



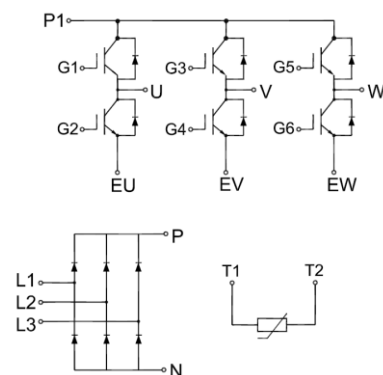
GT40RFF120B9H

IGBT Module

Preliminary Data

Features:

- Trench & Field Stop IGBT
- Short Circuit Rated >10 μ 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



Applications:

- Industrial Inverters
- Servo Applications

IGBT, Inverter Maximum Rated Values

Symbol	Description	Conditions	Values	Units
V _{CES}	Collector-Emitter Blocking Voltage	T _J =25℃	1200	V
V _{GES}	Gate-Emitter Voltage		±20	V
I _C	Continuous Collector Current	T _C =100℃	40	A
		T _C =25℃	80	A
I _{CM}	Peak Collector Current Repetitive	t _p =1ms	80	A
P _D	Maximum Power Dissipation per IGBT	T _C =25℃ T _{Jmax} =175℃	350	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	$I_C=40A, V_{GE}=15V$	$T_J=25^{\circ}C$	1.80	2.10	V
			$T_J=125^{\circ}C$	2.10		V
			$T_J=150^{\circ}C$	2.20		V
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	$V_{CE}=25V, V_{GE}=0V, f=100kHz, T_J=25^{\circ}C$		2.19		nF
C_{oes}	Output Capacitance			0.19		nF
C_{res}	Reverse Transfer Capacitance			0.04		nF

Switching Characteristics

t _{d(on)}	Turn-on Delay Time	V _{CC} =600V, I _C =40A, R _{Gon} =15Ω, V _{GE} =±15V, Inductive Load	T _J =25℃		92		ns
			T _J =125℃		93		
			T _J =150℃		94		
t _r	Rise Time		T _J =25℃		46		ns
			T _J =125℃		50		
			T _J =150℃		50		
t _{d(off)}	Turn-off Delay Time	V _{CC} =600V, I _C =40A, R _{Goff} =15Ω, V _{GE} =±15V, Inductive Load	T _J =25℃		183		ns
			T _J =125℃		185		
			T _J =150℃		189		
t _f	Fall Time		T _J =25℃		258		ns
			T _J =125℃		310		
			T _J =150℃		315		
E _{on}	Turn-on Switching Loss	V _{CC} =600V, I _C =40A, R _{Gon} =15Ω, V _{GE} =±15V, di/dt=720A/μs(T _J =150℃), Inductive Load	T _J =25℃		3.29		mJ
			T _J =125℃		3.40		
			T _J =150℃		3.87		



E _{off}	Turn-off Switching Loss	V _{CC} =600V, I _C =40A, R _{Goff} =15Ω, V _{GE} =±15V, du/dt=921V/μs(T _J =150°C), Inductive Load	T _J =25°C		3.01		mJ
			T _J =125°C		3.54		
			T _J =150°C		3.73		
Q _g	Total Gate Charge	V _{GE} =-15V...+15V	T _J =25°C		457		nC
R _{g internal}	Internal Gate Resistor		T _J =25°C		0		Ω
SCSOA	V _{CC} =600V, V _{GE} =±15V, t _p =10us, R _{Gon} =56Ω, R _{Goff} =56Ω, T _J =25°C				175		A
R _{θJH}	Thermal Resistance: Junction-to-Heatsink (per IGBT, λgrease=3.4W/(m·K))					0.43	°C/W

Diode, Inverter Maximum Rated Values

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	40	A
I _{FM}	Peak FWD Current Repetitive	t _p =1ms	80	A

