

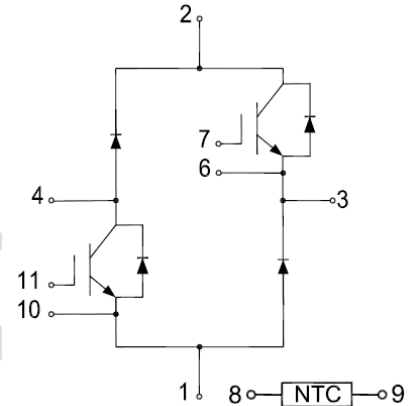


# GT300CH120T9H-SD

## IGBT Module

### Features:

- Trench & Field Stop IGBT
- Short Circuit Rated > 10 $\mu$ s
- Low Switching Loss
- 100% RBSOA Tested (2xIc)
- Low Stray Inductance
- Copper Wire Bonding on Power Terminal
- Lead Free, Compliant with RoHS Requirement



### Applications:

- UPS Systems
- Servo Applications
- Motor Drives
- Medical Applications
- High Frequency Switching Applications

### IGBT, Brake-chopper

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

$V_{CES}$	Collector-Emitter Blocking Voltage		1200	V
$V_{GES}$	Gate-Emitter Voltage		$\pm 20$	V
$I_C$	Continuous Collector Current	$T_C=100^\circ\text{C}$	300	A
		$T_C=25^\circ\text{C}$	580	A
$I_{CM}$	Peak Collector Current Repetitive	$T_J=175^\circ\text{C}$	600	A
$t_{SC}$	Short Circuit Withstand Time		>10	$\mu\text{s}$
$P_D$	Maximum Power Dissipation (IGBT)	$T_C=25^\circ\text{C}$ $T_{Jmax}=175^\circ\text{C}$	1975	W



## Electrical Characteristics of Brake-chopper IGBT ( $T_C=25^\circ\text{C}$ unless otherwise specified)

### Static Characteristics

Symbol	Description	Conditions	Min	Typ	Max	Unit
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=4\text{mA}$ , $V_{CE}=V_{GE}$	5.0	5.6	6.6	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=300\text{A}$ , $V_{GE}=15\text{V}$	$T_J=25^\circ\text{C}$	1.70	1.90	V
			$T_J=125^\circ\text{C}$	1.90		V
			$T_J=150^\circ\text{C}$	2.00		V
$I_{CES}$	Collector-Emitter Leakage Current	$V_{GE}=0\text{V}$ , $V_{CE}=V_{CES}$ , $T_J=25^\circ\text{C}$			1	mA
$I_{GES}$	Gate-Emitter Leakage Current	$V_{GE}=\pm 20\text{V}$ , $V_{CE}=0\text{V}$ , $T_J=25^\circ\text{C}$			400	nA
$C_{ies}$	Input Capacitance	$V_{CE}=25\text{V}$ , $V_{GE}=0\text{V}$ , $f=1\text{MHz}$		19.71		nF
$C_{oes}$	Output Capacitance			1.68		nF
$C_{res}$	Reverse Transfer Capacitance			1.10		nF

### Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	$V_{CC}=600\text{V}$ , $I_C=300\text{A}$ , $R_{Gon}=2\Omega$ , $V_{GE}=\pm 15\text{V}$ , Inductive Load	$T_J=25^\circ\text{C}$	0.39		$\mu\text{s}$
			$T_J=125^\circ\text{C}$	0.40		
			$T_J=150^\circ\text{C}$	0.40		
$t_r$	Rise Time		$T_J=25^\circ\text{C}$	0.13		$\mu\text{s}$
			$T_J=125^\circ\text{C}$	0.13		
			$T_J=150^\circ\text{C}$	0.13		
$t_{d(off)}$	Turn-off Delay Time		$T_J=25^\circ\text{C}$	0.39		$\mu\text{s}$
			$T_J=125^\circ\text{C}$	0.42		
			$T_J=150^\circ\text{C}$	0.42		
$t_f$	Fall Time	$T_J=25^\circ\text{C}$	0.13		$\mu\text{s}$	
		$T_J=125^\circ\text{C}$	0.19			
		$T_J=150^\circ\text{C}$	0.21			
$E_{on}$	Turn-on Switching Loss	$V_{CC}=600\text{V}$ , $I_C=300\text{A}$ , $R_{Gon}=2\Omega$ , $V_{GE}=\pm 15\text{V}$ , $di/dt=1880\text{A}/\mu\text{s}$ ( $T_J=150^\circ\text{C}$ ) Inductive Load	$T_J=25^\circ\text{C}$	20.6		mJ
		$T_J=125^\circ\text{C}$	27.3			
		$T_J=150^\circ\text{C}$	29.7			



