



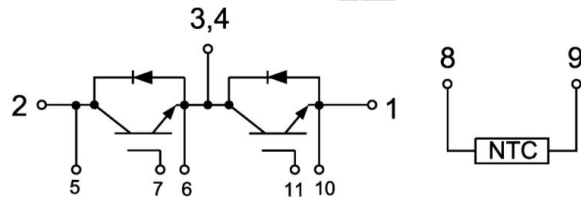
# GT600HF170T9H

## IGBT Module

### Features:

- Field Stop Trench Gate IGBT
- Short Circuit Rated >10 $\mu$ s
- Low Saturation Voltage
- Low Switching Loss
- 100% RBSOA Tested(2xI<sub>c</sub>)
- Low Stray Inductance
- Lead Free, Compliant with RoHS Requirement

### Circuit Diagram



### Applications:

- Inverter for Motor Driver
- AC and DC Servo Driver Amplifier
- Wind Turbines
- Uninterruptible Power Supply

### IGBT, Inverter

#### Maximum Rated Values (T<sub>C</sub>=25°C unless otherwise specified)

V <sub>CES</sub>	Collector-Emitter Blocking Voltage		1700	V
V <sub>GES</sub>	Gate-Emitter Voltage		±20	V
I <sub>c</sub>	Continuous Collector Current	T <sub>C</sub> =100°C	600	A
		T <sub>C</sub> =25°C	950	A
I <sub>CM</sub>	Peak Collector Current Repetitive	T <sub>J</sub> =175°C	1200	A
t <sub>sc</sub>	Short Circuit Withstand Time		>10	μs
P <sub>D</sub>	Maximum Power Dissipation (IGBT)	T <sub>C</sub> =25°C	3410	W
		T <sub>Jmax</sub> =175°C		



## 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	$I_C=24\text{mA}$ , $V_{CE}=V_{GE}$	4.5	5.7	6.5	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=600\text{A}$ , $V_{GE}=15\text{V}$	$T_J=25^\circ\text{C}$	1.80		V
			$T_J=125^\circ\text{C}$	2.20		V
			$T_J=150^\circ\text{C}$	2.30		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	$V_{CE}=25\text{V}$ , $V_{GE}=0\text{V}$ , $f=1\text{MHz}$		62.46		nF
$C_{oes}$	Output Capacitance			3.72		nF
$C_{res}$	Reveres Transfer Capacitance			0.72		nF

### Switching Characteristics

Symbol	Description	Conditions	Min.	Typ.	Max.	Units.	
$t_{d(on)}$	Turn-on Delay Time	$V_{CC}=900\text{V}$ , $I_C=600\text{A}$ , $R_{Gon}=1\Omega$ , $V_{GE}=\pm 15\text{V}$ , Inductive Load	$T_J=25^\circ\text{C}$		0.65		$\mu\text{s}$
			$T_J=125^\circ\text{C}$		0.66		
			$T_J=150^\circ\text{C}$		0.66		
$t_r$	Rise Time		$T_J=25^\circ\text{C}$		0.24		$\mu\text{s}$
			$T_J=125^\circ\text{C}$		0.28		
			$T_J=150^\circ\text{C}$		0.29		
$t_{d(off)}$	Turn-off Delay Time	$V_{CC}=900\text{V}$ , $I_C=600\text{A}$ , $R_{Goff}=1\Omega$ , $V_{GE}=\pm 15\text{V}$ , Inductive Load	$T_J=25^\circ\text{C}$		0.54		$\mu\text{s}$
			$T_J=125^\circ\text{C}$		0.61		
			$T_J=150^\circ\text{C}$		0.61		
$t_f$	Fall Time		$T_J=25^\circ\text{C}$		0.34		$\mu\text{s}$
			$T_J=125^\circ\text{C}$		0.58		
			$T_J=150^\circ\text{C}$		0.65		



