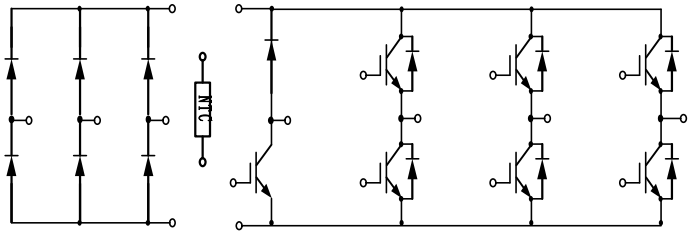
PIM IGBT Module

电气特性:

- 1200V 沟槽栅/场终止工艺
- 低开关损耗
- 正温度系数



典型应用:

- 变频器
- 伺服
- 逆变器

V_{CES} =1200V， $I_{C\ nom}$ =50A / I_{CRM} =100A

IGBT, 逆变器 / IGBT, Inverter

最大额定值 / Maximum Ratings

Parameter	Conditions	Symbol	Value	Unit
集电极-发射极电压 Collector-Emitter voltage	T_{vj}=25°C	V_{CES}	1200	V
连续集电极直流电流 Continuous DC collector current	T_C=100°C, $T_{vj\ max}$=175°C	$I_{C\ nom}$	50	A
集电极重复峰值电流 Repetitive peak collector current	t_P=1 ms	I_{CRM}	100	A
总功率损耗 Total power dissipation	T_C = 25°C, $T_{vj\ max}$ = 175°C	P_{tot}	280	W
栅极-发射极电压 Gate emitter voltage		V_{GE}	±20	V

特征值 / Characteristic Values

Parameter	Conditions		Symbol	Value			Unit
				Min.	Typ.	Max.	
集电极-发射极饱和电压 Collector-Emitter saturation voltage	V_{GE}=15V, I_C=50A V_{GE}=15V, I_C=50A V_{GE}=15V, I_C=50A	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	V_{CEsat}		2.14 2.73 2.89	2.65	V
栅极-发射极阈值电压 Gate-Emitter threshold voltage	I_C=1.7mA, V_{GE}= V_{CE}	T_{vj}=25°C	$V_{GE(th)}$	5.10	5.70	6.30	

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内部栅极电阻 Internal gate resistor		R_{Gint}		None		Ω
输入电容 Input capacitance	f=1MHz, V_{CE}=25 V, V_{GE}=0 V T_{vj}=25°C	C_{ies}		3.63		nF
反向传输电容 Reverse transfer capacitance		C_{res}		0.12		
集电极-发射极截止电流 Collector-emitter cut-off current	V_{CE}=1200V , V_{GE}= 0 V T_{vj}=25°C	I_{CES}			1	mA
栅极-发射极漏电流 Gate-emitter leakage current	V_{CE}=0 V, V_{GE}= 20 V T_{vj}=25°C	I_{GES}			100	nA
开通延迟时间 Turn-on delay time	I_C=50A, V_{CE}=600 V T_{vj}=25°C V_{GE}=±15 V, R_G=15Ω T_{vj}=125°C (电感负载) / (inductive load) T_{vj}=150°C	$t_{d\,on}$		62 62 56		ns
上升时间 Rise time	I_C=50A, V_{CE}=600 V T_{vj}=25°C V_{GE}=±15 V, R_G=15Ω T_{vj}=125°C (电感负载) / (inductive load) T_{vj}=150°C	t_r		28 33 34		
关断延迟时间 Turn-off delay time	I_C=50A, V_{CE}=600 V T_{vj}=25°C V_{GE}=±15 V, R_G=15Ω T_{vj}=125°C (电感负载) / (inductive load) T_{vj}=150°C	$t_{d\,off}$		204 243 251		
下降时间 Fall time	I_C=50A, V_{CE}=600 V T_{vj}=25°C V_{GE}=±15 V, R_G=15Ω T_{vj}=125°C (电感负载) / (inductive load) T_{vj}=150°C	t_f		164 216 256		
开通损耗能量（每脉冲） Turn-on energy loss per pulse	I_C=50A, V_{CE}=600 V T_{vj}=25°C V_{GE}=±15 V, R_G=15Ω T_{vj}=125°C (电感负载) / (inductive load) T_{vj}=150°C	E_{on}		3.38 6.91 8.03		mJ
关断损耗能量（每脉冲） Turn-off energy loss per pulse	I_C=50A, V_{CE}=600 V T_{vj}=25°C V_{GE}=±15 V, R_G=15Ω T_{vj}=125°C (电感负载) / (inductive load) T_{vj}=150°C	E_{off}		3.14 3.88 4.07		
短路数据 SC data	V_{GE}≤15V, Vcc=800V V_{CEmax}=V_{CES}-L_{sCE}·di/dt t_P≤10us, T_{vj}=150°C	I_{SC}		155		A
结-外壳热阻 Thermal resistance, junction to case	每个 IGBT / per IGBT	R_{thJC}			0.54	K/W
在开关状态下温度 Temperature under switching conditions		$T_{vj\,op}$	-40		150	°C

