

STARPOWER

SEMICONDUCTOR

IGBT

GD200HFT120C8SN

1200V/200A 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

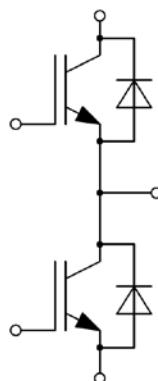
- Low $V_{CE(sat)}$ Trench IGBT technology
- 10 μ s short circuit capability
- $V_{CE(sat)}$ with positive temperature coefficient
- Maximum junction temperature 175 °C
- Low inductance case
- Fast & soft reverse recovery anti-parallel FWD
- Isolated copper baseplate using DBC technology



Typical Applications

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

Equivalent Circuit Schematic



Absolute Maximum Ratings $T_C=25^{\circ}\text{C}$ unless otherwise noted**IGBT**

Symbol	Description	Value	Unit
V_{CES}	Collector-Emitter Voltage	1200	V
V_{GES}	Gate-Emitter Voltage	± 30	V
I_C	Collector Current @ $T_C=25^{\circ}\text{C}$	350	A
	@ $T_C=100^{\circ}\text{C}$	200	A
I_{CM}	Pulsed Collector Current $t_p=1\text{ms}$	400	A
P_D	Maximum Power Dissipation @ $T_j=175^{\circ}\text{C}$	1260	W

Diode

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1200	V
I_F	Diode Continuous Forward Current	200	A
I_{FM}	Diode Maximum Forward Current $t_p=1\text{ms}$	400	A

Module

Symbol	Description	Value	Unit
T_{jmax}	Maximum Junction Temperature	175	$^{\circ}\text{C}$
T_{jop}	Operating Junction Temperature	-40 to +150	$^{\circ}\text{C}$
T_{STG}	Storage Temperature Range	-40 to +125	$^{\circ}\text{C}$
V_{ISO}	Isolation Voltage RMS, $f=50\text{Hz}$, $t=1\text{min}$	4000	V

IGBT Characteristics $T_C=25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit	
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C=200\text{A}, V_{GE}=15\text{V}, T_j=25^\circ\text{C}$		1.70	2.15	V	
		$I_C=200\text{A}, V_{GE}=15\text{V}, T_j=125^\circ\text{C}$		1.95			
		$I_C=200\text{A}, V_{GE}=15\text{V}, T_j=150^\circ\text{C}$		2.00			
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=8.0\text{mA}, V_{CE}=V_{GE}, T_j=25^\circ\text{C}$	5.0	5.8	6.5	V	
I_{CES}	Collector Cut-Off Current	$V_{CE}=V_{CES}, V_{GE}=0\text{V}, T_j=25^\circ\text{C}$			5.0	mA	
I_{GES}	Gate-Emitter Leakage Current	$V_{GE}=V_{GES}, V_{CE}=0\text{V}, T_j=25^\circ\text{C}$			400	nA	
R_{Gint}	Internal Gate Resistance			1.0		Ω	
C_{ies}	Input Capacitance	$V_{CE}=30\text{V}, f=1\text{MHz}, V_{GE}=0\text{V}$		18.2		nF	
C_{res}	Reverse Transfer Capacitance				0.56		nF
Q_G	Gate Charge	$V_{GE}=15\text{V}$		1.20		μC	
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600\text{V}, I_C=200\text{A}, R_G=3.0\Omega, V_{GE}=\pm 15\text{V}, T_j=25^\circ\text{C}$		213		ns	
t_r	Rise Time			64		ns	
$t_{d(off)}$	Turn-Off Delay Time			280		ns	
t_f	Fall Time			180		ns	
E_{on}	Turn-On Switching Loss				4.10		mJ
E_{off}	Turn-Off Switching Loss				16.3		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600\text{V}, I_C=200\text{A}, R_G=3.0\Omega, V_{GE}=\pm 15\text{V}, T_j=125^\circ\text{C}$		285		ns	
t_r	Rise Time			78		ns	
$t_{d(off)}$	Turn-Off Delay Time			363		ns	
t_f	Fall Time			278		ns	
E_{on}	Turn-On Switching Loss				7.40		mJ
E_{off}	Turn-Off Switching Loss				23.0		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600\text{V}, I_C=200\text{A}, R_G=3.0\Omega, V_{GE}=\pm 15\text{V}, T_j=150^\circ\text{C}$		293		ns	
t_r	Rise Time			81		ns	
$t_{d(off)}$	Turn-Off Delay Time			374		ns	
t_f	Fall Time			327		ns	
E_{on}	Turn-On Switching Loss				8.70		mJ
E_{off}	Turn-Off Switching Loss				25.2		mJ
I_{SC}	SC Data	$t_p \leq 10\mu\text{s}, V_{GE}=15\text{V}, T_j=150^\circ\text{C}, V_{CC}=900\text{V}, V_{CEM} \leq 1200\text{V}$		800		A	

