GT10PI120B3H

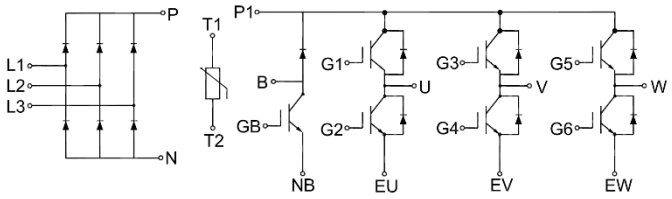
IGBT Module

Preliminary Data

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 (T_C=25℃ unless otherwise specified)

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℃	10	A
		T_C=25℃	20	A
I_{CM}	Peak Collector Current Repetitive	tp=1ms	20	A
P_D	Maximum Power Dissipation per IGBT	T_C=25℃ T_{Jmax}=175℃	155	W

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

Static Characteristics

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=0.35mA, V_{CE}=V_{GE}, T_J=25℃		5.0	5.6	6.5	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C=10A, V_{GE}=15V	T_J=25℃		1.85	2.25	V
			T_J=125℃		2.20		V
			T_J=150℃		2.25		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=100kHz, T_J=25℃			684		pF
C_{oes}	Output Capacitance				80		
C_{res}	Reverse Transfer Capacitance				9		

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	V_{CC}=600V, I_C=10A, R_{Gon}=68Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		72		ns
			T_J=125℃		77		
			T_J=150℃		80		
t_r	Rise Time		T_J=25℃		62		ns
			T_J=125℃		63		
			T_J=150℃		67		
$t_{d(off)}$	Turn-off Delay Time	V_{CC}=600V, I_C=10A, R_{Goff}=68Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		195		ns
			T_J=125℃		197		
			T_J=150℃		197		
t_f	Fall Time		T_J=25℃		435		ns
			T_J=125℃		441		
			T_J=150℃		452		
E_{on}	Turn-on Switching Loss	V_{CC}=600V, I_C=10A, R_{Gon}=68Ω, V_{GE}=±15V, di/dt=119A/μs (T_J=150℃), Inductive Load	T_J=25℃		2.73		mJ
			T_J=125℃		2.86		
			T_J=150℃		3.06		

E_{off}	Turn-off Switching Loss	V_{CC}=600V, I_C=10A, R_{Goff}=68Ω, V_{GE}=±15V, du/dt=1600V/μs (T_J=150℃), Inductive Load	T_J=25℃		0.32		mJ
			T_J=125℃		0.39		
			T_J=150℃		0.41		
Q_g	Total Gate Charge	V_{GE}=+15V…-15V	T_J=25℃		322		nC
$R_{G(int)}$	Internal Gate Resistance				0		Ω
I_{SC}	V_{CC}=600V, V_{GE}=±15V, t=10μs, T_J=150℃				37		A
$R_{\theta JC}$	Thermal Resistance: Junction-to-Case (per IGBT)					0.95	℃/W

Diode, Inverter

Maximum Rated Values (T_C=25℃ unless otherwise specified)

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 (T_C=25℃ unless otherwise specified)

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=194A/μs(T_J=150℃), V_{rr}=600V, V_{GE}=-15V	T_J=25℃		240		ns
			T_J=125℃		253		
			T_J=150℃		258		
I_{rr}	Peak Reverse Recovery Current		T_J=25℃		9.8		A
			T_J=125℃		10.9		
			T_J=150℃		11.5		
Q_{rr}	Reverse Recovery Charge		T_J=25℃		0.7		μC
			T_J=125℃		0.7		
			T_J=150℃		0.8		

E_{rec}	Reverse Recovery Energy	I_F=10A, -diF/dt=194A/μs(T_J=150℃), V_{rr}=600V, V_{GE}=-15V	T_J=25℃		0.15		mJ
			T_J=125℃		0.33		
			T_J=150℃		0.41		
$R_{\theta JC}$	Thermal Resistance: Junction-to-Case (per Diode)					1.71	℃/W

IGBT, Brake-Chopper

Maximum Rated Values (T_C=25℃ unless otherwise specified)

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℃	10	A
		T_C=25℃	20	A
I_{CM}	Peak Collector Current Repetitive	tp=1ms	20	A
P_D	Maximum Power Dissipation per IGBT	T_C=25℃ T_{Jmax}=175℃	155	W

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

Static Characteristics

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=0.35mA, V_{CE}=V_{GE}, T_J=25℃		5.0	5.6	6.5	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C=10A, V_{GE}=15V	T_J=25℃		1.85	2.25	V
			T_J=125℃		2.20		V
			T_J=150℃		2.25		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=100kHz, T_J=25℃			684		pF
C_{oes}	Output Capacitance				80		
C_{res}	Reverse Transfer Capacitance				9		

