

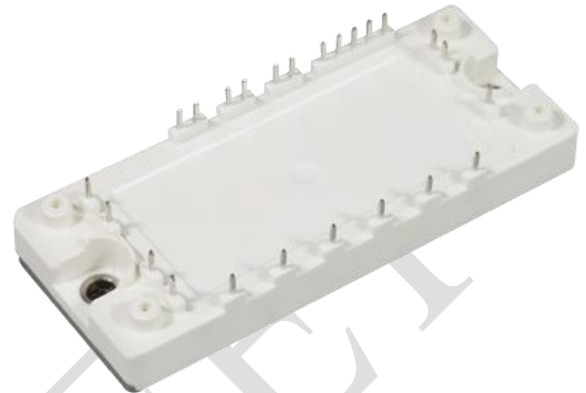


# GT15PI120T5H

## IGBT Module

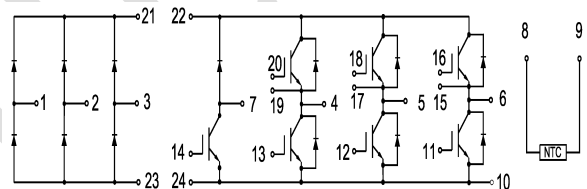
### Features:

- Short Circuit Rated >10μs
- Low Saturation Voltage:  $V_{CE(sat)} = 1.90V @ I_c = 15A, T_c=25^{\circ}C$
- Low Switching Loss
- 100% RBSOA Tested (2xIc)
- Low Stray Inductance
- Lead Free, Compliant with RoHS Requirement



### Applications:

- Industrial Inverters
- Servo Applications



### IGBT, Inverter

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

$V_{CES}$	Collector-Emitter Blocking Voltage		1200	V
$V_{GES}$	Gate-Emitter Voltage		$\pm 20$	V
$I_c$	Continuous Collector Current	$T_c = 80^{\circ}C,$	15	A
		$T_c = 25^{\circ}C$	30	A
$I_{CM(1)}$	Peak Collector Current Repetitive	$T_J = 175^{\circ}C$	30	A
$t_{sc}$	Short Circuit Withstand Time		>10	$\mu s$
$P_D$	Maximum Power Dissipation per IGBT	$T_c = 25^{\circ}C$	205	W
		$T_{Jmax}=175^{\circ}C$		



## 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	$I_C = 1\text{ mA}, V_{CE} = V_{GE}$	4.5	5.5	6.5	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C = 15\text{A}, V_{GE} = 15\text{V}$	$T_J = 25^\circ\text{C}$	1.90	2.20	V
			$T_J = 125^\circ\text{C}$	2.20		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	$V_{GE} = \pm 20\text{V}, V_{CE} = 0\text{V}, T_J = 25^\circ\text{C}$			200	nA
$C_{ies}$	Input Capacitance	$V_{CE} = 25\text{V}, V_{GE} = 0\text{V}, f = 1\text{MHz}$		2.0		nF
$C_{res}$	Output capacitance			0.10		nF

### Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	$V_{CC} = 600\text{V}, I_C = 15\text{A}, R_G = 40\Omega, V_{GE} = \pm 15\text{V},$ Inductive Load	$T_J = 25^\circ\text{C}$	175		ns
			$T_J = 125^\circ\text{C}$	160		
$t_r$	Rise Time		$T_J = 25^\circ\text{C}$	50		ns
			$T_J = 125^\circ\text{C}$	55		
$t_{d(off)}$	Turn-off Delay Time		$T_J = 25^\circ\text{C}$	140		ns
			$T_J = 125^\circ\text{C}$	145		
$t_f$	Fall Time		$T_J = 25^\circ\text{C}$	245		ns
			$T_J = 125^\circ\text{C}$	380		
$E_{on}$	Turn-on Switching Loss		$T_J = 25^\circ\text{C}$	1.74		mJ
			$T_J = 125^\circ\text{C}$	2.08		
$E_{off}$	Turn-off Switching Loss	$T_J = 25^\circ\text{C}$	0.63		mJ	
		$T_J = 125^\circ\text{C}$	1.09			
$Q_g$	Total Gate Charge	$T_J = 25^\circ\text{C}$	140		nC	
RBSOA	Reverse Bias Safe Operation Area	$I_C=30\text{A}, V_{CC}=1050\text{V}, V_p=1200\text{V}, R_g = 15\Omega, V_{GE}=\pm 15\text{V to } 0\text{V}, T_J = 150^\circ\text{C}$	Trapezoid			
SCSOA	Short Circuit Safe Operation Area	$V_{CC} = 600\text{V}, V_{GE} = 15\text{V}, T_J = 150^\circ\text{C}$	10			$\mu\text{s}$
$R_{\theta JC}$	IGBT Thermal Resistance: Junction-To-Case			0.73		$^\circ\text{C/W}$



