



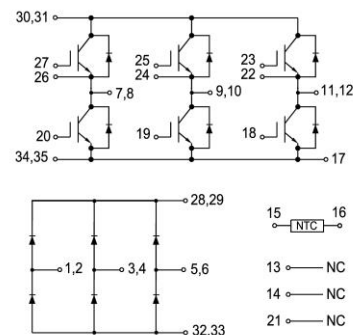
GT50RFF120T6H

IGBT Module

Features:

- Trench & Field Stop IGBT
- Short Circuit Rated $>10\mu\text{s}$
- Low Saturation Voltage
- Low Switching Loss
- 100% RBSOA Tested($2\times I_c$)
- Low Stray Inductance
- Lead Free, Compliant with RoHS Requirement

Circuit Diagram



Applications:

- Industrial Inverters
- Servo Applications

IGBT, Inverter

Maximum Rated Values ($T_c=25^\circ\text{C}$ unless otherwise specified)

V_{CES}	Collector-Emitter Blocking Voltage	$T_J=25^\circ\text{C}$	1200	V
V_{GES}	Gate-Emitter Voltage		± 20	V
I_c	Continuous Collector Current	$T_c=100^\circ\text{C}$	50	A
		$T_c=25^\circ\text{C}$	100	A
I_{CM}	Peak Collector Current Repetitive	$t_p=1\text{ms}$	100	A
P_D	Maximum Power Dissipation per IGBT	$T_c=25^\circ\text{C}$ $T_{Jmax}=175^\circ\text{C}$	391	W



Electrical Characteristics of IGBT ($T_C=25^{\circ}\text{C}$ unless otherwise specified)

Static Characteristics

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=1.7\text{mA}$, $V_{CE}=V_{GE}$, $T_J=25^{\circ}\text{C}$		5.00	5.60	6.50	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=50\text{A}$, $V_{GE}=15\text{V}$	$T_J=25^{\circ}\text{C}$		1.75	1.90	V
			$T_J=125^{\circ}\text{C}$		2.20		V
			$T_J=150^{\circ}\text{C}$		2.30		V
I_{CES}	Collector-Emitter Leakage Current	$V_{GE}=0\text{V}$, $V_{CE}=V_{CES}$, $T_J=25^{\circ}\text{C}$				1	mA
I_{GES}	Gate-Emitter Leakage Current	$V_{GE}=\pm 15\text{V}$, $V_{CE}=0\text{V}$, $T_J=25^{\circ}\text{C}$				± 200	nA
C_{ies}	Input Capacitance	$V_{CE}=25\text{V}$, $V_{GE}=0\text{V}$, $f=100\text{kHz}$			5.32		nF
C_{oes}	Output Capacitance				0.81		nF
C_{res}	Reveres Transfer Capacitance				0.34		nF

Switching Characteristics

t _{d(on)}	Turn-on Delay Time	V _{CC} =600V, I _C =50A, R _{Gon} =15Ω, V _{GE} =±15V, Inductive Load	T _J =25℃		92		ns
			T _J =125℃		92		
			T _J =150℃		96		
t _r	Rise Time		T _J =25℃		54		ns
			T _J =125℃		56		
			T _J =150℃		56		
t _{d(off)}	Turn-off Delay Time	V _{CC} =600V, I _C =50A, R _{Goff} =15Ω, V _{GE} =±15V, Inductive Load	T _J =25℃		222		ns
			T _J =125℃		272		
			T _J =150℃		256		
t _f	Fall Time		T _J =25℃		222		ns
			T _J =125℃		192		
			T _J =150℃		210		
E _{on}	Turn-on Switching Loss	V _{CC} =600V, I _C =50A, R _{Gon} =15Ω, V _{GE} =±15V, di/dt=767A/μs (T _J =150℃), Inductive Load	T _J =25℃		4.81		mJ
			T _J =125℃		6.16		
			T _J =150℃		7.48		



