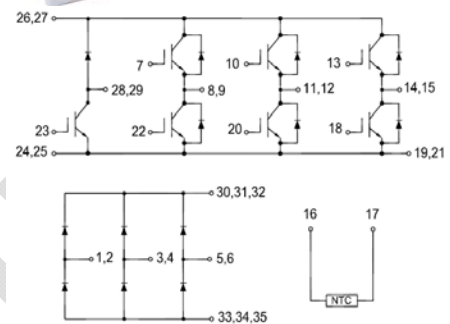


GT100PI120T6H-T4M

IGBT Module

Features:

- Field Stop Trench Gate IGBT
- Short Circuit Rated > 10 μ s
- Low Saturation Voltage
- 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°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	100	A
		T _C =25°C	200	A
I _{CM}	Peak Collector Current Repetitive	T _J =175°C	200	A
t _{SC}	Short Circuit Withstand Time		>10	μs
P _D	Maximum Power Dissipation (IGBT)	T _C =25°C T _{Jmax} =175°C	714	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	$I_C=1\text{mA}$, $V_{CE}=V_{GE}$	5.0	5.5	6.6	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=100\text{A}$, $V_{GE}=15\text{V}$	$T_J=25^{\circ}\text{C}$	1.70	2.00	V
			$T_J=125^{\circ}\text{C}$	1.90		V
			$T_J=150^{\circ}\text{C}$	1.90		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	$V_{CE}=25\text{V}$, $V_{GE}=0\text{V}$, $f=1\text{MHz}$		8.03		nF
C_{oes}	Output Capacitance			1.22		nF
C_{res}	Reveres Transfer Capacitance			0.59		nF

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	$V_{CC}=600V, I_C=100A,$ $R_{Gon}=1\Omega, V_{GE}=\pm 15V,$ Inductive Load	$T_J=25^{\circ}C$		228		ns
			$T_J=125^{\circ}C$		250		
			$T_J=150^{\circ}C$		254		
t_r	Rise Time		$T_J=25^{\circ}C$		63		ns
			$T_J=125^{\circ}C$		67		
			$T_J=150^{\circ}C$		69		
$t_{d(off)}$	Turn-off Delay Time		$T_J=25^{\circ}C$		269		ns
			$T_J=125^{\circ}C$		279		
			$T_J=150^{\circ}C$		284		
t_f	Fall Time	$T_J=25^{\circ}C$		184		ns	
		$T_J=125^{\circ}C$		291			
		$T_J=150^{\circ}C$		317			
E_{on}	Turn-on Switching Loss	$V_{CC}=600V, I_C=100A,$ $R_{Gon}=1\Omega, V_{GE}=\pm 15V,$ $di/dt=1387A/\mu s(T_J=150^{\circ}C),$ Inductive Load	$T_J=25^{\circ}C$		3.1		mJ
			$T_J=125^{\circ}C$		4.3		
			$T_J=150^{\circ}C$		4.8		

E_{off}	Turn-off Switching Loss	$V_{CC}=600V, I_C=100A, R_{Goff}=1\Omega, V_{GE}=\pm 15V, du/dt=4448V/\mu s(T_J=150^\circ C),$ Inductive Load	$T_J=25^\circ C$		5.28		mJ
			$T_J=125^\circ C$		8.33		
			$T_J=150^\circ C$		9.30		
Q_g	Total Gate Charge	$V_{GE}=\pm 15V \dots -15V$	$T_J=25^\circ C$		745		nC
$R_{g \text{ internal}}$	Internal Gate Resistance		$T_J=25^\circ C$		7.5		Ω
RBSOA	$I_C=200A, V_{CC}=1050V, V_p=1200V, R_{Goff}=1\Omega, V_{GE}=\pm 15V \text{ to } 0V, T_J=150^\circ C$			Trapezoid			
SC data	$V_{CC}=600V, t_p=10\mu s, V_{GE}=\pm 15V, R_{Gon}=1\Omega, R_{Goff}=1\Omega, T_J=25^\circ C$				575		A
$R_{\theta JC}$	IGBT Thermal Resistance: Junction-To-Case				0.21		$^\circ C/W$

Diode, Inverter

Maximum Rated Values ($T_C = 25^\circ C$ unless otherwise specified)

V_{RRM}	Repetitive Peak Reverse Voltage	1200	V
I_F	Diode Continuous Forward Current	100	A
I_{FM}	Peak FWD Current Repetitive	200	A

Electrical Characteristics of FWD ($T_C=25^\circ C$ unless otherwise specified)

Symbol	Description	Conditions	Min	Typ	Max	Unit
V_{FM}	Forward Voltage	$I_F=100A$	$T_J=25^\circ C$	1.70		V
			$T_J=125^\circ C$	1.80		
			$T_J=150^\circ C$	1.80		
t_{rr}	Reverse Recovery Time	$I_F=100A, -diF/dt = 1911A/\mu s(T_J=150^\circ C), V_R=600V, V_{GE}=-15V$	$T_J=25^\circ C$	260		ns
			$T_J=125^\circ C$	396		
			$T_J=150^\circ C$	454		
I_{rr}	Peak Reverse Recovery Current	$I_F=100A, -diF/dt = 1911A/\mu s(T_J=150^\circ C), V_R=600V, V_{GE}=-15V$	$T_J=25^\circ C$	92		A
			$T_J=125^\circ C$	104		
			$T_J=150^\circ C$	105		
Q_{rr}	Reverse Recovery Charge	$I_F=100A, -diF/dt = 1911A/\mu s(T_J=150^\circ C), V_R=600V, V_{GE}=-15V$	$T_J=25^\circ C$	10.2		μC
			$T_J=125^\circ C$	16.8		

