

STARPOWER

SEMICONDUCTOR™

IGBT

GD400HFT120C2S

Molding Type Module

1200V/400A 2 in one-package

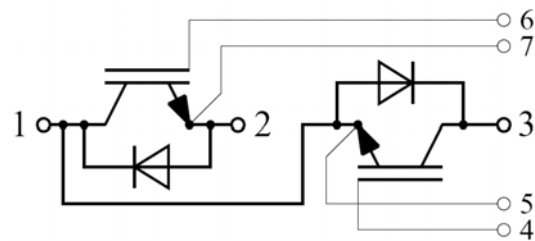
General Description

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



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

- Inverter for motor drive
- AC and DC servo drive amplifier
- Uninterruptible power supply

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

Symbol	Description	GD400HFT120C2S	Units
V_{CES}	Collector-Emitter Voltage	1200	V
V_{GES}	Gate-Emitter Voltage	± 20	V
I_C	Collector Current @ $T_C=25^{\circ}\text{C}$	600	A
	@ $T_C=80^{\circ}\text{C}$	400	
$I_{CM(1)}$	Pulsed Collector Current $t_p=1\text{ms}$	800	A
I_F	Diode Continuous Forward Current @ $T_C=80^{\circ}\text{C}$	400	A
I_{FM}	Diode Maximum Forward Current $t_p=1\text{ms}$	800	A
P_D	Maximum Power Dissipation @ $T_j=150^{\circ}\text{C}$	2119	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	2.5 to 5.0	N.m
	Mounting Screw:M6	3.0 to 5.0	

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	$I_C=16\text{mA}, V_{CE}=V_{GE}, T_j=25^{\circ}\text{C}$	5.0	5.8	6.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C=400\text{A}, V_{GE}=15\text{V}, T_j=25^{\circ}\text{C}$		1.70	2.15	V
		$I_C=400\text{A}, V_{GE}=15\text{V}, T_j=125^{\circ}\text{C}$		2.00		

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600V, I_C=400A,$ $R_G=1.8\Omega, V_{GE}=\pm 15V,$ $T_j=25^\circ C$		250		ns
t_r	Rise Time			39		ns
$t_{d(off)}$	Turn-Off Delay Time			500		ns
t_f	Fall Time			100		ns
E_{on}	Turn-On Switching Loss			17.0		mJ
E_{off}	Turn-Off Switching Loss			42.0		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600V, I_C=400A,$ $R_G=1.8\Omega, V_{GE}=\pm 15V,$ $T_j=125^\circ C$		299		ns
t_r	Rise Time			46		ns
$t_{d(off)}$	Turn-Off Delay Time			605		ns
t_f	Fall Time			155		ns
E_{on}	Turn-On Switching Loss			25.1		mJ
E_{off}	Turn-Off Switching Loss			61.9		mJ
C_{ies}	Input Capacitance	$V_{CE}=25V, f=1MHz,$ $V_{GE}=0V$		28.8		nF
C_{oes}	Output Capacitance			1.51		nF
C_{res}	Reverse Transfer Capacitance			1.31		nF
I_{SC}	SC Data	$t_{sc} \leq 10\mu s, V_{GE}=15V,$ $T_j=125^\circ C, V_{CC}=600V,$ $V_{CEM} \leq 1200V$		1600		A
R_{Gint}	Internal Gate Resistance			1.9		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	$I_F=400A$	$T_j=25^\circ C$	1.65	2.15	V
			$T_j=125^\circ C$	1.65		
Q_r	Recovered Charge	$I_F=400A,$	$T_j=25^\circ C$	44		μC
			$T_j=125^\circ C$	78		
I_{RM}	Peak Reverse Recovery Current	$V_R=600V,$ $di/dt=-6000A/\mu s,$	$T_j=25^\circ C$	490		A
			$T_j=125^\circ C$	555		
E_{rec}	Reverse Recovery Energy	$V_{GE}=-15V$	$T_j=25^\circ C$	19.0		mJ
			$T_j=125^\circ C$	35.1		

