

STARPOWER

SEMICONDUCTOR

IGBT

GD150HFK60C1S

Molding Type Module

600V/150A 2 in one-package

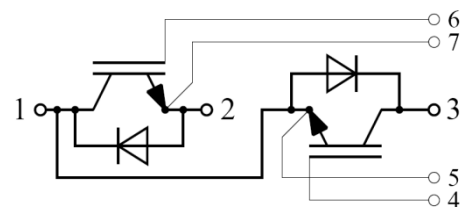
General Description

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



Features

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



Equivalent Circuit Schematic

Typical Applications

- Electrical welder
- SMPS
- UPS

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

Symbol	Description	GD150HFK60C1S	Units
V_{CES}	Collector-Emitter Voltage	600	V
V_{GES}	Gate-Emitter Voltage	± 20	V
I_C	Collector Current @ $T_C=25^{\circ}\text{C}$ @ $T_C=80^{\circ}\text{C}$	210	A
		150	
I_{CM}	Pulsed Collector Current $t_p=1\text{ms}$	300	A
I_F	Diode Continuous Forward Current	150	A
I_{FM}	Diode Maximum Forward Current $t_p=1\text{ms}$	300	A
P_D	Maximum Power Dissipation @ $T_j=150^{\circ}\text{C}$	576	W
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
Mounting Torque	Power Terminal Screw:M5 Mounting Screw:M6	2.5 to 5.0 3.0 to 5.0	N.m
Weight	Weight of Module	150	g

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	$T_j=25^{\circ}\text{C}$	600			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

On Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=500\mu\text{A}, V_{CE}=V_{GE},$ $T_j=25^{\circ}\text{C}$	3.5	4.5	5.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C=150\text{A}, V_{GE}=15\text{V},$ $T_j=25^{\circ}\text{C}$		1.90	2.35	V
		$I_C=150\text{A}, V_{GE}=15\text{V},$ $T_j=125^{\circ}\text{C}$		2.20		

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=300V, I_C=150A,$ $R_G=10\Omega, V_{GE}=\pm 15V,$ $T_j=25^\circ C$		302		ns
t_r	Rise Time			110		ns
$t_{d(off)}$	Turn-Off Delay Time			298		ns
t_f	Fall Time			89		ns
E_{on}	Turn-On Switching Loss			2.77		mJ
E_{off}	Turn-Off Switching Loss			3.12		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=300V, I_C=150A,$ $R_G=10\Omega, V_{GE}=\pm 15V,$ $T_j=125^\circ C$		319		ns
t_r	Rise Time			114		ns
$t_{d(off)}$	Turn-Off Delay Time			312		ns
t_f	Fall Time			111		ns
E_{on}	Turn-On Switching Loss			2.98		mJ
E_{off}	Turn-Off Switching Loss			4.27		mJ
C_{ies}	Input Capacitance	$V_{CE}=30V, f=1MHz,$ $V_{GE}=0V$		8.60		nF
C_{oes}	Output Capacitance			0.70		nF
C_{res}	Reverse Transfer Capacitance			0.32		nF
I_{SC}	SC Data	$t_p \leq 10\mu s, V_{GE}=15V,$ $T_j=125^\circ C, V_{CC}=360V,$ $V_{CEM} \leq 600V$		1350		A
Q_G	Gate Charge	$V_{CC}=400V, I_C=150A,$ $V_{GE}=15V$		0.54		μC
R_{Gint}	Internal Gate Resistance			2.35		Ω
L_{CE}	Stray Inductance				30	nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal To Chip			0.75		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 Voltage	$I_F=150A$	$T_j=25^\circ C$	1.35	1.80	V
			$T_j=125^\circ C$	1.33		
Q_r	Recovered Charge	$I_F=150A,$	$T_j=25^\circ C$	6.4		μC
			$T_j=125^\circ C$	9.1		
I_{RM}	Peak Reverse Recovery Current	$V_R=300V,$ $R_G=10\Omega,$	$T_j=25^\circ C$	90		A
			$T_j=125^\circ C$	100		
E_{rec}	Reverse Recovery Energy	$V_{GE}=-15V$	$T_j=25^\circ C$	1.40		mJ
			$T_j=125^\circ C$	2.16		

