STARPOWER

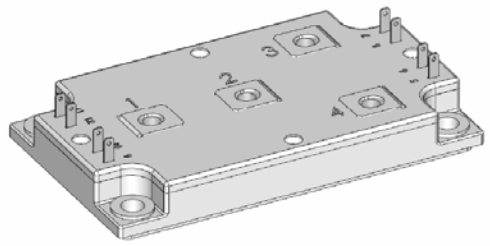
SEMICONDUCTOR™

IGBT

GD150HCT170B3S Preliminary

Molding Type Module

1700V/150A 4 in one-package

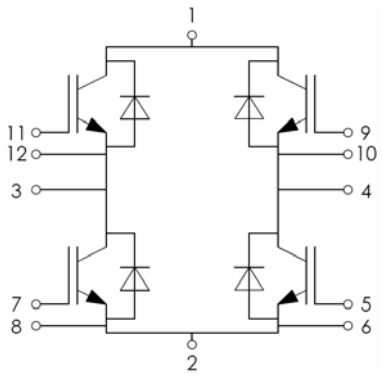


General Description

STARPOWER IGBT Power Module provides ultra low conduction loss as well as short circuit ruggedness. They are designed for the applications such as Switched Mode Power Supplies.

Features

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



Equivalent Circuit Schematic

Typical Applications

- Welding converters
- Switched mode power supplies
- Uninterruptible power supplies
- Motor control

Absolute Maximum Ratings T_C=25℃ unless otherwise noted

Symbol	Description	GD150HCT170B3S	Units
V_{CES}	Collector-Emitter Voltage	1700	V

Symbol	Description	GD150HCT170B3S	Units
V_{GES}	Gate-Emitter Voltage	±20	V
I_C	Collector Current @ T_C=25℃	240	A
	@ T_C=80℃	150	
$I_{CM(1)}$	Pulsed Collector Current t_p=1ms	300	A
I_F	Diode Continuous Forward Current	150	A
I_{FM}	Diode Maximum Forward Current	300	A
P_D	Maximum Power Dissipation @ T_j=150℃	893	W
T_{SC}	Short Circuit Withstand Time @ T_j=125℃	10	μs
T_j	Maximum Junction Temperature	150	℃
T_{STG}	Storage Temperature Range	-40 to +125	℃
I^2t-value,Diode	V_R=0V,t=10ms,T_j=125℃	3800	A^2s
V_{ISO}	Isolation Voltage RMS,f=50Hz,t=1min	3400	V
Mounting Torque	Power Terminal Screw:M5	2.0 to 3.5	N.m
	Mounting Screw:M6	3.0 to 5.0	N.m

Notes:

(1) Repetitive rating: Pulse width limited by max. junction temperature

Electrical Characteristics of IGBT T_C=25℃ unless otherwise noted

Off Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
BV_{CES}	Collector-Emitter Breakdown Voltage	V_{GE}=0V,I_C=4.0mA, T_j=25℃	1700			V
I_{CES}	Collector Cut-Off Current	V_{CE}=V_{CES},V_{GE}=0V, T_j=25℃			3.0	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=6.0mA,V_{CE}=V_{GE}, T_j=25℃	5.2	5.8	6.4	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C=150A,V_{GE}=15V, T_j=25℃		2.00	2.45	V
		I_C=150A,V_{GE}=15V, T_j=125℃		2.40		

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=900V,I_C=150A,		280		ns
t_r	Rise Time	R_G=9.1Ω,V_{GE}=±15V,		50		ns
$t_{d(off)}$	Turn-Off Delay Time	T_j=25℃		81		ns

t_f	Fall Time	V_{CC}=900V,I_C=150A, R_G=9.1Ω,V_{GE}=±15V, T_j=25℃		180		ns
E_{on}	Turn-On Switching Loss			33		mJ
E_{off}	Turn-Off Switching Loss			32		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=900V,I_C=150A, R_G=9.1Ω,V_{GE}=±15V, T_j=125℃		300		ns
t_r	Rise Time			66		ns
$t_{d(off)}$	Turn-Off Delay Time			1000		ns
t_f	Fall Time			300		ns
E_{on}	Turn-On Switching Loss			48		mJ
E_{off}	Turn-Off Switching Loss			47		mJ
C_{ies}	Input Capacitance	V_{CE}=25V,f=1MHz, V_{GE}=0V		13.20		nF
C_{oes}	Output Capacitance			0.55		nF
C_{res}	Reverse Transfer Capacitance			0.44		nF
I_{SC}	SC Data	t_{SC}≤10μs,V_{GE}=15V, T_j=125℃,V_{CC}=1000V, V_{CEM}≤1700V		600		A
R_{Gint}	Internal Gate Resistance			5.0		Ω

