

# STARPOWER

SEMICONDUCTOR™

# IGBT

## GD150HFU120C2S

Molding Type Module

1200V/150A 2 in one-package

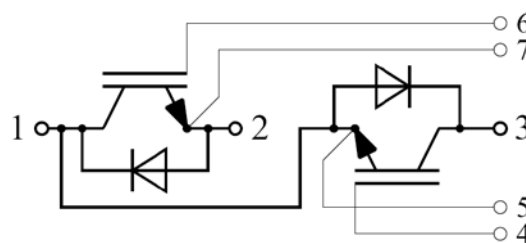
### General Description

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 $\mu$ 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



Equivalent Circuit Schematic

### Typical Applications

- Switching mode power supplies
- Inductive heating
- Electronic welder

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

Symbol	Description	GD150HFU120C2S	Units
$V_{CES}$	Collector-Emitter Voltage	1200	V
$V_{GES}$	Gate-Emitter Voltage	$\pm 20$	V
$I_C$	Collector Current @ $T_C=25^\circ\text{C}$	280	A
	@ $T_C=80^\circ\text{C}$	150	
$I_{CM(1)}$	Pulsed Collector Current $t_p=1\text{ms}$	300	A
$I_F$	Diode Continuous Forward Current	150	A
$I_{FM(1)}$	Diode Maximum Forward Current	300	A
$P_D$	Maximum power Dissipation @ $T_j=150^\circ\text{C}$	1147	W
$T_j$	Maximum Junction Temperature	150	$^\circ\text{C}$
$T_{STG}$	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:M6	2.5 to 5.0	N.m
	Mounting Screw:M6	3.0 to 6.0	N.m

**Notes:**

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

**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	$I_C=1.5\text{mA}$ , $V_{CE}=V_{GE}$ , $T_j=25^\circ\text{C}$	4.4	5.2	6.0	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C=150\text{A}$ , $V_{GE}=15\text{V}$ , $T_j=25^\circ\text{C}$		3.10	3.60	V
		$I_C=150\text{A}$ , $V_{GE}=15\text{V}$ , $T_j=125^\circ\text{C}$		3.45		

## Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600V, I_C=150A,$ $R_G=6.8\Omega, V_{GE}=\pm 15V,$ $L=200nH, T_j=25^\circ C$		612		ns
$t_r$	Rise Time			116		ns
$t_{d(off)}$	Turn-Off Delay Time			546		ns
$t_f$	Fall Time			125		ns
$E_{on}$	Turn-On Switching Loss			14.7		mJ
$E_{off}$	Turn-Off Switching Loss			8.9		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600V, I_C=150A,$ $R_G=6.8\Omega, V_{GE}=\pm 15V,$ $L=200nH, T_j=125^\circ C$		609		ns
$t_r$	Rise Time			116		ns
$t_{d(off)}$	Turn-Off Delay Time			564		ns
$t_f$	Fall Time			148		ns
$E_{on}$	Turn-On Switching Loss			17.5		mJ
$E_{off}$	Turn-Off Switching Loss			11.0		mJ
$C_{ies}$	Input Capacitance	$V_{CE}=30V, f=1MHz,$ $V_{GE}=0V$		12.7		nF
$C_{oes}$	Output Capacitance			1.14		nF
$C_{res}$	Reverse Transfer Capacitance			0.46		nF
$I_{SC}$	SC Data	$T_P \leq 10\mu s, V_{GE}=15V,$ $T_j=25^\circ C, V_{CC}=600V,$ $V_{CEM} \leq 1200V$		1400		A
$R_{Gint}$	Internal Gate Resistance			2.4		$\Omega$
$L_{CE}$	Stray Inductance				18	nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal To Chip	$T_C=25^\circ C$		0.32		m $\Omega$

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	$I_F=150A$	$T_j=25^\circ C$		1.75	2.15	V
			$T_j=125^\circ C$		1.80		
$Q_r$	Recovered Charge	$I_F=150A,$	$T_j=25^\circ C$		8.2		$\mu C$
			$T_j=125^\circ C$		19.1		
$I_{RM}$	Peak Reverse Recovery Current	$V_R=600V,$ $di/dt=-1500A/\mu s,$	$T_j=25^\circ C$		85		A
			$T_j=125^\circ C$		125		
$E_{rec}$	Reverse Recovery Energy	$V_{GE}=-15V$	$T_j=25^\circ C$		4.2		mJ
			$T_j=125^\circ C$		8.4		

