

STARPOWER

SEMICONDUCTOR

IGBT

GD100HHU120C6S

Molding Type Module

1200V/100A 4 in one-package

General Description

STARPOWER IGBT Power Module provides ultrafast switching speed as well as short circuit ruggedness. It's designed for the applications such as electronic welder and inductive heating.



Features

- NPT IGBT technology
- 10 μ s short circuit capability
- Low switching losses
- Rugged with ultrafast performance
- $V_{CE(sat)}$ 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 supplies
- Inductive heating
- Electronic welder

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

Symbol	Description	GD100HHU120C6S	Units
V_{CES}	Collector-Emitter Voltage	1200	V
V_{GES}	Gate-Emitter Voltage	± 20	V
I_C	Collector Current @ $T_C=25^\circ\text{C}$	160	A
	@ $T_C=80^\circ\text{C}$	100	
I_{CM}	Pulsed Collector Current $t_p=1\text{ms}$	200	A
I_F	Diode Continuous Forward Current	100	A
I_{FM}	Diode Maximum Forward Current $t_p=1\text{ms}$	200	A
P_D	Maximum Power Dissipation @ $T_j=150^\circ\text{C}$	638	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	Mounting Screw:M5	3.0 to 6.0	N.m

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	$T_j=25^\circ\text{C}$	1200			V
I_{CES}	Collector Cut-Off Current	$V_{CE}=V_{CES}$, $V_{GE}=0\text{V}$, $T_j=25^\circ\text{C}$			5.0	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	$I_C=1.0\text{mA}$, $V_{CE}=V_{GE}$, $T_j=25^\circ\text{C}$	4.4	4.9	6.0	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C=100\text{A}$, $V_{GE}=15\text{V}$, $T_j=25^\circ\text{C}$		3.10	3.55	V
		$I_C=100\text{A}$, $V_{GE}=15\text{V}$, $T_j=125^\circ\text{C}$		3.45		

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600V, I_C=100A,$ $R_G=5.6\Omega, V_{GE}=\pm 15V,$ $T_j=25^\circ C$		300		ns
t_r	Rise Time			64		ns
$t_{d(off)}$	Turn-Off Delay Time			340		ns
t_f	Fall Time			105		ns
E_{on}	Turn-On Switching Loss			4.76		mJ
E_{off}	Turn-Off Switching Loss			4.25		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600V, I_C=100A,$ $R_G=5.6\Omega, V_{GE}=\pm 15V,$ $T_j=125^\circ C$		320		ns
t_r	Rise Time			65		ns
$t_{d(off)}$	Turn-Off Delay Time			350		ns
t_f	Fall Time			13		ns
E_{on}	Turn-On Switching Loss			7.20		mJ
E_{off}	Turn-Off Switching Loss			5.50		mJ
C_{ies}	Input Capacitance	$V_{CE}=30V, f=1MHz,$ $V_{GE}=0V$		8.45		nF
C_{oes}	Output Capacitance			0.76		nF
C_{res}	Reverse Transfer Capacitance			0.31		nF
I_{SC}	SC Data	$t_p \leq 10\mu s, V_{GE}=15V,$ $T_j=125^\circ C, V_{CC}=600V,$ $V_{CEM} \leq 1200V$		900		A
R_{Gint}	Internal Gate Resistance			/		Ω
L_{CE}	Stray Inductance			21		nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal To Chip			1.80		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	$I_F=100A,$ $V_{GE}=0V$	$T_j=25^\circ C$	1.82	2.22	V
			$T_j=125^\circ C$	1.95		
Q_r	Recovered Charge	$I_F=100A,$ $V_R=600V,$ $R_G=5.6\Omega,$ $V_{GE}=-15V$	$T_j=25^\circ C$	5.4		μC
			$T_j=125^\circ C$	11.2		
I_{RM}	Peak Reverse Recovery Current	$V_R=600V,$ $R_G=5.6\Omega,$ $V_{GE}=-15V$	$T_j=25^\circ C$	81		A
			$T_j=125^\circ C$	101		
E_{rec}	Reverse Recovery Energy	$V_R=600V,$ $R_G=5.6\Omega,$ $V_{GE}=-15V$	$T_j=25^\circ C$	3.54		mJ
			$T_j=125^\circ C$	6.57		

