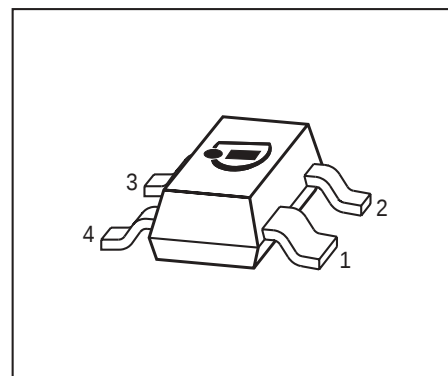


**NPN Silicon RF Transistor\***

- For low noise, high-gain broadband amplifiers at collector currents from 0.5 mA to 12 mA
- $f_T = 8$  GHz,  $F = 0.9$  dB at 900 MHz
- Pb-free (RoHS compliant) package<sup>1)</sup>
- Qualified according AEC Q101

\* Short term description



**ESD (Electrostatic discharge) sensitive device, observe handling precaution!**

| Type   | Marking | Pin Configuration |       |       |       |   |   | Package |
|--------|---------|-------------------|-------|-------|-------|---|---|---------|
| BFP181 | RFs     | 1 = C             | 2 = E | 3 = B | 4 = E | - | - | SOT143  |

**Maximum Ratings**

| Parameter                                                 | Symbol    | Value       | Unit |
|-----------------------------------------------------------|-----------|-------------|------|
| Collector-emitter voltage                                 | $V_{CEO}$ | 12          | V    |
| Collector-emitter voltage                                 | $V_{CES}$ | 20          |      |
| Collector-base voltage                                    | $V_{CBO}$ | 20          |      |
| Emitter-base voltage                                      | $V_{EBO}$ | 2           |      |
| Collector current                                         | $I_C$     | 20          | mA   |
| Base current                                              | $I_B$     | 2           |      |
| Total power dissipation <sup>2)</sup><br>$T_S \leq 75$ °C | $P_{tot}$ | 175         | mW   |
| Junction temperature                                      | $T_j$     | 150         | °C   |
| Ambient temperature                                       | $T_A$     | -65 ... 150 |      |
| Storage temperature                                       | $T_{stg}$ | -65 ... 150 |      |

**Thermal Resistance**

| Parameter                                | Symbol     | Value      | Unit |
|------------------------------------------|------------|------------|------|
| Junction - soldering point <sup>3)</sup> | $R_{thJS}$ | $\leq 430$ | K/W  |

<sup>1)</sup>Pb-containing package may be available upon special request

<sup>2)</sup> $T_S$  is measured on the collector lead at the soldering point to the pcb

<sup>3)</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>$I_C = 1\text{ mA}$ , $I_B = 0$           | $V_{(BR)CEO}$ | 12     | -    | -    | 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>$V_{EB} = 1\text{ V}$ , $I_C = 0$                 | $I_{EBO}$     | -      | -    | 1    | $\mu\text{A}$ |
| DC current gain-<br>$I_C = 5\text{ mA}$ , $V_{CE} = 8\text{ V}$ , pulse measured | $h_{FE}$      | 70     | 100  | 140  | -             |

