



GT300MAR120T9H

GT300MCR120T9H

IGBT Module

Preliminary Data

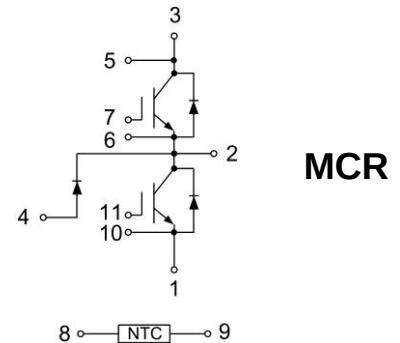
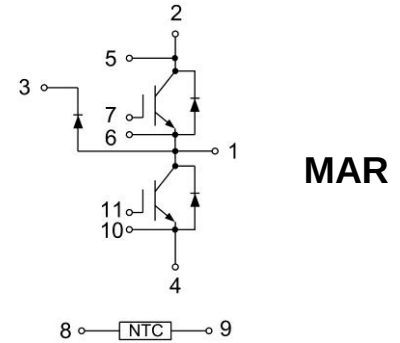
Features:

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

Applications:

- 3-Level-Applications

Circuit Diagram



IGBT, Inverter

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

V_{CES}	Collector-Emitter Blocking Voltage		1200	V
V_{GES}	Gate-Emitter Voltage		± 20	V
I_c	Continuous Collector Current	$T_c=100^\circ\text{C}$	300	A
		$T_c=25^\circ\text{C}$	600	A
I_{CM}	Peak Collector Current Repetitive	$t_p=1\text{ms}$	600	A
P_D	Maximum Power Dissipation (per leg)	$T_c=25^\circ\text{C}$ $T_{Jmax}=175^\circ\text{C}$	1920	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	$I_C=10.6\text{mA}$, $V_{CE}=V_{GE}$	5.0	5.8	6.5	V
V_{CEsat}	Collector-Emitter Saturation Voltage	$I_C=300\text{A}$, $V_{GE}=15\text{V}$	$T_J=25^{\circ}\text{C}$	1.65	1.90	V
			$T_J=125^{\circ}\text{C}$	1.90		V
			$T_J=150^{\circ}\text{C}$	1.95		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	$V_{GE}=\pm 20\text{V}$, $V_{CE}=0\text{V}$, $T_J=25^{\circ}\text{C}$			± 400	nA
C_{ies}	Input Capacitance	$V_{CE}=25\text{V}$, $V_{GE}=0\text{V}$, $f=100\text{kHz}$		32.95		nF
C_{oes}	Output Capacitance			5.06		nF
C_{res}	Reverse Transfer Capacitance			1.06		nF

Switching Characteristics

t _{d(on)}	Turn-on Delay Time	V _{CC} =600V, I _C =300A, R _{Gon} =2Ω, V _{GE} =±15V, Inductive Load	T _J =25℃		521		ns
			T _J =125℃		518		
			T _J =150℃		516		
t _r	Rise Time		T _J =25℃		167		ns
			T _J =125℃		179		
			T _J =150℃		183		
t _{d(off)}	Turn-off Delay Time	V _{CC} =600V, I _C =300A, R _{Goff} =2Ω, V _{GE} =±15V, Inductive Load	T _J =25℃		409		ns
			T _J =125℃		439		
			T _J =150℃		437		
t _f	Fall Time		T _J =25℃		154		ns
			T _J =125℃		282		
			T _J =150℃		211		
E _{on}	Turn-on Switching Loss	V _{CC} =600V, I _C =300A, R _{Gon} =2Ω, V _{GE} =±15V, di/dt=1357A/μs (T _J =150℃) Inductive Load	T _J =25℃		31.9		mJ
			T _J =125℃		38.5		
			T _J =150℃		40.0		