Electrical Characteristics of Diode

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
V _{FM}	Forward Voltage	I _F =40A	T _J =25℃		1.80		V
			T _J =125℃		1.90		
			T _J =150℃		1.90		
I _{rr}	Peak Reverse Recovery Current	I _F =40A, -di _F /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 _F /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 _{θJH}	Thermal Resistance: Junction-to- Heatsink (per Diode, λgrease=3.4W/(m·K))					0.60	°C/W

Diode, Rectifier Maximum Rated Values

Symbol	Description	Conditions	Values	Units
V _{RRM}	Repetitive Peak Reverse Voltage	T _J =25°C	1800	V
I _{FRMSM}	Maximum RMS Forward Current per Chip	T _J =80°C	50	A
I _{RMSM}	Maximum RMS Current at Rectifier Output	T _J =80°C	60	A
I _{FSM}	Surge Current @t _p =10 ms	T _J =25°C	420	A
		T _J =150°C	350	
I ² t	I ² t - value	T _J =25°C	900	A ² s
		T _J =150°C	650	

Electrical Characteristics of Diode

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
V _F	Forward Voltage	I _F =25A	T _J =25°C		1.10		V
			T _J =150°C		1.00		
I _R	Reverse Current	V _R =1600V	T _J =25°C			1	mA
R _{θJH}	Diode Thermal Resistance: Junction-to- Heatsink(λgrease=3.4W/(m·K))					0.63	°C/W



Internal NTC-Thermistor Characteristics

Symbol	Conditions	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		Min.	Typ.	Max.	Units
V _{IOS}	Isolation Voltage (All Terminals Shorted)	RMS, f=50Hz, 30s	4500			V
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		200			
T	Mounting Torque:M4		1.5		1.8	N·m
G	Weight			40		g



Ordering Information Table

Device code	G	T	40	RFF	120	B9	H
	①	②	③	④	⑤	⑥	⑦

- ① - IGBT Module
- ② - Trench & Field Stop IGBT
- ③ - Rated Current (40=40A)
- 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)

