DATA SHEET

海明微半导体
HIMINGWAY

6HP30N065A9P

650V 30A High-Density SiC IPM

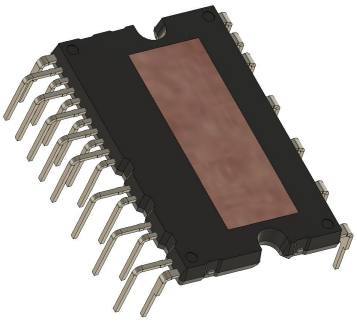
Description/描述

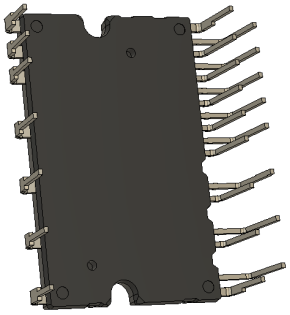
6HP30N065A9P offers the chance for integrating various power and control components to increase reliability, optimize PCB size and system costs. It is designed to operate as high-performance inverter for demanding motor drive applications and active power factor correction. The product concept is specially adapted to power applications, which need good thermal performance and electrical isolation as well as EMI save control and overload protection. Three phase inverter with 1200V SiC MOSFETs are combined with an optimized 6-channel SOI gate driver for excellent electrical performance. The bodydiodes of SiC MOSFETs can be used as free-wheeling diode, and turning on the MOSFET during bodydiode conduction (synchronous rectification) can be used to reduce losses further.

6HP30N065A9P 产品集成了多种功率与控制元件，旨在提升系统可靠性，精简 PCB 布局尺寸并降低系统总成本。本产品专为高性能逆变平台打造，能够胜任严苛的电机驱动及有源功率因数校正（APFC）应用。该产品方案针对功率应用进行了深度优化，具备卓越的热性能与高可靠电气隔离，同时兼顾了低 EMI 干扰控制与过载保护功能。其内部采用 1200V SiC MOSFET 组成三相全桥逆变电路，并辅以优化的 6 通道 SOI 栅极驱动器，确保了极致的电气性能。此外，SiC MOSFET 的体二极管可直接作为续流二极管使用；通过同步整流技术（在体二极管导通期间开启 MOSFET 沟道），可进一步显著降低功耗，提升整体效率。

Product features/产品特点

- Fully isolated Dual In-Line molded module
  全隔离双列直插模封模块
- Rugged 650V SOI gate driver technology with stability against transient and negative voltage
  高可靠 650V SOI 栅极驱动技术，具备稳定的负瞬态电压抗扰度
- Allowable negative VS potential up to -11V for signal transmission at VBS=15V
  在 VBS=15V 时，支持高达 -11V 的 VS 端负压信号传输
- Integrated bootstrap functionality and over durrent shutdown
  集成自举功能与过流关断保护
- Built-in NTC thermistor for temperature monitor
  内置 NTC 热敏电阻，用于温度监测
- Under-voltage lockout at all channels
  全通道欠压锁定（UVLO）保护
- Low side source pins accessible for phase current monitoring (open source)
  低端源极引脚引出，支持相电流监测（开源极结构）
- Anti cross-conduction prevention
  防交叉导通（直通）保护
- All of 6 switches turn off during protection
  保护触发时，全 6 路开关管同时关断
- Programmable fault clear timing and enable input
  故障清除时间可编程，并支持使能输入控制
- Lead-free terminal plating; RoHS compliant
  无铅端子镀层；符合 RoHS 标准





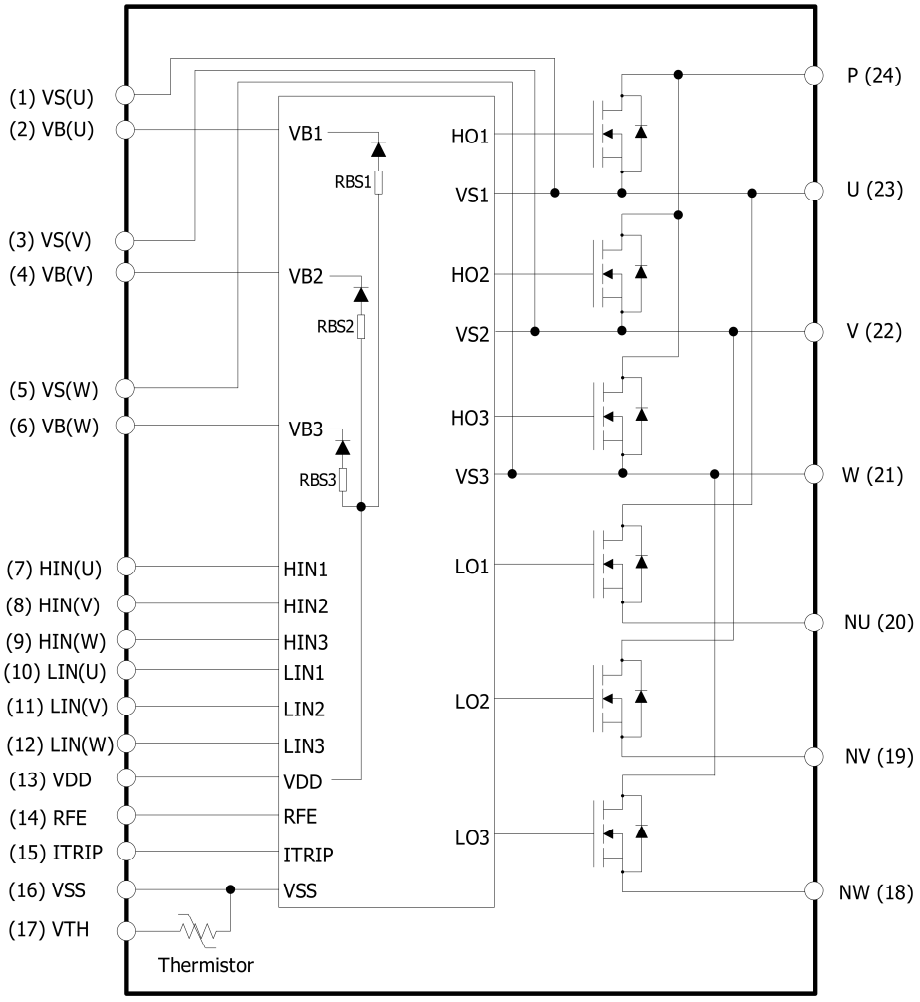
Applications/应用领域

- Fan drives
  风扇驱动
- Active power factor correction
  有源功率因数校正
- High-performance motor drives
  高性能电机驱动

