TXG100PI120S6K

S6 Module with low loss IGBT and Fast recovery diode.

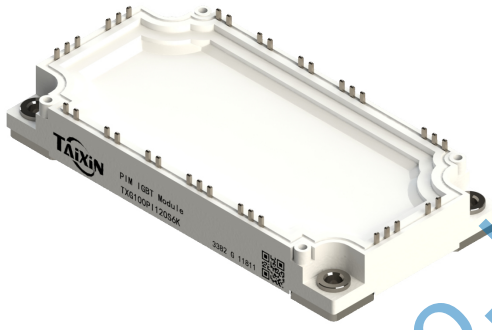
Feature

- Low $V_{CE(sat)}$ Trench IGBT technology
- 10μs short circuit capability
- Maximum junction temperature 175℃

Applications

- Inverter for motor drive
- AC and DC servo drive amplifier
- Uninterruptible power supply

Appearance



Maximum Ratings of Inverter IGBT (T_{vj}=25 ℃ unless otherwise noted)

Items	Symbol	Conditions	Maximum Rating	Units
Collector-emitter voltage	V_{CES}		1200	V
Gate-emitter voltage	V_{GES}		±20	V
Collector current	I_C	T_{vj}=25℃	200	A
		T_{vj}=100℃	100	A
Pulsed collector current	I_{CM}	t_P=1ms	200	A
Short circuit current	I_{sc}	V_{GE}≤15V,V_{CC}=900V,t_P≤10us V_{CEmax}=V_{CES}-L_{sCE} ·di/dt	400	A
Maximum power dissipation	P_D	T_c=25℃,T_{vj}=150℃	515	W

Electrical Characteristics of Inverter IGBT (T_{vj}=25 ℃ unless otherwise noted)

Items	Symbol	Conditions	Min.	typ.	Max.	Units
Collector-emitter breakdown voltage	V_{CES}	V_{GE}=0V,I_C=1mA	1200			V
Collector -emitter leakage current	I_{CES}	V_{CE}=1200V,V_{GE}=0V			1.0	mA
Gate leakage current, forward	I_{GES}	V_{GE}=20V,V_{CE}=0V			100	nA
		V_{GE}=-20V,V_{CE}=0V			-100	nA
Gate threshold voltage	$V_{GE(th)}$	V_{GE}=V_{CE},I_C=3.80mA	5.2	5.8	6.4	V
Collector-emitter saturation voltage	$V_{CE(sat)}$	V_{GE}=15V,I_C=100A,T_{vj}=25℃		1.75	2.20	V
		V_{GE}=15V,I_C=100A,T_{vj}=125℃		2.05		V
Integrated gate resistor	R_{Gint}	f=1M,V_{pp}=1V		7.5		Ω
Input capacitance	C_{ies}	V_{CE}=25V V_{GE}=0V f=1MHz		6.30		nF
Output capacitance	C_{oes}			0.58		nF
Reverse transfer capacitance	C_{res}			0.10		nF
Total gate charge	Q_g	V_{GE}=±15V		0.8		μC
Turn-on delay time	$t_{d(on)}$	V_{CC}=600V V_{GE}=±15V I_C=100A R_G=1.6Ω Inductive Load T_{vj}=25℃		160		ns
Rise time	t_r			30		ns
Turn-off delay time	$t_{d(off)}$			330		ns
Fall time	t_f			80		ns
Turn-on energy loss per pulse	E_{on}			5.50		mJ
Turn-off energy loss per pulse	E_{off}			5.50		mJ
Turn-on delay time	$t_{d(on)}$	V_{CC}=600V V_{GE}=±15V I_C=100A R_G=1.6Ω Inductive Load T_{vj}=125℃		170		ns
Rise time	t_r			40		ns
Turn-off delay time	$t_{d(off)}$			430		ns
Fall time	t_f			150		ns
Turn-on energy loss per pulse	E_{on}			8.5		mJ
Turn-off energy loss per pulse	E_{off}			8.5		mJ
Temperature under switching conditions	$T_{vj\ op}$		-40		150	℃

Maximum Ratings of Inverter Diode

Items	Symbol	Conditions	Maximum Rating	Units
Repetitive peak reverse voltage	V_{RRM}	T_{vj}=25℃	1200	V
Diode continuous forward current	I_F	T_{vj}=25℃	200	A
		T_{vj}=100℃	100	A
Diode maximum forward current	I_{FM}	t_P=1ms,T_{vj}=25℃	200	A

Electrical s Characteristics of Inverter Diode (T_{vj}=25℃ unless otherwise noted)

Items	Symbol	Conditions	Min.	typ.	Max.	Units
Diode forward voltage	V_F	I_F=100A,V_{GE} = 0 V,T_{vj}=25℃		1.70	2.15	V
		I_F=100A,V_{GE} = 0 V,Tvj=125℃		1.65		V
Diode peak reverse recovery current	I_{rr}	V_{CE}=600V,I_F=100A,V_{GE} =-15 V		115		A
Diode reverse recovery charge	Q_{rr}	d_{IF}/d_t=3000A/μs		9.50		μC
Reverse recovery energy	E_{rec}	T_{vj}=25℃		3.50		mJ
Diode peak reverse recovery current	I_{rr}	V_{CE}=600V,I_F=100A,V_{GE} = -15 V		125		A
Diode reverse recovery charge	Q_{rr}	d_{IF}/dt=3000A/μs		17.5		μC
Reverse recovery energy	E_{rec}	T_{vj}=125℃		6.00		mJ