二极管，逆变器 / Diode, Inverter

最大额定值 / Maximum Ratings

Parameter	Conditions	Symbol	Value	Unit
反向重复峰值电压 Repetitive peak reverse voltage	T_{vj}=25°C	V_{RRM}	1200	V
连续正向直流电流 Continuous DC forward current		I_F	50	A
正向重复峰值电流 Repetitive peak forward current	t_p=1ms	I_{FRM}	100	A
I^2t 值 I^2t-value	t_p=10ms, sin180° ， T_{vj}=125 °C	I^2t	570	A^2s

特征值 / Characteristic Values

Parameter	Conditions	Symbol	Value			Unit
			Min.	Typ.	Max.	
正向电压 Forward voltage	I_F=50A, V_{GE}=0V T_{vj}=25°C I_F=50A, V_{GE}=0V T_{vj}=125°C I_F=50A, V_{GE}=0V T_{vj}=150°C	V_F		2.45 2.10 1.75	2.95	V
反向恢复峰值电流 Peak reverse recovery current	I_F=50A, T_{vj}=25°C -di$_F$/dt=1210A/µs(T_{vj}=150°C) T_{vj}=125°C V_R=600V, V_{GE}=-15V T_{vj}=150°C	I_{RM}		35 60 75		A
恢复电荷 Recovered charge	I_F=50A, T_{vj}=25°C -di$_F$/dt=1210A/µs(T_{vj}=150°C) T_{vj}=125°C V_R=600V, V_{GE}=-15V T_{vj}=150°C	Q_r		4.45 7.88 12.89		µC
反向恢复损耗（每脉冲） Reverse recovered energy	I_F=50A, T_{vj}=25°C -di$_F$/dt=1210A/µs(T_{vj}=150°C) T_{vj}=125°C V_R=600V, V_{GE}=-15V T_{vj}=150°C	E_{rec}		1.57 2.29 4.04		mJ
结-外壳热阻 Thermal resistance, junction to case	每个二极管 / per diode	R_{thJC}			0.81	K/W
在开关状态下温度 Temperature under switching conditions		$T_{vj\ op}$	-40		150	°C

二极管，整流器 / Diode，Rectifier

最大额定值 / Maximum Ratings

Parameter	Conditions	Symbol	Value	Unit
反向重复峰值电压 Repetitive peak reverse voltage	T_{vj}=25°C，I_{RRM}=0.05mA	V_{RRM}	1600	V
反向不重复峰值电压 Non-Repetitive peak reverse voltage	T_{vj}=25°C，I_{RRM}=0.05mA	V_{RSM}	1800	V
最大正向平均电流 Maximum Average Forward Current	Ts=80°C，T_{vj}=25°C	$I_{F(AV)}$	35	A
正向浪涌电流 Surge forward current	t_p=10ms，sin180°，T_{vj}=25°C	I_{FSM}	420	A
I^2t 值 I^2t-value	t_p=10ms，sin180°，T_{vj}=25°C	I^2t	880	A^2s

特征值 / Characteristic Values

Parameter	Conditions	Symbol	Value			Unit
			Min.	Typ.	Max.	
正向电压 Forward voltage	I_F=5A, T_{vj}=25°C	V_F		0.9	1.0	V
反向电流 Reverse current	V_R=1600V T_{vj}=25°C	I_R			50	µA

