

GT40FF120A1H

IGBT Module

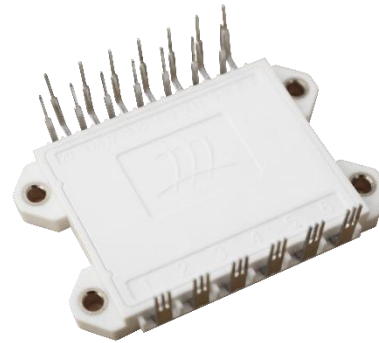
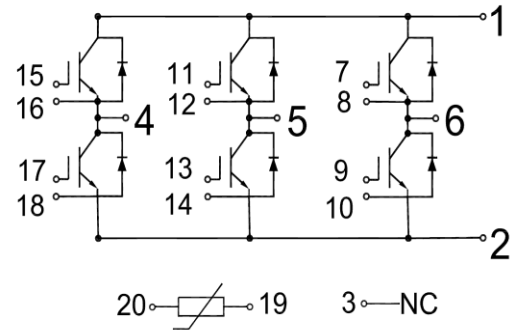
Features:

- $V_{CES}=1200V$ $I_C=40A$ Trench & Field Stop IGBT Module
- Short Circuit Capability
- Low Switching Loss
- 100% RBSOA Tested($2 \times I_C$)
- Low Stray Inductance
- Lead Free, Compliant with RoHS Requirement

Applications:

- Motor Drives
- Air Conditioning
- Servo Drives
- UPS

Circuit Diagram



Type	Package	Marking
GT40FF120A1H	A1	GT40FF120A1H

IGBT, Inverter

Maximum Rated Values ($T_C=25^\circ C$ unless otherwise specified)

V_{CES}	Collector-Emitter Blocking Voltage		1200	V
V_{GES}	Gate-Emitter Voltage		± 20	V
I_C	Continuous Collector Current Limited by T_{Jmax}	$T_C=100^\circ C$	40	A
		$T_C=25^\circ C$	80	A
I_{CM}	Peak Collector Current Repetitive	T_p limited by T_{Jmax}	80	A
P_D	Maximum Power Dissipation (IGBT)	$T_C=25^\circ C, T_{Jmax}=175^\circ C$	350	W



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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	$I_C=1\text{mA}$, $V_{CE}=V_{GE}$	5.0	5.8	6.6	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=40\text{A}$, $V_{GE}=15\text{V}$	$T_J=25^{\circ}\text{C}$	1.85	2.25	V
			$T_J=125^{\circ}\text{C}$	2.26		V
			$T_J=175^{\circ}\text{C}$	2.45		V
I_{CES}	Collector-Emitter Leakage Current	$V_{GE}=0\text{V}$, $V_{CE}=1200\text{V}$, $T_J=25^{\circ}\text{C}$			1	mA
I_{GES}	Gate-Emitter Leakage Current	$V_{GE}=20\text{V}$, $V_{CE}=0\text{V}$, $T_J=25^{\circ}\text{C}$			250	nA
C_{ies}	Input Capacitance	$V_{CE}=25\text{V}$, $V_{GE}=0\text{V}$, $f=100\text{kHz}$		2.31		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	$V_{CC}=600V, I_C=40A,$ $R_{Gon}=20\Omega, V_{GE}=\pm 15V,$ Inductive Load	$T_J=25^{\circ}C$		55		ns
			$T_J=125^{\circ}C$		53		
			$T_J=175^{\circ}C$		52		
t_r	Rise Time		$T_J=25^{\circ}C$		29		ns
			$T_J=125^{\circ}C$		31		
			$T_J=175^{\circ}C$		35		
$t_{d(off)}$	Turn-off Delay Time		$T_J=25^{\circ}C$		174		ns
			$T_J=125^{\circ}C$		194		
			$T_J=175^{\circ}C$		200		
t_f	Fall Time	$T_J=25^{\circ}C$		128		ns	
		$T_J=125^{\circ}C$		180			
		$T_J=175^{\circ}C$		210			
E_{on}	Turn-on Switching Loss	$V_{CC}=600V, I_C=40A,$ $R_{Gon}=20\Omega, V_{GE}=\pm 15V,$ $di/dt=900A/\mu s(T_J=175^{\circ}C)$ Inductive Load	$T_J=25^{\circ}C$		4.5		mJ
		$T_J=125^{\circ}C$		5.2			
		$T_J=175^{\circ}C$		5.8			