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

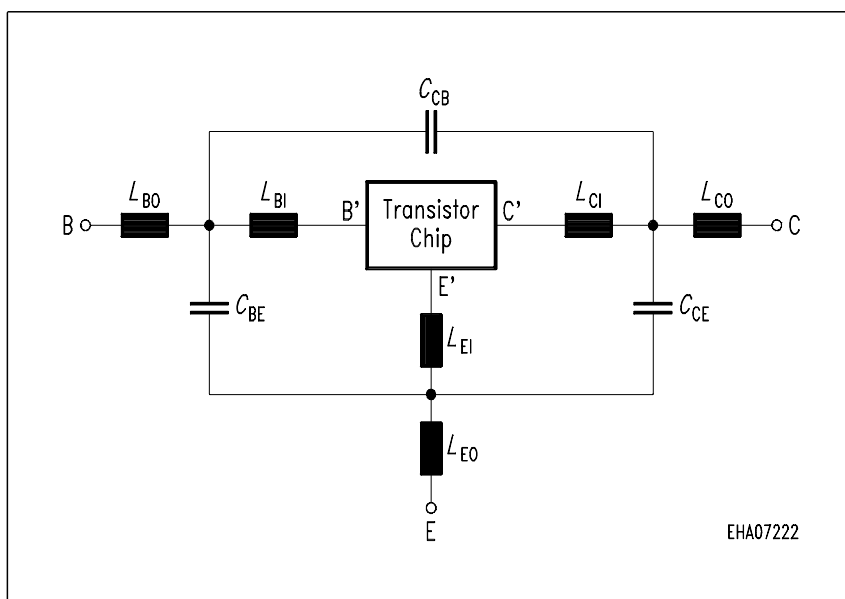
| Parameter                                                                                                                                                                                                                                                              | Symbol        | Values |              |        | Unit |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|--------|--------------|--------|------|
|                                                                                                                                                                                                                                                                        |               | min.   | typ.         | max.   |      |
| AC Characteristics (verified by random sampling)                                                                                                                                                                                                                       |               |        |              |        |      |
| Transition frequency<br>$I_C = 10\text{ mA}$ , $V_{CE} = 8\text{ V}$ , $f = 500\text{ MHz}$                                                                                                                                                                            | $f_T$         | 6      | 8            | -      | GHz  |
| Collector-base capacitance<br>$V_{CB} = 10\text{ V}$ , $f = 1\text{ MHz}$ , $V_{BE} = 0$ ,<br>emitter grounded                                                                                                                                                         | $C_{cb}$      | -      | 0.19         | 0.4    | pF   |
| Collector emitter capacitance<br>$V_{CE} = 10\text{ V}$ , $f = 1\text{ MHz}$ , $V_{BE} = 0$ ,<br>base grounded                                                                                                                                                         | $C_{ce}$      | -      | 0.3          | -      |      |
| Emitter-base capacitance<br>$V_{EB} = 0.5\text{ V}$ , $f = 1\text{ MHz}$ , $V_{CB} = 0$ ,<br>collector grounded                                                                                                                                                        | $C_{eb}$      | -      | 0.4          | -      |      |
| Noise figure<br>$I_C = 2\text{ mA}$ , $V_{CE} = 8\text{ V}$ , $Z_S = Z_{Sopt}$ ,<br>$f = 900\text{ MHz}$<br>$I_C = 2\text{ mA}$ , $V_{CE} = 8\text{ V}$ , $Z_S = Z_{Sopt}$ ,<br>$f = 1.8\text{ GHz}$                                                                   | $F$           | -<br>- | 0.9<br>1.2   | -<br>- | dB   |
| Power gain, maximum stable <sup>1)</sup><br>$I_C = 5\text{ mA}$ , $V_{CE} = 8\text{ V}$ , $Z_S = Z_{Sopt}$ , $Z_L = Z_{Lopt}$ ,<br>$f = 900\text{ MHz}$<br>$I_C = 5\text{ mA}$ , $V_{CE} = 8\text{ V}$ , $Z_S = Z_{Sopt}$ , $Z_L = Z_{Lopt}$ ,<br>$f = 1.8\text{ GHz}$ | $G_{ms}$      | -<br>- | 21<br>17.5   | -<br>- | dB   |
| Transducer gain<br>$I_C = 5\text{ mA}$ , $V_{CE} = 8\text{ V}$ , $Z_S = Z_L = 50\text{ }\Omega$ ,<br>$f = 900\text{ MHz}$<br>$I_C = 5\text{ mA}$ , $V_{CE} = 8\text{ V}$ , $Z_S = Z_L = 50\text{ }\Omega$ ,<br>$f = 1.8\text{ GHz}$                                    | $ S_{21e} ^2$ | -<br>- | 17.5<br>12.5 | -<br>- |      |

