STARPOWER

SEMICONDUCTOR™

IGBT

GD50HFT120C1SW

Molding Type Module

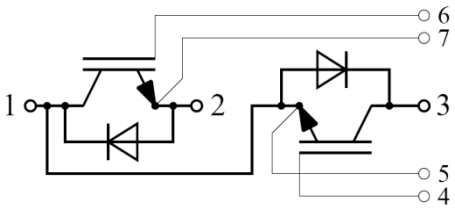
1200V/50A 2 in one-package

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 electronic welders.

Features

- Low $V_{CE(sat)}$ trench IGBT technology
- 10μs short circuit capability
- $V_{CE(sat)}$ with positive temperature coefficient
- Maximum junction temperature 175℃
- Low inductance case
- Fast & soft reverse recovery anti-parallel FWD
- Isolated copper baseplate using DBC technology



Equivalent Circuit Schematic

Typical Applications

- Switching mode power supplies
- Electronic welders

Absolute Maximum Ratings T_C=25℃ unless otherwise noted

Symbol	Description	GD50HFT120C1SW	Units
V_{CES}	Collector-Emitter Voltage	1200	V
V_{GES}	Gate-Emitter Voltage	±30	V
I_C	Collector Current @ T_C=25℃ @ T_C=80℃	90 50	A
I_{CM}	Pulsed Collector Current t_p=1ms	100	A
I_F	Diode Continuous Forward Current @ T_C=80℃	30	A
I_{FM}	Diode Maximum Forward Current t_p=1ms	60	A
P_D	Maximum Power Dissipation @ T_j=175℃	365	W
T_{jmax}	Maximum Junction Temperature	175	℃
T_{STG}	Storage Temperature Range	-40 to +125	℃
V_{ISO}	Isolation Voltage RMS,f=50Hz,t=1min	2500	V
Mounting Torque	Power Terminal Screw:M5 Mounting Screw:M6	2.5 to 5.0 3.0 to 5.0	N.m

Electrical Characteristics of IGBT T_C=25℃ unless otherwise noted

Off Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{(BR)CES}$	Collector-Emitter Breakdown Voltage	T_j=25℃	1200			V
I_{CES}	Collector Cut-Off Current	V_{CE}=V_{CES},V_{GE}=0V, T_j=25℃			5.0	mA
I_{GES}	Gate-Emitter Leakage Current	V_{GE}=V_{GES},V_{CE}=0V, T_j=25℃			400	nA

On Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=2.4mA,V_{CE}=V_{GE}, T_j=25℃	5.0	6.1	7.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C=50A,V_{GE}=15V, T_j=25℃		2.00	2.40	V
		I_C=50A,V_{GE}=15V, T_j=125℃		2.20		

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=50A, R_G=15Ω,V_{GE}=±15V, T_j=25℃		148		ns
t_r	Rise Time			83		ns
$t_{d(off)}$	Turn-Off Delay Time			245		ns
t_f	Fall Time			251		ns
E_{on}	Turn-On Switching Loss			5.51		mJ
E_{off}	Turn-Off Switching Loss			2.70		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=50A, R_G=15Ω,V_{GE}=±15V, T_j=125℃		263		ns
t_r	Rise Time			84		ns
$t_{d(off)}$	Turn-Off Delay Time			256		ns
t_f	Fall Time			292		ns
E_{on}	Turn-On Switching Loss			6.63		mJ
E_{off}	Turn-Off Switching Loss			3.25		mJ
C_{ies}	Input Capacitance	V_{CE}=30V,f=1MHz, V_{GE}=0V		6.24		nF
C_{oes}	Output Capacitance			0.23		nF
C_{res}	Reverse Transfer Capacitance			0.15		nF
I_{SC}	SC Data	t_P≤10μs,V_{GE}=15V, T_j=125℃,V_{CC}=900V, V_{CEM}≤1200V		500		A
L_{CE}	Stray Inductance				30	nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal To Chip			0.75		mΩ

