



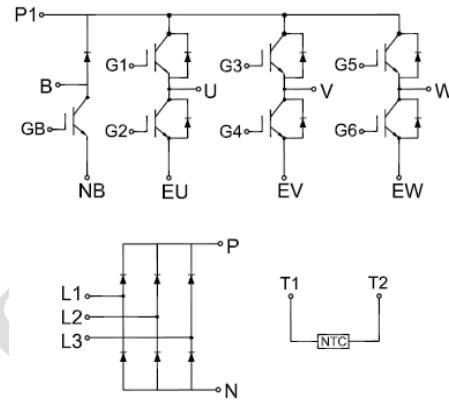
GT35PI120B9H

IGBT Module

Features:

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

Circuit Diagram



Applications:

- Motor Drives
- Air Conditioning
- Auxiliary Inverters

IGBT, Inverter Maximum Rated Values

V _{CES}	Collector-Emitter Blocking Voltage	T _J =25°C	1200	V
V _{GES}	Gate-Emitter Voltage		±20	V
I _C	Continuous Collector Current	T _C =100°C	35	A
		T _C =25°C	70	A
I _{CM}	Peak Collector Current Repetitive	t _p =1ms	70	A
t _{SC}	Short Circuit Withstand Time		>10	μs
P _D	Maximum Power Dissipation (per leg)	T _C =25°C T _{Jmax} =175°C	430	W



Electrical Characteristics of IGBT

Static Characteristics

Symbol	Description	Conditions	Min.	Typ.	Max.	Units
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=1mA, V_{CE}=V_{GE}, T_J=25^\circ C$	5.0	5.8	6.5	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=35A, V_{GE}=15V$		1.90	2.10	V
		$T_J=25^\circ C$		1.90	2.10	
		$T_J=125^\circ C$		2.30		
		$T_J=150^\circ C$		2.40		
I_{CES}	Collector-Emitter Leakage Current	$V_{GE}=0V, V_{CE}=V_{CES}, T_J=25^\circ C$			1	mA
I_{GES}	Gate-Emitter Leakage Current	$V_{GE}=\pm 20V, V_{CE}=0V, T_J=25^\circ C$			400	nA
C_{ies}	Input Capacitance	$V_{CE}=25V, V_{GE}=0V, f=100kHz, T_J=25^\circ C$		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	$V_{CC}=600V, I_C=35A, R_{Gon}=15\Omega, V_{GE}=\pm 15V, \text{Inductive Load}$	$T_J=25^\circ C$		45		ns		
			$T_J=125^\circ C$		55				
			$T_J=150^\circ C$		55				
t_r	Rise Time		$V_{CC}=600V, I_C=35A, R_{Goff}=15\Omega, V_{GE}=\pm 15V, \text{Inductive Load}$	$T_J=25^\circ C$		50		ns	
				$T_J=125^\circ C$		56			
				$T_J=150^\circ C$		56			
$t_{d(off)}$	Turn-off Delay Time			$V_{CC}=600V, I_C=35A, R_{Goff}=15\Omega, V_{GE}=\pm 15V, \text{Inductive Load}$	$T_J=25^\circ C$		170		ns
					$T_J=125^\circ C$		190		
					$T_J=150^\circ C$		192		
t_f	Fall Time	$V_{CC}=600V, I_C=35A, R_{Goff}=15\Omega, V_{GE}=\pm 15V, \text{Inductive Load}$			$T_J=25^\circ C$		250		ns
					$T_J=125^\circ C$		410		
					$T_J=150^\circ C$		420		
E_{on}	Turn-on Switching Loss		$V_{CC}=600V, I_C=35A, R_{Gon}=15\Omega, V_{GE}=\pm 15V, di/dt=580A/\mu s(T_J=150^\circ C), \text{Inductive Load}$		$T_J=25^\circ C$		2.32		mJ
					$T_J=125^\circ C$		2.64		
					$T_J=150^\circ C$		2.88		



E _{off}	Turn-off Switching Loss	V _{CC} =600V, I _C =35A, R _{Goff} =15Ω, V _{GE} =±15V, du/dt=3200V/μs(T _J =150°C), Inductive Load	T _J =25°C	2.08	mJ
			T _J =125°C	2.78	
			T _J =150°C	3.00	
Q _g	Total Gate Charge	V _{GE} =-15V...+15V	T _J =25°C	191	nC
RBSOA	I _C =70A, V _{CC} =1050V, V _P =1200V, R _G =15Ω, V _{GE} =+15V to 0V, T _J =150°C			Trapezoid	
SCSOA	V _{CC} =600V, V _{GE} =15V, R _G =15Ω, t _P =10μs, T _J =125°C			130	A
R _{θJC}	IGBT Thermal Resistance: Junction-to-Case (per Leg)			0.344	°C/W

Diode, Inverter Maximum Rated Values

V _{RRM}	Repetitive Peak Reverse Voltage	T _J =25°C	1200	V
I _F	Diode Continuous Forward Current		35	A
I _{FM}	Peak FWD Current Repetitive	t _p =1ms	70	A

Electrical Characteristics of Diode

Symbol	Description	Conditions	Min.	Typ.	Max.	Units
V _{FM}	Forward Voltage	I _F =35A	T _J =25°C	1.95	2.15	V
			T _J =125°C	2.05		
			T _J =150°C	2.05		
I _{rr}	Peak Reverse Recovery Current	I _F =35A, di/dt=775A/μs(T _J =150°C), V _{rr} =600V, V _{GE} =-15V	T _J =25°C	31		A
			T _J =125°C	32		
			T _J =150°C	35		
t _{rr}	Reverse Recovery Time	I _F =35A, di/dt=775A/μs(T _J =150°C), V _{rr} =600V, V _{GE} =-15V	T _J =25°C	105		ns
			T _J =125°C	410		
			T _J =150°C	420		
Q _{rr}	Reverse Recovery Charge	I _F =35A, di/dt=775A/μs(T _J =150°C), V _{rr} =600V, V _{GE} =-15V	T _J =25°C	1.7		μC
			T _J =125°C	5.0		
			T _J =150°C	5.5		



