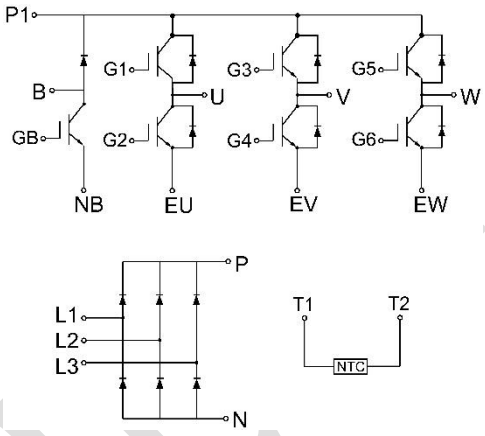
GK30PI60B9H

IGBT Module

Features：

- Non Punch Through (NPT) Technology
- 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

V_{CES}	Collector-Emitter Blocking Voltage	T_J=25℃	600	V
V_{GES}	Gate-Emitter Voltage		±20	V
I_C	Continuous Collector Current	T_C=80℃	30	A
		T_C=25℃	60	A
I_{CM}	Repetitive Peak Collector Current	tp=1ms	60	A
t_{SC}	Short Circuit Withstand Time		>10	μs
P_D	Maximum Power Dissipation per IGBT	T_C=25℃ T_{Jmax}=150℃	230	W

Electrical Characteristics of IGBT

Static Characteristics

Symbol	Description	Conditions		Min	Typ	Max	Unit
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=1mA, V_{CE}=V_{GE}, T_J=25℃		4.0	4.8	5.8	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C=30A, V_{GE}=15V	T_J=25℃		1.90	2.20	V
			T_J=125℃		2.20		V
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℃				200	nA
C_{ies}	Input Capacitance	V_{CE}=25V, V_{GE}=0V, f=100kHz, T_J=25℃			1.71		nF
C_{oes}	Output Capacitance				0.24		nF
C_{res}	Reverse Transfer Capacitance				0.07		nF

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	V_{CC}=300V, I_C=30A, R_{Gon}=15Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		28		ns
			T_J=125℃		33		
t_r	Rise Time		T_J=25℃		34		ns
			T_J=125℃		35		
$t_{d(off)}$	Turn-off Delay Time	V_{CC}=300V, I_C=30A, R_{Goff}=15Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		165		ns
			T_J=125℃		168		
t_f	Fall Time		T_J=25℃		102		ns
			T_J=125℃		162		
E_{on}	Turn-on Switching Loss	V_{CC}=300V, I_C=30A, R_{Gon}=15Ω, V_{GE}=±15V, di/dt=790A/μs (T_J=125℃) Inductive Load	T_J=25℃		0.24		mJ
			T_J=125℃		0.42		
E_{off}	Turn-off Switching Loss	V_{CC}=300V, I_C=30A, R_{Goff}=15Ω, V_{GE}=±15V, du/dt=3760V/μs (T_J=125℃) Inductive Load	T_J=25℃		0.39		mJ
			T_J=125℃		0.60		
Q_g	Total Gate Charge	V_{GE}=+15V…-15V	T_J=25℃		443		nC
RBSOA	I_C=60A, V_{CC}=480V, Vp=600V, R_G=15Ω, V_{GE}=+15V to 0V, T_J=125°C			Trapezoid			
SCSOA	V_{CC}=300V, V_{GE}=15V, T_J=125℃			10			μs
$R_{\theta JC}$	IGBT Thermal Resistance: Junction-To-Case(Per Leg)					0.540	℃/W

Diode, Inverter
Maximum Rated Values

V_{RRM}	Repetitive Peak Reverse Voltage	T_J=25℃	600	V
I_F	Diode Continuous Forward Current		30	A
I_{FM}	Diode Maximum Forward Current	tp=1ms	60	A

Electrical Characteristics of Diode

Symbol	Description	Conditions		Min	Typ	Max	Unit
V_{FM}	Forward Voltage	I_F=30A	T_J=25℃		1.70	2.00	V
			T_J=125℃		1.80		
t_{rr}	Reverse Recovery Time	I_F=30A, -diF/dt=750A/μs(T_J=125℃), V_{rr}=300V, V_{GE}=-15V	T_J=25℃		110		ns
			T_J=125℃		138		
I_{rr}	Peak Reverse Recovery Current		T_J=25℃		17.5		A
			T_J=125℃		20.6		
Q_{rr}	Reverse Recovery Charge		T_J=25℃		1.20		μC
			T_J=125℃		1.65		
E_{rec}	Reverse Recovery Energy		T_J=25℃		0.14		mJ
			T_J=125℃		0.31		
$R_{\theta JC}$	Diode Thermal Resistance: Junction-To-Case(Per Leg)					1.567	℃/W