Electrical Characteristics of DIODE T_C=25℃ unless otherwise noted

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Units
V_F	Diode Forward Voltage	I_F=30A	T_j=25℃		1.90	2.30	V
			T_j=125℃		1.80		
Q_r	Recovered Charge	I_F=30A, V_R=600V, R_G=15Ω, V_{GE}=-15V	T_j=25℃		2.6		μC
			T_j=125℃		4.2		
I_{RM}	Peak Reverse Recovery Current		T_j=25℃		20		A
			T_j=125℃		23		
E_{rec}	Reverse Recovery Energy		T_j=25℃		1.31		mJ
			T_j=125℃		2.08		

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case (per IGBT)		0.411	K/W
$R_{\theta JC}$	Junction-to-Case (per DIODE)		0.943	K/W
$R_{\theta CS}$	Case-to-Sink (Conductive grease applied)	0.05		K/W
Weight	Weight of Module	150		g

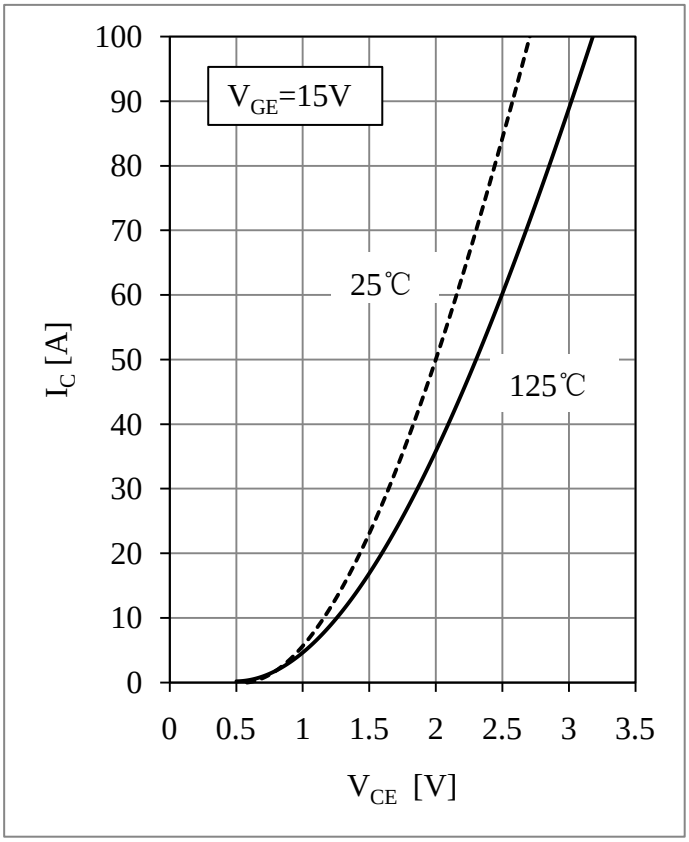


Fig 1. IGBT Output Characteristics

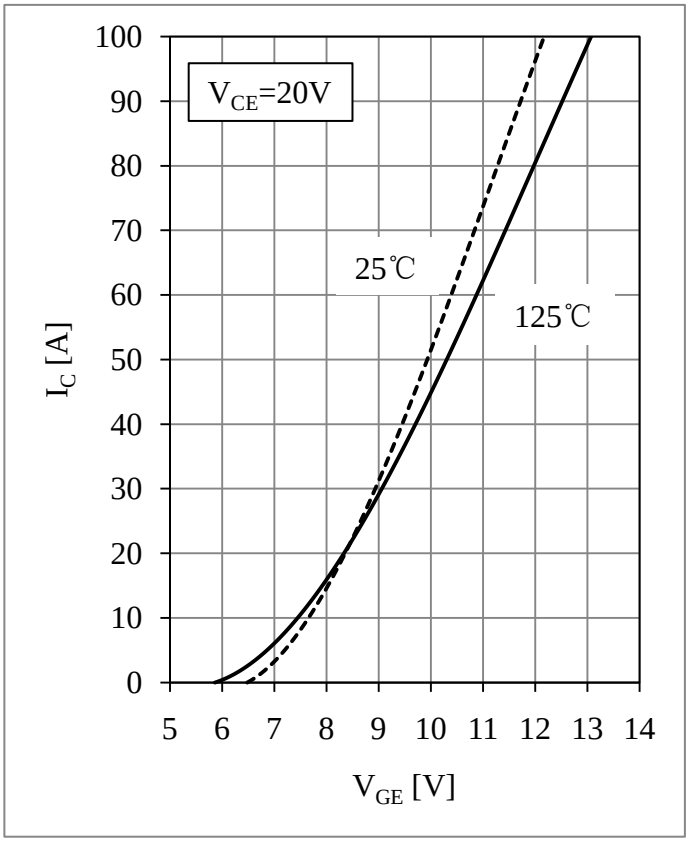


Fig 2. IGBT Transfer Characteristics

