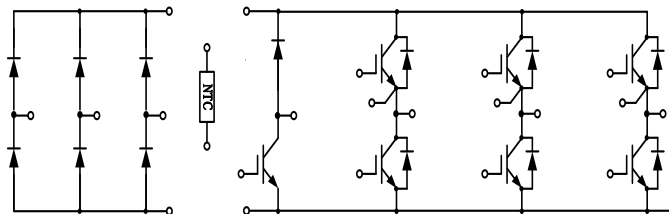


PIM IGBT Module

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



$V_{CES} = 1200V$, $I_{C\ nom} = 100A$ / $I_{CRM} = 200A$

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	$T_C = 100^{\circ}C$, $T_{vj\ max} = 175^{\circ}C$	$I_{C\ nom}$	100	A
集电极重复峰值电流 Repetitive peak collector current	$t_p = 1\ ms$	I_{CRM}	200	A
总功率损耗 Total power dissipation	$T_C = 25^{\circ}C$, $T_{vj\ max} = 175^{\circ}C$	P_{tot}	515	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	$V_{GE} = 15V$, $I_C = 100A$ $T_{vj} = 25^{\circ}C$ $V_{GE} = 15V$, $I_C = 100A$ $T_{vj} = 125^{\circ}C$ $V_{GE} = 15V$, $I_C = 100A$ $T_{vj} = 150^{\circ}C$	V_{CEsat}		2.03 2.29 2.41	2.50	V
栅极-发射极阈值电压	$I_C = 3.8mA$, $V_{GE} = V_{CE}$ $T_{vj} = 25^{\circ}C$	$V_{GE(th)}$	5.20	5.80	6.40	

Gate-Emitter threshold voltage							
栅电荷 Gate charge	$V_{GE}=-15V\dots+15V$	Q_G		0.47		μC	
内部栅极电阻 Internal gate resistor		R_{Gint}		5.86		Ω	
输入电容 Input capacitance	$f=1MHz, V_{CE}=25V, V_{GE}=0V \quad T_{vj}=25^\circ C$	C_{ies}		7.47		nF	
反向传输电容 Reverse transfer capacitance		C_{res}		0.28			
集电极-发射极截止电流 Collector-emitter cut-off current	$V_{CE}=1200V, V_{GE}=0V \quad T_{vj}=25^\circ C$	I_{CES}			1	mA	
栅极-发射极漏电流 Gate-emitter leakage current	$V_{CE}=0V, V_{GE}=20V \quad T_{vj}=25^\circ C$	I_{GES}			100	nA	
开通延迟时间 Turn-on delay time	$I_C=100A, V_{CE}=600V \quad T_{vj}=25^\circ C$ $V_{GE}=\pm 15V, R_G=2\Omega \quad T_{vj}=125^\circ C$ (电感负载) / (inductive load) $T_{vj}=150^\circ C$	t_{don}		109 115 118		ns	
上升时间 Rise time	$I_C=100A, V_{CE}=600V \quad T_{vj}=25^\circ C$ $V_{GE}=\pm 15V, R_G=2\Omega \quad T_{vj}=125^\circ C$ (电感负载) / (inductive load) $T_{vj}=150^\circ C$	t_r		25 29 30			
关断延迟时间 Turn-off delay time	$I_C=100A, V_{CE}=600V \quad T_{vj}=25^\circ C$ $V_{GE}=\pm 15V, R_G=2\Omega \quad T_{vj}=125^\circ C$ (电感负载) / (inductive load) $T_{vj}=150^\circ C$	t_{doff}		215 273 285			
下降时间 Fall time	$I_C=100A, V_{CE}=600V \quad T_{vj}=25^\circ C$ $V_{GE}=\pm 15V, R_G=2\Omega \quad T_{vj}=125^\circ C$ (电感负载) / (inductive load) $T_{vj}=150^\circ C$	t_f		154 233 239			
开通损耗能量 (每脉冲) Turn-on energy loss per pulse	$I_C=100A, V_{CE}=600V \quad T_{vj}=25^\circ C$ $V_{GE}=\pm 15V, R_G=2\Omega \quad T_{vj}=125^\circ C$ (电感负载) / (inductive load) $T_{vj}=150^\circ C$	E_{on}		3.64 5.91 6.80			mJ
关断损耗能量 (每脉冲) Turn-off energy loss per pulse	$I_C=100A, V_{CE}=600V \quad T_{vj}=25^\circ C$ $V_{GE}=\pm 15V, R_G=2\Omega \quad T_{vj}=125^\circ C$ (电感负载) / (inductive load) $T_{vj}=150^\circ C$	E_{off}		6.11 8.64 9.14			
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}		329		A	
结-外壳热阻 Thermal resistance, junction to case	每个 IGBT / per IGBT	R_{thJC}			0.29	K/W	
在开关状态下温度 Temperature under switching conditions		T_{vjop}	-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	$T_{vj}=25^\circ C$	V_{RRM}	1200	V
连续正向直流电流 Continuous DC forward current		I_F	100	A
正向重复峰值电流 Forward repetitive peak current	$t_p=1ms$	I_{FRM}	200	A

