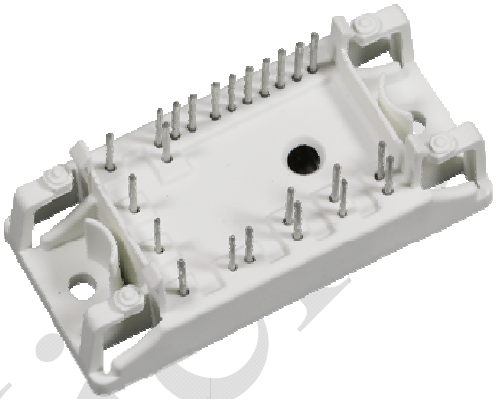
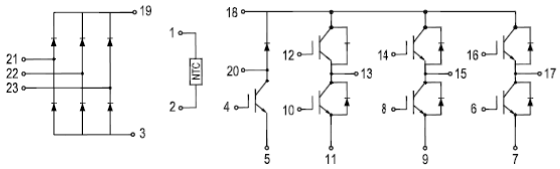
SILVERMICRO

GTS10PI120B2FH

IGBT Module





Features:

- Field Stop Trench Gate IGBT
- Short Circuit Rated >10μs
- Low Saturation Voltage
- 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℃	10	A
		T_C = 25℃	20	A
I_{CM}	Repetitive Peak Collector Current	T_J = 150℃	20	A
t_{SC}	Short Circuit Withstand Time		>10	μs
P_D	Maximum Power Dissipation per IGBT	T_C = 25℃ T_{Jmax}=150℃	143	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	6.0	6.8	V
$V_{CEsat(terminal)}$	Collector-Emitter Saturation Voltage	I_C = 10A, V_{GE} = 15V	T_J = 25℃		1.90	2.20	V
			T_J = 125℃		2.30		V
			T_J = 150℃		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			1.76		nF
C_{oes}	Output Capacitance				0.08		nF
C_{res}	Reverse Transfer Capacitance				0.03		nF

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	V_{CC} = 600V,I_C =10A, R_{Gon} =40Ω,V_{GE} = ±15V, Inductive Load	T_J=25℃		63		ns
			T_J=125℃		84		
			T_J=150℃		85		
t_r	Rise Time		T_J=25℃		25		ns
			T_J=125℃		27		
			T_J=150℃		27		
$t_{d(off)}$	Turn-off Delay Time	V_{CC} = 600V,I_C =10A, R_{Goff} =40Ω,V_{GE} = ±15V, Inductive Load	T_J=25℃		180		ns
			T_J=125℃		192		
			T_J=150℃		212		
t_f	Fall Time		T_J=25℃		241		ns
			T_J=125℃		339		
			T_J=150℃		340		
E_{on}	Turn-on Switching Loss	V_{CC} = 600V,I_C =10A, R_{Gon} = 40Ω,V_{GE} = ±15V, di/dt=343A/μs (T_J=150℃) Inductive Load	T_J=25℃		1.47		mJ
			T_J=125℃		1.72		
			T_J=150℃		2.07		
E_{off}	Turn-off Switching Loss	V_{CC} = 600V,I_C =10A, R_{Goff} = 40Ω,V_{GE} = ±15V, du/dt=1996V/μs (T_J=150℃) Inductive Load	T_J=25℃		0.21		mJ
			T_J=125℃		0.26		
			T_J=150℃		0.27		

Q_g	Total Gate Charge	V_{GE}=+15V…-15V		394		nC
RBSOA	I_C=20A,V_{CC}=1050V,Vp=1200V, R_{Goff} = 40Ω, V_{GE}=+15V to 0V, T_J =150°C			Trapezoid		
SCSOA	V_{CC}=600V, V_{GE}=15V, T_J =150°C		10			μs
$R_{\theta JC}$	IGBT Thermal Resistance: Junction-To-Case(per leg)			0.88		℃/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	10	A
I_{FM}	Diode Maximum Forward Current	20	A