## Diode, Inverter

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

$V_{RRM}$	Repetitive Peak Reverse Voltage	1200	V
$I_F$	Diode Continuous Forward Current	15	A
$I_{FM}$	Repetitive Peak Forward Current	30	A

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

Symbol	Description	Conditions	Min	Typ	Max	Unit
$V_{FM}$	Forward Voltage	$I_F = 15\text{A}$ , $V_{GE} = 0\text{V}$	$T_J = 25^\circ\text{C}$	2.00		V
			$T_J = 125^\circ\text{C}$		2.20	
$I_{rr}$	Peak Reverse Recovery Current		$T_J = 25^\circ\text{C}$	12		A
			$T_J = 125^\circ\text{C}$		15	
$Q_{rr}$	Reverse Recovery Charge	$I_F=15\text{A}$ , $di/dt = 370\text{A}/\mu\text{s}$ , $V_{rr} = 600\text{V}$ , $V_{GE} = -15\text{V}$	$T_J = 25^\circ\text{C}$	0.94		$\mu\text{C}$
			$T_J = 125^\circ\text{C}$		1.64	
$E_{rec}$	Reverse Recovery Energy		$T_J = 25^\circ\text{C}$	0.37		mJ
			$T_J = 125^\circ\text{C}$		0.76	
$R_{\theta JC}$	Diode Thermal Resistance: Junction-To-Case			1.19		$^\circ\text{C}/\text{W}$

## 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	$T_C = 80^\circ\text{C}$ ,	15	A
		$T_C = 25^\circ\text{C}$	30	A
$I_{CM}$	Peak Collector Current Repetitive	$T_J = 175^\circ\text{C}$	30	A
$t_{sc}$	Short Circuit Withstand Time		$>10$	$\mu\text{s}$
$P_D$	Maximum Power Dissipation (IGBT)	$T_C = 25^\circ\text{C}$ $T_{Jmax}=175^\circ\text{C}$	205	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	$I_C = 1\text{ mA}, V_{CE} = V_{GE}$	4.5	5.5	6.5	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C = 15\text{ A}, V_{GE} = 15\text{ V}$	$T_J = 25^\circ\text{C}$	1.90	2.10	V
			$T_J = 125^\circ\text{C}$	2.20		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	$V_{GE} = \pm 20\text{ V}, V_{CE} = 0\text{ V}, T_J = 25^\circ\text{C}$			200	nA
$C_{ies}$	Input Capacitance	$V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}, f = 1\text{ MHz}$		2.00		nF
$C_{oes}$	Output Capacitance			0.10		nF

### Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	$V_{CC} = 600\text{ V}, I_C = 15\text{ A}, R_G = 40\ \Omega, V_{GE} = \pm 15\text{ V},$ Inductive Load	$T_J = 25^\circ\text{C}$	175		ns
			$T_J = 125^\circ\text{C}$	160		
$t_r$	Rise Time		$T_J = 25^\circ\text{C}$	50		ns
			$T_J = 125^\circ\text{C}$	55		
$t_{d(off)}$	Turn-off Delay Time		$T_J = 25^\circ\text{C}$	140		ns
			$T_J = 125^\circ\text{C}$	145		
$t_f$	Fall Time		$T_J = 25^\circ\text{C}$	245		ns
			$T_J = 125^\circ\text{C}$	380		
$E_{on}$	Turn-on Switching Loss		$T_J = 25^\circ\text{C}$	1.74		mJ
			$T_J = 125^\circ\text{C}$	2.08		
$E_{off}$	Turn-off Switching Loss	$T_J = 25^\circ\text{C}$	0.63		mJ	
		$T_J = 125^\circ\text{C}$	1.09			
$Q_g$	Total Gate Charge	$T_J = 25^\circ\text{C}$	140		nC	
RBSOA	Reverse Bias Safe Operation Area	$I_C=30\text{ A}, V_{CC}=1050\text{ V}, V_p=1200\text{ V}, R_g = 15\ \Omega, V_{GE}=\pm 15\text{ V to } 0\text{ V}, T_J = 150^\circ\text{C}$	Trapezoid			
SCSOA	Short Circuit Safe Operation Area	$V_{CC} = 600\text{ V}, V_{GE} = 15\text{ V}, T_J = 150^\circ\text{C}$	10			$\mu\text{s}$
$R_{\theta JC}$	IGBT Thermal Resistance: Junction-To-Case			0.73		$^\circ\text{C/W}$



