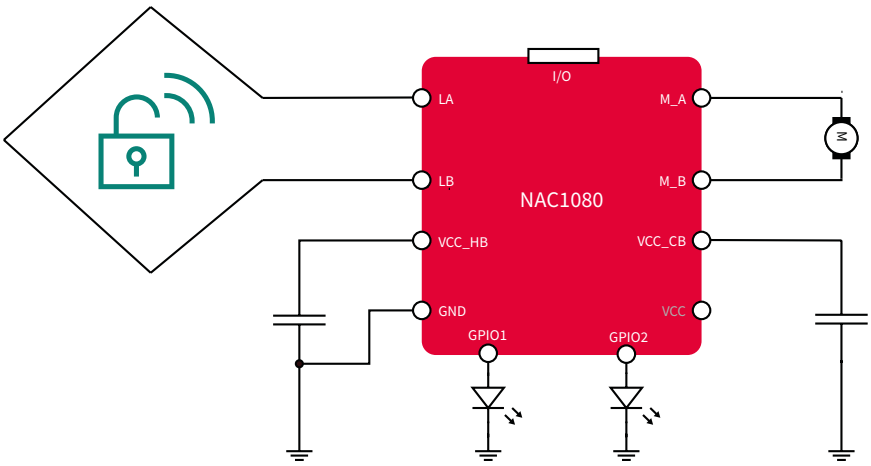
For more details on the product, click on the part number, visit infineon.com or contact our product support.

NAC1080 – NFC smart actuation controller

The NAC1080 is an NFC actuation controller with integrated half-bridge and energy harvesting modules, enabling cost effective development of passive smart actuators like passive locks. The low-power Arm® Cortex®-M0 based microcontroller with integrated NFC frontend, motor driver, and energy harvesting function enables customers to develop smart actuation devices with minimum system BOM requirement.

The flexible IC architecture and the smart partitioning between hardware and software enable customers to maximize software-defined functions. Furthermore, the NAC1080 includes hardware security functions such as a secure area in flash, a 128 bit AES accelerator, and a true random generator. A separate secure element can be connected via the digital interface on demand.

Users can program this NAC1080 with the industry-wide standard solutions for Cortex®-M0 processors. Especially for the smart lock application, SDK packages for firmware and mobile application development in Android and iOS systems are available to support a fast development cycle.



Applications

- Passive/active NFC lock
- Emergency power source for battery devices
- NFC configuration of electronic devices

Features and benefits

Key features
– NFC interface compliant to ISO 14443 type A
– Arm® 32 bit Cortex®-M0 microcontroller core
– Dual-operation mode: passive or battery mode
– 60 kB NVM, 16 kB RAM, 16 kB boot ROM
– Integrated H-bridge
– Energy harvesting output
– 128-bit AES accelerator, true random number generator

Key benefits
– A single-chip solution to build batteryless NFC actuators, like passive lock
– Batteryless IoT devices without battery exchange efforts and costs
– Intuitive connection via smartphone to enable cloud-based business models
– Minimum system BOM for easy and cost effective implementation



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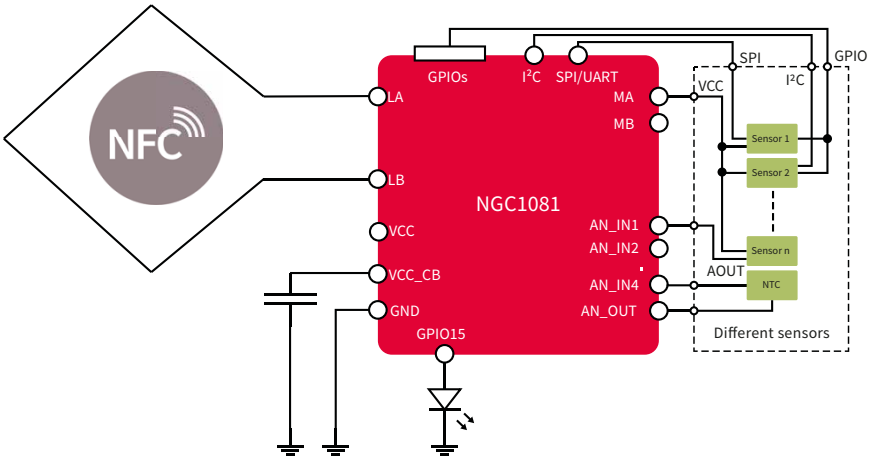
For more details on the product, click on the part number, visit infineon.com or contact our product support.

NGC1081 – NFC smart sensing controller

The NGC1081 is an NFC sensing controller with an integrated temperature sensor and ADC/DAC sensing unit in addition to the features provided by NAC1080. The low-power Arm® Cortex®-M0 based microcontroller with integrated NFC connectivity, sensing unit, and energy harvesting function in one device enables customers to develop miniaturized smart edge computing/sensing devices with minimum system BOM requirement.

NGC1081 works in both passive mode and battery mode. In passive mode, it can communicate with a mobile phone wirelessly while at the same time harvesting energy from the NFC field to power the whole sensing system including the IC and its connected sensors. Working in battery mode, it simplifies the implementation of many sensing applications like temperature, humidity, and vibration tracking devices. With the smartphone as the human interaction interface, the system functions are widely extended to cloud functionalities, such as uploading data and data analysis on the cloud.

NGC1081 has a 12-bit SAR ADC and a 10-bit DAC. It provides one analog output (DAC) and four analog inputs (ADC). The ADC has three sample and hold stages, which allow parallel signal sampling. A temperature sensor is integrated as well. Users can program the NGC1081 with the industry-wide standard solutions for Cortex®-M0 processors.



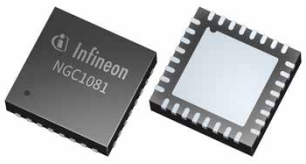
Applications

- Passive sensor device, inlay
- Medical, healthcare sensor patch
- Data logger, temperature logger
- Radiator thermostat
- Galvanic isolated sensor front end

Features and benefits

Key features
– NFC interface compliant to ISO 14443 type A
– Arm® 32-bit Cortex®-M0 microcontroller core
– Dual-operation mode: passive or battery mode
– 60 kB NVM, 16 kB RAM, 16kB boot ROM
– 12-bit SAR ADC, 10-bit DAC
– Integrated temperature sensor
– Integrated H-bridge
– Energy harvesting output
– 128-bit AES accelerator, true random number generator

Key benefits
– A single-chip solution to build a batteryless smart sensor for miniaturized design with low BOM cost
– Multiple power supply options for sensors: GPIO for low current or energy harvesting output for high current
– Natural galvanic isolated sensing interface for applications with direct human body contact
– Intuitive connection via smartphone to enable cloud-based business models



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DC-DC converters

Highest density end-to-end power management solutions

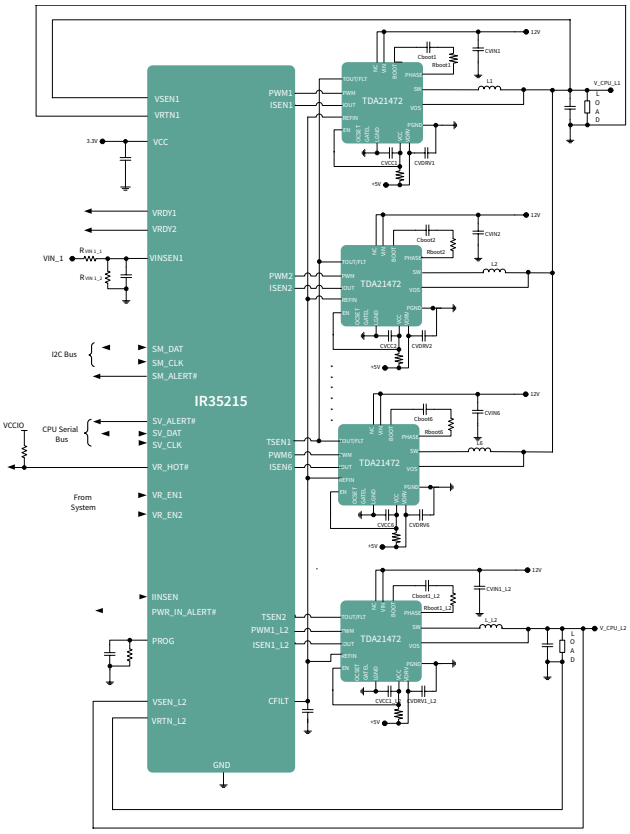
As the innovation leader for power semiconductor and energy efficiency technologies, we are continually developing and working on the best solutions for your applications. Our DC-DC converter portfolio includes integrated power stages, switching regulators, integrated POL converters and integrated POL voltage regulators, as well as digital multiphase controllers and digital power controllers (see XDPP1100 digital power controller family).

www.infineon.com/power-stages

OptiMOS™ power stage

60 A and 70 A integrated power stages with integrated current and temperature telemetry

Infineon's integrated OptiMOS™ power stage family contains a synchronous buck gate driver IC co-packed with control and synchronous MOSFETs and a Schottky diode to improve efficiency further. The package is optimized for PCB layout, heat transfer, driver/MOSFET control timing, and minimal switch node ringing when layout guidelines are followed. The paired gate driver and MOSFET combination enables higher efficiency at lower output voltages required by cutting-edge CPU, GPU, ASIC, and DDR memory designs. The TDA21472 integrated power stages internal MOSFET current sense algorithm, with integrated temperature compensation, achieves superior current sense accuracy versus best-in-class controller-based inductor DCR sense methods. Up to 1.0 MHz switching frequency enables high-performance transient response, allowing miniaturization of output inductors, as well as input and output capacitors, while maintaining industry-leading efficiency. The TDA21472 is optimized for CPU core power delivery in server applications. The ability to meet the stringent requirements of the server market also makes the TDA21472 ideally suited for powering GPU, ASIC, DDR memory, and other high current designs.



Features

- Integrated driver, Schottky diode, control MOSFET and synchronous MOSFET
- 5 mV/A on-chip MOSFET current sensing with temperature compensated reporting
- Input voltage (V_{in}) range of 4.5 to 15 V
- V_{CC} and V_{DR} V supply of 4.5 to 7 V
- Output voltage range from 0.25 up to 5.5 V
- Output current capability of 70 A
- Operation up to 1.0 MHz
- V_{CC} undervoltage lockout (UVLO)
- 8 mV/°C temperature analog output and thermal flag pull-up to 3.3 V
- Overtemperature protection (OTP)
- Cycle-by-cycle self-preservation overcurrent protection (OCP)
- MOSFET phase fault detection and flag
- Preliminary overvoltage protection (pre-OVP)
- Compatible with 3.3 V tri-state PWM input
- Body-Braking™ load transient support through PWM tri-state
- Diode emulation mode (DEM) for improved light-load efficiency
- Efficient dual-sided cooling
- Small 5.0 x 6.0 x 0.9 mm PQFN package

Applications

- High-frequency, high-current, low-profile DC-DC converters
- Voltage regulators for CPUs, GPUs, ASICs, and DDR memory arrays

Part type	Package	I_{out} [A]	V_{in} [V]	V_{out} [V]	Switching frequency [MHz]
TDA21472	5x6 x 0.9 mm PQFN	70	4.5 to 15	0.25 to 5.5	1.0
TDA21462*	5x6 x 0.9 mm PQFN	60	4.5 to 15	0.25 to 5.5	1.0

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*For more information on the product, contact our product support

Voltage regulators

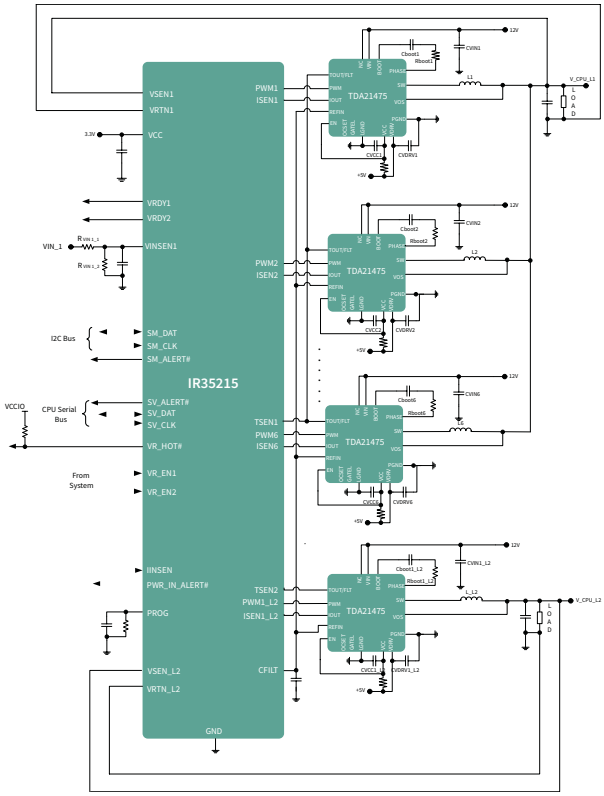
DC-DC converter

For more details on the product, click on the part number, visit infineon.com or contact our product support.

OptiMOS™ power stage

70 A power stage with exposed top for improved thermal performance

Infineon's TDA21475 exposed-top power stage contains a low quiescent-current synchronous buck gate driver IC co-packaged with high-side and low-side MOSFETs. The package is optimized for PCB layout, heat transfer, driver/MOSFET control timing, and minimal switch node ringing when layout guidelines are followed. The gate driver and MOSFET combination enables higher efficiency at the lower output voltages required by cutting-edge CPU, GPU, and DDR memory designs. The TDA21475 internal MOSFET current sense algorithm with temperature compensation achieves superior current sense accuracy versus best-in-class controller-based inductor DCR sense methods. Protection includes cycle-by-cycle overcurrent protection with programmable threshold, V_{CC}/V_{DRV} UVLO protection, bootstrap capacitor undervoltage protection, phase fault detection, IC temperature reporting, and thermal shutdown. The TDA21475 also features auto replenishment of the bootstrap capacitor to prevent over-discharge. The TDA21475 features a deep-sleep power-saving mode, which greatly reduces the power consumption when the multiphase system enters PS3/PS4 mode. Operation at switching frequency as high as 1.5 MHz enables high-performance transient response, allowing a reduction of output inductance and output capacitance while maintaining industry-leading efficiency. The TDA21475 is optimized for CPU core power delivery in server applications. The ability to meet the stringent requirements of the server market also makes the TDA21475 ideally suited for powering GPU and DDR memory designs.



Features

- Co-packaged driver, high-side and low-side MOSFETs
- 5 mV/A on-chip MOSFET current sensing with temperature compensated reporting input voltage (V_{IN}) range of 4.25 to 16 V
- V_{CC} and V_{DRV} supply of 4.25 to 5.5 V
- Output voltage range from 0.25 up to 5.5 V output current capability of 70 A operation up to 1.5 MHz
- V_{CC}/V_{DRV} undervoltage lockout (UVLO) bootstrap capacitor undervoltage protection 8 mV/°C temperature analog output
- Thermal shutdown and fault flag
- Cycle-by-cycle overcurrent protection with programmable threshold and fault flag MOSFET phase fault detection and flag
- Auto replenishment of bootstrap capacitor
- Deep-sleep mode for power saving
- Compatible with 3.3 V tri-state PWM input Body-Braking™ load transient support Small 5x6 x 0.65 mm PQFN package
- Lead-free RoHS compliant package
- Integrated driver, Schottky diode, control MOSFET and synchronous MOSFET

Applications

- High-frequency, high-current, low-profile DC-DC converters
- Voltage regulators for CPUs, GPUs, ASICs, and DDR memory arrays

Part type	Package	I_{out} [A]	V_{in} [V]	V_{out} [V]	Switching frequency [MHz]
TDA21475	5x6 x 0.9 mm PQFN	70	4.25 to 16	0.25 to 5.5	1.5

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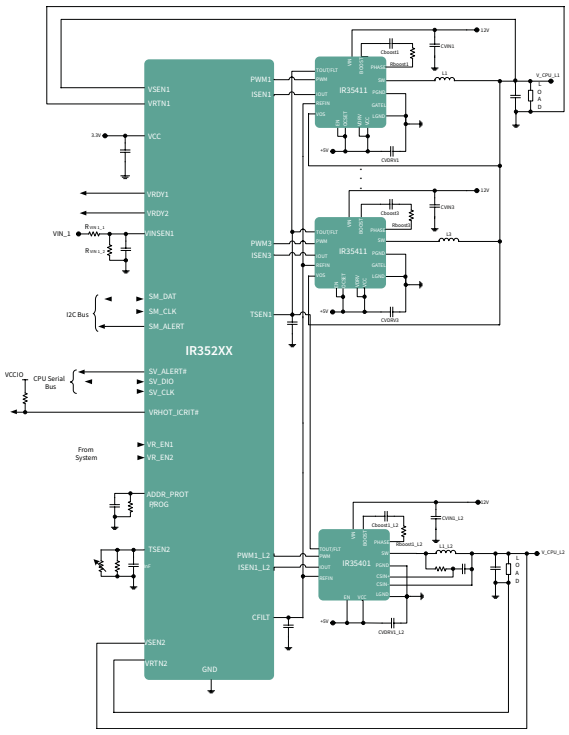
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OptiMOS™ power stage

20 A power stage with integrated current sense

Infineon's IR35401 integrated power stage contains a synchronous buck gate driver IC co-packaged with control and synchronous MOSFETs and a Schottky diode to improve efficiency further.. The package is optimized for PCB layout, heat transfer, driver/MOSFET control timing, and minimal switch node ringing when layout guidelines are followed. The paired gate driver and MOSFET combination enables higher efficiency at lower output voltages required by cutting-edge CPU, GPU and DDR memory designs. The IR35401 power stage features an integrated current sense amplifier to achieve superior current sense accuracy against best-in-class controller-based inductor DCR sense methods while delivering the clean and accurate current report information. The protection features inside IR35401 include V_{CC} UVLO and thermal flag. IR35401 also features an auto replenishment of the bootstrap capacitor to prevent the bootstrap capacitor from overdischarging. The IR35401 supports deep-sleep mode and consumesless than 100 µA V_{CC} bias current when the EN pin is pulled low. Up to 1.5 MHz switching frequency enables high-performance transient response, allowing miniaturization of output inductors, and input and output capacitors while maintaining industry-leading efficiency. When combined with Infineon's digital controllers, the IR35401 incorporates the Body-Braking™ feature through PWM tri-state which enables reduction of output capacitors. The IR35401 is optimized for low current CPU rails in server applications. The ability to meet the stringent requirements of the server market also makes the IR35401 ideally suited for powering GPU and DDR memory rails.



Features

- Integrated driver, control MOSFET and synchronous MOSFET
- Integrated bootstrap synchronous PFET
- Inductor DCR current sensing with temperature compensation
- Input voltage (V_{IN}) range from 4.25 to 16 V
- V_{CC} supply of 4.25 to 5.5 V
- Output voltage range from 0.5 to 3 V or up to 5.5 V if the internal current sense amplifier is not used
- Local lossless inductor current sensing with improved noise immunity and accuracy
- Single reference based current reporting output
- Output current capability of 20 A
- Operation up to 1.5 MHz
- V_{CC} undervoltage lockout
- Overtemperature and V_{CC} UVLO fault communication to controller via TOUT pin
- Compatible with 3.3 V tri-state PWM input
- Body-Braking™ load transient support through PWM tri-state
- Auto replenishment on BOOST pin
- Low operating quiescent current and <100 µA when disabled
- Small 4 x 5 x 0.9 mm PQFN package
- Lead-free RoHS compliant package

Applications

- General purpose POL DC-DC converters
- Voltage regulators for CPUs, GPUs, ASICs, and DDR memory arrays

Part type	Package	I_{out} [A]	V_{in} [V]	V_{out} [V]	Switching frequency [MHz]
IR35401	4 x 5 x 0.9 mm PQFN	20	4.25 to 16	0.5 to 5.5	1.5

Voltage regulators

DC-DC converter

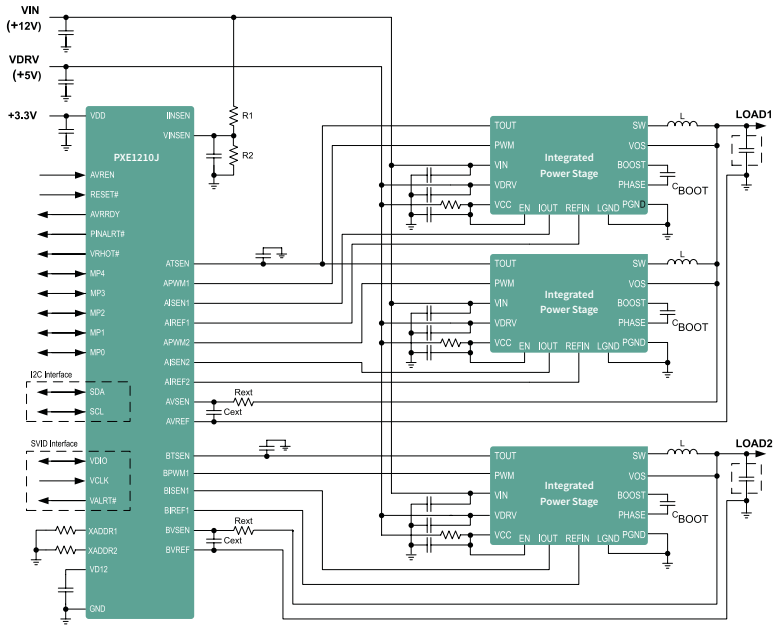
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OptiMOS™ power stage

25 A, 35 A, 40 A integrated power stages with highest efficiency on smallest form factor

Infineon's TDA21240 power stage is a multi-chip module that incorporates Infineon's premier MOSFET technology for a single high-side and a single low-side MOSFET coupled with a robust, high-performance, high switching frequency gate driver in a single PG-IQFN-30-2 package. The optimized gate timing allows for significant light-load efficiency improvements over discrete solutions. When combined with Infineon's family of digital multiphase controllers, the TDA21240 forms a complete core voltage regulator solution for advanced micro and graphics processors as well as point-of-load applications.



Features

- For synchronous buck converter step down voltage applications
- Maximum average current of 40 A
- Input voltage range +4.5 V to +16 V
- Power MOSFETs rated 25 V
- Fast switching technology for improved performance at high switching frequencies (> 500 kHz)
- Remote driver disable function
- Includes bootstrap diode
- Undervoltage lockout
- Shoot through protection
- +5 V high-side and low-side MOSFETs driving voltage
- Compatible to standard +3.3 V PWM controller integrated circuits
- Tri-state PWM input functionality
- Small package: PG-IQFN-30-2 (4 x 4 x 1 mm)
- RoHS compliant
- Thermal warning

Applications

- Desktop and server VR buck converter
- Single-phase and multiphase POL
- CPU/GPU regulation in notebook, desktop graphics cards, DDR memory, graphic memory
- High power density voltage regulator modules (VRM)
- Qualified for DC-DC industrial applications based on JEDEC (JESD47, JESD22, J-STD20)
- General purpose POL DC-DC converters

Part type	Package	I_{out} [A]	V_{in} [V]	Switching frequency [MHz]
TDA21242	4 x 4 x 1 mm PQFN	25	4.5 to 16	1.0
TDA21241	4 x 4 x 1 mm PQFN	35	4.5 to 16	1.0
TDA21240	4 x 4 x 1 mm PQFN	40	4.5 to 16	1.0

Desktop | Voltage regulators | DC-DC converter

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For more details on the product, click on the part number, visit infineon.com or contact our product support.

Integrated POL voltage regulators

Highest density high efficiency integrated POL (IPOL) for smart enterprise system

Infineon's integrated POL switching converters deliver benchmark efficiency and dramatically reduce system size. Solutions up to 35 A are available in compact PQFN packages. Target applications include server, storage, routers and switches, telecom base stations, digital home media, mobile computing, and embedded data processing. Solutions with and without PMBus digital communication are available in single output and multi-rail format.

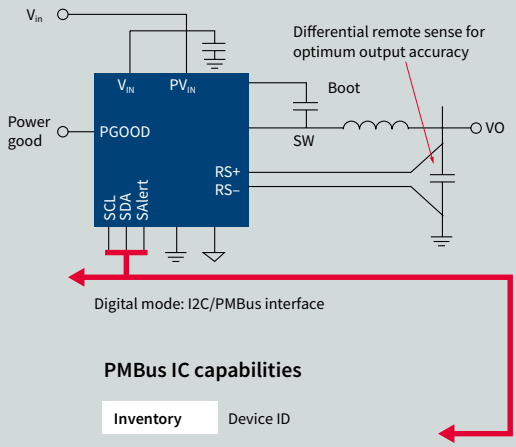
Point-of-load products – how to choose

DC-DC products
1 to 35 A

PMBus digital IPOL

IPOL with digital interface

- Telemetry
- Margining
- Intel SVID support
- Parallel VID
- IR3806x: 6-35 A with PMBus
- IR3816x: 15 A, 30 A with PMBus and Intel SVID
- IR38263: 30 A with PVID and PMBus

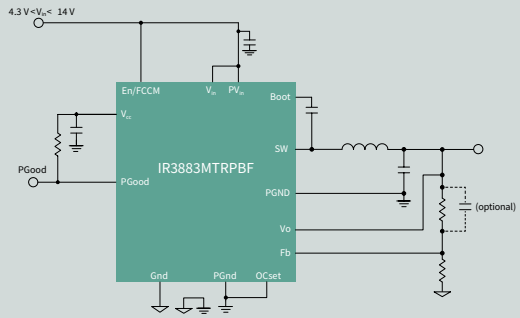


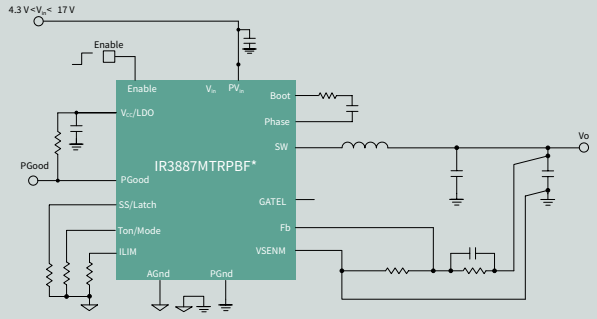
PMBus IC capabilities

Inventory	Device ID
Configuration	On/off configuration fault/warnings
Control	Sequencing delay/ramp fault response
Telemetry	V_{out}, I_{out}, power temperature, peak values
Status	Comms, data, temps

Constant on-time IPOL

Easy/light-load efficiency
IR3883MTRPBF (3 A), IR3888MTRPBF (25 A), IR3889MTRPBF (30 A), IR3887MTRPBF* (30 A)





Ready-to-go reference designs and the on-line PowerDesk simulator simplify the task of designing regulated voltage rails. Different control topologies are available to meet an application's specific requirements.

www.infineon.com/ipol
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*Coming soon

Server · Smart home · Datacom · Telecom · Router

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Integrated point-of-load converters IR3806x series (6 A/15 A/25 A/35 A)

Digital interface IPOL voltage regulators

The digital interface IPOL devices are easy-to-use, fully integrated, and highly efficient DC-DC regulator offering I²C/PMBus, parallel VID, Intel SVID. The on-board PWM controller and MOSFETs make the family a space-efficient solution, providing accurate power delivery for low output voltage and high current applications.

The IR3806x family of PMBus enabled IR MOSFET™ IPOL based IR MOSFET™ IPOL voltage regulators offers:
- Compactness of integrated controller, driver, and MOSFETs
- High-performance analog voltage mode engine
- Flexibility of a rich PMBus interface

The IR381(2/3)6x family features OptiMOS™ 5 for the highest efficiency and adds Intel SVID support (IR381(/3)6x) for Intel based systems or parallel VID (IR3826x) for voltage scaling or 8 programmable output voltages booting options to avoid programming at start up. Pin compatible options with and without PMBus are available to allow the flexibility of using PMBus only during evaluation or easily upgrade a system to PMBus without re-layout.

Features and benefits

Key features
– PMBus revision 1.2 compliant
– ≥ 66 PMBus commands
– Wide input voltage range and single 5 to 16 V input operations
– Differential remote sense
– Ultralow jitter voltage mode engine
– Operation temp: -40° to 125° C

Key benefits
– Only single-chip solution with extensive PMBus, parallel VID, Intel SVID support allows 50 percent space saving versus external power competition
– Intel SVID support for Intel-based systems
– Parallel VID or PMBus for voltage setting and margining
– Telemetry status via digital bus
– Remote monitoring and update
– Parameter changes by register
– Flexible sequencing
– High accuracy low ripple
– Integrated sequencing, margin, current and voltage monitoring

Digital interface IPOL

Part number	Max. current [A]	Package size [mm]	Max. V_{in}	Max. f_{sw}	Distinctive features
IR38064MTRPBF	35	5 x 7	21 V	1500 kHz	PMBus
IR38063M	25	5 x 7	21 V	1500 kHz	
IR38062M	15	5 x 7	21 V	1500 kHz	
IR38060M	6	5x6	16 V	1500 kHz	
IR38163M	30	5 x 7	16 V	1500 kHz	OptiMOS™ 5, SVID + PMBus
IR38165M	30	5 x 7	16 V	1500 kHz	OptiMOS™ 5, SVID
IR38363M	15	5 x 7	16 V	1500 kHz	OptiMOS™ 5, SVID + PMBus
IR38365M	15	5 x 7	16 V	1500 kHz	OptiMOS™ 5, SVID
IR38263M	30	5 x 7	16 V	1500 kHz	OptiMOS™ 5, PVID + PMBus
IR38265M	30	5 x 7	16 V	1500 kHz	OptiMOS™ 5, PVID
IR38164M	30	5 x 7	16 V	1500 kHz	OptiMOS™ 5, SVID + PMBus, enhanced Imon
IRPS5401M	4+4+2+2+0.5	7 x 7	14 V	1500 kHz	5 output PMIC, PMBus

DC-DC Desktop Telecom Server

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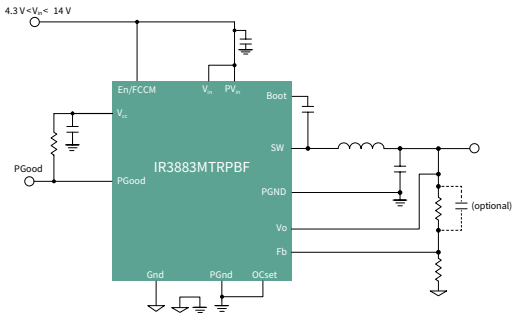
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OptiMOS™ IPOL voltage regulators with COT

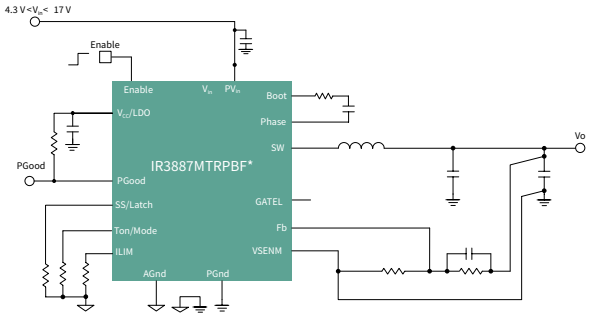
Easy-to-use with no external compensation and smallest BOM

OptiMOS™ IR3883MTRPBF, IR3887MTRPBF*, IR3889MTRPBF, and IR3888MTRPBF integrated point-of-load DC-DC devices are easy-to-use, fully integrated, and highly efficient DC-DC regulators that operate from a wide input voltage range and provide up to 30 A continuous current. The devices increase efficiency and power density and simplify design for POL applications in server, enterprise storage, netcom router and switches, datacom and telecom base stations.

Block diagram IR3883M



Block diagram IR3887M (30 A)



Main benefits

Main benefits
– Compensation free and stable with all ceramic caps
– Scalable solution from 3 A up to 40 A
– For designs requiring high density, low cost and easy design, the family includes a 3 A device with enhanced stability constant-on-time (COT) engine that does not require external compensation enabling easy designs and fast time to market.
– Quiescent current down to 5 µA
– Overload, overtemperature, short circuit, and reverse-polarity protection
– Low current consumption
– Extended temperature range -40°C ... +125°C

Analog interface IPOL

Part number	Max. current [A]	Package size [mm]	Max. V_{in}	Max. f_{sw}	Distinctive features
IR3883MTRPBF	3	3 x 3	14 V	800 kHz	Constant-on-time (COT)
IR3823AMTRPBF	3	3.5 x 3.5	17 V	2000 kHz	
IR3899AMTRPBF	9	4 x 5	17 V	2000 kHz	
TDA38820	20	4 x 5	17 V	2000 kHz	
IR3888MTRPBF	25	5x6	17 V	2000 kHz	
IR3447AMTRPBF	25	5x6	17 V	600 kHz	
IR3887MTRPBF	30	4 x 5	17 V	2000 kHz	
IR3889MTRPBF	30	5x6	17 V	2000 kHz	
TDA38840	40	5x6	17 V	2000 kHz	
IR3846AMTRPBF	40	5 x 7	17 V	600 kHz	

Datacom Server Storage Telecom

www.infineon.com/ipol

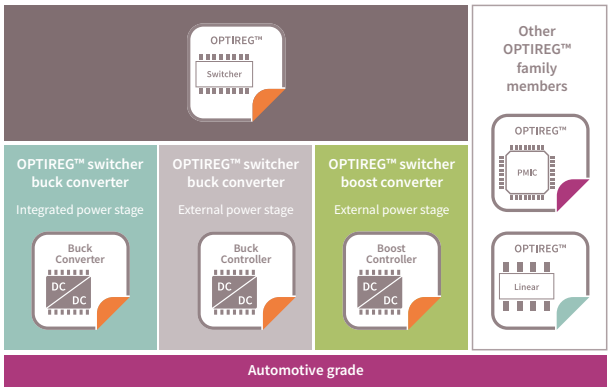
*Coming soon

For more details on the product, click on the part number, visit infineon.com or contact our product support.

OPTIREG™ switcher power supply ICs

High-efficiency solutions for harsh environments

Infineon offers optimized DC-DC converters that are designed specifically for harsh automotive environments. Wide input voltage range, optimized feature set, and extended qualification make our DC-DC converters perfectly suitable for multiple applications. Our DC-DC portfolio contains various products that operate in step-down (buck), step-up (boost), or a combination of those(buck-boost/sepic). High integration, efficiency, and flexibility are the main benefits of our products.



Features and benefits

Key features	Key benefits
– Input voltage up to 60 V	– High-efficiency regulation
– Output currents going from 500 mA up to 10 A	– Only a few external components needed for stable regulation
– Switching frequencies ranging from 100 kHz to 2.2 MHz	– Perfectly suited for regulation in pre-/post-regulation power supply architectures
– Shutdown quiescent current down to below 2 µA	
– Current limitation and overtemperature protection	
– Enable feature	

OPTIREG™ switcher

Product name	Input voltage $V_{S(OP)}$ [V]	Output current [mA]	Quiescent current (EN = ON) [mA]	Output voltage V_Q [V]	Synchronous topology	Accuracy [%]	Switching frequency PWM f_{sw} [kHz]	Enable	PFM operation	Reset	Watchdog	Early warning	Package
Buck converter (integrated MOSFET)													
TLE6365	8.00 … 40.00	400	1500	5.00		2	100			●			DSO-8
TLE8366	4.75 … 45.00	1800	7000	Adj., 3.30, 5.00		2(4)	200 … 530	●					DSO-8 EP
TLS4120D0	3.70 … 36.00	2000	0.032	Adj., 3.30, 5.00	●	2	380 … 2800	●	●	●			TSDSO-14 EP
TLS4125D0	3.70 … 36.00	2500	0.032	Adj., 3.30, 5.00	●	2	380 … 2800	●	●	●			TSDSO-14 EP
TLF50281	4.75 … 45.00	500	0.045	5.00		2	800 … 2200	●	●	●	●		SSOP-14 EP
TLF50251	4.75 … 45.00	500	0.045	5.00		2	800 … 2200	●	●	●			SSOP-14 EP
TLF50241	4.75 … 45.00	500	0.045	5.00		2	800 … 2200		●	●			SSOP-14 EP
TLF50211	4.75 … 45.00	500	0.045	5.00		2	800 … 2200	●	●				SSOP-14 EP
TLF50201	4.75 … 45.00	500	0.045	5.00		2	800 … 2200		●				SSOP-14 EP
Buck controller (external MOSFET)													
TLE6389-2GV	5.00 … 60.00	2300	0.120	Adj.		3	250 … 530	●	●	●		●	DSO-14
TLE6389-2GV50	5.00 … 60.00	2300	0.120	5.00		3	250 … 530	●	●	●		●	DSO-14
TLE6389-3GV50	5.00 … 60.00	2300	0.120	5.00		3	250 … 530	●	●	●[1]		●	DSO-14
TLF51801	4.75 … 45.00	Adj. max. 10,000	< 2.000 µA	1.20–$D_{max.}$*V_S	●	2	100 … 700	●					SSOP-14 EP
Boost controller													
TLE8386-2[2]	4.75 ... 45.00	dep.on V_Q	7000	Adj. (max. 9-times of V_S)		4	100 … 500	●					SSOP-14 EP

www.infineon.com/optireg-switcher

1) Different voltage reset hysteresis
2) LS-sense-booster

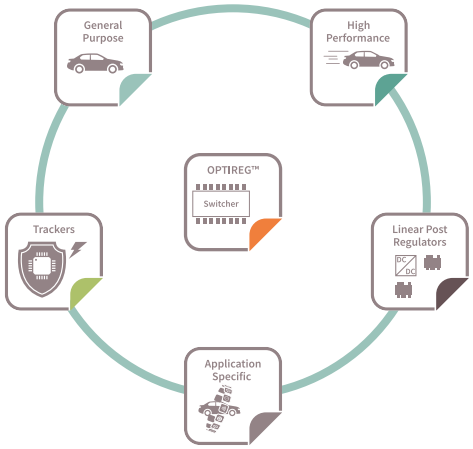
For more details on the product, click on the part number, visit infineon.com or contact our product support.

OPTIREG™ linear voltage regulators

Energy-efficient voltage regulators and trackers

Our linear voltage regulators and trackers help reduce energy consumption, extending operating time and minimizing operating costs across all systems. The wide supply voltage range, low quiescent current, rich protective feature set, and choice of packages make our devices the perfect fit across a broad application spectrum, apart from automation systems for health care, traffic, power tools, lighting, and many other multi-market systems. Our trackers are ideal as additional supplies for off-board loads to increase system reliability

OPTIREG™ linear voltage regulators (selection tree)



General purpose

Best suited for supplying	
› Microcontrollers › Transceivers (CAN, LIN,...) › Sensors (on-board) › Actuator ICs › Standby supply › Low load LEDs › Microphones	TLE42xxx TLE44xxx TLE46xxx TLE7xxx TLF4949 TLS71x

High performance

	Best suited for supplying
TLS8xx TLF80511	› Microcontrollers › Transceivers (CAN, LIN,...) › Sensors (on-board) › Actuator ICs › Standby supply

Trackers

Best suited for supplying	
› Sensors › Microphones › Satellite ECUs (off-board) › Small lamps (LED) › Protected loads	TLS1xx TLT1xx TLE425x

Post regulators

	Best suited for supplying
TLS2xx TLF1963	› Radar (MMIC) › Flash Memory › RAM Memory › Camera › SoC core supply › I/O supply › Ethernet PHY › Cluster supply › Low noise supply

Application specific

	Best suited for supplying
TLF4277x TLT807 TLE447xx	› Radar (MMIC) › Flash Memory › RAM Memory › Camera › SoC core supply › I/O supply › Ethernet PHY › Cluster supply › Low noise supply

Features and benefits

Key features	Key benefits
– Input voltage up to 60 V	– Pin-to-pin compatibility with industry-standard parts
– Output current up to 1.5 A	– Very low dropout voltage trackers for optimized heat distribution and external protection
– Output voltage adjustable or fixed to specific values	– Trackers for maximum system cost reduction
– Quiescent current down to 5 µA	– Small robust packages
– Overload, overtemperature, short circuit, and reverse-polarity protection	
– Low current consumption	
– Extended temperature range -40°C ... +125°C	

Infineon's microcontroller families and industrial voltage regulators

Microcontroller family	Input voltage [V]	Input current (max.) [mA]	Voltage regulator
XMC1000 family	1.8 to 5.5	<100	TLS810B1EJ, TLS810A1LD, TLE4266-2G, TLS820D3EL
XMC4000 family	3.3	<500/300	TLF80511x, TLE42764D, TLS835D2EL, TLS850FxTA
XC8xx	3.3 to 5.0	200	TLS810A1LD, TLS810B1EJ, TLE42764D, TLE4296-2G
XE166/XC2000	1.5 and 3.3 or 5.0	100	TLS810A1LD, TLS810B1EJ, TLE42764D, TLE4296-2G
TriCore™	1.5 to 3.3	>400	TLF80511TF/EJ/TC, TLE42764D, TLS850FxTA

www.infineon.com/optireg-linear

For more details on the product, click on the part number, visit infineon.com or contact our product support.

XDPP1100

The smallest digital power controller with PMBus interface

The XDPP1100 is Infineon's highly integrated and programmable digital power supply controller. This device offers advanced power control solution for 48 V DC-DC power applications with isolated topologies. The XDPP1100 device features many optimized power-processing blocks and pre-programmed peripherals to enhance the performance of isolated DC-DC converters, reduce external components, and minimize firmware development effort. The controller also provides an accurate telementry and power management bus (PMBus 1.3) interface for system communication, advance power conversion, and monitoring. Integrated current sensing capability and compact chip size (24-pin 4 mm^2) can greatly reduce the solution size by eliminating various external components. A combination of high-performance AFE, state machine-based digital control loop, and an Arm® Cortex®-M0 integrated into a single chip makes the XDPP1100 a highly integrated, fully programmable, and fastest time-to-market technology for modern high-end power systems employed in telecom infrastructure, 48 V server motherboards, data center and industrial 4.0 applications.

The XDPP1100 device can be configured to support different DCDC topologies including:

- Hard-switched full-bridge and half-bridge
- Phase shifted full-bridge
- Active clamp forward
- Interleaved FB, HB, and ACF
- Current-doubler
- Pre-buck or post-buck configuration

Infineon offers support tools such as a complementary graphical user interface (GUI) that allows customers to configure and monitor key parameters. In addition, developers have full control of their application and FW development process with commonly used Arm® based compilers.

Typical applications

- Isolated DC-DC brick modules
- Telecom radio power
- 48 V point of loads
- Non-isolated buck boost converters
- 48 V server motherboard

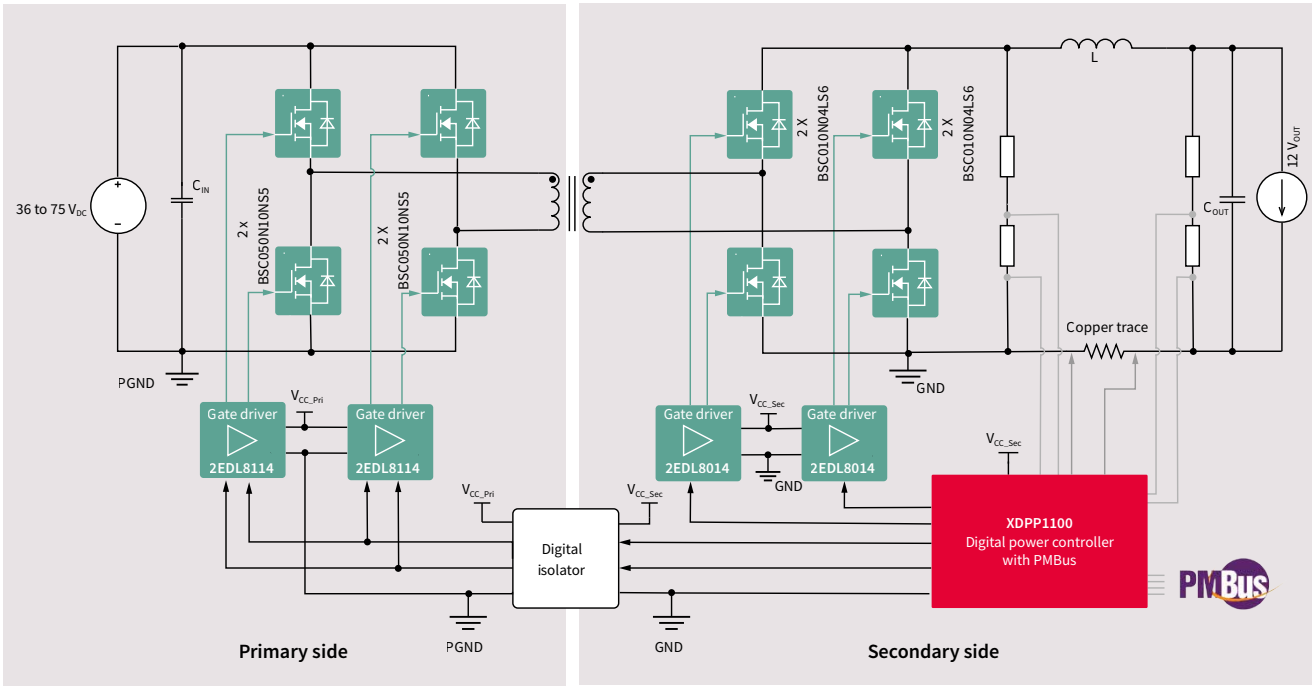
Features and benefits

Key features	Key benefits
– State machine based digital control for up to 2 independent voltage loops	– Ease of use thanks to firmware-based system configuration with GUI support
– Configurable feedback control	– User-specific customization and software-based design changes
– Arm® Cortex®-M0 processor	– Enhanced control and excellent dynamic transient performance
– Up to 16 configurable GPIOs	– Sophisticated system level fault handling
– Up to 12 high resolution digital modulated PWM outputs	– System housekeeping i.e., fan control, LED control, sequencing, with configurable GPIOs
– Input voltage feed-forward control scheme	– High efficiency at light-load management
– 3 high-speed voltage sense ADCs: 50 MHz 11-bit ADC with set point accuracy within ±1% overtemperature range	
– 2 current sense ADCs: 25 MHz, 9-bit with 100 µV and 1.45 mV LSB	
– Communication: 1 MHz I^2C/PMBus,	
– Operating temperature from -40° to 125°C	

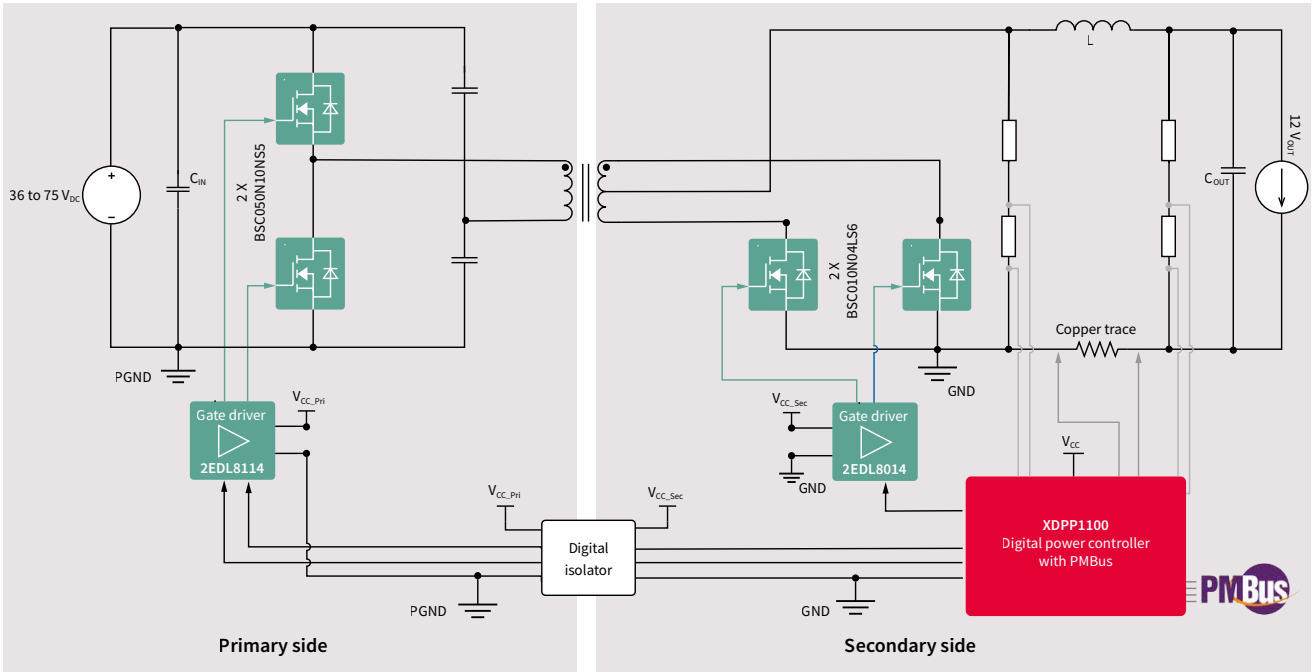
www.infineon.com/xdpp1100

For more details on the product, click on the part number, visit infineon.com or contact our product support.

XDPP1100 implementation in 48 to 12 V full-bridge isolated DC-DC converter



XDPP1100 implementation in 48 V to 12 V full-bridge isolated DC-DC converter



The XDPP1100 device is offered in two packages

VQFN 24-pin	VQFN 40-pin
4 x 4 mm	6 x 6 mm
6 PWM	12 PWM
Single loop	Dual loop

www.infineon.com/xdpp1100

For more details on the product, click on the part number, visit infineon.com or contact our product support.

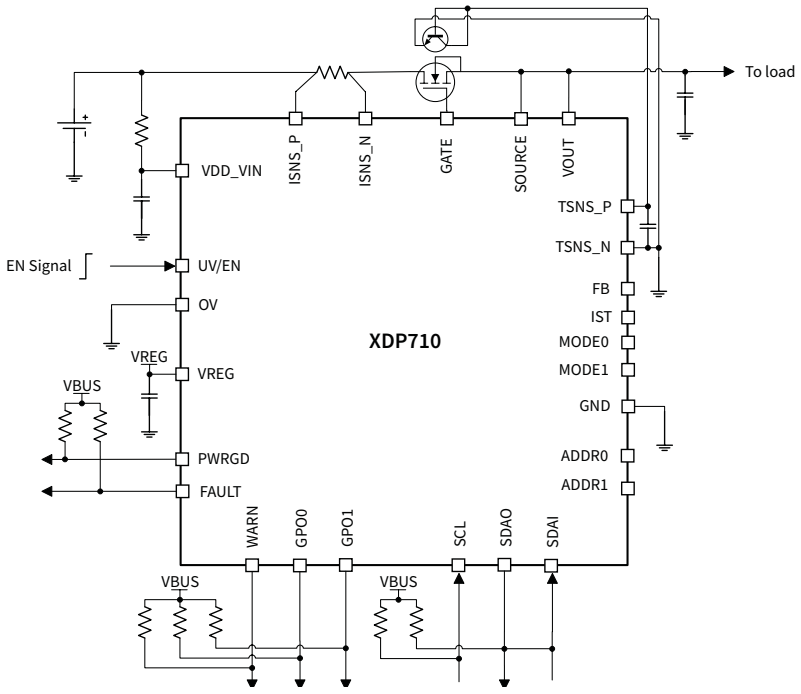
XDP™ XDP710

5.5 - 80 V hot swap controller with a programmable digital SOA

The XDP™ XDP710 is a wide input voltage hot-swap and system monitoring controller IC that drives a single or multiple parallel N-Channel MOSFETs. In addition to a controlled turn ON, XDP710 provides continuous system health monitoring and communication to the main MCU via PMBus interface. The high-speed communication through PMBus allows system designers to disable the downstream sub-systems fully or partially. It incorporates an extensive variety of system protections for safety operation and generates various protection responses depending on the severity of the incident. Latch off, reset, system shutdown, and retry are some examples of response types. Its SOA protection effectively ensures that the system FET always operates under safe condition.

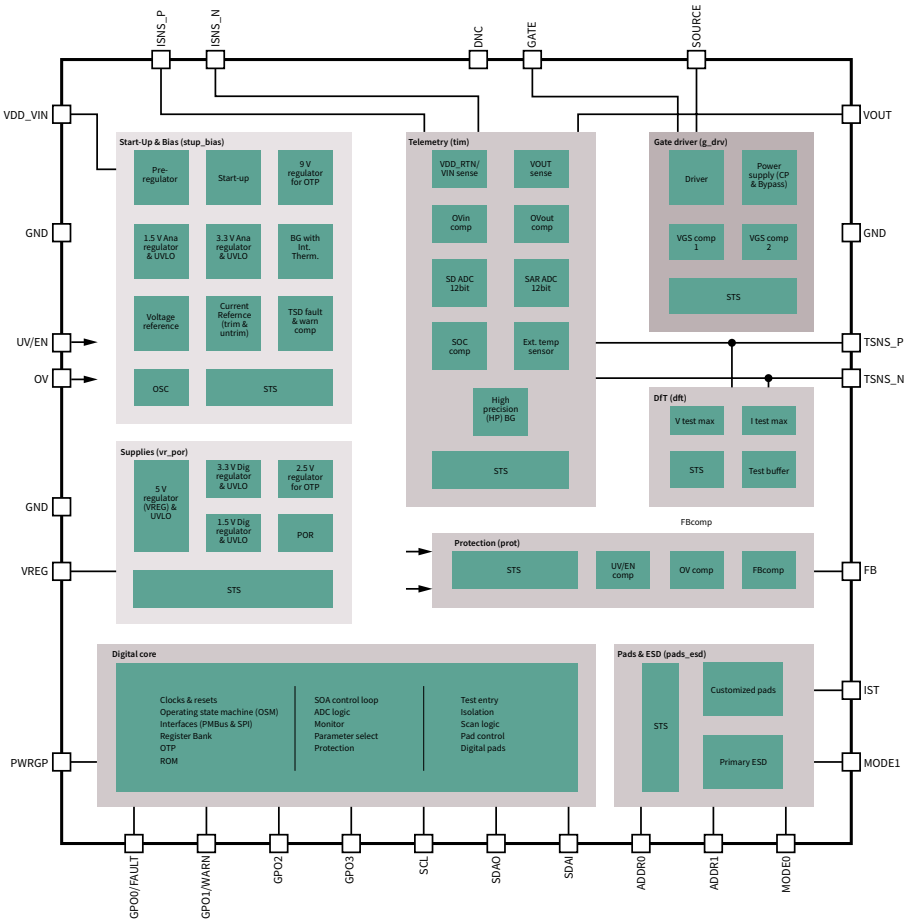
Features

Key features
– Compatible with Infineon's OptiMOS™
– Compatible with Infineon's Linear FET wide input voltage range: 5.5 to 80 V transient withstand: up to 100 V for 500 ms
– Option of external FET selection using resistor strapping
– Boost mode
– Dedicated current and voltage ADCs: 12-bit programmable and pre-set FET active SOA protection
– Advanced closed-loop SOA control and the fully digital operating mode
– Analog-Assisted Digital Mode for support of legacy systems
– Integrated gate driver and charge pump for external N-Channel MOSFET configurable fast FET's shut down: two step turn-off or 1.5 A pull-down current
– PMBus interface: 1 MHz
– Precision input and output voltage monitoring and reporting: ≤ 1% precision FET's current monitoring and reporting: ≤ 1%
– Precision input power monitoring and reporting: ≤ 2%
– Energy monitoring and reporting
– Programmable input OV and UV protections
– Support for external temperature sensor and OT protection
– Sequential turn-on capability
– 29-lead (6 mm x 6 mm) VQFN package
– -40° to 125°C junction temperature



www.infineon.com/xdp710-001

For more details on the product, click on the part number, visit infineon.com or contact our product support.