			T _J =150℃		19.2		
E _{rec}	Reverse Recovery Energy	I _F =100A, -diF/dt =1911A/μs(T _J =150℃), V _R =600V, V _{GE} =-15V	T _J =25℃		4.83		mJ
			T _J =125℃		7.92		
			T _J =150℃		9.13		
R _{θJC}	Diode Thermal Resistance: Junction-To-Case				0.34		℃/W

IGBT, Brake-Chopper Maximum Rated Values ($T_C=25^{\circ}\text{C}$ unless otherwise specified)

V_{CES}	Collector-Emitter Blocking Voltage	$T_C=25^{\circ}\text{C}$	1200	V
V_{GES}	Gate-Emitter Voltage		± 20	V
I_C	Continuous Collector Current	$T_C=100^{\circ}\text{C}$	50	A
		$T_C=25^{\circ}\text{C}$	100	A
$I_{\text{CM}(1)}$	Peak Collector Current Repetitive	$T_J=150^{\circ}\text{C}$	100	A
t_{SC}	Short Circuit Withstand Time		>10	μs
P_D	Maximum Power Dissipation (IGBT)	$T_C=25^{\circ}\text{C}$ $T_{J\text{max}}=175^{\circ}\text{C}$	398	W

Electrical Characteristics of IGBT ($T_C=25^{\circ}\text{C}$ unless otherwise specified)

Static Characteristics

Symbol	Description	Conditions	Min	Typ	Max	Unit
$V_{\text{GE(th)}}$	Gate-Emitter Threshold Voltage	$I_C=1\text{ mA}$, $V_{\text{CE}}=V_{\text{GE}}$	5.0	5.6	6.6	V
$V_{\text{CE(sat)}}$	Collector-Emitter Saturation Voltage	$I_C=50\text{A}$, $V_{\text{GE}}=15\text{V}$	$T_J=25^{\circ}\text{C}$	1.70	2.00	V
			$T_J=125^{\circ}\text{C}$	1.90		V
			$T_J=150^{\circ}\text{C}$	1.90		
I_{CES}	Collector-Emitter Leakage Current	$V_{\text{GE}}=0\text{V}$, $V_{\text{CE}}=V_{\text{CES}}$, $T_J=25^{\circ}\text{C}$			1	mA
I_{GES}	Gate-Emitter Leakage Current	$V_{\text{GE}}=\pm 20\text{V}$, $V_{\text{CE}}=0\text{V}$, $T_J=25^{\circ}\text{C}$			100	nA
C_{ies}	Input Capacitance	$V_{\text{CE}}=25\text{V}$, $V_{\text{GE}}=0\text{V}$, $f=1\text{MHz}$		3.65		nF
C_{oes}	Output Capacitance			0.50		nF
C_{res}	Reveres Transfer Capacitance			0.31		nF

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	$V_{CC}=600V, I_C=50A,$ $R_{Gon}=15\Omega, V_{GE}=\pm 15V,$ Inductive Load	$T_J=25^{\circ}C$		154		ns	
			$T_J=125^{\circ}C$		169			
			$T_J=150^{\circ}C$		174			
t_r	Rise Time		$T_J=25^{\circ}C$		51		ns	
			$T_J=125^{\circ}C$		54			
			$T_J=150^{\circ}C$		56			
$t_{d(off)}$	Turn-off Delay Time		$V_{CC}=600V, I_C=50A,$ $R_{Goff}=15\Omega, V_{GE}=\pm 15V,$ Inductive Load	$T_J=25^{\circ}C$		202		ns
				$T_J=125^{\circ}C$		216		
				$T_J=150^{\circ}C$		225		
t_f	Fall Time	$T_J=25^{\circ}C$			220		ns	
		$T_J=125^{\circ}C$			379			
		$T_J=150^{\circ}C$			407			
E_{on}	Turn-on Switching Loss	$T_J=25^{\circ}C$			3.37		mJ	
		$T_J=125^{\circ}C$			5.10			
		$T_J=150^{\circ}C$			5.53			
E_{off}	Turn-off Switching Loss	$T_J=25^{\circ}C$		2.42		mJ		
		$T_J=125^{\circ}C$		4.09				
		$T_J=150^{\circ}C$		4.52				
Q_g	Total Gate Charge	$V_{GE}=+15V \dots -15V$	$T_J=25^{\circ}C$		504		nC	
$R_{g \text{ internal}}$	Internal Gate Resistance		$T_J=25^{\circ}C$		4		Ω	
RBSOA	$I_C=100A, V_{CC}=1050V, V_p=1200V, R_{Goff}=15\Omega, V_{GE}=+15V \text{ to } 0V, T_J=150^{\circ}C$				Trapezoid			
SC data	$V_{CC}=600V, t_p=10\mu s, V_{GE}=\pm 15V, R_{Gon}=15\Omega, R_{Goff}=15\Omega, T_J=25^{\circ}C$					297	A	
$R_{\theta JC}$	IGBT Thermal Resistance: Junction-To-Case					0.38	$^{\circ}C/W$	

