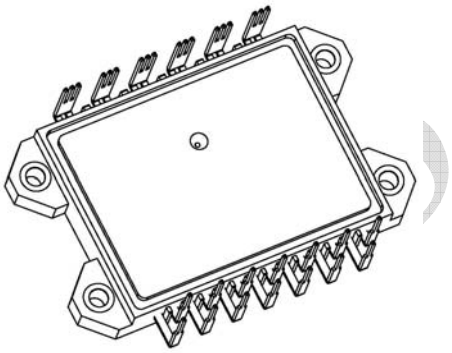
SILVERMICRO

GK50FB60A1H

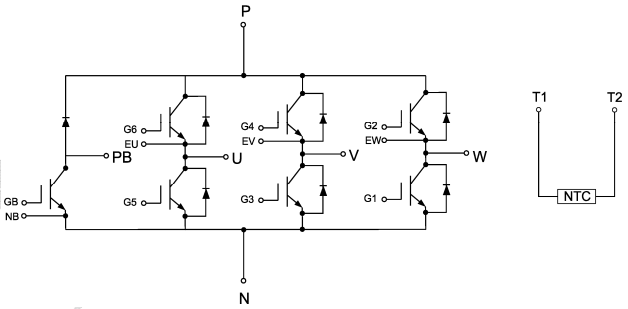
Preliminary Data

IGBT Module



Features：

- Short Circuit Rated 10μs
- Low Switching Loss
- Low Saturation Voltage: $V_{CE\ (sat)}$ = 1.80V @ I_C = 50A ,T_C=25℃
- 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		600	V
V_{GES}	Gate-Emitter Voltage		±20	V
I_C	Continuous Collector Current	T_C = 80℃,	50	A
		T_C = 25℃	100	A
I_{CM}	Repetitive Peak Collector Current	T_J = 150℃	100	A
t_{SC}	Short Circuit Withstand Time		>10	μs
P_D	Maximum Power Dissipation per IGBT	T_C = 25℃ T_{Jmax}=150℃	300	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}		3.0	4.5	5.0	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C = 50 A, V_{GE} = 15V	T_J = 25℃		1.80	2.10	V
			T_J = 125℃		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℃				200	nA
C_{ies}	Input Capacitance	V_{CE} = 25V, V_{GE} = 0V , f = 1MHz			3.0		nF
C_{oes}	Output Capacitance				0.35		nF

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	V_{CC} = 300V,I_C = 50A, R_G = 30 Ω,V_{GE} = ±15V, Inductive Load	T_J = 25℃		110		ns
			T_J = 125℃		100		
t_r	Rise Time		T_J = 25℃		75		ns
			T_J = 125℃		80		
$t_{d(off)}$	Turn-off Delay Time		T_J = 25℃		220		ns
			T_J = 125℃		240		
t_f	Fall Time		T_J = 25℃		90		ns
			T_J = 125℃		110		
E_{on}	Turn-on Switching Loss		T_J = 25℃		0.68		mJ
			T_J = 125℃		0.78		
E_{off}	Turn-off Switching Loss		T_J = 25℃		0.75		mJ
			T_J = 125℃		0.92		
Q_g	Total Gate Charge		T_J = 25℃		260		nC
RBSOA	Reverse Bias Safe Operation Area	I_C=100A,V_{CC}=480V,Vp=600V, Rg = 15Ω, V_{GE}=+15V to 0V, T_J =150°C		Trapezoid			
SCSOA	Short Circuit Safe Operation Area	V_{CC} = 300V, V_{GE} = 15V, T_J = 150℃		10			μs
$R_{\theta JC}$	IGBT Thermal Resistance: Junction-To-Case				0.42		℃/W

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

V_{RRM}	Repetitive Peak Reverse Voltage	600	V
I_F	Diode Continuous Forward Current	50	A
I_{FM}	Diode Maximum 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 , V_{GE} = 0V	T_J = 25℃		1.40	1.60	V
			T_J = 125℃		1.40		
I_{rr}	Peak Reverse Recovery Current	I_F = 50A, di/dt =840A/μs, V_{rr} = 300V, V_{GE} = -15V	T_J = 25℃		30		A
			T_J = 125℃		40		
Q_{rr}	Reverse Recovery Charge		T_J = 25℃		2.4		μC
			T_J = 125℃		3.6		
E_{rec}	Reverse Recovery Energy		T_J = 25℃		0.25		mJ
			T_J = 125℃		0.76		
$R_{\theta JC}$	Diode Thermal Resistance: Junction-To-Case				1.08		℃/W