**Thermal Characteristics**

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case (per IGBT)		0.109	K/W
$R_{\theta JC}$	Junction-to-Case (per DIODE)		0.180	K/W
$R_{\theta CS}$	Case-to-Sink (Conductive grease applied)	0.035		K/W
G	Weight of Module	300		g

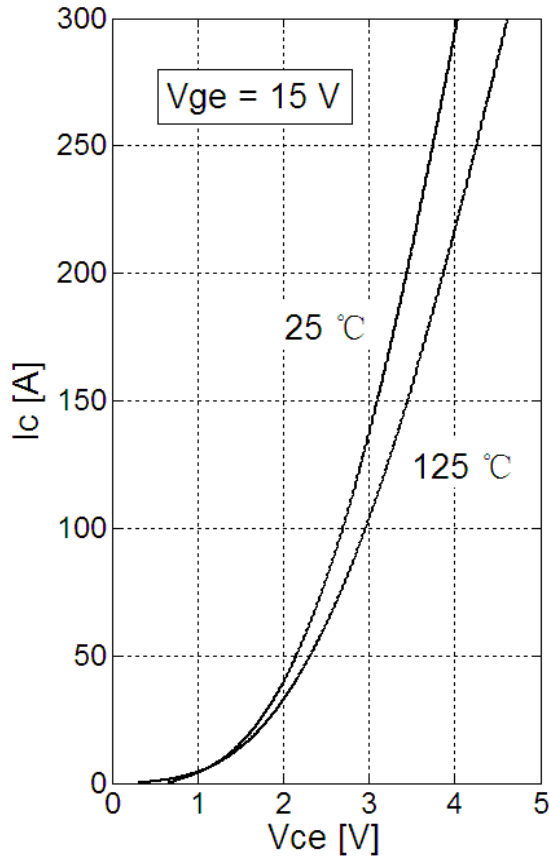


Fig 1. IGBT Typical Output Characteristics

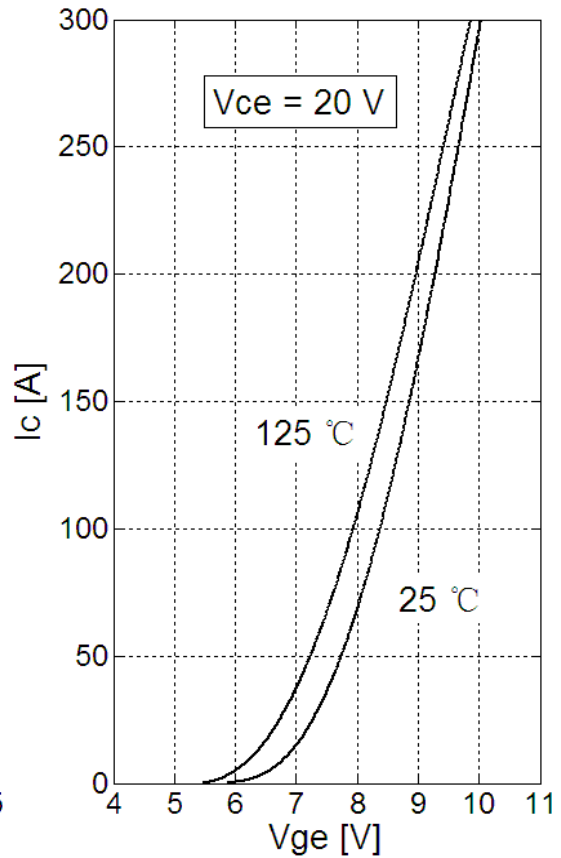


Fig 2. IGBT Typical Transfer Characteristics

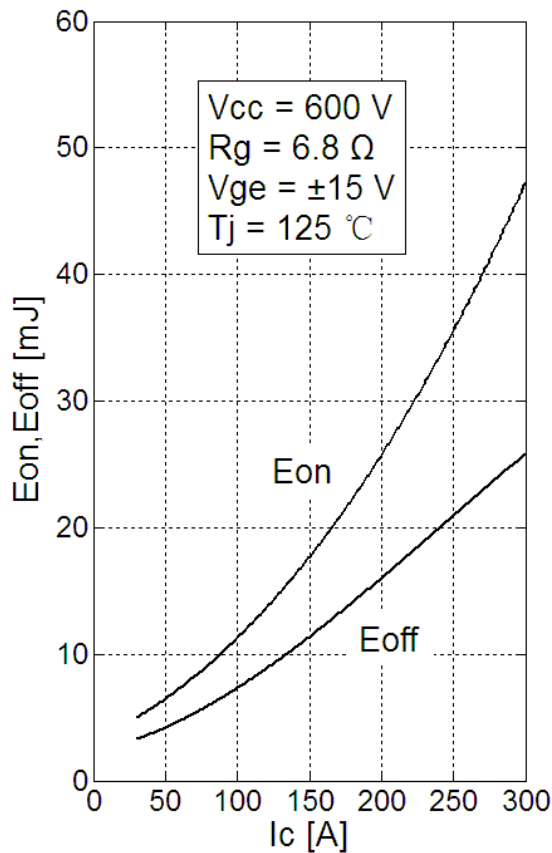


Fig 3. IGBT Switching Loss vs.  $I_c$

