GT40RFF120T6H

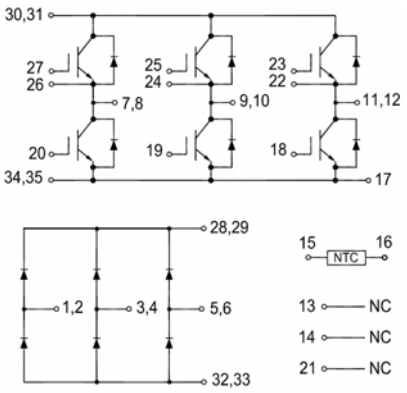
IGBT Module

Preliminary Data

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

Circuit Diagram



Applications：

- Industrial Inverters
- Servo Applications

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℃	40	A
		T_C=25℃	80	A
I_{CM}	Peak Collector Current Repetitive	tp=1ms	80	A
t_{SC}	Short Circuit Withstand Time		>10	μs
P_D	Maximum Power Dissipation per IGBT	T_C=25℃ T_{Jmax}=175℃	307	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	5.60	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℃		148		
t_r	Rise Time		T_J=25℃		74		ns
			T_J=125℃		73		
			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℃		422		
			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=150℃), 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=3440V/μs (T_J=150℃), 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	I_C=80A, V_{CC}=1050V, Vp=1200V, R_G=30Ω, V_{GE}=+15V to 0V, T_J=150℃			Trapezoid			
I_{SC}	V_{CC}=600V, V_{GE}=±15V, R_G=51Ω, tp=10μs, T_J=125℃				128		A
$R_{\theta JC}$	Thermal Resistance: Junction-To-Case (per IGBT)					0.489	℃/W

Diode, Inverter
Maximum Rated Values

V_{RRM}	Repetitive Peak Reverse Voltage	T_J=25℃	1200	V
I_F	Diode Continuous Forward Current		40	A
I_{FM}	Repetitive Peak Forward Current	tp=1ms	80	A

Electrical Characteristics of FWD

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, -diF/dt=750A/μs(T_J=150℃), V_{rr}=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, -diF/dt=750A/μs(T_J=150℃), V_{rr}=600V, V_{GE}=-15V	T_J=25℃		1.51		mJ
			T_J=125℃		3.02		
			T_J=150℃		3.40		
$R_{\theta JC}$	Thermal Resistance: Junction-To-Case (per Diode)					0.682	℃/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_J=80℃	50	A
I_{RMSM}	Maximum RMS Current at Rectifier Output	T_J=80℃	60	A
I_{FSM}	Surge Current @t_p=10ms	T_J=25℃	420	A
		T_J=150℃	350	
I^2t	I²t-value	T_J=25℃	900	A^2s
		T_J=150℃	650	

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

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
V_F	Forward Voltage	I_F=40A	T_J=25℃		1.20		V
			T_J=125℃		1.15		
			T_J=150℃		1.15		
I_R	Reverse Current	V_R=1600V	T_J=25℃			1	mA
$R_{\theta JC}$	Thermal Resistance: Junction-To-Case (per Diode)					0.822	℃/W

Internal NTC-Thermistor Characteristics

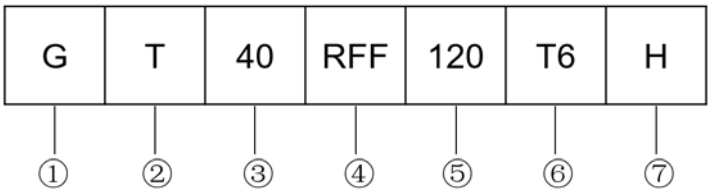
R_{25}	T_C=25℃	5		kΩ
△R/R	T_C=100℃, R_{100}=465Ω		±5	%
P_{25}	T_C=25℃	10		mW
$B_{25/50}$	$R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298.15K))]$	3380		K
$B_{25/80}$	$R_2=R_{25}\exp[B_{25/80}(1/T_2-1/(298.15K))]$	3440		K
$B_{25/100}$	$R_2=R_{25}\exp[B_{25/100}(1/T_2-1/(298.15K))]$	3545		K

