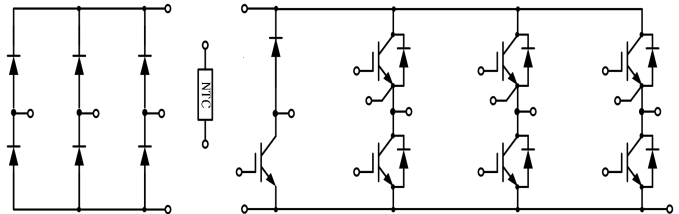


PIM IGBT Module

电气特性:

- 1200V 沟槽栅/场终止工艺
1200V trench gate/field termination process
- 低开关损耗
Low switching losses
- V_{cesat} 正温度系数
 V_{cesat} has a positive temperature coefficient



典型应用:

- 变频器
Power Converters
- 伺服电机
Servo Drives
- 逆变器
Inverter



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

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	$V_{GE}=15V, I_C=100A$ $V_{GE}=15V, I_C=100A$ $V_{GE}=15V, I_C=100A$	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	V_{CEsat}	1.92 2.34 2.44	2.50	V
栅极-发射极阈值电压 Gate-Emitter threshold voltage	$I_C=3.8mA, V_{GE}=V_{CE}$	$T_{vj}=25^{\circ}C$	$V_{GE(th)}$	5.20 5.80	6.40	
栅电荷 Gate charge	$V_{GE}=-15V...+15V$		Q_G	0.47		μC
内部栅极电阻 Internal gate resistor	$T_{vj}=25^{\circ}C$		R_{Gint}	5.86		Ω
输入电容 Input capacitance	$f=1MHz, V_{CE}=25V, V_{GE}=0V$	$T_{vj}=25^{\circ}C$	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	$V_{CE}=1200V, V_{GE}=0V$	$T_{vj}=25^{\circ}C$	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	$I_C=100A, V_{CE}=600V$ $V_{GE}=\pm 15V, R_G=2\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	t_{don}	104 113 118		ns
上升时间 Rise time	$I_C=100A, V_{CE}=600V$ $V_{GE}=\pm 15V, R_G=2\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	t_r	27 32 34		
关断延迟时间 Turn-off delay time	$I_C=100A, V_{CE}=600V$ $V_{GE}=\pm 15V, R_G=2\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	t_{doff}	203 251 259		
下降时间 Fall time	$I_C=100A, V_{CE}=600V$ $V_{GE}=\pm 15V, R_G=2\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	t_f	181 184 197		
开通损耗能量 (每脉冲) Turn-on energy loss per pulse	$I_C=100A, V_{CE}=600V$ $V_{GE}=\pm 15V, R_G=2\Omega$ $di/dt=2300A/\mu s$ ($T_{vj}=150^{\circ}C$) (电感负载) / (inductive load)	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	E_{on}	3.04 6.17 7.22		mJ
关断损耗能量 (每脉冲) Turn-off energy loss per pulse	$I_C=100A, V_{CE}=600V$ $V_{GE}=\pm 15V, R_G=2\Omega,$ $du/dt=5000V/\mu s$ ($T_{vj}=150^{\circ}C$) (电感负载) / (inductive load)	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	E_{off}	6.11 8.24 8.77		
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}	329		A
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	$T_{vj}=25^{\circ}\text{C}$	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 Repetitive peak forward current	$t_p=1\text{ms}$	I_{FRM}	200	A
I^2t 值 I^2t -value	$t_p=10\text{ms}$, $\sin 180^{\circ}$, $T_j=125^{\circ}\text{C}$	I^2t	1360	A^2s

