

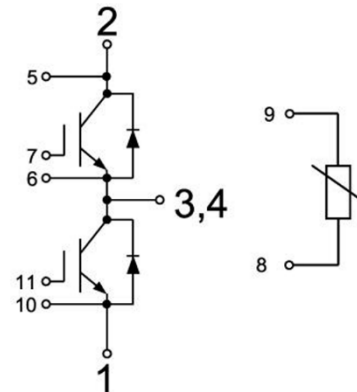
GT450HF120T9H

Circuit Diagram

IGBT Module

Features:

- $V_{CES}=1200V$ $I_C=450A$ 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:

- High-power Converters
- UPS System
- Motor Drives
- Servo Drives
- Wind Turbines



Type	Package	Marking
GT450HF120T9H	T9	GT450HF120T9H

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}	$T_C=90^\circ C$	450	A
		$T_C=25^\circ C$	900	A
I_{CM}	Peak Collector Current Repetitive	T_p limited by T_{Jmax}	900	A
P_D	Maximum Power Dissipation (IGBT)	$T_C=25^\circ C, T_{Jmax}=175^\circ C$	2860	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 =15mA, V _{CE} =V _{GE}		5.0	5.7	6.5	V
V _{CE(sat)}	Collector-Emitter Saturation Voltage	I _C =450A, V _{GE} =15V	T _J =25°C		1.79	2.15	V
			T _J =125°C		2.13		V
			T _J =175°C		2.25		V
I _{CES}	Collector-Emitter Leakage Current	V _{GE} =0V, V _{CE} =1200V, T _J =25°C				1	mA
I _{GES}	Gate-Emitter Leakage Current	V _{GE} =20V, V _{CE} =0V, T _J =25°C				400	nA
C _{ies}	Input Capacitance	V _{CE} =25V, V _{GE} =0V, f=100kHz			50		nF
C _{oes}	Output Capacitance				2.56		nF
C _{res}	Reverse Transfer Capacitance				0.51		nF

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	$V_{CC}=600V, I_C=450A,$ $R_{Gon}=1\Omega, V_{GE}=\pm 15V,$ Inductive Load	$T_J=25^{\circ}C$		164		ns
			$T_J=125^{\circ}C$		182		
			$T_J=175^{\circ}C$		196		
t_r	Rise Time		$T_J=25^{\circ}C$		99		ns
			$T_J=125^{\circ}C$		110		
			$T_J=175^{\circ}C$		116		
$t_{d(off)}$	Turn-off Delay Time		$T_J=25^{\circ}C$		261		ns
			$T_J=125^{\circ}C$		290		
			$T_J=175^{\circ}C$		310		
t_f	Fall Time	$T_J=25^{\circ}C$		155		ns	
		$T_J=125^{\circ}C$		169			
		$T_J=175^{\circ}C$		220			
E_{on}	Turn-on Switching Loss	$V_{CC}=600V, I_C=450A,$ $R_{Gon}=1\Omega, V_{GE}=\pm 15V,$ $di/dt=3100A/\mu s(T_J=175^{\circ}C)$ Inductive Load	$T_J=25^{\circ}C$		58.6		mJ
		$T_J=125^{\circ}C$		73.6			
		$T_J=175^{\circ}C$		87.7			

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E _{off}	Turn-off Switching Loss	V _{CC} =600V, I _C =450A, R _{Goff} =1Ω, V _{GE} =±15V, du/dt=4800V/μs(T _J =175°C) Inductive Load	T _J =25°C		34.6		mJ
			T _J =125°C		39.2		
			T _J =175°C		48.9		
Q _g	Total Gate Charge	V _{GE} =+15V...-15V	T _J =25°C		2.86		μC
R _{G (int)}	Internal Gate Resistance		T _J =25°C		1.6		Ω
T _{SC}	V _{CC} =600V, V _{GE} =±15V, T _J =175°C ^{note1}					10	μs
R _{θJC}	IGBT Thermal Resistance: Junction-to-Case (per IGBT)					0.052	°C/W
R _{θCS}	IGBT Thermal Resistance: Case-to-Sink (per IGBT) (per IGBT, λ _{grease} = 1 W/(m · K))				0.015		°C/W

