

STARPOWER

SEMICONDUCTOR

IGBT

GD50HFU120C1SD

1200V/50A 2 in one-package

General Description

STARPOWER IGBT Power Module provides ultra switching speed as well as short circuit ruggedness. They are designed for the applications such as electronic welder and inductive heating.

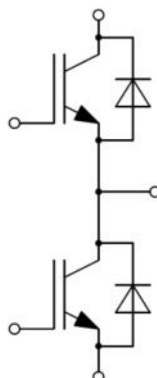
Features

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

Typical Applications

- 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 @ $T_C=25^{\circ}\text{C}$ @ $T_C=90^{\circ}\text{C}$	82 50	A
I_{CM}	Pulsed Collector Current $t_p=1\text{ms}$	100	A
P_D	Maximum Power Dissipation @ $T_{vj}=150^{\circ}\text{C}$	440	W

Diode

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1200	V
I_F	Diode Continuous Forward Current	50	A
I_{FM}	Diode Maximum Forward Current $t_p=1\text{ms}$	100	A

Module

Symbol	Description	Value	Unit
T_{vjmax}	Maximum Junction Temperature	150	$^{\circ}\text{C}$
T_{vjop}	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	$I_C=50\text{A}, V_{GE}=15\text{V}, T_{vj}=25^{\circ}\text{C}$		2.90	3.35	V
		$I_C=50\text{A}, V_{GE}=15\text{V}, T_{vj}=125^{\circ}\text{C}$		3.60		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=2.0\text{mA}, V_{CE}=V_{GE}, T_{vj}=25^{\circ}\text{C}$	5.0	6.1	7.0	V
I_{CES}	Collector Cut-Off Current	$V_{CE}=V_{CES}, V_{GE}=0\text{V}, T_{vj}=25^{\circ}\text{C}$			5.0	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			2		Ω
C_{ies}	Input Capacitance	$V_{CE}=25\text{V}, f=1\text{MHz}, V_{GE}=0\text{V}$		3.41		nF
C_{res}	Reverse Transfer Capacitance			0.20		nF
Q_G	Gate Charge	$V_{GE}=-15\dots+15\text{V}$		0.61		μC
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600\text{V}, I_C=50\text{A}, R_G=15\Omega, L_S=60\text{nH}, V_{GE}=\pm 15\text{V}, T_{vj}=25^{\circ}\text{C}$		40		ns
t_r	Rise Time			59		ns
$t_{d(off)}$	Turn-Off Delay Time			260		ns
t_f	Fall Time			30		ns
E_{on}	Turn-On Switching Loss			5.08		mJ
E_{off}	Turn-Off Switching Loss			1.23		mJ
$t_{d(on)}$	Turn-On Delay Time			37		ns
t_r	Rise Time			57		ns
$t_{d(off)}$	Turn-Off Delay Time	$V_{CC}=600\text{V}, I_C=50\text{A}, R_G=15\Omega, L_S=60\text{nH}, V_{GE}=\pm 15\text{V}, T_{vj}=125^{\circ}\text{C}$		288		ns
t_f	Fall Time			59		ns
E_{on}	Turn-On Switching Loss			5.97		mJ
E_{off}	Turn-Off Switching Loss			1.78		mJ
I_{SC}	SC Data	$t_P \leq 10\mu\text{s}, V_{GE}=15\text{V}, T_{vj}=125^{\circ}\text{C}, V_{CC}=900\text{V}, V_{CEM} \leq 1200\text{V}$		300		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	$I_F=50\text{A}, V_{GE}=0\text{V}, T_{vj}=25^{\circ}\text{C}$		1.85	2.30	V
		$I_F=50\text{A}, V_{GE}=0\text{V}, T_{vj}=125^{\circ}\text{C}$		1.90		
Q_r	Recovered Charge	$V_R=600\text{V}, I_F=50\text{A},$ $-di/dt=760\text{A}/\mu\text{s}, V_{GE}=-15\text{V}$ $L_S=60\text{nH}, T_{vj}=25^{\circ}\text{C}$		3.86		μC
I_{RM}	Peak Reverse Recovery Current			32		A
E_{rec}	Reverse Recovery Energy			1.13		mJ
Q_r	Recovered Charge	$V_R=600\text{V}, I_F=50\text{A},$ $-di/dt=830\text{A}/\mu\text{s}, V_{GE}=-15\text{V}$ $L_S=60\text{nH}, T_{vj}=125^{\circ}\text{C}$		6.37		μC
I_{RM}	Peak Reverse Recovery Current			37		A
E_{rec}	Reverse Recovery Energy			2.20		mJ

