

STARPOWER

SEMICONDUCTOR

IGBT

GD300CUT60C8SN

600V/300A chopper 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

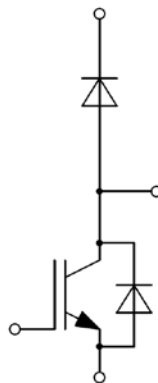
- Low $V_{CE(sat)}$ Trench IGBT technology
- Low switching loss
- $V_{CE(sat)}$ with positive temperature coefficient
- Low inductance case
- Fast & soft reverse recovery anti-parallel FWD
- Isolated copper baseplate using DBC technology



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	600	V
V_{GES}	Gate-Emitter Voltage	± 20	V
I_C	Collector Current @ $T_C=25^{\circ}\text{C}$	415	A
	@ $T_C=80^{\circ}\text{C}$	300	A
I_{CM}	Pulsed Collector Current $t_p=1\text{ms}$	600	A
P_D	Maximum Power Dissipation @ $T_j=175^{\circ}\text{C}$	1064	W

Diode

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	600	V
I_F	Diode Continuous Forward Current	300	A
I_{FM}	Diode Maximum Forward Current $t_p=1\text{ms}$	600	A

Module

Symbol	Description	Value	Unit
T_{jmax}	Maximum Junction Temperature	175	$^{\circ}\text{C}$
T_{jop}	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	$I_C=300\text{A}, V_{GE}=15\text{V}, T_j=25^\circ\text{C}$		1.55	2.00	V	
		$I_C=300\text{A}, V_{GE}=15\text{V}, T_j=125^\circ\text{C}$		1.70			
		$I_C=300\text{A}, V_{GE}=15\text{V}, T_j=150^\circ\text{C}$		1.73			
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=16.8\text{mA}, V_{CE}=V_{GE}, T_j=25^\circ\text{C}$	4.0	5.2	6.5	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			1.6		Ω	
C_{ies}	Input Capacitance	$V_{CE}=30\text{V}, f=1\text{MHz}, V_{GE}=0\text{V}$		23.3		nF	
C_{res}	Reverse Transfer Capacitance				0.68		nF
Q_G	Gate Charge	$V_{GE}=15\text{V}$		0.60		μC	
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=300\text{V}, I_C=300\text{A}, R_G=2.4\Omega, V_{GE}=\pm 15\text{V}, T_j=25^\circ\text{C}$		127		ns	
t_r	Rise Time			42		ns	
$t_{d(off)}$	Turn-Off Delay Time			168		ns	
t_f	Fall Time			33		ns	
E_{on}	Turn-On Switching Loss				0.95		mJ
E_{off}	Turn-Off Switching Loss				5.17		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=300\text{V}, I_C=300\text{A}, R_G=2.4\Omega, V_{GE}=\pm 15\text{V}, T_j=125^\circ\text{C}$		131		ns	
t_r	Rise Time			52		ns	
$t_{d(off)}$	Turn-Off Delay Time			185		ns	
t_f	Fall Time			47		ns	
E_{on}	Turn-On Switching Loss				1.32		mJ
E_{off}	Turn-Off Switching Loss				6.58		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=300\text{V}, I_C=300\text{A}, R_G=2.4\Omega, V_{GE}=\pm 15\text{V}, T_j=150^\circ\text{C}$		138		ns	
t_r	Rise Time			52		ns	
$t_{d(off)}$	Turn-Off Delay Time			188		ns	
t_f	Fall Time			47		ns	
E_{on}	Turn-On Switching Loss				1.45		mJ
E_{off}	Turn-Off Switching Loss				6.98		mJ
I_{SC}	SC Data	$t_p \leq 5\mu\text{s}, V_{GE}=15\text{V}, T_j=150^\circ\text{C}, V_{CC}=360\text{V}, V_{CEM} \leq 600\text{V}$		3200		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	$I_F=300\text{A}, V_{GE}=0\text{V}, T_j=25^\circ\text{C}$		1.70	2.15	V
		$I_F=300\text{A}, V_{GE}=0\text{V}, T_j=125^\circ\text{C}$		1.70		
		$I_F=300\text{A}, V_{GE}=0\text{V}, T_j=150^\circ\text{C}$		1.70		
Q_r	Recovered Charge	$V_R=300\text{V}, I_F=300\text{A}, R_G=2.4\Omega, V_{GE}=-15\text{V}, T_j=25^\circ\text{C}$		14.1		μC
I_{RM}	Peak Reverse Recovery Current			356		A
E_{rec}	Reverse Recovery Energy			4.15		mJ
Q_r	Recovered Charge	$V_R=300\text{V}, I_F=300\text{A}, R_G=2.4\Omega, V_{GE}=-15\text{V}, T_j=125^\circ\text{C}$		23.2		μC
I_{RM}	Peak Reverse Recovery Current			349		A
E_{rec}	Reverse Recovery Energy			7.49		mJ
Q_r	Recovered Charge	$V_R=300\text{V}, I_F=300\text{A}, R_G=2.4\Omega, V_{GE}=-15\text{V}, T_j=150^\circ\text{C}$		26.9		μC
I_{RM}	Peak Reverse Recovery Current			349		A
E_{rec}	Reverse Recovery Energy			7.92		mJ