Electrical Characteristics of NTC $T_C=25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
R_{25}	Rated Resistance			5.0		$\text{k}\Omega$
$\Delta R/R$	Deviation of R_{100}	$R_{100}=493.3\Omega$	-5		5	%
P_{25}	Power Dissipation				20.0	mW
$B_{25/50}$	B-value	$R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298.15\text{K}))]$		3375		K

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case (per IGBT)		0.196	K/W
$R_{\theta JC}$	Junction-to-Case (per Diode)		0.294	K/W
$R_{\theta CS}$	Case-to-Sink (Conductive grease applied)	0.009		K/W
Weight	Weight of Module	300		g

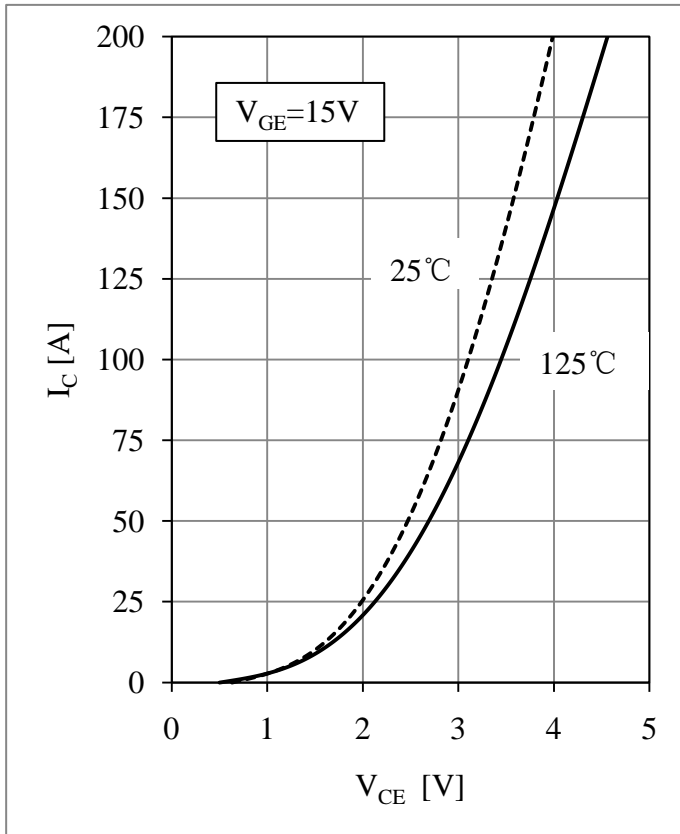


Fig 1. IGBT Output Characteristic

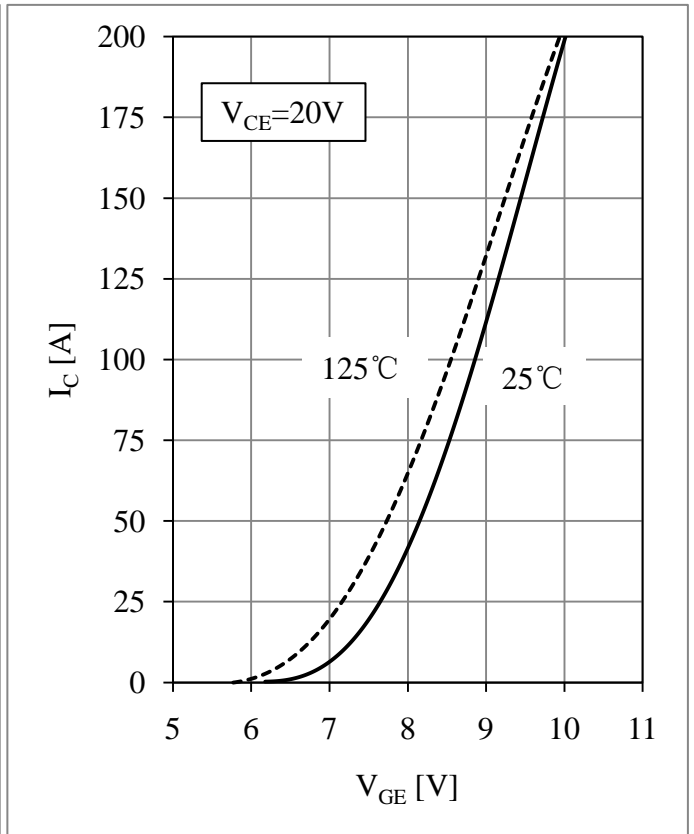


Fig 2. IGBT Transfer Characteristic

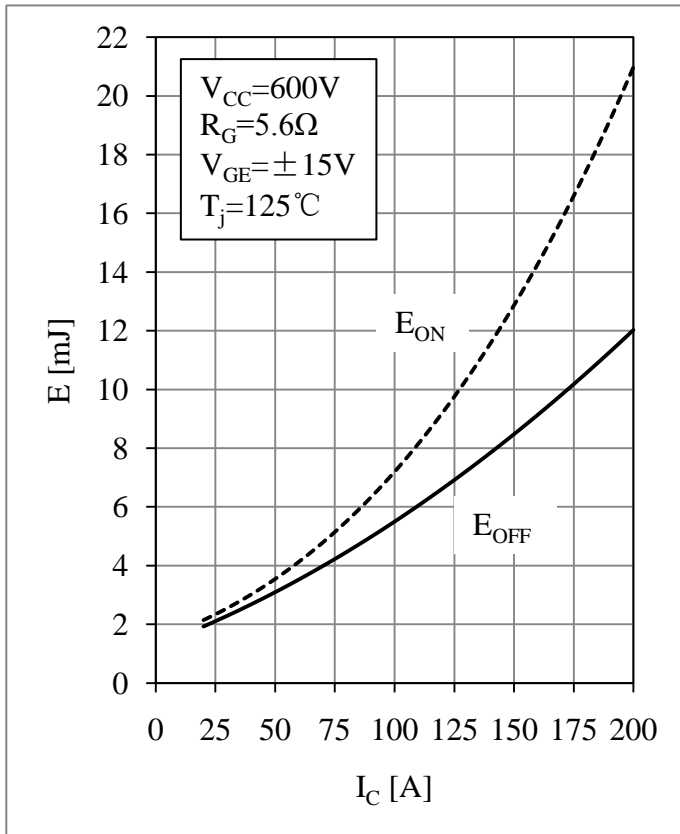


Fig 3. IGBT Switching Loss vs. I_C

