

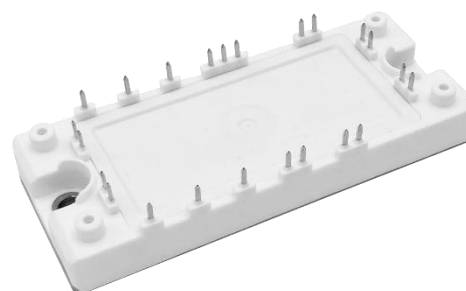
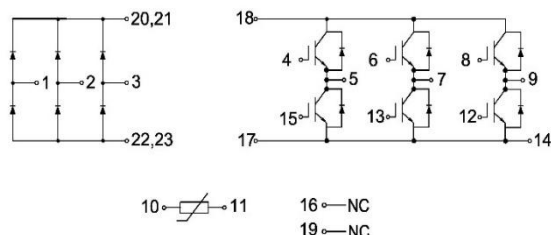
GT50RFF120T5H-T4

Circuit Diagram

IGBT Module

Features:

- $V_{CES}=1200V$ $I_C=50A$ Trench & Field Stop IGBT Module
- Short Circuit Capability
- Low Switching Loss
- 100% RBSOA Tested($2 \times I_C$)
- Low Stray Inductance
- Lead Free, Compliant with RoHS Requirement



Applications:

- Auxiliary Inverters
- Motor Drives
- Servo Drives

Type	Package	Marking
GT50RFF120T5H-T4	T5	GT50RFF120T5H-T4

IGBT, Inverter

Maximum Rated Values ($T_C=25^\circ C$ unless otherwise specified)

V_{CES}	Collector-Emitter Blocking Voltage		1200	V
V_{GES}	Gate-Emitter Voltage		± 20	V
I_C	Continuous Collector Current Limited by T_{Jmax}	$T_C=100^\circ C$	50	A
		$T_C=25^\circ C$	100	A
I_{CM}	Peak Collector Current Repetitive	T_p limited by T_{Jmax}	100	A
P_D	Maximum Power Dissipation (IGBT)	$T_C=25^\circ C, T_{Jmax}=175^\circ C$	300	W



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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	5.8	6.6	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=50\text{A}$, $V_{GE}=15\text{V}$	$T_J=25^{\circ}\text{C}$	1.85	2.25	V
			$T_J=125^{\circ}\text{C}$	2.37		V
			$T_J=175^{\circ}\text{C}$	2.53		V
I_{CES}	Collector-Emitter Leakage Current	$V_{GE}=0\text{V}$, $V_{CE}=1200\text{V}$, $T_J=25^{\circ}\text{C}$			1	mA
I_{GES}	Gate-Emitter Leakage Current	$V_{GE}=20\text{V}$, $V_{CE}=0\text{V}$, $T_J=25^{\circ}\text{C}$			200	nA
C_{ies}	Input Capacitance	$V_{CE}=25\text{V}$, $V_{GE}=0\text{V}$, $f=100\text{kHz}$		5.41		nF
C_{oes}	Output Capacitance			0.69		nF
C_{res}	Reverse Transfer Capacitance			0.06		nF

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	$V_{CC}=600V, I_C=50A,$ $R_{Gon}=15\Omega, V_{GE}=\pm 15V,$ Inductive Load	$T_J=25^{\circ}C$		84		ns
			$T_J=125^{\circ}C$		85		
			$T_J=175^{\circ}C$		85		
t_r	Rise Time		$T_J=25^{\circ}C$		35		ns
			$T_J=125^{\circ}C$		39		
			$T_J=175^{\circ}C$		40		
$t_{d(off)}$	Turn-off Delay Time		$T_J=25^{\circ}C$		210		ns
			$T_J=125^{\circ}C$		238		
			$T_J=175^{\circ}C$		246		
t_f	Fall Time	$T_J=25^{\circ}C$		205		ns	
		$T_J=125^{\circ}C$		260			
		$T_J=175^{\circ}C$		305			
E_{on}	Turn-on Switching Loss	$V_{CC}=600V, I_C=50A,$ $R_{Gon}=15\Omega, V_{GE}=\pm 15V,$ $di/dt=1000A/\mu s(T_J=175^{\circ}C)$ Inductive Load	$T_J=25^{\circ}C$		4.0		mJ
		$T_J=125^{\circ}C$		5.4			
		$T_J=175^{\circ}C$		6.3			

