

GT300MAR120T9H

IGBT Module

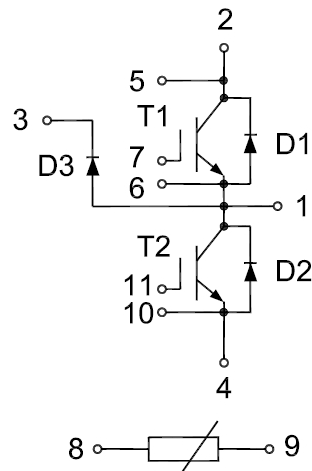
Features:

- $V_{CES}=1200V$ $I_C=300A$ 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:

- 3-Level-Applications
- Energy Storage Application

Circuit Diagram



Type	Package	Marking
GT300MAR120T9H	T9	GT300MAR120T9H

IGBT, Inverter(T1/T2)

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}	$T_C=90^\circ C$	300	A
		$T_C=25^\circ C$	600	A
I_{CM}	Peak Collector Current Repetitive	t_p limited by T_{JMax}	600	A
P_D	Maximum Power Dissipation (IGBT)	$T_C=25^\circ C, T_{JMax}=150^\circ C$	1600	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	$I_C=11.5\text{mA}$, $V_{CE}=V_{GE}$	5.0	5.8	6.6	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=300\text{A}$, $V_{GE}=15\text{V}$	$T_J=25^{\circ}\text{C}$	2.10	2.50	V
			$T_J=125^{\circ}\text{C}$	2.88		V
			$T_J=150^{\circ}\text{C}$	3.02		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	$V_{CE}=25\text{V}$, $V_{GE}=0\text{V}$, $f=100\text{kHz}$		34.05		nF
C_{oes}	Output Capacitance			1.60		nF
C_{res}	Reverse Transfer Capacitance			0.03		nF

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	$V_{CC}=600V, I_C=300A,$ $R_{Gon}=1\Omega, V_{GE}=\pm 15V,$ Inductive Load	$T_J=25^{\circ}C$		134		ns
			$T_J=125^{\circ}C$		149		
			$T_J=150^{\circ}C$		152		
t_r	Rise Time		$T_J=25^{\circ}C$		35		ns
			$T_J=125^{\circ}C$		40		
			$T_J=150^{\circ}C$		42		
$t_{d(off)}$	Turn-off Delay Time		$T_J=25^{\circ}C$		183		ns
			$T_J=125^{\circ}C$		211		
			$T_J=150^{\circ}C$		217		
t_f	Fall Time	$T_J=25^{\circ}C$		49		ns	
		$T_J=125^{\circ}C$		67			
		$T_J=150^{\circ}C$		72			
E_{on}	Turn-on Switching Loss	$V_{CC}=600V, I_C=300A,$ $R_{Gon}=1\Omega, V_{GE}=\pm 15V,$ $di/dt=5700A/\mu s(T_J=150^{\circ}C)$ Inductive Load	$T_J=25^{\circ}C$		13.5		mJ
		$T_J=125^{\circ}C$		22.0			
		$T_J=150^{\circ}C$		24.1			

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E _{off}	Turn-off Switching Loss	V _{CC} =600V, I _C =300A, R _{Goff} =1Ω, V _{GE} =±15V, du/dt=9200V/μs(T _J =150°C) Inductive Load	T _J =25°C		10.8		mJ
			T _J =125°C		13.5		
			T _J =150°C		14.6		
Q _g	Total Gate Charge	V _{GE} =+15V...-15V	T _J =25°C		1.92		uC
R _{G (int)}	Internal Gate Resistance		T _J =25°C		1.9		Ω
T _{SC}	V _{CC} =600V, V _{GE} =±15V, T _J =150°C ^{note1}					10	us
R _{θJC}	IGBT Thermal Resistance: Junction-to-Case (per IGBT)					0.078	°C/W
R _{θCS}	IGBT Thermal Resistance: Case-to-Sink (per IGBT) (per IGBT, λ _{grease} = 1 W/(m · K))				0.039		°C/W

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

Diode, Inverter(D1/D2/D3)