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=150A	T_j=25℃		1.80	2.20	V
			T_j=125℃		1.90		
Q_r	Diode Reverse Recovery Charge	I_F=150A, V_R=900V, di/dt=-2150A/μs, V_{GE}=-15V	T_j=25℃		39.0		μC
			T_j=125℃		65.5		
I_{RM}	Diode Peak Reverse Recovery Current		T_j=25℃		175		A
			T_j=125℃		190		
E_{rec}	Reverse Recovery Energy		T_j=25℃		20		mJ
			T_j=125℃		36		

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case (Per IGBT)		0.14	K/W
$R_{\theta JC}$	Junction-to-Case (Per DIODE)		0.30	K/W
$R_{\theta JC}$	Case-to-Sink (Conductive grease applied)	0.038		K/W
Weight	Weight of Module	300		g

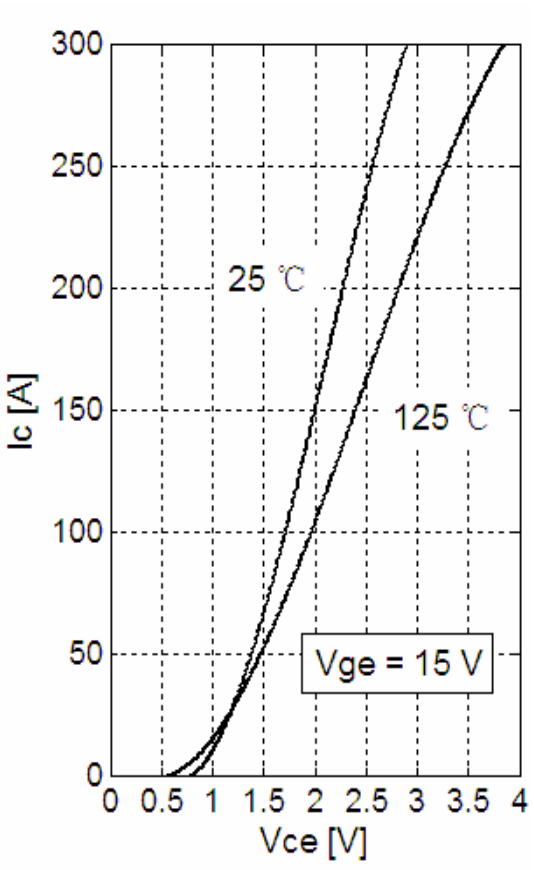


Fig 1. IGBT Typical Output Characteristics

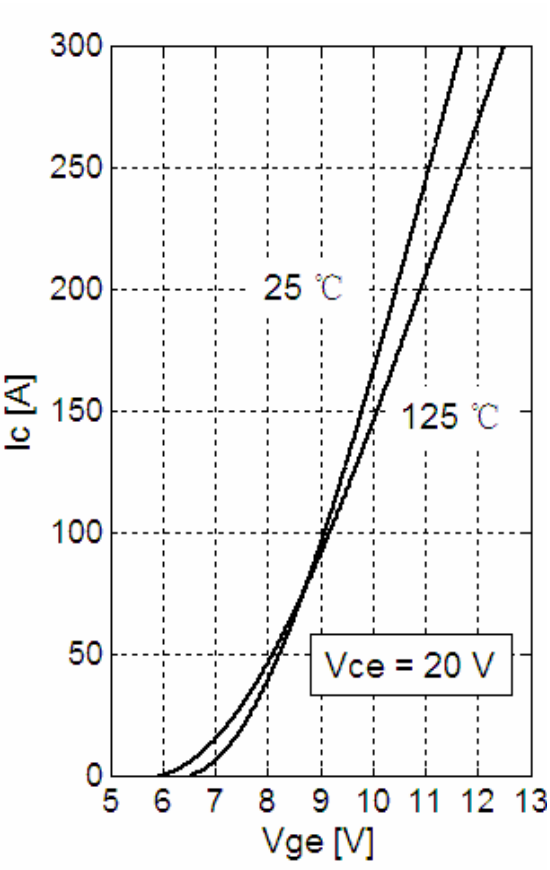


Fig 2. IGBT Typical Transfer Characteristics

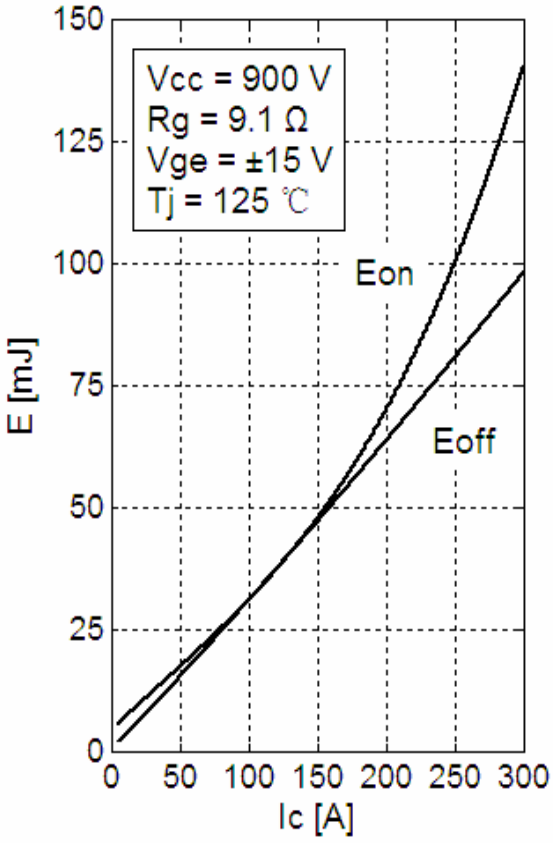


Fig 3. IGBT Switching Loss vs. I_C

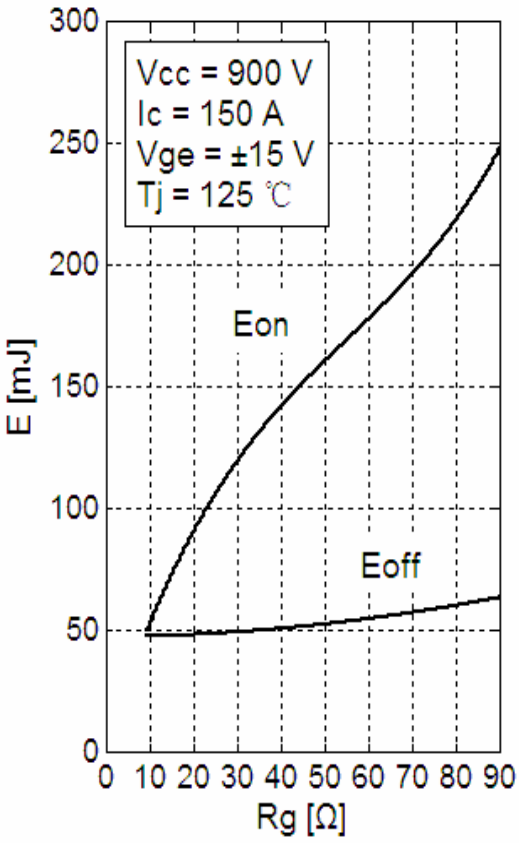


Fig 4. IGBT Switching Loss vs. R_G

