

STARPOWER

SEMICONDUCTOR

IGBT

GD50HFU120C1S

Molding Type Module**1200V/50A 2 in one-package**

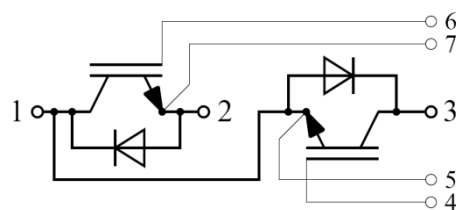
General Description

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
- Low inductance case
- Fast & soft reverse recovery anti-parallel FWD
- Isolated copper baseplate using DBC technology



Equivalent Circuit Schematic

Typical Applications

- Switching mode power supplies
- Inductive heating
- Electronic welder

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

Symbol	Description	GD50HFU120C1S	Units
V_{CES}	Collector-Emitter Voltage	1200	V
V_{GES}	Gate-Emitter Voltage	± 20	V
I_C	Collector Current @ $T_C=25^{\circ}\text{C}$	78	A
	@ $T_C=80^{\circ}\text{C}$	50	
I_{CM}	Pulsed Collector Current $t_p=1\text{ms}$	100	A
I_F	Diode Continuous Forward Current	50	A
I_{FM}	Diode Maximum Forward Current $t_p=1\text{ms}$	100	A
P_D	Maximum Power Dissipation @ $T_j=150^{\circ}\text{C}$	414	W
T_{jmax}	Maximum Junction Temperature	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
Mounting Torque	Power Terminal Screw:M5 Mounting Screw:M6	2.5 to 5.0 3.0 to 5.0	N.m

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	$I_C=0.5\text{mA}$, $V_{CE}=V_{GE}$, $T_j=25^{\circ}\text{C}$	4.4	5.2	6.0	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C=50\text{A}$, $V_{GE}=15\text{V}$, $T_j=25^{\circ}\text{C}$		3.15	3.60	V
		$I_C=50\text{A}$, $V_{GE}=15\text{V}$, $T_j=125^{\circ}\text{C}$		3.50		

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600V, I_C=50A,$ $R_G=13\Omega, V_{GE}=\pm 15V,$ $T_j=25^\circ C$		262		ns
t_r	Rise Time			52		ns
$t_{d(off)}$	Turn-Off Delay Time			272		ns
t_f	Fall Time			116		ns
E_{on}	Turn-On Switching Loss			4.69		mJ
E_{off}	Turn-Off Switching Loss			1.89		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600V, I_C=50A,$ $R_G=13\Omega, V_{GE}=\pm 15V,$ $T_j=125^\circ C$		276		ns
t_r	Rise Time			53		ns
$t_{d(off)}$	Turn-Off Delay Time			290		ns
t_f	Fall Time			146		ns
E_{on}	Turn-On Switching Loss			5.92		mJ
E_{off}	Turn-Off Switching Loss			2.69		mJ
C_{ies}	Input Capacitance	$V_{CE}=30V, f=1MHz,$ $V_{GE}=0V$		4.23		nF
C_{oes}	Output Capacitance			0.38		nF
C_{res}	Reverse Transfer Capacitance			0.15		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				30	nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal To Chip			0.75		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 =50A	T _j =25°C		1.82	2.25	V
			T _j =125°C		1.95		
Q _r	Recovered Charge	I _F =50A, V _R =600V, R _G =13Ω, V _{GE} =-15V	T _j =25°C		4.3		μC
			T _j =125°C		8.4		
I _{RM}	Peak Reverse Recovery Current		T _j =25°C		49		A
			T _j =125°C		59		
E _{rec}	Reverse Recovery Energy		T _j =25°C		2.12		mJ
			T _j =125°C		3.64		

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case (per IGBT)		0.310	K/W
$R_{\theta JC}$	Junction-to-Case (per diode)		0.524	K/W
$R_{\theta CS}$	Case-to-Sink (Conductive grease applied)	0.05		K/W
G	Weight of Module	150		g

