

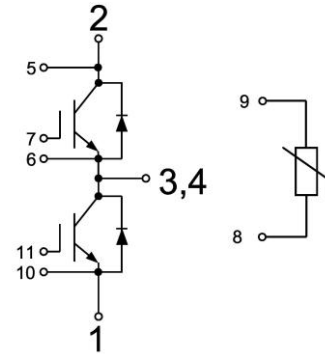
GT600HF120T9H

IGBT Module

Circuit Diagram

Features:

- $V_{CES}=1200V$ $I_C=600A$ 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:

- UPS System
- Motor Drives
- Servo Drives
- Wind Turbines



Type	Package	Marking
GT600HF120T9H	T9	GT600HF120T9H

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}	$T_C=90^\circ C$	600	A
		$T_C=25^\circ C$	1200	A
I_{CM}	Peak Collector Current Repetitive	t_p limited by T_{JMax}	1200	A
P_D	Maximum Power Dissipation (IGBT)	$T_C=25^\circ C, T_{JMax}=175^\circ C$	3000	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	$I_C=24\text{mA}$, $V_{CE}=V_{GE}$	5.0	5.5	6.5	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=600\text{A}$, $V_{GE}=15\text{V}$	$T_J=25^{\circ}\text{C}$	1.75	2.10	V
			$T_J=125^{\circ}\text{C}$	2.17		V
			$T_J=175^{\circ}\text{C}$	2.36		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	$V_{GE}=20\text{V}$, $V_{CE}=0\text{V}$, $T_J=25^{\circ}\text{C}$			400	nA
C_{ies}	Input Capacitance	$V_{CE}=25\text{V}$, $V_{GE}=0\text{V}$, $f=100\text{kHz}$		70.14		nF
C_{oes}	Output Capacitance			3.57		nF
C_{res}	Reverse Transfer Capacitance			0.68		nF

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	$V_{CC}=600V, I_C=600A,$ $R_{Gon}=1\Omega, V_{GE}=\pm 15V,$ Inductive Load	$T_J=25^{\circ}C$		207		ns
			$T_J=125^{\circ}C$		214		
			$T_J=175^{\circ}C$		225		
t_r	Rise Time		$T_J=25^{\circ}C$		113		ns
			$T_J=125^{\circ}C$		131		
			$T_J=175^{\circ}C$		136		
$t_{d(off)}$	Turn-off Delay Time		$T_J=25^{\circ}C$		288		ns
			$T_J=125^{\circ}C$		324		
			$T_J=175^{\circ}C$		344		
t_f	Fall Time	$T_J=25^{\circ}C$		140		ns	
		$T_J=125^{\circ}C$		236			
		$T_J=175^{\circ}C$		237			
E_{on}	Turn-on Switching Loss	$V_{CC}=600V, I_C=600A,$ $R_{Gon}=1\Omega, V_{GE}=\pm 15V,$ $di/dt=3500A/\mu s(T_J=175^{\circ}C)$ Inductive Load	$T_J=25^{\circ}C$		91		mJ
		$T_J=125^{\circ}C$		118			
		$T_J=175^{\circ}C$		131			

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E _{off}	Turn-off Switching Loss	V _{CC} =600V, I _C =600A, R _{Goff} =1Ω, V _{GE} =±15V, du/dt=2025V/μs(T _J =175°C) Inductive Load	T _J =25°C		48		mJ
			T _J =125°C		60		
			T _J =175°C		68		
Q _g	Total Gate Charge	V _{GE} =+15V...-15V	T _J =25°C		4.01		uC
R _{G (int)}	Internal Gate Resistance		T _J =25°C		1.2		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)					0.05	°C/W
R _{θCS}	IGBT Thermal Resistance: Case-to-Sink (per IGBT) (per IGBT, λ _{grease} = 1 W/(m · K))				0.042		°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		600	A
I _{FM}	Diode Maximum Forward Current	T _p =1ms	1200	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 =600A	T _J =25°C		1.75	2.18	V
			T _J =125°C		1.96		
			T _J =175°C		1.96		
t _{rr}	Reverse Recovery Time	I _F =600A, -diF/dt=2222A/μs(T _J =175°C), V _R =600V, V _{GE} =-15V	T _J =25°C		330		ns
			T _J =125°C		462		
			T _J =175°C		562		
I _{rr}	Peak Reverse Recovery Current		T _J =25°C		208		A
			T _J =125°C		248		
			T _J =175°C		256		
Q _{rr}	Reverse Recovery Charge		T _J =25°C		45		μC
			T _J =125°C		82		
			T _J =175°C		95		

