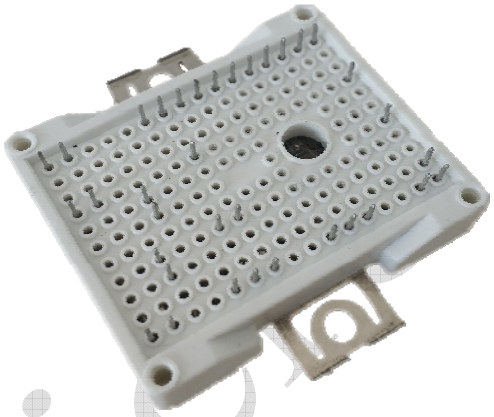
SILVERMICRO

GTS15PI120B9H

IGBT Module

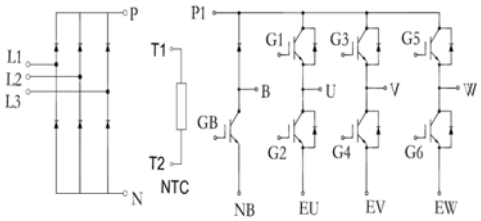


Features：

- Short Circuit Rated ＞10μs
- Low Saturation Voltage: $V_{CE\ (sat)}$ = 2.15V @ I_C =15A , T_C=25℃
- Low Switching Loss
- 100% RBSOA Tested（2×Ic）
- Low Stray Inductance
- Lead Free, Compliant with RoHS Requirement

Applications：

- Industrial Inverters
- Servo Applications



IGBT, Inverter

Maximum Rated Values(T_C = 25℃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℃	15	A
		T_C = 25℃	30	A
I_{CM}	Peak Collector Current Repetitive	T_J = 150℃	30	A
t_{SC}	Short Circuit Withstand Time		>10	μs
P_D	Maximum Power Dissipation (IGBT)	T_C = 25℃ T_{Jmax}=150℃	160	W

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Electrical Characteristics of IGBT (T_C = 25℃unless otherwise specified)

Static Characteristics

Symbol	Description	Conditions		Min	Typ	Max	Unit
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C = 1 mA, V_{CE} = V_{GE}		5.2	5.9	6.7	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C =15A, V_{GE} = 15V	T_J = 25℃		2.15	2.5	V
			T_J = 125℃		2.40		V
I_{CES}	Collector-Emitter Leakage Current	V_{GE} = 0V, V_{CE} = V_{CES}, T_J = 25℃				1	mA
I_{GES}	Gate-Emitter Leakage Current	V_{GE} = ±20V, V_{CE} = 0V, T_J = 25℃				200	nA
C_{ies}	Input Capacitance	V_{CE} = 25V, V_{GE} = 0V , f =1MHz			1.12		nF
C_{oes}	Output Capacitance				0.09		nF

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	V_{CC} = 600V,I_C =15A, R_G = 20Ω,V_{GE} = ±15V, Inductive Load	T_J = 25℃		79		ns
			T_J = 125℃		53		
t_r	Rise Time		T_J = 25℃		35		ns
			T_J = 125℃		36		
$t_{d(off)}$	Turn-off Delay Time		T_J = 25℃		146		ns
			T_J = 125℃		155		
t_f	Fall Time		T_J = 25℃		280		ns
			T_J = 125℃		383		
E_{on}	Turn-on Switching Loss		T_J = 25℃		1.4		mJ
			T_J = 125℃		1.59		
E_{off}	Turn-off Switching Loss		T_J = 25℃		0.41		mJ
			T_J = 125℃		0.76		
Q_g	Total Gate Charge		T_J = 25℃		399		nC
RBSOA	RBSOA	I_C=30A,V_{CC}=1050V,Vp=1200V, Rg = 20Ω, V_{GE}=+15V to 0V, T_J =150°C		Trapezoid			
SCSOA	SCSOA	V_{CC} = 600V, V_{GE} = 15V, T_J = 150℃		10			μs
$R_{\theta JC}$	IGBT Thermal Resistance: Junction-To-Case				0.78		℃/W

Diode, Inverter

Maximum Rated Values (T_C = 25℃ unless otherwise specified)

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

Electrical Characteristics of FWD (T_C = 25℃ unless otherwise specified)

