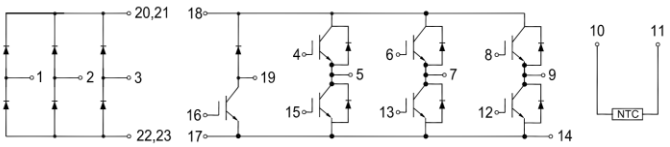
GK35PI60T5H-T4

IGBT Module

Preliminary Data

Features：



- Non Punch Through (NPT) Technology
- 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：

- 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℃	50	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 per IGBT	T_C = 25℃ T_{Jmax}=150℃	190	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, R_G = 20Ω, 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=70A, V_{CC}=480V, Vp=600V, R_G = 20Ω, 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	

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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
$R_{\theta JC}$	Diode Thermal Resistance: Junction-To-Case					0.89	℃/W

Internal NTC-Thermistor Characteristics

Symbol	Description		Min.	Typ.	Max.	Units.
R_{25}	Rated Resistance	T_C=25℃		5		kΩ
△R/R	Deviation of R100	T_C=100℃，R_{100}=481Ω	-5		5	%
P_{25}	Power Dissipation	T_C=25℃			10	mW
$B_{25/50}$	B-Value	$R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298.15K))]$		3380		K
$B_{25/80}$	B-Value	$R_2=R_{25}\exp[B_{25/80}(1/T_2-1/(298.15K))]$		3440		K
$B_{25/100}$	B-Value	$R_2=R_{25}\exp[B_{25/100}(1/T_2-1/(298.15K))]$		3545		K

Module

Symbol	Description		Min	Typ	Max	Unit
V_{iso}	Isolation Voltage (All Terminals Shorted)	RMS, 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)				0.03	℃/W
M	Mounting Torque for Module Mounting	Screw M5--Mounting according to valid application note	3.0		5.0	N·m
G	Weight			190		g

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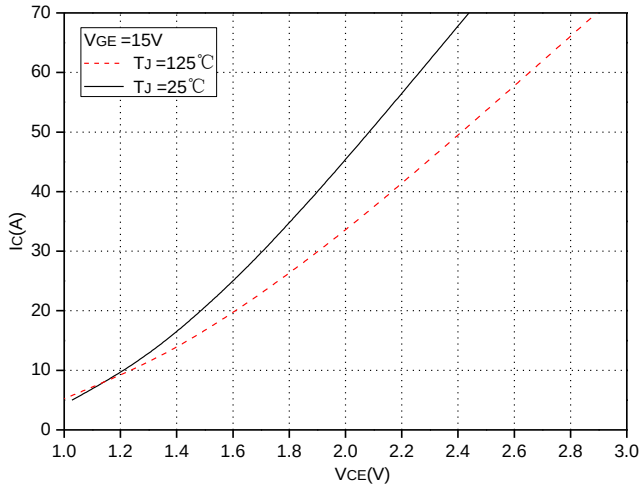

