



GT40RFF120C7H

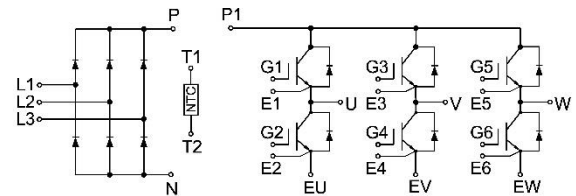
IGBT Module

Preliminary Data

Features:

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

Circuit Diagram



Applications:

- Motor Drives
- Air Conditioning
- Auxiliary Inverters

IGBT, Inverter Maximum Rated Values

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	$T_C=100^{\circ}\text{C}$	40	A
		$T_C=25^{\circ}\text{C}$	80	A
I_{CM}	Peak Collector Current Repetitive	$t_p=1\text{ms}$	80	A
P_D	Maximum Power Dissipation (IGBT)	$T_C=25^{\circ}\text{C}$ $T_{Jmax}=175^{\circ}\text{C}$	290	W



Electrical Characteristics of IGBT

Static Characteristics

Symbol	Description	Conditions	Min.	Typ.	Max.	Units
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=1mA, V_{CE}=V_{GE}, T_J=25^{\circ}C$	5.0	5.8	6.5	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=40A, V_{GE}=15V$				V
		$T_J=25^{\circ}C$		1.80	2.10	
		$T_J=125^{\circ}C$		2.10		
		$T_J=150^{\circ}C$		2.20		
I_{CES}	Collector-Emitter Leakage Current	$V_{GE}=0V, V_{CE}=V_{CES}, T_J=25^{\circ}C$			1	mA
I_{GES}	Gate-Emitter Leakage Current	$V_{GE}=\pm 20V, V_{CE}=0V, T_J=25^{\circ}C$			± 200	nA
C_{ies}	Input Capacitance	$V_{CE}=25V, V_{GE}=0V, f=100kHz, T_J=25^{\circ}C$		3.44		nF
C_{oes}	Output Capacitance			0.51		
C_{res}	Reverse Transfer Capacitance			0.32		

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	$V_{CC}=600V, I_C=40A, R_{Gon}=15\Omega, V_{GE}=\pm 15V, \text{Inductive Load}$	$T_J=25^{\circ}C$		92		ns
			$T_J=125^{\circ}C$		93		
			$T_J=150^{\circ}C$		94		
t_r	Rise Time	$V_{CC}=600V, I_C=40A, R_{Gon}=15\Omega, V_{GE}=\pm 15V, \text{Inductive Load}$	$T_J=25^{\circ}C$		46		ns
			$T_J=125^{\circ}C$		50		
			$T_J=150^{\circ}C$		50		
$t_{d(off)}$	Turn-off Delay Time	$V_{CC}=600V, I_C=40A, R_{Goff}=15\Omega, V_{GE}=\pm 15V, \text{Inductive Load}$	$T_J=25^{\circ}C$		183		ns
			$T_J=125^{\circ}C$		185		
			$T_J=150^{\circ}C$		189		
t_f	Fall Time	$V_{CC}=600V, I_C=40A, R_{Goff}=15\Omega, V_{GE}=\pm 15V, \text{Inductive Load}$	$T_J=25^{\circ}C$		258		ns
			$T_J=125^{\circ}C$		310		
			$T_J=150^{\circ}C$		315		
E_{on}	Turn-on Switching Loss	$V_{CC}=600V, I_C=40A, R_{Gon}=15\Omega, V_{GE}=\pm 15V, di/dt=720A/\mu s(T_J=150^{\circ}C), \text{Inductive Load}$	$T_J=25^{\circ}C$		2.48		mJ
			$T_J=125^{\circ}C$		2.68		
			$T_J=150^{\circ}C$		3.05		



