



BYD Microelectronics Co., Ltd.

BG150B12LY2R-I

IGBT Power Module

$V_{CE}=1200V$ $I_C=150A$

General Description

BYD IGBT Power Module BG150B12LY2R-I provides low switching loss as well as high short circuit capability, which introduce the advanced IGBT chip/FWD and improved connection, it is able to take on a perfect performance in various applications up to 20KHz.

Features

- Half-bridge
- Low inductance
- Standard package
- High short circuit capability
- Ultra low conduction and switching loss
- Including ultra fast & soft recovery anti-parallel FWD

Applications

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



Characteristic values

Parameter	Symbol	Conditions	Temperature	Value	Unit
Absolute Maximum Ratings					
Collector-emitter voltage	V_{CES}	$V_{GE}=0V$	$T_{vj}=25^{\circ}C$	1200	V
Continuous collector current	I_C	—	$T_c=80^{\circ}C$	150	A
Peak collector current	I_{CRM}	$t_p=1ms$	$T_c=80^{\circ}C$	300	A
Gate-emitter voltage	V_{GES}	—	—	+/-20	V
Total power dissipation	P_{tot}	per switch (IGBT)	$T_c = 25^{\circ}C$	1250	W
IGBT short circuit SOA	t_{psc}	$V_{CC}=600V, V_{GE}\leq 15V$ $V_{CEM}\leq 1200V$	$T_{vj}\leq 125^{\circ}C$	10	us
Junction temperature	T_{vj}	—	—	-40~150	$^{\circ}C$
Storage temperature range	T_{stg}	—	—	-40~125	$^{\circ}C$
Diode DC forward current	I_F	—	$T_c=80^{\circ}C$	150	A
Peak forward current	I_{FRM}	$I_{FRM}=2I_F$	—	300	A
I^2t -value, Diode	I^2t	$V_R=0V, t=10ms$	$T_j=125^{\circ}C$	—	A^2s
Isolation voltage	V_{isol}	$t=1min, f=50Hz$	—	2500	V



Parameter	Symbol	Conditions	Temperature	Value			Unit
Characteristics							
IGBT				min.	typ.	max.	
Gate-emitter threshold voltage	$V_{GE(th)}$	$I_C=6mA, V_{GE}=V_{CE}$	$T_{vj}=25^{\circ}C$	5.0	5.8	6.5	V
Collector-emitter cut-off current	I_{CES}	$V_{CE}=1200V, V_{GE}=0V$	$T_{vj}=25^{\circ}C$	—	—	0.2	mA
			$T_{vj}=125^{\circ}C$	—	—	—	mA
Gate-emitter cut-off current	I_{GES}	$V_{CE}=0V, V_{GE}=\pm 20V$	$T_{vj}=25^{\circ}C$	-300	—	300	nA
Collector-emitter saturation voltage	$V_{CE(sat)}$	$I_C=150A, V_{GE}=15V$	$T_{vj}=25^{\circ}C$	—	2.1	—	V
			$T_{vj}=125^{\circ}C$	—	2.4	—	V
Integrated gate resistor	R_{Gint}	—	$T_{vj}=25^{\circ}C$	—	5	—	Ω
Input capacitance	C_{ies}	$V_{CE}=25V, V_{GE}=0V,$ $f=1MHz$	$T_{vj}=25^{\circ}C$	—	8.8	—	nF
Output capacitance	C_{oes}			—	0.58	—	nF
Reverse transfer capacitance	C_{res}			—	0.47	—	nF
Turn-on delay time	$t_{d(on)}$	$V_{CC}=600V, I_C=150A,$ $R_{Gon}=R_{Goff}=2.2\Omega,$ $V_{GE}=\pm 15V,$ $L\sigma=80nH,$ Inductive load	$T_{vj}=25^{\circ}C$	—	232	—	ns
			$T_{vj}=125^{\circ}C$	—	245	—	ns
Rise time	t_r		$T_{vj}=25^{\circ}C$	—	68	—	ns
			$T_{vj}=125^{\circ}C$	—	72	—	ns
Turn-off delay time	$t_{d(off)}$		$T_{vj}=25^{\circ}C$	—	315	—	ns
			$T_{vj}=125^{\circ}C$	—	365	—	ns
Fall time	t_f		$T_{vj}=25^{\circ}C$	—	155	—	ns
			$T_{vj}=125^{\circ}C$	—	210	—	ns
Energy dissipation during turn-on time	E_{on}		$T_{vj}=25^{\circ}C$	—	11.5	—	mJ
			$T_{vj}=125^{\circ}C$	—	17.0	—	mJ
Energy dissipation during turn-off time	E_{off}	$T_{vj}=25^{\circ}C$	—	9.3	—	mJ	
		$T_{vj}=125^{\circ}C$	—	15.0	—	mJ	
Diode				min.	typ.	max.	
Forward voltage	V_F	$I_F=150A$	$T_{vj}=25^{\circ}C$	—	1.8	—	V
			$T_{vj}=125^{\circ}C$	—	1.8	—	V
Peak reverse recovery current	I_{RR}	$I_F=150A, V_R=600V,$ $di/dt=1960A/\mu s$	$T_{vj}=125^{\circ}C$	—	145	—	A
Recovered charge	Q_{rr}		$T_{vj}=125^{\circ}C$	—	24.1	—	μC
Reverse recovery time	t_{rr}		$T_{vj}=125^{\circ}C$	—	310	—	ns
Reverse recovery energy	E_{rec}		$T_{vj}=125^{\circ}C$	—	10.5	—	mJ



