

STARPOWER

SEMICONDUCTOR

IGBT

GD300CUX120C2SA

1200V/300A chopper 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 inductive heating.

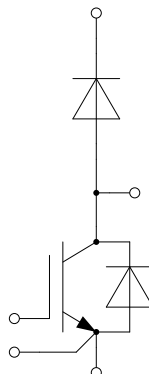
Features

- 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

- Switching mode power supply
- Inductive heating
- Electronic welder

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 @ $T_C=25^{\circ}\text{C}$	477	A
	@ $T_C=100^{\circ}\text{C}$	300	A
I_{CM}	Pulsed Collector Current $t_p=1\text{ms}$	600	A
P_D	Maximum Power Dissipation @ $T_{vj}=175^{\circ}\text{C}$	1578	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_{vjmax}	Maximum Junction Temperature	175	$^{\circ}\text{C}$
T_{vjop}	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	$I_C=300\text{A}, V_{GE}=15\text{V}, T_{vj}=25^{\circ}\text{C}$		1.70	2.15	V
		$I_C=300\text{A}, V_{GE}=15\text{V}, T_{vj}=125^{\circ}\text{C}$		1.95		
		$I_C=300\text{A}, V_{GE}=15\text{V}, T_{vj}=150^{\circ}\text{C}$		2.00		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=12.0\text{mA}, V_{CE}=V_{GE}, T_{vj}=25^{\circ}\text{C}$	5.6	6.2	6.8	V
I_{CES}	Collector Cut-Off Current	$V_{CE}=V_{CES}, V_{GE}=0\text{V}, T_{vj}=25^{\circ}\text{C}$			1.0	mA
I_{GES}	Gate-Emitter Leakage Current	$V_{GE}=V_{GES}, V_{CE}=0\text{V}, T_{vj}=25^{\circ}\text{C}$			400	nA
R_{Gint}	Internal Gate Resistance			1.0		Ω
C_{ies}	Input Capacitance	$V_{CE}=25\text{V}, f=1\text{MHz}, V_{GE}=0\text{V}$		31.1		nF
C_{res}	Reverse Transfer Capacitance			0.87		nF
Q_G	Gate Charge	$V_{GE}=-15\dots+15\text{V}$		2.33		μC
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600\text{V}, I_C=300\text{A}, R_G=1.3\Omega, L_s=43\text{nH}, V_{GE}=\pm 15\text{V}, T_{vj}=25^{\circ}\text{C}$		181		ns
t_r	Rise Time			39		ns
$t_{d(off)}$	Turn-Off Delay Time			305		ns
t_f	Fall Time			199		ns
E_{on}	Turn-On Switching Loss			22.7		mJ
E_{off}	Turn-Off Switching Loss			21.0		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600\text{V}, I_C=300\text{A}, R_G=1.3\Omega, L_s=43\text{nH}, V_{GE}=\pm 15\text{V}, T_{vj}=125^{\circ}\text{C}$		191		ns
t_r	Rise Time			45		ns
$t_{d(off)}$	Turn-Off Delay Time			357		ns
t_f	Fall Time			313		ns
E_{on}	Turn-On Switching Loss			39.8		mJ
E_{off}	Turn-Off Switching Loss			30.7		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600\text{V}, I_C=300\text{A}, R_G=1.3\Omega, L_s=43\text{nH}, V_{GE}=\pm 15\text{V}, T_{vj}=150^{\circ}\text{C}$		193		ns
t_r	Rise Time			47		ns
$t_{d(off)}$	Turn-Off Delay Time			368		ns
t_f	Fall Time			336		ns
E_{on}	Turn-On Switching Loss			44.2		mJ
E_{off}	Turn-Off Switching Loss			32.3		mJ
I_{SC}	SC Data	$t_p \leq 10\mu\text{s}, V_{GE}=15\text{V}, T_{vj}=150^{\circ}\text{C}, V_{CC}=800\text{V}, V_{CEM} \leq 1200\text{V}$		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	$I_F=300\text{A}, V_{GE}=0\text{V}, T_{vj}=25^{\circ}\text{C}$		1.85	2.30	V
		$I_F=300\text{A}, V_{GE}=0\text{V}, T_{vj}=125^{\circ}\text{C}$		1.90		
		$I_F=300\text{A}, V_{GE}=0\text{V}, T_{vj}=150^{\circ}\text{C}$		1.95		
Q_r	Recovered Charge	$V_R=600\text{V}, I_F=300\text{A},$ $-di/dt=7400\text{A}/\mu\text{s}, L_s=43\text{nH},$ $V_{GE}=-15\text{V}, T_{vj}=25^{\circ}\text{C}$		59.7		μC
I_{RM}	Peak Reverse Recovery Current			397		A
E_{rec}	Reverse Recovery Energy			24.9		mJ
Q_r	Recovered Charge	$V_R=600\text{V}, I_F=300\text{A},$ $-di/dt=6300\text{A}/\mu\text{s}, L_s=43\text{nH},$ $V_{GE}=-15\text{V}, T_{vj}=125^{\circ}\text{C}$		91.8		μC
I_{RM}	Peak Reverse Recovery Current			383		A
E_{rec}	Reverse Recovery Energy			36.5		mJ
Q_r	Recovered Charge	$V_R=600\text{V}, I_F=300\text{A},$ $-di/dt=6100\text{A}/\mu\text{s}, L_s=43\text{nH},$ $V_{GE}=-15\text{V}, T_{vj}=150^{\circ}\text{C}$		99.6		μC
I_{RM}	Peak Reverse Recovery Current			380		A
E_{rec}	Reverse Recovery Energy			39.1		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		0.35		m Ω
R_{thJC}	Junction-to-Case (per IGBT)			0.095	K/W
	Junction-to-Case (per Diode)			0.163	
R_{thCH}	Case-to-Heatsink (per IGBT)		0.022		K/W
	Case-to-Heatsink (per Diode)		0.037		
	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