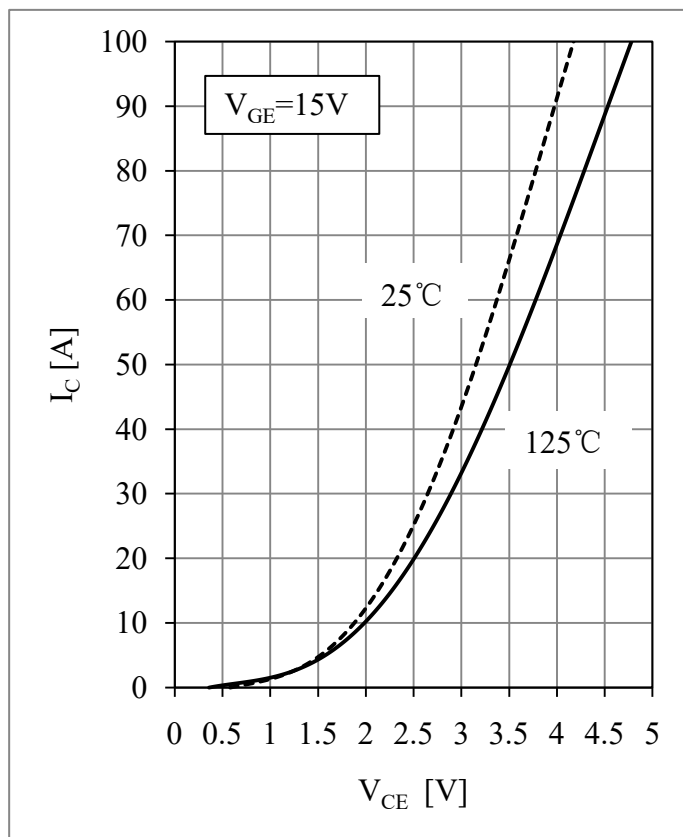


Fig 1. IGBT Output Characteristic

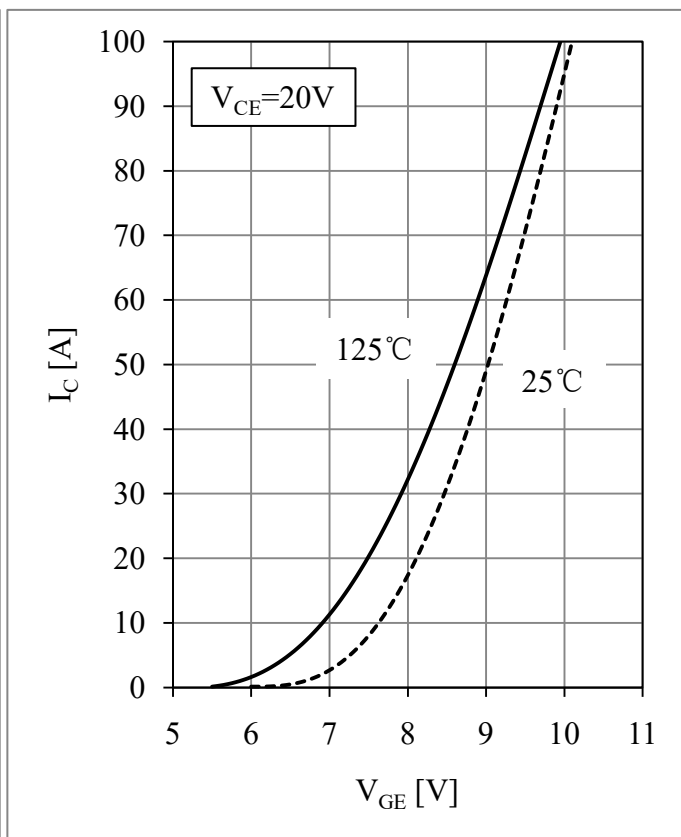
