Half Bridge 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
- 正温度系数

  Vcesat with positive temperature coefficient

典型应用:

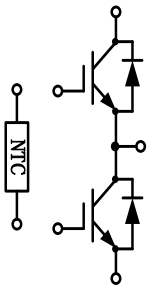
- UPS 系统

  UPS system
- 伺服驱动器

  Servo drives
- 大功率变流器

  High Power Converters
- 电机传动

  Motor drives



V_{CES} =1200V，$I_{C\ nom}$ =900A / I_{CRM} =1800A

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°C	V_{CES}	1200	V
连续集电极直流电流 Continuous DC collector current	T_C=100°C, $T_{vj\ max}$=175°C	$I_{C\ nom}$	900	A
模块端子的最大均方根电流 Maximum RMS module DC-terminal current	$T_{Terminal} \leq$ 90°C, Tc = 90°C $T_{Terminal} \leq$ 105°C, Tc = 90°C	I_{TRMS}	580 565	A
集电极重复峰值电流 Repetitive peak collector current	t_P = 1ms	I_{CRM}	1800	A

总功率损耗 Total power dissipation	T_C = 25°C, $T_{vj\ max}$ = 175°C	P_{tot}	2600	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=900A V_{GE}=15V, I_C=900A V_{GE}=15V, I_C=900A	T_{vj}=25°C T_{vj}=125°C T_{vj}=175°C	$V_{CE\ sat}$		1.75 2.15 2.30	2.20	V
栅极-发射极阈值电压 Gate-Emitter threshold voltage	I_C=18mA, V_{GE}= V_{CE},	T_{vj}=25°C	V_{GEth}	5.2	5.8	6.4	
栅电荷 Gate charge	V_{GE}=-15V…+15V		Q_G		11		µC
内部栅极电阻 Internal gate resistor	T_{vj}=25°C		R_{Gint}		0.6		Ω
输入电容 Input capacitance	f=100KHz, V_{CE}=25V, V_{GE}=0 V	T_{vj}=25°C	C_{ies}		139		nF
反向传输电容 Reverse transfer capacitance			C_{res}		0.55		
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°C	I_{CES}			0.1	mA
栅极-发射极漏电流 Gate-emitter leakage current	V_{CE}=0 V, V_{GE}= 20 V	T_{vj}=25°C	I_{GES}			100	nA
开通延迟时间 Turn-on delay time	I_C=900 A, V_{CE}=600 V V_{GE}=±15 V, R_G=0.5Ω (电感负载) / (inductive load)	T_{vj}=25°C T_{vj}=125°C T_{vj}=175°C	$t_{d\ on}$		446 468 490		ns
上升时间 Rise time	I_C=900 A, V_{CE}=600 V V_{GE}=±15 V, R_G=0.5Ω (电感负载) / (inductive load)	T_{vj}=25°C T_{vj}=125°C T_{vj}=175°C	t_r		110 132 138		
关断延迟时间 Turn-off delay time	I_C=900 A, V_{CE}=600 V V_{GE}=±15 V, R_G=0.5Ω (电感负载) / (inductive load)	T_{vj}=25°C T_{vj}=125°C T_{vj}=175°C	$t_{d\ off}$		436 494 523		
下降时间 Fall time	I_C=900 A, V_{CE}=600 V V_{GE}=±15 V, R_G=0.5Ω (电感负载) / (inductive load)	T_{vj}=25°C T_{vj}=125°C T_{vj}=175°C	t_f		132 222 281		
开通损耗能量（每脉冲） Turn-on energy loss per pulse	I_C=900 A, V_{CE}=600 V di/dt=5200A/us(Tvj=175℃) V_{GE}=±15 V, R_G=0.5Ω	T_{vj}=25°C T_{vj}=125°C T_{vj}=175°C	E_{on}		142 210 246		mJ
关断损耗能量（每脉冲） Turn-off energy loss per pulse	I_C=900 A, V_{CE}=600 V dv/dt=3900V/us(Tvj=175℃) V_{GE}=±15 V, R_G=0.5Ω	T_{vj}=25°C T_{vj}=125°C T_{vj}=175°C	E_{off}		78 105 119		mJ

