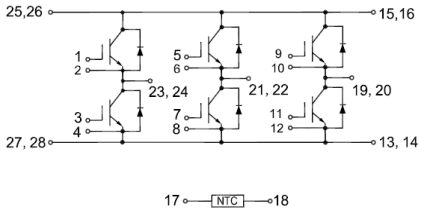
GT40FF120T5H
IGBT Module

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

Applications：

- Industrial Inverters
- Servo Applications

IGBT, Inverter
Maximum Rated Values (T_C=25℃ 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=80℃	40	A
		T_C=25℃	80	A
I_{CM}	Peak Collector Current Repetitive	T_J=150℃	80	A
t_{SC}	Short Circuit Withstand Time		>10	μs
P_D	Maximum Power Dissipation (IGBT)	T_C=25℃ T_{Jmax}=150℃	255	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=1mA, V_{CE}=V_{GE}, T_J=25℃		5.00	5.60	6.50	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C=40A, V_{GE}=15V	T_J=25℃		2.00	2.30	V
			T_J=125℃		2.30		V
			T_J=150℃		2.40		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℃			3.45		nF
C_{oes}	Output Capacitance				0.51		nF
C_{res}	Reverse Transfer Capacitance				0.04		nF

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	V_{CC}=600V, I_C=40A, R_{Gon}=30Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		136		ns
			T_J=125℃		132		
			T_J=150℃		147		
t_r	Rise Time		T_J=25℃		74		ns
			T_J=125℃		74		
			T_J=150℃		74		
$t_{d(off)}$	Turn-off Delay Time	V_{CC}=600V, I_C =40A, R_{Goff}=30Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		190		ns
			T_J=125℃		196		
			T_J=150℃		219		
t_f	Fall Time		T_J=25℃		219		ns
			T_J=125℃		427		
			T_J=150℃		484		
E_{on}	Turn-on Switching Loss	V_{CC}=600V, I_C=40A, R_{Gon}=30Ω, V_{GE}=±15V, di/dt=490A/μs(T_J=125℃), Inductive Load	T_J=25℃		4.06		mJ
			T_J=125℃		5.19		
			T_J=150℃		5.55		

E_{off}	Turn-off Switching Loss	V_{CC}=600V, I_C=40A, R_{Goff}=30Ω, V_{GE}=±15V, du/dt=3440A/μs(T_J=125℃), Inductive Load	T_J=25℃		1.99		mJ
			T_J=125℃		3.42		
			T_J=150℃		3.85		
Q_g	Total Gate Charge	V_{GE}=+15V…-15V	T_J=25℃		460		nC
RBSOA	Reverse Bias Safe Operation Area	I_C=80A, V_{CC}=1050V, Vp=1200V, R_{Goff}=30Ω, V_{GE}=+15V to 0V, T_J=150°C		Trapezoid			
I_{SC}	V_{CC}=600V, V_{GE}=±15V, R_G=51Ω, tp=10μs, T_J=125℃				128		A
$R_{\theta JC}$	IGBT Thermal Resistance: Junction-To-Case (per IGBT)					0.490	℃/W

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

V_{RRM}	Repetitive Peak Reverse Voltage	1200	V
I_F	Diode Continuous Forward Current	40	A
I_{FM}	Diode Maximum Forward Current	80	A

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

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
V_{FM}	Forward Voltage	I_F=40A	T_J=25℃		1.80	2.20	V
			T_J=125℃		2.00		
			T_J=150℃		2.00		
t_{rr}	Reverse Recovery Time	I_F=40A, -di$_F$/dt=750A/μs(T_J=150℃), V_R=600V, V_{GE}=-15V	T_J=25℃		297		ns
			T_J=125℃		586		
			T_J=150℃		611		
I_{rr}	Peak Reverse Recovery Current		T_J=25℃		29.4		A
			T_J=125℃		36.2		
			T_J=150℃		37.5		
Q_{rr}	Reverse Recovery Charge		T_J=25℃		4.34		μC
			T_J=125℃		8.04		
			T_J=150℃		8.93		

E_{rec}	Reverse Recovery Energy	I_F=40A, -di$_F$/dt=750A/μs(T_J=150℃), V_R=600V, V_{GE}=-15V	T_J=25℃		1.51		mJ
			T_J=125℃		3.02		
			T_J=150℃		3.40		
$R_{θJC}$	Diode Thermal Resistance: Junction-To-Case (per Diode)					0.682	℃/W