E <sub>off</sub>	Turn-off Switching Loss	V <sub>CC</sub> =600V, I <sub>C</sub> =300A, R <sub>Goff</sub> =2Ω, V <sub>GE</sub> = ±15V, du/dt=3300V/μs (T <sub>J</sub> =150°C) Inductive Load	T <sub>J</sub> =25°C	26.7	mJ
			T <sub>J</sub> =125°C	35.6	
			T <sub>J</sub> =150°C	38.3	
Q <sub>g</sub>	Total Gate Charge	V <sub>GE</sub> =+15V...-15V	T <sub>J</sub> =25°C	1.56	μC
R <sub>g internal</sub>	Internal Gate Resistance		T <sub>J</sub> =25°C	2.5	Ω
RBSOA	I <sub>C</sub> =600A, V <sub>CC</sub> =1050V, V <sub>p</sub> =1200V, R <sub>G</sub> =2Ω, V <sub>GE</sub> =+15V to 0V, T <sub>J</sub> =150°C			Trapezoid	
I <sub>SC</sub>	SC Data	V <sub>CC</sub> =600V, V <sub>GE</sub> =±15V, R <sub>Gon</sub> =2ohm, R <sub>Goff</sub> =2ohm, t <sub>p</sub> =10us, T <sub>J</sub> =125°C, Inductive Load		1594	A
R <sub>θJC</sub>	IGBT Thermal Resistance: Junction-To-Case(per leg)				0.076 °C/W

## Diode, Brake-chopper

### Maximum Rated Values of Brake-chopper Diode (T<sub>C</sub>=25°C unless otherwise specified)

V <sub>RRM</sub>	Repetitive Peak Reverse Voltage	1200	V
I <sub>F</sub>	Diode Continuous Forward Current	300	A
I <sub>FM</sub>	Diode Maximum Forward Current	600	A

### Electrical Characteristics of Brake-chopper Diode (T<sub>C</sub>=25°C unless otherwise specified)

Symbol	Description	Conditions	Min	Typ	Max	Unit
V <sub>FM</sub>	Forward Voltage	I <sub>F</sub> =300A	T <sub>J</sub> =25°C	1.80		V
			T <sub>J</sub> =125°C	1.80		
			T <sub>J</sub> =150°C	1.80		
t <sub>rr</sub>	Reverse Recovery Time	I <sub>F</sub> =300A, -di <sub>F</sub> /dt=2010A/μs(T <sub>J</sub> =150°C), V <sub>R</sub> =600V, V <sub>GE</sub> =-15V	T <sub>J</sub> =25°C	0.41		μs
			T <sub>J</sub> =125°C	0.60		
			T <sub>J</sub> =150°C	0.64		
I <sub>rr</sub>	Peak Reverse Recovery Current	I <sub>F</sub> =300A, -di <sub>F</sub> /dt=2010A/μs(T <sub>J</sub> =150°C), V <sub>R</sub> =600V, V <sub>GE</sub> =-15V	T <sub>J</sub> =25°C	150		A
			T <sub>J</sub> =125°C	181		
			T <sub>J</sub> =150°C	191		



Q <sub>rr</sub>	Reverse Recovery Charge	I <sub>F</sub> =300A, -diF/dt=2010/μs(T <sub>J</sub> =150°C), V <sub>R</sub> =600V, V <sub>GE</sub> =-15V	T <sub>J</sub> =25°C	29.7	μC
			T <sub>J</sub> =125°C	50.7	
			T <sub>J</sub> =150°C	57.8	
E <sub>rec</sub>	Reverse Recovery Energy		T <sub>J</sub> =25°C	12.9	mJ
			T <sub>J</sub> =125°C	22.0	
			T <sub>J</sub> =150°C	25.4	
R <sub>θJC</sub>	Diode Thermal Resistance: Junction-To-Case (per leg)			0.134	°C/W

### Diode, Anti-parallel

#### Maximum Rated Values of Anti-parallel Diode (T<sub>C</sub>=25°C unless otherwise specified)

V <sub>RRM</sub>	Repetitive Peak Reverse Voltage	1200	V
I <sub>F</sub>	Diode Continuous Forward Current	225	A
I <sub>FM</sub>	Diode Maximum Forward Current	450	A

#### Electrical Characteristics of Anti-parallel Diode

Symbol	Description	Conditions	Min	Typ	Max	Unit
V <sub>FM</sub>	Forward Voltage	I <sub>F</sub> =225A	T <sub>J</sub> =25°C	1.50		V
			T <sub>J</sub> =125°C	1.50		
			T <sub>J</sub> =150°C	1.50		
t <sub>rr</sub>	Reverse Recovery Time	I <sub>F</sub> =225A, -diF/dt =1700/μs(T <sub>J</sub> =150°C), V <sub>rr</sub> =600V, V <sub>GE</sub> = -15V	T <sub>J</sub> =25°C	0.39		μs
			T <sub>J</sub> =125°C	0.60		
I <sub>rr</sub>	Peak Reverse Recovery Current		T <sub>J</sub> =25°C	128		A
			T <sub>J</sub> =125°C	140		
Q <sub>rr</sub>	Reverse Recovery Charge		T <sub>J</sub> =25°C	13.2		μC
			T <sub>J</sub> =125°C	29.5		
E <sub>rec</sub>	Reverse Recovery Energy	T <sub>J</sub> =25°C	4.5		mJ	
		T <sub>J</sub> =125°C	9.6			
R <sub>θJC</sub>	Diode Thermal Resistance: Junction-To-Case				0.145	°C/W



