

STARPOWER

SEMICONDUCTOR

IGBT

GD150HFT170C2S

Molding Type Module

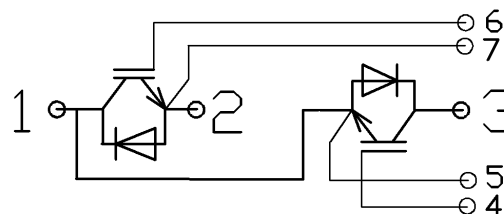
1700V/150A 2 in one-package

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 AC inverters.

Features

- Low $V_{CE(sat)}$ trench IGBT technology
- Low switching losses
- 10 μ s 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

- AC inverter drives mains 575-750V AC
- Public transport (auxiliary syst.)

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

Symbol	Description	GD150HFT170C2S	Units
V_{CES}	Collector-Emitter Voltage	1700	V

Symbol	Description	GD150HFT170C2S	Units
V_{GES}	Gate-Emitter Voltage	± 20	V
I_C	Collector Current @ $T_C=25^\circ\text{C}$	280	A
	@ $T_C=80^\circ\text{C}$	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	300	A
P_D	Maximum Power Dissipation @ $T_j=175^\circ\text{C}$	1250	W
T_{SC}	Short Circuit Withstand Time @ $T_j=125^\circ\text{C}$	10	μs
T_{jmax}	Maximum Junction Temperature	175	$^\circ\text{C}$
T_{jop}	Operating Junction Temperature	-40 to +150	$^\circ\text{C}$
T_{STG}	Storage Temperature Range	-40 to +125	$^\circ\text{C}$
I^2t -value, Diode	$V_R=0\text{V}, t=10\text{ms}, T_j=125^\circ\text{C}$	3800	A^2s
V_{ISO}	Isolation Voltage RMS, $f=50\text{Hz}, t=1\text{min}$	4000	V
Mounting Torque	Power Terminal Screw:M6	2.5 to 5.0	N.m
	Mounting Screw:M6	3.0 to 5.0	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
BV_{CES}	Collector-Emitter Breakdown Voltage	$V_{GE}=0\text{V}, I_C=3.0\text{mA}, T_j=25^\circ\text{C}$	1700			V
I_{CES}	Collector Cut-Off Current	$V_{CE}=V_{CES}, V_{GE}=0\text{V}, T_j=25^\circ\text{C}$			3.0	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	$I_C=6.0\text{mA}, V_{CE}=V_{GE}, T_j=25^\circ\text{C}$	5.2	5.8	6.4	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C=150\text{A}, V_{GE}=15\text{V}, T_j=25^\circ\text{C}$		2.0		V
		$I_C=150\text{A}, V_{GE}=15\text{V}, T_j=125^\circ\text{C}$		2.4		

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=900\text{V}, I_C=150\text{A}, R_G=9.1\Omega, V_{GE}=\pm 15\text{V}, T_j=25^\circ\text{C}$		280		ns
t_r	Rise Time			50		ns
$t_{d(off)}$	Turn-Off Delay Time			810		ns
t_f	Fall Time	$V_{CC}=900\text{V}, I_C=150\text{A},$		180		ns

E_{on}	Turn-On Switching Loss	$R_G=9.1\Omega, V_{GE}=\pm 15V,$ $T_j=25^\circ C$		33		mJ
E_{off}	Turn-Off Switching Loss			32		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=900V, I_C=150A,$ $R_G=9.1\Omega, V_{GE}=\pm 15V,$ $T_j=125^\circ C$		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	$V_{CE}=25V, f=1MHz,$ $V_{GE}=0V$		13.28		nF
C_{oes}	Output Capacitance			0.55		nF
C_{res}	Reverse Transfer Capacitance			0.44		nF
I_{SC}	SC Data	$t_{sc}\leq 10\mu s, V_{GE}=15V,$ $T_j=125^\circ C, V_{CC}=1000V,$ $V_{CEM}\leq 1700V$		600		A
R_{Gint}	Internal Gate Resistance			3.8		Ω
L_{CE}	Stray Inductance				20	nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal to Chip	$T_C=25^\circ C$		0.35		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	$I_F=150A$	$T_j=25^\circ C$		1.8	V
			$T_j=125^\circ C$		1.9	
Q_r	Diode Reverse Recovery Charge	$I_F=150A,$ $V_R=900V,$ $di/dt=-2150A/\mu s,$ $V_{GE}=-15V$	$T_j=25^\circ C$		39.0	μC
			$T_j=125^\circ C$		65.5	
I_{RM}	Diode Peak Reverse Recovery Current		$T_j=25^\circ C$		175	A
			$T_j=125^\circ C$		190	
E_{rec}	Reverse Recovery Energy		$T_j=25^\circ C$		20	mJ
			$T_j=125^\circ C$		36	