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E _{off}	Turn-off Switching Loss	V _{CC} =600V, I _C =40A, R _{Goff} =20Ω, V _{GE} =±15V, du/dt=6100V/μs(T _J =175°C) Inductive Load	T _J =25°C		2.3		mJ
			T _J =125°C		2.9		
			T _J =175°C		3.3		
Q _g	Total Gate Charge	V _{GE} =+15V...-15V	T _J =25°C		198		nC
R _{G (int)}	Internal Gate Resistance		T _J =25°C		4.5		Ω
T _{SC}	V _{CC} =600V, V _{GE} =±15V, T _J =175°C ^{note1}					10	us
R _{θJC}	IGBT Thermal Resistance: Junction-to-Case (per IGBT)					0.419	°C/W
R _{θCS}	IGBT Thermal Resistance: Case-to-Sink (per IGBT) (per IGBT, λ _{grease} = 1 W/(m · K))				0.528		°C/W

note1: Short circuit withstand time cannot exceed 10us under specified condition

Diode, Inverter

Maximum Rated Values of Diode (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		40	A
I _{FM}	Diode Maximum Forward Current	tp=1ms	80	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 =40A	T _J =25°C		1.55	1.90	V
			T _J =125°C		1.60		
			T _J =175°C		1.57		
t _{rr}	Reverse Recovery Time	I _F =40A, -diF/dt=1100A/μs(T _J =175°C), V _R =600V, V _{GE} =-15V	T _J =25°C		340		ns
			T _J =125°C		480		
			T _J =175°C		595		
I _{rr}	Peak Reverse Recovery Current		T _J =25°C		32		A
			T _J =125°C		35		
			T _J =175°C		37		
Q _{rr}	Reverse Recovery Charge		T _J =25°C		3.7		μC
			T _J =125°C		6.2		
			T _J =175°C		8.3		



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E _{rec}	Reverse Recovery Energy	I _F =40A, -diF/dt=1100A/μs(T _J =175°C), V _R =600V, V _{GE} =-15V	T _J =25°C		1.2		mJ
			T _J =125°C		2.3		
			T _J =175°C		3.2		
R _{θJC}	Diode Thermal Resistance: Junction-to-Case (per Diode)					0.663	°C/W
R _{θCS}	Diode Thermal Resistance: Case-to-Sink (per Diode, λ _{grease} = 1 W/(m • K))				0.836		°C/W

Internal NTC-Thermistor Characteristics

Symbol	Conditions	Min.	Typ.	Max.	Units.
R_{25}	$T_C=25^\circ C$		5		k Ω
$\Delta R/R$	$T_C=100^\circ C$, $R_{100}=465\Omega$	-5		+5	%
P_{25}	$T_C=25^\circ C$			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, 60s			V
T_J	Maximum Junction Temperature	-40		175	$^\circ C$
T_{JOP}	Maximum Operating Junction Temperature Range ^{note2}	-40		150	$^\circ C$
T_{stg}	Storage Temperature	-40		125	$^\circ C$
CTI	Comparative Tracking Index	200			
T	Mounting Screw:M3	0.75		1.20	N·m
G	Weight		30		g

note2: $T_{JOP} > 150^\circ C$ is only allowed for operation at overload conditions.

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Ordering Information Table

Device code	G	T	40	FF	120	A1	H
	①	②	③	④	⑤	⑥	⑦

- ① - IGBT Module
- ② - Field Stop Trench Gate 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)



