



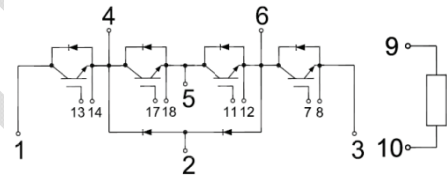
# GTR300TL65T2SH

## IGBT Module

Preliminary Data

### Features:

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



### Applications:

- UPS and SMPS
- Industrial Inverters
- Servo Applications
- 3 Level Inverter

### IGBT, Inverter

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

V <sub>CES</sub>	Collector-Emitter Blocking Voltage		650	V
V <sub>GES</sub>	Gate-Emitter Voltage		±20	V
I <sub>C</sub>	Continuous Collector Current	T <sub>C</sub> = 100°C	300	A
		T <sub>C</sub> = 25°C	435	A
I <sub>CM</sub>	Peak Collector Current Repetitive	T <sub>J</sub> = 175°C	600	A
t <sub>SC</sub>	Short Circuit Withstand Time		>10	$\mu$ s
P <sub>D</sub>	Maximum Power Dissipation (IGBT)	T <sub>C</sub> = 25°C T <sub>Jmax</sub> =175°C	1300	W



## Electrical Characteristics of 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	$I_C = 8\text{mA}$ , $V_{CE} = V_{GE}$	5.0	5.9	6.8	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C = 300\text{A}$ , $V_{GE} = 15\text{V}$	$T_J = 25^\circ\text{C}$	1.50	1.80	V
			$T_J = 125^\circ\text{C}$	1.80		V
			$T_J = 150^\circ\text{C}$	1.80		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	$V_{GE} = \pm 20\text{V}$ , $V_{CE} = 0\text{V}$ , $T_J = 25^\circ\text{C}$			300	nA
$C_{ies}$	Input Capacitance	$V_{CE} = 25\text{V}$ , $V_{GE} = 0\text{V}$ , $f = 1\text{MHz}$		25		nF
$C_{oes}$	Output Capacitance			1.0		nF
$C_{res}$	Reveres Transfer Capacitance			0.8		nF

### Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	$V_{CC} = 300\text{V}$ , $I_C = 300\text{A}$ , $R_{Gon} = 4.7 \Omega$ , $V_{GE} = \pm 15\text{V}$ Inductive Load	$T_J = 25^\circ\text{C}$	408	ns
			$T_J = 125^\circ\text{C}$	404	
$t_r$	Rise Time	$V_{CC} = 300\text{V}$ , $I_C = 300\text{A}$ , $R_{Gon} = 4.7 \Omega$ , $V_{GE} = \pm 15\text{V}$ Inductive Load	$T_J = 25^\circ\text{C}$	203	ns
			$T_J = 125^\circ\text{C}$	205	
$t_{d(off)}$	Turn-off Delay Time	$V_{CC} = 300\text{V}$ , $I_C = 300\text{A}$ , $R_{Goff} = 4.7 \Omega$ , $V_{GE} = \pm 15\text{V}$ Inductive Load	$T_J = 25^\circ\text{C}$	359	ns
			$T_J = 125^\circ\text{C}$	365	
$t_f$	Fall Time	$V_{CC} = 300\text{V}$ , $I_C = 300\text{A}$ , $R_{Goff} = 4.7 \Omega$ , $V_{GE} = \pm 15\text{V}$ Inductive Load	$T_J = 25^\circ\text{C}$	98	ns
			$T_J = 125^\circ\text{C}$	121	
$E_{on}$	Turn-on Switching Loss	$V_{CC} = 300\text{V}$ , $I_C = 300\text{A}$ , $R_{Gon} = 4.7 \Omega$ , $V_{GE} = \pm 15\text{V}$ $di/dt = 1250\text{A}/\mu\text{s}$ ( $T_J = 125^\circ\text{C}$ ), Inductive Load	$T_J = 25^\circ\text{C}$	5.3	mJ
			$T_J = 125^\circ\text{C}$	5.7	
$E_{off}$	Turn-off Switching Loss	$V_{CC} = 300\text{V}$ , $I_C = 300\text{A}$ , $R_{Goff} = 4.7 \Omega$ , $V_{GE} = \pm 15\text{V}$ $du/dt = 2570\text{V}/\mu\text{s}$ ( $T_J = 125^\circ\text{C}$ ), Inductive Load	$T_J = 25^\circ\text{C}$	12.9	mJ
			$T_J = 125^\circ\text{C}$	15.5	
$Q_g$	Total Gate Charge	$V_{GE} = +15\text{V} \dots -15\text{V}$	$T_J = 25^\circ\text{C}$	1.82	nC
RBSOA	$I_C = 600\text{A}$ , $V_{CC} = 600\text{V}$ , $V_p = 650\text{V}$ , $R_{Goff} = 4.7\Omega$ , $V_{GE} = +15\text{V}$ to $0\text{V}$ , $T_J = 150^\circ\text{C}$	Trapezoid			
SCSOA	$V_{CC} = 300\text{V}$ , $V_{GE} = 15\text{V}$ , $T_J = 150^\circ\text{C}$	10			$\mu\text{s}$
$R_{\theta JC}$	IGBT Thermal Resistance: Junction-To-Case(per leg)			0.115	$^\circ\text{C}/\text{W}$