E _{off}	Turn-off Switching Loss	V _{CC} =600V, I _C =50A, R _{Goff} =15Ω, V _{GE} =±15V, du/dt=4951V/μs (T _J =150°C), Inductive Load	T _J =25°C		3.76		mJ
			T _J =125°C		4.21		
			T _J =150°C		5.30		
Q _g	Total Gate Charge	V _{GE} =+15V...-15V	T _J =25°C		2850		nC
R _{g internal}	Internal Gate Resistance		T _J =25°C		3.4		Ω
SCSOA	V _{CC} =600V, V _{GE} =±15V, R _G =15Ω, T _J =150°C			10			μs
R _{θJC}	Thermal Resistance: Junction-To-Case (per IGBT)					0.384	°C/W

Diode, Inverter

Maximum Rated Values (T_C=25°C unless otherwise specified)

V _{RRM}	Repetitive Peak Reverse Voltage	T _J =25°C	1200	V
I _F	Diode Continuous Forward Current		50	A
I _{FM}	Repetitive Peak Forward Current	tp=1ms	100	A

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

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
V _{FM}	Forward Voltage	I _F =50A	T _J =25℃		1.75		V
			T _J =125℃		1.85		
			T _J =150℃		1.85		
t _{rr}	Reverse Recovery Time	I _F =50A, -diF/dt=904A/μs(T _J =150℃), V _{rr} =600V, V _{GE} =-15V	T _J =25℃		290		ns
			T _J =125℃		524		
			T _J =150℃		542		
I _{rr}	Peak Reverse Recovery Current		T _J =25℃		38.6		A
			T _J =125℃		45.2		
			T _J =150℃		43.8		
Q _{rr}	Reverse Recovery Charge		T _J =25℃		5.7		μC
			T _J =125℃		10.3		
			T _J =150℃		11.1		



E _{rec}	Reverse Recovery Energy	I _F =50A, -diF/dt=904A/μs(T _J =150°C), V _{rr} =600V, V _{GE} =-15V	T _J =25°C		1.86		mJ
			T _J =125°C		3.83		
			T _J =150°C		4.09		
R _{θJC}	Thermal Resistance: Junction-To-Case (per Diode)					0.501	°C/W

Diode, Rectifier

Maximum Rated Values (T_C=25°C unless otherwise specified)

V _{RRM}	Repetitive Peak Reverse Voltage	T _J =25°C	1900	V
I _{FRMSM}	Maximum RMS Forward Current per Chip	T _J =80°C	50	A
I _{RMSM}	Maximum RMS Current at Rectifier Output	T _J =80°C	60	A
I _{FSM}	Surge Current @t _p =10 ms	T _J =25°C	482	A
		T _J =150°C	371	
I ² t	I ² t - value	T _J =25°C	1161	A ² s
		T _J =150°C	668	

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

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
V _F	Forward Voltage	I _F =50A	T _J =25°C		1.21		V
			T _J =125°C		1.20		
I _R	Reverse Current	V _R =1600V	T _J =25°C			1	mA
R _{θJC}	Diode Thermal Resistance: Junction-To-Case (per Diode)					0.717	°C/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
M	Baseplate		Copper			
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 _{θCS}	Case-To-Sink Thermally (Conductive Grease Applied)				0.03	℃/W
T	Mounting Screw:M5		3.0		6.0	N·m
G	Weight			300		g



Ordering Information Table

Device code

G	T	50	RFF	120	T6	H
①	②	③	④	⑤	⑥	⑦

- ① - IGBT Module
- ② - Trench, Low Switching Losses IGBT
- ③ - Rated Current (50=50A)
- 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)

