GT400MAR120T9H
GT400MCR120T9H
IGBT Module

Preliminary Data

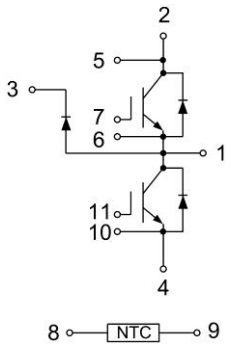
Features:

- Trench & Field Stop IGBT
- Short Circuit Rated >10μs
- Low Switching Loss
- 100% RBSOA Tested(2×Ic)
- Low Stray Inductance
- Lead Free, Compliant with RoHS Requirement

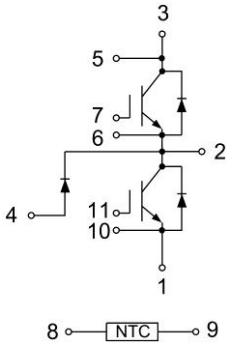
Applications:

- 3-Level-Applications
- Energy Storage Application

Circuit Diagram



MAR



MCR

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=100℃	400	A
		T_C=25℃	800	A
I_{CM}	Peak Collector Current Repetitive	t_P=1ms	800	A
P_D	Maximum Power Dissipation (per leg)	T_C=25℃ T_{Jmax}=175℃	2542	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=16mA, V_{CE}=V_{GE}		5.5	6.1	6.8	V
V_{CEsat}	Collector-Emitter Saturation Voltage	I_C=300A, V_{GE}=15V	T_J=25℃		1.75	2.10	V
			T_J=125℃		2.05		V
			T_J=150℃		2.10		V
I_{CES}	Collector-Emitter Leakage Current	V_{GE}=0V, V_{CE}=V_{CES}				1	mA
I_{GES}	Gate-Emitter Leakage Current	V_{GE}=±20V, V_{CE}=0V				±200	nA
C_{ies}	Input Capacitance	V_{CE}=25V, V_{GE}=0V, f=100kHz			44.24		nF
C_{oes}	Output Capacitance				2.37		nF
C_{res}	Reverse Transfer Capacitance				0.50		nF

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	V_{CC}=600V, I_C=400A, R_{Gon}=2Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		641		ns
			T_J=125℃		659		
			T_J=150℃		665		
t_r	Rise Time		T_J=25℃		211		ns
			T_J=125℃		223		
			T_J=150℃		232		
$t_{d(off)}$	Turn-off Delay Time	V_{CC}=600V, I_C=400A, R_{Goff}=2Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		472		ns
			T_J=125℃		507		
			T_J=150℃		514		
t_f	Fall Time		T_J=25℃		175		ns
			T_J=125℃		313		
			T_J=150℃		326		
E_{on}	Turn-on Switching Loss	V_{CC}=600V, I_C=400A, R_{Gon}=2Ω, V_{GE}=±15V, di/dt=1449A/μs (T_J=150℃) Inductive Load	T_J=25℃		44		mJ
			T_J=125℃		58		
			T_J=150℃		65		

E_{off}	Turn-off Switching Loss	V_{CC}=600V, I_C=400A, R_{Goff}=2Ω, V_{GE}=±15V, du/dt=3566V/μs (T_J=150℃) Inductive Load	T_J=25℃		42		mJ
			T_J=125℃		60		
			T_J=150℃		64		
Q_g	Total Gate Charge	V_{GE}=+15V…-15V	T_J=25℃		2.51		μC
$R_{g\ internal}$	Internal Gate Resistor		T_J=25℃		1.5		Ω
SCSOA	V_{CC}=600V, V_{GE}=±15V, R_{Gon}=2Ω, R_{Goff}=2Ω, t_p=10us, T_J=150℃				1700		A
$R_{\theta JC}$	IGBT Thermal Resistance: Junction-to-Case (per IGBT)					0.059	℃/W

Diode, Inverter

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

V_{RRM}	Repetitive Peak Reverse Voltage	T_J=25℃	1200	V
I_F	Diode Continuous Forward Current	T_C=100℃	400	A
I_{FM}	Diode Maximum Forward Current	t_P=1ms	800	A

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

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
V_{FM}	Forward Voltage	I_F=400A	T_J=25℃		1.65		V
			T_J=125℃		1.75		
			T_J=150℃		1.75		
t_{rr}	Reverse Recovery Time	I_F=400A, -di_F/dt=1717A/μs(T_J=150℃), V_R=600V, V_{GE}=-15V	T_J=25℃		335		ns
			T_J=125℃		550		
			T_J=150℃		609		
I_{rr}	Peak Reverse Recovery Current		T_J=25℃		188		A
			T_J=125℃		231		
			T_J=150℃		238		
Q_{rr}	Reverse Recovery Charge		T_J=25℃		38.1		μC
			T_J=125℃		69.3		
			T_J=150℃		78.5		