note1: Short circuit withstand time cannot exceed 10μs 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		450	A
I _{FM}	Diode Maximum Forward Current	t _p =1ms	900	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 =450A	T _J =25°C		1.84	2.35	V
			T _J =125°C		1.98		
			T _J =175°C		1.99		
t _{rr}	Reverse Recovery Time	I _F =450A, -diF/dt=2300A/μs(T _J =175°C), V _R =600V, V _{GE} =-15V	T _J =25°C		314		ns
			T _J =125°C		464		
			T _J =175°C		594		
I _{rr}	Peak Reverse Recovery Current		T _J =25°C		160		A
			T _J =125°C		192		
			T _J =175°C		216		
Q _{rr}	Reverse Recovery Charge		T _J =25°C		31.7		μC
			T _J =125°C		56.9		
			T _J =175°C		77.5		

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E _{rec}	Reverse Recovery Energy	I _F =450A, -diF/dt=2300A/μs(T _J =175°C), V _R =600V, V _{GE} =-15V	T _J =25°C		9.7		mJ
			T _J =125°C		19.7		
			T _J =175°C		27.7		
R _{θJC}	Diode Thermal Resistance: Junction-to-Case (per Diode)					0.108	°C/W
R _{θCS}	Diode Thermal Resistance: Case-to-Sink (per Diode, λ _{grease} = 1 W/(m • K))				0.032		°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	Conditions	Min.	Typ.	Max.	Units
V _{iso}	Isolation Voltage (All Terminals Shorted)	RMS, f=50Hz, 1minute	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	Power Terminals Screw:M6		4.0		5.0	N·m
T	Mounting Screw:M5		3.0		6.0	N·m
G	Weight			330		g

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

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IGBT Module Datasheet



Ordering Information Table

Device code

G	T	450	HF	120	T9	H
①	②	③	④	⑤	⑥	⑦

- ① - IGBT Module
- ② - Trench, Low Switching Losses IGBT
- ③ - Rated Current (450=450A)
- 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

