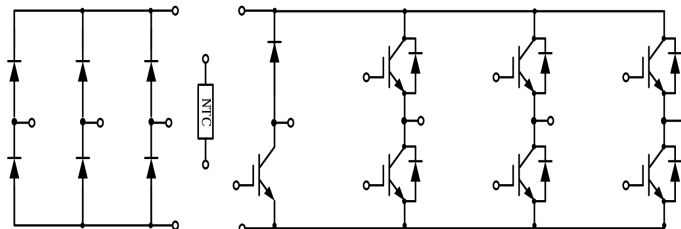


## PIM IGBT Module

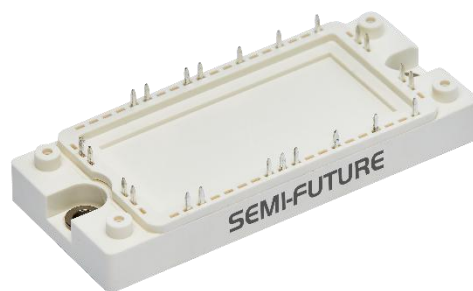
### 电气特性:

- 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		$V_{GE}$	$\pm 20$	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	$V_{GE}=15V$ , $I_C=50A$ $V_{GE}=15V$ , $I_C=50A$ $V_{GE}=15V$ , $I_C=50A$	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	$V_{CESat}$	2.14 2.73 2.89	2.65	V
栅极-发射极阈值电压 Gate-Emitter threshold voltage	$I_C=1.7mA$ , $V_{GE}=V_{CE}$	$T_{vj}=25^{\circ}C$	$V_{GE(th)}$	5.10 5.70	6.30	

内部栅极电阻 Internal gate resistor		$R_{Gint}$	None		$\Omega$
输入电容 Input capacitance	$f=1\text{MHz}, V_{CE}=25\text{V}, V_{GE}=0\text{V}$ $T_{vj}=25^\circ\text{C}$	$C_{ies}$	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	$V_{CE}=1200\text{V}, V_{GE}=0\text{V}$ $T_{vj}=25^\circ\text{C}$	$I_{CES}$		1	mA
栅极-发射极漏电流 Gate-emitter leakage current	$V_{CE}=0\text{V}, V_{GE}=20\text{V}$ $T_{vj}=25^\circ\text{C}$	$I_{GES}$		100	nA
开通延迟时间 Turn-on delay time	$I_C=50\text{A}, V_{CE}=600\text{V}$ $V_{GE}=\pm 15\text{V}, R_G=15\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^\circ\text{C}$ $T_{vj}=125^\circ\text{C}$ $T_{vj}=150^\circ\text{C}$	$t_{don}$	62	
上升时间 Rise time				62	
				56	
关断延迟时间 Turn-off delay time	$I_C=50\text{A}, V_{CE}=600\text{V}$ $V_{GE}=\pm 15\text{V}, R_G=15\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^\circ\text{C}$ $T_{vj}=125^\circ\text{C}$ $T_{vj}=150^\circ\text{C}$	$t_{doff}$	28	ns
				33	
				34	
下降时间 Fall time	$I_C=50\text{A}, V_{CE}=600\text{V}$ $V_{GE}=\pm 15\text{V}, R_G=15\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^\circ\text{C}$ $T_{vj}=125^\circ\text{C}$ $T_{vj}=150^\circ\text{C}$	$t_f$	204	
				243	
				251	
开通损耗能量 (每脉冲) Turn-on energy loss per pulse	$I_C=50\text{A}, V_{CE}=600\text{V}$ $V_{GE}=\pm 15\text{V}, R_G=15\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^\circ\text{C}$ $T_{vj}=125^\circ\text{C}$ $T_{vj}=150^\circ\text{C}$	$E_{on}$	3.38	mJ
				6.91	
				8.03	
关断损耗能量 (每脉冲) Turn-off energy loss per pulse	$I_C=50\text{A}, V_{CE}=600\text{V}$ $V_{GE}=\pm 15\text{V}, R_G=15\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^\circ\text{C}$ $T_{vj}=125^\circ\text{C}$ $T_{vj}=150^\circ\text{C}$	$E_{off}$	3.14	
				3.88	
				4.07	
短路数据 SC data	$V_{GE}\leq 15\text{V}, V_{CC}=800\text{V}$ $V_{CEmax}=V_{CES}-L_{sCE}\cdot di/dt$ $t_p\leq 10\mu\text{s}, T_{vj}=150^\circ\text{C}$	$I_{sc}$		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		$T_{vjop}$	-40	150	$^\circ\text{C}$

