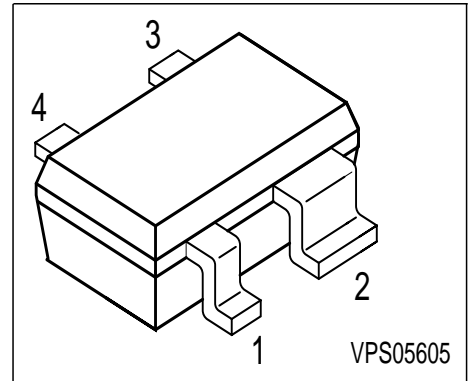


**NPN Silicon RF Transistor**

- For low noise, low distortion broadband amplifiers in antenna and telecommunications systems up to 1.5 GHz at collector currents from 20 mA to 89 mA
- Power amplifier for DECT and PCN systems
- $f_T = 7.5$  GHz  
 $F = 1.5$  dB at 900 MHz



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

| Type    | Marking | Pin Configuration |       |       |       | Package |
|---------|---------|-------------------|-------|-------|-------|---------|
| BFP196W | RIs     | 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                                         | $I_C$     | 100         | mA   |
| Base current                                              | $I_B$     | 12          |      |
| Total power dissipation<br>$T_S \leq 69$ °C <sup>1)</sup> | $P_{tot}$ | 700         | mW   |
| Junction temperature                                      | $T_j$     | 150         | °C   |
| Ambient temperature                                       | $T_A$     | -65 ... 150 |      |
| Storage temperature                                       | $T_{stg}$ | -65 ... 150 |      |

**Thermal Resistance**

|                                          |            |            |     |
|------------------------------------------|------------|------------|-----|
| Junction - soldering point <sup>2)</sup> | $R_{thJS}$ | $\leq 115$ | 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. |               |
| <b>DC characteristics</b>                                               |               |        |      |      |               |
| 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>$I_C = 50 \text{ mA}, V_{CE} = 8 \text{ V}$          | $h_{FE}$      | 50     | 100  | 200  | -             |

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

| Parameter                                                                                                                                                                                         | Symbol          | Values |              |      | Unit |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------|--------------|------|------|
|                                                                                                                                                                                                   |                 | min.   | typ.         | max. |      |
| <b>AC characteristics</b> (verified by random sampling)                                                                                                                                           |                 |        |              |      |      |
| Transition frequency<br>$I_C = 70\text{ mA}$ , $V_{CE} = 8\text{ V}$ , $f = 500\text{ MHz}$                                                                                                       | $f_T$           | 5      | 7.5          | -    | GHz  |
| Collector-base capacitance<br>$V_{CB} = 10\text{ V}$ , $f = 1\text{ MHz}$                                                                                                                         | $C_{cb}$        | -      | 1            | 1.4  | pF   |
| Collector-emitter capacitance<br>$V_{CE} = 10\text{ V}$ , $f = 1\text{ MHz}$                                                                                                                      | $C_{ce}$        | -      | 0.36         | -    |      |
| Emitter-base capacitance<br>$V_{EB} = 0.5\text{ V}$ , $f = 1\text{ MHz}$                                                                                                                          | $C_{eb}$        | -      | 3.7          | -    |      |
| Noise figure<br>$I_C = 20\text{ mA}$ , $V_{CE} = 8\text{ V}$ , $Z_S = Z_{\text{Sopt}}$ ,<br>$f = 900\text{ MHz}$<br>$f = 1.8\text{ GHz}$                                                          | $F$             | -      | 1.5<br>2.5   | -    | dB   |
| Power gain, maximum available <sup>1)</sup><br>$I_C = 50\text{ mA}$ , $V_{CE} = 8\text{ V}$ , $Z_S = Z_{\text{Sopt}}$ , $Z_L = Z_{\text{Lopt}}$ ,<br>$f = 900\text{ MHz}$<br>$f = 1.8\text{ GHz}$ | $G_{\text{ma}}$ | -      | 17.5<br>11.5 | -    |      |
| Transducer gain<br>$I_C = 50\text{ mA}$ , $V_{CE} = 8\text{ V}$ , $Z_S = Z_L = 50\Omega$ ,<br>$f = 900\text{ MHz}$<br>$f = 1.8\text{ GHz}$                                                        | $ S_{21e} ^2$   | -      | 12.5<br>6.5  | -    |      |

