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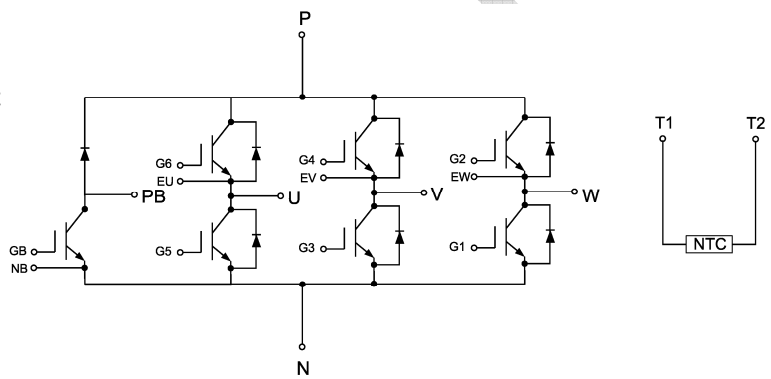
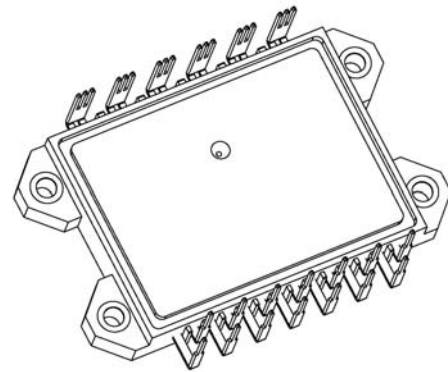
IGBT Module

Features:

- Short Circuit Rated 10 μ s
- Low Saturation Voltage: $V_{CE(sat)} = 1.90V @ I_C = 25A, T_C=25^\circ C$
- Low Switching Loss
- 100% RBSOA Tested ($2 \times I_C$)
- Low Stray Inductance
- Lead Free, Compliant with RoHS Requirement

Applications:

- Industrial Inverters
- Servo Applications



IGBT, Inverter

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

V_{CES}	Collector-Emitter Blocking Voltage		1200	V
V_{GES}	Gate-Emitter Voltage		± 20	V
I_C	Continuous Collector Current	$T_C = 80^\circ C,$	25	A
		$T_C = 25^\circ C$	50	A
I_{CM}	Repetitive Peak Collector Current	$T_J = 175^\circ C$	50	A
t_{SC}	Short Circuit Withstand Time		>10	μs
P_D	Maximum Power Dissipation per IGBT	$T_C = 25^\circ C$ $T_{Jmax} = 175^\circ C$	320	W

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

Static characteristics

Symbol	Description	Conditions	Min	Typ	Max	Unit
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C = 1 \text{ mA}, V_{CE} = V_{GE}$	4.5	5.3	6.5	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C = 25 \text{ A}, V_{GE} = 15 \text{ V}$	$T_J = 25^\circ\text{C}$	1.90	2.20	V
			$T_J = 125^\circ\text{C}$	2.30	2.50	V
I_{CES}	Collector-Emitter Leakage Current	$V_{GE} = 0 \text{ V}, V_{CE} = V_{CES}, T_J = 25^\circ\text{C}$			1	mA
I_{GES}	Gate-Emitter Leakage Current	$V_{GE} = \pm 20 \text{ V}, V_{CE} = 0 \text{ V}, T_J = 25^\circ\text{C}$			200	nA
C_{ies}	Input Capacitance	$V_{CE} = 25 \text{ V}, V_{GE} = 0 \text{ V}, f = 1 \text{ MHz}$		3.4		nF
C_{oes}	Output Capacitance			0.20		nF

