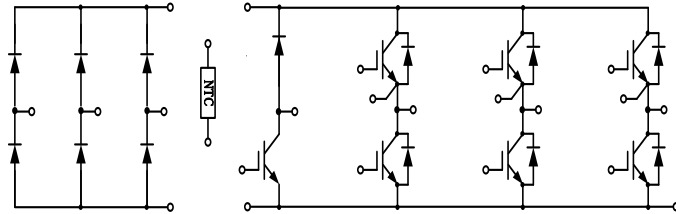


PIM IGBT Module

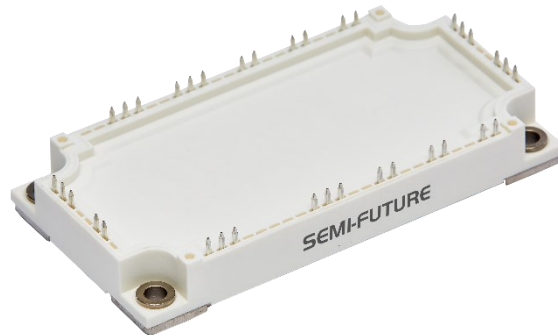
电气特性:

- 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



$V_{CES}=1200V$, $I_{C\ nom}=75A$ / $I_{CRM}=150A$

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	$T_C=100^{\circ}C$, $T_{vj\ max}=175^{\circ}C$	$I_{C\ nom}$	75	A
集电极重复峰值电流 Repetitive peak collector current	$t_p=1\ ms$	I_{CRM}	150	A
总功率损耗 Total power dissipation	$T_C=25^{\circ}C$, $T_{vj\ max}=175^{\circ}C$	P_{tot}	380	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	$V_{GE}=15V$, $I_C=75A$ $V_{GE}=15V$, $I_C=75A$ $V_{GE}=15V$, $I_C=75A$	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	V_{CEsat}	1.72 2.04 2.12	2.10	V
栅极-发射极阈值电压	$I_C=2.4mA$, $V_{GE}=V_{CE}$	$T_{vj}=25^{\circ}C$	$V_{GE(th)}$	5.10 5.60	6.20	

Gate-Emitter threshold voltage						
栅电荷 Gate charge	$V_{GE}=-15V\dots+15V$	Q_G		0.58		μC
内部栅极电阻 Internal gate resistor		R_{Gint}		6.24		Ω
输入电容 Input capacitance	$f=1MHz, V_{CE}=25V, V_{GE}=0V \quad T_{vj}=25^\circ C$	C_{ies}		5.24		nF
反向传输电容 Reverse transfer capacitance		C_{res}		0.24		
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}			1.0	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	$I_C=75A, V_{CE}=600V \quad T_{vj}=25^\circ C$ $V_{GE}=\pm 15V, R_G=1\Omega \quad T_{vj}=125^\circ C$ (电感负载) / (inductive load) $T_{vj}=150^\circ C$	t_{don}		85		
				95		
				96		
上升时间 Rise time	$I_C=75A, V_{CE}=600V \quad T_{vj}=25^\circ C$ $V_{GE}=\pm 15V, R_G=1\Omega \quad T_{vj}=125^\circ C$ (电感负载) / (inductive load) $T_{vj}=150^\circ C$	t_r		31		ns
				34		
				37		
关断延迟时间 Turn-off delay time	$I_C=75A, V_{CE}=600V \quad T_{vj}=25^\circ C$ $V_{GE}=\pm 15V, R_G=1\Omega \quad T_{vj}=125^\circ C$ (电感负载) / (inductive load) $T_{vj}=150^\circ C$	t_{doff}		256		
				309		
				323		
下降时间 Fall time	$I_C=75A, V_{CE}=600V \quad T_{vj}=25^\circ C$ $V_{GE}=\pm 15V, R_G=1\Omega \quad T_{vj}=125^\circ C$ (电感负载) / (inductive load) $T_{vj}=150^\circ C$	t_f		186		
				178		
				167		
开通损耗能量 (每脉冲) Turn-on energy loss per pulse	$I_C=75A, V_{CE}=600V \quad T_{vj}=25^\circ C$ $V_{GE}=\pm 15V, R_G=1\Omega \quad T_{vj}=125^\circ C$ $di/dt=1682A/\mu s (T_{vj}=150^\circ C)$ (电感负载) / (inductive load) $T_{vj}=150^\circ C$	E_{on}		4.34		mJ
				7.86		
				8.90		
关断损耗能量 (每脉冲) Turn-off energy loss per pulse	$I_C=75A, V_{CE}=600V \quad T_{vj}=25^\circ C$ $V_{GE}=\pm 15V, R_G=1\Omega \quad T_{vj}=125^\circ C$ $dv/dt=4147V/\mu s (T_{vj}=150^\circ C)$ (电感负载) / (inductive load) $T_{vj}=150^\circ C$	E_{off}		5.58		
				6.87		
				7.06		
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}		398		A
结-外壳热阻 Thermal resistance, junction to case	每个 IGBT / per IGBT	R_{thJC}			0.39	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	$T_{vj}=25^\circ C$	V_{RRM}	1200	V
连续正向直流电流		I_F	60	A