## Diode, Brake-Chopper

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

$V_{RRM}$	Repetitive Peak Reverse Voltage	1200	V
$I_F$	Diode Continuous Forward Current	15	A
$I_{FM}$	Repetitive Peak Forward Current	30	A

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

Symbol	Description	Conditions	Min	Typ	Max	Unit
$V_{FM}$	Forward Voltage	$I_F = 15\text{ A},$ $V_{GE} = 0\text{ V}$	$T_J = 25^\circ\text{C}$	2.00		V
			$T_J = 125^\circ\text{C}$	2.20		
$I_{rr}$	Peak Reverse Recovery Current		$T_J = 25^\circ\text{C}$	12		A
			$T_J = 125^\circ\text{C}$	15		
$Q_{rr}$	Reverse Recovery Charge	$I_F = 15\text{ A},$ $di/dt = 370\text{ A}/\mu\text{s},$ $V_{rr} = 600\text{ V},$ $V_{GE} = -15\text{ V}$	$T_J = 25^\circ\text{C}$	0.94		$\mu\text{C}$
			$T_J = 125^\circ\text{C}$	1.64		
$E_{rec}$	Reverse Recovery Energy		$T_J = 25^\circ\text{C}$	0.37		mJ
			$T_J = 125^\circ\text{C}$	0.76		
$R_{\theta JC}$	Diode Thermal Resistance: Junction-To-Case			1.19		$^\circ\text{C}/\text{W}$

## Diode, Rectifier

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

$V_{RRM}$	Repetitive Peak Reverse Voltage	$T_J = 25^\circ\text{C}$	1800	V
$I_{FRMSM}$	Maximum RMS Forward Current per Chip	$T_J = 80^\circ\text{C}$	35	A
$I_{RMSM}$	Maximum RMS Current at Rectifier Output	$T_J = 80^\circ\text{C}$	45	A
$I_{FSM}$	Surge Current @ $t_p=10\text{ ms}$	$T_J = 25^\circ\text{C}$	280	A
		$T_J = 150^\circ\text{C}$	250	
$I^2t$	$I^2t$ - value	$T_J = 25^\circ\text{C}$	500	$\text{A}^2\text{s}$
		$T_J = 150^\circ\text{C}$	370	



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

$V_F$	Forward voltage	$I_F = 15\text{A}$	$T_J = 25^\circ\text{C}$	1.05		V
			$T_J = 150^\circ\text{C}$	1.00		
$I_R$	Reverse current	$V_R = 1200\text{V}$	$T_J = 25^\circ\text{C}$		1	mA
$R_{\theta JC}$	Junction-To-Case Diode				0.89	$^\circ\text{C/W}$

### Internal NTC-Thermistor Characteristics

$R_{25}$	$T_C = 25^\circ\text{C}$	5		k $\Omega$
$\Delta R/R$	$T_C = 100^\circ\text{C}$ , $R_{100} = 481\Omega$		$\pm 5$	%
$P_{25}$	$T_C = 25^\circ\text{C}$	10		mW
$B_{25/50}$	$R_2 = R_{25} \exp[B_{25/50}(1/T_2 - 1/(298.15\text{K}))]$	3380		K
$B_{25/80}$	$R_2 = R_{25} \exp[B_{25/80}(1/T_2 - 1/(298.15\text{K}))]$	3440		K