Module

Symbol	Description		Min.	Typ.	Max.	Units
V_{iso}	Isolation Voltage (All Terminals Shorted)	RMS, f=50Hz, 30s		4500		V
Material of Module Baseplate				Copper		
Internal Isolation				Al_2O_3		
L_{sCE}	Stray Inductance Module			60		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)				0.03	℃/W
M	Mounting Screw:M5		3.0		6.0	N·m
G	Weight			300		g

Ordering Information Table

Device code



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

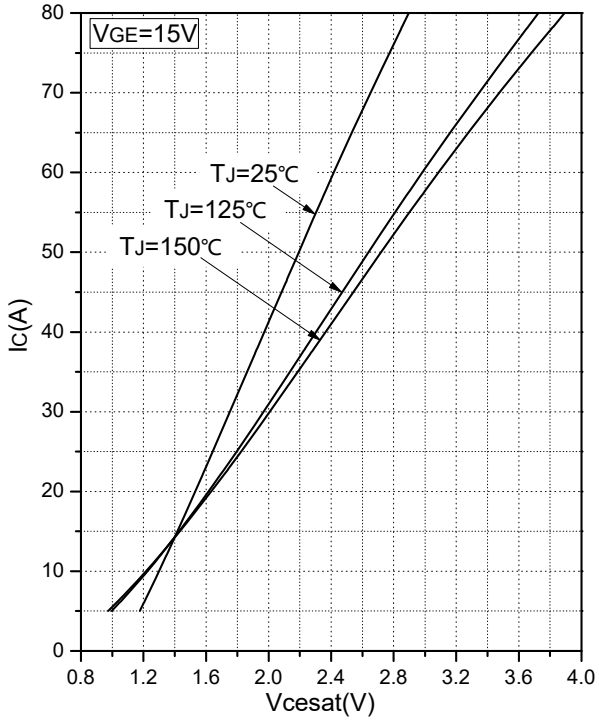


Fig.1 Typical Saturation Voltage Characteristics (Inverter)

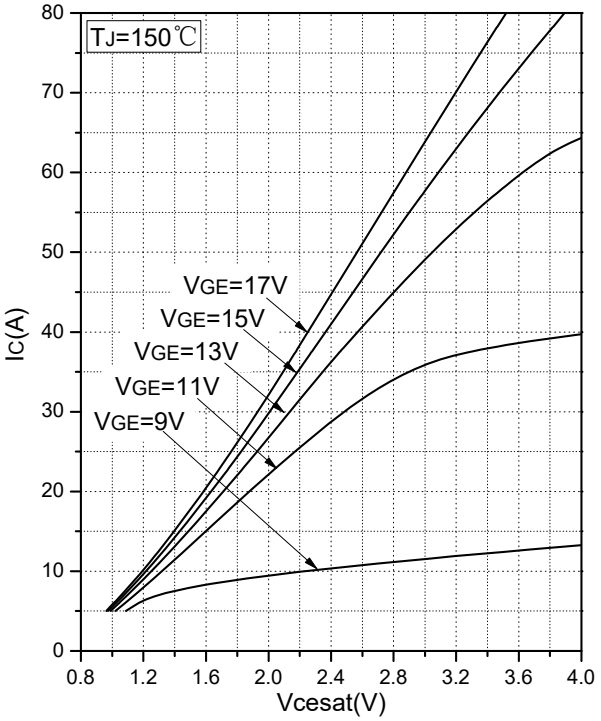


Fig.2 Typical Output Characteristics (Inverter)

