

STARPOWER

SEMICONDUCTOR

IGBT

GD75HFL170C1S

1700V/75A 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

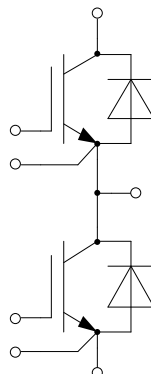
- Low $V_{CE(sat)}$ SPT+ IGBT technology
- 10 μ s short circuit capability
- $V_{CE(sat)}$ with positive temperature coefficient
- Maximum junction temperature 175°C
- Low inductance case
- Fast & soft reverse recovery anti-parallel FWD
- Isolated copper baseplate using DBC technology



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	1700	V
V_{GES}	Gate-Emitter Voltage	± 20	V
I_C	Collector Current @ $T_C=25^{\circ}\text{C}$	120	A
	@ $T_C=100^{\circ}\text{C}$	75	A
I_{CM}	Pulsed Collector Current $t_p=1\text{ms}$	150	A
P_D	Maximum Power Dissipation @ $T_j=175^{\circ}\text{C}$	572	W

Diode

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1700	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_{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	$I_C=75\text{A}, V_{GE}=15\text{V}, T_j=25^\circ\text{C}$		2.40	2.85	V
		$I_C=75\text{A}, V_{GE}=15\text{V}, T_j=125^\circ\text{C}$		2.80		
		$I_C=75\text{A}, V_{GE}=15\text{V}, T_j=150^\circ\text{C}$		2.90		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=3.0\text{mA}, V_{CE}=V_{GE}, T_j=25^\circ\text{C}$	5.4	6.2	7.4	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			11.5		Ω
C_{ies}	Input Capacitance	$V_{CE}=25\text{V}, f=1\text{MHz}, V_{GE}=0\text{V}$		5.10		nF
C_{res}	Reverse Transfer Capacitance			0.18		nF
Q_G	Gate Charge	$V_{GE}=-15\dots+15\text{V}$		0.61		μC
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=900\text{V}, I_C=75\text{A}, R_G=6.8\Omega, V_{GE}=\pm 15\text{V}, T_j=25^\circ\text{C}$		209		ns
t_r	Rise Time			77		ns
$t_{d(off)}$	Turn-Off Delay Time			216		ns
t_f	Fall Time			461		ns
E_{on}	Turn-On Switching Loss			23.7		mJ
E_{off}	Turn-Off Switching Loss			11.1		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=900\text{V}, I_C=75\text{A}, R_G=6.8\Omega, V_{GE}=\pm 15\text{V}, T_j=125^\circ\text{C}$		218		ns
t_r	Rise Time			89		ns
$t_{d(off)}$	Turn-Off Delay Time			242		ns
t_f	Fall Time			734		ns
E_{on}	Turn-On Switching Loss			30.4		mJ
E_{off}	Turn-Off Switching Loss			17.2		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=900\text{V}, I_C=75\text{A}, R_G=6.8\Omega, V_{GE}=\pm 15\text{V}, T_j=150^\circ\text{C}$		219		ns
t_r	Rise Time			92		ns
$t_{d(off)}$	Turn-Off Delay Time			247		ns
t_f	Fall Time			777		ns
E_{on}	Turn-On Switching Loss			34.4		mJ
E_{off}	Turn-Off Switching Loss			18.8		mJ
I_{SC}	SC Data	$t_p \leq 10\mu\text{s}, V_{GE}=15\text{V}, T_j=150^\circ\text{C}, V_{CC}=1000\text{V}, V_{CEM} \leq 1700\text{V}$		250		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	$I_F=75\text{A}, V_{GE}=0\text{V}, T_j=25^\circ\text{C}$		1.80	2.25	V
		$I_F=75\text{A}, V_{GE}=0\text{V}, T_j=125^\circ\text{C}$		1.95		
		$I_F=75\text{A}, V_{GE}=0\text{V}, T_j=150^\circ\text{C}$		1.90		
Q_r	Recovered Charge	$V_R=900\text{V}, I_F=75\text{A},$ $-di/dt=900\text{A}/\mu\text{s}, V_{GE}=-15\text{V}$ $T_j=25^\circ\text{C}$		21.8		μC
I_{RM}	Peak Reverse Recovery Current			69		A
E_{rec}	Reverse Recovery Energy			10.8		mJ
Q_r	Recovered Charge	$V_R=900\text{V}, I_F=75\text{A},$ $-di/dt=900\text{A}/\mu\text{s}, V_{GE}=-15\text{V}$ $T_j=125^\circ\text{C}$		31.5		μC
I_{RM}	Peak Reverse Recovery Current			73		A
E_{rec}	Reverse Recovery Energy			17.6		mJ
Q_r	Recovered Charge	$V_R=900\text{V}, I_F=75\text{A},$ $-di/dt=900\text{A}/\mu\text{s}, V_{GE}=-15\text{V}$ $T_j=150^\circ\text{C}$		36.5		μC
I_{RM}	Peak Reverse Recovery Current			70		A
E_{rec}	Reverse Recovery Energy			20.6		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_{thJC}	Junction-to-Case (per IGBT)			0.262	K/W
	Junction-to-Case (per Diode)			0.427	
R_{thCH}	Case-to-Heatsink (per IGBT)		0.161		K/W
	Case-to-Heatsink (per Diode)		0.263		
	Case-to-Heatsink (per Module)		0.050		
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