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case (per IGBT)		0.059	K/W
$R_{\theta JC}$	Junction-to-Case (per DIODE)		0.106	K/W
$R_{\theta CS}$	Case-to-Sink (Conductive grease applied)	0.035		K/W
Weight	Weight of Module	300		g

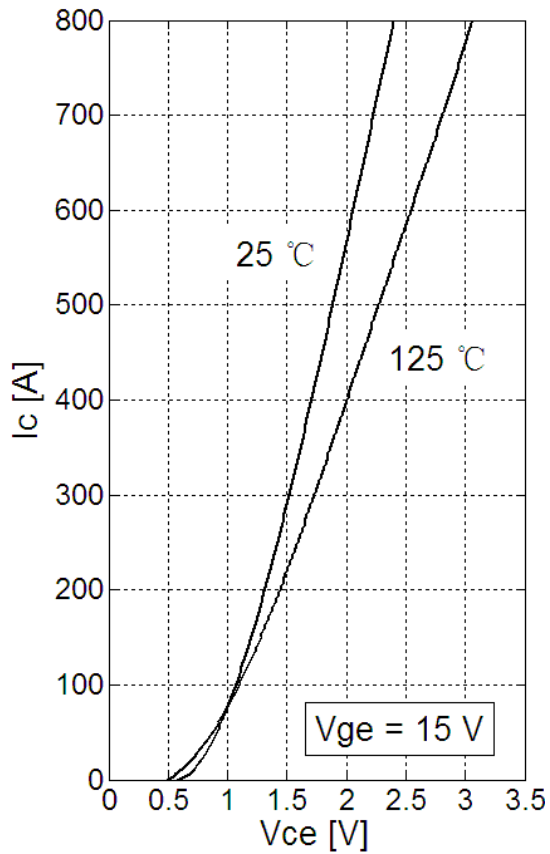


Fig 1. IGBT Typical Output Characteristics

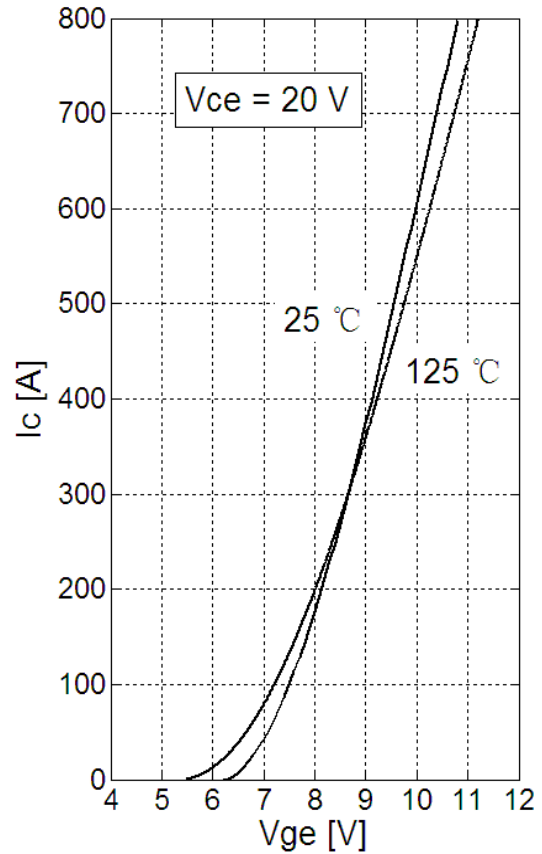


Fig 2. IGBT Typical Transfer Characteristics

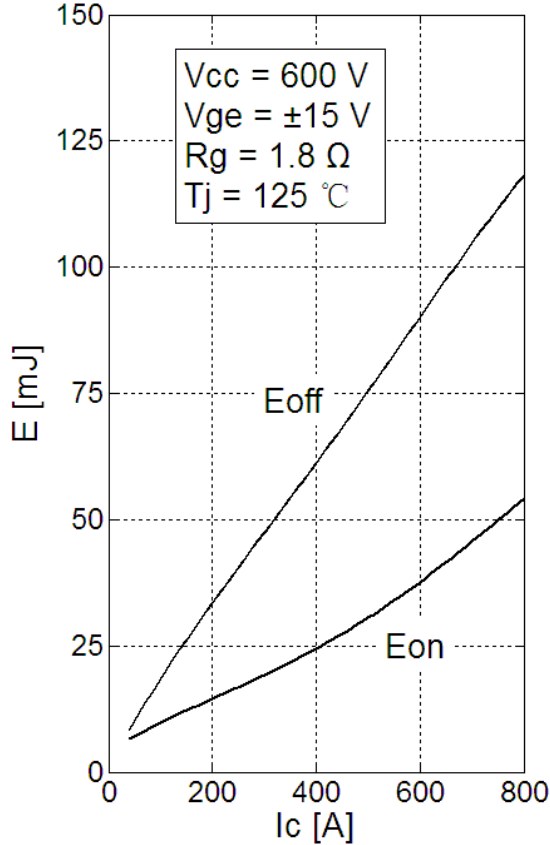


Fig 3. IGBT Switching Loss vs. I_c