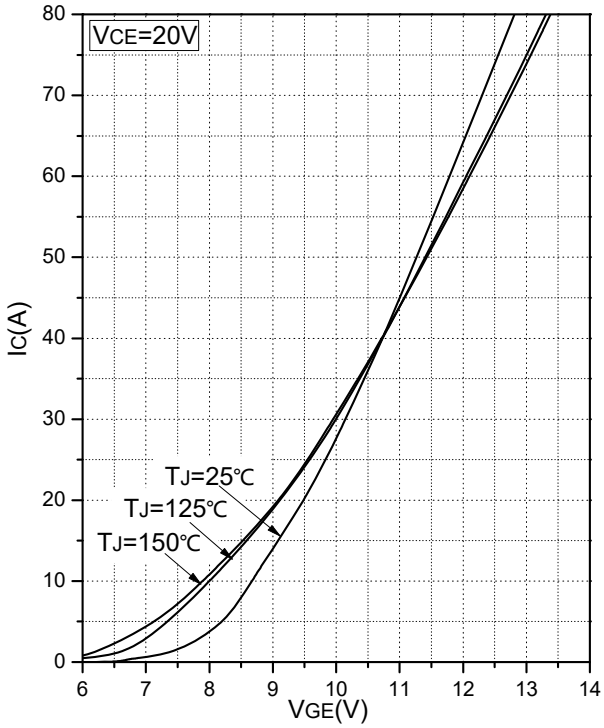


Fig.3 Transfer Characteristic (Inverter)

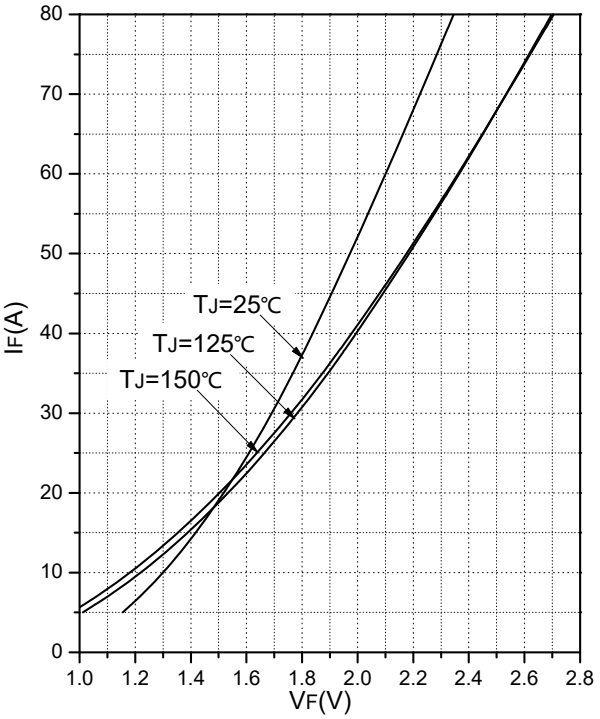


Fig.4 Forward Characteristics of Diode (Inverter)

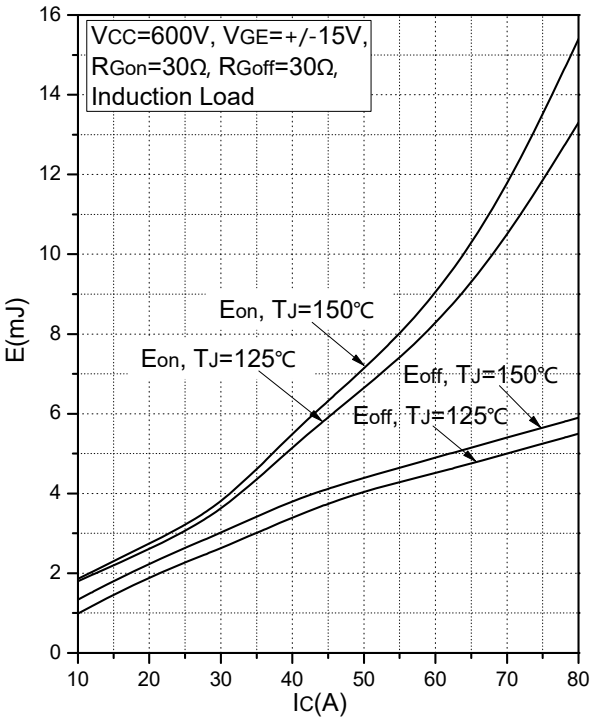


Fig.5 Typical Switching Loss vs. Collector Current (Inverter)