Package parameters/封装信息

Type/型号	Package/封装	Marking/标识	Packaging method/包装方式
6HP30N065A9P	SDIP24	6HP30N065P	Tube/管装

1. Internal electrical schematic
内部电路原理图

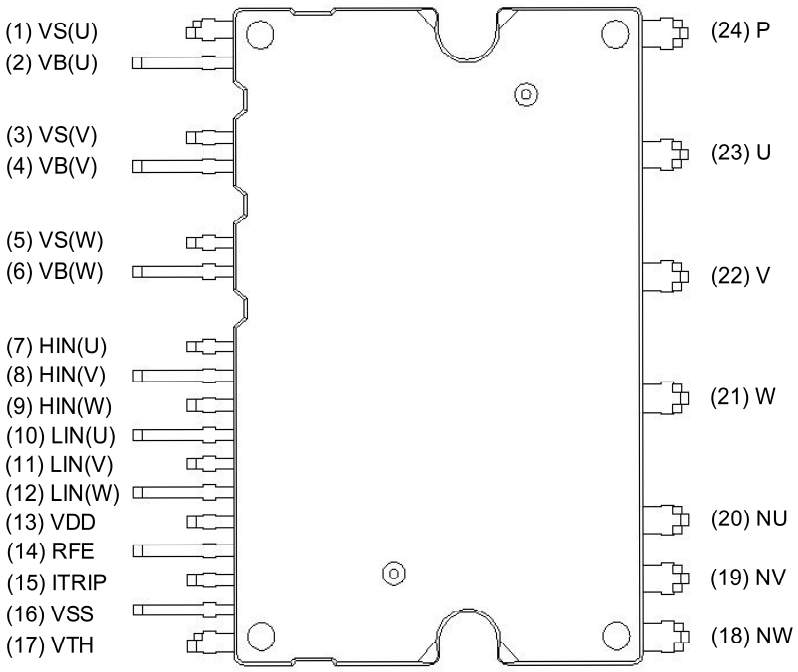


Bottom View/底部视图

Figure 1. Internal electrical schematic/内部电路原理图

2. Pin configuration
引脚配置

2.1. Pin assignment/引脚分布



Bottom View/底部视图

Figure 2. Module pinout/模块引脚分布

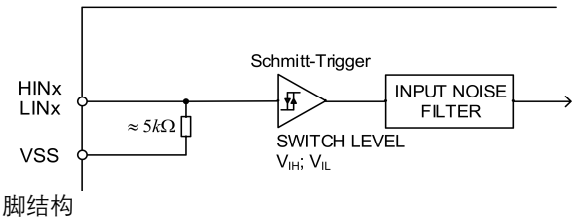


Figure 3. Input pin structure/输入引脚结构

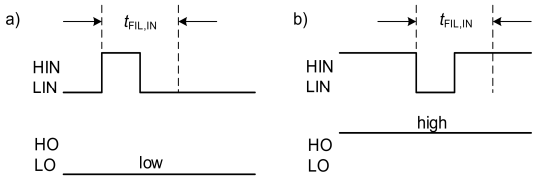


Figure 4. Input filter timing diagram/输入滤波器时序图

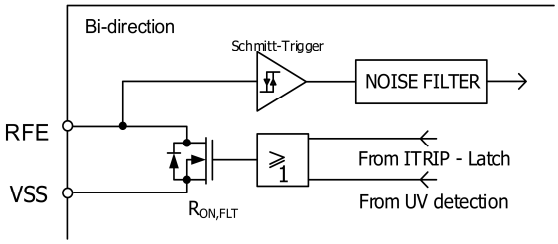


Figure 5. Internal circuit at pin RFE/ RFE 引脚内部电路

Table 1 Pin assignment/引脚分配

Pin number 引脚编号	Pin name 引脚名称	Pin description 引脚描述
1	VS(U)	U-phase high side floating IC supply offset voltage U相高边驱动IC浮点偏置电压
2	VB(U)	U-phase high side floating IC supply voltage U相高边驱动IC浮点供电电压
3	VS(V)	V-phase high side floating IC supply offset voltage V相高边驱动IC浮点偏置电压
4	VB(V)	V-phase high side floating IC supply voltage V相高边驱动IC浮点供电电压
5	VS(W)	W-phase high side floating IC supply offset voltage W相高边驱动IC浮点偏置电压
6	VB(W)	W-phase high side floating IC supply voltage W相高边驱动IC浮点供电电压
7	HIN(U)	U-phase high side gate driver input U相高边栅极驱动输入端
8	HIN(V)	V-phase high side gate driver input V相高边栅极驱动输入端
9	HIN(W)	W-phase high side gate driver input W相高边栅极驱动输入端
10	LIN(U)	U-phase low side gate driver input U相低边栅极驱动输入端
11	LIN(V)	V-phase low side gate driver input V相低边栅极驱动输入端
12	LIN(W)	W-phase low side gate driver input W相低边栅极驱动输入端
13	VDD	Low side control supply 低边控制电源
14	RFE	Programmable fault clear time, fault output, enable input 可编程故障清除时间、故障输出、使能输入端
15	ITRIP	Over current shutdown input 过流关断输入端
16	VSS	Low side control negative supply 低边控制负电源
17	VTH	Thermistor therminal 热敏电阻
18	NW	W-phase low side source W相低边源极
19	NV	V-phase low side source V相低边源极
20	NU	U-phase low side source U相低边源极
21	W	Motor W-phase output 电机W相输出
22	V	Motor V-phase output 电机V相输出
23	U	Motor U-phase output 电机U相输出
24	P	Positive bus input voltage 母线电压输入正极

