KWN2FP50R12S2BM

1200V 50A PIM Module

Features

High speed trench field-stop IGBT

Integrated NTC Temperature Sensor

High ruggedness

Very tight parameter distribution

Low Vcesat(V_{CE}=1.9V)

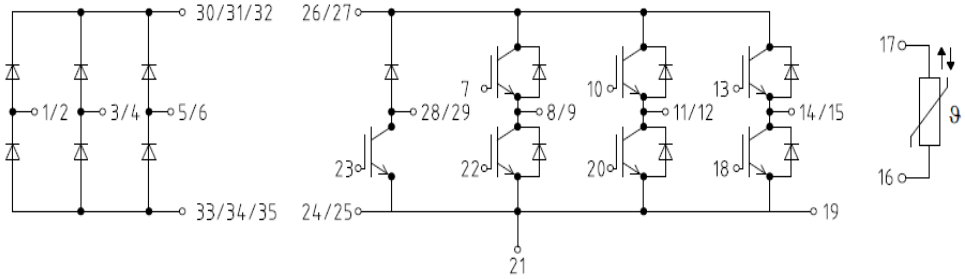
Low switching losses(E_{off}=3.2mJ)

High short circuit capability(>10us)

Applications

Motor Drives

Servo driver



IGBT, Inverter

Maximum Rated Values (T_j=25°C, unless otherwise noted)

Parameter	Symbol	Conditions	Values	Units
Collector-emitter voltage	V_{CES}		1200	V
Gate-emitter peak voltage	V_{GES}		±20	
Continuous DC collector current	I_C	T_C=25°C T_C=100°C	100 50	A
Repetitive peak collectorcurrent	I_{CRM}	t_P=1ms	100	
Total power dissipation	P_{tot}	T_C=25°C, $T_{vj\ max}$=150°C	313	W
SC stand time	t_{SC}	V_{GE}=15V,V_{CC}=600V T_j=150°C	>10	μs
Operating junctiontemperature	T_{vjop}		-40~150	°C

IGBT, Inverter

Characteristic Values (T_j=25°C, unless otherwise noted)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Static Characteristics						
Collector-emitter Breakdown Voltage	$V_{(BR)CES}$	V_{GE}=0V, I_C=1mA	1200	-	-	V
Collector-emitter saturation Voltage	$V_{CE(sat)}$	V_{GE}=15V, I_C=50A T_j=25°C T_j=150°C	- -	1.9 2.4	- -	
Gate theshold voltage	$V_{GE(th)}$	I_C=1.5mA, V_{CE}=V_{GE}	-	6.00	-	
Collector-emitter cut-off current	I_{CES}	V_{CE}=1200V,V_{GE}=0V	-	-	3	mA
Gate-emitter leakage current	I_{GES}	V_{CE}=0V,V_{GE}=20V	-	-	300	nA
Dynamic Characteristic						
Input capacitance	C_{iss}	V_{CE}=25V V_{GE}=0V f=1MHz	-	5800	-	pF
Output capacitance	C_{oss}		-	320	-	
Reverse transfer capacitance	C_{rss}		-	180	-	
Gate charge	Q_G	V_{CC}=600V,I_C=50A, V_{GE}=15V	-	427	-	nC
Short circuit collector current	I_{SC}	V_{GE}=15V,V_{CC}=600V, T_j=150°C	-	183		A
Switching Charactetistics（Inductive load）						
Turn-on delay time	$t_{d(on)}$	T_j=25°C V_{CC}=600V I_C=50A V_{GE}=±15V R_G=15Ω	-	47	-	ns
Rise time	t_r		-	165	-	
Turn-off delay time	$t_{d(off)}$		-	210	-	
Fall time	t_f		-	140	-	
Turn-on energy	E_{on}		-	6.5	-	mJ
Turn-off energy	E_{off}		-	3.2	-	
Total swiching energy	E_{ts}		-	9.7	-	
Turn-on delay time	$t_{d(on)}$	T_j=150°C V_{CC}=600V I_C=50A V_{GE}=±15V R_G=15Ω	-	41	-	ns
Rise time	t_r		-	154	-	
Turn-off delay time	$t_{d(off)}$		-	253	-	
Fall time	t_f		-	223	-	
Turn-on energy	E_{on}		-	6.3	-	mJ
Turn-off energy	E_{off}		-	4.5	-	
Total swiching energy	E_{ts}		-	10.8	-	
Thermal resistance, junction to case	R_{thJC}	per IGBT	-	-	0.59	K/W