## 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 <sup>2</sup> t 值 I <sup>2</sup> t-value	t <sub>p</sub> =10ms, sin180° , T <sub>vj</sub> =125°C	I <sup>2</sup> t	570	A <sup>2</sup> s
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## 特征值 / Characteristic Values

Parameter	Conditions	Symbol	Value			Unit
			Min.	Typ.	Max.	
正向电压 Forward voltage	I <sub>F</sub> =50A, V <sub>GE</sub> =0V I <sub>F</sub> =50A, V <sub>GE</sub> =0V I <sub>F</sub> =50A, V <sub>GE</sub> =0V	T <sub>vj</sub> =25°C T <sub>vj</sub> =125°C T <sub>vj</sub> =150°C	V <sub>F</sub>	2.45 2.10 1.75	2.95	V
反向恢复峰值电流 Peak reverse recovery current	I <sub>F</sub> =50A, -di <sub>F</sub> /dt=1210A/μs(T <sub>vj</sub> =150°C) V <sub>R</sub> =600V, V <sub>GE</sub> =-15V	T <sub>vj</sub> =25°C T <sub>vj</sub> =125°C T <sub>vj</sub> =150°C	I <sub>RM</sub>	35 60 75		A
恢复电荷 Recovered charge	I <sub>F</sub> =50A, -di <sub>F</sub> /dt=1210A/μs(T <sub>vj</sub> =150°C) V <sub>R</sub> =600V, V <sub>GE</sub> =-15V	T <sub>vj</sub> =25°C T <sub>vj</sub> =125°C T <sub>vj</sub> =150°C	Q <sub>r</sub>	4.45 7.88 12.89		μC
反向恢复损耗（每脉冲） Reverse recovered energy	I <sub>F</sub> =50A, -di <sub>F</sub> /dt=1210A/μs(T <sub>vj</sub> =150°C) V <sub>R</sub> =600V, V <sub>GE</sub> =-15V	T <sub>vj</sub> =25°C T <sub>vj</sub> =125°C T <sub>vj</sub> =150°C	E <sub>rec</sub>	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 <sub>thJC</sub>			0.81	K/W
在开关状态下温度 Temperature under switching conditions		T <sub>vj op</sub>	-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 <sub>vj</sub> =25°C, I <sub>RRM</sub> =0.05mA	V <sub>RRM</sub>	1600	V
反向不重复峰值电压 Non-Repetitive peak reverse voltage	T <sub>vj</sub> =25°C, I <sub>RRM</sub> =0.05mA	V <sub>RSM</sub>	1800	V
最大正向平均电流 Maximum Average Forward Current	T <sub>S</sub> =80°C, T <sub>vj</sub> =25°C	I <sub>F(AV)</sub>	35	A
正向浪涌电流 Surge forward current	t <sub>p</sub> =10ms, sin180° , T <sub>vj</sub> =25°C	I <sub>FSM</sub>	420	A
I <sup>2</sup> t 值 I <sup>2</sup> t-value	t <sub>p</sub> =10ms, sin180° , T <sub>vj</sub> =25°C	I <sup>2</sup> t	880	A <sup>2</sup> s

## 特征值 / Characteristic Values

Parameter	Conditions	Symbol	Value			Unit
			Min.	Typ.	Max.	
正向电压 Forward voltage	I <sub>F</sub> =5A, T <sub>vj</sub> =25°C	V <sub>F</sub>		0.9	1.0	V