E <sub>on</sub>	Turn-on Switching Loss	V <sub>CC</sub> =900V, I <sub>C</sub> =600A, R <sub>Gon</sub> =1Ω, V <sub>GE</sub> = ±15V, Inductive Load di/dt=1725A/μs(T <sub>J</sub> =150°C)	T <sub>J</sub> =25°C	153	mJ
			T <sub>J</sub> =125°C	216	
			T <sub>J</sub> =150°C	236	
E <sub>off</sub>	Turn-off Switching Loss	V <sub>CC</sub> =900V, I <sub>C</sub> =600A, R <sub>Goff</sub> =1Ω, V <sub>GE</sub> =±15V, Inductive Load du/dt=3275V/μs(T <sub>J</sub> =150°C)	T <sub>J</sub> =25°C	155	mJ
			T <sub>J</sub> =125°C	209	
			T <sub>J</sub> =150°C	223	
Q <sub>g</sub>	Total Gate Charge	V <sub>GE</sub> =-15V...+15V	T <sub>J</sub> =25°C	3.06	uC
R <sub>g internal</sub>	Internal Gate Resistance		T <sub>J</sub> =25°C	1.67	Ω
RBSOA	I <sub>C</sub> =1200A, V <sub>CC</sub> =1650V, V <sub>p</sub> =1700V, R <sub>G</sub> =1Ω, V <sub>GE</sub> =+15V to 0V, T <sub>J</sub> =150°C			Trapezoid	
SCSOA	V <sub>CC</sub> =900V, V <sub>GE</sub> =15V, T <sub>J</sub> =150°C		10		μs
R <sub>θJC</sub>	IGBT Thermal Resistance: Junction-To-Case (per leg)				0.044 °C/W

## Diode, Inverter

### Maximum Rated Values (T<sub>C</sub>=25°C unless otherwise specified)

V <sub>RRM</sub>	Repetitive Peak Reverse Voltage	1700	V
I <sub>F</sub>	Diode Continuous Forward Current	600	A
I <sub>FM</sub>	Peak FWD Current Repetitive	1200	A

### Electrical Characteristics of FWD (T<sub>C</sub>=25°C unless otherwise specified)

Symbol	Description	Conditions	Min.	Typ.	Max.	Units.
V <sub>FM</sub>	Forward Voltage	I <sub>F</sub> =600A	T <sub>J</sub> =25°C	2.80		V
			T <sub>J</sub> =125°C	3.00		
			T <sub>J</sub> =150°C	3.00		
t <sub>rr</sub>	Reverse Recovery Time	I <sub>F</sub> =600A, -di <sub>F</sub> /dt=2090A/μs(T <sub>J</sub> =150°C), V <sub>R</sub> =900V, V <sub>GE</sub> =-15V	T <sub>J</sub> =25°C	0.67		μs
			T <sub>J</sub> =125°C	0.94		
			T <sub>J</sub> =150°C	1.05		



I <sub>rr</sub>	Peak Reverse Recovery Current	I <sub>F</sub> =600A, -di <sub>F</sub> /dt=2090A/μs(T <sub>J</sub> =150°C), V <sub>R</sub> =900V, V <sub>GE</sub> =-15V	T <sub>J</sub> =25°C	169	A
			T <sub>J</sub> =125°C	238	
			T <sub>J</sub> =150°C	250	
Q <sub>rr</sub>	Reverse Recovery Charge		T <sub>J</sub> =25°C	38	μC
			T <sub>J</sub> =125°C	91	
			T <sub>J</sub> =150°C	111	
E <sub>rec</sub>	Reverse Recovery Energy		T <sub>J</sub> =25°C	22	mJ
			T <sub>J</sub> =125°C	49	
			T <sub>J</sub> =150°C	61	
R <sub>θJC</sub>	Diode Thermal Resistance: Junction-To-Case (per leg)			0.077	°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 R <sub>100</sub>	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				150	°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>eCS</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

