Half Bridge IGBT Module

电气特性:

- 1700V 沟槽栅/场终止工艺

  1700V Trench with Field Stop Technology
- 低开关损耗

  Low switching losses
- Vcesat 正温度系数

  Vcesat has a positive temperature coefficient

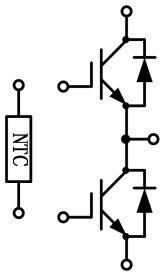
典型应用:

- 大功率变流器

  Power Conversion System
- SVG

  Static Var Generator
- 风力发电机

  Wind Generator



V_{CES} =1700V，$I_{C\ nom}$ =600A / I_{CRM} =1200A

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}	1700	V
连续集电极直流电流 Continuous DC collector current	T_C=100°C, $T_{vj\ max}$=175°C	$I_{C\ nom}$	600	A
集电极重复峰值电流 Repetitive peak collector current	t_P=1 ms	I_{CRM}	1200	A
总功率损耗 Total power dissipation	T_C = 25°C, $T_{vj\ max}$ = 175°C	P_{tot}	3100	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=600A V_{GE}=15V, I_C=600A V_{GE}=15V, I_C=600A	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	V_{CEsat}		2.00 2.40 2.50	2.40	V
栅极-发射极阈值电压 Gate-Emitter threshold voltage	I_C=24mA, V_{GE}= V_{CE}	T_{vj}=25°C	$V_{GE(th)}$	5.20	5.80	6.40	
栅电荷 Gate charge	V_{GE}=-15V...+15V		Q_G		4.6		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}=25 V, V_{GE}=0 V	T_{vj}=25°C	C_{ies}		76.5		nF
反向传输电容 Reverse transfer capacitance			C_{res}		0.50		
集电极-发射极截止电流 Collector-emitter cut-off current	V_{CE}=1700V , V_{GE}= 0 V	T_{vj}=25°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°C	I_{GES}			100	nA
开通延迟时间 Turn-on delay time	I_C=600A, V_{CE}=900 V V_{GE}=±15 V, R_G=1.0Ω (电感负载) / (inductive load)	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	$t_{d\,on}$		182 206 235		ns
上升时间 Rise time	I_C=600A, V_{CE}=900 V V_{GE}=±15 V, R_G=1.0Ω (电感负载) / (inductive load)	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	t_r		70 93 100		
关断延迟时间 Turn-off delay time	I_C=600A, V_{CE}=900 V V_{GE}=±15 V, R_G=1.0Ω (电感负载) / (inductive load)	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	$t_{d\,off}$		311 362 375		
下降时间 Fall time	I_C=600A, V_{CE}=900 V V_{GE}=±15 V, R_G=1.0Ω (电感负载) / (inductive load)	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	t_f		378 547 584		
开通损耗能量（每脉冲） Turn-on energy loss per pulse	I_C=600A, V_{CE}=900 V V_{GE}=±15 V, R_G=1.0Ω di/dt=4700A/µs(Tvj=150°C) (电感负载) / (inductive load)	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	E_{on}		135.5 182.7 197.0		mJ
关断损耗能量（每脉冲） Turn-off energy loss per pulse	I_C=600A, V_{CE}=900 V V_{GE}=±15 V, R_G=1.0Ω du/dt=7400V/µs(Tvj=150°C) (电感负载) / (inductive load)	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	E_{off}		103.8 136.2 142.9		
短路数据 SC data	V_{GE}≤15V, Vce=1000V V_{CEmax}=V_{CES}-L_{sCE}·di/dt	t_P≤10us, T_{vj}=150°C	I_{SC}		2800		A
结-外壳热阻 Thermal resistance, junction to case	每个 IGBT / per IGBT		R_{thJC}			0.049	K/W
在开关状态下温度 Temperature under switching conditions			$T_{vj\,op}$	-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°C	V_{RRM}	1700	V
连续正向直流电流 Continuous DC forward current		I_F	600	A
正向重复峰值电流 Repetitive peak forward current	t_p=1ms	I_{FRM}	1200	A
I^2t 值 I^2t-value	t_p=10ms，sin180°，T_j=125°C	I^2t	26000	A^2s

