产品描述：

TRM306A2S3 是一款 600V/30A 三相全桥智能功率模块，内置了低损耗沟槽栅场截止型 IGBT 和 FRD,内部集成了自举二极管 BSD，简化了客户的 PCB 设计。内部集成温度输出 VOT 功能用于检测模块内部的温度。集成多种保护功能，包含 UVLO 欠压保护，CIN 过流保护，过温保护。并兼容 3.3V，5V 和 15V 逻辑电平。

Description

TRM306A2S3 is a 600V/30A three-phase full bridge intelligent power module with built-in low power loss trench gate field-stop IGBT and FRD, The bootstrap diode BSD is integrated inside, which simplifies PCB design. The internal integrated temperature output VOT function is used to detect the temperature inside the module. The module integrates multiple protection functions, including UVLO under voltage protection and CIN over current protection. The compatible with 3.3V, 5V, and 15V logic input.

主要特点：

- 600V/30A 三相全桥智能功率模块
- 内置低损耗沟道栅-场截止型 IGBT
- 下桥臂 IGBT 发射极输出
- 内置带限流电阻的自举二极管 BSD
- V_{OT} 线性温度输出
- 兼容 3.3V，5V 和 15V 逻辑电平
- UVLO 欠压保护，过流保护，过温保护
- 符合 RoHS 2.0

MAIN FUNCTION AND RATING

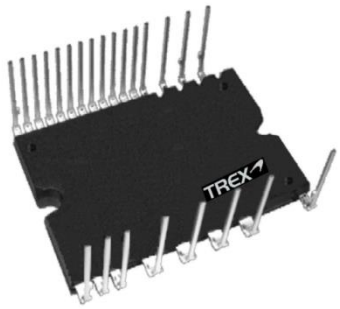
- 600V/30A three-phase full bridge intelligent power module
- Built-in Lower power loss trench gate field-stop IGBT
- N-side IGBT open emitter
- Built-in bootstrap diode with current limiting resistor
- V_{OT} linear temperature output
- Compatible with 3.3V, 5V, and 15V logic input
- UVLO under voltage protection, short circuit protection, over temperature protection
- Compliant with RoHS 2.0

应用：

- 变频空调压缩机驱动
- 工业伺服变频器
- 大功率变频风机水泵
- 电机驱动器

APPLICATION

- Inverter air-conditioning compressor drive
- Industrial servo converter
- High power inverter's fan and water pump
- Motor driver



封装/Package：DIP24

订货信息 PART ORDING TABLE

订货信息 Booking information	产品名称 Product name	封装形式 Package	无卤素 Halogen Free	包装方式 Packing
TRM306A2S3	TRM306A2S3	DIP24	是 Yes	条管 Tube

内部等效电路/管脚说明

Internal Equivalent Circuit/Pin Configuration

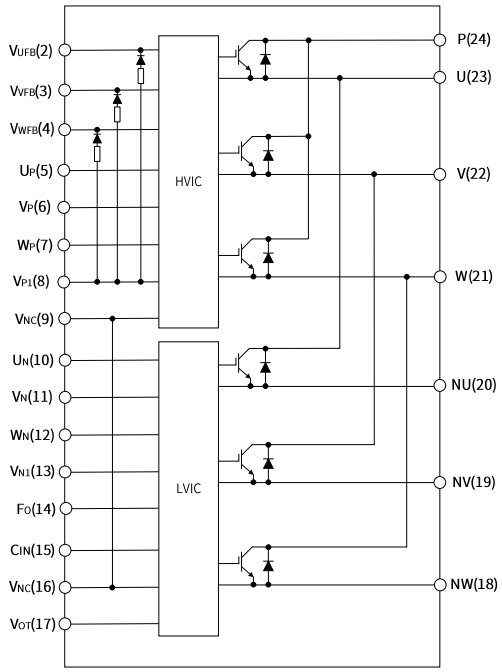


图 1：内部等效电路

Fig1: Internal Equivalent Circuit

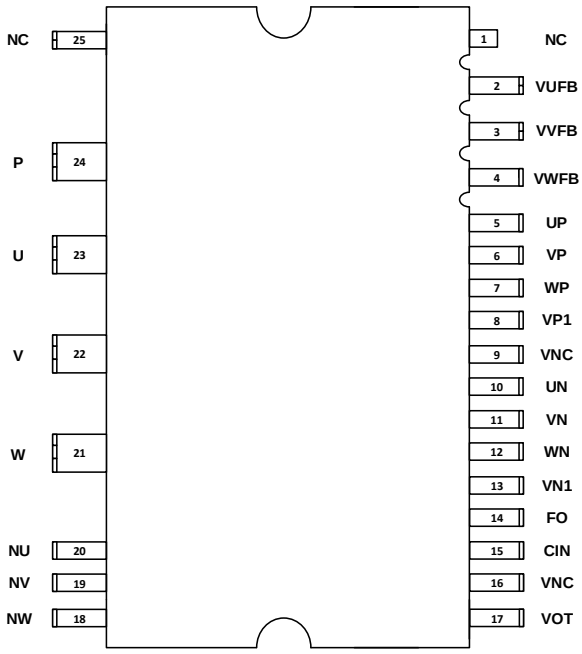


图 2：引脚定义图

Fig2: Pin Configuration

管脚定义/Pin Descriptions

管脚编号 Pin Number	管脚名称 Pin Name	管脚描述 Pin Description
1	NC	无连接 No connection
2	V_{UFB}	U 相上臂驱动电源端子 U-phase upper arm drive power supply
3	V_{VFB}	V 相上臂驱动电源端子 V-phase upper arm drive power supply
4	V_{WFB}	W 相上臂驱动电源端子 W-phase upper arm drive power supply
5	U_P	U 相上臂控制信号输入端子 U-phase upper arm control signal input
6	V_P	V 相上臂控制信号输入端子 V-phase upper arm control signal input
7	W_P	W 相上臂控制信号输入端子 W-phase upper arm control signal input

