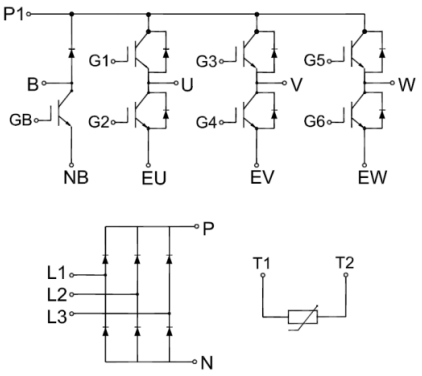
GT40PI120B9H

Preliminary Data

IGBT Module

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：

- Motor Drives
- Air Conditioning
- Auxiliary Inverters

IGBT, Inverter
Maximum Rated Values

V_{CES}	Collector-Emitter Blocking Voltage		1200	V
V_{GES}	Gate-Emitter Voltage		±20	V
I_C	Continuous Collector Current	T_C=100℃	40	A
		T_C=25℃	80	A
I_{CM}	Peak Collector Current Repetitive	t_p=1ms	80	A
P_D	Maximum Power Dissipation (IGBT)	T_C=25℃ T_{Jmax}=175℃	355	W

Electrical Characteristics of IGBT

Static Characteristics

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=1.5mA, V_{CE}=V_{GE}, T_J=25℃		5.0	5.7	6.5	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C=40A, V_{GE}=15V	T_J=25℃		1.90	2.30	V
			T_J=125℃		2.40		
			T_J=150℃		2.50		
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℃			2.19		nF
C_{oes}	Output Capacitance				0.19		
C_{res}	Reverse Transfer Capacitance				0.04		

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	V_{CC}=600V, I_C=40A, R_{Gon}=36Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		114		ns
			T_J=125℃		126		
			T_J=150℃		130		
t_r	Rise Time		T_J=25℃		88		ns
			T_J=125℃		96		
			T_J=150℃		102		
$t_{d(off)}$	Turn-off Delay Time	V_{CC}=600V, I_C=40A, R_{Goff}=36Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		338		ns
			T_J=125℃		362		
			T_J=150℃		364		
t_f	Fall Time		T_J=25℃		90		ns
			T_J=125℃		110		
			T_J=150℃		114		
E_{on}	Turn-on Switching Loss	V_{CC}=600V, I_C=40A, R_{Gon}=36Ω, V_{GE}=±15V, di/dt=385A/μs(T_J=150℃), Inductive Load	T_J=25℃		3.7		mJ
			T_J=125℃		4.1		
			T_J=150℃		4.3		

E_{off}	Turn-off Switching Loss	V_{CC}=600V, I_C=40A, R_{Goff}=36Ω, V_{GE}=±15V, du/dt=3855V/μs(T_J=150℃), Inductive Load	T_J=25℃		2.3		mJ
			T_J=125℃		2.5		
			T_J=150℃		2.9		
Q_g	Total Gate Charge	V_{GE}=-15V…+15V	T_J=25℃		457		nC
$R_{G(int)}$	Internal Gate Resistor		T_J=25℃		0		Ω
I_{SC}	V_{CC}=600V, V_{GE}=±15V, tp=10us, T_J=150℃				162		A
$R_{\theta JC}$	Thermal Resistance: Junction-to-Case (per IGBT)					0.42	℃/W

Diode, Inverter
Maximum Rated Values

Symbol	Description	Conditions	Values	Units
V_{RRM}	Repetitive Peak Reverse Voltage	T_J=25℃	1200	V
I_F	Diode Continuous Forward Current	T_C=100℃	40	A
I_{FM}	Peak FWD Current Repetitive	t_p=1ms	80	A

Electrical Characteristics of Diode

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
V_{FM}	Forward Voltage	I_F=40A	T_J=25℃		1.70		V
			T_J=125℃		1.85		
			T_J=150℃		1.85		
I_{rr}	Peak Reverse Recovery Current	I_F=40A, di/dt=432A/μs(T_J=150℃), V_{rr}=600V, V_{GE}=-15V	T_J=25℃		24.3		A
			T_J=125℃		25.4		
			T_J=150℃		25.8		
t_{rr}	Reverse Recovery Time		T_J=25℃		174		ns
			T_J=125℃		190		
			T_J=150℃		208		
Q_{rr}	Reverse Recovery Charge		T_J=25℃		2.2		μC
			T_J=125℃		2.4		
			T_J=150℃		2.8		

E_{rec}	Reverse Recovery Energy	I_F=40A, di/dt=432A/μs(T_J=150℃), V_{rr}=600V, V_{GE}=-15V	T_J=25℃		0.17		mJ
			T_J=125℃		0.18		
			T_J=150℃		0.20		
$R_{\theta JC}$	Thermal Resistance: Junction-to-Case (per Diode)					0.68	℃/W

IGBT, Brake-Chopper
Maximum Rated Values

V_{CES}	Collector-Emitter Blocking Voltage		1200	V
V_{GES}	Gate-Emitter Voltage		±20	V
I_C	Continuous Collector Current	T_C=100℃	40	A
		T_C=25℃	80	A
I_{CM}	Peak Collector Current Repetitive	t_p=1ms	80	A
P_D	Maximum Power Dissipation (IGBT)	T_C=25℃, T_{Jmax}=175℃	355	W