Key features

- Digital configuration reduces external components
- Analog-Assisted Digital Mode for support of legacy systems
- Multiple SOA configuration profiles in NVM reduces design time
- Input transient and MOSFET SOA protection enables the use of smaller FETs
- Small package

Potential applications

- AI, ML, GPU accelerator cards
- Network router and switches
- Intelligent e-fuse
- Power distribution systems
- 24 to 48 V Industrial system

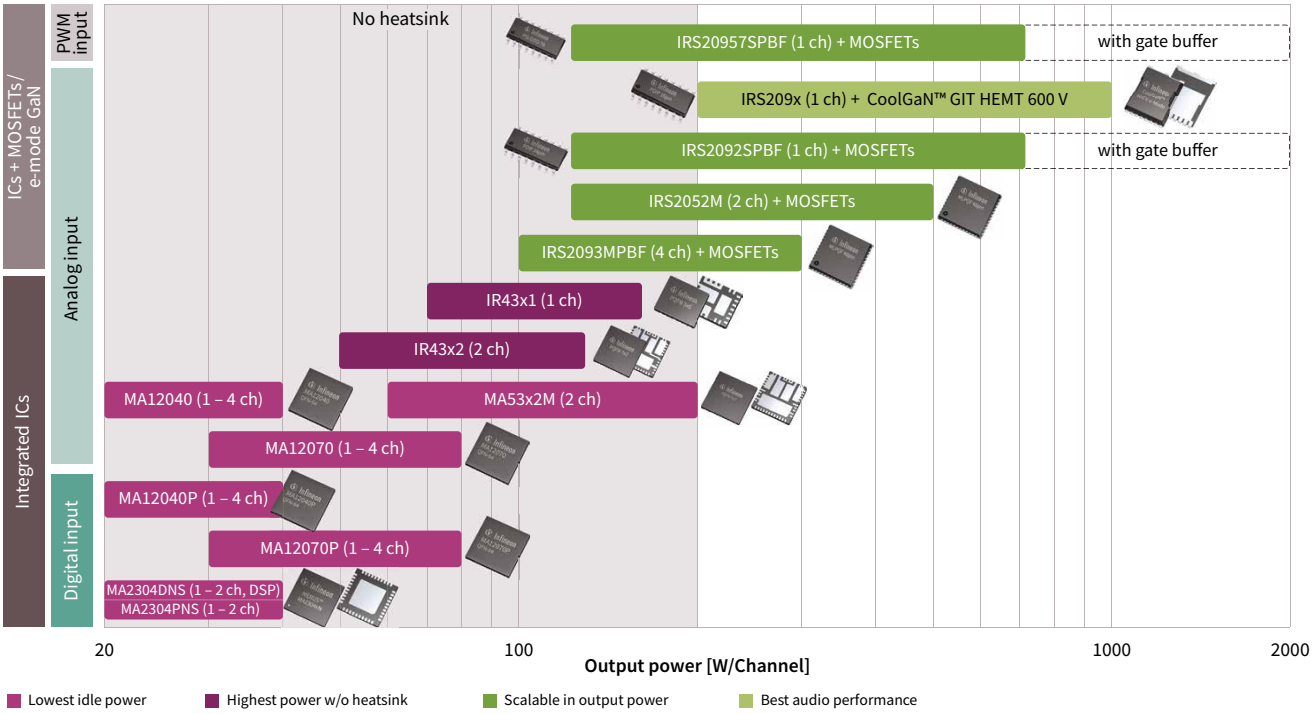
www.infineon.com/xdp710-001

For more details on the product, click on the part number, visit infineon.com or contact our product support.

Integrated class D audio amplifier ICs

Cooler, smaller, and lighter class D audio amplifiers for great sounding products

Infineon's MERUS™ audio solutions enable audio designers to improve the performance of their products while increasing efficiency and reducing solution size. Advances in semiconductor processes, in combination with new innovative architectures, are behind a portfolio of class D technologies that allow professional, commercial/home and portable audio applications to benefit from the unparalleled performance, power density, and reliability. The broad portfolio covers power ranges from 20 W to 2 kW per channel, from the smallest single-chip devices and multi-chip modules (MCMs) to highly scalable discrete audio amplifier solutions consisting of powerful MOSFET/CoolGaN™ GIT HEMT and driver ICs combinations.



By combining our core principles, competencies, and leadership in groundbreaking power semiconductors with revolutionary audio amplifier technologies, such as MERUS™, we provide solutions that are smaller, lighter, more robust and flexible, running with less heat dissipation. In addition to outstanding quality and reliability, Infineon's amplifier solutions are designed to maximize power efficiency and dynamic range while providing best-in-class performance in product form factors that make them an optimal fit for any high-end application. These include portable/battery-powered applications, voice controlled active speakers, television sets, stereo HiFi, soundbars, monitors, power over ethernet (PoE), and multichannel systems.

Design with Infineon's solutions to benefit from:

- Exceptional audio performance
- Maximized power efficiency
- Maximized output power
- Design freedom
- Fast time to market

www.infineon.com/merus

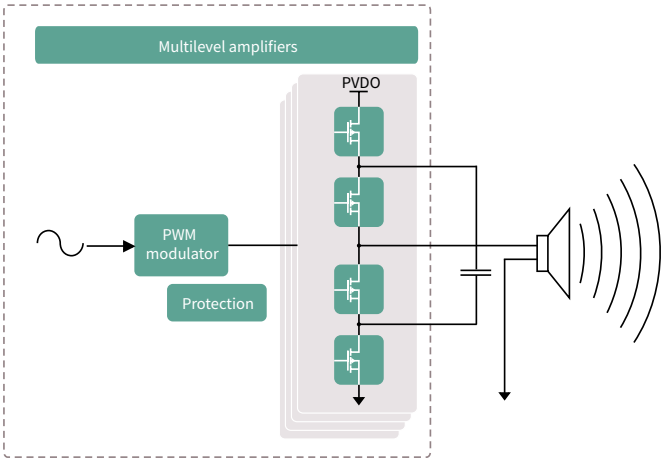
For more details on the product, click on the part number, visit infineon.com or contact our product support.

Integrated MERUS™ multilevel amplifier ICs for class D audio solutions

High power efficiency and density in small packages

With its revolutionary MERUS™ integrated multilevel class D audio amplifier ICs, Infineon is leading in efficiency and power density. Compared to traditional class D amplifier ICs, which produce only two voltage output levels, multilevel amplifier ICs use additional on-chip MOSFETs and capacitors to produce outputs with a higher signal ranularity, i.e., higher switching frequencies and/or multiple output signal levels – typically up to five voltage levels

Filterless topology with “flying capacitor” of an integrated class D IC

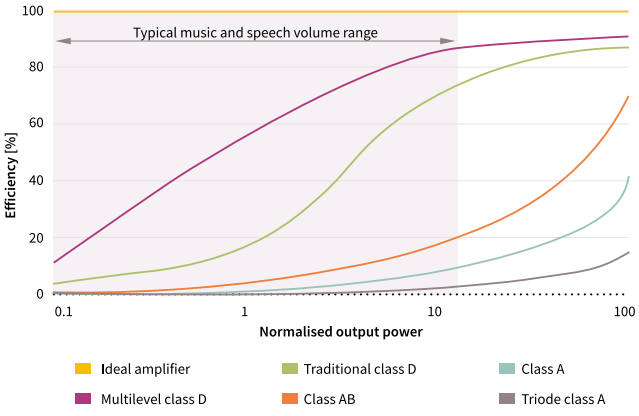


Features and benefits

Key features
– Multilevel switching technology
– Scalable signal “granularity”
– Proprietary circuits architecture

Key benefits
– Highest efficiency and power density
– Potential LC filter removal
– Low THD+N
– Cooler operation
– Low power loss
– Virtually no switching loss measurable in idle mode

Efficiency where it matters for audio reproduction



For MERUS™ integrated multilevel audio amplifier ICs, amplifier efficiency at average output power is key. As the graph on the left shows, MERUS™ multilevel amplifier is much more effective than the traditional class D amplifier, which translates into less power consumption in AC input and in battery-powered audio applications.

Audio amplifier | Wireless audio | Audio | PoE | Audio

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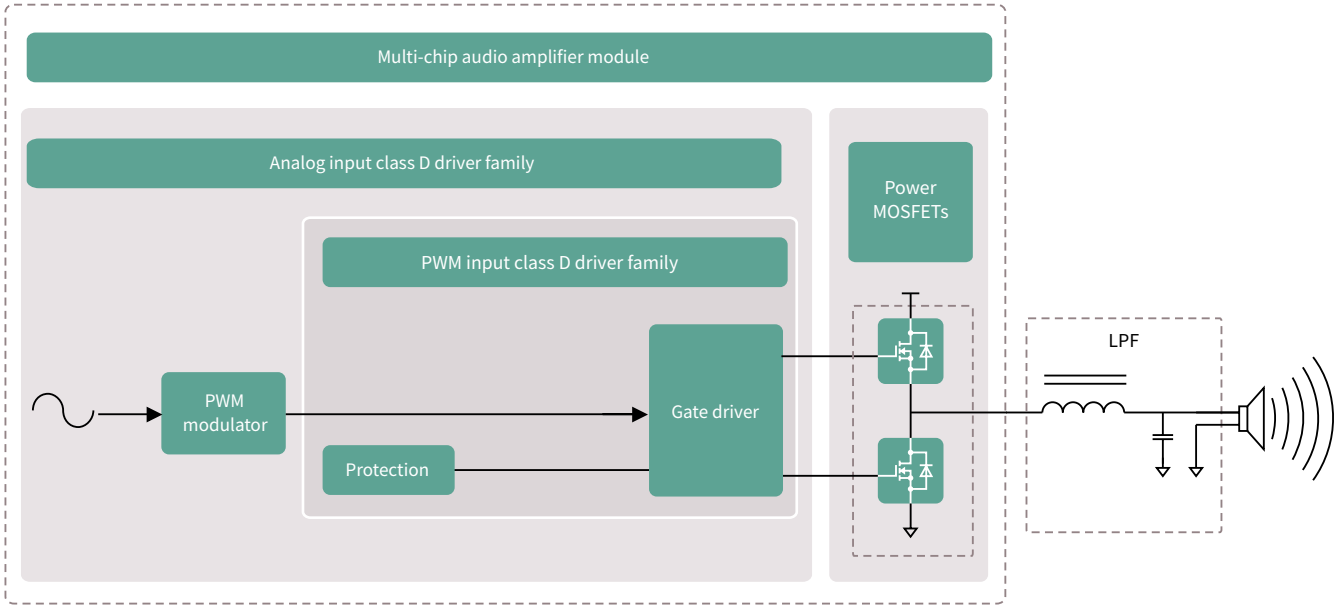
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MERUS™ integrated audio amplifier multi-chip modules (MCM)

Integrated components for scalable output power and superb audio performance

Multi-chip modules integrate PWM controller and power MOSFETs in a single package to offer a highly efficient, compact solution that reduces component count, shrinks PCB size up to 70 percent, and simplifies class D amplifier design.

Multi-chip audio amplifier module



Features and benefits

Key features
– Single package with integrated PWM controller and audio-performance-optimized power MOSFET
– Overcurrent protection
– Thermal shutdown
– Floating differential input
– Clip detection
– Best-in-class power efficiency and audio performance
– Lower component count, leading to design simplification
– Compatible with single supply or split rail configuration
– Click noise reduction

Key benefits
– Extended battery playback time
– Unrivaled audio performance
– Smaller solution size (BOM reduction, system level cost savings)
– Eliminated need for heatsink
– High noise immunity
– Reliable operation
– Thermal efficiency

Audio amplifier · Wireless audio · Audio · PoE · Audio

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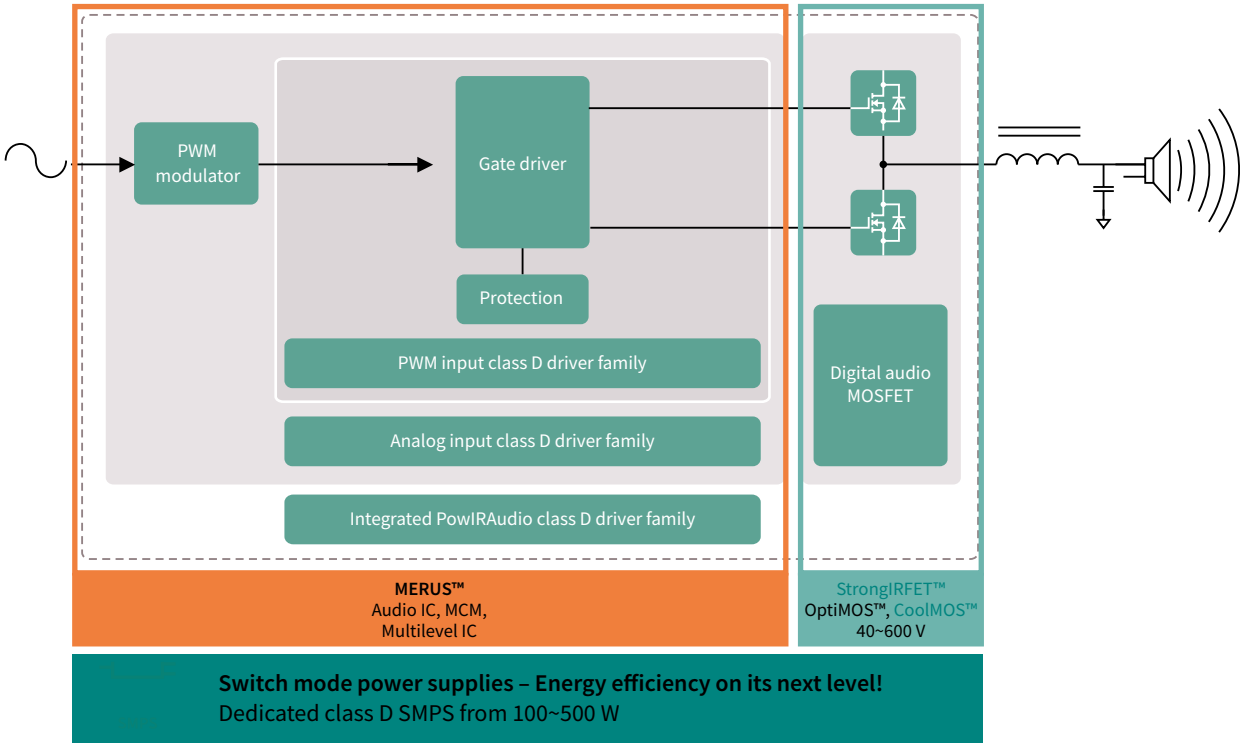
For more details on the product, click on the part number, visit infineon.com or contact our product support.

Discrete MERUS™ audio amplifier driver ICs with MOSFET and gallium nitride CoolGaN™ GIT HEMT 400 V

Scalable output power with a unified design platform

Infineon's discrete audio solutions are scalable to various output power levels, simply by replacing the external MOSFETs or CoolGaN™ GIT HEMTs of the driver-transistor combinations. Key parameters for the transistors used in discrete class D audio applications include on-state resistance ($R_{DS(on)}$), gate charge (Q_G), and reverse recovery charge (Q_{rr}). Our products are specifically suitable for class D audio applications and optimized for these parameters to achieve maximized efficiency, THD, and EMI amplifier performance. The CoolGaN™ GIT HEMT 400 V portfolio is specifically built for class D audio requirements, with high-performing SMD packages to fully utilize the benefits of gallium nitride.

Audio solution overview



Features and benefits

Key benefits	Key advantages
– Unified design platform	– Superior audio performance
– Scalable output power up to over 2 kW per channel	– Increased reliability
– Simple yet effective - exchange of external MOSFET triggers alteration in output power level	– Unique audio experience
– Best-in-class power efficiency	

www.infineon.com/merus
www.infineon.com/gan

Audio amplifier · Wireless audio · Audio · PoE · Audio

For more details on the product, click on the part number, visit infineon.com or contact our product support.

Integrated class D audio amplifier IC portfolio

MERUS™ Gen2 integrated multilevel audio amplifier IC product portfolio

		MA2304DNS	MA2304PNS
Specifications	Number of audio channels	2xBTL	
	Max. peak power at 4 Ω 10% THD	2x37 W	
	Supply voltage	10-20 V	
	3-level and 5-level modulation	√	√
	Selectable power mode profiles:	Low power consumption (LPC) or high audio performance (HAP)	
	Audio input	Digital	
	HiRes audio compliant	I2S/TDM	
	Integrated DSP	√	
	Volume and dynamic range control	√	√
	Idle power dissipation Max. output and all channels switching	52 mW (LPC mode)	
	Audio performance (PMP2)	106 dB DNR 52 μV_{RMS} output noise <0.03% THD+N	
Features	Sample rates	32, 44.1, 48, 88.2, 96, 176.4, 192 kHz	
	Comprehensive protection scheme*	√	√
	Configurable for SE or PBTL operation	√	√
	I^2C communication	√	√
	Filterless implementation	√	√
	Package type	40-pin QFN package with exposed thermal pad	
	Evaluation boards	EVAL_AUDIO_MA2304DNS	EVAL_AUDIO_MA2304PNS

*All ICs carry a full protection scheme comprising undervoltage lockout, overtemperature warning/error, short circuit/overload protection, power stage pin-to-pin short circuit, error reporting through serial interface (I^2C), and DC protection

MERUS™ integrated audio amplifier multi-chip modules (MCMs)

		IR4301M	IR4321M	IR4311M	IR4302M	IR4322M	IR4312M	MA5332MS
Specifications	Number of audio channels	1	1	1	2	2	2	2
	Max. power per channel	160 W	90 W	45 W	130 W	100 W	40 W	200 W
	Supply voltage	~ ± 31 V or 62 V	~ ± 25 V or 50 V	~ ± 15 V or 30 V	~ ± 31 V or 62 V	~ ± 25 V or 50 V	~ ± 16 V or 32 V	~±40 V or 80 V
	Max. PWM frequency	500 kHz	500 kHz	500 kHz	500 kHz	500 kHz	500 kHz	500 kHz
Features	Differential audio input	✓	✓	✓	✓	✓	✓	✓
	Overcurrent protection	✓	✓	✓	✓	✓	✓	✓
	Integrated power MOSFET	✓	✓	✓	✓	✓	✓	✓
	Voltage	80 V	60 V	40 V	80 V	60 V	40 V	100 V
	PWM controller	✓	✓	✓	✓	✓	✓	✓
	Thermal shutdown	✓	✓	✓	✓	✓	✓	✓
	Click noise reduction	✓	✓	✓	✓	✓	✓	✓
	Clip detection				✓	✓	✓	✓
	Package type	5x6 mm QFN	5x6 mm QFN	5x6 mm QFN	7 x 7 mm QFN	7 x 7 mm QFN	7 x 7 mm QFN	7 x 7 mm QFN
	Evaluation boards	IRAUDAMP12 IRAUDAMP19	IRAUDAMP21	IRAUDAMP15	IRAUDAMP16 IRAUDAMP17	IRAUDAMP22	IRAUDAMP18	EVAL_AUDAMP25 REF_ MA5332BTLSPS

www.infineon.com/merus

For more details on the product, click on the part number, visit infineon.com or contact our product support.

MERUS™ discrete audio amplifier driver IC product portfolio

		IRS20965S	IRS20957SPBF	IRS2092SPBF	IRS2052M	IRS2093MPBF	IRS2452AM
Specifications	Number of audio channels						
	Max. power per channel	500 W	500 W	500 W	300 W	300 W	500 W
	Supply voltage	± 100 V	± 100 V	± 100 V	± 100 V	± 100 V	± 200 V
	Gate sink/source current	2.0/2.0 A	1.2/1.0 A	1.2/1.0 A	0.6/0.5 A	0.6/0.5 A	0.6/0.5 A
Features	Overcurrent protection	✓	✓	✓	✓	✓	✓
	Overcurrent flag	✓					
	PWM input	✓	✓				
	Floating input	✓	✓	✓	✓	✓	✓
	Dead time		✓	✓	✓	✓	✓
	Protection control logic	✓	✓	✓	✓	✓	✓
	PWM controller			✓	✓	✓	✓
	Clip detection				✓		
	Click noise reduction			✓	✓	✓	✓
	Temperature sensor input				✓		✓
	Thermal shutdown				✓		
	Clock input				✓		✓
	Package type	16-pin SOIC narrow	16-pin SOIC narrow	16-pin SOIC narrow	MLPQ48	MLPQ48	MLPQ32
	Evaluation boards		IRAUDAMP4A IRAUDAMP6	IRAUDAMP5 IRAUDAMP7S IRAUDAMP7D IRAUDAMP9	IRAUDAMP10	IRAUDAMP8	IRAUDAMP23

Recommended MOSFET (through-hole) product portfolio

Output power	Recommended discrete audio driver IC	Speaker resistance		
		2 Ω	4 Ω	8 Ω
150 W	IRS2093MPBF	IRFB4019	IRFB4019	IRFI4020H-117P
200 W	IRS2052M	IRFB5615	IRFB4019	IRFI4020H-117P
300 W	IRS2092SPBF	IRFB4228PBF	IRFB4227	IRFB4229
500 W	IRS20957SPBF	IRFB4228PBF	IRFB4227	IRFB4229
750 W		IRFB4227	IRFB4229	
1000 W		IRFP4668	IRFB4229 x 2	

IRS2093MPBF works up to 150 W and IRS2052M works up to 300 W.
IRS2092SPBF and IRS20957SPBF work with all power levels listed above.

Recommended MOSFET (DirectFET™) product portfolio

Output power	Recommended discrete audio driver IC	Speaker resistance		
		2 Ω	4 Ω	8 Ω
150 W	IRS2093MPBF	IRF6645	IRF6665	IRF6775M
200 W	IRS2052M	IRF6646	IRF6775M	IRF6775M
300 W	IRS2092SPBF	IRF6644	IRF6775M	IRF6785
500 W	IRS20957SPBF	IRF6643	IRF6641	

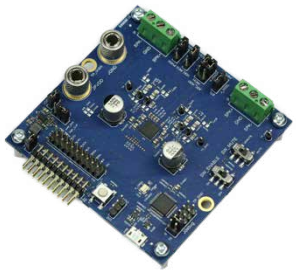
www.infineon.com/merus
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Recommended audio evaluation boards

Enabling fast time to market and device performance evaluation

MERUS™ integrated multilevel audio amplifier IC evaluation boards

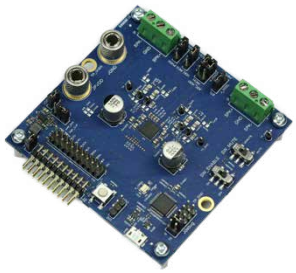


EVAL_AUDIO_MA2304DNS*

The demonstration board EVAL_AUDIO_MA2304DNS is an evaluation and demonstration board for MERUS™ audio MA2304DNS. It contains a digital input and a variety of output and setup/selection features. It also contains an on-board power supply generator (selectable 1.8 or 3.3 V buck-converted) so only one external power supply (PVDD) is necessary. It can be controlled and programmed with its software GUI.

The board can be used for evaluating or demonstrating key features/advantages of the MERUS™ technology:

- Energy efficiency: power losses at typical audio listening levels/ultralow idle power consumption
- Adaptive power management system
- Minimum output filter components: significant cost and size reduction
- THD performance and audio quality
- Integrated MERUS™ DSP



EVAL_AUDIO_MA2304PNS*

The demonstration board EVAL_AUDIO_MA2304PNS is an evaluation and demonstration board for MERUS™ audio MA2304PNS. It contains a digital input and a variety of output and setup/selection features. It also contains an on-board power supply generator (selectable 1.8 or 3.3 V buck-converted) so only one external power supply (PVDD) is necessary. It can be controlled and programmed with its software GUI.

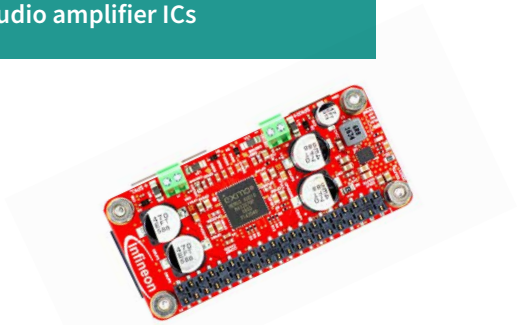
The board can be used for evaluating or demonstrating key features/advantages of the MERUS™ technology:

- Energy efficiency: power losses at typical audio listening levels/ultralow idle power consumption
- Adaptive power management system
- Minimum output filter components: significant cost and size reduction
- THD performance and audio quality
- Integrated volume and limiter processors

www.infineon.com/merus

*Coming soon

For more details on the product, click on the part number, visit infineon.com or contact our product support.



KIT_40W_AMPHAT_ZW

Kit board - MERUS™ audio amplifier HAT ZW class D audio amplifier 40 W for Raspberry Pi Zero W featuring MA12070P

Summary of features

- Equipped with MERUS™ MA12070P proprietary multilevel amplifier
- Compatible with Raspberry Pi Zero and Raspberry Pi Zero wireless
- Power input: 5 V/2.5 A - sourced from the same single supply as the Raspberry Pi
- No need for external or extra power supplies
- Up to 40 W instantaneous peak output power with the Raspberry Pi official 5 V/2.5 A supply

Benefits

- Compatibility with major streaming applications for Raspberry Pi (Volumio, JustBoom Player, Max2Play)
- Up to 48 kHz of sample rate and 24-bit of music playback
- Full hardware control, customization, and error monitoring trough Linux Alsamixer

Potential Applications

- DIY on the go wireless speakers
- DIY intelligent home audio systems



KIT_ARDMKR_AMP_40W

Kit board MA12070P audio amplifier - compatible with Arduino MKR boards

Summary of features

- Equipped with MERUS™ MA12070P proprietary multilevel amplifier
- Power input: 5 V/2.5 A - sourced from the same single USB-C power supply or battery pack
- No need for external or extra power supplies
- Up to 40 W instantaneous peak output power with a USB-C power supply or battery pack

Benefits

- Compatible with Arduino MKRZERO and MKR1000 WIFI
- Full hardware control and customization
- Error monitoring through Arduino programming framework



DEMO_BASSAMP_60W_MA12070

Reference design demoboard MERUS™ MA12070 as musical instrument bass amplifier

Summary of features

- 1 x 60 W at 4 Ω speaker output
- Powered by off-the-shelf regulated wall adapter
- 12AU7 vacuum-tube preamplifier
- Stereo 3.5 mm AUX input
- XLR D.I. output with ground lift switch
- Bright switch for slap-bass sound
- Low idle power consumption

Benefits

- Superior sound quality
- Modelled after classic bass amplifier topology
- Genuine vacuum-tube preamplifier
- Small size and scalable platform
- Excellent efficiency



EVAL_AUDAMP25

Number of audio channels: 2
Output power per channel [RMS]: 200 W
Featured class D IC: MA5332MS
Input: analog
OPN: EVALAUDAMP25TOBO1



REF_MA5332BTLSPS

Number of audio channels: 1
Output power per channel [RMS]: 200 W
Featured class D IC: MA5332MS
Input: analog
OPN: REFMA5332BTLSPSTOBO1

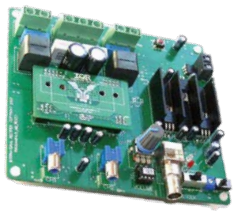
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For more details on the product, click on the part number, visit infineon.com or contact our product support.

MERUS™ integrated audio amplifier multi-chip module (MCM) evaluation boards







IRAUDAMP12
Number of audio channels: 2
Output power per channel [RMS]: 130 W
Featured class D IC: IR4301M
Input: Analog
OPN: IRAUDAMP12

IRAUDAMP17
Number of audio channels: 2
Output power per channel [RMS]: 100 W
Featured class D IC: IR4302M
Input: Analog
OPN: IRAUDAMP17

IRAUDAMP19
Number of audio channels: 2
Output power per channel [RMS]: 100 W
Featured class D IC: IR4301M
Input: Analog
OPN: IRAUDAMP19

IRAUDAMP21
Number of audio channels: 2
Output power per channel [RMS]: 135 W
Featured class D IC: IR4321M
Input: Analog
OPN: IRAUDAMP21

IRAUDAMP22
Number of audio channels: 2
Output power per channel [RMS]: 100 W
Featured class D IC: IR4322M
Input: Analog
OPN: IRAUDAMP22

Discrete MERUS™ audio amplifier driver IC and MOSFET evaluation boards






IRAUDAMP4A
Number of audio channels: 2
Output power per channel [RMS]: 120 W
Featured driver IC: IRS20957S
Featured MOSFET: IRF6645TRPbF
OPN: IRAUDAMP4A

IRAUDAMP5
Number of audio channels: 2
Output power per channel [RMS]: 120 W
Featured driver IC: IRS2092S
Featured MOSFET: IRF6645TRPbF
OPN: IRAUDAMP5

IRAUDAMP6
Number of audio channels: 2
Output power per channel [RMS]: 250 W
Featured driver IC: IRS20957S
Featured MOSFET: IRF6785MTRPbF
OPN: IRAUDAMP6

IRAUDAMP7S
Number of audio channels: 2
Output power per channel [RMS]: 500 W
Featured driver IC: IR-S2452AM
Featured MOSFET: IRFI4019H-117P
OPN: IRAUDAMP7S





IRAUDAMP9
Number of audio channels: 1
Output power per channel [RMS]: 1700 W
Featured driver IC: IRS2092S
Featured MOSFET: IRFB4227PbF
OPN: IRAUDAMP9

IRAUDAMP10
Number of audio channels: 2
Output power per channel [RMS]: 370 W
Featured driver IC: IRS2052M
Featured MOSFET: IRF6775MTRPbF
OPN: IRAUDAMP10

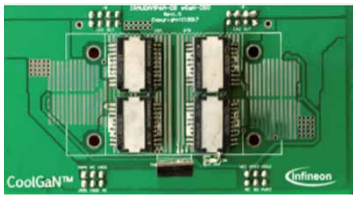
IRAUDAMP23
Number of audio channels: 2
Output power per channel [RMS]: 500 W
Featured driver IC: IRS2452AM
Featured MOSFET: IPP60R180C7
OPN: IRAUDAMP23

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Discrete audio amplifier driver IC and CoolGaN™ GIT HEMT 400 V evaluation board



EVAL_AUDAMP24

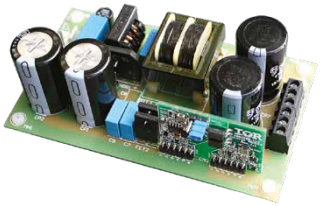
Number of audio channels: 2
Output power per channel [RMS]: 300 W at 1%
Featured driver IC: IRS20957S
Featured HEMT: IGOT40R070D1
IGT40R070D1
OPN: EVAL_AUDAMP24

Power supply units for audio evaluation boards



IRAUDPS1

Input voltage: 12 V_{DC}
Output voltage: ± 35 V
Output power per channel [RMS]: 100 W
Featured driver IC: IR2085
Description: 250-1000 W scalable audio power supply
OPN: IRAUDPS1



IRAUDPS3

Input voltage: 110/220 V_{AC}
Output voltage: ± 30 V
Output power per channel [RMS]: 200 W
Featured driver IC: IRS27952S
Description: Power supply for class D audio amplifier
OPN: IRAUDPS3

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AC-DC LED driver ICs

Digital and mixed-signal, single- and dual-stage high-voltage control ICs for LED drivers

XDP™ digital power – digital single- and dual-stage flyback combo controllers
The XDP™ portfolio of high-performance digital power control ICs addresses today's challenges, such as smart or connected lighting, meeting demanding LED driver requirements with unique features.

Mixed-signal control ICs for solid-state lighting luminaires
Infineon's mixed-signal control ICs for LED drivers deliver excellent power quality and high efficiency for LED lighting applications supporting dimming levels down to 1 percent. The integration of advanced functions saves external components and minimizes system cost. The wide variety of features and functions gives the option to choose the best fitting part for the application.

www.infineon.com/offline-led-driver

LEDs plug & play

LED

Lighting

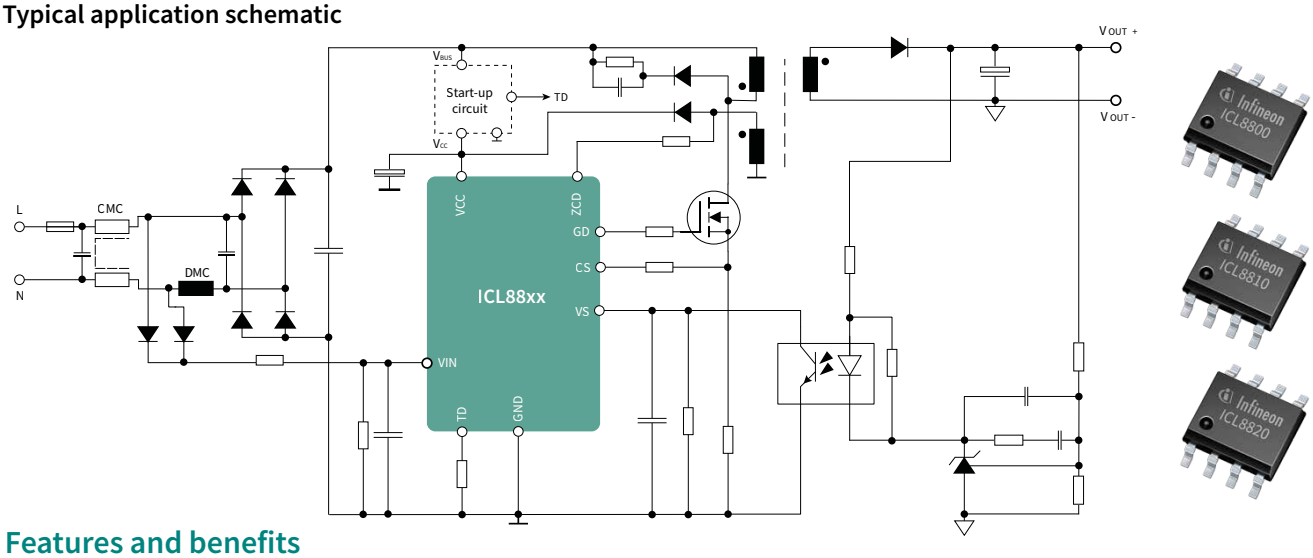
ICL8800/ICL8810/ICL8820

Single-stage flyback LED controllers for constant voltage output

The ICL88xx family of single-stage flyback controllers for constant voltage output is tailored for LED lighting applications to meet the required performance cost-effectively. All three ICs offer benchmarking performance for power factor correction and total harmonic distortion at full-load and at low-load conditions. Their comprehensive set of protection features (compare table below) and bottom-up design make them easy to design and require a minimum number of external components. The controllers are optimized as secondary-side regulated (SSR) constant voltage (CV) output flyback controllers and are also well suited for primary-side regulation (PSR).

Additionally, the controllers' low standby power due to the integrated BM (in ICL8810, ICL8820) is ideally suited for smart lighting systems' requirements. The jitter function (in ICL8820) eases the design of emergency lighting LED drivers without additional circuitry. It fulfills EMI requirements in DC operation and improves the EMI performance.

Typical application schematic



Features and benefits

Key benefits
– Optimized for SSR CV output flyback operation, additionally suited for PSR
– PF > 0.9 and THD < 10% across a wide load range (AC input up to 277 V_{RMS})
– CCM and QRM with smart valley hopping
– ICL8810 also contains burst mode (BM) to ensure low standby power (< 100 mW)
– ICL8820 also contains built-in jitter function

Key advantages
– Low BOM for wide range of applications with PFC functionality where dual-stage topologies are required
– Enables platform design and window drivers
– Optimum efficiency and low EMI at low BOM without compromising light quality
– ICL8810 **enables in addition:** smart lighting in connection with microcontrollers (standby power < 500mW, i.e., more power budget for additional components)
– ICL8820 **enables in addition:** Fulfillment complying with EMI regulations in DC operation at low cost and effort

Order information for ICL88xx

Board name	Description	Ordering code
ICL8800	Single-stage flyback controller for constant voltage output	ICL8800XUMA1
REF_ICL8800_LED_43W*	Demoboard with ICL8800	REFICL8800LED43W
ICL8810	Single-stage flyback controller for constant voltage output with low standby power	ICL8810XUMA1
REF_ICL8810_LED_43W_BM*	Demoboard with ICL8810 with burst mode	REFICL8810LED43WBM
REF_ICL8810_LED_42W_PSR	Demoboard with ICL8810 for primary side regulation	REFICL8810LED42WPSR
ICL8820	Single-stage flyback controller for constant voltage output with low standby power and jitter function	ICL8820XUMA1
REF_ICL8820_LED_43W_JT*	Demoboard with ICL8820 with jitter function	REFICL8820LED43WJT

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www.infineon.com/offline-led-driver

*See Plug & LEDs play, ideally to be combined with secondary-side boards

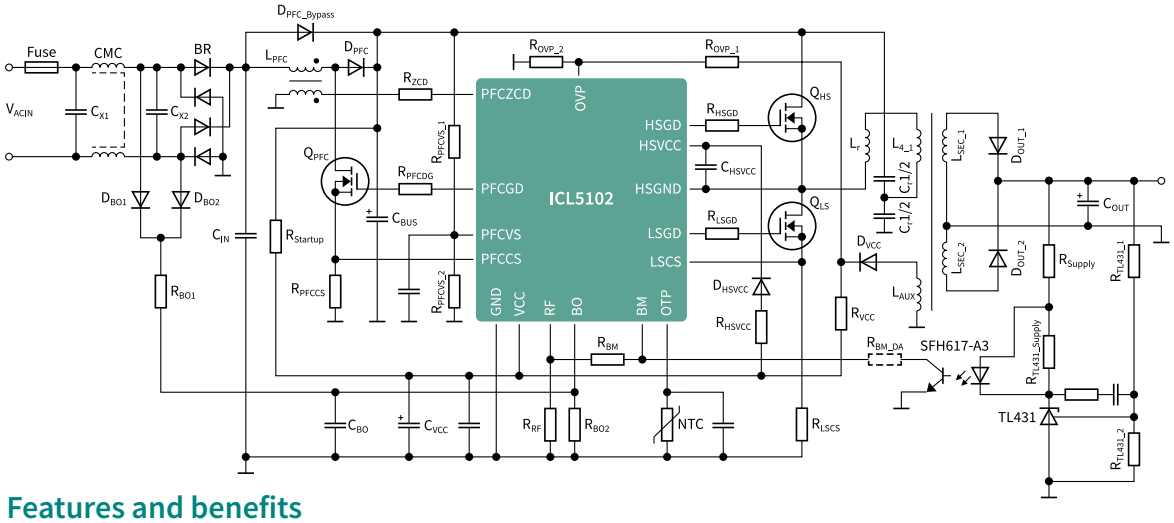
For more details on the product, click on the part number, visit infineon.com or contact our product support.

ICL5102

High-performance PFC + resonant controller for LCC and LLC

With ICL5102, Infineon offers a highly integrated combo controller IC with a universal input of 70 V to 325 V. This allows manufacturers to realize global designs, keeping the cost for product variety and stock low. The highest efficiency of up to 94 percent by resonant topology, a THD factor less than 3.5 percent, and a high power factor of more than 0.95 allow for more lumen output and less thermal load, enabling cost-effective designs and keeping the cost for LEDs and heat sink low. Thanks to the high integration, there is no need for additional expensive components in PFC and LLC stage, reducing the overall BOM cost. In addition, integrated protection features complement the ICL5102 features.

Typical application schematic



Features and benefits

Key features and benefits
– **Small form factor LED driver and low BOM** The high level of integration assures a low count of external components, enabling small form factor designs and making them ideal for compact and slimline power supplies for lighting, such as LED driver for indoor and outdoor applications
– **High performance, digital PFC, and advanced HB driver** The high-performance digital PFC stage achieves power factor of 99 percent, through operation in CrCM and DCM mode, in a frequency range of 22 to 500 kHz. This supports stable operation even at low-load conditi-ons down to 0.1 percent of the nominal power without audible noise
– **Fast time-to-light and low standby** With a start-up current of less than 100 µA the controller provides very fast time-to-light within less than 300 ms, while in standby the controller changes into active burst mode which reduces power consumption to less than 300 mW
– **Safety first** The controller has a comprehensive set of protection features built in to increase the system safety. In run mode it monitors the complete system regarding bus over- and undervoltage, open loop, overcurrent of PFC and/or inverter, output overvoltage, overtemperature, and capacitive load operation



Order information for ICL5102

Type	Description	Ordering code
ICL5102	PFC and resonant controller for LCC and LLC	ICL5102XUMA2
REF-ICL5102-U130W-CC	PFC/LLC-CC constant current evaluation board 130 W LED driver	REFICL5102U130WCCTOBO1
REF-ICL5102-U52W-CC	Low-cost PFC/LCC reference design 52 W LED driver, non-dimmable	REFICL5102U52WCCTOBO1
REF_ICL5102_U100W_LCC	Low-cost PFC/LCC reference design 100 W, dimmable	REFICL5102U100WLCC
REF_LLC_BUCK_4CH_320W*	Scalable 320 W multichannel high-power LED driver (using ICL5102 board and ILD8150E board)	REFLLCBUCK4CH320WTOBO1

LEDs plug & play | Smart city lighting | Lighting

www.infineon.com/icl5102

*See Plug & LEDs play, ideally to be combined with secondary-side boards

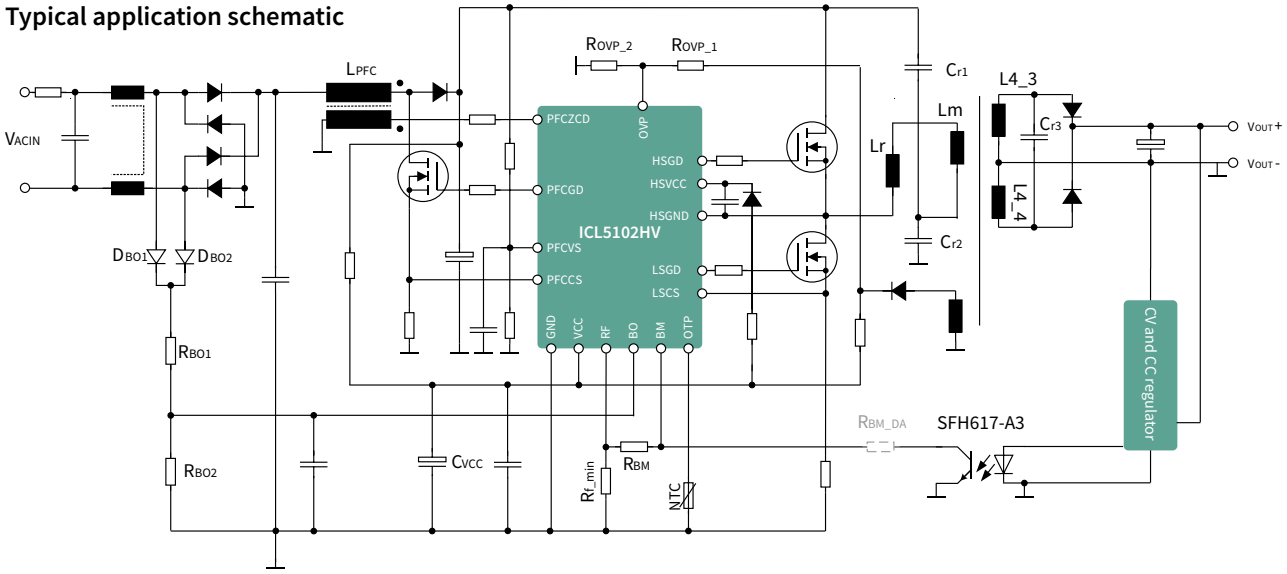
For more details on the product, click on the part number, visit infineon.com or contact our product support.

ICL5102HV

High-performance PFC + resonant controller for LCC and LLC, supporting 980 V high side

ICL5102HV control IC for LED drivers offers a unique one-package solution for lighting applications up to 350 W, supporting LLC/LCC topology. It is particularly designed to deliver best performance of total harmonic distortions (THD) and power factor (PF). Compared to level-shifter technology, the integrated coreless transformer not only further reduces the loss at high operation frequency, but also enhances the capability of handling a huge negative voltage (-600 V on HSGND). Reduce the number of external components to optimize the form factor and reduce the bill of materials (BOM) with the integrated two-stage combination controller (PFC + LLC/LCC) for lighting applications. Simplify your design and shorten time-to-market.

Typical application schematic



Features and benefits

Key features and benefits
– **Small form factor LED driver and low BOM** The high level of integration assures a low count of external components, enabling small form factor designs and making them ideal for compact and slimline power supplies for lighting, such as LED driver for indoor and outdoor applications
– **High performance, digital PFC, and advanced HB driver** The high-performance digital PFC stage achieves power factor of 99 percent, through operation in CrCM and DCM mode, in a frequency range of 22 to 500 kHz. This supports stable operation even at low-load conditi-ons down to 0.1 percent of the nominal power without audible noise
– **Fast time-to-light and low standby** With a start-up current of less than 100 µA the controller provides very fast time-to-light within less than 300 ms, while in standby the controller changes into active burst mode which reduces power consumption to less than 300 mW
– **Safety first** The controller has a comprehensive set of protection features built in to increase the system safety. In run mode it monitors the complete system regarding bus over- and undervoltage, open loop, overcurrent of PFC and/or inverter, output overvoltage, overtemperature, and capacitive load operation



Order information for ICL5102HV

Type	Description	Ordering code
ICL5102HV	PFC and resonant controller for LCC and LLC	ICL5102HVXUMA1
REF-ICL5102HV-U150W	PFC/LCC evaluation board 150 W, CC LED driver	REFICL5102HVU150WTOBO1

Lighting

www.infineon.com/icl5102hv

For more details on the product, click on the part number, visit infineon.com or contact our product support.

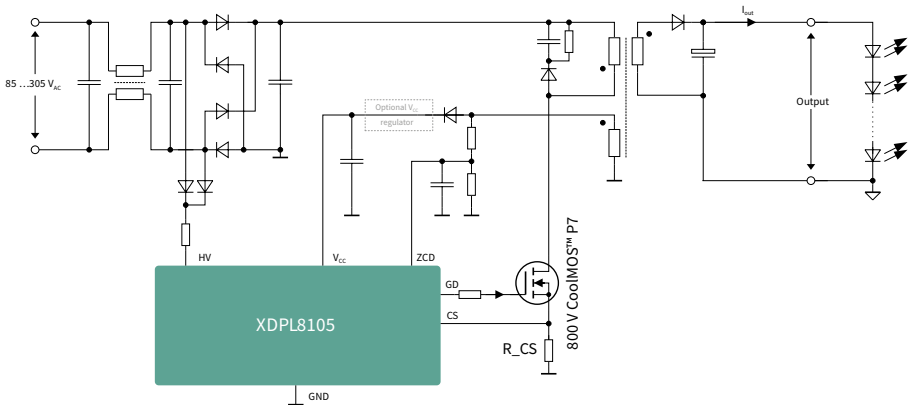
XDP™ LED

The IC family XDP™ is the first all-in-one package solution combining a digital controller with key power peripherals. Such integration provides exceptional flexibility and performance. The XDP™ family addresses essential features for advanced LED driver.

XDPL8105 – digital flyback controller IC for LED driver

The XDPL8105 is a digital, single-stage flyback controller with high power factor for constant current LED driver.
The device offers versatile functions for different indoor and outdoor lighting applications. The IC is available in a DSO-8 package and provides a wide feature set, requiring a minimum of external components. The advanced control algorithms in the digital core of the XDPL8105 provide multimode operation for high efficiency. Configurable parameters allow last minute changes, shorten the product development time, and reduce hardware variants. The extensive set of configurable standard and sophisticated protection mechanisms ensure a safe, reliable, and robust LED driver device for diverse use cases.

Typical application schematic



Features and benefits

Key features and benefits
– Constant current with primary-side regulation
– Supports AC and DC input
– Nominal input voltage range 90-305 V_{AC} or 120-350 V_{DC}
– Integrated 600 V start-up cell
– Power factor > 0.9 and THD < 15 percent over wide load range
– Highly accurate primary-side control output current typ. ± 3 percent
– Reference board efficiency > 90 percent
– Internal temperature guard with adaptive thermal management
– Multimode operation – QRM (quasi-resonant mode) – DCM (discontinuous conduction mode) – ABM (active burst mode)
– Digital parameters
– Relevant error conditions are monitored and protected – Undervoltage – Overvoltage – Open load – Output shorted

Order information for XDPL8105

Type	Description	Ordering code
XDPL8105	Digital flyback constant current controller IC	XDPL8105XUMA1
REF-XDPL8105-CDM10V	40 W reference design with CDM10V isolated 0 V-10 V dimming interface	REFXDPL8105CDM10VTOBO1

Lighting

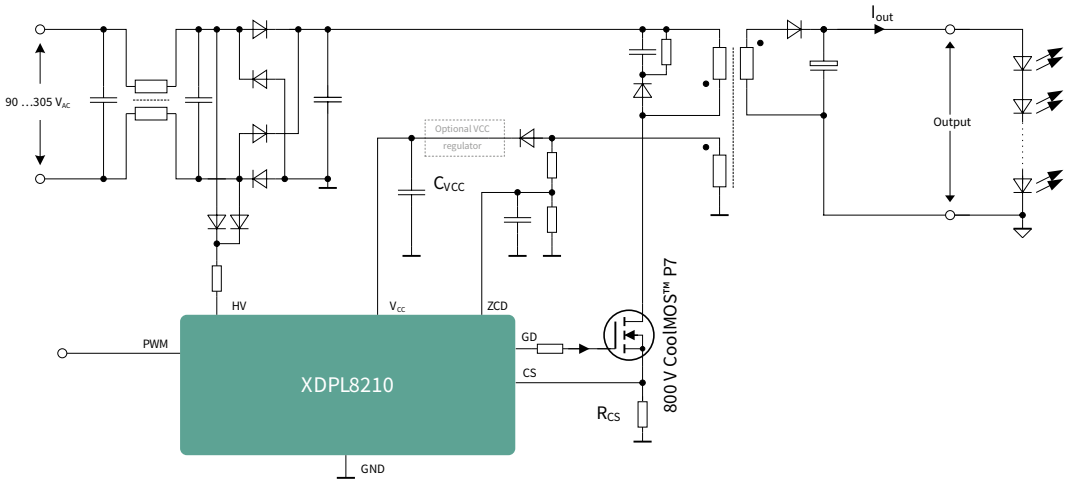
www.infineon.com/xdpl8105

For more details on the product, click on the part number, visit infineon.com or contact our product support.

XDPL8210 – digital flyback constant current controller IC for LED driver with 1 percent dimming

The XDPL8210 is a digital, single-stage, quasi-resonant flyback controller with high power factor and high precision primary-side controlled constant current output. The IC is available in a DSO-8 package and provides a wide feature set, which requires only a small number of external components. Sophisticated algorithms provide flicker-free dimming below one percent. The driver fully supports IEC61000-3-2 class C designs. The limited power mode improves functional safety, while configurable parameters allow last minute changes, shorten the product development time, and reduce hardware variants. The extensive set of configurable standard and sophisticated protection mechanisms ensure a safe, reliable, and robust LED driver for a large set of use cases.

