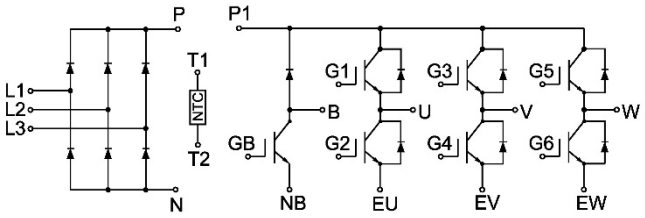
GTS15PI120B3H

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

Circuit Diagram



Applications：

- Motor Drives
- Air Conditioning
- Auxiliary Inverters

IGBT, Inverter
Maximum Rated Values

V_{CES}	Collector-Emitter Blocking Voltage	T_J=25℃	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}	Repetitive Peak Collector Current	tp=1ms	30	A
t_{SC}	Short Circuit Withstand Time		>10	μs
P_D	Maximum Power Dissipation per Leg	T_C=25℃ T_{Jmax}=175℃	225	W

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Electrical Characteristics of IGBT

Static Characteristics

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=1mA, V_{CE}=V_{GE}, T_J=25℃		5.2	5.8	6.2	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C=15A, V_{GE}=15V	T_J=25℃		1.90	2.20	V
			T_J=125℃		2.30		
			T_J=150℃		2.40		
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=100kHz, T_J=25℃			1.14		nF
C_{oes}	Output Capacitance				0.16		
C_{res}	Reverse Transfer Capacitance				0.04		

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	V_{CC}=600V, I_C=15A, R_{Gon}=39Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		115		ns
			T_J=125℃		110		
			T_J=150℃		110		
t_r	Rise Time		T_J=25℃		42		ns
			T_J=125℃		48		
			T_J=150℃		52		
$t_{d(off)}$	Turn-off Delay Time	V_{CC}=600V, I_C=15A, R_{Goff}=39Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		145		ns
			T_J=125℃		158		
			T_J=150℃		160		
t_f	Fall Time		T_J=25℃		275		ns
			T_J=125℃		335		
			T_J=150℃		350		
E_{on}	Turn-on Switching Loss	V_{CC}=600V, I_C=15A, R_{Gon}=39Ω, V_{GE}=±15V, di/dt=230A/μs (T_J=150℃) Inductive Load	T_J=25℃		2.03		mJ
			T_J=125℃		2.27		
			T_J=150℃		2.42		

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E_{off}	Turn-off Switching Loss	V_{CC}=600V, I_C=15A, R_{Goff}=39Ω, V_{GE}=±15V, du/dt=2268V/μs (T_J=150℃) Inductive Load	T_J=25℃		0.64		mJ
			T_J=125℃		0.89		
			T_J=150℃		0.97		
Q_g	Total Gate Charge	V_{GE}=+15V…-15V	T_J=25℃		113		nC
RBSOA	I_C=30A, V_{CC}=1050V, Vp=1200V, R_{Goff}=39Ω, V_{GE}=+15V to 0V, T_J=150°C				Trapezoid		
SC Data	Vcc=600V, tp=10us, V_{GE}=+/-15V, R_{Gon}=39Ω, R_{Goff}=39Ω, T_J=125℃				73		A
$R_{\theta JC}$	IGBT Thermal Resistance: Junction-to-Case(Per Leg)					0.662	℃/W

Diode, Inverter
Maximum Rated Values

V_{RRM}	Repetitive Peak Reverse Voltage	T_J=25℃	1200	V
I_F	Diode Continuous Forward Current		15	A
I_{FM}	Diode Maximum Forward Current	tp=1ms	30	A

Electrical Characteristics of Diode

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
V_{FM}	Forward Voltage	I_F=15A	T_J=25℃		1.85		V
			T_J=125℃		2.00		
			T_J=150℃		2.00		
t_{rr}	Reverse Recovery Time	I_F=15A, -diF/dt=368A/μs(T_J=150℃), V_{rr}=600V, V_{GE}=-15V	T_J=25℃		288		ns
			T_J=125℃		462		
			T_J=150℃		477		
I_{rr}	Peak Reverse Recovery Current		T_J=25℃		8.4		A
			T_J=125℃		9.1		
			T_J=150℃		9.7		
Q_{rr}	Reverse Recovery Charge		T_J=25℃		1.34		μC
			T_J=125℃		2.14		
			T_J=150℃		2.34		

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E_{rec}	Reverse Recovery Energy	I_F=15A, -diF/dt=368A/μs(T_J=150℃), V_{rr}=600V, V_{GE}=-15V	T_J=25℃		0.37		mJ
			T_J=125℃		0.70		
			T_J=150℃		0.80		
$R_{\theta JC}$	Diode Thermal Resistance: Junction-to-Case(Per Leg)					1.127	℃/W