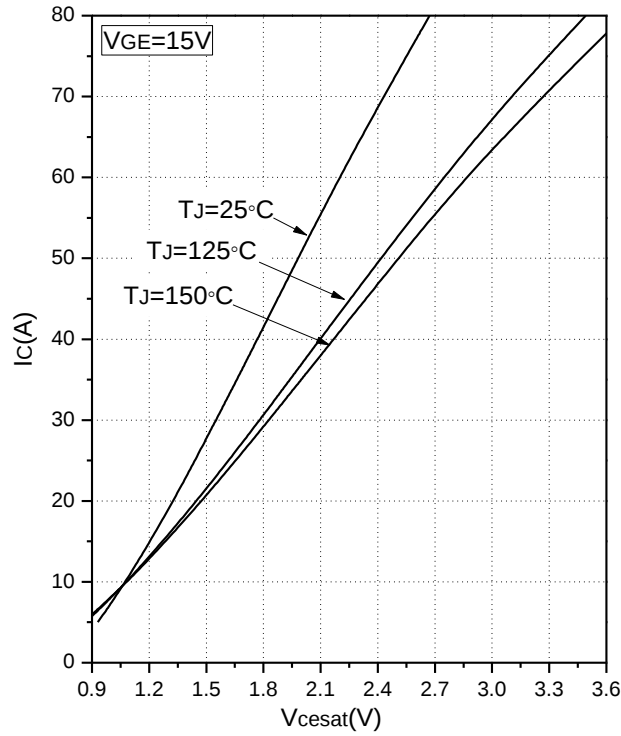


Fig.1 Typical Saturation Voltage Characteristics

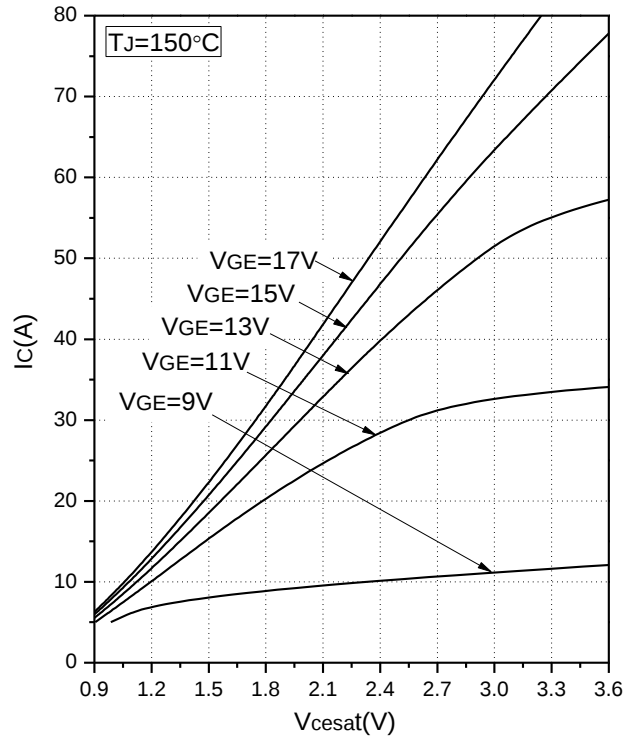


Fig.2 Typical Output Characteristics

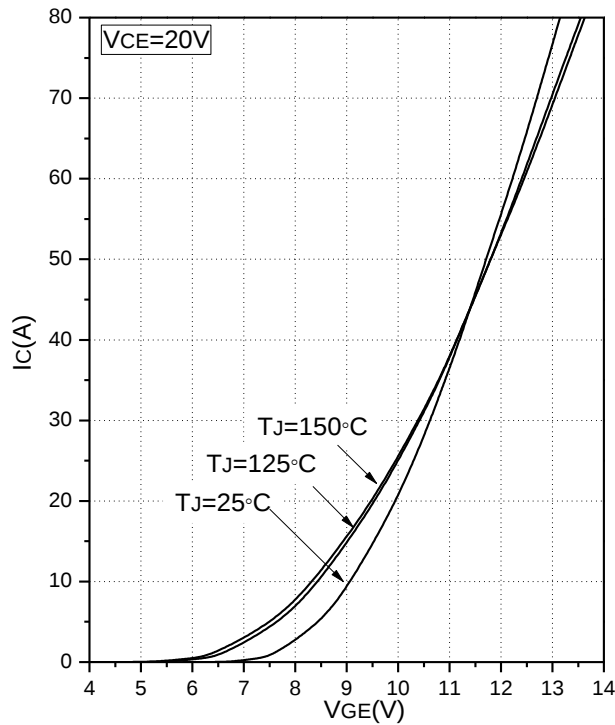


Fig.3 Transfer Characteristic