Diode Characteristics $T_C=25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_F	Diode Forward Voltage	$I_F=200\text{A}, V_{GE}=0\text{V}, T_j=25^\circ\text{C}$		1.80	2.25	V
		$I_F=200\text{A}, V_{GE}=0\text{V}, T_j=125^\circ\text{C}$		1.85		
		$I_F=200\text{A}, V_{GE}=0\text{V}, T_j=150^\circ\text{C}$		1.85		
Q_r	Recovered Charge	$V_R=600\text{V}, I_F=200\text{A},$ $-di/dt=2600\text{A}/\mu\text{s}, V_{GE}=-15\text{V}$ $T_j=25^\circ\text{C}$		17.3		μC
I_{RM}	Peak Reverse Recovery Current			162		A
E_{rec}	Reverse Recovery Energy			11.4		mJ
Q_r	Recovered Charge	$V_R=600\text{V}, I_F=200\text{A},$ $-di/dt=2600\text{A}/\mu\text{s}, V_{GE}=-15\text{V}$ $T_j=125^\circ\text{C}$		35.5		μC
I_{RM}	Peak Reverse Recovery Current			215		A
E_{rec}	Reverse Recovery Energy			21.5		mJ
Q_r	Recovered Charge	$V_R=600\text{V}, I_F=200\text{A},$ $-di/dt=2600\text{A}/\mu\text{s}, V_{GE}=-15\text{V}$ $T_j=150^\circ\text{C}$		41.0		μC
I_{RM}	Peak Reverse Recovery Current			235		A
E_{rec}	Reverse Recovery Energy			25.0		mJ

Module Characteristics $T_C=25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Min.	Typ.	Max.	Unit
L_{CE}	Stray Inductance			22	nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal to Chip		0.65		m Ω
$R_{\theta JC}$	Junction-to-Case (per IGBT)			0.119	K/W
	Junction-to-Case (per Diode)			0.163	
$R_{\theta CS}$	Case-to-Sink (per IGBT)		0.159		K/W
	Case-to-Sink (per Diode)		0.218		
$R_{\theta CS}$	Case-to-Sink		0.046		K/W
M	Terminal Connection Torque, Screw M5	2.5		3.5	N.m
	Mounting Torque, Screw M5	2.5		3.5	
G	Weight of Module		200		g

