

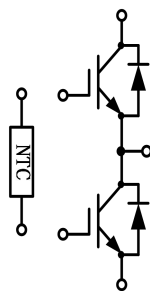
## Half Bridge IGBT Module

### 电气特性:

- 1200V 沟槽栅/场终止工艺  
1200V Trench with Field Stop technology
- 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	$T_{vj} = 25^{\circ}C$	$V_{CES}$	1200	V
连续集电极直流电流 Continuous DC collector current	$T_C = 90^{\circ}C$ , $T_{vj\ max} = 175^{\circ}C$	$I_{C\ nom}$	900	A
集电极重复峰值电流 Repetitive peak collector current	$t_p = 1\ ms$	$I_{CRM}$	1800	A
总功率损耗 Total power dissipation	$T_C = 25^{\circ}C$ , $T_{vj\ max} = 175^{\circ}C$	$P_{tot}$	3600	W
栅极-发射极电压 Gate emitter voltage		$V_{GE}$	$\pm 20$	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	$V_{GE}=15V, I_C=900A$ $V_{GE}=15V, I_C=900A$ $V_{GE}=15V, I_C=900A$	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=175^{\circ}C$	$V_{CE\ sat}$	1.65 1.95 2.10	2.10	V
栅极-发射极阈值电压 Gate-Emitter threshold voltage	$I_C=18mA, V_{GE}=V_{CE},$	$T_{vj}=25^{\circ}C$	$V_{GEth}$	5.2	5.8	6.4
栅电荷 Gate charge	$V_{GE}=-15V...+15V$		$Q_G$		11.5	$\mu C$
内部栅极电阻 Internal gate resistor	$T_{vj}=25^{\circ}C$		$R_{Gint}$		0.5	$\Omega$
输入电容 Input capacitance	$f=100KHz, V_{CE}=25V, V_{GE}=0V$	$T_{vj}=25^{\circ}C$	$C_{ies}$		140	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	$V_{CE}=1200V, V_{GE}=0V$	$T_{vj}=25^{\circ}C$	$I_{CES}$		0.1	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	$I_C=900A, V_{CE}=600V$ $V_{GE}=\pm 15V, R_G=0.5\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=175^{\circ}C$	$t_{d\ on}$		409 435 445	ns
上升时间 Rise time	$I_C=900A, V_{CE}=600V$ $V_{GE}=\pm 15V, R_G=0.5\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=175^{\circ}C$	$t_r$		75 86 95	
关断延迟时间 Turn-off delay time	$I_C=900A, V_{CE}=600V$ $V_{GE}=\pm 15V, R_G=0.5\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=175^{\circ}C$	$t_{d\ off}$		510 575 620	
下降时间 Fall time	$I_C=900A, V_{CE}=600V$ $V_{GE}=\pm 15V, R_G=0.5\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=175^{\circ}C$	$t_f$		147 238 295	
开通损耗能量 (每脉冲) Turn-on energy loss per pulse	$I_C=900A, V_{CE}=600V$ $di/dt=7500A/us(T_{vj}=175^{\circ}C)$ $V_{GE}=\pm 15V, R_G=0.5\Omega$	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=175^{\circ}C$	$E_{on}$		36 69 93	mJ
关断损耗能量 (每脉冲) Turn-off energy loss per pulse	$I_C=900A, V_{CE}=600V$ $dv/dt=3100V/us(T_{vj}=175^{\circ}C)$ $V_{GE}=\pm 15V, R_G=0.5\Omega$	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=175^{\circ}C$	$E_{off}$		94 122 139	mJ
短路数据 SC data	$V_{GE}\leq 15V, V_{CC}=800V$ $t_p\leq 8us, T_{vj}=150^{\circ}C$ $V_{CEmax}=V_{CES}-L_{sCE}\cdot di/dt$ $t_p\leq 6us, T_{vj}=175^{\circ}C$		$I_{sc}$		3400 3200	A
结-外壳热阻 Thermal resistance, junction to case	每个 IGBT / per IGBT		$R_{thJC}$		0.044	K/W
在开关状态下温度 Temperature under switching conditions	$T_{vj\ op} > 150^{\circ}C$ is only allowed for operation at overload conditions.		$T_{vj\ op}$	-40	175	$^{\circ}C$

