



BGW800F12C34S6

$V_{CES} = 1200V$ $I_C = 800A$

General Description

BYD IGBT Power Module BG800F12C34S6 provides low switching loss as well as high short circuit capability, which introduce the advanced FS IGBT chip and ultra fast & soft recovery anti-parallel FRD to improved connection, it is able to take on a perfect performance in various applications up to 16KHz.

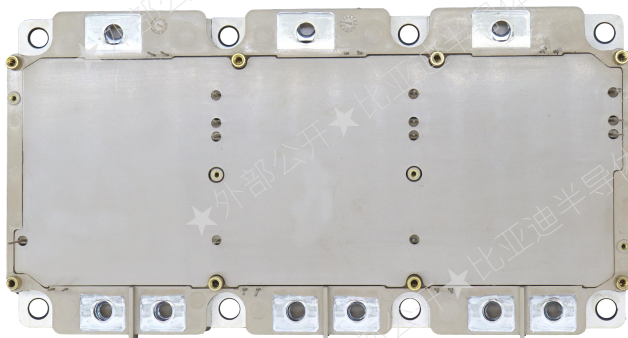
比亚迪IGBT功率模块BG800F12C34S6提供低损和高短路能力, 内含先进的平面栅场终止技术IGBT和超快速软恢复二极管芯片, 在不超过16KHZ频率的应用中表现出优良的性能

Features

- Full bridge module
全桥模块
- High short circuit withstand capability
高短路能力
- 1200V planar&field stop technology
1200V 平面栅场终止技术
- Ultra low conduction and switching loss
低导通和开关损耗
- Including ultra fast & soft recovery anti-parallel FRD
反并联超快速软恢复二极管

Applications

- AC motor control
交流马达控制
- Inverters
逆变器
- Servo
伺服电机
- Maximum applied voltage platform: 750V
最高支持750V电压平台





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Absolute Maximum Ratings / 最大额定值

Parameter	Symbol	Conditions		Value	Unit
Collector-emitter voltage 集电极-发射极电压	V_{CES}	$V_{GE}=0V$	$T_{vj}=25^{\circ}C$	1200	V
Continuous collector current 连续集电极直流电流	I_{c_nom}	—	$T_{vj}=150^{\circ}C$ $T_F=65^{\circ}C$	500 ⁽¹⁾	A
	I_C	—	$T_F=25^{\circ}C$	800	
Peak collector current 集电极峰值电流	I_{CRM}	$I_{CRM}=2 \times I_C$	—	1600	A
Gate-emitter voltage 栅极-发射极电压	V_{GES}	—	—	± 20	V
IGBT short circuit ,SCSOA IGBT 短路安全工作区	t_{psc}	$V_{CC}=750V$, $V_{GE} \leq 15V$	$T_{vj} \leq 150^{\circ}C$	4	us
Junction temperature 结温	T_{vj}	T_{op} continuous	—	-40~150	$^{\circ}C$
Storage temperature range 存储温度	T_{stg}	—	—	-40~125	$^{\circ}C$
Diode DC forward current 二极管直流正向电流	I_F	—	$T_C=25^{\circ}C$	800	A
Isolation voltage 绝缘电压	V_{isol}	AC, $t=1min$, $f=50Hz$	—	3800	V
Total power dissipation 耗散功率	P_{tot}	per switch (IGBT)	$T_F=65^{\circ}C$ $T_{vj}=150^{\circ}C$	1268	W

(1) Other conditions: $V_{CC}=750V$, $f_{SW}=8kHz$, $\Delta V/\Delta t=8L/min$, 50% water/50% ethylene glycol

IGBT Characteristics / IGBT 特性

IGBT	Symbol	Conditions		Min.	Typ.	Max.	Unit
Collector-emitter breakdown voltage 集电极-发射极击穿电压	$V_{(BR)CES}$	$V_{GE}=0V$, $I_C=1mA$	$T_{vj}=25^{\circ}C$	1250	—	—	V
Gate-emitter threshold voltage 栅极-发射极阈值电压	$V_{GE(th)}$	$I_C=32mA$, $V_{CE}=V_{GE}$	$T_{vj}=25^{\circ}C$	5.0	6.0	7.0	V
Collector-emitter cut-off current 集电极-发射极截止电流	I_{CES}	$V_{CE}=1200V$, $V_{GE}=0V$	$T_{vj}=25^{\circ}C$	—	—	200	uA
Gate-emitter leakage current 栅极-发射极漏电流	I_{GES}	$V_{CE}=0V$, $V_{GE}=20V$	$T_{vj}=25^{\circ}C$	—	—	200	nA



