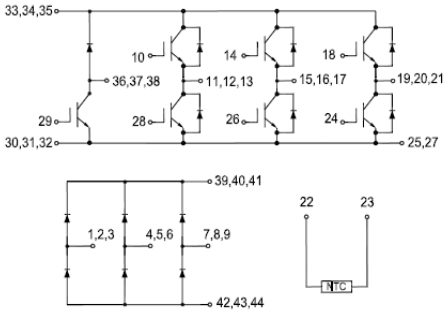
SYMT150PI120T6H-T4M

IGBT Module

Features：



- Field Stop Trench Gate 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℃	150	A
		T_C=25℃	300	A
I_{CM}	Peak Collector Current Repetitive	T_J=175℃	300	A
t_{SC}	Short Circuit Withstand Time		>10	μs
P_D	Maximum Power Dissipation per IGBT	T_C=25℃ T_{Jmax}=175℃	1085	W

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

Static Characteristics

Symbol	Description	Conditions		Min	Typ	Max	Unit
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=4mA, V_{CE}=V_{GE}		5.0	5.9	6.6	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C=150A, V_{GE} =15V	T_J=25℃		1.70	2.00	V
			T_J=125℃		1.90		V
			T_J=150℃		2.00		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℃				400	nA
C_{ies}	Input Capacitance	V_{CE}=25V, V_{GE}=0V , f=1MHz			10.13		nF
C_{oes}	Out Capacitance				1.01		nF
C_{res}	Reverse Transfer Capacitance				0.77		nF

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	V_{CC}=600V,I_C=150A, R_{Gon}=4.7Ω,V_{GE}= ±15V, Inductive Load	T_J=25℃		258		ns
			T_J=125℃		258		
			T_J=150℃		260		
t_r	Rise Time		T_J=25℃		85		ns
			T_J=125℃		89		
			T_J=150℃		89		
$t_{d(off)}$	Turn-off Delay Time	V_{CC}=600V,I_C=150A, R_{Goff} =4.7Ω,V_{GE}= ±15V, Inductive Load	T_J=25℃		265		ns
			T_J=125℃		277		
			T_J=150℃		284		
t_f	Fall Time		T_J=25℃		205		ns
			T_J=125℃		376		
			T_J=150℃		428		
E_{on}	Turn-on Switching Loss	V_{CC}=600V,I_C=150A, R_{Gon} =4.7Ω,V_{GE}= ±15V, di/dt=1550A/μs (T_J=150℃) Inductive Load	T_J=25℃		12.5		mJ
			T_J=125℃		15.7		
			T_J=150℃		17.5		

E_{off}	Turn-off Switching Loss	V_{CC}=600V,I_C=150A, R_{Goff} =4.7Ω,V_{GE}= ±15V, du/dt=4106V/μs (T_J=150℃) Inductive Load	T_J=25℃		10.3		mJ
			T_J=125℃		15.8		
			T_J=150℃		17.4		
Q_g	Total Gate Charge	V_{GE}=+15V…-15V	T_J = 25℃		0.71		uC
$R_{g\ internal}$	Internal Gate Resistance		T_J=25℃		5		Ω
RBSOA	I_C=300A, V_{CC}=1050V, Vp=1200V, R_G =4.7Ω, V_{GE}=+15V to 0V, T_J=150°C			Trapezoid			
SC Data	Vcc=600V, R_{Gon}=4.7 Ω, R_{Goff}=4.7 Ω, tp=10us, V_{GE}=+/-15V,T_J=125℃				680		A
$R_{\theta JC}$	IGBT Thermal Resistance: Junction-To-Case（per leg）					0.14	℃/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	150	A
I_{FM}	Repetitive Peak Forward Current	300	A

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

Symbol	Description	Conditions		Min	Typ	Max	Unit
V_{FM}	Forward Voltage	I_F=150A	T_J=25℃		1.50		V
			T_J=125℃		1.50		
			T_J=150℃		1.50		
t_{rr}	Reverse Recovery Time	I_F=150A, -diF/dt=1670A/μs(T_J=150℃), V_R=600V, V_{GE}=-15V	T_J=25℃		371		ns
			T_J=125℃		562		
			T_J=150℃		625		
I_{rr}	Peak Reverse Recovery Current		T_J=25℃		127		A
			T_J=125℃		142		
			T_J=150℃		145		

