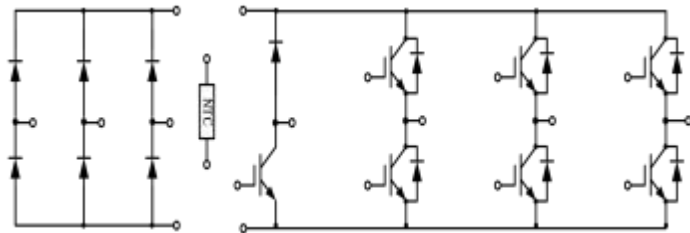


PIM IGBT Module

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	$T_{vj}=25^{\circ}C$	V_{CES}	1200	V
连续集电极直流电流 Continuous DC collector current	$T_C = 100^{\circ}C, T_{vj\ max} = 175^{\circ}C$	$I_{C\ nom}$	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	$T_C = 25^{\circ}C, T_{vj\ max} = 175^{\circ}C$	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	$V_{GE}=15V, I_C=50A$ $V_{GE}=15V, I_C=50A$ $V_{GE}=15V, I_C=50A$	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	V_{CEsat}	2.0 2.73 2.89	2.3	V
栅极-发射极阈值电压 Gate- Emitter threshold voltage	$I_C=1.7mA, V_{GE}=V_{CE}$	$T_{vj}=25^{\circ}C$	$V_{GE(th)}$	5.10 5.70	6.30	
内部栅极电阻 Internal gate resistor			R_{Gint}	None		Ω
输入电容 Input capacitance	$f=1MHz, V_{CE}=25V, V_{GE}=0V$	$T_{vj}=25^{\circ}C$	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	$V_{CE}=1200V, V_{GE}=0V$	$T_{vj}=25^{\circ}C$	I_{CES}		1	mA
栅极-发射极漏电流 Gate-emitter leakage current	$V_{CE}=0V, V_{GE}=20V$	$T_{vj}=25^{\circ}C$	I_{GES}		100	nA
开通延迟时间 Turn-on delay time	$I_C=50A, V_{CE}=600V$ $V_{GE}=\pm 15V, R_G=15\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	t_{don}	62 62 56		ns
上升时间 Rise time	$I_C=50A, V_{CE}=600V$ $V_{GE}=\pm 15V, R_G=15\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	t_r	28 33 34		
关断延迟时间 Turn-off delay time	$I_C=50A, V_{CE}=600V$ $V_{GE}=\pm 15V, R_G=15\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	t_{doff}	204 243 251		
下降时间 Fall time	$I_C=50A, V_{CE}=600V$ $V_{GE}=\pm 15V, R_G=15\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	t_f	164 216 256		
开通损耗能量 (每脉冲) Turn-on energy loss per pulse	$I_C=50A, V_{CE}=600V$ $V_{GE}=\pm 15V, R_G=15\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	E_{on}	3.38 6.91 8.03		
关断损耗能量 (每脉冲) Turn-off energy loss per pulse	$I_C=50A, V_{CE}=600V$ $V_{GE}=\pm 15V, R_G=15\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	E_{off}	3.14 3.88 4.07		
短路数据 SC data	$V_{GE} \leq 15V, V_{CC}=800V$ $V_{CEmax}=V_{CES}-L_{sCE} \cdot di/dt \quad t_p \leq 10\mu s, T_{vj}=150^{\circ}C$		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	$^{\circ}C$

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	$T_{vj}=25^{\circ}\text{C}$	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	$t_p=1\text{ms}$	I_{FRM}	100	A
I^2t 值 I^2t -value	$t_p=10\text{ms}, \sin 180^{\circ}$, $T_{vj}=125^{\circ}\text{C}$	I^2t	570	A^2s