Symbol	Description	Conditions		Min	Typ	Max	Unit
V_{FM}	Forward Voltage	I_F = 15A	T_J = 25℃		2.20		V
			T_J = 125℃		2.30		
I_{rr}	Peak Reverse Recovery Current	I_F=15A, di/dt =370A/μs, V_{rr} = 600V, V_{GE} = -15V	T_J = 25℃		12		A
			T_J = 125℃		15		
Q_{rr}	Reverse Recovery Charge		T_J = 25℃		0.94		μC
			T_J = 125℃		1.64		
E_{rec}	Reverse Recovery Energy		T_J = 25℃		0.37		mJ
			T_J = 125℃		0.75		
$R_{\theta JC}$	Diode Thermal Resistance: Junction-To-Case				1.32		℃/W

IGBT, Brake-Chopper

Maximum Rated Values (T_C = 25℃ unless otherwise specified)

V_{CES}	Collector-Emitter Blocking Voltage	T_C = 25℃	1200	V
V_{GES}	Gate-Emitter Voltage		±20	V
I_C	Continuous Collector Current	T_C = 80℃	15	A
		T_C = 25℃	30	A
$I_{CM(1)}$	Peak Collector Current Repetitive	T_J = 150℃	30	A
t_{SC}	Short Circuit Withstand Time		>10	μs
P_D	Maximum Power Dissipation (IGBT)	T_C = 25℃ T_{Jmax}=150℃	160	W

Electrical Characteristics of IGBT (T_C = 25℃unless otherwise specified)

Static Characteristics

Symbol	Description	Conditions		Min	Typ	Max	Unit
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C = 1mA, V_{CE} = V_{GE}		5.2	5.9	6.7	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C =15A, V_{GE} = 15V	T_J = 25℃		2.15	2.50	V
			T_J = 125℃		2.40		V
I_{CES}	Collector-Emitter Leakage Current	V_{GE} = 0V, V_{CE} = V_{CES}, T_J = 25℃				1	mA
I_{GES}	Gate-Emitter Leakage Current	V_{GE} = ±20V, V_{CE} = 0V, T_J = 25℃				100	nA
C_{ies}	Input Capacitance	V_{CE} = 25V, V_{GE} = 0V , f =1MHz			1.12		nF
C_{oes}	Output Capacitance				0.09		nF

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	V_{CC} = 600V,I_C =50A, R_G = 15Ω,V_{GE} = ±15V, Inductive Load	T_J = 25℃		79		ns
			T_J = 125℃		53		
t_r	Rise Time		T_J = 25℃		35		ns
			T_J = 125℃		36		
$t_{d(off)}$	Turn-off Delay Time		T_J = 25℃		146		ns
			T_J = 125℃		155		
t_f	Fall Time		T_J = 25℃		280		ns
			T_J = 125℃		383		
E_{on}	Turn-on Switching Loss		T_J = 25℃		1.4		mJ
			T_J = 125℃		1.59		
E_{off}	Turn-off Switching Loss		T_J = 25℃		0.41		mJ
			T_J = 125℃		0.76		
Q_g	Total Gate Charge		T_J = 25℃		399		nC
RBSOA	RBSOA	I_C=100A,V_{CC}=1050V,Vp=1200V, Rg = 15Ω, V_{GE}=+15V to 0V, T_J =150°C		Trapezoid			
SCSOA	SCSOA	V_{CC} = 600V, V_{GE} = 15V, T_J = 150℃		10			μs
$R_{\theta JC}$	IGBT Thermal Resistance: Junction-To-Case				0.78		℃/W

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Diode, Brake-Chopper

Maximum Rated Values(T_C = 25℃unless otherwise specified)

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

Electrical Characteristics of FWD (T_C = 25℃unless otherwise specified)

Symbol	Description	Conditions		Min	Typ	Max	Unit
V_{FM}	Forward Voltage	I_F = 15 A	T_J = 25℃		2.00		V
			T_J = 125℃		2.20		
I_{rr}	Peak Reverse Recovery Current	I_F=15A, di/dt =370A/μs, V_{rr} = 600V, V_{GE} = -15V	T_J = 25℃		12		A
			T_J = 125℃		15		
Q_{rr}	Reverse Recovery Charge		T_J = 25℃		0.94		μC
			T_J = 125℃		1.64		
E_{rec}	Reverse Recovery Energy		T_J = 25℃		0.37		mJ
			T_J = 125℃		0.75		
$R_{\theta JC}$	IGBT Thermal Resistance: Junction-To-Case				1.32		℃/W