Maximum Ratings of Rectifier Diode

Items	Symbol	Conditions	Maximum Rating	Units
Repetitive peak reverse voltage	V_{RRM}	T_C=25℃	1600	V
Maximum RMS forward current per chip	I_{FRMSM}	T_C=80℃	100	A
Maximum RMS current at rectifier output	I_{RMSM}	T_C=80℃	150	A
Surge forward current	I_{FSM}	T_{vj}=150℃,t_p=10ms	880	A
I^2t - value	I^2t	T_{vj}=150°C,t_p=10ms	3850	A^2s

Electrical s Characteristics of Rectifier Diode (T_{vj}=25℃ unless otherwise noted)

Items	Symbol	Conditions	Min.	typ.	Max.	Units
Forward voltage	V_F	I_F=100A,T_{vj}=150℃		1.00		V
Reverse current	I_r	V_R=1600V,T_{vj}=150℃		1.00		mA
Temperature under switching conditions	$T_{vj\ op}$		-40		150	℃

Maximum Ratings of Inverter Brake IGBT (T_{vj}=25 ℃ unless otherwise noted)

Items	Symbol	Conditions	Maximum Rating	Units
Collector-emitter voltage	V_{CES}		1200	V
Gate-emitter voltage	V_{GES}		±20	V
Collector current	I_C	T_{vj}=25℃	100	A
		T_{vj}=175℃	50	A
Pulsed collector current	I_{CM}	t_P=1ms	100	A
Short circuit current	I_{sc}	V_{GE}≤15V,V_{CC}=900V,T_{vj}=125 °C V_{CEmax}=V_{CES}-L_{sCE} ·	180	A
Maximum power dissipation	P_D	T_c=25℃,T_{vj}=175℃	280	W

Electrical Characteristics of Brake IGBT (T_{vj}=25 ℃ unless otherwise noted)

Items	Symbol	Conditions	Min.	typ.	Max.	Units
Collector-emitter breakdown voltage	V_{CES}	V_{GE}=0V,I_C=1mA	1200			V
Collector -emitter leakage current	I_{CES}	V_{CE}=1200V,V_{GE}=0V			1.0	mA
Gate leakage current, forward	I_{GES}	V_{GE}=20V,V_{CE}=0V			100	nA
		V_{GE}=-20V,V_{CE}=0V			-100	nA
Gate threshold voltage	$V_{GE(th)}$	V_{GE}=V_{CE},I_C=1.6mA	5.2	5.8	6.5	V
Collector-emitter saturation voltage	$V_{CE(sat)}$	V_{GE}=15V,I_C=50A,T_{vj}=25℃		1.85	2.25	V
		V_{GE}=15V,I_C=50A,T_{vj}=125℃		2.15		V
Integrated gate resistor	R_{Gint}	f=1M;V_{pp}=1V		4.0		Ω
Input capacitance	C_{ies}	V_{CE}=25V		2.80		nF
Output capacitance	C_{oes}	V_{GE}=0V		0.20		nF
Reverse transfer capacitance	C_{res}	f=1MHz		0.10		nF
Total gate charge	Q_g	V_{CC}=600V， V_{GE}=±15V,I_C=50A		0.38		μC
Turn-on delay time	$t_{d(on)}$	V_{CC}=600V		160		ns
Rise time	t_r	V_{GE}=±15V		30		ns
Turn-off delay time	$t_{d(off)}$	I_C=50A		330		ns
Fall time	t_f	R_G=15Ω		80		ns
Turn-on energy loss per pulse	E_{on}	Inductive Load		5.70		mJ
Turn-off energy loss per pulse	E_{off}	T_{vj}=25℃		2.80		mJ
Turn-on delay time	$t_{d(on)}$	V_{CC}=600V		170		ns
Rise time	t_r	V_{GE}=±15V		40		ns
Turn-off delay time	$t_{d(off)}$	I_C=50A		430		ns
Fall time	t_f	R_G=15Ω		150		ns
Turn-on energy loss per pulse	E_{on}	Inductive Load		7.70		mJ
Turn-off energy loss per pulse	E_{off}	T_{vj}=125℃		4.30		mJ
Temperature under switching conditions	$T_{vj\ op}$		-40		150	℃

Maximum Ratings of Brake Diode

Items	Symbol	Conditions	Maximum Rating	Units
Repetitive peak reverse voltage	V_{RRM}	T_{vj}=25℃	1200	V
Diode continuous forward current	I_F	T_{vj}=25℃	50	A
		T_{vj}=100℃	25	A
Diode maximum forward current	I_{FM}	t_P=1ms,T_{vj}=25℃	50	A

Electrical s Characteristics of Brake Diode (T_{vj}=25℃ unless otherwise noted)

Items	Symbol	Conditions	Min.	typ.	Max.	Units
Diode forward voltage	V_F	I_F=25A,V_{GE}=0V,T_{vj}=25℃		1.75	2.25	V
		I_F=25A,V_{GE}=0V,T_{vj}=125℃		1.75		V
Diode peak reverse recovery current	I_{rr}	V_{CE}=600V,I_F=25A		39.0		A
Diode reverse recovery charge	Q_{rr}	dI_F/dt=1200A/μs		2.40		μC
Reverse recovery energy	E_{rec}	T_{vj}=25℃		0.90		mJ
Diode peak reverse recovery current	I_{rr}	V_{CE}=600V,IF=25A		40.0		A
Diode reverse recovery charge	Q_{rr}	dI_F/dt=1200A/μs		4.10		μC
Reverse recovery energy	E_{rec}	T_{vj}=125℃		1.50		mJ

Characteristics of NTC (T_{vj}=25℃ unless otherwise noted)