<sup>1)</sup> $G_{ms} = |S_{21} / S_{12}|$

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

|       |           |          |       |         |          |        |          |          |
|-------|-----------|----------|-------|---------|----------|--------|----------|----------|
| IS =  | 0.0010519 | fA       | BF =  | 96.461  | -        | NF =   | 0.90617  | -        |
| VAF = | 22.403    | V        | IKF = | 0.12146 | A        | ISE =  | 12.603   | fA       |
| NE =  | 1.7631    | -        | BR =  | 16.504  | -        | NR =   | 0.87757  | -        |
| VAR = | 5.1127    | V        | IKR = | 0.24951 | A        | ISC =  | 0.01195  | fA       |
| NC =  | 1.6528    | -        | RB =  | 9.9037  | $\Omega$ | IRB =  | 0.69278  | mA       |
| RBM = | 6.6315    | $\Omega$ | RE =  | 2.1372  | -        | RC =   | 2.2171   | $\Omega$ |
| CJE = | 1.8168    | fF       | VJE = | 0.73155 | V        | MJE =  | 0.43619  | -        |
| TF =  | 17.028    | ps       | XTF = | 0.33814 | -        | VTF =  | 0.12571  | V        |
| ITF = | 1.0549    | mA       | PTF = | 0       | deg      | CJC =  | 319.69   | fF       |
| VJC = | 1.1633    | V        | MJC = | 0.30013 | -        | XCJC = | 0.082903 | -        |
| TR =  | 2.7449    | ns       | CJS = | 0       | fF       | VJS =  | 0.75     | V        |
| MJS = | 0         | -        | XTB = | 0       | -        | EG =   | 1.11     | eV       |
| XTI = | 3         | -        | FC =  | 0.99768 |          | 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)

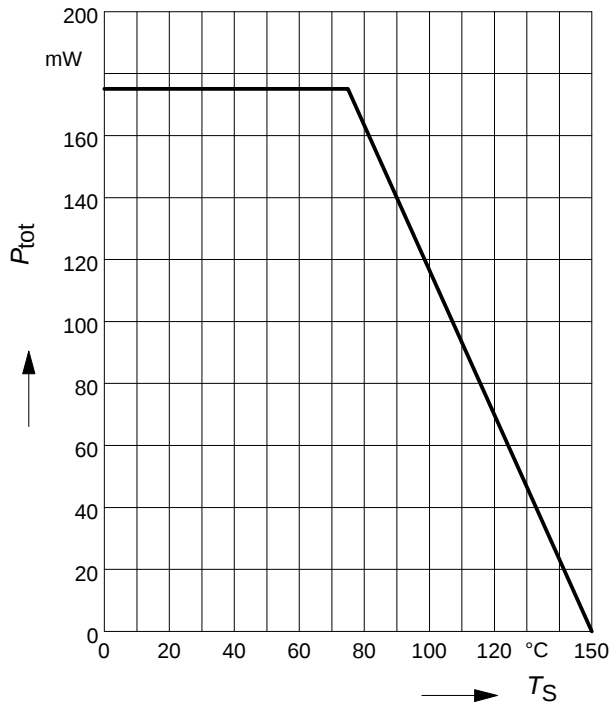
**Package Equivalent Circuit:**


|            |      |    |
|------------|------|----|
| $L_{BI}$ = | 0.89 | nH |
| $L_{BO}$ = | 0.73 | nH |
| $L_{EI}$ = | 0.4  | nH |
| $L_{EO}$ = | 0.15 | nH |
| $L_{CI}$ = | 0    | nH |
| $L_{CO}$ = | 0.42 | nH |
| $C_{BE}$ = | 189  | fF |
| $C_{CB}$ = | 15   | fF |
| $C_{CE}$ = | 187  | fF |

