

STARPOWER

SEMICONDUCTOR

IGBT

GD150HFL120C1S

1200V/150A 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.



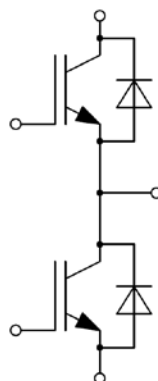
Features

- Low $V_{CE(sat)}$ SPT+ IGBT technology
- 10 μ s short circuit capability
- $V_{CE(sat)}$ with positive temperature coefficient
- Maximum junction temperature 175 °C
- Low inductance case
- Fast & soft reverse recovery anti-parallel FWD
- Isolated copper baseplate using DBC technology

Typical Applications

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

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	± 20	V
I_C	Collector Current @ $T_C=25^{\circ}\text{C}$	290	A
	@ $T_C=100^{\circ}\text{C}$	150	A
I_{CM}	Pulsed Collector Current $t_p=1\text{ms}$	300	A
P_D	Maximum Power Dissipation @ $T_j=175^{\circ}\text{C}$	1136	W

Diode

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1200	V
I_F	Diode Continuous Forward Current	150	A
I_{FM}	Diode Maximum Forward Current $t_p=1\text{ms}$	300	A

Module

Symbol	Description	Value	Unit
T_{jmax}	Maximum Junction Temperature	175	$^{\circ}\text{C}$
T_{jop}	Operating Junction Temperature	-40 to +150	$^{\circ}\text{C}$
T_{STG}	Storage Temperature Range	-40 to +125	$^{\circ}\text{C}$
V_{ISO}	Isolation Voltage RMS, $f=50\text{Hz}$, $t=1\text{min}$	4000	V

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C=150\text{A}, V_{GE}=15\text{V}, T_j=25^\circ\text{C}$		1.90	2.35	V
		$I_C=150\text{A}, V_{GE}=15\text{V}, T_j=125^\circ\text{C}$		2.10		
		$I_C=150\text{A}, V_{GE}=15\text{V}, T_j=150^\circ\text{C}$		2.20		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=6.0\text{mA}, V_{CE}=V_{GE}, T_j=25^\circ\text{C}$	5.0	6.5	7.0	V
I_{CES}	Collector Cut-Off Current	$V_{CE}=V_{CES}, V_{GE}=0\text{V}, T_j=25^\circ\text{C}$			1.0	mA
I_{GES}	Gate-Emitter Leakage Current	$V_{GE}=V_{GES}, V_{CE}=0\text{V}, T_j=25^\circ\text{C}$			400	nA
R_{Gint}	Internal Gate Resistance			1.5		Ω
C_{ies}	Input Capacitance	$V_{CE}=25\text{V}, f=1\text{MHz}, V_{GE}=0\text{V}$		11.0		nF
C_{res}	Reverse Transfer Capacitance				0.52	
Q_G	Gate Charge	$V_{GE}=-15 \dots +15\text{V}$		1.56		μC
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600\text{V}, I_C=150\text{A}, R_G=4.7\Omega, V_{GE}=\pm 15\text{V}, T_j=25^\circ\text{C}$		347		ns
t_r	Rise Time			75		ns
$t_{d(off)}$	Turn-Off Delay Time			375		ns
t_f	Fall Time			181		ns
E_{on}	Turn-On Switching Loss			8.95		mJ
E_{off}	Turn-Off Switching Loss			9.32		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600\text{V}, I_C=150\text{A}, R_G=4.7\Omega, V_{GE}=\pm 15\text{V}, T_j=125^\circ\text{C}$		352		ns
t_r	Rise Time			80		ns
$t_{d(off)}$	Turn-Off Delay Time			401		ns
t_f	Fall Time			327		ns
E_{on}	Turn-On Switching Loss			11.9		mJ
E_{off}	Turn-Off Switching Loss			16.0		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600\text{V}, I_C=150\text{A}, R_G=4.7\Omega, V_{GE}=\pm 15\text{V}, T_j=150^\circ\text{C}$		360		ns
t_r	Rise Time			81		ns
$t_{d(off)}$	Turn-Off Delay Time			410		ns
t_f	Fall Time			366		ns
E_{on}	Turn-On Switching Loss			13.5		mJ
E_{off}	Turn-Off Switching Loss			18.0		mJ
I_{SC}	SC Data	$t_p \leq 10\mu\text{s}, V_{GE}=15\text{V}, T_j=150^\circ\text{C}, V_{CC}=900\text{V}, V_{CEM} \leq 1200\text{V}$		700		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	$I_F=150\text{A}, V_{GE}=0\text{V}, T_j=25^\circ\text{C}$		1.80	2.25	V
		$I_F=150\text{A}, V_{GE}=0\text{V}, T_j=125^\circ\text{C}$		1.85		
		$I_F=150\text{A}, V_{GE}=0\text{V}, T_j=150^\circ\text{C}$		1.85		
Q_r	Recovered Charge			14.0		μC
I_{RM}	Peak Reverse Recovery Current	$V_R=600\text{V}, I_F=150\text{A}, R_G=4.7\Omega, V_{GE}=-15\text{V}$		143		A
E_{rec}	Reverse Recovery Energy	$T_j=25^\circ\text{C}$		9.54		mJ
Q_r	Recovered Charge			28.6		μC
I_{RM}	Peak Reverse Recovery Current	$V_R=600\text{V}, I_F=150\text{A}, R_G=4.7\Omega, V_{GE}=-15\text{V}$		179		A
E_{rec}	Reverse Recovery Energy	$T_j=125^\circ\text{C}$		17.5		mJ
Q_r	Recovered Charge			31.5		μC
I_{RM}	Peak Reverse Recovery Current	$V_R=600\text{V}, I_F=150\text{A}, R_G=4.7\Omega, V_{GE}=-15\text{V}$		188		A
E_{rec}	Reverse Recovery Energy	$T_j=150^\circ\text{C}$		20.3		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		0.75		m Ω
$R_{\theta JC}$	Junction-to-Case (per IGBT)			0.132	K/W
	Junction-to-Case (per Diode)			0.214	
$R_{\theta CS}$	Case-to-Sink (per IGBT)		0.162		K/W
	Case-to-Sink (per Diode)		0.262		
$R_{\theta CS}$	Case-to-Sink		0.05		K/W
M	Terminal Connection Torque, Screw M5	2.5		5.0	N.m
	Mounting Torque, Screw M6	3.0		5.0	
G	Weight of Module		150		g