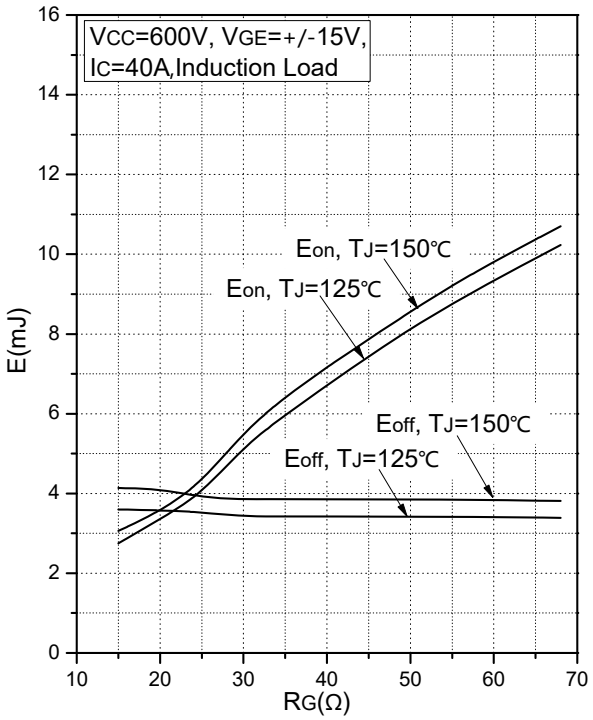


Fig.6 Typical Switching Loss vs. Gate Resistance (Inverter)

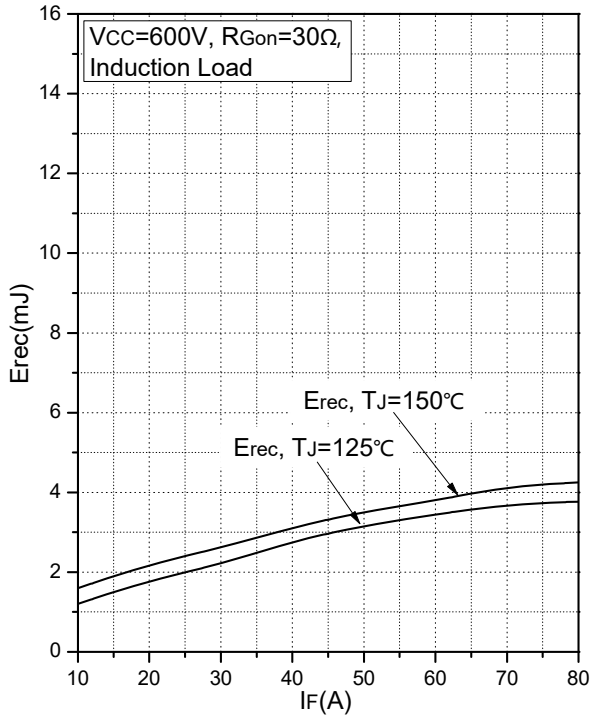


Fig.7 Typical Switching Loss vs. Forward Current (Inverter)

