

# STARPOWER

SEMICONDUCTOR

IGBT

## GD75HFU120C1SD

1200V/75A 2 in one-package

### General Description

STARPOWER IGBT Power Module provides ultra switching speed as well as short circuit ruggedness. They are designed for the applications such as electronic welder and inductive heating.

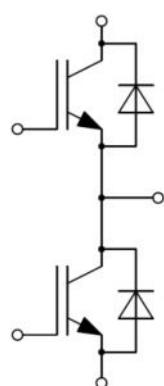
### Features

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

### Typical Applications

- Switching mode power supply
- Inductive heating
- Electronic welder

### Equivalent Circuit Schematic



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

Symbol	Description	Value	Unit
$V_{CES}$	Collector-Emitter Voltage	1200	V
$V_{GES}$	Gate-Emitter Voltage	$\pm 20$	V
$I_C$	Collector Current @ $T_C=25^\circ\text{C}$ @ $T_C=65^\circ\text{C}$	100 75	A
$I_{CM}$	Pulsed Collector Current $t_p=1\text{ms}$	150	A
$P_D$	Maximum Power Dissipation @ $T_{vj}=150^\circ\text{C}$	484	W

**Diode**

Symbol	Description	Value	Unit
$V_{RRM}$	Repetitive Peak Reverse Voltage	1200	V
$I_F$	Diode Continuous Forward Current	75	A
$I_{FM}$	Diode Maximum Forward Current $t_p=1\text{ms}$	150	A

**Module**

Symbol	Description	Value	Unit
$T_{vjmax}$	Maximum Junction Temperature	150	$^\circ\text{C}$
$T_{viop}$	Operating Junction Temperature	-40 to +125	$^\circ\text{C}$
$T_{STG}$	Storage Temperature Range	-40 to +125	$^\circ\text{C}$
$V_{ISO}$	Isolation Voltage RMS, $f=50\text{Hz}, t=1\text{min}$	2500	V