## Ordering Information Table

Device code	G	T	600	HF	170	T9	H
	①	②	③	④	⑤	⑥	⑦

- ① - IGBT Module
- ② - Trench, Low Switching Losses IGBT
- ③ - Rated Current (600=600A)
- ④ - Circuit Configuration: HF (Half Bridge)
- ⑤ - Rated Voltage (170=1700V)
- ⑥ - Package Type
- ⑦ - Test Level (Pass the Important Reliability Test-Industrial Grade)

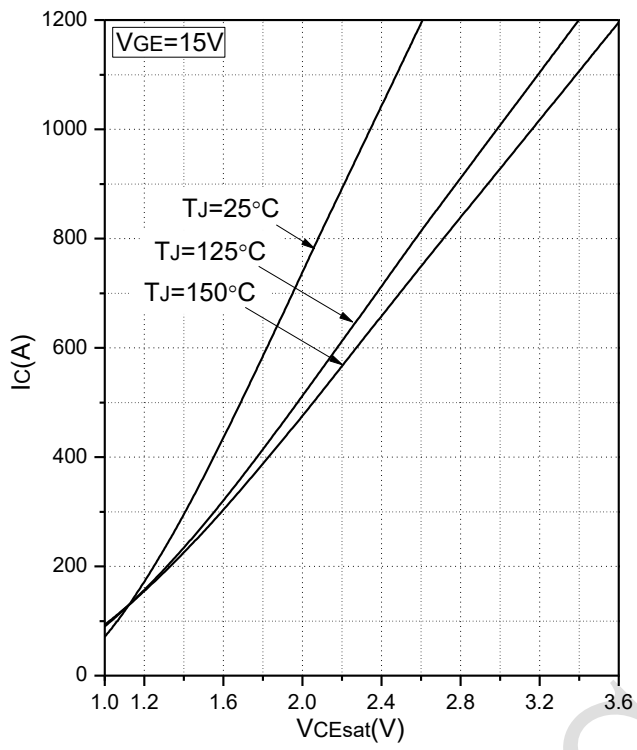


Fig.1 Typical Saturation Voltage Characteristics

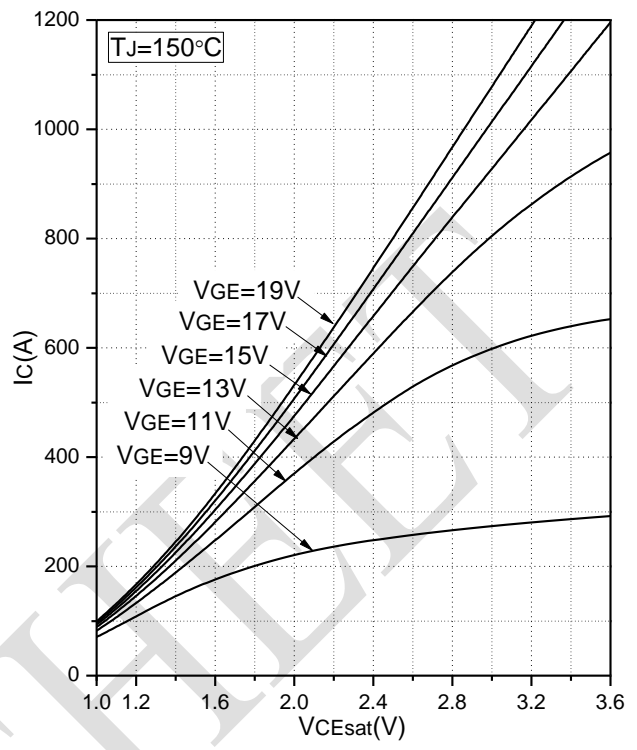


Fig.2 Typical Output Characteristics

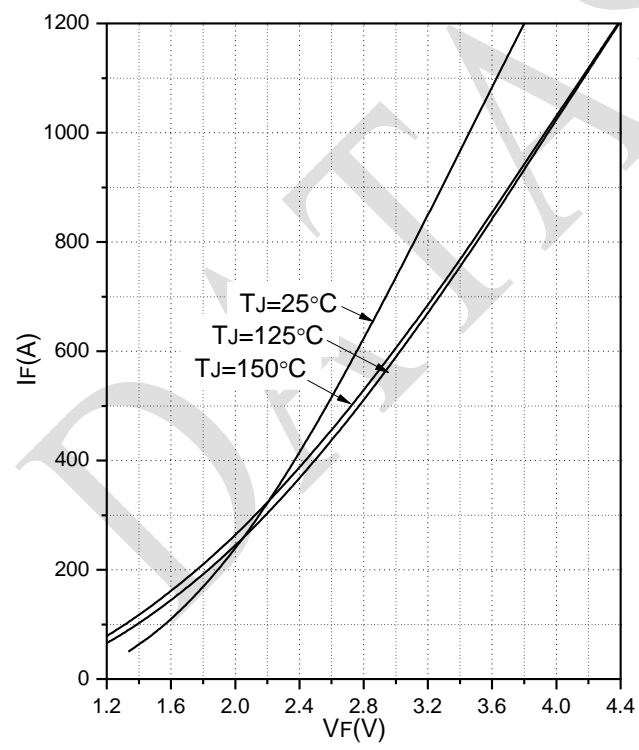