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		300	A
I _{FM}	Diode Maximum Forward Current	T _p =1ms	600	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 =300A	T _J =25°C		1.78	2.20	V
			T _J =125°C		1.93		
			T _J =150°C		1.93		
t _{rr}	Reverse Recovery Time	I _F =300A, -diF/dt=7300A/μs(T _J =150°C), V _R =600V, V _{GE} =-15V	T _J =25°C		240		ns
			T _J =125°C		367		
			T _J =150°C		415		
I _{rr}	Peak Reverse Recovery Current		T _J =25°C		308		A
			T _J =125°C		316		
			T _J =150°C		320		
Q _{rr}	Reverse Recovery Charge		T _J =25°C		25.7		μC
			T _J =125°C		39.9		
			T _J =150°C		44.5		

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E _{rec}	Reverse Recovery Energy	I _F =300A, -diF/dt=7300A/μs(T _J =150°C), V _R =600V, V _{GE} =-15V	T _J =25°C		10.3		mJ
			T _J =125°C		16.4		
			T _J =150°C		18.5		
R _{θJC}	Diode Thermal Resistance: Junction-to-Case (per Diode)					0.163	°C/W
R _{θCS}	Diode Thermal Resistance: Case-to-Sink (per Diode, λ _{grease} = 1 W/(m • K))				0.082		°C/W

Internal NTC-Thermistor Characteristics

Symbol	Conditions	Min.	Typ.	Max.	Units
R_{25}	$T_C=25^\circ C$		5		k Ω
$\Delta R/R$	$T_C=100^\circ C$, $R_{100}=465\Omega$	-5		+5	%
P_{25}	$T_C=25^\circ C$			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		+150	$^\circ C$
T_{JOP}	Maximum Operating Junction Temperature Range		-40		+150	$^\circ C$
T_{stg}	Storage Temperature		-40		+125	$^\circ C$
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



Ordering Information Table

Device code	G	T	300	MAR	120	T9	H
	①	②	③	④	⑤	⑥	⑦

- ① - IGBT Module
- ② - Field Stop Trench Gate IGBT
- ③ - Rated Current (300=300A)
- ④ - Circuit Configuration MAR(Emitter Controlled HE Diode)
- ⑤ - Rated Voltage (120=1200V)
- ⑥ - Package Type
- ⑦ - Test Level (Pass the Important Reliability Test-Industrial Grade)



Characteristic diagram

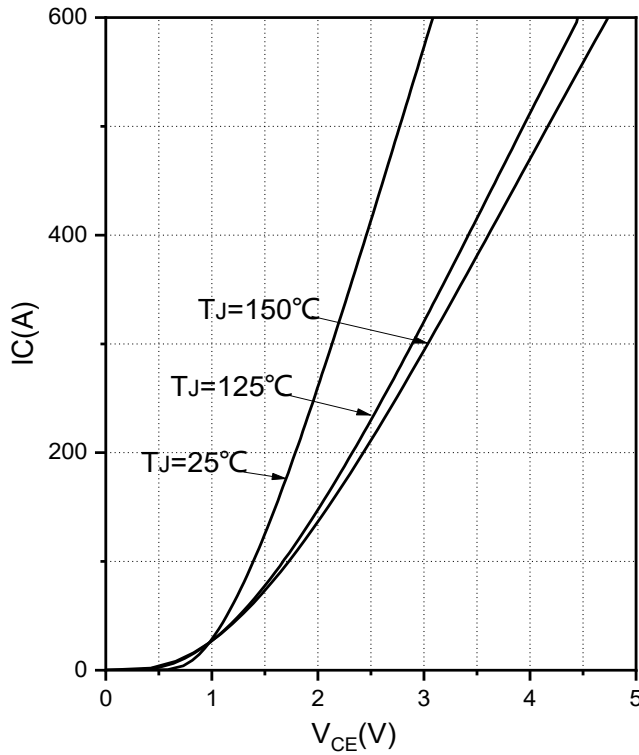


Fig.1 Typical Saturation Voltage Characteristics(T1/T2)

