比亚迪半导体
Semiconductor

BIPN60020C

概述

BIPN60020C 是比亚迪公司设计开发的智能功率模块（IPM-Intelligent Power Module）。该产品具有封装小、抗干扰能力强等优点；实现了与绝缘栅双极型晶体管（IGBT）的最佳匹配。内部集成了欠压闭锁电路、过流保护电路和驱动电路，进一步提高了系统的可靠性。内置的高压集成电路（HVIC）提供了无需光耦隔离的驱动功能。由于采用了分立的负端子，可独立监测逆变器的每一相电流。该产品适用于结构紧凑、性能高效的交流电机驱动器，如小功率变频器、变频空调等领域。

General Description

BIPN60020C is an advanced intelligent power module that BYD has newly developed and designed to provide very compact and high performance as ac motor drivers mainly targeting low-power inverter-driven applications like air conditioner and washing machine. It combines optimized circuit protection and drive matched to low-loss IGBT. System reliability is further enhanced by the integrated under-voltage lock-out and Over-current protection. The high speed built-in HVIC provides opto-coupler-less single-supply IGBT gate driving capability that further reduce the overall size of the inverter system design. Each phase current of inverter can be monitored separately due to the divided negative dc terminals.

产品特性

- 采用陶瓷覆铜板（DBC），低热阻设计
- 600V、20A三相IGBT逆变器，内置门极驱动和功率器件保护用控制IC
- 分立的三相直流负端，可独立检测相电流
- 内置高压集成电路(HVIC)和自举二极管，可采用单电源驱动
- 绝缘等级为2500Vrms/min

Features

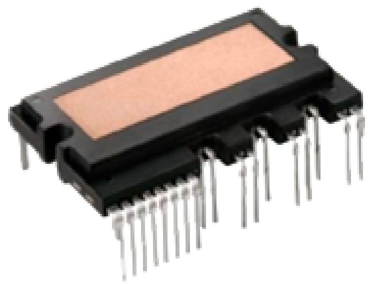
- Very low thermal resistance due to using DBC
- 600V20A Three-phase IGBT inverter bridge including control ICs for gate driving and protection
- Divided negative dc-link terminals for inverter current sensing applications
- Single-grounded power supply due to built-in HVIC and bootstrap diode
- Isolation rating of 2500Vrms/min

应用领域

- 空调、洗衣机等变频家电
- 小功率变频器
- 伺服控制系统
- 小功率交流电机传动系统使用的三相逆变器

Applications

- Three-phase inverter drive for small power ac motor control
- Home appliances applications like air conditioner and washing machine