IGBT, Brake-Chopper
Maximum Rated Values (T_C=25℃ unless otherwise specified)

V_{CES}	Collector-Emitter Blocking Voltage		600	V
V_{GES}	Gate-Emitter Voltage		±20	V
I_C	Continuous Collector Current	T_C = 80℃,	30	A
		T_C = 25℃	60	A
$I_{CM(1)}$	Peak Collector Current Repetitive	T_J = 150℃	60	A
t_{SC}	Short Circuit Withstand Time		>10	μs
P_D	Maximum Power Dissipation per IGBT	T_C = 25℃, T_{Jmax}=150℃	190	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}		3.0	4.5	5.0	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C = 30 A, V_{GE} = 15V	T_J = 25℃		1.80	2.10	V
			T_J = 125℃		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℃				200	nA
C_{ies}	Input Capacitance	V_{CE} = 25V, V_{GE} = 0V , f = 1MHz			1.90		nF
C_{oes}	Output Capacitance				0.25		nF

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	V_{CC} = 300V,I_C = 30A, R_G = 30 Ω,V_{GE} = ±15V, Inductive Load	T_J = 25℃		65		ns
			T_J = 125℃		60		
t_r	Rise Time		T_J = 25℃		50		ns
			T_J = 125℃		50		
$t_{d(off)}$	Turn-off Delay Time		T_J = 25℃		120		ns
			T_J = 125℃		130		
t_f	Fall Time		T_J = 25℃		100		ns
			T_J = 125℃		140		
E_{on}	Turn-on Switching Loss		T_J = 25℃		0.25		mJ
			T_J = 125℃		0.38		
E_{off}	Turn-off Switching Loss		T_J = 25℃		0.28		mJ
			T_J = 125℃		0.44		
Q_g	Total Gate Charge		T_J = 25℃		150		nC
RBSOA	Reverse Bias Safe Operation Area	I_C=60A,V_{CC}=480V,Vp=600V, Rg = 15Ω, V_{GE}=+15V to 0V, T_J =150°C		Trapezoid			
SCSOA	Short Circuit Safe Operation Area	V_{CC} = 300V, V_{GE} = 15V, T_J = 150℃		10			μs
$R_{\theta JC}$	IGBT Thermal Resistance: Junction-To-Case				0.67		℃/W

Diode, Brake-Chopper

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

V_{RRM}	Repetitive Peak Reverse Voltage	600	V
I_F	Diode Continuous Forward Current	30	A
I_{FM}	Diode Maximum Forward Current	60	A

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

Symbol	Description	Conditions		Min	Typ	Max	Unit
V_{FM}	Forward Voltage	I_F = 30A , V_{GE} = 0V	T_J = 25℃		1.40	1.60	V
			T_J = 125℃		1.40		
I_{rr}	Peak Reverse Recovery Current	I_F =30A, di/dt = 960A/μs, V_{rr} = 300V, V_{GE} = 15V	T_J = 25℃		30		A
			T_J = 125℃		35		
Q_{rr}	Reverse Recovery Charge		T_J = 25℃		1.5		μC
			T_J = 125℃		2.4		
E_{rec}	Reverse Recovery Energy		T_J = 25℃		0.1		mJ
			T_J = 125℃		0.30		
$R_{\theta JC}$	Diode Thermal Resistance: Junction-To-Case				1.63		℃/W

Internal NTC-Thermistor Characteristics

R_{25}	T_C =25℃	5		kΩ
△R/R	T_C =100℃， R_{100} =481Ω		±5	%
P_{25}	T_C =25℃	50		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

Module

Symbol	Description		Min	Typ	Max	Unit
V_{iso}	Isolation Voltage(All Terminals Shorted)	f = 50Hz, 1minute			2500	V
T_J	Maximum Junction Temperature				150	℃
T_{JOP}	Maximum Operating Junction Temperature Range		-40		+150	℃
T_{stg}	Storage Temperature		-40		+125	℃
$R_{\theta CS}$	Case-To-Sink (Conductive Grease Applied)			0.1		℃/W
M	Mounting Screw:M3		1.5		2.0	N·m
G	Weight			30		g