特征值 / Characteristic Values

Parameter	Conditions		Symbol	Value			Unit
				Min	Typ	Max	
正向电压 Forward voltage	I_F=600A, V_{GE}=0V I_F=600A, V_{GE}=0V I_F=600A, V_{GE}=0V	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	V_F		1.85 2.15 2.20	2.20	V
反向恢复峰值电流 Peak reverse recovery current	I_F=600A -di$_F$/dt=4000A/µs(T_{vj}=150°C) V_R=900V, V_{GE}=-15V	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	I_{RM}		280 355 371		A
恢复电荷 Recovered charge	I_F=600A -di$_F$/dt=4000A/µs(T_{vj}=150°C) V_R=900V, V_{GE}=-15V	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	Q_r		123 208 234		µC
反向恢复损耗（每脉冲） Reverse recovered energy	I_F=600A -di$_F$/dt=4000A/µs(T_{vj}=150°C) V_R=900V, V_{GE}=-15V	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	E_{rec}		73.8 130.7 147.9		mJ
结-外壳热阻 Thermal resistance, junction to case	每个二极管 / per diode		R_{thJC}			0.081	K/W
在开关状态下温度 Temperature under switching conditions			$T_{vj\ op}$	-40		150	°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，±5%	R_{25}		5.0		kΩ
B-值 B-value	±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}	4000			V
内部绝缘 Internal isolation			Al_2O_3			
储存温度 Storage temperature		T_{stg}	-40		125	°C
模块安装的扭矩 Mounting torque for modul mounting		M	3.0		6.0	Nm
端子联接扭距 Terminal connection torque		M	3.0		6.0	Nm
重量 Weight		W		350		g

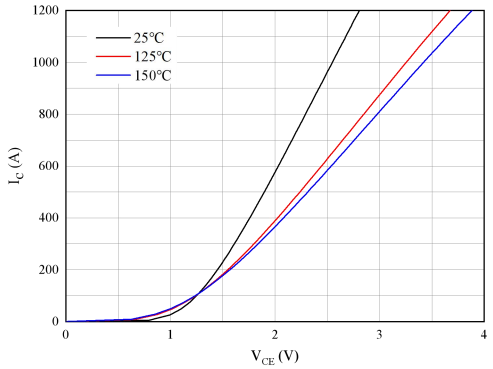


图 1. 典型输出特性 (V_{GE}=15V)

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

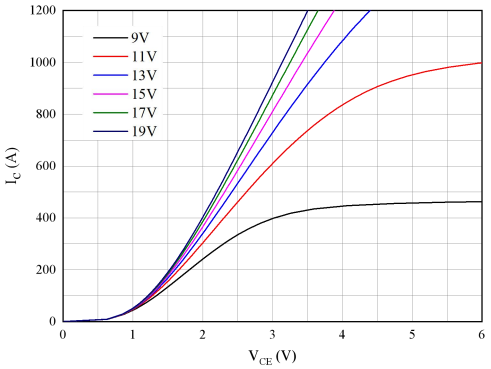


图 2. 典型输出特性 (T_{vj}=150℃)

Figure 2. Typical output characteristics (T_{vj}=150℃)

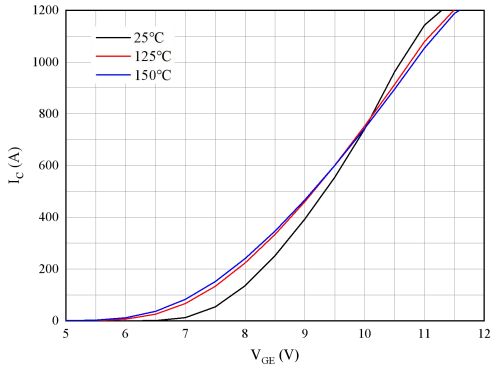


图 3. 典型传输特性(V_{CE}=20V)