E_{rec}	Reverse Recovery Energy	I_F=400A, -diF/dt=1717/μs(T_J=150℃), V_R=600V, V_{GE}=-15V	T_J=25℃		13.7		mJ
			T_J=125℃		26.0		
			T_J=150℃		29.5		
$R_{\theta JC}$	Diode Thermal Resistance: Junction-to-Case (per Diode)					0.097	℃/W

Diode, 3-Level
Maximum Rated Values (T_C=25℃unless otherwise specified)

V_{RRM}	Repetitive Peak Reverse Voltage	T_J=25℃	1200	V
I_F	Diode Continuous Forward Current	T_C=100℃	400	A
I_{FM}	Diode Maximum Forward Current	t_P=1ms	800	A

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

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
V_{FM}	Forward Voltage	I_F=400A	T_J=25℃		1.65		V
			T_J=125℃		1.75		
			T_J=150℃		1.75		
t_{rr}	Reverse Recovery Time	I_F=400A, -d_{iF}/d_t=1717A/μs(T_J=150℃), V_R=600V, V_{GE}=-15V	T_J=25℃		335		ns
			T_J=125℃		550		
			T_J=150℃		609		
I_{rr}	Peak Reverse Recovery Current		T_J=25℃		188		A
			T_J=125℃		231		
			T_J=150℃		238		
Q_{rr}	Reverse Recovery Charge		T_J=25℃		38.1		μC
			T_J=125℃		69.3		
			T_J=150℃		78.5		
E_{rec}	Reverse Recovery Energy		TJ=25℃		13.7		mJ
			TJ=125℃		26.0		
			TJ=150℃		29.5		
$R_{\theta JC}$	Diode Thermal Resistance: Junction-to-Case (per Diode)					0.097	℃/W

Internal NTC-Thermistor Characteristics

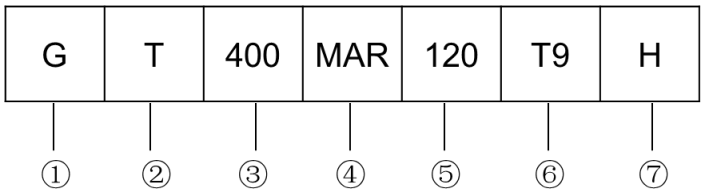
Symbol	Conditions	Min.	Typ.	Max.	Units.
R_{25}	T_C=25℃		5		kΩ
△R/R	T_C=100℃, R_{100}=465Ω	-5		+5	%
P_{25}	T_C=25℃			10	mW
$B_{25/50}$	$R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298.15K))]$		3380		K
$B_{25/80}$	$R_2=R_{25}\exp[B_{25/80}(1/T_2-1/(298.15K))]$		3440		K
$B_{25/100}$	$R_2=R_{25}\exp[B_{25/100}(1/T_2-1/(298.15K))]$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

Module

Symbol	Description		Min.	Typ.	Max.	Units
V_{iso}	Isolation Voltage (All Terminals Shorted)	f=50Hz, 30s	4500			V
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			
$R_{\theta CS}$	Case-to-Sink Thermally (Conductive Grease Applied)				0.03	℃/W
M	Power Terminals Screw:M6		4.0		5.0	N·m
M	Mounting Screw:M5		3.0		6.0	N·m
G	Weight			330		g

Ordering Information Table

Device code



① - IGBT Module
② - Trench, Low Switching Losses IGBT
③ - Rated Current (400=400A)
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)