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Characteristic diagram

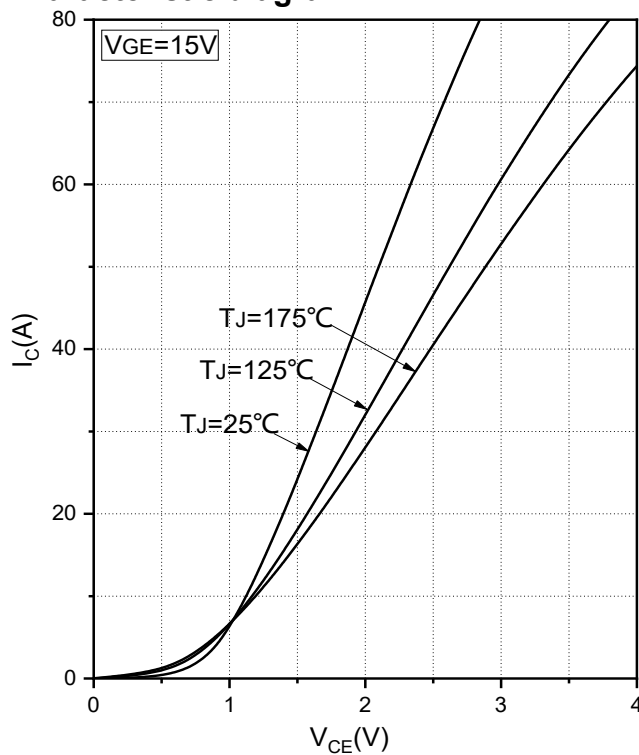


Fig.1 Typical Saturation Voltage Characteristics

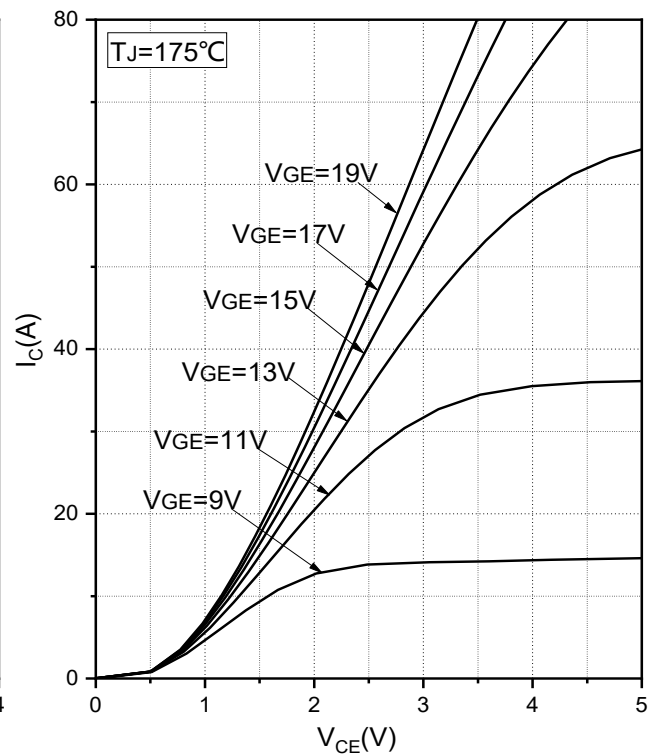


Fig.2 Typical Output Characteristics

