

SYMT15PI120B3H

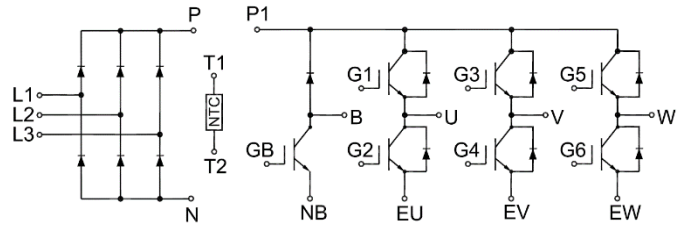
IGBT Module



Features:

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

Circuit Diagram



Applications:

- Industrial Inverters

IGBT, Inverter

Maximum Rated Values (T_C=25°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°C	15	A
		T _C =25°C	30	A
I _{CM}	Repetitive Peak Collector Current	t _p =1ms	30	A
P _D	Maximum Power Dissipation per IGBT	T _C =25°C, T _{Jmax} =175°C	199	W

Electrical Characteristics of IGBT (T_C=25°C 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	5.9	6.5	V
V _{CE(sat)}	Collector-Emitter Saturation Voltage	I _C =15A, V _{GE} =15V	T _J =25°C	1.8	2.0	V
			T _J =125°C	2.0		V
			T _J =150°C	2.1		V
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			100	nA
C _{ies}	Input Capacitance	V _{CE} =25V, V _{GE} =0V, f=100kHz		1.45		nF
C _{oes}	Output Capacitance			0.10		nF
C _{res}	Reverse Transfer Capacitance			0.06		nF

Switching Characteristics

t _{d(on)}	Turn-on Delay Time	V _{CC} =600V, I _C =15A, R _{Gon} =36Ω, V _{GE} =±15V, Inductive Load	T _J =25℃		85		ns
			T _J =125℃		89		
			T _J =150℃		92		
t _r	Rise Time		T _J =25℃		50		ns
			T _J =125℃		52		
			T _J =150℃		53		
t _{d(off)}	Turn-off Delay Time	V _{CC} =600V, I _C =15A, R _{Goff} =36Ω, V _{GE} =±15V, Inductive Load	T _J =25℃		137		ns
			T _J =125℃		146		
			T _J =150℃		151		
t _f	Fall Time		T _J =25℃		222		ns
			T _J =125℃		290		
			T _J =150℃		428		
E _{on}	Turn-on Switching Loss	V _{CC} =600V, I _C =15A, R _{Gon} =36Ω, V _{GE} =±15V, di/dt=232A/μs(T _J =150℃), Inductive Load	T _J =25℃		2.35		mJ
			T _J =125℃		3.03		
			T _J =150℃		3.29		

E_{off}	Turn-off Switching Loss	$V_{CC}=600V, I_C=15A,$ $R_{Goff}=36\Omega, V_{GE}=\pm 15V,$ $du/dt=1984V/\mu s(T_J=150^\circ C),$ Inductive Load	$T_J=25^\circ C$		0.70		mJ
			$T_J=125^\circ C$		1.23		
			$T_J=150^\circ C$		1.28		
Q_g	Total Gate Charge	$V_{GE}=\pm 15V \dots -15V$	$T_J=25^\circ C$		354		nC
$R_{G(int)}$	Internal Gate Resistance				0		Ω
SCSOA	$V_{CC}=600V, V_{GE}=\pm 15V, R_{Gon}=36\Omega, R_{Goff}=36\Omega, T_J=125^\circ C$			10			μs
$R_{\theta JC}$	Thermal Resistance: Junction-to-Case (per IGBT)					0.753	$^\circ C/W$

Diode, Inverter

Maximum Rated Values ($T_C=25^\circ C$ unless otherwise specified)

V_{RRM}	Repetitive Peak Reverse Voltage	$T_J=25^\circ C$	1200	V
I_F	Diode Continuous Forward Current		15	A
I_{FM}	Diode Maximum Forward Current	$t_p=1ms$	30	A

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

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
V _{FM}	Forward Voltage	I _F =15A	T _J =25°C		1.9		V
			T _J =125°C		2.0		
			T _J =150°C		2.0		
t _{rr}	Reverse Recovery Time	I _F =15A, -diF/dt=344A/μs(T _J =150°C), V _{rr} =600V, V _{GE} =-15V	T _J =25°C		154		ns
			T _J =125°C		159		
			T _J =150°C		206		
I _{rr}	Peak Reverse Recovery Current		T _J =25°C		7.8		A
			T _J =125°C		12.2		
			T _J =150°C		12.8		
Q _{rr}	Reverse Recovery Charge		T _J =25°C		0.83		μC
			T _J =125°C		1.22		
			T _J =150°C		1.47		