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		$I_F$	900	A
正向重复峰值电流 Repetitive peak forward current	$t_p=1\text{ms}$	$I_{FRM}$	1800	A
$I^2t$ 值 $I^2t$ -value	$t_p=10\text{ms}$ , $\sin 180^{\circ}$ , $T_j=125^{\circ}\text{C}$	$I^2t$	30000	$\text{A}^2\text{s}$

## 特征值 / Characteristic Values

Parameter	Conditions	Symbol	Value			Unit
			Min.	Typ.	Max.	
正向电压 Forward voltage	$I_F=900\text{A}$ , $V_{GE}=0\text{V}$ $I_F=900\text{A}$ , $V_{GE}=0\text{V}$ $I_F=900\text{A}$ , $V_{GE}=0\text{V}$	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=175^{\circ}\text{C}$	$V_F$	2.05 2.25 2.25	2.35	V
反向恢复峰值电流 Peak reverse recovery current	$I_F=900\text{A}$ $-di_F/dt=7500\text{A}/\mu\text{s}$ ( $T_{vj}=175^{\circ}\text{C}$ ) $V_R=600\text{V}$ , $V_{GE}=-15\text{V}$	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=175^{\circ}\text{C}$	$I_{RM}$	512 544 556		A
恢复电荷 Recovered charge	$I_F=900\text{A}$ $-di_F/dt=7500\text{A}/\mu\text{s}$ ( $T_{vj}=175^{\circ}\text{C}$ ) $V_R=600\text{V}$ , $V_{GE}=-15\text{V}$	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=175^{\circ}\text{C}$	$Q_F$	85 148 189		$\mu\text{C}$
反向恢复损耗（每脉冲） Reverse recovered energy	$I_F=900\text{A}$ $-di_F/dt=7500\text{A}/\mu\text{s}$ ( $T_{vj}=175^{\circ}\text{C}$ ) $V_R=600\text{V}$ , $V_{GE}=-15\text{V}$	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=175^{\circ}\text{C}$	$E_{rec}$	42 68 83		mJ
结-外壳热阻 Thermal resistance, junction to case	每个 Diode / per diode		$R_{thJC}$		0.069	K/W
在开关状态下温度 Temperature under switching conditions	$T_{vj\ op} > 150^{\circ}\text{C}$ is only for operation at overload conditions.		$T_{vj\ op}$	-40	175	$^{\circ}\text{C}$

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	$T_c=25^{\circ}\text{C}$ , $\pm 3\%$	$R_{25}$		5.0		K $\Omega$
B-值 B-value	$R_2 = R_{25}\exp[B_{25/50}(1/T_2 - 1/(298,15\text{ K}))]$	$B_{25/50}$		3375		K
B-值 B-value	$R_2 = R_{25}\exp[B_{25/80}(1/T_2 - 1/(298,15\text{ K}))]$	$B_{25/80}$		3425		K
B-值 B-value	$R_2 = R_{25}\exp[B_{25/100}(1/T_2 - 1/(298,15\text{ K}))]$	$B_{25/100}$		3443		K

模块 / Module

Parameter	Conditions	Symbol	Value			Unit
绝缘测试电压 Isolation test voltage	RMS, $f=50\text{Hz}$ , $t=1\text{min}$	$V_{\text{ISOL}}$		3400		V
内部绝缘 Internal isolation	基本绝缘 (class 1, IEC 61140) basic insulation (class 1, IEC 61140)			$\text{Al}_2\text{O}_3$		
相对电痕指数 Comperative tracking index		CTI		>200		
相对温度指数(电) RTI Elec.	housing	RTI		140		$^{\circ}\text{C}$
杂散电感, 模块 Stray inductance module		$L_{\text{sCE}}$		20		nH
储存温度 Storage temperature		$T_{\text{stg}}$	-40		125	$^{\circ}\text{C}$
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		357		g