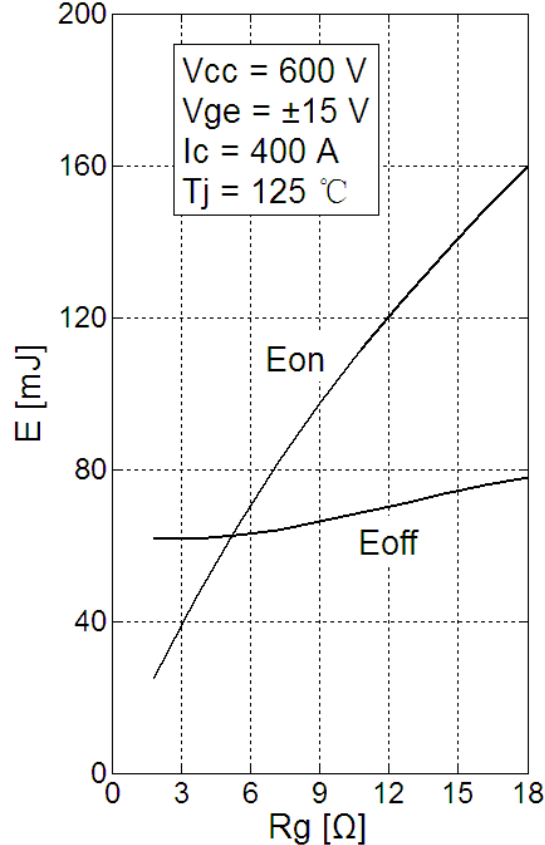


Fig 4. IGBT Switching Loss vs. R_g

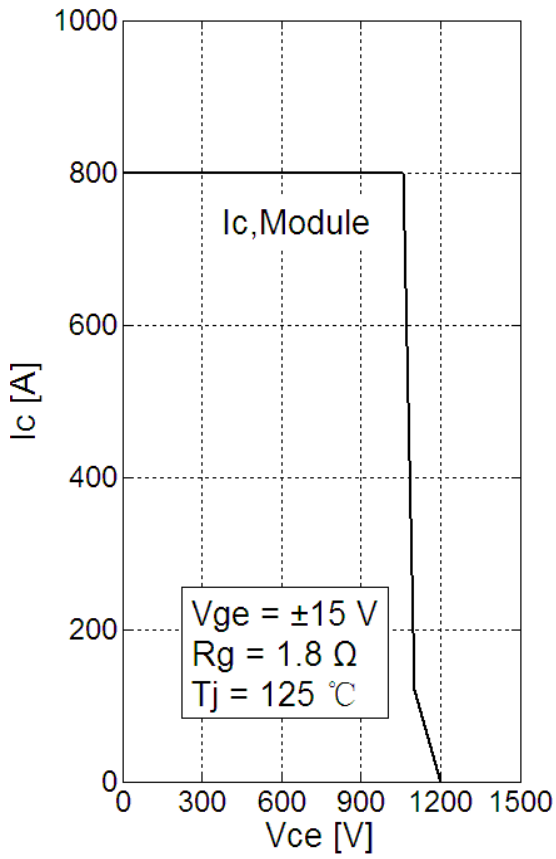


Fig 5. RBSOA

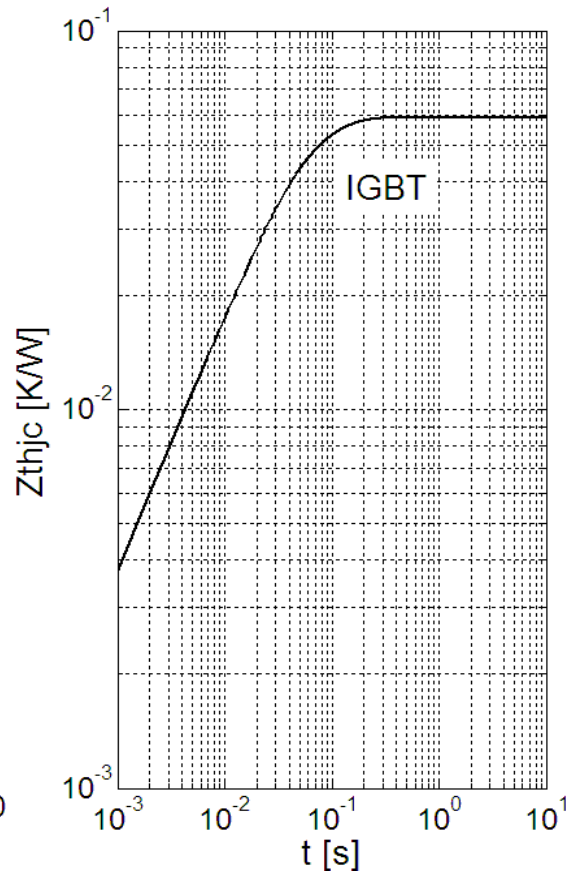


Fig 6. IGBT Transient Thermal Impedance

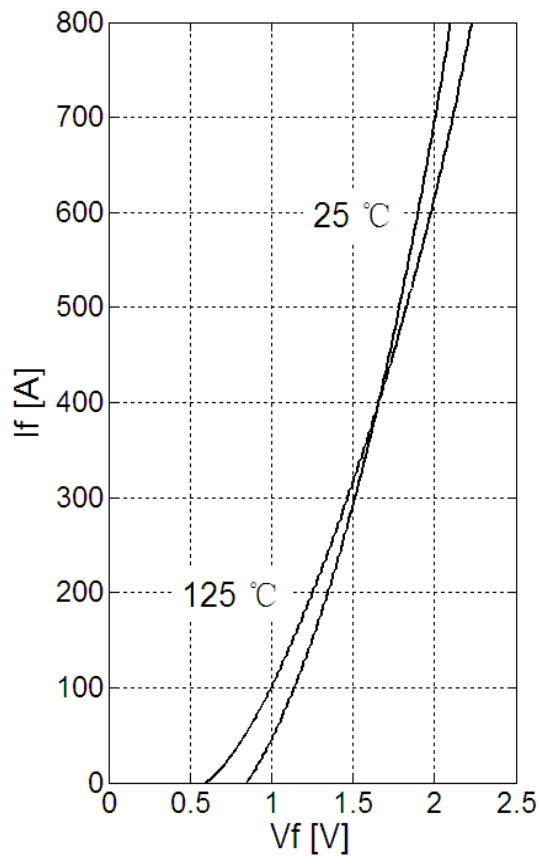


