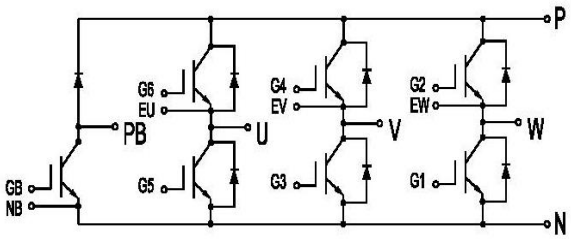
GT40FB120A1H

IGBT Module

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



Applications:

- Industrial Inverters
- Servo Applications

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℃	40	A
		T_C=25℃	80	A
I_{CM}	Peak Collector Current Repetitive	T_J=175℃	80	A
t_{SC}	Short Circuit Withstand Time		>10	μs
P_D	Maximum Power Dissipation (per leg)	T_C=25℃ T_{Jmax}=175℃	379	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=1mA, V_{CE}=V_{GE}		5.0	5.6	6.5	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C=40A, V_{GE}=15V	T_J=25℃		1.90	2.10	V
			T_J=125℃		2.30		
			T_J=150℃		2.40		
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℃				100	nA
C_{ies}	Input Capacitance	V_{CE}=25V, V_{GE}=0V, f=100kHz			2.83		nF
C_{oes}	Output Capacitance				0.22		
C_{res}	Reverse Transfer Capacitance				0.08		

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℃		195		ns
			T_J=125℃		184		
			T_J=150℃		182		
t_r	Rise Time		T_J=25℃		69		ns
			T_J=125℃		74		
			T_J=150℃		76		
$t_{d(off)}$	Turn-off Delay Time	V_{CC}=600V, I_C=40A, R_{Goff}=30Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		216		ns
			T_J=125℃		226		
			T_J=150℃		232		
t_f	Fall Time		T_J=25℃		228		ns
			T_J=125℃		324		
			T_J=150℃		331		
E_{on}	Turn-on Switching Loss	V_{CC}=600V, I_C=40A, R_{Gon}=30Ω, V_{GE}=±15V, di/dt=420A/μs(T_J=150℃), Inductive Load	T_J=25℃		4.89		mJ
			T_J=125℃		5.69		
			T_J=150℃		5.93		

E_{off}	Turn-off Switching Loss	V_{CC}=600V, I_C=40A, R_{Goff}=30Ω, V_{GE}=±15V, du/dt=3320V/μs(T_J=150℃), Inductive Load	T_J=25℃		1.74		mJ
			T_J=125℃		2.56		
			T_J=150℃		2.76		
Q_g	Total Gate Charge	V_{GE}=-15V…+15V	T_J=25℃		238		nC
RBSOA	I_C=80A, V_{CC}=1050V, V_P=1200V, R_G=30Ω, V_{GE}=+15V to 0V, T_J=150℃			Trapezoid			
SCSOA	V_{CC}=600V, V_{GE}=15V, R_G=30Ω, t_P=10μs, T_J=125℃				175		A
$R_{\theta JC}$	IGBT Thermal Resistance: Junction-to-Case (per Leg)					0.395	℃/W

Diode, Inverter

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

V_{RRM}	Repetitive Peak Reverse Voltage	1200	V
I_F	Diode Continuous Forward Current	40	A
I_{FM}	Peak FWD Current Repetitive	80	A

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

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
V_{FM}	Forward Voltage	I_F=40A	T_J=25℃		2.10	2.35	V
			T_J=125℃		2.25		
			T_J=150℃		2.20		
I_{rr}	Peak Reverse Recovery Current	I_F=40A, di/dt=590A/μs(T_J=150℃), V_{rr}=600V, V_{GE}=-15V	T_J=25℃		16.2		A
			T_J=125℃		20.6		
			T_J=150℃		21.9		
t_{rr}	Reverse Recovery Time		T_J=25℃		344		ns
			T_J=125℃		477		
			T_J=150℃		507		
Q_{rr}	Reverse Recovery Charge		T_J=25℃		2.3		μC
			T_J=125℃		4.3		
			T_J=150℃		5.0		

E_{rec}	Reverse Recovery Energy	I_F=40A, di/dt=590A/μs(T_J=150℃), V_{rr}=600V, V_{GE}=-15V	T_J=25℃		0.56		mJ
			T_J=125℃		1.39		
			T_J=150℃		1.72		
$R_{\theta JC}$	Diode Thermal Resistance: Junction-to-Case (per Leg)					0.645	℃/W