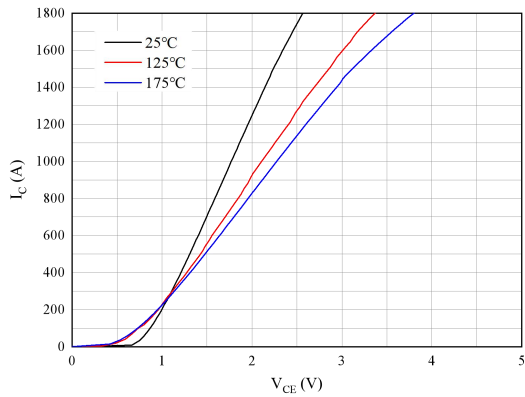


图 1. 典型输出特性 ( $V_{GE}=15V$ )  
Figure 1. Typical output characteristics ( $V_{GE}=15V$ )

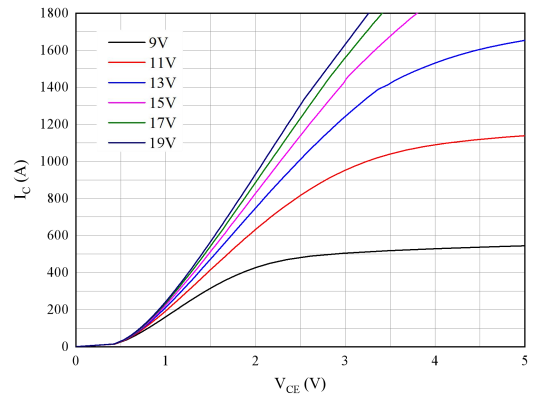


图 2. 典型输出特性 ( $T_{vj}=175^{\circ}C$ )  
Figure 2. Typical output characteristics ( $T_{vj}=175^{\circ}C$ )

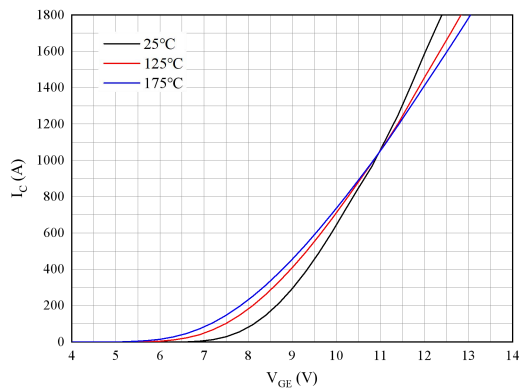


图 3. 典型传输特性 ( $V_{CE}=20V$ )  
Figure 3. Typical transfer characteristic ( $V_{CE}=20V$ )

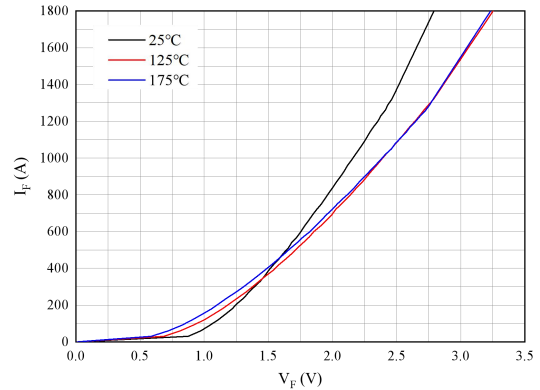


图 4. 正向偏压特性 二极管  
Figure 4. Forward characteristic of Diode

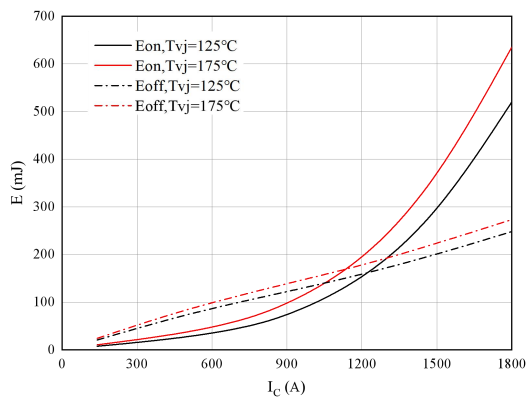


图 5. 开关损耗 逆变器  
Figure 5. Switching losses of IGBT  
 $V_{GE}=\pm 15V$ ,  $R_{Gon}=0.5\Omega$ ,  $R_{Goff}=0.5\Omega$ ,  $V_{CE}=600V$