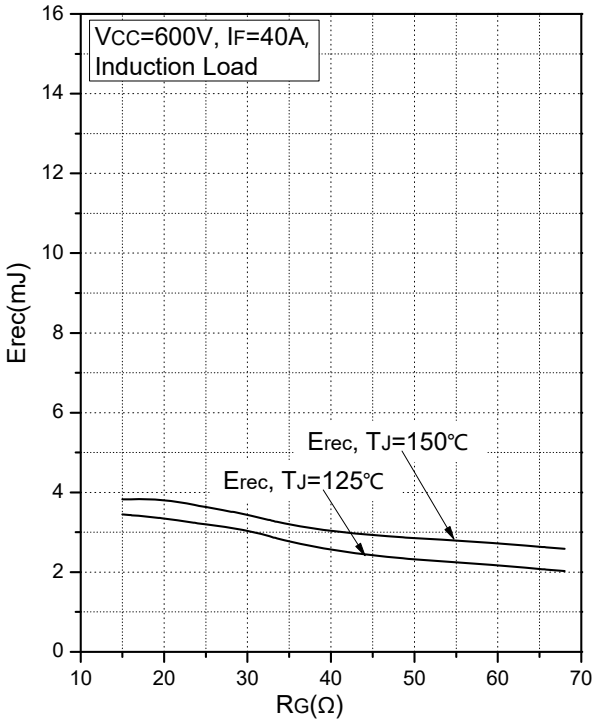


Fig.8 Typical Switching Loss vs. Gate Resistance (Inverter)

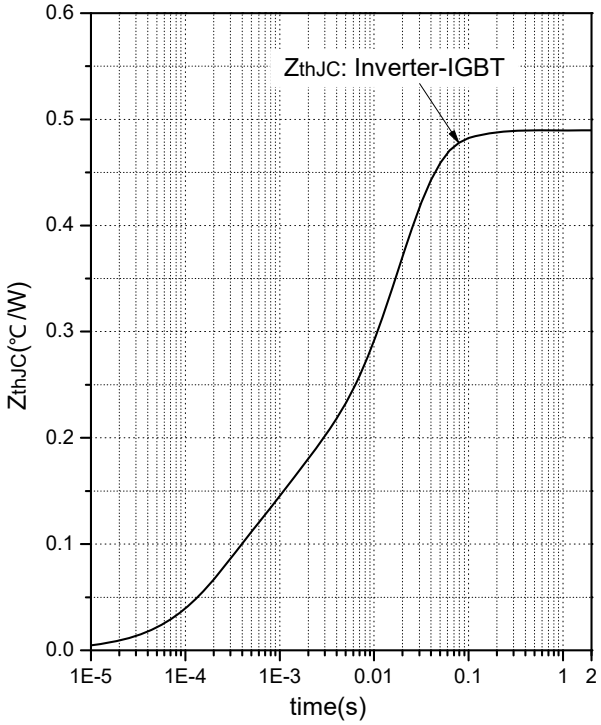


Fig.9 Transient Thermal Impedance (Inverter-IGBT)

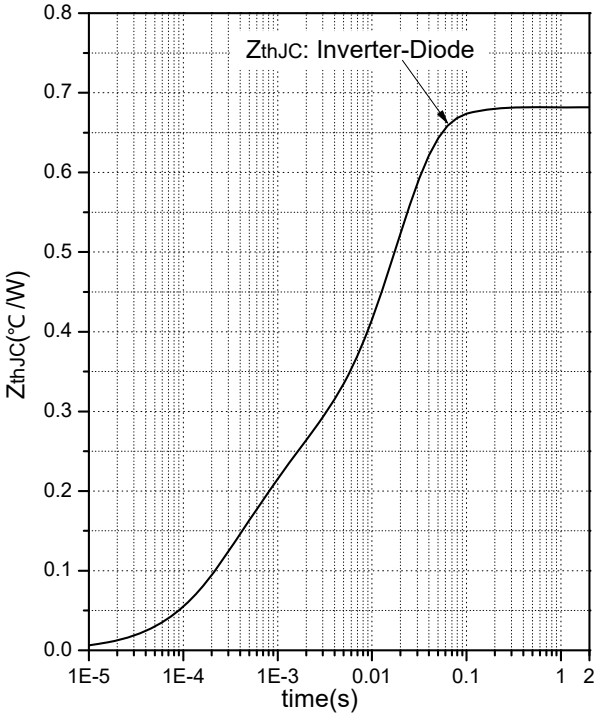


Fig.10 Transient Thermal Impedance (Inverter-Diode)