Electrical Characteristics of IGBT

Static Characteristics

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=1.5mA, V_{CE}=V_{GE}, T_J=25℃		5.0	5.7	6.5	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C=40A, V_{GE}=15V	T_J=25℃		1.90	2.30	V
			T_J=125℃		2.40		
			T_J=150℃		2.50		
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℃			2.19		nF
C_{oes}	Output Capacitance				0.19		
C_{res}	Reverse Transfer Capacitance				0.04		

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	V_{CC}=600V, I_C=40A, R_{Gon}=36Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		114		ns
			T_J=125℃		126		
			T_J=150℃		130		
t_r	Rise Time		T_J=25℃		88		ns
			T_J=125℃		96		
			T_J=150℃		102		
$t_{d(off)}$	Turn-off Delay Time	V_{CC}=600V, I_C=40A, R_{Goff}=36Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		338		ns
			T_J=125℃		362		
			T_J=150℃		364		
t_f	Fall Time		T_J=25℃		90		ns
			T_J=125℃		110		
			T_J=150℃		114		
E_{on}	Turn-on Switching Loss	V_{CC}=600V, I_C=40A, R_{Gon}=36Ω, V_{GE}=±15V, di/dt=385A/μs(T_J=150℃), Inductive Load	T_J=25℃		3.7		mJ
			T_J=125℃		4.1		
			T_J=150℃		4.3		
E_{off}	Turn-off Switching Loss	V_{CC}=600V, I_C=40A, R_{Goff} =36Ω, V_{GE}=±15V, du/dt=3855V/μs(T_J=150℃), Inductive Load	T_J=25℃		2.3		mJ
			T_J=125℃		2.5		
			T_J=150℃		2.9		
Q_g	Total Gate Charge	V_{GE}=-15V…+15V	T_J=25℃		457		nC
$R_{G(int)}$	Internal Gate Resistor		T_J=25℃		0		Ω
I_{SC}	V_{CC}=600V, V_{GE}=±15V, tp=10us, T_J=150℃				162		A
$R_{\theta JC}$	Thermal Resistance: Junction-to-Case (per IGBT)					0.42	℃/W

Diode, Brake-Chopper
Maximum Rated Values

Symbol	Description	Conditions	Values	Units
V_{RRM}	Repetitive Peak Reverse Voltage	T_J=25℃	1200	V
I_F	Diode Continuous Forward Current	T_C=100℃	10	A
I_{FM}	Repetitive Peak Forward Current	tp=1ms	20	A

Electrical Characteristics of Diode

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
V_{FM}	Forward Voltage	I_F=10A	T_J=25℃		1.70		V
			T_J=125℃		1.80		
			T_J=150℃		1.75		
t_{rr}	Reverse Recovery Time	I_F=10A, -diF/dt=176A/μs(T_J=150℃), V_{rr}=600V, V_{GE}=-15V	T_J=25℃		217		ns
			T_J=125℃		241		
			T_J=150℃		256		
I_{rr}	Peak Reverse Recovery Current		T_J=25℃		7.4		A
			T_J=125℃		8.4		
			T_J=150℃		8.8		
Q_{rr}	Reverse Recovery Charge		T_J=25℃		0.7		μC
			T_J=125℃		0.8		
			T_J=150℃		0.9		
E_{rec}	Reverse Recovery Energy		T_J=25℃		0.17		mJ
			T_J=125℃		0.35		
			T_J=150℃		0.48		
$R_{\theta JC}$	Diode Thermal Resistance: Junction-to-Case(per Diode)					1.71	℃/W

Diode, Rectifier
Maximum Rated Values

Symbol	Description	Conditions	Values	Units
V_{RRM}	Repetitive Peak Reverse Voltage	T_J=25℃	1800	V
I_{FRMSM}	Maximum RMS Forward Current per Chip	T_C=80℃	40	A
I_{RMSM}	Maximum RMS Current at Rectifier Output	T_C=80℃	65	A
I_{FSM}	Surge Current @t_p=10 ms	T_J=25℃	450	A
		T_J=150℃	370	
I^2t	I^2t - value	T_J=25℃	1000	A^2s
		T_J=150℃	685	

Electrical Characteristics of Diode

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
V_F	Forward Voltage	I_F=40A	T_J=25℃		1.15		V
			T_J=150℃		1.10		
I_R	Reverse Current	V_R=1600V	T_J=25℃			1	mA
$R_{\theta JC}$	Diode Thermal Resistance: Junction-to-Case					0.62	℃/W

