

STARPOWER

SEMICONDUCTOR

IGBT

GD600SGK120C2S

1200V/600A 1 in one-package

General Description

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

Features

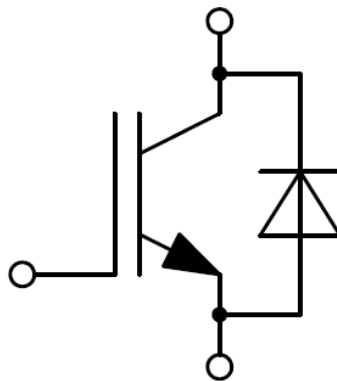
- NPT IGBT technology
- 10 μ s short circuit capability
- $V_{CE(sat)}$ with positive temperature coefficient
- Low inductance case
- Fast & soft reverse recovery anti-parallel FWD
- Isolated copper baseplate using DBC technology



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	± 20	V
I_C	Collector Current @ $T_C=25^{\circ}\text{C}$	1009	A
	@ $T_C=90^{\circ}\text{C}$	600	A
I_{CM}	Pulsed Collector Current $t_p=1\text{ms}$	1200	A
P_D	Maximum Power Dissipation @ $T_j=150^{\circ}\text{C}$	4032	W

Diode

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1200	V
I_F	Diode Continuous Forward Current	600	A
I_{FM}	Diode Maximum Forward Current $t_p=1\text{ms}$	1200	A

Module

Symbol	Description	Value	Unit
T_{jmax}	Maximum Junction Temperature	150	$^{\circ}\text{C}$
T_{jop}	Operating Junction Temperature	-40 to +125	$^{\circ}\text{C}$
T_{STG}	Storage Temperature Range	-40 to +125	$^{\circ}\text{C}$
V_{ISO}	Isolation Voltage RMS, $f=50\text{Hz}$, $t=1\text{min}$	2500	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	$I_C=600\text{A}, V_{GE}=15\text{V}, T_j=25^\circ\text{C}$		2.15	2.60	V
		$I_C=600\text{A}, V_{GE}=15\text{V}, T_j=125^\circ\text{C}$		2.65		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=24.0\text{mA}, V_{CE}=V_{GE}, T_j=25^\circ\text{C}$	4.5	5.5	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			0.5		Ω
C_{ies}	Input Capacitance			40.8		nF
C_{res}	Reverse Transfer Capacitance	$V_{CE}=25\text{V}, f=1\text{MHz}, V_{GE}=0\text{V}$		2.64		nF
Q_G	Gate Charge	$V_{GE}=-15\dots+15\text{V}$		6.35		μC
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600\text{V}, I_C=600\text{A}, R_G=3.3\Omega, V_{GE}=\pm 15\text{V}, T_j=25^\circ\text{C}$		673		ns
t_r	Rise Time			207		ns
$t_{d(off)}$	Turn-Off Delay Time			995		ns
t_f	Fall Time			154		ns
E_{on}	Turn-On Switching Loss			23.1		mJ
E_{off}	Turn-Off Switching Loss			88.5		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600\text{V}, I_C=600\text{A}, R_G=3.3\Omega, V_{GE}=\pm 15\text{V}, T_j=125^\circ\text{C}$		678		ns
t_r	Rise Time			211		ns
$t_{d(off)}$	Turn-Off Delay Time			1047		ns
t_f	Fall Time			164		ns
E_{on}	Turn-On Switching Loss			29.8		mJ
E_{off}	Turn-Off Switching Loss			95.4		mJ
I_{SC}	SC Data	$t_p \leq 10\mu\text{s}, V_{GE}=15\text{V}, T_j=125^\circ\text{C}, V_{CC}=900\text{V}, V_{CEM} \leq 1200\text{V}$		3600		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	$I_F=600\text{A}, V_{GE}=0\text{V}, T_j=25^{\circ}\text{C}$		1.65	2.10	V
		$I_F=600\text{A}, V_{GE}=0\text{V}, T_j=125^{\circ}\text{C}$		1.65		
Q_r	Recovered Charge	$V_{CC}=600\text{V}, I_F=600\text{A},$ $-di/dt=2750\text{A}/\mu\text{s}, V_{GE}=\pm 15\text{V},$ $T_j=25^{\circ}\text{C}$		55.7		μC
I_{RM}	Peak Reverse Recovery Current			288		A
E_{rec}	Reverse Recovery Energy			26.4		mJ
Q_r	Recovered Charge	$V_{CC}=600\text{V}, I_F=600\text{A},$ $-di/dt=2750\text{A}/\mu\text{s}, V_{GE}=\pm 15\text{V},$ $T_j=125^{\circ}\text{C}$		98.5		μC
I_{RM}	Peak Reverse Recovery Current			375		A
E_{rec}	Reverse Recovery Energy			48.5		mJ

