

STARPOWER

SEMICONDUCTOR

IGBT

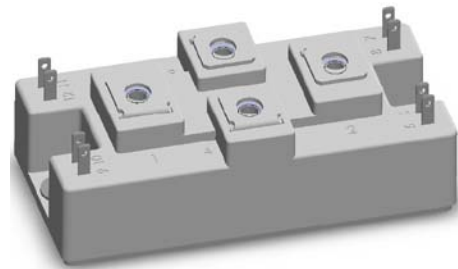
GD50HCU120C8S

Molding Type Module

1200V/50A 4 in one-package

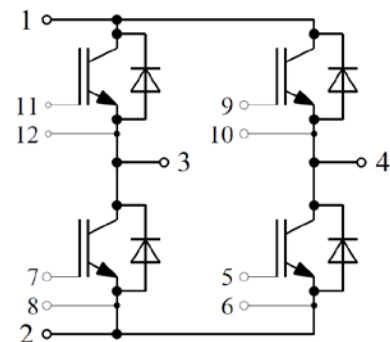
General Description

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
- Isolated copper baseplate using DBC technology



Equivalent Circuit Schematic

Typical Applications

- Switching mode power supply
- Inductive heating
- Welding machine

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

Symbol	Description	GD50HCU120C8S	Units
V_{CES}	Collector-Emitter Voltage	1200	V
V_{GES}	Gate-Emitter Voltage	± 20	V
I_C	Collector Current @ $T_C=25^\circ\text{C}$ @ $T_C=80^\circ\text{C}$	75	A
		50	
I_{CM}	Pulsed Collector Current $t_p=1\text{ms}$	100	A
I_F	Diode Continuous Forward Current	30	A
I_{FM}	Diode Maximum Forward Current $t_p=1\text{ms}$	60	A
P_D	Maximum Power Dissipation @ $T_j=150^\circ\text{C}$	401	W
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
Mounting Torque	Power Terminal Screw:M5 Mounting Screw:M5	2.5 to 5.0 3.0 to 5.0	N.m
Weight	Weight of Module	210	g

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{(BR)CES}$	Collector-Emitter Breakdown Voltage	$T_j=25^\circ\text{C}$	1200			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

On Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=1.0\text{mA}$, $V_{CE}=V_{GE}$, $T_j=25^\circ\text{C}$	5.0	6.1	7.0	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C=50\text{A}$, $V_{GE}=15\text{V}$, $T_j=25^\circ\text{C}$		2.90	3.35	V
		$I_C=50\text{A}$, $V_{GE}=15\text{V}$, $T_j=125^\circ\text{C}$		3.60		

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600V, I_C=50A,$ $R_G=13\Omega, V_{GE}=\pm 15V,$ $T_j=25^\circ C$		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			4.20		mJ
E_{off}	Turn-Off Switching Loss			1.64		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600V, I_C=50A,$ $R_G=13\Omega, V_{GE}=\pm 15V,$ $T_j=125^\circ C$		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			5.50		mJ
E_{off}	Turn-Off Switching Loss			2.41		mJ
C_{ies}	Input Capacitance	$V_{CE}=30V, f=1MHz,$ $V_{GE}=0V$		TBD		nF
C_{oes}	Output Capacitance			TBD		nF
C_{res}	Reverse Transfer Capacitance			TBD		nF
I_{SC}	SC Data	$t_p \leq 10\mu s, V_{GE}=15V,$ $T_j=125^\circ C, V_{CC}=900V,$ $V_{CEM} \leq 1200V$		450		A
L_{CE}	Stray Inductance				22	nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal To Chip			0.65		m Ω

Electrical Characteristics of Diode $T_C=25^\circ C$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V_F	Diode Forward Voltage	$I_F=30A$	$T_j=25^\circ C$	1.90	2.30	V
			$T_j=125^\circ C$	1.80		
Q_r	Recovered Charge	$I_F=30A,$ $V_R=600V,$ $R_G=15\Omega,$ $V_{GE}=-15V$	$T_j=25^\circ C$	2.6		μC
			$T_j=125^\circ C$	4.2		
I_{RM}	Peak Reverse Recovery Current	$V_{GE}=-15V$	$T_j=25^\circ C$	20		A
			$T_j=125^\circ C$	23		
E_{rec}	Reverse Recovery Energy	$V_{GE}=-15V$	$T_j=25^\circ C$	1.31		mJ
			$T_j=125^\circ C$	2.08		