8	V_{P1}	控制电源端子 Drive power supply
9	V_{NC}	控制电源 GND 端子 Control power supply ground
10	U_N	U 相下臂控制信号输入端子 U-phase lower arm control signal input
11	V_N	V 相下臂控制信号输入端子 V-phase lower arm control signal input
12	W_N	W 相下臂控制信号输入端子 W-phase lower arm control signal input
13	V_{N1}	控制电源端子 Drive power supply
14	F_O	故障输出端子 Fault output
15	CIN	短路保护触发电压检测端子 Short current protection input
16	V_{NC}	控制电源 GND 端子 Control power supply ground
17	V_{OT}	温度检测输出端子 Temperature detection output
18	NW	W 相下臂 IGBT 发射极端子 W-phase lower arm IGBT emitter output
19	NV	V 相下臂 IGBT 发射极端子 V-phase lower arm IGBT emitter output
20	NU	U 相下臂 IGBT 发射极端子 U-phase lower arm IGBT emitter output
21	W	W 相输出端子 W-phase output
22	V	V 相输出端子 V-phase output
23	U	U 相输出端子 U-phase output
24	P	逆变器直流输入端子 Inverter DC input
25	NC	无连接 No connection

最大额定值（T_j= 25°C，除非特殊说明）

Absolute Maximum Ratings (T_j= 25°C, unless otherwise noted)

逆变部分/Inverter Part

符号 Symbol	参数 Parameter	条件 Condition	额定值 Ratings	单位 Unit
V_{CC}	电源电压 Supply voltage	应用于P-NU，NV，NW之间 Applied between P-NU, NV, NW	450	V
$V_{CC\ (Surge)}$	电源电压（含浪涌） Supply voltage(surge)	应用于P-NU，NV，NW之间 Applied between P-NU, NV, NW	500	V
V_{CES}	集电极-发射极间电压 Collector-emitter voltage		600	V
± I_C	集电极电流 Each IGBT collector current	T_C = 25°C （备注1） (Note1)	30	A
± I_{CP}	集电极电流（峰值） Each IGBT collector current (peak)	T_C = 25°C，脉冲宽度小于1ms T_C = 25°C，less than 1ms	60	A
P_C	集电极功耗 Collector power loss	T_C = 25°C，单晶片 T_c=25°C, single chip	104	W
T_j	结温 Junction temperature	（备注2） (Note 2)	-30~+150	°C

备注 1：脉宽和周期受限于结温。

Note 1：Pulse width and period are limited due to junction temperature.

备注 2：IPM 内部功率晶片最大额定结温为 150°C(@表面温度 T_C≤125°C)。但是,为了确保 IPM 运行安全，结温应限定于 Tj(ave)≤125°C（@表面温度 Tc≤100°C)。

Note 2：The maximum rated junction temperature of the IGBT is 150°C(@T_C≤125°C).To ensure the safe operation of IPM, the junction temperature should be limited to Tj (ave) ≤ 125°C (@T_C≤100°C).

控制部分/Control(Protection)Part

符号 Symbol	参数 Parameter	条件 Condition	额定值 Ratings	单位 Unit
V_{DB}	上桥臂控制电源电压 P-side control supply voltage	应用于V_{UFB}-U，V_{VFB}-V，V_{WFB}-W之间 Applied between V_{UFB}-U, V_{VFB}-V, V_{WFB}-W	20	V
V_D	控制电源电压 Control supply voltage	应用于V_{P1}-V_{NC}和V_{N1}-V_{NC}之间 Applied between V_{P1}-V_{NC}, V_{N1}-V_{NC}	20	V

V_{IN}	输入信号电压 Input voltage	应用于U_P,V_P,W_P,U_N,V_N,W_N-V_{NC}之间 Applied between U_P,V_P,W_P,U_N,V_N,W_N-V_{NC}	-0.5~V_D+0.5	V
V_{FO}	故障输出电压 Fault output supply voltage	应用于F_O -V_{NC}之间 Applied between F_O -V_{NC}	-0.5~V_D+0.5	V
I_{FO}	故障输出电流 Fault output current	Fo端子灌入电流值 Sink current at F_O terminal	5	mA
V_{SC}	电流检测端输入电压 Current sensing input voltage	应用于CIN-V_{NC}之间 Applied between CIN-V_{NC}	-0.5~V_D+0.5	V

系统/Total System

符号 Symbol	参数 Parameter	条件 Condition	额定值 Ratings	单位 Unit
$V_{CC(PROT)}$	自保护电源电压限制（短路保护能力） Self-protection supply voltage limit (Short circuit protection capability)	V_D = V_{DB} = 13.5 ~ 16.5V,T_j= 125°C, 无重复，时间小于2us V_D = V_{DB} = 13.5-16.5V, inverter part T_j= 125°C, Non-repetitive, less than 2us	400	V
T_C	正常工作壳温 Module case operation temperature		-30~+100	°C
T_{STG}	贮存温度 Storage temperature		-40~+125	°C
V_{ISO}	绝缘耐压 Isolation voltage	60Hz，AC 1分钟，在插脚和散热片之间 60HZ, AC 1min, between connected all pins and heat-sink plate	1500	Vrms
$R_{th(j-c)Q}$	结点到壳的热阻 Junction to case thermal resistance	单个IGBT芯片 Per IGBT part	1.21	°C/W
$R_{th(j-c)F}$		单个FRD芯片 Per FRD part	1.43	°C/W