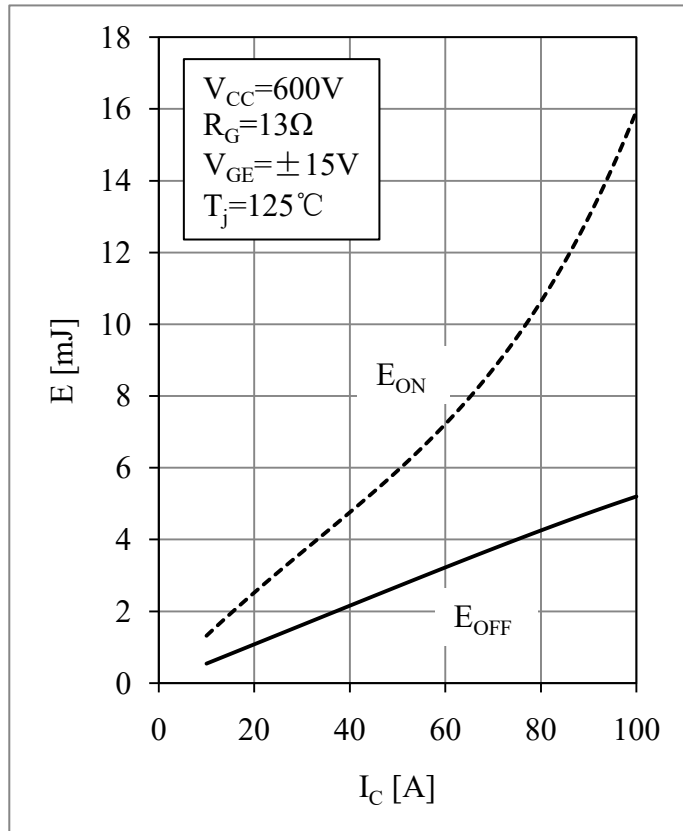
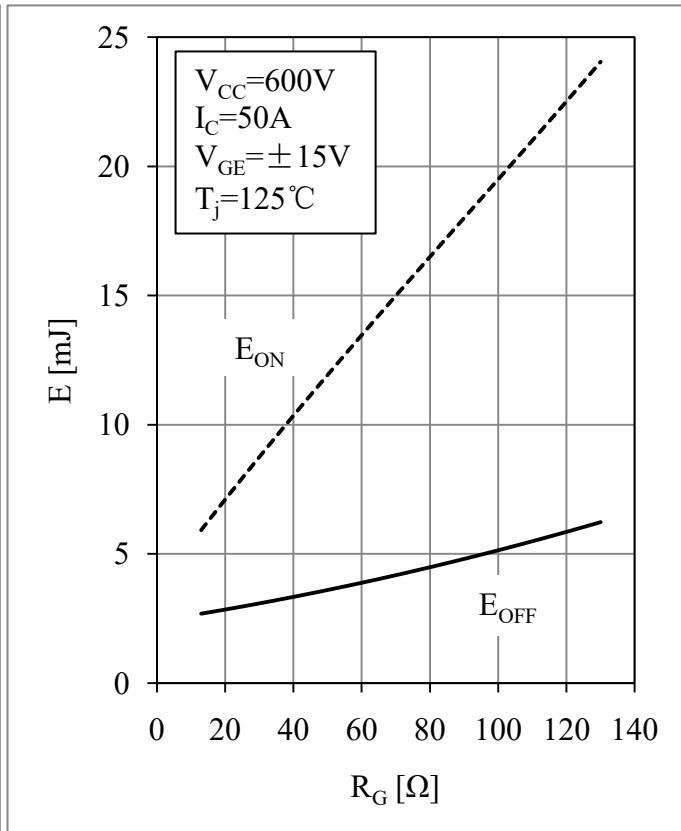


