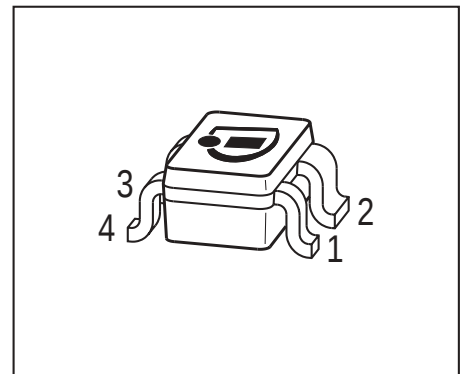


**NPN Silicon RF Transistor\***

- For low noise, high-gain amplifiers up to 2 GHz
- For linear broadband amplifiers
- $f_T = 8 \text{ GHz}$ ,  $F = 1 \text{ dB}$  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 |
|---------|---------|-------------------|-------|-------|-------|---|---|---------|
| BFP193W | RCs     | 1 = E             | 2 = C | 3 = E | 4 = B | - | - | SOT343  |

**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                                                    | $I_C$     | 80          | mA               |
| Base current                                                         | $I_B$     | 10          |                  |
| Total power dissipation <sup>2)</sup><br>$T_S \leq 66^\circ\text{C}$ | $P_{tot}$ | 580         | mW               |
| Junction temperature                                                 | $T_j$     | 150         | $^\circ\text{C}$ |
| Ambient temperature                                                  | $T_A$     | -55 ... 150 |                  |
| Storage temperature                                                  | $T_{stg}$ | -55 ... 150 |                  |

**Thermal Resistance**

| Parameter                                | Symbol     | Value      | Unit |
|------------------------------------------|------------|------------|------|
| Junction - soldering point <sup>3)</sup> | $R_{thJS}$ | $\leq 145$ | 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>$I_C = 30\text{ mA}$ , $V_{CE} = 8\text{ V}$ , pulse measured | $h_{FE}$      | 70     | 100  | 140  | -             |

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

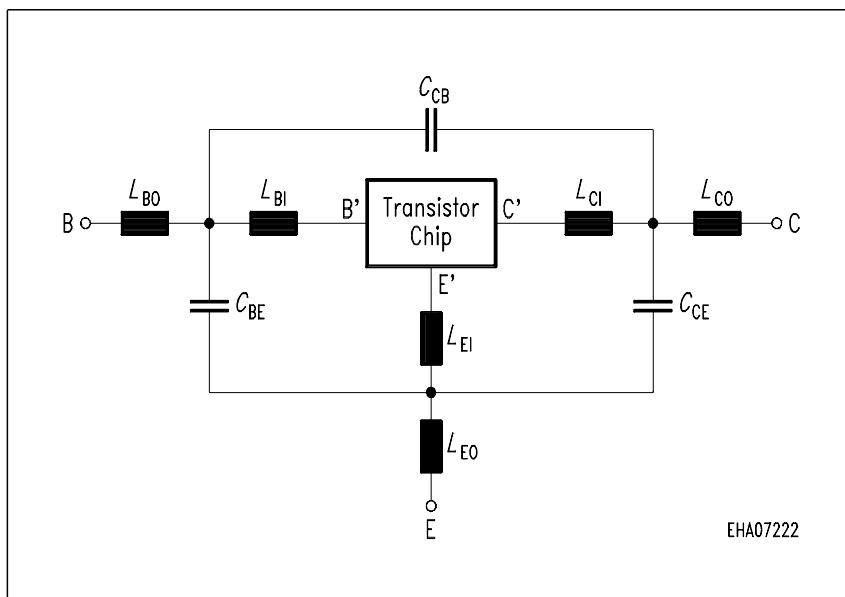
| Parameter                                                                                                                                                                                                                                                                   | Symbol        | Values |              |        | Unit |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|--------|--------------|--------|------|
|                                                                                                                                                                                                                                                                             |               | min.   | typ.         | max.   |      |
| AC Characteristics (verified by random sampling)                                                                                                                                                                                                                            |               |        |              |        |      |
| Transition frequency<br>$I_C = 50\text{ mA}$ , $V_{CE} = 8\text{ V}$ , $f = 500\text{ MHz}$                                                                                                                                                                                 | $f_T$         | 6      | 8            | -      | GHz  |
| Collector-base capacitance<br>$V_{CB} = 10\text{ V}$ , $f = 1\text{ MHz}$ , $V_{BE} = 0$ ,<br>emitter grounded                                                                                                                                                              | $C_{cb}$      | -      | 0.63         | 0.9    | pF   |
| Collector emitter capacitance<br>$V_{CE} = 10\text{ V}$ , $f = 1\text{ MHz}$ , $V_{BE} = 0$ ,<br>base grounded                                                                                                                                                              | $C_{ce}$      | -      | 0.36         | -      |      |
| Emitter-base capacitance<br>$V_{EB} = 0.5\text{ V}$ , $f = 1\text{ MHz}$ , $V_{CB} = 0$ ,<br>collector grounded                                                                                                                                                             | $C_{eb}$      | -      | 2.25         | -      |      |
| Noise figure<br>$I_C = 10\text{ mA}$ , $V_{CE} = 8\text{ V}$ , $Z_S = Z_{Sopt}$ ,<br>$f = 900\text{ MHz}$<br>$I_C = 10\text{ mA}$ , $V_{CE} = 8\text{ V}$ , $Z_S = Z_{Sopt}$ ,<br>$f = 1.8\text{ GHz}$                                                                      | $F$           | -<br>- | 1<br>1.6     | -<br>- | dB   |
| Power gain, maximum available <sup>1)</sup><br>$I_C = 30\text{ mA}$ , $V_{CE} = 8\text{ V}$ , $Z_S = Z_{Sopt}$ ,<br>$Z_L = Z_{Lopt}$ , $f = 900\text{ MHz}$<br>$I_C = 30\text{ mA}$ , $V_{CE} = 8\text{ V}$ , $Z_S = Z_{Sopt}$ ,<br>$Z_L = Z_{Lopt}$ , $f = 1.8\text{ GHz}$ | $G_{ma}$      | -<br>- | 20.5<br>13.5 | -<br>- |      |
| Transducer gain<br>$I_C = 30\text{ mA}$ , $V_{CE} = 8\text{ V}$ , $Z_S = Z_L = 50\Omega$ ,<br>$f = 900\text{ MHz}$<br>$I_C = 30\text{ mA}$ , $V_{CE} = 8\text{ V}$ , $Z_S = Z_L = 50\Omega$ ,<br>$f = 1.8\text{ GHz}$                                                       | $ S_{21e} ^2$ | -<br>- | 15<br>9      | -<br>- | dB   |