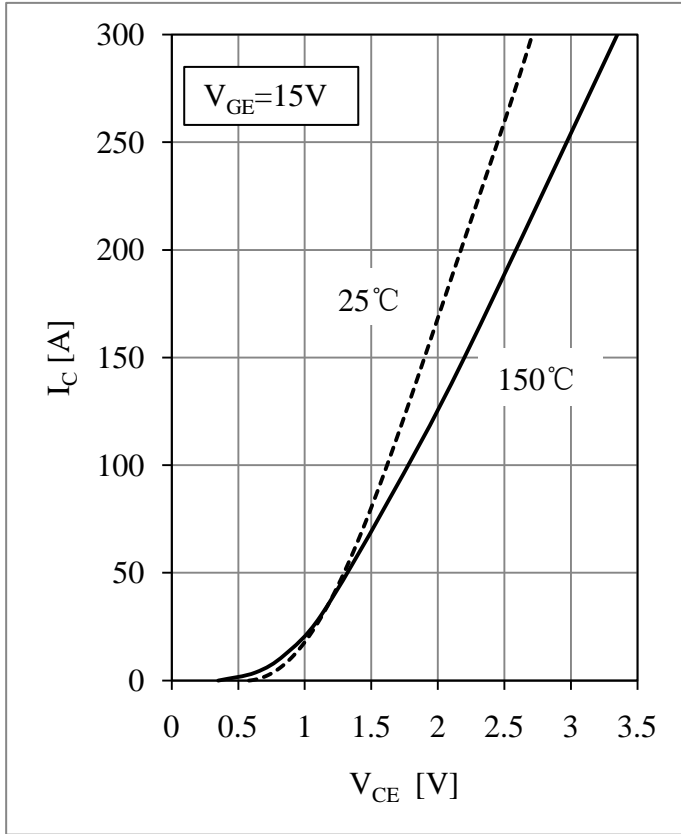


Fig 1. IGBT Output Characteristics

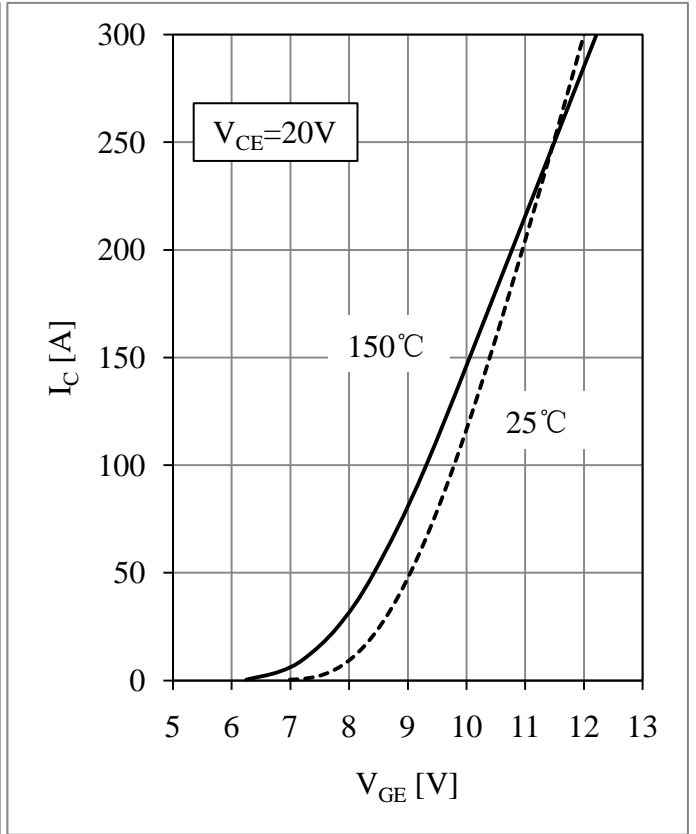


Fig 2. IGBT Transfer Characteristics