E _{rec}	Reverse Recovery Energy	I _F =15A, -diF/dt=344A/μs(T _J =150℃), V _{rr} =600V, V _{GE} =-15V	T _J =25℃		0.10		mJ
			T _J =125℃		0.15		
			T _J =150℃		0.17		
R _{θJC}	Thermal Resistance: Junction-To-Case (per Diode)					1.127	℃/W

IGBT, Brake-Chopper

Maximum Rated Values (T_C=25°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°C	15	A
		T _C =25°C	30	A
I _{CM}	Repetitive Peak Collector Current	t _p =1ms	30	A
P _D	Maximum Power Dissipation per IGBT	T _C =25°C T _{Jmax} =175°C	199	W

Electrical Characteristics of IGBT (T_C=25°C 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	5.9	6.5	V
V _{CE(sat)}	Collector-Emitter Saturation Voltage	I _C =15A, V _{GE} =15V	T _J =25°C		1.8	2.0	V
			T _J =125°C		2.0		V
			T _J =150°C		2.1		V
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				100	nA
C _{ies}	Input Capacitance	V _{CE} =25V, V _{GE} =0V, f=100kHz			1.45		nF
C _{oes}	Output Capacitance				0.10		nF
C _{res}	Reverse Transfer Capacitance				0.06		nF

Switching Characteristics

t _{d(on)}	Turn-on Delay Time	V _{CC} =600V, I _C =15A, R _{Gon} =36Ω, V _{GE} =±15V, Inductive Load	T _J =25℃		85		ns	
			T _J =125℃		89			
			T _J =150℃		92			
t _r	Rise Time		T _J =25℃		50		ns	
			T _J =125℃		52			
			T _J =150℃		53			
t _{d(off)}	Turn-off Delay Time		V _{CC} =600V, I _C =15A, R _{Goff} =36Ω, V _{GE} =±15V, Inductive Load	T _J =25℃		137		ns
				T _J =125℃		146		
				T _J =150℃		151		
t _f	Fall Time	T _J =25℃			222		ns	
		T _J =125℃			290			
		T _J =150℃			428			
E _{on}	Turn-on Switching Loss	T _J =25℃			2.35		mJ	
		T _J =125℃			3.03			
		T _J =150℃			3.29			
E _{off}	Turn-off Switching Loss	T _J =25℃		0.70		mJ		
		T _J =125℃		1.23				
		T _J =150℃		1.28				
Q _g	Total Gate Charge	V _{GE} =+15V...-15V	T _J =25℃		354		nC	
R _{G(int)}	Internal Gate Resistance				0		Ω	
SCSOA	V _{CC} =600V, V _{GE} =±15V, R _{Gon} =36Ω, R _{Goff} =36Ω, T _J =125℃			10			μs	
R _{θJC}	Thermal Resistance: Junction-to-Case (per IGBT)					0.753	℃/W	

Diode, Brake-Chopper

Maximum Rated Values ($T_C=25^\circ C$ unless otherwise specified)

V_{RRM}	Repetitive Peak Reverse Voltage	$T_J=25^\circ C$	1200	V
I_F	Diode Continuous Forward Current		10	A
I_{FM}	Diode Maximum Forward Current	$t_p=1ms$	20	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 =10A	T _J =25℃		1.7		V
			T _J =125℃		1.9		
			T _J =150℃		1.8		
t _{rr}	Reverse Recovery Time	I _F =10A, -diF/dt=250A/μs(T _J =150℃), V _{rr} =600V, V _{GE} =-15V	T _J =25℃		381		ns
			T _J =125℃		490		
			T _J =150℃		583		
I _{rr}	Peak Reverse Recovery Current		T _J =25℃		8.4		A
			T _J =125℃		9.0		
			T _J =150℃		10.4		
Q _{rr}	Reverse Recovery Charge		T _J =25℃		1.34		μC
			T _J =125℃		2.11		
			T _J =150℃		2.58		
E _{rec}	Reverse Recovery Energy		T _J =25℃		0.33		mJ
			T _J =125℃		0.68		
			T _J =150℃		0.78		
R _{θJC}	Thermal Resistance: Junction-To-Case (per Diode)					1.284	℃/W

Diode, Rectifier

Maximum Rated Values (T_C=25°C unless otherwise specified)

