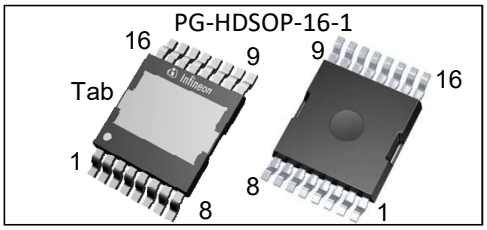
Automotive MOSFET

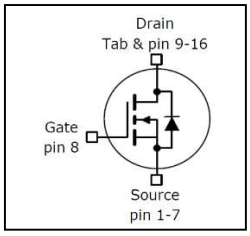
OptiMOS™ 5 Power-Transistor

RoHS Infineon Automotive Quality AEC Qualified



Features

- OptiMOS™ power MOSFET for automotive applications
- N-channel – enhancement mode – normal level
- Extended qualification beyond AEC-Q101
- Enhanced electrical testing
- Robust design
- MSL1 up to 260°C peak reflow
- 175°C operating temperature
- RoHS compliant
- 100% avalanche tested
- Very low reverse recovery charge (Q_{rr})



Potential applications

General automotive applications.

Product validation

Qualified for automotive applications. Product validation according to AEC-Q101.

Product Summary

V_{DS}	120	V
$R_{DS(on)}$	1.8	mΩ
I_D (chip limited)	309	A

Type	Package	Marking
IAUTN12S5N018T	PG-HDSOP-16-1	5N12N018

Table of Contents

Maximum ratings

at T_j=25 °C, unless otherwise specified

Parameter	Symbol	Conditions	Value	Unit
Continuous drain current	I_D	V_{GS}=10 V, Chip limitation[1,2)]	309	A
		V_{GS}=10V, DC current[3)]	300	
		T_a=100 °C, V_{GS}=10 V, R_{thJA} on top[2,4)]	85	
Pulsed drain current[2)]	$I_{D,pulse}$	T_C=25 °C, t_p= 100 µs	1150	
Avalanche energy, single pulse[2)]	E_{AS}	I_D=150 A	510	mJ
Avalanche current, single pulse	I_{AS}	–	300	A
Gate source voltage	V_{GS}	–	±20	V
Power dissipation	P_{tot}	T_C=25 °C	358	W
Operating and storage temperature	T_j, T_{stg}	–	-55 ... +175	°C
IEC climatic category; DIN IEC 68-1	–	–	55/175/56	

Thermal characteristics[2)]

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Thermal resistance, junction - case	R_{thJC}	Top	-	-	0.42	K/W
		Bottom (Pin 1-7)	-	9	-	
		Bottom (Pin 9-16)	-	3	-	
Thermal resistance, junction - ambient[4)]	R_{thJA}	Top	-	2.8	-	
		Bottom (through PCB)	-	40	-	

Electrical characteristics

at T_j=25 °C, unless otherwise specified

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Static characteristics						
Drain-source breakdown voltage	$V_{(BR)DSS}$	V_{GS}=0 V, I_D=1 mA	120	–	–	V
Gate threshold voltage	$V_{GS(th)}$	V_{DS}=V_{GS}, I_D=270 µA	2.6	3.1	3.6	
Zero gate voltage drain current	I_{DSS}	V_{DS}=120 V, V_{GS}=0 V, T_j=25 °C	–	0.3	3	µA
		V_{DS}=120 V, V_{GS}=0 V, T_j=100 °C[2)]	–	10	100	
Gate-source leakage current	I_{GSS}	V_{GS}=20 V, V_{DS}=0 V	–	–	100	nA
Drain-source on-state resistance	$R_{DS(on)}$	V_{GS}=7 V, I_D=50 A	–	2.0	2.8	mΩ
		V_{GS}=10 V, I_D=100 A	–	1.5	1.8	
Gate resistance[2)]	R_G	–	–	1.1	–	Ω

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Dynamic characteristics[2]						
Input capacitance	C_{iss}	V_{GS}=0 V, V_{DS}=60 V, f=1 MHz	–	8260	10740	pF
Output capacitance	C_{oss}		–	2369	3080	
Reverse transfer capacitance	C_{rss}		–	45	68	
Turn-on delay time	$t_{d(on)}$	V_{DD}=60 V, V_{GS}=10 V, I_D=100 A, R_G=3.5 Ω	–	28	–	ns
Rise time	t_r		–	55	–	
Turn-off delay time	$t_{d(off)}$		–	45	–	
Fall time	t_f		–	53	–	
Gate Charge Characteristics[2]						
Gate to source charge	Q_{gs}	V_{DD}=60 V, I_D=100 A, V_{GS}=0 to 10 V	–	43	55	nC
Gate to drain charge	Q_{gd}		–	23	35	
Gate charge total	Q_g		–	111	145	
Gate plateau voltage	$V_{plateau}$		–	5.2	–	V
Reverse Diode						
Diode continous forward current[2]	I_S	T_C=25 °C	–	–	309	A
Diode pulse current[2]	$I_{S,pulse}$	T_C=25 °C, t_p= 100 µs	–	–	1150	
Diode forward voltage	V_{SD}	V_{GS}=0 V, I_F=100 A, T_j=25 °C	–	0.85	0.95	V
Reverse recovery time[2]	t_{rr}	V_R=60 V, I_F=50A, di_F/dt=100 A/µs	–	45	67	ns
Reverse recovery charge[2]	Q_{rr}		–	34	68	nC

[1] Practically the current is limited by the overall system design including the customer-specific PCB.