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case (per IGBT)		0.217	K/W
$R_{\theta JC}$	Junction-to-Case (per Diode)		0.355	K/W
$R_{\theta CS}$	Case-to-Sink (Conductive grease applied)	0.05		K/W

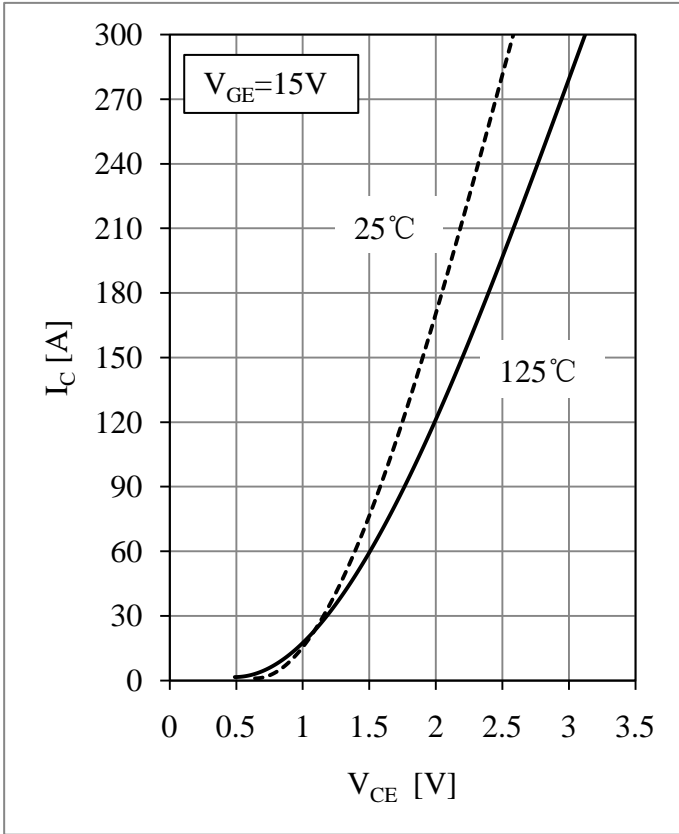


Fig 1. IGBT Output Characteristic

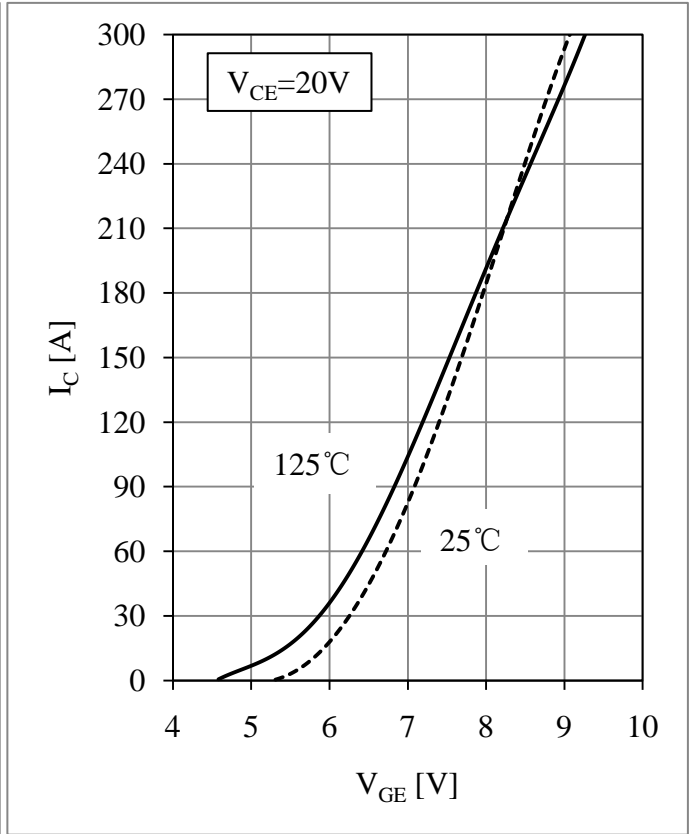


Fig 2. IGBT Transfer Characteristic