Typical application schematic



Features and benefits

Key features and benefits
– Constant current with primary-side regulation
– Supports AC and DC input
– Nominal input voltage range 90-305 V_{AC} or 90-430 V_{DC}
– Reference board efficiency > 90 percent
– Power factor > 0.9 and THD < 15 percent over wide load range
– Standby power < 100 mW
– Internal temperature guard with adaptive thermal management
– Multimode operation – QRM (quasi-resonant mode) – DCM (discontinuous conduction mode) – ABM (active burst mode)
– Digital parameters
– Relevant error conditions are monitored and protected – Undervoltage – Overvoltage – Open load – Output shorted



Order information for XDPL8210

Type	Description	Ordering code
XDPL8210	Digital flyback constant current controller IC	XDPL8210XUMA1
REF-XDPL8210-U35W	35 W reference design with CDM10V isolated 0 V-10 V dimming interface	REFXDPL8210U35WTOBO1

Lighting

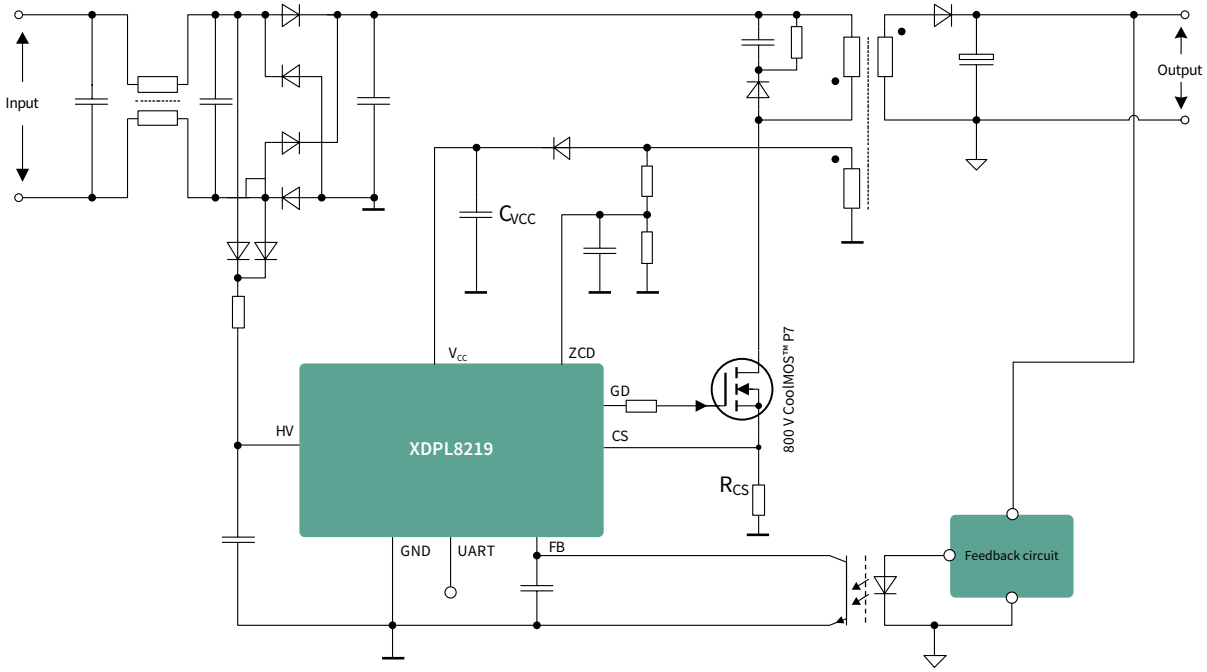
www.infineon.com/xdpl8210

For more details on the product, click on the part number, visit infineon.com or contact our product support.

XDPL8219 – PFC/flyback controller with enhanced total harmonic distortion

The XDPL8219 is a digital high-performance secondary-side regulated flyback controller with constant voltage output. With its high power factor, the controller is the perfect fit for cost-effective, dual-stage LED drivers and enables smart lighting applications. The device operates in quasi-resonant mode (QRM) to maximize the efficiency and minimize the electromagnetic interference (EMI) over a wide load range. It enters active burst mode (ABM) at light load to prevent audible noise from being heard while achieving no-load standby power as low as <100mW. The XDPL8219 is available is available in a DSO-8 package.

Typical application schematic



Features and benefits

Key benefits
– Secondary-side-regulated (SSR) constant voltage (CV) output
– Flyback controller with power factor correction
– Depending on load condition, either quasi-resonant, discontinuous conduction mode or active burst mode (ABM)
– Integrated 600 V start-up cell

Key benefits
– Supports wide load range and fast and stable reaction to dynamic load changes
– PF > 0.9 and THD < 10% across a wide load range (AC input up to 277 V_{RMS})
– Optimal efficiency, power factor, and THD can be achieved by best-suited mode. In addition, DCM eases compliance with EMI at low-load condition
– Very low standby power < 100 mW can be achieved
– Integrated start-up cell enables very high efficiency

Order information for XDPL8218

Type	Description	Ordering code
XDPL8219	Digital flyback CV output controller IC	XDPL8219XUMA1
REF-XDPL8219-U40W*	Efficient 40 W reference circuit design for XDPL8219 with high power factor and low THD. It is built for universal input voltage 120–277 V AC or 127–432 V DC	REFXDPL8219U40WTOBO1

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www.infineon.com/xdpl8219

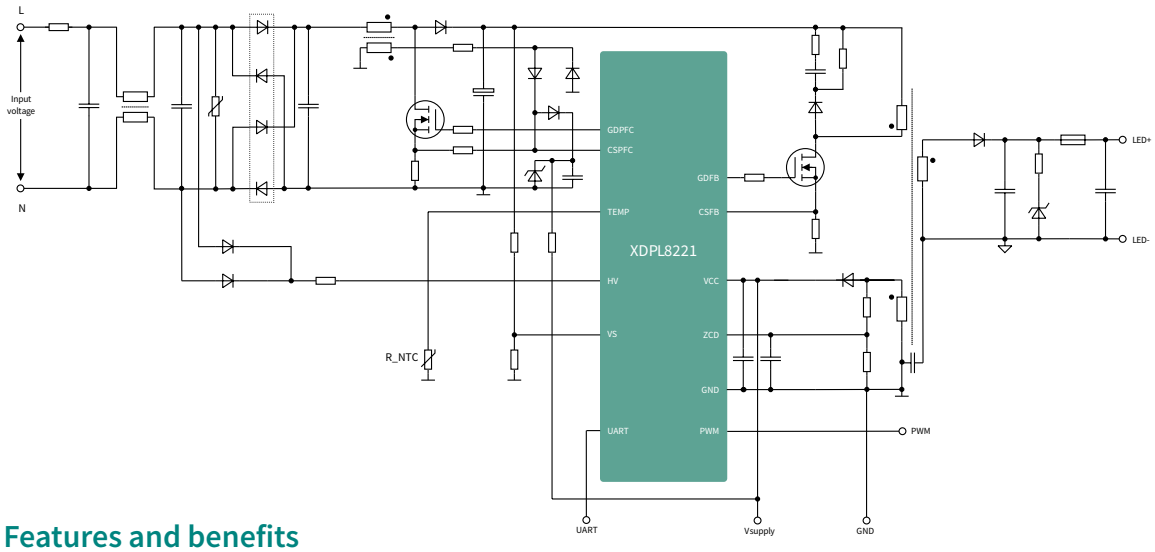
*See Plug & LEDs play, ideally to be combined with secondary-side boards

For more details on the product, click on the part number, visit infineon.com or contact our product support.

XDPL8221 - digital dual-stage multimode flyback controller for CC, CV, LP with 1 percent dimming and serial interface

The XDPL8221 is a digital, highly integrated, future-proof device combining a quasi-resonant PFC with a quasi-resonant flyback controller with primary-side regulation. A serial communication interface supports direct communication with an external microcontroller unit (MCU). The XDPL8221 is specially designed for advanced LED driver in smart lighting or IoT applications, featuring flicker-free dimming down to 1 percent of the nominal current. The device enables customizable LED driver and simplifies the generation and maintenance of different variants without increasing the number of stock keeping units. The IC is available in a DSO-16 package.

Typical application schematic



Features and benefits

Key features and benefits
– Nominal input voltage range 100-305 V_{AC} or 90-430 V_{DC}
– Reference board efficiency > 90 percent
– Power factor > 0.9 and THD < 15 percent over wide load range
– UART interface for control and real-time monitoring
– Constant current, constant voltage, limited power with primary-side regulation
– 1 percent dimming
– Dim-to-off with low standby power < 100 mW
– Internal temperature guard with adaptive thermal management
– The UART interface and the command set enable to control the function of the XDPL8221 or inquire status information
– Multimode operation – QRM (quasi-resonant mode) – DCM (discontinuous conduction mode) – ABM (active burst mode)
– Digital parameters
– Relevant error conditions are monitored and protected – Undervoltage – Overvoltage – Open load – Output shorted



Order information for XDPL8221

Type	Description	Ordering code
XDPL8221	Digital dual-stage multimode flyback controller for CC, CV, LP with 1 percent dimming	XDPL8221XUMA1
REF-XDPL8221-U50W	50 W reference board with CDM10V isolated 0 V-10 V dimming interface	REFXDPL8221U50WTOBO1
REF-XDPL8221-U100W	100 W reference board with CDM10V isolated 0 V-10 V dimming interface	REFXDPL8221U100WTOBO1

www.infineon.com/xdpl8221

Lighting

For more details on the product, click on the part number, visit infineon.com or contact our product support.



DC-DC LED driver ICs

DC-DC switch mode LED driver ICs with efficiencies up to 98 percent, dimming level down to 0.5 percent

Infineon offers highly integrated DC-DC LED driver ICs that support currents up to 1.5 A, making these drivers the ideal choice for high- and ultrahigh-power LEDs. These highly integrated DC to DC driver ICs achieve efficiency levels as high as 98 percent across a wide range of operation conditions. Integrated smart thermal protection, along with overvoltage and overcurrent protection, contribute to a longer LED lifetime.

Go for quality with Infineon's cost-efficient linear LED driver ICs

Infineon's BCR linear driver ICs are the best choice for driving LED strings supplied by a DC voltage source. The BCR regulators are suitable for driving currents from 10 to 250 mA. That is why they are the best solution for low- and mid-power LEDs. For high-power LEDs, the linear controller ICs and an external power stage allow for the greatest design flexibility.

www.infineon.com/cms/en/product/power/lighting-ics/dc-dc-led-driver-ic
www.infineon.com/cms/en/product/power/lighting-ics/linear-led-driver-ic

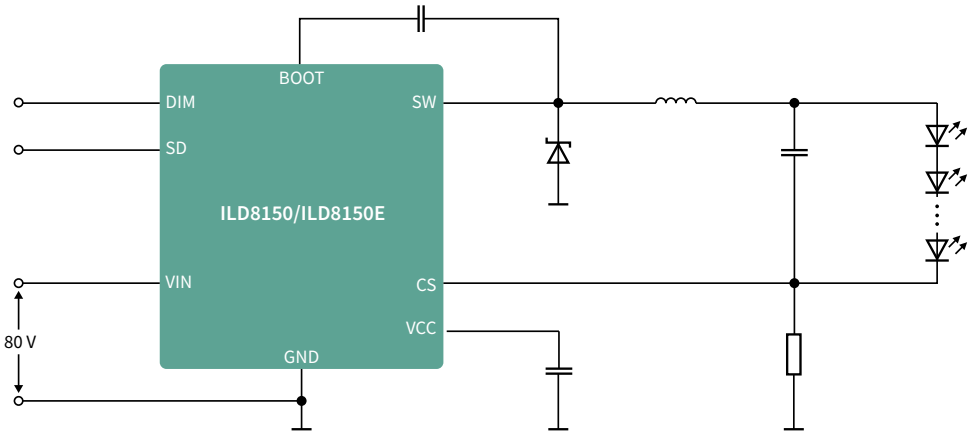
Dimming | LEDs plug & play | LED | Lighting

ILD8150/ILD8150E – 80 V DC-DC buck LED driver IC for high-power LEDs and high-performance hybrid dimming

The ILD8150 is 80 V DC-DC converter IC, designed to be used in LED applications to drive high-power LEDs. For applications operating close to safe extra low voltage (SELV) limits, it provides a high safety voltage margin. The buck LED driver IC is tailored for LEDs in general lighting applications with average currents up to 1.5 A using a high-side integrated switch. Several performance and protection features provide the right fit for professional LED lighting.

The hysteretic current control provides an extremely fast regulation and stable LED current combined with good EMI performance. The efficiency of the LED driver IC is remarkably high, reaching more than 95 percent efficiency over a wide range. A PWM input signal between 250 Hz and 20 kHz controls dimming of the LEDs current in analog mode from 100 to 12.5 percent and 12.5 to 0.5 percent in PWM mode with flicker-free modulation frequency of 3.4 kHz.

Digital PWM dimming detection with high resolution makes ILD8150/E the perfect LED driver IC for use together with microcontrollers. Precise output current accuracy from device to device under all loads and input voltage conditions makes it perfect for tunable white and flat panel designs where the current must be identical string to string.





Features and benefits

Key benefits
– Wide input voltage ranging from 8–80 V_{DC}
– Up to 1.5 A average output current, adjustable via shunt resistor
– Efficiency > 95 percent
– Up to 2 MHz switching frequency
– Soft-start
– PWM dimming input, with 250 Hz to 20 kHz PWM dimming frequency

Key advantages
– Hybrid dimming for flicker-free light down to 0.5 percent – Analog dimming 100 percent – 12.5 percent – PWM dimming 12.5 percent – 0.5 percent with 3.4 kHz flicker-free modulation, dim-to-off
– Typical 3 percent output current accuracy
– Overtemperature protection
– Pull-down transistor to avoid LED glowing in dim-to-off
– DSO-8 package to enable wave soldering
– DSO-8 with exposed pad for higher thermal performance (ILD8150E)

Type	Description	Package	Ordering code
ILD8150	80 V DC-DC buck LED driver IC	DSO-8	ILD8150XUMA1
ILD8150E	80 V DC-DC buck LED driver IC	DSO-8 exposed pad	ILD8150EXUMA1
REF_ILD8150_DC_1.5A*	Reference design board 1.5 A with through hole inductor	Board with ILD8150E	REFILD8150DC15ATOBO1
REF_ILD8150_DC_1.5A*	Reference design board 1.5 A	Board with ILD8150E	REFILD8150DC15ATOBO1
REF_TW_ILD8150E_60V_1A*	Reference board for professional tunable white and multichannel applications	Board with 2x ILD8150E	REFTWILD8150E60V1ATOBO1
REF_ILD8150_DC_1.5A_SMD*	Reference design board 1 A with SMD inductor	Board with 2x ILD8150E	REFILD8150DC15ASMDTOBO1

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www.infineon.com/ild8150

*See Plug & LEDs play, ideally to be combined with secondary-side boards

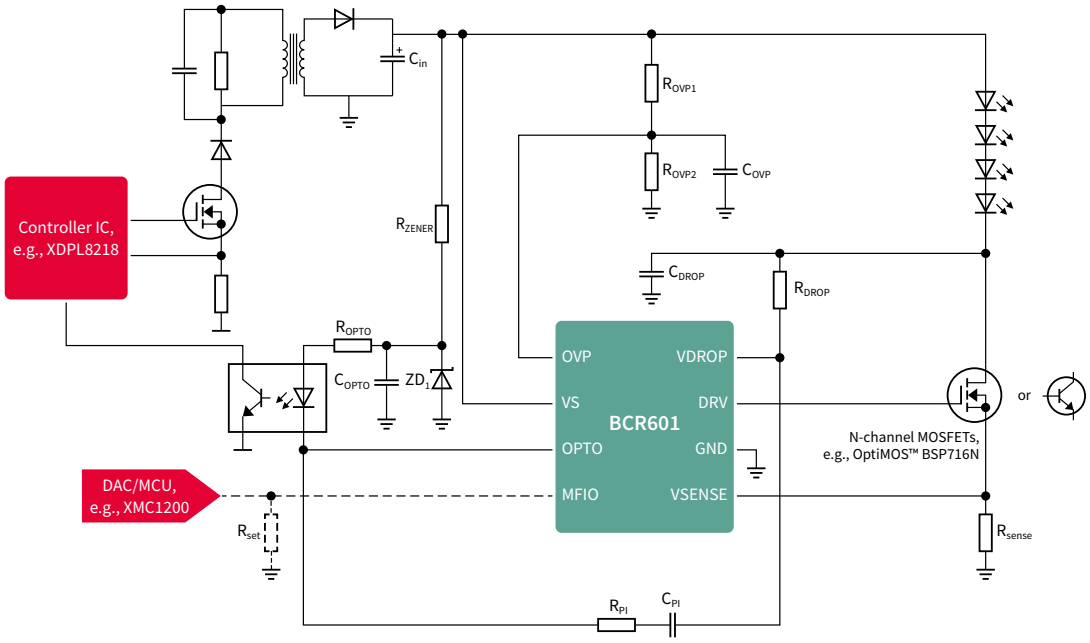
For more details on the product, click on the part number, visit infineon.com or contact our product support.

Linear current regulators

60 V linear LED controller IC with active headroom control for power- and cost-efficient linear regulation on DC-DC side

A unique feature of BCR601 is to provide feedback to the primary side via an optocoupler to control the output voltage of the primary-side converter, e.g., XDPL8219 or ICL88xx. The integrated control loop minimizes the voltage overhead and power dissipation of the external driver transistor. This capability, coupled with the adjustment of voltage overhead by external configuration according to application needs, leads to power- and cost-efficient LED systems. AC line ripple suppression, analog dimming option, and various protection features round up this device for LED drivers allowing for flicker-free light and longevity of LEDs.

Typical application schematic



Features and benefits

Key features and benefits
– Active headroom control (supports an optocoupler feedback loop to primary side minimizing power losses)
– Dimming in pure analog mode down to 3%
– Suppresses the voltage ripple of the power supply driving a constant LED current for high light quality
– The embedded hot-plug protection allows plug in and plug out of any LED load during operation without damaging the LEDs
– Supports wide current range depending on external driver transistor
– Supply voltage range up to 60 V
– Gate driver current 10 mA
– LED current can be adjusted by R_{set} functionality
– Overtemperature protection and adjustable overvoltage protection



Order information for BCR601

Type	Description	Ordering code
BCR601	60 V linear LED controller IC with voltage feedback to primary side	BCR601XUMA1
DEMO_BCR601_60V_IVCTRL*	Demonstration board BCR601 current and voltage control, 700 mA	DEMOBCR60160VIVCTRLTOBO1
REF_TW_BCR601_55V_0.5A*	Demoboard for design evaluation of tunable white applications with cost-effective linear LED controllers, 500 mA	REFTWBCR60155V05ATOBO1

www.infineon.com/bcr601

*See Plug & LEDs play, ideally to be combined with secondary-side boards

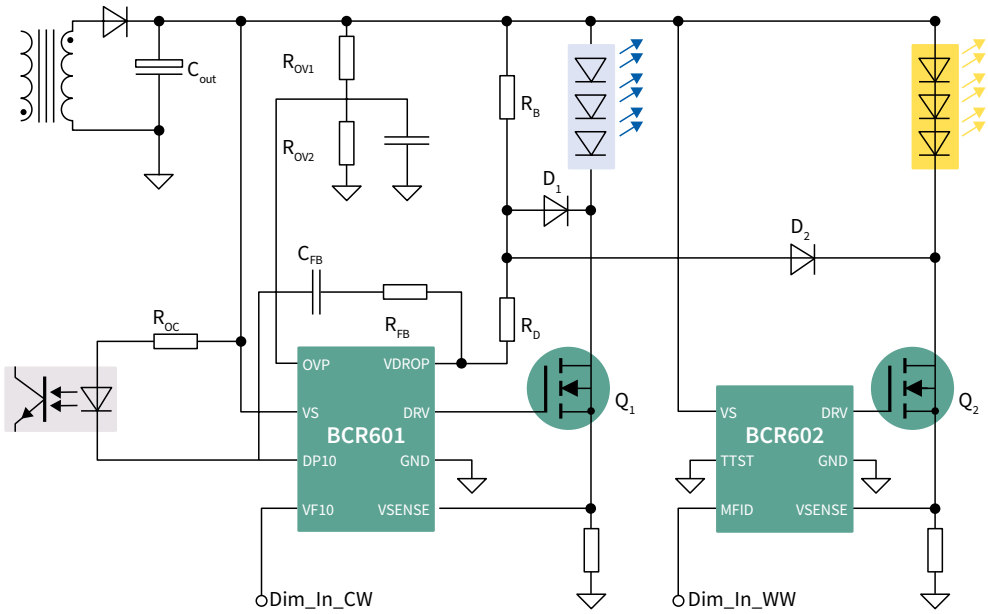
LEDs plug & play

Lighting

For more details on the product, click on the part number, visit infineon.com or contact our product support.

BCR601/BCR602 – 60 V linear LED controller ICs for tunable white plus active headroom control and flexible dimming

BCR601 is a linear controller that enables high efficiency at low cost as a second-stage LED controller to replace DC-DC buck converters especially in low- to mid-power LED drivers. The cost-effectiveness, especially in multichannel designs, can be further enhanced using BCR602 in a tiny SOT-23-6 package regulating the LED current for flicker-free deep dimming performance.



Features and benefits

Key benefits
– BCR601, as the master controller, controls the voltage overhead of both channels and the current of one channel
– BCR602, as slave controller, regulates current of second channel
– Input voltage up to 60 V
– Can be operated with either BJT or N-channel MOSFET
– Analog dimming down to 3%, PWM dimming down to 1% (BCR602)
– Current precision ±3%
– OTP, OVP, hot-plug protection

Key advantages
– Linear regulators give considerable cost advantage over buck topology
– Cost advantage increases with additional channels
– Efficiency can be on par with buck (depends on output ripple of first stage)
– Highest light quality, zero ripple
– Deep, full analog dimming
– Easy to extend to additional outputs (e.g., RGBW)

Order information

Type	Description	Ordering code
REF_TW_BCR601_55V_0.5A*	Demoboard for design evaluation of tunable white applications with cost-effective linear LED controllers BCR601/BCR602, 500 mA	REFTWBCR60155V05ATOBO1
BCR601	60 V linear LED controller IC with voltage feedback to primary side	BCR601XUMA1
DEMO_BCR601_60V_IVCTRL*	Demonstration board BCR601 current and voltage control, 700 mA	DEMOBCR60160VIVCTRLTOBO1
BCR602	60 V linear LED controller IC	BCR602XTSA1
DEMO_BCR602_60V_ICTRL*	Demoboard for design evaluation of cost-efficient, highly reliable, dimmable LED engines/modules, 60 V, 200 mA	DEMOBCR60260VICTRLTOBO1



www.infineon.com/cms/en/product/evaluation-boards/ref_tw_bcr601_55v_0.5a
www.infineon.com/cms/en/product/power/lighting-ics/linear-led-driver-ic/bcr601
www.infineon.com/bcr602

LEDs plug & play

Lighting

*See Plug & LEDs play, ideally to be combined with secondary-side boards

For more details on the product, click on the part number, visit infineon.com or contact our product support.

BCR43x linear LED driver ICs for low-power LEDs

The BCR3x family is the smallest and lowest-cost series of LED drivers. These products are perfectly suited for driving low-power LEDs in general lighting applications.

The advantages over resistor biasing are:

- Long lifetime of LEDs due to constant current in each LED string
- Homogenous LED light output independent of LED forward voltage binning, temperature increase, and supply voltage variations

The advantages over discrete semiconductors are:

- Reduced part count and assembly effort
- Pretested output current
- Defined negative temperature co-efficient protection

Need more details on replacing resistors?

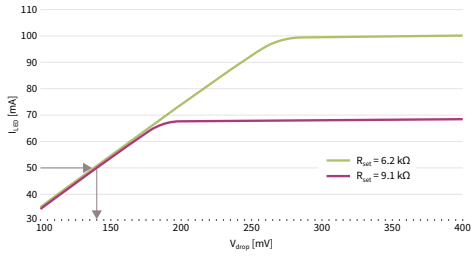
Download now the application note
"Driving low power LEDs from 10 to 65 mA LED driver ICs"

Features and benefits

Key features and benefits
– Output current from 8 to 100 mA (adjustable by external resistor)
– Supply voltage up to 40 V (BCR430U, BCR431U*)
– Reduction of output current at high temperature, contributing to long lifetime LED systems
– Extra low voltage drop for more voltage headroom and flexibility in designs (BCR430U, BCR431U)
– Excellent ESD performance on device and system level for BCR43xU
– Very small form factor packages with up to 600 mW max. power handling capability



LED current versus voltage drop (V_S = 24 V)



The voltage drop at the integrated LED driver stage can go down to 135 mV at 50 mA and less, improving the overall system efficiency and providing extra voltage headroom to compensate for tolerances of LED forward voltage or supply voltage. With the BCR430U and BCR431U, additional LEDs can be added to lighting designs, or longer LED strips can be created without changing the supply voltage.

Low-power LED driver ICs (5-100 mA)

Type	Group	Topology	V_S (min.) [V]	V_S (max.) [V]	I_{out} (typ.) [mA]	I_{out} (max.) [mA]	Dimming	Package	P_{tot} (max.) [mW]	Ordering code
BCR430U*	LED drivers for low-power LEDs	Linear	6	42	Defined by R_{set}	100	PWM by external transistor	SOT-23	600	BCR430UXTSA2
BCR431U**	LED drivers for low-power LEDs	Linear	6	42	Defined by R_{set}	42		SOT-23	600	BCR431UXTSA1

Type	Description	Ordering code
BCR430U LED BOARD	Low-power demoboard with 8 LEDs, 50 mA	BCR430ULEDBOARDTOBO11
DEMO_BCR431U_LVDROP	Low-power demoboard with 8 LEDs, 15 mA	DEMOBCR431ULVDROPTOBO1

Lighting

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* Ultralow voltage drop version BCR430U with only 135 mV at 50 mA
** Ultralow voltage drop version BCR431U with only 115 mV at 15 mA

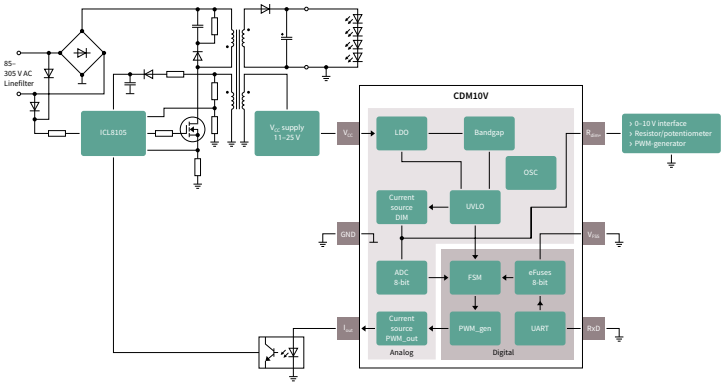
For more details on the product, click on the part number, visit infineon.com or contact our product support.

CDM10V and CDM10VD – most flexible dimming interface ICs for 0-10 V input

Infineon's fully integrated dimming solutions

Infineon's CDM10V and CDM10VD are the industry's first single-chip lighting interface ICs. They are capable of transforming an analog 0–10 V input into a PWM or dimming input signal, required by a lighting controller IC. CDM10V and CDM10VD devices are dedicated for commercial and industrial LED lighting applications. The compact and highly integrated devices allow designers to replace up to 25 discrete components, used in conventional 0–10 V dimming schemes, with a single device. Supplied in an ultra-miniature 6-pin SOT package, the CDM10Vx and CDM10VDx perfectly match small PCBs with high component densities.

Typical application schematic using CDM10V





Features and benefits

Key benefits
– Active dimming (0–10 V) and passive dimming (resistor)
– Embedded digital signal processing which maintains minimum variations from device to device
– PWM input
– One-time configurable device: CDM10V and preconfigured devices with various feature sets

Key advantages
– Single-device solution leading to low BOM and PCB savings
– Dimming ICs in small SOT-23 package for high power density designs
– Granular portfolio for highest flexibility and easy design-in
– Wide input V_{CC} range 11–25 V, extended range down to 6 V for CDM10V
– Attractive pricing and faster time to market

Product type	I_{out} [mA]	Min. duty cycle [%]	PWM output frequency [kHz]	Dimmer/resistor bias current [µA]	Dimm-to-off	Ordering code
CDM10V	5	1/2/**5**/10	0.2/0.5/**1**/2	50/100/**200**/500	**Disabled**/enabled	CDM10VXTSA1
CDM10V-2	5	n.a.	1	200	Enabled	CDM10V2XTSA1
CDM10V-3	5	1	1	200	Disabled	CDM10V3XTSA1
CDM10V-4	5	n.a.	2	100	Enabled	CDM10V4XTSA1
CDM10VD	5	5	1	120	Enabled	CDM10VDXTSA1
CDM10VD-2	5	10	1	120	Enabled	CDM10V2DXTSA1
CDM10VD-3	1	5	1	120	Enabled	CDM10V3DXTSA1
CDM10VD-4	1	10	1	120	Enabled	CDM10V4DXTSA1

Board name	Description	Ordering code
REF-XDPL8105-CDM10V	40 W single-stage PFC FB digital power reference design with CDM10V	REFXDPL8105CDM10VTOBO1

Dimming

www.infineon.com/cdm10V

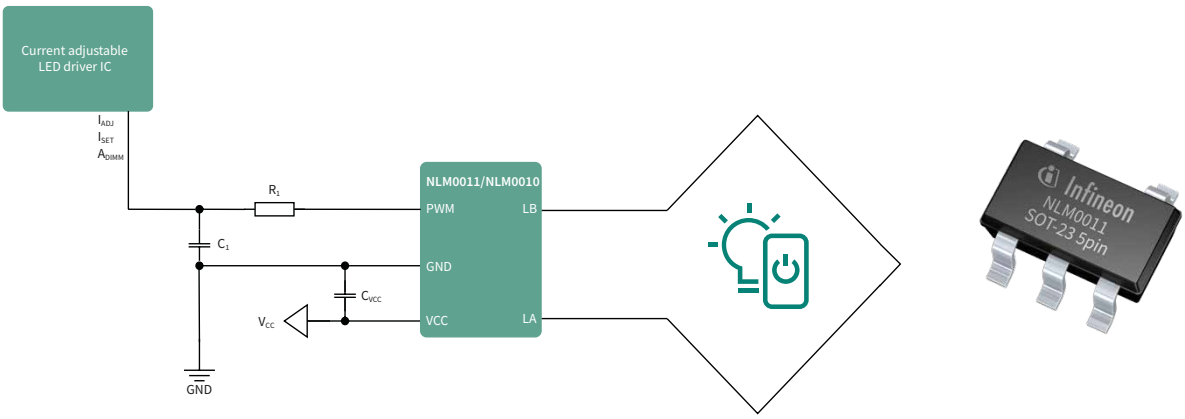
For more details on the product, click on the part number, visit infineon.com or contact our product support.

NFC-PWM configuration ICs

Dual-mode NFC wireless configuration ICs with CLO function and pulse-width modulation (PWM) output for lighting applications

The NLM0011 is a dual-mode NFC wireless configuration IC with PWM output. It is compatible with existing analog LED driver designs and with the NFC-programming specification from the module-driver interface special interest group (MD-SIG). This device is primarily designed for LED applications to enable NFC programming. IIn addition, advanced features, such as the constant lumen output (CLO) and the on/off counting, are integrated, and there is no need for an additional microcontroller. Since the NLM0011 is designed to work together with mainstream analog driver ICs, there are no firmware development efforts needed. It can be easily adapted into existing designs to replace the “plug-in resistor” current configuration concept. The NLM0010 is a light version without CLO function.

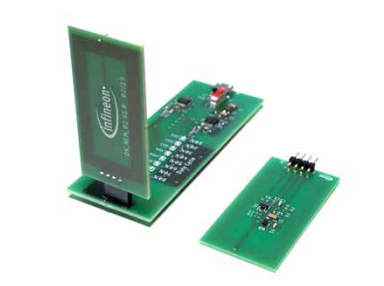
Typical example of NFC lighting application



Features and benefits

Key benefits
– Configurable pulse-width modulation (PWM) output
– NFC contactless interface compliant to ISO/IEC 18000-3 mode 1 (ISO/IEC 15963)
– Constant light output (CLO) with 8 configurable points
– Integrated operation-time counter (OTC) and on/off counter
– Non-volatile memory (NVM) including UID and 20 bytes free memory for user data

Key advantages
– Fast and cost-effective implementation of NFC programming and CLO without the need of an additional microcontroller
– Compatible with most analog LED driver designs using the „plug-in resistor“ method
– Stable PWM output with fixed 2.8 V amplitude and ±0.1% duty cycle accuracy
– Internal voltage regulator (LDO) to avoid influence of instable external supply voltage



EVAL_NLM0011_DC – evaluation board demo kit

This evaluation board not only enables fast demonstration of NFC-PWM configuration ICs with NLM0011 through the NFC-PWM mobile app, but also accelerates the development of the NFC-reader software. EVAL_NLM0011_DC does not require a full system, but allows NFC configuration for existing LED driver boards.

Ordering code: EVALNLM0011DCTOBO1

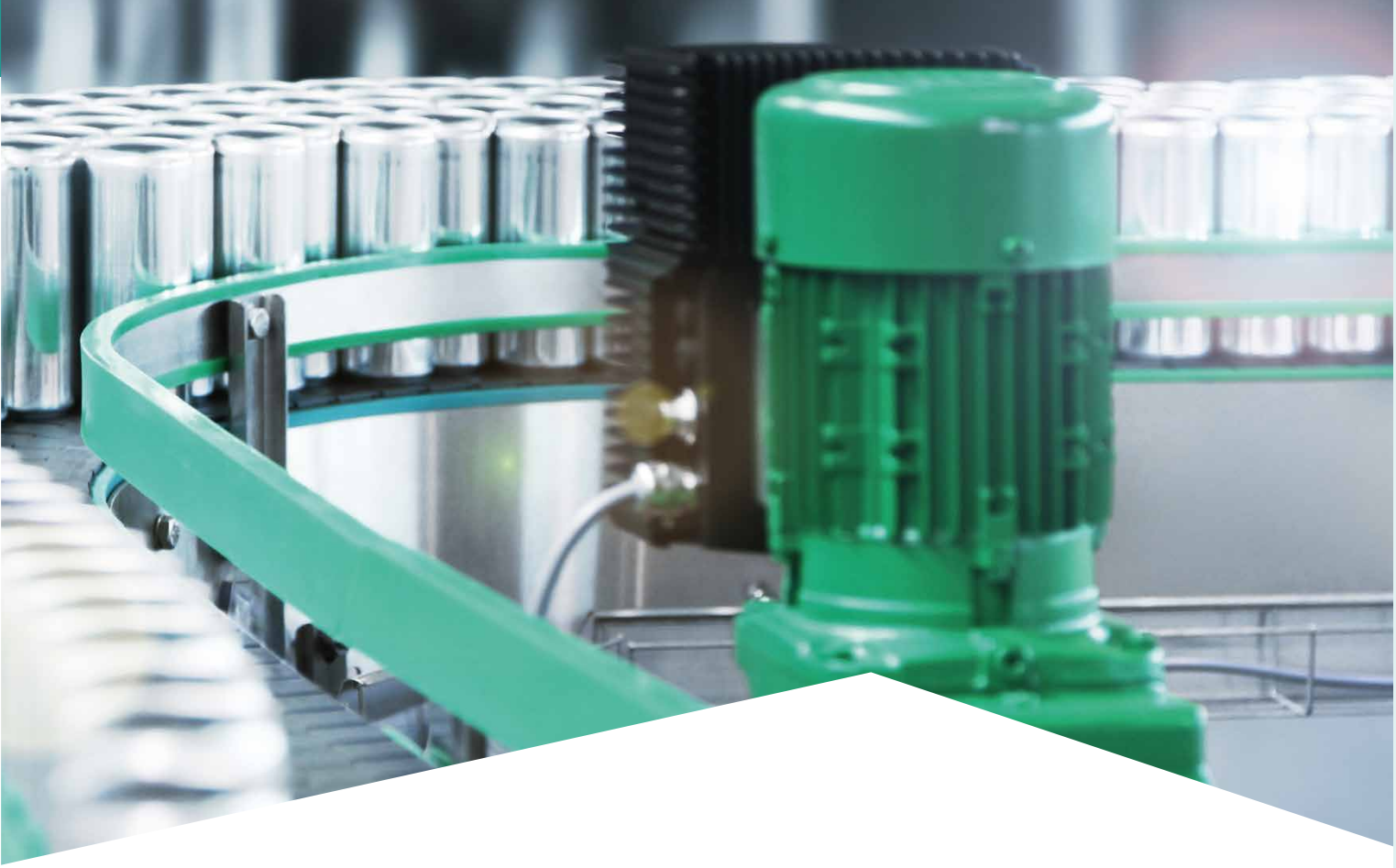
Type	Description	Package	Ordering code
NLM0011	Dual-mode NFC configuration IC with PWM output and CLO function	SOT-23-5	NLM0011XTSA1
NLM0010	Dual-mode NFC configuration IC with PWM output, without CLO function	SOT-23-5	NLM0010XTSA1

Smart city lighting

Lighting

www.infineon.com/NFC-PWM

For more details on the product, click on the part number, visit infineon.com or contact our product support.



iMOTION™ integrated motor control solutions

A family of highly integrated products for the control of a variable speed drive

iMOTION™ products are offered in several integration levels including hardware as well as software. The hardware integration comprises stand-alone motor controllers (iMOTION™ controller), motor controllers with integrated gate drivers (iMOTION™ driver), and fully integrated inverters-in-a-package (iMOTION™ IPM). In terms of software, Infineon offers full turnkey solutions as well as freely programmable modules.

Infineon's field-proven Motion Control Engine (MCE) eliminates software coding from the motor control development process reducing the effort to the configuration for the respective motor and power stage.

The MCE implements highly efficient control of the motor and an optional power factor correction (PFC) and integrates all necessary protections and a flexible scripting engine. Assisted by powerful tools like the iMOTION™ Solution Designer (iSD), it is possible to have the motor up and running in less than an hour. Integrated support for functional safety for home appliances paves the way to meet regulations in the global market

Infineon provides complete solutions for motor control with its combined offering of iMOTION™ together with EiceDRIVER™ gate drivers, TRENCHSTOP™ IGBTs, CoolMOS™ MOSFETs, and CIPOS™ IPMs.

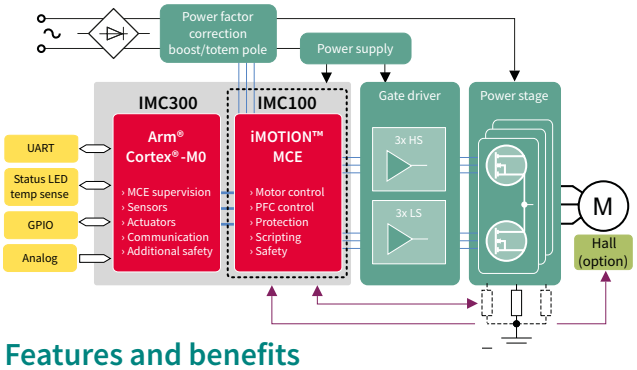
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iMOTION™ controller

Motor/PFC controller plus optional MCU for maximum flexibility

The iMOTION™ controllers consist of two different families: iMOTION™ IMC100 is a series of highly integrated ICs for the control of variable speed drives. By integrating both the required hardware and algorithm to perform control of a three-phase motor they provide the shortest time to market for any motor system at the lowest system and development cost. By combining the iMOTION™ IMC100 with an additional microcontroller based on the Arm® Cortex®-M0 core, iMOTION™ IMC300 series is the perfect fit for applications requiring application flexibility beyond pure motor and PFC control.

Infineon's field-proven Motion Control Engine (MCE) implements field-oriented control (FOC) using single or leg shunt current feedback and uses space vector PWM with sinusoidal signals to achieve highest energy efficiency. The MCE can run sensorless as well as using Hall sensors for low speed operation. It also integrates multiple protection features like over- and undervoltage, overcurrent, rotor lock etc. The integrated scripting engine grants flexibility for a wide range of applications. The IMC100/300 series are offered in several device variants. All devices can be used in applications requiring functional safety acc. to IEC/UL 60730 ('Class B'). With this wide application scope the iMOTION™ controller is the perfect choice for any highly efficient variable speed drive - from low to high voltage.





Features and benefits

Key features	Key benefits
– Completely self-sustaining Motion Control Engine	– Easy motor parametrization and tuning
– Option for boost or totem pole PFC	– Low BOM cost for active PFC applications
– Integrated protection features	– Safeguard power stage and motor
– Scripting engine for application flexibility	– Maximum flexibility for customer functions
– Additional independent microcontroller	– Full flexibility for custom functions or communication
– Support for IEC 60335-1 ('Class B')	– Support for functional safety integrated



The REF-VACUUM_C101_2ED is a reference design kit featuring IMC101T iMOTION™ controller, 2ED2304 SOI half-bridge gate driver, and BSC030N04NS OptiMOS™. It demonstrates our thin-film-SOI and advanced MCE technologies for low-voltage, permanent-magnet motor drives up to 120 KRPM speed, and inverter section rating of 30 V and 25 A. It is optimized for major low-voltage home appliances like vacuums, fans, pumps, and compressors.

www.infineon.com/IMC
www.infineon.com/iMOTION

Home appliance · Aircon · Fans · Pumps

For more details on the product, click on the part number, visit infineon.com or contact our product support.

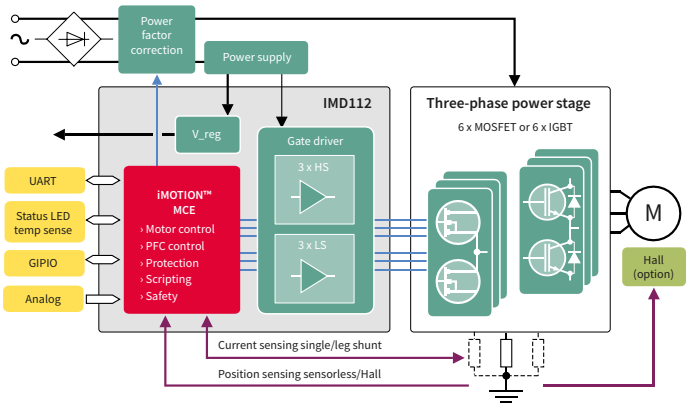
iMOTION™ driver

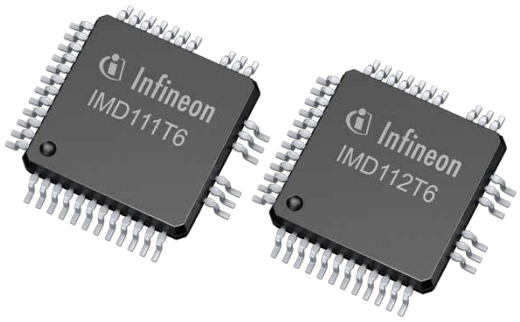
Motor/PFC controller with gate driver and voltage regulator

The iMOTION™ IMD110 is a series of highly integrated ICs for the control of three-phase motors. The IMD110 drivers are an optimal combination of a ready-to-use motor and (optional) PFC controller with a high-voltage three-phase SOI gate driver and a voltage regulator. They can be combined with almost any low- to high-voltage MOSFET or IGBT to create a very compact yet still highly flexible drive solution. The full set of protections, improved clearance, and creepage makes the IMD110 a highly robust and reliable driver family.

The family implements the identical field-proven Motion Control Engine (MCE) as the iMOTION™ controller family. The scripting engine that executes customer scripts with access to the MCE, a high number of GPIOs, analog inputs, and a configurable UART grants flexibility for a wide range of applications. Based on Infineon's latest SOI technology, the three-phase gate driver exhibits market-leading robustness and lowest failure rates. The very low level-shift losses reduce thermal stress and allow high-frequency operation, while the built-in bootstrap diodes help to reduce PCB space and cost. Protections like over- and undervoltage lockout and cross conduction prevention safeguard the power stage during erroneous conditions. All IMD110 devices support the functional safety requirements according to the IEC/UL 60730-1 ('Class B').

Block diagram





Features and benefits

Key features	Key benefits
– Completely self-sustaining Motion Control Engine with identical feature set as the IMC100 series	– Fastest time to market with easy parametrization and tuning of motor and PFC control
– Option for boost or totem pole PFC	– Low BOM cost for active PFC applications
– High-voltage three-phase gate driver and built-in bootstrap diodes	– Reducing BOM and PCB space
– Single layer design possible	– Reducing PCB and production costs
– Support for IEC 60335-1 ('Class B')	– Support for functional safety integrated



The REF_FRIDGE_D111T_MOS board is a ready-to-use three-phase inverter designed for refrigerator compressors featuring the iMOTION™ driver. The 600 V CoolMOS™ PFD7 super junction MOSFET demonstrates market-leading light-load efficiency. The board provides a single-phase AC-connector, rectifier, and three-phase output for the motor. Targeting low-cost applications, the motor is run with sensorless field-oriented control (FOC) using single shunt current sensing. The direct sensing of all voltages and currents does not require any OpAamp.

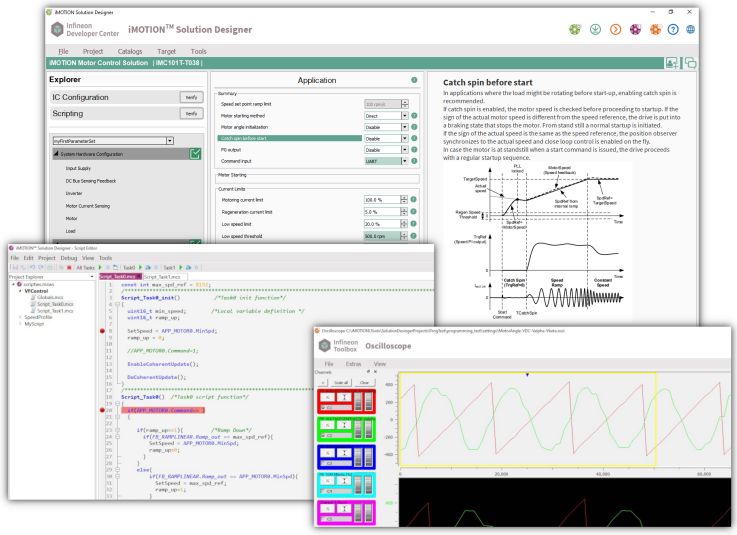
Home appliance Fridge Fans Pumps

www.infineon.com/IMD
www.infineon.com/iMOTION

For more details on the product, click on the part number, visit infineon.com or contact our product support.

iMOTION™ tools and development support

The easy way to get started with motor control



The iMOTION™ Solution Designer is the new all-in-one PC tool supporting the iMOTION™ products in all stages of a motor control project. A new project can be started by choosing one of the preconfigured applications or by selecting an evaluation board or a specific device. Solution Designer offers individual views for all design steps from configuration up to the final tuning of the control loop.

Drive configuration is assisted by the integrated help describing all parameters in detail. After downloading the parameter sets into the iMOTION™ device, customer configurable dashboards help with starting and running the motor and tuning the control loop parameters to the desired behavior. All relevant parameters like voltages, currents, torque, speed can be visualized in real time on the 8-channel oscilloscope. Going one step beyond the configuration of the motor and PFC, the integrated editor, compiler, and debugger help develop scripts for the iMOTION™ script engine.

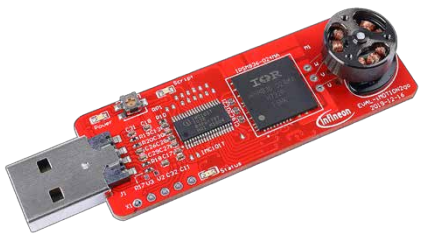
Features and benefits

Key features
– Integrated PC tool for all devices in all project phases
– Configuration wizard for motor and PFC parameter sets
– Dashboards for typical design steps, customer configurable
– Oscilloscope with 8 channels
– Full IDE for editing, compiling, and debugging of scripts
– Programmer for firmware, parameter sets, and scripts
– Catalogs for devices, boards, loads, and projects

Key benefits
– One common tool and consistent workflow for all iMOTION™ products
– Easy handling of parameter sets with fully integrated help system
– Fully configurable for individual testing and tuning stages
– Real-time insight into all motor and PFC parameters
– Assisted creation of scripts and live debugging including breakpoints
– Unified data handling from project to device
– Project centric work and ease of creating derived projects

iMOTION2Go

Getting familiar with iMOTION™ firmware, features and tools



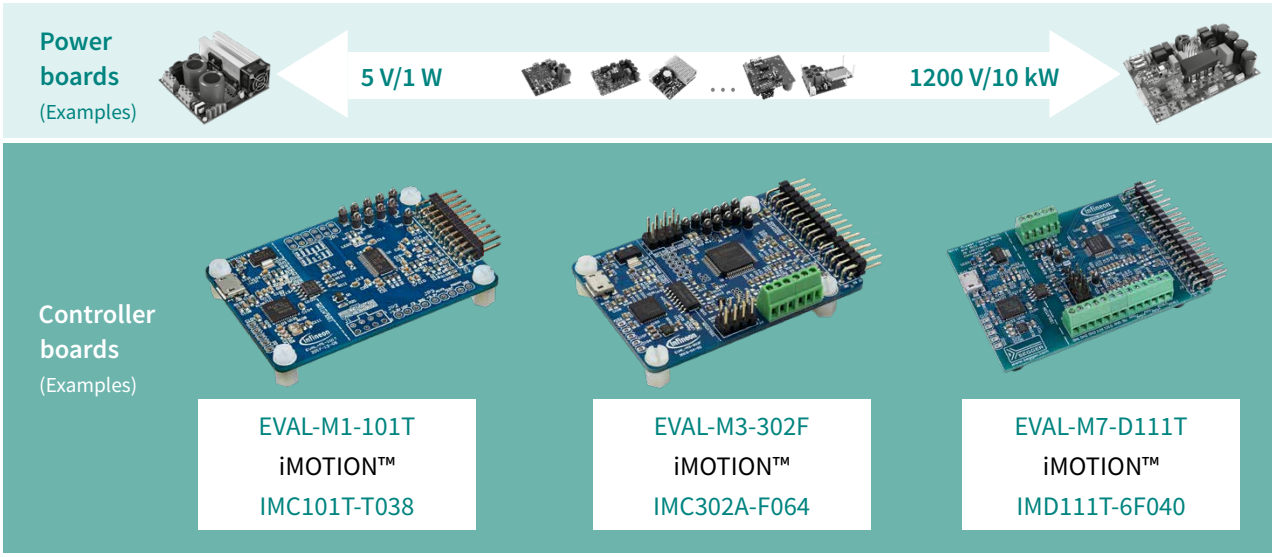
The iMOTION2go kit contains a complete motor control system on a small form factor board and is powered via USB. It is particularly useful for a first evaluation of the iMOTION™ firmware and tools like the iMOTION™ Solution Designer. This combination of the IMC101 motor control IC with the Solution Designer supports all project stages from drive configuration up to optimization and tuning using dashboards and oscilloscope. Scripting can be practiced by downloading and debugging via the IDE integrated in the Solution Designer.

www.infineon.com/iMOTION2go
www.infineon.com/iMOTION-software
www.infineon.com/MCE

Drives Pumps Fans Cooling compressors Motor control

iMOTION™ Modular Application Design Kit

Get a motor running in less than 1 hour!



The iMOTION™ Modular Application Design Kit (MADK) is an evaluation platform targeting variable speed-drive applications up to 10 kW. The platform offers a modular and scalable system solution with different control board options and a wide range of power boards. Using the iMOTION™ MADK standardized platform interfaces, different control and power boards can be combined into a system that perfectly meets the requirements of the final application. This modular approach allows developers the maximum flexibility and scalability during the evaluation and development phase at affordable costs.

While the M1 platform provides control of a permanent magnet synchronous motor (PMSM), the M3 platform additionally includes an active power factor correction (PFC) implemented as a CCM boost PFC.
The M7 platform is based on the iMOTION™ driver series IMD110. The gate driver is contained on the control board, and the power boards use different types of discrete power devices, thus covering a wide voltage range from 20 to 600 V with either MOSFETs or IGBTs. Boards with M7 connector are available with and without active PFC.

iMOTION™ Link

Isolated debug interface for final application boards



iMOTION™ Link is an isolated debug probe for all iMOTION™ motor control products. It connects to the user's target board (final application board) or any other evaluation or reference board via a galvanically isolated interface. iMOTION™ Solution Designer is then used for configuring, parameterizing, and tuning of the respective iMOTION™ device. In addition to the serial interface iMOTION™ Link also provides a standard Arm® SWD debug connection for programming the MCU core in devices like the IMC300 series.

www.infineon.com/iMOTION-link
www.infineon.com/MADK

Drives Pumps Fans Cooling compressors Motor control

For more details on the product, click on the part number, visit infineon.com or contact our product support.

BLDC motor control shield with IFX007T for Arduino

The BLDC motor control shield is a high-current motor control board compatible with Arduino and Infineon's XMC4700 boot kit. It is equipped with three smart IFX007T half-bridges. The BLDC motor control shield is capable to drive one BLDC motor. Alternatively, it can be used to drive one or two bidirectional DC motors (H-bridge configuration, cascaded to support second motor) or up to three unidirectional DC motors (half-bridge configuration). The implemented integrated NovalithIC™ IFX007T half-bridges can be controlled by a PWM via the IN-pin.

Features

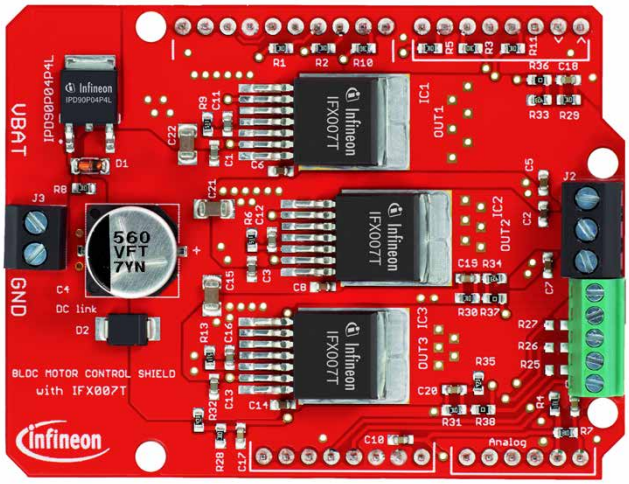
Key features
– Capable of high-frequency PWM, e.g., 30 kHz
– Adjustable slew rates for optimized EMI by changing external resistor
– Driver circuit with logic level inputs
– Diagnosis with current sense

Target applications

– Brushed DC motor control up to 250 W continuous load
– 24 V nominal input voltage (max. 6 - 40 V)
– Average motor current 30 A restricted due to PCB (IFX007T current limitation at 55 A min.)