[2] The parameter is not subject to production testing – specified by design.

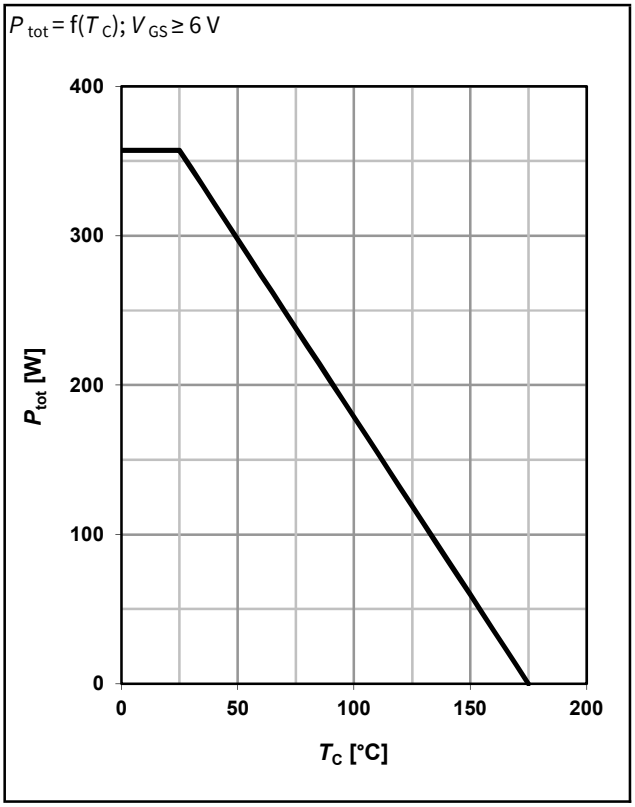
[3] Current is limited by chip.

[4] Device on a four-layer 2s2p FR4 PCB with topside cooling. Thermal insulation material is 100 µm thick and has a conductivity of 0.7 W/m/K. Top surface of heat sink is fixed at ambient temperature. Bottom surface of PCB is left at free convection. Values may vary depending on the customer-specific design.