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

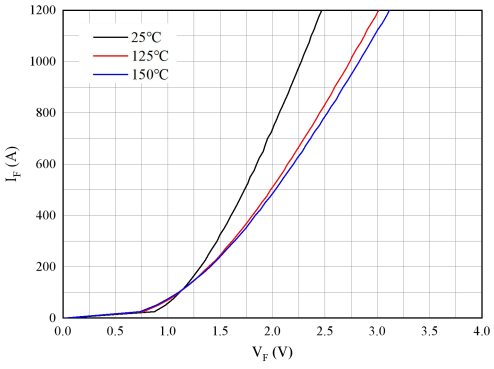


图 4. 正向偏压特性 二极管

Figure 4. Forward characteristics of Diode

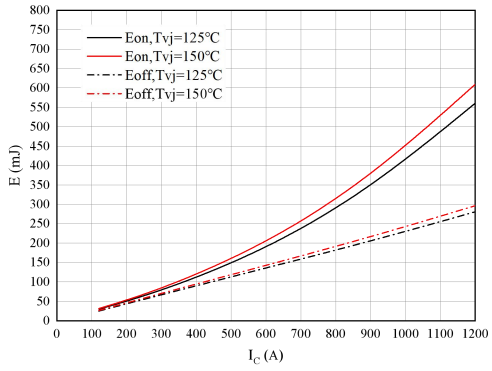


图 5. 开关损耗 逆变器

Figure 5. Switching losses of IGBT

V_{GE}=±15V, R_{Gon}=1.0Ω, R_{Goff}=1.0Ω, V_{CE}=900V

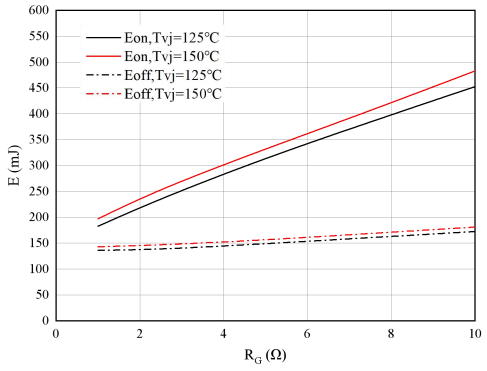


图 6. 开关损耗 逆变器

Figure 6. Switching losses of IGBT

V_{GE}=±15V, I_C=600A, V_{CE}=900V

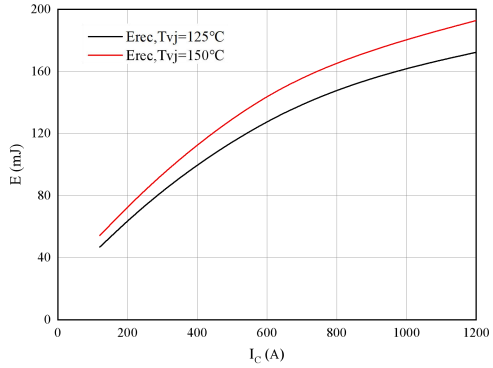


图 7. 开关损耗 二极管
Figure 7. Switching losses of Diode
R_{Gon}=1.0Ω, V_{CE}=900V

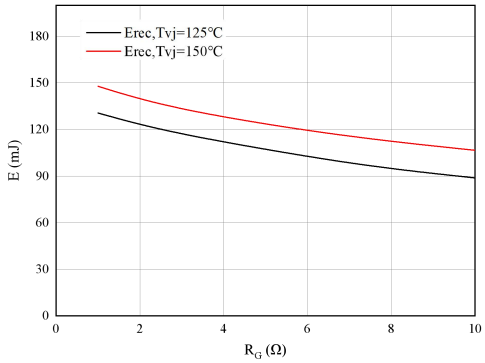


图 8. 开关损耗 二极管