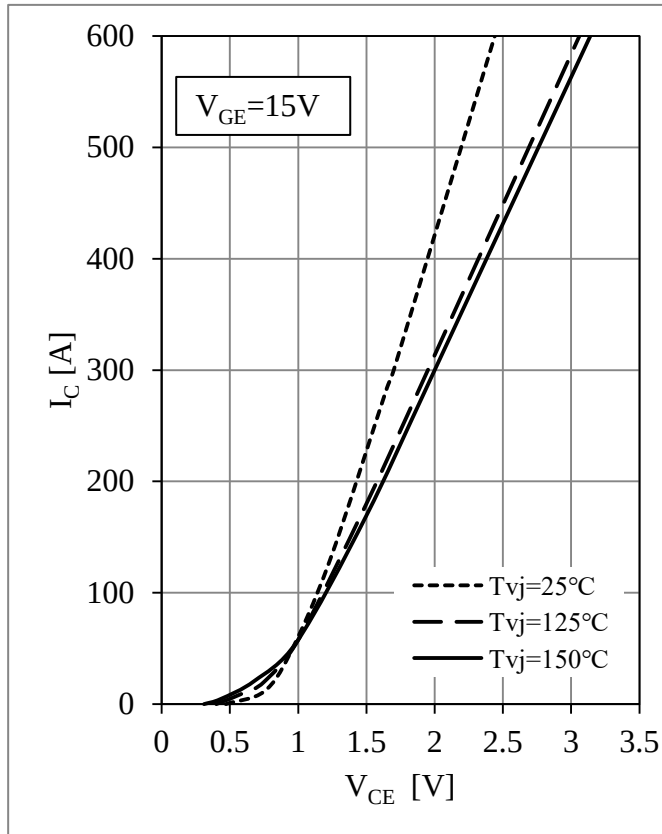


Fig 1. IGBT Output Characteristics

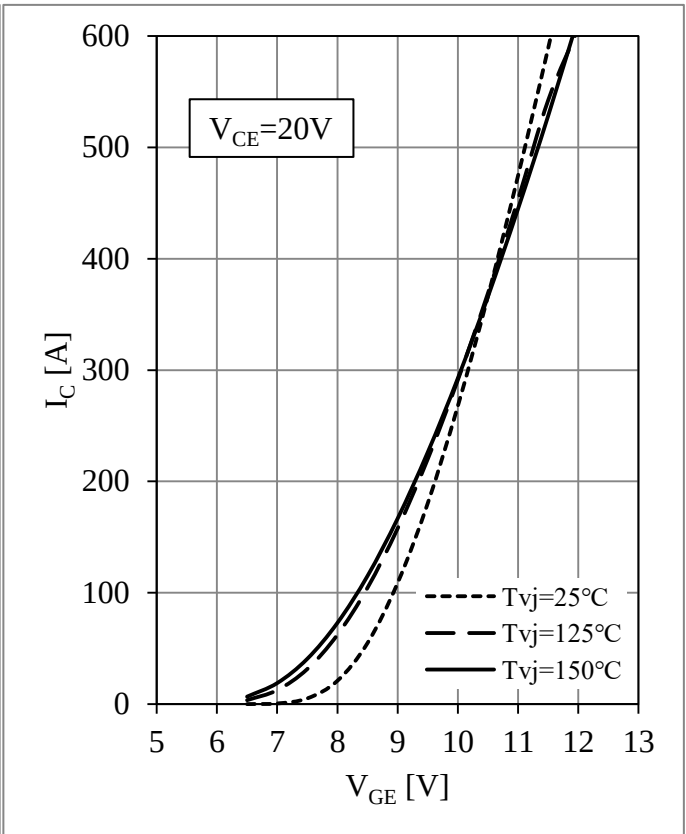