Fig.1 Typical Saturation Voltage Characteristics

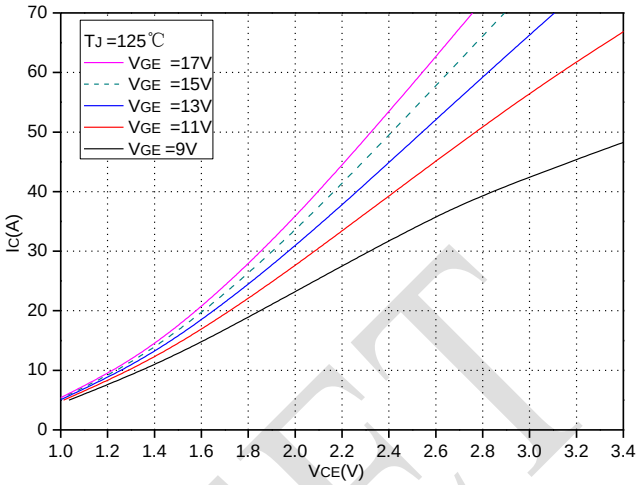

Fig.2 Typical Output Characteristics

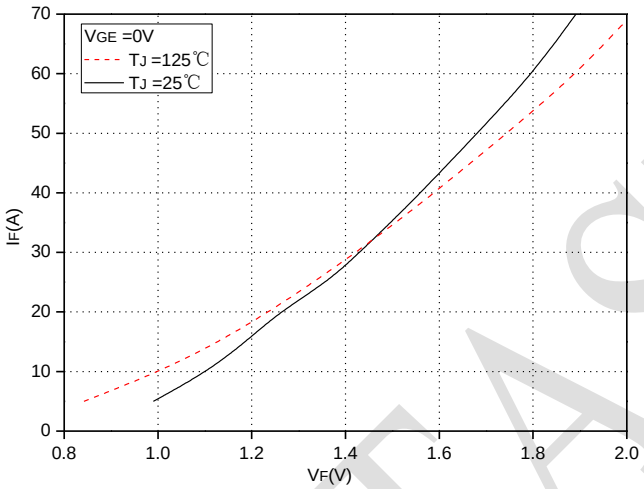

Fig.3 Forward Characteristics of FWD

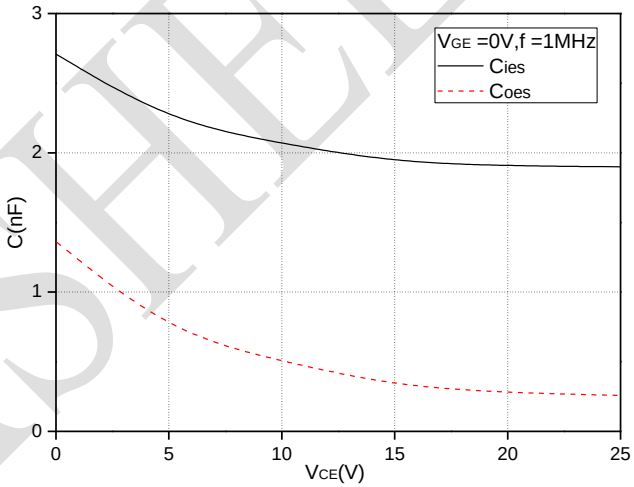

Fig.4 Capacitance Characteristics

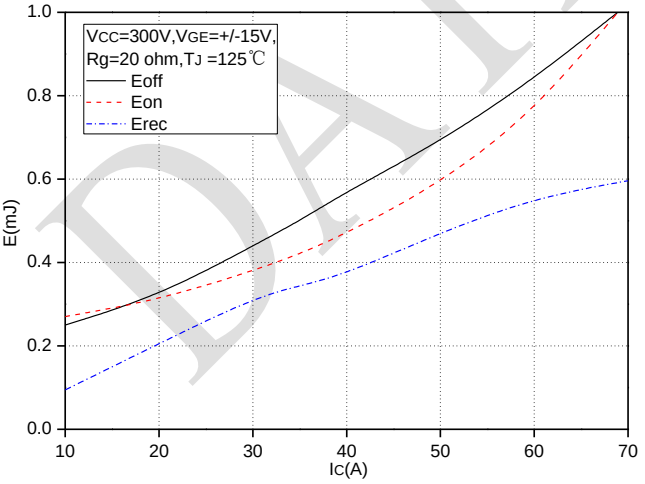

Fig.5 Typical Switching Loss vs. Collector Current

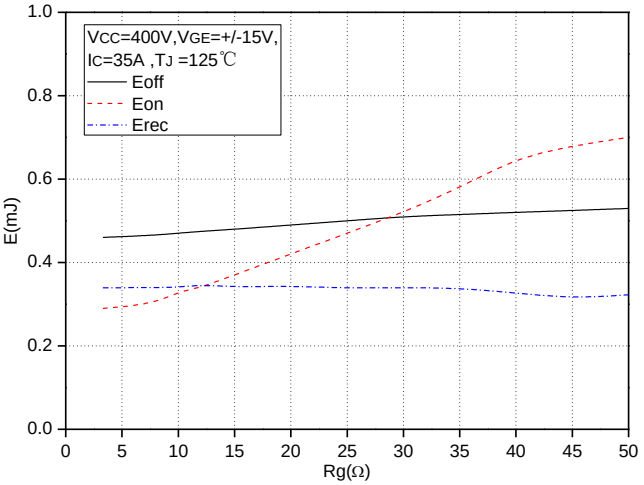