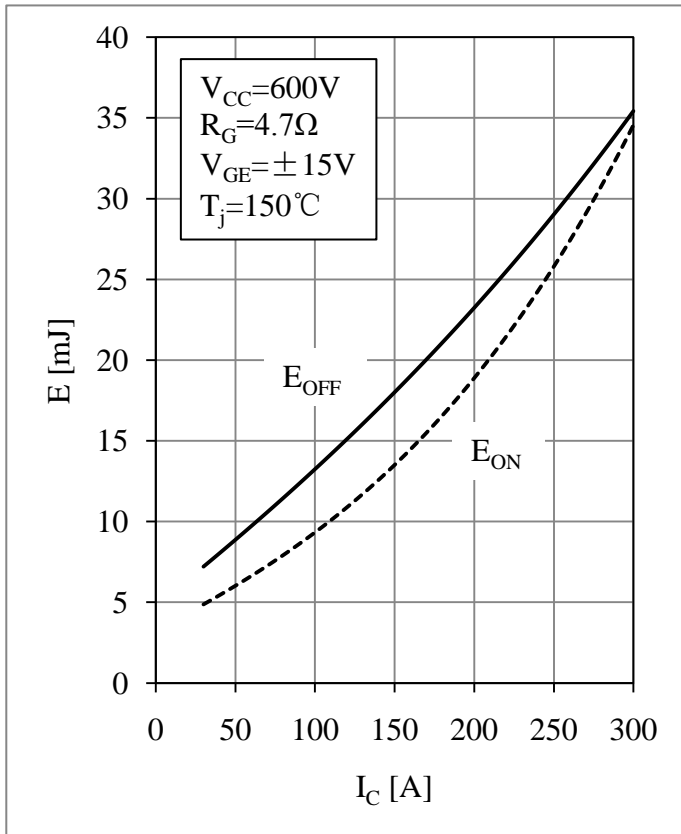


Fig 3. IGBT Switching Loss vs. I_C

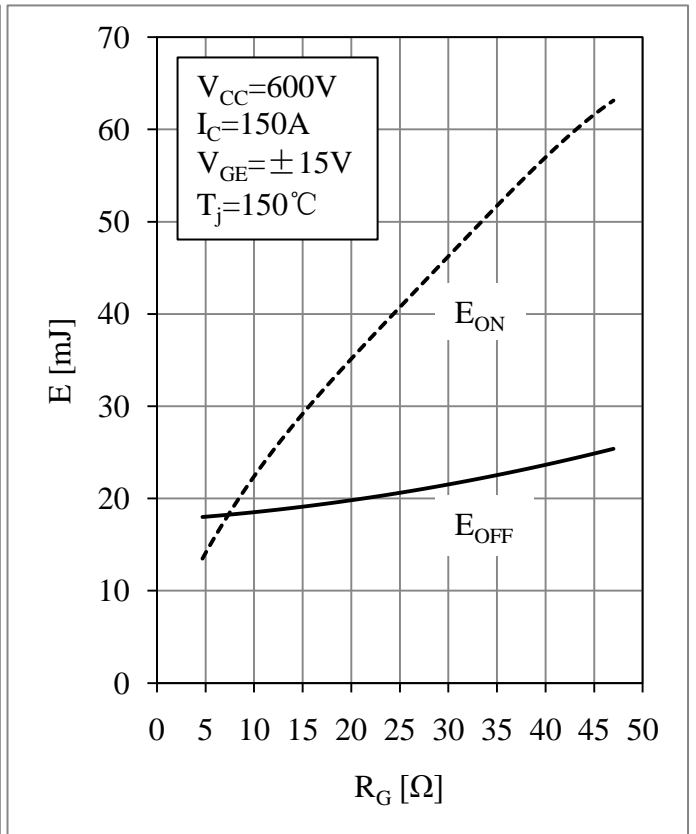


Fig 4. IGBT Switching Loss vs. R_G