反向电流 Reverse current	$V_R=V_{RRM}$	$T_{vj}=25^{\circ}\text{C}$	$I_R$			50	$\mu\text{A}$
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		$V_{GE}$	$\pm 20$	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	$V_{GE}=15\text{V}, I_C=25\text{A}$ $V_{GE}=15\text{V}, I_C=25\text{A}$ $V_{GE}=15\text{V}, I_C=25\text{A}$	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$	$V_{CESat}$	1.81 2.11 2.20	2.20	V
栅极-发射极阈值电压 Gate-Emitter threshold voltage	$I_C=0.85\text{mA}, V_{GE}=V_{CE}$	$T_{vj}=25^{\circ}\text{C}$	$V_{GE(th)}$	5.30 5.85	6.40	
内部栅极电阻 Internal gate resistor			$R_{Gint}$	None		$\Omega$
输入电容 Input capacitance	$f=1\text{MHz}, V_{CE}=25\text{V}, V_{GE}=0\text{V}$	$T_{vj}=25^{\circ}\text{C}$	$C_{ies}$	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	$V_{CE}=1200\text{V}, V_{GE}=0\text{V}$	$T_{vj}=25^{\circ}\text{C}$	$I_{CES}$		1	mA
栅极-发射极漏电流 Gate-emitter leakage current	$V_{CE}=0\text{V}, V_{GE}=20\text{V}$	$T_{vj}=25^{\circ}\text{C}$	$I_{GES}$		100	nA
开通延迟时间 Turn-on delay time	$I_C=25\text{A}, V_{CE}=600\text{V}$ $V_{GE}=\pm 15\text{V}, R_G=40\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$	$t_{don}$	72 60 58		ns
上升时间 Rise time	$I_C=25\text{A}, V_{CE}=600\text{V}$ $V_{GE}=\pm 15\text{V}, R_G=40\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$	$t_r$	57 62 63		
关断延迟时间 Turn-off delay time	$I_C=25\text{A}, V_{CE}=600\text{V}$ $V_{GE}=\pm 15\text{V}, R_G=40\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$	$t_{doff}$	283 324 335		
下降时间 Fall time	$I_C=25\text{A}, V_{CE}=600\text{V}$ $V_{GE}=\pm 15\text{V}, R_G=40\Omega$	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$	$t_f$	171 238		

	(电感负载) / (inductive load)	$T_{vj}=150^{\circ}\text{C}$			250		
开通损耗能量 (每脉冲) Turn-on energy loss per pulse	$I_C=25\text{A}, V_{CE}=600\text{V}$	$T_{vj}=25^{\circ}\text{C}$	E <sub>on</sub>		2.66	mJ	
	$V_{GE}=\pm 15\text{V}, R_G=40\Omega$	$T_{vj}=125^{\circ}\text{C}$			3.55		
	(电感负载) / (inductive load)	$T_{vj}=150^{\circ}\text{C}$			3.89		
关断损耗能量 (每脉冲) Turn-off energy loss per pulse	$I_C=25\text{A}, V_{CE}=600\text{V}$	$T_{vj}=25^{\circ}\text{C}$	E <sub>off</sub>		1.37		
	$V_{GE}=\pm 15\text{V}, R_G=40\Omega$	$T_{vj}=125^{\circ}\text{C}$			1.87		
	(电感负载) / (inductive load)	$T_{vj}=150^{\circ}\text{C}$			2.02		
短路数据 SC data	$V_{GE}\leq 15\text{V}, V_{CC}=800\text{V}$		I <sub>SC</sub>		116		A
在开关状态下温度 Temperature under switching conditions	$V_{CEmax}=V_{CES}-L_{sCE}\cdot di/dt$ $t_p\leq 10\mu\text{s}, T_{vj}=150^{\circ}\text{C}$		T <sub>vj op</sub>	-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	$T_{vj}=25^{\circ}\text{C}$	V <sub>RRM</sub>	1200	V
连续正向直流电流 Continuous DC forward current		I <sub>F</sub>	15	A
正向重复峰值电流 Repetitive peak forward current	$t_p=1\text{ms}$	I <sub>FRM</sub>	30	A
I <sup>2</sup> t 值 I <sup>2</sup> t-value	$t_p=10\text{ms}, \sin 180^{\circ}, T_{vj}=125^{\circ}\text{C}$	I <sup>2</sup> t	50	A <sup>2</sup> s

