BYD Microelectronics Co., Ltd.

BG150B12UX2S-I

IGBT Power Module

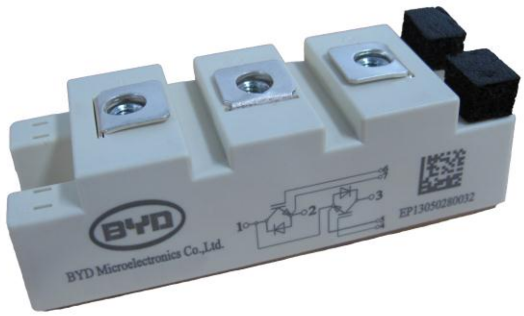
V_{CE}=1200V I_C=150A

General Description

BYD IGBT Power Module BG150B12UX2S-I provides fast switching characteristic 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BG150B12UX2S-I采用先进的IGBT及FRD芯片并优化电气连接，具有快速开关特性和高短路耐量。



Features

- Half-bridge
- Low inductance
- Standard package
- High short circuit capability
- Ultra low conduction and switching loss

特性

- 半桥结构
- 更低的电感
- 标准封装
- 更高的短路耐量
- 超低的通态及开关损耗

Applications

- AC motor control
- Inverters
- Servo
- UPS (Uninterruptible Power Supplies)
- Electric welding

应用

- 电机控制
- 逆变器
- 伺服系统
- 不间断电源
- 电焊机

Characteristic Values /特征值

Parameter 参数	Symbol 符号	Conditions 条件	Temperature 温度	Value 值			Unit 单位
Absolute Maximum Ratings 最大额定值							
Collector-emitter voltage 集电极-发射极电压	V_{CES}	I_C=5.5mA,V_{GE}=0V	T_{vj}=25℃	1200			V
Continuous collector current 集电极电流	I_C	—	T_c=80℃	150			A
Peak collector current 集电极峰值电流	I_{CM}	I_{CRM} =2I_C	—	300			A
Gate-emitter voltage 栅极-发射极电压	V_{GES}	—	—	+/-20			V
Total power dissipation 总耗散功率	P_{tot}	per switch (IGBT)	T_c = 25℃	1000			W
IGBT short circuit SOA 短路安全工作区	t_{psc}	V_{CC}=600V, V_{GE}≤15V V_{CEM}≤1200V	T_{vj}≤150℃	10			us
Max. junction temperature 最大结温	$T_{vj\ max}$	—	—	175			℃
Operation junction temperature 工作结温	$T_{vj\ op}$	—	—	-40~150			℃
Storage temperature range 存储温度范围	T_{stg}	—	—	-40~125			℃
Diode DC forward current 连续正向直流电流	I_F	—	T_c=80℃	150			A
Peak forward current 正向峰值电流	I_{FRM}	I_{FRM}=2I_F	—	300			A
I^2t-value, Diode 电流二次方时间	I^2t	V_R=0V,t=10ms	T_{vj}=150℃	—			A^2s
Isolation voltage 绝缘耐压	V_{isol}	t=1min,f=50Hz	—	AC 2500			V
IGBT				**min**	**typ**	**max**	
Gate-emitter threshold voltage 栅极阈值电压	$V_{GE(th)}$	I_C=6mA,V_{GE}=V_{CE}	T_{vj}=25℃	5	5.8	7	V
Collector-emitter cut-off current 集电极漏电流	I_{CES}	V_{CE}=1200V,V_{GE}=0V	T_{vj}=25℃	—	—	1.0	mA
Gate-emitter cut-off current 栅极漏电流	I_{GES}	V_{CE}=0V,V_{GE}=±20V	T_{vj}=25℃	—	—	400	nA
Collector-emitter saturation voltage 集电极-发射极饱和压降	$V_{CE(sat)}$	I_C=150A,V_{GE}=15V	T_{vj}=25℃	—	2.2	—	V
			T_{vj}=150℃	—	2.6	—	V
Integrated gate resistor 内部栅极电阻	R_{Gint}	—	T_{vj}=25℃	—	5	—	Ω

