STARPOWER

SEMICONDUCTOR™

IGBT

GD400HFU120C2S

Molding Type Module

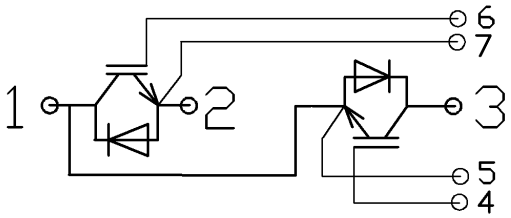
1200V/400A 2 in one-package

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

- 10μs 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℃ unless otherwise noted

Symbol	Description	GD400HFU120C2S	Units
V_{CES}	Collector-Emitter Voltage	1200	V
V_{GES}	Gate-Emitter Voltage	±20	V
I_C	Collector Current @ T_C=25℃	660	A
	@ T_C=80℃	400	
$I_{CM(1)}$	Pulsed Collector Current t_p=1ms	800	A
I_F	Diode Continuous Forward Current	400	A
$I_{FM(1)}$	Diode Maximum Forward Current	800	A
P_D	Maximum power Dissipation @ T_j=150℃	2660	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	℃
V_{ISO}	Isolation Voltage RMS,f=50Hz,t=1min	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℃ unless otherwise noted

Off Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{(BR)CES}$	Collector-Emitter Breakdown Voltage	T_j=25℃	1200			V
I_{CES}	Collector Cut-Off Current	V_{CE}=V_{CES},V_{GE}=0V, T_j=25℃			5.0	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=4.0mA,V_{CE}=V_{GE}, T_j=25℃	4.4	4.9	6.0	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C=400A,V_{GE}=15V, T_j=25℃		3.10	3.60	V
		I_C=400A,V_{GE}=15V, T_j=125℃		3.45		

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=2.2Ω,V_{GE}=±15V, T_j=25℃		680		ns
t_r	Rise Time			142		ns
$t_{d(off)}$	Turn-Off Delay Time			638		ns
t_f	Fall Time			99		ns
E_{on}	Turn-On Switching Loss			19.0		mJ
E_{off}	Turn-Off Switching Loss			32.5		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=400A, R_G=2.2Ω,V_{GE}=±15V, T_j=125℃		690		ns
t_r	Rise Time			146		ns
$t_{d(off)}$	Turn-Off Delay Time			669		ns
t_f	Fall Time			108		ns
E_{on}	Turn-On Switching Loss			26.1		mJ
E_{off}	Turn-Off Switching Loss			36.7		mJ
C_{ies}	Input Capacitance	V_{CE}=30V,f=1MHz, V_{GE}=0V		33.7		nF
C_{oes}	Output Capacitance			2.99		nF
C_{res}	Reverse Transfer Capacitance			1.21		nF
I_{SC}	SC Data	T_P≤10μs,V_{GE}=15V, T_j=25℃,V_{CC}=600V, V_{CEM}≤1200V		2600		A
R_{Gint}	Internal Gate Resistance			0.5		Ω
L_{CE}	Stray Inductance				18	nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal To Chip	T_C=25℃		0.32		mΩ

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=400A	T_j=25℃		1.95	2.35	V
			T_j=125℃		1.85		
Q_r	Recovered Charge	I_F=400A, V_R=600V, di/dt=-2850A/μs, V_{GE}=-15V	T_j=25℃		24.1		μC
			T_j=125℃		44.3		
I_{RM}	Peak Reverse Recovery Current		T_j=25℃		220		A
			T_j=125℃		295		
E_{rec}	Reverse Recovery Energy		T_j=25℃		13.9		mJ
			T_j=125℃		24.8		

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case (per IGBT)		0.047	K/W
$R_{\theta JC}$	Junction-to-Case (per DIODE)		0.096	K/W
$R_{\theta CS}$	Case-to-Sink (Conductive grease applied)	0.035		K/W
G	Weight of Module	350		g