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

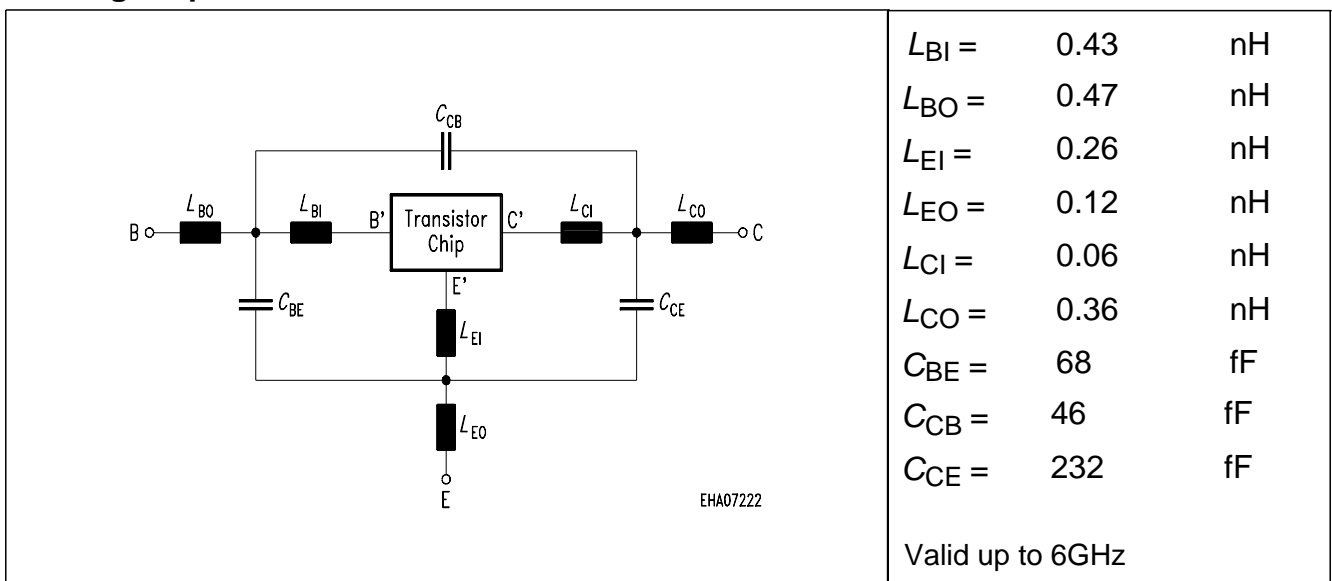
**SPICE Parameters (Gummel-Poon Model, Berkley-SPICE 2G.6 Syntax) :**

**Transistor Chip Data**

|       |         |          |       |          |          |        |          |          |
|-------|---------|----------|-------|----------|----------|--------|----------|----------|
| IS =  | 1.7264  | fA       | BF =  | 125      | -        | NF =   | 0.80012  | -        |
| VAF = | 20      | V        | IKF = | 0.4294   | A        | ISE =  | 119.22   | fA       |
| NE =  | 1.1766  | -        | BR =  | 10.584   | -        | NR =   | 0.94288  | -        |
| VAR = | 3.8128  | V        | IKR = | 0.019511 | A        | ISC =  | 4.8666   | fA       |
| NC =  | 0.88299 | -        | RB =  | 1.2907   | $\Omega$ | IRB =  | 0.084011 | mA       |
| RBM = | 1       | $\Omega$ | RE =  | 0.75103  | $\Omega$ | RC =   | 0.27137  | $\Omega$ |
| CJE = | 13.325  | fF       | VJE = | 0.7308   | V        | MJE =  | 0.33018  | -        |
| TF =  | 23.994  | ps       | XTF = | 0.44322  | -        | VTF =  | 0.1      | V        |
| ITF = | 1.9775  | mA       | PTF = | 0        | deg      | CJC =  | 1667     | fF       |
| VJC = | 0.73057 | V        | MJC = | 0.3289   | -        | XCJC = | 0.29998  | -        |
| TR =  | 2.2413  | ns       | CJS = | 0        | fF       | VJS =  | 0.75     | V        |
| MJS = | 0       | -        | XTB = | 0        | -        | EG =   | 1.11     | eV       |
| XTI = | 3       | -        | FC =  | 0.50922  | -        | TNOM   | 300      | K        |

