

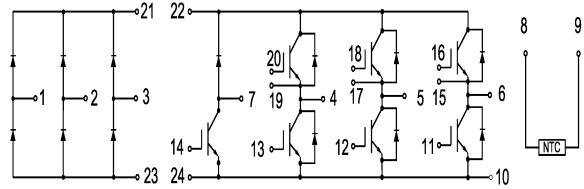


GT10PI120T5H

IGBT Module

Features:

- Field Stop Trench Gate IGBT
- Short Circuit Rated >10μs
- Low Saturation Voltage
- 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°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 = 100°C	10	A
		T _C = 25°C	20	A
I _{CM(1)}	Peak Collector Current Repetitive	T _J = 175°C	20	A
t _{SC}	Short Circuit Withstand Time		>10	μs
P _D	Maximum Power Dissipation per IGBT	T _C = 25°C T _{Jmax} =175°C	155	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	6.0	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C = 10\text{A}, V_{GE} = 15\text{V}$	$T_J = 25^\circ\text{C}$	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	$V_{CE} = 25\text{V}, V_{GE} = 0\text{V}, f = 1\text{MHz}$		1.60		nF
C_{res}	Reverse Transfer Capacitance			0.05		nF

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	$V_{CC} = 600\text{V}, I_C = 10\text{A}, R_G = 40\Omega, V_{GE} = \pm 15\text{V},$ Inductive Load	$T_J = 25^\circ\text{C}$		110		ns
			$T_J = 125^\circ\text{C}$		105		
t_r	Rise Time		$T_J = 25^\circ\text{C}$		35		ns
			$T_J = 125^\circ\text{C}$		30		
$t_{d(off)}$	Turn-off Delay Time		$T_J = 25^\circ\text{C}$		90		ns
			$T_J = 125^\circ\text{C}$		105		
t_f	Fall Time		$T_J = 25^\circ\text{C}$		350		ns
			$T_J = 125^\circ\text{C}$		440		
E_{on}	Turn-on Switching Loss		$T_J = 25^\circ\text{C}$		12.7		mJ
			$T_J = 125^\circ\text{C}$		1.48		
E_{off}	Turn-off Switching Loss	$T_J = 25^\circ\text{C}$		0.59		mJ	
		$T_J = 125^\circ\text{C}$		0.70			
Q_g	Total Gate Charge	$T_J = 25^\circ\text{C}$		80		nC	
RBSOA	$I_C=20\text{A}, V_{CC}=1050\text{V}, V_p=1200\text{V}, R_G=15\Omega, V_{GE}=\pm 15\text{V to } 0\text{V}, T_J = 150^\circ\text{C}$			Trapezoid			
SCSOA	$V_{CC} = 600\text{V}, V_{GE} = 15\text{V}, T_J = 150^\circ\text{C}$			10		μs	
$R_{\theta JC}$	IGBT Thermal Resistance: Junction-To-Case				0.98	$^\circ\text{C/W}$	



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	10	A
I_{FM}	Repetitive Peak Forward Current	20	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	$I_F = 10\text{A}$, $V_{GE} = 0\text{V}$	$T_J = 25^\circ\text{C}$	1.70	2.10	V
			$T_J = 125^\circ\text{C}$	1.80		
I_{rr}	Peak Reverse Recovery Current		$T_J = 25^\circ\text{C}$	10		A
			$T_J = 125^\circ\text{C}$	12		
Q_{rr}	Reverse Recovery Charge	$I_F = 10\text{A}$, $di/dt = 300\text{A}/\mu\text{s}$, $V_{rr} = 600\text{V}$, $V_{GE} = -15\text{V}$	$T_J = 25^\circ\text{C}$	1.00		μC
			$T_J = 125^\circ\text{C}$	1.49		
E_{rec}	Reverse Recovery Energy		$T_J = 25^\circ\text{C}$	0.15		mJ
			$T_J = 125^\circ\text{C}$	0.31		
$R_{\theta JC}$	Diode Thermal Resistance: Junction-To-Case				1.98	$^\circ\text{C}/\text{W}$