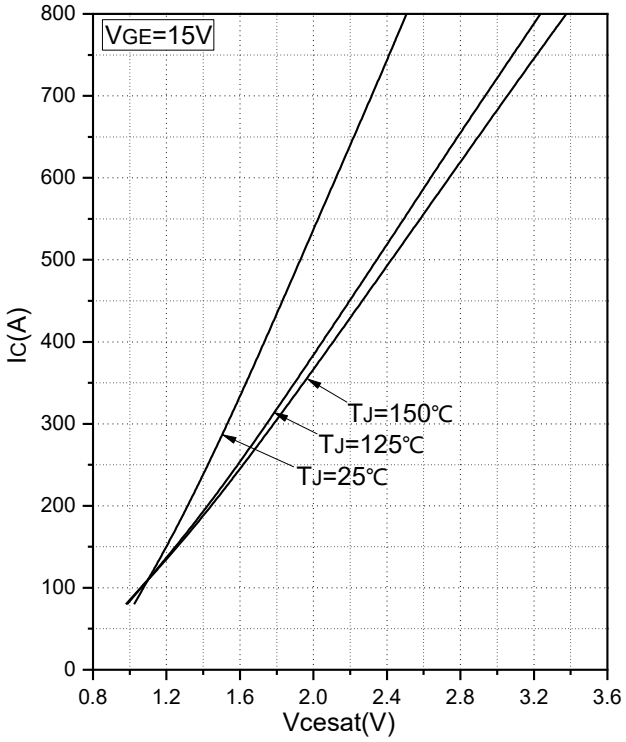


Fig.1 Typical Saturation Voltage Characteristics

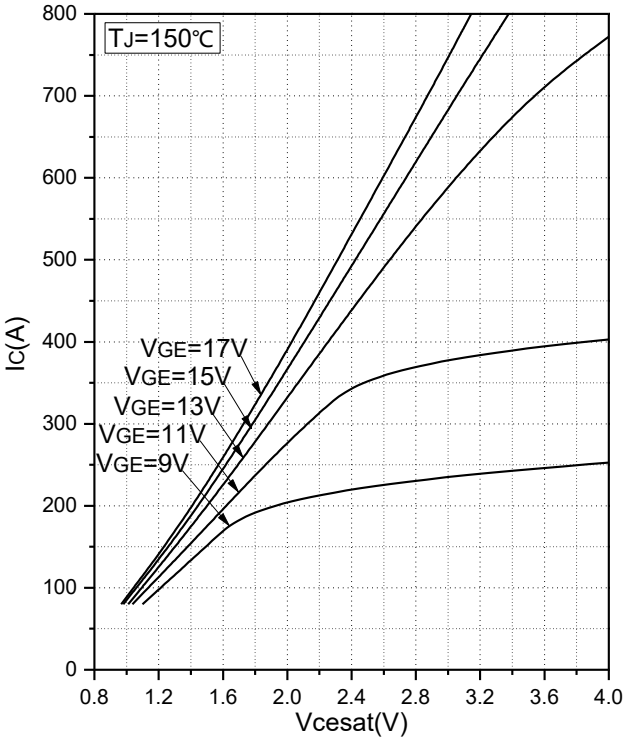


Fig.2 Typical Output Characteristics

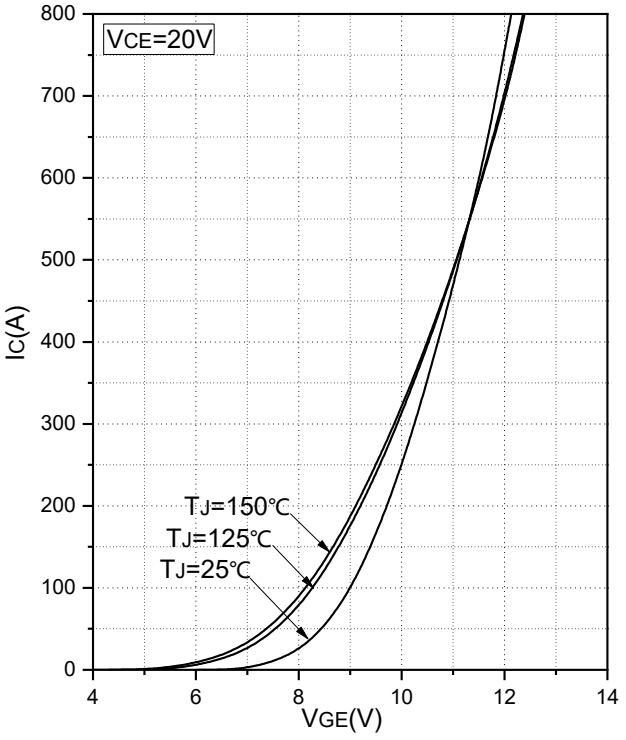


Fig.3 Transfer Characteristic