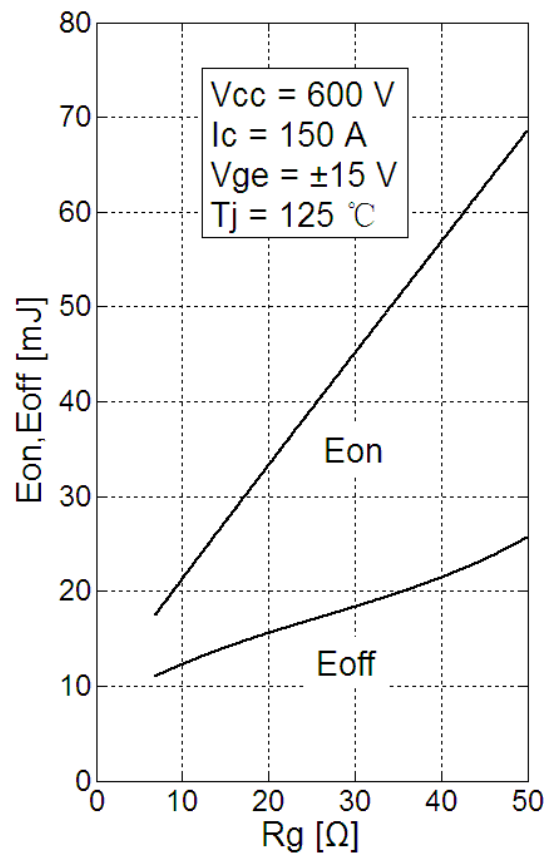


Fig 4. IGBT Switching Loss vs.  $R_g$

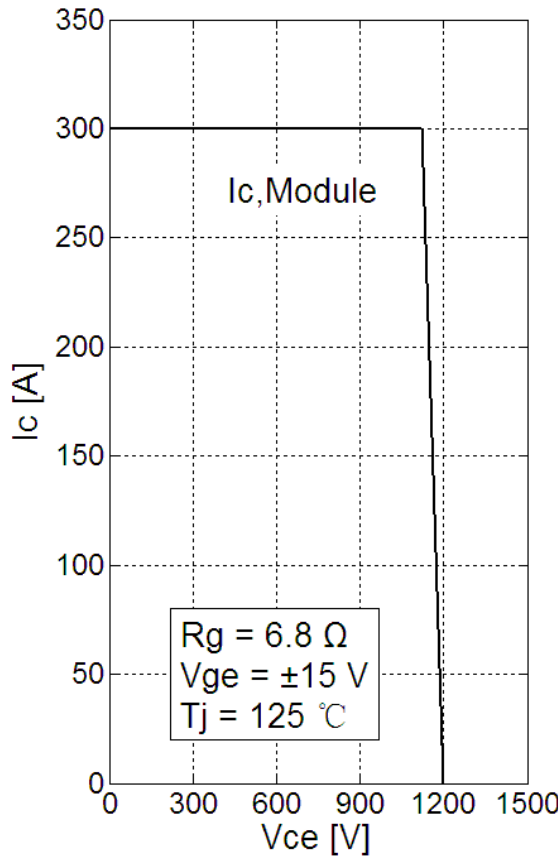


Fig 5. RBSOA

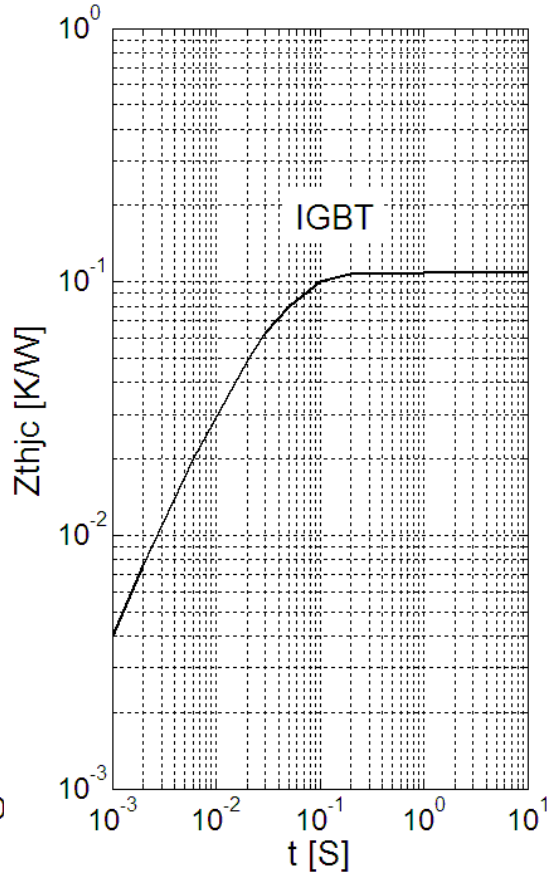


Fig 6. IGBT Transient Thermal Impedance

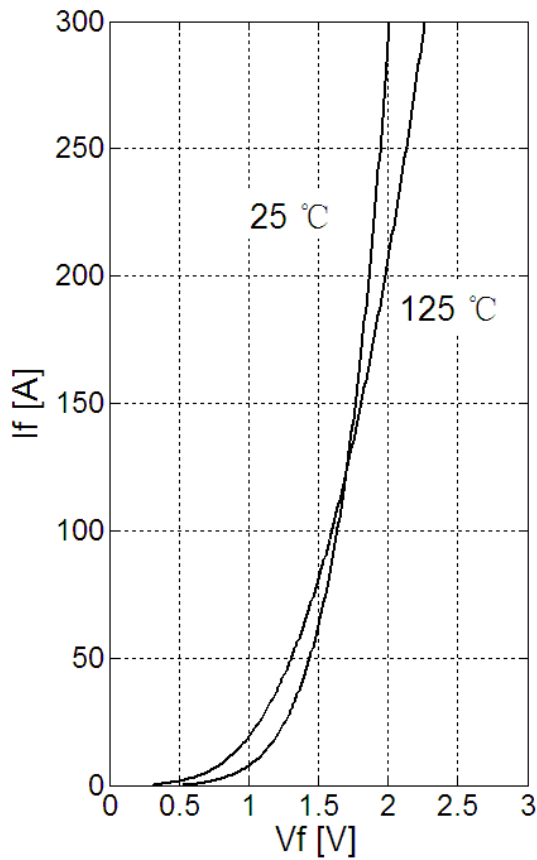