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	$T_C = 100^\circ\text{C}$	10	A
		$T_C = 25^\circ\text{C}$	20	A
I_{CM}	Peak Collector Current Repetitive	$T_J = 175^\circ\text{C}$	20	A
t_{SC}	Short Circuit Withstand Time		>10	μs
P_D	Maximum Power Dissipation (IGBT)	$T_C = 25^\circ\text{C}$ $T_{Jmax} = 175^\circ\text{C}$	155	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	6.0	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C = 10\text{A}, V_{GE} = 15\text{V}$	$T_J = 25^\circ\text{C}$	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	$V_{CE} = 25\text{V}, V_{GE} = 0\text{V}, f = 1\text{MHz}$		1.60		nF
C_{res}	Reverse Transfer Capacitance			0.05		nF

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	$V_{CC} = 600\text{V}, I_C = 10\text{A}, R_G = 40 \Omega, V_{GE} = \pm 15\text{V},$ Inductive Load	$T_J = 25^\circ\text{C}$	110		ns
			$T_J = 125^\circ\text{C}$	105		
t_r	Rise Time		$T_J = 25^\circ\text{C}$	35		ns
			$T_J = 125^\circ\text{C}$	30		
$t_{d(off)}$	Turn-off Delay Time		$T_J = 25^\circ\text{C}$	90		ns
			$T_J = 125^\circ\text{C}$	105		
t_f	Fall Time		$T_J = 25^\circ\text{C}$	350		ns
			$T_J = 125^\circ\text{C}$	440		
E_{on}	Turn-on Switching Loss		$T_J = 25^\circ\text{C}$	1.27		mJ
			$T_J = 125^\circ\text{C}$	1.48		
E_{off}	Turn-off Switching Loss	$T_J = 25^\circ\text{C}$	0.59		mJ	
		$T_J = 125^\circ\text{C}$	0.70			
Q_g	Total Gate Charge	$T_J = 25^\circ\text{C}$	80		nC	
RBSOA	$I_C=20\text{A}, V_{CC}=1050\text{V}, V_p=1200\text{V}, R_G = 15\Omega, V_{GE}=\pm 15\text{V to } 0\text{V}, T_J = 150^\circ\text{C}$			Trapezoid		
SCSOA	$V_{CC} = 600\text{V}, V_{GE} = 15\text{V}, T_J = 150^\circ\text{C}$			10		μs
$R_{\theta JC}$	IGBT Thermal Resistance: Junction-To-Case				0.98	$^\circ\text{C/W}$



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	10	A
I_{FM}	Repetitive Peak Forward Current	20	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	$I_F = 10\text{ A}$, $V_{GE} = 0\text{ V}$	$T_J = 25^\circ\text{C}$	1.70	2.00	V
			$T_J = 125^\circ\text{C}$	1.80		
I_{rr}	Peak Reverse Recovery Current		$T_J = 25^\circ\text{C}$	10		A
			$T_J = 125^\circ\text{C}$	12		
Q_{rr}	Reverse Recovery Charge	$I_F = 10\text{ A}$, $di/dt = 300\text{ A}/\mu\text{s}$, $V_{rr} = 600\text{ V}$, $V_{GE} = -15\text{ V}$	$T_J = 25^\circ\text{C}$	1.00		μC
			$T_J = 125^\circ\text{C}$	1.49		
E_{rec}	Reverse Recovery Energy		$T_J = 25^\circ\text{C}$	0.15		mJ
			$T_J = 125^\circ\text{C}$	0.31		
$R_{\theta JC}$	Diode Thermal Resistance: Junction-To-Case				1.98	$^\circ\text{C}/\text{W}$

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	$T_J = 80^\circ\text{C}$	40	A
I_{FSM}	Surge Current @ $t_p=10\text{ ms}$	$T_J = 25^\circ\text{C}$	260	A
		$T_J = 150^\circ\text{C}$	180	
I^2t	I^2t - value	$T_J = 25^\circ\text{C}$	400	A^2s
		$T_J = 150^\circ\text{C}$	280	



Electrical Characteristics of Diode (T_C=25°C unless otherwise specified)

V _F	Forward Voltage	I _F = 10 A ,	T _J =25°C	1.10			V
			T _J =150°C	1.00			
I _R	Reverse Current	V _R =1200V	T _J =25°C			1	mA
R _{θJC}	Diode Thermal Resistance: Junction-To-Case					1.12	°C/W