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E _{rec}	Reverse Recovery Energy	I _F =600A, -diF/dt=2222A/μs(T _J =175°C), V _R =600V, V _{GE} =-15V	T _J =25°C		13.6		mJ
			T _J =125°C		27.3		
			T _J =175°C		32.5		
R _{θJC}	Diode Thermal Resistance: Junction-to-Case (per Diode)					0.08	°C/W
R _{θCS}	Diode Thermal Resistance: Case-to-Sink (per Diode, λ _{grease} = 1 W/(m • K))				0.067		°C/W

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 _{JMax}	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			
M	Power Terminals Screw:M6		4.0		5.0	N·m
M	Mounting Screw:M5		3.0		6.0	N·m
G	Weight			330		g

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



Ordering Information Table

Device code

G	T	600	HF	120	T9	H
①	②	③	④	⑤	⑥	⑦

- ① - IGBT Module
- ② - Field Stop Trench Gate IGBT
- ③ - Rated Current (600=600A)
- ④ - Circuit Configuration (Half Bridge)
- ⑤ - Rated Voltage (120=1200V)
- ⑥ - Package Type
- ⑦ - Test Level (Pass the Important Reliability Test-Industrial Grade)

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Characteristic diagram

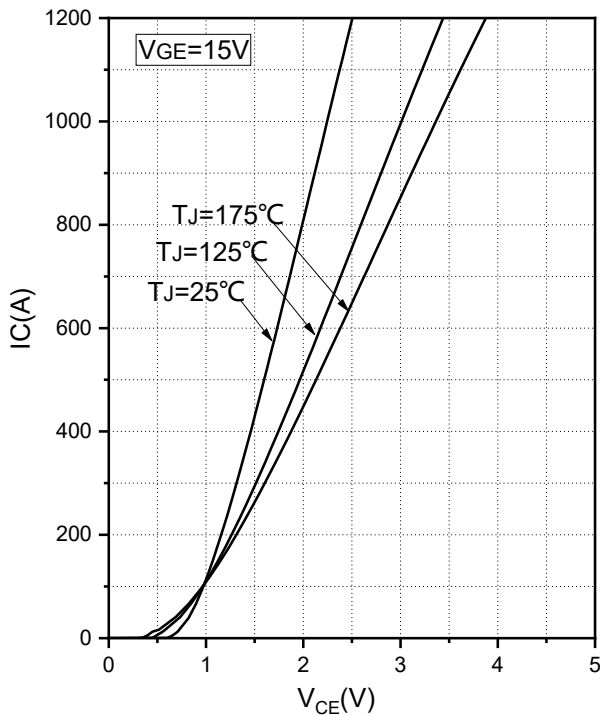


Fig.1 Typical Saturation Voltage Characteristics

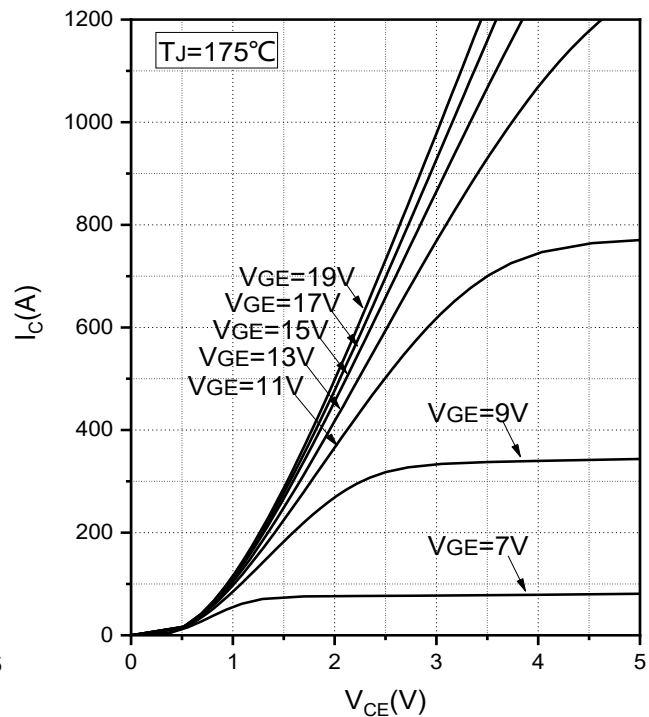


Fig.2 Typical Output Characteristics

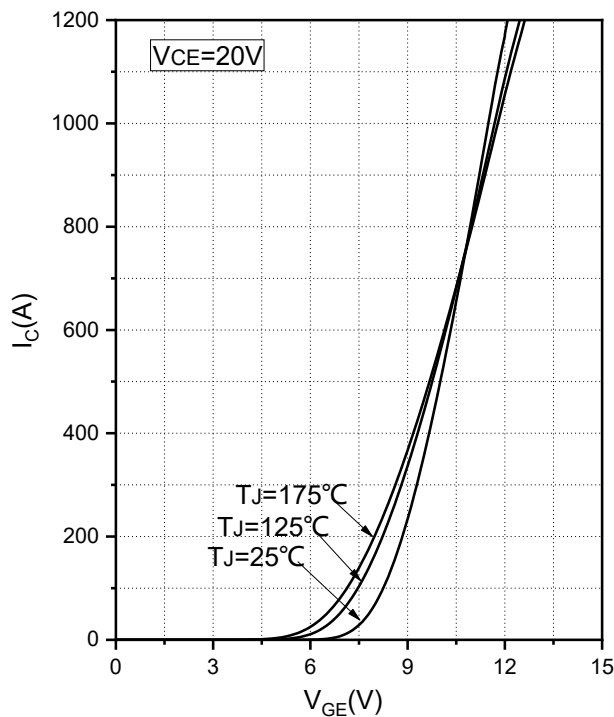


Fig.3 Transfer Characteristic

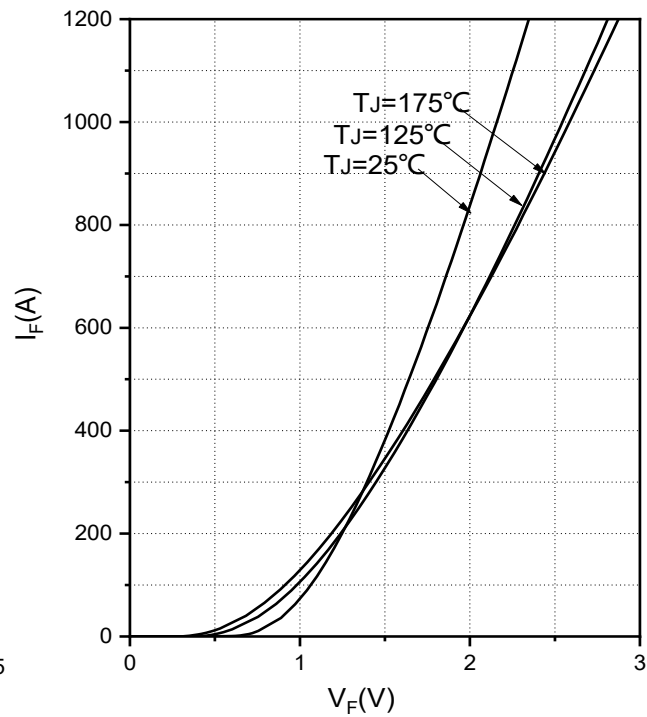


Fig.4 Forward Characteristics of Diode