IGBT, Brake-Chopper
Maximum Rated Values

V_{CES}	Collector-Emitter Blocking Voltage	T_J=25℃	600	V
V_{GES}	Gate-Emitter Voltage		±20	V
I_C	Continuous Collector Current	T_C=80℃	30	A
		T_C=25℃	60	A
I_{CM}	Repetitive Peak Collector Current	tp=1ms	60	A
t_{SC}	Short Circuit Withstand Time		>10	μs
P_D	Maximum Power Dissipation per IGBT	T_C=25℃ T_{Jmax}=150℃	230	W

Electrical Characteristics of IGBT

Static Characteristics

Symbol	Description	Conditions		Min	Typ	Max	Unit
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=1mA, V_{CE}=V_{GE}, T_J=25℃		4.0	4.8	5.8	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C=30A, V_{GE}=15V	T_J=25℃		1.90	2.20	V
			T_J=125℃		2.20		V
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℃				200	nA
C_{ies}	Input Capacitance	V_{CE}=25V, V_{GE}=0V, f=100kHz, T_J=25℃			1.71		nF
C_{oes}	Output Capacitance				0.24		nF
C_{res}	Reverse Transfer Capacitance				0.07		nF

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	V_{CC}=300V, I_C=30A, R_{Gon}=15Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		28		ns
			T_J=125℃		33		
t_r	Rise Time		T_J=25℃		34		ns
			T_J=125℃		35		
$t_{d(off)}$	Turn-off Delay Time	V_{CC}=300V, I_C=30A, R_{Goff}=15Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		165		ns
			T_J=125℃		168		
t_f	Fall Time		T_J=25℃		102		ns
			T_J=125℃		162		
E_{on}	Turn-on Switching Loss	V_{CC}=300V, I_C=30A, R_{Gon}=15Ω, V_{GE}=±15V, di/dt=790A/μs (T_J=125℃) Inductive Load	T_J=25℃		0.24		mJ
			T_J=125℃		0.42		
E_{off}	Turn-off Switching Loss	V_{CC}=300V, I_C=30A, R_{Goff}=15Ω, V_{GE}=±15V, du/dt=3760V/μs (T_J=125℃) Inductive Load	T_J=25℃		0.39		mJ
			T_J=125℃		0.60		
Q_g	Total Gate Charge	V_{GE}=+15V…-15V	T_J=25℃		443		nC
RBSOA	I_C=60A, V_{CC}=480V, Vp=600V, R_G=15Ω, V_{GE}=+15V to 0V, T_J=125°C			Trapezoid			
SCSOA	V_{CC}=300V, V_{GE}=15V, T_J=125℃			10			μs
$R_{\theta JC}$	IGBT Thermal Resistance: Junction-To-Case(Per Leg)					0.540	℃/W

Diode, Brake-Chopper
Maximum Rated Values

V_{RRM}	Repetitive Peak Reverse Voltage	T_J=25℃	600	V
I_F	Diode Continuous Forward Current		15	A
I_{FM}	Diode Maximum Forward Current	tp=1ms	30	A

Electrical Characteristics of Diode

Symbol	Description	Conditions		Min	Typ	Max	Unit
V_{FM}	Forward Voltage	I_F=15A	T_J=25℃		1.40	2.00	V
			T_J=125℃		1.40		
t_{rr}	Reverse Recovery Time	I_F=15A, -diF/dt=500A/μs(T_J=125℃), V_{rr}=300V, V_{GE}=-15V	T_J=25℃		89		ns
			T_J=125℃		133		
I_{rr}	Peak Reverse Recovery Current		T_J=25℃		12.5		A
			T_J=125℃		14.8		
Q_{rr}	Reverse Recovery Charge		T_J=25℃		0.76		μC
			T_J=125℃		1.27		
E_{rec}	Reverse Recovery Energy		T_J=25℃		0.12		mJ
			T_J=125℃		0.27		
$R_{\theta JC}$	Diode Thermal Resistance: Junction-To-Case(Per Leg)					1.567	℃/W

Diode, Rectifier
Maximum Rated Values

V_{RRM}	Repetitive Peak Reverse Voltage	T_J=25℃	1800	V
I_{FRMSM}	Maximum RMS Forward Current per Chip	T_J=80℃	30	A
I_{RMSM}	Maximum RMS Current at Rectifier Output	T_J=80℃	30	A
I_{FSM}	Surge Current @t_p=10 ms	T_J=25℃	300	A
		T_J=150℃	250	
I^2t	I^2t - value	T_J=25℃	450	A^2s
		T_J=150℃	310	

Electrical Characteristics of Diode

Symbol	Description	Conditions		Min	Typ	Max	Unit
V_F	Forward Voltage	I_F=30A	T_J=25℃			1.20	V
			T_J=150℃			1.20	
I_R	Reverse Current	V_R=1600V	T_J=25℃			50	uA
$R_{\theta JC}$	Diode Thermal Resistance: Junction-To-Case					0.806	℃/W