Q_{rr}	Reverse Recovery Charge	I_F=150A, -diF/dt=1670A/μs(T_J=150℃), V_R=600V, V_{GE}=-15V	T_J=25℃		22.6		μC
			T_J=125℃		34.6		
			T_J=150℃		39.4		
E_{rec}	Reverse Recovery Energy		T_J=25℃		9.7		mJ
			T_J=125℃		15.2		
			T_J=150℃		17.6		
$R_{\theta JC}$	Diode Thermal Resistance: Junction-To-Case（per leg）					0.21	℃/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℃	100	A
		T_C=25℃	200	A
I_{CM}	Peak Collector Current Repetitive	T_J=175℃	200	A
t_{SC}	Short Circuit Withstand Time		>10	μs
P_D	Maximum Power Dissipation (IGBT)	T_C=25℃ T_{Jmax}=175℃	714	W

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

Static Characteristics

Symbol	Description	Conditions		Min	Typ	Max	Unit
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=1 mA, V_{CE}=V_{GE}		5.0	5.5	6.6	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C=100A, V_{GE} =15V	T_J=25℃		1.70	2.00	V
			T_J=125℃		1.90		V
			T_J=150℃		1.90		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 =1MHz		8.03		nF
C_{oes}	Output Capacitance			1.22		nF
C_{res}	Reverse Transfer Capacitance			0.59		nF

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	V_{CC}=600V, I_C=100A, R_{Gon}=1Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		228		ns
			T_J=125℃		250		
			T_J=150℃		254		
t_r	Rise Time		T_J=25℃		63		ns
			T_J=125℃		67		
			T_J=150℃		69		
$t_{d(off)}$	Turn-off Delay Time	V_{CC}=600V, I_C=100A, R_{Goff}=1Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		269		ns
			T_J=125℃		279		
			T_J=150℃		284		
t_f	Fall Time		T_J=25℃		184		ns
			T_J=125℃		291		
			T_J=150℃		317		
E_{on}	Turn-on Switching Loss	V_{CC}=600V, I_C=100A, R_{Gon}=1Ω, V_{GE}=±15V, di/dt=1387A/μs(T_J=150℃), Inductive Load	T_J=25℃		3.1		mJ
			T_J=125℃		4.3		
			T_J=150℃		4.8		
E_{off}	Turn-off Switching Loss	V_{CC}=600V, I_C=100A, R_{Goff}=1Ω, V_{GE}=±15V, du/dt=4448V/μs(T_J=150℃), Inductive Load	T_J=25℃		5.28		mJ
			T_J=125℃		8.33		
			T_J=150℃		9.30		
Q_g	Total Gate Charge	V_{GE}=+15V…-15V	T_J=25℃		745		nC
$R_{g\ internal}$	Internal Gate Resistance		T_J=25℃		7.5		Ω
RBSOA	I_C=200A,V_{CC}=1050V,Vp=1200V, R_G=1Ω, V_{GE}=+15V to 0V, T_J=150°C			Trapezoid			
SC data	Vcc=600V, tp=10us, Vge=+/-15V, R_{Gon} =1ohm, R_{Goff} =1ohm,Tj=25℃				575		A
$R_{\theta JC}$	IGBT Thermal Resistance: Junction-To-Case（per leg）					0.21	℃/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	50	A
I_{FM}	Repetitive Peak Forward Current	100	A

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

Symbol	Description	Conditions		Min	Typ	Max	Unit
V_{FM}	Forward Voltage	I_F=50 A	T_J=25℃		1.50		V
			T_J=125℃		1.60		
			T_J=150℃		1.60		
t_{rr}	Reverse Recovery Time	I_F=50A, -diF/dt =1197A/μs(T_J=150℃), V_R=600V, V_{GE}=-15V	T_J=25℃		318		ns
			T_J=125℃		539		
			T_J=150℃		554		
I_{rr}	Peak Reverse Recovery Current		T_J=25℃		57		A
			T_J=125℃		60		
			T_J=150℃		65		
Q_{rr}	Reverse Recovery Charge		T_J=25℃		7.95		μC
			T_J=125℃		12.78		
			T_J=150℃		14.17		
E_{rec}	Reverse Recovery Energy		T_J=25℃		3.15		mJ
			T_J=125℃		5.21		
			T_J=150℃		6.05		
$R_{\theta JC}$	Diode Thermal Resistance: Junction-To-Case （per leg）					0.51	℃/W

Diode, Rectifier

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

V_{RRM}	Repetitive Peak Reverse Voltage	T_J=25℃	1600	V
I_{FRMSM}	Maximum RMS Forward Current per Chip	T_J=80℃	150	A
I_{RMSM}	Maximum RMS Current at Rectifier Output	T_J=80℃	200	A
I_{FSM}	Surge Current @t_p=10 ms	T_J=25℃	1320	A
		T_J=150℃	1200	
I^2t	I^2t - value	T_J=25℃	8712	A^2s
		T_J=150℃	7200	