## Diode, Inverse

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

$V_{RRM}$	Repetitive Peak Reverse Voltage	650	V
$I_F$	Diode Continuous Forward Current	200	A
$I_{FM}$	Peak FWD Current Repetitive	400	A

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

$V_{FM}$	Forward Voltage	$I_F=200\text{A}$	$T_J=25^\circ\text{C}$	1.60	V
			$T_J=125^\circ\text{C}$	1.70	
			$T_J=150^\circ\text{C}$	1.70	
$t_{rr}$	Reverse Recovery Time		$T_J=25^\circ\text{C}$	118	ns
			$T_J=125^\circ\text{C}$	158	
			$T_J=150^\circ\text{C}$	171	
$I_{rr}$	Peak Reverse Recovery Current	$I_F=200\text{A},$ $-di_F/dt=1445\text{A}/\mu\text{s}(T_J=150^\circ\text{C}),$ $V_R=300\text{V},$ $V_{GE}=-15\text{V}$	$T_J=25^\circ\text{C}$	69	A
			$T_J=125^\circ\text{C}$	91	
			$T_J=150^\circ\text{C}$	97	
$Q_{rr}$	Reverse Recovery Charge		$T_J=25^\circ\text{C}$	5.15	$\mu\text{C}$
			$T_J=125^\circ\text{C}$	9.6	
			$T_J=150^\circ\text{C}$	11.1	
$E_{rec}$	Reverse Recovery Energy		$T_J=25^\circ\text{C}$	0.41	mJ
			$T_J=125^\circ\text{C}$	1.53	
			$T_J=150^\circ\text{C}$	1.88	
$R_{\theta JC}$	Diode Thermal Resistance: Junction-To-Case(per leg)			0.295	$^\circ\text{C}/\text{W}$



**Diode, Freewheeling (Neutral Clamp Diode)**  
**Maximum Rated Values (T<sub>C</sub>=25°C unless otherwise specified)**

V <sub>RRM</sub>	Repetitive Peak Reverse Voltage	650	V
I <sub>F</sub>	Diode Continuous Forward Current	300	A
I <sub>FM</sub>	Peak FWD Current Repetitive	600	A

