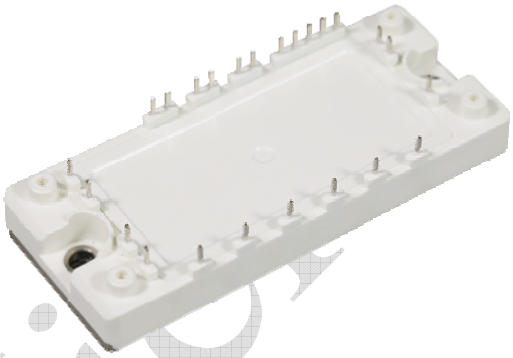
SILVERMICRO

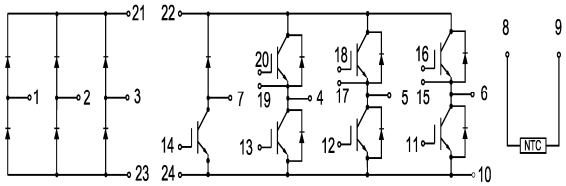
GK35PI60T5H

IGBT Module



Features:

- Short Circuit Rated >10μs
- Low Saturation Voltage: $V_{CE\ (sat)}$ = 1.80V @ I_C = 35A , T_C=25℃
- 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		600	V
V_{GES}	Gate-Emitter Voltage		±20	V
I_C	Continuous Collector Current	T_C = 80℃,	35	A
		T_C = 25℃	70	A
$I_{CM(1)}$	Peak Collector Current Repetitive	T_J = 150℃	70	A
t_{SC}	Short Circuit Withstand Time		>10	μs
P_D	Maximum Power Dissipation per IGBT	T_C = 25℃ T_{Jmax}=150℃	260	W

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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 =35A, 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_{res}	Output capacitance				0.30		nF

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	V_{CC} = 300V,I_C = 35A, R_G = 20Ω,V_{GE} = ±15V, Inductive Load	T_J = 25℃		70		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℃		128		ns
			T_J = 125℃		130		
t_f	Fall Time		T_J = 25℃		90		ns
			T_J = 125℃		110		
E_{on}	Turn-on Switching Loss		T_J = 25℃		0.29		mJ
			T_J = 125℃		0.42		
E_{off}	Turn-off Switching Loss		T_J = 25℃		0.31		mJ
			T_J = 125℃		0.50		
Q_g	Total Gate Charge		T_J = 25℃		160		nC
RBSOA	Reverse Bias Safe Operation Area	I_C=70A,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

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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	35	A
I_{FM}	Repetitive Peak Forward Current	70	A

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

Symbol	Description	Conditions		Min	Typ	Max	Unit
V_{FM}	Forward Voltage	I_F = 35A , V_{GE} = 0V	T_J = 25℃		1.40	1.60	V
			T_J = 125℃		1.40		
I_{rr}	Peak Reverse Recovery Current	I_F=35A, di/dt =960A/μs, V_{rr} = 300V, V_{GE} = -15V	T_J = 25℃		18		A
			T_J = 125℃		22		
Q_{rr}	Reverse Recovery Charge		T_J = 25℃		2.76		μC
			T_J = 125℃		2.43		
E_{rec}	Reverse Recovery Energy		T_J = 25℃		0.14		mJ
			T_J = 125℃		0.34		
$R_{\theta JC}$	Diode Thermal Resistance: Junction-To-Case				1.63		℃/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℃,	35	A
		T_C = 25℃	70	A
I_{CM}	Peak Collector Current Repetitive	T_J = 150℃	70	A
t_{SC}	Short Circuit Withstand Time		>10	μs
P_D	Maximum Power Dissipation (IGBT)	T_C = 25℃, T_{Jmax}=150℃	260	W

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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 = 35A, 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				0.30		nF

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	V_{CC} = 300V,I_C = 35A, R_G = 20Ω,V_{GE} = ±15V, Inductive Load	T_J = 25℃		70		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℃		128		ns
			T_J = 125℃		130		
t_f	Fall Time		T_J = 25℃		90		ns
			T_J = 125℃		110		
E_{on}	Turn-on Switching Loss		T_J = 25℃		0.29		mJ
			T_J = 125℃		0.42		
E_{off}	Turn-off Switching Loss		T_J = 25℃		0.31		mJ
			T_J = 125℃		0.50		
Q_g	Total Gate Charge		T_J = 25℃		160		nC
RBSOA	Reverse Bias Safe Operation Area	I_C=30A,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