特征值 / Characteristic Values

Parameter	Conditions	Symbol	Value			Unit
			Min.	Typ.	Max.	
正向电压 Forward voltage	$I_F=100\text{A}$, $V_{GE}=0\text{V}$ $I_F=100\text{A}$, $V_{GE}=0\text{V}$ $I_F=100\text{A}$, $V_{GE}=0\text{V}$	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$	V_F	2.20 2.15 2.07	2.80	V
反向恢复峰值电流 Peak reverse recovery current	$I_F=100\text{A}$, $-di_F/dt=2300\text{A}/\mu\text{s}$ ($T_{vj}=150^{\circ}\text{C}$) $V_R=600\text{V}$, $V_{GE}=-15\text{V}$	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$	I_{RM}	109 121 124		A
恢复电荷 Recovered charge	$I_F=100\text{A}$, $-di_F/dt=2300\text{A}/\mu\text{s}$ ($T_{vj}=150^{\circ}\text{C}$) $V_R=600\text{V}$, $V_{GE}=-15\text{V}$	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$	Q_r	6.04 12.58 15.34		μC
反向恢复损耗（每脉冲） Reverse recovered energy	$I_F=100\text{A}$, $-di_F/dt=2300\text{A}/\mu\text{s}$ ($T_{vj}=150^{\circ}\text{C}$) $V_R=600\text{V}$, $V_{GE}=-15\text{V}$	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$	E_{rec}	2.09 4.72 5.79		mJ
在开关状态下温度 Temperature under switching conditions		$T_{vj\text{op}}$	-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	$T_{vj}=25^{\circ}\text{C}$, $I_{RRM}=5\mu\text{A}$	V_{RRM}	1800	V
反向不重复峰值电压 Non-Repetitive peak reverse voltage	$T_{vj}=25^{\circ}\text{C}$, $I_{RRM}=5\mu\text{A}$	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	$t_p=10\text{ms}$, $\sin 180^{\circ}$, $T_j=25^{\circ}\text{C}$	I_{FSM}	960	A
I^2t 值 I^2t -value	$t_p=10\text{ms}$, $\sin 180^{\circ}$, $T_j=25^{\circ}\text{C}$	I^2t	4600	A^2s

特征值 / Characteristic Values

Parameter	Conditions	Symbol	Value			Unit
			Min.	Typ.	Max.	
正向电压 Forward voltage	$I_F=80A, T_J=25^\circ C$	V_F		1.10	1.20	V
反向电流 Reverse current	$V_R=V_{RRM} \quad T_{vj}=25^\circ C$	I_R			10	μA
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	$T_{vj}=25^\circ C$	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}	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	$V_{GE}=15V, I_C=50A$ $V_{GE}=15V, I_C=50A$ $V_{GE}=15V, I_C=50A$	$T_{vj}=25^\circ C$ $T_{vj}=125^\circ C$ $T_{vj}=150^\circ C$	V_{CEsat}	2.10 2.53 2.61	2.90	V
栅极-发射极阈值电压 Gate-Emitter threshold voltage	$I_C=1.6mA, V_{GE}=V_{CE}$	$T_{vj}=25^\circ C$	$V_{GE(th)}$	5.20	5.80	6.40
栅电荷 Gate charge	$V_{GE}=-15V\dots+15V$		Q_G	0.24		μC
内部栅极电阻 Internal gate resistor	$T_{vj}=25^\circ C$		R_{Gint}	2.78		Ω
输入电容 Input capacitance	$f=1MHz, V_{CE}=25V, V_{GE}=0V$	$T_{vj}=25^\circ C$	C_{ies}	2.96		nF
反向传输电容 Reverse transfer capacitance			C_{res}	0.11		
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)	$T_{vj}=25^\circ C$ $T_{vj}=125^\circ C$ $T_{vj}=150^\circ C$	$t_{d\ on}$		56 60 61	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		36 43 45	
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)	$T_{vj}=25^\circ C$ $T_{vj}=125^\circ C$ $T_{vj}=150^\circ C$	$t_{d\ off}$		189 235 245	
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		184 221 244	
开通损耗能量 (每脉冲) Turn-on energy loss per pulse	$I_C=50A, V_{CE}=600V$ $V_{GE}=\pm 15V, R_G=15\Omega$ $di/dt=800A/\mu s$ ($T_{vj}=150^\circ C$) (电感负载) / (inductive load)	$T_{vj}=25^\circ C$ $T_{vj}=125^\circ C$ $T_{vj}=150^\circ C$	E_{on}		3.50 5.83 6.59	mJ
关断损耗能量 (每脉冲) Turn-off energy loss per pulse	$I_C=50A, V_{CE}=600V$ $V_{GE}=\pm 15V, R_G=15\Omega$ $du/dt=5600V/\mu s$ ($T_{vj}=150^\circ C$) (电感负载) / (inductive load)	$T_{vj}=25^\circ C$ $T_{vj}=125^\circ C$ $T_{vj}=150^\circ C$	E_{off}		2.93 4.05 4.42	
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}		190	A
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	$T_{vj}=25^\circ C$	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	1.94 1.64 1.57	2.40	V
反向恢复峰值电流 Peak reverse recovery current	$I_F=30A,$ $-di_F/dt=800A/\mu s(T_{vj}=150^\circ C)$ $V_R=600V, V_{GE}=-15V$	$T_{vj}=25^\circ C$ $T_{vj}=125^\circ C$ $T_{vj}=150^\circ C$	I_{RM}	20 29 31		A
恢复电荷 Recovered charge	$I_F=30A,$ $-di_F/dt=800A/\mu s(T_{vj}=150^\circ C)$ $V_R=600V, V_{GE}=-15V$	$T_{vj}=25^\circ C$ $T_{vj}=125^\circ C$ $T_{vj}=150^\circ C$	Q_F	2.04 5.23 6.18		μC
反向恢复损耗（每脉冲） Reverse recovered energy	$I_F=30A,$ $-di_F/dt=800A/\mu s(T_{vj}=150^\circ C)$ $V_R=600V, V_{GE}=-15V$	$T_{vj}=25^\circ C$ $T_{vj}=125^\circ C$ $T_{vj}=150^\circ C$	E_{rec}	0.95 2.01 2.28		mJ
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	$\pm 2\%$	$B_{25/50}$		3375		K