V _{RRM}	Repetitive Peak Reverse Voltage	T _J =25°C	1600	V
I _F	Diode Continuous Forward Current	T _J =25°C	10	A
I _{FRMSM}	Maximum RMS Forward Current per Chip	T _J =80°C	20	A
I _{RMSM}	Maximum RMS Current at Rectifier Output	T _J =80°C	30	A
I _{FSM}	Surge Current @t _p =10ms	T _J =25°C	300	A
		T _J =150°C	250	
I ² t	I ² t - value	T _J =25°C	450	A ² s
		T _J =150°C	312	

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

V _F	Forward Voltage	I _F =10A	T _J =25°C		1.05		V
			T _J =150°C		1.00		
I _R	Reverse Current	V _R =1600V	T _J =25°C			1	mA
R _{θJC}	Thermal Resistance: Junction-To-Case (per Diode)					0.944	°C/W

Internal NTC-Thermistor Characteristics

R ₂₅	T _C =25°C	5		kΩ
ΔR/R	T _C =100°C, R ₁₀₀ =465Ω		±5	%
P ₂₅	T _C =25°C	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)	RMS, f=50Hz, 30s	4500			V
T _J	Maximum Junction Temperature				175	°C
T _{JOP}	Maximum Operating Junction Temperature Range		-40		+150	°C
T _{stg}	Storage Temperature		-40		+150	°C
CTI	Comparative Tracking Index		200			
R _{θCS}	Case-To-Sink Thermally (Conductive Grease Applied)				0.08	°C/W
T	Mounting Screw:M4		1.0		1.2	N·m
G	Weight			25		g

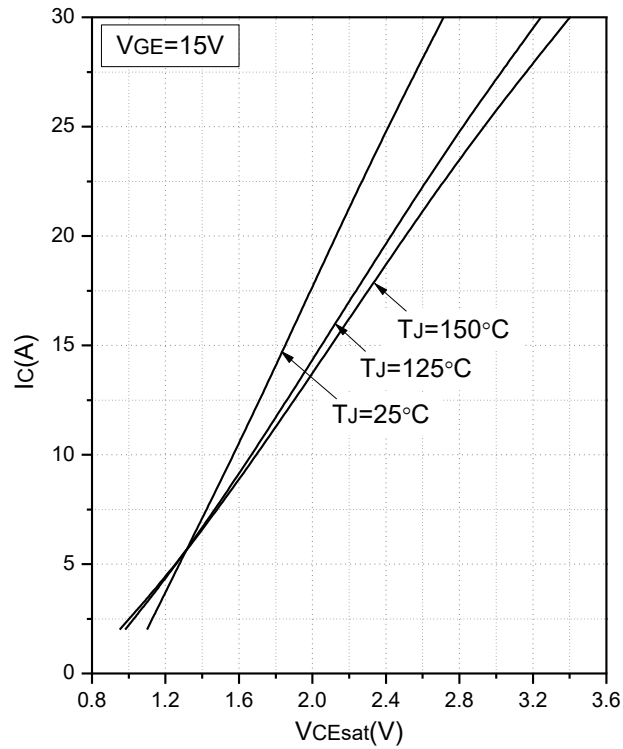


Fig.1 Typical Saturation Voltage Characteristics (Inverter)

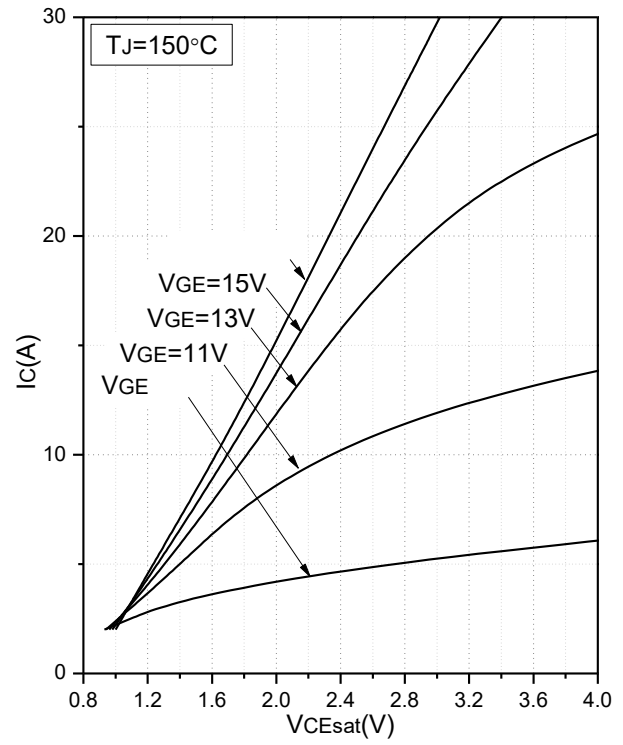


Fig.2 Typical Output Characteristics (Inverter)