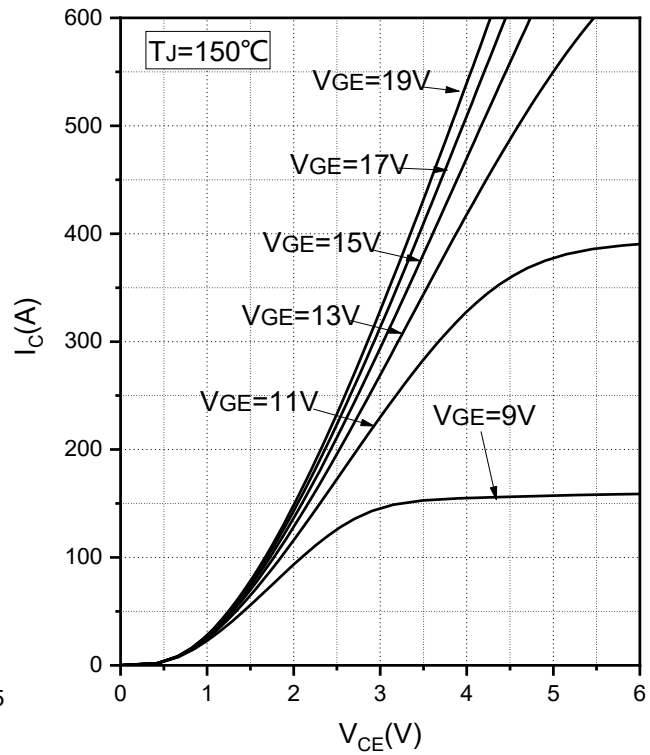


Fig.2 Typical Output Characteristics(T1/T2)

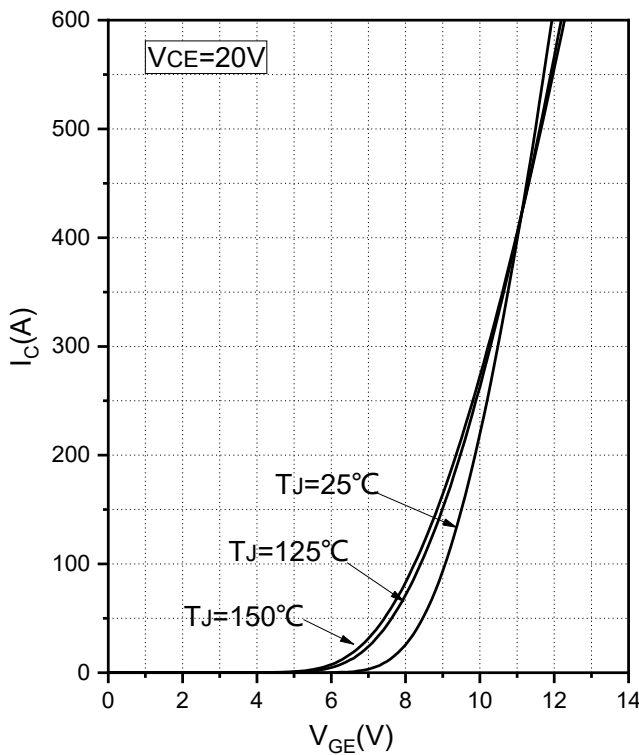


Fig.3 Transfer Characteristic(T1/T2)

