



## **SF50R12A6H 34mm Half Bridge IGBT Module**

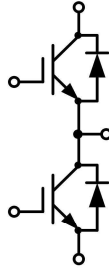
### 电气特性 / Features and Benefits:

- 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  
Positive Temperature Coefficient

### 典型应用 / Application:

- 逆变焊机  
Inverter Welding Machine
- 感应加热  
Induction Heating
- 高频开关应用  
High Frequency Switch Applications
- 逆变器  
Inverter



$V_{CES}=1200V, I_{C\ nom}=50A / I_{CRM}=100A$

## **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<br>Collector-Emitter voltage         | $T_{vj}=25^{\circ}C$                         | $V_{CES}$    | 1200     | V    |
| 连续集电极直流电流<br>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<br>Repetitive peak collector current | $t_p=1\ ms$                                  | $I_{CRM}$    | 100      | A    |
| 栅极-发射极电压<br>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<br>Collector-Emitter saturation voltage | $V_{GE}=15V, I_C=50A$<br>$V_{GE}=15V, I_C=50A$<br>$V_{GE}=15V, I_C=50A$ | $T_{vj}=25^{\circ}C$<br>$T_{vj}=125^{\circ}C$<br>$T_{vj}=150^{\circ}C$ | $V_{CESat}$  | 2.18<br>2.75<br>2.87 | 2.65 | V        |
| 栅极-发射极阈值电压<br>Gate-Emitter threshold voltage        | $I_C = 1.7mA, V_{GE}= V_{CE}$   | $T_{vj}=25^{\circ}C$   | $V_{GE(th)}$ | 5.20                 | 5.80 | 6.40     |
| 栅电荷<br>Gate charge                                  | $V_{GE}=-15V...+15V$  |  | $Q_G$        | 0.27                 |      | $\mu C$  |
| 内部栅极电阻<br>Internal gate resistor                    |   |  | $R_{Gint}$   | 2.7                  |      | $\Omega$ |
| 输入电容<br>Input capacitance                           | $f=1MHz, V_{CE}=25\ V, V_{GE}=0\ V$                                     | $T_{vj}=25^{\circ}C$   | $C_{ies}$    | 3.0                  |      | nF       |

## Typical Characteristics

|  |  |  |              |     |                      |             |
|--|--|--|--------------|-----|----------------------|-------------|
| Input capacitance                                  |  |  |              |     |                      |             |
| 反向传输电容<br>Reverse transfer capacitance             |  |  | $C_{res}$    |     | 0.14                 |             |
| 集电极-发射极截止电流<br>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<br>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<br>Turn-on delay time                       | $I_C=50A, V_{CE}=600V$<br>$V_{GE}=\pm 15V, R_G=15\Omega$<br>(电感负载) / (inductive load)                              | $T_{vj}=25^{\circ}C$<br>$T_{vj}=125^{\circ}C$<br>$T_{vj}=150^{\circ}C$ | $t_{don}$    |     | 60<br>64<br>64       | ns          |
| 上升时间<br>Rise time                                  | $I_C=50A, V_{CE}=600V$<br>$V_{GE}=\pm 15V, R_G=15\Omega$<br>(电感负载) / (inductive load)                              | $T_{vj}=25^{\circ}C$<br>$T_{vj}=125^{\circ}C$<br>$T_{vj}=150^{\circ}C$ | $t_r$        |     | 36<br>42<br>45       |             |
| 关断延迟时间<br>Turn-off delay time                      | $I_C=50A, V_{CE}=600V$<br>$V_{GE}=\pm 15V, R_G=15\Omega$<br>(电感负载) / (inductive load)                              | $T_{vj}=25^{\circ}C$<br>$T_{vj}=125^{\circ}C$<br>$T_{vj}=150^{\circ}C$ | $t_{doff}$   |     | 158<br>181<br>209    |             |
| 下降时间<br>Fall time                                  | $I_C=50A, V_{CE}=600V$<br>$V_{GE}=\pm 15V, R_G=15\Omega$<br>(电感负载) / (inductive load)                              | $T_{vj}=25^{\circ}C$<br>$T_{vj}=125^{\circ}C$<br>$T_{vj}=150^{\circ}C$ | $t_f$        |     | 111<br>129<br>199    |             |
| 开通损耗能量 (每脉冲)<br>Turn-on energy loss per pulse      | $I_C=50A, V_{CE}=600V$<br>$V_{GE}=\pm 15V, R_G=15\Omega$<br>(电感负载) / (inductive load)                              | $T_{vj}=25^{\circ}C$<br>$T_{vj}=125^{\circ}C$<br>$T_{vj}=150^{\circ}C$ | $E_{on}$     |     | 3.27<br>5.01<br>6.31 |             |
| 关断损耗能量 (每脉冲)<br>Turn-off energy loss per pulse     | $I_C=50A, V_{CE}=600V$<br>$V_{GE}=\pm 15V, R_G=15\Omega$<br>(电感负载) / (inductive load)                              | $T_{vj}=25^{\circ}C$<br>$T_{vj}=125^{\circ}C$<br>$T_{vj}=150^{\circ}C$ | $E_{off}$    |     | 1.91<br>2.36<br>2.72 | mJ          |
| 短路数据<br>SC data                                    | $V_{GE}\leq 15V, V_{CC}=800V$<br>$V_{CEmax}=V_{CES}-L_{sCE}\cdot di/dt \quad t_p\leq 10\mu s, T_{vj}=150^{\circ}C$ |  | $I_{SC}$     |     | 164                  | A           |
| 在开关状态下温度<br>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<br>Repetitive peak reverse voltage | $T_{vj}=25^{\circ}C$                              | $V_{RRM}$ | 1200  | V      |
| 连续正向直流电流<br>Continuous DC forward current   |   | $I_F$     | 50    | A      |
| 正向重复峰值电流<br>Repetitive peak forward current | $t_p=1ms$   | $I_{FRM}$ | 100   | A      |
| $I^2t$ 值<br>$I^2t$ -value                   | $t_p=10ms, \sin 180^{\circ}, T_{vj}=125^{\circ}C$ | $I^2t$    | 613   | $A^2s$ |

