

STARPOWER

SEMICONDUCTOR

IGBT

GD75HHU120C5S

1200V/75A 4 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 welding machine and inductive heating.

Features

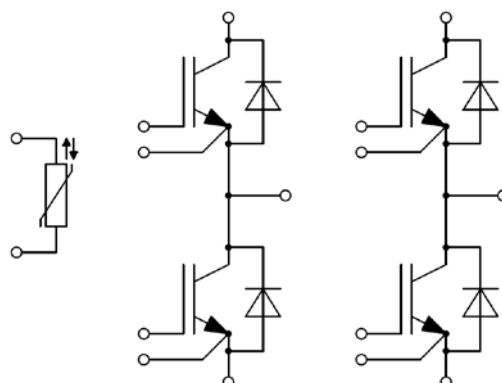
- NPT IGBT technology
- 10 μ s short circuit capability
- Low switching losses
- $V_{CE(sat)}$ with positive temperature coefficient
- Square RBSOA
- Low inductance case
- Fast & soft reverse recovery anti-parallel FWD



Typical Applications

- Switching mode power supply
- Inductive heating
- Welding machine

Equivalent Circuit Schematic



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

Symbol	Description	Values	Unit
V_{CES}	Collector-Emitter Voltage	1200	V
V_{GES}	Gate-Emitter Voltage	± 20	V
I_C	Collector Current @ $T_C=25^{\circ}\text{C}$ @ $T_C=80^{\circ}\text{C}$	115 75	A
I_{CM}	Pulsed Collector Current $t_p=1\text{ms}$	150	A
P_D	Maximum Power Dissipation @ $T_j=150^{\circ}\text{C}$	667	W

Diode

Symbol	Description	Values	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	Values	Unit
T_{jmax}	Maximum Junction Temperature	150	$^{\circ}\text{C}$
T_{jop}	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, $f=50\text{Hz}$, $t=1\text{min}$	4000	V
M	Mounting Torque, Screw M5	3.0 to 6.0	N.m

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	$I_C=75\text{A}, V_{GE}=15\text{V}, T_j=25^{\circ}\text{C}$		3.10	3.55	V
		$I_C=75\text{A}, V_{GE}=15\text{V}, T_j=125^{\circ}\text{C}$		3.45		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=0.75\text{mA}, V_{CE}=V_{GE}, T_j=25^{\circ}\text{C}$	4.4	5.2	6.0	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
R_{Gint}	Internal Gate Resistance			/		Ω
C_{ies}	Input Capacitance	$V_{CE}=30\text{V}, f=1\text{MHz}, V_{GE}=0\text{V}$		6.35		nF
C_{res}	Reverse Transfer Capacitance			0.23		nF
Q_G	Gate Charge	$V_{GE}=15\text{V}$		600		nC
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600\text{V}, I_C=75\text{A}, R_G=7.5\Omega, V_{GE}=\pm 15\text{V}, T_j=25^{\circ}\text{C}$		286		ns
t_r	Rise Time			53		ns
$t_{d(off)}$	Turn-Off Delay Time			304		ns
t_f	Fall Time			103		ns
E_{on}	Turn-On Switching Loss			4.16		mJ
E_{off}	Turn-Off Switching Loss			2.17		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600\text{V}, I_C=75\text{A}, R_G=7.5\Omega, V_{GE}=\pm 15\text{V}, T_j=125^{\circ}\text{C}$		297		ns
t_r	Rise Time			56		ns
$t_{d(off)}$	Turn-Off Delay Time			321		ns
t_f	Fall Time			136		ns
E_{on}	Turn-On Switching Loss			5.82		mJ
E_{off}	Turn-Off Switching Loss			3.44		mJ
I_{SC}	SC Data	$t_p \leq 10\mu\text{s}, V_{GE}=15\text{V}, T_j=125^{\circ}\text{C}, V_{CC}=900\text{V}, V_{CEM} \leq 1200\text{V}$		675		A