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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	35	A
I_{FM}	Repetitive Peak Forward Current	70	A

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

Symbol	Description	Conditions		Min	Typ	Max	Unit
V_{FM}	Forward Voltage	I_F = 35 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=35A, 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℃		1.51		μC
			T_J = 125℃		2.43		
E_{rec}	Reverse Recovery Energy		T_J = 25℃		0.14		mJ
			T_J = 125℃		0.34		
$R_{\theta JC}$	Diode Thermal Resistance: Junction-To-Case				1.63		℃/W

Diode, Rectifier

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

V_{RRM}	Repetitive Peak Reverse Voltage	T_J =25℃	1200	V
I_{FRMSM}	Maximum RMS Forward Current per Chip	T_J =80℃	35	A
I_{RMSM}	Maximum RMS Current at Rectifier Output	T_J =80℃	35	A
I_{FSM}	Surge Current @t_p=10 ms	T_J =25℃	300	A
		T_J =150℃	450	
I^2t	I²t - value	T_J =25℃	450	A^2s
		T_J =150℃	300	

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

V_F	Forward voltage	I_F = 35 A ,	T_J =25℃	1.10			V
			T_J =150℃	1.00			
I_R	Reverse current	V_R=1200V	T_J =25℃			1	mA
$R_{\theta JC}$	Junction-To-Case Diode				0.89		℃/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:M5		3.0		5.0	N·m
G	Weight			200		g