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	V_{CC}=600V, I_C=10A, R_{Gon}=68Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		72		ns
			T_J=125℃		77		
			T_J=150℃		80		
t_r	Rise Time		T_J=25℃		62		ns
			T_J=125℃		63		
			T_J=150℃		67		
$t_{d(off)}$	Turn-off Delay Time	V_{CC}=600V, I_C=10A, R_{Goff}=68Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		195		ns
			T_J=125℃		197		
			T_J=150℃		197		
t_f	Fall Time		T_J=25℃		435		ns
			T_J=125℃		441		
			T_J=150℃		452		
E_{on}	Turn-on Switching Loss	V_{CC}=600V, I_C=10A, R_{Gon}=68Ω, V_{GE}=±15V, di/dt=119A/μs (T_J=150℃), Inductive Load	T_J=25℃		2.73		mJ
			T_J=125℃		2.86		
			T_J=150℃		3.06		
E_{off}	Turn-off Switching Loss	V_{CC}=600V, I_C=10A, R_{Goff}=68Ω, V_{GE}=±15V, du/dt=1600V/μs (T_J=150℃), Inductive Load	T_J=25℃		0.32		mJ
			T_J=125℃		0.39		
			T_J=150℃		0.41		
Q_g	Total Gate Charge	V_{GE}=+15V…-15V	T_J=25℃		322		nC
$R_{G(int)}$	Internal Gate Resistance				0		Ω
I_{SC}	V_{CC}=600V, V_{GE}=±15V, t=10μs, T_J=150℃				37		A
$R_{\theta JC}$	Thermal Resistance: Junction-to-Case (per IGBT)					0.95	℃/W

Diode, Brake-Chopper

Maximum Rated Values (T_C=25℃ unless otherwise specified)

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 (T_C=25℃ unless otherwise specified)

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=194A/μs(T_J=150℃), V_{rr}=600V, V_{GE}=-15V	T_J=25℃		240		ns
			T_J=125℃		253		
			T_J=150℃		258		
I_{rr}	Peak Reverse Recovery Current		T_J=25℃		9.8		A
			T_J=125℃		10.9		
			T_J=150℃		11.5		
Q_{rr}	Reverse Recovery Charge		T_J=25℃		0.7		μC
			T_J=125℃		0.7		
			T_J=150℃		0.8		
E_{rec}	Reverse Recovery Energy		T_J=25℃		0.15		mJ
			T_J=125℃		0.33		
			T_J=150℃		0.41		
$R_{\theta JC}$	Thermal Resistance: Junction-to-Case (per Diode)					1.71	℃/W

Diode, Rectifier

Maximum Rated Values (T_C=25℃ unless otherwise specified)

V_{RRM}	Repetitive Peak Reverse Voltage	T_J=25℃	1800	V
I_{FRMSM}	Maximum RMS Forward Current per Chip	T_C=80℃	20	A
I_{RMSM}	Maximum RMS Current at Rectifier Output	T_C=80℃	30	A
I_{FSM}	Surge Current @t_p=10ms	T_J=25℃	300	A
		T_J=150℃	245	
I^2t	I²t - value	T_J=25℃	450	A^2s
		T_J=150℃	300	

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

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
V_F	Forward Voltage	I_F=10A	T_J=25℃		1.05		V
			T_J=125℃		1.00		
I_R	Reverse Current	V_R=1600V	T_J=25℃			1	mA
$R_{\theta JC}$	Diode Thermal Resistance: Junction-to-Case (per Diode)					0.94	℃/W

Internal NTC-Thermistor Characteristics

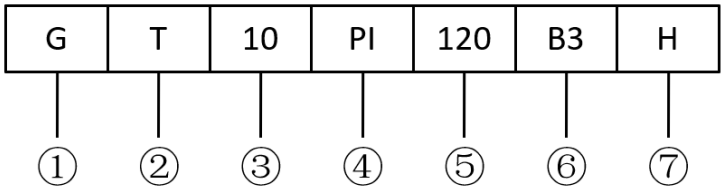
Symbol	Conditions	Min.	Typ.	Max.	Units
R_{25}	T_C=25℃		5		kΩ
△R/R	T_C=100℃, R_{100}=465Ω	-5		+5	%
P_{25}	T_C=25℃			10	mW
$B_{25/50}$	$R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298.15K))]$		3380		K
$B_{25/80}$	$R_2=R_{25}\exp[B_{25/80}(1/T_2-1/(298.15K))]$		3440		K
$B_{25/100}$	$R_2=R_{25}\exp[B_{25/100}(1/T_2-1/(298.15K))]$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

Module

Symbol	Description		Min.	Typ.	Max.	Units
V_{iso}	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)				0.08	℃/W
T	Mounting Screw:M4		1.5		1.8	N·m
G	Weight			23		g

Ordering Information Table

Device code



① - IGBT Module
② - Trench, Low Switching Losses IGBT
③ - Rated Current (10=10A)
④ - Circuit Configuration (Power Integrated)
⑤ - Rated Voltage (120=1200V)
⑥ - Package Type
⑦ - Test Level (Pass the Important Reliability Test-Industrial Grade)