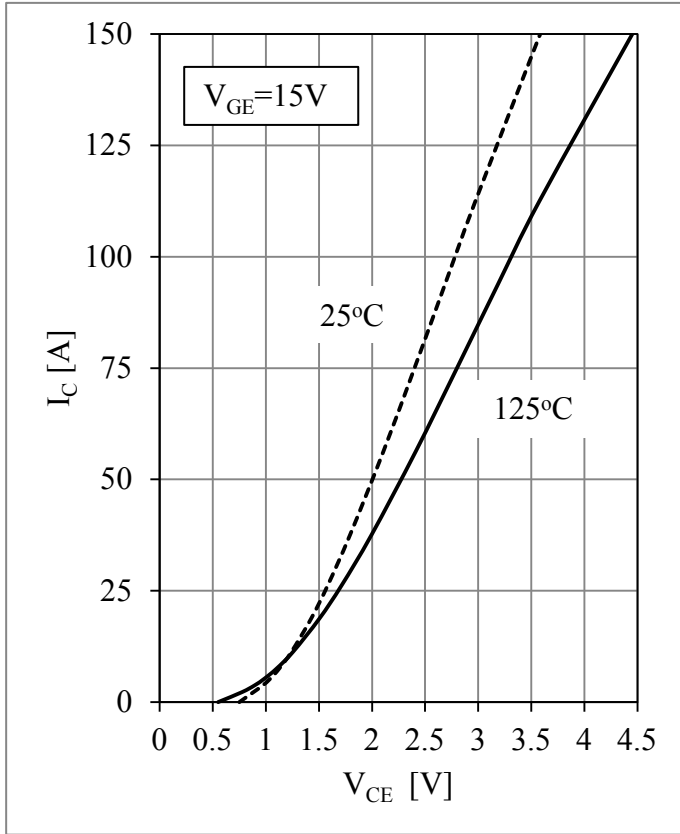


Fig 1. IGBT Output Characteristics

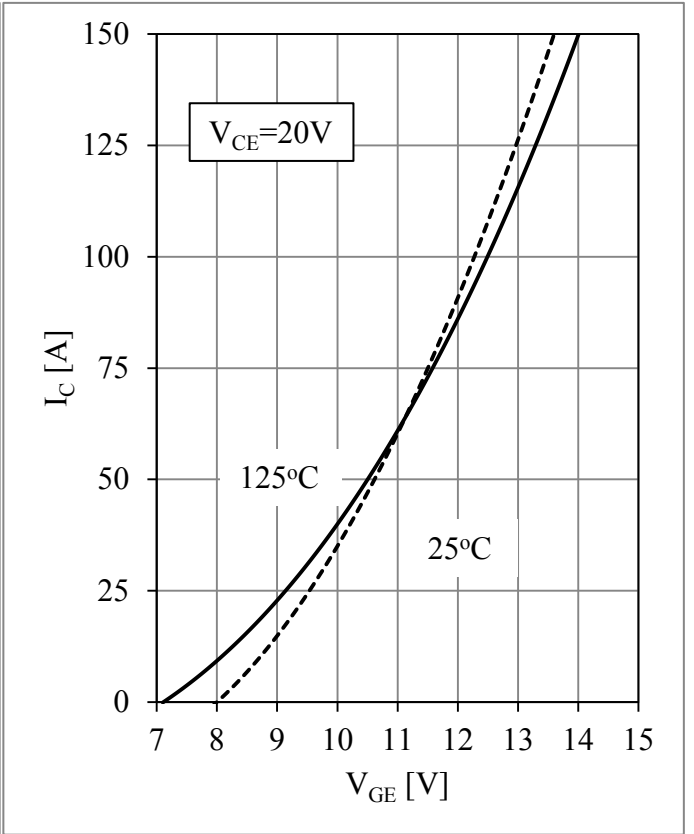


Fig 2. IGBT Transfer Characteristics