Items	Symbol	Conditions	Min.	typ.	Max.	Units
Rated resistance	R_{25}			5.00		KΩ
Deviation of R100	△R/R	T_C = 100°C, R_{100} = 493 W	-5		5	%
Power dissipation	P_{25}				20.0	mW
B-value	$B_{25/50}$	$R_2=R_{25}$ exp [$B_{25/50}$(1/T_2-1/(298,15 K))]		3375		K
B-value	$B_{25/80}$	$R_2=R_{25}$ exp [$B_{25/80}$(1/T_2-1/(298,15 K))]		3411		K
B-value	$B_{25/100}$	$R_2=R_{25}$ exp [$B_{25/100}$(1/T_2-1/(298,15 K))]		3433		K

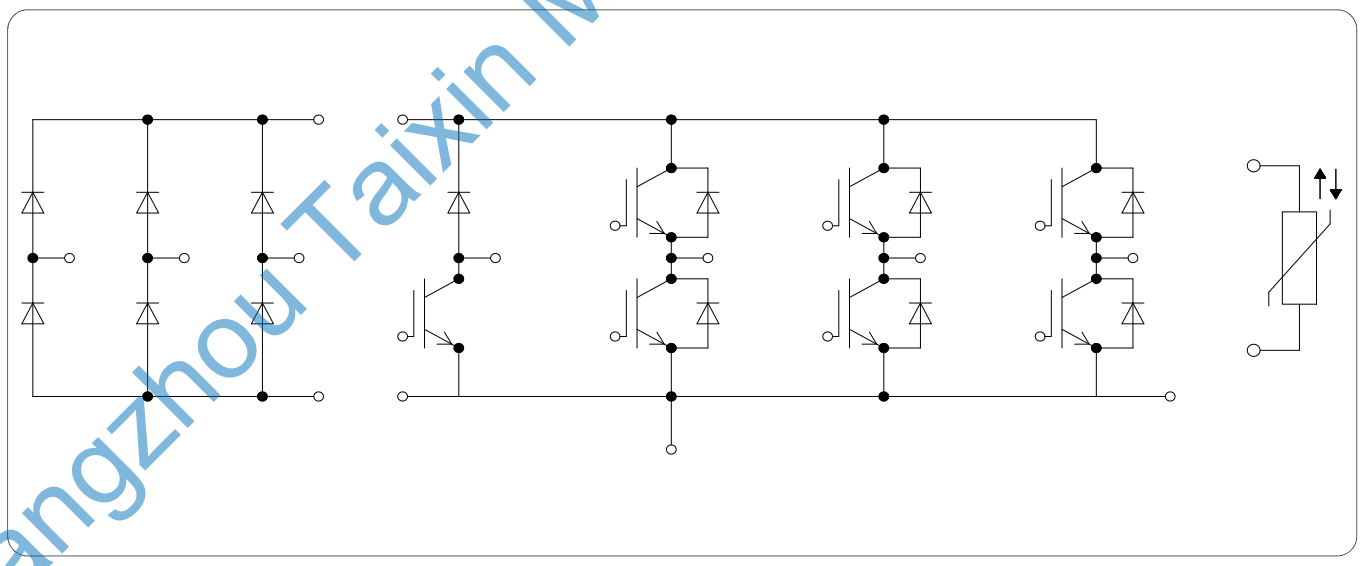
Thermal Characteristics

Items	Symbol	Min.	typ.	Max.	Units
Thermal resistance, junction to case for Inverter IGBT	$R_{th\ j-c}$			0.29	℃/W
Thermal resistance, junction to case for Inverter Diode	$R_{th\ j-c}$			0.50	℃/W
Thermal resistance, junction to case for Rectifier Diode	$R_{th\ j-c}$			0.40	℃/W
Thermal resistance, junction to case for Brake IGBT	$R_{th\ j-c}$			0.54	℃/W
Thermal resistance, junction to case for Brake Diode	$R_{th\ j-c}$			1.35	℃/W
Thermal resistance, case to sink	R_{thC-S}		0.03		℃/W

Module Characteristics

Items	Symbol	Conditions	Min.	typ.	Max.	Units
Material of module baseplate				Cu		
Internal isolation		terminal to terminal		Al_2O_3		
Isolation test voltage	V_{isol}	RMS, f = 50 Hz, t = 1 min.	2.5			kV
Stray inductance module	L_{sCE}			40		nH
Mounting torque for modul mounting	M	Screw M5	3.0		6.0	Nm
Storage temperature range	T_{STG}		-40		125	℃
Weight of Module	W_t			300		g

Internal Circuit:



Representative Characteristics

Fig 1. Output characteristic IGBT
$I_C=f(V_{CE}),V_{GE}=15V$

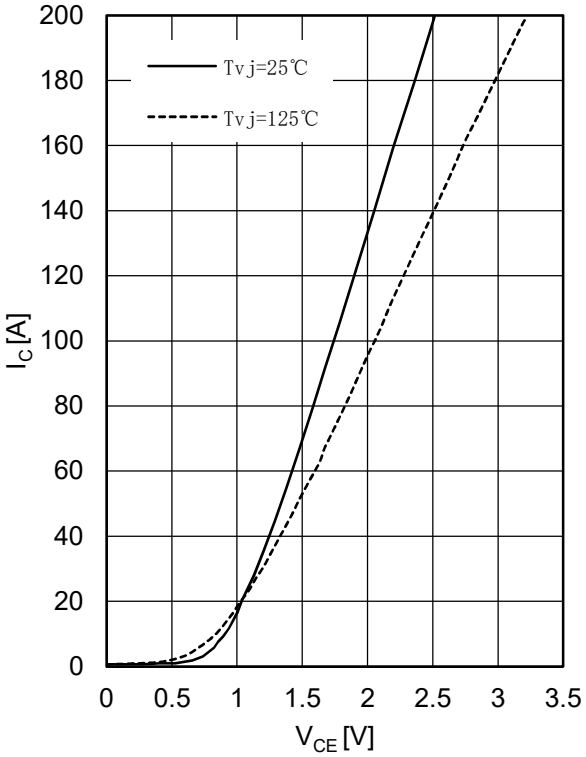


Fig 2. Output characteristic IGBT
$I_C=f(V_{CE})$
$T_{vj}=150℃$

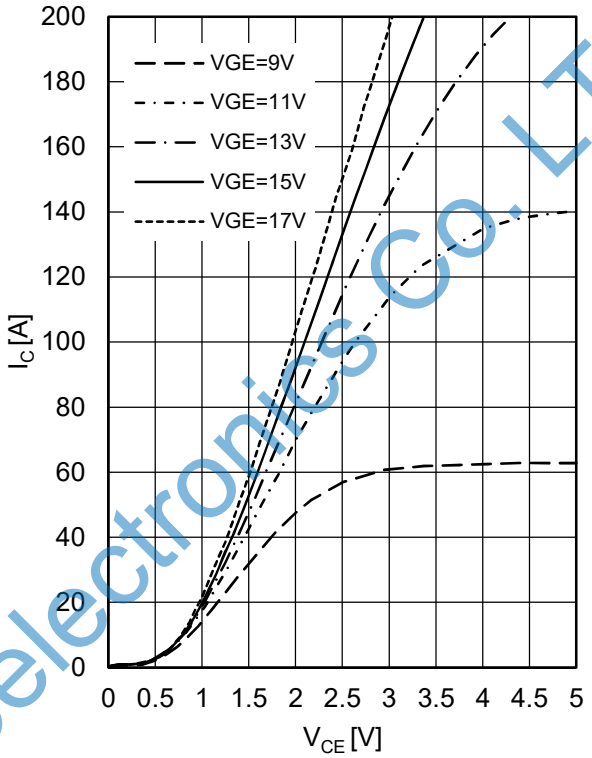


Fig 3. Transfer characteristic IGBT
$I_C=f(V_{GE})$
$V_{CE}=20V$

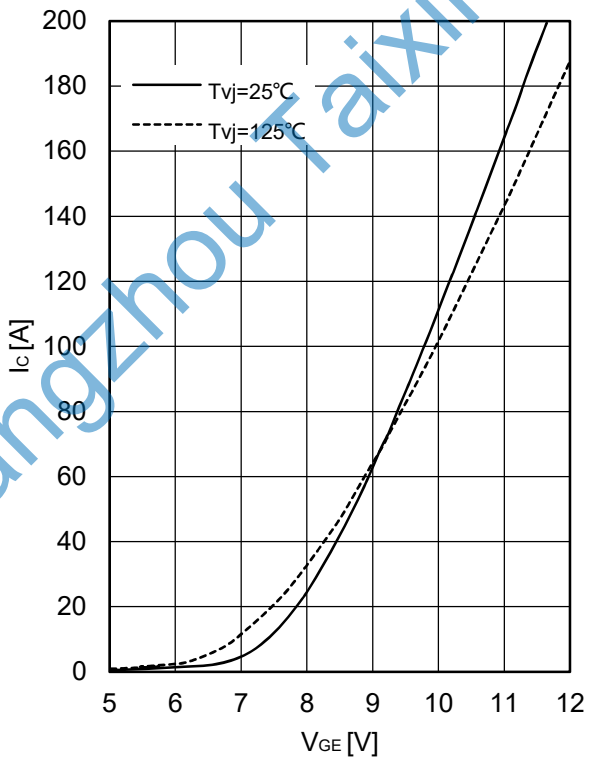


Fig 4. Switching losses IGBT
$E_{on}=f(I_C),E_{off}=f(I_C),$
$V_{GE}=\pm15V,R_G=1.6\Omega,V_{CE}=600V$

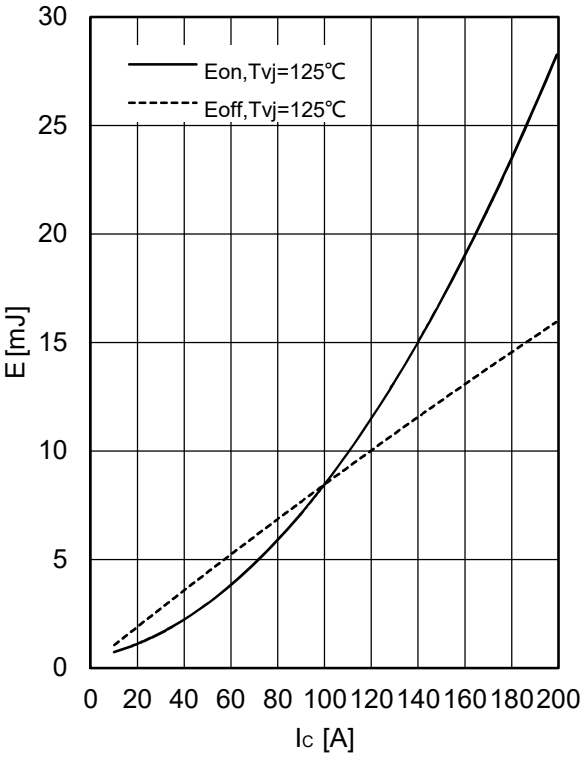


Fig 5. Switching losses IGBT
$E_{on}=f(R_G)$,$E_{off}=f(R_G)$,
$V_{GE}=\pm15V$,$I_C=100A$,$V_{CE}=600V$