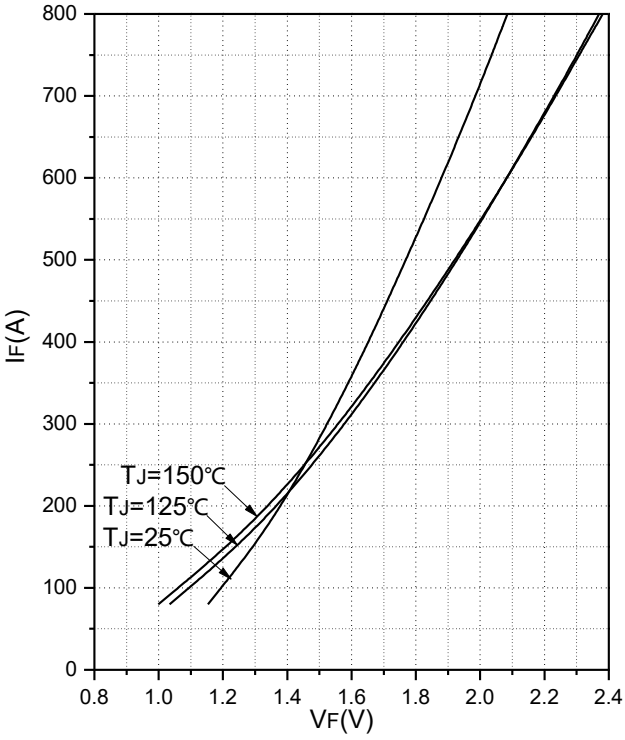


Fig.4 Forward Characteristics of Diode

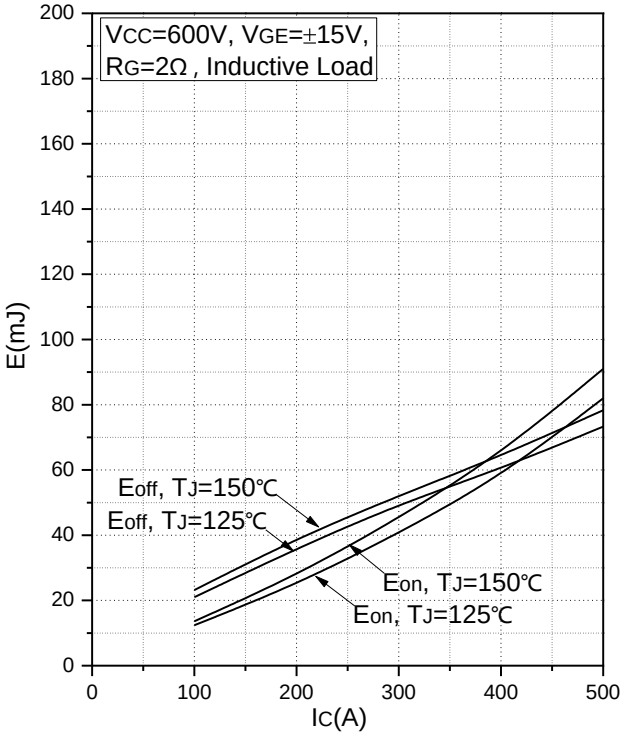


Fig.5 Typical Switching Loss vs. Collector Current

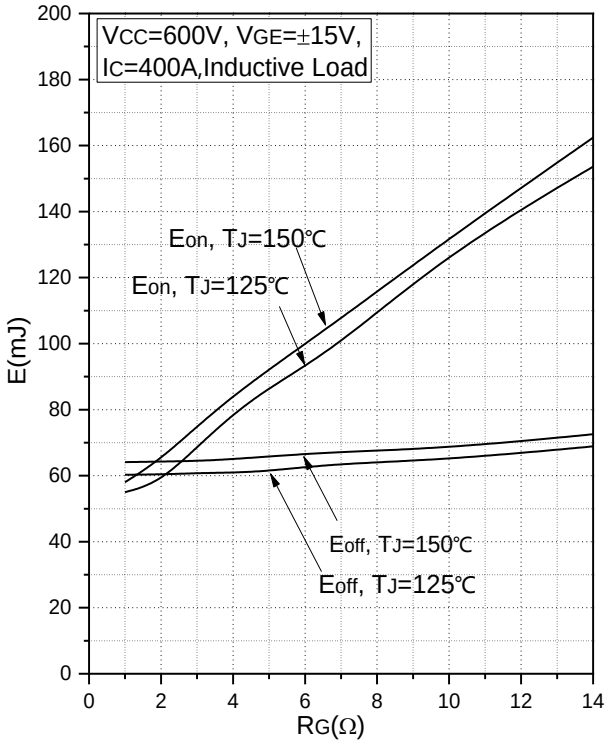


Fig.6 Typical Switching Loss vs. Gate Resistance