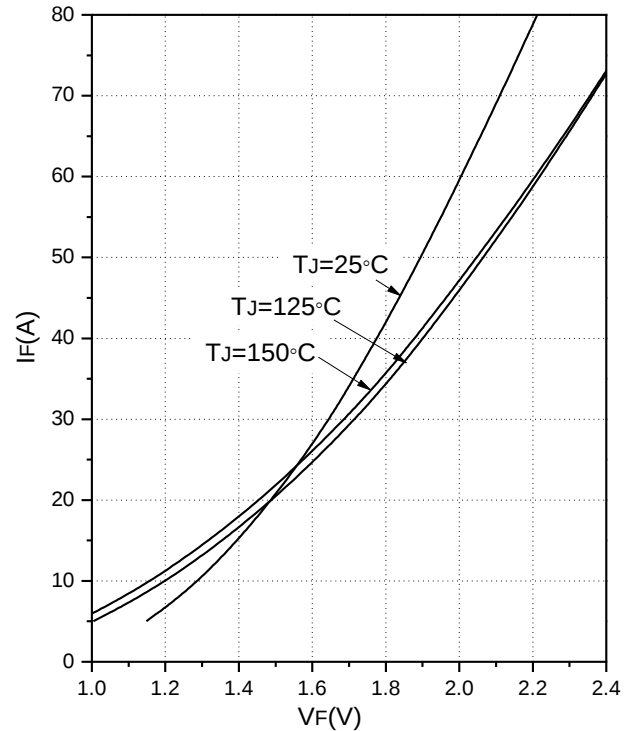


Fig.4 Forward Characteristics of Diode

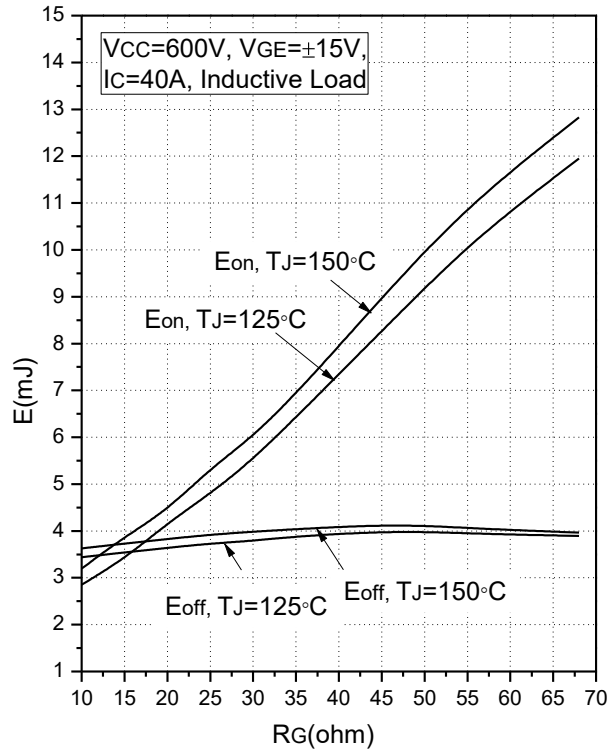


Fig.5 Typical Switching Loss vs. Gate Resistance

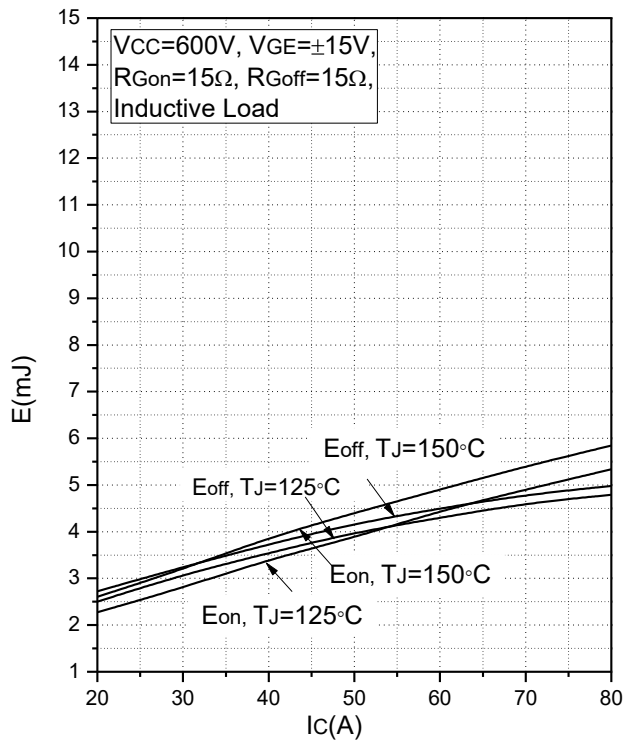


Fig.6 Typical Switching Loss vs. Collector Current