Diode, Rectifier

Maximum Rated Values (T_C=25℃unless otherwise specified)

V_{RRM}	Repetitive Peak Reverse Voltage	T_J =25℃	1600	V
I_{FRMSM}	Maximum RMS Forward Current Per Chip	T_J =80℃	20	A
I_{RMSM}	Maximum RMS Current At Rectifier Output	T_J =80℃	30	A
I_{FSM}	Surge Current @t_p=10 ms	T_J =25℃	300	A
		T_J =150℃	250	
I^2t	I²t - Value	T_J =25℃	4450	A^2s
		T_J =150℃	300	

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

Symbol	Description	Conditions		Min	Typ	Max	Unit
V_F	Forward Voltage	I_F = 15 A	T_J =25℃		1.05		V
			T_J =150℃		1.00		
I_R	Reverse Current	V_R= 1200V	T_J =25℃			1	mA
$R_{\theta JC}$	IGBT Thermal Resistance: Junction-To-Case				1.04		℃/W

Internal NTC-Thermistor Characteristics

R_{25}	T_C =25℃	5		kΩ
△R/R	T_C =100℃，R_{100} =481Ω		±5	%
P_{25}	T_C =25℃	50		mW
$B_{25/50}$	$R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298.15K))]$	3380		K
$B_{25/80}$	$R_2=R_{25}\exp[B_{25/80}(1/T_2-1/(298.15K))]$	3440		K

Module

Symbol	Description	Conditions	Min	Typ	Max	Unit
V_{iso}	Isolation Voltage (All Terminals Shorted)	f = 50Hz, 1minute	2500			V
T_J	Maximum Junction Temperature				150	℃
T_{JOP}	Maximum Operating Junction Temperature Range		-40		150	℃
T_{stg}	Storage Temperature		-40		125	℃
CTI	Comparative Tracking Index		200			V
$R_{\theta CS}$	Case-To-Sink Thermally (Conductive Grease Applied)			0.1		℃/W
M	Power Terminals Screw:M5		2.0		2.3	N·m
G	Weight			40		g