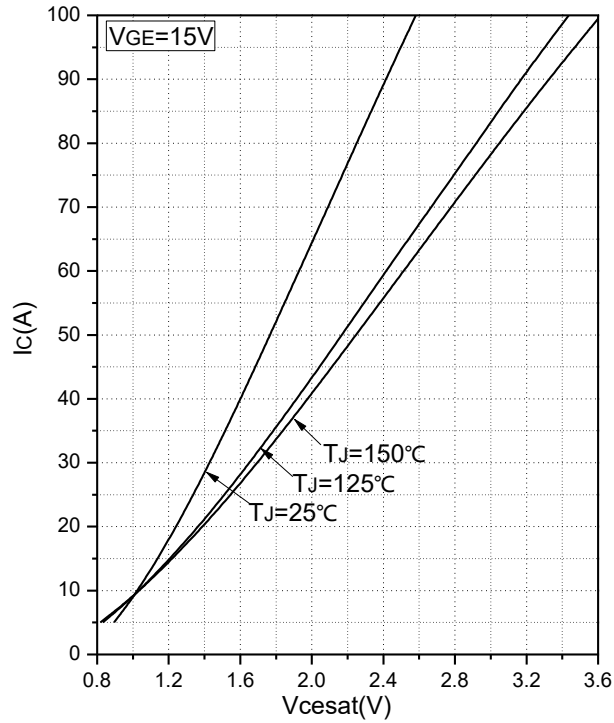


Fig.1 Typical Saturation Voltage Characteristics

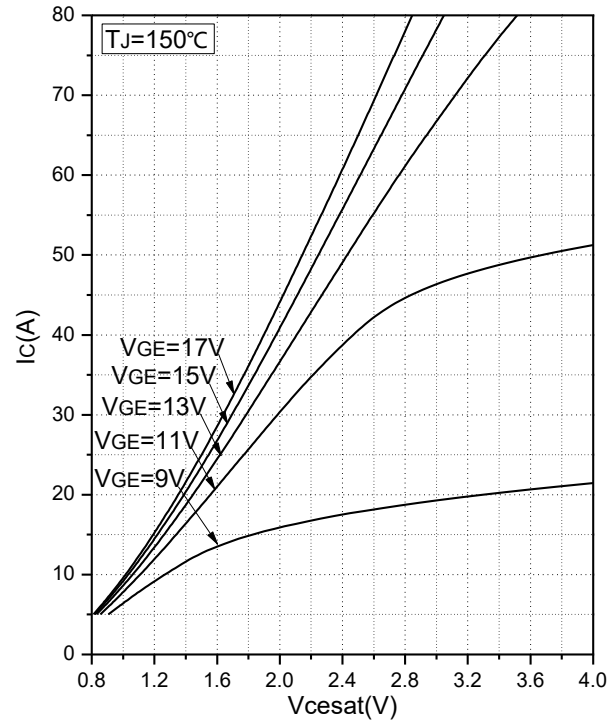


Fig.2 Typical Output Characteristics

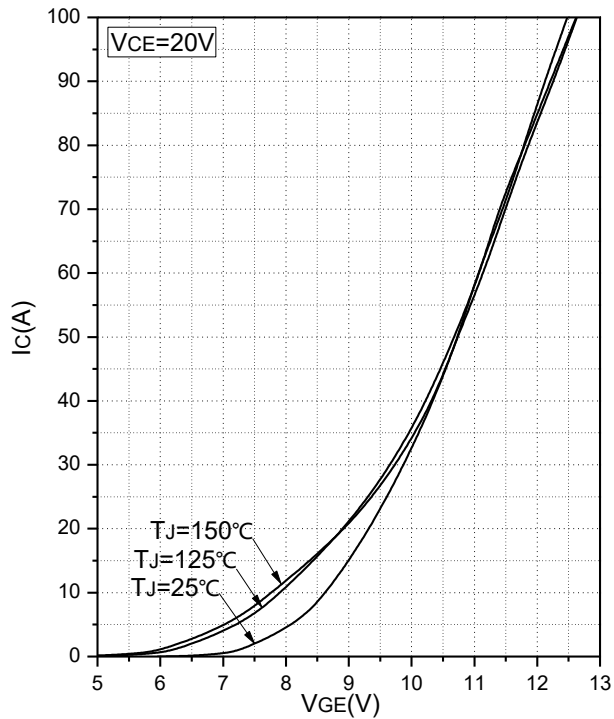


Fig.3 Transfer Characteristics (Inverter)