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V_F	Diode Forward Voltage	$I_C=75\text{A}, V_{GE}=0\text{V}, T_j=25^{\circ}\text{C}$		1.75	2.20	V
		$I_C=75\text{A}, V_{GE}=0\text{V}, T_j=125^{\circ}\text{C}$		1.85		
Q_r	Recovered Charge	$V_R=600\text{V}, I_F=75\text{A},$ $R_G=7.5\Omega, V_{GE}=-15\text{V}$ $T_j=25^{\circ}\text{C}$		3.6		μC
I_{RM}	Peak Reverse Recovery Current			63		A
E_{rec}	Reverse Recovery Energy			2.21		mJ
Q_r	Recovered Charge	$V_R=600\text{V}, I_F=75\text{A},$ $R_G=7.5\Omega, V_{GE}=-15\text{V}$ $T_j=125^{\circ}\text{C}$		7.9		μC
I_{RM}	Peak Reverse Recovery Current			73		A
E_{rec}	Reverse Recovery Energy			4.48		mJ

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
R_{25}	Rated Resistance			5.0		$\text{k}\Omega$
$\Delta R/R$	Deviation of R_{100}	$T_C=100^{\circ}\text{C}, R_{100}=493.3\Omega$	-5		5	%
P_{25}	Power Dissipation				20.0	mW
$B_{25/50}$	B-value	$R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298.15\text{K}))]$		3375		K

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		2.20		$\text{m}\Omega$
$R_{\theta JC}$	Junction-to-Case (per IGBT)			0.225	K/W
	Junction-to-Case (per Diode)			0.370	
$R_{\theta CS}$	Case-to-Sink (per IGBT)		0.129		K/W
	Case-to-Sink (per Diode)		0.212		
$R_{\theta CS}$	Case-to-Sink		0.02		K/W
G	Weight of Module		200		g