壳温 TC 测试点/Tc Measurement Point

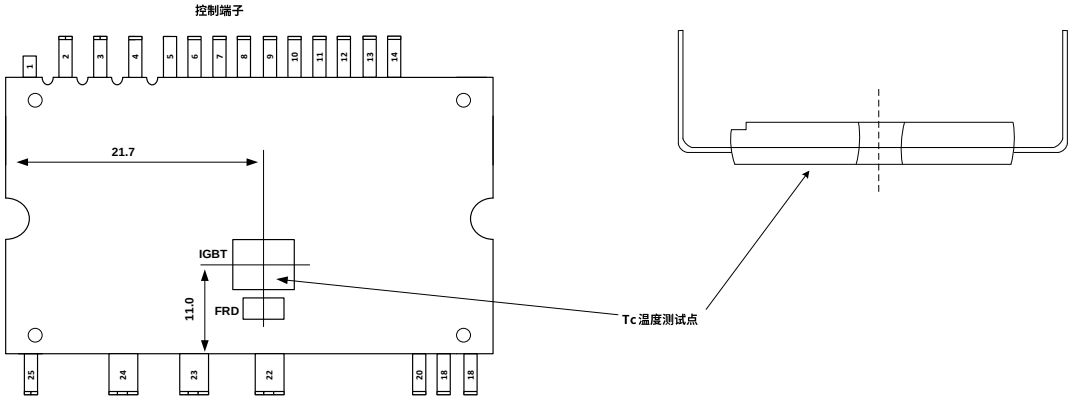


图 3：壳温 TC 测试点

Fig 3: Tc measurement point

电气特性：（Tj= 25°C，除非特殊说明）

Electrical Characteristics：（Tj= 25°C, unless otherwise noted）

逆变部分/Inverter Part

符号 Symbol	项目 Parameter	条件 Condition	最小值 Min.	典型值 Typ.	最大值 Max.	单位 Unit
$V_{CE\,(sat)}$	集电极与发射极间饱和电压 Collector-emitter saturation voltage	$V_D = V_{DB} = 15V$ $V_{IN} = 5V$, $I_C = 30A$, $T_j = 25°C$		1.86	2.1	V
		$V_D = V_{DB} = 15V$ $V_{IN} = 5V$, $I_C = 30A$, $T_j = 125°C$		2.1		V
V_F	FWD 正向导通电压 FWD forward voltage	$V_{IN} = 0V$, $I_C = 30A$, $T_j = 25°C$		1.48	2.0	V
BV	BV电压 BV voltage	$V_{CC}=V_{BS}=15V$, $I_C = 1mA$	650			V
t_{ON}	开关时间（备注 3） switching time (Note 3)	$V_{CC} = 400V$, $V_D = V_{DB} = 15V$, $I_C=30A$, $V_{IN} = 0V\sim5V$, inductive loading		880		ns
$t_{C(ON)}$				320		ns
t_{OFF}				980		ns
$t_{C(OFF)}$				140		ns
t_{rr}				150		ns
I_{CES}	集电极到发射极漏电流 Collector-emitter cut-off current	$V_{CE} = V_{CES}$ $T_j = 25°C$			1	mA
		$V_{CE} = V_{CES}$ $T_j = 125°C$			10	mA

备注 3：t_{ON} 和 t_{OFF} 包括驱动 Ic 内部传输延迟时间。$t_{C(ON)}$ 和 $t_{C(OFF)}$ 是 IGBT 自身被内部给定门极驱动条件下的开关时间。具体请参考开关时间定义。

Note 3：t_{ON} and t_{OFF} include the internal transmission delay time of the driver IC。$t_{C(ON)}$ and $t_{C(OFF)}$ are the switching times of the IGBT itself under the internal given gate driving conditions. Please refer to switching time definition for details.

开关时间定义/Switching Time Definition

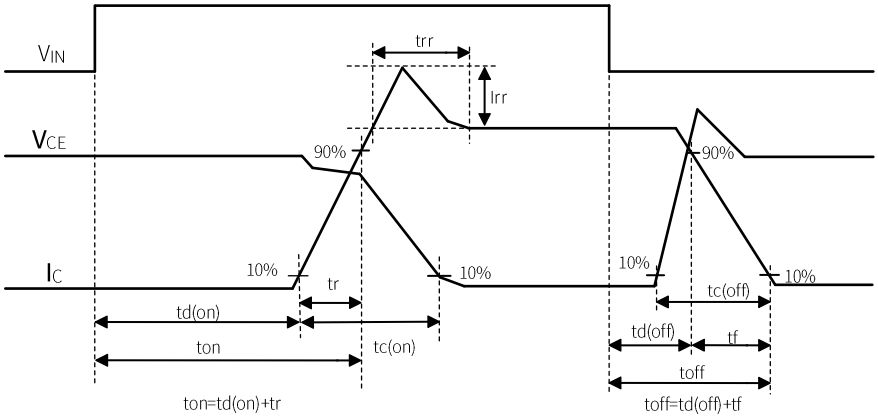


图 4：开关时间定义

Fig 4: Switching Time Definition

控制部分（Tj= 25℃，除非特殊说明）

Control (Protection) Part（Tj= 25℃, unless otherwise noted）

符号 Symbol	项目 Parameter	条件 Condition	最小值 Min.	典型值 Typ.	最大值 Max.	单位 Unit
I_D	V_D静态电流 Quiescent V_D current	V_D = 15V, V_{IN} = 0V, V_{P1}-V_{NC}			1.6	mA
		V_D = 15V, V_{IN} = 5V, V_{P1}-V_{NC}				
I_{DB}	V_{DB}静态电流 Quiescent V_{DB} current	V_{DB} = 15V, V_{IN} = 0V, V_{UFB} –U, V_{VFB}–V, V_{WFB} -W			0.1	mA
		V_{DB} = 15V, V_{IN} = 5V, V_{UFB} – U, V_{VFB}–V, V_{WFB}-W				
I_{IN}	输入电流 Input current	V_{IN} = 5V		1	1.5	mA
$V_{th(on)}$	开通阈值电压 ON threshold voltage	应用U_P/V_P/W_P/U_N/V_N/W_N-V_{NC}之间 Applied between U_P/V_P/W_P/U_N/V_N/W_N- V_{NC}		2.5	3	V
$V_{th(off)}$	关断阈值电压 OFF threshold voltage		0.8	1.3		V
UV_{Dt}	电源欠压保护控制 Control supply under-voltage protection	低侧触发电平 Trip level(L)	10.5	11.5	12.5	V
UV_{Dr}		低侧复位电平 Reset level(L)	11.0	12.3	13.0	V
UV_{DBt}		高侧触发电平 Trip level(H)	9.5	10.5	11.5	V

UV_{DBr}		高侧复位电平 Reset level(H)		10.5	11.5	12.5	V
V_{FOH}	故障输出电压 Fault output voltage	V_{SC} = 0V, F_O通过10K电阻上拉至5V V_{SC} = 0V, F_O pulled up to 5V by 10KΩ		4.7			V
V_{FOL}	故障输出电压 Fault output voltage	V_{SC} =1V, F_O通过10K电阻上拉至5V V_{SC} =1V, F_O pulled up to 5V by 10KΩ				0.3	V
$V_{SC\ (ref)}$	过流保护触发阈值 Short circuit trip level	V_D = 15V		0.455	0.480	0.505	V
V_{OT}	温度输出 Temperature Output	T_C=25°C			1.1		V
		T_C=90°C		2.54	2.77	2.91	V
T_{FILIN}	输入信号滤波时间 Input filter time	V_{IN} = 0 V & 5 V			350		ns
T_{FO}	故障输出脉冲宽度 Fault output pulse width			60			us
T_{CIN}	CIN 输入信号滤波时间 CIN signal filter time				700		ns
OT_t	过温保护阈值 Over temperature protection	LVIC 温度 LVIC temperature	触发温度 Trip level	115	125	135	°C
OT_{rh}			复位温度 Hysteresis of trip-reset	105	115	125	°C
V_F	正向电压	I_F=10mA, Tc=25°C			2.6		V
R_{BSD}	自举电阻 Built-in limiting resistance	（包括自举二极管） (Included in bootstrap Diode)		150	180	210	ohm