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

Symbol	Parameter	Min.	Typ.	Max.	Unit
L_{CE}	Stray Inductance			22	nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal to Chip		0.65		m Ω
$R_{\theta JC}$	Junction-to-Case (per IGBT)			0.141	K/W
	Junction-to-Case (per Diode)			0.224	
$R_{\theta CS}$	Case-to-Sink (per IGBT)		0.121		K/W
	Case-to-Sink (per Diode)		0.192		
$R_{\theta CS}$	Case-to-Sink		0.046		K/W
M	Terminal Connection Torque, Screw M5	2.5		3.5	N.m
	Mounting Torque, Screw M5	2.5		3.5	
G	Weight of Module		200		g

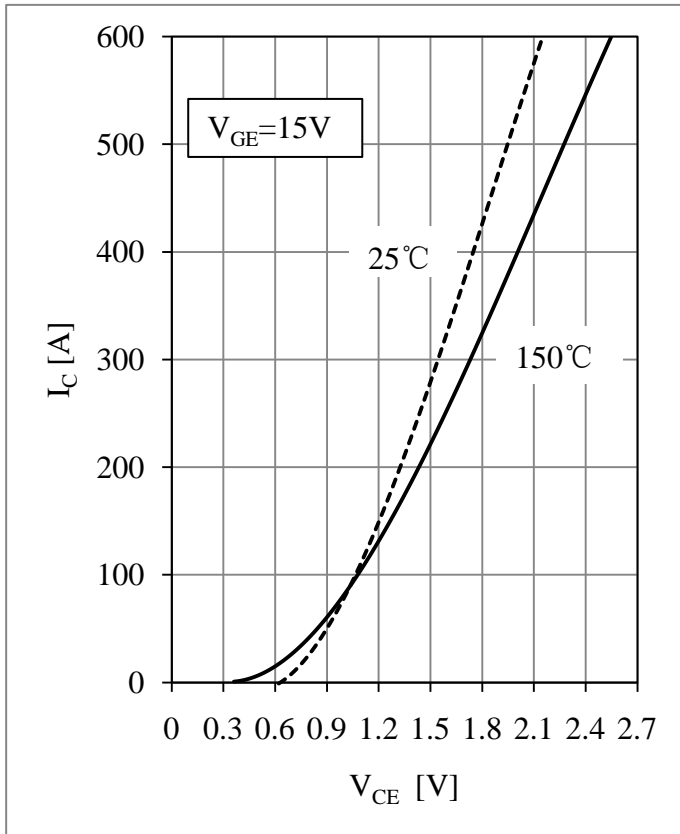


Fig 1. IGBT Output Characteristics

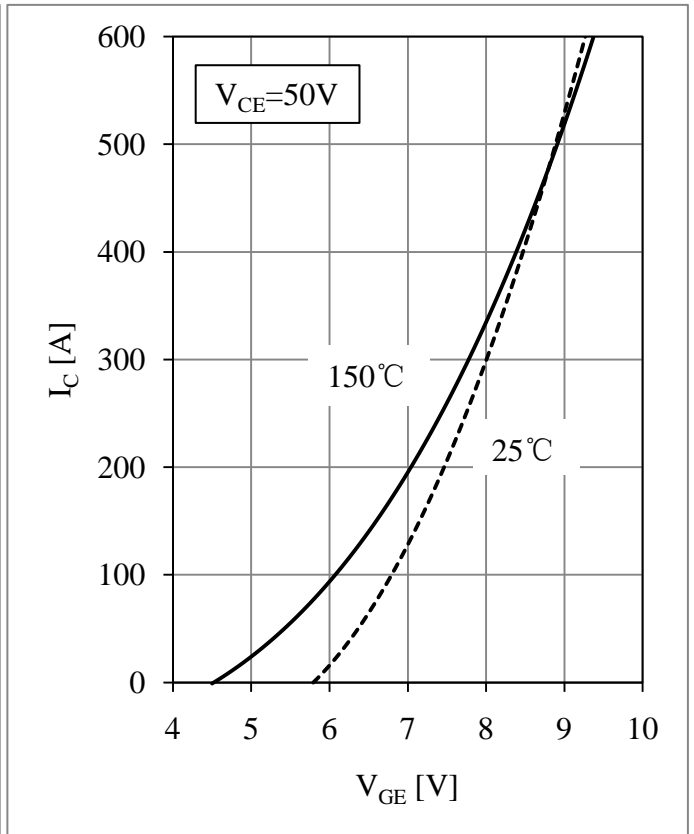


Fig 2. IGBT Transfer Characteristics

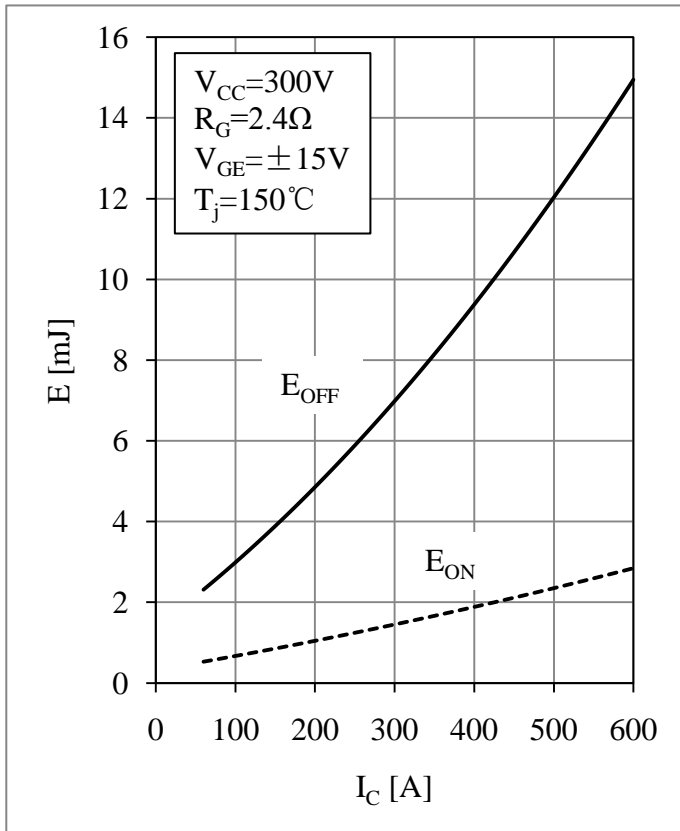


Fig 3. IGBT Switching Loss vs. I_C

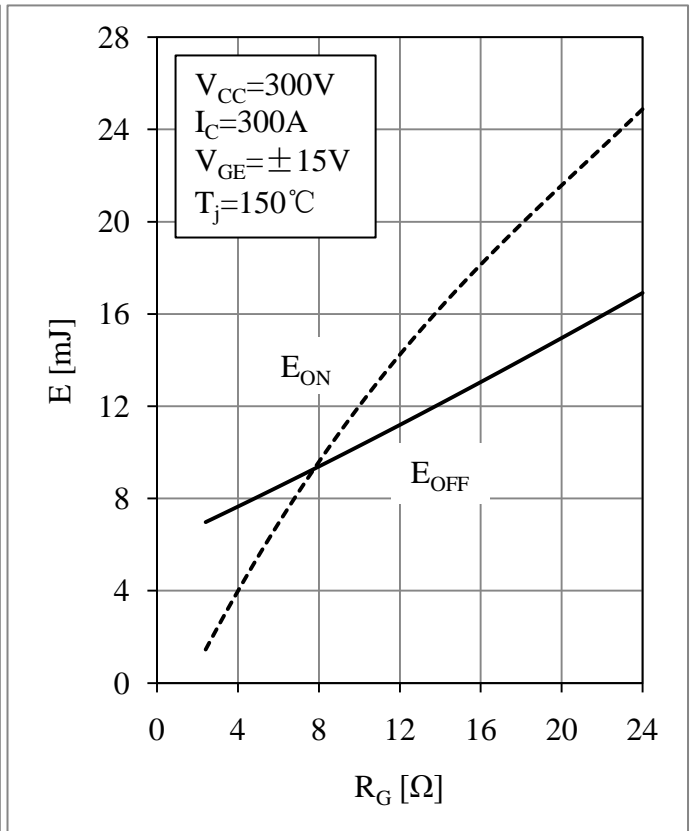


