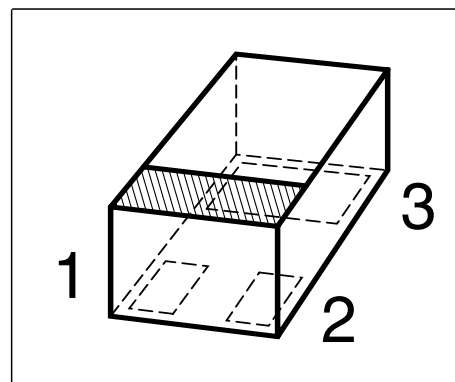


## NPN Silicon RF Transistor

Preliminary data

- Low voltage/ Low current operation
- Transition frequency of 14 GHz
- High insertion gain
- Ideal for low current amplifiers and oscillators



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

| Type     | Marking | Pin Configuration |       |       | Package  |
|----------|---------|-------------------|-------|-------|----------|
| BFR340L3 | FA      | 1 = B             | 2 = E | 3 = C | TSLP-3-1 |

### 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                                                     | $I_C$     | 10          | mA               |
| Base current                                                          | $I_B$     | 2           |                  |
| Total power dissipation <sup>1)</sup><br>$T_S \leq 120^\circ\text{C}$ | $P_{tot}$ | 60          | 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> | $R_{thJS}$ | tbd   | 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. |               |
| 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>$I_C = 5\text{ mA}$ , $V_{CE} = 3\text{ V}$           | $h_{FE}$      | 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>$I_C = 6\text{ mA}$ , $V_{CE} = 3\text{ V}$ , $f = 1\text{ GHz}$                                                                                                                          | $f_T$         | 10         | 14              | -          | GHz  |
| Collector-base capacitance<br>$V_{CB} = 5\text{ V}$ , $f = 1\text{ MHz}$ , emitter grounded                                                                                                                       | $C_{cb}$      | -          | 0.17            | 0.4        | pF   |
| Collector emitter capacitance<br>$V_{CE} = 5\text{ V}$ , $f = 1\text{ MHz}$ , base grounded                                                                                                                       | $C_{ce}$      | -          | 0.13            | -          |      |
| Emitter-base capacitance<br>$V_{EB} = 0.5\text{ V}$ , $f = 1\text{ MHz}$ , collector grounded                                                                                                                     | $C_{eb}$      | -          | 0.12            | -          |      |
| Noise figure<br>$I_C = 1\text{ mA}$ , $V_{CE} = 3\text{ V}$ , $Z_S = Z_{Sopt}$ ,<br>$f = 1.8\text{ GHz}$                                                                                                          | $F_{min}$     | -          | 1.15            | -          | dB   |
| Power gain, maximum stable <sup>1)</sup><br>$I_C = 5\text{ mA}$ , $V_{CE} = 3\text{ V}$ , $Z_S = Z_{Sopt}$ ,<br>$Z_L = Z_{Lopt}$ , $f = 1.8\text{ GHz}$                                                           | $G_{ms}$      | -          | 17              | -          | -    |
| Power gain, maximum available <sup>1)</sup><br>$I_C = 5\text{ mA}$ , $V_{CE} = 3\text{ V}$ , $Z_S = Z_{Sopt}$ ,<br>$Z_L = Z_{Lopt}$ , $f = 3\text{ GHz}$                                                          | $G_{ma}$      | -          | 12.5            | -          | dB   |
| Transducer gain<br>$I_C = 5\text{ mA}$ , $V_{CE} = 3\text{ V}$ , $Z_S = Z_L = 50\Omega$ ,<br>$f = 1.8\text{ GHz}$<br>$I_C = 5\text{ mA}$ , $V_{CE} = 3\text{ V}$ , $Z_S = Z_L = 50\Omega$ ,<br>$f = 3\text{ GHz}$ | $ S_{21e} ^2$ | -<br><br>- | 13.5<br><br>9.5 | -<br><br>- | dBm  |
| Third order intercept point at output <sup>2)</sup><br>$V_{CE} = 3\text{ V}$ , $I_C = 5\text{ mA}$ , $f = 1.8\text{ GHz}$ ,<br>$Z_S = Z_L = 50\Omega$                                                             | $IP_3$        | -          | 12.5            | -          |      |
| 1dB Compression point at output<br>$I_C = 5\text{ mA}$ , $V_{CE} = 3\text{ V}$ , $Z_S = Z_L = 50\Omega$ ,<br>$f = 1.8\text{ GHz}$                                                                                 | $P_{-1dB}$    | -          | -1              | -          |      |