Gate Charge 栅极电荷	Q_g	V_{CE}=600V,Ic=150A, V_{GE}=-5V…+15V	—		0.5		uC
Gate-Emitter Charge 栅极-发射极电荷	Q_{ge}		—		0.32		uC
Gate-Collector Charge 栅极-集电极电荷	Q_{gc}		—		0.15		uC
Input capacitance输入电容	Cies	V_{CE}=25V,V_{GE} =0V, f=1MHz	T_{vj}=25℃	—	5.88	—	nF
Output capacitance输出电容	Coes			—	0.40	—	nF
Reverse transfer capacitance 反向传输电容	Cres			—	0.26	—	nF
Turn-on delay time 开通延迟时间	$t_{d(on)}$	V_{CC}=600V,Ic=150A, R_{Gon}=R_{Goff}=3.3Ω, V_{GE}=-8V…+15V, $L_σ$=80nH, Inductive load	T_{vj}=25℃	—	180.6	—	ns
			T_{vj}=150℃	—	188	—	ns
Rise time 上升时间	t_r		T_{vj}=25℃	—	135	—	ns
			T_{vj}=150℃	—	143	—	ns
Turn-off delay time 关断延迟时间	$t_{d(off)}$		T_{vj}=25℃	—	327	—	ns
			T_{vj}=150℃	—	368	—	ns
Fall time 下降时间	t_f		T_{vj}=25℃	—	49.7	—	ns
			T_{vj}=150℃	—	53.3	—	ns
Turn-on energy loss 开通损耗能量	E_{on}		T_{vj}=25℃	—	12.5	—	mJ
			T_{vj}=150℃	—	17	—	mJ
Turn-off energy loss 关断损耗能量	E_{off}		T_{vj}=25℃	—	6.8	—	mJ
			T_{vj}=150℃	—	10	—	mJ
Diode				**min**	**typ**	**max**	
Forward voltage 正向电压	V_F	I_F=150A	T_{vj}=25℃	—	1.9	—	V
			T_{vj}=150℃	—	2.0	—	V
Peak reverse recovery current 反向恢复峰值电流	I_{RR}	I_F=150A,V_R=600V, di_F/dt=1600A/us	T_{vj}=150℃	—	82	—	A
Recovered charge 恢复电荷	Q_{rr}		T_{vj}=150℃	—	6.78	—	uC
Reverse recovery time 反向恢复时间	t_{rr}		T_{vj}=150℃	—	574	—	ns
Reverse recovery energy 反向恢复能量	E_{rec}		T_{vj}=150℃	—	3.8	—	mJ

Parameter 参数	**Symbol 符号**	**Conditions 条件**		**min**	**typ**	**max**	**Unit**
Thermal-Mechanical Specifications热力学特性							
Thermal resistance junction to case 结-壳热阻	$R_{th(j-c)}$	IGBT		—	0.13	—	K/W
	$R_{th(j-c)}$	Diode		—	0.2	—	K/W
Thermal resistance case to heat-sink 接触热阻	$R_{th(c-s)}$	Module		—	0.03	—	K/W
Dimensions 尺寸	L x W x H	Typical , see outline drawing			94 x 34x 30.5		mm
Clearance distance in air 空气间隙	da	according to IEC 60664-1 and EN 50124-1	Term. to base:	—	—	17	mm
			Term. to term:	—	—	9.5	mm

Surface creepage distance 爬电距离	ds	according to IEC 60664-1and EN 50124-1	Term. to base:	—	—	17	mm
			Term. to term:	—	—	20	
Mass 重量	m	—	—	—	160	—	g

Thermal and mechanical properties according to IEC 60747 – 15

热和机械特性参考IEC60747-15

Specification according to the valid application note.