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

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

|       |         |          |       |          |          |        |          |          |
|-------|---------|----------|-------|----------|----------|--------|----------|----------|
| IS =  | 0.2738  | fA       | BF =  | 125      | -        | NF =   | 0.95341  | -        |
| VAF = | 24      | V        | IKF = | 0.26949  | A        | ISE =  | 10.627   | fA       |
| NE =  | 1.935   | -        | BR =  | 14.267   | -        | NR =   | 1.4289   | -        |
| VAR = | 3.8742  | V        | IKR = | 0.037925 | A        | ISC =  | 0.037409 | fA       |
| NC =  | 0.94371 | -        | RB =  | 1.8368   | $\Omega$ | IRB =  | 0.91763  | mA       |
| RBM = | 1       | $\Omega$ | RE =  | 0.76534  | -        | RC =   | 0.11938  | $\Omega$ |
| CJE = | 1.1824  | fF       | VJE = | 0.70276  | V        | MJE =  | 0.48654  | -        |
| TF =  | 18.828  | ps       | XTF = | 0.69477  | -        | VTF =  | 0.8      | V        |
| ITF = | 0.96893 | mA       | PTF = | 0        | deg      | CJC =  | 935.03   | fF       |
| VJC = | 1.1828  | V        | MJC = | 0.30002  | -        | XCJC = | 0.053563 | -        |
| TR =  | 1.0037  | ns       | CJS = | 0        | fF       | VJS =  | 0.75     | V        |
| MJS = | 0       | -        | NK =  | 0        | -        | EG =   | 1.11     | eV       |
| XTI = | 3       | -        | FC =  | 0.72063  |          | 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:**