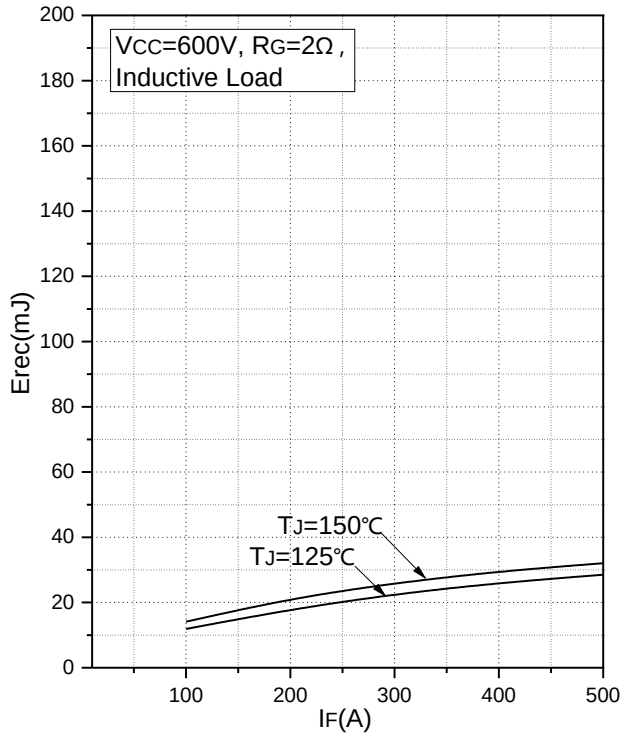


Fig.7 Typical Switching Loss vs. Forward Current

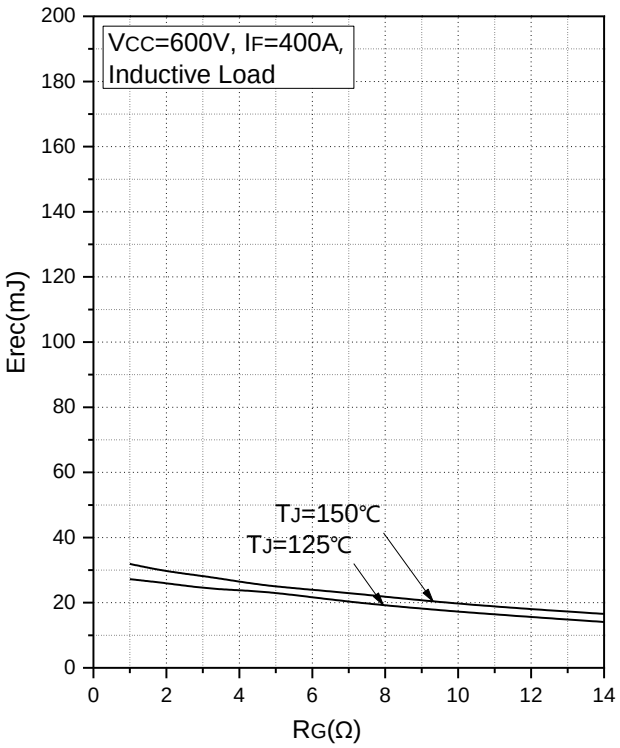


Fig.8 Typical Switching Loss vs. Gate Resistance

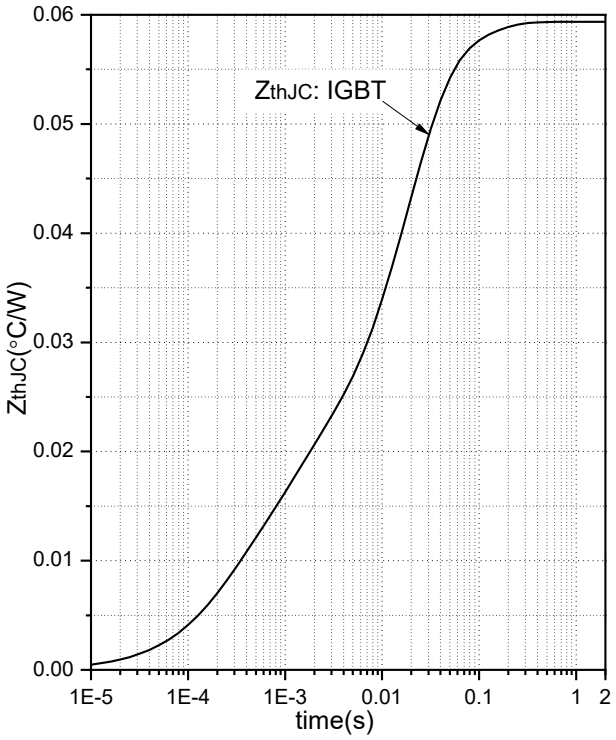


Fig.9 Transient Thermal Impedance (IGBT)