Continuous DC forward current				
正向重复峰值电流 Repetitive peak forward current	$t_p=1ms$	I_{FRM}	120	A
I^2t 值 I^2t -value	$t_p=10ms, \sin 180^\circ, T_j=125^\circ C$	I^2t	960	A^2s

特征值 / Characteristic Values

Parameter	Conditions	Symbol	Value			Unit
			Min.	Typ.	Max.	
正向电压 Forward voltage	$I_F=60A, V_{GE}=0V$ $I_F=60A, V_{GE}=0V$ $I_F=60A, V_{GE}=0V$	$T_{vj}=25^\circ C$ $T_{vj}=125^\circ C$ $T_{vj}=150^\circ C$	V_F	2.12 1.72 1.64	2.50	V
反向恢复峰值电流 Peak reverse recovery current	$I_F=60A,$ $-di_F/dt=1704A/\mu s(T_{vj}=150^\circ C)$ $V_R=600V, V_{GE}=-15V$	$T_{vj}=25^\circ C$ $T_{vj}=125^\circ C$ $T_{vj}=150^\circ C$	I_{RM}	64 98 107		A
恢复电荷 Recovered charge	$I_F=60A,$ $-di_F/dt=1704A/\mu s(T_{vj}=150^\circ C)$ $V_R=600V, V_{GE}=-15V$	$T_{vj}=25^\circ C$ $T_{vj}=125^\circ C$ $T_{vj}=150^\circ C$	Q_F	4.74 10.79 12.65		μC
反向恢复损耗（每脉冲） Reverse recovered energy	$I_F=60A,$ $-di_F/dt=1704A/\mu s(T_{vj}=150^\circ C)$ $V_R=600V, V_{GE}=-15V$	$T_{vj}=25^\circ C$ $T_{vj}=125^\circ C$ $T_{vj}=150^\circ C$	E_{rec}	1.75 3.87 4.86		mJ
结-外壳热阻 Thermal resistance, junction to case	每个二极管 / per diode	R_{thJC}			0.62	K/W
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}	1800	V
反向不重复峰值电压 Non-Repetitive peak reverse voltage	$T_{vj}=25^\circ C, I_{RRM}=10\mu A$	V_{RSM}	2000	V
最大正向平均电流 Maximum Average Forward Current		$I_{F(AV)}$	70	A
正向浪涌电流 Surge forward current	$t_p=10ms, \sin 180^\circ, T_{vj}=25^\circ C$	I_{FSM}	840	A
I^2t 值 I^2t -value	$t_p=10ms, \sin 180^\circ, T_{vj}=25^\circ C$	I^2t	3528	A^2s

特征值 / Characteristic Values

Parameter	Conditions	Symbol	Value			Unit
			Min.	Typ.	Max.	