说明书根据合理的应用条款

Characterization Curves /特征曲线

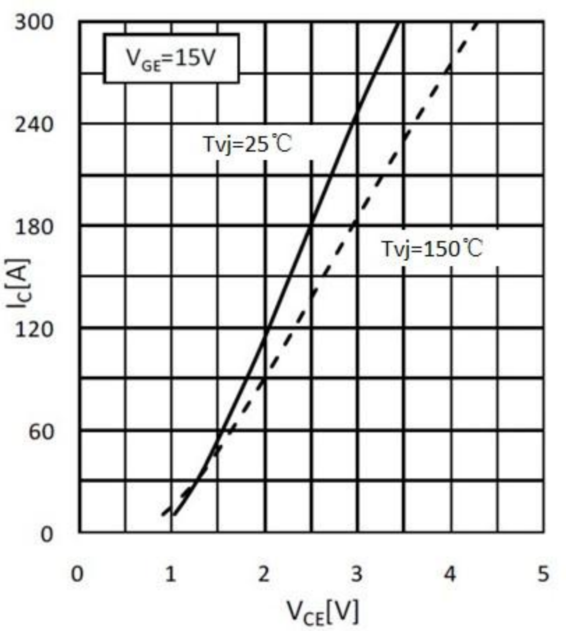


Fig.1 Typ. On-state Characteristics

图 1 开通状态特性

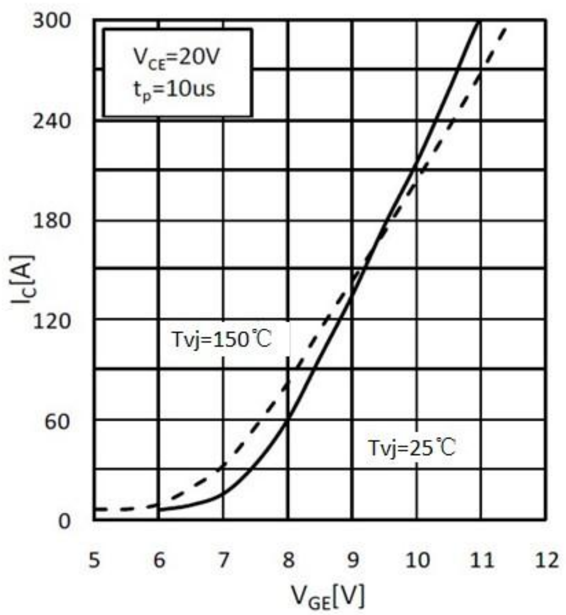


Fig.2 Typ. Transfer Characteristics

图 2 传输特性

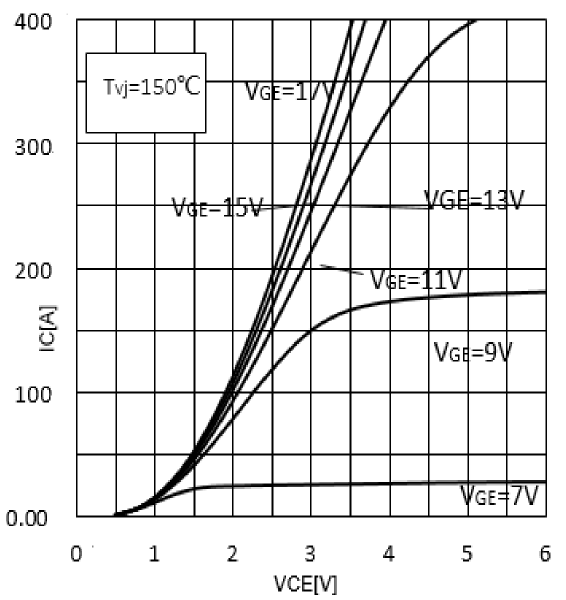


Fig.3 Typ. Output Characteristics

图 3 输出特性

