GT15PI120T5H-T4

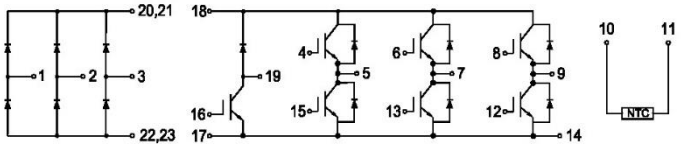
IGBT Module

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:

- Industrial Inverters
- Servo Applications

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℃	15	A
		T_C=25℃	30	A
I_{CM}	Repetitive Peak Collector Current	tp=1ms	30	A
P_D	Maximum Power Dissipation per IGBT	T_C=25℃ T_{Jmax}=175℃	170	W

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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=1mA, V_{CE}=V_{GE}, T_J=25℃		5.00	5.90	6.50	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C=15A, V_{GE}=15V	T_J=25℃		1.85	2.00	V
			T_J=125℃		2.05		
			T_J=150℃		2.10		
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=100kHz, T_J=25℃			1.45		nF
C_{oes}	Output Capacitance				0.10		
C_{res}	Reverse Transfer Capacitance				0.06		

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	V_{CC}=600V, I_C=15A, R_{Gon}=68Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		115		ns
			T_J=125℃		140		
			T_J=150℃		154		
t_r	Rise Time		T_J=25℃		95		ns
			T_J=125℃		95		
			T_J=150℃		102		
$t_{d(off)}$	Turn-off Delay Time	V_{CC}=600V, I_C=15A, R_{Goff}=68Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		158		ns
			T_J=125℃		166		
			T_J=150℃		166		
t_f	Fall Time		T_J=25℃		331		ns
			T_J=125℃		422		
			T_J=150℃		416		
E_{on}	Turn-on Switching Loss	V_{CC}=600V, I_C=15A, R_{Gon}=68Ω, V_{GE}=±15V, di/dt=117A/μs(T_J=150℃), Inductive Load	T_J=25℃		3.25		mJ
			T_J=125℃		4.01		
			T_J=150℃		4.38		

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E_{off}	Turn-off Switching Loss	V_{CC}=600V, I_C=15A, R_{Goff}=68Ω, V_{GE}=±15V, du/dt=1963V/μs(T_J=150℃), Inductive Load	T_J=25℃		0.76		mJ
			T_J=125℃		1.16		
			T_J=150℃		1.27		
Q_g	Total Gate Charge	V_{GE}=+15V…-15V	T_J=25℃		363		nC
$R_{g\ internal}$	Internal Gate Resistor	T_J=25℃			0		Ω
SCSOA	V_{CC}=600V, V_{GE}=±15V, R_{Gon}=68Ω, R_{Goff}=68Ω, T_J=125℃			10			μs
$R_{θJC}$	Thermal Resistance: Junction-to-Case (per IGBT)					0.873	℃/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		15	A
I_{FM}	Diode Maximum Forward Current	tp=1ms	30	A

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

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
V_{FM}	Forward Voltage	I_F=15A	T_J=25℃		1.90		V
			T_J=125℃		2.05		
			T_J=150℃		2.00		
t_{rr}	Reverse Recovery Time	I_F=15A, -diF/dt=174A/μs(T_J=150℃), V_{rr}=600V, V_{GE}=-15V	T_J=25℃		241		ns
			T_J=125℃		249		
			T_J=150℃		276		
I_{rr}	Peak Reverse Recovery Current		T_J=25℃		15.6		A
			T_J=125℃		20.6		
			T_J=150℃		16.3		
Q_{rr}	Reverse Recovery Charge		T_J=25℃		0.89		μC
			T_J=125℃		1.34		
			T_J=150℃		1.38		

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E_{rec}	Reverse Recovery Energy	I_F=15A, -diF/dt=174A/μs(T_J=150℃), V_{rr}=600V, V_{GE}=-15V	T_J=25℃		0.12		mJ
			T_J=125℃		0.13		
			T_J=150℃		0.14		
$R_{\theta JC}$	Diode Thermal Resistance: Junction-to-Case(per Diode)					1.282	℃/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℃	10	A
		T_C=25℃	20	A
I_{CM}	Peak Collector Current Repetitive	tp=1ms	20	A
P_D	Maximum Power Dissipation (IGBT)	T_C=25℃, T_{Jmax}=175℃	138	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℃		5.00	5.70	6.50	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C=10A, V_{GE}=15V	T_J=25℃		1.85	2.10	V
			T_J=125℃		2.10		
			T_J=150℃		2.15		
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=100kHz, T_J=25℃			0.972		nF
C_{oes}	Output Capacitance				0.043		
C_{res}	Reverse Transfer Capacitance				0.012		