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

Symbol	Parameter	Min.	Typ.	Max.	Unit
L_{CE}	Stray Inductance		30		nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal to Chip		0.65		m Ω
R_{thJC}	Junction-to-Case (per IGBT)			0.284	K/W
	Junction-to-Case (per Diode)			0.655	
R_{thCH}	Case-to-Heatsink (per IGBT)		0.143		K/W
	Case-to-Heatsink (per Diode)		0.331		
	Case-to-Heatsink (per Module)		0.050		
M	Terminal Connection Torque, Screw M5	2.5		5.0	N.m
	Mounting Torque, Screw M6	3.0		5.0	
G	Weight of Module		150		g

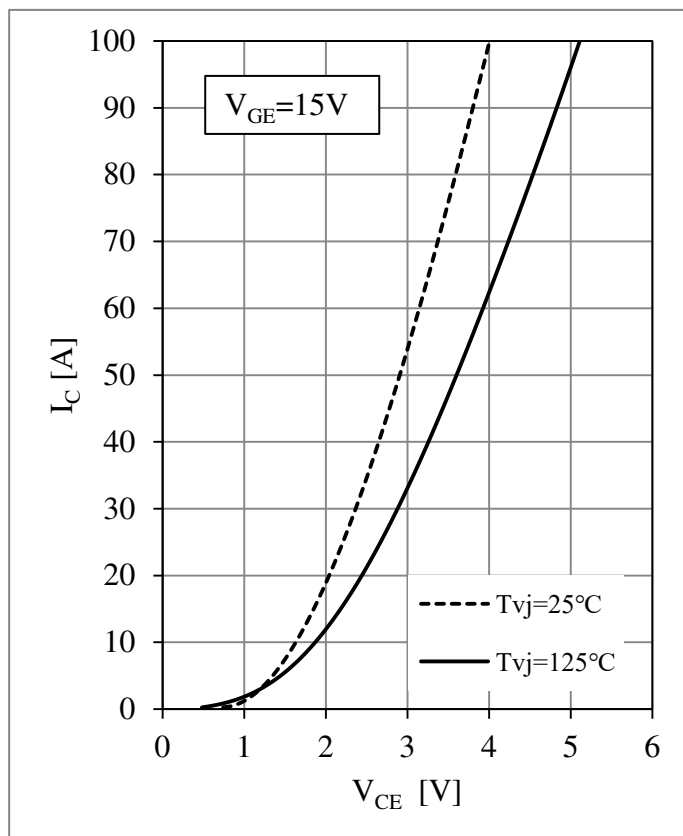


Fig 1. IGBT Output Characteristics

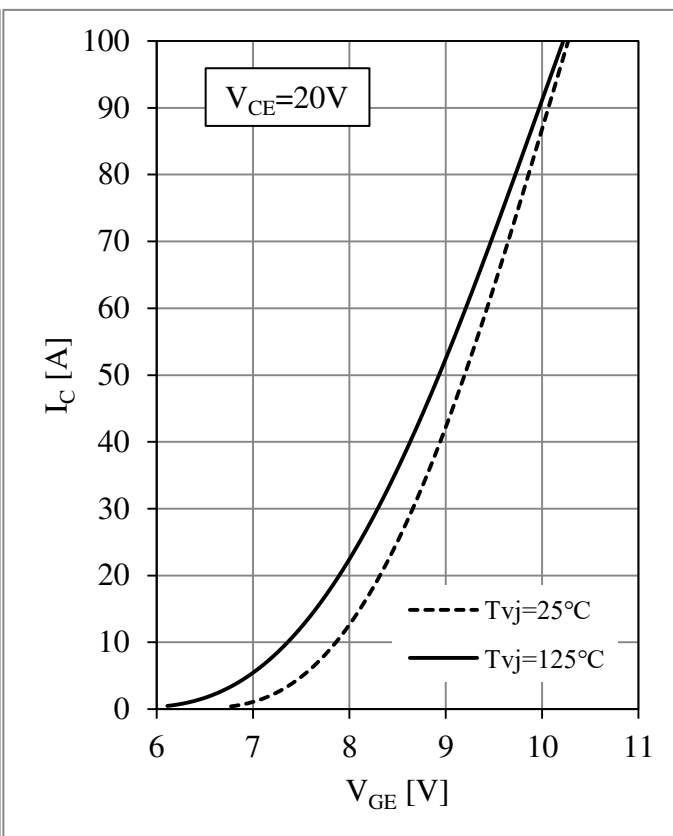
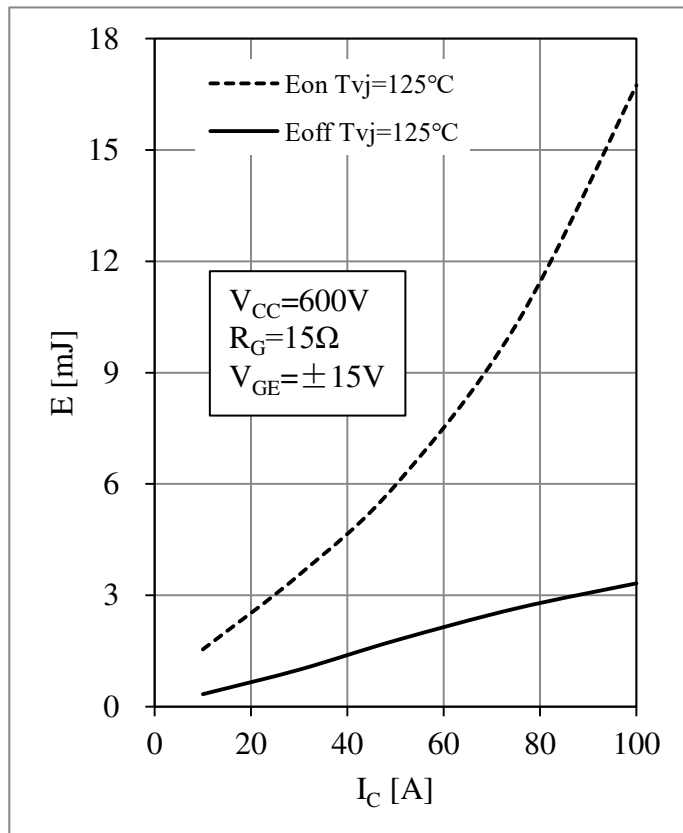
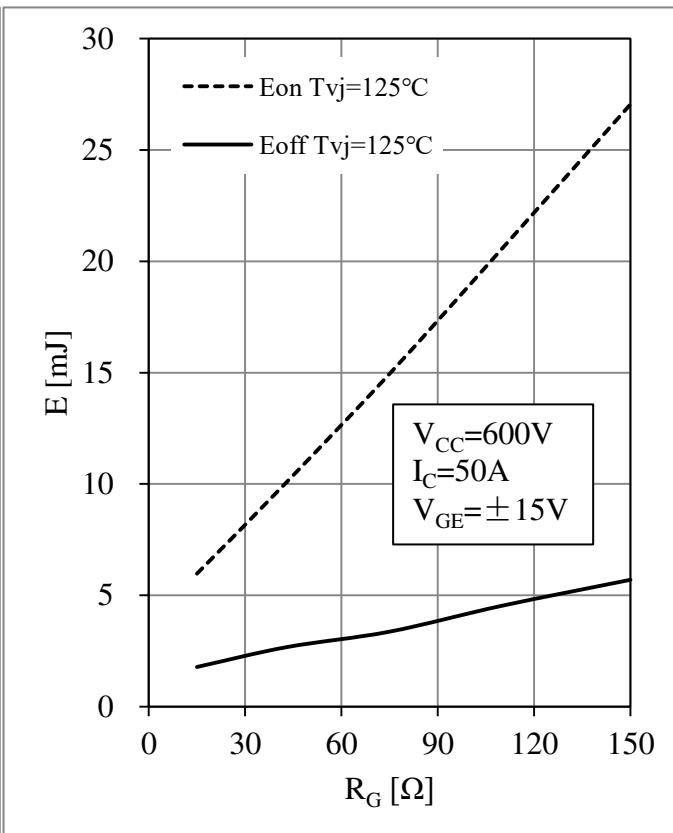