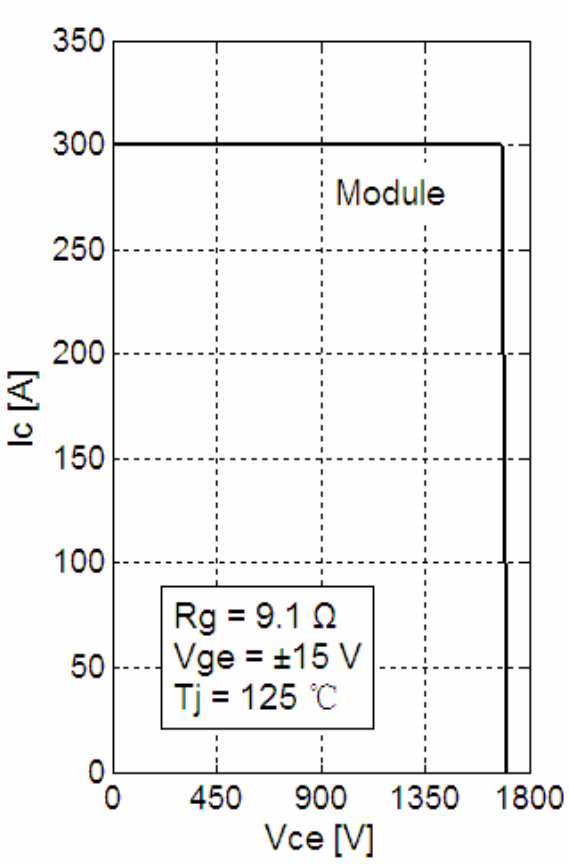


Fig 5. RBSOA

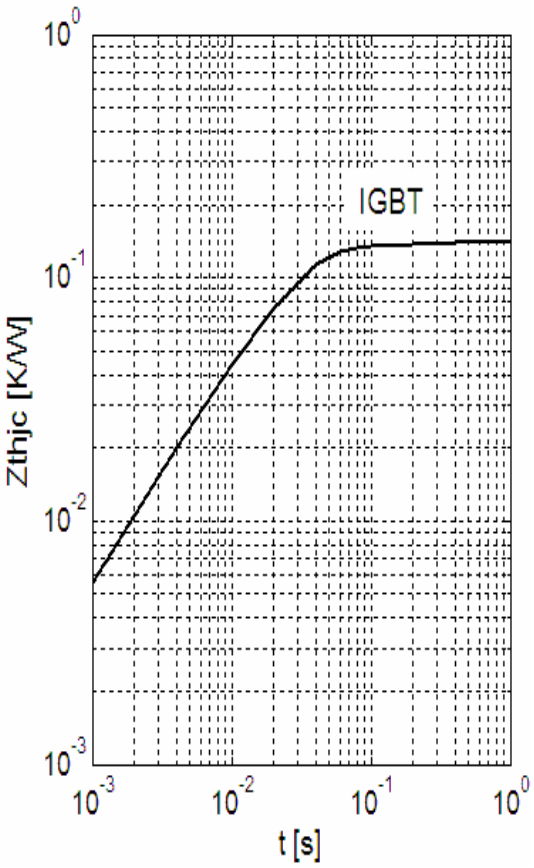


Fig 6. IGBT Transient Thermal Impedance

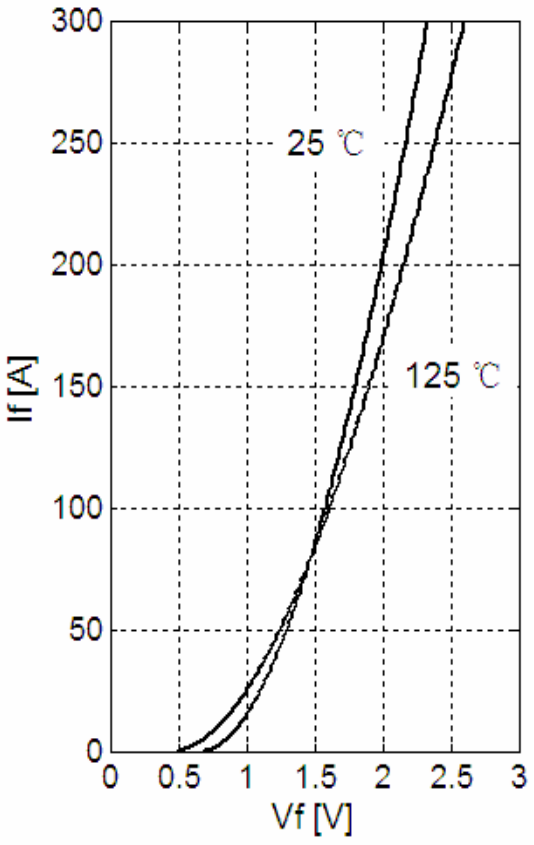


Fig 7. Diode Typical Forward Characteristics

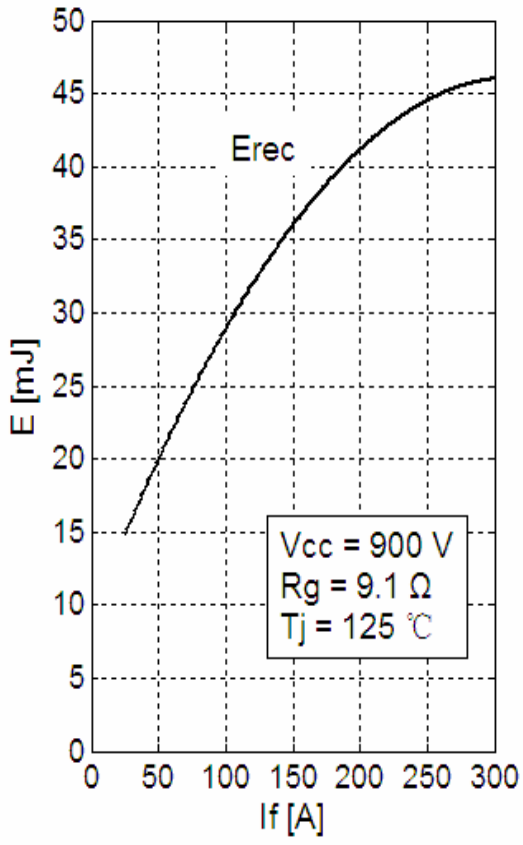


Fig 8. Diode Switching Loss vs. I_F