E _{rec}	Reverse Recovery Energy	I _F =35A, di/dt=775A/μs(T _J =150°C), V _{rr} =600V, V _{GE} =-15V	T _J =25°C	0.76	mJ
			T _J =125°C	1.60	
			T _J =150°C	1.98	
R _{θJC}	Diode Thermal Resistance: Junction-to-Case (per Leg)			0.524	°C/W

IGBT, Brake-Chopper Maximum Rated Values

V _{CES}	Collector-Emitter Blocking Voltage	T _J =25°C	1200	V
V _{GES}	Gate-Emitter Voltage		±20	V
I _C	Continuous Collector Current	T _C =100°C	35	A
		T _C =25°C	70	A
I _{CM}	Peak Collector Current Repetitive	tp=1ms	70	A
t _{SC}	Short Circuit Withstand Time		>10	μs
P _D	Maximum Power Dissipation (per leg)	T _C =25°C T _{Jmax} =175°C	430	W

Electrical Characteristics of IGBT

Static Characteristics

Symbol	Description	Conditions	Min.	Typ.	Max.	Units
V _{GE(th)}	Gate-Emitter Threshold Voltage	I _C =1mA, V _{CE} =V _{GE} , T _J =25°C	5.0	5.8	6.5	V
V _{CE(sat)}	Collector-Emitter Saturation Voltage	I _C =35A, V _{GE} =15V	T _J =25°C	1.90	2.10	V
			T _J =125°C	2.30		
			T _J =150°C	2.40		
I _{CES}	Collector-Emitter Leakage Current	V _{GE} =0V, V _{CE} =V _{CES} , T _J =25°C			1	mA
I _{GES}	Gate-Emitter Leakage Current	V _{GE} =±20V, V _{CE} =0V, T _J =25°C			400	nA
C _{ies}	Input Capacitance	V _{CE} =25V, V _{GE} =0V, f=100kHz, T _J =25°C		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	$V_{CC}=600V, I_C=35A,$ $R_{Gon}=15\Omega, V_{GE}=\pm 15V,$ Inductive Load	$T_J=25^\circ C$		45		ns	
			$T_J=125^\circ C$		55			
			$T_J=150^\circ C$		55			
t_r	Rise Time		$V_{CC}=600V, I_C=35A,$ $R_{Goff}=15\Omega, V_{GE}=\pm 15V,$ Inductive Load	$T_J=25^\circ C$		50		ns
				$T_J=125^\circ C$		56		
				$T_J=150^\circ C$		56		
$t_{d(off)}$	Turn-off Delay Time	$V_{CC}=600V, I_C=35A,$ $R_{Goff}=15\Omega, V_{GE}=\pm 15V,$ Inductive Load		$T_J=25^\circ C$		170		ns
				$T_J=125^\circ C$		190		
				$T_J=150^\circ C$		192		
t_f	Fall Time		$V_{CC}=600V, I_C=35A,$ $R_{Goff}=15\Omega, V_{GE}=\pm 15V,$ Inductive Load	$T_J=25^\circ C$		250		ns
				$T_J=125^\circ C$		410		
				$T_J=150^\circ C$		420		
E_{on}	Turn-on Switching Loss	$V_{CC}=600V, I_C=35A,$ $R_{Gon}=15\Omega, V_{GE}=\pm 15V,$ $di/dt=580A/\mu s(T_J=150^\circ C),$ Inductive Load		$T_J=25^\circ C$		2.32		mJ
				$T_J=125^\circ C$		2.64		
				$T_J=150^\circ C$		2.88		
E_{off}	Turn-off Switching Loss		$V_{CC}=600V, I_C=35A,$ $R_{Goff}=15\Omega, V_{GE}=\pm 15V,$ $du/dt=3200V/\mu s(T_J=150^\circ C),$ Inductive Load	$T_J=25^\circ C$		2.08		mJ
				$T_J=125^\circ C$		2.78		
				$T_J=150^\circ C$		3.00		
Q_g	Total Gate Charge	$V_{GE}=-15V\dots+15V$		$T_J=25^\circ C$		191		nC
RBSOA	$I_C=70A, V_{CC}=1050V, V_P=1200V, R_G=15\Omega, V_{GE}=+15V \text{ to } 0V, T_J=150^\circ C$			Trapezoid				
SCSOA	$V_{CC}=600V, V_{GE}=15V, R_G=15\Omega, t_P=10\mu s, T_J=125^\circ C$				130		A	
$R_{\theta JC}$	IGBT Thermal Resistance: Junction-to-Case (per Leg)					0.344	$^\circ C/W$	



Diode, Brake-Chopper Maximum Rated Values

V_{RRM}	Repetitive Peak Reverse Voltage	$T_J=25^{\circ}\text{C}$	1200	V
I_F	Diode Continuous Forward Current		10	A
I_{FM}	Diode Maximum Forward Current	$t_p=1\text{ms}$	20	A

Electrical Characteristics of Diode ($T_C=25^{\circ}\text{C}$ unless otherwise specified)