E _{off}	Turn-off Switching Loss	V _{CC} =600V, I _C =300A, R _{Goff} =2Ω, V _{GE} =±15V, du/dt=4943V/μs (T _J =150°C) Inductive Load	T _J =25°C		20.1		mJ
			T _J =125°C		32.6		
			T _J =150°C		35.6		
Q _g	Total Gate Charge	V _{GE} =+15V...-15V	T _J =25°C		1.16		μC
R _{g internal}	Internal Gate Resistor		T _J =25°C		2.3		Ω
SCSOA	V _{CC} =600V, V _{GE} =±15V, R _{Gon} =2Ω, R _{Goff} =2Ω, t _p =10us, T _J =125°C				1260		A
R _{θJC}	IGBT Thermal Resistance: Junction-to-Case(per leg)					0.078	°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		300	A
I _{FM}	Diode Maximum Forward Current	t _p =1ms	600	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 =300A	T _J =25°C		1.75		V
			T _J =125°C		1.90		
			T _J =150°C		1.90		
t _{rr}	Reverse Recovery Time	I _F =300A, -di _F /dt=1612A/μs(T _J =150°C), V _R =600V, V _{GE} =-15V	T _J =25°C		353		ns
			T _J =125°C		538		
			T _J =150°C		597		
I _{rr}	Peak Reverse Recovery Current		T _J =25°C		153		A
			T _J =125°C		169		
			T _J =150°C		172		
Q _{rr}	Reverse Recovery Charge		T _J =25°C		29.1		μC
			T _J =125°C		46.3		
			T _J =150°C		52.0		



E _{rec}	Reverse Recovery Energy	I _F =300A, -diF/dt =1612/μs(T _J =150°C), V _R =600V, V _{GE} =-15V	T _J =25°C		11.6		mJ
			T _J =125°C		18.7		
			T _J =150°C		19.0		
R _{θJC}	Diode Thermal Resistance: Junction-to-Case (per leg)					0.129	°C/W

Diode, 3-Level

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		300	A
I _{FM}	Diode Maximum Forward Current	t _P =1ms	600	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 =300A	T _J =25℃		1.75		V
			T _J =125℃		1.90		
			T _J =150℃		1.90		
t _{rr}	Reverse Recovery Time	I _F =300A, -di _F /dt=1612A/μs(T _J =150℃), V _R =600V, V _{GE} =-15V	T _J =25℃		353		ns
			T _J =125℃		538		
			T _J =150℃		597		
I _{rr}	Peak Reverse Recovery Current		T _J =25℃		153		A
			T _J =125℃		169		
			T _J =150℃		172		
Q _{rr}	Reverse Recovery Charge		T _J =25℃		29.1		μC
			T _J =125℃		46.3		
			T _J =150℃		52.0		
			T _J =25℃		11.6		
			T _J =125℃		18.7		
			T _J =150℃		19.0		
R _{θJC}	Diode Thermal Resistance: Junction-to-Case (per leg)					0.129	℃/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)	f=50Hz, 30s		4500	V
Internal Isolation		Al ₂ O ₃			
Material of Module 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)			0.02	℃/W
M	Power Terminals Screw:M6	3.0		6.0	N·m
M	Mounting Screw:M5	3.0		6.0	N·m
G	Weight		330		g



Ordering Information Table

Device code	G	T	300	MAR	120	T9	H
	①	②	③	④	⑤	⑥	⑦

- ① - IGBT Module
- ② - Trench, Low Switching Losses IGBT
- ③ - Rated Current (300=300A)
- ④ - Circuit Configuration: MAR(Emitter Controlled HE Diode)
MCR(Emitter Controlled HE Diode)
- ⑤ - Rated Voltage (120=1200V)
- ⑥ - Package Type
- ⑦ - Test Level (Pass the Important Reliability Test-Industrial Grade)