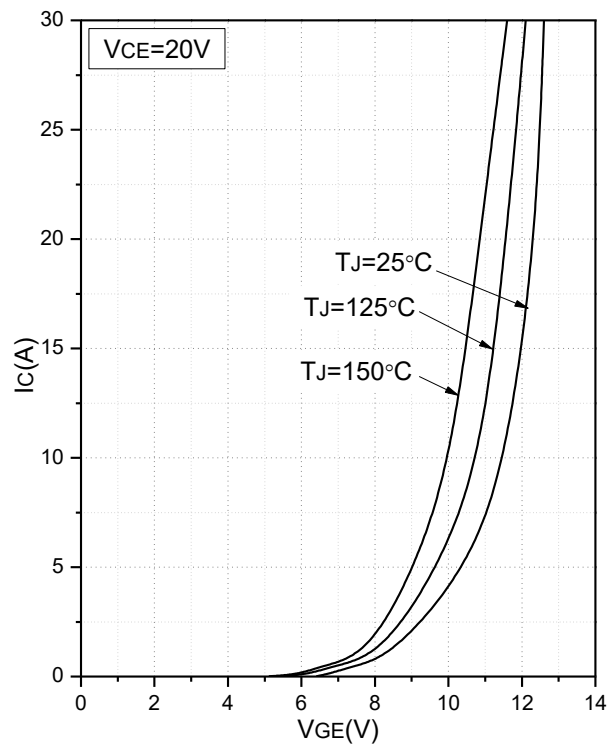


Fig.3 Transfer Characteristic (Inverter)

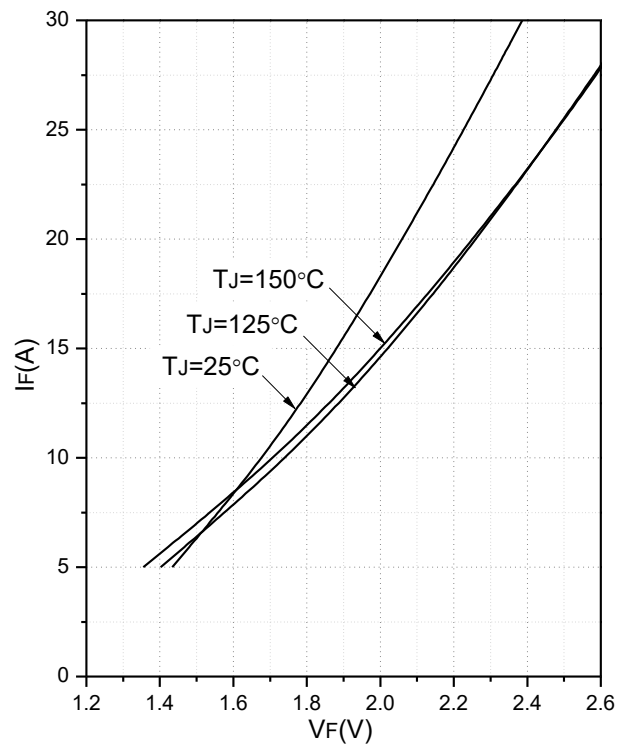


Fig.4 Forward Characteristics of Diode (Inverter)

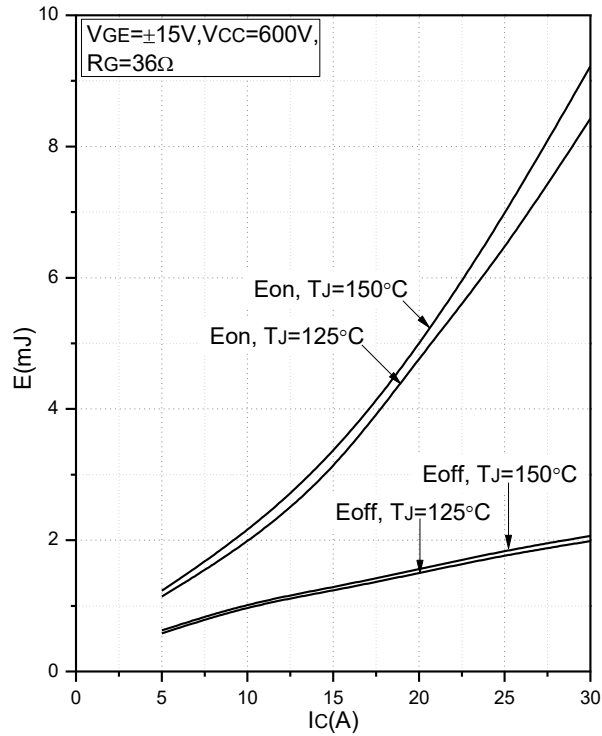


Fig.5 Typical Switching Loss vs. Collector Current (Inverter)

