

STARPOWER

SEMICONDUCTOR

IGBT

GD900SGF120A3SN

1200V/900A 1 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 high power converters.

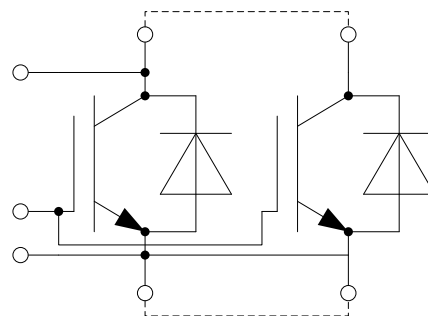
Features

- Low $V_{CE(sat)}$ Trench IGBT technology
- $V_{CE(sat)}$ with positive temperature coefficient
- Fast & soft reverse recovery anti-parallel FWD
- Low inductance case
- AlSiC baseplate for high power cycling capability
- AlN substrate for low thermal resistance

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	1200	V
V_{GES}	Gate-Emitter Voltage	± 20	V
I_C	Collector Current @ $T_C=25^{\circ}\text{C}$ @ $T_C=100^{\circ}\text{C}$	1466 900	A
I_{CM}	Pulsed Collector Current $t_p=1\text{ms}$	1800	A
P_D	Maximum Power Dissipation @ $T_{vj}=175^{\circ}\text{C}$	5.34	kW

Diode

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1200	V
I_F	Diode Continuous Forward Current	900	A
I_{FM}	Diode Maximum Forward Current $t_p=1\text{ms}$	1800	A

Module

Symbol	Description	Value	Unit
T_{vjmax}	Maximum Junction Temperature	175	$^{\circ}\text{C}$
T_{vioop}	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	$I_C=900\text{A}, V_{GE}=15\text{V}, T_{vj}=25^{\circ}\text{C}$		2.00	2.45	V
		$I_C=900\text{A}, V_{GE}=15\text{V}, T_{vj}=125^{\circ}\text{C}$		2.50		
		$I_C=900\text{A}, V_{GE}=15\text{V}, T_{vj}=150^{\circ}\text{C}$		2.65		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=32.0\text{mA}, V_{CE}=V_{GE}, T_{vj}=25^{\circ}\text{C}$	5.2	6.0	6.8	V
I_{CES}	Collector Cut-Off Current	$V_{CE}=V_{CES}, V_{GE}=0\text{V}, T_{vj}=25^{\circ}\text{C}$			1.0	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			1.44		Ω
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600\text{V}, I_C=900\text{A}, R_{Gon}=1\Omega, R_{Goff}=2\Omega, L_S=50\text{nH}, V_{GE}=-10/+15\text{V}, T_{vj}=25^{\circ}\text{C}$		520		ns
t_r	Rise Time			127		ns
$t_{d(off)}$	Turn-Off Delay Time			493		ns
t_f	Fall Time			72		ns
E_{on}	Turn-On Switching Loss			76.0		mJ
E_{off}	Turn-Off Switching Loss			85.0		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600\text{V}, I_C=900\text{A}, R_{Gon}=1\Omega, R_{Goff}=2\Omega, L_S=50\text{nH}, V_{GE}=-10/+15\text{V}, T_{vj}=125^{\circ}\text{C}$		580		ns
t_r	Rise Time			168		ns
$t_{d(off)}$	Turn-Off Delay Time			644		ns
t_f	Fall Time			89		ns
E_{on}	Turn-On Switching Loss			127		mJ
E_{off}	Turn-Off Switching Loss			98.5		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600\text{V}, I_C=900\text{A}, R_{Gon}=1\Omega, R_{Goff}=2\Omega, L_S=50\text{nH}, V_{GE}=-10/+15\text{V}, T_{vj}=150^{\circ}\text{C}$		629		ns
t_r	Rise Time			176		ns
$t_{d(off)}$	Turn-Off Delay Time			676		ns
t_f	Fall Time			96		ns
E_{on}	Turn-On Switching Loss			134		mJ
E_{off}	Turn-Off Switching Loss			99.0		mJ

