

STARPOWER

SEMICONDUCTOR

IGBT

GD300HFX120C2S_B36

1200V/300A 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.

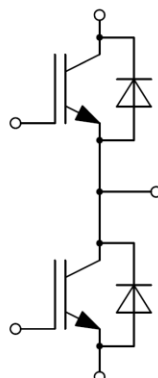
Features

- 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	± 20	V
I_C	Collector Current @ $T_C=25^{\circ}\text{C}$ @ $T_C=90^{\circ}\text{C}$	451 300	A
I_{CM}	Pulsed Collector Current $t_p=1\text{ms}$	600	A
P_D	Maximum Power Dissipation @ $T_j=175^{\circ}\text{C}$	1428	W

Diode

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1200	V
I_F	Diode Continuous Forward Current	300	A
I_{FM}	Diode Maximum Forward Current $t_p=1\text{ms}$	600	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, $f=50\text{Hz}$, $t=1\text{min}$	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	$I_C=300\text{A}, V_{GE}=15\text{V}, T_j=25^{\circ}\text{C}$		1.75	2.20	V
		$I_C=300\text{A}, V_{GE}=15\text{V}, T_j=125^{\circ}\text{C}$		2.00		
		$I_C=300\text{A}, V_{GE}=15\text{V}, T_j=150^{\circ}\text{C}$		2.05		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=12.0\text{mA}, V_{CE}=V_{GE}, T_j=25^{\circ}\text{C}$	5.6	6.2	6.8	V
I_{CES}	Collector Cut-Off Current	$V_{CE}=V_{CES}, V_{GE}=0\text{V}, T_j=25^{\circ}\text{C}$			1.0	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	$V_{CE}=25\text{V}, f=1\text{MHz}, V_{GE}=0\text{V}$		27.9		nF
C_{res}	Reverse Transfer Capacitance			0.78		nF
Q_G	Gate Charge	$V_{GE}=-15\dots+15\text{V}$		2.10		μC
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600\text{V}, I_C=300\text{A}, R_G=1.3\Omega, V_{GE}=\pm 15\text{V}, T_j=25^{\circ}\text{C}$		146		ns
t_r	Rise Time			43		ns
$t_{d(off)}$	Turn-Off Delay Time			440		ns
t_f	Fall Time			68		ns
E_{on}	Turn-On Switching Loss			11.5		mJ
E_{off}	Turn-Off Switching Loss			24.5		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600\text{V}, I_C=300\text{A}, R_G=1.3\Omega, V_{GE}=\pm 15\text{V}, T_j=125^{\circ}\text{C}$		154		ns
t_r	Rise Time			43		ns
$t_{d(off)}$	Turn-Off Delay Time			548		ns
t_f	Fall Time			107		ns
E_{on}	Turn-On Switching Loss			17.8		mJ
E_{off}	Turn-Off Switching Loss			36.7		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600\text{V}, I_C=300\text{A}, R_G=1.3\Omega, V_{GE}=\pm 15\text{V}, T_j=150^{\circ}\text{C}$		162		ns
t_r	Rise Time			43		ns
$t_{d(off)}$	Turn-Off Delay Time			587		ns
t_f	Fall Time			118		ns
E_{on}	Turn-On Switching Loss			19.7		mJ
E_{off}	Turn-Off Switching Loss			41.1		mJ
I_{SC}	SC Data	$t_p \leq 10\mu\text{s}, V_{GE}=15\text{V}, T_j=150^{\circ}\text{C}, V_{CC}=900\text{V}, V_{CEM} \leq 1200\text{V}$		1200		A

