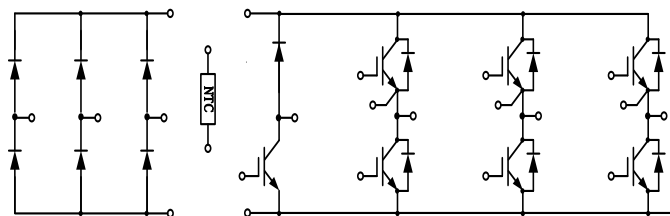


## PIM IGBT Module

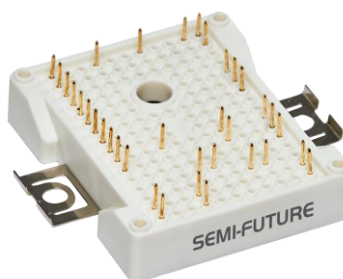
### 电气特性:

- 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



$V_{CES} = 1200V$ ,  $I_{C\ nom} = 40A$  /  $I_{CRM} = 80A$

## IGBT, 逆变器 / IGBT, Inverter

### 最大额定值 / Maximum Ratings

Parameter	Conditions	Symbol	Value			Unit
			Min.	Typ.	Max.	
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	$T_C = 100^{\circ}C$ , $T_{vj\ max} = 175^{\circ}C$	$I_{C\ nom}$		40		A
集电极重复峰值电流 Repetitive peak collector current	$t_p = 1\ ms$	$I_{CRM}$		80		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	$V_{GE} = 15V$ , $I_C = 40A$ $T_{vj} = 25^{\circ}C$ $V_{GE} = 15V$ , $I_C = 40A$ $T_{vj} = 125^{\circ}C$ $V_{GE} = 15V$ , $I_C = 40A$ $T_{vj} = 150^{\circ}C$	$V_{CESat}$		1.73 2.02 2.04	2.15	V
栅极-发射极阈值电压 Gate-Emitter threshold voltage	$I_C = 1.5mA$ , $V_{GE} = V_{CE}$ $T_{vj} = 25^{\circ}C$	$V_{GE(th)}$	5.00	5.60	6.20	
栅电荷 Gate charge	$V_{GE} = -15V \dots +15V$	$Q_G$		0.33		$\mu C$
内部栅极电阻 Internal gate resistor		$R_{Gint}$		None		$\Omega$

输入电容 Input capacitance	$f=1\text{MHz}, V_{CE}=25\text{V}, V_{GE}=0\text{V}$ $T_{vj}=25^\circ\text{C}$	$C_{ies}$	2.72	nF
反向传输电容 Reverse transfer capacitance		$C_{res}$	0.14	
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	$I_C=40\text{A}, V_{CE}=600\text{V}$ $V_{GE}=\pm 15\text{V}, R_G=20\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^\circ\text{C}$	49	ns
上升时间 Rise time		$T_{vj}=125^\circ\text{C}$	42	
		$T_{vj}=150^\circ\text{C}$	44	
关断延迟时间 Turn-off delay time	$I_C=40\text{A}, V_{CE}=600\text{V}$ $V_{GE}=\pm 15\text{V}, R_G=20\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^\circ\text{C}$	267	
		$T_{vj}=125^\circ\text{C}$	320	
		$T_{vj}=150^\circ\text{C}$	336	
下降时间 Fall time	$I_C=40\text{A}, V_{CE}=600\text{V}$ $V_{GE}=\pm 15\text{V}, R_G=20\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^\circ\text{C}$	148	
		$T_{vj}=125^\circ\text{C}$	226	
		$T_{vj}=150^\circ\text{C}$	245	
开通损耗能量 (每脉冲) Turn-on energy loss per pulse	$I_C=40\text{A}, V_{CE}=600\text{V}$ $V_{GE}=\pm 15\text{V}, R_G=20\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^\circ\text{C}$	3.47	mJ
		$T_{vj}=125^\circ\text{C}$	4.94	
		$T_{vj}=150^\circ\text{C}$	5.65	
关断损耗能量 (每脉冲) Turn-off energy loss per pulse	$I_C=40\text{A}, V_{CE}=600\text{V}$ $V_{GE}=\pm 15\text{V}, R_G=20\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^\circ\text{C}$	2.07	mJ
		$T_{vj}=125^\circ\text{C}$	2.92	
		$T_{vj}=150^\circ\text{C}$	3.17	
短路数据 SC data	$V_{GE}\leq 15\text{V}, V_{CC}=800\text{V}$ $V_{CEmax}=V_{CES}-L_{sCE}\cdot di/dt$ $t_p\leq 8\mu\text{s}, T_{vj}=150^\circ\text{C}$	$I_{sc}$	196	A
在开关状态下温度 Temperature under switching conditions		$T_{vj\text{ op}}$	-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	$T_{vj}=25^\circ\text{C}$	$V_{RRM}$	1200	V
连续正向直流电流 Continuous DC forward current		$I_F$	30	A
正向重复峰值电流 Repetitive peak forward current	$t_p=1\text{ms}$	$I_{FRM}$	60	A
$I^2t$ 值 $I^2t$ -value	$t_p=10\text{ms}, \sin 180^\circ, T_{vj}=125^\circ\text{C}$	$I^2t$	1560	$\text{A}^2\text{s}$