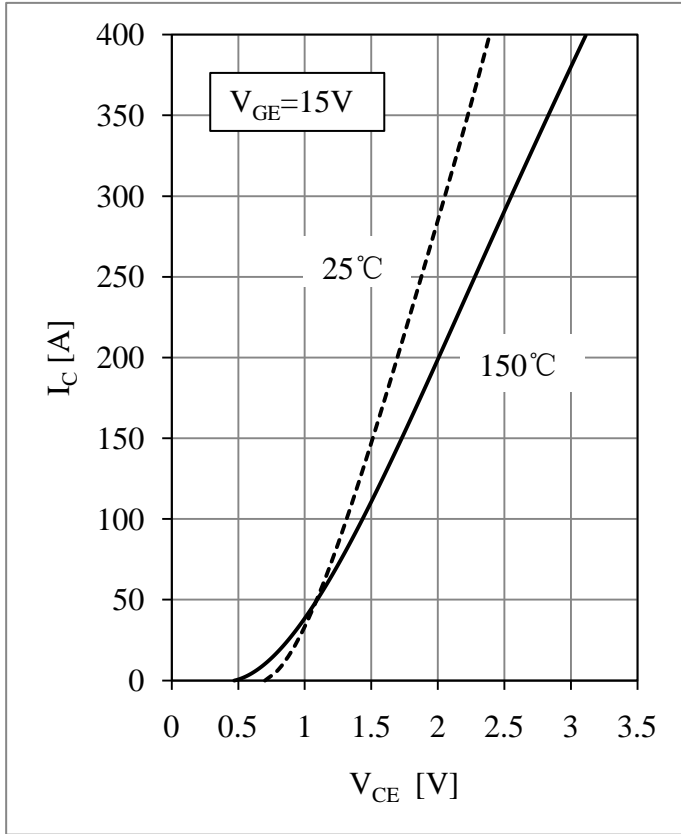


Fig 1. IGBT Output Characteristics

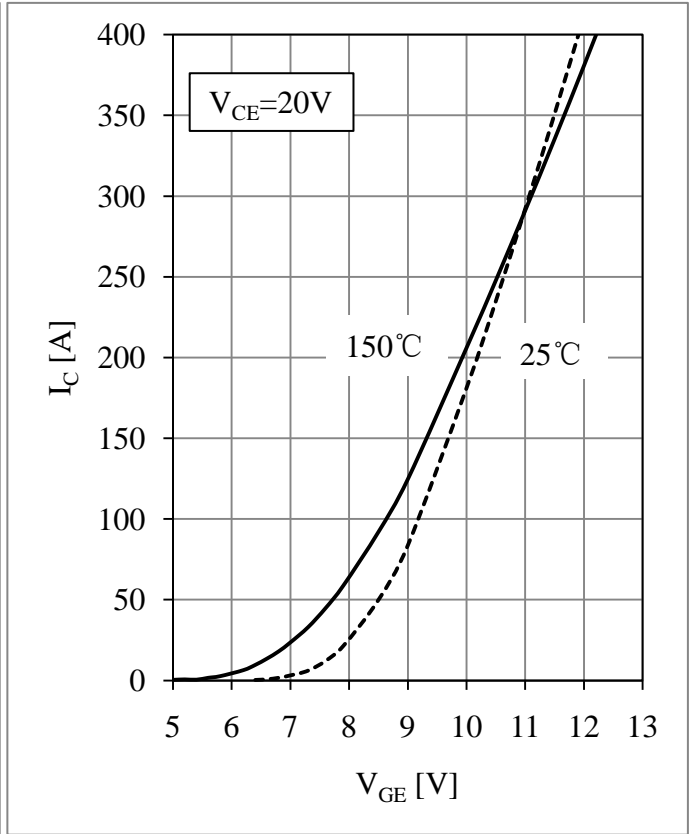


Fig 2. IGBT Transfer Characteristics