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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℃		101		ns
			T_J=125℃		84		
			T_J=150℃		93		
t_r	Rise Time		T_J=25℃		62		ns
			T_J=125℃		61		
			T_J=150℃		55		
$t_{d(off)}$	Turn-off Delay Time	V_{CC}=600V, I_C=10A, R_{Goff}=68Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		166		ns
			T_J=125℃		172		
			T_J=150℃		172		
t_f	Fall Time		T_J=25℃		382		ns
			T_J=125℃		573		
			T_J=150℃		546		
E_{on}	Turn-on Switching Loss	V_{CC}=600V, I_C=10A, R_{Gon}=68Ω, V_{GE}=±15V, di/dt=145A/μs(T_J=150℃), Inductive Load	T_J=25℃		2.25		mJ
			T_J=125℃		2.55		
			T_J=150℃		2.61		
E_{off}	Turn-off Switching Loss	V_{CC}=600V, I_C=10A, R_{Goff} =68Ω, V_{GE}=±15V, du/dt=1532V/μs(T_J=150℃), Inductive Load	T_J=25℃		0.31		mJ
			T_J=125℃		0.62		
			T_J=150℃		0.75		
Q_g	Total Gate Charge	V_{GE}=-15V…+15V	T_J=25℃		340		nC
$R_{g\ internal}$	Internal Gate Resistor		T_J=25℃		0		Ω
I_{SC}	V_{CC}=600V, V_{GE}=±15V, tp=10us, R_{Gon}=68Ω, R_{Goff}=68Ω, T_J=125℃				53		A
$R_{\theta JC}$	Thermal Resistance: Junction-to-Case (per IGBT)					1.093	℃/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		10	A
I_{FM}	Peak FWD Current Repetitive	tp=1ms	20	A

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Electrical Characteristics of FWD (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℃		1.80		
I_{rr}	Peak Reverse Recovery Current	I_F=10A, -di_F/dt=208A/μs(T_J=150℃), V_{rr}=600V, V_{GE}=-15V	T_J=25℃		6.6		A
			T_J=125℃		7.2		
			T_J=150℃		8.4		
t_{rr}	Reverse Recovery Time		T_J=25℃		279		ns
			T_J=125℃		305		
			T_J=150℃		392		
Q_{rr}	Reverse Recovery Charge		T_J=25℃		1.05		μC
			T_J=125℃		1.46		
			T_J=150℃		1.91		
E_{rec}	Reverse Recovery Energy		T_J=25℃		0.18		mJ
			T_J=125℃		0.25		
			T_J=150℃		0.43		
$R_{\theta JC}$	Thermal Resistance: Junction-to-Case (per Diode)					1.451	℃/W

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

V_{RRM}	Repetitive Peak Reverse Voltage	T_J=25℃	1600	V
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=10 ms	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 (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 =150℃		1.00		
I_R	Reverse Current	V_R=1600V	T_J =25℃			1	mA
$R_{\theta JC}$	Diode Thermal Resistance: Junction-To-Case					1.074	℃/W

Internal NTC-Thermistor Characteristics

R_{25}	T_C=25℃	5		kΩ
△R/R	T_C=100℃, R_{100} =465Ω		±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

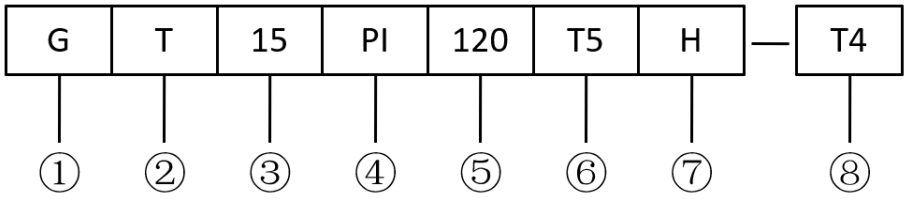
Module

Symbol	Description		Min.	Typ.	Max.	Units
V_{iso}	Isolation Voltage (All Terminals Shorted)	RMS, f=50Hz, t=30s	4500			V
Internal Isolation			Al_2O_3			
T_J	Maximum Junction Temperature				175	℃
T_{JOP}	Maximum Operating Junction Temperature Range		-40		+150	℃
T_{stg}	Storage Temperature		-40		+150	℃
CTI	Comparative Tracking Index		200			
$R_{\theta CS}$	Case-To-Sink Thermally (Conductive Grease Applied)				0.04	℃/W
T	Mounting Screw:M5		3.0		6.0	N·m
G	Weight			200		g

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Ordering Information Table

Device code



① - IGBT Module
② - Trench, Low Switching Losses 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)
⑧ - Internal Control Code