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

Symbol	Parameter	Min.	Typ.	Max.	Unit
L_{CE}	Stray Inductance			20	nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal to Chip		0.18		m Ω
R_{thJC}	Junction-to-Case (per IGBT)			0.031	K/W
	Junction-to-Case (per Diode)			0.070	
R_{thCH}	Case-to-Heatsink (per IGBT)		0.051		K/W
	Case-to-Heatsink (per Diode)		0.114		
	Case-to-Heatsink (per Module)		0.035		
M	Terminal Connection Torque, Screw M4	1.1		2.0	N.m
	Terminal Connection Torque, Screw M6	2.5		5.0	
	Mounting Torque, Screw M6	3.0		6.0	
G	Weight of Module		300		g

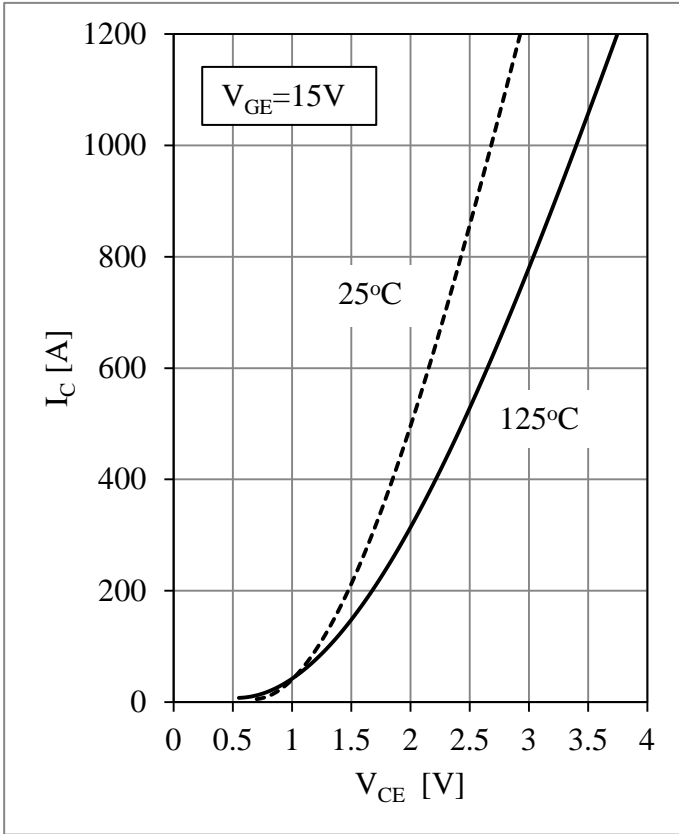


Fig 1. IGBT Output Characteristics

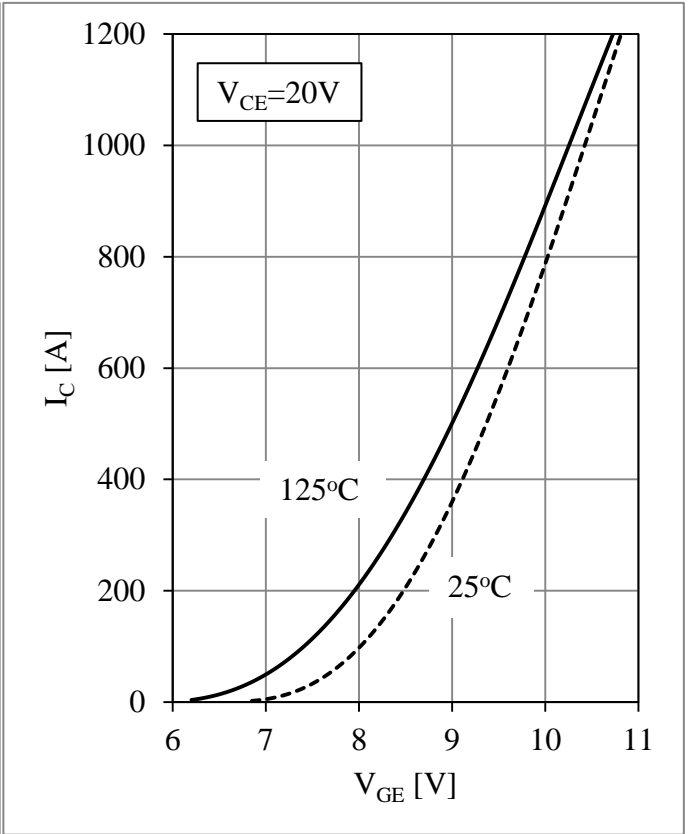


Fig 2. IGBT Transfer Characteristics

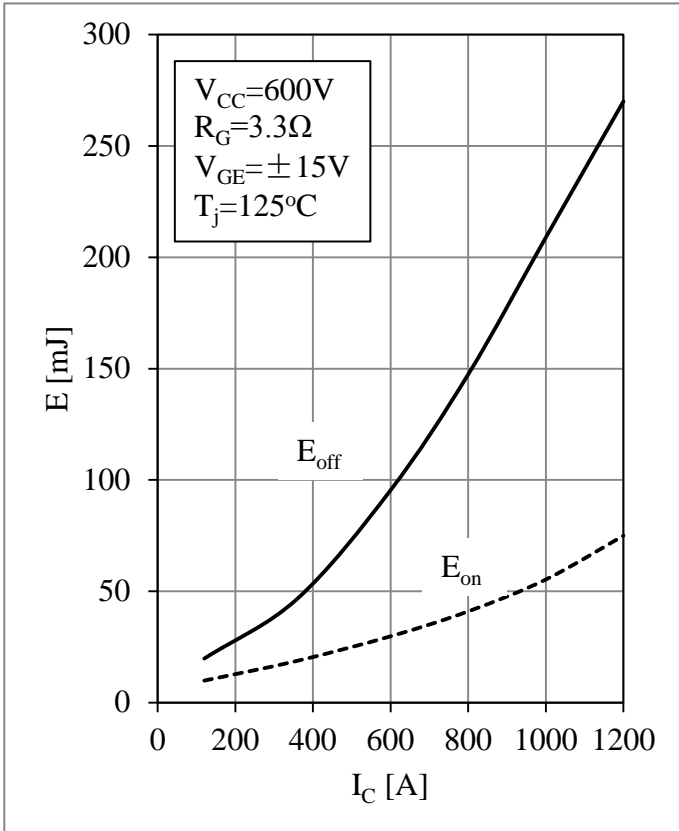


Fig 3. IGBT Switching Loss vs. I_C