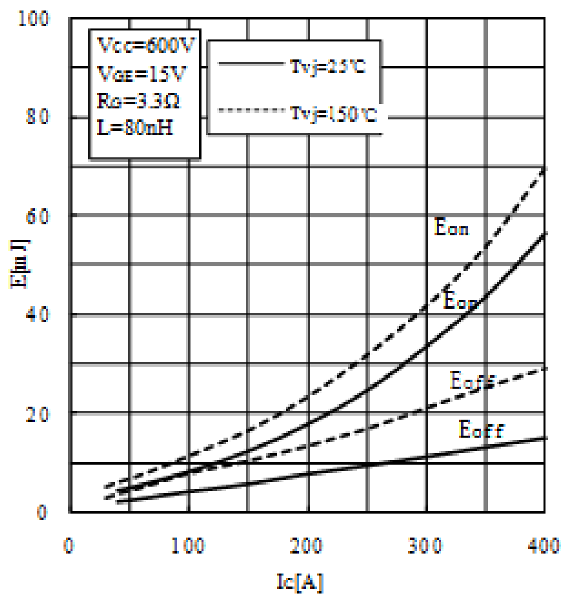


Fig.4 Switching Loss vs. Collector Current

图 4 开关损耗和集电极电流

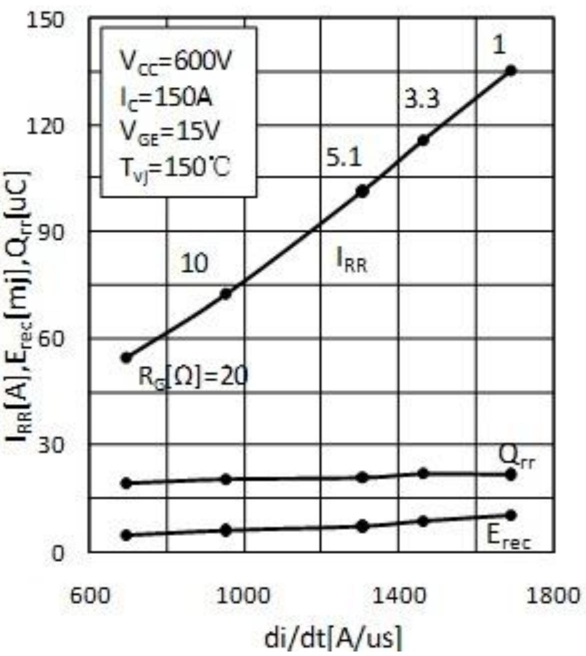


Fig.5 Typ. Reverse Recovery Characteristics vs. di/dt

图 5 反向恢复特性和 di/dt

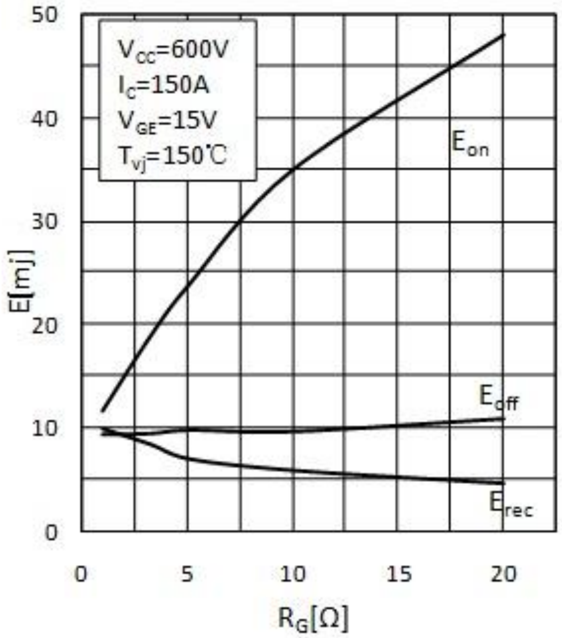


Fig.6 Switching Loss vs. Gate Resistor

图 6 开关损耗和门极电阻

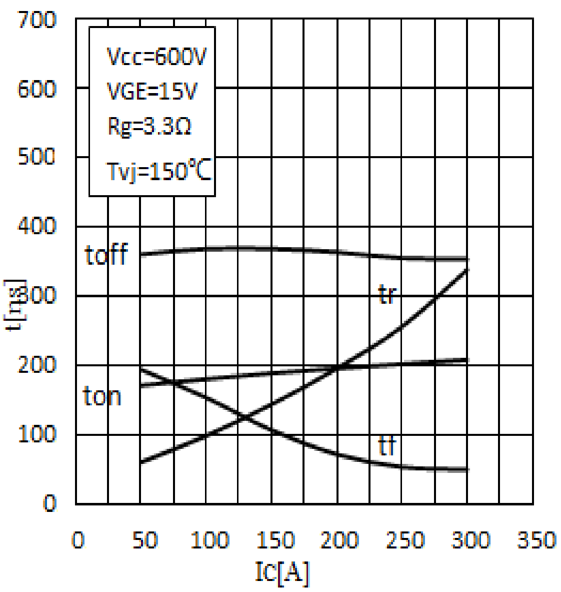