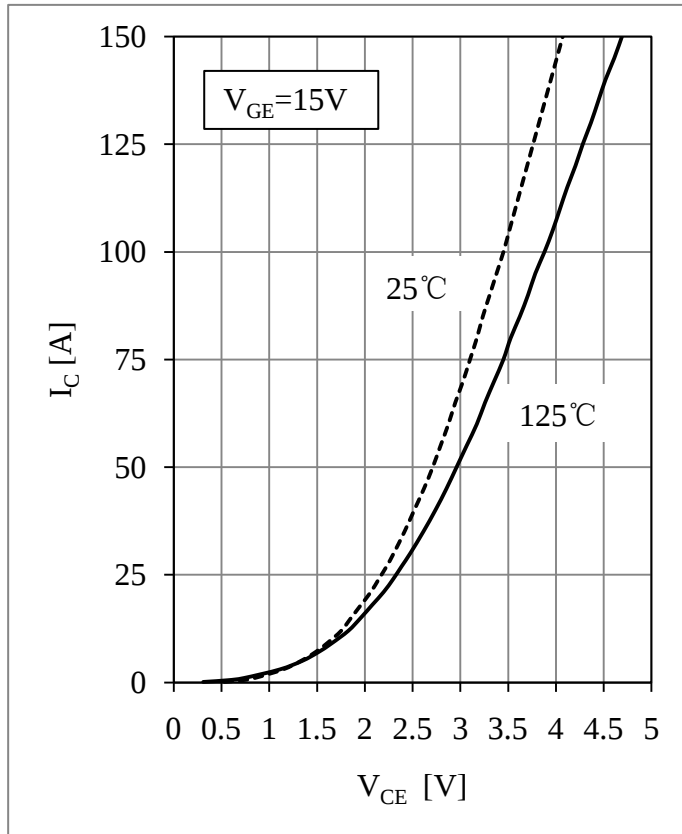


Fig 1. IGBT Output Characteristics

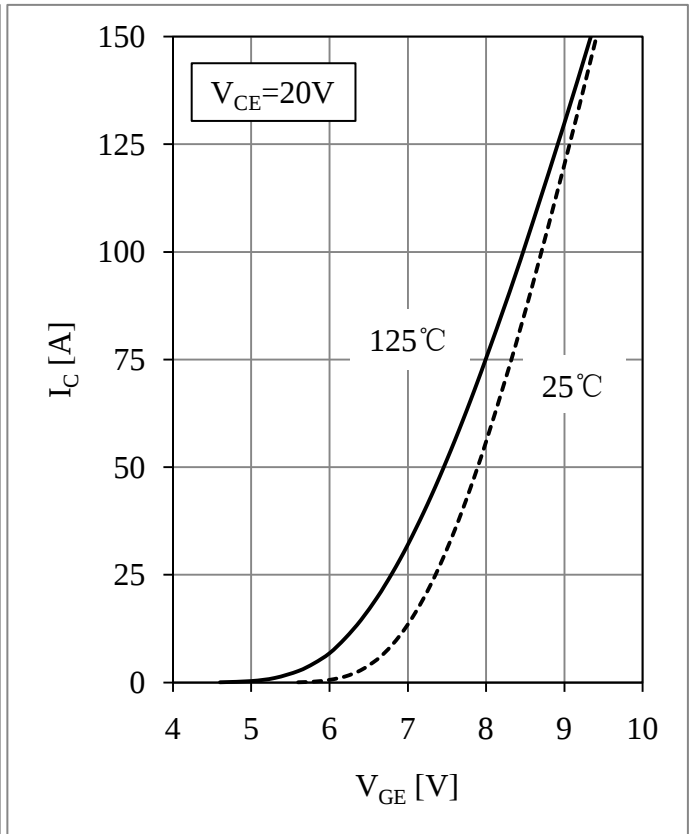
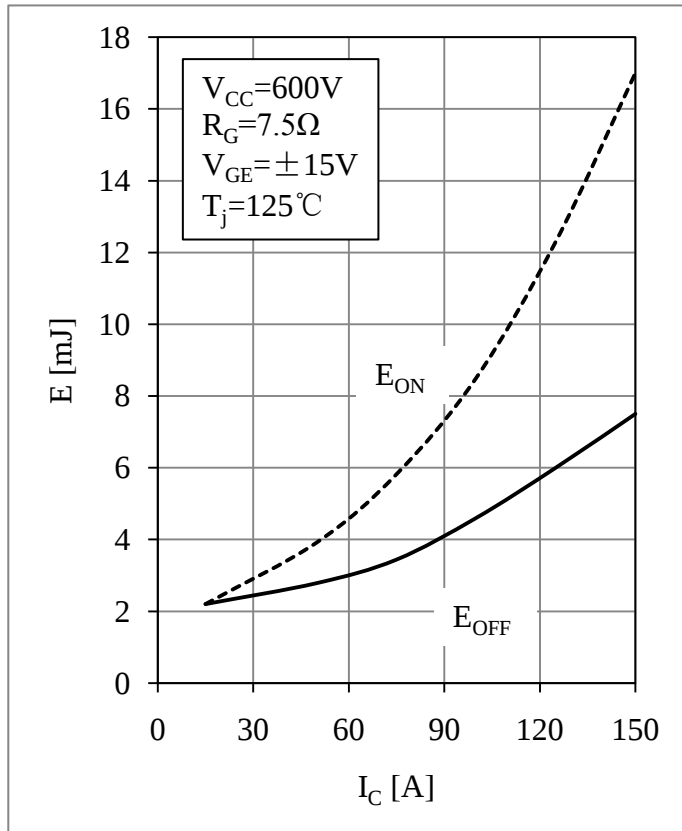
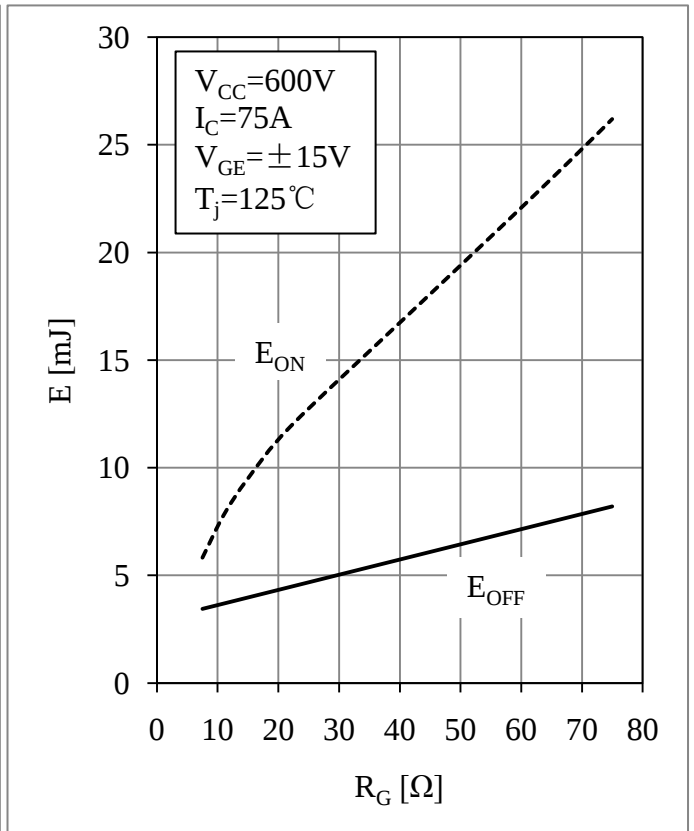