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Collector-emitter saturation voltage 集电极-发射极饱和电压	$V_{CE(sat)}$	$I_C=800A$, $V_{GE}=15V$	$T_{vj}=25^{\circ}C$	1.2	—	2.1	V
			$T_{vj}=150^{\circ}C$	—	1.8	—	V
Integrated gate resistor 内部栅极电阻	R_{Gint}	—	$T_{vj}=25^{\circ}C$	—	0.7	—	Ω
IGBT Characteristics / IGBT 特性							
Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
Input capacitance 输入电容	C_{ies}	$V_{CE}=25V$, $V_{GE}=0V$, $f=1MHz$	—	—	17.16	—	nF
Reverse transfer capacitance 反向传输电容	C_{res}		—	—	0.13	—	nF
Turn-on delay time 开通延迟时间	$t_{d(on)}$	$V_{CC}=750V$ $I_C=800A$, $R_{Gon}=3.3\Omega$, $R_{Goff}=5\Omega$, $V_{GEon}=+15V$, $V_{GEoff}=-8V$, $L_S=30nH$	$T_{vj}=25^{\circ}C$	—	285	—	ns
			$T_{vj}=125^{\circ}C$	—	291	—	ns
			$T_{vj}=150^{\circ}C$	—	290	—	ns
Rise time 上升时间	t_r		$T_{vj}=25^{\circ}C$	—	128	—	ns
			$T_{vj}=125^{\circ}C$	—	142	—	ns
			$T_{vj}=150^{\circ}C$	—	147	—	ns
Turn-off delay time 关断延迟时间	$t_{d(off)}$		$T_{vj}=25^{\circ}C$	—	820	—	ns
			$T_{vj}=125^{\circ}C$	—	855	—	ns
			$T_{vj}=150^{\circ}C$	—	850	—	ns
Fall time 下降时间	t_f		$T_{vj}=25^{\circ}C$	—	155	—	ns
			$T_{vj}=125^{\circ}C$	—	250	—	ns
			$T_{vj}=150^{\circ}C$	—	276	—	ns
Energy dissipation during turn-on time 开通损耗	E_{on}		$T_{vj}=25^{\circ}C$	—	111	—	mJ
			$T_{vj}=125^{\circ}C$	—	143	—	mJ
			$T_{vj}=150^{\circ}C$	—	151	—	mJ
Energy dissipation during turn-off time 关断损耗	E_{off}		$T_{vj}=25^{\circ}C$	—	124	—	mJ
		$T_{vj}=125^{\circ}C$	—	150	—	mJ	
		$T_{vj}=150^{\circ}C$	—	154	—	mJ	
Diode Characteristics / 二极管特征值							
Forward voltage 正向电压	V_F	$I_F=800A$	$T_{vj}=25^{\circ}C$	1.5	—	2.4	V
			$T_{vj}=150^{\circ}C$	—	1.83	—	V
Peak reverse recovery current 反向恢复峰值电流	I_{RR}	$I_F=600A$, $V_R=750V$,	$T_{vj}=25^{\circ}C$	—	347.8	—	A
			$T_{vj}=125^{\circ}C$	—	208.4	—	A
			$T_{vj}=150^{\circ}C$	—	235.9	—	A
Recovered charge 恢复电荷	Q_r		$T_{vj}=25^{\circ}C$	—	57.5	—	μC
			$T_{vj}=125^{\circ}C$	—	77.49	—	μC
			$T_{vj}=150^{\circ}C$	—	93.89	—	μC



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Reverse recovery energy 反向恢复能量	E _{rec}	R _{Gon} =2.5Ω, R _{Goff} =5Ω	T _{vj} =25℃	—	32.61	—	mJ
			T _{vj} =125℃	—	35.7	—	mJ
			T _{vj} =150℃	—	43.82	—	mJ
Thermal-Mechanical Specifications / 热力参数							
Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
Thermal resistance junction to coolant 结到冷却液热阻	R _{th(j-f)}	IGBT, T _F =45℃, ΔV/Δt=8L/min		—	0.067	—	K/W
	R _{th(j-f)}	FRD, T _F =45℃, ΔV/Δt=8L/min		—	0.088	—	K/W
Module Characteristics/ 模块特性							
Dimensions 尺寸	L x W x H	Typical , see outline drawing		217.1×113.4×38.0			mm
Clearance distance in air 空气间隙	da	according to IEC 60664-1 and EN 50124-1	Term. to base:	—	12	—	mm
			Term. to term:	6	—	—	
Surface creepage distance 爬电距离	ds	according to IEC 60664-1and EN 50124-1	Term. to base:	15	—	—	mm
			Term. to term:	—	12	—	
Mass 重量	m	—	—	—	1795	—	g
Pressure drop in cooling circuit 在冷却液中的压差	ΔP	Δv/Δt=12L/min, T=25℃ ,cooling fluid=50% water/50% ethylenglycol		—	10	—	KPa
Maximum pressure in cooling circuit 冷却循环中的最大压力	P	—		—	250	—	KPa
Stray inductance module 杂散电感	L _{sce}	—		—	18	—	nH
Module lead resistance, terminals – chip 模块引线电阻, 端子—芯片	R _{CC'+EE'}	—		—	0.75	—	mΩ
Mounting torque 安装扭矩	M	Screw M6-mounting according to valid application note		3.0	—	4.5	Nm
Terminal connection torque 端子连接扭矩	M	Screw M6-mounting according to valid application note		3.0	—	4.5	Nm
NTC-Thermistor Characteristic Values/ 热敏电阻特性							
Rated resistance 额定阻值	R ₂₅	T _C =25℃		—	5.0	—	KΩ