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

V_F	Forward Voltage	I_F=150 A	T_J=25℃	1.10			V
			T_J=150℃	1.00			
I_R	Reverse Current	V_R=1600V	T_J=25℃			1	mA
$R_{\theta JC}$	Diode Thermal Resistance: Junction-To-Case （per leg）					0.22	℃/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

Module

Symbol	Description	Conditions	Min	Typ	Max	Unit
V_{iso}	Isolation Voltage (All Terminals Shorted)	RMS, f=50Hz, 1minute		2500		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			V
$R_{\theta CS}$	Case-To-Sink Thermally (Conductive Grease Applied)				0.02	℃/W
M	Mounting Torque for Module Mounting	Screw M5--Mounting according to valid application note	3.0		6.0	N·m
G	Weight			300		g

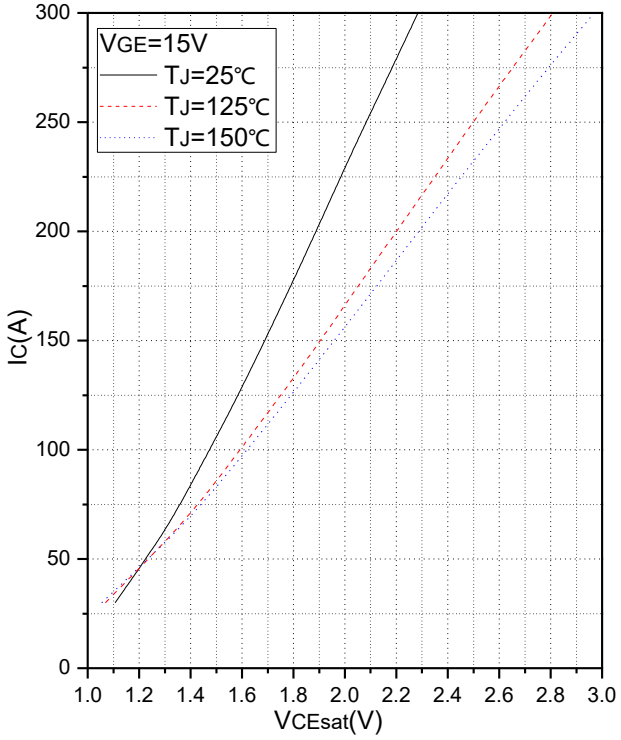


Fig.1 Typical Saturation Voltage Characteristics (Inverter)

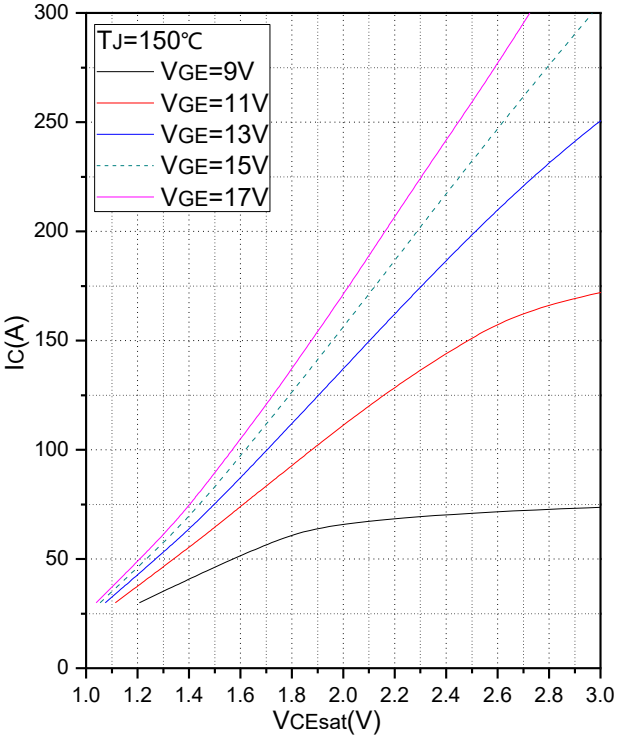


Fig.2 Typical Output Characteristics (Inverter)

