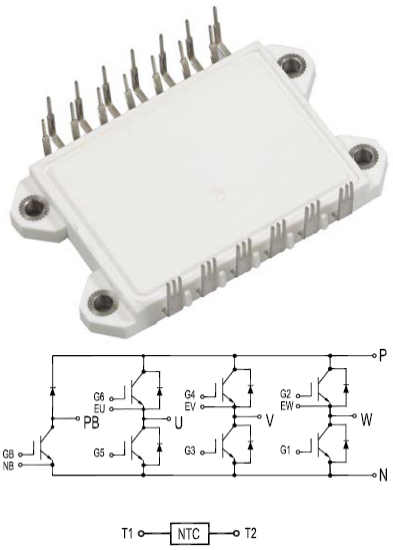
GTS40FB120A1H

IGBT Module

Preliminary Data



Features：

- Trench & Field Stop 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℃	40	A
		T_C = 25℃	75	A
$I_{CM(1)}$	Peak Collector Current Repetitive	T_J = 150℃	80	A
t_{SC}	Short Circuit Withstand Time		>10	μs
P_D	Maximum Power Dissipation per IGBT	T_C = 25℃ T_{Jmax}=150℃	330	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 = 4mA, V_{CE} = V_{GE}		5.1	5.8	6.4	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C =40A, V_{GE} = 15V	T_J = 25℃		1.90		V
			T_J = 125℃		2.30		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			6.1		nF
C_{oes}	Output Capacitance				0.58		nF
C_{res}	Reverse Transfer Capacitance				0.28		nF

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	V_{CC} = 600V,I_C = 40A, $R_{G\,on}$ = 4.7Ω,V_{GE} = ±15V, Inductive Load	T_J = 25℃		130		ns
			T_J = 125℃		132		
t_r	Rise Time		T_J = 25℃		30		ns
			T_J = 125℃		32		
$t_{d(off)}$	Turn-off Delay Time	V_{CC} = 600V,I_C = 40A, $R_{G\,off}$ = 4.7Ω,V_{GE} = ±15V, Inductive Load	T_J = 25℃		210		ns
			T_J = 125℃		220		
t_f	Fall Time		T_J = 25℃		145		ns
			T_J = 125℃		178		
E_{on}	Turn-on Switching Loss	V_{CC}=600V,I_C=40A, $R_{G\,on}$ =4.7 Ω, V_{GE}= ±15V, di/dt=1020A/μs (T_J=125℃) Inductive Load	T_J = 25℃		2.29		mJ
			T_J = 125℃		2.85		
E_{off}	Turn-off Switching Loss	V_{CC} = 600V,I_C = 40A, R_{Goff} = 4.7Ω,V_{GE} = ±15V, du/dt=4180V/μs (T_J=125℃) Inductive Load	T_J = 25℃		0.61		mJ
			T_J = 125℃		1.04		
Q_g	Total Gate Charge		T_J = 25℃		662		nC
RBSOA	Reverse Bias Safe Operation Area	I_C=80A,V_{CC}=1050V,Vp=1200V, R_{Goff} = 4.7 Ω,V_{GE}=+15V to 0V, T_J =125°C		Trapezoid			
I_{SC}	SC data	V_{CC} = 600V, V_{GE} = ±15V, tp=10us $R_{G\,on}$ =15Ω, R_{Goff} = 15Ω,T_J = 125℃			260		A
$R_{\theta JC}$	IGBT Thermal Resistance: Junction-To-Case(per leg)				0.38		℃/W

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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	40	A
I_{FM}	Repetitive Peak Forward Current	80	A

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

Symbol	Description	Conditions		Min	Typ	Max	Unit
V_{FM}	Forward Voltage	I_F = 40A	T_J = 25℃		1.80	2.10	V
			T_J = 125℃		1.90		
I_{rr}	Peak Reverse Recovery Current	I_F=40A, -diF /dt =1850A/μs, (T_J = 125℃) V_{rr} = 600V, V_{GE} = -15V	T_J = 25℃		50		A
			T_J = 125℃		60		
Q_{rr}	Reverse Recovery Charge		T_J = 25℃		4.00		μC
			T_J = 125℃		6.20		
E_{rec}	Reverse Recovery Energy		T_J = 25℃		1.8		mJ
			T_J = 125℃		3.5		
$R_{\theta JC}$	Diode Thermal Resistance: Junction-To-Case (per leg)				0.59		℃/W

