



GT50RFF120B9H

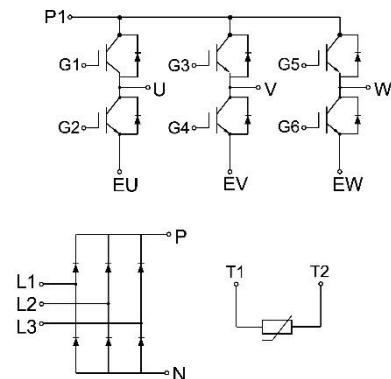
IGBT Module

Preliminary Data

Features:

- Field Stop Trench Gate IGBT
- Short Circuit Rated $>10\mu\text{s}$
- Low Saturation Voltage
- Low Switching Loss
- 100% RBSOA Tested ($2 \times I_c$)
- Low Stray Inductance
- Pre-applied Thermal Interface Material
- Lead Free, Compliant with RoHS Requirement

Circuit Diagram



Applications:

- Industrial Inverters
- Servo Applications

IGBT, Inverter

Maximum Rated Values ($T_c=25^\circ\text{C}$ unless otherwise specified)

Symbol	Description	Conditions	Values	Units
V_{CES}	Collector-Emitter Blocking Voltage	$T_J=25^\circ\text{C}$	1200	V
V_{GES}	Gate-Emitter Voltage		± 20	V
I_c	Continuous Collector Current	$T_c=100^\circ\text{C}$	50	A
		$T_c=25^\circ\text{C}$	100	A
I_{CM}	Peak Collector Current Repetitive	$t_p=1\text{ms}$	100	A
P_D	Maximum Power Dissipation (IGBT)	$T_c=25^\circ\text{C}$ $T_{Jmax}=175^\circ\text{C}$	455	W



Electrical Characteristics of IGBT ($T_C=25^{\circ}\text{C}$ unless otherwise specified)

Static Characteristics

Symbol	Description	Conditions	Min.	Typ.	Max.	Units
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=1.7\text{mA}$, $V_{CE}=V_{GE}$	5.0	5.6	6.5	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=50\text{A}$, $V_{GE}=15\text{V}$	$T_J=25^{\circ}\text{C}$	1.75	2.10	V
			$T_J=125^{\circ}\text{C}$	2.20		V
			$T_J=150^{\circ}\text{C}$	2.30		V
I_{CES}	Collector-Emitter Leakage Current	$V_{GE}=0\text{V}$, $V_{CE}=V_{CES}$, $T_J=25^{\circ}\text{C}$			1	mA
I_{GES}	Gate-Emitter Leakage Current	$V_{GE}=\pm 20\text{V}$, $V_{CE}=0\text{V}$, $T_J=25^{\circ}\text{C}$			± 200	nA
C_{ies}	Input Capacitance	$V_{CE}=25\text{V}$, $V_{GE}=0\text{V}$, $f=100\text{kHz}$		5.32		nF
C_{oes}	Output Capacitance			0.81		nF
C_{res}	Reveres Transfer Capacitance			0.34		nF

Switching Characteristics

t _{d(on)}	Turn-on Delay Time	V _{CC} =600V, I _C =50A, R _{Gon} =15Ω, V _{GE} =±15V, Inductive Load	T _J =25℃		92		ns
			T _J =125℃		92		
			T _J =150℃		96		
t _r	Rise Time		T _J =25℃		54		ns
			T _J =125℃		56		
			T _J =150℃		56		
t _{d(off)}	Turn-off Delay Time	V _{CC} =600V, I _C =50A, R _{Goff} =15Ω, V _{GE} =±15V, Inductive Load	T _J =25℃		222		ns
			T _J =125℃		256		
			T _J =150℃		272		
t _f	Fall Time		T _J =25℃		192		ns
			T _J =125℃		210		
			T _J =150℃		222		
E _{on}	Turn-on Switching Loss	V _{CC} =600V, I _C =50A, R _{Gon} =15Ω, V _{GE} =±15V, di/dt=767A/μs(T _J =150℃), Inductive Load	T _J =25℃		4.81		mJ
			T _J =125℃		6.16		
			T _J =150℃		7.48		