Internal NTC-Thermistor Characteristics

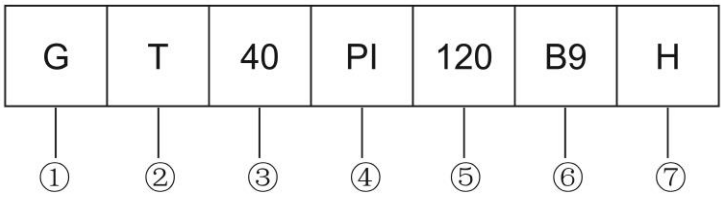
Symbol	Conditions	Min.	Typ.	Max.	Units
R_{25}	T_C=25℃		5		kΩ
△R/R	T_C=100℃, R_{100}=465Ω	-5		+5	%
P_{25}	T_C=25℃			10	mW
$B_{25/50}$	$R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298.15K))]$		3380		K
$B_{25/80}$	$R_2=R_{25}\exp[B_{25/80}(1/T_2-1/(298.15K))]$		3440		K
$B_{25/100}$	$R_2=R_{25}\exp[B_{25/100}(1/T_2-1/(298.15K))]$		3545		K

Module

Symbol	Description		Min.	Typ.	Max.	Units
V_{IOS}	Isolation Voltage (All Terminals Shorted)	RMS, 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)				0.05	℃/W
T	Mounting Torque:M4		1.5		1.8	N·m
G	Weight			40		g

Ordering Information Table

Device code



① - IGBT Module
② - Trench & Field Stop IGBT
③ - Rated Current (40=40A)
④ - Circuit Configuration: PI (Power Integrated)
⑤ - Rated Voltage (120=1200V)
⑥ - Package Type
⑦ - Test Level (Pass the Important Reliability Test-Industrial Grade)

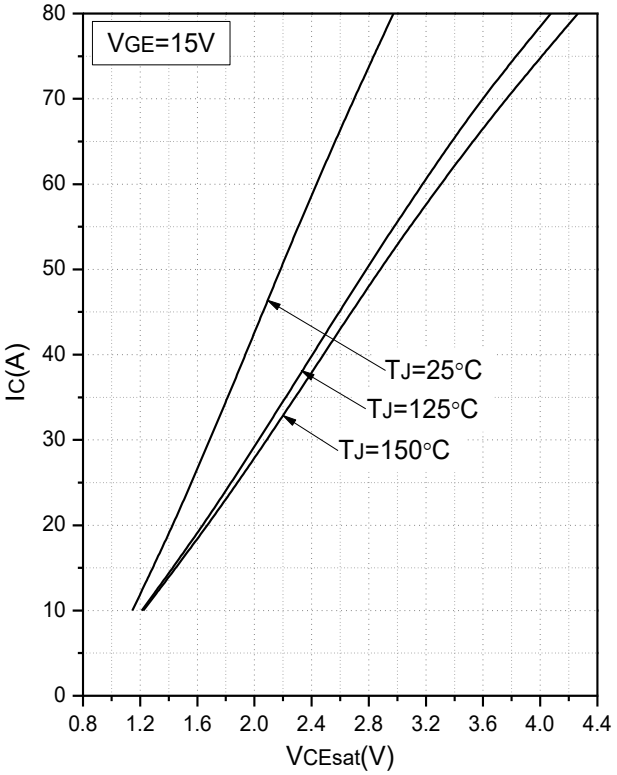


Fig.1 Typical Saturation Voltage Characteristics(Inverter)

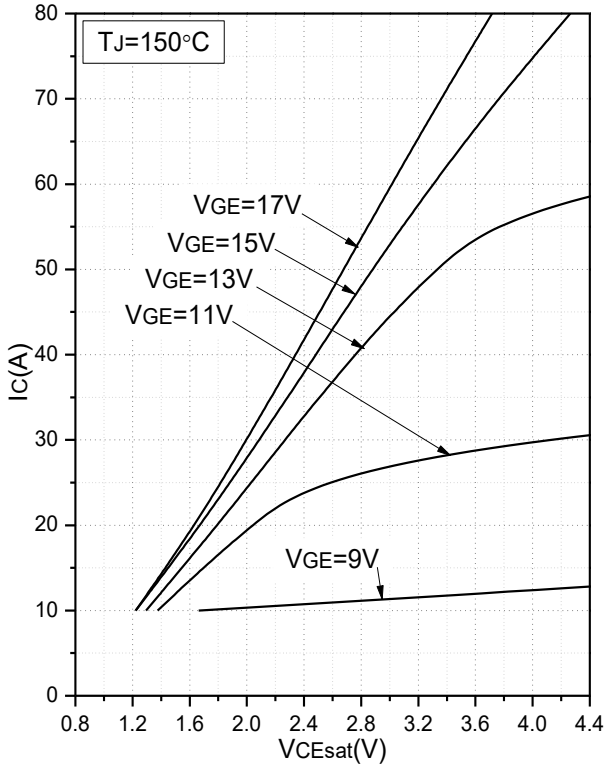


Fig.2 Typical Output Characteristics(Inverter)