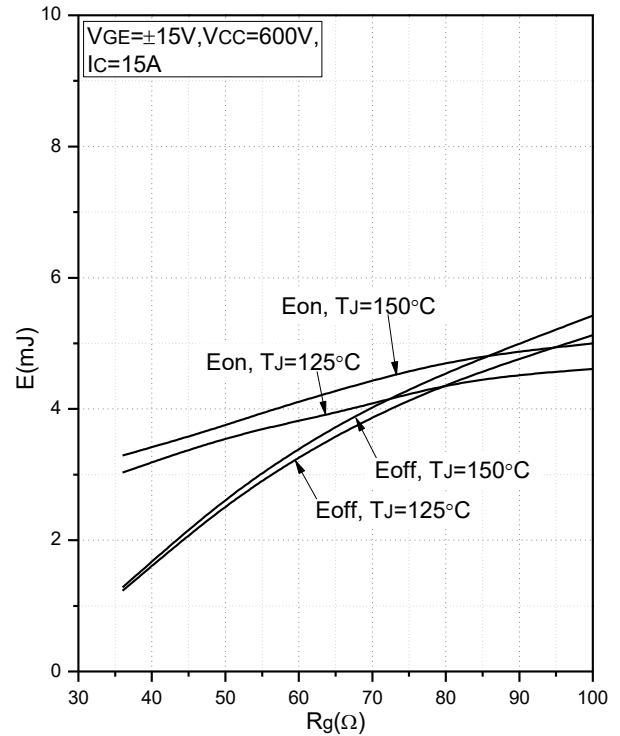


Fig.6 Typical Switching Loss vs. Forward Current (Inverter)

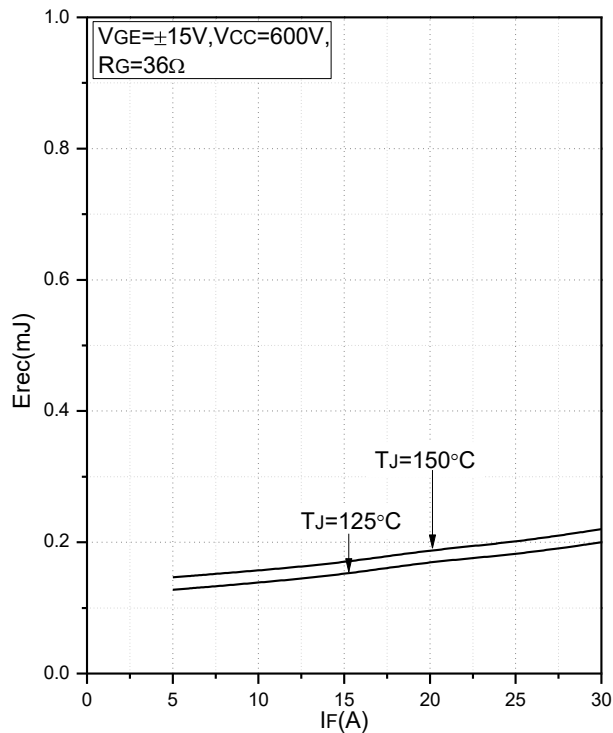


Fig.7 Typical Switching Loss vs. Gate Resistance (Inverter)

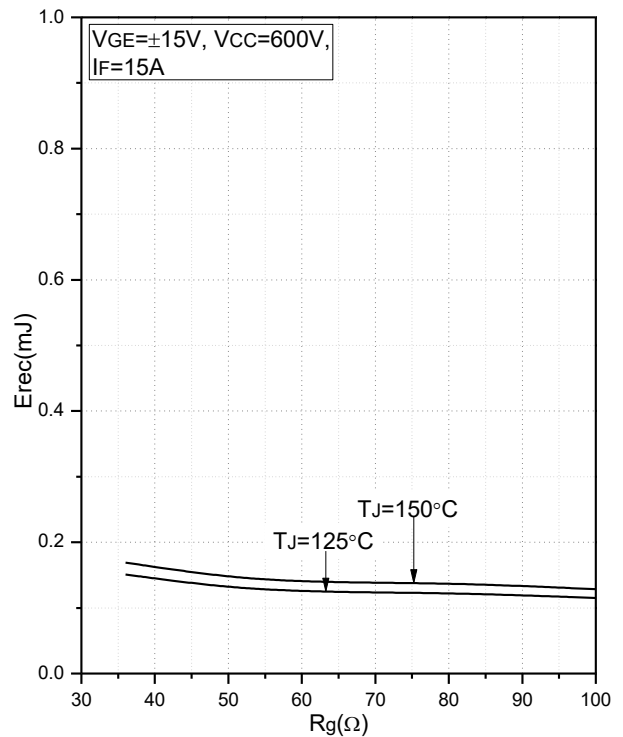


Fig.8 Typical Switching Loss vs. Gate Resistance (Inverter)