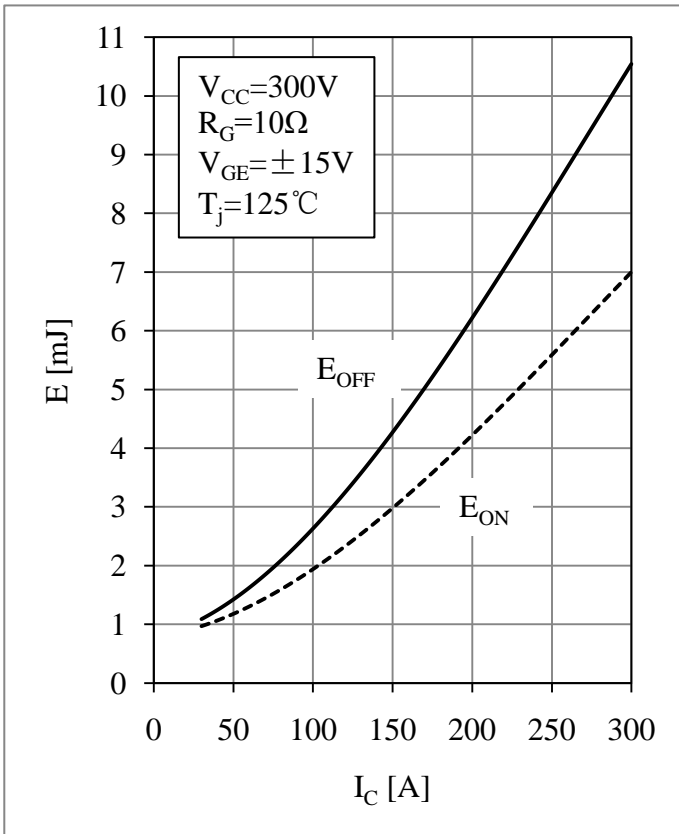


Fig 3. IGBT Switching Loss vs. I_C

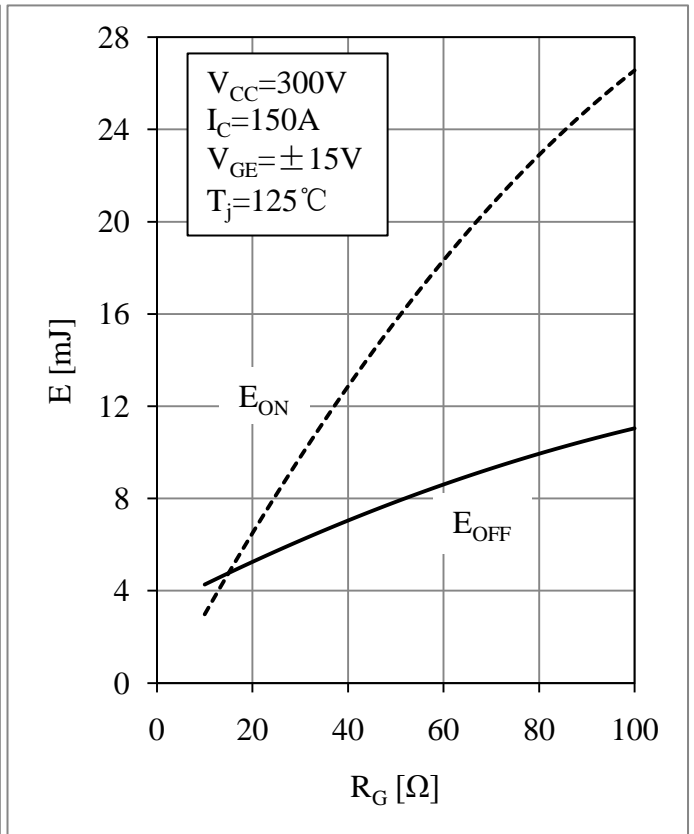


Fig 4. IGBT Switching Loss vs. R_G

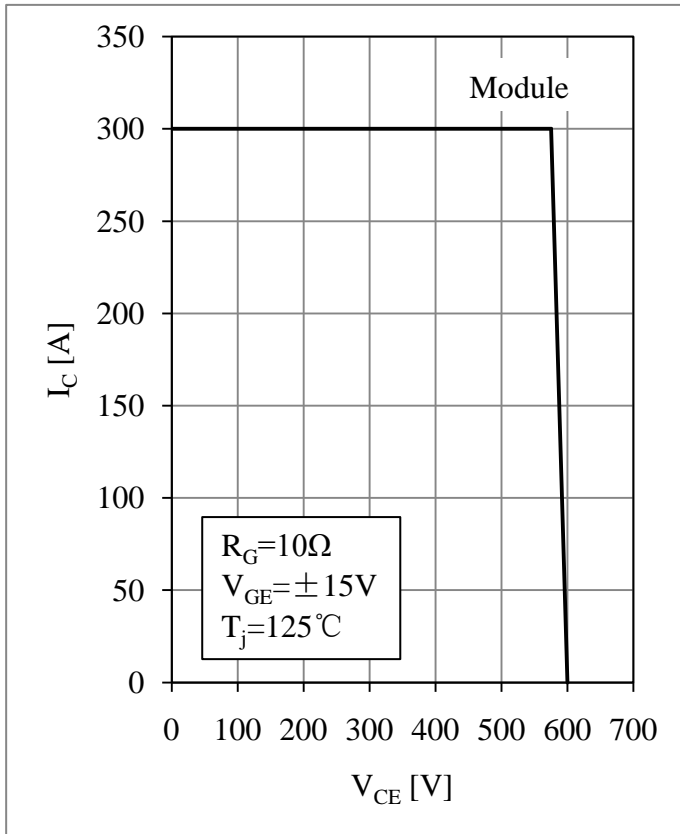