Fig 2. IGBT Transfer Characteristics

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

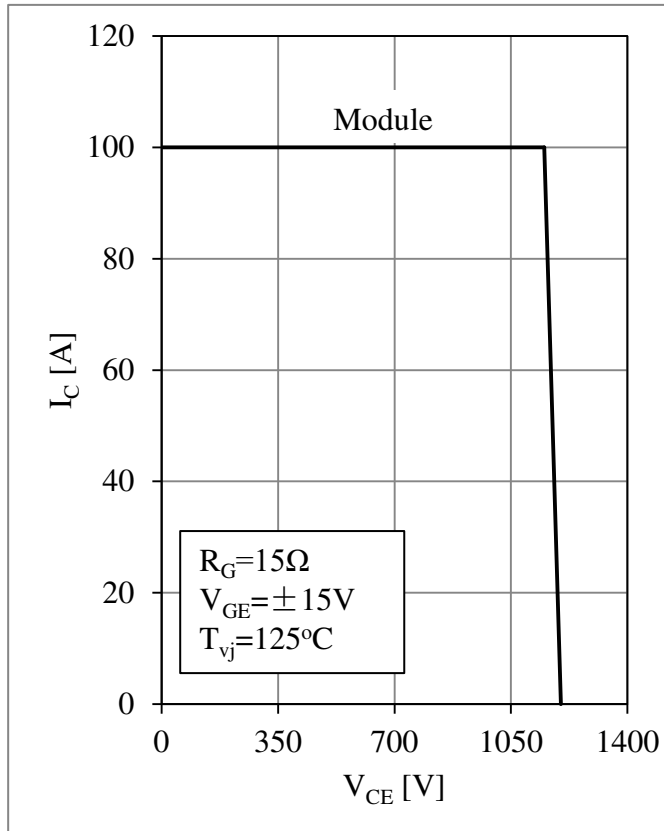


Fig 5. RBSOA