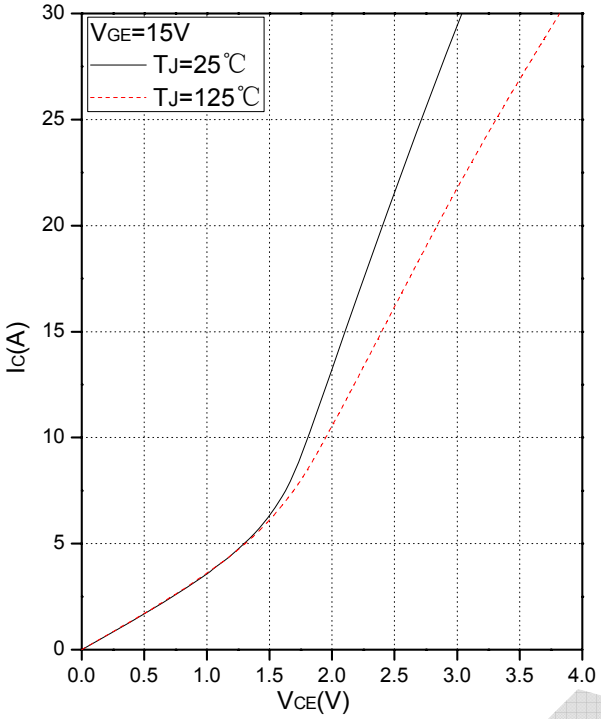


Fig.1 Typical Saturation Voltage Characteristics（Inverter）

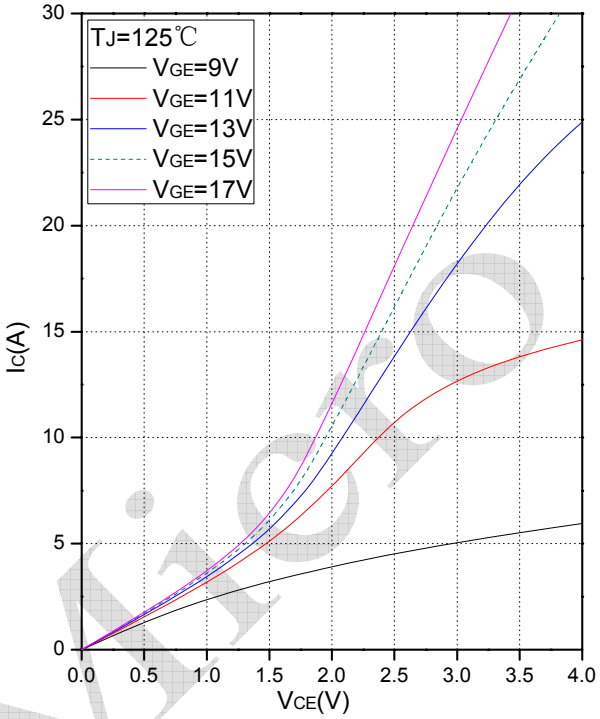


Fig.2 Typical Output Characteristics（Inverter）

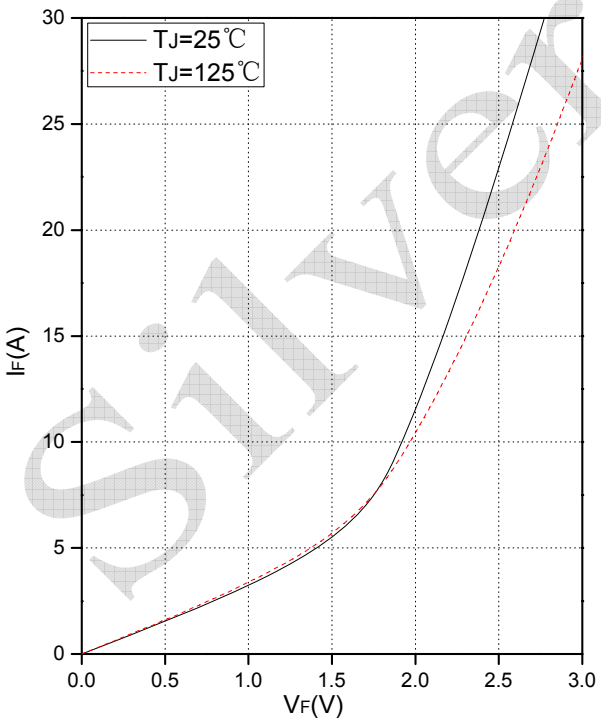


Fig.3 Forward Characteristics of FWD（Inverter）

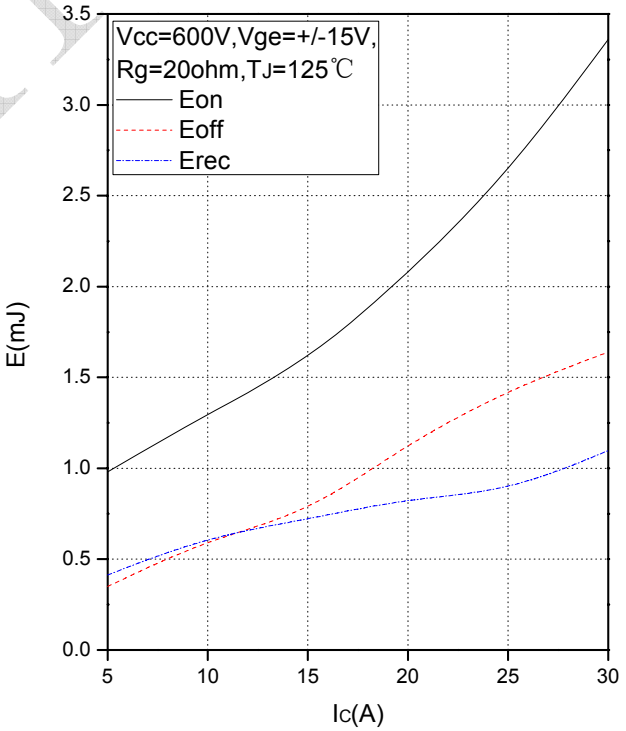


