

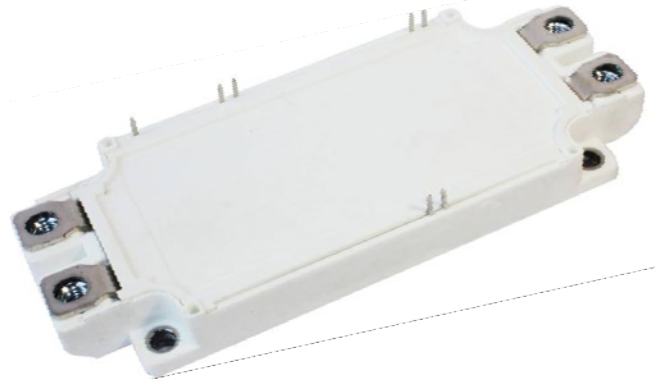
# GSID600A120S4B1

## Half-Bridge IGBT Module



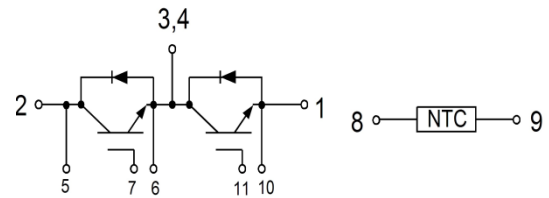
### Features:

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



### Applications:

- Hybrid Electrical Vehicles
- Automotive Applications
- Commercial Agriculture Vehicles
- Motor Drives



### IGBT, Inverter

#### Maximum Rated Values (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> = 80°C	600	A
		T <sub>C</sub> = 25°C	980	A
I <sub>CM(1)</sub>	Peak Collector Current Repetitive	T <sub>J</sub> = 150°C	1200	A
P <sub>D</sub>	Maximum Power Dissipation per IGBT	T <sub>C</sub> = 25°C T <sub>Jmax</sub> = 175°C	3330	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	$I_C = 12\text{ mA}, V_{CE} = V_{GE}$	4.5	5.5	6.5	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C = 600\text{A}, V_{GE} = 15\text{V}$	$T_J = 25^\circ\text{C}$	1.70	2.00	V
			$T_J = 125^\circ\text{C}$	2.10		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	$V_{CE} = 25\text{V}, V_{GE} = 0\text{V}, f = 1\text{MHz}$		49.4		nF
$C_{oes}$	Output capacitance			3.63		nF
$C_{res}$	Reverse capacitance			1.93		nF

#### Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	$V_{CC} = 600\text{V}, I_C = 600\text{A}, R_g = 1\ \Omega, V_{GE} = \pm 15\text{V},$ Inductive Load	$T_J = 25^\circ\text{C}$	213		ns
			$T_J = 125^\circ\text{C}$	265		
$t_r$	Rise Time		$T_J = 25^\circ\text{C}$	143		ns
			$T_J = 125^\circ\text{C}$	150		
$t_{d(off)}$	Turn-off Delay Time		$T_J = 25^\circ\text{C}$	530		ns
			$T_J = 125^\circ\text{C}$	551		
$t_f$	Fall Time		$T_J = 25^\circ\text{C}$	120		ns
			$T_J = 125^\circ\text{C}$	168		
$E_{on}$	Turn-on Switching Loss		$T_J = 25^\circ\text{C}$	38.6		mJ
			$T_J = 125^\circ\text{C}$	50		
$E_{off}$	Turn-off Switching Loss	$T_J = 25^\circ\text{C}$	53.8		mJ	
		$T_J = 125^\circ\text{C}$	76			
$Q_g$	Total Gate Charge	$T_J = 25^\circ\text{C}$	4.95		$\mu\text{C}$	
RBSOA	RBSOA	$I_C=1200\text{A}, V_{CC}=1050\text{V}, V_p=1200\text{V}, R_g = 1\ \Omega, V_{GE}=+15\text{V to } 0\text{V}, T_J=150^\circ\text{C}$	Trapezoid			
SCSOA	SCSOA	$V_{CC} = 600\text{V}, V_{GE} = 15\text{V}, T_J = 150^\circ\text{C}$	10			$\mu\text{s}$

R <sub>θJC</sub>	IGBT Thermal Resistance: Junction-To-Case (per Leg)		0.045		°C/W
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### 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		600		A
I <sub>FM</sub>	Repetitive Peak Forward Current		1200		A