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case (per IGBT)		0.312	K/W
$R_{\theta JC}$	Junction-to-Case (per Diode)		0.942	K/W
$R_{\theta CS}$	Case-to-Sink (Conductive grease applied)	0.046		K/W

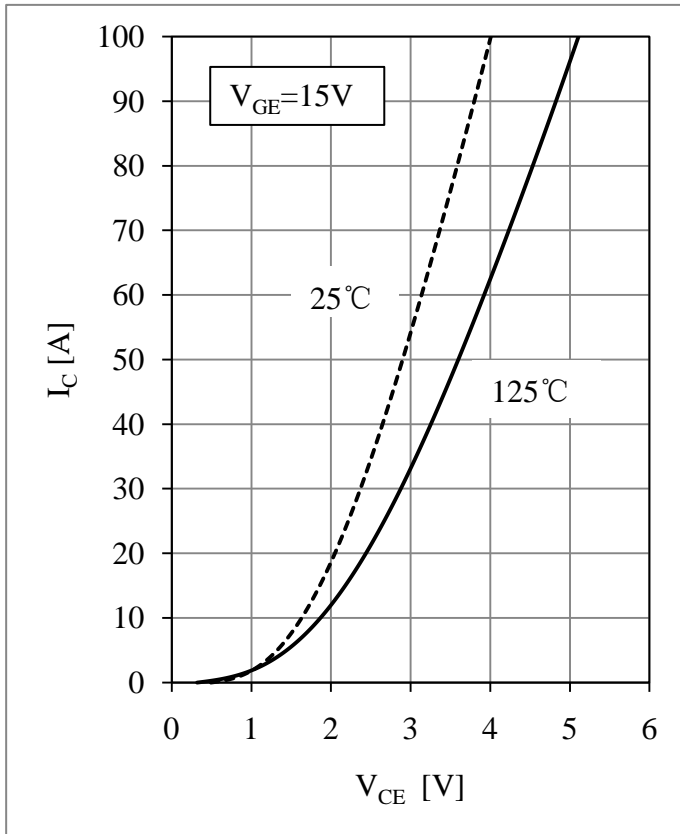


Fig 1. IGBT Output Characteristics

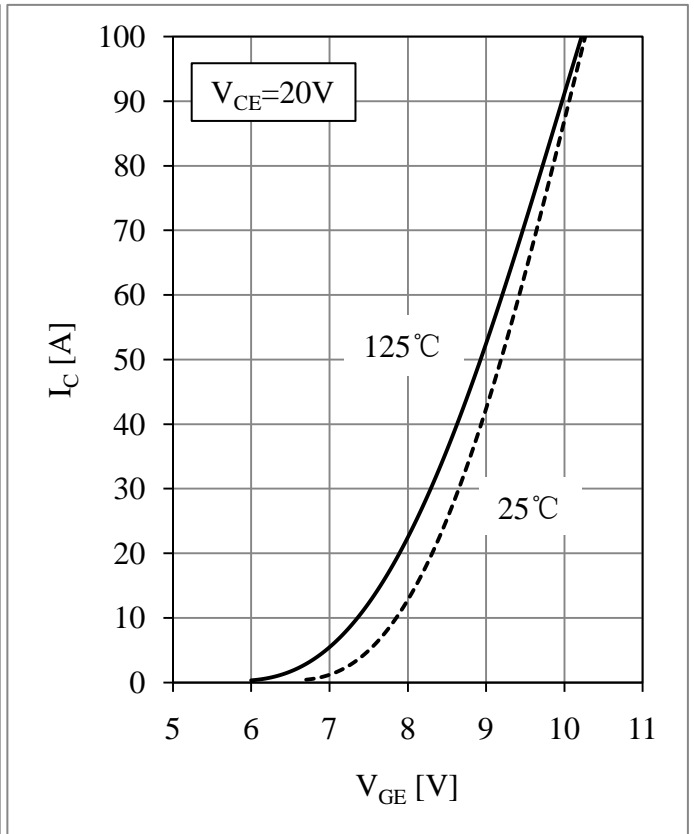


Fig 2. IGBT Transfer Characteristics

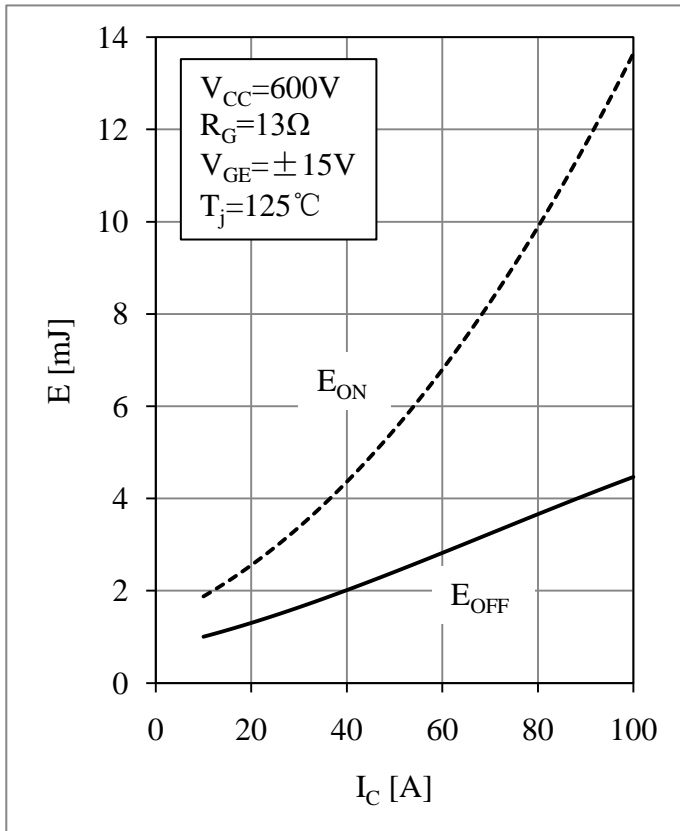