Fig.4 Typical Switching Loss vs. Collector Current（Inverter）

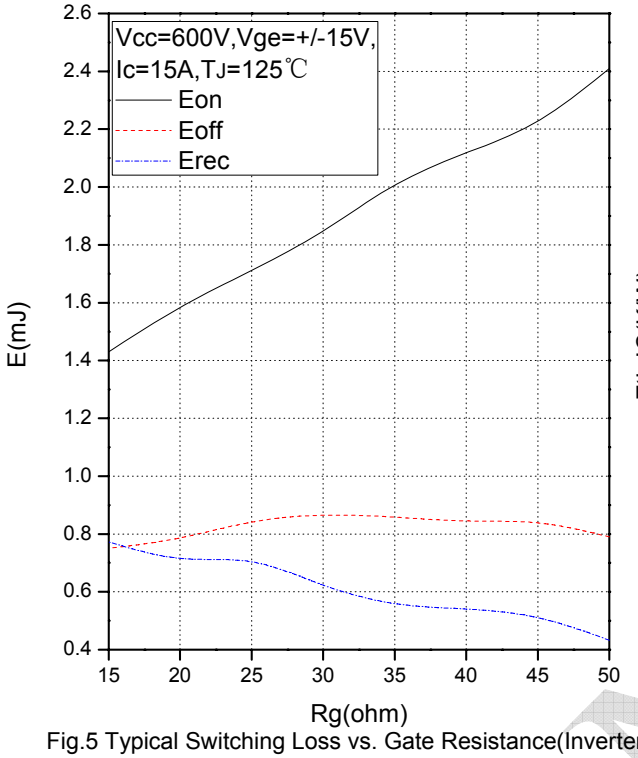


Fig.5 Typical Switching Loss vs. Gate Resistance(Inverter)

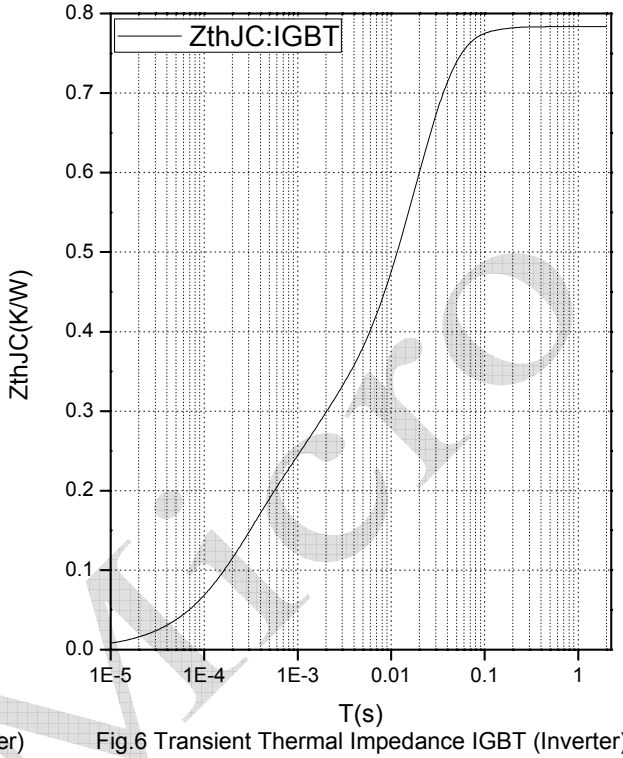


Fig.6 Transient Thermal Impedance IGBT (Inverter)

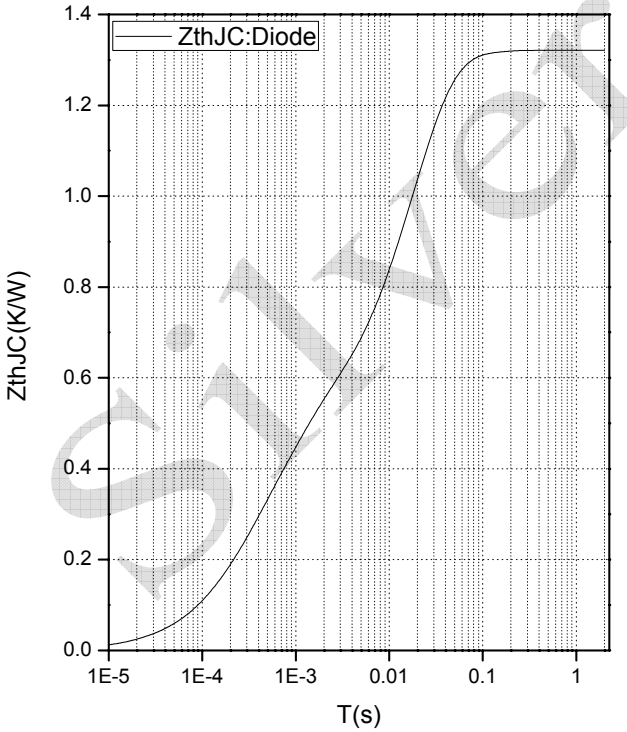


Fig.7 Transient Thermal Impedance Diode (Inverter)