E _{off}	Turn-off Switching Loss	V _{CC} =600V, I _C =50A, R _{Goff} =15Ω, V _{GE} =±15V, du/dt=4951V/μs(T _J =150°C), Inductive Load	T _J =25°C		3.76		mJ
			T _J =125°C		4.21		
			T _J =150°C		5.30		
Q _g	Total Gate Charge	V _{GE} =+15V...-15V	T _J =25°C		560		nC
R _{G(int)}	Internal Gate Resistor		T _J =25°C		3.4		Ω
I _{SC}	V _{CC} =600V, V _{GE} =+/-15V, t _p =10us, R _{Gon} =47Ω, R _{Goff} =47Ω, T _J =150°C				209		A
R _{θJH}	Thermal Resistance: Junction-to-Heatsink (per IGBT, λgrease=3.4W/(m·K))					0.33	°C/W

Diode, Inverter

Maximum Rated Values (T_C=25°C unless otherwise specified)

Symbol	Description	Conditions	Values	Units
V _{RRM}	Repetitive Peak Reverse Voltage	T _J =25°C	1200	V
I _F	Diode Continuous Forward Current	T _C =100°C	50	A
I _{FM}	Peak Diode Current Repetitive	t _p =1ms	100	A

Electrical Characteristics of Diode (T_C=25°C unless otherwise specified)

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
V _{FM}	Forward Voltage	I _F =50A	T _J =25℃		1.90		V
			T _J =125℃		2.05		
			T _J =150℃		2.05		
t _{rr}	Reverse Recovery Time	I _F =50A, -diF/dt=1096A/μs(T _J =150℃), V _R =600V, V _{GE} =-15V	T _J =25℃		161		ns
			T _J =125℃		174		
			T _J =150℃		175		
I _{rr}	Peak Reverse Recovery Current		T _J =25℃		55.8		A
			T _J =125℃		61.9		
			T _J =150℃		63.8		
Q _{rr}	Reverse Recovery Charge		T _J =25℃		4.3		μC
			T _J =125℃		6.1		
			T _J =150℃		6.2		



E _{rec}	Reverse Recovery Energy	I _F =50A, -diF/dt=1096A/μs(T _J =150°C), V _R =600V, V _{GE} =-15V	T _J =25°C		1.75		mJ
			T _J =125°C		2.44		
			T _J =150°C		2.59		
R _{θJH}	Thermal Resistance: Junction-to-Heatsink (per Diode, λgrease=3.4W/(m·K))					0.59	°C/W

Diode, Rectifier Maximum Rated Values

Symbol	Description	Conditions	Values	Units
V_{RRM}	Repetitive Peak Reverse Voltage	$T_J=25^{\circ}C$	1800	V
I_{FRMSM}	Maximum RMS Forward Current per Chip	$T_J=80^{\circ}C$	50	A
I_{RMSM}	Maximum RMS Current at Rectifier Output	$T_J=80^{\circ}C$	60	A
I_{FSM}	Surge Current @ $t_p=10$ ms	$T_J=25^{\circ}C$	420	A
		$T_J=150^{\circ}C$	350	
I^2t	I^2t - value	$T_J=25^{\circ}C$	900	A^2s
		$T_J=150^{\circ}C$	650	

Electrical Characteristics of Diode

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
V_F	Forward Voltage	$I_F=25A$	$T_J=25^{\circ}C$		1.10		V
			$T_J=150^{\circ}C$		1.00		
I_R	Reverse Current	$V_R=1600V$	$T_J=25^{\circ}C$			1	mA
$R_{\theta JH}$	Diode Thermal Resistance: Junction-to- Heatsink($\lambda_{grease}=3.4W/(m \cdot K)$)					0.63	$^{\circ}C/W$