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case (IGBT Part, per 1/2 Module)		0.12	K/W
$R_{\theta JC}$	Junction-to-Case (DIODE Part, per 1/2 Module)		0.22	K/W
$R_{\theta JC}$	Case-to-Sink (Conductive grease applied)	0.035		K/W
Weight	Weight of Module	300		g

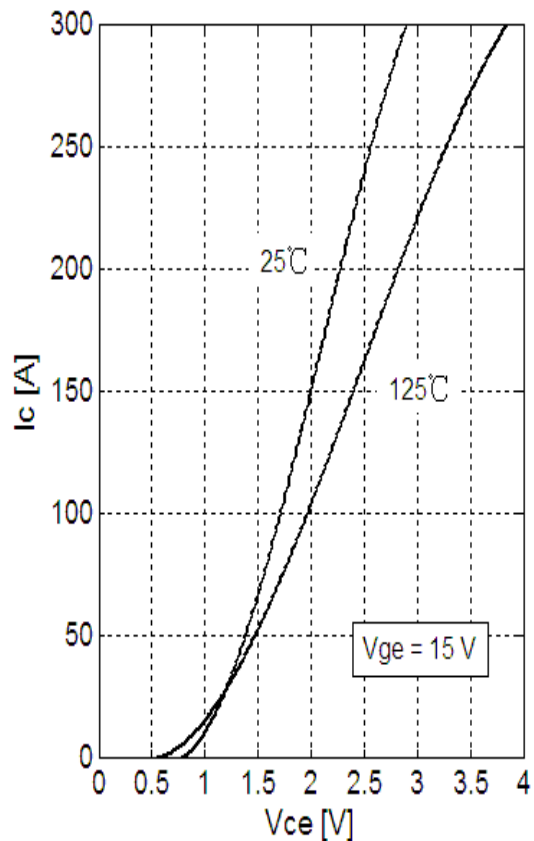


Fig 1. IGBT Typical Output Characteristics

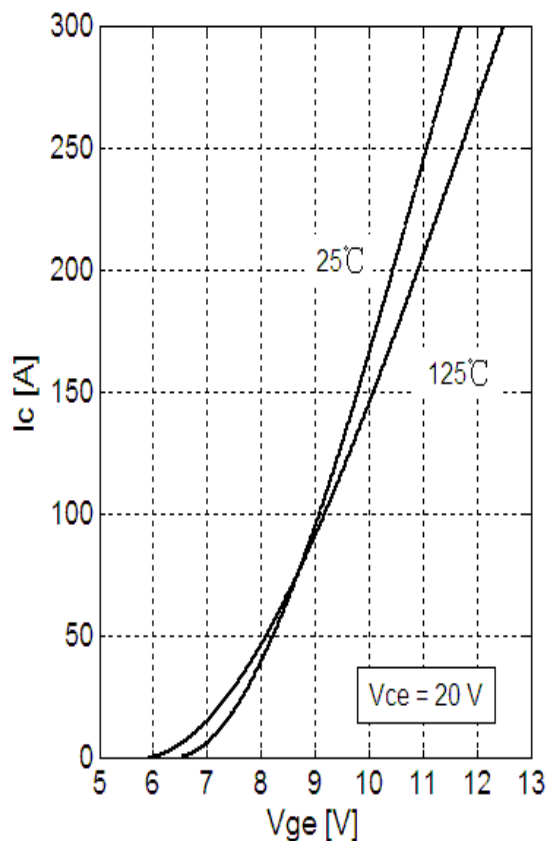


Fig 2. IGBT Typical Transfer Characteristics

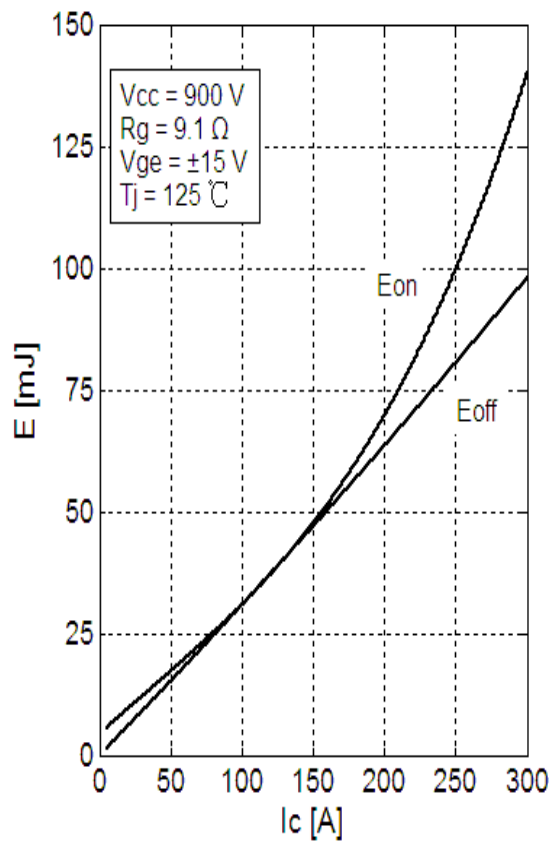