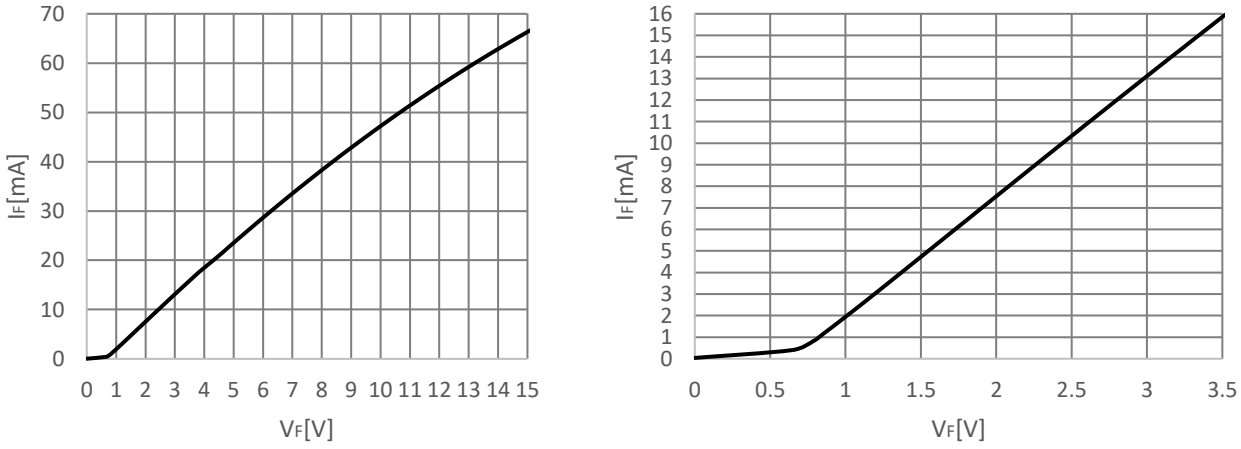


图 5：自举二极管特性曲线

Fig5：bootstrap diode characteristic curve

V_{OT} 输出曲线/V_{OT} Output Curve

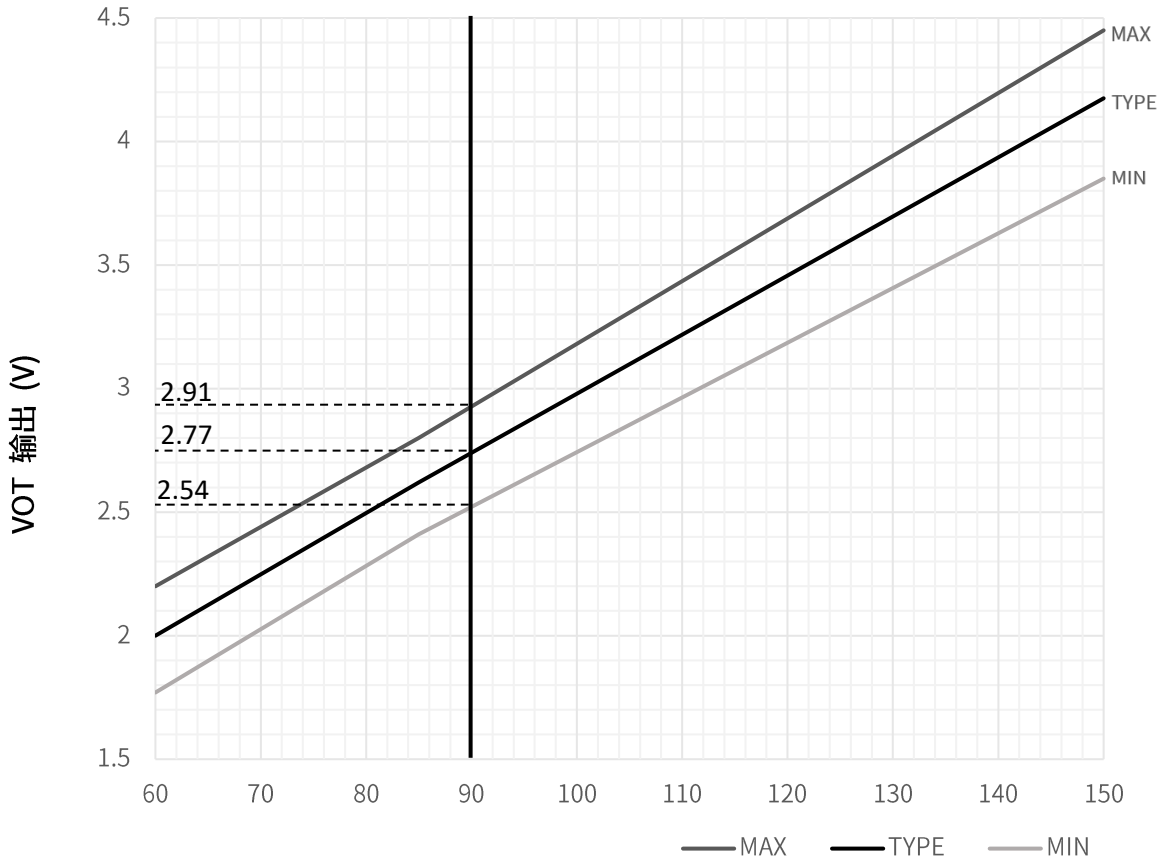


图 6：LVIC 温度-V_{OT} 输出特性

Fig6：LVIC temperature-V_{OT} output characteristics

推荐工作条件/Recommended Operation Conditions

符号 Symbol	项目 Parameter	条件 Parameter	最小值 Min.	典型值 Min.	最大值 Max	单位 Unit
V_{CC}	电源电压 Supply voltage	应用于P-NU/NV/NW之间 Applied between P-NU/NV/NW	0	300	400	V
V_D	控制电源电压 Control supply voltage	应用于V_{P1}– V_{NC}之间 Applied between V_{P1}– V_{NC}	13.5	15	16.5	V
V_{DB}	上臂控制电源电压 Top side supply voltage	应用于V_{UFB}–U/V_{VFB}–V/V_{WFB}-W之间 Applied between V_{UFB}–U/V_{VFB}–V/V_{WFB}-W	13.5	15	18.5	V
T_{dead}	死区时间 Dead time	各桥臂输入对应, T_C≤100°C For each input signal, Tc≤100°C	1			us