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	$V_{CC} = 600 \text{ V}, I_C = 25 \text{ A}, R_G = 20 \Omega, V_{GE} = \pm 15 \text{ V},$ Inductive Load	$T_J = 25^\circ\text{C}$	90		ns
			$T_J = 125^\circ\text{C}$	85		
t_r	Rise Time		$T_J = 25^\circ\text{C}$	50		ns
			$T_J = 125^\circ\text{C}$	60		
$t_{d(off)}$	Turn-off Delay Time		$T_J = 25^\circ\text{C}$	245		ns
			$T_J = 125^\circ\text{C}$	255		
t_f	Fall Time		$T_J = 25^\circ\text{C}$	230		ns
			$T_J = 125^\circ\text{C}$	375		
E_{on}	Turn-on Switching Loss		$T_J = 25^\circ\text{C}$	2.46		mJ
			$T_J = 125^\circ\text{C}$	3.07		
E_{off}	Turn-off Switching Loss	$T_J = 25^\circ\text{C}$	1.41		mJ	
		$T_J = 125^\circ\text{C}$	2.34			
Q_g	Total Gate Charge	$T_J = 25^\circ\text{C}$	535		nC	
RBSOA	Reverse Bias Safe Operation Area	$I_C=50\text{A}, V_{CC}=1050\text{V}, V_p=1200\text{V}, R_g = 15\Omega, V_{GE}=\pm 15\text{V to } 0\text{V}, T_J = 150^\circ\text{C}$	Trapezoid			
SCSOA	Short Circuit Safe Operation Area	$V_{CC} = 600 \text{ V}, V_{GE} = 15 \text{ V}, T_J = 150^\circ\text{C}$	10		μs	
$R_{\theta JC}$	IGBT Thermal Resistance: Junction-To-Case			0.47	$^\circ\text{C/W}$	

Diode, Inverter
Maximum Rated Values ($T_C=25^\circ\text{C}$ unless otherwise specified)

V_{RRM}	Repetitive Peak Reverse Voltage	1200	V
I_F	Diode Continuous Forward Current	25	A
I_{FM}	Diode Maximum Forward Current	50	A

Electrical Characteristics of FWD

Symbol	Description	Conditions	Min	Typ	Max	Unit
V_{FM}	Forward Voltage	$I_F = 25\text{A}$, $V_{GE} = 0\text{V}$	$T_J = 25^\circ\text{C}$	2.1		V
			$T_J = 125^\circ\text{C}$	2.3		
I_{rr}	Peak Reverse Recovery Current		$T_J = 25^\circ\text{C}$	35		A
			$T_J = 125^\circ\text{C}$	40		
Q_{rr}	Reverse Recovery Charge	$I_F = 25\text{A}$, $di/dt = 815\text{A}/\mu\text{s}$, $V_{rr} = 600\text{V}$, $V_{GE} = -15\text{V}$	$T_J = 25^\circ\text{C}$	2.0		μC
			$T_J = 125^\circ\text{C}$	2.76		
E_{rec}	Reverse Recovery Energy		$T_J = 25^\circ\text{C}$	0.62		mJ
			$T_J = 125^\circ\text{C}$	1.13		
$R_{\theta JC}$	Diode Thermal Resistance: Junction-To-Case			1.28		$^\circ\text{C}/\text{W}$

IGBT, Brake-Chopper
Maximum Rated Values ($T_C=25^\circ\text{C}$ unless otherwise specified)

V_{CES}	Collector-Emitter Blocking Voltage		1200	V
V_{GES}	Gate-Emitter Voltage		± 20	V
I_C	Continuous Collector Current	$T_C = 80^\circ\text{C}$,	15	A
		$T_C = 25^\circ\text{C}$	30	A
I_{CM}	Repetitive Peak Collector Current	$T_J = 175^\circ\text{C}$	30	A
t_{SC}	Short Circuit Withstand Time		>10	μs
P_D	Maximum Power Dissipation per IGBT	$T_C = 25^\circ\text{C}$ $T_{Jmax} = 175^\circ\text{C}$	255	W

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

Static characteristics

Symbol	Description	Conditions	Min	Typ	Max	Unit
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C = 1 \text{ mA}, V_{CE} = V_{GE}$	4.5	5.2	6.5	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C = 15 \text{ A}, V_{GE} = 15 \text{ V}$	$T_J = 25^\circ\text{C}$	2.40	2.60	V
			$T_J = 125^\circ\text{C}$	2.60	2.80	V
I_{CES}	Collector-Emitter Leakage Current	$V_{GE} = 0 \text{ V}, V_{CE} = V_{CES}, T_J = 25^\circ\text{C}$			1	mA
I_{GES}	Gate-Emitter Leakage Current	$V_{GE} = \pm 20 \text{ V}, V_{CE} = 0 \text{ V}, T_J = 25^\circ\text{C}$			200	nA
C_{ies}	Input Capacitance	$V_{CE} = 25 \text{ V}, V_{GE} = 0 \text{ V}, f = 1 \text{ MHz}$		1.5		nF
C_{oes}	Output Capacitance			0.13		nF