### 特征值 / Characteristic Values

Parameter	Conditions	Symbol	Value			Unit
			Min.	Typ.	Max.	
正向电压 Forward voltage	$I_F=15\text{A}, V_{GE}=0\text{V}$ $I_F=15\text{A}, V_{GE}=0\text{V}$ $I_F=15\text{A}, V_{GE}=0\text{V}$	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$	V <sub>F</sub>	2.19 1.87 1.75	2.70	V
反向恢复峰值电流 Peak reverse recovery current	$I_F=15\text{A},$ $-di_F/dt=364\text{A}/\mu\text{s}(T_{vj}=150^{\circ}\text{C})$ $V_R=600\text{V}, V_{GE}=-15\text{V}$	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$	I <sub>RM</sub>	4 10 13		A
恢复电荷 Recovered charge	$I_F=15\text{A},$ $-di_F/dt=364\text{A}/\mu\text{s}(T_{vj}=150^{\circ}\text{C})$ $V_R=600\text{V}, V_{GE}=-15\text{V}$	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$	Q <sub>r</sub>	0.26 1.02 1.31		μC
反向恢复损耗 (每脉冲) Reverse recovered energy	$I_F=15\text{A},$ $-di_F/dt=364\text{A}/\mu\text{s}(T_{vj}=150^{\circ}\text{C})$ $V_R=600\text{V}, V_{GE}=-15\text{V}$	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$	E <sub>rec</sub>	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 <sub>thJC</sub>			1.50	K/W
在开关状态下温度 Temperature under switching conditions		T <sub>vj op</sub>	-40		150	°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, $f=50\text{Hz}$ , $t=1\text{min}$	$V_{\text{ISOL}}$	2500			V
内部绝缘 Internal isolation			$\text{Al}_2\text{O}_3$			
储存温度 Storage temperature		$T_{\text{stg}}$	-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

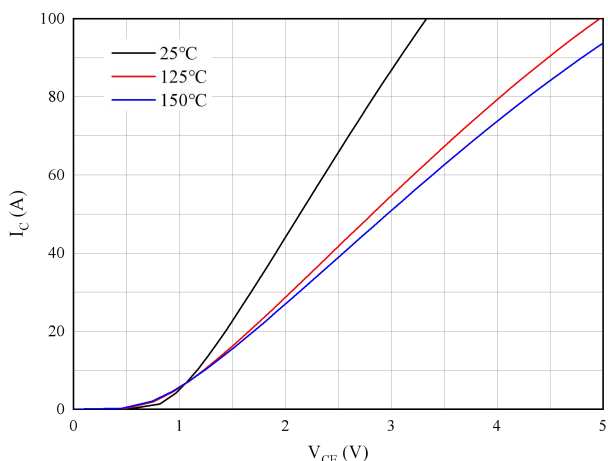


图 1. 输出特性 逆变器 ( $V_{GE}=15V$ )

Figure 1. Output characteristics IGBT, Inverter

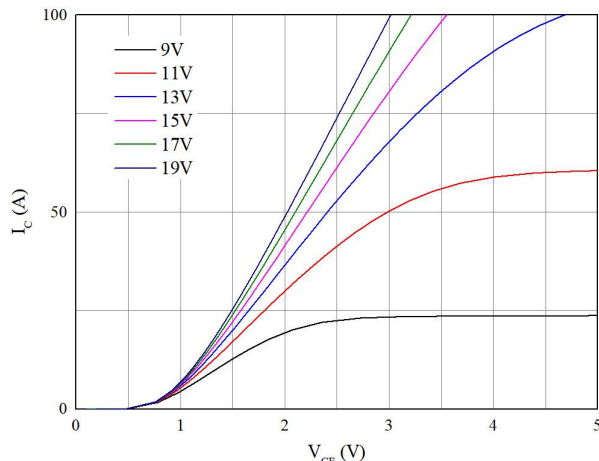


图 2. 输出特性 逆变器 ( $T_{vj}=150^{\circ}C$ )