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

Symbol	Description	Conditions		Min	Typ	Max	Unit
V_{FM}	Forward Voltage	I_F =10A	T_J=25℃		1.80		V
			T_J=125℃		1.90		
			T_J=150℃		1.90		
t_{rr}	Reverse Recovery Time	I_F＝10A, -diF/dt =252A/μs,(T_J=150℃) V_{rr} = 600V, V_{GE} = -15V	T_J=25℃		381		ns
			T_J=125℃		490		
			T_J=150℃		494		
I_{rr}	Peak Reverse Recovery Current		T_J=25℃		9.02		A
			T_J=125℃		11.52		
			T_J=150℃		10.43		
Q_{rr}	Reverse Recovery Charge		T_J=25℃		1.34		μC
			T_J=125℃		2.12		
			T_J=150℃		2.58		
E_{rec}	Reverse Recovery Energy		T_J=25℃		0.47		mJ
			T_J=125℃		0.85		
			T_J=150℃		1.12		
$R_{\theta JC}$	Diode Thermal Resistance: Junction-To-Case				1.29		℃/W

SILVERMICRO

IGBT, Brake-Chopper

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℃	10	A
		T_C = 25℃	20	A
I_{CM}	Repetitive Peak Collector Current	T_J = 150℃	20	A
t_{SC}	Short Circuit Withstand Time		>10	μs
P_D	Maximum Power Dissipation per IGBT	T_C = 25℃ T_{Jmax}=150℃	143	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	6.0	6.8	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C = 10A, V_{GE} = 15V	T_J = 25℃		1.90	2.20	V
			T_J = 125℃		2.30		V
			T_J = 150℃		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			1.76		nF
C_{oes}	Output Capacitance				0.08		nF
C_{res}	Reverse Transfer Capacitance				0.03		nF

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	V_{CC} = 600V,I_C =10A, R_{Gon} =40Ω,V_{GE} = ±15V, Inductive Load	T_J=25℃		63		ns
			T_J=125℃		84		
			T_J=150℃		85		
t_r	Rise Time		T_J=25℃		25		ns
			T_J=125℃		27		
			T_J=150℃		27		

$t_{d(off)}$	Turn-off Delay Time	V_{CC} = 600V,I_C =10A, R_{Goff} =40Ω,V_{GE} = ±15V, Inductive Load	T_J=25℃		180		ns
			T_J=125℃		192		
			T_J=150℃		212		
t_f	Fall Time		T_J=25℃		241		ns
			T_J=125℃		339		
			T_J=150℃		340		
E_{on}	Turn-on Switching Loss	V_{CC} = 600V,I_C =10A, R_{Gon} = 40Ω,V_{GE} = ±15V, di/dt=343A/μs (T_J=150℃) Inductive Load	T_J=25℃		1.47		mJ
			T_J=125℃		1.72		
			T_J=150℃		2.07		
E_{off}	Turn-off Switching Loss	V_{CC} = 600V,I_C =10A, R_{Goff} = 40Ω,V_{GE} = ±15V, du/dt=1996V/μs (T_J=150℃) Inductive Load	T_J=25℃		0.21		mJ
			T_J=125℃		0.26		
			T_J=150℃		0.27		
Q_g	Total Gate Charge	V_{GE}=+15V…-15V			394		nC
RBSOA	I_C=20A,V_{CC}=1050V,Vp=1200V, R_{Goff} = 40Ω, V_{GE}=+15V to 0V, T_J =150°C			Trapezoid			
SCSOA	V_{CC}=600V, V_{GE}=15V, T_J =150°C			10			μC
$R_{\theta JC}$	IGBT Thermal Resistance: Junction-To-Case(per leg)				0.88		℃/W

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	10	A
I_{FM}	Diode Maximum Forward Current	20	A

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

Symbol	Description	Conditions		Min	Typ	Max	Unit
V_{FM}	Forward Voltage	I_F =10A	T_J = 25℃		1.80		V
			T_J = 125℃		1.90		
			T_J = 150℃		1.90		
t_{rr}	Reverse Recovery Time	I_F=10A, -diF/dt =252A/μs, (T_J = 150℃) V_{rr} = 600V, V_{GE} = -15V	T_J = 25℃		381		ns
			T_J = 125℃		490		
			T_J = 150℃		494		
I_{rr}	Peak Reverse Recovery Current		T_J = 25℃		9.02		A
			T_J = 125℃		11.52		
			T_J = 150℃		10.43		
Q_{rr}	Reverse Recovery Charge		T_J = 25℃		1.34		μC
			T_J = 125℃		2.12		
			T_J = 150℃		2.58		
E_{rec}	Reverse Recovery Energy		T_J = 25℃		0.47		mJ
			T_J = 125℃		0.85		
			T_J = 150℃		1.12		
$R_{\theta JC}$	Diode Thermal Resistance: Junction-To-Case				1.29		℃/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)