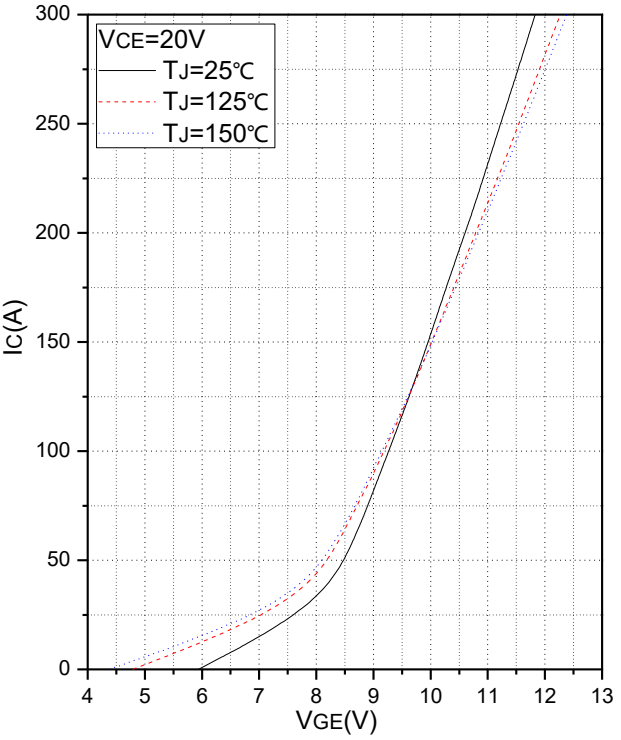


Fig.3 Transfer Characteristic (Inverter)

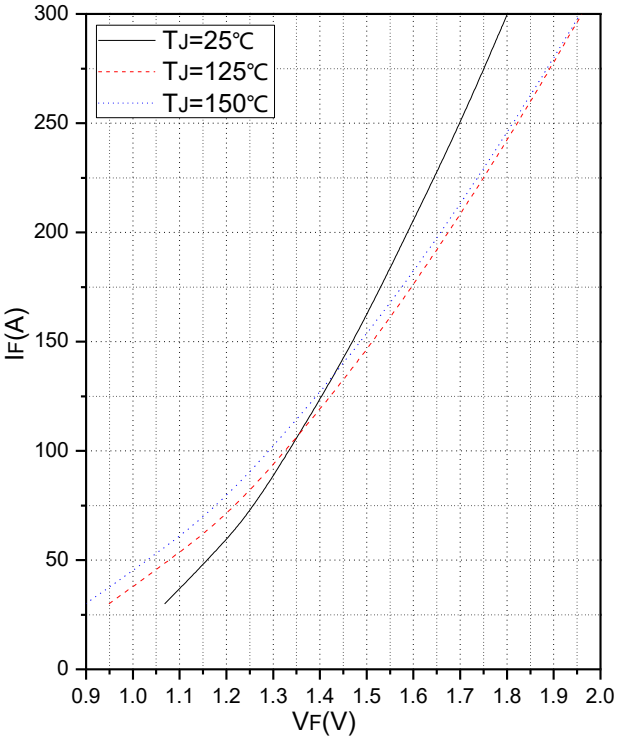


Fig.4 Forward Characteristics of Diode (Inverter)