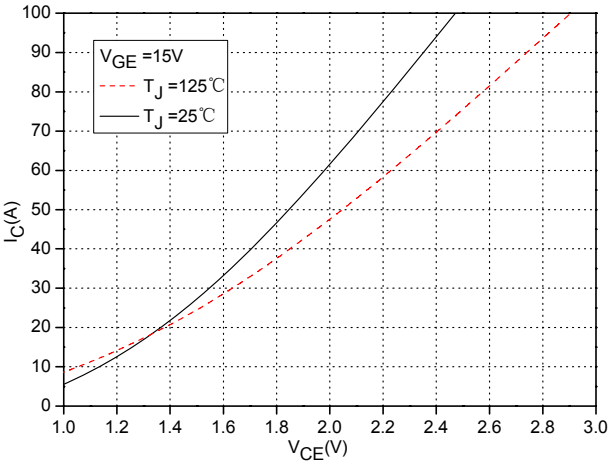


Fig.1 Typical Saturation Voltage Characteristics (Inverter)

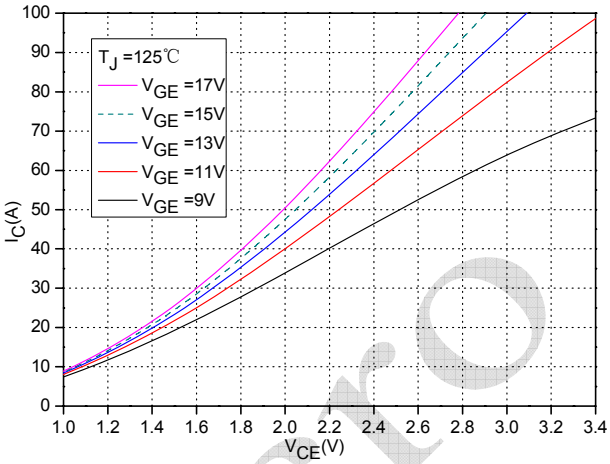


Fig.2 Typical Output Characteristics (Inverter)

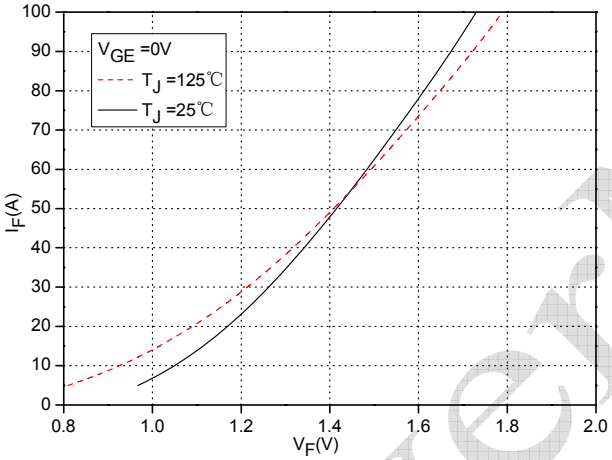


Fig.3 Forward Characteristics of FWD (Inverter)

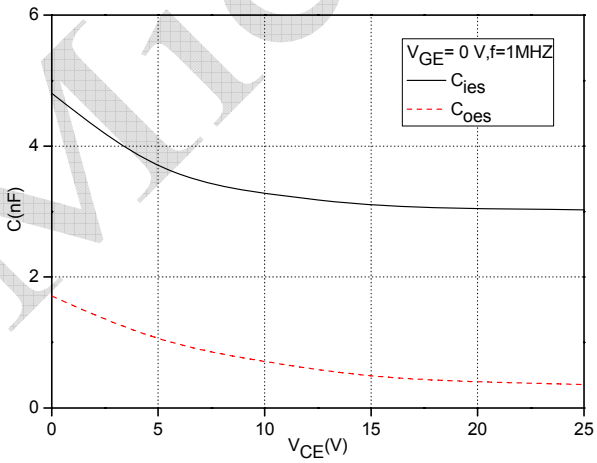


Fig.4 Capacitance Characteristics

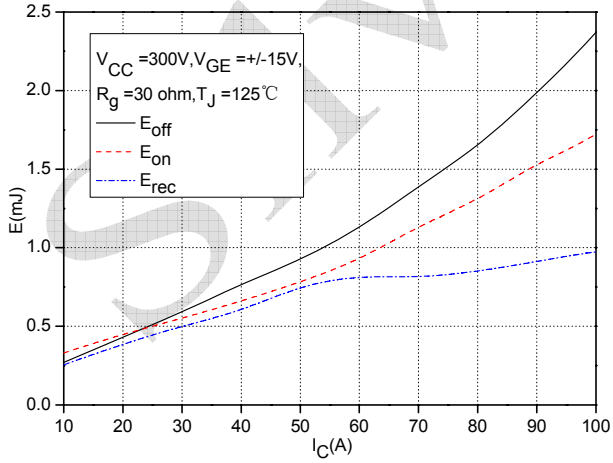


Fig.5 Typical Switching Losses vs. Collector Current (Inverter)