Internal NTC-Thermistor Characteristics

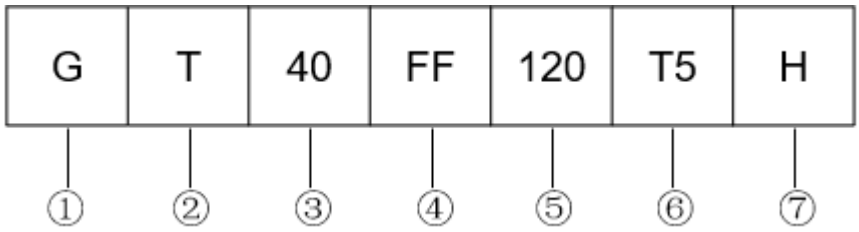
Symbol	Description		Min.	Typ.	Max.	Units.
R_{25}	Rated Resistance	T_C=25℃		5		kΩ
△R/R	Deviation of R100	T_C=100℃, R_{100}=481Ω	-5		5	%
P_{25}	Power Dissipation	T_C=25℃			10	mW
$B_{25/50}$	B-Value	$R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298.15K))]$		3380		K
$B_{25/80}$	B-Value	$R_2=R_{25}\exp[B_{25/80}(1/T_2-1/(298.15K))]$		3440		K
$B_{25/100}$	B-Value	$R_2=R_{25}\exp[B_{25/100}(1/T_2-1/(298.15K))]$		3545		K

Module

Symbol	Description		Min.	Typ.	Max.	Units.
V_{iso}	Isolation Voltage (All Terminals Shorted)	RMS, f=50Hz, 30s	4500			V
L_{sCE}	Stray Inductance Module			19		nH
T_J	Maximum Junction Temperature				150	℃
T_{JOP}	Maximum Operating Junction Temperature Range		-40		+150	℃
T_{stg}	Storage Temperature		-40		+125	℃
CTI	Comparative Tracking Index		200			
$R_{θCS}$	Case-To-Sink Thermally (Conductive Grease Applied)				0.03	℃/W
M	Mounting Torque for Module Mounting	Screw M5--Mounting according to valid application note	3.0		5.0	N·m
G	Weight			190		g

Ordering Information Table

Device code



① - IGBT Module
② - Trench, Low Switching Losses IGBT
③ - Rated Current (40=40A)
④ - Circuit Configuration: FF (Full Bridge)
⑤ - Rated Voltage (120=1200V)
⑥ - Package Type
⑦ - Test Level (Pass the Important Reliability Test-Industrial Grade)