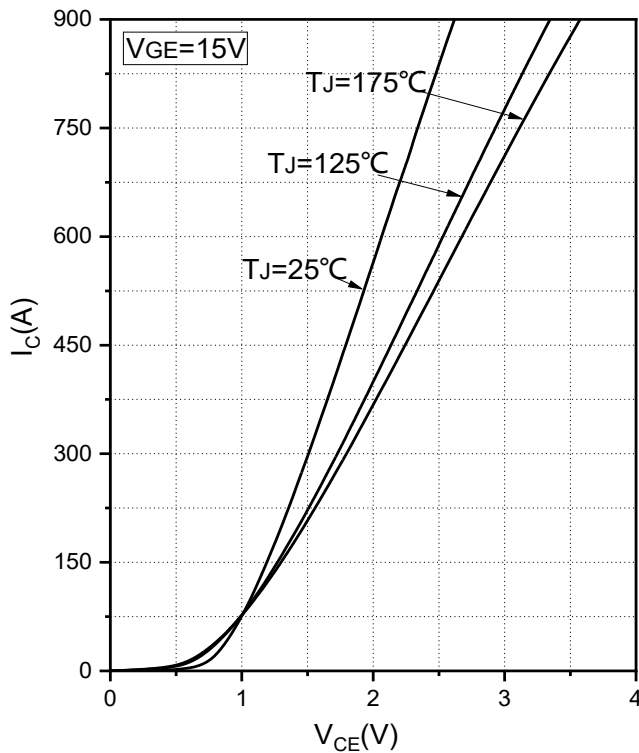


Fig.1 Typical Saturation Voltage Characteristics

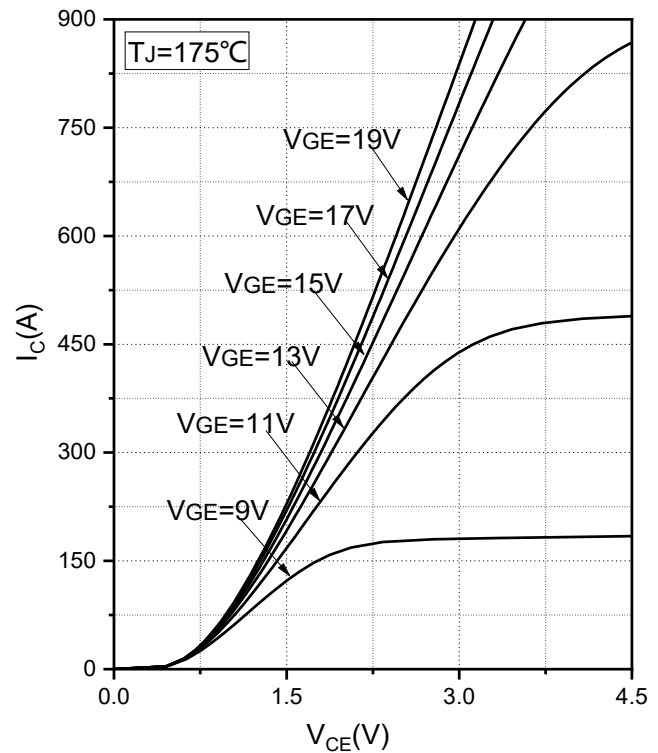


Fig.2 Typical Output Characteristics

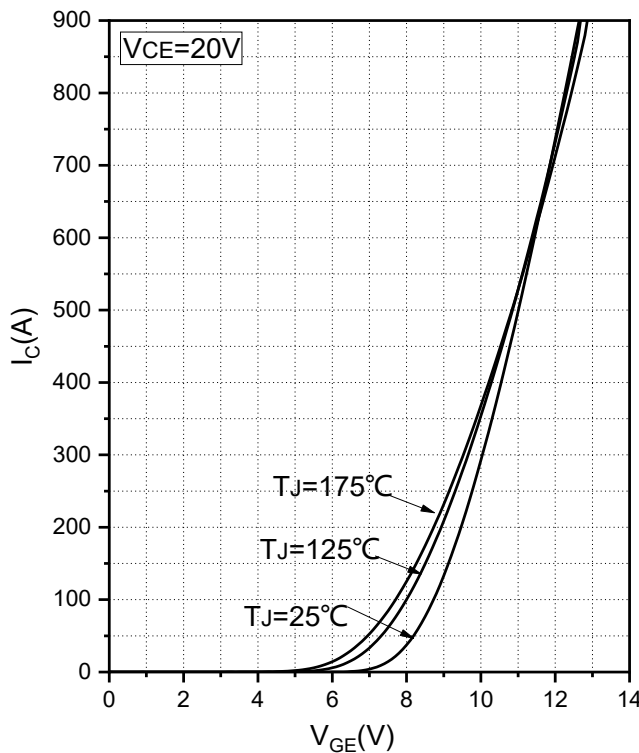