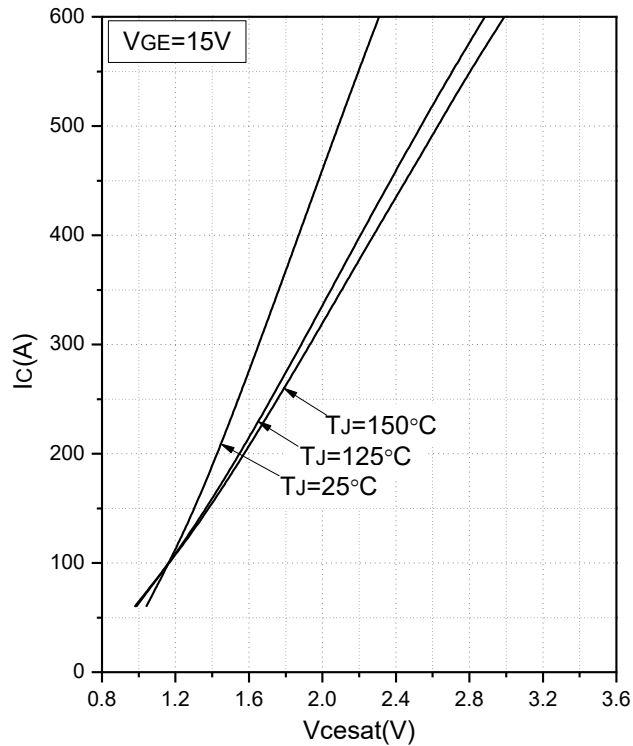


Fig.1 Typical Saturation Voltage Characteristics

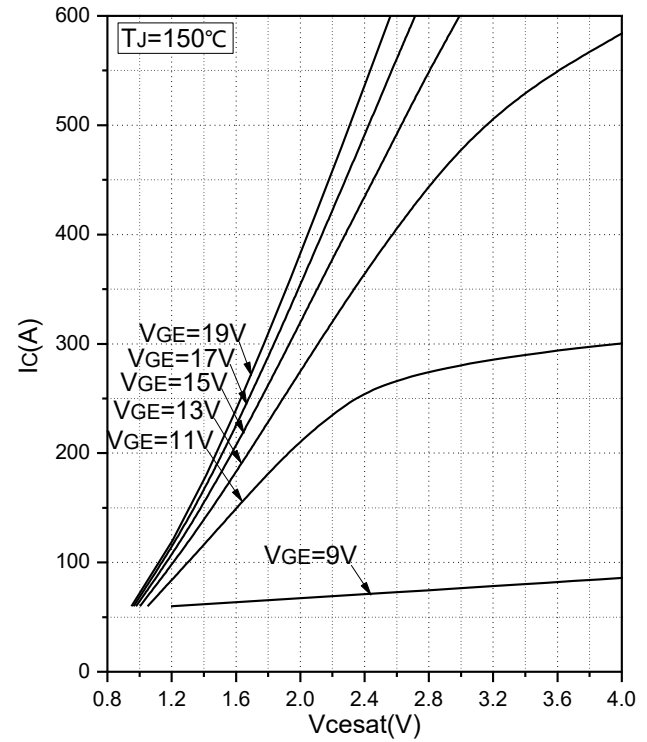


Fig.2 Typical Output Characteristics

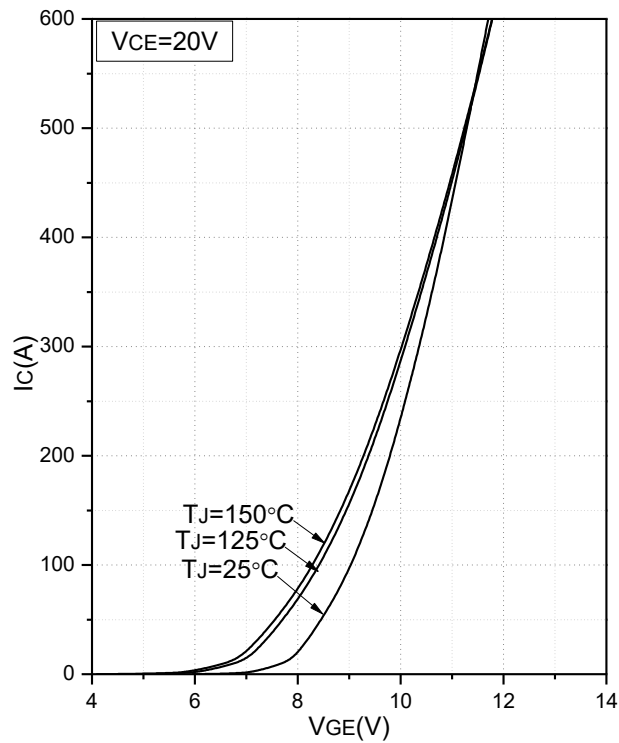


Fig.3 Transfer Characteristic