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	$V_{CC} = 600 \text{ V}, I_C = 15 \text{ A}, R_G = 68 \Omega, V_{GE} = \pm 15 \text{ V},$ Inductive Load	$T_J = 25^\circ\text{C}$		105		ns
			$T_J = 125^\circ\text{C}$		90		
t_r	Rise Time		$T_J = 25^\circ\text{C}$		50		ns
			$T_J = 125^\circ\text{C}$		50		
$t_{d(off)}$	Turn-off Delay Time		$T_J = 25^\circ\text{C}$		260		ns
			$T_J = 125^\circ\text{C}$		275		
t_f	Fall Time		$T_J = 25^\circ\text{C}$		240		ns
			$T_J = 125^\circ\text{C}$		360		
E_{on}	Turn-on Switching Loss		$T_J = 25^\circ\text{C}$		1.67		mJ
			$T_J = 125^\circ\text{C}$		2.08		
E_{off}	Turn-off Switching Loss	$T_J = 25^\circ\text{C}$		0.62		mJ	
		$T_J = 125^\circ\text{C}$		1.13			
Q_g	门 Total Gate Charge	$T_J = 25^\circ\text{C}$		145		nC	
RBSOA	Reverse Bias Safe Operation Area	$I_C=30\text{A}, V_{CC}=1050\text{V}, V_p=1200\text{V}, R_g = 15\Omega, V_{GE}=\pm 15\text{V to } 0\text{V}, T_J=150^\circ\text{C}$	Trapezoid				
SCSOA	Short Circuit Safe Operation Area	$V_{CC} = 600 \text{ V}, V_{GE} = 15 \text{ V}, T_J = 150^\circ\text{C}$	10			μs	
$R_{\theta JC}$	IGBT Thermal Resistance: Junction-To-Case			0.59		$^\circ\text{C/W}$	

Diode, Brake-Chopper Maximum Rated Values ($T_C=25^\circ\text{C}$ unless otherwise specified)

V_{RRM}	Repetitive Peak Reverse Voltage	1200	V
I_F	Diode Continuous Forward Current	15	A
I_{FM}	Diode Maximum Forward Current	30	A

Electrical Characteristics of FWD

Symbol	Description	Conditions	Min	Typ	Max	Unit
V_{FM}	Forward Voltage	$I_F = 15\text{ A}$, $V_{GE} = 0\text{ V}$	$T_J = 25^\circ\text{C}$	2.00		V
			$T_J = 125^\circ\text{C}$	2.30		
I_{rr}	Peak Reverse Recovery Current		$T_J = 25^\circ\text{C}$	10		A
			$T_J = 125^\circ\text{C}$	15		
Q_{rr}	Reverse Recovery Charge	$I_F = 15\text{ A}$, $di/dt = 345\text{ A}/\mu\text{s}$, $V_{rr} = 600\text{ V}$, $V_{GE} = -15\text{ V}$	$T_J = 25^\circ\text{C}$	0.8		μC
			$T_J = 125^\circ\text{C}$	1.6		
E_{rec}	Reverse Recovery Energy		$T_J = 25^\circ\text{C}$	0.31		mJ
			$T_J = 125^\circ\text{C}$	0.66		
$R_{\theta JC}$	Diode Thermal Resistance: Junction-To-Case			1.28		$^\circ\text{C}/\text{W}$

Internal NTC-Thermistor Characteristic

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}	$T_C = 25^\circ\text{C}$	50		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	Unit
V _{iso}	Isolation Voltage(All Terminals Shorted)	f = 50Hz, 1minute	2500		V
T _J	Maximum Junction Temperature			175	°C
T _{JOP}	Maximum Operating Junction Temperature Range	-40		+150	°C
T _{stg}	Storage Temperature	-40		+125	°C
R _{ecs}	Case-To-Sink (Conductive Grease Applied)		0.1		°C/W
M	Mounting Screw:M3	1.5		2.0	N·m
G	Weight		30		g