Repetitive peak forward current				
I ² t 值 I ² t-value	t _p =10ms, sin180°, T _j =125°C	I ² t	1680	A ² s

特征值 / Characteristic Values

Parameter	Conditions	Symbol	Value			Unit
			Min.	Typ.	Max.	
正向电压 Forward voltage	I _F =100A, V _{GE} =0V I _F =100A, V _{GE} =0V I _F =100A, V _{GE} =0V	T _{vj} =25°C T _{vj} =125°C T _{vj} =150°C	V _F		2.40 2.40 2.32	2.80 V
反向恢复峰值电流 Peak reverse recovery current	I _F =100A, -di _F /dt=2430A/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}		73 82 91	A
恢复电荷 Recovered charge	I _F =100A, -di _F /dt=2430A/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		5.44 10.71 14.18	μC
反向恢复损耗（每脉冲） Reverse recovered energy	I _F =100A, -di _F /dt=2430A/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}		1.87 3.91 5.32	mJ
结-外壳热阻 Thermal resistance, junction to case	每个二极管 / per diode		R _{thJC}			0.50 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} =5μA	V _{RRM}	1800	V
反向不重复峰值电压 Non-Repertitive peak reverse voltage	T _{vj} =25°C, I _{RRM} =5μA	V _{RSM}	2000	V
最大正向平均电流 Maximum Average Forward Current		I _{F(AV)}	80	A
正向浪涌电流 Surge forward current	t _p =10ms, sin180°, T _j =25°C	I _{FSM}	960	A
I ² t 值 I ² t-value	t _p =10ms, sin180°, T _j =25°C	I ² t	4600	A ² s

特征值 / Characteristic Values

Parameter	Conditions	Symbol	Value			Unit
			Min.	Typ.	Max.	
正向电压 Forward voltage	I _F =80A, T _j =25°C	V _F		1	1.2	V

反向电流 Reverse current	$V_R=V_{RRM}$	$T_{vj}=25^{\circ}\text{C}$	I_R			10	μA
在开关状态下温度 Temperature under switching conditions			$T_{vj\ op}$	-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	$T_C=100^{\circ}\text{C}, T_{vj\ max}=175^{\circ}\text{C}$	$I_{C\ nom}$	50	A
集电极重复峰值电流 Repetitive peak collector current	$t_p=1\ \text{ms}$	I_{CRM}	100	A
总功率损耗 Total power dissipation	$T_C=25^{\circ}\text{C}, T_{vj\ max}=175^{\circ}\text{C}$	P_{tot}	270	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	$V_{GE}=15\text{V}, I_C=50\text{A}$ $V_{GE}=15\text{V}, I_C=50\text{A}$ $V_{GE}=15\text{V}, I_C=50\text{A}$	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$	V_{CEsat}		2.52 3.30 3.52	2.90	V
栅极-发射极阈值电压 Gate-Emitter threshold voltage	$I_C=1.6\text{mA}, V_{GE}=V_{CE}$	$T_{vj}=25^{\circ}\text{C}$	$V_{GE(th)}$	5.20	5.90	6.40	
栅电荷 Gate charge	$V_{GE}=-15\text{V}\dots+15\text{V}$		Q_G		0.25		μC
内部栅极电阻 Internal gate resistor			R_{Gint}		3.10		Ω
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}		3.84		nF
反向传输电容 Reverse transfer capacitance			C_{res}		0.13		
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)	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$	$t_{d\ on}$		62 63 63		ns
上升时间 Rise 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_r		47 50 52		