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E _{off}	Turn-off Switching Loss	V _{CC} =600V, I _C =50A, R _{Goff} =15Ω, V _{GE} =±15V, du/dt=5700V/μs(T _J =175°C) Inductive Load	T _J =25°C		3.7		mJ
			T _J =125°C		4.8		
			T _J =175°C		5.4		
Q _g	Total Gate Charge	V _{GE} =+15V...-15V	T _J =25°C		300		nC
R _{G (int)}	Internal Gate Resistance		T _J =25°C		3		Ω
T _{SC}	V _{CC} =600V, V _{GE} =±15V, T _J =175°C ^{note1}					10	us
R _{θJC}	IGBT Thermal Resistance: Junction-to-Case (per IGBT)					0.499	°C/W
R _{θCS}	IGBT Thermal Resistance: Case-to-Sink (per IGBT) (per IGBT, λ _{grease} = 1 W/(m · K))				0.276		°C/W

note1: Short circuit withstand time cannot exceed 10us under specified condition

Diode, Inverter

Maximum Rated Values of Diode (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		50	A
I _{FM}	Diode Maximum Forward Current	tp=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°C		1.73	2.10	V
			T _J =125°C		1.85		
			T _J =175°C		1.84		
t _{rr}	Reverse Recovery Time	I _F =50A, -diF/dt=1200A/μs(T _J =175°C), V _R =600V, V _{GE} =-15V	T _J =25°C		358		ns
			T _J =125°C		515		
			T _J =175°C		633		
I _{rr}	Peak Reverse Recovery Current		T _J =25°C		46		A
			T _J =125°C		46		
			T _J =175°C		47		
Q _{rr}	Reverse Recovery Charge		T _J =25°C		5.5		μC
			T _J =125°C		9.0		
			T _J =175°C		11.2		



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E _{rec}	Reverse Recovery Energy	I _F =50A, -diF/dt=1200A/μs(T _J =175°C), V _R =600V, V _{GE} =-15V	T _J =25°C		2.1		mJ
			T _J =125°C		3.6		
			T _J =175°C		4.6		
R _{θJC}	Diode Thermal Resistance: Junction-to-Case (per Diode)					0.920	°C/W
R _{θCS}	Diode Thermal Resistance: Case-to-Sink (per Diode, λ _{grease} = 1 W/(m • K))				0.508		°C/W

Diode, Rectifier

Maximum Rated Values ($T_C=25^\circ C$ unless otherwise specified)

V_{RRM}	Repetitive Peak Reverse Voltage	$T_J=25^\circ C$	1600	V
I_{FRMSM}	Maximum RMS Forward Current per Chip	$T_J=25^\circ C$	55	A
I_{RMSM}	Maximum RMS Forward Current at Rectifier Output	$T_J=80^\circ C$	80	A
I_{FSM}	Surge Current @ $t_p=10ms$	$T_J=25^\circ C$	630	A
		$T_J=150^\circ C$	500	
I^2t	I^2t - value	$T_J=25^\circ C$	1980	A^2s
		$T_J=150^\circ C$	1250	

Electrical Characteristics of Diode ($T_C=25^\circ C$ unless otherwise specified)

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
V_F	Forward Voltage	$I_F=50A$	$T_J=25^\circ C$		1.29		V
			$T_J=150^\circ C$		1.31		
I_R	Reverse Current	$V_R=1600V$	$T_J=25^\circ C$			1	mA
$R_{\theta JC}$	Thermal Resistance: Junction-to-Case (per Diode)					0.726	$^\circ C/W$
$R_{\theta CS}$	Diode Thermal Resistance: Case-to-Sink (per Diode, $\lambda_{grease} = 1 W/(m \cdot K)$)				0.401		$^\circ C/W$



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Internal NTC-Thermistor Characteristics

Symbol	Conditions	Min.	Typ.	Max.	Units.
R ₂₅	T _C =25°C		5		kΩ
ΔR/R	T _C =100°C, R ₁₀₀ =465Ω	-5		+5	%
P ₂₅	T _C =25°C			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 _{iso}	Isolation Voltage (All Terminals Shorted) RMS, f=50Hz, 60s		2500		V
T _J	Maximum Junction Temperature	-40		175	°C
T _{JOP}	Maximum Operating Junction Temperature Range ^{note2}	-40		150	°C
T _{stg}	Storage Temperature	-40		125	°C
CTI	Comparative Tracking Index		200		
T	Mounting Screw:M5	3		6	N·m
G	Weight		190		g

note2: T_{JOP}> 150°C is allowed for operation at overload conditions.

