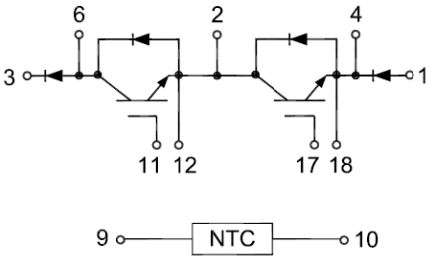
SILVERMICRO

GTR400TAR65T2SH

IGBT Module



Features：

- Field Stop Trench Gate IGBT
- Improved Turn off Voltage Stress
- 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：

- UPS and SMPS
- Industrial Inverters
- Servo Applications
- 3 Level Inverter

IGBT, Inverter

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

V_{CES}	Collector-Emitter Blocking Voltage		650	V
V_{GES}	Gate-Emitter Voltage		±20	V
I_C	Continuous Collector Current	T_C = 100℃	400	A
		T_C = 25℃	630	A
I_{CM}	Peak Collector Current Repetitive	T_J = 175℃	800	A
t_{SC}	Short Circuit Withstand Time		>10	μs
P_D	Maximum Power Dissipation (IGBT)	T_C = 25℃ T_{Jmax}=175℃	1650	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=9.6mA, V_{CE} = V_{GE}		5.0	5.9	6.8	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C = 400A, V_{GE} = 15V	T_J=25℃		1.50		V
			T_J=125℃		1.60		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℃				300	nA
C_{ies}	Input Capacitance	V_{CE} = 25V, V_{GE} = 0V, f =1MHz			32.6		nF
C_{oes}	Output Capacitance				1.82		nF
C_{res}	Reveres Transfer Capacitance				0.50		nF

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	V_{CC}=300V,I_C=400A, R_{Gon} =4.7Ω,V_{GE}=+15V/-8V Inductive Load	T_J=25℃		0.47		μs
			T_J=125℃		0.43		
t_r	Rise Time		T_J=25℃		0.32		μs
			T_J=125℃		0.32		
$t_{d(off)}$	Turn-off Delay Time	V_{CC} = 300V,I_C = 400A, R_{Goff} =4.7Ω,V_{GE}=+15V/-8V Inductive Load	T_J=25℃		0.65		μs
			T_J=125℃		0.63		
t_f	Fall Time		T_J=25℃		0.19		μs
			T_J=125℃		0.20		
E_{on}	Turn-on Switching Loss	V_{CC} = 300V,I_C = 400A, R_{Gon} =4.7Ω,V_{GE}=+15V/-8V di/dt=1110A/μs(T_J=125℃), Inductive Load	T_J=25℃		15.4		mJ
			T_J=125℃		15.9		
E_{off}	Turn-off Switching Loss	V_{CC} = 300V,I_C = 400A, R_{Goff} =4.7Ω,V_{GE}=+15V/-8V du/dt=1240V/μs(T_J=125℃), Inductive Load	T_J=25℃		39.3		mJ
			T_J=125℃		41.9		
Q_g	Total Gate Charge	V_{GE}=+15V…-8V	T_J = 25℃		1.80		μC
RBSOA	I_C=800A,V_{CC}=600V,Vp=650V, R_{Goff} = 4.7Ω, V_{GE}=+15V to 0V, T_J =150°C			Trapezoid			
SCSOA	V_{CC}=300V, V_{GE}=+15V/-8V, T_J=150℃			10			μs
$R_{\theta JC}$	IGBT Thermal Resistance: Junction-To-Case(per leg)				0.091		℃/W

Diode, Inverse

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

V_{RRM}	Repetitive Peak Reverse Voltage	650	V
I_F	Diode Continuous Forward Current	50	A
I_{FM}	Peak FWD Current Repetitive	100	A

