

STARPOWER

SEMICONDUCTOR™

IGBT

GD400HFU120C2S

Molding Type Module

1200V/400A 2 in one-package

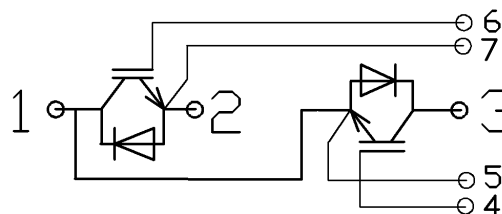
General Description

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

- 10 μ 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	GD400HFU120C2S	Units
V_{CES}	Collector-Emitter Voltage	1200	V
V_{GES}	Gate-Emitter Voltage	± 20	V
I_C	Collector Current @ $T_C=25^{\circ}\text{C}$ @ $T_C=80^{\circ}\text{C}$	660 400	A
$I_{CM(1)}$	Pulsed Collector Current $t_p=1\text{ms}$	800	A
I_F	Diode Continuous Forward Current	400	A
$I_{FM(1)}$	Diode Maximum Forward Current	800	A
P_D	Maximum power Dissipation @ $T_j=150^{\circ}\text{C}$	2660	W
T_{SC}	Short Circuit Withstand Time @ $T_j=125^{\circ}\text{C}$	10	μs
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	$I_C=4.0\text{mA}$, $V_{CE}=V_{GE}$, $T_j=25^{\circ}\text{C}$	4.4	4.9	6.0	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C=400\text{A}$, $V_{GE}=15\text{V}$, $T_j=25^{\circ}\text{C}$		3.10	3.60	V
		$I_C=400\text{A}$, $V_{GE}=15\text{V}$, $T_j=125^{\circ}\text{C}$		3.45		

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600V, I_C=400A,$ $R_G=2.2\Omega, V_{GE}=\pm 15V,$ $T_J=25^\circ C$		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	$V_{CC}=600V, I_C=400A,$ $R_G=2.2\Omega, V_{GE}=\pm 15V,$ $T_J=125^\circ C$		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	$T_P \leq 10\mu s, V_{GE}=15V,$ $T_J=25^\circ C, V_{CC}=600V,$ $V_{CEM} \leq 1200V$		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	$T_C=25^\circ C$		0.32		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	$I_F=400A$	$T_J=25^\circ C$		1.95	2.35	V
			$T_J=125^\circ C$		1.85		
Q_r	Recovered Charge	$I_F=400A,$ $V_R=600V,$ $di/dt=-2850A/\mu s,$	$T_J=25^\circ C$		24.1		μC
			$T_J=125^\circ C$		44.3		
I_{RM}	Peak Reverse Recovery Current	$V_{GE}=-15V$	$T_J=25^\circ C$		220		A
			$T_J=125^\circ C$		295		
E_{rec}	Reverse Recovery Energy	$V_{GE}=-15V$	$T_J=25^\circ C$		13.9		mJ
			$T_J=125^\circ C$		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