模块 / Module

Parameter	Conditions	Symbol	Value			Unit
绝缘测试电压 Isolation test voltage	RMS, f=50Hz, t=1min	V_{ISOL}	2500			V
内部绝缘 Internal isolation			Al ₂ O 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

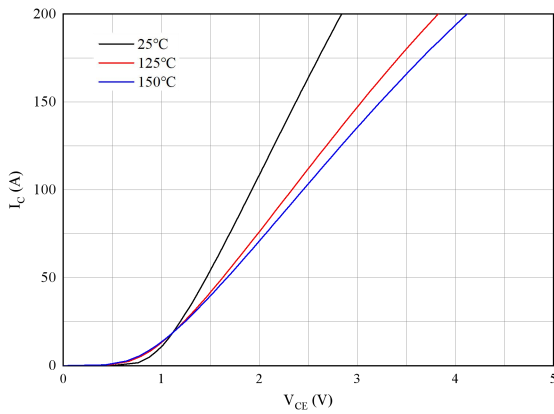


图 1. 典型输出特性($V_{GE}=15V$)

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

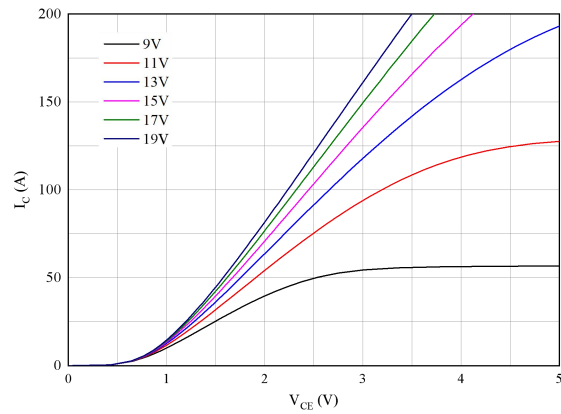


图 2. 典型输出特性 ($T_{vj}=150^{\circ}C$)

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

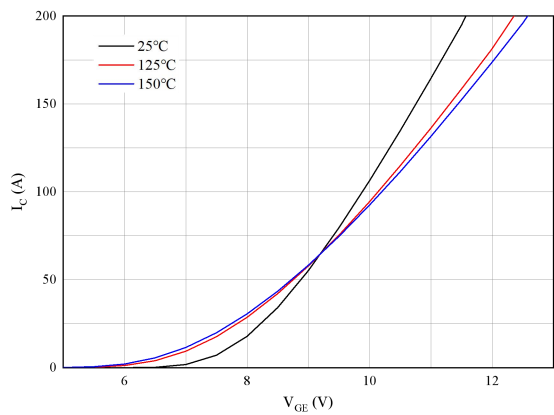


图 3. 典型传输特性($V_{CE}=20V$)