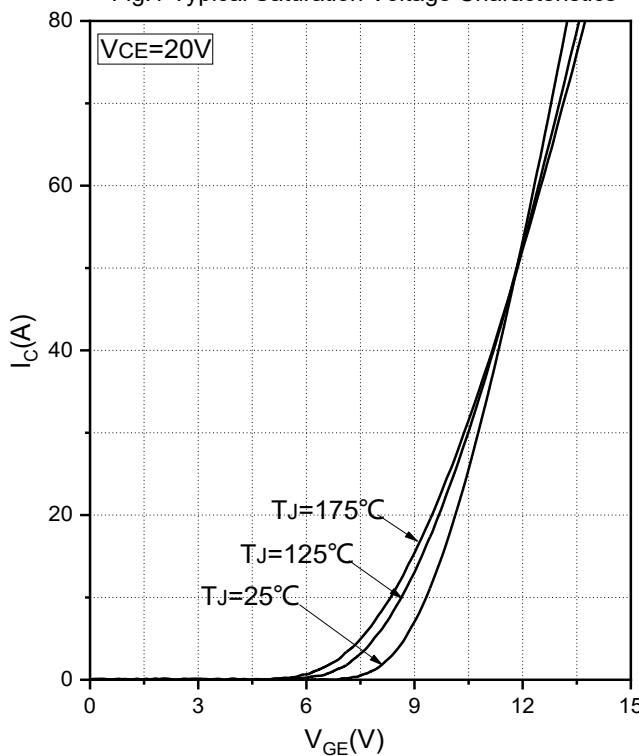


Fig.3 Transfer Characteristic

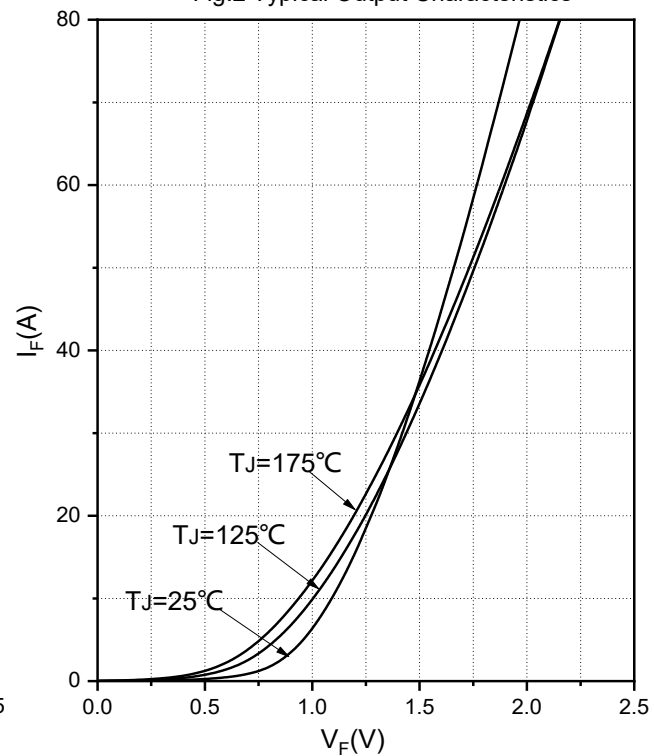


Fig.4 Forward Characteristics of Diode

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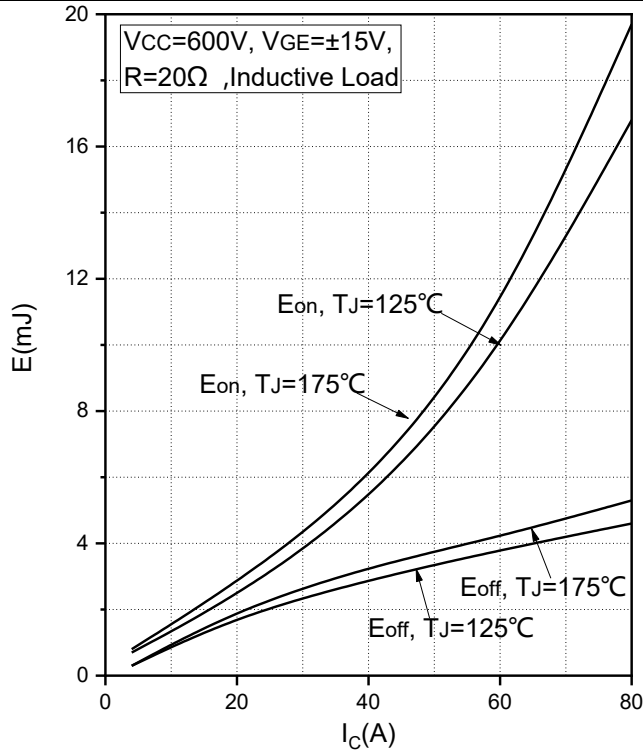