Diode, Inverter
Maximum Rated Values (T_j=25°C, unless otherwise noted)

Parameter	Symbol	Conditions	Values	Units
Repetitive peak reverse voltage	V_{RRM}		1200	V
Continuous DC forward current	I_F	T_C=25°C T_C=100°C	100 50	A
Repetitive peak forward current	I_{FRM}	t_P=1ms	100	
Operating junctiontemperature	T_{vjop}		-40~150	°C

Diode, Inverter
Characteristic Values (T_j=25°C, unless otherwise noted)

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Static Characteristics						
Forward voltage	V_F	V_{GE}=0V, I_F=50A T_j=25°C T_j=150°C	- -	1.9 1.85	- -	V
Switching Characteristics (Inductive load)						
Recovered time	t_{rr}	T_j=25°C V_R=600V, I_F=50A -di/dt=600A/us	-	195	-	ns
Recovered charge	Q_{rr}		-	2.75	-	μC
Peak reverse recoverycurrent	I_{rrm}		-	27.0	-	A
Recovered time	t_{rr}	T_j=150°C V_R=600V, I_F=50A -di/dt=600A/us	-	315	-	ns
Recovered charge	Q_{rr}		-	6.95	-	μC
Peak reverse recoverycurrent	I_{rrm}		-	37.0	-	A
Thermal resistance, junction to case	R_{thJCD}	per diode	-	0.78	-	K/W

Diode, Rectifier

Maximum Rated Values (T_j=25°C, unless otherwise noted)

Parameter	Symbol	Conditions	Values	Units
Repetitive peak reverse	V_{RRM}		1600	V
Average forward current	$I_{F(AV)}$		50	A
Forward surge current	I_{FSM}	t_P=10ms, T_j=25°C	600	
I²t - value	I^2t	*sin* 180°	1800	A^2s
Operating junctiontemperature	T_{vjop}		-40~150	°C

Diode, Rectifier

Characteristic Values (T_j=25°C, unless otherwise noted)

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Repetitive peak reverse voltage	V_{RRM}	I_R=0.5mA	1600	-	-	V
Forward voltage	V_F	T_j=25°C I_F=50A	-	1	1.1	V
		T_j=150°C I_F=50A	-	-	-	
Reverse current	I_R	T_j=25°C V_R=1600V	-	-	1	mA
		T_j=150°C V_R=1600V	-	-	5	mA
Thermal resistance, junction to case	R_{thJCD}	per diode	-	-	0.60	K/W

IGBT, Brake-Chopper

Maximum Rated Values (T_j=25°C, unless otherwise noted)

Parameter	Symbol	Conditions	Values	Units
Collector-emitter voltage	V_{CES}		1200	V
Gate-emitter peak voltage	V_{GES}		±20	
Continuous DC collector current	I_C	T_C=25°C T_C=100°C	80 40	A
Repetitive peak collectorcurrent	I_{CRM}	t_P=1ms	80	
Total power dissipation	P_{tot}	T_C=25°C $T_{vj\,max}$=150°C	192	W
SC stand time	t_{SC}	T_j=150°C V_{GE}=15V V_{CE}=600V	>10	µs
Operating junctiontemperature	T_{vjop}		-40~150	°C

