

STARPOWER

SEMICONDUCTOR

IGBT

GD600SGL170C2S

Molding Type Module

1700V/600A 1 in one-package

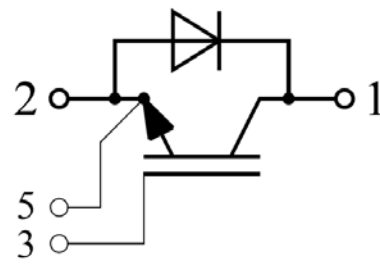
General Description

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



Equivalent Circuit Schematic

Typical Applications

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

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

Symbol	Description	GD600SGL170C2S	Units
V_{CES}	Collector-Emitter Voltage	1700	V
V_{GES}	Gate-Emitter Voltage	± 20	V
I_C	Collector Current @ $T_C=25^{\circ}\text{C}$	880	A
	@ $T_C=100^{\circ}\text{C}$	600	
I_{CM}	Pulsed Collector Current $t_p=1\text{ms}$	1200	A
I_F	Diode Continuous Forward Current	600	A
I_{FM}	Diode Maximum Forward Current $t_p=1\text{ms}$	1200	A
P_D	Maximum Power Dissipation @ $T_j=175^{\circ}\text{C}$	3750	W
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
Mounting Torque	Power Terminal Screw:M4	1.1 to 2.0	N.m
	Power Terminal Screw:M6	2.5 to 5.0	
	Mounting Screw:M6	3.0 to 5.0	

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{(BR)CES}$	Collector-Emitter Breakdown Voltage	$T_j=25^{\circ}\text{C}$	1700			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

On Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=24.0\text{mA}, V_{CE}=V_{GE}, T_j=25^{\circ}\text{C}$	5.4	6.2	7.4	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C=600\text{A}, V_{GE}=15\text{V}, T_j=25^{\circ}\text{C}$		2.50	2.95	V
		$I_C=600\text{A}, V_{GE}=15\text{V}, T_j=125^{\circ}\text{C}$		3.00		

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=900V, I_C=600A,$ $R_G=2.4\Omega, V_{GE}=\pm 15V,$ $T_j=25^\circ C$		464		ns
t_r	Rise Time			157		ns
$t_{d(off)}$	Turn-Off Delay Time			421		ns
t_f	Fall Time			290		ns
E_{on}	Turn-On Switching Loss			215		mJ
E_{off}	Turn-Off Switching Loss			110		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=900V, I_C=600A,$ $R_G=2.4\Omega, V_{GE}=\pm 15V,$ $T_j=125^\circ C$		483		ns
t_r	Rise Time			161		ns
$t_{d(off)}$	Turn-Off Delay Time			465		ns
t_f	Fall Time			538		ns
E_{on}	Turn-On Switching Loss			256		mJ
E_{off}	Turn-Off Switching Loss			167		mJ
C_{ies}	Input Capacitance	$V_{CE}=25V, f=1MHz,$ $V_{GE}=0V$		40.0		nF
C_{oes}	Output Capacitance			2.08		nF
C_{res}	Reverse Transfer Capacitance			1.44		nF
I_{SC}	SC Data	$t_p \leq 10\mu s, V_{GE}=15V,$ $T_j=125^\circ C, V_{CC}=1300V,$ $V_{CEM} \leq 1700V$		1920		A
Q_G	Gate Charge	$V_{CC}=900V, I_C=600A,$ $V_{GE}=-15 \dots +15V$		3.60		μC
R_{Gint}	Internal Gate Resistance			1.0		Ω
L_{CE}	Stray Inductance			15	20	nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal To Chip			0.18		m Ω

Electrical Characteristics of Diode $T_C=25^\circ C$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V_F	Diode Forward Vd tage	$I_F=600A$	$T_j=25^\circ C$	1.80	2.25	V
			$T_j=125^\circ C$	1.95		
Q_r	Recovered Charge	$I_F=600A,$	$T_j=25^\circ C$	140		μC
			$T_j=125^\circ C$	215		
I_{RM}	Peak Reverse Recovery Current	$V_R=900V,$ $R_G=2.4\Omega,$	$T_j=25^\circ C$	418		A
			$T_j=125^\circ C$	476		
E_{rec}	Reverse Recovery Energy	$V_{GE}=-15V$	$T_j=25^\circ C$	81.4		mJ
			$T_j=125^\circ C$	130		