IGBT, Brake-Chopper

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℃	40	A
		T_C=25℃	80	A
I_{CM}	Peak Collector Current Repetitive	T_J=175℃	80	A
t_{SC}	Short Circuit Withstand Time		>10	μs
P_D	Maximum Power Dissipation (per leg)	T_C=25℃, T_{Jmax}=175℃	450	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=1mA, V_{CE}=V_{GE}		5.0	5.6	6.5	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C=40A, V_{GE}=15V	T_J=25℃		1.90	2.10	V
			T_J=125℃		2.30		
			T_J=150℃		2.40		
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℃				100	nA
C_{ies}	Input Capacitance	V_{CE}=25V, V_{GE}=0V, f=100kHz			2.83		nF
C_{oes}	Output Capacitance				0.22		
C_{res}	Reverse Transfer Capacitance				0.08		

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℃		195		ns
			T_J=125℃		184		
			T_J=150℃		182		
t_r	Rise Time		T_J=25℃		69		ns
			T_J=125℃		74		
			T_J=150℃		76		
$t_{d(off)}$	Turn-off Delay Time	V_{CC}=600V, I_C=40A, R_{Goff}=30Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		216		ns
			T_J=125℃		226		
			T_J=150℃		232		
t_f	Fall Time		T_J=25℃		228		ns
			T_J=125℃		324		
			T_J=150℃		331		
E_{on}	Turn-on Switching Loss	V_{CC}=600V, I_C=40A, R_{Gon}=30Ω, V_{GE}=±15V, di/dt=420A/μs(T_J=150℃), Inductive Load	T_J=25℃		4.89		mJ
			T_J=125℃		5.69		
			T_J=150℃		5.93		
E_{off}	Turn-off Switching Loss	V_{CC}=600V, I_C=40A, R_{Goff} =30Ω, V_{GE}=±15V, du/dt=3320V/μs(T_J=150℃), Inductive Load	T_J=25℃		1.74		mJ
			T_J=125℃		2.56		
			T_J=150℃		2.76		
Q_g	Total Gate Charge	V_{GE}=-15V…+15V	T_J=25℃		238		nC
RBSOA	I_C=80A, V_{CC}=1050V, V_P=1200V, R_G=30Ω, V_{GE}=+15V to 0V, T_J=150℃			Trapezoid			
SCSOA	V_{CC}=600V, V_{GE}=15V, R_G=30Ω, t_P=10μs, T_J=125℃				175		A
$R_{\theta JC}$	IGBT Thermal Resistance: Junction-to-Case (per Leg)					0.395	℃/W

Diode, Brake-Chopper

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

V_{RRM}	Repetitive Peak Reverse Voltage	1200	V
I_F	Diode Continuous Forward Current	10	A
I_{FM}	Diode Maximum Forward Current	20	A

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

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
V_{FM}	Forward Voltage	I_F=10A	T_J=25℃		1.80		V
			T_J=125℃		1.90		
			T_J=150℃		1.85		
t_{rr}	Reverse Recovery Time	I_F=10A, -diF/dt=388A/μs(T_J=150℃), V_{rr}=600V, V_{GE}=-15V	T_J=25℃		133		ns
			T_J=125℃		182		
			T_J=150℃		186		
I_{rr}	Peak Reverse Recovery Current		T_J=25℃		10.0		A
			T_J=125℃		14.0		
			T_J=150℃		14.7		
Q_{rr}	Reverse Recovery Charge		T_J=25℃		1.12		μC
			T_J=125℃		1.43		
			T_J=150℃		1.57		
E_{rec}	Reverse Recovery Energy		T_J=25℃		0.3		mJ
			T_J=125℃		0.7		
			T_J=150℃		0.8		
$R_{\theta JC}$	Diode Thermal Resistance: Junction-to-Case (per Leg)					1.472	℃/W

Internal NTC-Thermistor Characteristics

R_{25}	T_C=25℃	5		kΩ
△R/R	T_C=100℃, R_{100}=481Ω		±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

Module

Symbol	Description		Min.	Typ.	Max.	Units
V_{ISOL}	Isolation Voltage (All Terminals Shorted)	DC, 3s	3500			V
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)				0.06	℃/W
T	Mounting Screw:M3		1.5		2.0	N·m
G	Weight			30		g

Ordering Information Table

Device code

G	T	40	FB	120	A1	H
①	②	③	④	⑤	⑥	⑦

① - IGBT Module
② - Trench, Low Switching Losses IGBT
③ - Rated Current (40=40A)
④ - Circuit Configuration: Seven Pack
⑤ - Rated Voltage (120=1200V)
⑥ - Package Type
⑦ - Test Level (Pass the Important Reliability Test-Industrial Grade)