Electrical characteristics diagrams

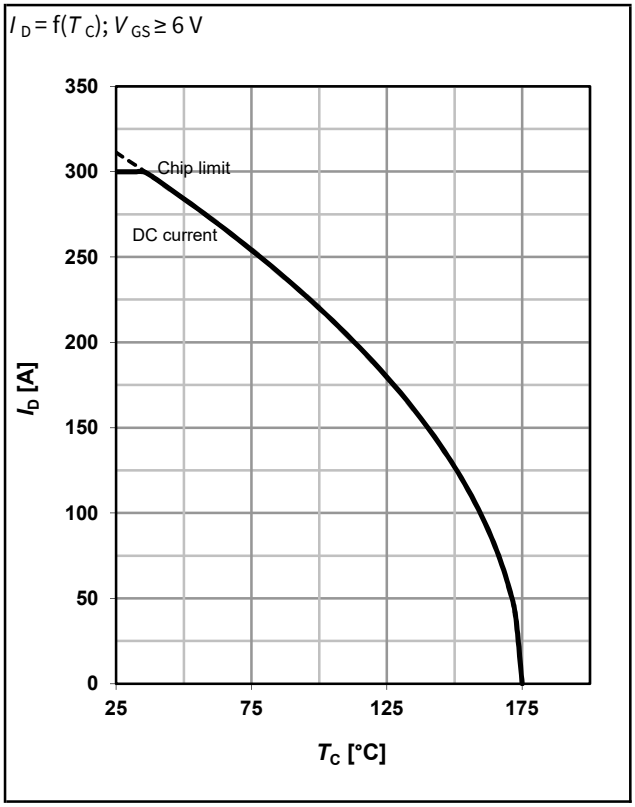
1 Power dissipation

$P_{tot} = f(T_C)$; $V_{GS} \geq 6$ V



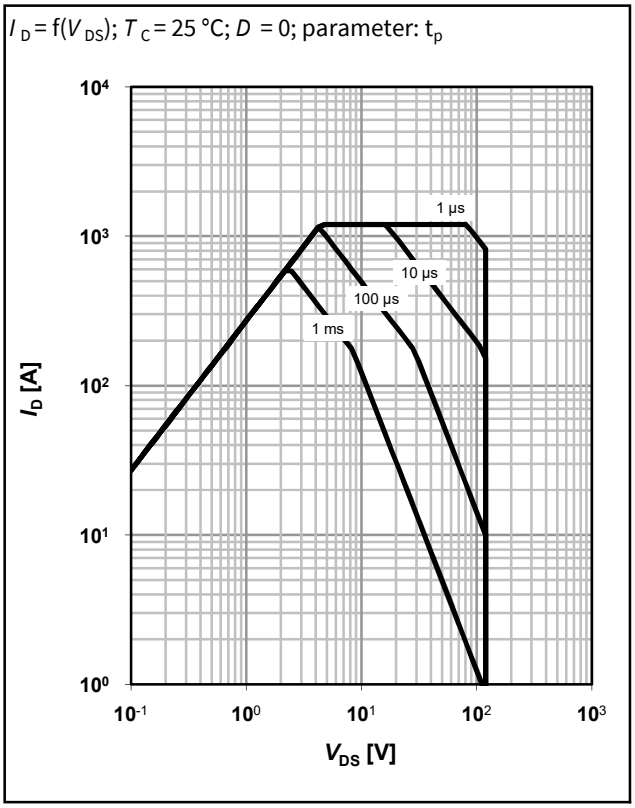
2 Drain current

$I_D = f(T_C)$; $V_{GS} \geq 6$ V



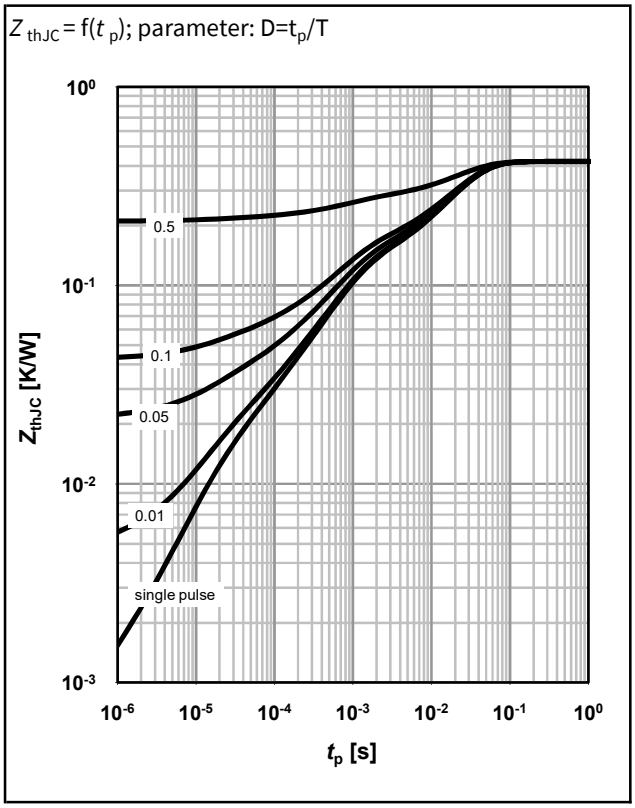
3 Safe operating area

$I_D = f(V_{DS})$; $T_C = 25$ °C; $D = 0$; parameter: t_p