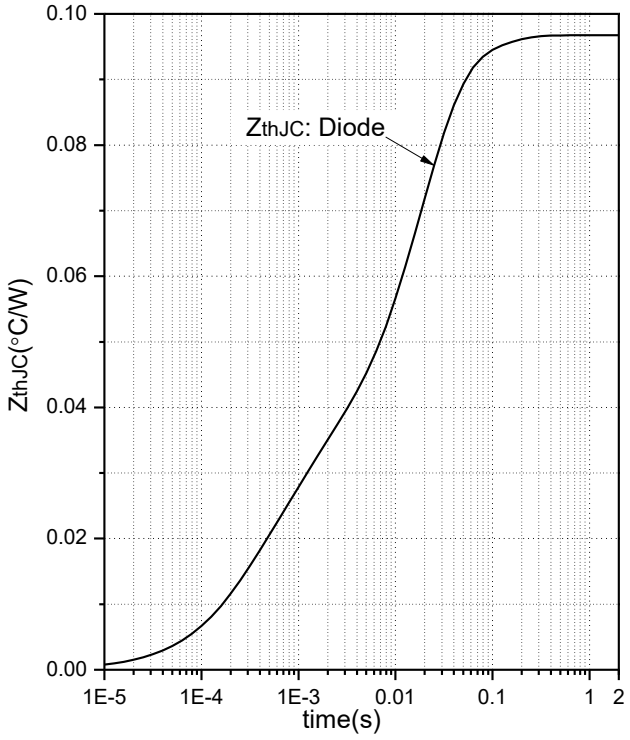


Fig.10 Transient Thermal Impedance (Diode)

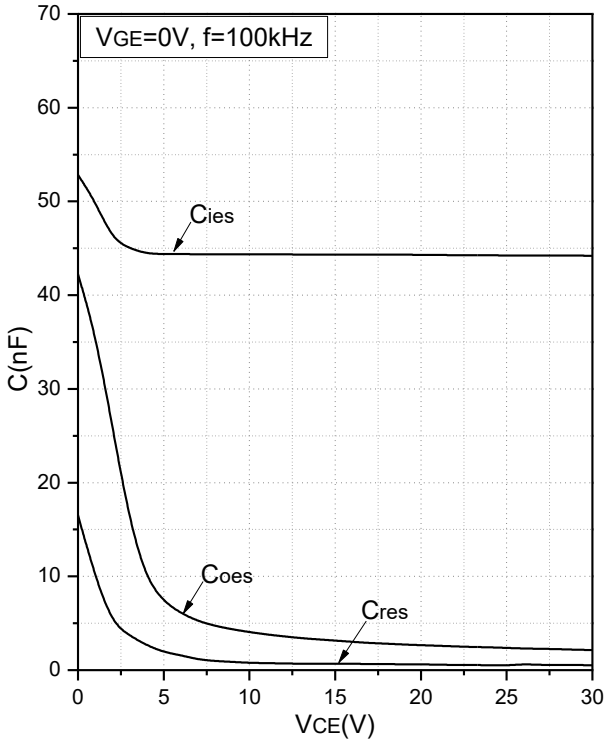


Fig.11 Capacitance Characteristics

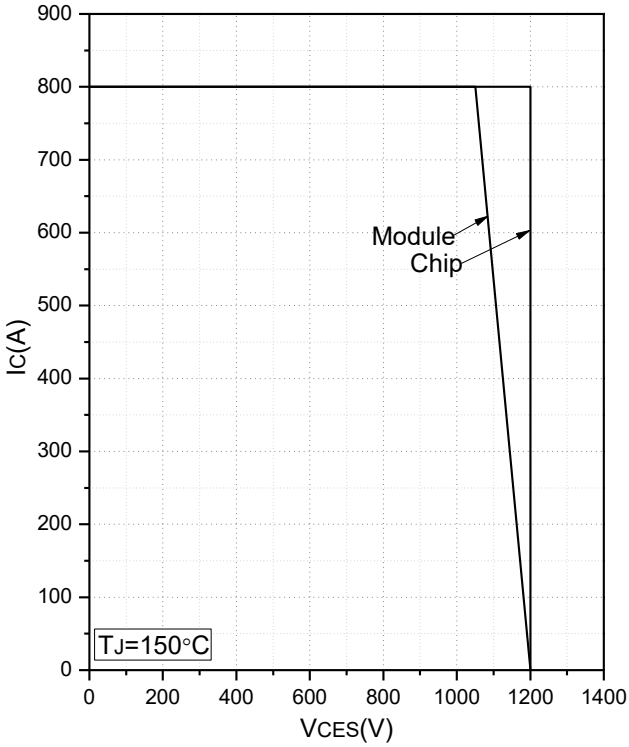


Fig.12 Reverse Bias Safe Operation Area (RBSOA)

