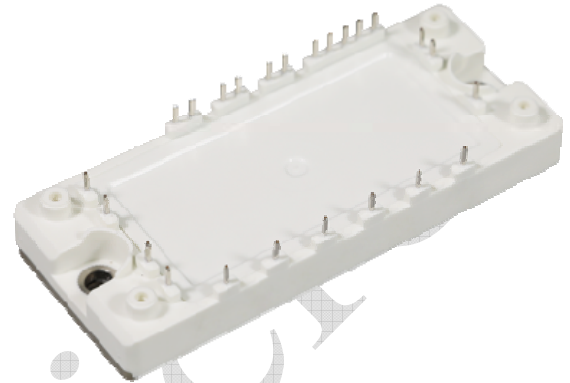


GT15PI120T5H

IGBT Module

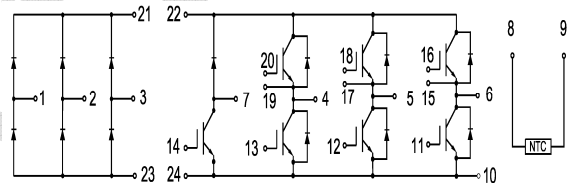
Features:

- Short Circuit Rated >10 μ s
- Low Saturation Voltage: $V_{CE(sat)} = 1.90V @ I_C = 15A, T_C=25^\circ C$
- Low Switching Loss
- 100% RBSOA Tested ($2 \times I_C$)
- 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		± 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	μ s
P_D	Maximum Power Dissipation per IGBT	$T_C = 25^\circ C$ $T_{Jmax}=175^\circ C$	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	2.20	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			μs
$R_{\theta JC}$	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		μC
			$T_J = 125^\circ\text{C}$	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		± 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	μs
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			μs	
$R_{\theta JC}$	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		μC
			$T_J = 125^\circ\text{C}$	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	A^2s
		$T_J = 150^\circ\text{C}$	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	$^\circ\text{C}/\text{W}$

Internal NTC-Thermistor Characteristics

R_{25}	$T_C = 25^\circ\text{C}$	5		k Ω
$\Delta R/R$	$T_C = 100^\circ\text{C}$, $R_{100} = 481\Omega$		± 5	%
P_{25}	$T_C = 25^\circ\text{C}$	50		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)		0.1		$^\circ\text{C}/\text{W}$
M	Mounting Screw:M5	3.0		5.0	N·m
G	Weight		200		g