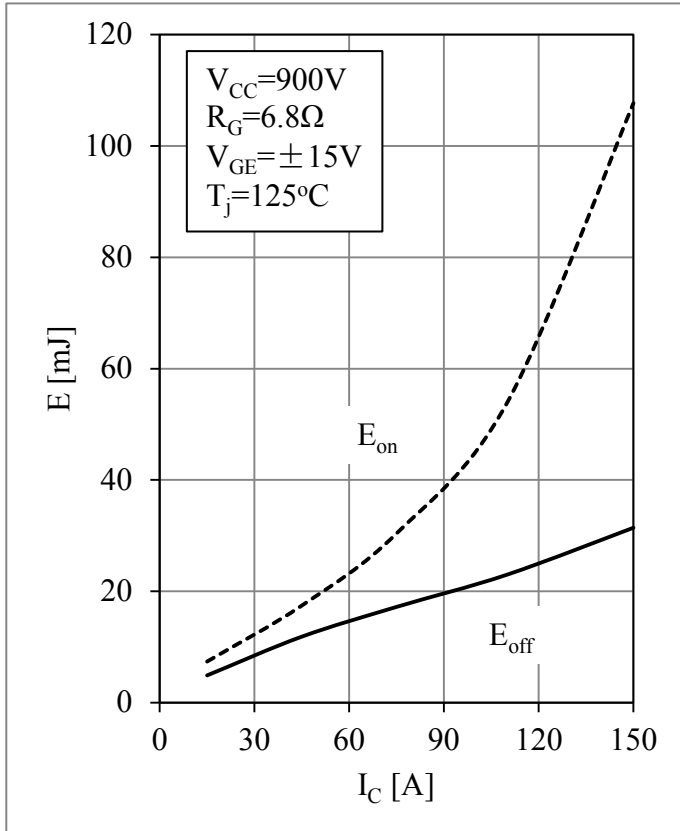


Fig 3. IGBT Switching Loss vs. I_C

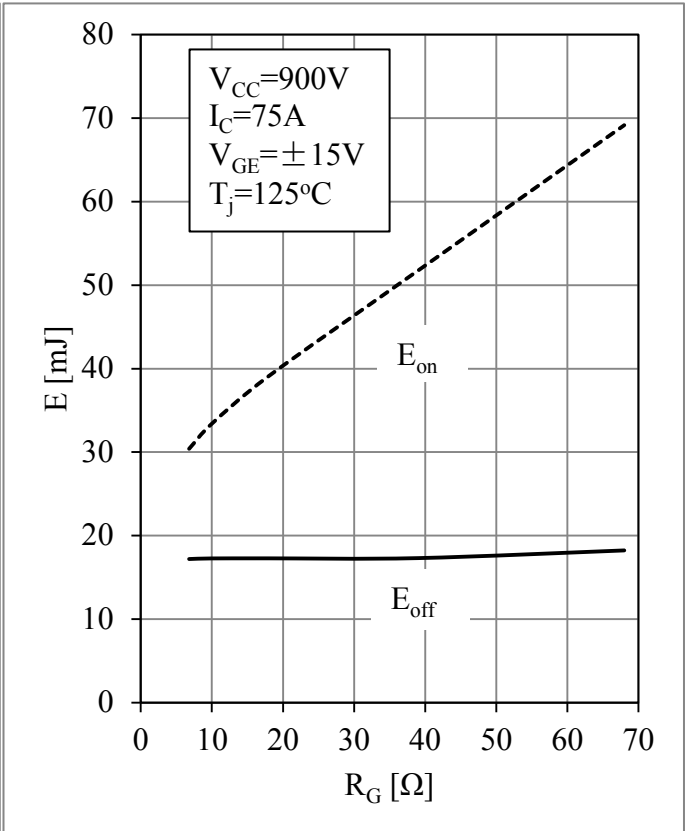


Fig 4. IGBT Switching Loss vs. R_G

