

# STARPOWER

SEMICONDUCTOR™

# IGBT

## GD300HFK60C2S

Molding Type Module

600V/300A 2 in one-package

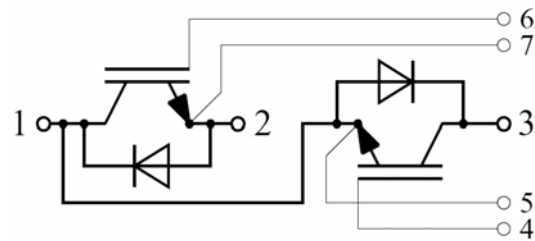
### General Description

STARPOWER IGBT Power Module provides ultra low conduction and switching loss as well as short circuit ruggedness. They are designed for the applications such as UPS and SMPS.



### Features

- NPT IGBT technology
- 10 $\mu$ s short circuit capability
- $V_{CE(sat)}$  with positive temperature coefficient
- Square RBSOA
- Latch-up free
- Low inductance case
- Fast & soft reverse recovery anti-parallel FWD
- Isolated copper baseplate using DBC technology



Equivalent Circuit Schematic

### Typical Applications

- UPS
- Switching mode power supplies
- Electronic welders

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

Symbol	Description	GD300HFK60C2S	Units
$V_{CES}$	Collector-Emitter Voltage	600	V
$V_{GES}$	Gate-Emitter Voltage	$\pm 20$	V
$I_C$	Collector Current @ $T_C=25^{\circ}\text{C}$	380	A
	@ $T_C=80^{\circ}\text{C}$	300	
$I_{CM(1)}$	Pulsed Collector Current $t_p=1\text{ms}$	600	A
$I_F$	Diode Continuous Forward Current @ $T_C=80^{\circ}\text{C}$	300	A
$I_{FM}$	Diode Maximum Forward Current $t_p=1\text{ms}$	600	A
$P_D$	Maximum Power Dissipation @ $T_j=150^{\circ}\text{C}$	1106	W
$T_{jmax}$	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 Mounting Screw:M6	2.5 to 5.0 3.0 to 5.0	N.m

**Notes:**

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

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{(BR)CES}$	Collector-Emitter Breakdown Voltage	$T_j=25^{\circ}\text{C}$	600			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	$I_C=1.0\text{mA}, V_{CE}=V_{GE},$ $T_j=25^{\circ}\text{C}$	3.5	4.5	5.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C=300\text{A}, V_{GE}=15\text{V},$ $T_j=25^{\circ}\text{C}$		1.95	2.30	V
		$I_C=300\text{A}, V_{GE}=15\text{V},$ $T_j=125^{\circ}\text{C}$		2.20		

## Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=300V, I_C=300A,$ $R_G=4.7\Omega, V_{GE}=\pm 15V,$ $T_j=25^\circ C$		390		ns
$t_r$	Rise Time			75		ns
$t_{d(off)}$	Turn-Off Delay Time			315		ns
$t_f$	Fall Time			70		ns
$E_{on}$	Turn-On Switching Loss			5.25		mJ
$E_{off}$	Turn-Off Switching Loss			7.17		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=300V, I_C=300A,$ $R_G=4.7\Omega, V_{GE}=\pm 15V,$ $T_j=125^\circ C$		421		ns
$t_r$	Rise Time			76		ns
$t_{d(off)}$	Turn-Off Delay Time			366		ns
$t_f$	Fall Time			105		ns
$E_{on}$	Turn-On Switching Loss			6.20		mJ
$E_{off}$	Turn-Off Switching Loss			10.25		mJ
$C_{ies}$	Input Capacitance	$V_{CE}=25V, f=1MHz,$ $V_{GE}=0V$		18.2		nF
$C_{oes}$	Output Capacitance			1.36		nF
$C_{res}$	Reverse Transfer Capacitance			0.61		nF
$I_{SC}$	SC Data	$t_{sc} \leq 10\mu s, V_{GE}=15V,$ $T_j=125^\circ C, V_{CC}=600V,$ $V_{CEM} \leq 1200V$		TBD		A
$R_{Gint}$	Internal Gate Resistance			1.2		$\Omega$
$L_{CE}$	Stray Inductance				20	nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal to Chip	$T_C=25^\circ C$		0.35		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	$I_F=300A$	$T_j=25^\circ C$	1.35	1.75	V
			$T_j=125^\circ C$	1.35		
$Q_r$	Recovered Charge	$I_F=300A,$	$T_j=25^\circ C$	12.1		$\mu C$
			$T_j=125^\circ C$	21.3		
$I_{RM}$	Peak Reverse Recovery Current	$V_R=300V,$ $di/dt=-4000A/\mu s,$	$T_j=25^\circ C$	155		A
			$T_j=125^\circ C$	186		
$E_{rec}$	Reverse Recovery Energy	$V_{GE}=-15V$	$T_j=25^\circ C$	3.50		mJ
			$T_j=125^\circ C$	6.38		