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case (per IGBT)		0.040	K/W
$R_{\theta JC}$	Junction-to-Case (per Diode)		0.069	K/W
$R_{\theta CS}$	Case-to-Sink (Conductive grease applied)	0.035		K/W
Weight	Weight of Module	300		g

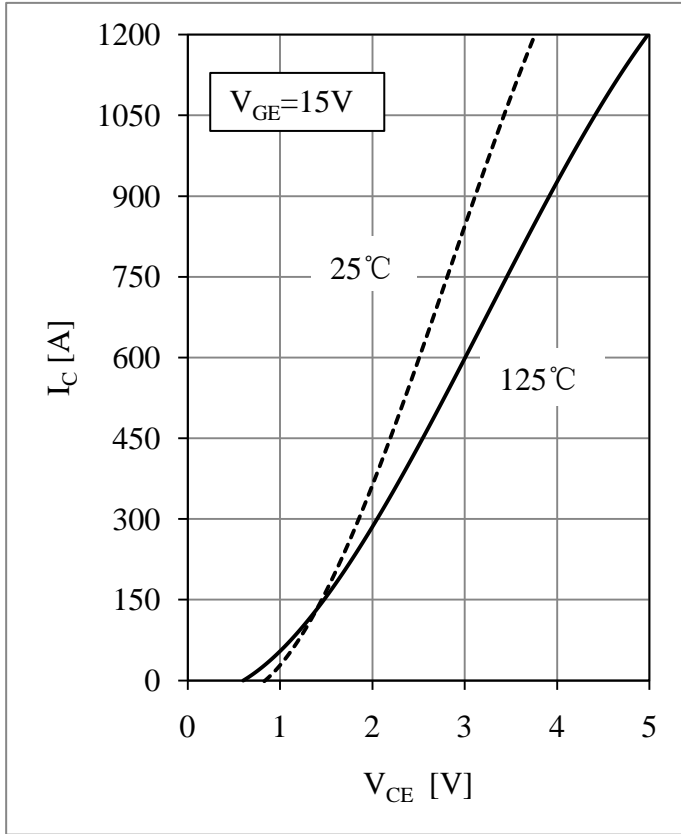


Fig 1. IGBT Output Characteristic

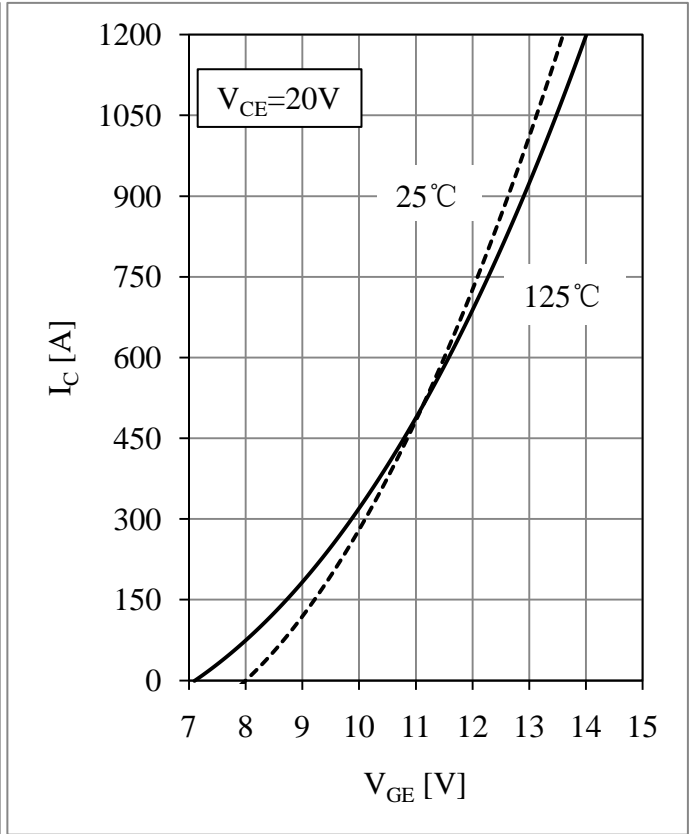


Fig 2. IGBT Transfer Characteristic