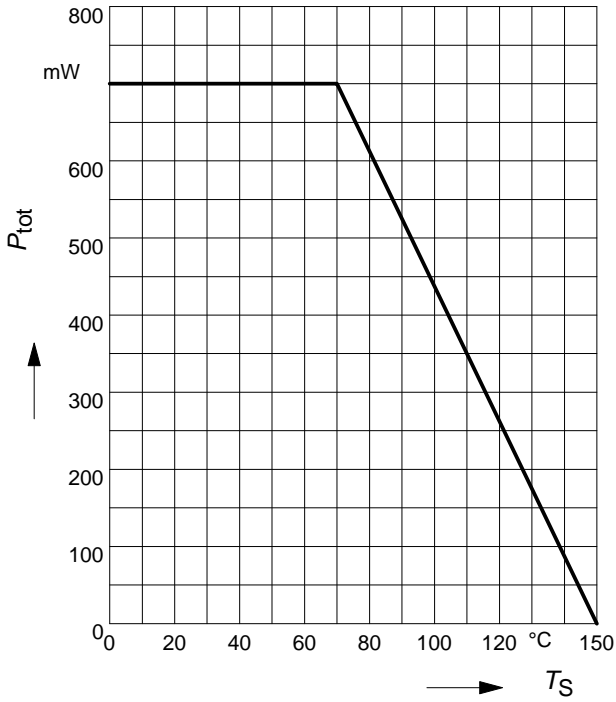
All parameters are ready to use, no scaling is necessary.  
 Extracted on behalf of Infineon Technologies AG by:  
 Institut für Mobil-und Satellitentechnik (IMST)

**Package Equivalent Circuit:**

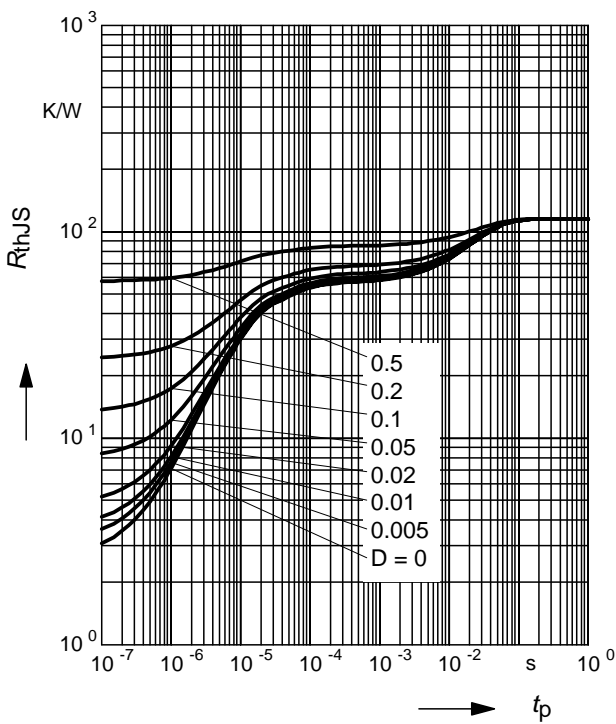


For examples and ready to use parameters please contact your local Infineon Technologies distributor or sales office to obtain a Infineon Technologies CD-ROM or see Internet: <http://www.infineon.com/products/discrete/index.htm>