Fig 2. IGBT Transfer Characteristic

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

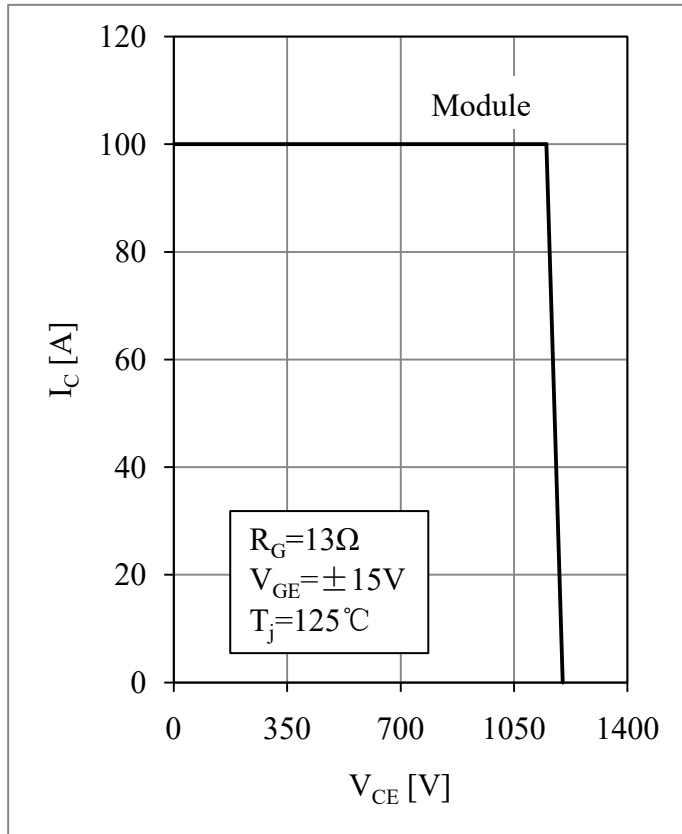


Fig 5. RBSOA

