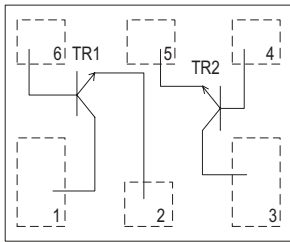
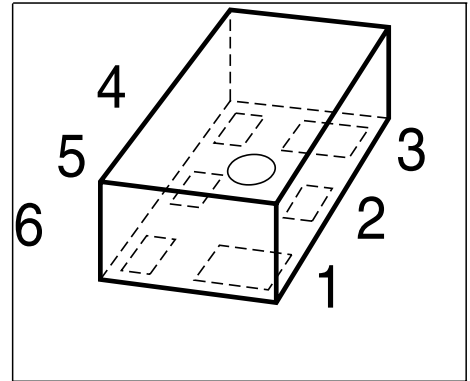


# NPN Silicon RF Transistor

## Preliminary data

- Low voltage/ Low current operation
- For low noise amplifiers
- For Oscillators up to 3.5 GHz and Pout > 10 dBm
- Low noise figure: 1.0 dB at 1.8 GHz

Built in 2 transistors ( TR1, TR2: die as BFR360L3)



**ESD:** Electrostatic discharge sensitive device, observe handling precaution!

| Type     | Marking | Pin Configuration |      |      |      |      |      | Package  |
|----------|---------|-------------------|------|------|------|------|------|----------|
| BFS360L6 | FB      | 1=C1              | 2=E1 | 3=C2 | 4=B2 | 5=E2 | 6=B1 | TSLP-6-1 |

## Maximum Ratings

| Parameter                                                             | Symbol    | Value       | Unit             |
|-----------------------------------------------------------------------|-----------|-------------|------------------|
| Collector-emitter voltage                                             | $V_{CEO}$ | 6           | V                |
| Collector-emitter voltage                                             | $V_{CES}$ | 15          |                  |
| Collector-base voltage                                                | $V_{CBO}$ | 15          |                  |
| Emitter-base voltage                                                  | $V_{EBO}$ | 2           |                  |
| Collector current                                                     | $I_C$     | 35          | mA               |
| Base current                                                          | $I_B$     | 4           |                  |
| Total power dissipation <sup>1)</sup><br>$T_S \leq 101^\circ\text{C}$ | $P_{tot}$ | 210         | mW               |
| Junction temperature                                                  | $T_j$     | 150         | $^\circ\text{C}$ |
| Ambient temperature                                                   | $T_A$     | -65 ... 150 |                  |
| Storage temperature                                                   | $T_{stg}$ | -65 ... 150 |                  |

## Thermal Resistance

| Parameter                                | Symbol     | Value      | Unit |
|------------------------------------------|------------|------------|------|
| Junction - soldering point <sup>2)</sup> | $R_{thJS}$ | $\leq 230$ | K/W  |

<sup>1)</sup>  $T_S$  is measured on the collector lead at the soldering point to the pcb

<sup>2)</sup> For calculation of  $R_{thJA}$  please refer to Application Note Thermal Resistance

**Electrical Characteristics** at  $T_A = 25^\circ\text{C}$ , unless otherwise specified

| Parameter                                                                 | Symbol        | Values |      |      | Unit          |
|---------------------------------------------------------------------------|---------------|--------|------|------|---------------|
|                                                                           |               | min.   | typ. | max. |               |
| DC Characteristics                                                        |               |        |      |      |               |
| Collector-emitter breakdown voltage<br>$I_C = 1\text{ mA}$ , $I_B = 0$    | $V_{(BR)CEO}$ | 6      | 9    | -    | V             |
| Collector-emitter cutoff current<br>$V_{CE} = 15\text{ V}$ , $V_{BE} = 0$ | $I_{CES}$     | -      | -    | 10   | $\mu\text{A}$ |
| Collector-base cutoff current<br>$V_{CB} = 5\text{ V}$ , $I_E = 0$        | $I_{CBO}$     | -      | -    | 100  | nA            |
| Emitter-base cutoff current<br>$V_{EB} = 1\text{ V}$ , $I_C = 0$          | $I_{EBO}$     | -      | -    | 1    | $\mu\text{A}$ |
| DC current gain<br>$I_C = 15\text{ mA}$ , $V_{CE} = 3\text{ V}$           | $h_{FE}$      | 60     | 130  | 200  | -             |