IGBT, Brake-Chopper

Characteristic Values (T_j=25°C, unless otherwise noted)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Static Characteristics						
Collector-emitter Breakdown Voltage	$V_{(BR)CES}$	V_{GE}=0V, I_C=1mA	1200	-	-	V
Collector-emitter saturation Voltage	$V_{CE(sat)}$	V_{GE}=15V, I_C=40A T_j=25°C T_j=150°C	- -	2.00 2.58	- -	
Gate theshold voltage	$V_{GE(th)}$	I_C=0.5mA, V_{CE}=V_{GE}	-	6.10	-	
Collector-emitter cut-off current	I_{CES}	V_{CE}=1200V,V_{GE}=0V	-	-	3	mA
Gate-emitter leakage current	I_{GES}	V_{CE}=0V,V_{GE}=20V	-	-	400	nA
Dynamic Characteristic						
Input capacitance	C_{iss}	V_{CE}=25V V_{GE}=0V f=1MHz	-	2820	-	pF
Output capacitance	C_{oss}		-	169	-	
Reverse transfer capacitance	C_{rss}		-	131	-	
Gate charge	Q_G	V_{CC}=600V,I_C=40A, V_{GE}=15V	-	187	-	nC
Short circuit collector current	I_{SC}	V_{GE}=15V,V_{CC}=600V T_j=150°C	-	146	-	A
Switching Charactetistics（Inductive load）						
Turn-on delay time	$t_{d(on)}$	T_j=25°C V_{CC}=600V I_C=40A V_{GE}=±15V R_G=33Ω	-	76	-	ns
Rise time	t_r		-	150	-	
Turn-off delay time	$t_{d(off)}$		-	257	-	
Fall time	t_f		-	103	-	
Turn-on energy	E_{on}		-	5.16	-	mJ
Turn-off energy	E_{off}		-	2.05	-	
Total swiching energy	E_{ts}		-	7.21	-	
Turn-on delay time	$t_{d(on)}$	T_j=150°C V_{CC}=600V I_C=40A V_{GE}=±15V R_G=33Ω	-	66	-	ns
Rise time	t_r		-	138	-	
Turn-off delay time	$t_{d(off)}$		-	292	-	
Fall time	t_f		-	186	-	
Turn-on energy	E_{on}		-	5.30	-	mJ
Turn-off energy	E_{off}		-	2.80	-	
Total swiching energy	E_{ts}		-	8.10	-	
Thermal resistance, junction to case	R_{thJC}	per IGBT	-	-	0.65	K/W

Diode, Brake-Chopper
Maximum Rated Values (T_j=25°C, unless otherwise noted)

Parameter	Symbol	Conditions	Values	Units
Repetitive peak reverse voltage	V_{RRM}		1200	V
Continuous DC forward current	I_F	T_C=25°C T_C=100°C	30 15	A
Repetitive peak forward current	I_{FRM}	t_P=1ms	30	
Operating junctiontemperature	T_{vjop}		-40~150	°C

Diode, Brake-Chopper
Characteristic Values (T_j=25°C, unless otherwise noted)

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Static Characteristics						
Forward voltage	V_F	V_{GE}=0V, I_F=15A T_j=25°C T_j=150°C	- -	1.85 1.75	- -	V
Switching Characteristics (Inductive load)						
Recovered time	t_{rr}	T_j=25°C V_R=600V, I_F=15A -di/dt=600A/us	-	130	-	ns
Recovered charge	Q_{rr}		-	1.07	-	μC
Peak reverse recoverycurrent	I_{rrm}		-	18	-	A
Recovered time	t_{rr}	T_j=150°C V_R=600V, I_F=15A -di/dt=600A/us	-	210	-	ns
Recovered charge	Q_{rr}		-	2.15	-	μC
Peak reverse recoverycurrent	I_{rrm}		-	22	-	A
Thermal resistance, junction to case	R_{thJCD}	per diode	-	1.60	-	K/W