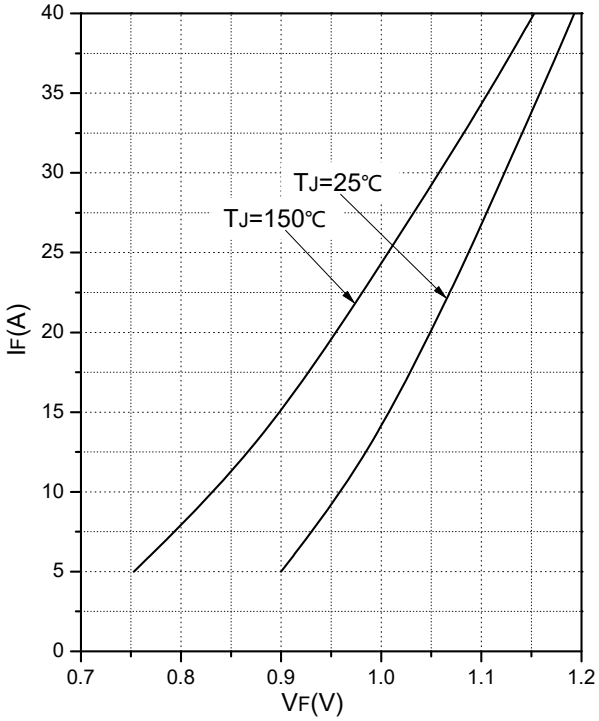


Fig.11 Forward Characteristics of Diode (Rectifier)

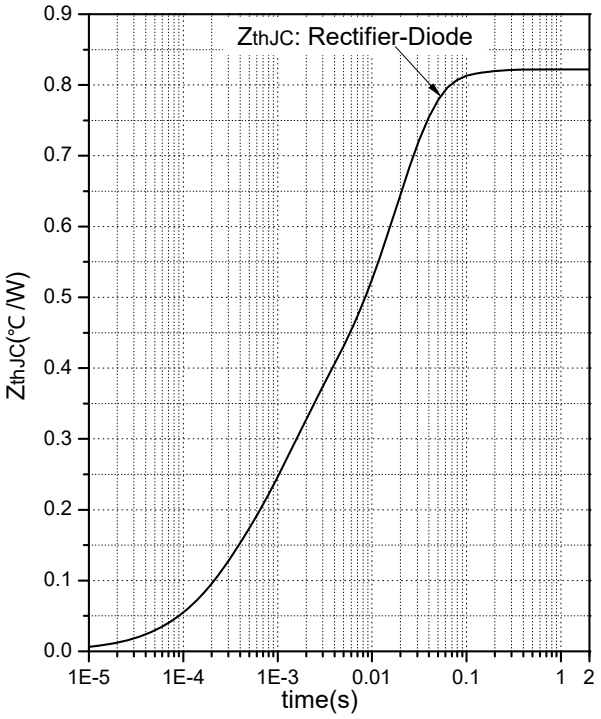


Fig.12 Transient Thermal Impedance (Rectifier-Diode)