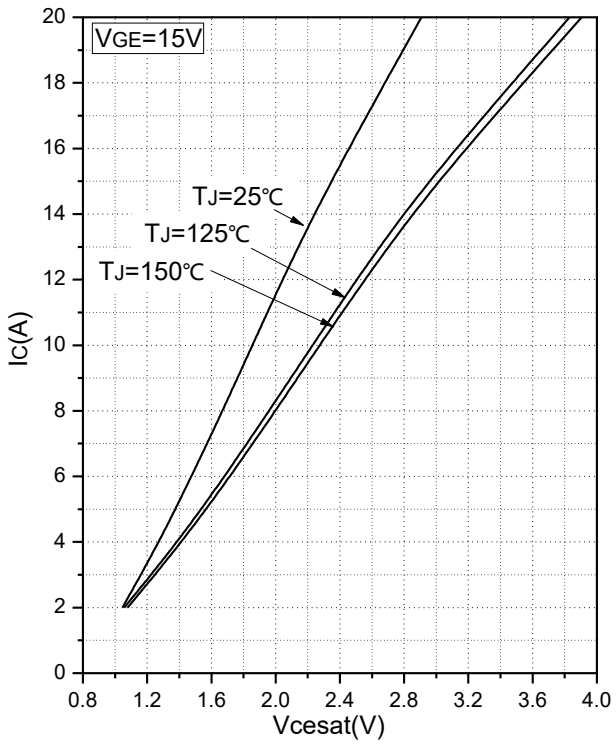


Fig.1 Typical Saturation Voltage Characteristics (Inverter)

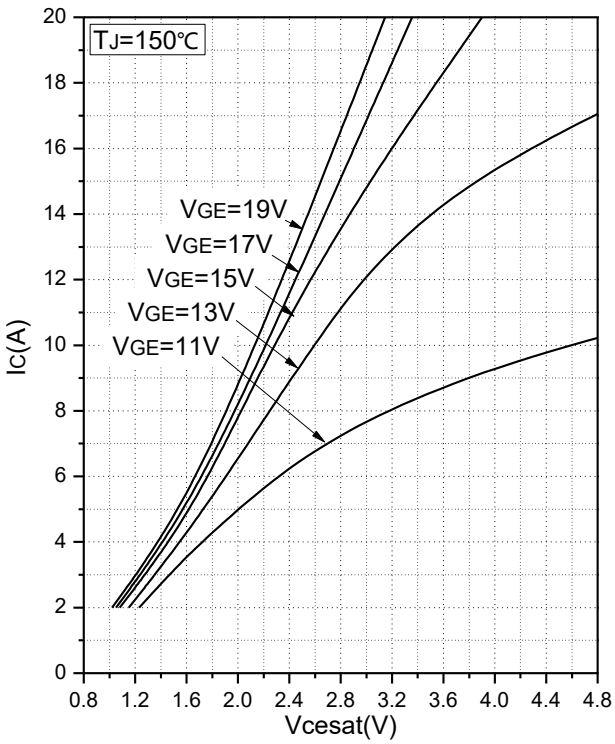


Fig.2 Typical Output Characteristics (Inverter)

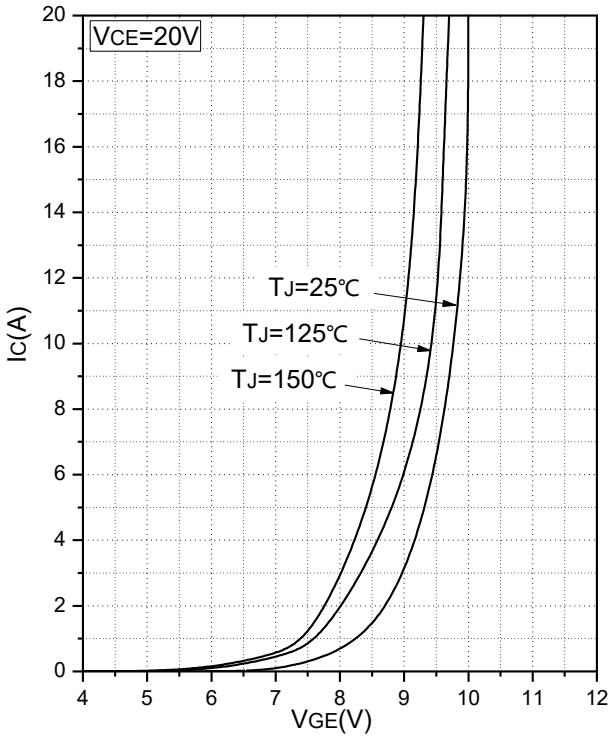


Fig.3 Transfer Characteristic (Inverter)