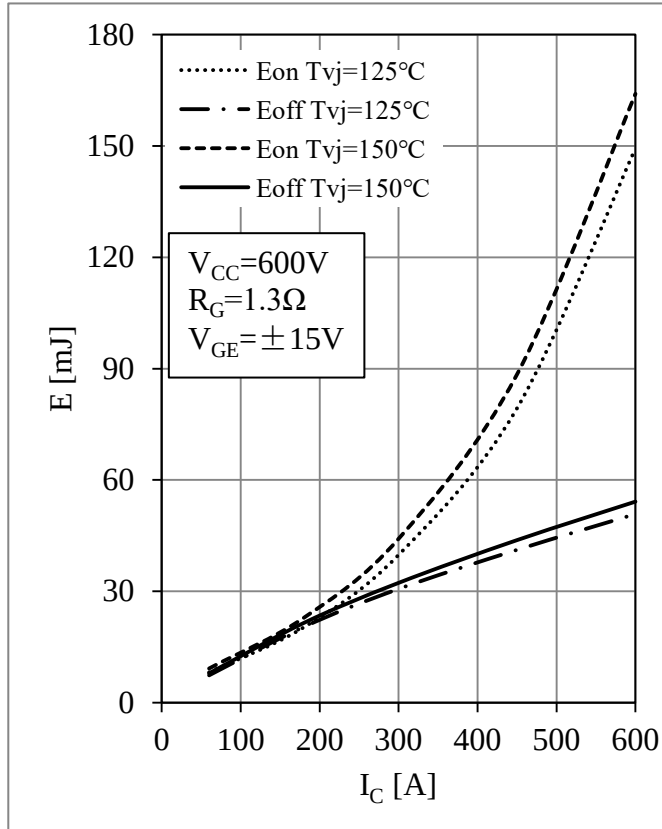
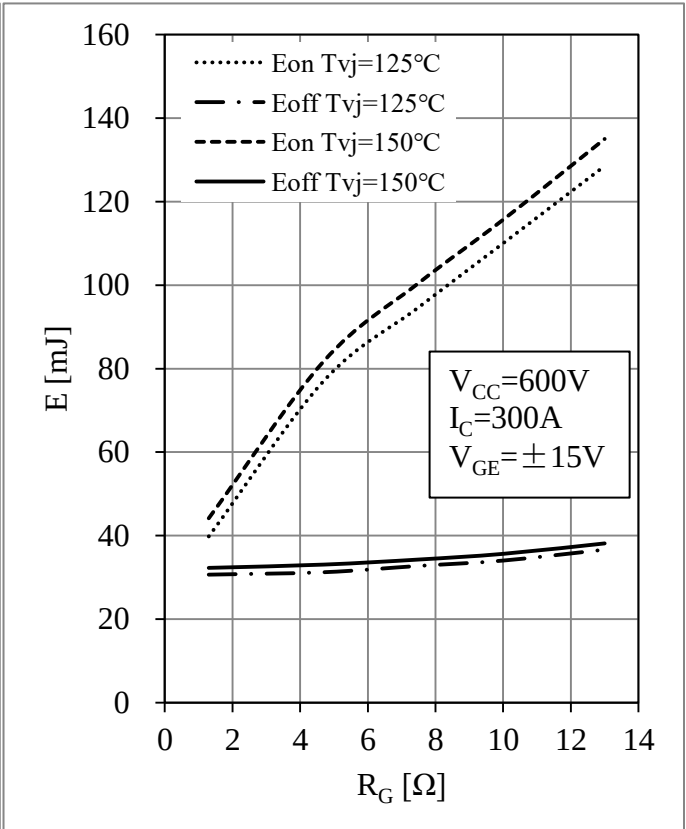