Fig 3. IGBT Switching Loss vs. I_C

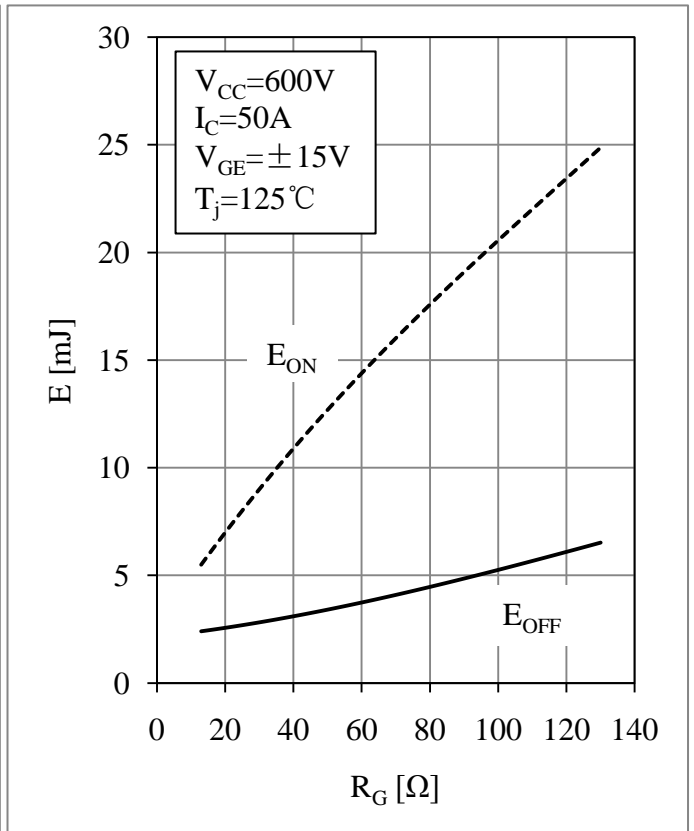


Fig 4. IGBT Switching Loss vs. R_G

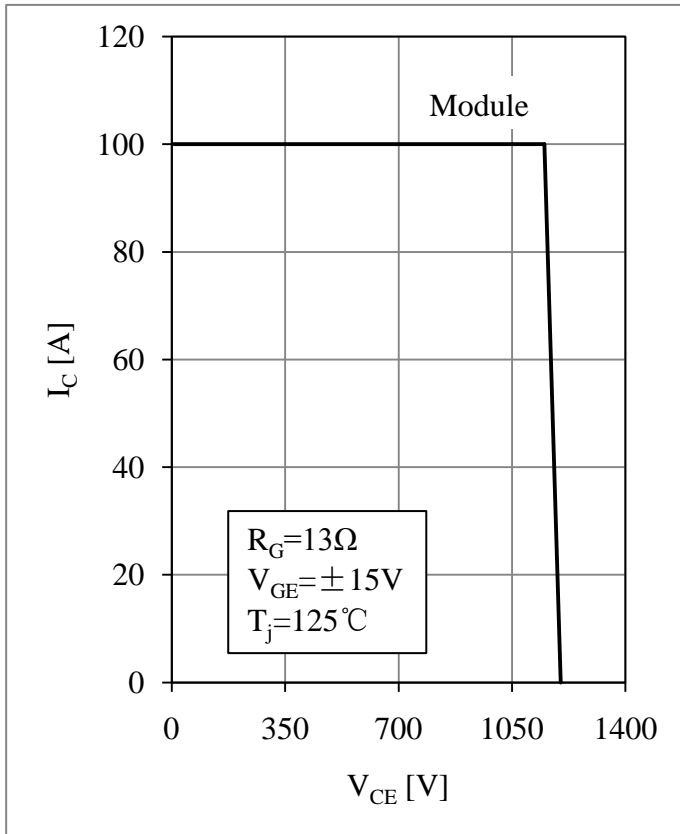


Fig 5. RBSOA

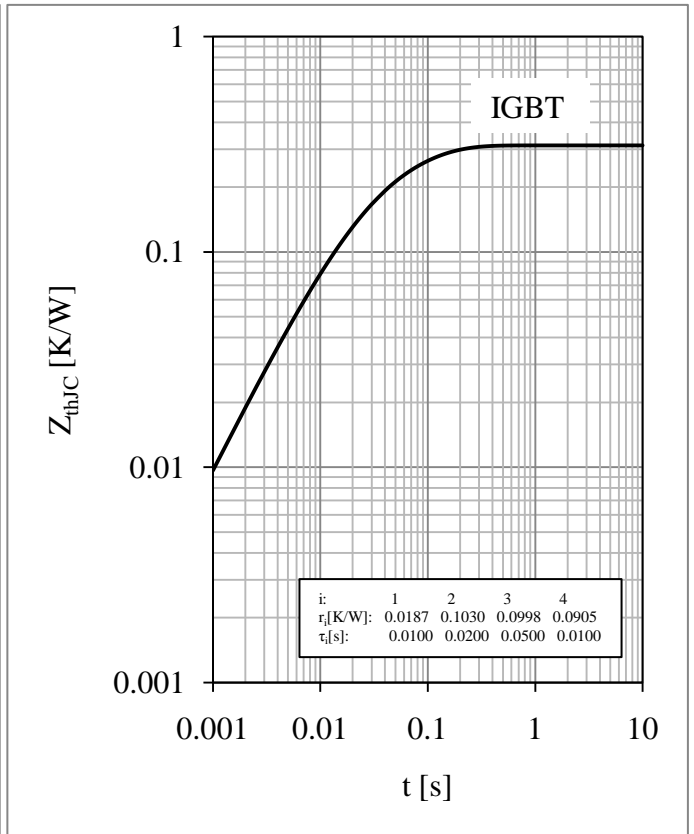