Internal NTC-Thermistor Characteristics

Symbol	Description	Min.	Typ.	Max.	Units
R ₂₅	T _C =25℃		5		kΩ
△R/R	T _C =100℃, R ₁₀₀ =465Ω	-5		5	%
P ₂₅	T _C =25℃			10	mW
B _{25/50}	$R_2=R_{25} \exp[B_{25/50}(1/T_2-1/(298.15K))]$		3380		K
B _{25/80}	$R_2=R_{25} \exp[B_{25/80}(1/T_2-1/(298.15K))]$		3440		K
B _{25/100}	$R_2=R_{25} \exp[B_{25/100}(1/T_2-1/(298.15K))]$		3545		K

Module

Symbol	Description	Conditions	Min.	Typ.	Max.	Units
V _{iso}	Isolation Voltage (All Terminals Shorted)	f=50Hz, 30s	4500			V
T _J	Maximum Junction Temperature				175	℃
T _{JOP}	Maximum Operating Junction Temperature Range		-45		+150	℃
T _{stg}	Storage Temperature		-45		+150	℃
CTI	Comparative Tracking Index		200			
T	Mounting Screw:M4		1.5		1.8	N·m
G	Weight			40		g



Ordering Information Table

Device code	G	T	50	RFF	120	B9	H
	①	②	③	④	⑤	⑥	⑦

- ① - IGBT Module
- ② - Trench, Low Switching Losses IGBT
- ③ - Rated Current (50=50A)
- ④ - Circuit Configuration: RFF (Rectifier + Full Bridge)
- ⑤ - Rated Voltage (120=1200V)
- ⑥ - Package Type
- ⑦ - Test Level (Pass the Important Reliability Test-Industrial Grade)

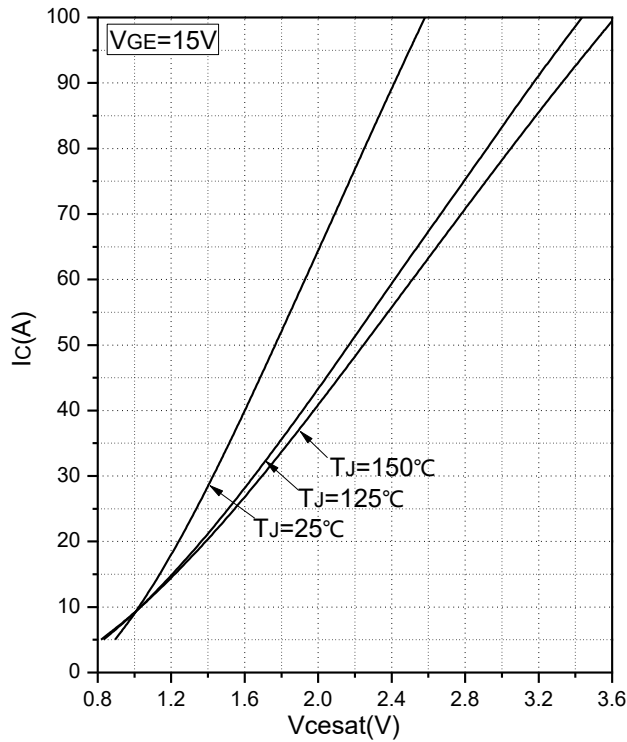


Fig.1 Typical Saturation Voltage Characteristics(Inverter)