Fig 2. IGBT Transfer Characteristics

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

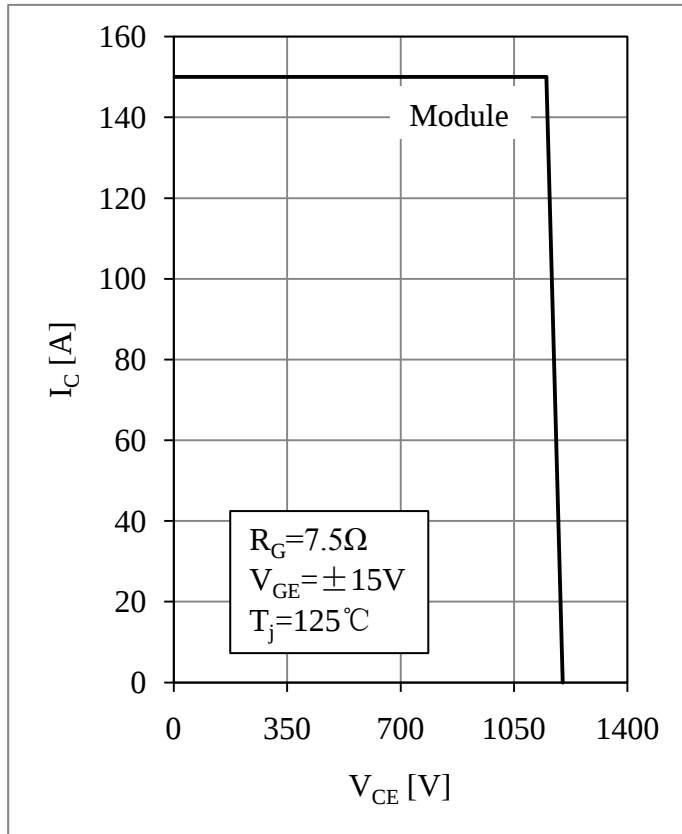


Fig 5. RBSOA