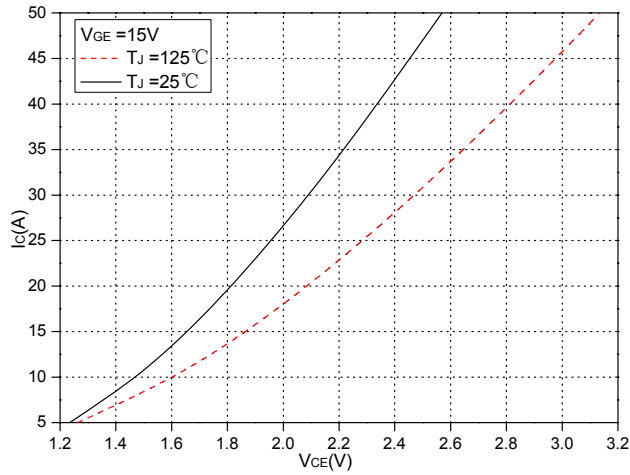


Fig.1 Typical Saturation Voltage Characteristics (Inverter)

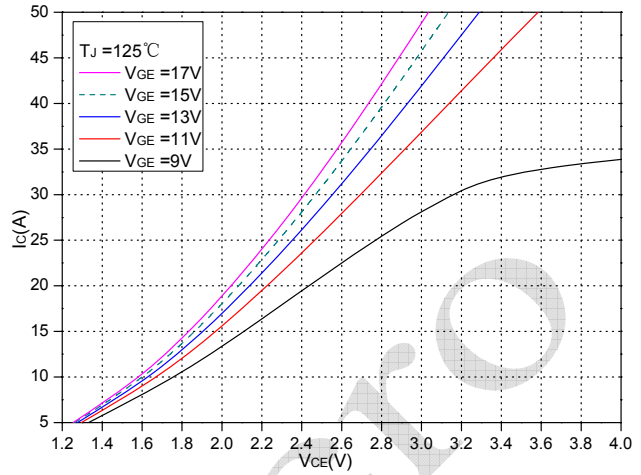


Fig.2 Typical Output Characteristics (Inverter)

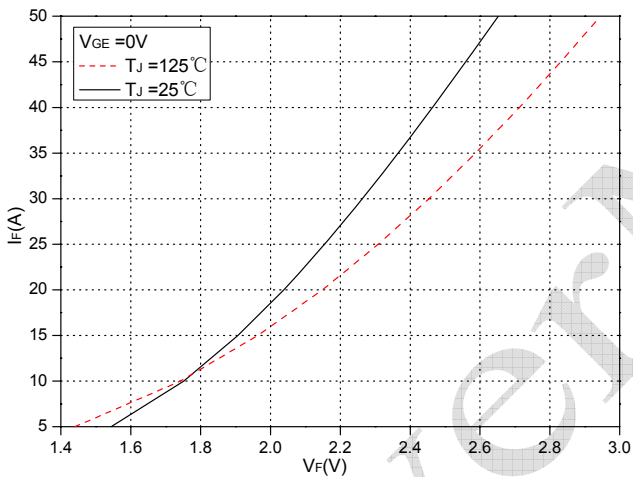


Fig.3 Forward Characteristics of FWD (Inverter)