BLDC-SHIELD_IFX007T

BLDC motor control with half-bridge IFX007T
Infineon's shields for Arduino are compatible with microcontroller boards using the Arduino-compatible form factor, e.g., Infineon's XMC™ microcontroller kits.
Ordering code: BLDCSHIELDIFX007TTOBO1



www.infineon.com/bldc-shield-ifx007t
www.infineon.com/shields-for-arduino

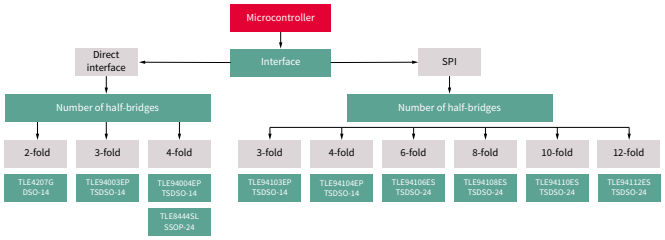
For more details on the product, click on the part number, visit infineon.com or contact our product support.

MOTIX™ multi half-bridge ICs

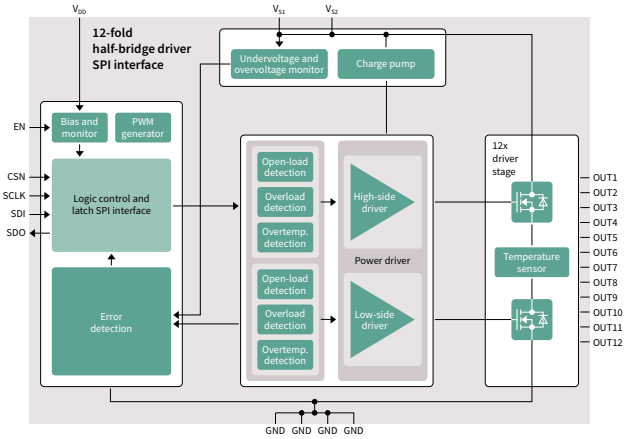
Extensive offering ranging from two-fold half-bridge ICs to twelve-fold half-bridge ICs

The MOTIX™ TLE94xyz products are protected half-bridge drivers designed for 12 V motion control applications such as small DC motors for heating, ventilation, and air conditioning (HVAC), as well as automotive mirror adjustment and fold. The family offers two-, three-, four-, six-, eight-, ten-, and twelve-fold integrated half-bridge driver. All devices can drive DC motor loads up to 0.9 A per output, or the outputs can be used stand-alone or combined with increasing driving capability up to 3.6 A. They provide diagnosis of short circuit, open load, power supply failure, and overtemperature for each half-bridge to ensure safe operation in HVAC or other systems. The TLE94xyz offers enhanced EMC performance, which in combination with the low quiescent current and a small package, makes the product attractive for a wide range of 12 V automotive and industrial applications. In addition to TLE94xyz, Infineon's multi half-bridge offerings include a dual-half-bridge driver, TLE4207G.

Infineon's portfolio of MOTIX™ multi half-bridge ICs



Block diagram MOTIX™ TLE94112ES



Features and benefits

Key features and benefits
– Three-, four-, six-, eight-, ten-, and twelve-fold half-bridges with integrated output stages and PWM
– 16-bit SPI or direct inputs for control and diagnosis
– Voltage supply range: 5.5– 20 V
– Variable driving schemes for up to 11 motors

Key applications

- 12 V automotive and industrial applications
- Flap motors in HVAC systems
- Mirror adjustment and fold
- Small DC motors (≤ 0.9 A/output)
- Bistable relays
- Bipolar stepper motors in full-step and half-step mode

Product name	Config.	$I_{L(NOM)}$ [A]	$I_{L(lim)}$ [A]	I_q [µA]	$V_{S(OP)}$ [V]	Protection	Diagnostic interface	Highlights	$V_{CE(sat)}$/ $R_{DS(on)}$ [mΩ]	Package
TLE94003EP	3 x half-bridge	3 x 0.30	3 x 0.90	0.6	5.5 to 20	OC, OT, VS, UV/OV	Error flag	TLE94xyz family concept + small package	850/switch	TSDSO-14-
TLE94103EP	3 x half-bridge	3 x 0.30	3 x 0.90	0.6	5.5 to 20	OC, OT, OL, VS, UV/OV	16-bit SPI	TLE94xyz family concept + small package		TSDSO-14-
TLE94004EP	4 x half-bridge	4 x 0.30	4 x 0.90	0.6	5.5 to 20	OC, OT, VS, UV/OV	Error flag	TLE94xyz family concept + small package		TSDSO-14-
TLE94104EP	4 x half-bridge	4 x 0.30	4 x 0.90	0.6	5.5 to 20	OC, OT, OL, VS, UV/OV	16-bit SPI	TLE94xyz family concept + small package		TSDSO-14-
TLE94106ES	6 x half-bridge	6 x 0.30	6 x 0.90	0.6	5.5 to 20	OC, OT, OL, VS, UV/OV	16-bit SPI	TLE94xyz family concept + backwards compatible to TLE84106EL		TSDSO-24
TLE94108ES	8 x half-bridge	8 x 0.30	8 x 0.90	0.6	5.5 to 20	OC, OT, OL, VS, UV/OV	16-bit SPI	TLE94xyz family concept		TDSO-24
TLE94110ES	10 x half-bridge	10 x 0.30	10 x 0.90	0.6	5.5 to 20	OC, OT, OL, VS, UV/OV	16-bit SPI	TLE94xyz family concept + backwards compatible to TLE84110		TDSO-24
TLE94112ES	12 x half-bridge	12 x 0.30	12 x 0.90	0.6	5.5 to 20	OC, OT, OL, VS, UV/OV	16-bit SPI	TLE94xyz family concept + 12 outputs in one package		TDSO-24
TLE4207G	2 x half-bridge	2 x 0.80	2 x 1.50	20	8 to 18	OC, OT, VS, UV/OV	Status flag	Error detection		DSO-14

www.infineon.com/multi-half-bridge-ics

For more details on the product, click on the part number, visit infineon.com or contact our product support.

DC motor control HAT with MOTIX™ TLE94112ES

Complies with Raspberry Pi HAT specification

The Infineon motor control HAT with MOTIX™ TLE94112ES complies with Raspberry Pi HAT specification and provides you with unique evaluation experience. It is equipped with 12-fold half-bridge driver TLE94112ES and comes with a ready-to-use software library. The HAT is also equipped with an Infineon TLS4125D0EP V50, a synchronous step-down converter which can power the Raspberry Pi.

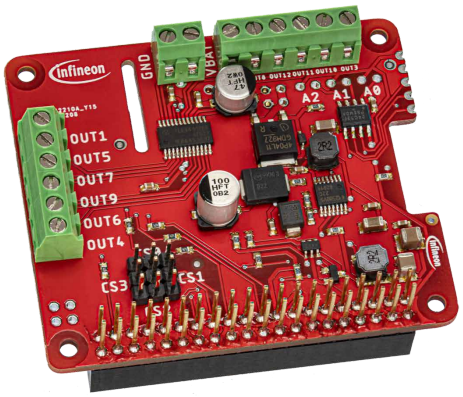
Features and benefits

Key features
– Twelve half-bridge power outputs, 0.9 A each (combinable to up to 3.6 A)
– Wide input voltage range of 5.5 V to 20 V
– Powering of Raspberry Pi by TLS4125D0EP V50
– Reverse polarity protection
– Driver is protected against overtemperature, overcurrent, overvoltage, undervoltage, and enables diagnosis of overcurrent, overvoltage, undervoltage
– SPI interface with zero clock diagnosis
– Enhanced EMC performance
– Integrated PWM generator with 3 different frequencies (80 Hz, 100 Hz, 200 Hz)

Benefits
– Compact design for multi-motor applications
– Quick and easy setup for evaluation and demo applications
– Wide range of applications

Target applications

– Automotive motor control: HVAC flap control
– Multi-motor applications
– DC motors and voltage controlled bipolar stepper motors
– Toys



Ordering code: TLE94112ESRPIHATTOBO1

www.infineon.com/makers
www.infineon.com/raspTLE94112ES

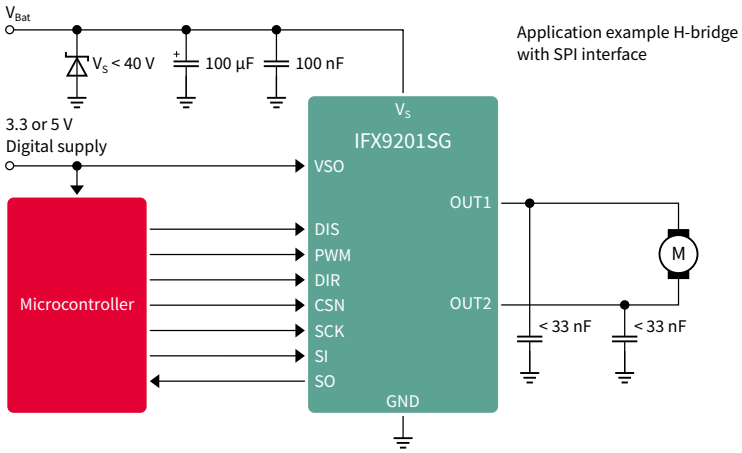
For more details on the product, click on the part number, visit infineon.com or contact our product support.

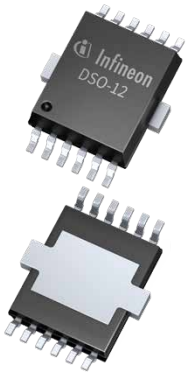
MOTIX™ full-bridge ICs

General purpose 6 A H-bridges

MOTIX™ IFX9201SG is a general-purpose 6 A H-bridge for industrial applications, home appliance and building automation, power tools battery management, and medical applications, designed to control small DC motors and inductive loads. The outputs can be pulse-width modulated at frequencies up to 20 kHz, which enables operation above the human sonic range by means of PWM/DIR control. While the signal at the DIR input defines the direction of the DC motor, the PWM signal controls the duty cycle. For load currents above the current limitation threshold (8 A typically), the H-bridges switch into chopper current limitation mode.

Applications examples





Features

Key features
– Up to nominal 36 V supply voltage
– Short circuit, overtemperature protection, and undervoltage shutdown
– Detailed SPI diagnosis or simple error flag
– Simple design with few external components
– Small and robust DSO-12-17 (IFX9201SG) and DSO-36-72 (IFX9202ED) packages

Product number	Operating voltage	Current limit (min.) [A]	Quiescent current (typ.) [µA]	Operating range [V]	$R_{DS(on)}$ (typ./switch) [mΩ]	Package	R_{thJC} (max.) [K/W]
IFX9201SG	4.5 to 36 V	6.0	19.0	5 to 36	100	PG-DSO-12 (power)	2.0

www.infineon.com/ifx9201sg

For more details on the product, click on the part number, visit infineon.com or contact our product support.

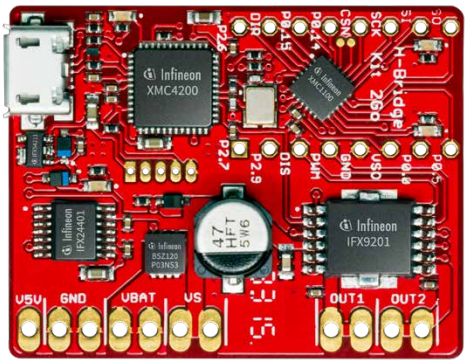
H-BRIDGE KIT 2GO with MOTIX™ IFX9201SG

Build your own DC motor control with the H-bridge Kit 2GO, a ready-to-use evaluation kit. It is fully populated with all electronic components equipped with the H-bridge MOTIX™ IFX9201 combined with XMC1100 microcontroller based on Arm® Cortex®-M0 CPU. It is designed for the control of DC motors or other inductive loads up to 6 A or up to 36 V of supply.

Target applications

- DC motor control for industrial applications
- Home and building automation
- Power tools battery management
- Industrial robotic applications
- Electric toys applications

Ordering code: HBRIDGEKIT2GOTOBO1



KIT_XMC1300_IFX9201
Stepper motor control shield with MOTIX™ IFX9201SG and XMC1300 for Arduino

The stepper motor control shield from Infineon is one of the first high-current stepper motor control boards being compatible to Arduino as well as to Infineon's XMC1100 boot kit. The stepper motor control shield is capable to drive the two coils in a stepper motor featuring dual-half-bridge configuration. The implemented integrated MOTIX™ IFX9201 half-bridges can be controlled by a STEP-signal via the STEP pin. Interfacing to a microcontroller is made easy by the integrated XMC1300 microcontroller that holds the peripherals to allow high-speed current control. Microstepping of the stepper motor can be achieved using the internal comparators, while operational amplifiers are installed to adapt the motor current sense signal to the microcontroller's input levels.

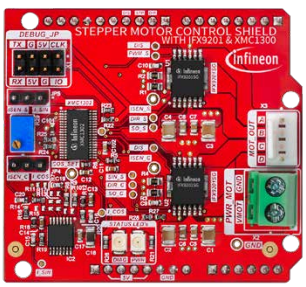
Features and benefits

Key features	Key benefits
– Compatible with microcontroller boards using the Arduino form factor, e.g., Infineon's XMC™ microcontroller kits	– Fast and inexpensive prototyping of stepper motor control
– Capable of high-frequency PWM, e.g., 30 kHz	– Simple testing of microstepping algorithms
– Adjustable slew rates for optimized EMI by changing external resistor	– Diagnose pin to allow hardware feedback during development
– Driver circuit with logic level inputs	– Overtemperature shutdown with latch behavior and undervoltage shutdown of the power section
– Diagnosis with current sense	

Target applications

- Stepper motors up to 5 A phase current
- 24 V nominal input voltage for the power stage
- Average motor current 3 A without additional cooling effort, 5 A possible with proper cooling

Ordering code: KITXMC1300IFX9201TOBO1



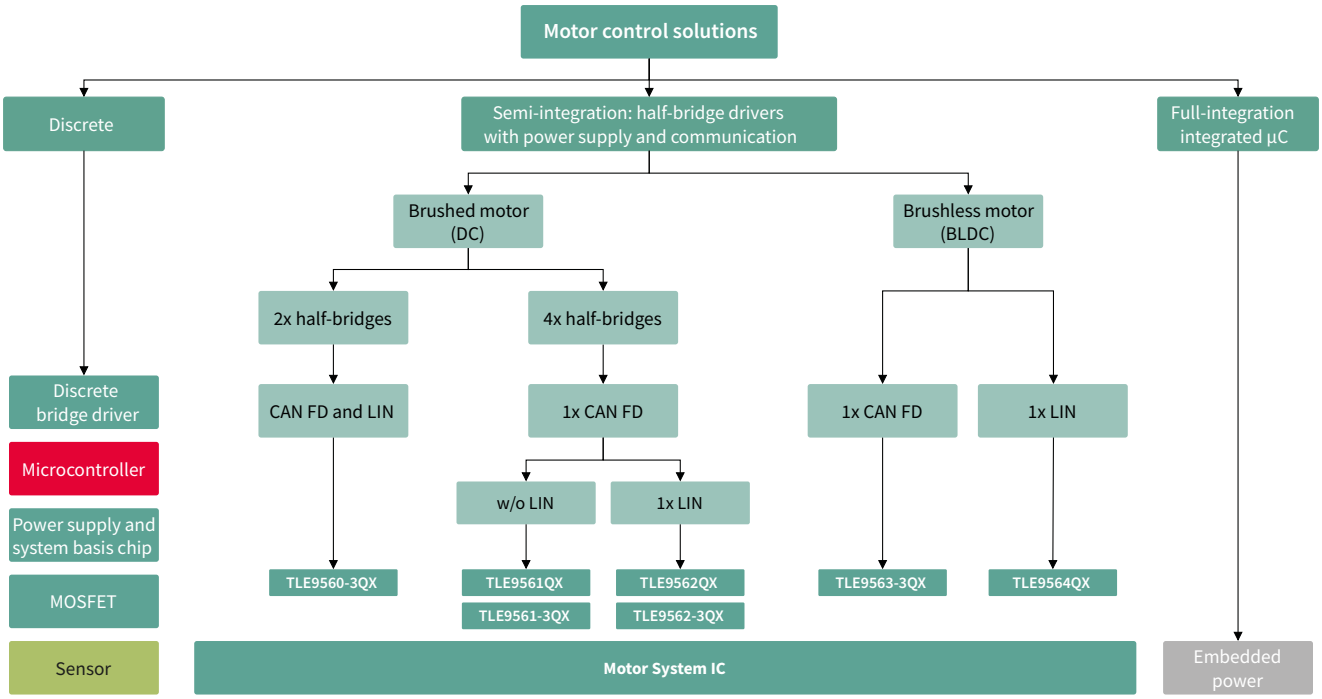
www.infineon.com/h-bridge-kit-2go
www.infineon.com/kit-xmc1300-ifx9201
www.infineon.com/makers

For more details on the product, click on the part number, visit infineon.com or contact our product support.

MOTIX™ SBC

(BL)DC motor system IC combines power supply, communication, and multiple half-bridge MOSFET drivers

Infineon's MOTIX™ SBC family offers high integration and high performance with optimized system cost for DC and BLDC motor control applications. All devices of the motor system IC family feature a low-dropout voltage regulator with an output current of 250 mA/5 V. The communication interface incorporates a CAN FD transceiver up to 5 Mbit/s according to ISO 11898-2:2016 (including partial networking (PN) option) and/or a LIN transceiver.



Features

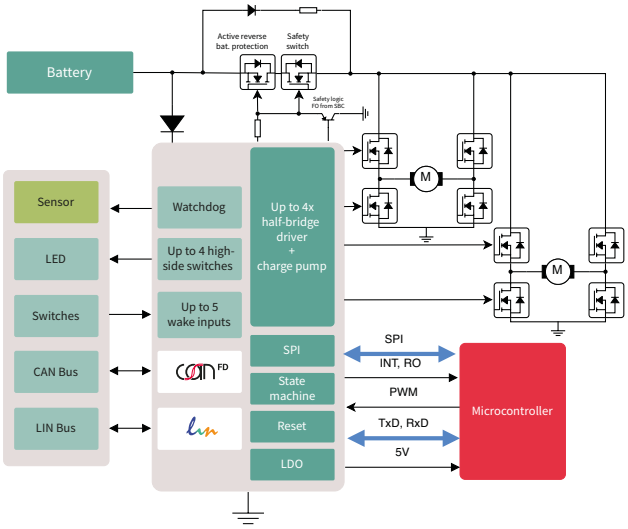
Features
– 5 V linear regulator up to 250 mA
– CAN FD up to 5 Mbps CAN PN and FD tolerant ("-3" variants)
– LIN2.2B/J2602
– MOTIX™ TLE9560/1/2: up to 4 half-bridge gate drivers with adaptive MOSFET control up to 100 mA constant gate charge
– MOTIX™ TLE9563/4: three-phase gate driver with CSA and adaptive MOSFET control up to 150 mA constant gate charge
– Up to 4 high-side switches (with 7 on-resistance) Up to 5 wake inputs
– Up to 6 PWM inputs

Benefits
– PCB savings up to 50 percent due to unique integration approach
– Lower switching losses and EMC optimization due to adaptive MOSFET control
– Automatic regulation of MOSFET pre-charge currents diminish need for production MOSFET calibration
– VS monitoring in sleep mode activates MOSFET to prevent from ECU damage when motor is in generator mode

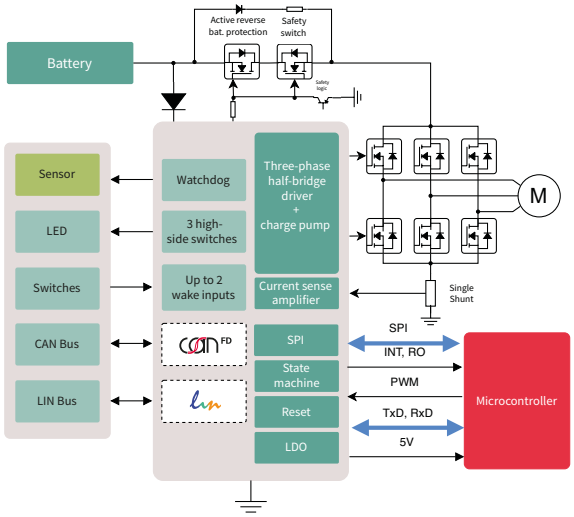
www.infineon.com/bldc-motor-system-ics
www.infineon.com/bdc-motor-system-ics

For more details on the product, click on the part number, visit infineon.com or contact our product support.

Application diagram MOTIX™ TLE9560/1/2 for DC motor control

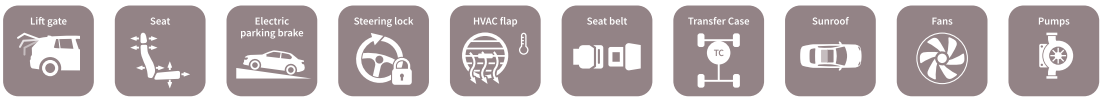


Application diagram MOTIX™ TLE9563/4 for BLDC motor control



Product table

Product variant	V_{cc}1	CAN FD	CAN PN	LIN	HS switches	PWM input	Driver
TLE9560-3QX	5 V up to 250 mA	✓	✓	✓	4	1	2x half-bridges (100 mA const.)
TLE9561QX	5 V up to 250 mA	✓	–	–	4	4	4x half-bridges (100 mA const.)
TLE9561-3QX	5 V up to 250 mA	✓	✓	–	4	4	4x half-bridges (100 mA const.)
TLE9562QX	5 V up to 250 mA	✓	–	✓	4	2	4x half-bridges (100 mA const.)
TLE9562-3QX	5 V up to 250 mA	✓	✓	✓	4	2	4x half-bridges (100 mA const.)
TLE9563-3QX	5 V up to 250 mA	✓	✓	–	3	6	3x half-bridges (150 mA const.)
TLE9564QX	5 V up to 250 mA	–	–	✓	3	6	3x half-bridges (150 mA const.)



www.infineon.com/bdc-motor-system-ics
www.infineon.com/bldc-motor-system-ics

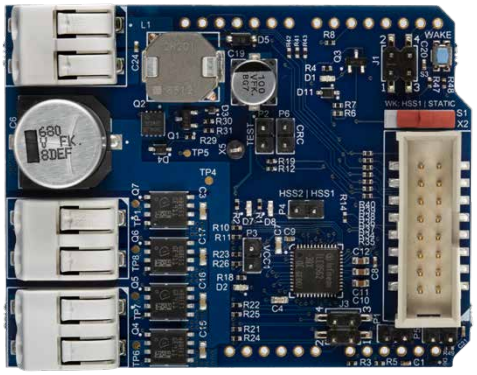
For more details on the product, click on the part number, visit infineon.com or contact our product support.

DC and BLDC motor control shields and evaluation boards with MOTIX™ TLE9562-3QX and with MOTIX™ TLE9563-3QX

The purpose of these boards is to provide a quick evaluation solution for lab assessments. The evaluation boards offer a unique two-in-one solution: they can be connected via a UIO stick with the computer to evaluate features via config wizard (a graphical user interface) which can be found in the Infineon Developer Center. In addition, the evaluation boards feature an Arduino shield interface for rapid prototyping.

Summary of features BLDC motor control shield with MOTIX™ TLE9563-3QX

- Operating voltage range 5.5-28 V with 5 V compatible logic input
- Integrated reverse polarity protection with on-board EMC filter
- Three integrated half-bridges MOSFET (2-in-1 MOSFET package)
- 5 mΩ low-side current sense
- High-power RGB LED driven by integrated high-side switches
- On-board back-EMF detection circuit and connector for Hall-sensor
- Arduino example codes available



Sales product name: BLDC SHIELD_TLE956X
Ordering code: BLDCSHIELDTLE956XTOBO1

Summary of features DC motor control shield with MOTIX™ TLE9562-3QX

- Operating voltage range 5.5-28 V with 5 V compatible logic input
- Integrated reverse polarity protection with on-board EMC filter
- Four integrated half-bridge MOSFETs (2 in 1 MOSFET package)
- Easy interfacing of CAN and LIN transceiver
- Miniaturization/shrink of the PCB area
- Arduino example codes available

Sales product name: DC SHIELD_TLE956X
Ordering code: DCSHIELDTLE956XTOBO1

Benefits of DC and BLDC motor control shields

- 2-in-1 board with GUI and Arduino interface for evaluation and rapid prototyping
- 50 percent reduced internal operating current consumption
- Simplified and cost efficient ground network
- Smaller package size for area savings
- Very low quiescent current in sleep-mode

www.infineon.com/bldc-shield_tle956x
www.infineon.com/bdc-shield_tle956x

MOTIX™ 6EDL7141

Three-phase smart gate drive controller IC

The MOTIX™ 6EDL7141 is Infineon's latest three-phase motor control gate driver IC that enables development of high-performance-battery-operated products using BLDC or PMSM motors. Ideal applications include cordless power tools, gardening products, and automated guided vehicles. With over 50 programmable parameters using built-in digital SPI interface, the MOTIX™ 6EDL7141 is fully configurable to drive a wide range of MOSFET's to yield the best possible system efficiency. The MOTIX™ 6EDL7141 is also designed for maximum flexibility. With an operating voltage from 5.5-70 V and configurable gate drive sink and source current up to 1.5 A, it can drive a wide range of MOSFETs effectively to best fit the application. It has an adjustable gate driver supply voltage setting between 7 V, 10 V, 12 V, and 15 V even at low battery voltage thanks to built-in dual charge pumps. The MOTIX™ 6EDL7141 also has adjustable gate driver parameters to enable control of the slew rate to minimize system EMI. All of the MOTIX™ 6EDL7141 settings can be quickly changed with the available easy-to-use GUI. The integrated buck regulator requires only an external capacitor and inductor to provide power for both the microcontroller and the Hall sensors in the motor, further reducing fault conditions.

EVAL_6EDL7141_TRAP_1SH

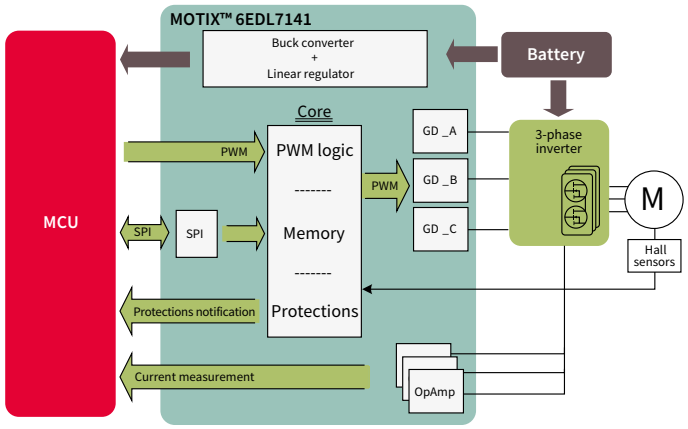
- Single shunt evaluation board for trapezoidal commutation of BLDC motors with 40 V OptiMOS™ 5 PQFN and XMC1404 MCU
- On-board programming dongle
- Featured IC: MOTIX™ 6EDL7141



Features and benefits

Key features	Key benefits
– Integrated power supplies	– Reduced external components and PCB area
– Adjustable slew rate	– Optimized efficiency and EMI
– Programmable gate drive parameters	– Maximum flexibility to use diff erent inverter FETs
– 3x current shunt amplifier	– Highly accurate current sense while saving external components
– Complete dedicated motor control protection suite	– Higher dynamic range to increase signal resolution
	– Improve reliability and fault detection

Block diagram



Product portfolio

Part number	Package	Voltage [V]	$R_{DS(on),max}$, [mΩ]
6EDL7141	PG-VQFN-48-78	5.5 – 70 V	2.2

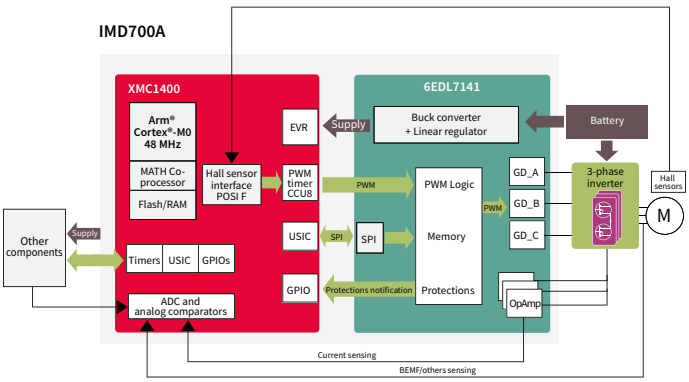
www.infineon.com/6edl7141

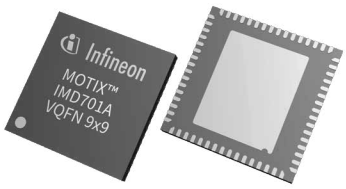
For more details on the product, click on the part number, visit infineon.com or contact our product support.

MOTIX™ IMD700A/IMD701A integrated controller

Fully programmable motor controller combining microcontroller and gate driver IC

Today's newest battery-operated motor drive applications require increased power density and longer run-time, which needs higher efficiency. MOTIX ™ IMD700A and IMD701A are Infineon's latest fully programmable motor controllers integrating XMC1404 microcontroller with MOTIX™ 6EDL7141 3-phase gate driver IC in one package to enable the development of next-generation battery-operated products using BLDC or PMSM motors. These controllers are ideal for applications such as professional cordless power tools, gardening products, e-bikes, and automated guided vehicles. With integrated precision power supply and current shunt amplifiers, much of the peripheral circuitry is no longer necessary, reducing PCB space and improving system packaging possibilities. XMC1404, Arm® Cortex®-M0 based microcontroller incorporates dedicated features to improve motor drive control. A hardware MATH Co-Processor clocked at 96 MHz, enhances calculations including division and trigonometric functions commonly used in Field Oriented Control of PMSM. Additionally, XMC1404 inherits most of the high-end peripherals found in the XMC4000 family (ARM® Cortex®-M4), including PWM timers -CCU8 and CCU4-, position interface (POSIF) or serial communication modules including CAN, ensuring best in class control. The integrated 3-phase gate driver (6EDL7141) includes configurable gate drive sink and source currents up to 1.5 A, it enables the ability to drive a wide range of MOSFETs effectively to minimize losses and increase efficiency. It has adjustable gate driver supply voltage settings between 7 V, 10 V, 12 V, and 15 V even at low battery voltage thanks to built-in high and low side charge pumps. The 6EDL7141 also has dynamically adjustable gate driver parameters to enable control of the slew rate to minimize system EMI and voltage overshoots. In addition, with a full suite of system protection features such as OCP, UVLO, over-temperature, and locked rotor detection, this dedicated motor controller will increase reliability and robustness in severe operating fault conditions.





Features and benefits

Key features	Key benefits
– Integrated power supplies	– Reduced external component count and PCB area
– Adjustable slew rate	– Lower voltage overshoots and EMI reduction
– Programmable gate drive parameters	– Maximum flexibility to use different inverter MOSFETs
– 3x current shunt amplifier	– Highly accurate integrated current sense saves external components
– Complete dedicated motor control protection suite	– Improved reliability and fault detection

Part number	Package	Voltage [V]	D_{VDD} regulator output [V]
IMD700A-Q064X128-AA	PG-VQFN-64-8 9 x 9 mm	5.5 – 60 V	3.3 V
IMD701A-Q064X128-AA	PG-VQFN-64-8 9 x 9 mm	5.5 – 60 V	5.0 V

Power tools · Gardening tools · Multicopter · Service robots · eBike · Vacuum cleaner

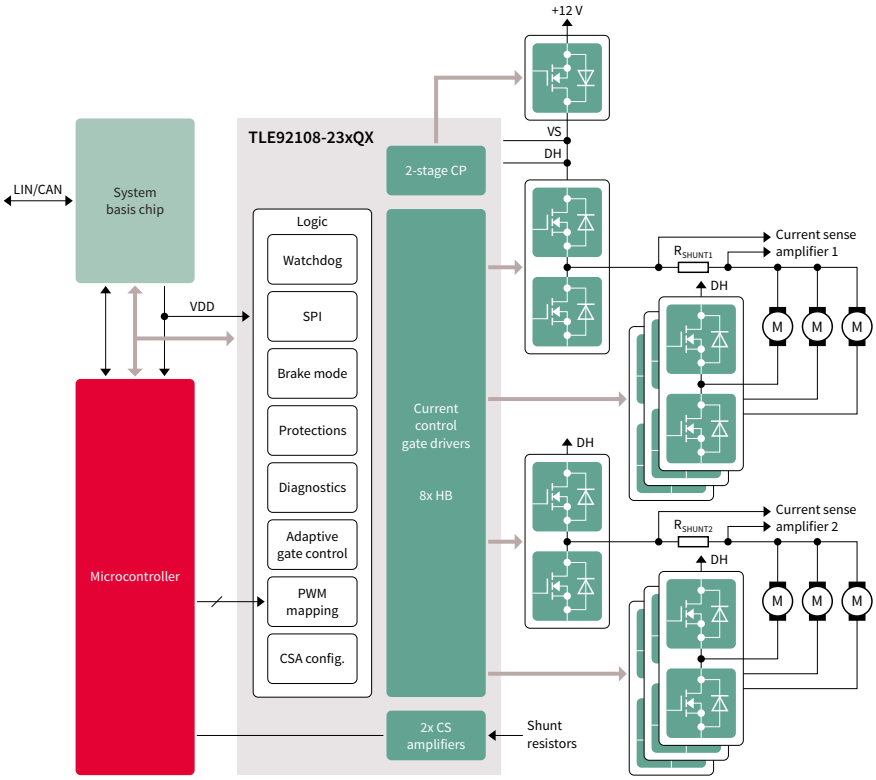
www.infineon.com/MOTIX

For more details on the product, click on the part number, visit infineon.com or contact our product support.

MOTIX™ multi-MOSFET driver

Multiple half-bridge drivers designed to control up to eight half-bridges

Infineon's MOTIX™ TLE9210x is a family of multi-MOSFET drivers, designed to control up to eight half-bridges (up to 16 N-channel MOSFETs) with one packaged device. Having only one device for several half-bridges enables further savings, such as less pick and place costs and less required PCB area compared to discrete solutions.
The MOTIX™ TLE92108 and MOTIX™ TLE92104 multiple MOSFET driver offer a reliable and cost-optimized solution with state-of-the-art diagnostic and protection. The devices of the MOTIX™ TLE9210x family are pin and software compatible. Furthermore, the product family allows motor cascading: with TLE92108 (8 half-bridges), up to 7 bidirectional DC motors motors can be driven.



Product table

Type	Description	Brake mode	Package	Ordering code
TLE92108-231QX	8-fold multi-MOSFET driver IC	No	PG-VQFN-48	TLE92108231QXXUMA1
TLE92108-232QX	8-fold multi-MOSFET driver IC	Yes	PG-VQFN-48	TLE92108232QXXUMA1
TLE92104-131QX	4-fold multi-MOSFET driver IC	No	PG-VQFN-48	TLE92104131QXXUMA1
TLE92104-232QX	4-fold multi-MOSFET driver IC	Yes	PG-VQFN-48	TLE92104232QXXUMA1

www.infineon.com/multi-mosfet-driver

For more details on the product, click on the part number, visit infineon.com or contact our product support.

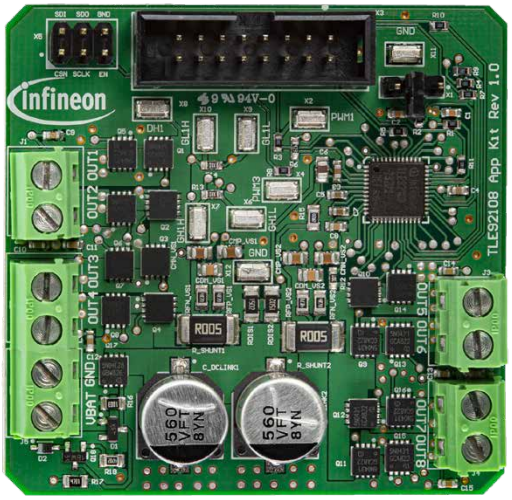
MOTIX™ TLE92104-23QX APPKIT and MOTIX™ TLE92108-23QX APPKIT

Infineon's evaluation boards to measure and evaluate the hardware and software functionalities of the MOTIX™ multi-MOSFET driver family

The TLE92104-23QX APPKIT contains the multi-MOSFET driver IC TLE92104-232QX, and a typical application circuit, including 4 MOSFET half-bridges (OptiMOS™ 40 V MOSFETs in S3O8 package) to drive up to 3 bidirectional DC motors.

The TLE92108-23QX APPKIT contains the multi-MOSFET driver IC the TLE92108-232QX and a typical application circuit, including 8 MOSFET half-bridges (OptiMOS™ 40 V in S3O8 package) to drive up to 7 bidirectional DC motors.

The application boards can be connected via a UIO stick with the computer to evaluate their features via config wizard (a graphical user interface) which can be found in the Infineon Developer Center.



Ordering code: TLE9210423QXAPPKITTOBO1
Ordering code: TLE9210823QXAPPKITTOBO1

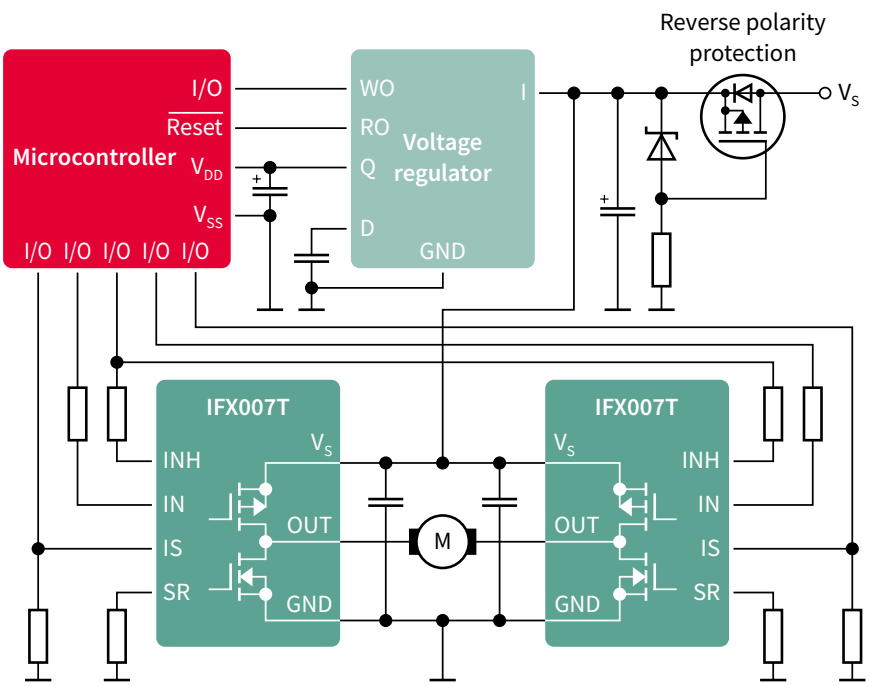
www.infineon.com/tle92104-23qx-appkit
www.infineon.com/tle92108-23qx-appkit

Single half-bridge IC

Protected high-current half-bridge for industrial applications

The NovalithIC™ provides a complete, low-ohmic protected half-bridge in a single package (typical path resistance at 25°C down to 10 mΩ). It can also be combined with an additional NovalithIC™ to create an H-bridge or three-phase bridge. The NovalithIC™ family has the capability to switch high-frequency PWM while providing overcurrent, overvoltage, and overtemperature protection. The NovalithIC™ family offers cost-optimized, scalable solutions for protected high-current PWM motor drives with very restrictive board space. Due to the P-channel high-side switch the need for a charge pump is eliminated thus minimizing EMI. The latest addition to the NovalithIC™ family is the IFX007T, which is optimized for industrial applications.

Application example for high-current PWM motor drives



High-current H-bridge



Features

Basic features
– Low quiescent current
– Capable for high PWM frequency
– Logic level input
– Adjustable slew rate
– Cross-current protection

Protection features
– Overtemperature shutdown
– Overvoltage shutdown
– Undervoltage
– Overcurrent

Diagnostic features
– Overtemperature
– Overvoltage
– Current sense and status

Product number	Operating range [V]	$R_{DS(on)}$ path (typ.) [mΩ]	$I_{D(lim)}$ (typ.) [A]	I_q (typ.) [µA]	Switch time (typ.) [µs]	Diagnosis	Protection	Package	Qualification
IFX007T	5.5 ... 40.0	10.0	70	7	0.25	OT, OC, CS	UV, OT, OC	PG-TO-263-7	JESD471

www.infineon.com/novalithic

CS = Current sense OC = Overcurrent OT = Overtemperature UV = Undervoltage

For more details on the product, click on the part number, visit infineon.com or contact our product support.



Infineon support for power ICs

Useful links and helpful information

Further information, datasheets and documents

www.infineon.com/acdc
www.infineon.com/coolset
www.infineon.com/integrated-powerstages
www.infineon.com/digital-controller
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Support
Evaluation board
Tools
Simulation



Wide bandgap semiconductors

Gallium nitride (GaN)

- CoolGaN™ GIT HEMTs
- CoolGaN™ GIT HEMTs 600 V
- CoolGaN™ IPS half-bridge 600 V
- CoolGaN™ product portfolio

Silicon carbide (SiC)

- CoolSiC™ MOSFETs 650 V overview and portfolio
- CoolSiC™ MOSFETs 1200 V overview and portfolio
- CoolSiC™ MOSFETs 1700 V overview and portfolio
- CoolSiC™ MOSFETs 2000 V overview and portfolio
- CoolSiC™ Schottky diodes
- CoolSiC™ Schottky diodes 650 V
- CoolSiC™ Schottky diodes 1200 V
- CoolSiC™ diodes product portfolio
- CoolGaN™ and CoolSiC™ nomenclature

Please click here to discover **CoolSiC™ hybrid devices**.

Wide bandgap semiconductors

Gallium nitride (GaN) and silicon carbide (SiC)

The key to the next essential step towards an energy-efficient world is the use of new materials, such as wide bandgap semiconductors that allow for greater power efficiency, smaller size, lighter weight, lower overall cost – or all of these together. As the leading and trusted power supplier, Infineon offers the broadest product and technology portfolio of silicon (Si) and wide bandgap (WBG) solutions with more than 40 years of heritage in silicon, and several decades of heritage in wide bandgap technology development.

CoolGaN™ – ultimate efficiency and reliability

Compared to silicon (Si) MOSFETs, the breakdown field of Infineon's CoolGaN™ gate injection transistor (GIT) enhancement mode (e-mode) HEMTs is ten times higher, and the electron mobility is double. Both the output charge and gate charge are ten times lower than with Si and the reverse recovery charge is almost zero, which is key to high-frequency operations. GaN is the best-suited technology in hard-switching and resonant topologies, enabling new approaches in current modulation. Infineon's GaN solution is based on the market's most robust and performing concept in – the enhancement-mode concept - offering fast turn-on and turn-off speed. CoolGaN™ products focus on high performance and robustness, and add significant value to a wide variety of systems across many applications such as server, telecom, hyperscale data centers, wireless charging, adapter/charger, and audio. CoolGaN™ switches are easy to design-in with the matching EiceDRIVER™ gate driver ICs optimized for CoolGaN™ 600 V from Infineon.

CoolSiC™ - revolution to rely on

Silicon carbide (SiC) has a wide bandgap of 3 electronvolts (eV) and a much higher thermal conductivity compared to silicon. SiC-based MOSFETs are best-suited for high-breakdown, high-power applications that operate at higher frequencies compared to traditional IGBTs. CoolSiC™ MOSFETs come along with a fast internal freewheeling diode, thus making hard commutation without additional diode chips possible. Due to its unipolar character, the MOSFETs show very low temperature-independent switching and low conduction losses, especially under partial load conditions. Based on proven, high-quality volume manufacturing, Infineon's silicon carbide solutions combine revolutionary technology with benchmark reliability – for our customers' success today and tomorrow. The offering is completed by EiceDRIVER™ SiC MOSFET gate driver ICs based on Infineon's successful coreless transformer technology.

www.infineon.com/wbg

CoolGaN™ GIT HEMTs

Tailor-made for the highest efficiency and power density in switch-mode power supplies

Compared to the next best silicon alternative, CoolGaN™ enables higher power density and the highest efficiency, especially in the partial load range, through novel topologies such as the CCM totem-pole PFC stage. GaN e-mode HEMT performance features a low reverse recovery charge and excellent dynamic performance in reverse conduction compared to silicon FET solutions. This characteristic enables more efficient operation at established frequencies and much higher frequency operation, improving power density by shrinking the size of passive components. CoolGaN™ enables doubled output power in a given energy storage slot size, freeing up space and realizing higher efficiency simultaneously. Infineon's CoolGaN™ comes with industry-leading reliability. During the quality management process, it is not only the device that is thoroughly tested but also its behavior in the application environment. The performance of CoolGaN™ goes beyond other GaN products in the market.

Features
- Low output charge and gate charge
- No reverse recovery charge

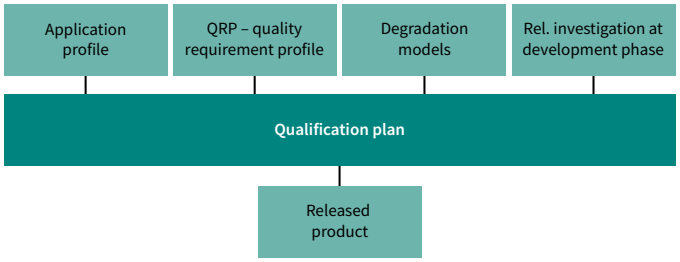
Design benefits
- High power density, small and light design
- High efficiency in resonant circuits
- New topologies and current modulation
- Fast and (near-)lossless switching

Advantages
- Operational expenses (OPEX) and capital expenditure (CAPEX) reduction
- BOM and overall cost savings

Infineon's high- and low-voltage MOSFETs, gate-driver ICs and digital controllers complement the CoolGaN™ offering to fully exploit the benefits of GaN technology in systems.

The highest quality

The qualification of GaN switches requires a dedicated approach, well above existing silicon standards
- Infineon qualifies GaN devices well beyond industry standards
- Application profiles are an integral part of the qualification process
- Failure models, based on accelerated test conditions, ensure target lifetime and quality are met
- Infineon sets the next level of wide bandgap quality



CoolGaN™ GIT HEMTs overview

GIT HEMTs		
CoolGaN™ GIT HEMTs 600 V	CoolGaN™ Integrated Power Stage (IPS)	
Dedicated gate driver ICs for CoolGaN™ GIT HEMTs	CoolGaN™ IPS half-bridge 600 V	CoolGaN™ IPS single-channel 600 V
EiceDRIVER™ 1 EDi-G1		
Standard gate driver for flexible design		
EiceDRIVER™ 2EDi family, 1EDB family, 1EDN-TDI family		

www.infineon.com/gan

For more details on the product, click on the part number, visit infineon.com or contact our product support.

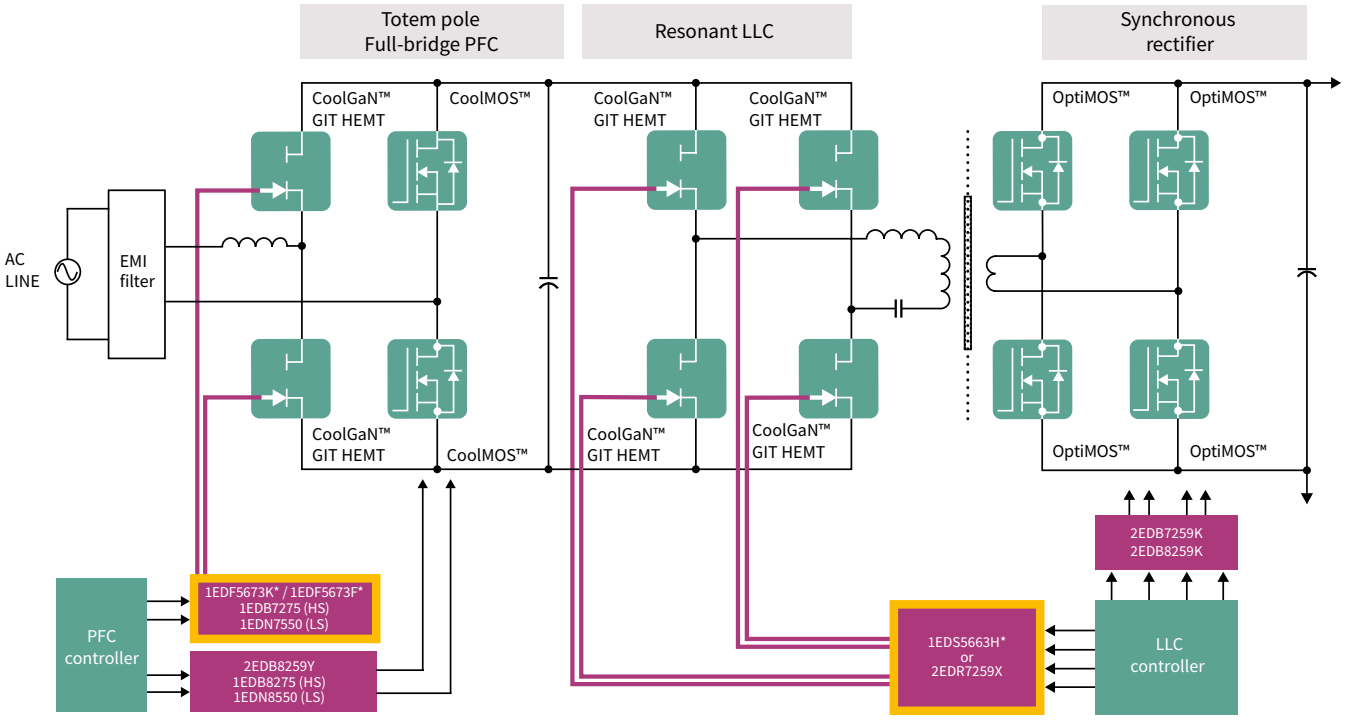
CoolGaN™ GIT HEMTs – bringing GaN technology to the next level

Infineon's CoolGaN™ GIT e-mode HEMTs enable more than 98 percent system efficiency and help customers make their end products smaller and lighter. Driving enhancement-mode devices requires additional features when choosing the correct gate driver IC. With the EiceDRIVER™ 1EDx56x3x family, Infineon offers dedicated single-channel galvanically isolated gate driver ICs, which are a perfect fit for e-mode GaN HEMTs with non-isolated gate (diode input characteristic) and low threshold voltage, such as CoolGaN™. However, CoolGaN™ technology does not require customized ICs, and in many applications, CoolGaN™ can be driven by standard gate drivers when coupled to an RC interface.

Complete support of all requirements specific to e-mode GaN HEMTs operation:

- Low driving impedance (on-resistance 0.85 Ω source, 0.35 Ω sink)
- Resistor programmable gate current for steady on-state (typically 10 mA)
- Programmable negative gate voltage to completely avoid spurious turn-on in half-bridges

Block diagram: high-efficiency GaN switched-mode power supply (SMPS)



*Single-channel EiceDRIVER™ ICs dedicated for CoolGaN™ GIT HEMTs

www.infineon.com/gan

For more details on the product, click on the part number, visit infineon.com or contact our product support.

CoolGaN™ GIT HEMTs 600 V

The highest efficiency and power density with reduced system costs

The e-mode concept offers fast turn-on and turn-off speed, as well as a better path towards integration. CoolGaN™ GIT HEMTs 600 V enable simpler and more cost-effective half-bridge topologies. As e-mode based products reach maturity, CoolGaN™ GIT HEMTs 600 V are gaining growing prominence thanks to their potential. Infineon manufactures their CoolGaN™ 600 V series according to a specific, GaN-tailored qualification process that goes far beyond the standard for silicon power devices. CoolGaN™ GIT HEMT 600 V is designed for datacom and server SMPS, telecom rectifiers, as well as mobile chargers and adapters, and can be used as a general switch in many other industrial and consumer applications. It is the most rugged and reliable solution in the market. The CoolGaN™ portfolio is built around high-performing SMD packages to fully exploit the benefits of GaN.

CoolGaN™ GIT HEMTs for PFC

CoolGaN™ enables the adoption of simpler half-bridge topologies (including the elimination of the lossy input bridge rectifier). The result is record efficiency (>99%) with a potential for BOM savings.

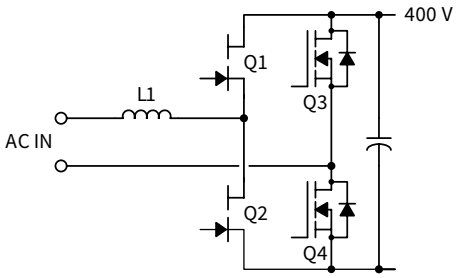
CoolGaN™ GIT HEMTs for resonant topologies

- In resonant applications, ten times lower Q_{oss} and Q_G enables high-frequency operations (>1 MHz) at the highest efficiency levels
- Linear output capacitance leads to 8 to 10 times lower dead time
- Devices can be easily paralleled
- Power density can be pushed even further by optimizing the thermal performance
- CoolGaN™ enables to push the efficiency forward, thus enabling high power density e.g., in low-power chargers/adapters

Applications

- Telecom
- Server
- Datacom
- Adapter and charger
- Wireless charging
- SMPS

Full-bridge totem pole



Demonstration board

2.5 kW totem-pole PFC board:
EVAL_2500W_PFC_GAN_A



- 2 x 70 mΩ CoolGaN™ GIT HEMT in DSO-20-85
- 2 x 33 mΩ CoolMOS™

www.infineon.com/hemt

For more details on the product, click on the part number, visit infineon.com or contact our product support.