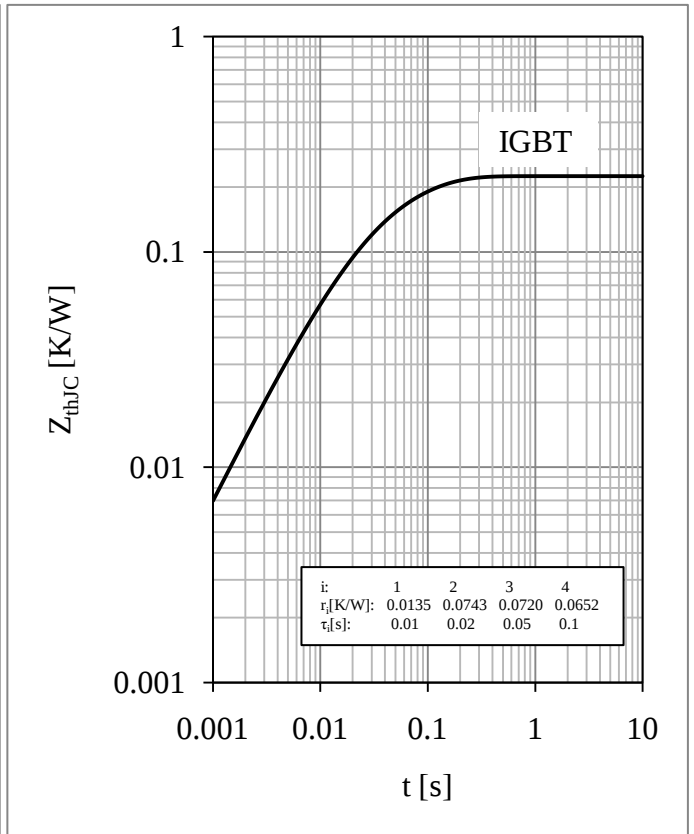


Fig 6. IGBT Transient Thermal Impedance

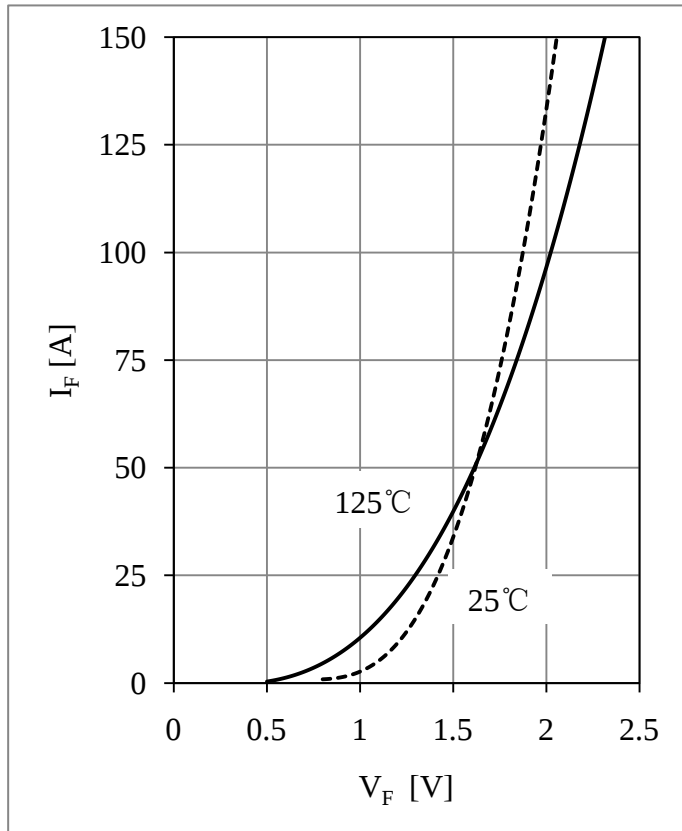
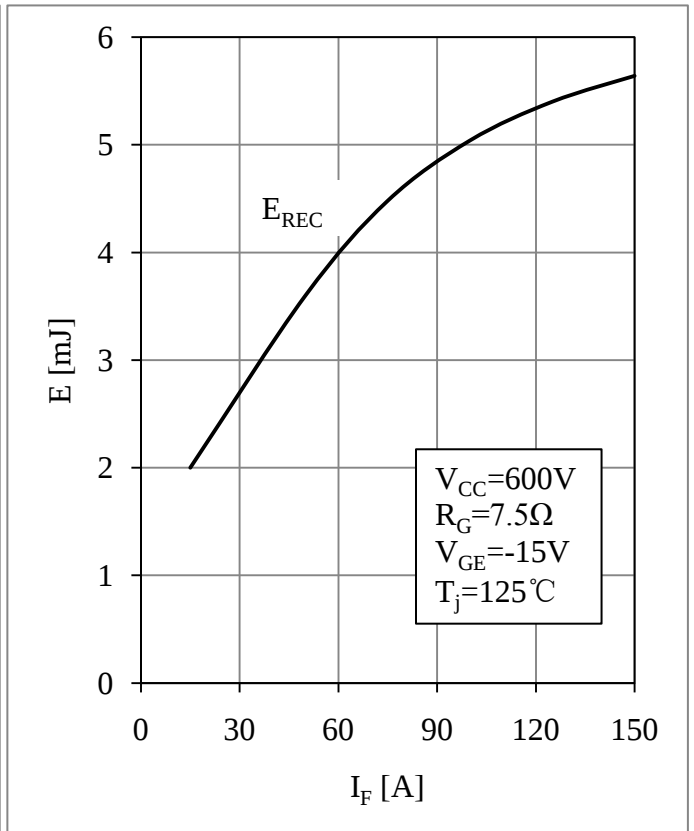


