

STARPOWER

SEMICONDUCTOR

IGBT

GD75HFX170C1S

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.

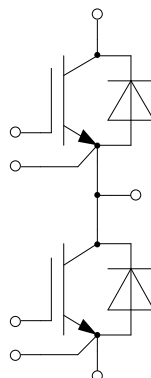
Features

- Low $V_{CE(sat)}$ Trench 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 @ $T_C=25^{\circ}\text{C}$ @ $T_C=100^{\circ}\text{C}$	136 75	A
I_{CM}	Pulsed Collector Current $t_p=1\text{ms}$	150	A
P_D	Maximum Power Dissipation @ $T_{vj}=175^{\circ}\text{C}$	539	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_{vjmax}	Maximum Junction Temperature	175	$^{\circ}\text{C}$
T_{vioP}	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	$I_C=75\text{A}, V_{GE}=15\text{V}, T_{vj}=25^{\circ}\text{C}$		1.85	2.20	V
		$I_C=75\text{A}, V_{GE}=15\text{V}, T_{vj}=125^{\circ}\text{C}$		2.25		
		$I_C=75\text{A}, V_{GE}=15\text{V}, T_{vj}=150^{\circ}\text{C}$		2.35		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=3.0\text{mA}, V_{CE}=V_{GE}, T_{vj}=25^{\circ}\text{C}$	5.6	6.2	6.8	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			8.5		Ω
C_{ies}	Input Capacitance	$V_{CE}=25\text{V}, f=1\text{MHz}, V_{GE}=0\text{V}$		9.03		nF
C_{res}	Reverse Transfer Capacitance			0.22		nF
Q_G	Gate Charge	$V_{GE}=-15\dots+15\text{V}$		0.71		μC
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=900\text{V}, I_C=75\text{A}, R_G=6.8\Omega, V_{GE}=\pm 15\text{V}, L_s=60\text{nH}, T_{vj}=25^{\circ}\text{C}$		237		ns
t_r	Rise Time			59		ns
$t_{d(off)}$	Turn-Off Delay Time			314		ns
t_f	Fall Time			361		ns
E_{on}	Turn-On Switching Loss			25.0		mJ
E_{off}	Turn-Off Switching Loss			9.5		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=900\text{V}, I_C=75\text{A}, R_G=6.8\Omega, V_{GE}=\pm 15\text{V}, L_s=60\text{nH}, T_{vj}=125^{\circ}\text{C}$		254		ns
t_r	Rise Time			70		ns
$t_{d(off)}$	Turn-Off Delay Time			383		ns
t_f	Fall Time			524		ns
E_{on}	Turn-On Switching Loss			33.3		mJ
E_{off}	Turn-Off Switching Loss			15.1		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=900\text{V}, I_C=75\text{A}, R_G=6.8\Omega, V_{GE}=\pm 15\text{V}, L_s=60\text{nH}, T_{vj}=150^{\circ}\text{C}$		257		ns
t_r	Rise Time			75		ns
$t_{d(off)}$	Turn-Off Delay Time			396		ns
t_f	Fall Time			588		ns
E_{on}	Turn-On Switching Loss			36.9		mJ
E_{off}	Turn-Off Switching Loss			16.6		mJ
I_{SC}	SC Data	$t_p \leq 10\mu\text{s}, V_{GE}=15\text{V}, T_{vj}=150^{\circ}\text{C}, V_{CC}=1000\text{V}, V_{CEM} \leq 1700\text{V}$		300		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	$I_F=75\text{A}, V_{GE}=0\text{V}, T_{vj}=25^{\circ}\text{C}$		1.80	2.25	V
		$I_F=75\text{A}, V_{GE}=0\text{V}, T_{vj}=125^{\circ}\text{C}$		1.90		
		$I_F=75\text{A}, V_{GE}=0\text{V}, T_{vj}=150^{\circ}\text{C}$		1.95		
Q_r	Recovered Charge	$V_R=900\text{V}, I_F=75\text{A},$ $-di/dt=700\text{A}/\mu\text{s}, V_{GE}=-15\text{V}$ $L_s=60\text{nH}, T_{vj}=25^{\circ}\text{C}$		16.4		μC
I_{RM}	Peak Reverse Recovery Current			58		A
E_{rec}	Reverse Recovery Energy			7.2		mJ
Q_r	Recovered Charge	$V_R=900\text{V}, I_F=75\text{A},$ $-di/dt=600\text{A}/\mu\text{s}, V_{GE}=-15\text{V}$ $L_s=60\text{nH}, T_{vj}=125^{\circ}\text{C}$		30.8		μC
I_{RM}	Peak Reverse Recovery Current			64		A
E_{rec}	Reverse Recovery Energy			15.8		mJ
Q_r	Recovered Charge	$V_R=900\text{V}, I_F=75\text{A},$ $-di/dt=600\text{A}/\mu\text{s}, V_{GE}=-15\text{V}$ $L_s=60\text{nH}, T_{vj}=150^{\circ}\text{C}$		31.4		μC
I_{RM}	Peak Reverse Recovery Current			64		A
E_{rec}	Reverse Recovery Energy			18.2		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		m Ω
R_{thJC}	Junction-to-Case (per IGBT)			0.278	K/W
	Junction-to-Case (per Diode)			0.467	
R_{thCH}	Case-to-Heatsink (per IGBT)		0.160		K/W
	Case-to-Heatsink (per Diode)		0.268		
	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