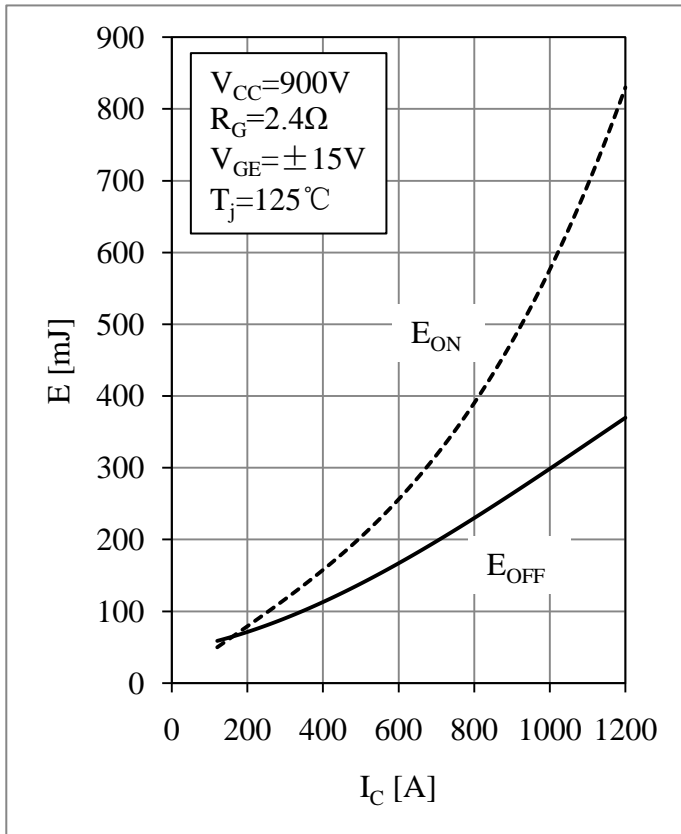


Fig 3. IGBT Switching Loss vs. I_C

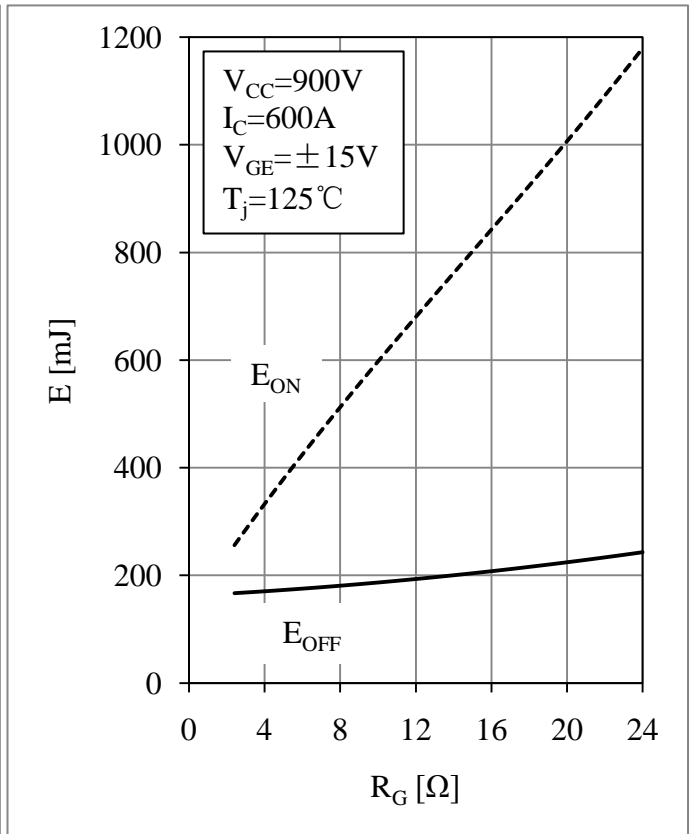


Fig 4. IGBT Switching Loss vs. R_G

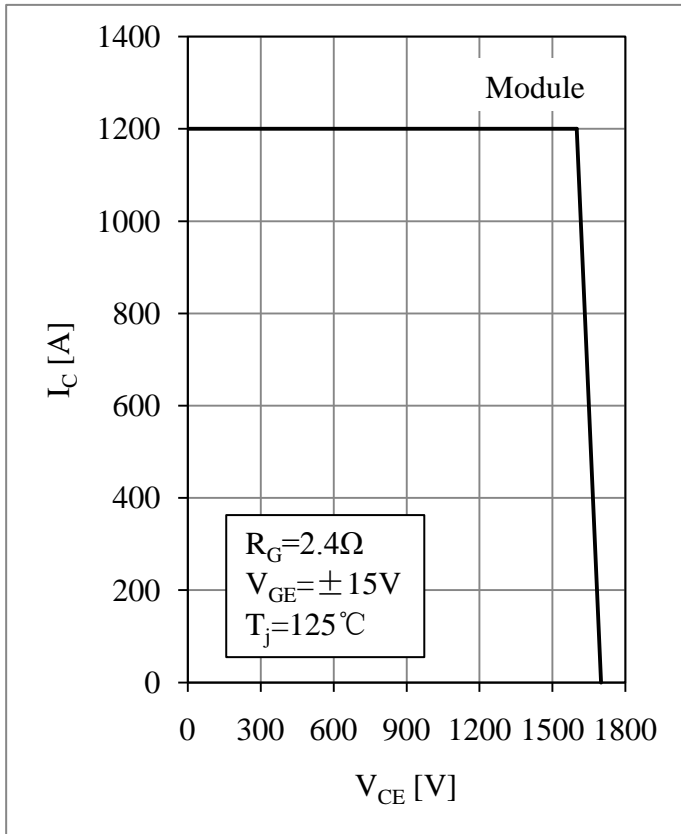