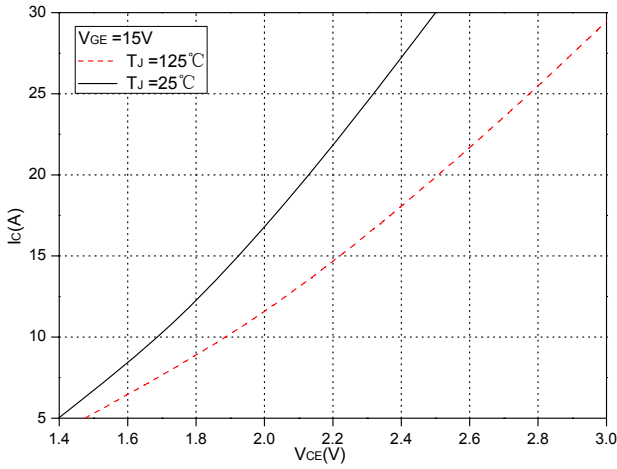


Fig.1 Typical Saturation Voltage Characteristics

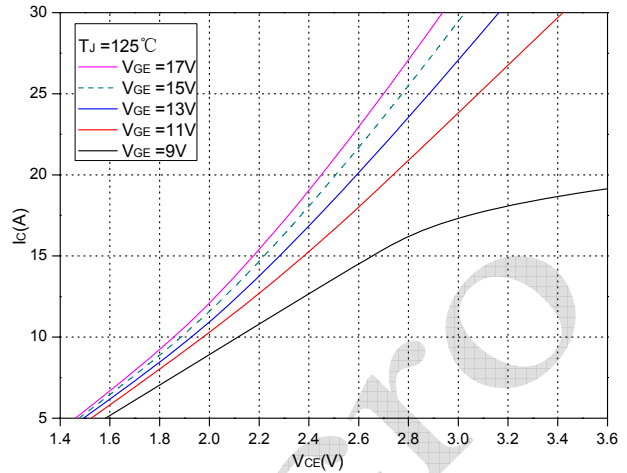


Fig.2 Typical Output Characteristics

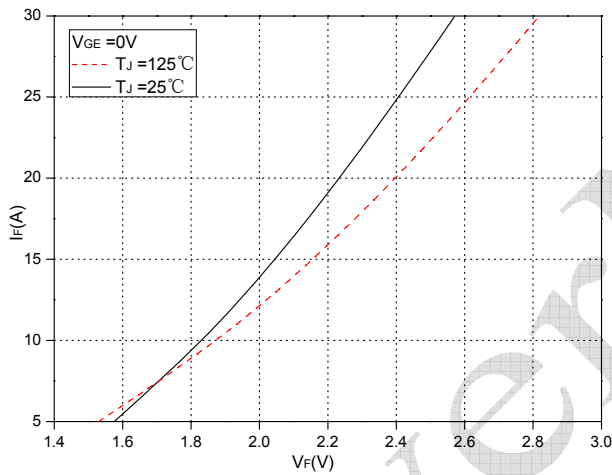


Fig.3 Forward Characteristics of FWD

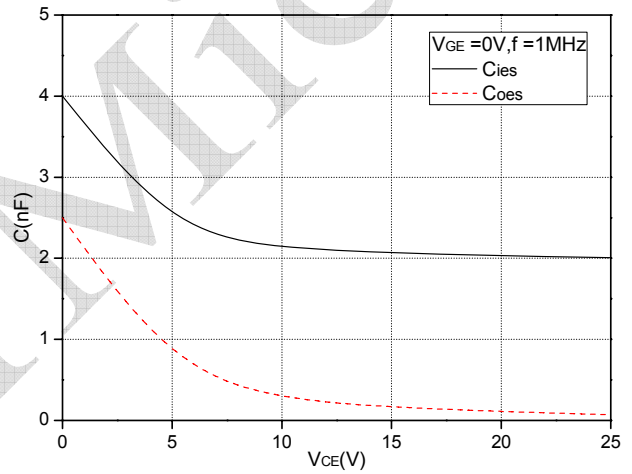


Fig.4 Capacitance Characteristics

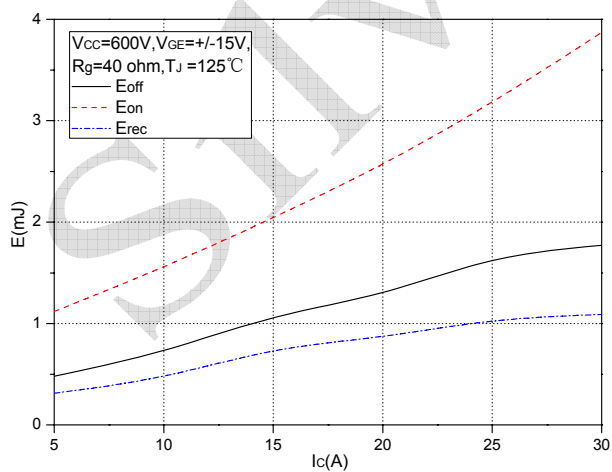


Fig.5 Typical Switching Loss vs. Collector Current