Fig 7. Diode Forward Characteristics

Fig 8. Diode Switching Loss vs. I_F

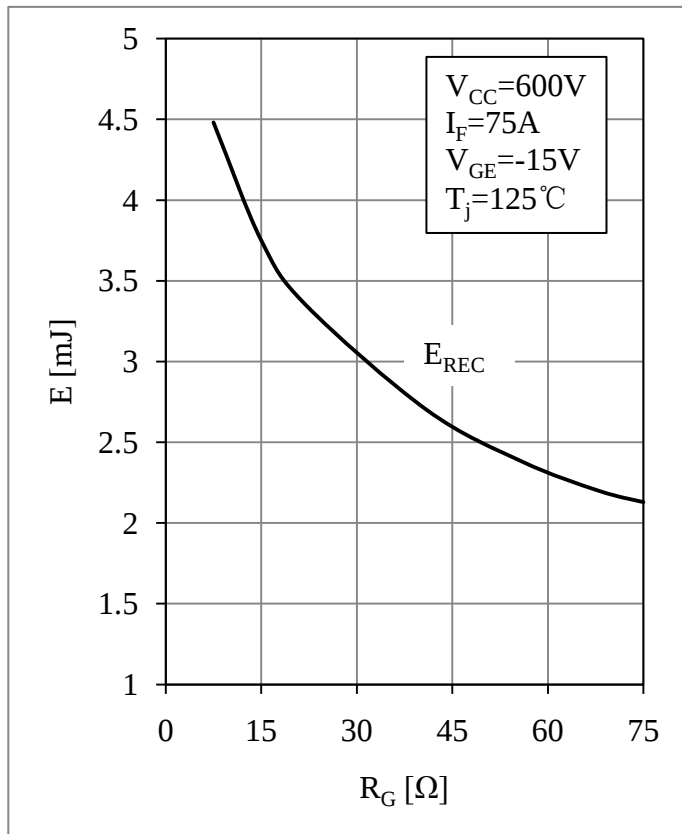
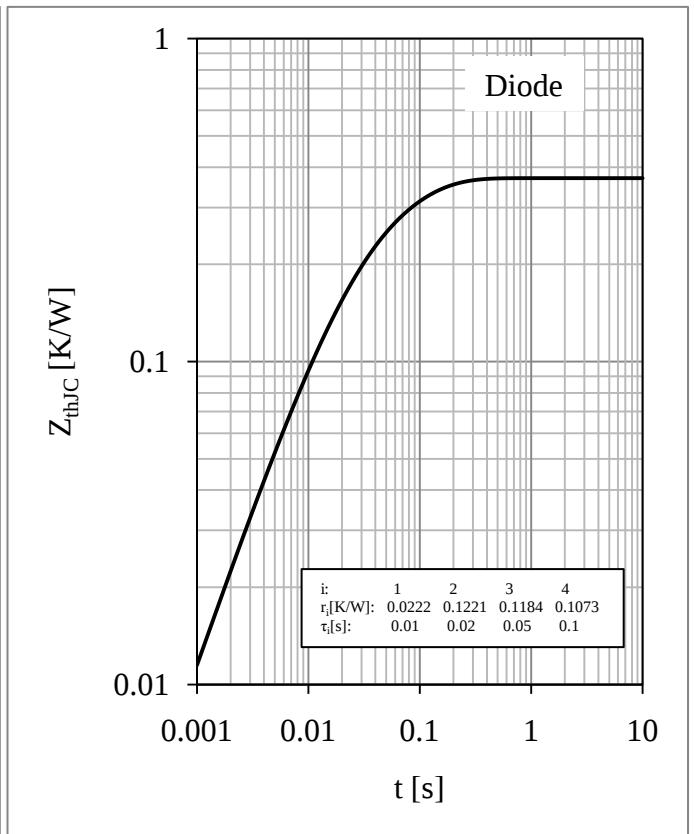
Fig 9. Diode Switching Loss vs. R_G 