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

V <sub>FM</sub>	Forward Voltage	I <sub>F</sub> = 300A	T <sub>J</sub> =25°C	1.90	V	
			T <sub>J</sub> =125°C	1.90		
			T <sub>J</sub> =150°C	1.90		
t <sub>rr</sub>	Reverse Recovery Time	I <sub>F</sub> =300A, -di <sub>F</sub> /dt = 1440A/μs(T <sub>J</sub> =150°C), V <sub>R</sub> = 300V, V <sub>GE</sub> = -15V	T <sub>J</sub> =25°C	139	ns	
			T <sub>J</sub> =125°C	194		
I <sub>rr</sub>	Peak Reverse Recovery Current		T <sub>J</sub> =25°C	103	A	
			T <sub>J</sub> =125°C	138		
Q <sub>rr</sub>	Reverse Recovery Charge		T <sub>J</sub> =25°C	8.6	μC	
			T <sub>J</sub> =125°C	16.3		
E <sub>rec</sub>	Reverse Recovery Energy		T <sub>J</sub> =25°C	0.25	mJ	
			T <sub>J</sub> =125°C	2.19		
R <sub>θJC</sub>	Diode Thermal Resistance: Junction-To-Case(per leg)			0.224	°C/W	

**Internal NTC- Thermistor Characteristic**

R <sub>25</sub>	T <sub>C</sub> =25°C	5		kΩ
ΔR/R	T <sub>C</sub> =100°C, R <sub>100</sub> =481Ω		±5	%
P <sub>25</sub>	T <sub>C</sub> =25°C	10		mW
B <sub>25/50</sub>	R <sub>2</sub> =R <sub>25</sub> exp[B <sub>25/50</sub> (1/T <sub>2</sub> -1/(298.15K))]	3380		K
B <sub>25/80</sub>	R <sub>2</sub> =R <sub>25</sub> exp[B <sub>25/80</sub> (1/T <sub>2</sub> -1/(298.15K))]	3440		K



## Module

Symbol	Description	Min	Typ	Max	Unit
V <sub>iso</sub>	Isolation Voltage (All Terminals Shorted)	f = 50Hz, 1minute	2500		V
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			V
R <sub>θCS</sub>	Case-To-Sink Thermally (Conductive Grease Applied)			0.03	°C/W
M	Power Terminals Screw:M6	3.0		5.0	N·m
M	Mounting Screw:M6	4.0		6.0	N·m
G	Weight		345		g