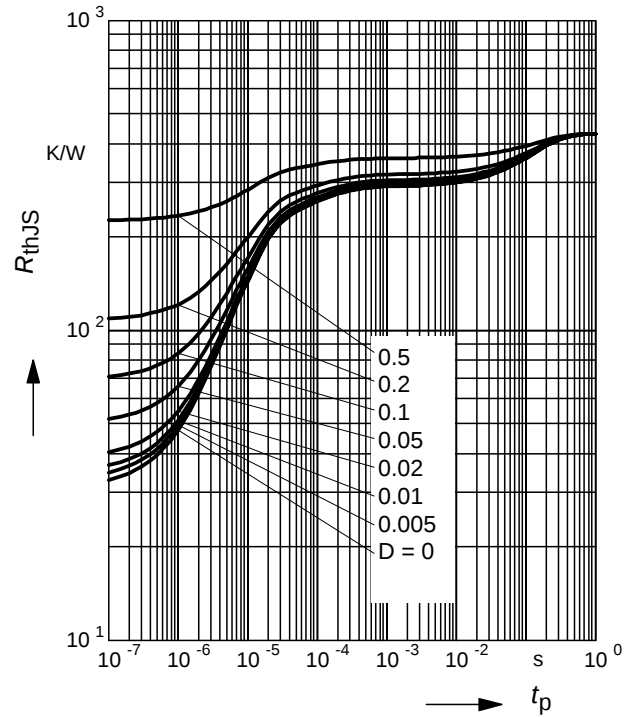
Valid up to 6GHz

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>

Total power dissipation  $P_{\text{tot}} = f(T_S)$

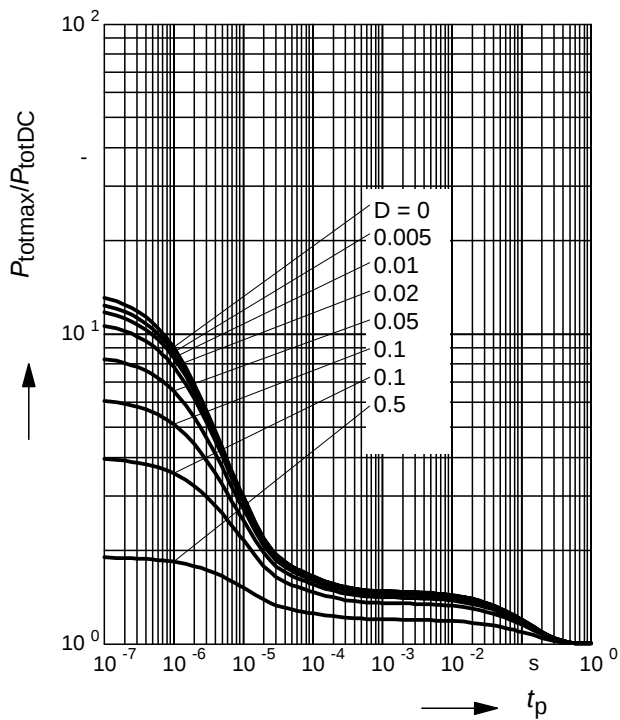


Permissible Pulse Load  $R_{\text{thJS}} = f(t_p)$

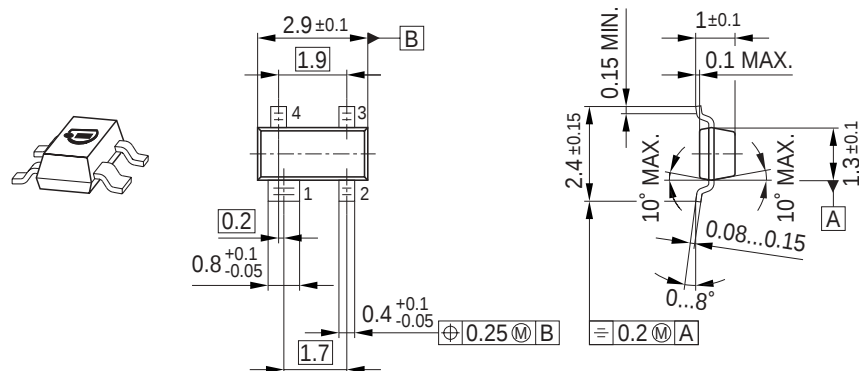


Permissible Pulse Load

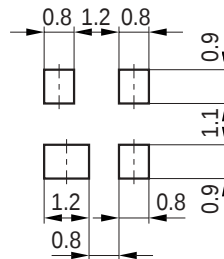
$P_{\text{totmax}}/P_{\text{totDC}} = f(t_p)$



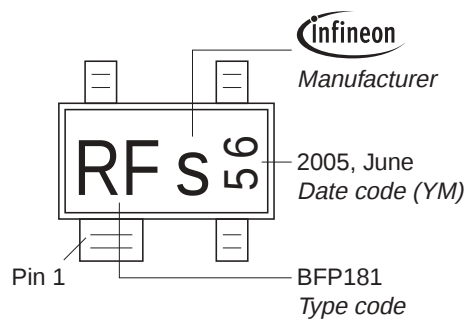
## Package Outline



## Foot Print

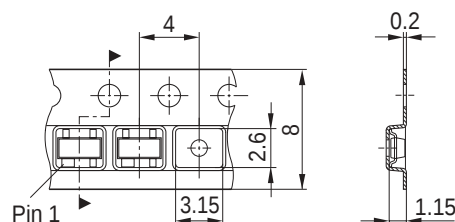


## Marking Layout (Example)



## Standard Packing

Reel ø180 mm = 3.000 Pieces/Reel  
 Reel ø330 mm = 10.000 Pieces/Reel



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