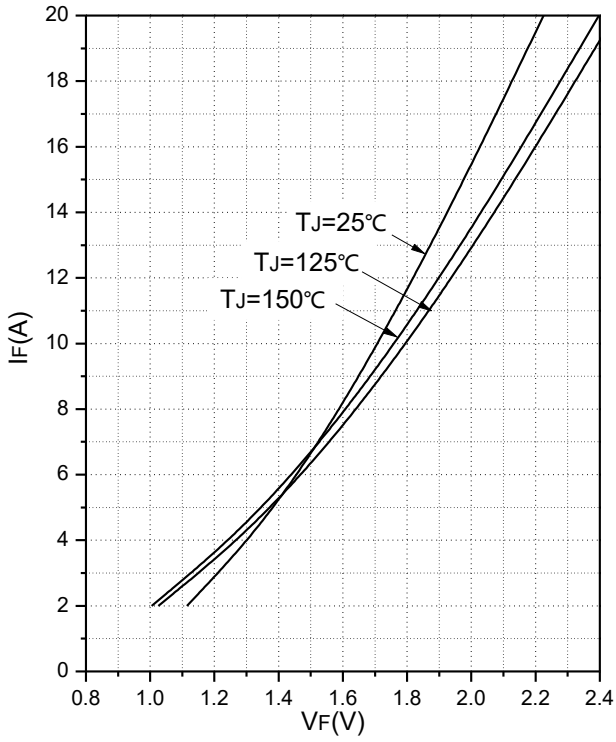


Fig.4 Forward Characteristics of Diode (Inverter)

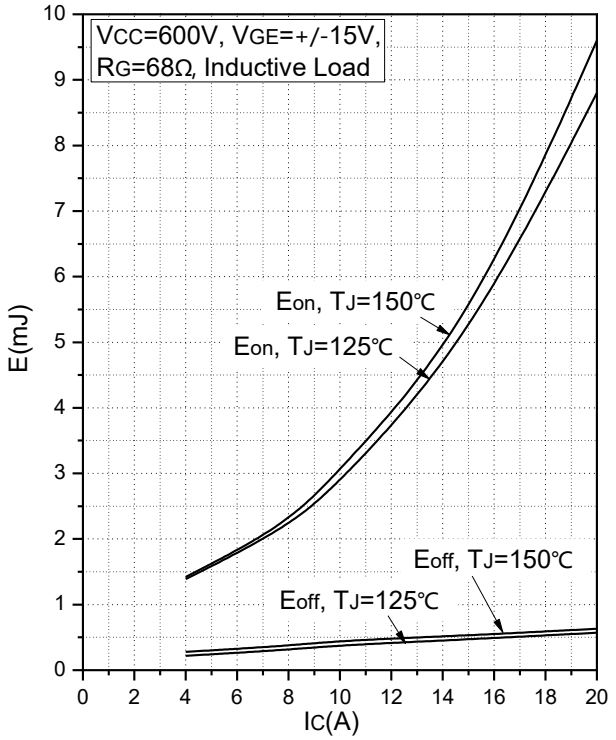


Fig.5 Typical Switching Loss vs. Collector Current (Inverter)

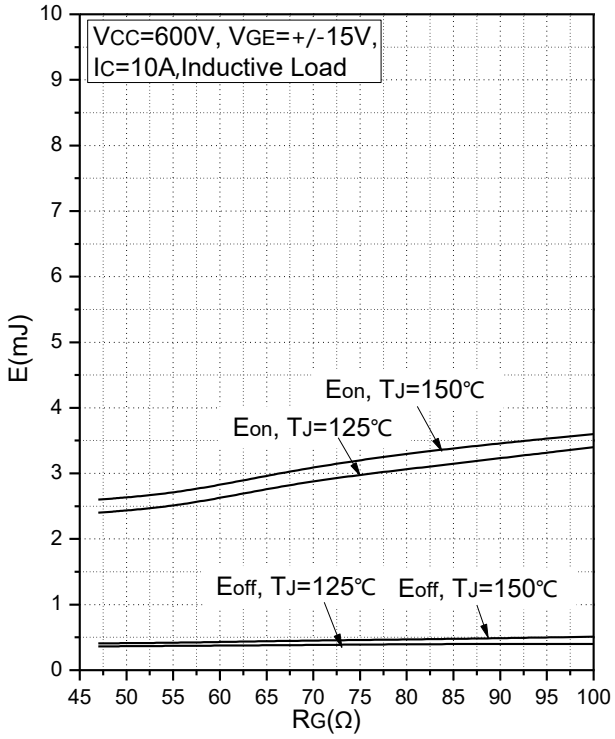


Fig.6 Typical Switching Loss vs. Gate Resistance (Inverter)