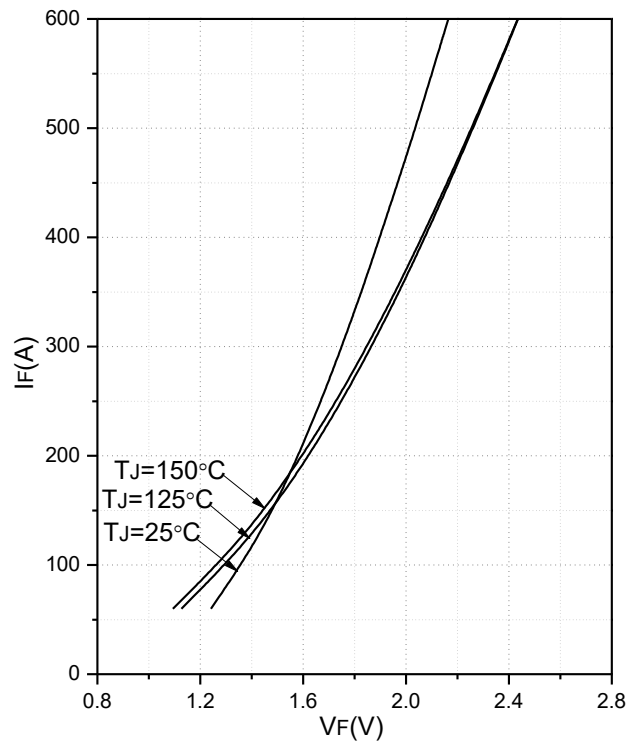


Fig.4 Forward Characteristics of Diode

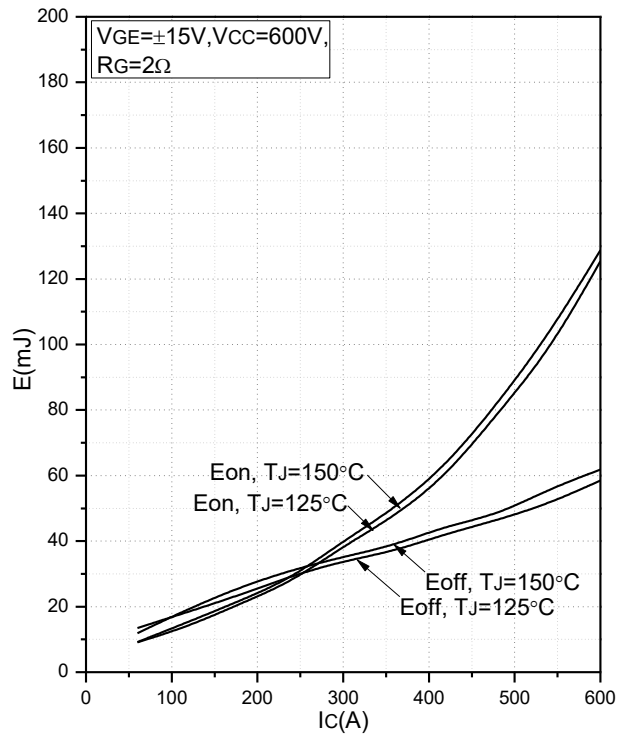


Fig.5 Typical Switching Loss vs. Collector Current

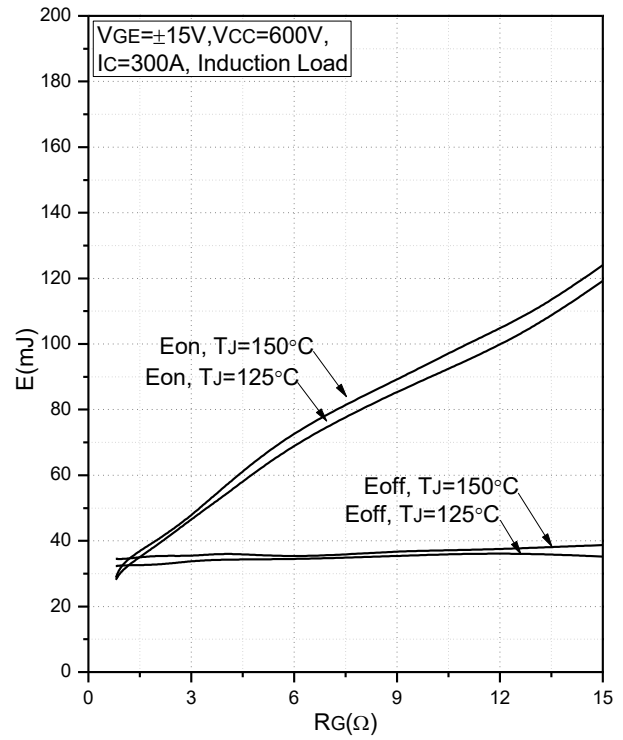


Fig.6 Typical Switching Loss vs. Gate Resistance