Parameter	Symbol	Conditions	min.	typ.	Max.	Unit	
Thermal-Mechanical Specifications							
IGBT thermal resistance junction to case	$R_{th(j-c)}$	per IGBT	—	—	0.12	K/W	
Diode thermal resistance junction to case	$R_{th(j-c)}$	per diode	—	—	0.19	K/W	
Thermal resistance case to heat-sink	$R_{th(c-s)}$	per module	—	0.03	—	K/W	
Dimensions	L x W x H	Typical , see outline drawing	106.4×61.4×31.5			mm	
Clearance distance in air	da	according to IEC 60664-1 and EN 50124-1	Term. to base:	—	28.3	—	mm
			Term. to term:	—	6.0	—	
Surface creepage distance	ds	according to IEC 60664-1 and EN 50124-1	Term. to base:	—	24	—	mm
			Term. to term:	—	14	—	
Mass	m	—	—	320	—	g	

Thermal and mechanical properties according to IEC 60747 – 15

Electrical characteristics according to IEC 60747 – 9

Specification according to the valid application note.

Characterization curves

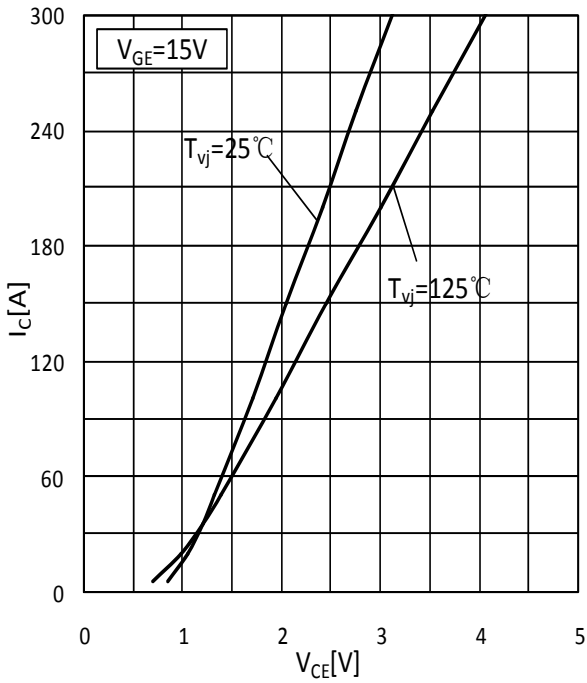


Fig.1 Typ. On-state Characteristics

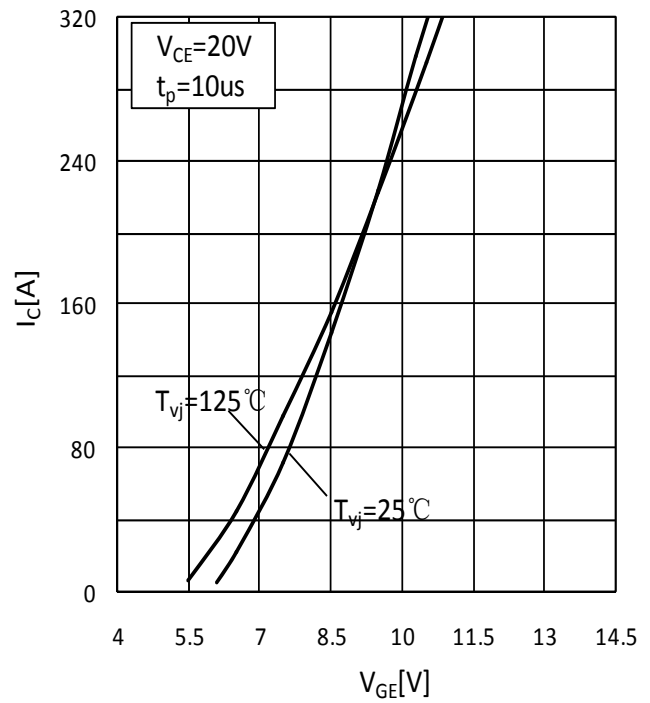


Fig.2 Typ. Transfer Characteristics

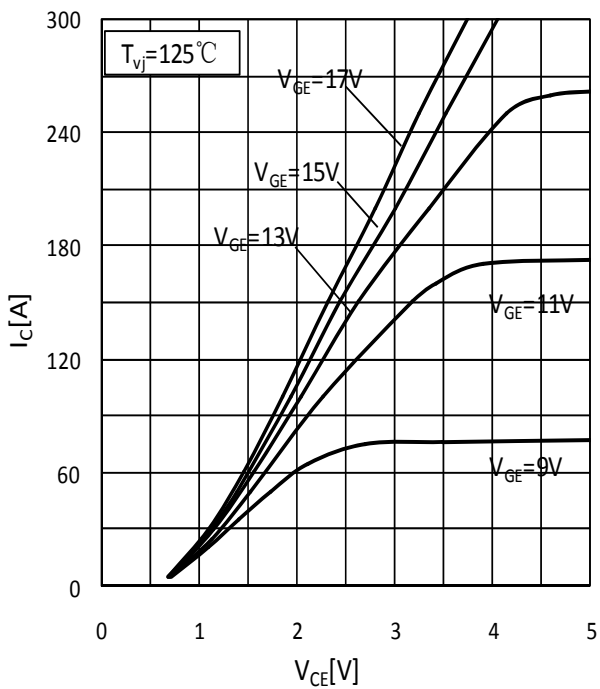


Fig.3 Typ. Output Characteristics

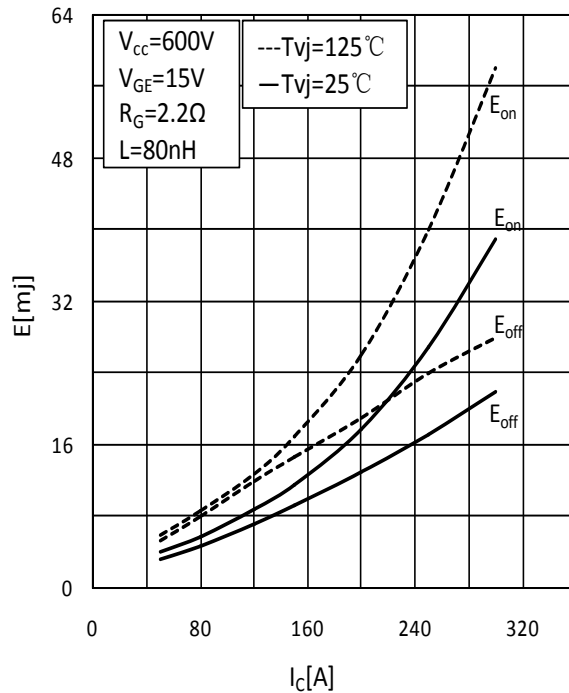


Fig.4 Switching Loss vs. Collector Current

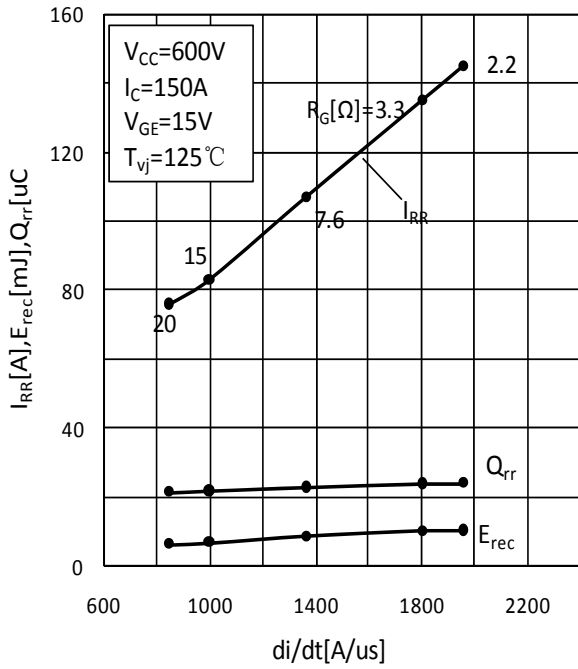


Fig.5 Typ. Reverse Recovery Characteristics