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

V_{FM}	Forward Voltage	I_F = 50A	T_J=25℃		1.40		V
			T_J=125℃		1.40		
			T_J=150℃		1.40		
t_{rr}	Reverse Recovery Time	I_F=50A, -di$_F$/dt =925A/μs(T_J=150℃), V_R=300V, V_{GE} = -8V	T_J=25℃		0.08		μs
			T_J=125℃		0.12		
			T_J=150℃		0.13		
I_{rr}	Peak Reverse Recovery Current		T_J=25℃		35.1		A
			T_J=125℃		40.3		
			T_J=150℃		42.7		
Q_{rr}	Reverse Recovery Charge		T_J=25℃		2.05		μC
			T_J=125℃		2.91		
			T_J=150℃		3.33		
E_{rec}	Reverse Recovery Energy	I_F=50A, -di$_F$/dt =925A/μs(T_J=150℃), V_R=300V, V_{GE} = -8V	T_J=25℃		0.40		mJ
			T_J=125℃		0.43		
			T_J=150℃		0.59		
$R_{\theta JC}$	Diode Thermal Resistance: Junction-To-Case(per leg)				0.831		℃/W

Diode, Freewheeling

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

V_{RRM}	Repetitive Peak Reverse Voltage	650	V
I_F	Diode Continuous Forward Current	400	A
I_{FM}	Peak FWD Current Repetitive	800	A

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

V_{FM}	Forward Voltage	I_F=400A	T_J=25℃		2.00		V
			T_J=125℃		2.00		
			T_J=150℃		2.10		
t_{rr}	Reverse Recovery Time	I_F=400A, $-di_F/dt$=1271A/μs(T_J=150℃), V_R=300V, V_{GE}=-8V	T_J=25℃		0.18		μs
			T_J=125℃		0.25		
			T_J=150℃		0.28		
I_{rr}	Peak Reverse Recovery Current		T_J=25℃		69		A
			T_J=125℃		119		
			T_J=150℃		131		
Q_{rr}	Reverse Recovery Charge		T_J=25℃		7.8		μC
			T_J=125℃		18.3		
			T_J=150℃		22.5		
E_{rec}	Reverse Recovery Energy		T_J=25℃		0.86		mJ
			T_J=125℃		3.17		
			T_J=150℃		4.37		
$R_{\theta JC}$	Diode Thermal Resistance: Junction-To-Case(per leg)				0.179		℃/W

Internal NTC- Thermistor Characteristic

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				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)			0.10		℃/W
M	Power Terminals Screw:M6		3.0		5.0	N·m
M	Mounting Screw:M6		4.0		6.0	N·m
G	Weight			230		g