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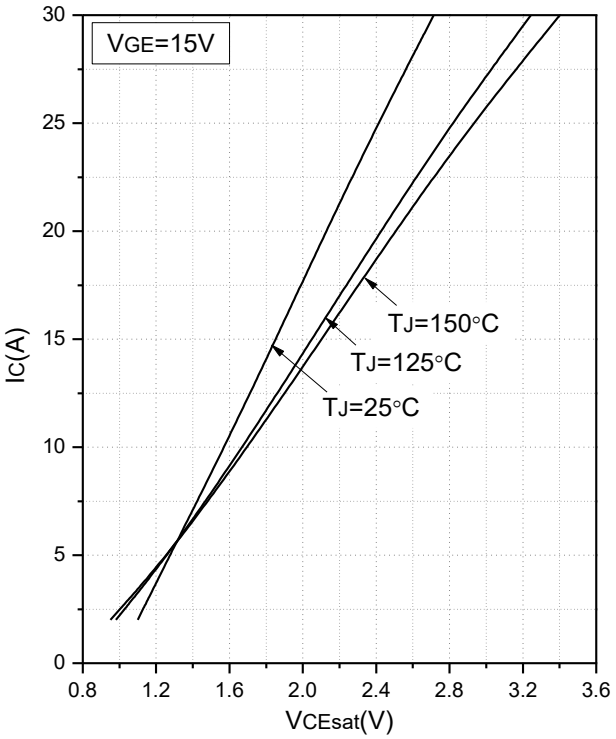


Fig.1 Typical Saturation Voltage Characteristics (Inverter)

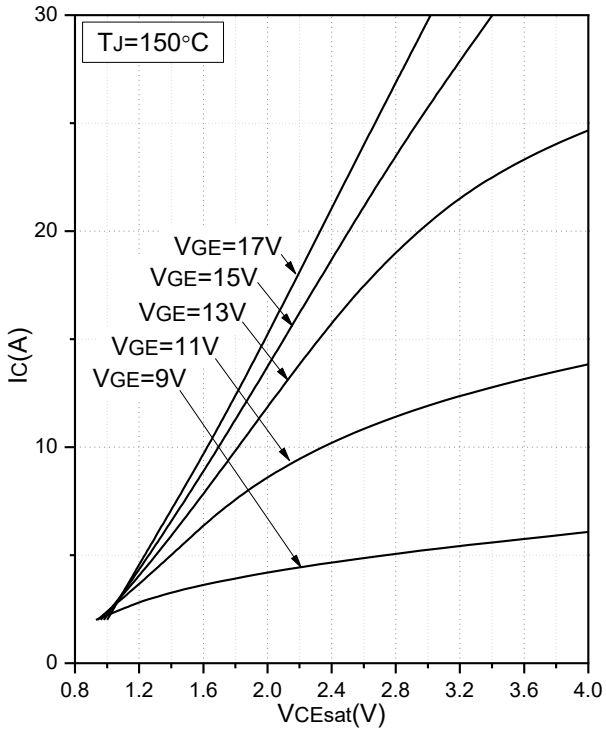


Fig.2 Typical Output Characteristics (Inverter)

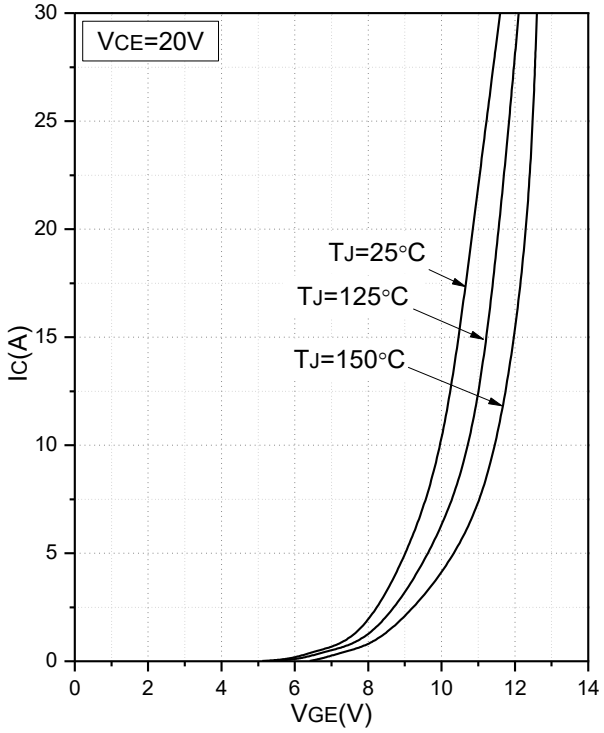


Fig.3 Transfer Characteristic (Inverter)