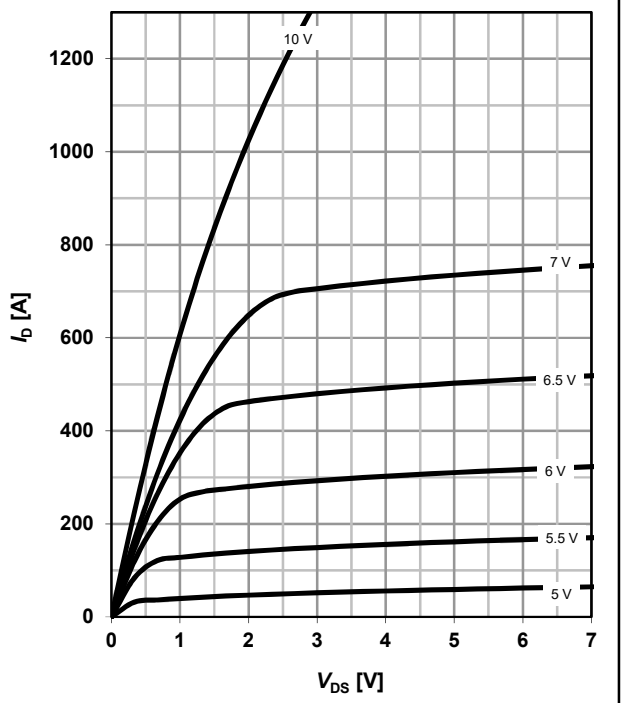
4 Max. transient thermal impedance

$Z_{thJC} = f(t_p)$; parameter: $D=t_p/T$



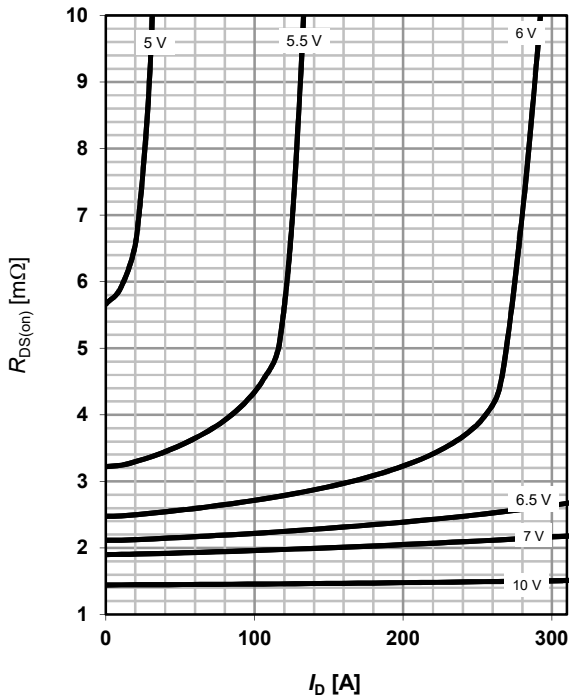
5 Typ. output characteristics

$I_D = f(V_{DS})$; $T_j = 25$ °C; parameter: V_{GS}



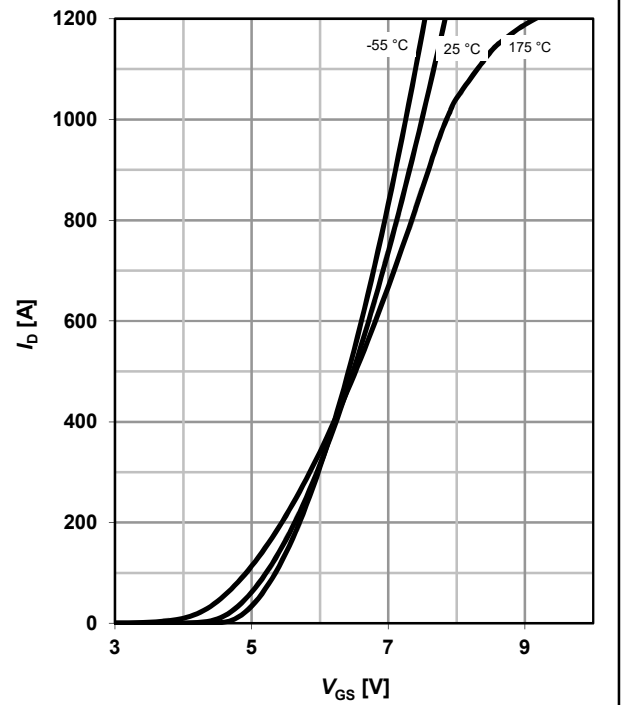