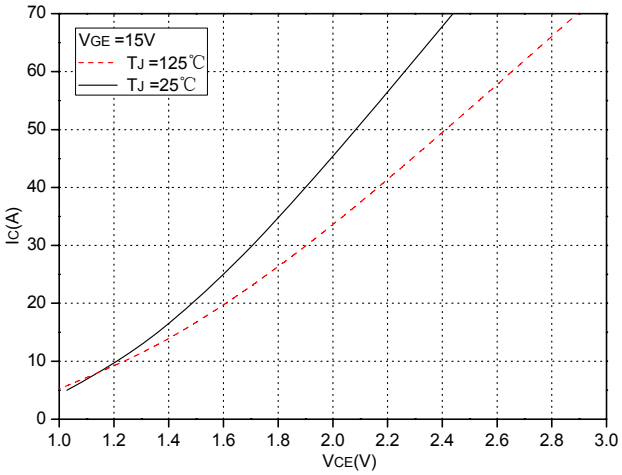


Fig.1 Typical Saturation Voltage Characteristics

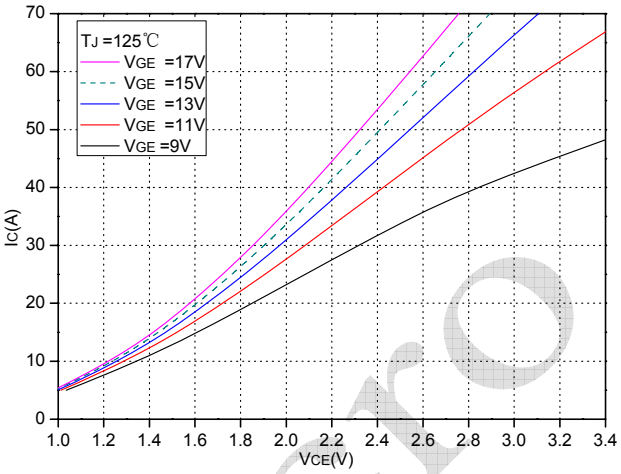


Fig.2 Typical Output Characteristics

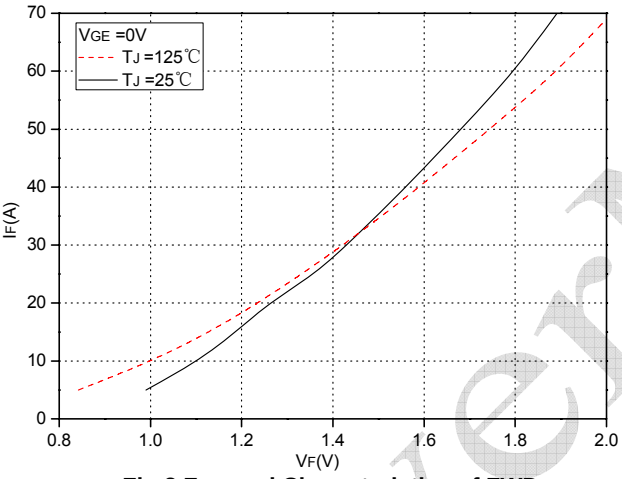


Fig.3 Forward Characteristics of FWD

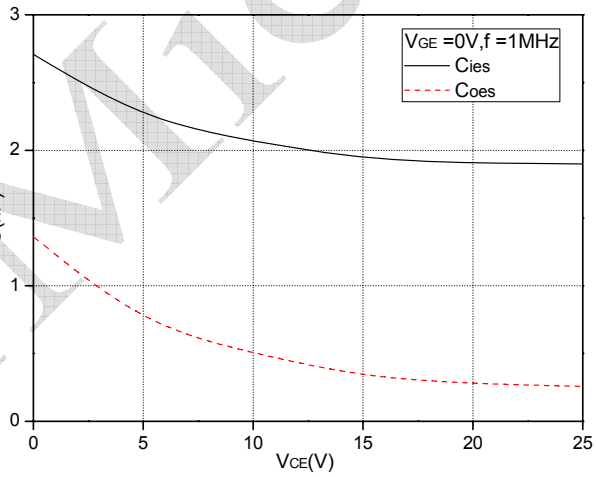


Fig.4 Capacitance Characteristics

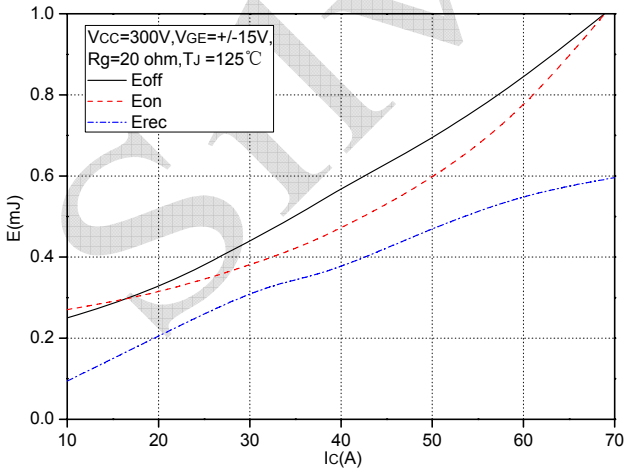


Fig.5 Typical Switching Loss vs. Collector Current