Fig 2. IGBT Transfer Characteristics

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

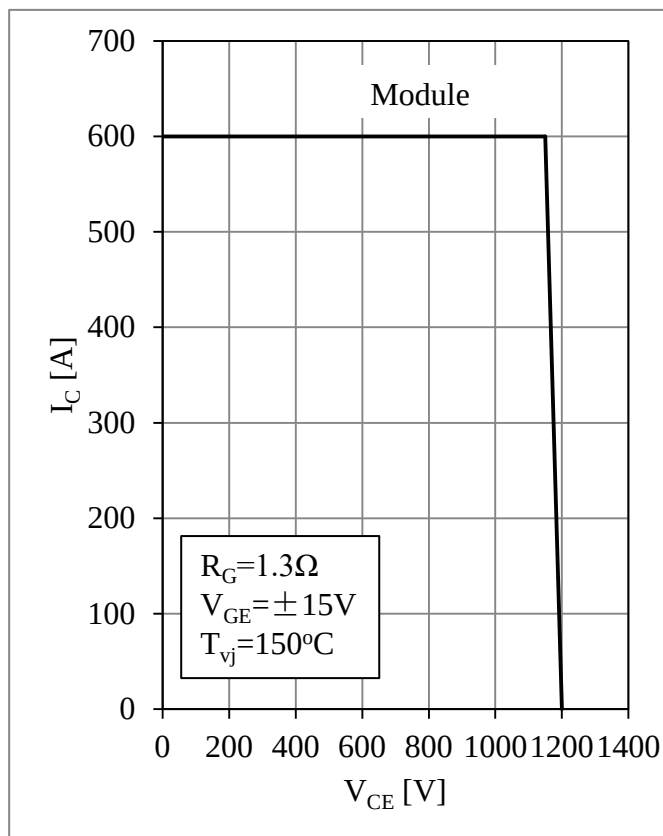


Fig 5. RBSOA