Figure 2. Output characteristics IGBT, Inverter

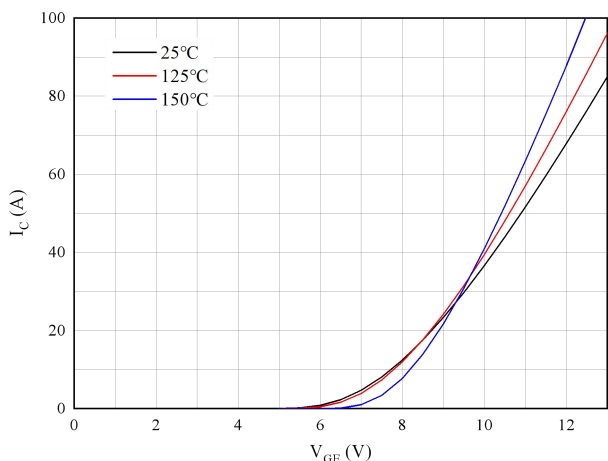


图 3. 输出特性 逆变器 ( $V_{GE}=15V$ )

Figure 3. Output characteristics IGBT, Inverter

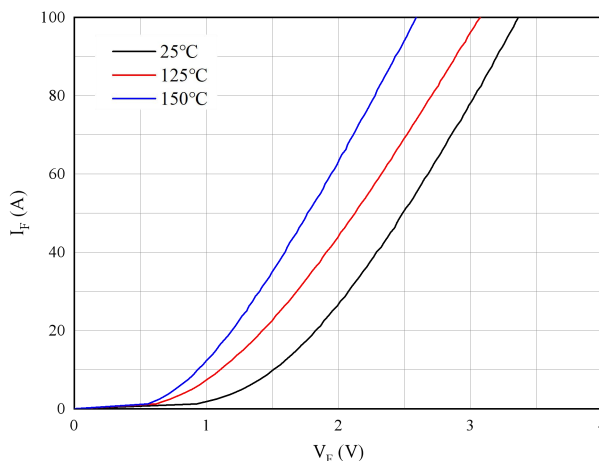


图 4. 正向偏压特性 二极管

Figure 4. Forward characteristic of Diode

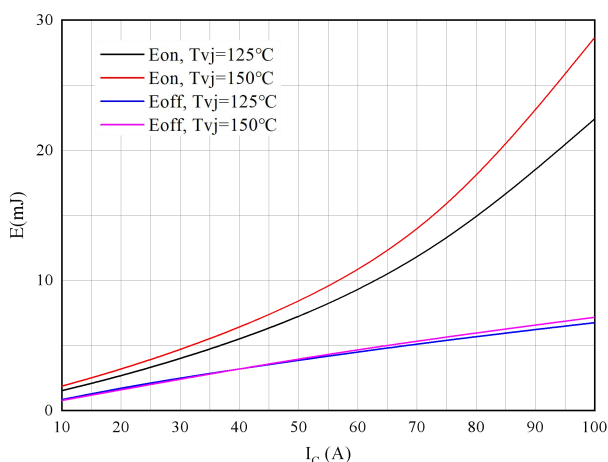


图 5. 开关损耗 逆变器

Figure 5. Switching losses of IGBT

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

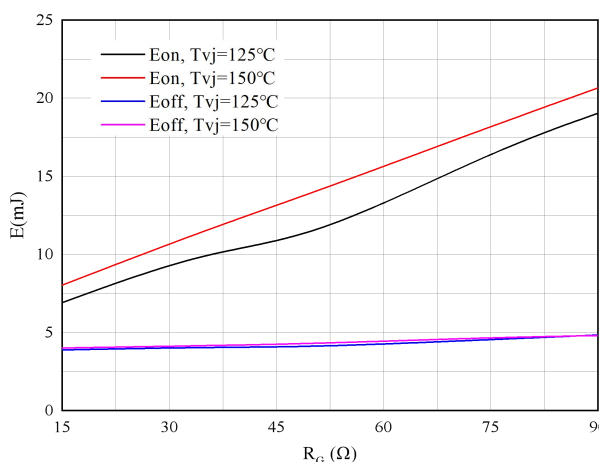


图 6. 开关损耗 逆变器

Figure 6. Switching losses of IGBT