6 Typ. drain-source on-state resistance

$R_{DS(on)} = f(I_D)$; $T_j = 25$ °C; parameter: V_{GS}



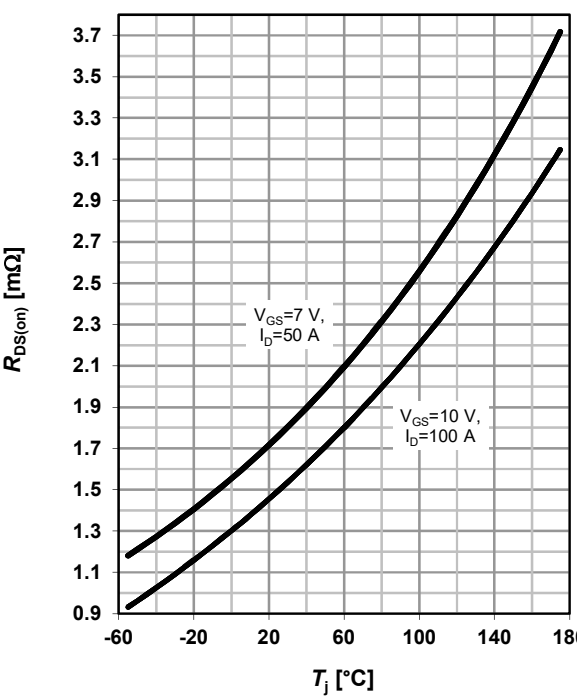
7 Typ. transfer characteristics

$I_D = f(V_{GS})$; $V_{DS} = 6$V: parameter: T_j



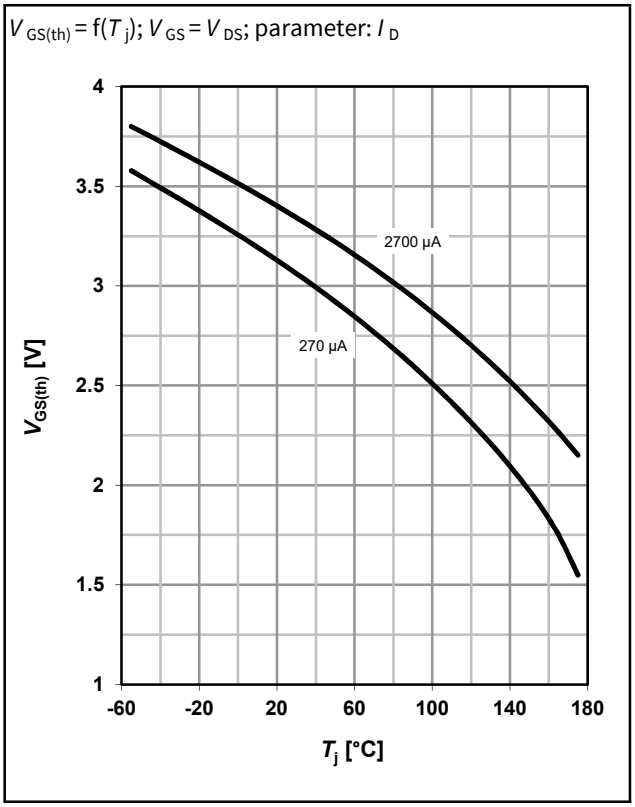
8 Typ. drain-source on-state resistance

$R_{DS(on)} = f(T_j)$; parameter: I_D, V_{GS}