NTC-Thermistor

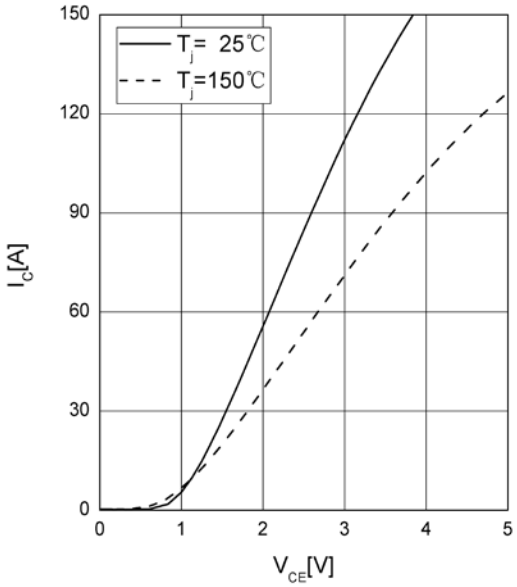
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Rated resistance	R_{25}	T_C=25℃	-	5	-	KΩ
Deviation of R100	$\Delta R/R$	T_C=25℃， R_{100}=481Ω	tbd	-	tbd	%
Power dissipation	P_{25}	T_C=25℃	-	tbd	-	mW
B-值	$B_{25/50}$	$R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298.15K))]$	-	3380	-	K
B-值	$B_{25/80}$	$R_2=R_{25}\exp[B_{25/80}(1/T_2-1/(298.15K))]$	-	3440	-	K

Module

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Isolaton test voltage	V_{ISOL}	f = 50Hz, 1minute	2500	-	-	V
Maximum junction	$T_{vj\ max}$		-	-	150	℃
Working juncitontemperature	T_j		-40	-	150	℃
Thermal resistance,case to heatsink	$R_{\theta CS}$	per module	-	0.01	-	K/W
Storage temperature	T_{stg}		-40	-	125	℃
Mounting torque	M	Mounting Screw:M5	3.0	-	6.0	N·m
Weight	G		-	300	-	g

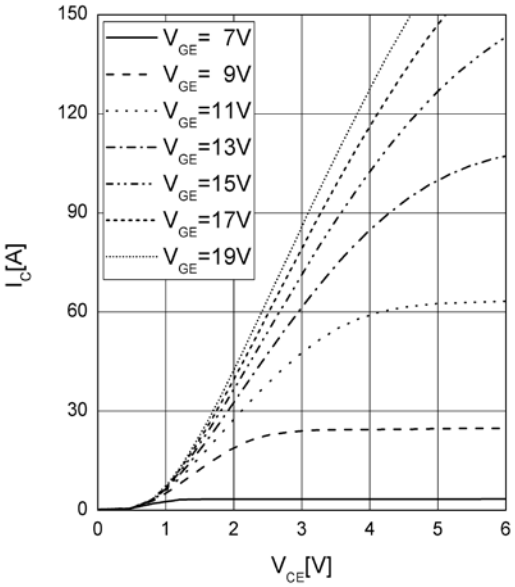
output characteristic IGBT,Inverter (typical)

$I_C = f(V_{CE})$, $V_{GE} = 15$ V



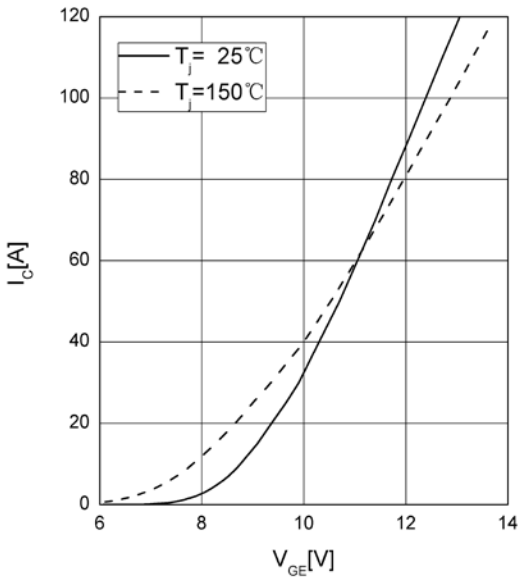
output characteristic IGBT,Inverter (typical)