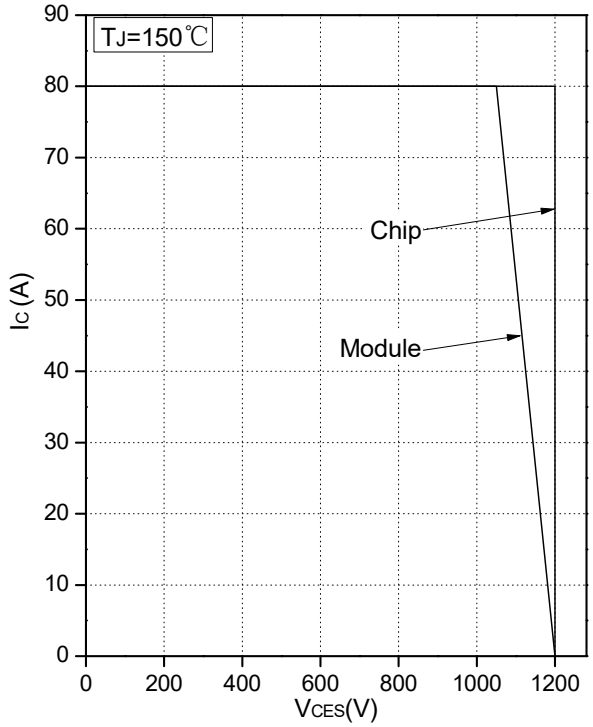


Fig.13 Reverse Bias Safe Operation Area (RBSOA)

