

SYMT40FF120B3H

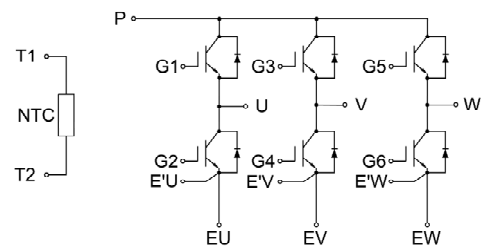
IGBT Module Preliminary Data



Features:

- Trench & Field Stop IGBT
- Short Circuit Rated $>10\mu\text{s}$
- Low Saturation Voltage
- Low Switching Loss
- 100% RBSOA Tested($2\times I_c$)
- Low Stray Inductance
- Lead Free, Compliant with RoHS Requirement

Circuit Diagram



Applications:

- Motor Drives
- Air Conditioning
- Servo Drives
- UPS

IGBT, Inverter Maximum Rated Values

V_{CES}	Collector-Emitter Blocking Voltage	$T_J=25^{\circ}\text{C}$	1200	V
V_{GES}	Gate-Emitter Voltage		± 20	V
I_c	Continuous Collector Current	$T_C=100^{\circ}\text{C}$	40	A
		$T_C=25^{\circ}\text{C}$	80	A
I_{CM}	Peak Collector Current Repetitive	$t_p=1\text{ms}$	80	A
t_{SC}	Short Circuit Withstand Time		>10	μs
P_D	Maximum Power Dissipation (IGBT)	$T_C=25^{\circ}\text{C}$ $T_{Jmax}=175^{\circ}\text{C}$	360	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	$I_C=40A, V_{GE}=15V$	$T_J=25^{\circ}C$	1.80	2.10	V
			$T_J=125^{\circ}C$	2.10		
			$T_J=150^{\circ}C$	2.20		
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	$V_{GE}=\pm 20V, V_{CE}=0V, T_J=25^{\circ}C$			200	nA
C_{ies}	Input Capacitance	$V_{CE}=25V, V_{GE}=0V, f=100kHz, T_J=25^{\circ}C$		3.44		nF
C_{oes}	Output Capacitance			0.51		
C_{res}	Reverse Transfer Capacitance			0.32		

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	$V_{CC}=600V, I_C=40A,$ $R_{Gon}=15\Omega, V_{GE}=\pm 15V,$ Inductive Load	$T_J=25^{\circ}C$		92		ns
			$T_J=125^{\circ}C$		93		
			$T_J=150^{\circ}C$		94		
t_r	Rise Time		$T_J=25^{\circ}C$		46		ns
			$T_J=125^{\circ}C$		50		
			$T_J=150^{\circ}C$		50		
$t_{d(off)}$	Turn-off Delay Time		$T_J=25^{\circ}C$		183		ns
			$T_J=125^{\circ}C$		185		
			$T_J=150^{\circ}C$		189		
t_f	Fall Time	$T_J=25^{\circ}C$		258		ns	
		$T_J=125^{\circ}C$		310			
		$T_J=150^{\circ}C$		315			
E_{on}	Turn-on Switching Loss	$V_{CC}=600V, I_C=40A,$ $R_{Gon}=15\Omega, V_{GE}=\pm 15V,$ $di/dt=720A/\mu s(T_J=150^{\circ}C),$ Inductive Load	$T_J=25^{\circ}C$		2.48		mJ
		$T_J=125^{\circ}C$		2.68			
		$T_J=150^{\circ}C$		3.05			

E _{off}	Turn-off Switching Loss	V _{CC} =600V, I _C =40A, R _{Goff} =15Ω, V _{GE} =±15V, du/dt=2880V/μs(T _J =150°C), Inductive Load	T _J =25°C		3.21		mJ
			T _J =125°C		3.77		
			T _J =150°C		3.97		
Q _g	Total Gate Charge	V _{GE} =-15V...+15V	T _J =25°C		457		nC
R _{g internal}	Internal Gate Resistor		T _J =25°C		0		Ω
RBSOA	I _C =80A, V _{CC} =1050V, V _P =1200V, R _G =15Ω, V _{GE} =+15V to 0V, T _J =150°C			Trapezoid			
I _{SC}	V _{CC} =600V, V _{GE} = ±15V, tp=10us, R _{Gon} =56Ω, R _{Goff} =56Ω, T _J =25°C				175		A
R _{θJC}	IGBT Thermal Resistance: Junction-to-Case					0.417	°C/W