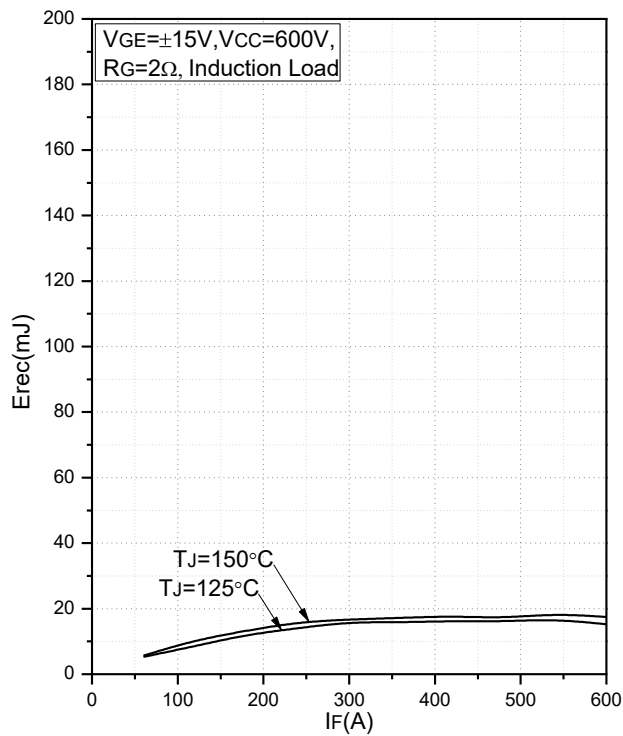


Fig.7 Typical Switching Loss vs. Forward Current

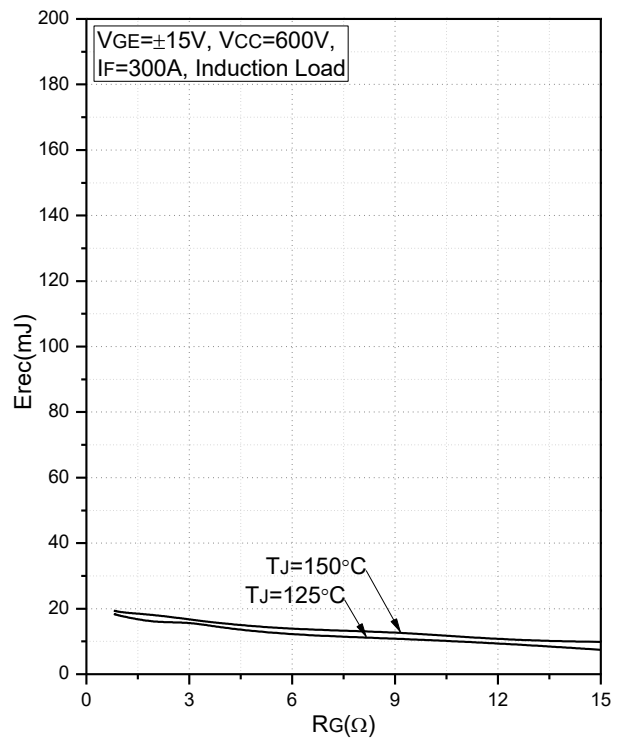


Fig.8 Typical Switching Loss vs. Gate Resistance

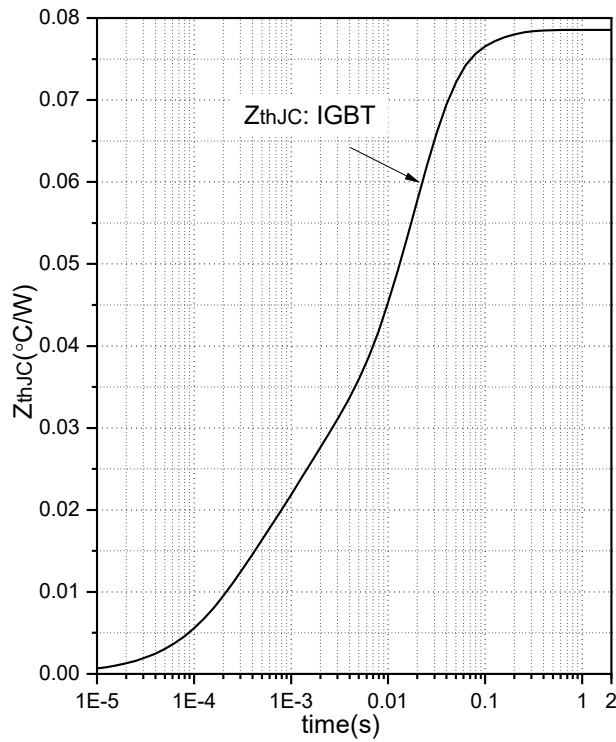


Fig.9 Transient Thermal Impedance (IGBT)