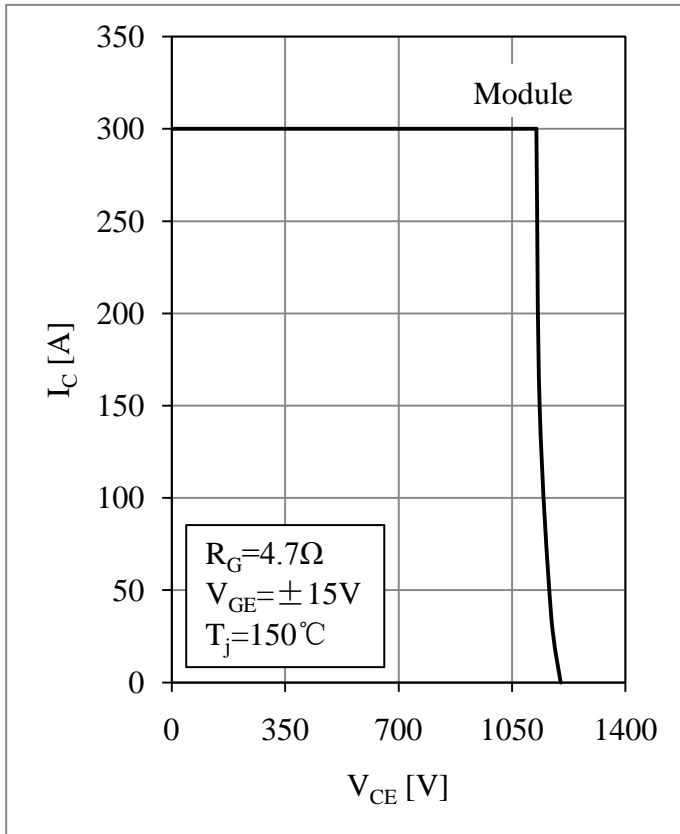


Fig 5. RBSOA

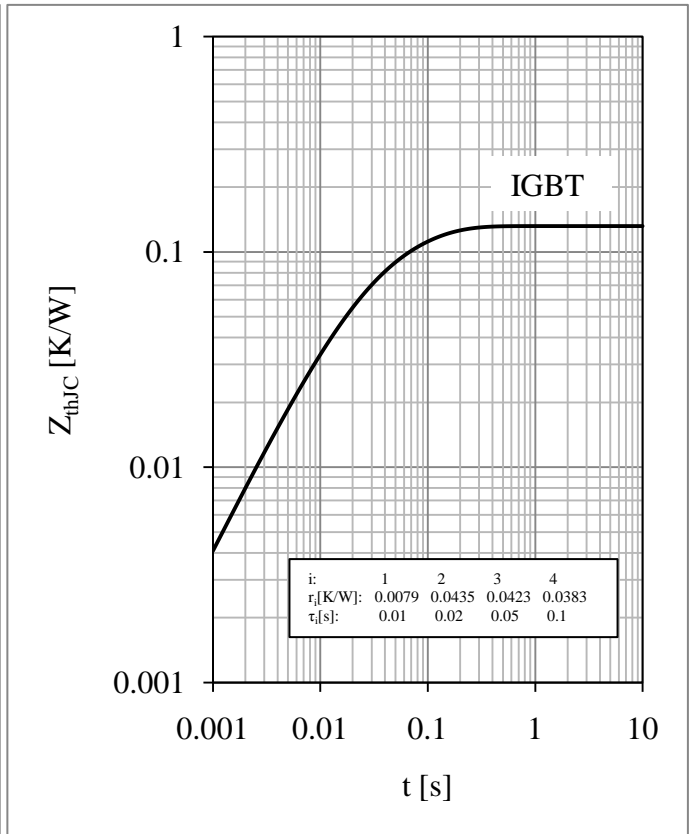


Fig 6. IGBT Transient Thermal Impedance