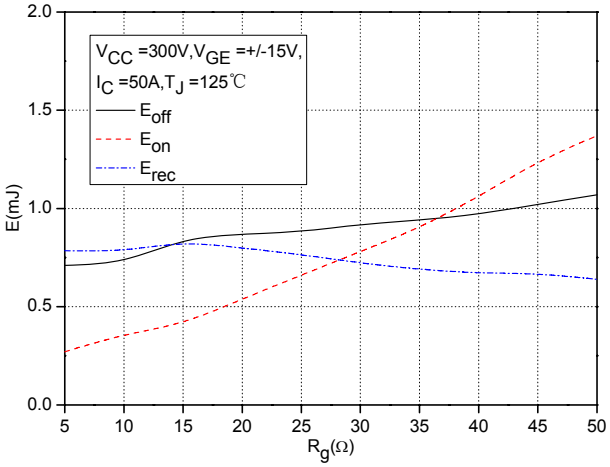


Fig.6 Typical Switching Loss vs. Gate Resistance (Inverter)

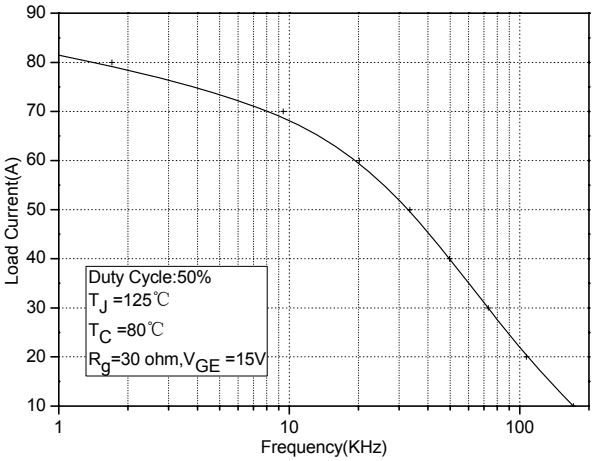


Fig.7 Typical Load Current vs. Frequency (Inverter)

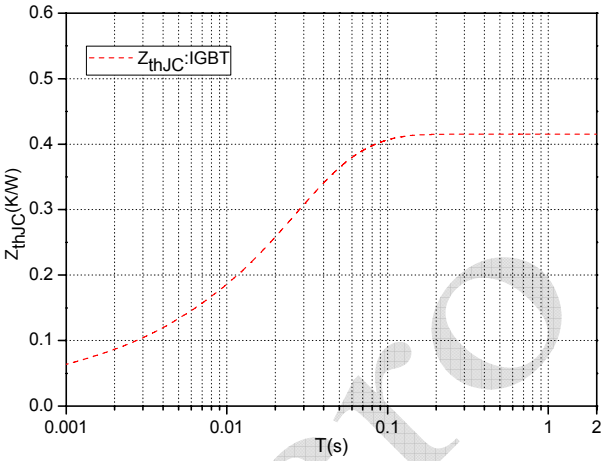


Fig.8 Transient Thermal Impedance IGBT (Inverter)

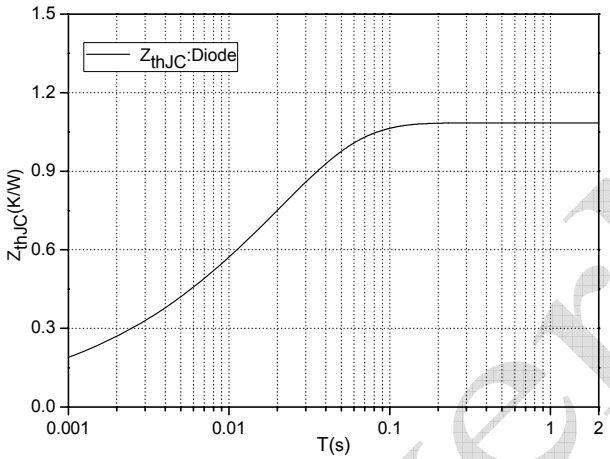


Fig.9Transient Thermal Impedance Diode (Inverter)