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

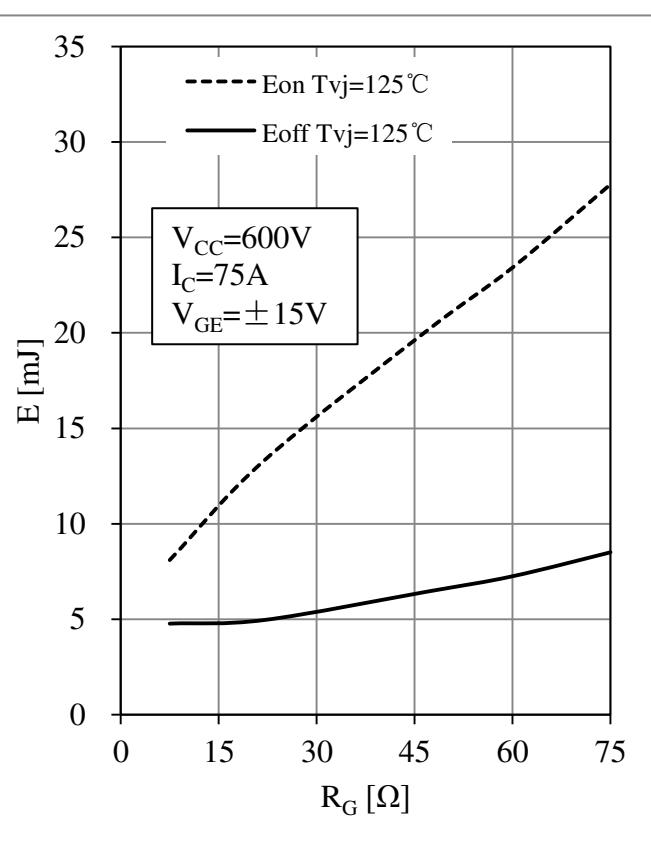
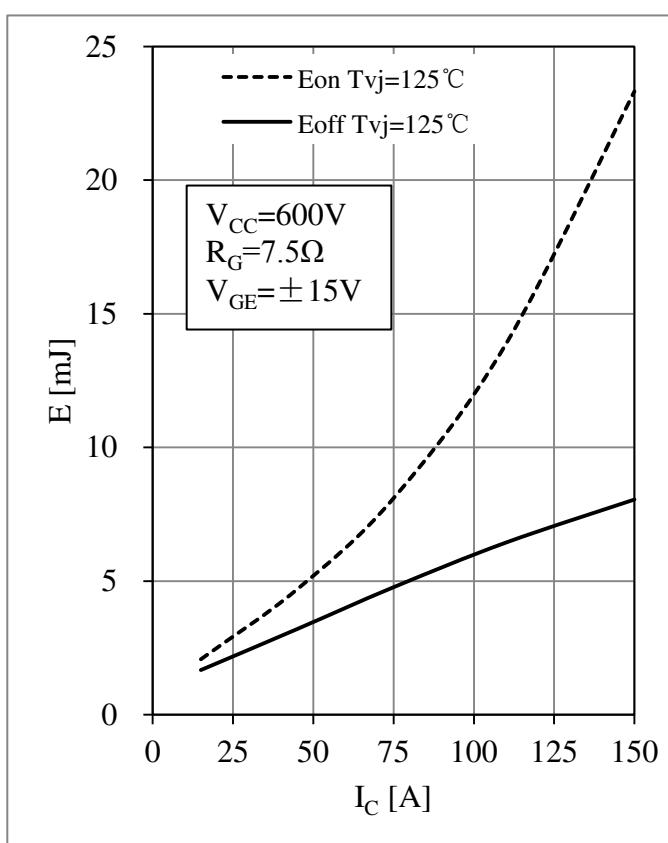
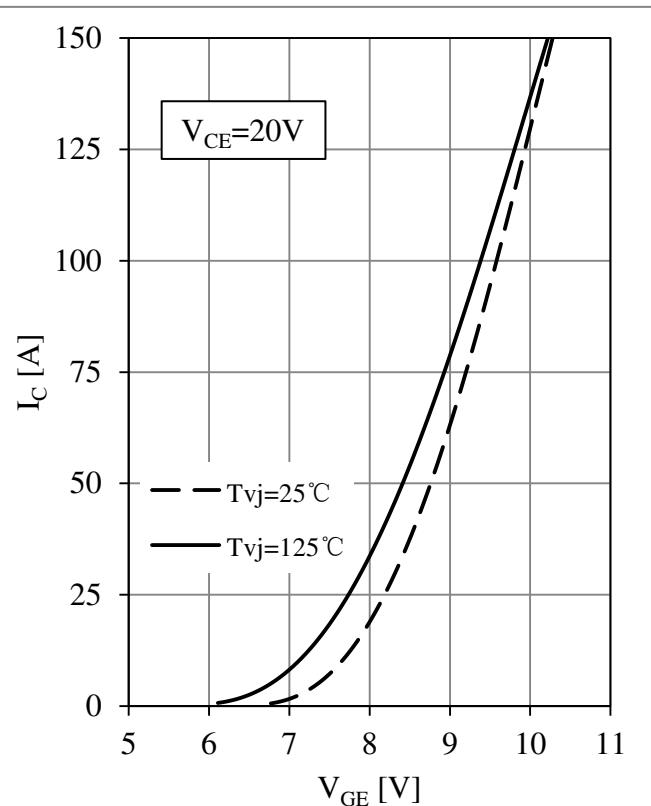
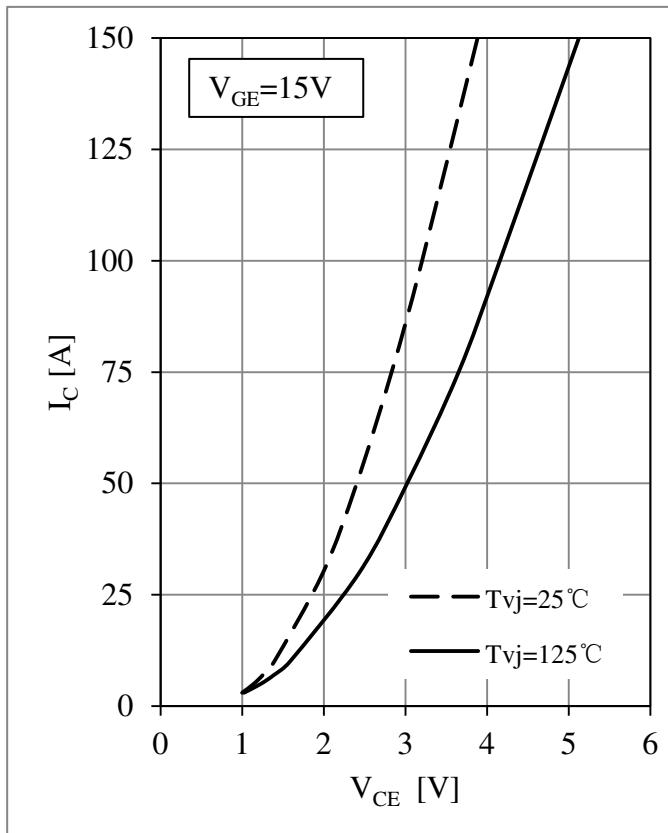
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{CE(\text{sat})}$	Collector to Emitter Saturation Voltage	$I_C=75\text{A}, V_{GE}=15\text{V}, T_{vj}=25^\circ\text{C}$		2.80	3.25	V
		$I_C=75\text{A}, V_{GE}=15\text{V}, T_{vj}=125^\circ\text{C}$		3.65		
$V_{GE(\text{th})}$	Gate-Emitter Threshold Voltage	$I_C=3.0\text{mA}, V_{CE}=V_{GE}, T_{vj}=25^\circ\text{C}$	4.7	5.7	6.7	V
$I_{CES}$	Collector Cut-Off Current	$V_{CE}=V_{CES}, V_{GE}=0\text{V}, T_{vj}=25^\circ\text{C}$			5.0	mA
$I_{GES}$	Gate-Emitter Leakage Current	$V_{GE}=V_{GES}, V_{CE}=0\text{V}, T_{vj}=25^\circ\text{C}$			400	nA
$R_{Gint}$	Internal Gate Resistance			2.50		$\Omega$
$C_{ies}$	Input Capacitance	$V_{CE}=25\text{V}, f=1\text{MHz}, V_{GE}=0\text{V}$		5.07		nF