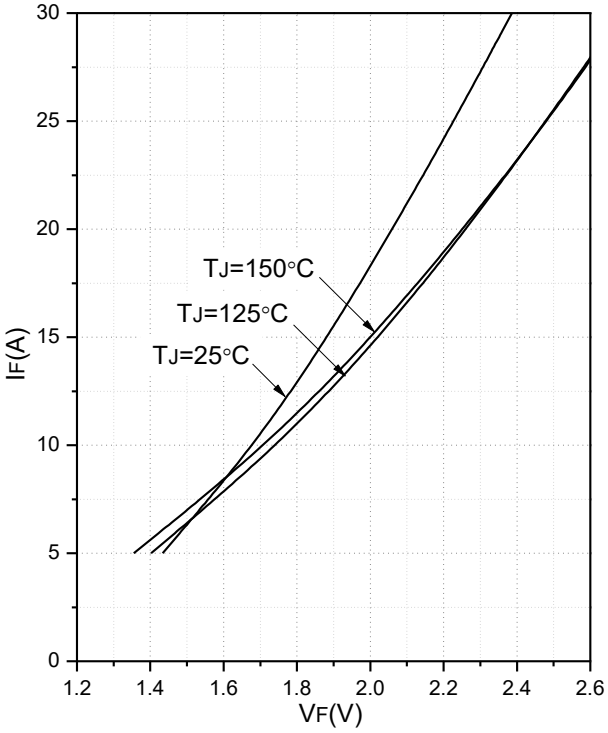


Fig.4 Forward Characteristics of Diode (Inverter)

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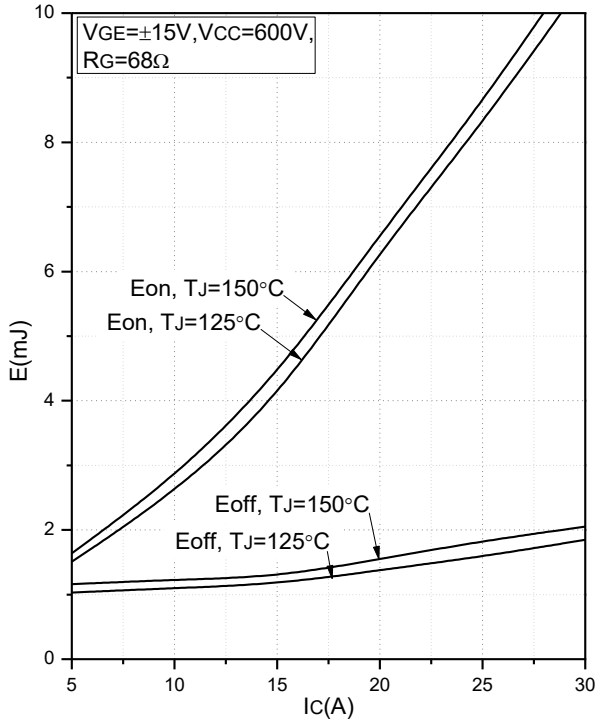


Fig.5 Typical Switching Loss vs. Collector Current (Inverter)

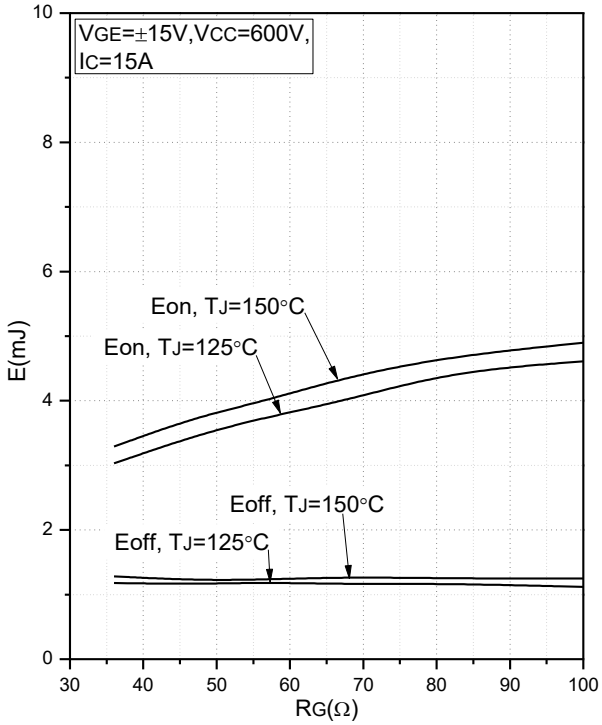


Fig.6 Typical Switching Loss vs. Gate Resistance (Inverter)