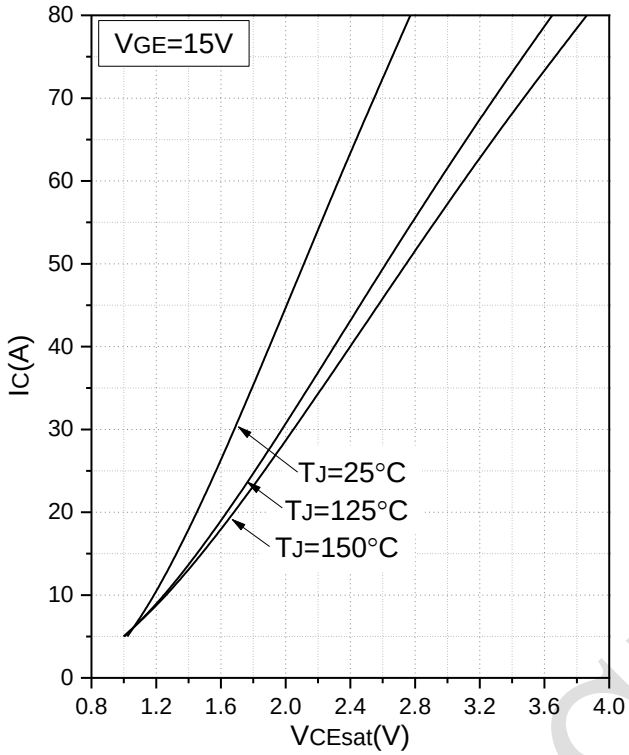


Fig.1 Typical Saturation Voltage Characteristics (Inverter)

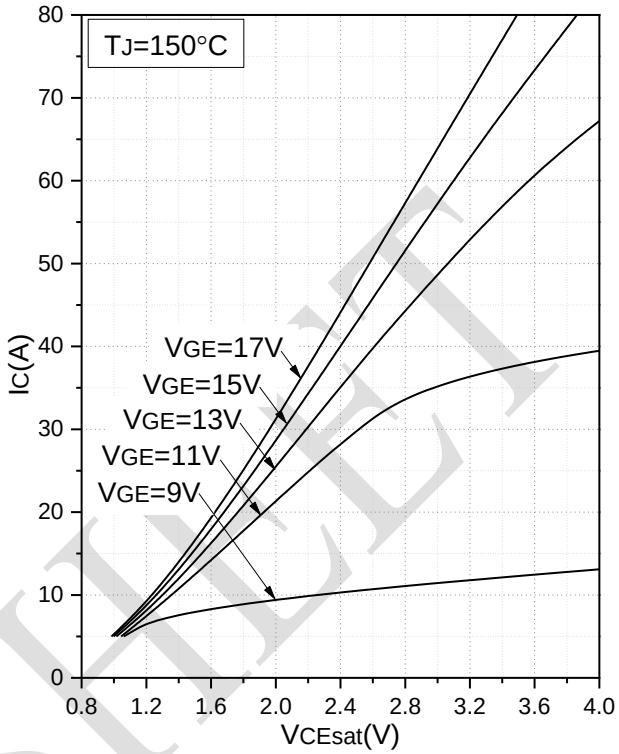


Fig.2 Typical Output Characteristics (Inverter)

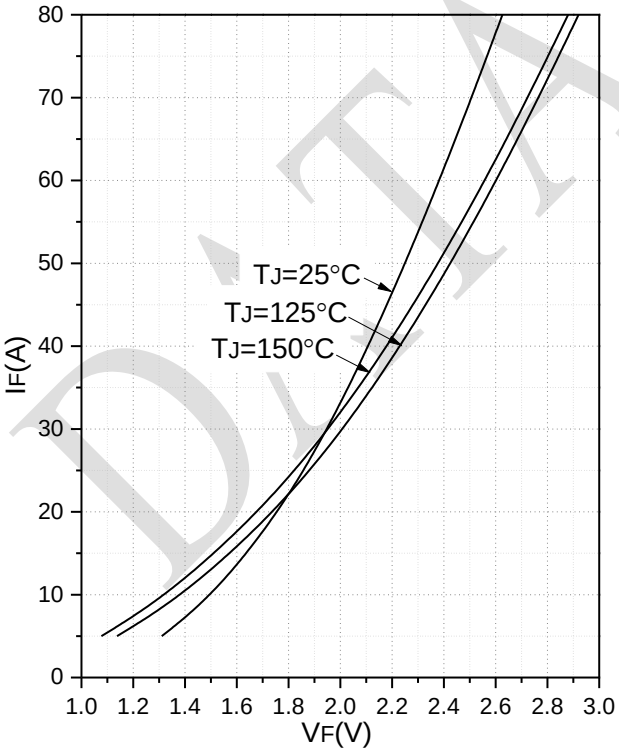


Fig.3 Forward Characteristics of Diode (Inverter)