IGBT, Brake-Chopper
Maximum Rated Values

V_{CES}	Collector-Emitter Blocking Voltage	T_J=25℃	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}	Repetitive Peak Collector Current	tp=1ms	30	A
t_{SC}	Short Circuit Withstand Time		>10	μs
P_D	Maximum Power Dissipation per Leg	T_C=25℃ T_{Jmax}=175℃	225	W

Electrical Characteristics of IGBT

Static Characteristics

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=1mA, V_{CE}=V_{GE}, T_J=25℃		4.5	5.8	6.5	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C=15A, V_{GE}=15V	T_J=25℃		1.90		V
			T_J=125℃		2.30		
			T_J=150℃		2.40		
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=100kHz, T_J=25℃			1.14		nF
C_{oes}	Output Capacitance				0.16		
C_{res}	Reverse Transfer Capacitance				0.04		

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Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	V_{CC}=600V, I_C=15A, R_{Gon}=39Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		115		ns
			T_J=125℃		110		
			T_J=150℃		110		
t_r	Rise Time		T_J=25℃		42		ns
			T_J=125℃		48		
			T_J=150℃		52		
$t_{d(off)}$	Turn-off Delay Time	V_{CC}=600V, I_C=15A, R_{Goff}=39Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		145		ns
			T_J=125℃		158		
			T_J=150℃		160		
t_f	Fall Time		T_J=25℃		275		ns
			T_J=125℃		335		
			T_J=150℃		350		
E_{on}	Turn-on Switching Loss	V_{CC}=600V, I_C=15A, R_{Gon}=39Ω, V_{GE}=±15V, di/dt=230A/μs (T_J=150℃) Inductive Load	T_J=25℃		2.03		mJ
			T_J=125℃		2.27		
			T_J=150℃		2.42		
E_{off}	Turn-off Switching Loss	V_{CC}=600V, I_C=15A, R_{Goff}=39Ω,V_{GE}=±15V, du/dt=2268V/μs (T_J=150℃) Inductive Load	T_J=25℃		0.64		mJ
			T_J=125℃		0.89		
			T_J=150℃		0.97		
Q_g	Total Gate Charge	V_{GE}=+15V…-15V	T_J=25℃		113		nC
RBSOA	I_C=30A,V_{CC}=1050V,Vp=1200V,R_{Goff}=39Ω, V_{GE}=+15V to 0V, T_J=150°C				Trapezoid		
SC Data	Vcc=600V, tp=10us, V_{GE}=+/-15V, R_{Gon}=39Ω, R_{Goff}=39Ω, T_J=125℃				73		A
$R_{\theta JC}$	IGBT Thermal Resistance: Junction-To-Case(Per Leg)					0.662	℃/W

Diode, Brake-Chopper
Maximum Rated Values

V_{RRM}	Repetitive Peak Reverse Voltage	T_J=25℃	1200	V
I_F	Diode Continuous Forward Current		10	A
I_{FM}	Diode Maximum Forward Current	tp=1ms	20	A

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Electrical Characteristics of Diode

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
V_{FM}	Forward Voltage	I_F=10A	T_J=25℃		1.75		V
			T_J=125℃		1.90		
			T_J=150℃		1.85		
t_{rr}	Reverse Recovery Time	I_F=10A, -diF/dt=250A/μs(T_J=150℃), V_{rr}=600V, V_{GE}=-15V	T_J=25℃		381		ns
			T_J=125℃		490		
			T_J=150℃		583		
I_{rr}	Peak Reverse Recovery Current		T_J=25℃		8.4		A
			T_J=125℃		9.0		
			T_J=150℃		10.4		
Q_{rr}	Reverse Recovery Charge		T_J=25℃		1.34		μC
			T_J=125℃		2.11		
			T_J=150℃		2.58		
E_{rec}	Reverse Recovery Energy		T_J=25℃		0.33		mJ
			T_J=125℃		0.68		
			T_J=150℃		0.78		
$R_{\theta JC}$	Diode Thermal Resistance: Junction-To-Case(Per Leg)					1.237	℃/W

Diode, Rectifier
Maximum Rated Values

V_{RRM}	Repetitive Peak Reverse Voltage	T_J=25℃	1600	V
I_F	Diode Continuous Forward Current	T_J=25℃	10	A
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=10ms	T_J=25℃	300	A
		T_J=150℃	250	
I^2t	I^2t - value	T_J=25℃	450	A^2s
		T_J=150℃	312	

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Electrical Characteristics of Diode

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
V_F	Forward Voltage	I_F=10A	T_J=25℃		1.10		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 (Per Leg)					0.925	℃/W

Internal NTC-Thermistor Characteristics

Symbol	Conditions	Min.	Typ.	Max.	Units
R_{25}	T_C=25℃		5		kΩ
△R/R	T_C=100℃, R_{100}=481Ω	-5		+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

