

STARPOWER

SEMICONDUCTOR

IGBT

GD200HFY120C8SN

1200V/200A 2 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

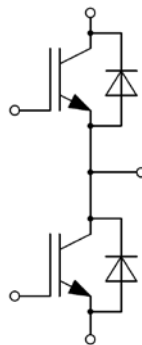
- Low $V_{CE(sat)}$ Trench IGBT technology
- 10 μ s short circuit capability
- $V_{CE(sat)}$ with positive temperature coefficient
- Maximum junction temperature 175°C
- Low inductance case
- Fast & soft reverse recovery anti-parallel FWD
- Isolated copper baseplate using DBC technology



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	Values	Unit
V_{CES}	Collector-Emitter Voltage	1200	V
V_{GES}	Gate-Emitter Voltage	± 20	V
I_C	Collector Current @ $T_C=25^{\circ}\text{C}$	400	A
	@ $T_C=100^{\circ}\text{C}$	200	A
I_{CM}	Pulsed Collector Current $t_p=1\text{ms}$	400	A
P_D	Maximum Power Dissipation @ $T_j=175^{\circ}\text{C}$	1578	W

Diode

Symbol	Description	Values	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1200	V
I_F	Diode Continuous Forward Current	200	A
I_{FM}	Diode Maximum Forward Current $t_p=1\text{ms}$	400	A

Module

Symbol	Description	Values	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, $f=50\text{Hz}$, $t=1\text{min}$	2500	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	$I_C=200\text{A}, V_{GE}=15\text{V}, T_j=25^\circ\text{C}$		1.70	2.15	V
		$I_C=200\text{A}, V_{GE}=15\text{V}, T_j=125^\circ\text{C}$		1.95		
		$I_C=200\text{A}, V_{GE}=15\text{V}, T_j=150^\circ\text{C}$		2.00		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=5.0\text{mA}, V_{CE}=V_{GE}, T_j=25^\circ\text{C}$	5.2	6.0	6.8	V
I_{CES}	Collector Cut-Off Current	$V_{CE}=V_{CES}, V_{GE}=0\text{V}, T_j=25^\circ\text{C}$			1.0	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			3.8		Ω
C_{ies}	Input Capacitance	$V_{CE}=25\text{V}, f=1\text{MHz}, V_{GE}=0\text{V}$		20.7		nF
C_{res}	Reverse Transfer Capacitance				0.58	
Q_G	Gate Charge	$V_{GE}=-15\dots+15\text{V}$		1.55		μC
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600\text{V}, I_C=200\text{A}, R_G=1.1\Omega, V_{GE}=\pm 15\text{V}, T_j=25^\circ\text{C}$		150		ns
t_r	Rise Time			32		ns
$t_{d(off)}$	Turn-Off Delay Time			330		ns
t_f	Fall Time			93		ns
E_{on}	Turn-On Switching Loss			11.2		mJ
E_{off}	Turn-Off Switching Loss			11.3		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600\text{V}, I_C=200\text{A}, R_G=1.1\Omega, V_{GE}=\pm 15\text{V}, T_j=125^\circ\text{C}$		161		ns
t_r	Rise Time			37		ns
$t_{d(off)}$	Turn-Off Delay Time			412		ns
t_f	Fall Time			165		ns
E_{on}	Turn-On Switching Loss			19.8		mJ
E_{off}	Turn-Off Switching Loss			17.0		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600\text{V}, I_C=200\text{A}, R_G=1.1\Omega, V_{GE}=\pm 15\text{V}, T_j=150^\circ\text{C}$		161		ns
t_r	Rise Time			43		ns
$t_{d(off)}$	Turn-Off Delay Time			433		ns
t_f	Fall Time			185		ns
E_{on}	Turn-On Switching Loss			21.9		mJ
E_{off}	Turn-Off Switching Loss			19.1		mJ
I_{SC}	SC Data	$t_p \leq 10\mu\text{s}, V_{GE}=15\text{V}, T_j=150^\circ\text{C}, V_{CC}=900\text{V}, V_{CEM} \leq 1200\text{V}$		800		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	$I_F=200\text{A}, V_{GE}=0\text{V}, T_j=25^{\circ}\text{C}$		1.65	2.10	V
		$I_F=200\text{A}, V_{GE}=0\text{V}, T_j=125^{\circ}\text{C}$		1.65		
		$I_F=200\text{A}, V_{GE}=0\text{V}, T_j=150^{\circ}\text{C}$		1.65		
Q_r	Recovered Charge			17.6		μC
I_{RM}	Peak Reverse Recovery Current	$V_R=600\text{V}, I_F=200\text{A},$ $-di/dt=5400\text{A}/\mu\text{s}, V_{GE}=-15\text{V}$ $T_j=25^{\circ}\text{C}$		228		A
E_{rec}	Reverse Recovery Energy			7.7		mJ
Q_r	Recovered Charge			31.8		μC
I_{RM}	Peak Reverse Recovery Current	$V_R=600\text{V}, I_F=200\text{A},$ $-di/dt=5400\text{A}/\mu\text{s}, V_{GE}=-15\text{V}$ $T_j=125^{\circ}\text{C}$		238		A
E_{rec}	Reverse Recovery Energy			13.8		mJ
Q_r	Recovered Charge			36.6		μC
I_{RM}	Peak Reverse Recovery Current	$V_R=600\text{V}, I_F=200\text{A},$ $-di/dt=5400\text{A}/\mu\text{s}, V_{GE}=-15\text{V}$ $T_j=150^{\circ}\text{C}$		247		A
E_{rec}	Reverse Recovery Energy			15.2		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_{thJC}	Junction-to-Case (per IGBT)			0.095	K/W
	Junction-to-Case (per Diode)			0.161	
R_{thCH}	Case-to-Heatsink (per IGBT)		0.146		K/W
	Case-to-Heatsink (per Diode)		0.248		
	Case-to-Heatsink (per Module)		0.046		
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