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V_F	Diode Forward Voltage	$I_F=300\text{A}, V_{GE}=0\text{V}, T_j=25^{\circ}\text{C}$		1.65	2.15	V
		$I_F=300\text{A}, V_{GE}=0\text{V}, T_j=125^{\circ}\text{C}$		1.70		
		$I_F=300\text{A}, V_{GE}=0\text{V}, T_j=150^{\circ}\text{C}$		1.65		
Q_r	Recovered Charge	$V_{CC}=600\text{V}, I_F=300\text{A},$ $-di/dt=4900\text{A}/\mu\text{s}, V_{GE}=-15\text{V},$ $T_j=25^{\circ}\text{C}$		29.2		μC
I_{RM}	Peak Reverse Recovery Current			360		A
E_{rec}	Reverse Recovery Energy			15.5		mJ
Q_r	Recovered Charge	$V_{CC}=600\text{V}, I_F=300\text{A},$ $-di/dt=4900\text{A}/\mu\text{s}, V_{GE}=-15\text{V},$ $T_j=125^{\circ}\text{C}$		66.7		μC
I_{RM}	Peak Reverse Recovery Current			450		A
E_{rec}	Reverse Recovery Energy			24.2		mJ
Q_r	Recovered Charge	$V_{CC}=600\text{V}, I_F=300\text{A},$ $-di/dt=4900\text{A}/\mu\text{s}, V_{GE}=-15\text{V},$ $T_j=150^{\circ}\text{C}$		77.1		μC
I_{RM}	Peak Reverse Recovery Current			475		A
E_{rec}	Reverse Recovery Energy			28.3		mJ

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

Symbol	Parameter	Min.	Typ.	Max.	Unit
L_{CE}	Stray Inductance		15		nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal to Chip		0.25		m Ω
R_{thJC}	Junction-to-Case (per IGBT)			0.105	K/W
	Junction-to-Case (per Diode)			0.252	
R_{thCH}	Case-to-Heatsink (per IGBT)		0.028		K/W
	Case-to-Heatsink (per Diode)		0.068		
	Case-to-Heatsink (per Module)		0.010		
M	Terminal Connection Torque, Screw M6	2.5		5.0	N.m
	Mounting Torque, Screw M6	3.0		5.0	
G	Weight of Module		300		g