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Module

Symbol	Description		Min.	Typ.	Max.	Units
V_{iso}	Isolation Voltage(All Terminals Shorted)	DC, 3s	3500			V
Internal Isolation			Al_2O_3 Ceramic			
d_{creep}	Creepage Distance: Terminal to Heatsink			11.5		mm
	Creepage Distance: Terminal to Terminal			6.3		mm
d_{clear}	Clearance Distance: Terminal to Heatsink			10		mm
	Clearance Distance: Terminal to Terminal			5		mm
L_{SCE}	Stray Inductance Module			30		nH
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)				0.08	℃/W
M	Mounting Screw:M4		1.5		1.8	N·m
G	Weight			23		g

Ordering Information Table

Device code

G	TS	15	PI	120	B3	H
①	②	③	④	⑤	⑥	⑦

① - IGBT Module
② - Trench & Field Stop IGBT
③ - Rated Current (15=15A)
④ - Circuit Configuration: PI (Power Integrated)
⑤ - Rated Voltage (120=1200V)
⑥ - Package Type
⑦ - Test Level (Pass the Important Reliability Test-Industrial Grade)

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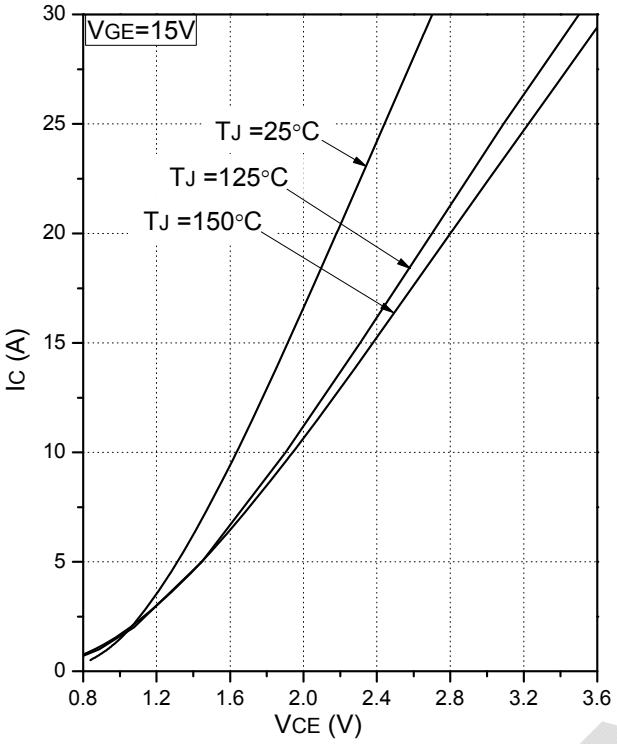

Fig.1 Typical Saturation Voltage Characteristics (Inverter)

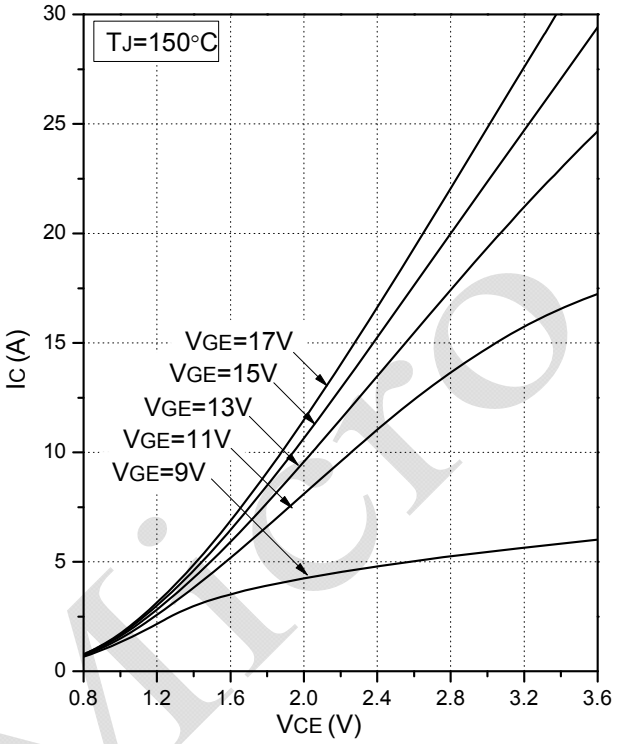

Fig.2 Typical Output Characteristics (Inverter)