**Thermal Characteristics**

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case (per IGBT)		0.113	K/W
$R_{\theta JC}$	Junction-to-Case (per DIODE)		0.188	K/W
$R_{\theta CS}$	Case-to-Sink (Conductive grease applied)	0.035		K/W
Weight	Weight of Module	300		g

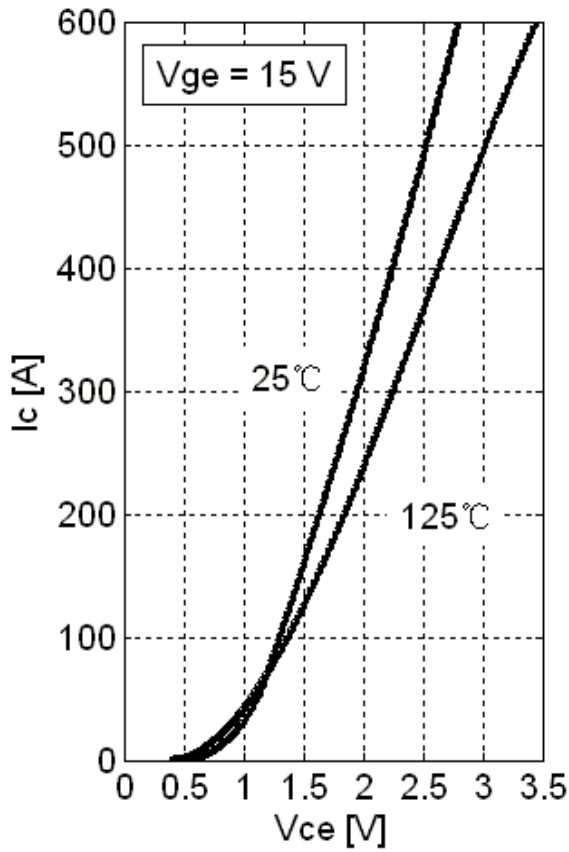


Fig 1. IGBT Typical Output Characteristics

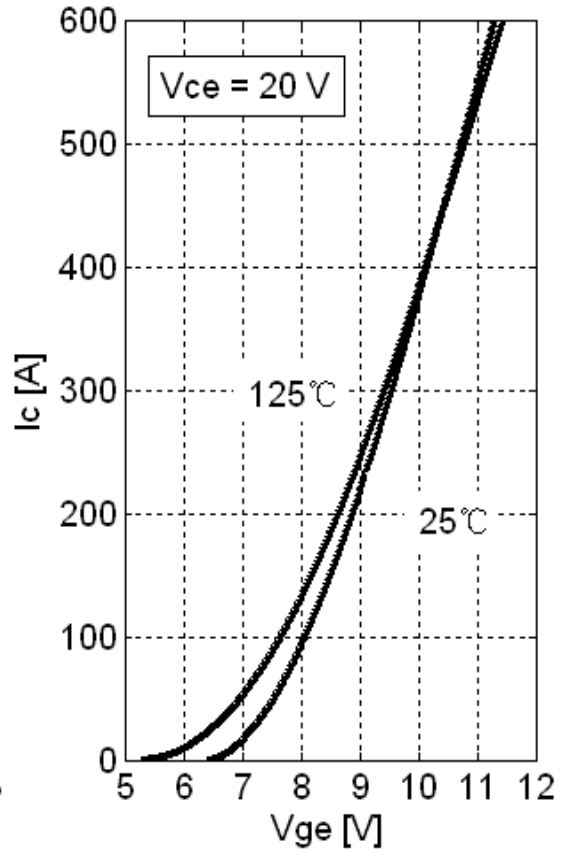


Fig 2. IGBT Typical Transfer Characteristics

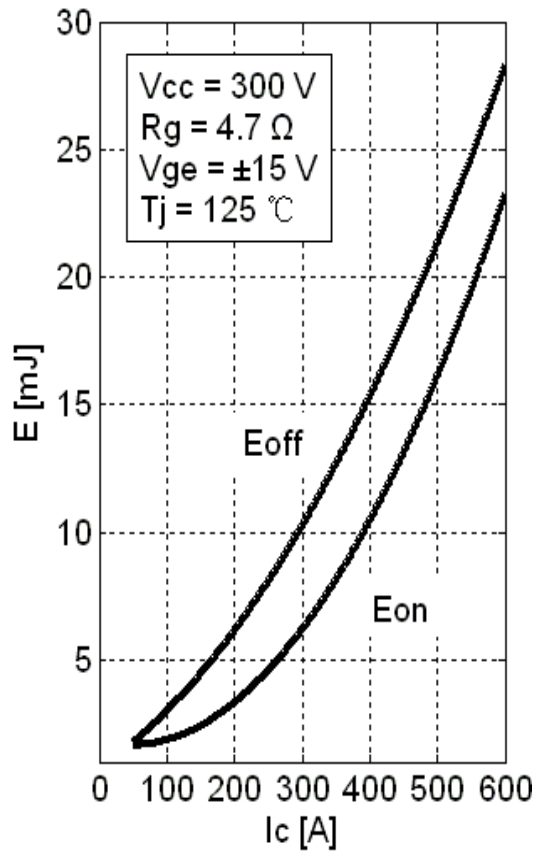


Fig 3. IGBT Switching Loss vs.  $I_C$