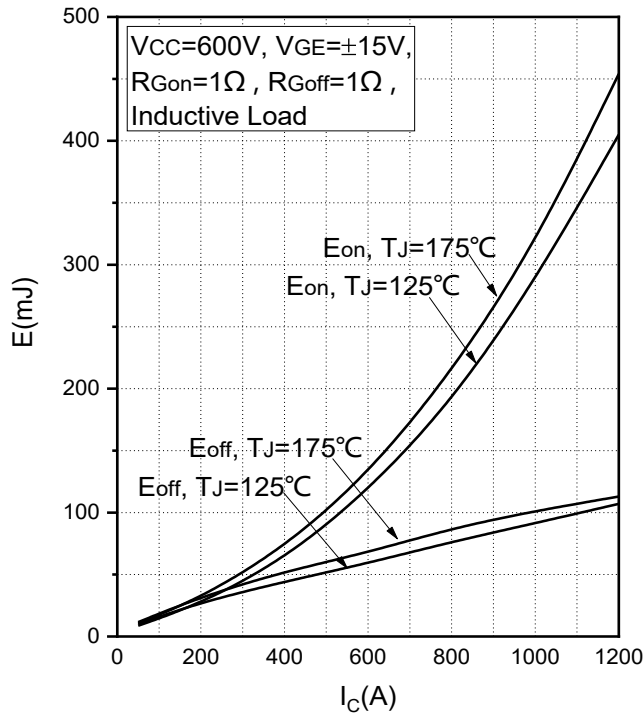


Fig.5 Typical Switching Loss vs. Collector Current

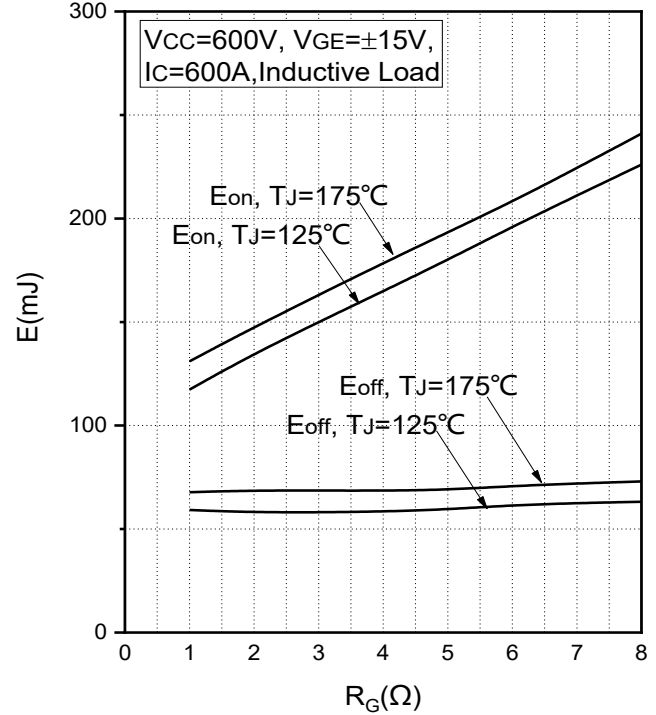


Fig.6 Typical Switching Loss vs. Gate Resistance

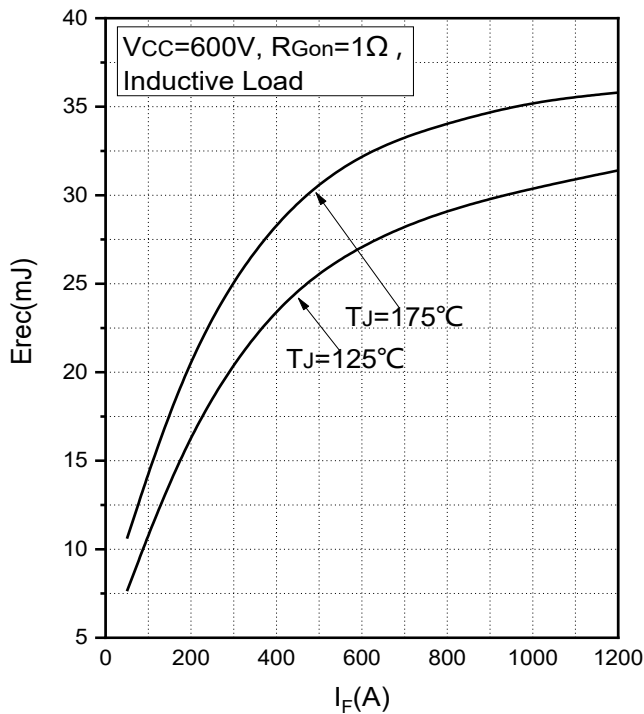


Fig.7 Typical Switching Loss vs. Forward Current

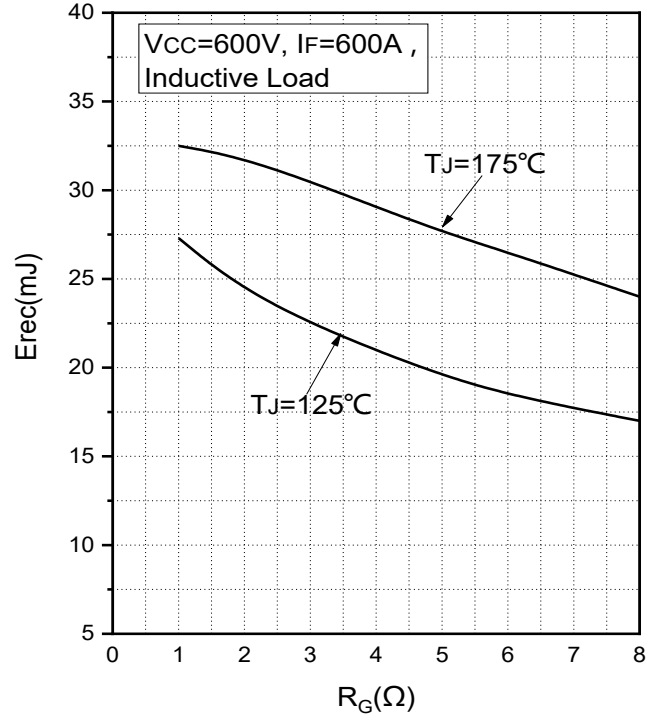


Fig.8 Typical Switching Loss vs. Gate Resistance

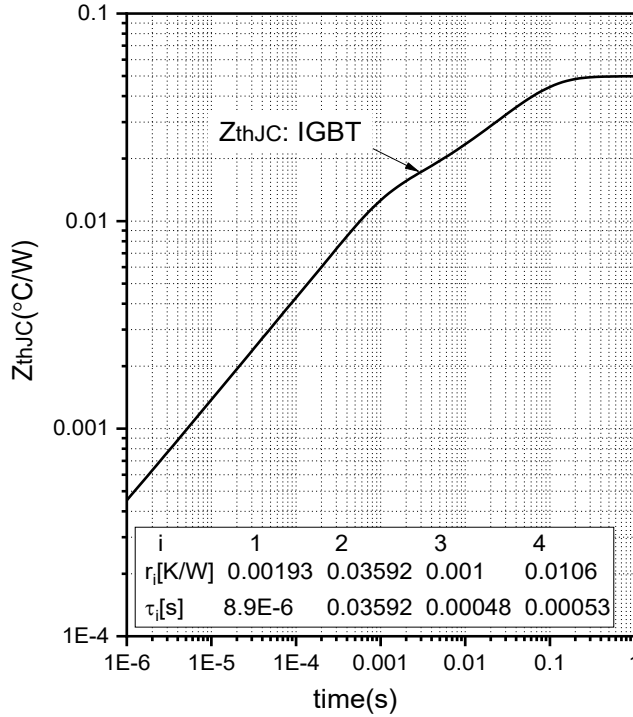


Fig.9 Transient Thermal Impedance (IGBT)