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Deviation of R100 R100 偏差	$\Delta R/R$	$T_C=100^{\circ}\text{C}$, $R_{100}=493\Omega$	-5	—	5	%
Power dissipation 耗散功率	P_{25}	$T_C=25^{\circ}\text{C}$	—	—	20.0	mW
B-value B-值	$B_{25/50}$	$R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298.15\text{K}))]$	—	3375	—	K
B-value B-值	$B_{25/80}$	$R_2=R_{25}\exp[B_{25/80}(1/T_2-1/(298.15\text{K}))]$	—	3411	—	K
B-value B-值	$B_{25/100}$	$R_2=R_{25}\exp[B_{25/100}(1/T_2-1/(298.15\text{K}))]$	—	3433	—	K

Thermal and mechanical properties according to IEC 60747 – 15, Specification according to the valid application note. 热和机械特性
参考 IEC 60747 – 15



Characterization Curves/特性曲线

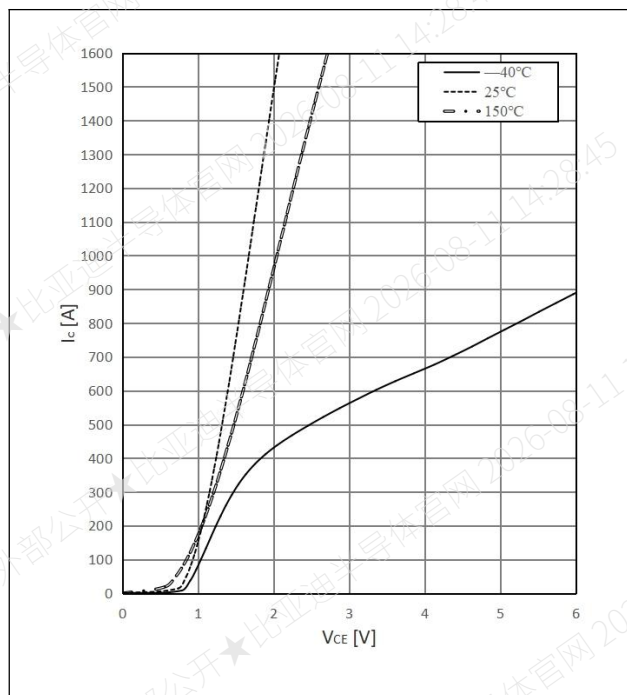


Fig.1 Typ. On-state Characteristics

图1: 通态特性

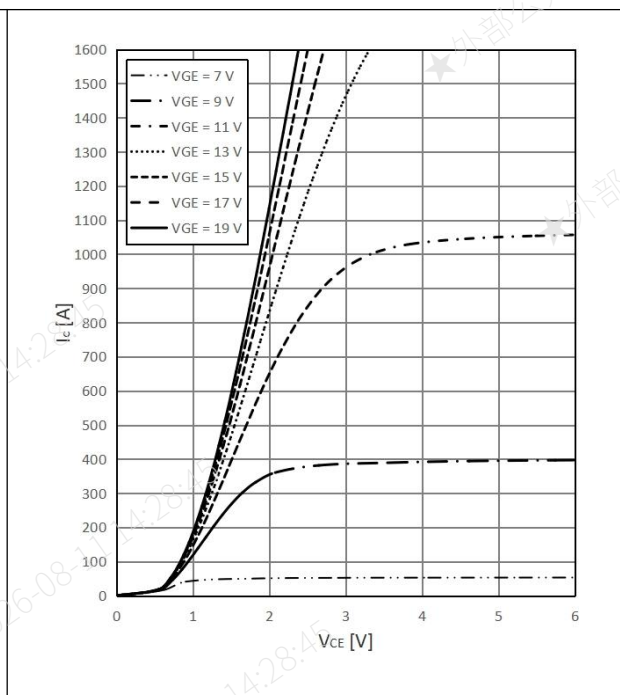


Fig.2 Typ. Output Characteristics

图2: 输出特性

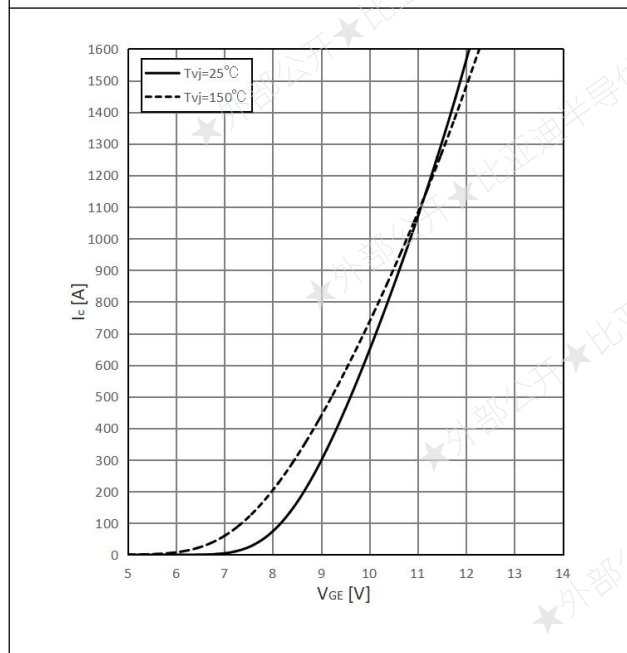


Fig.3 Typ. Transfer Characteristics

图3: 传输特性

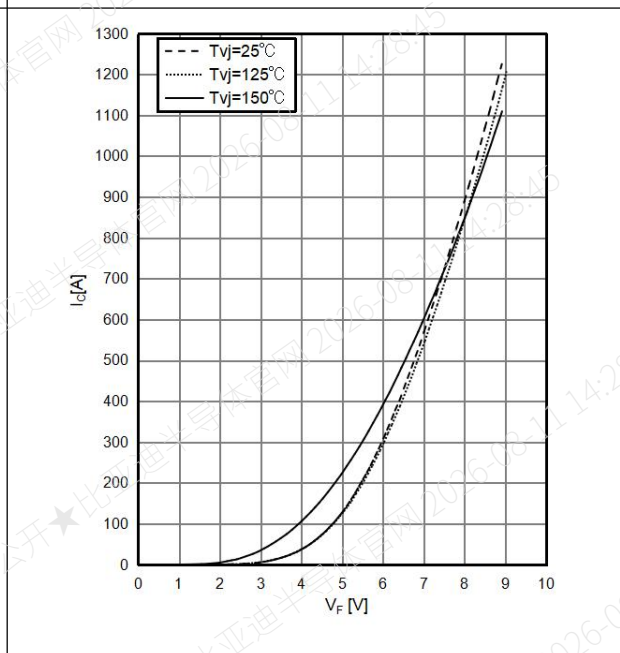


Fig.4 FWD Forward Characteristics

图4: 二极管正向特性



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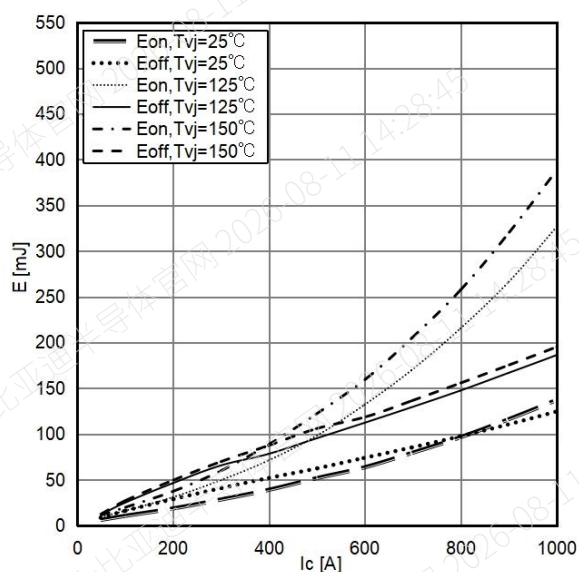