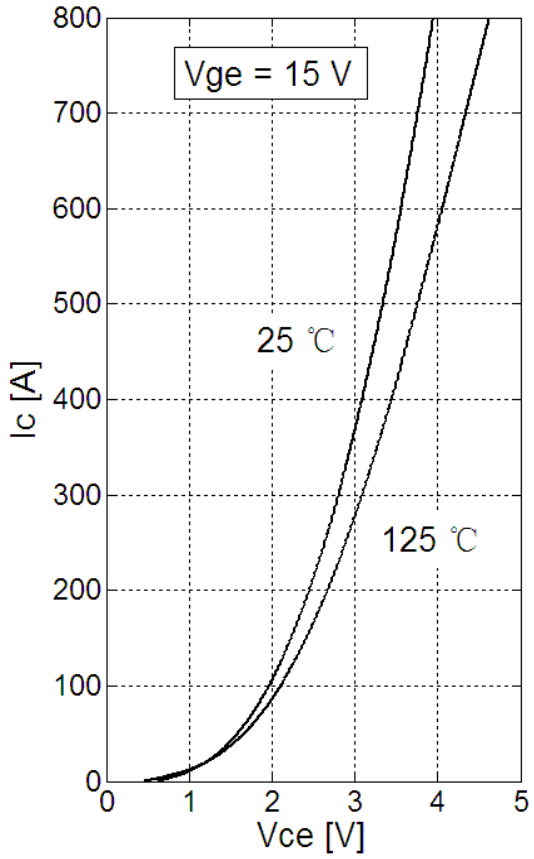


Fig 1. IGBT Typical Output Characteristics

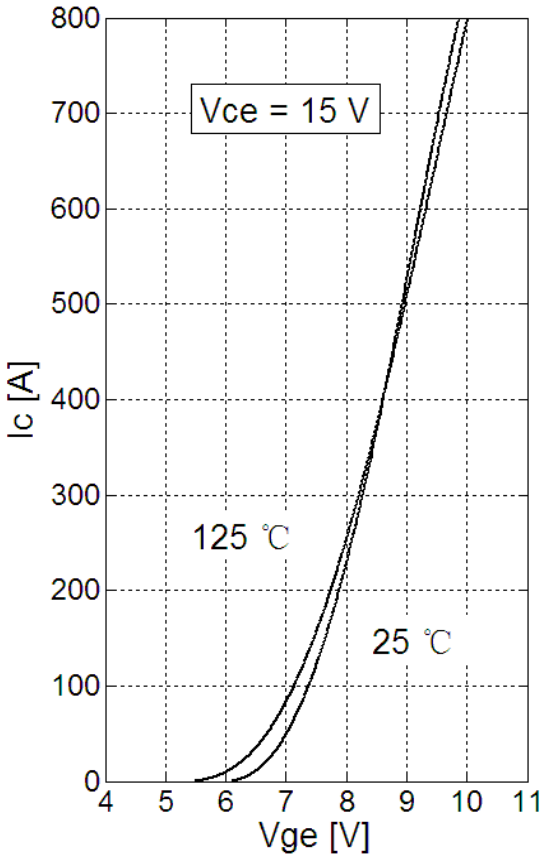


Fig 2. IGBT Typical Transfer Characteristics