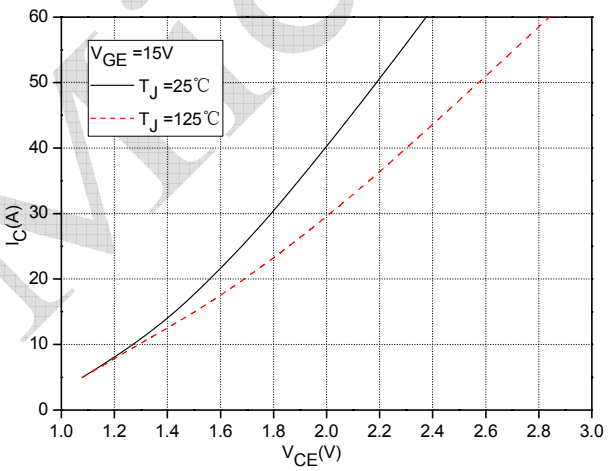


Fig.10 Typical Saturation Voltage Characteristics (Brake-Chopper)

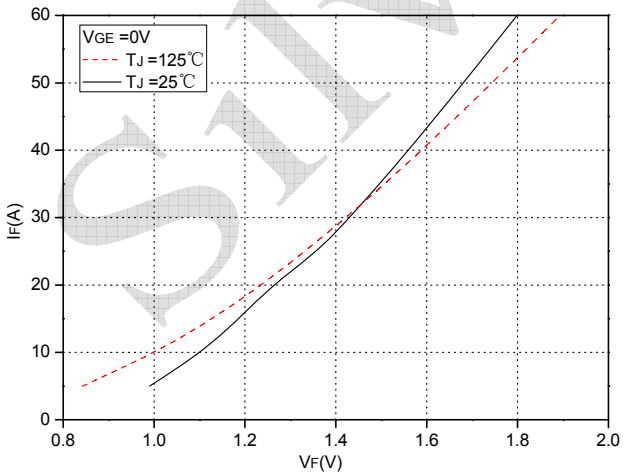


Fig.11 Forward Characteristics of FWD (Brake-Chopper)

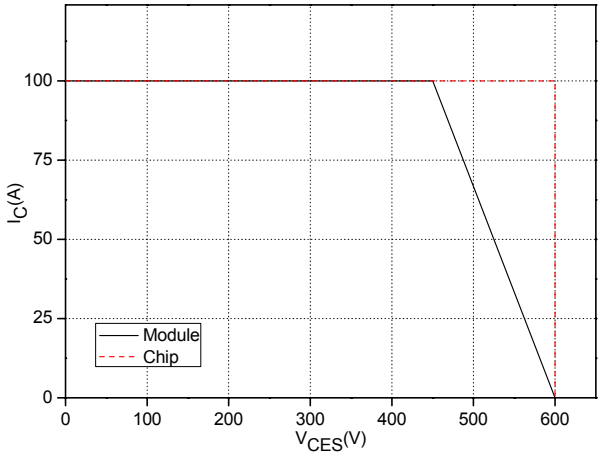


Fig.12 Reverse Bias Safe Operation Area (RBSOA)