Fig 7. Diode Typical Forward Characteristics

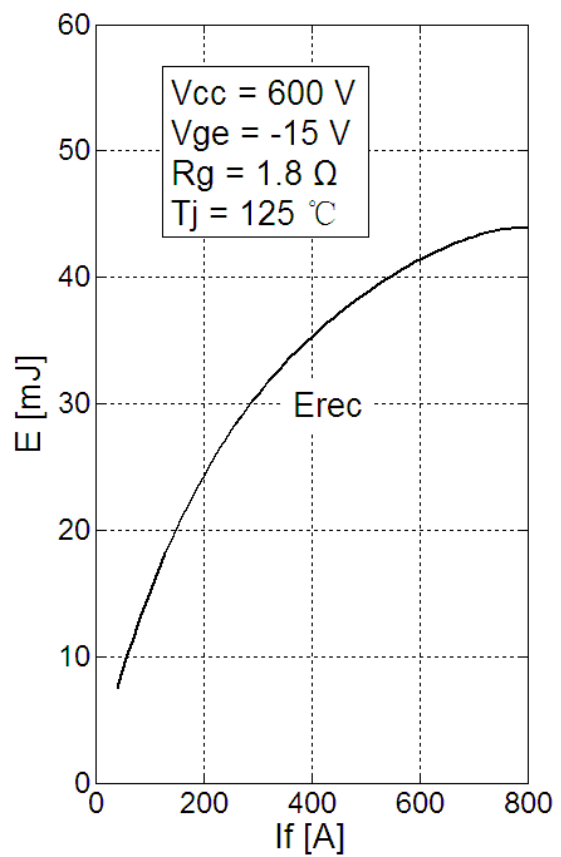


Fig 8. Diode Switching Loss vs. I_f

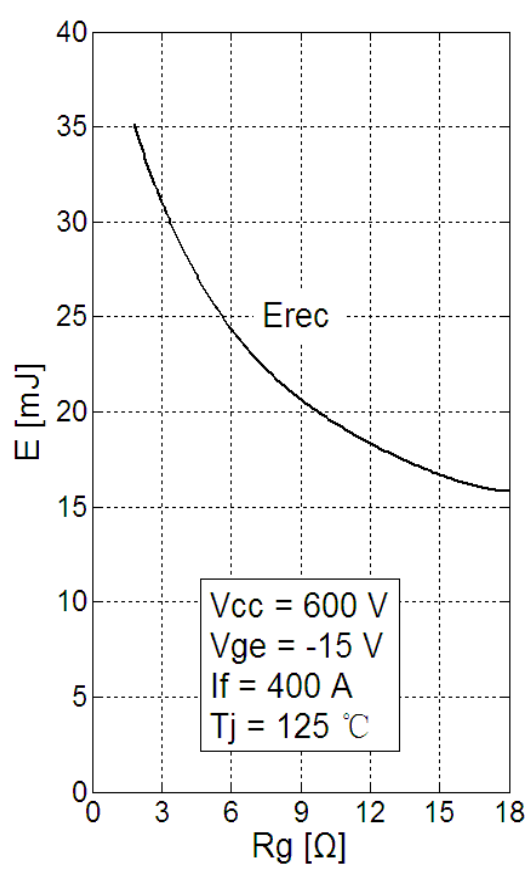


Fig 9. Diode Switching Loss vs. R_G

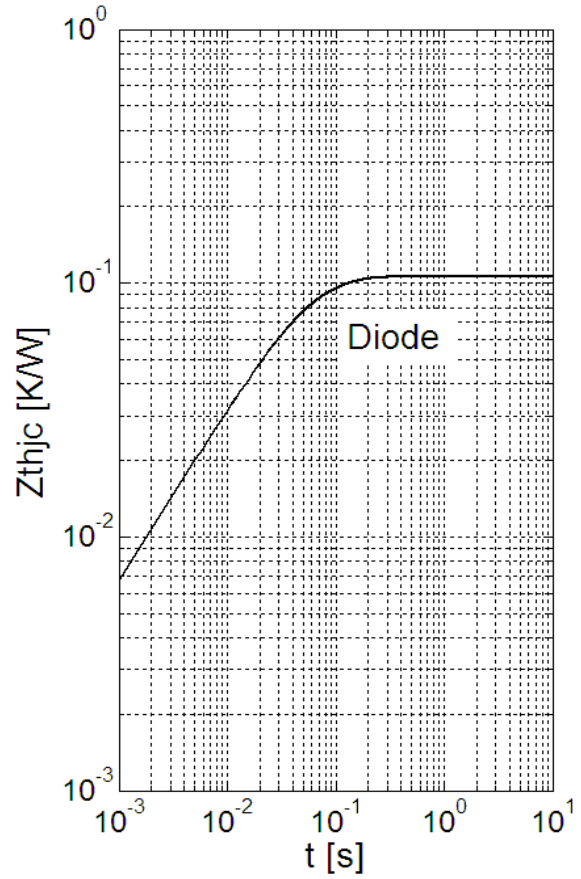