$I_C = f(V_{CE})$, $T_j = 150°C$



transfer characteristic IGBT,Inverter(typical)

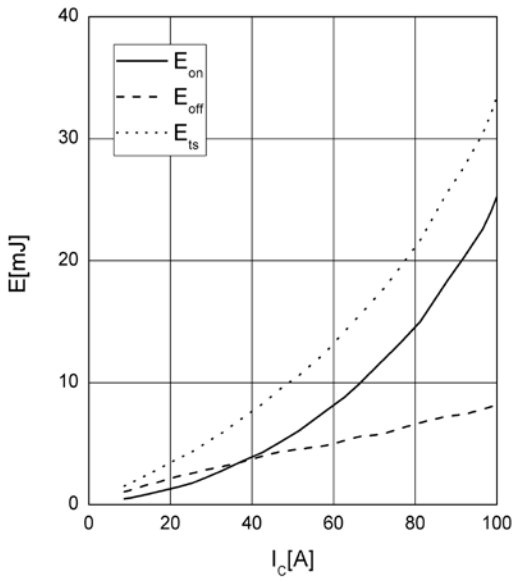
$I_C = f(V_{GE})$, $V_{CE} = 20$ V



switching losses IGBT,Inverter (typical)

$E_{on} = f(I_C)$, $E_{off} = f(I_C)$

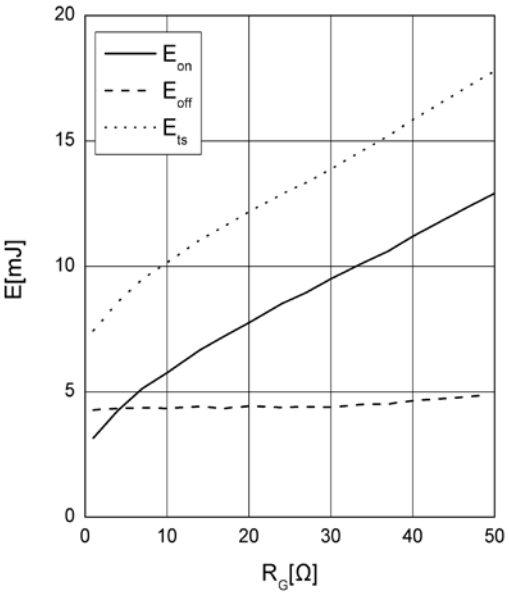
$V_{GE} = \pm 15$ V, $R_G = 15\ \Omega$, $V_{CE} = 600$ V, $T_j = 150°C$



switching losses IGBT,Inverter (typical)

$E_{on} = f(R_G)$, $E_{off} = f(R_G)$

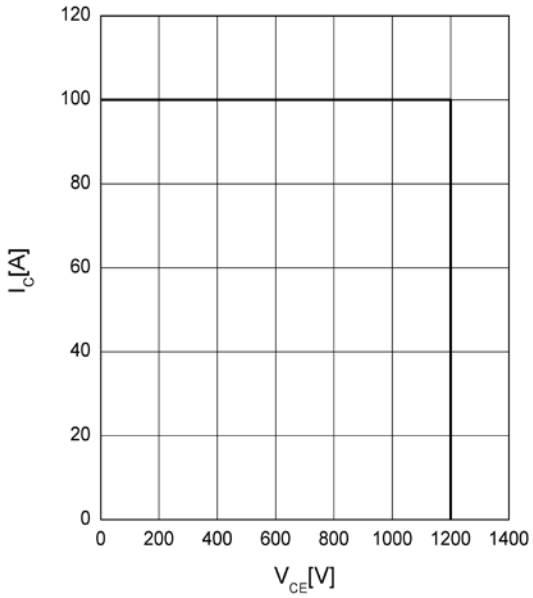
V_{GE} = ±15 V, I_C = 50 A, V_{CE} = 600 V, T_j = 150°C