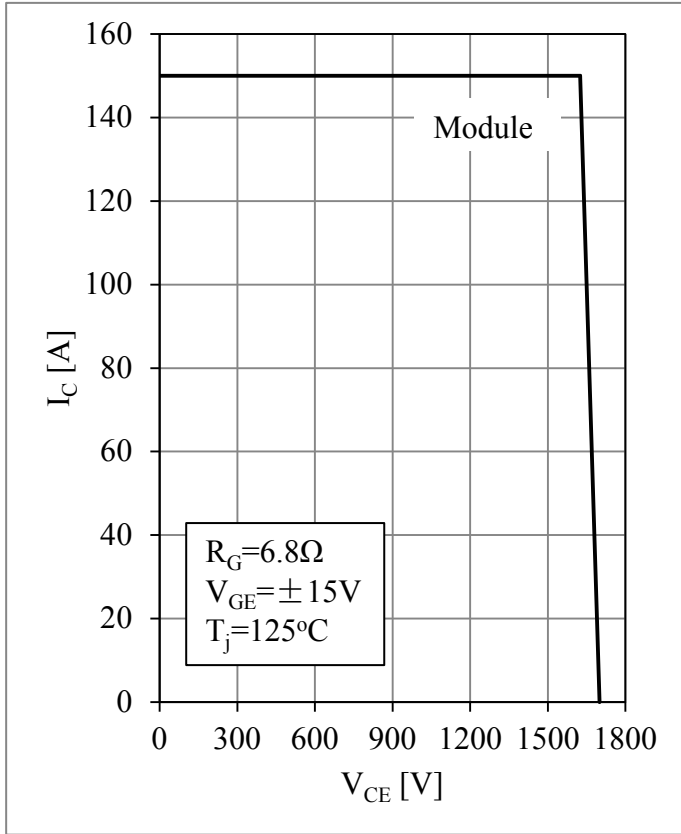


Fig 5. RBSOA

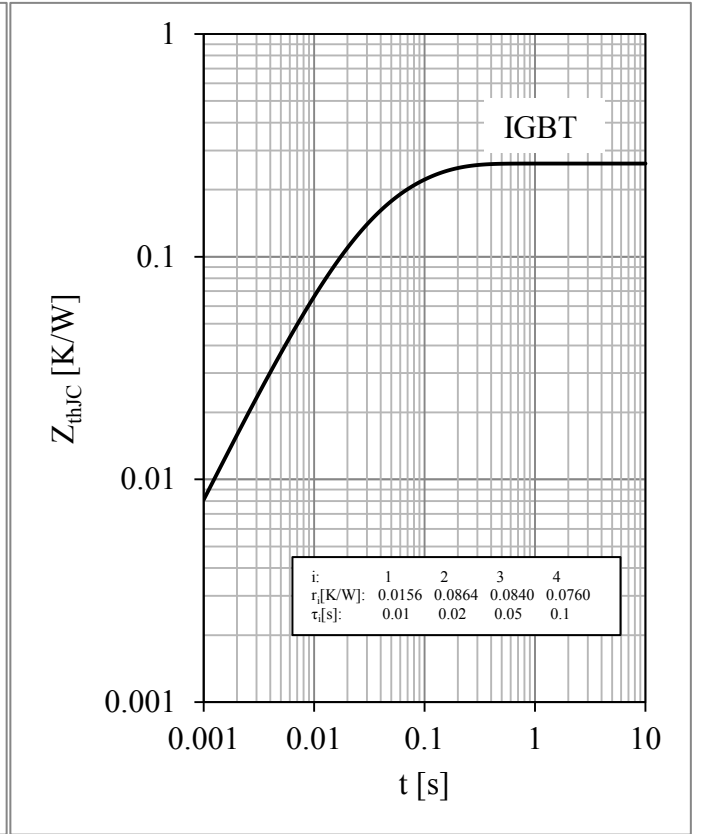


Fig 6. IGBT Transient Thermal Impedance