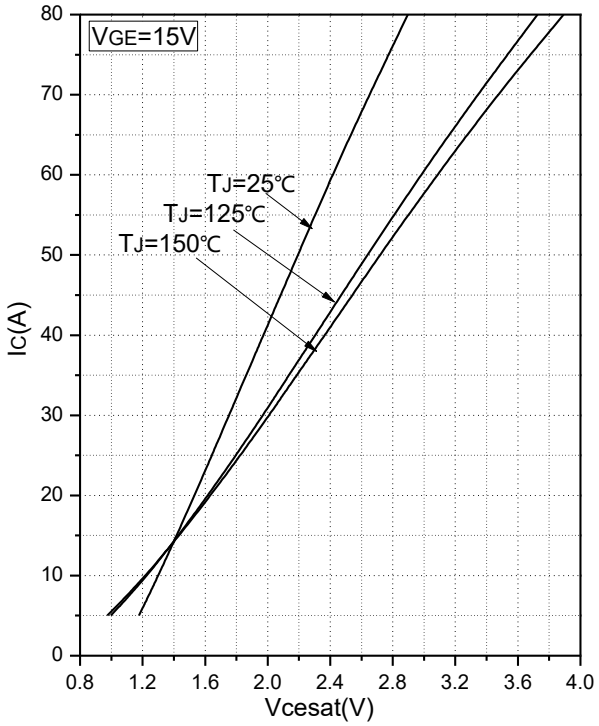


Fig.1 Typical Saturation Voltage Characteristics

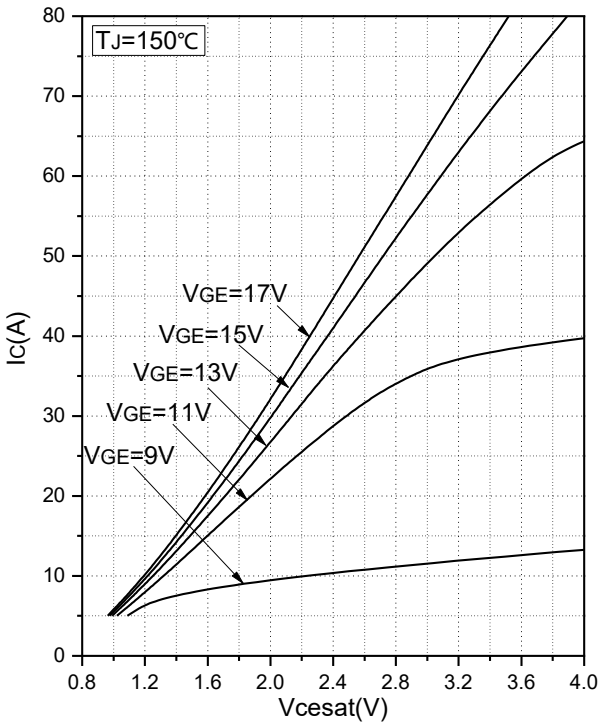


Fig.2 Typical Output Characteristics

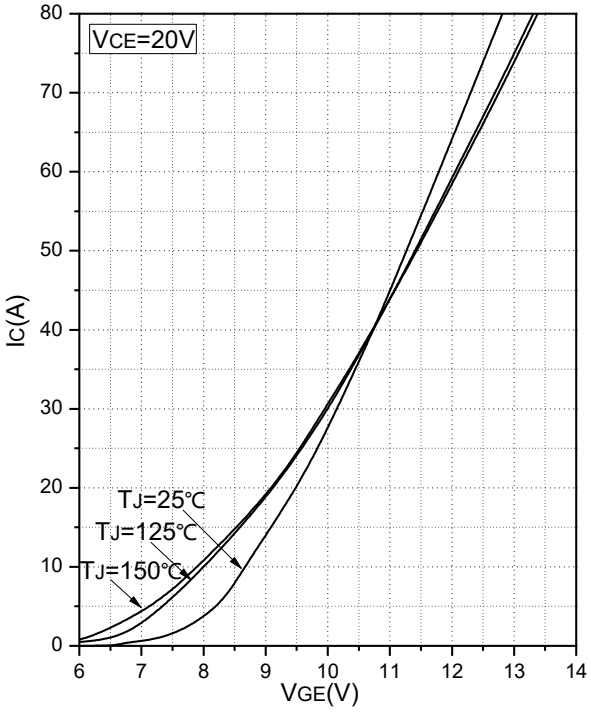


Fig.3 Transfer Characteristic

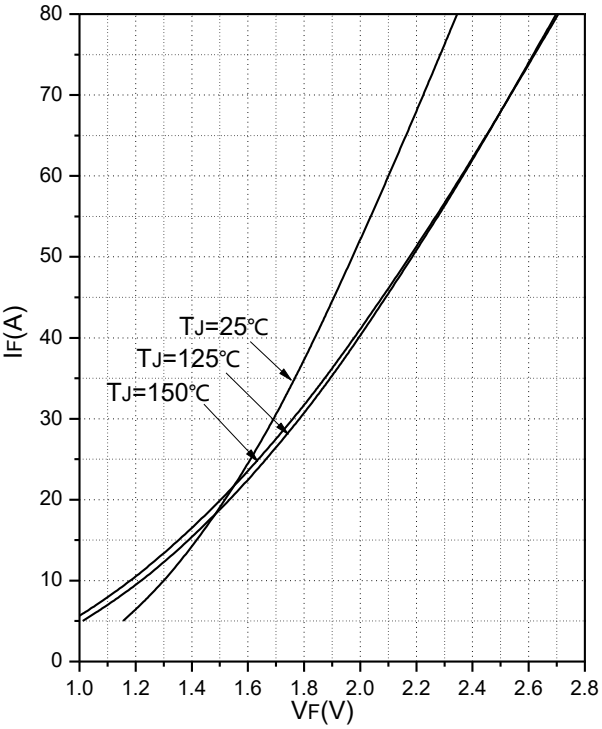