Figure 8. Switching losses of Diode
I_F=600A, V_{CE}=900V

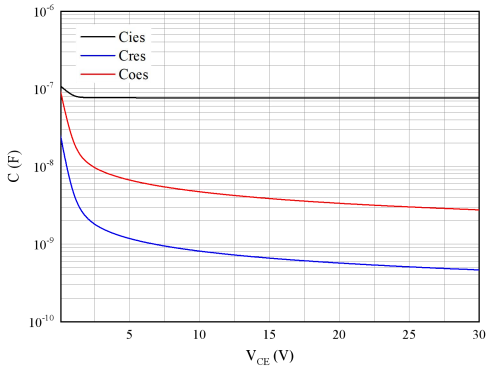


图 9. 电容特性
Figure 9. Capacitance characteristics

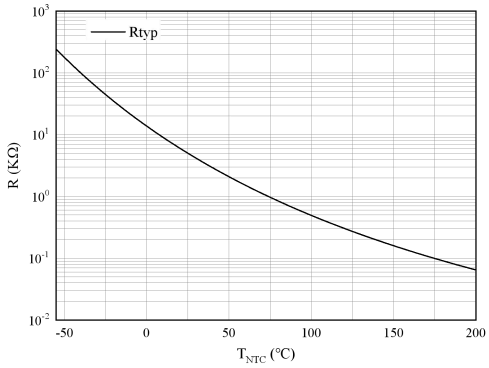


图 10. 负温度系数热敏电阻 温度特性
Figure 10. NTC-Thermistor-temperature characteristic

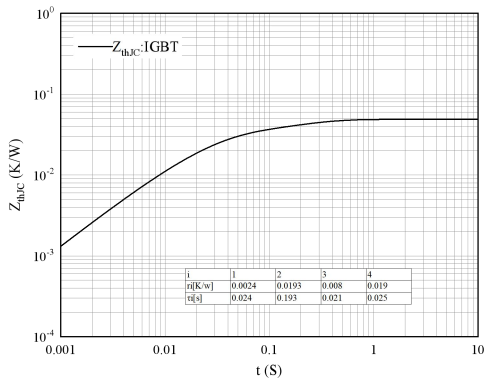


图 11. 瞬态热阻抗 IGBT 逆变器
Figure11. Transient thermal impedance IGBT, Inverter
Figure 11. Z_{thJC}=f(t)

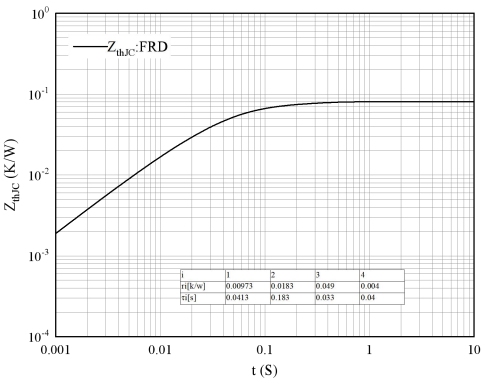
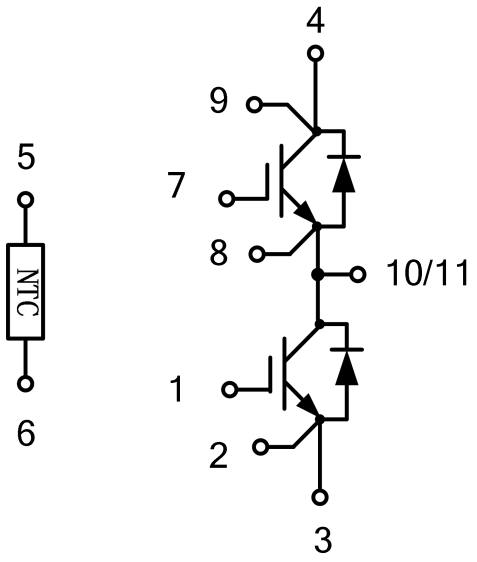


图 12. 瞬态热阻抗 FRD 逆变器
Figure12. Transient thermal impedance FRD, Inverter
Figure 12. Z_{thJC}=f(t)

接线图 / Circuit diagram



封装尺寸 / Package outlines