



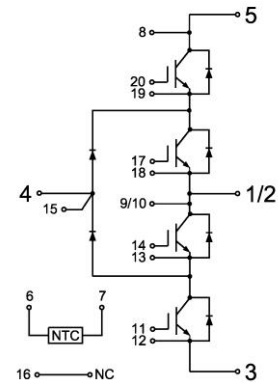
# GT300TL120A8H

## IGBT Module

Preliminary Data

### Features:

- Field Stop Trench Gate IGBT
- Short Circuit Rated >10 $\mu$ s
- VCE(sat) with Positive Temperature Coefficient
- Reliable Mechanical Design with Injection Moulded Terminals and Reliable Internal Connections
- 100% RBSOA Tested (2xIc)
- Low Stray Inductance
- Lead Free, Compliant with RoHS Requirement



### Applications:

- 3-Level-Applications
- Motor Drives
- Solar Applications
- UPS Systems

### IGBT, Inverter

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

V <sub>CES</sub>	Collector-Emitter Blocking Voltage		1200	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	580	A
I <sub>CM</sub>	Repetitive Peak Collector Current	T <sub>J</sub> =175°C	600	A
t <sub>sc</sub>	Short Circuit Withstand Time		>10	μs
P <sub>D</sub>	Maximum Power Dissipation per IGBT	T <sub>C</sub> =25°C	1975	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	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	$V_{CE} = 25\text{V}$ , $V_{GE} = 0\text{V}$ , $f = 1\text{MHz}$		25.2		nF
$C_{res}$	Reverse Transfer Capacitance			0.86		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>Goff</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, tp=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, Inverter

### Maximum Rated Values of 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 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, 3-Level  
Maximum Rated Values (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 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, -diF/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		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	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	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	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

### Internal NTC-Thermistor Characteristics

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)	4000			V
Internal Isolation		Al <sub>2</sub> O <sub>3</sub>			
Material of Module Baseplate		Copper			
L <sub>sCE</sub>		45			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>ecs</sub>	Case-To-Sink Thermally (Conductive Grease Applied)		0.026		°C/W
M	Power Terminals Screw:M6	3.0		6.0	N·m
M	Mounting Screw:M5	3.0		6.0	N·m
G	Weight		390		g