Fig.5 Typical Switching Loss vs. Collector Current

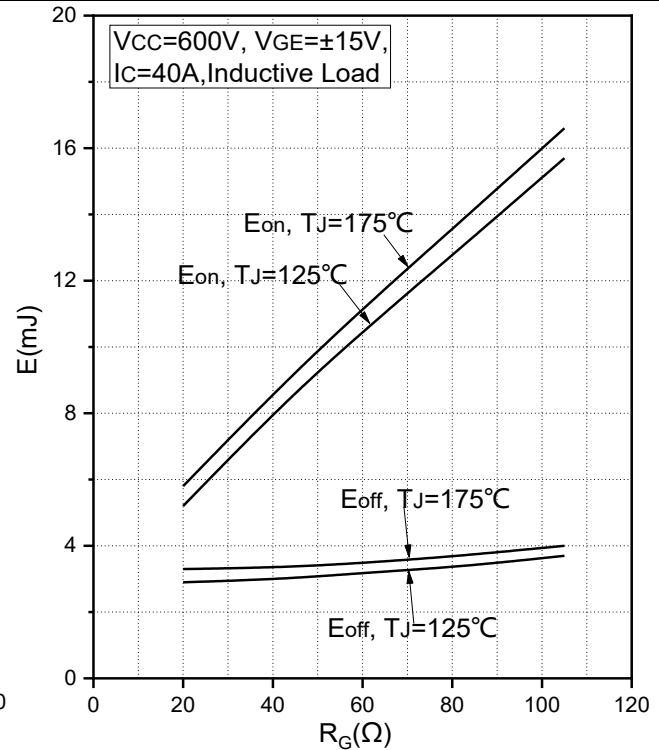


Fig.6 Typical Switching Loss vs. Gate Resistance

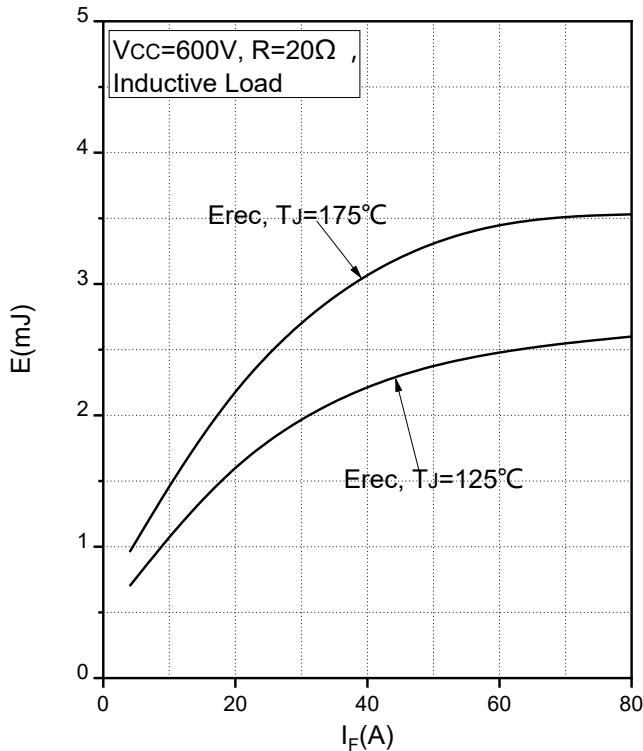


Fig.7 Typical Switching Loss vs. Forward Current

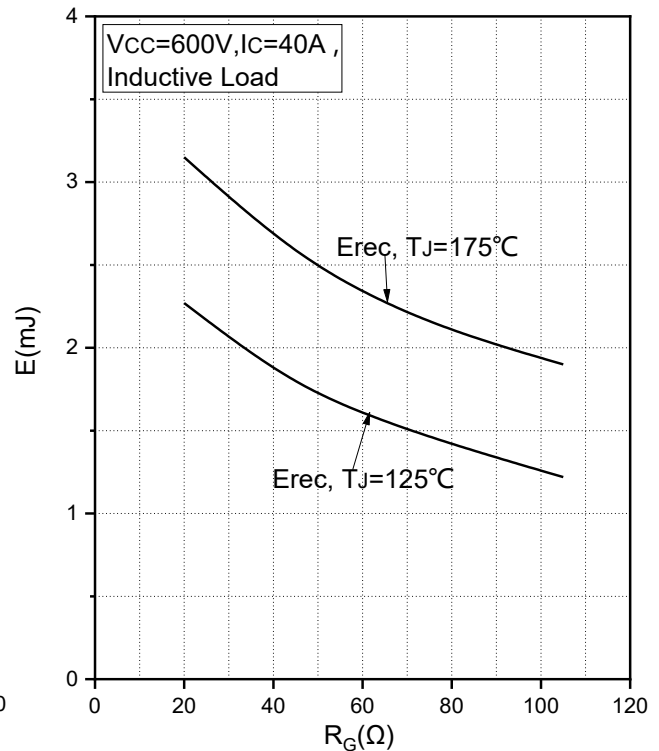


Fig.8 Typical Switching Loss vs. Gate Resistance

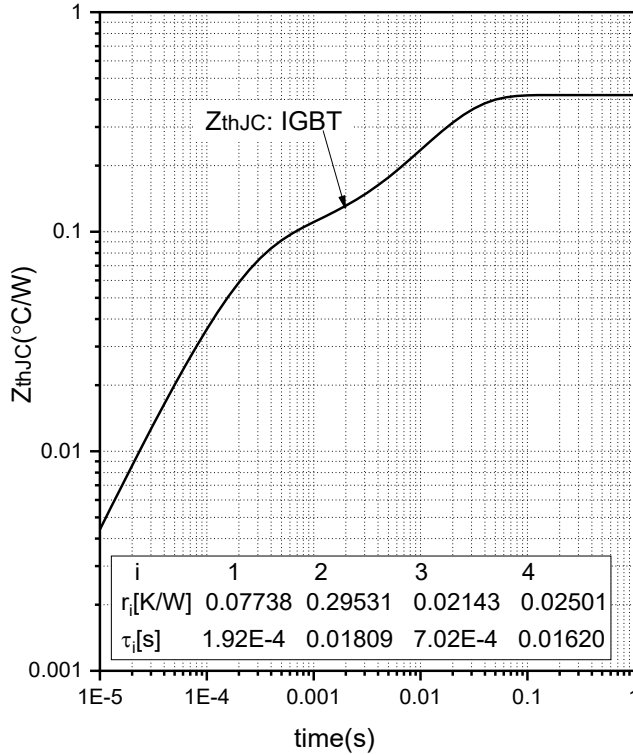


Fig.9 Transient Thermal Impedance (IGBT)