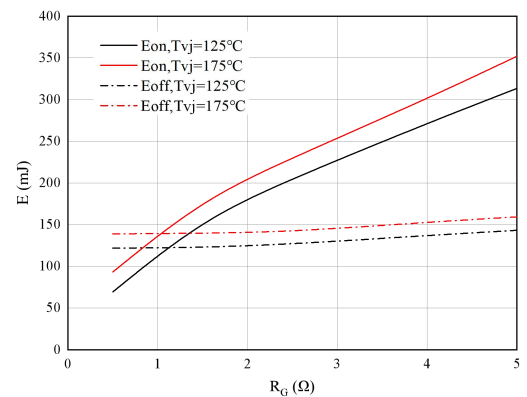


图 6. 开关损耗 逆变器  
Figure 6. Switching losses of IGBT  
 $V_{GE}=\pm 15V$ ,  $I_c=900A$ ,  $V_{CE}=600V$

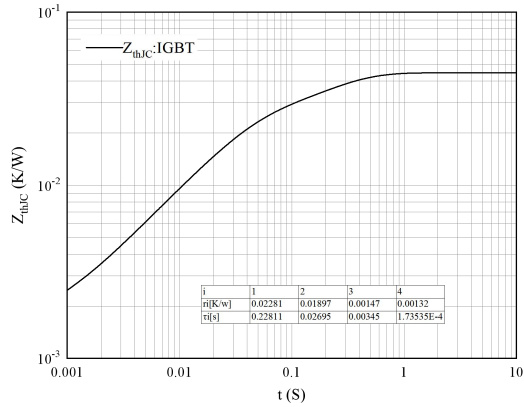


图 7. 瞬态热阻抗 IGBT 逆变器

Figure 7. Transient thermal impedance IGBT, Inverter

$$Z_{thJC}=f(t)$$

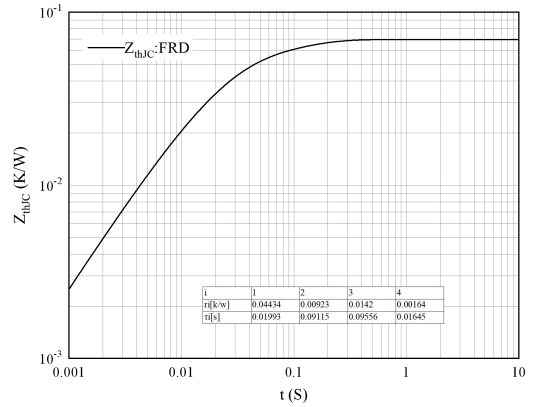


图 8. 瞬态热阻抗 FRD 逆变器

Figure 8. Transient thermal impedance FRD, Inverter

$$Z_{thJC}=f(t)$$

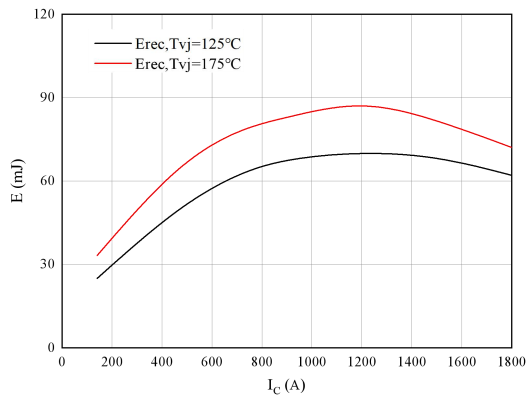


图 9. 开关损耗 二极管

Figure 9. Switching losses of Diode

$R_{Gon}=0.5\Omega, V_{CE}=600V$