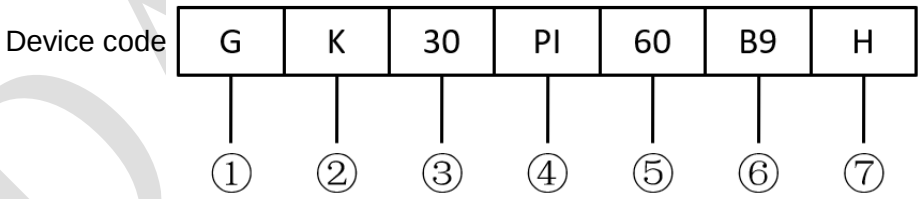
Internal NTC-Thermistor Characteristics

Symbol	Description		Min.	Typ.	Max.	Units.
R_{25}	Rated Resistance	T_C=25℃		5		kΩ
△R/R	Deviation of R100	T_C=100℃，R_{100}=481Ω	-5		5	%
P_{25}	Power Dissipation	T_C=25℃			10	mW
$B_{25/50}$	B-Value	$R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298.15K))]$		3380		K
$B_{25/80}$	B-Value	$R_2=R_{25}\exp[B_{25/80}(1/T_2-1/(298.15K))]$		3440		K
$B_{25/100}$	B-Value	$R_2=R_{25}\exp[B_{25/100}(1/T_2-1/(298.15K))]$		3545		K

Module

Symbol	Description		Min.	Typ.	Max.	Units
V_{IOS}	Isolation Voltage (All Terminals Shorted)	RMS, f=50Hz, 30s	4500			V
Internal Isolation				Al2O3 Ceramic		
d_{creep}	Creepage Distance: Terminal to Heatsink			11.5		mm
	Creepage Distance: Terminal to Terminal			6.3		
d_{clear}	Clearance: Terminal to Heatsink			10.0		mm
	Clearance: Terminal to Terminal			5.0		
L_{SCE}	Stray Inductance Module			30		nH
T_J	Maximum Junction Temperature				150	℃
T_{JOP}	Maximum Operating Junction Temperature Range		-40		+125	℃
T_{stg}	Storage Temperature		-40		+125	℃
CTI	Comparative Tracking Index		200			
$R_{\theta CS}$	Case-to-Sink Thermally (Conductive Grease Applied)				0.05	℃/W
T	Mounting Screw:M4		2.0		2.3	N·m
G	Weight			40		g

Ordering Information Table



① - IGBT Module
② - Non Punch Through (NPT) Technology
③ - Rated Current (30=30A)
④ - Circuit Configuration (PI=Power Integrated)
⑤ - Rated Voltage (60=600V)
⑥ - Package Type
⑦ - Test Level (Pass the Important Reliability Test-Industrial Grade)

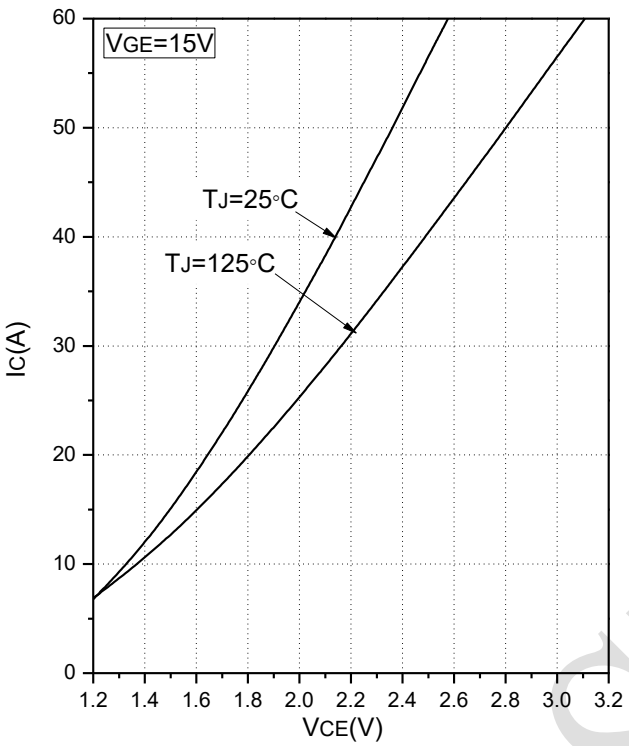


Fig.1 Typical Saturation Voltage Characteristics(Inverter)

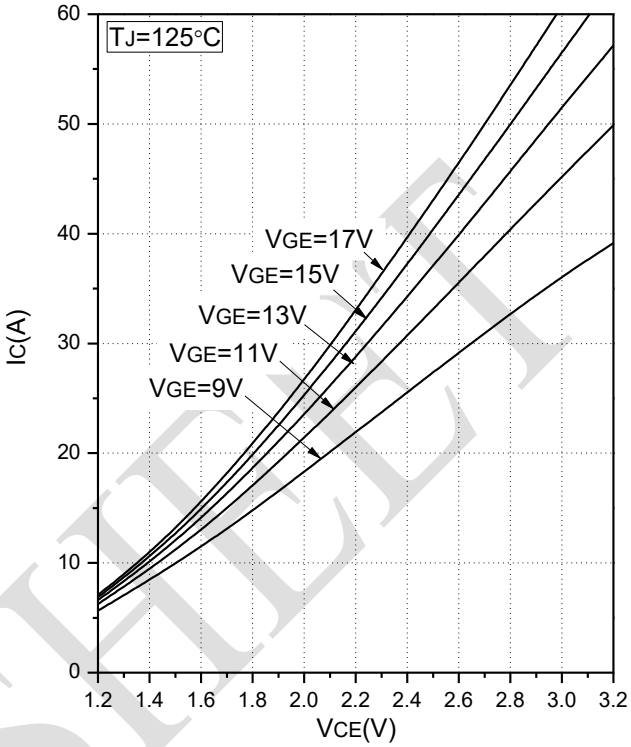


Fig.2 Typical Output Characteristics(Inverter)