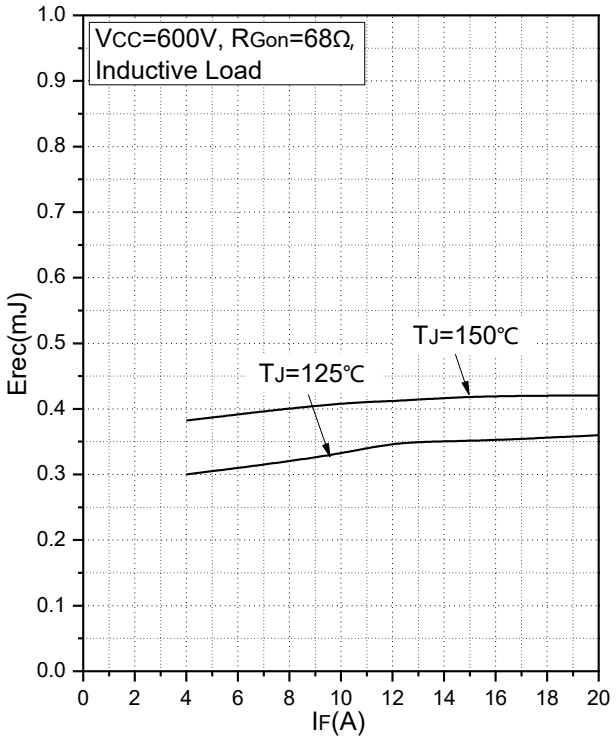


Fig.7 Typical Switching Loss vs. Forward Current (Inverter)

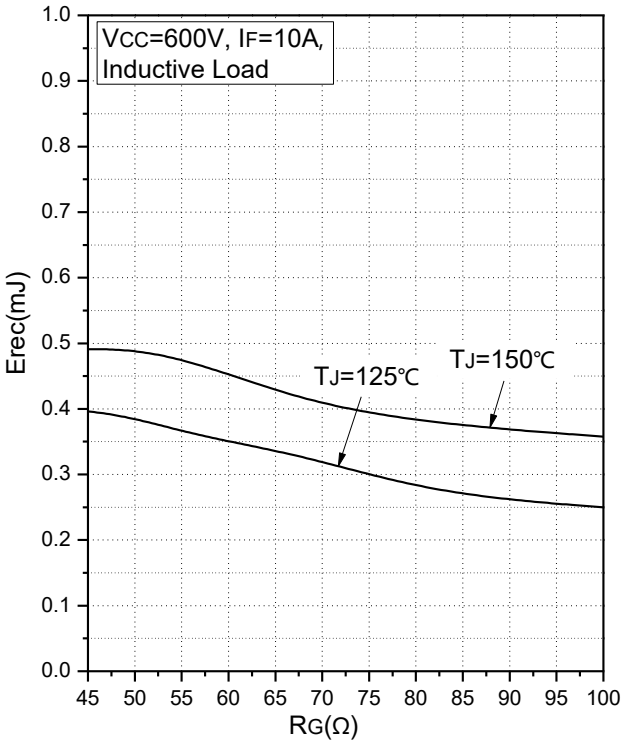


Fig.8 Typical Switching Loss vs. Gate Resistance (Inverter)

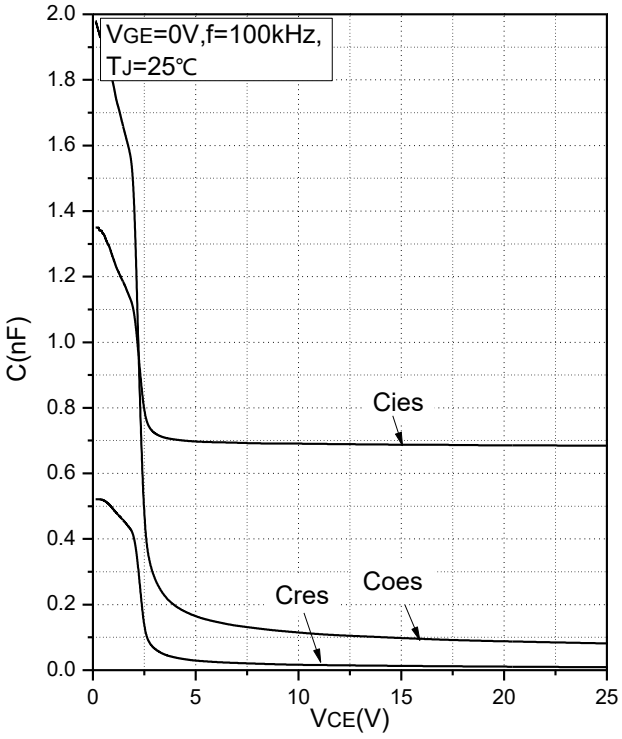


Fig.9 Capacitance Characteristics (Inverter)

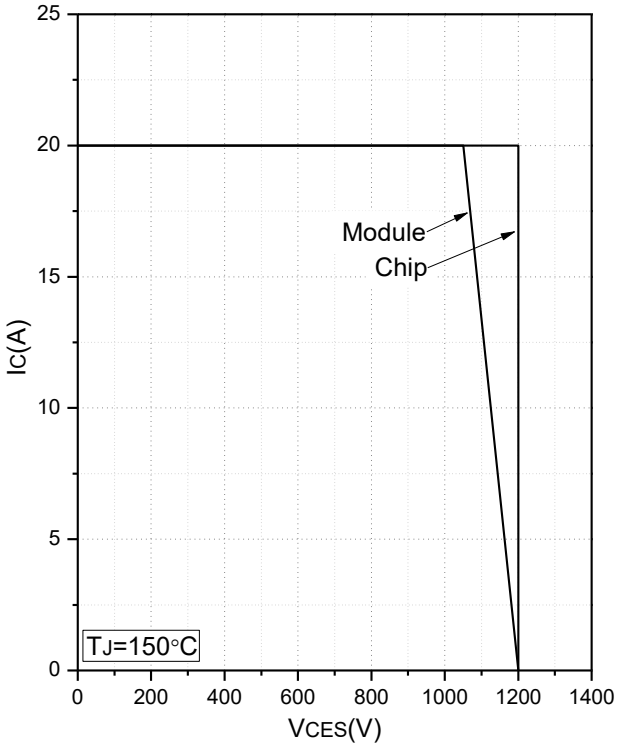


Fig.10 Reverse Bias Safe Operation Area (Inverter)