### Module

Symbol	Description	Min	Typ	Max	Unit
$V_{iso}$	Isolation Voltage(All Terminals Shorted)	$f = 50\text{Hz}$ , 1minute	2500		V
$T_J$	Maximum Junction Temperature			175	$^\circ\text{C}$
$T_{JOP}$	Maximum Operating Junction Temperature Range		-40	+150	$^\circ\text{C}$
$T_{stg}$	Storage Temperature		-40	+125	$^\circ\text{C}$
$R_{\theta CS}$	Case-To-Sink (Conductive Grease Applied)			0.03	$^\circ\text{C/W}$
M	Mounting Screw:M5		3.0	5.0	N·m
G	Weight			200	g

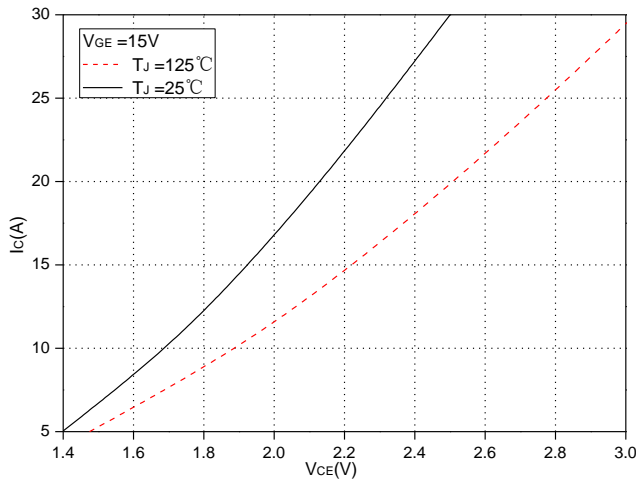