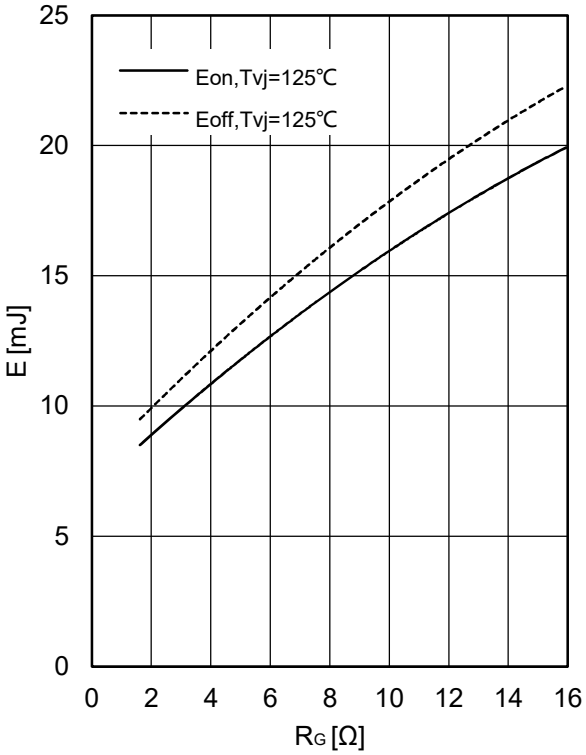


Fig 6. Transient thermal impedance IGBT
$Z_{thjc}=f(t)$

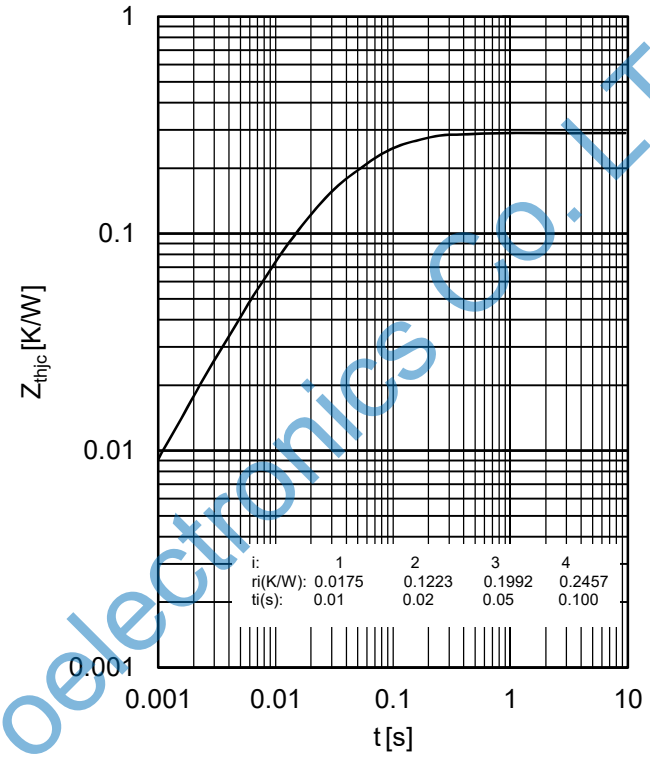


Fig 7. Reverse bias safe operating area IGBT,Inverter (RBSOA)
$I_C=f(V_{CE})$
$V_{GE}=\pm15V$,$R_{Goff}=1.6\Omega$,$T_{vj}=150℃$