特征值 / Characteristic Values

Parameter	Conditions	Symbol	Value			Unit
			Min.	Typ.	Max.	
正向电压 Forward voltage	$I_F=50\text{A}, V_{GE}=0\text{V}$ $T_{vj}=25^{\circ}\text{C}$ $I_F=50\text{A}, V_{GE}=0\text{V}$ $T_{vj}=125^{\circ}\text{C}$ $I_F=50\text{A}, V_{GE}=0\text{V}$ $T_{vj}=150^{\circ}\text{C}$	V_F		2.45 2.10 1.75	2.95	V
反向恢复峰值电流 Peak reverse recovery current	$I_F=50\text{A},$ $T_{vj}=25^{\circ}\text{C}$ $-di_F/dt=1210\text{A}/\mu\text{s}(T_{vj}=150^{\circ}\text{C})$ $T_{vj}=125^{\circ}\text{C}$ $V_R=600\text{V}, V_{GE}=-15\text{V}$ $T_{vj}=150^{\circ}\text{C}$	I_{RM}		35 60 75		A
恢复电荷 Recovered charge	$I_F=50\text{A},$ $T_{vj}=25^{\circ}\text{C}$ $-di_F/dt=1210\text{A}/\mu\text{s}(T_{vj}=150^{\circ}\text{C})$ $T_{vj}=125^{\circ}\text{C}$ $V_R=600\text{V}, V_{GE}=-15\text{V}$ $T_{vj}=150^{\circ}\text{C}$	Q_F		4.45 7.88 12.89		μC
反向恢复损耗 (每脉冲) Reverse recovered energy	$I_F=50\text{A},$ $T_{vj}=25^{\circ}\text{C}$ $-di_F/dt=1210\text{A}/\mu\text{s}(T_{vj}=150^{\circ}\text{C})$ $T_{vj}=125^{\circ}\text{C}$ $V_R=600\text{V}, V_{GE}=-15\text{V}$ $T_{vj}=150^{\circ}\text{C}$	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	$^{\circ}\text{C}$

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	$T_{vj}=25^{\circ}\text{C}$, $I_{RRM}=0.05\text{mA}$	V_{RRM}	1600	V
反向不重复峰值电压 Non- Repetitive peak reverse voltage	$T_{vj}=25^{\circ}\text{C}$, $I_{RRM}=0.05\text{mA}$	V_{RSM}	1800	V
最大正向平均电流 Maximum Average Forward Current	$T_s=80^{\circ}\text{C}$, $T_{vj}=25^{\circ}\text{C}$	$I_{F(AV)}$	35	A
正向浪涌电流 Surge forward current	$t_p=10\text{ms}$, $\sin 180^{\circ}$, $T_{vj}=25^{\circ}\text{C}$	I_{FSM}	420	A
I^2t 值 I^2t -value	$t_p=10\text{ms}$, $\sin 180^{\circ}$, $T_{vj}=25^{\circ}\text{C}$	I^2t	880	A^2s

特征值 / Characteristic Values

Parameter	Conditions	Symbol	Value			Unit
			Min.	Typ.	Max.	
正向电压 Forward voltage	$I_F=5\text{A}$, $T_{vj}=25^{\circ}\text{C}$	V_F		0.9	1.0	V
反向电流 Reverse current	$V_R=V_{RRM}$ $T_{vj}=25^{\circ}\text{C}$	I_R			50	μA
在开关状态下温度 Temperature under switching conditions		$T_{vj\text{ op}}$	-40		150	$^{\circ}\text{C}$

