❒ General Description

BYD IGBT Power Module BG300B12LY4-I provides low switching loss as well as high short circuit capability, which introduce the advanced IGBT chip/FWD and improved connection.

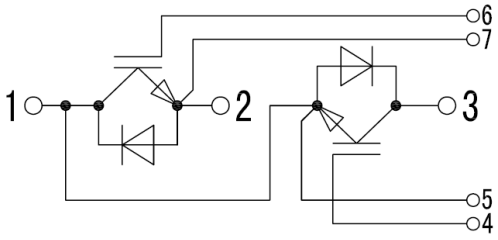
❒ 概述

BYD IGBT 功率模块 BG300B12LY4-I 采用高性能的 IGBT 芯片和 FRD 芯片和优化的电气连接，具有低损和高短路耐量。

V_{CE}=1200V, I_C=300A

❒ Key Features

- Half-bridge module
- High short circuit withstand capability
- Ultra low conduction and switching loss
- Including ultra fast&soft recovery anti-parallel FWD



❒ 关键特性

- 半桥模块
- 高短路耐量
- 低导通和开关损耗
- 并联超快软恢复续流二极管

❒ Applications

- Induction heating
- Inverters
- Servo
- UPS (Uninterruptible Power Supplies)
- Electric welding

❒ 应用

- 感应加热
- 逆变器
- 伺服系统
- 不间断电源
- 电焊机

❒ IGBT/IGBT

● Maximum Rated Values/最大额定值

符号 Symbol	参数 Parameter	工作条件 Conditions	额定值 Ratings	单位 Units
V_{CES}	Collector-emitter voltage 集电极-发射极电压	T_{vj}=25℃	1200	V
I_C	Collector current 连续集电极直流电流	T_c=80℃，T_{vj}=175℃	300	A
V_{GES}	Gate-emitter voltage 栅极-发射极峰值电压	T_{vj}=25℃	±20	V
I_{CRM}	Repetitive peak collector current 集电极重复峰值电流	t_p=1ms，T_{vj}=25℃	600	A
t_{psc}	IGBT short circuit SOA 短路安全工作区	V_{GE}≤15V,V_{CC}=600V V_{CEM}≤1200V, T_{vj}≤25℃	10	us
P_{tot}	Total power dissipation 总耗散功率	T_c=25℃，T_{vj}=175℃	1350	W

● Characteristics Values/特征值

符号 Symbol	参数 Parameter	工作条件 Conditions	额定值 Ratings			单位 Units
			Min.	Typ.	Max.	
$V_{CE\ sat}$	Collector-Emitter Saturation Voltage 集电极-发射极饱和电压	I_C=300A,V_{GE}=15V,T_{vj}=25℃	-	2.05	-	V
		I_C=300A,V_{GE}=15V,T_{vj}=125℃	-	2.22	-	V
V_{GEth}	Gate threshold voltage 栅极阈值电压	V_{CE}=V_{GE},I_C=12mA,T_{vj}=25℃	5.0	5.7	7.0	V
Q_G	Gate charge 栅极电荷	V_{GE}=-15V...+15V	-	1.2	-	uC
R_{gint}	Internal gate resistance 内部栅极电阻	T_{vj}=25℃	-	2.0	-	Ω
C_{ies}	Input capacitance 输入电容	T_{vj}=25℃,f=1MHz, V_{GE}=0V, V_{CE}=25V	-	10	-	nF
C_{res}	Reverse capacitance 反向传输电容		-	0.5	-	nF
I_{CES}	Collector-emitter cut-off current 集电极-发射极截止电流	V_{CE}=1200V,V_{GE}=0V,T_{vj}=25℃	-	-	1.0	mA
I_{GES}	Gate-emitter leakage current 栅极-发射极漏电流	V_{CE}=0V,V_{GE}=20V,T_{vj}=25℃	-	-	1000	nA