正向电压 Forward voltage	$I_F=60A, T_{vj}=25^{\circ}C$	V_F		2.12 1.72 1.64	2.50	V
反向电流 Reverse current	$V_R=V_{RRM}$	$T_{vj}=25^{\circ}C$	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 curren	$T_C=100^{\circ}C, T_{vj\ max}=175^{\circ}C$	$I_{C\ nom}$	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}		2.02 2.52 2.68	2.40	V
栅极-发射极阈值电压 Gate-Emitter threshold voltage	$I_C=1.6mA, V_{GE}=V_{CE}$	$T_{vj}=25^{\circ}C$	$V_{GE(th)}$	5.10	5.70	6.30	
栅电荷 Gate charge	$V_{GE}=-15V...+15V$		Q_G		0.23		μC
内部栅极电阻 Internal gate resistor			R_{Gint}		2.61		Ω
输入电容 Input capacitance	$f=1MHz, V_{CE}=25\ V, V_{GE}=0\ V$	$T_{vj}=25^{\circ}C$	C_{ies}		3.64		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	$V_{CE}=1200V, V_{GE}=0\ V$	$T_{vj}=25^{\circ}C$	I_{CES}			1	mA
栅极-发射极漏电流 Gate-emitter leakage current	$V_{CE}=0\ V, V_{GE}=20\ V$	$T_{vj}=25^{\circ}C$	I_{GES}			100	nA
开通延迟时间 Turn-on delay time	$I_C=50A, V_{CE}=600\ V$ $V_{GE}=\pm 15\ V, R_G=40\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	$t_{d\ on}$		119 112 111		ns

上升时间 Rise time	$I_C=50A, V_{CE}=600V$ $V_{GE}=\pm 15V, R_G=40\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^\circ C$ $T_{vj}=125^\circ C$ $T_{vj}=150^\circ C$	t_r		38 47 49		
关断延迟时间 Turn-off delay time	$I_C=50A, V_{CE}=600V$ $V_{GE}=\pm 15V, R_G=40\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^\circ C$ $T_{vj}=125^\circ C$ $T_{vj}=150^\circ C$	$t_{d\ off}$		319 358 368		
下降时间 Fall time	$I_C=50A, V_{CE}=600V$ $V_{GE}=\pm 15V, R_G=40\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^\circ C$ $T_{vj}=125^\circ C$ $T_{vj}=150^\circ C$	t_f		176 257 237		
开通损耗能量 (每脉冲) Turn-on energy loss per pulse	$I_C=50A, V_{CE}=600V$ $V_{GE}=\pm 15V, R_G=40\Omega$ $di/dt = 779A/\mu s$ ($T_{vj} = 150^\circ C$) (电感负载) / (inductive load)	$T_{vj}=25^\circ C$ $T_{vj}=125^\circ C$ $T_{vj}=150^\circ C$	E_{on}		4.00 7.00 7.89		mJ
关断损耗能量 (每脉冲) Turn-off energy loss per pulse	$I_C=50A, V_{CE}=600V$ $V_{GE}=\pm 15V, R_G=40\Omega$ $dv/dt = 5151V/\mu s$ ($T_{vj} = 150^\circ C$) (电感负载) / (inductive load)	$T_{vj}=25^\circ C$ $T_{vj}=125^\circ C$ $T_{vj}=150^\circ C$	E_{off}		3.13 4.26 4.68		
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，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	90	A^2s

特征值 / Characteristic Values

Parameter	Conditions	Symbol	Value			Unit
			Min.	Typ.	Max.	
正向电压 Forward voltage	$I_F=30A, V_{GE}=0V$ $I_F=30A, V_{GE}=0V$ $I_F=30A, V_{GE}=0V$	V_F		2.10 1.71 1.62	2.40	V
反向恢复峰值电流 Peak reverse recovery current	$I_F=30A,$ $-di_F/dt=712A/\mu s$ ($T_{vj}=150^\circ C$) $V_R=600V, V_{GE}=-15V$	I_{RM}		28 35 36		A
恢复电荷	$I_F=30A,$	Q_F		1.68		μC