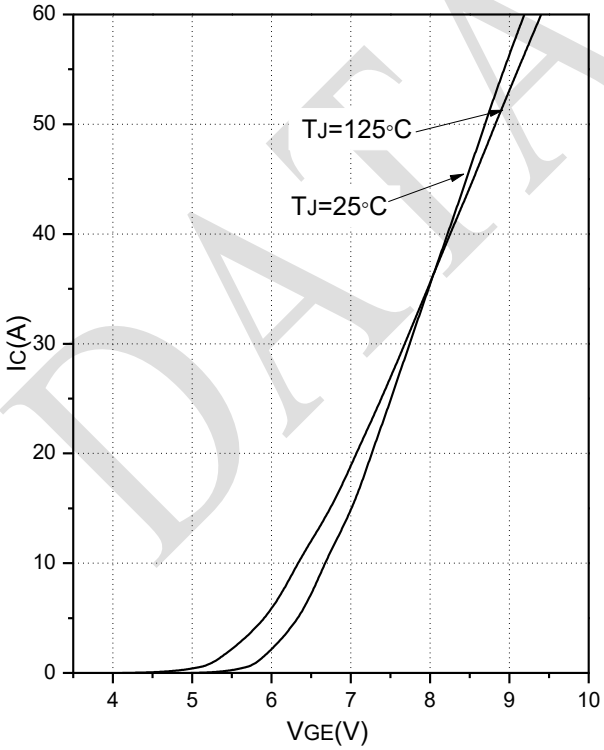


Fig.3 Transfer Characteristic(Inverter)

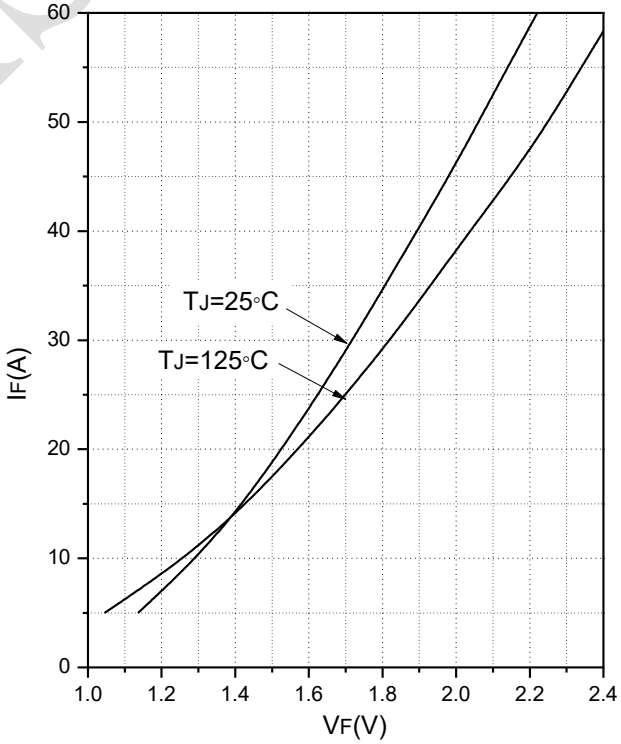


Fig.4 Forward Characteristics of Diode(Inverter)

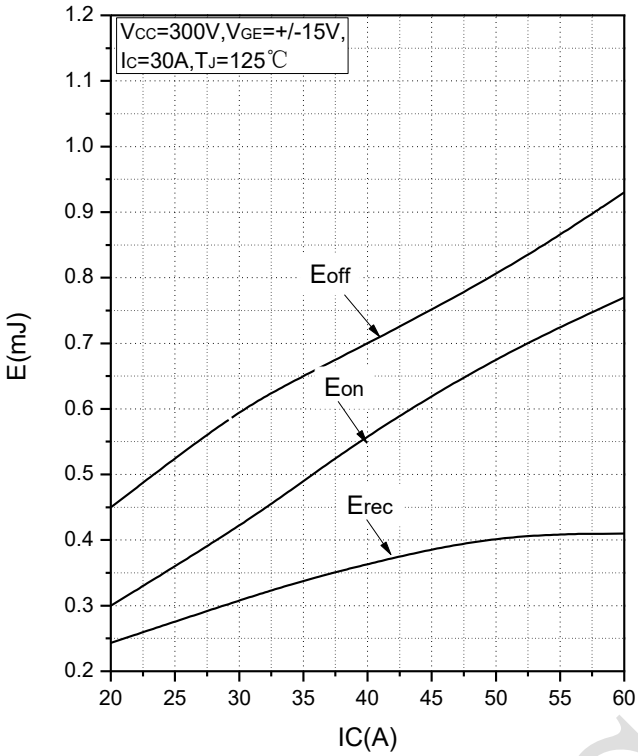


Fig.5 Typical Switching Loss vs. Collector Current(Inverter)