3. Maximum ratings V_{DD}=18V and T_j=25°C,unless otherwise specified.
最大额定值默认V_{DD}=18V和T_j=25°C,除非另有说明

Table 2 Module part/模块部分

Parameter 参数	Symbol 符号	Test conditions 测试条件	Value 值	Unit 单位
Storage temperature range 存储温度范围	T_{STG}		-40~125	°C
Operating case temperature 外壳工作温度	T_C	Refer to Figure 7	-40~125	°C
Operating junction temperature 工作结温	T_J		-40~150	°C
Isolation test voltage 绝缘耐压	V_{ISO}	1min, RMS, f = 60Hz	2500	V

Table 3 Inverter part/逆变器部分

Parameter 参数	Symbol 符号	Test conditions 测试条件	Value 值	Unit 单位
Max. blocking voltage 最大阻断电压	V_{DSS}		650	V
DC link supply voltage of P-N P-N间直流供电电压	V_{PN}	Applied between P-N	450	V
DC link supply voltage (surge) of P-N P-N间直流供电电压（浪涌）	$V_{PN(surge)}$	Applied between P-N	500	V
DC drain current 漏极直流电流	I_D[1]	T_C=25°C,T_J<150°C	±30	A
		T_C=80°C,T_J<150°C	±21	
Pulse drain current 漏极脉冲电流	I_{DP}[2]		±58	A
Maximum output phase peak current 最大输出相电流峰值	I_{OM}		±50	A
Power dissipation per MOSFET 每颗MOS管耗散功率	P_{tot}	T_C=25°C	21	W

Table 4 Control part/控制部分

Parameter 参数	Symbol 符号	Test conditions 测试条件	Value 值	Unit 单位
High Side offset voltage 高边偏置电压	V_S		650	V
Repetitive peak reverse voltage of bootstrap diode 自举二极管反向重复峰值电压	V_{RRM}		650	V
Module control supply voltage 模块控制电源电压	V_{DD}		-1~20	V
High side floating supply voltage(V_B reference to V_S) 高边浮点供电电压（V_B与V_S之间）	V_{BS}		-1~20	V
Input voltage (LIN, HIN, ITRIP, RFE) 输入电压(LIN, HIN, ITRIP, RFE)	V_{IN}		-1~Vop+ 0.3	V
Logic ground 逻辑地V_{SS}	V_{SS}		0~Vop+ 0.3	V
Allowable Vs offset supply transient relative to V_{SS} 相对于V_{SS}允许的V_S偏移电源瞬态	dV_S/dt		50	V/ns

1. Pulse width t_p limited by $T_{j(max)}$ /脉宽受限于最大结温
2. Limited by T_j(max)/受限于最大结温

4. Thermal characteirstics
热特性

Table 5 Thermal characteristics/热特性

Parameter 参数	Symbol 符号	Test conditions 测试条件	Value/值			Unit 单位
			Min.	Typ.	Max.	
Single MOSFET thermal resistance, junction-case 单MOS芯片结壳热阻	R_{thJC}				6.09	°C/W

5. Recommended operation conditions
推荐工作条件

Table 6 Thermal Recommended operation conditions/推荐工作条件

Parameter 参数	Symbol 符号	Value/值			Unit 单位
		Min.	Typ.	Max.	
DC link supply voltage of P-N P-N间直流供电电压	V_{PN}	0		450	V
Low side supply voltage 低边供电电压	V_{DD}	15	18	20	V
High side floating supply voltage (V_B vs. V_S) 高边浮点供电电压（V_B与V_S之间）	V_{BS}	14		20	V
Logic input voltages LIN, HIN, ITRIP, RFE 逻辑输入电压 LIN, HIN, ITRIP, RFE	V_{IN}	0		5	V
External dead time between HIN & LIN HIN 与 LIN 之间的外部死区时间	DT	0.5			μs
Voltage between VSS - N (including surge) VSS与N之间的电压（包括浪涌）	V_{COMP}	-5		5	V
Minimum input pulse width 最小输入脉冲宽度	$PW_{IN(ON)}$ $PW_{IN(OFF)}$	1			μs
Control supply variation 控制电源波动	ΔV_{BS} ΔV_{DD}	-1 -1		1 1	V/μs

6. Static characteristics V_{DD}=18V and T_j=25°C,unless otherwise specified.
静态特性默认V_{DD}=18V和T_j=25°C,除非另有说明

Table 7 Inverter part/逆变器部分

Parameter 参数	Symbol 符号	Test conditions 测试条件		Value/值			Unit 单位
				Min.	Typ.	Max.	
Drain-source on-state resistance 漏极-源极导通电阻	$R_{DS(on)}$	I_D=15A,V_{IN}=5V	T_j=25°C		115	127	mΩ
			T_j=150°C		106		
Drain-source leakage current 漏源极漏电流	I_{DSS}	V_{DS}=650V				1	mA
Diode forward voltage 二极管正向压降	V_{SD}	I_{SD}=5A,V_{IN}=0V	T_j=25°C		3.5	4.8	V
			T_j=150°C		3.1		