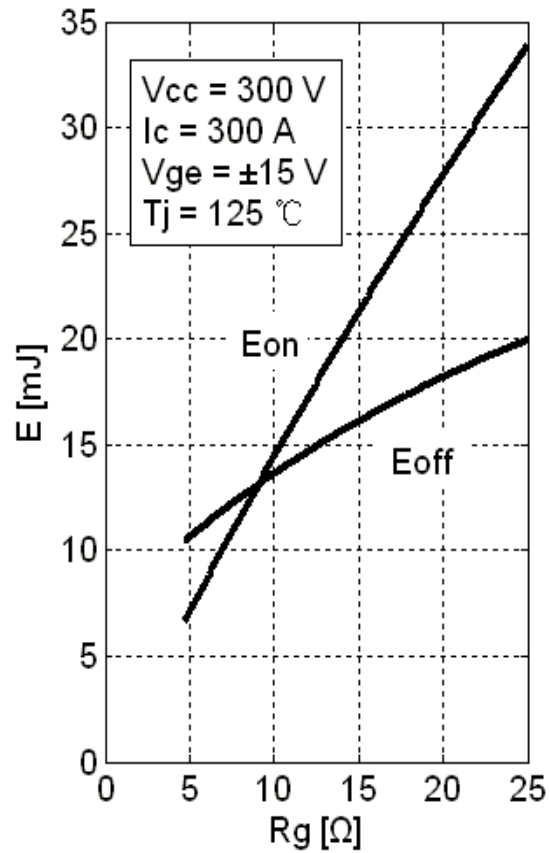


Fig 4. IGBT Switching Loss vs.  $R_G$

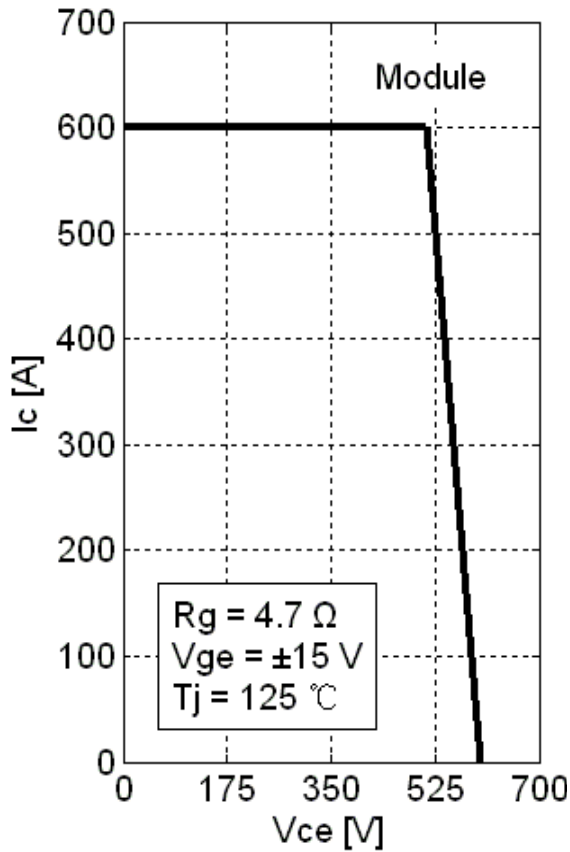


Fig 5. RBSOA

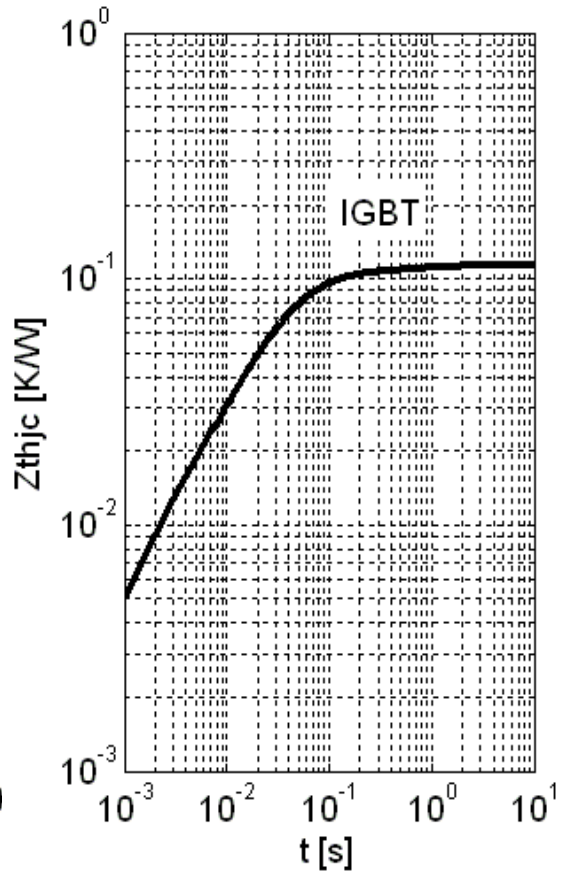


Fig 6. IGBT Transient Thermal Impedance