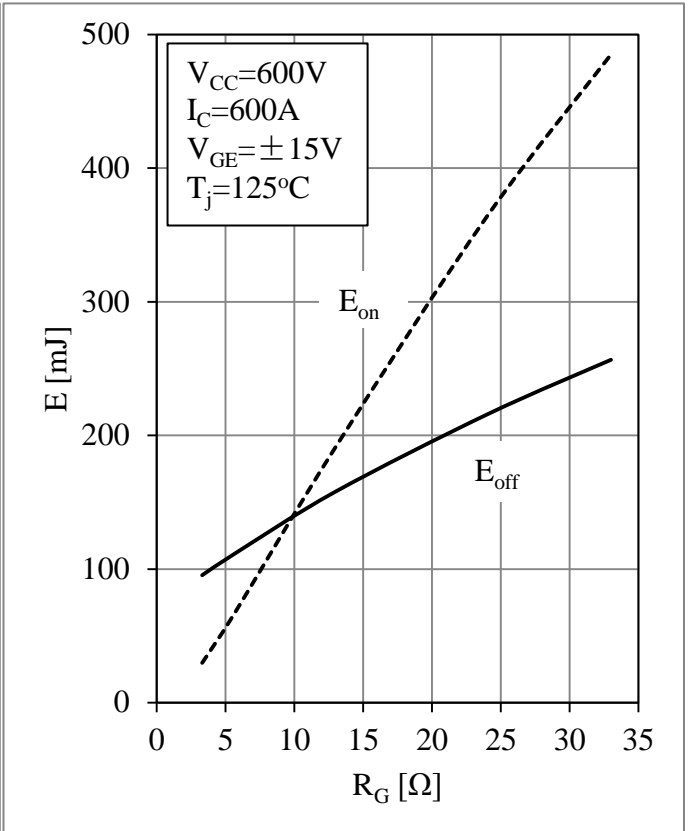


Fig 4. IGBT Switching Loss vs. R_G

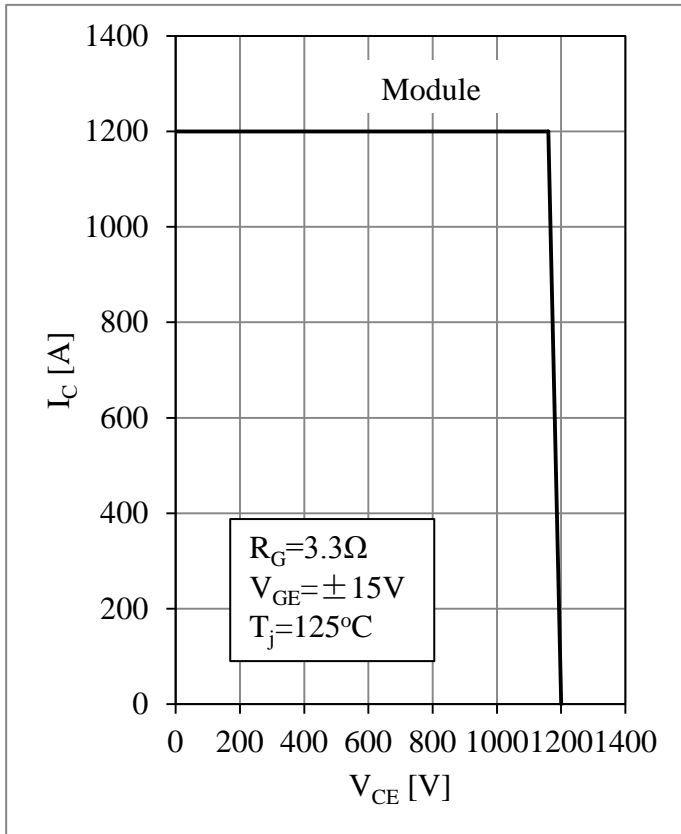


Fig 5. RBSOA

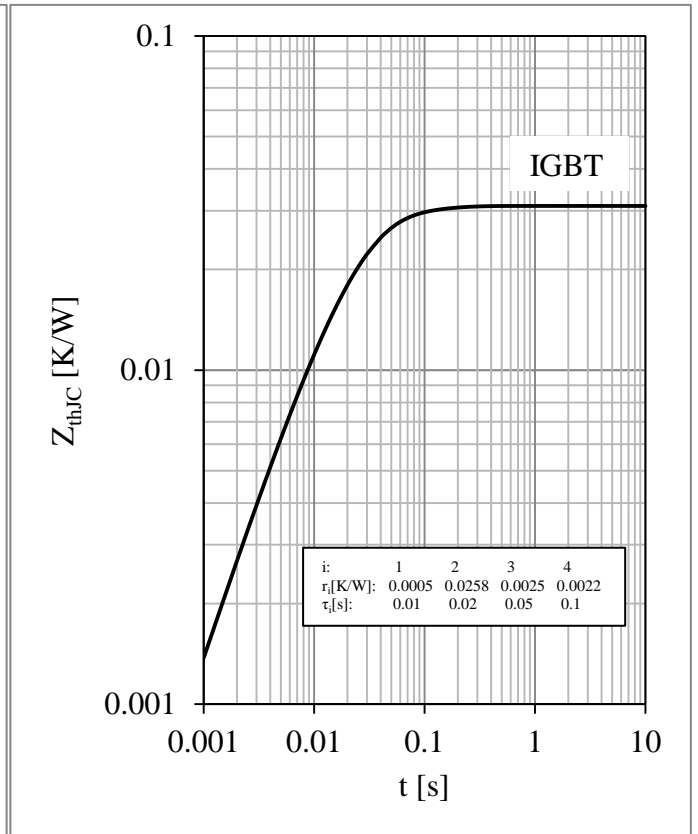


Fig 6. IGBT Transient Thermal Impedance

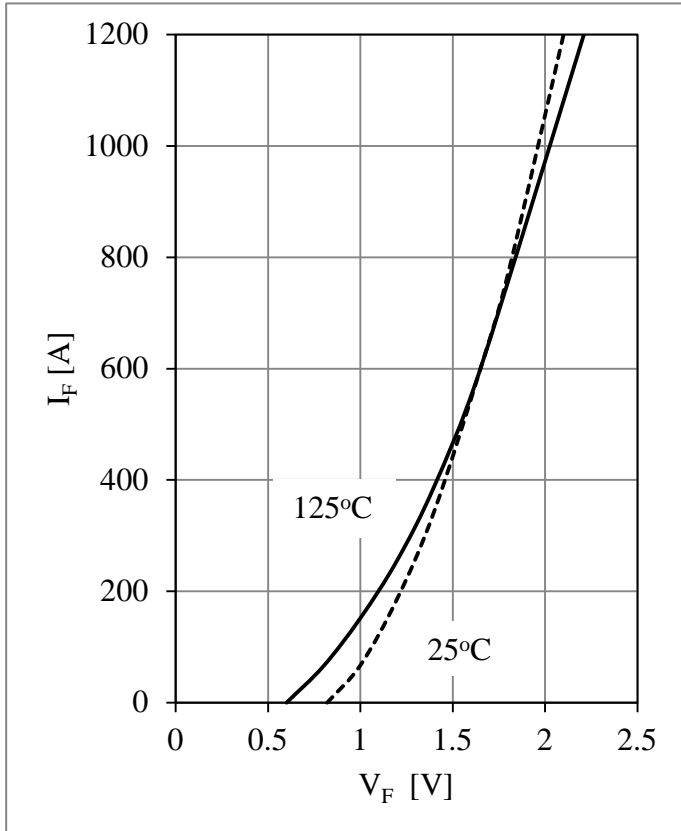


