STARPOWER

SEMICONDUCTOR

IGBT

GD150HFL120C8SN

Molding Type Module

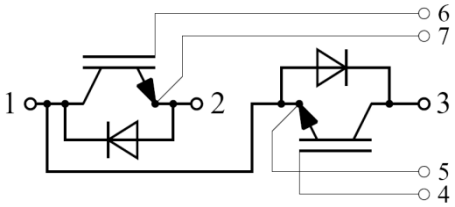
1200V/150A 2 in one-package

General Description

STARPOWER IGBT Power Module provides ultra low conduction loss as well as short circuit ruggedness. They are designed for the applications such as general inverters and UPS.

Features

- Low $V_{CE(sat)}$ SPT+ IGBT technology
- 10μs short circuit capability
- $V_{CE(sat)}$ with positive temperature coefficient
- Maximum junction temperature 175℃
- Low inductance case
- Fast & soft reverse recovery anti-parallel FWD
- Isolated copper baseplate using DBC technology
- UL file number E340089



Equivalent Circuit Schematic

Typical Applications

- Inverter for motor drive
- AC and DC servo drive amplifier
- Uninterruptible power supply

Absolute Maximum Ratings T_C=25℃ unless otherwise noted

Symbol	Description	GD150HFL120C8SN	Units
V_{CES}	Collector-Emitter Voltage	1200	V
V_{GES}	Gate-Emitter Voltage	±20	V
I_C	Collector Current @ T_C=25℃ @ T_C=100℃	280 150	A
I_{CM}	Pulsed Collector Current t_p=1ms	300	A
I_F	Diode Continuous Forward Current	150	A
I_{FM}	Diode Maximum Forward Current t_p=1ms	300	A
P_D	Maximum Power Dissipation @ T_j=175℃	1128	W
T_{jmax}	Maximum Junction Temperature	175	℃
T_{jop}	Operating Junction Temperature	-40 to +150	℃
T_{STG}	Storage Temperature Range	-40 to +125	℃
V_{ISO}	Isolation Voltage RMS,f=50Hz,t=1min	2500	V
Mounting Torque	Power Terminal Screw:M5 Mounting Screw:M5	2.5 to 3.5 2.5 to 3.5	N.m

Electrical Characteristics of IGBT T_C=25℃ unless otherwise noted

Off Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{(BR)CES}$	Collector-Emitter Breakdown Voltage	T_j=25℃	1200			V
I_{CES}	Collector Cut-Off Current	V_{CE}=V_{CES},V_{GE}=0V, T_j=25℃			5.0	mA
I_{GES}	Gate-Emitter Leakage Current	V_{GE}=V_{GES},V_{CE}=0V, T_j=25℃			400	nA

On Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=6.0mA,V_{CE}=V_{GE}, T_j=25℃	5.0	6.2	7.0	V
$V_{CE(sat)}$ (chip)	Collector to Emitter Saturation Voltage	I_C=150A,V_{GE}=15V, T_j=25℃		1.90	2.35	V
		I_C=150A,V_{GE}=15V, T_j=125℃		2.10		
$V_{CE(sat)}$ (terminal)	Collector to Emitter Saturation Voltage	I_C=150A,V_{GE}=15V, T_j=25℃		2.00	2.45	
		I_C=150A,V_{GE}=15V, T_j=125℃		2.20		

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=150A, R_G=4.7Ω,V_{GE}=±15V, T_j=25℃		347		ns
t_r	Rise Time			75		ns
$t_{d(off)}$	Turn-Off Delay Time			375		ns
t_f	Fall Time			181		ns
E_{on}	Turn-On Switching Loss			8.95		mJ
E_{off}	Turn-Off Switching Loss			9.32		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=150A, R_G=4.7Ω,V_{GE}=±15V, T_j=125℃		352		ns
t_r	Rise Time			80		ns
$t_{d(off)}$	Turn-Off Delay Time			401		ns
t_f	Fall Time			327		ns
E_{on}	Turn-On Switching Loss			11.9		mJ
E_{off}	Turn-Off Switching Loss			16.0		mJ
C_{ies}	Input Capacitance	V_{CE}=25V,f=1MHz, V_{GE}=0V		11.0		nF
C_{oes}	Output Capacitance			0.80		nF
C_{res}	Reverse Transfer Capacitance			0.52		nF
I_{SC}	SC Data	t_P≤10μs,V_{GE}=15V, T_j=125℃,V_{CC}=900V, V_{CEM}≤1200V		890		A
R_{Gint}	Internal Gate Resistance			1.5		Ω
L_{CE}	Stray Inductance				22	nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal To Chip			0.65		mΩ