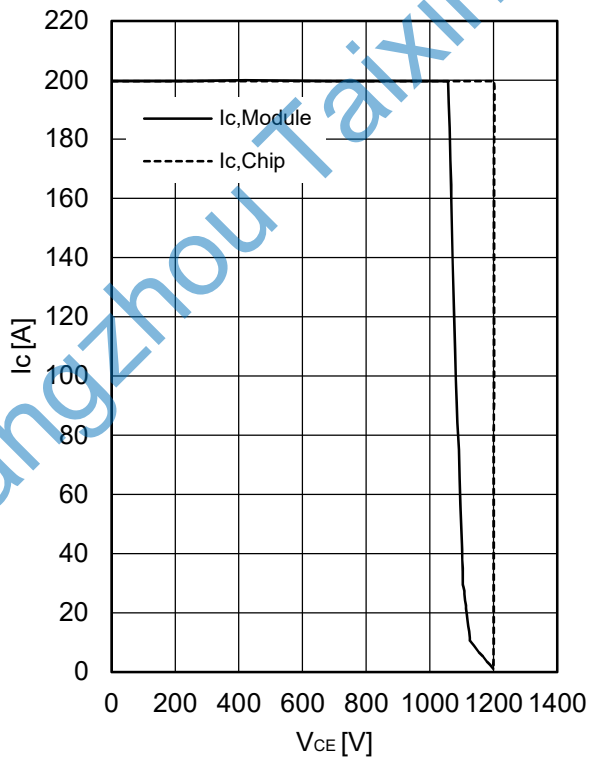


Fig 8. Forward characteristic of Diode
$I_F=f(V_F)$

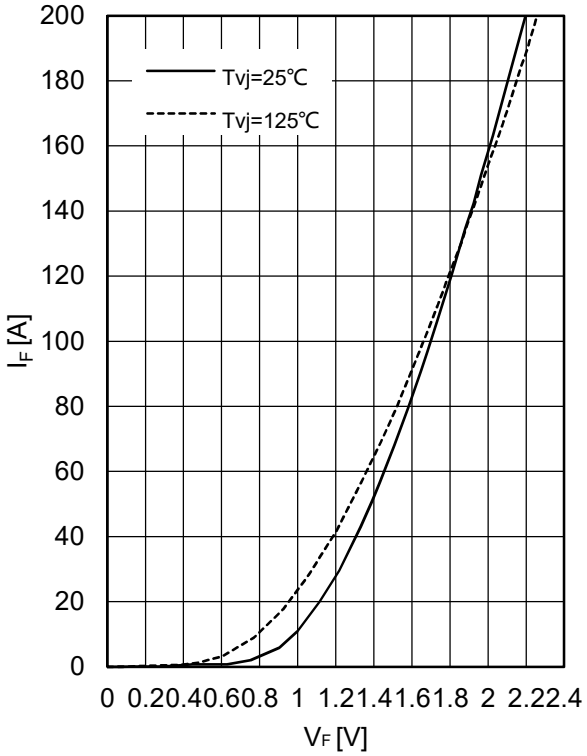


Fig 9. Switching losses Diode
$E_{rec}=f(I_F)$
$R_G=1.6\Omega, V_{CE}=600V$

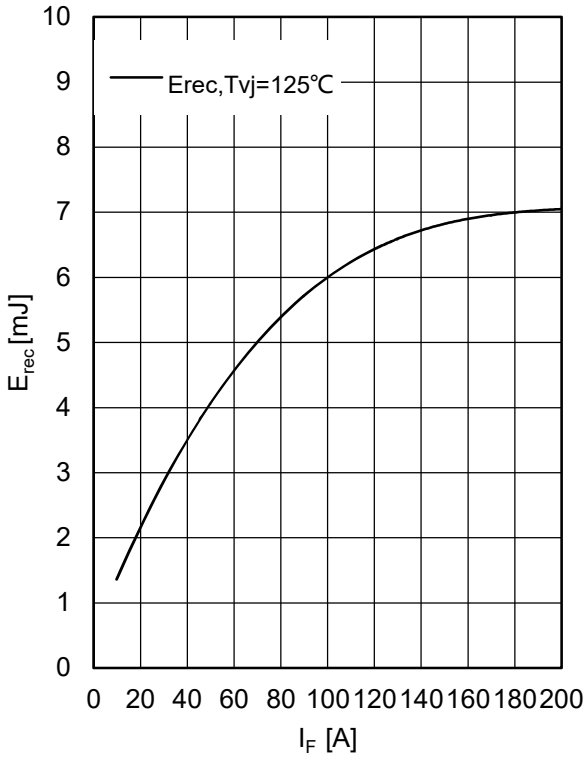


Fig 10. Switching losses Diode
$E_{rec}=f(R_G)$
$I_F=100A, V_{CE}=600V$

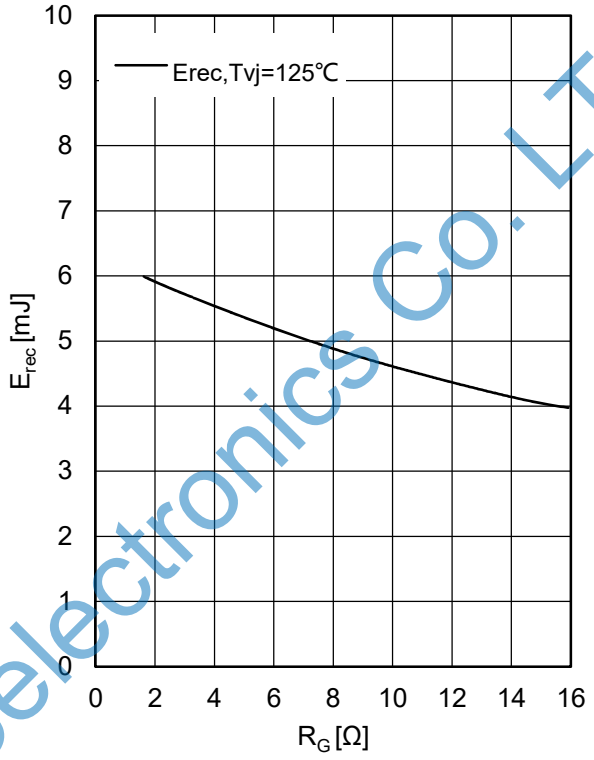


Fig 11. transient thermal impedance Inverter Diode
$Z_{thjc}=f(t)$

