XNS50S12E6

智能功率模块 / IPM

描述/Description

- XNS50S12E6基于Trench FS-IGBT技术，提供紧凑且高性能的变频伺服解决方案，适合较高功率消费和工业应用领域。

  XNS50S12E6 is an Advanced IPM Based on Trench FS-IGBT Technology as a Compact and High Performance Inverter or Server Solution for Higher Power Consumption and Industrial Applications.
- XNS50S12E6通过优化开关速度和减小寄生电感实现低电磁干扰（EMI）特性。

  XNS50S12E6 Features Low Electromagnetic Interference (EMI) Characteristics Through Optimizing Switching Speed and Reducing Parasitic Inductance.
- XNS50S12E6内置优化的保护和驱动电路并与低损耗IGBT匹配，欠压锁定和短路保护进一步提高了系统可靠性。

  XNS50S12E6 Combines Optimized Circuit Protection and Drive Matched to Low-Loss IGBTs. System Reliability is Further Enhanced by the Integrated Under-Voltage Lock-Out and Short-Circuit Protection.
- XNS50S12E6内置高速HVIC，提供无光耦单电源IGBT栅极驱动能力，进一步缩小了逆变器系统设计的总体尺寸。

  XNS50S12E6 Combines High Speed HVIC Provides Opto-Coupler-Less Single-Supply IGBT Gate Driving Capability that Further Reduce the Overall Size of the Inverter System Design.
- 分开的负直流端子使得变频器的每相电流可以单独监视到。

  Each Phase Current of Inverter can be Monitored Separately Due to the Divided Negative DC Terminals.

主要特点

- 集成600V-50 A三相IGBT逆变器，以及包含栅极驱动和保护功能的控制IC
- 防桥臂直通功能
- 采用DBC (Al2O3) 基板实现非常低的热阻
- 内置带限流电阻的自举二极管和专用的Vs引脚
- 低端IGBT的各相发射极引脚开路用于三相电流感测
- HVIC内部集成欠压保护锁定、过流保护与温度输出功能
- 可调节的故障输出脉宽（CFO）并集成使能输入
- 绝缘级别：2500V_{rms}/1min
- 单接地电源供电

应用

- 电机控制 – 家用设备 / 工业电机

Features

- Integrated 600V-50A 3-Phase IGBT Inverter Bridge and Control ICs for Gate Driving and Protection
- Shoot-through prevention
- Extremely low Thermal Resistance based on DBC（Al2O3）structure
- Built-In Bootstrap Diodes with current limiting resistor and dedicated Vs Pins
- Separate Open-Emitter pins from Low-side IGBTs for Three-Phase Current Sensing
- Under-voltage lockout(UVLO)、Short-circuit current protection(CIN) and Temperature monitoring output(V_{OT})
- Programmable fault clear timing and enable input
- Isolation Voltage Rating : 2500 Vrms/1min
- Single-Ground Power Supply

Applications

- Motor Control – Home Appliance / Industrial Motor

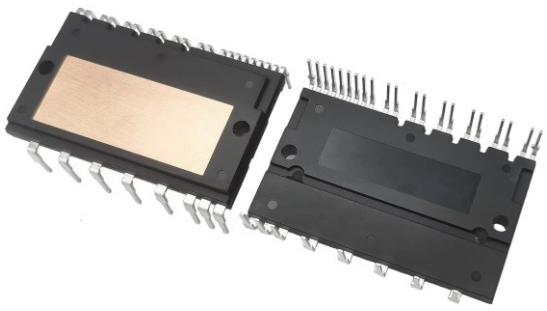


图1. 封装概览

Figure1. Package Overview

绝对最大额定值 / Absolute Maximum Ratings

逆变器部分(单个IGBT，除非另有说明) / Inverter Part (Each IGBT ® Unless Otherwise Specified)

符号/Symbol	参数/Parameter	工作条件/ Conditions	额定值/Rating	单位/Unit
V_{PN}	加在P-N之间的电源电压 DC Link Input Voltage		450	V
$V_{PN(Surge)}$	加在P-N之间的电源浪涌电压 DC Link Input Voltage Surge		500	
V_{CES}	集电极-发射极之间电压 Collector-Emitter Voltage		600	
$\pm I_C$	单个IGBT集电极电流 Each IGBT Collector Current	T_C= 25°C,	50	A
$\pm I_{CP}$	单个IGBT集电极峰值电流 Each IGBT Collector Peak Current	T_C= 25°C, PW < 1ms	100	
P_C	最大功耗 Maximum Power Dissipation	T_C= 25°C，单个芯片/Per one chip	139	W
T_J	工作结温 Operating Junction Temperature		-40 ~ 150	°C

控制部分 / Control Part

符号/Symbol	参数/Parameter	工作条件/ Conditions	额定值/Rating	单位/Unit
V_D	控制电源电压 Control Supply Voltage	施加在V_{P1}-V_{NC}, V_{N1}-V_{NC}之间 Applied Between V_{P1}-V_{NC}, V_{N1}-V_{NC}	20	V
V_{DB}	高端偏置电压 High-side Bias Voltage	施加在V_{UFB}-V_{UFS}, V_{VFB}-V_{VFS}, V_{WFB}-V_{WFS}之间 Applied Between V_{UFB}-V_{UFS}, V_{VFB}-V_{VFS}, V_{WFB}-V_{WFS}	20	
V_{IN}	输入信号电压 Input Signal Voltage	施加在IN和V_{NC}之间 Applied Between IN and V_{NC}	- 0.3 ~ V_D + 0.3	
V_{FO}	故障输出电源电压 Fault Output Supply Voltage	施加在FO和V_{NC}之间 Applied Between FO and V_{NC}	- 0.3 ~ V_D + 0.3	
I_{FO}	故障输出电流 Fault Output Current	FO引脚处的灌电流 Sink Current at FO Pin	1	mA
V_{SC}	电流感应输入电压 Current Sensing Input Voltage	施加在CIN和V_{NC}之间 Applied Between CIN and V_{NC}	- 0.3 ~ V_D + 0.3	V

自举二极管部分(单个二极管，除非另有说明) / Bootstrap Diode Part (Each Bootstrap Diode Unless Otherwise Specified)

符号/Symbol	参数/Parameter	工作条件/ Conditions	额定值/Rating	单位/Unit
V_{RRMB}	最大重复反向电压 Maximum Repetitive Reverse Voltage		600	V
$*I_{FB}$	正向电流 Forward Current	T_C= 25°C	0.5	A
$*I_{FPB}$	正向电流（峰值） Forward Current (Peak)	T_C= 25°C, PW < 1ms	1	
T_J	工作结温 Operating Junction Temperature		-40 ~ 150	°C

热阻 / Thermal Resistance

符号/Symbol	参数/Parameter	工作条件/ Conditions	额定值/Rating	单位/Unit
$R_{th(j-c)Q}$	节点-壳体热阻（注1） Junction to Case Thermal Resistance (Note1)	逆变器工作条件下的单个IGBT Each IGBT under Inverter Operating Condition	0.9	°C /W
$R_{th(j-c)F}$		逆变器工作条件下的单个FRD Each FRD under Inverter Operating Condition	2.7	

注 / Note:
1.关于壳体温度（T_C）的测量点，参见图2。 / For the Measurement Point of Case Temperature T_C, Please refer to Figure 2.
2.标记"*"的为计算值或设计因素。/Marking "*"is calculation value or Design Factor.