Fig 5. RBSOA

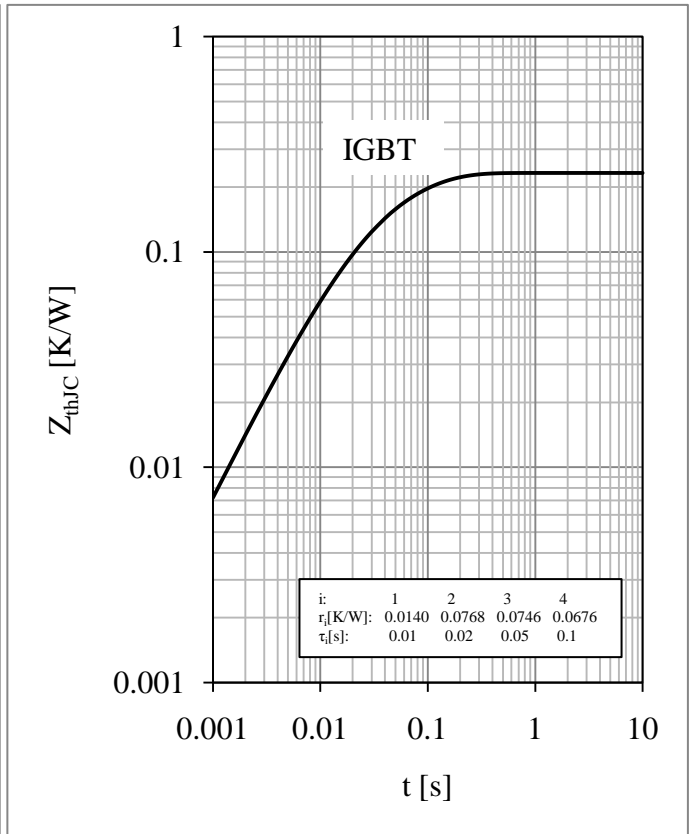


Fig 6. IGBT Transient Thermal Impedance

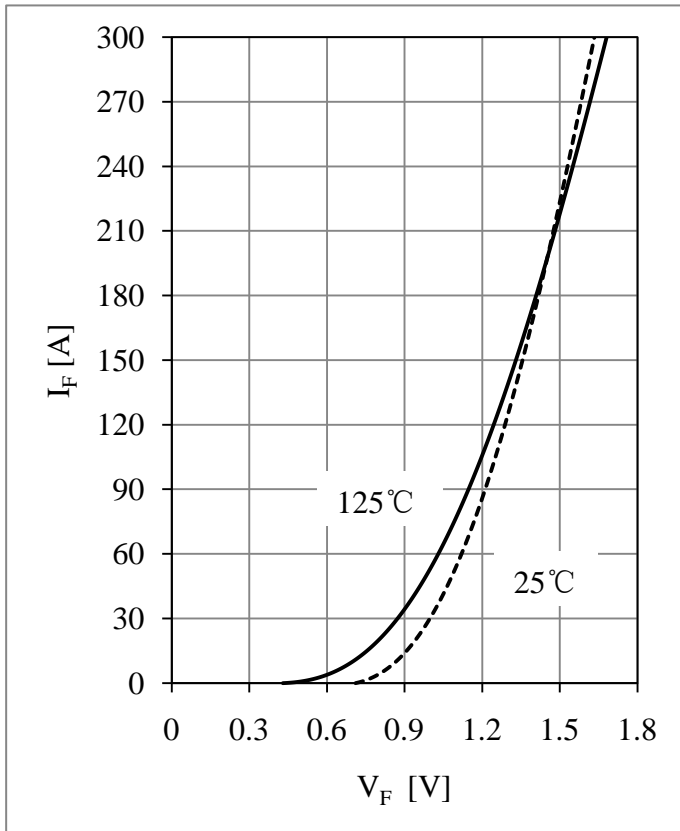


Fig 7. Diode Forward Characteristic