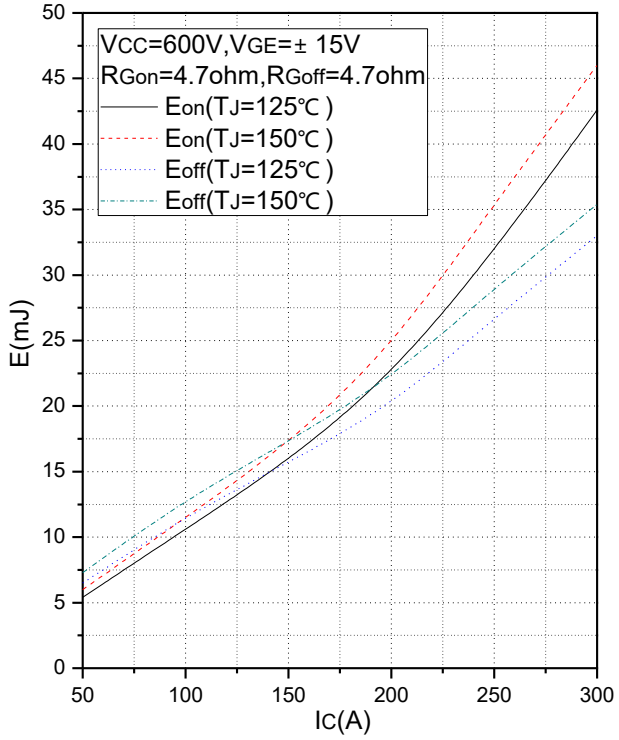


Fig.5 Typical Switching Loss vs. Collector Current

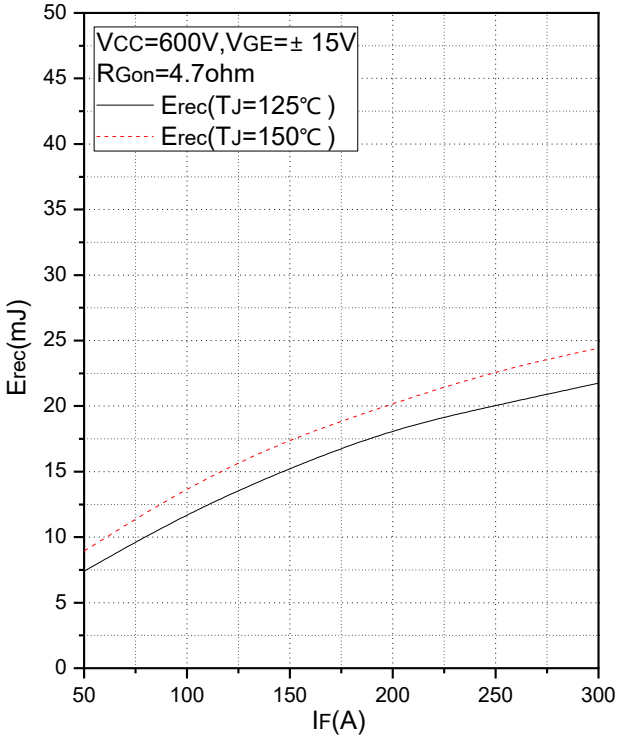


Fig.6 Typical Switching Loss vs. Forward Current

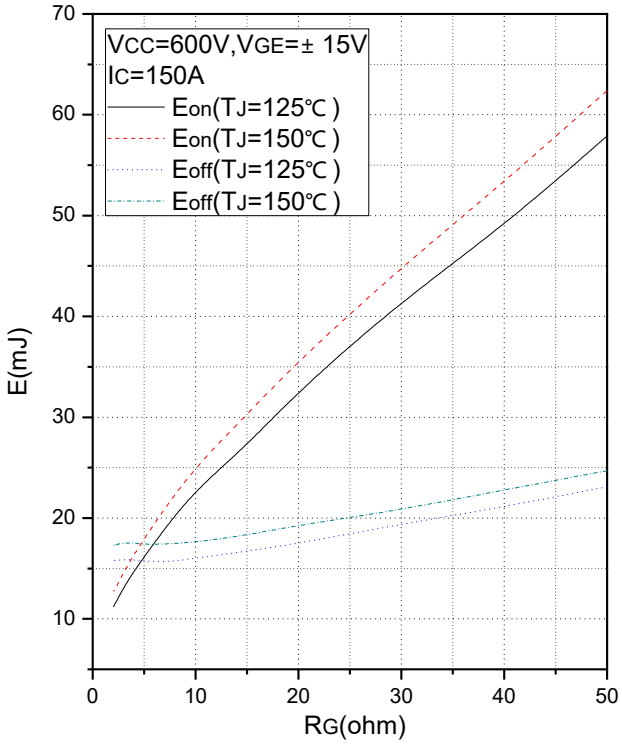


Fig.7 Typical Switching Loss vs. Gate Resistance

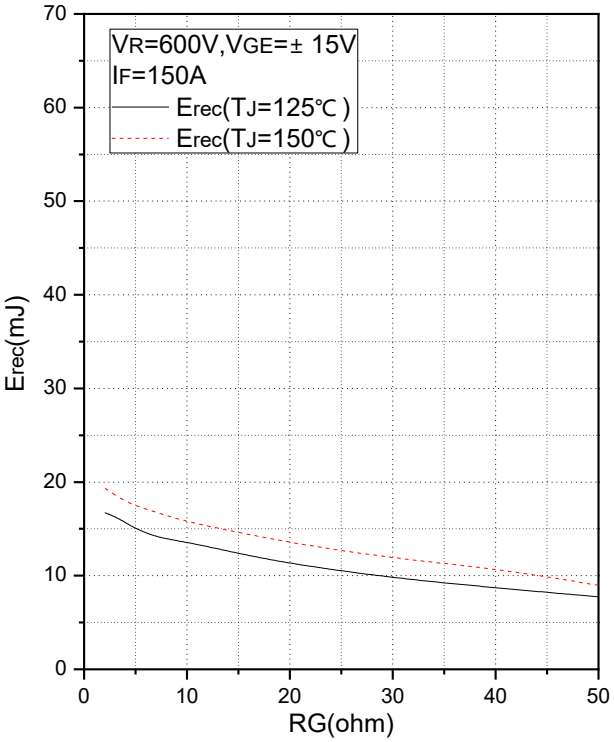