在开关状态下温度 Temperature under switching conditions		$T_{vj\ op}$	-40		150	°C

IGBT，制动-斩波器 / IGBT, Brake-Chopper

最大额定值 / Maximum Ratings

Parameter	Conditions	Symbol	Value	Unit
集电极-发射极电压 Collector-Emitter voltage	T_{vj}=25°C	V_{CES}	1200	V
连续集电极直流电流 Continuous DC collector current	T_C=100°C, $T_{vj\ max}$=175°C	$I_{C\ nom}$	25	A
集电极重复峰值电流 Repetitive peak collector current	t_P=1 ms	I_{CRM}	50	A
总功率损耗 Total power dissipation	T_C = 25°C, $T_{vj\ max}$ = 175°C	P_{tot}	160	W
栅极-发射极电压 Gate emitter voltage		V_{GE}	±20	V

特征值 / Characteristic Values

Parameter	Conditions		Symbol	Value			Unit
				Min.	Typ.	Max.	
集电极-发射极饱和电压 Collector-Emitter saturation voltage	V_{GE}=15V, I_C=25A V_{GE}=15V, I_C=25A V_{GE}=15V, I_C=25A	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	V_{CEsat}		2.03 2.55 2.62	2.55	V
栅极-发射极阈值电压 Gate-Emitter threshold voltage	I_C=0.85mA, V_{GE}= V_{CE}	T_{vj}=25°C	$V_{GE(th)}$	5.20	5.70	6.40	
内部栅极电阻 Internal gate resistor			R_{Gint}		None		Ω
输入电容 Input capacitance	f=1MHz, V_{CE}=25 V, V_{GE}=0 V	T_{vj}=25°C	C_{ies}		1.42		nF
反向传输电容 Reverse transfer capacitance			C_{res}		0.06		
集电极-发射极截止电流 Collector-emitter cut-off current	V_{CE}=1200V , V_{GE}= 0 V	T_{vj}=25°C	I_{CES}			1	mA
栅极-发射极漏电流 Gate-emitter leakage current	V_{CE}=0 V, V_{GE}= 20 V	T_{vj}=25°C	I_{GES}			100	nA
开通延迟时间 Turn-on delay time	I_C=25A, V_{CE}=600 V V_{GE}=±15 V, R_G=40Ω (电感负载) / (inductive load)	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	$t_{d\ on}$		63 60 59		ns
上升时间 Rise time	I_C=25A, V_{CE}=600 V V_{GE}=±15 V, R_G=40Ω (电感负载) / (inductive load)	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	t_r		51 59 59		
关断延迟时间 Turn-off delay time	I_C=25A, V_{CE}=600 V V_{GE}=±15 V, R_G=40Ω (电感负载) / (inductive load)	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	$t_{d\ off}$		203 243 252		
下降时间 Fall time	I_C=25A, V_{CE}=600 V V_{GE}=±15 V, R_G=40Ω	T_{vj}=25°C T_{vj}=125°C	t_f		173 167		

	(电感负载) / (inductive load)	T_{vj}=150°C			214		
开通损耗能量（每脉冲） Turn-on energy loss per pulse	I_C=25A, V_{CE}=600 V V_{GE}=±15 V, R_G=40Ω (电感负载) / (inductive load)	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	E_{on}		1.67 2.48 2.80		mJ
关断损耗能量（每脉冲） Turn-off energy loss per pulse	I_C=25A, V_{CE}=600 V V_{GE}=±15 V, R_G=40Ω (电感负载) / (inductive load)	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	E_{off}		1.54 1.99 2.14		
短路数据 SC data	V_{GE}≤15V, Vcc=800V V_{CEmax}=V_{CES}-L_{sCE}·di/dt	t_P≤10us, T_{vj}=150°C	I_{SC}		82		A
结-外壳热阻 Thermal resistance, junction to case	每个 IGBT / per IGBT		R_{thJC}			0.95	K/W
在开关状态下温度 Temperature under switching conditions			$T_{vj\ op}$	-40		150	°C