整个系统 / Total System

符号/Symbol	参数/Parameter	工作条件/ Conditions	额定值/Rating	单位/Unit
$V_{PN(PROT)}$	自我保护电源电压限制 Self-Protection Supply Voltage Limit	V_D=V_{DB}= 13.5V ~ 16.5V, T_J= 125°C，非重复性，＜ 2μs	400	V
T_C	模块壳体工作温度 Module Case Operation Temperature	-40°C ≤T_J≤ 150°C	-30 ~ 125	°C
T_{STG}	存储温度 Storage Temperature		-40 ~ 125	
V_{ISO}	绝缘电压 Isolation Voltage	60Hz，正弦波，1分钟，连接基板到引脚 60 Hz, Sinusoidal, 1 minute, Connection Pins to Heatsink	2500	V_{rms}

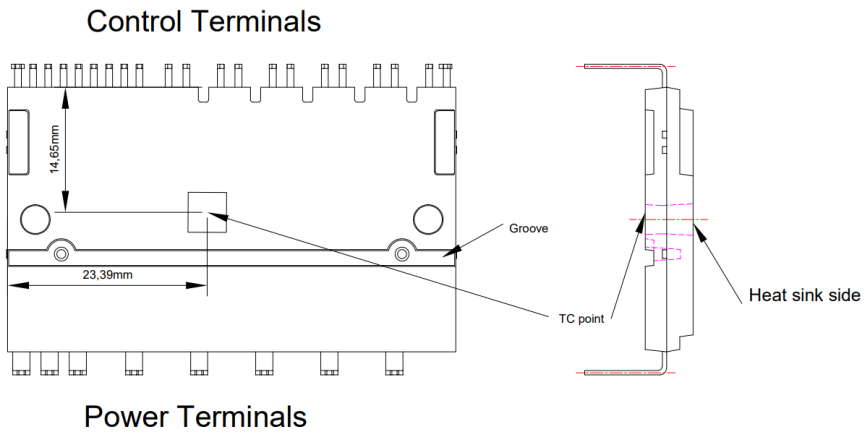


图2. 壳温测量点

Figure2. Tc Measurement Position

引脚描述 / Pin descriptions

引脚号/Pin Number	引脚名/Pin Name	引脚描述/Pin Description
1	V_{UFS}	High-Side Bias Voltage Ground for U-Phase IGBT Driving 上桥臂U相驱动地端
2	V_{UFB}	High-Side Bias Voltage for U-Phase IGBT Driving 上桥臂U相驱动正端
3	V_{P1}	Common Bias Voltage for IC and IGBTs Driver 控制电源正端
4	U_P	Signal Input for High-Side U Phase 上半桥U相逻辑输入端
5	V_{VFS}	High-Side Bias Voltage Ground for V-Phase IGBT Driving 上桥臂V相驱动地端
6	V_{VFB}	High-Side Bias Voltage for V-Phase IGBT Driving 上桥臂V相驱动正端
7	V_{P1}	Common Bias Voltage for IC and IGBTs Driver 控制电源正端
8	V_P	Signal Input for High-Side V Phase 上半桥V相逻辑输入端
9	V_{WFS}	High-Side Bias Voltage Ground for W-Phase IGBT Driving 上桥臂W相驱动地端
10	V_{WFB}	High-Side Bias Voltage for W-Phase IGBT Driving 上桥臂W相驱动正端
11	V_{P1}	Common Bias Voltage for IC and IGBTs Driver 控制电源正端
12	W_P	Signal Input for High-Side W Phase 上半桥W相逻辑输入端
13	V_{OT}	Temperature Output Voltage 温度输出脚
14	U_N	Signal Input for Low-Side U Phase 下桥臂U相逻辑输入端
15	V_N	Signal Input for Low-Side V Phase 下桥臂V相逻辑输入端
16	W_N	Signal Input for Low-Side W Phase 下桥臂W相逻辑输入端
17	F_O/EN	Fault Output/Enable Input 故障信号输出端/使能输入端
18	CF_O	Fault clear time setting Fault信号复位时间调整输入引脚
19	CIN	Capacitor for Short-Circuit Current Detector Input 过流跳闸电压检测输入端
20	V_{NC}	Common Supply Ground 下桥臂参考地端
21	V_{N1}	Common Bias Voltage for IC and IGBTs Driver 控制电源正端
22	NW	Negative DC-Link Input for W-Phase 逆变器直流电源负端（W相）
23	NV	Negative DC-Link Input for V-Phase 逆变器直流电源负端（V相）
24	NU	Negative DC-Link Input for U-Phase 逆变器直流电源负端（U相）
25	W	Output for W-Phase 逆变器W相输出端
26	V	Output for V-Phase 逆变器V相输出端
27	U	Output for U-Phase 逆变器U相输出端
28	P	Positive DC-Link Input 逆变器直流电压正端
29	NC	N.C 空引脚

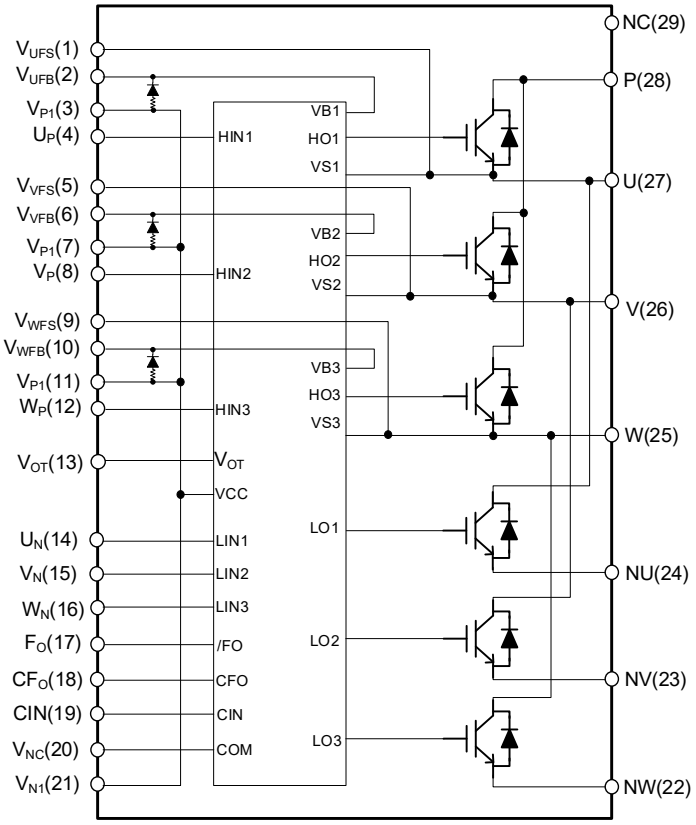


图3. 引脚布局和内部框图（仰视图）

Figure3. Pin Configuration and Internal Block Diagram (Bottom View)