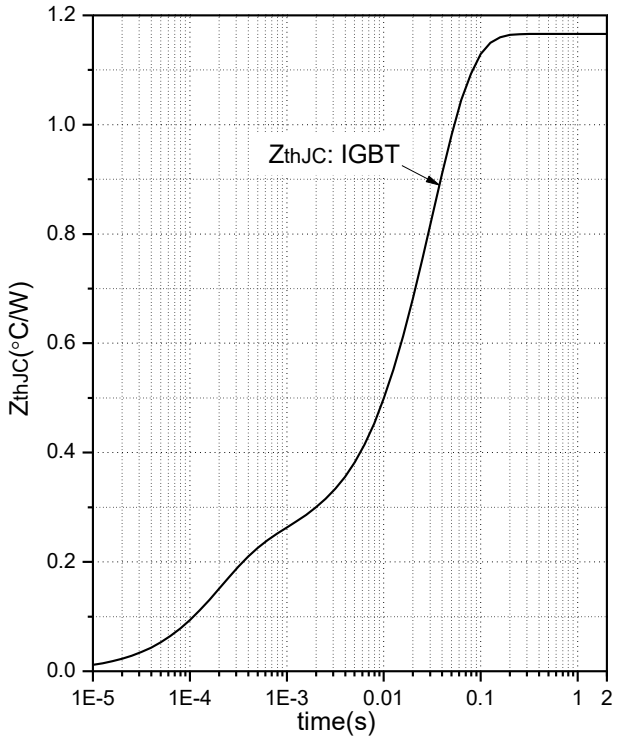


Fig.11 Transient Thermal Impedance IGBT (Inverter)

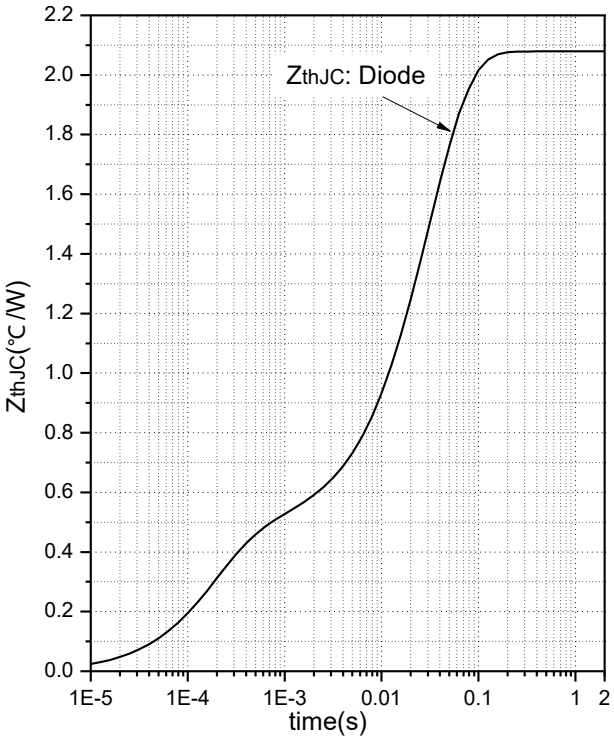
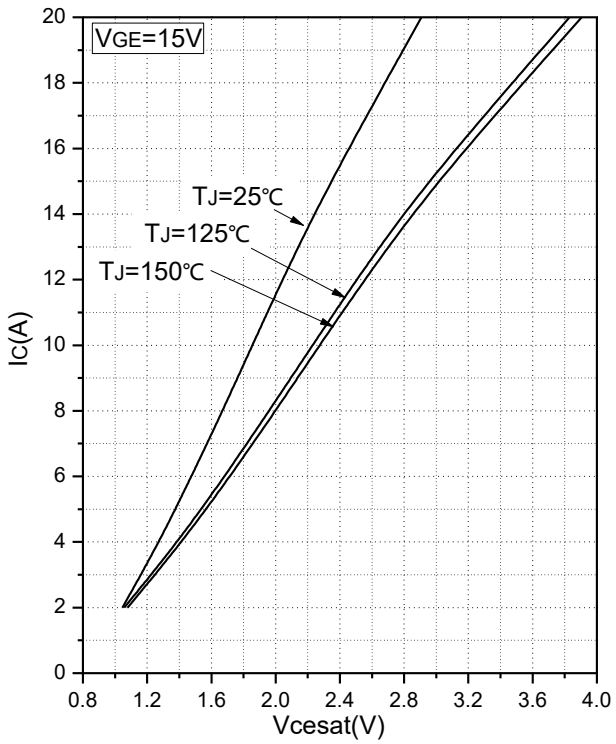