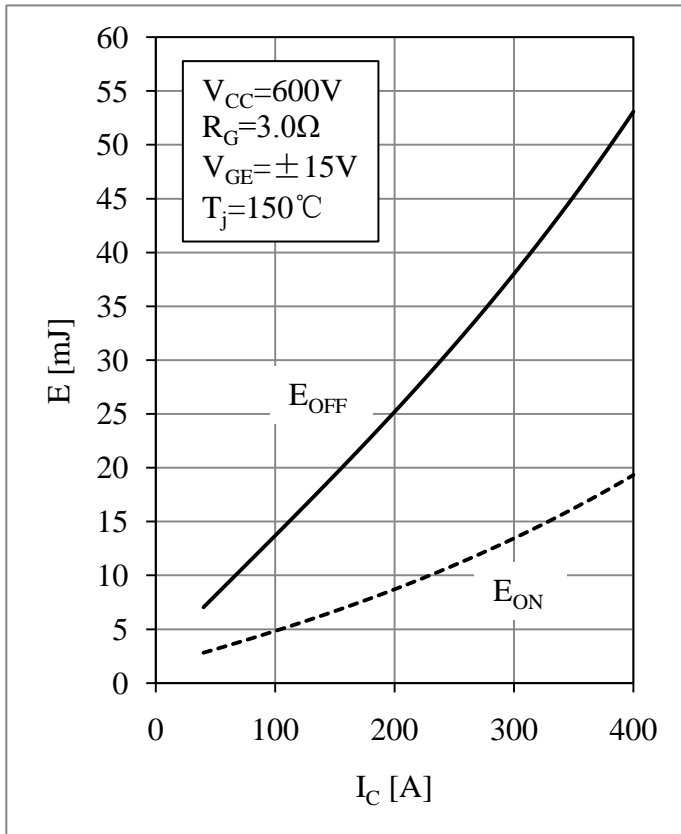


Fig 3. IGBT Switching Loss vs. I_C

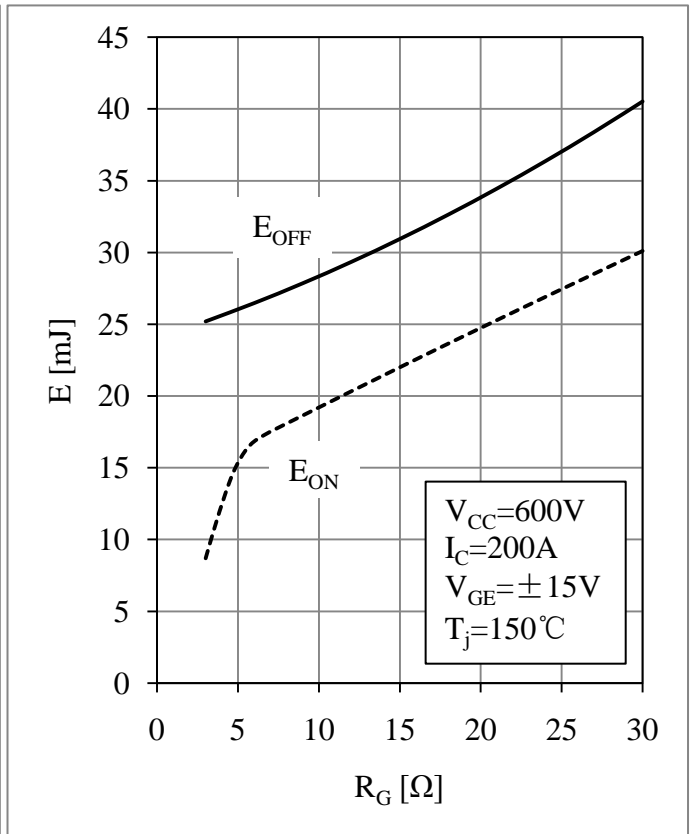


Fig 4. IGBT Switching Loss vs. R_G