## Internal NTC-Thermistor Characteristics

Symbol	Description		Min.	Typ.	Max.	Units.
R <sub>25</sub>	Rated Resistance	T <sub>C</sub> =25°C		5		kΩ
ΔR/R	Deviation of R100	T <sub>C</sub> =100°C, R <sub>100</sub> =481Ω	-5		5	%
P <sub>25</sub>	Power Dissipation	T <sub>C</sub> =25°C			10	mW
B <sub>25/50</sub>	B-Value	$R_2=R_{25} \exp[B_{25/50}(1/T_2-1/(298.15K))]$		3380		K
B <sub>25/80</sub>	B-Value	$R_2=R_{25} \exp[B_{25/80}(1/T_2-1/(298.15K))]$		3440		K

## Module

Symbol	Description		Min.	Typ.	Max.	Units
V <sub>iso</sub>	Isolation Voltage (All Terminals Shorted)	RMS, f=50Hz, 1minute		2500		V
L <sub>sCE</sub>	Stray Inductance Module			20		nH
T <sub>J</sub>	Maximum Junction Temperature				175	°C
T <sub>JOP</sub>	Maximum Operating Junction Temperature Range		-40		+150	°C
T <sub>stg</sub>	Storage Temperature		-40		+125	°C
CTI	Comparative Tracking Index		200			
R <sub>θCS</sub>	Case-to-Sink Thermally (Conductive Grease Applied)				0.02	°C/W
M	Terminals Connection Torque	Screw M6-Mounting according to valid application note	3.0		6.0	N·m
M	Mounting Torque for Module Mounting	Screw M5--Mounting according to valid application note	3.0		6.0	N·m
G	Weight			330		g