短路数据 SC data	V_{GE}≤15V, Vcc=800V t_P≤8us, T_{vj}=150°C $V_{CEmax}=V_{CES}-L_{sCE}\cdot di/dt$ t_P≤6us, T_{vj}=175°C	I_{SC}		3000 2900		A
结-外壳热阻 Thermal resistance, junction to case	每个 IGBT / per IGBT	R_{thJC}			0.057	K/W
在开关状态下温度 Temperature under switching conditions	$T_{vj\ op}$ ＞150℃ is only allowed for operation at overload conditions.	Tvj op	-40		175	°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°C	V_{RRM}	1200	V
连续正向直流电流 Continuous DC forward current		I_F	900	A
正向重复峰值电流 Repetitive peak forward current	t_p=1ms	I_{FRM}	1800	A
I^2t 值 I^2t-value	t_p=10ms，sin180°，T_j=125°C	I^2t	45000	A^2s

特征值 / Characteristic Values

Parameter	Conditions		Symbol	Value			Unit
				Min.	Typ.	Max.	
正向电压 Forward voltage	I_F=900A, V_{GE}=0V I_F=900A, V_{GE}=0V	T_{vj}=25°C T_{vj}=125°C T_{vj}=175°C	V_F		1.6 1.65 1.65	2.0	V
反向恢复峰值电流 Peak reverse recovery current	I_F=900A -di_F/dt=5200A/μs (Tvj=175℃) V_R=600V, V_{GE}=-15V	T_{vj}=25°C T_{vj}=125°C T_{vj}=175°C	I_{RM}		352 400 416		A
恢复电荷 Recovered charge	I_F=900A -di_F/dt=5200A/μs (Tvj=175℃) V_R=600V, V_{GE}=-15V	T_{vj}=25°C T_{vj}=125°C T_{vj}=175°C	Q_r		120 219 282		μC
反向恢复损耗（每脉冲） Reverse recovered energy	I_F=900A -di_F/dt=5200A/μs (Tvj=175℃) V_R=600V, V_{GE}=-15V	T_{vj}=25°C T_{vj}=125°C T_{vj}=175°C	E_{rec}		38 73 97		mJ
结-外壳热阻 Thermal resistance, junction to case	每个 Diode / per diode		R_{thJC}			0.096	K/W
在开关状态下温度 Temperature under switching conditions	$T_{vj\ op}$ ＞150°C is only for operation at overload conditions.		$T_{vj\ op}$	-40		175	°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°C，±3%	R_{25}		5.0		KΩ
B-值 B-value	R2 = R25 exp [$B_{25/50}$(1/T2 - 1/(298,15 K))]	$B_{25/50}$		3375		K
B-值 B-value	R2 = R25 exp [$B_{25/80}$(1/T2 - 1/(298,15 K))]	$B_{25/80}$		3425		K
B-值 B-value	R2 = R25 exp [$B_{25/100}$(1/T2 - 1/(298,15 K))]	$B_{25/100}$		3443		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}		3400		V
内部绝缘 Internal isolation	基本绝缘 (class 1, IEC 61140) basic insulation (class 1, IEC 61140)			Al_2O_3		
相对电痕指数 Comperative tracking index		CTI		＞200		
相对温度指数(电) RTI Elec.	住房 housing	RTI		140		℃
杂散电感，模块 Stray inductance module		L_{sCE}		23		nH
储存温度 Storage temperature		T_{stg}	-40		125	°C
模块安装的扭矩 Mounting torque for module mounting		M	3.0		6.0	Nm
端子连接扭矩 Terminal Connection Torque		M	3.0		6.0	Nm
重量 Weight		W		356		g

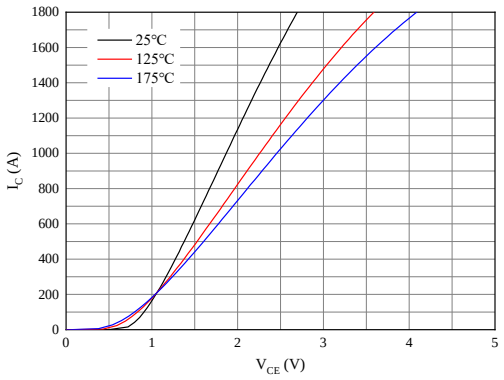


图 1. 典型输出特性 (V_{GE}=15V)

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

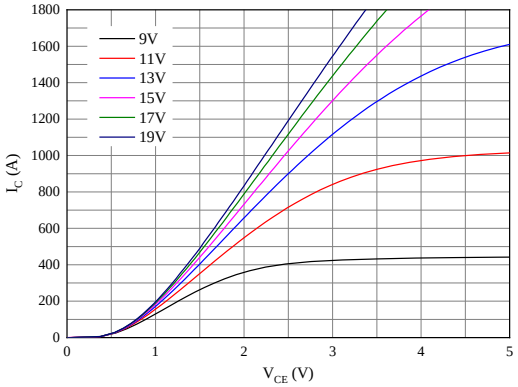


图 2. 典型输出特性 (T_{vj}=175℃)