Fig.5: Switching Loss vs. Collector Current

图5: 开关损耗与集电极电流关系

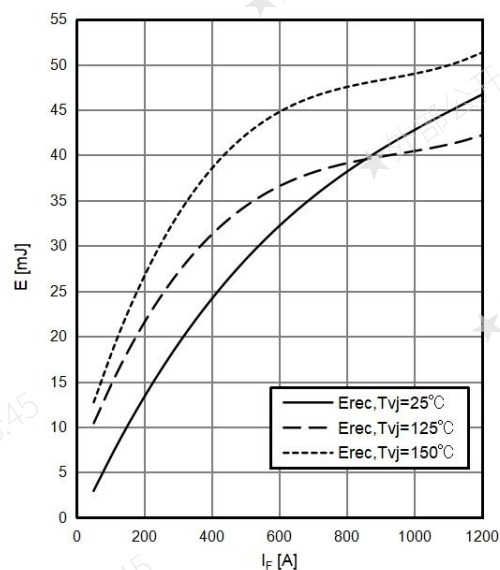


Fig.6: Reverse recovery Energy

图6: 反向恢复损耗

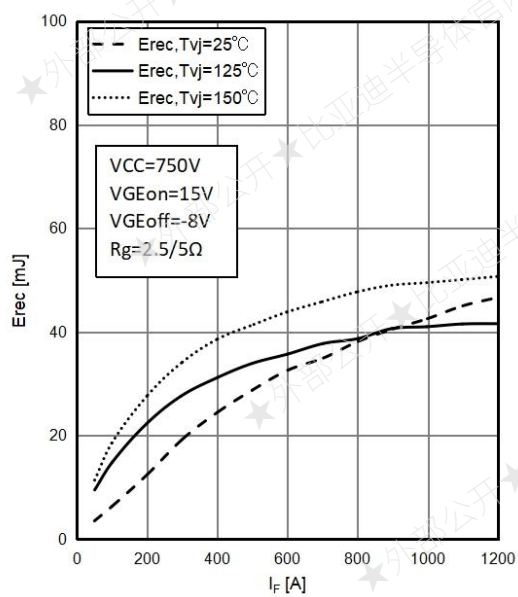


Fig.7 Typ. Reverse Recovery Characteristics vs. di/dt

图7: 反向恢复损耗与正向电流的关系

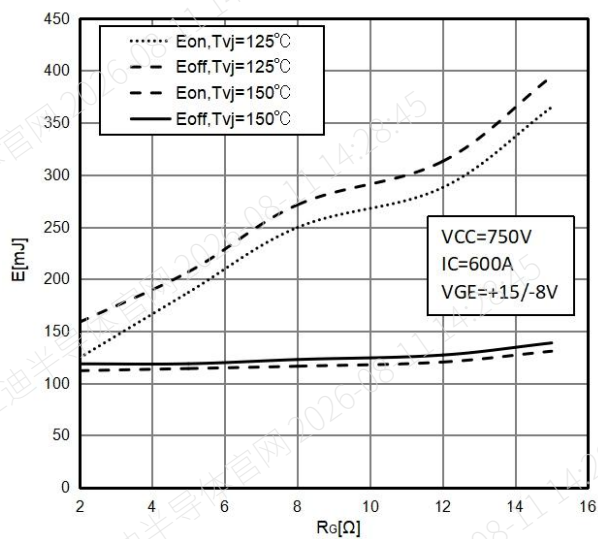


Fig.8: Switching Loss vs. Gate Resistor

图8: 开关损耗与门极电阻关系



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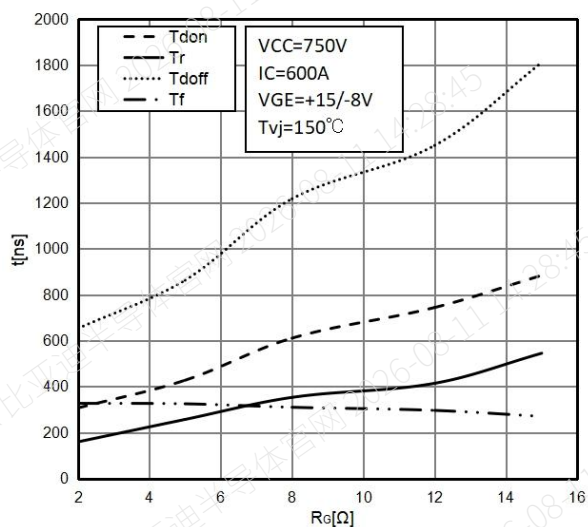