### 特征值 / Characteristic Values

Parameter	Conditions	Symbol	Value			Unit
			Min.	Typ.	Max.	
正向电压 Forward voltage	$I_F=30A, V_{GE}=0V$ $I_F=30A, V_{GE}=0V$ $I_F=30A, V_{GE}=0V$	$T_{vj}=25^\circ C$ $T_{vj}=125^\circ C$ $T_{vj}=150^\circ C$	$V_F$		2.05 1.71 1.61	2.60 V
反向恢复峰值电流 Peak reverse recovery current	$I_F=30A,$ $-di_F/dt=632A/\mu s(T_{vj}=150^\circ C)$ $V_R=600V, V_{GE}=-15V$	$T_{vj}=25^\circ C$ $T_{vj}=125^\circ C$ $T_{vj}=150^\circ C$	$I_{RM}$		28 43 47	A
恢复电荷 Recovered charge	$I_F=30A,$ $-di_F/dt=632A/\mu s(T_{vj}=150^\circ C)$ $V_R=600V, V_{GE}=-15V$	$T_{vj}=25^\circ C$ $T_{vj}=125^\circ C$ $T_{vj}=150^\circ C$	$Q_F$		2.39 5.90 7.21	$\mu C$
反向恢复损耗（每脉冲） Reverse recovered energy	$I_F=30A,$ $-di_F/dt=632A/\mu s(T_{vj}=150^\circ C)$ $V_R=600V, V_{GE}=-15V$	$T_{vj}=25^\circ C$ $T_{vj}=125^\circ C$ $T_{vj}=150^\circ C$	$E_{rec}$		0.81 1.99 2.42	mJ
在开关状态下温度 Temperature under switching conditions			$T_{vj op}$	-40		150 $^\circ C$

## 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	$T_{vj}=25^\circ C$	$V_{RRM}$	1600	V
反向不重复峰值电压 Non-Repetitive peak reverse voltage	$T_{vj}=25^\circ C, I_{RRM}=5\mu A$	$V_{RSM}$	2000	V
最大正向平均电流 Maximum Average Forward Current		$I_{F(AV)}$	30	A
正向浪涌电流 Surge forward current	$t_p=10ms, \sin 180^\circ, T_{vj}=25^\circ C$	$I_{FSM}$	360	A
$I^2t$ 值 $I^2t$ -value	$t_p=10ms, \sin 180^\circ, T_{vj}=125^\circ C$	$I^2t$	648	$A^2s$