Figure 2. Typical output characteristics (T_{vj}=175℃)

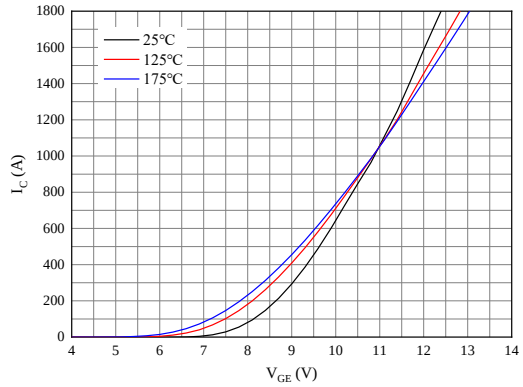


图 3. 典型传输特性(V_{CE}=20V)

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

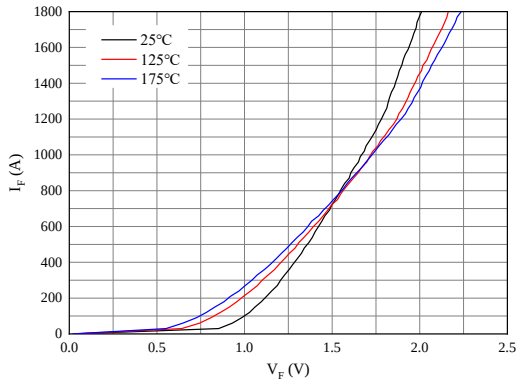


图 4. 正向偏压特性 二极管

Figure 4. Forward characteristic of Diode

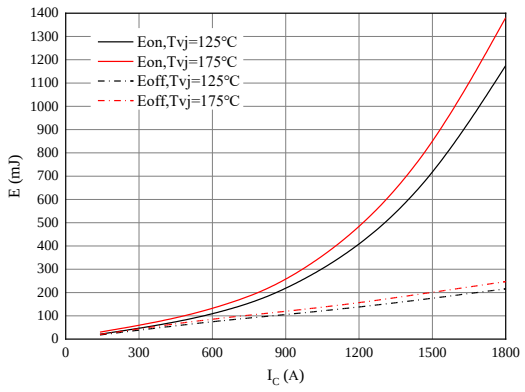


图 5. 开关损耗 逆变器

Figure 5. Switching losses of IGBT

VGE=±15V, RGon=0.5Ω, RGoff=0.5Ω, VCE=600V

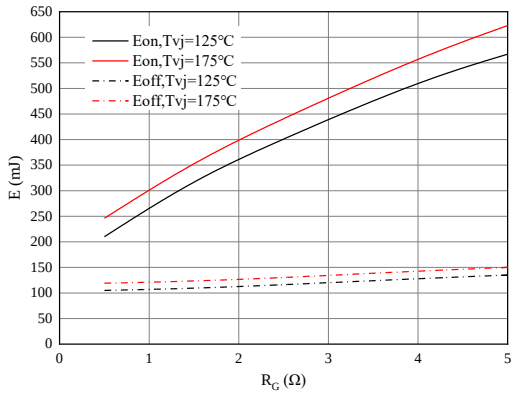


图 6. 开关损耗 逆变器

Figure 6. Switching losses of IGBT

VGE=±15V, I_C=900A , VCE=600V

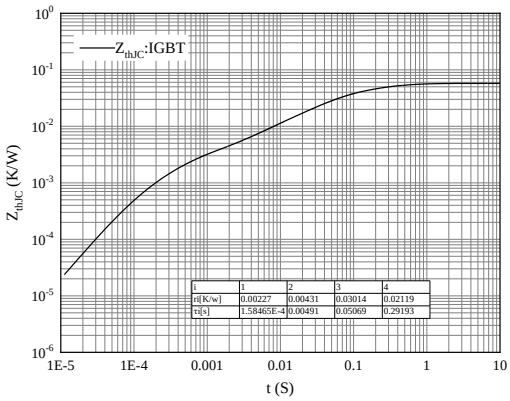


图 7. 瞬态热阻抗 IGBT 逆变器

Figure 7. Transient thermal impedance IGBT, Inverter

$Z_{thJC}=f(t)$