CoolGaN™ IPS half-bridge 600 V

Ease of use with integrated drivers for highest efficiency and power density

The CoolGaN™ IPS half-bridge 600 V combines a half-bridge power stage consisting of two CoolGaN™ GIT HEMTs and a dedicated gate driver IC in one thermally enhanced 8 x 8 mm QFN-28 package. The CoolGaN™ IPS HB family is available in $R_{DS(on),typ}$ of in 2x 140/200/270/500 mΩ, in a thermally enhanced 8 x 8 mm QFN-28 package and 2x500 mΩ in 6x8 mm TFLGA-27 package. It is thus ideally suited to support the design of compact appliances in the low-to-medium power area. Infineon's CoolGaN™ power switches provide a very robust gate structure. When driven by a continuous gate current of a few mA in the on-state, a minimum on-resistance $R_{DS(on)}$ is always guaranteed, independent of temperature and parameter variations.

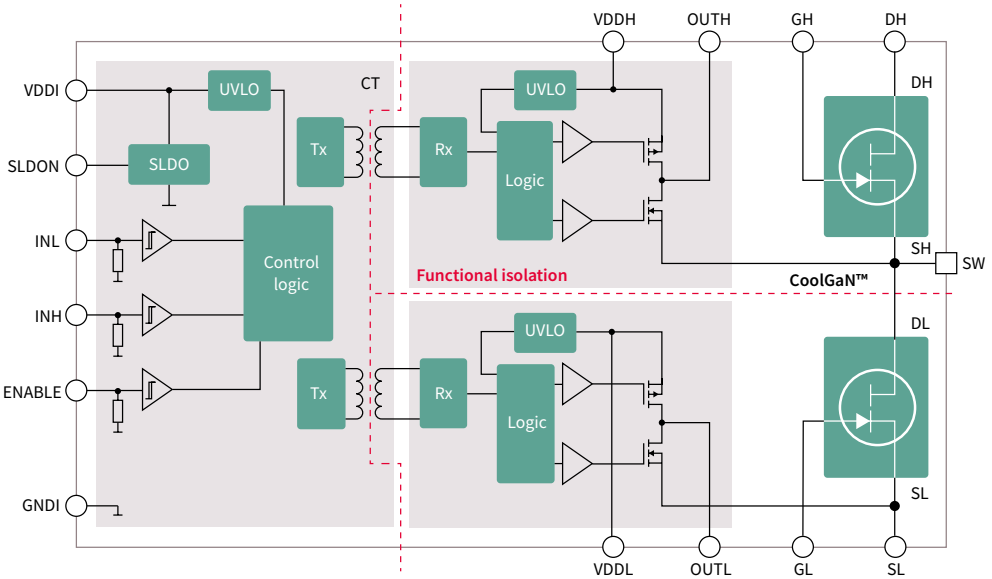
Due to the GaN-specific low threshold voltage and the fast switching transients, a negative-gate drive voltage is required in certain applications to avoid spurious turn-on effects. This can be achieved by the well-known RC interface between the driver and the switch. A few external SMD resistors and capacitors allow for easy adaptation to different applications (low/medium power, hard/soft switching).

The built-in driver utilizes an on-chip coreless transformer (CT) technology to achieve level-shifting to the high side. Besides, CT technology guarantees excellent robustness even for extremely fast switching transients above 150 V/ns.

The CoolGaN™ IPS 600 V family, is available in various configurations such as half-bridge and single-channel.

Features and benefits

Key features	Key benefits
– Digital-in, power-out building block	– Easy to drive with 2x digital PWM input
– Application configurable switching behavior	– Low system BOM
– Highly accurate and stable timing	– Configurability of gate path with low inductance loop on PCB
– Thermally enhanced 8 x 8 mm QFN-28 and 6 x 8 mm TFLGA-27 package	– Allows short dead-time setting in order to maximize system efficiency
	– Small package for compact system designs





www.infineon.com/gan-ips

For more details on the product, click on the part number, visit infineon.com or contact our product support.

CoolGaN™ GIT HEMTs 600 V



Package / $R_{DS(on),max.}$	DSO-20-85 Bottom-side cooling	DSO-20-87 Top-side cooling	HSOF-8-3 TO-Leadless	LSON-8-1 DFN 8x8	TSON-8-3 ThinPAK 5x6
42 mΩ	IGO60R042D1	IGOT60R042D1	IGT60R042D1		
70 mΩ	IGO60R070D1	IGOT60R070D1	IGT60R070D1	IGLD60R070D1	
190 mΩ			IGT60R190D1	IGLD60R190D1	IGLR60R190D1
260 mΩ					IGLR60R260D1
340 mΩ					IGLR60R340D1

EiceDRIVER™ family optimized for CoolGaN™ GIT HEMTs 600 V



Product	Package	Input to output isolation				Propagation delay accuracy	Typ. high level (sourcing) output resistance	Typ. low level (sinking) output resitance
		Isolation class	Rating	Surge testing	Certification			
1EDF5673K	LGA, 13-pin, 5x5 mm	functional	V_{IO} = 1.5 kV_{DC}	n.a.	n.a.	-6 ns/+7ns	0.85 Ω	0.35 Ω
1EDF5673F	DSO, 16-pin, 150 mil	functional	V_{IO} = 1.5 kV_{DC}	n.a.	n.a.	-6 ns/+7ns	0.85 Ω	0.35 Ω
1EDS5663H	DSO, 16-pin, 300 mil	reinforced	V_{IOTM} = 8 kV_{pk} V_{ISO} = 5.7 kV_{RMS}	V_{ISOM} > 10 kV_{pk}	EN 62368-1 UL1577	-6 ns/+7ns	0.85 Ω	0.35 Ω

EiceDRIVER™ standard gate drivers



Product	Package	Input to output isolation			Output UVLO[1]	Output peak source/sink current	CMTI (min.)	Propagation dealy (typ.)	Propagation delay accuracy
		Isolation class	Rating	Certification					
2EDR7259X	DSO, 14-pin, 300 mil	reinforced	V_{ISO} = 5.7 kV_{RMS} V_{IOTM} = 8 kV_{pk}	UL1577, VDE 0884-11	4 V	5 A/9 A	150 V/ns	38 ns	-5 ns/+9 ns
2EDR8259X[2]					8 V				
2EDB7259Y	DSO, 14-pin, 150 mil	single protection	V_{ISO} = 3.0 kV_{RMS}	UL1577	4 V				
2EDB8259Y					8 V				
1EDB7275F	DSO, 8-pin, 150 mil	single protection	V_{ISO} = 3.0 kV_{RMS}	UL1577	4 V		300 V/ns	45 ns	-4 ns/+6 ns
1EDB8275F					8 V				
1EDN7550B	SOT23, 6-pin	non-isolated	n.a.	n.a.	4 V		n.a.	45 ns	-7 ns/+10 ns
1EDN8550B					8 V				

CoolGaN™ IPS 600 V half-bridge/single-channel



Package / $R_{DS(on),max.}$	8x8 mm QFN-28	8x8 mm QFN-21	6x8 mm LGA-27
100 mΩ		IGI60F100A1L*	
140 mΩ	IGI60F1414A1L	IGI60F140A1L*	
200 mΩ	IGI60F2020A1L	IGI60F200A1L*	
270 mΩ	IGI60F2727A1L	IGI60F270A1L*	
500 mΩ	IGI60F5050A1L		IGI60L5050A1M

www.infineon.com/hemt **www.infineon.com/gan-ips** **www.infineon.com/driver-gan**

* Coming soon
1) 8 V UVLO parts recommended for bipolar driving or for unipolar driving with V_{DD} ≥ 10V
2) 2EDR8258X with ENABLE function also available

For more details on the product, click on the part number, visit infineon.com or contact our product support.



Silicon carbide

Revolution to rely on

Silicon carbide (SiC) devices belong to the so-called wide bandgap semiconductor group, which offers many attractive characteristics for high voltage power semiconductors compared to commonly used silicon (Si). In particular, the much higher breakdown field strength and thermal conductivity of silicon carbide allow developing devices which by far outperform the corresponding silicon-based ones, and enable efficiency levels unattainable otherwise. Infineon's portfolio of SiC devices covers 600 V to 1200 V Schottky diodes as well as the revolutionary CoolSiC™ MOSFETs 650 V, 750 V, 1200 V, 1700 V and 2000 V.

EiceDRIVER™ SiC MOSFET gate-driver ICs are well-suited to drive SiC MOSFETs, especially Infineon's ultra-fast switching CoolSiC™ SiC MOSFETs. These gate drivers incorporate the most important key features and parameters for driving SiC, such as tight propagation delay matching, precise input filters, wide output-side supply range, negative gate voltage capability, active Miller clamp, DESAT protection, and extended CMTI capability.

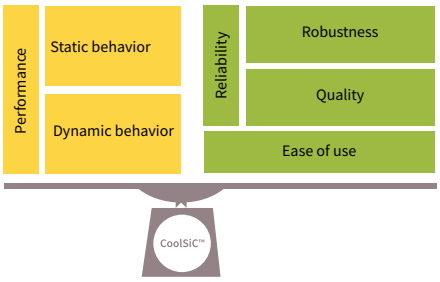
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CoolSiC™ MOSFETs discrete 650 V

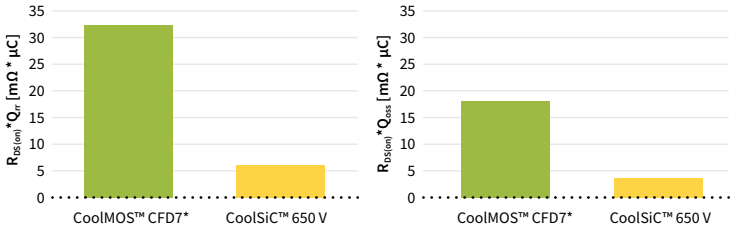
Delivering reliable and cost-effective top performance

Silicon carbide physical characteristics, from wide bandgap to electron mobility and thermal conductivity, provide the basis to engineer high-performance semiconductor technologies and products. The CoolSiC™ MOSFETs from Infineon maximize the advantages of silicon carbide, offering a high-performance product that also meets power electronics design requirements, like reliability and ease of use. As per performance, the CoolSiC™ MOSFETs show low $R_{DS(on)}$ dependency with temperature and low switching losses. The reliability is built on technological strengths and on flawless quality processes. Some aspects of Infineon's SiC technology, like superior gate oxide reliability, excellent thermal behavior, advanced avalanche ruggedness and short circuit capabilities, contribute to the robustness of the device. Infineon's benchmark quality was further improved for silicon carbide, with an application-focused qualification scope exceeding standards, complemented by SiC-specific screening measures. Additional unique features, like 0 V turn-off V_{GS}, wide V_{GS} range, and the use of silicon MOSFET drivers and driving schemas make CoolSiC™ MOSFETs 650 V easy to integrate and use.

Leveraging SiC's material properties



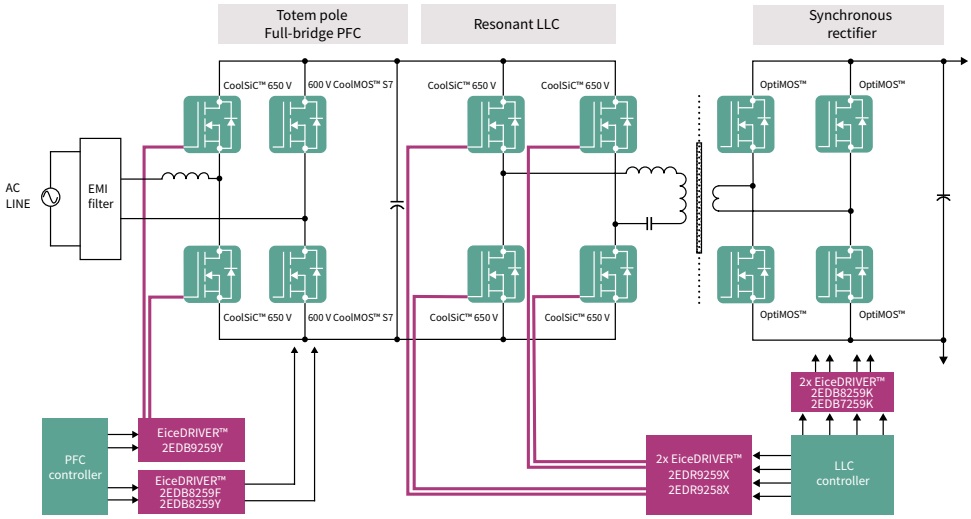
Robustness for continuous hard commutation topologies



* Best CoolMOS™ SJ MOSFET reference in the market

CoolSiC™ MOSFETs can enable streamlined and cost-optimized system designs with fewer components, weight and size, reaching high energy efficiency and power density. For instance, the CoolSiC™ MOSFETs boast a low level of Q_{rr}, roughly 80% less of the best CoolMOS™ reference in the market, the CoolMOS™ CFD7. This ensures the robustness of the body diode, making the CoolSiC™ MOSFETs suitable for topologies with continuous hard commutation, like the high-efficiency totem-pole PFC, a topology that enables > 99% of efficiency.

High-efficiency CoolSiC™ totem-pole PFC in server SMPS (switched-mode power supply)



www.infineon.com/coolsic-mosfet-discretes
www.infineon.com/SiCgd

For more details on the product, click on the part number, visit infineon.com or contact our product support.

CoolSiC™ MOSFET 650 V/750 V



$R_{DS(on)}$ max. [mΩ]	$R_{DS(on)}$ typ. [mΩ]	TO-247 4-pin	TO-247	D²PAK-7	TOLL	QDPAK TSC
11	8					IMDQ75R008M1H*
22	16					IMDQ75R016M1H*
30/34	22/27	IMZA65R027M1H	IMW65R027M1H	IMBG65R022M1H	IMT65R022M1H	
52	40					IMDQ75R040M1H*
42	30	IMZA65R030M1H	IMW65R030M1H	IMBG65R030M1H	IMT65R030M1H	
50	39	IMZA65R039M1H	IMW65R039M1H	IMBG65R039M1H	IMT65R039M1H	
64	48	IMZA65R048M1H	IMW65R048M1H	IMBG65R048M1H	IMT65R048M1H	
74	57	IMZA65R057M1H	IMW65R057M1H	IMBG65R057M1H	IMT65R057M1H	
94	72	IMZA65R072M1H	IMW65R072M1H	IMBG65R072M1H	IMT65R072M1H	
111	83	IMZA65R083M1H	IMW65R083M1H	IMBG65R083M1H	IMT65R083M1H	
141	107	IMZA65R107M1H	IMW65R107M1H	IMBG65R107M1H	IMT65R107M1H	
182	140					IMDQ75R140 M1H*
217	163			IMBG65R163M1H	IMT65R163M1H	
346	260			IMBG65R260M1H	IMT65R260M1H	

CoolSiC™ Automotive MOSFET 750 V



$R_{DS(on)}$ max. [mΩ]	$R_{DS(on)}$ typ. [mΩ]	QDPAK TSC	D²PAK-7
11	8	AIMDQ75R008M1H*	
22	16	AIMDQ75R016M1H*	AIMBG75R016M1H
52	40	AIMDQ75R040M1H*	AIMBG75R040M1H
182	140	AIMDQ75R140M1H*	AIMBG75R140M1H

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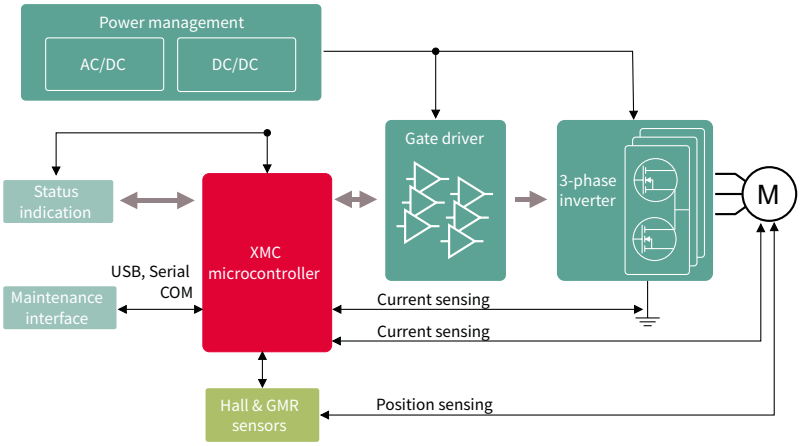
* Coming soon

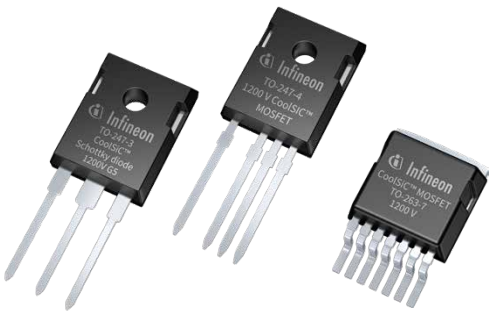
For more details on the product, click on the part number, visit infineon.com or contact our product support.

CoolSiC™ MOSFETs discrete 1200 V

Infineon's CoolSiC™ technology enables radically new product designs

Silicon carbide (SiC) opens up new degrees of freedom for designers to harness unseen levels of efficiency and system flexibility. Compared to traditional silicon-based switches like IGBTs and MOSFETs, SiC MOSFETs offer many advantages. These include the low switching losses, the very low reverse recovery losses of the internal commutation-proof body diode, temperature-independent low switching losses, and threshold-free on-state characteristics. Based on volume experience and compatibility know-how, Infineon presents the revolutionary CoolSiC™ technology which enables radically new product designs with high performance and high reliability. CoolSiC™ MOSFET products are targeted for automotive, photovoltaic inverters, battery charging, EV-charging, industrial drives, UPS, SMPS, and energy storage.





Features and benefits

Key features
– Very low switching losses
– Superior gate-oxide reliability
– Threshold-free on-state characteristic
– Wide gate-source voltage range
– Benchmark gate threshold voltage, $V_{GS(th)}$ = 4.5 V
– Fully controllable dV/dt
– Commutation robust body diode, ready for synchronous rectification

Key benefits
– Best-in-class system performance
– Efficiency improvement and reduced cooling effort
– Longer lifetime and higher reliability
– Enables higher frequency operation, allowing the increase in power density
– Reduction in system cost
– Ease of use

Energy storage · UPS · Drives · EV charging · SMPS · Solar

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The TO-247 4-pin package contains an additional connection to the source (Kelvin connection) used as a reference potential for the gate driving voltage, thereby eliminating the effect of voltage drops over the source inductance. The result is even lower switching losses than for the TO-247 3-pin version, especially at higher currents and higher switching frequencies.

The gate-source pin of the TO-263 7-pin package, similar to the TO-247 4-pin, eliminates the effect of voltage drops over the source inductance, further reducing turn-on switching loss. TO-263 7-pin package minimizes the leakage inductance between drain and source, reducing the risk of high turn-off voltage overshoot.

CoolSiC™ MOSFET 1200 V



Package / $R_{DS(on)}$	TO-247	TO-247-4	D^2PAK 7-pin TO-263 7-pin	Gate-driver ICs for CoolSiC™	
				EiceDRIVER™ Compact:	**EiceDRIVER™ Enhanced:**
7 mΩ	IMW120R007M1H	IMZA120R007M1H		1EDI20I12MF 1EDI60I12AF 1ED3124MU12F 1ED3125MU12F 1ED3122MC12H 1ED3124MC12H 1ED3241MC12H	1ED3322MC12N 1ED3491MC12M 1ED3890MC12M 2ED020I12-F2
14 mΩ	IMW120R014M1H	IMZA120R014M1H			
20 mΩ	IMW120R020M1H	IMZA120R020M1H			
30 mΩ	IMW120R030M1H	IMZ120R030M1H IMZA120R030M1H	IMBG120R030M1H		
40/45 mΩ	IMW120R040M1H	IMZA120R040M1H	IMBG120R045M1H		
60 mΩ	IMW120R060M1H	IMZ120R060M1H	IMBG120R060M1H		
90 mΩ	IMW120R090M1H	IMZ120R090M1H	IMBG120R090M1H		
140 mΩ	IMW120R140M1H	IMZ120R140M1H	IMBG120R140M1H		
220 mΩ	IMW120R220M1H	IMZ120R220M1H	IMBG120R220M1H		
350 mΩ	IMW120R350M1H	IMZ120R350M1H	IMBG120R350M1H		

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For more details on the product, click on the part number, visit infineon.com or contact our product support.

CoolSiC™ MOSFETs discrete 1700 V

Best efficiency and reduced complexity for high voltage auxiliary power supplies

The CoolSiC™ 1700 V MOSFET in a TO-263-7 high-creepage package is optimized for flyback topologies that are used in auxiliary power supplies connected to DC-link voltages ranging from 600 V up to 1000 C. This makes it ideal for numerous power applications.

Features and benefits

Key features	Key benefits
– Optimized for flyback topologies	– The CoolSiC™ 1700 V MOSFET enables simple single-ended flyback topology at high efficiency level for use in auxiliary power supplies
– Extremely low switching loss	– SMD package enables direct integration into PCB, with natural convection cooling without extra heatsink
– 12 V/0 V gate source voltage compatible with fly-back controllers	– Reduced isolation efforts due to extended creepage and clearance distance of package
– Fully controllable dV/dt for EMI optimization	– Reduced system complexity
– SMD package with enhanced creepage and clearance distances, >7 mm	– High power density

CoolSiC™ MOSFET 1700 V

Battery Charger Solar UPS SMPS Motor drivers

Package / $R_{DS(on)}$	D^2PAK 7-pin TO-263-7
450 mΩ	IMBF170R450M1
650 mΩ	IMBF170R650M1
1000 mΩ	IMBF170R1K0M1

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For more details on the product, click on the part number, visit infineon.com or contact our product support.

CoolSiC™ MOSFETs discrete 2000 V in TO-247-PLUS-4-HCC package

The CoolSiC™ 2000 V MOSFET in TO-247-4-PLUS-HCC package has been designed to offer increased power density without compromising the system's reliability even under demanding high voltage and switching frequency conditions. The low power losses of CoolSiC™ technology provide increased reliability thanks to the .XT interconnection technology in a 2000 V optimized package, enabling top efficiency in applications such as string inverters, solar power optimizer, EV-charging and energy storage systems. The CoolSiC™ MOSFET 2000 V product family will be accompanied by the matching CoolSiC™ Schottky diodes 2000 V in TO-247PLUS-4-HCC (10 A - 80 A).

Features and benefits

Key features	Key benefits
– V_{DSS} = 2000 V for high DC-link systems up to 1500 V_{DC}	– High power density
– Very low switching losses	– Excellent reliability
– Innovative HCC package with 14 mm creepage and 5.5 mm clearance distances	– Highest efficiency
– Benchmark gate threshold voltage, $V_{GS(th)}$ = 4.5 V	– Ease of design
– Robust body diode for hard commutation	
– .XT interconnection technology for best-in-class thermal performance	
– Improved humidity robustness proved through H3HVTRB stress tests	

CoolSiC™ MOSFET 2000 V

Solar · Energy storage · EV charger

Package / $R_{DS(on)}$	TO-247PLUS-4-HCC
12 mΩ	IMYH200R012M1H
24 mΩ	IMYH200R024M1H
50 mΩ	IMYH200R050M1H
75 mΩ	IMYH200R075M1H
100 mΩ	IMYH200R100M1H

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For more details on the product, click on the part number, visit infineon.com or contact our product support.

CoolSiC™ Schottky diodes

The differences in material properties between silicon carbide and silicon limit the fabrication of practical silicon unipolar diodes (Schottky diodes) to a range up to 100-150 V, with a relatively high on-state resistance and leakage current. With SiC, Schottky diodes can reach a much higher breakdown voltage. With more than 20 years of field experience in SiC, Infineon is the world's first SiC discrete power supplier. Infineon offers products up to 1700 V in discrete packages and up to 2000 V in modules.

The long market presence and experience enable Infineon to deliver highly reliable, industry-leading SiC performance. With over ten years of pioneering experience in developing and manufacturing SiC diodes, Infineon's latest CoolSiC™ Schottky diode generation 6 family sets a benchmark in quality, efficiency and reliability.

Features

- No reverse recovery charge
- Purely capacitive switching
- High operating temperature ($T_{j, max}$ 175°C)

Advantages

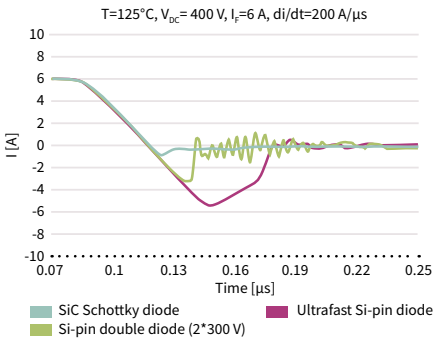
- Low turn-off losses
- Reduction of CoolMOS™ or IGBT turn-on loss
- Switching losses independent from load current, switching speed and temperature

Benefits

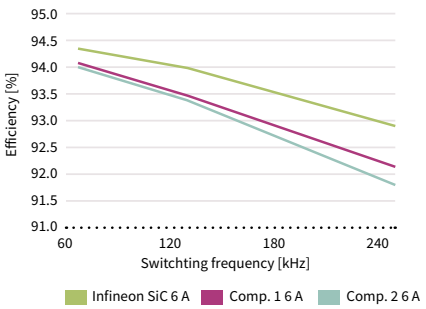
- System efficiency improvement compared to Si diodes
- Reduced cooling requirements
- Enabling higher frequency/increased power density
- Higher system reliability due to lower operating temperature
- Reduced EMI

Applications

- Server
- Telecom
- Solar
- UPS
- EV-charging
- Energy storage
- PC power
- Motor drives
- Lighting
- CAV



Reverse-recovery charge of SiC Schottky diodes versus Si-pin diodes
The majority of carrier characteristics imply no reverse recovery charge and the only contribution to the switching losses comes from the tiny displacement charge of capacitive nature. In the same voltage range, silicon devices have a bipolar component resulting in much higher switching losses. The graph shows the comparison between various 600 V devices.



Improved system efficiency (PFC in CCM mode operation, full load, low line)
The fast switching characteristics of the SiC diodes provide clear efficiency improvements at a system level. The performance gap between SiC and high-end silicon devices increases with the operating frequency.

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CoolSiC™ Schottky diodes 650 V

CoolSiC™ Schottky diodes 650 V G6 and G5

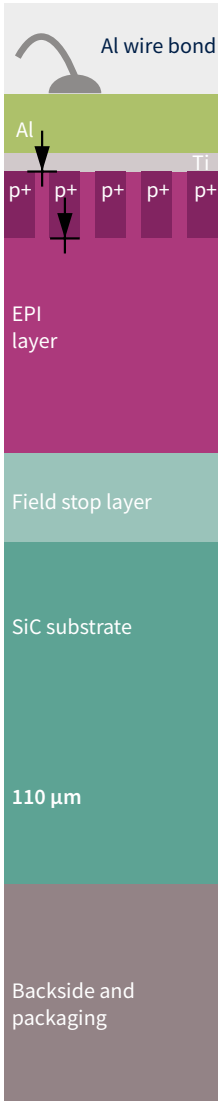
The CoolSiC™ Schottky diode 650 V G6 product family is built over the strong characteristics of the previous G5 generation, fully leveraging technology and process innovation to propose the best efficiency and price/performance products to date.

Foundation technology – CoolSiC™ Schottky diodes 650 V G5

The established CoolSiC™ Schottky diodes G5 product family has been optimized after all key aspects including junction structure, substrate and die attach. It represents a well-balanced product family which offers state-of-the-art performance and high surge current capability at a competitive cost level.

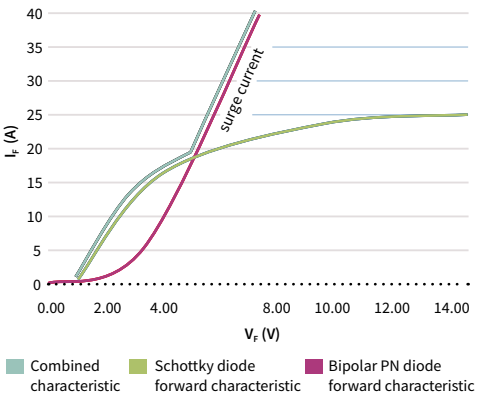
Innovation: optimized junction, substrate and die attach

Infineon's SiC Schottky diode generation 5 is optimized with regard to all key aspects relevant for high-power and high-efficiency SMPS applications.



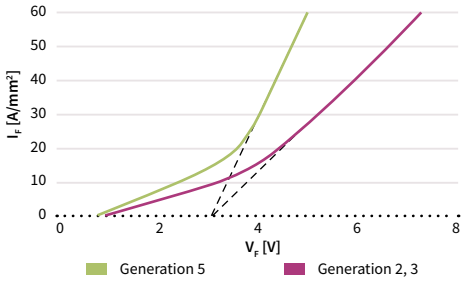
Junction: merged PN structure

On the junction level, it has an optimized merged PN structure. Compared to competitors, Infineon's SiC diode has an additional P-doped area, which, together with the N-doped EPI layer, forms a PN junction diode. Thus, it is a combination of Schottky diode and PN junction diode. Under normal conditions it works like a standard Schottky diode. Under abnormal conditions such as lighting, AC line drop-out, it works like a PN junction diode. At high current level, the PN junction diode has a significantly lower forward voltage (V_F) than the Schottky diode, which leads to less power dissipation, thus significantly improving the surge current capability.



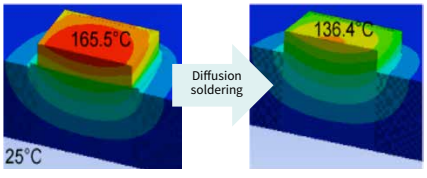
Substrate: thin wafer technology

On the substrate level, Infineon introduced the thin wafer technology. At the later stage of our SiC diode production, the thin wafer process is used to reduce the wafer thickness by about two-thirds, which significantly reduces the substrate resistance contribution, thus, improving both forward voltage (V_F) and thermal performance.



Die attach: diffusion soldering

On the backside, package level diffusion soldering is introduced, which significantly improves the thermal path between the lead frame and the diode, enhancing the thermal performance. With the same chip size and power dissipation, the junction temperature is reduced by 30°C.



R_{thJC}=2.0 K/W R_{thJC}=1.5 K/W

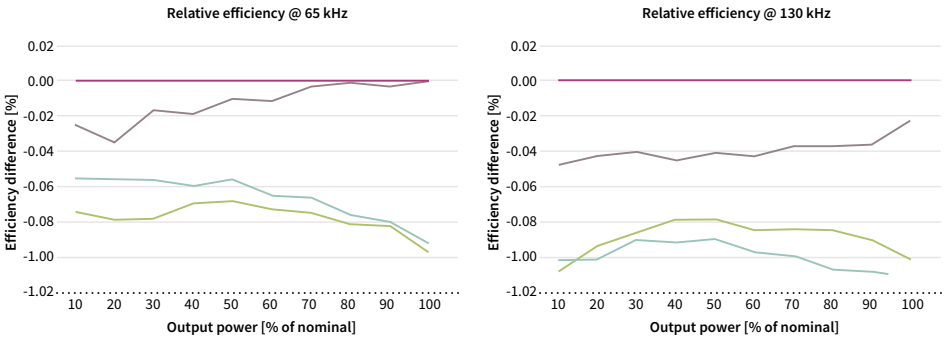
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Latest development - CoolSiC™ Schottky diodes 650 V G6

The CoolSiC™ Schottky diodes G6 product family introduces a novel and proprietary Schottky metal system. This contributes to reducing the forward voltage (VF) to challenging levels, determining a measurable decrease of conduction losses. Infineon's CoolSiC™ Schottky diodes enable optimum efficiency and ruggedness. Lower forward voltage (V_F) means lower conduction loss, and lower capacitive charge (Q_c) means lower switching loss. Q_c x V_F is the figure of merit for efficiency, and comparison indicates that the latest generation 6 products have the lowest Q_c x V_F on the market. Infineon's CoolSiC™ Schottky diodes offer a surge current robustness far better than the one offered by the most efficient products. Thus, under abnormal conditions, this surge current capability offers excellent device robustness.

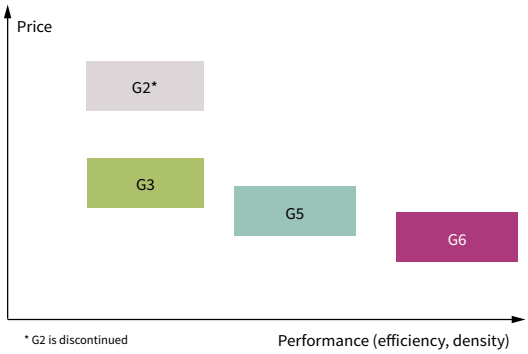
Efficiency comparison



In terms of efficiency, the 8 A G6 device has been tested in CCM PFC. The maximum output power is 3.5 kW. The left figure shows the relative efficiency at 65 kHz, while the figure on the right shows the relative efficiency at 130 kHz. This shows that Infineon's CoolSiC™ Schottky diode G6 delivers better efficiency over the full load range, keeping this advantage even at 130 kHz, therefore meeting the needs of designers who want to increase the switching frequencies in their designs to attain more power density.

The best price performance

CoolSiC™ Schottky diodes G6 are the outcome of Infineon's continuous technological and process improvements, which enable the design and development of SiC-based products, making them more price-competitive and increasing performance across generations. As a result, G6 is Infineon's best price/performance CoolSiC™ Schottky diode generation, offering the highest efficiency. In addition, Infineon offers the reliability of collaborating with the industry leader. Customers can leverage Infineon's proven quality and supply chain reliability. They can benefit from "one-stop-shop" advantages and maximize system performance, combining CoolSiC™ Schottky diodes with the SJ MOSFETs of the CoolMOS™ 7 family, such as 600 V C7, 650 V C7, 600 V G7, 650 V G7 and 600 V P7.



A comprehensive portfolio

The combined G6 and G5 CoolSiC™ Schottky diode 650 V diode portfolio offers a wide choice of packages and ampere class granularity to allow the best fit to applications. G6 comes in double DPAK, the first top-side cooled surface mount package, which allows thermal decoupling of PCB to chip junction and enables higher power dissipation and improved system lifetime thanks to the reduced board temperature.

www.infineon.com/sic-diodes

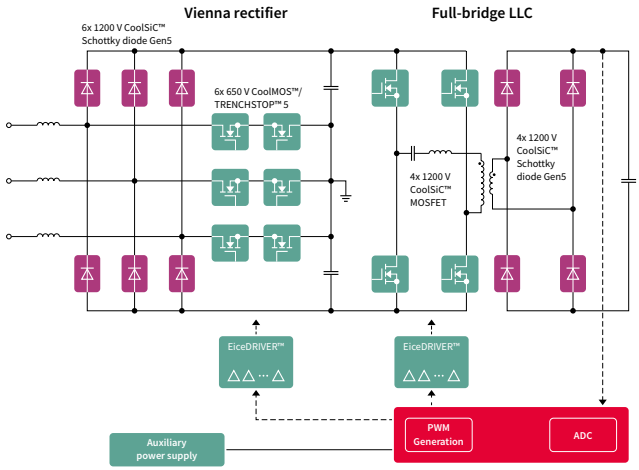
For more details on the product, click on the part number, visit infineon.com or contact our product support.

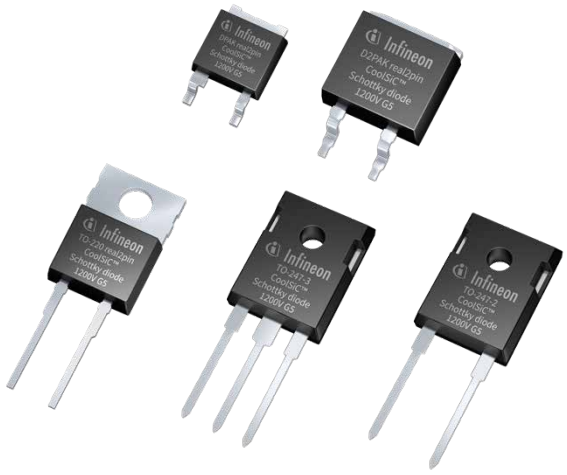
CoolSiC™ Schottky diodes 1200 V

A new level of system efficiency and reliability

By using hybrid Si power switch/SiC diode sets, industrial application designers will gain flexibility for system optimization compared to purely silicon-based solutions. SiC diodes enable system improvements such as higher output power, greater efficiency or higher switching frequency. By implementing CoolSiC™ diodes generation 5, for example, in Vienna rectifier topology, in combination with Infineon's 650 V TRENCHSTOP™ IGBTs and 650 V CoolMOS™ MOSFETs, designers can achieve outstanding system-level performance and reliability.

One of the most commonly used topologies for EV DC charging



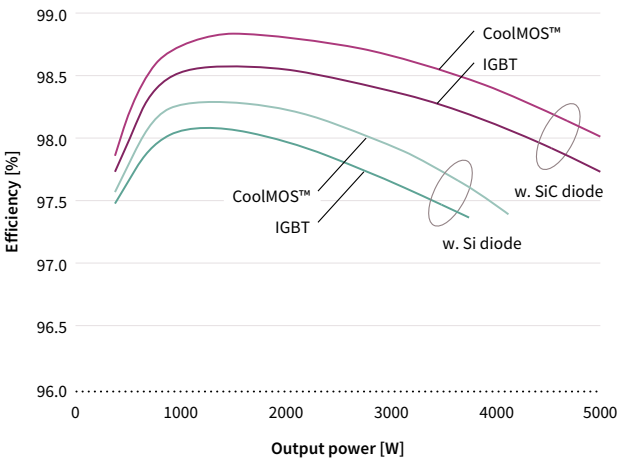


Features and benefits

Key features
– Zero Q_{rr} leading to no reverse recovery losses
– High surge current capability up to fourteen times of the nominal current
– Tight forward voltage distribution
– Temperature-independent switching behavior
– Low forward voltage (V_F = 1.4 V) even at high operating temperature
– Available in both through-hole and SMD packages
– Up to 40 A rated diode

Key benefits
– System efficiency improvement over Si-based diodes
– Enabling higher frequency/increased power density solutions
– High system reliability by extended surge current
– Reduced cooling requirements through lower diode losses and lower case temperatures
– System size/cost saving due to reduced heatsink requirements and smaller magnetics

650 V Si IGBT/Si SJ MOSFET and 1200 V SiC diode/ultrafast Si diode in a Vienna rectifier topology, f_{sw}=48 kHz



650 V SJ MOSFET + 1200 V SiC diode (IPW65R045C7 + IDW15G120C5B)

650 V IGBT + 1200 V SiC diode (IKW50N65EH5 + IDW15G120C5B)

650 V SJ MOSFET + 1200 V Si diode (IPW65R045C7 + Vendor A)

650 V IGBT + 1200 V Si diode (IKW50N65EH5 + Vendor A)

SiC vs. Si diode

› +0.8% higher efficiency

› Increased output power is possible

EV charging SMPS Solar Drives

www.infineon.com/sicdiodes1200v

For more details on the product, click on the part number, visit infineon.com or contact our product support.



CoolSiC™ Schottky diodes 650 V G6

Server Telecom Solar UPS Lighting PC power

I_F [A]	TO-220 R2L	Double DPAK
4	IDH04G65C6	
6	IDH06G65C6	
8	IDH08G65C6	IDDD08G65C6
10	IDH10G65C6	
12	IDH12G65C6	IDDD12G65C6
16	IDH16G65C6	IDDD16G65C6
20	IDH20G65C6	

CoolSiC™ Schottky diodes 650 V G5

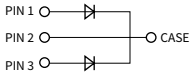
Server Telecom Solar UPS Lighting PC power

IF [A]	TO-220 R2L	TO-247 Dual Die	TO-247	D²PAK R2L	ThinPAK 8x8
2	IDH02G65C5			IDK02G65C5	
4	IDH04G65C5			IDK04G65C5	IDL04G65C5
6	IDH06G65C5			IDK06G65C5	IDL06G65C5
8	IDH08G65C5			IDK08G65C5	IDL08G65C5
10	IDH10G65C5		IDW10G65C5	IDK10G65C5	IDL10G65C5
12	IDH12G65C5		IDW12G65C5	IDK12G65C5	IDL12G65C5
16	IDH16G65C5		IDW16G65C5		
20	IDH20G65C5	IDW20G65C5B	IDW20G65C5		
24					
30/32		IDW32G65C5B	IDW30G65C5		
40		IDW40G65C5B	IDW40G65C5		

www.infineon.com/coolsic-diodes

*For more information on the product, contact our product support

„B“ in product name refers to dual die with the common-cathode configuration.



For more details on the product, click on the part number, visit infineon.com or contact our product support.

CoolSiC™ Schottky diodes 600 V G3



I_F [A]	TO-220 R2L	DPAK R2L
3		IDD03SG60C
4	IDH04SG60C	IDD04SG60C
6	IDH06SG60C	IDD06SG60C
8	IDH08SG60C	IDD08SG60C
10	IDH10SG60C	IDD10SG60C
12	IDH12SG60C	

CoolSiC™ Schottky diodes 1200 V G5



I_F [A]	TO-220 R2L	TO-247 Dual Die	TO-247 R2L	DPAK R2L	D²PAK R2L
2	IDH02G120C5			IDM02G120C5	IDK02G120C5
5	IDH05G120C5			IDM05G120C5	IDK05G120C5
8	IDH08G120C5			IDM08G120C5	IDK08G120C5
10	IDH10G120C5	IDW10G120C5B	IDWD10G120C5	IDM10G120C5	IDK10G120C5
15/16	IDH16G120C5	IDW15G120C5B	IDWD15G120C5		IDK16G120C5
20	IDH20G120C5	IDW20G120C5B	IDWD20G120C5		IDK20G120C5
30		IDW30G120C5B	IDWD30G120C5		
40		IDW40G120C5B	IDWD40G120C5		

CoolSiC™ Schottky diodes 2000 V G5

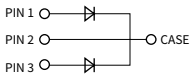


I_F [A]	TO-247PLUS-4 HCC
10	IDYH10G200C5*
25	IDYH25G200C5*
40	IDYH40G200C5*
50	IDYH50G200C5*
80	IDYH80G200C5*

www.infineon.com/coolsic-diodes

*For more information on the product, contact our product support

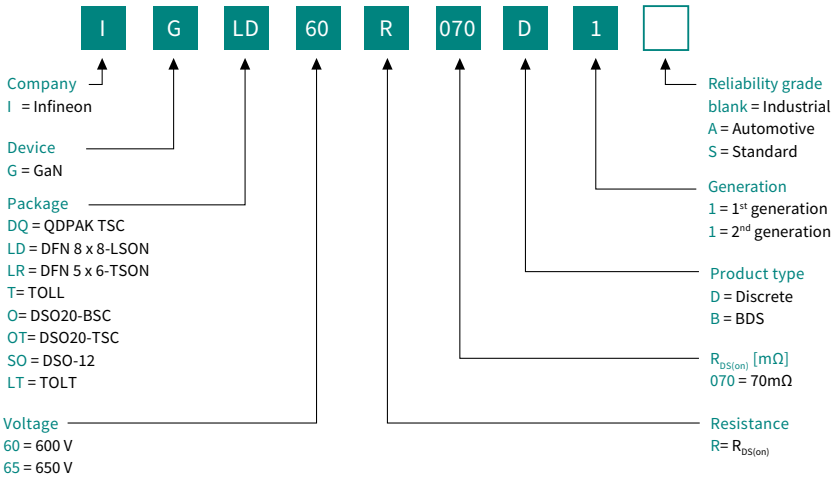
„B“ in product name refers to dual die with the common-cathode configuration.



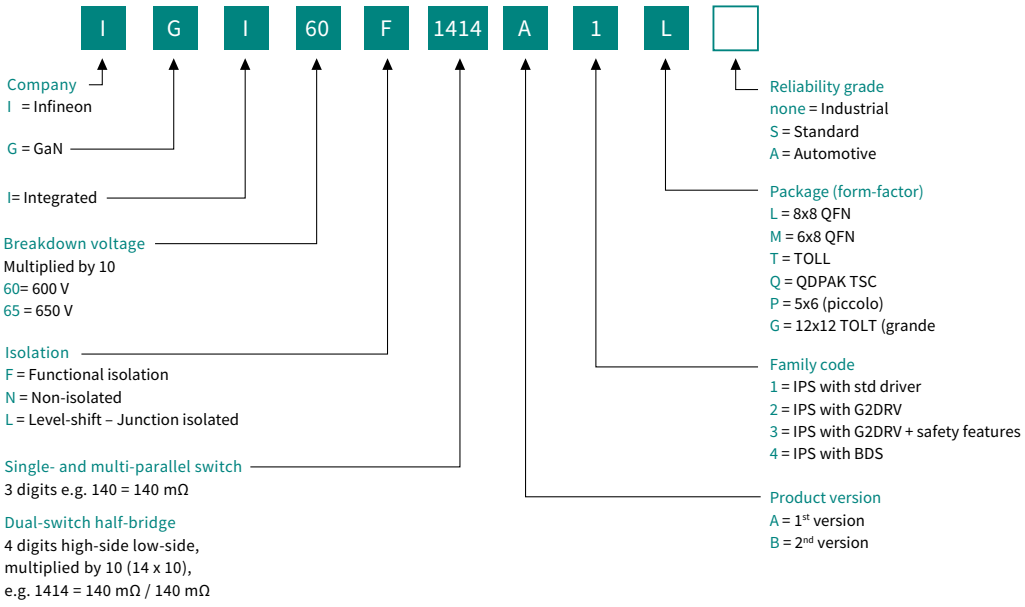
For more details on the product, click on the part number, visit infineon.com or contact our product support.

Nomenclature

CoolGaN™ GIT HEMTs



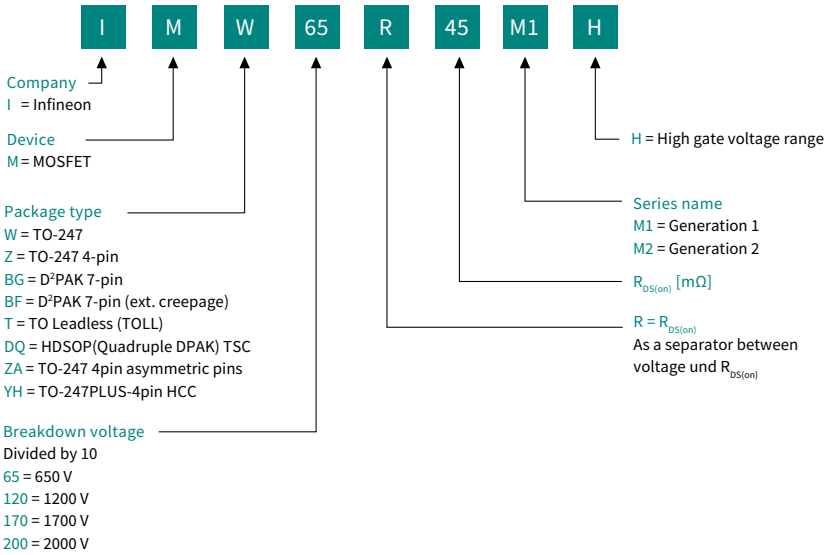
CoolGaN™ IPS



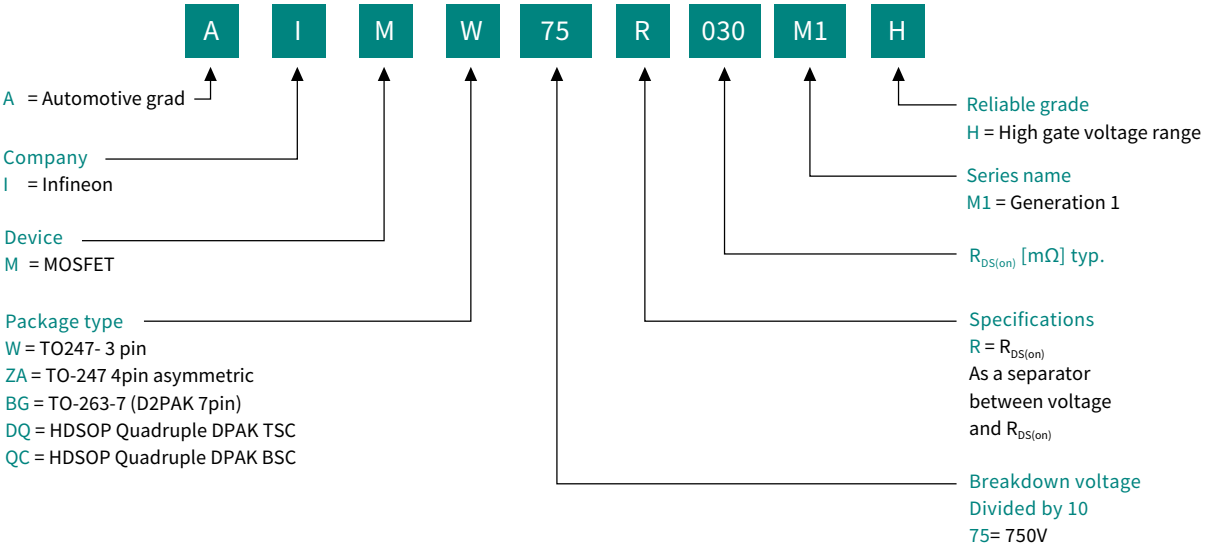
www.infineon.com/gan www.infineon.com/gan-ips

For more details on the product, click on the part number, visit infineon.com or contact our product support.

CoolSiC™ MOSFET nomenclature



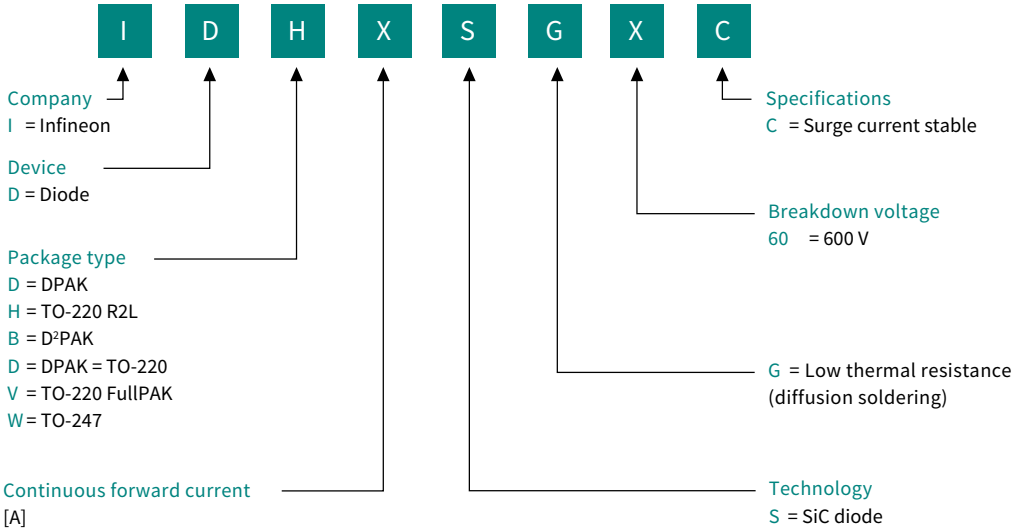
CoolSiC™ Automotive MOSFET discrete 750 V nomenclature



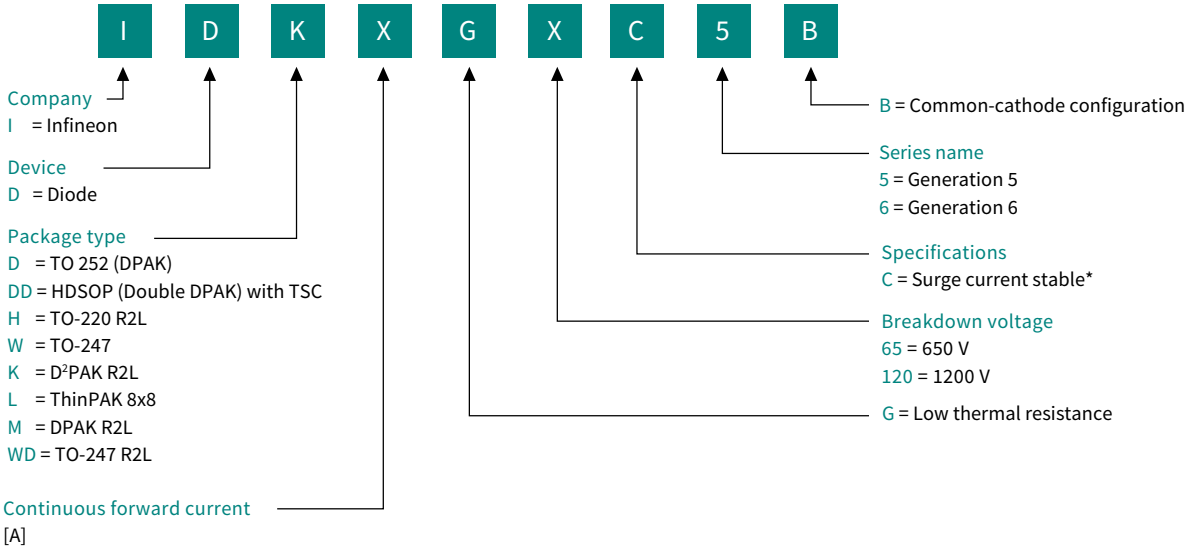
www.infineon.com/sic

For more details on the product, click on the part number, visit infineon.com or contact our product support.

CoolSiC™ Schottky diodes G2 and G3



CoolSiC™ Schottky diodes G5 and G6



www.infineon.com/coolsic-diodes

For more details on the product, click on the part number, visit infineon.com or contact our product support.



Infineon support for wide bandgap semiconductors

Useful links and helpful information

Further information, datasheets and documents

www.infineon.com/wbg
www.infineon.com/gan
www.infineon.com/gan-ips
www.infineon.com/driver-gan
www.infineon.com/sic
www.infineon.com/sic-diodes
www.infineon.com/SiCgd
community.infineon.com

Support
Evaluation board
Tools
Simulation



XENSIV™ sensor technologies for automotive, industrial, consumer and IoT applications

- Infineon Developer Community
- Barometric (BAP) and Manifold (MAP) sensors
- Current sensors
- Magnetic position sensors
- Magnetic speed sensors
- MEMS microphones for automotive
- Intuitive sensing
- MEMS microphone for consumer applications
- Pressure sensors for IoT
- PAS CO2 sensor
- 60 GHz radar sensor ICs
- 24 GHz radar sensor ICs

Design support

- Connected sensor kit
- Shield2Go
- Sensor 2GO kits
- Add ons for Sensor 2GO kits and Shield2Go



XENSIV™ sensors – part of the Infineon Developer Community

Join the XENSIV™ Developer Community

The Infineon Developer Community offers 24/7 self-service and lightning fast responses to customer demands. Any user, anywhere, anytime – any subject. The community is well-organized due to its multi-channel strategy. Unlike unmoderated forums, the developer community is based on high quality content that is professionally moderated and reviewed.