Fig.3 Transfer Characteristic

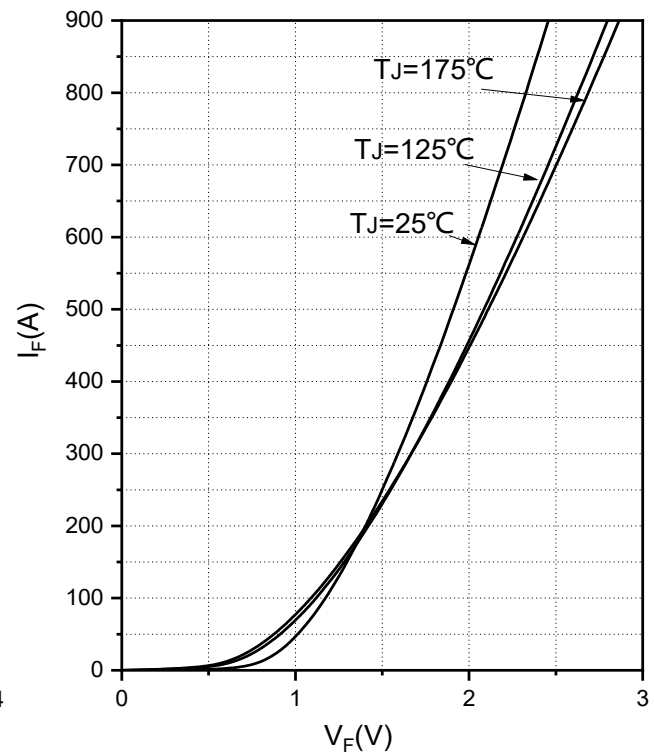
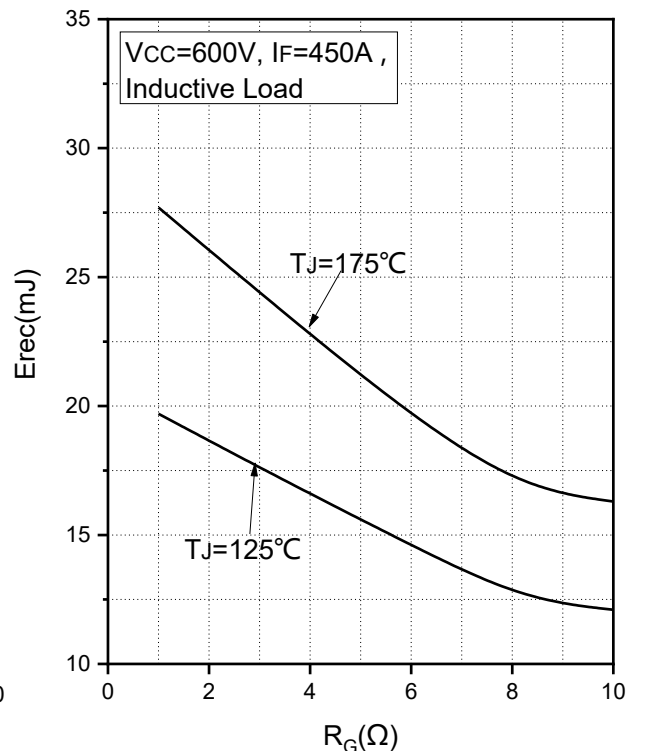
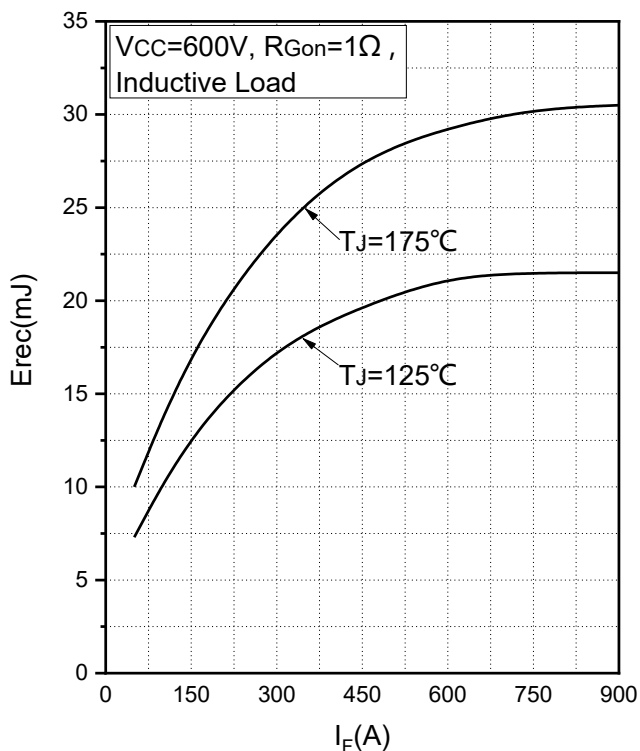
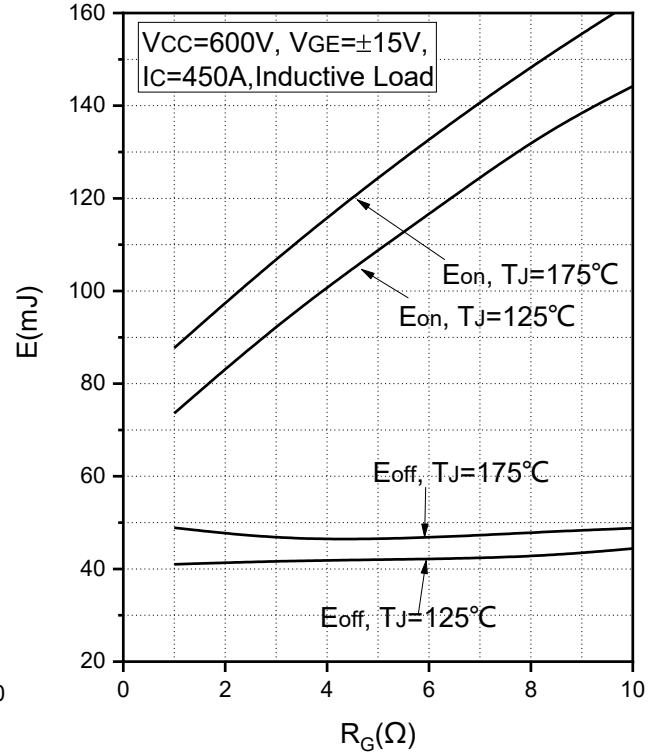
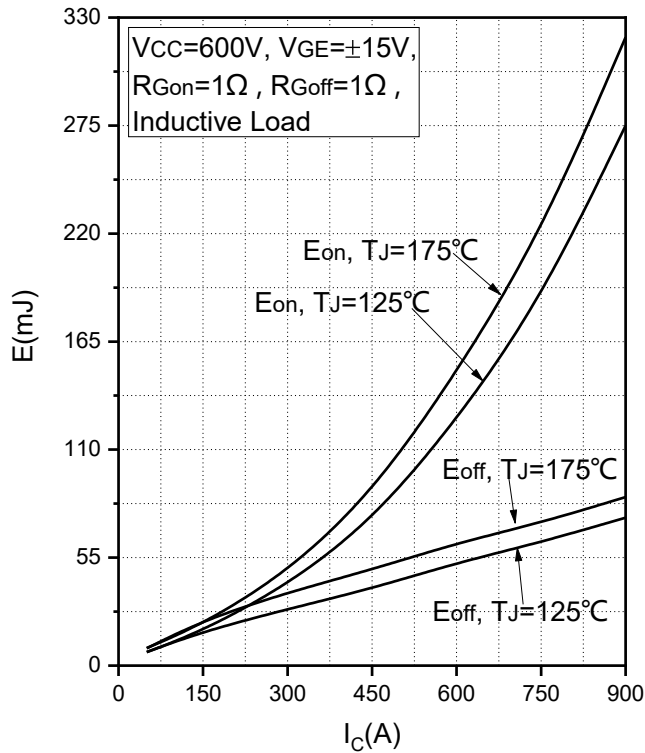