Fig.1 Typical Saturation Voltage Characteristics

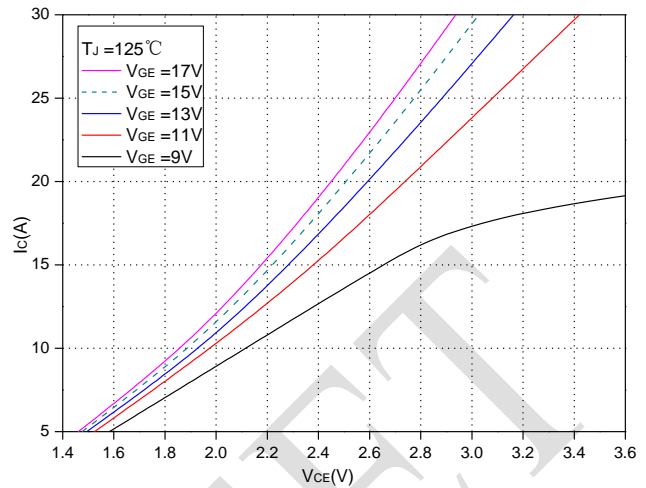


Fig.2 Typical Output Characteristics

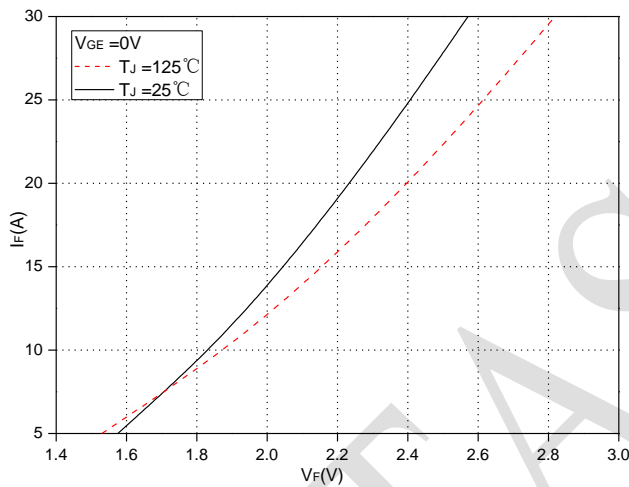


Fig.3 Forward Characteristics of FWD

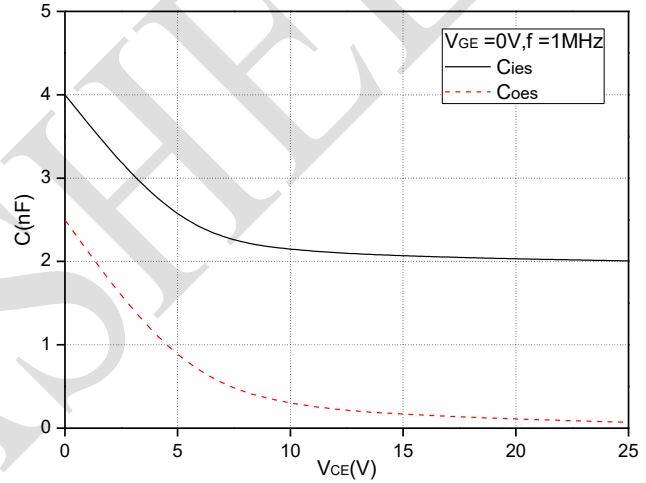


Fig.4 Capacitance Characteristics

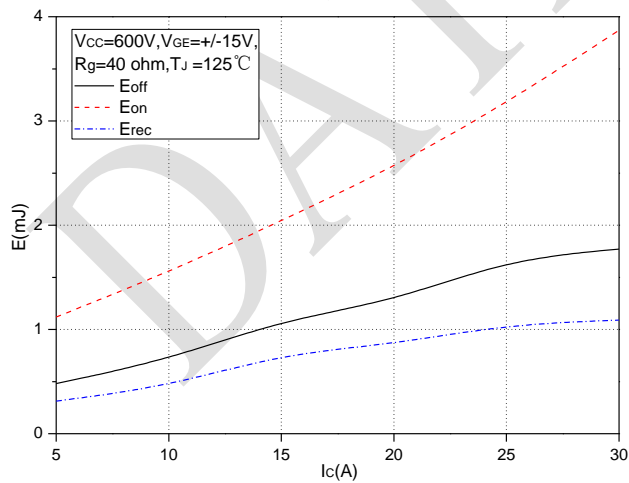


Fig.5 Typical Switching Loss vs. Collector Current

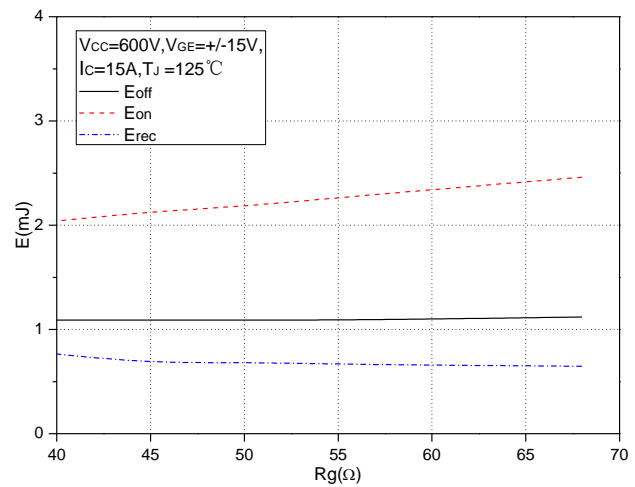
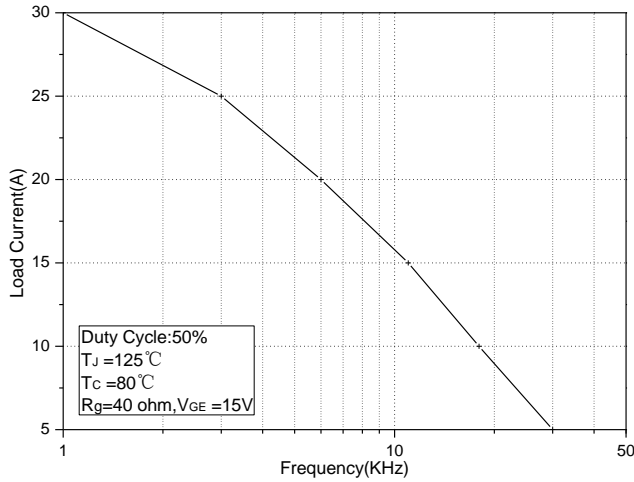
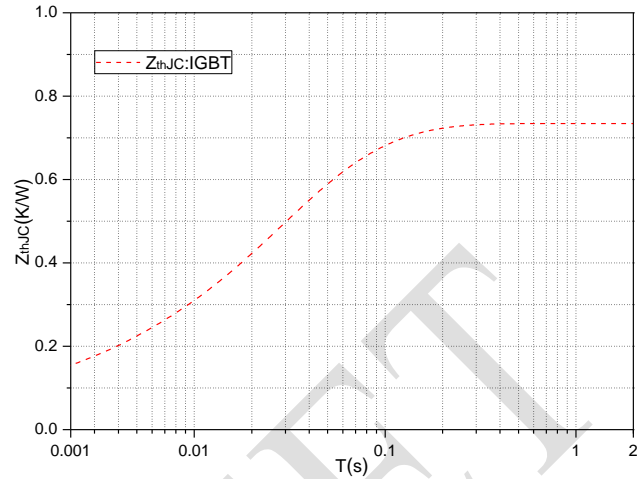