Fig.3 Forward Characteristics of FWD

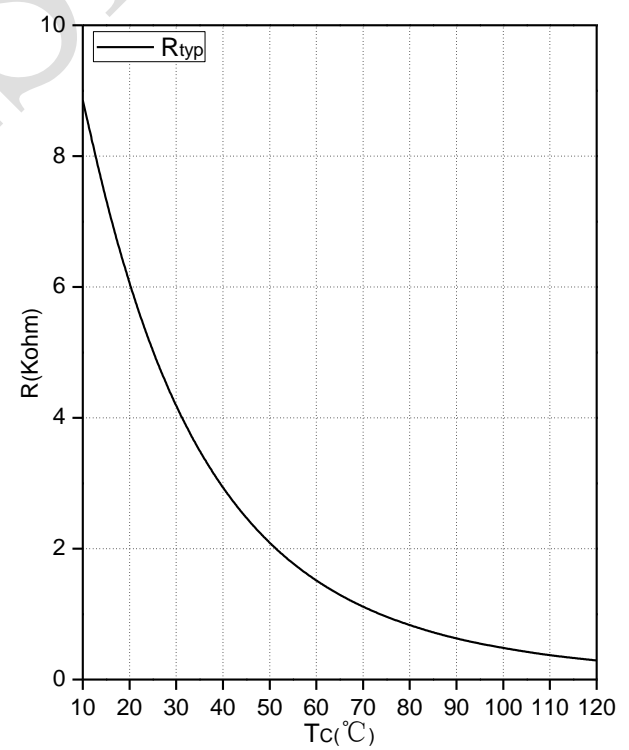


Fig.4 NTC Temperature characteristics

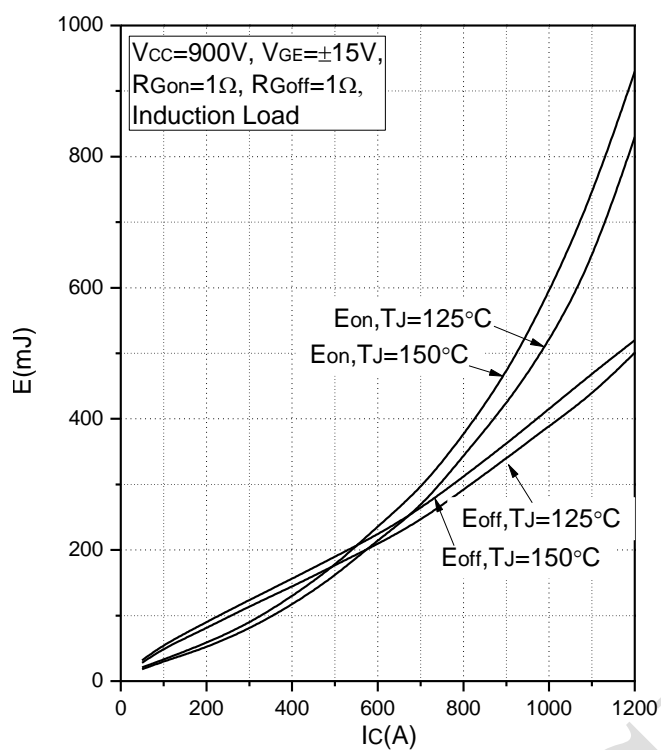


Fig.5 Typical Switching Loss vs. Collector Current

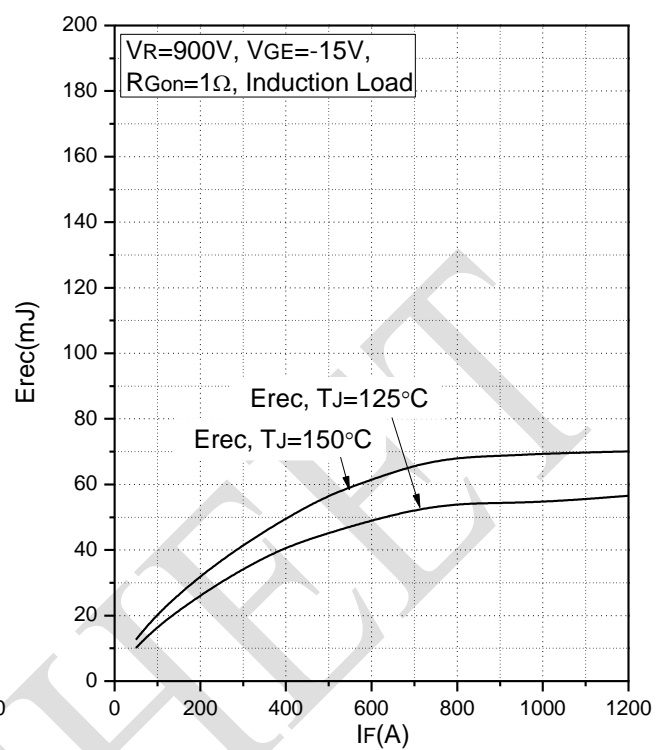


Fig.6 Typical Switching Loss vs. Forward Current