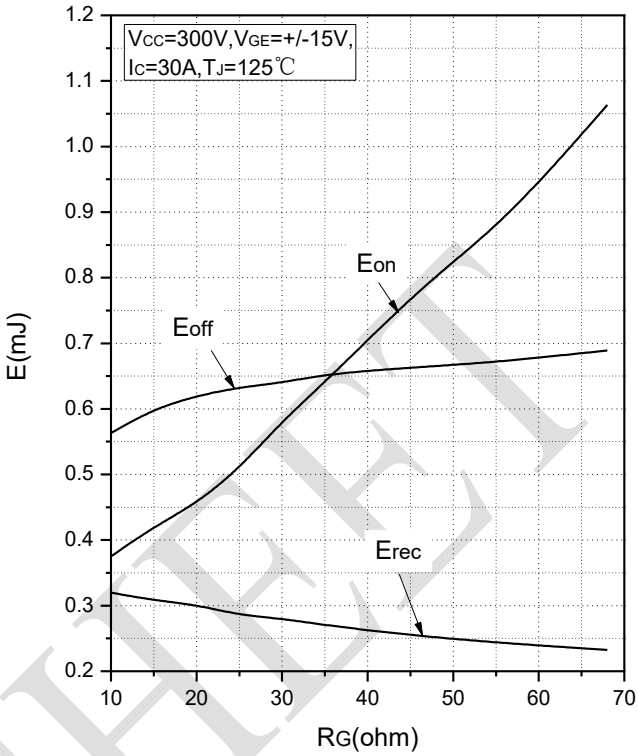


Fig.6 Typical Switching Loss vs. Gate Resistance(Inverter)

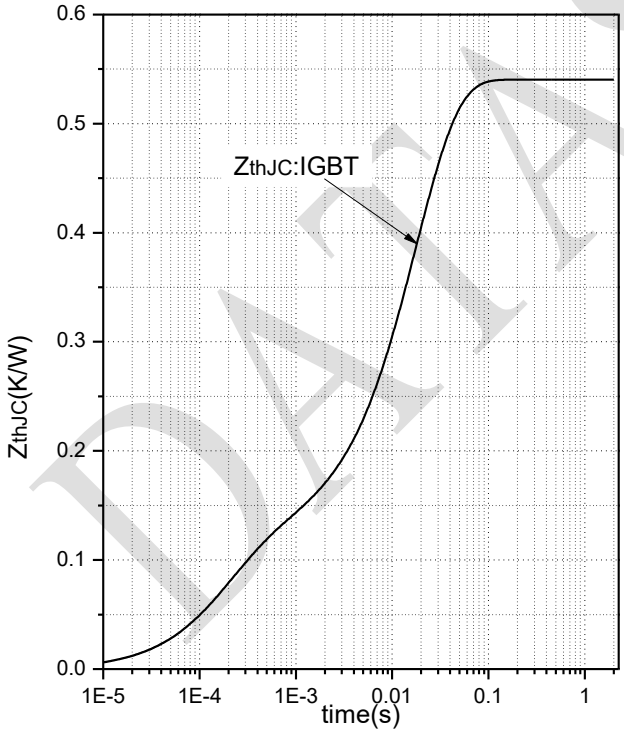


Fig.7 Transient Thermal Impedance IGBT(Inverter)

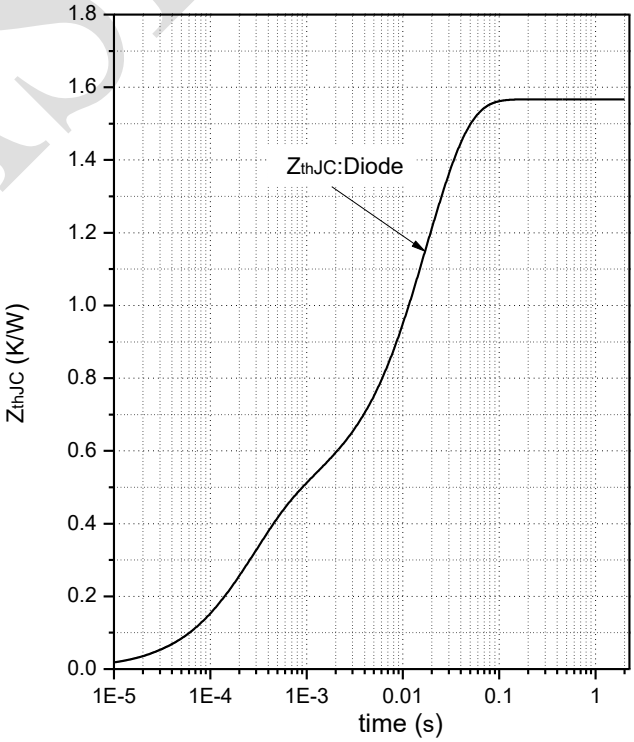


Fig.8 Transient Thermal Impedance Diode(Inverter)