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

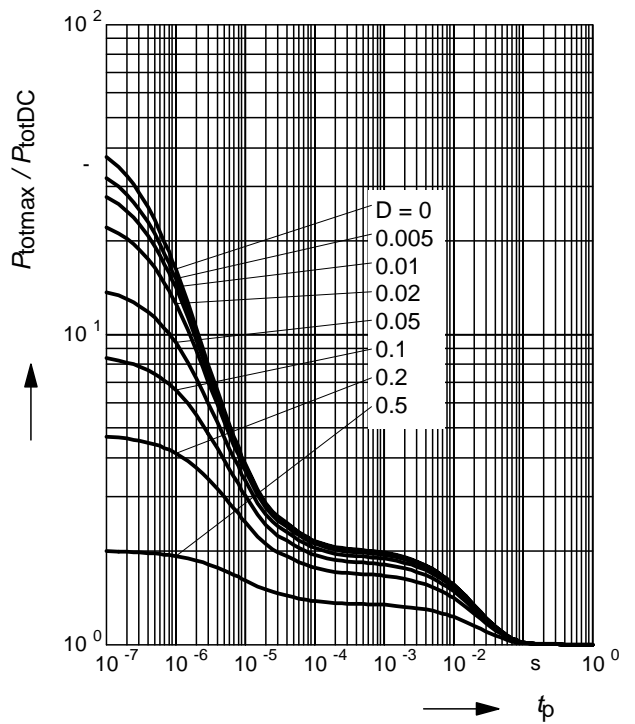


**Permissible Pulse Load  $R_{thJS} = f(t_p)$**

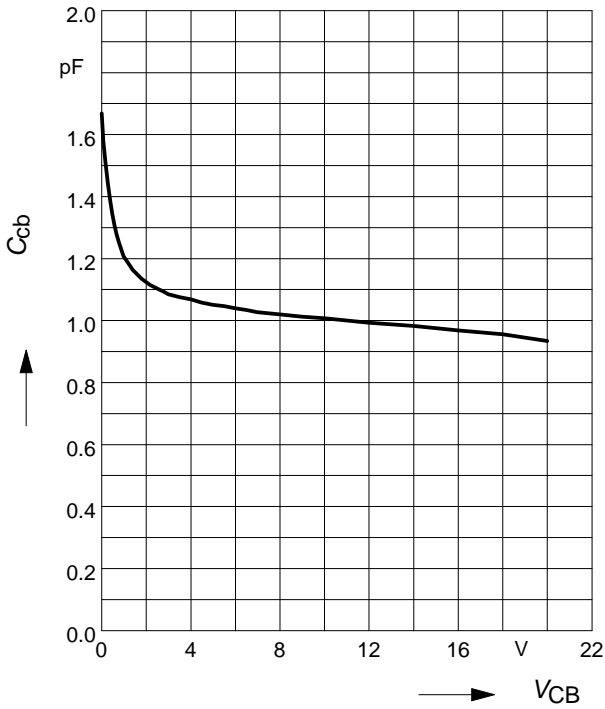


**Permissible Pulse Load**

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

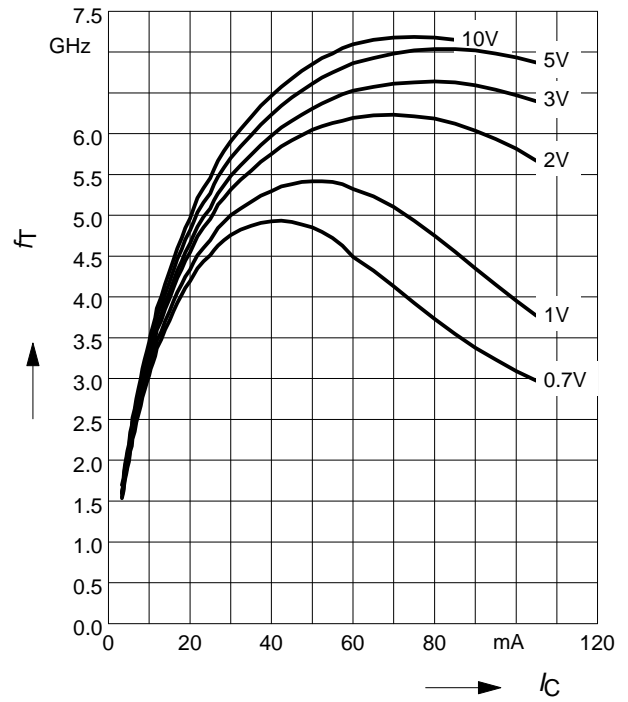