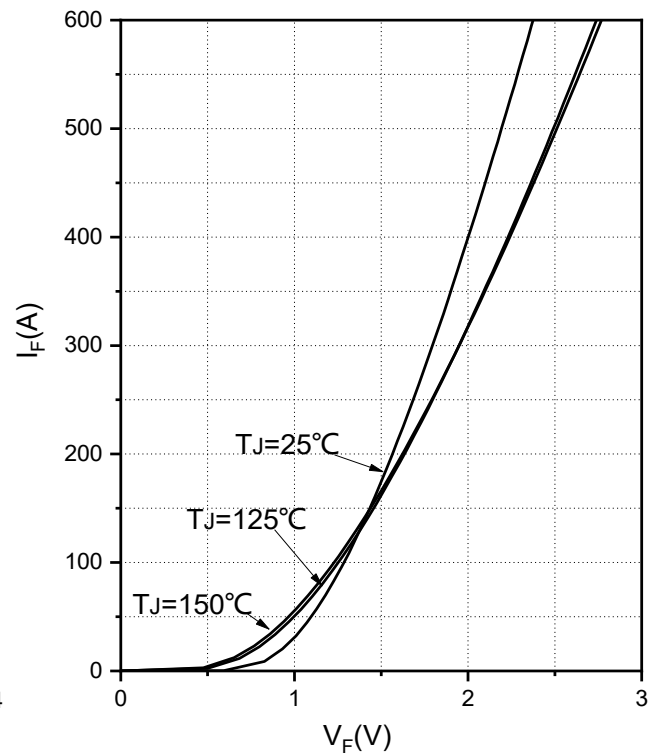
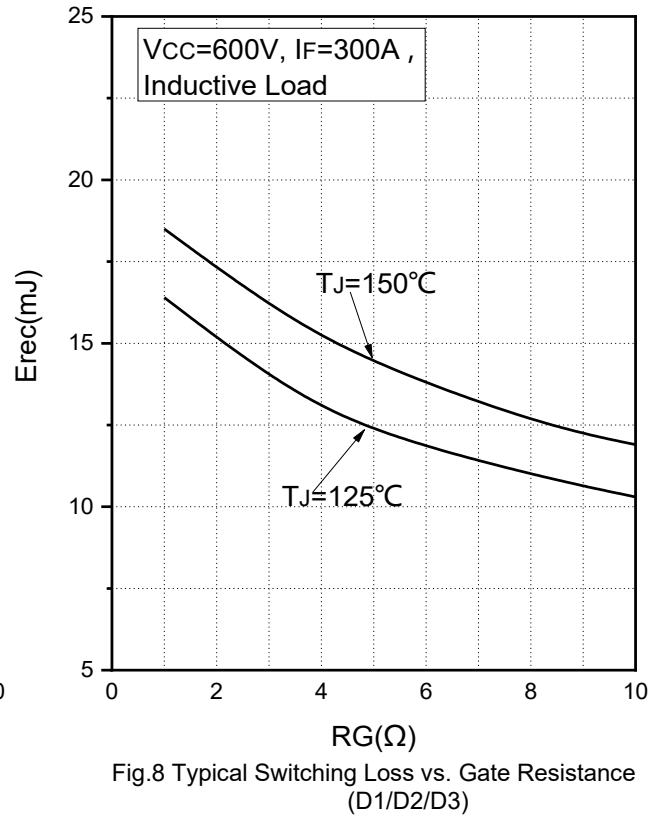
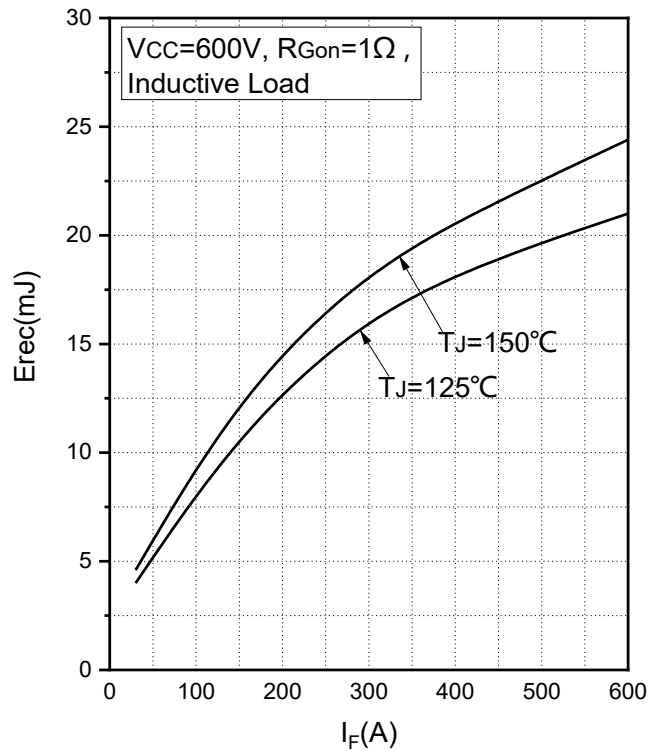
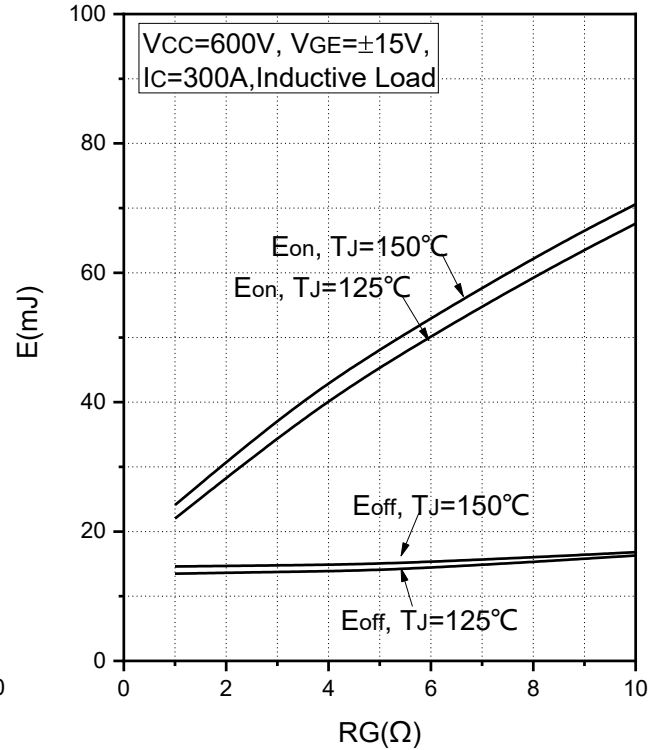
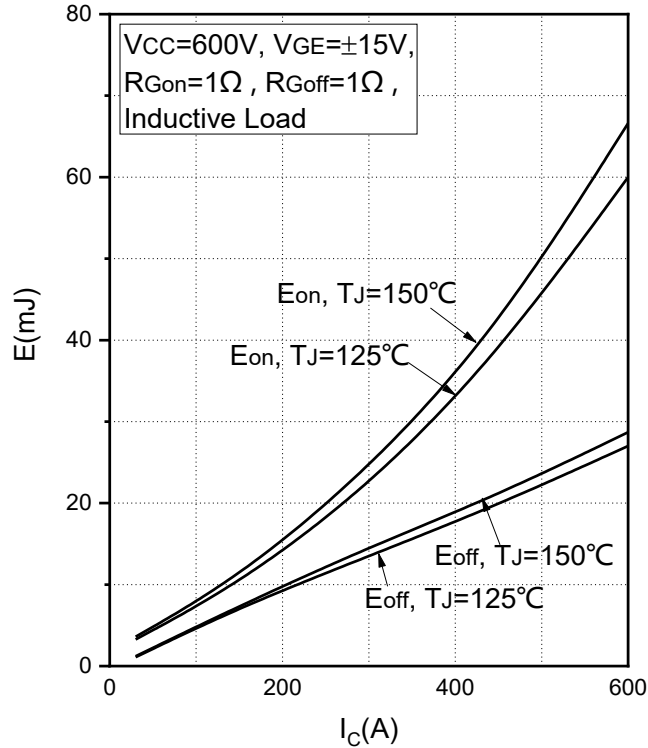