Fig.8 Typical Switching Loss vs. Gate Resistance

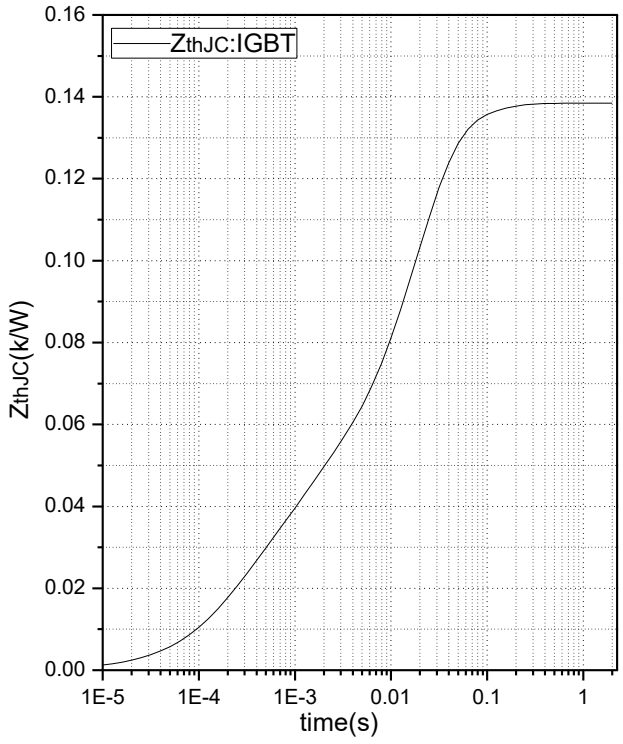


Fig.9 Transient Thermal Impedance (IGBT)

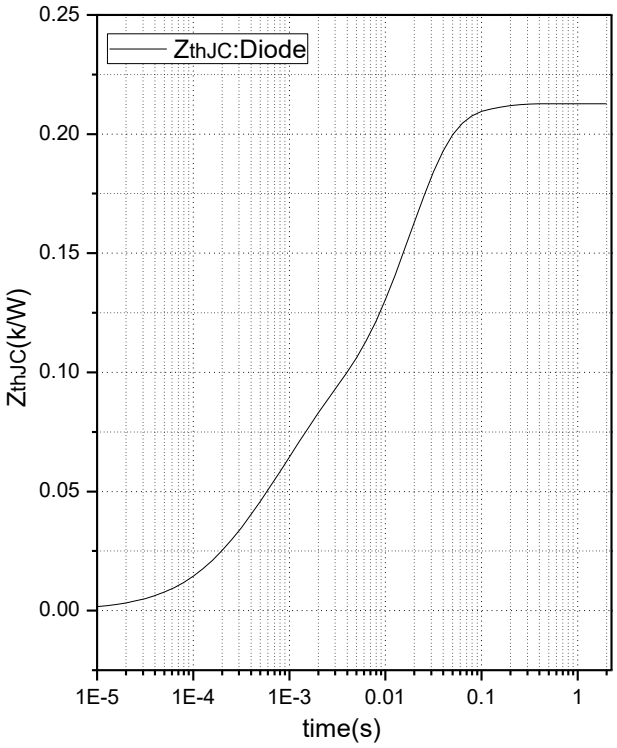


Fig.10 Transient Thermal Impedance (Diode)

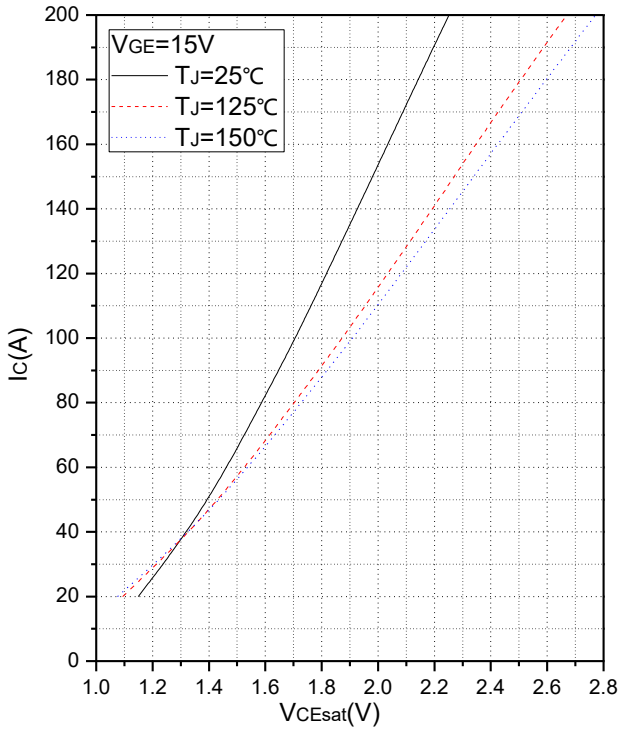


Fig.11Typical Saturation Voltage Characteristics (Brake-Chopper)