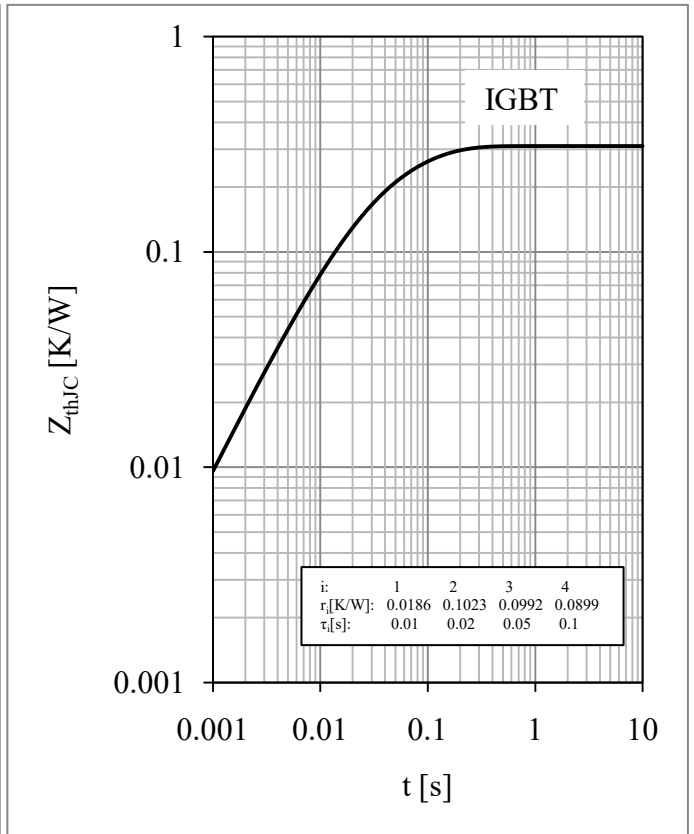


Fig 6. IGBT Transient Thermal Impedance

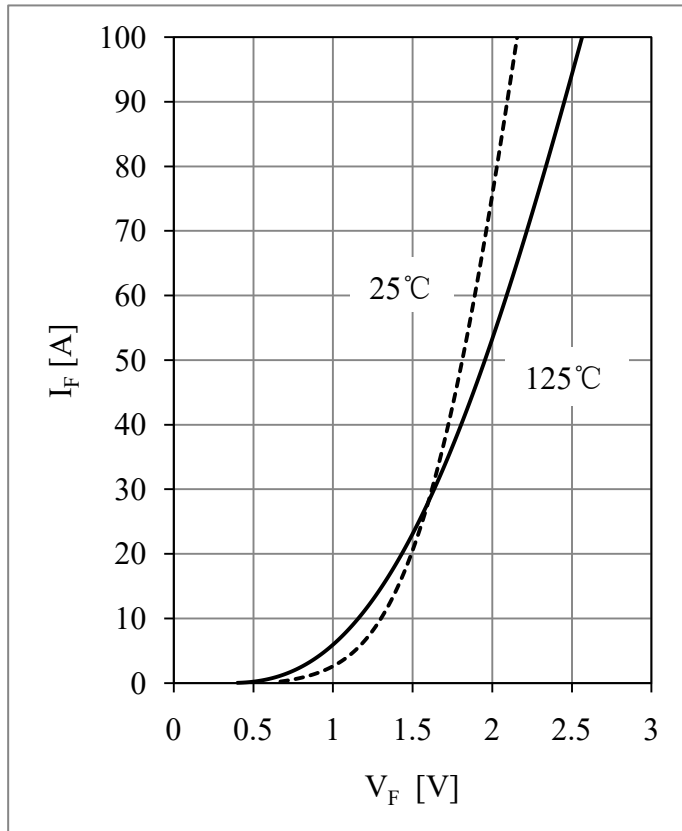
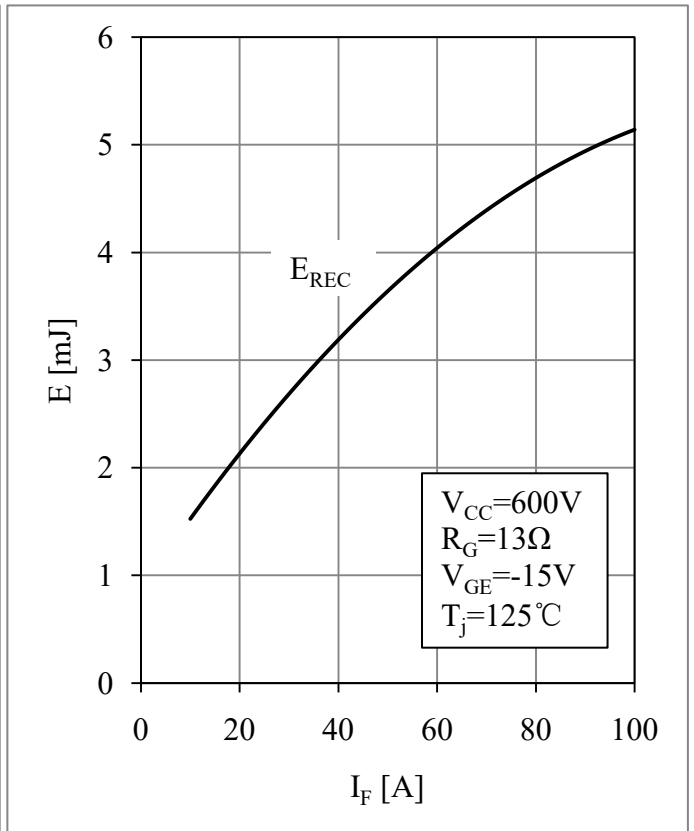