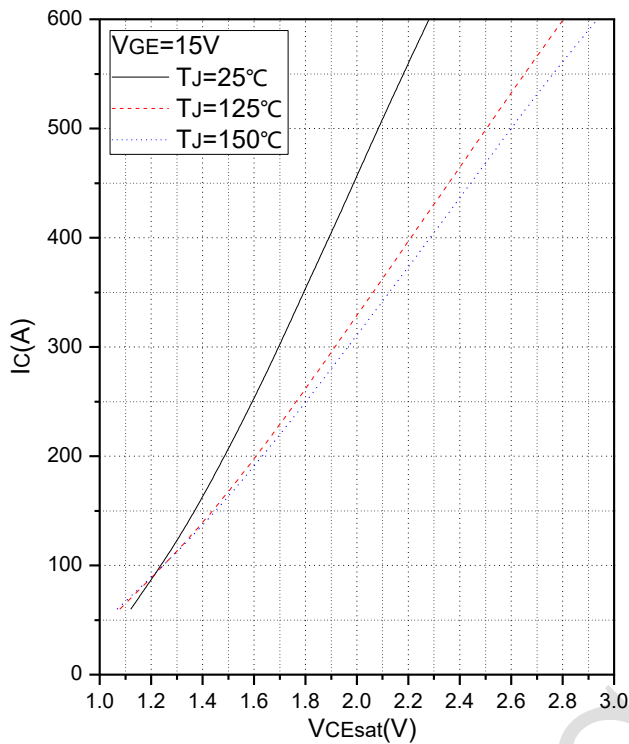


Fig.1 Typical Saturation Voltage Characteristics

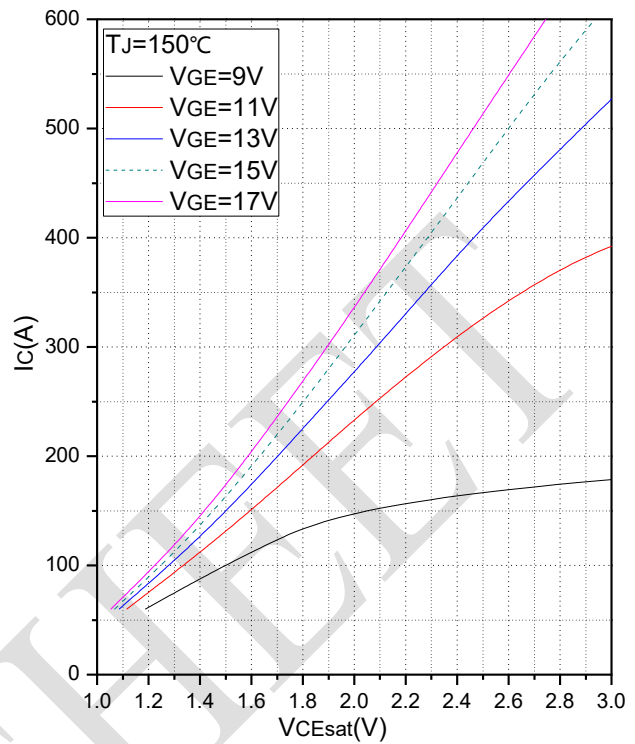


Fig.2 Typical Output Characteristics

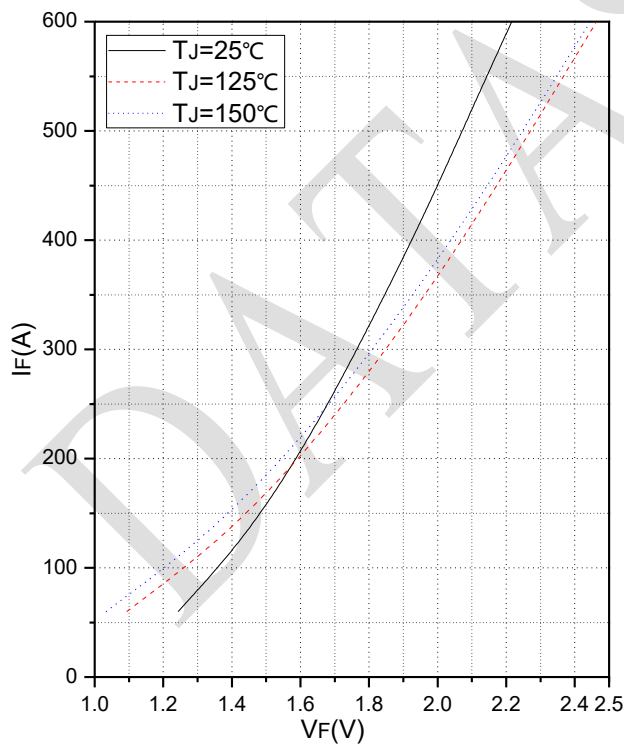


Fig.3 Forward Characteristics of Reverse Diode

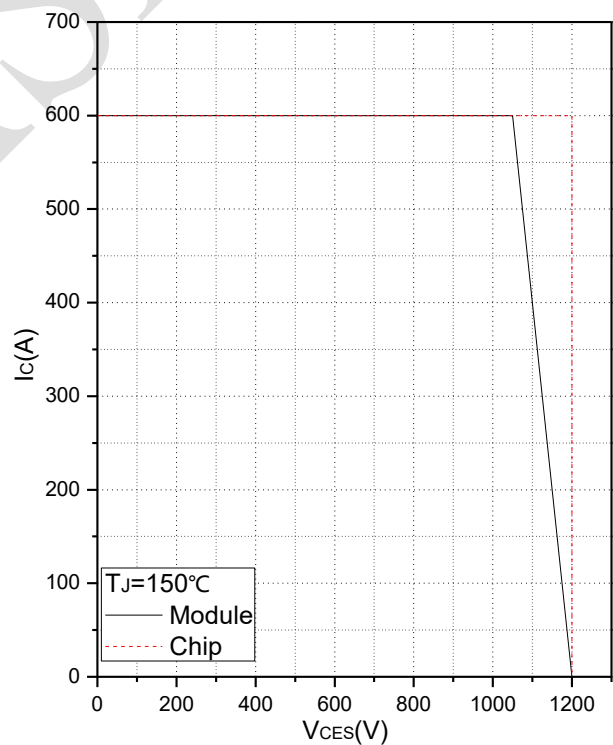


Fig.4 Reverse Bias Safe Operation Area (RBSOA)

