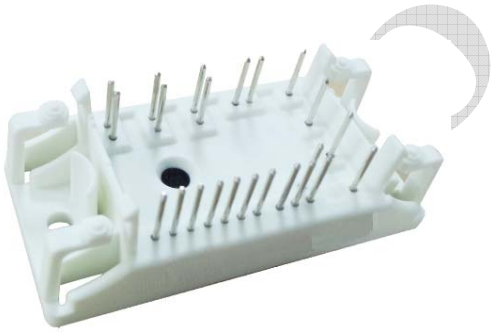
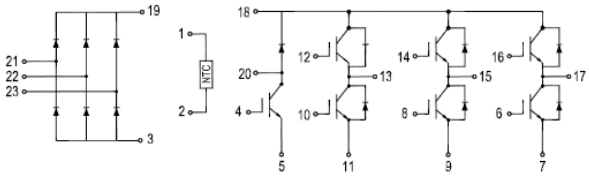
GK20PI60B2FH

IGBT Module

Features：



- Short Circuit Rated >10μs
- Low Saturation Voltage：$V_{CE\ (sat)}$ = 1.80V @ I_C =20A , 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℃,	20	A
		T_C = 25℃	40	A
I_{CM}	Repetitive Peak Collector Current	T_J = 150℃	40	A
t_{SC}	Short Circuit Withstand Time		>10	μs
P_D	Maximum Power Dissipation per IGBT	T_C = 25℃ T_{Jmax}=150℃	150	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 = 1.5mA, V_{CE} = V_{GE}		3.5	4.7	5.5	V
$V_{CE(sat)chip}$	Collector-Emitter Saturation Voltage	I_C = 20A, V_{GE} = 15V	T_J = 25℃		1.80	2.10	V
			T_J = 125℃		2.00		V
$V_{CE(sat)terminal}$	Collector-Emitter Saturation Voltage	I_C = 20A, V_{GE} = 15V	T_J = 25℃		2.00	2.30	V
			T_J = 125℃		2.35		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			0.90		nF
C_{oes}	Output Capacitance				0.03		nF

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	V_{CC} = 300V,I_C = 20A, R_G =30Ω,V_{GE} = ±15V, Inductive Load	T_J = 25℃		72.7		ns
			T_J = 125℃		76.2		
t_r	Rise Time		T_J = 25℃		34.7		ns
			T_J = 125℃		35.4		
$t_{d(off)}$	Turn-off Delay Time		T_J = 25℃		110		ns
			T_J = 125℃		110.5		
t_f	Fall Time		T_J = 25℃		138		ns
			T_J = 125℃		140		
E_{on}	Turn-on Switching Loss		T_J = 25℃		0.46		mJ
			T_J = 125℃		0.54		
E_{off}	Turn-off Switching Loss		T_J = 25℃		0.18		mJ
			T_J = 125℃		0.21		
Q_g	Total Gate Charge		T_J = 25℃		130		nC
RBSOA	Reverse Bias Safe Operation Area	I_C=40A,V_{CC}=480V,Vp=600V, Rg = 30Ω, 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				0.842		℃/W

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	20	A
I_{FM}	Diode Maximum Forward Current	40	A