Internal NTC-Thermistor Characteristics

Symbol	Description		Min.	Typ.	Max.	Units.
R ₂₅	Rated Resistance	T _C =25°C		5		kΩ
ΔR/R	Deviation of R100	T _C =100°C, R ₁₀₀ =481Ω	-5		5	%
P ₂₅	Power Dissipation	T _C =25°C			10	mW
B _{25/50}	B-Value	$R_2=R_{25} \exp[B_{25/50}(1/T_2-1/(298.15K))]$		3380		K
B _{25/80}	B-Value	$R_2=R_{25} \exp[B_{25/80}(1/T_2-1/(298.15K))]$		3440		K

Module

Symbol	Description		Min	Typ	Max	Unit
V _{iso}	Isolation Voltage (All Terminals Shorted)	RMS, f=50Hz, 1minute	2500			V
L _{sCE}	Stray Inductance Module			60		nH
T _J	Maximum Junction Temperature				175	°C
T _{JOP}	Maximum Operating Junction Temperature Range		-40		+150	°C
T _{stg}	Storage Temperature		-40		+125	°C
CTI	Comparative Tracking Index		200			
R _{θCS}	Case-To-Sink Thermally (Conductive Grease Applied)				0.03	°C/W
M	Mounting Torque for Module Mounting	Screw M5--Mounting according to valid application note	3.0		5.0	N·m
G	Weight			190		g