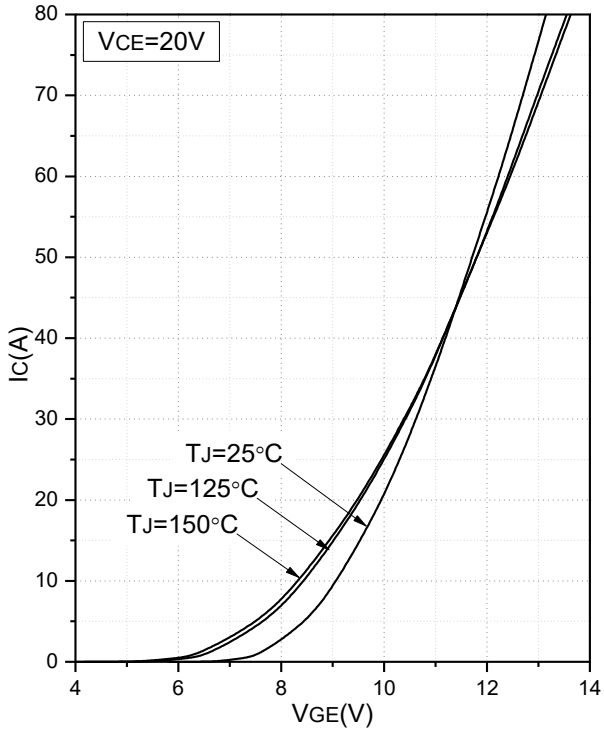


Fig.3 Transfer Characteristic (Inverter)

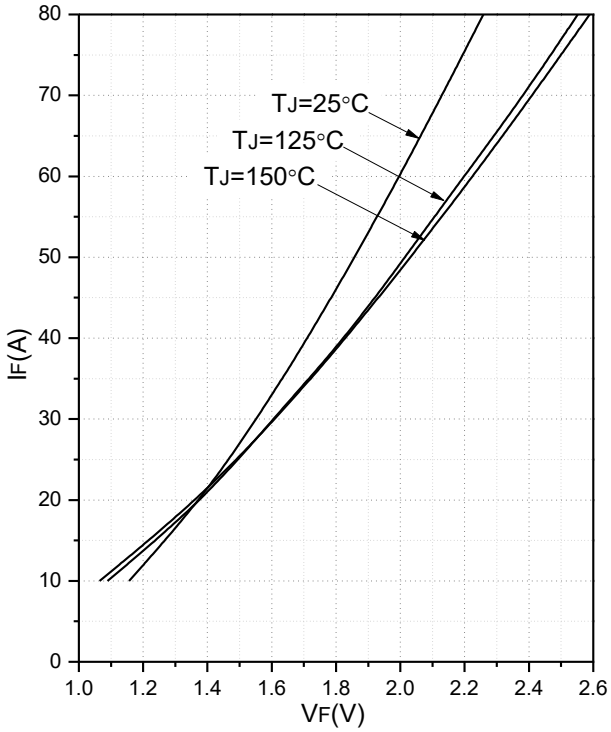


Fig.4 Forward Characteristics of Diode (Inverter)

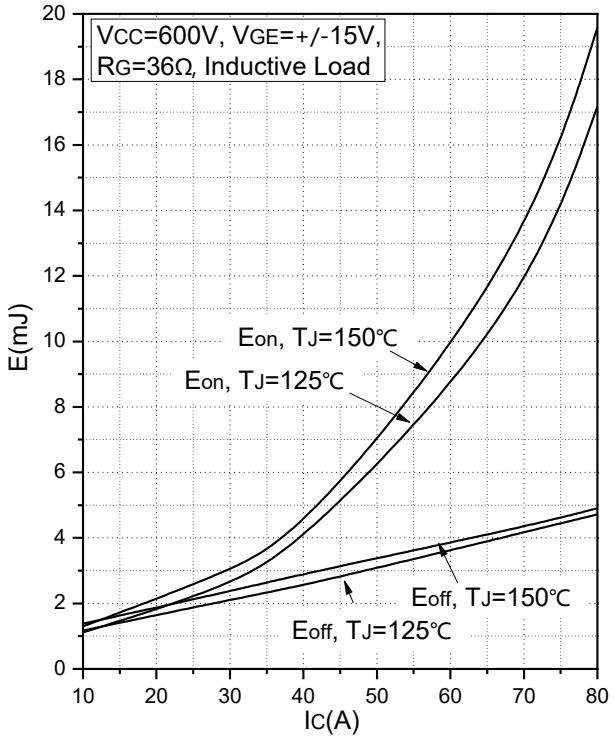


Fig.5 Typical Switching Loss vs. Collector Current(Inverter)

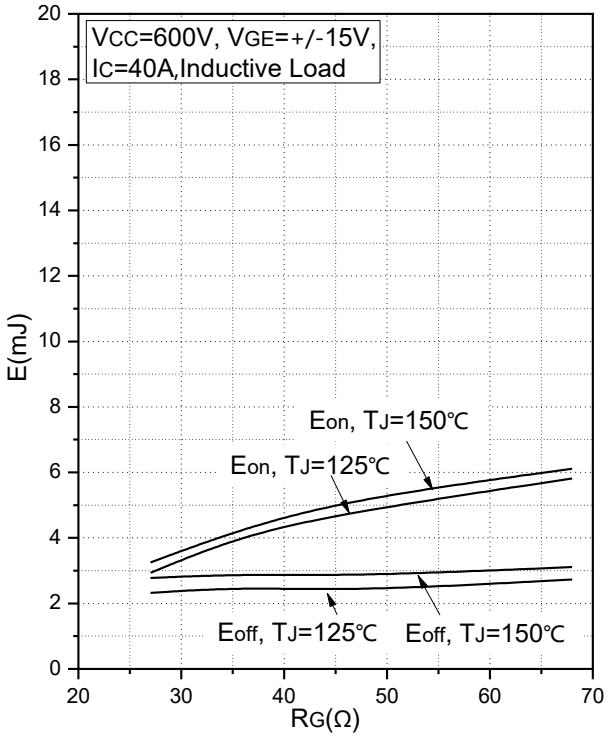


Fig.6 Typical Switching Loss vs. Gate Resistance(Inverter)