Fig.4 Forward Characteristics of Diode

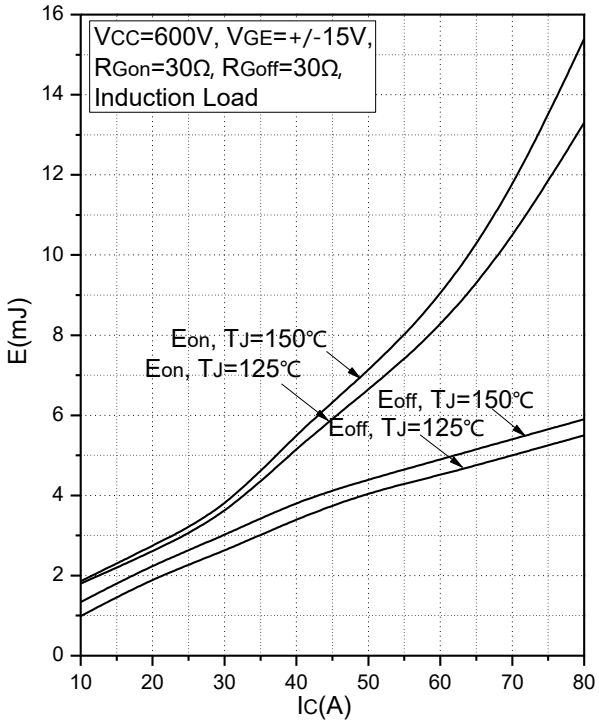


Fig.5 Typical Switching Loss vs. Collector Current

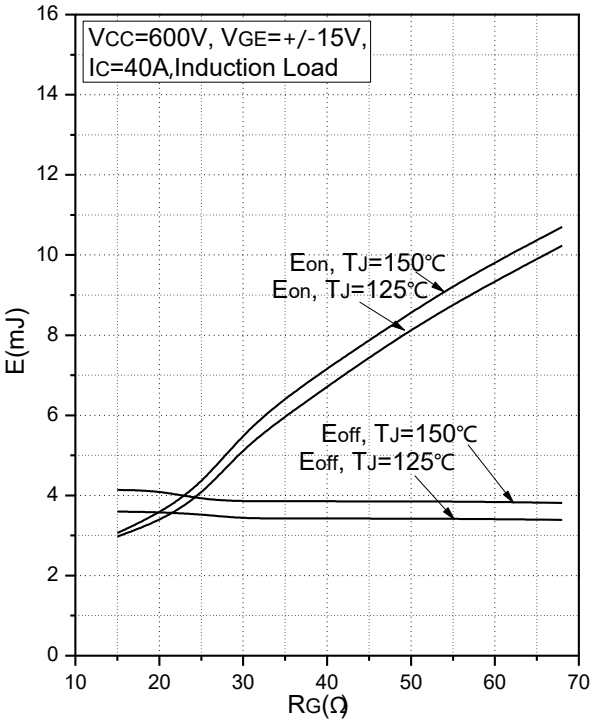


Fig.6 Typical Switching Loss vs. Gate Resistance

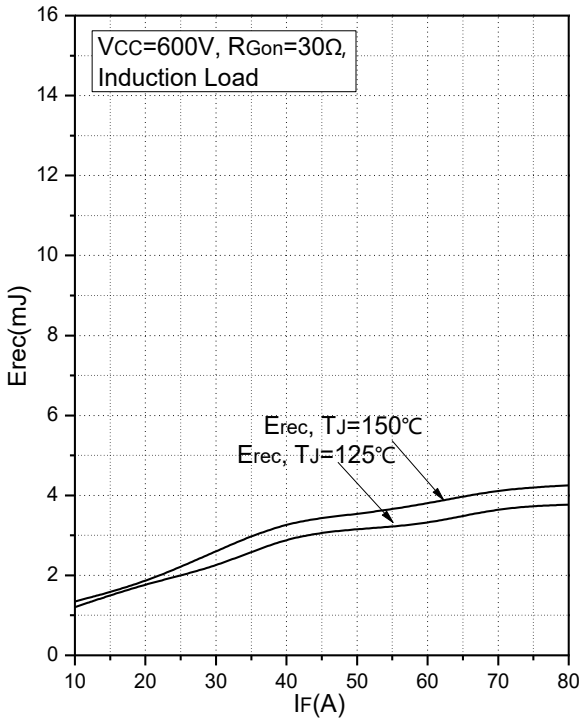