Symbol	Description	Conditions	Min.	Typ.	Max.	Units
V_{FM}	Forward Voltage	$I_F=10\text{A}$	$T_J=25^{\circ}\text{C}$	1.80		V
			$T_J=125^{\circ}\text{C}$	1.90		
			$T_J=150^{\circ}\text{C}$	1.85		
t_{rr}	Reverse Recovery Time		$T_J=25^{\circ}\text{C}$	133		ns
			$T_J=125^{\circ}\text{C}$	182		
			$T_J=150^{\circ}\text{C}$	186		
I_{rr}	Peak Reverse Recovery Current	$I_F=10\text{A}$, $-di_F/dt=388\text{A}/\mu\text{s}(T_J=150^{\circ}\text{C})$, $V_{rr}=600\text{V}$, $V_{GE}=-15\text{V}$	$T_J=25^{\circ}\text{C}$	10.0		A
			$T_J=125^{\circ}\text{C}$	14.0		
			$T_J=150^{\circ}\text{C}$	14.7		
Q_{rr}	Reverse Recovery Charge		$T_J=25^{\circ}\text{C}$	1.12		μC
			$T_J=125^{\circ}\text{C}$	1.43		
			$T_J=150^{\circ}\text{C}$	1.57		
E_{rec}	Reverse Recovery Energy		$T_J=25^{\circ}\text{C}$	0.3		mJ
			$T_J=125^{\circ}\text{C}$	0.7		
			$T_J=150^{\circ}\text{C}$	0.8		
$R_{\theta JC}$	Diode Thermal Resistance: Junction-to-Case (per Leg)				1.157	$^{\circ}\text{C}/\text{W}$



Diode, Rectifier Maximum Rated Values

V_{RRM}	Repetitive Peak Reverse Voltage	$T_J=25^{\circ}\text{C}$	1800	V
I_F	Diode Continuous Forward Current	$T_J=25^{\circ}\text{C}$	16	A
I_{FRMSM}	Maximum RMS Forward Current per Chip	$T_J=80^{\circ}\text{C}$	25	A
I_{FSM}	Surge Current @ $t_p=10\text{ms}$	$T_J=25^{\circ}\text{C}$	320	A
		$T_J=125^{\circ}\text{C}$	240	
I^2t	I^2t - value	$T_J=25^{\circ}\text{C}$	512	A ² s
		$T_J=125^{\circ}\text{C}$	288	

Electrical Characteristics of Diode

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
V_F	Forward Voltage	$I_F=16\text{A}$	$T_J=25^{\circ}\text{C}$		1.05		V
			$T_J=125^{\circ}\text{C}$		1.00		
I_R	Reverse Current	$V_R=1200\text{V}$	$T_J=25^{\circ}\text{C}$			1	mA
$R_{\theta JC}$	Diode Thermal Resistance: Junction-to-Case (per Leg)					0.711	$^{\circ}\text{C}/\text{W}$

Internal NTC-Thermistor Characteristics

R_{25}	$T_C=25^{\circ}\text{C}$	5		k Ω
$\Delta R/R$	$T_C=100^{\circ}\text{C}$, $R_{100}=481\Omega$		± 5	%
P_{25}	$T_C=25^{\circ}\text{C}$	10		mW
$B_{25/50}$	$R_2=R_{25} \exp[B_{25/50}(1/T_2-1/(298.15\text{K}))]$	3380		K
$B_{25/80}$	$R_2=R_{25} \exp[B_{25/80}(1/T_2-1/(298.15\text{K}))]$	3440		K



Module

Symbol	Description	Min.	Typ.	Max.	Units
V _{IOS}	Isolation Voltage (All Terminals Shorted)	DC, 3s	3500		V
Internal Isolation		ZTA 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			175	°C
T _{JOP}	Maximum Operating Junction Temperature Range	-40		+150	°C
T _{stg}	Storage Temperature	-40		+125	°C
CTI	Comparative Tracking Index	200			
R _{θCS}	Case-to-Sink Thermally (Conductive Grease Applied)			0.05	°C/W
T	Mounting Screw:M4	1.5		1.8	N·m
G	Weight		40		g

Ordering Information Table

Device code	G	T	35	PI	120	B9	H
	①	②	③	④	⑤	⑥	⑦

- ① - IGBT Module
- ② - Trench, Low Switching Losses IGBT
- ③ - Rated Current (35=35A)
- ④ - Circuit Configuration: Power Integrated
- ⑤ - Rated Voltage (120=1200V)
- ⑥ - Package Type
- ⑦ - Test Level (Pass the Important Reliability Test-Industrial Grade)

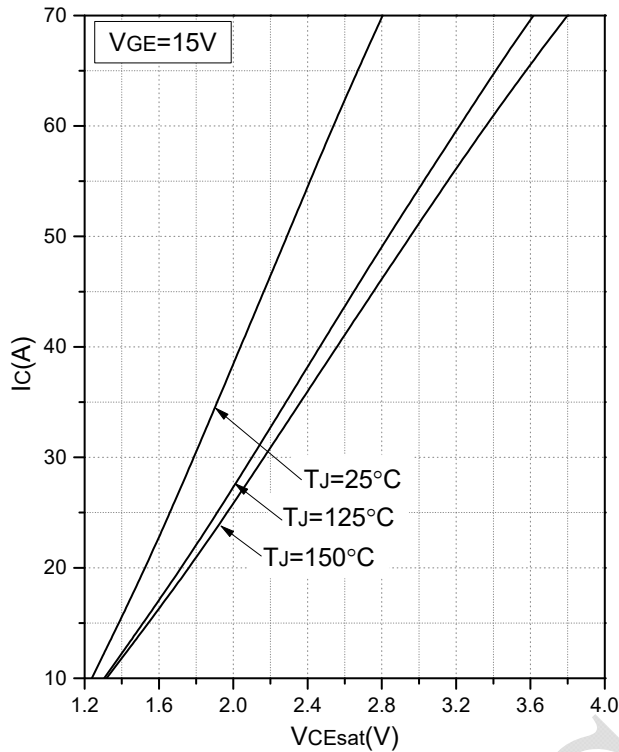


Fig.1 Typical Saturation Voltage Characteristics (Inverter)