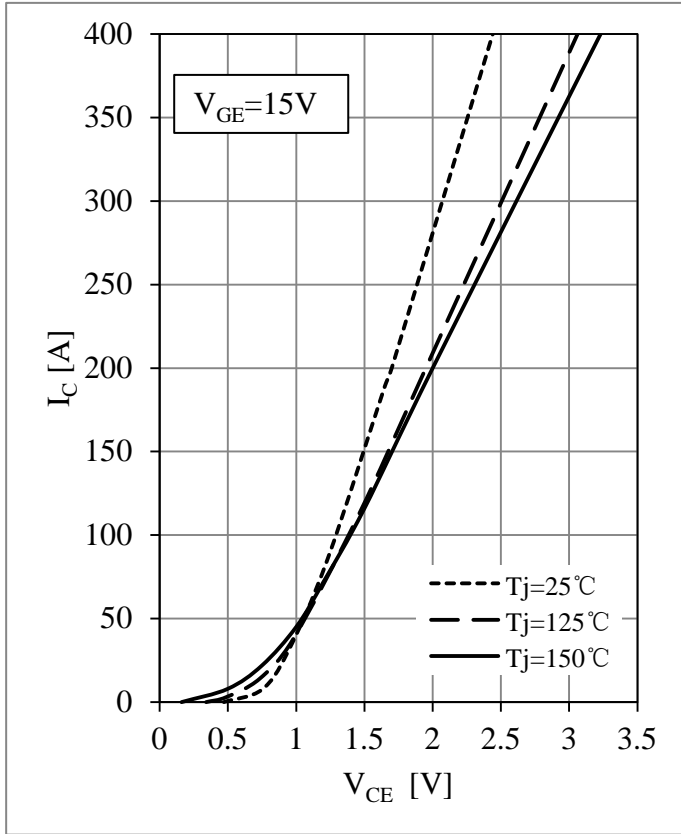


Fig 1. IGBT Output Characteristics

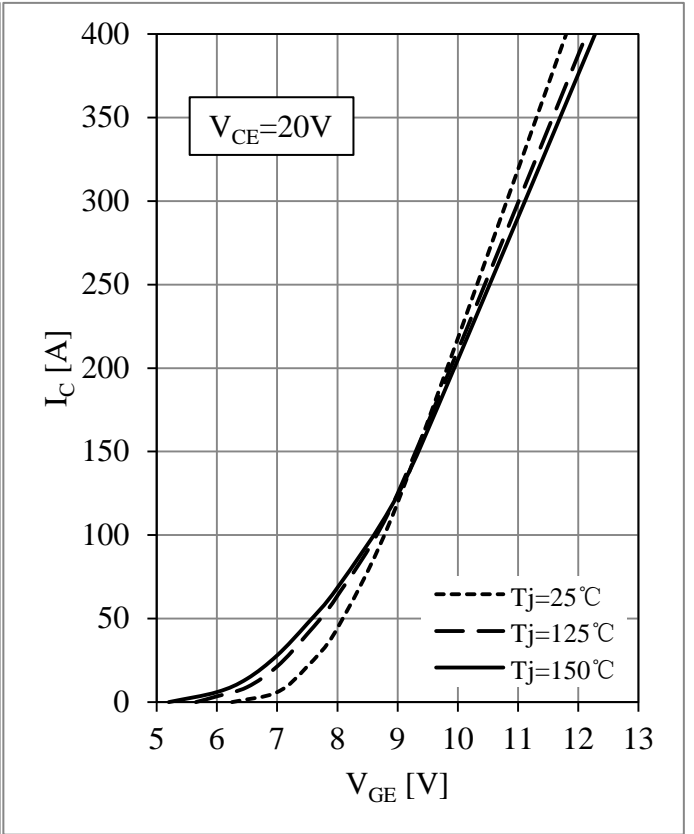


Fig 2. IGBT Transfer Characteristics