电气特性(T_J= 25°C, V_D=V_{DB}= 15V，除非另有说明) / Electrical Characteristics (T_J= 25°C, V_D=V_{DB}= 15V, Unless Otherwise Specified)

逆变器部分(单个IGBT，除非另有说明) / Inverter Part(Each IGBT Unless Otherwise Specified)

符号/Symbol		参数/Parameter	工作条件/ Conditions		最小值 /Min	典型值 /Typ	最大值 /Max	单位 /Unit
$V_{CE(SAT)}$		集电极-发射极间饱和电压 Collector-Emitter Saturation Voltage	V_D=V_{DB}= 15V, V_{IN}= 5V	I_C= 50A, T_J= 25°C,	-	1.9	2.3	V
				I_C= 50A, T_J= 125°C,	-	2.1	-	
V_{EC}		FWD正向电压 FWD Forward Voltage	V_{IN}= 0V, I_C= -50A,		-	1.5	1.8	
I_{CES}		集电极-发射极间漏电流 Collector-Emitter Leakage Current	V_{CE}=V_{CES}	T_J= 25°C,	-	-	1	mA
				T_J= 125°C,	-	-	10	
HS	t_{ON}	开关时间 Switching Parameters	V_{PN}= 400V, V_D=V_{DB}= 15V, I_C= 50A V_{IN}= 0V ↔ 5V，电感负载 / Inductive Load		-	1500	-	ns
	$T_{C(ON)}$				-	1100	-	
	t_{OFF}				-	1300	-	
	$T_{C(OFF)}$				-	1250	-	
	t_{rr}				-	120	-	
LS	t_{ON}				-	1600	-	
	$T_{C(ON)}$					1100	-	
	t_{OFF}					1400	-	
	$T_{C(OFF)}$					1350	-	
	t_{rr}					160	-	

控制部分 / Control Part

符号/Symbol	参数/Parameter	工作条件/ Conditions		最小值 /Min	典型值 /Typ	最大值 /Max	单位 /Unit
I_{QC}	V_D静态电流 Quiescent V_D Current	V_D= 15V, V_{IN}= 0V	施加在V_{P1}, V_{N1}和V_{NC}之间 Applied Between V_{P1}, V_{N1} and V_{NC}	1.2	1.35	1.5	mA
I_{DB}	V_{DB}静态电流 Quiescent V_{DB} Current	V_{DB}= 15V, V_{IN}= 0V	施加在V_{UFB}-V_{UFS}, V_{VFB}-V_{VFS}, V_{WFB}-V_{WFS}; Applied Between V_{UFB}-V_{UFS}, V_{VFB}-V_{VFS}, V_{WFB}-V_{WFS}	70	90	110	μA
V_{FOH}	故障输出电压 Fault Output Voltage	V_{SC}= 0V, V_{FO}电路：10KΩ至5V上拉		4.9	-	-	V
V_{FOL}		V_{SC}= 1V, I_{FO}= 1mA		-	-	0.95	
$V_{SC(ref)}$	Short Circuit Trip Level 短路电流触发电平	V_D= 15V (注3 / Note 3)(图7 / Figure 7)		0.39	0.48	0.55	
I_{IN}	Input Current 输入脚电流	V_{IN}= 5V		0.7	1.00	1.50	mA
t_{FILIN}	输入U_P,V_P,W_P,U_N,V_N,W_N滤波时间 Input Filter Time at U_P,V_P,W_P,U_N,V_N,W_N	V_{SC}= 0V, V_{IN}= 0&5V		200	300	400	ns
t_{FILEN}	使能高电平滤波时间 Fault high filter time			120	200	-	
T_{SC}	保护关断延迟时间 Shutdown Propagation Delay	V_{SC}= 1V		400	600	800	
T_{FO}	CIN到FO延迟时间 Propagation Delay CIN to FO			300	460	720	
V_{DUV-}	下桥欠压保护（图5） Low-Side Undervoltage Protection (Figure 5)	V_D欠压保护检测电平 V_D Undervoltage Protection Detection Level		10.3	11.4	12.5	V
V_{DUV+}		V_D欠压保护复位电平 V_D Undervoltage Protection Reset Level		10.8	11.9	13	
V_{DBUV-}	上桥欠压保护（图6） High-Side Undervoltage Protection (Figure 6)	V_{DB}欠压保护检测电平 V_{DB} Undervoltage Protection Detection Level		9.9	11	12.1	
V_{DBUV+}		V_{DB}欠压保护复位电平 V_{DB} Undervoltage Protection Reset Level		10.4	11.5	12.6	
t_{FOD}	故障输出脉宽 Fault Output Pulse Width	C_{FO}= 22nF (注4 / Note 4)		1.8	2.4	3	ms
V_{IH}	输入导通阈值电压 Input ON Threshold Voltage	施加在IN和V_{NC}之间 Applied between IN and V_{NC}		-	2.00	-	V
V_{IL}	输入关断阈值电压 Input OFF Threshold Voltage			-	1.25	-	
V_{OT}	Temperature Output Voltage 温度输出电压	T_J= 25°C		0.98	1.16	1.35	V

注 / Note:

3.短路电流保护同时作用于上下桥。 / Short-Circuit Current Protection is working on the high and Low-Side at the same time.

4.当触发过流保护或欠压保护的时候，故障信号FO输出。不同保护模式的FO输出的脉冲宽度也不同。在触发过流保护时，FO输出脉冲宽度是由一个固定的宽度加上一个根据连接到CF_O管脚的电容确定的宽度。(T_{FOD}=55μs + 0.12ms/nF*C_{FO})，但在触发欠压保护时，故障信号FO持续输出，直到从欠压保护状态恢复(但最小FO脉冲宽度是由CF_O指定的时间)。

Fault signal FO outputs when SC or UV protection works. Fo pulse width is different for each protection modes. At SC failure. FO pulse width is a fixed width which is specified by the capacitor connected to CFO terminal. (T_{FOD}=55μs + 0.12ms/nF*C_{FO}), but at UV failure, FO outputs continuously until recovering from UV state.(But minimum FO pulse width is the specified time by C_{FO}.)