DATA SHEET

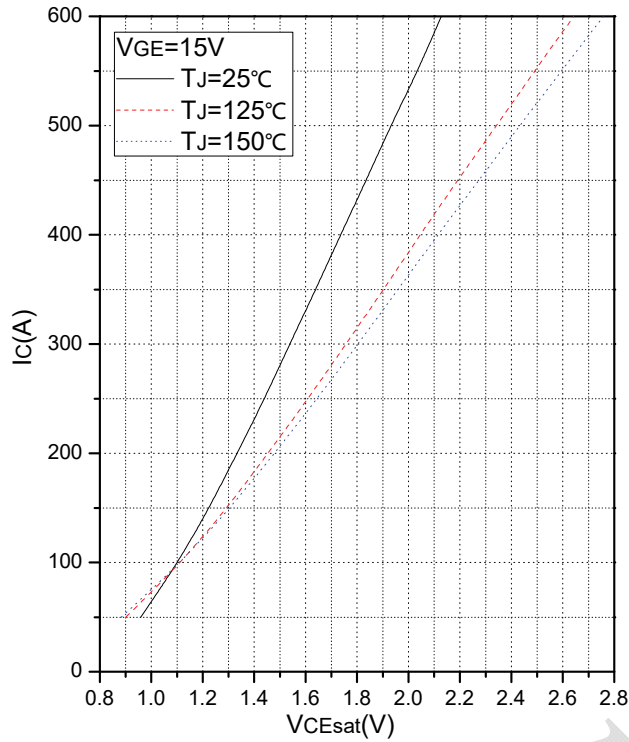


Fig.1 Typical Saturation Voltage Characteristics

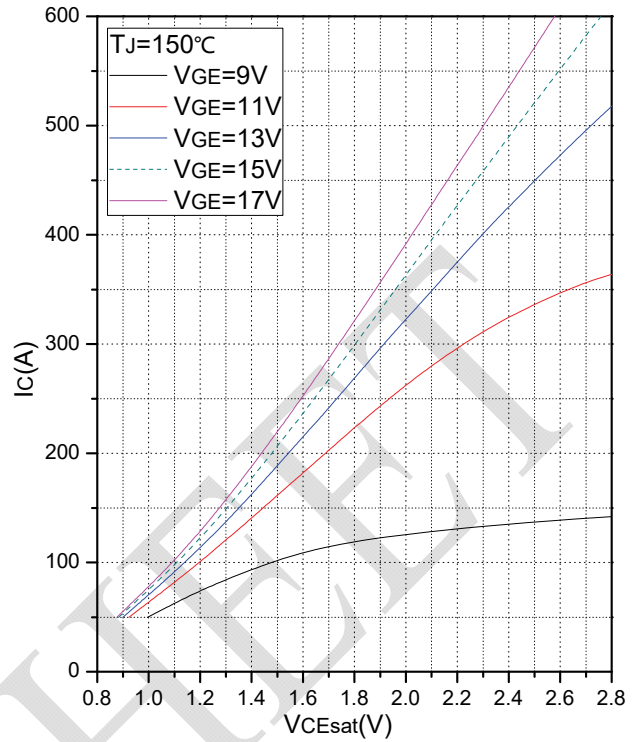


Fig.2 Typical Output Characteristics

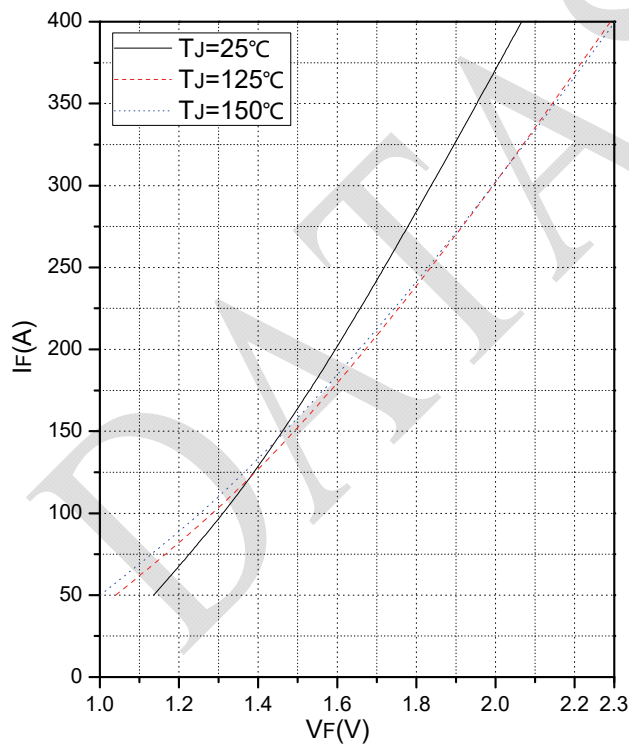


Fig.3 Forward Characteristics of FWD (Inverse)