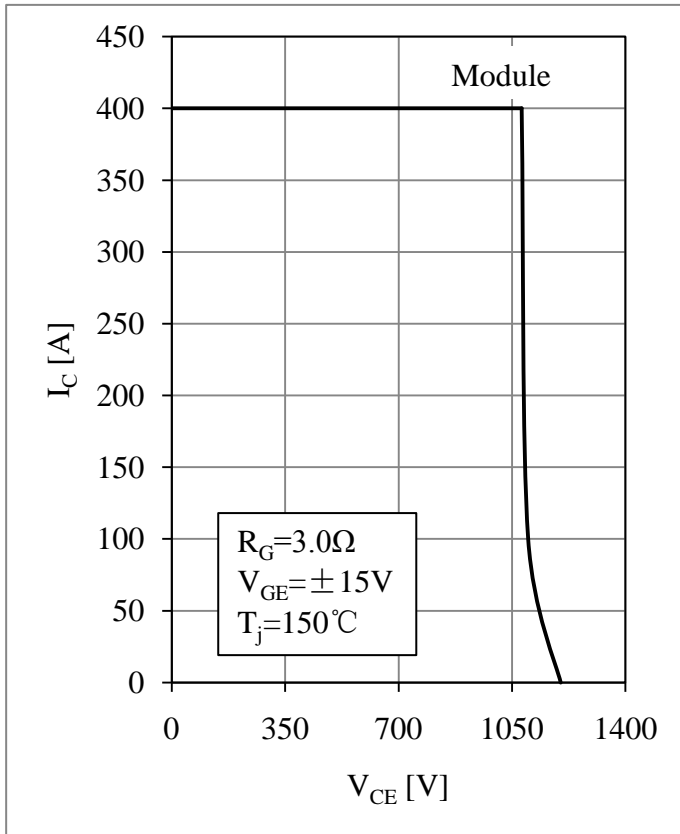


Fig 5. RBSOA

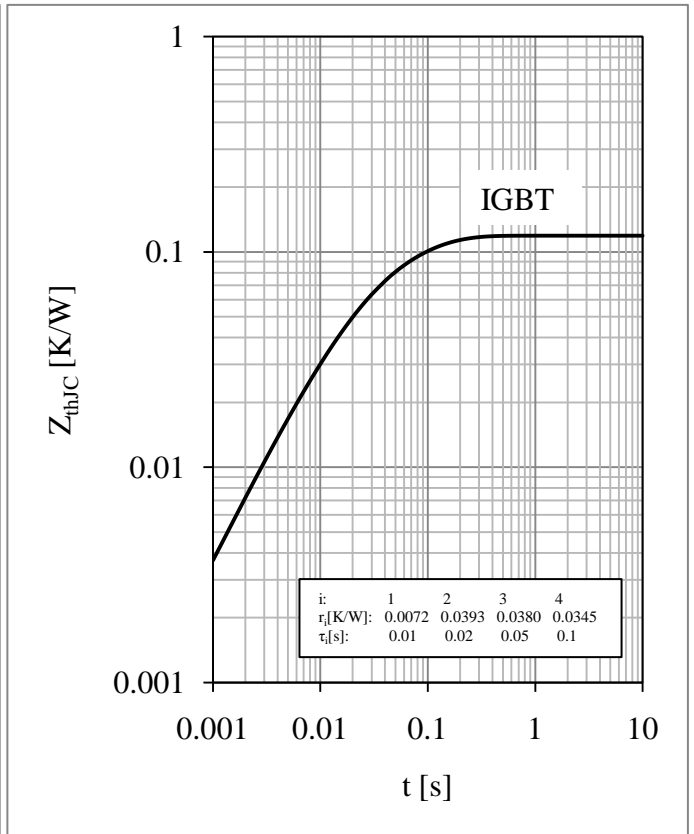


Fig 6. IGBT Transient Thermal Impedance