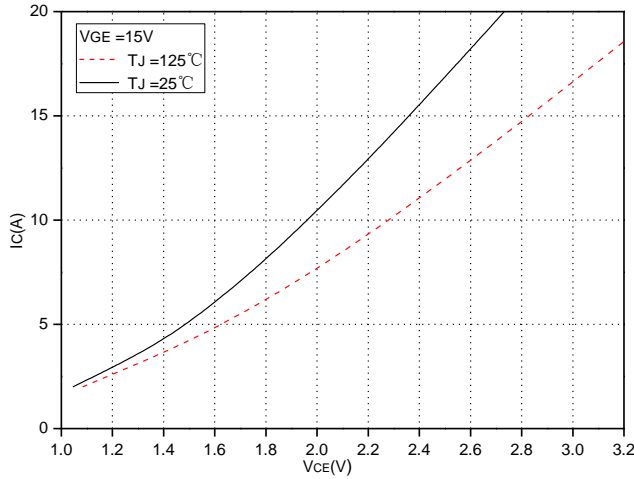


Fig.1 Typical Saturation Voltage Characteristics

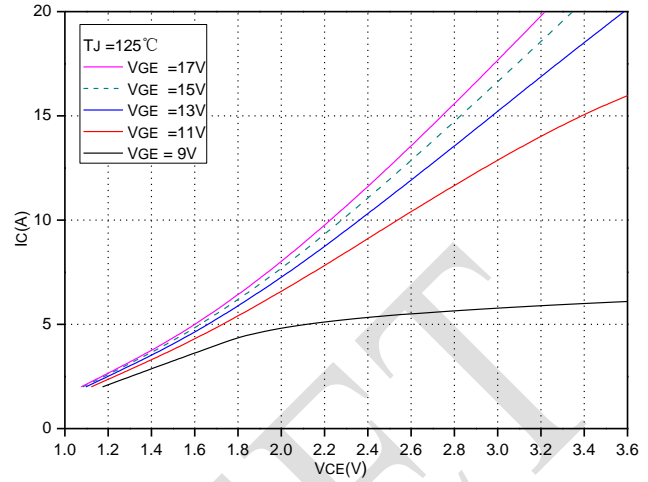


Fig.2 Typical Output Characteristics

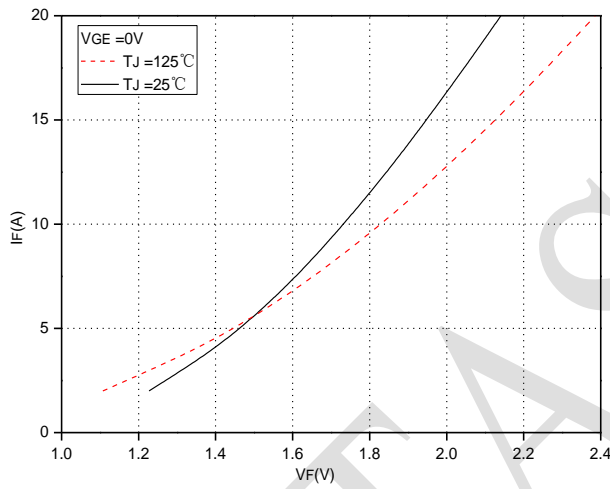


Fig.3 Forward Characteristics of FWD

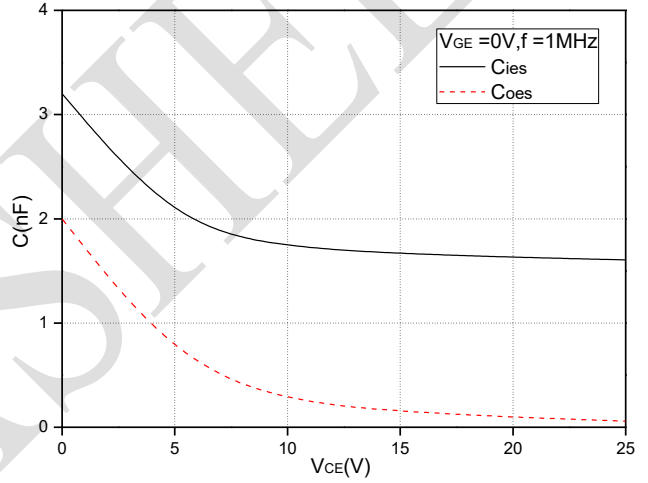


Fig.4 Capacitance Characteristics

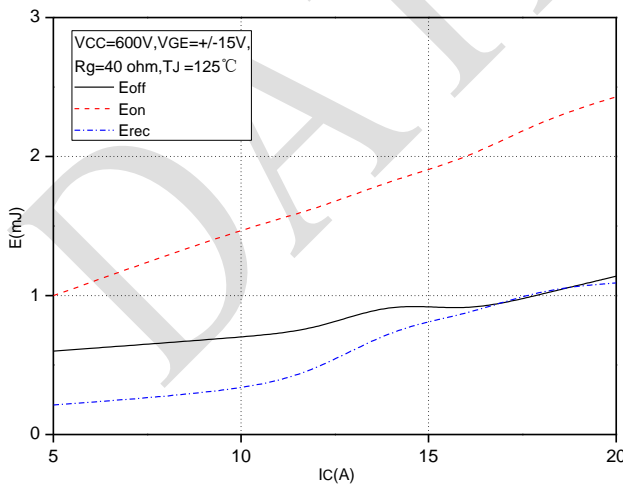


Fig.5 Typical Switching Loss vs. Collector Current