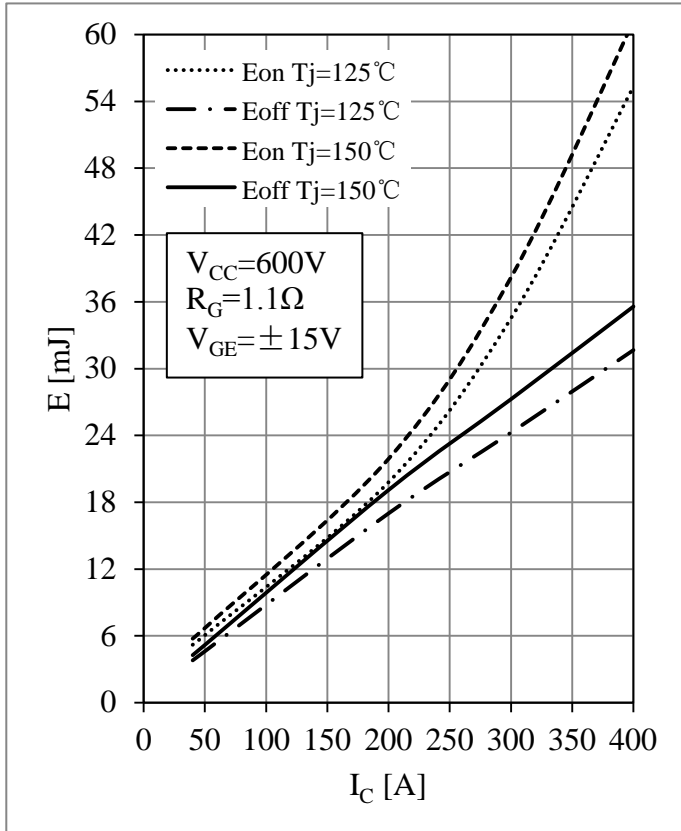


Fig 3. IGBT Switching Loss vs. I_C

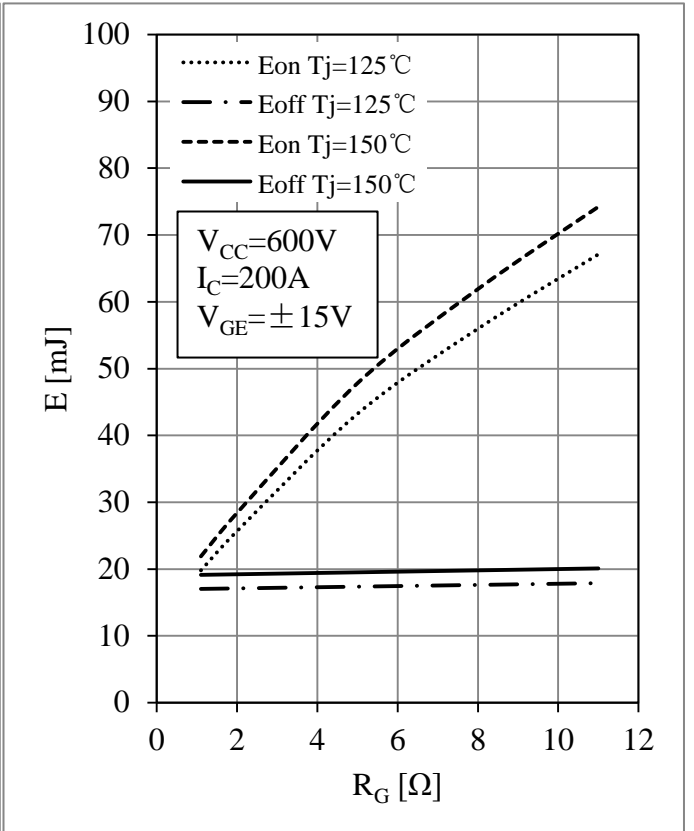


Fig 4. IGBT Switching Loss vs. R_G