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 = 100℃	15	A
		T_C = 25℃	30	A
I_{CM}	Peak Collector Current Repetitive	T_J = 175℃	30	A
t_{SC}	Short Circuit Withstand Time		>10	μs
P_D	Maximum Power Dissipation (IGBT)	T_C = 25℃ T_{Jmax}=175℃	242	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}		4.5	5.5	6.5	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C = 15A, V_{GE} = 15V	T_J = 25℃		1.90	2.10	V
			T_J = 125℃		2.20		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			1.95		nF
C_{oes}	Output Capacitance				0.07		nF
C_{res}	Reverse Transfer Capacitance				0.04		nF

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	V_{CC} = 600V,I_C = 15A, R_{Gon} = 15 Ω,V_{GE} = ±15V, Inductive Load	T_J = 25℃		175		ns
			T_J = 125℃		160		
t_r	Rise Time		T_J = 25℃		50		ns
			T_J = 125℃		55		
$t_{d(off)}$	Turn-off Delay Time	V_{CC} = 600V,I_C = 15A, R_{Goff} = 15 Ω,V_{GE} = ±15V, Inductive Load	T_J = 25℃		140		ns
			T_J = 125℃		145		
t_f	Fall Time		T_J = 25℃		245		ns
			T_J = 125℃		380		
E_{on}	Turn-on Switching Loss	V_{CC}=600V,I_C=15A, $R_{G\ on}$ =15 Ω, V_{GE}= ±15V, di/dt=380A/μs (T_J=125℃) Inductive Load	T_J = 25℃		1.74		mJ
			T_J = 125℃		2.08		
E_{off}	Turn-off Switching Loss	V_{CC} = 600V,I_C = 15A, R_{Goff} = 15Ω,V_{GE} = ±15V, du/dt=1360V/μs (T_J=125℃) Inductive Load	T_J = 25℃		0.63		mJ
			T_J = 125℃		1.09		
Q_g	Total Gate Charge		T_J = 25℃		140		nC
RBSOA	Reverse Bias Safe Operation Area	I_C=30A,V_{CC}=1050V,Vp=1200V, R_{Goff} = 15Ω, V_{GE}=+15V to 0V, T_J =150°C		Trapezoid			
SCSOA	Short Circuit Safe Operation Area	V_{CC} = 600V, V_{GE} = 15V, T_J = 150℃		10			μs
$R_{\theta JC}$	IGBT Thermal Resistance: Junction-To-Case(per leg)				0.62		℃/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	15	A
I_{FM}	Repetitive Peak Forward Current	30	A

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

Symbol	Description	Conditions		Min	Typ	Max	Unit
V_{FM}	Forward Voltage	I_F=15A	T_J=25℃		1.60		V
			T_J=125℃		1.70		
t_{rr}	Reverse Recovery Time	I_F=15A, -diF/dt=488A/μs(T_J=125℃) V_{rr} = 600V, V_{GE} = -15V	T_J=25℃		241		ns
			T_J=125℃		261		
I_{rr}	Peak Reverse Recovery Current		T_J=25℃		21.9		A
			T_J=125℃		24.7		
Q_{rr}	Reverse Recovery Charge		T_J=25℃		1.82		μC
			T_J=125℃		2.37		
E_{rec}	Reverse Recovery Energy		T_J=25℃		0.74		mJ
			T_J=125℃		1.28		
$R_{\theta JC}$	Diode Thermal Resistance: Junction-To-Case (per leg)				1.13		℃/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		Min	Typ	Max	Unit
V_{iso}	Isolation Voltage (All Terminals Shorted)	f = 50Hz, 1minute	2500			V
T_J	Maximum Junction Temperature				175	℃
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
M	Mounting Screw:M3		1.5		2.0	N·m
G	Weight			30		g