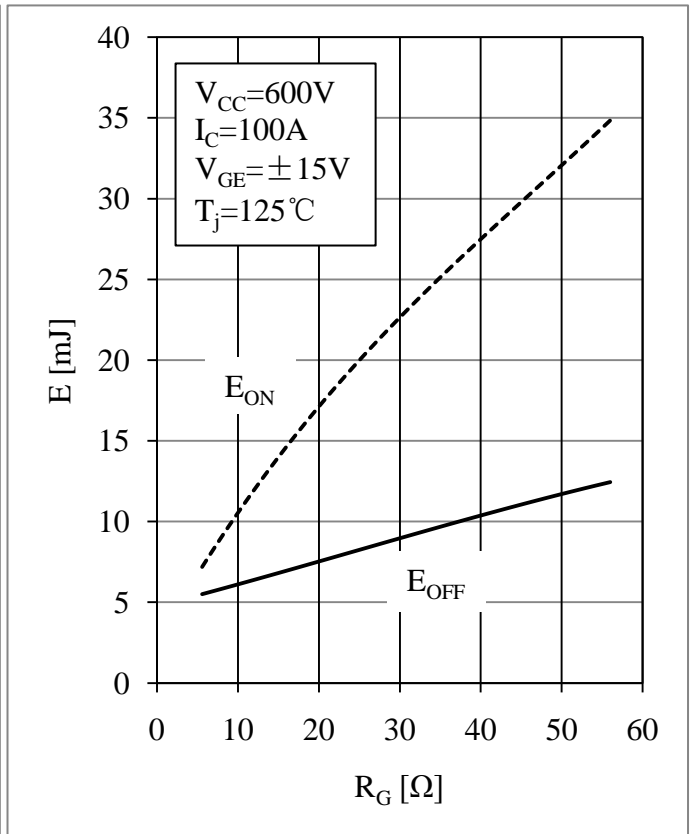


Fig 4. IGBT Switching Loss vs. R_G

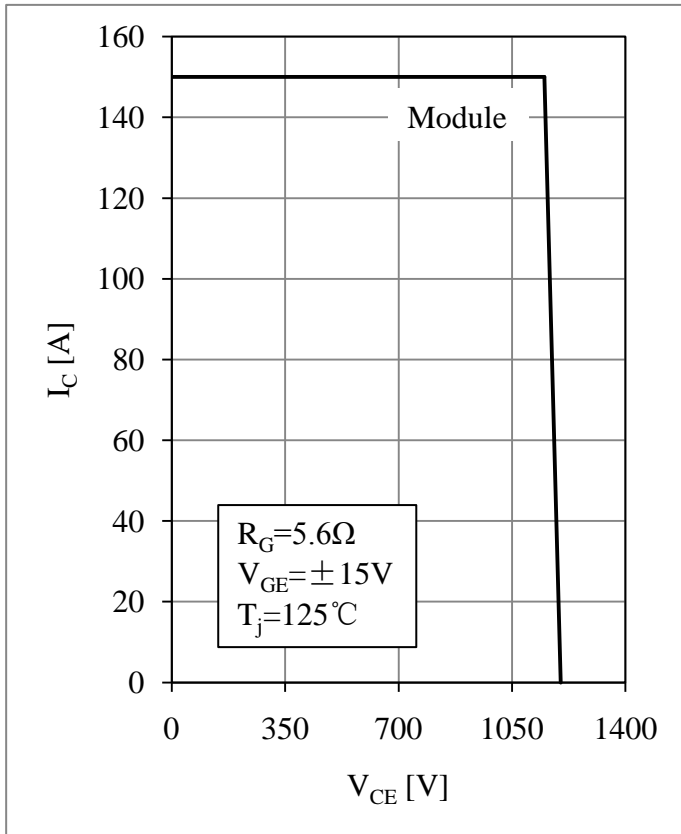


Fig 5. RBSOA

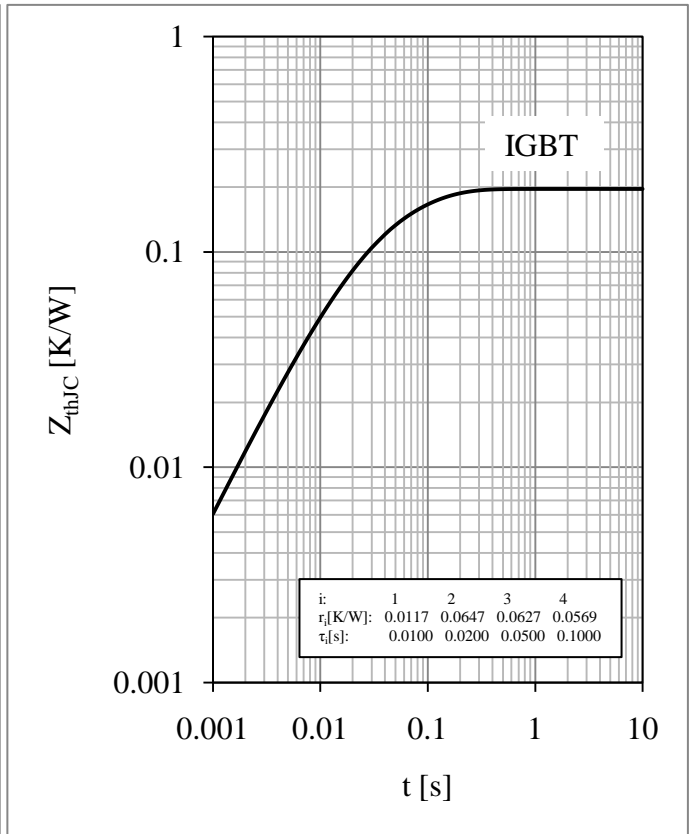


Fig 6. IGBT Transient Thermal Impedance

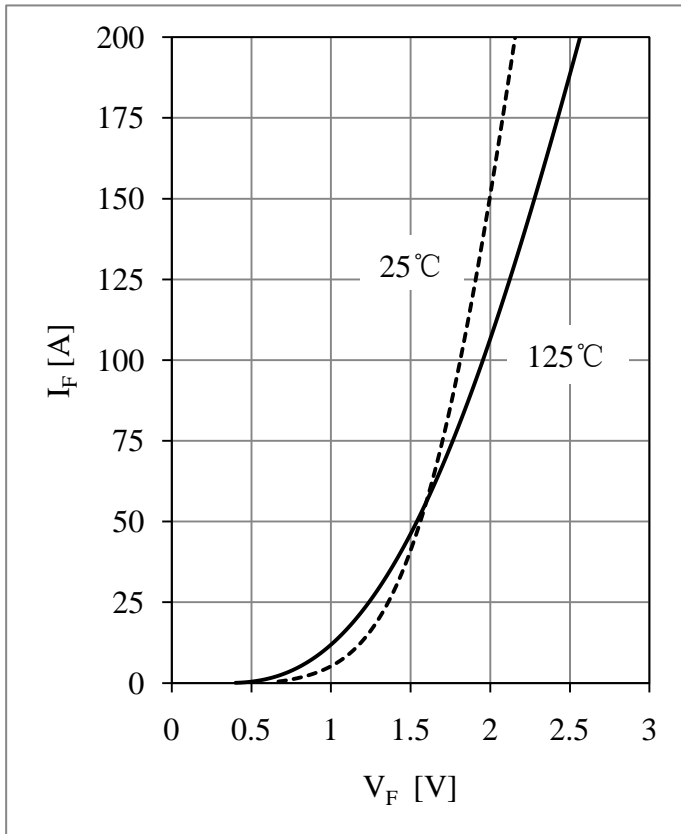