Electrical Characteristics of DIODE T_C=25℃ unless otherwise noted

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Units
V_F (chip)	Diode Forward Voltage	I_F=150A	T_j=25℃		1.80	2.25	V
			T_j=125℃		1.85		
V_F (terminal)	Diode Forward Voltage	I_F=150A	T_j=25℃		1.90	2.35	V
			T_j=125℃		1.95		
Q_r	Recovered Charge	I_F=150A, V_R=600V, R_G=4.7Ω, V_{GE}=-15V	T_j=25℃		14.0		μC
			T_j=125℃		28.6		
I_{RM}	Peak Reverse Recovery Current		T_j=25℃		143		A
			T_j=125℃		179		
E_{rec}	Reverse Recovery Energy		T_j=25℃		9.54		mJ
			T_j=125℃		17.5		

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case (per IGBT)		0.133	K/W
$R_{\theta JC}$	Junction-to-Case (per DIODE)		0.223	K/W
$R_{\theta CS}$	Case-to-Sink (Conductive grease applied)	0.046		K/W
Weight	Weight of Module	200		g

List of Materials

No.	Material No.	Component	Material(main)	Quantity
1	C1100087	IGBT Chip	Silicon	4
2	C3200043	FWD Chip	Silicon	4
3	C8100083	Case	PBT	1
4	C8100120	Signal Frame	PBT + CuSn6(150-200HV)	1
5	C7100167	Baseplate	Cu	1
6	C7600402	DBC	Al_2O_3 + Cu	1
7	C7600403	DBC	Al_2O_3 + Cu	1
8	C7100169	Power Terminal	Cu	3
9	C7100006	Power Bridge	Cu	1
10	C7100168	Bush	Brass	2
11	C7400001	Nut	Fe	3
12	C7200026	Wiring	Al	
13	C7300004	Solder(under chip)	PbSnAg	
14	C7300020	Solder(under DBC)	SnAgCu	
15	C7100112	Signal Wire	Cu	
16	C8400001	Silicon Gel	Silicon Resin	
17	C8400004	Sealant	Silicon Resin	
18	C7300006	Solder Wire	SnAgCu	
19	C8400005	Yellow Tube	Silicon Resin	
20	C8400006	Red Tube	Silicon Resin	