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)	$T_{vj}=25^\circ C$ $T_{vj}=125^\circ C$ $T_{vj}=150^\circ C$	$t_{d\ off}$		198 246 257		
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		184 261 284		
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}		4.60 7.18 7.71		mJ
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}		3.04 4.47 4.80		
短路数据 SC data	$V_{GE}\leq 15V, V_{CC}=800V$ $V_{CEmax}=V_{CES}-L_{sCE}\cdot di/dt$ $t_p\leq 10\mu s, T_{vj}=150^\circ C$		I_{SC}		157		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，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	$T_{vj}=25^\circ C$	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	$t_p=1ms$	I_{FRM}	60	A
I^2t 值 I^2t -value	$t_p=10ms, \sin 180^\circ, T_{vj}=125^\circ C$	I^2t	120	A^2s

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	2.86 2.66 2.59	3.40	V
反向恢复峰值电流 Peak reverse recovery current	$I_F=30A,$ $-di_F/dt=771A/\mu s(T_{vj}=150^\circ C)$ $V_R=600V, V_{GE}=-15V$	$T_{vj}=25^\circ C$ $T_{vj}=125^\circ C$ $T_{vj}=150^\circ C$	I_{RM}	20 29 31		A
恢复电荷 Recovered charge	$I_F=30A,$ $-di_F/dt=771A/\mu s(T_{vj}=150^\circ C)$ $V_R=600V, V_{GE}=-15V$	$T_{vj}=25^\circ C$ $T_{vj}=125^\circ C$ $T_{vj}=150^\circ C$	Q_f	2.64 5.66 6.49		μC

反向恢复损耗（每脉冲） Reverse recovered energy	$I_F=30A$, $-di_F/dt=771A/\mu s(T_{vj}=150^\circ C)$ $V_R=600V, V_{GE}=-15V$	$T_{vj}=25^\circ C$ $T_{vj}=125^\circ C$ $T_{vj}=150^\circ C$	E_{rec}		0.95 2.01 2.28		mJ
结-外壳热阻 Thermal resistance, junction to case	每个二极管 / per diode		R_{thJC}			1.35	K/W
在开关状态下温度 Temperature under switching conditions			$T_{vj op}$	-40		150	$^\circ C$

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	$T_c=25^\circ C, \pm 5\%$	R_{25}		5.0		K Ω
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, $f=50Hz, t=1min$	V_{ISOL}	2500			V
内部绝缘 Internal isolation			Al_2O_3			
储存温度 Storage temperature		T_{stg}	-40		125	$^\circ C$
模块安装的扭矩 Mounting torque for modul mounting		M	3.0		6.0	Nm
重量 Weight		W		300		g