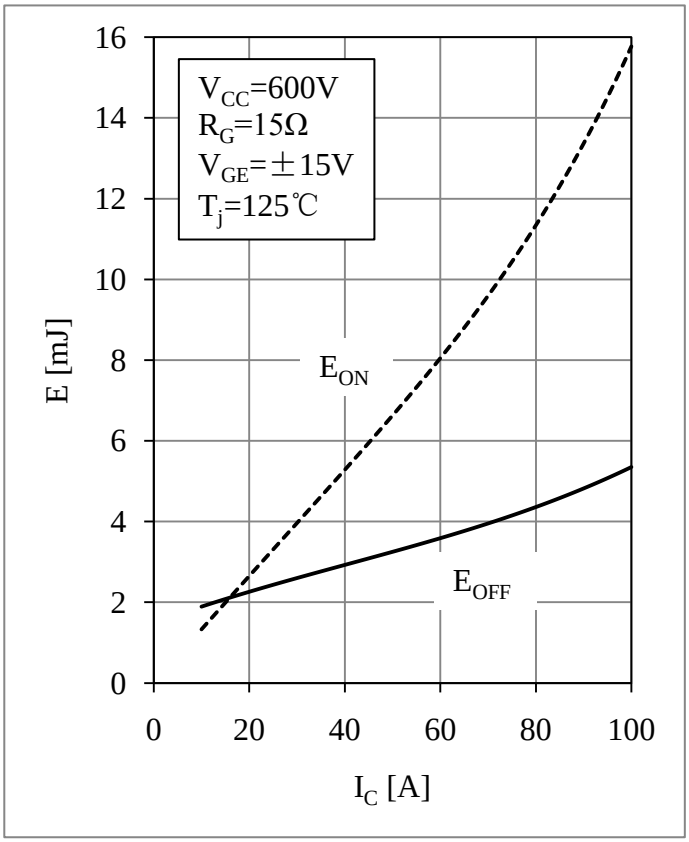


Fig 3. IGBT Switching Loss vs. I_C

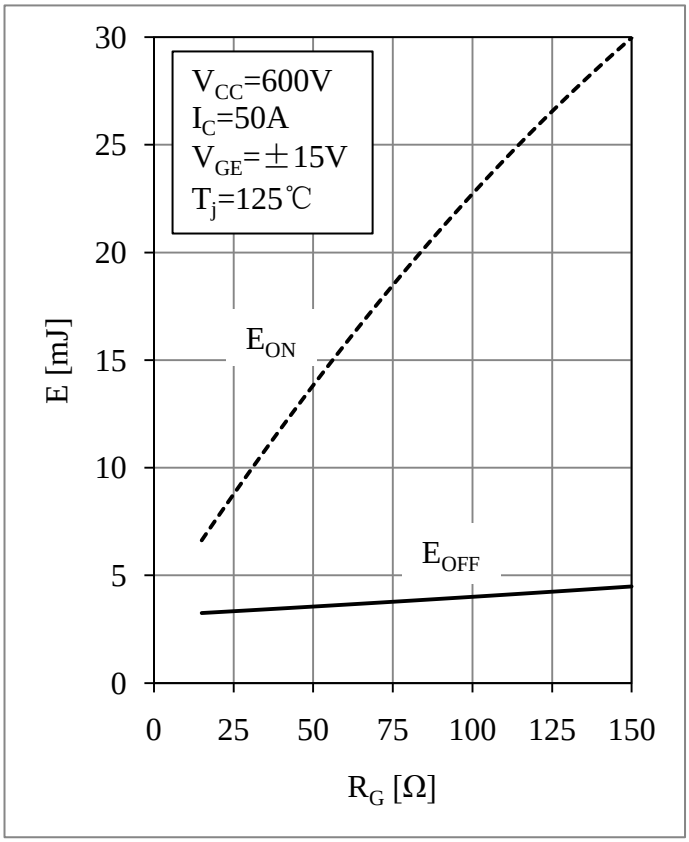


Fig 4. IGBT Switching Loss vs. R_G

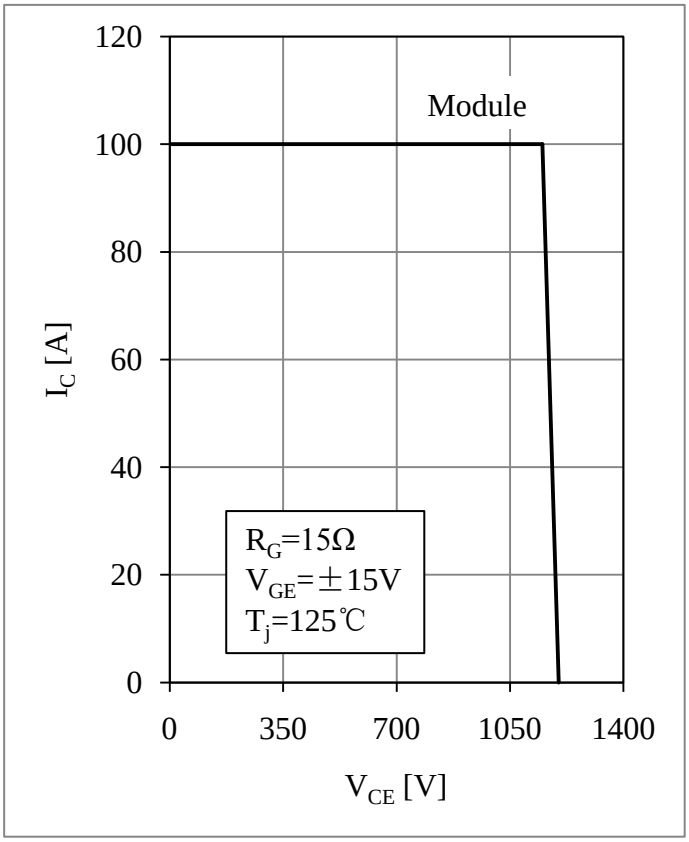


Fig 5. RBSOA

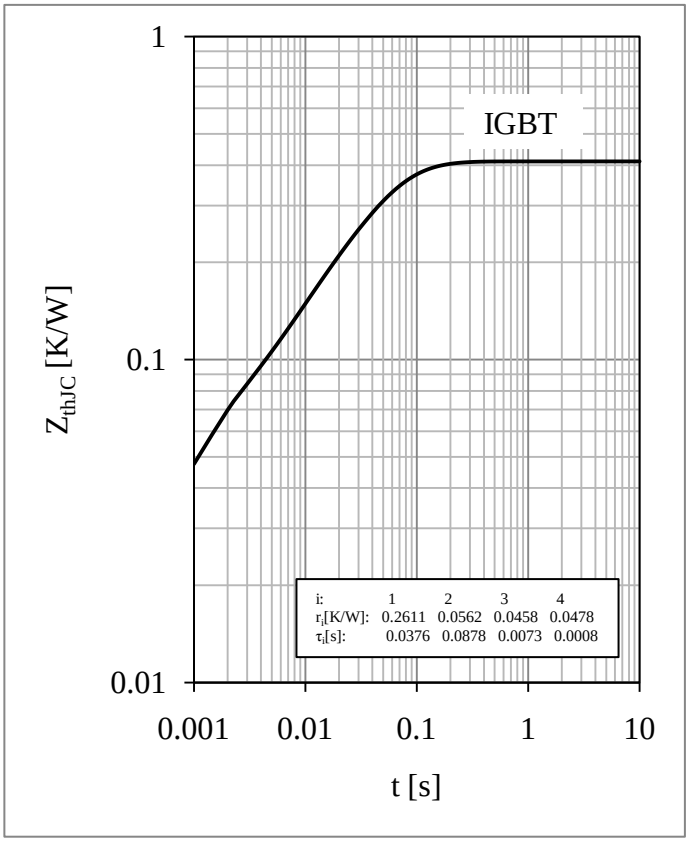


Fig 6. IGBT Transient Thermal Impedance