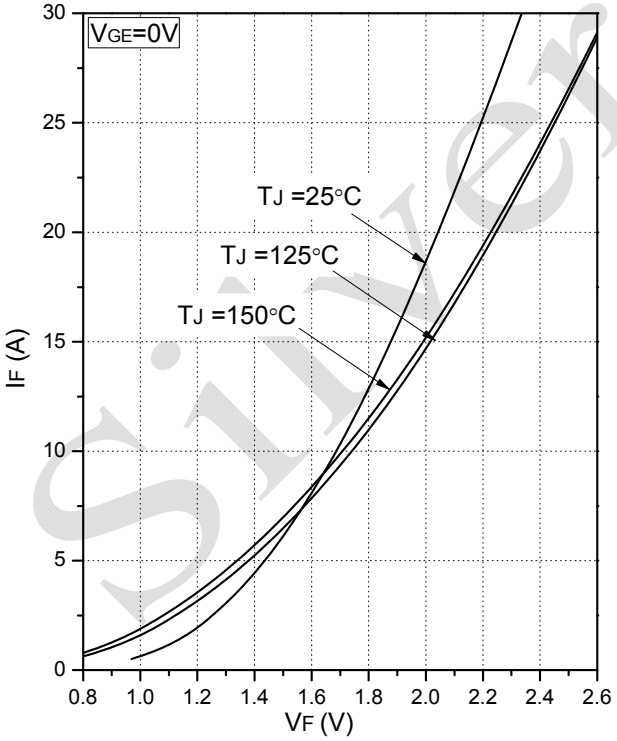

Fig.3 Forward Characteristics of Diode (Inverter)

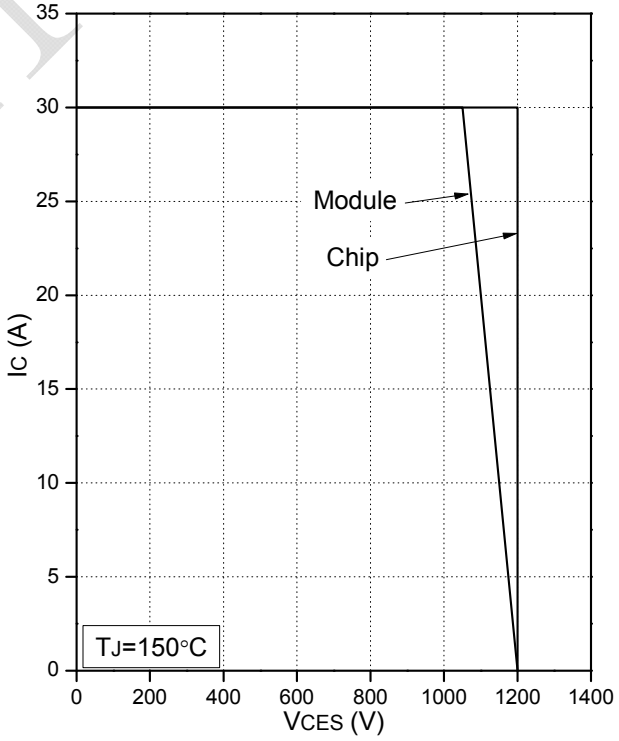

Fig.4 Reverse Bias Safe Operation Area (RBSOA)

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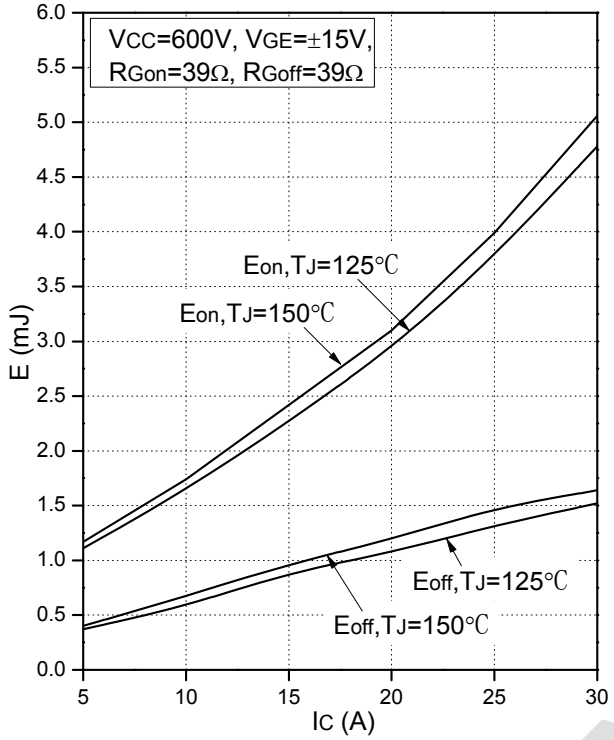

Fig.5 Typical Switching Loss vs. Collector Current (Inverter)