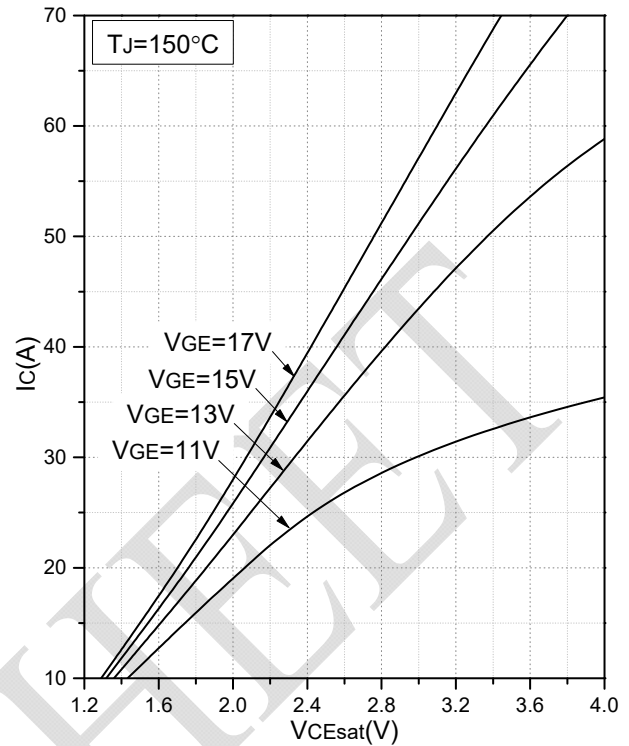


Fig.2 Typical Output Characteristics (Inverter)

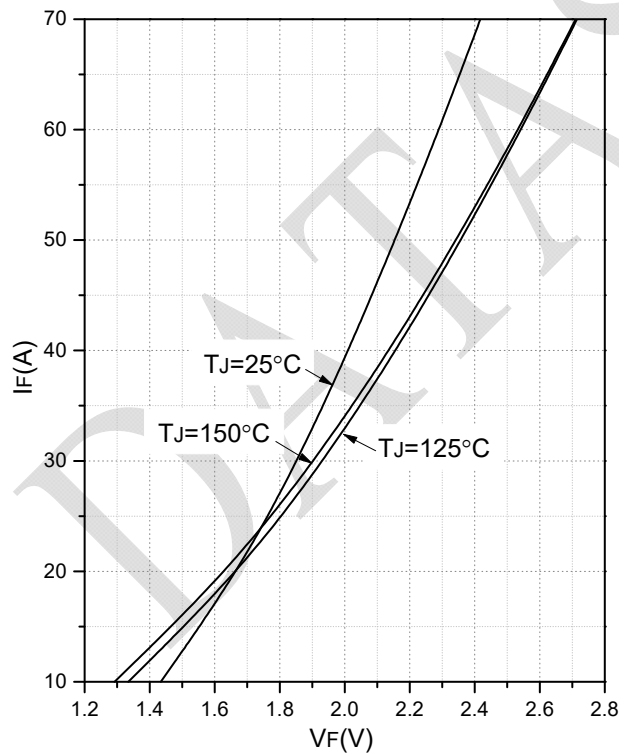


Fig.3 Forward Characteristics of Diode (Inverter)