封装/Package

DIP27-4426

典型应用电路/Typical Application Circuit

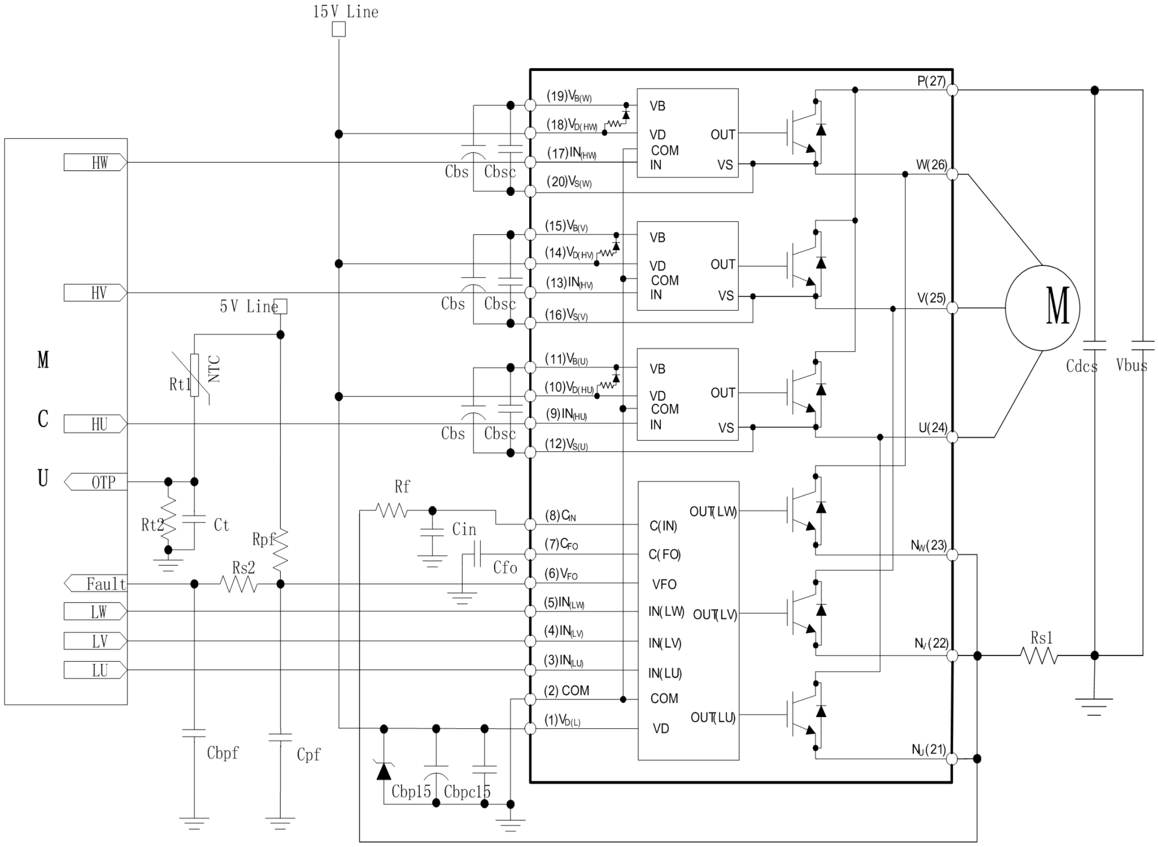


图 1.典型应用电路
Fig 1. Typical Application Circuit

引脚布局/Pin Configuration

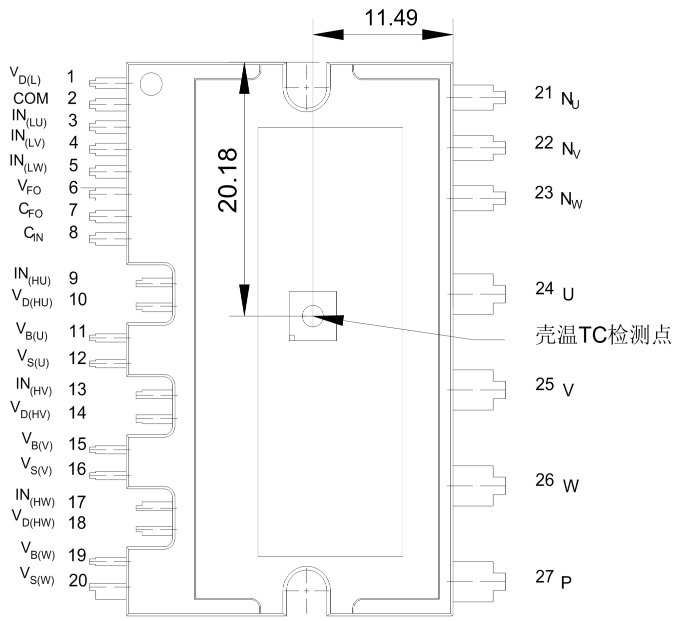


图 2.引脚布局图(top view)

Fig 2. Pin Configuration(Top View)

引脚描述/Pin Descriptions

引脚号 Pin	引脚名 Name	描述 Descriptions
1	$V_{D(L)}$	低端 IGBT 驱动 IC 供电 Low-side common bias voltage for IC and IGBT driving
2	COM	电源（公共）地 Common supply ground
3	$IN_{(LU)}$	低端 U 相的信号输入 Signal input for low-side U phase
4	$IN_{(LV)}$	低端 V 相的信号输入 Signal input for low-side V phase
5	$IN_{(LW)}$	低端 W 相的信号输入 Signal input for low-side W phase
6	V_{FO}	故障输出 Fault output
7	C_{FO}	设置故障输出持续时间的电容连接端 Capacitor for fault output duration time selection
8	C_{IN}	短路电流检测输入端 Capacitor (low-pass Filter) for over-current detection input
9	$IN_{(HU)}$	高端 U 相的信号输入 Signal input for high-side U phase
10	$V_{D(HU)}$	高端 U 相 IGBT 驱动 IC 供电 High-side bias voltage for U phase IC
11	$V_{B(U)}$	高端 U 相 IGBT 驱动辅助供电正电源端 High-side bias voltage for U phase IGBT driving
12	$V_{S(U)}$	高端 U 相 IGBT 驱动辅助供电负电源端 High-side bias voltage ground for U phase IGBT driving
13	$IN_{(HV)}$	高端 V 相的信号输入 Signal input for high-side V phase
14	$V_{D(HV)}$	高端 V 相 IGBT 驱动 IC 供电 High-side bias voltage for V phase IC
15	$V_{B(V)}$	高端 V 相 IGBT 驱动辅助供电正电源端 High-side bias voltage for V phase IGBT driving
16	$V_{S(V)}$	高端 V 相 IGBT 驱动辅助供电负电源端 High-side bias voltage ground for V phase IGBT driving
17	$IN_{(HW)}$	高端 W 相的信号输入 Signal input for high-side W phase
18	$V_{D(HW)}$	高端 W 相 IGBT 驱动 IC 供电 High-side bias voltage for w phase IC
19	$V_{B(W)}$	高端 W 相 IGBT 驱动辅助供电正电源端 High-side bias voltage for w phase IC
20	$V_{S(W)}$	高端 W 相 IGBT 驱动辅助供电负电源端 High-side bias voltage ground for W phase IGBT driving

21	N_U	U 相的直流负端 Negative dc–link input for U phase
22	N_V	V 相的直流负端 Negative dc–link input for V phase
23	N_W	W 相的直流负端 Negative dc–link input for W phase
24	U	U 相输出 Output for U phase
25	V	V 相输出 Output for V phase
26	W	W 相输出 Output for W phase
27	P	直流正端 Positive dc–link input

最大绝对额定值/Absolute Maximum Ratings

(T_J=25℃,除非另外注明/unless otherwise noted)

逆变器部分/Inverter Part

符号 Symbol	参数 Parameter	工作条件 Conditions	额定值 Ratings	单位 Units
V_{PN}	电源电压 Supply voltage	施加在 P-N_U, N_V, N_W之间 Applied between P-N_U, N_V, N_W	450	V
V_{PN}(surge)	电源（浪涌） Supply voltage (surge)	施加在 P-N_U, N_V, N_W之间 Applied between P-N_U, N_V, N_W	500	V
V_{CES}	集电极-发射极之间电压 Collector-emitter voltage	V_{GE}=0V, I_C=100uA,T_J=25℃	600	V
±I_C	单颗 IGBT 集电极电流 Each IGBT collector current	T_C = 25°C	20	A
±I_{CP}	单颗 IGBT 集电极电流（峰值） Each IGBT collector current (peak)	T_C = 25°C，持续 1ms 的脉冲宽度 T_C = 25°C , less than 1ms	40	A
P_C	集电极功耗 Collector dissipation	T_C = 25°C，每一片 T_C = 25°C, per 1 chip	61	W
T_J	结温 Junction temperature	(注 1/Note 1)	-40~+150	℃

注 1：智能功率模块中集成的功率芯片的最大结温额定值为 150℃(@T_C ≤ 100℃)。但是，为了确保智能功率模块的安全工作，平均结温应限制为 T_J(avg) ≤ 125℃(@T_C ≤100℃)。

Note 1 : The maximum junction temperature rating of the power chips integrated within the IPM is 150°C (@ T_C ≤ 100°C). However, to ensure safe operation of the IPM, the average junction temperature should be limited to T_J (avg) ≤ 125°C (@ T_C ≤ 100°C).