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

Symbol	Description	Conditions		Min	Typ	Max	Unit
$V_{FM(terminal)}$	Forward Voltage	I_F =20A	T_J = 25℃		1.70		V
			T_J = 125℃		1.75		
I_{rr}	Peak Reverse Recovery Current	I_F＝20A, di/dt =600A/μs, V_{rr} =300V, V_{GE} = -15V	T_J = 25℃		16.5		A
			T_J = 125℃		17		
Q_{rr}	Reverse Recovery Charge		T_J = 25℃		0.68		μC
			T_J = 125℃		1.07		
E_{rec}	Reverse Recovery Energy		T_J = 25℃		0.21		mJ
			T_J = 125℃		0.28		
$R_{\theta JC}$	Diode Thermal Resistance: Junction-To-Case				1.630		℃/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℃	20	A
		T_C = 25℃	40	A
I_{CM}	Repetitive Peak Collector Current	T_J = 150℃	40	A
t_{SC}	Short Circuit Withstand Time		>10	μs
P_D	Maximum Power Dissipation per IGBT	T_C = 25℃ T_{Jmax}=150℃	150	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 = 1.5mA, V_{CE} = V_{GE}		3.5	4.7	5.5	V
$V_{CE(sat)chip}$	Collector-Emitter Saturation Voltage	I_C = 20A, V_{GE} = 15V	T_J = 25℃		1.80	2.10	V
			T_J = 125℃		2.00		V
$V_{CE(sat)terminal}$	Collector-Emitter Saturation Voltage	I_C = 20A, V_{GE} = 15V	T_J = 25℃		2.00	2.30	V
			T_J = 125℃		2.35		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			0.90		nF
C_{oes}	Output Capacitance				0.03		nF

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	V_{CC} = 300V,I_C = 20A, R_G =30Ω,V_{GE} = ±15V, Inductive Load	T_J = 25℃		72.7		ns
			T_J = 125℃		76.2		
t_r	Rise Time		T_J = 25℃		34.7		ns
			T_J = 125℃		35.4		
$t_{d(off)}$	Turn-off Delay Time		T_J = 25℃		110		ns
			T_J = 125℃		110.5		
t_f	Fall Time		T_J = 25℃		138		ns
			T_J = 125℃		140		
E_{on}	Turn-on Switching Loss		T_J = 25℃		0.46		mJ
			T_J = 125℃		0.54		
E_{off}	Turn-off Switching Loss		T_J = 25℃		0.18		mJ
			T_J = 125℃		0.21		
Q_g	Total Gate Charge		T_J = 25℃		130		nC
RBSOA	Reverse Bias Safe Operation Area	I_C=40A,V_{CC}=480V,Vp=600V, Rg = 30Ω, 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				0.842		℃/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	20	A
I_{FM}	Diode Maximum Forward Current	40	A

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

Symbol	Description	Conditions		Min	Typ	Max	Unit
$V_{FM(terminal)}$	Forward Voltage	I_F =20A	T_J = 25℃		1.70		V
			T_J = 125℃		1.75		
I_{rr}	Peak Reverse Recovery Current	I_F＝20A, di/dt =600A/μs, V_{rr} = 300V, V_{GE} = -15V	T_J = 25℃		16.5		A
			T_J = 125℃		17		
Q_{rr}	Reverse Recovery Charge		T_J = 25℃		0.68		μC
			T_J = 125℃		1.07		
E_{rec}	Reverse Recovery Energy		T_J = 25℃		0.21		mJ
			T_J = 125℃		0.28		
$R_{\theta JC}$	Diode Thermal Resistance: Junction-To-Case				1.630		℃/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℃	20	A
I_{RMSM}	Maximum RMS Current at Rectifier Output	T_J =80℃	30	A
I_{FSM}	Surge Current @t_p=10 ms	T_J =25℃	300	A
		T_J =150℃	250	
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 = 20 A	T_J =25℃	1.05			V
			T_J =150℃	1.00			
I_R	Reverse Current	V_R=1200V	T_J =25℃			1	mA
$R_{\theta JC}$	Diode Thermal Resistance: Junction-To-Case				0.870		℃/W

Internal NTC-Thermistor Characteristics

R_{25}	T_C =25℃	22.7		kΩ
△R/R	T_C =100℃， R_{100} =1481 KΩ		±3	%
P_{25}	T_C =25℃	200		mW
$B_{25/50}$	$R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298.15K))]$	3950		K
$B_{25/80}$	$R_2=R_{25}\exp[B_{25/100}(1/T_2-1/(298.15K))]$	4000		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 Thermally (Conductive Grease Applied)			0.1		℃/W
T	Power Terminals Screw:M4		1.0		1.5	N·m
G	Weight			24		g