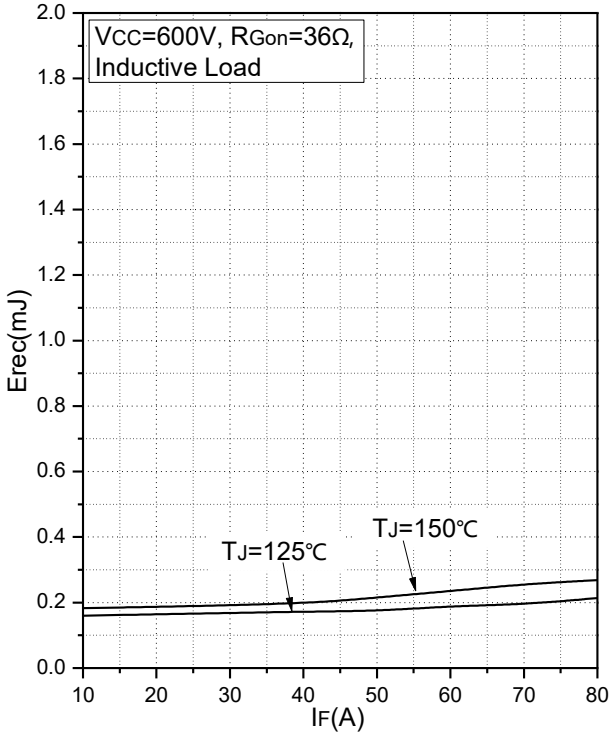


Fig.7 Typical Switching Loss vs. Forward Current(Inverter)

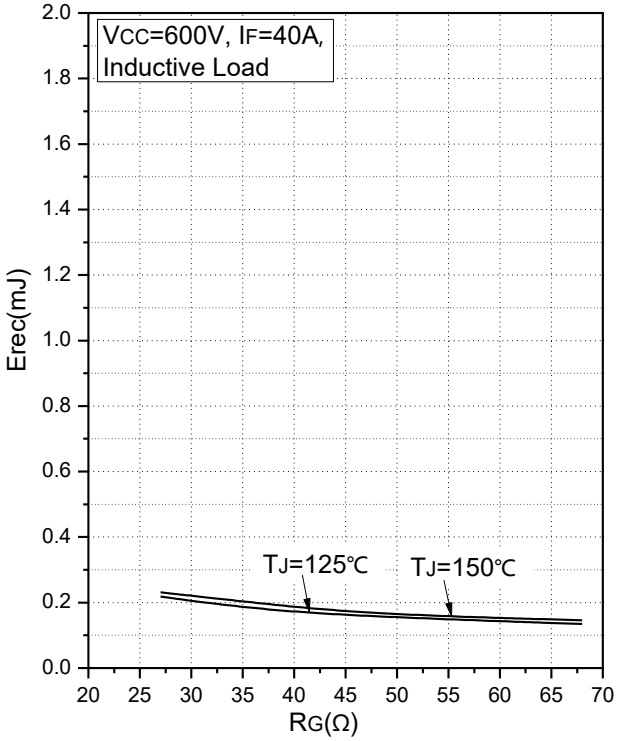


Fig.8 Typical Switching Loss vs. Gate Resistance(Inverter)

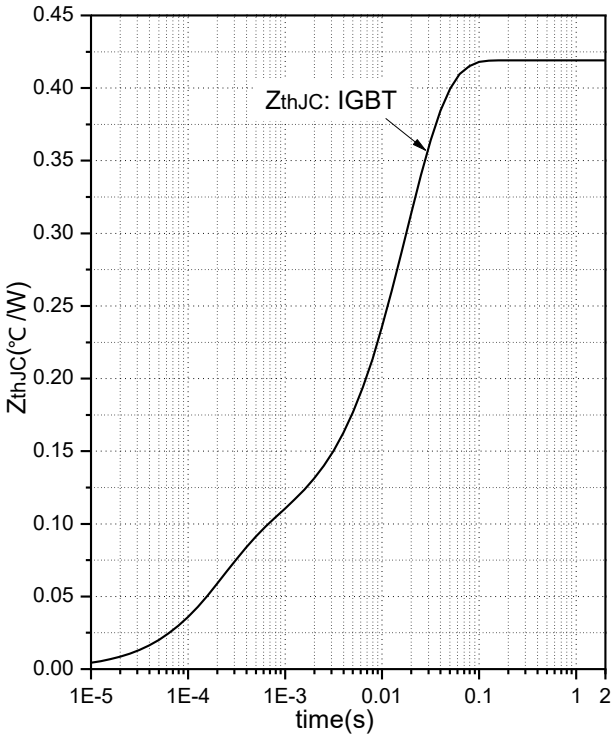


Fig.9 Transient Thermal Impedance (Inverter-IGBT)