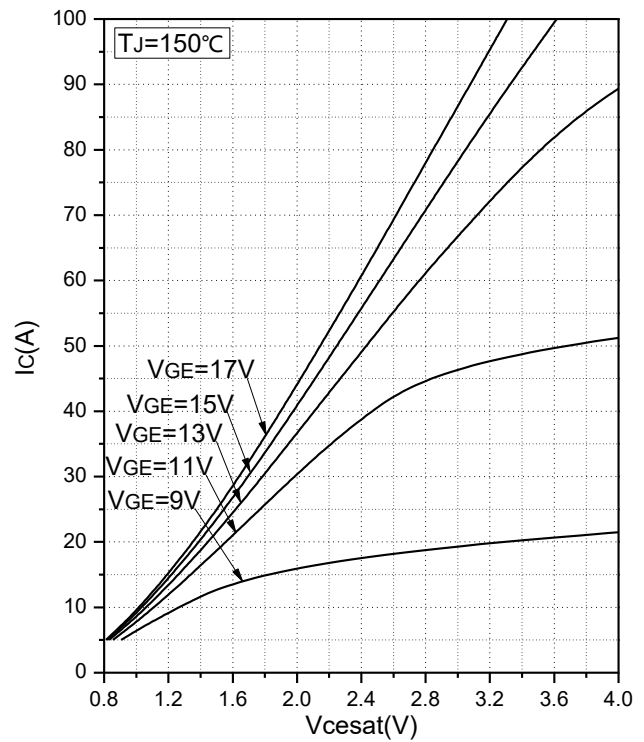


Fig.2 Typical Output Characteristics(Inverter)

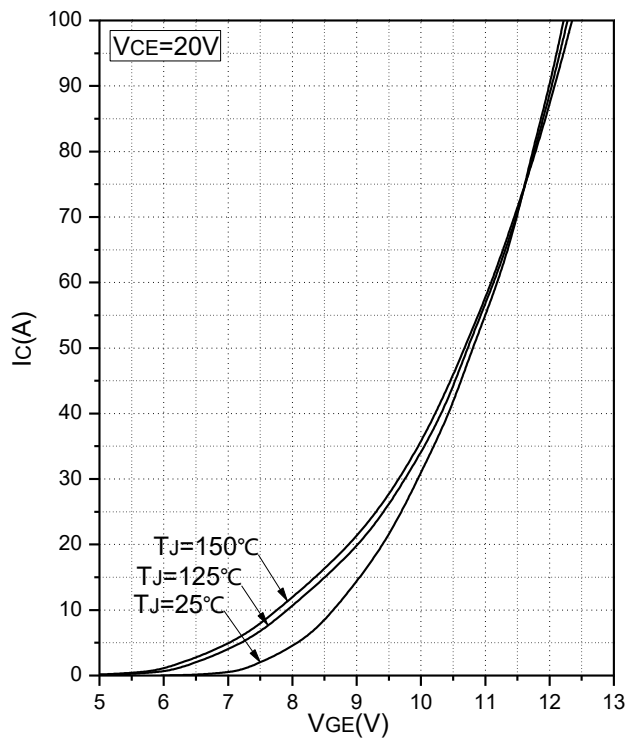


Fig.3 Transfer Characteristics(Inverter)

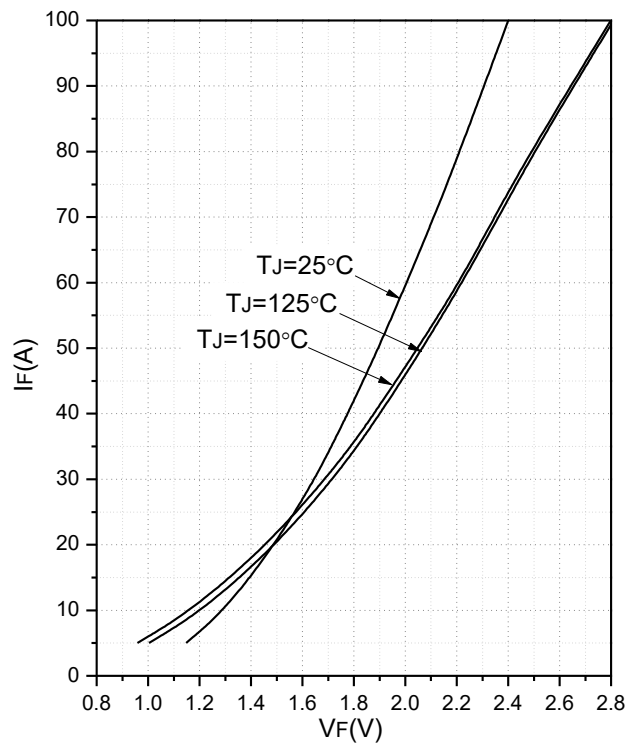


Fig.4 Forward Characteristics of Diode(Inverter)