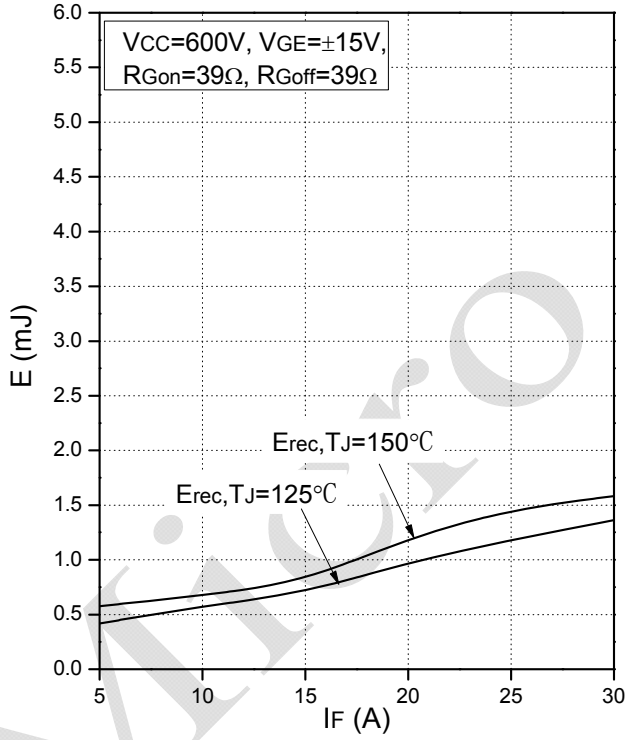

Fig.6 Typical Switching Loss vs. Forward Current (Inverter)

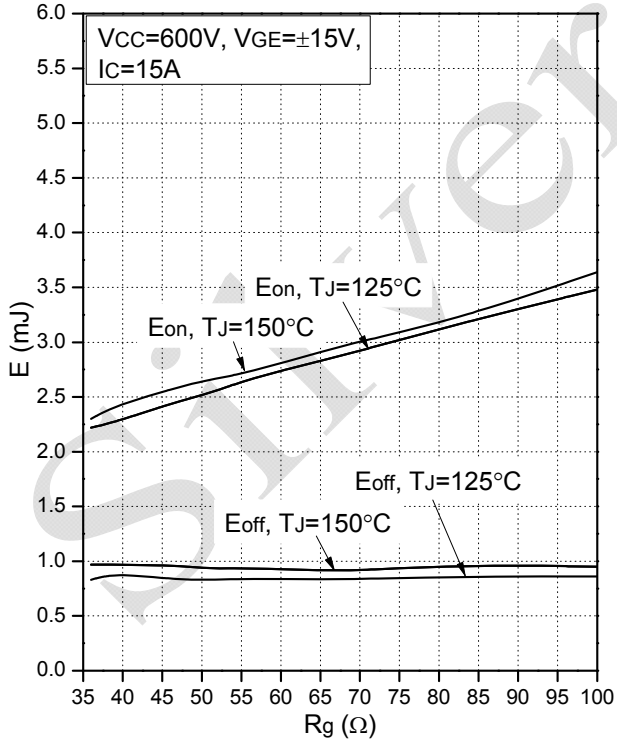

Fig.7 Typical Switching Loss vs. Gate Resistance (Inverter)

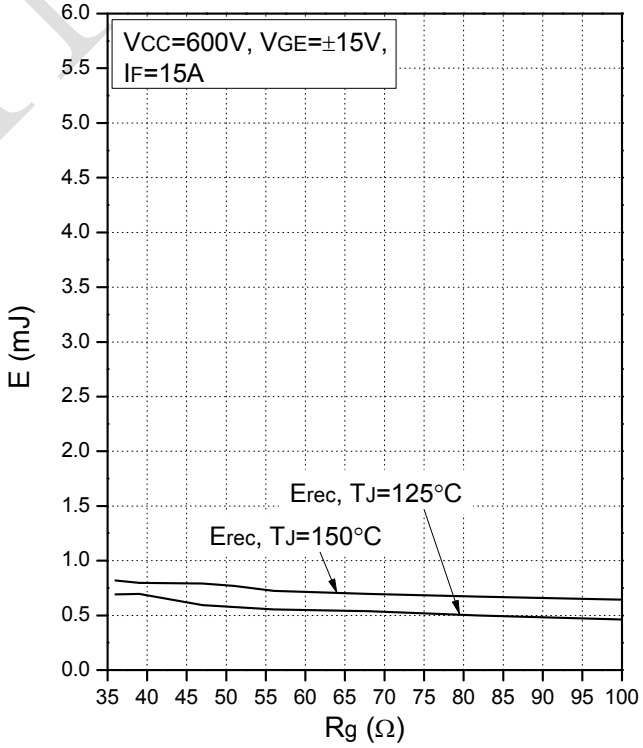

Fig.8 Typical Switching Loss vs. Gate Resistance (Inverter)