Fig 7. Diode Forward Characteristics

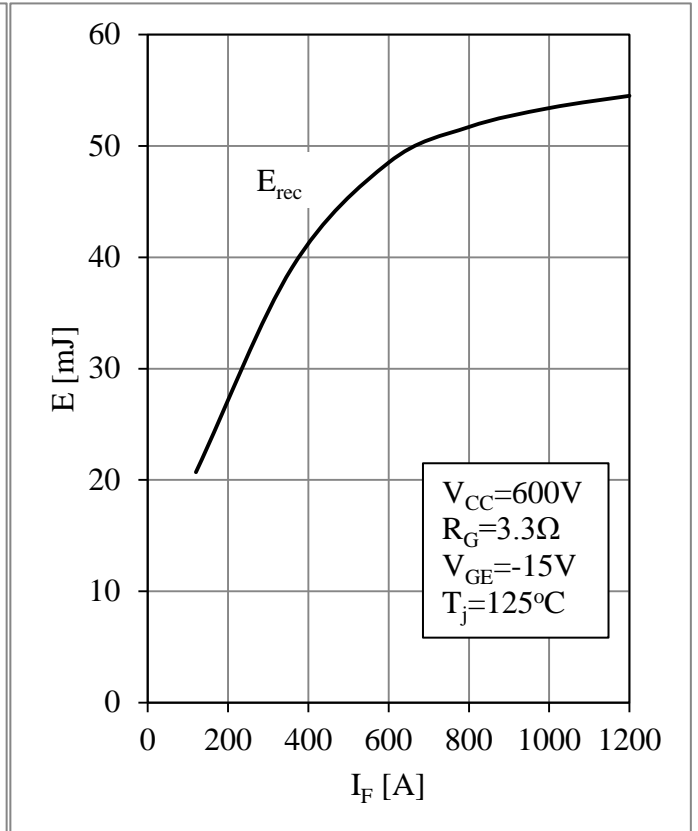


Fig 8. Diode Switching Loss vs. I_F

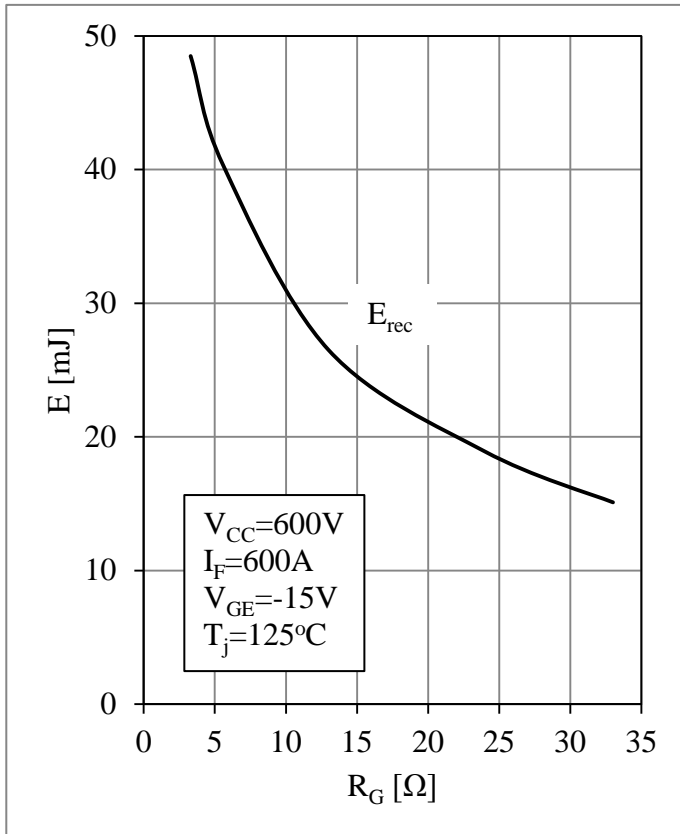


Fig 9. Diode Switching Loss vs. R_G

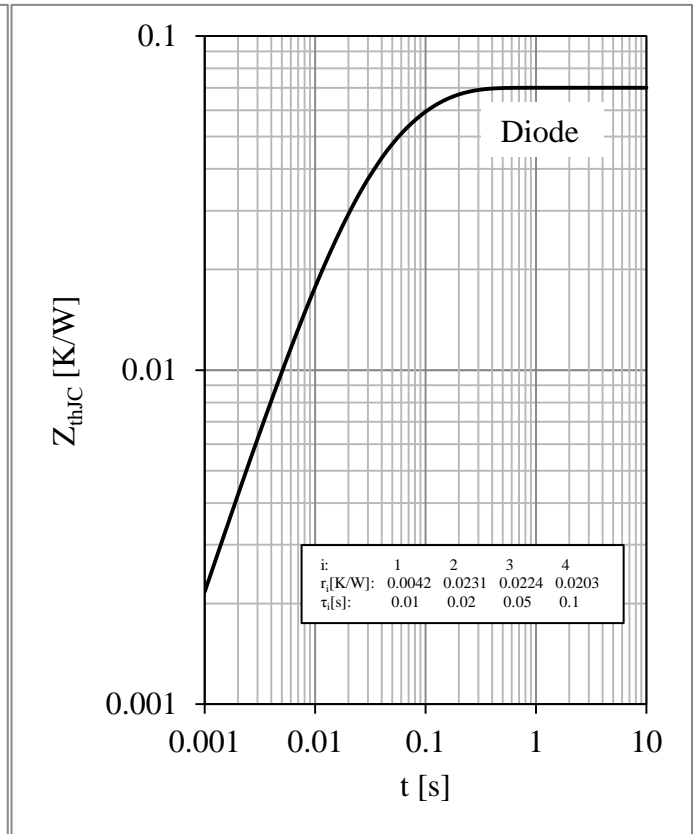
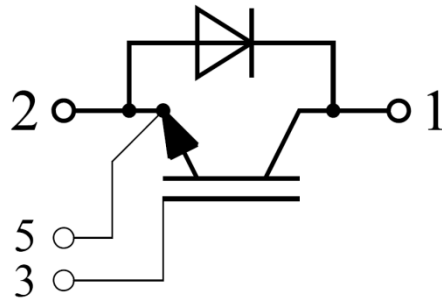