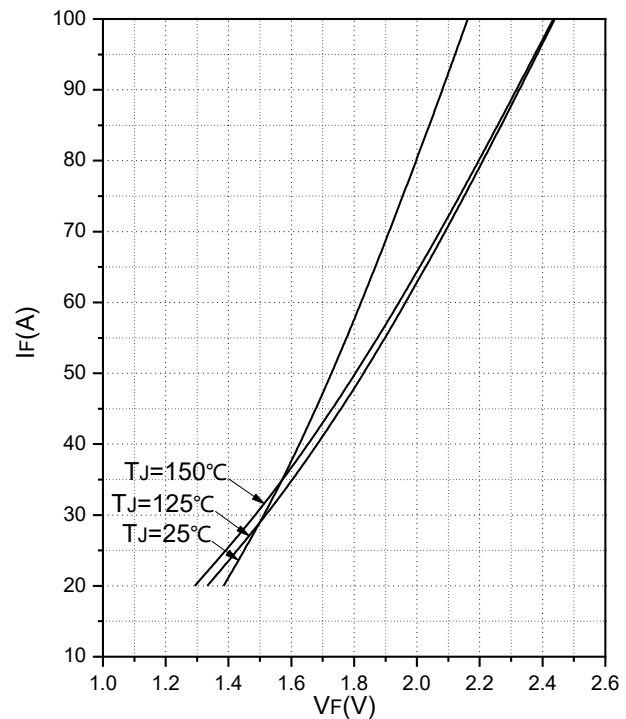


Fig.4 Forward Characteristics of Diode

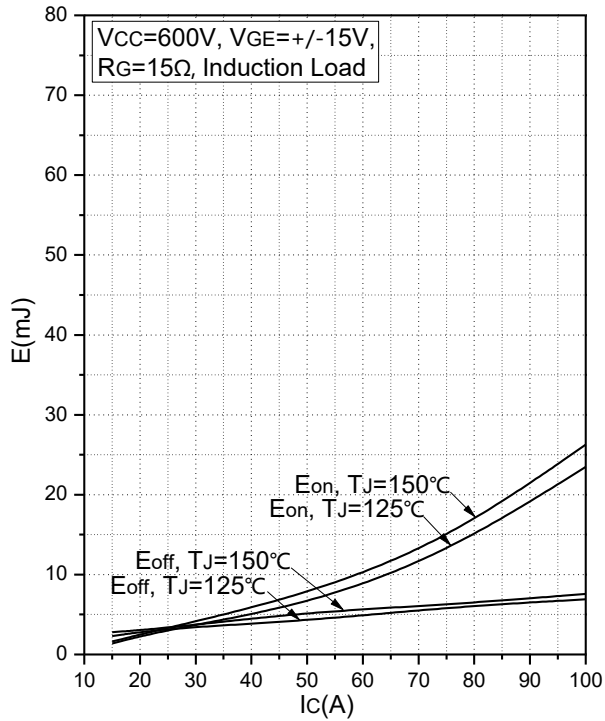


Fig.5 Typical Switching Loss vs. Collector Current

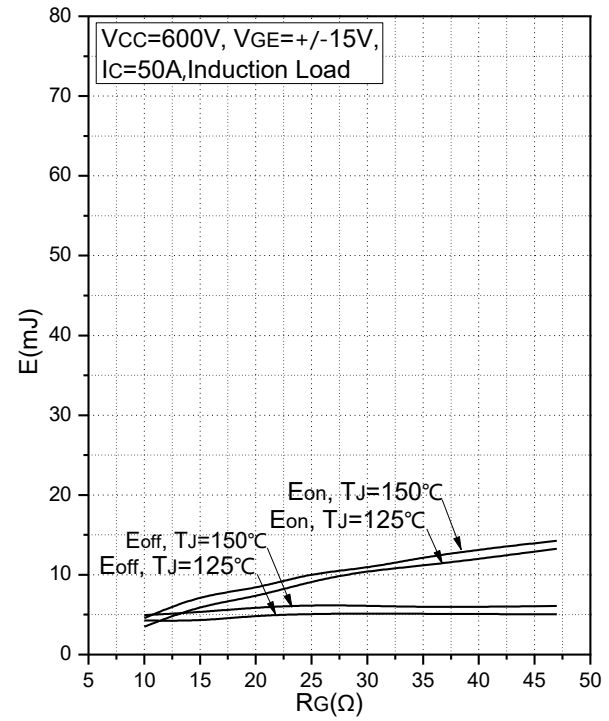


Fig.6 Typical Switching Loss vs. Gate Resistance