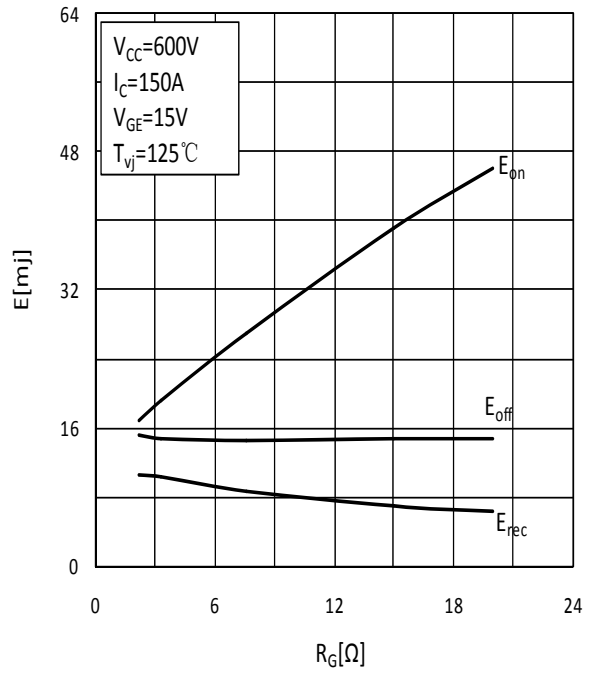


Fig.6 Switching Loss vs. Gate Resistor

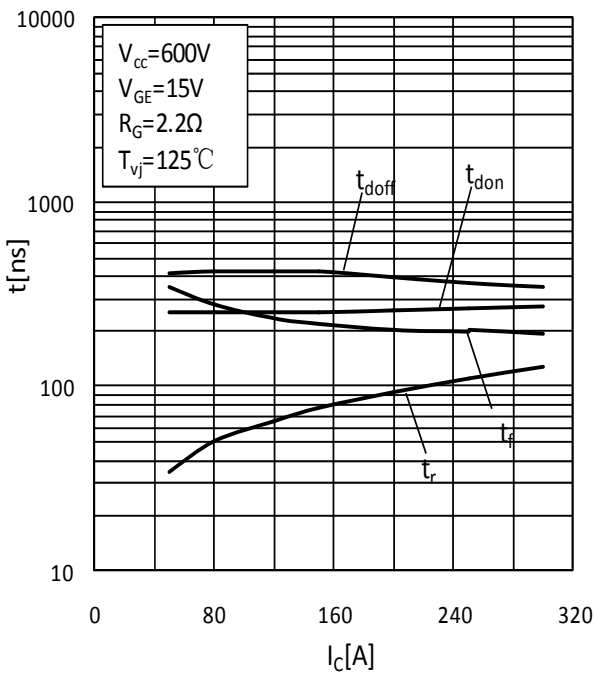


Fig.7 Typ. Switching Times vs. I_C

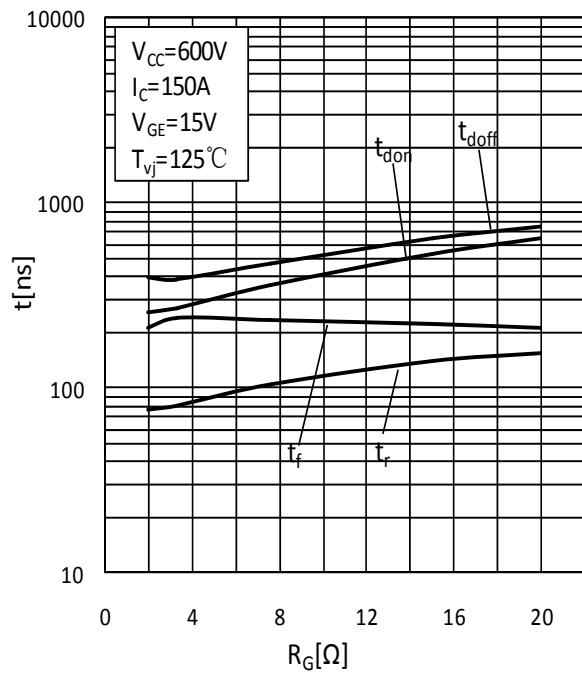


Fig.8 Typ. Switching Times vs. Gate Resistor

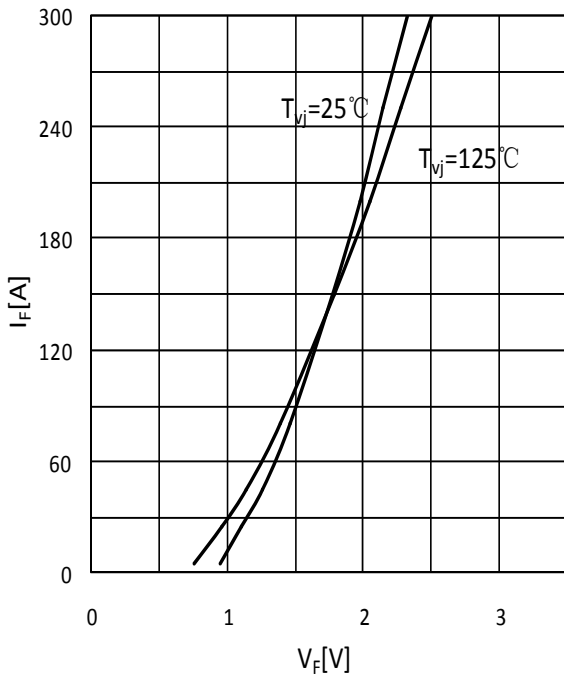


Fig.9 FWD Forward Characteristics.

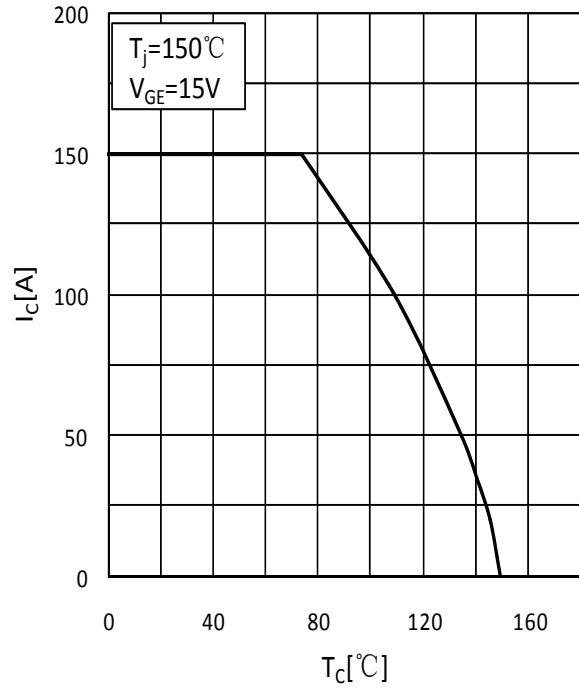


Fig.10 Rate Current vs. Temperature (T_C)