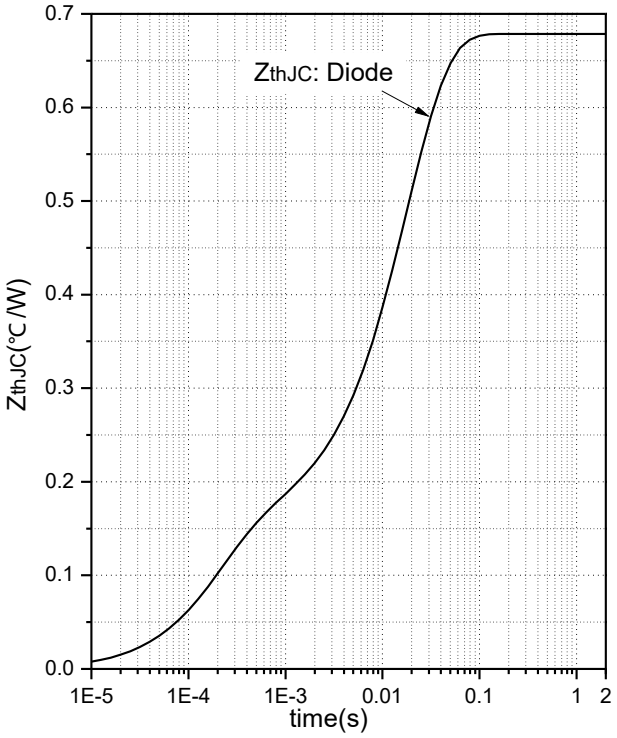


Fig.10 Transient Thermal Impedance (Inverter-Diode)

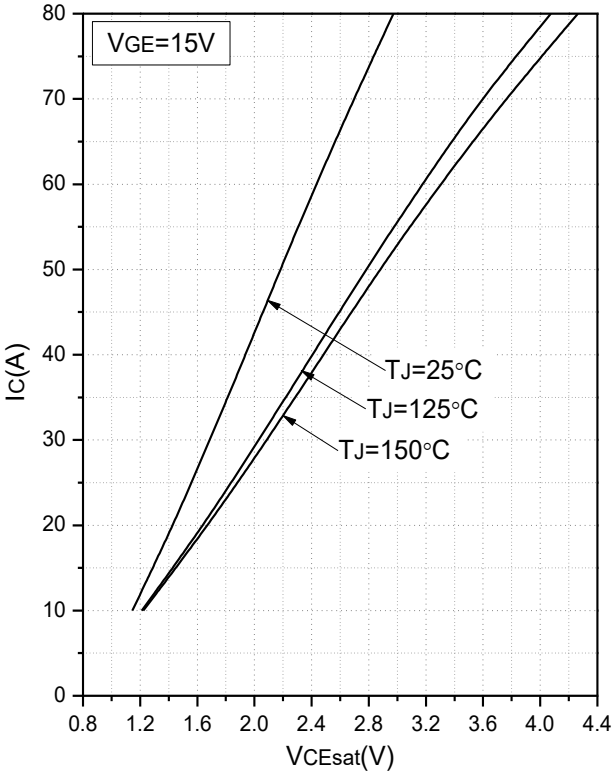


Fig.11 Typical Saturation Voltage Characteristics
(Brake-Chopper)

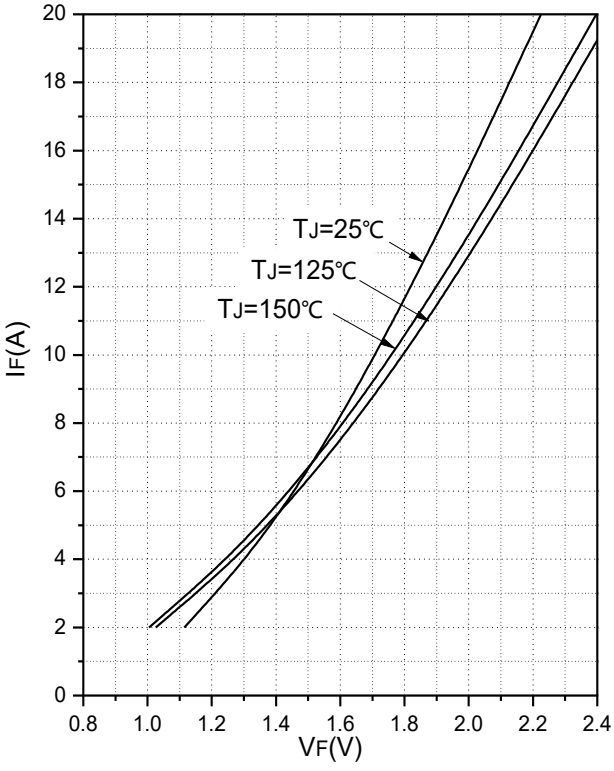


Fig.12 Forward Characteristics of Diode
(Brake-Chopper)