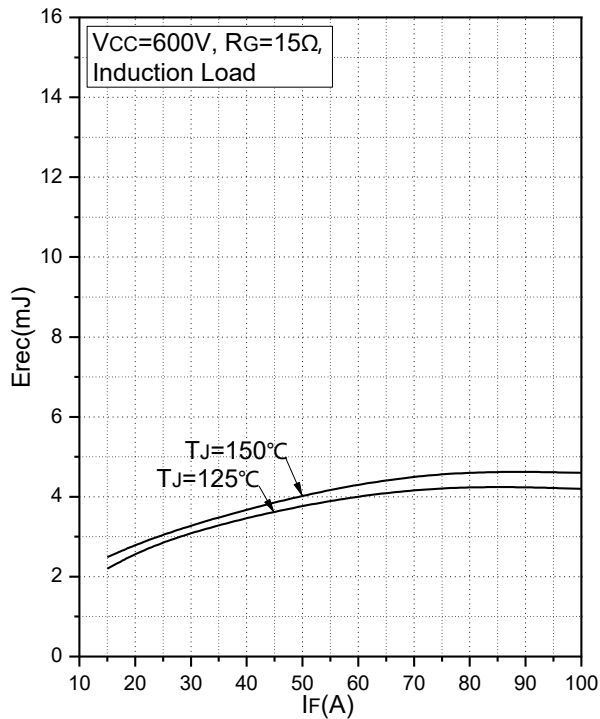


Fig.7 Typical Switching Loss vs. Forward Current

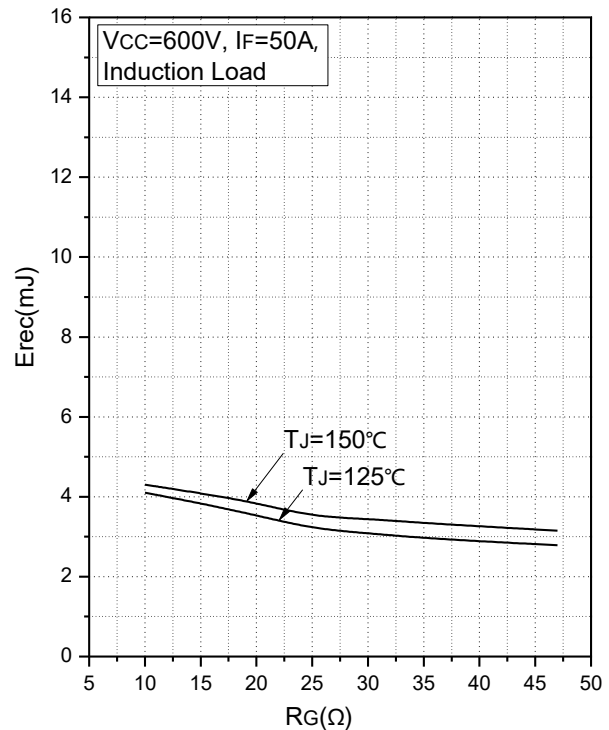


Fig.8 Typical Switching Loss vs. Gate Resistance

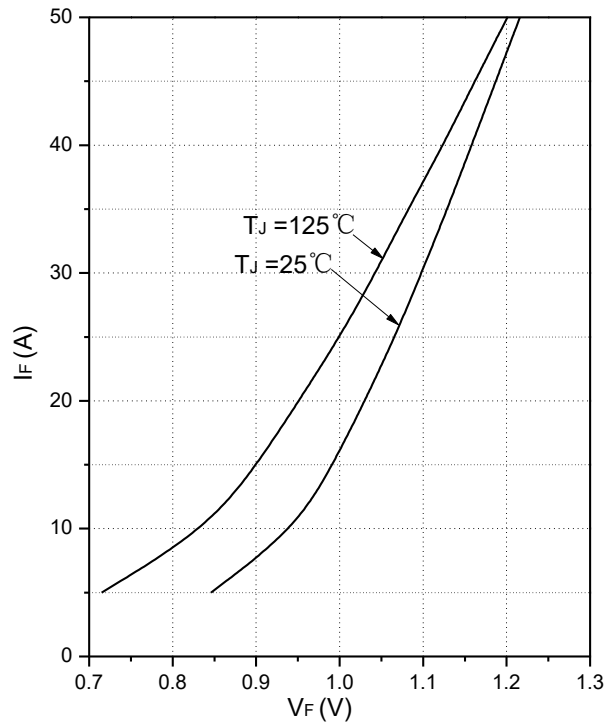


Fig.9 Forward Characteristics of Diode(Rectifier)