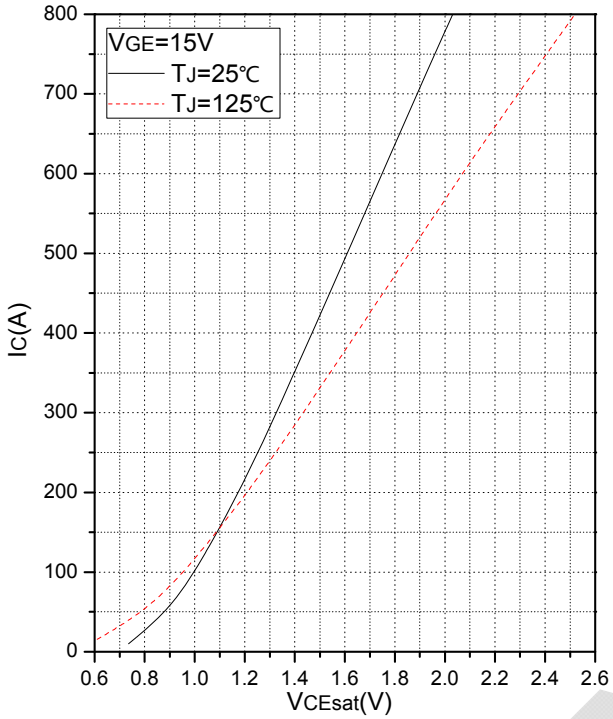


Fig.1 Typical Saturation Voltage Characteristics

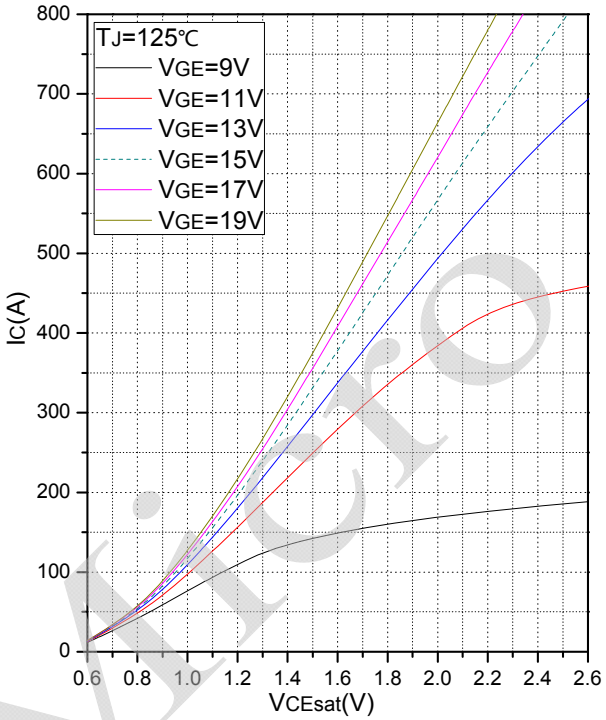


Fig.2 Typical Output Characteristics

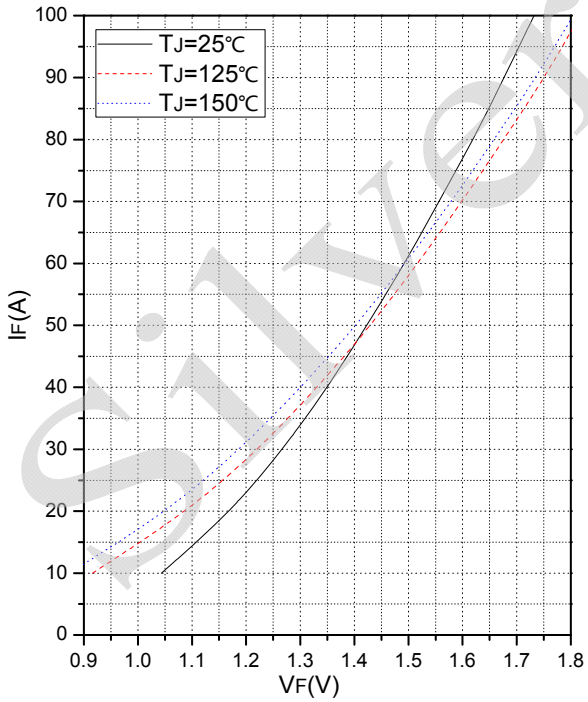


Fig.3 Forward Characteristics of FWD (Inverse)