Fig 7. Diode Forward Characteristic

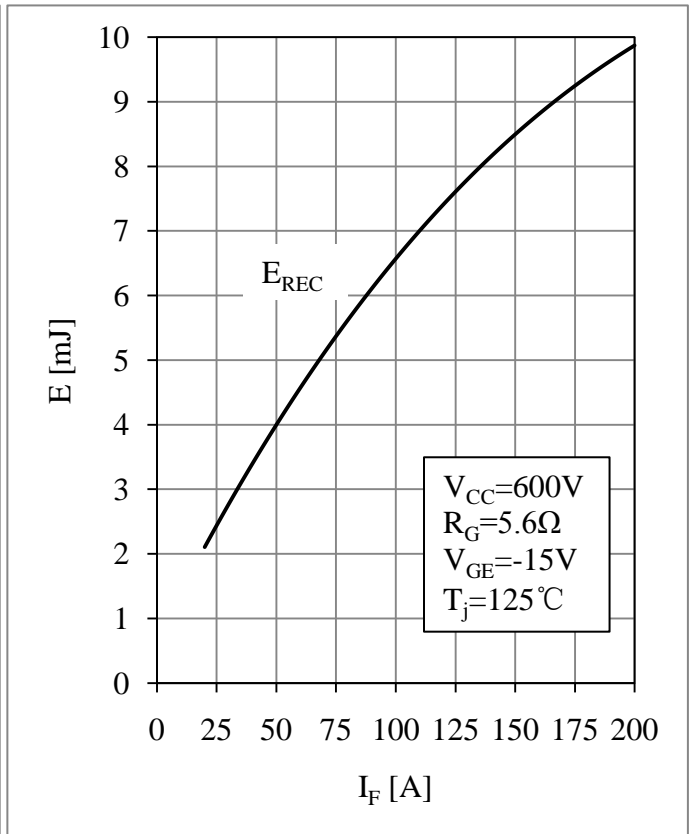


Fig 8. Diode Switching Loss vs. I_F

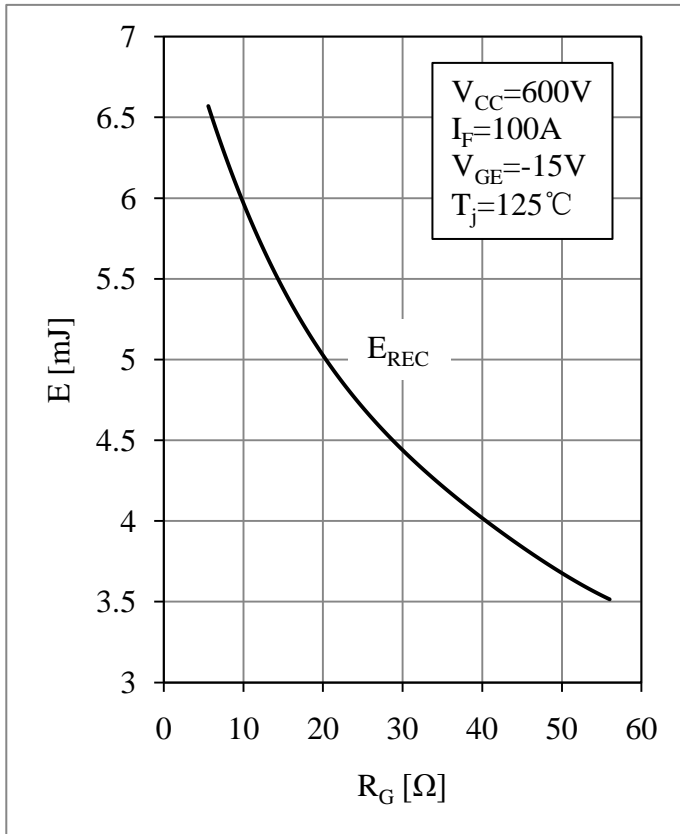


Fig 9. Diode Switching Loss vs. R_G

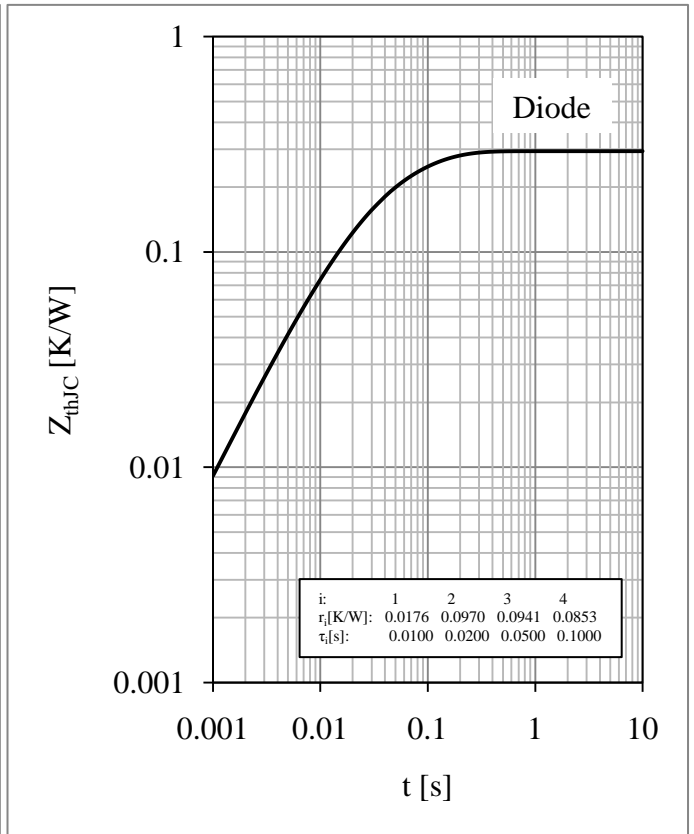
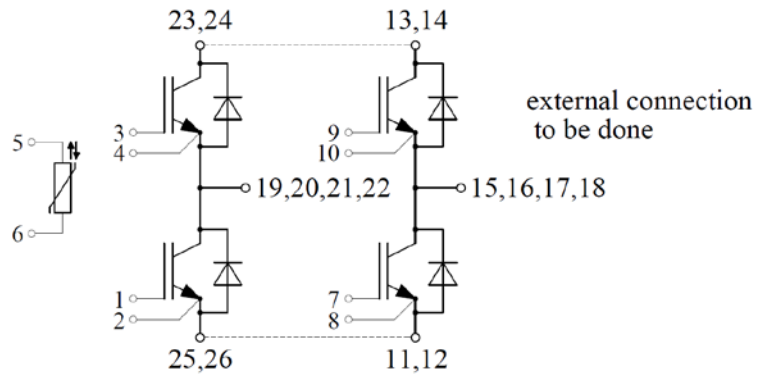