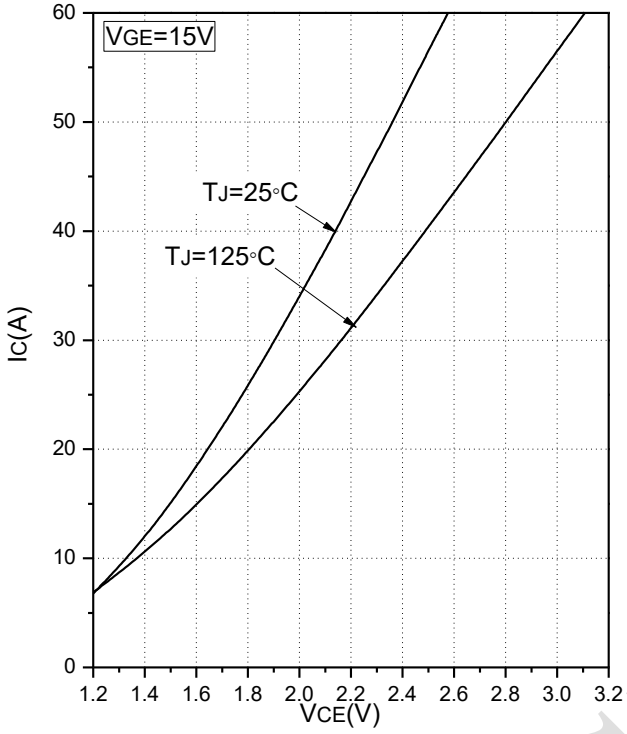


Fig.9 Typical Saturation Voltage Characteristics(Brake-Chopper)

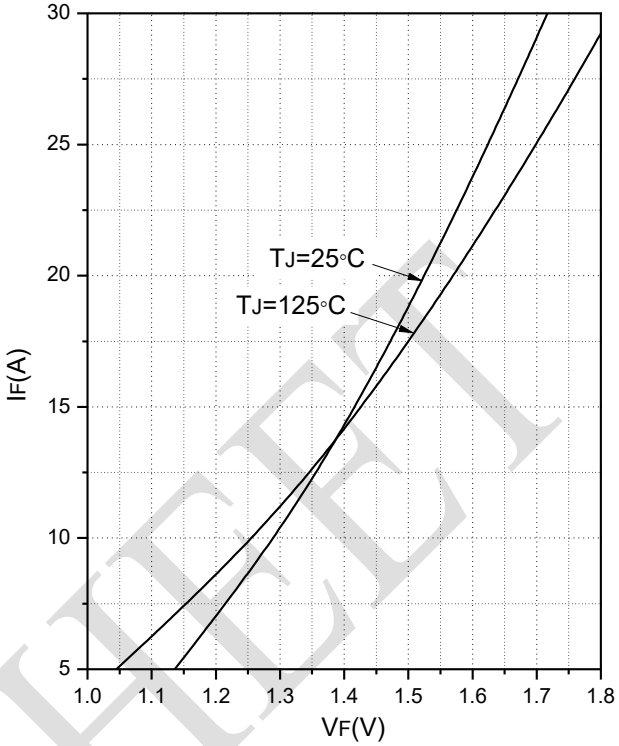


Fig.10 Forward Characteristics of FWD(Brake-Chopper)

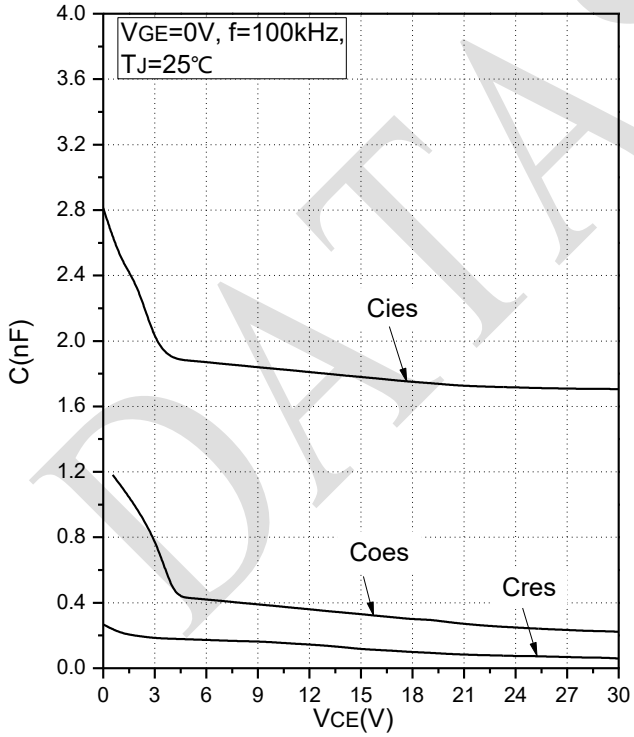


Fig.11 Capacitance Characteristics(Inverter)