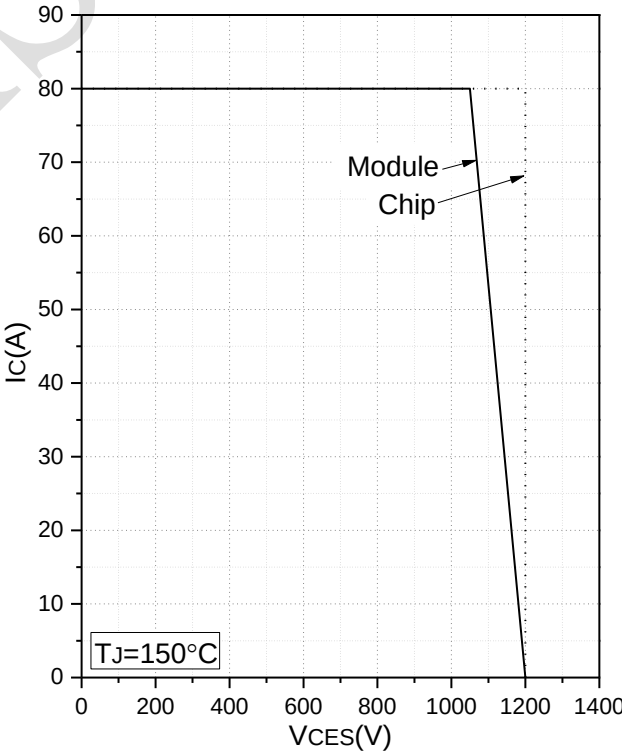


Fig.4 Reverse Bias Safe Operation Area (Inverter)

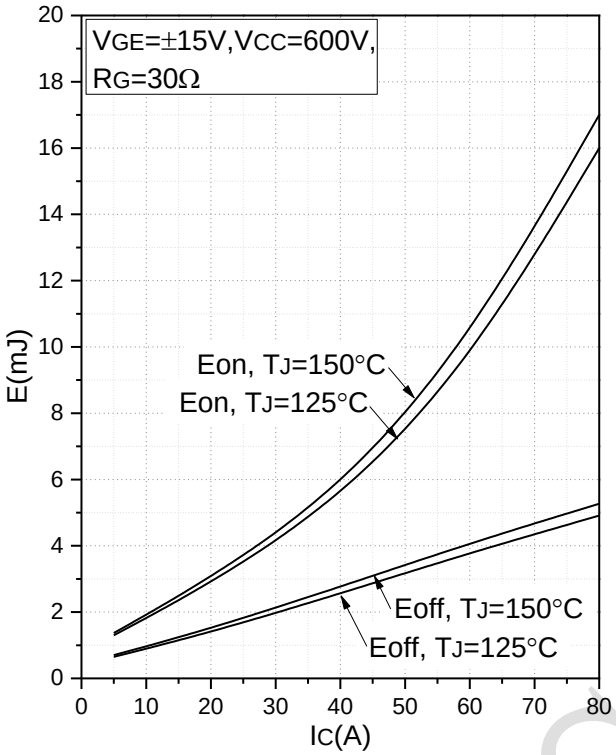


Fig.5 Typical Switching Loss vs. Collector Current (Inverter)