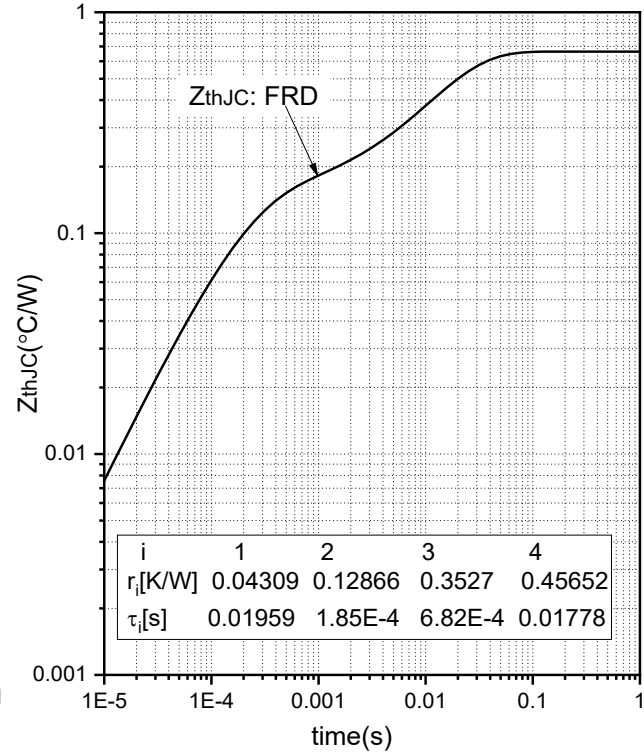


Fig.10 Transient Thermal Impedance (Diode)