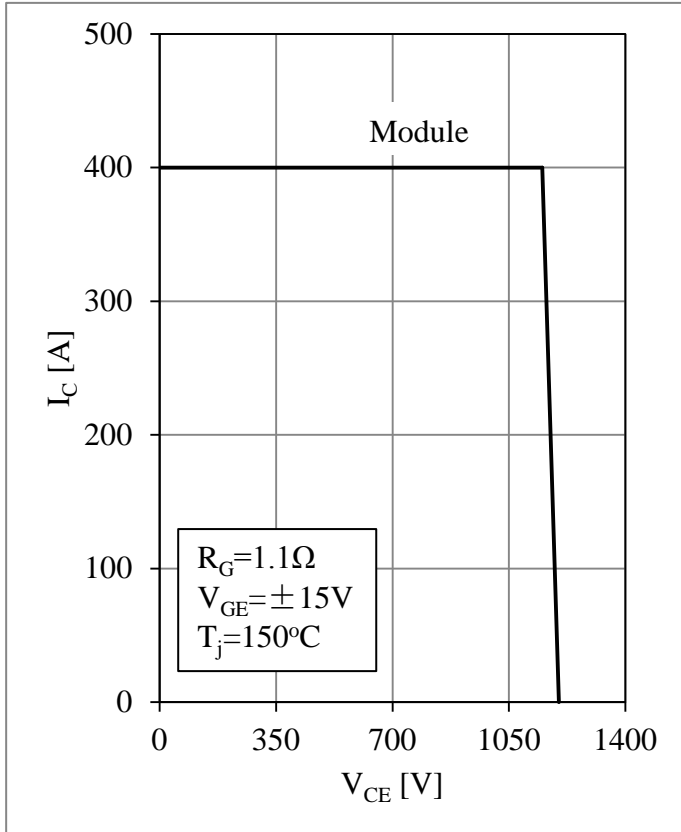


Fig 5. RBSOA

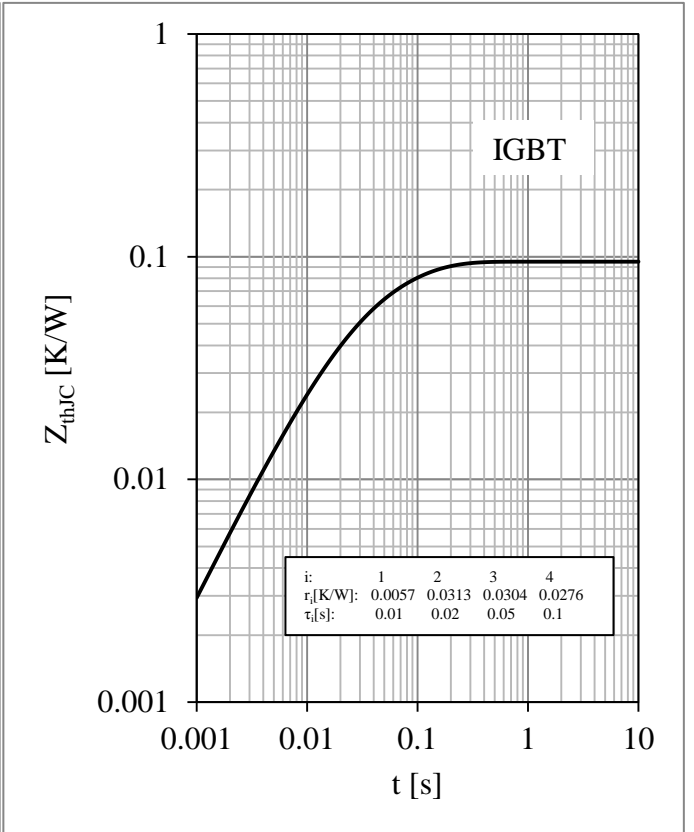


Fig 6. IGBT Transient Thermal Impedance

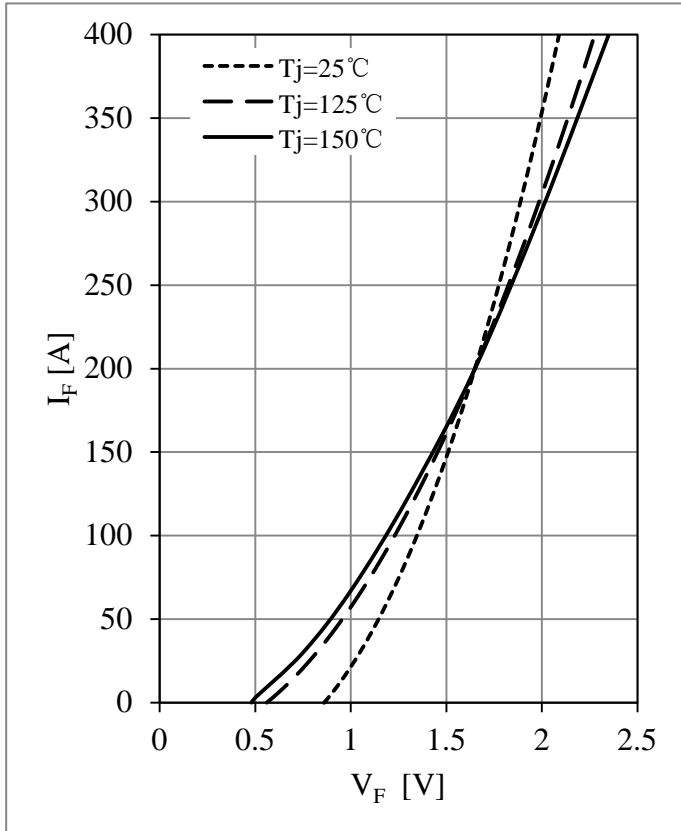