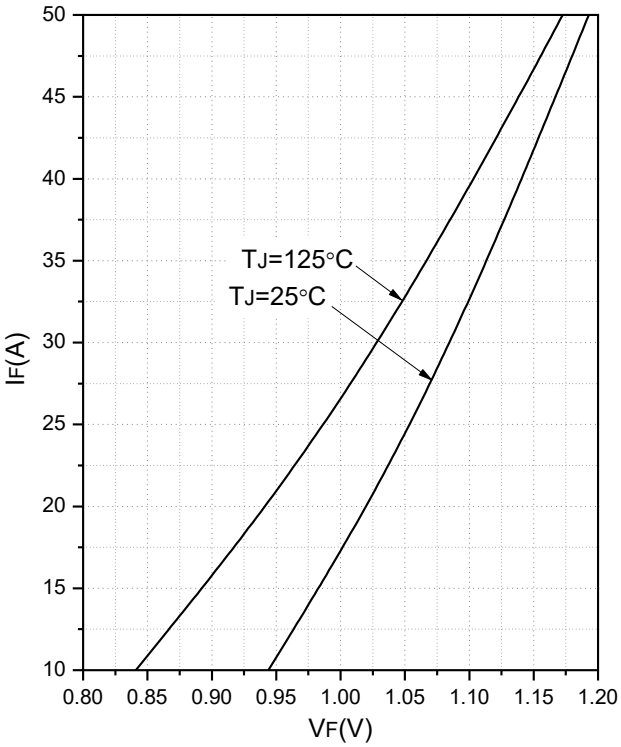


Fig.13 Forward Characteristics of Diode (Rectifier)

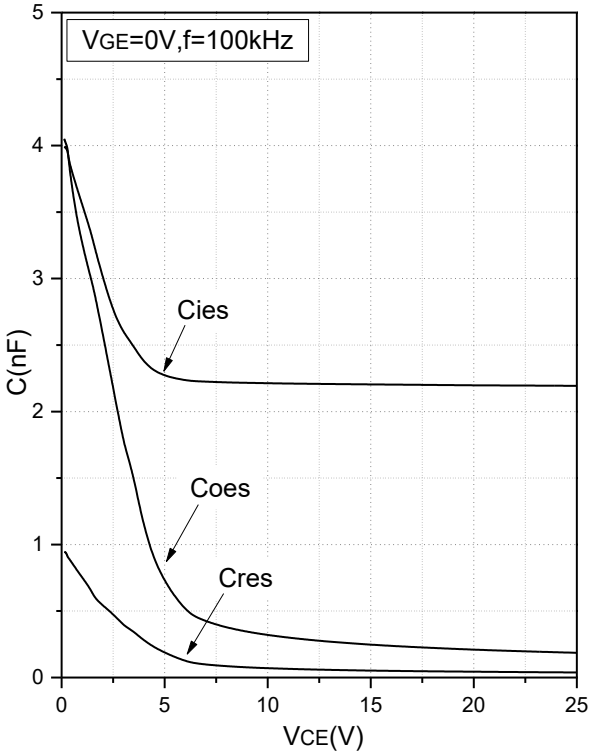


Fig.14 Capacitance Characteristics

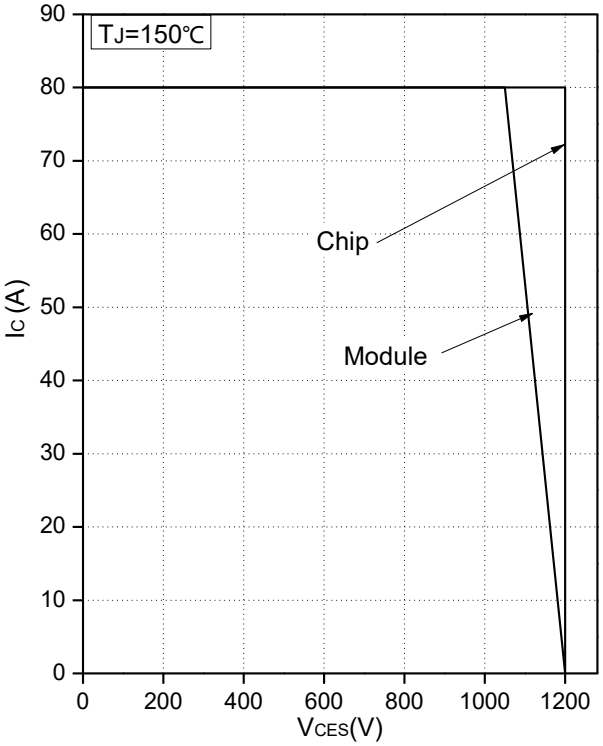


Fig.15 Reverse Bias Safe Operation Area (RBSOA)