Diode, Inverter

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

V _{RRM}	Repetitive Peak Reverse Voltage	T _J =25°C	1200	V
I _F	Diode Continuous Forward Current		40	A
I _{FM}	Peak FWD Current Repetitive	tp=1ms	80	A

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

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
V _{FM}	Forward Voltage	I _F =40A	T _J =25°C		1.80	2.10	V
			T _J =125°C		1.90		
			T _J =150°C		1.90		
I _{rr}	Peak Reverse Recovery Current	I _F =40A, di/dt=830A/μs(T _J =150°C), V _{rr} =600V, V _{GE} =-15V	T _J =25°C		53.7		A
			T _J =125°C		62.5		
			T _J =150°C		63.8		
t _{rr}	Reverse Recovery Time		T _J =25°C		164		ns
			T _J =125°C		186		
			T _J =150°C		186		
Q _{rr}	Reverse Recovery Charge		T _J =25°C		4.53		μC
			T _J =125°C		6.31		
			T _J =150°C		6.54		

E _{rec}	Reverse Recovery Energy	I _F =40A, di/dt=830A/μs(T _J =150℃), V _{rr} =600V, V _{GE} =-15V	T _J =25℃		1.56		mJ
			T _J =125℃		2.14		
			T _J =150℃		2.45		
R _{θJC}	Diode Thermal Resistance: Junction-to-Case					0.584	℃/W

Internal NTC-Thermistor Characteristics

Symbol	Description		Min.	Typ.	Max.	Units.
R ₂₅	Rated Resistance	T _C =25°C		5		kΩ
ΔR/R	Deviation of R100	T _C =100°C, R ₁₀₀ =465Ω	-5		5	%
P ₂₅	Power Dissipation	T _C =25°C			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)	AC Test Voltage, t=30s	4500			V
Internal Isolation			Al ₂ O ₃			
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			25		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 _{eCS}	Case-to-Sink Thermally (Conductive Grease Applied)				0.08	°C/W
M	Mounting Torque for solder pins Module Mounting	Screw M4--Mounting according to valid application note	1.5		1.8	N·m
	Mounting Torque for press-fit pins Module Mounting	Screw M4--Mounting according to valid application note	1.0		1.5	N·m
G	Weight			23		g