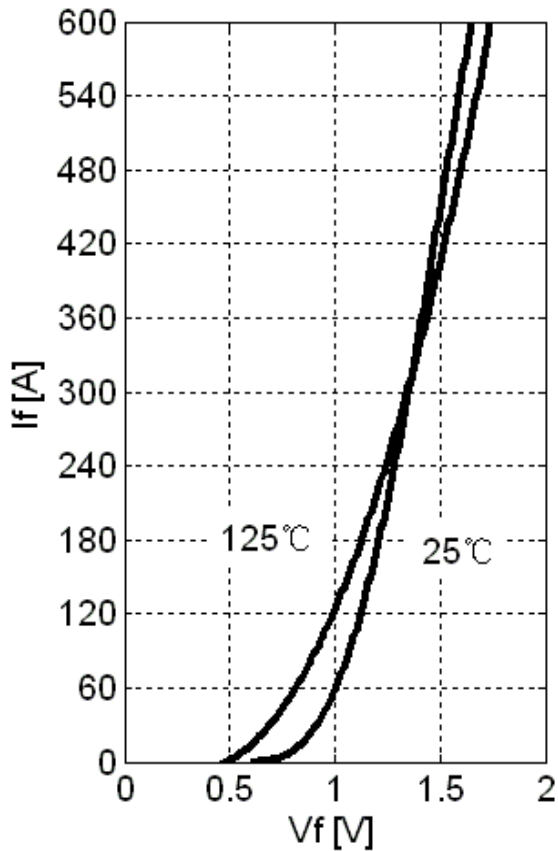


Fig 7. Diode Typical Forward Characteristics

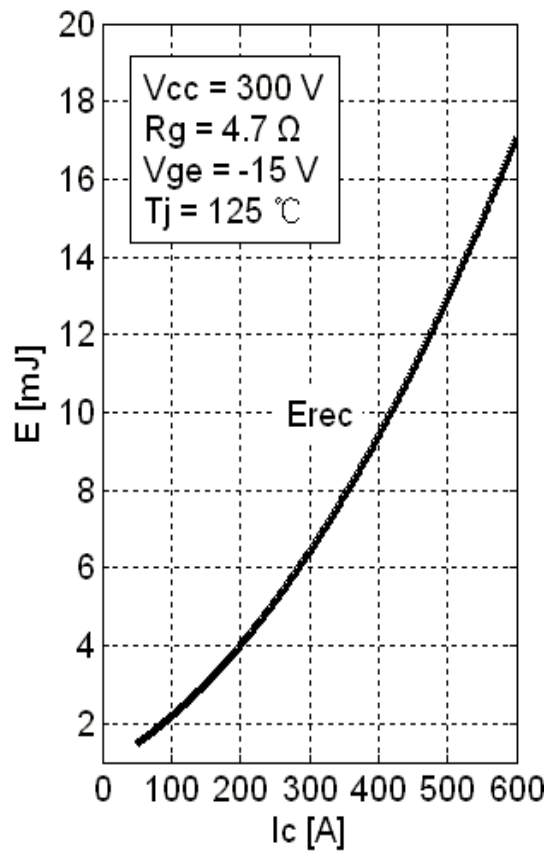


Fig 8. Diode Switching Loss vs.  $I_f$

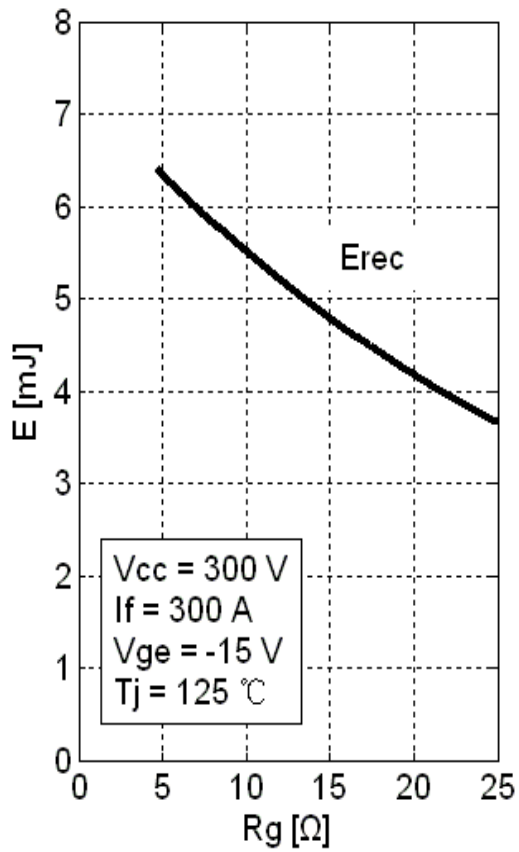


Fig 9. Diode Switching Loss vs. R<sub>G</sub>