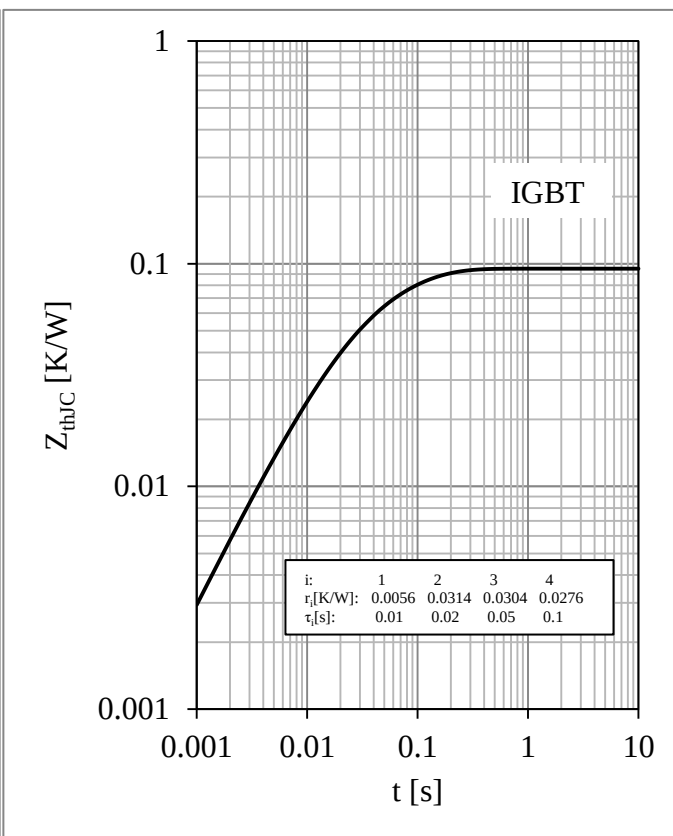


Fig 6. IGBT Transient Thermal Impedance

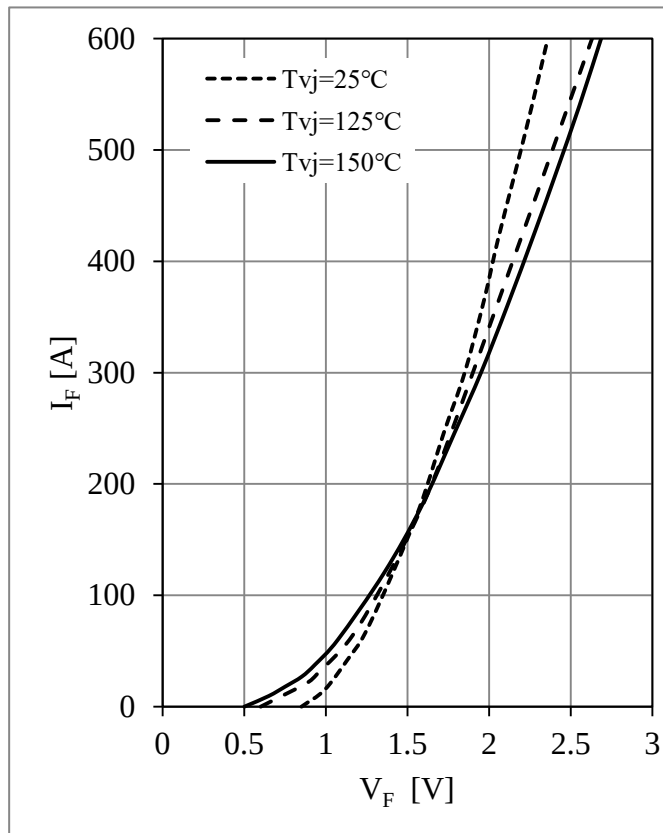
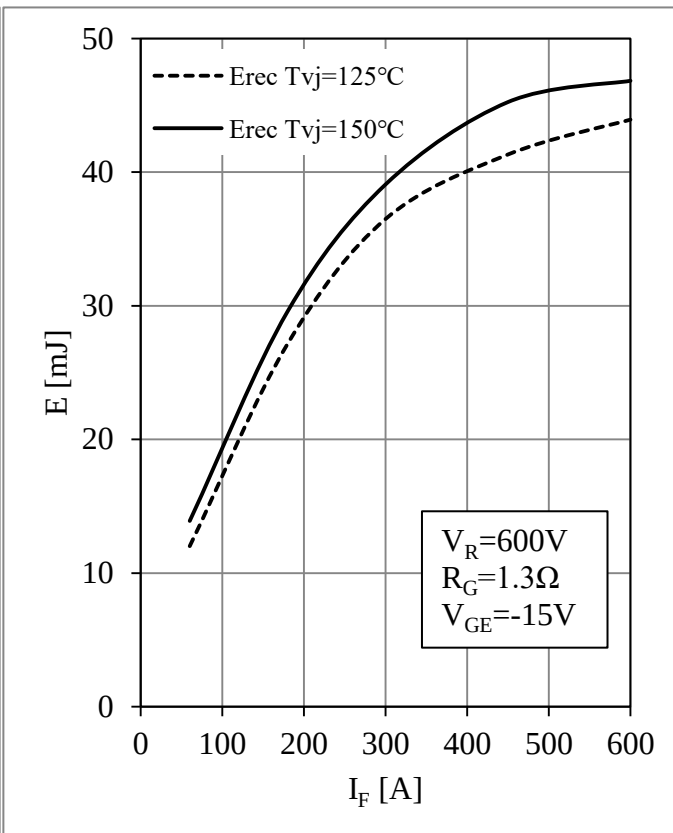