Fig 3. IGBT Switching Loss vs. Collector Current

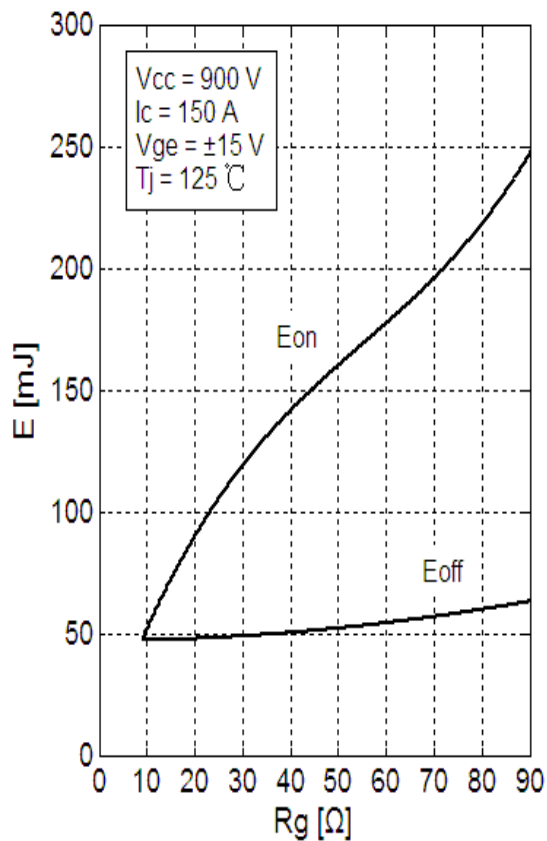


Fig 4. IGBT Switching Loss vs. Gate Resistor

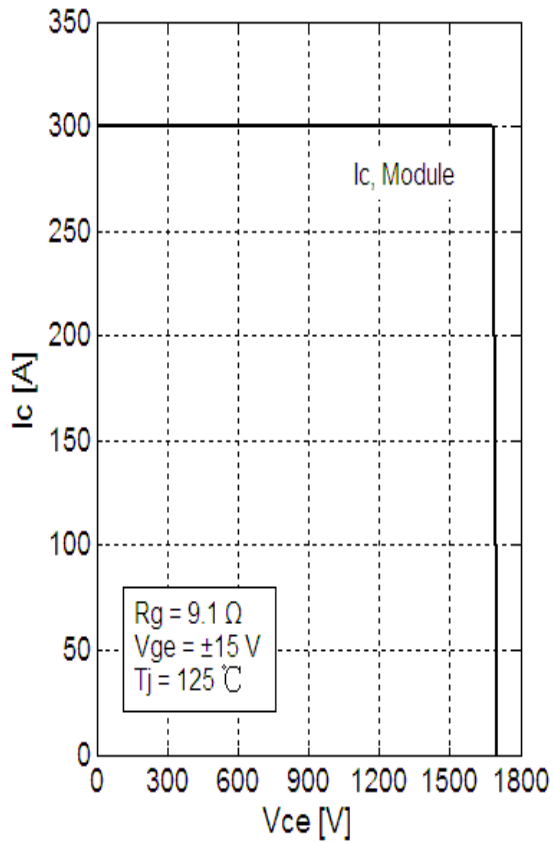


Fig 5. RBSOA

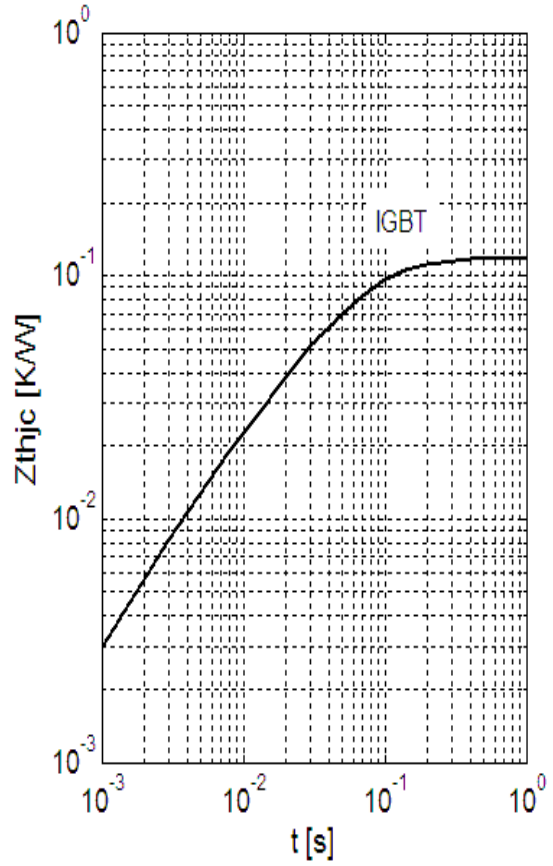


Fig 6. IGBT Transient Thermal Impedance