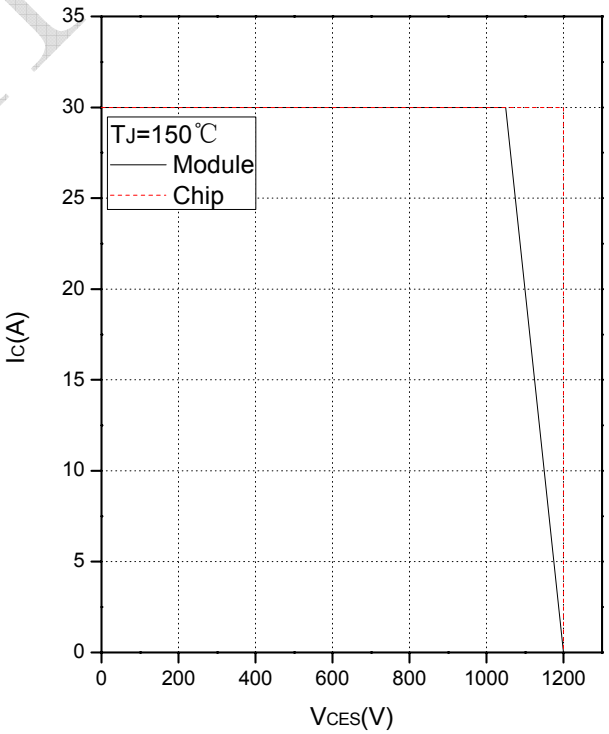


Fig.8 Reverse Bias Safe Operation Area (RBSOA)