Fig.4 Forward Characteristics of Diode

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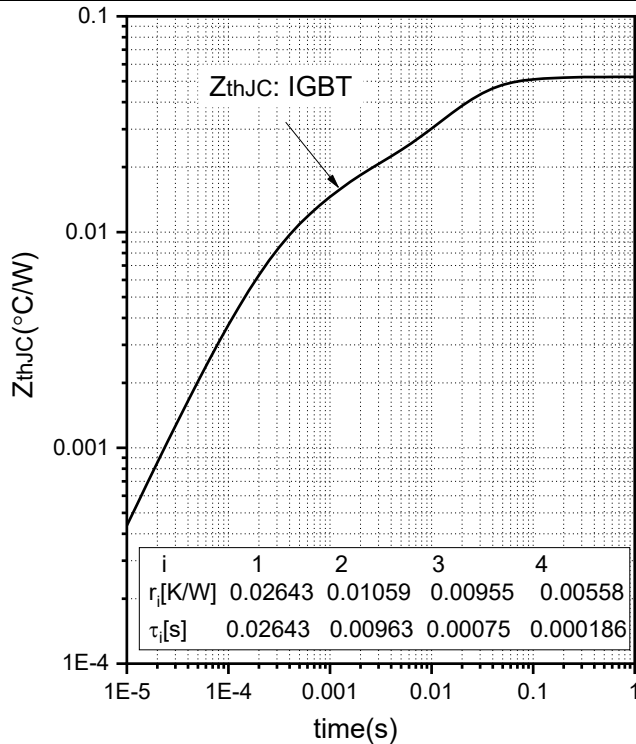


Fig.9 Transient Thermal Impedance (IGBT)