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	35	A
I_{FM}	Peak FWD Current Repetitive	70	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 =35A	T _J =25℃		1.90		V	
			T _J =125℃		2.00			
t _{rr}	Reverse Recovery Time	I _F =35A, -diF/dt=816A/μs(T _J =125℃), V _{rr} =600V, V _{GE} =-15V	T _J =25℃		137		ns	
			T _J =125℃		269			
I _{rr}	Peak Reverse Recovery Current		T _J =25℃		20		A	
			T _J =125℃		25			
Q _{rr}	Reverse Recovery Charge		T _J =25℃		3.15		μC	
			T _J =125℃		5.05			
E _{rec}	Reverse Recovery Energy		T _J =25℃		1.24		mJ	
			T _J =125℃		2.12			
R _{θJC}	Diode Thermal Resistance: Junction-To-Case				0.70		℃/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	$T_J=80^{\circ}\text{C}$	130	A
I_{RMSM}	Maximum RMS Current At Rectifier Output	$T_J=80^{\circ}\text{C}$	180	A
I_{FSM}	Surge Current @ $t_p=10$ ms	$T_J=25^{\circ}\text{C}$	1500	A
		$T_J=150^{\circ}\text{C}$	1150	
I^2t	I^2t - Value	$T_J=25^{\circ}\text{C}$	11560	A^2s
		$T_J=150^{\circ}\text{C}$	6610	

Electrical Characteristics of Diode ($T_C=25^{\circ}\text{C}$ unless otherwise specified)

Symbol	Description	Conditions	Min	Typ	Max	Unit
V_F	Forward Voltage	$I_F=85$ A	$T_J=25^{\circ}\text{C}$	1.00		V
			$T_J=125^{\circ}\text{C}$	0.90		
			$T_J=150^{\circ}\text{C}$	0.90		
I_R	Reverse Current	$V_R=1800\text{V}$	$T_J=25^{\circ}\text{C}$		1	mA
$R_{\theta JC}$	IGBT Thermal Resistance: Junction-To-Case			0.29		$^{\circ}\text{C}/\text{W}$

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	Conditions	Min	Typ	Max	Unit
V _{iso}	Isolation Voltage (All Terminals Shorted)	f = 50Hz, 1minute	2500			V
L _{sCE}	Stray Inductance Module			40		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			V
R _{θCS}	Case-To-Sink Thermally (Conductive Grease Applied)			0.1		°C/W
M	Power Terminals Screw:M5		3.0		5.0	N·m
G	Weight			300		g

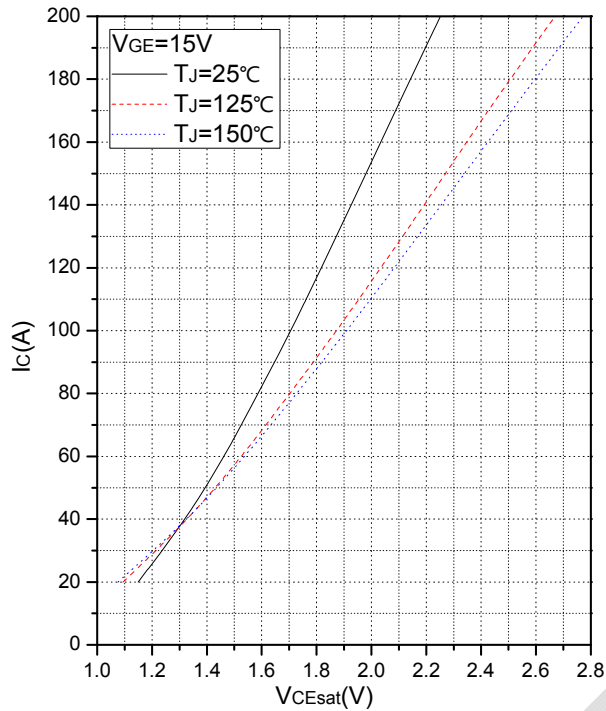


Fig.1 Typical Saturation Voltage Characteristics (Inverter)

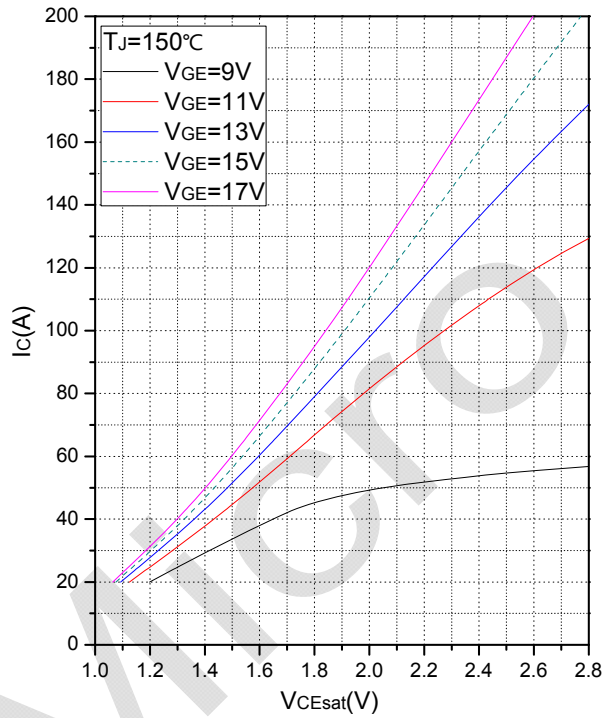


Fig.2 Typical Output Characteristics (Inverter)