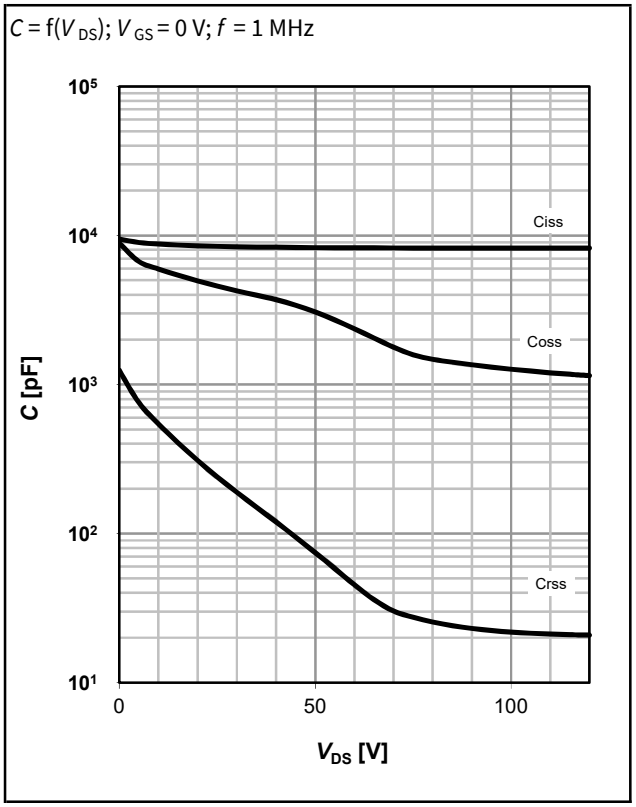
9 Typ. gate threshold voltage

$V_{GS(th)} = f(T_j)$; $V_{GS} = V_{DS}$; parameter: I_D



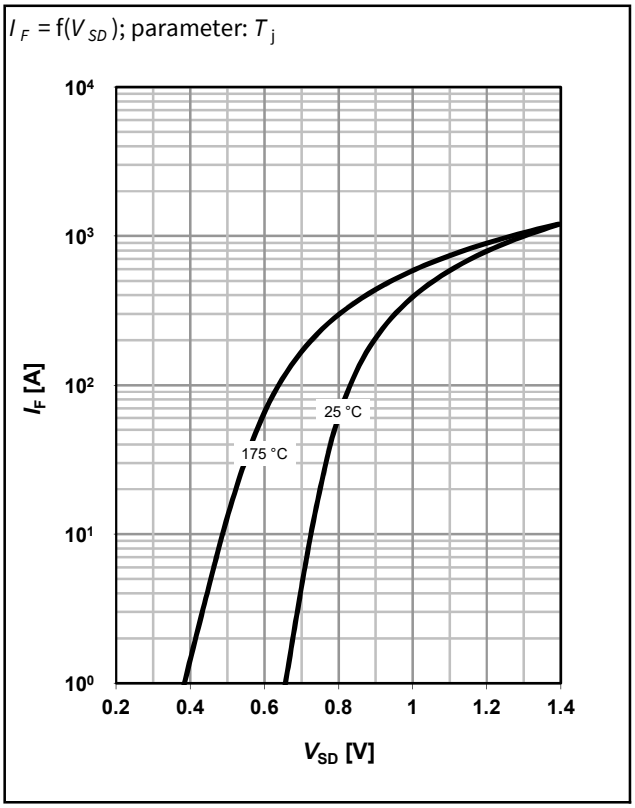
10 Typ. capacitances

$C = f(V_{DS})$; $V_{GS} = 0$ V; $f = 1$ MHz



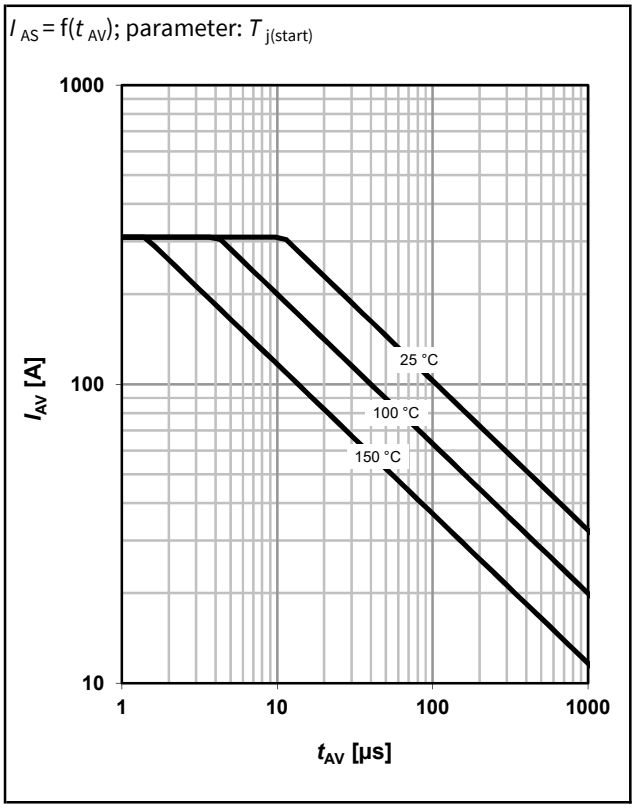
11 Typical forward diode characteristics