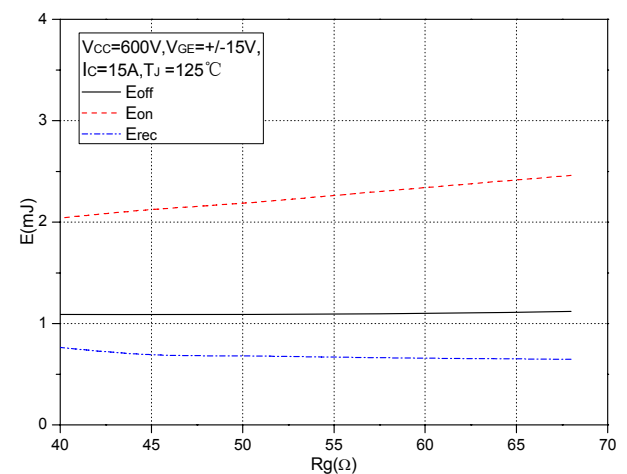


Fig.6 Typical Switching Loss vs. Gate Resistance

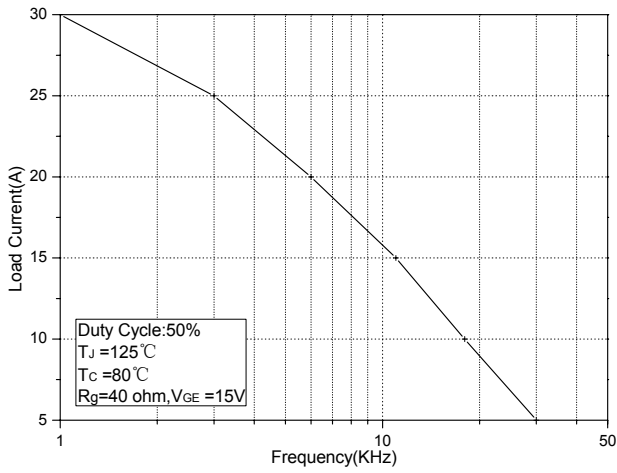


Fig.7 Typical Load Current vs. Frequency

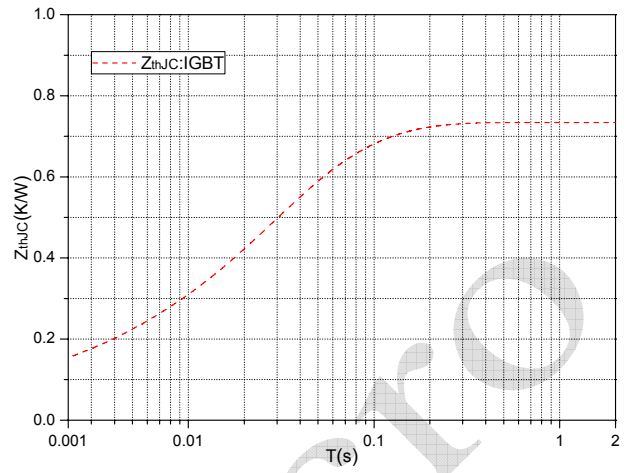


Fig.8 Transient thermal impedance (IGBT)

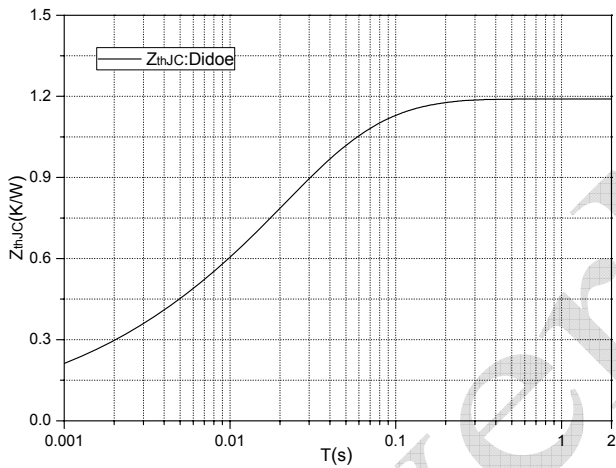


Fig.9 Transient thermal impedance Diode

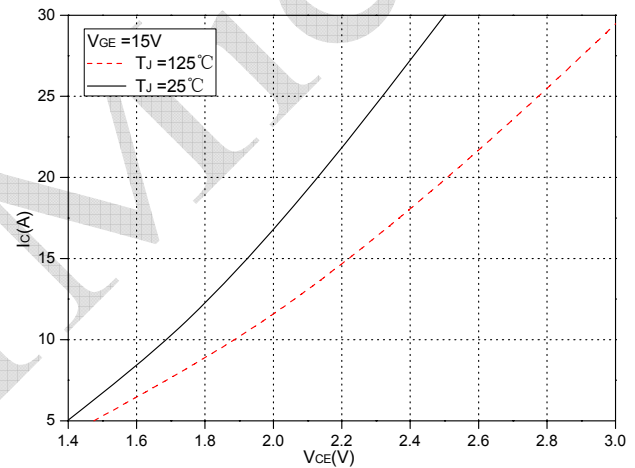


Fig.10 Typical Saturation Voltage Characteristics (Brake-Chopper)