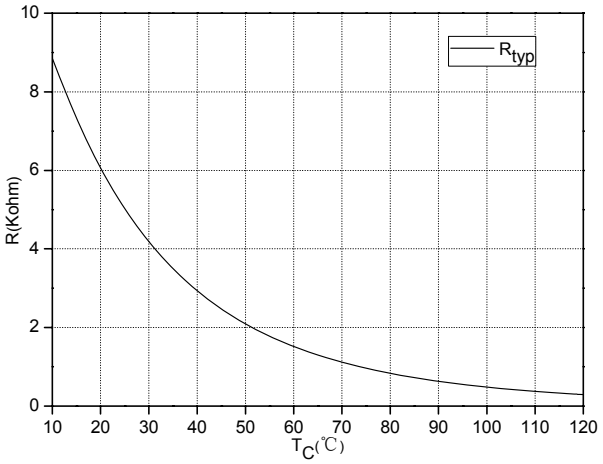
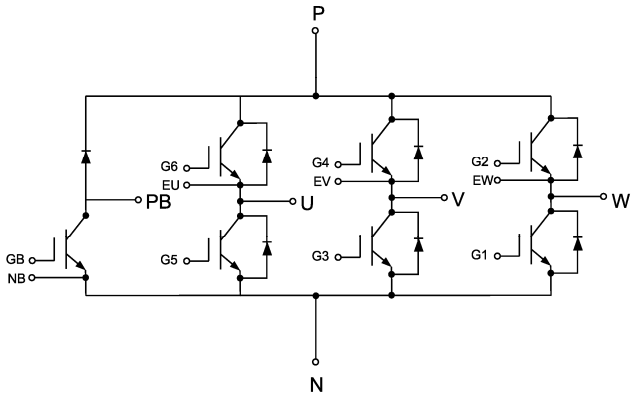
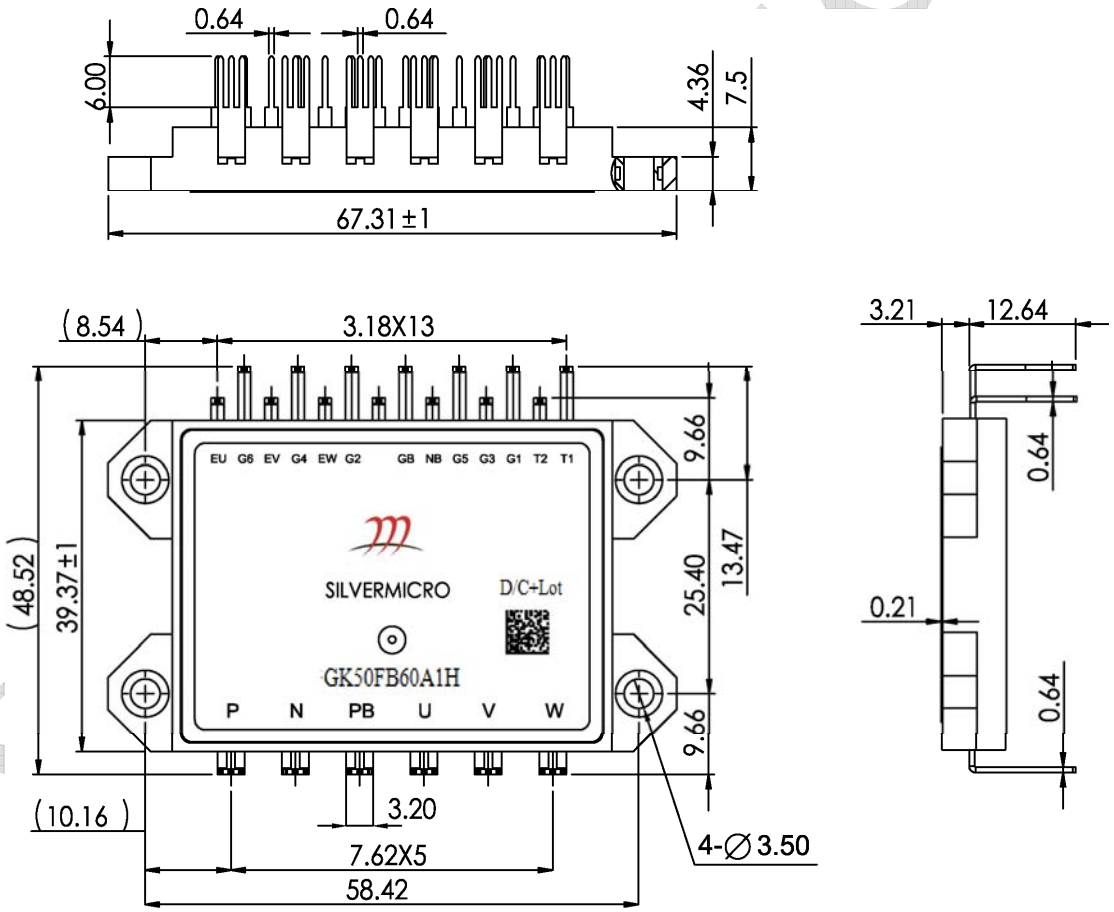


Fig.13 NTC Temperature characteristics

Internal Circuit:



Package Outline (Unit: mm):



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