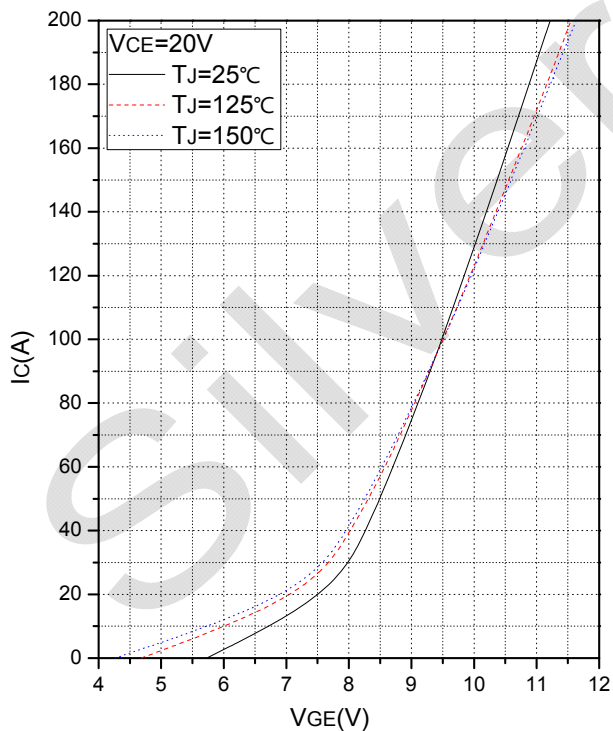


Fig.3 Transfer Characteristic (Inverter)

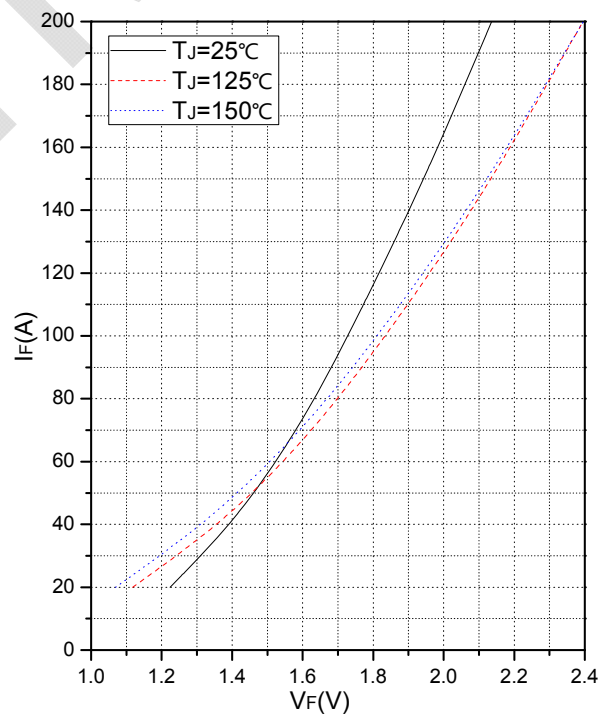


Fig.4 Forward Characteristics of FWD (Inverter)

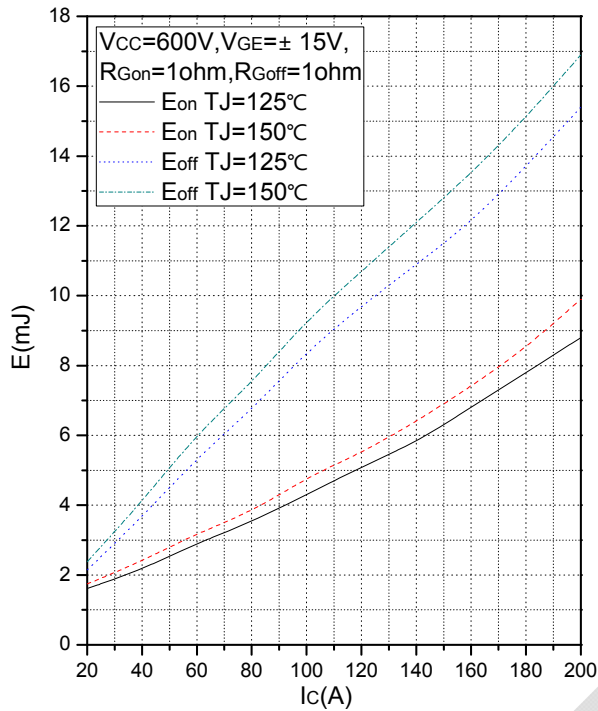


Fig.5 Typical Switching Loss vs. Collector Current (Inverter)