Fig.12 Transient Thermal Impedance Diode (Inverter)



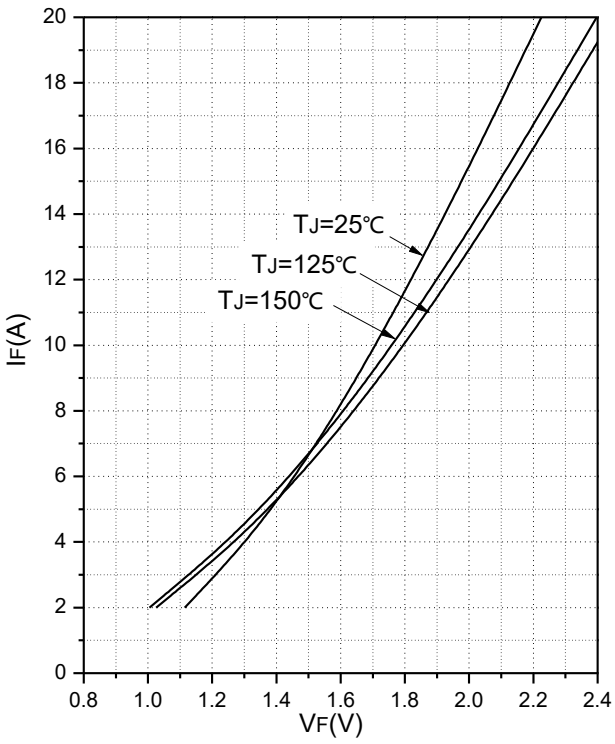
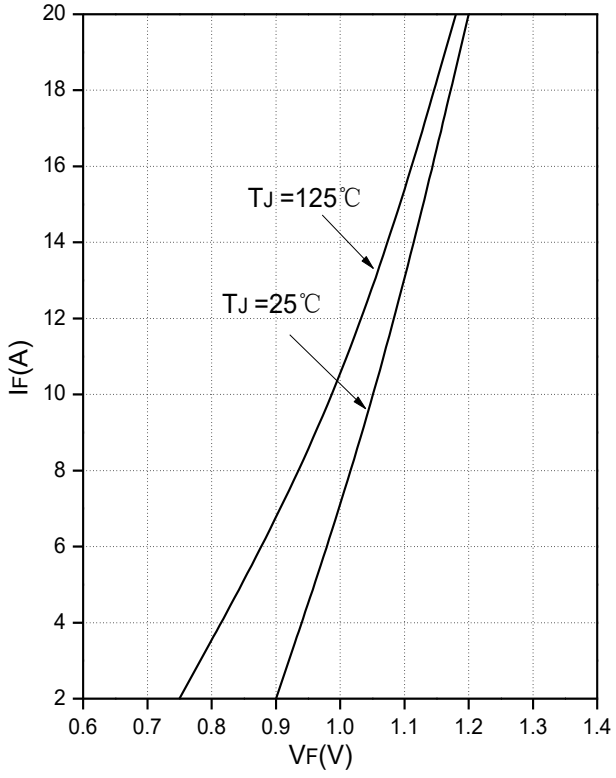


Fig.13 Typical Saturation Voltage Characteristics (Brake-Chopper) Fig.14 Forward Characteristics of Diode (Brake-Chopper)