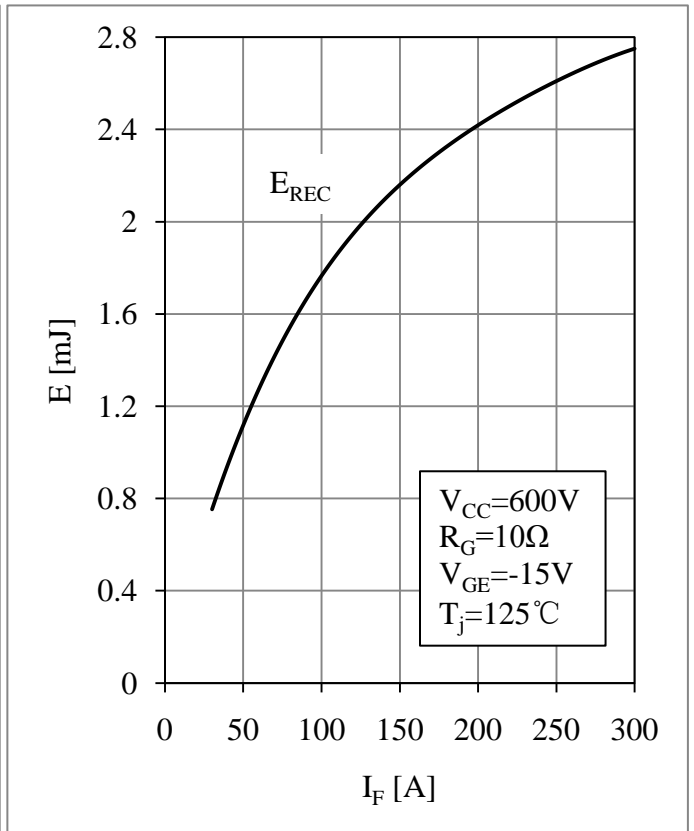


Fig 8. Diode Switching Loss vs. I_F

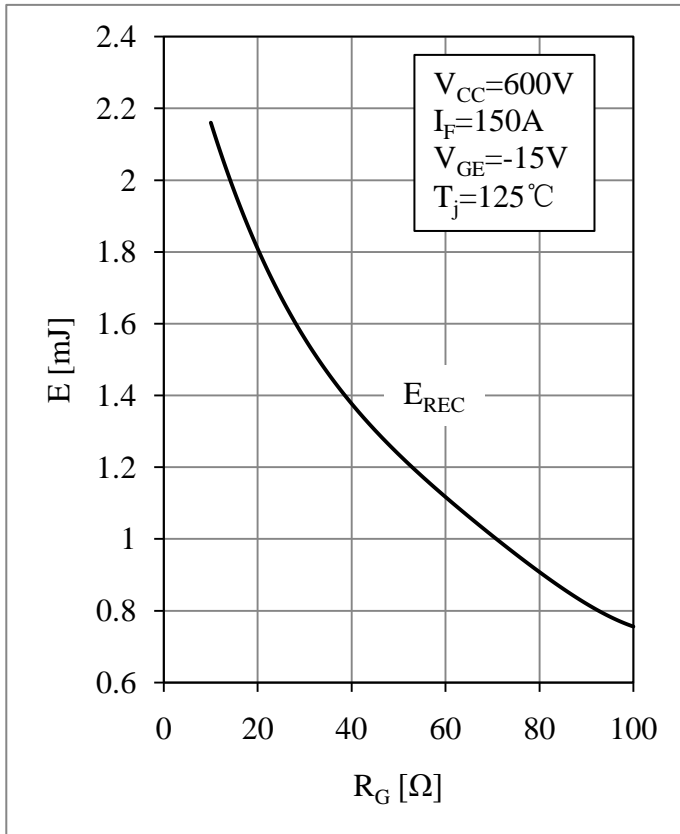


Fig 9. Diode Switching Loss vs. R_G

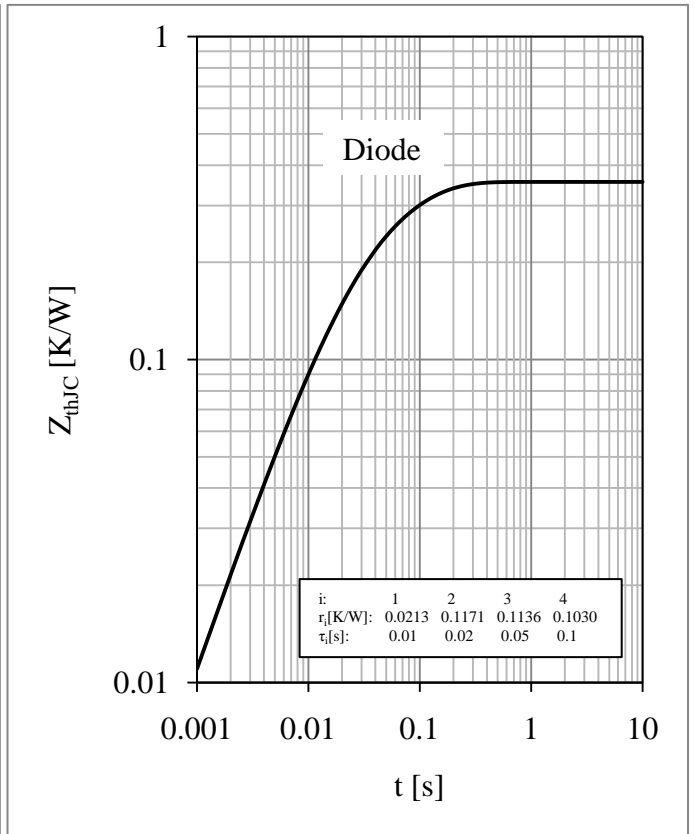