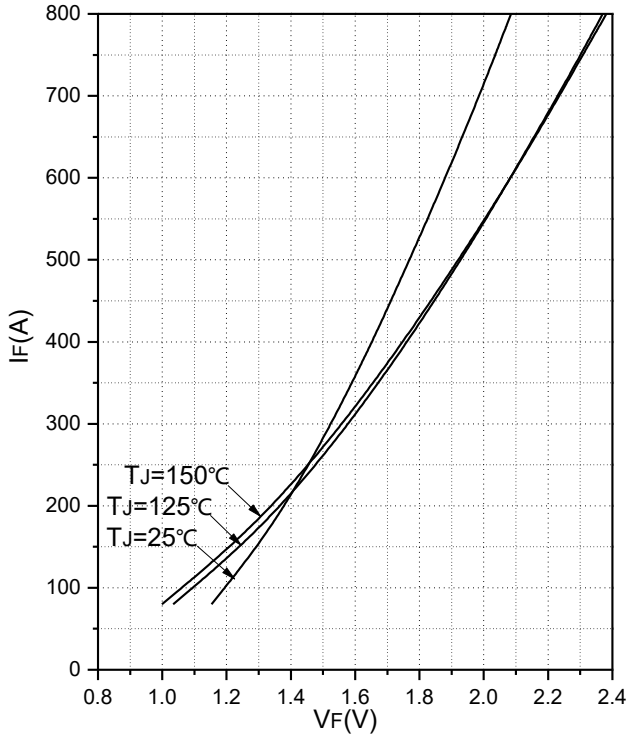


Fig.13 Forward Characteristics (Diode, 3-Level)

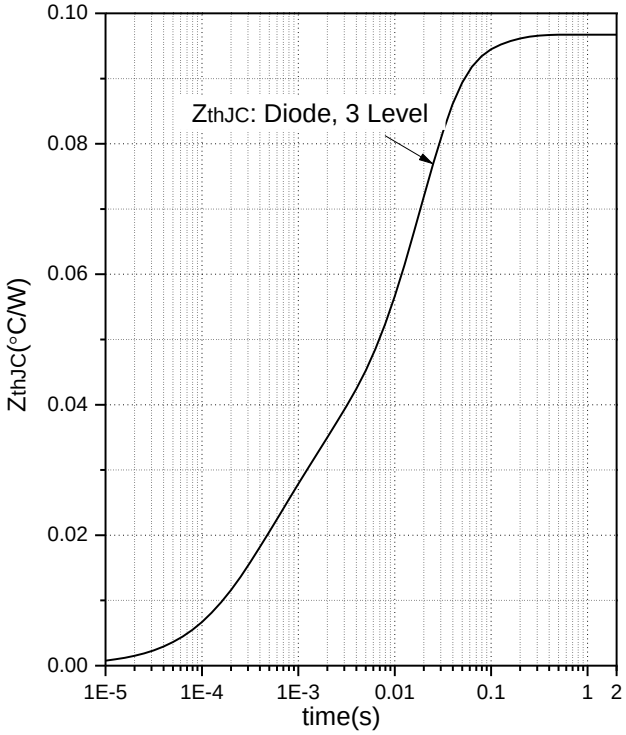


Fig.14 Transient Thermal Impedance (Diode, 3-Level)

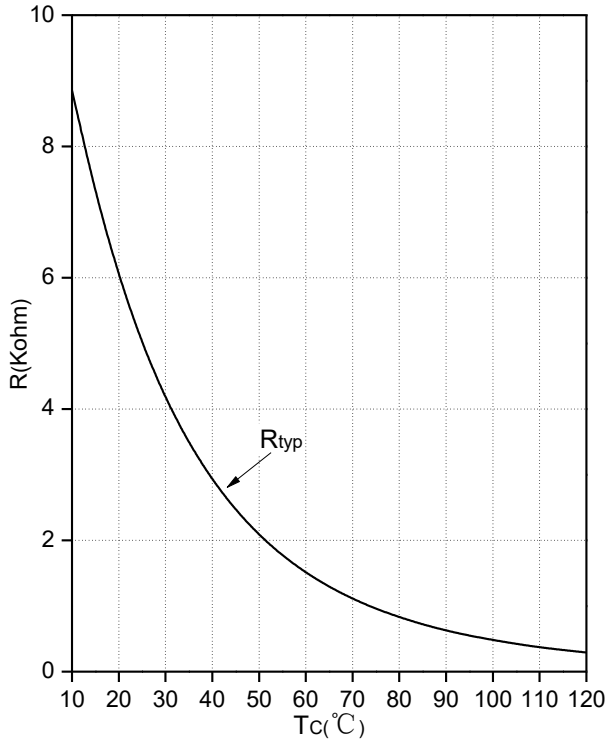
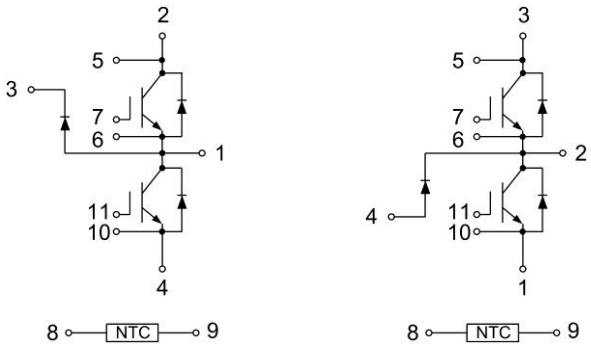