Recovered charge	$-di_F/dt=712A/\mu s(T_{vj}=150^\circ C)$ $V_R=600V, V_{GE}=-15V$	$T_{vj}=125^\circ C$ $T_{vj}=150^\circ C$			4.85 5.79		
反向恢复损耗（每脉冲） Reverse recovered energy	$I_F=30A,$ $-di_F/dt=712A/\mu s(T_{vj}=150^\circ C)$ $V_R=600V, V_{GE}=-15V$	$T_{vj}=25^\circ C$ $T_{vj}=125^\circ C$ $T_{vj}=150^\circ C$	E_{rec}		0.47 1.45 1.75		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	$\pm 2\%$	$B_{25/50}$		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_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

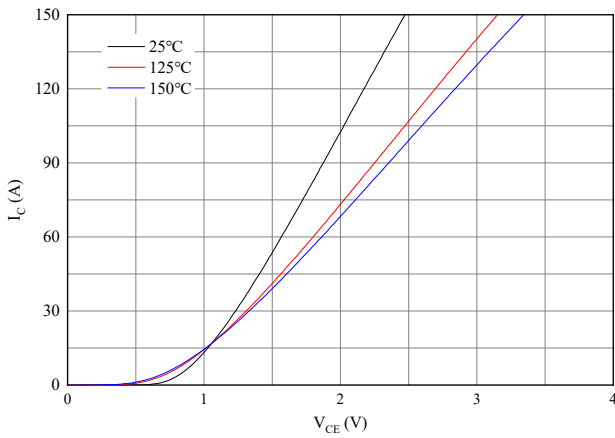


图 1. 典型输出特性 ($V_{GE}=15V$)

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

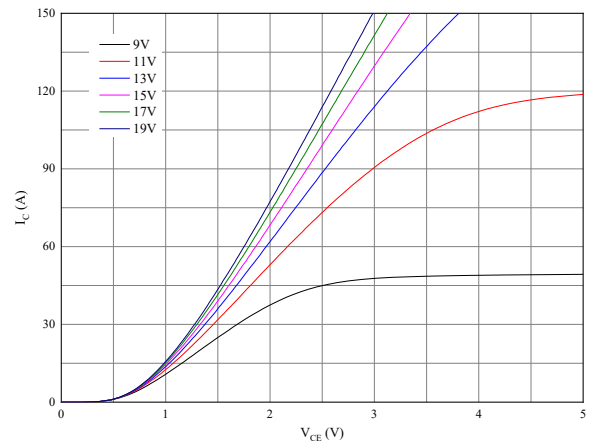


图 2. 典型输出特性 ($T_{vj}=150^{\circ}C$)

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

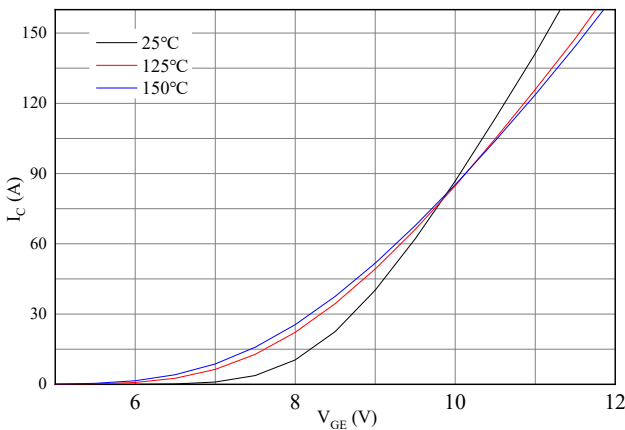


图 3. 典型传输特性 ($V_{CE}=20V$)