## Typical Characteristics

### 特征值 / Characteristic Values

| Parameter  | Conditions   | Symbol   | Value |                      |      | Unit        |
|--|--|--|-------|----------------------|------|-------------|
|  |  |  | Min.  | Typ.                 | Max. |             |
| 正向电压<br>Forward voltage                            | $I_F=50A, V_{GE}=0V$<br>$I_F=50A, V_{GE}=0V$<br>$I_F=50A, V_{GE}=0V$                 | $T_{vj}=25^{\circ}C$<br>$T_{vj}=125^{\circ}C$<br>$T_{vj}=150^{\circ}C$ |       | 2.20<br>1.74<br>1.65 | 2.70 | V           |
| 反向恢复峰值电流<br>Peak reverse recovery current          | $I_F=50A,$<br>$-di_F/dt=1226A/\mu s(T_{vj}=150^{\circ}C)$<br>$V_R=600V, V_{GE}=-15V$ | $T_{vj}=25^{\circ}C$<br>$T_{vj}=125^{\circ}C$<br>$T_{vj}=150^{\circ}C$ |       | 14<br>27<br>29       |      | A           |
| 恢复电荷<br>Recovered charge                           | $I_F=50A,$<br>$-di_F/dt=1226A/\mu s(T_{vj}=150^{\circ}C)$<br>$V_R=600V, V_{GE}=-15V$ | $T_{vj}=25^{\circ}C$<br>$T_{vj}=125^{\circ}C$<br>$T_{vj}=150^{\circ}C$ |       | 1.91<br>5.51<br>6.60 |      | $\mu C$     |
| 反向恢复损耗（每脉冲）<br>Reverse recovered energy            | $I_F=50A,$<br>$-di_F/dt=1226A/\mu s(T_{vj}=150^{\circ}C)$<br>$V_R=600V, V_{GE}=-15V$ | $T_{vj}=25^{\circ}C$<br>$T_{vj}=125^{\circ}C$<br>$T_{vj}=150^{\circ}C$ |       | 0.61<br>1.64<br>1.96 |      | mJ          |
| 在开关状态下温度<br>Temperature under switching conditions |  | $T_{vj\ op}$   | -40   |                      | 150  | $^{\circ}C$ |

### 模块 / Module

| Parameter                                     | Conditions            | Symbol     | Value     |     |     | Unit        |
|---|-----------------------|------------|-----------|-----|-----|-------------|
| 绝缘测试电压<br>Isolation test voltage              | RMS, $f=50Hz, t=1min$ | $V_{ISOL}$ | 2500      |     |     | V           |
| 内部绝缘<br>Internal isolation                    |                       |            | $Al_2O_3$ |     |     |             |
| 储存温度<br>Storage temperature                   |                       | $T_{stg}$  | -40       |     | 125 | $^{\circ}C$ |
| 模块安装的扭矩<br>Mounting torque for modul mounting |                       | M          | 3.0       |     | 6.0 | Nm          |
| 重量<br>Weight                                  |                       | W          |           | 155 |     | g           |