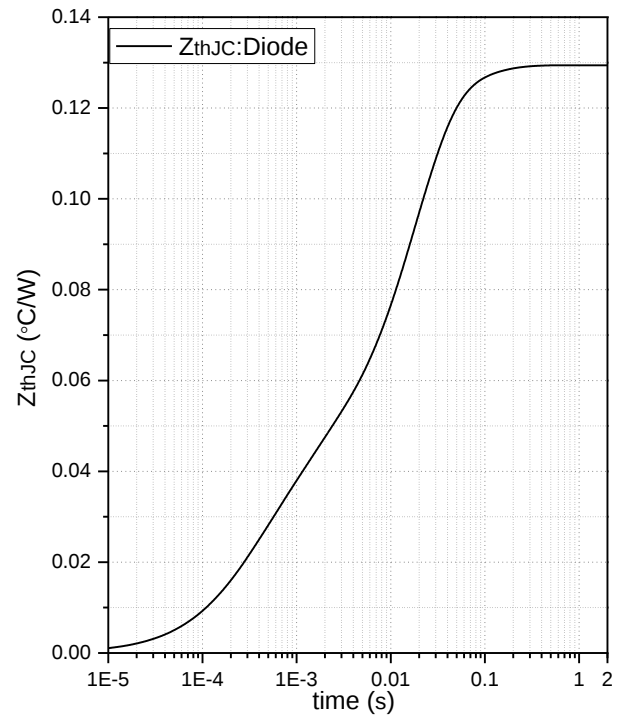


Fig.10 Transient Thermal Impedance (Diode)

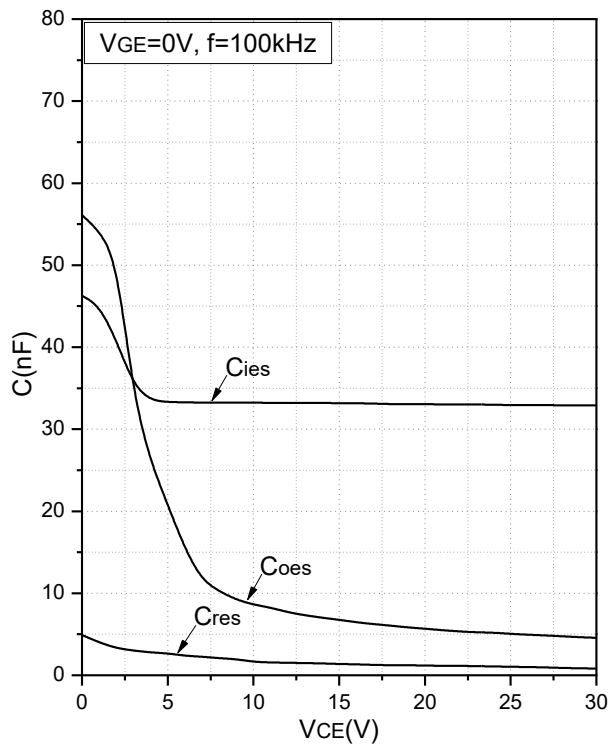


Fig.11 Capacitance Characteristics

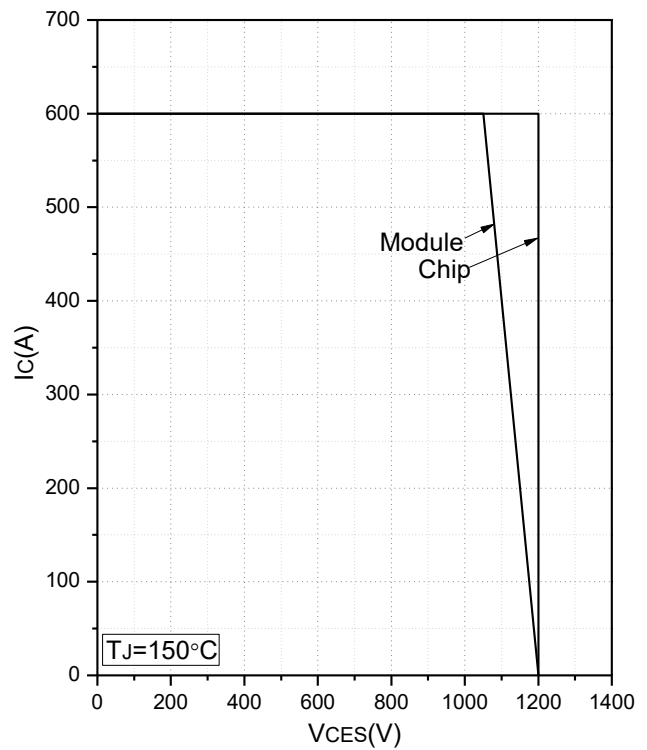


Fig.12 Reverse Bias Safe Operation Area (RBSOA)