E _{off}	Turn-off Switching Loss	V _{CC} =600V, I _C =40A, R _{Goff} =15Ω, V _{GE} =±15V, du/dt=2880V/μs(T _J =150°C), Inductive Load	T _J =25°C		3.21		mJ
			T _J =125°C		3.77		
			T _J =150°C		3.97		
Q _g	Total Gate Charge	V _{GE} =-15V...+15V	T _J =25°C		457		nC
RBSOA	I _C =80A, V _{CC} =1050V, V _P =1200V, R _G =15Ω, V _{GE} =+15V to 0V, T _J =150°C			Trapezoid			
I _{SC}	V _{CC} =600V, V _{GE} =±15V, t _p =10us, R _{Gon} =56Ω, R _{Goff} =56Ω, T _J =25°C				175		A
R _{θJC}	Thermal Resistance: Junction-to-Case (per IGBT)					0.517	°C/W

Diode, Inverter

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

V _{RRM}	Repetitive Peak Reverse Voltage	T _J =25°C	1200	V
I _F	Diode Continuous Forward Current		40	A
I _{FM}	Peak FWD Current Repetitive	t _p =1ms	80	A

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

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
V _{FM}	Forward Voltage	I _F =40A	T _J =25℃		1.80	2.10	V
			T _J =125℃		1.90		
			T _J =150℃		1.90		
I _{rr}	Peak Reverse Recovery Current	I _F =40A, di/dt=830A/μs(T _J =150℃), V _{rr} =600V, V _{GE} =-15V	T _J =25℃		53.7		A
			T _J =125℃		62.5		
			T _J =150℃		63.8		
t _{rr}	Reverse Recovery Time		T _J =25℃		164		ns
			T _J =125℃		186		
			T _J =150℃		186		
Q _{rr}	Reverse Recovery Charge		T _J =25℃		4.53		μC
			T _J =125℃		6.31		
			T _J =150℃		6.54		



E _{rec}	Reverse Recovery Energy	I _F =40A, di/dt=830A/μs(T _J =150°C), V _{rr} =600V, V _{GE} =-15V	T _J =25°C		1.56		mJ
			T _J =125°C		2.14		
			T _J =150°C		2.45		
R _{θJC}	Thermal Resistance: Junction-to-Case (per Diode)					0.720	°C/W

Diode, Rectifier

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

V _{RRM}	Repetitive Peak Reverse Voltage	T _J =25°C	1800	V
I _F	Diode Continuous Forward Current	T _J =25°C	16	A
I _{FRMSM}	Maximum RMS Forward Current per Chip	T _J =80°C	25	A
I _{FSM}	Surge Current @t _p =10ms	T _J =25°C	320	A
		T _J =125°C	240	
I ² t	I ² t - value	T _J =25°C	512	A ² s
		T _J =125°C	288	

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

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
V _F	Forward Voltage	I _F =16A	T _J =25°C		1.05		V
			T _J =125°C		1.00		
I _R	Reverse Current	V _R =1200V	T _J =25°C			1	mA
R _{θJC}	Thermal Resistance: Junction-to-Case (per Diode)					0.955	°C/W



Internal NTC-Thermistor Characteristics

R ₂₅	T _C =25℃	5		kΩ
△R/R	T _C =100℃, R ₁₀₀ =465Ω		±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	Min.	Typ.	Max.	Units
V _{IOS}	Isolation Voltage (All Terminals Shorted)	f=50Hz, 30s		4500	V
Internal Isolation		Al ₂ O ₃			
T _J	Maximum Junction Temperature			175	℃
T _{JOP}	Maximum Operating Junction Temperature Range	-40		+150	℃
T _{stg}	Storage Temperature	-40		+150	℃
CTI	Comparative Tracking Index	225			
R _{θCS}	Case-to-Sink Thermally (Conductive Grease Applied)			0.05	℃/W
T	Mounting Screw:M4	1.5		2.0	N·m
G	Weight		31		g