Fig.9: Switching Times vs. Gate Resistor

图9: 开关时间与门极电阻关系

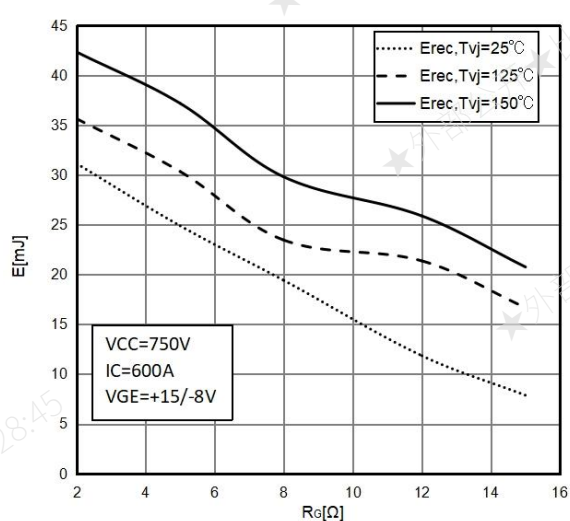


Fig.10: Reverse recovery Energy vs. Gate Resistor

图10: 反向恢复损耗与门极电阻关系

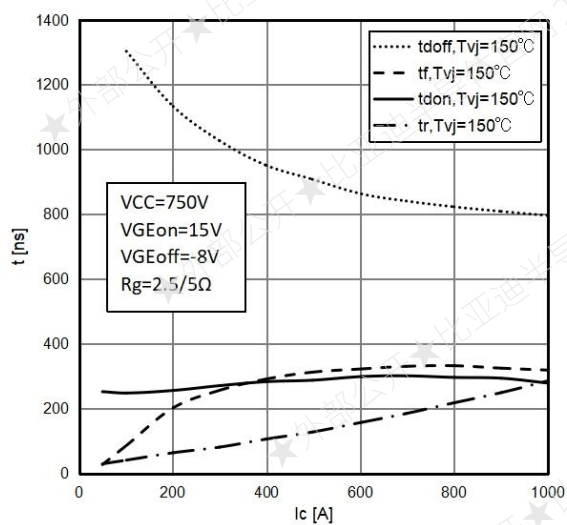


Fig.11: Switching Times vs. IC

图11: 开关时间与集电极电流关系

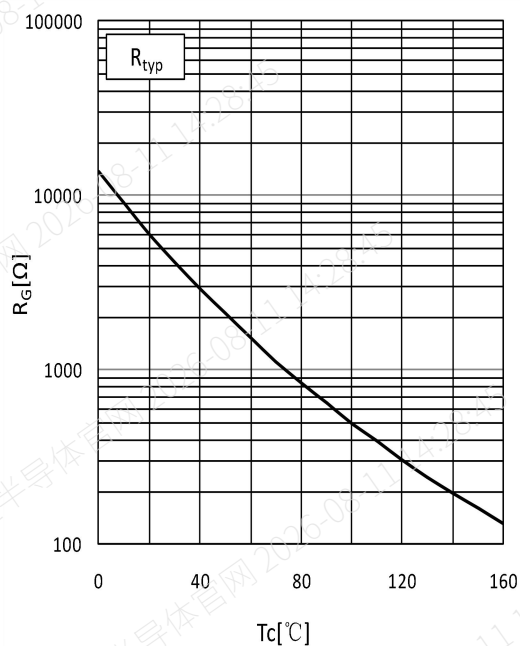


Fig.12 Typ. NTC-Temperature Characteristics

图12: NTC 热特性



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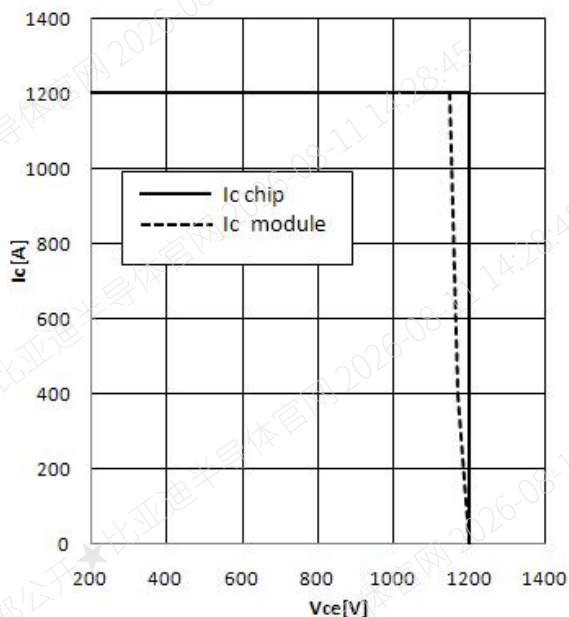