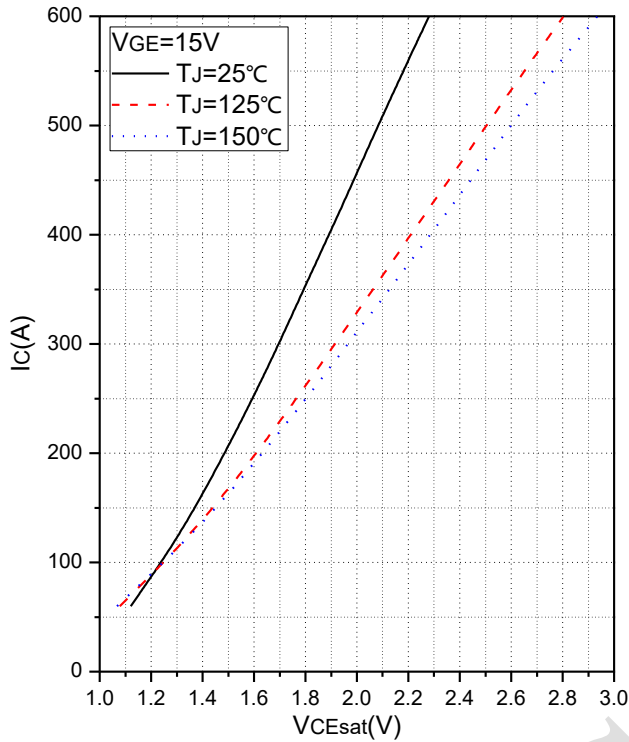


Fig.1 Typical Saturation Voltage Characteristics

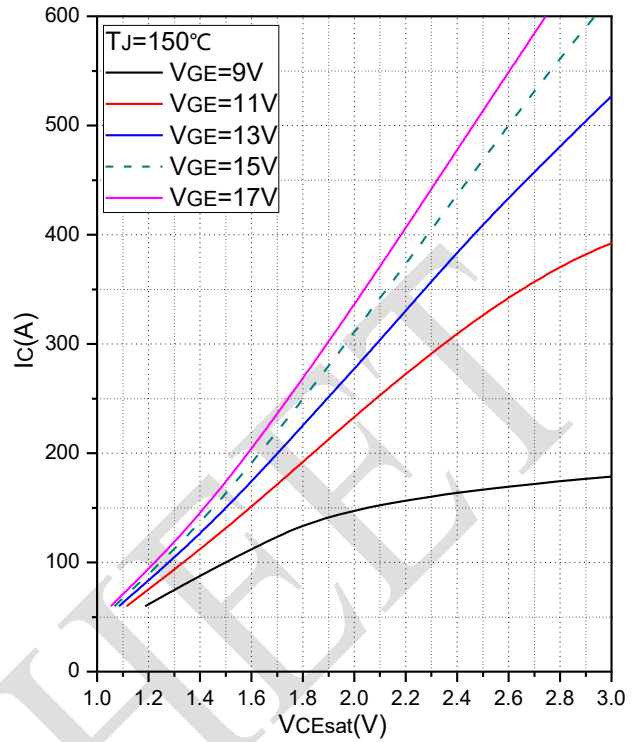


Fig.2 Typical Output Characteristics

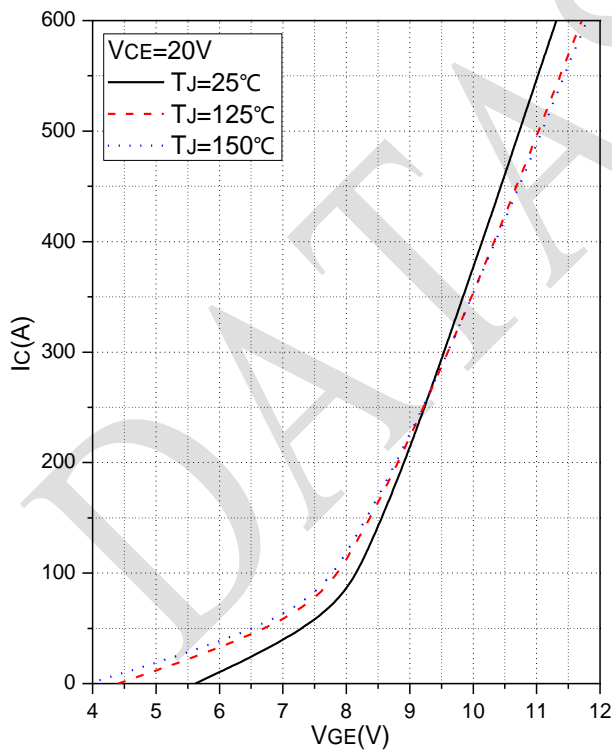


Fig.3 Transfer Characteristics

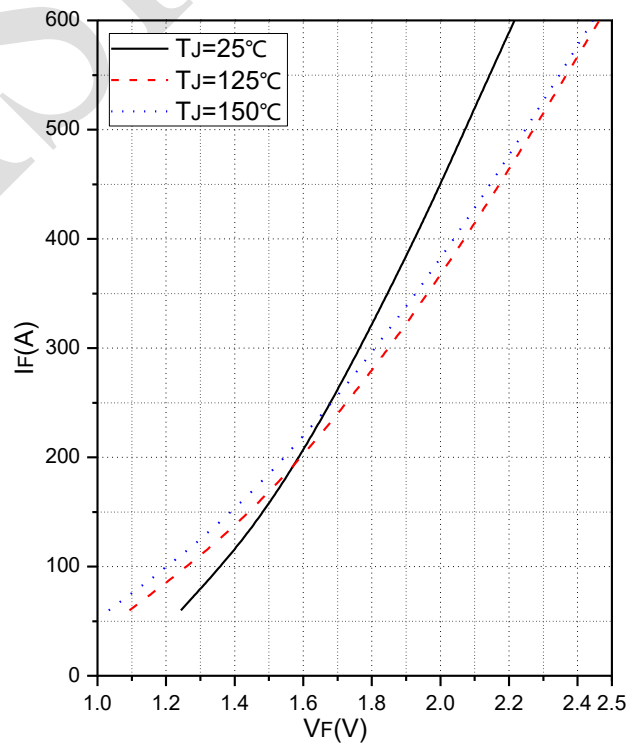