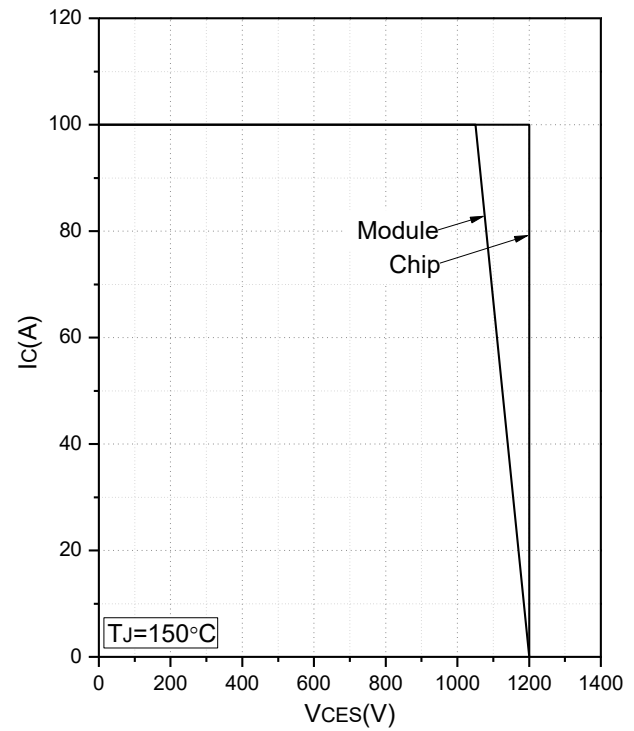


Fig.10 Transient Thermal Impedance (IGBT)

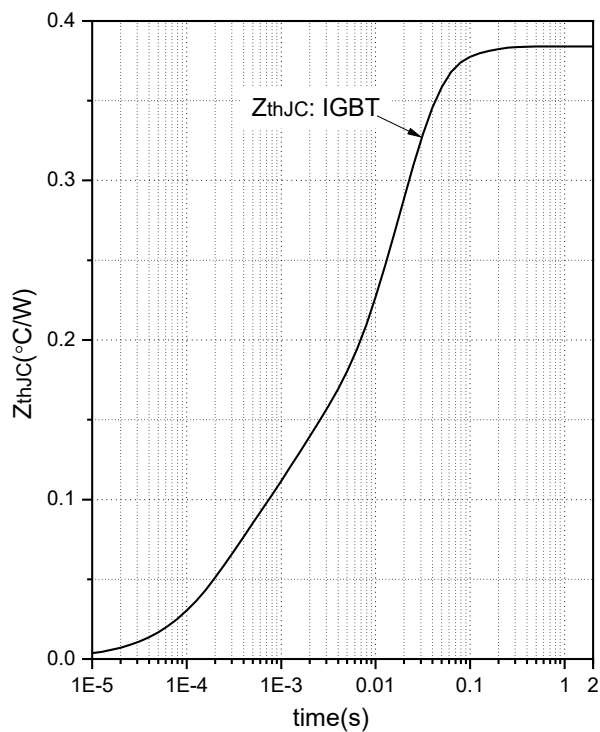


Fig.11 Transient Thermal Impedance (IGBT)