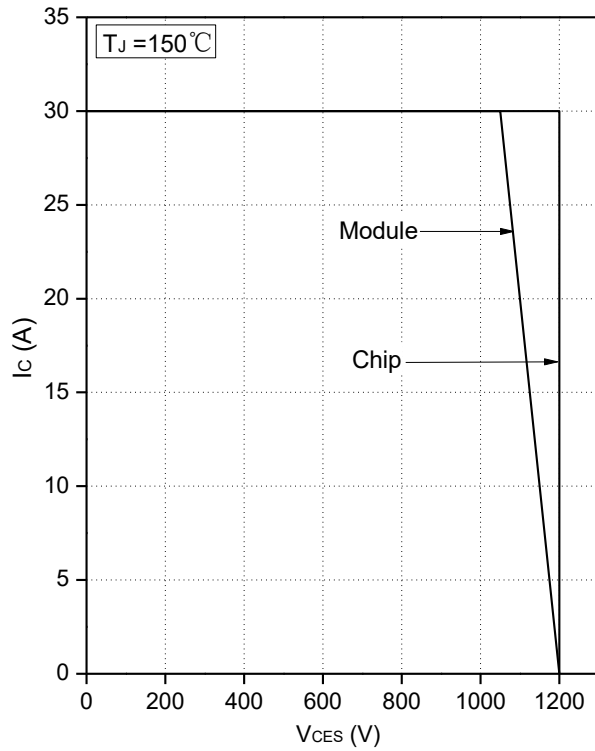


Fig.9 Reverse Bias Safe Operation Area (RBSOA)

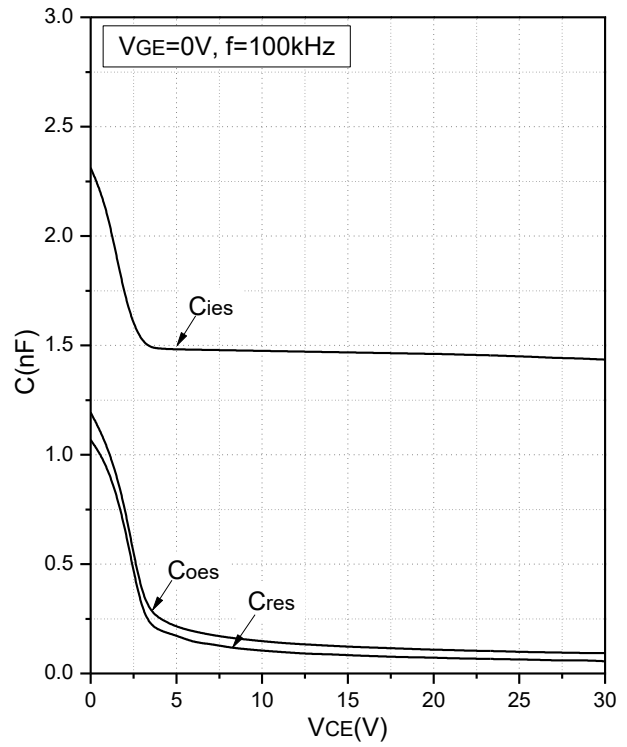


Fig.10 Capacitance Characteristics

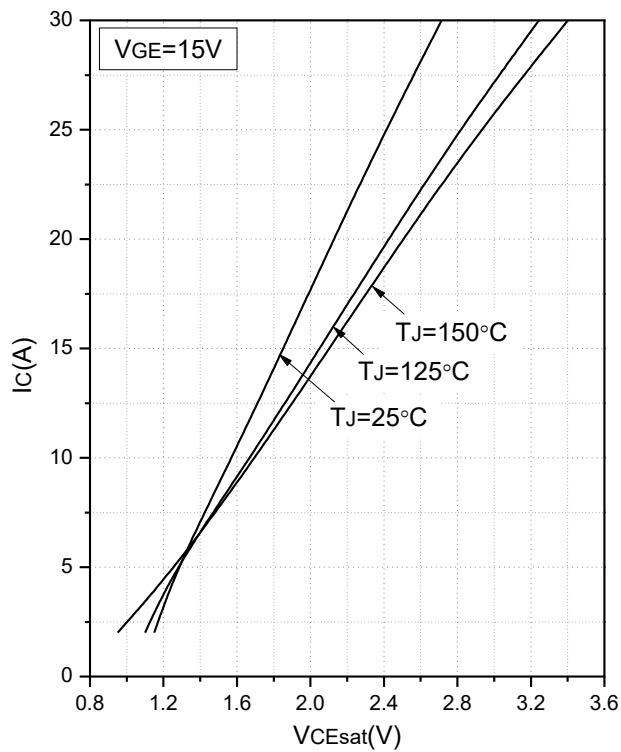


Fig.11 Typical Saturation Voltage Characteristics (Brake-Chopper)