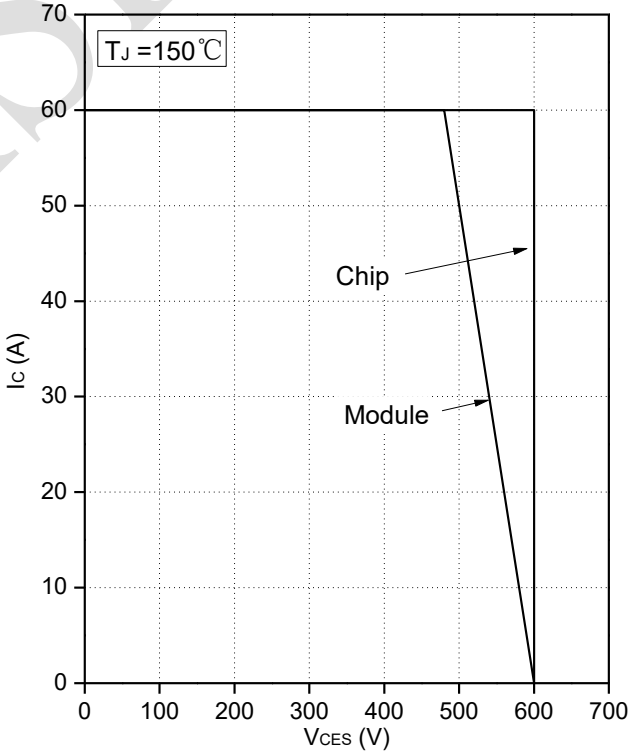


Fig.12 Reverse Bias Safe Operation Area (RBSOA)

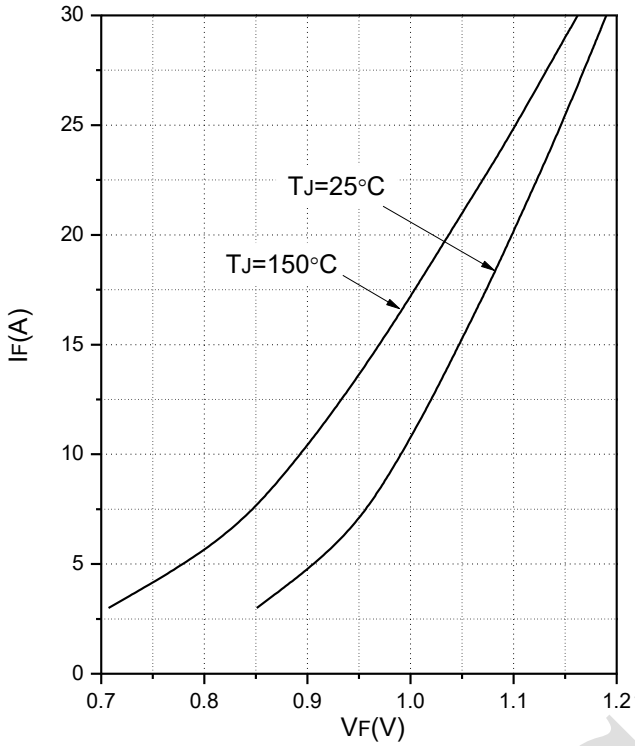


Fig.13 Forward Characteristics of Diode (Rectifier)