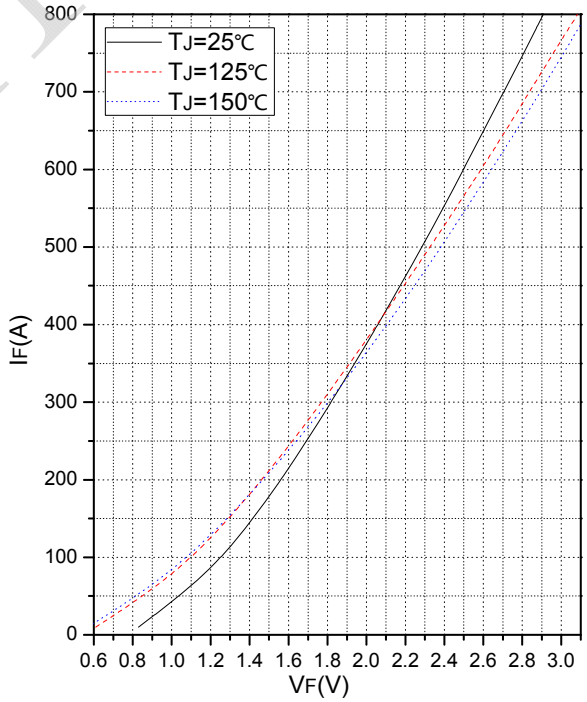


Fig.4 Forward Characteristics of FWD (Freewheeling)