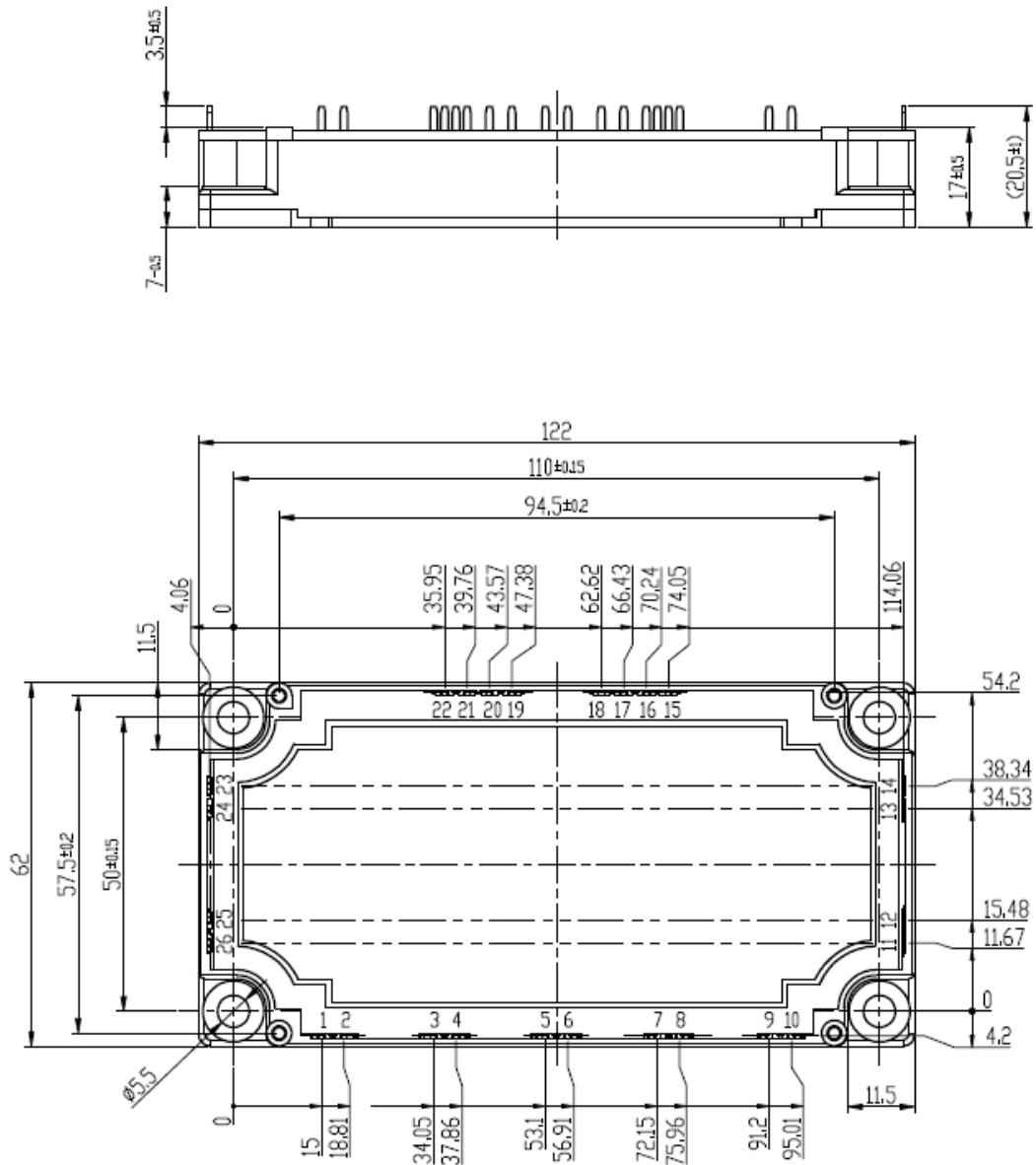
Fig 10. Diode Transient Thermal Impedance

Equivalent Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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