Fig 7. Diode Forward Characteristics

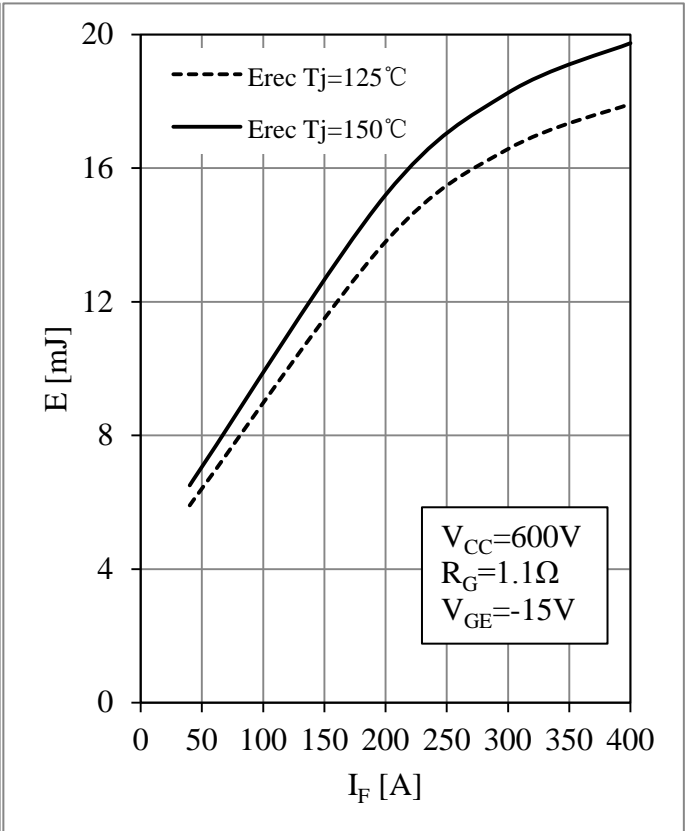


Fig 8. Diode Switching Loss vs. I_F

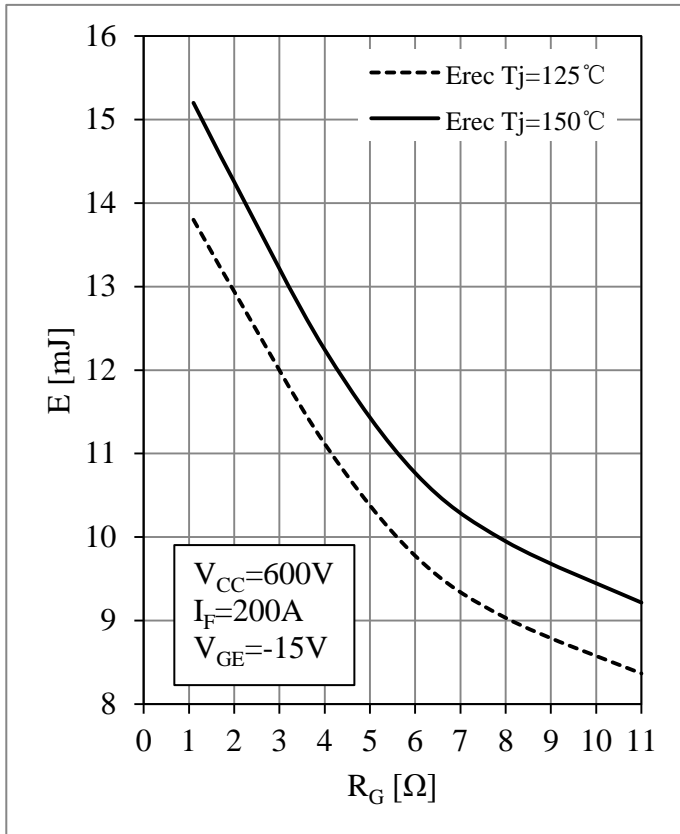