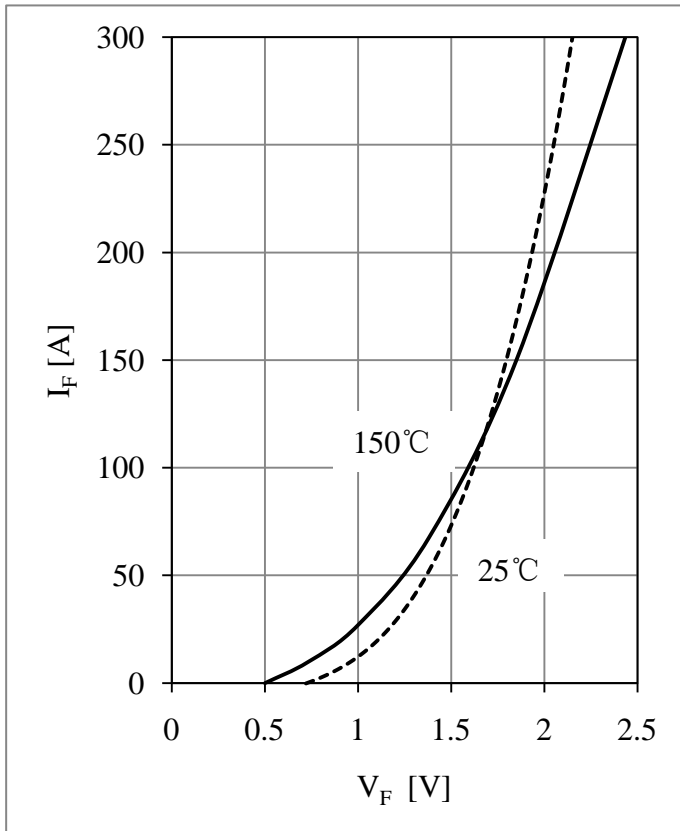


Fig 7. Diode Forward Characteristics

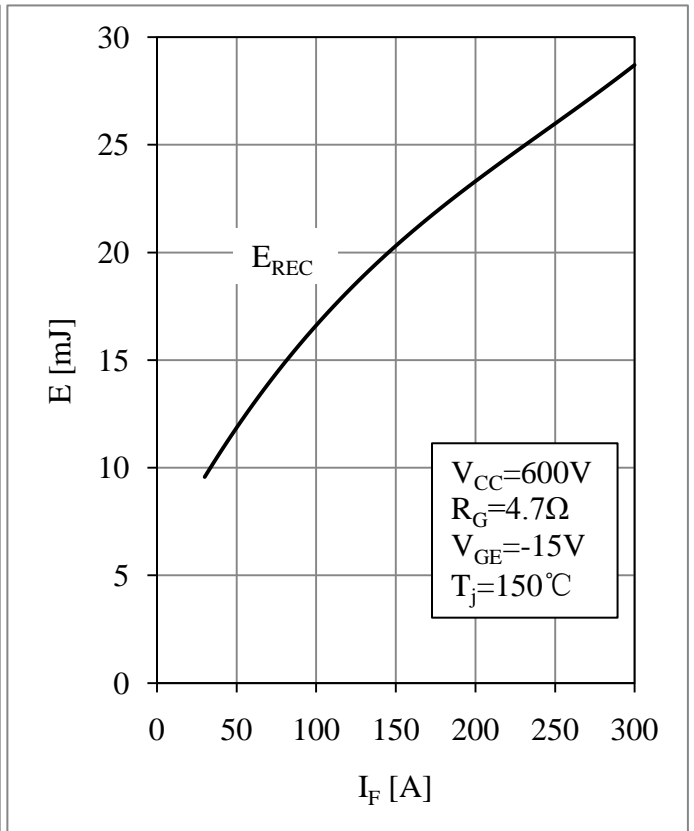


Fig 8. Diode Switching Loss vs. I_F