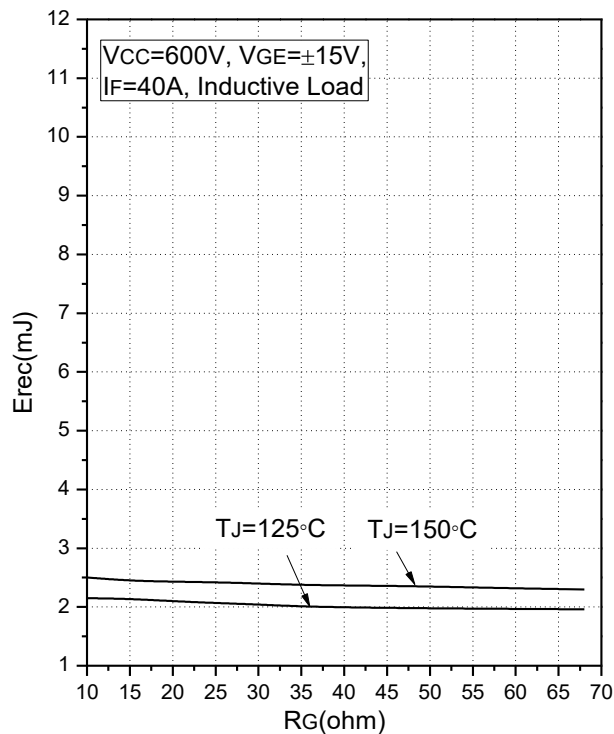


Fig.7 Typical Switching Loss vs. Gate Resistance

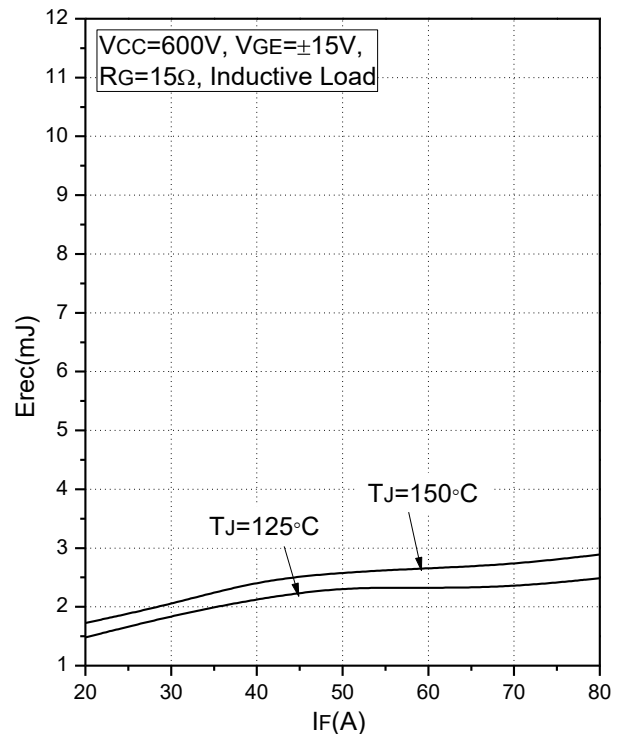


Fig.8 Typical Switching Loss vs. Forward Current

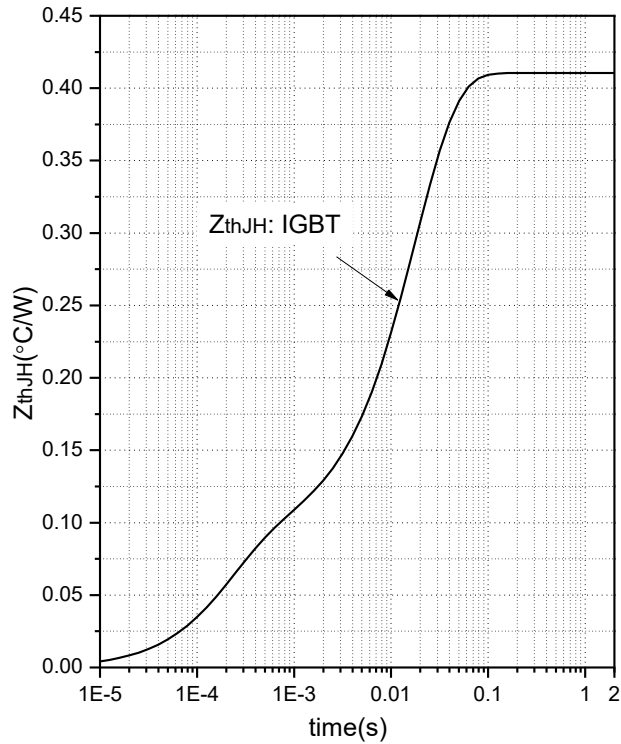


Fig.9 Transient Thermal Impedance (Inverter-IGBT)