$I_F = f(V_{SD})$; parameter: T_j



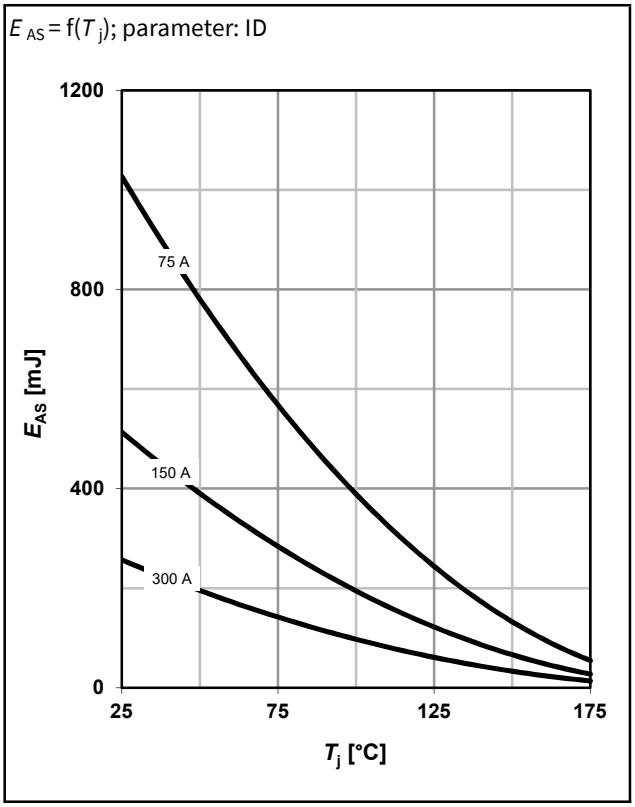
12 Typ. avalanche characteristics

$I_{AS} = f(t_{AV})$; parameter: $T_{j(start)}$



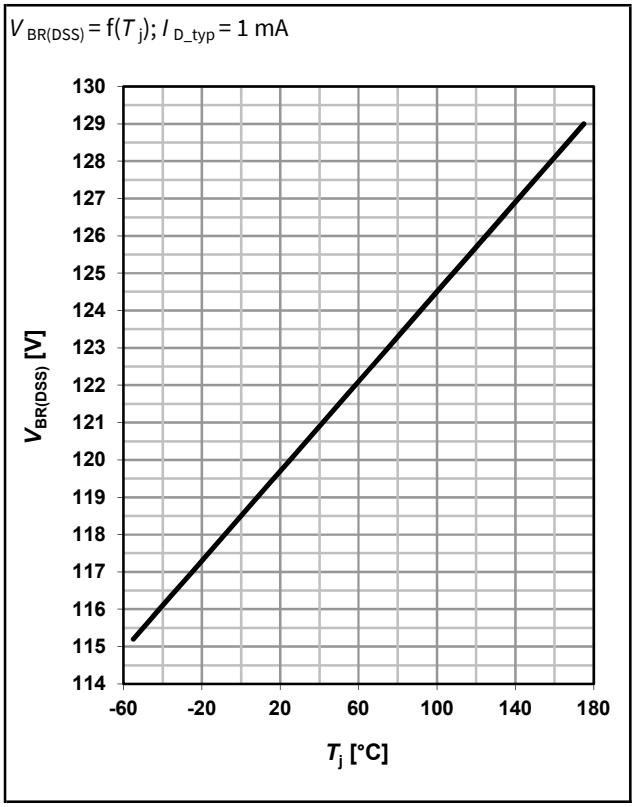
13 Typical avalanche energy

$E_{AS} = f(T_j)$; parameter: ID



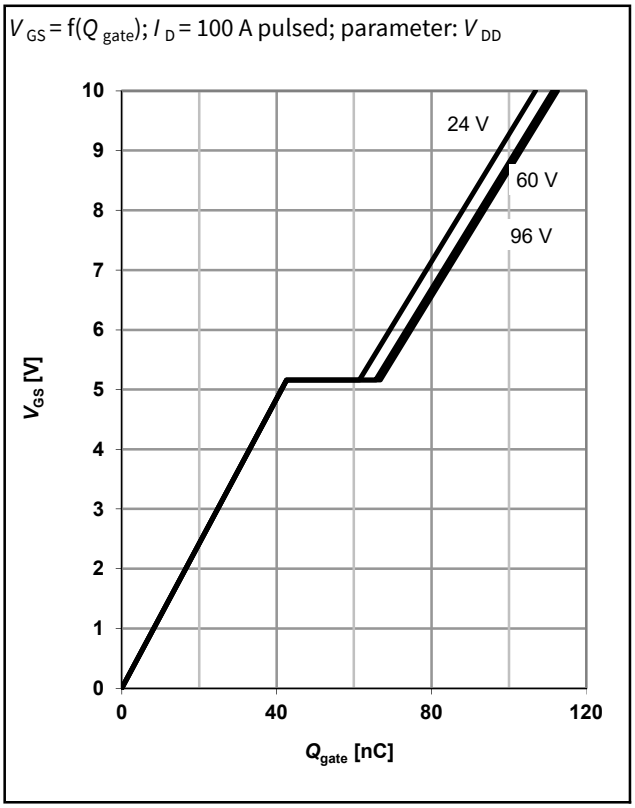
14 Drain-source breakdown voltage

$V_{BR(DSS)} = f(T_j)$; I_{D_typ} = 1 mA

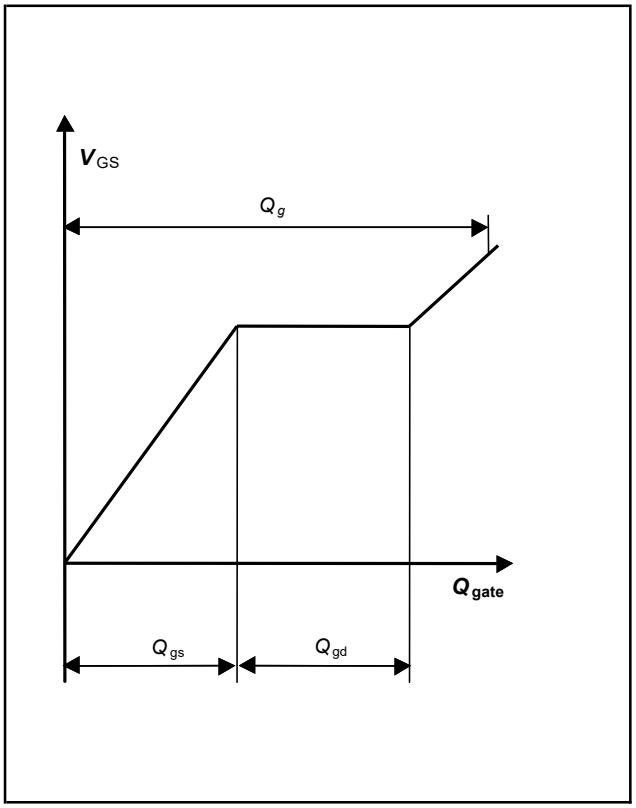


