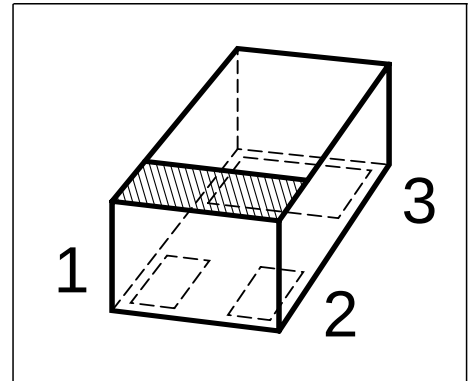


## NPN Silicon RF Transistor

### Preliminary data

- For low noise, high-gain broadband amplifiers at collector currents from 1 mA to 20 mA
- $f_T = 9 \text{ GHz}$   
 $F = 1.0 \text{ dB at } 1 \text{ GHz}$



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

| Type     | Marking | Pin Configuration |       |       | Package  |
|----------|---------|-------------------|-------|-------|----------|
| BFR949L3 | RK      | 1 = B             | 2 = E | 3 = C | TSLP-3-1 |

### Maximum Ratings

| Parameter                                                  | Symbol    | Value       | Unit             |
|------------------------------------------------------------|-----------|-------------|------------------|
| Collector-emitter voltage                                  | $V_{CEO}$ | 10          | V                |
| Collector-emitter voltage                                  | $V_{CES}$ | 20          |                  |
| Collector-base voltage                                     | $V_{CBO}$ | 20          |                  |
| Emitter-base voltage                                       | $V_{EBO}$ | 1.5         |                  |
| Collector current                                          | $I_C$     | 35          | mA               |
| Base current                                               | $I_B$     | 4           |                  |
| Total power dissipation<br>$T_S \leq 100^\circ\text{C}^1)$ | $P_{tot}$ | 250         | mW               |
| Junction temperature                                       | $T_j$     | 150         | $^\circ\text{C}$ |
| Ambient temperature                                        | $T_A$     | -65 ... 150 |                  |
| Storage temperature                                        | $T_{stg}$ | -65 ... 150 |                  |

### Thermal Resistance

|                                          |            |                   |     |
|------------------------------------------|------------|-------------------|-----|
| Junction - soldering point <sup>2)</sup> | $R_{thJS}$ | $\leq \text{tdb}$ | 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>$I_C = 1\text{ mA}$ , $I_B = 0$    | $V_{(BR)CEO}$ | 10     | -    | -    | V             |
| Collector-emitter cutoff current<br>$V_{CE} = 20\text{ V}$ , $V_{BE} = 0$ | $I_{CES}$     | -      | -    | 100  | $\mu\text{A}$ |
| Collector-base cutoff current<br>$V_{CB} = 10\text{ V}$ , $I_E = 0$       | $I_{CBO}$     | -      | -    | 100  | nA            |
| Emitter-base cutoff current<br>$V_{EB} = 1\text{ V}$ , $I_C = 0$          | $I_{EBO}$     | -      | -    | 0.1  | $\mu\text{A}$ |
| DC current gain<br>$I_C = 5\text{ mA}$ , $V_{CE} = 6\text{ V}$            | $h_{FE}$      | 100    | 140  | 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>$I_C = 15\text{ mA}$ , $V_{CE} = 6\text{ V}$ , $f = 1\text{ GHz}$                                                                                                                           | $f_T$          | 7       | 9        | -        | GHz  |
| Collector-base capacitance<br>$V_{CB} = 10\text{ V}$ , $f = 1\text{ MHz}$                                                                                                                                           | $C_{cb}$       | -       | 0.25     | -        | pF   |
| Collector-emitter capacitance<br>$V_{CE} = 10\text{ V}$ , $f = 1\text{ MHz}$                                                                                                                                        | $C_{ce}$       | -       | 0.15     | -        |      |
| Emitter-base capacitance<br>$V_{EB} = 0.5\text{ V}$ , $f = 1\text{ MHz}$                                                                                                                                            | $C_{eb}$       | -       | 0.7      | -        |      |
| Noise figure<br>$I_C = 5\text{ mA}$ , $V_{CE} = 6\text{ V}$ , $Z_S = Z_{Sopt}$ ,<br>$f = 1\text{ GHz}$<br>$I_C = 3\text{ mA}$ , $V_{CE} = 8\text{ V}$ , $Z_S = Z_{Sopt}$ ,<br>$f = 1.8\text{ GHz}$                  | $F$            | -<br>-  | 1<br>1.5 | 2.5<br>- | dB   |
| Power gain, maximum stable 1)<br>$I_C = 10\text{ mA}$ , $V_{CE} = 8\text{ V}$ , $Z_S = Z_{Sopt}$ , $Z_L = Z_{Lopt}$ ,<br>$f = 900\text{ MHz}$                                                                       | $G_{ms}$       | -       | 21.5     | -        |      |
| Power gain, maximum available 2)<br>$I_C = 10\text{ mA}$ , $V_{CE} = 8\text{ V}$ , $Z_S = Z_{Sopt}$ , $Z_L = Z_{Lopt}$ ,<br>$f = 1.8\text{ GHz}$                                                                    | $G_{ma}$       | -       | 15.5     | -        |      |
| Transducer gain<br>$I_C = 15\text{ mA}$ , $V_{CE} = 6\text{ V}$ , $Z_S = Z_L = 50\Omega$ ,<br>$f = 1\text{ GHz}$<br>$I_C = 10\text{ mA}$ , $V_{CE} = 8\text{ V}$ , $Z_S = Z_L = 50\Omega$ ,<br>$f = 1.8\text{ GHz}$ | $ S_{21el} ^2$ | 14<br>- | 17<br>12 | -<br>-   |      |

$$^1G_{ms} = |S_{21} / S_{12}|$$

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