Ordering Information Table

Device code	G	T	40	RFF	120	C7	H
	①	②	③	④	⑤	⑥	⑦

- ① - IGBT Module
- ② - Trench, Low Switching Losses IGBT
- ③ - Rated Current (40=40A)
- ④ - Circuit Configuration: (Rectifier + Full Bridge)
- ⑤ - Rated Voltage (120=1200V)
- ⑥ - Package Type
- ⑦ - Test Level (Pass the Important Reliability Test-Industrial Grade)

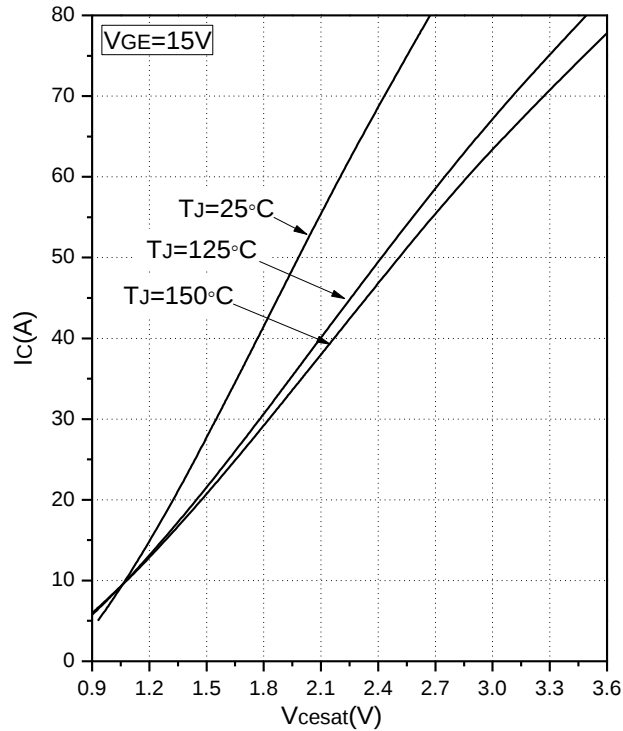


Fig.1 Typical Saturation Voltage Characteristics(Inverter)

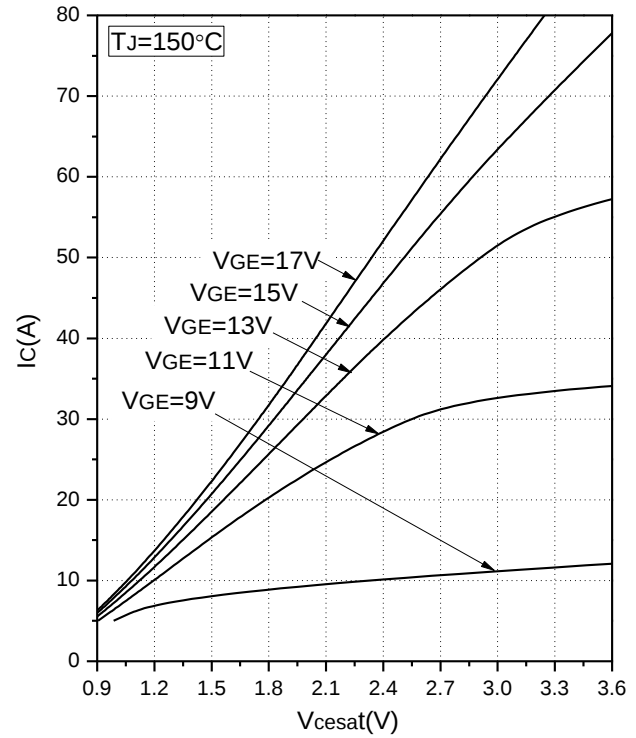


Fig.2 Typical Output Characteristics(Inverter)