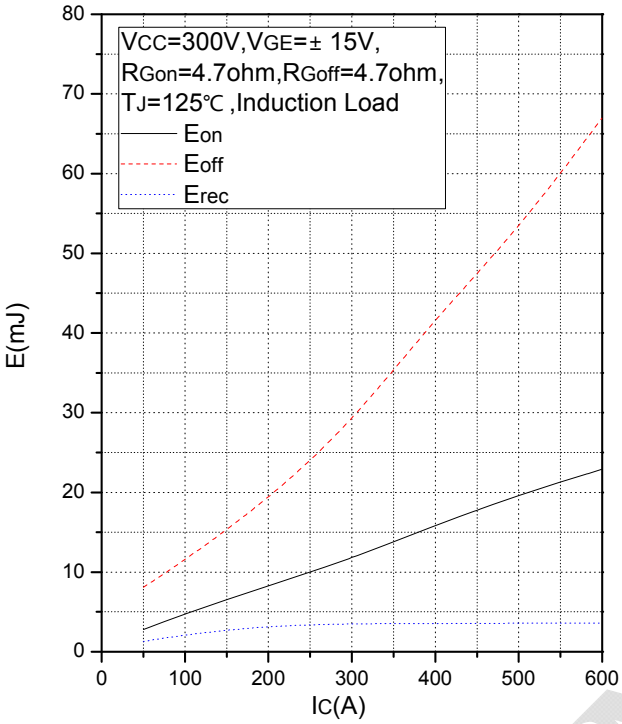


Fig.5 Typical Switching Loss vs. Collector Current

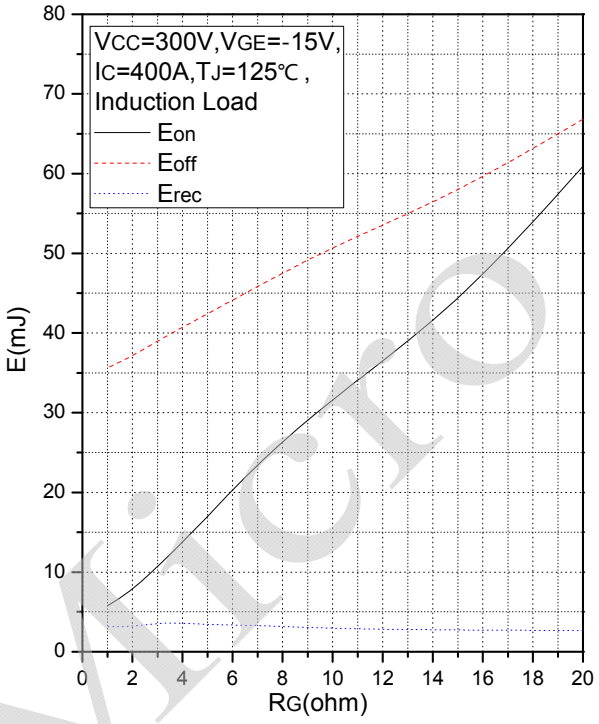


Fig.6 Typical Switching Loss vs. Gate Resistance

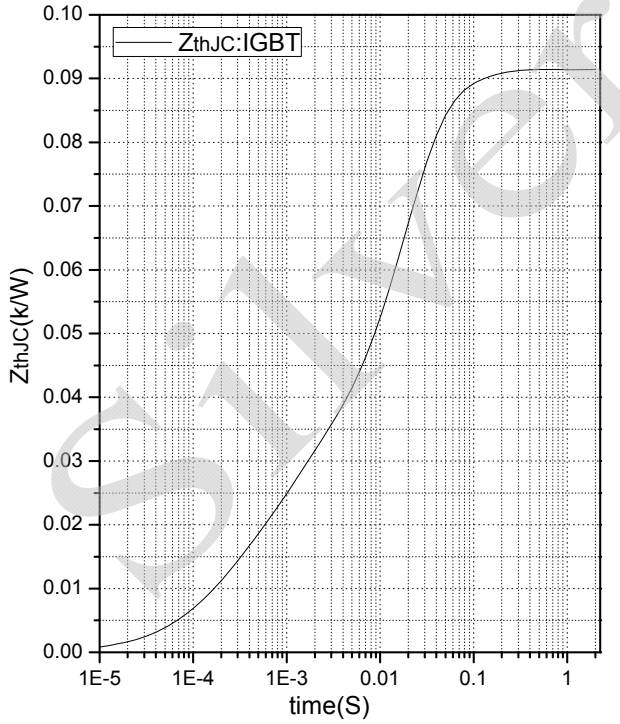