V_F	Forward Voltage	I_F = 10A	T_J =25℃	1.05			V
			T_J =150℃	1.00			
I_R	Reverse Current	V_R=1600V	T_J =25℃			1	mA
$R_{\theta JC}$	Diode Thermal Resistance: Junction-To-Case				0.93		℃/W

Internal NTC-Thermistor Characteristics

R_{25}	T_C =25℃	22.7		kΩ
△R/R	T_C =100℃，R_{100} =1481 KΩ		±3	%
P_{25}	T_C =25℃	200		mW
$B_{25/50}$	$R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298.15K))]$	3950		K
$B_{25/80}$	$R_2=R_{25}\exp[B_{25/100}(1/T_2-1/(298.15K))]$	4000		K

Module

Symbol	Description		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			
$R_{\theta CS}$	Case-To-Sink Thermally (Conductive Grease Applied)			0.1		℃/W
T	Mounting Screw:M4		1.0		1.5	N·m
G	Weight			25		g

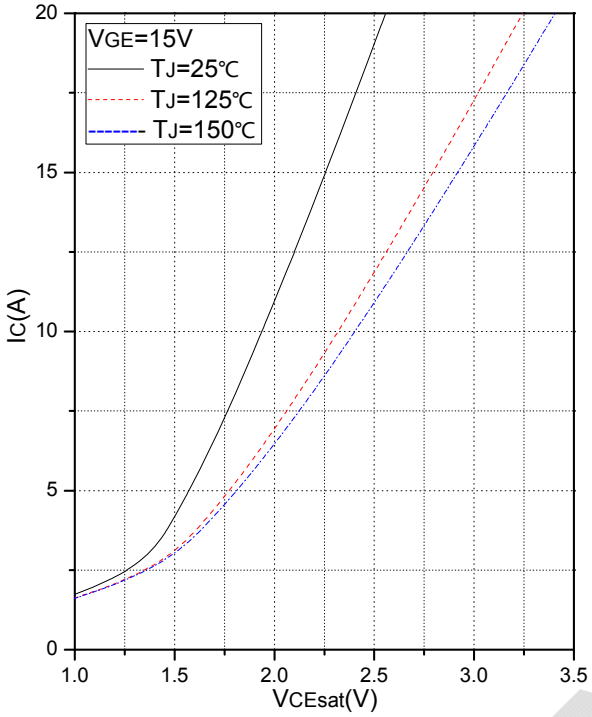


Fig.1 Typical Saturation Voltage Characteristics (Inverter)

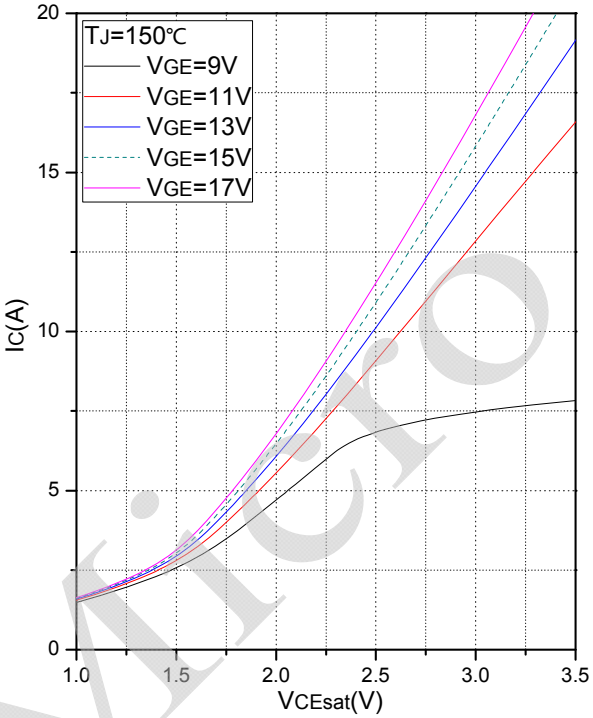


Fig.2 Typical Output Characteristics (Inverter)