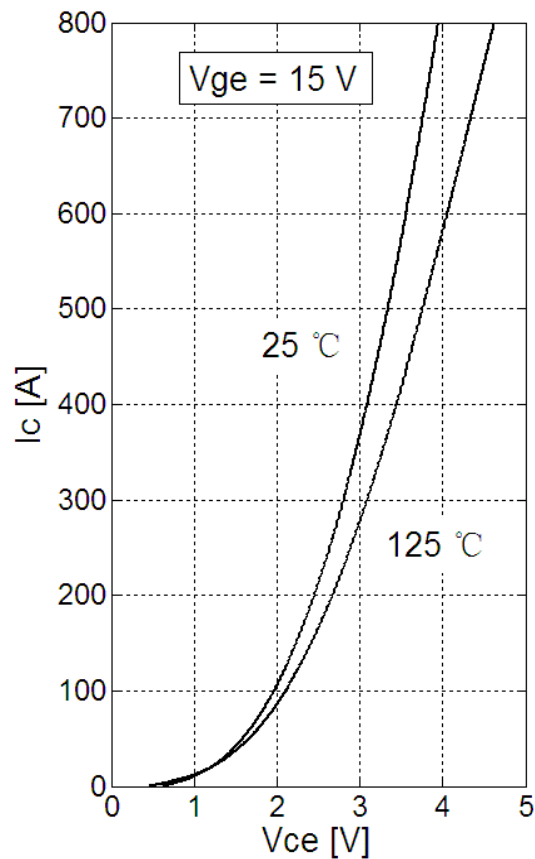


Fig 1. IGBT Typical Output Characteristics

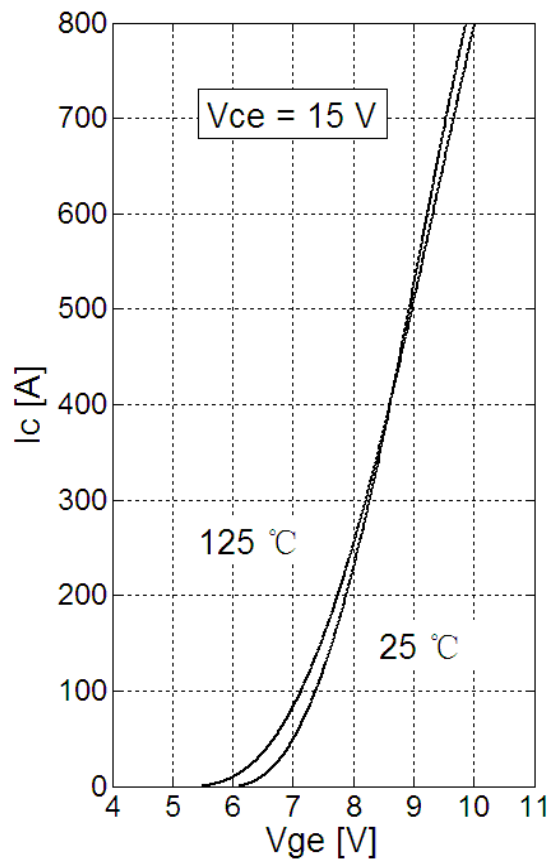
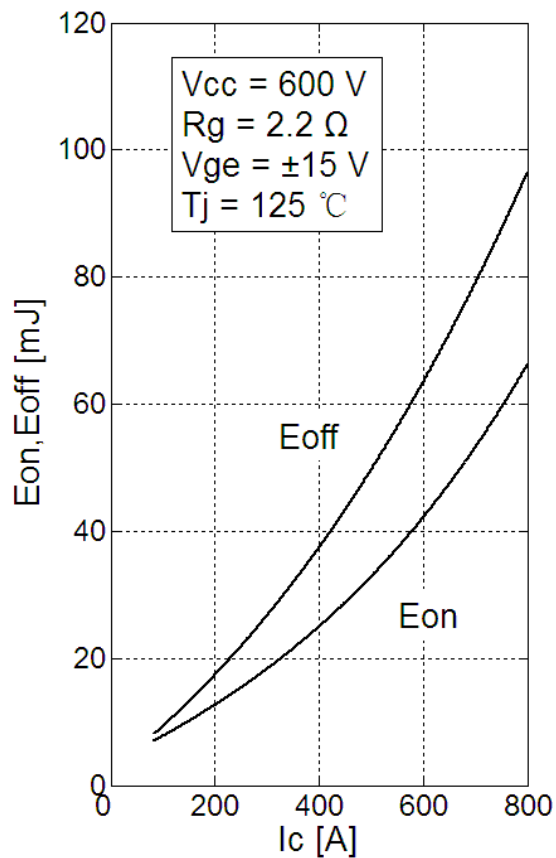
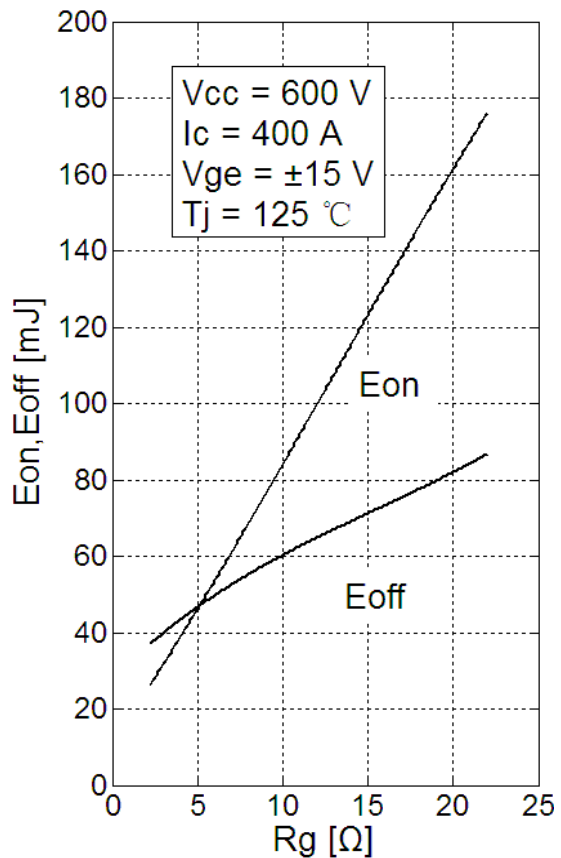