Fig.7 Typical Switching Loss vs. Forward Current

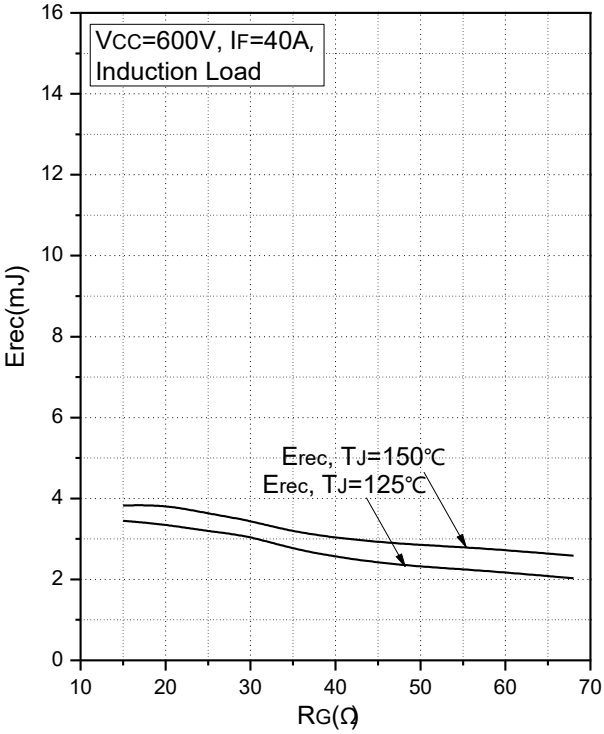


Fig.8 Typical Switching Loss vs. Gate Resistance

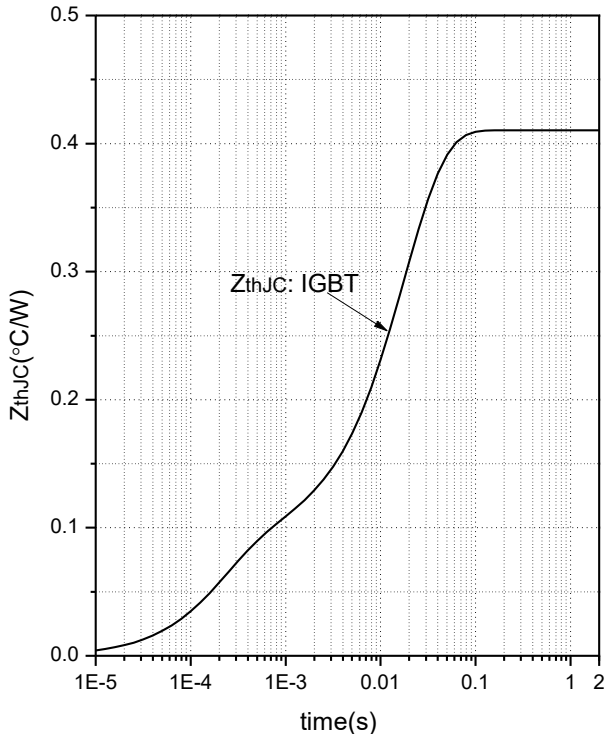


Fig.9 Transient Thermal Impedance (IGBT)

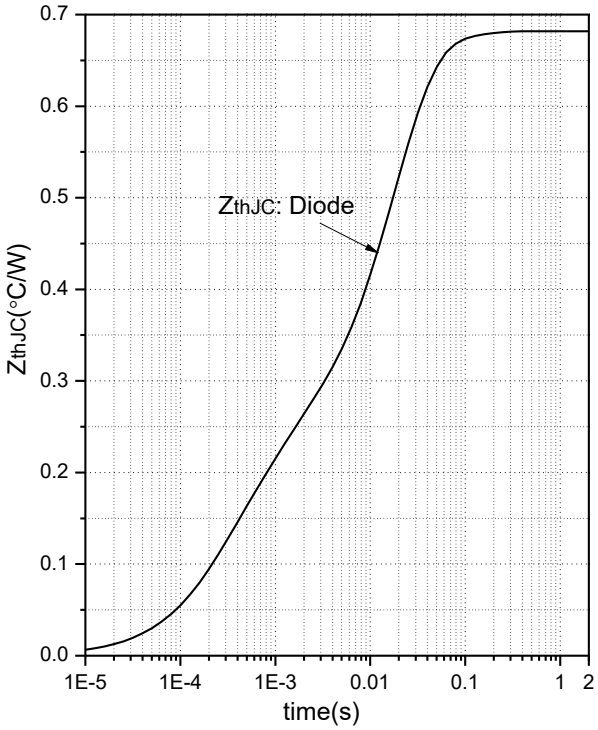


Fig.10 Transient Thermal Impedance (Diode)