### 特征值 / Characteristic Values

Parameter	Conditions	Symbol	Value			Unit
			Min.	Typ.	Max.	
正向电压 Forward voltage	$I_F=30A, T_j=25^\circ C$	$V_F$			1.2	V
反向电流 Reverse current	$V_R=V_{RRM}$ $T_{vj}=25^\circ C$	$I_R$			5	$\mu A$
在开关状态下温度 Temperature under switching conditions		$T_{vj op}$	-40		150	$^\circ C$

## 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	$T_C=100^{\circ}\text{C}$ , $T_{vj\max}=175^{\circ}\text{C}$	$I_{C\text{nom}}$	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	$V_{GE}=15\text{V}$ , $I_C=25\text{A}$ $V_{GE}=15\text{V}$ , $I_C=25\text{A}$ $V_{GE}=15\text{V}$ , $I_C=25\text{A}$	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$ $V_{CE\text{sat}}$		1.97 2.20 2.26	2.40	V
栅极-发射极阈值电压 Gate-Emitter threshold voltage	$I_C=1\text{mA}$ , $V_{GE}=V_{CE}$	$T_{vj}=25^{\circ}\text{C}$ $V_{GE(\text{th})}$	5.10	5.70	6.30	
栅电荷 Gate charge	$V_{GE}=-15\text{V}\dots+15\text{V}$	$Q_G$		0.18		$\mu\text{C}$
内部栅极电阻 Internal gate resistor		$R_{G\text{int}}$		None		$\Omega$
输入电容 Input capacitance	$f=1\text{MHz}$ , $V_{CE}=25\text{V}$ , $V_{GE}=0\text{V}$	$T_{vj}=25^{\circ}\text{C}$	$C_{\text{ies}}$	1.65		nF
反向传输电容 Reverse transfer capacitance						
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	$I_C=25\text{A}$ , $V_{CE}=600\text{V}$ $V_{GE}=\pm 15\text{V}$ , $R_G=68\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$ $t_{d\text{on}}$		112 97 96		
上升时间 Rise time	$I_C=25\text{A}$ , $V_{CE}=600\text{V}$ $V_{GE}=\pm 15\text{V}$ , $R_G=68\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$ $t_r$		96 102 105		ns
关断延迟时间 Turn-off delay time	$I_C=25\text{A}$ , $V_{CE}=600\text{V}$ $V_{GE}=\pm 15\text{V}$ , $R_G=68\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$ $t_{d\text{off}}$		422 460 470		
下降时间 Fall time	$I_C=25\text{A}$ , $V_{CE}=600\text{V}$ $V_{GE}=\pm 15\text{V}$ , $R_G=68\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$ $t_f$		187 262 282		
开通损耗能量 (每脉冲) Turn-on energy loss per pulse	$I_C=25\text{A}$ , $V_{CE}=600\text{V}$ $V_{GE}=\pm 15\text{V}$ , $R_G=68\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$ $E_{\text{on}}$		3.75 4.67 5.02		mJ
关断损耗能量 (每脉冲)	$I_C=25\text{A}$ , $V_{CE}=600\text{V}$	$T_{vj}=25^{\circ}\text{C}$ $E_{\text{off}}$		1.83 2.28		

Turn-off energy loss per pulse	$V_{GE}=\pm 15\text{ V}$ , $R_G=68\Omega$ (电感负载) / (inductive load)	$T_{vj}=125^\circ\text{C}$ $T_{vj}=150^\circ\text{C}$			2.45		
在开关状态下温度 Temperature under switching conditions			$T_{vj\text{ op}}$	-40		150	$^\circ\text{C}$

## 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	$T_{vj}=25^\circ\text{C}$	$V_{RRM}$	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	$t_p=10\text{ms}$ , $\sin 180^\circ$ , $T_{vj}=125^\circ\text{C}$	$I^2t$	120	$\text{A}^2\text{s}$