Fig 2. IGBT Typical Transfer Characteristics

Fig 3. IGBT Switching Loss vs. I_c Fig 4. IGBT Switching Loss vs. R_g

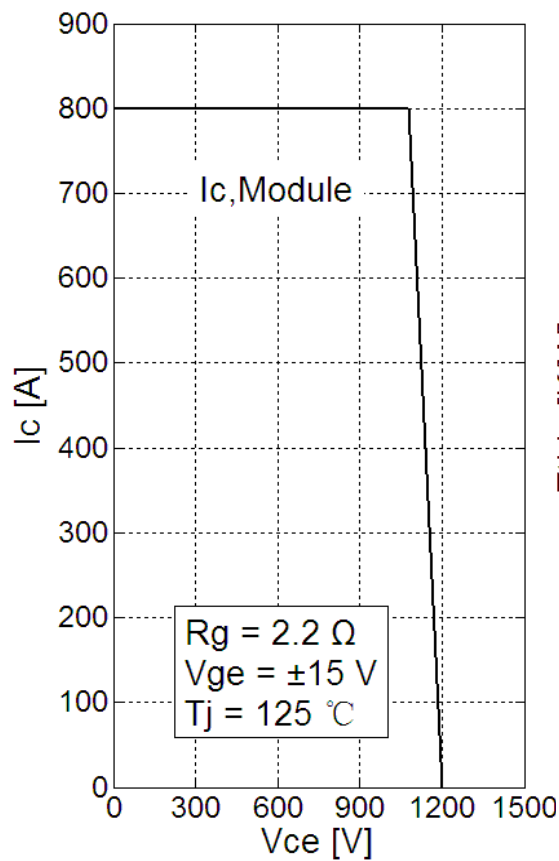


Fig 5. RBSOA