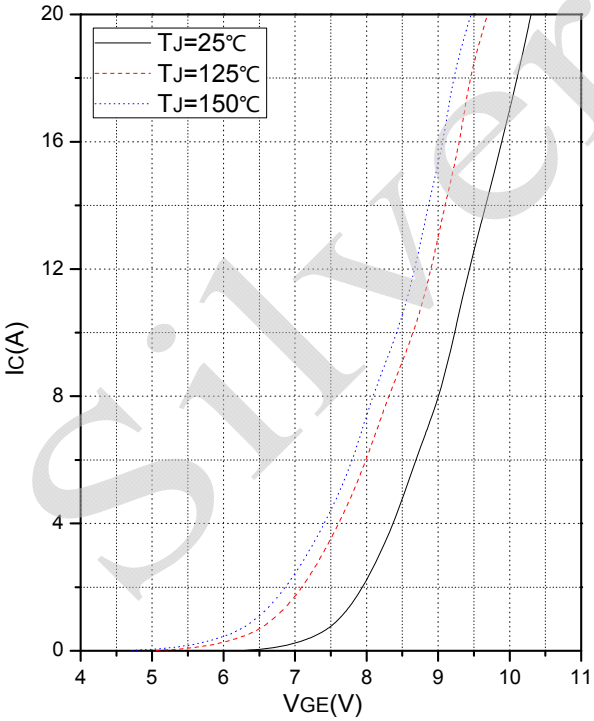


Fig.3Transfer Characteristic

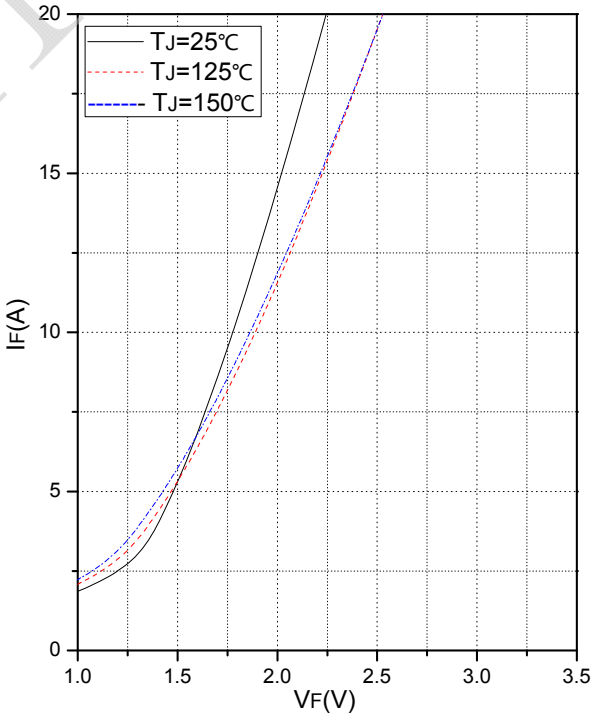


Fig.4 Forward Characteristics of Diode (Inverter)