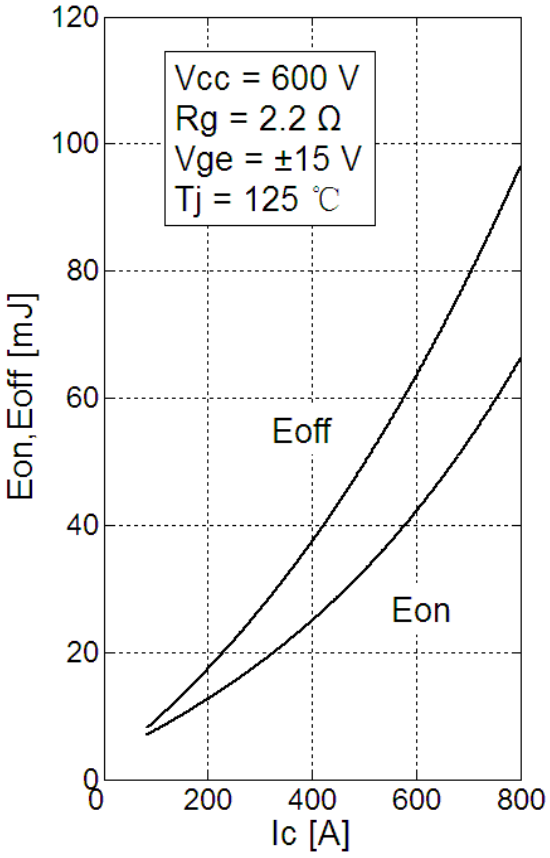


Fig 3. IGBT Switching Loss vs. I_C

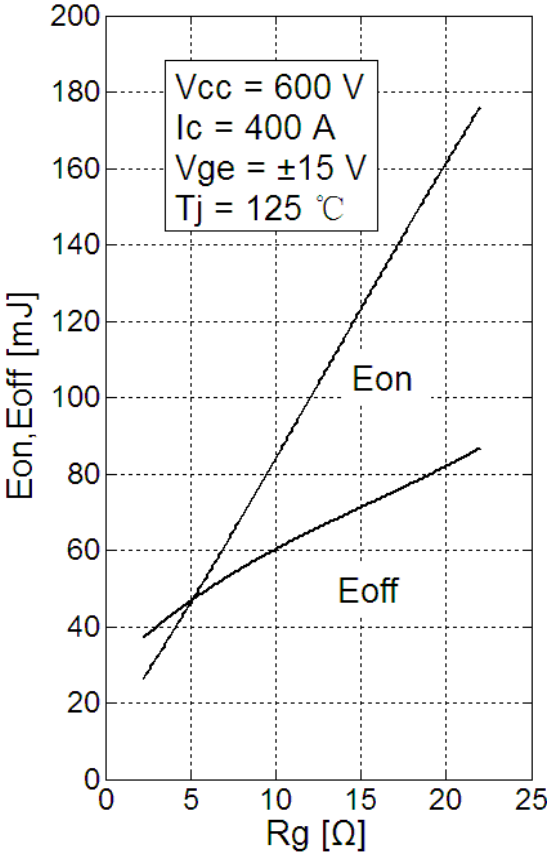


Fig 4. IGBT Switching Loss vs. R_G

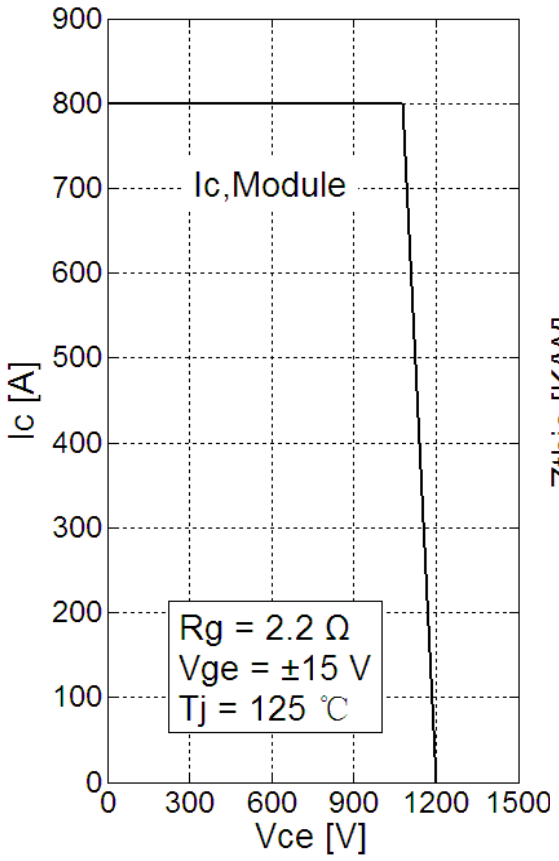