Fig 10. Diode Transient Thermal Impedance

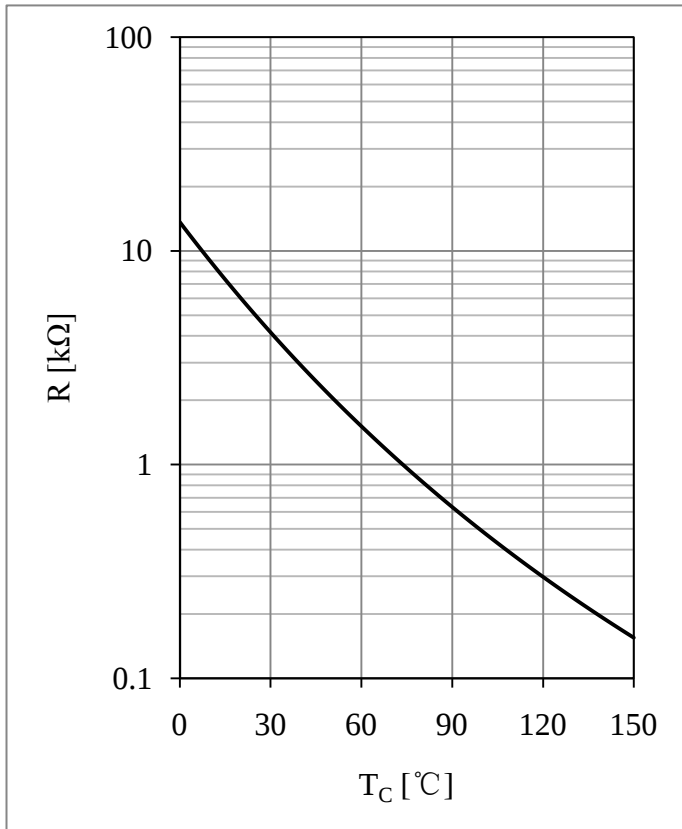


Fig 11. NTC Temperature Characteristic

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