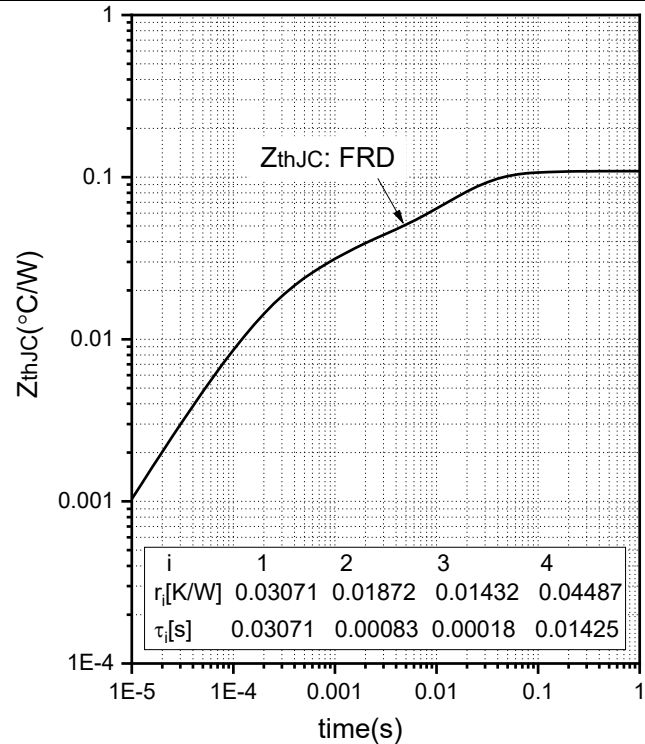


Fig.10 Transient Thermal Impedance (Diode)