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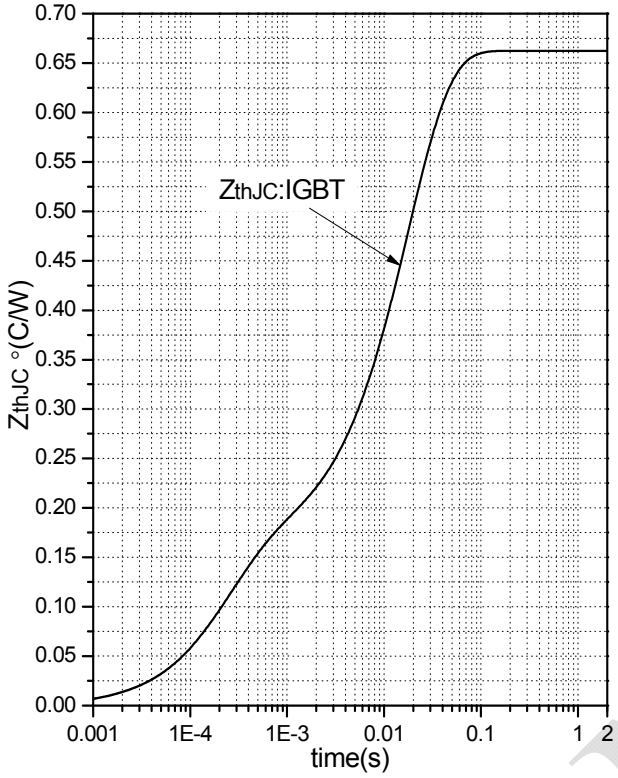

Fig.9 Transient Thermal Impedance (Inverter- IGBT)

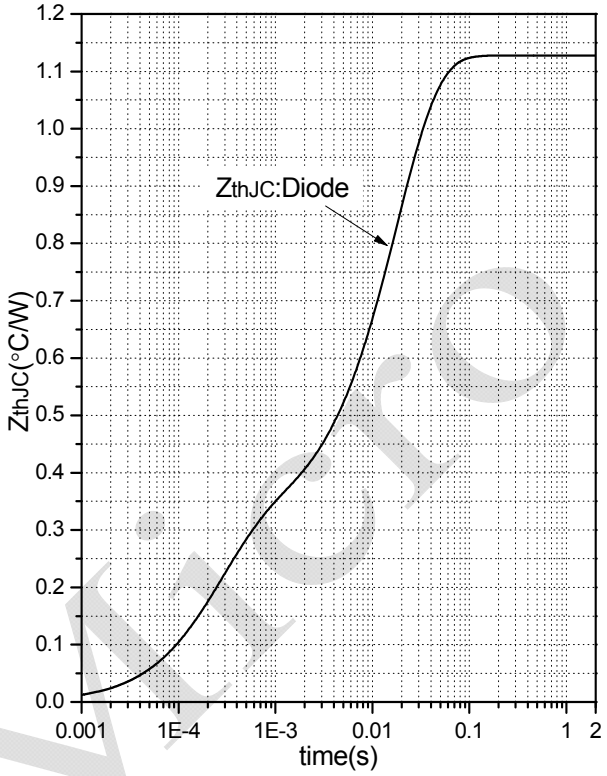

Fig.10 Transient Thermal Impedance (Inverter-Diode)

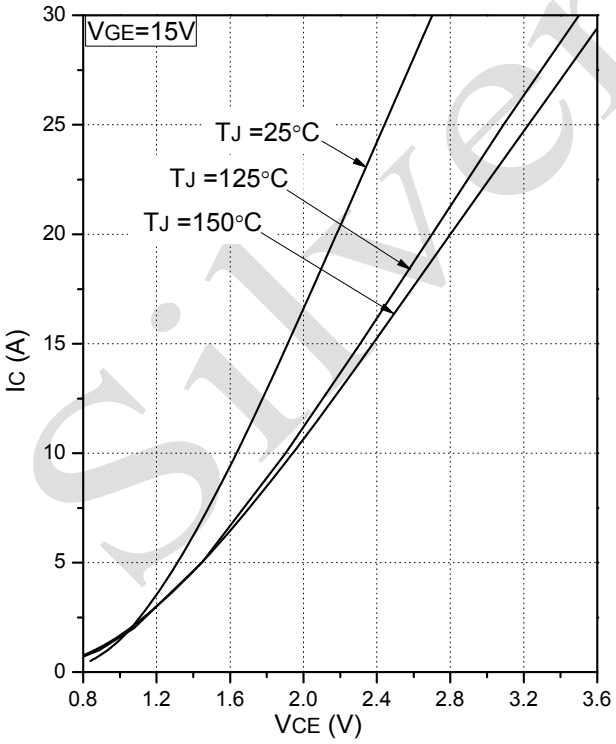

Fig.11Typical Saturation Voltage Characteristics (Brake-Chopper)