二极管，制动-斩波器 / Diode, Brake-Chopper

最大额定值 / Maximum Ratings

Parameter	Conditions	Symbol	Value	Unit
反向重复峰值电压 Repetitive peak reverse voltage	T_{vj}=25°C	V_{RRM}	1200	V
连续正向直流电流 Continuous DC forward current		I_F	15	A
正向重复峰值电流 Repetitive peak forward current	t_p=1ms	I_{FRM}	30	A
I^2t 值 I^2t-value	t_p=10ms, sin180°， T_{vj}=125 °C	I^2t	50	A^2s

特征值 / Characteristic Values

Parameter	Conditions		Symbol	Value			Unit
				Min.	Typ.	Max.	
正向电压 Forward voltage	I_F=15A, V_{GE}=0V I_F=15A, V_{GE}=0V I_F=15A, V_{GE}=0V	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	V_F		2.19 1.87 1.75	2.70	V
反向恢复峰值电流 Peak reverse recovery current	I_F=15A, -di$_F$/dt=364A/µs(T_{vj}=150°C) V_R=600V, V_{GE}=-15V	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	I_{RM}		4 10 13		A
恢复电荷 Recovered charge	I_F=15A, -di$_F$/dt=364A/µs(T_{vj}=150°C) V_R=600V, V_{GE}=-15V	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	Q_r		0.26 1.02 1.31		µC
反向恢复损耗（每脉冲） Reverse recovered energy	I_F=15A, -di$_F$/dt=364A/µs(T_{vj}=150°C) V_R=600V, V_{GE}=-15V	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	E_{rec}		0.05 0.25 0.35		mJ
结-外壳热阻 Thermal resistance, junction to case	每个二极管 / per diode		R_{thJC}			1.50	K/W
在开关状态下温度 Temperature under switching			$T_{vj\ op}$	-40		150	°C

conditions						

负温度系数热敏电阻 / NTC-Thermistor

特征值 / Characteristic Values

Parameter	Conditions	Symbol	Value			Unit
			Min.	Typ.	Max.	
额定电阻值 Rated resistances	T_c=25°C，±5%	R_{25}		5.0		KΩ
B-值 B-value	±1%	$B_{25/50}$		3380		K

模块 / Module

Parameter	Conditions	Symbol	Value			Unit
绝缘测试电压 Isolation test voltage	RMS, f=50Hz, t=1min	V_{ISOL}	2500			V
内部绝缘 Internal isolation			Al_2O_3			
储存温度 Storage temperature		T_{stg}	-40		125	°C
模块安装的扭矩 Mounting torque for modul mounting		M	3.0		6.0	Nm
重量 Weight		W		170		g

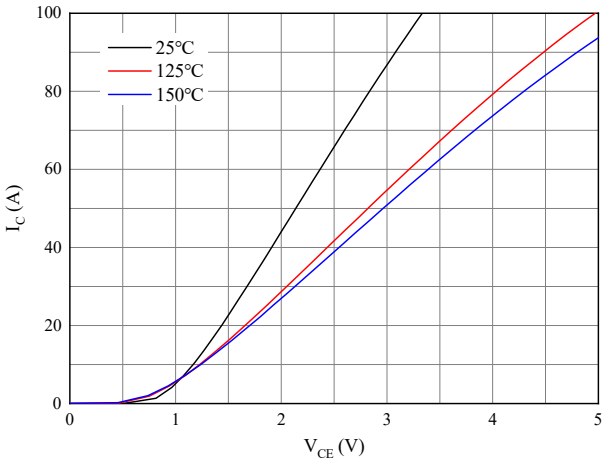


图 1. 输出特性 逆变器 (V_{GE}=15V)

Figure 1. Output characteristics IGBT, Inverter

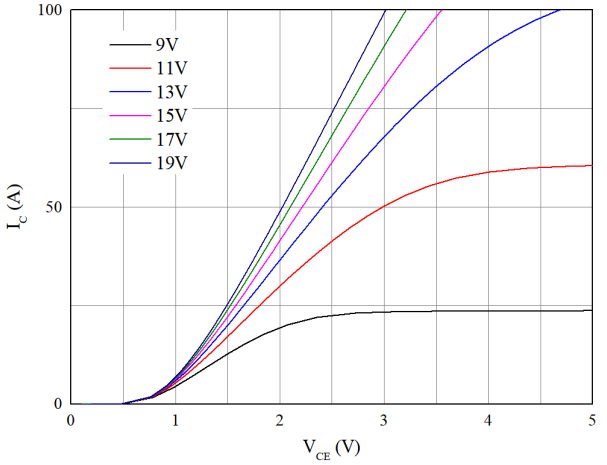


图 2. 输出特性 逆变器 (T_{vj}=150℃)