Fig.13: Reverse Bias Safe Operating Area

图13: 反偏安全工作区

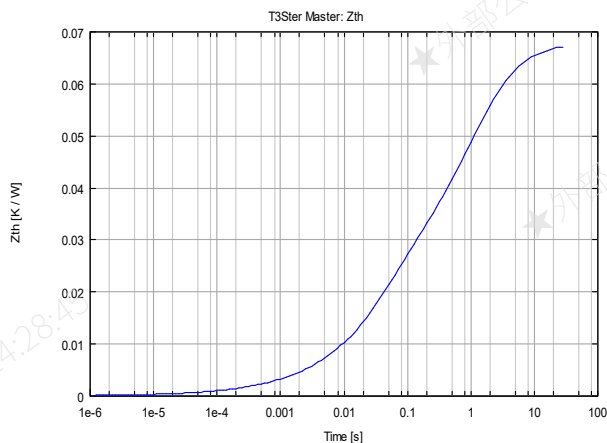


Fig.14: Typ. transient thermal impedance(IGBT) Z_{thJF}

IGBT(K/W)

图14: 典型的瞬态热阻抗(IGBT) Z_{thJF} IGBT(K/W)

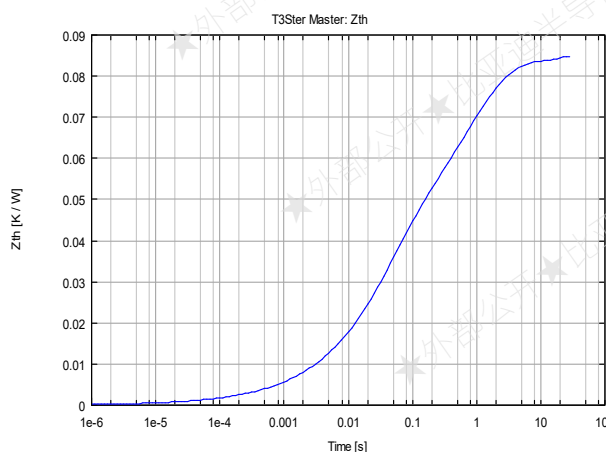


Fig.15: Typ. transient thermal impedance(FRD) Z_{thJF}

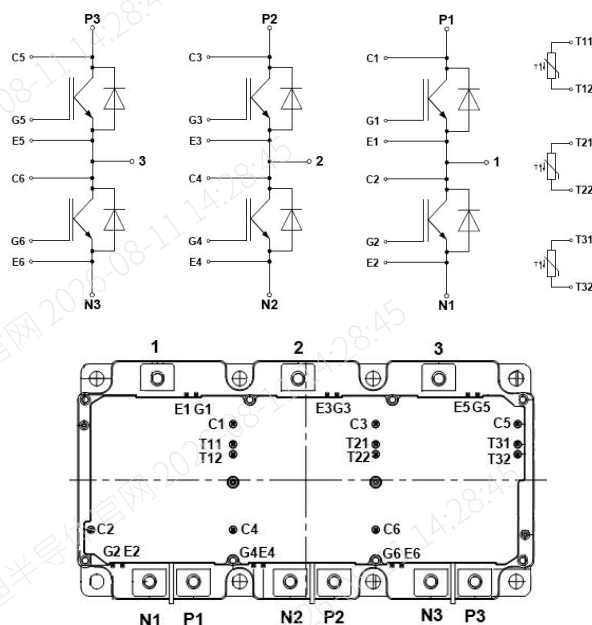
FRD(K/W)

图15: 典型的瞬态热阻抗(FRD) Z_{thJF} FRD(K/W)