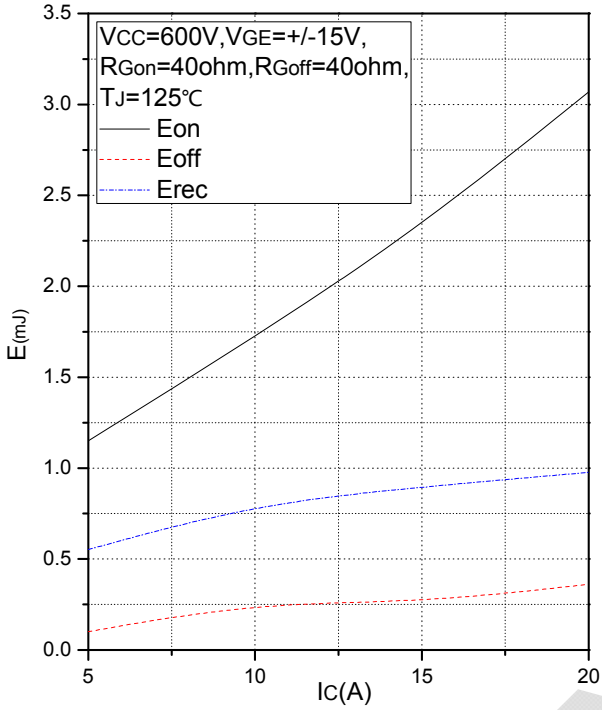


Fig.5 Typical Switching Loss vs. Collector Current

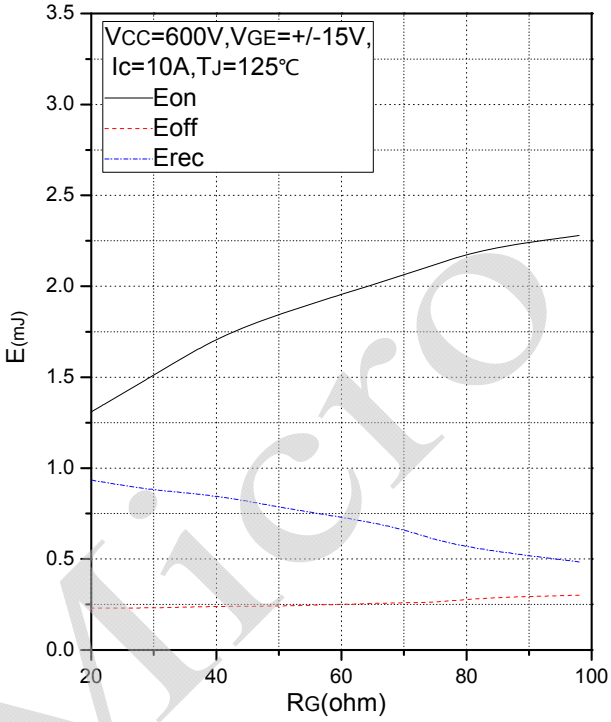


Fig.6 Typical Switching Loss vs. Gate Resistance

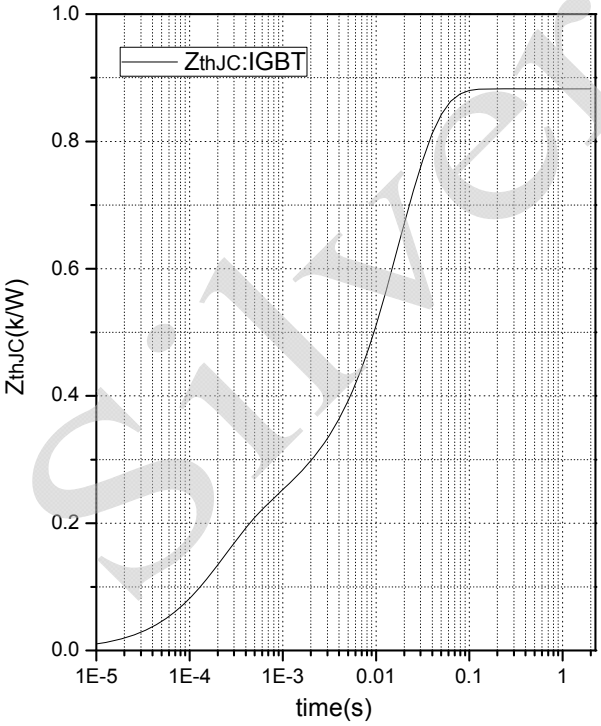


Fig.7 Transient Thermal Impedance (Inverter-IGBT)

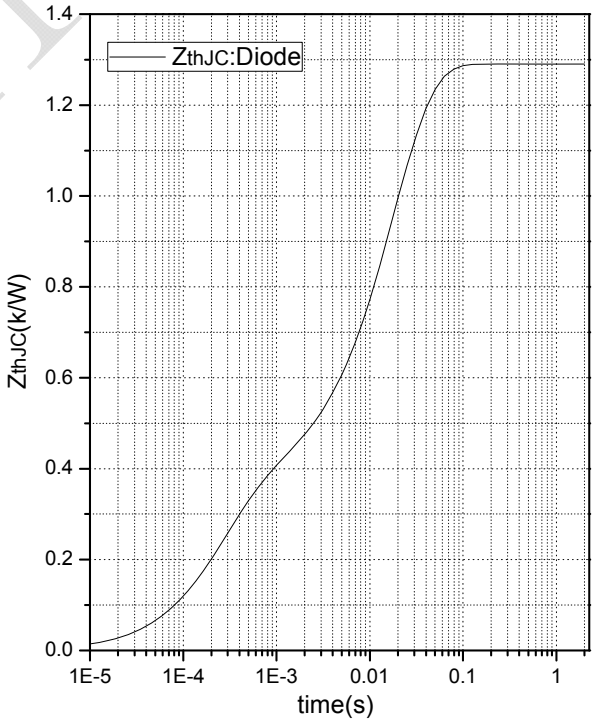


Fig.8 Transient Thermal Impedance (Inverter- Diode)