Ordering Information Table

Device code	G	T	50	RFF	120	T5	H	-	T4
	①	②	③	④	⑤	⑥	⑦		⑧

- ① - IGBT Module
- ② - Field Stop Trench Gate 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)
- ⑧ - Internal Control Code



Characteristic diagram

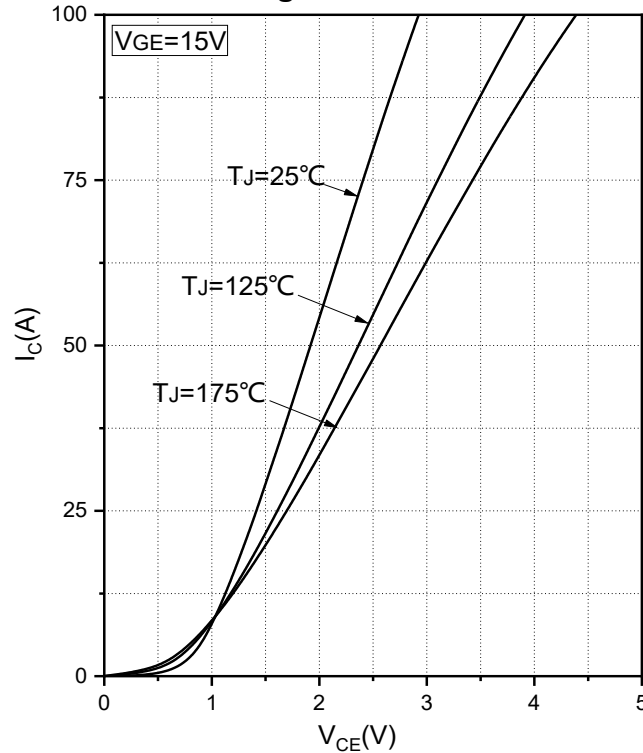


Fig.1 Typical Saturation Voltage Characteristics