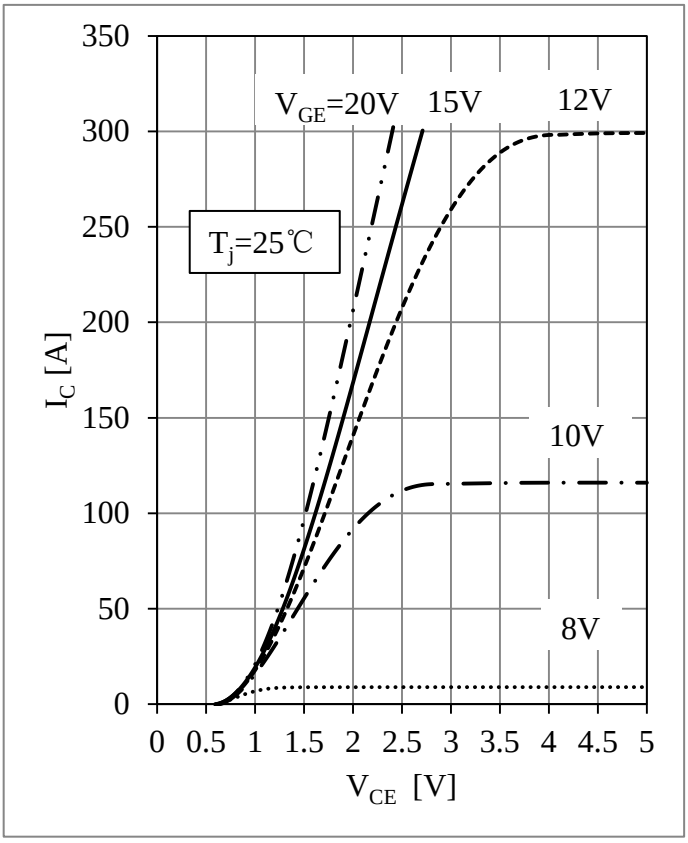


Fig 1. IGBT Output Characteristic

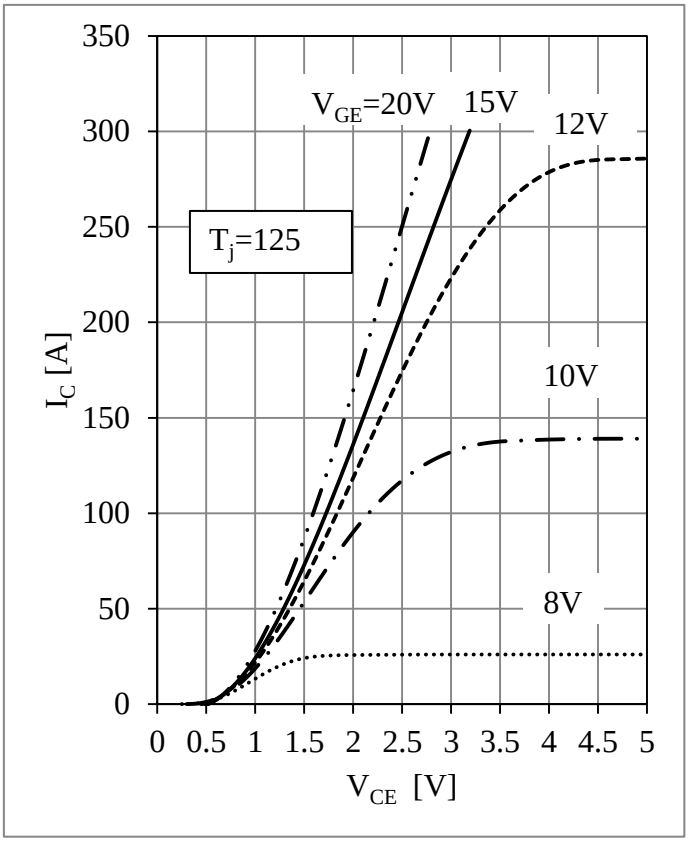


Fig 2. IGBT Output Characteristic

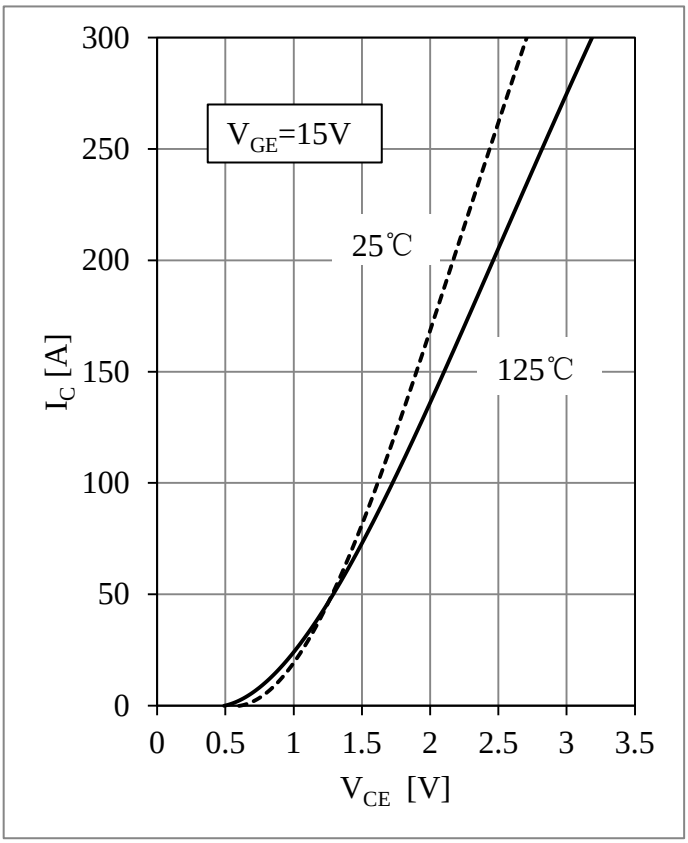