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	$T_{vj}=25^{\circ}\text{C}$	V_{CES}	1200	V
连续集电极直流电流 Continuous DC collector current	$T_C=100^{\circ}\text{C}$, $T_{vj\text{ max}}=175^{\circ}\text{C}$	$I_{C\text{ nom}}$	25	A
集电极重复峰值电流 Repetitive peak collector current	$t_p=1\text{ms}$	I_{CRM}	50	A
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	$V_{GE}=15V, I_C=25A$ $V_{GE}=15V, I_C=25A$ $V_{GE}=15V, I_C=25A$	$T_{vj}=25oC$ $T_{vj}=125oC$ $T_{vj}=150oC$	V_{CEsat}	1.81 2.11 2.20	2.20	V
栅极-发射极阈值电压 Gate-Emitter threshold voltage	$I_C=0.85mA, V_{GE}=V_{CE}$	$T_{vj}=25oC$	$V_{GE(th)}$	5.30 5.85	6.40	
内部栅极电阻 Internal gate resistor			R_{Gint}	None		Ω
输入电容 Input capacitance	$f=1MHz, V_{CE}=25V, V_{GE}=0V$	$T_{vj}=25oC$	C_{ies}	1.66		nF
反向传输电容 Reverse transfer capacitance			C_{res}	0.08		
集电极-发射极截止电流 Collector-emitter cut-off current	$V_{CE}=1200V, V_{GE}=0V$	$T_{vj}=25oC$	I_{CES}		1	mA
栅极-发射极漏电流 Gate-emitter leakage current	$V_{CE}=0V, V_{GE}=20V$	$T_{vj}=25oC$	I_{GES}		100	nA
开通延迟时间 Turn-on delay time	$I_C=25A, V_{CE}=600V$ $V_{GE}=\pm 15V, R_G=40\Omega$ (电感负载) / (inductive load)	$T_{vj}=25oC$ $T_{vj}=125oC$ $T_{vj}=150oC$	t_{don}	72 60 58		ns
上升时间 Rise time	$I_C=25A, V_{CE}=600V$ $V_{GE}=\pm 15V, R_G=40\Omega$ (电感负载) / (inductive load)	$T_{vj}=25oC$ $T_{vj}=125oC$ $T_{vj}=150oC$	t_r	57 62 63		
关断延迟时间 Turn-off delay time	$I_C=25A, V_{CE}=600V$ $V_{GE}=\pm 15V, R_G=40\Omega$ (电感负载) / (inductive load)	$T_{vj}=25oC$ $T_{vj}=125oC$ $T_{vj}=150oC$	t_{doff}	283 324 335		
下降时间 Fall time	$I_C=25A, V_{CE}=600V$ $V_{GE}=\pm 15V, R_G=40\Omega$	$T_{vj}=25oC$ $T_{vj}=125oC$	t_f	171 238		
	(电感负载) / (inductive load)	$T_{vj}=150oC$		250		
开通损耗能量 (每脉冲) Turn-on energy loss per pulse	$I_C=25A, V_{CE}=600V$ $V_{GE}=\pm 15V, R_G=40\Omega$ (电感负载) / (inductive load)	$T_{vj}=25oC$ $T_{vj}=125oC$ $T_{vj}=150oC$	E_{on}	2.66 3.55 3.89		mJ
关断损耗能量 (每脉冲) Turn-off energy loss per pulse	$I_C=25A, V_{CE}=600V$ $V_{GE}=\pm 15V, R_G=40\Omega$ (电感负载) / (inductive load)	$T_{vj}=25oC$ $T_{vj}=125oC$ $T_{vj}=150oC$	E_{off}	1.37 1.87 2.02		
短路数据 SC data	$V_{GE}\leq 15V, V_{CC}=800V$ $V_{CEmax}=V_{CES}-L_{sCE}\cdot di/dt$ $t_p\leq 10us, T_{vj}=150oC$		I_{sc}	116		A
在开关状态下温度 Temperature under switching conditions			$T_{vj op}$	-40	150	oC

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	$T_{vj}=25^{\circ}\text{C}$	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	$t_p=1\text{ms}$	I_{FRM}	30	A
I^2t 值 I^2t -value	$t_p=10\text{ms}, \sin 180^{\circ}$, $T_{vj}=125^{\circ}\text{C}$	I^2t	50	A^2s