自举二极管部分(单个二极管，除非另有说明) / Bootstrap Diode Part(Each Bootstrap Diode Unless Otherwise Specified)

符号/Symbol	参数/Parameter	工作条件/ Conditions	最小值 /Min	典型值 /Typ	最大值 /Max	单位 /Unit
V_{FB}	正向电压 Forward Voltage	I_F= 0.1A, T_C= 25°C	-	4.5	-	V
t_{rrB}	反向恢复时间 Reverse Recovery Time	I_F= 0.1A, T_C= 25°C	-	80	-	
R_{BSD}	串联电阻 Resistance between V_F= 4V and V_F= 5V	V_{F1}= 4V, V_{F2}= 5V	20	30	40	Ω

推荐工作条件 / Recommended Operating Condition

符号/Symbol	参数/Parameter	工作条件/ Conditions	最小值 /Min	典型值 /Typ	最大值 /Max	单位 /Unit
V_{PN}	电源电压 Supply Voltage	施加在P和N之间 Applied Between P and N	-	300	400	V
V_D	控制电源电压 Control Supply Voltage	施加在V_{P1}-V_{NC}, V_{N1}-V_{NC}之间 Applied Between V_{P1}-V_{NC}, V_{N1}-V_{NC}	13.5	15	16.5	
V_{DB}	高端偏压 High-Side Bias Voltage	施加在V_{UFB}-V_{UFS}, V_{VFB}-V_{VFS}, V_{WFB}-V_{WFS}; Applied Between V_{UFB}-V_{UFS}, V_{VFB}-V_{VFS}, V_{WFB}-V_{WFS}	13.5	15	16.5	V
dV_D/d_t, dV_{DBS}/d_t	控制电源波动 Control Supply Variation		-1	-	1	V/μs
$V_{IN(ON)}$	逻辑高电平 Logic high level	施加在IN和V_{NC}之间 Applied between IN and V_{NC}	2.5	-	V_D	V
$V_{IN(OFF)}$	逻辑低电平 Logic low level		0	-	0.8	
t_{dead}	防止桥臂直通的死区时间 Blanking Time for Preventing Arm-Short	每个输入信号/For Each Input Signal	1	-	-	μs
f_{PWM}	PWM开关频率 PWM Switching Frequency	-30°C ≤T_C≤ 125°C, -40°C ≤T_J≤ 150°C	-	-	20	kHz
V_{GND}	逻辑接地端变化 Logic ground variation	施加在N_U, N_V, N_W和V_{NC}之间（包括浪涌电压） Applied between N_U, N_V, N_W and V_{NC} (Including Surge Voltage)	-5	-	5	V
T_C	工作温度 Operating Temperature		-30	-	125	°C

机械特性和额定值 / Mechanical Characteristics and Ratings

参数/Parameter	工作条件/ Conditions		最小值 /Min	典型值 /Typ	最大值 /Max	单位 /Unit
安装扭矩 Mounting Torque	安装螺钉：M3 Mounting Screw: M3	建议0.78 N.m Recommended 0.78 N.m	0.59	-	0.98	N.m
器件平面度 Device Flatness		见图4 See Figure 4	-50	-	100	μm
重量 Weight			-	21.4	-	g

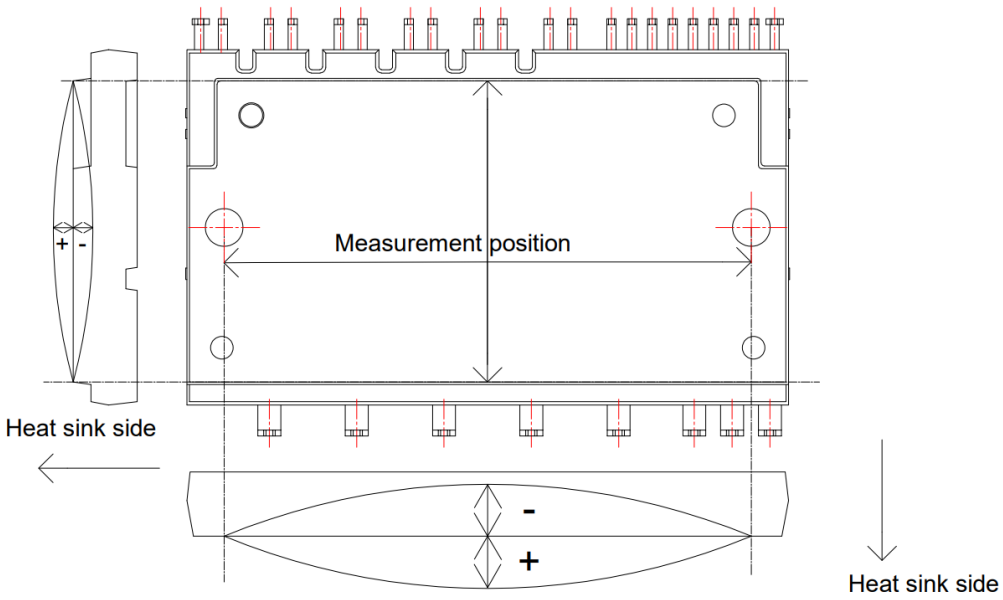


图4. 平面度测量位置

Figure4. Flatness Measurement Position

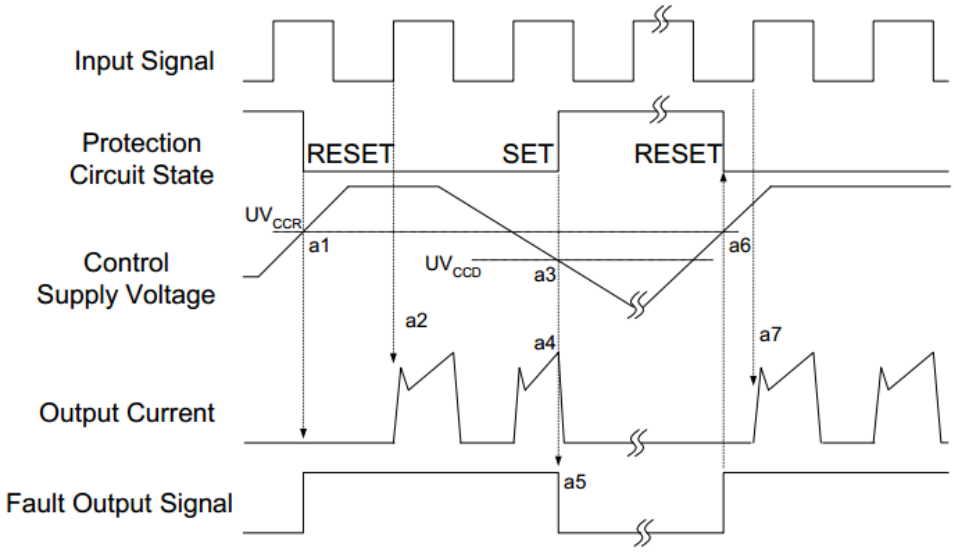


图5. 欠压保护（低端）

Figure 5. Undervoltage Protection (Low-side)