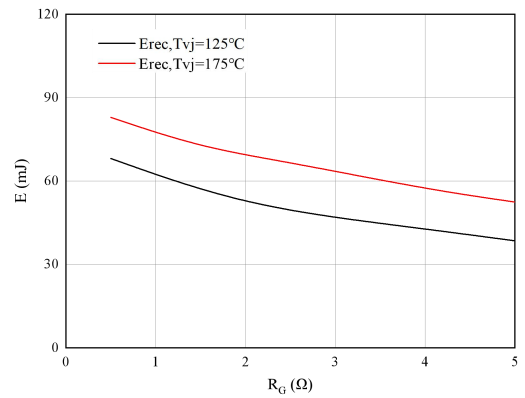


图 10. 开关损耗 二极管

Figure 10. Switching losses of Diode

$I_F=900A, V_{CE}=600V$

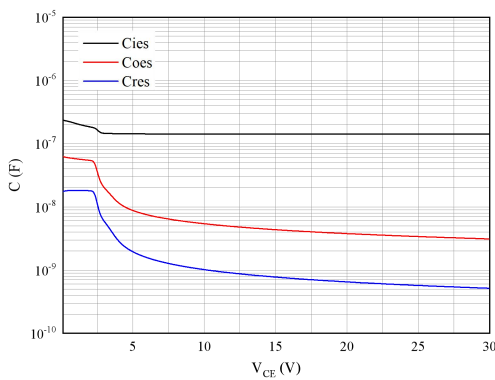


图 11. 电容特性

Figure 11. Capacitance characteristic

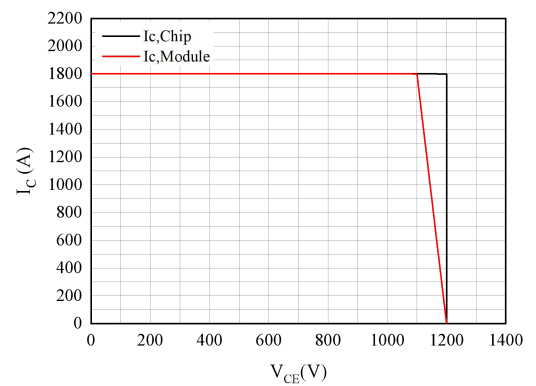


图 12. 反偏安全工作区

Figure12. RBSOA

$V_{GE}=\pm 15V, R_{Goff}=0.5\Omega, T_{vj}=175^\circ C$

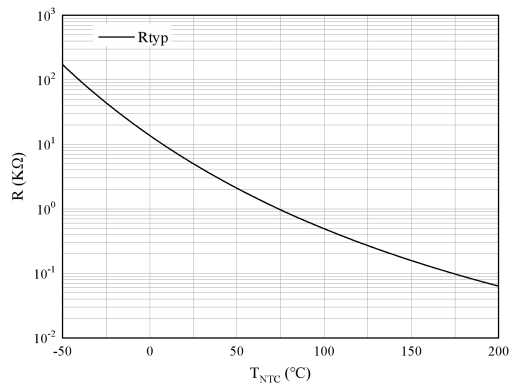
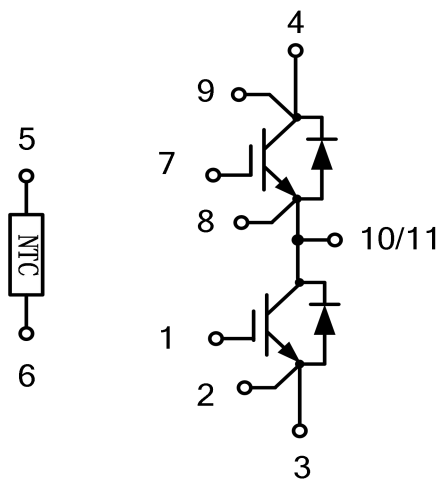


图 13. 负温系数热敏电阻 温度特性

Figure13. NTC-Thermistor-temperature characteristic

接线图 / Circuit diagram



封装尺寸 / Package outlines