Figure 2. Output characteristics IGBT, Inverter

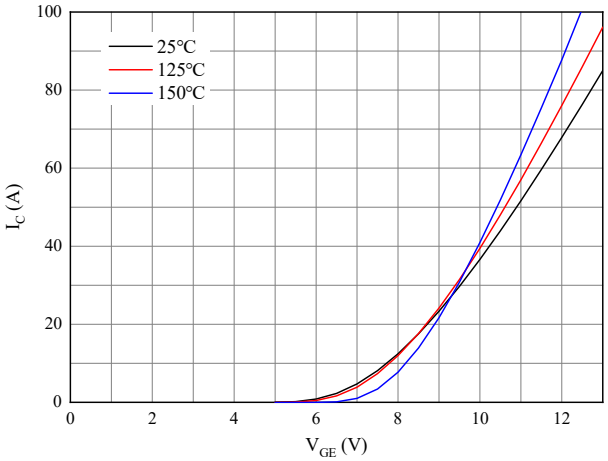


图 3.输出特性 逆变器 (V_{GE}=15V)

Figure 3. Output characteristics IGBT, Inverter

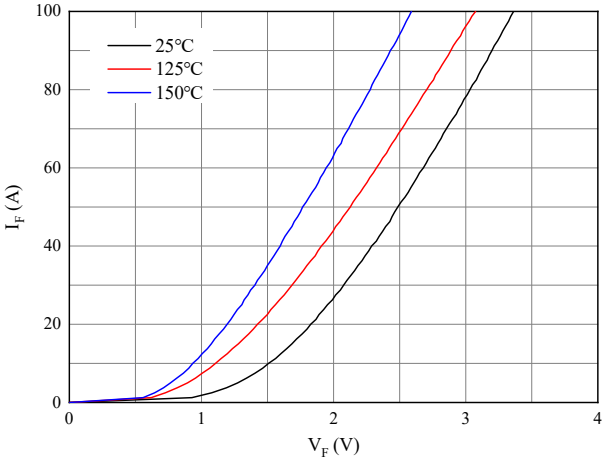


图 4. 正向偏压特性 二极管

Figure 4. Forward characteristic of Diode

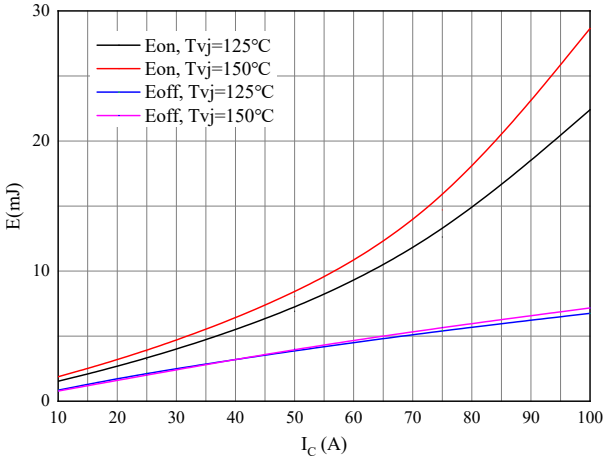


图 5. 开关损耗 逆变器

Figure 5. Switching losses of IGBT

VGE=±15V, RGon=15Ω, RGoff=15Ω, VCE=600V