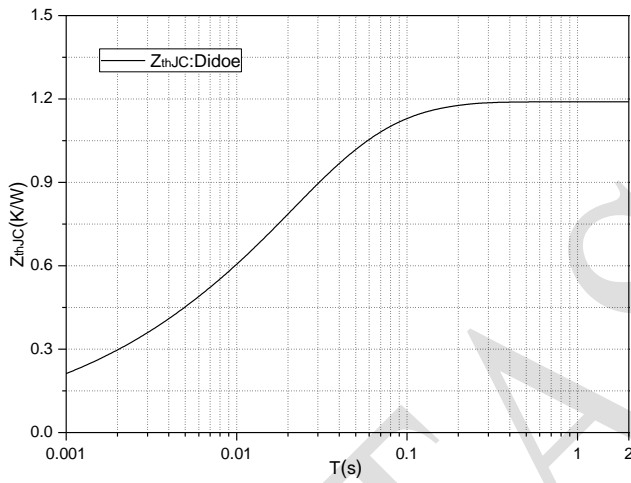
Fig.6 Typical Switching Loss vs. Gate Resistance



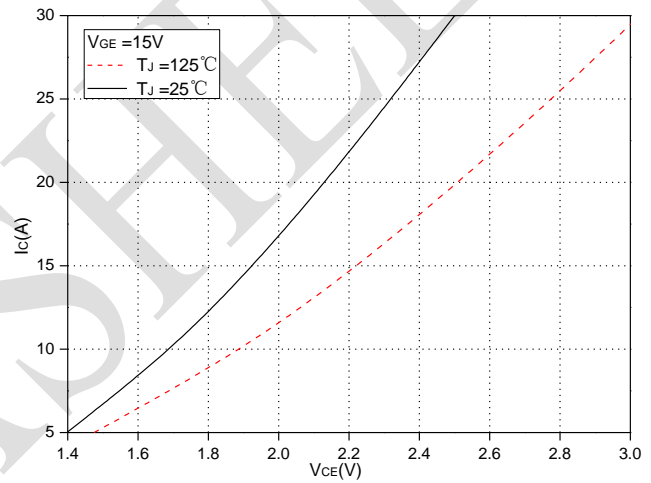
**Fig.7 Typical Load Current vs. Frequency**



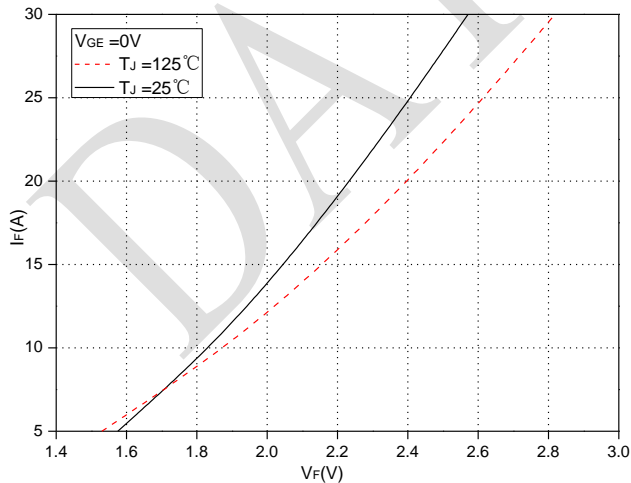
**Fig.8 Transient thermal impedance (IGBT)**