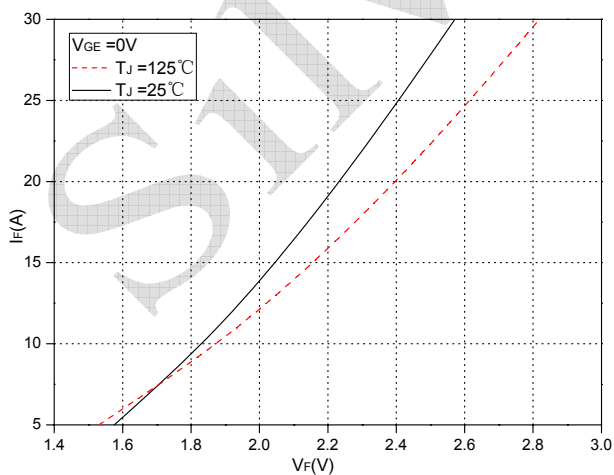


Fig.11 Forward Characteristics of FWD (Brake-Chopper)

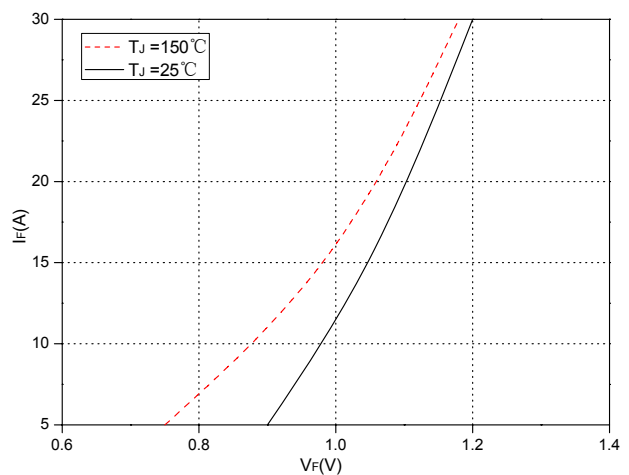


Fig.12 Forward Characteristics of Diode (Rectifier)

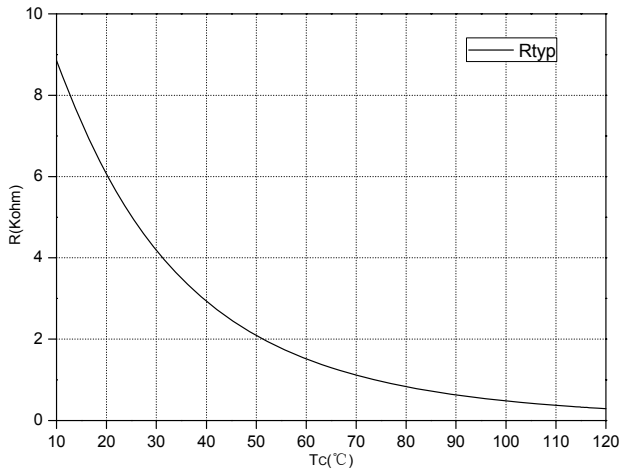


Fig.13 NTC Temperature characteristics

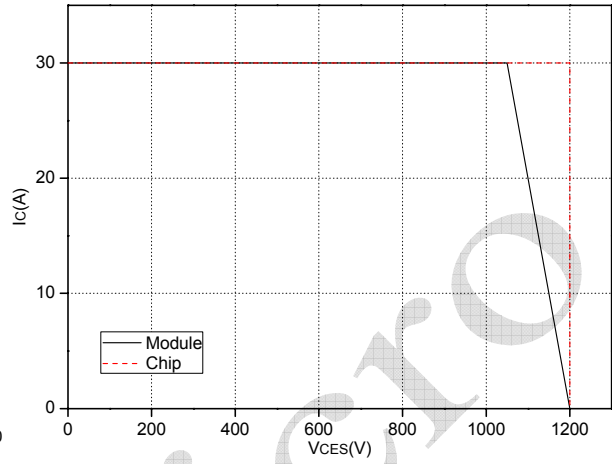
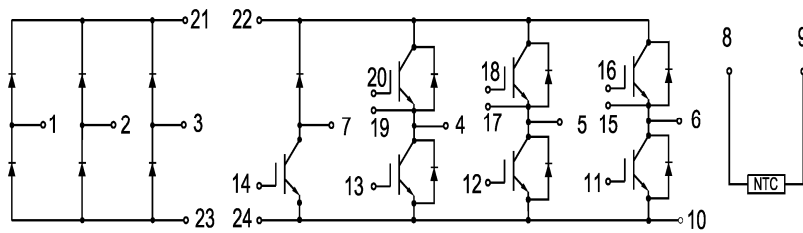