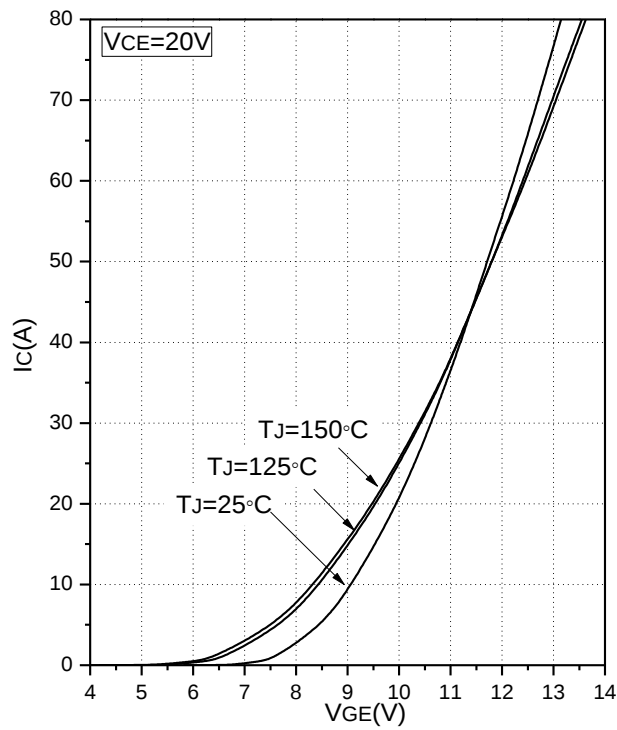


Fig.3 Transfer Characteristic(Inverter)

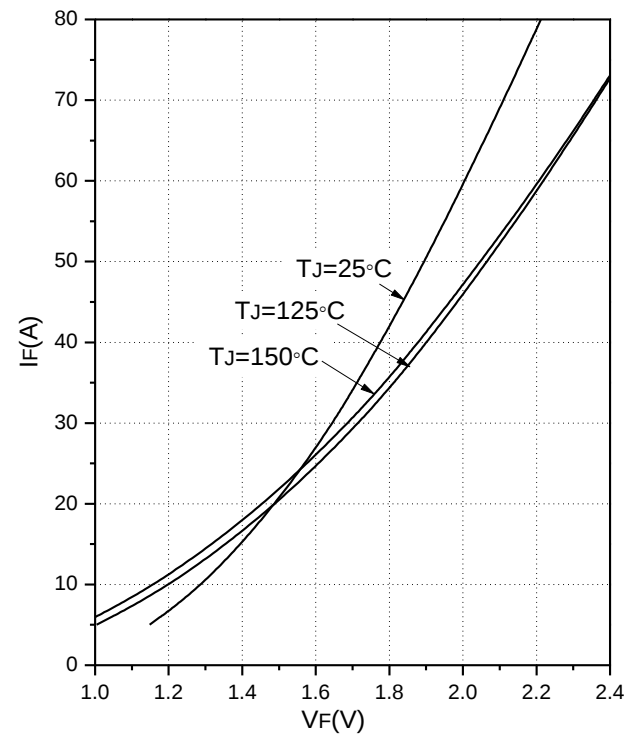


Fig.4 Forward Characteristics of FWD(Inverter)