**Electrical Characteristics** at  $T_A = 25^\circ\text{C}$ , unless otherwise specified

| Parameter                                                                                                                                                                                                                                                                 | Symbol        | Values |            |        | Unit |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|--------|------------|--------|------|
|                                                                                                                                                                                                                                                                           |               | min.   | typ.       | max.   |      |
| AC Characteristics (verified by random sampling)                                                                                                                                                                                                                          |               |        |            |        |      |
| Transition frequency<br>$I_C = 15\text{ mA}$ , $V_{CE} = 3\text{ V}$ , $f = 1\text{ GHz}$                                                                                                                                                                                 | $f_T$         | -      | 14         | -      | GHz  |
| Collector-base capacitance<br>$V_{CB} = 5\text{ V}$ , $f = 1\text{ MHz}$ , emitter grounded                                                                                                                                                                               | $C_{cb}$      | -      | 0.3        | -      | pF   |
| Collector emitter capacitance<br>$V_{CE} = 5\text{ V}$ , $f = 1\text{ MHz}$ , base grounded                                                                                                                                                                               | $C_{ce}$      | -      | 0.15       | -      |      |
| Emitter-base capacitance<br>$V_{EB} = 0.5\text{ V}$ , $f = 1\text{ MHz}$ , collector grounded                                                                                                                                                                             | $C_{eb}$      | -      | 0.43       | -      |      |
| Noise figure<br>$I_C = 3\text{ mA}$ , $V_{CE} = 3\text{ V}$ , $Z_S = Z_{Sopt}$ , $f = 1,8\text{ GHz}$<br>$I_C = 3\text{ mA}$ , $V_{CE} = 3\text{ V}$ , $Z_S = Z_{Sopt}$ , $f = 3\text{ GHz}$                                                                              | $F_{min}$     | -<br>- | 1<br>1.5   | -<br>- | dB   |
| Power gain, maximum available <sup>1)</sup><br>$I_C = 15\text{ mA}$ , $V_{CE} = 3\text{ V}$ , $Z_S = Z_{Sopt}$ ,<br>$Z_L = Z_{Lopt}$ , $f = 1.8\text{ GHz}$<br>$I_C = 15\text{ mA}$ , $V_{CE} = 3\text{ V}$ , $Z_S = Z_{Sopt}$ ,<br>$Z_L = Z_{Lopt}$ , $f = 3\text{ GHz}$ | $G_{ma}$      | -<br>- | 14.5<br>10 | -<br>- |      |
| Transducer gain<br>$I_C = 15\text{ mA}$ , $V_{CE} = 3\text{ V}$ , $Z_S = Z_L = 50\Omega$ ,<br>$f = 1.8\text{ GHz}$<br>$I_C = 15\text{ mA}$ , $V_{CE} = 3\text{ V}$ , $Z_S = Z_L = 50\Omega$ ,<br>$f = 3\text{ GHz}$                                                       | $ S_{21e} ^2$ | -<br>- | 12<br>8    | -<br>- |      |
| Third order intercept point at output <sup>2)</sup><br>$V_{CE} = 3\text{ V}$ , $I_C = 15\text{ mA}$ , $f = 1.8\text{ GHz}$ ,<br>$Z_S = Z_L = 50\Omega$                                                                                                                    | $IP_3$        | -      | 24         | -      | dBm  |
| 1dB Compression point at output<br>$I_C = 15\text{ mA}$ , $V_{CE} = 3\text{ V}$ , $Z_S = Z_L = 50\Omega$ ,<br>$f = 1.8\text{ GHz}$                                                                                                                                        | $P_{-1dB}$    | -      | 9          | -      |      |

$$^1G_{ma} = |S_{21e}| / |S_{12e}| (k - (k^2 - 1)^{1/2})$$

<sup>2)</sup>IP3 value depends on termination of all intermodulation frequency components.  
Termination used for this measurement is 50Ω from 0.1 MHz to 6 GHz