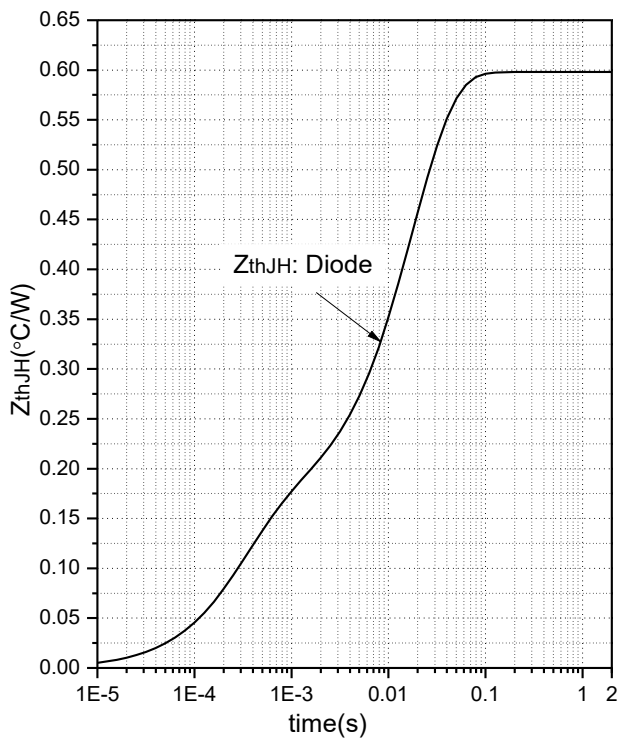


Fig.10 Transient Thermal Impedance (Inverter-Diode)

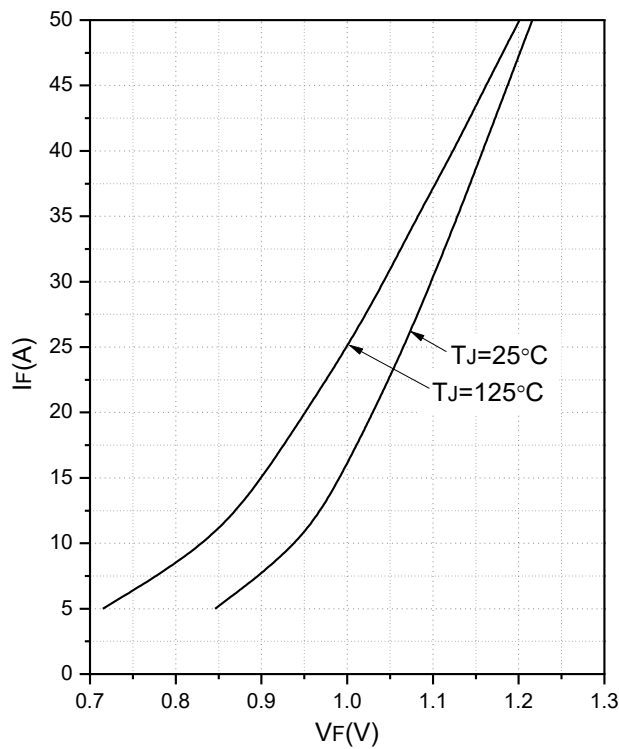


Fig.11 Forward Characteristics of Diode (Rectifier)