Fig.7 Typ. Switching Times vs. Ic

图 7 开关时间和集电极电流

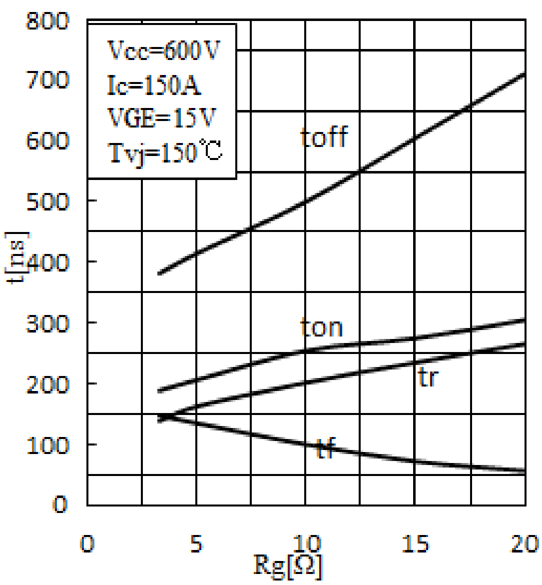


Fig.8 Typ. Switching Times vs. Gate Resistor

图 8 开关时间和门极电阻

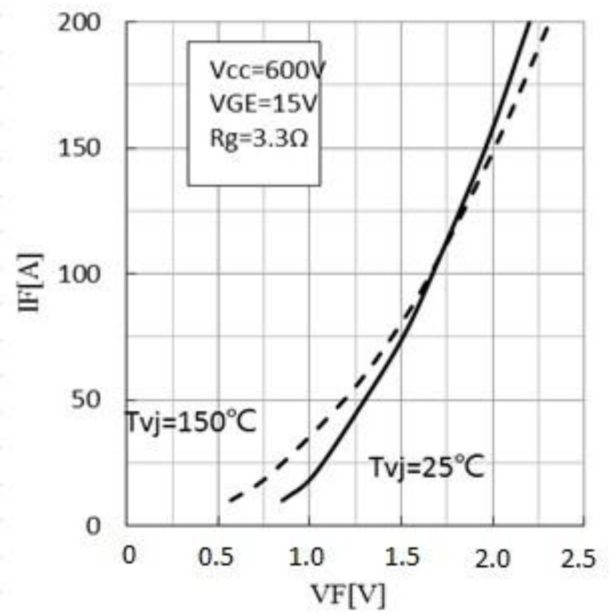


Fig.9 FWD Forward Characteristics.
图 9 二极管输出特性

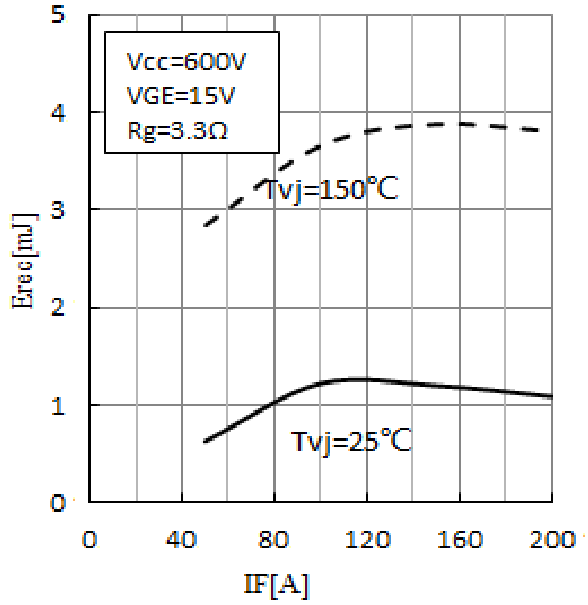