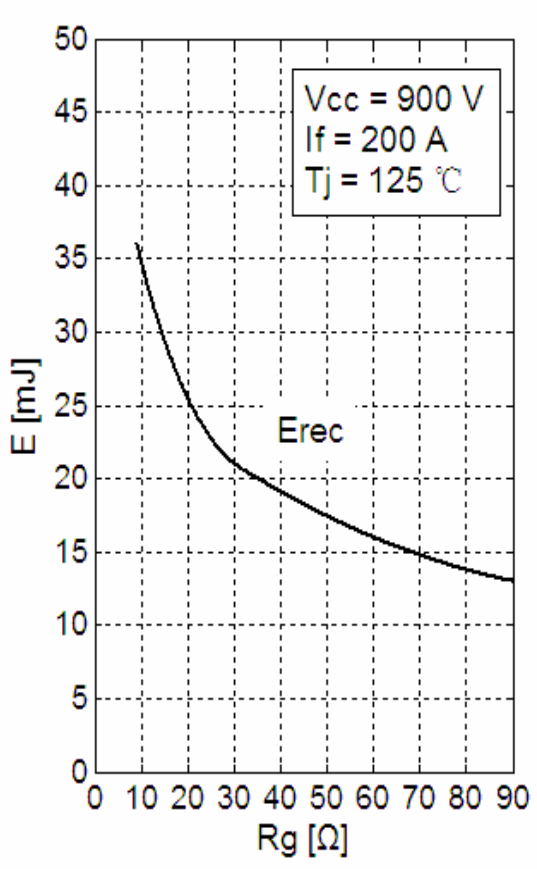


Fig 9. Diode Switching Loss vs. R_G

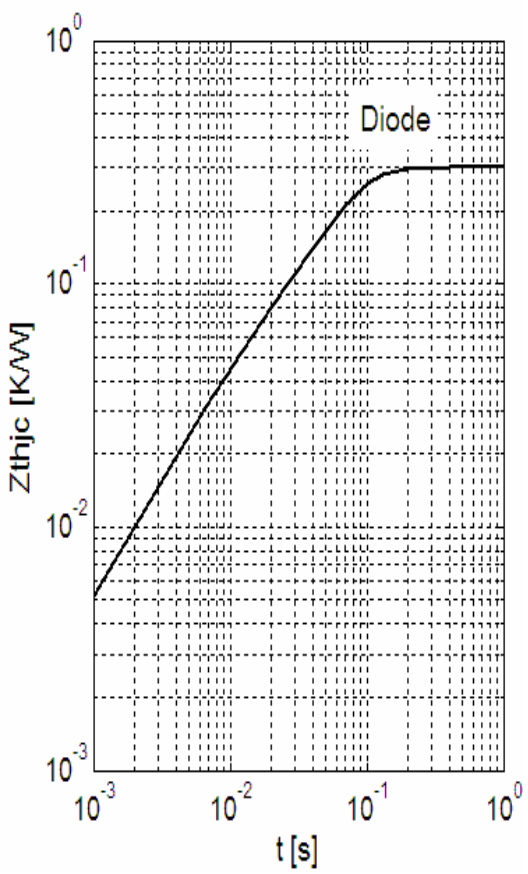
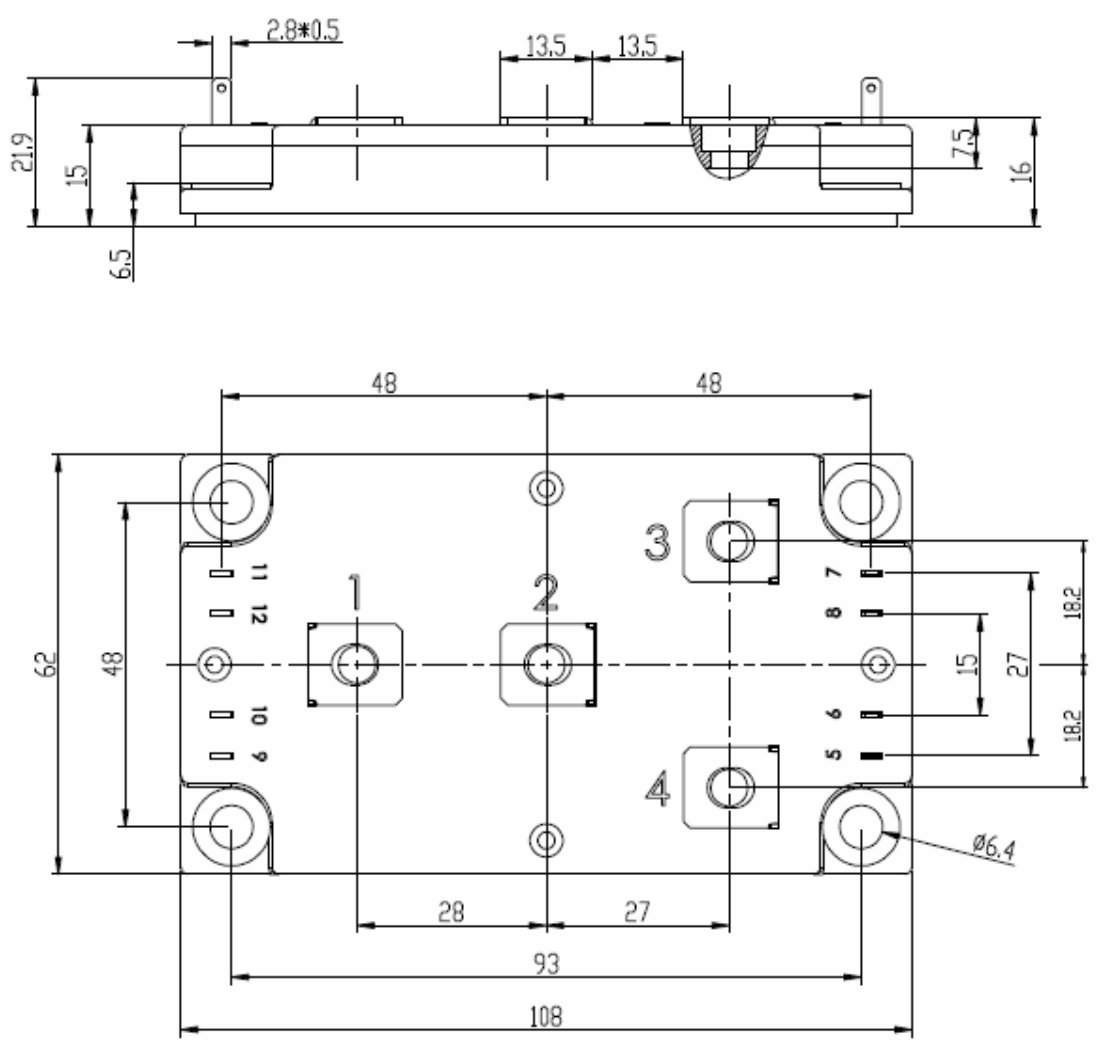


Fig 10. Diode Transient Thermal Impedance

Package Dimension

Dimensions in Millimeters



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