Fig 5. RBSOA

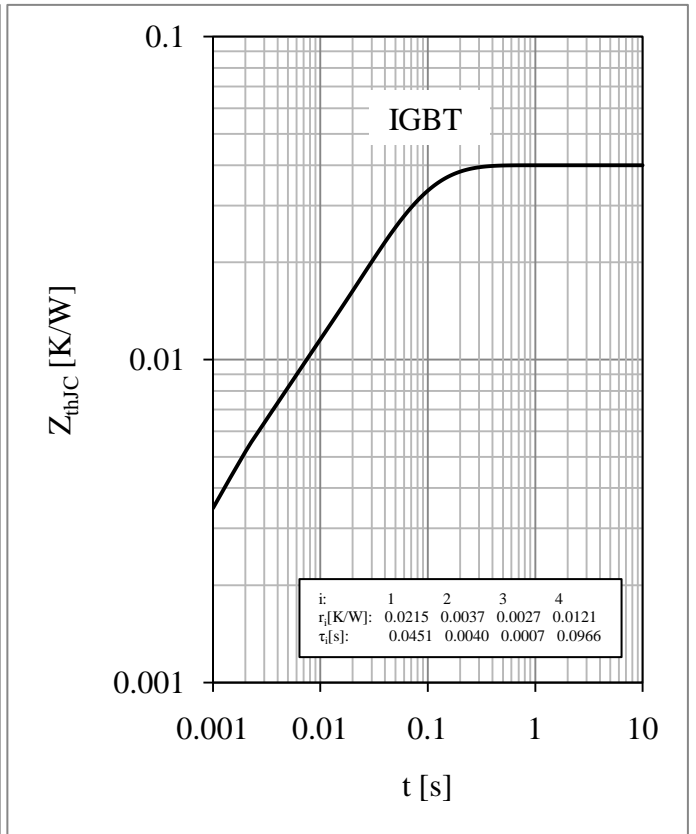


Fig 6. IGBT Transient Thermal Impedance

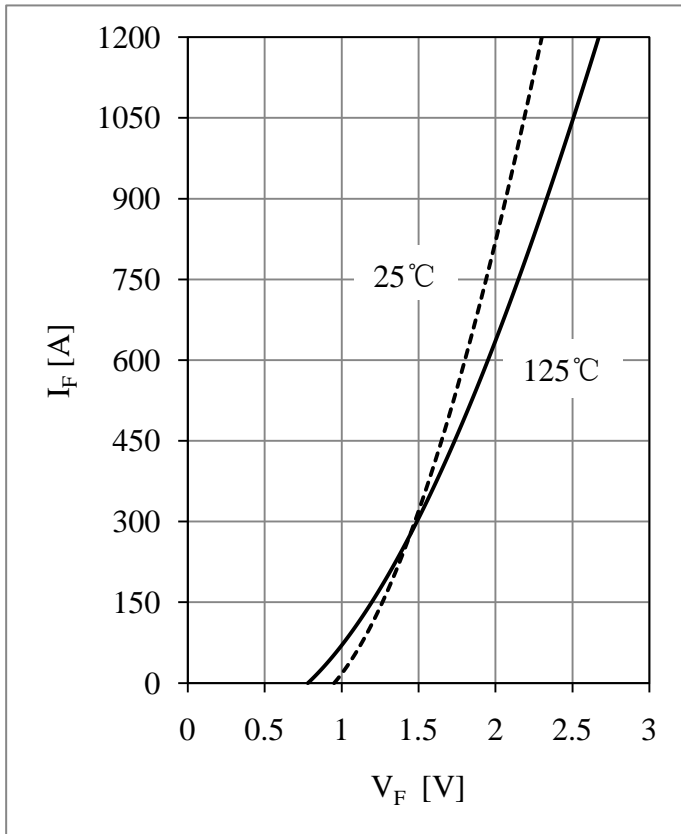


Fig 7. Diode Forward Characteristic