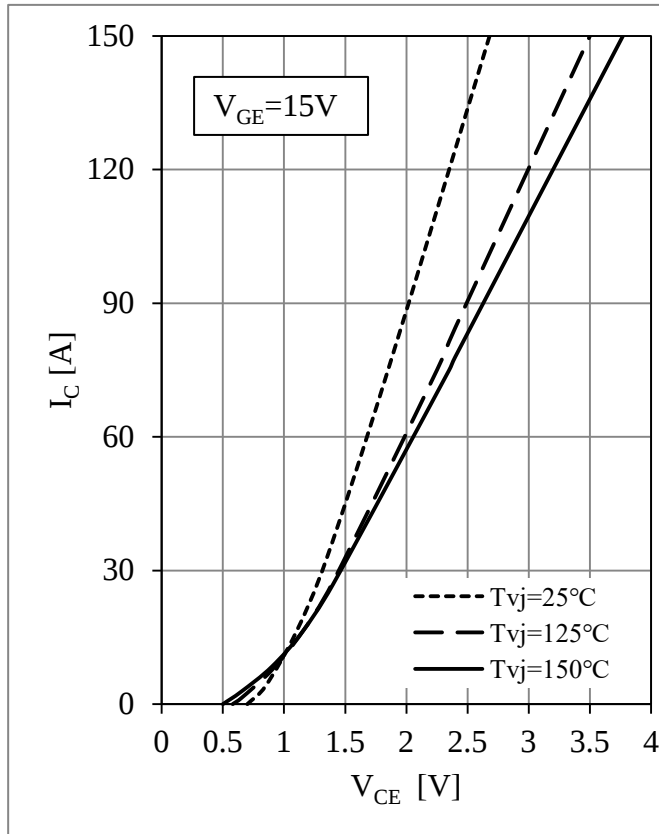


Fig 1. IGBT Output Characteristics

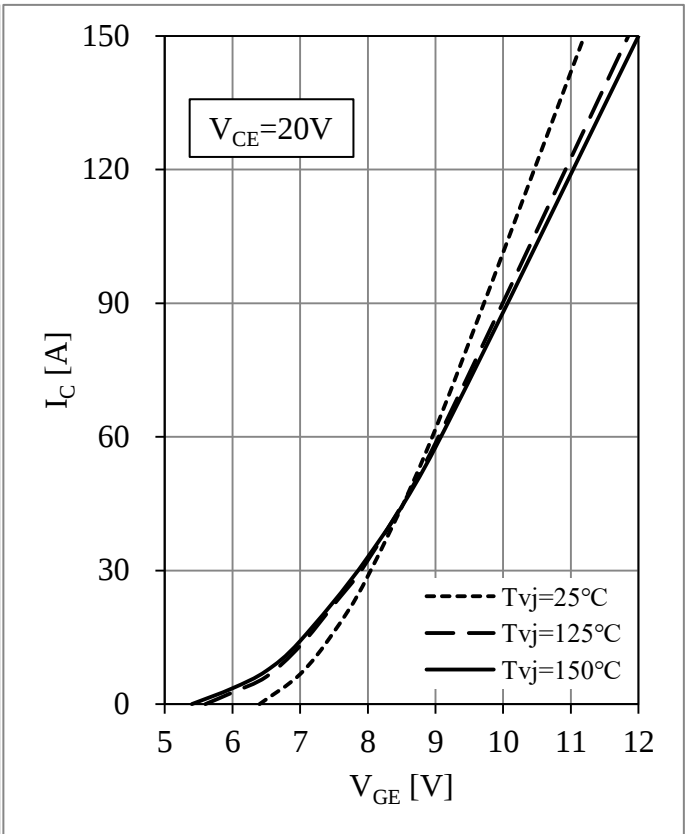