**Collector-base capacitance  $C_{cb} = f(V_{CB})$**   
 $f = 1\text{MHz}$



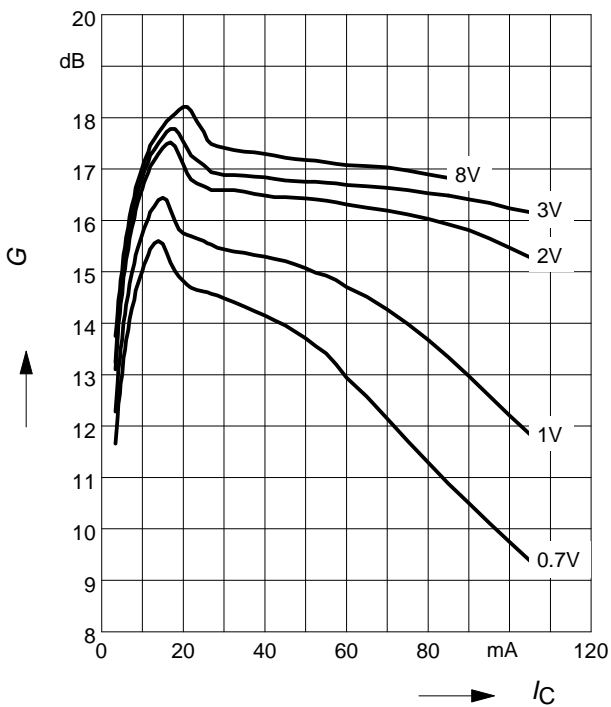
**Transition frequency  $f_T = f(I_C)$**

$V_{CE} = \text{Parameter}$



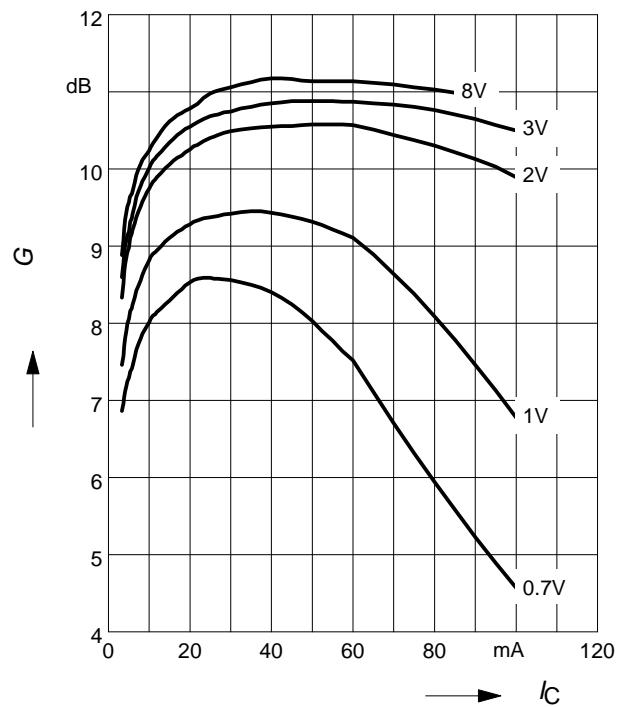
**Power Gain  $G_{ma}, G_{ms} = f(I_C)$**   
 $f = 0.9\text{GHz}$