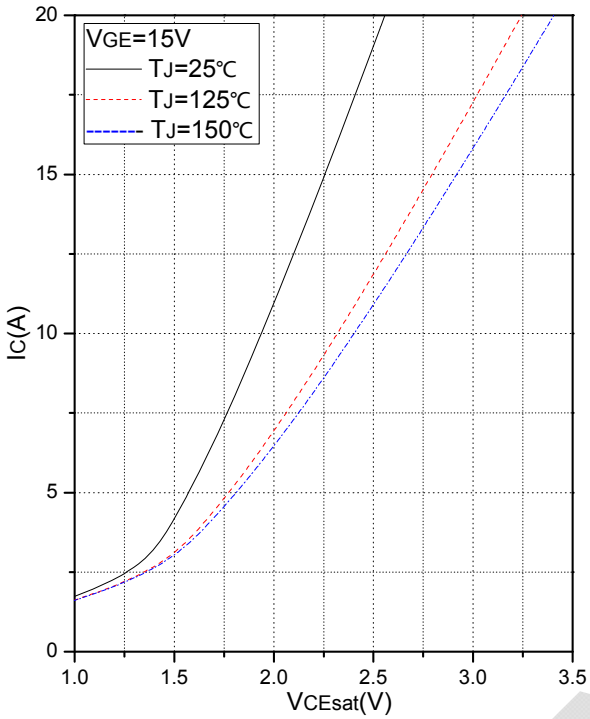


Fig.9 Typical Saturation Voltage Characteristics (Brake-Chopper)

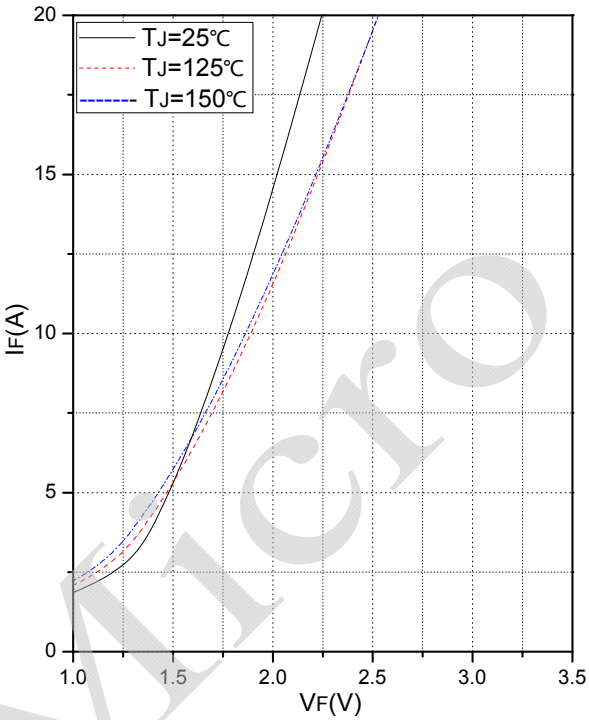


Fig.10 Forward Characteristics of Diode (Brake-Chopper)

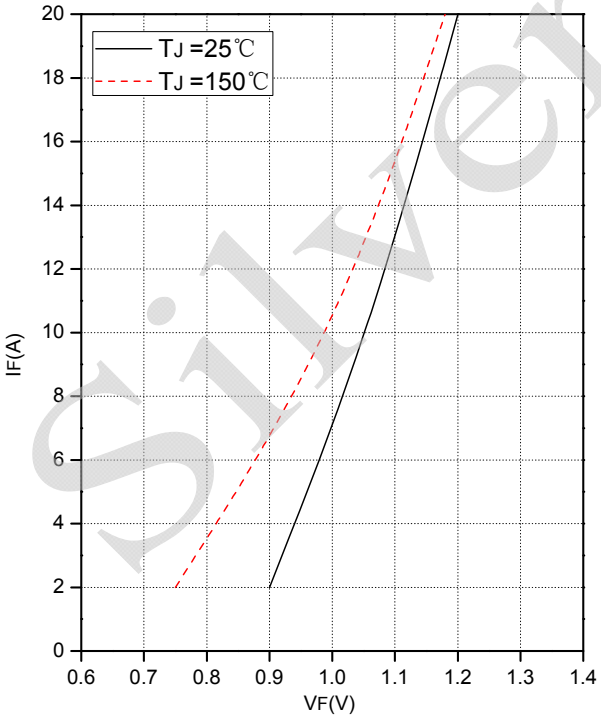


Fig.11 Forward Characteristics of Diode (Rectifier)