Fig 3. IGBT Output Characteristic

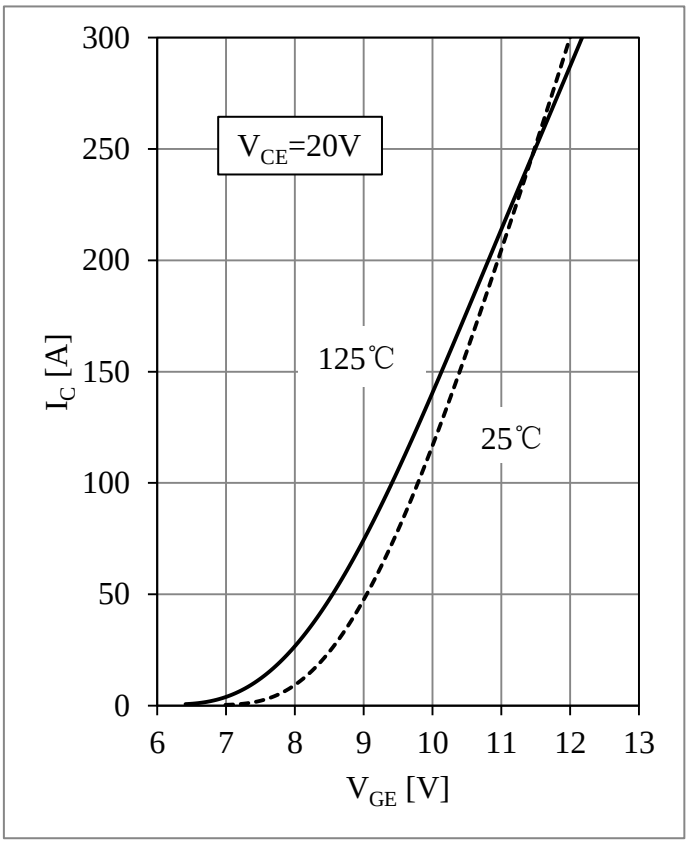


Fig 4. IGBT Transfer Characteristic

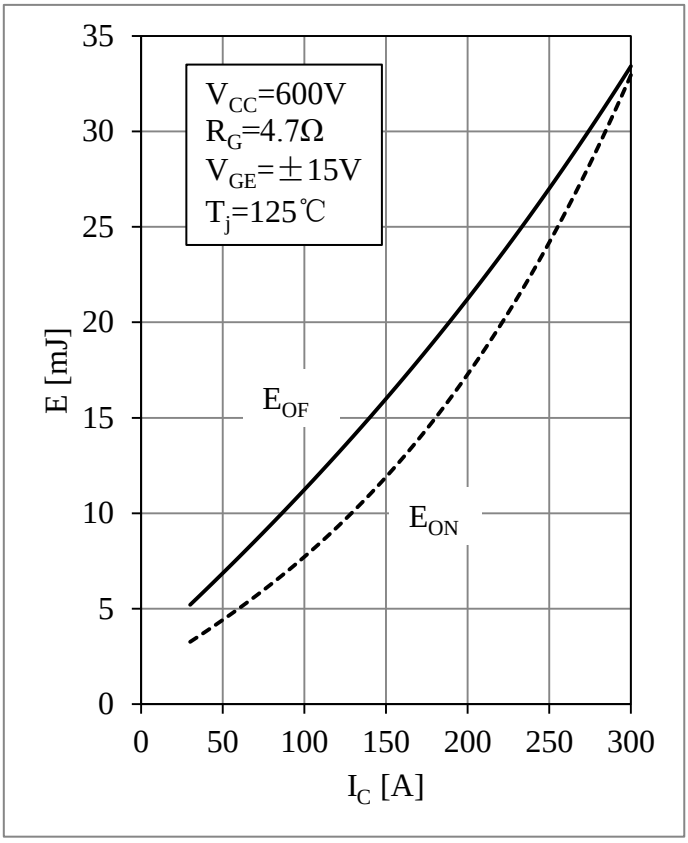


Fig 5. IGBT Switching Loss vs. I_C

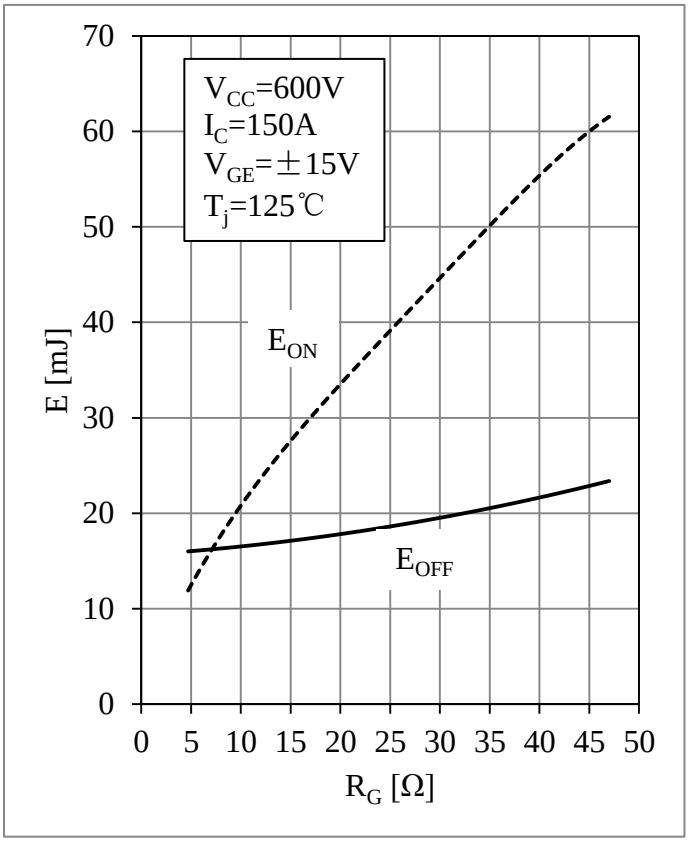