控制部分/Control Part

符号 Symbol	参数 Parameter	工作条件 Conditions	额定值 Ratings	单位 Units
V_D	控制电源电压	施加在 $V_{D(HU)}$, $V_{D(HV)}$, $V_{D(HW)}$, $V_{D(L)}$-COM 之间	20	V

	Control supply voltage	Applied between $V_{D(HU)}$, $V_{D(HV)}$, $V_{D(HW)}$, $V_{D(L)}$ -COM		
V_{DB}	高端控制辅助供电 Control supply voltage	施加在 $V_{B(U)}$-$V_{S(U)}$, $V_{B(V)}$-$V_{S(V)}$,$V_{B(W)}$-$V_{S(W)}$之间 Applied between $V_{B(U)}$-$V_{S(U)}$, $V_{B(V)}$-$V_{S(V)}$, $V_{B(W)}$ -$V_{S(W)}$	20	V
V_{IN}	输入电压 Input voltage	施加在 $IN_{(HU)}$, $IN_{(HV)}$, $IN_{(HW)}$, $IN_{(LU)}$, $IN_{(LV)}$, $IN_{(LW)}$-COM 之间 Applied between $IN_{(HU)}$, $IN_{(HV)}$, $IN_{(HW)}$, $IN_{(LU)}$, $IN_{(LV)}$,$IN_{(LW)}$)-COM	-0.3~V_D+0.3	V
V_{FO}	故障输出电压 Fault output voltage	施加在 V_{FO}-COM 之间 Applied between V_{FO}-COM	-0.3~V_D+0.3	V
I_{FO}	故障输出电流 Fault output current	在引脚 V_{FO} 处灌电流 Sink current at V_{FO} terminal	5.0	mA
V_{CIN}	电流检测输入电压 Current sensing input voltage	施加在 C_{IN}-COM 之间 Applied between C_{IN}-COM	-0.3~V_D+0.3	V

自举二极管部分/Bootstrap Diode Part

符号 **Symbol**	参数 **Parameter**	工作条件 **Conditions**	额定值 **Ratings**	单位 **Units**
V_{RRM}	最大重复反向电压 Maximum Repetitive Reverse Voltage		600	V
I_F	正向电流/Forward Current	T_C = 25℃	1	A
I_{FP}	正向电流(脉冲) Forward Current (Peak)	T_C = 25℃,持续 1ms 的脉冲宽度 T_C = 25℃, Under 1ms Pulse Width	2	A
T_J	结温/Junction temperature		-40~+150	℃

整个系统/Total System

符号 **Symbol**	参数 **Parameter**	工作条件 **Conditions**	额定值 **Ratings**	单位 **Units**
$V_{PN(PROT)}$	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 = 13.5~16.5V, T_J = 125℃，非重复性，小于 5 us V_D = 13.5~16.5V, inverter part T_J = 125℃, non-repetitive, less than 5us	400	V
T_C	模块壳体工作温度 Module case operation temperature	-20℃≤T_J≤125℃，图 2 (Fig 2.)	-20~+100	℃
T_{STG}	存储/保存温度 Storage temperature		-40~+125	℃
V_{ISO}	绝缘电压/Isolation voltage	60Hz，正弦波形，交流 1 分钟，所有引脚与 DBC 之间 60Hz, sinusoidal, AC 1 minute, connection pins to heat sink plate	2500	Vrms

热阻/Thermal Resistance

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 Units
$R_{th(j-c)Q}$	结点-壳体的热阻 Junction to case thermal resistance	逆变器 IGBT 部分（每 1/6 模块） Inverter IGBT part (per 1/6 module)	-	-	1.63	℃/W
$R_{th(j-c)F}$		逆变器 FRD 部分（每 1/6 模块） Inverter FRD part (per 1/6 module)	-	-	2.48	℃/W

电气特性/Electrical Characteristics

(T_J=25℃,除非另外注明/unless otherwise noted)

逆变器部分/Inverter Part

符号 Symbol		参数说明 Parameter	工作条件 Conditions	最小值 Min.	典型值 Typ.	最大值 Max.	单位 Units
$V_{CE(SAT)}$		集电极-发射极间饱和电压 Collector-emitter saturation voltage	V_D=V_{BS}=15V, V_{IN}=5V, I_C=20A, T_J =25℃	---	1.9	2.3	V
V_F		FRD 正向电压 FRD forward voltage	V_{IN}=0V, I_C=15A, T_J =25℃	---	1.7	2.2	
高端	t_{ON}	开通时间 Turn-on time	V_{PN}=300V, V_D=V_{BS}=15V, I_C = 20A, V_{IN} = 0~5V T_J =25℃, 感性负载（注 2） Inductive load (Note 2)	---	800	---	ns
	$t_{C(ON)}$	开通交叉时间 Turn-on across time		---	250	---	ns
	t_{OFF}	关断时间 Turn-off time		---	1150	---	ns
	$t_{C(OFF)}$	关断交叉时间 Turn-off across time		---	220	---	ns
低端	t_{ON}	开通时间 Turn-on time		---	700	---	ns
	$t_{C(ON)}$	开通交叉时间 Turn-on across time		---	300	---	ns
	t_{OFF}	关断时间 Turn-off time		---	1150	---	ns
	$t_{C(OFF)}$	关断交叉时间 Turn-off across time		---	220	---	ns
I_{CES}		集电极-发射极间漏电流 Collector-Emitter leakage current	V_{CE}=V_{CES}, V_{GE}=0V, T_J=25℃	---	---	0.1	mA

注 2：t_{ON} 和 t_{OFF} 包括模块内部驱动集成电路(IC) 的传输延迟时间。$t_{C(ON)}$和 $t_{C(OFF)}$指在内部给定的门极驱动条件下， IGBT 本身的切换时间。详细信息，参考图 3。

Note 2 : ton and toff include the propagation delay time of the internal drive IC. tc(on) and tc(off) are the switching time of IGBT itself under the given gate driving condition internally.See figure 3.