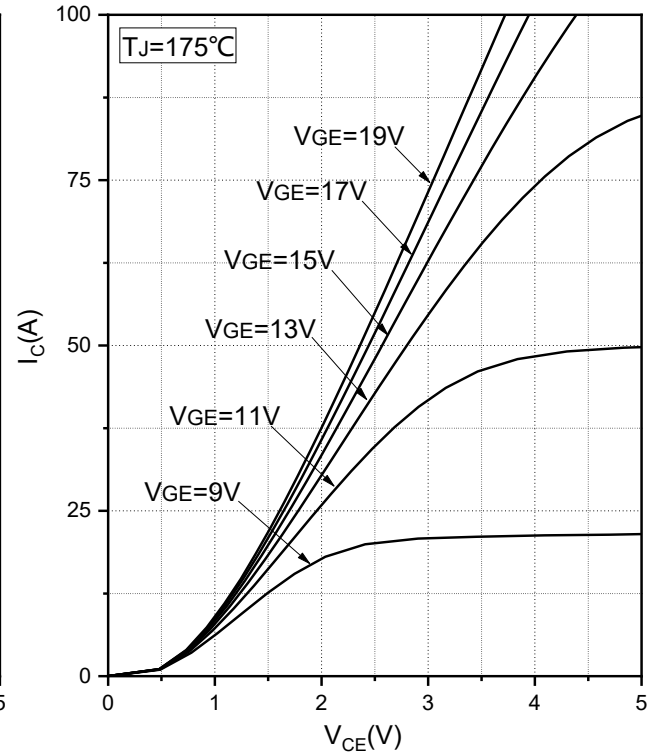


Fig.2 Typical Output Characteristics

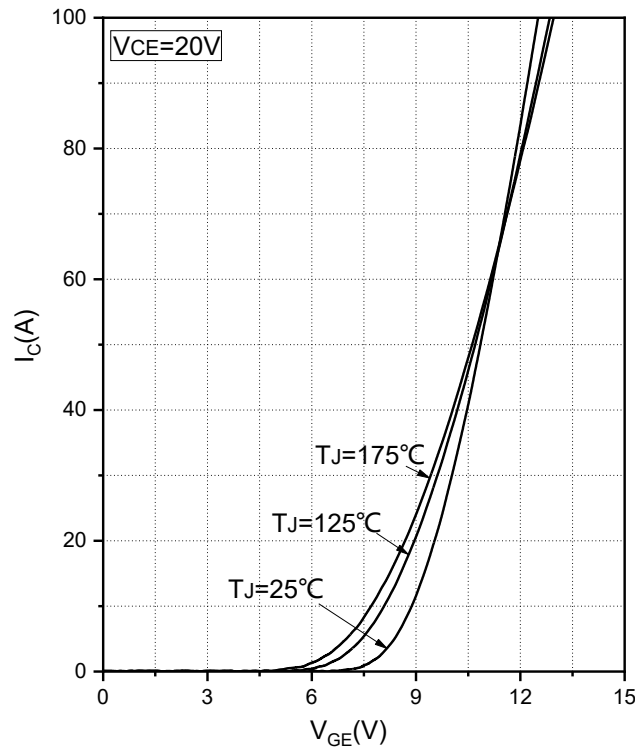


Fig.3 Transfer Characteristic

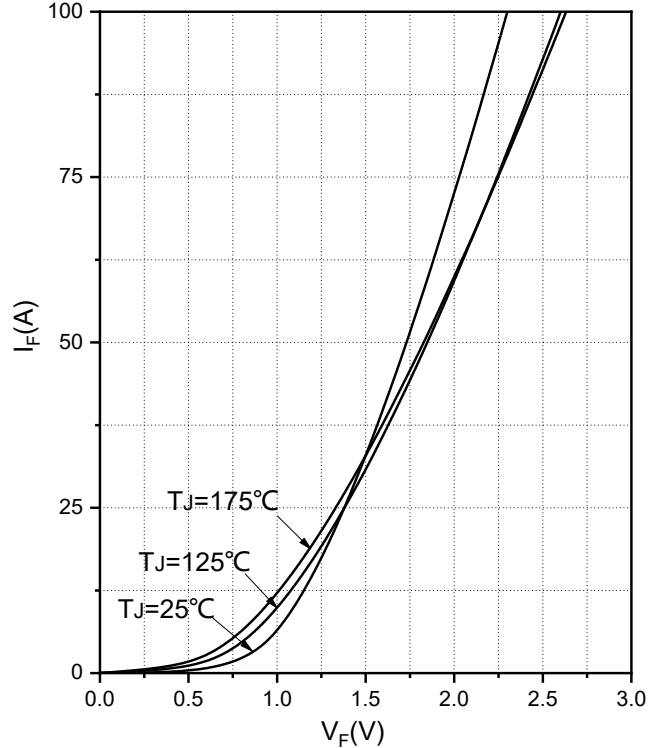


Fig.4 Forward Characteristics of Diode(Inverter)

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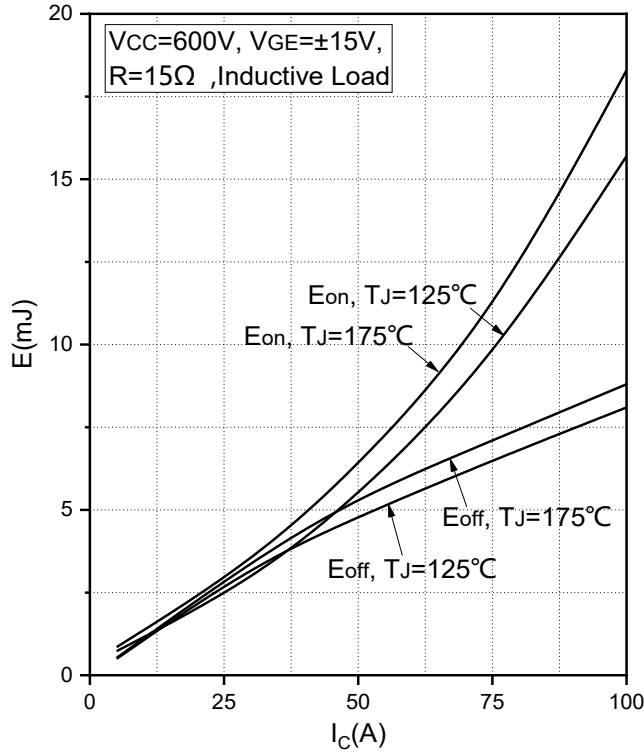