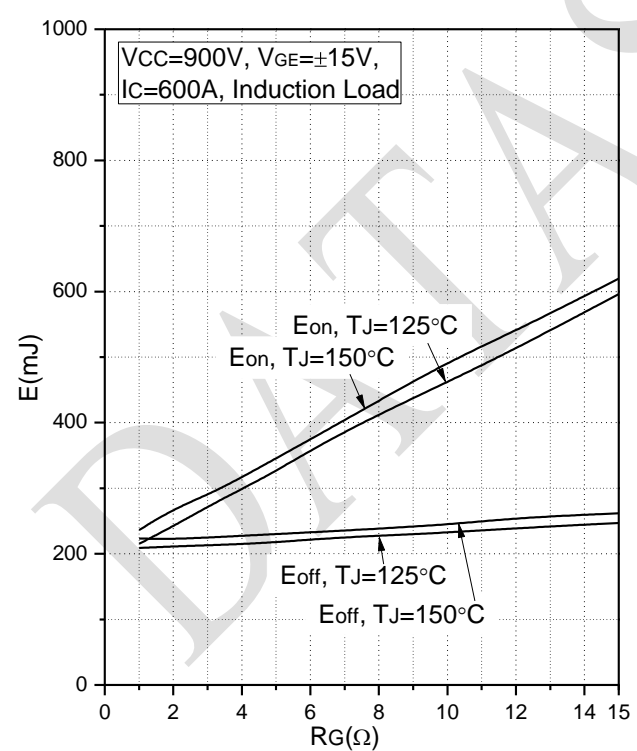


Fig.7 Typical Switching Loss vs. Gate Resistance

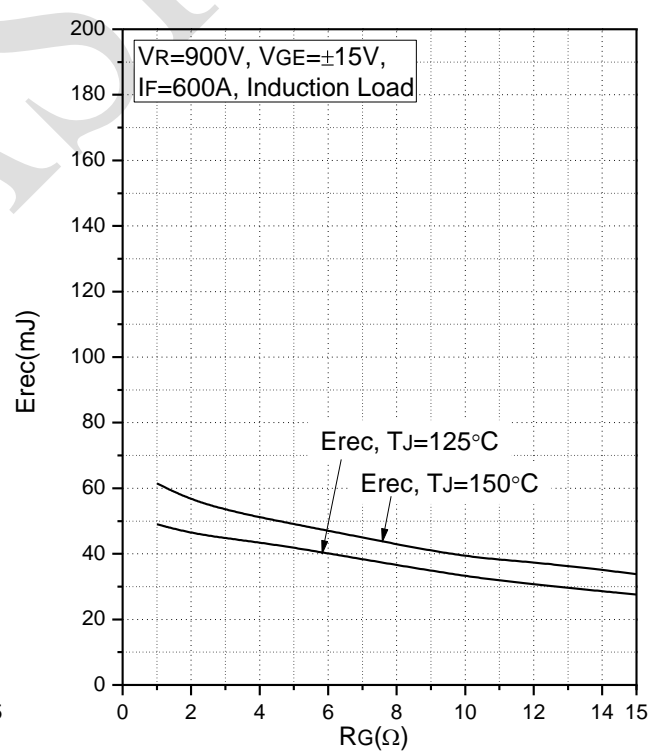


Fig.8 Typical Switching Loss vs. Gate Resistance

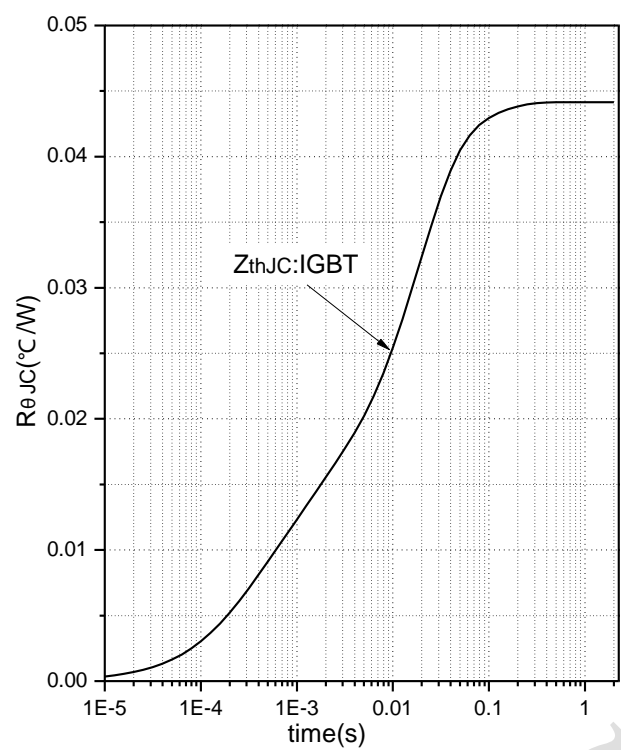


Fig.9 Transient Thermal Impedance (IGBT)