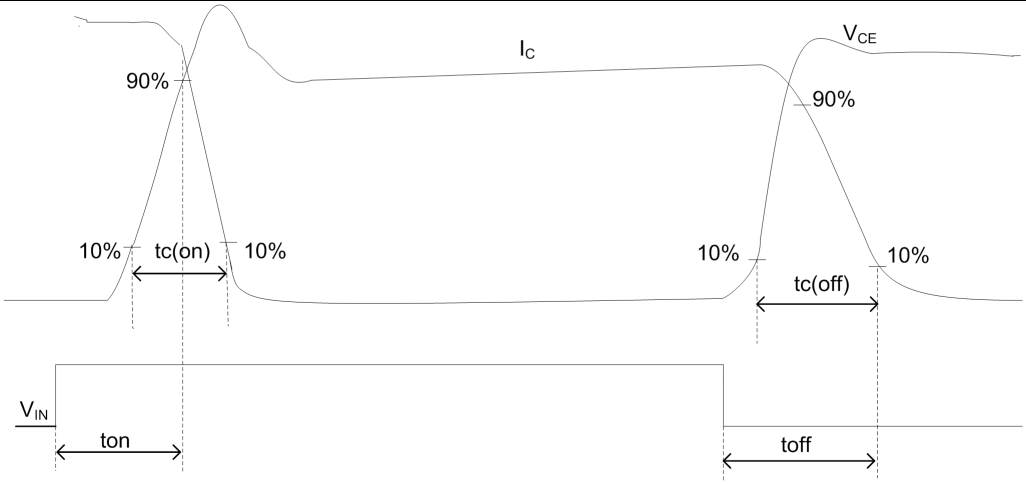


图 3.开关时间定义
Fig 3. Switching Time Definition

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 Units
I_{DL}	V_D 静态电流 Quiescent V_D supply current	V_D=15V, $IN_{(LU,LV,LW)}$=0V	$V_{D(L)}$-COM	---	---	600	μA
I_{DH}		V_D=15V, $IN_{(HU,HV,HW)}$=0V	$V_{D(HU)}$, $V_{D(HV)}$, $V_{D(HW)}$-COM	---	---	300	μA
I_{QBS}	V_{BS} 静态电流 Quiescent V_{BS} supply current	V_{BS}=15V, $IN_{(HU,HV,HW)}$=0V	$V_{B(U)}$-$V_{S(U)}$, $V_{B(V)}$-$V_{S(V)}$, $V_{B(W)}$-$V_{S(W)}$	---	---	150	
V_{FOH}	故障输出电压 Fault output voltage	V_{CIN}=0V, V_{FO} 电路 4.7K 上拉到 5V V_{FO} circuit: 4.7K to 5V pull-up		4.5	---	---	V
V_{FOL}		V_{CIN}=1V, V_{FO} 电路 4.7K 上拉到 5V V_{FO} circuit: 4.7K to 5V pull-up		---	---	0.8	
$V_{CIN(ref)}$	短路保护触发电压 Short circuit trip level	T_C=-20~100℃, V_D=15V （注 3 / Note3）		0.44	0.51	0.56	
UV_{DLD}	供电电路欠压保护 Supply circuit under-voltage protection	检测电平（低端） Detection level（LS）		11.0	12.0	13.0	V
UV_{DLR}		复位电平（低端） Rest level（LS）		12.0	13.0	14.0	
UV_{BSD}		检测电平（高端） Detection level（HS）		9.1	10.0	10.9	
UV_{BSR}		复位电平（高端） Rest level（HS）		10.1	11.0	11.9	
t_{FO}	故障信号输出脉冲宽度 Fault-out pulse width	C_{FO}=26nF（注 4 / Note4）		---	1.80	---	ms
		C_{FO}=33nF（注 4 / Note4）		---	2.30	---	
$V_{IN(ON)}$	导通阈值电压 ON threshold voltage	施加在 $IN_{(HU)}$, $IN_{(HV)}$, $IN_{(HW)}$, $IN_{(LU)}$, $IN_{(LV)}$, $IN_{(LW)}$-COM 之间		---	---	3.0	V

$V_{IN(OFF)}$	关断阈值电压 OFF threshold voltage	Applied between $IN_{(HU)}$, $IN_{(HV)}$, $IN_{(HW)}$, $IN_{(LU)}$,$IN_{(LV)}$,$IN_{(LW)}$-COM	0.8	---	---	

注 3 :只有下桥驱动具有短路保护功能。
注 4 :故障信号输出脉冲宽度 t_{FO} 依赖电容 C_{FO} 的容值，近似的计算公式如下：C_{FO}≈14.3 * 10^{-6} * t_{FO} [F]。
Note 3 : Short circuit protection is functioning only at the low-side.
Note 4 : The fault output pulse-width t_{FO} depends on the capacitance value of C_{FO} according to the following approximate equation : C_{FO} ≈ 14.3 * 10^{-6} * t_{FO} [F].

自举二极管部分/Bootstrap Diode 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 **Units**
V_F	正向电压 Forward Voltage	I_F = 1A, T_J = 25℃	---	24.7	---	V
t_{rr}	反向恢复时间 Reverse Recovery Time	I_F =1A, T_J = 25℃	---	130	---	ns

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

符号 **Symbol**	工作条件 **Conditions**		最小值 **Min.**	典型值 **Typ.**	最大值 **Max.**	单位 **Units**
安装扭矩 Mounting torque	安装螺钉：-M3，螺钉结构参见图 5 Mounting screw: - M3，see figure 5 for screw structure.	推荐选用：0.62N·m Recommended 0.62N.m	0.51	0.62	0.72	N · m
重量 Weight			---	15	---	g
器件平面度 Device flatness	参见图 4（See Fig 4）		0	---	120	μm