Check it out and be part of the XENSIV™ sensor community.



For more details on the product, click on the part number, visit infineon.com or contact our product support.



Infineon XENSIV™ – sensing the world

From a world leader in sensing technology, XENSIV™ sensors smartify lives by enabling things to “see”, “hear”, “feel”, and “smell” and therefore intuitively “understand” their environment. As a result of proven quality and outstanding reliability, customers can count on XENSIV™ for system stability, durability and integrity. Providing high accuracy and best-in-class measurement performance, XENSIV™ sensors add great value to customer applications. More than 40 years of experience in sensing solutions and a deep-rooted system understanding result in the broadest portfolio of ready-to-use sensor solutions on the market. Ecosystem partners and our customers partner with us for leading technologies, perfect-fit solutions and continuous innovation.

In the Internet of Things, sensors are omnipresent and mark the starting point of each and every IoT system. They collect all kinds of data on their surroundings, providing the entry point for all subsequent functions and features. Building on its well-founded systems expertise, Infineon’s broad portfolio in the XENSIV™ family contains ready-to-use solutions to enable a fast time-to-market and reliable functionality for applications in the area of smart home and smart building, smart things, smart factory or smart cars.

We inspire the next generation of smart environments, capable of understanding and responding to human communication. Infineon’s semiconductors are at the very heart of machine-to-machine (M2M), human-machine interface (HMI), mobile and wireless infrastructure technologies. As the technological boundary between humans and machines gradually disappears, these devices need even more advanced intelligence, enriched with voice assistance capabilities and the latest sensor fusion innovations, not to mention robust security technologies to protect personal data. Infineon’s sensors and microphones already deliver this intelligent functionality and inspiring the next step in mobile connectivity.

www.infineon.com/xensiv

Barometric (BAP) and Manifold (MAP) sensors

Infineon's pressure sensors offer the highest quality and accuracy for automotive, industrial, or consumer applications. Our XENSIV™ family includes integrated pressure sensors that tick all these boxes with anlalog or digital SPI interface. Our absolute pressure sensors (MAP and BAP) provide highest accuracy and precision on the smallest footprint and energy bill.

KP21x/KP22x – Analog manifold air pressure sensor family (MAP + turbo MAP)

Features

- Manifold air pressure measurement – MAP and turbo MAP
- Excellent accuracy of up to 1.0 kPa over a large temperature range
- Ratiometric analog voltage output proportional to the applied pressure
- Output signal fully compensated over pressure and temperature
- Pressure range from 10 to 400 kPa
- Temperature range from -40 to +140°C
- Output clamping (optional)
- Complete product family available with multiple transfer functions
- Reverse polarity protection
- Green SMD package

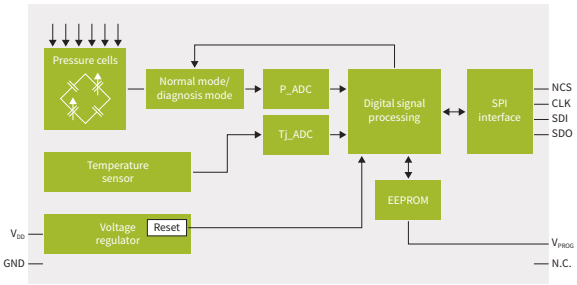


KP464/KP464E and KP466/KP466P – Digital barometric air pressure (BAP) sensor family

Features

- High-accuracy pressure sensing
- Integrated and highly accurate temperature sensor (chip temperature)
- 10-, 12- or 14-bit resolution pressure and temperature values via SPI Interface
- SPI interface with 4-wire full-duplex SPI
- Self-diagnosis features
- Low power consumption: supply current down to 3.5 mA without SPI communication, in power down mode: 10 µA)
- Green and small 8-pin DFN package (4.5 x 5.1 x 1.75 mm^3)
- Small five holes to prevent intrusion of small parts or animals
- High operating temperature range from -40°C to 125°C
- Pressure range from 40 to 165 kPa (wider ranges technically possible)
- AEC-Q103-002 qualified
- Backwards compatible to existing BAP
- Temperature transfer function from -40°C to 125°C
- KP466P with increased accuracy and faster start-up time

Block diagram



www.infineon.com/bap-map-pressure

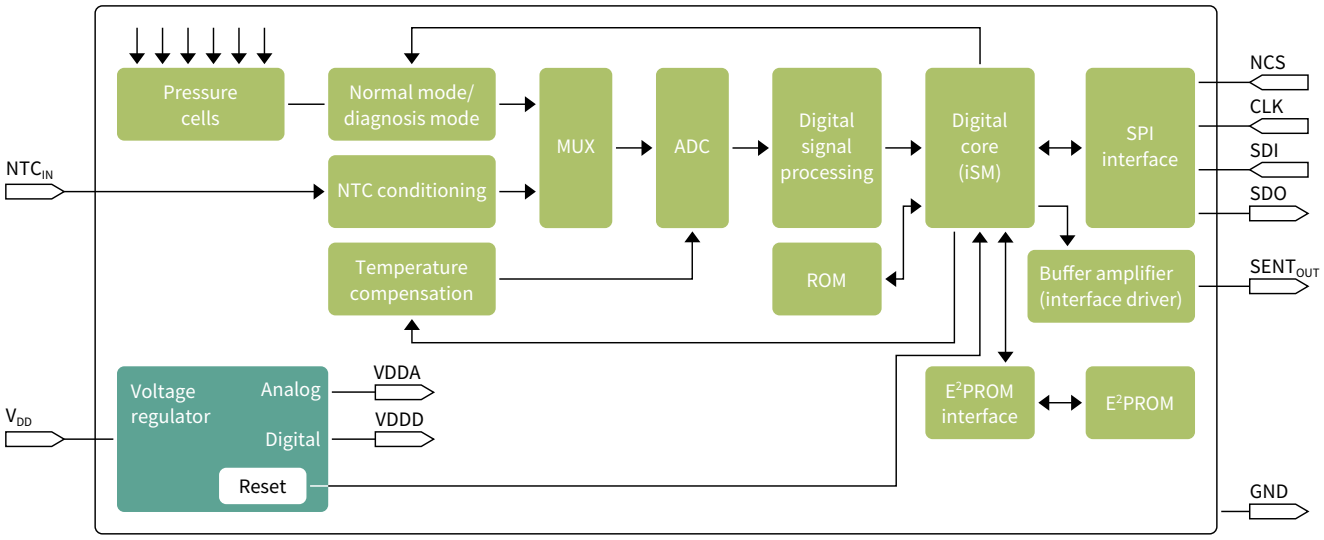
For more details on the product, click on the part number, visit infineon.com or contact our product support.

KP276
Media robust MAP sensor with digital interface

Features

- Media robustness for current automotive requirements
- Digital single edge nibble transmission (SENT) interface (282 clock ticks)
- Excellent accuracy of up to of ±0.77 percent FSS
- Green SMD package
- Temperature range -40 to +170°C
- Integrated NTC temperature sensor functionality with fast start up time (typ. 10ms)

Block diagram



Integrated pressure sensors for manifold and barometric air pressure

Product	Max. accuracy [kPa]	Max. operating temperature [°C]	Automotive	Industrial	ISO 26262	Pressure range [kPa]
KP21x	1.0	140	✓	✓	–	10...150
KP22x	2.5	140	✓	✓	–	10...400
KP23x	1.0	125	✓	✓	–	15...115
KP236N6165	1.0	125	✓	✓	–	60...165
KP276x	3.0	150 (170 time limited)	✓	✓	–	10...400

Product	Max. accuracy [kPa]	Max. operating temperature [°C]	Automotive	Industrial	Pressure range [kPa]
KP464	Digital SPI	40...115	-40 to 125	±1	powertrain
KP464E					
KP466		60...165			seat comfort
KP466P[1)]					advanced seat comfort and BMS satellite

www.infineon.com/bap-map-pressure

1) Faster start-up time (3 ms max.), improved accuracy for high and low temperatures

For more details on the product, click on the part number, visit infineon.com or contact our product support.



XENSIV™ – high-precision coreless current sensors for automotive and industrial

Used to measure both AC and/or DC currents, Infineon's current sensors provide accurate and stable current measurement up to 120 A or 31 mT respectively. Our magnetic current sensors include either an integrated current rail in the package for low currents or measure the magnetic field of an external current rail for medium to high currents. The products are intended for use in 48 V, as well as high voltage and/or wide bandgap applications such as traction inverters, industrial drives, photovoltaic inverters, or EV-charging systems.

Infineon's XENSIV™ family of high-precision coreless open-loop current sensors are less bulky, and cost less compared to core-based current sensors. Based on Infineon's precise and stable Hall effect current sensor IC technology, the current sensor analog output signal is highly linear over temperature and lifetime. Due to lacking an iron core or a flux concentrator, the sensor signal shows neither hysteresis nor does it suffer from saturation.

The differential current sensor measurement with two Hall cells ensures high accuracy even in a noisy environment like crosstalk from adjacent current lines or magnetic stray fields. System designers can program the sensitivity of the sensor as well as the threshold levels of the two dedicated overcurrent signals and therefore adapt them to individual requirements without any external components. The contactless current sensor IC also provides a warning signal in case of an over- or under-voltage condition for the supply voltage.

Product Portfolio

Infineon's product portfolio includes wide bandgap current sensors for both industrial and automotive application needs. Our current sensors achieve high accuracy using the Hall effect, which enables current measurements from DC to AC with an internal bandwidth of up to 240 kHz without being disturbed by external magnetic fields.
On the one hand, we have the current sensors with an integrated current rail. The sensors in the TISON package allow the accurate measurement with high frequencies and small impact on the phase shift of the current signal. On the other hand, our current sensors for external current rails are non-invasive Hall effect current sensors and provide safe and reliable solutions for power electronics since there is no additional power dissipation. Our selection of isolated, non-contact current sensors can be used for current detection and monitoring in SiC and GaN applications, including motor control applications.

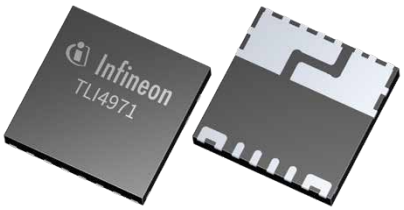
www.infineon.com/current-sensors

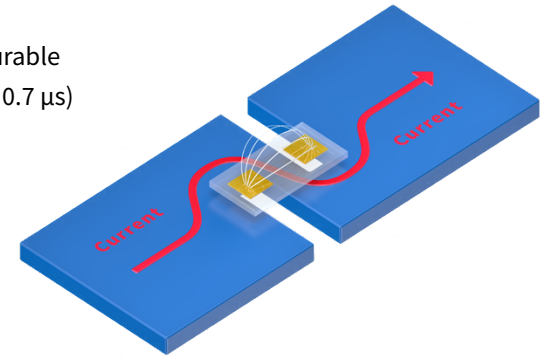
TLI4971

High-precision coreless sensors for industrial applications

Features

- Integrated current rail with typical 220 µΩ insertion resistance enables ultralow power loss
- Small form factor, 8x8 mm SMD, for easy integration and board area saving
- Highly accurate, scalable, DC and AC current sensing
- Bandwidth of 240 kHz enables wide range of applications
- Very low sensitivity error over temperature (< 2.0%)
- Excellent stability of offset over temperature and lifetime
- Galvanic functional isolation up to 1150 V peak VIORM, partial discharge 3500 V_{RMS}, 4 mm clearance and creepage
- Differential sensor principle ensures superior magnetic stray field suppression
- Two independent fast over-current detection (OCD) pins with configurable thresholds enable protection mechanisms for power circuitry (typical 0.7 µs)
- Pre-calibrated sensor





Applications

- Energy storage systems
- Electrical drives (up to 975 Vpk)
- Photovoltaic inverter
- General purpose & GaN-based inverters
- Chargers
- Power supplies

www.infineon.com/current-sensors

1) Total error over lifetime and temperature

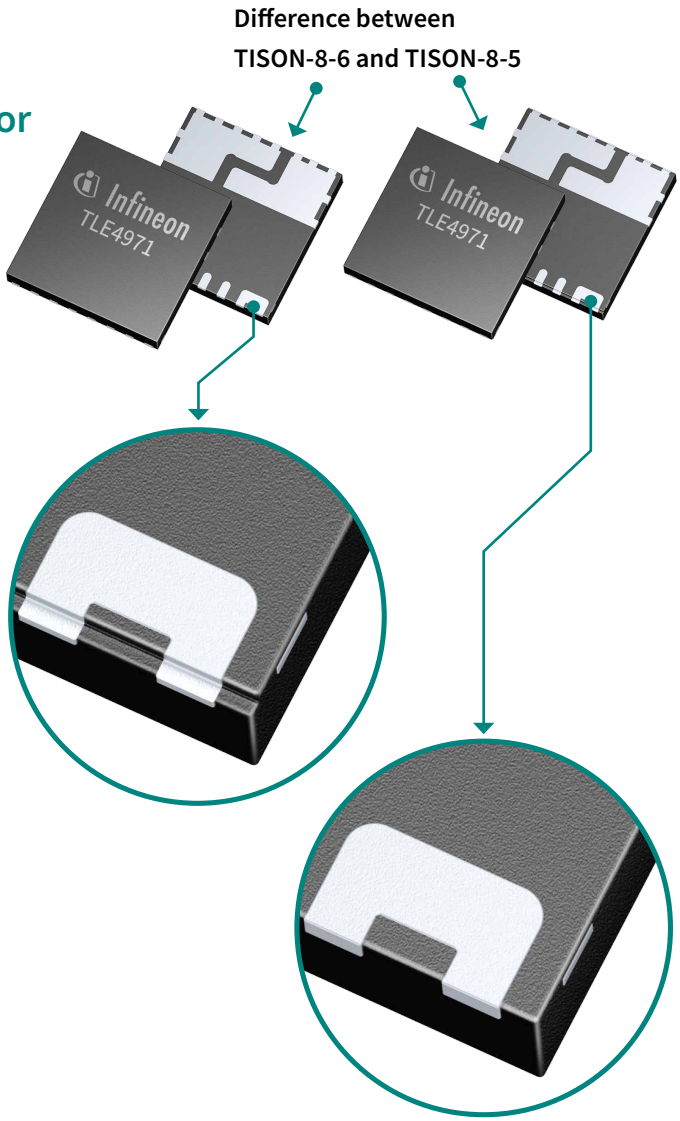
For more details on the product, click on the part number, visit infineon.com or contact our product support.

TLE4971

High-precision coreless current sensor for automotive and industrial applications

The Infineon TLE4971 is a high-precision current sensor for bi-directional AC and DC measurements. The device has an analog interface and two fast overcurrent detection outputs that support the power circuitry's protection. Galvanic isolation is provided due to magnetic sensing principle.

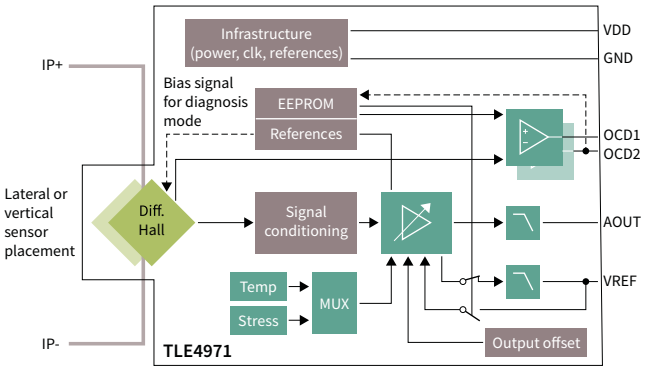
Infineon's well-established and robust monolithic Hall technology enables accurate and highly linear measurement of currents with a full scale up to 120 A. Negative effects, like saturation and hysteresis, commonly known from core-based sensor techniques, are not present in the Infineon open loop, coreless sensors principle. The smart current rail design (double U-shape) combined with a differential signal sensing makes the current sensor robust against stray fields. The sensor is shipped as a fully calibrated product without requiring any customer end-of-line calibration. It comes in a small 8x8 mm TISON-8 leadless package, which allows standard SMD assembly. The sensor can be reprogrammed for many parameters enabling the customer to achieve maximal adaption for his application requirements, such as industrial drives, xEV auxiliary drives, PV inverter, DC fast charger and on-board-charger (OBC).



Features and benefits

Key features	Key benefits
– Measurement up to 70 A_{RMS} at 690 V_{RMS}	– Ultra-low power loss due to minimal resistance of current rail
– Typical error at 25°C < 2 percent	– Reliable current measurement over lifetime (no re-calibration)
– Current rail resistance at 220 µΩ and inductance <1 nH specified typical	– Functional isolation for high-voltage application
– Analog output signal (with typ. 210 kHz) bandwidth	– Easy and compact package allows high-power density design
– Fast (<0.7 µs) overcurrent detection up to 2 x IFSR	– Pre-programmed variants for 25 A, 50 A, 75 A and 120 A
– AEC-Q100 Grade 1 qualified	– High accuracy, low noise analog output

Block diagram



The integrated primary conductor (current rail) with very low insertion resistance and inductance minimizes the power loss and enables miniaturization of the sensing circuit. The analog output (AOUT) can be configured in single-ended, semi-differential, and fully-differential mode together with the voltage reference pin (VREF) Two separate overcurrent pins (OCD1/OCD2) provide a fast output signal in case the current exceeds a pre-set threshold.

www.infineon.com/current-sensors

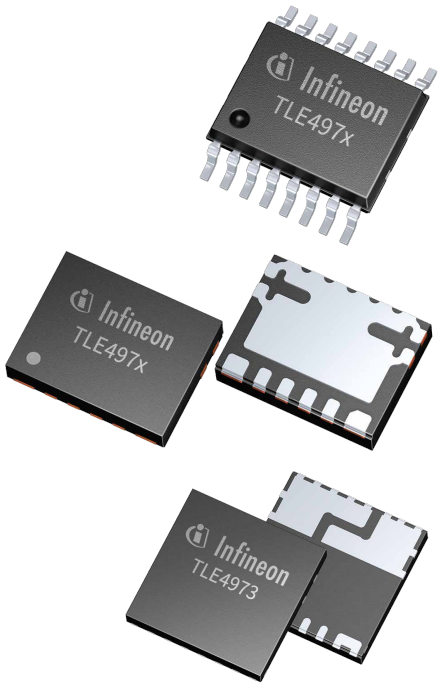
For more details on the product, click on the part number, visit infineon.com or contact our product support.

TLE4972/TLE4973

High-precision coreless current sensors for automotive and industrial applications

The Infineon TLE4972 product family of coreless magnetic current sensors specifically addresses requirements for current sensing in automotive applications. The well-established and robust Hall technology enables accurate and highly linear current measurements of the magnetic field induced by the current. With its compact design and diagnosis modes, the TLE4972 is ideal for xEV applications like traction inverters used in hybrid and battery-driven vehicles, as well as for battery main switches.

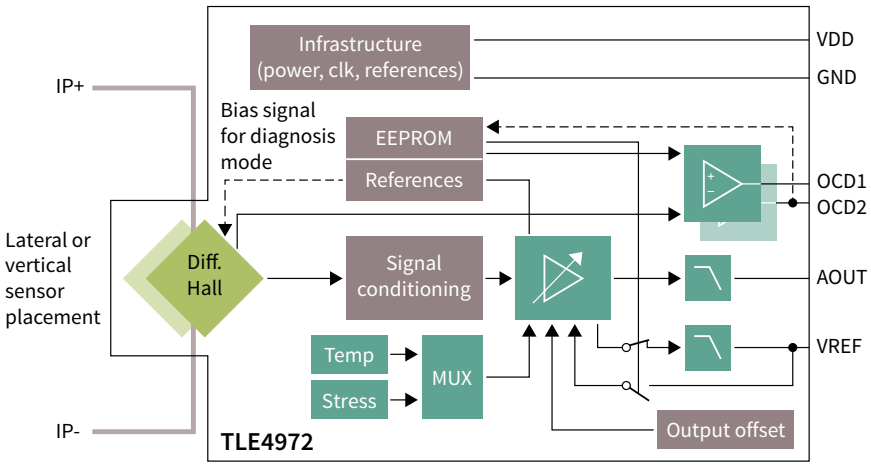
Infineon will expand the sensor portfolio with an new family of 5 V current sensors TLE4973. The new sensors will be available in three different packages to cover a wide range of applications in the automotive and industrial market. Target applications include traction inverter for xEV, auxiliary drives, PV inverter and on-board-charger (OBC).



Features and benefits

Key features
– Hall based coreless magnetic current sensor
– AC and DC sensing
– Two dedicated pins for overcurrent detection
– Scalable sensitivity
– ISO 26262 compliant
– ASIL B as SEooC
– Typical bandwidth of 210 kHz

Key benefits
– High accuracy up to 2 kA
– Very low error over temperature and lifetime
– Protection against overcurrent events for fast switching technologies, e.g. SiC
– No saturation or hysteresis effects
– Very low power losses through sensing structure
– Ideal for platform designs
– Fast reaction time of analog sensor output
– Simplified functional safety assessment



www.infineon.com/currents-sensors

For more details on the product, click on the part number, visit infineon.com or contact our product support.

Current sensors – overview

Product	Current range [A]	Bandwidth typ. [kHz]	Sensitivity [mV/A]	Accuracy [%]	Output noise density [µA/√Hz]	Certification	Indust-rial	ATV	Supply voltage [V]	Current rail	Package
TLI4971 family →											
TLI4971-A025T5-U-E0001	25	240	48	< 2	350	UL1577/ IEC 62368-1	✓	–	3.3	Internal	TISON-8-5
TLI4971-A025T5-E0001	25	240	48	< 2	350	IEC 62368-1	✓	–	3.3	Internal	TISON-8-5
TLI4971-A050T5-U-E0001	50	240	24	< 2	350	UL1577/ IEC 62368-1	✓	–	3.3	Internal	TISON-8-5
TLI4971-A050T5-E0001	50	240	24	< 2	350	IEC 62368-1	✓	–	3.3	Internal	TISON-8-5
TLI4971-A075T5-U-E0001	75	240	16	< 2	350	UL1577/ IEC 62368-1	✓	–	3.3	Internal	TISON-8-5
TLI4971-A075T5-E0001	75	240	16	< 2	350	IEC 62368-1	✓	–	3.3	Internal	TISON-8-5
TLI4971-A120T5-U-E0001	120	240	10	< 2	350	UL1577/ IEC 62368-1	✓	–	3.3	Internal	TISON-8-5
TLI4971-A120T5-E0001	120	240	10	< 2	350	IEC 62368-1	✓	–	3.3	Internal	TISON-8-5
TLE4971 family →											
TLE4971-A025N5-U-E0001	25	210	48	< 2	260	AEC-Q100/ UL1577/ IEC 62368-1	✓	✓	3.3	Internal	TISON-8-5
TLE4971-A025N5-E0001	25	210	48	< 2	260		✓	✓	3.3	Internal	TISON-8-5
TLE4971-A050N5-U-E0001	50	210	24	< 2	260		✓	✓	3.3	Internal	TISON-8-5
TLE4971-A050N5-E0001	50	210	24	< 2	260		✓	✓	3.3	Internal	TISON-8-5
TLE4971-A075N5-U-E0001	75	210	16	< 2	260		✓	✓	3.3	Internal	TISON-8-5
TLE4971-A075N5-E0001	75	210	16	< 2	260		✓	✓	3.3	Internal	TISON-8-5
TLE4971-A120N5-U-E0001	120	210	10	< 2	260		✓	✓	3.3	Internal	TISON-8-5
TLE4971-A120N5-E0001	120	210	10	< 2	260		✓	✓	3.3	Internal	TISON-8-5
TLE4971-A025T5-U-E0001	25	210	48	< 2	260		✓	✓	3.3	Internal	TISON-8-6
TLE4971-A025T5-E0001	25	210	48	< 2	260		✓	✓	3.3	Internal	TISON-8-6
TLE4971-A050T5-U-E0001	50	210	24	< 2	260		✓	✓	3.3	Internal	TISON-8-6
TLE4971-A050T5-E0001	50	210	24	< 2	260		✓	✓	3.3	Internal	TISON-8-6
TLE4971-A075T5-U-E0001	75	210	16	< 2	260		✓	✓	3.3	Internal	TISON-8-6
TLE4971-A075T5-E0001	75	210	16	< 2	260		✓	✓	3.3	Internal	TISON-8-6
TLE4971-A120T5-U-E0001	120	210	10	< 2	260		✓	✓	3.3	Internal	TISON-8-6
TLE4971-A120T5-E0001	120	210	10	< 2	260		✓	✓	3.3	Internal	TISON-8-6

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For more details on the product, click on the part number, visit infineon.com or contact our product support.

Current sensors – overview

Product	Current range	Bandwidth typ. [kHz]	Sensitivity	Accuracy [%]	Output noise density	Certification	Industrial	Automotive	Supply voltage [V]	Current rail	Package
TLE4973-A025T5-S0001	27.5 [A]	210	65.5 mV/A]	< 2	290 [µA/√Hz]	AEC-Q100	✓	✓	5.0	Internal	TISON-8-6
TLE4973-A050T5-S0001	55 [A]	210	32.8 mV/A]	< 2	290 [µA/√Hz]	AEC-Q100	✓	✓	5.0	Internal	TISON-8-6
TLE4973-A075T5-S0001	82.5 [A]	210	21.8 mV/A]	< 2	290 [µA/√Hz]	AEC-Q100	✓	✓	5.0	Internal	TISON-8-6
TLE4973-A120T5-S0001	132 [A]	210	13.7 mV/A]	< 2	290 [µA/√Hz]	AEC-Q100	✓	✓	5.0	Internal	TISON-8-6
TLE4973-R025T5-S0001	27.5 [A]	210	65.5 mV/A]	< 2	290 [µA/√Hz]	AEC-Q100	✓	✓	5.0	Internal	TISON-8-6
TLE4973-R050T5-S0001	55 [A]	210	32.8 mV/A]	< 2	290 [µA/√Hz]	AEC-Q100	✓	✓	5.0	Internal	TISON-8-6
TLE4973-R075T5-S0001	82.5 [A]	210	21.8 mV/A]	< 2	290 [µA/√Hz]	AEC-Q100	✓	✓	5.0	Internal	TISON-8-6
TLE4973-R120T5-S0001	132 [A]	210	13.7 mV/A]	< 2	290 [µA/√Hz]	AEC-Q100	✓	✓	5.0	Internal	TISON-8-6
TLE4973-R025T5-S0010	27.5 [A]	210	65.5 mV/A]	< 2	290 [µA/√Hz]	AEC-Q100	✓	✓	5.0	Internal	TISON-8-6
TLE4973-R050T5-S0010	55 [A]	210	32.8 mV/A]	< 2	290 [µA/√Hz]	AEC-Q100	✓	✓	5.0	Internal	TISON-8-6
TLE4973-R075T5-S0010	82.5 [A]	210	21.8 mV/A]	< 2	290 [µA/√Hz]	AEC-Q100	✓	✓	5.0	Internal	TISON-8-6
TLE4973-R120T5-S0010	132 [A]	210	13.7 mV/A]	< 2	290 [µA/√Hz]	AEC-Q100	✓	✓	5.0	Internal	TISON-8-6
TLE4973-R025T5-U-S0010	27.5 [A]	210	65.5 mV/A]	< 2	290 [µA/√Hz]	AEC-Q100 UL 1577	✓	✓	5.0	Internal	TISON-8-6
TLE4973-R050T5-U-S0010	55 [A]	210	32.8 mV/A]	< 2	290 [µA/√Hz]	AEC-Q100 UL 1577	✓	✓	5.0	Internal	TISON-8-6
TLE4973-R075T5-U-S0010	82.5 [A]	210	21.8 mV/A]	< 2	290 [µA/√Hz]	AEC-Q100 UL 1577	✓	✓	5.0	Internal	TISON-8-6
TLE4973-R120T5-U-S0010	132 [A]	210	13.7 mV/A]	< 2	290 [µA/√Hz]	AEC-Q100 UL 1577	✓	✓	5.0	Internal	TISON-8-6
TLE4973-AE35D5-S0001	34 [mT]	210	53[1)] [mV/mT]	1	70 [nT/√Hz]	AEC-Q100	✓	✓	5.0	external	TDSO-16
TLE4973-RE35D5-S0001	34 [mT]	210	53[1)] [mV/mT]	1	70 [nT/√Hz]	AEC-Q100	✓	✓	5.0	external	TDSO-16
TLE4973-RE35D5-S0010	34 [mT]	210	53[1)] [mV/mT]	1	70 [nT/√Hz]	AEC-Q100	✓	✓	5.0	external	TDSO-16
TLE4973-AE35S5-S0001	34 [mT]	210	53[1)] [mV/mT]	1	70 [nT/√Hz]	AEC-Q100	✓	✓	5.0	external	VSON-6
TLE4973-RE35S5-S0001	34 [mT]	210	53[1)] [mV/mT]	1	70 [nT/√Hz]	AEC-Q100	✓	✓	5.0	external	VSON-6
TLE4973-RE35S5-S0010	34 [mT]	210	53[1)] [mV/mT]	1	70 [nT/√Hz]	AEC-Q100	✓	✓	5.0	external	VSON-6

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1) Can be reprogrammed by customer

For more details on the product, click on the part number, visit infineon.com or contact our product support.

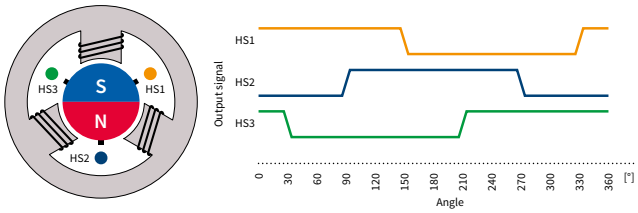
Magnetic switches

Broadest energy saving portfolio of high precision magnetic switches for automotive, industrial and consumer applications

TLE/TLI/TLV4961, TLE/TLI/TLV4964, TLE/TLI/TLV4968
Energy-efficient magnetic switches family for up to 32 V

The TLE/TLI/TLV496x-xM/L family of magnetic switches saves energy and enables designers to create precise and compact systems. With an operational current consumption of just 1.6 mA, TLE/TLI/TLV496x-xM/L products can cut energy consumption by up to 50 percent, compared with similar competitor products. Thanks to its small magnetic hysteresis, the family paves the way for precise switching points in systems. The integrated temperature profile compensates magnetic drifts and enables stable performance over temperature and lifetime.

TLE/TLI/TLV496x-xM products come in the smallest SOT23 package, thus reducing height by 10 percent compared with predecessor products. The sensors also feature an integrated functionality test for better system control.



Features

- Current consumption of just 1.6 mA
- 3 to 32 V supply voltage range (over voltage up to 42 V)
- 7 kV ESD protection (HBM)
- Overtemperature and overcurrent protection
- Temperature compensation
- Smallest SOT23 package
- Dedicated products for industrial applications (TLI496x) and consumer applications (TLV496x)
- AEC-Q100 qualified

Applications

- Window lifter
- Power closing
- Gear stick
- Seat belt
- BLDC commutation (e.g. wiper, seat belt pretensioner, pump, seating)
- Service robots
- Power tools
- White goods

Product	Type	Operating point B_{OP} [mT]	Release point B_{RP} [mT]	Hysteresis ΔB_{HY} [mT]	Automotive	Industrial	Consumer	Package
TLE4961-1M/L	Latch	2.0	-2.0	4.0	✓	✓	✓	SOT23/SSO-3-2
TLE4961-2M	Latch	5.0	-5.0	10.0	✓	✓	✓	SOT23
TLE4961-3M/L	Latch	7.5	-7.5	15.0	✓	✓	✓	SOT23/SSO-3-2
TLE4961-4M	Latch	10.0	-10.0	20.0	✓	✓	✓	SOT23
TLE4961-5M	Latch	15.0	-15.0	30.0	✓	✓	✓	SOT23
TLE4964-1M	Switch	18.0	12.5	5.5	✓	✓	✓	SOT23
TLE4964-2M	Switch	28.0	22.5	5.5	✓	✓	✓	SOT23
TLE4964-3M	Switch	12.5	9.5	3.0	✓	✓	✓	SOT23
TLE4964-4M	Switch	10.0	8.5	1.5	✓	✓	✓	SOT23
TLE4964-6M	Switch	3.5	2.5	1.0	✓	✓	✓	SOT23
TLE4964-5M	Switch	7.5	5.0	2.5	✓	✓	✓	SOT23
TLE4968-1M/L	Bipolar	1.0	-1.0	2.0	✓	✓	✓	SOT23/SSO-3-2
TLI4961-1M	Latch	2.0	-2.0	4.0	–	✓	✓	SOT23/SSO-3-2
TLV4961-1M	Latch	2.0	-2.0	4.0	–	–	✓	SOT23
TLV4961-3M	Latch	7.5	-7.0	15.0	–	–	✓	SOT23
TLV4964-1M	Switch	18.0	12.5	5.5	–	–	✓	SOT23
TLV4964-2M	Switch	28.0	22.5	5.5	–	–	✓	SOT23

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TLE/TLI4963/65-xM
5 V high-precision harsh environment/industrial Hall-effect sensors

By offering an excellent magnetic behavior Infineon's switches are ideally suited for:

- Index counting application with a pole wheel
- Rotor position detection (BLDC motors)
- Open/close detection

Features

- 3.0 to 5.5 V operating supply voltage
- Low current consumption 1.4 mA
- ESD protection 4 kV HBM
- Active error compensation (chopped)
- High stability of magnetic thresholds
- Low jitter (typ. 0.35 µs)
- Operating temperature range:
  - from -40 to +170°C (TLE496x-xM)
  - from -40 to +125°C (TLI496x-xM)
- Small SMD package SOT23
- TLE: AEC-Q100 qualified
- TLI: JESD47 qualified



Product	Type	Operating point B_{OP} [mT]	Release point B_{RP} [mT]	Hysteresis ΔB_{HY} [mT]	Harsh environment	Industrial	Package
TLE4963-1M	Latch	2.0	-2.0	4.0	✓	✓	SOT23
TLE4963-2M	Latch	5.0	-5.0	10.0	✓	✓	SOT23
TLE4965-5M	Unipolar switch	7.5	5.0	2.5	✓	✓	SOT23
TLI4963-1M	Latch	2.0	-2.0	4.0	–	✓	SOT23
TLI4963-2M	Latch	5.0	-5.0	10.0	–	✓	SOT23
TLI4965-5M	Unipolar switch	7.5	5.0	2.5	–	✓	SOT23

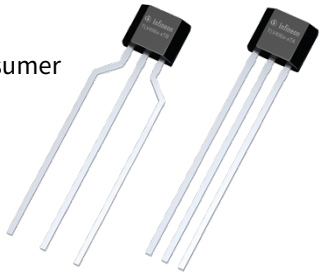
TLV496x-xTA/B
Precision Hall-effect sensor for consumer applications in leaded package

Features

- 3.0 to 26 V operating supply voltage
- Low current consumption 1.6 mA
- ESD protection 4 kV HBM
- Operating temperature range from -40 to +125 °C
- Leaded package TO92S

Applications

- BLDC motor commutation for consumer devices (e.g. e-bikes, fans, aircons)
- Position detection e.g. flaps and control buttons



Product	Type	Operating point B_{OP} [mT]	Release point B_{RP} [mT]	Hysteresis ΔB_{HY} [mT]	Consumer	Package
TLV4961-1TA	Latch	2.0	-2.0	4.0	✓	TO92S-3-1
TLV4961-1TB	Latch	2.0	-2.0	4.0	✓	TO92S-3-2
TLV4961-3TA	Latch	7.5	-7.5	15.0	✓	TO92S-3-1
TLV4961-3TB	Latch	7.5	-7.5	15.0	✓	TO92S-3-2
TLV4964-4TA	Unipolar switch	10.0	8.5	1.5	✓	TO92S-3-1
TLV4964-4TB	Unipolar switch	10.0	8.5	1.5	✓	TO92S-3-2
TLV4964-5TA	Unipolar switch	7.5	5.0	2.5	✓	TO92S-3-1
TLV4964-5TB	Unipolar switch	7.5	5.0	2.5	✓	TO92S-3-2
TLV4968-1TA	Latch	1.0	-1.0	2.0	✓	TO92S-3-1
TLV4968-1TB	Latch	1.0	-1.0	2.0	✓	TO92S-3-2

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For more details on the product, click on the part number, visit infineon.com or contact our product support.

TLx4966
Two-in-one double Hall sensor

Features

- Two Hall probes for information on speed and direction
- Excellent matching between the two Hall probes
- Hall plate distance of 1.45 mm
- High resistance to mechanical stress by Active Error Compensation
- TSOP6 package
- TLE: AEC-Q100 qualified
- TLI: JESD47 qualified

Applications

- Window lift
- Sunroof
- Automatic tailgate
- Automated doors
- Sun blinds
- Garage doors

Product	Type	Output	Operating point B_{OP} [mT]	Release point B_{RP} [mT]	Hysteresis ΔB_{HY} [mT]	Automotive	Industrial	Consumer	Package
TLE4966G	Double Hall, speed and direction output	Speed and direction	7.5	-7.5	15	✓	✓	✓	TSOP6/SSO-4-1
TLE4966L	Double Hall, speed and direction output	Speed and direction	7.5	-7.5	15	✓	✓	✓	TSOP6/SSO-4-1
TLE4966-2G	Double Hall, two independent outputs	2 x speed	7.5	-7.5	15	✓	✓	✓	TSOP6
TLE4966-3G	Double Hall, speed and direction output	Speed and direction	2.5	-2.5	5	✓	✓	✓	TSOP6
TLE4966V-1G	Vertical double Hall, speed and direction output	Speed and direction	2.5	-2.5	5	✓	✓	✓	TSOP6
TLI4966G	Double Hall, speed and direction output	Speed and direction	7.5	-7.5	15	–	✓	✓	TSOP6

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Linear sensors

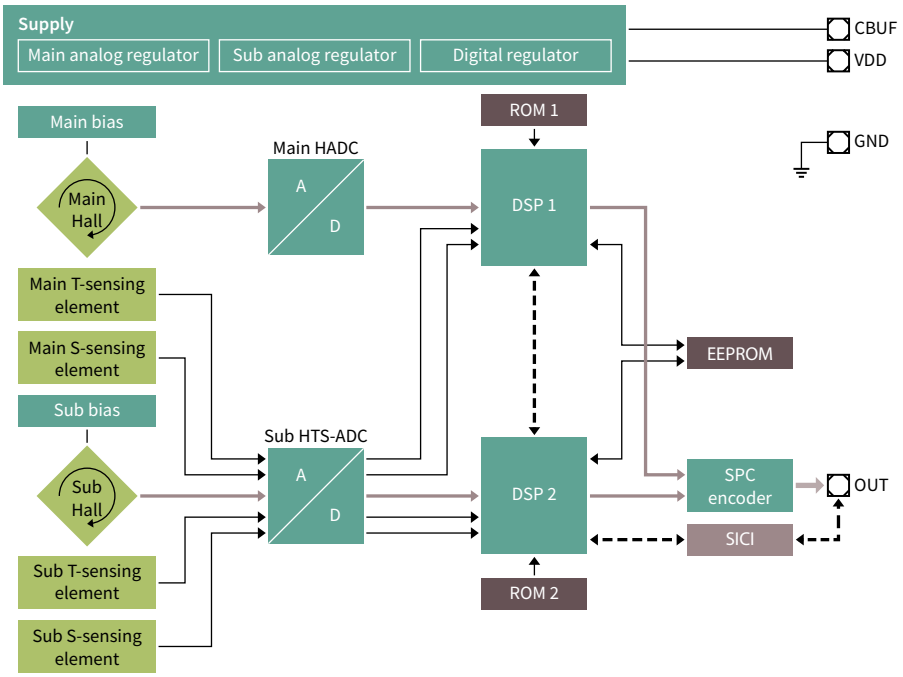
Programmable dual-channel linear Hall sensor with fast SPC interface for high-precision applications

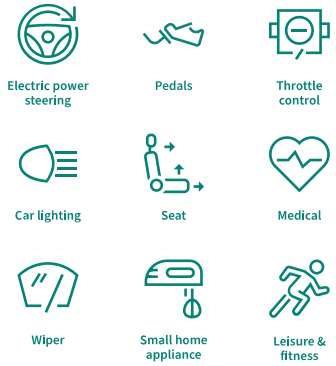
Infineon's TLE4999C8 is a programmable dual channel linear Hall sensor designed to meet the requirements of safety critical automotive and industrial applications. It is developed in full compliance with ISO 26262 by means of two sensor elements included within one monolithic silicon design. In order to fulfill the state-of-the-art safety requirements on system level and enable ASIL D system developments the sensor cells are designed in a complementary way. Their signals follow two independent analog paths. Each signal path has its own digital signal processing unit to ensure maximum independency - redundancy, respectively. The sensor offers a multi-point calibration with up to 9 selectable set points for enhanced linearization of the output signal. For an easy and flexible adaptation to non-linearity of magnetic circuit design, the chip provides 5 different calibration characteristics.



TLE4999C features a digital Short-PWM-Code (SPC) interface, with a bus-capability for up to 4 sensor ICs on a single data output. The communication interface with min. 0.5 µs unit time guarantees a fast transmission of complete 2 channel data signal in less than 500 µs. The additionally implemented frame holder circuit enables the synchronicity of multiple sensors (e.g., in combination of angle sensors) via a SPC bus. The chip offers a 12, 14 and 16-Bit resolution of the output signal, ensuring highest flexibility and superior noise performance. Highest accuracy over a wide temperature range and lifetime is achieved by an integrated digital temperature- and stress-compensation. The chip is available in a thin 8-pin SMD single sensor package.







www.infineon.com/linear-sensors

For more details on the product, click on the part number, visit infineon.com or contact our product support.

Features

- Fully ISO 26262 compliant, supports ASIL D systems
- < 2% sensitivity drift, < 100 µT offset drift over temperature and life time
- Integrated digital temperature- and stress-compensation
- Fast digital SPC interface (unit time 0.5 – 3.0 µs)
- Multi-point calibration with up to 9 linearization set points

Key benefits

- High diagnostic coverage, ISO 26262-compliancy and dual sensor cell integration enable development of fail operational systems
- Multi-point calibration for better fit into various magnetic circuit designs
- Easy system integration due to programmability of several sensor parameters

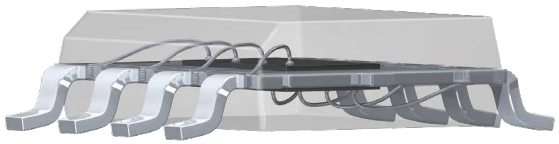
Applications

Automotive safety critical applications

- Electric power steering
- Linear movement position sensing
- Pedal position
- Electric throttle control
- Seat rail adjustment
- Headlight adjustment

Industrial applications

- Small home appliances
- Joystick applications



Sales name	Interface	Magnetic linear range [mT]	Sensitivity	Sensitivity drift [%]	Gain	Magnetic offset drift [µT] 1)	ISO 26262	Ordering code	Package
TLE4997A8D	Analog ratiometric	50, 100, 200	±60 mV/mT default for 100 mT range, with gain 1.5	±3	±4	< ±400	Ready	SP000902760	TDSO-8
TLE4998P8D	Digital interface PWM	50, 100, 200	±48 LSB_{12}/mT default for 100 mT range, with gain 1.5	±2	±4	< ±400	Ready	SP000902776	TDSO-8
TLE4998S8D	Digital interface SENT	50, 100, 200	±48 LSB_{12}/mT default for 100 mT range, with gain 1.5	±2	±4	< ±400	Ready	SP000902784	TDSO-8
TLE4998C8D	Digital interface SPC	50, 100, 200	±48 LSB_{12}/mT default for 100 mT range, with gain 1.5	±2	±4	< ±400	Ready	SP000902768	TDSO-8
TLE4999I3	Digital interface PSI5	12.5, 25	±147.5 LSB_{13}/mT default for 25 mT range, with gain 1.5	±2	±5	< ±100/ < ±200 2)	Compliant	SP001689862	SSO-3
TLE4999C8 (TLE4999C8-S0001)	Digital interface SPC	25, 50	±36.875 LSB_{12}/mT default for in 50 mT range, with gain 1.0	±2	±5	< ±100/ < ±2002 2)	Compliant ASIL D (ASIL C)	SP002662500 (SP005727371)	TDSO-8
TLE4999C4 (TLE4999C4-S0001)	Digital interface SPC	25, 50	±36.875 LSB_{12}/mT default for in 50 mT range, with gain 1.0	±2	±5	< ±100/ < ±200 2)	Compliant ASIL D (ASIL C)	SP003420076 (SP005727375)	SSO-4

1) Maximum drift over temperature and life time
2) Main channel/sub channel

www.infineon.com/linear-sensors

PRO SIL ISO 26262 compliant PRO SIL ISO 26262 ready

For more details on the product, click on the part number, visit infineon.com or contact our product support.

TLE499x family

Programmable analog/digital single-channel linear Hall sensor family

Infineon's family of TLE499x linear Hall ICs is tailored to the needs of highly accurate angular and linear position detection and current measurement applications. Each product measures the vertical component of a magnetic field and outputs a signal that is directly proportional to the magnetic field. These programmable linear Hall sensors come with different interface options: TLE4997 features ratiometric analog output, while TLE4998P comes with pulse width modulation (PWM), TLE4998S with single edge nibble transmission (SENT), and TLE4998C with short PWM codes (SPC). These high-precision 12-bit resolution linear Hall sensors feature EEPROM memory for flexible programming across a wide range of parameters. Thanks to digital signal processing based on a 20-bit DSP architecture plus digital temperature compensation, these sensors deliver outstanding temperature stability compared with similar compensation methods. TLE4998 also includes stress compensation to withstand stress effects from the package, such as moisture, thus ensuring best-in-class accuracy over the device's lifetime.

Features

- Best-in-class accuracy with low drift of output signal (including stress compensation in TLE4998)
- Programmable transfer function (gain, offset), clamping, bandwidth, and temperature characteristics
- AEC-Q100 qualified
- Available in various packages including SSO-3-9 with two integrated capacitors to improve ESD and ESC behavior
- TLE4997, TLE4998 ISO 26262 ready

Applications

- Detecting linear and angular position
- Detecting pedal and throttle position
- Steering torque measurement
- Headlight leveling
- High-current sensing
- Seat position and occupant detection
- Suspension control
- Detecting gear stick/lever positions
- Detecting fuel tank levels
- Current sensing e.g. for battery management

Product	Programm-able	Number of pins	Sensitivity (programmable range)	Magnetic offset	Supply voltage (extended range)	Automotive	ISO 26262	Interface	Package
TLE4997	EEPROM	3/Single die SMD 8	±12.5 to ±300 mV/mT	< ±400 µT	5 V ±10% (7 V)	✓	–	Analog	SSO-3-10 TDSO-8
TLE4998P	EEPROM	3/4/Single die SMD 8	±0.2 to ±6%/mT	< ±400 µT	5 V ±10% (16 V)	✓	Ready	PWM	SSO-3 SSO-4 SSO-3 (2 capacitors) TDSO- 8
TLE4998S	EEPROM	3/4/Single die SMD 8	±8.2 to ±245 LSB_{12}/mT	< ±400 µT	5 V ±10% (16 V)	✓	Ready	SENT	SSO-3 SSO-4 SSO-3 (2 capacitors) TDSO-8
TLE4998C	EEPROM	3/4/Single die SMD 8	±8.2 to ±245 LSB_{12}/mT	< ±400 µT	5 V ±10% (16 V)	✓	Ready	SPC	SSO-3 SSO-4 SSO-3 (2 capacitors) TDSO-8

1) 147.44 LSB_{13} converts to 294.88 LSB_{12}

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PRO SIL ISO 26262 ready

For more details on the product, click on the part number, visit infineon.com or contact our product support.

Angle sensors

Compact designs in small outline packages

Highest variety - low-end to high-end, standardized and specialized in all four magnetic technologies: Hall, GMR, AMR and TMR

Infineon's magnetic sensor products TLE5501, are fast analog TMR-based angle sensors dedicated to automotive applications. Their fields of use range from steering angle applications, with the highest functional safety requirements, to motors for wipers, pumps and actuators, and electric motors in general. They are also ready to be used in industrial and consumer applications like robotics or gimbal. Angle sensors detect the orientation of an applied magnetic field by measuring sine and cosine angle components with monolithically integrated magnetoresistive elements.

Infineon's iGMR sensors are ideal for applications with a wide-angle range, such as BLDC motors or steering sensors. They are pre-calibrated and ready to use. Different levels of signal processing integration enable designers to optimize system partitioning. The XENSIV™ iAMR sensors also perfectly fit applications with the highest accuracy requirements, as they offer the best performance over temperature, lifetime, and magnetic field range.

iGMR, iAMR and iTMR based angle sensors

Diverse redundant sensor with analog and digital interface

Product	Technology	Die configuration	Sin/cos output	Angle output	Second interface	Accuracy	ISO 26262	Package
TLE5009	GMR	Single die	Analog sin/cos	–	–	0.9°	Ready	DSO-8
TLE5009A16(D)	GMR	Dual die	Analog sin/cos	–	–	1.0°	Ready	TDSO-16
TLE5011	GMR	Single die	SSC (SPI)	–	–	1.6°	Ready	DSO-8
TLI5012B	GMR	Single die	SSC (SPI)	SSC (SPI)	PWM/IIF/SPC/HSM	1.9°	QM	DSO-8
TLE5012B(D)	GMR	Single & dual die	SSC (SPI)	SSC (SPI)	PWM/IIF/SPC/HSM	1.0°	Ready	DSO-8/TDSO-16
TLE5014C16(D)	GMR	Single & dual die	–	SPC	–	1.0°	Compliant	TDSO-16
TLE5014P16(D)	GMR	Single & dual die	–	PWM	–	1.0°	Compliant	TDSO-16
TLE5014S16(D)	GMR	Single & dual die	–	SENT	–	1.0°	Compliant	TDSO-16
TLE5014SP16(D)	GMR	Single & dual die	–	SPI	–	1.0°	QM/Compliant	TDSO-16
TLE5109A16(D)	AMR	Single & dual die	Analog sin/cos	–	–	0.5°	Ready	TDSO-16
TLE5309D	AMR + GMR	Dual die	Analog sin/cos	–	–	AMR 0.5°, GMR 1.0°	Ready	TDSO-16
TLE5501	TMR	Single die	Analog sin/cos	–	–	1.0°	Compliant	DSO-8

SPI = Serial peripheral interface
IIF = Incremental interface
PWM = Pulse width modulation
SENT = Single Edge Nibble Transmission
HSM = Hall Switch Mode

www.infineon.com/angle-sensors

PRO SIL ISO 26262 compliant
PRO SIL ISO 26262 ready

For more details on the product, click on the part number, visit infineon.com or contact our product support.

iTMR

iTMR based angle sensors

Tunneling Magneto Resisitive (iTMR) technology is offering high sensing sensitivity with a high output voltage, reducing the need for an internal amplifier. Thus, the sensor can be connected directly to the microcontroller without any further amplification. In addition, iTMR technology shows a very low temperature drift, reducing external calibration and compensation efforts. The iTMR technology is also well known for its low current consumption.

TLE5501

With the TLE5501 products, Infineon is currently launching the first angle sensor products based on iTMR technology. TLE5501 is available in two versions.



TLE5501 - product versions with different pinout:

- TLE5501 E0001: pin-compatible to TLE5009
  automotive qualified acc. AEC-Q100
- TLE5001 E0002: decoupled bridges for redundant external angle calculation and highest diagnostic coverage, realizing ISO 26262-compliant development ASIL D

Features

- Large output signals of up to 0.37 V/V for direct microcontroller connection
- Discrete bridge with differential sine and cosine output
- Very low supply current: ~2 mA
- Magnetic field range (20-100 mT)
- Typ. angle error ~ 1.0° (over temperature and lifetime)
- DSO-8 package
- AEC-Q100, grade 0: TA = -40°C to 150°C (ambient temperature)
- For TLE5501 E0002:
  - Reaching ASIL D with just one single sensor chip
  - ISO 26262-compliant development ASIL D

Applications

- Steering angle sensor
- BLDC motor commutation e.g. wipers, pumps and actuators
- Angular position sensing for e.g. robotics or gimbal
- Electric motors
- Industrial automation
- Safety applications

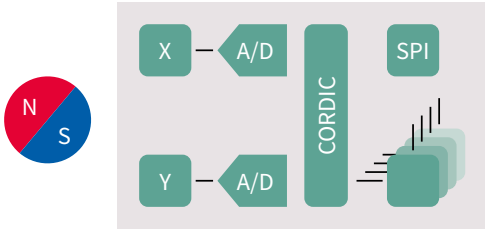
iGMR based angle sensors TLE5014(D)

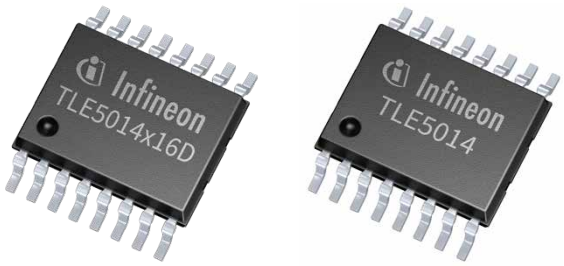
Digital iGMR sensor with an easy-to-use plug-and-play concept for the highest functional safety applications

All XENSIV™ TLE5014 angle sensors are available as single and dual die products. The products come pre-configured and pre-calibrated as plug-and-play sensors and are easy to use. Customers can choose between the interfaces SENT, PWM, SPC, and SPI. On top of those protocol options, the sensors can be adapted to any kind of application setup via their programmable E²PROM interfaces. TLE5014 magnetic angle sensors meet ISO 26262 ASIL C for the single die and ISO 26262 ASIL D for the dual die versions. All products are ready for applications with the highest functional safety requirements. The sensors show an extremely small angle error of less than 1° across the entire temperature profile and lifetime. This is particularly helpful in applications with the need for very accurate position sensing such as steering angle sensing or motor commutation. Further application areas range from rotor position measurement, electric power steering (EPS), pedal position to any other kind of position measurement.