特征值 / Characteristic Values

Parameter	Conditions	Symbol	Value			Unit
			Min.	Typ.	Max.	
正向电压 Forward voltage	$I_F=15\text{A}, V_{GE}=0\text{V}$ $T_{vj}=25^{\circ}\text{C}$ $I_F=15\text{A}, V_{GE}=0\text{V}$ $T_{vj}=125^{\circ}\text{C}$ $I_F=15\text{A}, V_{GE}=0\text{V}$ $T_{vj}=150^{\circ}\text{C}$	V_F		2.19 1.87 1.75	2.70	V
反向恢复峰值电流 Peak reverse recovery current	$I_F=15\text{A},$ $T_{vj}=25^{\circ}\text{C}$ $-\text{di}_F/\text{dt}=364\text{A}/\mu\text{s}(T_{vj}=150^{\circ}\text{C})$ $T_{vj}=125^{\circ}\text{C}$ $V_R=600\text{V}, V_{GE}=-15\text{V}$ $T_{vj}=150^{\circ}\text{C}$	I_{RM}		4 10 13		A
恢复电荷 Recovered charge	$I_F=15\text{A},$ $T_{vj}=25^{\circ}\text{C}$ $-\text{di}_F/\text{dt}=364\text{A}/\mu\text{s}(T_{vj}=150^{\circ}\text{C})$ $T_{vj}=125^{\circ}\text{C}$ $V_R=600\text{V}, V_{GE}=-15\text{V}$ $T_{vj}=150^{\circ}\text{C}$	Q_r		0.26 1.02 1.31		μC
反向恢复损耗 (每脉冲) Reverse recovered energy	$I_F=15\text{A},$ $T_{vj}=25^{\circ}\text{C}$ $-\text{di}_F/\text{dt}=364\text{A}/\mu\text{s}(T_{vj}=150^{\circ}\text{C})$ $T_{vj}=125^{\circ}\text{C}$ $V_R=600\text{V}, V_{GE}=-15\text{V}$ $T_{vj}=150^{\circ}\text{C}$	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 conditions		$T_{vj\ op}$	-40		150	$^{\circ}\text{C}$

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	$T_c=25^{\circ}\text{C}$, $\pm 5\%$	R_{25}		5.0		$\text{K}\Omega$
B-值 B-value	$\pm 1\%$	$B_{25/50}$		3380		K

模块 / Module

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

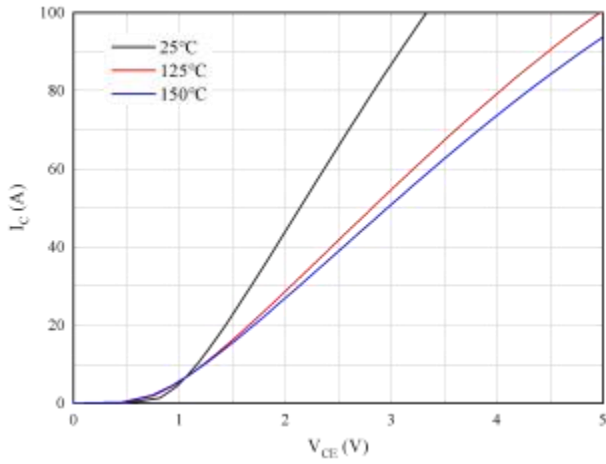


图 1. 输出特性 逆变器 ($V_{GE}=15V$)

Figure 1. Output characteristics IGBT, Inverter

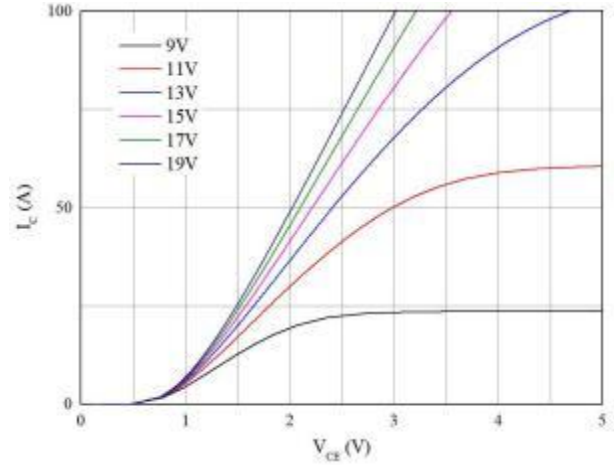


图 2. 输出特性 逆变器 ($T_{vj}=150^{\circ}C$)

Figure 2. Output characteristics IGBT, Inverter

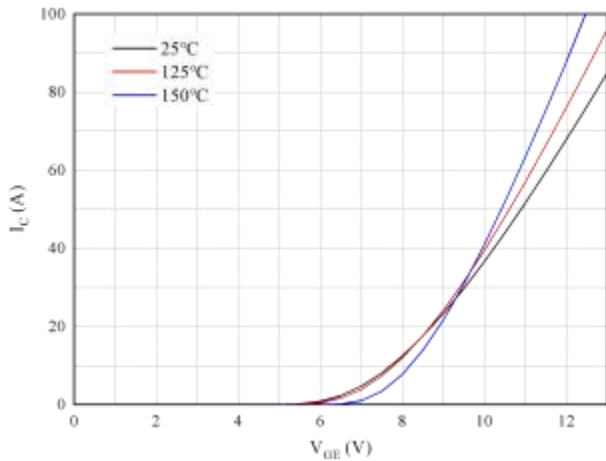


图 3. 输出特性 逆变器 ($V_{CE}=15V$)