Fig.6 Typical Switching Loss vs. Gate Resistance

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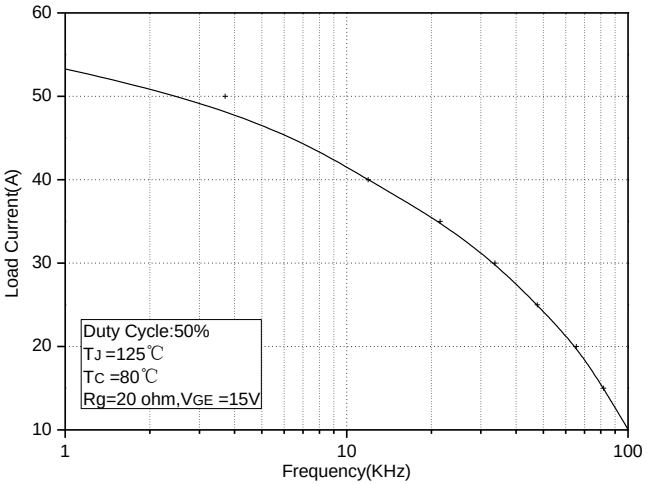

Fig.7 Typical Load Current vs. Frequency

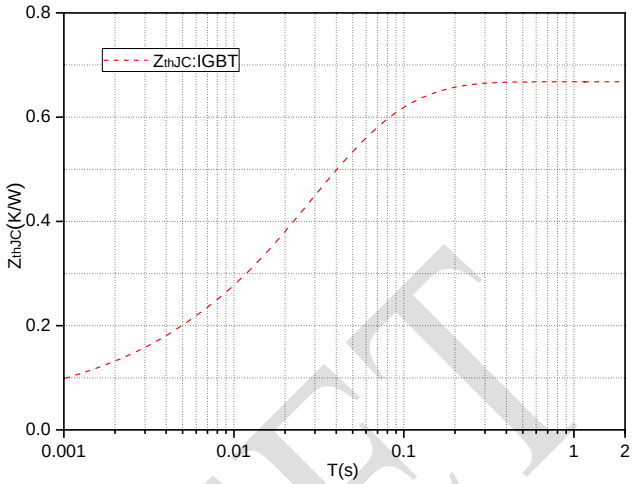

Fig.8 Transient Thermal Impedance (IGBT)

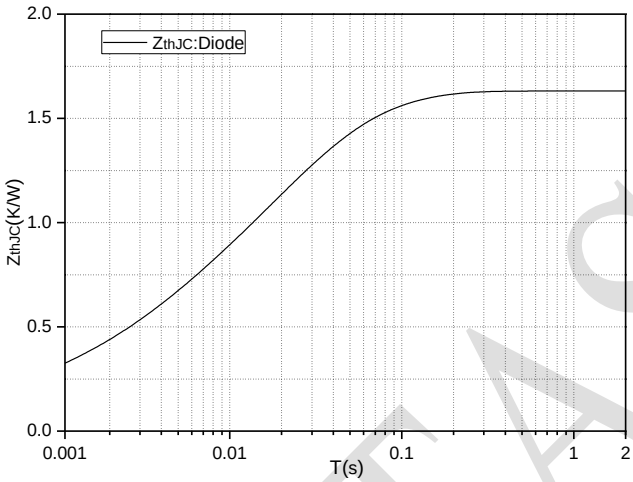

Fig.9 Transient Thermal Impedance (Diode)

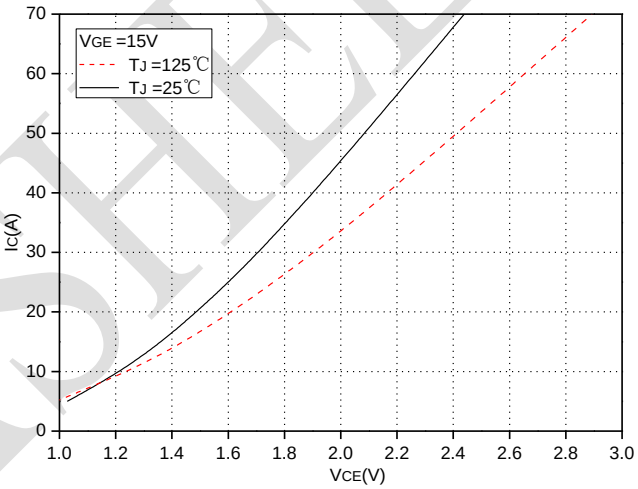

Fig.10 Typical Saturation Voltage Characteristics (Brake-Chopper)