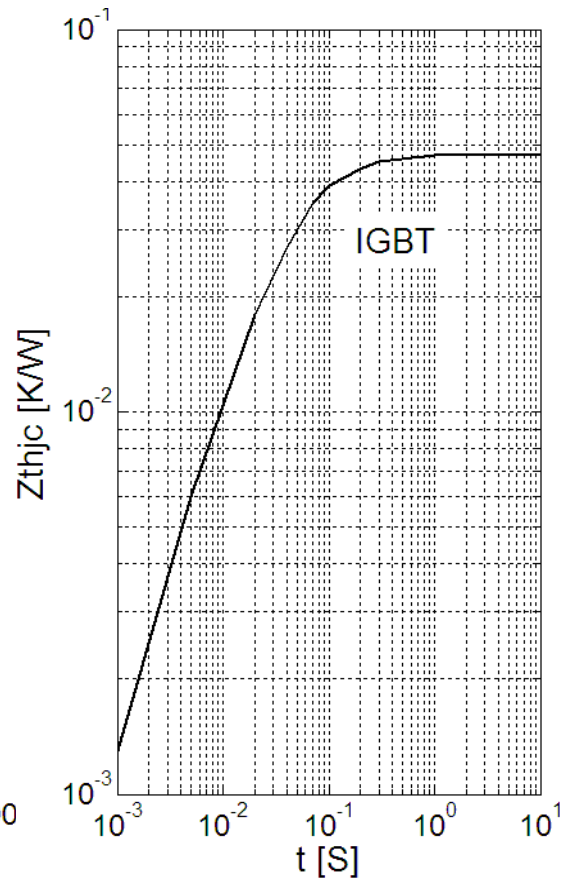


Fig 6. IGBT Transient Thermal Impedance

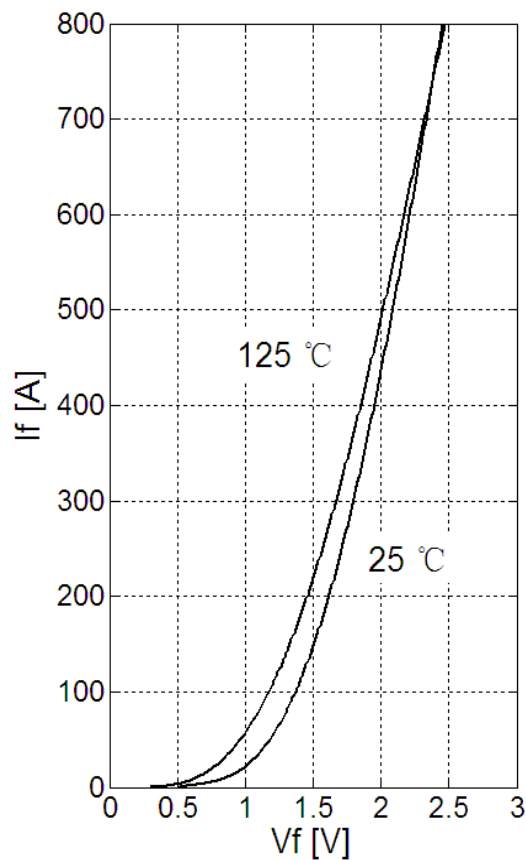
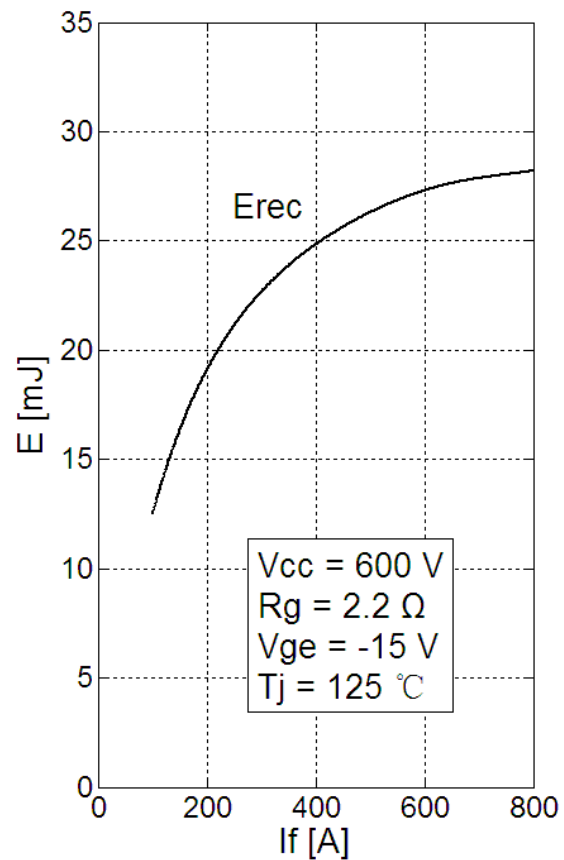