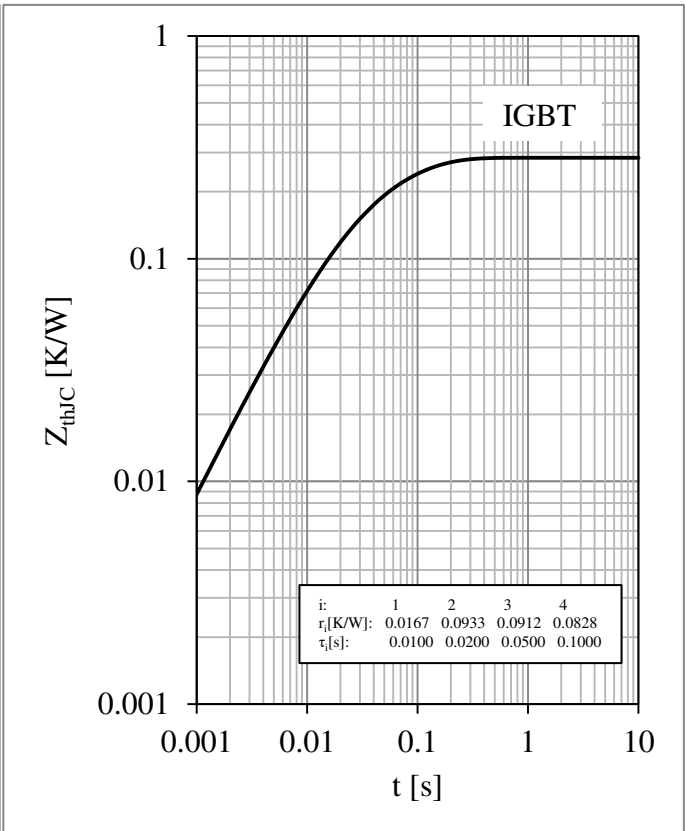


Fig 6. IGBT Transient Thermal Impedance

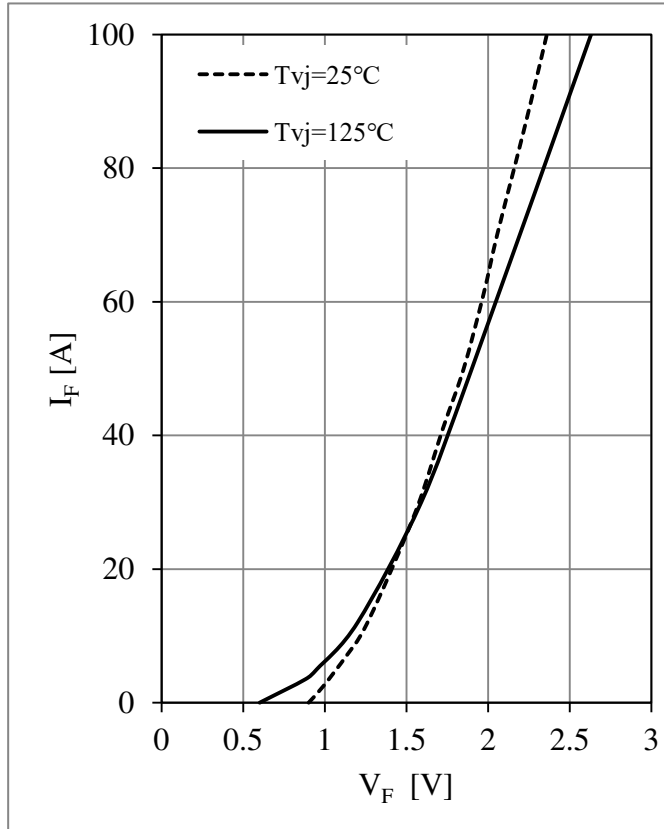
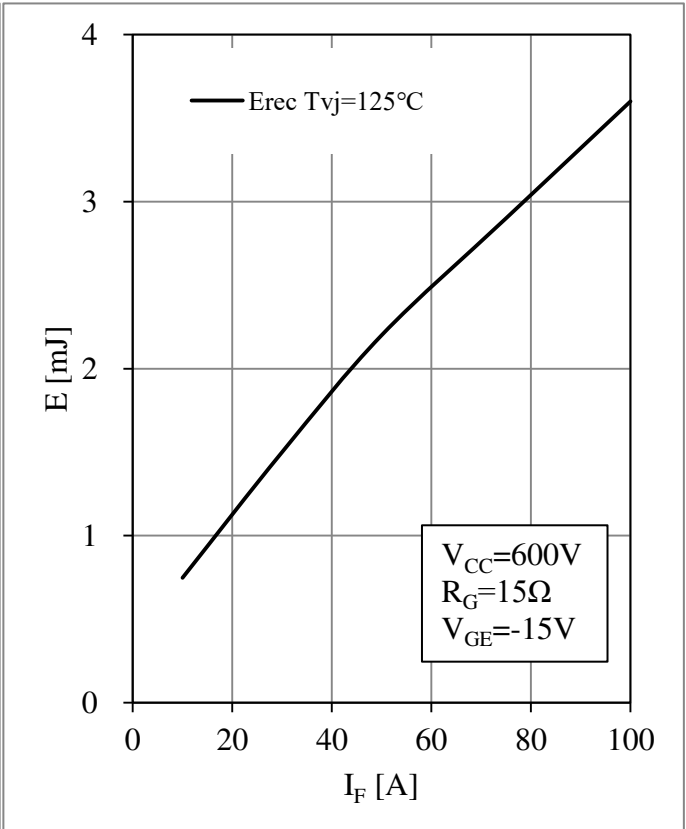