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_F	Diode Forward Voltage	$I_F=900\text{A}, V_{GE}=0\text{V}, T_{vj}=25^{\circ}\text{C}$		1.95	2.40	V
		$I_F=900\text{A}, V_{GE}=0\text{V}, T_{vj}=125^{\circ}\text{C}$		2.00		
		$I_F=900\text{A}, V_{GE}=0\text{V}, T_{vj}=150^{\circ}\text{C}$		2.05		
Q_r	Recovered Charge	$V_R=600\text{V}, I_F=900\text{A},$ $-di/dt=7100\text{A}/\mu\text{s}, L_s=50\text{nH},$ $V_{GE}=-10\text{V},$ $T_{vj}=25^{\circ}\text{C}$		80		μC
I_{RM}	Peak Reverse Recovery Current			486		A
E_{rec}	Reverse Recovery Energy			35.0		mJ
Q_r	Recovered Charge	$V_R=600\text{V}, I_F=900\text{A},$ $-di/dt=5180\text{A}/\mu\text{s}, L_s=50\text{nH},$ $V_{GE}=-10\text{V},$ $T_{vj}=125^{\circ}\text{C}$		153		μC
I_{RM}	Peak Reverse Recovery Current			510		A
E_{rec}	Reverse Recovery Energy			64.0		mJ
Q_r	Recovered Charge	$V_R=600\text{V}, I_F=900\text{A},$ $-di/dt=4990\text{A}/\mu\text{s}, L_s=50\text{nH},$ $V_{GE}=-10\text{V},$ $T_{vj}=150^{\circ}\text{C}$		158		μC
I_{RM}	Peak Reverse Recovery Current			513		A
E_{rec}	Reverse Recovery Energy			74.0		mJ

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

Symbol	Parameter	Min.	Typ.	Max.	Unit
L_{CE}	Stray Inductance		12		nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal to Chip		0.19		m Ω
R_{thJC}	Junction-to-Case (per IGBT)			28.1	K/kW
	Junction-to-Case (per Diode)			44.1	
R_{thCH}	Case-to-Heatsink (per IGBT)		9.82		K/kW
	Case-to-Heatsink (per Diode)		15.4		
	Case-to-Heatsink (per Module)		6.0		
M	Terminal Connection Torque, Screw M4	1.8		2.1	N.m
	Terminal Connection Torque, Screw M8	8.0		10	
	Mounting Torque, Screw M6	4.25		5.75	
G	Weight of Module		1050		g

