

STARPOWER

SEMICONDUCTOR

IGBT

GD150HHU120C6S

1200V/150A 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 electronic welder and inductive heating.

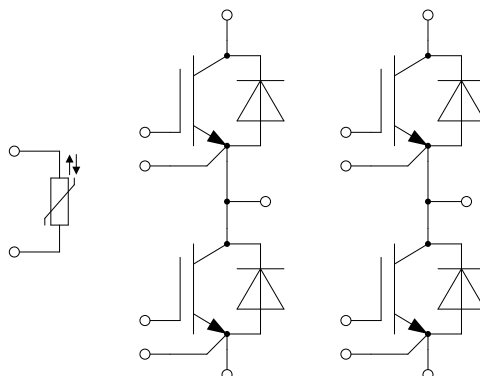
Features

- NPT IGBT technology
- 10 μ s short circuit capability
- Low switching losses
- Rugged with ultrafast performance
- $V_{CE(sat)}$ with positive temperature coefficient
- 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	± 20	V
I_C	Collector Current @ $T_C=25^{\circ}\text{C}$	230	A
	@ $T_C=80^{\circ}\text{C}$	150	
I_{CM}	Pulsed Collector Current $t_p=1\text{ms}$	300	A
P_D	Maximum Power Dissipation @ $T_j=150^{\circ}\text{C}$	1179	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	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

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	$I_C=150\text{A}, V_{GE}=15\text{V}, T_j=25^\circ\text{C}$		2.90	3.35	V	
		$I_C=150\text{A}, V_{GE}=15\text{V}, T_j=125^\circ\text{C}$		3.60			
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=3.0\text{mA}, V_{CE}=V_{GE}, T_j=25^\circ\text{C}$	5.0	6.1	7.0	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			1.5		Ω	
C_{ies}	Input Capacitance			19.2		nF	
C_{res}	Reverse Transfer Capacitance	$V_{CE}=30\text{V}, f=1\text{MHz}, V_{GE}=0\text{V}$		0.60		nF	
Q_G	Gate Charge	$V_{GE}=-15\dots+15\text{V}$		1.83		μC	
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600\text{V}, I_C=150\text{A}, R_G=4.3\Omega, V_{GE}=\pm 15\text{V}, T_j=25^\circ\text{C}$		203		ns	
t_r	Rise Time			49		ns	
$t_{d(off)}$	Turn-Off Delay Time			261		ns	
t_f	Fall Time			136		ns	
E_{on}	Turn-On Switching Loss				12.6		mJ
E_{off}	Turn-Off Switching Loss				4.92		mJ
$t_{d(on)}$	Turn-On Delay Time		$V_{CC}=600\text{V}, I_C=150\text{A}, R_G=4.3\Omega, V_{GE}=\pm 15\text{V}, T_j=125^\circ\text{C}$		203		ns
t_r	Rise Time				50		ns
$t_{d(off)}$	Turn-Off Delay Time			271		ns	
t_f	Fall Time			172		ns	
E_{on}	Turn-On Switching Loss				16.5		mJ
E_{off}	Turn-Off Switching Loss				7.23		mJ
I_{SC}	SC Data	$t_P \leq 10\mu\text{s}, V_{GE}=15\text{V}, T_j=125^\circ\text{C}, V_{CC}=900\text{V}, V_{CEM} \leq 1200\text{V}$			975		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	$I_F=150\text{A}, V_{GE}=0\text{V}, T_j=25^{\circ}\text{C}$		2.25	2.70	V
		$I_F=150\text{A}, V_{GE}=0\text{V}, T_j=125^{\circ}\text{C}$		2.35		
Q_r	Recovered Charge	$V_R=600\text{V}, I_F=150\text{A},$ $-di/dt=3000\text{A}/\mu\text{s}, V_{GE}=-15\text{V}$ $T_j=25^{\circ}\text{C}$		10.5		μC
I_{RM}	Peak Reverse Recovery Current			123		A
E_{rec}	Reverse Recovery Energy			4.14		mJ
Q_r	Recovered Charge			20.1		μC
I_{RM}	Peak Reverse Recovery Current	$V_R=600\text{V}, I_F=150\text{A},$ $-di/dt=3000\text{A}/\mu\text{s}, V_{GE}=-15\text{V}$ $T_j=125^{\circ}\text{C}$		168		A
E_{rec}	Reverse Recovery Energy			9.48		mJ