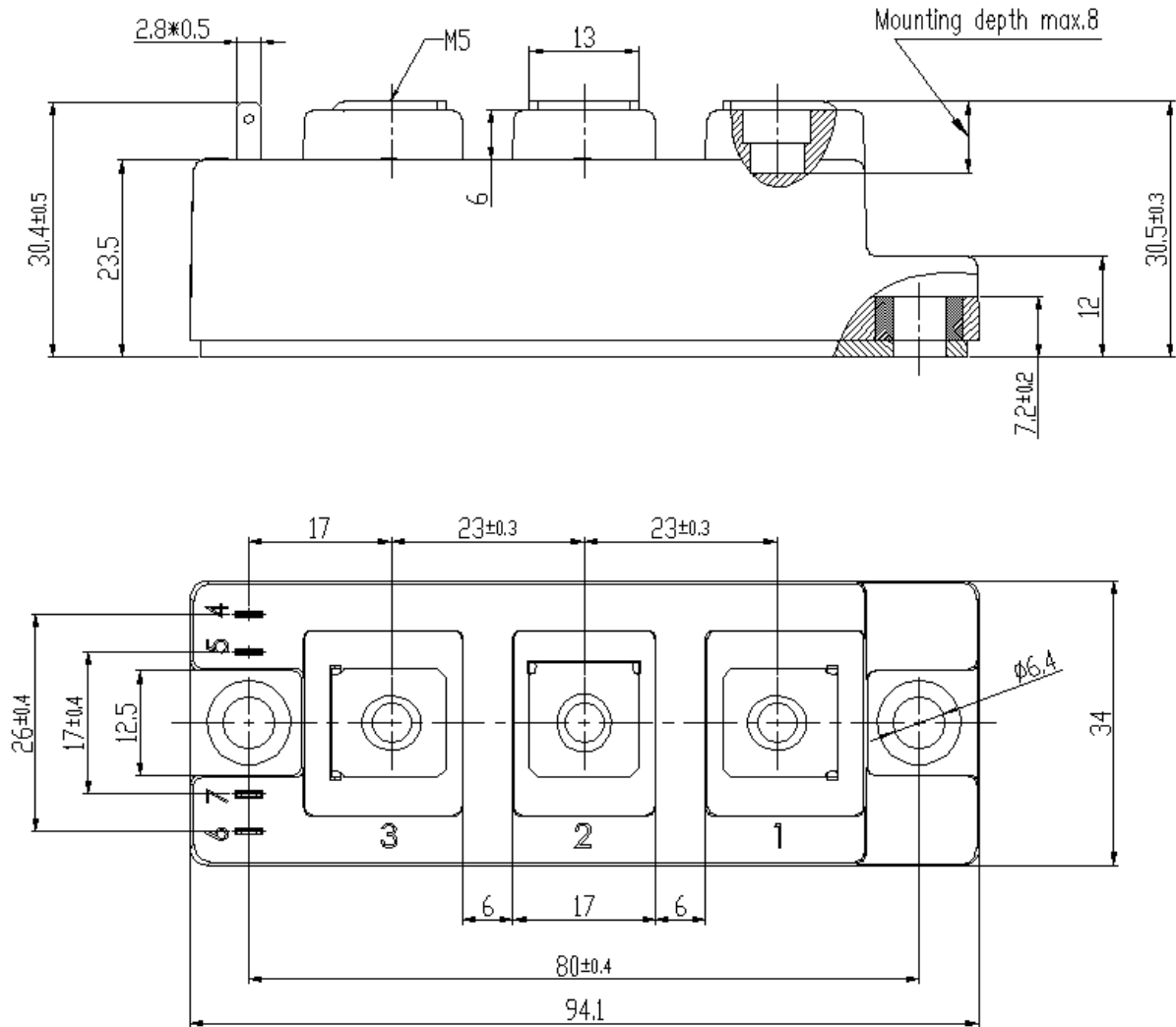


Fig 10. Diode Transient Thermal Impedance

Package Dimensions

Dimensions in Millimeters



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