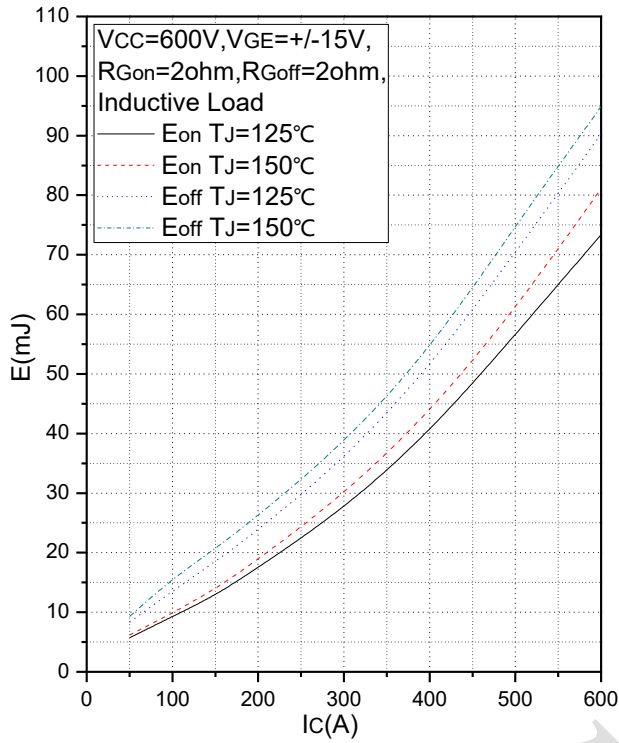


Fig.5 Typical Switching Loss vs. Collector Current

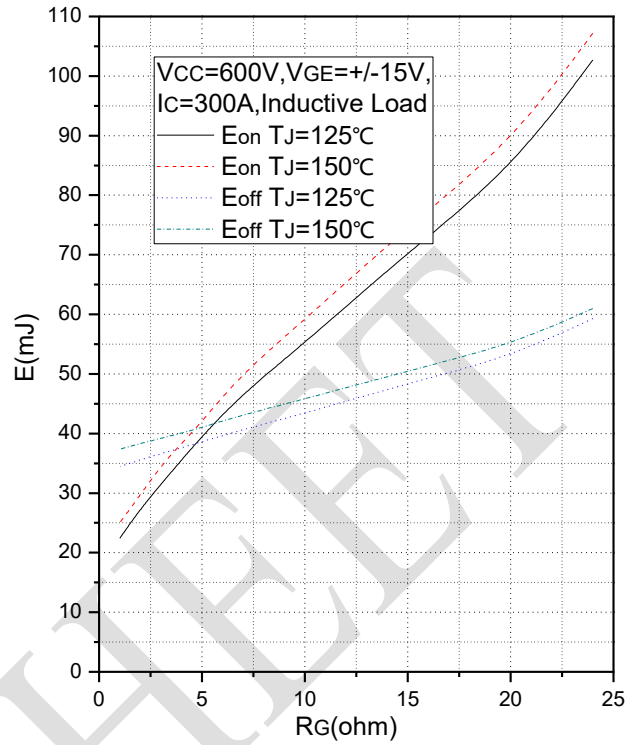


Fig.6 Typical Switching Loss vs. Gate Resistance

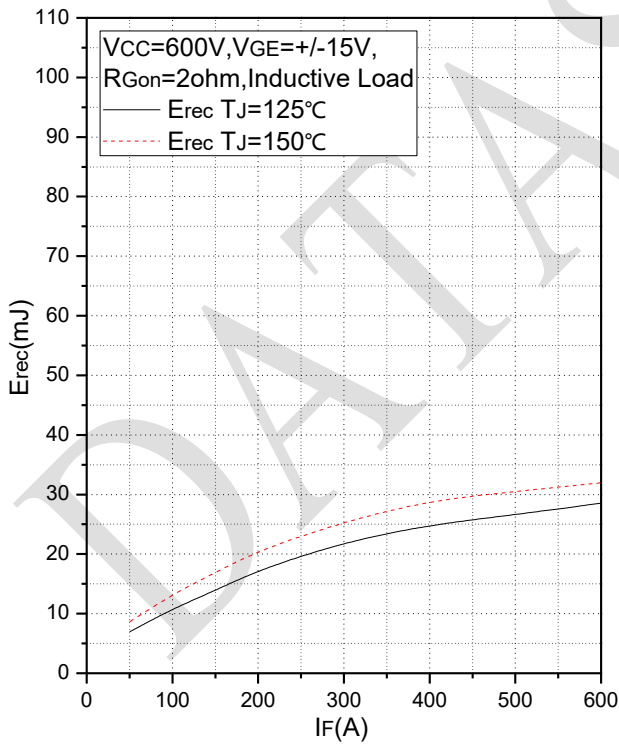