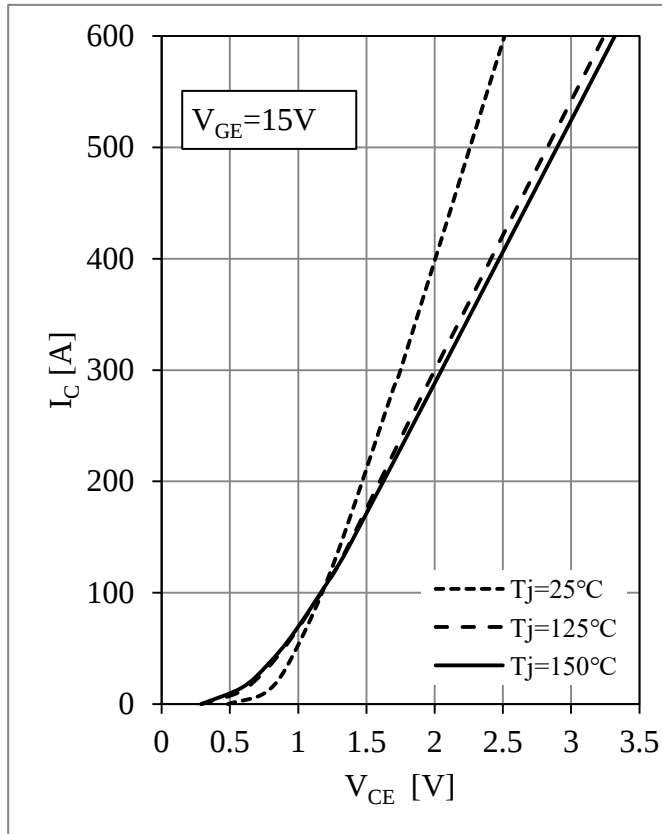


Fig 1. IGBT Output Characteristics

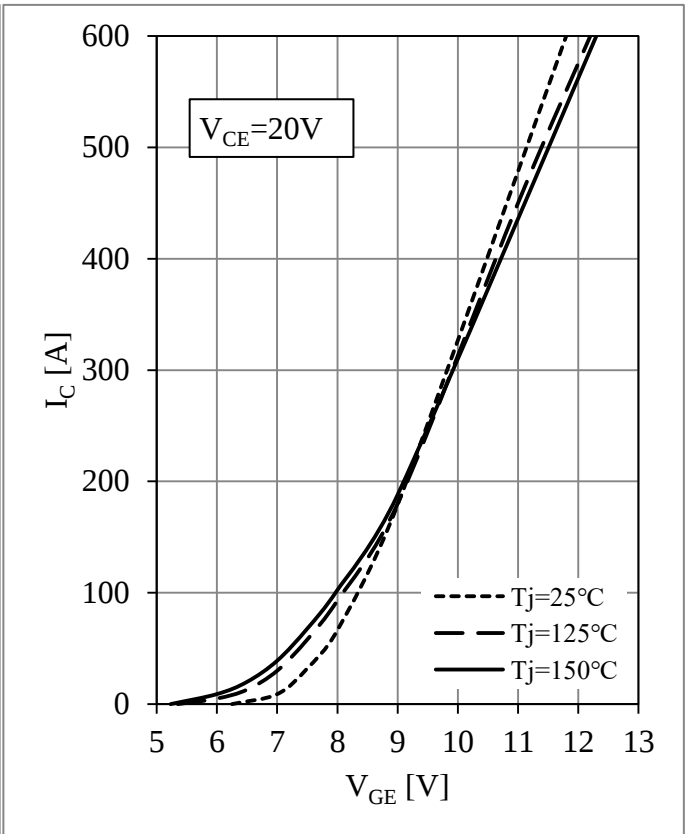