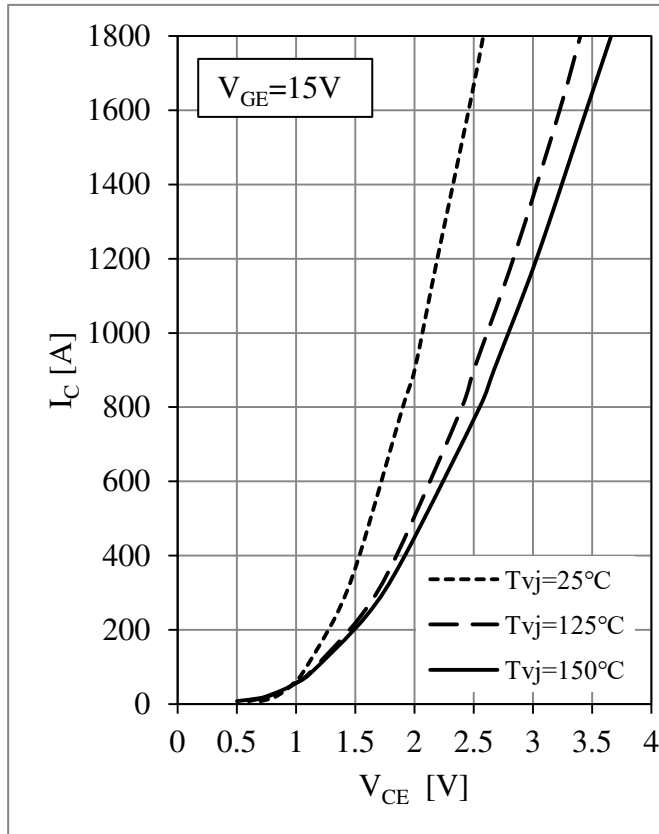


Fig 1. IGBT Output Characteristics

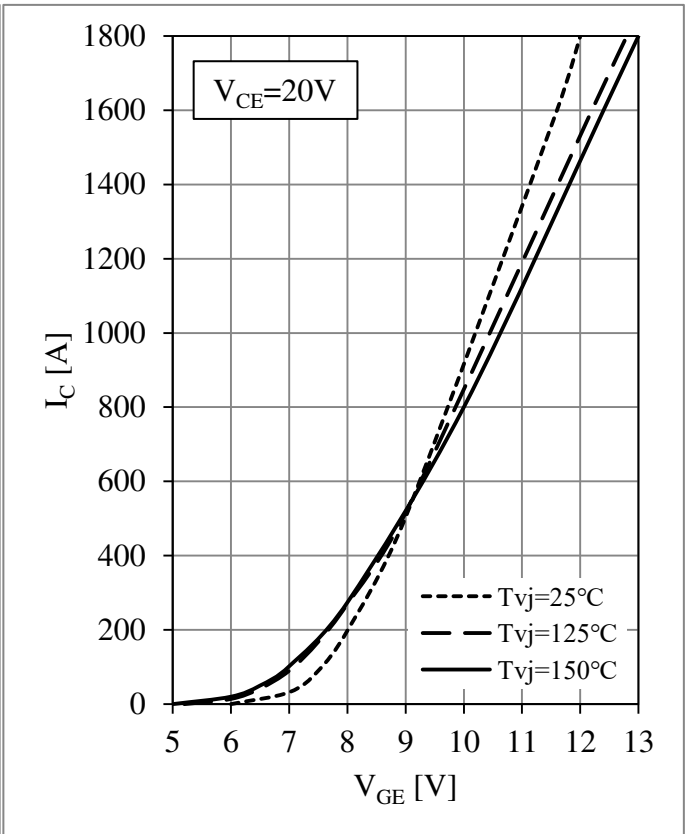