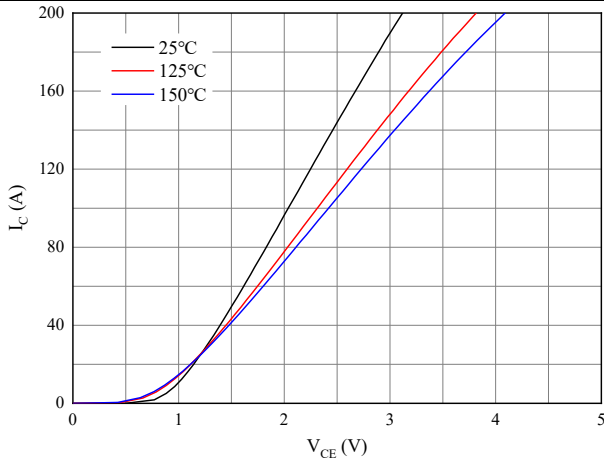


图 1. 典型输出特性 ($V_{GE}=15V$)

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

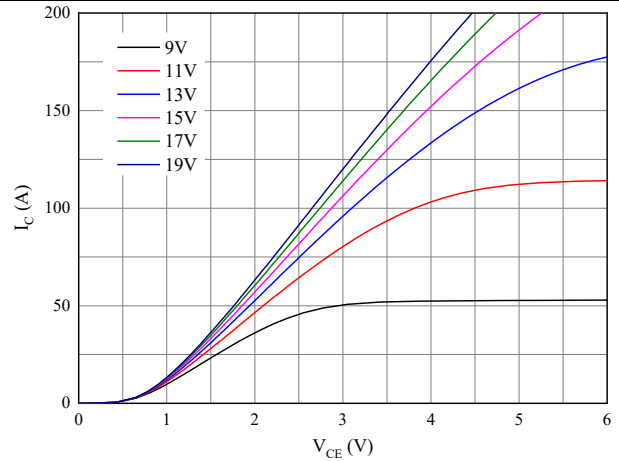


图 2. 典型输出特性 ($T_{vj}=150^{\circ}C$)

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

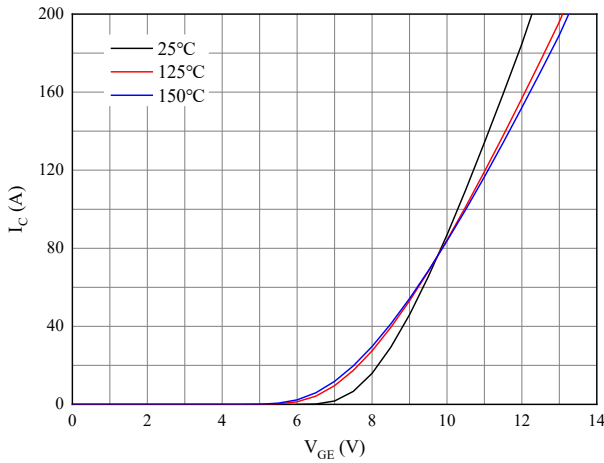


图 3. 典型传输特性($V_{CE}=20V$)