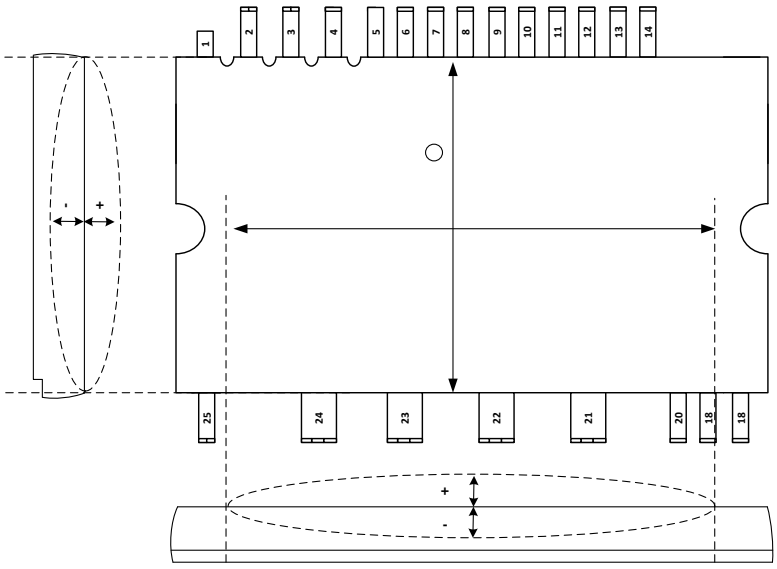
$\Delta V_D/\Delta V_{DB}$	控制电源纹波 Control supply variation		-1		1	V/us
f_{PWM}	PWM 频率 PWM input frequency	-20°C≤Tc≤+100°C -20°C≤Tj≤+125°C			20	kHz
PWM(ON/OFF)	最小输入信号脉冲宽度 Minimum input pulse width	ON	0.7			us
		OFF	0.7			us
V_{NC}	V_{NC} variation	Between V_{NC}-NU, NV, NW (including surge)	-5		5	V
T_j	结温 Junction temperature		-20		125	°C

机械特性/Mechanical Characteristics And Ratings

参数 Parameter	条件 Conditions	最小值 Min.	典型值 Typ.	最大值 Max.	单位 Unit
安装扭矩 Mounting torque	螺丝钉尺寸：M3 Mounting screw：M3	0.59	0.69	0.78	N·m
设计平面度 Heat-sink flatness	（备注4） (Note4)	-50		+100	um
重量 Weight			9		g

备注 4：散热部分平整度的测量位置如下

Note4：Measurement positions of heat radiation part flatness are as below



应用指南 Application Guide

欠压保护/Under-Voltage Protection

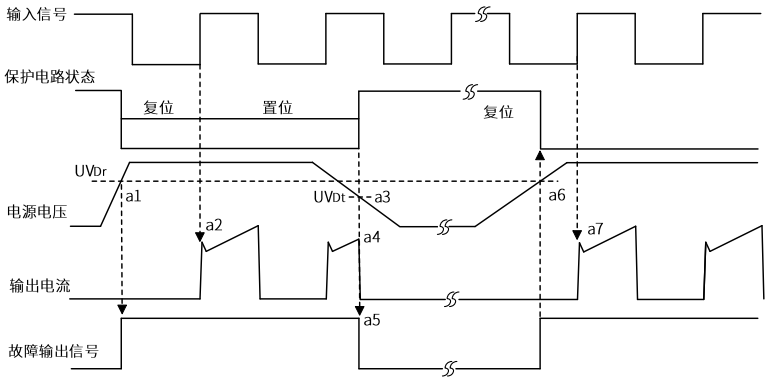


图 7：欠压保护时序图（低侧）

Fig7:Under-voltage protection timing charts（Low-side）

a1：电源电压上升：电压上升到欠压恢复点，在下一个欠压信号被执行前该电路将启动运行。

a1: Power supply voltage rise：when the voltage exceeds the under voltage reset level, the circuit works in normal before the next under voltage signal is executed.

a2：正常运行: IGBT 开启并加载电流。

a2: Normal operation: IGBT ON and outputs current.

a3：欠压检测点(UV_{Dt})。

a3：VD level drops to under voltage trip level (UV_{Dt}).

a4：不管输入是什么信号，IGBT 都是关闭状态。

a4：All N-side IGBTs turn OFF regardless of control input condition.

a5：故障输出开启。

a5：Fo outputs operation starts.

a6：欠压恢复(UV_{Dr})。

a6：VD level reaches UV_{Dr}.

a7：正常运行: IGBT 导通并加载负载电流。

a7：Normal operation: IGBT ON and carrying current.

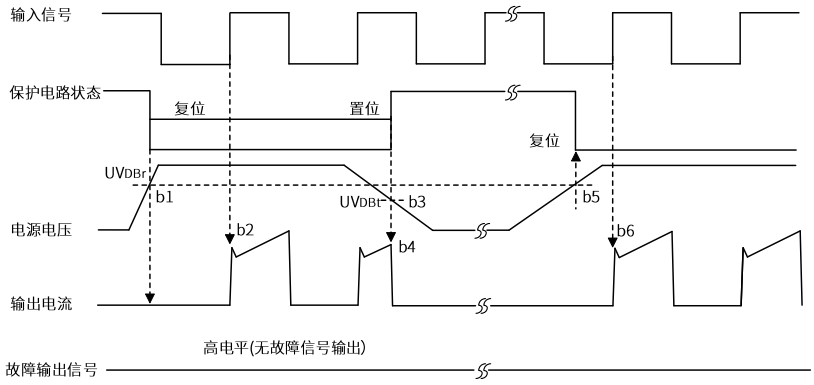


图 8：欠压保护时序图（高侧）

Fig 8：Under-voltage protection timing charts (High-side)

b1：电源电压上升：当该电压上升到欠压恢复点，在下一个欠压信号被执行前该电路将启动运行。

b1.：Control supply voltage VDB rises：after the voltage reaches under voltage reset level UV_{DBr}, IGBT turns on by the next ON signal(L→H).

b2：正常运行: IGBT 导通并加载。

b2：Normal operation: IGBT ON and outputs current.

b3：欠压检测（UV_{DBt})。

b3：VDB level drops to under voltage trip level (UV_{DBt}).

b4：不管输入是什么信号，IGBT 都是关闭状态。

b4：IGBT of the correspond phase only turns OFF regardless of the input signal, but there is no FO signal output.

b5：欠压恢复(UV_{DBr})。

b5：VDB level reaches UV_{DBr}.

b6：正常运行: IGBT 导通并加载负载电流。

b6：Normal operation: IGBT ON and outputs current.