Figure 3. Output characteristics IGBT, Inverter

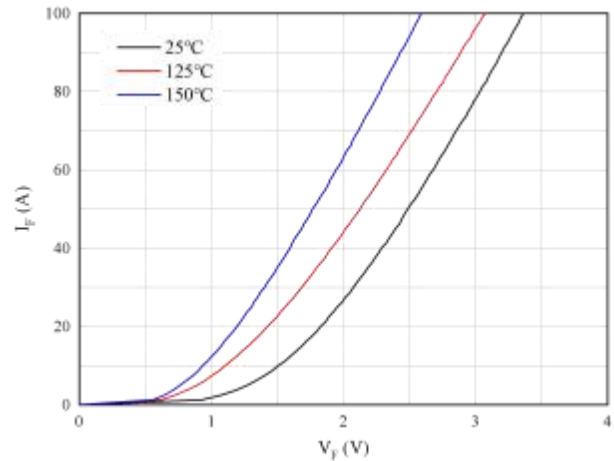


图 4. 正向偏压特性 二极管

Figure 4. Forward characteristic of Diode

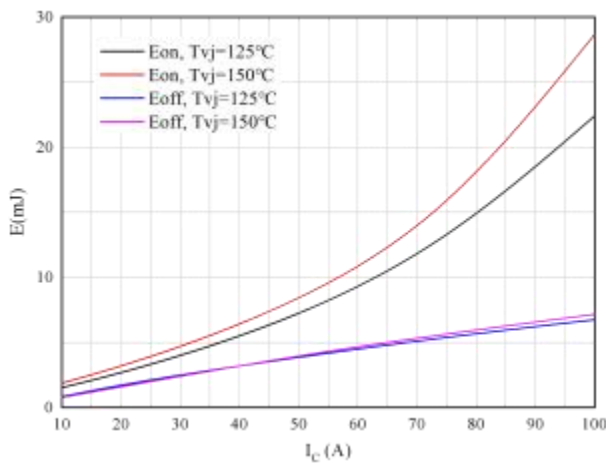


图 5. 开关损耗 逆变器

Figure 5. Switching losses of IGBT

$V_{GE}=\pm 15V$, $R_{Gon}=15\Omega$, $R_{Goff}=15\Omega$, $V_{CE}=600V$

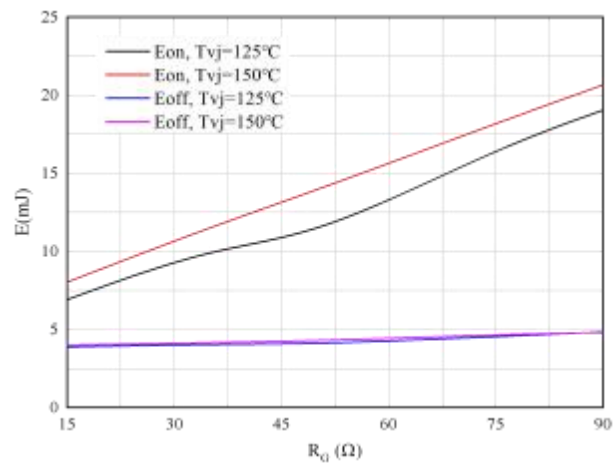


图 6. 开关损耗 逆变器

Figure 6. Switching losses of IGBT

$V_{GE}=\pm 15V$, $I_C=50A$, $V_{CE}=600V$