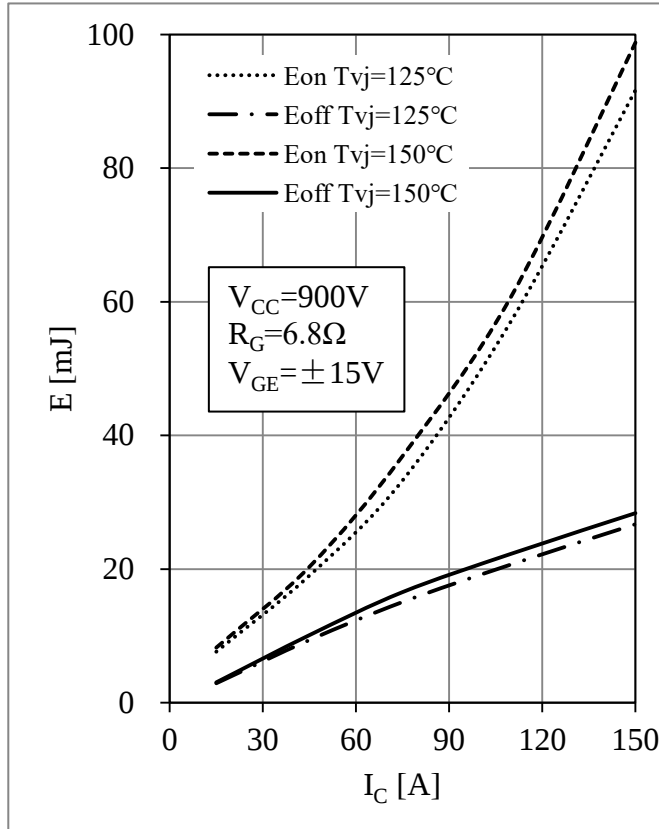
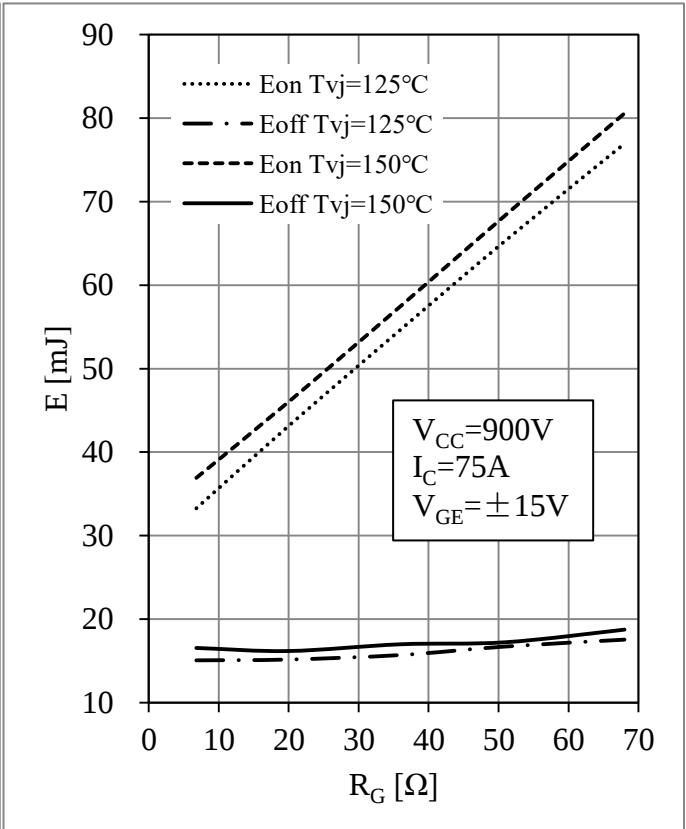