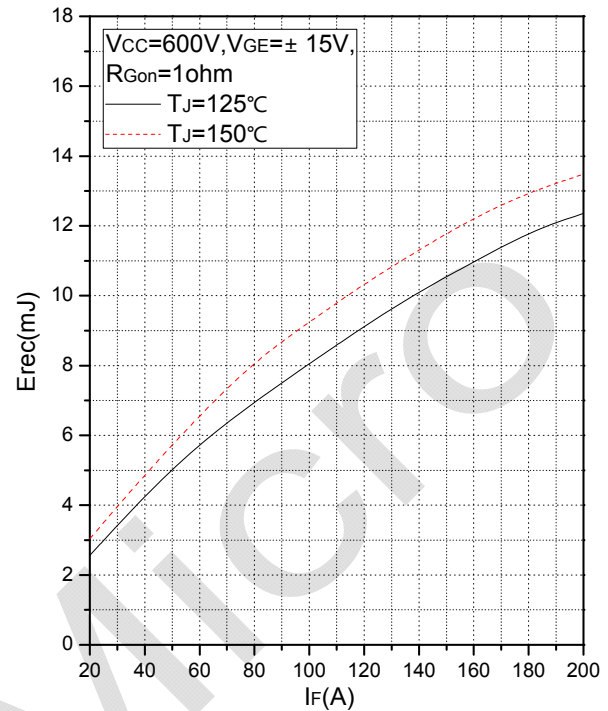


Fig.6 Typical Switching Loss vs. Forward Current (Inverter)

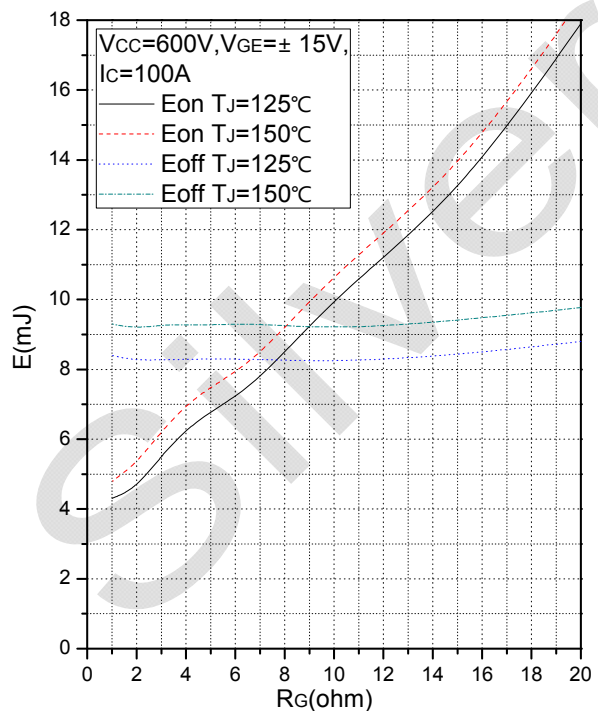


Fig.7 Typical Switching Loss vs. Gate Resistance (Inverter)