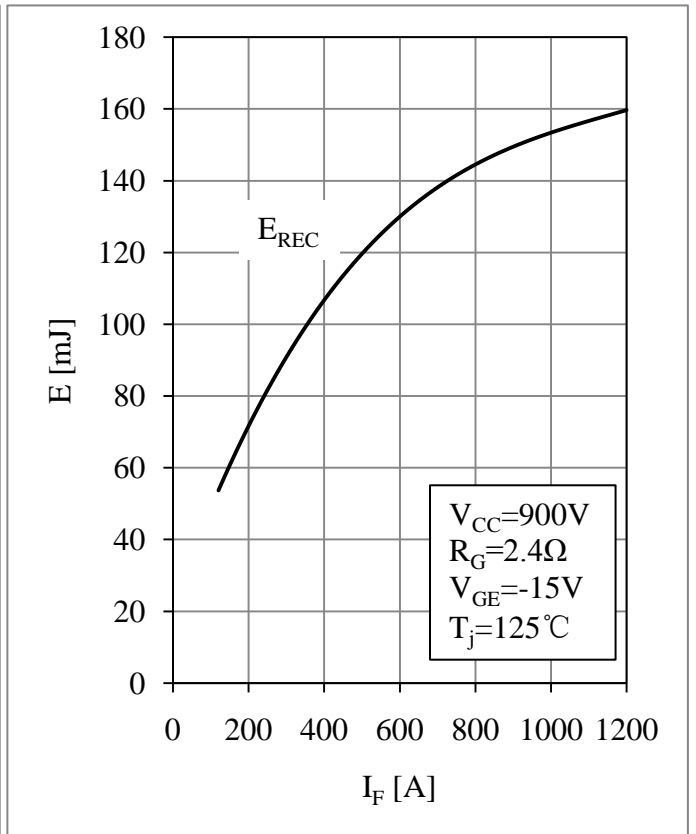


Fig 8. Diode Switching Loss vs. I_F

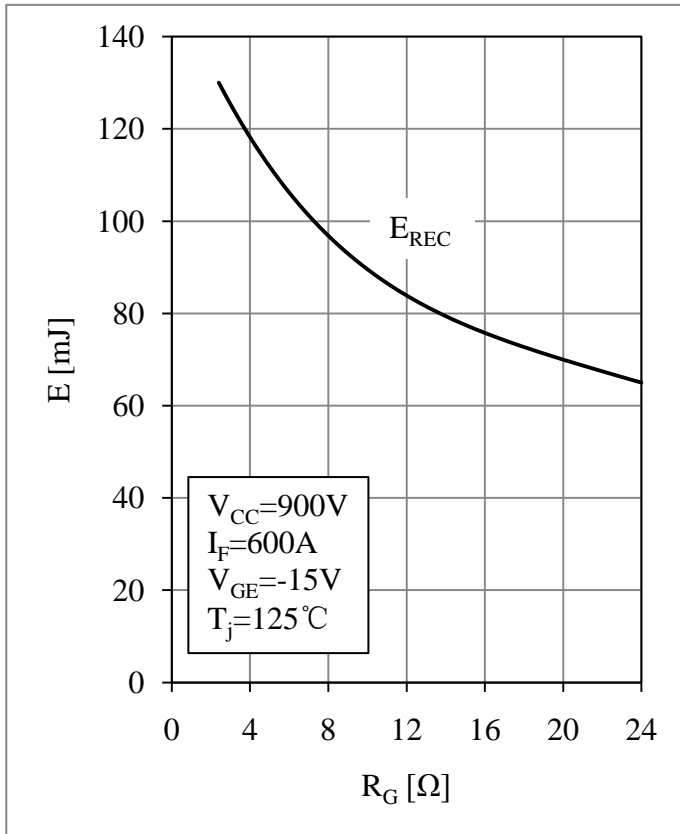


Fig 9. Diode Switching Loss vs. R_G

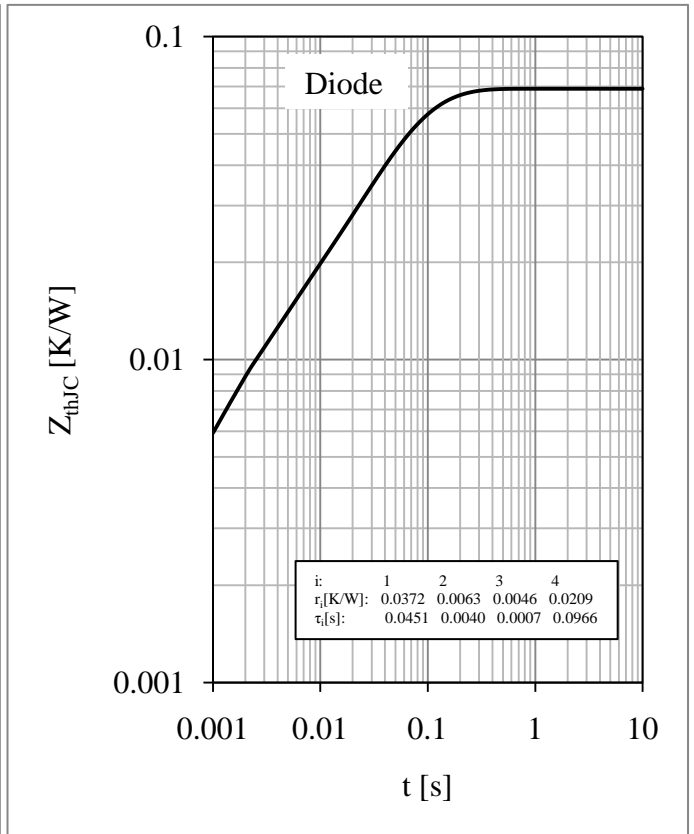