Fig 2. IGBT Transfer Characteristics

Fig 3. IGBT Switching Loss vs. I_C Fig 4. IGBT Switching Loss vs. R_G

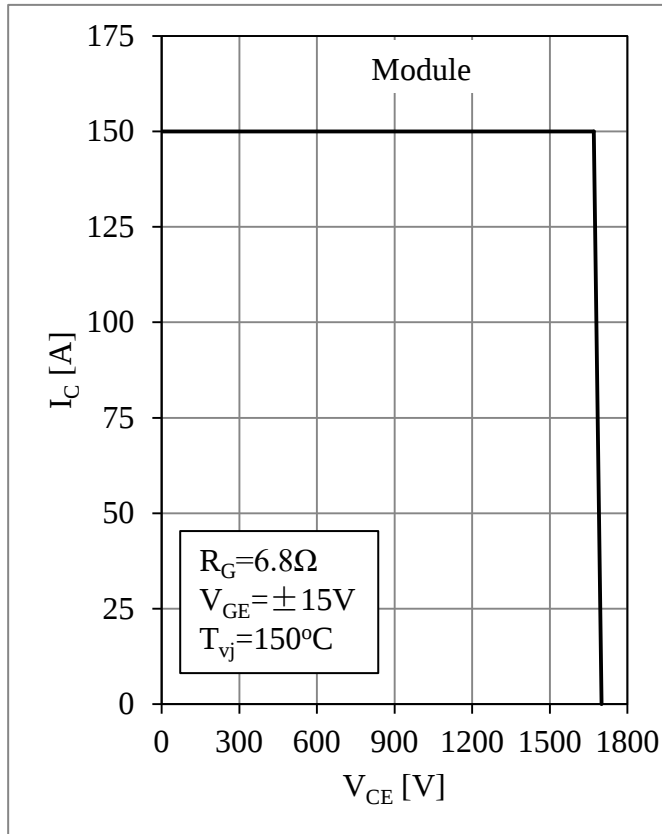


Fig 5. RBSOA