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

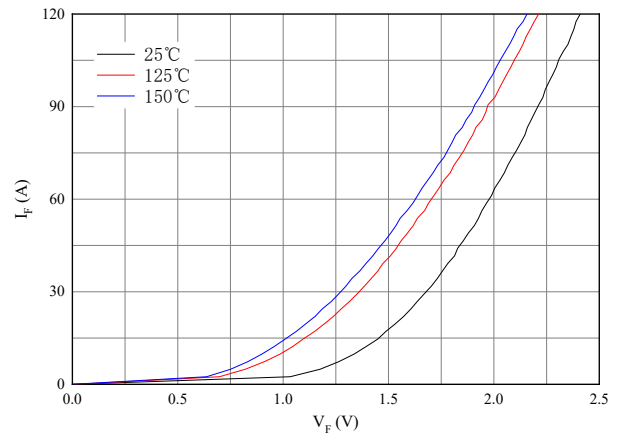


图 4. 正向偏压特性 二极管

Figure 4. Forward characteristic of Diode

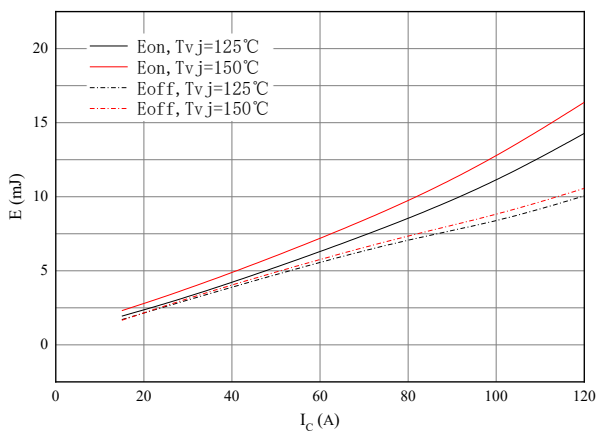


图 5. 开关损耗 逆变器

Figure 5. Switching losses of IGBT

$V_{GE}=\pm 15V, R_{Gon}=1\Omega, R_{Goff}=1\Omega, V_{CE}=600V$

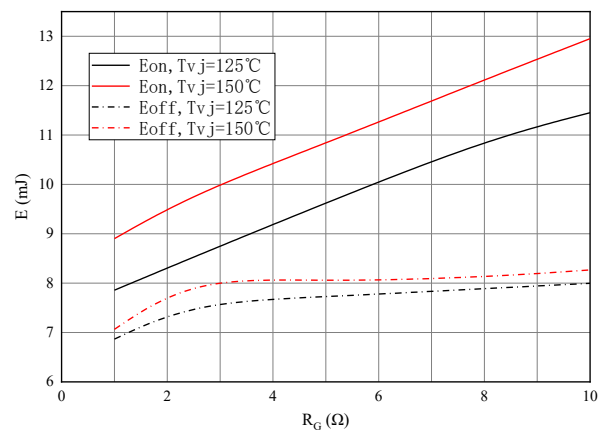


图 6. 开关损耗 逆变器

Figure 6. Switching losses of IGBT

$V_{GE}=\pm 15V, I_C=75A, V_{CE}=600V$

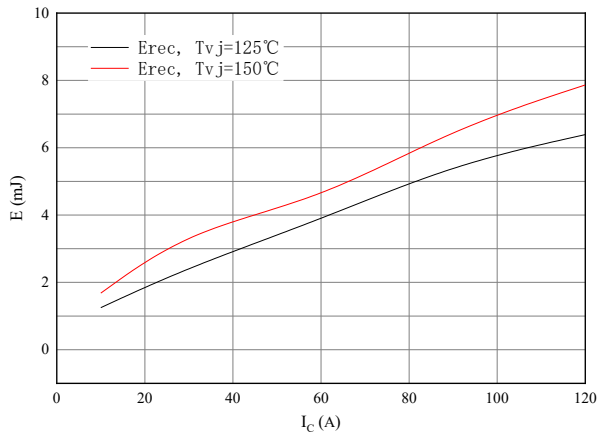