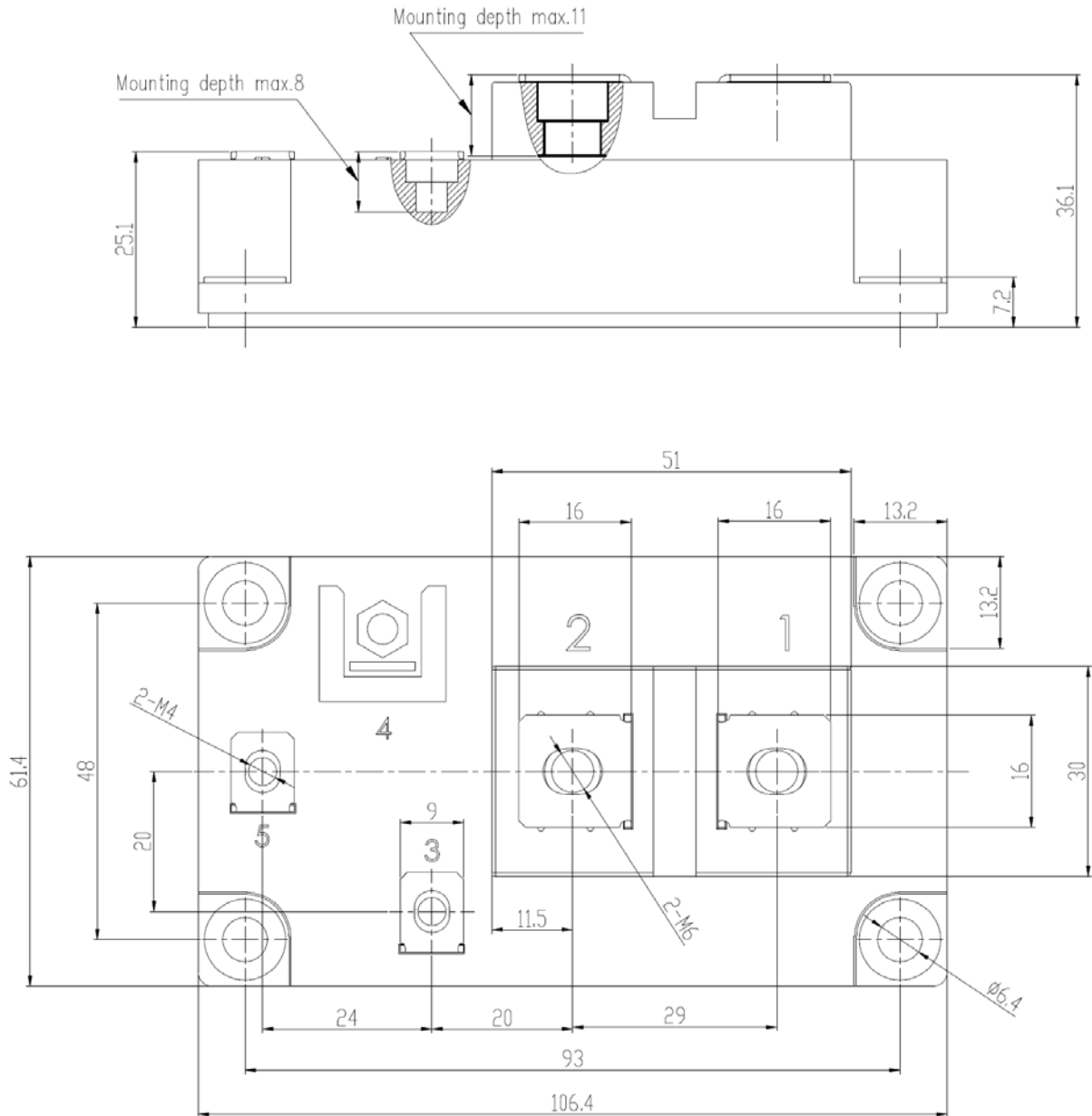
Fig 10. Diode Transient Thermal Impedance

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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