Fig.10 Typ. Switching Losses Diode-Inverter
图 10 开关损耗二极管-逆变器

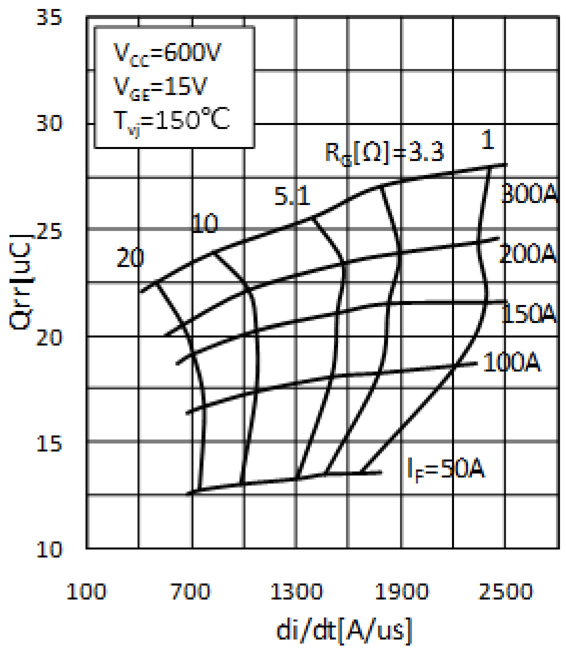


Fig.11 Typ. FRD Recovery Charge
图 11 二极管恢复电荷

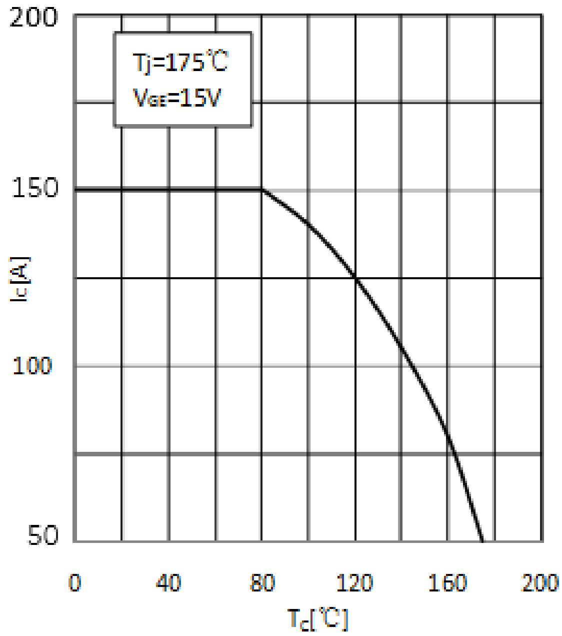


Fig. 12 Rate Current vs. Temperature（Tc）
图 12 额定电流和温度

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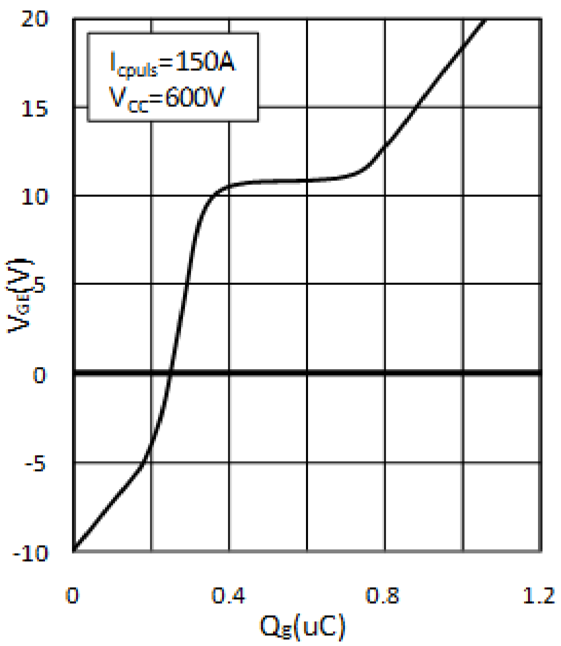