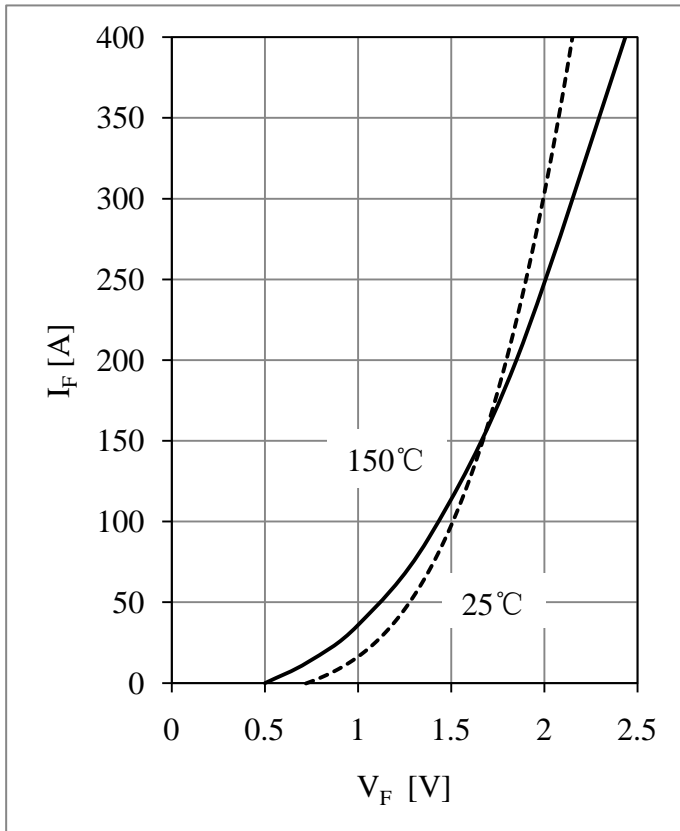


Fig 7. Diode Forward Characteristics

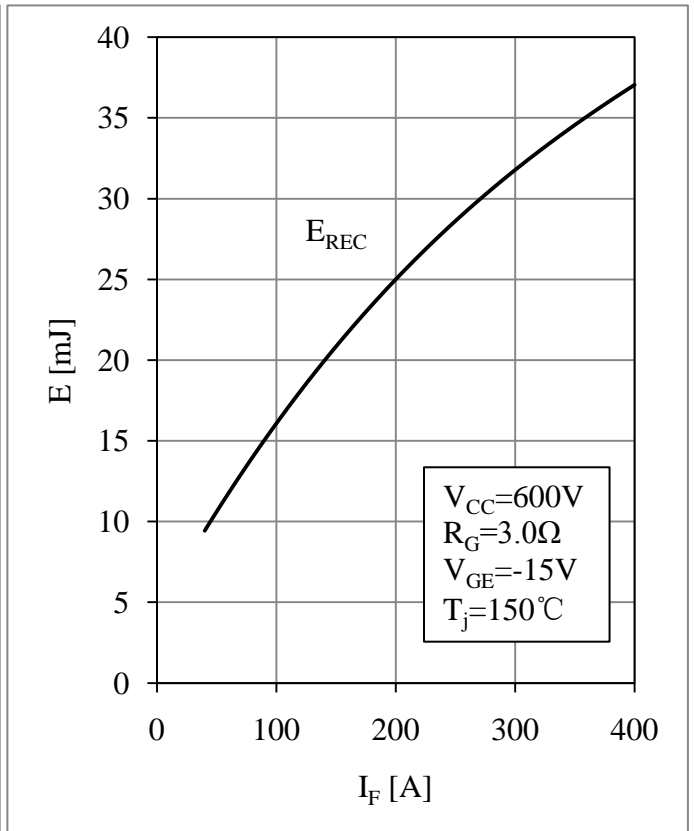


Fig 8. Diode Switching Loss vs. I_F