Features

- Easy-to-use, plug-and-play sensors, pre-configured and pre-calibrated
- Offering high flexibility:
  - Available as single and dual die products
  - 12 bit digital interface with protocol options PWM, SENT, SPC and SPI
  - E2 PROM and look-up table for customer configuration and calibration
- High angle accuracy: max. 1.0° over temperature and lifetime
- High voltage capability up to 26 V
- Development fully compliant with ISO 26262
  - Developed acc. ASIL D level
  - Dual die sensors reaching ASIL D, single die sensors ASIL C metrics
- Safety manual and safety analysis summary report available on request
- Applications
- Steering angle sensing (SAS)
- Motor commutation
- Rotor position measurement
- Pedal position
- Safety applications
- Any other kind of high-accuracy position measurement





www.infineon.com/angle-sensors

* Giant Magneto Resistance

For more details on the product, click on the part number, visit infineon.com or contact our product support.

iGMR based angle sensors

TLE5012B, TLE5012B(D)

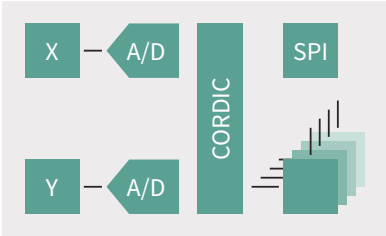
iGMR sensor with integrated angle calculation and multiple interfaces



Features

- Integrated angle calculation with CORDIC algorithm
- 15-bit representation of calculated angle value
- High update rate up to 43 µs (23 kHz)
- Range of selectable interfaces
- SPI compatible Synchronous Serial Communication (SSC)
- Bi-directional communication up to 8 Mbit/s
- Pulse Width Modulation (PWM)
- Hall Switch Mode (HSM) for motor commutation
- Incremental Interface (IIF)
- Temperature compensation and auto-calibration algorithm
- Diagnostic function for sensor elements and circuitry with PRO-SIL™ support
- Dual die SMD package (redundancy)
- ISO 26262 ready
- Available as single and dual die product





Applications

- Steering angle
- Brushless DC motor commutation (for example electric power steering (EPS))
- Rotary switches
- General angular sensing
- Incremental or absolute magnetic encoders
- Gimbals, drones, robots

iAMR based angle sensors
TLE5109A16(D)

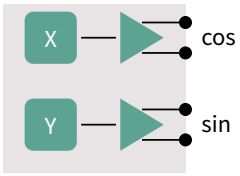


Analog iAMR sensor with temperature compensation

Features

- Features a differential or single-ended analog interface for sine and cosine values
- Internal temperature drift compensation for gain and offset
- Also available as a dual-sensor package
- ISO 26262-ready
- Typical 0.1° angle error over lifetime and temperature range after compensation (max 0.5°)
- Available as single and dual die product



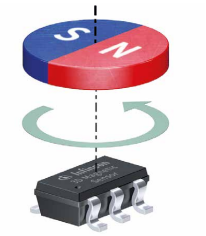


www.infineon.com/angle-sensors

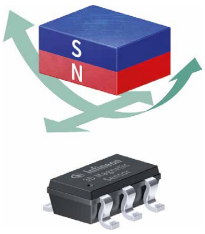
For more details on the product, click on the part number, visit infineon.com or contact our product support.

3D magnetic sensors for industrial and consumer markets

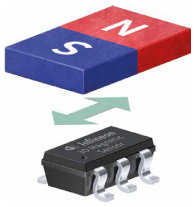
The TLx493D-x2Bx sensor realizes accurate three-dimensional sensing with extremely low power consumption in a small package. Capable of detecting the magnetic field in the x, y, and z-direction, the sensor is ideally suited for the measurement of linear, rotation, or 3-dimensional movements. Thanks to its small package and low power consumption, the TLx493D-x2Bx can be used in new applications, replacing potentiometer and optical solutions. Featuring contactless position sensing and high-temperature stability of the magnetic measurement, the sensor allows systems to get smaller, more accurate, and more robust.



Rotation movement



3D movement



Linear movement



Features

- 3D magnetic sensing
- Integrated temperature sensing
- Low current consumption
  - 7 nA in power-down mode
- 2.8 to 3.5 V operating supply voltage
- Digital output via a 2-wire standard I²C interface
- B_x, B_y and B_z linear field measurement up to ±160 mT
- JESD47 qualified
- 12-bit data resolution for each measurement direction
- Various resolution options from 32 µT/LSB to 130 µT
- Operating temperature range from -40 to +125°C

Product	Temperature range	Classification	Linear magnetic range	Sensitivity	I_{DD}	Update rate	Package	Ordering code
TLI493D-A2B6	-40…105°C	JESD47	±160 mT (min) ±100 mT (min)	7.7 or 15.4 LSB_{12}/mT	7 nA - 3.4 mA	10 Hz – 8.4 kHz	TSOP6	SP001689844
TLI493D-W2BW A0 TLI493D-W2BW A1 TLI493D-W2BW A2 TLI493D-W2BW A3	-40...125°C	JESD47	±50, ±100 or ±160 mT	7.7, 15.4 or 30.8 LSB_{12}/mT	7 nA – 3.4 mA	0.05 Hz - 11.6 kHz	WLB-5	SP005409964 SP005409966 SP005409968 SP005409970
TLV493D-A1B6	-40…125°C	JESD47	±130 mT (typ)	10.2 LSB_{12}/mT	7 nA – 3.7 mA	10 Hz – 3.3 kHz	TSOP6	SP001286056
TLV493D-A2BW	-20°C…85°C	JESD47	±50, ±100 or ±160 mT	7.7, 15.4 or 30.8 LSB_{12}/mT	7 nA – 3.4 mA	6 Hz – 11,6 kHz	WLB-5	SP005542151

New features

- Advanced operation modes to provide high flexiblitity
- Short mode range setting, focusing on the half of the magnetic range, ensuring higher accuracy
- Higher update frequency allows for an application field that requires faster update speed
- Angular mode (for x and y read-out only)

Applications

- Anti tempering protection in smart meters
- Joysticks
- Control elements e.g. white goods multifunction knobs
- Ergonomic push and control buttons on domestic appliances and power tools
- Position control in robotics
- Smart lock position detection

www.infineon.com/3d-magnetics

For more details on the product, click on the part number, visit infineon.com or contact our product support.

3D magnetic sensors for automotive applications

Infineon's XENSIV™ TLE493D-x2B6 enables all kind of automotive control element applications within the passenger compartment or under the hood with a temperature range of -40 to +125°C, with linear magnetic range requirements up to ±160 mT.



Features

- 3D magnetic sensing
- Integrated temperature sensing
- 2.8 to 3.5 V operating supply voltage
- Low current consumption
  - 0.007 µA in power-down mode
  - 10 µA in ultralow power mode
  - Up to 10 power modes
- Digital output via a 2-wire standard I²C interface
- B_x, B_y and B_z linear field measurement ±160 mT
- AEC-Q100 qualified/ISO 26262-ready
- 12-bit data resolution for each measurement direction
- Various resolution options from 65 µT/LSB to 130 µT
- Operating temperature range from -40 to +125°C

Product	Temperature range	Qualification	Linear magnetic range	Resolution	I_{DD}	Update rate XYZ measurements	Wake-up	Package	Ordering code
TLE493D-A2B6	-40 … 125°C	AEC-Q100	±160 mT ±100 mT	130 µT/LSB 65 µT/LSB [1)]	7 nA – 3.4 mA	up to 7.8 kHz	No	TSOP6	SP001689848
TLE493D-W2B6 A0 TLE493D-W2B6 A1 TLE493D-W2B6 A2 TLE493D-W2B6 A3	-40 … 125°C	AEC-Q100 ISO 26262 ready	±160 mT ±100 mT	130 µT/LSB 65 µT/LSB [1)]	7 nA – 3.4 mA	up to 7.8 kHz	Yes	TSOP6	SP001655334 SP001655340 SP001655344 SP001655348
TLE493D-P2B6 A0 TLE493D-P2B6 A1 TLE493D-P2B6 A2 TLE493D-P2B6 A3	-40 … 125°C	AEC-Q100/ ISO 26262 ready	±160 mT ±100 mT	130 µT/LSB 65 µT/LSB [1)]	7 nA – 3.4 mA	up to 7.8 kHz	Yes	TSOP6	SP005557415 SP005557413 SP005557411 SP005557408

1) Short range mode

The XENSIV™ sensor TLE493D-A2B6 features include a sensor address read-back feature for additional communication verification, a half-range mode focusing to half of the magnetic range, ensuring higher accuracy, and an angular mode (for x and y readout only).

With the TLE493D-W2B6/P2B6 A0-A3, a 3D sensor family with an enhanced dynamic wake-up feature was developed. Four pre-programmed address options (A0-A3) are available, enabling for a fast start-up initialization when used in I²C bus configurations. Our sensors include enhanced test options, and safety documentation is available to enable the usage of this sensor in the context of ASIL B systems.

Compared to the previous products of this family the new TLE493D-P2B6 A0-A3 family offers enhance precision in x-, y-, z- sensing direction, while otherwise featuring the same dynamic wake-up features, programmability, and test options like TLE493D-W2B6 A0-A3. We provide safety documentation on request for usage of the sensor in the context of ASIL B systems.

Applications

- Control elements for infotainment/navigation systems, air conditioners, multifunctional steering wheels, seat controls
- Top column modules e.g. direction indicator, wiper control
- Gear stick position sensing
- Multi-function knobs
- Pedal/valve position sensing

www.infineon.com/3d-magnetics

For more details on the product, click on the part number, visit infineon.com or contact our product support.

Magnetic speed sensors

Easy-to-use, robust and cost-effective sensors for speed measurement

Infineon's Hall and GMR-based magnetic speed sensors are designed to measure speed in safety and powertrain applications such as speedometers, ABS, camshafts, crankshafts, and automatic transmissions. They are also used in similar applications in the industrial sector. The sensors use a ferromagnetic gear tooth or encoder structure to measure linear or rotational speed and position. Hall sensor measuring rotational speed with a gear tooth and a magnetic encoder wheel. The majority of sensors also feature additional benefits such as integrated capacitorsfor high EMC robustness and the highest levels of ESD protection.

TLE4922
Highly robust, easy-to-use mono-Hall speed sensor with twist-independent mounting

This sensor is specially designed to provide an easy-to-use, robust and cost-effective solution for vehicle or industrial speed sensing applications. The TLE4922 can, therefore, be back-biased using a simple, low-cost bulk magnet, while providing a good air gap performance and switching accuracy. Its hidden adaptive hysteresis and calibration algorithm enable good accuracy over air gap jumps and immunity to vibration and run-out events.

Features

- Large operating air gap capability
- Flexible mounting (also known as Twist-independent mounting)
- Hidden adaptive hysteresis
- Low current consumption
- Reverse magnetic polarity capability
- Advanced protection technology
  - Reverse voltage protection at VS-pin
  - Short-circuit protection
  - Overtemperature protection
- Wide operating temperature ranges of -40°C ≤ Tj ≤ ±150°C
- High ESD robustness up to ±4 kV HBM
- 3-wire PWM voltage interface



Applications

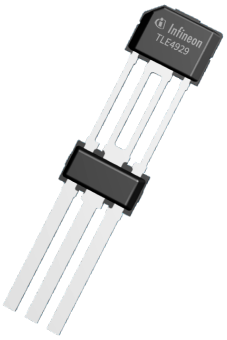
- Industrial applications
- Two-wheeler and automotive vehicle speed

www.infineon.com/speed-sensors

For more details on the product, click on the part number, visit infineon.com or contact our product support.

TLE4929
Fully programmable crankshaft sensor

The TLE4929 is an active differential Hall sensor ideally suited for crankshaft applications and similar industrial applications, such as a speedometer or any speed sensor with excellent accuracy and low jitter capabilities. It as well addresses new requirements for crankshaft speed sensing from hybrid powertrains. An advanced vibration detection algorithm ensures valid sensor data for any hybrid powertrain traction. This improves efficiency of the engine start and helps to avoid misfiring or ECU error messages caused by wrongly calibrated sensor data. Also, the compatible 3-pin-package allows a one-to-onereplacement of the former generation of crankshaft sensors without direction detection, TLE4924/25/26/27/28, widely backward compatible functionality through flexible EEPROM configuration of parameters, means former TLE492x-family can be mimicked.



Features

- Differential Hall speed sensor to measure speed and position of tooth/pole wheels
- Ease of use single chip solution in SSO-3-52
- Switching point in the middle of the tooth enables backward compatibility
- Robustness over magnetic stray-field due to the differential sensing principle
- Precise miss fire detection through excellent jitter performance
- Dedicated hybrid engine algorithm keeps combustion engine calibrated during an electric drive cycle
- Digital output signal with programmable output-protocol including diagnosis interface
- Direction detection and stop-start-algorithm
- High accuracy and low jitter
- High sensitivity enables large air gap
- End-of-line programmable to adapt engine parameters
- Can be used as a differential camshaft sensor
- Pre-programmed version TLE4929C-XAN available, TLE4929C-X2A available for 2-wheeler applications
- Automotive operating temperature range

Product	Sensor technology	AEC-Q100 qualified	Direction detection	Automotive	Industrial	Protocol	RoHS
TLE4922	Mono-Hall	✓	–	✓	✓	Single pulse	✓
TLE4929	Differential Hall	✓	✓	✓	✓	PWM, Single pulse	✓

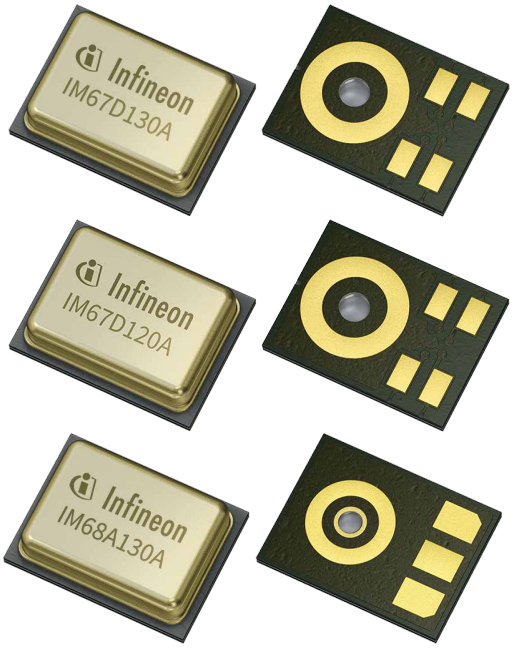
www.infineon.com/speed-sensors

For more details on the product, click on the part number, visit infineon.com or contact our product support.

MEMS microphones for automotive applications

Qualified according to automotive standard, AEC-Q103-003

As part of our comprehensive XENSIV™ sensor family, we also offer high-performance MEMS microphones, qualified according to the state-of-the-art automotive quality standard AEC-Q103-003. These microphones close the gap in the automotive industry, providing the best possible fit for automotive applications.
These automotive XENSIV™ MEMS microphones combine our proven expertise in the automotive industry with our technical leadership in high-end MEMS microphones. They are suited to all applications inside and outside the car, where the best audio performance in harsh automotive environments is required.



Customer benefit

- Automotive qualification according to AEC-Q103, together with long term availability reduces design-in risk and effort
- Increased operating temperature range allows flexible usage in automotive environment up to +105°C
- Best in class audio performance (SNR, AOP, THD) for optimum speech quality and capture of distortion-free audio signals in loud environments such as inside a car
- Narrow sensitivity matching for enhanced performance of beam-forming (noise suppression) arrays
- Flat frequency and stable phase response to < 10 Hz for optimal fit in acoustic noise cancellation use cases (for IM66D130A and IM68A130A, best fit for ANC/RNC automotive applications)

Parametrics	IM66D130A	IM67D120A	IM67D130A	IM68A130A
Acoustic overload point	130 dBSPL	120 dBSPL	130 dBSPL	130 dBSPL
Current consumption	1.300 µA	980 µA	980 µA	105 µA
Interfaces	PDM	PDM	PDM	Analog single-ended output
Sensitivity	-36 dBFS	-26 dBFS	-36 dBFS	-39 dBFS
Signal to noise	66 dB(A)	> 67 dB(A)	> 67 dB(A)	68 dB(A)
Supply voltage	–	1.62–3.6 V	1.62–3.6 V	–
LFRO	< 10 Hz	28 Hz	28 Hz	< 10 Hz
Ordering code	Coming soon	SP005550431	SP005582032	SP005738297

www.infineon.com/mems-automotive

For more details on the product, click on the part number, visit infineon.com or contact our product support.

Typical applications for automotive MEMS microphones in-cabin and outside of the vehicle



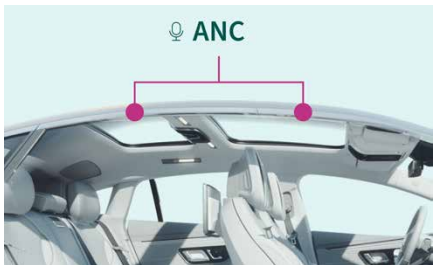
Speech: Hands free/e-call/ICC
Enabling distortion free audio capturing for all speech related application thanks to their high SNR and low distortions.

Interior



Speech: Microphone arrays – beamforming voice command
Making possible to operate infotainment systems with voice commands due to their narrow sensitivity matching for enhanced performance of beam-forming arrays .

Interior



Active and road noise cancellation
Enabling a quite environment for comfortable travels, the microphones are a good fit for ANC applications thanks to their flat frequency and stable phase response. IM68A130A and IM66D130A: dedicated product family for ANC with superior performance with analog and digital interface.

Interior





– Event **sound detection/sirens detection/contact detection**
– **Road** condition detection
Contributing to road safety, by detecting sounds like sirens from emergency vehicles or even dangerous road conditions thanks their large dynamic range and acoustic overload point.

Exterior



Voice recognition/external interaction
Allowing external interaction e.g. for controlling certain functions via voice commands due to their good suitability for voice recognition use cases.

Exterior

www.infineon.com/mems-automotive

XENSIV™ sensors for consumer and IoT applications

Intuitive sensing: Giving things human-like senses for a better contextual awareness

Imagine a world where technology is unobtrusive and seamlessly integrated into our lives. Where intentional and deliberate communication between people and devices is no longer necessary. In this world, there is no need to push buttons or issue commands in order to activate devices because technology is capable of interpreting implicit intentions and context. This enhances the user experience and makes it more natural – it would seem as if the devices around us intuitively understand what we want them to do. At Infineon, this future is already becoming reality. We develop sensor solutions that enable simple and effortless user interactions with all kinds of smart devices. Bridging the gap between the real and digital worlds, our technology is developed to make life easier, safer, greener and more efficient. Our intuitive sensing solutions are at the very core of this mission. Reflecting our belief that the essential value of sensor technology lies in making our lives more convenient through seamless, natural interactions between people and sensing devices, our aim is to leave you free to focus on what really matters in life.

Choose your type of sense

Thanks to industry-leading technologies Infineon, XENSIV™ sensors are exceptionally precise. They are the perfect fit for various customer applications in automotive, industrial and consumer markets.

Pressure sensors

Our digital barometric pressure sensors give designers the best choice when it comes to small form factors, highest precision and accuracy over a wide temperature range, fast read-out speeds and low power consumption.

Radar sensors

Radar supports existing applications while providing features that enable completely new use cases. It measures velocity, range and angle, both horizontal and vertical, for precise position mapping and 3D tracking.

MEMS microphones

MEMS microphones overcome existing audio chain limitations and are designed for applications where low self-noise (high SNR), wide dynamic range, low distortions and a high acoustic overload point are required.

PAS CO2 sensor

Leveraging photoacoustic spectroscopy (PAS), Infineon has developed an exceptionally small CO_2 sensor that overcomes existing size, cost and performance challenges.

Today, sensors already enable interactions between people and devices

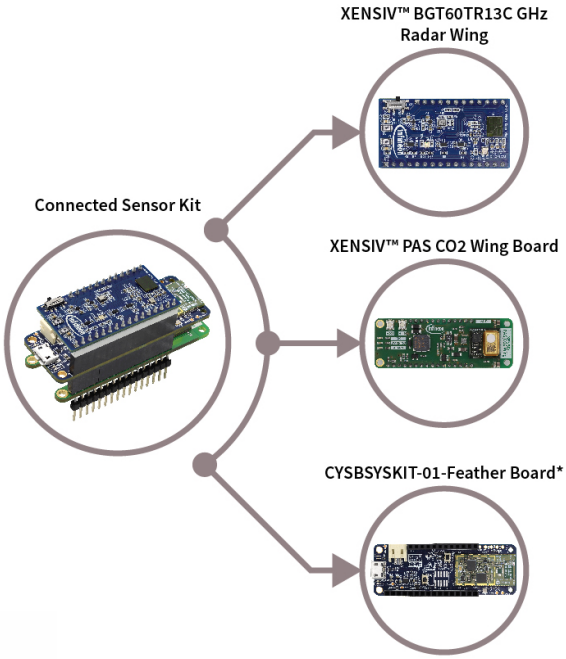
This interaction often depends on the interpretation and merging of information from different sources. Machines cannot yet read our minds and do not always have the information necessary to correctly evaluate a given situation. So, we sometimes have to explicitly tell devices what we want them to do. This can be inconvenient and time-consuming. Inspired by human nature, Infineon intuitive sensing solutions are designed to take the complexity out of our interaction with devices.

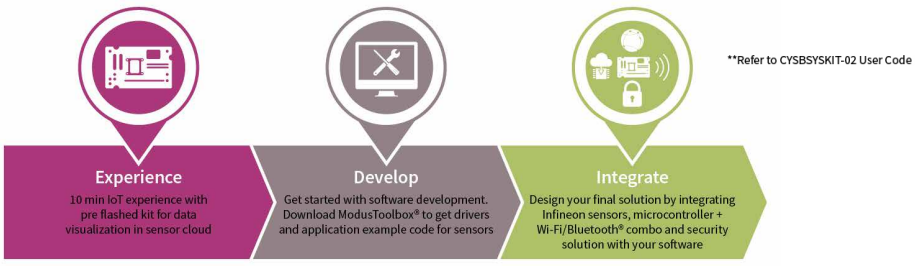
Reflecting a holistic approach, we combine different sensors with state-of-the-art software to create a comprehensive picture of the world around us. By fusing several smart sensors into one coherent intelligent system, our intuitive sensing solutions simplify complex technical processes and enable people to effortlessly interact with devices. These smart devices intuitively sense the world around them, determining what is expected and needed from them.

XENSIV™ connected sensor kit

Rapid IoT prototyping experience enabled by XENSIV™ sensors

The XENSIV™ connected sensor kit enables rapid development of a custom solution built on Infineon products. The CSK supports customers in testing sensor-driven IoT products and use cases as well as in prototyping. It offers a real-time sensor evaluation with custom configurations and cloud-based sensor data visualization with sensor fusion. The development kit supports use cases based on XENSIV™ 60 GHz radar and PAS CO2 with DPS368 pressure sensor (Sense), PSoC™ 6 microcontroller embedded processing (Compute), connectivity via Infineon AIROC™ CYW43012 Wi-Fi and Bluetooth® Combo (Connect) and hardware security with OPTIGA™ Trust M (Secure). Code examples and sensor libraries are available in the Infineon software ecosystem ModusToolbox™ to help customers create use case-specific application codes for new product offerings.

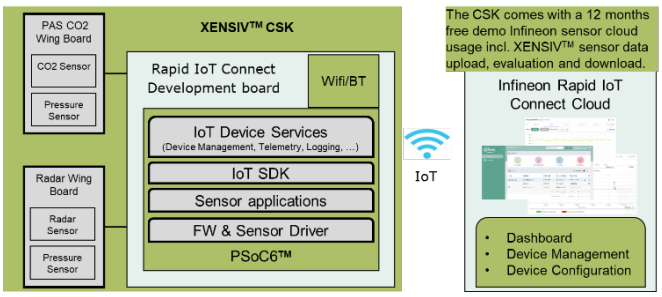




**Refer to CYSBSYSKIT-02 User Code

Features and benefits

Key features	Key benefits
– Small form-factor (22.5 mm x 63 mm x 30 mm) Adafruit feather compatible design	– Ideal for prototyping battery-powered IoT devices due to optimized power consumption. Suited for customer field trials.
– Wi-Fi and Bluetooth 5.0-compliant combo radio module	– Rapid development and deployment via code examples in ModusToolbox™ for presence detection, entrance counter, air quality measurements. Enabler for Multi-sensor data fusion.
– Power optimized design, deployable with battery	– Secure cloud device onboarding and management with OPTIGA™ Trust M. Secure kit provisioning (unique user ID).
– Interchangeable sensor wings – 60 GHz radar, PAS CO2	
– Seamless integration into ModusToolbox™	
– FCC and CE certified	



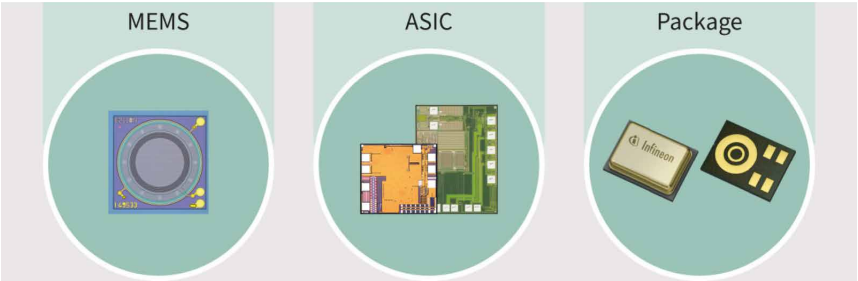
The Infineon Rapid IoT Connect SOM platform deployed on the XENSIV™ CSK provides hardware, firmware, and cloud artifacts to enable rapid onboarding to the Internet of Things. Bidirectional XENSIV™ sensor to cloud data communication is securely enabled. The XENSIV™ CSK is a pre-implemented Infineon Prototyping Sensor System that makes it possible to provision, monitor and manage Infineon hardware remotely. Sensor2cloud kit set up takes 10 minutes with 12 months free user access to a dedicated cloud demo platform for sensor data collection and interpretation as well as sensor data download.

www.infineon.com/connectedsensorkit

XENSIV™ MEMS microphones for consumer

High-performance analog and digital MEMS microphones for consumer electronics

Infineon's XENSIV™ MEMS microphones are designed for capturing audio signals with unprecedented precision and quality. The microphones are comprised of Infineon's MEMS microphone chips and ASICs which are not without reason the world's best-selling microphone components.

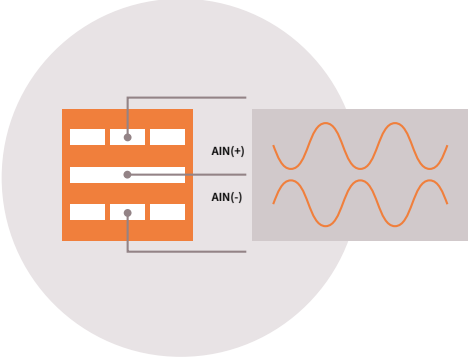


XENSIV™ MEMS microphones feature ultra-low self-noise (high SNR), extremely low distortions (THD) even at high sound pressure levels (SPL), very tight part-to-part phase and sensitivity matching, a flat frequency response with a low LFRO (low frequency roll-off) and an ultra-low group delay. Combined with selectable power modes and their very small package size, Infineon XENSIV™ MEMS microphones are a perfect match for consumer electronics with excellent audio capturing functionalities and also for selected industrial applications such as predictive maintenance and security.

Low-noise capturing of the faintest sounds	High SNR	Wide dynamic range		Robustness	Integrated ingress protection and filters for RF suppression ensure stable performance in challenging environments
Enables best-in-class transparent hearing and active noise cancelling functionality				Low power consumption	Selectable power modes for long-lasting battery life
Low signal distortions even at high sound pressure levels	High AOP			Low part variability	Better manufacturability and performance with low group delay for multi-mic applications
Handling of high signal peaks for reliable ANC performance (e.g. concerts, traffic, tap noise)				Quality	Highest qualification standards and 100% test coverage during manufacturing

Infineon's Sealed Dual Membrane (SDM) MEMS technology

Infineon's latest Sealed Dual Membrane MEMS technology delivers high ingress protection (IP57) at a microphone level. The sealed MEMS design prevents water or dust from entering between membrane and backplate, preventing mechanical blockage or electric leakage issues commonly observed in MEMS microphones. Microphones built with the Sealed Dual Membrane technology can be used to create IP68 devices, requiring only minimal mesh protection.



www.infineon.com/mems

Product portfolio

	Infineon Model	Main Features	Interface	Package size	SNR	AOP (1/10%THD)	Current	Sensitivity	LFRO
Digital	IM69D130	High SNR and high AOP	PDM	4.00 x 3.00 x 1.20 mm	69 dB(A)	128/130 dBSPL	980 µA @ 3.072 MHz	-36 dBFS	28 Hz
	IM69D120	High SNR and sensitivity	PDM	4.00 x 3.00 x 1.20 mm	69 dB(A)	118/120 dBSPL	980 µA @ 3.072 MHz	-26 dBFS	28 Hz
	IM69D127	High performance in small size	PDM	3.60 x 2.50 x 1.00 mm	69 dB(A)	123/127 dBSPL	980 µA @ 3.072 MHz	-34 dBFS	40 Hz
	IM69D128S NEW	Ultra-low current consumption	PDM	3.50 x 2.65 x 1.00 mm	69 dB(A)	125/128 dBSPL	520 µA @ 3.072MHz	-37 dBFS	30 Hz
	IM70D122 NEW	High SNR and sensitivity	PDM	3.50 x 2.65 x 1.00 mm	70 dB(A)	120/122 dBSPL	980 µA @ 3.072MHz	-26 dBFS	30 Hz
	IM72D128 NEW	Ultra-high SNR	PDM	4.00 x 3.00 x 1.20 mm	72 dB(A)	126/128 dBSPL	980 µA @ 3.072MHz	-36 dBFS	20 Hz
	IM73D122 NEW	Ultra-high SNR & sensitivity	PDM	4.00 x 3.00 x 1.20 mm	73 dB(A)	120/122 dBSPL	980 µA @ 3.072MHz	-26 dBFS	20 Hz
Analog	IM68A130 NEW	Small package and low LFRO	Single Ended	3.35 x 2.50 x 0.98 mm	68 dB(A)	118/130 dBSPL	110 µA @ 2.75 V	-38 dBV	10 Hz
	IM70A135 NEW	High SNR & high AOP	Differential	3.50 x 2.65 x 1.00 mm	70 dB(A)	132/135 dBSPL	170 µA @ 2.75 V	-38 dBV	37 Hz
	IM73A135 NEW	Ultra-high SNR & high AOP	Differential	4.00 x 3.00 x 1.20 mm	73 dB(A)	132/135 dBSPL	170 µA @ 2.75 V	-38 dBV	20 Hz

All XENSIV™ consumer microphones have bottom port. Due to SDM (Sealed Dual Membrane) XENSIV™ microphone deliver IP57 ingress protection on the component level for better manufacturability and robustness against water and dust.

Features, applications and use cases

Features
– Ultra-low self-noise / ultra-high SNR
– Selectable power modes for longer battery life
– Sealed Dual Membrane (SDM) technology with ingress protection at microphone level
– Extremely low distortions (THD) even at high sound pressure levels
– High dynamic range and very high acoustic overload points (AOP)
– Very tight part-to-part phase and sensitivity matching
– Flat frequency response with a low LFRO (low frequency roll-off)
– Ultra-low group delay for multi-mic applications
– Very small package sizes for various applications

Typical applications

- TWS earbuds
- ANC headphones
- Smart speakers
- Conference speakers
- Laptops / tablets
- Wearables
- AR/VR devices

Emerging applications

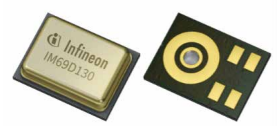
- Cameras
- Video doorbells
- Smart home
- Smart infrastructure
- Home appliances
- Industrial applications
- Medical applications

Typical use cases

- Studio quality audio capturing for communication devices
- Low latency wide band audio signal capturing for Active Noise Cancellation (ANC) and transparent hearing functionality
- Small form factor & current consumption for battery and size constraint devices
- Multi-microphone (array) based beamforming and source separation for audio zoom features and multi user audio capturing
- High range, far field voice pickup for multi room applications
- Capturing of audio signals in loud environments, such as outdoor
- Audio pattern detection for predictive and preventive maintenance and security

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For more details on the product, click on the part number, visit infineon.com or contact our product support.

Product	Description
IM69D130 	IM69D130 is a high-performance digital MEMS microphone making use of Infineon's Dual Backplate MEMS technology to deliver 105 dB dynamic range and high output linearity up to 130 dBSPL. The application benefits are crystal clear audio signals, extended pick-up distance and sensitivity to both soft and loud signals - from whispered speech to rock concerts.
IM69D120 	IM69D120 is a high-performance digital MEMS microphone making use of Infineon's Dual Backplate MEMS technology to deliver 95 dB dynamic range and high output linearity up to 120 dBSPL. If IM69D130 is used in a 16 bit audio signal chain, the full SNR performance would not be realized as the noise floor will be limited by the system dynamic range. IM69D120 has been specifically designed to preserve 69 dB(A) SNR in a 16 bit system. This is achieved by increasing the microphone sensitivity to -26 dBFS, and reducing the acoustic overload point to 120 dBSPL.
IM69D127 	IM69D127 is a digital high-performance MEMS microphone based on Infineon's new Sealed Dual Membrane MEMS technology which delivers high ingress protection (IP57) at a microphone level. Its small size of only 3.60 x 2.50 x 1.00 mm³ makes it a perfect match for compact audio devices, such as TWS earbuds.
IM69D128S 	Great signal-to-noise ratio (SNR) of 69 dB(A) enables crystal clear audio experience without compromising on battery life. Enabled by a revolutionary digital microphone ASIC, the IM69D128S sets a new benchmark by cutting current consumption to 520 µA – almost the half of what models with similar performance on the market can offer. Additionally, IM69D128S masters the art of switching between different power & performance profiles without any audible artifacts, i.e. glitches that the user can hear.
IM70D122 	High performance digital XENSIV™ MEMS microphone IM70D122 makes the most out of Infineon's Sealed Dual Membrane technology to meet a very high signal-to-noise ratio of 70 dB(A) and a very high sensitivity of -26 dBFS. Especially thanks to its high sensitivity and high SNR the IM70D122 is perfectly tailored for advanced audio capturing which can uplift the audio experience for laptops, tablets, cameras and conference systems.
IM72D128 	The IM72D128V01 is an ultra-high-performance digital microphone designed for applications which require a very high SNR (low self-noise) and low distortions (high AOP). The flat frequency response (20 Hz low-frequency roll-off) and tight manufacturing tolerance improve performance of multi-microphone (array) applications. The digital microphone ASIC contains an extremely low-noise preamplifier and a high-performance sigma-delta ADC. Different power modes can be selected in order to suit clock frequency and current consumption requirements.
IM73D122 	Ultra-low noise digital XENSIV™ MEMS microphone IM73D122 is designed for applications which require a very high SNR (low self-noise) and a high sensitivity. The flat frequency response (20 Hz low-frequency roll-off) and tight manufacturing tolerance improve performance of multi-microphone (array) applications. The powerful mix of ultra-high SNR and high sensitivity empowers high quality audio capturing for voice user interface applications in laptops, tablets or conferencing devices.
IM68A130 	The IM68A130 is a high performance, single-ended, analog MEMS microphone designed for applications which require a low LFRO (10 Hz), a high SNR (low self-noise), and low distortion (high AOP).The high signal-to-noise ratio (SNR) of 68 dB(A) enables far field and low volume audio pick-up. The flat frequency response and tight manufacturing tolerance improve the performance of Active Noise Cancellation (ANC) and multi-microphone array applications.
IM70A135 	Infineon's XENSIV™ MEMS analog microphone IM70A135 is a compact high performance microphone with a very high acoustic overload point of 135 dBSPL and a size of only 3.50 x 2.65 x 1.00 mm³. This microphone is based on Infineon's new Sealed Dual Membrane MEMS technology which delivers high ingress protection (IP57) at a microphone level. The small size makes this microphone especially suited for TWS earbud applications.
IM73A135 	Infineon's XENSIV™ MEMS analog microphone IM73A135 sets a new performance benchmark in MEMS microphones. A best-in-class signal to noise ratio (SNR) of 73 dB and a high acoustic overload point of 135 dBSPL enable clear audio pick up of the quietest and the loudest sounds. This microphone is based on Infineon's new Sealed Dual Membrane MEMS technology which delivers high ingress protection (IP57) at a microphone level. The IM73A135 allows designers to reach a level of high audio performance that was previously only achievable by ECMs while at the same time reaping the benefits inherent in MEMS technology.

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For more details on the product, click on the part number, visit infineon.com or contact our product support.

XENSIV™ MEMS microphone partners

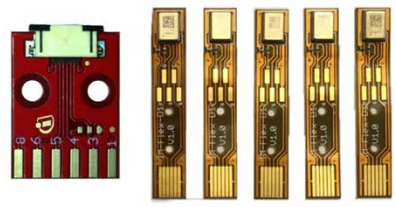
Building upon the superior XENSIV™ MEMS microphone performance, Infineon's extensive network of global partners offers customers a comprehensive portfolio of XENSIV™ MEMS microphone-based reference designs, as well as Infineon inside MEMS microphones that will propel audio performance to the next level even for the most demanding applications. Click on the buttons below to learn more about our partner solutions.





Microphone flex evaluation kits

The flex evaluation kits allow simple and easy evaluation of XENSIV™ MEMS microphones. One microphone of the respective type is mounted on each flex board. A flex board can be easily connected to an audio testing setup with the included adapter board via a 6-position ZIF connector. Each kit includes five flex boards and one adapter board.

Product	Kit	Features
	EVAL_IM69D130_FLEXKIT SP: SP002153022	– Quick and easy connection to evaluation system – Small size: 25 mm x 4.5 mm – Pre-soldered MEMS microphone – Configurable select pin configuration for digital microphones
	EVAL_IM69D120_FLEXKIT SP: SP002153026	
	KIT_IM69D127V11_FLEX SP: SP005403891	
	KIT_IM73A135V01_FLEX SP: SP005415695	
	KIT_IM72D128V01_FLEX SP: SP005429924	
	KIT_IM70A135V10_FLEX SP: SP005728204	
	KIT_IM68A130V01_FLEX SP: SP005728206	
	KIT_IM69D128SV01_FLEX SP: SP005744505	
	KIT_IM70D122V01_FLEX SP: SP005826638	

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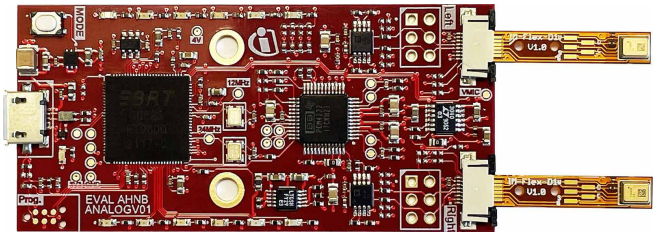
For more details on the product, click on the part number, visit infineon.com or contact our product support.

The Infineon Audiohub Nano

The Infineon Audiohub Nano enables better the evaluation of Infineon microphones. The kit includes an Infineon Audiohub Nano and four microphones on flex board. Up to two additional Infineon XENSIV™ MEMS microphones can be connected to the evaluation board in mono or stereo output. The evaluation board provides a USB audio interface to stream audio data from the microphone with any audio recording and editing software. Board comes in two different interfaces – analog and digital.

EVAL AHNB ANALOGV01

Analog XENSIV™ MEMS microphones evaluation board
SP: SP005568087



Summary of features

- Audio interface for analog XENSIVTM MEMS microphones
- Audio streaming over USB interface
- 48 kHz sampling rate
- 24-bit audio data (stereo)
- Dynamic range 120 dB
- LED indication for the configured gain level in normal mode and low power mode
- Volume unit meter display with onboard LEDs
- Powered through Micro-USB

EVAL AHNB IM69D130V01

Analog XENSIV™ MEMS microphones evaluation board
SP: SP005285852



Summary of features

- Audio streaming over USB interface
- 48 kHz sampling rate
- 24-bit audio data (stereo)
- Mode switch for toggling between normal mode and low power mode with 4 pre-defined gain configurations
- LEDs indication for the configured gain level in normal mode and low power mode
- Volume unit meter display with on board LEDs
- Powered through Micro-USB

www.infineon.com/mems

XENSIV™ digital barometric pressure sensor

for mobile and wearable devices

Infineon's digital barometric pressure sensor family is the best choice for mobile and wearable devices due to its small form factor, high precision, and low power consumption. Pressure sensing is based on capacitive technology, which guarantees ultra-high precision (±2 cm) and excellent relative accuracy (±0.06 hPa) over a wide temperature range. The sensor's internal signal processor converts the output from the pressure and temperature sensor elements to 24-bit results. Each pressure sensor has been calibrated individually and contains calibration coefficients. The coefficients are used in the application to convert the measurement results to true pressure and temperature values. All sensors have a FIFO that can store the last 32 measurements. Since the host processor can remain in a sleep mode for a longer period between readouts, a FIFO can reduce the system power consumption. Sensor measurements and calibration coefficients are available via the serial I²C/SPI interface.

DPS310

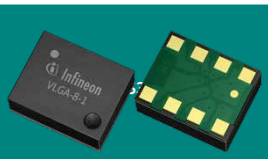
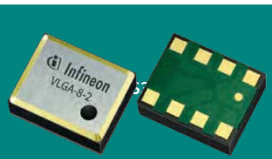
A barometric pressure sensor with very low power consumption is recommended for applications where power consumption is critical and the highest precision in pressure metering is required.

DPS368

DPS368 offers the best-in-class resolution (±2 cm), a very fast read-out speed, and low current consumption. The sensor can be used in harsh environments, as it is robust against water (IPx8 - 50 m underwater for 1 hour), dust and humidity. The small package size saves up to 80 percent of the space and makes the DPS368 ideal for mobile applications and wearable devices.

Typical applications

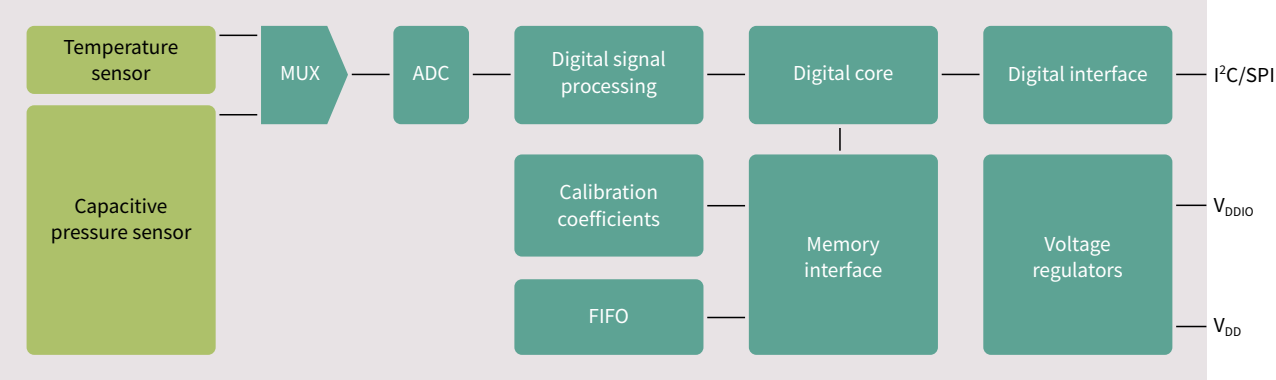
- Drones: altitude detection and height stability
- Health and fitness: accurate elevation gain and step counting (e.g. for smartwatches)
- Outdoor Navigation: GPS start-up time/accuracy improvement; dead reckoning (e.g. in tunnels)
- Indoor navigation: floor detection e.g. in shopping malls and parking garages
- Smart home: micro weather forecasting; room temperature control; intruder detection
- Airflow control: Smart filter replacement alarm (e.g. in home appliances); predictive maintenance
- Health care: fall detection; respiratory devices; smart inhalers

Key product features		
Package size	2.0 x 2.5 x 1.0 mm³	2.0 x 2.5 x 1.1 mm³
Operating pressure range	300 … 1200 hPa	
Operating temperature range	-40 … 85°C	
Pressure level precision	± 0.002 hPa (or ±0.02 m)	
Relative accuracy	± 0.06 hPa (or ±0.5 m)	
Absolute accuracy	± 1 hPa (or ±8 m)	
Temperature accuracy	0.5°C	
Pressure temperature sensitivity	0.5 Pa/K	
Measurement time	3.6 ms (low precision); 27.6 ms (standard mode)	
Average current consumption @ 1 Hz sampling rate	1.7 µA pressure measurement, 1.5 µA temp. measurement, standby 0.5 µA	
Supply voltage	V_{DDIO}: 1.2 – 3.6 V; V_{DD}: 1.7 – 3.6 V	
Operating modes	Command (manual), background (automatic), standby	
Interface	I²C and SPI, both with optional interrupt	

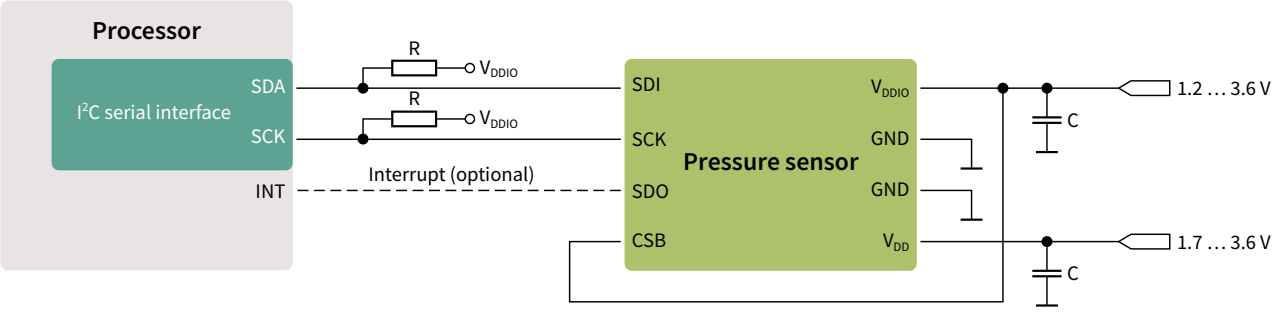
www.infineon.com/pressure-sensors-iot

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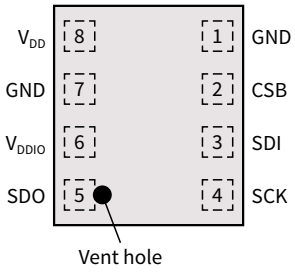
Functional block diagram



Application circuit example (in I²C configuration)



Pin configuration (top view)



Pin	Name	Function
1	GND	Ground
2	CSB	Chip select
3	SDI	Serial data in/out
4	SCK	Serial clock
5	SDO	Serial data out
6	V_{DDIO}	Digital interface supply
7	GND	Ground
8	V_{DD}	Analog supply

Infineon inside pressure sensor partners

Building upon its best-in-class technology, Infineon offers a full range of barometric pressure sensors as chipsets. Infineon's network of global partners offers customers a comprehensive portfolio of Infineon inside pressure sensors that will propel performance to the next level even for the most demanding applications.

Visit www.infineon.com/pressure-sensor-partners to learn more and purchase our partner solutions.



www.infineon.com/pressure-sensors-iot



XENSIV™ PAS CO2

High performance, small size and compliance with air quality standards - Introducing a disruptive CO_2 sensor based on photoacoustic spectroscopy (PAS)

Infineon's XENSIV™ PAS CO2 breaks the boundaries of CO_2 sensing with its exceptionally small form factor, state-of-the-art accuracy and compliance with the requirements of the international green building certification systems WELL and LEED.

Mapping Your Green Products greenmap



Measure what matters with our XENSIV™ PAS CO2 sensor

CO_2 measurement contributes to improvements in health, comfort and productivity as well as energy efficiency. Even at moderate levels, CO_2 can have a negative impact on health and productivity, causing drowsiness and headaches. Fortunately, smart indoor air quality sensors can "smell" rising levels of CO_2 and either alert the user or trigger a system response. Given the correlation between CO_2 and aerosol concentration, CO_2 sensors can contribute to mitigating the transmission of not only COVID-19 but also other airborne illnesses such as the common cold and influenza. Moreover, as part of the global effort to pursue decarbonization, methods for improving the energy efficiency of buildings are being widely adopted. Continuous and accurate measurement of CO_2 concentrations are key to ensure compliance with the highest air quality standards such as WELL, LEED and ASHRAE and to enable significant reductions in energy demand and utility costs through Demand Control Ventilation (DCV).

Accurate, real-time CO_2 measurement thanks to superior MEMS technology

Widespread adoption of real CO_2 sensors has so far been hampered by size, performance and cost constraints. Infineon's XENSIV™ PAS CO2 sensor leverages photoacoustic spectroscopy (PAS) technology to provide an exceptionally small, real CO_2 sensor that is both highly accurate and cost-effective. Infineon's leading position in MEMS technology is the foundation for this unique and accurate CO_2 detection approach. Reliable CO_2 measurement enables smart monitoring of indoor air quality, facilitating improvements in health, productivity and overall well-being. These features make the XENSIV™ PAS CO2 sensor ideal for demand-controlled ventilation and air conditioning applications (HVAC) as well as for integration into consumer IoT devices such as air purifiers, thermostats, baby monitoring devices, wake-up alarms and smart speakers.

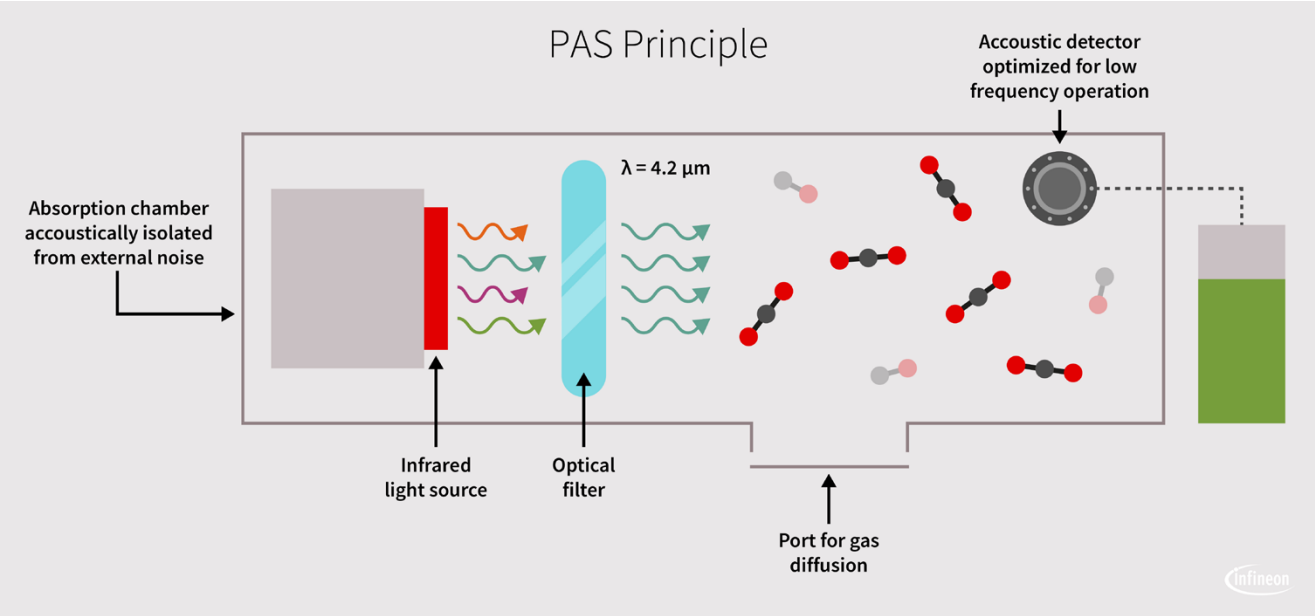
Disruptive environmental sensor technology from Infineon

XENSIV™ PAS CO2 integrates on the PCB a photoacoustic transducer, including an acoustic detector, infrared source and optical filter; a microcontroller for signal processing and a MOSFET chip to drive the infrared source. The exceptional sensitivity of the acoustic detector coupled with the integrated PCB design reduce space requirements by more than 75 percent compared to nowadays state-of-the-art NDIR CO_2 sensors.

www.infineon.com/CO2

The PAS (photoacoustic spectroscopy) principle

The sensor is characterized by a disruptive measurement principle called PAS (photoacoustic spectroscopy). It works as follows: pulses of infrared light pass through an optical filter tuned to the CO_2 absorption wavelength. The CO_2 molecules absorb the filtered light, causing them to shake and generate a pressure wave with each pulse. This is called the photoacoustic effect. The sound is then detected by an acoustic detector optimized for low frequency operation and converted to a CO_2 concentration reading by the microcontroller.