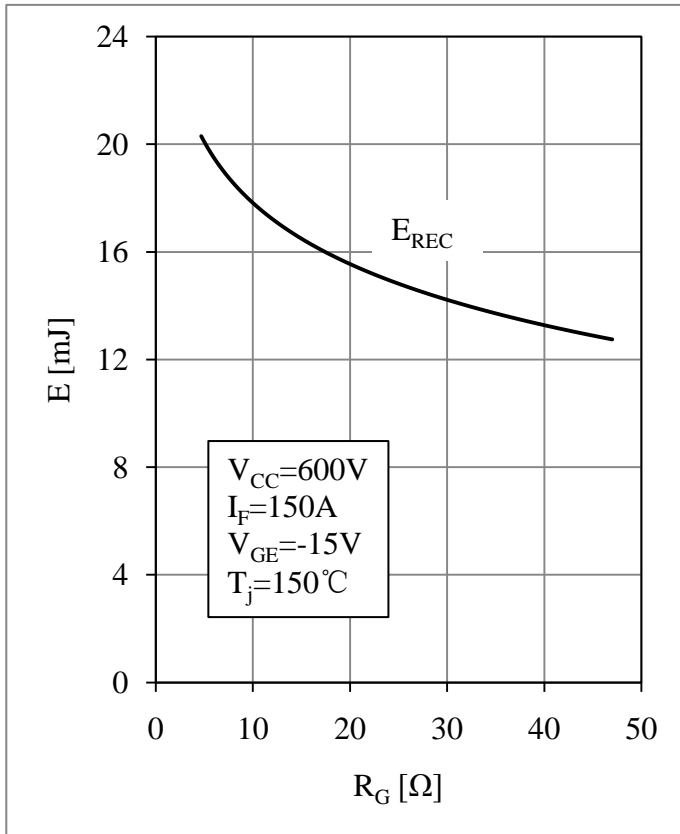


Fig 9. Diode Switching Loss vs. R_G

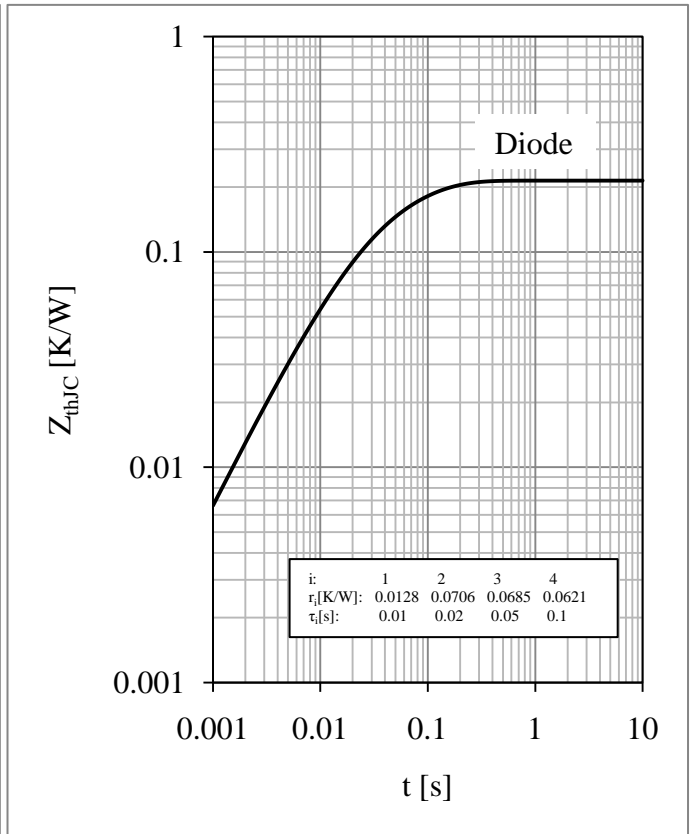
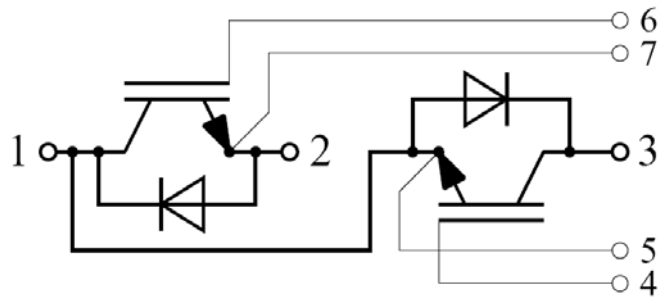