$t_{d\ on}$	Turn-on delay time 开通延迟时间	I_C = 300 A, V_{CE} = 600 V, V_{GE}=-8V…+15 V , R_{Gon} = R_{Goff} = 3.3Ω, L_s=35nH	T_{vj}=25℃	-	120	-	ns
			T_{vj}=125℃	-	150	-	ns
t_r	Rise time 上升时间		T_{vj}=25℃	-	70	-	ns
			T_{vj}=125℃	-	90	-	ns
$t_{d\ off}$	Turn-off delay time, 关断延迟时间		T_{vj}=25℃	-	310	-	ns
			T_{vj}=125℃	-	740	-	ns
t_f	Fall time 下降时间		T_{vj}=25℃	-	150	-	ns
			T_{vj}=125℃	-	200	-	ns
E_{on}	Turn-on energy loss 开通损耗能量		T_{vj}=25℃	-	23	-	mJ
			T_{vj}=125℃	-	33	-	mJ
E_{off}	Turn-off energy loss 关断损耗能量		T_{vj}=25℃	-	25	-	mJ
			T_{vj}=125℃	-	36	-	mJ

❒ FRD/二极管

● Maximum Rated Values/最大额定值

符号 Symbol	参数 Parameter	工作条件 Conditions	额定值 Ratings	单位 Units
V_{RRM}	Repetitive peak reverse voltage 反向重复峰值电压	T_{vj} = 25℃	1200	V
I_F	Forward current of diode 连续正向直流电流	T_C = 25℃	300	A
I_{FRM}	Repetitive peak forward current 正向重复峰值电流	T_C = 25℃，T_{vj} = 175℃	600	A

● Characteristics Values/特征值

符号 Symbol	参数 Parameter	工作条件 Conditions		额定值 Ratings Min.	 Typ.	 Max.	单位 Units
V_F	Forward voltage 正向电压	I_F=300A, V_{GE}=0V	T_{vj}=25℃	-	2.0	-	V
			T_{vj}=125℃	-	2.1	-	V
I_{RM}	Peak reverse recovery current 反向恢复峰值电流	I_F=300 A, V_R = 600 V, V_{GE}=-8V…+15V, R_{Gon} =3.3Ω, L_s=35nH	T_{vj}=25℃	-	190	-	A
			T_{vj}=125℃		210		A
Q_r	Recovered charge 恢复电荷		T_{vj}=25℃	-	18	-	uC
			T_{vj}=125℃		25		uC
E_{rec}	Reverse recovery energy 反向恢复损耗		T_{vj}=25℃	-	11	-	mJ
			T_{vj}=125℃		17		mJ

❒ Module/模块

符号 Symbol	参数 Parameter	工作条件 Conditions	额定值 Ratings			单位 Units
			Min.	Typ.	Max.	
T_{vjmax}	Maximum junction temperature 最大结温	-	-	-	175	℃
T_{vjop}	Temperature under switching conditions 工作结温	-	-40	-	150	℃
T_{stg}	Storage temperature 储存温度	-	-40	-	125	℃
$R_{thjc\ IGBT}$	IGBT, thermal resistance, junction to case 结-外壳热阻	per IGBT 单个 IGBT	-	-	0.11	K/W
$R_{thjc\ Diode}$	Diode, thermal resistance, junction to case 结-外壳热阻	per diode 单个二极管	-	-	0.12	K/W
V_{isol}	Isolation test voltage 绝缘测试电压	f = 50Hz, t = 1min.	2.5	-	-	KV
G	Weight 重量	-	-	320	-	g
-	Cree page distance 爬电距离	Terminal to terminal 端子到端子	-	14	-	mm
-		Terminal to base 端子到底板	-	24	-	
-	Clearance distance in air 空气间隙	Terminal to terminal 端子到端子	-	6.0	-	
-		Terminal to base 端子到底板	-	28.3	-	
M_1	Mounting torque for module mounting 模块的安装扭矩	Screw M6 M6 螺栓	3.0	-	6.0	N.m
M_2	Terminal connection torque 端子的连接扭矩	Screw M6 M6 螺栓	2.5	-	5.0	N.m
-	Internal isolation 内部绝缘	ceramics 陶瓷	Al_2O_3			-
-	Material of module baseplate 模块基板材料	-	Cu			-
L x W x H	Dimensions 尺寸	-	106.4 x 61.4 x 31.5			mm