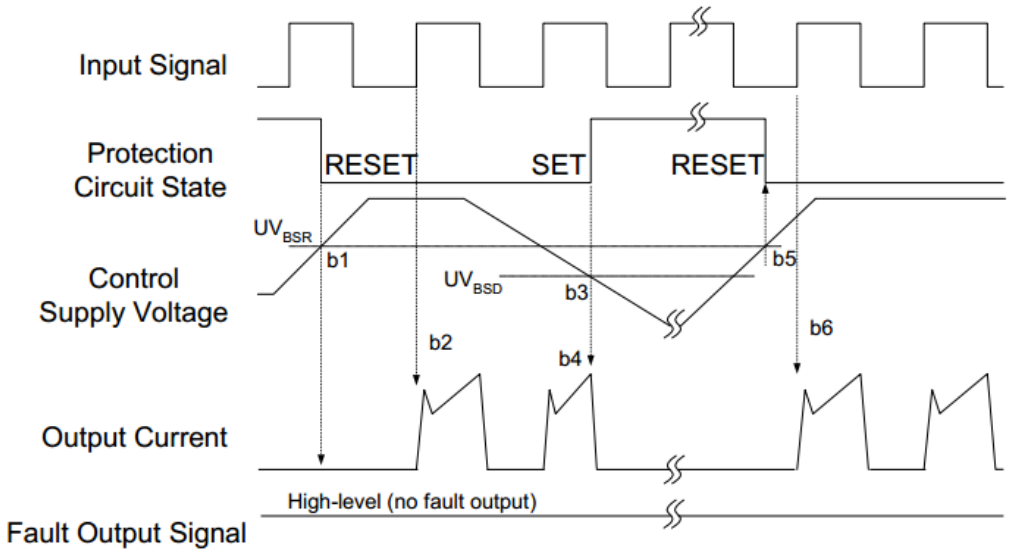


图6. 欠压保护（高端）

Figure 6. Undervoltage Protection (High-side)

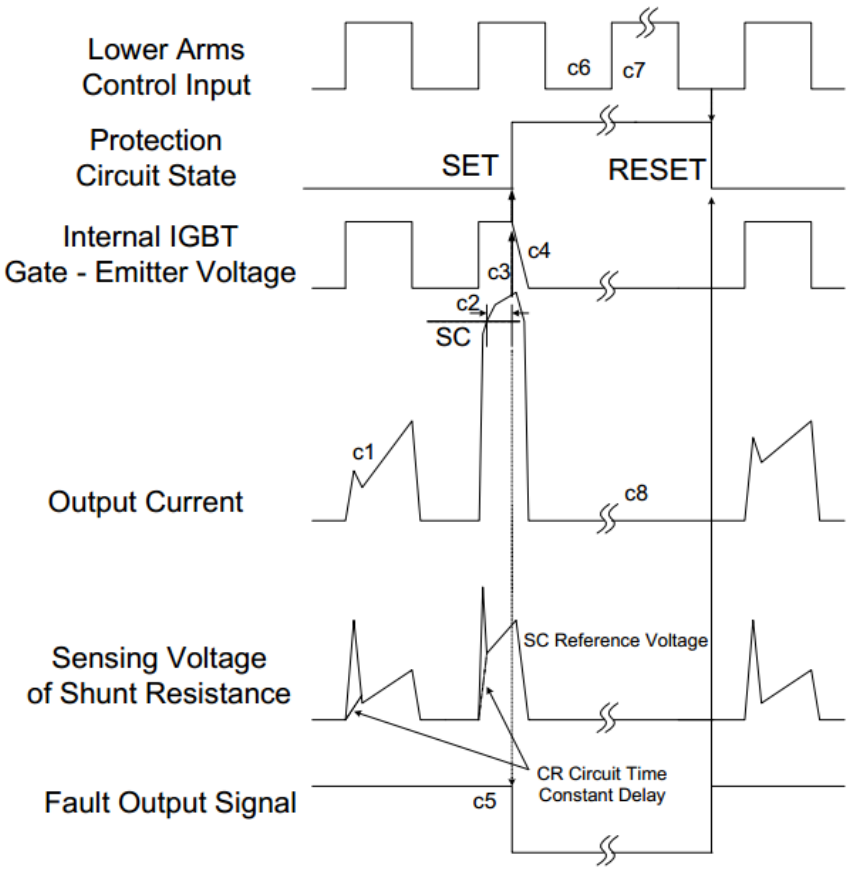


图7. 短路电流保护（低端）

Figure 7. Short-circuit Current Protection (Low-side)

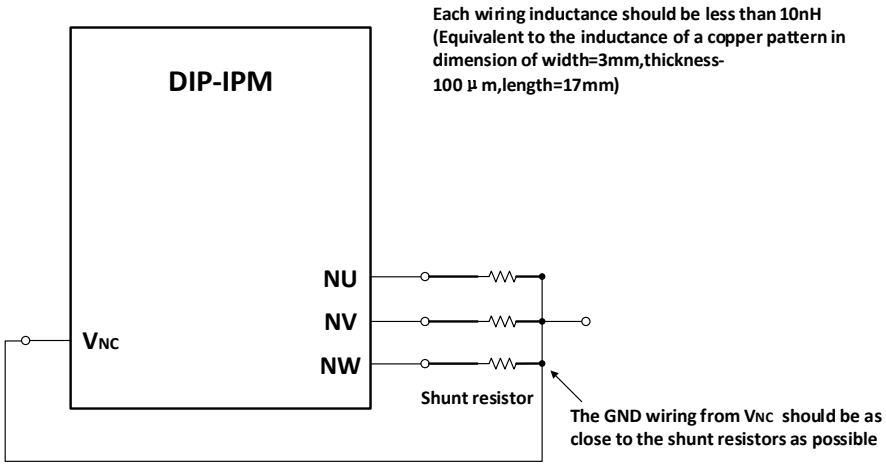
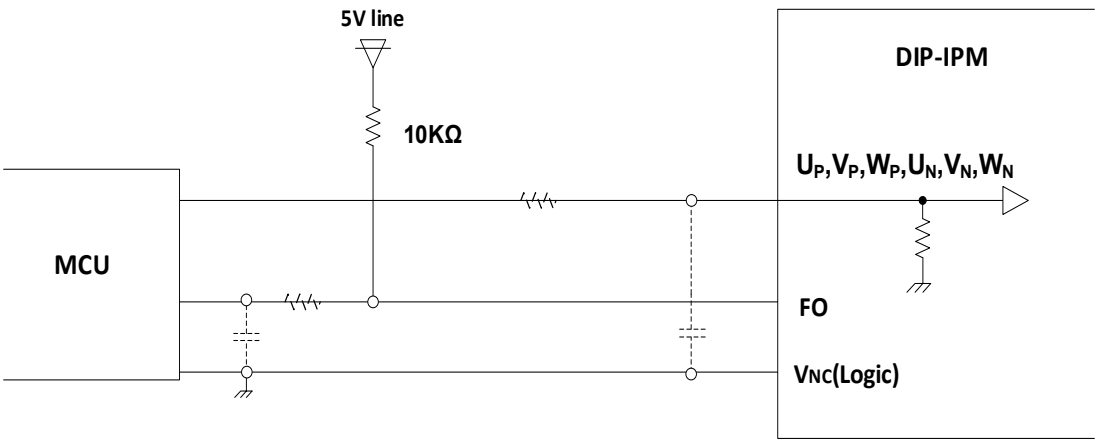