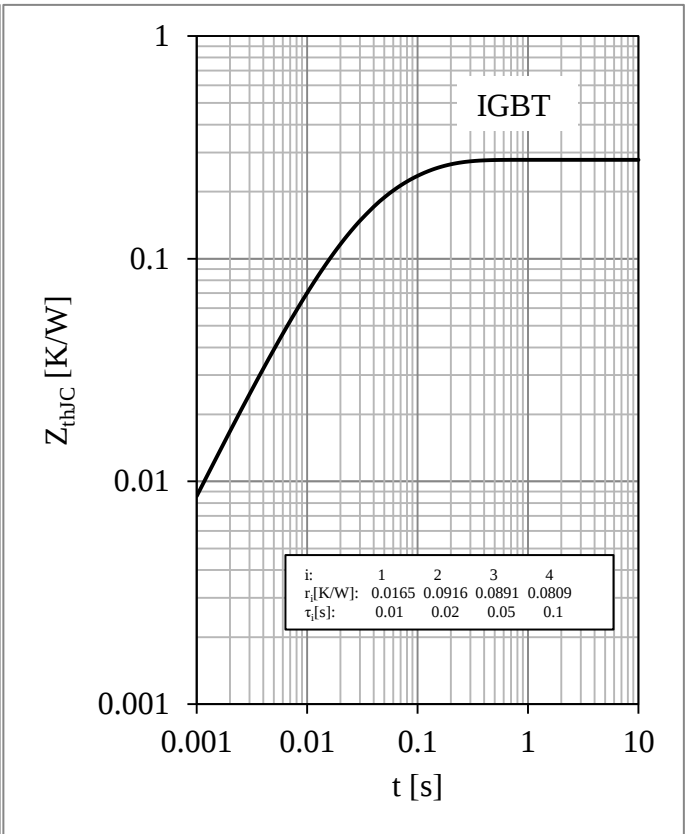


Fig 6. IGBT Transient Thermal Impedance

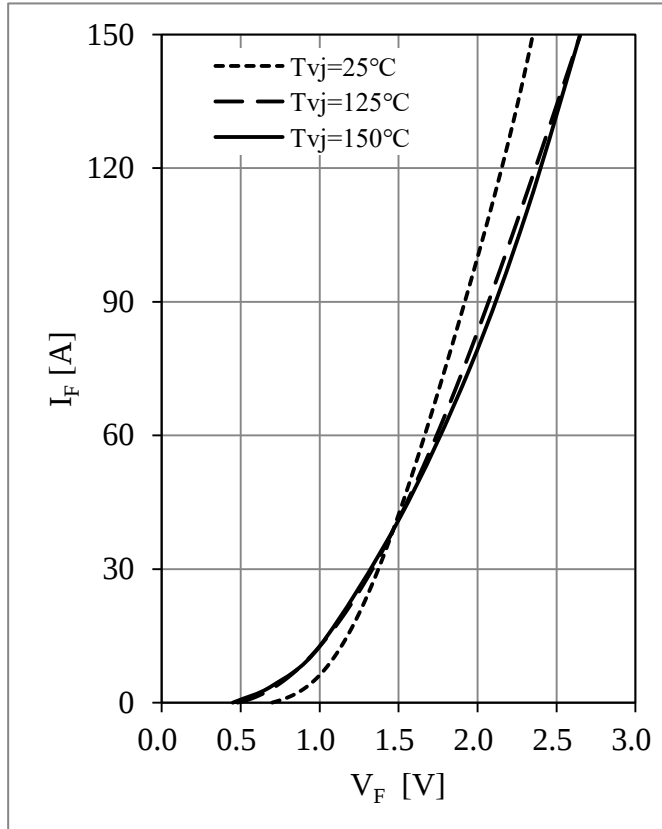
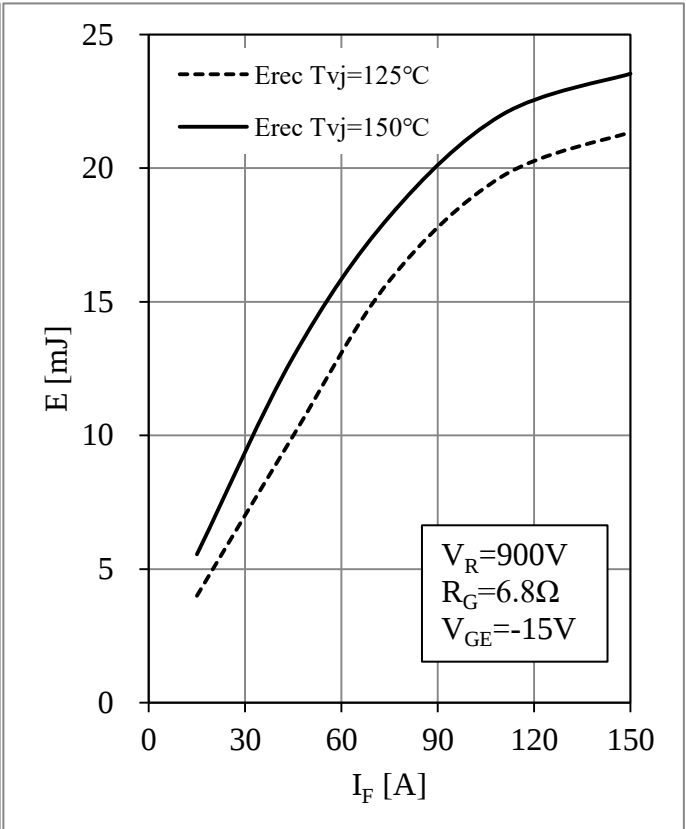