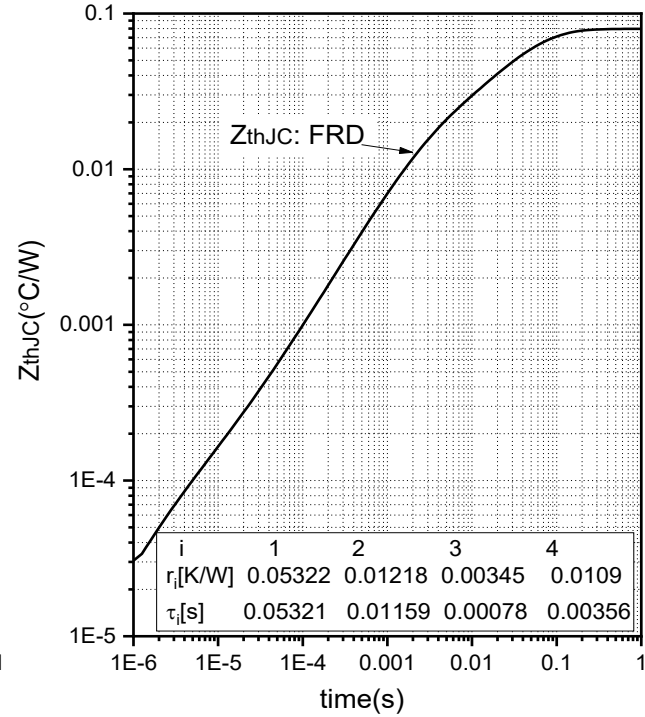


Fig.10 Transient Thermal Impedance (Diode)

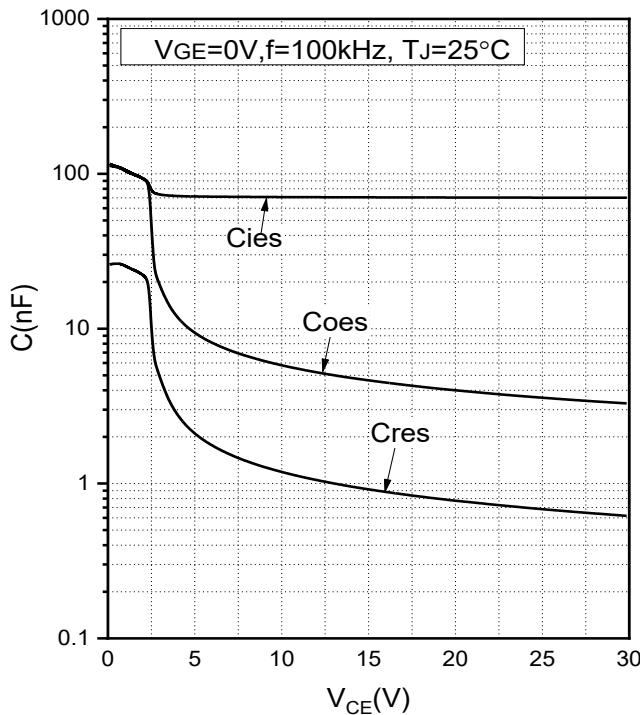


Fig.11 Capacitance Characteristics

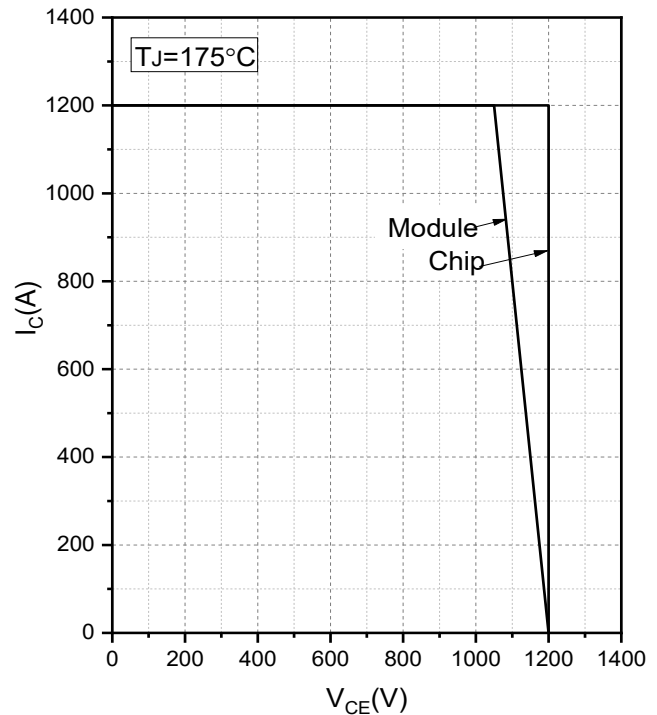


Fig.12 Reverse Bias Safe Operation Area (RBSOA)