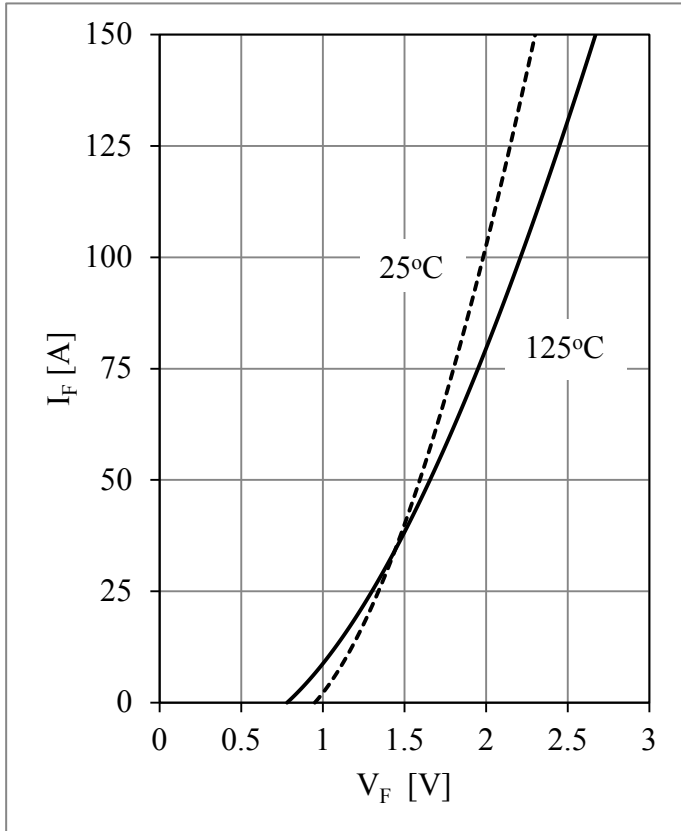


Fig 7. Diode Forward Characteristics

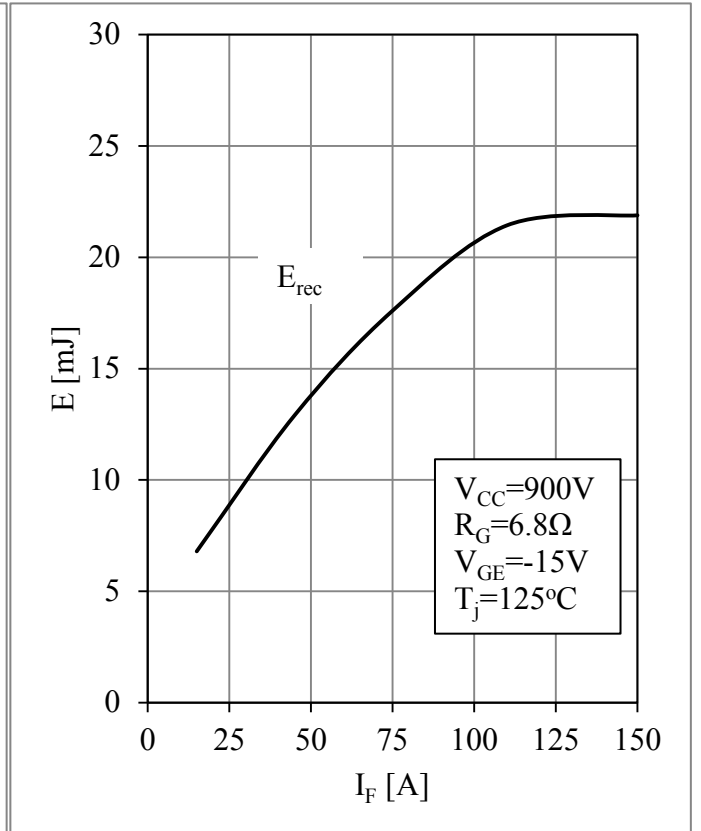


Fig 8. Diode Switching Loss vs. I_F