Features and benefits

Key features	Key benefits
– Exceptionally small form factor (14 x 13.8 x 7.5 mm³)	– Space savings in customers' end products
– High accuracy (±30 ppm ±3% of reading)	– High quality data, energy and cost savings, compliance with green building standards
– SMD package delivered in tape and reel	– Cost-effective high-volume assembly and easy system integration
– Advanced compensation and self-calibration algorithms	– Plug & play for fast design-to-market
– Various configuration options (e.g. sampling rate, baseline calibration) and interfaces (UART, I²C, PWM)	– Customer flexibility

Applications

- HVAC (Heating, Ventilation and Air Conditioning) systems
- Smart home appliances such as thermostats, air conditioners and air purifiers
- Consumer devices for air quality monitoring such as smart speakers, personal assistants and CO_2 traffic lights
- Smart indoor lighting and conference systems



www.infineon.com/CO2

Smart speaker · Thermostat · Conference system · Smart home · HVAC flap · Smart building · Smart lighting

For more details on the product, click on the part number, visit infineon.com or contact our product support.

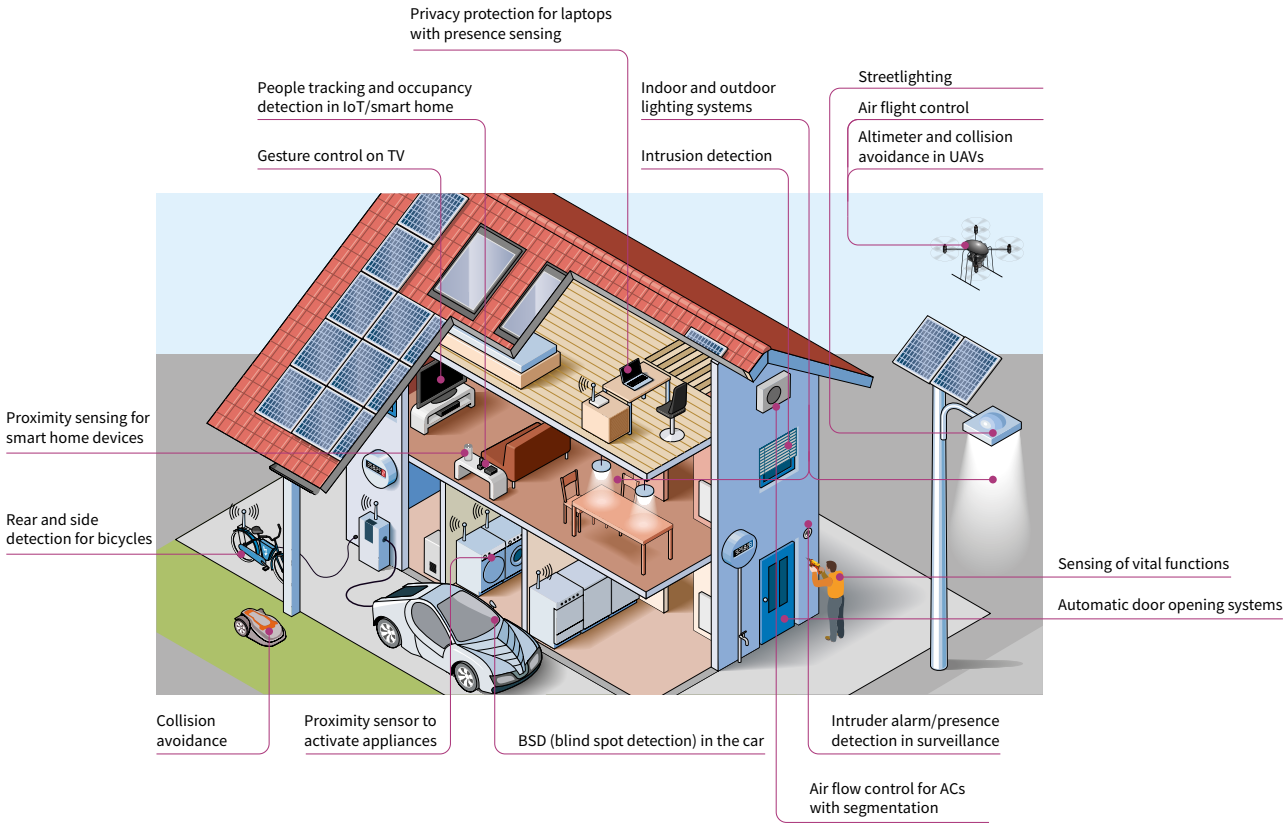
XENSIV™ radar sensors for consumer and IoT applications

As market leader in radar chips, we offer a wide portfolio of mmWave radar sensors as part of our XENSIV™ sensor family – including Doppler radar as well as FMCW radar systems. This portfolio includes the smallest 24 GHz MMIC in the market as well as the most integrated and largest 24 GHz radar transceiver family currently available. These radar chips are designed to support different industrial, smart home, and consumer applications. In addition, we also offer radar sensors in the 60 GHz range, which are used in consumer products such as the Google Pixel 4 smartphone.

Motion detection with radar offers significant advantages over PIR and other motion-sensing technologies

With our 24 and 60 GHz radar sensors, we cover a wide range of applications. Many of them are based on motion detection triggering systems like lighting solutions, automatic doors, camera and security systems, or smart home devices. In contrast to other motion detection technologies like PIR, radar technology offers significant advantages. These include smaller system sizes, greater accuracy, and more precise measurements of detected objects. In addition, radar can also determine the direction of a moving object, speed of an object, distance, and depending on the antenna configuration, even the position of a moving object.

Applications for Infineon's radar sensors

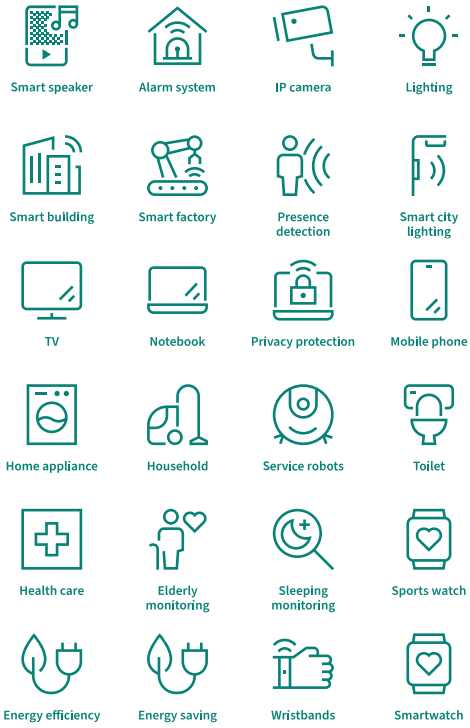


www.infineon.com/radar-for-iot

Key benefits of radar sensing

- Direction, proximity, and speed detection
- Segmentation and tracking functionalities
- Target positioning
- Detection through non-conductive materials
  - Product design flexibility
  - Anonymous sensing
- Maintains operation through harsh environmental conditions such as rain, snow, fog, dust, etc.
- Sensitive enough to capture breathing and heartbeat
  - Radar can feel presence & vital functions
- Radar performance parameters can be adjusted
  - Adaptable to different application requirements

Applications



New application or simple PIR replacement? Radar has it covered.

Radar, used in motion detection applications, increases accuracy when compared to passive infrared (PIR) technology, allowing more precise measurement of object detection, and providing new capabilities such as the detection of speed and the direction of moving objects. Radar is also superior to camera-based systems by allowing detection of the objects while keeping identities anonymous.

Example applications that can benefit from radar technology

Smart home



Robust, discreet, small

Door opening



Direction of travel to remove false opening

Security



Privacy protection, and increased accuracy

Lighting



Indoor and outdoor Resistant to harsh weather

Monitors and laptops



Small, hidden, sensitive

Home appliances



Activate displays based on presence around

Air conditioners



Track people to move the airflow away from them

Smart speaker



Eliminate keyword based activation

TV



Safe energy & OLED lifetime by turning off

Gaming and VR



Enhance gaming experience

Gesture control



Additional gesture package available

Material detection



Object recognition and classification

Service robots



Robust, small footprint, accurate

Robotics



Safety, accuracy and efficiency

Vital sensing



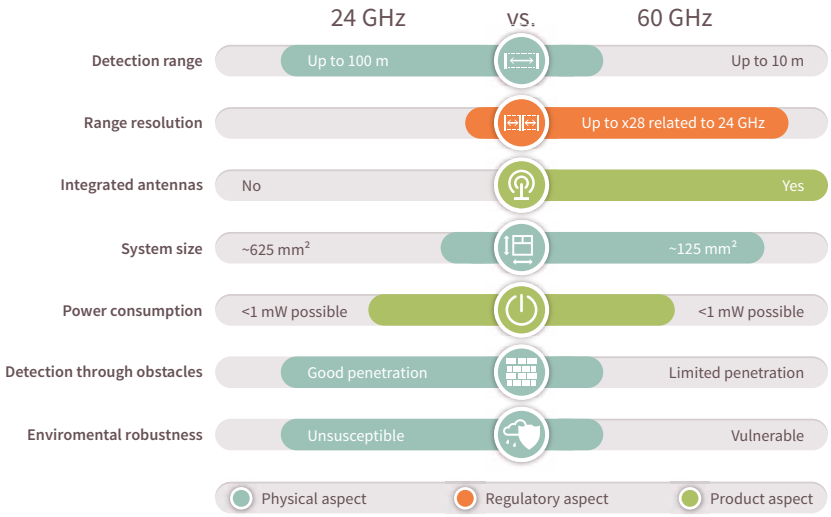
Breathing & heart rate measurement

www.infineon.com/radar-for-iot

When to use 24 GHz or 60 GHz radar technology

In the 24 GHz range, the bandwidth for FMCW radar operations covers 250 MHz within the regulated ISM band. In the 60 GHz regime, an unlicensed ultra-wideband of up to 7 GHz can be used for short-range applications. Consequently, 60 GHz FMCW radar systems can offer a better resolution and therefore allow additional use cases such as human tracking and segmentation. Even gesture control, material classification, or the monitoring of various vital functions (respiration, heartbeat, or even blood pressure) is possible with radar technology due to micromotion detection.

XENSIV™ radar sensors for industrial and consumer applications



Partners

Click this link to view our network of partners who provide modules and design support for all 24 GHz industrial applications:



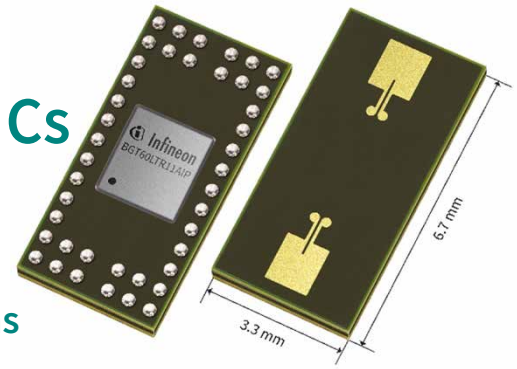
Have questions?

Visit our Community to inquire, share, and connect:



www.infineon.com/radar-for-iot

XENSIV™ 60 GHz radar sensor ICs



Infineon's innovative XENSIV™ 60 GHz radar chip enables things to see and revolutionizes the human-machine interface.

BGT60LTR11AIP for consumer and IoT applications

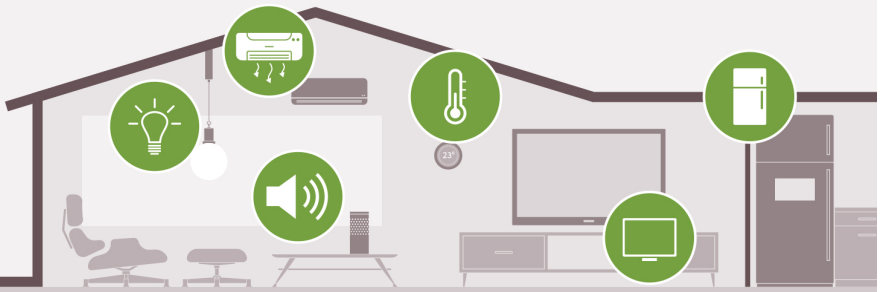
The BGT60LTR11AIP is a fully integrated microwave motion sensor including Antennas in Package (AIP) as well as built-in detectors for motion and direction of motion. A state machine enables operation of the device without any external microcontroller. In this autonomous mode, it detects a human target up to 7 m with a low power consumption of less than 2 mW. The BGT60LTR11AIP enables radar technology for everyone, since it does not require know-how in RF, antenna design, or radar signal processing. These features make the small-sized radar solution a compelling smart and cost-effective replacement for conventional PIR sensors in low power or battery-powered applications. Also, with its small form factor, Infineon's highly integrated radar sensor solutions bring innovative, intuitive sensing capabilities to many applications.

Radar has been demonstrated to be a powerful sensor for short-range motion detection. Through reliable presence and absence detection, smart devices equipped with radar sensors become more energy efficient and therefore smart and more sustainable. Users can also benefit from vacancy detection in applications such as televisions. For example BGT60LTR11AIP has been implemented in Samsung's Frame TV 2021, which puts the TV from art mode into sleep mode when there is no person nearby for a user-specified time. This function not only saves energy, but also displays lifetime. BGT60LTR11AIP has a high sensitivity and can detect if a person is present and if the device needs to be ready – similar to a screensaver that deactivates the PC monitor after a certain time without mouse or keyboard input and reactivates it as soon as new input is noticed.

Through this reliable presence and absence detection, Infineon's 60 GHz radar powers the design of truly smart, energy-saving devices. Find out more at: www.infineon.com/green-energy

Radar sensor for smart devices – huge energy-saving potential

By using highly sensitive Infineon radar sensors[1], smart devices are able to detect the presence and absence of people. Thus, radar-supported smart devices can automatically switch between on mode and energy-saving deep sleep mode.



300 million smart home households worldwide in 2022[2]

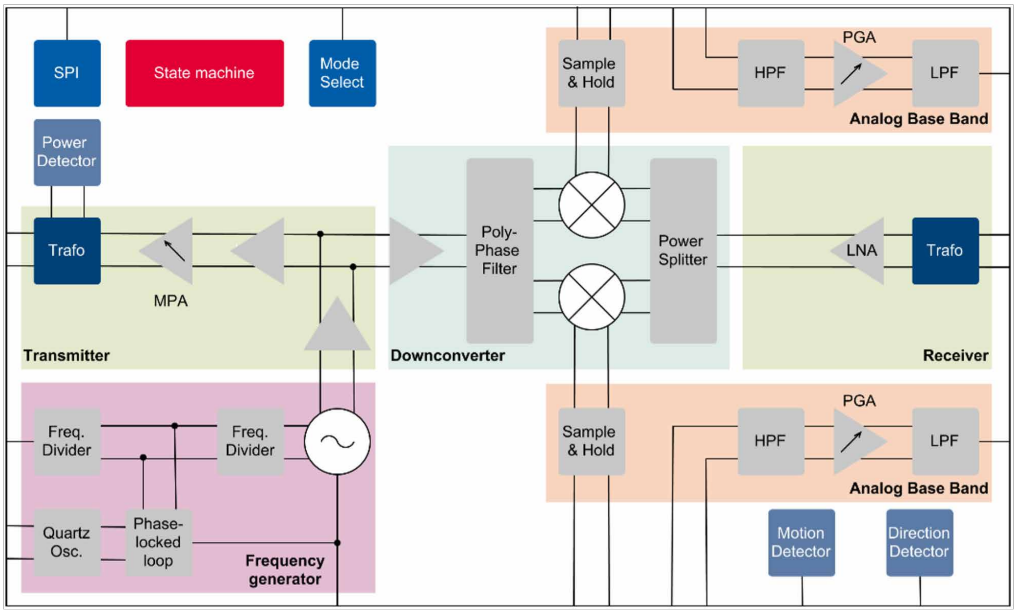
Assumption: **5 smart devices** per household, equipped with **radar sensors**	**Average energy savings** per device per day = 100 Wh[3]	Energy-saving potential per household per day = 0.5 kWh (≙ 5% of its entire energy consumption[4])	Cumulative **energy-saving potential** for 300 million smart households worldwide = **55 TWh per year**	Annual energy production of **5,000 wind power turbines**[5]

1 Infineon XENSIV™ 60 GHz radar sensor, www.infineon.com/60GHz
2 Source: Statista
3 Average out of a wide saving range. From a single watt (e.g. putting a device from stand-by to a deeper sleeping mode) to 100 watts and more (e.g. turning off a TV while nobody is in the room)
4 Assumption: 3-person household with 3,500 kWh energy consumption per year
5 Assumption: Average energy production of a wind turbine = 10 GWh

www.infineon.com/BGT60LTR11AIP

For more details on the product, click on the part number, visit infineon.com or contact our product support.

Block diagram of the BGT60LTR11AIP



Key features

- 3.3 x 6.7 x 0.56 mm³ package size
- 1Tx 1Rx Antennas in Package (AIP) with 80 ° field of view
- Built-in motion detector
- Built-in direction of motion detector
- Multiple modes of operation including. a completely autonomous mode
- Adjustable performance parameters: detection sensitivity, hold time and frequency of operation
- FR4 material for PCB design is sufficient

Key benefits

- Autonomous mode:
  - Up to 7 m detection range
  - Less than 2 mW power consumption
  - Requires minimal external circuitry incl. crystal, LDO and some resistors capacitors

Adding a M0 MCU extends flexibility

- Up to 14 m detection range (SPI mode)
- Less than 2 mW power consumption possible

Target application

- Smart building and smart home
- Home appliances
- Smart home security
- Room air conditioners
- Automated door openers
- Smart entrance counter solution
- Displays such as TVs, monitors, laptops or tablets
- Lighting systems and lighting control

www.infineon.com/BGT60LTR11AIP

Product portfolio

Product	SP	OPN	Package	Description	Status
BGT60LTR11AIP	SP005537624	BGT60LTR11AIPE6327XUMA2	PG-UF2BGA-42-1	Chip samples	Available
DEMO BGT60LTR11AIP	SP005422969	DEMOBGT60LTR11AIPTOBO1		Demonstration Kit (Shield + 60 GHz baseboard)	Available
SHIELD_BGT60LTR11AIP	SP005422968	SHIELDBGT60LTR11AIPTOBO1		Shield fitting on 60 GHz baseboard	Available
SHIELD_AUTONOM_BGT60	SP005630363	SHIELDAUTONOMBGT60TOBO1		Shield for autonomous operation of BGT60LTR11AIP; directly fits on Arduino MKR board	Available
REF_60LTR11_AUTO	SP005636053	REFBGT60LTR11AIPTOBO1		Reference design (autonomous mode)	Upcoming
S2GO RADAR BGT60LTR11	SP005594890	S2GORADARBGT60LTR11TOBO1		Shield2Go version	Upcoming
REF_BGT60LTR11AIP_M0	SP005894766	REFBGT60LTR11AIPM0TOBO1		Reference design (with M0 MCU)	Upcoming

DEMO BGT60LTR11AIP

For evaluation of the completely autonomous 60 GHz radar sensor MMIC for motion sensing



This demo features Infineon's first completely autonomous radar sensor – the BGT60LTR11AIP. The 60 GHz radar MMIC is a fully integrated microwave motion sensor including Antennas in Package (AIP) as well as integrated detectors for motion and direction of motion. A state machine enables operation of the device without any external microcontroller. In this autonomous mode, it detects a human target up to 7 m with a low-power consumption of less than 2 mW. These features make the small-sized radar solution a compelling, smart and cost-effective replacement for conventional PIR sensors in low-power or battery-powered applications.

For evaluation of the BGT60LTR11AIP MMIC, this demo includes the BGT60LTR11AIP shield as well as the Infineon Radar Baseboard MCU7.

The BGT60LTR11AIP shield can be attached to an Arduino MKR board or the included Infineon Radar Baseboard MCU7. Infineon's Toolbox supports this platform with a demonstration software and a Radar GUI to display and analyze acquired data in time and frequency domain. It further enables to change various performance parameters of the BGT60LTR11AIP in order to evaluate this radar sensor.

www.infineon.com/BGT60LTR11AIP

BGT60TR13C – XENSIV™ 60 GHz radar sensor for advance sensing

Enablement of horizontal and vertical angular measurement

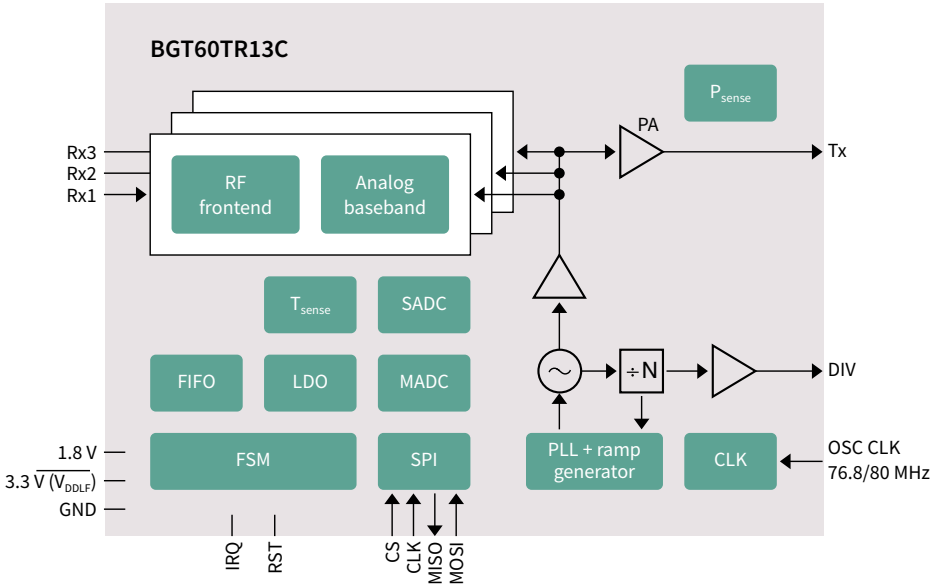
The BGT60TR13C MMIC is a 60 GHz radar sensor with integrated antennas and comes with one transmitting and three receiving antennas. Thanks to the Antennas in Package (AIP) concept, the antenna design complexity at the user end can be eliminated and the PCB designed with standard FR4 materials.

BGT60TR13C offers innovative and intuitive sensing capabilities

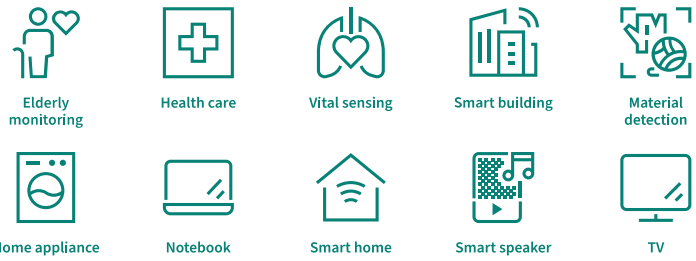
With its small form factor and low power consumption, BGT60TR13C MMIC brings innovative, intuitive sensing capabilities to many applications. Based on the developed algorithm the MMIC can serve established as well as new applications and use cases without intruding on privacy. Thanks to its feature-set, the MMIC can measure velocity, angle, horizontal as well as vertical.

BGT60TR13C has been demonstrated to be a powerful sensor for:

- Presence detection/segmentation/tracking: BGT60TR13C enables human presence detection, tracking, and segmentation while providing extremely high accuracy in detecting micro and macro motions
- Gesture Sensing: BGT60TR13C ensures detection of submillimeter motions
- Vital sensing: BGT60TR13C is able to track vital signs in consumer electronics, healthcare as well as industrial applications



Target applications



www.infineon.com/BGT60TR13C

For more details on the product, click on the part number, visit infineon.com or contact our product support.

Features and benefits

Key features	Key benefits
– Integrated Finite-State-Machine (FSM)	– FSM for flexible configuration of the radar sensor to manage modulation and power modes
– Ramp up speed of 400 MHz/µs	– Achievement of higher doppler velocity
– High Signal-To-Noise Ratio (SNR)	– Detection of people up to 15 m (front facing)
– High bandwith >5 GHz	– Very good range resolution of down to ~3 cm
– High sensitivity	– Detection of sub-milimeter movements
– Package: 6.5 x 5.0 x 0.9 mm³	– Thanks tot the small package size, PCB area can be saved and the design-in process simplified
– <5 mW (duty cycling according to released FCC waiver)	– Lowest power consumption, thanks to optimized power modes during sensor operation. Further reduction of average power consumption ensured via DC duty cycling

Product portfolio

Product	SP No.	OPN No.
DEMO BGT60TR13C	SP005728718	DEMOBGT60TR13CTOBO1
BGT60TR13C	SP002262606	BGT60TR13CE6327XUMA1

DEMO BGT60TR13C
Getting started with the XENSIV™ 60G Hz demo board for advanced sensing

BGT60TR13C offers innovative and intuitive sensing capabilities

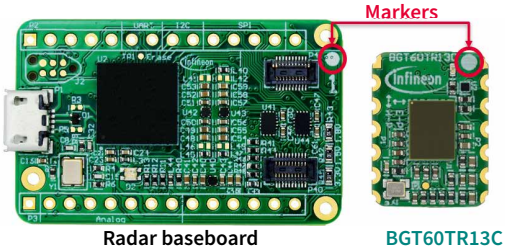
This demo board features Infineon's XENSIV™ 60 GHz radar sensor BGT60TR13C and consists of a radar baseboard as well as a BGT60TR13C shield.

The radar baseboard is a 40.64 x 25.4 mm² printed circuit board (PCB). Its main purpose is to provide a generic sensor interface for BGT60TR13C MMIC. The central microcontroller unit (MCU) can perform radar data processing or forward the sensor data to a USB interface or an Arduino MKR interface.

The BGT60TR13C shield presents a minimized form factor of 17 x 12.7 mm² and comes with an integrated BGT60TR13C Antenna-in-Package (AIP) radar chip of 6.5 x 5.0 x 0.85 mm³. Moreover, the shield contains a digital interface for configuration and transfer of the acquired radar data to a microcontroller board. The shield is optimized for fast prototyping designs and system integrations as well as initial product feature evaluations. In addition, it offers developers the flexibility to choose their own platform depending on their preferred use cases.

Several benefits come along with the BGT60TR13C demoboard:

- Flexible platform selection
- Variable connector options, and option to solder onto other PCBs
- Highly flexible configuration on FMCW modulation
- Power consumption can be optimized according to use case



Radar baseboard

BGT60TR13C shield

www.infineon.com/BGT60TR13C

For more details on the product, click on the part number, visit infineon.com or contact our product support.

Automotive radar 60 GHz

XENSIV™ 60 GHz radar sensor for automotive enables highly reliable in-cabin monitoring systems

XENSIV™ BGT60ATR24C, an automotive 60 GHz radar sensor, enables ultra-wide bandwidth FMCW operation in a small package. Sensor configuration and data acquisition are enabled with a digital interface and the integrated state machine enables independent data acquisition with power mode optimization for lowest power consumption.

Summary of features

- 60 GHz radar sensor for FMCW operation
- 4 GHz bandwidth
- 2Tx/4Rx channels
- Digital interface for chip configuration and radar data acquisition
- Optimized power modes for low-power operation
- Integrated state machine for independent operation
- AEC-Q100/101 qualified

Benefits

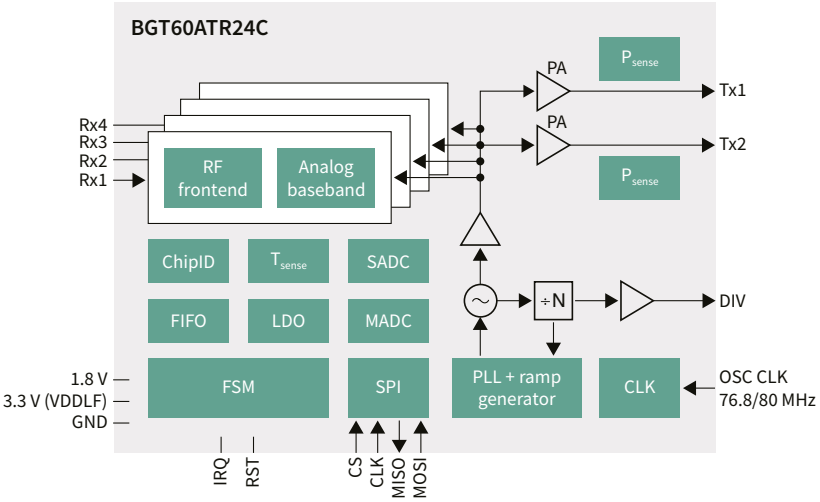
- Low power consumption
- Accurate and robust performance
- Excellent thermal management
- Size and space optimized solution

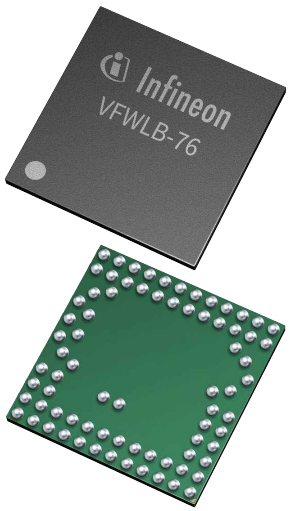
Potential applications

- Radar frontend for gesture sensing
- High resolution FMCW radars
- Short range sensing operations
- Hidden sensing applications behind radome

60 GHz – Product overview

Product	Frequency [GHz]	SP number	Packages
BGT60ATR24C	58 – 62	SP005350514	VFWLB-76-1
SHIELD_60ATR24ES_01	58 – 62	SP005448216	VFWLB-76-1





www.infineon.com/radar

For more details on the product, click on the part number, visit infineon.com or contact our product support.

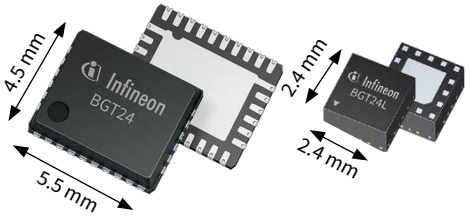
XENSIV™ 24 GHz radar sensor ICs

Infineon BGT24M/L family of MMIC chips

Infineon's range of 24 GHz industrial radar chips provides five configurations of transmit and receiver channels, ensuring that there is a chip to support your specific application. From basic applications such as motion detection in security systems, which only requires one transmit and one receive channel, to more complex applications like 3D positioning, which requires two or more receive channels, our range of radar chips supports all of your requirements.

Features	Infineon MMIC	Benefits

- 24 GHz ISM band operation for motion, speed, direction movement and distance measurements
- Five 24 GHz chips available
- Highly integrated MMICs

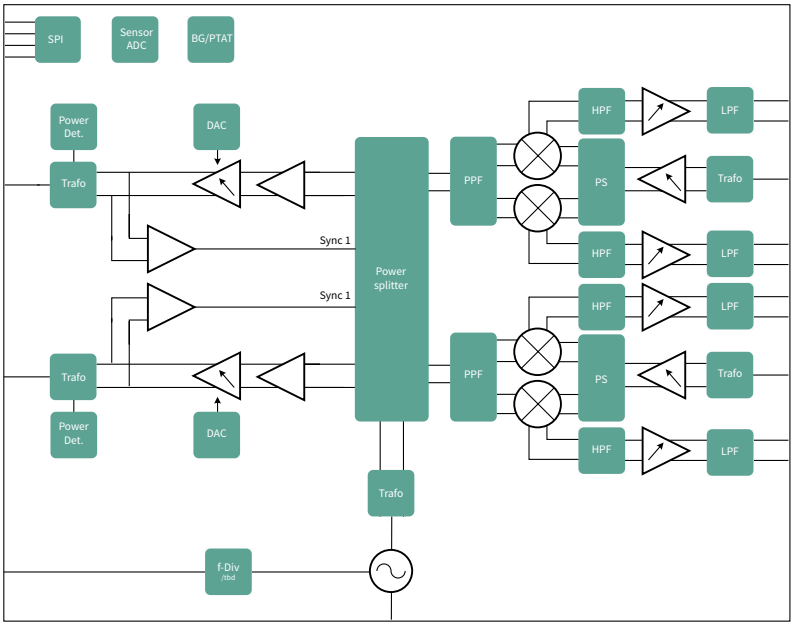


- Long-range distance detection of moving objects up to 50 m
- Wide range speed detection up to ±100 km/h
- Low BOM costs

Product	Configuration	Features
BGT24MTR11	1Tx + 1Rx	– Measures, not just motion, but also speed, direction, and distance – Small form factor – Resistance to moisture, dirt, and temperature – Increased area coverage – Discrete design – Low power MMICs for energy saving – Privacy protection – Adaptable to different application requirements – Highly integrated chips eliminating costly external components
BGT24MR2	2Rx	
BGT24MTR12	1Tx + 2Rx	
BGT24LTR11N16	1Tx + 1Rx	
BGT24LTR22	2Tx + 2Rx	

The BGT24LTR22 key features

- 24 GHz transceiver MMIC
- Fully integrated low phase noise VCO
- Integrated analog base band stage with programmable gain and filter settings
- Bi-directional pin for synchronization
- Built in temperature compensation circuit for VCO stabilization, no PLL needed
- Low power consumption
- Fully ESD protected device
- Single ended RF and IF terminals
- Single supply voltage 1.5 V



www.infineon.com/24GHz

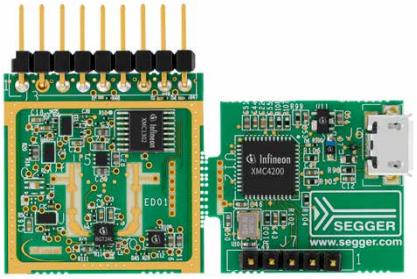
For more details on the product, click on the part number, visit infineon.com or contact our product support.

24 GHz evaluation and demonstration boards

In addition to the BGT24M/L family of MMIC chips, Infineon provides a continuously expanding range of evaluation and demonstration boards to support the testing and development of radar in multiple applications of our customers. All boards are provided with base-level software to support the ease of use and faster time-to-market integration.

Features	Infineon development kit	Benefits

- Four system boards available
- All include 24 GHz radar chip and XMC™ microcontroller
- Kit contains user manual, GUI, MATLAB compiler and Gerber files
- Software available via Infineon Toolbox



Demonstrator with SW support

- Capability to detect motion, speed and direction of movement (approaching or retreating)
- distance and angle of arrival based on hardware
- Fast prototyping with available software

Sense2GoL Pulse (BGT24LTR11 +)	Distance2GoL (BGT24LTR11 +)
– Capability to detect motion, speed, and direction of movement (approaching or retreating) – Detection range of 18 m for a human target at a power consumption < 5 mW – High sensitivity of detection in comparison to PIR – Arduino compatible microcontroller board (Arduino standard connectors) – Modulation parameters can be changed to suit the application requirements – Multiple current sensors for current consumption monitoring and optimization – Integrated multiple-element patch antennas	– Capability to detect the distance of the closest human target – Capability to detect motion, speed, and direction of movement (approaching or retreating) – Very low power consumption due to duty cycling options – Operates in harsh environments and detects through non-metallic materials – BGT24LTR11 – 24 GHz highly integrated RF MMIC – XMC4700 Arm® Cortex®-M4 –32-bit industrial microcontroller – Debug over Cortex 10 pin debug connector – Microstrip patch antennas with – 10 dBi gain and 29°/80° field of view
– Main applications – Security – Indoor and outdoor lighting – Smart home – Automatic door opener – Intelligent switches – Speed measurement	– Main applications – Smart Home devices – Indoor and outdoor lighting systems – Unmanned aerial vehicles (UAV) – Security systems from commercial surveillance to low-power IP cameras – HVAC products like smart air conditioners – Smart sanitary facilities (eg Smart Toilets)
– Board dimensions – Board 55 mm x 85 mm – Shield: 55 mm x 66 mm	– Board dimensions – Board 55 mm x 85 mm – Shield: 55 mm x 66 mm
– Kit contents – RF radar shield: SHIELD_BGT24LTR11 – Programmed controller board: RADAR BB XMC4700 – Micro USB cable – SW GUI to operate kit – Doppler FW and SW [1] – Schematic and bill-of-materials of module	– Kit contents – RF radar shield: SHIELD_BGT24LTR11 – Programmed controller board: RADAR BB XMC4700 – Micro USB cable – SW GUI to operate kit – Doppler FW and SW [1]

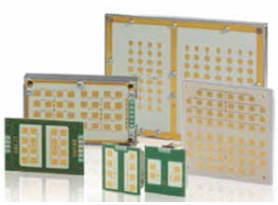
www.infineon.com/24GHz

1) Usage of the FMCW and/or Doppler FW and SW requires agreeing to Infineon's user's agreement and licensing terms.

For more details on the product, click on the part number, visit infineon.com or contact our product support.

24 GHz modules

Partnering with the leading radar solution providers enables Infineon to connect our customers looking for turnkey solutions and design support for a complete range of applications. Utilizing our strong network of partners, the radar portfolio is extended to include a range of easy-to-integrate modules. Each of them contains Infineon's 24 GHz MMIC.

Features	Partner modules using Infineon chips	Benefits
– Complete module, including radar MMIC, antenna options, MCU signal processing options, and SW options (Doppler, FSK and FMCW versions available)	 Module (RF module; RF module + MCU including SW)	– Ease of design – Turnkey solution, no need for test and certification

By integrating Infineon's 24GHz MMIC chip into the partners easy-to-use and simple-to-integrate modules the complexity and time to market for a range of applications such as smart home automation, camera & security systems, air conditioners, UAVs, robotics, and smart lighting, are reduced.

www.infineon.com/24GHz

For more details on the product, click on the part number, visit infineon.com or contact our product support.

Smallest, fully featured, budget-priced evaluation boards

Shield2Go

Security

Product name: OPTIGA™ Trust E Security Shield2Go
Sales name: S2GO_Security_OPTIGA_E
Ordering code: SP001820138

Product information

Product name: OPTIGA™ Trust X Security Shield2Go
Sales name: S2GO SECURITY OPTIGA X
Ordering code: SP002349576

Product information

Sensors

Product name: IM69D130 Microphone Shield2Go
Sales name: S2GO MEMSMIC IM69D
Ordering code: SP002851544

Product information

Product name: PASCO2V01 Shield2Go
Sales name: SHIELD PASCO2 SENSOR
Ordering code: SP002851544

Product information

Product name: S2GO Pressure Sensor DPS310
Sales name: S2GO_PRESSURE_DPS310
Ordering code: SP001777630

Product information

Product name: S2GO Pressure Sensor DPS368
Sales name: S2GO PRESSURE DPS368
Ordering code: SP005338022

Product information

Product name: TLE493DW2B6 3DSense Shield2Go
Sales name: S2GO_3D_TLE493DW2B6-A0
Ordering code: SP004308594

Product information

Product name: TLE4964-3M Hall Sense Shield2Go
Sales name: S2GO_HALL_TLE4964-3M
Ordering code: SP004308590

Product information

www.infineon.com/sensors2go
www.infineon.com/makers

For more details on the product, click on the part number, visit infineon.com or contact our product support.

Shield2Go

Sensors

Product name: TLE4966K Double Hall Shield2Go
Sales name: S2GO_2_HALL_TLE4966K
Ordering code: SP004308598

Product information

Product name: TLI493D-W2BW 3D Sense Shield2Go in small WLB-5 package (1.13 mm x 0.93 mm x 0.59 mm)
Sales name: S2GO_3D_TLI493DW2BW-A0
Ordering code: SP005410385

Product information

Product name: TLI4971 Current Sense Shield2Go
Sales name: S2GO_CUR-SENSE_TLI4971
Ordering code: SP005345472

Product information

Product name: TLV493D 3D Sense Shield2Go
Sales name: S2GO_3D-SENSE_TLV493D
Ordering code: SP001823678

Product information

Microcontroller

Product name: XMC 2Go Kit
Sales name: KIT_XMC_2GO_XMC1100_V1
Ordering code: SP001199544

Product information

MyIoT – Adapter

Product name: MyIoT Adapter
Sales name: MYIOTADAPTERTOBO1
Ordering code: SP002434972

Product information

www.infineon.com/sensors2go
www.infineon.com/makers

For more details on the product, click on the part number, visit infineon.com or contact our product support.

Sensor 2GO kits

Automotive pressure sensor 2GO kit
Product name: KP215F1701-PS2GO-KIT/ KP229E3518-PS2GO-KIT/ KP236-PS2GO-KIT/KP254-PS2GO-KIT/ KP275-PS2GO-KIT
Ordering code: SP002676652/SP002676656/ SP002676664/SP002676664/ SP002676648

Product information

3D magnetic sensor 2GO kit
Product name: TLE493D-A2B6 MS2GO/ TLE493D-W2B6 MS2GO/ TLV493D-A1B6 MS2GO
Ordering code: SP001707582/SP001707578/ SP001707574

Product information

TLI4971 current sensor 2GO kit
Product name: TLI4971_MS2GO
Ordering code: SP005345474

Product information

Speed sensor 2GO kit
Product name: TLE4922 MS2GO
Ordering code: SP003029974

Product information

Angle sensor 2GO kit
Product name: TLE5012B_E1000_MS2GO/ TLI5012B_E1000_MS2GO/ TLE5012B_E5000_MS2GO/ TLE5012B_E9000_MS2GO
Ordering code: SP002133956/ SP002133960/ SP002133964/ SP002133968

Product information

Microphone flex evaluation kits
Product name: EVAL_IM69D130_FLEXKIT/ EVAL_IM69D120_FLEXKIT/ EVAL_IM69D127_FLEXKIT/ EVAL_IM73D135_FLEXKIT/ EVAL_IM72D128_FLEXKIT/ EVAL_IM70A135_FLEXKIT/ EVAL_IM67D120_FLEXKIT/ EVAL_IM67D130_FLEXKIT
Ordering code: SP002153022/SP002153026/SP005403891/ SP005415695/SP005429924/SP005728204/ SP005560671/SP005537489

Product information

XENSIV™ – TLE4966 Hall switches 2GO kit
Product name: TLE4966 MS2GO
Ordering code: SP005406992

Product information

www.infineon.com/sensors2go
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For more details on the product, click on the part number, visit infineon.com or contact our product support.

Add ons for Sensor 2GO kits and Shield2Go

Joystick for all 3D Magnetic Sensor 2GO kits and Shield2Go
Product name: JOYSTICK FOR 3D 2 GO KIT
Ordering code: SP001491834

Product information

Rotate knob for all 3D Magnetic Sensor 2GO kits, Angle Sensor 2GO kits and 3D Magnetic Sensor Shield2Go
Product name: ROTATE KNOB 3D 2 GO KIT
Ordering code: SP001504602

Product information

Linear slider for all 3D Magnetic Sensor 2GO kits and Shield2Go
Product name: LINEAR-SLIDER 2GO
Ordering code: SP002043034

Product information

Out of shaft adapter for all 3D magnetic sensor 2GO kits and Shield2Go
Product name: OUT OF SHAFT FOR 3D 2 GO
Ordering code: SP003475178

Product information

Linear control trigger for all 3D magnetic Sensor 2GO Kits and Shield2Go
Product name: POWER_DRILL2GO
Ordering code: SP005350194

Product information

Human Machine Interface (HMI) direction indicator for all 3D magnetic sensor 2GO Kits and Shield2Go
Product name: DIR_INDICATOR2GO
Ordering code: SP005350196

Product information

HMI mini control with 4 directions and 360° rotation for all 3D magnetic sensor 2GO Kits and Shield2Go
Product name: MINI_CONTROL2GO
Ordering code: SP005350192

Product information

OpenClose Adapter for Hall switch Shield2Go
Product name: OPENCLOSE2GOHSTOBO1

Product information

Play2Go for 3D magnetic sensor
Product name: PLAY2GO
Ordering code: SP005731811

Product information

Contactless switch array for all 3D magnetic sensor 2GO kits and Shield2Go

Product information

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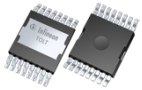
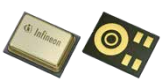


Packages

- Surface mount device (SMD) technology
- Through-hole device (THD) technology

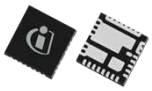
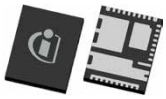
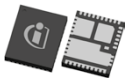
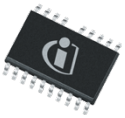
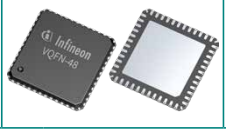
Packages

Surface mount device (SMD) technology

DPAK (TO-252-2)		DPAK (TO-252)		DPAK 5-pin (TO-252)		DDPAK (TO-252)		QDPAK TSC		QDPAK BSC	
2	9.9 x 6.5 x 2.3	3	9.9 x 6.5 x 2.3	5	9.9 x 6.5 x 2.3	10	20.96 x 6.5 x 2.3	22	20.96 x 15.0 x 2.3	22	0.96 x 15.0 x 2.3
											
D2PAK (TO-263)		**D2PAK (TO-263-2)**		**TO263-7-11**		**TO263-7-12**		**TO263-7-13**		**D2PAK 7-pin (TO-263)**	
3	15.0 x 10.0 x 4.4	2	15.0 x 10.0 x 4.4	7	15.0 x 10.0 x 4.4	7	15.0 x 10.0 x 4.4	7	15.0 x 10.0 x 4.4	7	15.0 x 10.0 x 4.4
											
TO-Leadless (TOLL)		**TOLT (top-side cooling)**		**TOLG (Gullwing leads)**		**sTOLL**		**SC59**		**SOT-23**	
8	11.7 x 9.9 x 2.3	16	15.0 x 9.9 x 2.3	8	11.7 x 9.9 x 2.3	5	8.0 x 7.0 x 2.3	3	3.0 x 2.8 x 1.1	3	2.9 x 2.4 x 1.0
											
SOT-23-5		**SOT-23-6**		**SOT-89**		**SOT-223**		**SOT223-3-1**		**SOT-323**	
5	2.9 x 1.6 x 1.3	6	2.9 x 1.6 x 1.3	3	4.5 x 4.0 x 1.5	4	6.5 x 7.0 x 1.6	3	7.0 x 6.5 x 1.6	3	2.0 x 2.1 x 0.9
											
SOT-363		**TSOP6**		**PQFN 2x2**		**PQFN 2x2 dual**		**PQFN 3.3x3.3**		**SuperSO8**	
6	2.0 x 2.1 x 0.9	6	2.9 x 2.5 x 1.1	6	2.0 x 2.0 x 0.9	6	2.0 x 2.0 x 0.9	8	3.3 x 3.3 x 1.0	8	5.15 x 6.15 x 1.0
											
SuperSO8 dual		**SuperSO8 fused leads**		**SuperSO8 DSC** (dual-side cooling)		**LSON-8-1**		**TDSON-8-47**		**TDSON-10-2**	
8	5.15x6.15 x 1.0	8	5.15 x 6.15 x 1.0	8	6.0 x 5.0 x 0.75	8	8.0 x 8.0 x 1.35 (max.)	8	5.15 x 6.15 x 1.0	10	3.0 x 3.0 x 0.9
											
TDSON-10-7		**TSDSON-8-25 fused leads**		**TISON-8**		**TISON-8-5/TISON-8-6**		**TISON-8 (power stage 5x6)**		**TISON-8-4 (Power Block)**	
10	3.0 x 3.0 x 0.9	8	3.3 x 3.3 x 1.0	8	7.0 x 7.0 x 1.0	8	8.0 x 8.0 x 1.0	8	5.0 x 6.0 x 1.0	8	5.0 x 6.0 x 1.0
											
TSON-8-1		**TSON-8-3**		**ThinPAK 5x6** (TSON-8)		**LLGA-5-4**		**TSON-10**		**TDSO-16-30**	
8	3.0 x 3.0 x 1.0	8	5.0 x 6.0 x 1.0	8	6.15 x 5.33 x 1.0	5	4.0 x 3.0 x 1.2	10	3.3 x 3.3 x 1.0	16	5.0 x 6. x 1.2
											
PG-TDSO-08-31		**TSNP-6-13**		**ThinPAK 8x8** (VSON-4)		**VDSON-8**		**DSOF-8-16**		**DSOF-8-164**	
8	4.9 x 1.15 x 3.9	6	1.5 x 1 x 0.375	4	8.0 x 8.0 x 1.0	8	4.0 x 4.0 x 0.9	8	7.0 x 7.0 x 2.8	8	7.0 x 7.0 x 2.8
											
DFN-8-1		**DSOSP-14-82**		**WSON-6-1**		**WSON-8-3**		**WSON-10**		**WFWLB-5-2**	
8	4.5 x 4.3 x 1.55	14	5.4 x 5.7 x 3.4	6	3 x 3 x 0.75	8	3 x 3 x 0.75	10	4.0 x 4.0 x 0.8	5	1.13 x 0.59 x 0.93
											

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HSOF-8-1 (TOLL)		IQFN-27-2		IQFN-30 (DrMOS 4x4)		IQFN-31 (DrMOS 5x5)		IQFN-36		IQFN-39	
8	10.375 x 9.9 x 2.3	27	3.3 x 6.0 x 0.9	30	4.0 x 4.0 x 1.0	31	5.0 x 5.0 x 0.8	36	7.5 x 6.0 x 0.9	39	5.0 x 6.0 x 0.9
											
IQFN-40		**TIQFN-21-1**		**TIQFN-28-1**		**SO8/SO8 dual**		**SO-16/12**		**SO-14**	
40	6.0 x 6.0 x 0.8	21	8.0 x 8.0 x 1.15	28	8.0 x 8.0 x 1.15	8	5.0 x 6.0 x 1.75	12	10.0 x 6.0 x 1.75	14	8.75 x 6.0 x 1.75
											
SO-16		**SO-18**		**DSO-12**		**DSO-14 150 mil**		**DSO-14 300 mil**		**DSO-16-30 (300 mil)**	
16	10.0 x 6.0 x 1.75	18	12.8 x 10.3 x 2.65	12	10.3 x 7.8 x 2.6 (max)	14	9.9 x 3.9 x 1.75	14	10.3 x 7.5 x 2.65	16	10.3 x 7.5 x 2.35
											
DSO-20-85		**DSO-20-87**		**DSO-24**		**SSOP-24**		**TDSO-16**		**SO-19**	
20	15.9 x 11.0 x 3.25	20	15.9 x 11.0 x 3.25	24	10.5 x 15.6 x 2.65 (max)	24	6 x 8.65 x 1.75 (max)	16	5.0 x 6.0 x 1.2	19	12.8 x 10.3 x 2.65
											
SO-20		**DSO-28**		**SO-36**		**TSSOP-28**		**TSSOP-48**		**LFBGA-516-5**	
20	12.8 x 10.3 x 2.65	28	18.1 x 10.3 x 2.65	36	15.9 x 11.0 x 3.5	28	9.7 x 6.4 x 1.2	48	12.5x6.1 x 1.1	516	25.3 x 25.3 x 2.8
											
LFBGA-292-6		**BGA-416-26**		**TFLGA-13-1**		**LQFP-176-22**		**LQFP-144-22**		**TQFP-144-27**	
292	17.3 x 17.3 x 2.35	416	27.3 x 27.3 x 3.2	13	5 x 5 x 0.96	176	26.7 x 26.7 x 2.1	144	22.4 x 22.4 x 2.2	144	18.7 x 18.7 x 1.6
											
TQFP-100-23		**TQFP-80-7**		**VQFN-40-13**		**VQFN-48-60**		**VQFN-48-78 (LTI)**		**VQFN-56-5/-6**	
100	14.5 x 14.5 x 1.5	80	12.6 x 12.6 x 1.5	40	5 x 5 x 0.85	48	6 x 6 x 0.85	48	7 x 7 x 0.85	56	7 x 7 x 0.9
											
VFWLB-76-1		**Package (JEITA-code)**									
	4217x2315	X	L x W x H								
		pin-count V = Variable number of pins All dimensions in mm									

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Through-hole device (THD) technology

IPAK (TO251)		IPAK SL (TO251 SL)		IPAK short lead with ISO standoff		I2PAK (TO262)		TO-220 real 2-pin		TO-220 2-pin	
3	16.5x6.5 x 2.3	3	10.5x6.5 x 2.3	3	9.5x6.6 x 2.3	3	23.3 x 10 x 4.4	2	29.15 x 10.0 x 4.4	2	29.1 x 9.9 x 4.4
											
TO-220 3-pin		**TO-220 FullPAK**		**TO-220 FullPAK Narrow Lead**		**TO-220 FullPAK Wide Creepage**		**TO-220-6-46**		**TO-220-6-47**	
3	28.8 x 10 x 4.4	3	29.2 x 10.3 x 4.7	3	29.6 x 10.5 x 4.7	3	28.85 x 11 x 4.7	6	21.7 x 9.9 x 4.4	6	26.1 x 9.9 x 4.4
											
TO-247		**TO-247-3-AI**		**TO-247 4-pin**		**DIP-7**		**DIP-8**		**DIP-14**	
3	41 x 16 x 5	3	41.3 x 10.9 x 5.18	4	40.15 x 15.9 x 5.0	7	9.52 x 8.9 x 4.37	8	9.52 x 8.9 x 4.37	14	19.5 x 8.9 x 4.37
											
DIP-20		**Super220**		**Super247**		**SSO-3-9**		**SSO-3-9**		**SSO-3-10**	
20	24.6 x 9.9 x 4.2	3	28.25 x 10.5 x 4.5	3	34.6 x 15.6 x 5	3	A: 3.71 x 5.34 x 1 B: 2.68 x 5.34 x 1.2	3	5.34 x 1.0 x 3.71	3	4.06 x 1.5 x 4.05
											
SSO-4-1		**TO92S-3-1**		**TO92S-3-2**		**SSO-2-1**		**SSO-2-51**		**SSO-2-53**	
4	5.34 x 1.0 x 3.71	3	4.0 x 1.52 x 3.15	3	4.0 x 1.52 x 3.15		5.34 x 1.0 x 3.71		5.34 x 1.0 x 3.71		5.34 x 1.0 x 3.71
											
SSO-2-4		**SSOA22-2-51**		**SSOA32-2-51**		**SSO-3-41**		**Package (JEITA-code)**			
	5.34 x 1.0 x 3.71		6 x 4 x 7.85		7 x 5.4 x 4.4		6 x 1.2 x 7	X	L x W x H		
								| pin-count V = Variable number of pins All dimensions in mm			

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- India 000 800 4402 951 (English)
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- Other countries 00* 800 951 951 951 (English/German)
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