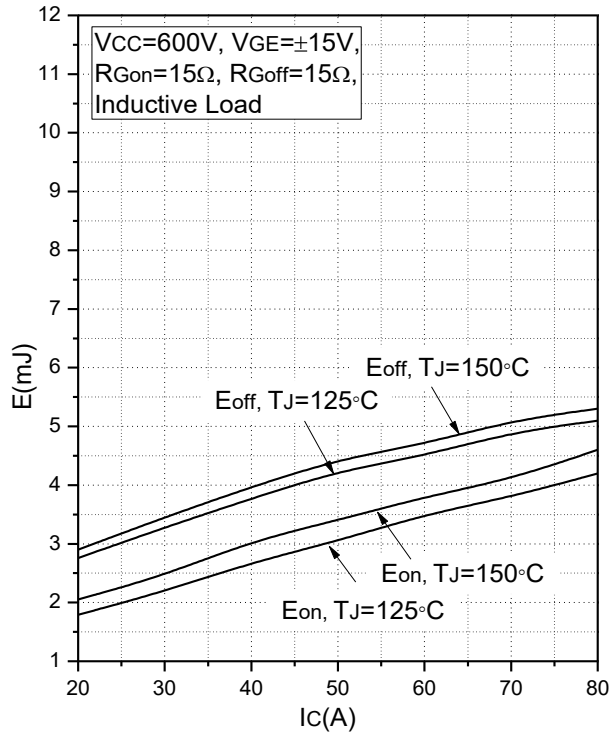


Fig.5 Typical Switching Loss vs. Collector Current(Inverter)

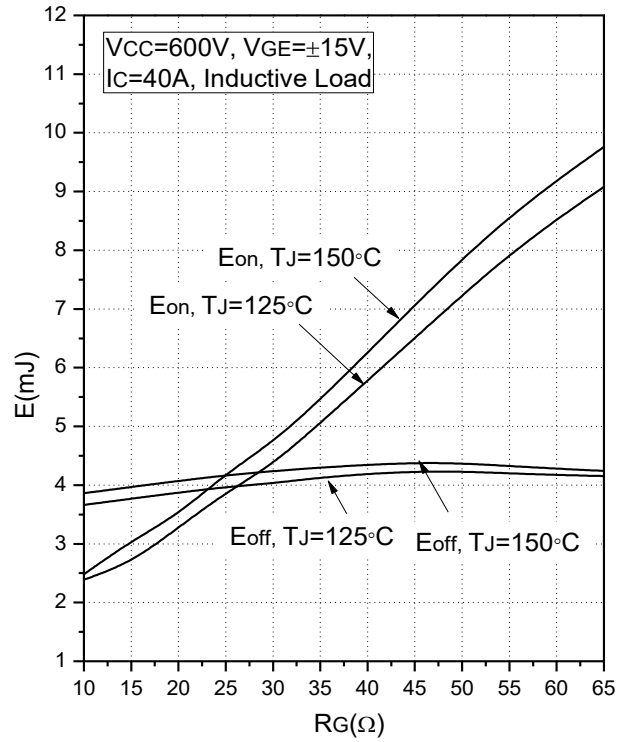


Fig.6 Typical Switching Loss vs. Gate Resistance(Inverter)

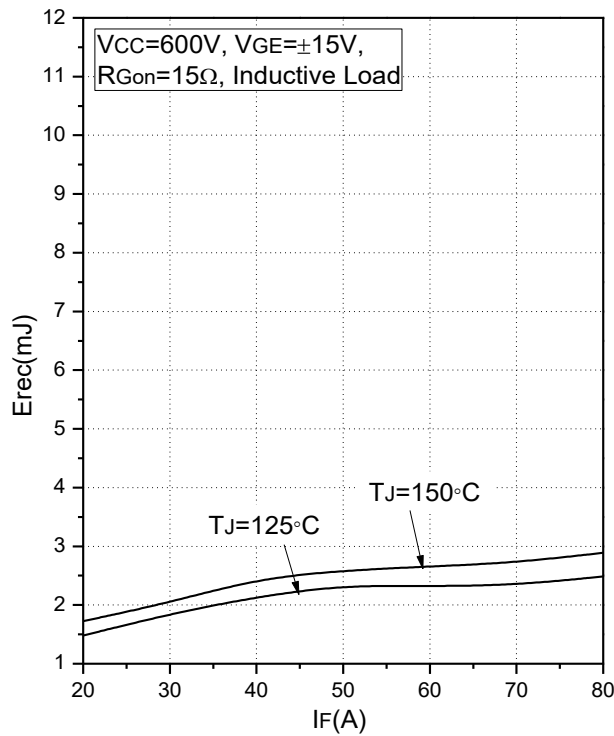


Fig.7 Typical Switching Loss vs. Forward Current(Inverter)