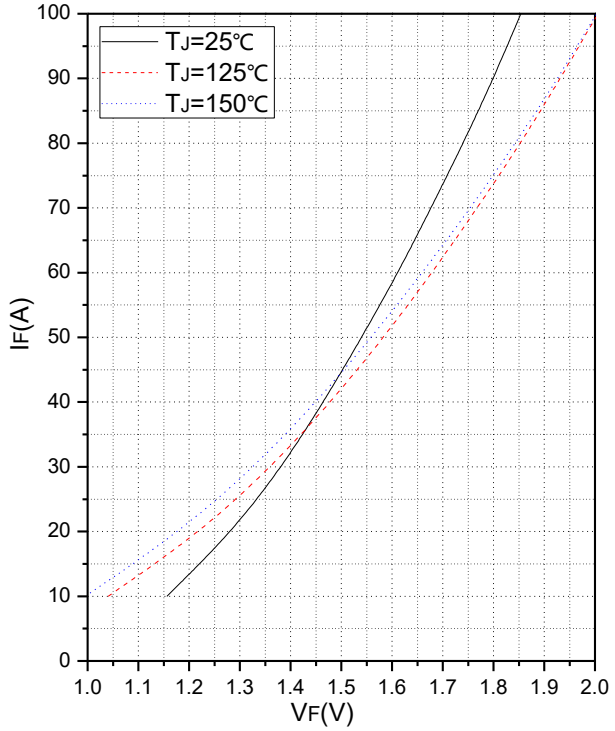


Fig.12 Forward Characteristics of Diode (Brake-Chopper)

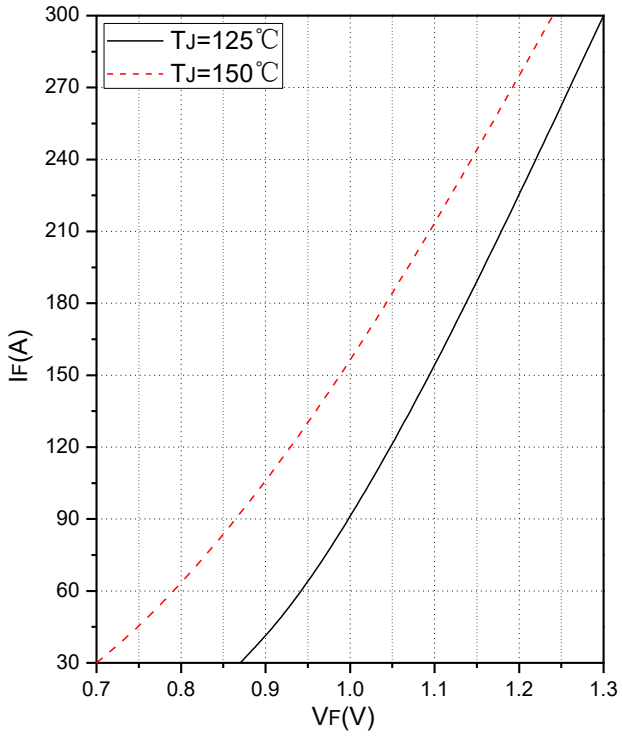


Fig.13 Forward Characteristics of Diode (Rectifier)

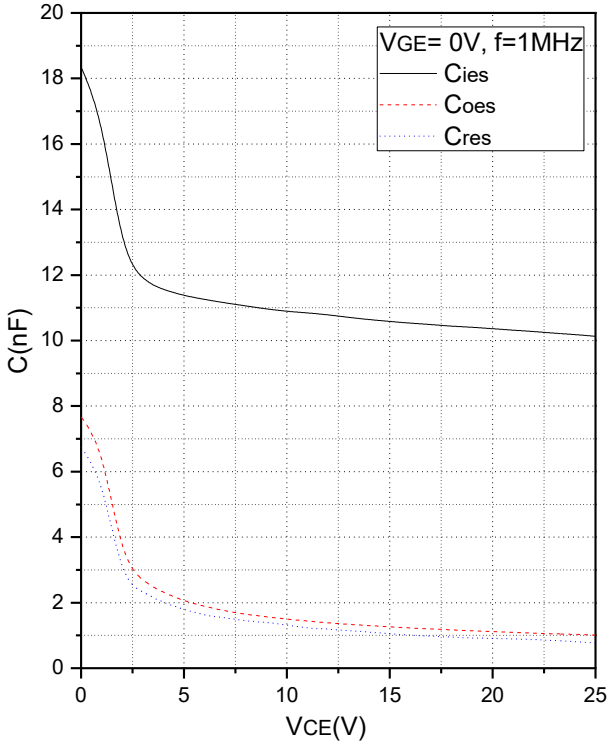


Fig.14 Reverse Bias Safe Operation Area (RBSOA)