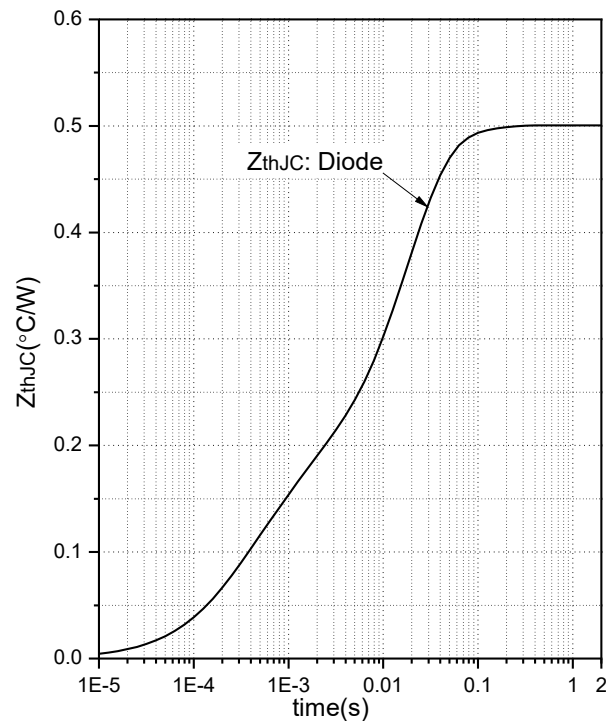


Fig.12 Transient Thermal Impedance (Diode)

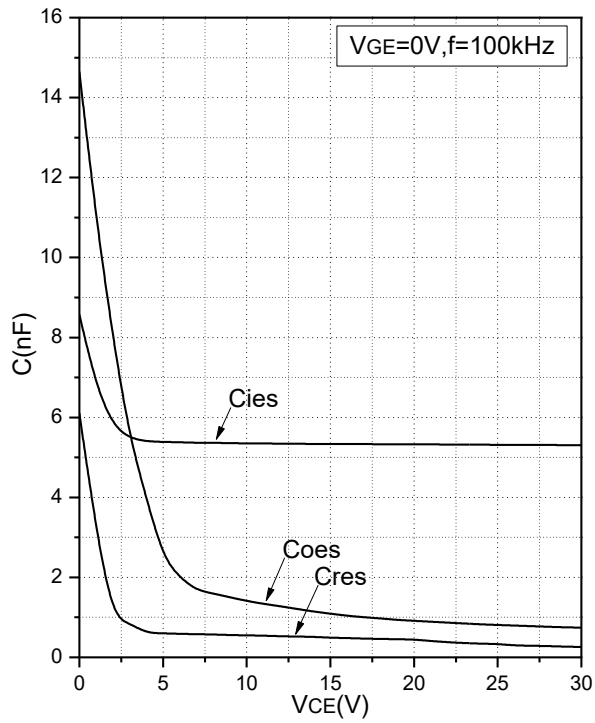


Fig.13 Capacitance Characteristics

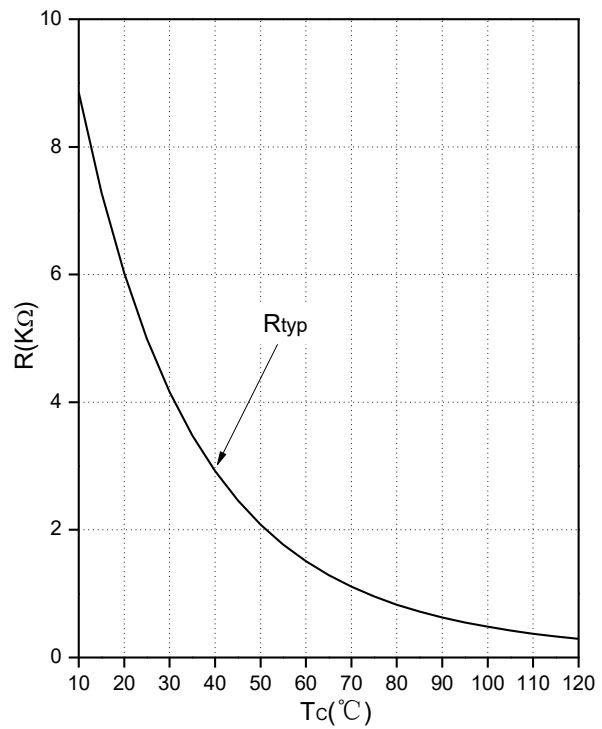
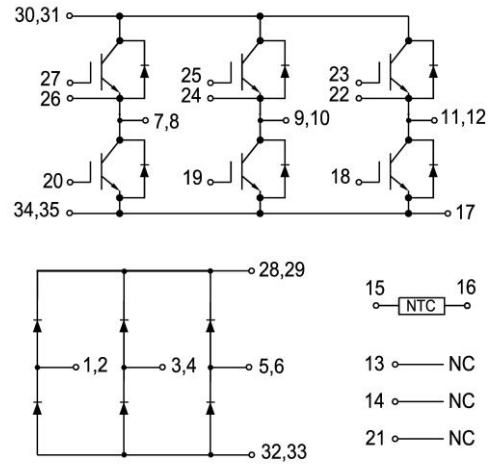