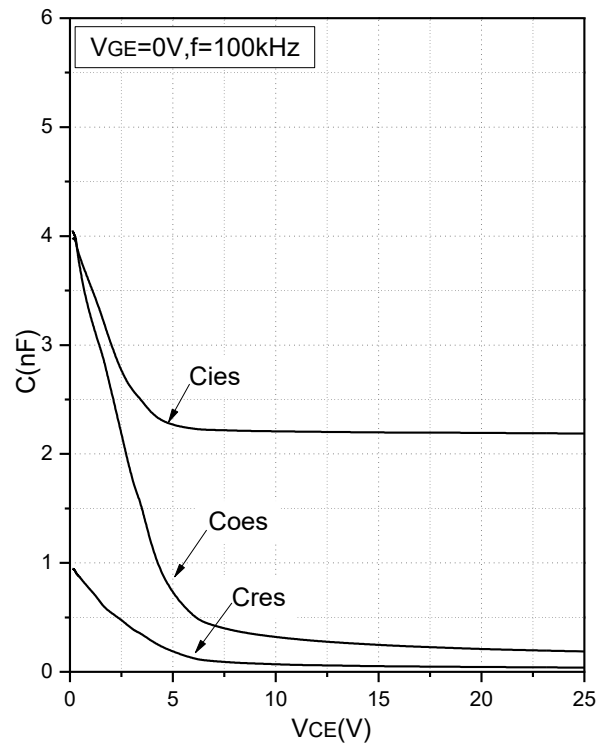


Fig.12 Capacitance Characteristics

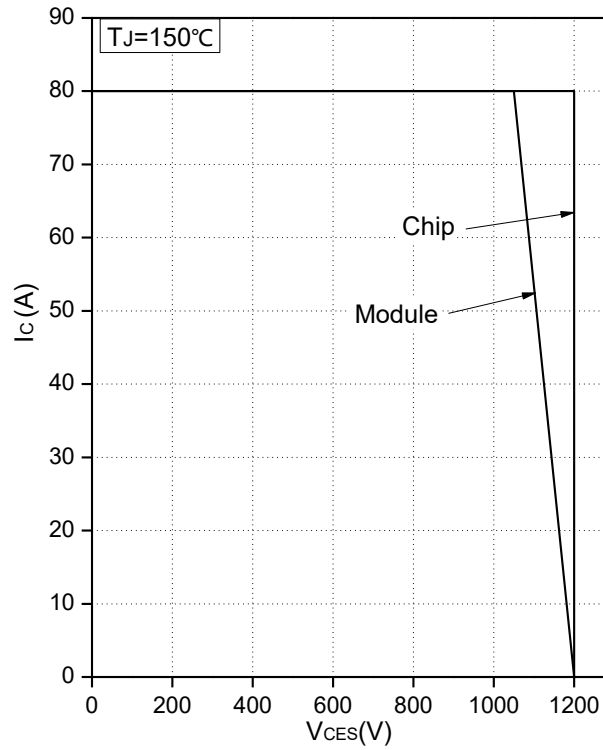


Fig.13 Reverse Bias Safe Operation Area (RBSOA)

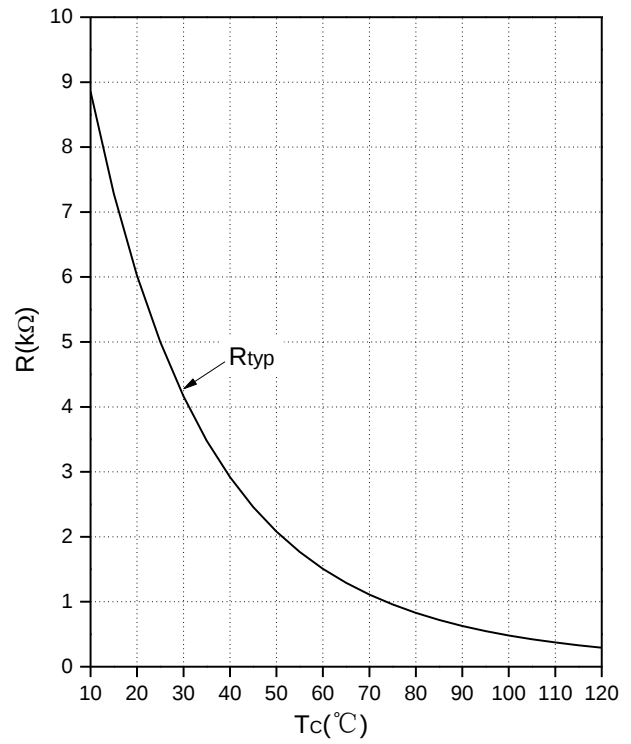
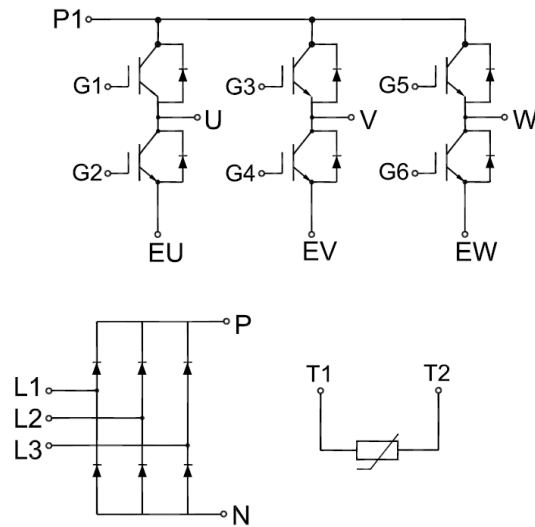