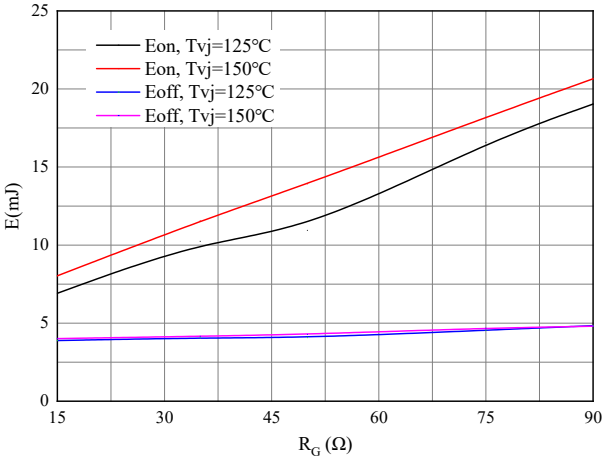


图 6. 开关损耗 逆变器

Figure 6. Switching losses of IGBT

VGE=±15V, IC=50A, VCE=600V

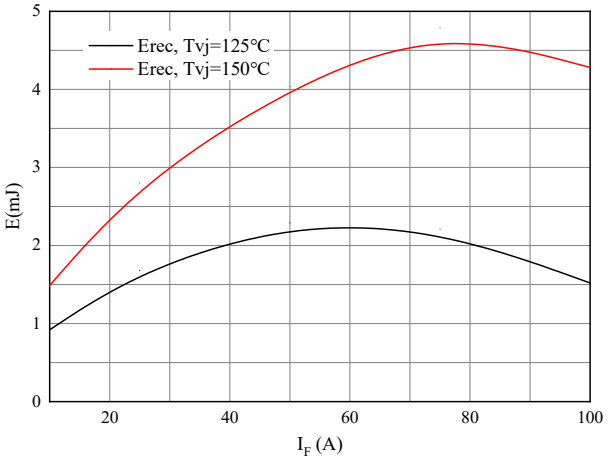


图 7. 开关损耗 二极管

Figure 7. Switching losses of Diode

RGon=15 Ω , VCE=600V

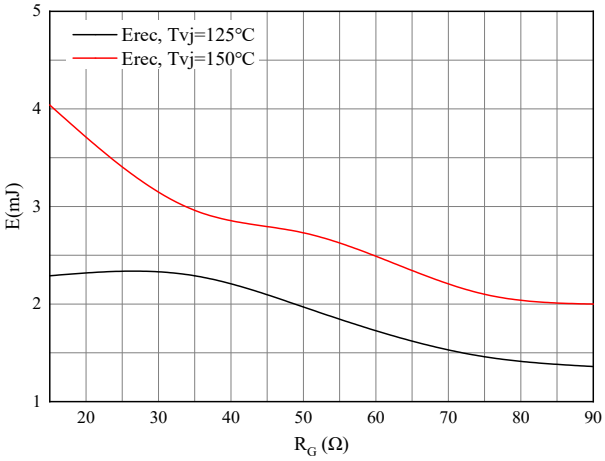


图 8. 开关损耗 二极管

Figure 8. Switching losses of Diode

IF=50A, VCE=600V

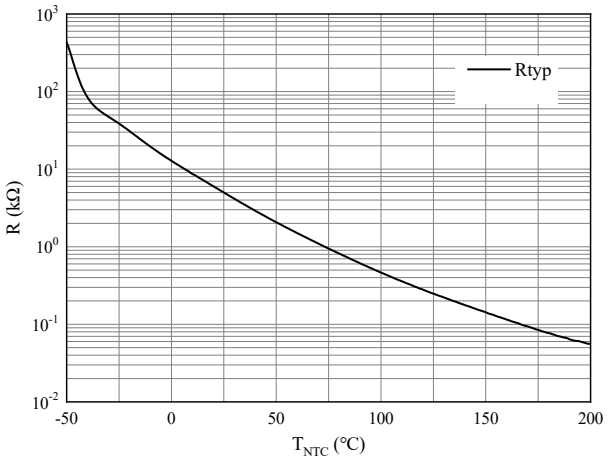
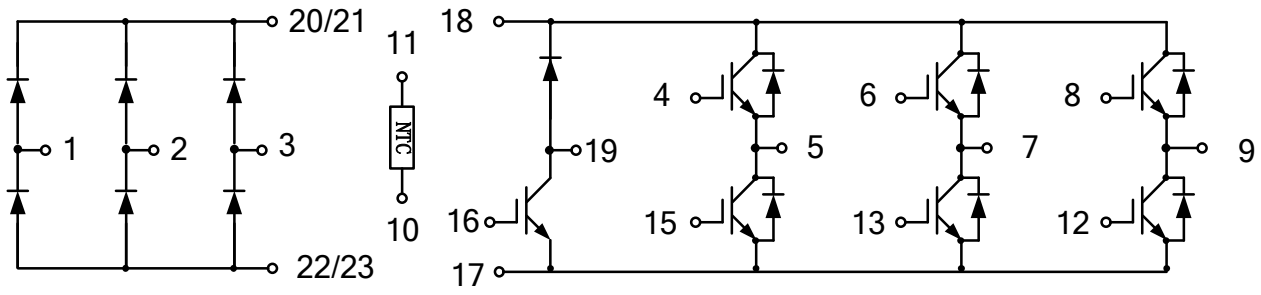