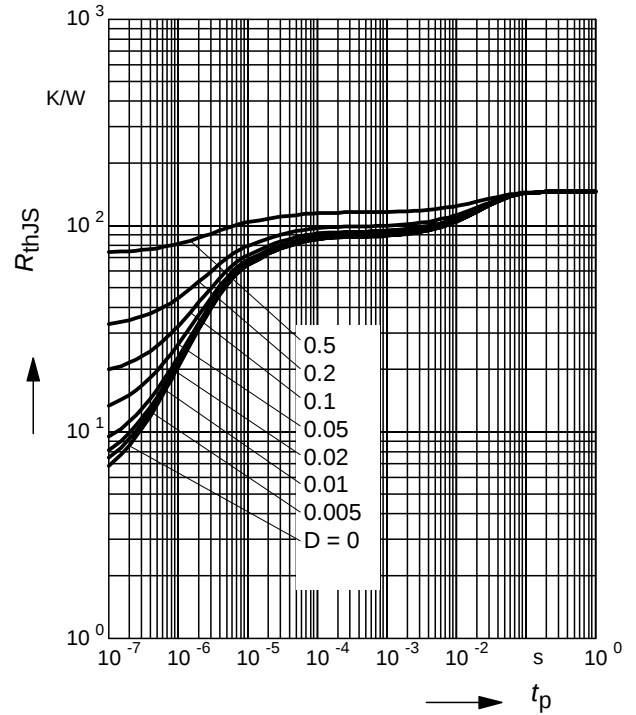
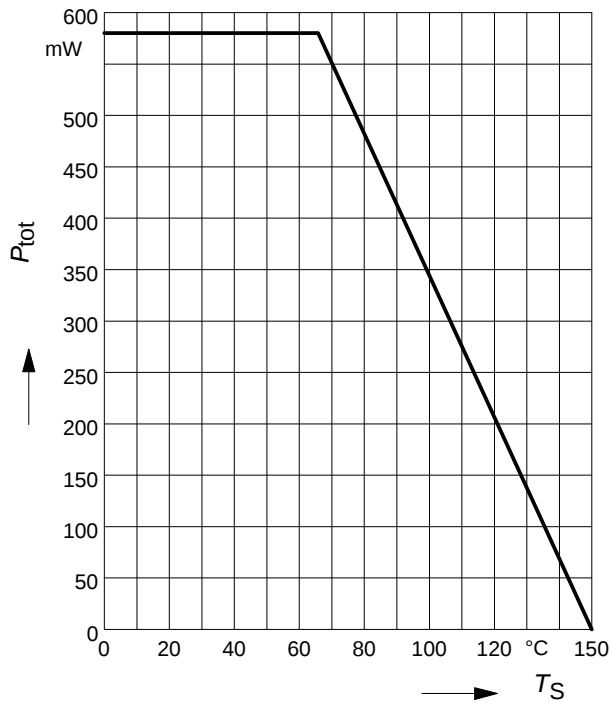
|            |      |    |
|------------|------|----|
| $L_{BI}$ = | 0.43 | nH |
| $L_{BO}$ = | 0.47 | nH |
| $L_{EI}$ = | 0.26 | nH |
| $L_{EO}$ = | 0.12 | nH |
| $L_{CI}$ = | 0.06 | nH |
| $L_{CO}$ = | 0.36 | nH |
| $C_{BE}$ = | 68   | fF |
| $C_{CB}$ = | 46   | fF |
| $C_{CE}$ = | 232  | fF |

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>

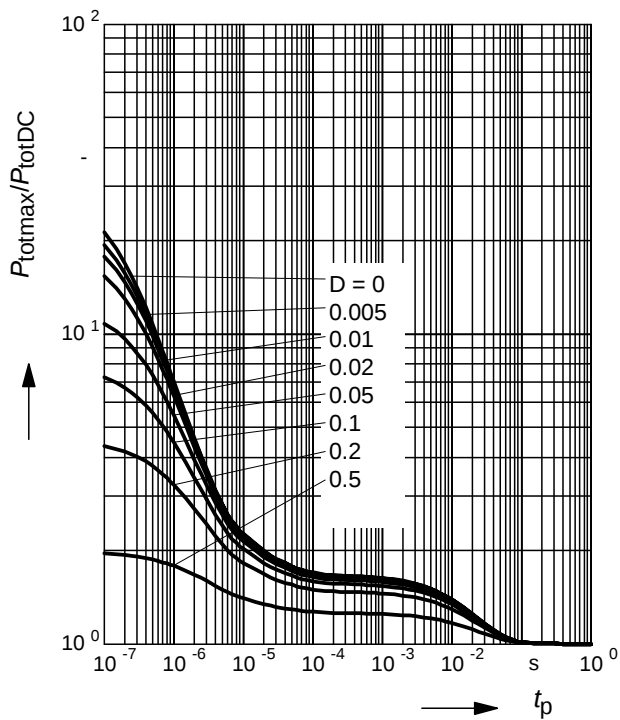
Total power dissipation  $P_{\text{tot}} = f(T_S)$

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



Permissible Pulse Load

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



Technical drawing of a mechanical part with dimensions: 0.6, 0.8, 1.6, 1.15, and 0.9.

Pin 1

Manufacturer

2005, June  
Date code (YM)

BGA420  
Type code

Edition 2006-02-01

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