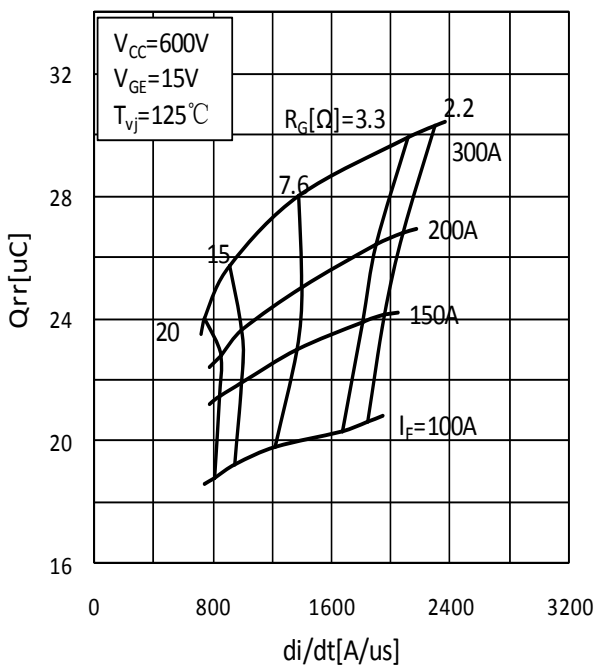


Fig.11 Typ. FRD Recovery Charge

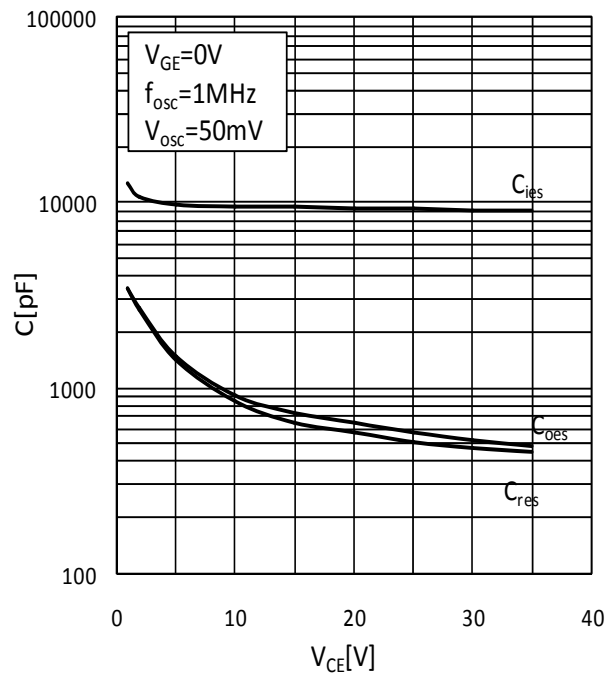


Fig. 12 Capacitances vs. Collector-Emitter Voltage

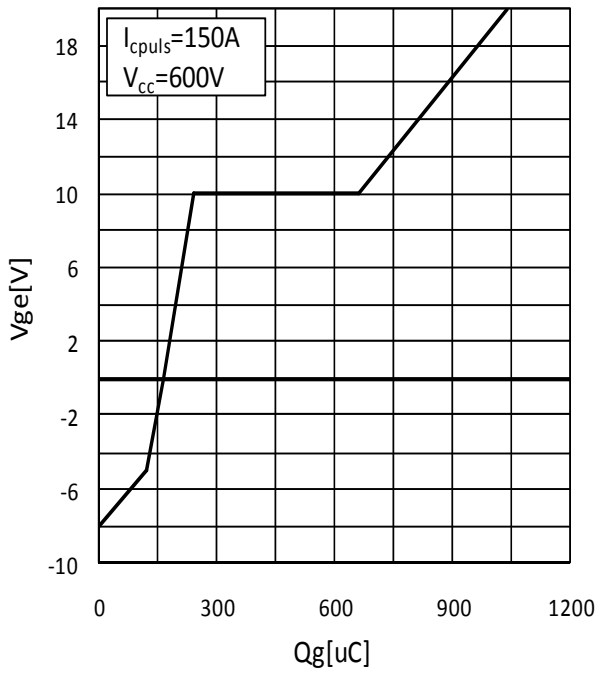


Fig.13 Typ. Gate Charge Characteristics

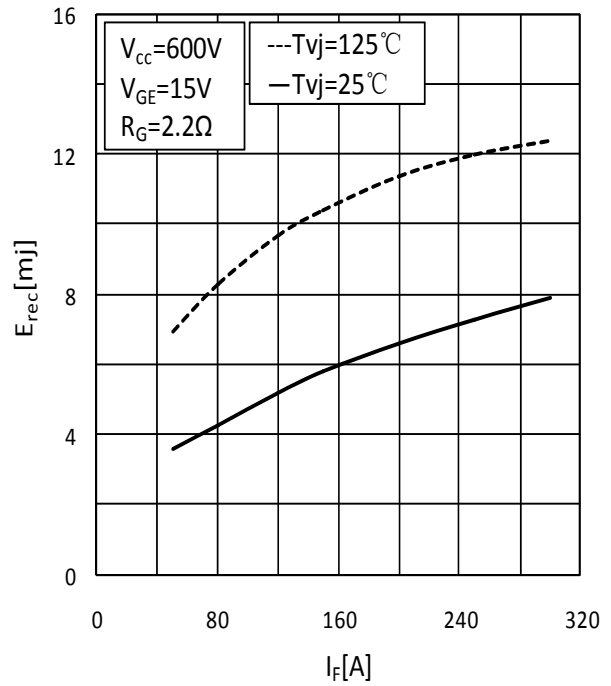


Fig.14 Typ. Switching Losses Diode-Inverter

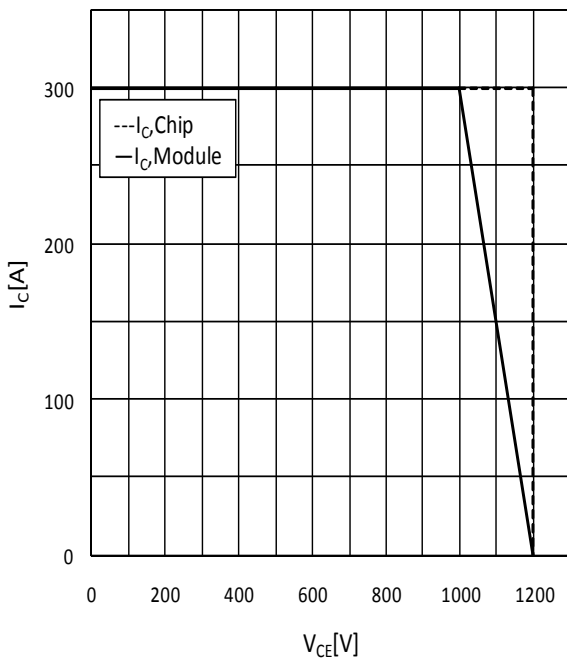


Fig.15 Reverse Bias Safe Operating Area (RBSOA)

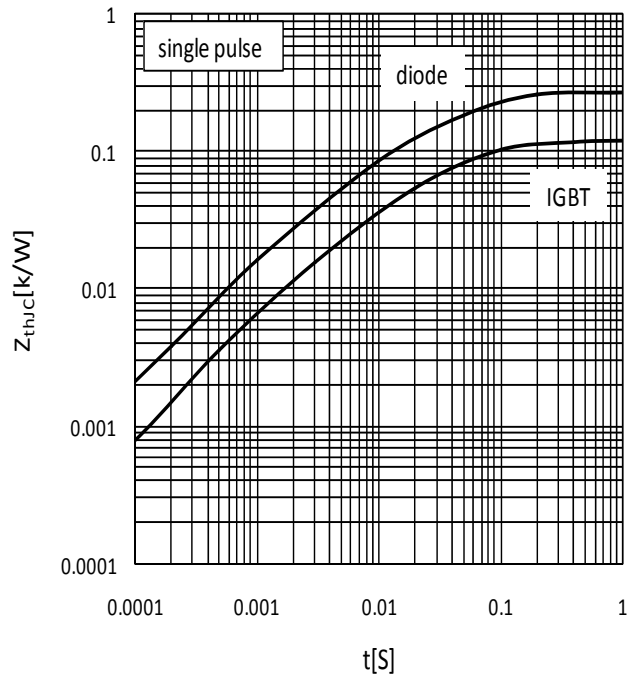


Fig.16 Typ. Transient Thermal Impedance



Attention

1. In order to reduce the contact resistance, we suggest add thermal grease between base and heat-sink, which thickness is about 0.1mm.
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.
3. This is an electrostatic sensitive device, please observe the international standard IEC 60747-1, chap. IX.

RESTRICTIONS ON PRODUCT USE

- The information contained herein is subject to change without notice.
- BYD Microelectronics Co., Ltd. (short for BME) 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.
- The BME products listed in this document are intended for usage in general electronics applications (personal equipment, measuring equipment, industrial robotics, domestic appliances, etc.). These BME 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 BME products listed in this document shall be made at the customer's own risk.