reverse bias safe operating area IGBT,Inverter

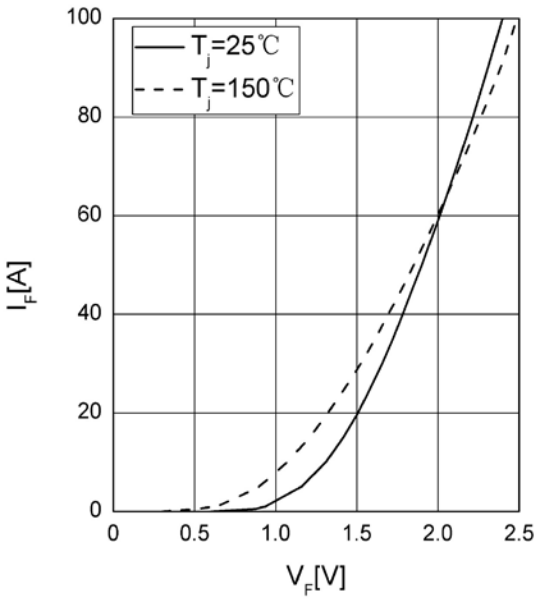
$I_C = f(V_{CE})$

V_{GE} = ±15 V, R_{Goff} = 10 Ω, T_j = 150°C



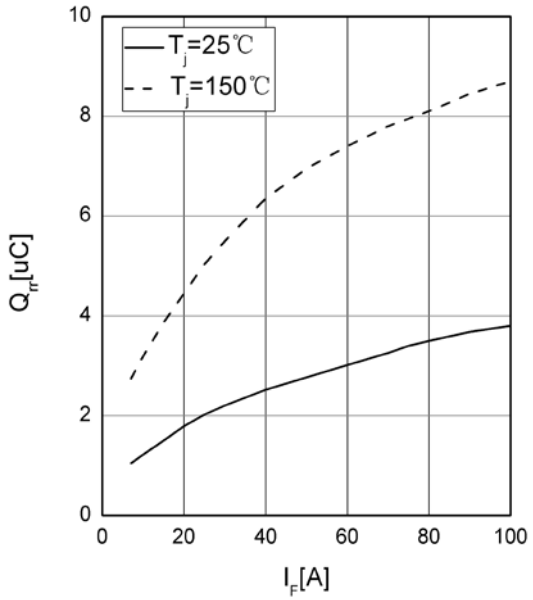
forward characteristic of Diode, Inverter (typical)

$I_F = f(V_F)$



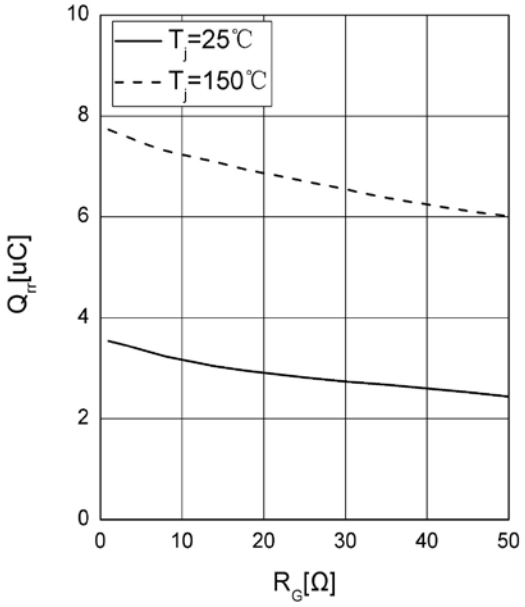
recovered charge of Diode, Inverter (typical)