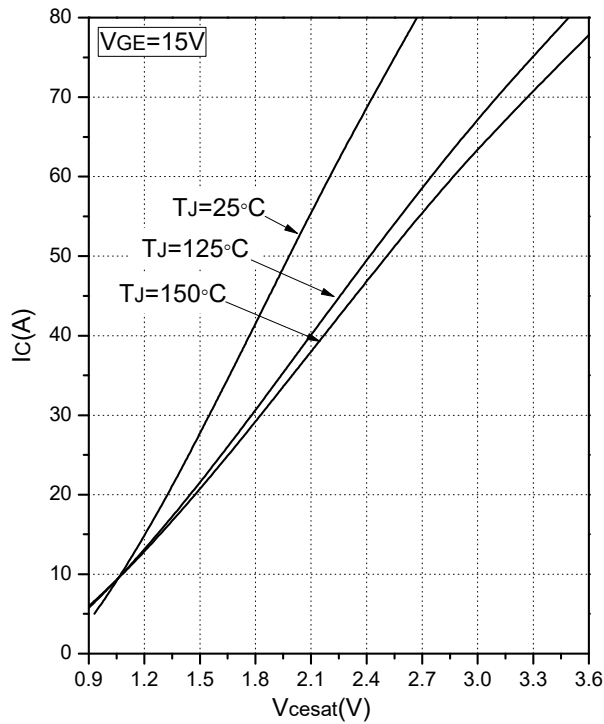


Fig.1 Typical Saturation Voltage Characteristics

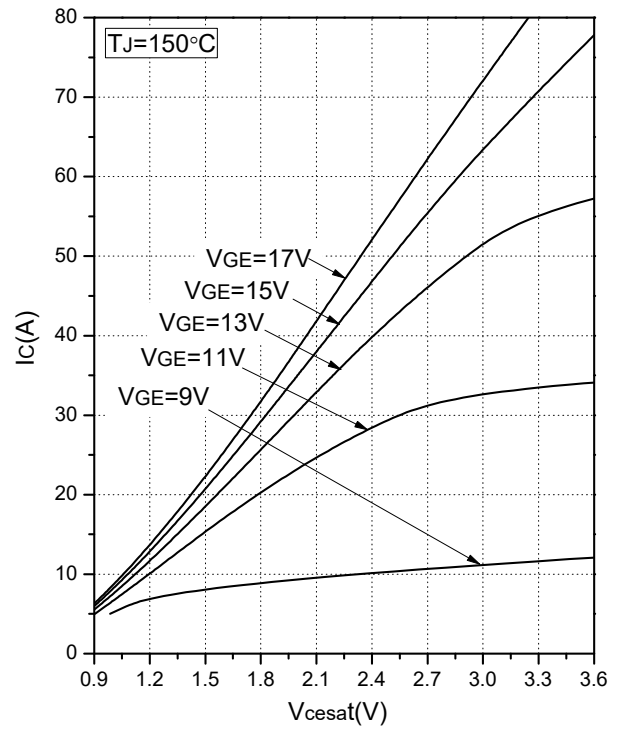


Fig.2 Typical Output Characteristics

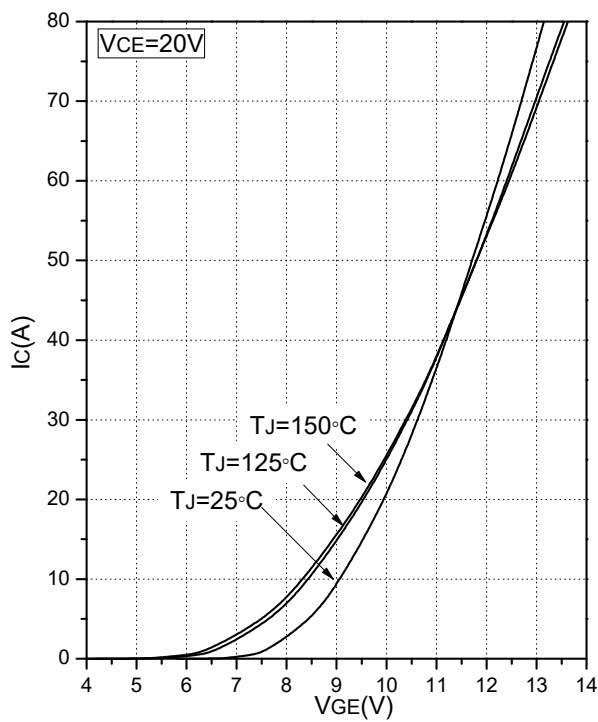


Fig.3 Forward Characteristics of FWD

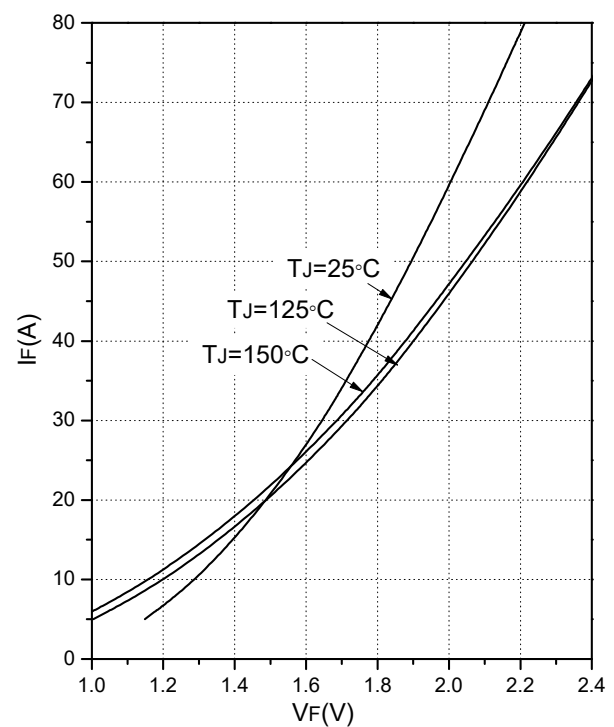