Fig.7 Typical Switching Loss vs. Forward Current

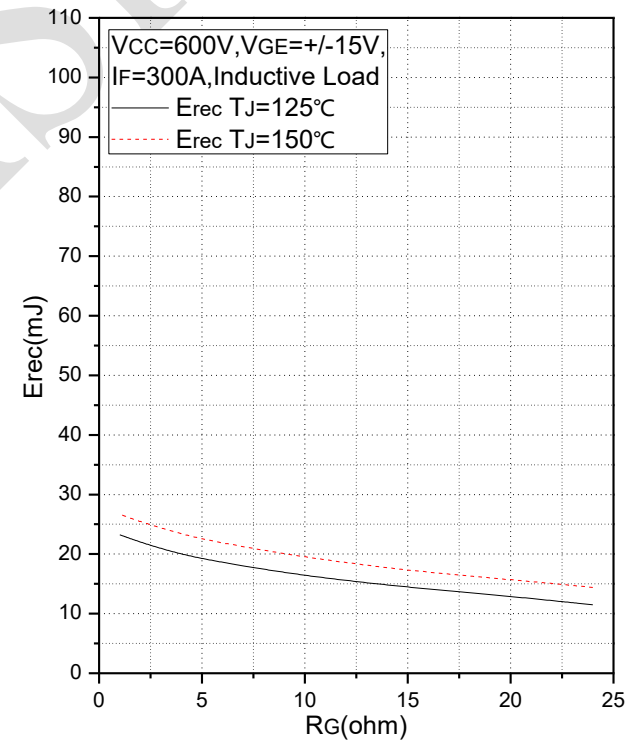


Fig.8 Typical Switching Loss vs. Gate Resistance

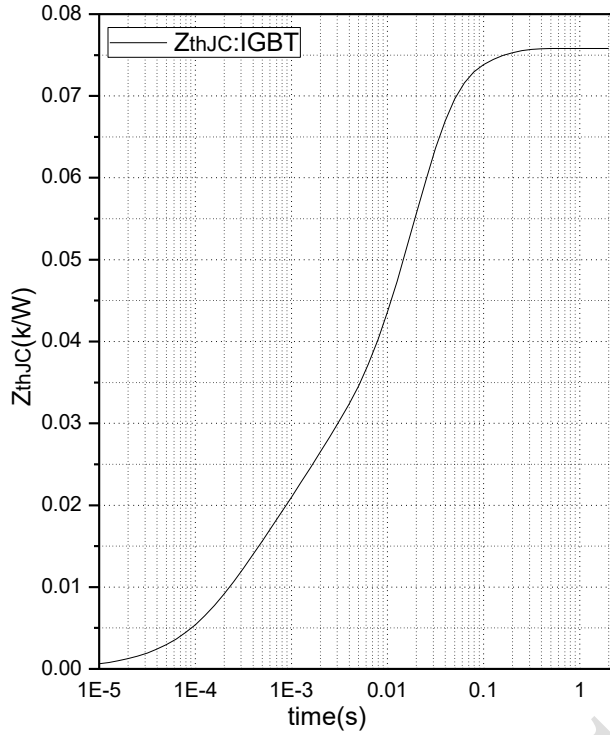


Fig.9 Transient Thermal Impedance (IGBT)