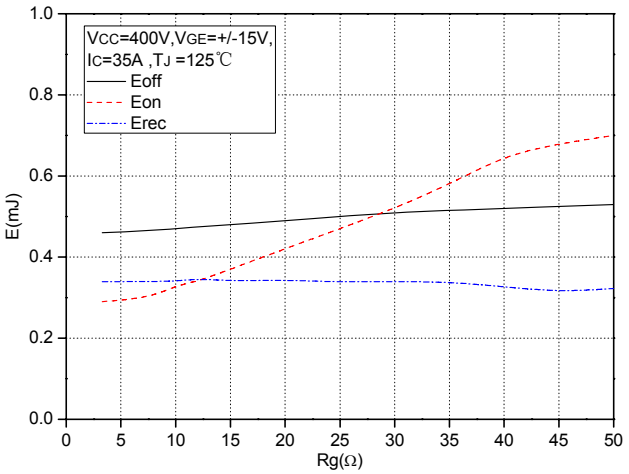


Fig.6 Typical Switching Loss vs. Gate Resistance

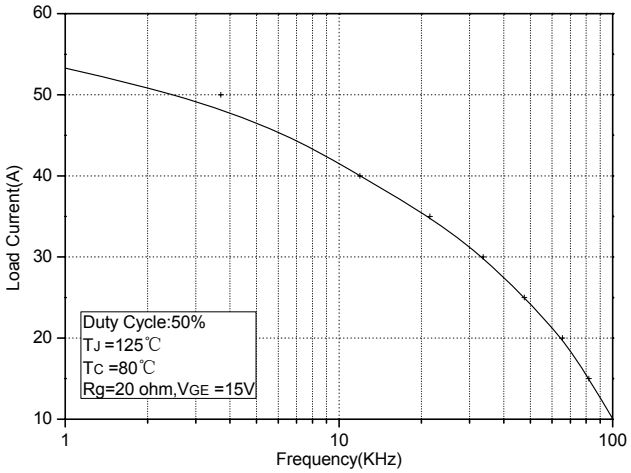


Fig.7 Typical Load Current vs. Frequency

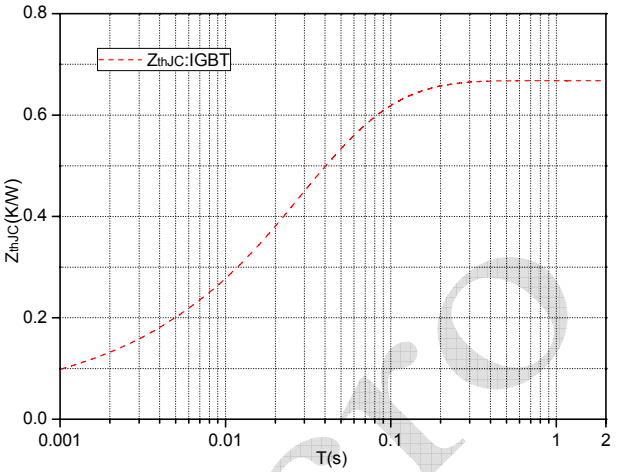


Fig.8 Transient thermal impedance (IGBT)

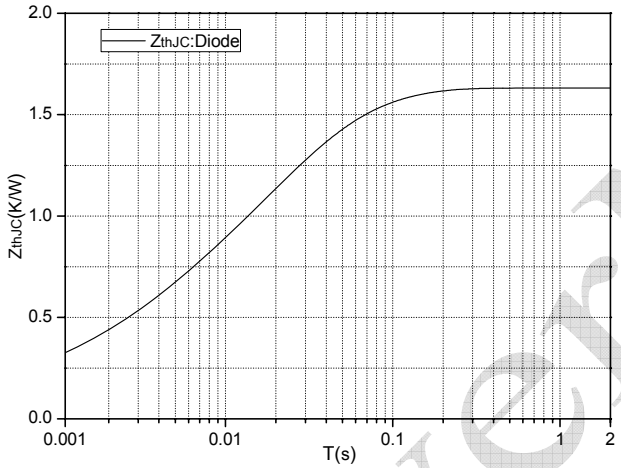


Fig.9 Transient thermal impedance Diode

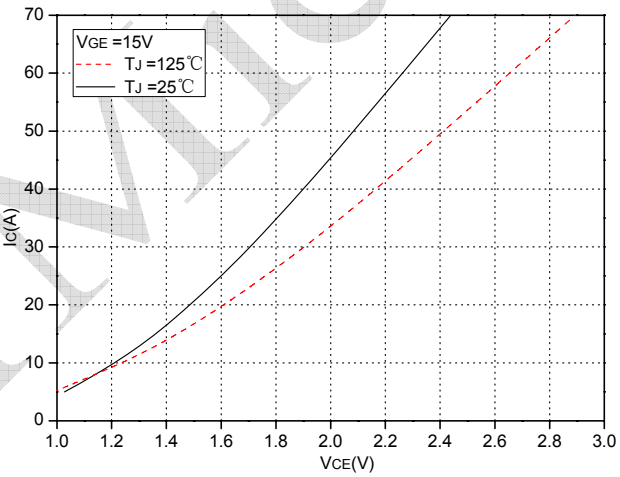


Fig.10 Typical Saturation Voltage Characteristics (Brake-Chopper)