Fig 10. Diode Transient Thermal Impedance

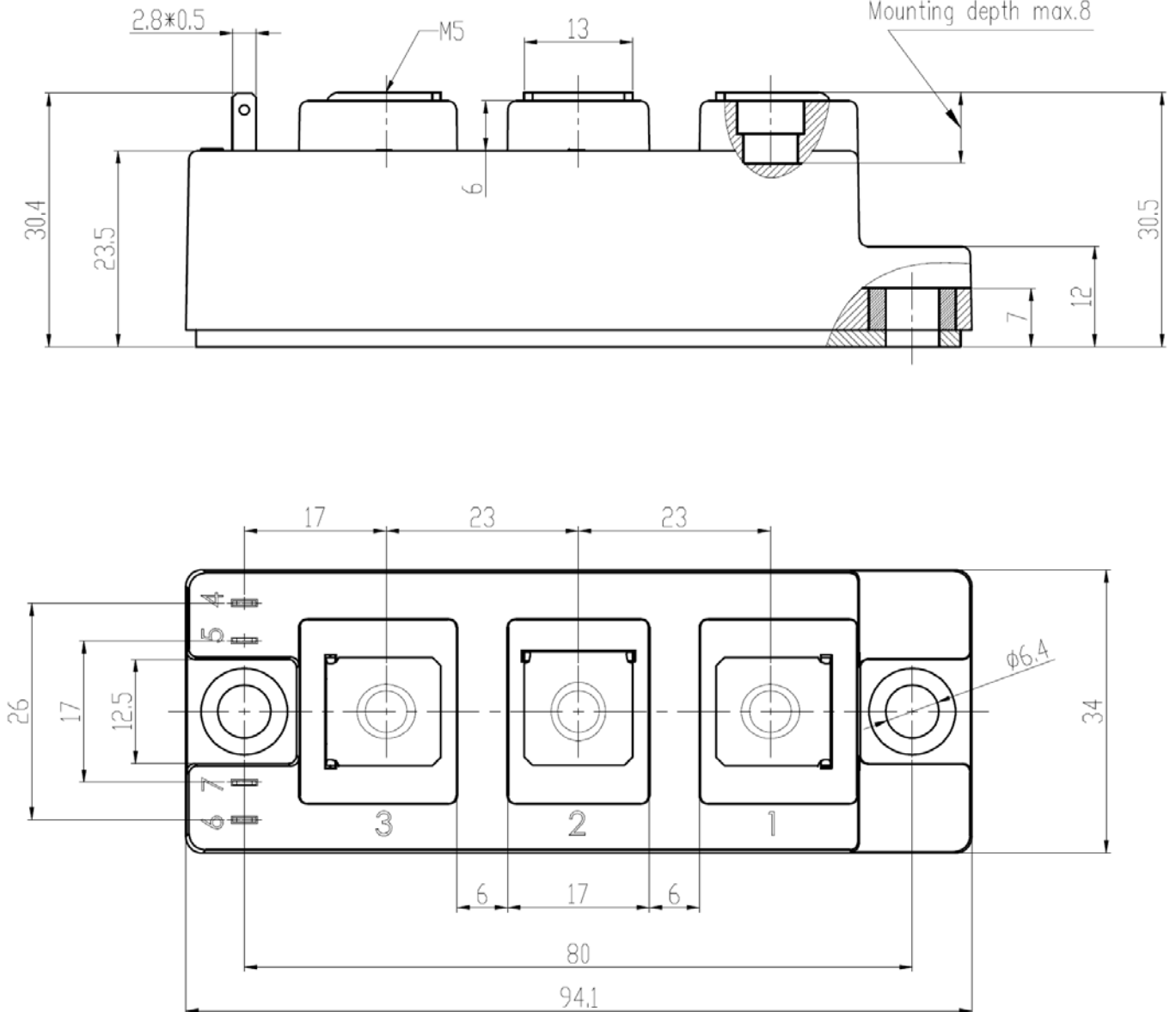
Circuit Schematic



Package Dimensions

Dimensions in Millimeters

Mounting depth max.8



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