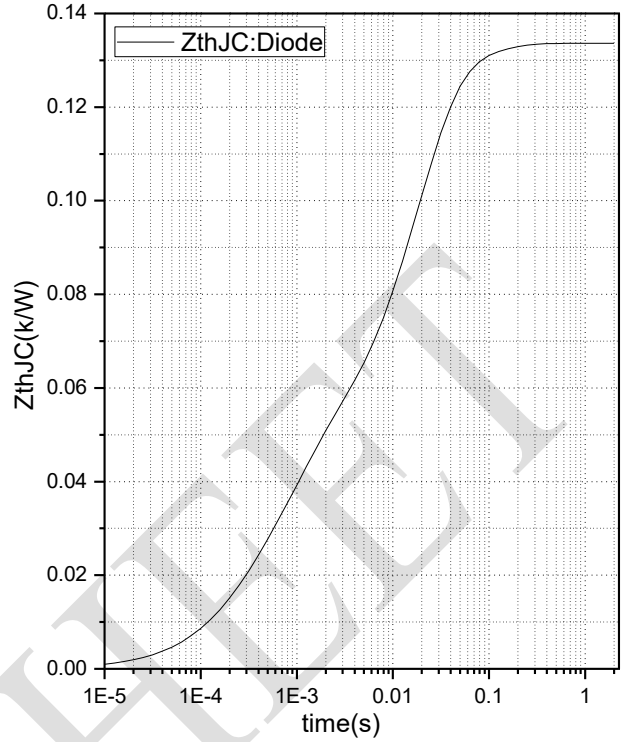


Fig.10 Transient Thermal Impedance (Diode)

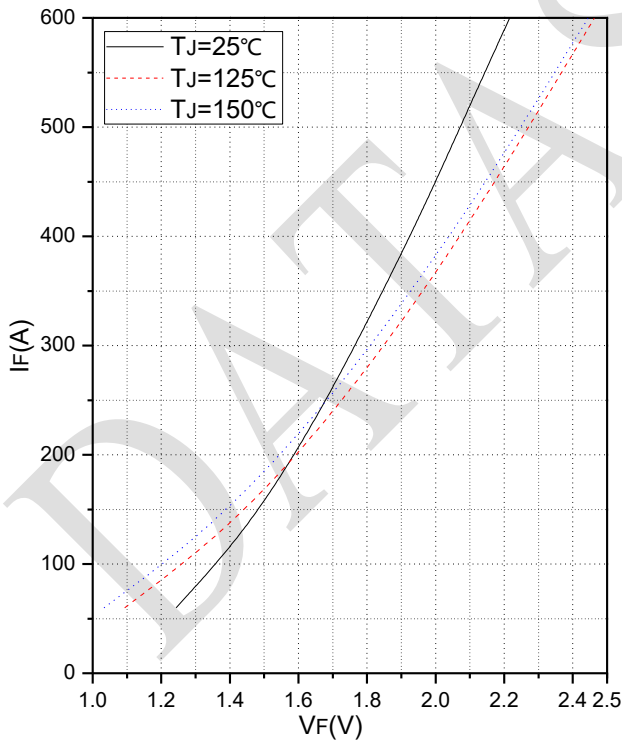


Fig.11 Forward Characteristics of 3-Level Diode

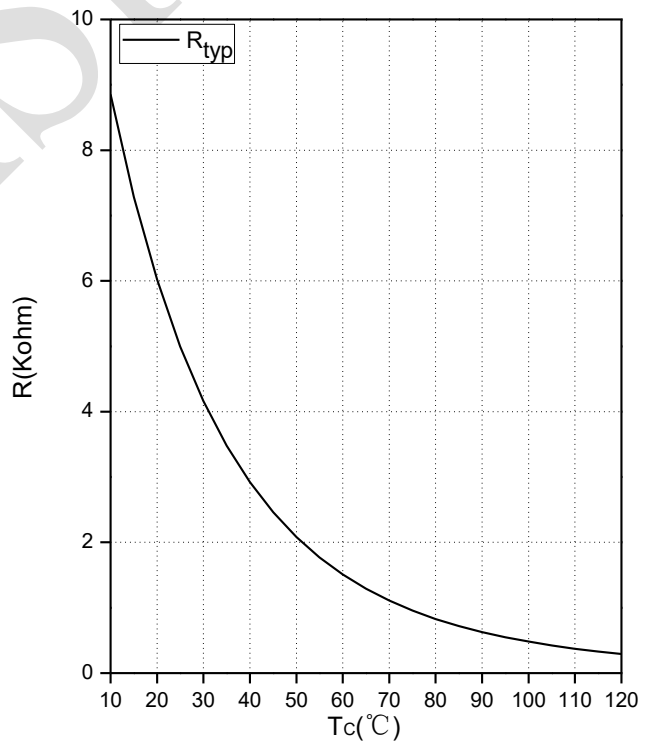
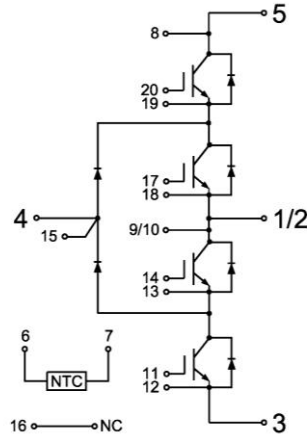