Table 8 Control part/控制部分

Parameter 参数	Symbol 符号	Test conditions 测试条件	Value/值			Unit 单位
			Min.	Typ.	Max.	
Logic "1" input voltage (LIN, HIN) 逻辑“1”输入电压	V_{IH}			1.9	2.3	V
Logic "0" input voltage (LIN, HIN) 逻辑“0”输入电压	V_{IL}		0.7	0.9		V
ITRIP positive going threshold ITRIP 正向阈值	$V_{IT,TH+}$		475	500	525	mV
ITRIP input hysteresis ITRIP 输入滞后	$V_{IT,HYS}$			55		mV
V_{DD} and V_{BS} supply under voltage positive going threshold V_{DD} 和 V_{BS} 电源欠压正向阈值	V_{DDUV+}		11.5	12.2	13.0	V
	V_{BSUV+}		10.5	11.2	12.0	
V_{DD}/V_{BS} supply under voltage negative going threshold V_{DD}/V_{BS} 电源欠压反向阈值	V_{DDUV-}		10.5	11.2	12.0	V
	V_{BSUV-}		9.5	10.2	11.0	
V_{DD}/V_{BS} supply under voltage lockout hysteresis V_{DD}/V_{BS} 电源欠压锁定滞后	V_{DDUVH}			1		V
	V_{BSUVH}			1		
Quiescent V_{BX} supply current (V_{BX} only) 静态 V_{BX} 电源电流（仅V_{BX}）	I_{QBS}	H_{IN}=0V		200		μA
Quiescent V_{DD} supply current (V_{DD} only) 静态 V_{DD} 电源电流（仅V_{DD}）	I_{QDD}	L_{INX}=0V,H_{INX}=5V		1.2		mA
Input bias current for LIN, HIN LIN、HIN 的输入偏置电流	I_{IN+}	V_{IN}=5V		1		mA
Input bias current for ITRIP ITRIP的输入偏置电流	I_{ITRIP+}	V_{ITRIP}=5V		30	100	μA
Input bias current for RFE RFE的输入偏置电流	I_{RFE}	V_{RFE}=5V,V_{ITRIP}=0V			5	μA
RFE output voltage RFE输出电压	V_{RFE}	I_{RFE}=10mA,V_{ITRIP}=1V		0.4		V
V_{RFE} positive going threshold V_{RFE}正向阈值	$V_{RFE,TH+}$			1.9	2.3	V
V_{RFE} negative going threshold V_{RFE}反向阈值	$V_{RFE,TH-}$		0.7	0.9		V
Bootstrap diode forward voltage 自举二极管正向电压	V_{F_BSD}	I_F=0.3mA		0.9		V
Bootstrap diode resistance 自举二极管电阻	R_{BSD}	Between V_F=4V and V_F=5V		120		Ω

7. Dynamic characteristics V_{DD}=18V and T_j=25°C,unless otherwise specified.
动态特性默认V_{DD}=18V和T_j=25°C,除非另有说明

Table 9 Inverter part(High side)/逆变器部分（高侧）

Parameter 参数	Symbol 符号	Test conditions 测试条件		Value/值			Unit 单位
				Min.	Typ.	Max.	
Turn-on propagation delay time 开通传输延迟时间	t_{on}	V_{HIN}=5V, I_D=15A, V_{DC}=400V			462		ns
Turn-on rise time 开通上升时间	t_r				25		
Turn-on switching time 开通时间	$t_{c(on)}$				58		
Reverse recovery time 反向恢复时间	t_{rr}				71		
Turn-off propagation delay time 关断传输延迟时间	t_{off}	V_{HIN}=0V, I_D=15A, V_{DC}=400V			712		ns
Turn-off fall time 关断下降时间	t_f				36		
Turn-off switching time 关断时间	$t_{c(off)}$				81		
MOSFET turn-on energy MOSFET开通能量	E_{on}	V_{DC}=400V, I_D=15A	T_j=25°C		0.38		mJ
			T_j=150°C		0.76		
MOSFET turn-off energy MOSFET关断能量	E_{off}		T_j=25°C		0.28		mJ
			T_j=150°C		0.52		
Body diode recovery energy 体二极管反向恢复能量	E_{rec}		T_j=25°C		0.10		mJ
			T_j=150°C		0.21		

Table 10 Inverter part(Low side)/逆变器部分（低侧）

Parameter 参数	Symbol 符号	Test conditions 测试条件		Value/值			Unit 单位
				Min.	Typ.	Max.	
Turn-on propagation delay time 开通传输延迟时间	t_{on}	V_{HIN}=5V, I_D=15A, V_{DC}=400V			532		ns
Turn-on rise time 开通上升时间	t_r				48		
Turn-on switching time 开通时间	$t_{c(on)}$				68		
Reverse recovery time 反向恢复时间	t_{rr}				69		
Turn-off propagation delay time 关断传输延迟时间	t_{off}	V_{HIN}=0V, I_D=15A, V_{DC}=400V			685		ns
Turn-off fall time 关断下降时间	t_f				71		
Turn-off switching time 关断时间	$t_{c(off)}$				67		
MOSFET turn-on energy MOSFET开通能量	E_{on}	V_{DC}=400V, I_D=15A	T_j=25°C		0.71		mJ
			T_j=150°C		1.16		
MOSFET turn-off energy MOSFET关断能量	E_{off}		T_j=25°C		0.15		mJ
			T_j=150°C		0.22		
Body diode recovery energy 体二极管反向恢复能量	E_{rec}		T_j=25°C		0.04		mJ
			T_j=150°C		0.08		
Short circuit propagation delay time 短路传输延迟时间	t_{scp}[1]	From $V_{IT,\ TH+}$ to 10% I_{SC}			1.0		μS