❒ Characteristics Diagrams/特性曲线

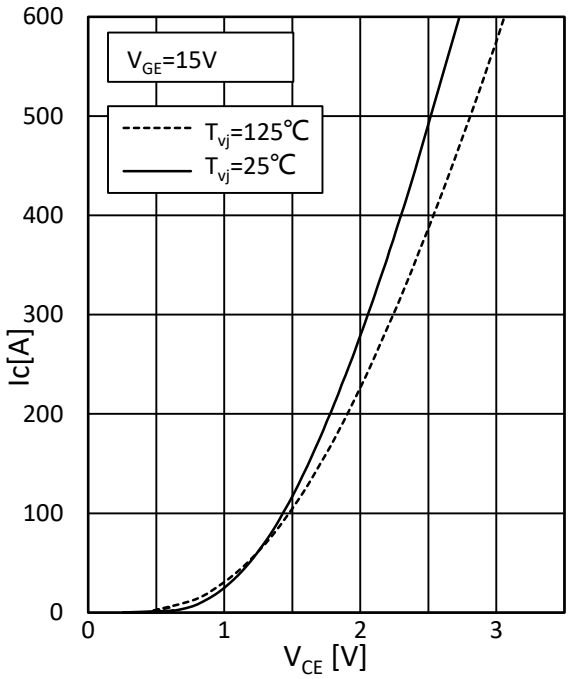


Fig.1 Typ. On-state Characteristics

图 1 开通状态特性

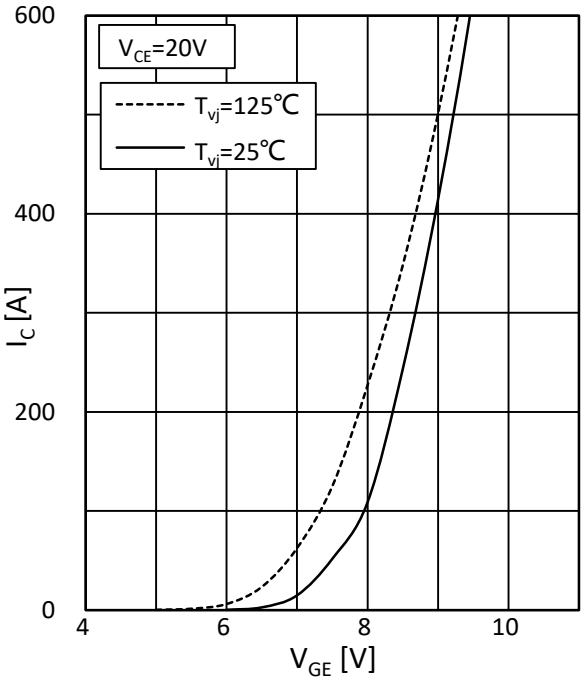


Fig.2 Typ. Transfer Characteristics

图 2 传输特性

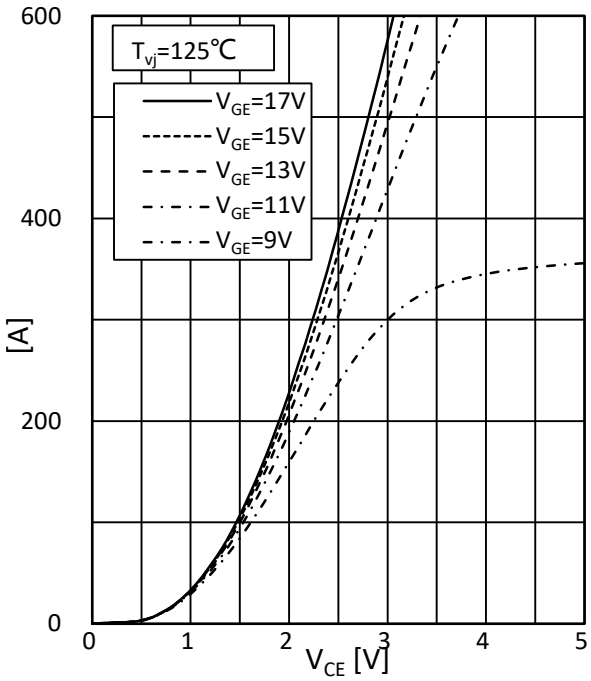


Fig.3 Typ. Output Characteristics

图 3 输出特性