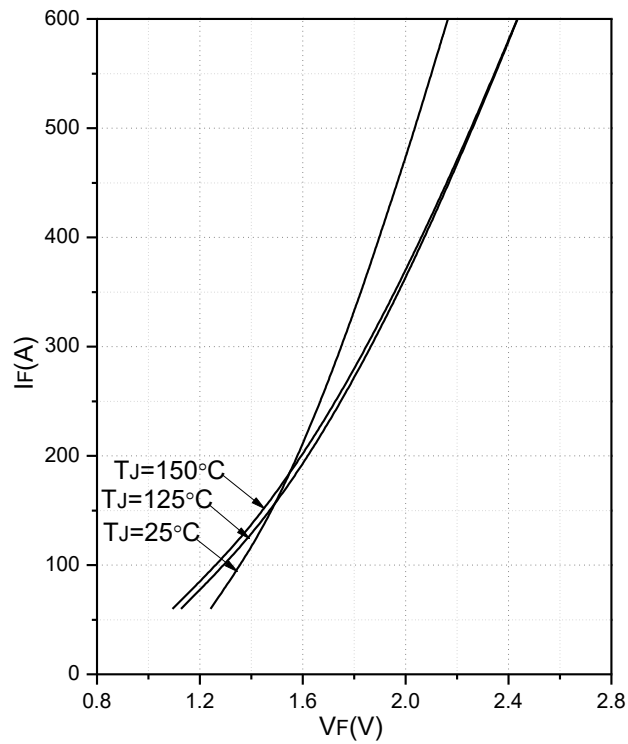


Fig.13 Forward Characteristics (Diode, 3-Level)

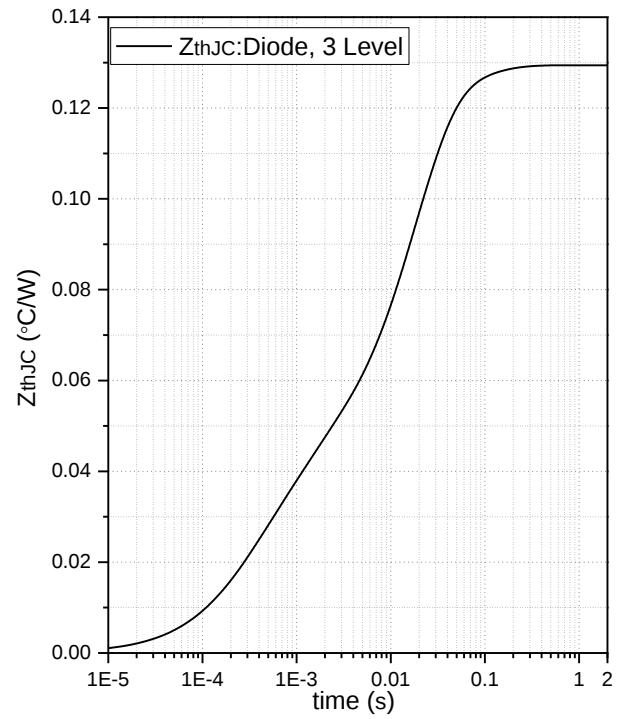


Fig.14 Transient Thermal Impedance (Diode, 3-Level)

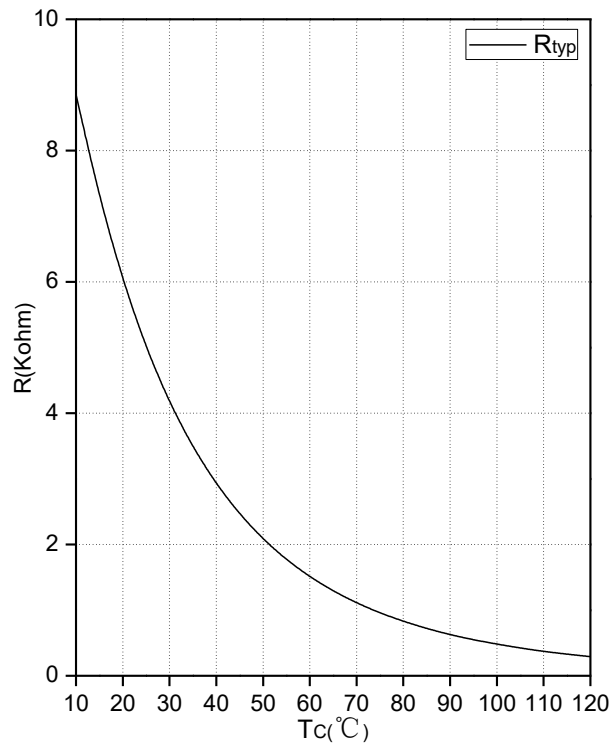
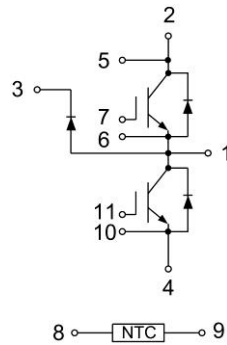