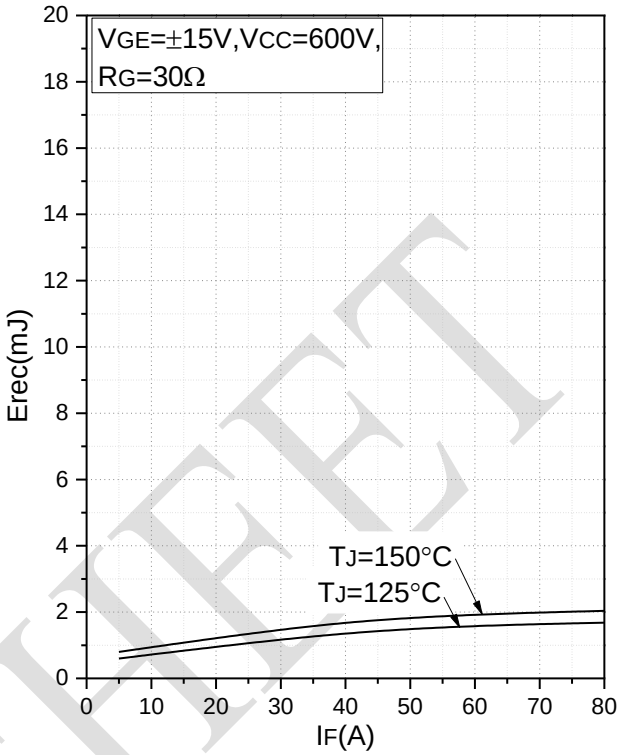


Fig.6 Typical Switching Loss vs. Forward Current (Inverter)

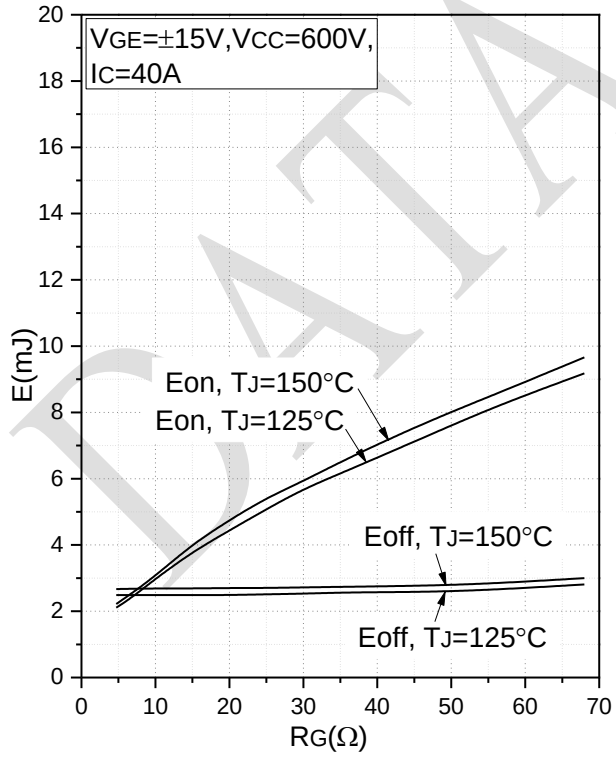


Fig.7 Typical Switching Loss vs. Gate Resistance (Inverter)

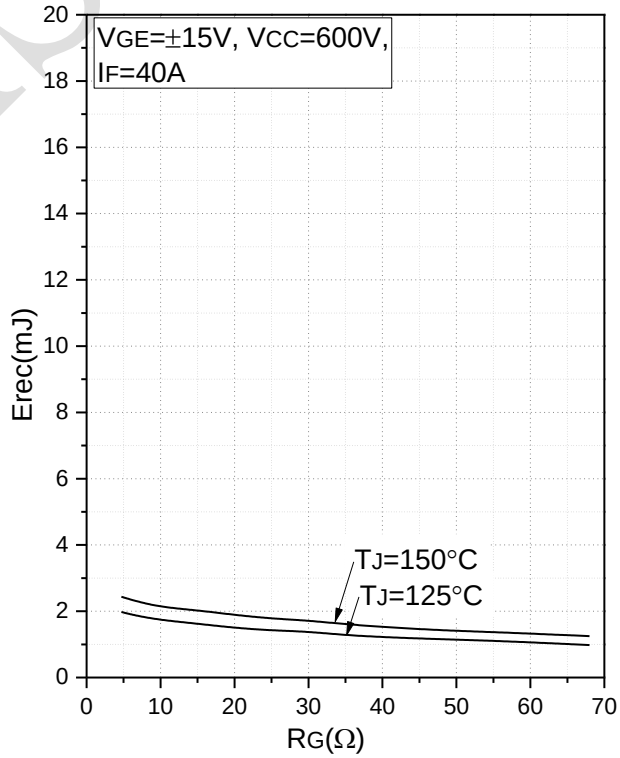


Fig.8 Typical Switching Loss vs. Gate Resistance (Inverter)