### 特征值 / Characteristic Values

Parameter	Conditions	Symbol	Value			Unit
			Min.	Typ.	Max.	
正向电压 Forward voltage	$I_F=15\text{A}$ , $V_{GE}=0\text{V}$ $I_F=15\text{A}$ , $V_{GE}=0\text{V}$ $I_F=15\text{A}$ , $V_{GE}=0\text{V}$	$T_{vj}=25^\circ\text{C}$ $T_{vj}=125^\circ\text{C}$ $T_{vj}=150^\circ\text{C}$	$V_F$		2.32 1.80 1.69	2.70 V
反向恢复峰值电流 Peak reverse recovery current	$I_F=15\text{A}$ , $-di_F/dt=189\text{A}/\mu\text{s}$ ( $T_{vj}=150^\circ\text{C}$ ) $V_R=600\text{V}$ , $V_{GE}=-15\text{V}$	$T_{vj}=25^\circ\text{C}$ $T_{vj}=125^\circ\text{C}$ $T_{vj}=150^\circ\text{C}$	$I_{RM}$		8 12 14	A
恢复电荷 Recovered charge	$I_F=15\text{A}$ , $-di_F/dt=189\text{A}/\mu\text{s}$ ( $T_{vj}=150^\circ\text{C}$ ) $V_R=600\text{V}$ , $V_{GE}=-15\text{V}$	$T_{vj}=25^\circ\text{C}$ $T_{vj}=125^\circ\text{C}$ $T_{vj}=150^\circ\text{C}$	$Q_r$		1.25 2.75 3.58	$\mu\text{C}$
反向恢复损耗（每脉冲） Reverse recovered energy	$I_F=15\text{A}$ , $-di_F/dt=189\text{A}/\mu\text{s}$ ( $T_{vj}=150^\circ\text{C}$ ) $V_R=600\text{V}$ , $V_{GE}=-15\text{V}$	$T_{vj}=25^\circ\text{C}$ $T_{vj}=125^\circ\text{C}$ $T_{vj}=150^\circ\text{C}$	$E_{rec}$		0.40 0.90 1.21	mJ
在开关状态下温度 Temperature under switching conditions			$T_{vj\text{ op}}$	-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	$\pm 2\%$	$B_{25/50}$		3375		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		42		g

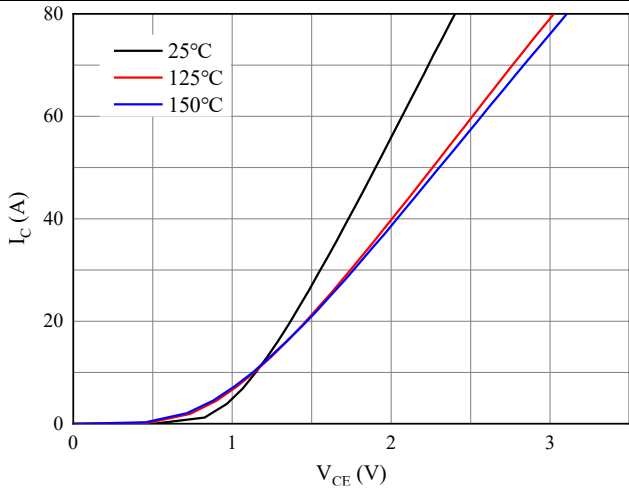


图 1. 典型输出特性 ( $V_{GE}=15V$ )

Figure 1. Typical output characteristics ( $V_{GE}=15V$ )