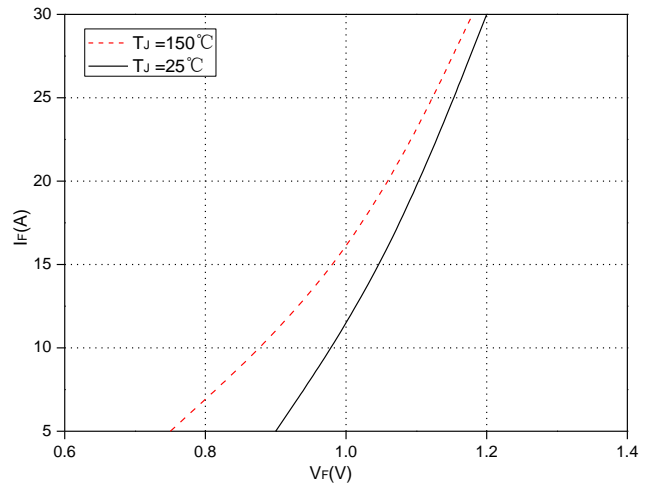
**Fig.9 Transient thermal impedance Diode**



**Fig.10 Typical Saturation Voltage Characteristics (Brake-Chopper)**



**Fig.11 Forward Characteristics of FWD (Brake-Chopper)**



**Fig.12 Forward Characteristics of Diode (Rectifier)**



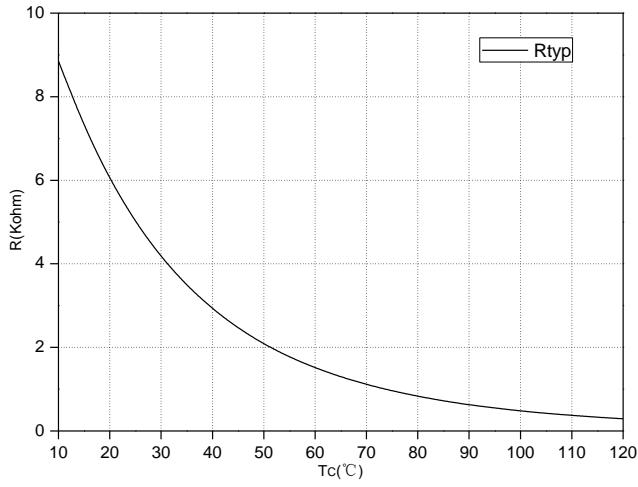


Fig.13 NTC Temperature characteristics

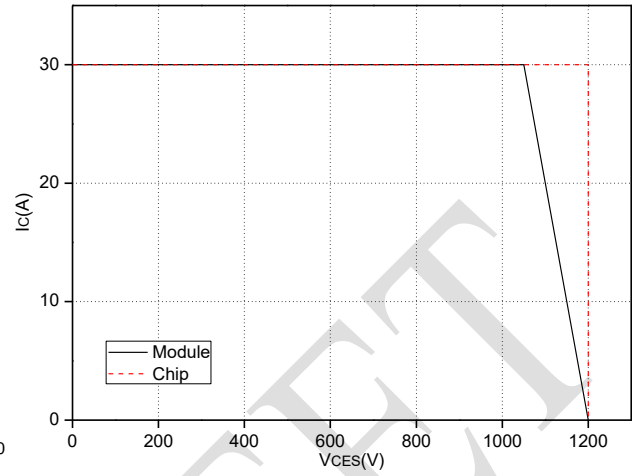
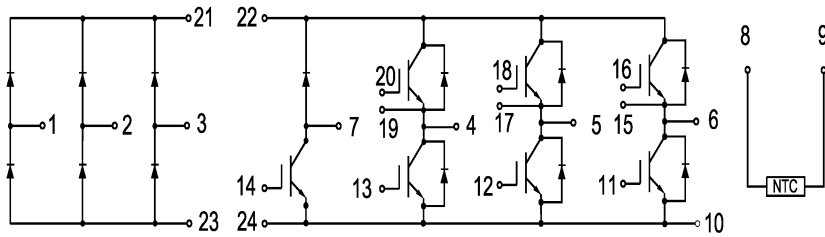