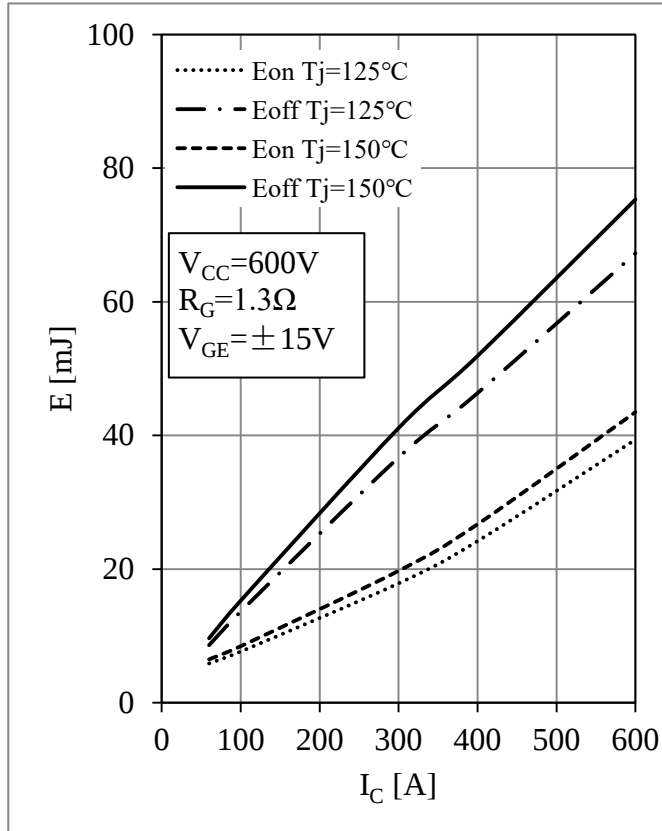
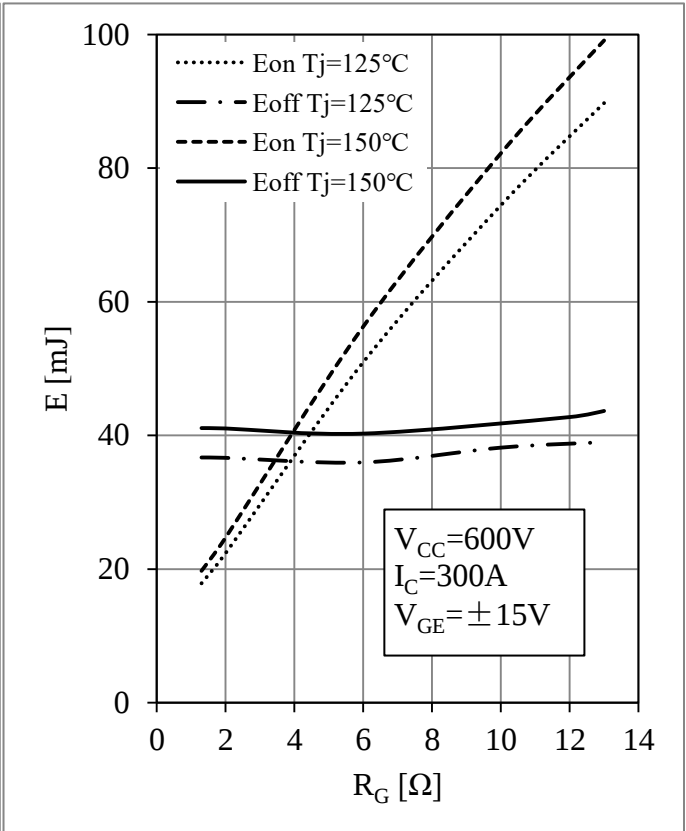