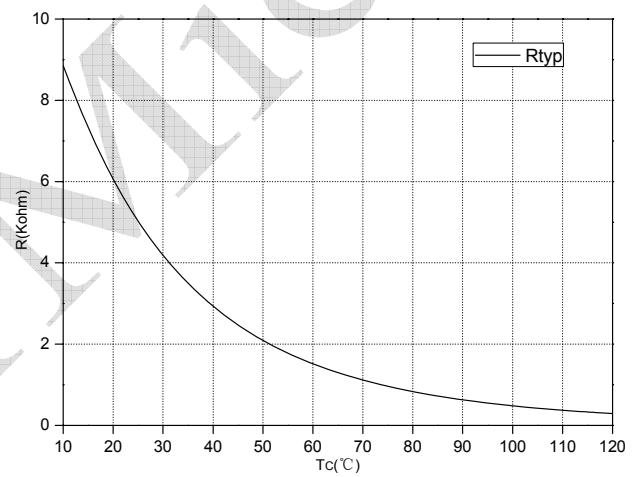


Fig.4 NTC Temperature characteristics

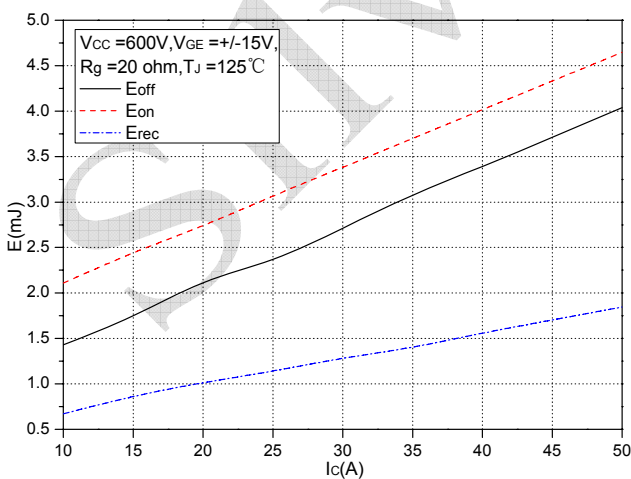


Fig. 5 Typical Switching Loss vs. Collector Current (Inverter)

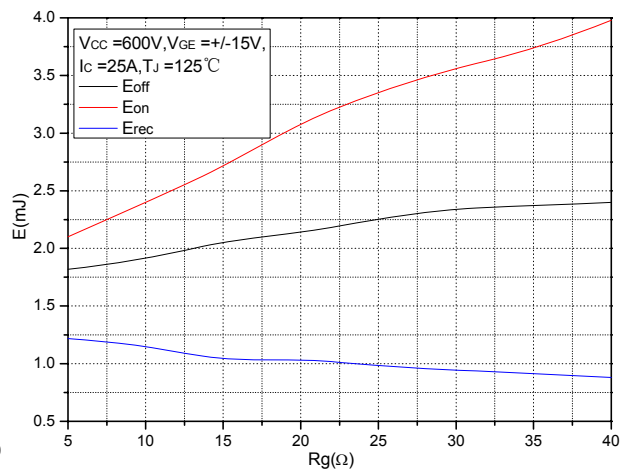


Fig.6 Typical Switching Loss vs. Gate Resistance (Inverter)

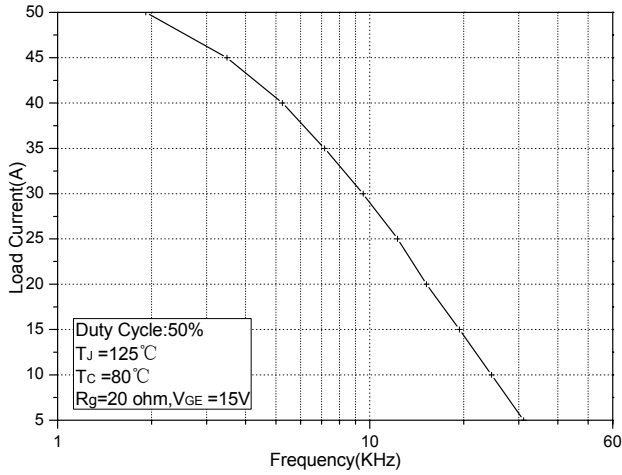


Fig.7 Typical Load Current vs. Frequency (Inverter)

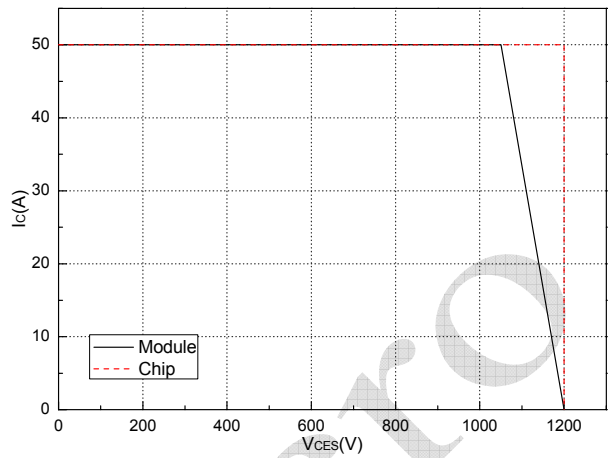


Fig.8 Reverse Bias Safe Operation Area (RBSOA)