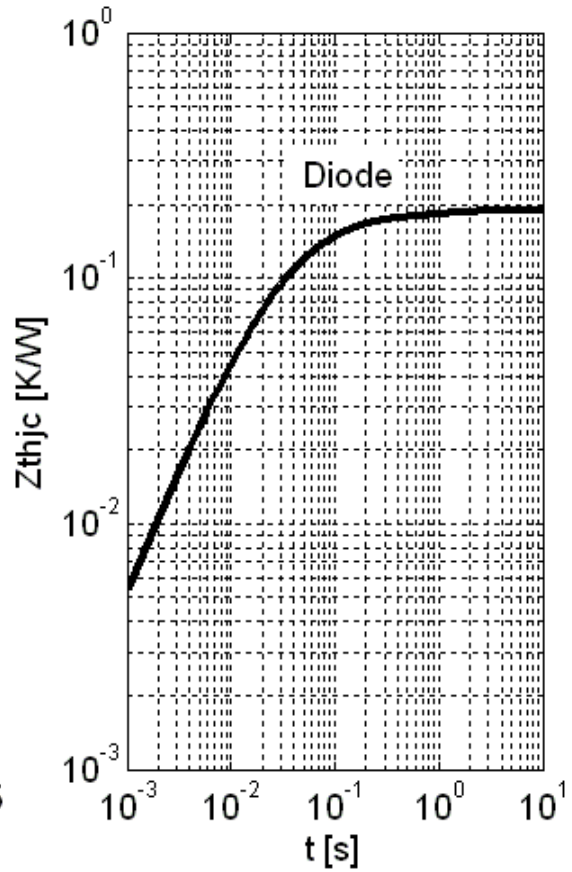
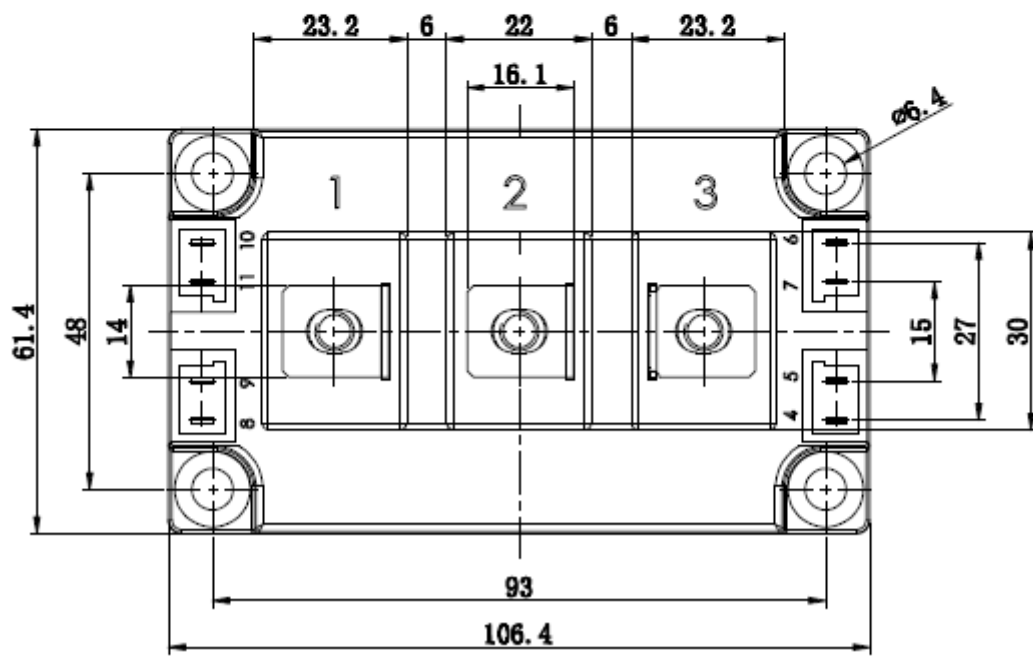
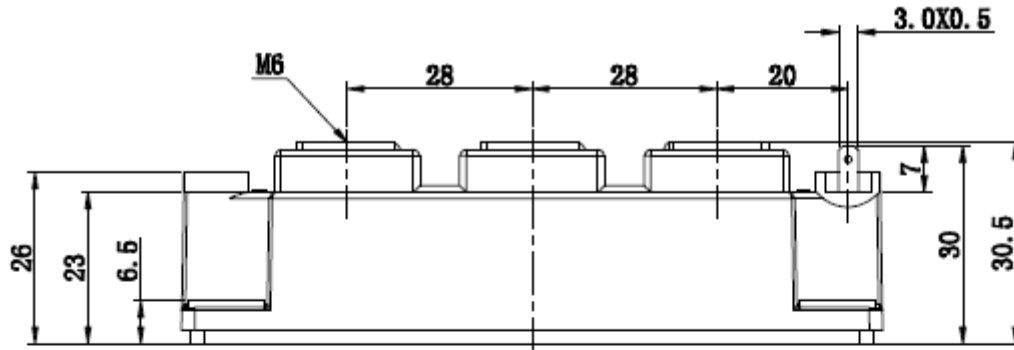


Fig 10. Diode Transient Thermal Impedance

Package Dimension

Dimensions in Millimeters





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