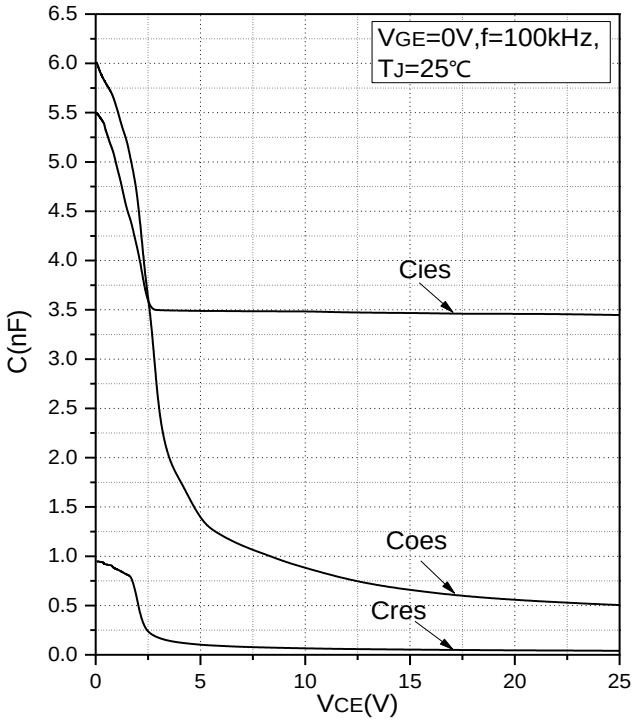


Fig.11 Capacitance Characteristics

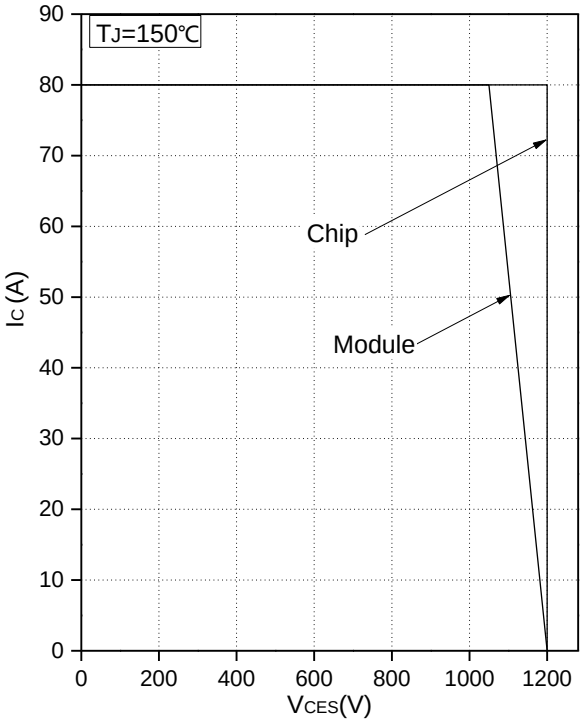


Fig.12 Reverse Bias Safe Operation Area (RBSOA)