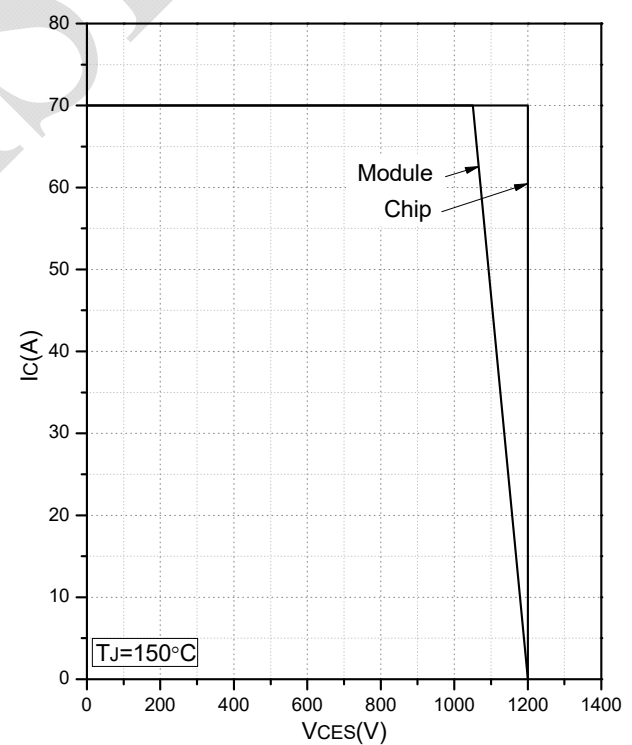
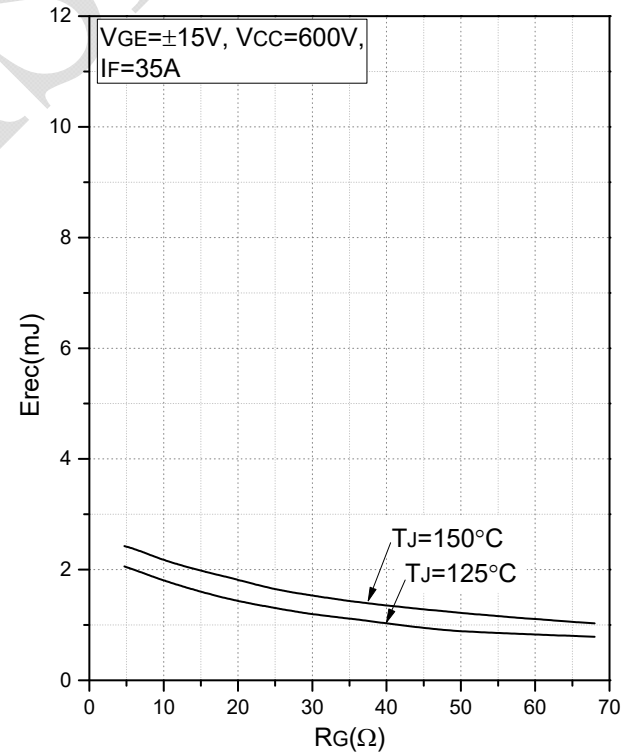
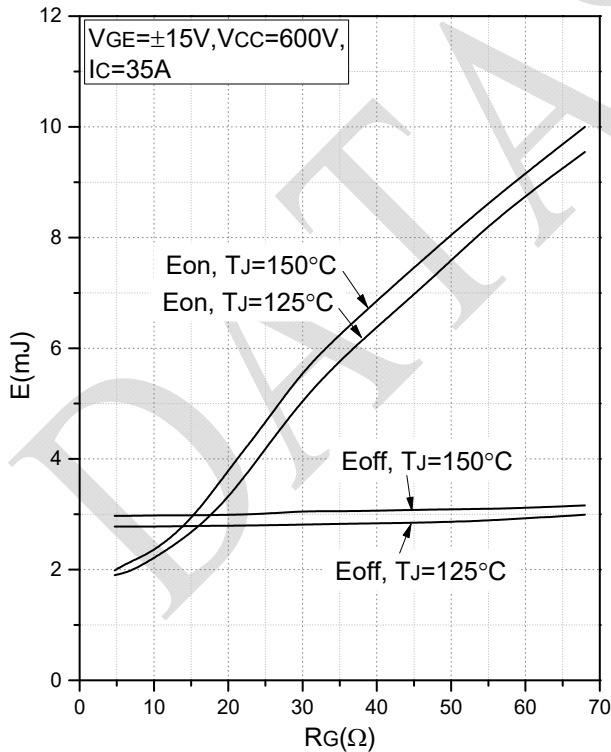
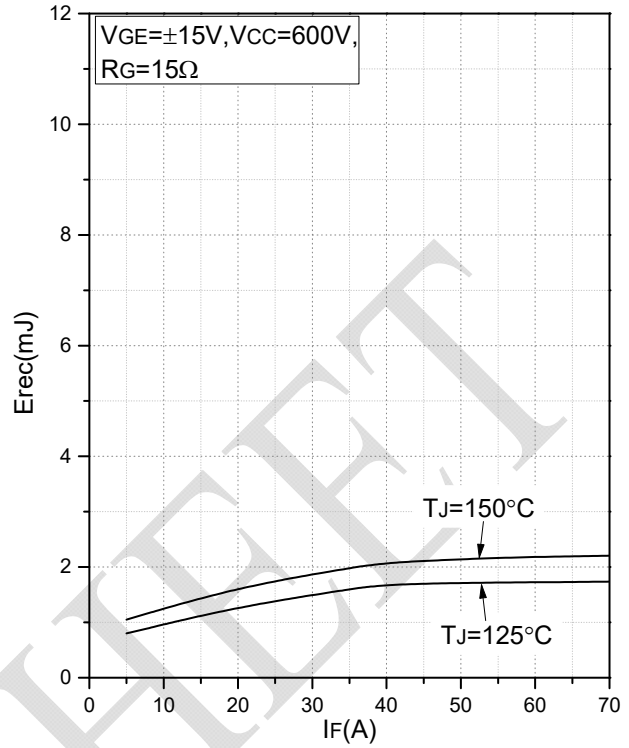
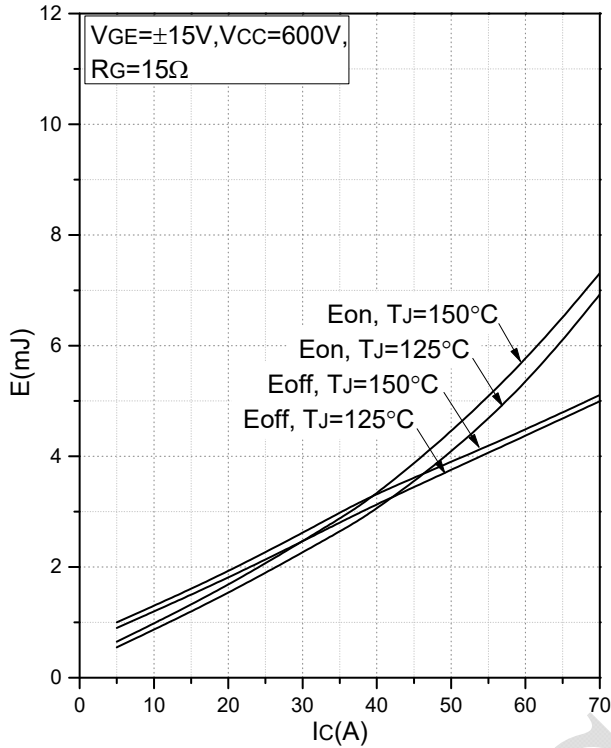