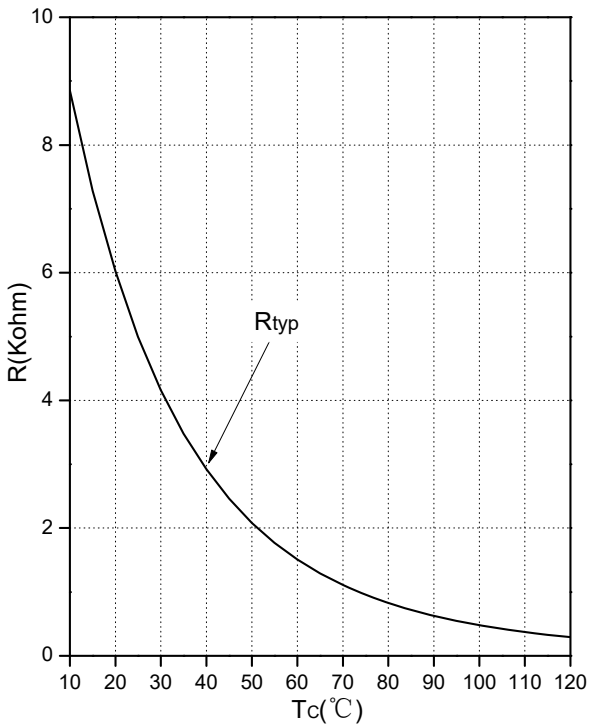


Fig.14 NTC Temperature Characteristics

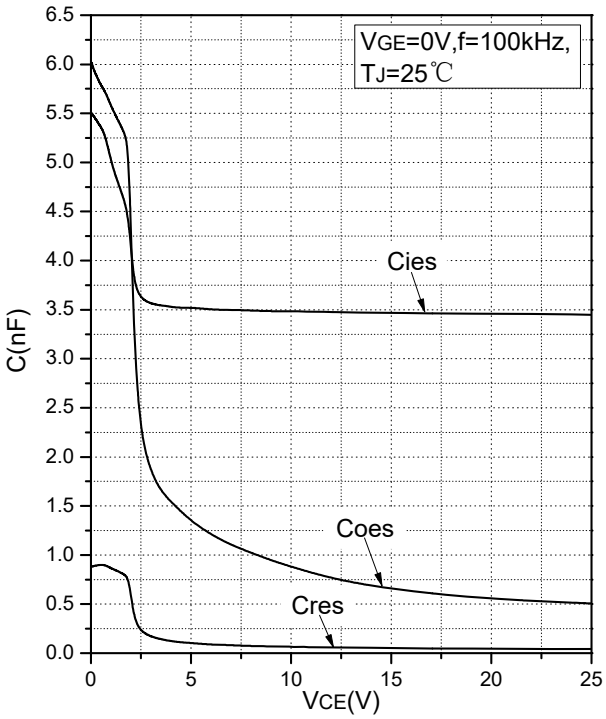
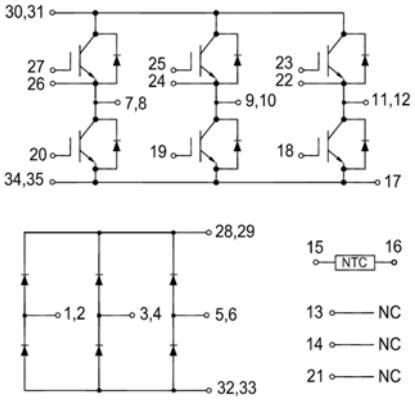
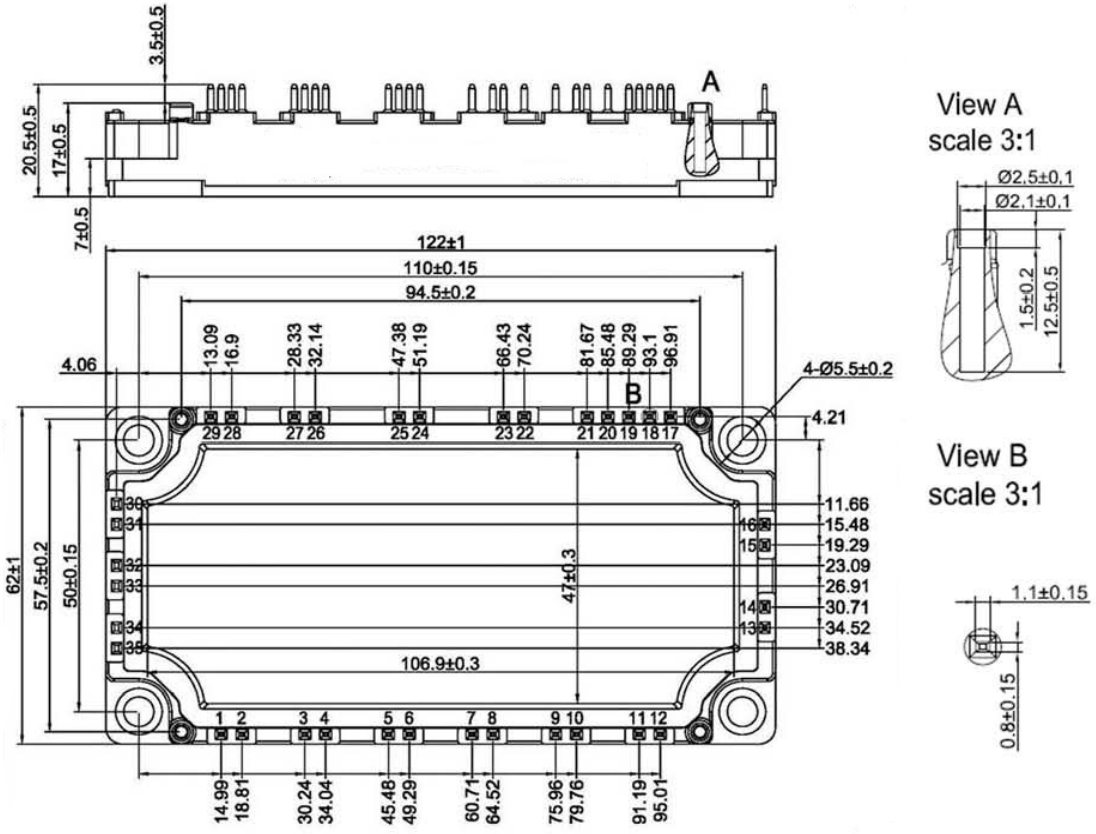


Fig.15 Capacitance Characteristics

Internal Circuit:



Package Outline (Unit: mm):



Date	Revision	Notes
10/08/2023	01	Initial Release

Announcement

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