Fig 7. Diode Forward Characteristics

Fig 8. Diode Switching Loss vs. I_F

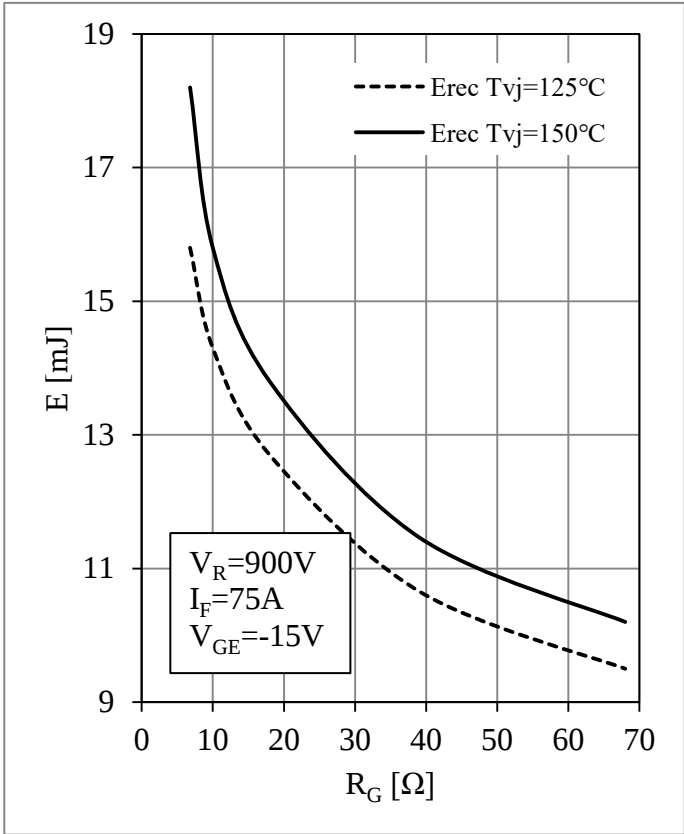


Fig 9. Diode Switching Loss vs. R_G

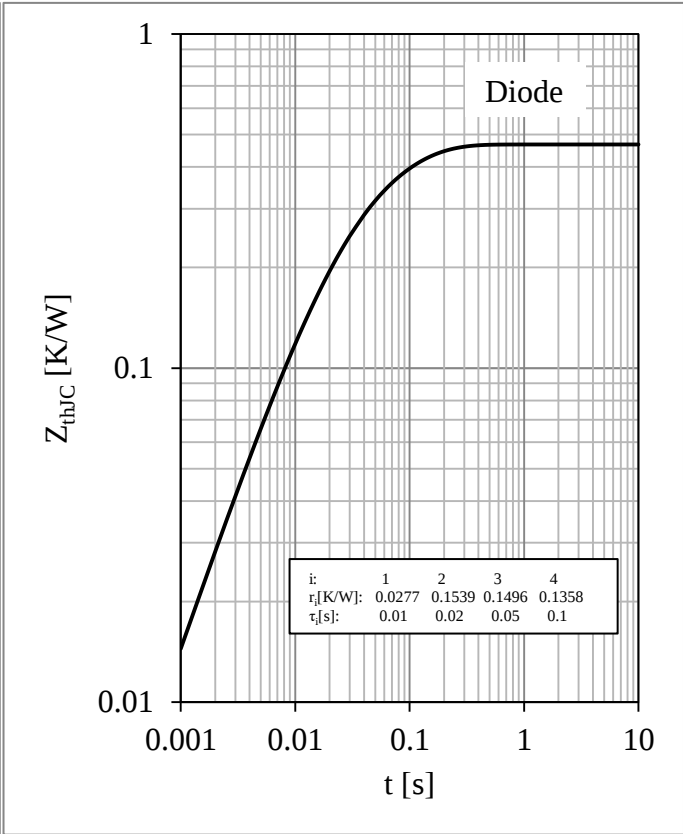
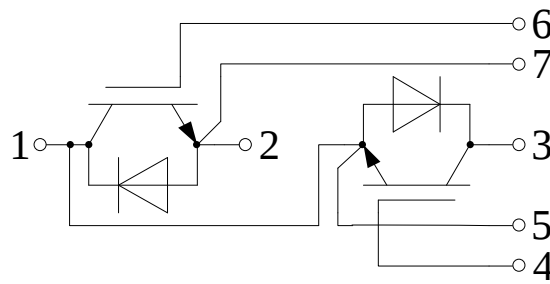