Fig.4 Forward Characteristics of Brake-chopper Diode

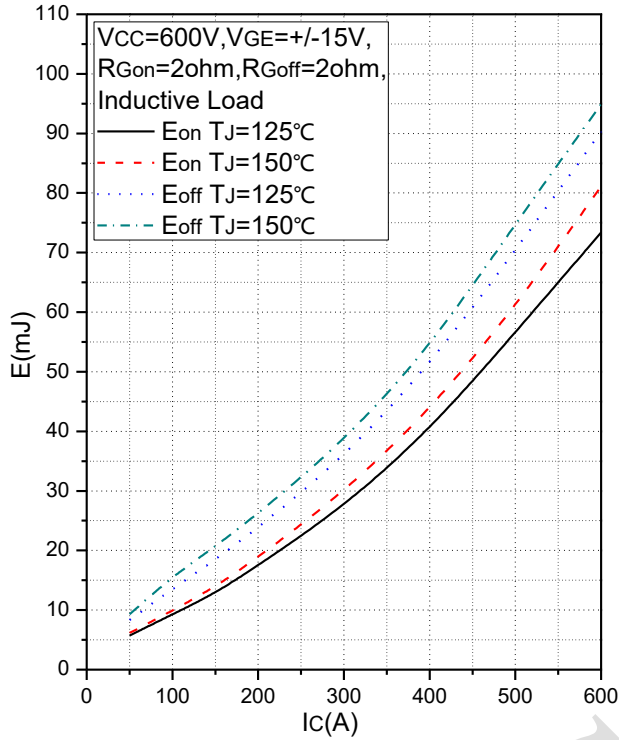


Fig.5 Typical Switching Loss vs. Collector Current

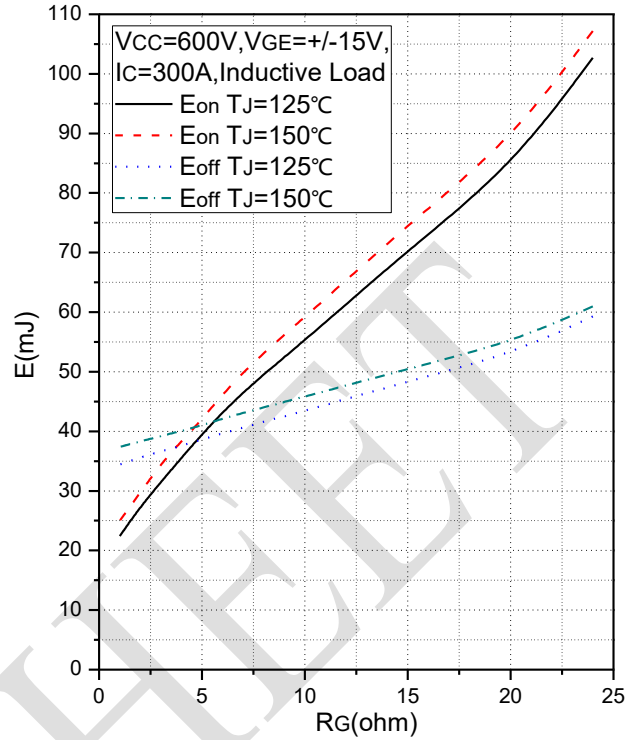


Fig.6 Typical Switching Loss vs. Gate Resistance

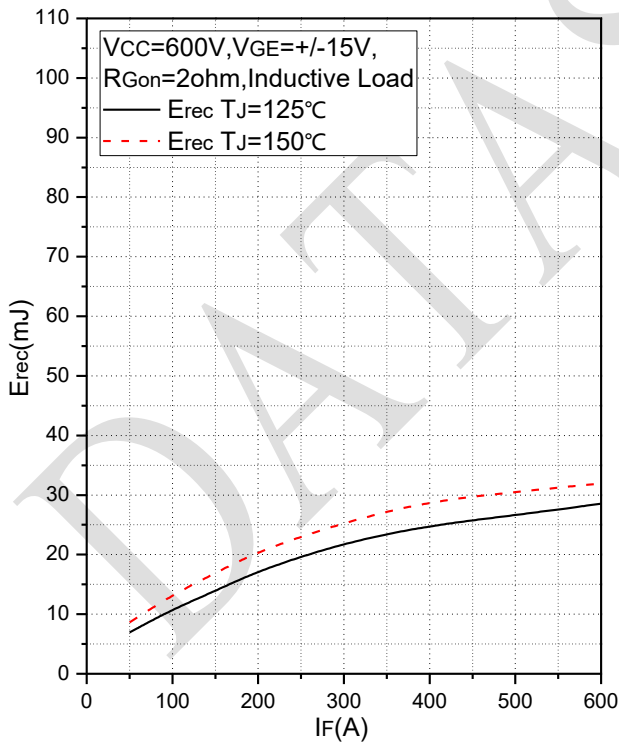