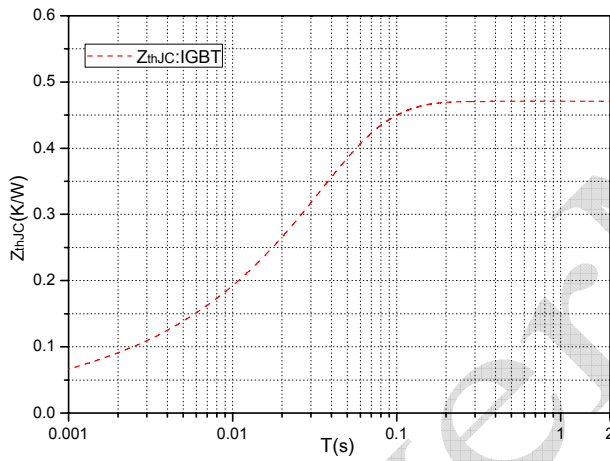


Fig.9 Transient Thermal Impedance IGBT (Inverter)

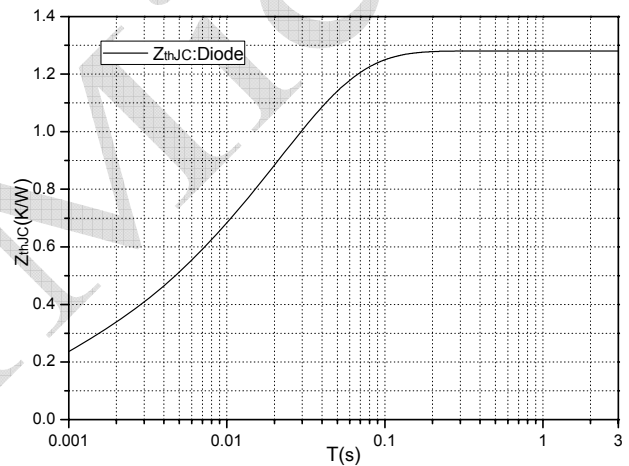


Fig.10 Transient Thermal Impedance Diode (Inverter)

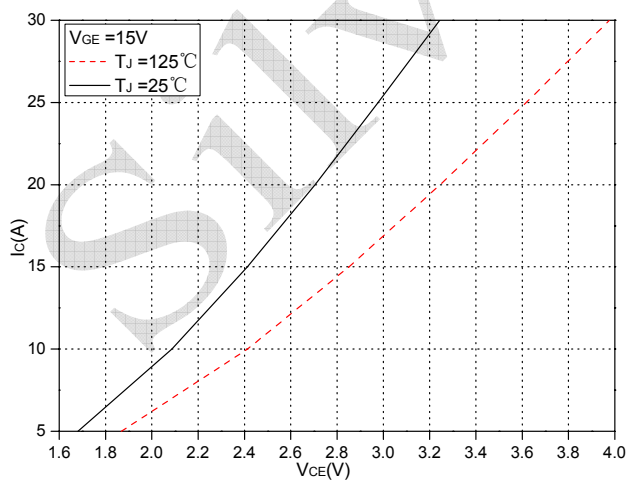


Fig.11 Typical Saturation Voltage Characteristics (Brake-Chopper)