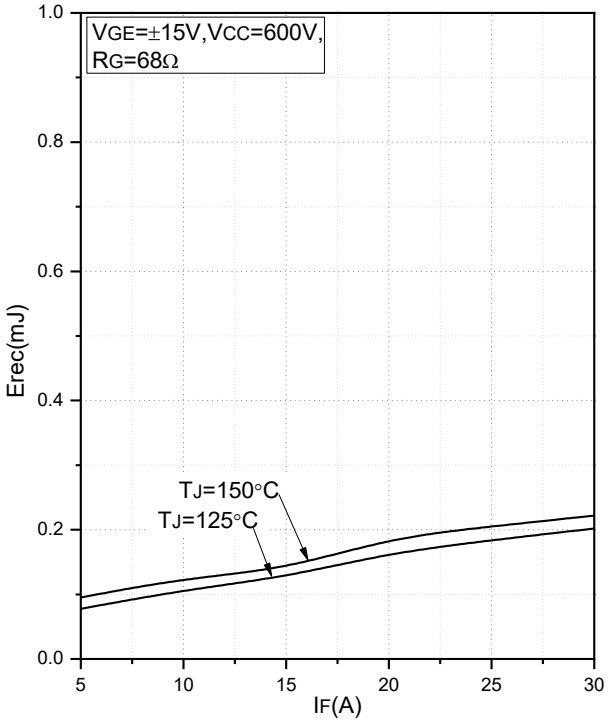


Fig.7 Typical Switching Loss vs. Forward Current (Inverter)

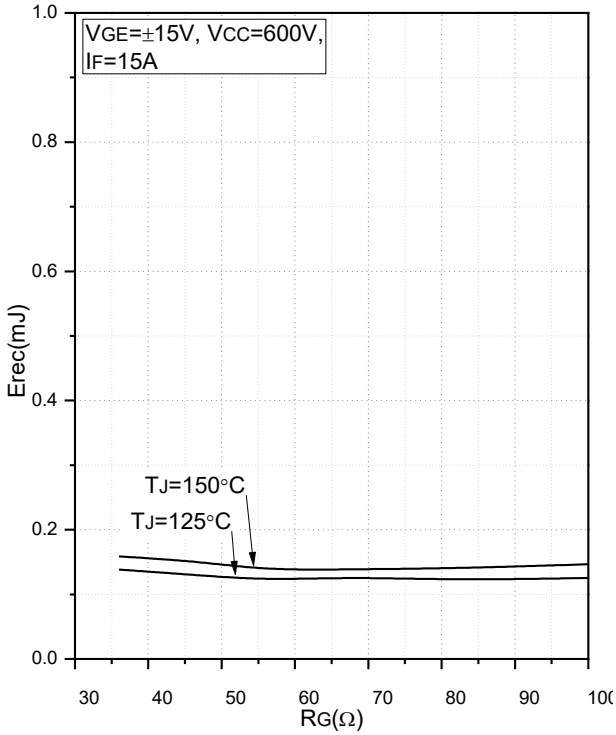


Fig.8 Typical Switching Loss vs. Gate Resistance (Inverter)

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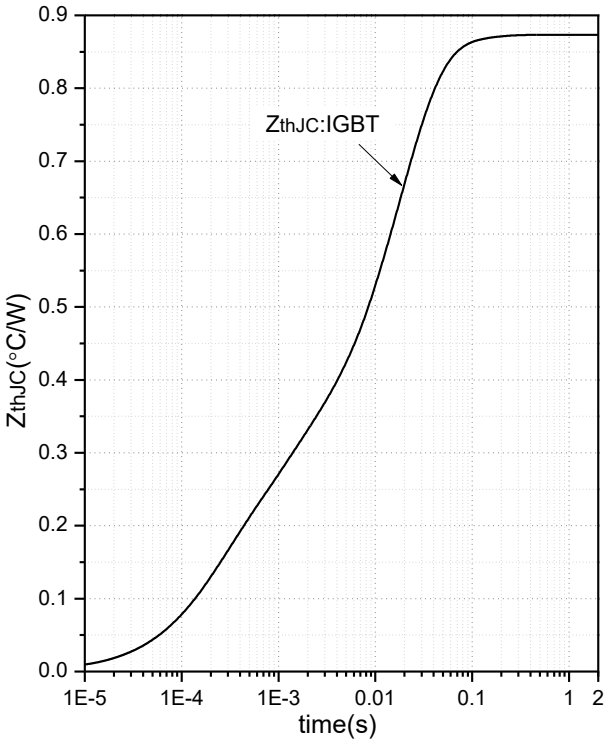


Fig.9 Transient Thermal Impedance IGBT(Inverter)