$V_{CE} = \text{Parameter}$



**Power Gain  $G_{ma}, G_{ms} = f(I_C)$**   
 $f = 1.8\text{GHz}$

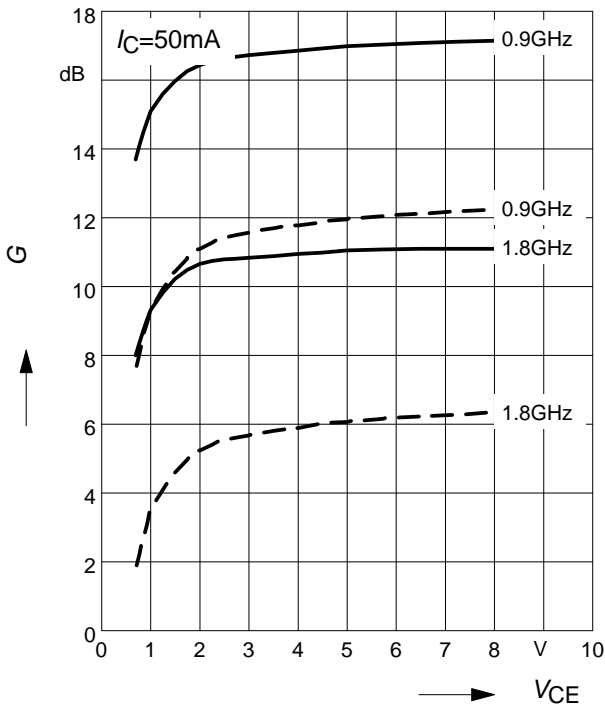
$V_{CE} = \text{Parameter}$



**Power Gain**  $G_{ma}, G_{ms} = f(V_{CE})$ : \_\_\_\_\_

$|S_{21}|^2 = f(V_{CE})$ : -----

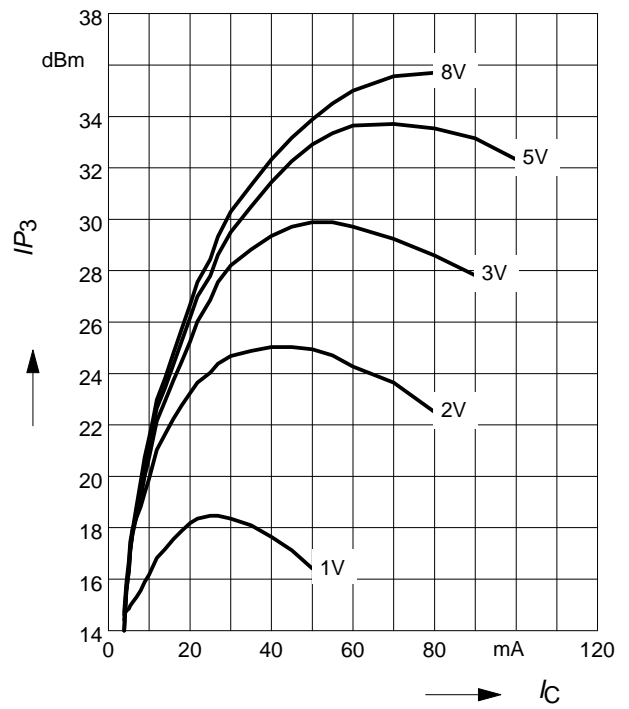
$f =$  Parameter



**Intermodulation Intercept Point**  $IP_3 = f(I_C)$

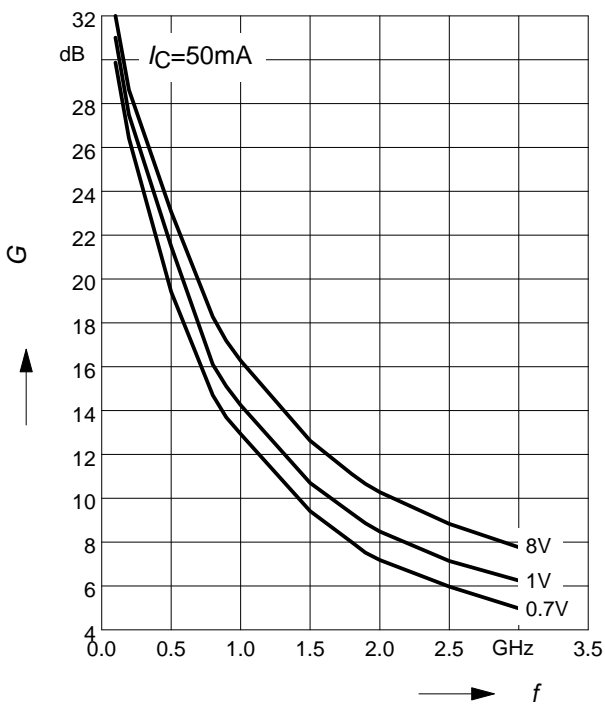
(3rd order, Output,  $Z_S = Z_L = 50\Omega$ )

$V_{CE} =$  Parameter,  $f = 900\text{MHz}$



**Power Gain**  $G_{ma}, G_{ms} = f(f)$

$V_{CE} =$  Parameter



**Power Gain**  $|S_{21}|^2 = f(f)$

$V_{CE} =$  Parameter