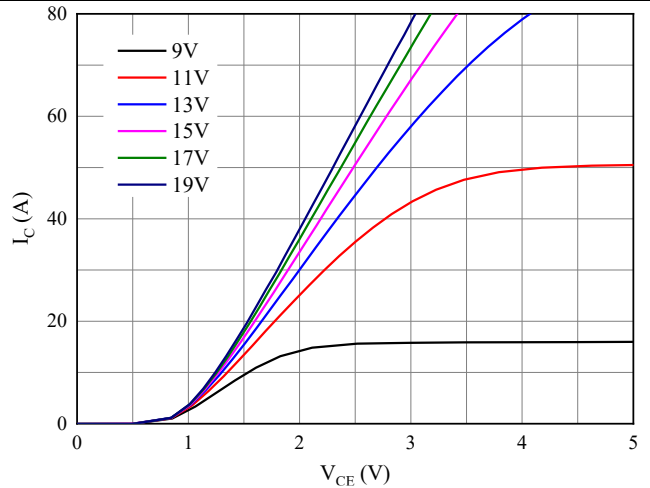


图 2. 典型输出特性 ( $T_{vj}=150^{\circ}C$ )

Figure 2. Typical output characteristics ( $T_{vj}=150^{\circ}C$ )

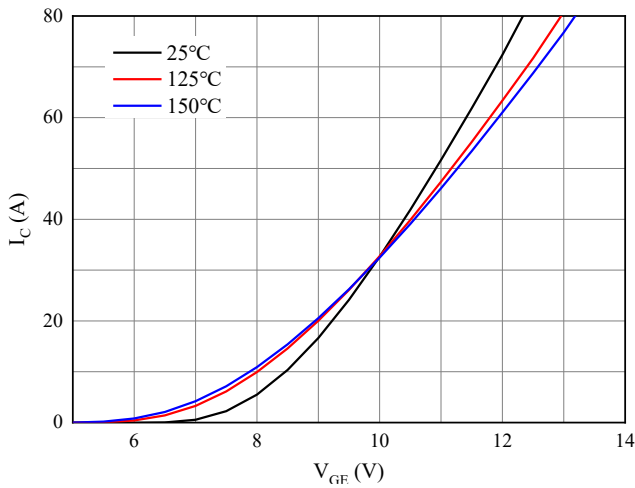


图 3. 典型传输特性 ( $V_{CE}=20V$ )

Figure 3. Typical transfer characteristic ( $V_{CE}=20V$ )

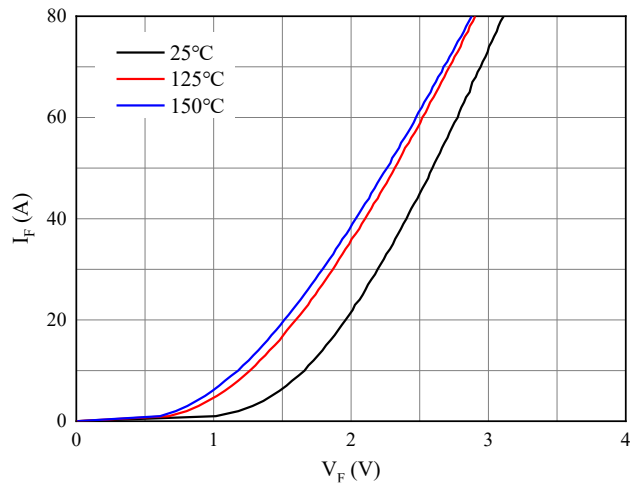


图 4. 正向偏压特性 二极管

Figure 4. Forward characteristic of Diode

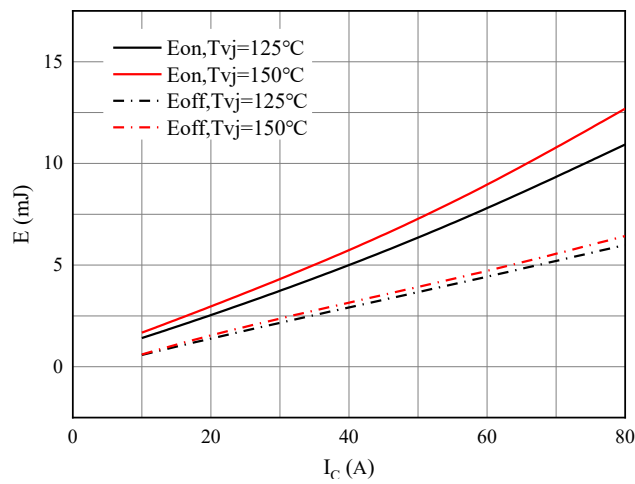


图 5. 开关损耗 逆变器

Figure 5. Switching losses of IGBT  
 $V_{GE}=\pm 15V, R_{Gon}=20\Omega, R_{Goff}=20\Omega, V_{CE}=600V$