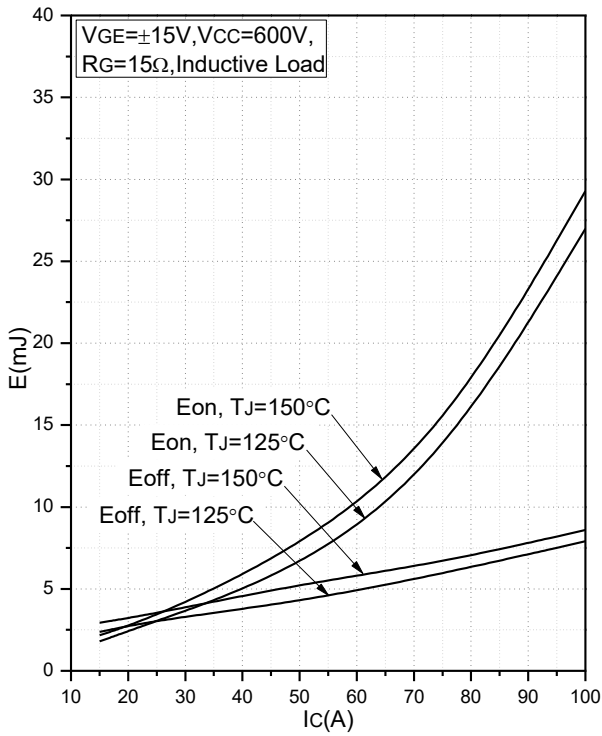


Fig.5 Typical Switching Loss vs. Collector Current(Inverter)

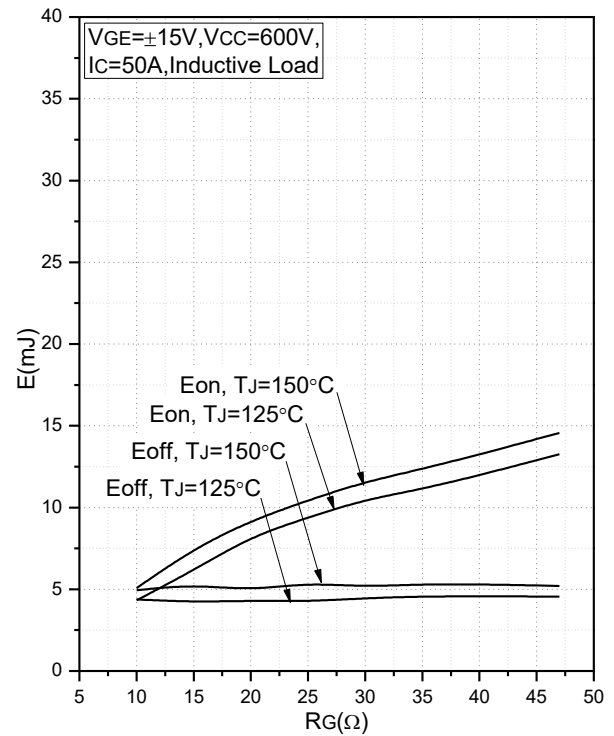


Fig.6 Typical Switching Loss vs. Gate Resistance(Inverter)