1. Integrated Global Protection/集成全局保护

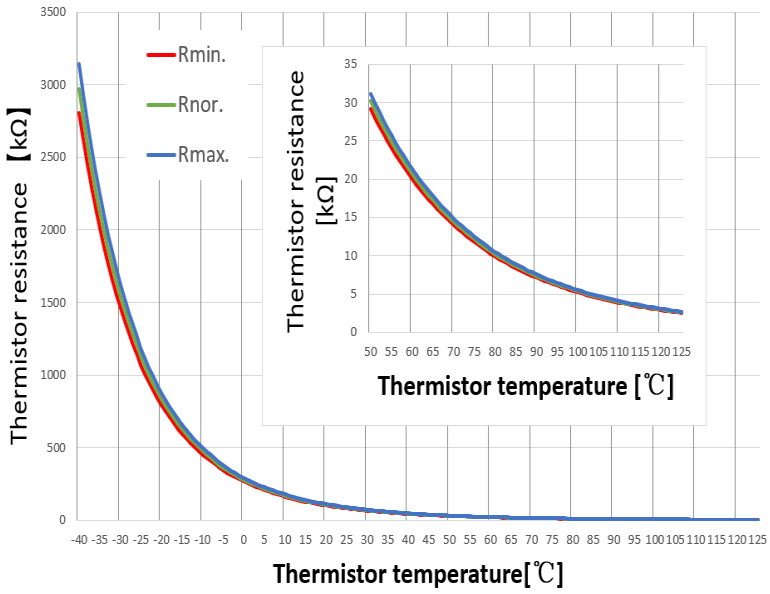
Table 11 Control part/控制部分

Parameter 参数	Symbol 符号	Test conditions 测试条件	Value/值			Unit 单位
			Min.	Typ.	Max.	
Input filter time ITRIP ITRIP 输入滤波时间	t_{ITRIP}	V_{ITRIP}=1V		500		ns
Input filter time at LIN, HIN for turn on and off LIN、HIN 引脚的导通与关断输入滤波时间	$T_{FIL, IN}$	$V_{LIN,HIN}$=0V or 5V		350		ns
Fault clear time after ITRIP-fault ITRIP 故障后的故障清除时间	$t_{FLT,CLR}$	V_{ITRIP}=1V,$V_{pull-up}$=5V, (R_{RFE}=2MΩ,C_{RFE}=1nF)		1.1		ms
ITRIP to Fault propagation delay ITRIP 至故障的传输延迟	t_{FLT}	$V_{LIN,HIN}$=0 or 5V, V_{ITRIP}=1V		650	900	ns
Internal deadtime 内部死区时间	DT_{IC}	V_{IN}=0 or V_{IN}=5V	300			ns
Matching propagation delay time (On & Off) all channels 所有通道的匹配传输延迟时间（导通与关断）	M_T	External dead time > 500ns			130	ns

8. Thermistor characteristics
热敏电阻特性

Table 12 Thermistor characteristics/热敏电阻特性

Parameter 参数	Symbol 符号	Test conditions 测试条件	Value/值			Unit 单位
			Min.	Typ.	Max.	
Resistance 电阻	R_{NTC}	T_{NTC} = 25℃		85		kΩ
B-constant of NTC(Negative Temperature Coefficient) NTC的B常数（负温度系数）	$B_{(25/100)}$			4092		K



T(°C)	$R_{min.}$(KΩ)	$R_{nor.}$(KΩ)	$R_{max.}$(KΩ)
50	29.151	30.157	31.178
60	20.018	20.669	21.329
70	13.994	14.424	14.858
80	9.946	10.234	10.523
90	7.177	7.373	7.569
100	5.253	5.388	5.523
110	3.884	3.990	4.096
120	2.908	2.991	3.075
125	2.527	2.601	2.676

Figure 6. Thermistor resistance – temperature curve and table/热敏电阻-温度曲线和表格

9. Mechanical characteristics and ratings
机械特性与额定值

Table 13 Mechanical characteristics and ratings/机械特性与额定值

Parameter 参数	Test conditions 测试条件	Value/值			Unit 单位
		Min.	Typ.	Max.	
Comparative Tracking Index (CTI) 相比漏电起痕指数（CTI）		600			
Mounting torque 安装扭矩	M3 screw and washer M3螺丝和垫片	0.49		0.78	Nm
Backside curvature 背面曲率	Refer to Figure 8	0		150	μm
Weight 重量			6.95		g