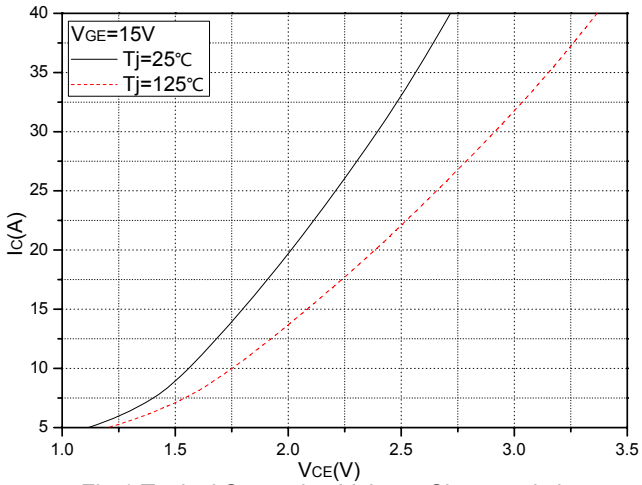


Fig.1 Typical Saturation Voltage Characteristics (Inverter-terminal)

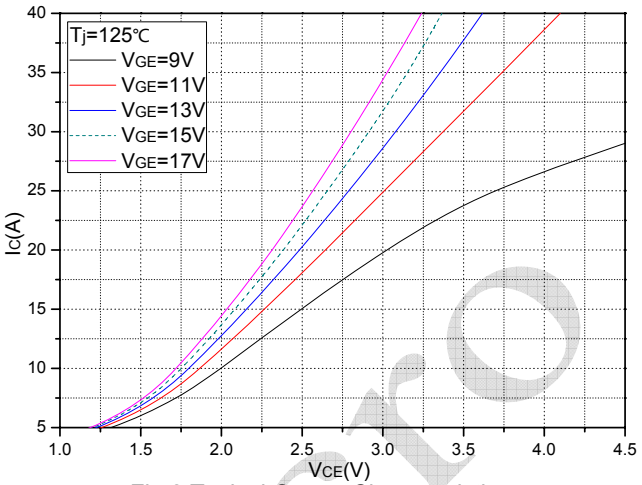


Fig.2 Typical Output Characteristics (Inverter-terminal)

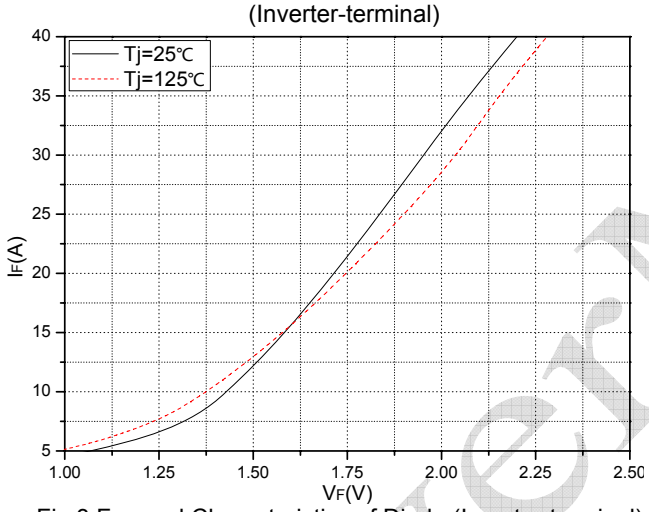


Fig.3 Forward Characteristics of Diode (Inverter-terminal)