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

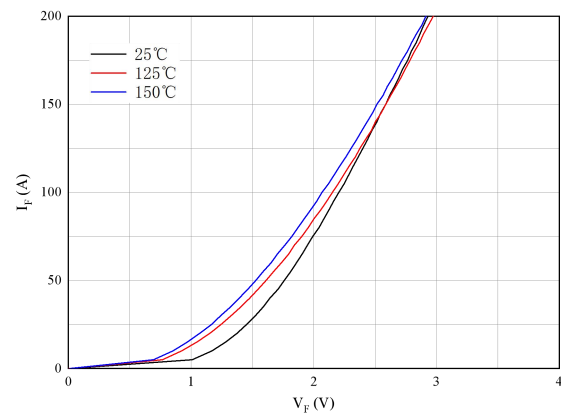


图 4. 正向偏压特性 二极管

Figure 4. Forward characteristic of Diode

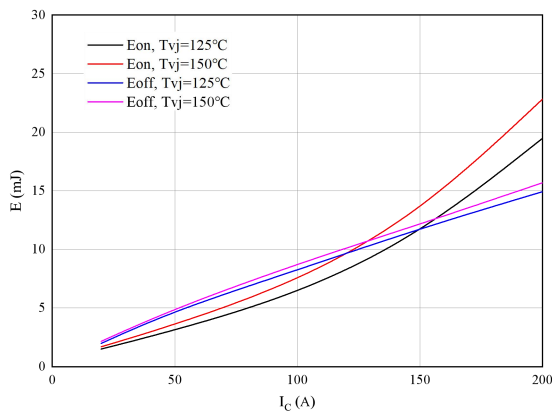


图 5. 开关损耗 逆变器

Figure 5. Switching losses of IGBT

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

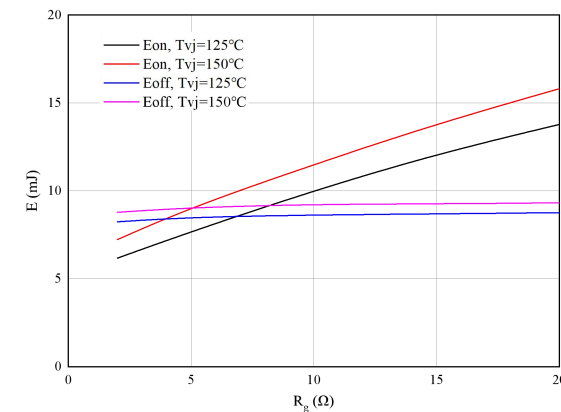


图 6. 开关损耗 逆变器

Figure 6. Switching losses of IGBT

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

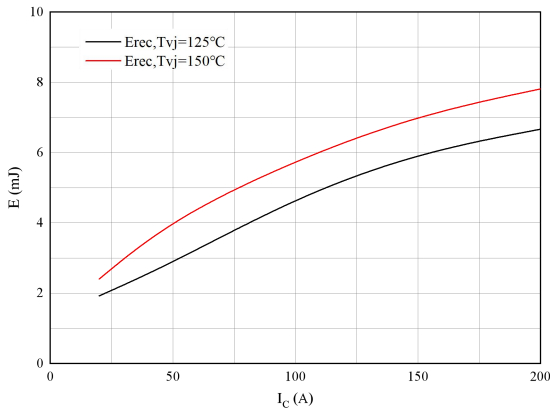


图 7. 开关损耗 二极管
Figure 7. Switching losses of Diode
 $R_{Gon}=2\Omega, V_{CE}=600V$

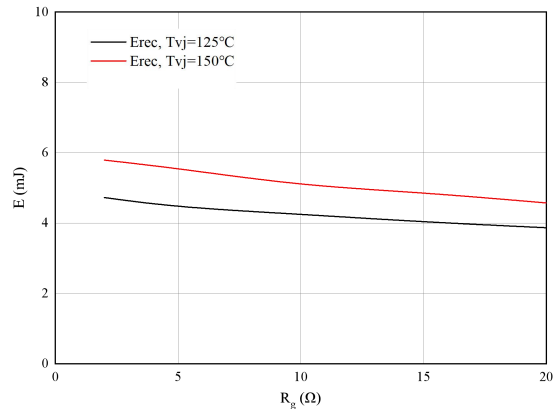


图 8. 开关损耗 二极管
Figure 8. Switching losses of Diode
 $I_F=100A, V_{CE}=600V$

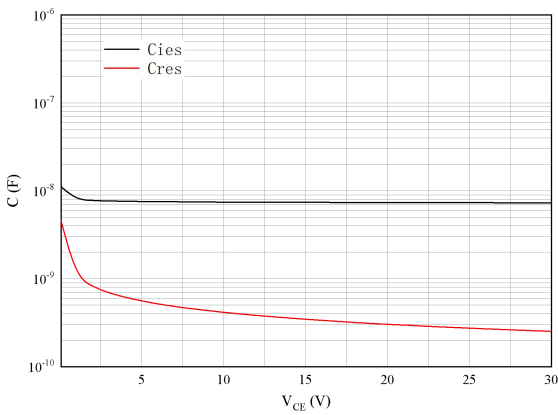


图 9. 电容特性
Figure 9. Capacitance characteristic

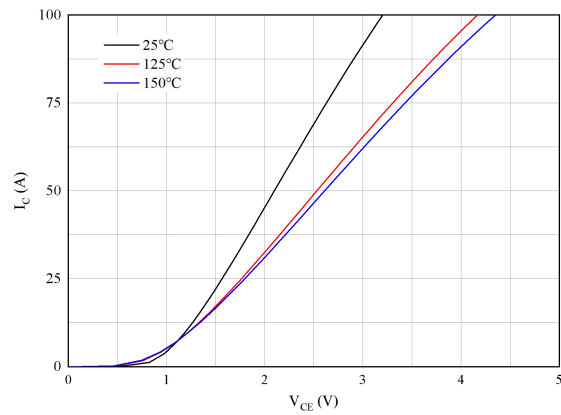


图 10. 典型输出特性 斩波($V_{GE}=15V$)
Figure 10. Typical output characteristics ($V_{GE}=15V$)