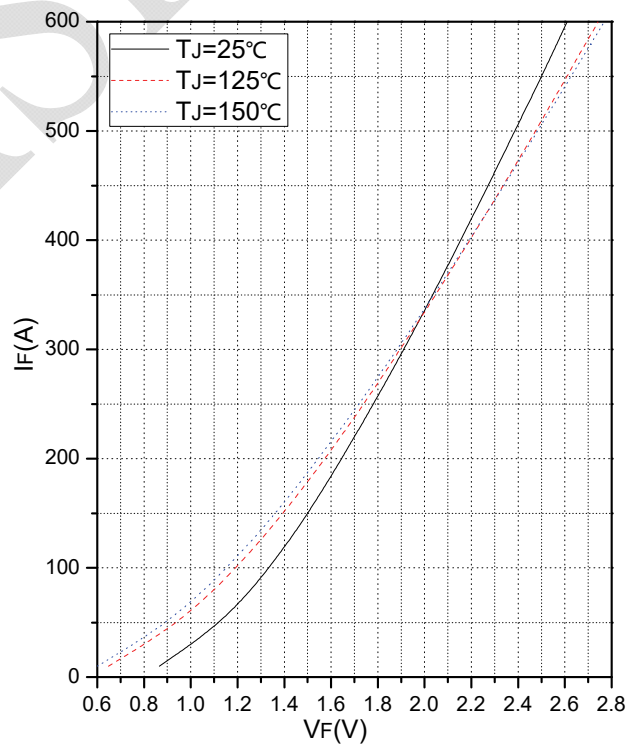
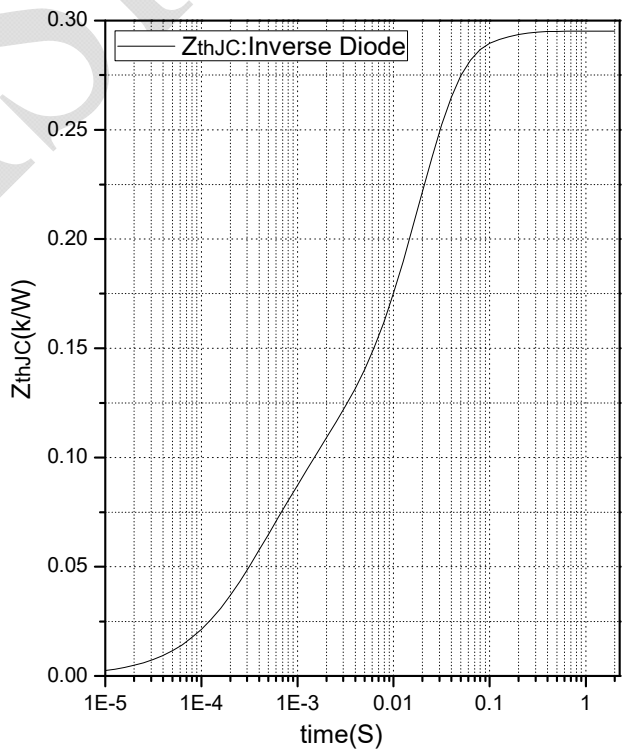
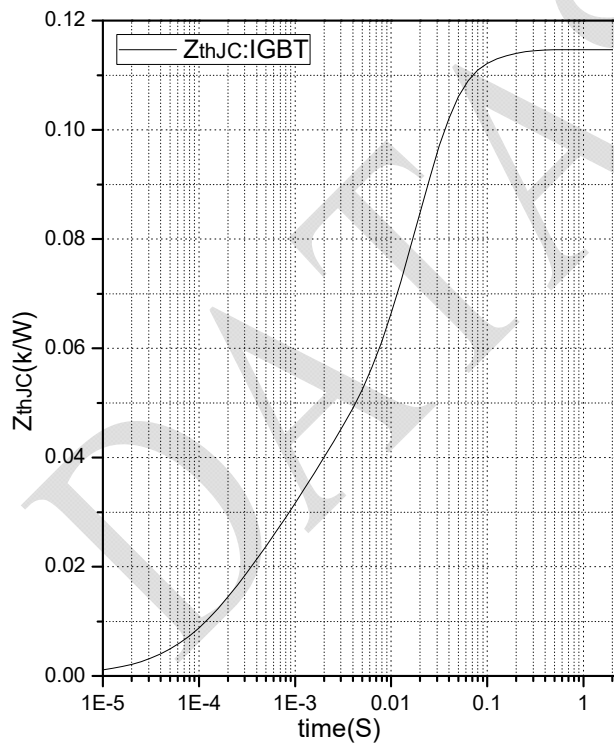