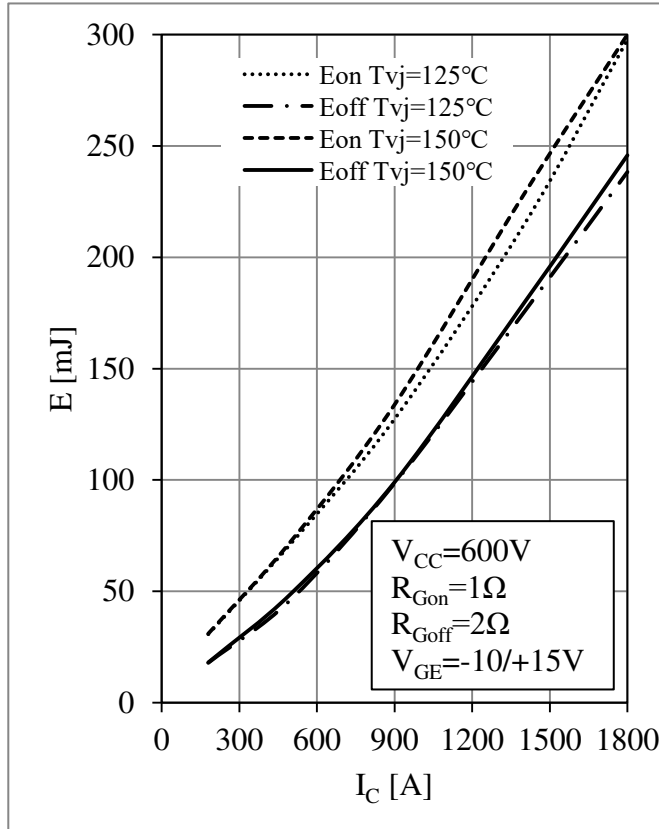
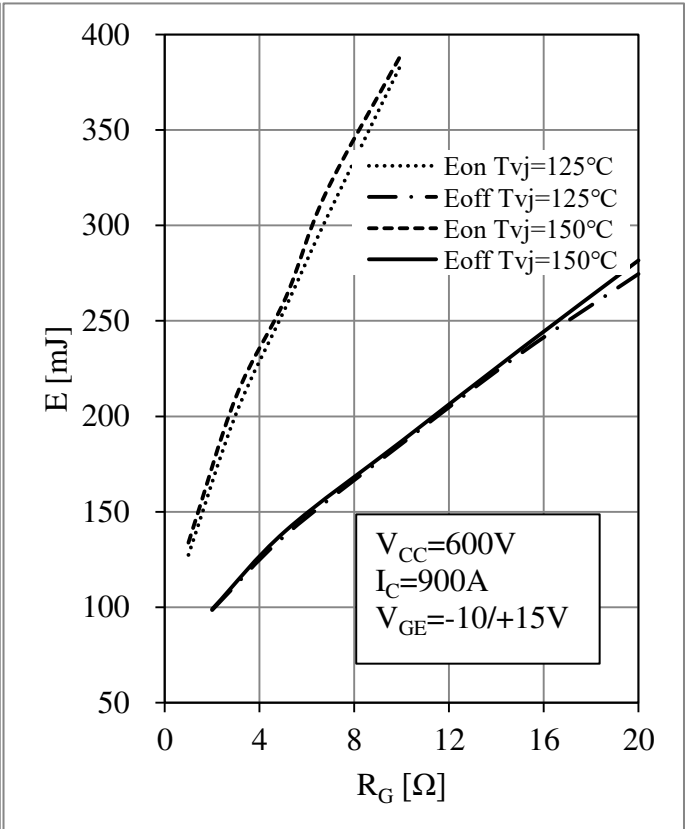