10. Diagrams and tables
图表

10.1. T_C measurement point(mm)/ T_C壳温测试点(mm)

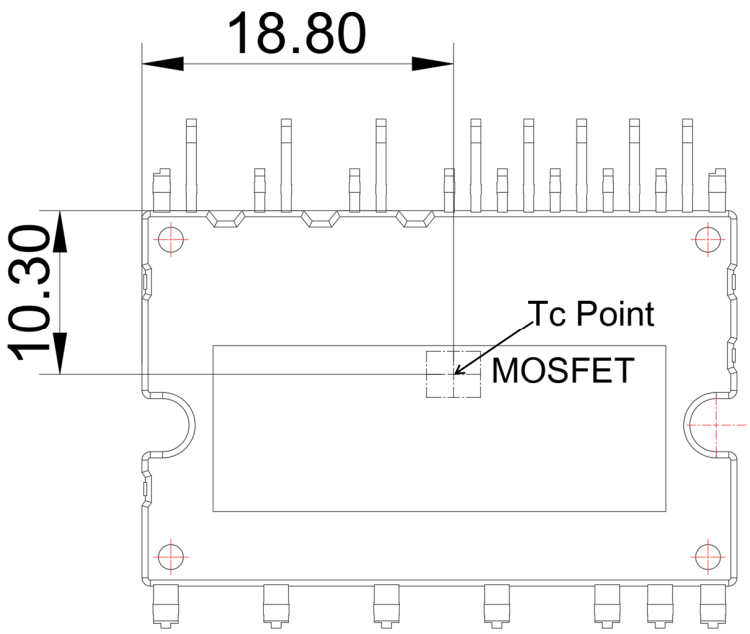


Figure 7. T_C measurement point/ T_C壳温测试点

10.2. Backside curvature measurement position/背面曲度测试点

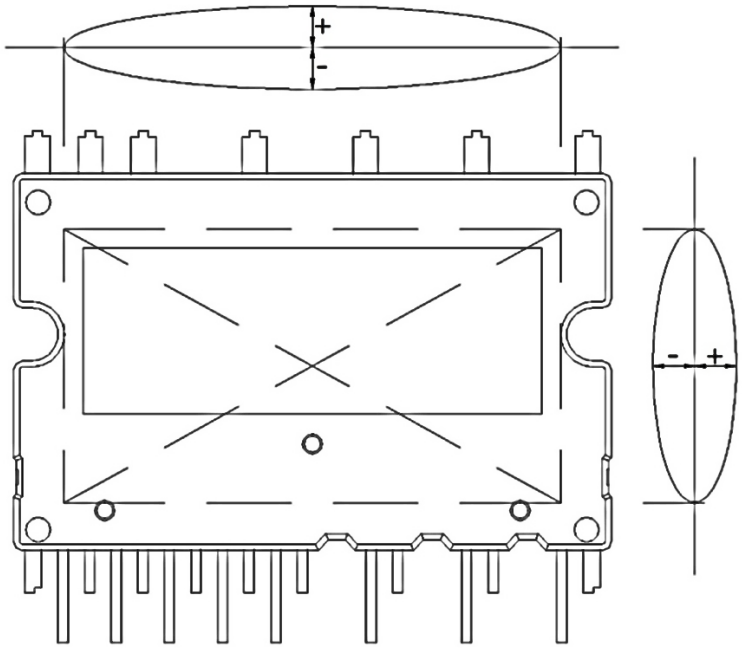


Figure 8. Backside curvature measurement position/背面曲度测试点

10.3. Switching test circuit/开关测试电路

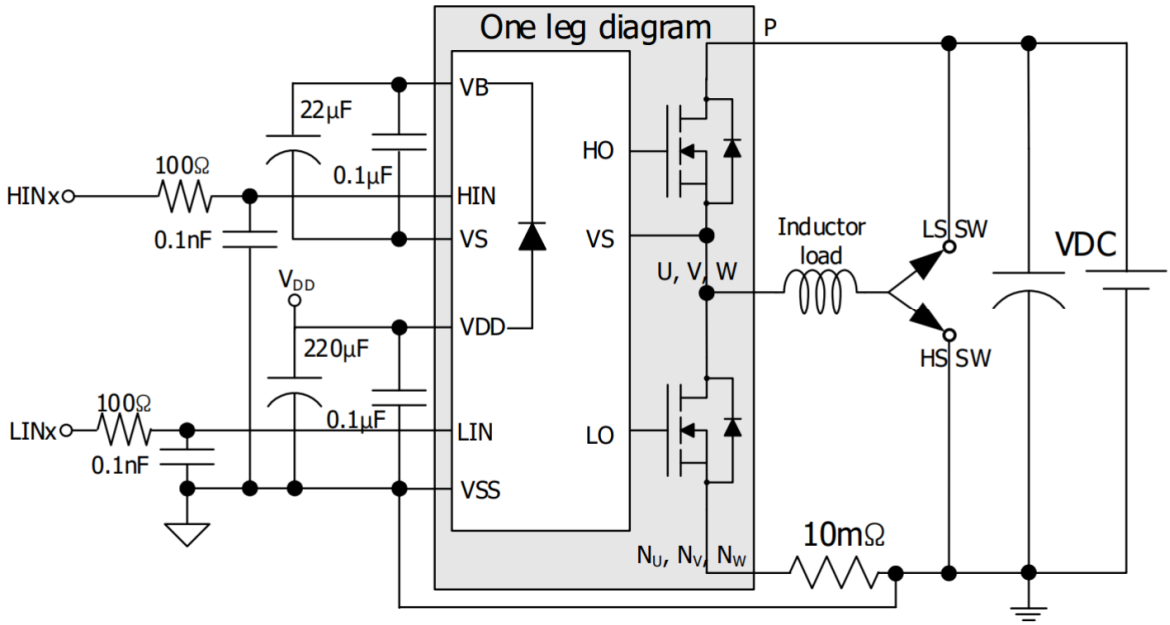


Figure 9. Switching test circuit/开关测试电路

10.4. Switching times definition/开关时间定义

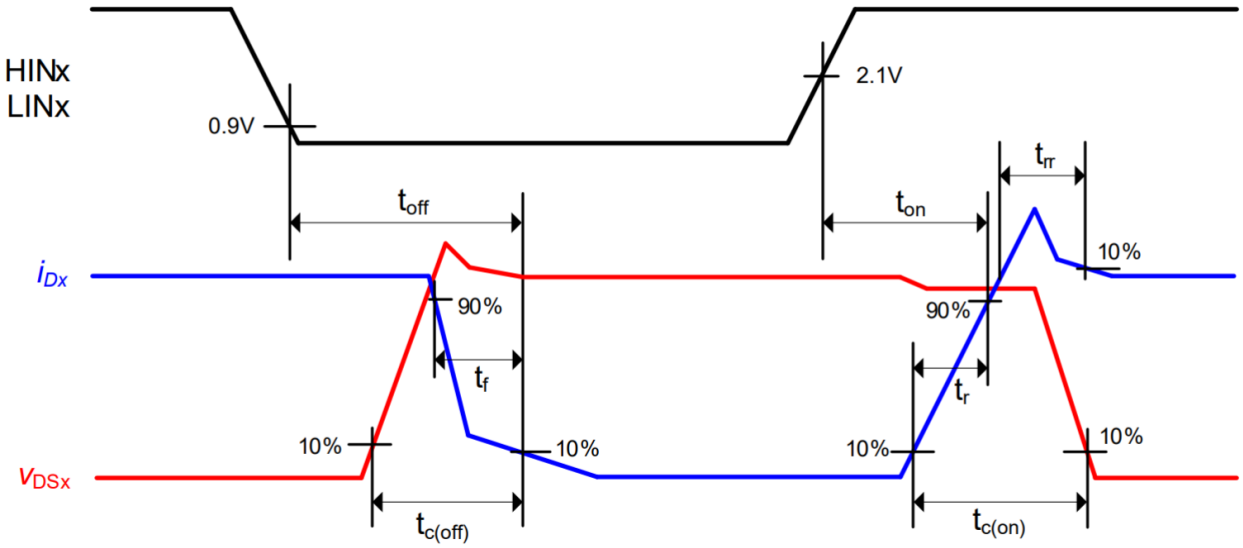


Figure 10. Switching test circuit/开关测试电路

11. Application guide

应用指南

11.1. Typical application circuit/典型应用电路

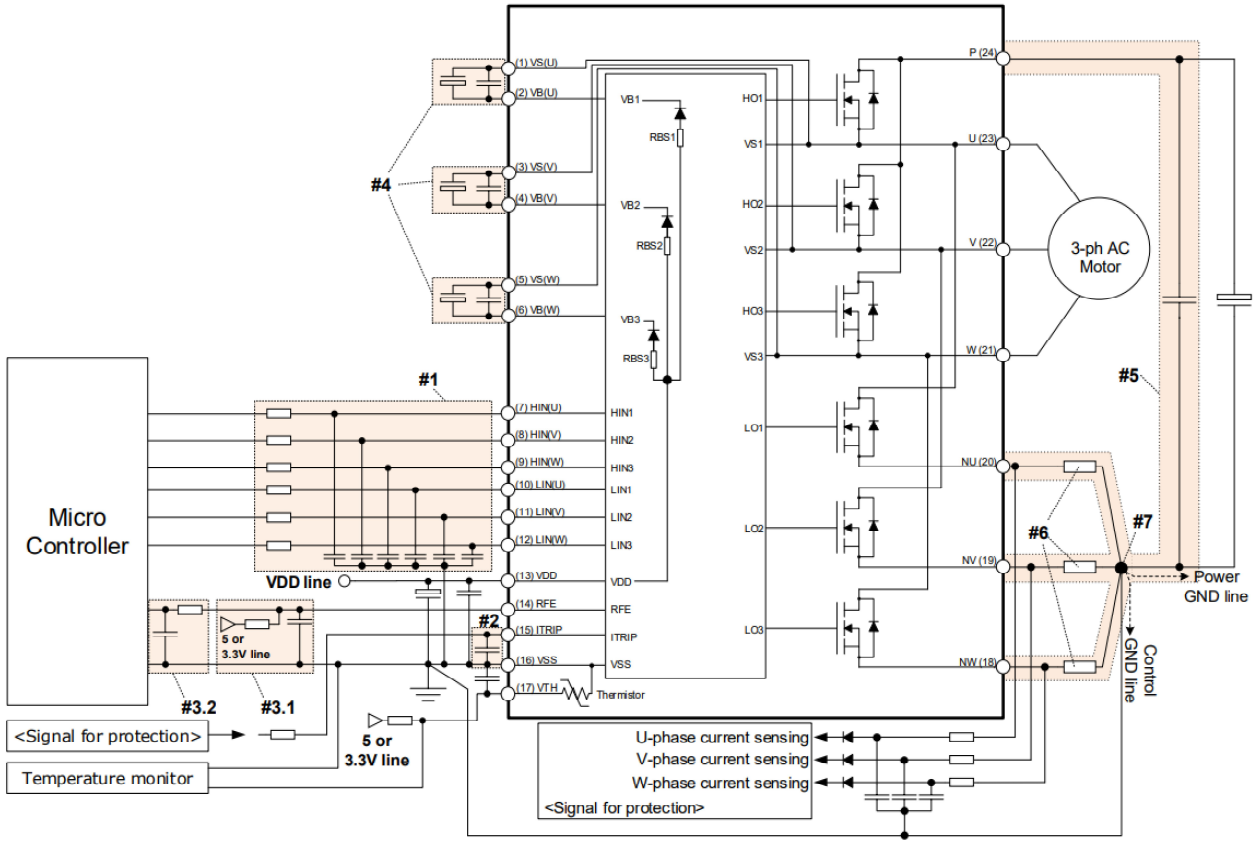


Figure 11. Typical application circuit/典型应用电路

a) Input circuit/输入电路

- To reduce input signal noise by high speed switching, the R_{IN} and C_{IN} filter circuit should be mounted. (100Ω, 1nF)
  为降低高速开关输入信号噪声，应安装 R_{IN} 和 C_{IN} 滤波电路（100Ω，1nF）
- C_{IN} should be placed as close to V_{SS} pin as possible.
  C_{IN}就尽量放置在离V_{SS}引脚近的位置

b) Itrip circuit/ Itrip电路

- To prevent protection function errors, C_{ITRIP} should be placed as close to Itrip and V_{SS} pins as possible.
  为防止保护功能出现错误，C_{ITRIP} 应尽可能靠近 Itrip 引脚和 V_{SS} 引脚放置

c) RFE circuit/ RFE 电路

i) Pull-up resistor (R_{RFE}) and pull-down capacitor (C_{RFE})/上拉电阻（R_{RFE}）和下拉电容（C_{RFE}）

- RFE output is an open drain output. This signal line should be pulled up to the positive side of the 5V/3.3V control power supply voltage (V_{CTR}) with a proper resistor R_{FE}.