Fig 2. IGBT Transfer Characteristics

Fig 3. IGBT Switching Loss vs. I_C Fig 4. IGBT Switching Loss vs. R_G

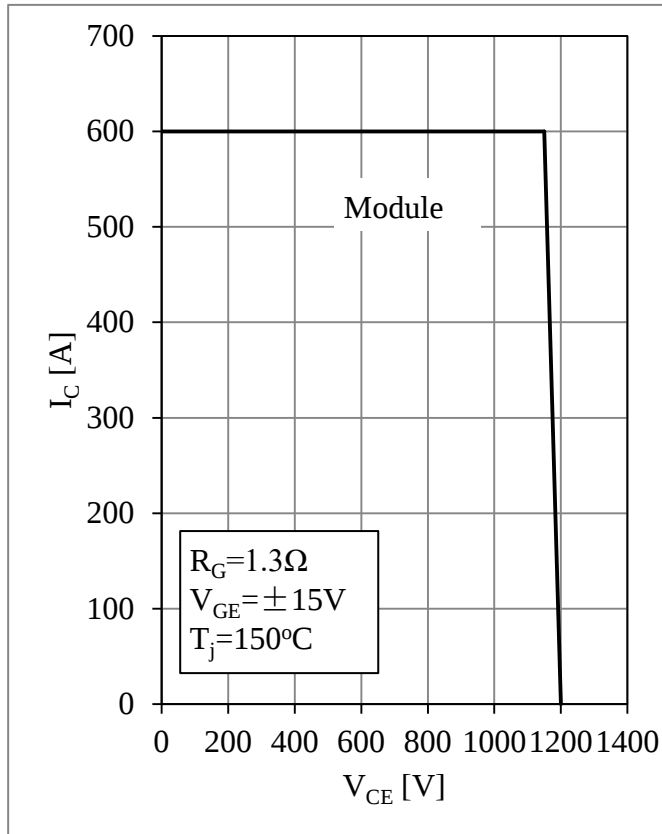


Fig 5. RBSOA

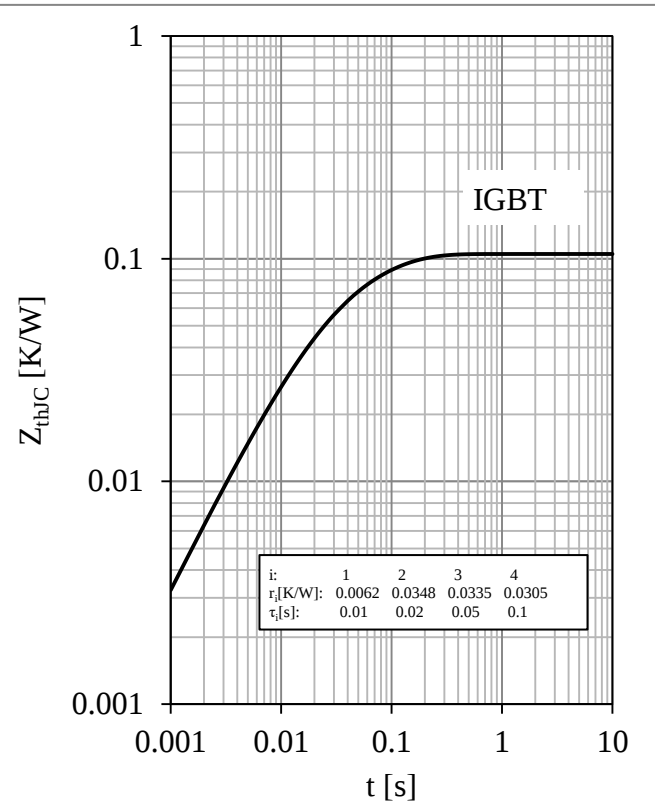


Fig 6. IGBT Transient Thermal Impedance

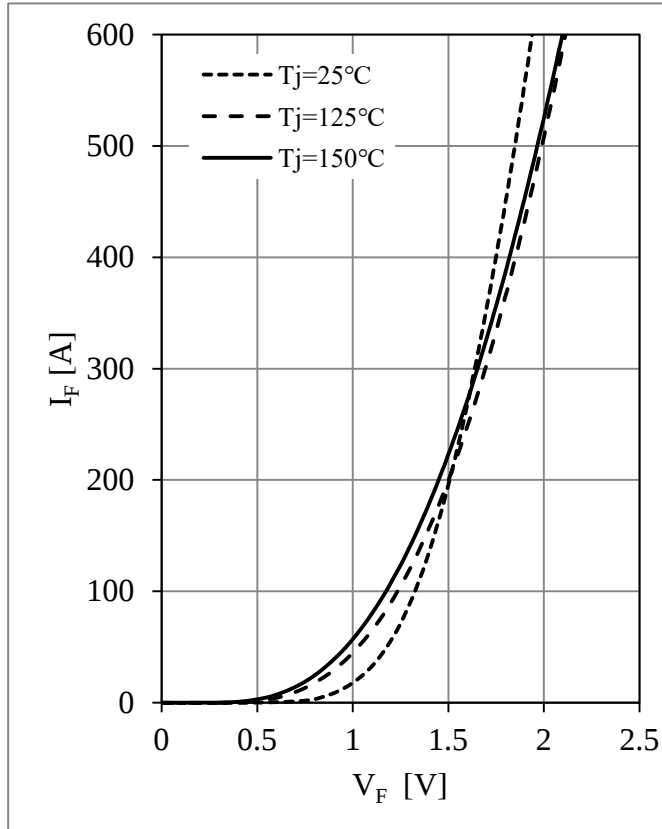
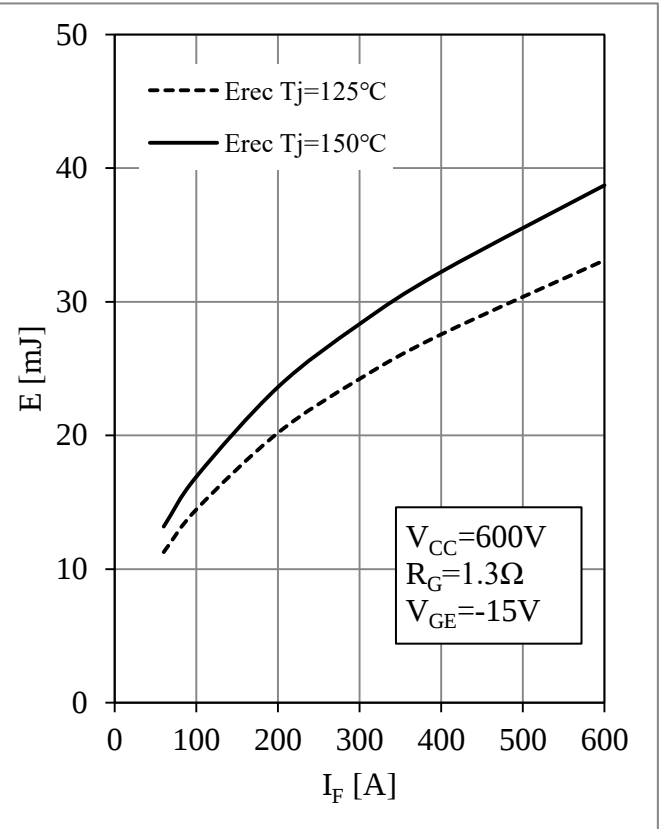