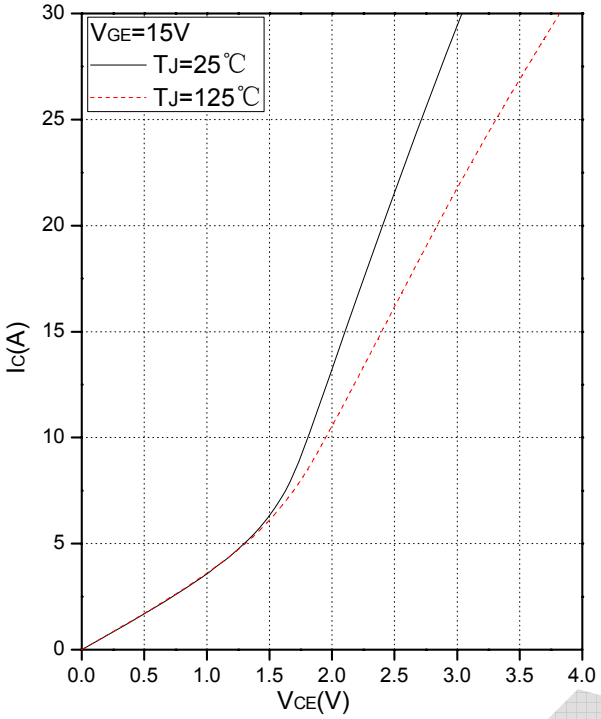


Fig.9 Typical Saturation Voltage Characteristics
（Brake-Chopper）

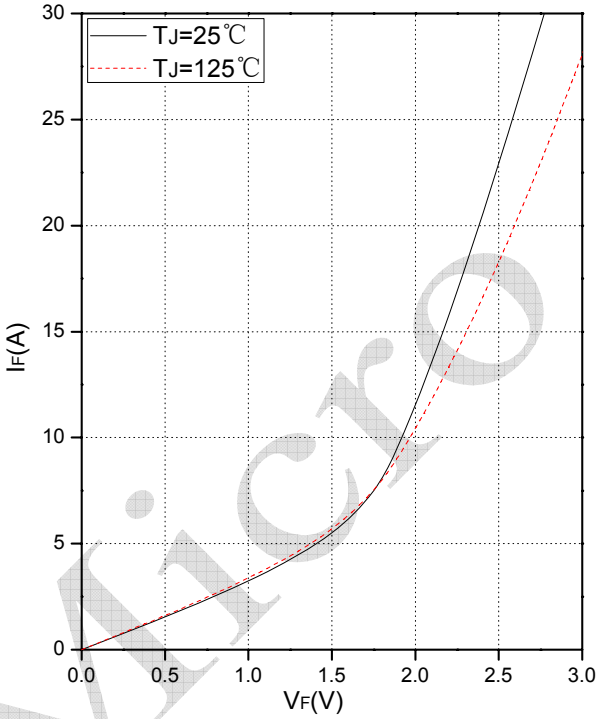


Fig.10 Forward Characteristics of Diode
（Brake-Chopper）

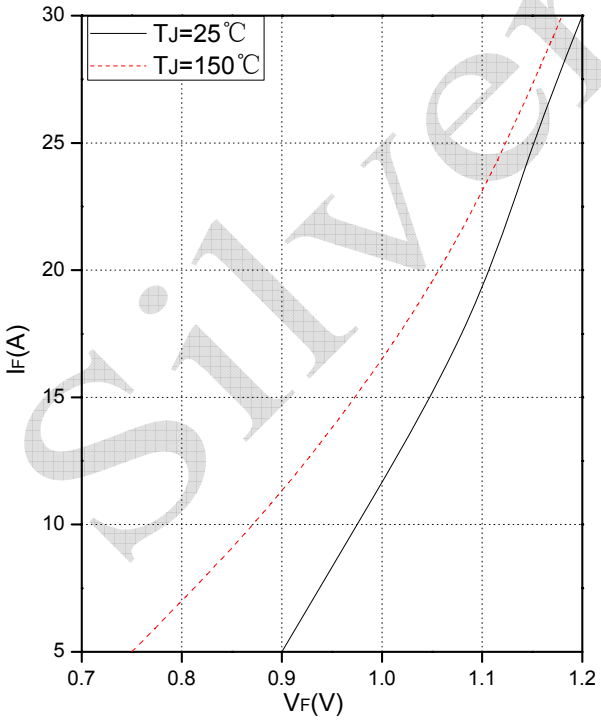


Fig.11 Forward Characteristics of Diode (Rectifier)