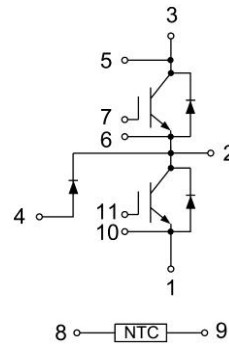
Fig.15 NTC Temperature Characteristics



Internal Circuit:

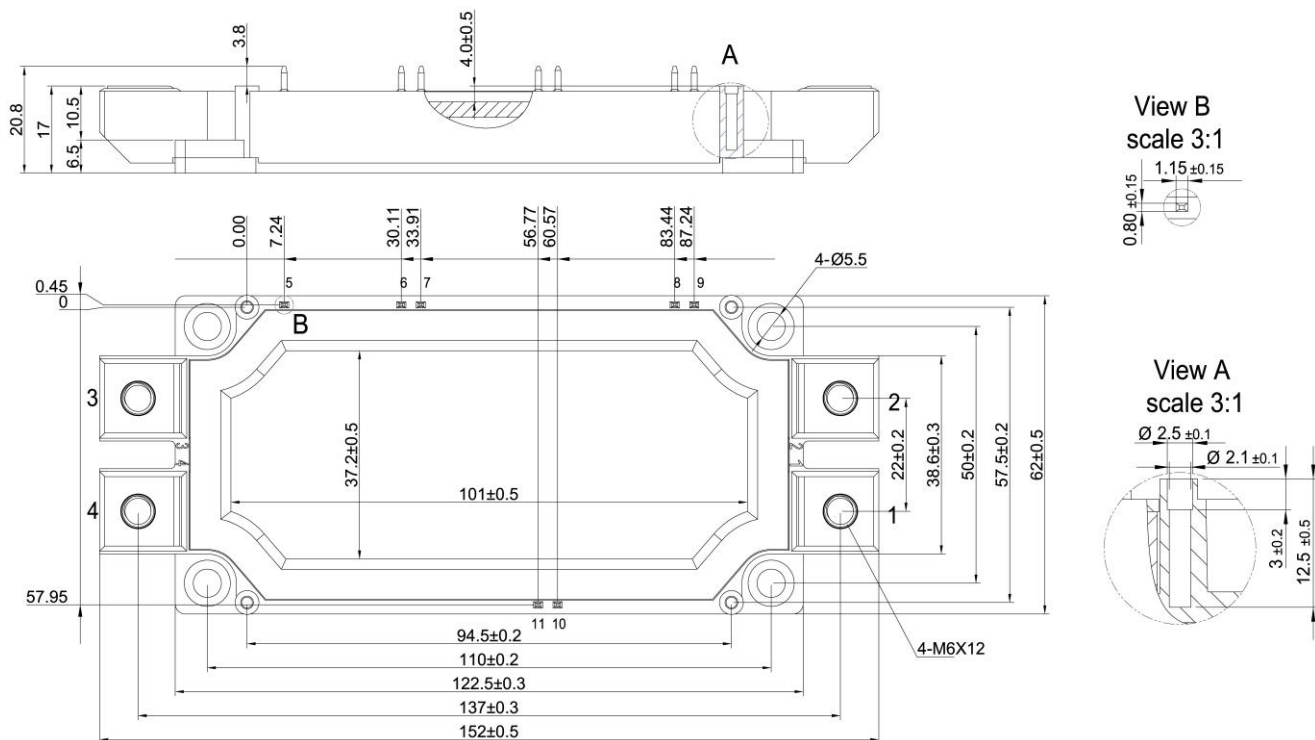


MAR



MCR

Package Outline (Unit: mm):





Date	Revision	Notes
06/07/2024	01	Initial Release

Announcements

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