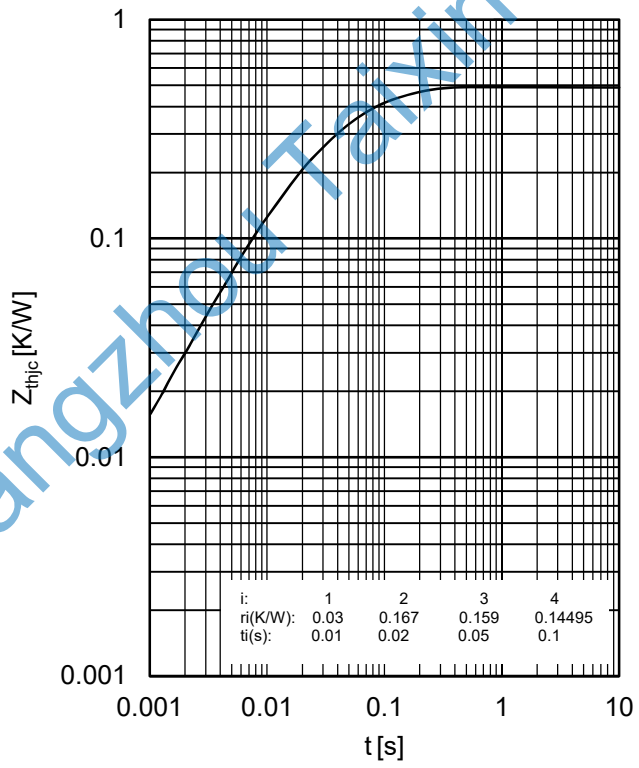


Fig12. Forward characteristic of Rectifier Diode
$I_F=f(V_F)$

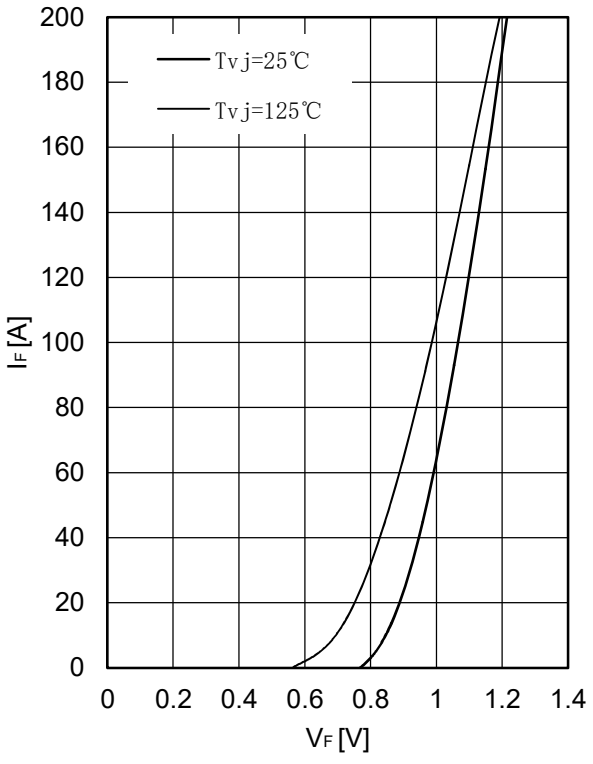


Fig 13. Output characteristic IGBT, Brake-Chopper (typical)

$I_C = f(V_{CE})$

V_{GE} = 15 V

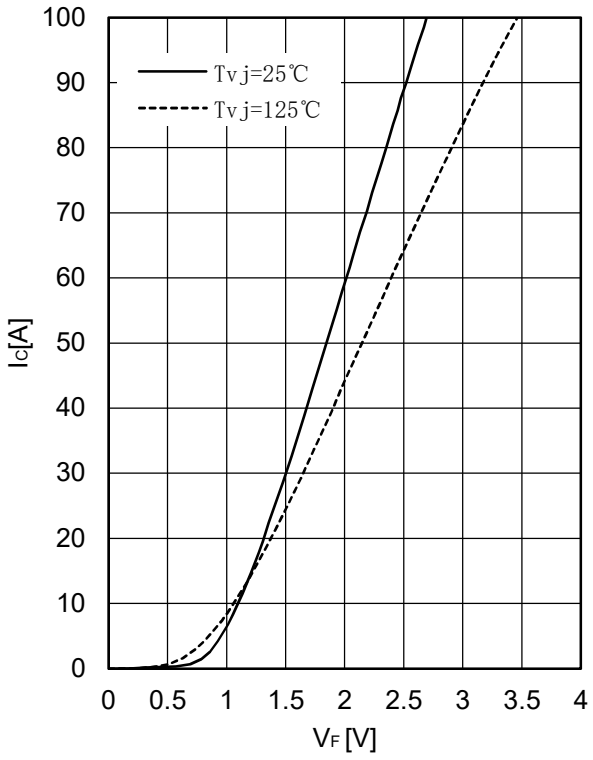


Fig 14. Forward characteristic of Diode, Brake-Chopper

$I_F = f(V_F)$

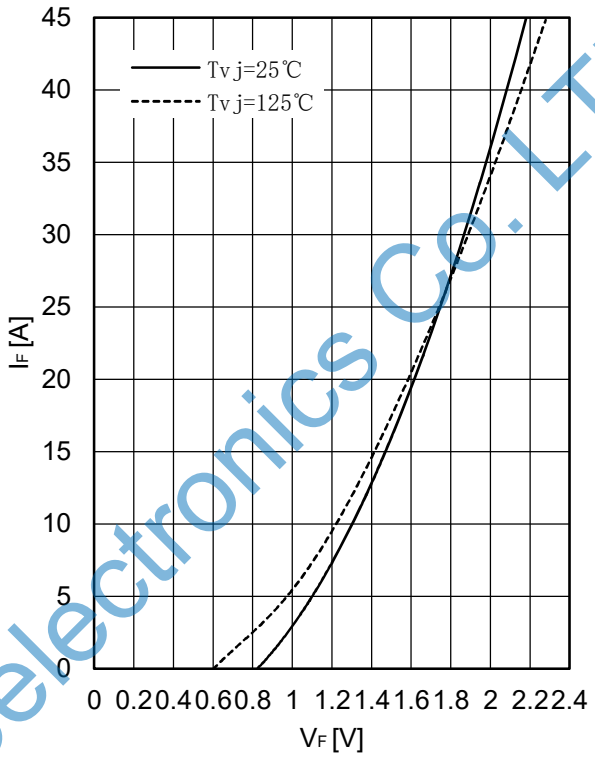
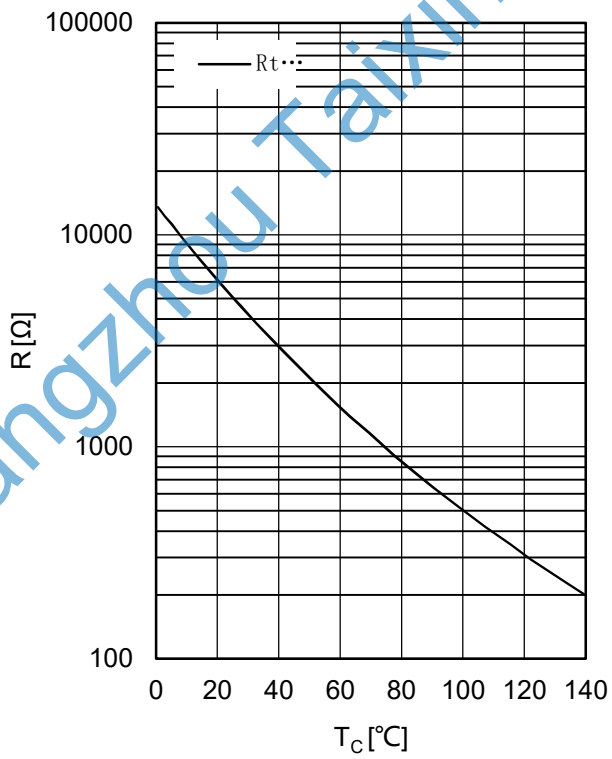