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

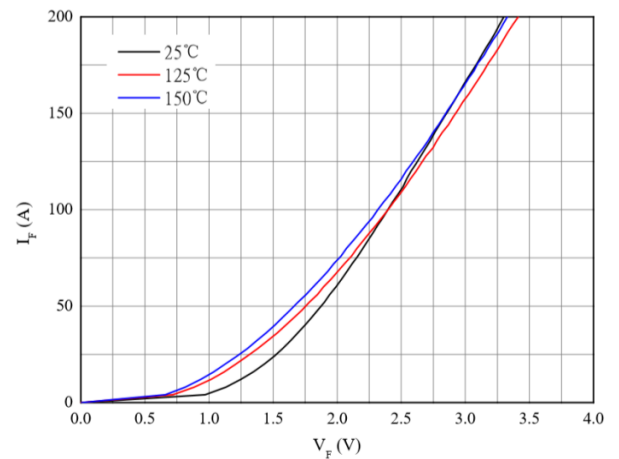


图 4. 正向偏压特性 二极管

Figure 4. Forward characteristic of Diode

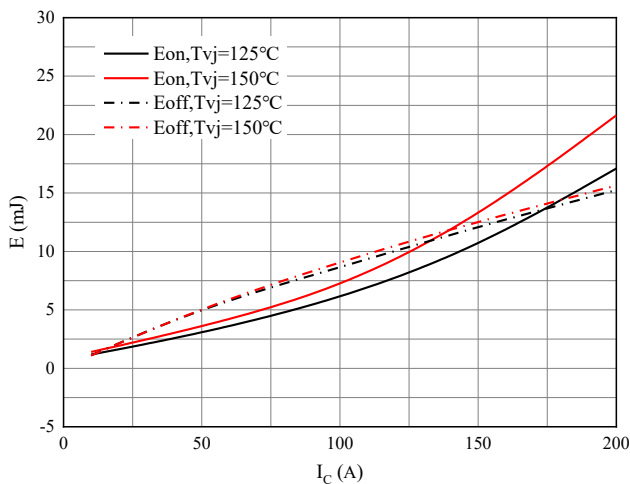


图 5. 开关损耗 逆变器

Figure 5. Switching losses of IGBT

$V_{GE}=\pm 15V, R_{Gon}=2\Omega, R_{Goff}=2\Omega, V_{CE}=600V$

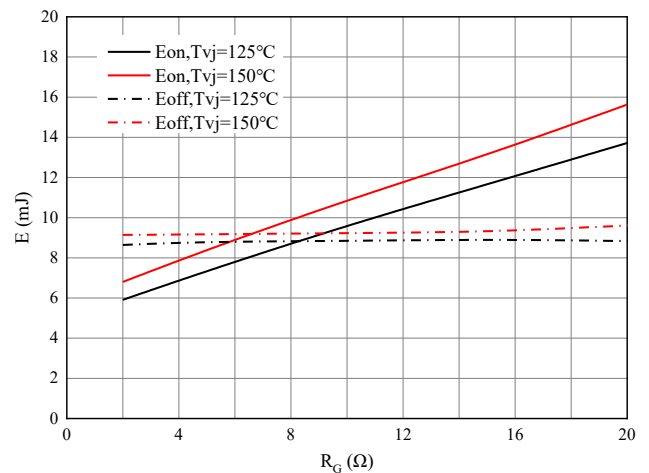


图 6. 开关损耗 逆变器

Figure 6. Switching losses of IGBT

$V_{GE}=\pm 15V, I_C=100A, V_{CE}=600V$

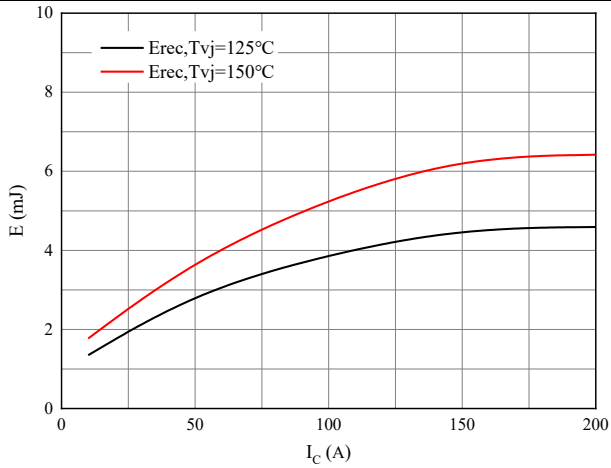