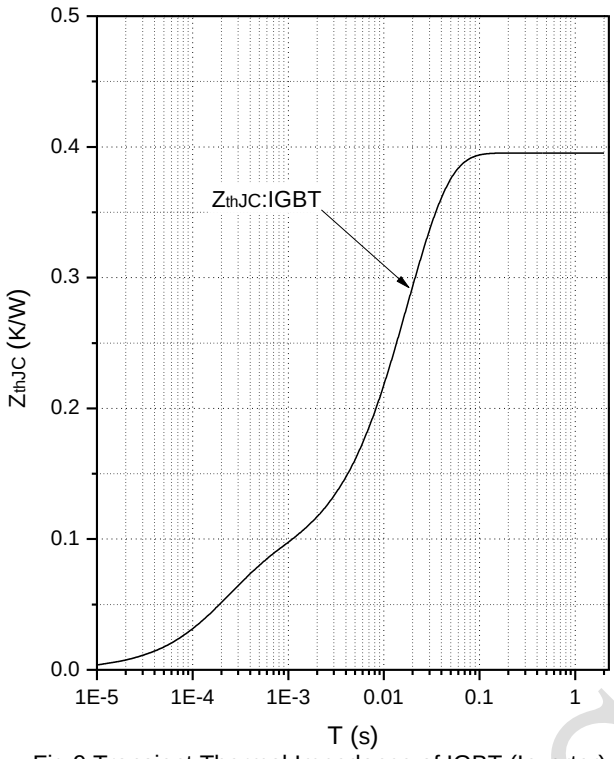


Fig.9 Transient Thermal Impedance of IGBT (Inverter)

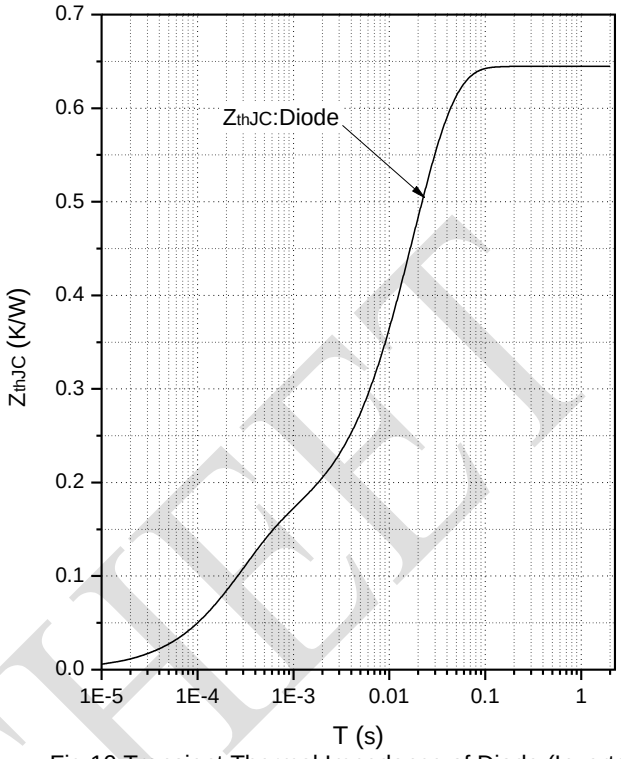


Fig.10 Transient Thermal Impedance of Diode (Inverter)

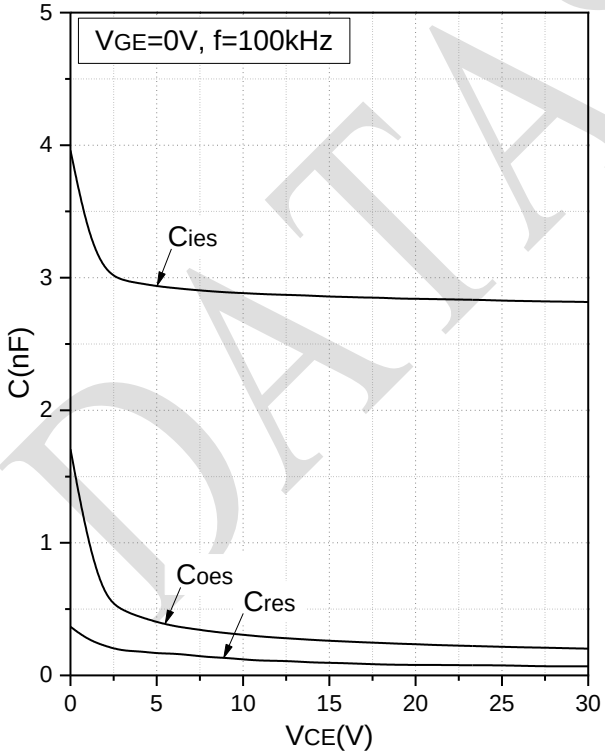


Fig.11 Capacitance Characteristics (Inverter)