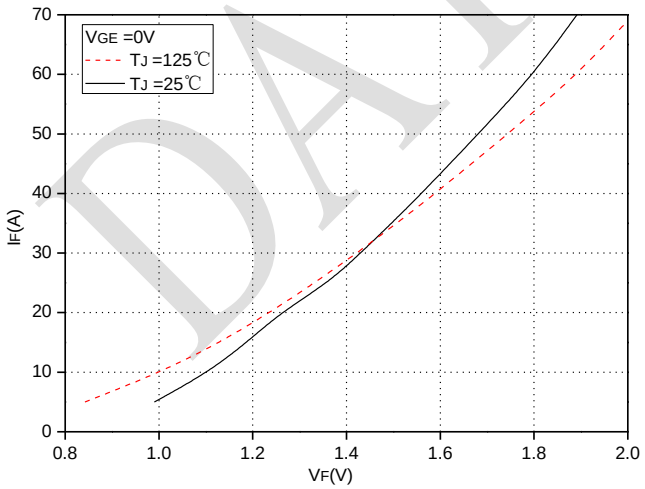

Fig.11 Forward Characteristics of FWD (Brake-Chopper)

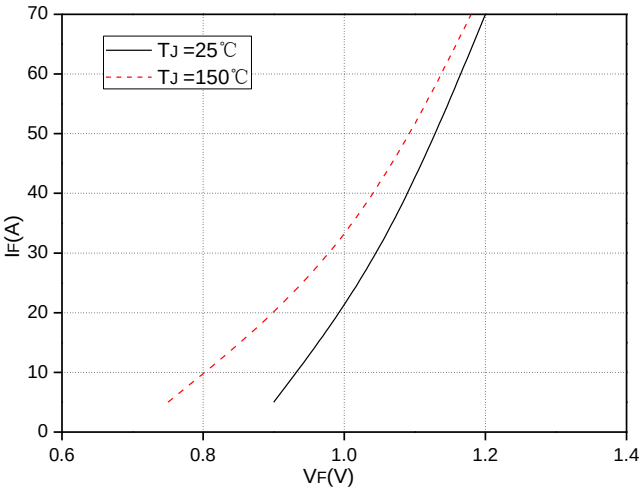

Fig.12 Forward Characteristics of Diode (Rectifier)

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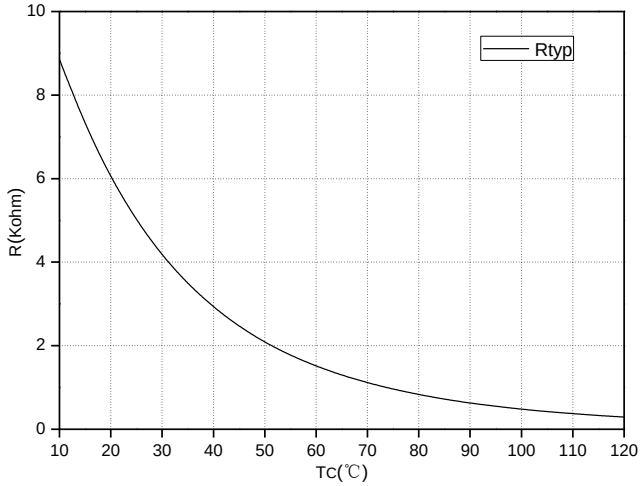

Fig.13 NTC Temperature Characteristics

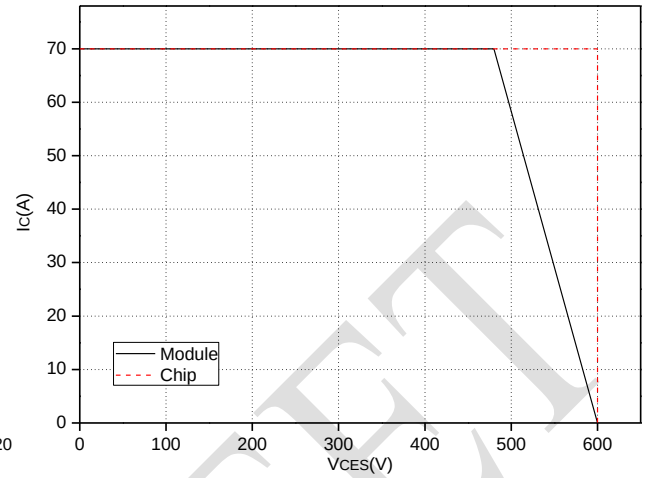

Fig.14 Reverse Bias Safe Operation Area (RBSOA)