Fig 5. RBSOA

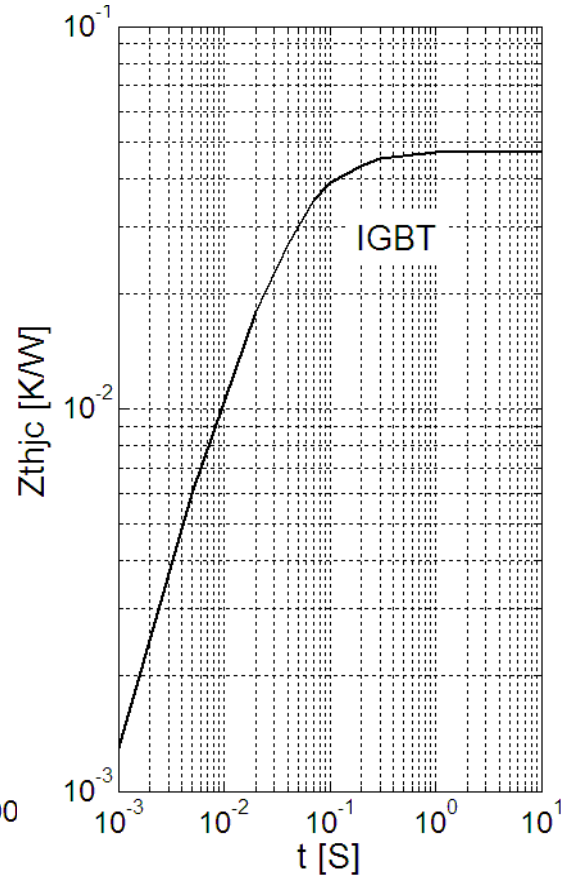


Fig 6. IGBT Transient Thermal Impedance

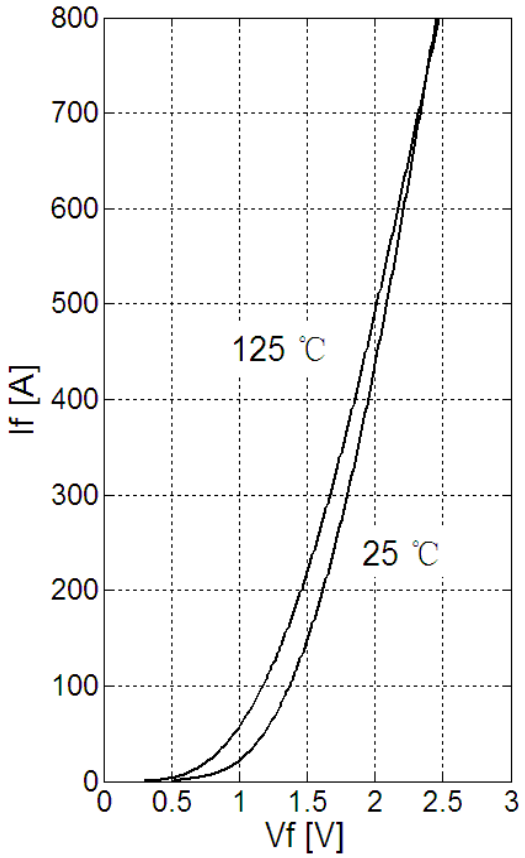


Fig 7. Diode Typical Forward Characteristics