Fig 4. IGBT Switching Loss vs. R_G

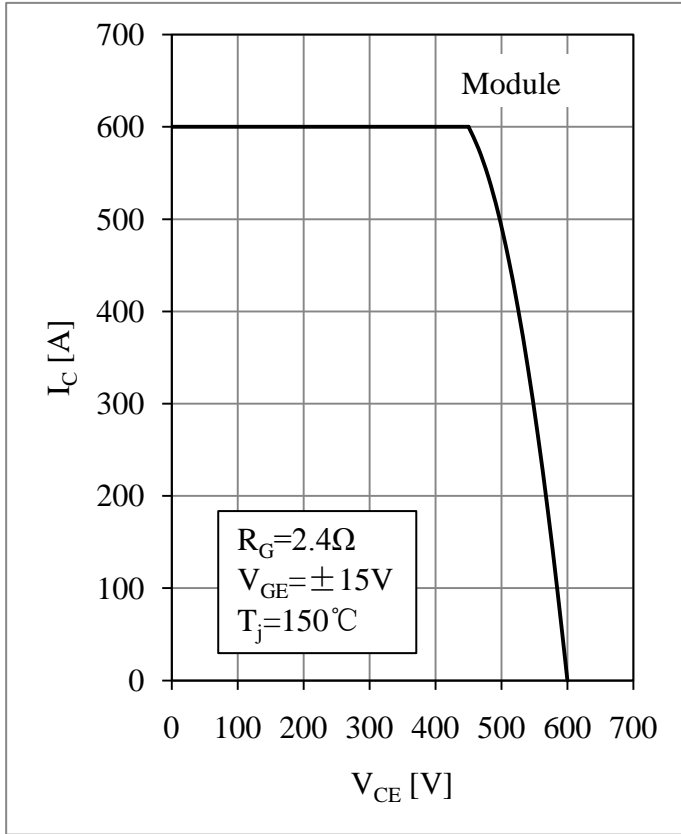


Fig 5. RBSOA

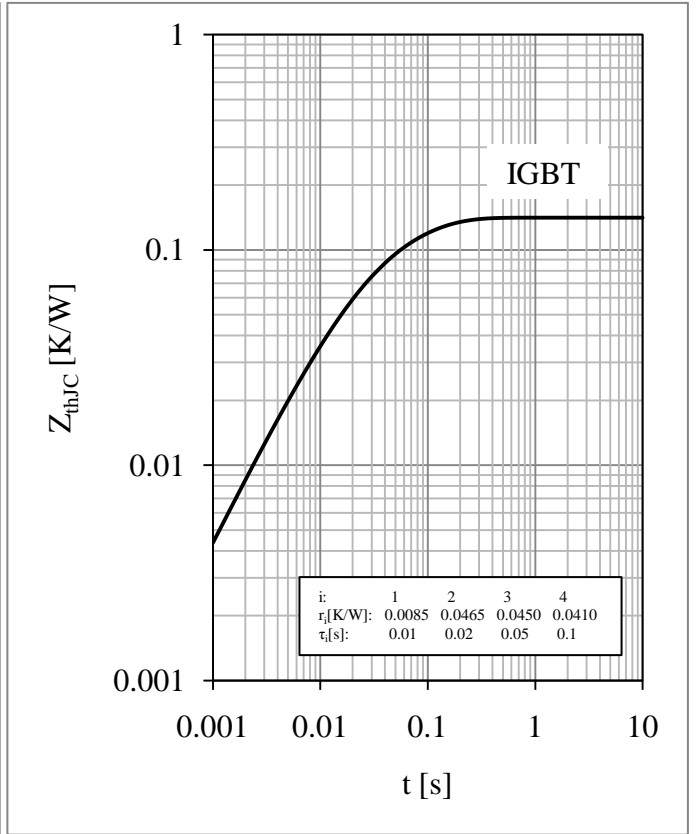


Fig 6. IGBT Transient Thermal Impedance

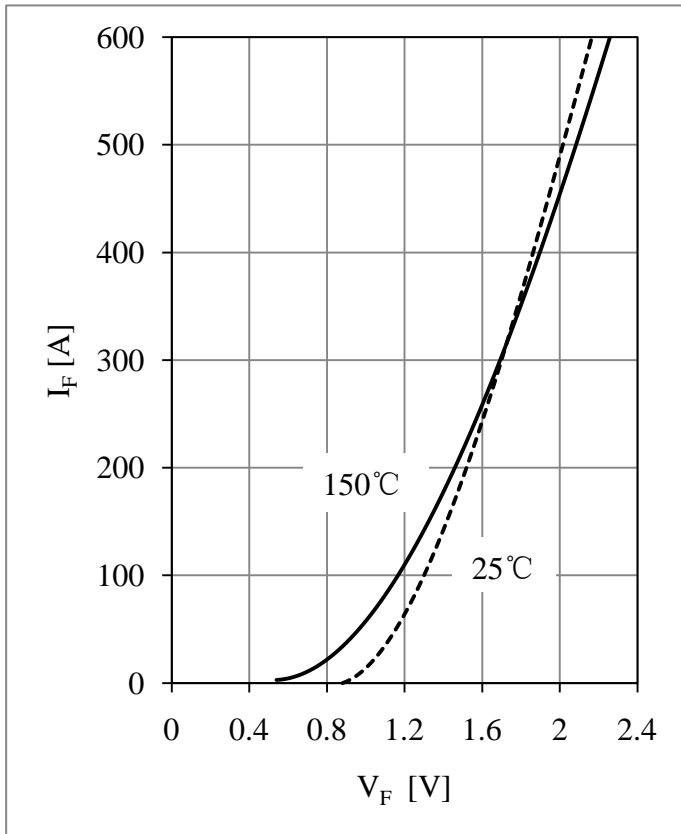


Fig 7. Diode Forward Characteristics

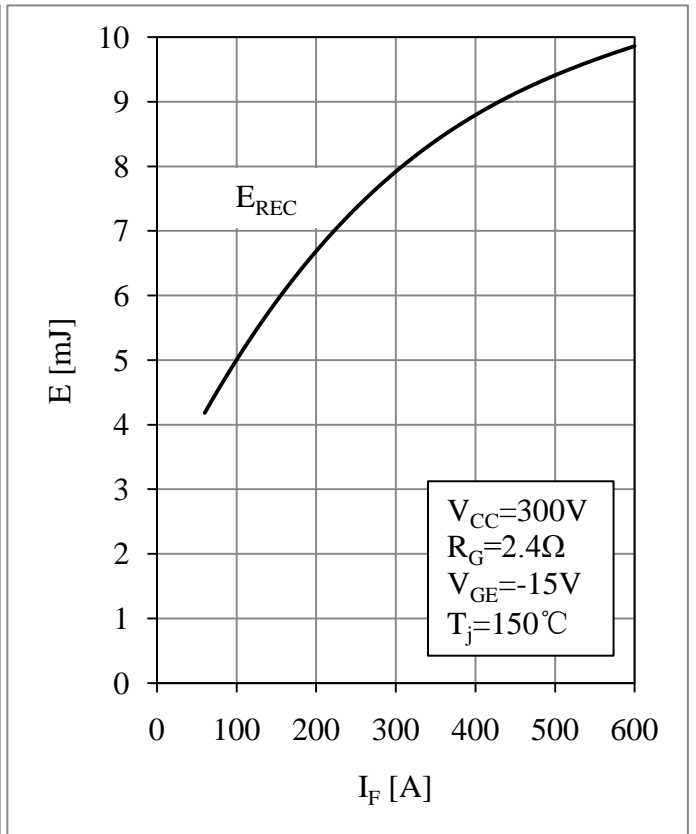