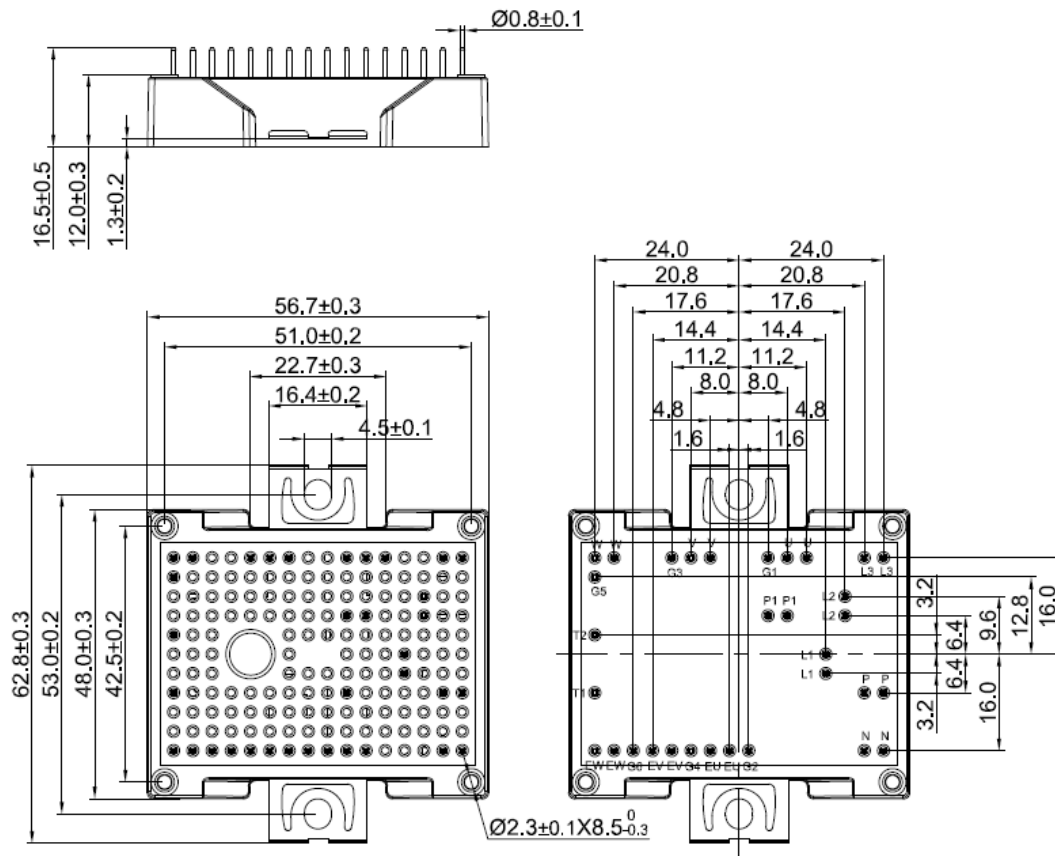
Fig.14 NTC Temperature Characteristics



Internal Circuit:



Package Outline (Unit: mm):





Revision	Notes
01	Initial Release

Announcement

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