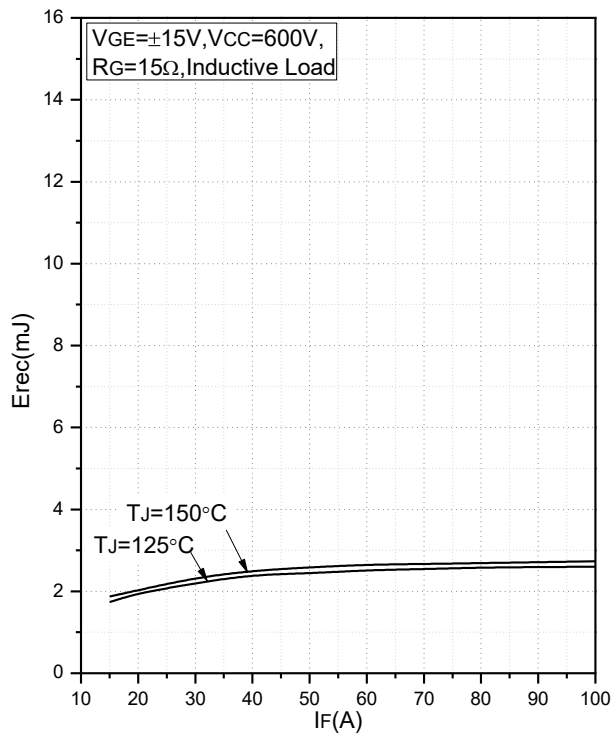


Fig.7 Typical Switching Loss vs. Forward Current(Inverter)

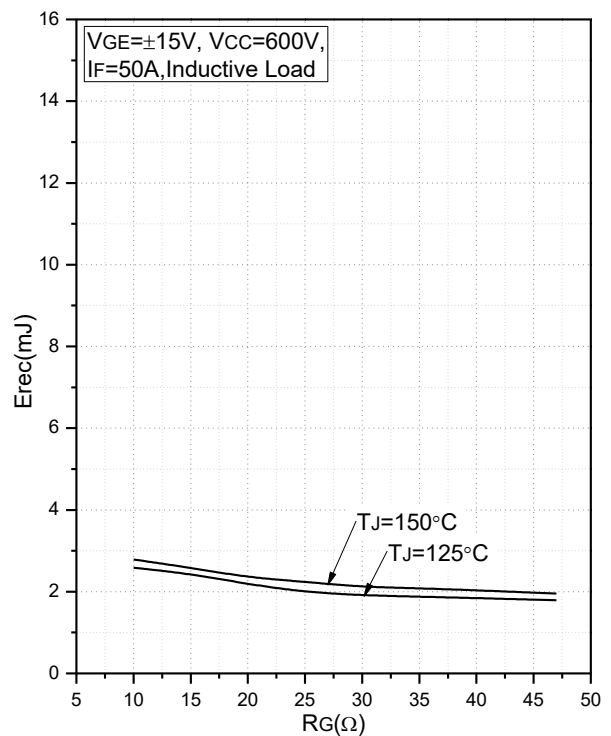


Fig.8 Typical Switching Loss vs. Gate Resistance(Inverter)

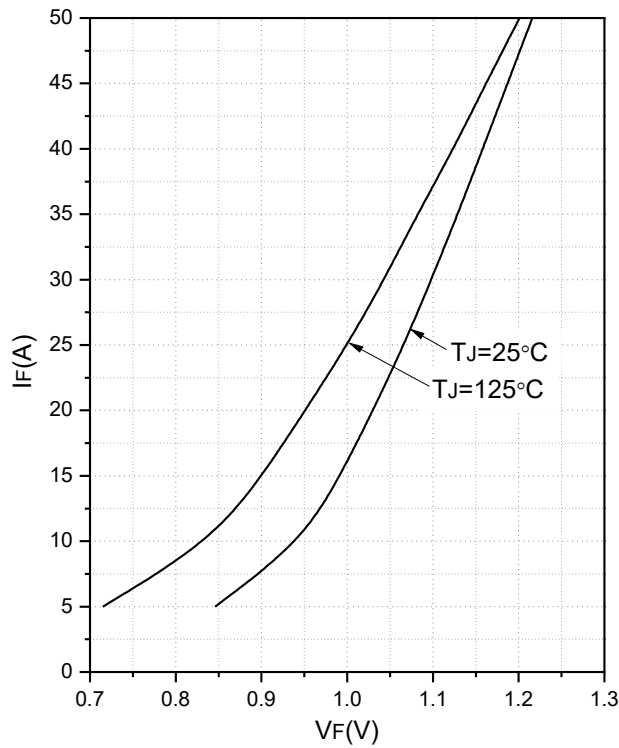


Fig.9 Forward Characteristics of Diode(Rectifier)