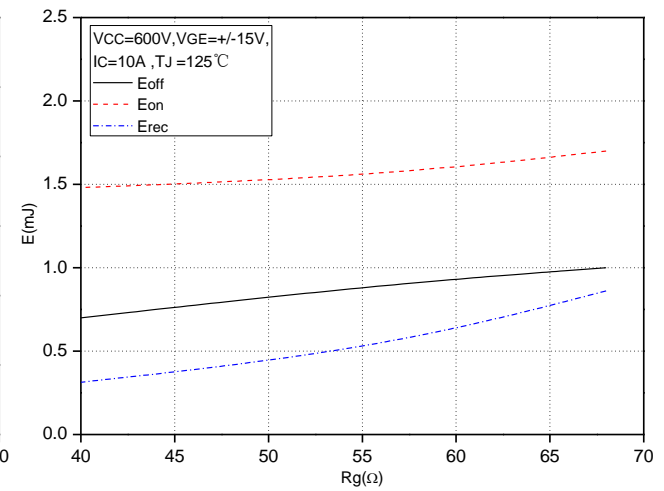


Fig.6 Typical Switching Loss vs. Gate Resistance

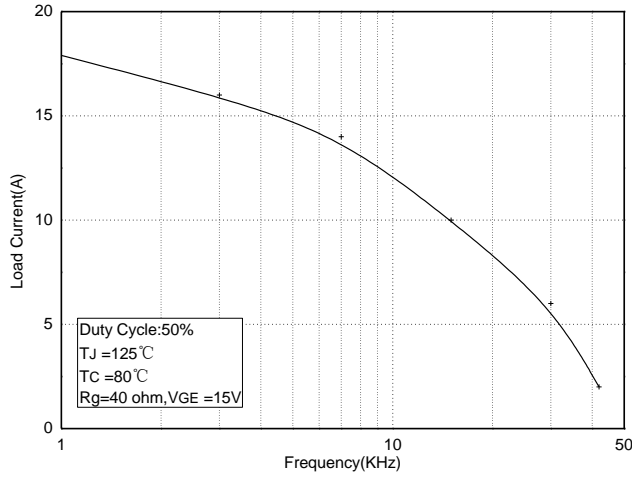


Fig.7 Typical Load Current vs. Frequency

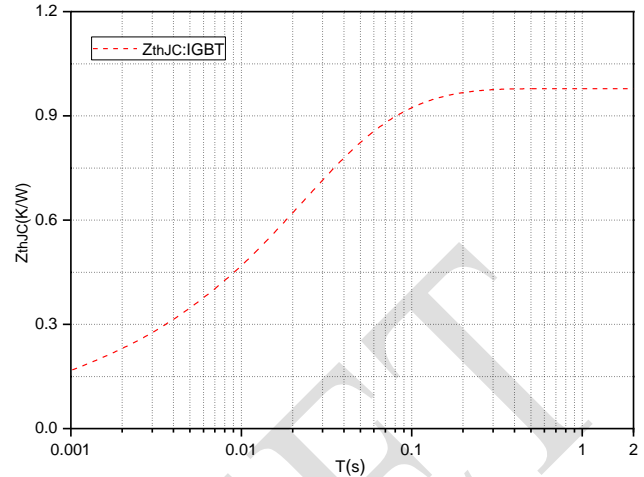


Fig.8 Transient Thermal Impedance (IGBT)

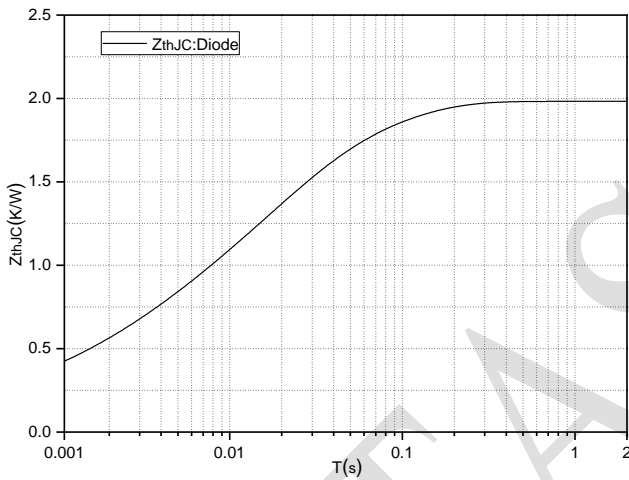


Fig.9 Transient Thermal Impedance (Diode)

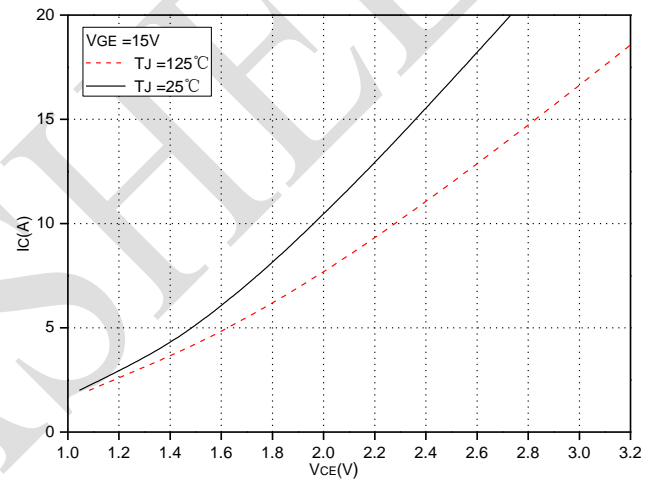


Fig.10 Typical Saturation Voltage Characteristics (Brake-Chopper)