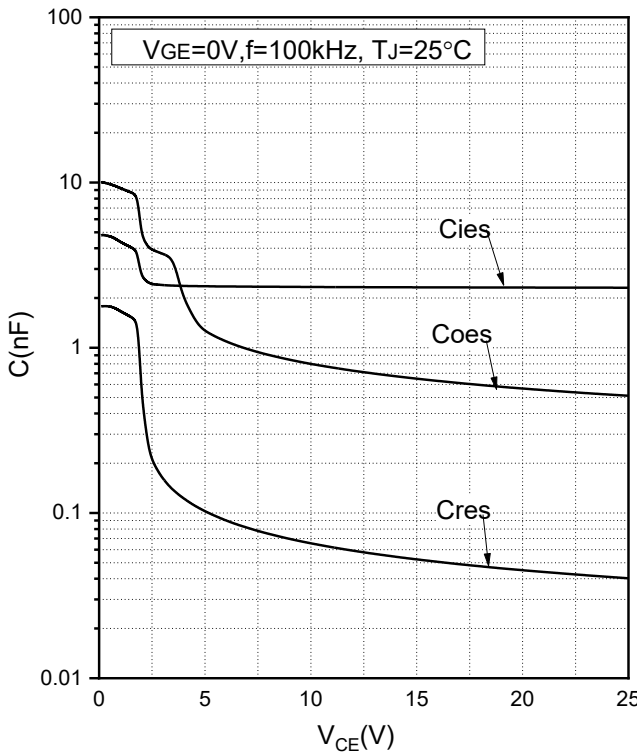


Fig.11 Capacitance Characteristics

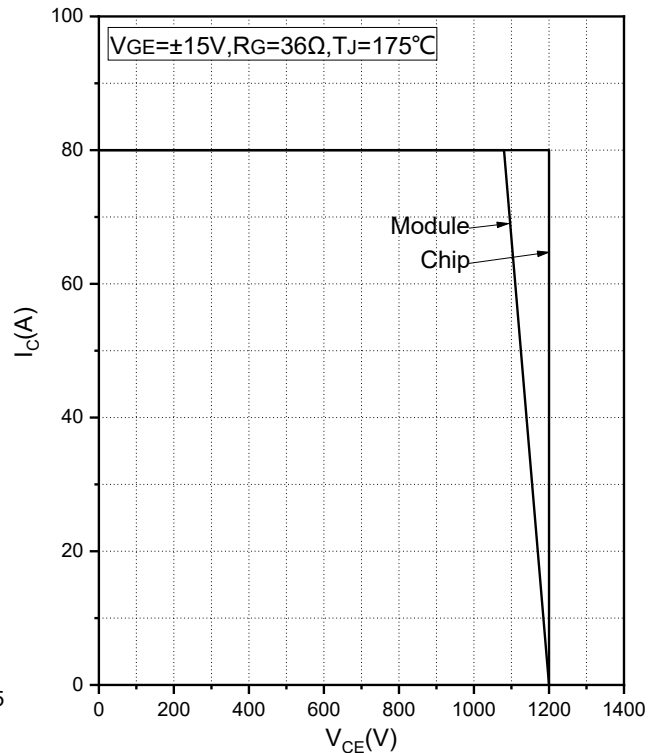


Fig.12 Reverse Bias Safe Operation Area (RBSOA)



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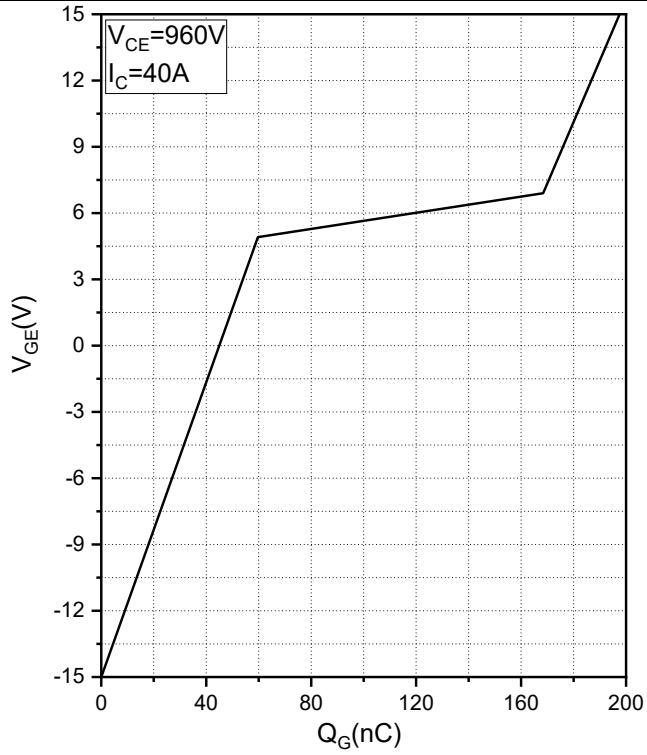