Fig.4 Forward Characteristics of FWD

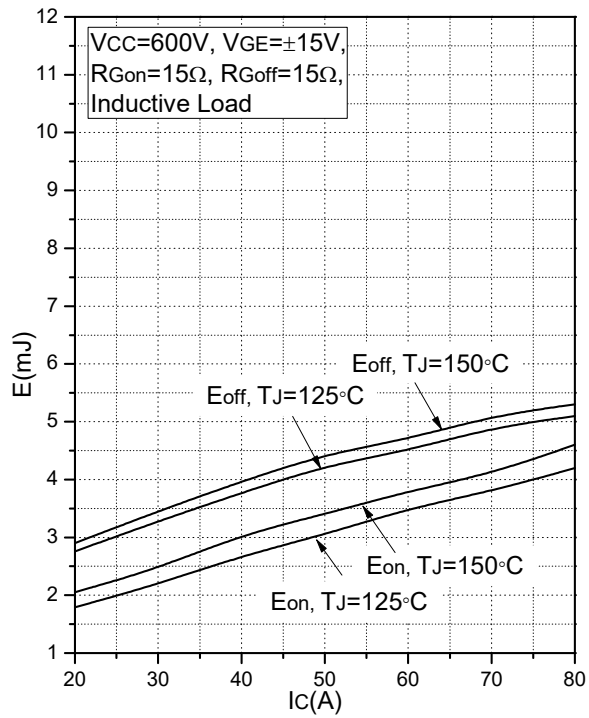


Fig.5 Typical Switching Loss vs. Collector Current

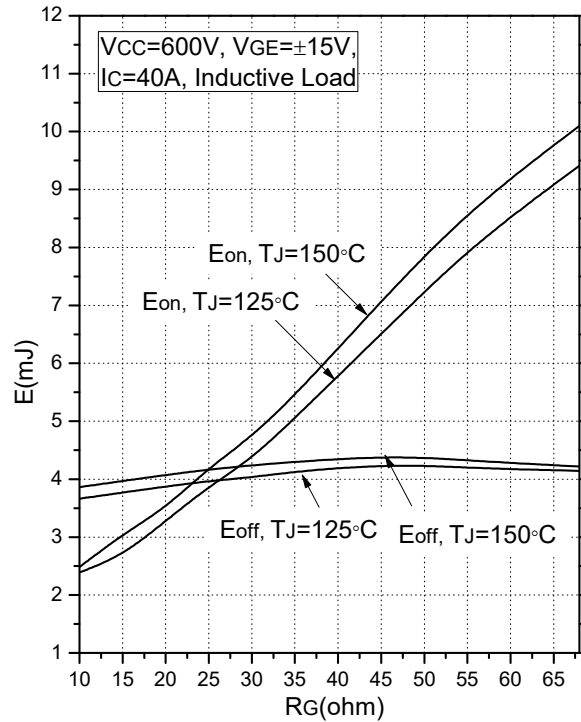


Fig.6 Typical Switching Loss vs. Gate Resistance

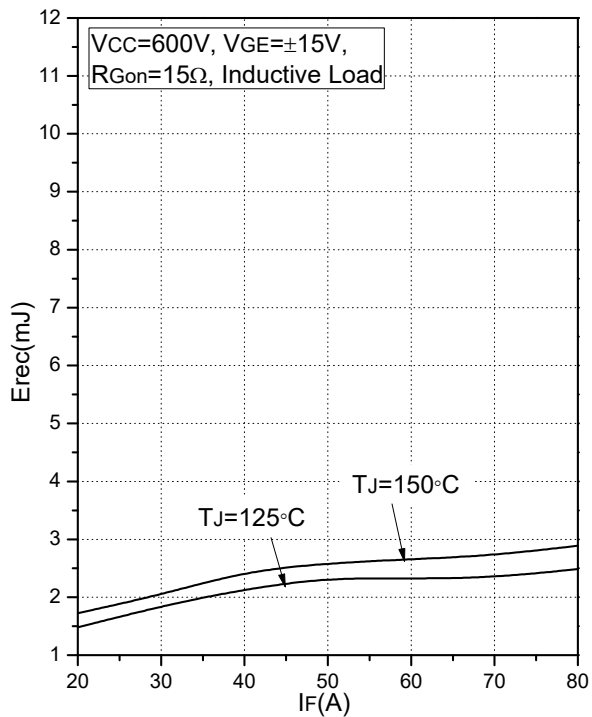