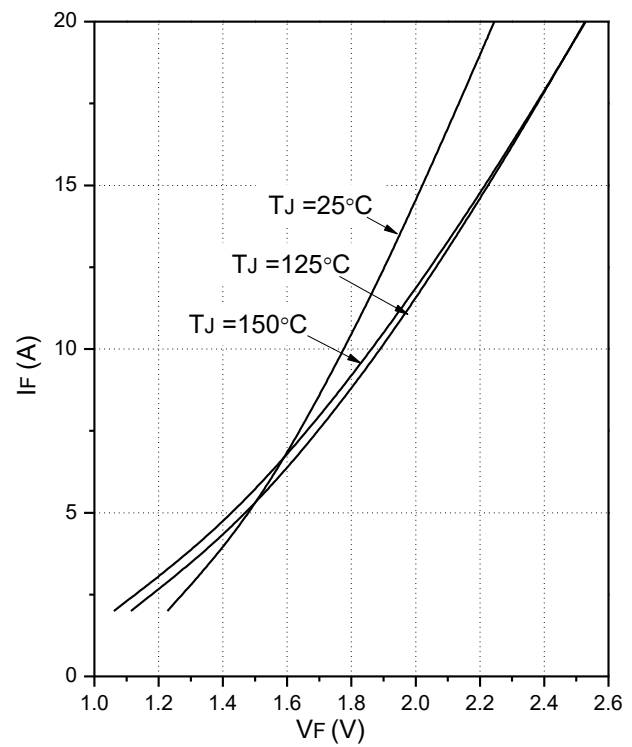


Fig.12 Forward Characteristics of Diode (Brake-Chopper)

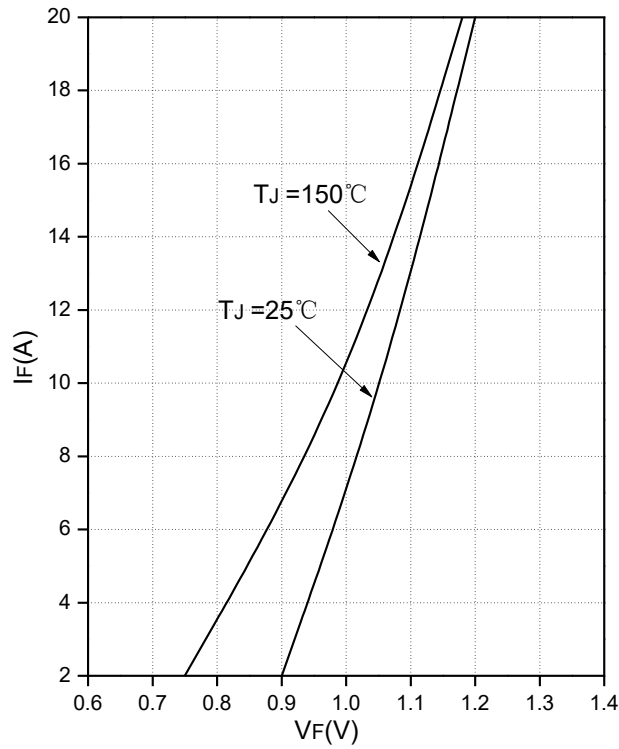


Fig.13 Forward Characteristics of Diode (Rectifier Diode)