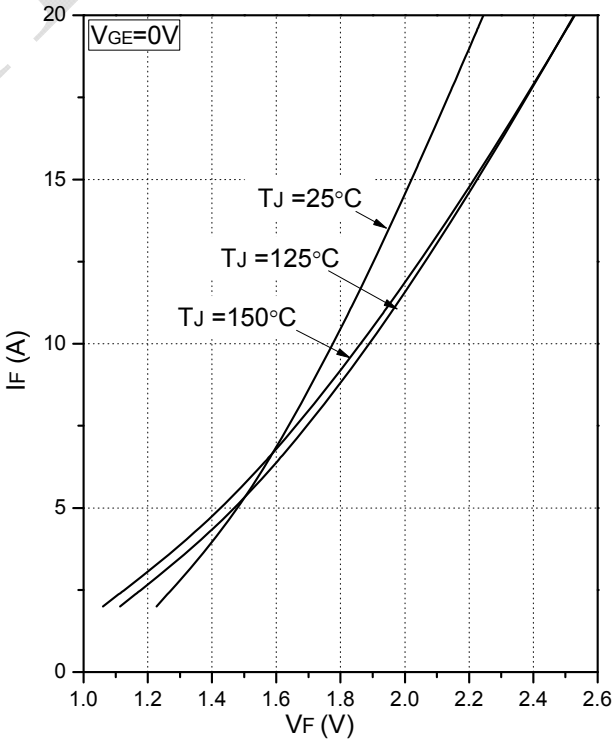

Fig.12 Forward Characteristics of Diode (Brake-Chopper)

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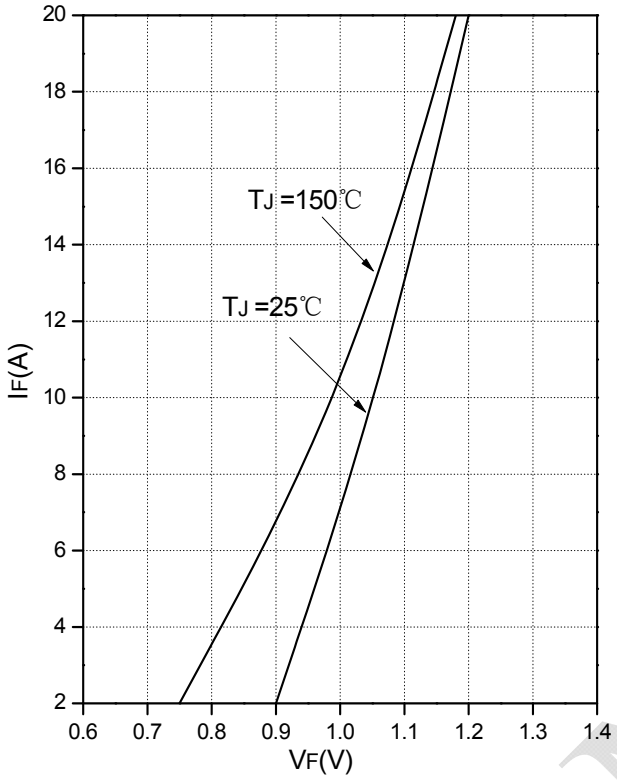

Fig.13 Forward Characteristics of Diode (Rectifier)