Fig 6. IGBT Switching Loss vs. R_G

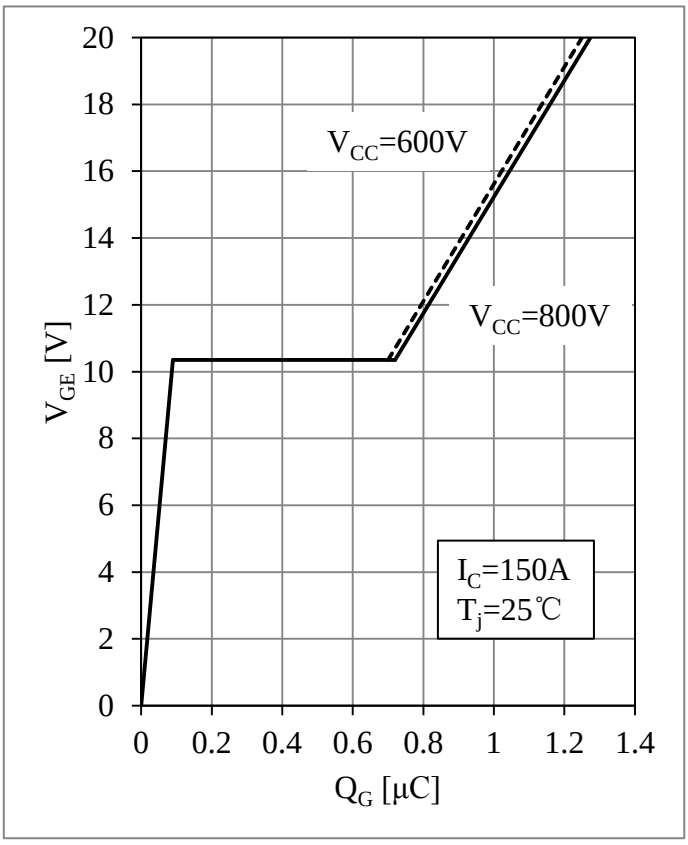


Fig 7. IGBT Gate Charge Characteristic

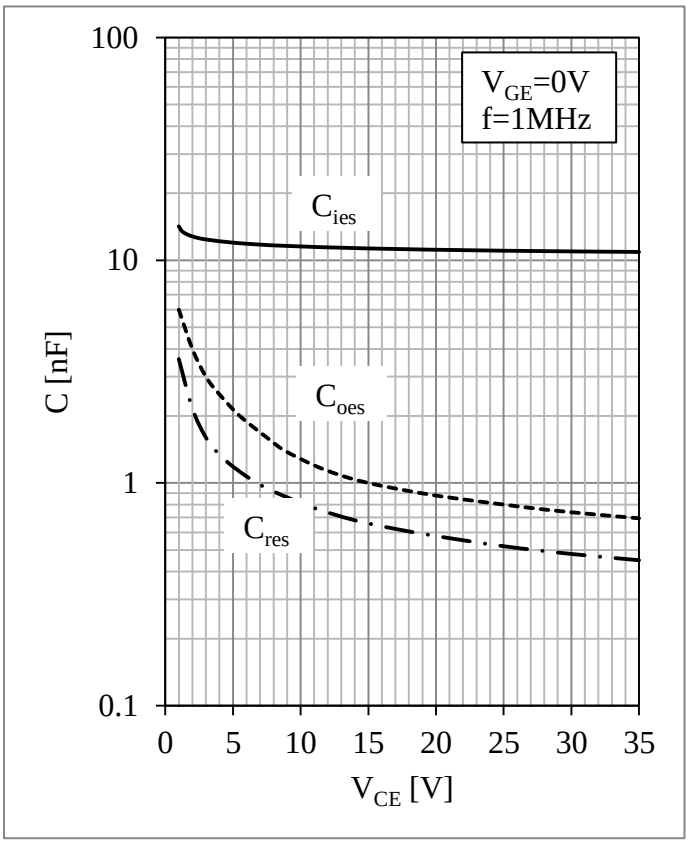


Fig 8. IGBT Capacitances vs. V_{CE}