Fig.4 Forward Characteristics of Diode(D1/D2/D3)

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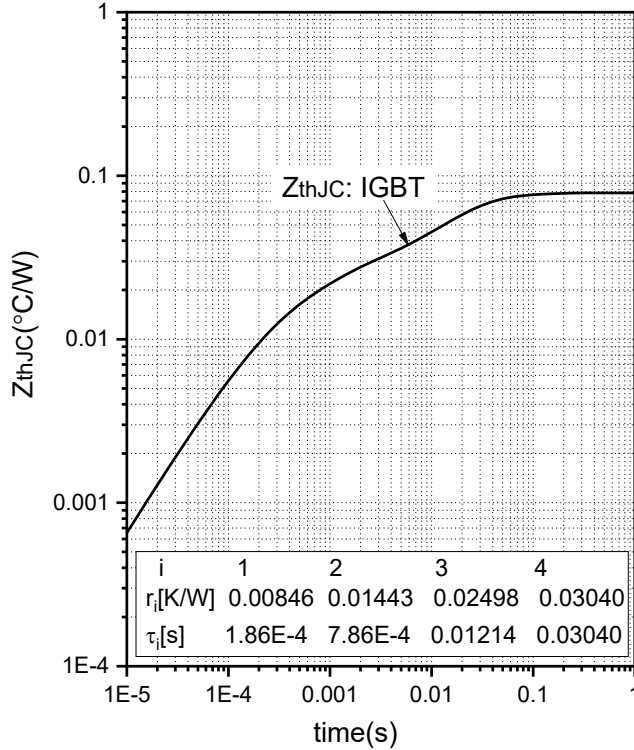