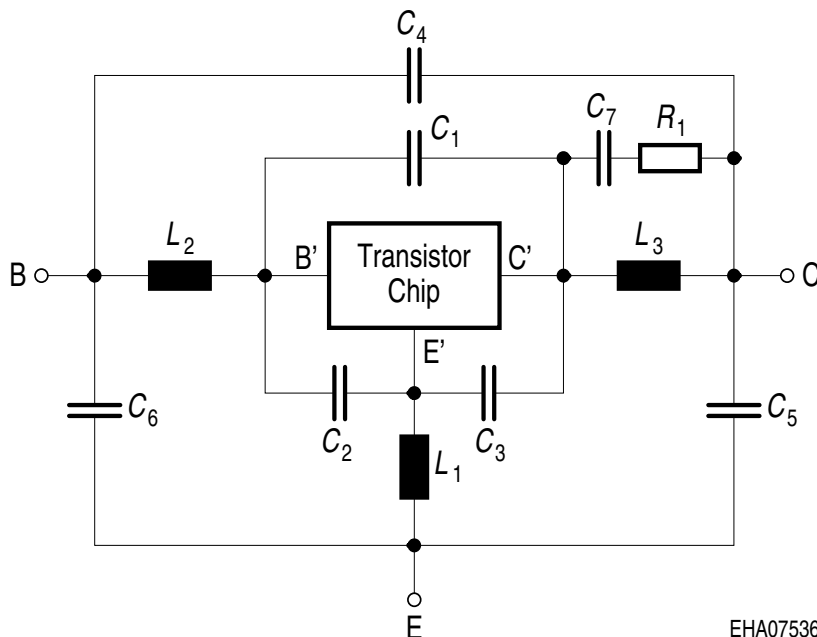
$$^1G_{ma} = |S_{21e}| / |S_{12e}| (k - (k^2 - 1)^{1/2})$$

<sup>2</sup> $IP_3$  value depends on termination of all intermodulation frequency components.  
Termination used for this measurement is  $50\Omega$  from 0.1 MHz to 6 GHz

**SPICE Parameter (Gummel-Poon Model, Berkley-SPICE 2G.6 Syntax):**
**Transistor Chip Data:**

|       |        |          |       |       |          |        |        |          |
|-------|--------|----------|-------|-------|----------|--------|--------|----------|
| IS =  | 6.12   | fA       | BF =  | 98.48 | -        | NF =   | 0.4213 | -        |
| VAF = | 42.228 | V        | IKF = | 103   | mA       | ISE =  | 11.768 | nA       |
| NE =  | 2.4753 | -        | BR =  | 19.61 | -        | NR =   | 0.3253 | -        |
| VAR = | 16.777 | V        | IKR = | 0.834 | A        | ISC =  | 3.632  | nA       |
| NC =  | 0.8956 | -        | RB =  | 59.99 | $\Omega$ | IRB =  | 0.01   | mA       |
| RBM = | 0.2403 | $\Omega$ | RE =  | 3.677 | -        | RC =   | 5.2493 | $\Omega$ |
| CJE = | 182    | fF       | VJE = | 0.626 | V        | MJE =  | 0.4172 | -        |
| TF =  | 10.3   | ps       | XTF = | 0     | -        | VTF =  | 0.262  | V        |
| ITF = | 0.0017 | mA       | PTF = | 0     | deg      | CJC =  | 222.63 | fF       |
| VJC = | 0.5487 | V        | MJC = | 0.319 | -        | XCJC = | 0.3904 | -        |
| TR =  | 2.71   | ns       | CJS = | 0     | fF       | VJS =  | 0.75   | V        |
| MJS = | 0      | -        | NK =  | 0.5   | -        | EG =   | 1.11   | eV       |
| XTI = | 0      | -        | FC =  | 0.735 |          | TNOM   | 300    | K        |

All parameters are ready to use, no scaling is necessary. Extracted on behalf of Infineon Technologies AG by:  
Institut für Mobil- und Satellitentechnik (IMST)

**Package Equivalent Circuit:**


|         |       |          |
|---------|-------|----------|
| $L_1 =$ | 0.575 | nH       |
| $L_2 =$ | 0.575 | nH       |
| $L_3 =$ | 0.275 | nH       |
| $C_1 =$ | 33    | fF       |
| $C_2 =$ | 28    | fF       |
| $C_3 =$ | 131   | fF       |
| $C_4 =$ | 8     | fF       |
| $C_5 =$ | 8     | fF       |
| $C_6 =$ | 24    | fF       |
| $C_7 =$ | 300   | fF       |
| $R_1 =$ | 204   | $\Omega$ |

Valid up to 6GHz

EHA07536

For examples and ready to use parameters  
please contact your local Infineon Technologies  
distributor or sales office to obtain a Infineon  
Technologies CD-ROM or see Internet:  
<http://www.infineon.com/silicondiscretes>