Fig 7. Diode Typical Forward Characteristics

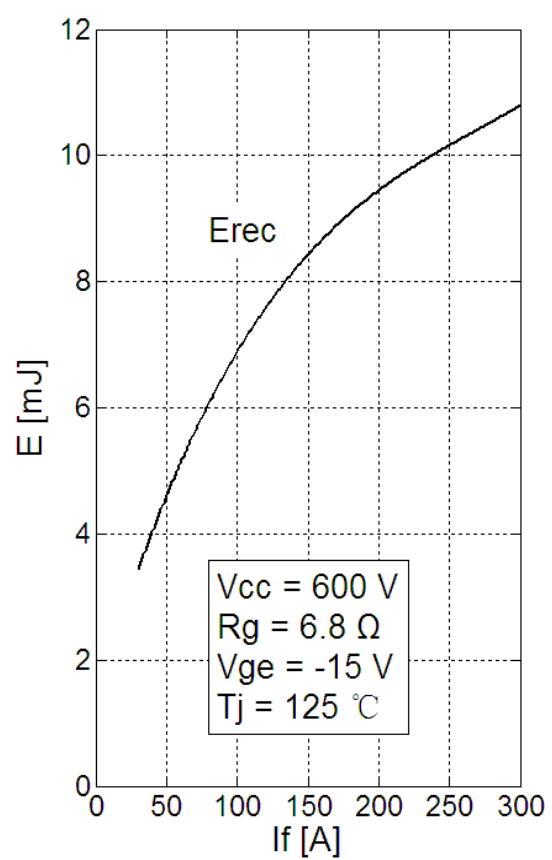


Fig 8. Diode Switching Loss vs.  $I_f$

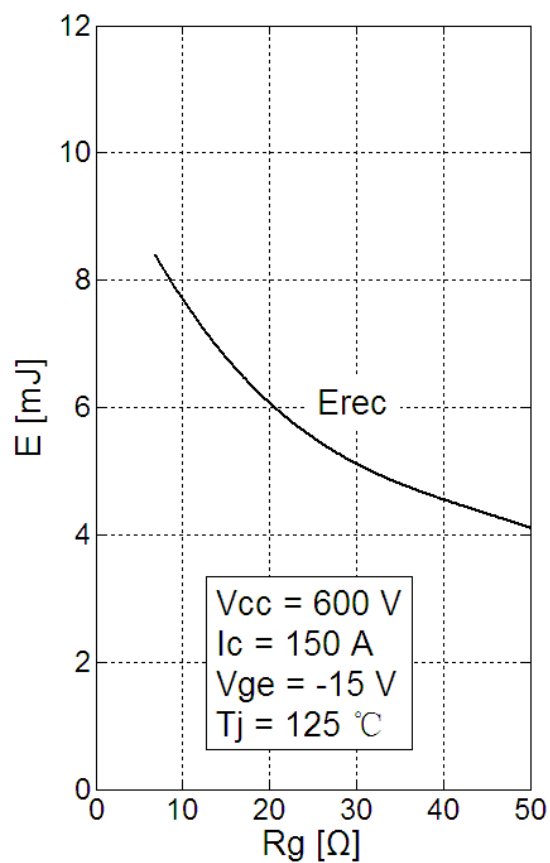


Fig 9. Diode Switching Loss vs.  $R_g$

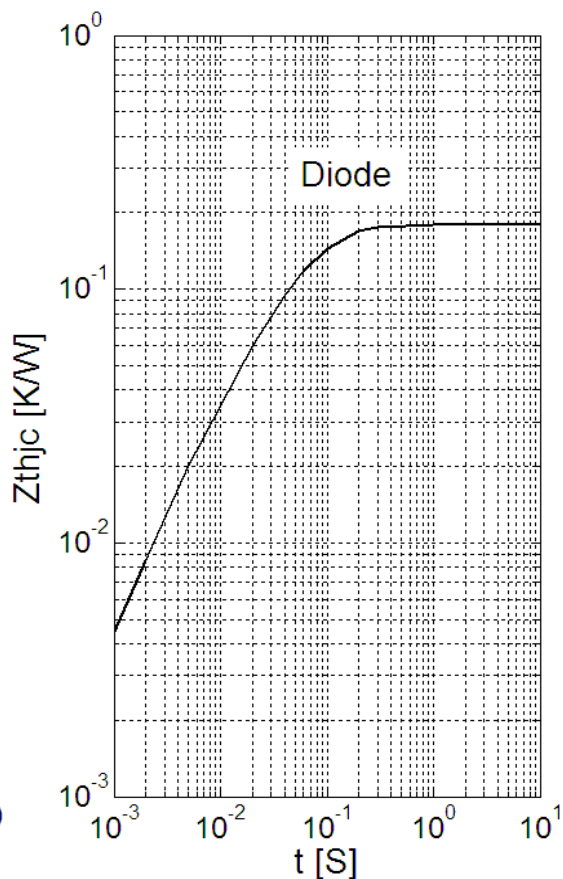