Fig.9 Transient Thermal Impedance (IGBT)(T1/T2)

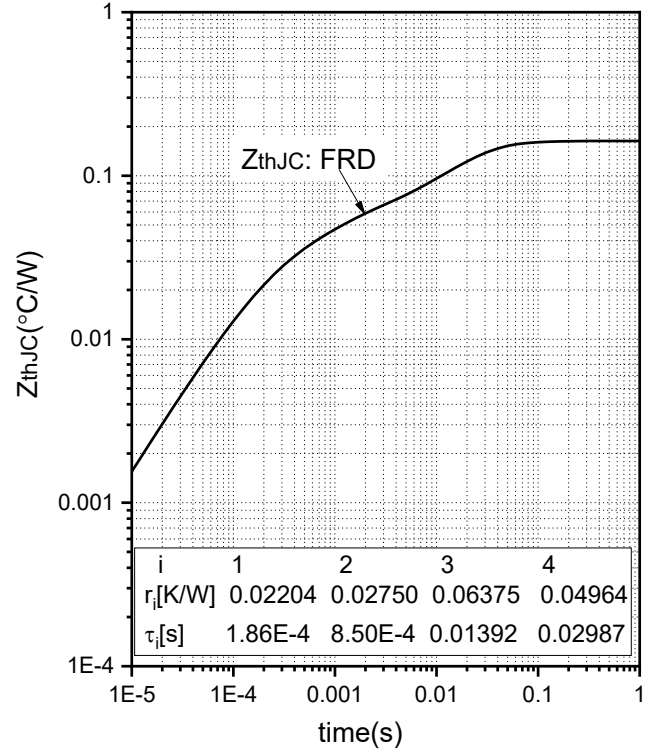


Fig.10 Transient Thermal Impedance (Diode)(D1/D2/D3)

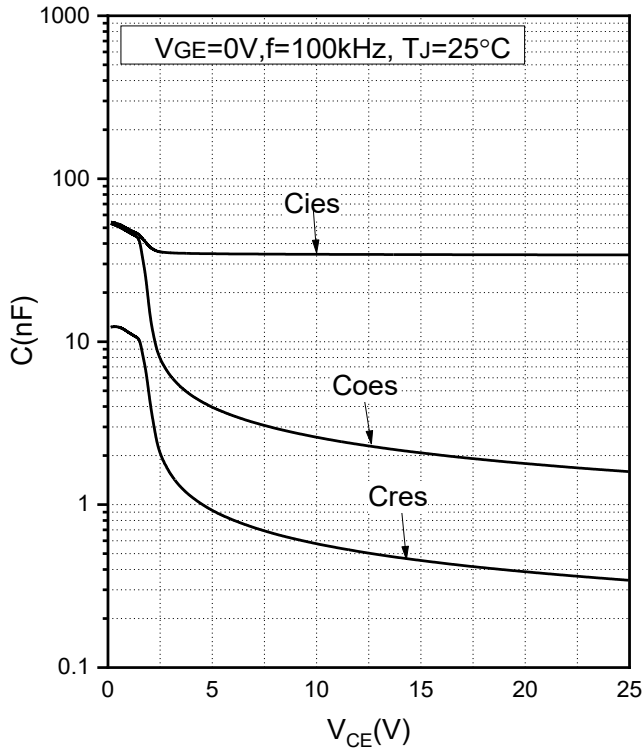


Fig.11 Capacitance Characteristics(T1/T2)