Fig.13 Typ. Gate Charge Characteristics
图 13 门极电荷特性

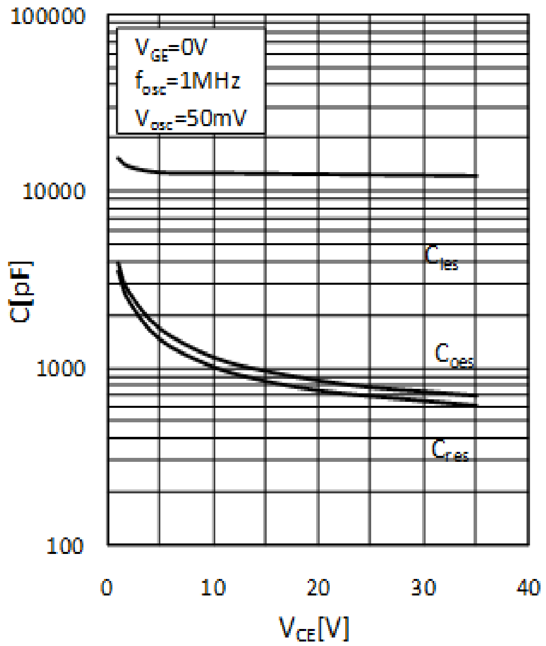


Fig.14 Typ. Capacitances vs Collector-Emitter Voltage
图 14 电容和集-射极电压

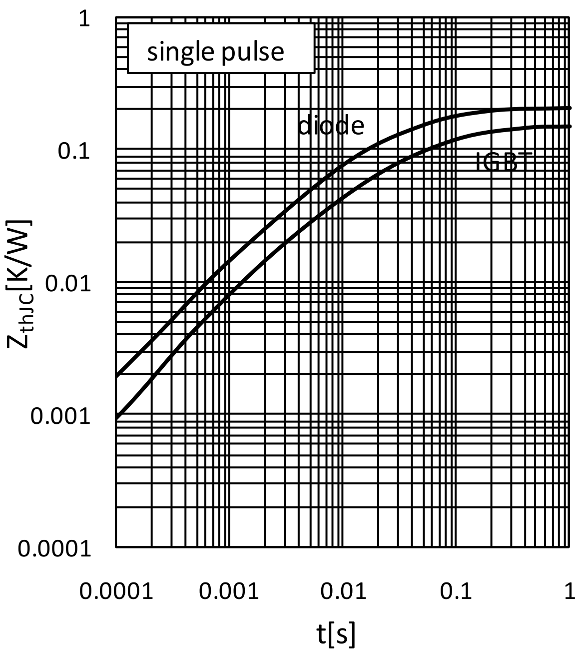


Fig.15 Typ. Transient Thermal Impedance
图 15 瞬态热阻

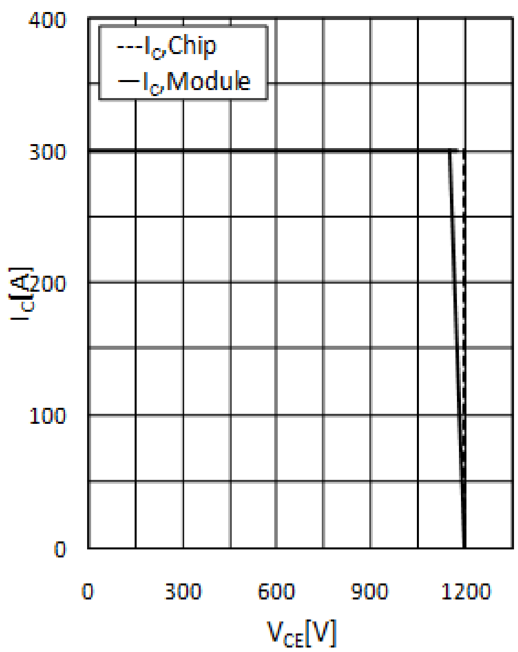
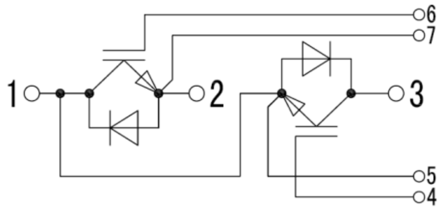