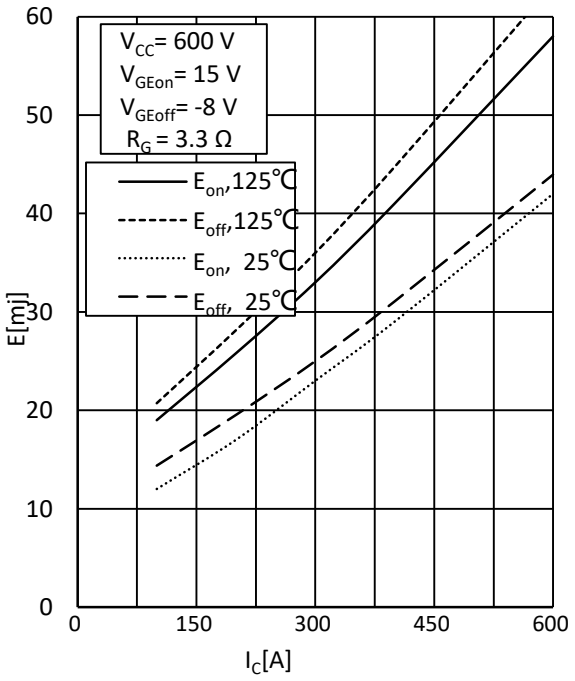


Fig.4 Switching Loss vs. Collector Current

图 4 开关损耗和集电极电流

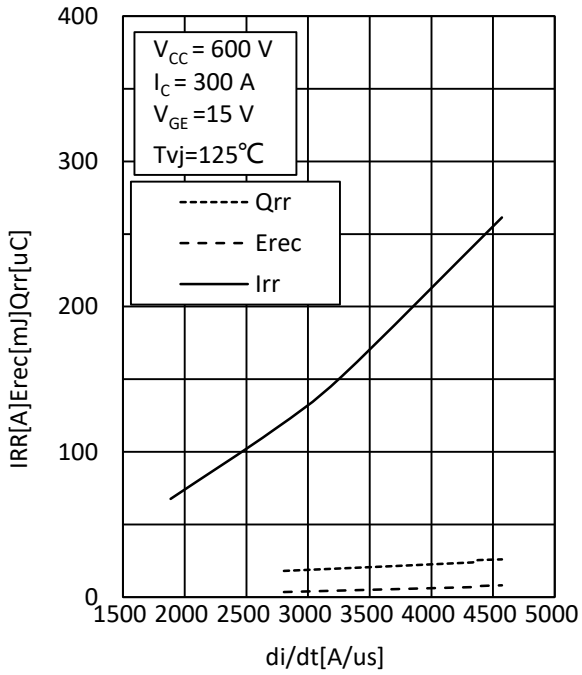


Fig.5 Typ. Reverse Recovery Characteristics vs. di/dt

图 5 反向恢复特性和 di/dt

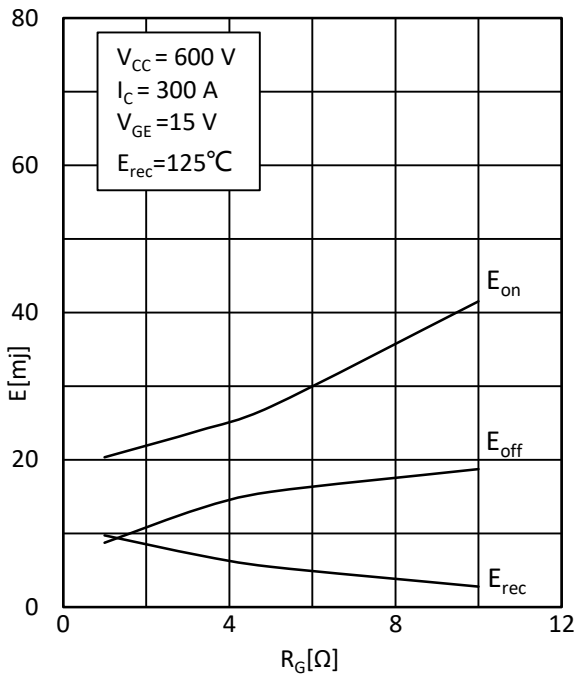


Fig.6 Switching Loss vs. Gate Resistor