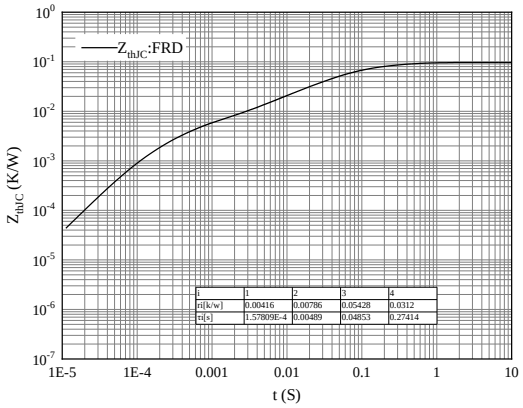


图 8. 瞬态热阻抗 FRD 逆变器

Figure 8. Transient thermal impedance FRD, Inverter

$Z_{thJC}=f(t)$

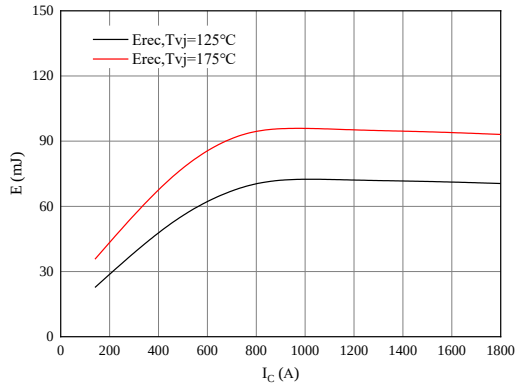


图 9. 开关损耗 二极管

Figure 9. Switching losses of Diode

RGon=0.5Ω, VCE=600V

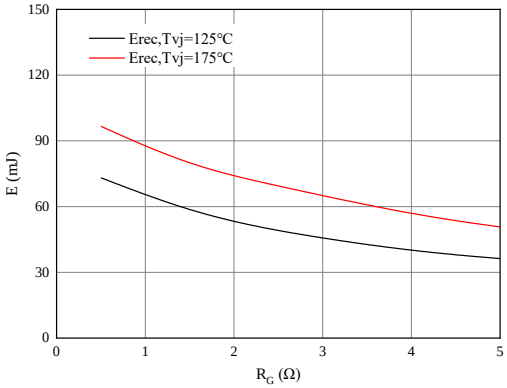


图 10. 开关损耗 二极管

Figure 10. Switching losses of Diode

IF=900A, VCE=600V

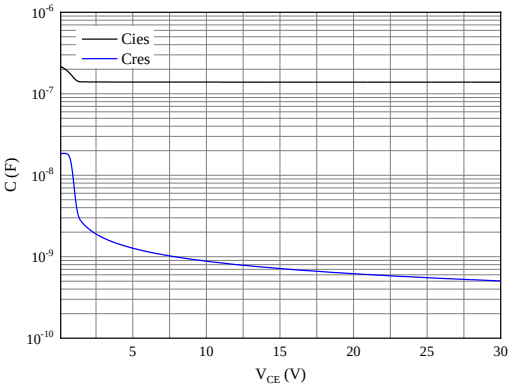


图 11. 电容特性

Figure 11. Capacitance characteristic

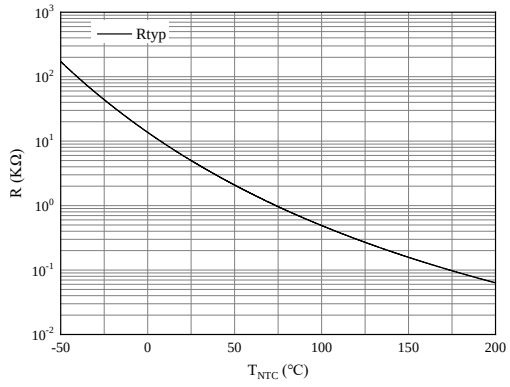
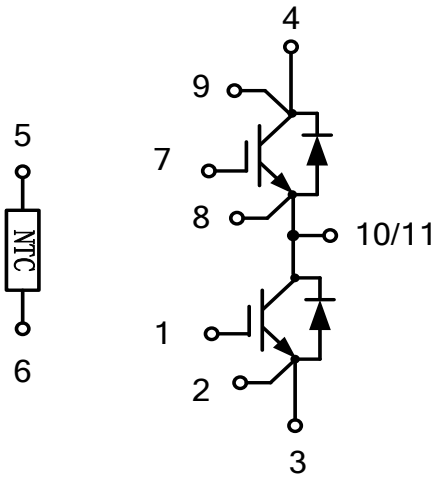


图 12. 负温系数热敏电阻 温度特性

Figure12. NTC-Thermistor-temperature characteristic

接线图 / Circuit diagram



封装尺寸 / Package outlines