$C_{res}$	Reverse Transfer Capacitance			0.31		nF
$Q_G$	Gate Charge	$V_{GE}=-15\ldots+15\text{V}$		0.81		$\mu\text{C}$
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600\text{V}, I_C=75\text{A}, R_G=7.5\Omega, V_{GE}=\pm15\text{V}, T_{vj}=25^\circ\text{C}$		63		ns
$t_r$	Rise Time			37		ns
$t_{d(off)}$	Turn-Off Delay Time			278		ns
$t_f$	Fall Time			156		ns
$E_{on}$	Turn-On Switching Loss			6.43		mJ
$E_{off}$	Turn-Off Switching Loss			3.36		mJ
$t_{d(on)}$	Turn-On Delay Time			67		ns
$t_r$	Rise Time	$V_{CC}=600\text{V}, I_C=75\text{A}, R_G=7.5\Omega, V_{GE}=\pm15\text{V}, T_{vj}=125^\circ\text{C}$		39		ns
$t_{d(off)}$	Turn-Off Delay Time			297		ns
$t_f$	Fall Time			232		ns
$E_{on}$	Turn-On Switching Loss			8.10		mJ
$E_{off}$	Turn-Off Switching Loss			4.77		mJ
$I_{SC}$	SC Data	$t_p \leq 10\mu\text{s}, V_{GE}=15\text{V}, T_{vj}=125^\circ\text{C}, V_{CC}=800\text{V}, V_{CEM} \leq 1200\text{V}$		450		A