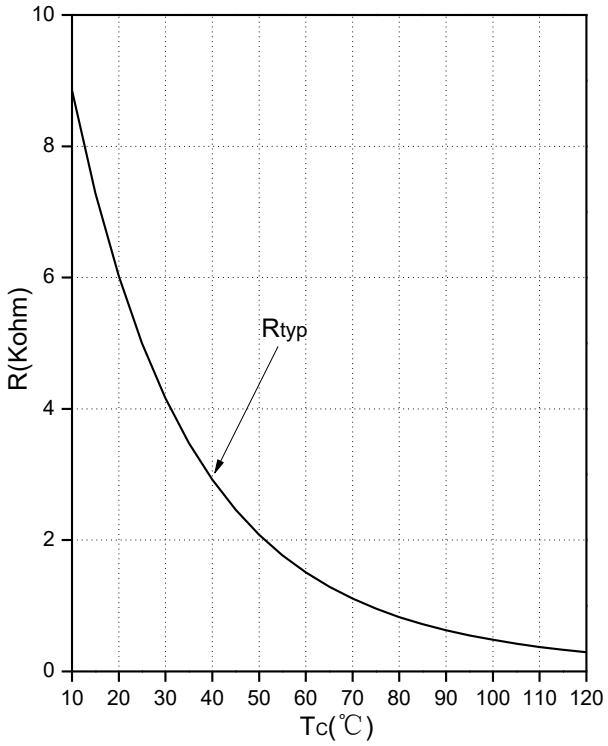
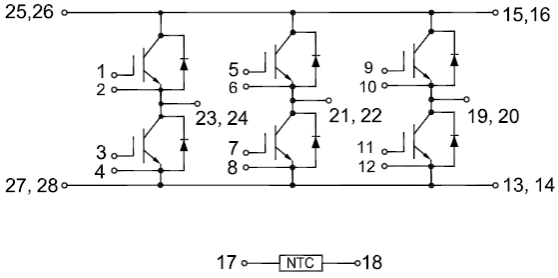
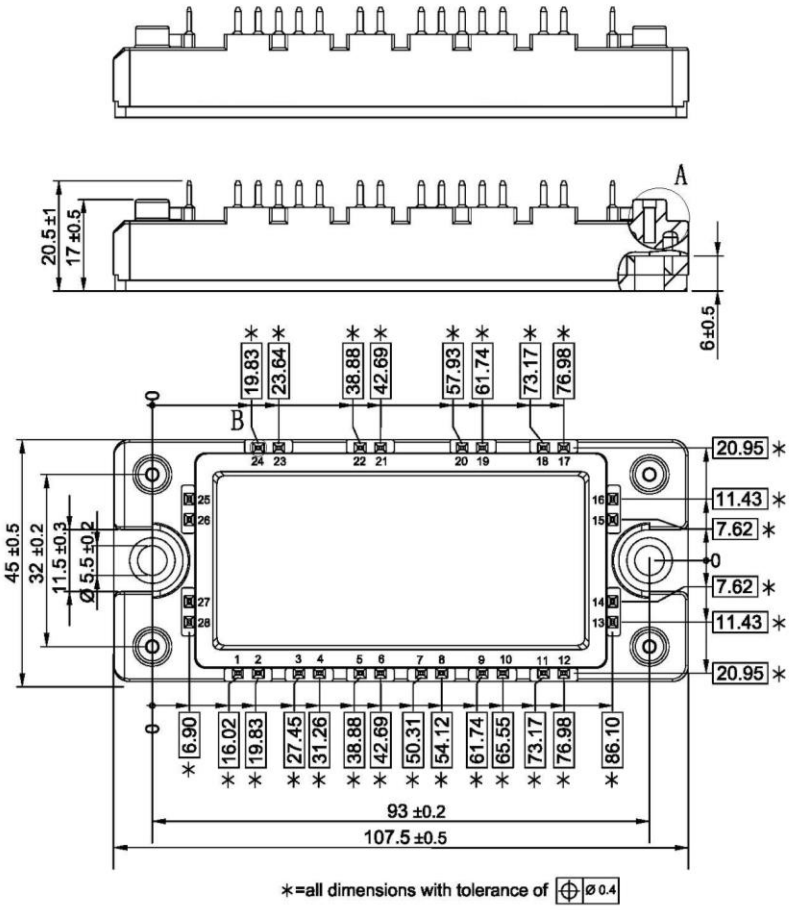


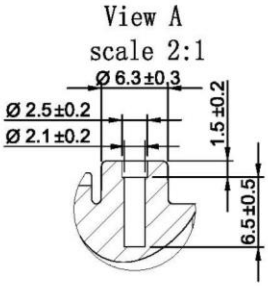
Fig.13 NTC Temperature Characteristics

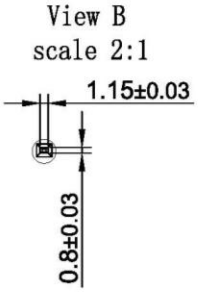
Internal Circuit:



Package Outline (Unit: mm):







Date	Revision	Notes
08/21/2023	A	Final Version

Announcement

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