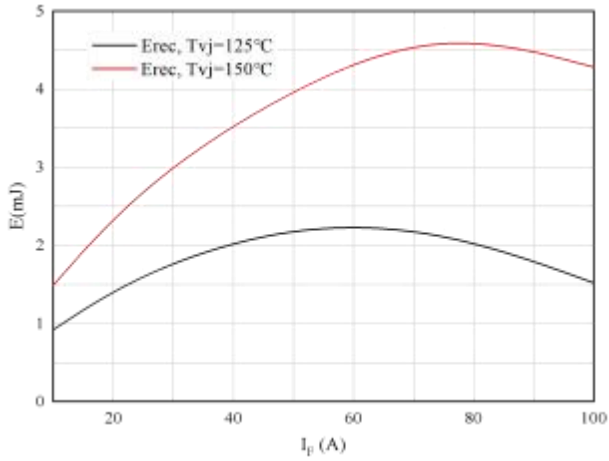


图 7. 开关损耗 二极管
Figure 7. Switching losses of Diode

$R_{Gon}=15\ \Omega$, $V_{CE}=600\text{V}$

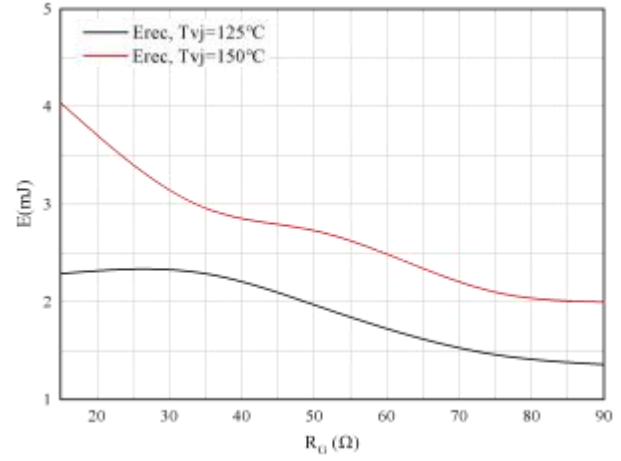


图 8. 开关损耗 二极管
Figure 8. Switching losses of Diode

$I_F=50\text{A}$, $V_{CE}=600\text{V}$

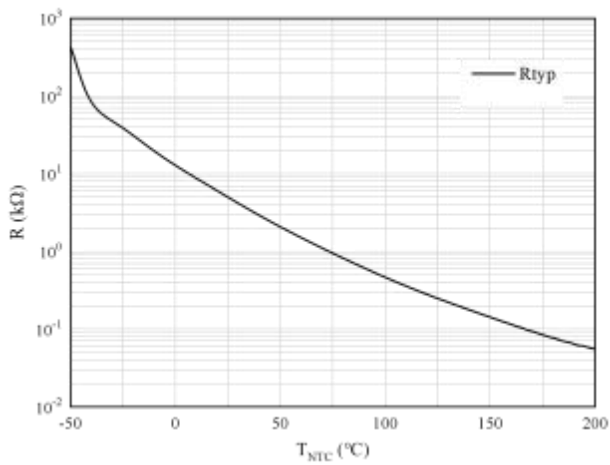
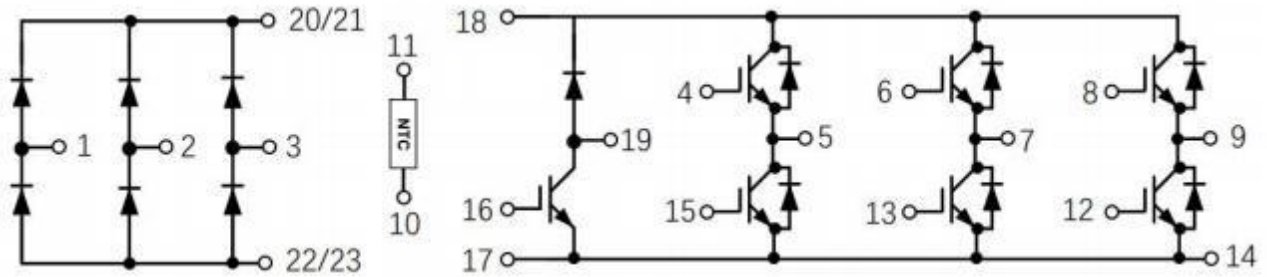


图 9. 负温系数热敏电阻 温度特性
Figure 9. NTC-Themistor-temperature characteristic

接线图 / Circuit diagram



封装尺寸 / Package outlines