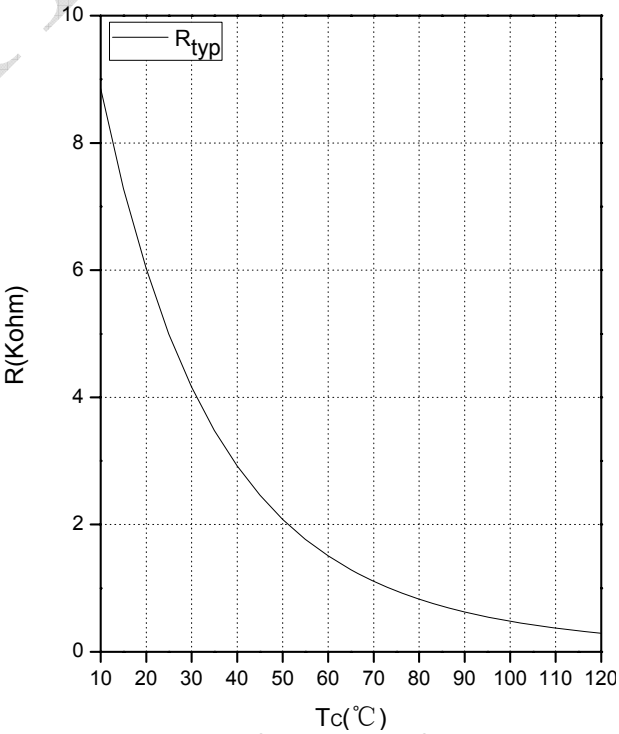
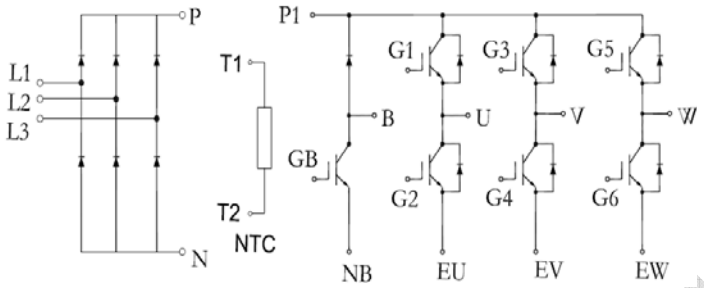
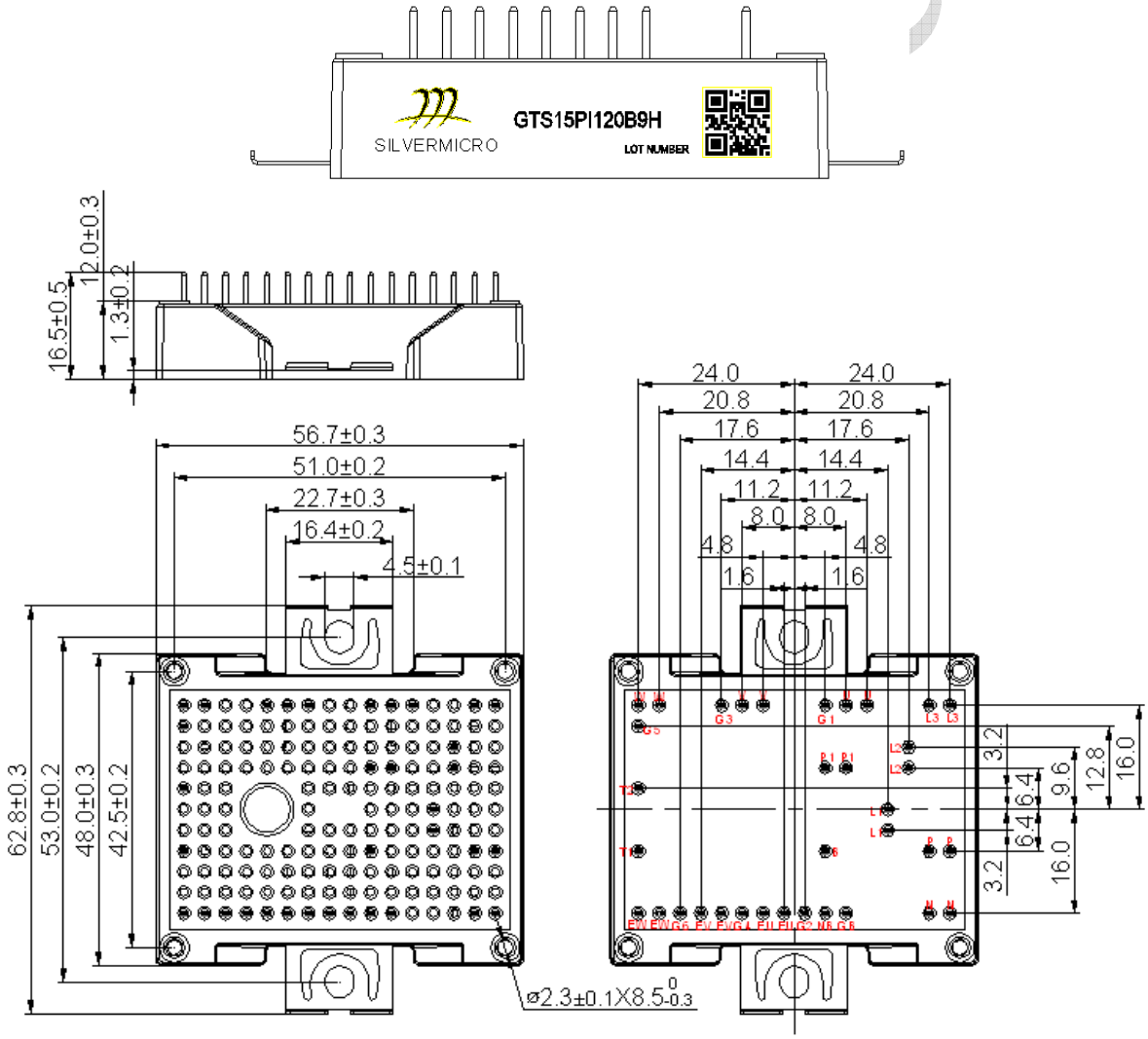


Fig.12 NTC Temperature Characteristics

Internal Circuit:



Package Outline (Unit: mm):



Date	Revision	Notes
07/07/2019	A	Final Version

Announcement

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