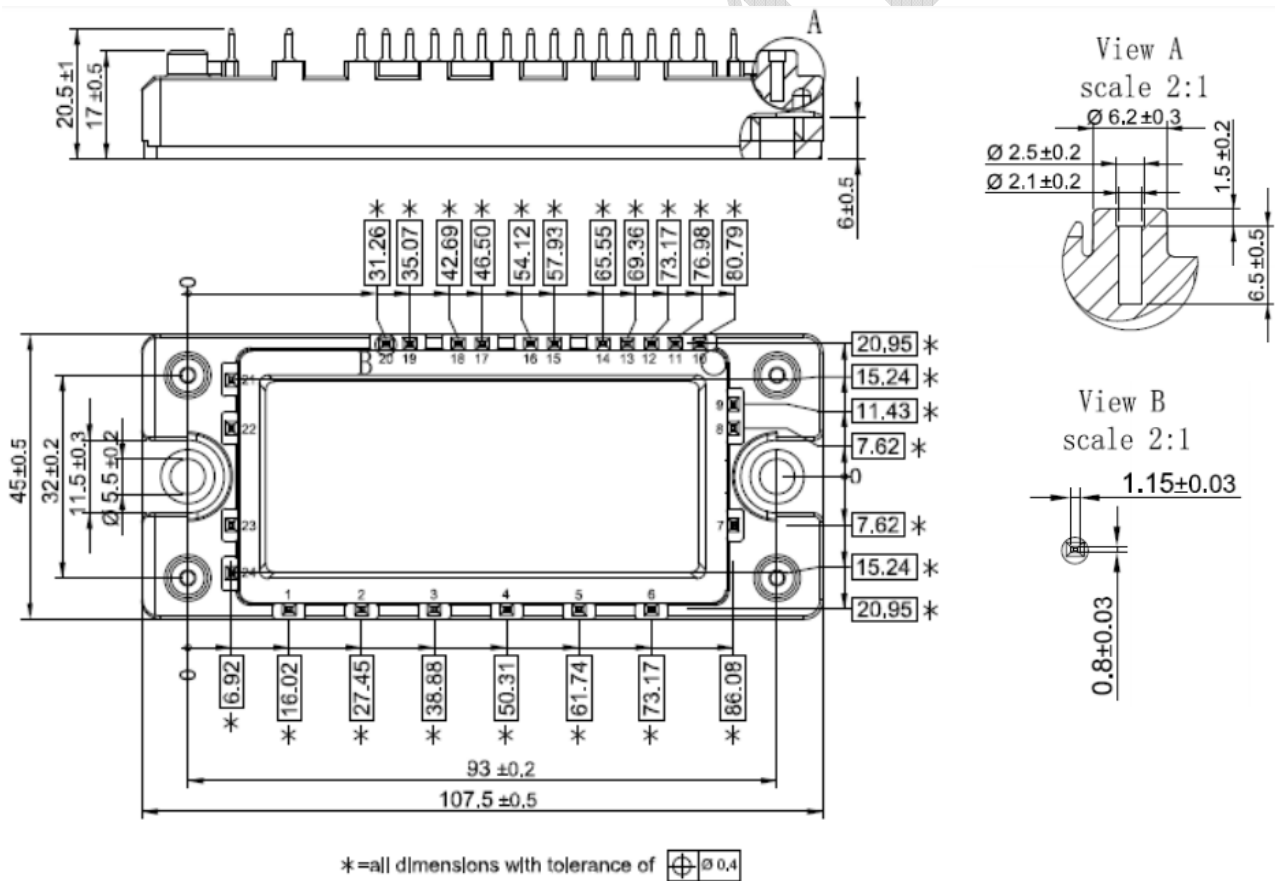
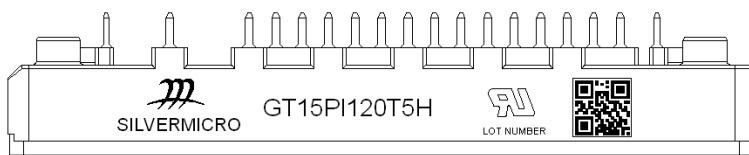
Fig.14 Reverse Bias Safe Operation Area (RBSOA)

SilverMicro

Internal Circuit:



Package Outline (Unit: mm):





Date	Revision	Notes
07/07/2019	A	Final Version

Announcement

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