图8. 推荐的分流电阻布线

Figure8. Recommended Wiring Around The Shunt Resistor



Input				Output			
HIN	LIN	CIN	EN	High side IGBT	Low side IGBT	U,V,W	FO
1	0	0	1	ON	OFF	P	OFF
0	1	0	1	OFF	ON	NU,NV,NW	OFF
0	0	0	1	OFF	OFF	High Impedance	OFF
1	1	0	1	OFF	OFF	High Impedance	OFF
×	×	1	×	OFF	OFF	High Impedance	ON
×	×	0	0	OFF	OFF	High Impedance	OFF

图9. 推荐的MCU接口和真值表

Figure9. Recommended MCU Interface and The Truth Table

Built in Bootstrap Diode V_F-I_F Characteristic

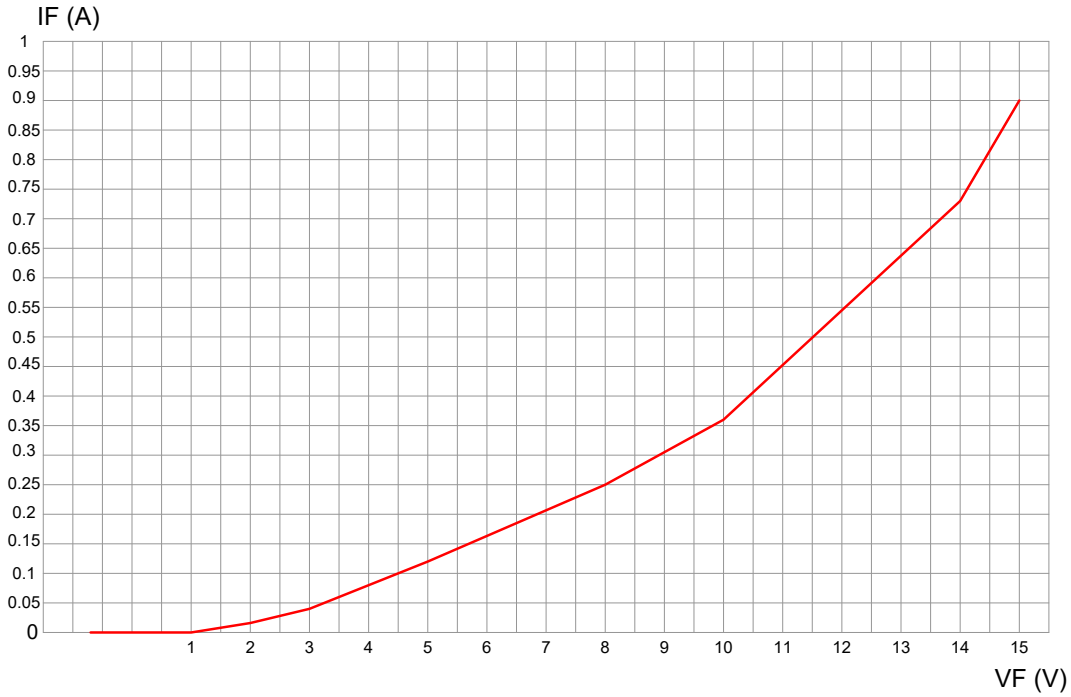


图10. 内置自举二极管特性（典型值）

Figure10. Built in Bootstrap Diode Characteristics (Typ.)