Fig.13 Gate Charge Characteristics

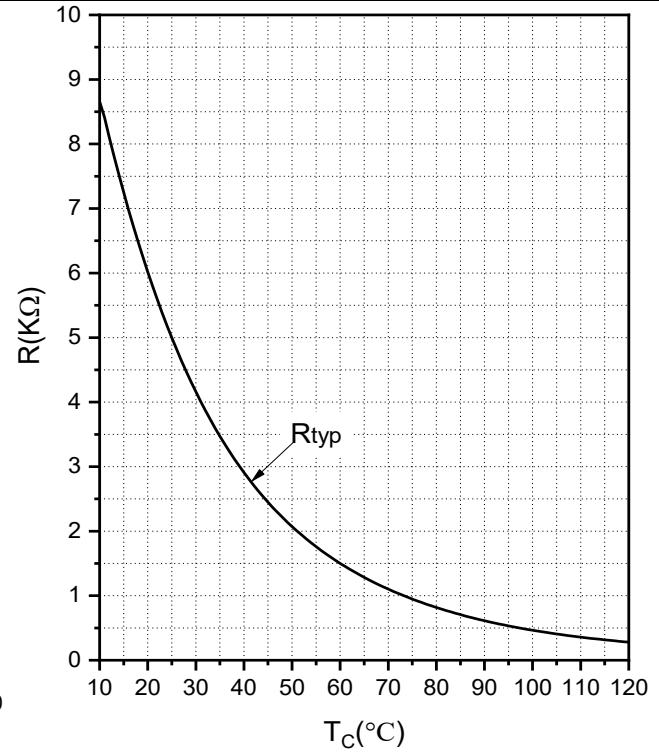


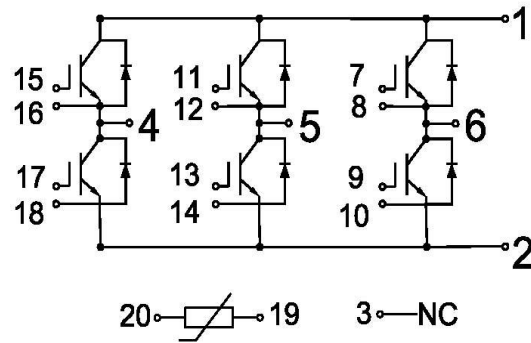
Fig.14 NTC Temperature Characteristics



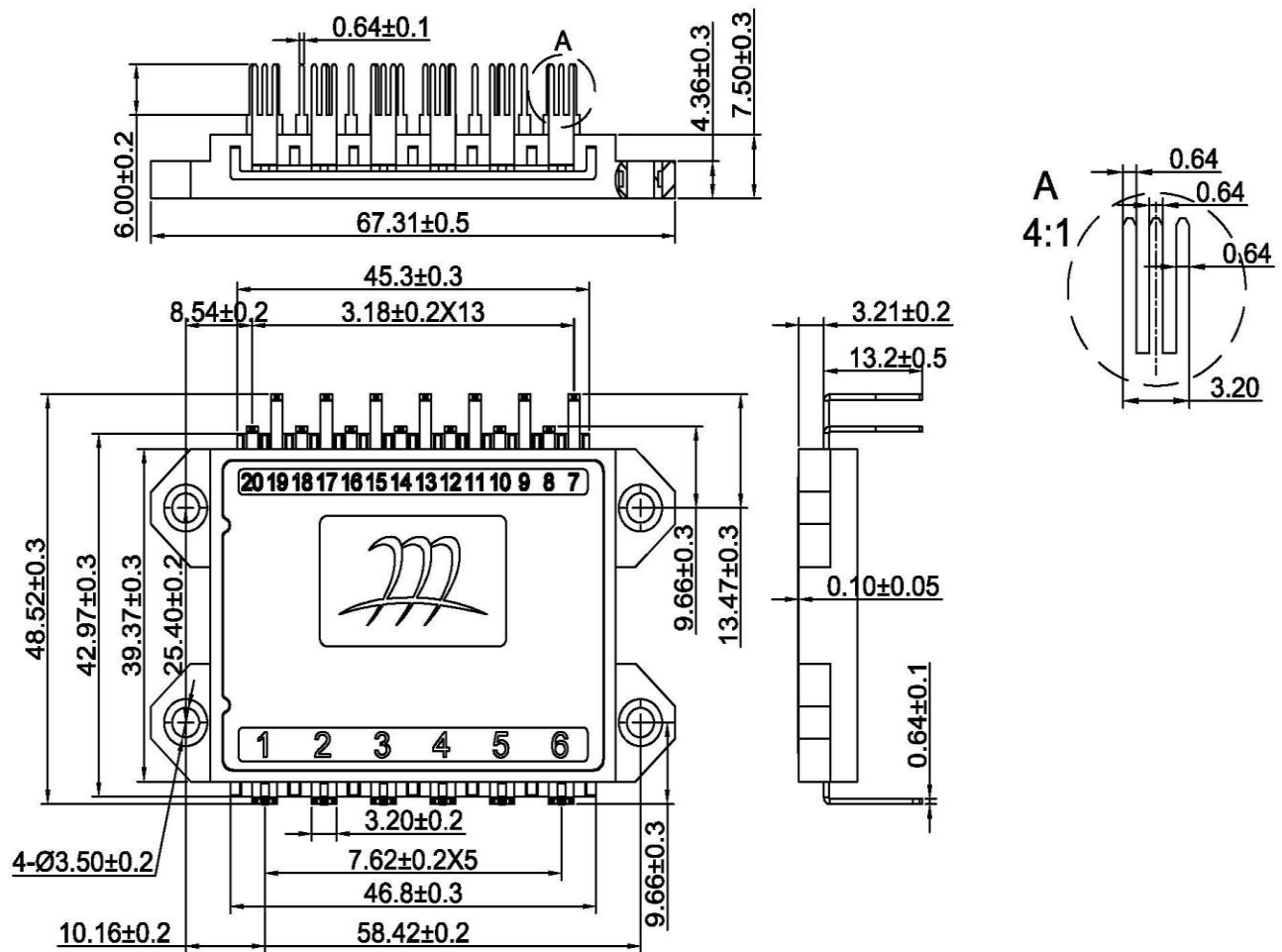
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Internal Circuit:



Package Outline (Unit: mm):



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Revision	Notes
A	Fina Datasheet Initial Release

Announcement

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