Fig.4 Reverse Bias Safe Operation Area (Inverter)



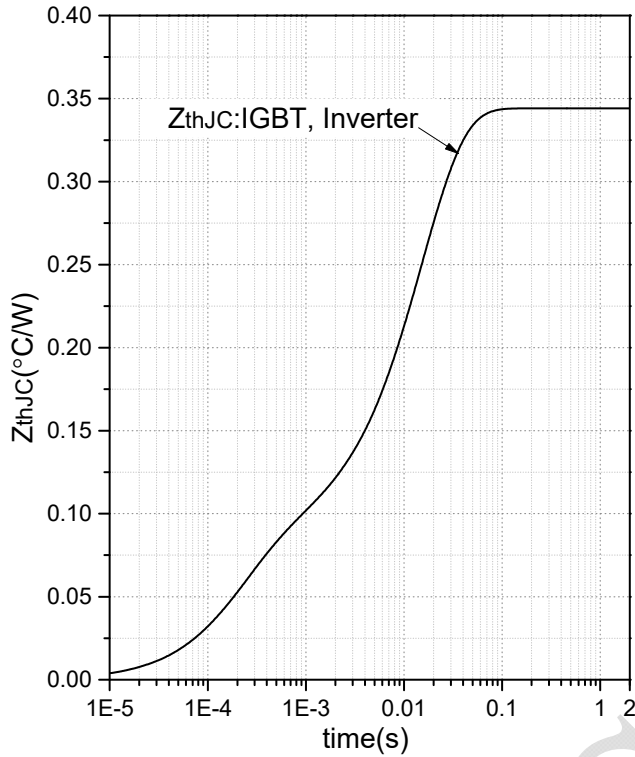


Fig.9 Transient Thermal Impedance of IGBT (Inverter)

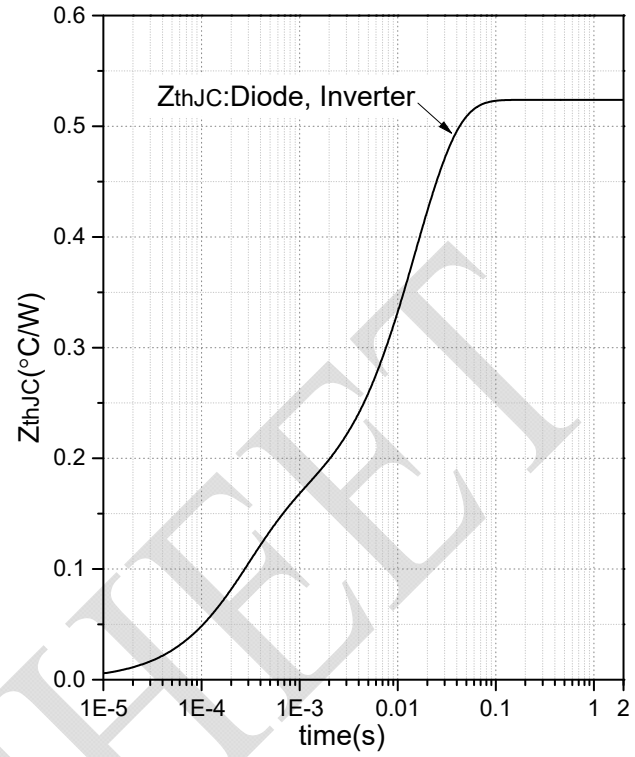


Fig.10 Transient Thermal Impedance of Diode (Inverter)

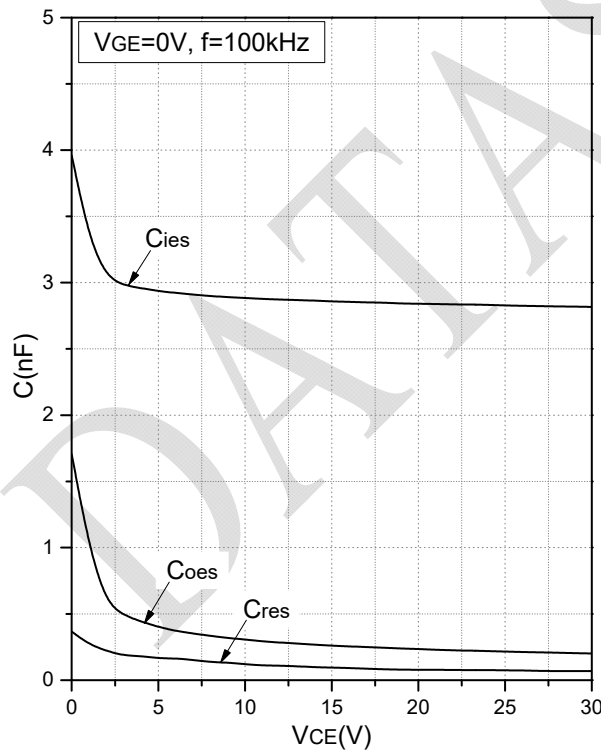


Fig.11 Capacitance Characteristics (Inverter)