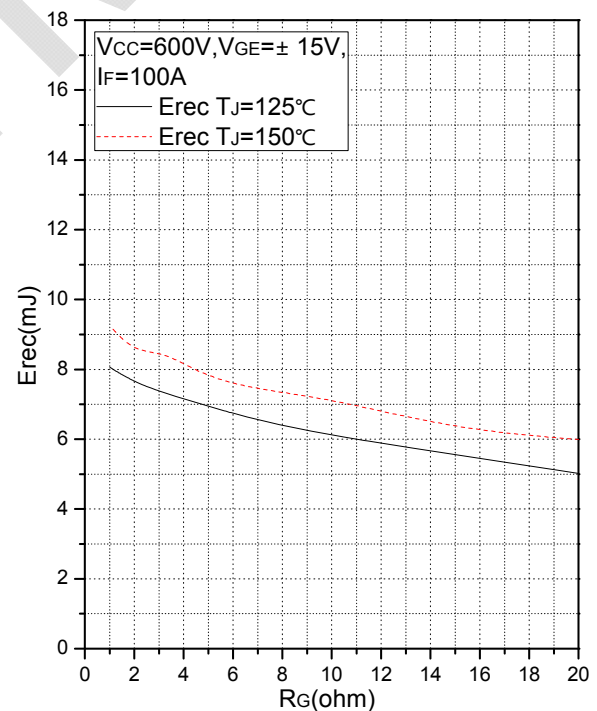
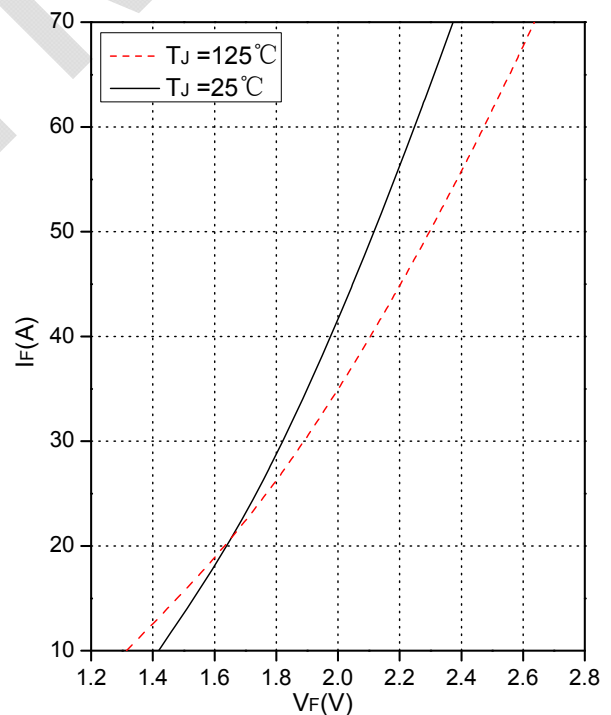
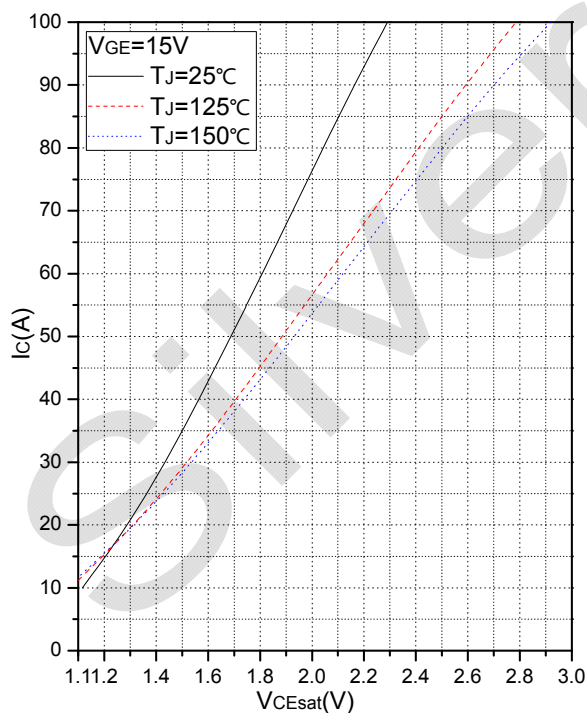
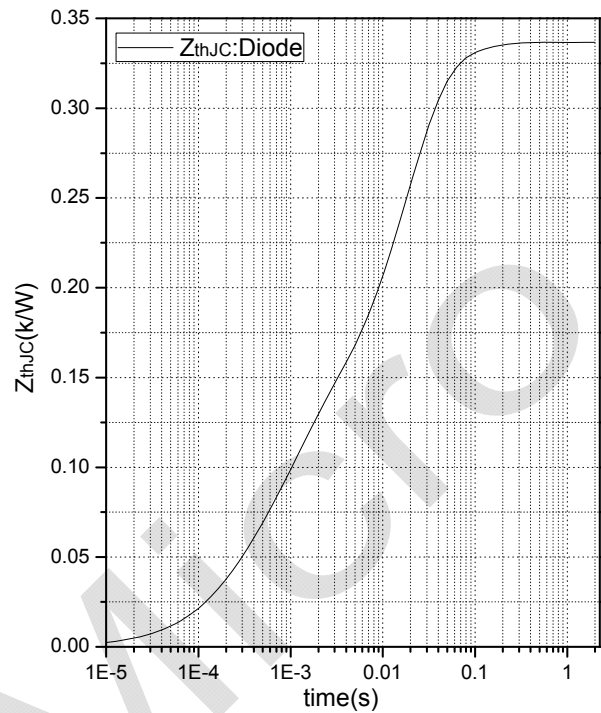
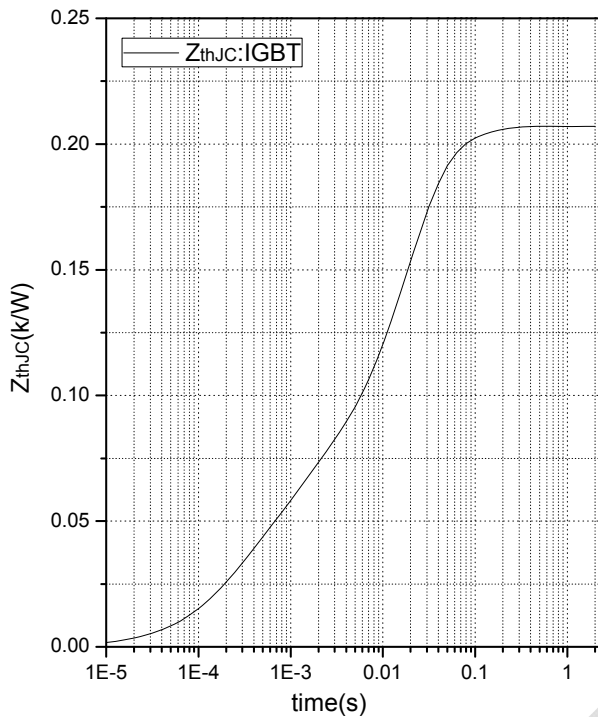


Fig.8 Typical Switching Loss vs. Gate Resistance (Inverter)