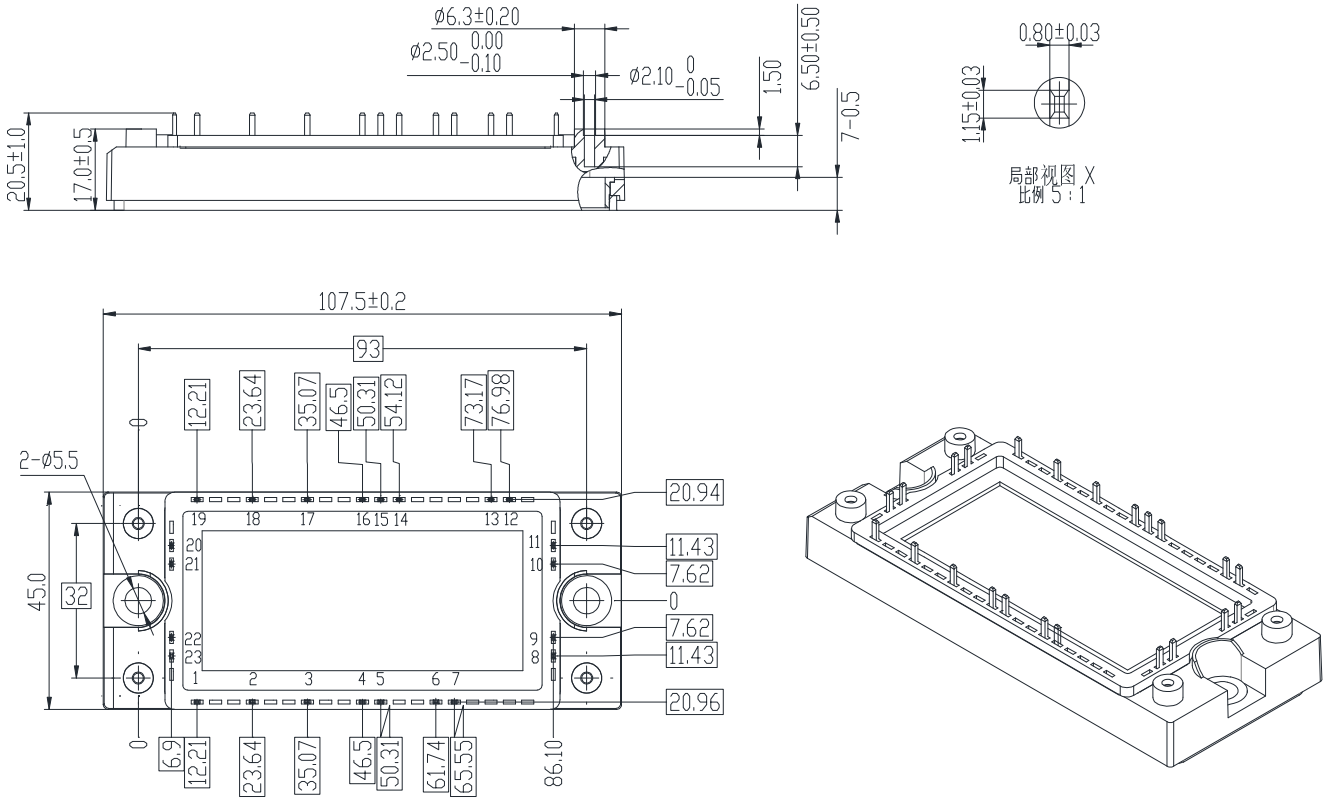
图 9. 负温系数热敏电阻 温度特性

Figure 9. NTC-Themistor-temperature characteristic

接线图 / Circuit diagram



封装尺寸 / Package outlines



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