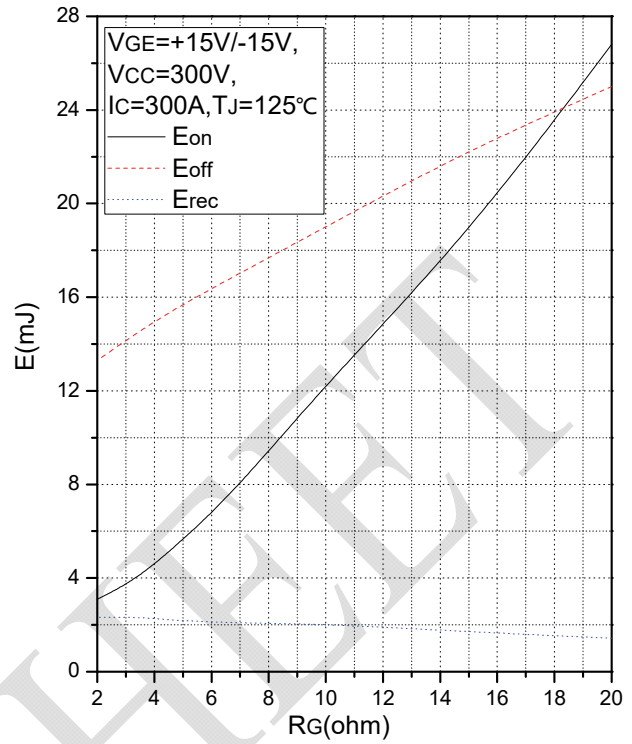
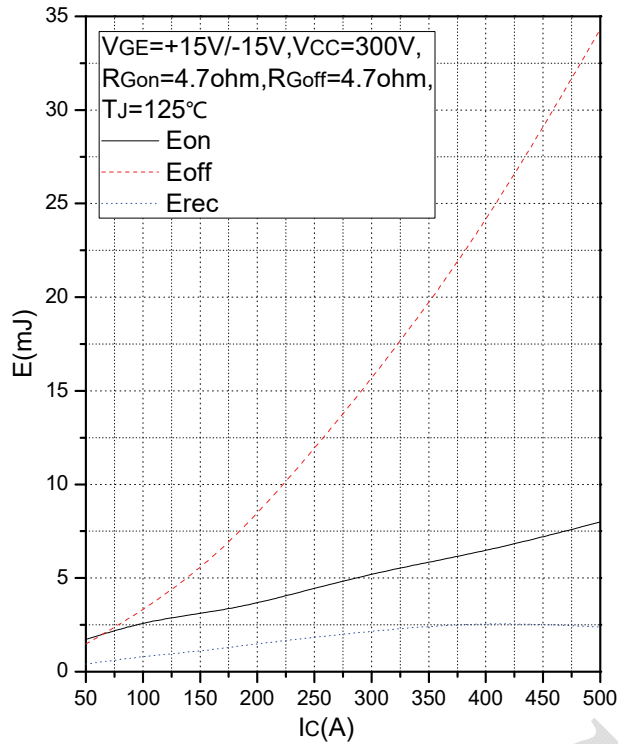