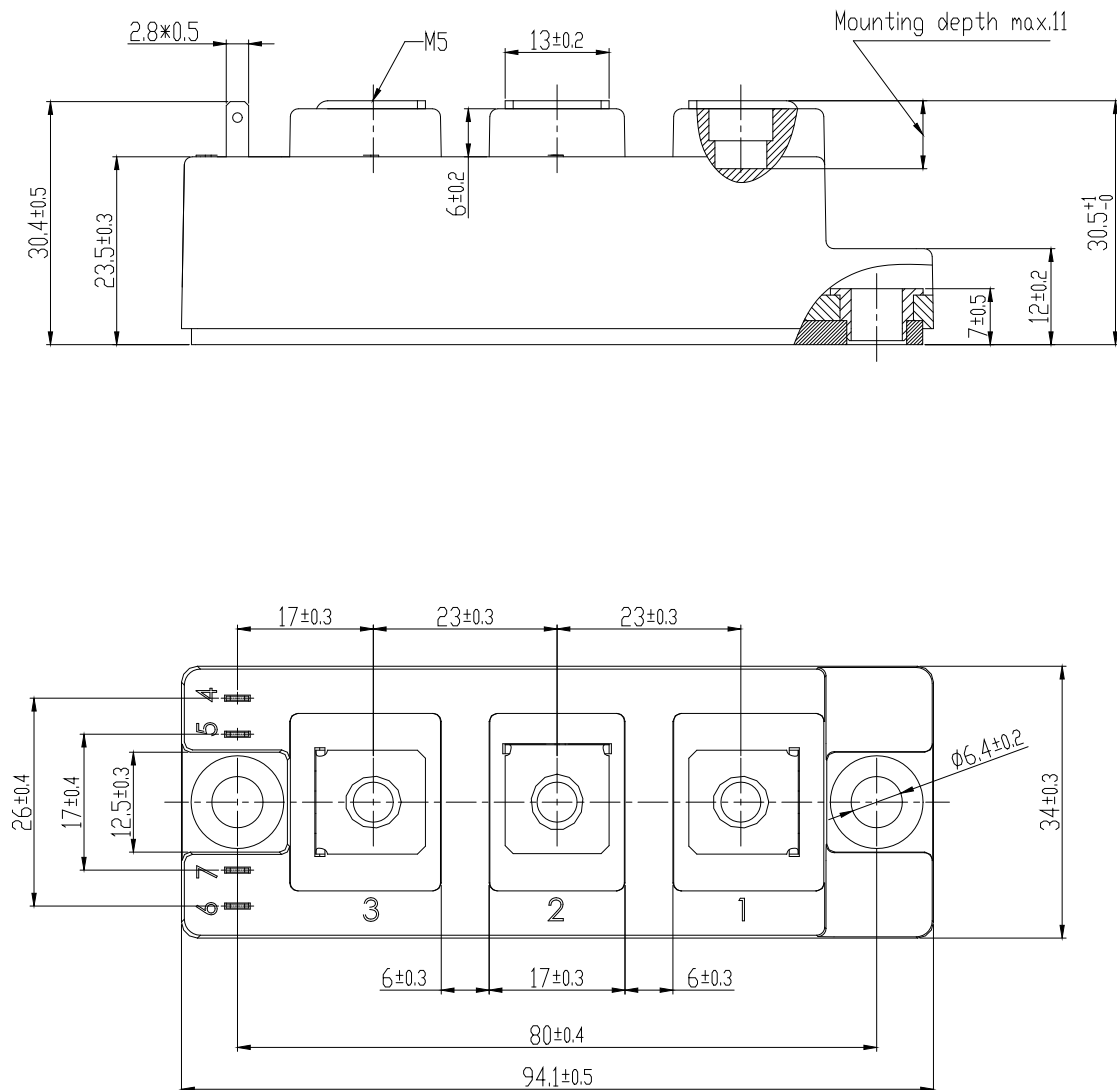
Fig 10. Diode Transient Thermal Impedance

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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