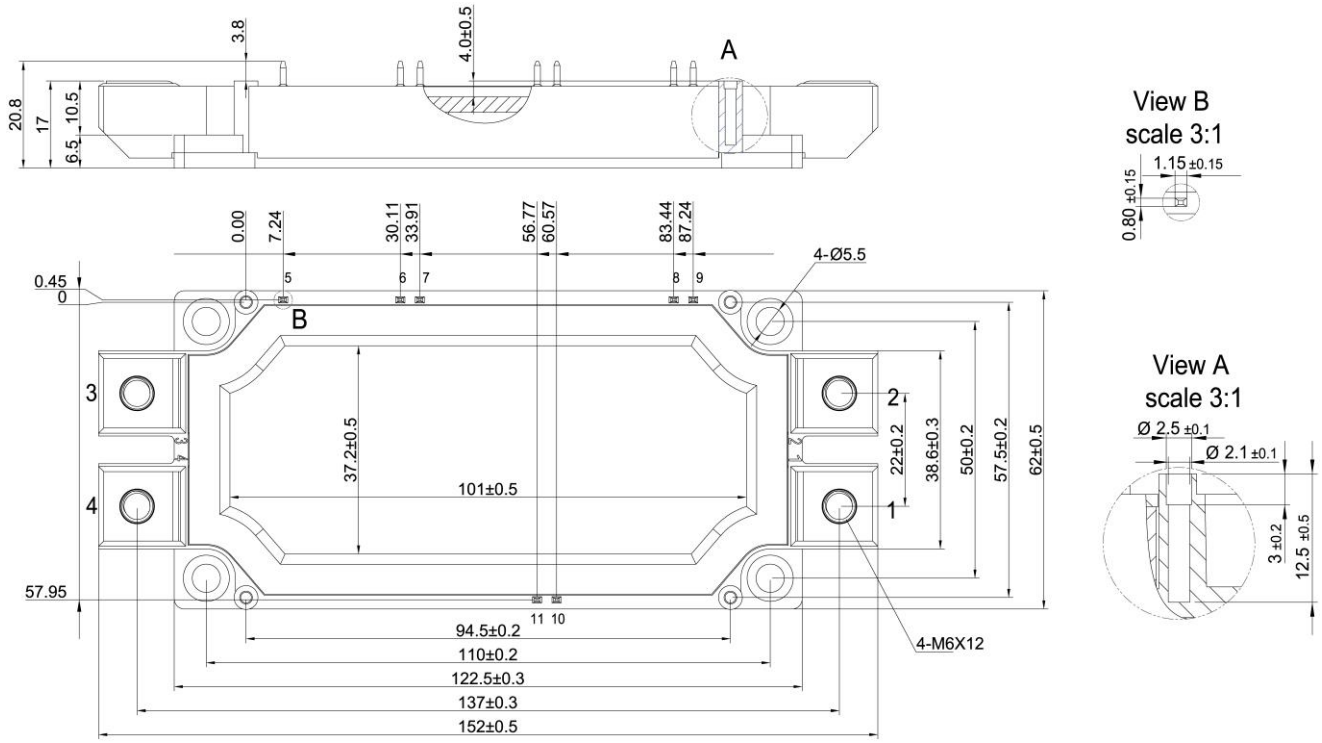
Fig.15 NTC Temperature Characteristics

Internal Circuit:



MAR **MCR**

Package Outline (Unit: mm):



Revision	Notes
01	Initial Release

Announcements

Information in this document is believed to be accurate and reliable. However, NJSME does not give any representations or warranties, expressed or implied, as to the accuracy or completeness of such information and shall have no liability for the consequences of use of such information.

Right to Make Changes

NJSME reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.

The datasheet with “REV.” + “Arabic numerals” is based on engineering data for initial reference purpose only.

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