图 6 开关损耗和门极电阻

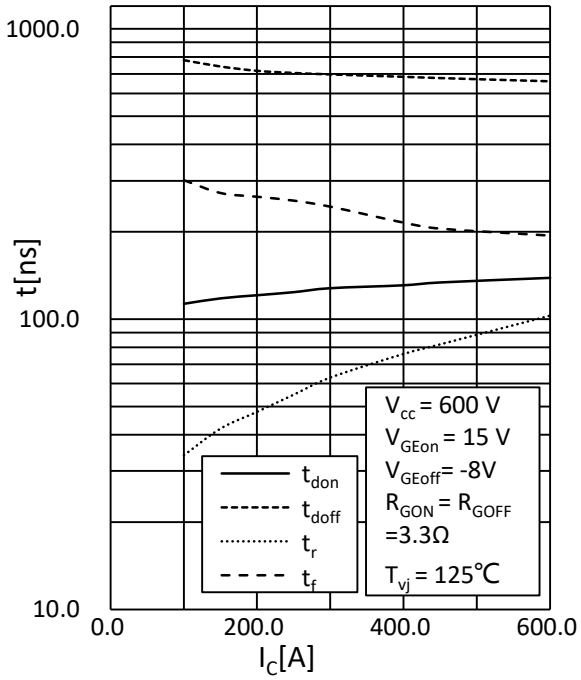


Fig.7 Typ. Switching Times vs. I_C

图 7 开关时间和集电极电流

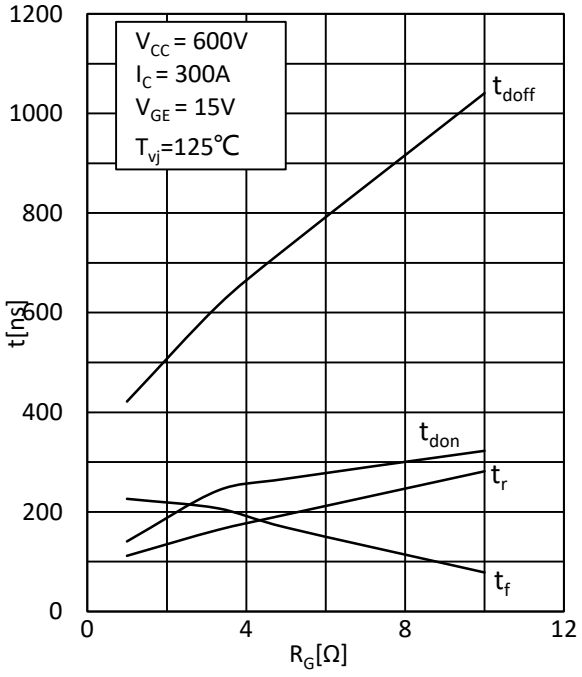


Fig.8 Typ. Switching Times vs. Gate Resistor

图 8 开关时间和门极电阻

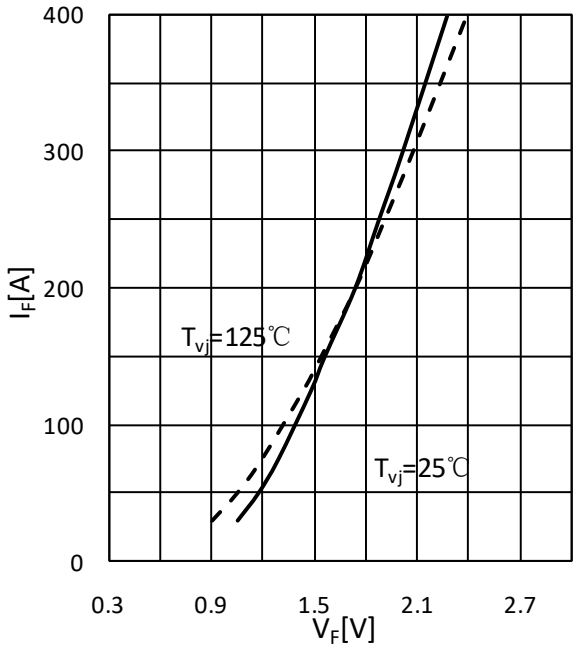


Fig.9 FWD Forward Characteristics

图 9 二极管输出特性