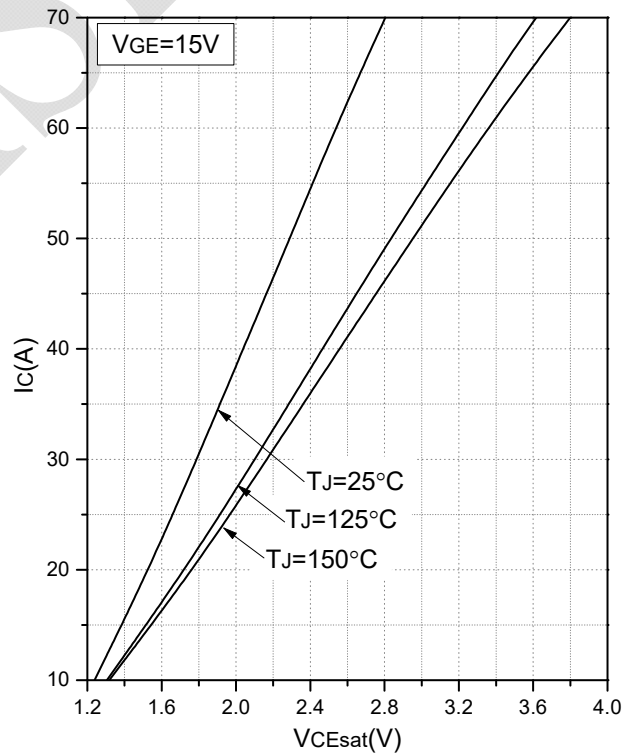


Fig.12 Typical Saturation Voltage Characteristics of IGBT (Brake-Chopper)

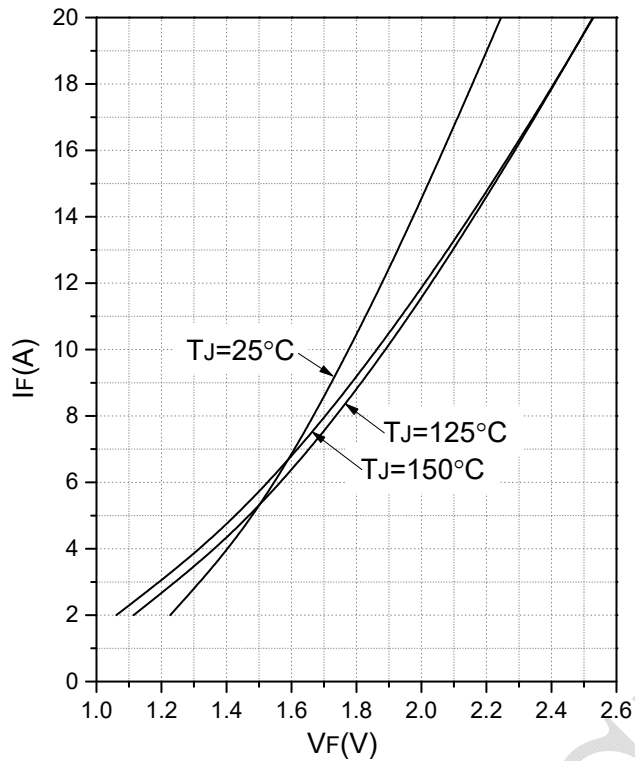


Fig.13 Forward Characteristics of Diode (Brake-Chopper)

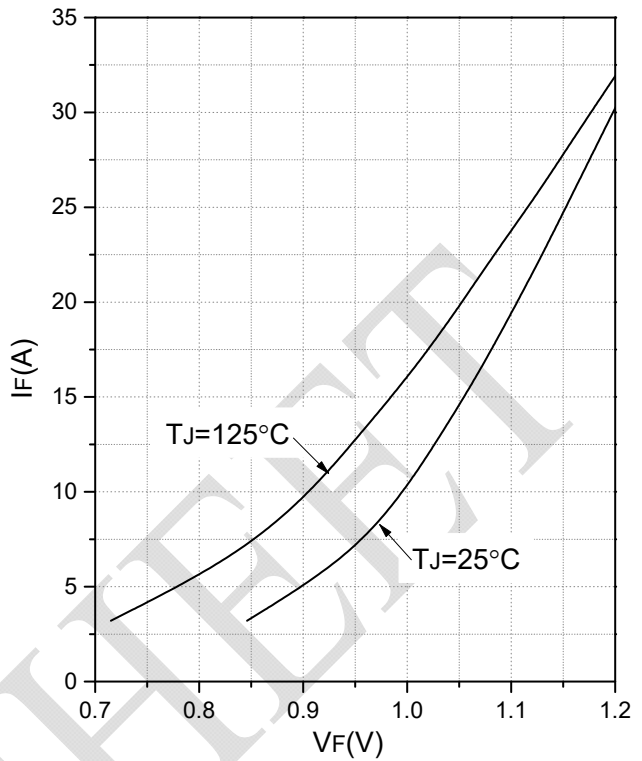


Fig.14 Forward Characteristics of Diode (Rectifier)