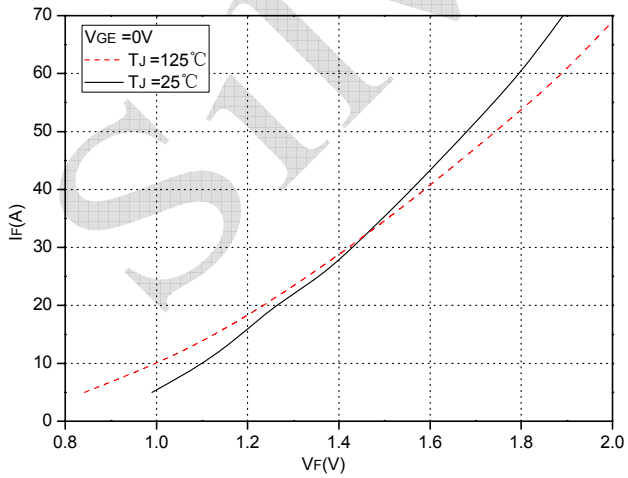


Fig.11 Forward Characteristics of FWD (Brake-Chopper)

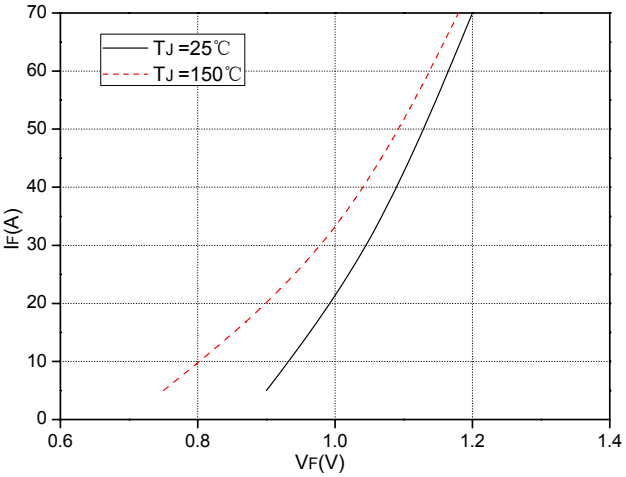


Fig.12 Forward Characteristics of Diode (Rectifier)