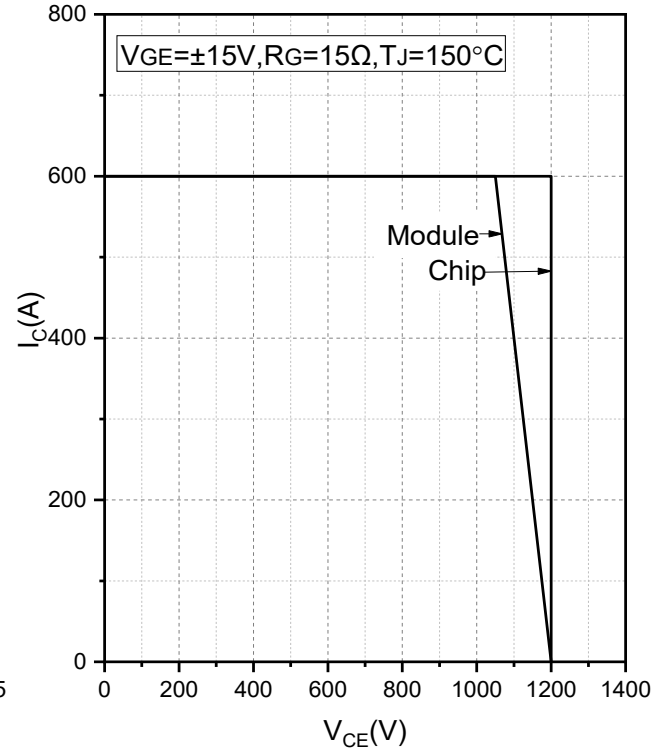


Fig.12 Reverse Bias Safe Operation Area (RBSOA)(T1/T2)