Fig.4 Forward Characteristics of FWD (Freewheeling)



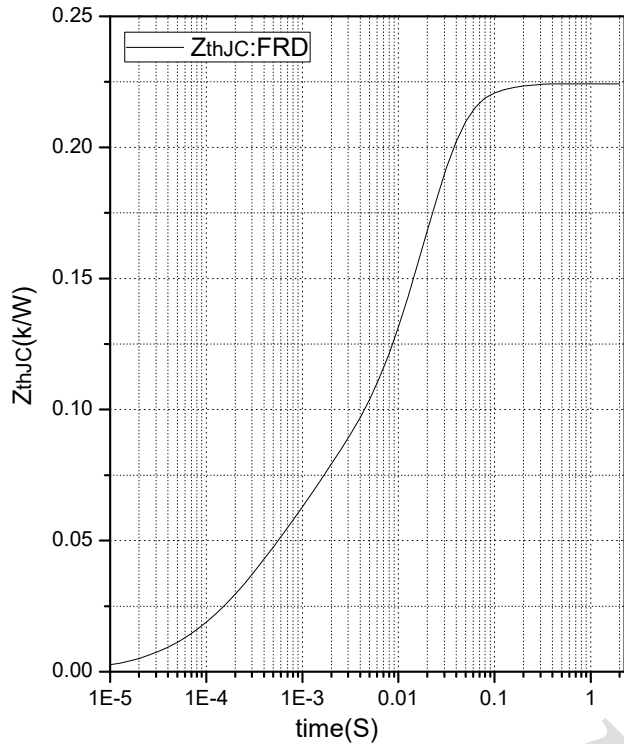


Fig.9 Transient Thermal Impedance (Freewheeling Diode)

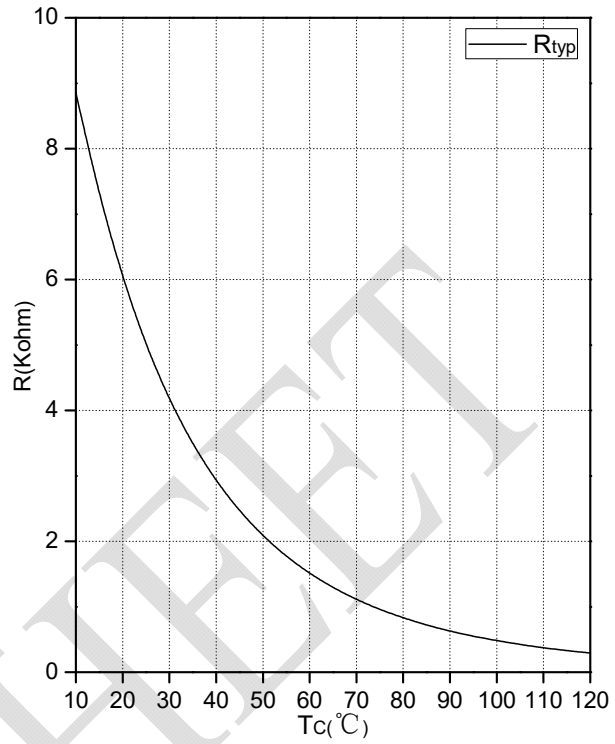


Fig.10 NTC Temperature Characteristics

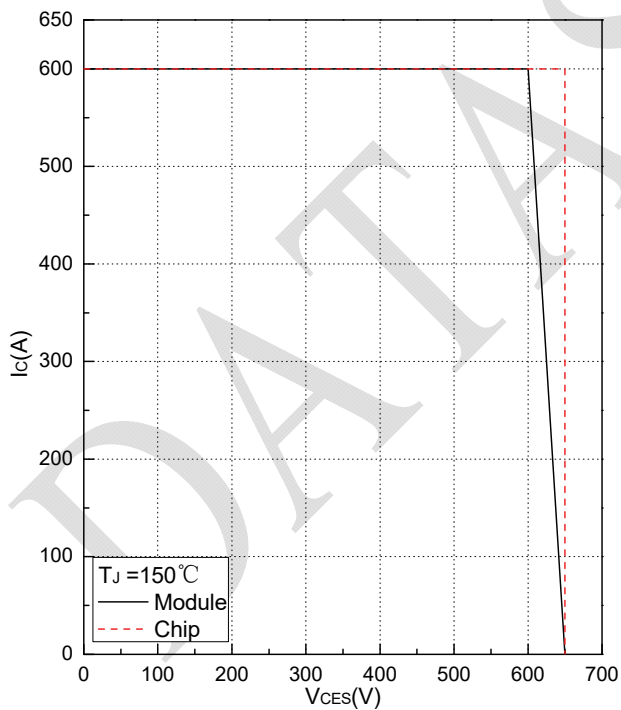
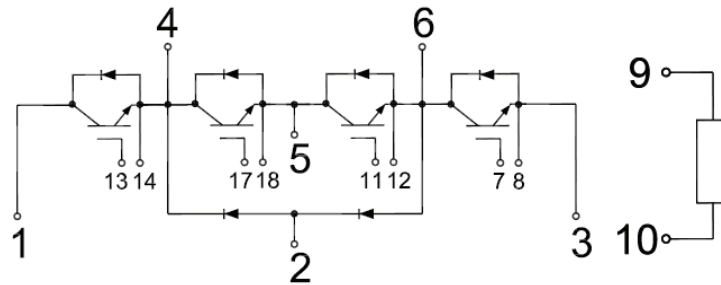