图 7. 开关损耗 二极管
 Figure 7. Switching losses of Diode
 R_{Gon}=2Ω, V_{CE}=600V

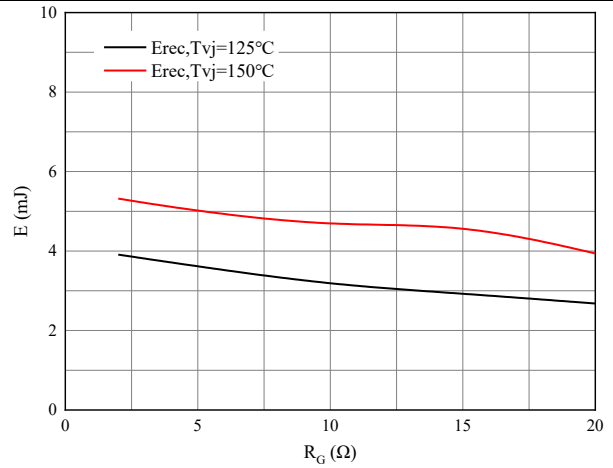


图 8. 开关损耗 二极管
 Figure 8. Switching losses of Diode
 I_F=100A, V_{CE}=600V

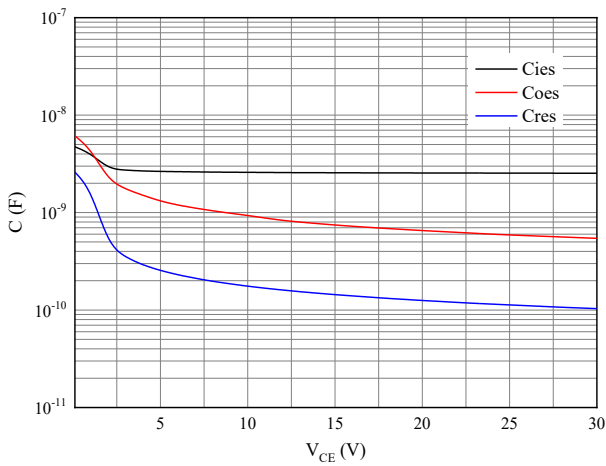


图 9. 电容特性
 Figure 9. Capacitance characteristic

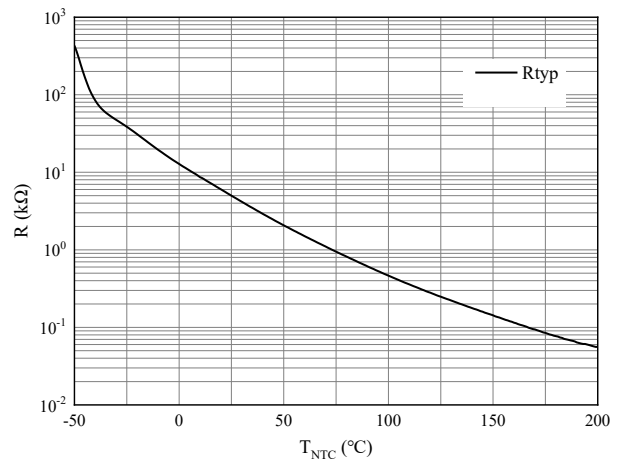
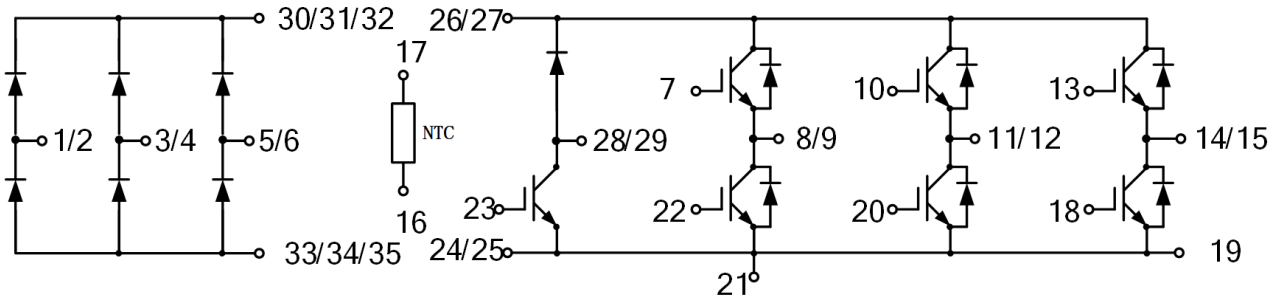


图 10. 负温系数热敏电阻 温度特性
 Figure 10. NTC-Themistor-temperature characteristic

接线图 / Circuit diagram



封装尺寸 / Package outlines