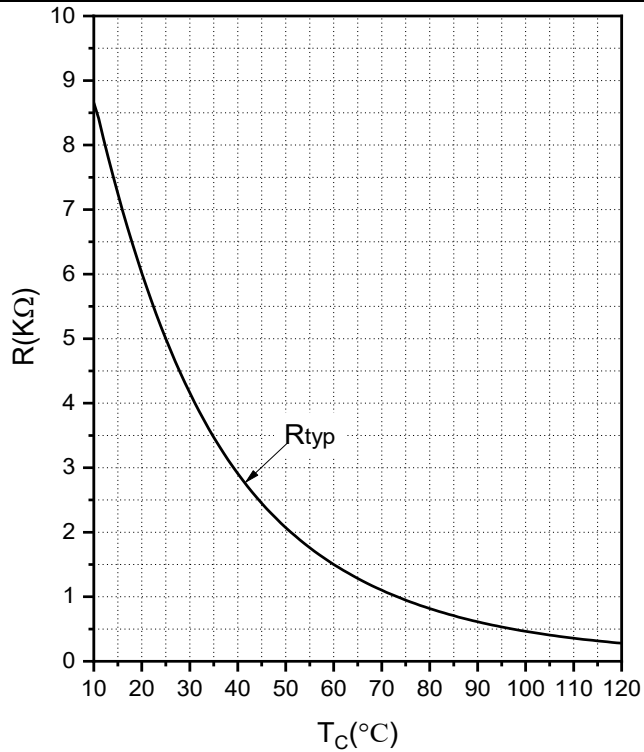


Fig.13 NTC Temperature Characteristics

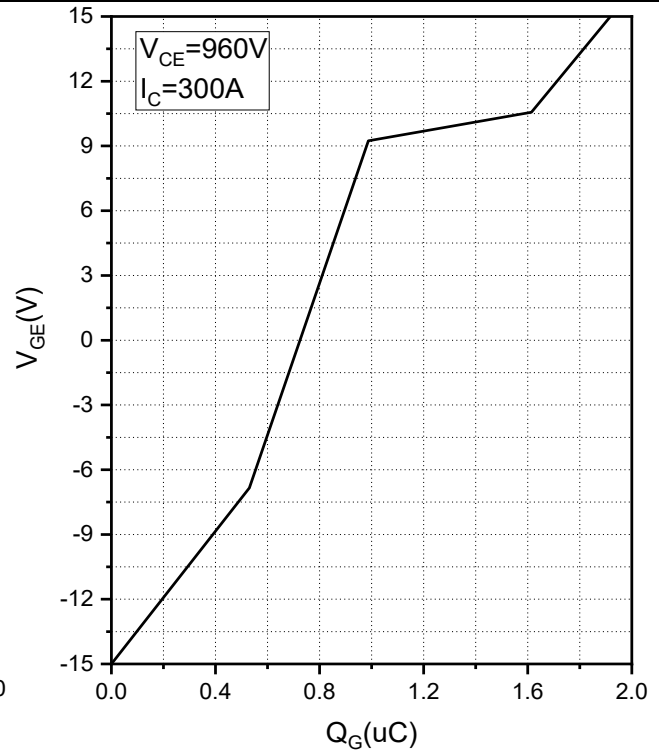


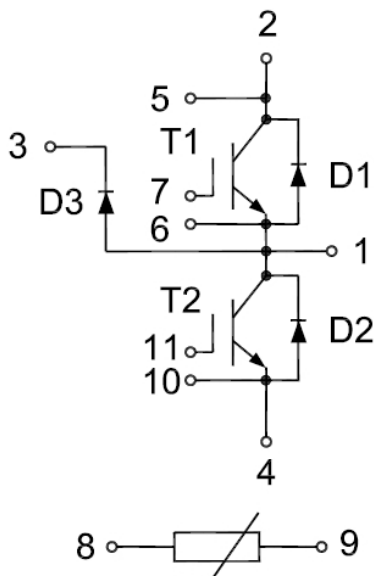
Fig.14 Gate Charge Characteristics(T1/T2)

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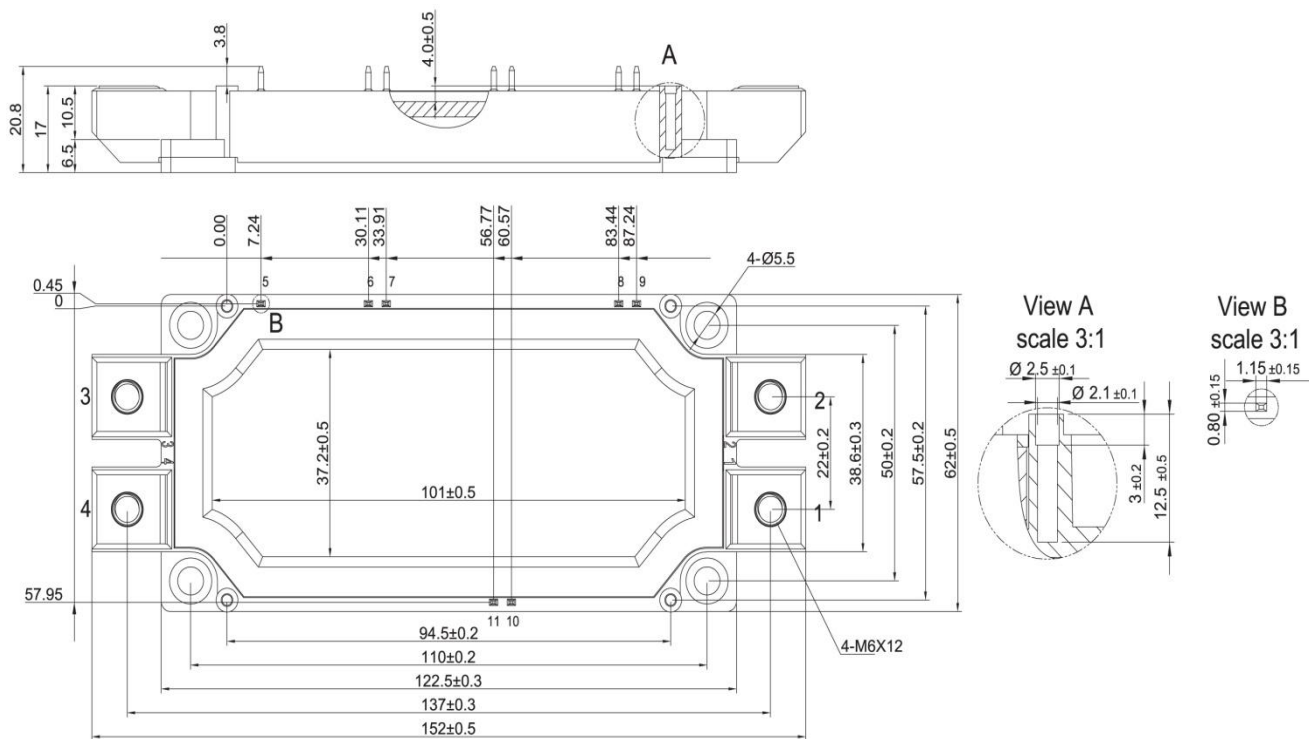
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Internal Circuit:



Package Outline (Unit: mm):





Revision	Notes
02	Engineering Sample Datasheet

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