Fig 9. Diode Switching Loss vs. R_G

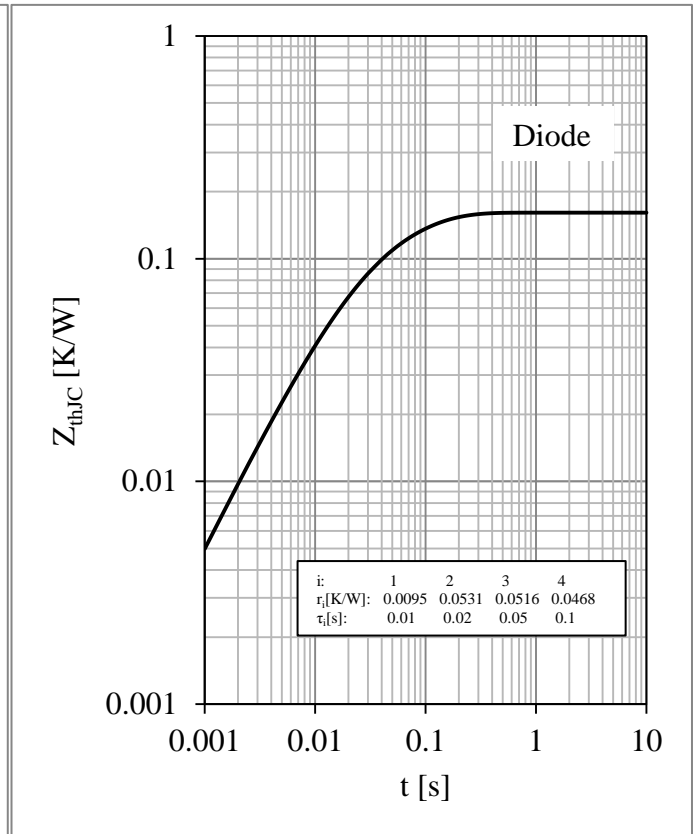


Fig 10. Diode Transient Thermal Impedance

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