Fig 7. Diode Forward Characteristics

Fig 8. Diode Switching Loss vs. I_F

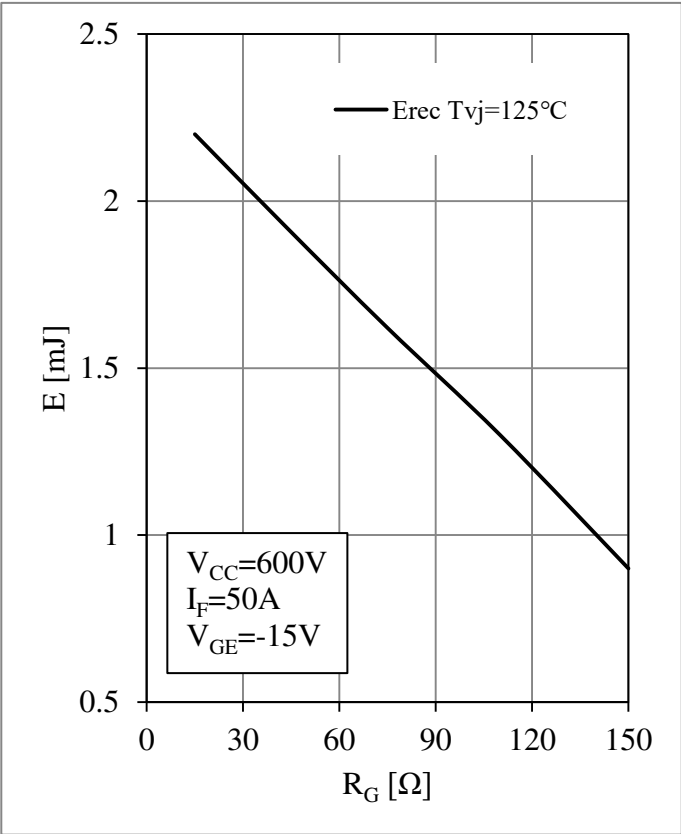


Fig 9. Diode Switching Loss vs. R_G

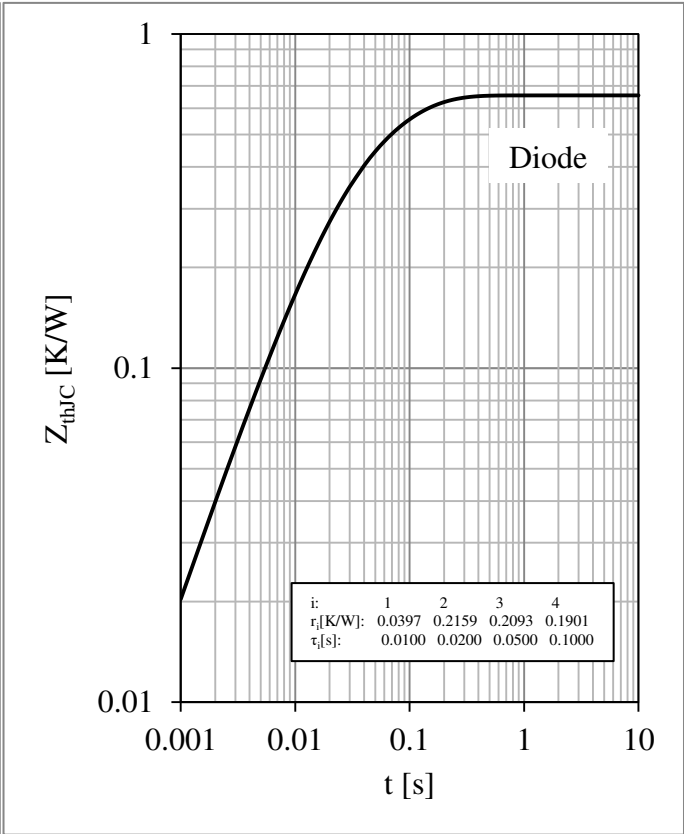
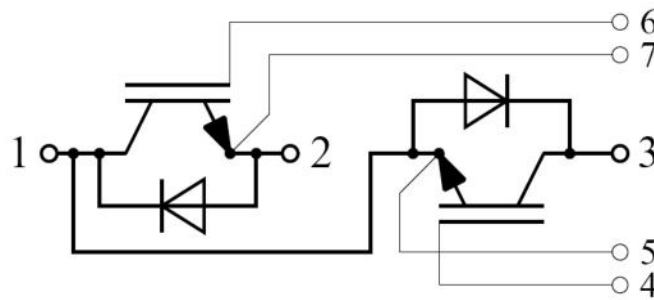