Fig.7 Typical Switching Loss vs. Forward Current

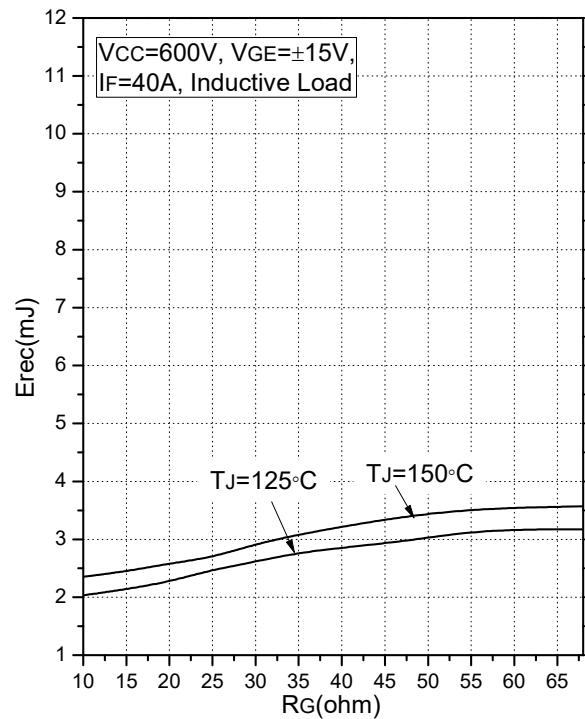


Fig.8 Typical Switching Loss vs. Gate Resistance

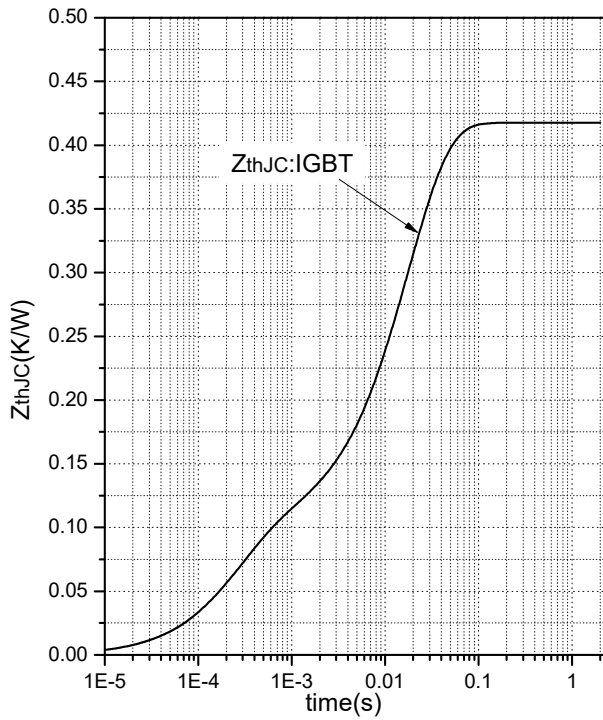


Fig.9 Transient Thermal Impedance

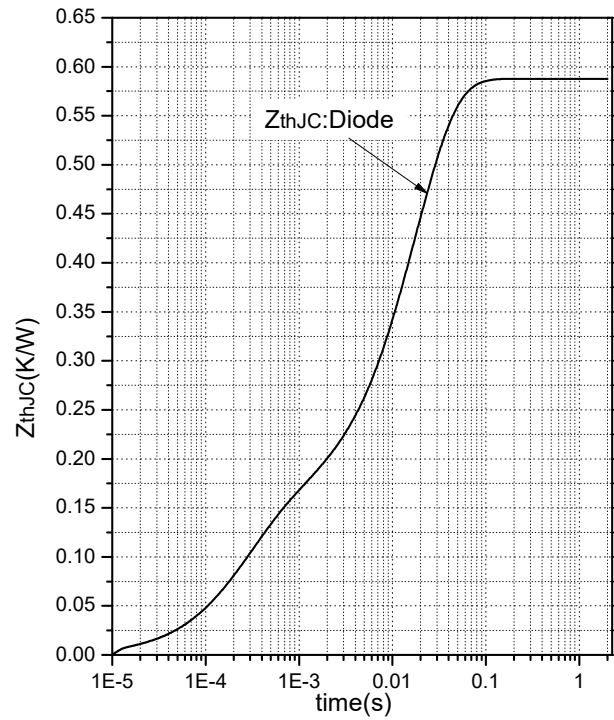