# Typical Characteristics

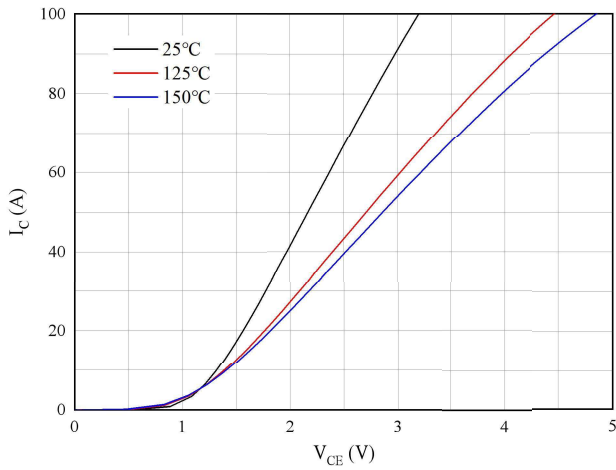


图 1. 典型输出特性 ( $V_{GE}=15V$ )

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

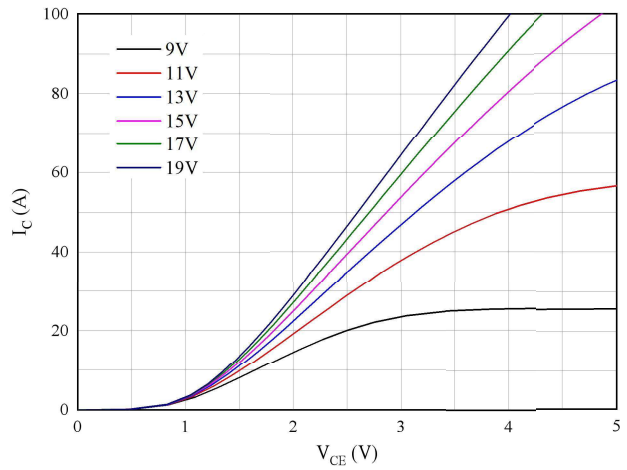


图 2. 典型输出特性 ( $T_{vj}=150^{\circ}C$ )

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

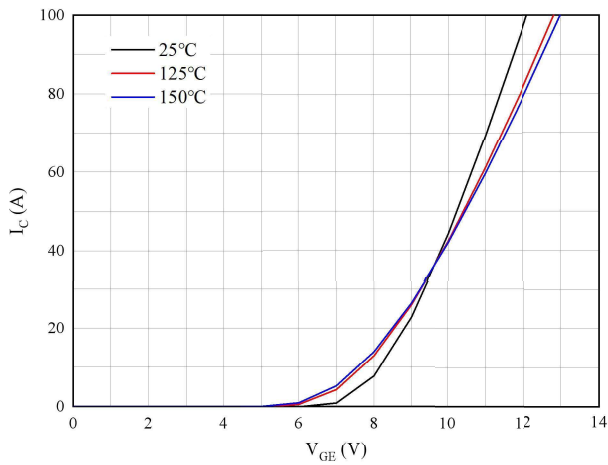


图 3. 典型传输特性 ( $V_{CE}=20V$ )