  RFE 输出为漏极开路输出。该信号线应通过合适的电阻 R_{FE} 上拉至 5V/3.3V 控制电源电压（V_{CTR}）的正极侧。
- The fault-clear time is adjusted by RC network of R_{RFE} and C_{RFE} and pull-up voltage.
  故障清除时间由R_{RFE}和C_{RFE}的RC网络以及上拉电压调节。
  - t_{FLTCLR}=-R_{RFE} · C_{RFE} · ln(1- $V_{RFE,TH+}$/V_{CTR}) + internal fault-clear time 160 µs
  - t_{FLTCLR}=-1MΩ x 2nF x ln(1 - 1.9 / 5 V) + 160µs ≈ 1.1ms at RRFE = 1 MΩ, C_{RFE} = 2 nF and V_{CTR} = 5 V
  - A pull-up resistor is limited to max. 2 MΩ
    上拉电阻最大限制为2MΩ
  - In case of V_{CTR} is higher than 5 V, the R_{RFE} needs to be at least 200 kΩ to limit the IC power dissipation
    若V_{CTR}高于5V，为限制集成电路的功耗，R_{RFE}至少需要为200 kΩ

ii) RC filter/RC滤波

- It is recommended that RC filter be placed as close to the controller as possible.
  建议将 RC 滤波器放置在尽可能靠近控制器的位置。

d) VB-VS circuit/ VB-VS 电路

- Capacitor for Low side floating supply voltage should be placed as close to VB and VS pins as possible.
  低压侧悬浮电源电压的电容应尽可能靠近 VB 引脚和 VS 引脚放置

e) Snubber capacitor 缓冲电容器

- The wiring between 6HP30N065A9P and snubber capacitor including shunt resistor should be as short as possible.
  6HP30N065A9P与缓冲电容器（包括分流电阻器）之间的布线应尽可能短。

f) 6. Shunt resistor 分流电阻器

- The shunt resistor of SMD type should be used for reducing its stray inductance.
  应使用表面贴装（SMD）型分流电阻器，以降低其杂散电感。

g) 7. Ground pattern

- Ground pattern should be separated at only one point of shunt resistor as short as possible.
  接地图形应仅在分流电阻器的一个点处分离，且分离部分要尽可能短。