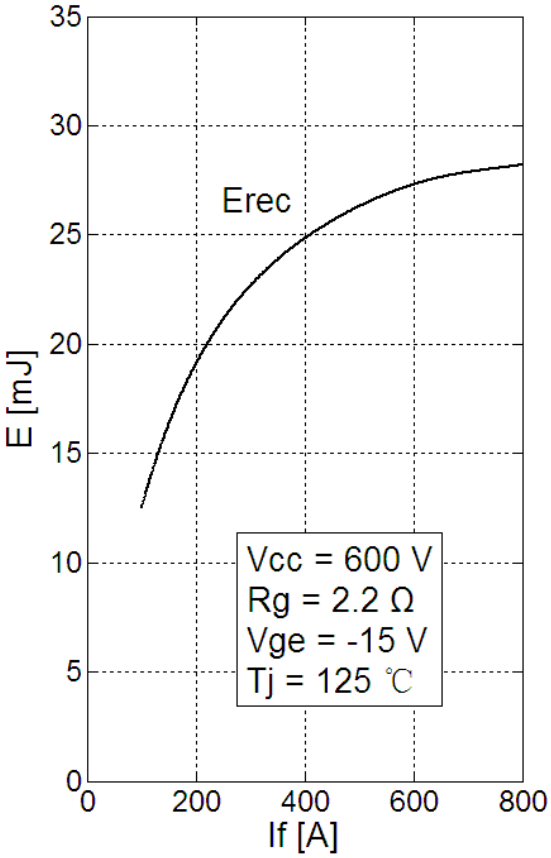


Fig 8. Diode Switching Loss vs. I_F

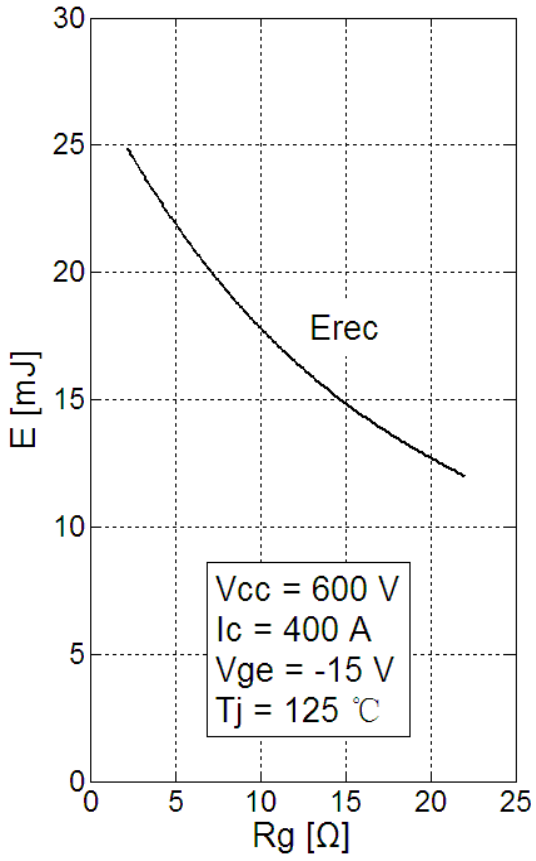


Fig 9. Diode Switching Loss vs. R_G

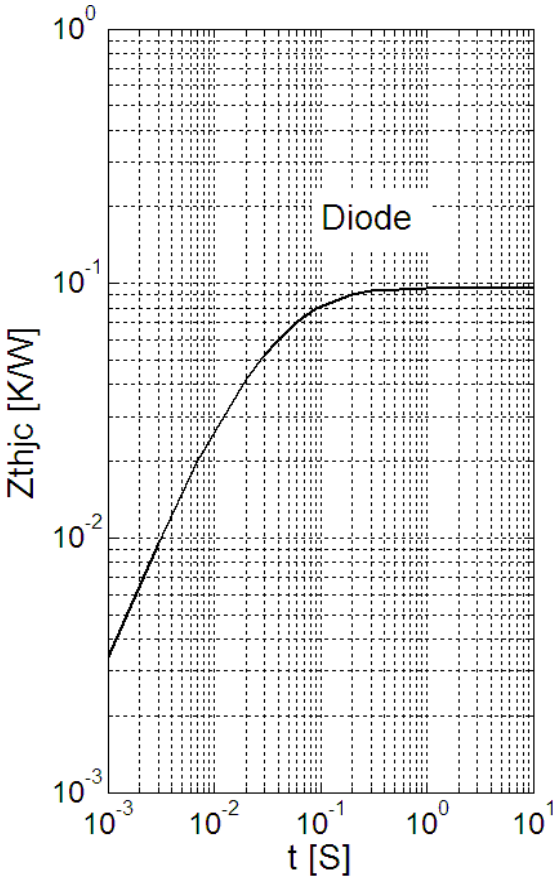