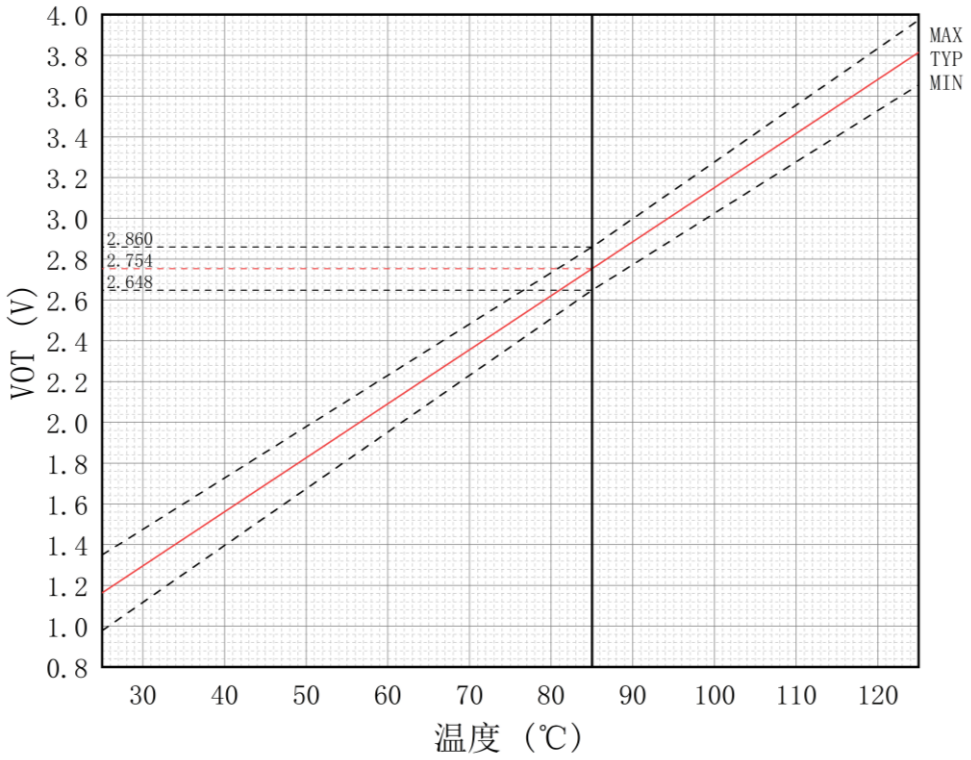


图11. V_{OT}的温度曲线

Figure 11. Temperature Profile of V_{OT}

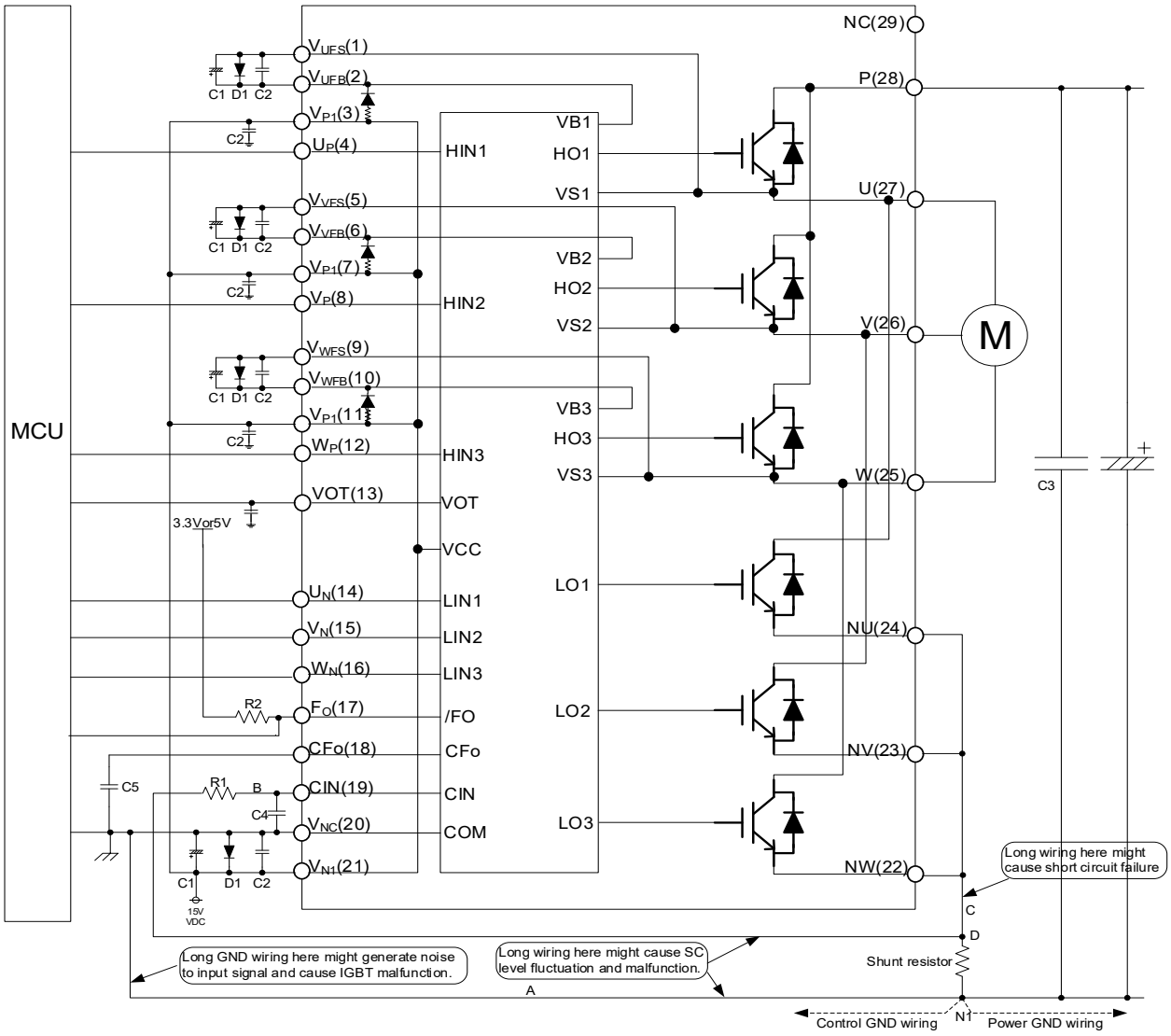


图12. 典型应用电路

Figure12. Typical Application Circuit

注 / Note:

1.推荐在电源上加稳压二极管D1（24V/1W），防止浪涌电压损坏IPM。
It is recommended to insert a Zener diode D1 (24V/1W) between each pair of control supply terminals to prevent surge destruction.

2.输入正逻辑，下拉电阻5KΩ。为了避免故障，应尽可能缩短每个输入端的连线 （小于2-3 cm）。
Input logic is High-active. There is a 5KΩ pull down resistor. To avoid malfunction, the wiring of each input should be as short as possible (less than 2-3cm).

3.为避免保护功能出错，应尽可能缩短R1和C4 周围的连线。
To prevent errors of the protection function, the wiring of B, C and D point should be as short as possible.

4.在短路保护电路中，R1C4 的时间常数应在1.5 ~ 2.0 μs 的范围内进行选择。
In the short-circuit protection circuit, please select the R1C4 time constant in the range 1.5 ~ 2.0 μs.

5.每个电容都应尽可能地靠近产品的引脚安装。（C1：温度特性好，频率特性好；C2：0.22 ~ 2μF，温度特性好，频率特性好）
Each capacitor should be mounted as close to the pins of the product as possible. (C1: good temperature, frequency characteristic electrolytic type and C2: 0.22 ~ 2μF, good temperature, frequency and DC bias characteristic ceramic type are recommended.)

6.为防止浪涌的破坏，应尽可能缩短滤波电容和P & GND 引脚间的连线。推荐在P & GND 引脚间使用0.1 ~ 0.22 μF 的高频无感电容C3。
To prevent surge destruction, the wiring between the smoothing capacitor and the P & GND pins should be as short as possible. The use of a high-frequency non-inductive C3 capacitor of around 0.1 ~ 0.22 μF between the P & GND pins is recommended.

7.在各种家用电器设备中，几乎都用到了继电器。在这些情况下，MCU 和继电器之间应留有足够的距离。
Relays are used at almost every systems of electrical equipments at industrial application. In these cases, there should be sufficient distance between the MCU and the relays.

8.控制地和功率地应该分开不限，相交于一点N1。
It is recommended to connect control GND and power GND at only a point N1 (near the terminal of shunt resistor).

9.为避免误动作，A、B、C布线应尽可能的短。
To prevent malfunction, the wiring of A, B, C should be as short as possible.