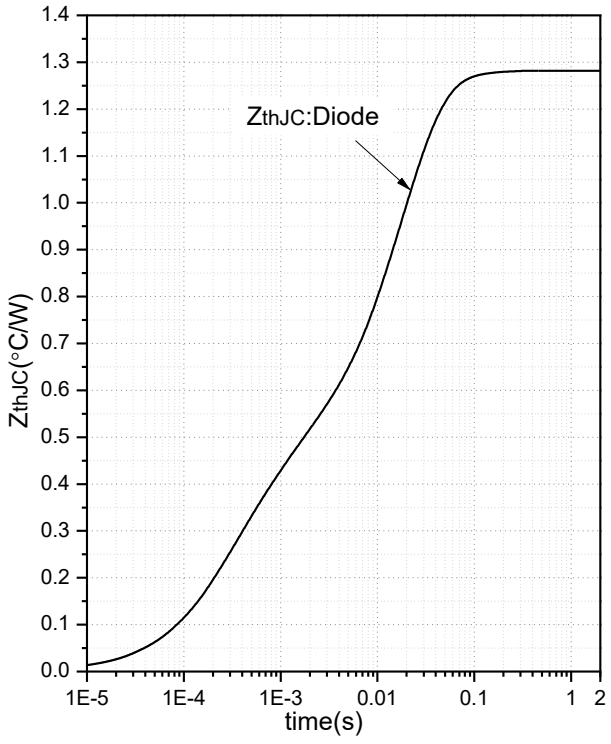


Fig.10 Transient Thermal Impedance Diode(Inverter)

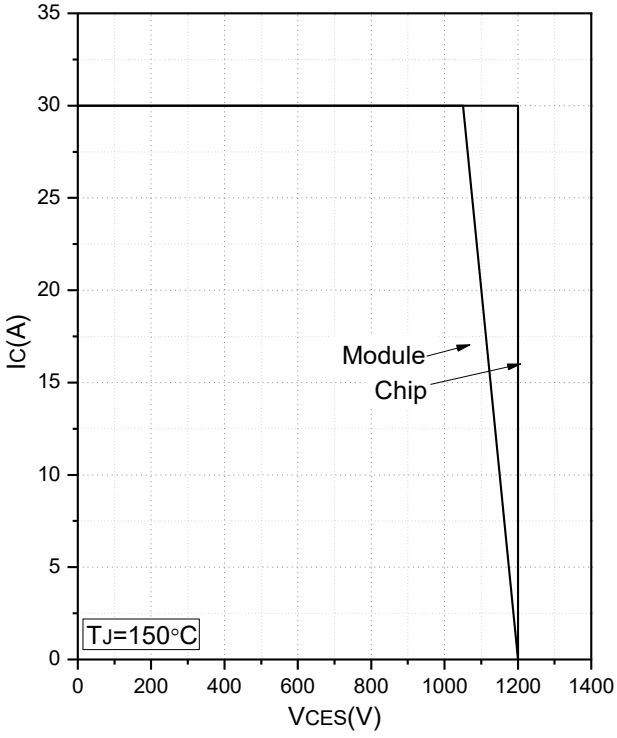


Fig.11 Reverse Bias Safe Operation Area (RBSOA)

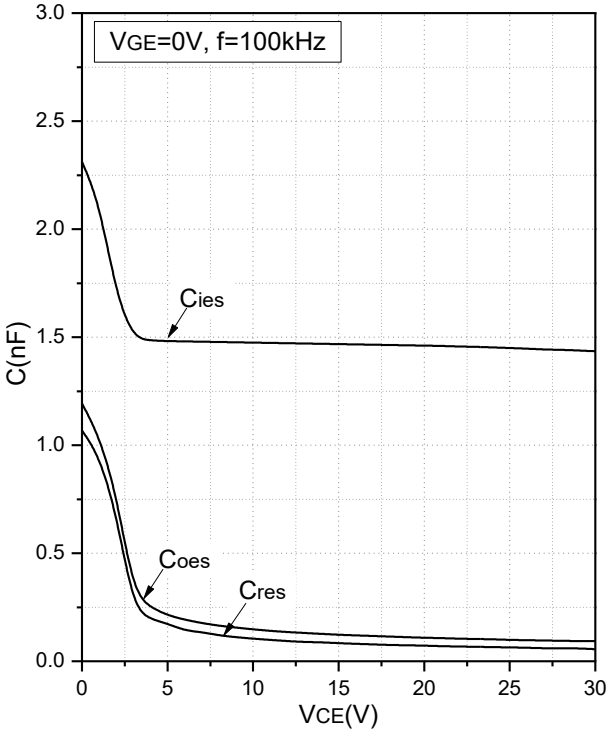


Fig.12 Capacitance Characteristics (Inverter)

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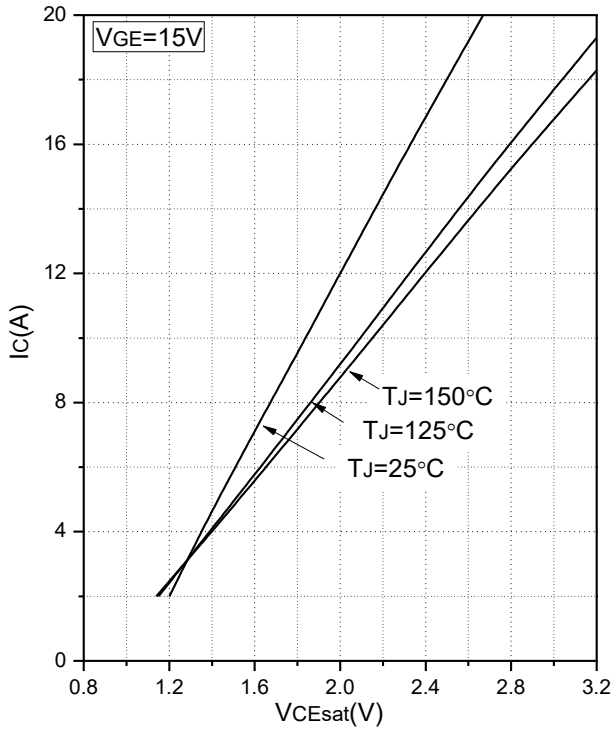