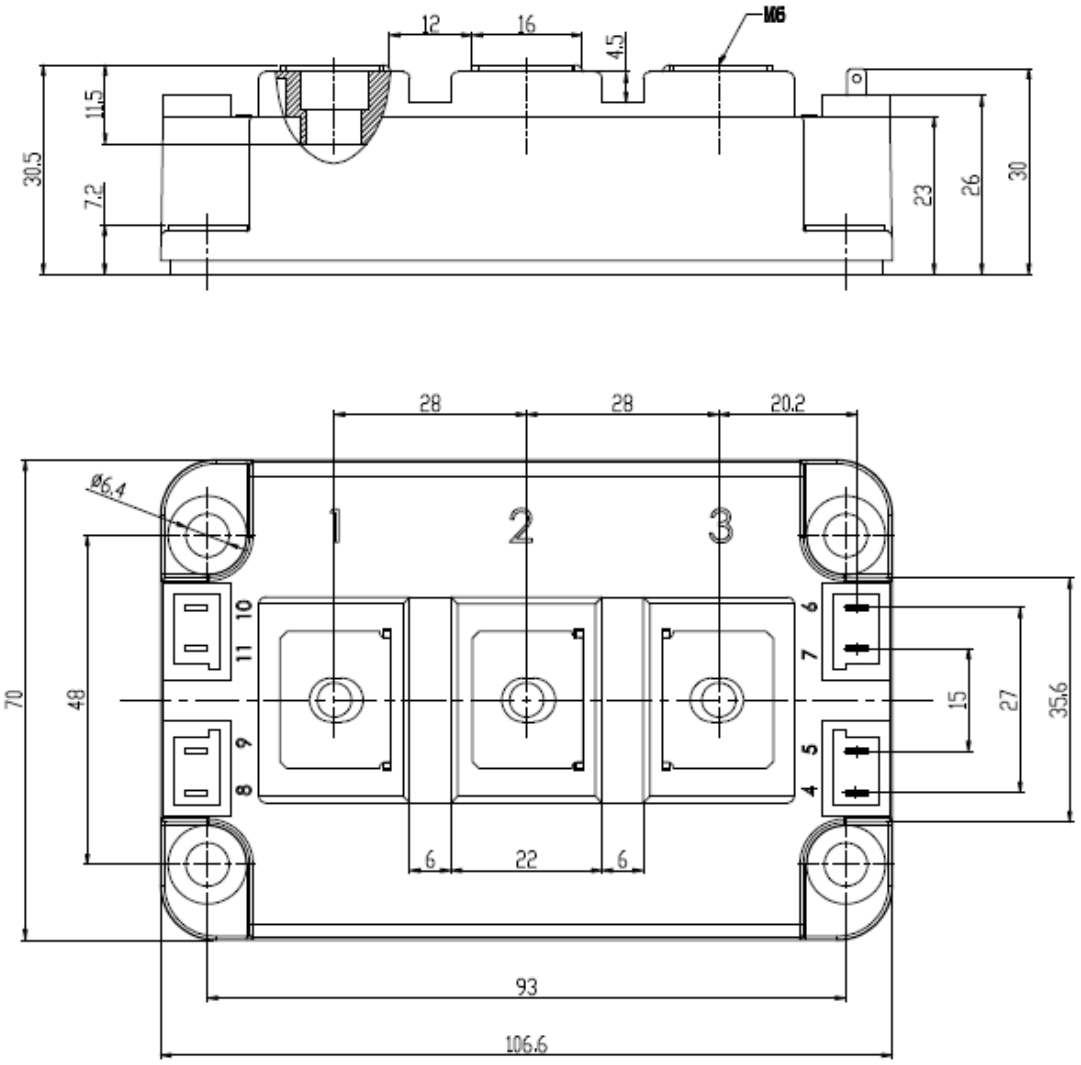


Fig 10. Diode Transient Thermal Impedance

Package Dimension

Dimensions in Millimeters



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