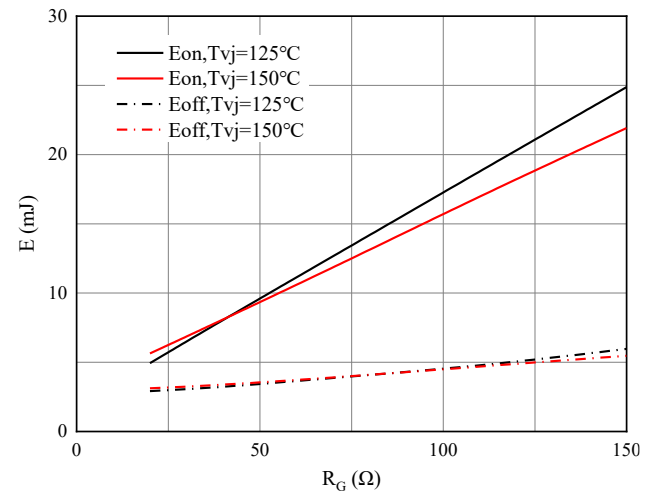


图 6. 开关损耗 逆变器

Figure 6. Switching losses of IGBT  
 $V_{GE}=\pm 15V, I_C=40A, V_{CE}=600V$

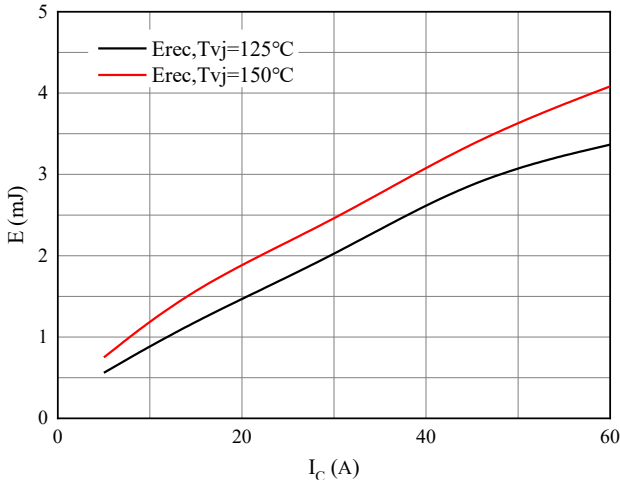


图 7. 开关损耗 二极管  
Figure 7. Switching losses of Diode  
R<sub>Gon</sub>=68Ω, V<sub>CE</sub>=600V

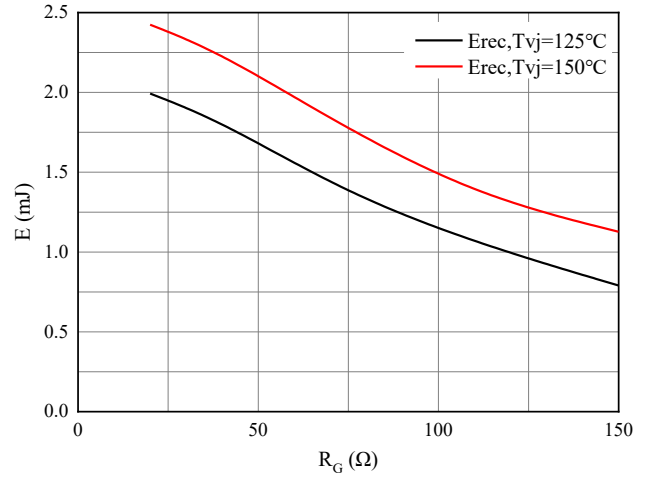


图 8. 开关损耗 二极管  
Figure 8. Switching losses of Diode  
I<sub>F</sub>=30A, V<sub>CE</sub>=600V