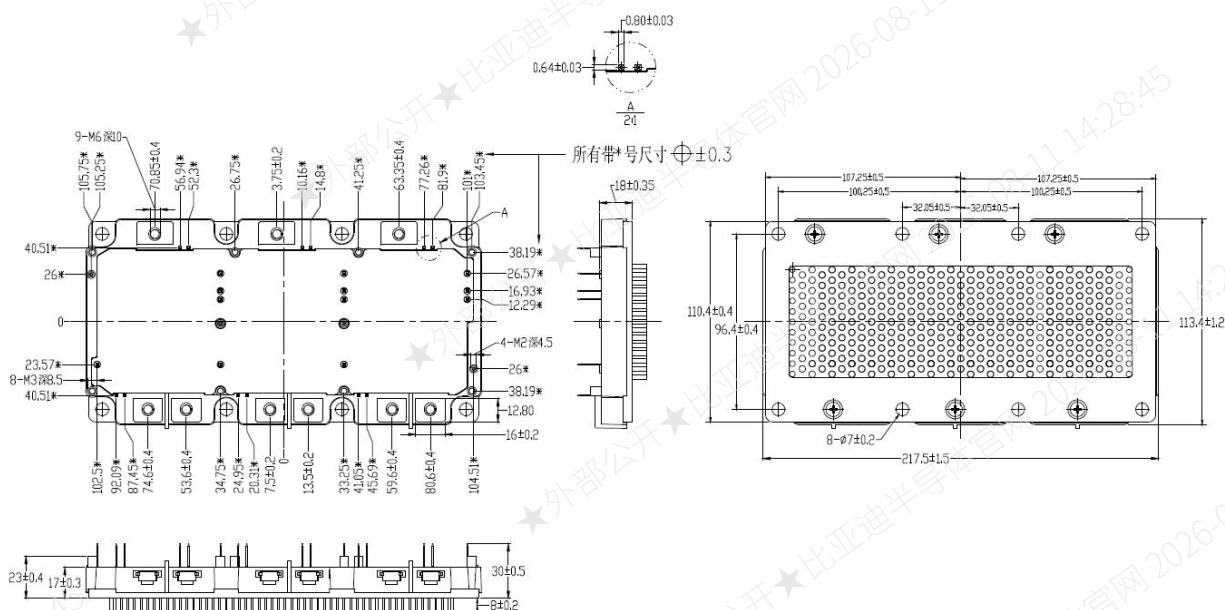


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Circuit Diagram



Package Outlines





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Attached (recommended torque and screw):

Terminal Torque(M6): pre-tightening torque 0.5 N.m and final torque 3.0-4.5 N·m

端子扭矩(M6)预紧扭矩0.5 N.m, 最终扭矩3.0-4.5 N·m

Mounting Torque(M3):0.5-1.0 N·m

安装扭矩(M3): 0.5-1.0 N·m

For the 1.0mm thickness shielding plate mounting, we suggest you use the M2x5 screws

对于1.0mm厚度的屏蔽板安装, 建议使用M2X5的螺钉。

Signal pin hole diameter $0.8 \pm 0.1 \times 0.64 \pm 0.1$ mm, recommended drive plate aperture: 1.5 ± 0.075 mm.

信号针大小: $0.8 \pm 0.1 \times 0.64 \pm 0.1$ mm, 推荐驱动板孔径: 1.5 ± 0.075 mm。

Attention

1. When installing the module, please wear an electrostatic bracelet to prevent the gate breakdown and the imbalance power may damage the internal chip, even to damage the module.

当您安装模块时, 请佩戴静电手环防止栅极被击穿, 静电可能会破坏芯片, 甚至损坏模块。

2. This is an electrostatic sensitive device, please observe the international standard IEC 60747-1, chap. IX.

这是静电敏感器件, 请遵循国际标准 IEC 60747-1, chap. IX。



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免责声明 | DISCLAIMER

- **使用范围：**本产品适用于一般车规级电气应用，不当的操作（如电应力、机械应力等）可能导致模块损毁。请注意以下介绍，并根据指导来使用比亚迪 IGBT 模块。本产品为灌装硅胶的模块，须沿信号针向上方向安装。

Applications: This product is suitable for general vehicle-grade electrical applications. Unsuitable operation (such as electrical, mechanical stress and so on) may lead to damage of power modules. Please pay attention to the following descriptions and use BYD's IGBT modules according to the guidance. Please install IGBT modules which potting with silicone properly with the pins up.

- **质保期：**除双方在合作协议或其他书面文件中另行约定外，本规格书所述产品质保期自出货起 12 个月。

Warranty Period: Unless otherwise agreed in the COOPERATION AGREEMENT or other WRITTEN DOCUMENTS. The warranty period for the product described in this specification is 12 months from the date of shipment.