Fig.13 Typical Saturation Voltage Characteristics (Brake-Chopper)

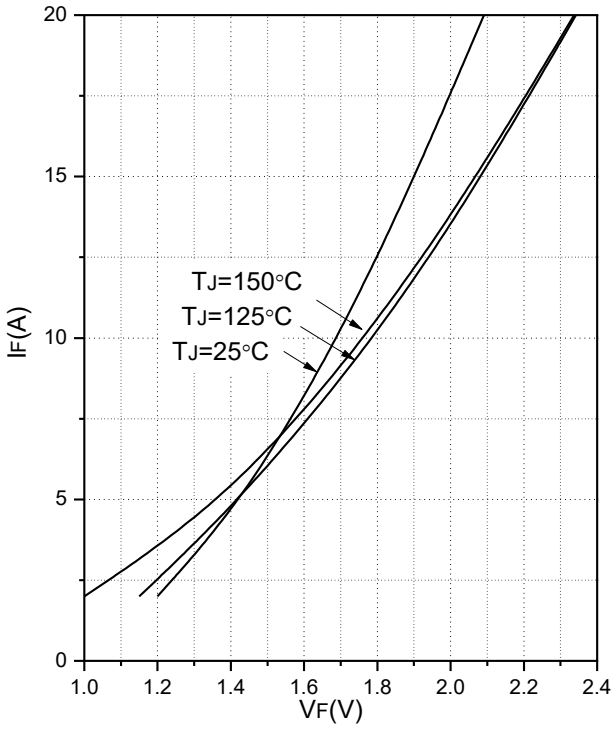


Fig.14 Forward Characteristics of Diode (Brake-Chopper)

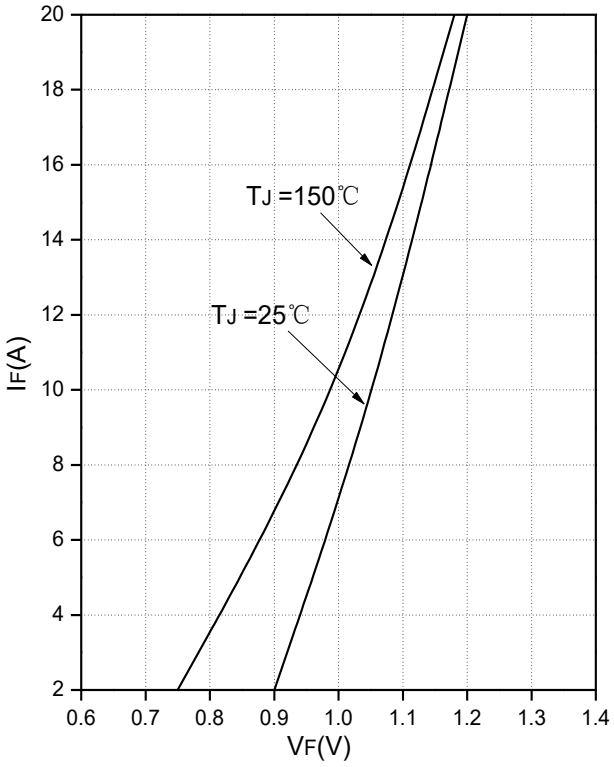


Fig.15 Forward Characteristics of Diode (Rectifier Diode)