短路保护/Short Circuit Protection

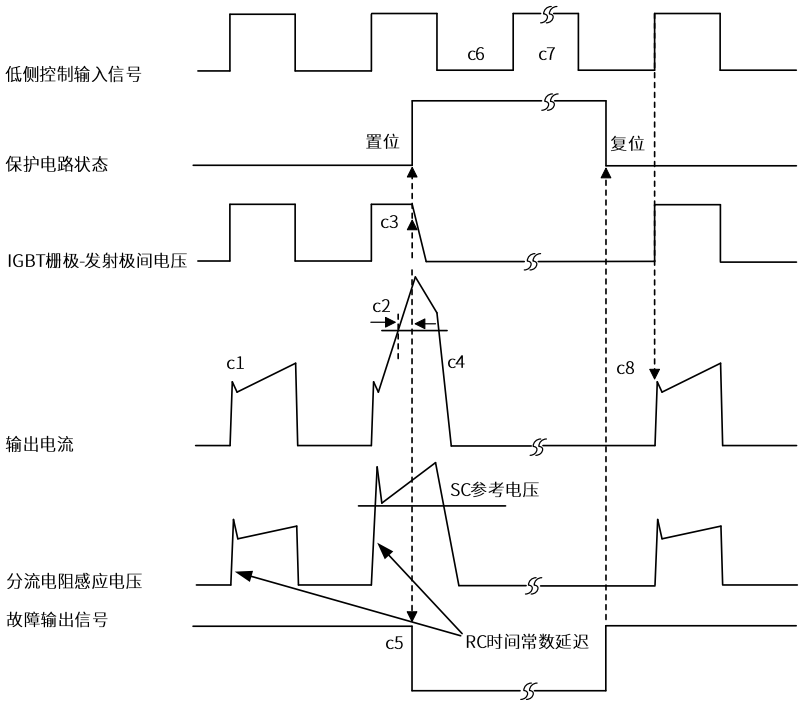


图 9：短路电流保护时序图

Fig9：Short circuit protection timing charts

c1：正常运行: IGBT 导通载流。

c1：Normal operation: IGBT ON and carrying current.

c2：短路电流检测(Cin 短路触发)。

c2：Short circuit current detection (SC trigger).

c3：所有 N 侧 IGBT 栅极被强制关断。

c3：All N-side IGBT’s gates are hard interrupted .

c4：所有 N 侧 IGBT 被关断。

c4：all N-side IGBTs turn OFF.

c5：故障输出脚输出一个固定的脉宽信号（tFo≥60us)。

c5：The fault output pin outputs a fixed pulse width signal(tFo≥60us).

c6：输入“L”：IGBT 关闭。

c6：Input“L”:IGBT OFF.

c7：输入“H”：IGBT 开通，但在故障输出期间，IGBT 仍然是关断状态。

c7：Input=“H”:IGBT ON,in case of the Fo signal works, the IGBT still OFF.

c8：正常工作：IGBT 导通，输出电流。

c8：Normal operation: IGBT conduction, output current.

过温保护(N 侧)/Over Temperature Protection(N-side, Detecting LVIC temperature)

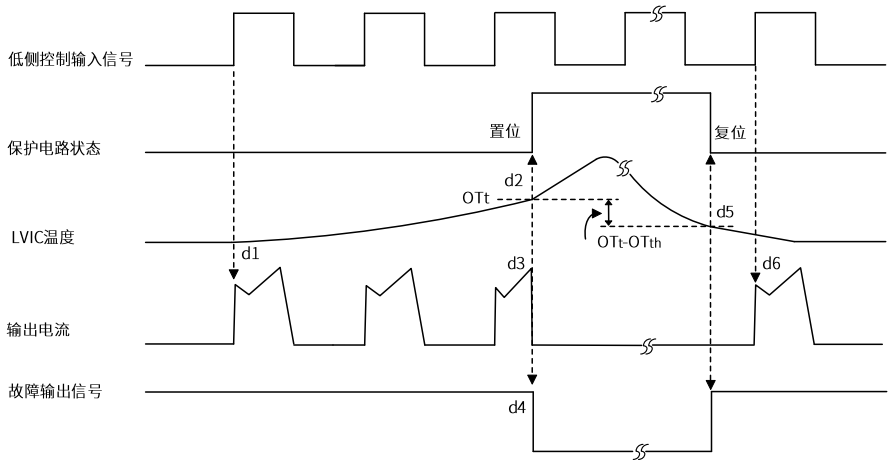


图 10：过温保护时序图

Fig10：Over Temperature protection timing charts

d1：正常工作：IGBT 开通，输出电流。

d1：Normal operation: IGBT ON and outputs current.

d2：LVIC 温度超过过温保护触发点(OTt)。

d2：LVIC temperature exceeds over temperature trip level (OTt).

d3：无论输入什么信号，所有 N 侧 IGBT 关断。

d3：All N-side IGBTs turn OFF in spite of control input condition.

d4：Fo 输出最小 60us 故障信号，在过温期间，Fo 会持续输出故障信号。

d4：Fo outputs for tFo=minimum 60μs, but output is extended during LVIC temperature keeps over OTt.

d5：LVIC 温度降到过温保护复位水平。

d5：LVIC temperature drops to over temperature reset level.

d6：正常工作：当下一个开通信号到来时，IGBT 正常开通。

d6：Normal operation: IGBT turns on by next ON signal (L→H).