**Diode Characteristics**  $T_C=25^\circ\text{C}$  unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_F$	Diode Forward Voltage	$I_F=75\text{A}, V_{GE}=0\text{V}, T_{vj}=25^\circ\text{C}$		1.85	2.30	V
		$I_F=75\text{A}, V_{GE}=0\text{V}, T_{vj}=125^\circ\text{C}$		1.90		
$Q_r$	Recovered Charge	$V_R=600\text{V}, I_F=75\text{A}, -di/dt=1450\text{A}/\mu\text{s}, V_{GE}=-15\text{V}$ $T_{vj}=25^\circ\text{C}$		10.2		$\mu\text{C}$
$I_{RM}$	Peak Reverse Recovery Current			46		A
$E_{rec}$	Reverse Recovery Energy			3.24		$\text{mJ}$
$Q_r$	Recovered Charge	$V_R=600\text{V}, I_F=75\text{A}, -di/dt=1470\text{A}/\mu\text{s}, V_{GE}=-15\text{V}$ $T_{vj}=125^\circ\text{C}$		11.6		$\mu\text{C}$
$I_{RM}$	Peak Reverse Recovery Current			73		A
$E_{rec}$	Reverse Recovery Energy			4.05		$\text{mJ}$

**Module Characteristics**  $T_C=25^\circ\text{C}$  unless otherwise noted

Symbol	Parameter	Min.	Typ.	Max.	Unit
$L_{CE}$	Stray Inductance		30		nH
$R_{CC+EE}$	Module Lead Resistance, Terminal to Chip		0.65		$\text{m}\Omega$
$R_{thJC}$	Junction-to-Case (per IGBT) Junction-to-Case (per Diode)			0.258 0.527	K/W
$R_{thCH}$	Case-to-Heatsink (per IGBT) Case-to-Heatsink (per Diode) Case-to-Heatsink (per Module)		0.149 0.304 0.050		K/W
M	Terminal Connection Torque, Screw M5 Mounting Torque, Screw M6	2.5 3.0		5.0 5.0	N.m
G	Weight of Module		150		g