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
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		21		nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal to Chip		2.60		$\text{m}\Omega$
$R_{\theta JC}$	Junction-to-Case (per IGBT)			0.106	K/W
	Junction-to-Case (per Diode)			0.260	
$R_{\theta CS}$	Case-to-Sink (per IGBT)		0.051		K/W
	Case-to-Sink (per Diode)		0.124		
$R_{\theta CS}$	Case-to-Sink		0.009		K/W
M	Mounting Torque, Screw M6	3.0		6.0	N.m
G	Weight of Module		300		g

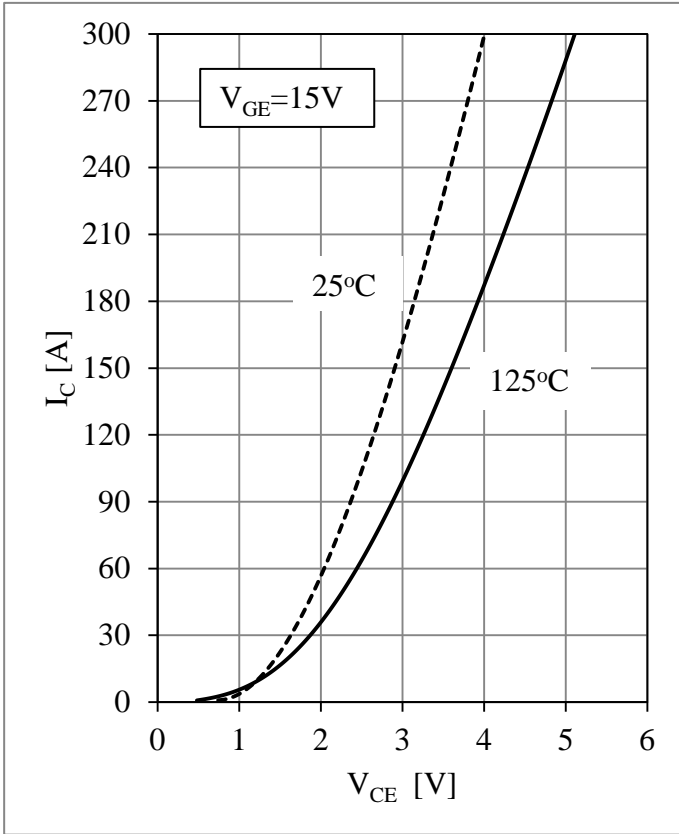


Fig 1. IGBT Output Characteristics