Fig.7 Transient Thermal Impedance (IGBT)

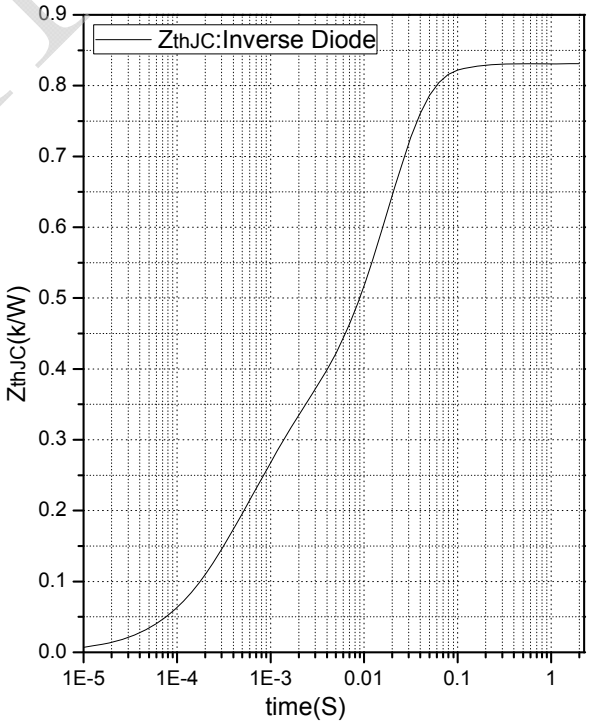


Fig.8 Transient Thermal Impedance (Inverse Diode)

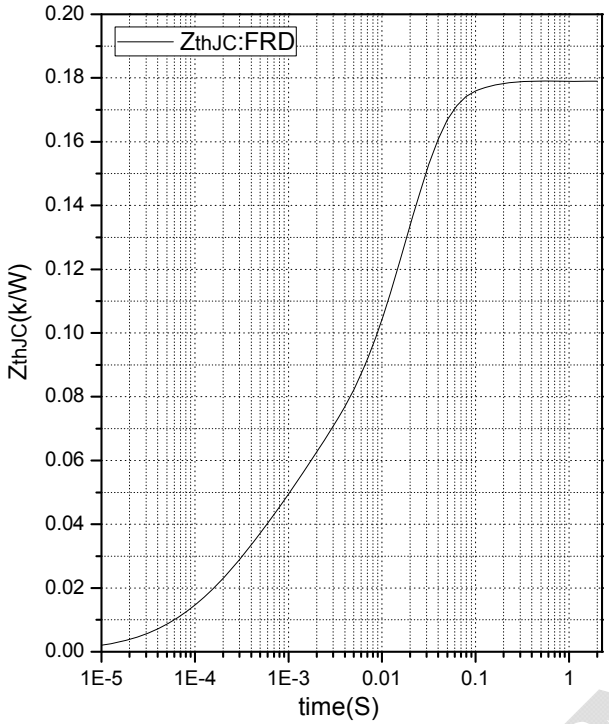


Fig.9 Transient Thermal Impedance (Freewheeling Diode)