Fig 8. Diode Switching Loss vs. I_F

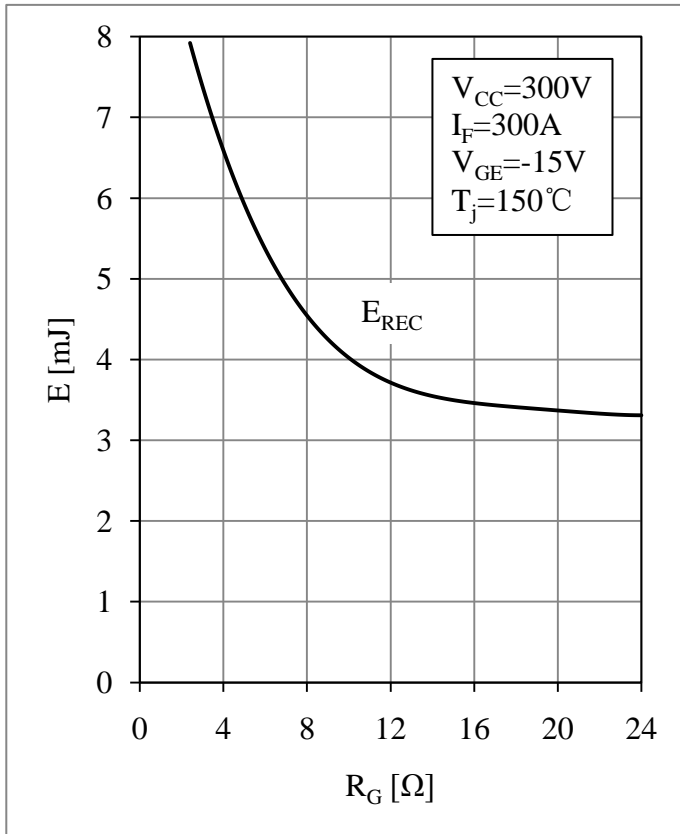


Fig 9. Diode Switching Loss vs. R_G

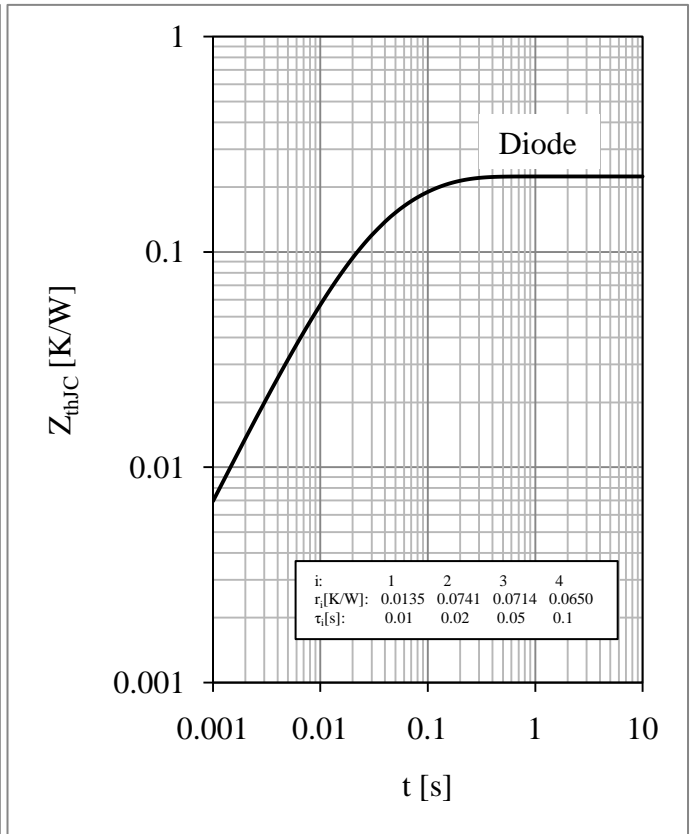


Fig 10. Diode Transient Thermal Impedance

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