Fig.5 Typical Switching Loss vs. Collector Current

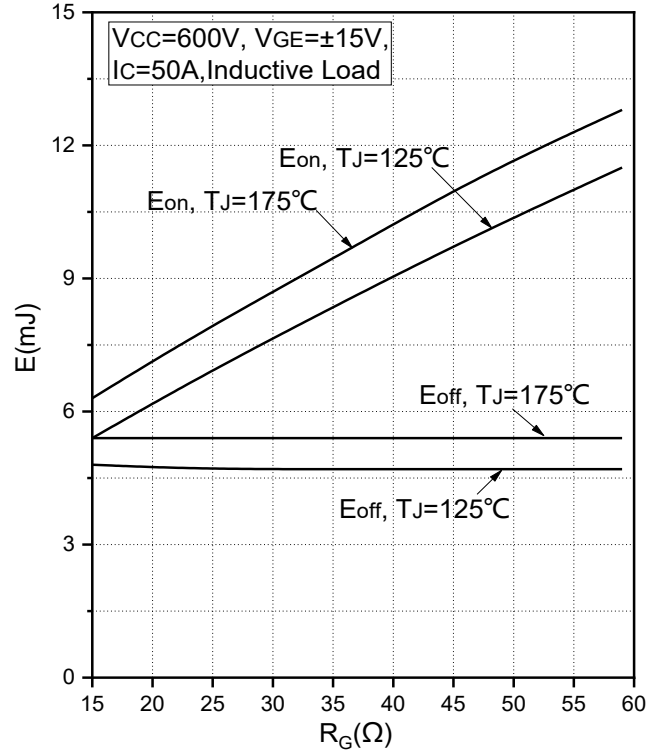


Fig.6 Typical Switching Loss vs. Gate Resistance

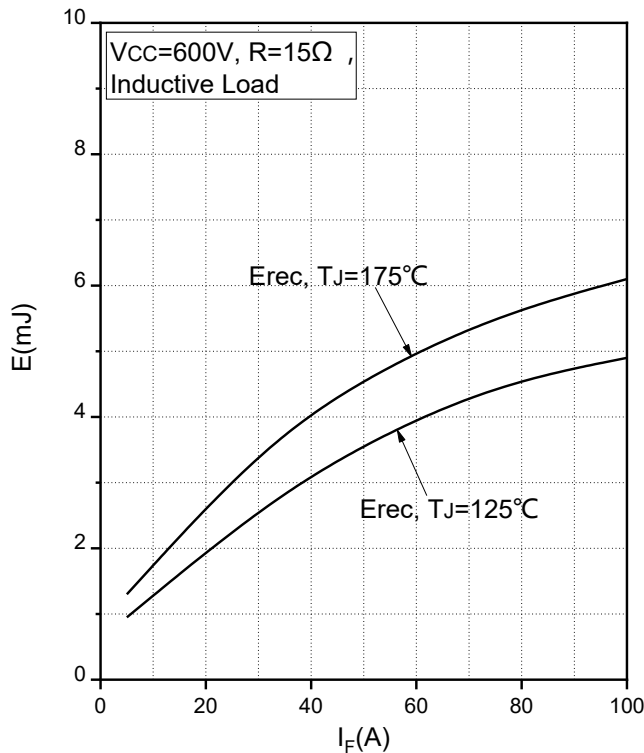


Fig.7 Typical Switching Loss vs. Forward Current

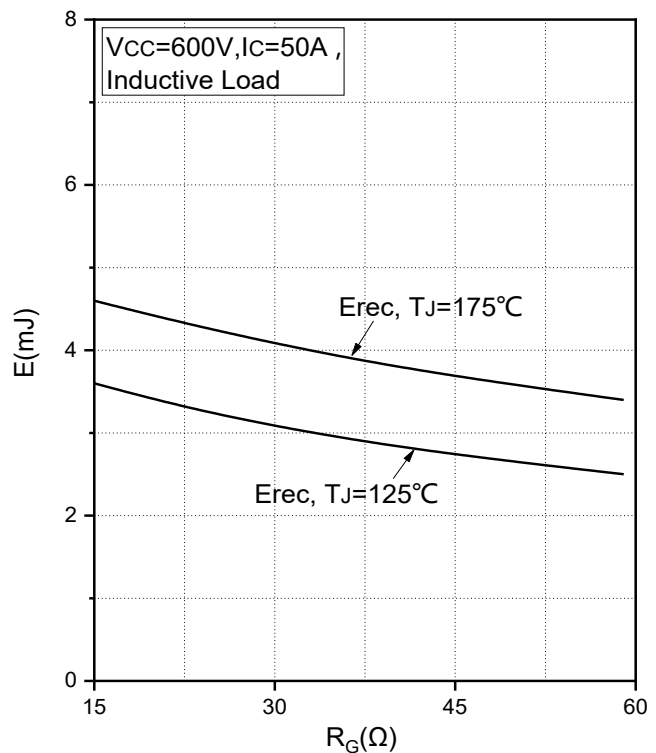


Fig.8 Typical Switching Loss vs. Gate Resistance

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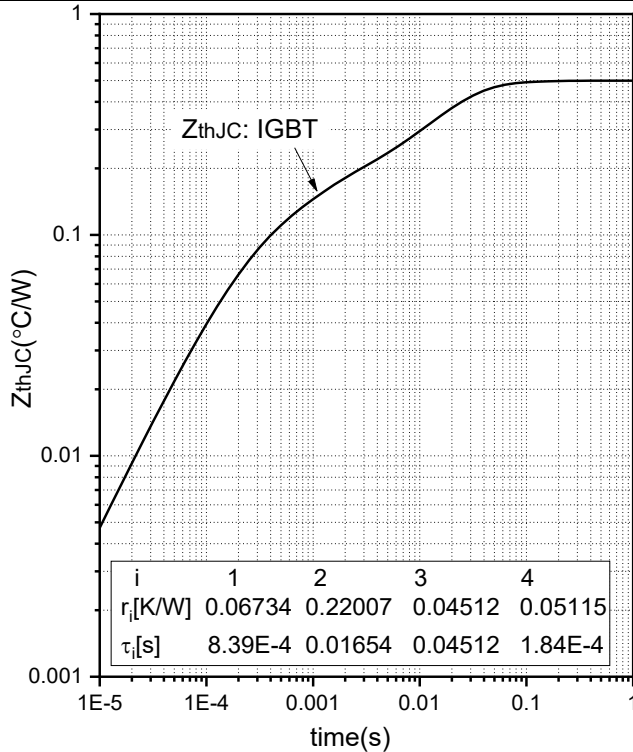