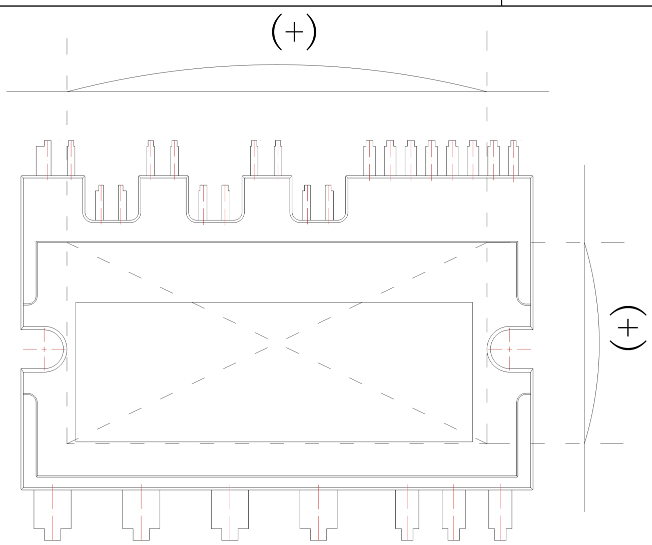


图 4. 平面度测量位置
Fig 4. Flatness Measurement Position

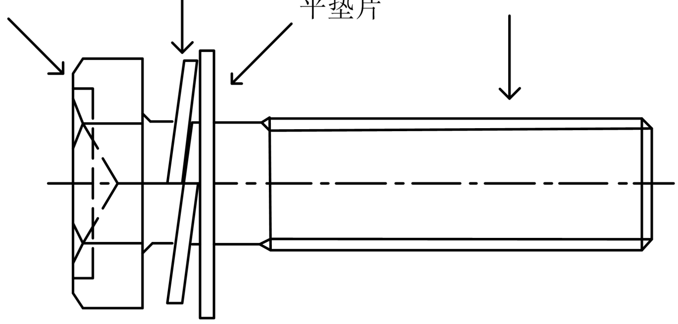


图 5.螺钉结构图
Fig 5. screw structure diagram

推荐工作条件/Recommended Operating Conditions

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 Units
V_{PN}	电源电压 Supply voltage	施加在 P-N_U, N_V, N_W之间 Applied between P -N_U, N_V, N_W	---	300	400	V
V_D	控制电源电压 Control supply voltage	施加在 $V_{D(HU)}$, $V_{D(HV)}$, $V_{D(HW)}$, $V_{D(L)}$-COM 之间 Applied between $V_{D(HU)}$, $V_{D(HV)}$, $V_{D(HW)}$, $V_{D(L)}$-COM	13.5	15.0	16.5	V
V_{BS}	高端辅助供电 High-side bias voltage	施加在 $V_{B(U)}$-$V_{S(U)}$, $V_{B(V)}$-$V_{S(V)}$, $V_{B(W)}$-$V_{S(W)}$之间 Applied between $V_{B(U)}$ -$V_{S(U)}$, $V_{B(V)}$ -$V_{S(V)}$, $V_{B(W)}$ -$V_{S(W)}$	13.5	15.0	18.5	V
ΔV_D, ΔV_{DB}	控制电源电压波动 Control supply variation		-1	---	1	V/μs
t_{DEAD}	防止桥臂直通的死区时间 Blanking time for preventing arm-short	适用于每个输入信号 For each input signal	2.0	---	---	μs
f_{PWM}	PWM 输入信号 PWM input signal	-20℃≤T_C≤100℃,-20℃≤T_J≤125℃	---	---	20	kHz
V_{SEN}	电流检测产生的电压 Voltage for current sensing	施加在 N_U, N_V, N_W- COM 之间 (包括浪涌电压) Applied between N_U, N_V, N_W -COM (Including surge voltage)	-4	---	4	V

IPM 保护功能时序图/Time charts of IPM Protection Function

过流保护/Over Current Protection

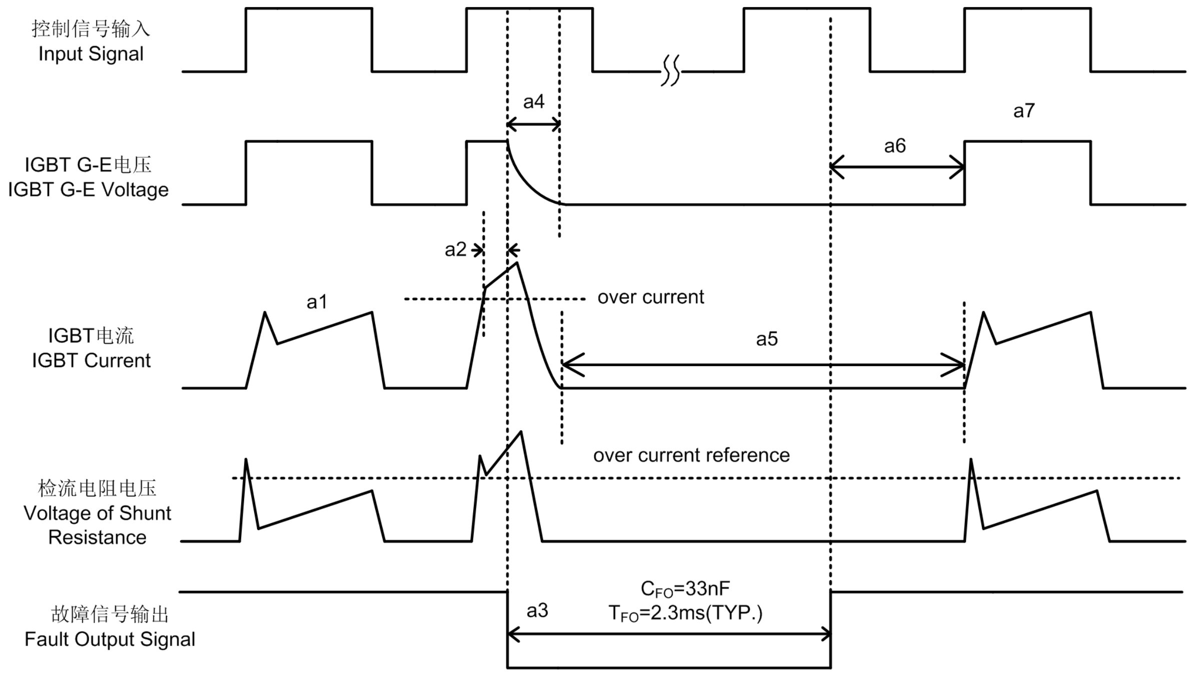


图 6.过流保护
Fig 5.Over Current Protection

（仅下桥有,包含外部分流电阻和 RC 滤波器
Low-side only ,with the external shunt resistance and RC filter）

a1 IGBT正常工作，输出电流
Normal operation: IGBT ON and carrying current

a2 短路电流检测及滤波
Over current detection and filter

a3 故障信号输出开始，脉宽由外部C_{FO}电容调节
Fault output timer operation starts: The pulse width of the V_{FO} is set by the external capacitor C_{FO}

a4 IGBT软关断
IGBT turns off softly

a5 IGBT处于关断状态
IGBT OFF state

a6 故障信号输出恢复高电平，但IGBT在下一个高电平输入信号时才会开通
V_{FO} finishes output, but IGBTs don't turn on until inputting next ON signal.

a7 当输入信号由L→H时，IGBT正常工作
Normal operation: IGBT ON and outputs current by next ON signal(L→H).