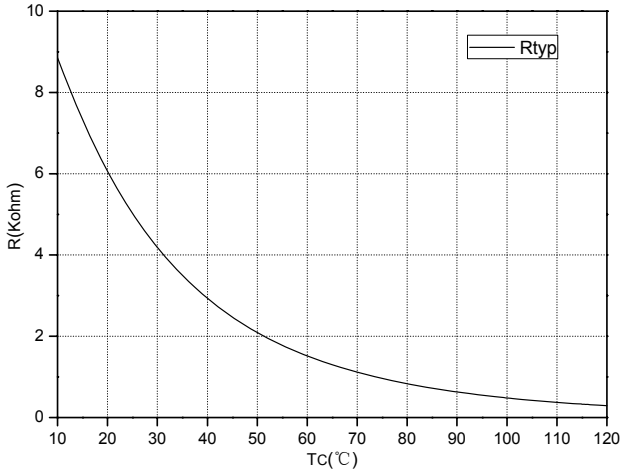


Fig.13 NTC Temperature characteristics

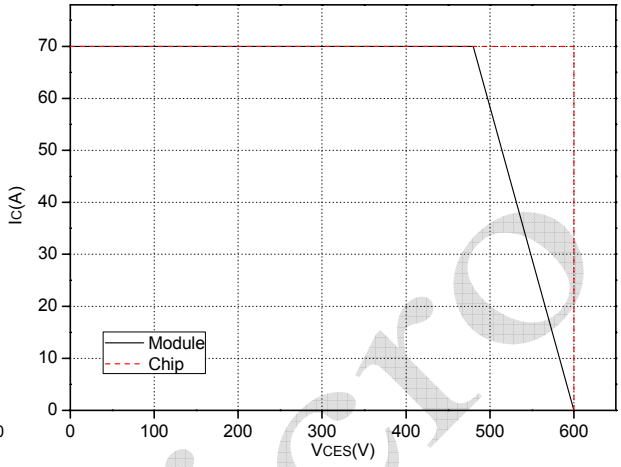
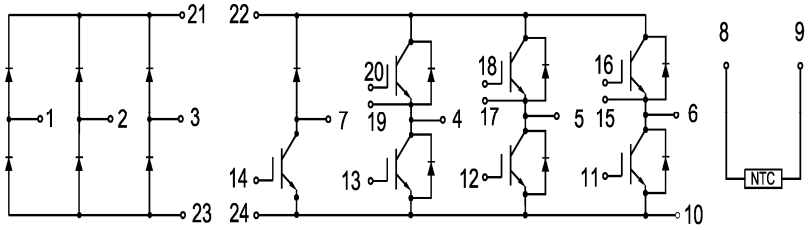
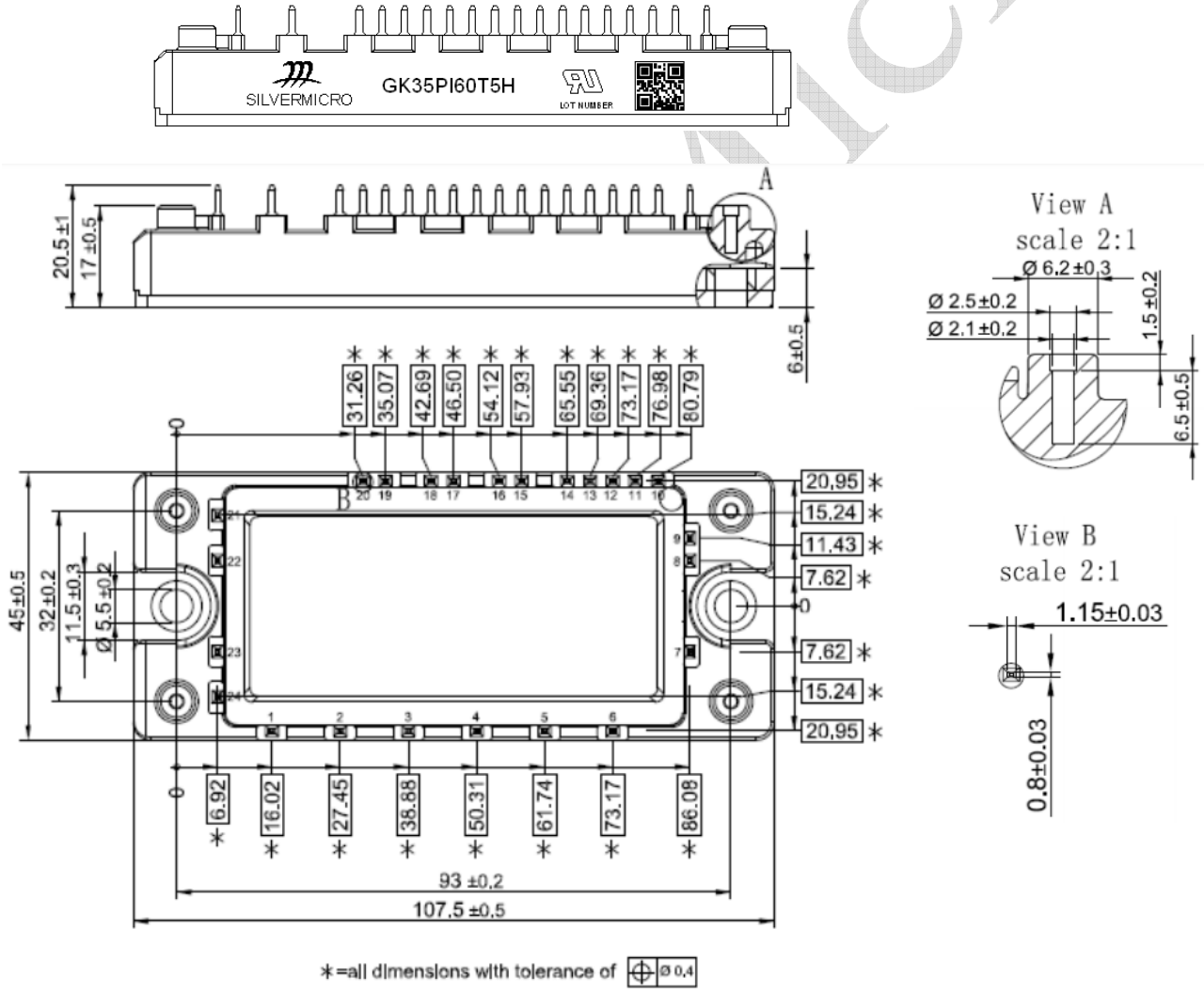


Fig.14 Reverse Bias Safe Operation Area (RBSOA)

Internal Circuit:



Package Outline (Unit: mm):



Date	Revision	Notes
07/07/2019	A	Final Version

Announcement

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