Fig.9 Transient Thermal Impedance (IGBT)

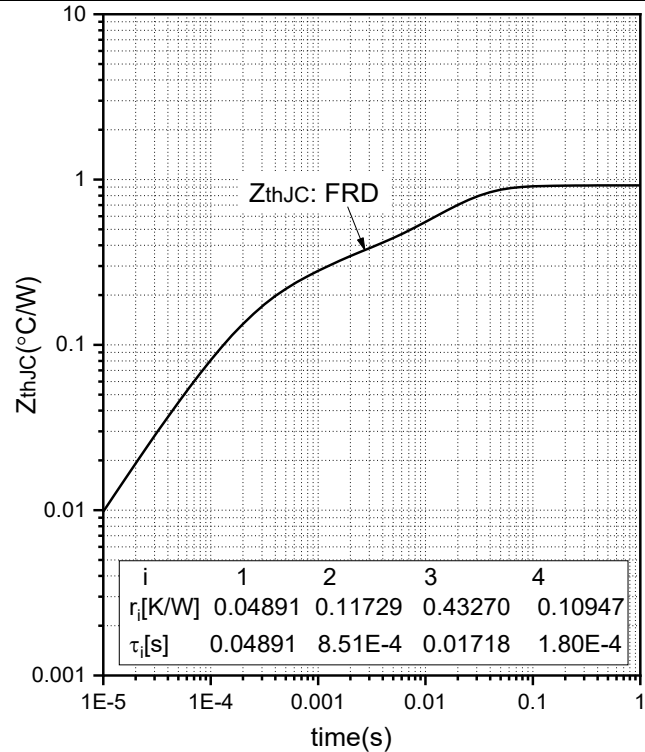


Fig.10 Transient Thermal Impedance (Diode Inverter)