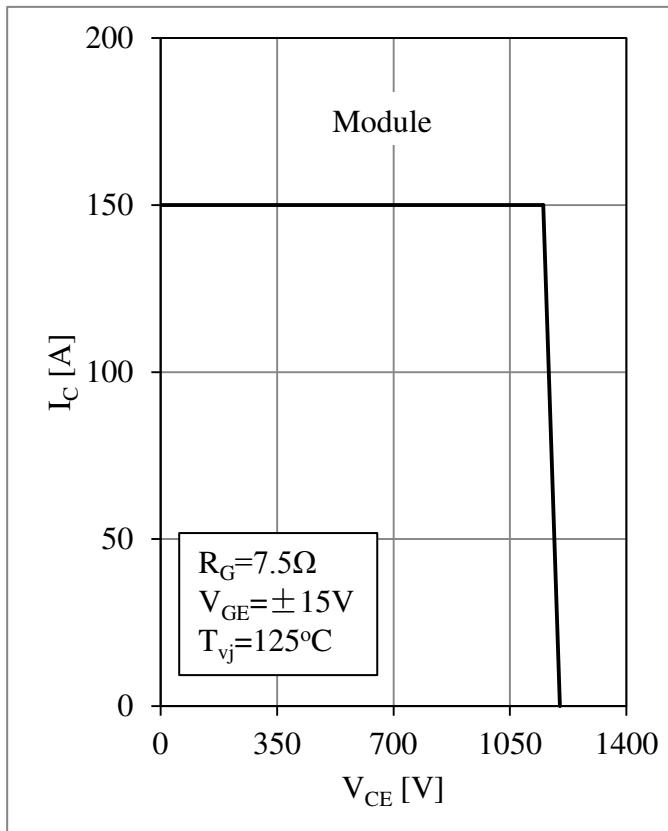


Fig 5. RBSOA

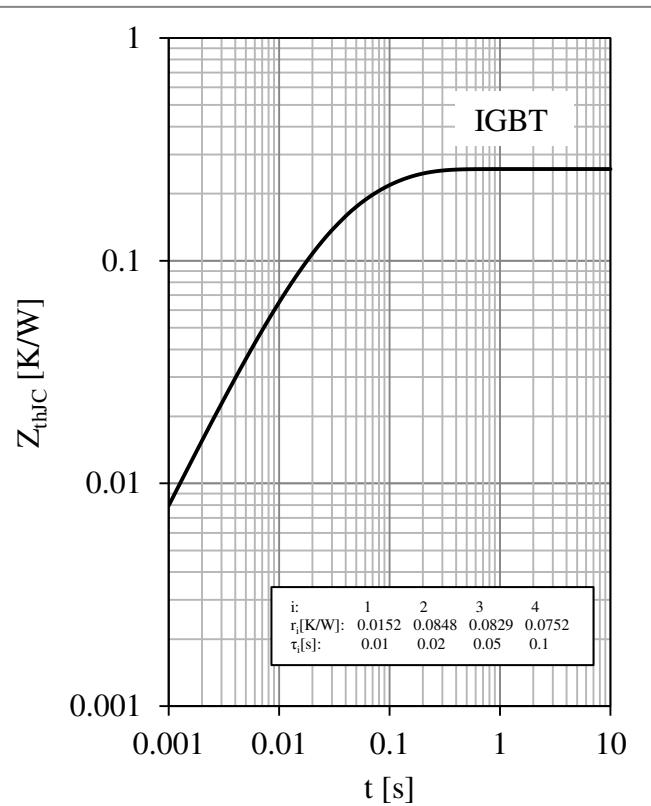


Fig 6. IGBT Transient Thermal Impedance

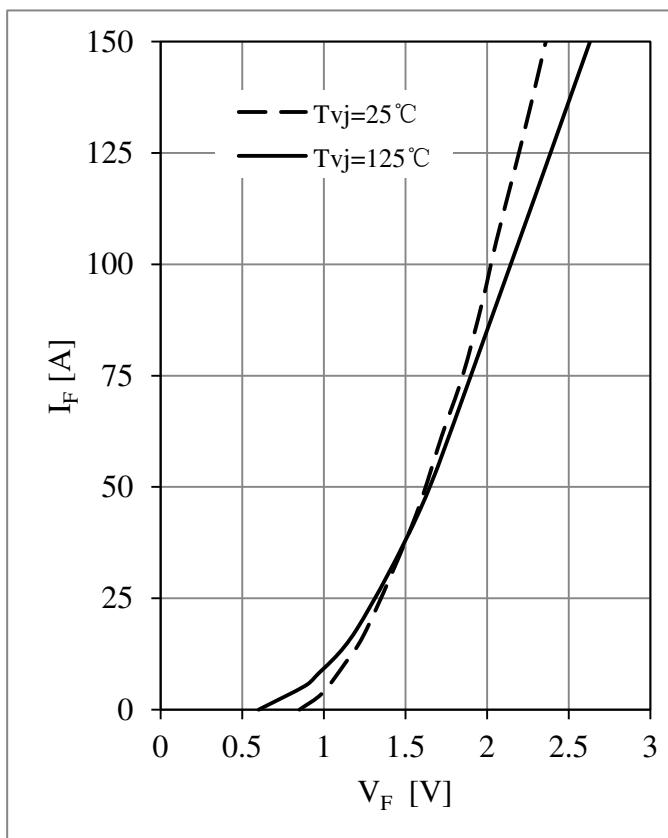


Fig 7. Diode Forward Characteristics