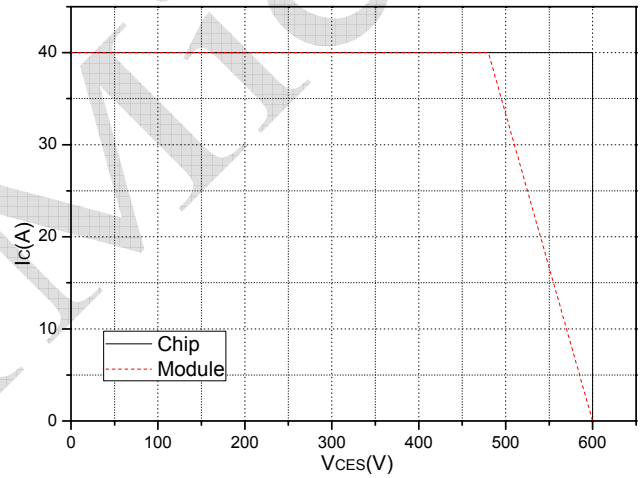


Fig.4 Reverse Bias Safe Operation Area (RBSOA)

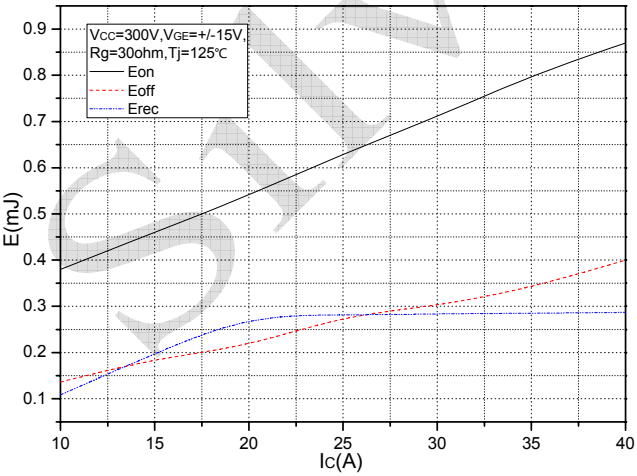


Fig.5 Typical Switching Loss vs. Collector Current

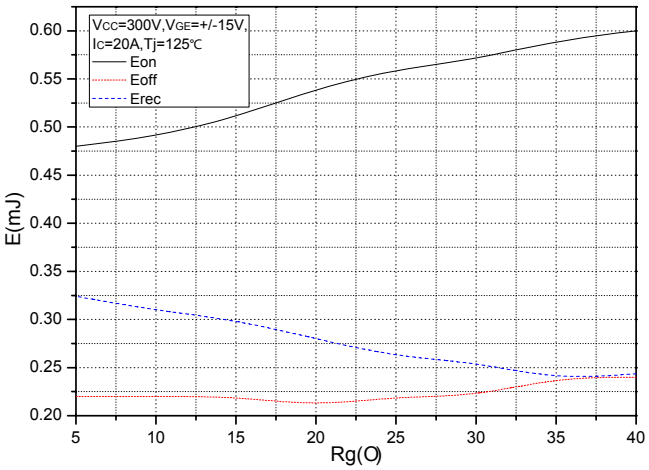


Fig.6 Typical Switching Loss vs. Gate Resistance

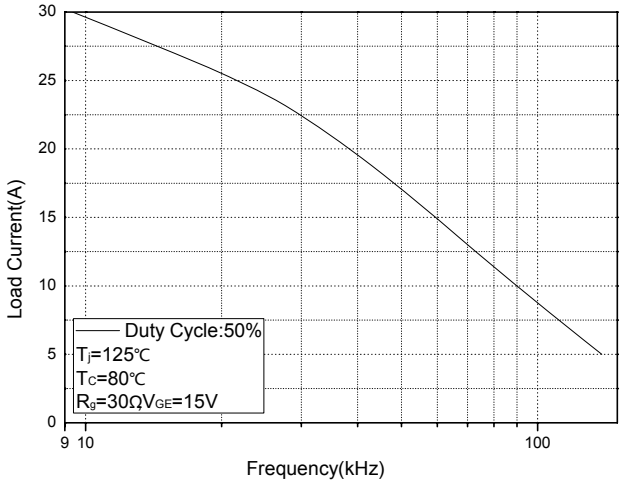


Fig.7 Typical Load Current vs. Frequency

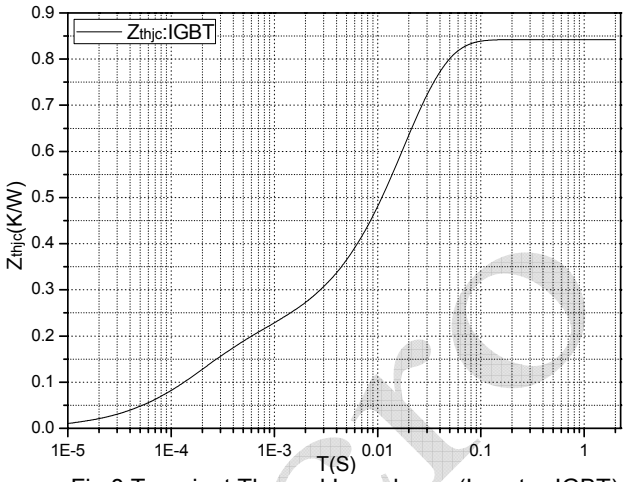