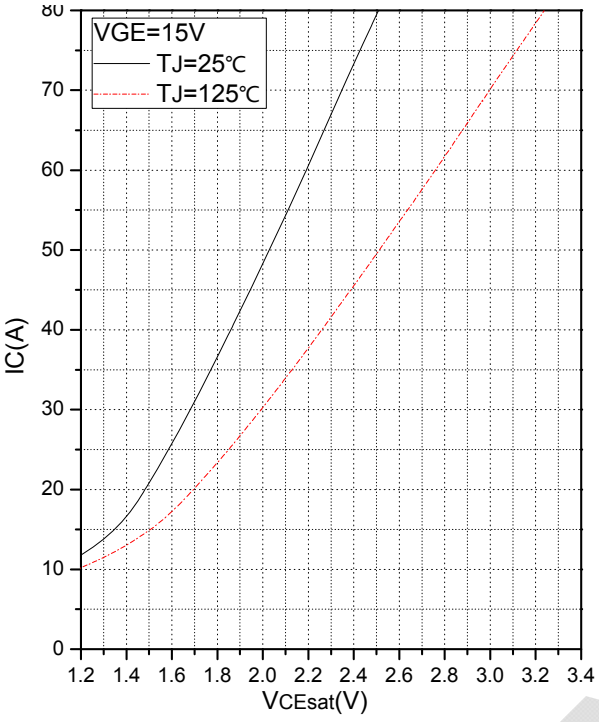


Fig.1 Typical Saturation Voltage Characteristics (Inverter)

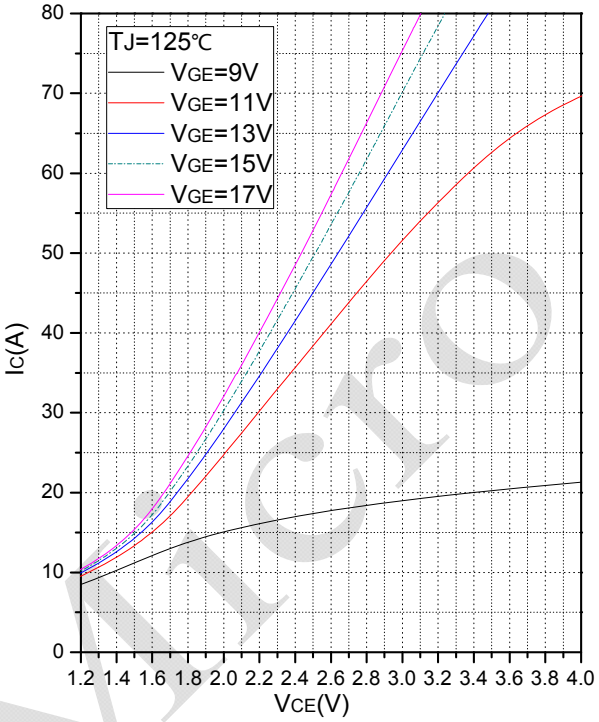


Fig.2 Typical Output Characteristics (Inverter)

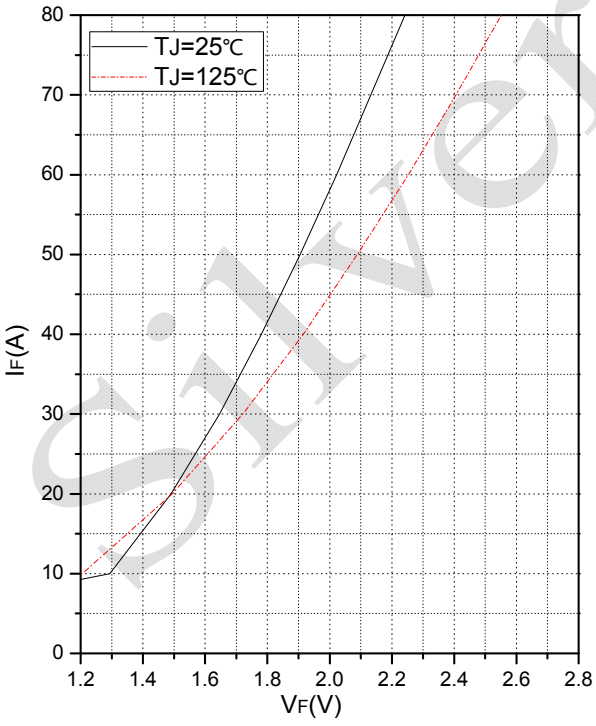


Fig.3 Forward Characteristics of FWD (Inverter)