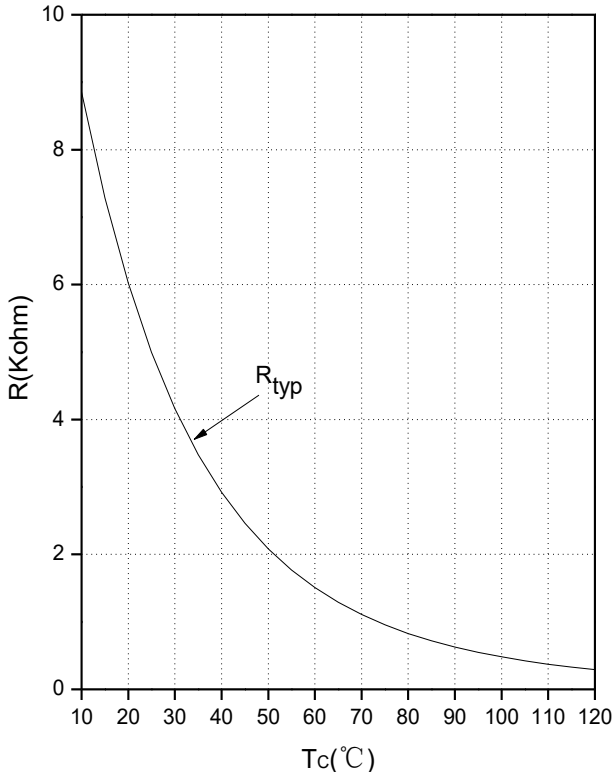
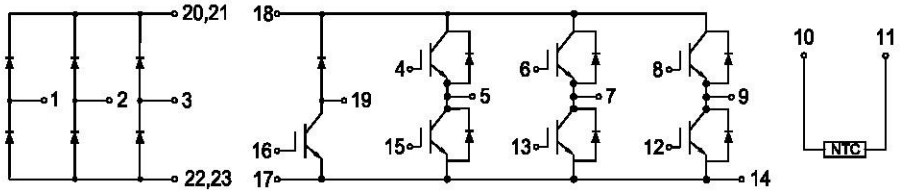


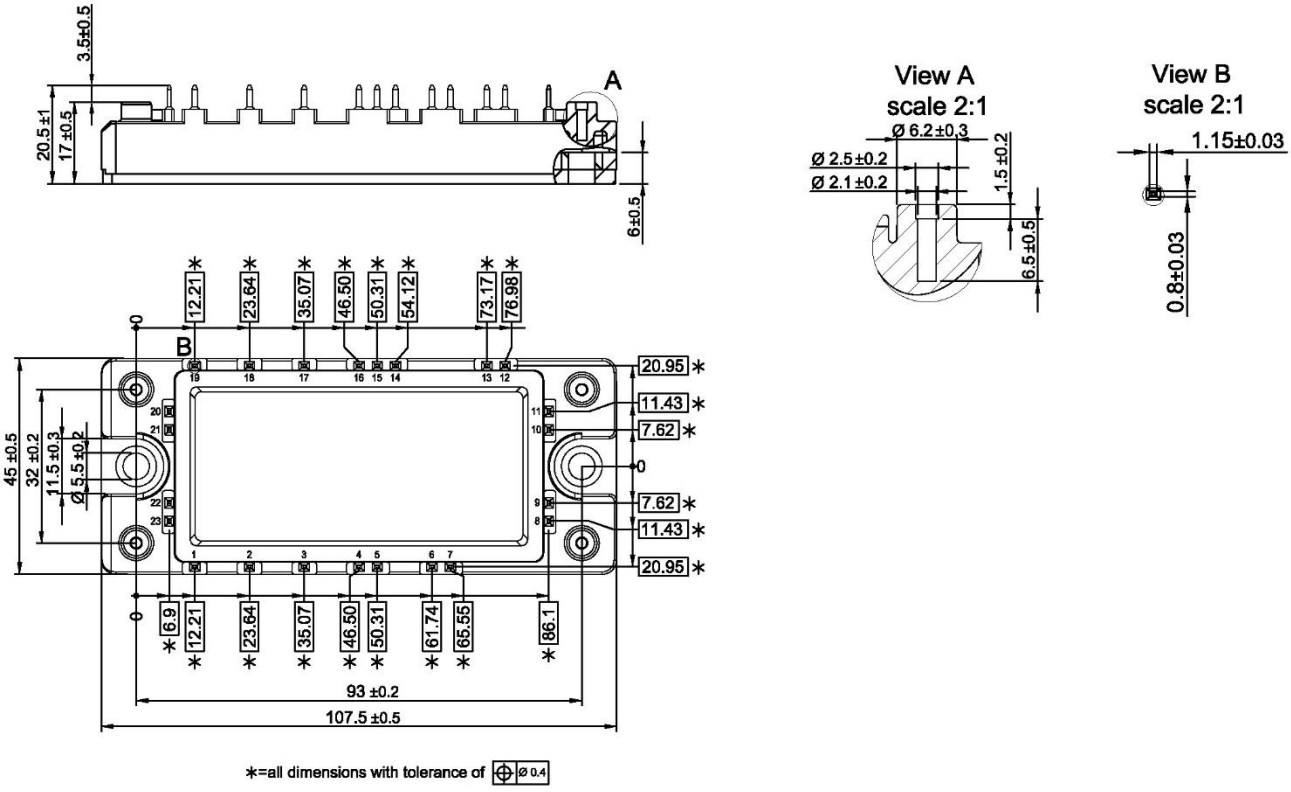
Fig.16 NTC Temperature Characteristics

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Internal Circuit



Package Outlines (Unit: mm):



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Date	Revision	Notes
04/28/2024	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”.

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