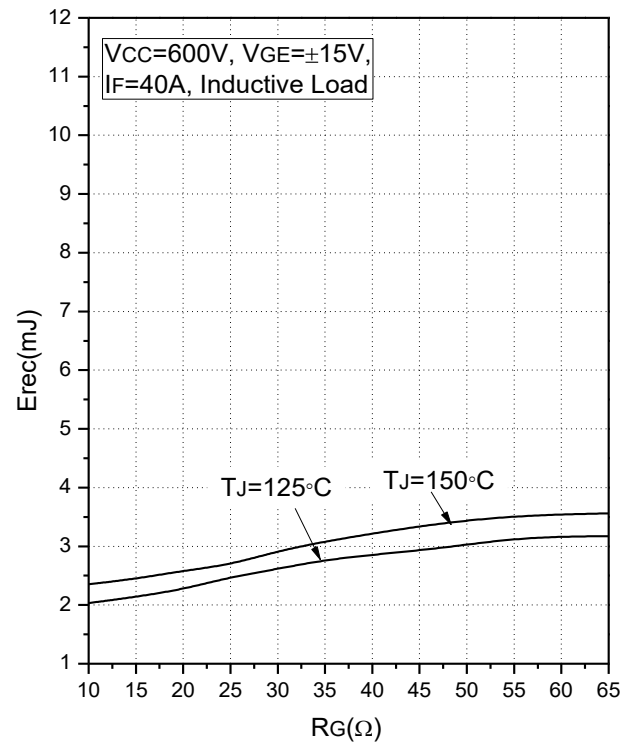


Fig.8 Typical Switching Loss vs. Gate Resistance(Inverter)

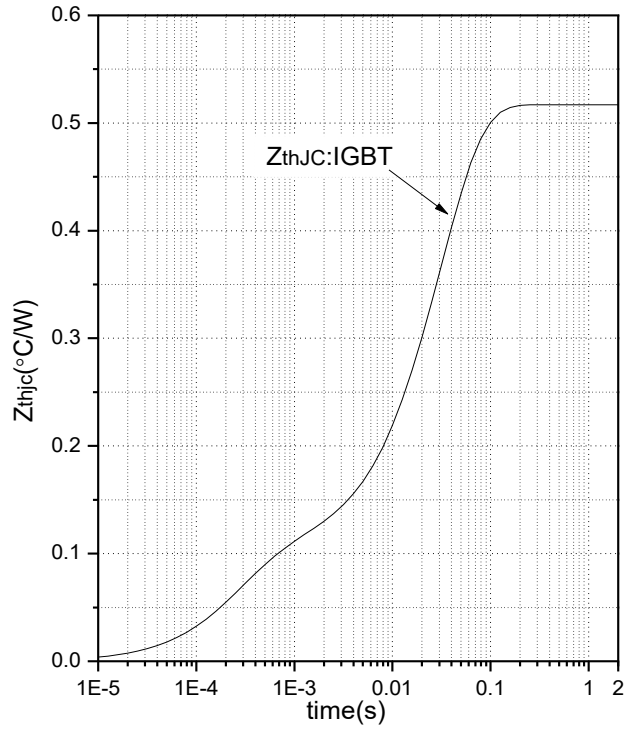


Fig.9 Transient Thermal Impedance(Inverter)