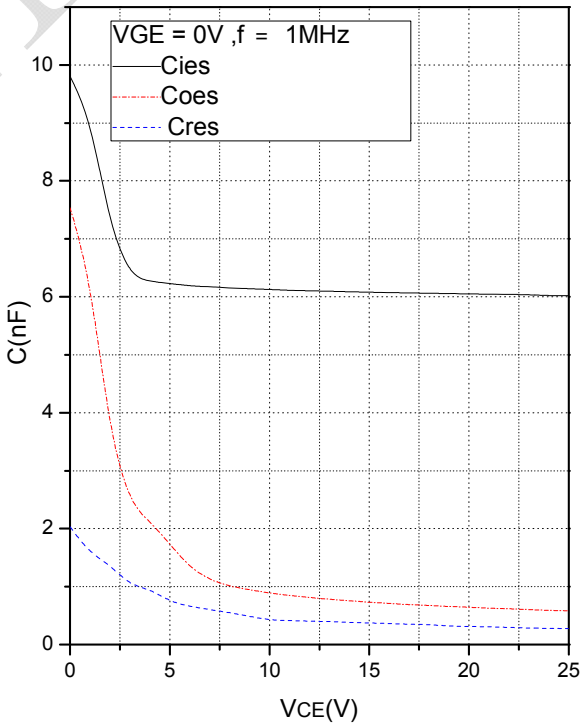


Fig.4 Capacitance Characteristics

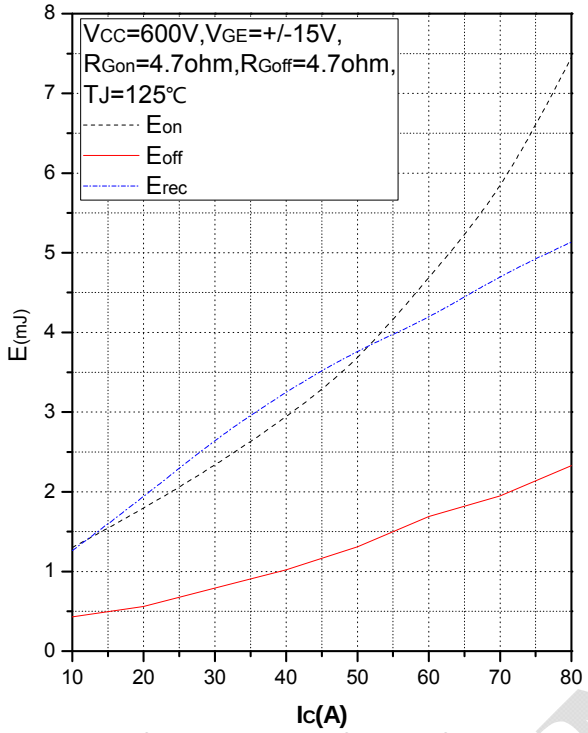


Fig.5 Typical Switching Loss vs. Collector Current (Inverter)

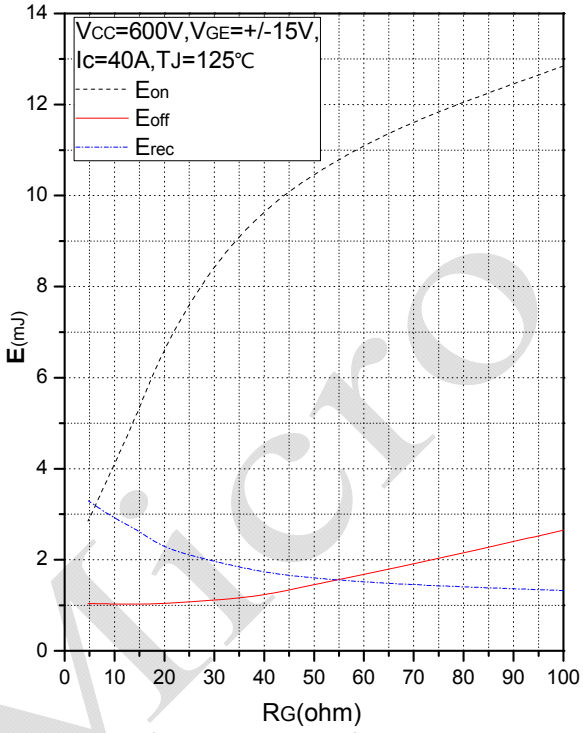


Fig.6 Typical Switching Loss vs. Gate Resistance (Inverter)