输入/输出接口电路/Input/Output Interface Circuit

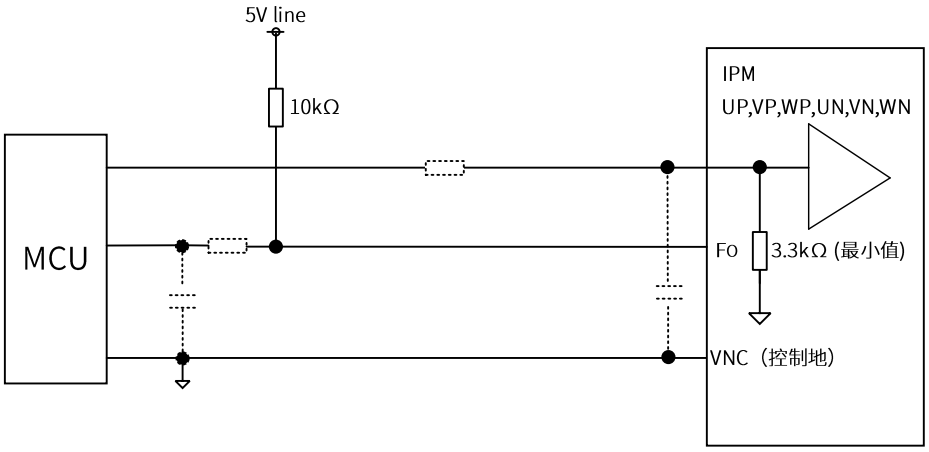


图 11：MCU 输入/输出连接电路（推荐）

Fig11：MCU I/O Interface Circuit (Recommended)

备注 5：控制输入端的 RC 滤波容量的选择取决于应用系统的 PWM 控制方式和 PCB 的引线阻抗。

Note 5：The RC coupling (parts shown in the dotted line) at each input depends on user’ s PWM control strategy and the wiring impedance of the printed circuit board.

备注 6：控制输入在模块内部接有 3.3KΩ的下拉电阻，因此，当外接滤波电阻时，请注意在输入端子上的控制信号压降（它应满足控制电压阈值的要求）。

Note 6：The DIPIPM signal input section integrates a 3.3kΩ(min) pull-down resistor. Therefore, when using an external filtering.

分流电阻接线/Wiring Around The Shunt Resistor

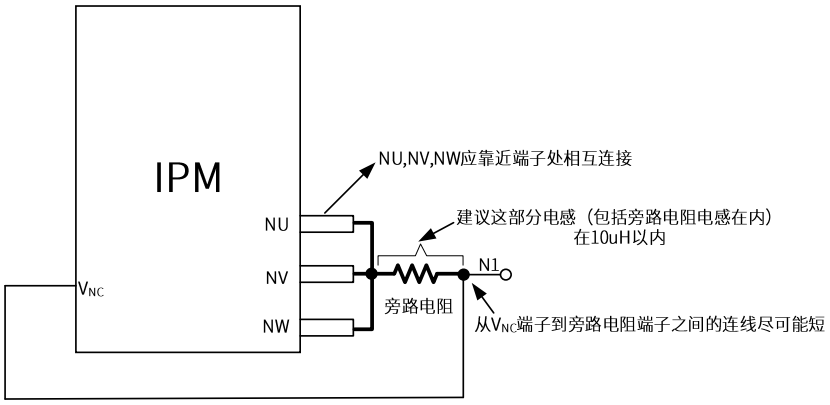


图 12：旁路电阻接线注意事项

Fig12: Recommended Wiring Around The Shunt Resistor

典型应用电路图/Typical Application Circuit

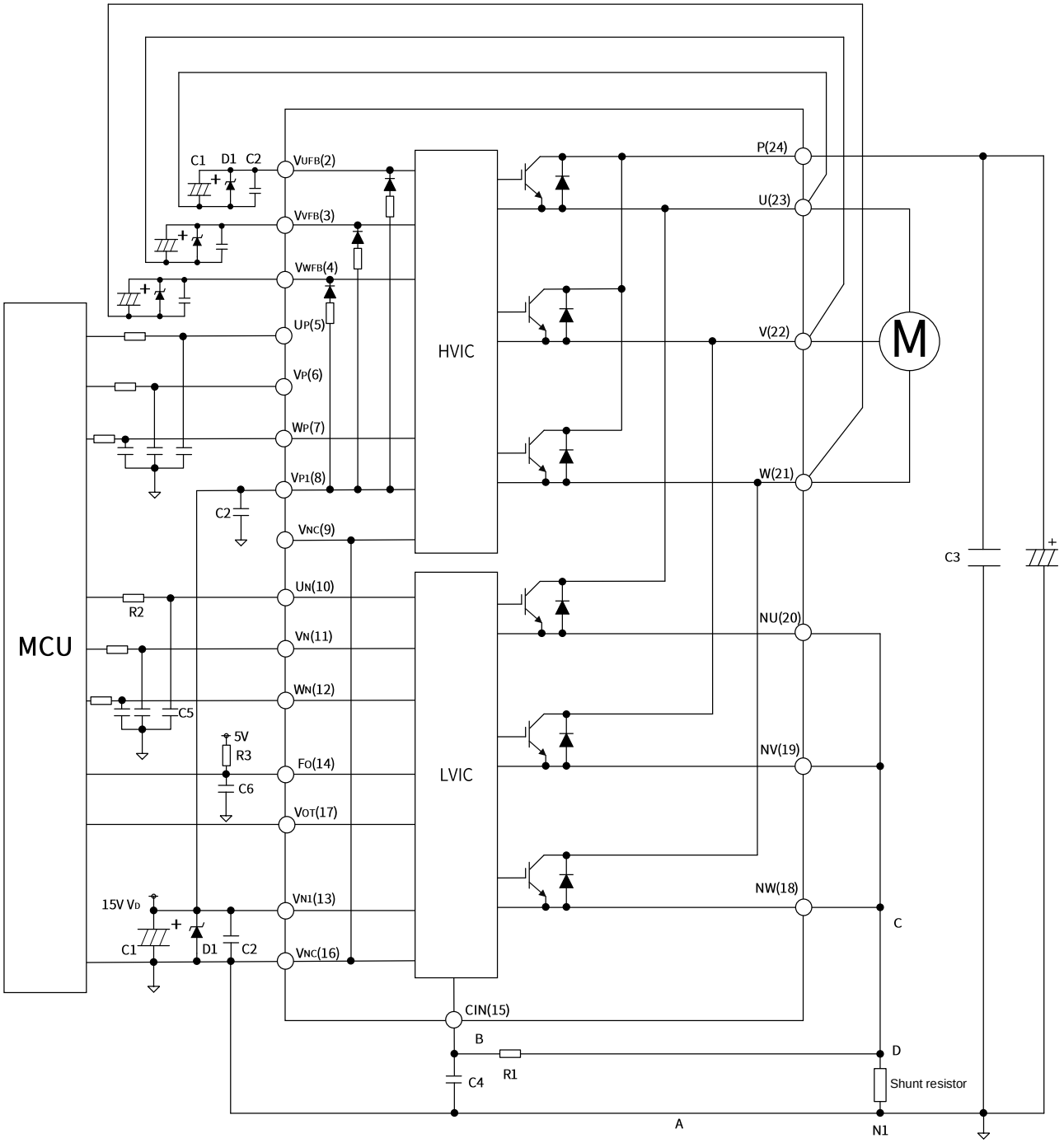


图 13: 典型应用电路

Fig13: Typical Application Circuit

备注/Note

1.建议信号地和功率地在 N1 处单点连接。

1.It is recommended to connect control GND and power GND at only a point N1 (near the terminal of shunt resistor).