Fig.8 Transient Thermal Impedance (Inverter-IGBT)

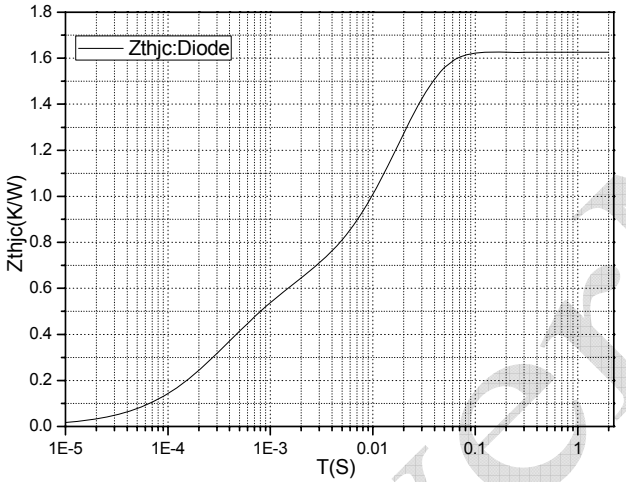


Fig.9 Transient Thermal Impedance (Inverter- Diode)

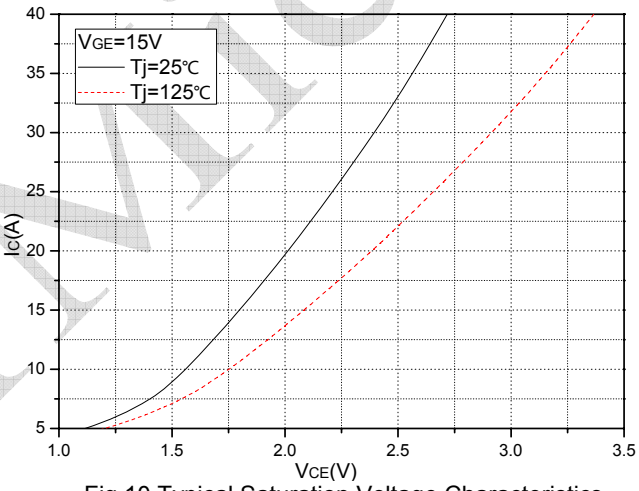


Fig.10 Typical Saturation Voltage Characteristics (Brake-Chopper-terminal)

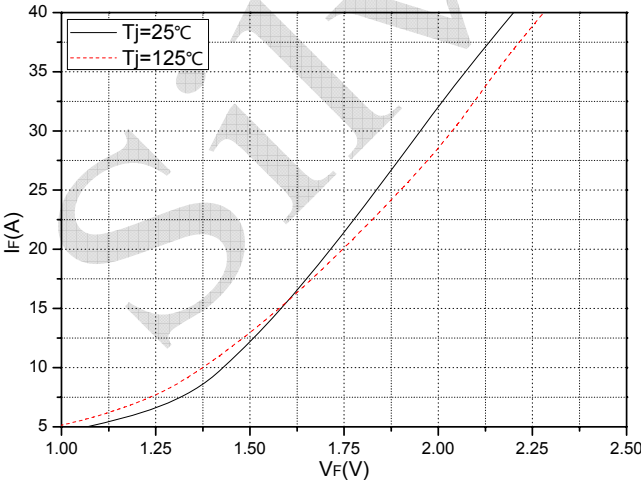


Fig.11 Forward Characteristics of FWD (Brake-Chopper-terminal)