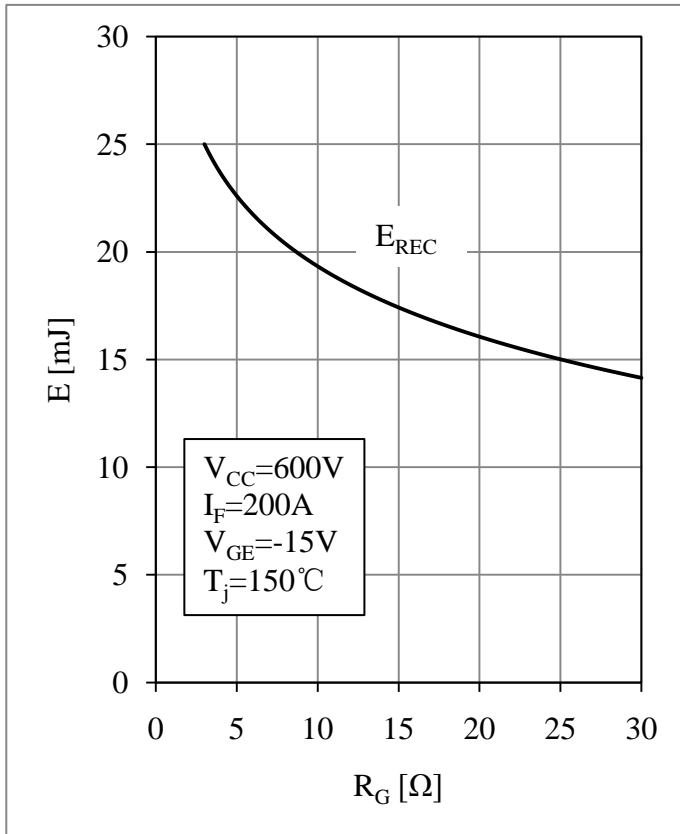


Fig 9. Diode Switching Loss vs. R_G

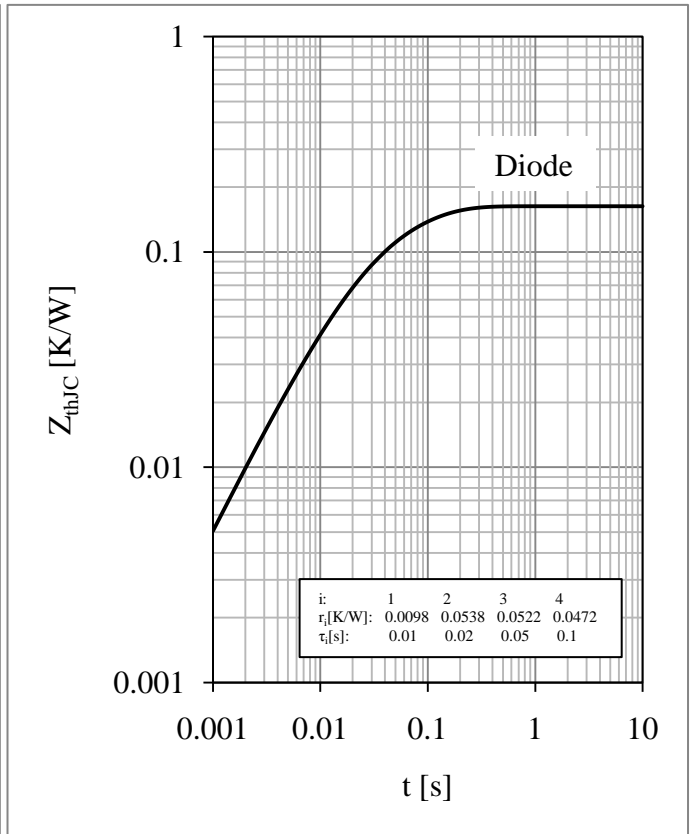
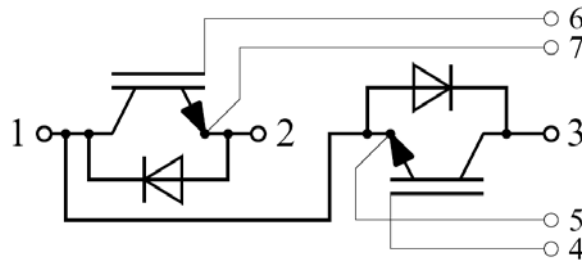