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

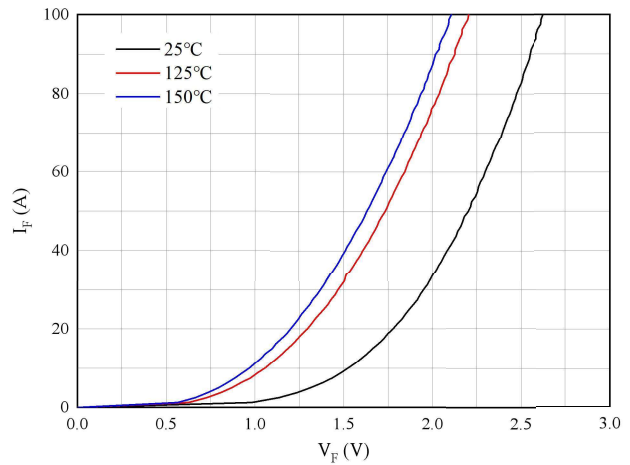


图 4. 正向偏压特性 二极管

Figure 4. Forward characteristic of Diode

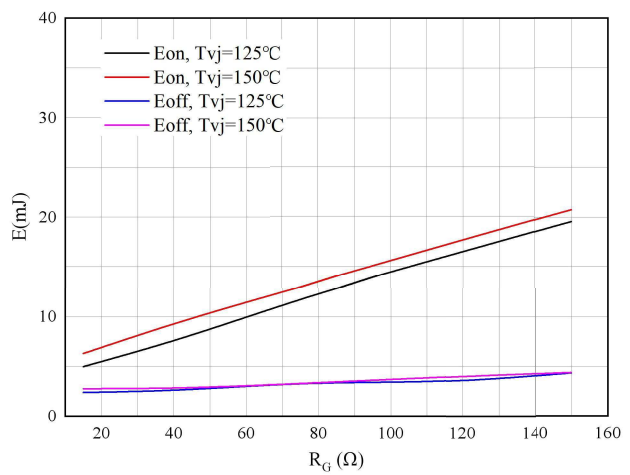
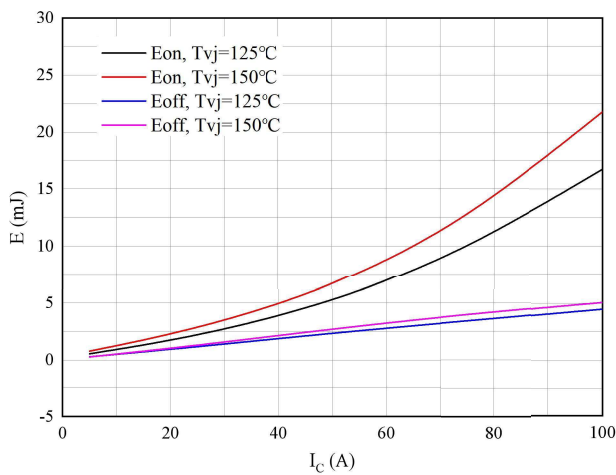


图 5. 开关损耗 逆变器

Figure 5. Switching losses of IGBT  
 $V_{GE} = \pm 15V$ ,  $R_{Gon} = 15\Omega$ ,  $R_{Goff} = 15\Omega$ ,  $V_{CE} = 600V$

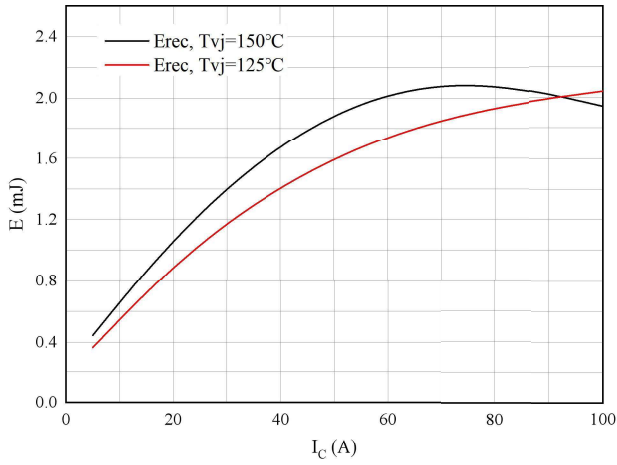


图 7. 开关损耗 二极管

Figure 7. Switching losses of Diode  
 $R_{Gon} = 15\Omega$ ,  $V_{CE} = 600V$

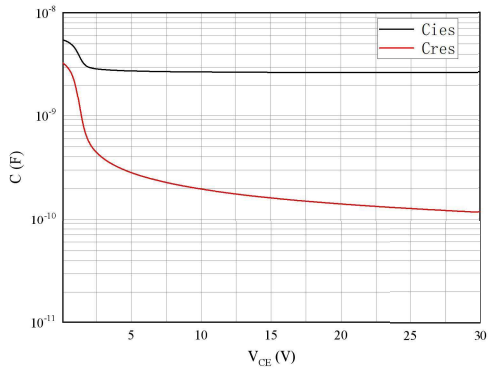


图 9. 电容特性

Figure 9. Capacitance characteristic

图 6. 开关损耗 逆变器

Figure 6. Switching losses of IGBT  
 $V_{GE} = \pm 15V$ ,  $I_C = 50A$ ,  $V_{CE} = 600V$