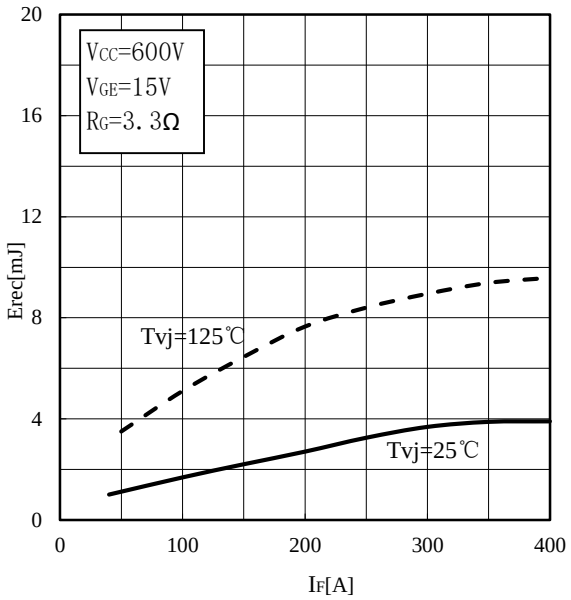


Fig.10 Typ. Switching Losses Diode-Inverter

图 10 开关损耗二极管-逆变器

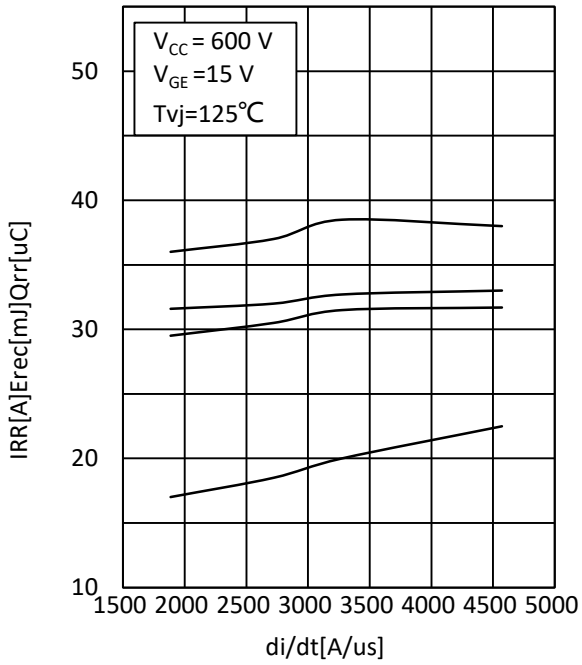


Fig.11 Typ. FRD Recovery Charge

图 11 二极管恢复电荷

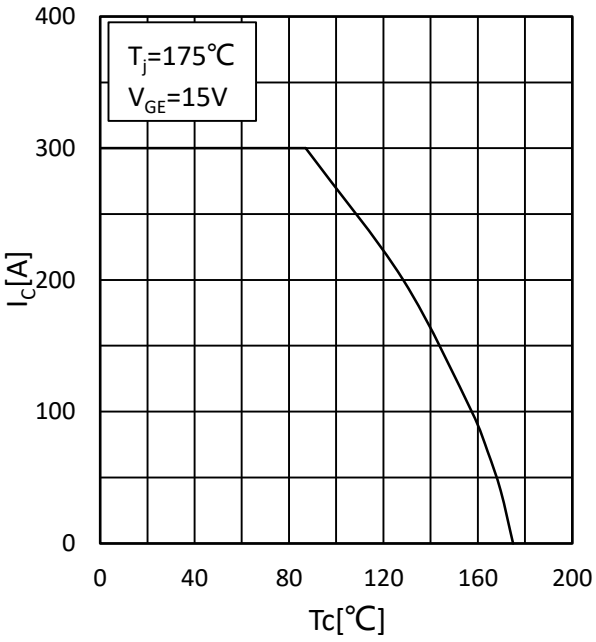


Fig. 12 Rate Current vs. Temperature（Tc）

图 12 额定电流和温度