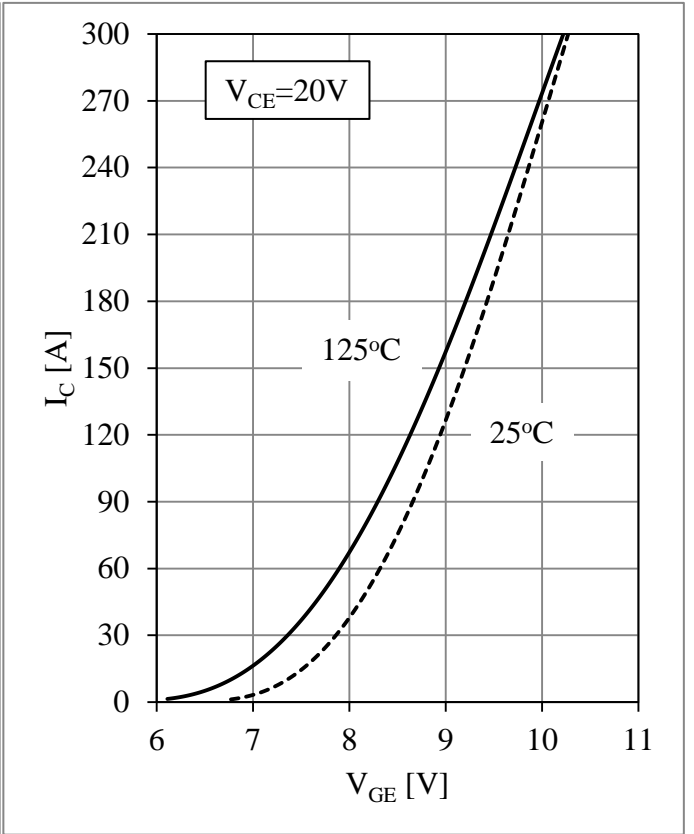


Fig 2. IGBT Transfer Characteristics

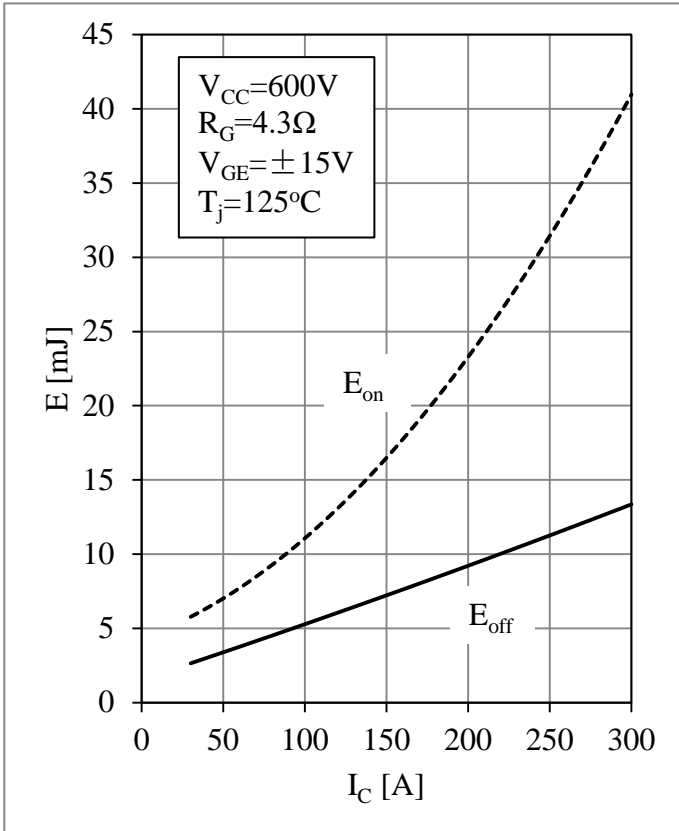


Fig 3. IGBT Switching Loss vs. I_C

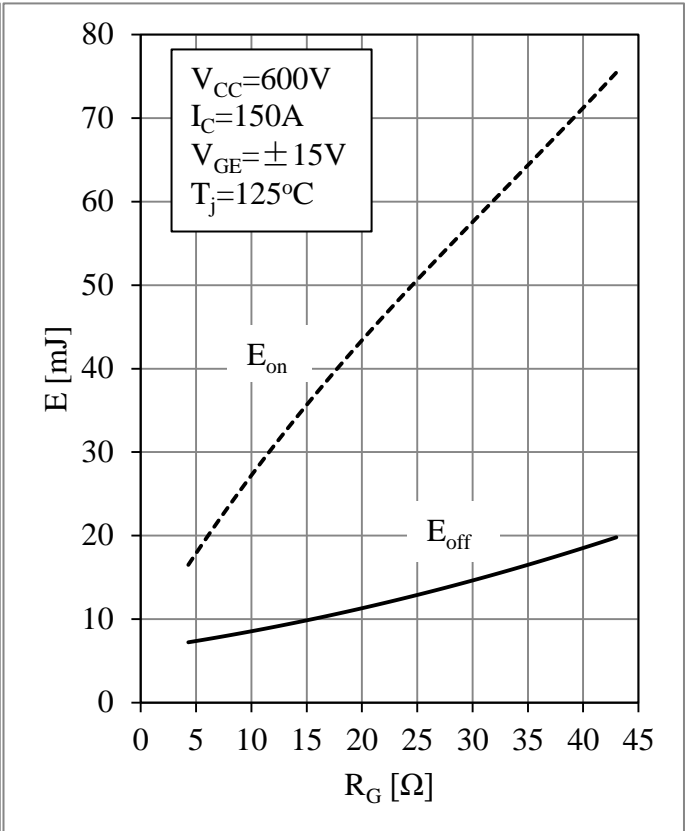


Fig 4. IGBT Switching Loss vs. R_G

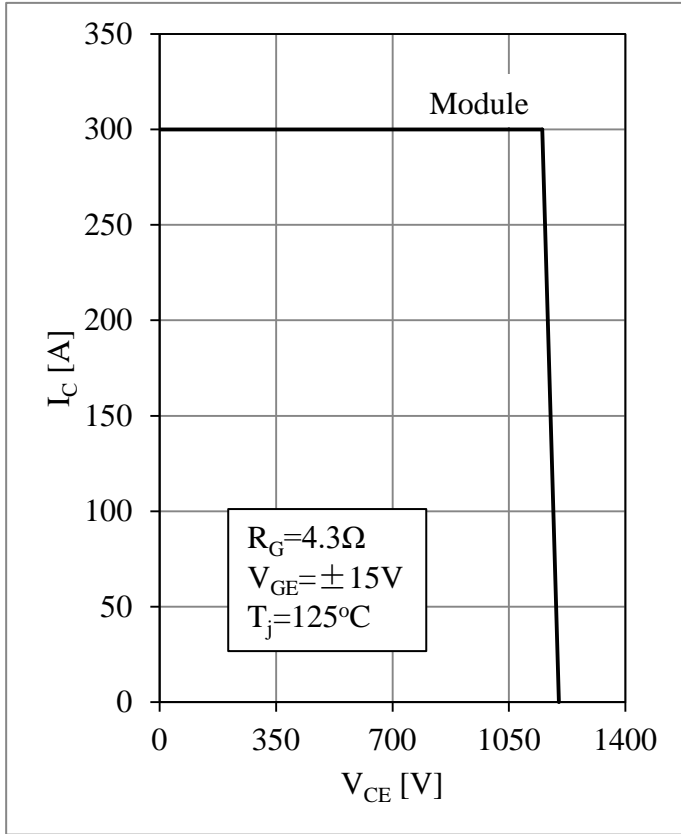