Fig 6. IGBT Transient Thermal Impedance

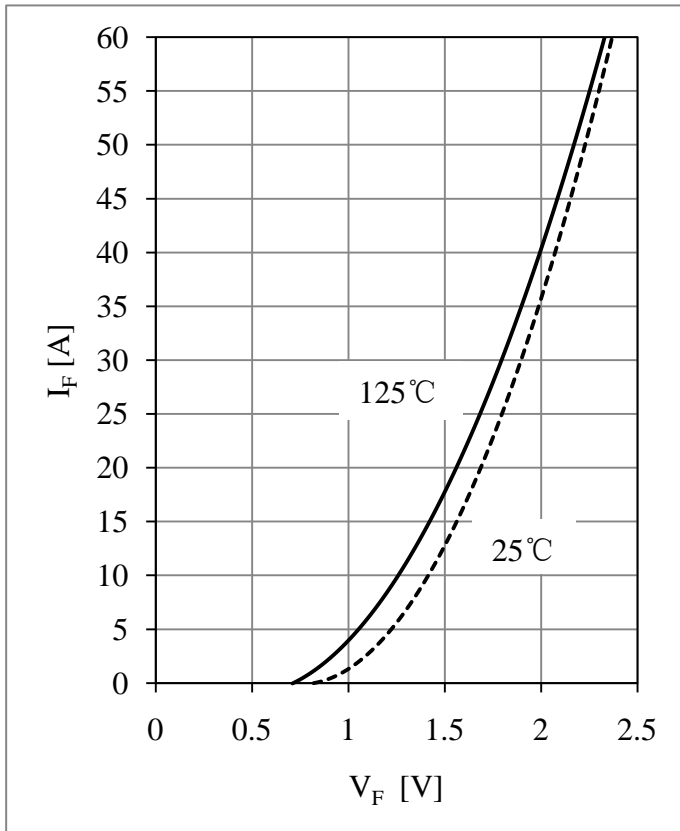


Fig 7. Diode Forward Characteristics

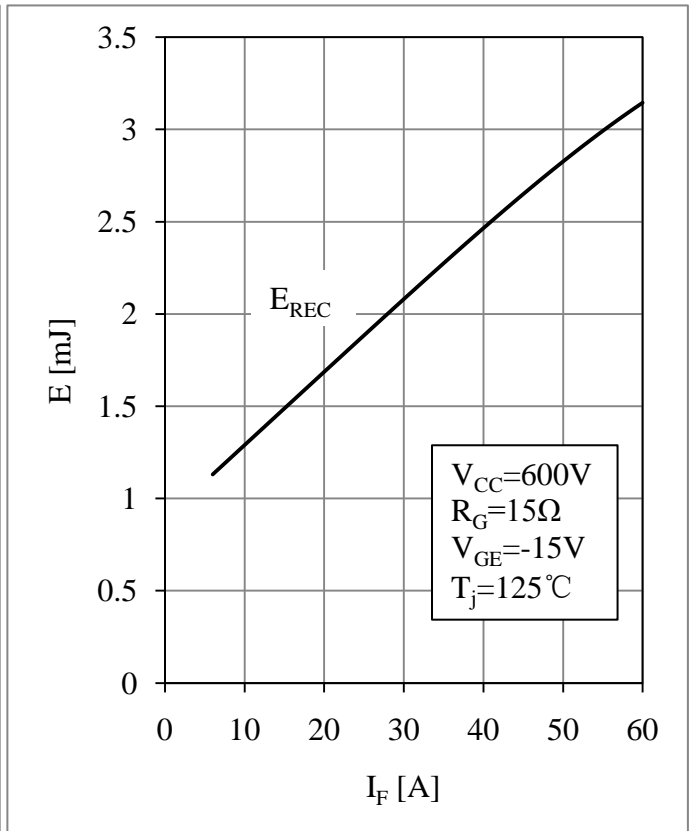


Fig 8. Diode Switching Loss vs. I_F