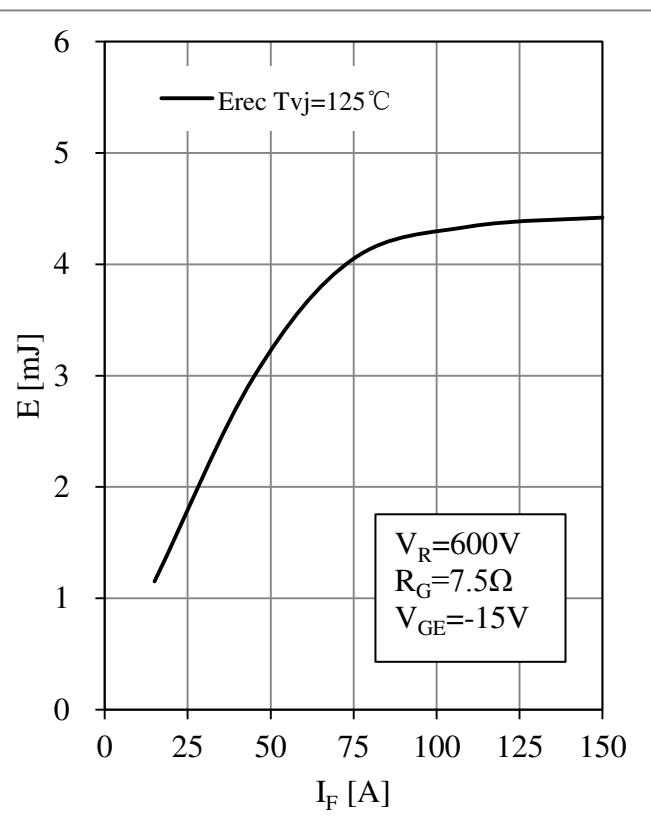


Fig 8. Diode Switching Loss vs. I\_F

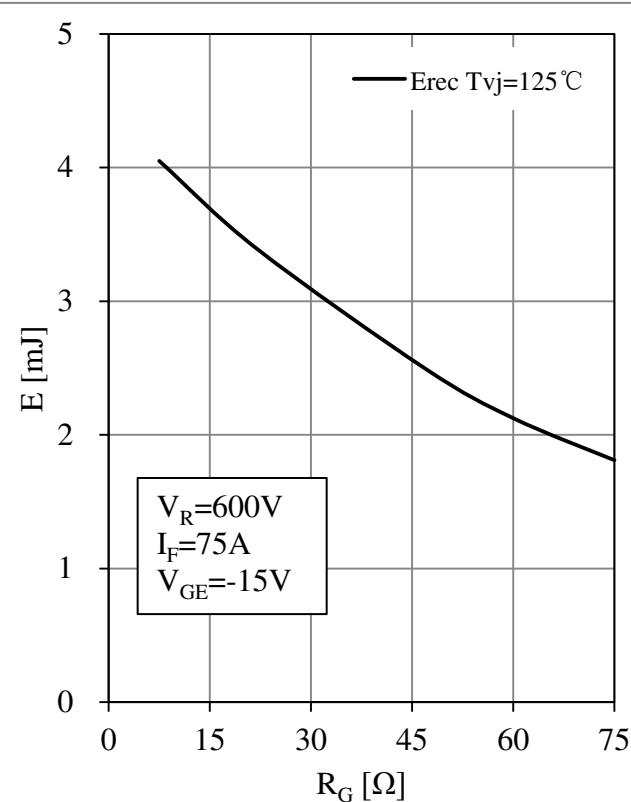
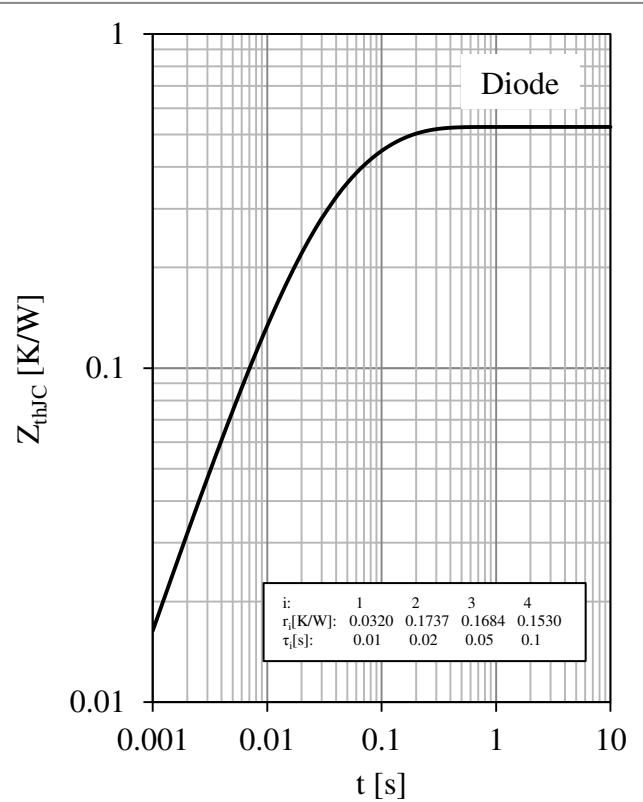
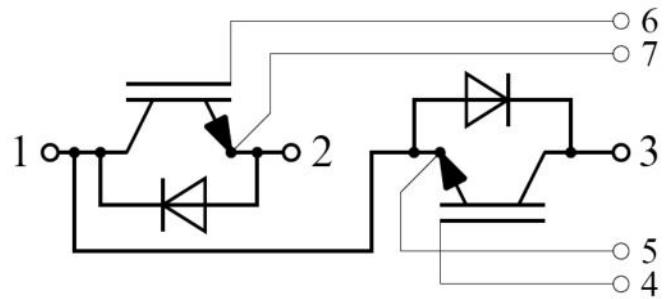
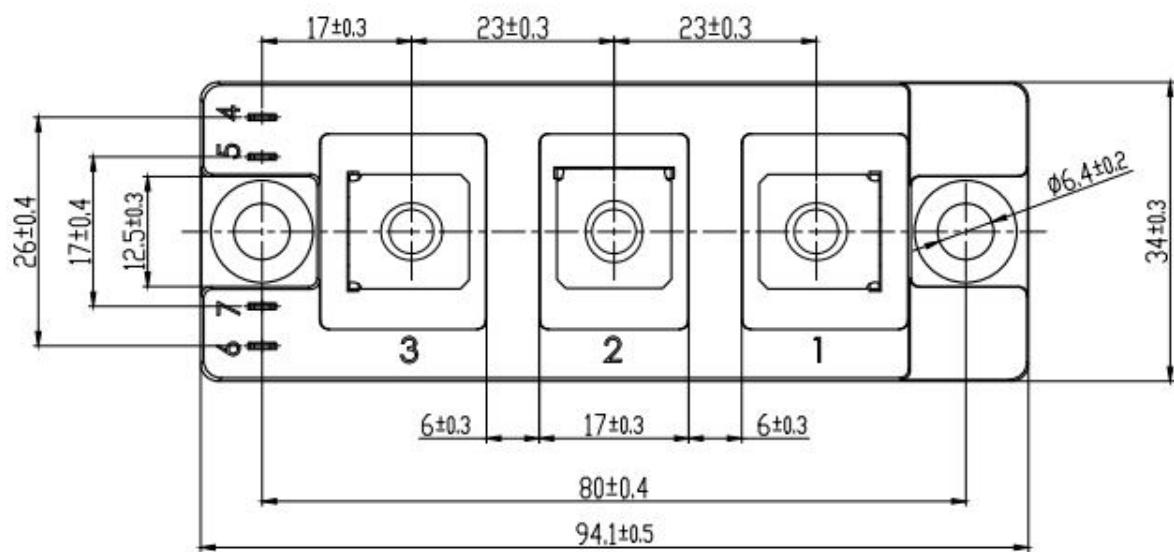