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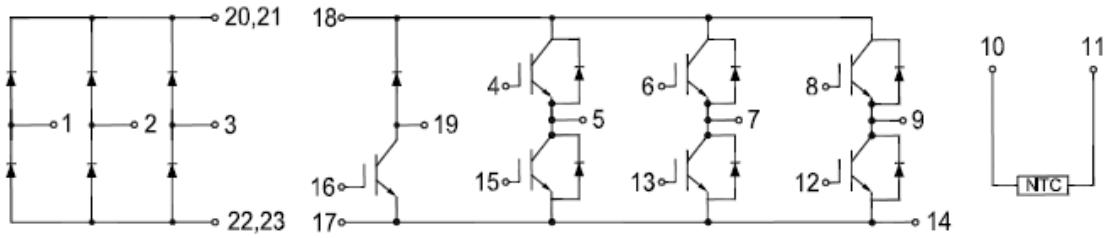
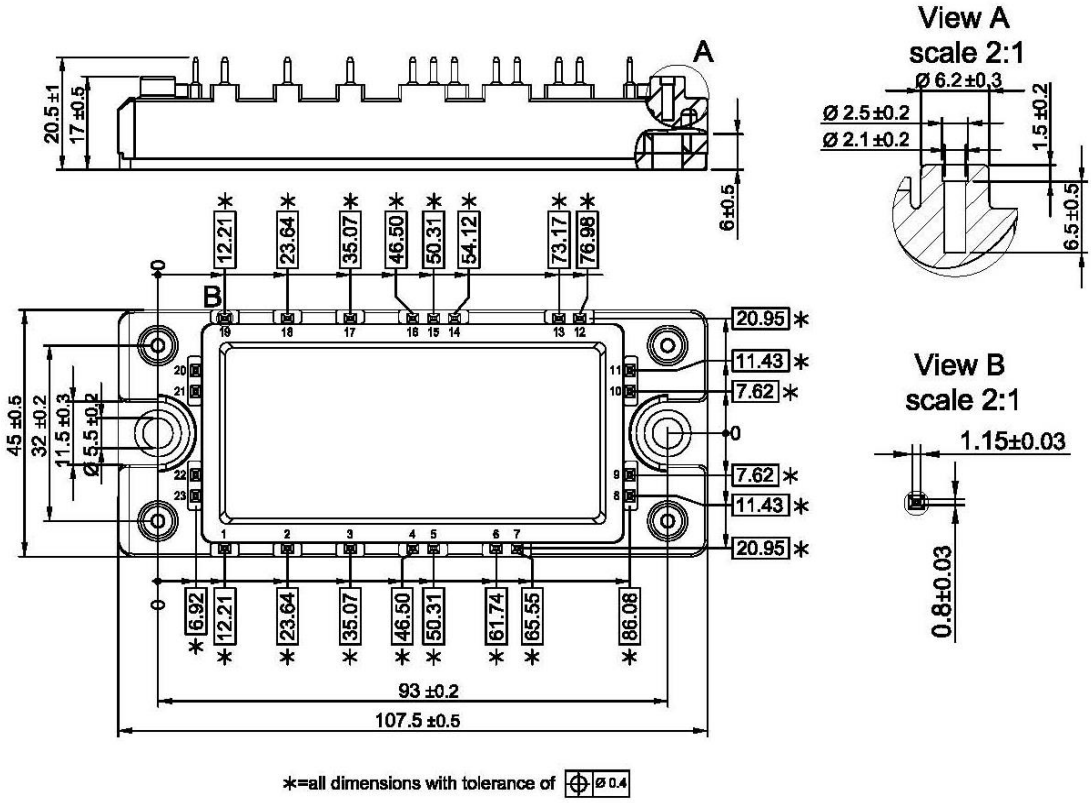
Internal Circuit:



Package Outline (Unit: mm):



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Announcement

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