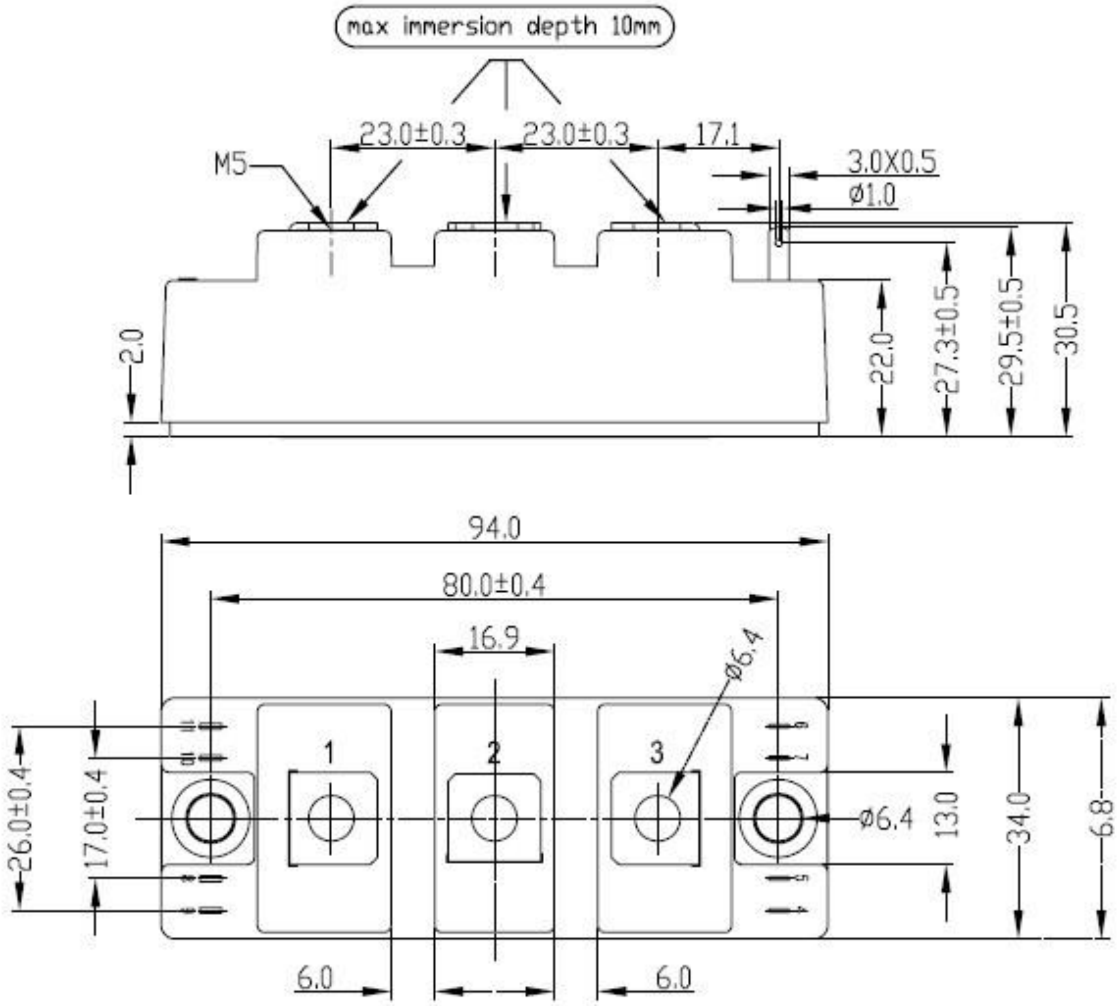
Fig.16 Reverse Bias Safe Operating Area (RBSOA)
图 16 反偏安全工作区

Circuit Diagram /电路图



Package Outlines /封装尺寸

Dimensions in mm



Attached (recommended torque) /推荐扭矩

M_S : (to heat sink M6) 3~5 Nm /散热器 M_t : (to terminals M5) 2.5~4 Nm /接线端子

Attention /警示

1. In order to reduce the contact resistance, we suggest add thermal grease between base and heat-sink, which thickness is about 0.1mm.
   为了减少接触电阻，建议您在底板和散热器之间涂覆厚度约为 0.1mm 的导热硅脂。
2. When installing the module, please wear a 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击穿，并且不平衡的能量可能会破坏内部芯片，甚至损坏模块。
3. 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IEC60747-1,chap.IX.

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