Fig 7. Diode Forward Characteristic

Fig 8. Diode Switching Loss vs. I_F

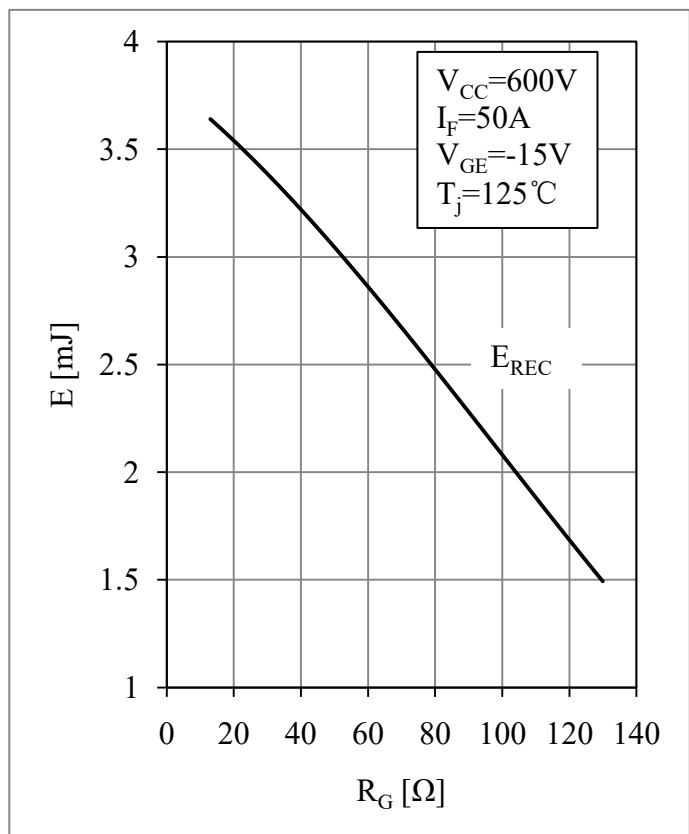
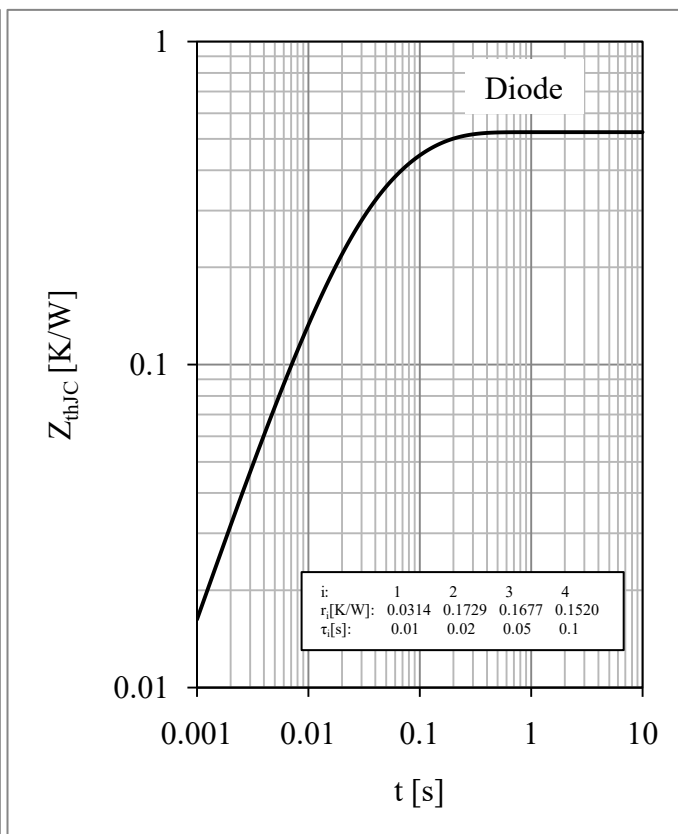
Fig 9. Diode Switching Loss vs. R_G 

Fig 10. Diode Transient Thermal Impedance

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