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

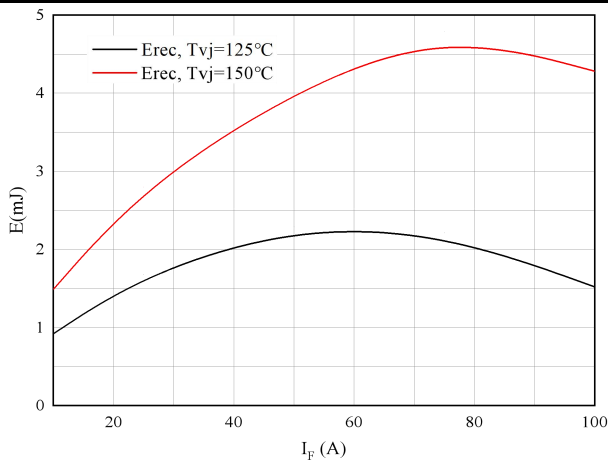


图 7. 开关损耗 二极管

Figure 7. Switching losses of Diode

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

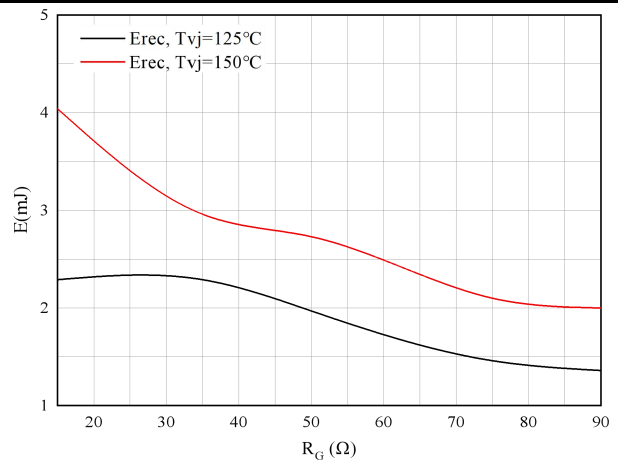


图 8. 开关损耗 二极管

Figure 8. Switching losses of Diode

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

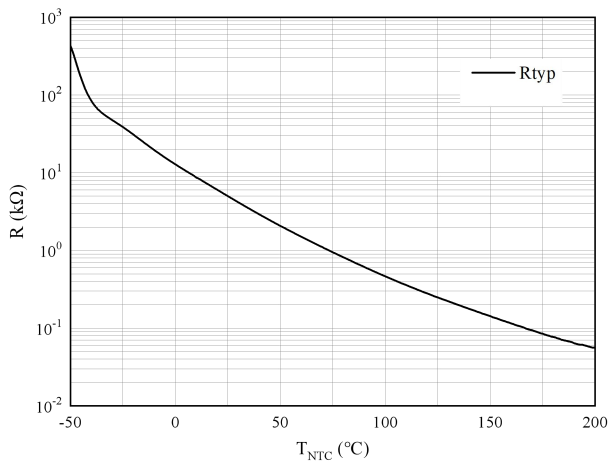
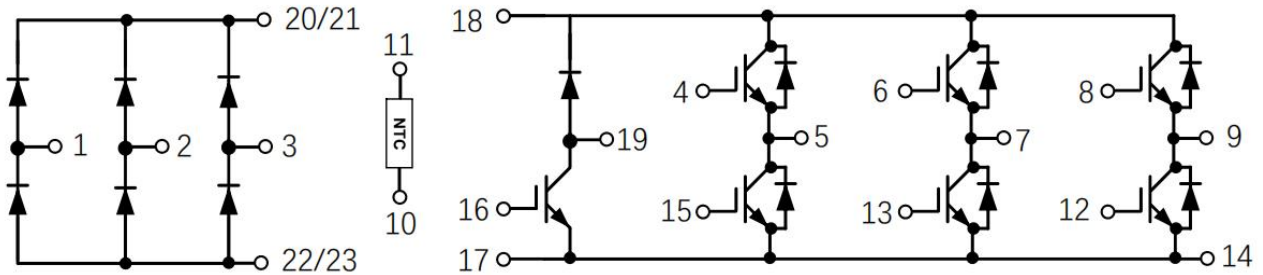


图 9. 负温系数热敏电阻 温度特性

Figure 9. NTC-Themistor-temperature characteristic



接线图 / Circuit diagram



封装尺寸 / Package outlines