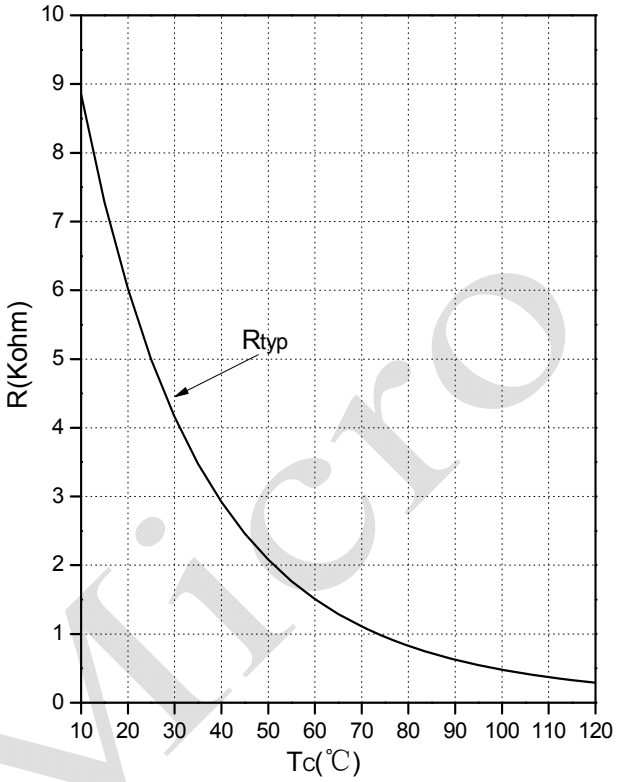

Fig.14 NTC Temperature Characteristics

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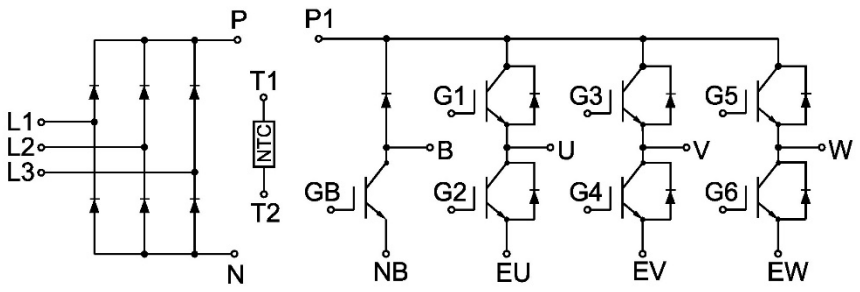
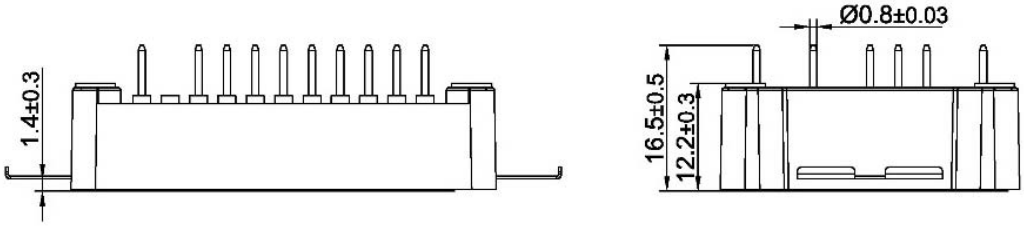
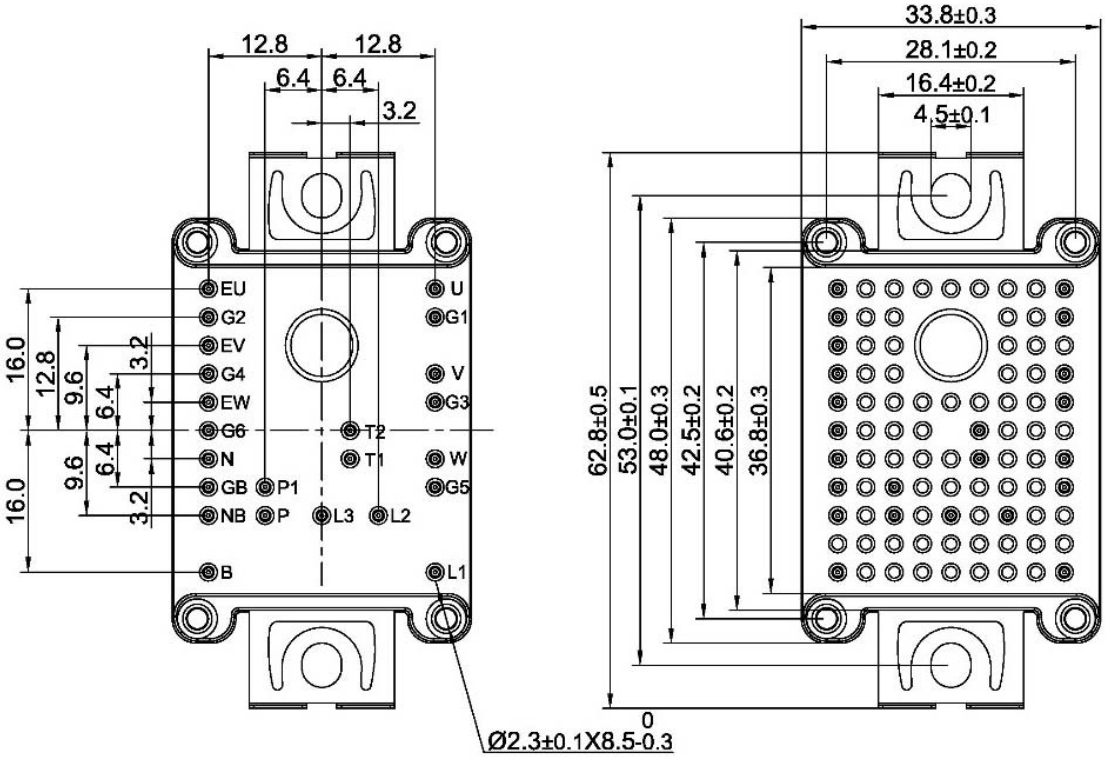
Internal Circuit



Package Outline (Unit: mm):





Pinpositions with tolerance of ⊕ Ø 0.4

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Date	Revision	Notes
04/14/2022	A	Final Version

Announcement

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The datasheet with “REV.” + “Arabic numerals” is based on engineering data for initial reference purpose only.

The released datasheet would be issued with “REV.” + “alphabet characters”.

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