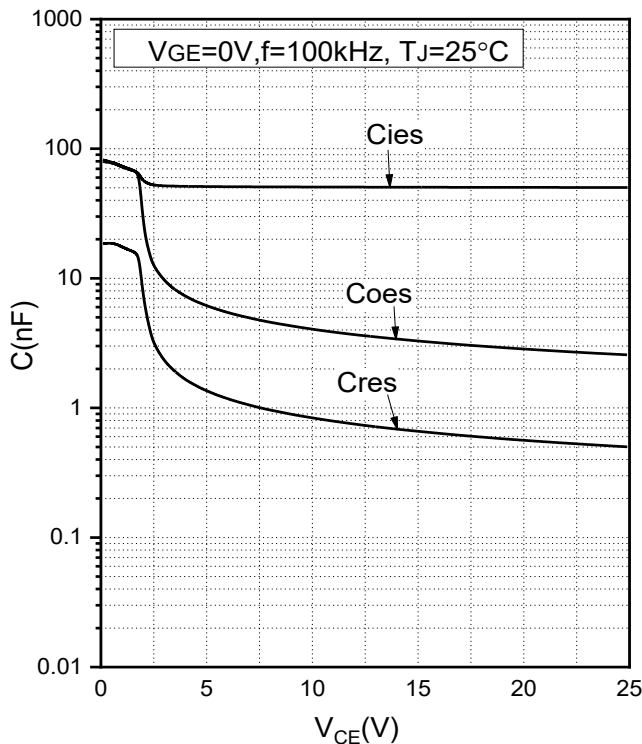


Fig.11 Capacitance Characteristics

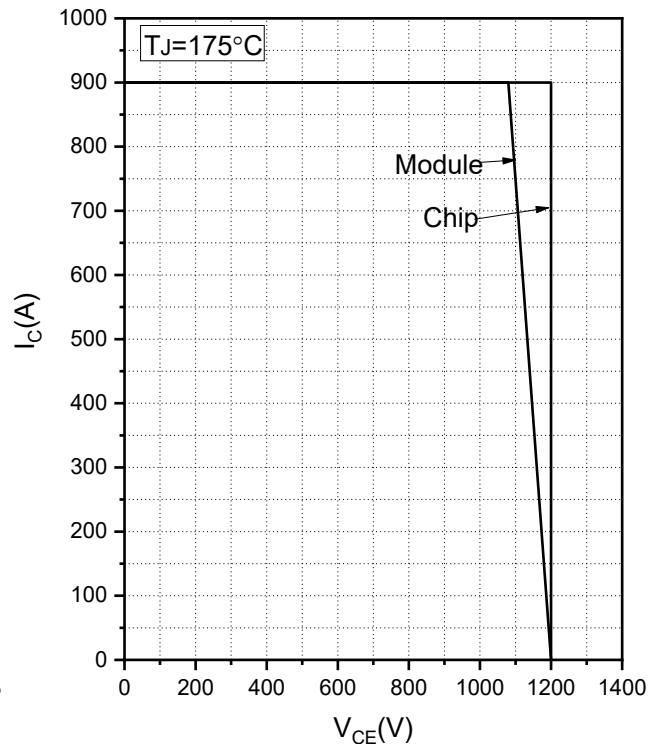


Fig.12 Reverse Bias Safe Operation Area (RBSOA)

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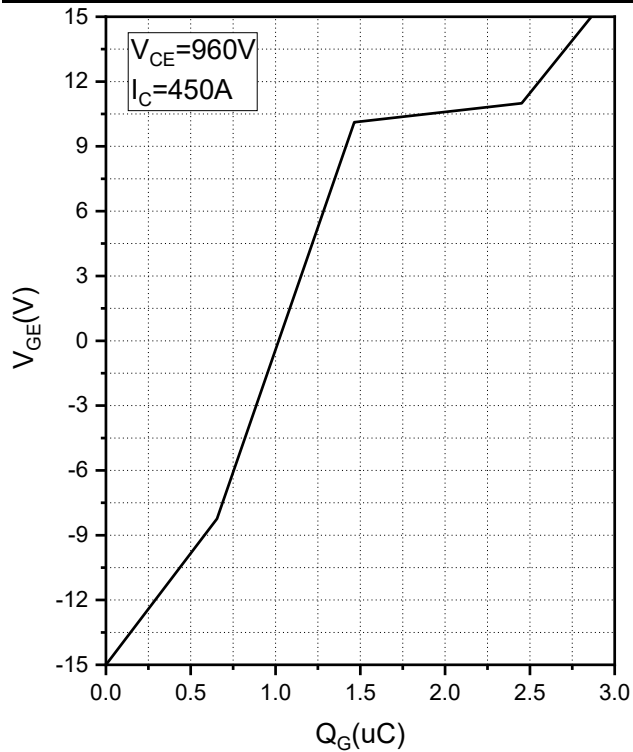