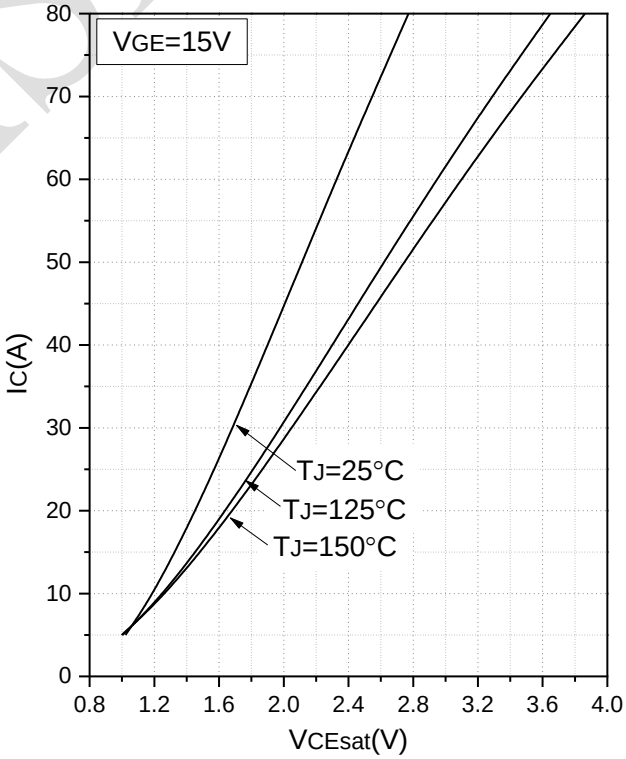


Fig.12 Typical Saturation Voltage Characteristics of IGBT (Brake-Chopper)

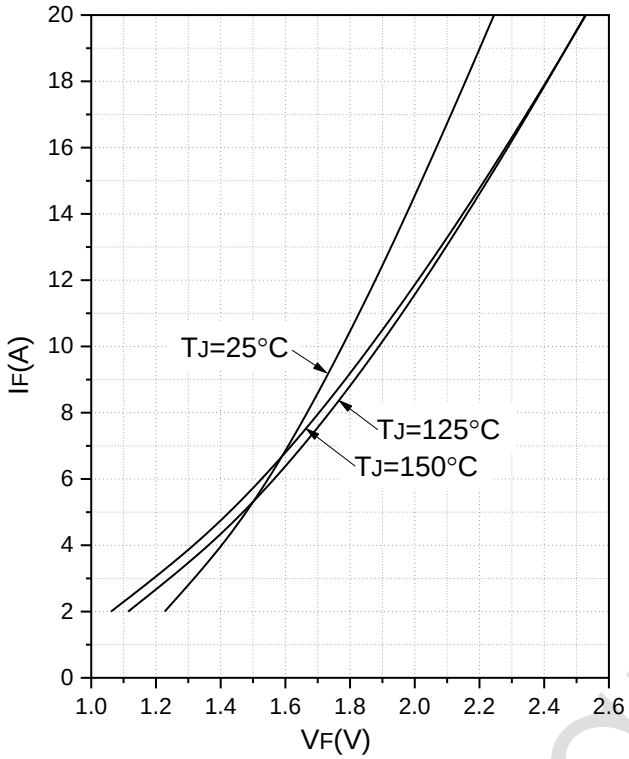


Fig.13 Forward Characteristics of Diode (Brake-Chopper)