Fig.7 Typical Switching Loss vs. Forward Current

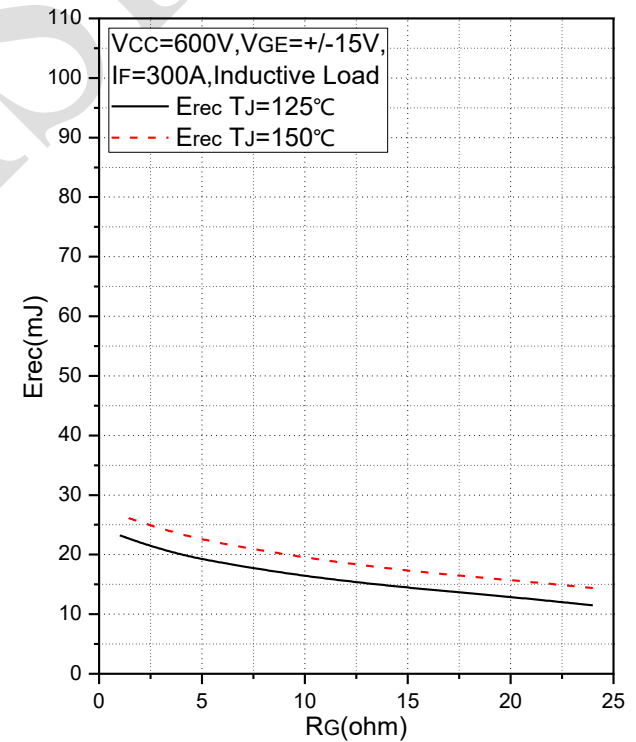


Fig.8 Typical Switching Loss vs. Gate Resistance

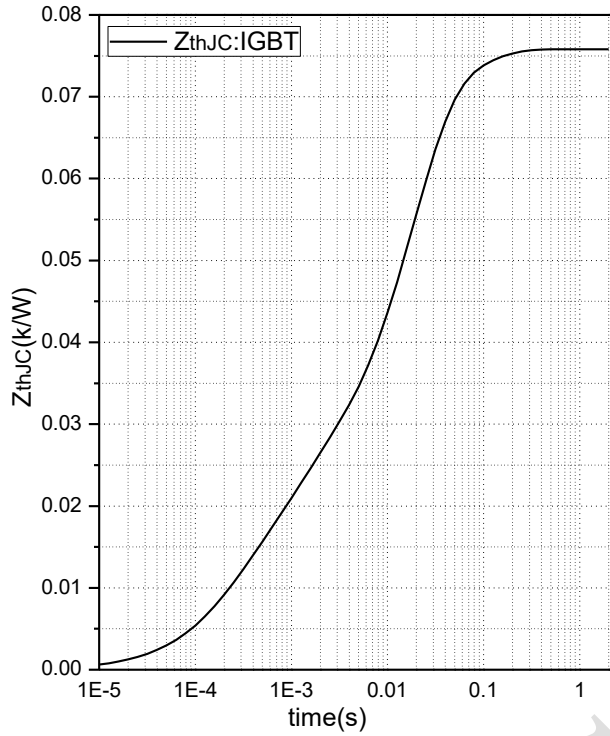


Fig.9 Transient Thermal Impedance (IGBT)

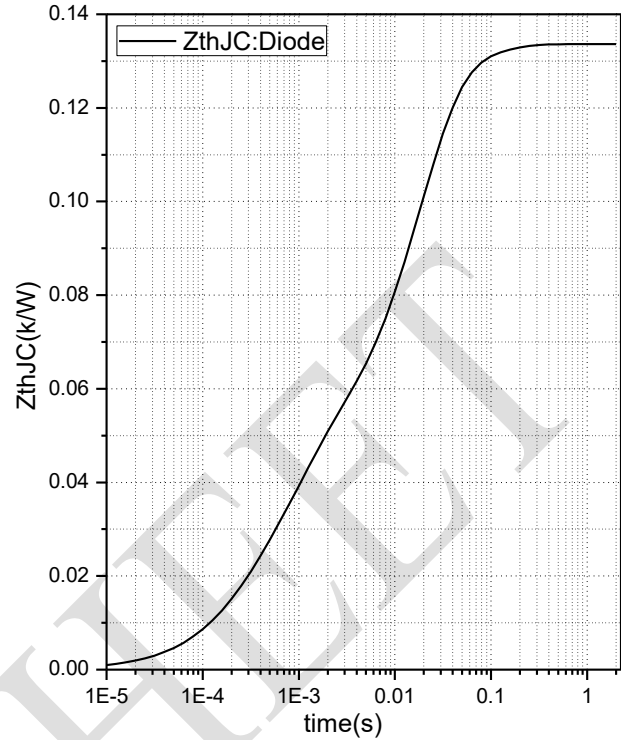


Fig.10 Transient Thermal Impedance (Diode)