Fig.11 Reverse Bias Safe Operation Area (RBSOA)

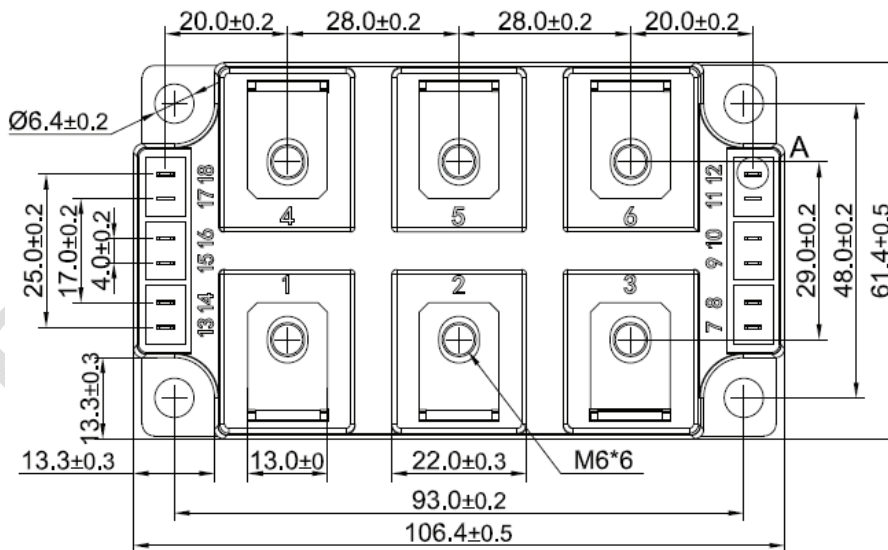
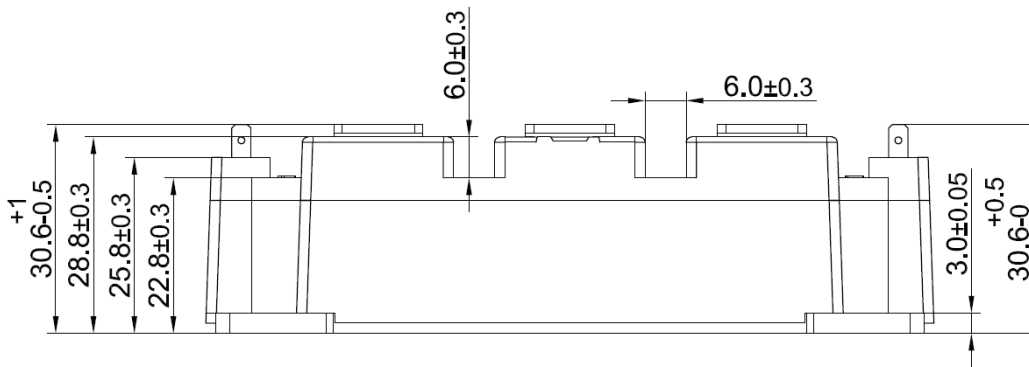




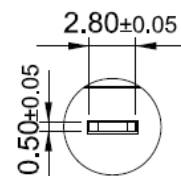
## Internal Circuit



## Package Outline (Unit: mm):



View A  
scale 3:1





Date	Revision	Notes
06/13/2018	01	Initial release
09/29/2018	A	Final Version

### **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