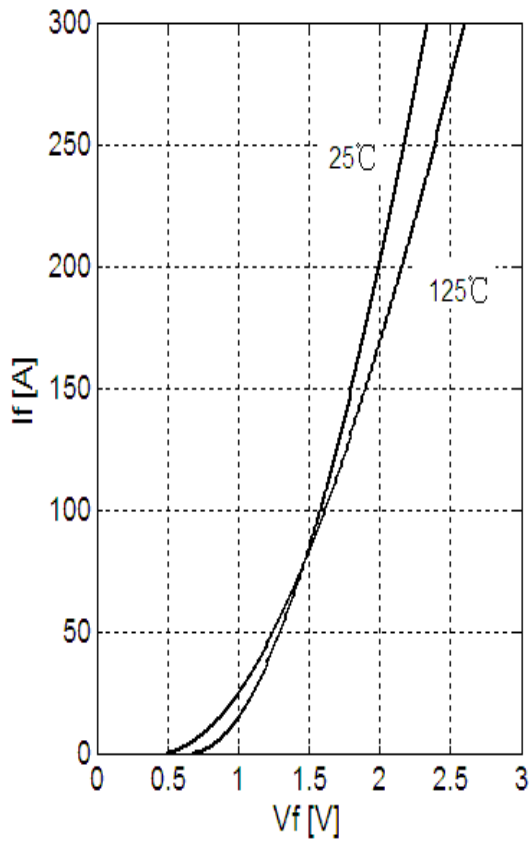


Fig 7. Forward Characteristics of Diode

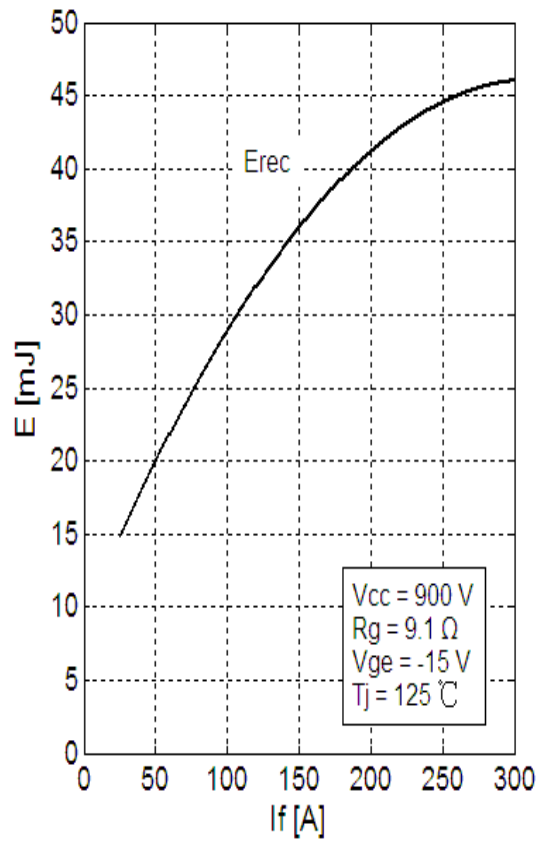


Fig 8. Diode Switching Loss vs. Collector Current

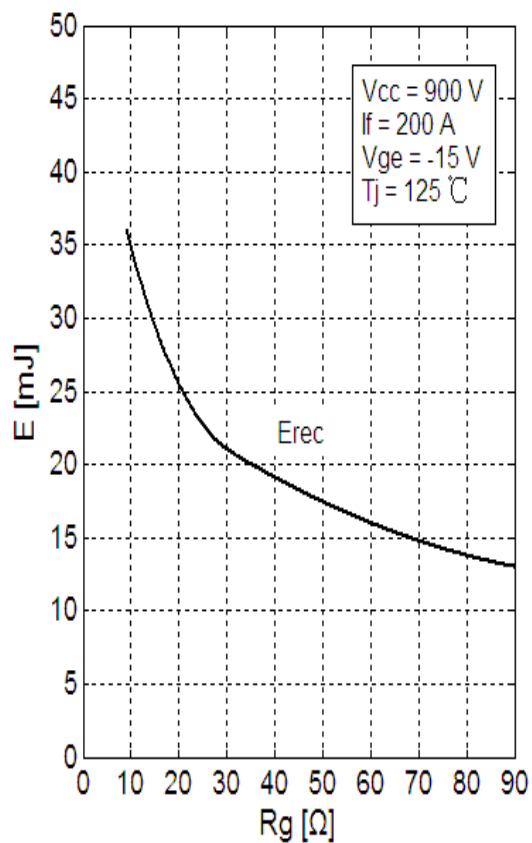