Fig 7. Diode Forward Characteristics

Fig 8. Diode Switching Loss vs. I_F

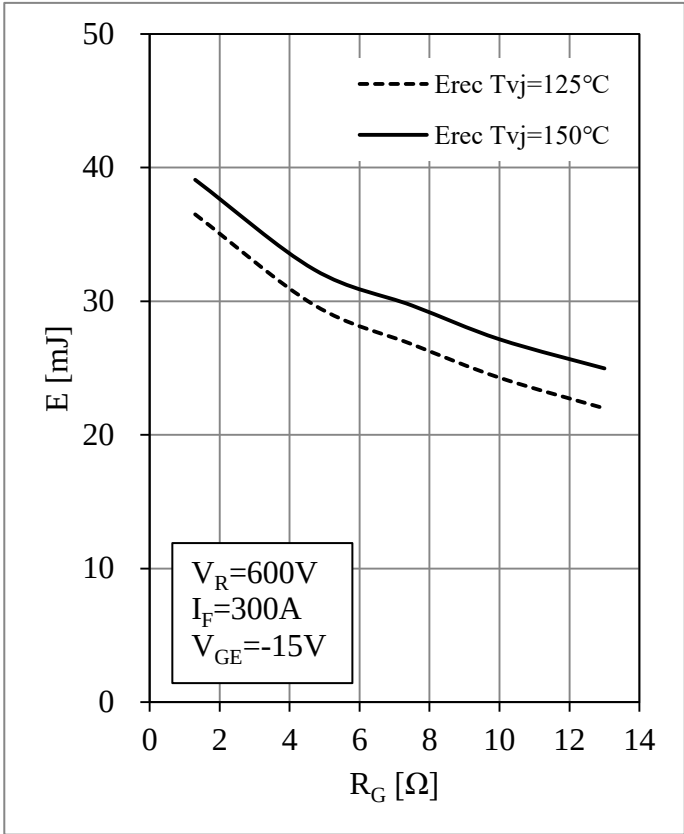


Fig 9. Diode Switching Loss vs. R_G

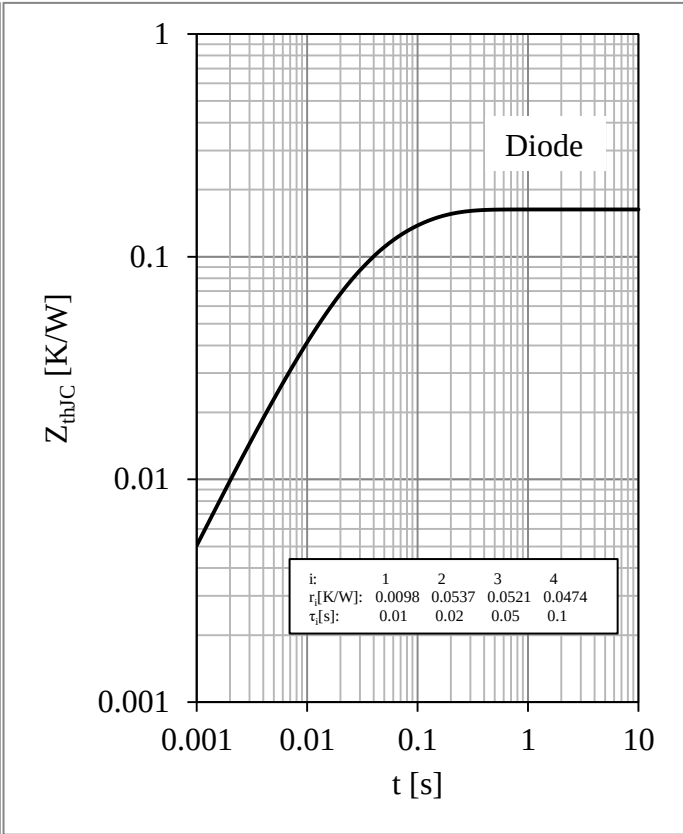
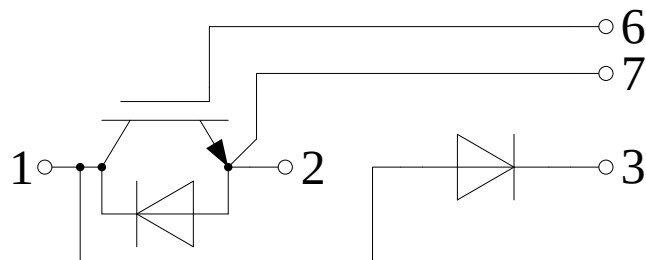