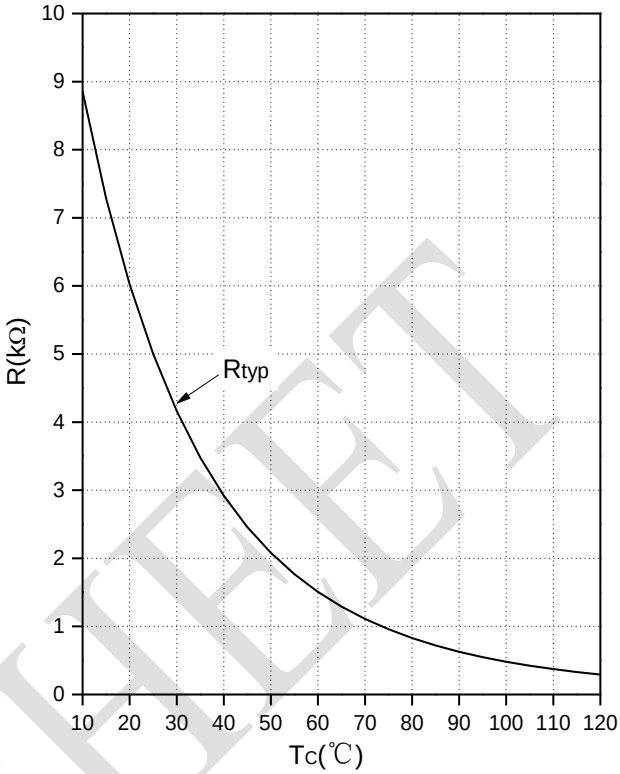
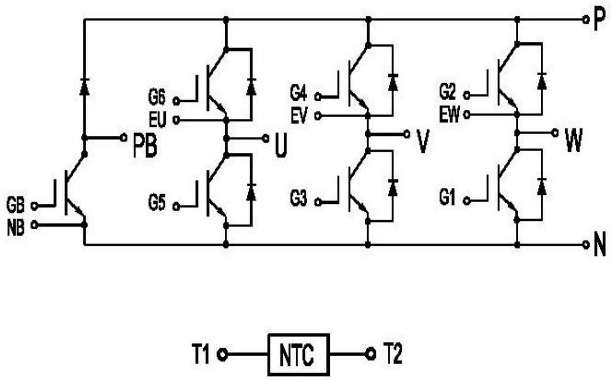
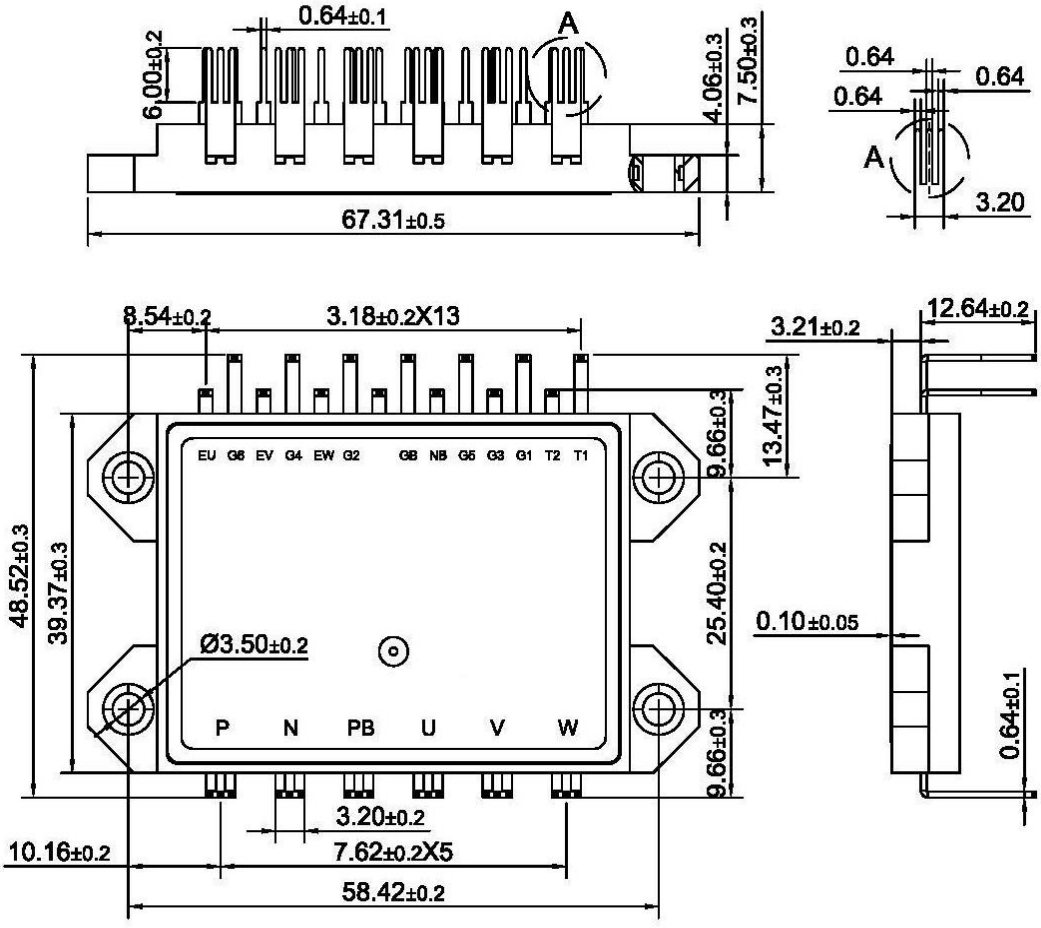


Fig.14 NTC Temperature Characteristics

Internal Circuit:



Package Outline (Unit: mm):



Date	Revision	Notes
05/05/2022	A	Final Version

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”.