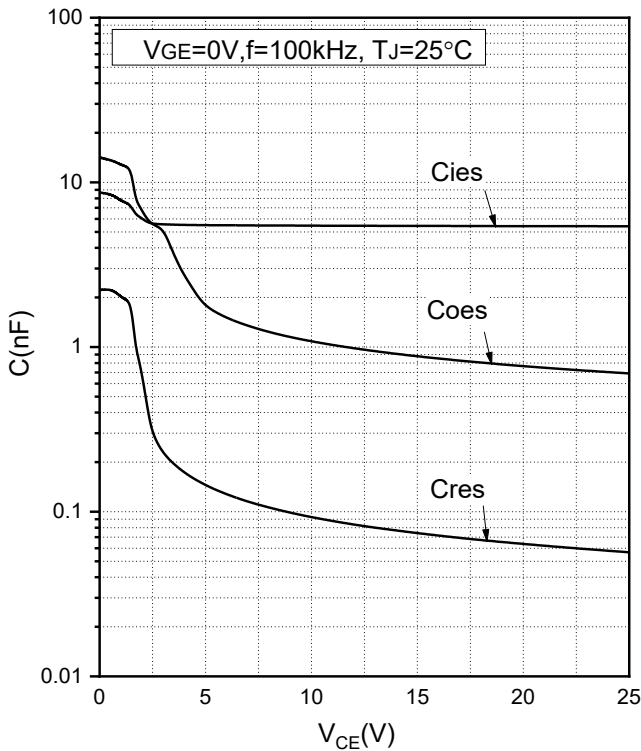


Fig.11 Capacitance Characteristics

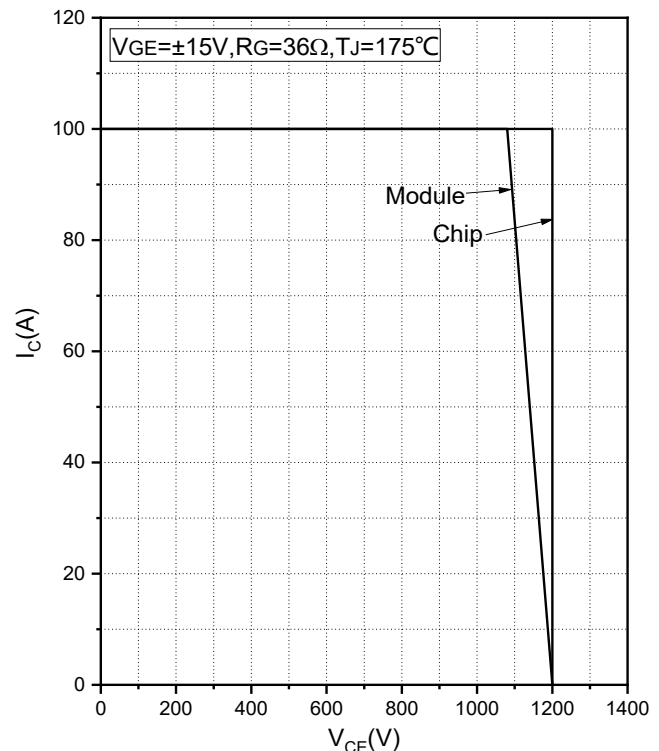
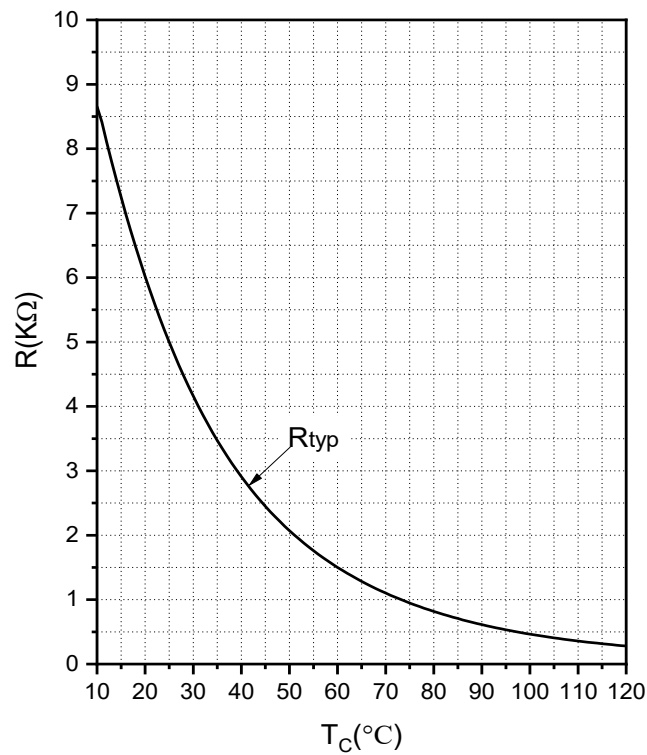
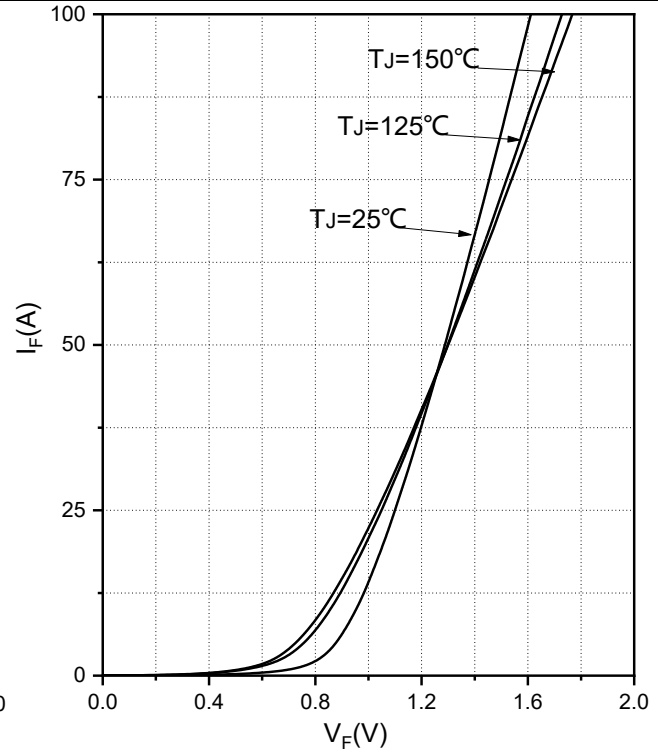
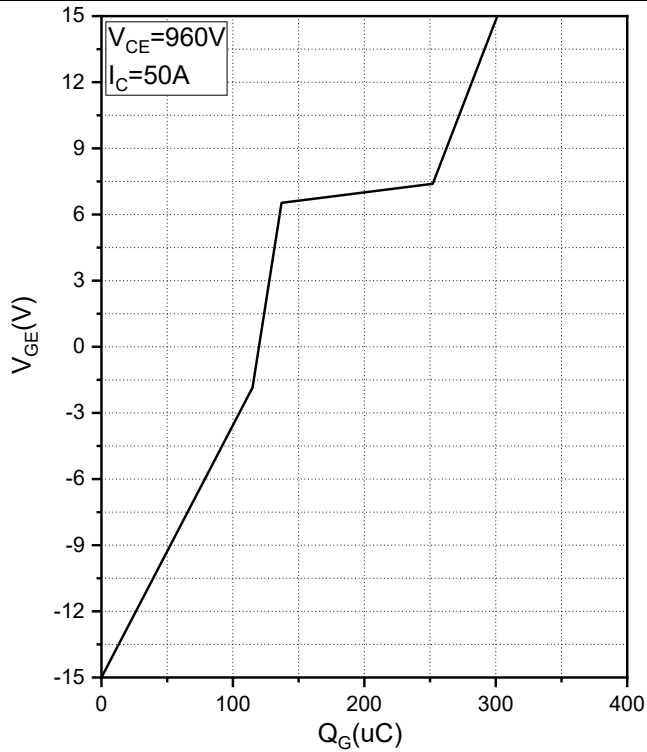