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

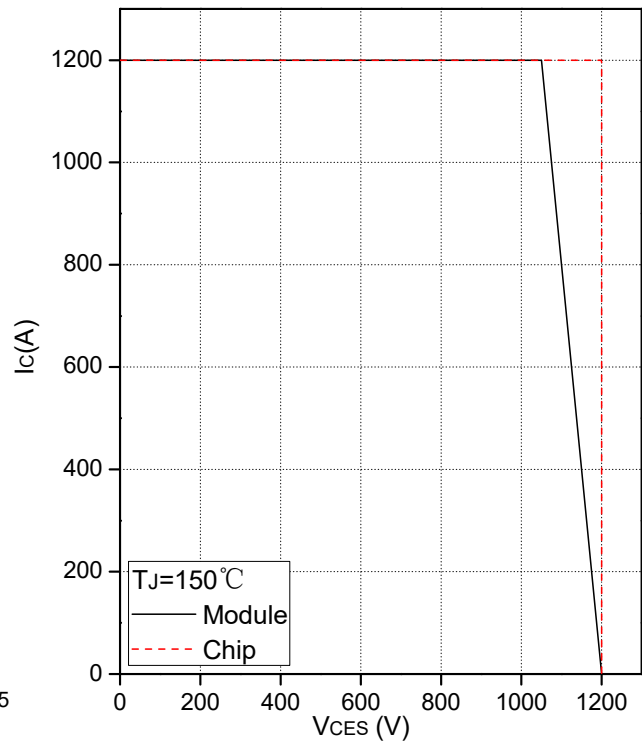
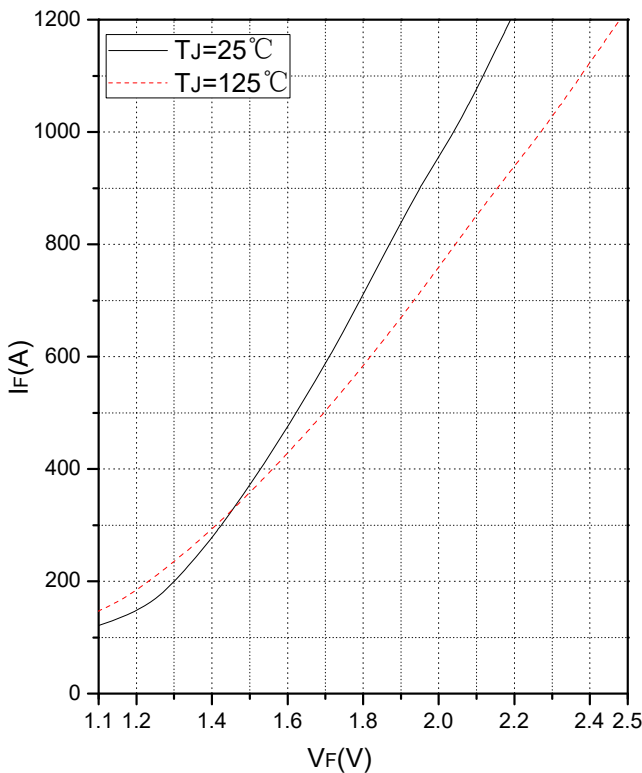
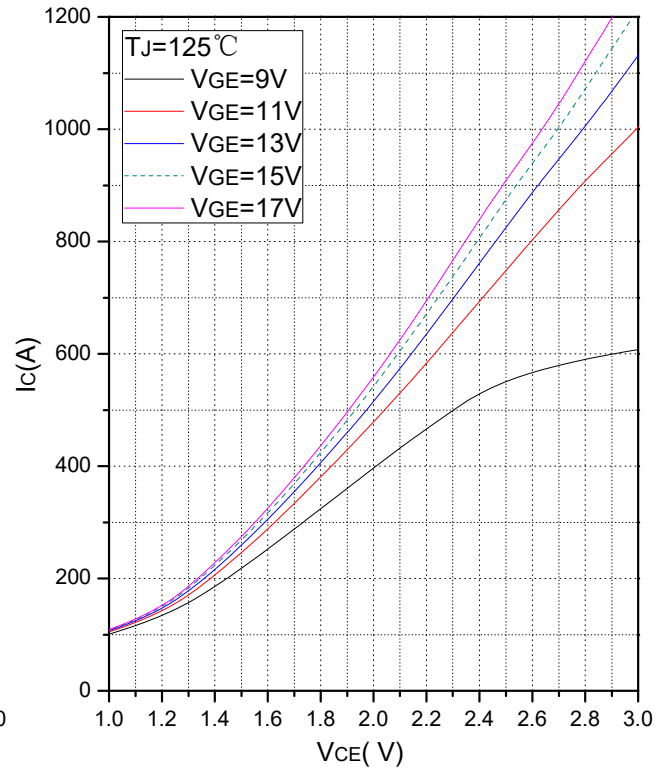
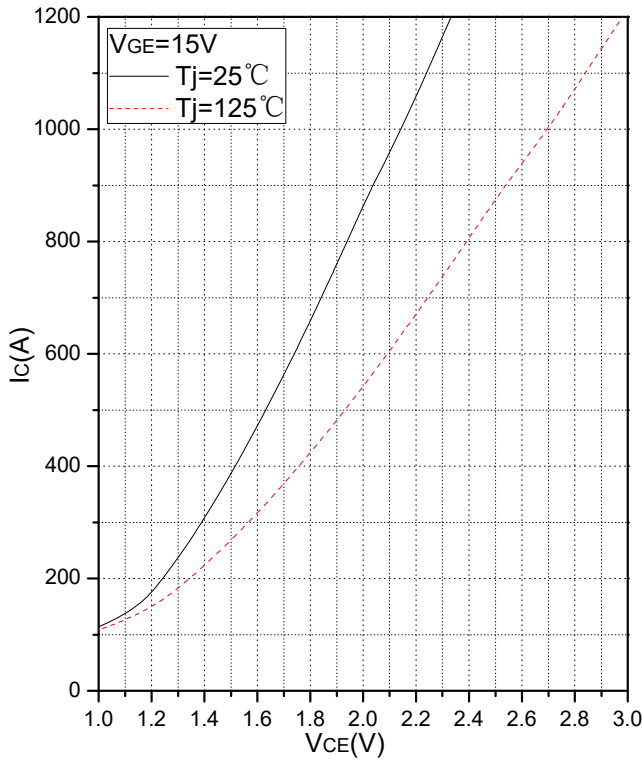
V <sub>FM</sub>	Forward Voltage	I <sub>F</sub> = 600A , V <sub>GE</sub> = 0V	T <sub>J</sub> = 25°C		1.70		V
			T <sub>J</sub> = 125°C		1.80		
t <sub>rr</sub>	Reverse Recovery Time		T <sub>J</sub> = 25°C		309		
			T <sub>J</sub> = 125°C		394		
I <sub>rr</sub>	Peak Reverse Recovery Current	I <sub>F</sub> =600A, di/dt =2678A/μs, V <sub>rr</sub> = 600V, V <sub>GE</sub> = -15V	T <sub>J</sub> = 25°C		59.8		A
			T <sub>J</sub> = 125°C		99.1		
Q <sub>rr</sub>	Reverse Recovery Charge		T <sub>J</sub> = 25°C		27.6		μC
			T <sub>J</sub> = 125°C		47.1		
E <sub>rec</sub>	Reverse Recovery Energy		T <sub>J</sub> = 25°C		394		mJ
			T <sub>J</sub> = 125°C		59.8		
R <sub>θJC</sub>	Diode Thermal Resistance: Junction-To-Case (per Leg)				0.064		°C/W