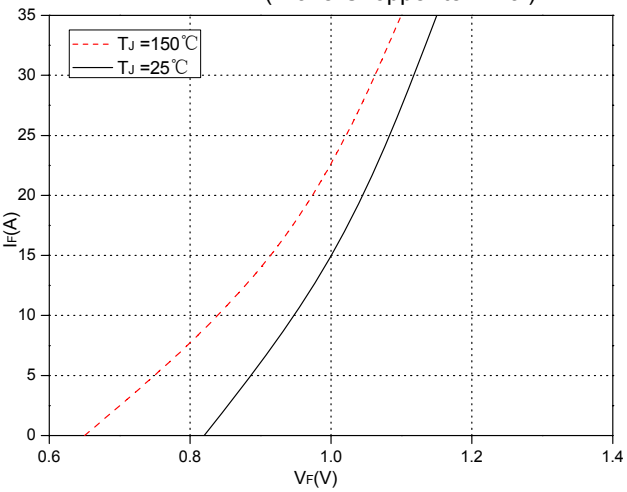


Fig.12 Forward Characteristics of Diode (Rectifier)

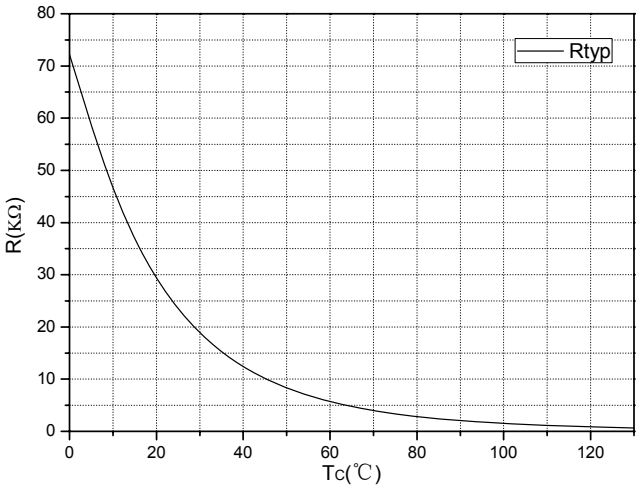
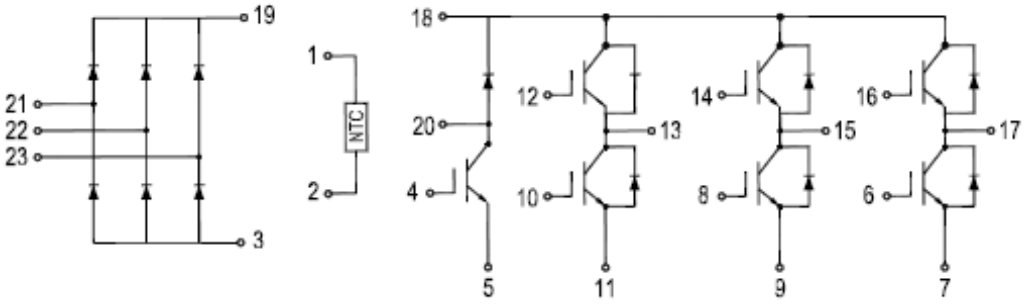
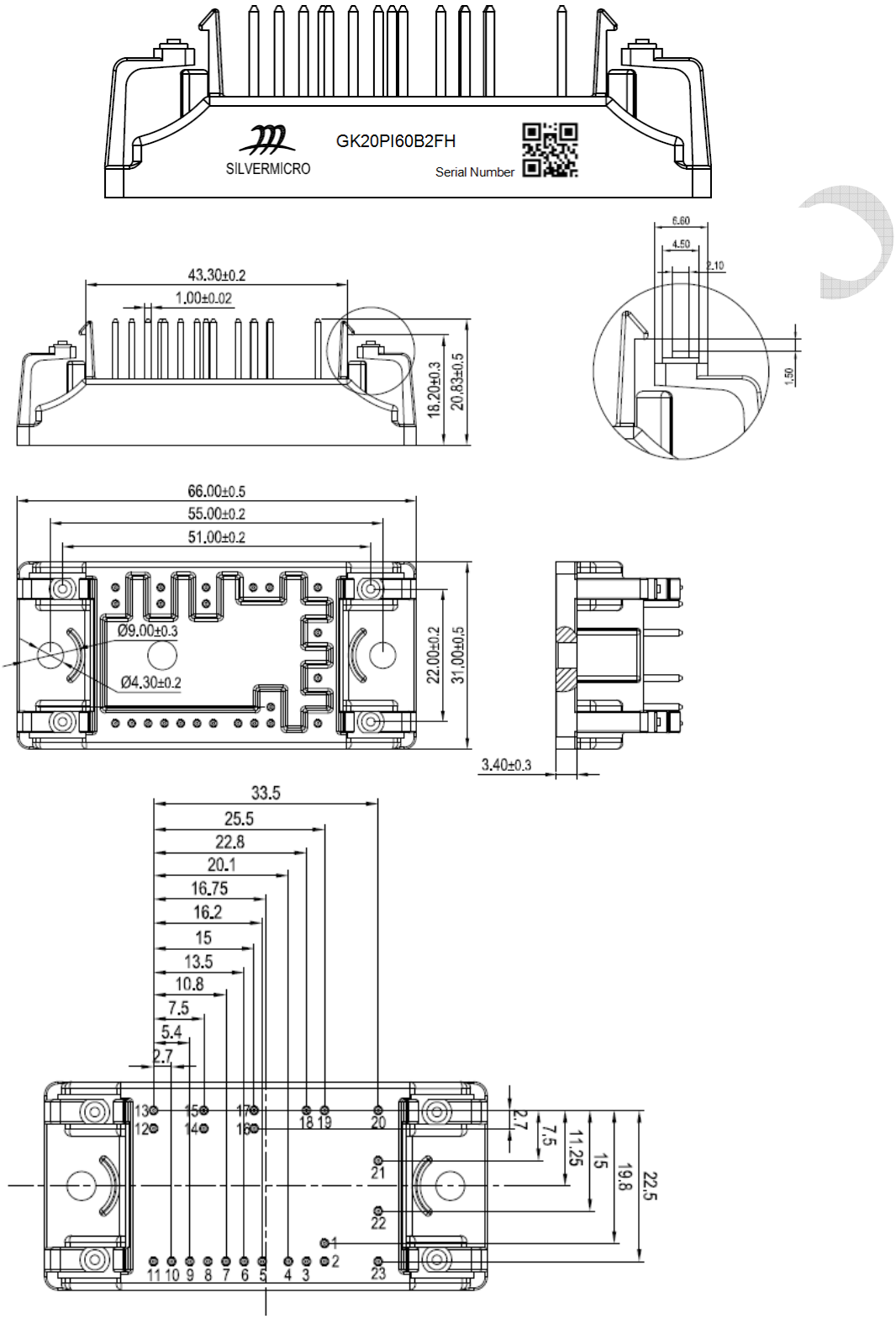


Fig.13 NTC Temperature Characteristics

Internal Circuit



Package Outline (Unit: mm):



Announcement

Information in this document is believed to be accurate and reliable. However, NJSME does not give any representations or warranties, expressed or implied, as to the accuracy or completeness of such information and shall have no liability for the consequences of use of such information.

Right to Make Changes

NJSME reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.