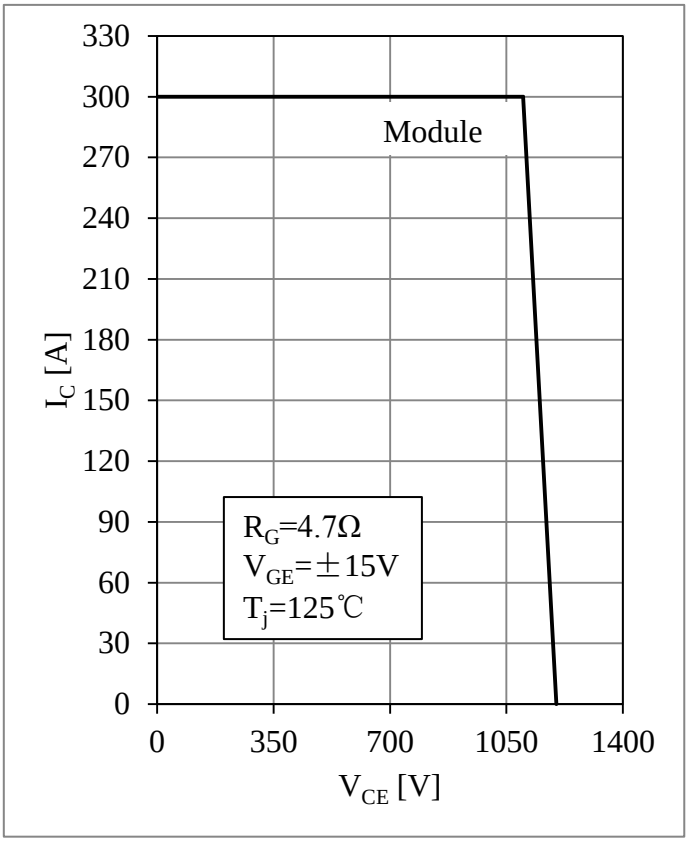


Fig 9. RBSOA

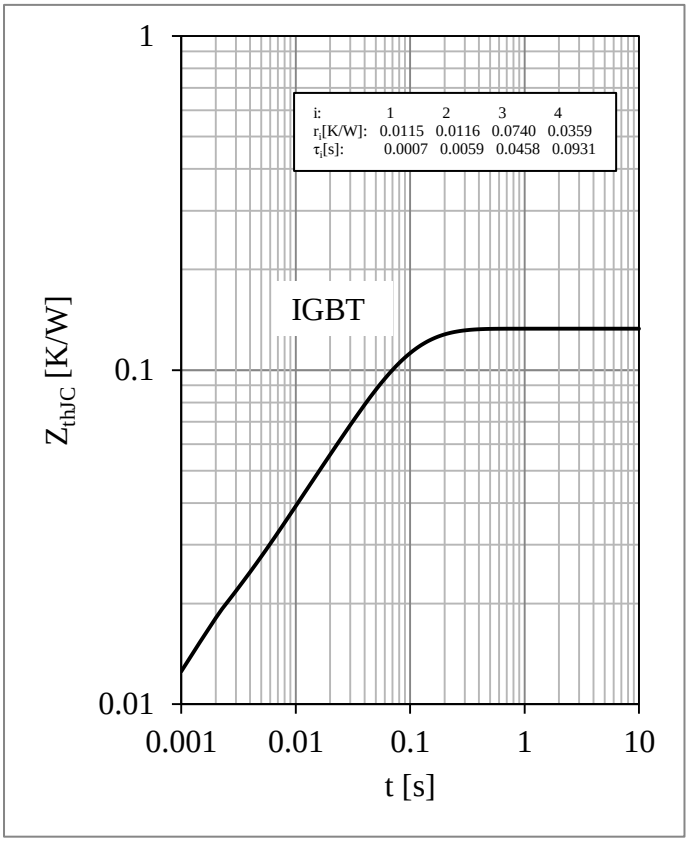


Fig 10. IGBT Transient Thermal Impedance

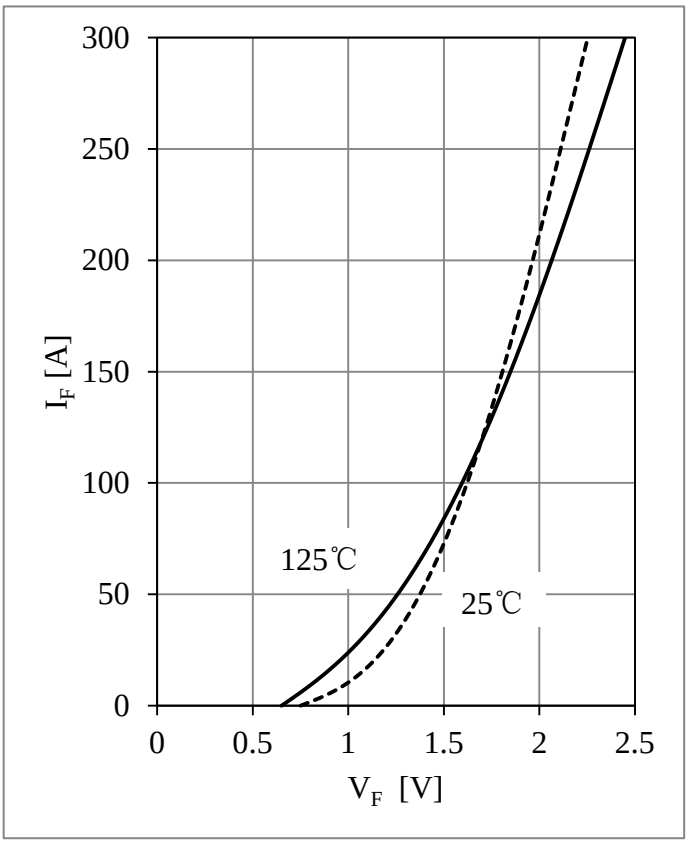