$Q_{rr} = f(I_F)$



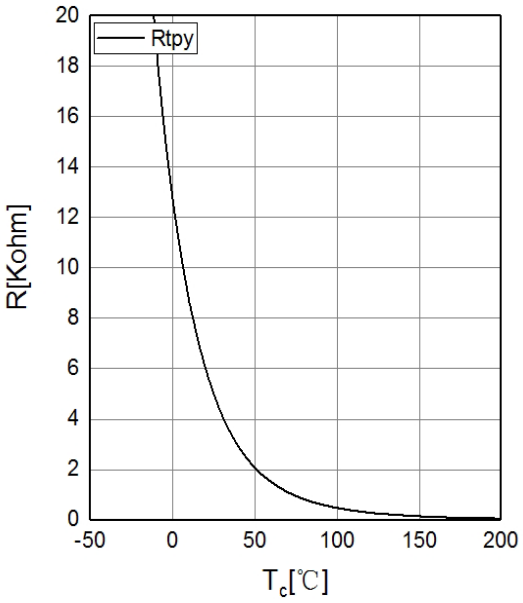
recovered charge of Diode, Inverter (typical)

Q_{rr} = f (R_G), I_F=50A, V_{CE} = 600 V

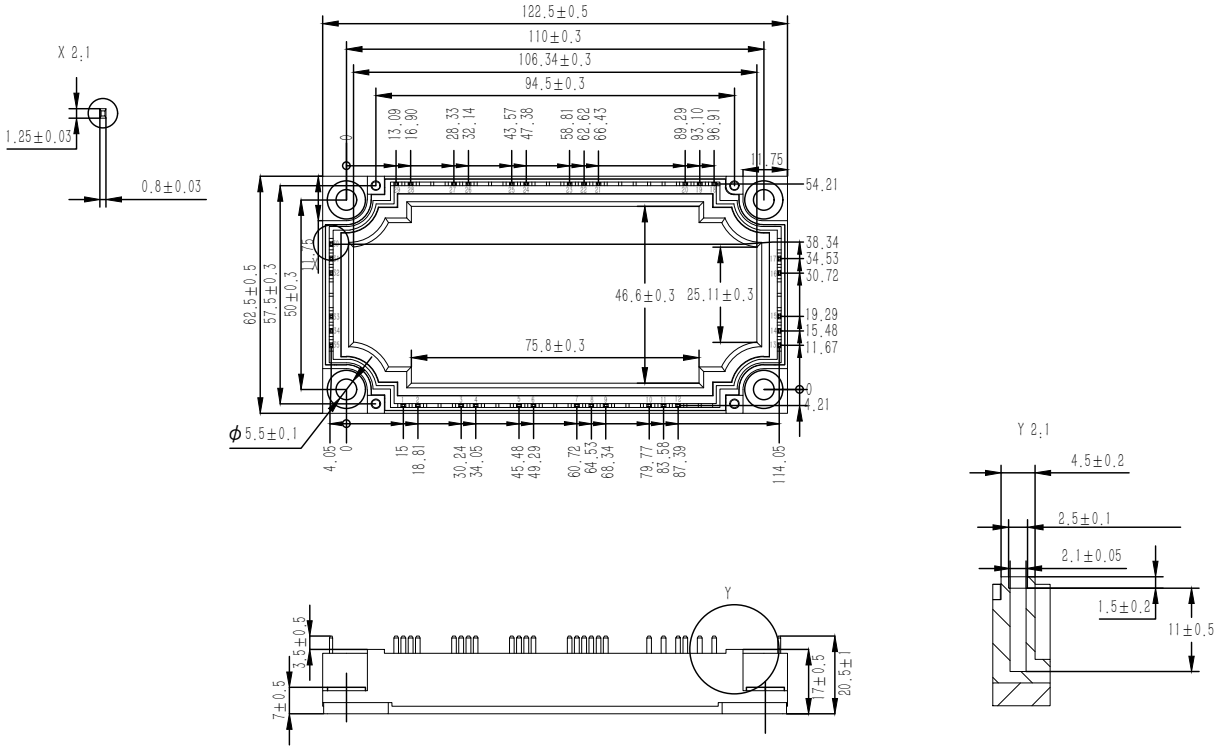


NTC temperature characteristic (typical)

R = f (T)



Package outlines（Units：mm）



Circuit_diagram_headline