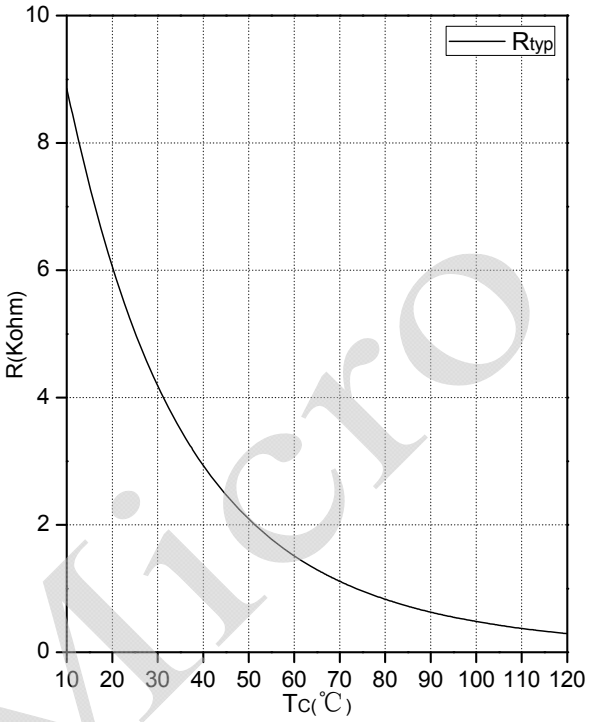


Fig.10 NTC Temperature Characteristics

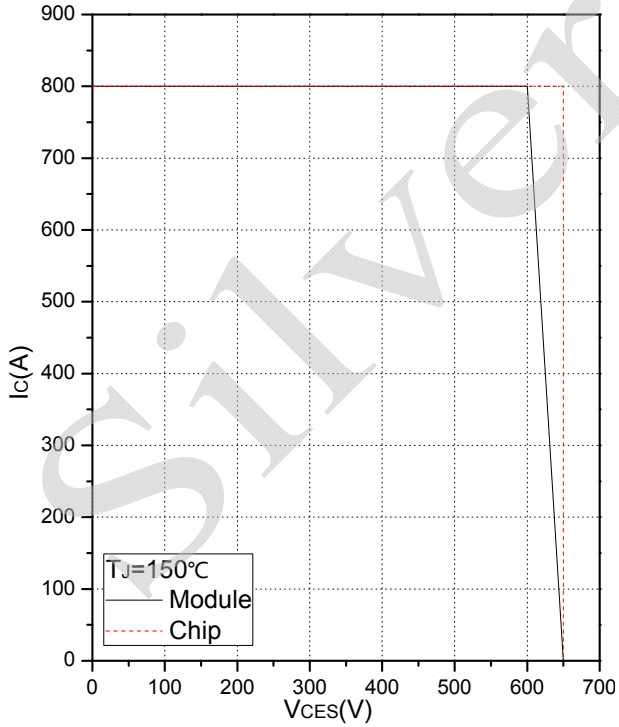
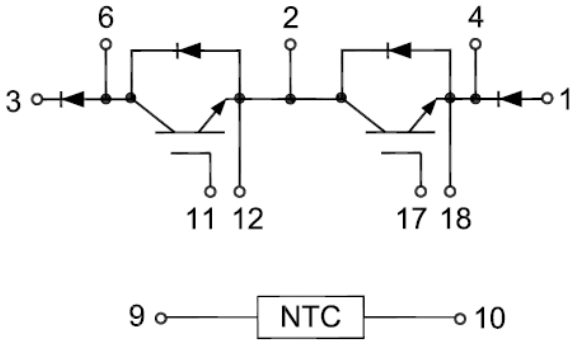
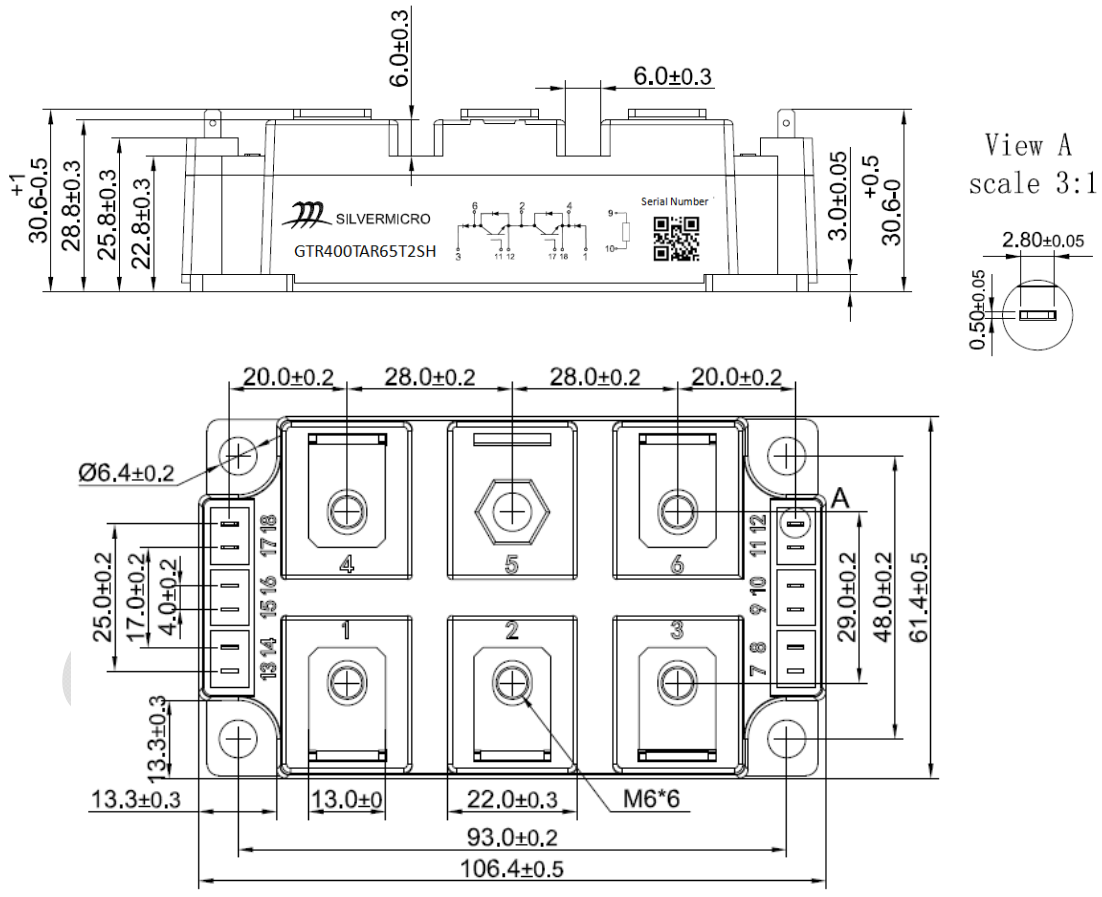


Fig.11 Reverse Bias Safe Operation Area (RBSOA)

Internal Circuit



Package Outline (Unit: mm):



Date	Revision	Notes
06/13/2018	01	Initial release
09/29/2018	02	Improved Turn off Voltage Stress

Announcement

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