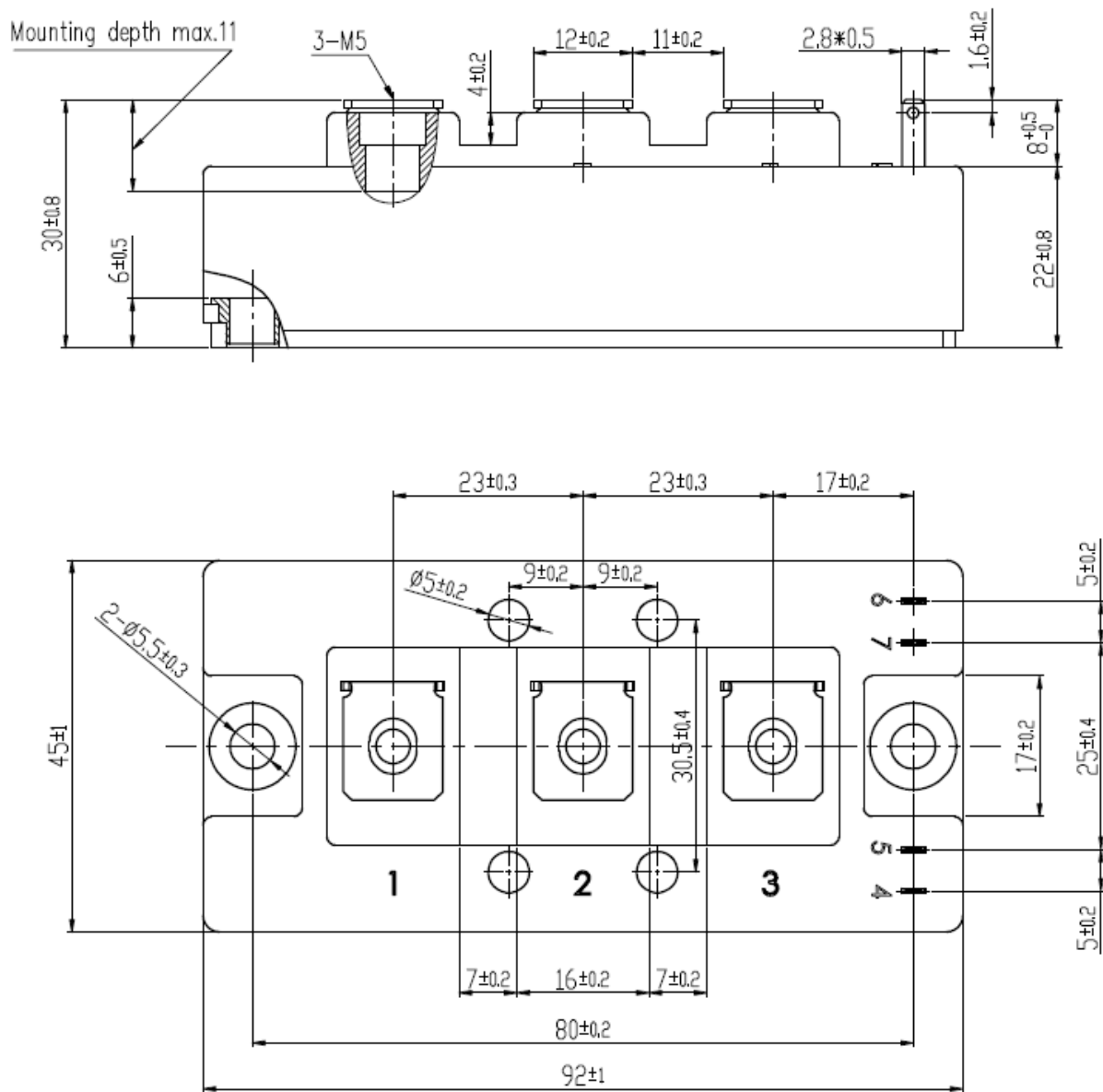
Fig 10. Diode Transient Thermal Impedance

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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