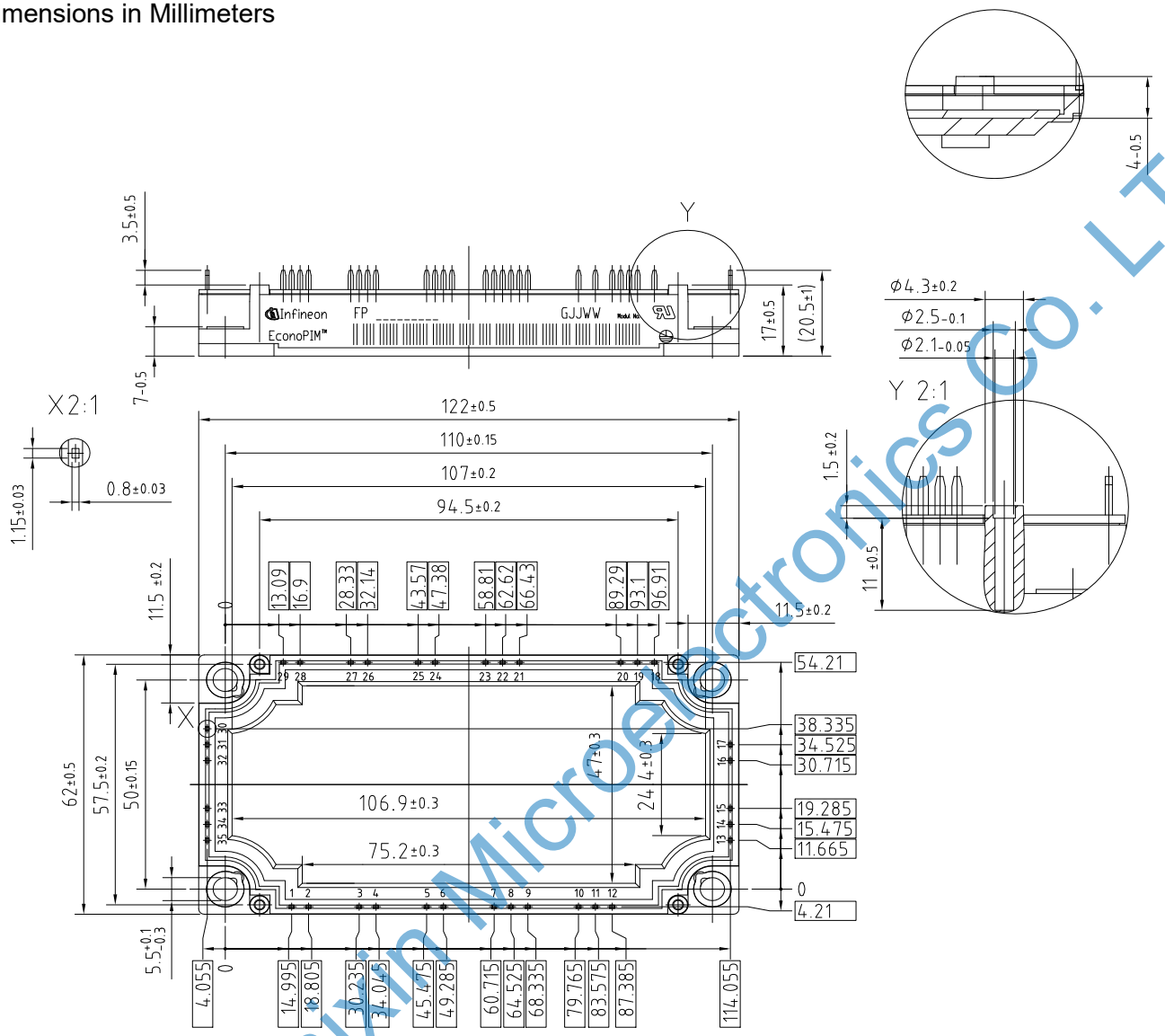
Fig 13. NTC-Thermistor-temperature characteristic (typical)

R = f (T)



Package Dimensions

Dimensions in Millimeters



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