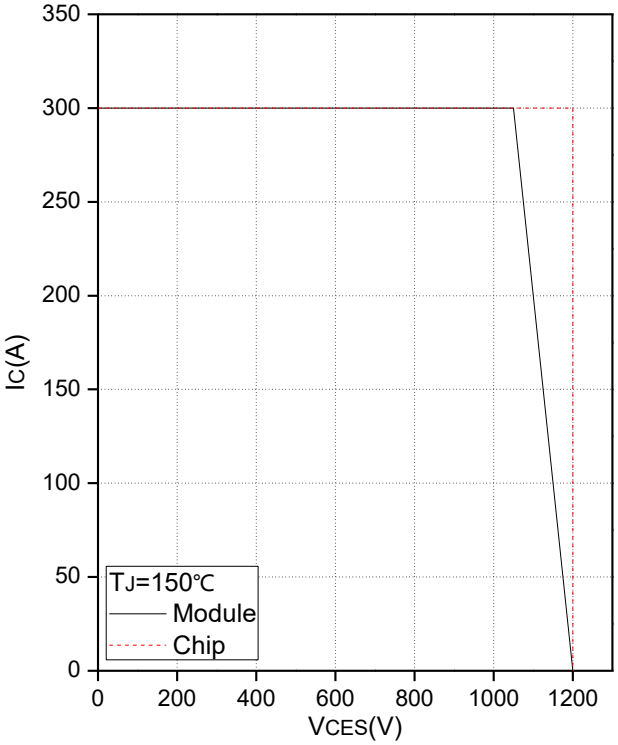


Fig.15 Reverse Bias Safe Operation Area (RBSOA)

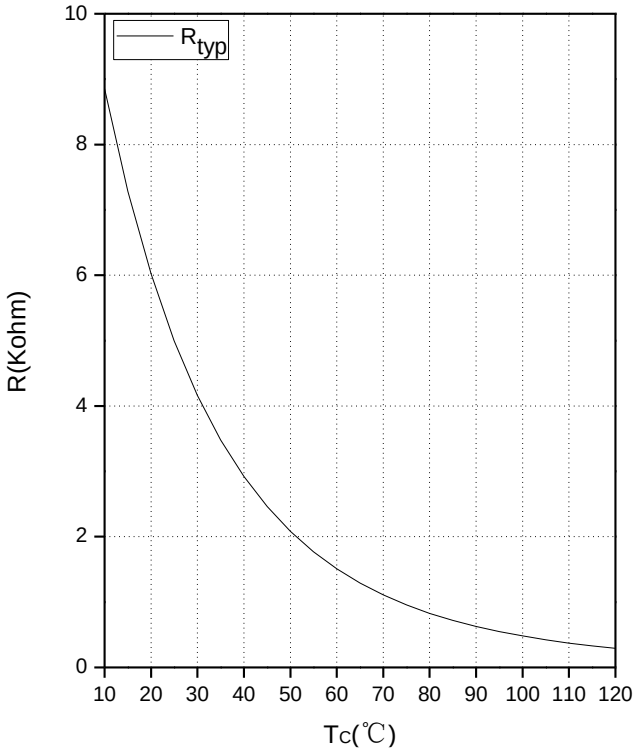
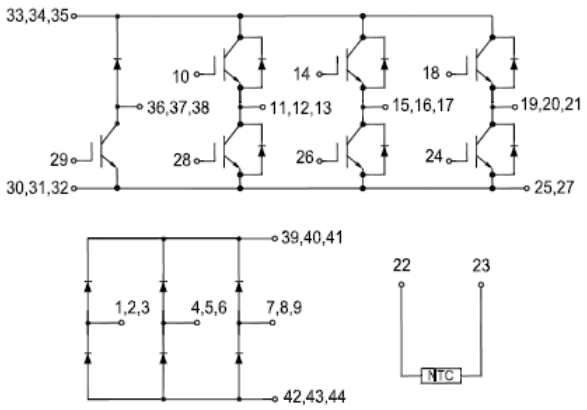


Fig.16 NTC Temperature Characteristics

Internal Circuit:



Package Outline (Unit: mm):