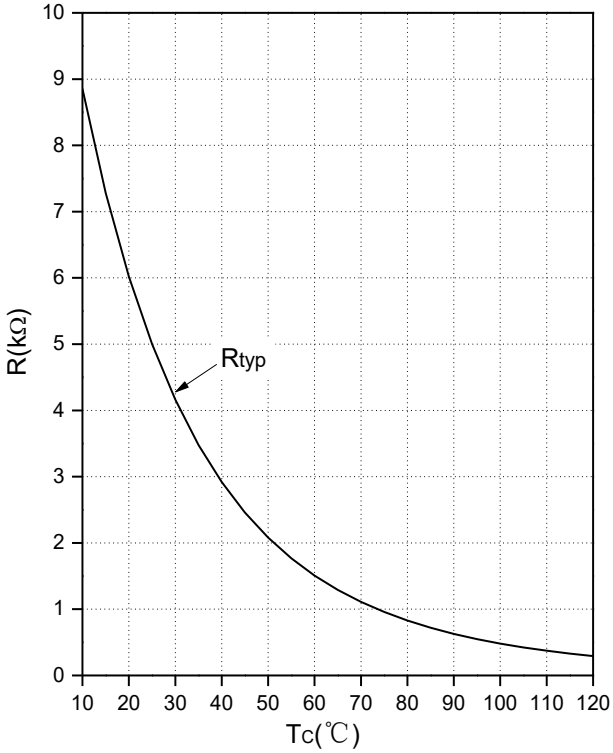
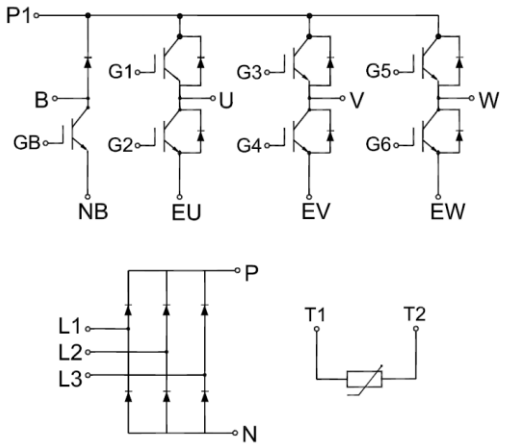
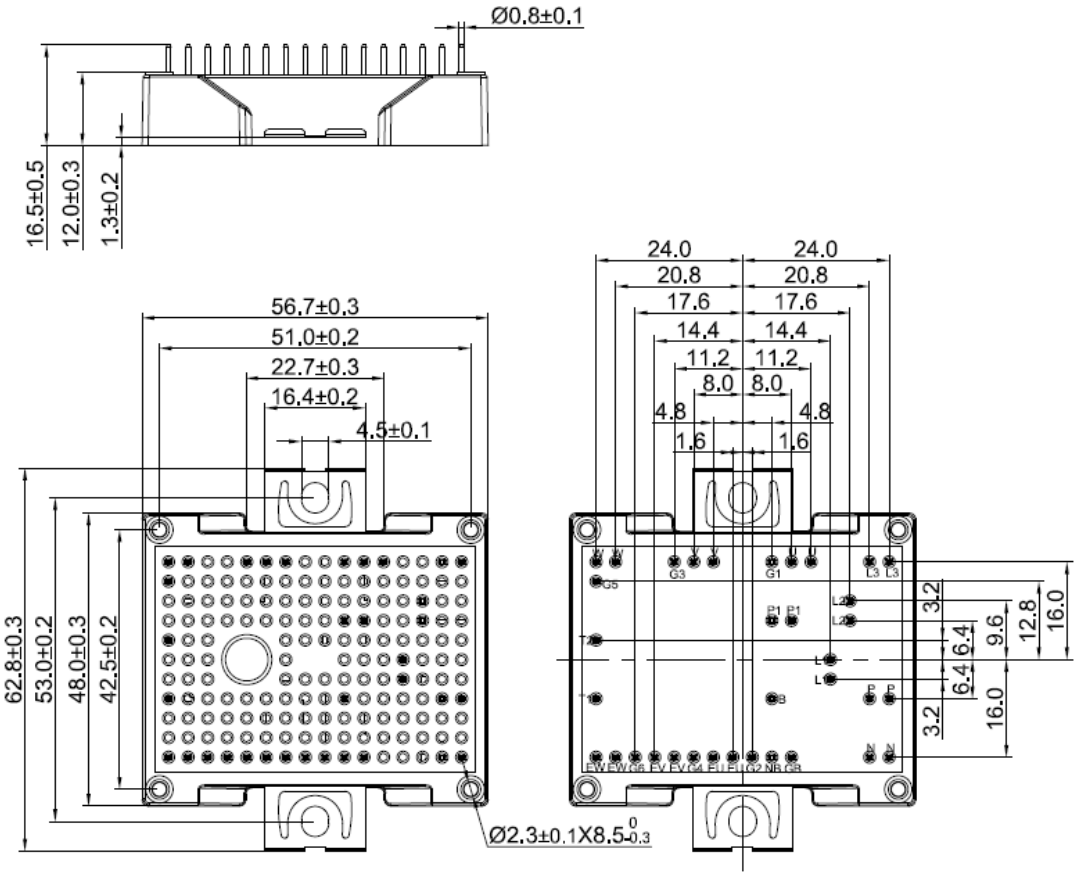


Fig.16 NTC Temperature Characteristics

Internal Circuit:



Package Outline (Unit: mm):



Revision	Notes
01	Initial Release

Announcement

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