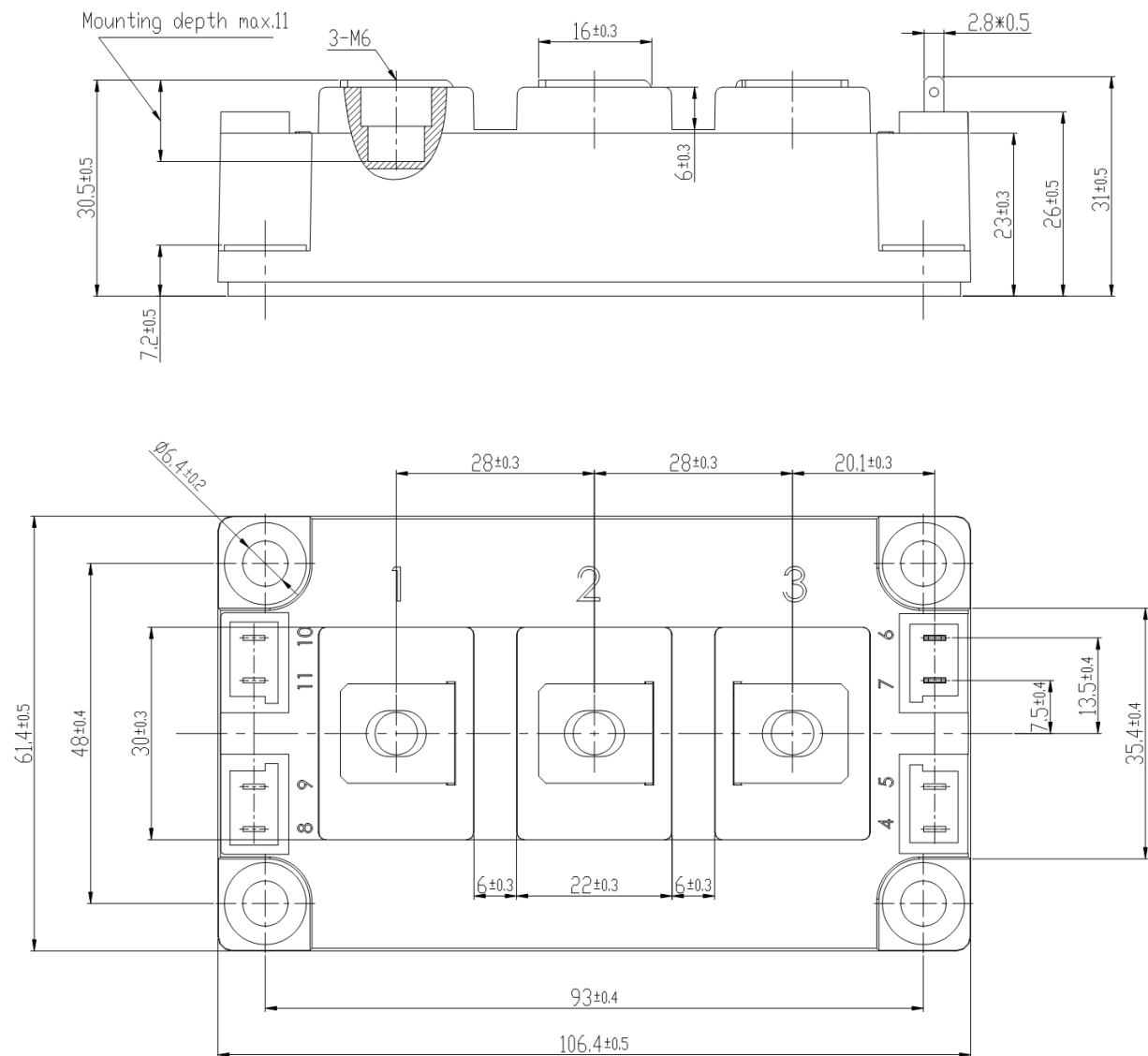
Fig 10. Diode Transient Thermal Impedance

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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