Fig 11. Diode Forward Characteristic

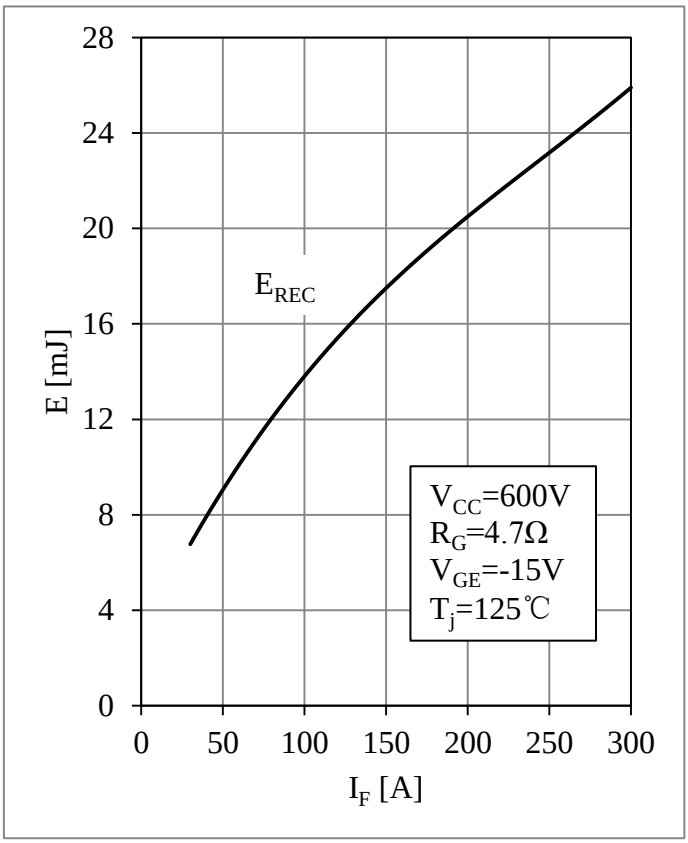


Fig 12. Diode Switching Loss vs. I_F

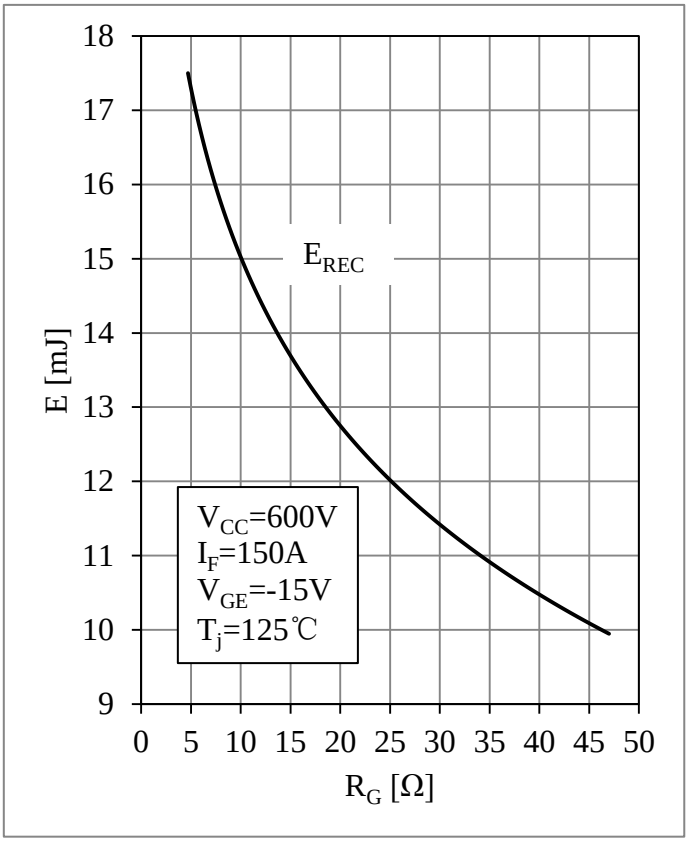


Fig 13. Diode Switching Loss vs. R_G

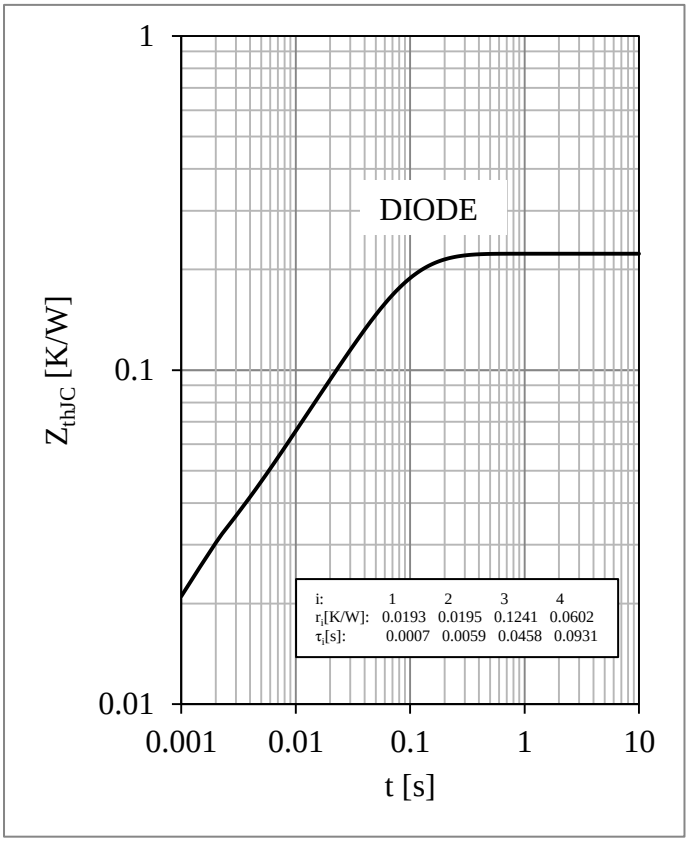