Fig 7. Diode Typical Forward Characteristics

Fig 8. Diode Switching Loss vs. I_f

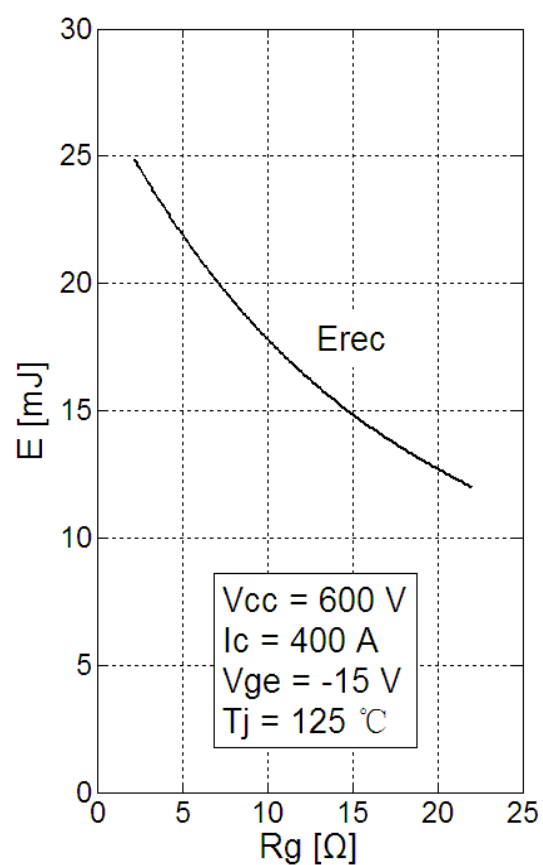
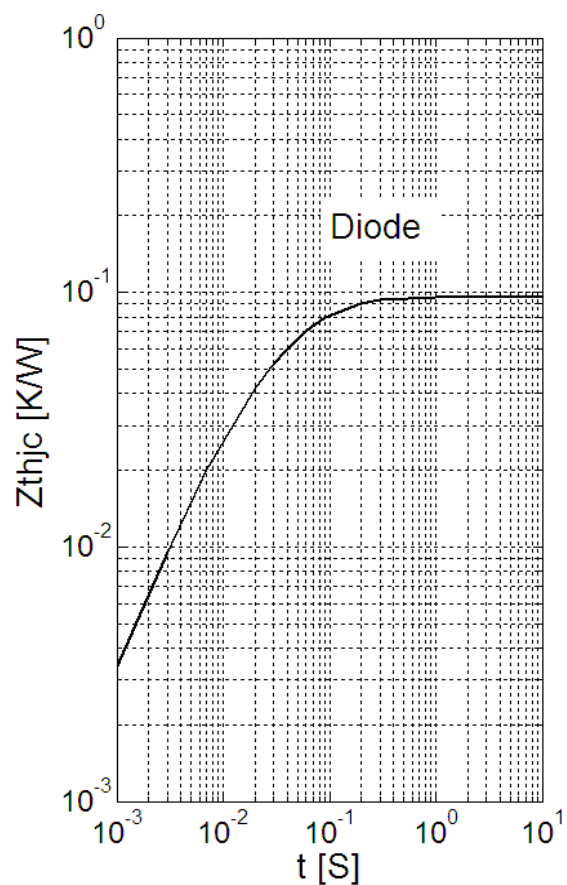
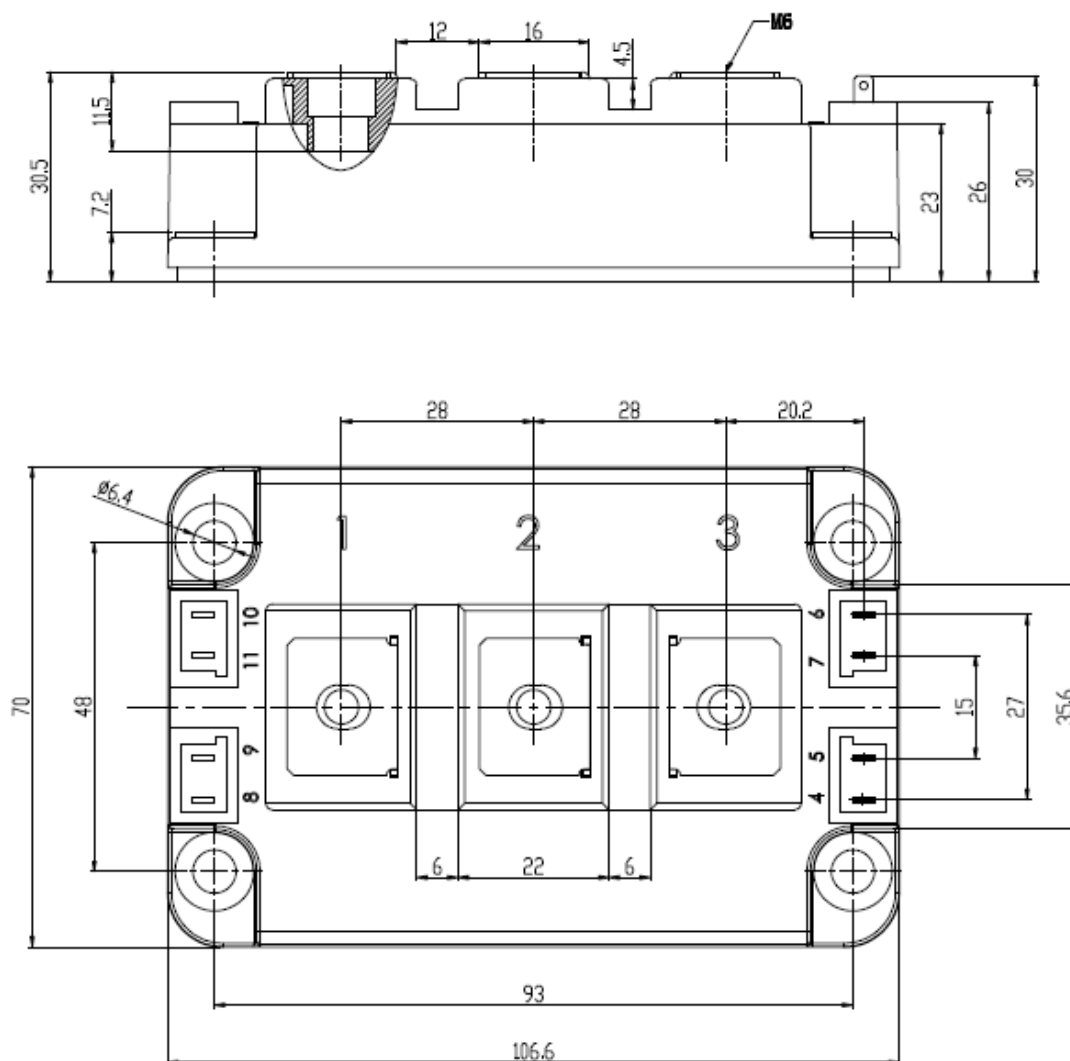
Fig 9. Diode Switching Loss vs. R_g 

Fig 10. Diode Transient Thermal Impedance

Package Dimension

Dimensions in Millimeters



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