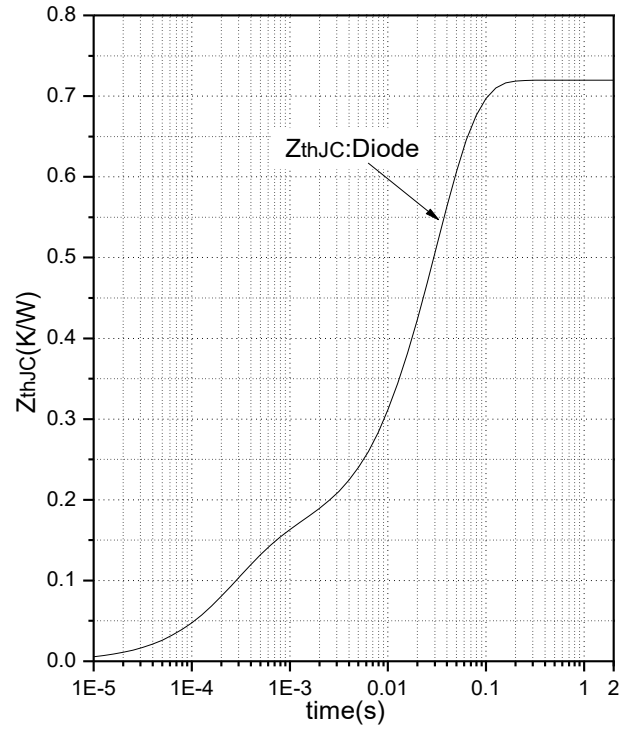


Fig.10 Transient Thermal Impedance(Inverter)

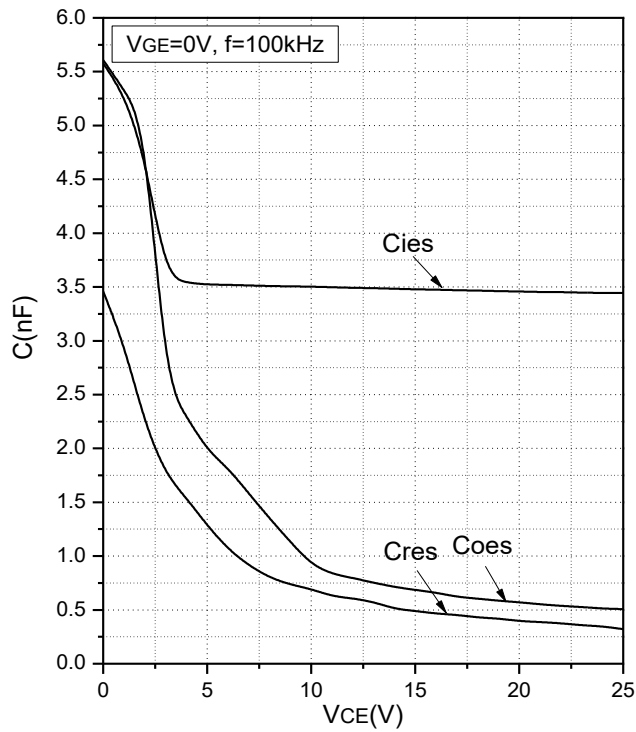


Fig.11 Capacitance Characteristics(Inverter)

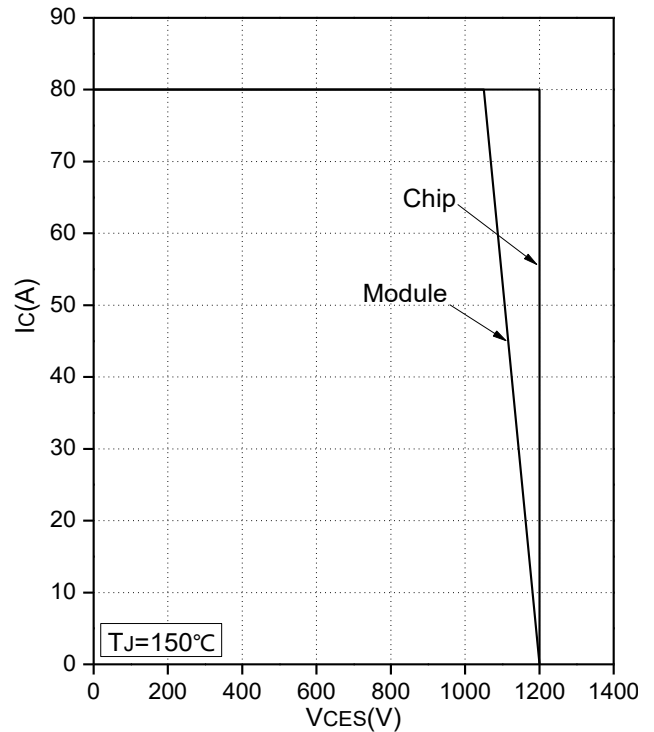


Fig.12 Reverse Bias Safe Operation Area (RBSOA)