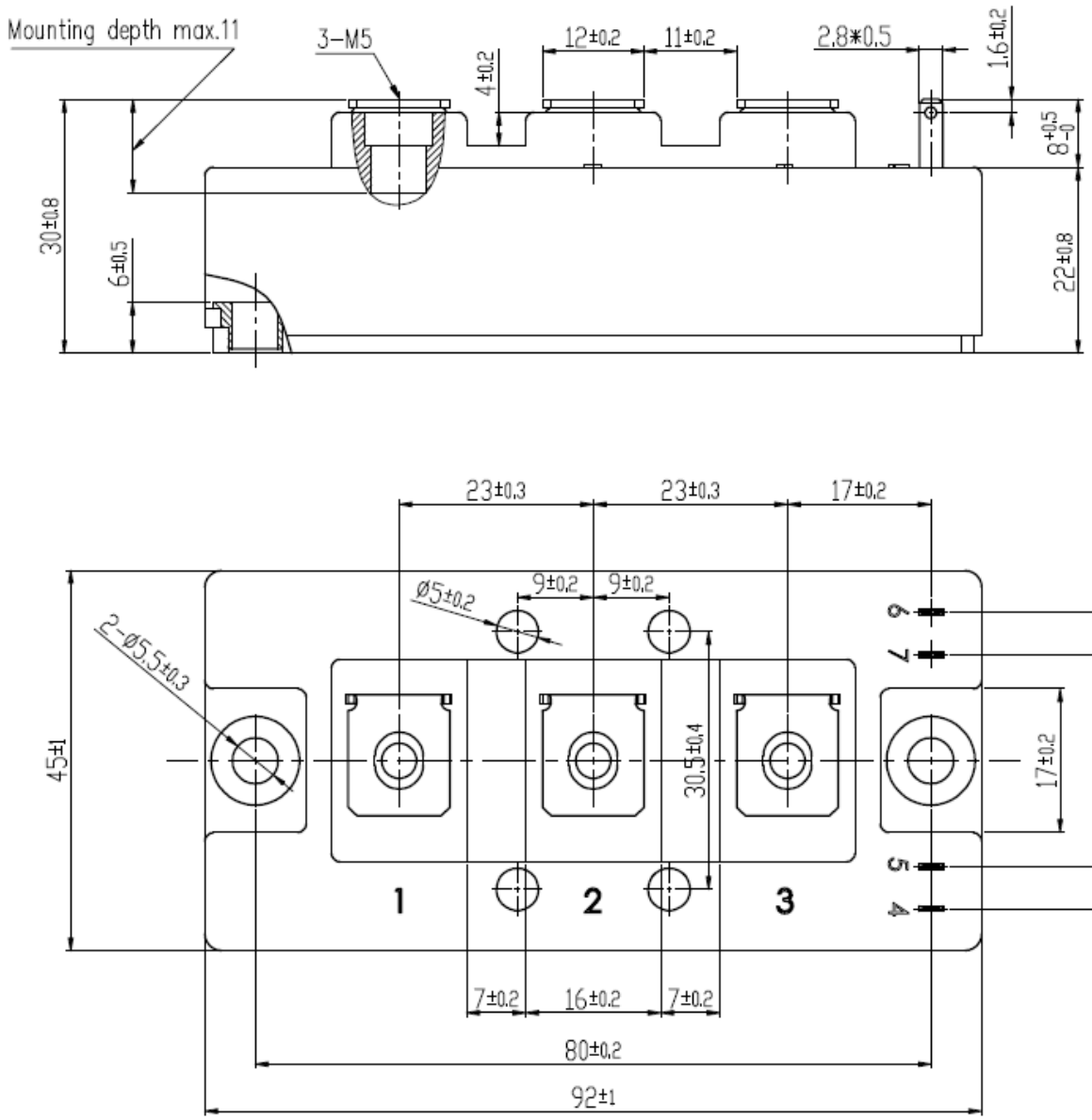


Fig 14. Diode Transient Thermal Impedance

Package Dimensions

Dimensions in Millimeters



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