### Internal NTC-Thermistor Characteristics

Symbol	Description	Min	Typ	Max	Unit
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		50		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) <span style="float: right;">f = 50Hz, 1minute</span>	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
R <sub>θCS</sub>	Case-To-Sink (Conductive Grease Applied)		0.02		°C/W
M	Mounting Screw:M5	3.0		5.0	N·m
M	Power Terminals Screw: M6	4.0		6.0	N·m
G	Weight		330		g



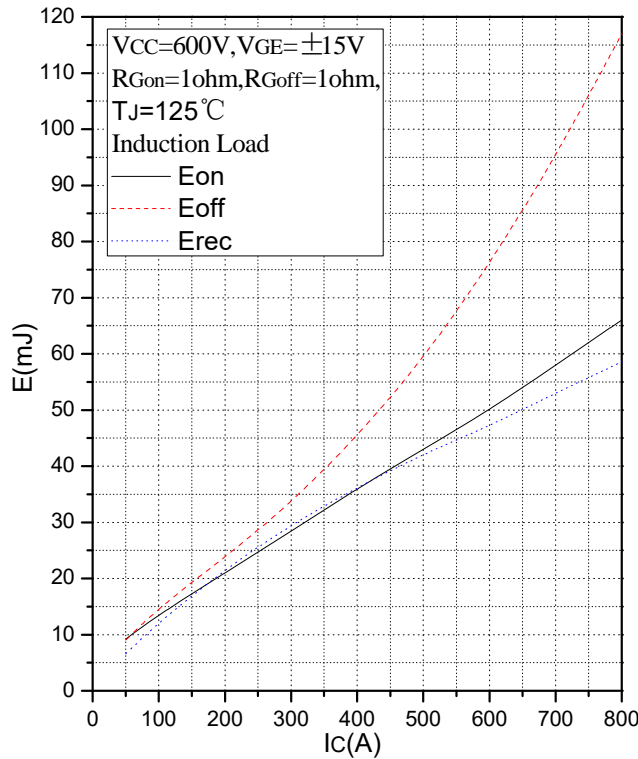


Fig.5 Typical Switching Loss vs. Collector Current

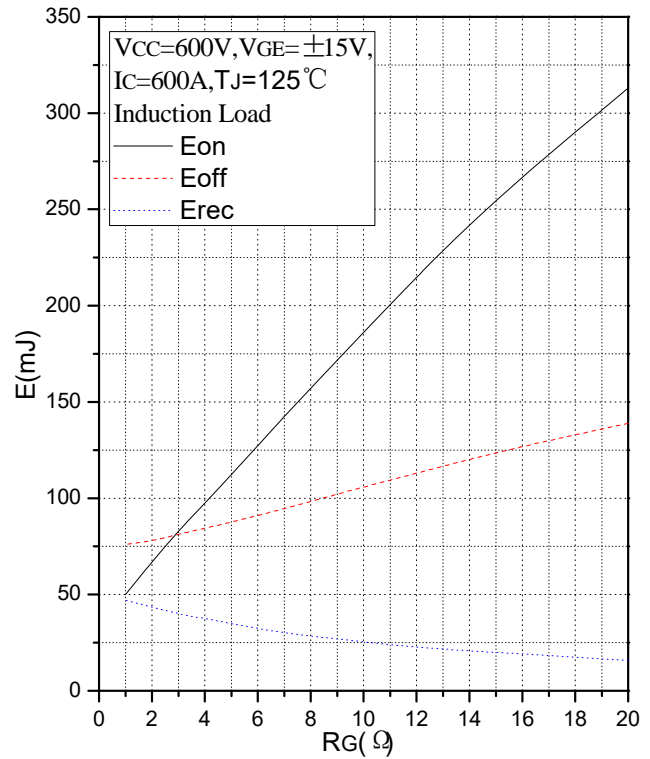


Fig.6 Typical Switching Loss vs. Gate Resistance

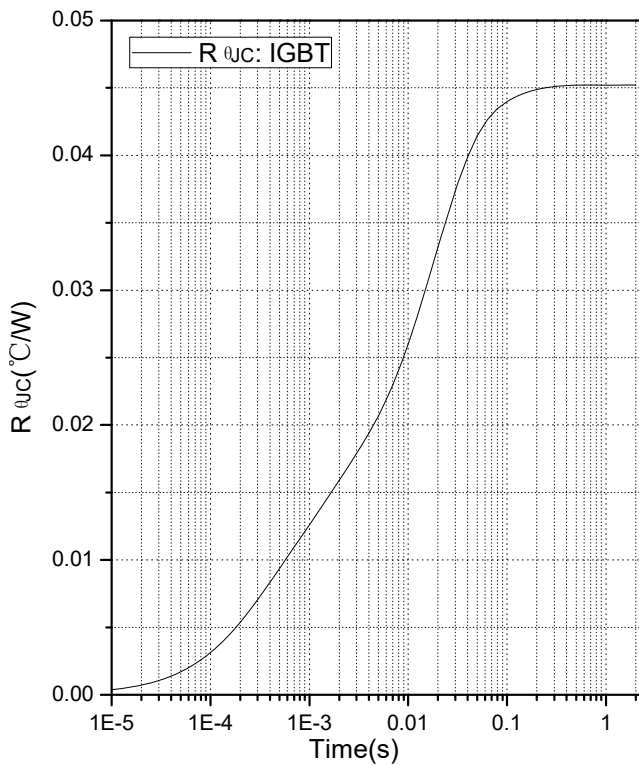


Fig.7 Transient Thermal Impedance (IGBT)