Fig 2. IGBT Transfer Characteristics

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

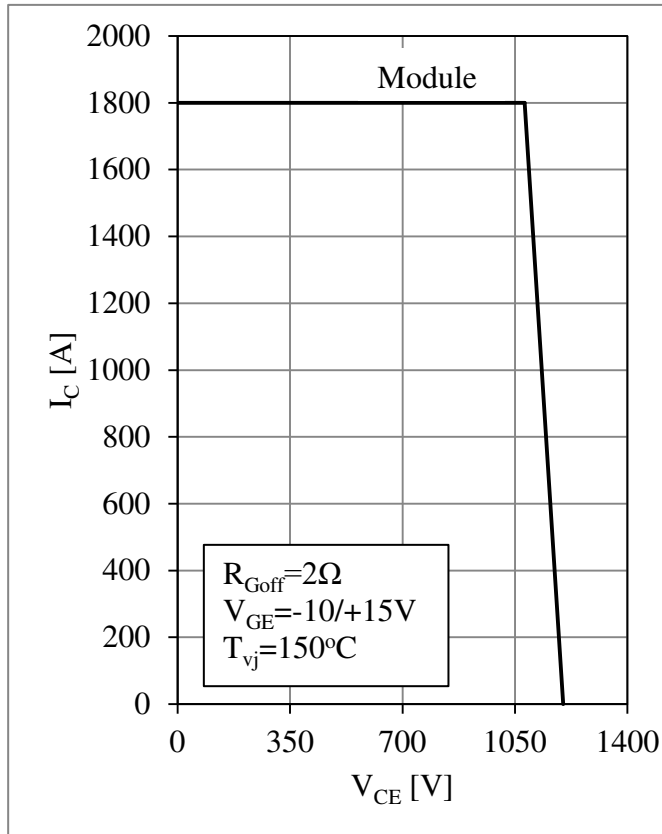


Fig 5. RBSOA

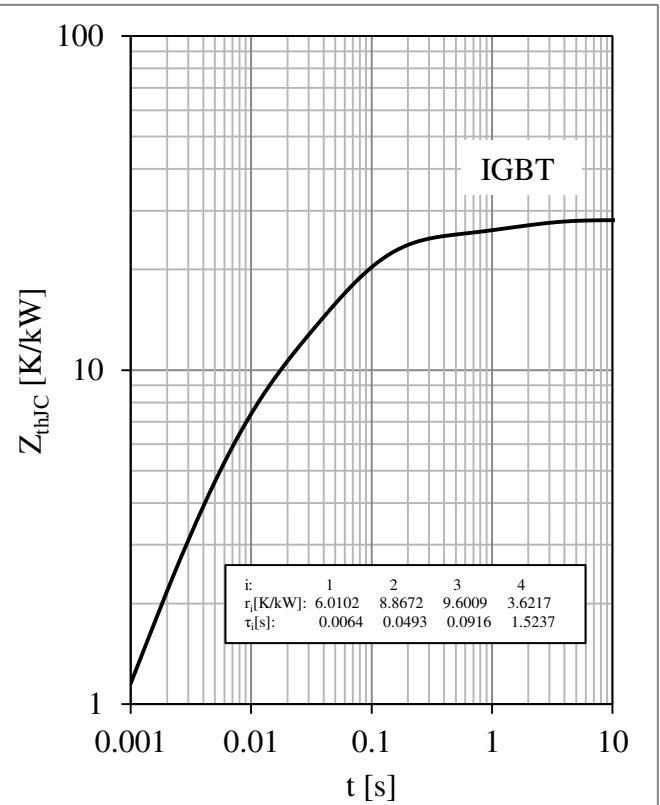


Fig 6. IGBT Transient Thermal Impedance

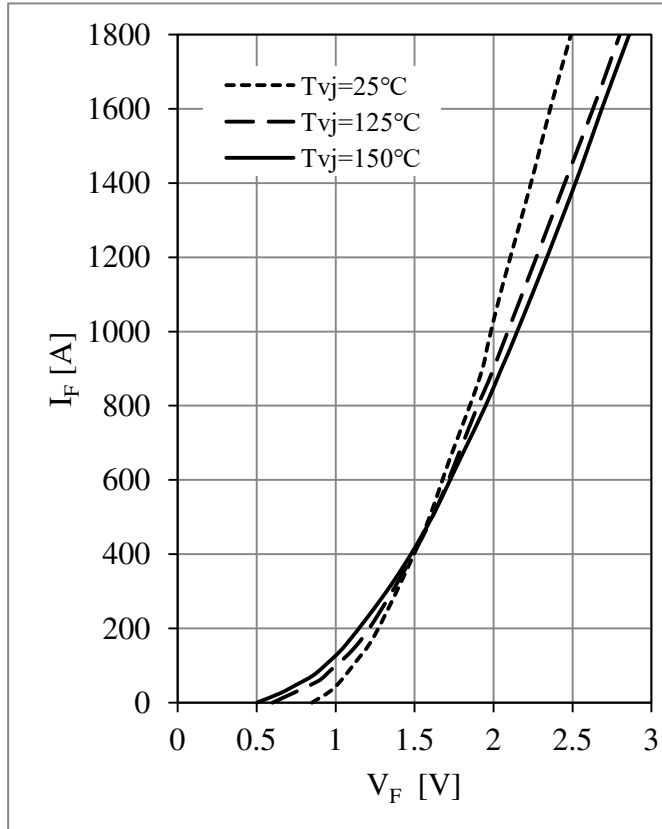
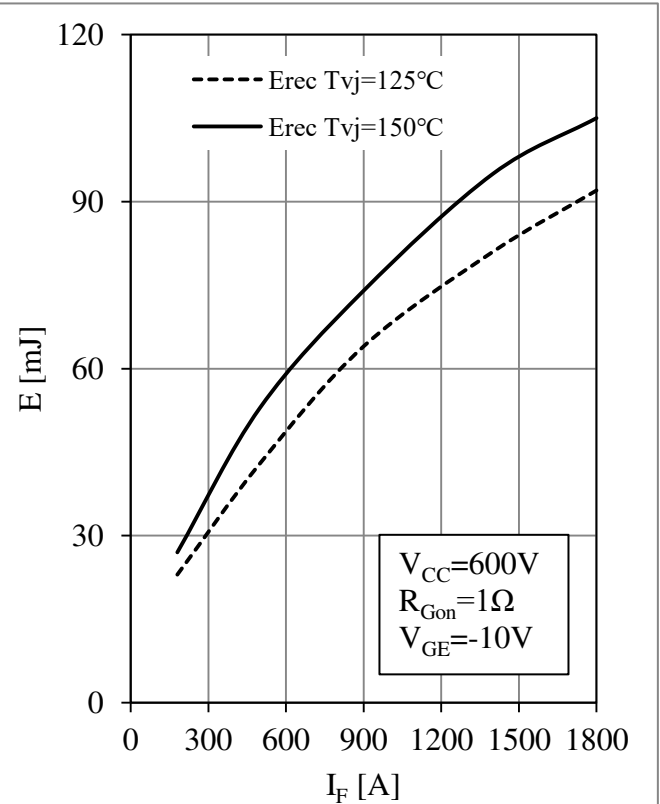