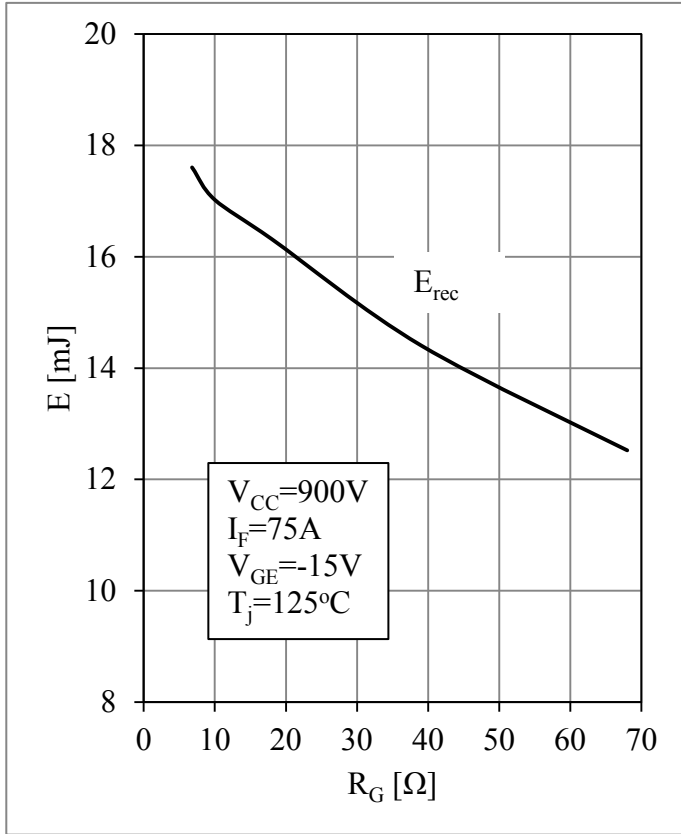


Fig 9. Diode Switching Loss vs. R_G

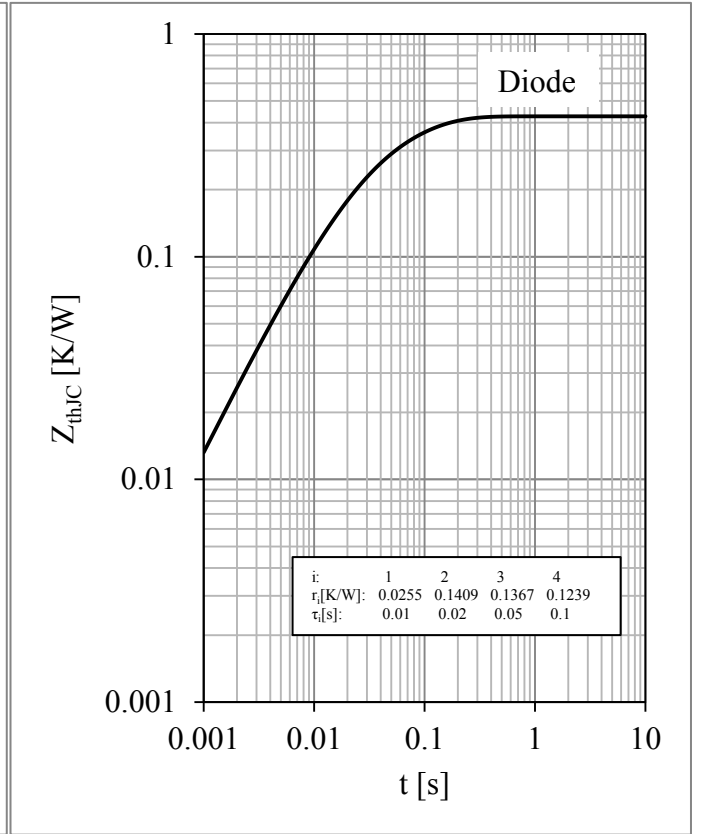
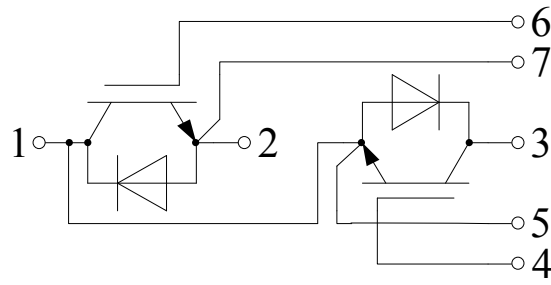