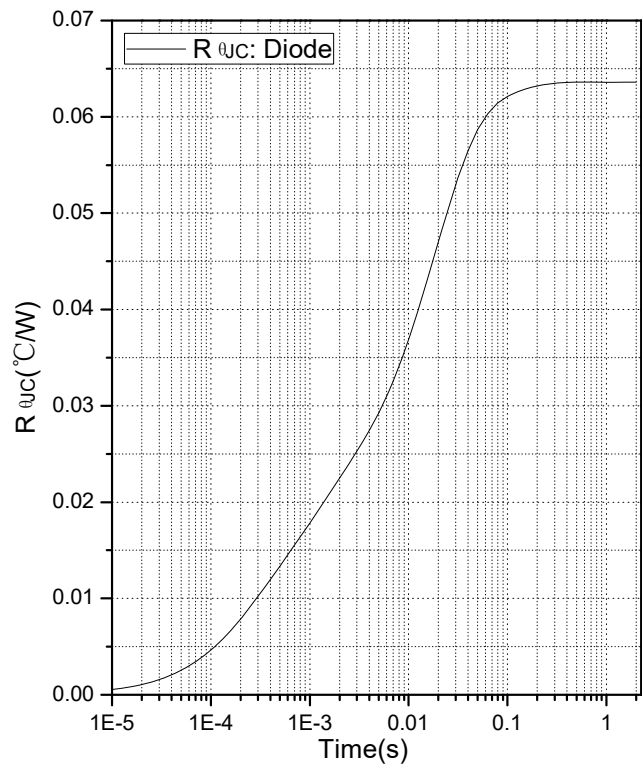


Fig.8 Transient Thermal Impedance (Diode)