下桥欠压保护/Under-Voltage Protection of Low-side

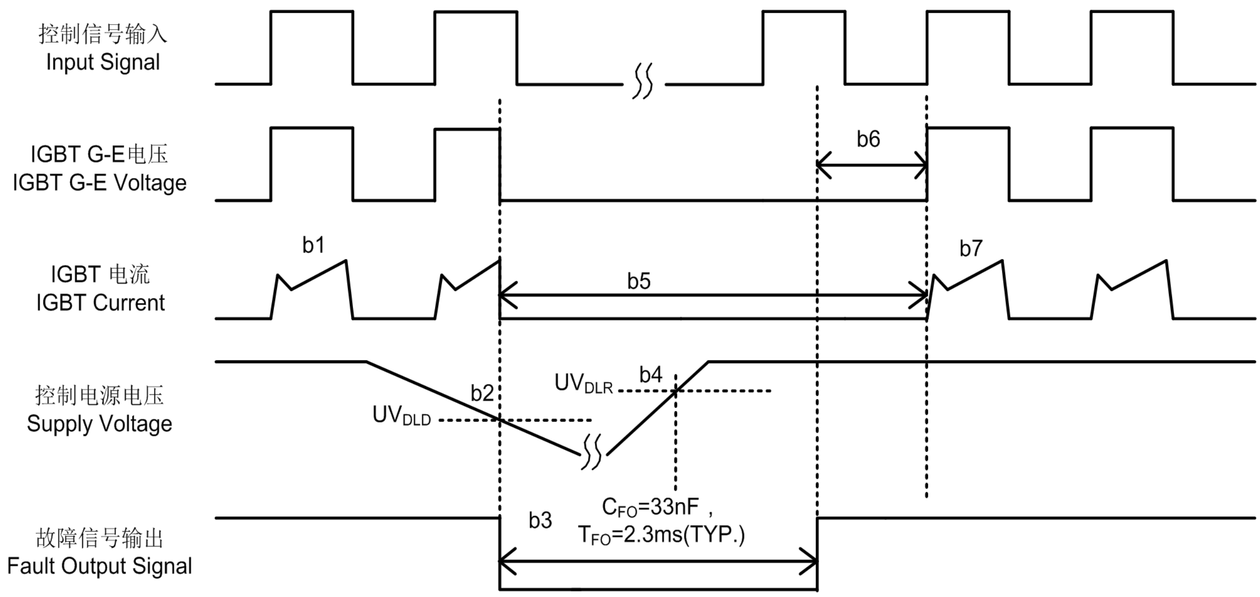


图 7.下桥欠压保护
Fig 6.Under-Voltage Protection of Low-side

b1 IGBT正常工作，输出电流
Normal operation: IGBT ON and carrying current

b2 欠压保护检测（UV_{DLD}）
Under voltage detection（UV_{DLD}）

b3 故障信号输出低电平，脉宽由外部C_{FO}电容调节
Fault output timer operation starts: The pulse width of the V_{FO} is set by the external capacitor C_{FO}

b4 欠压恢复（UV_{DLR}）
Under voltage reset（UV_{DLR}）

b5 IGBT处于关断状态
IGBT OFF state

b6 故障信号输出恢复高电平，但IGBT在下一个高电平输入信号时才会开通
V_{FO} finishes output, but IGBTs don’t turn on until inputting next ON signal.

b7 当输入信号由L→H时，IGBT正常工作
Normal operation: IGBT ON and outputs current by next ON signal(L→H).

上桥欠压保护/Under-Voltage Protection of High-side

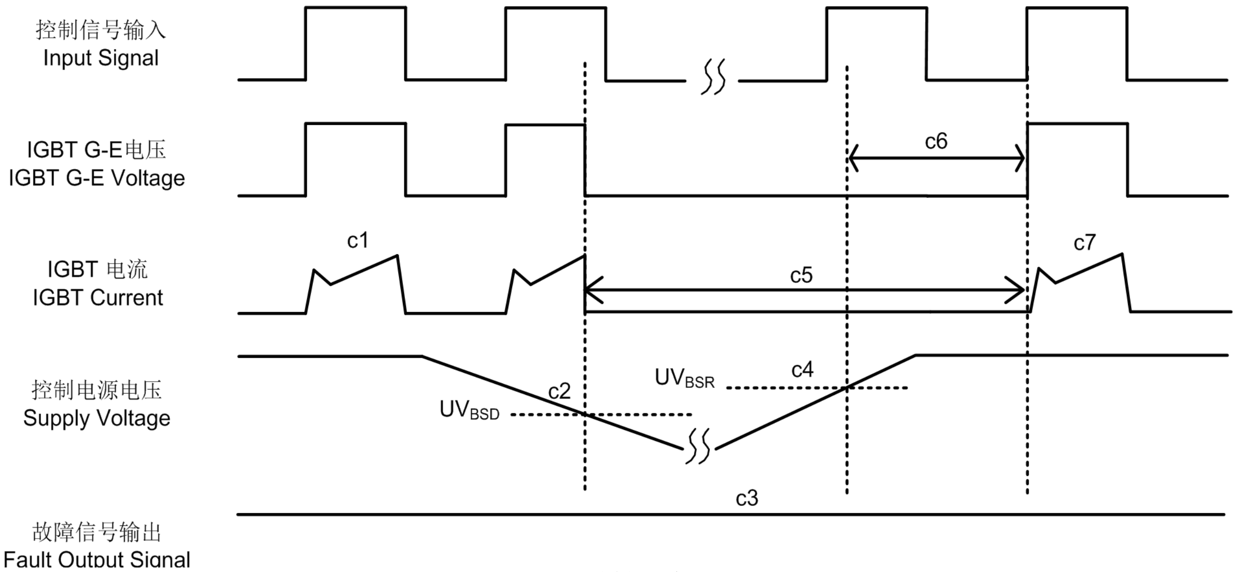


图 8.上桥欠压保护

Fig 7.Under-Voltage Protection of High-side

c1 IGBT正常工作，输出电流
Normal operation: IGBT ON and carrying current

c2 欠压保护检测（UV_{BSD}）
Under voltage detection（UV_{BSD}）

c3 故障信号保持高电平，上桥欠压无故障信号输出
No fault output signal

c4 欠压恢复（UV_{BSR}）
Under voltage reset（UV_{BSR}）

c5 IGBT处于关断状态
IGBT OFF state

c6 欠压已恢复，但IGBT在下一个高电平输入信号时才会开通
Under voltage reset, but IGBTs don’t turn on until inputting next ON signal.

c7 当输入信号由L→H时，IGBT正常工作
Normal operation: IGBT ON and outputs current by next ON signal(L→H).