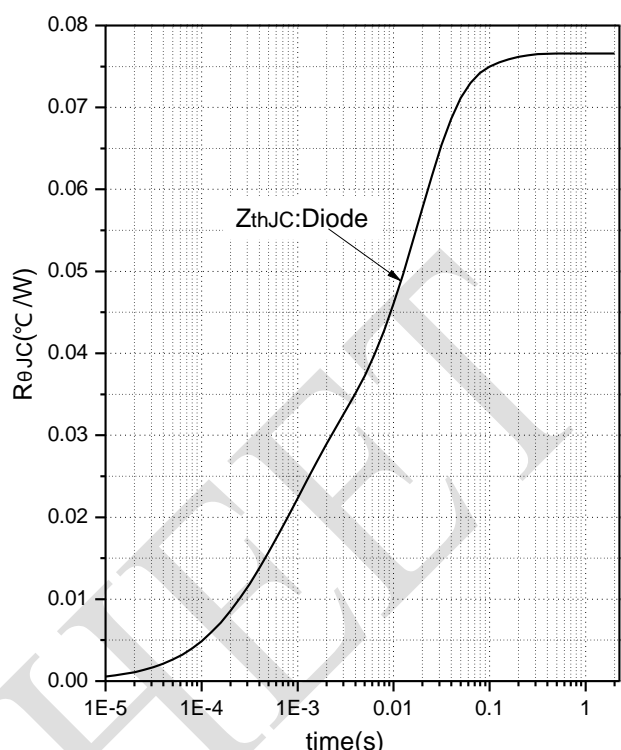


Fig.10 Transient Thermal Impedance (Diode)

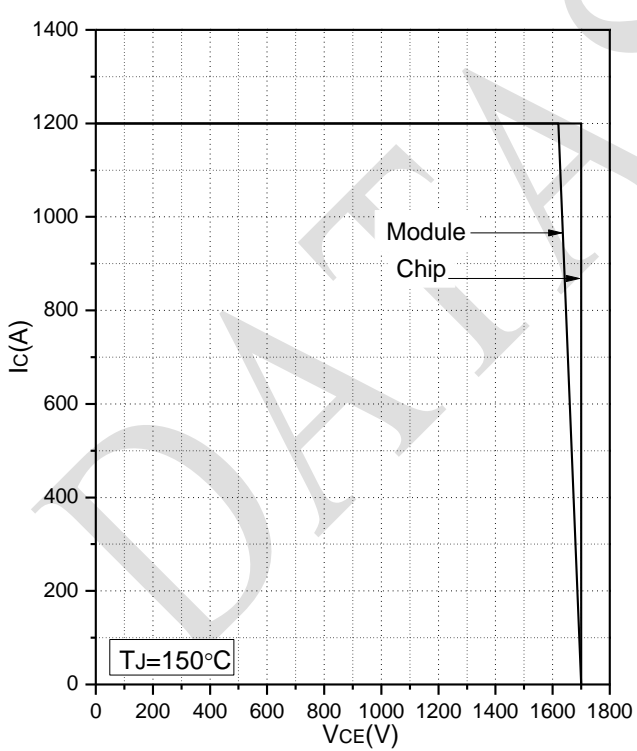
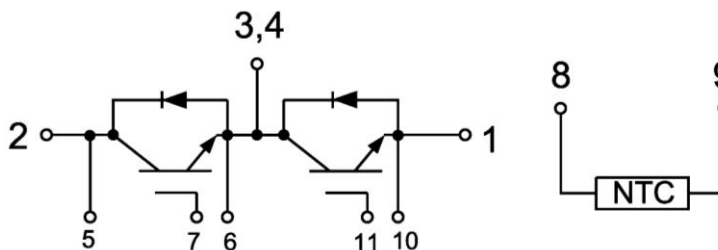


Fig.11 Reverse Bias Safe Operation Area (RBSOA)