Fig 5. RBSOA

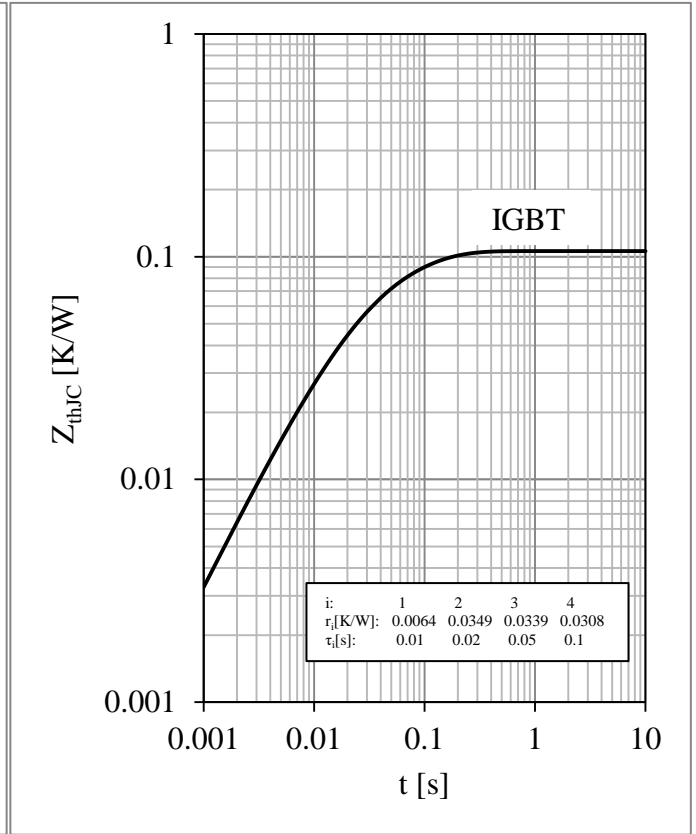


Fig 6. IGBT Transient Thermal Impedance

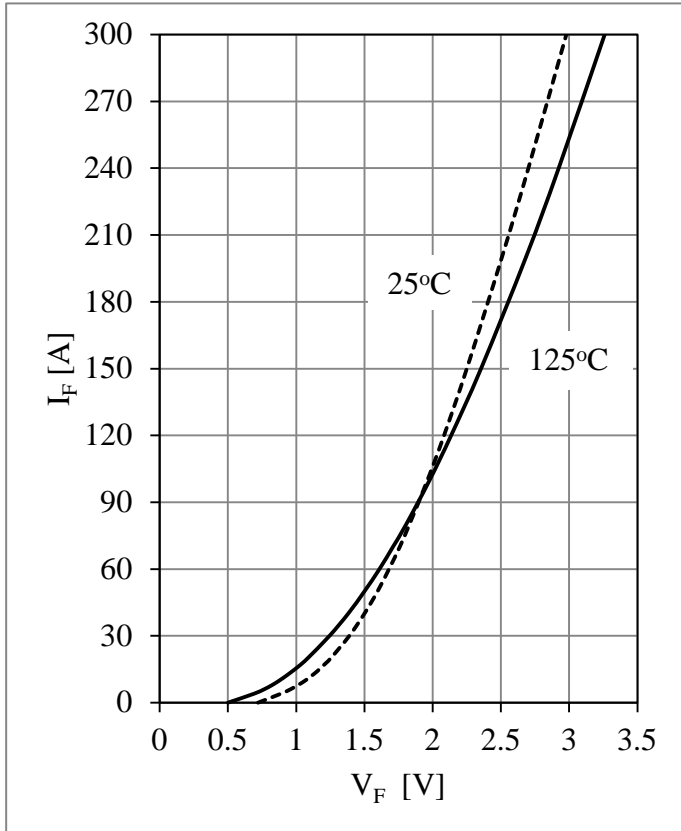


Fig 7. Diode Forward Characteristics

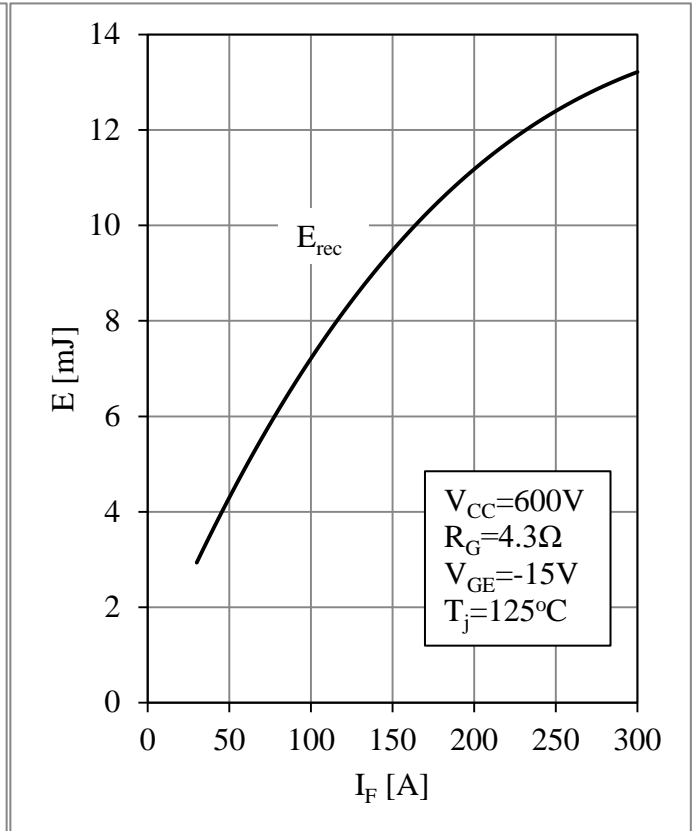


Fig 8. Diode Switching Loss vs. I_F