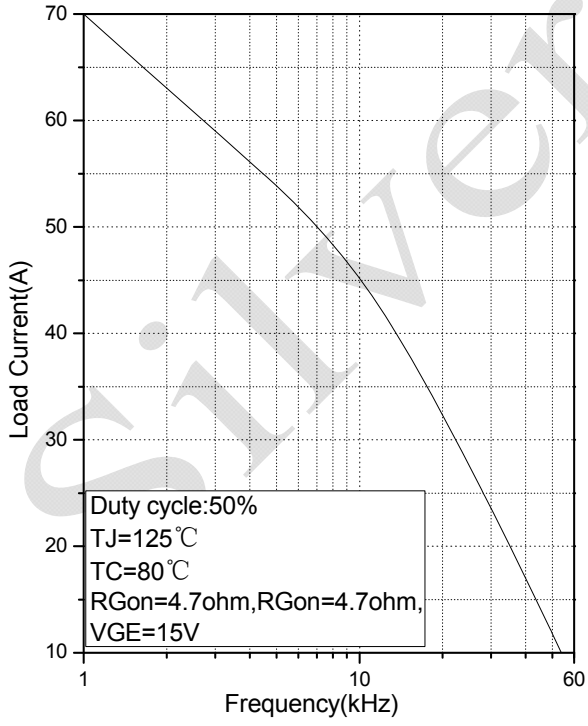


Fig.7 Typical Load Current vs. Frequency

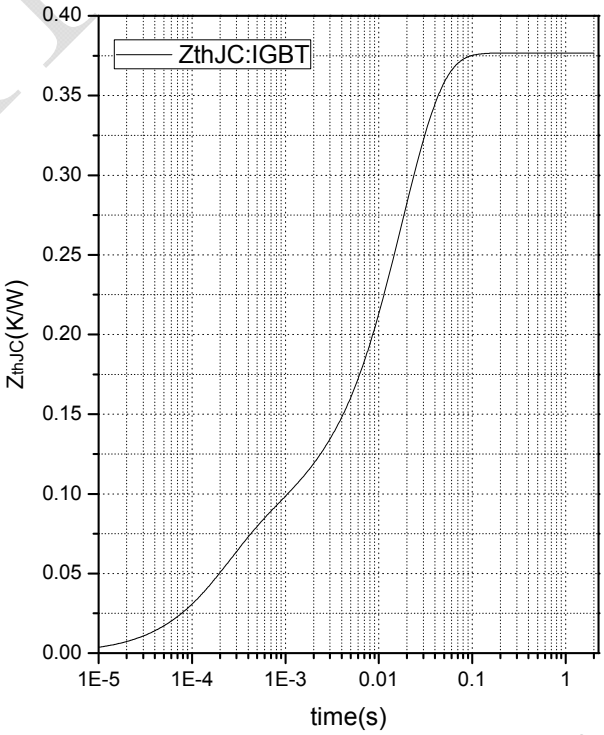


Fig.8 Transient Thermal Impedance (Inverter-IGBT)

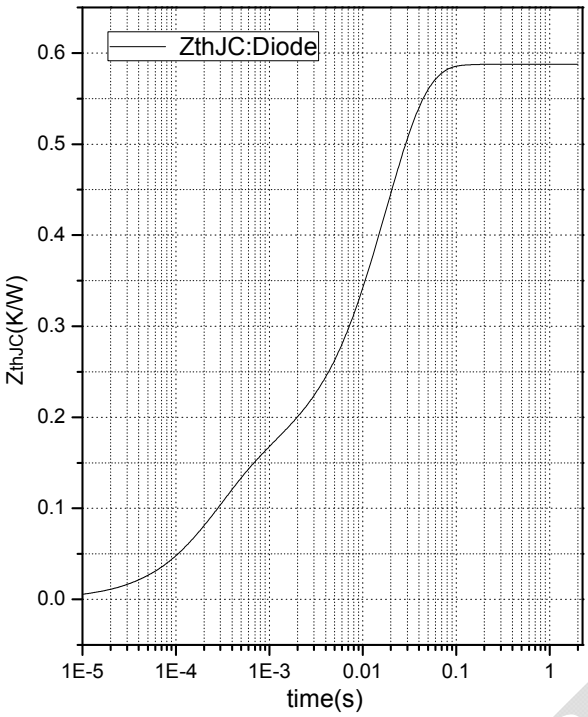


Fig.9 Transient Thermal Impedance (Inverter-Diode)