- **与产品相关的特别说明：**

- **运输过程中：**运输过程中包装箱堆叠不能超过 6 层，包装箱颠簸或坠落可能导致内部器件损毁。器件遇水受潮将导致故障失效，在雨雪天气尤其要注意保护器件防止淋湿。
- **贮存：**包装箱堆叠不能超过 6 层，贮存地点温度与湿度应分别控制在 $5\sim 35^{\circ}\text{C}$ 和 $30\sim 75\%\text{RH}$ 。如果贮存环境远高于或低于指示的变化范围，将危害器件的性能与可靠性。
- **应用环境：**器件不应当暴露在水，有机溶剂，腐蚀性气体、易燃易爆性气体，微尘，腐蚀性药剂中，上述任何一种情况都会导致严重事故。防静电措施：带栅极器件应采取以下预警来防止可以损毁器件的静电生成。预防措施可以防止静电击穿器件。（1）门极与发射极间产生的人体静电、包装箱静电和过电压将损毁或击穿器件。采样发射极和温度传感器同样容易受到过压损毁。防静电地板可以抑制电荷生成并快速耗散；（2）不要用易受静电影响的容器运输或贮存器件；（3）发射极信号端子应一直用碳纤维布或类似物短接直到模块使用前。任何情况下不要徒手碰触信号端子；（4）安装过程中始终保持设备和你的身体接地（移除碳纤维布或类似物后）。用导电垫覆盖工作地点及周围地板并使其接地；（5）使用接地烙铁头。

Special Instructions Related to Products:

- **During transportation:** The stacking of packaging boxes should not exceed 6 layers during



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transportation. Tossing or dropping of a carton may damage devices inside. If a device gets wet with water, malfunctioning and failure may result. Special care should be taken during rain or snow to prevent the devices from getting wet.

●**Storage:** The stacking of packaging boxes should not exceed 6 layers. The temperature and humidity of the storage place should be 5~35 ° C and 30~75%RH respectively. The performance and reliability of devices may be jeopardized if devices are stored in an environment far above or below the range indicated above.

●**Operating Environment:** Devices should not be exposed to water, organic solvents, corrosive gases, explosive gases, fine particles, or corrosive agents, since any of those can lead to a serious accident. Anti-electrostatic Measures: Following precautions should be taken for gated devices to prevent static buildup which could damage the devices. Precautions against the device rupture caused by static electricity. (1) Static electricity of human bodies and cartons and/or excessive voltage applied across the gate to emitter may damage and rupture devices. Sense-emitter and temperature-sensor are also vulnerable to excessive voltage. The basis of anti-electrostatic is suppression of build-up and quick dissipation of the charged electricity. (2) Containers that are susceptible to static electricity should not be used for transit or for storage. (3) Signal terminals to emitter should be always shorted with a carbon cloth or the like until right before a module is used. Never touch the signal terminals with bare hands. (4) Always ground the equipment and your body during installation (after removing a carbon cloth or the like. It is advisable to cover the workstation and its surrounding floor with conductive mats and ground them. (5) Use soldering irons with grounded tips.

- 本公司致力于提高产品质量与稳定性。本规格书之目的，仅在于陈述产品相关技术信息。

Our company is committed to enhancing product quality and stability. This specification serves solely to delineate technical product details.

- 尽管本公司已尽合理努力及注意，但由于产品本身敏感特性以及测试环境、系统的差异，存在



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一定的故障发生率以及可能在某些情况下出现故障或失效。因此，本公司不承诺规格书中所列信息准确性及产品适配、适销性。规格书所载信息不应被视为本公司对产品功能、条件或质量的保证与承诺。

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The Company shall not be held liable for any product damage or consequential incidents resulting from usage beyond the recommended storage conditions, operating parameters, or absolute maximum ratings (or other explicitly stated limits) specified in this specification. Customers must strictly adhere to the operational procedures and conditions outlined in the latest version of the specification when utilizing or testing the product. Customers are responsible for complying with safety standards, including but not limited to redundant design, fire prevention measures, and fault prevention, to design and maintain a safe and



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stable system environment. Customers must verify all functionalities described in the specifications before or during actual application to ensure product suitability, safety (preventing potential accidents, fires, or public harm etc.), and reliability. It is recommended that Customers consult our company prior to testing to confirm whether the product information adequately covers the application requirements.

- 本产品不能且禁止应用在一些需要更高稳定性及质量的特殊设备上，以免导致人员伤亡等意外发生，包括原子能控制设备、飞机及航空器件、船舶、轨道等运输设备、交通信号设备、燃烧控制设备、医药设备以及所有安全性设备等。用户应通过本公司或经本公司授权的渠道购买正品，并应在法律约束范围内及本规格书明确条件下合法、合理使用，否则造成损失与伤害的，本公司概不负责。

This product shall not be used in any equipment requiring higher reliability or quality standards where failure could result in personal injury, death, or catastrophic events, including but not limited to nuclear control systems, aircraft/aviation components, maritime/rail transport equipment, traffic signaling devices, combustion control systems, medical equipment, or other safety-critical applications. Customers must procure genuine products exclusively through the Company or authorized channels, and utilize them strictly within legally permitted boundaries and under conditions expressly defined in this specification. The Company disclaims all liability for losses, damages, or injuries arising from non-compliance with these requirements.

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The information presented in this specification constitutes the latest product details compiled and recorded by the Company with reasonable efforts at the time of publication. To ensure greater accuracy, the Company reserves the right to make periodic corrections, modifications, and version updates to this specification without prior notice. Customers should always refer to the latest version when using or consulting this document.

- 本规格书以中英文双语书就，如有不同之处，以中文内容为准。

This specification is written in both Chinese and English, and in case of any conflict between the Chinese and English versions, the Chinese version shall prevail.