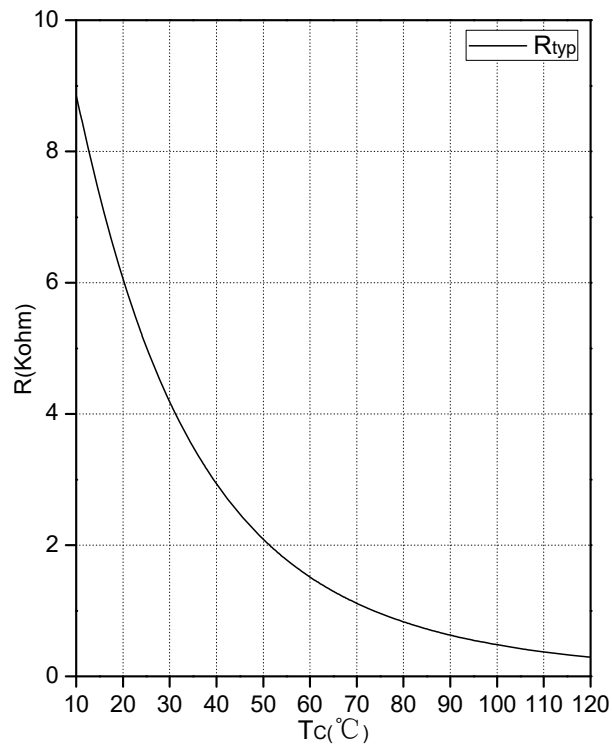
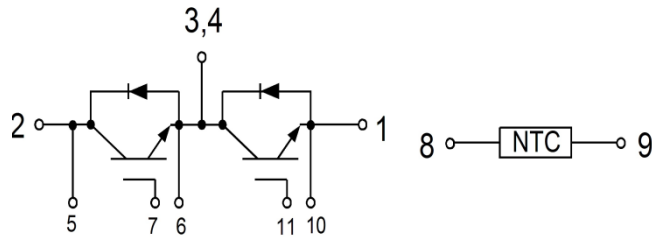
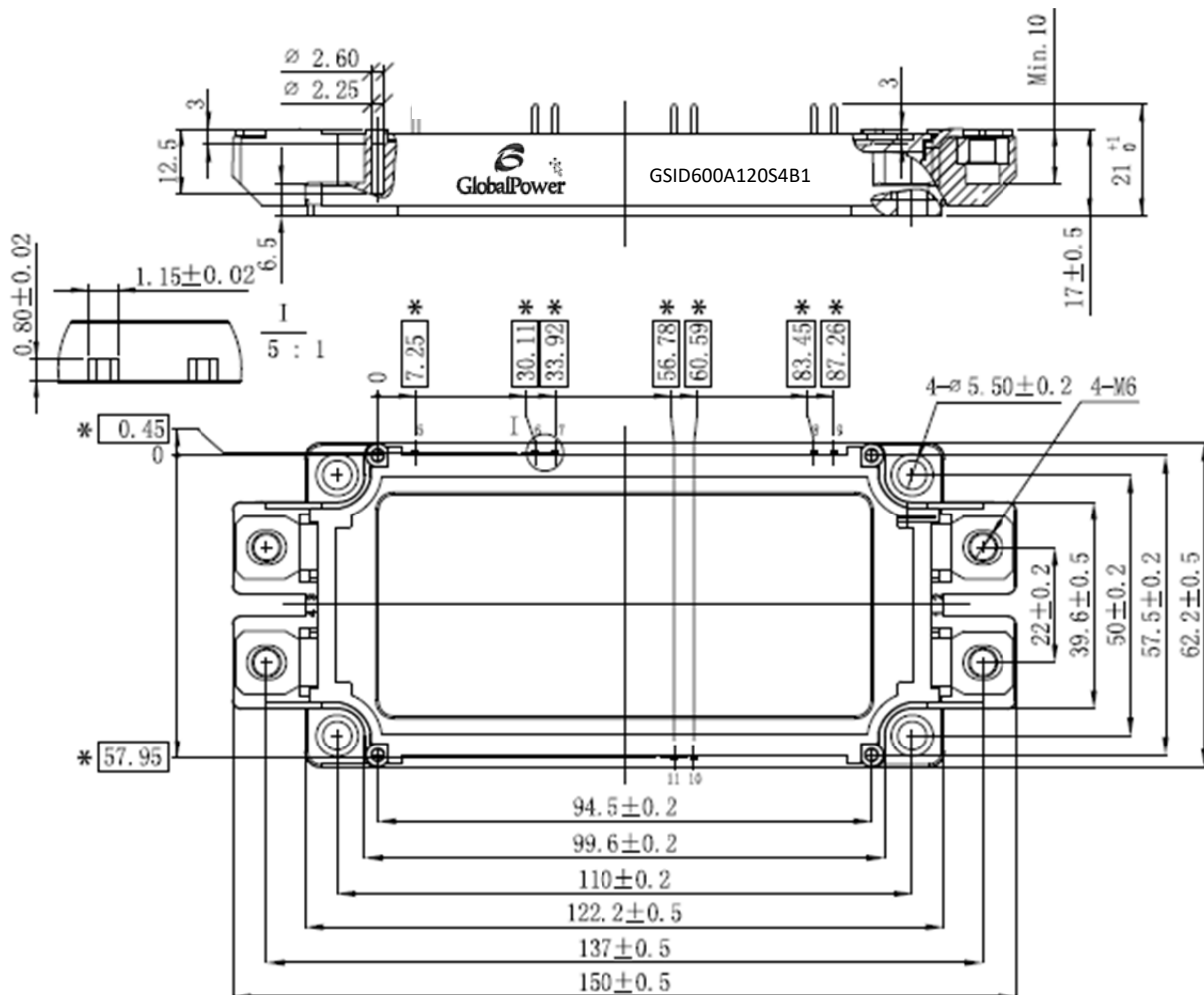


Fig.9 NTC Temperature Characteristics

### Internal Circuit



### Package Outline (Unit: mm):





### Revision History

Date	Revision	Notes
05/11/2015	0.1	Initial release of preliminary datasheet.
12/21/2015	0.2	Add SCSSOA specification
05/20/2016	0.3	Revise the measured data
10/20/2019	0.4	Improved IGBT and FWD for automotive applications
01/03/2020	0.5	Applied company name change

#### Notes

##### RoHS Compliance

The levels of RoHS restricted materials in this product are below the maximum concentration values (also referred to as the threshold limits) permitted for such substances, or are used in an exempted application, in accordance with EU Directive 2011/65/EC (RoHS2), as implemented March, 2013. RoHS Declarations for this product can be obtained from the Product Documentation sections of [www.SemiQ.com](http://www.SemiQ.com).

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