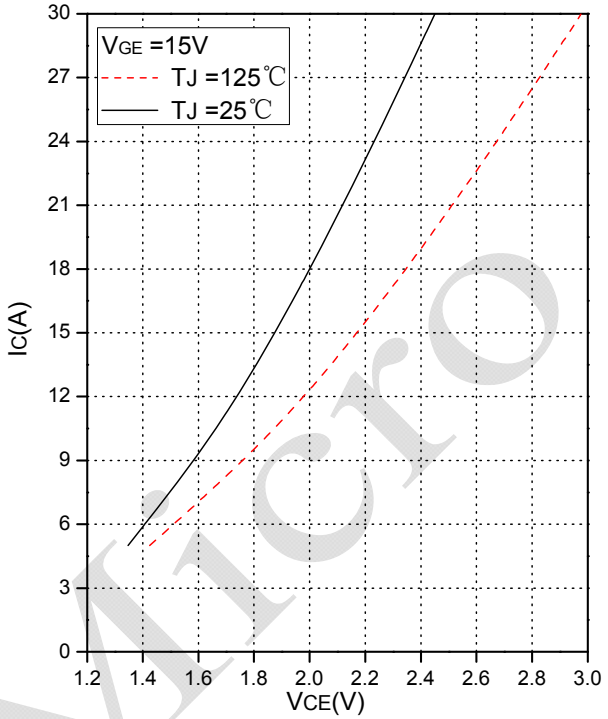


Fig.10 Typical Saturation Voltage Characteristics (Brake-Chopper)

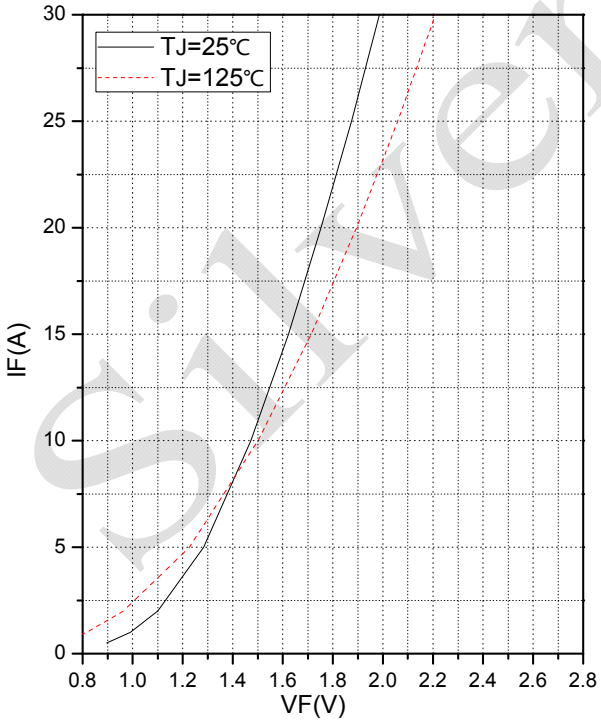


Fig.11 Forward Characteristics of Diode (Brake-Chopper)