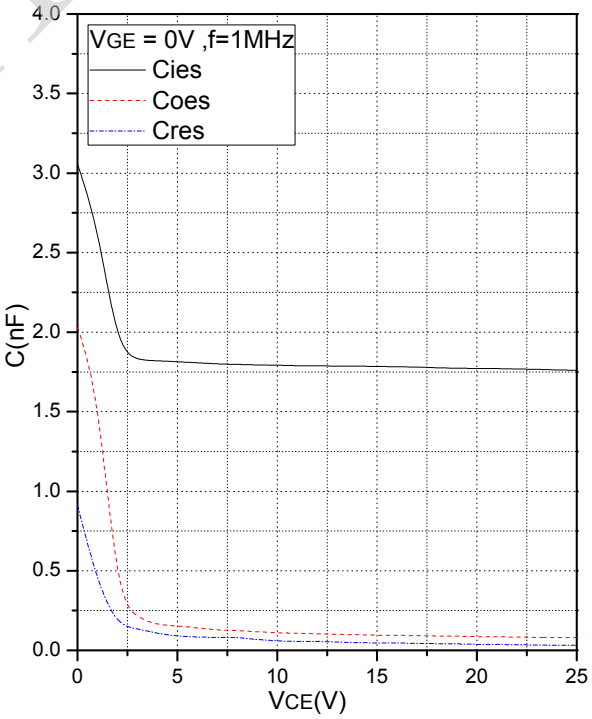


Fig.12 Capacitance Characteristics

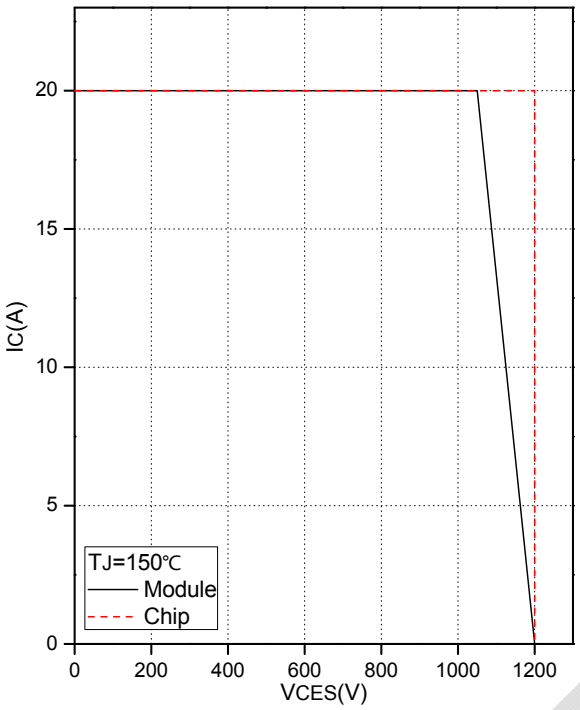


Fig.13 Reverse Bias Safe Operation Area (RBSOA)