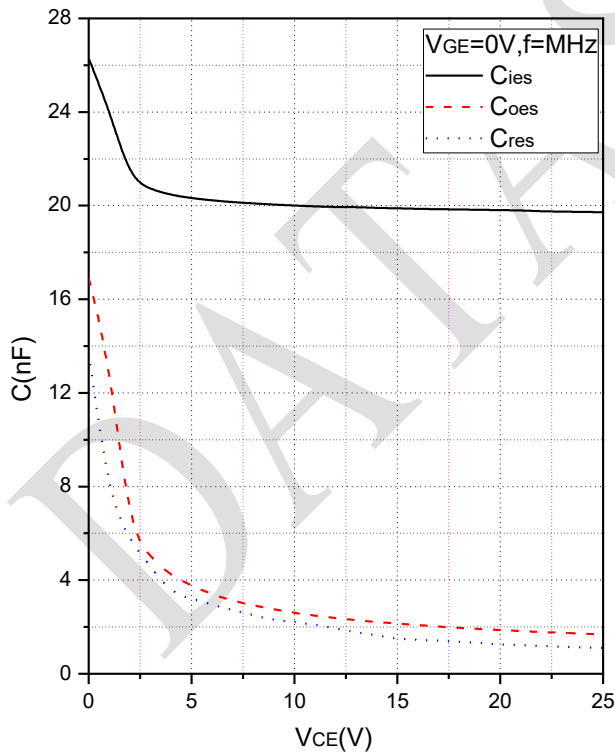


Fig.11 Capacitance Characteristics

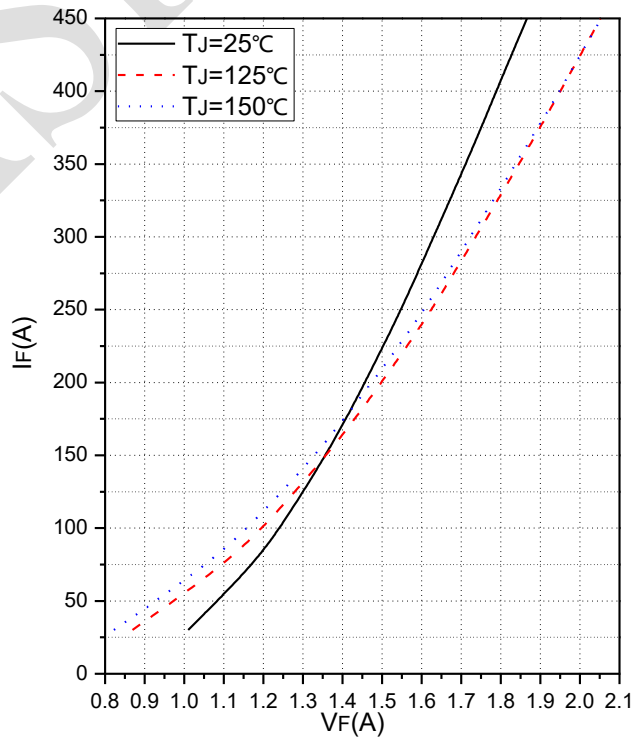


Fig.12 Forward Characteristics of Anti-parallel Diode



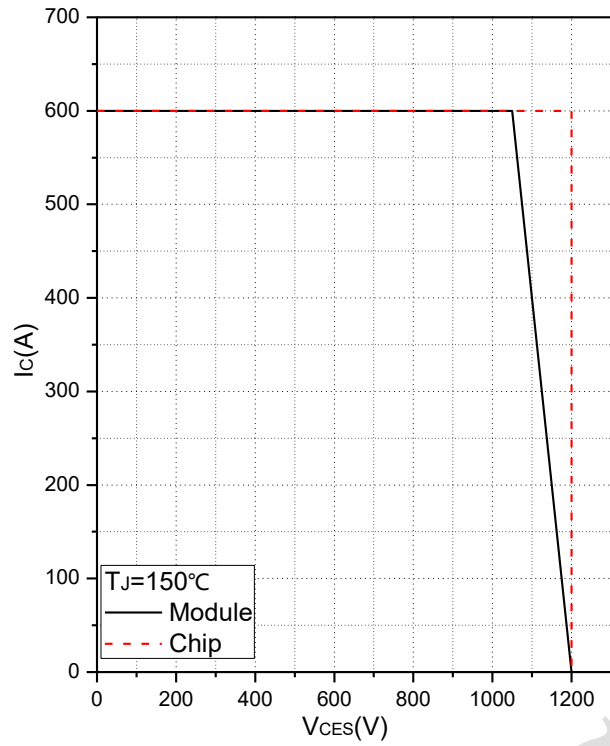


Fig.13 Reverse Bias Safe Operation Area (RBSOA)

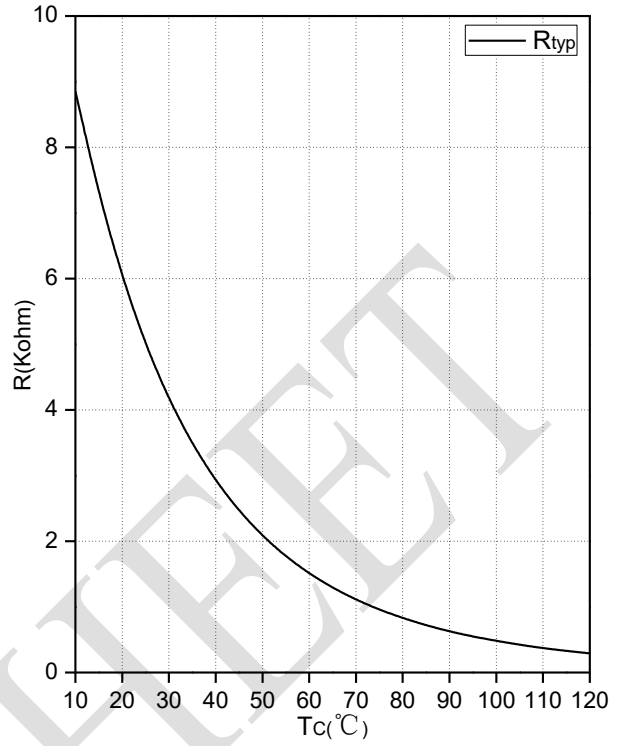
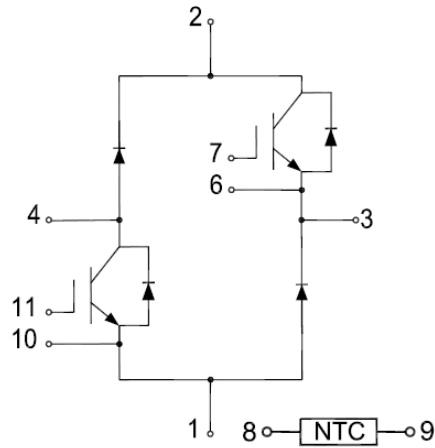