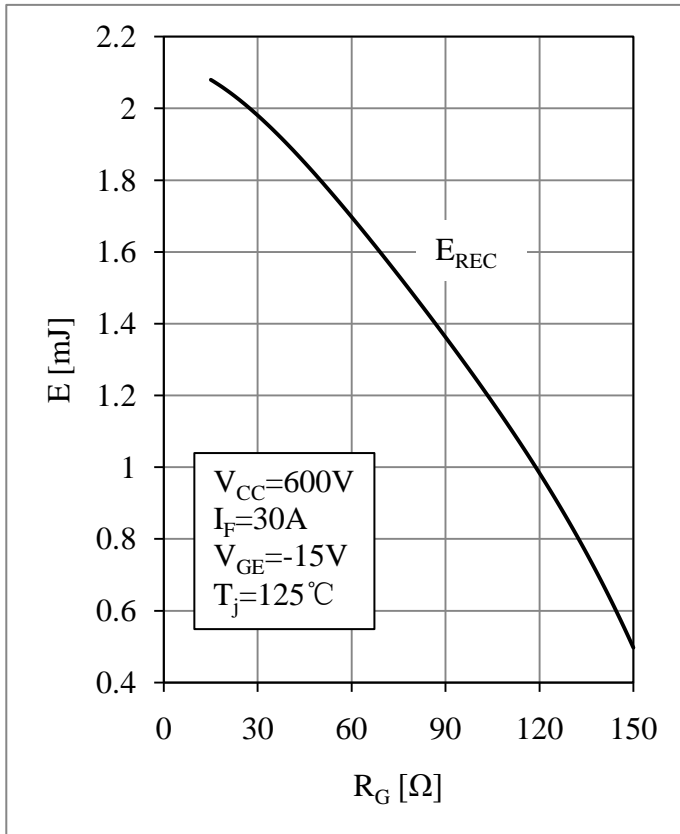


Fig 9. Diode Switching Loss vs. R_G

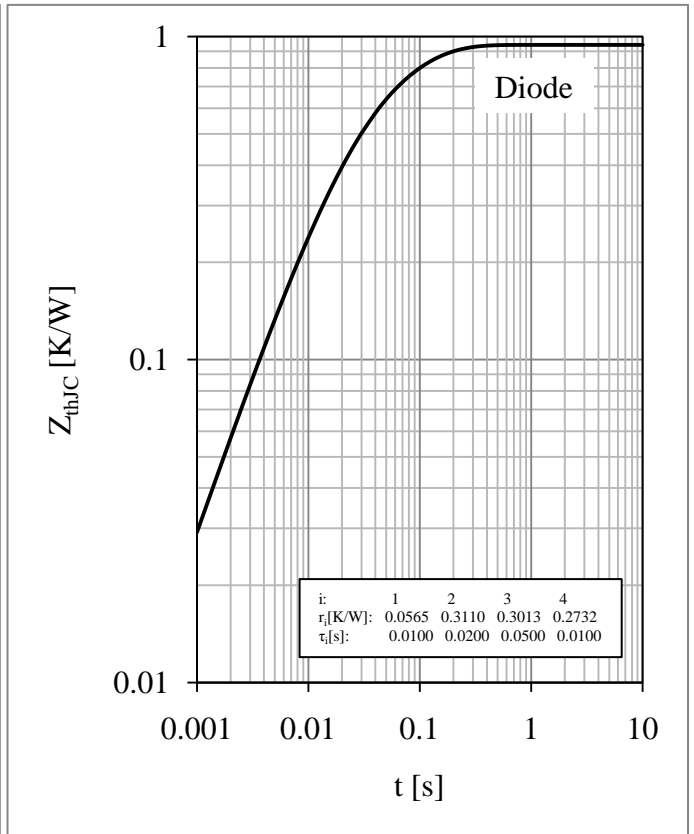


Fig 10. Diode Transient Thermal Impedance

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