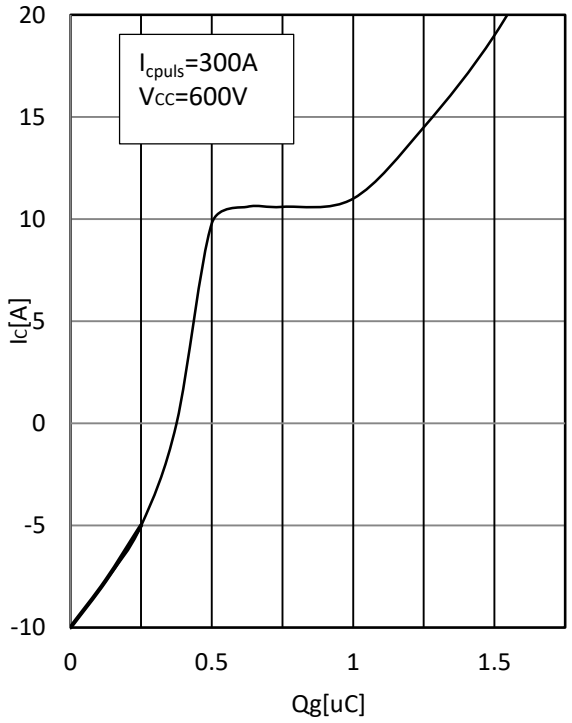


Fig.13 Typ. Gate Charge Characteristics

图 13 门极电荷特性

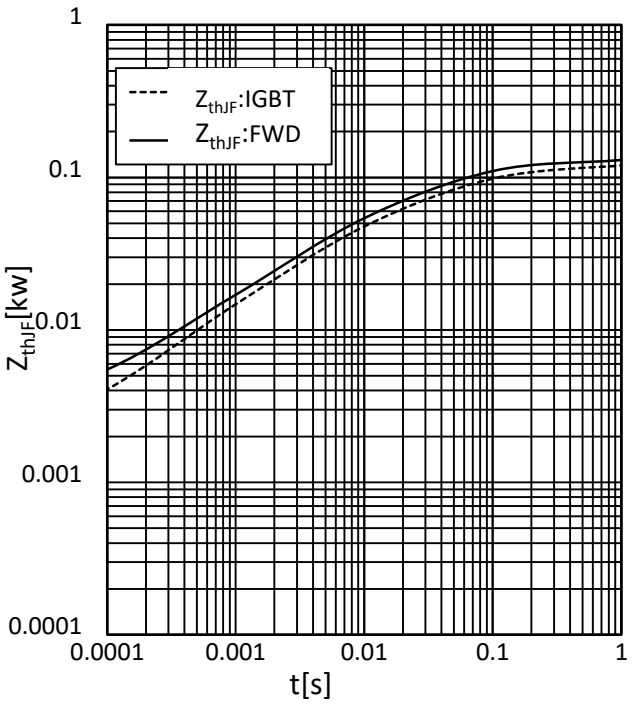


Fig.14 Typ. Transient Thermal Impedance

图 14 瞬态热阻

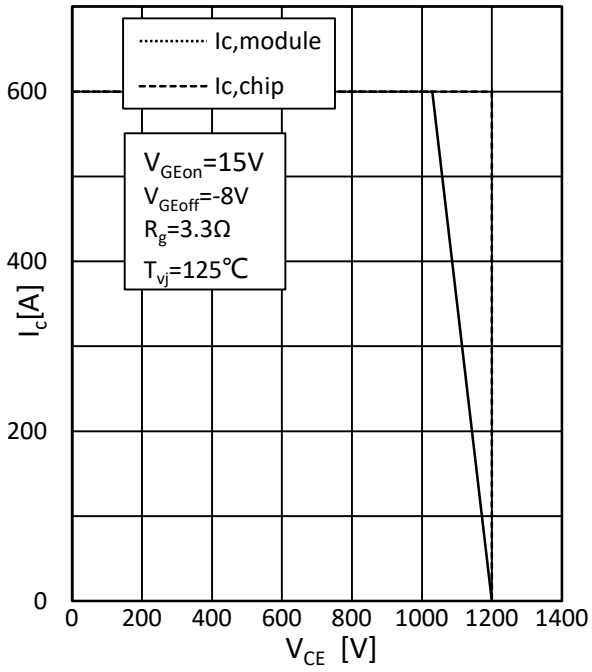
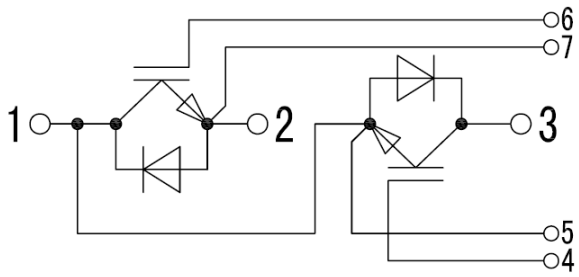


Fig.15 Reverse Bias Safe Operating Area (RBSOA)