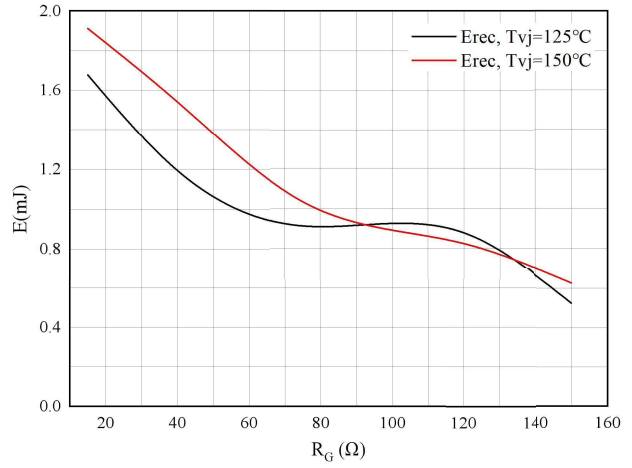
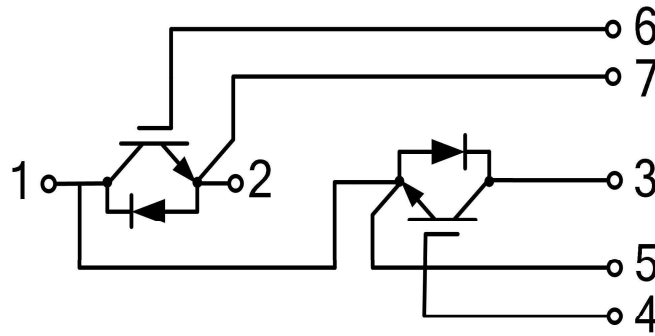


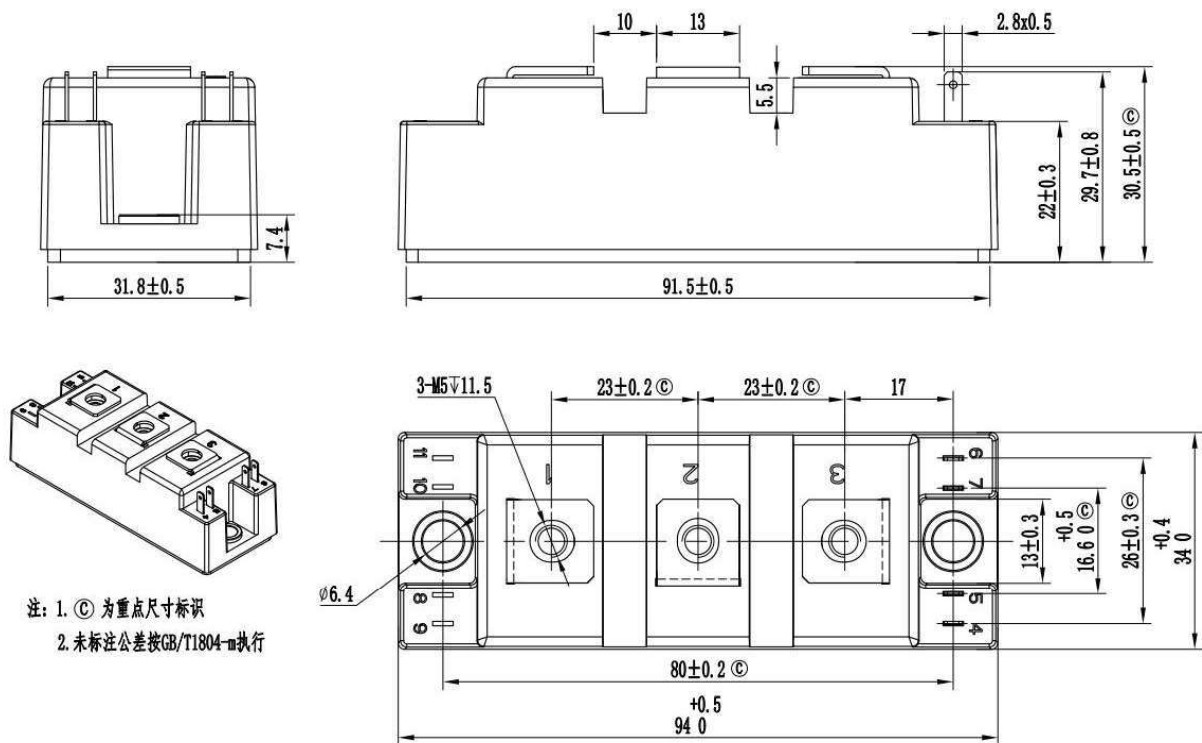
图 8. 开关损耗 二极管

Figure 8. Switching losses of Diode  
 $I_F = 50A$ ,  $V_{CE} = 600V$

接线图 / Circuit diagram



封装尺寸 / Package outlines



Dimensions in (mm)