Fig.12 Reverse Bias Safe Operation Area (RBSOA)



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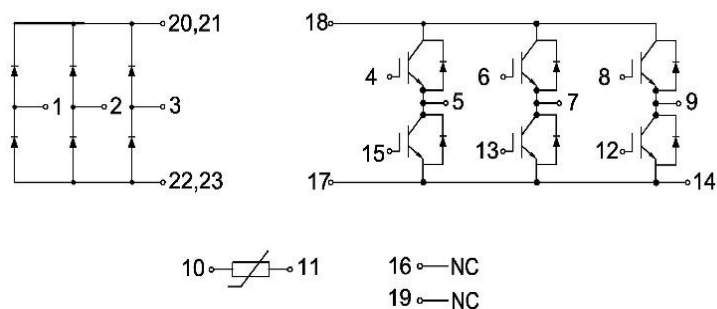
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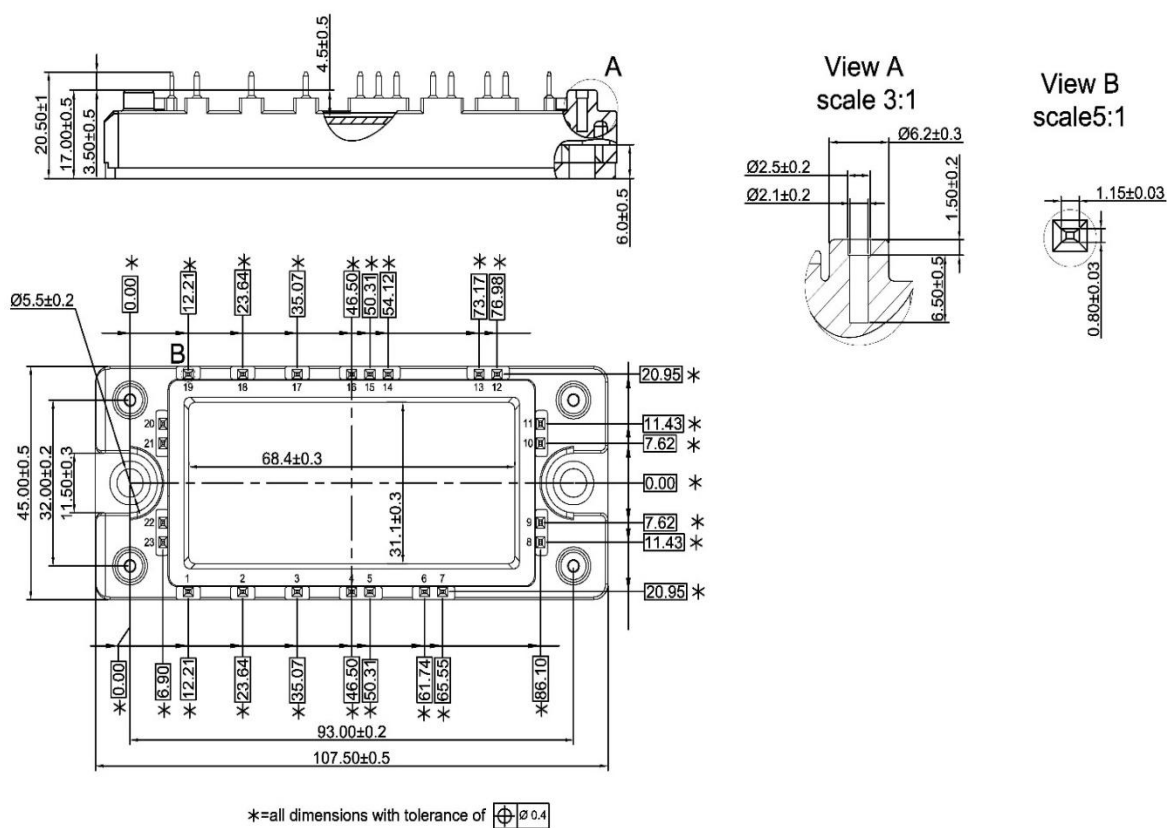
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Internal Circuit:



Package Outline (Unit: mm):



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Revision	Notes
A	Fina Datasheet Initial Release

Announcement

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