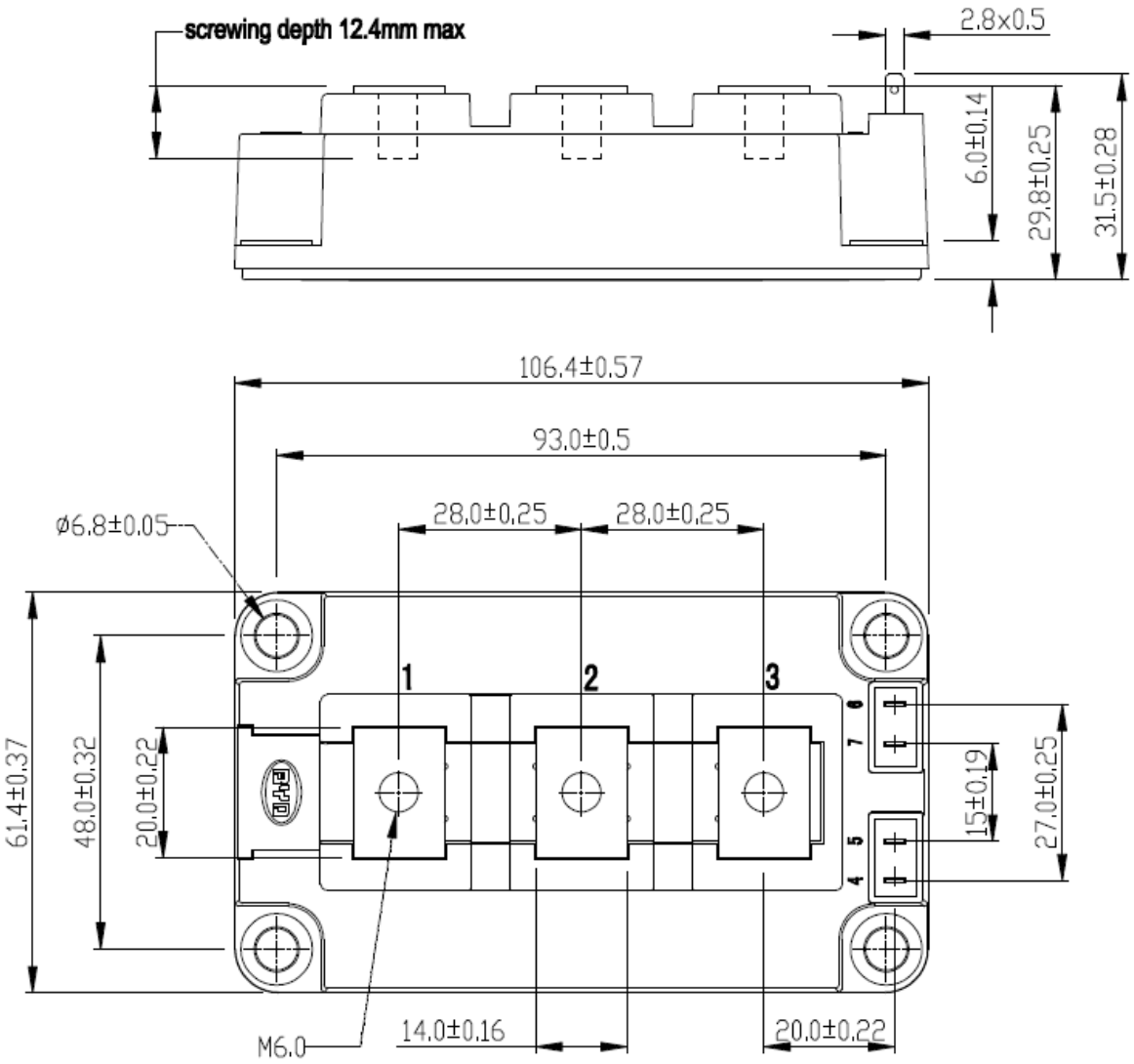
图 15 反偏安全工作区

● Circuit Diagram/接线图



(1)AC Output	(1)交流输出端
(2)N-Negative Power	(2) N-负电极
(3)P-Positive Power	(3) P-正电极
(4)GH-Gate High	(4) GH-上桥门极
(5)EH-Emitter High	(5) EH-上桥发射极
(6)GL-Gate Low	(6) GL-下桥门极
(7)EL-Emitter Low	(7) EL-下桥发射极

❒ Package outlines/封装尺寸



❒ Attention

Correct and Safety Use of Power Module

• 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.

During Transit:

• 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 temperature and humidity of the storage place should be 5~35°C and 45~75% 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.

Prolonged Storage:

• When storing devices more than one year, dehumidifying measures should be provided for the storage place. When using devices after a long period of storage, make sure to check the exterior of the devices is free from scratches, dirt, rust, and so on.

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.

(1) Precautions against the device rupture caused by static electricity

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.

* Containers that are susceptible to static electricity should not be used for transit or for storage.

* 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.

* 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.

* Use soldering irons with grounded tips.

BYD Semiconductor Co., Ltd. (short for) 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 BME 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.