12. Package outline

封装外形

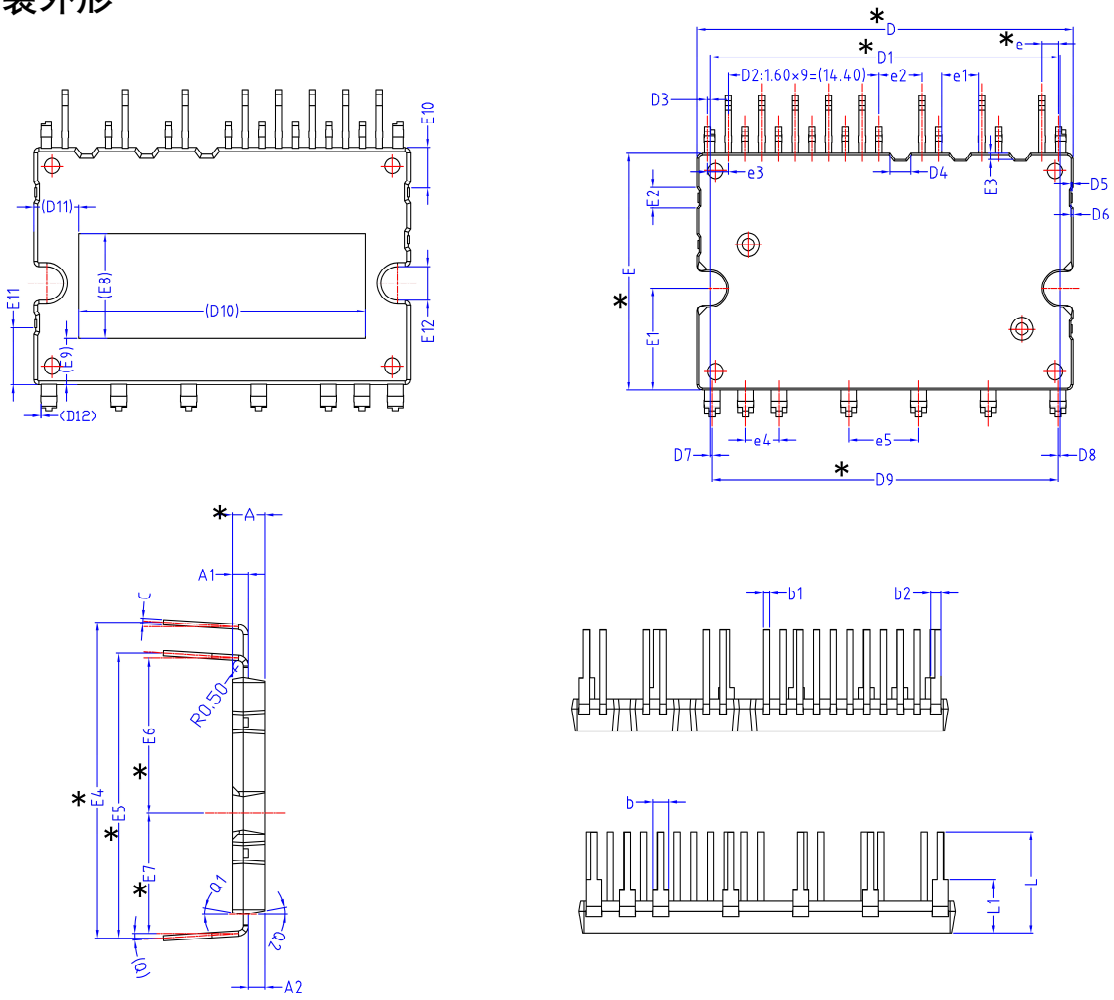


Figure 12. Package outline/封装外形

注：*为重要尺寸，()为参考尺寸

SYMBOL	COMMON Dimensions millimeter			SYMBOL	COMMON Dimensions millimeter		
	Min	Nom	Max		Min	Nom	Max
A	3.00	3.10	3.20	E2	1.90	2.00	2.10
A1	1.40	1.50	1.60	E3	0.52	0.62	0.72
A2	1.50	1.60	1.70	E4	29.80	30.30	30.80
b	1.45	1.50	1.55	E5	26.80	27.30	27.80
b1	0.55	0.60	0.65	E6	14.35	14.85	15.35
b2	0.95	1.00	1.05	E7	11.05	11.55	12.05
C	0.45	0.50	0.55	(E8)	9.70	10.00	10.30
D	35.70	36.00	36.30	(E9)	4.20	4.50	4.80
D1	33.20	33.50	33.80	E10	3.60	3.85	4.10
D2	14.20	14.40	14.60	E11	5.20	5.45	5.70
D3	--	0.26	--	E12	3.05	3.20	3.35
D4	1.90	2.00	2.10	e	1.45	1.60	1.75
D5	0	--	0.10	e1	3.39	3.54	3.69
D6	--	0.20	--	e2	3.99	4.14	4.29
D7	--	0.20	-	e3	1.85	2.00	2.15
D8	--	0.20	--	e4	3.05	3.20	3.35
D9	32.91	33.11	33.31	e5	6.48	6.68	6.88
(D10)	27.10	27.40	27.70	L	9.20	9.70	10.20
(D11)	4.00	4.30	4.60	L1	4.60	5.10	5.60
(D12)	0	-	0.12	(Q)	2°	3.5°	5°
E	22.40	22.70	23.00	Q1	9°	10°	11°
E1	9.40	9.70	10.00	Q2	9°	10°	11°

13. Revision history
修订历史

Table 14 Date and version number/日期与版本号

Date日期	Revision版本	Changes更改内容
2026-04-15	Rev. G 1.0	Target Datasheet（目标规格书）

14. Matters needing attention
注意事项

Appendix 1. Important Technical Guidance, Application Policy, and Copyright Notice/重要技术指南、应用规范与版权声明

[Data and Design Guidance]

The information provided herein, including typical values and application examples, serves as technical guidance only and should not be construed as a formal guarantee of product characteristics. This documentation is intended for qualified engineering personnel, who bear the ultimate responsibility for evaluating the product's suitability for their specific application and compliance with all industry standards.

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