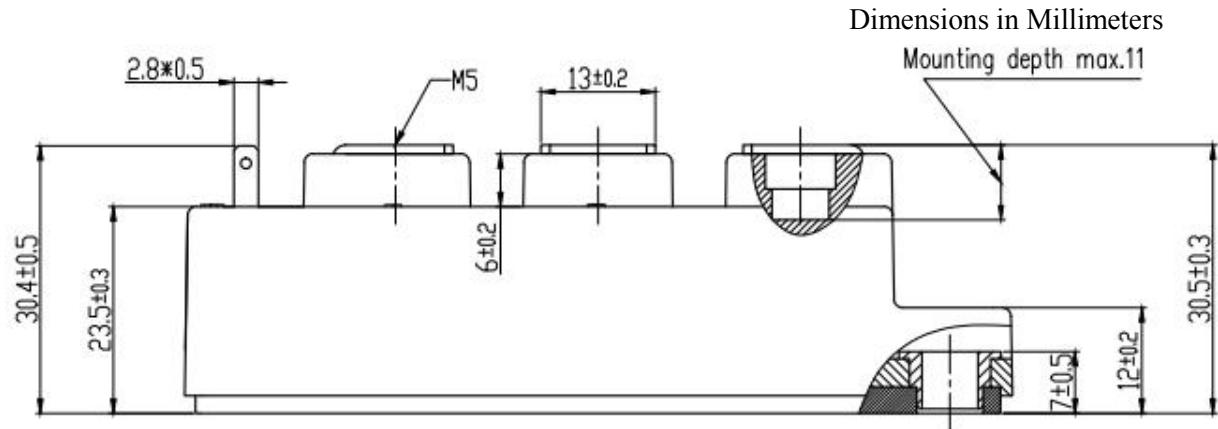
Fig 9. Diode Switching Loss vs.  $R_G$ 

Fig 10. Diode Transient Thermal Impedance

## Circuit Schematic



## Package Dimensions



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