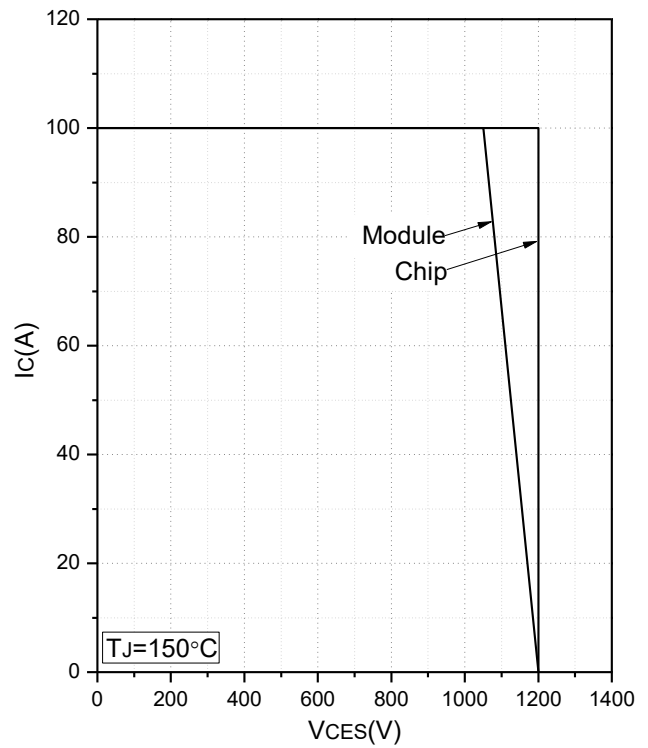


Fig.10 Reverse Bias Safe Operation Area (RBSOA)

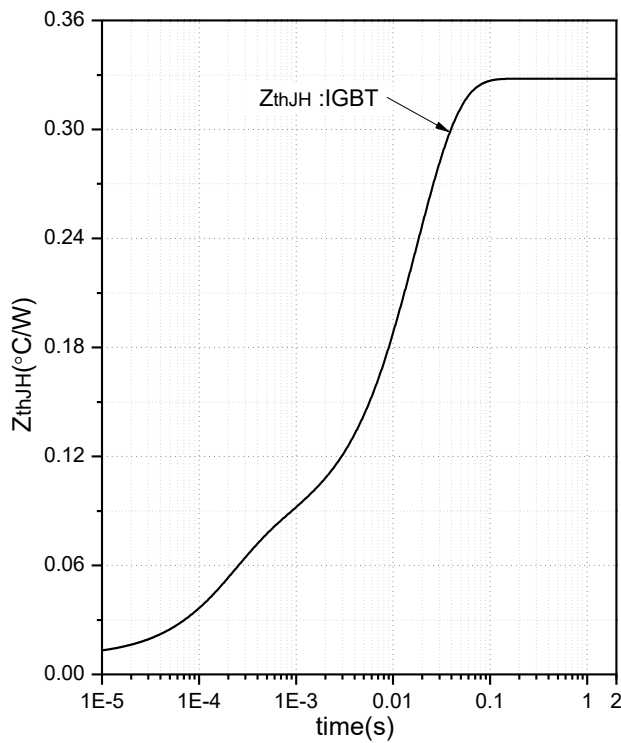


Fig.11 Transient Thermal Impedance(Inverter-IGBT)