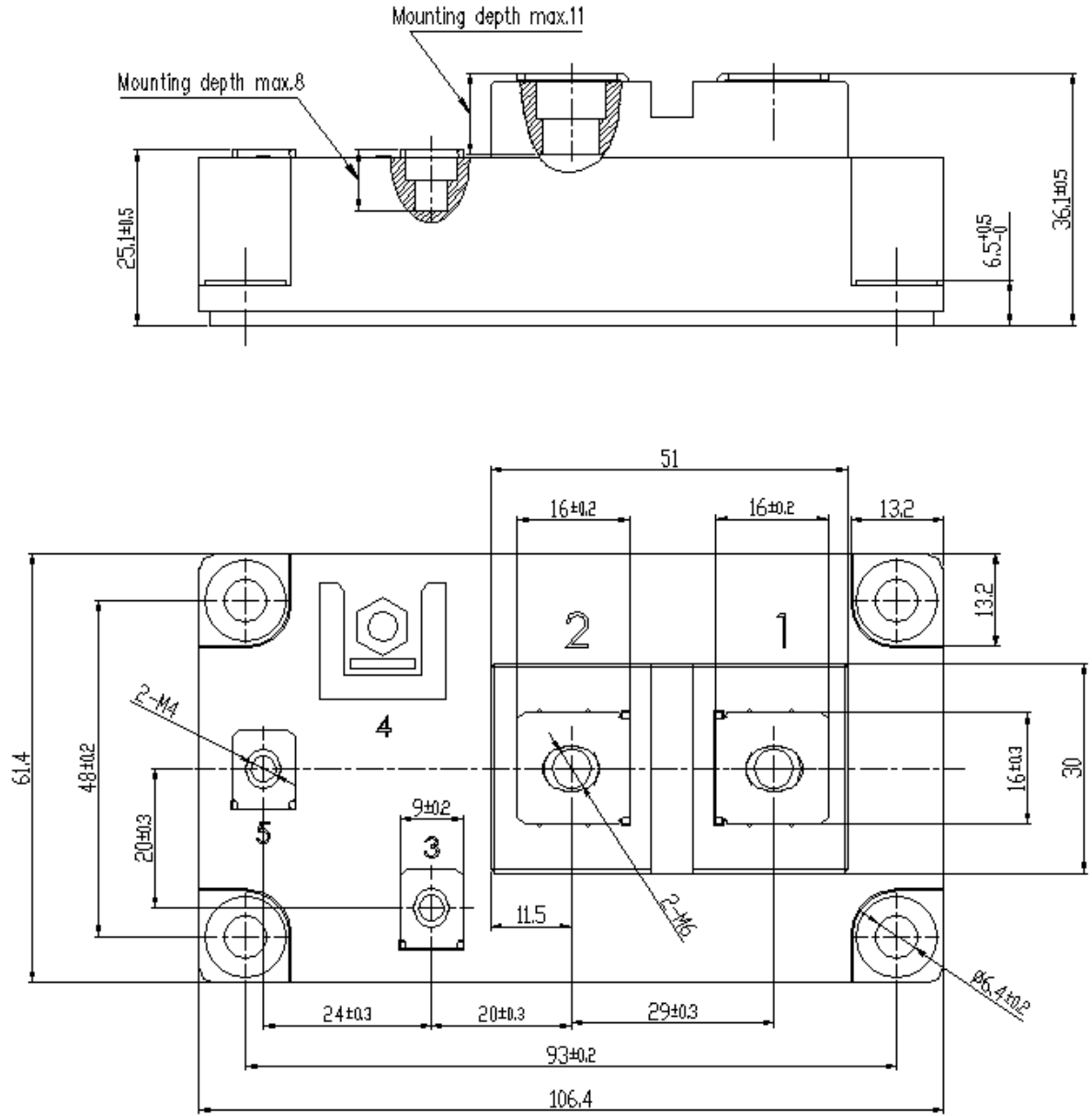


Fig 10. Diode Transient Thermal Impedance

Package Dimensions

Dimensions in Millimeters



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