内部等效电路和输入输出引脚/Internal Equivalent Circuit and Input/Output Pins

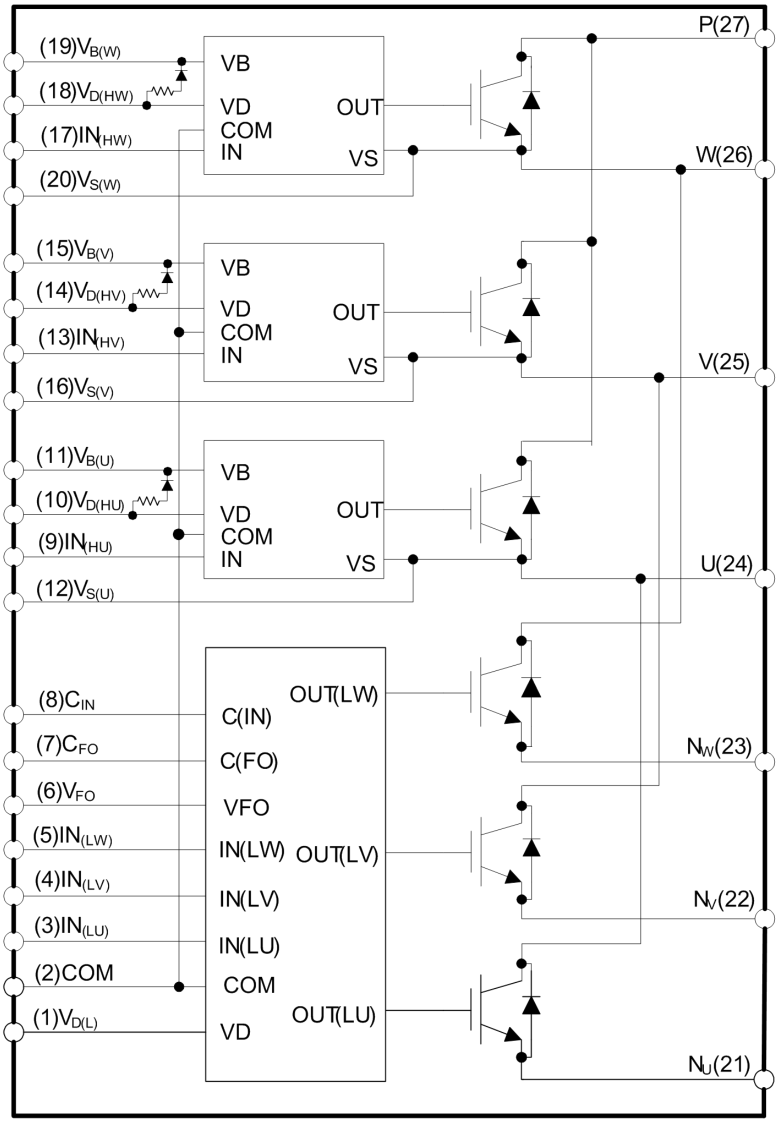


图9. 内部等效电路和输入输出引脚

Fig 8. Internal Equivalent Circuit and Input/Output Pins

注:

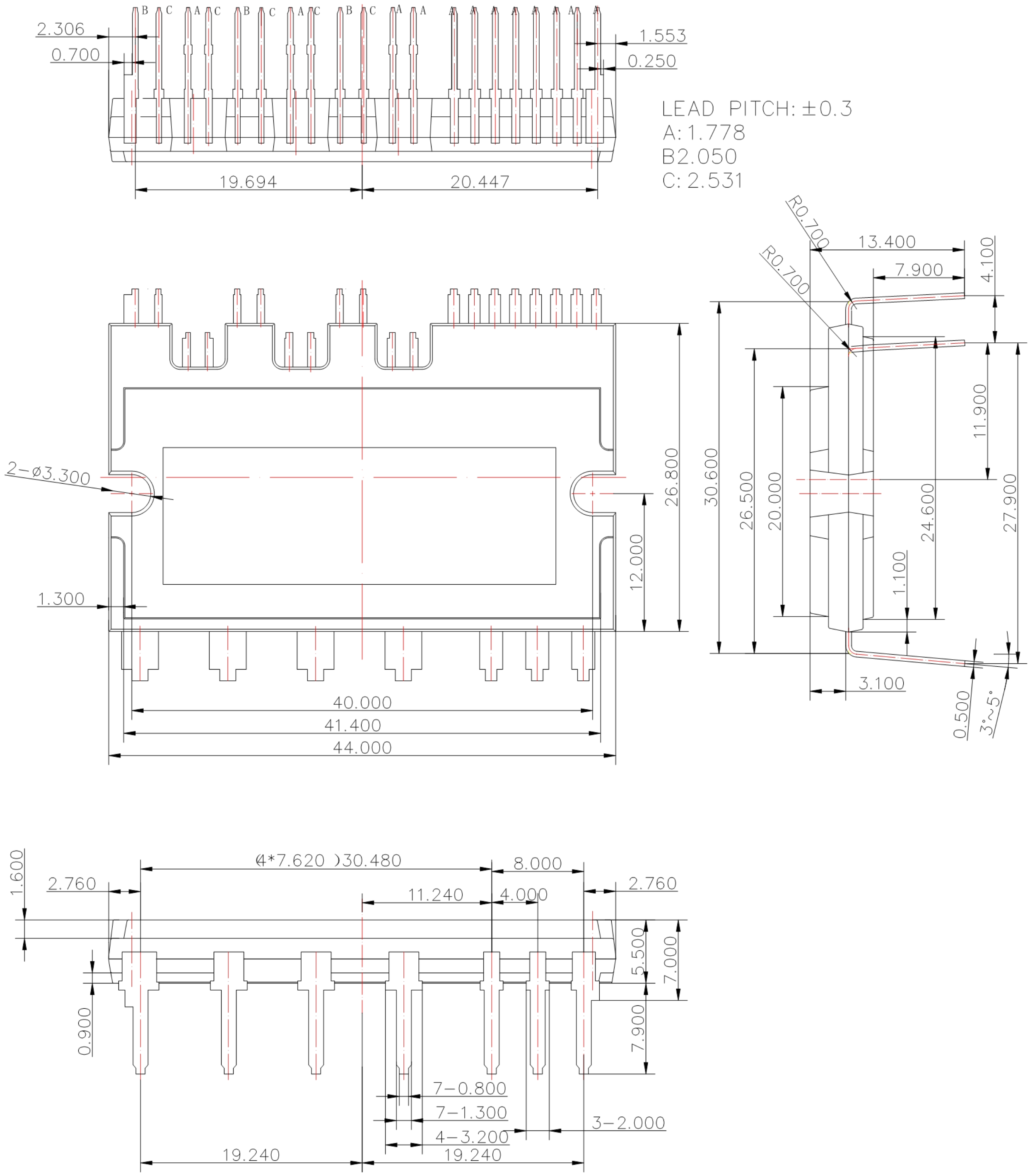
1. 逆变器低端由三个 IGBT 组成，每个 IGBT 配有一个快恢复二极管(FRD)并包括一个具有门极驱动和保护功能的控制集成电路(LVIC)。
2. 逆变器的功率端是由逆变器的四个直流端和逆变器的三个输出端组成。
3. 逆变器高端由三个 IGBT 组成，每个 IGBT 配有一个快恢复二极管(FRD),一个驱动集成电路(HVIC)和一个自举二极管(bootstrap diode)。