Fig9. Diode Switching Loss vs. Gate Resistor

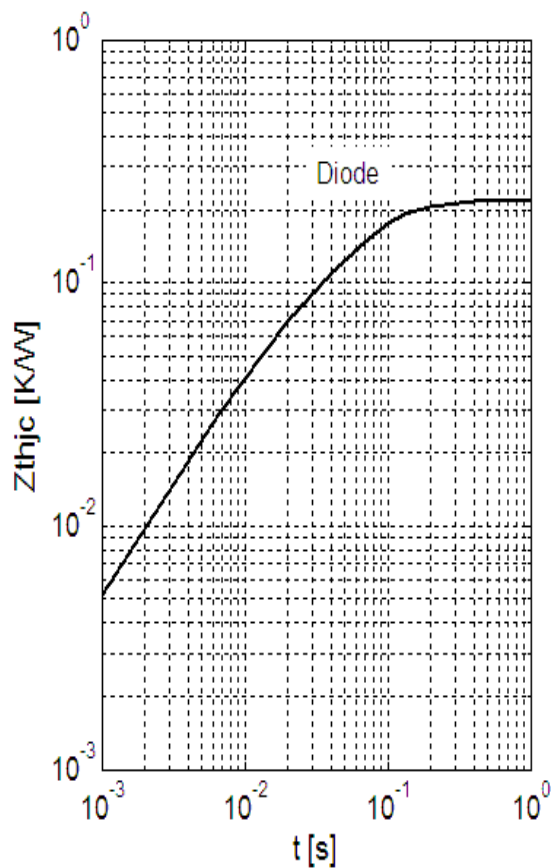
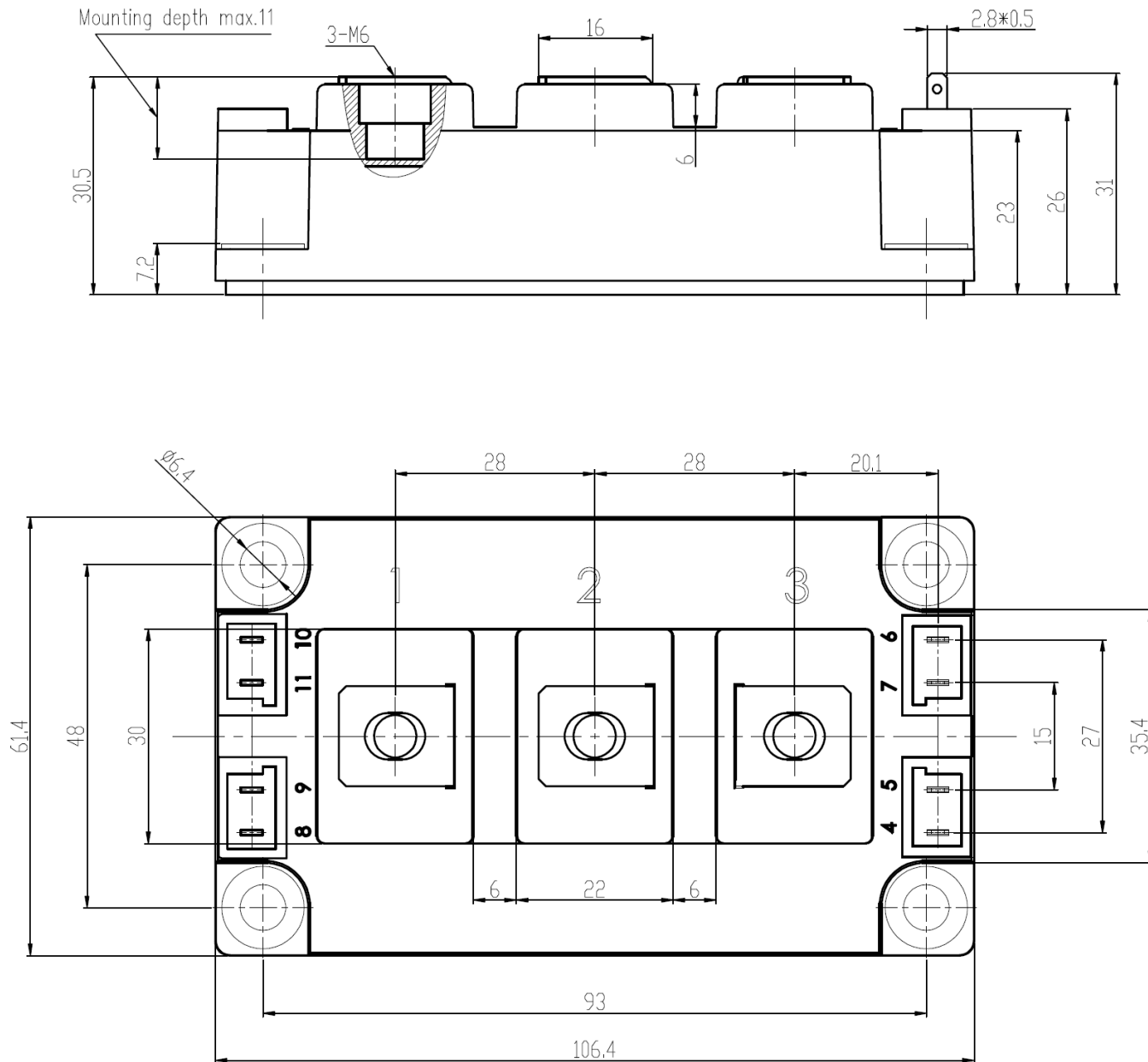


Fig 10. Diode Transient Thermal Impedance

Package Dimensions

Dimensions in Millimeters



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