15 Typ. gate charge

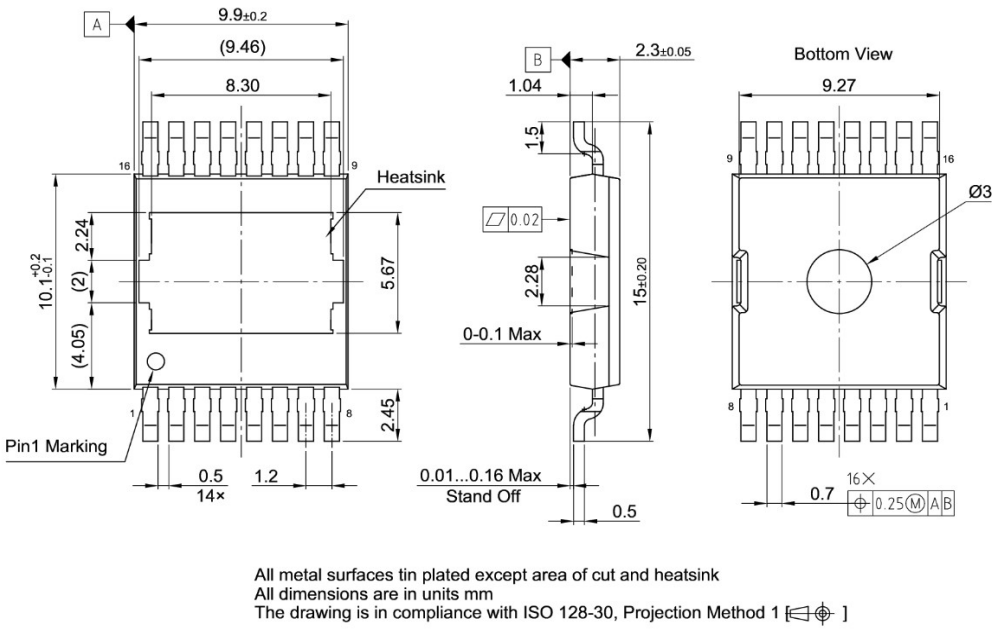
$V_{GS} = f(Q_{gate})$; I_D = 100 A pulsed; parameter: V_{DD}



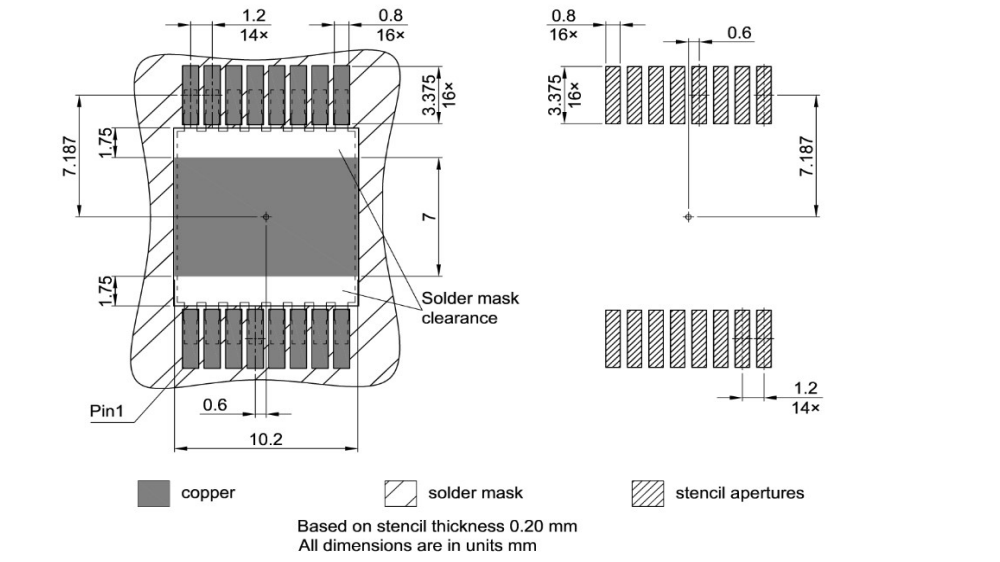
16 Gate charge waveforms



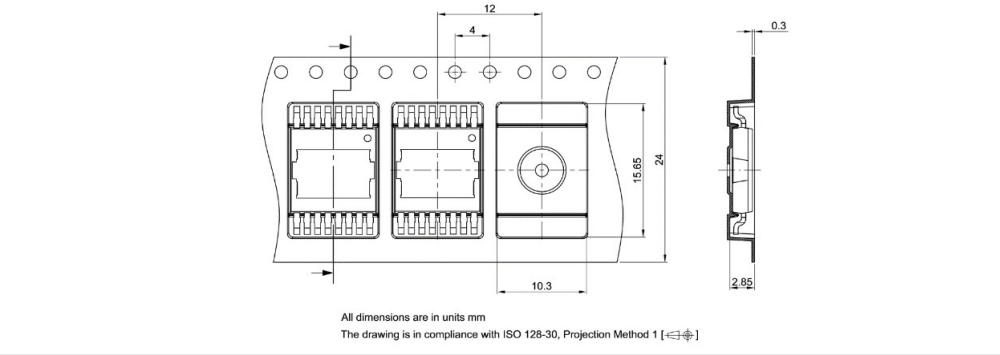
Package Outline



Footprint



Packaging



Revision History

Revision	Date	Changes
Revision 1.0	2022-12-15	Final data sheet

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