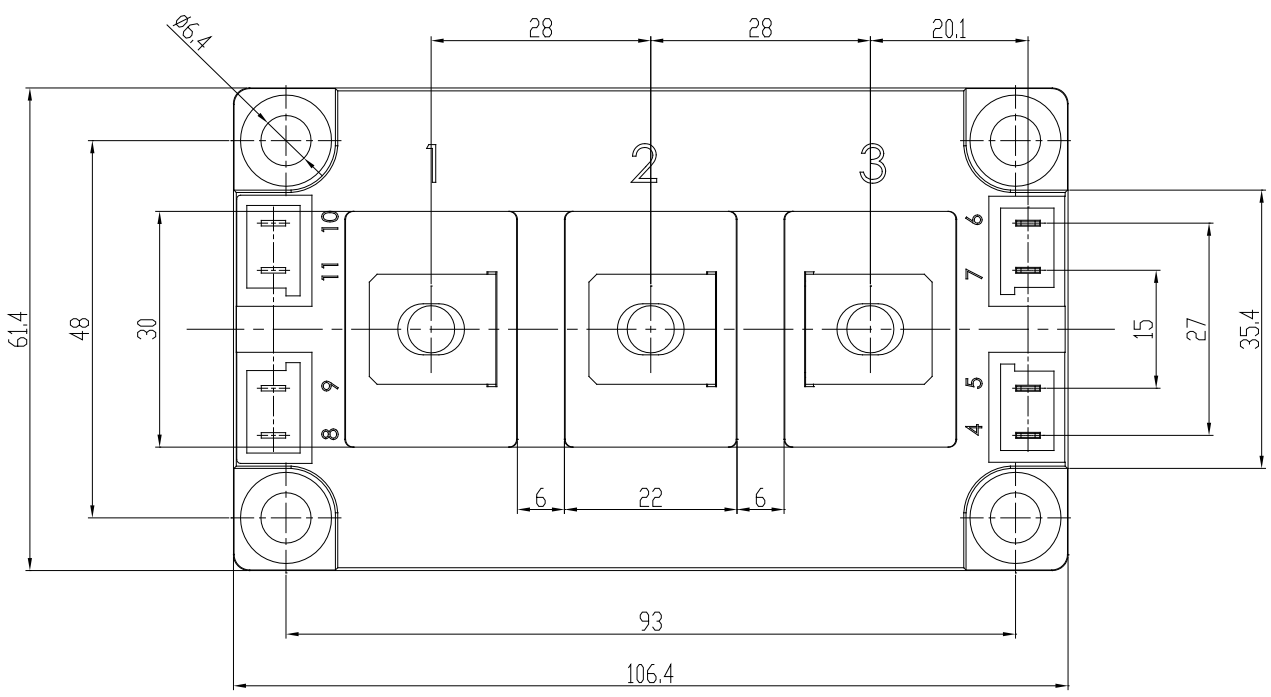
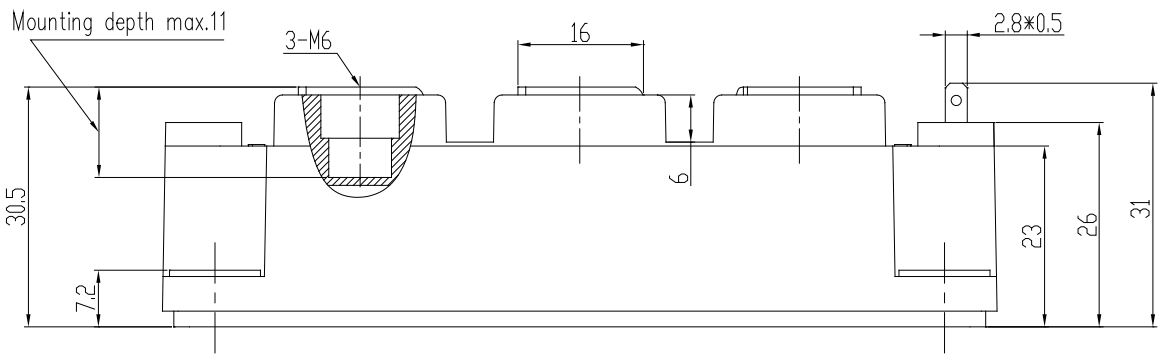


Fig 10. Diode Transient Thermal Impedance

### Package Dimension

Dimensions in Millimeters





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