2.为防止浪涌损坏，建议在每一路电源引脚与地之间接 18V/1W 的稳压管。

2.It is recommended to insert a Zener diode D1(18V/1W) between each pair of control supply terminals to prevent surge destruction.

3.为防止浪涌破坏，建议在 P/N1 端子之间增加一个缓冲电容 C3。容值一般在 0.1 ~ 0.22μF，且电容的走线尽量短。

3.To prevent surge destruction, the wiring between the smoothing capacitor and the P, N1 terminals should be as short as possible. Generally a 0.1-0.22μF snubber capacitor C3 between the P-N1 terminals is recommended.

4.R1，C4 型 RC 滤波器为防止保护电路故障，建议选用精确、温度补偿型。设置时间常数 R1C4，使 SC 电流在 2μs 内关断。(一般值为 1.5μs~2μs)SC 关断时间随走线方式不同而不同，因此有必要对实际系统进行充分的评估。

4.R1, C4 of RC filter for preventing protection circuit malfunction is recommended to select tight tolerance, temp-compensated type. The time constant R1C4 should be set so that SC current is shut down within 2μs. (1.5μs~2μs is general value.) SC interrupting time might vary with the wiring pattern, so the enough evaluation on the real system is necessary.

5.为防止干扰，A,B,C 处的线应尽量短。

5.To prevent malfunction, the wiring of A, B, C should be as short as possible.

6.CIN 引脚的滤波电路应接在 D 点附近，NU, NV, NW 端子应靠近旁路电阻连接。

6.The point D at which the wiring to CIN filter is divided should be near the terminal of shunt resistor. NU, NV, NW terminals should be connected at near NU, NV, NW terminals.

7.所有电容应尽可能靠近端子安装。(C1:温度、频率特性良好的电解型;C2:0.22μ-2μF，温度、频率、直流偏置特性良好的陶瓷型。)

7.All capacitors should be mounted as close to the terminals as possible. (C1: good temperature, frequency characteristic electrolytic type and C2:0.22μ-2μF, good temperature, frequency and DC bias characteristic ceramic type are recommended.)

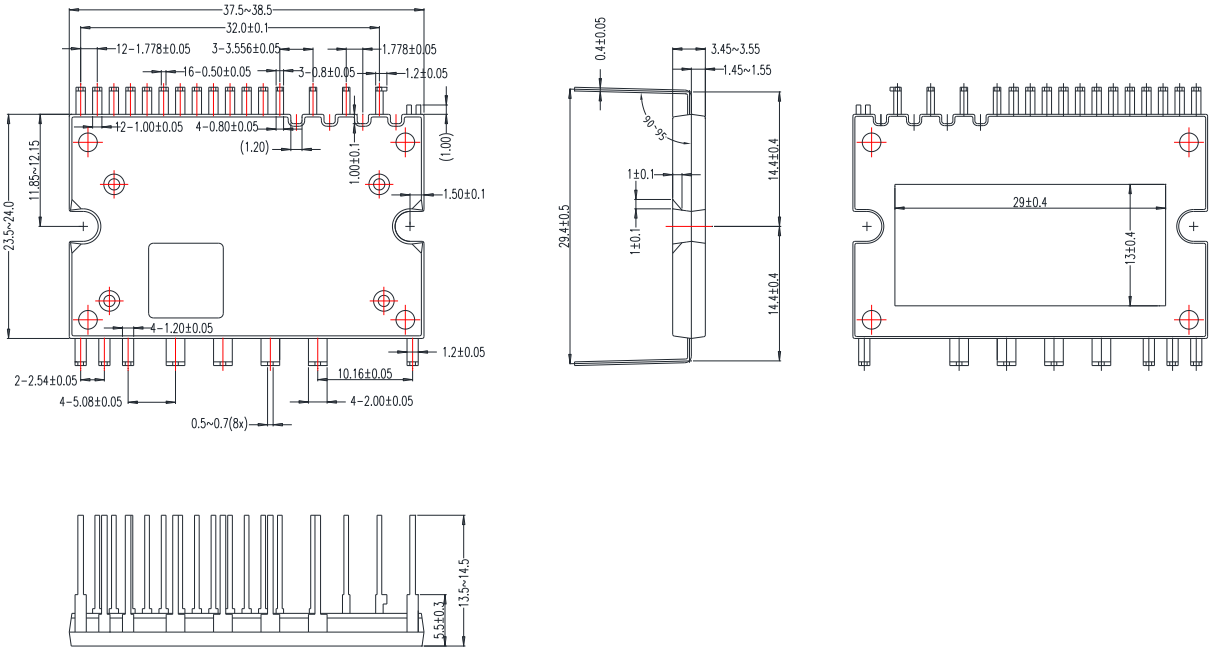
8.模块输入内部有一个最小的 3.3kΩ 下拉电阻。为了防止故障，每个输入的接线应尽可能短。使用 RC 滤波电路时，应保证输入信号电平满足通断阈值电压。

8.There is a minimum 3.3kΩ pull-down resistor in the input circuit of IPM. To prevent malfunction, the wiring of each input should be as short as possible. When using RC coupling circuit, make sure the input signal level meet the turn-on and turn-off threshold voltage.

9.Fo 输出为开漏式。它应该通过一个电阻上拉到 MCU 或控制电源(例如 5V,15V)，使 IFo 达到 1mA。(IFO 由控制电源电压除以上拉电阻的公式粗略估计。在拉到 5V 的情况下，建议使用 5kΩ)。

9.Fo output is open drain type. It should be pulled up to MCU or control power supply (e.g. 5V,15V) by a resistor that makes IFo up to 1mA. (IFO is estimated roughly by the formula of control power supply voltage divided by pull-up resistance. In the case of pulled up to 5V, 10kΩ is recommended.)

封装外形图/ Package Outline Drawing



修订历史 REVISE HISTORY

日期 Date	版本 Version	修订明细 Update detail
2024.09.06	1.0	第一版