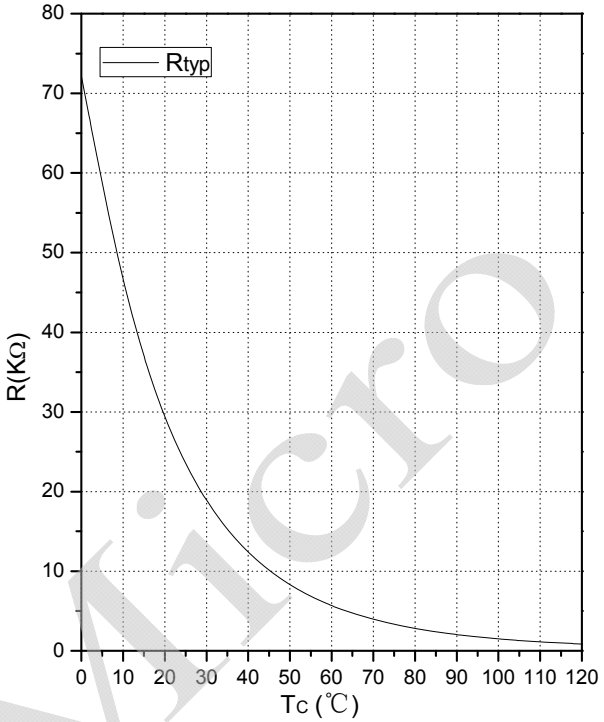
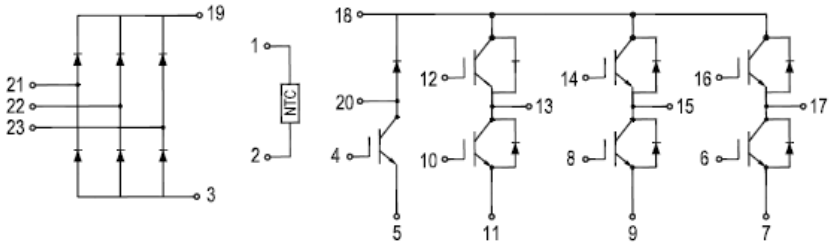
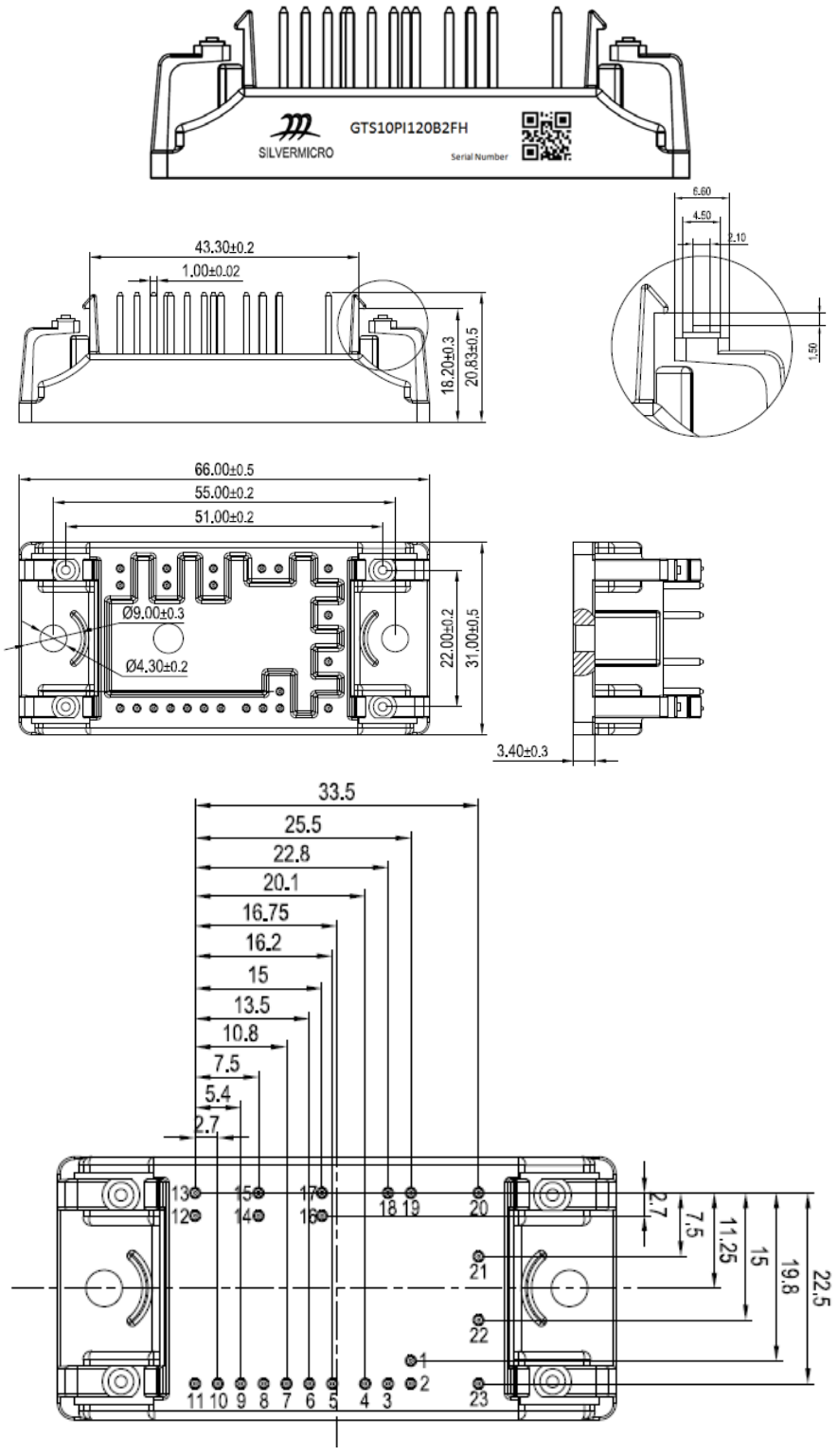


Fig.14 NTC Temperature Characteristics

Internal Circuit



Package Outline (Unit: mm):



Date	Revision	Notes
07/02/2019	A	Final Version

Announcement

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