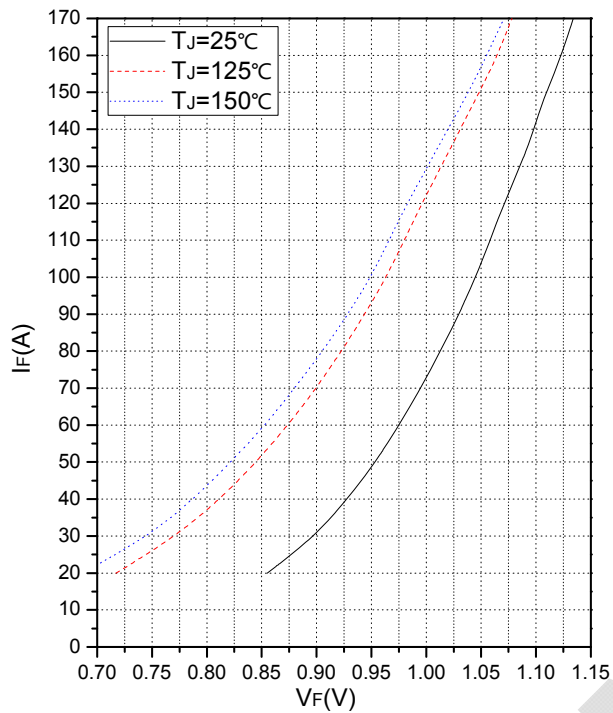


Fig.13 Forward Characteristics of Diode (Rectifier)

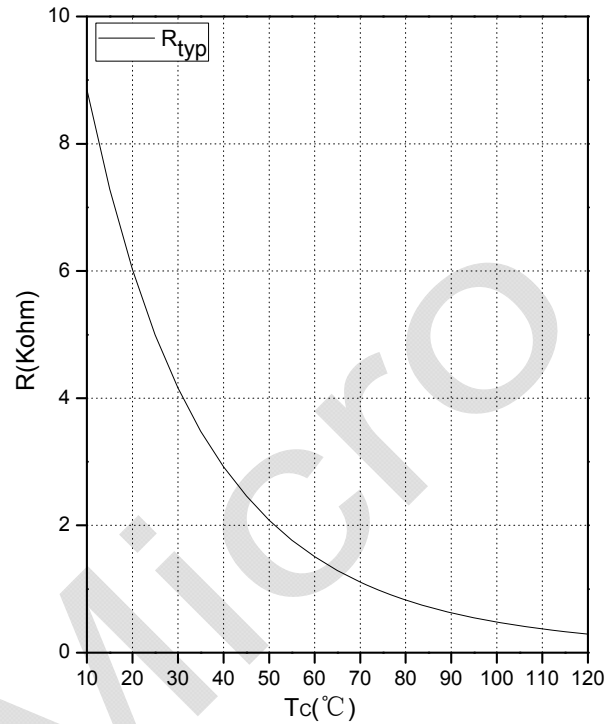


Fig.14 NTC Temperature Characteristics

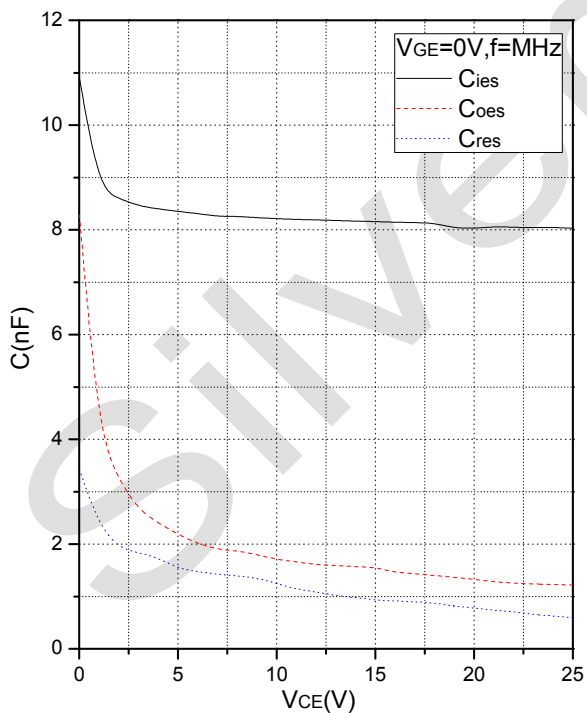


Fig.15 Capacitance Characteristics (Inverter- IGBT)