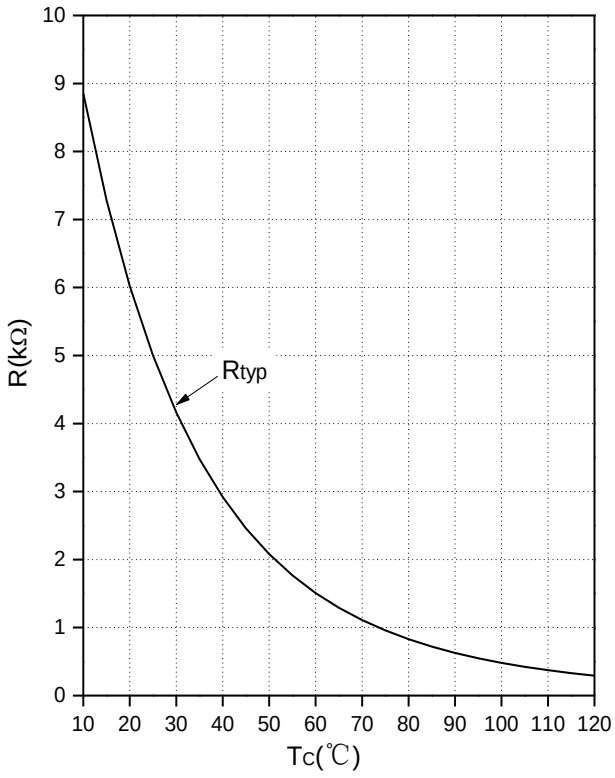
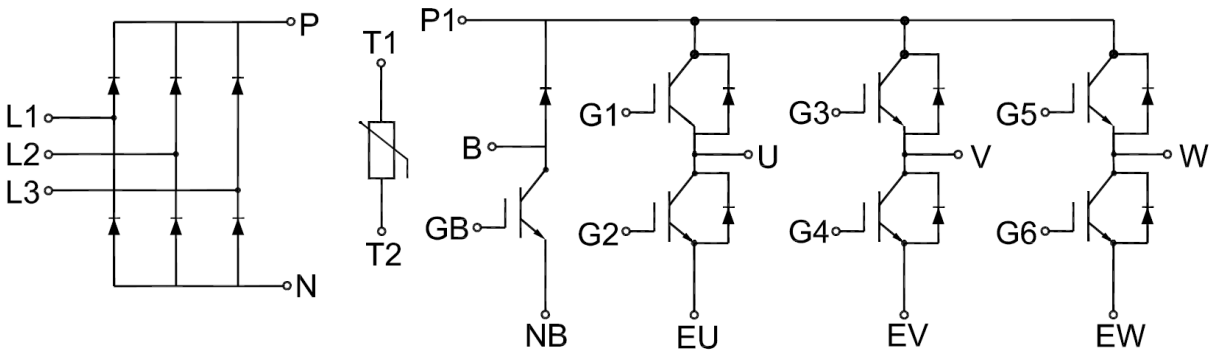


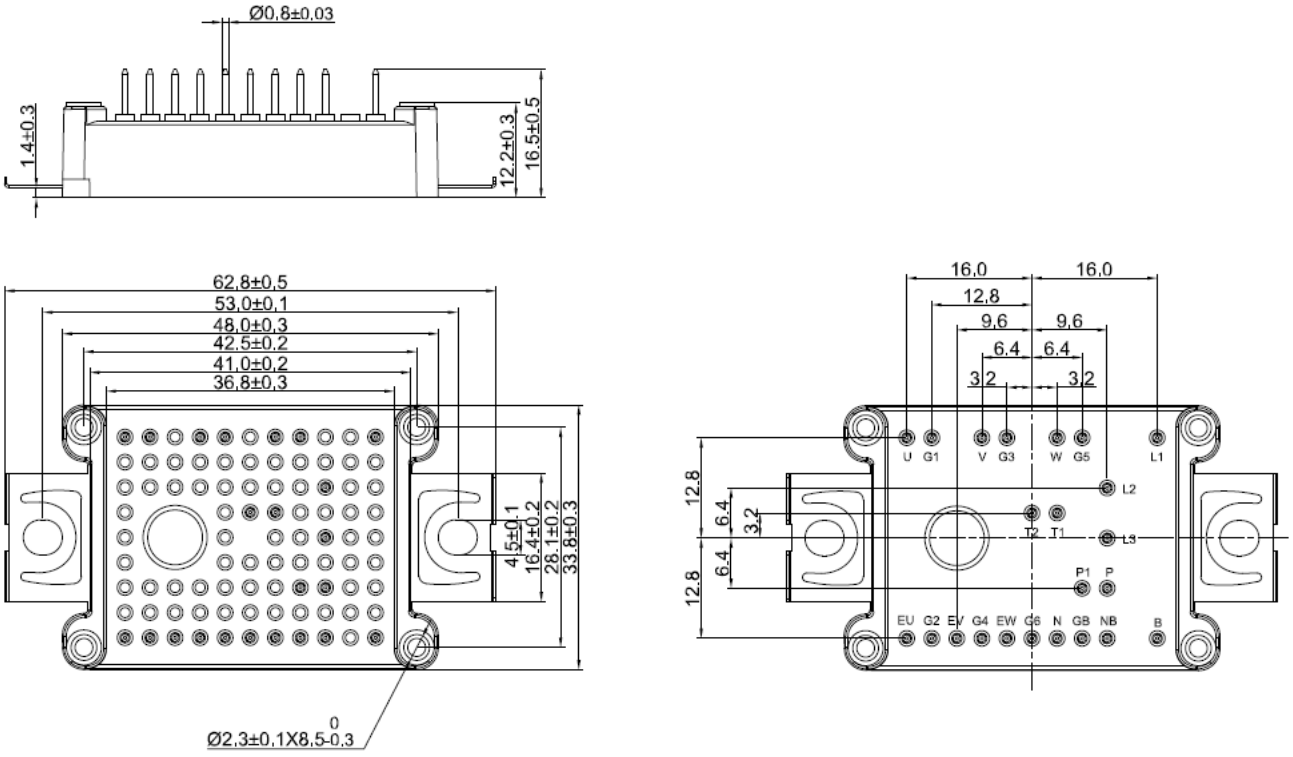
Fig.15 Forward Characteristics of Diode (Rectifier)

Fig.16 NTC Temperature Characteristics

Internal Circuit



Package Outline (Unit: mm):



Revision	Notes
01	Initial Release

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”.