Fig.10 Transient Thermal Impedance

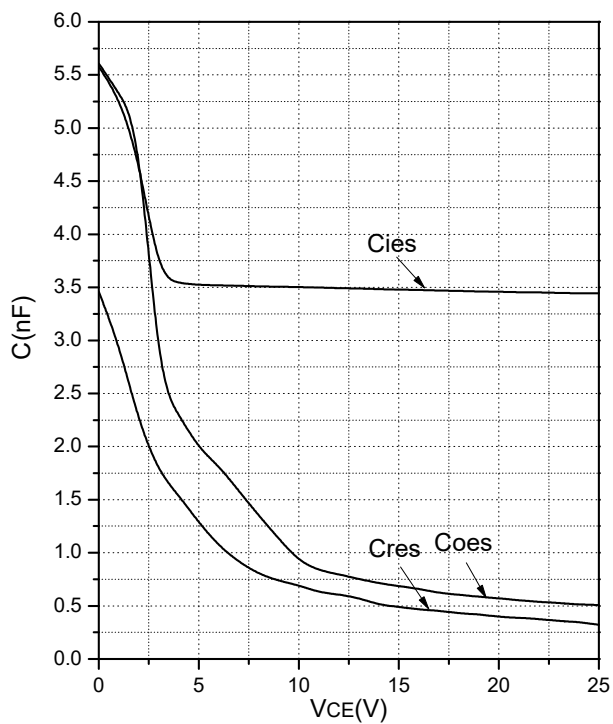


Fig.11 Capacitance Characteristics

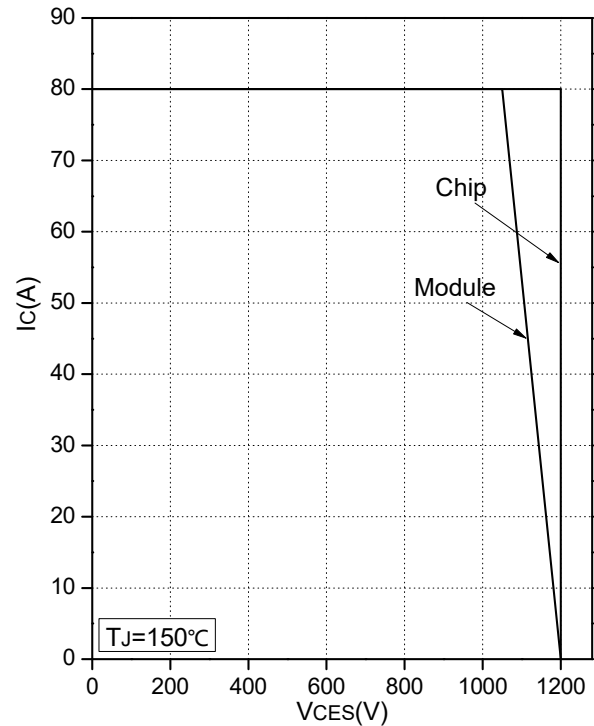


Fig.12 Reverse Bias Safe Operation Area (RBSOA)

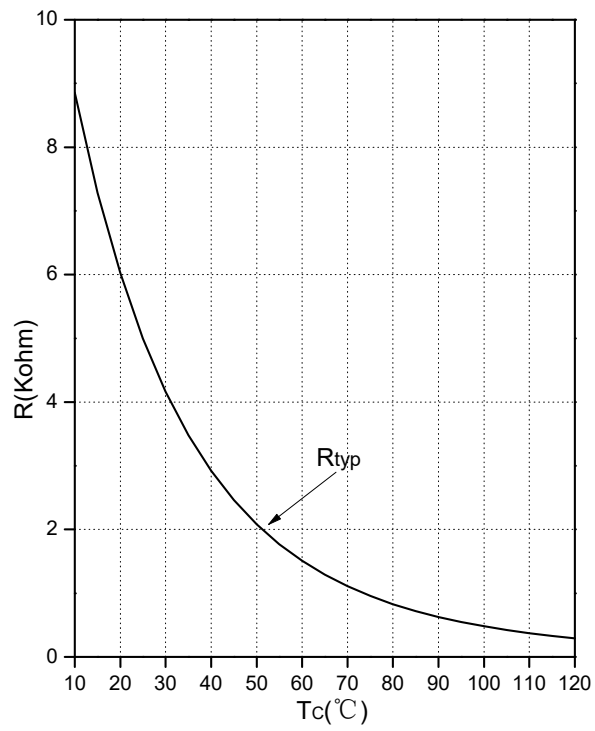
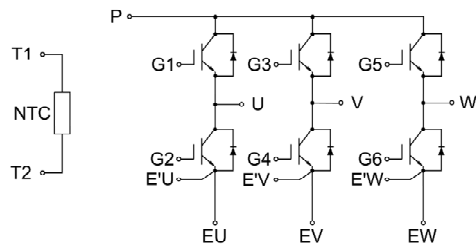