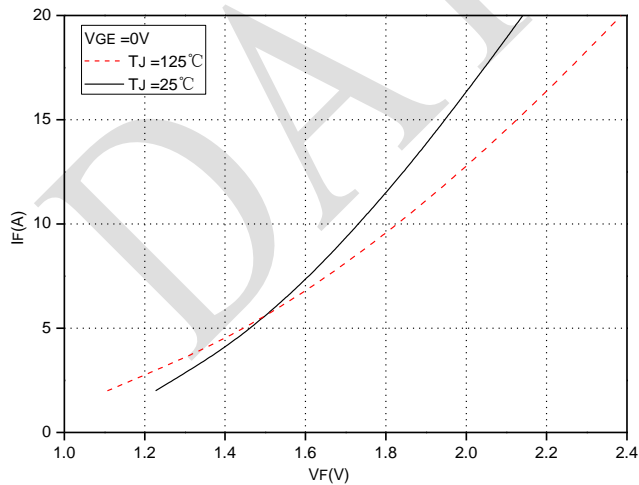


Fig.11 Forward Characteristics of Diode (Brake-Chopper)

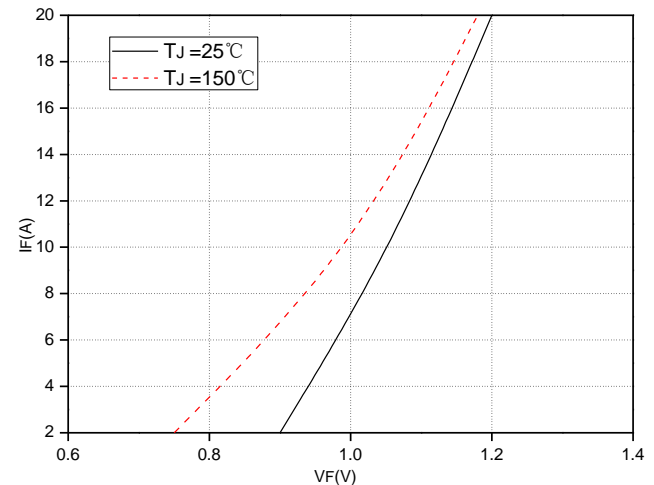


Fig.12 Forward Characteristics of Diode (Rectifier)