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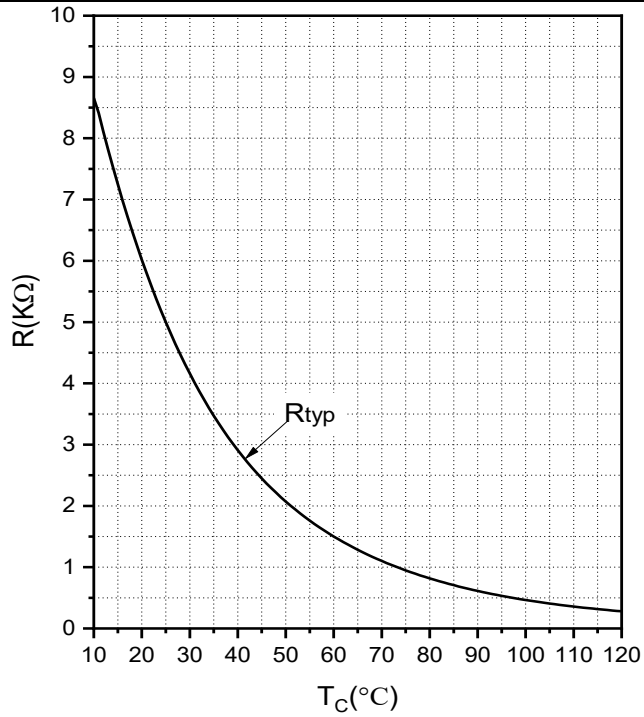