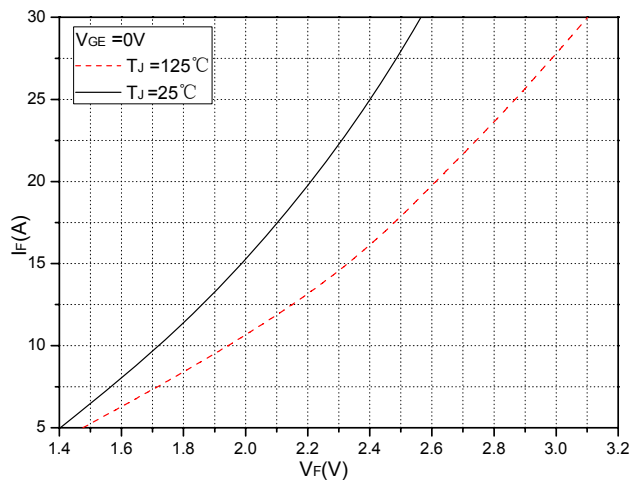
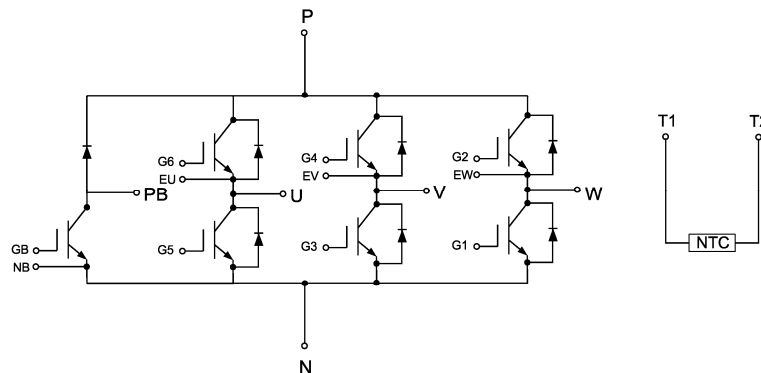
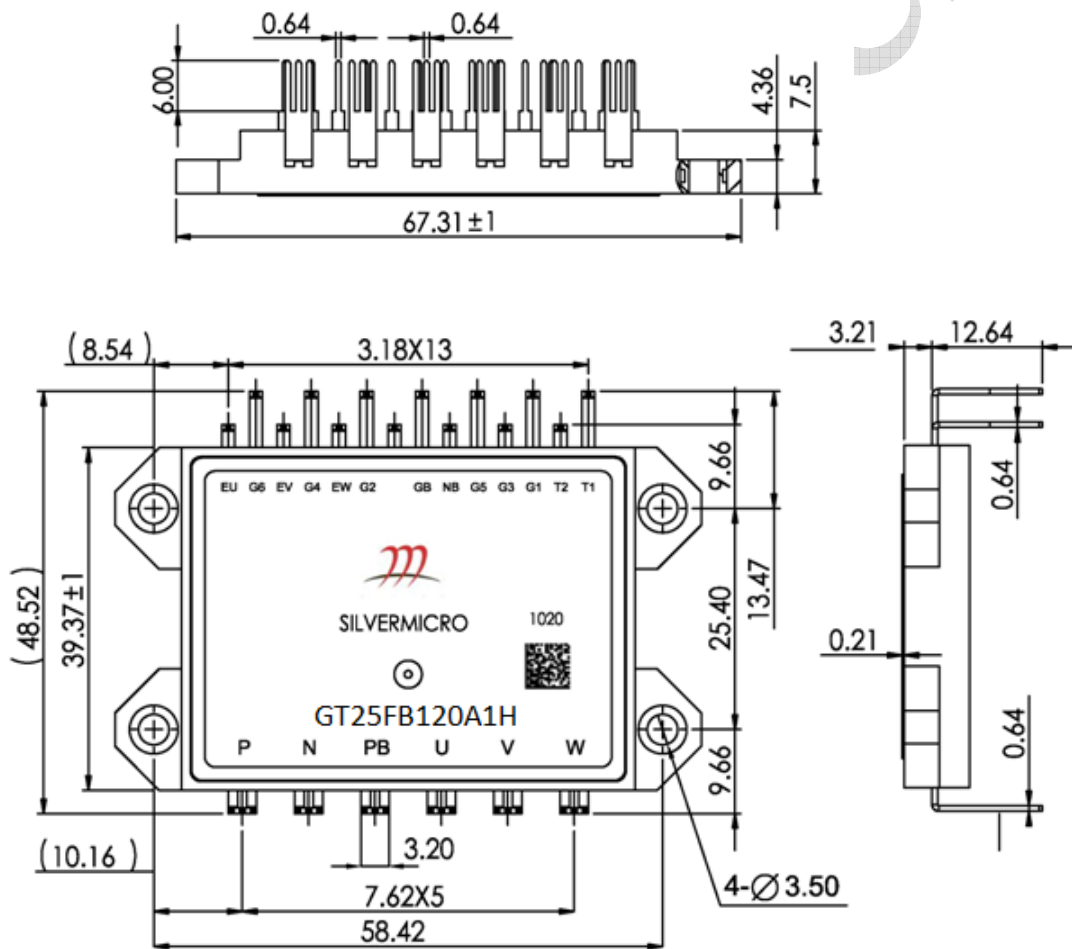


Fig.12 Forward Characteristics of FWD (Brake-Chopper)

Internal Circuit:



Package Outline (Unit: mm):



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