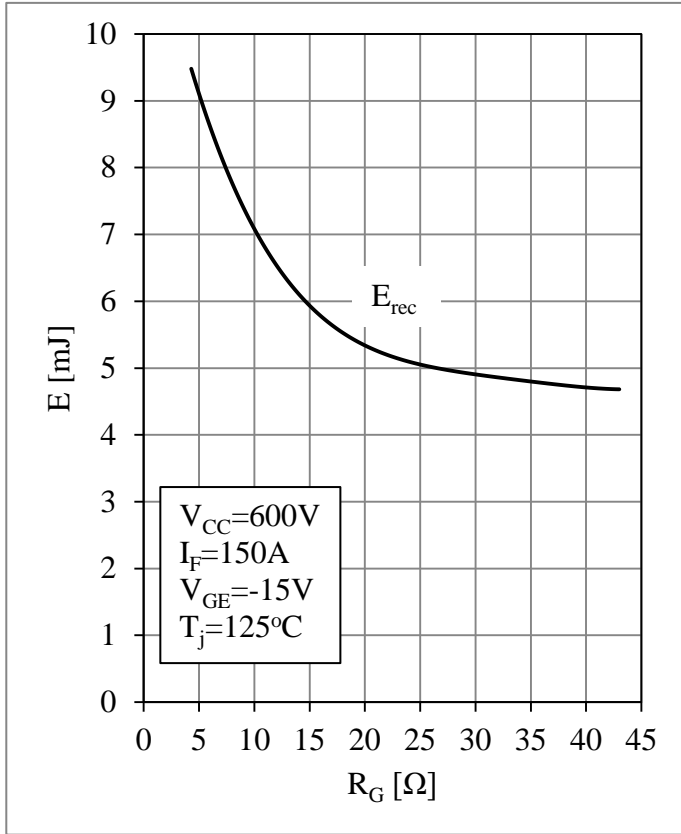


Fig 9. Diode Switching Loss vs. R_G

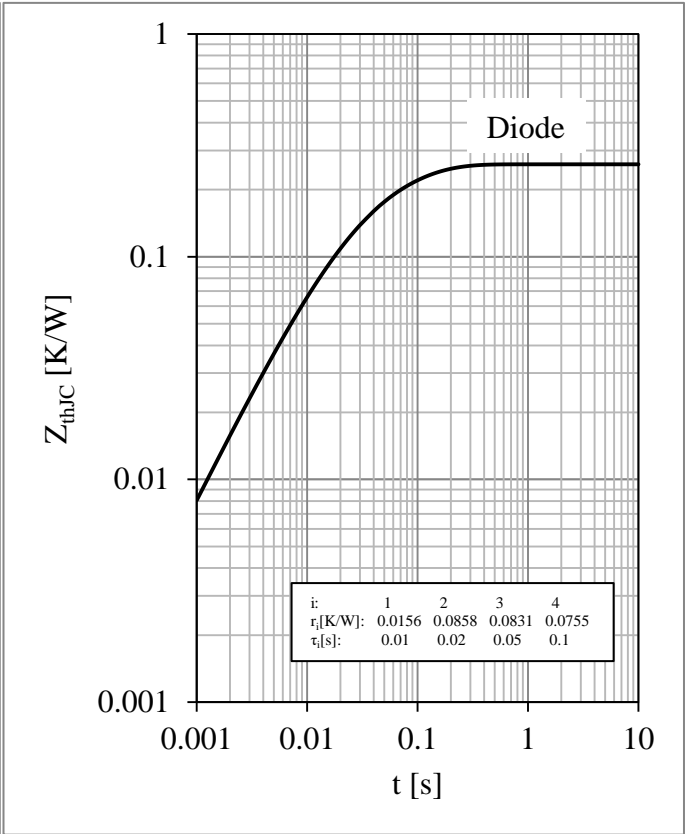


Fig 10. Diode Transient Thermal Impedance

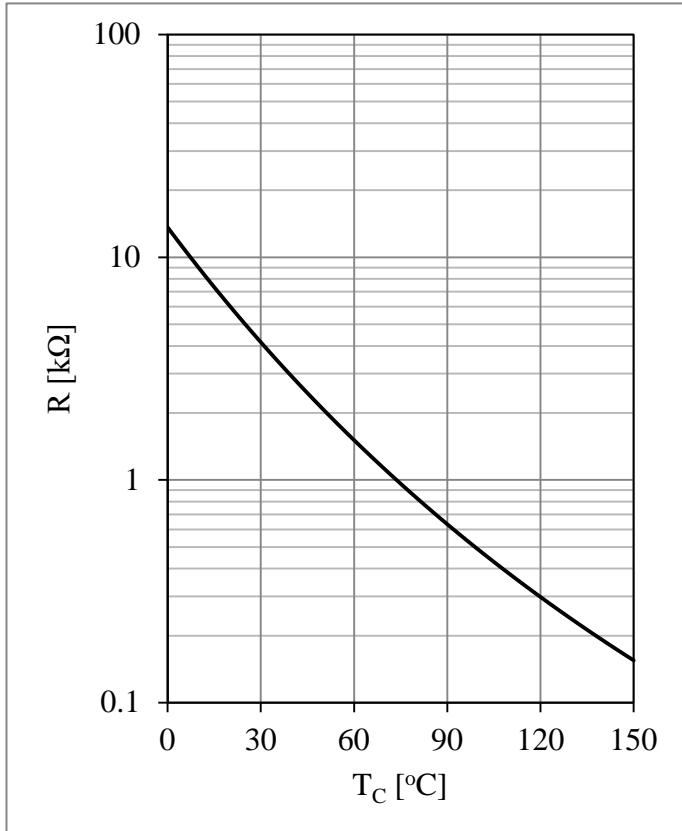


Fig 11. NTC Temperature Characteristic

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