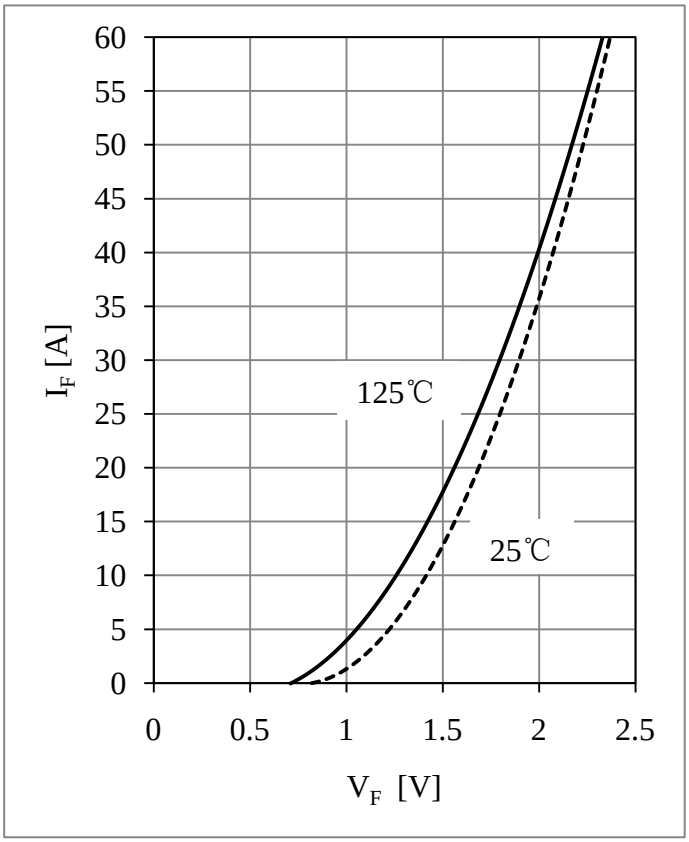


Fig 7. Diode Forward Characteristics

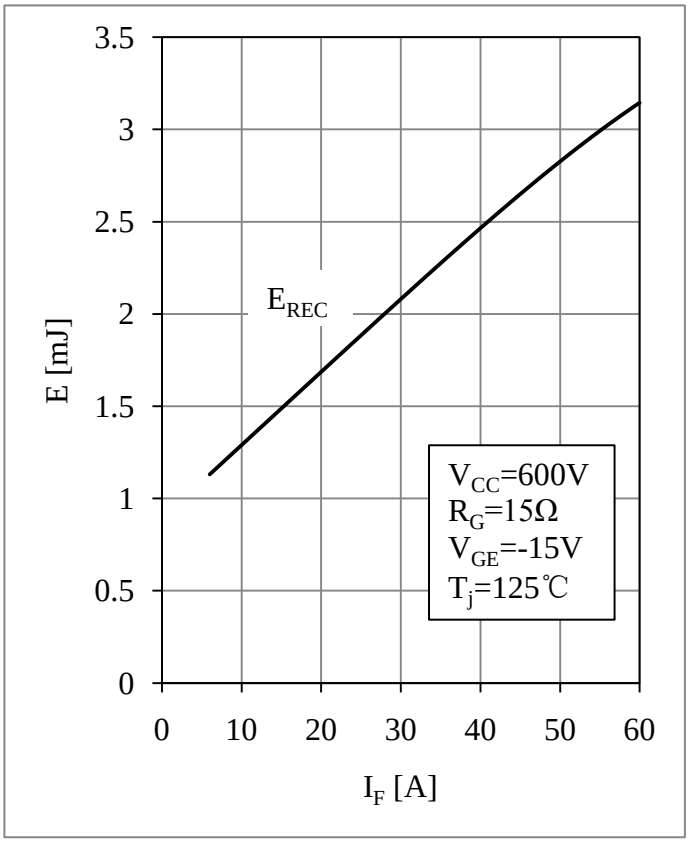


Fig 8. Diode Switching Loss vs. I_F

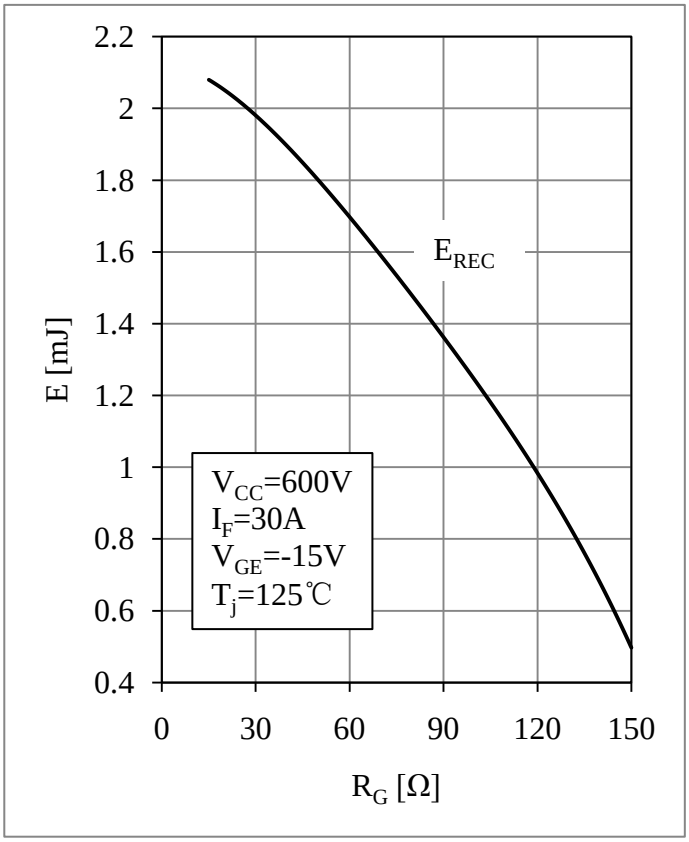


Fig 9. Diode Switching Loss vs. R_G

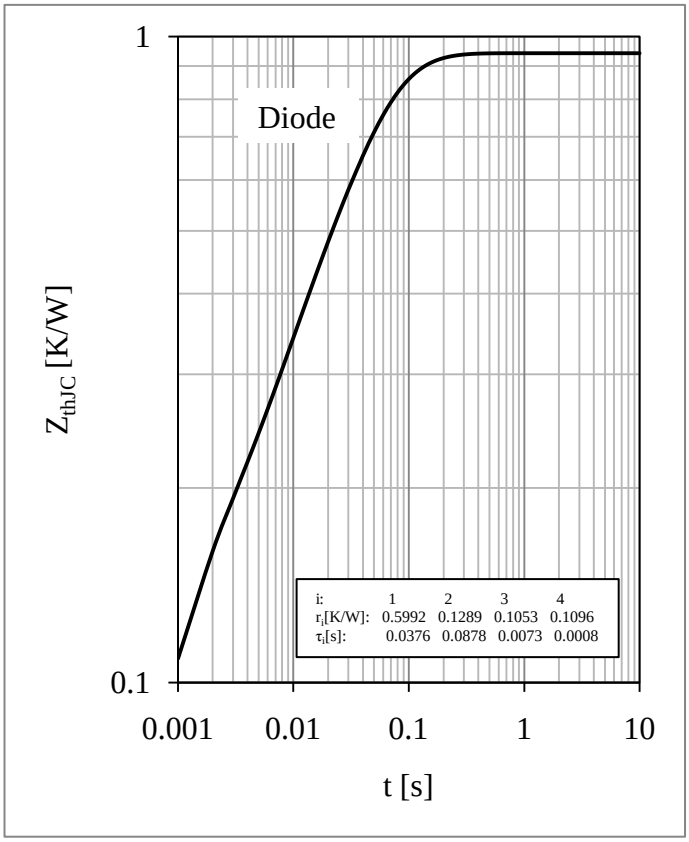