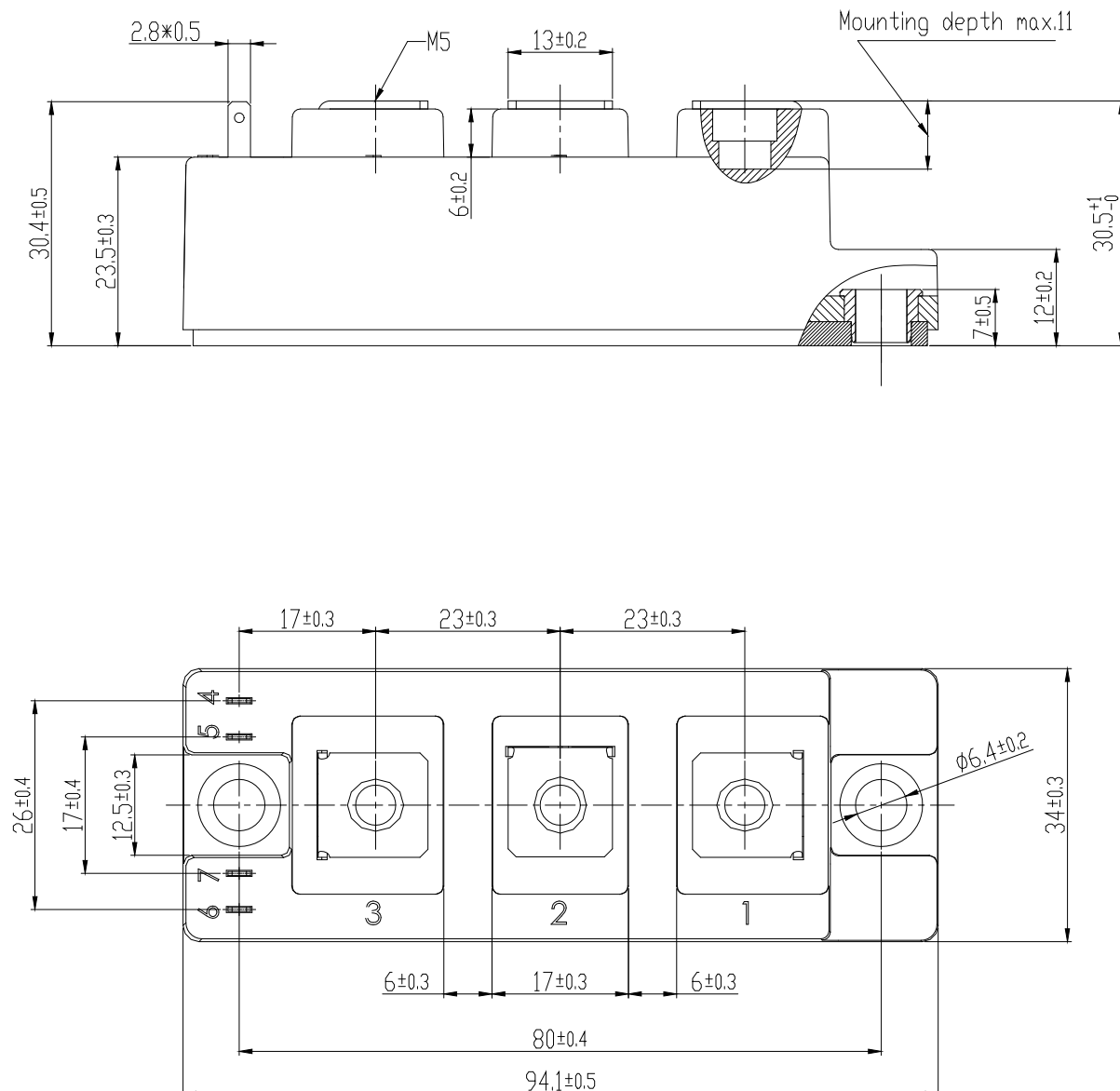
Fig 10. Diode Transient Thermal Impedance

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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