Fig.13 Gate Charge Characteristics

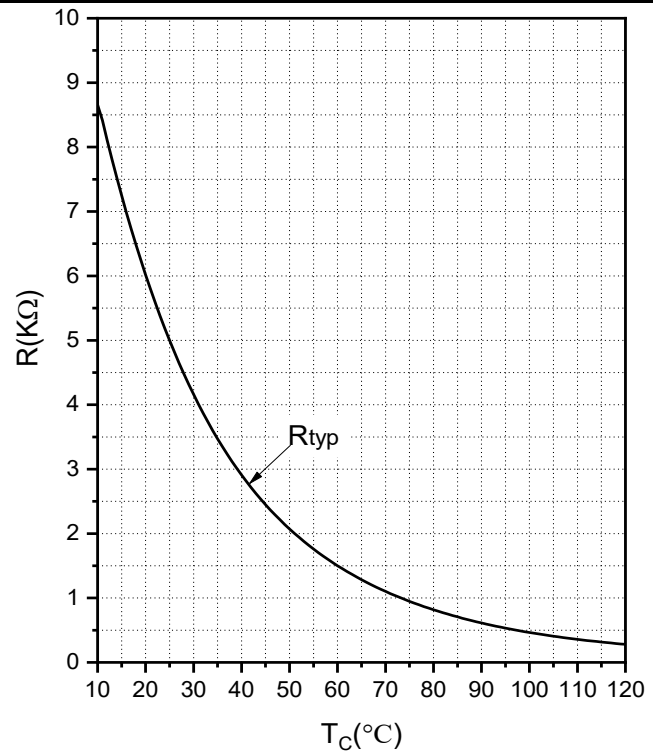


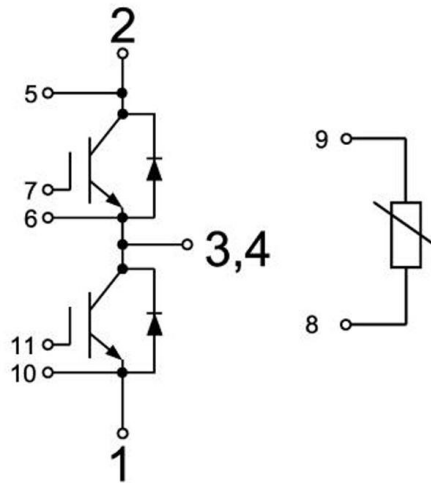
Fig.14 NTC Temperature Characteristics

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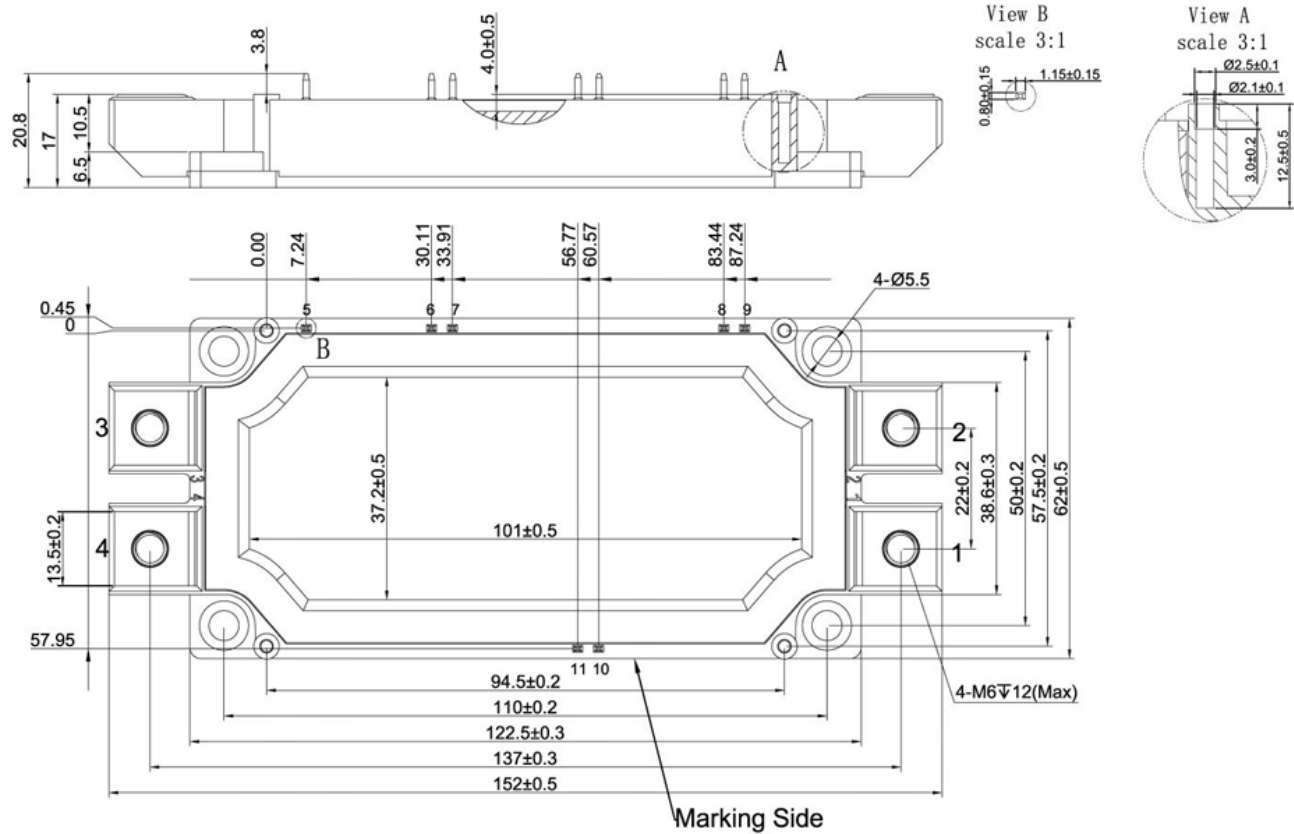
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Internal Circuit:



Package Outline (Unit: mm):





Revision	Notes
A	Final Datasheet Initial Release

Announcement

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