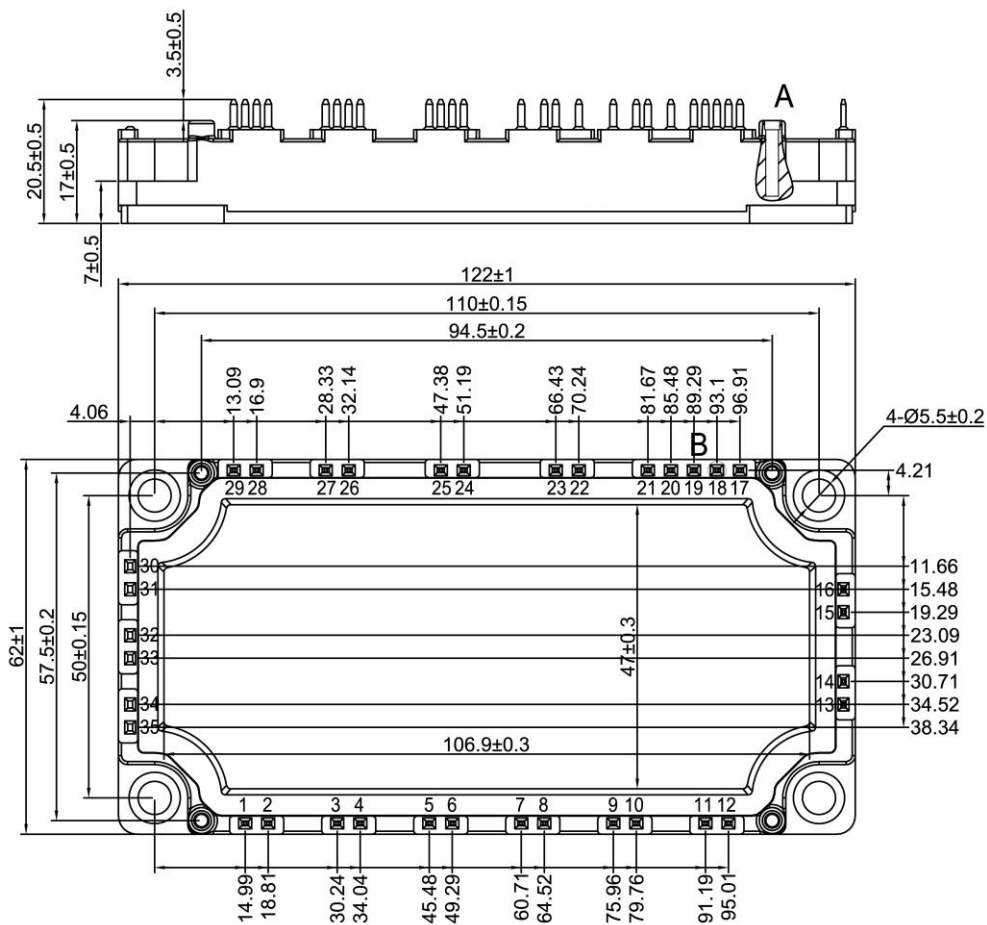
Fig.14 NTC Temperature Characteristics



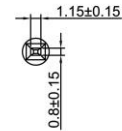
Internal Circuit:



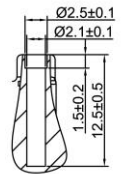
Package Outline (Unit: mm):



View B
scale 3:1



View A
scale 3:1





Date	Revision	Notes
04/09/2024	A	Final Version
07/05/2024	B	Update Rectifier Bridge Characteristics

Announcement

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