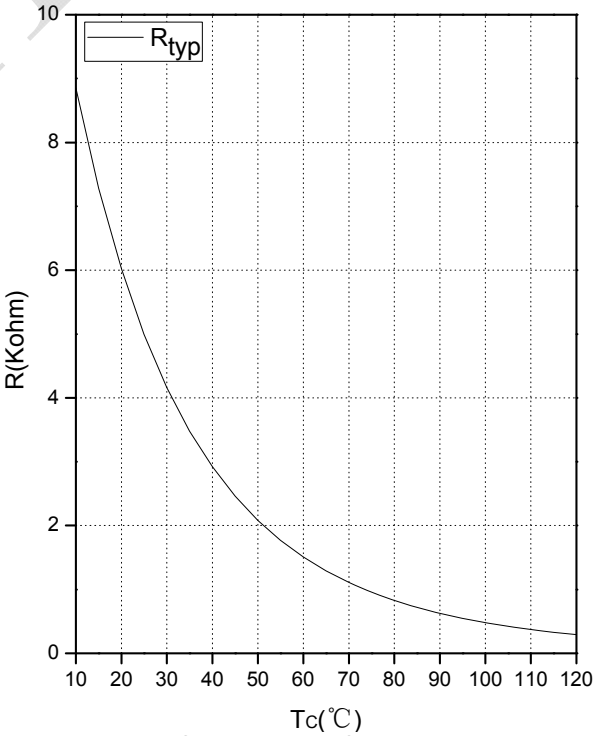


Fig.13 NTC Temperature Characteristics

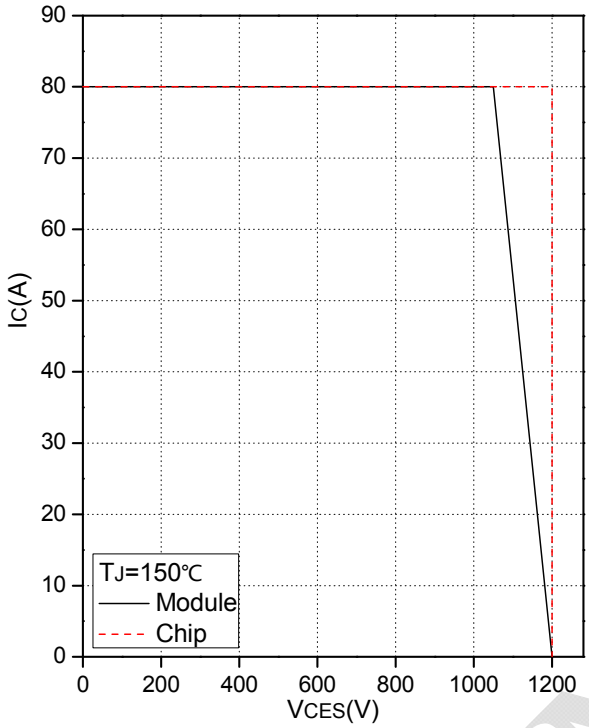
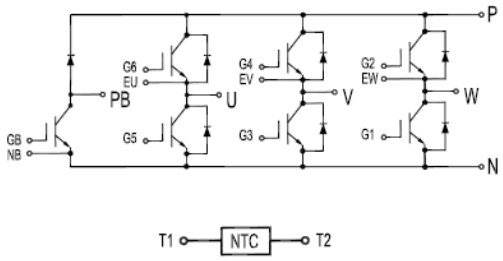
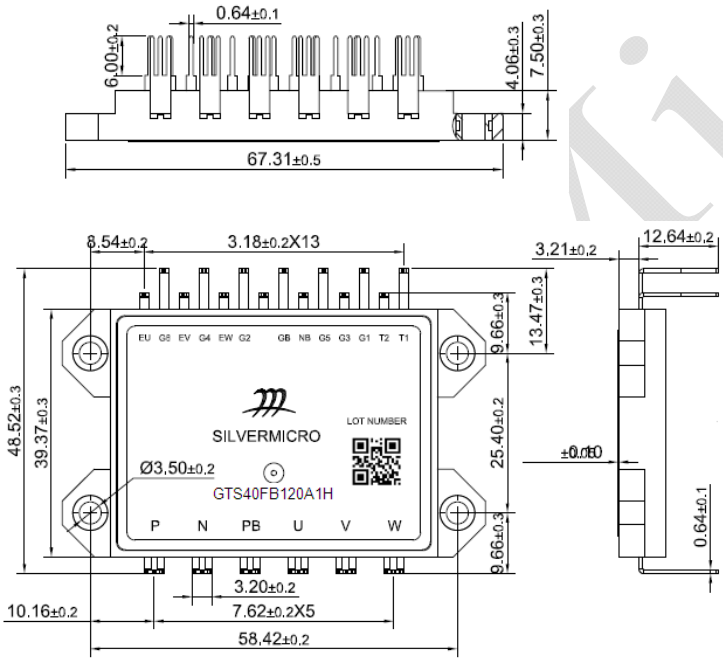


Fig.14 Reverse Bias Safe Operation Area (RBSOA)

Internal Circuit:



Package Outline (Unit: mm):



Date	Revision	Notes
05/29//2019	01	Initial Release

Announcement

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