Fig 7. Diode Forward Characteristics

Fig 8. Diode Switching Loss vs. I_F

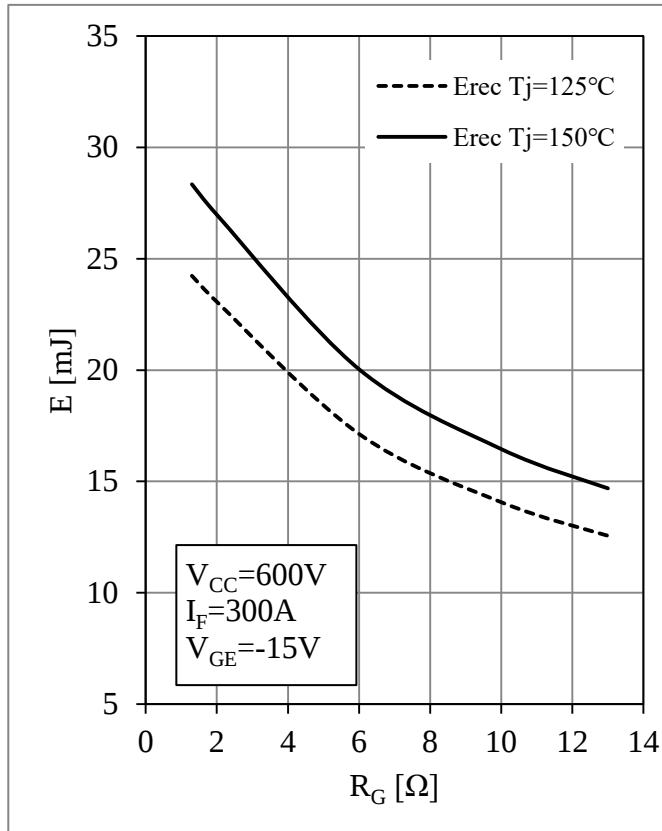
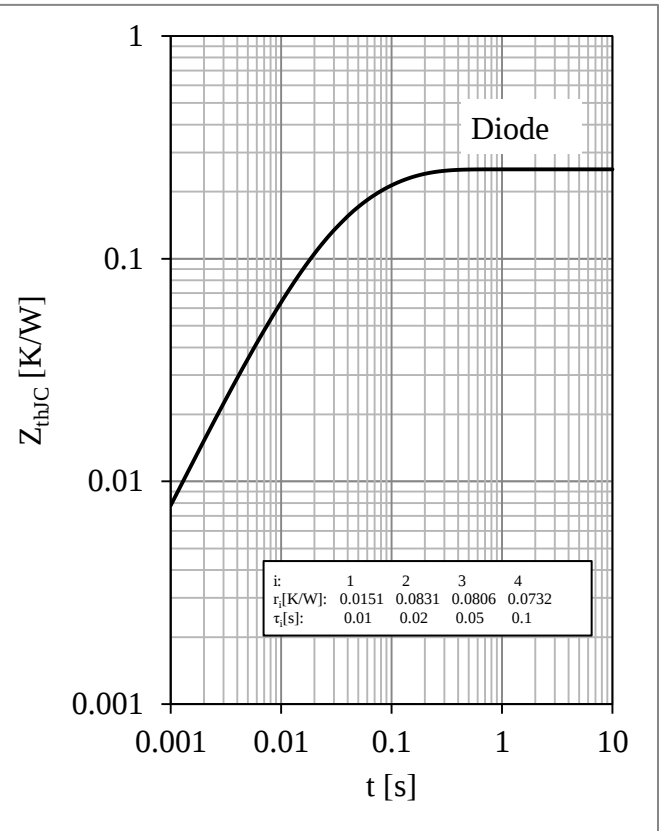
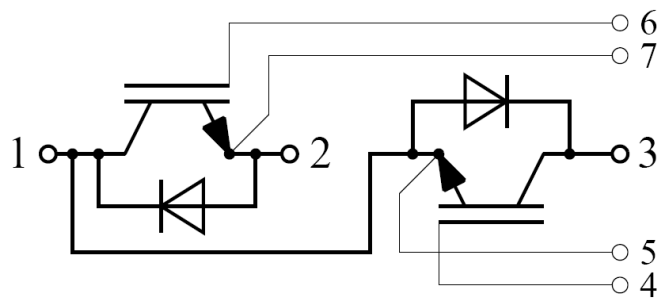
Fig 9. Diode Switching Loss vs. R_G 