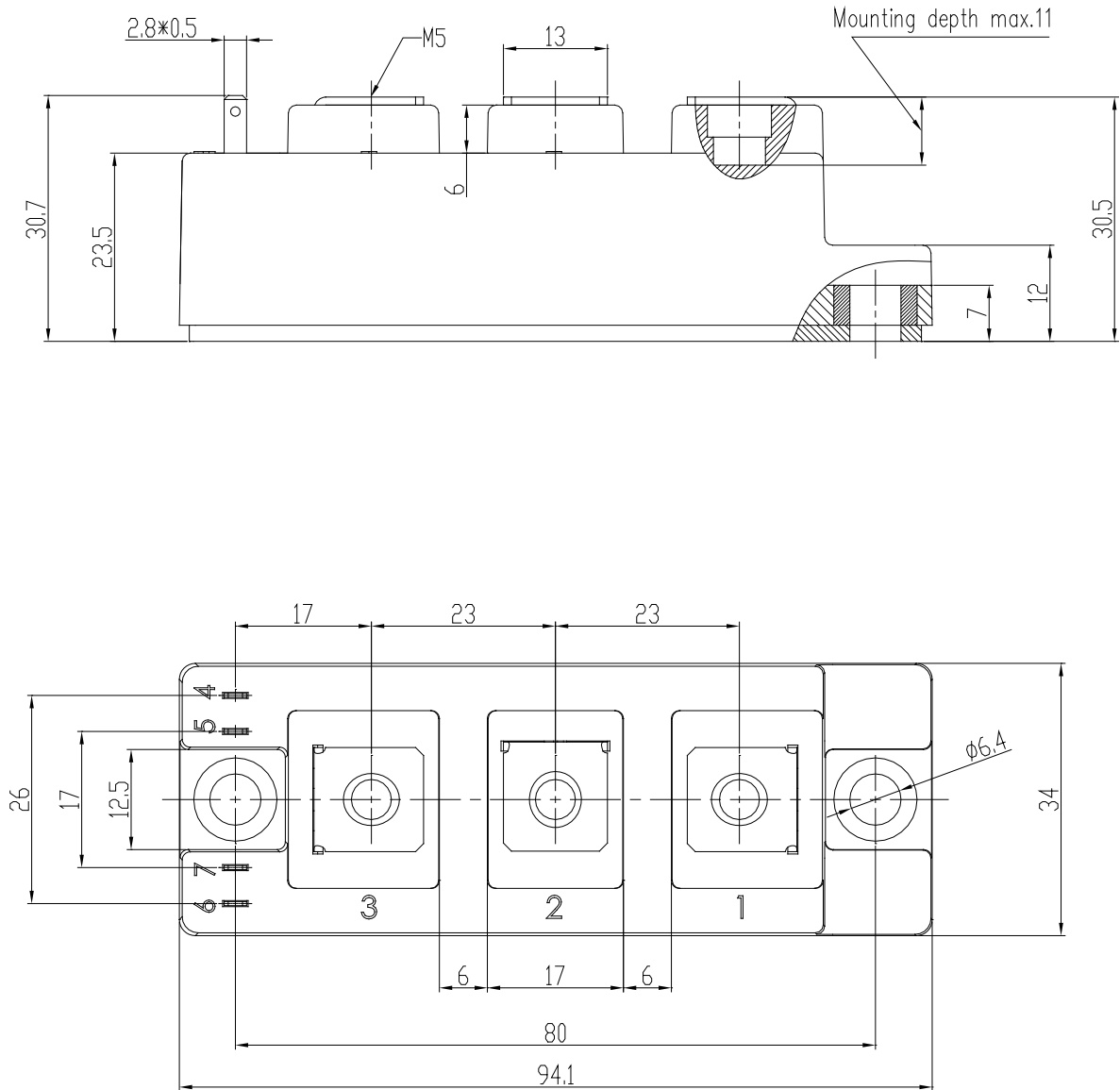
Fig 10. Diode Transient Thermal Impedance

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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