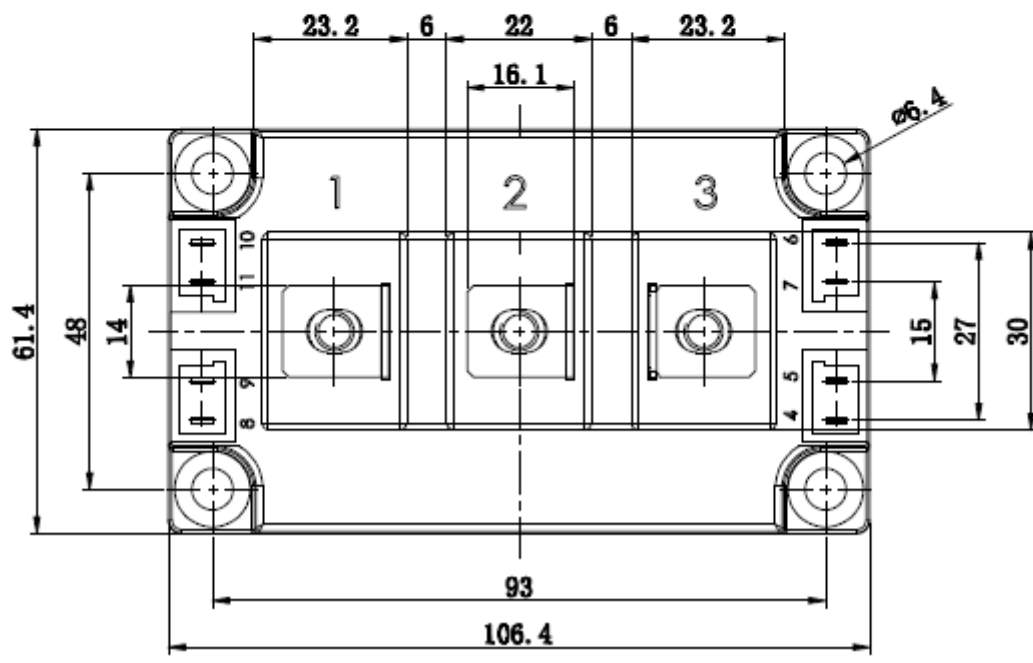
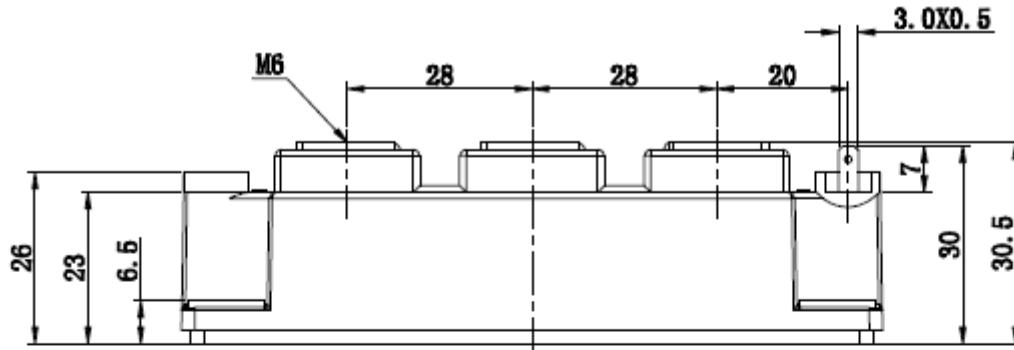


Fig 10. Diode Transient Thermal Impedance

Package Dimension

Dimensions in Millimeters



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