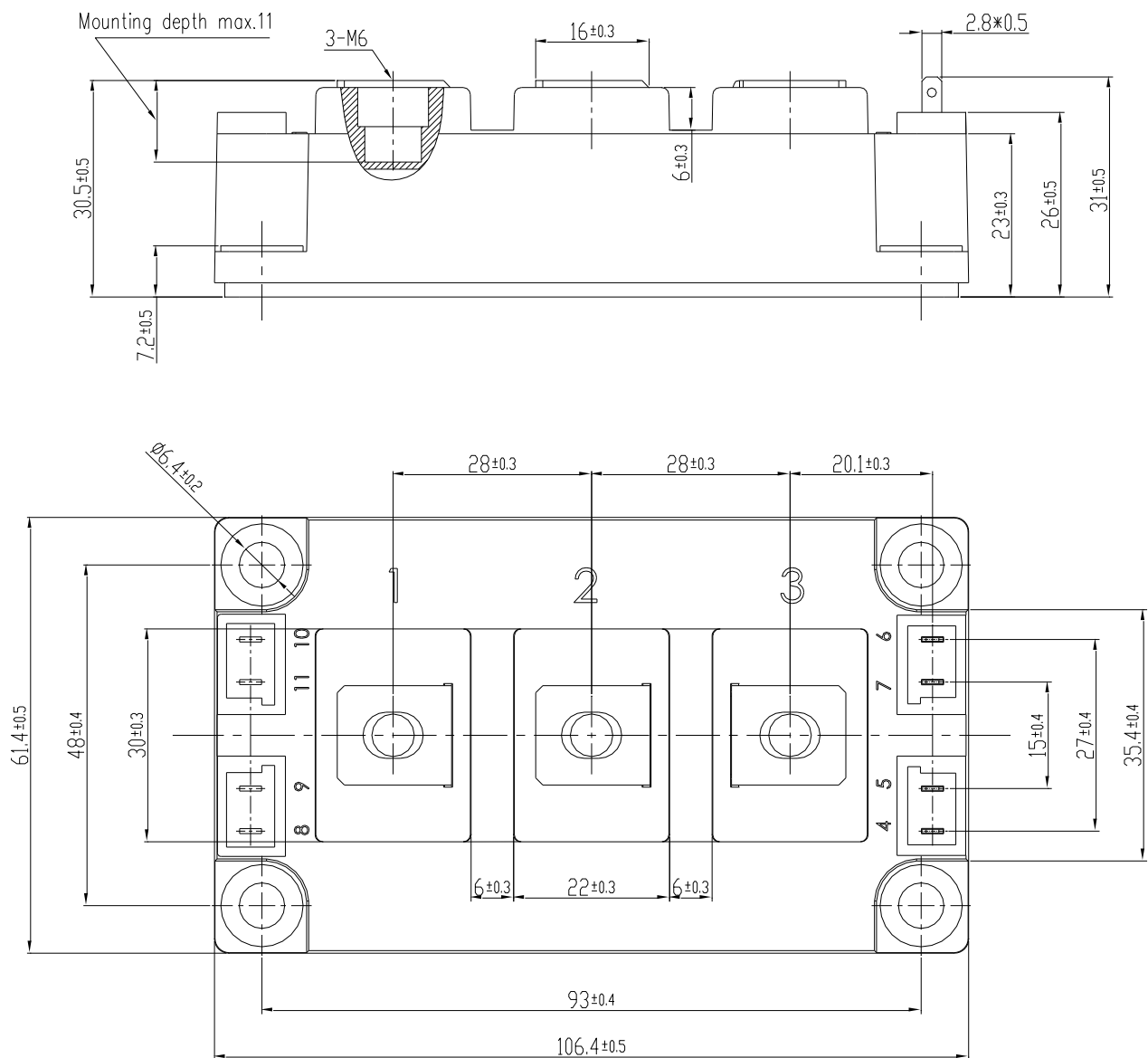
Fig 10. Diode Transient Thermal Impedance

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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