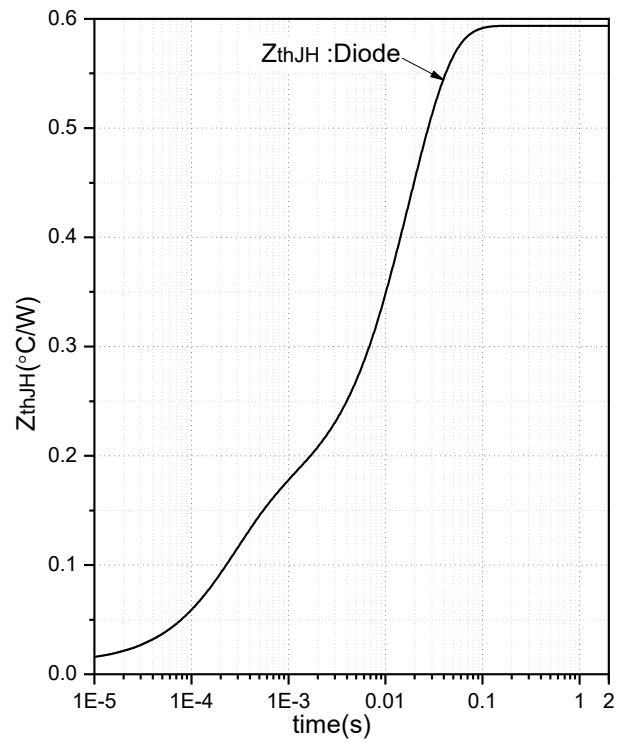


Fig.12 Transient Thermal Impedance(Inverter-Diode)

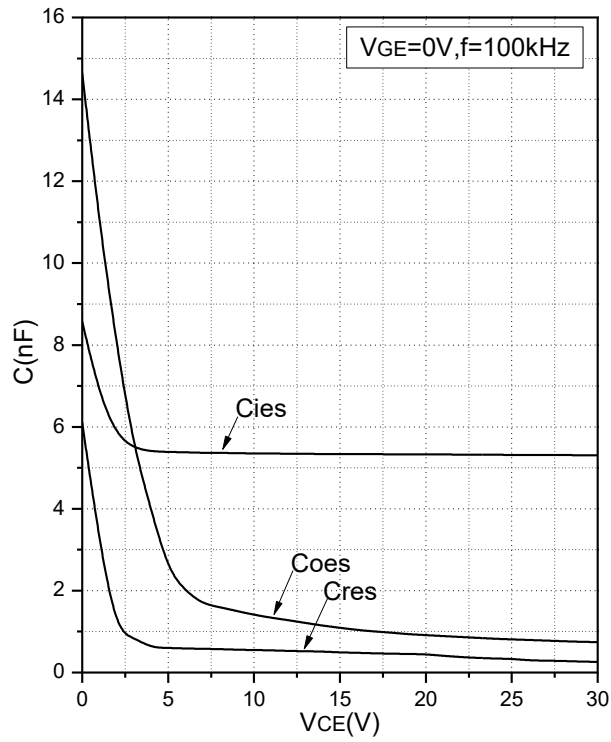


Fig.13 Capacitance Characteristics(Inverter)

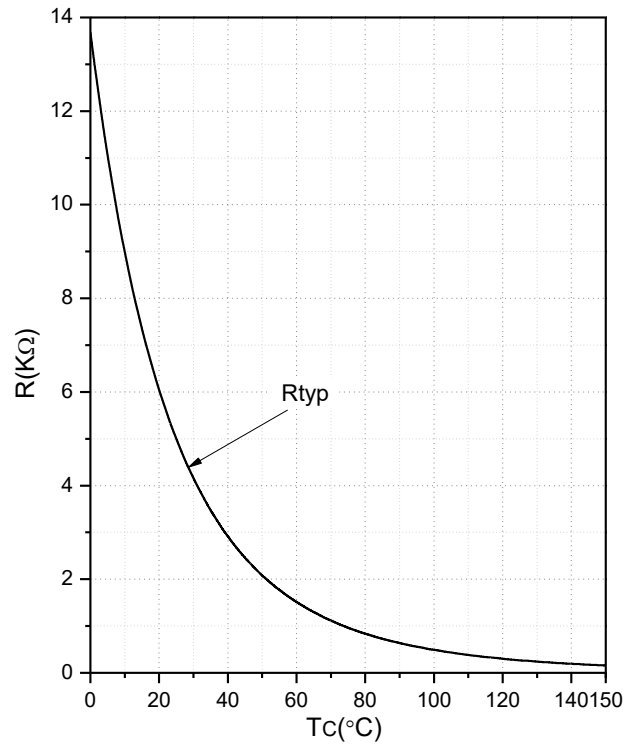


Fig.14 NTC Temperature Characteristics



Revision	Notes
01	Initial Release

Announcement

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