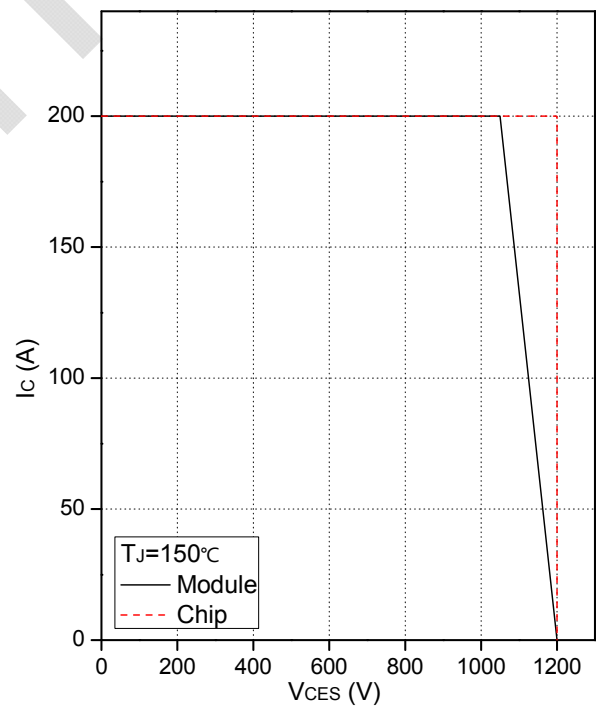
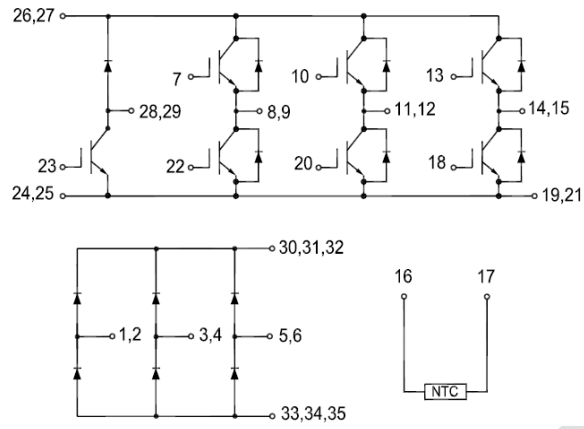
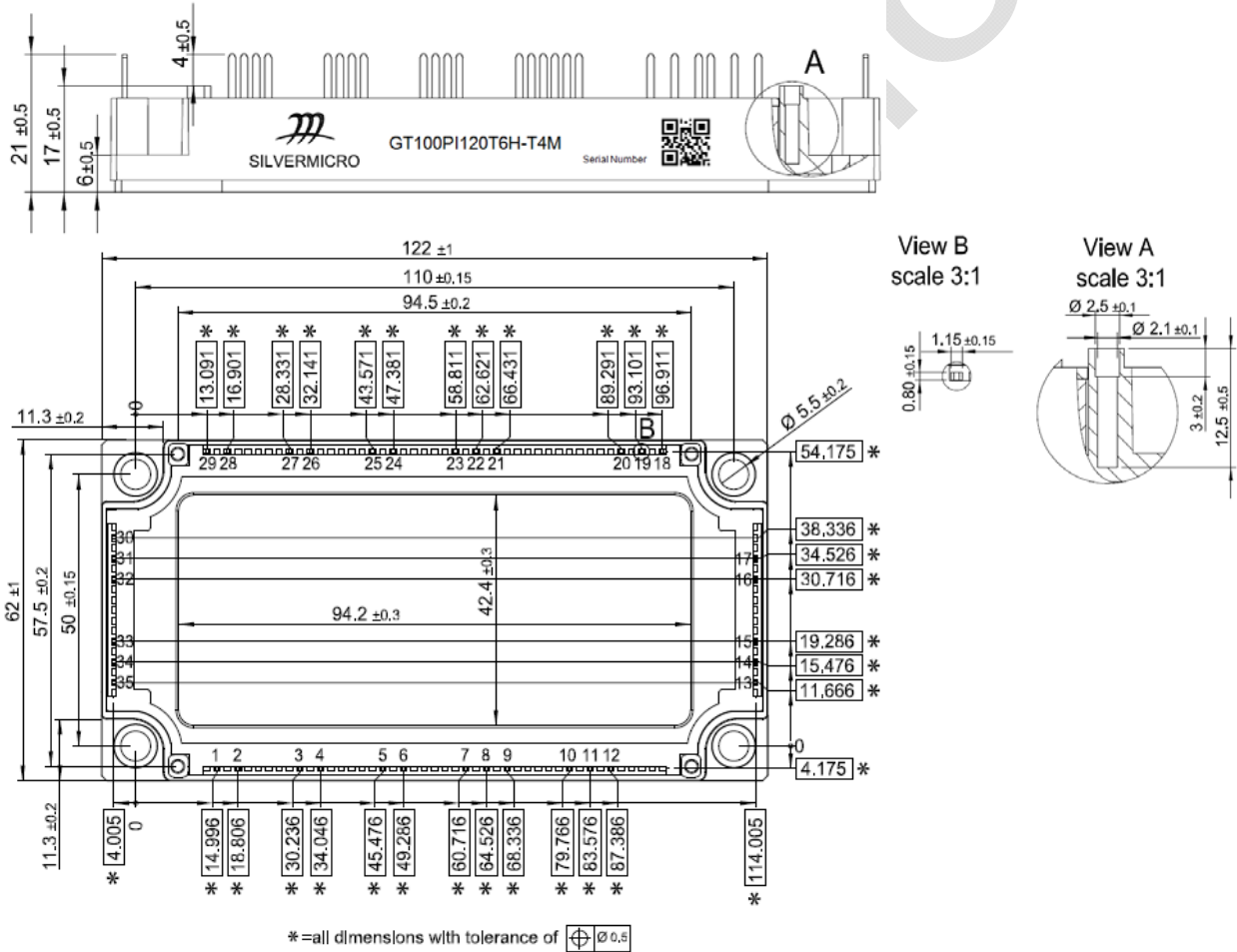


Fig.16 Reverse Bias Safe Operation Area (RBSOA)

Internal Circuit:



Package Outline (Unit: mm):



Date	Revision	Notes
05/09/2019	A	Final Version
09/12/2019	B	Add R _g internal

Announcement

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