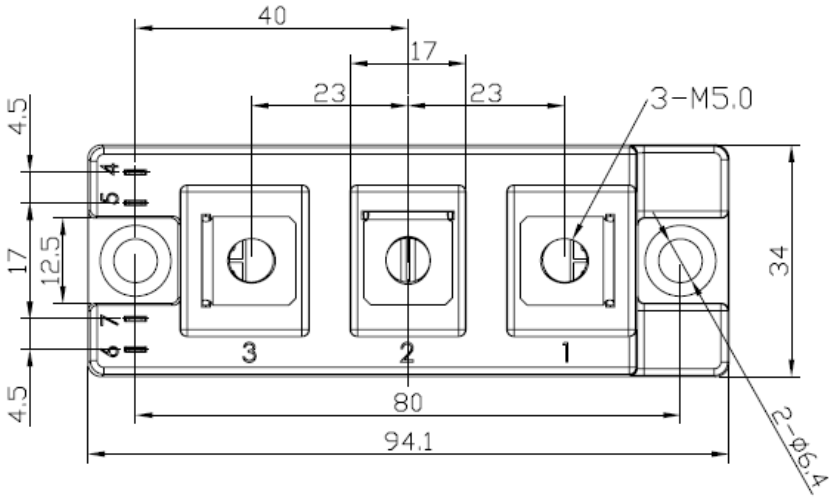
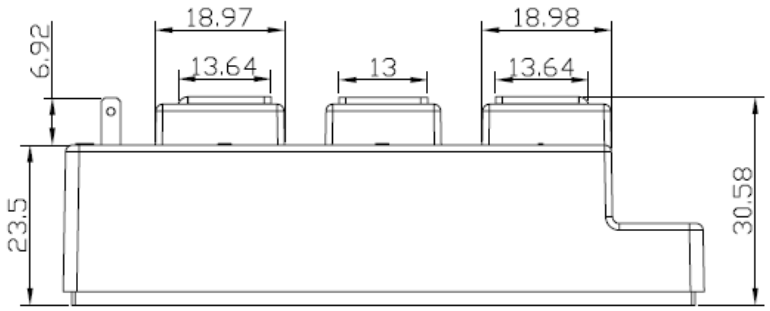


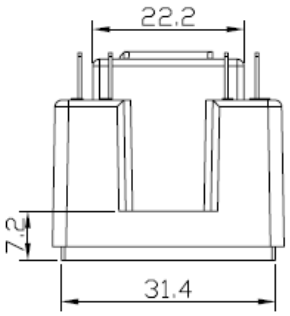
Fig 10. Diode Transient Thermal Impedance

Package Dimension

Dimensions in Millimeters







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