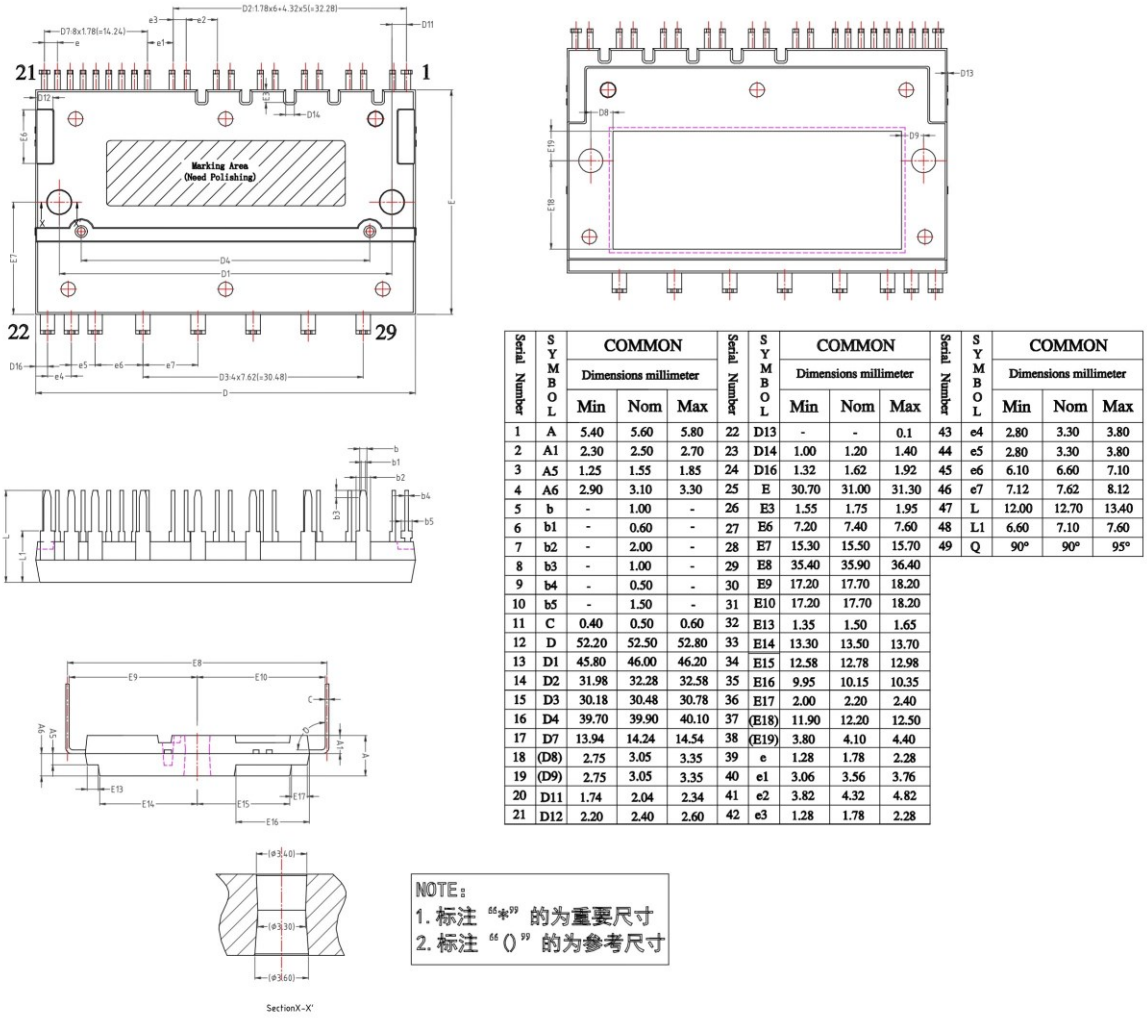
10.D点应该靠近分流电阻端。当使用一个分流电阻时，NU, NV, NW三个端子应相互靠近。推荐使用高精度温度系数低的分流电阻。
The point D at which the wiring to C4 filter is divided should be near the terminal of shunt resistor. NU, NV, NW terminals should be connected at near NU, NV, NW terminals when it is used by one shunt operation. Low inductance SMD type with tight tolerance, temp-compensated type is recommended for shunt resistor.

11.FO是集电极开路，需要用电阻上拉到MCU的电源电压（5V或3.3V），I_{FO}电流不得超过1mA。
FO output is open drain type. It should be pulled up to power supply of MCU (e.g. 5V, 3.3V) by a resistor that makes I_{FO} up to 1mA.

12.FO信号的复位脉宽时间可以通过调整在CFO引脚与GND之间的电容进行相应变化。
FO pulse width can be set by the capacitor connected to CFO terminal.

13.高频噪声施加在控制电源上会造成IC误动作，导致IPM错误运行。为避免这个问题，控制电压应满足dV/dt≤+/-1V/μs, Vripple≤2Vp-p。
If high frequency noise superimposed to the control supply line, IC malfunction might happen and cause IPM erroneous operation. To avoid such problem, line ripple voltage should meet dV/dt≤+/-1V/μs, Vripple≤2Vp-p.

轮廓封装详图 / Detailed Package Outline Drawings



Serial Number	SYMBOL	COMMON Dimensions millimeter			Serial Number	SYMBOL	COMMON Dimensions millimeter			Serial Number	SYMBOL	COMMON Dimensions millimeter		
		Min	Nom	Max			Min	Nom	Max			Min	Nom	Max
1	A	5.40	5.60	5.80	22	D13	-	-	0.1	43	e4	2.80	3.30	3.80
2	A1	2.30	2.50	2.70	23	D14	1.00	1.20	1.40	44	e5	2.80	3.30	3.80
3	A5	1.25	1.55	1.85	24	D16	1.32	1.62	1.92	45	e6	6.10	6.60	7.10
4	A6	2.90	3.10	3.30	25	E	30.70	31.00	31.30	46	e7	7.12	7.62	8.12
5	b	-	1.00	-	26	E3	1.55	1.75	1.95	47	L	12.00	12.70	13.40
6	b1	-	0.60	-	27	E6	7.20	7.40	7.60	48	L1	6.60	7.10	7.60
7	b2	-	2.00	-	28	E7	15.30	15.50	15.70	49	Q	90°	90°	95°
8	b3	-	1.00	-	29	E8	35.40	35.90	36.40					
9	b4	-	0.50	-	30	E9	17.20	17.70	18.20					
10	b5	-	1.50	-	31	E10	17.20	17.70	18.20					
11	C	0.40	0.50	0.60	32	E13	1.35	1.50	1.65					
12	D	52.20	52.50	52.80	33	E14	13.30	13.50	13.70					
13	D1	45.80	46.00	46.20	34	E15	12.58	12.78	12.98					
14	D2	31.98	32.28	32.58	35	E16	9.95	10.15	10.35					
15	D3	30.18	30.48	30.78	36	E17	2.00	2.20	2.40					
16	D4	39.70	39.90	40.10	37	(E18)	11.90	12.20	12.50					
17	D7	13.94	14.24	14.54	38	(E19)	3.80	4.10	4.40					
18	(D8)	2.75	3.05	3.35	39	e	1.28	1.78	2.28					
19	(D9)	2.75	3.05	3.35	40	e1	3.06	3.56	3.76					
20	D11	1.74	2.04	2.34	41	e2	3.82	4.32	4.82					
21	D12	2.20	2.40	2.60	42	e3	1.28	1.78	2.28					

图13. 封装轮廓

Figure13. Package Outline

封装打标和订货信息 / Package Marking & Ordering Information

Device Marking	Device	Package	Packing Type	Quantity
XNS50S12E6	XNS50S12E6	IPM-DIP29	Tube	10

深圳芯能半导体技术有限公司
Shenzhen invsemi technology co.,ltd
IGBT_IPM_PIM_HVIC_深圳芯能半导体技术有限公司 (invsemi.com)