Note:

1. Inverter low-side is composed of three IGBTs, freewheeling diodes for each IGBT and one control IC. It has gate drive and protection functions
2. Inverter power side is composed of four inverter dc-link input terminals and three inverter output terminals
3. Inverter high-side is composed of three IGBTs, freewheeling diodes, bootstrap diodes and three drive ICs for each IGBT

封装轮廓详图/Detailed Package Outline Drawings

封装/Package：DIP27-4426
（单位/Unit：mm）



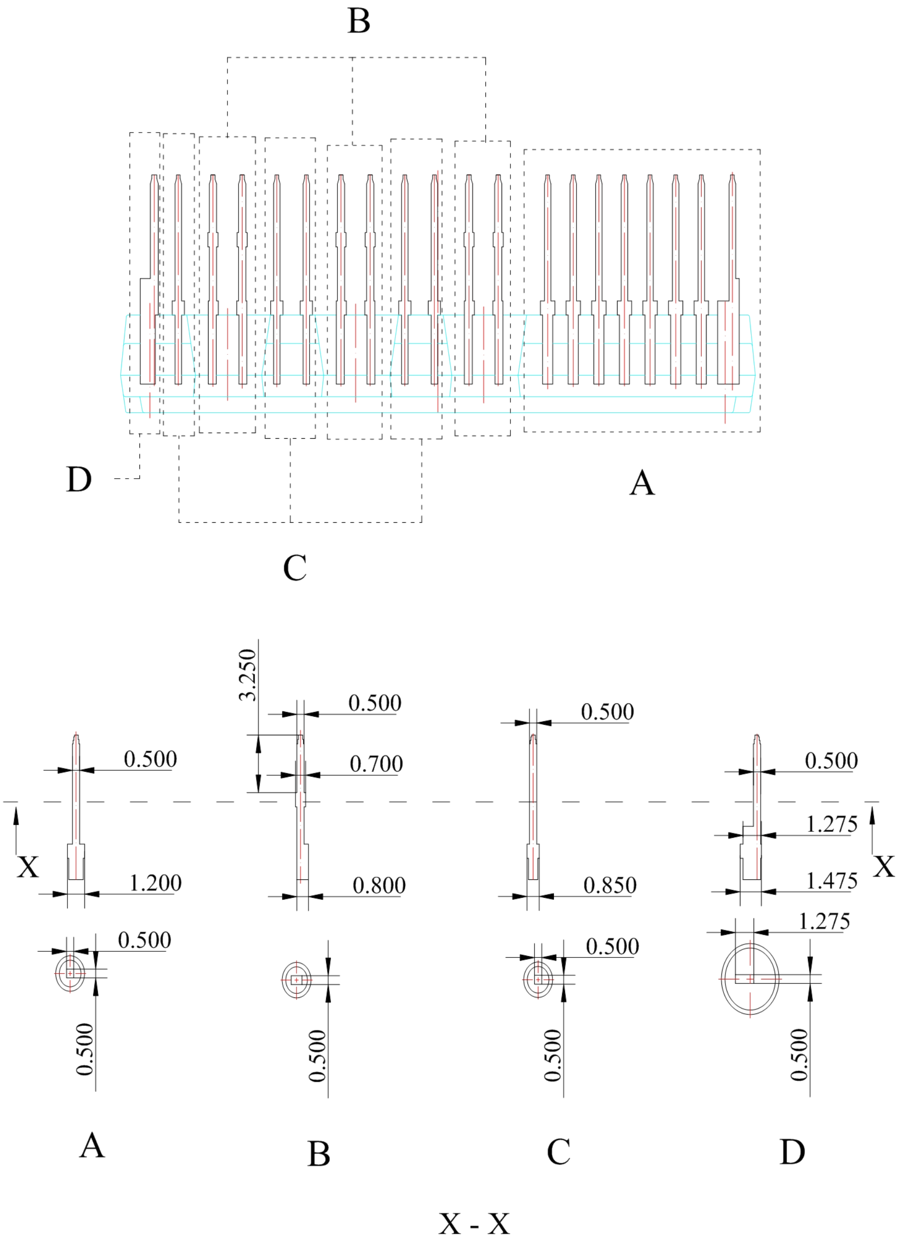


图 10. 封装轮廓详图
Fig 9.Detailed Package Outline Drawings

包装/Packing

包装 package	pcs/料管 pcs/tube	料管/内盒 tube/ inner box	内盒/箱 inner box/ carton	pcs/箱 pcs/carton
料管/tube	10	7	5	350

产品使用须知/RESTRICTIONS ON PRODUCT USE

- 本资料内容随产品的改进，可能会有未经预告之修改，比亚迪半导体股份有限有限公司拥有优先修改权。
- 尽管本公司一向致力于提高产品质量和可靠性，但是半导体产品有可能按某种概率发生故障或错误工作，为防止因故障或错误工作而产生人身事故，火灾事故，社会性损害等，请充分留意冗余设计、火灾蔓延对策设计、防止错误动作设计等安全设计。
- 本文所列比亚迪半导体股份有限公司产品仅可应用于计算机、个人设备、办公设备、测量设备、工业机器臂、家用电器等通用电气设备中，不可用于对精度、可靠性要求极高的设备中，也不可应用于会造成人身伤亡的设备中，不可用设备包括但不限于原子能控制器、航空航天设备、医疗设备与其他安环设备，对产品不恰当的使用将由使用者承担可能存在的风险。

- The information contained herein is subject to change without notice.
- **BYD Semiconductor Company Limited** exerts the greatest possible effort to ensure high quality and reliability. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing products, to comply with the standards of safety in making a safe design for the entire system, including redundancy, fire-prevention measures, and malfunction prevention, to prevent any accidents, fires, or community damage that may ensue. In developing your designs, please ensure that BME products are used within specified operating ranges as set forth in the most recent BME products specifications.
- The products listed in this document are intended for usage in general electronics applications (computer, personal equipment, office equipment, measuring equipment, industrial robotics, domestic appliances, etc.). These products are neither intended nor warranted for usage in equipment that requires extraordinarily high quality and/or reliability or a malfunction or failure of which may cause loss of human life or bodily injury (“Unintended Usage”). Unintended Usage include atomic energy control instruments, airplane or spaceship instruments, transportation instruments, traffic signal instruments, combustion control instruments, medical instruments, all types of safety devices, etc.. Unintended Usage of products listed in this document shall be made at the customer’s own risk.