Fig 7. Diode Forward Characteristics

Fig 8. Diode Switching Loss vs. I_F

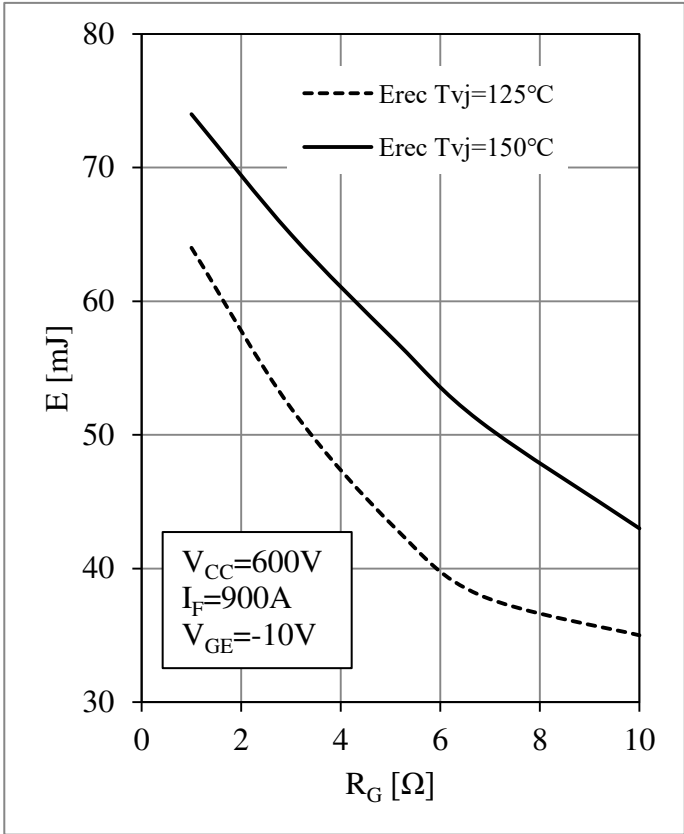


Fig 9. Diode Switching Loss vs. R_G

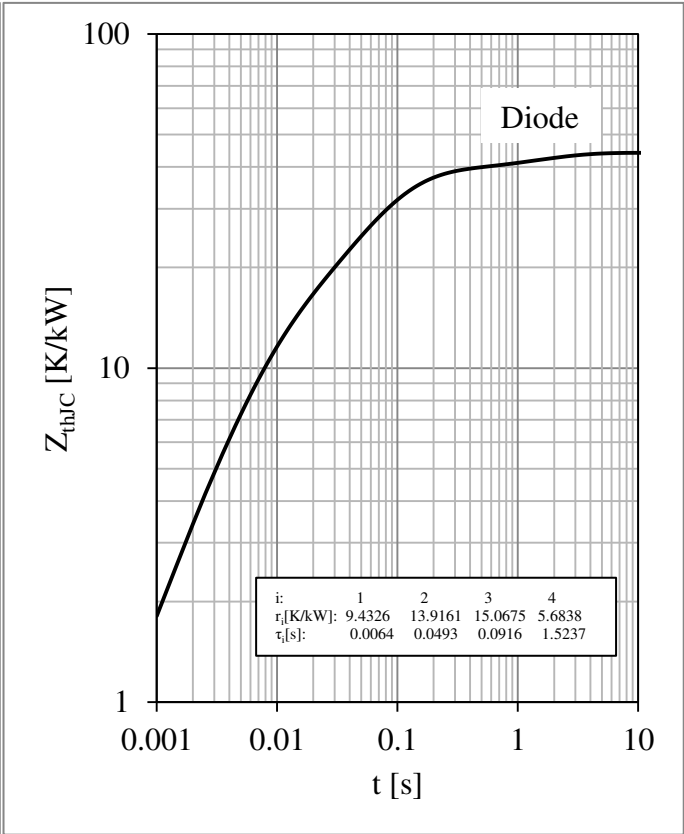


Fig 10. Diode Transient Thermal Impedance

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