图 7. 开关损耗 二极管
Figure 7. Switching losses of Diode
RGon=1Ω, VCE=600V

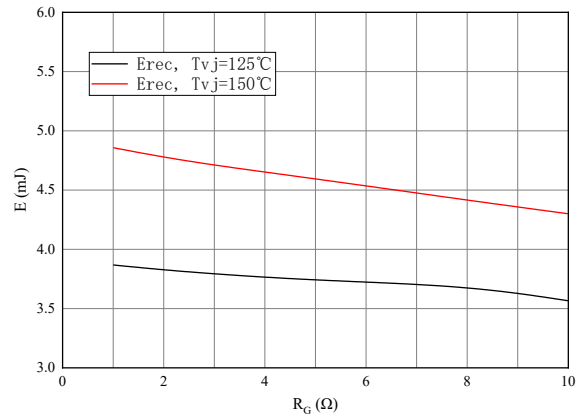


图 8. 开关损耗 二极管
Figure 8. Switching losses of Diode
IF=60A, VCE=600V

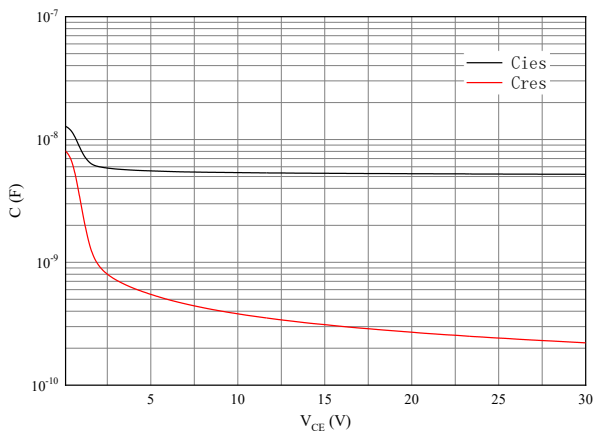


图 9. 电容特性
Figure 9. Capacitance characteristic

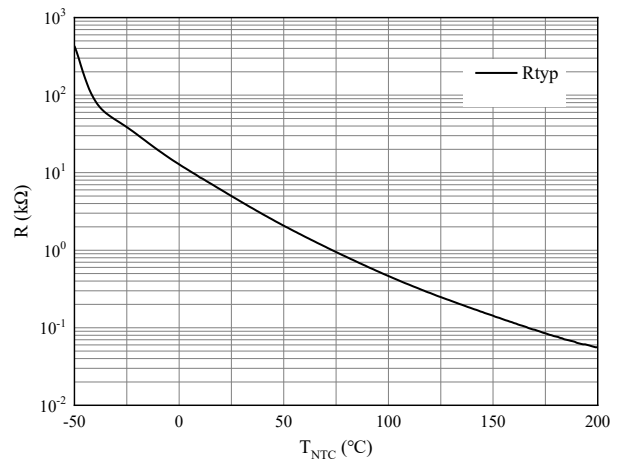
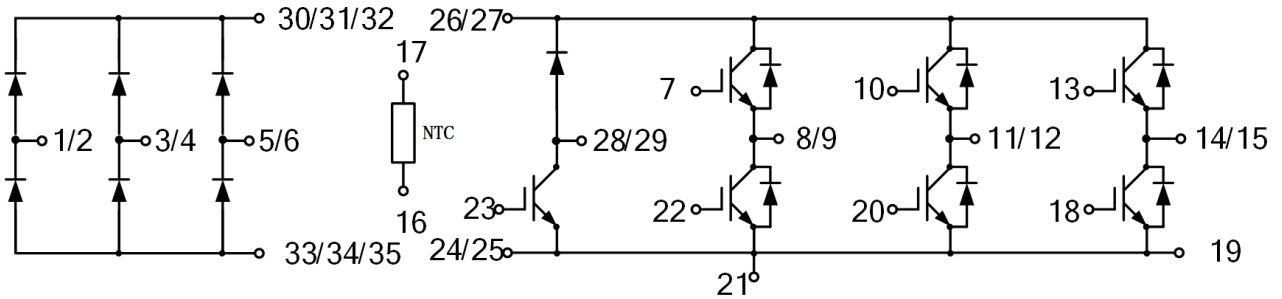


图 10. 负温系数热敏电阻 温度特性
Figure 10. NTC-Themistor-temperature characteristic

接线图 / Circuit diagram



封装尺寸 / Package outlines