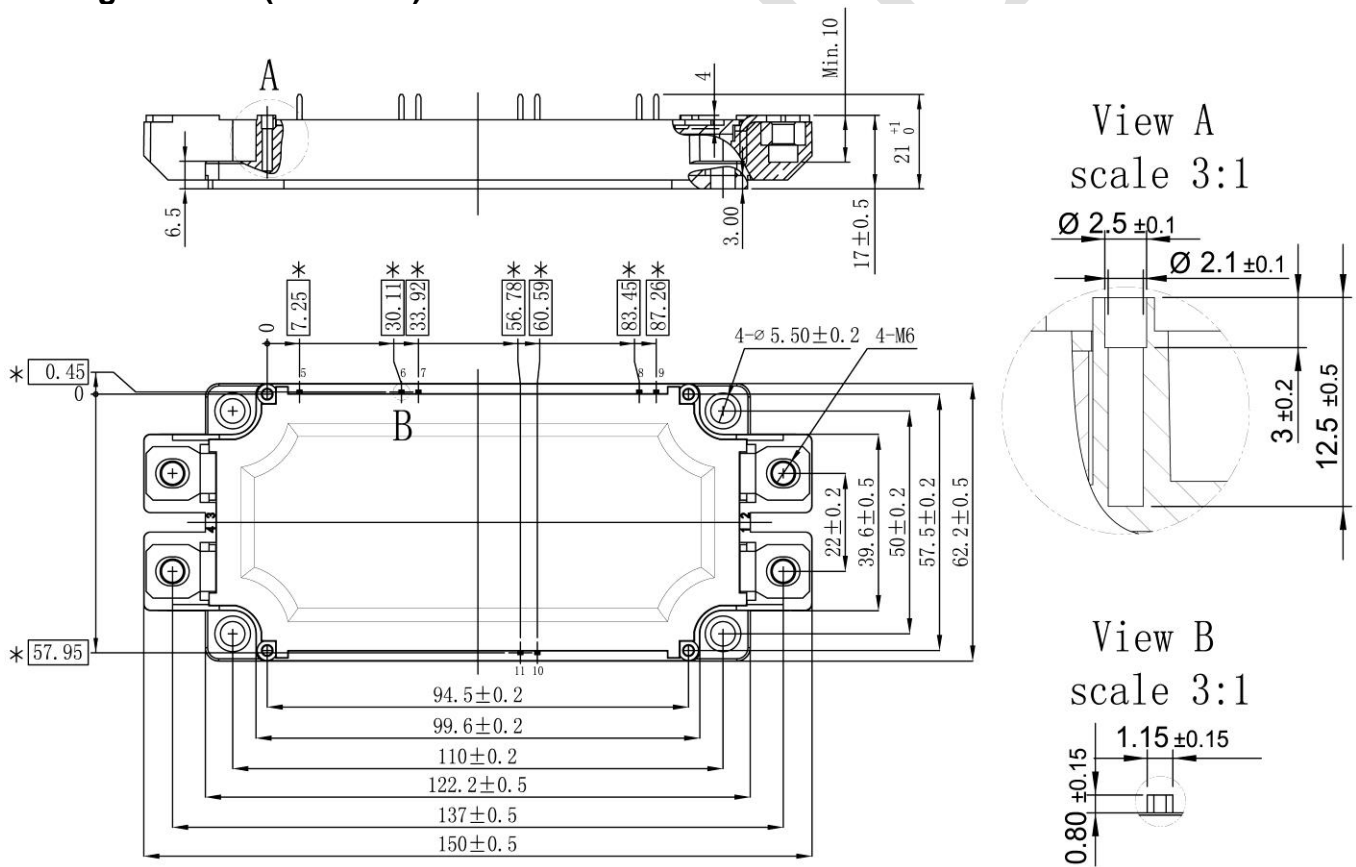
Fig.14 NTC Temperature Characteristics



### Internal Circuit:



### Package Outline (Unit: mm):





Date	Revision	Notes
03/23/2020	01	Initial Release
05/20/2020	02	Update Outline

## **Announcement**

Information in this document is believed to be accurate and reliable. However, NJSME does not give any representations or warranties, expressed or implied, as to the accuracy or completeness of such information and shall have no liability for the consequences of use of such information.

## **Right to Make Changes**

NJSME reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.

DATA SHEET