Fig.12 NTC Temperature Characteristics

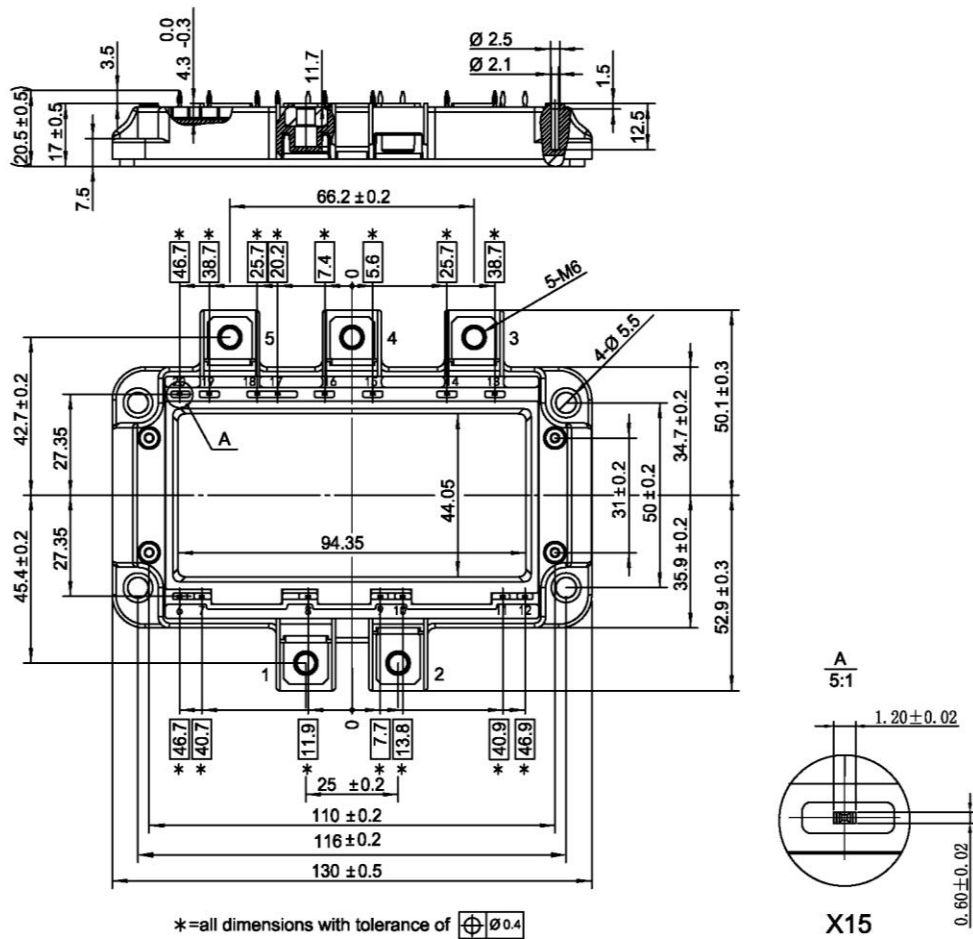




## Internal Circuit



## Package Outline (Unit: mm):





Date	Revision	Notes
11/18/2020	01	Initial release

## Announcement

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DATA SHEET