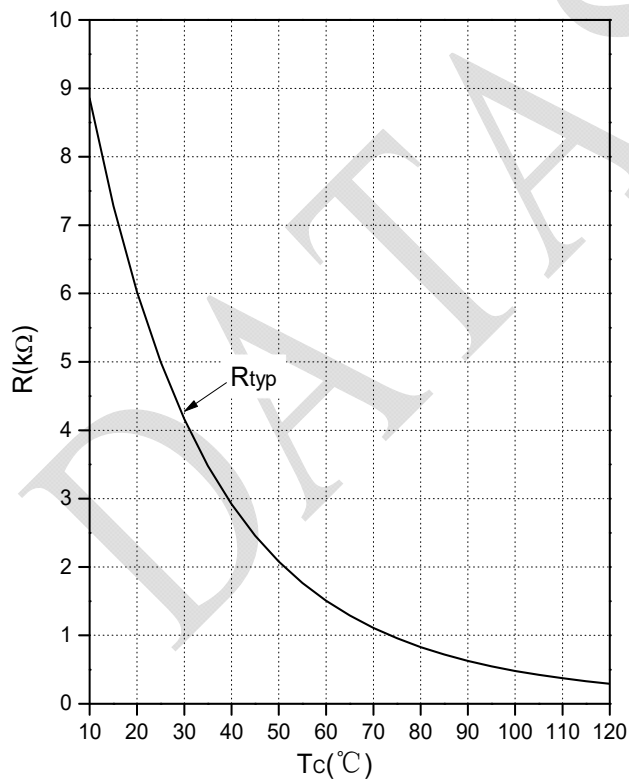
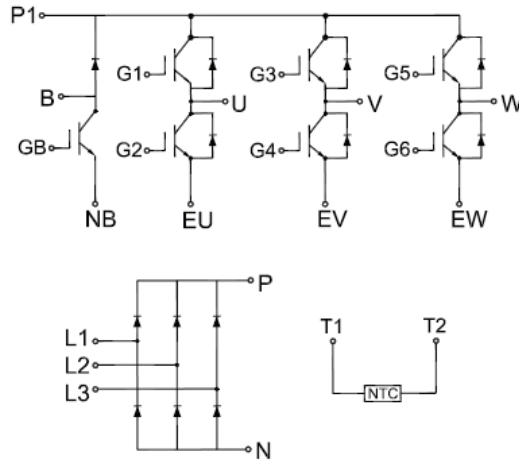


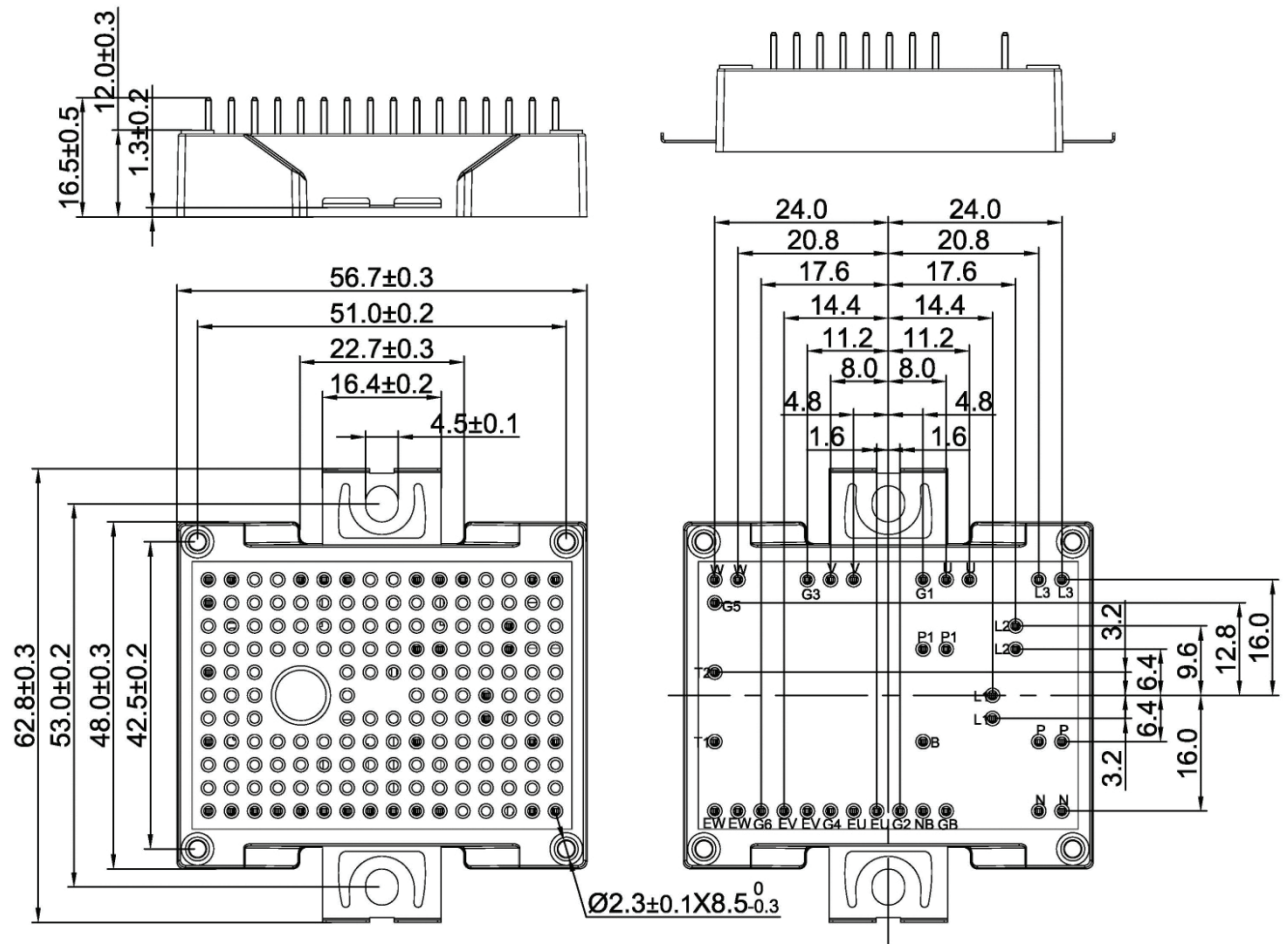
Fig.15 NTC Temperature Characteristics



Internal Circuit:



Package Outline (Unit: mm):





Date	Revision	Notes
04/19/2022	A	Final Version

Announcements

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

DATA SHEET