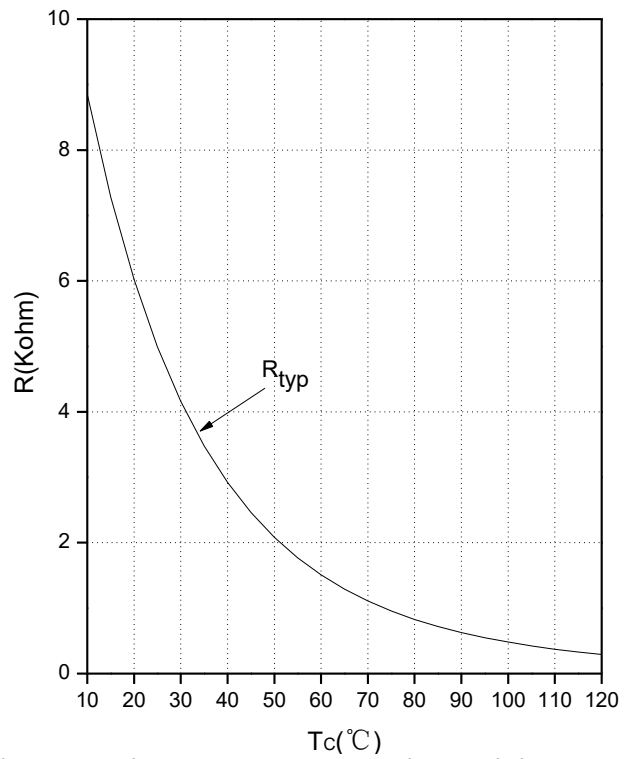


Fig.14 NTC Temperature Characteristics

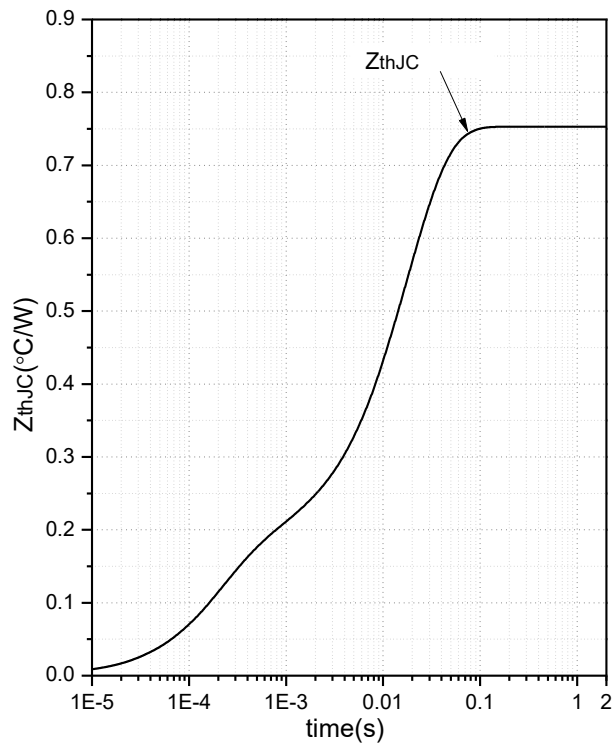


Fig.15 Transient Thermal Impedance (Inverter IGBT)

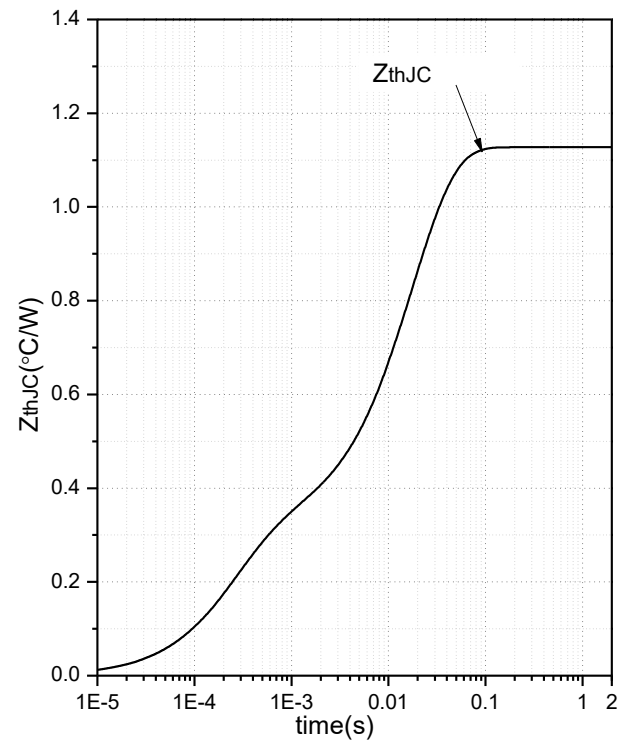
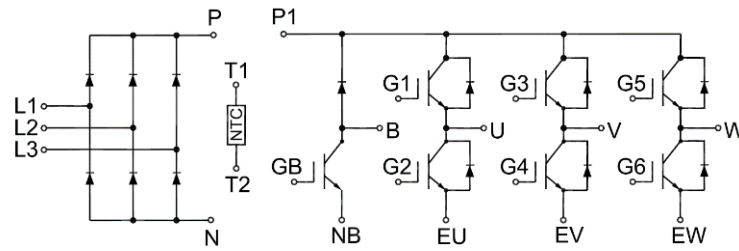


Fig.16 Transient Thermal Impedance (Inverter Diode)

Internal Circuit



Package Outline (Unit: mm):