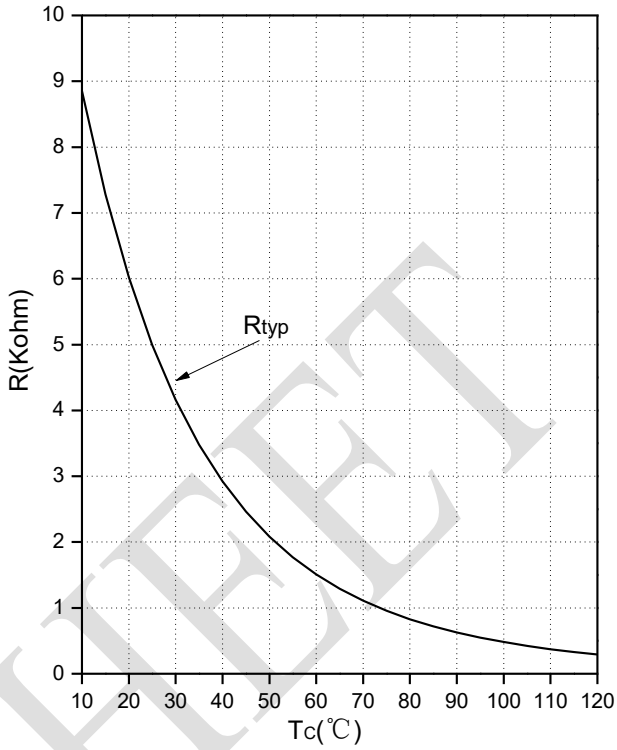
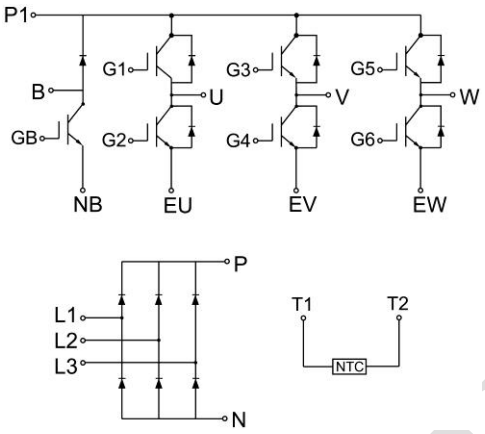
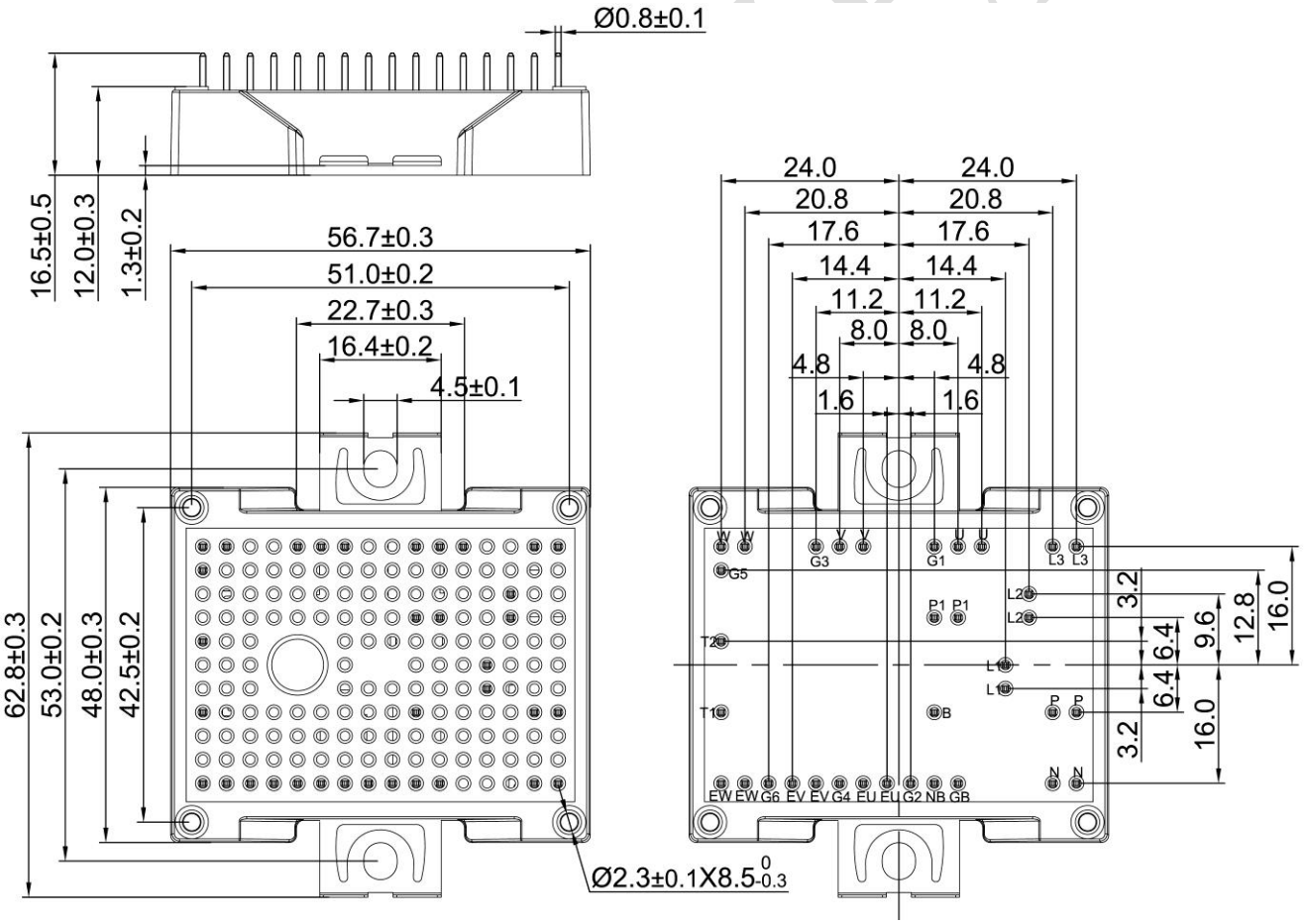


Fig.14 NTC Temperature Characteristic

Internal Circuit



Package Outlines (Unit: mm)



Date	Revision	Notes
05/26/2023	A	Final Version

Announcement

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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”.