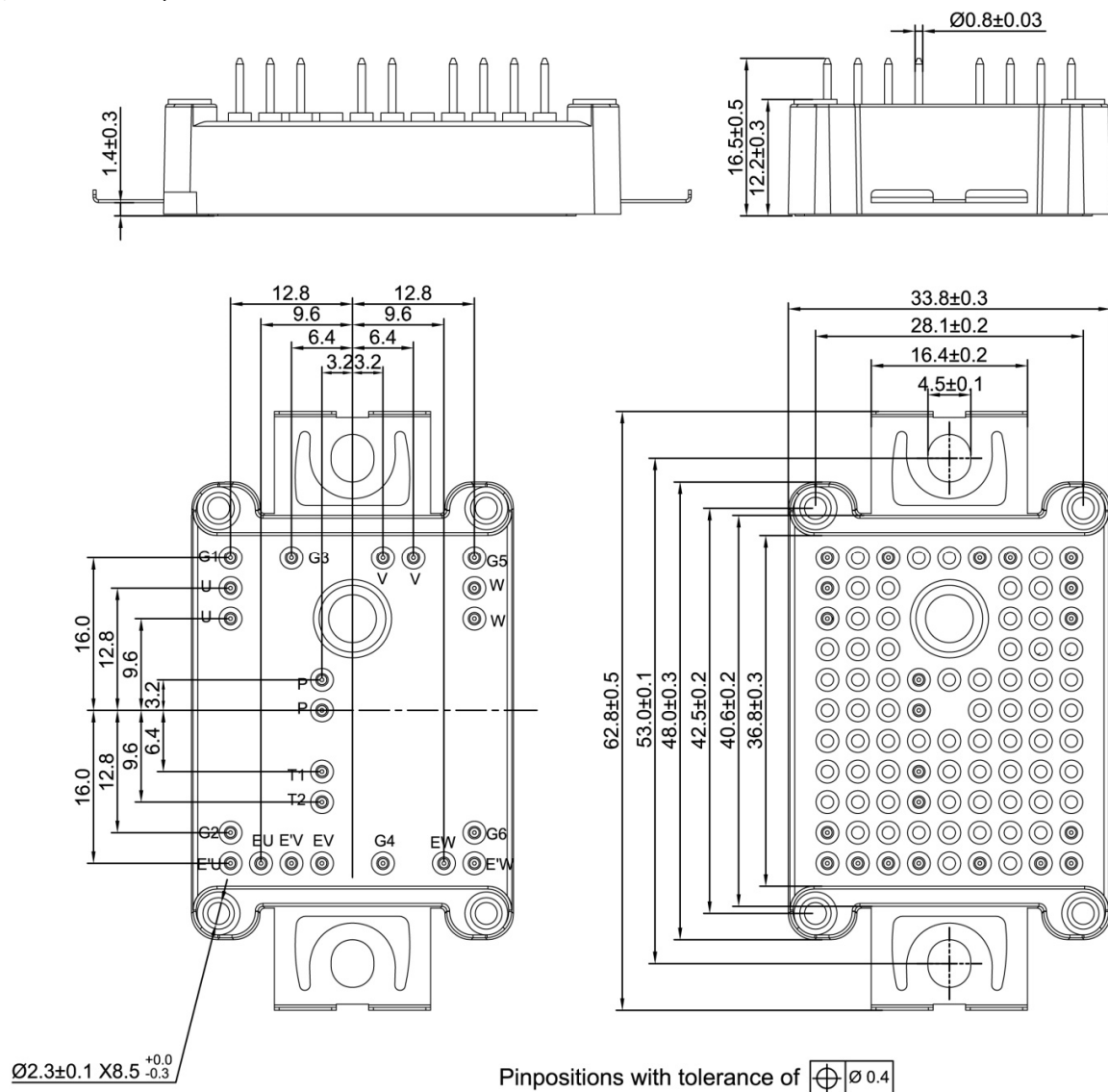
Fig.13 NTC Temperature Characteristics

Internal Circuit:



Package Outline (Unit: mm):

Pins type I --Solder pins



Pins type II--Press-fit pins