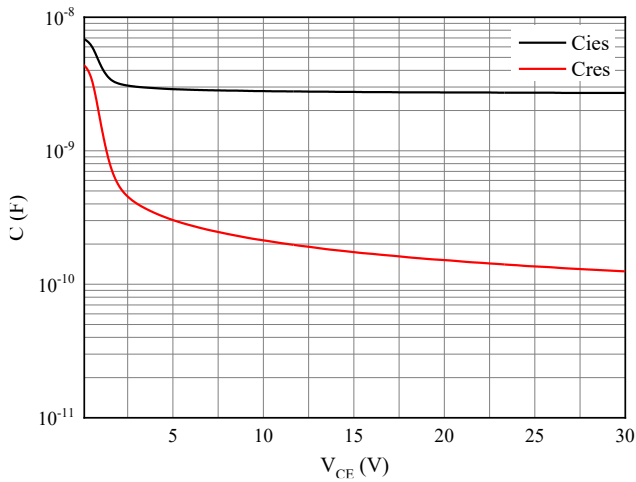


图 9. 电容特性  
Figure 9. Capacitance characteristic

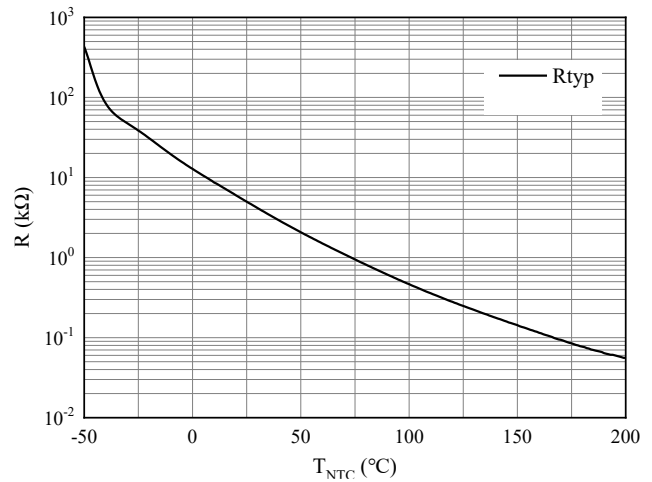
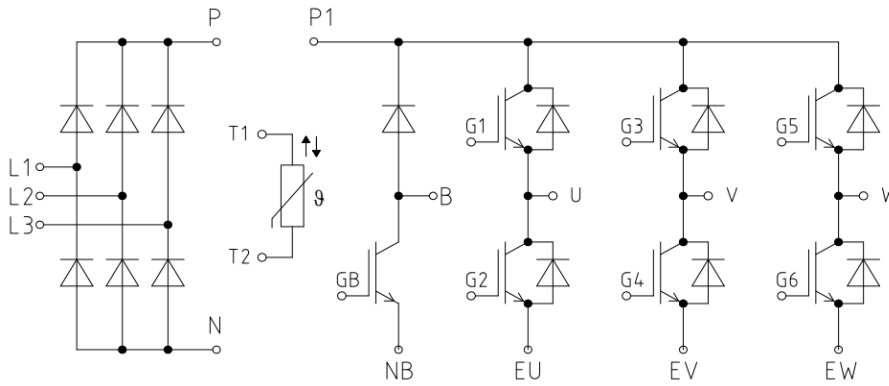


图 10. 负温系数热敏电阻 温度特性  
Figure 10. NTC-Themistor-temperature characteristic



接线图 / Circuit diagram



封装尺寸 / Package outlines