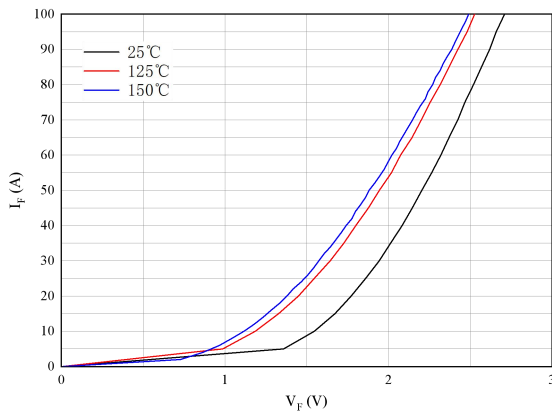


图 11. 正向偏压特性 斩波二极管
Figure 11. Forward characteristic of Diode

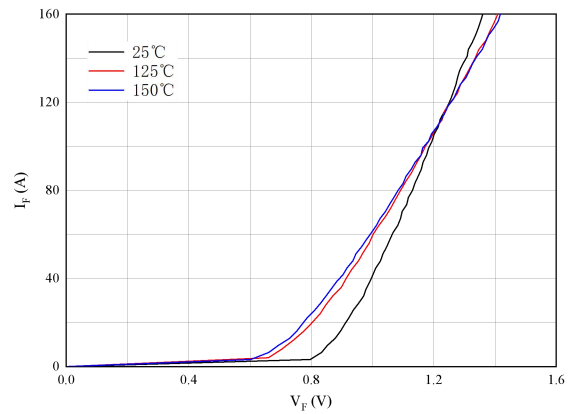


图 12. 正向偏压特性 整流二极管
Figure 12. Forward characteristic of Diode

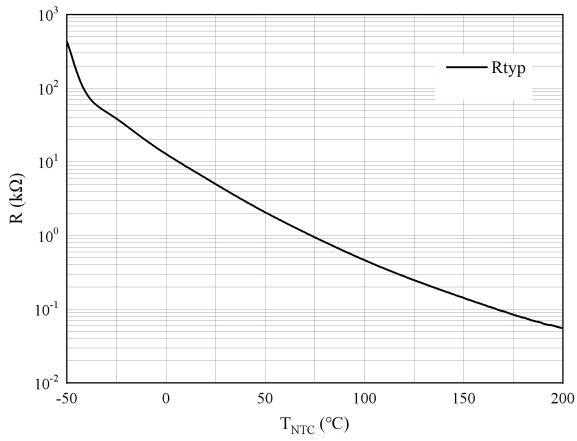
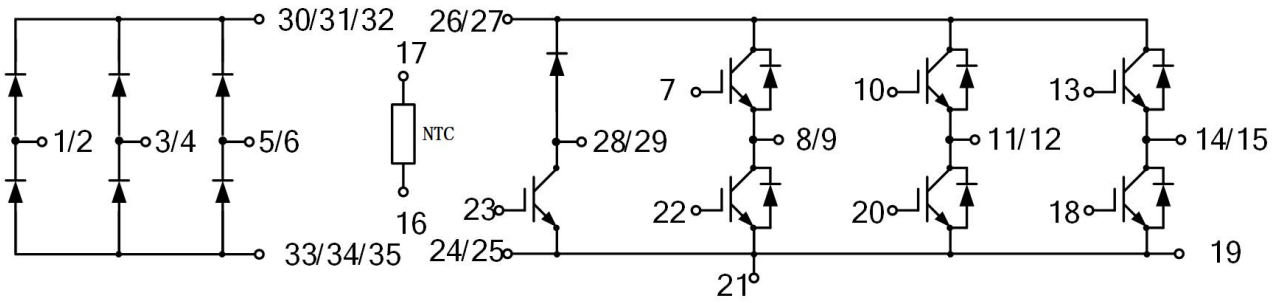


图 13. 负温系数热敏电阻 温度特性

Figure 13.NTC-Themistor-temperature characteristic

接线图 / Circuit diagram



封装尺寸 / Package outlines