Fig.13 NTC Temperature Characteristics

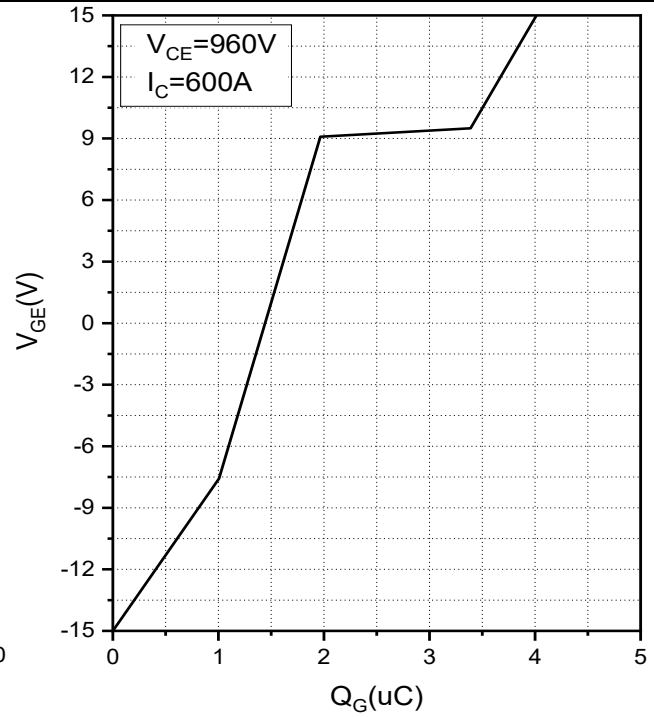


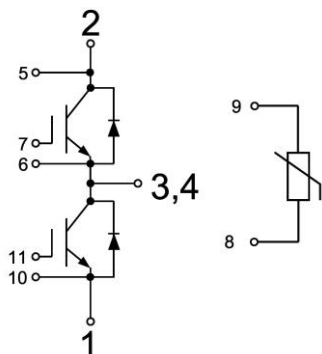
Fig.14 Gate Charge Characteristics

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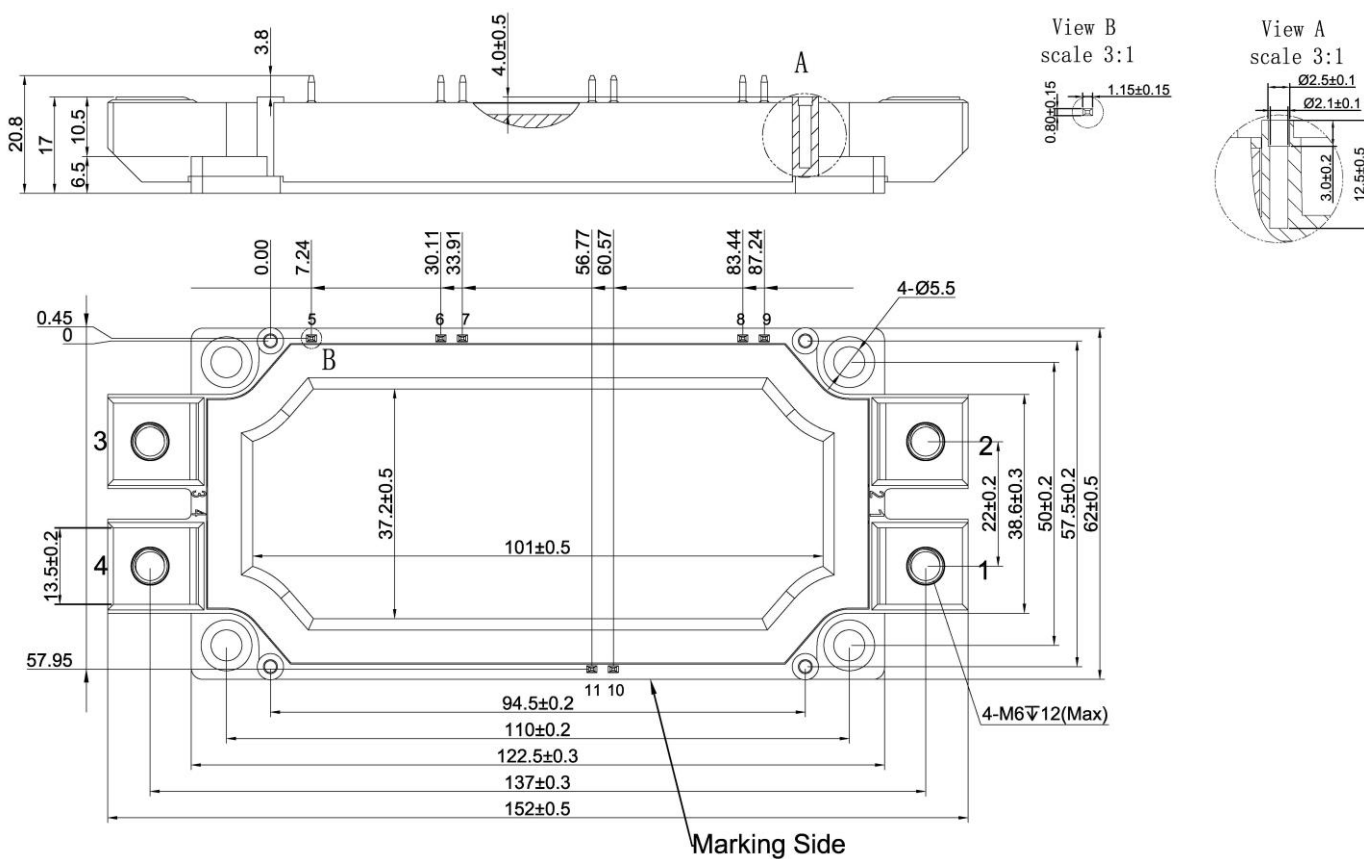
IGBT Module Datasheet



Internal Circuit:



Package Outline (Unit: mm):





Revision	Notes
A	Final Datasheet Initial Release

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