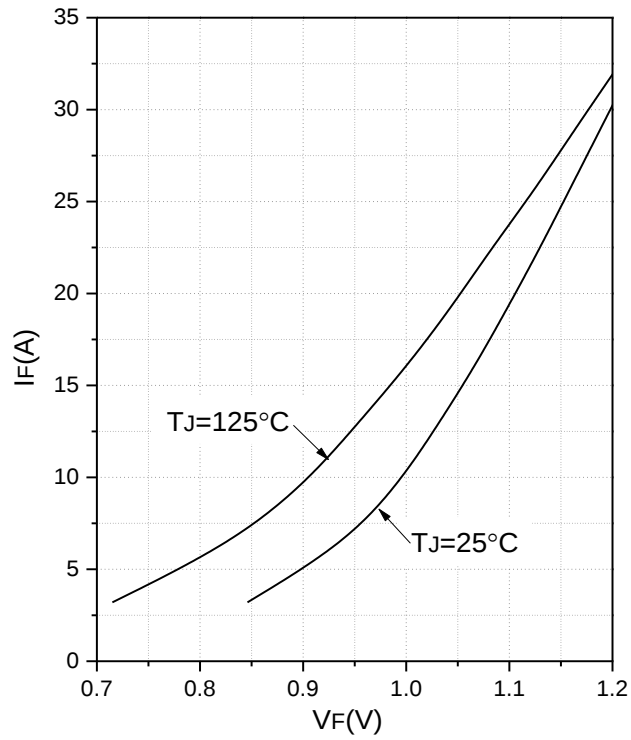


Fig.13 Forward Characteristics of Diode (Rectifier)

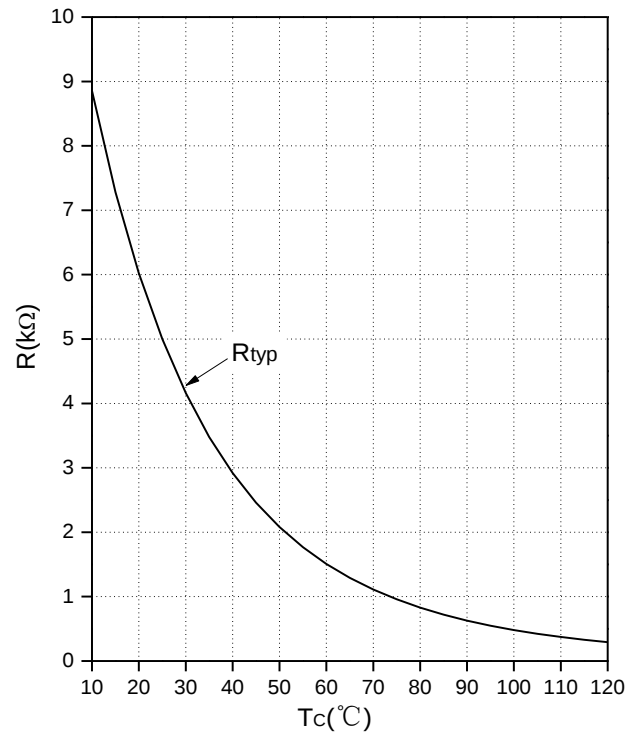


Fig.14 NTC Temperature Characteristics



Date	Revision	Notes
02/04/2024	01	Initial Release

Announcements

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The released datasheet would be issued with “REV.” + “alphabet characters”.