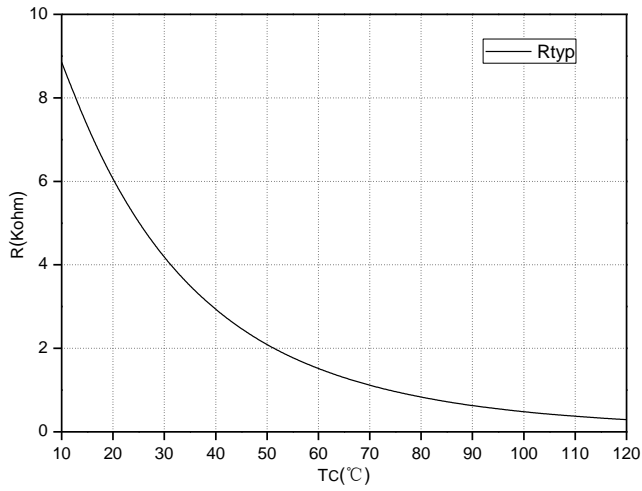


Fig.13 NTC Temperature characteristics

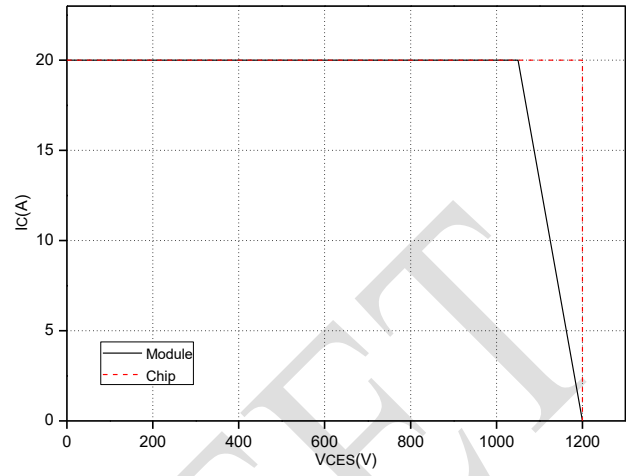
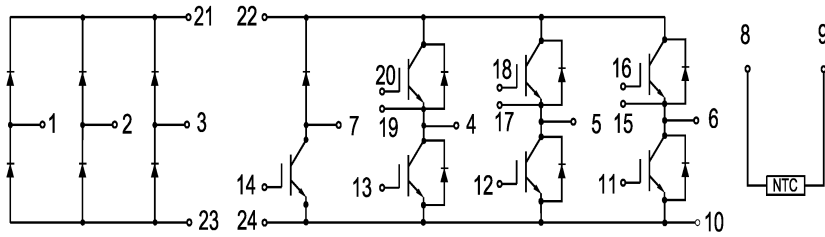


Fig.14 Reverse Bias Safe Operation Area (RBSOA)

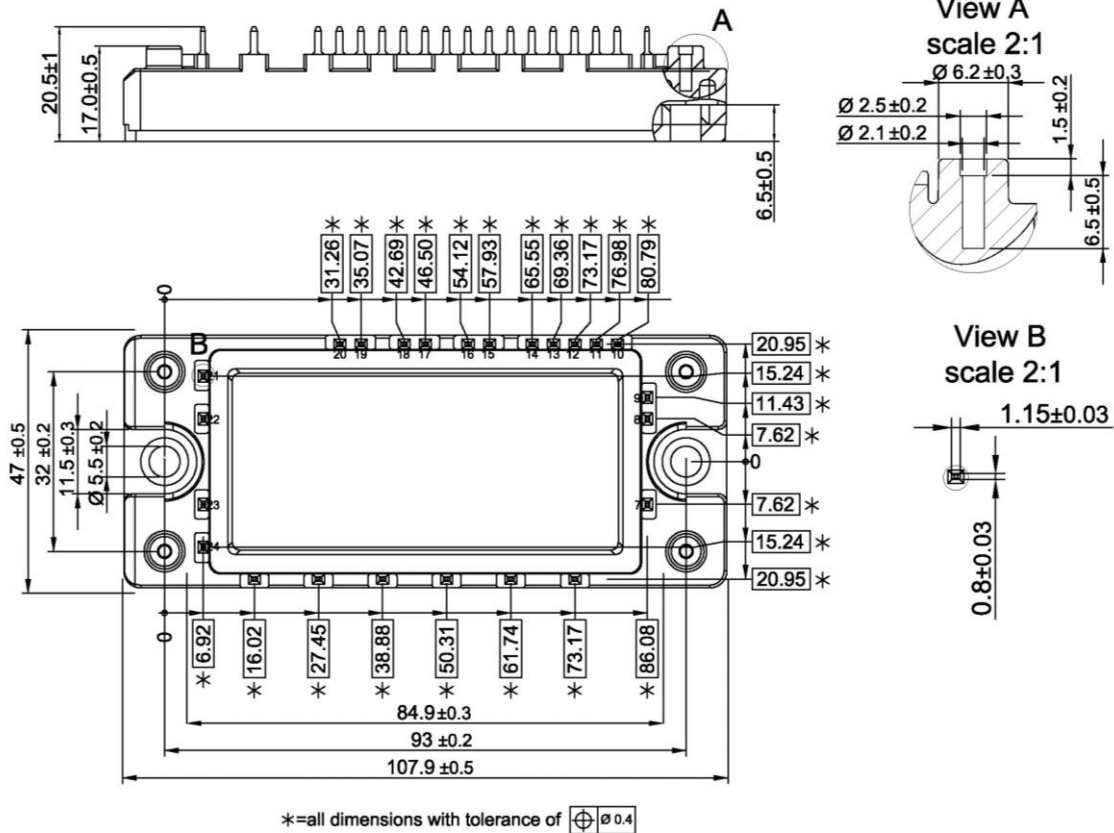
DATA SHEET



Internal Circuit:



Package Outline (Unit: mm):





Announcement

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DATA SHEET