Fig.14 Reverse Bias Safe Operation Area (RBSOA)

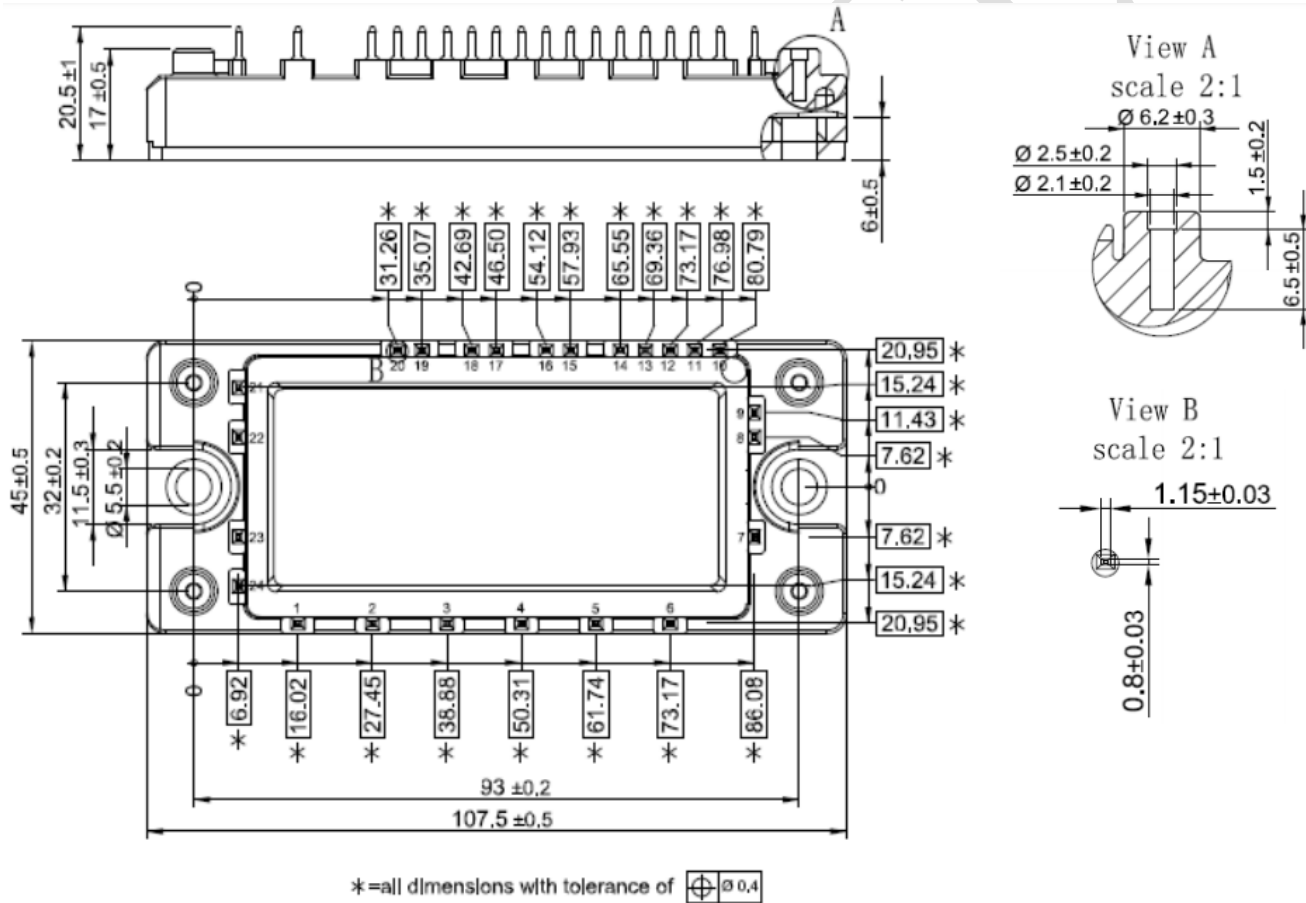
DATA SHEET



### Internal Circuit:



### Package Outline (Unit: mm):





Date	Revision	Notes
07/07/2019	A	Final Version

## **Announcement**

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DATA SHEET