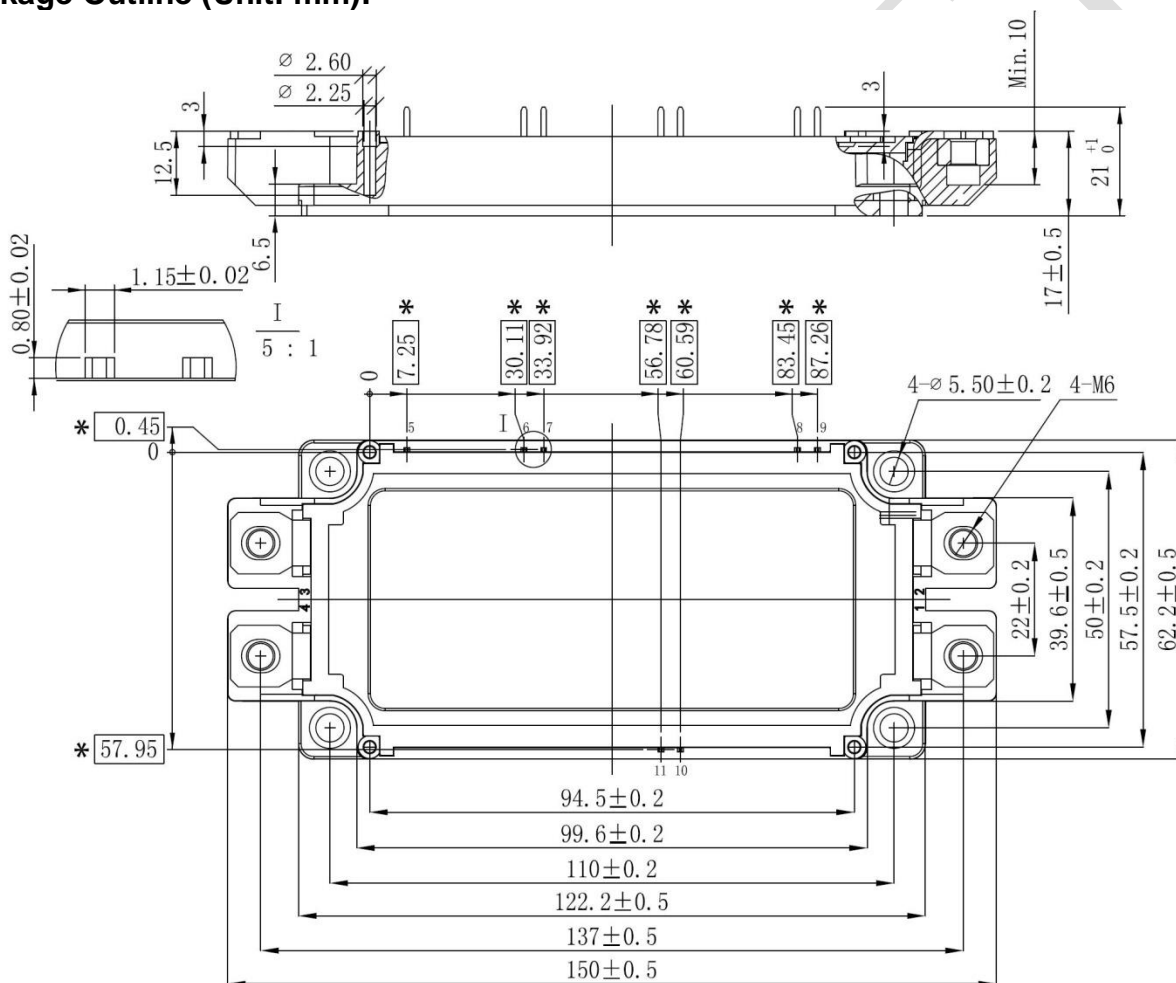




### Internal Circuit



### Package Outline (Unit: mm):



\* =all dimensions with tolerance of  $\boxed{\text{⊕} \text{ } \varnothing 0.5}$



Date	Revision	Notes
10/08/2018	A	Initial Release

## Announcement

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The released datasheet would be issued with "REV." + "alphabet characters".