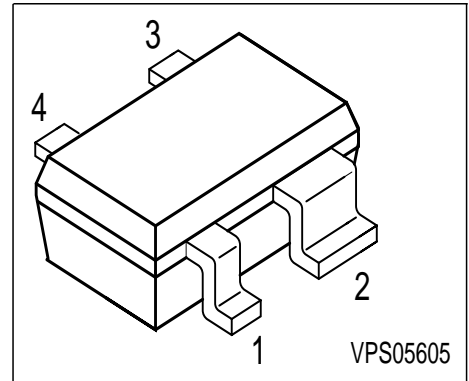


NPN Silicon RF Transistor

- For low noise, high-gain amplifiers up to 2 GHz
- For linear broadband amplifiers
- $f_T = 8 \text{ GHz}$
 $F = 1.3 \text{ dB at } 900 \text{ MHz}$



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 $T_S \leq 66 \text{ °C } ^1)$ | P_{tot} | 580 | mW |
| Junction temperature | T_j | 150 | °C |
| Ambient temperature | T_A | -65 ... 150 | |
| Storage temperature | T_{stg} | -65 ... 150 | |

Thermal Resistance

| | | | |
|--|------------|------------|-----|
| Junction - soldering point ²⁾ | R_{thJS} | ≤ 145 | K/W |
|--|------------|------------|-----|

¹ T_S is measured on the collector lead at the soldering point to the pcb

² 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 $I_C = 1 \text{ mA}, I_B = 0$ | $V_{(BR)CEO}$ | 12 | - | - | V |
| Collector-emitter cutoff current $V_{CE} = 20 \text{ V}, V_{BE} = 0$ | I_{CES} | - | - | 100 | μA |
| Collector-base cutoff current $V_{CB} = 10 \text{ V}, I_E = 0$ | I_{CBO} | - | - | 100 | nA |
| Emitter-base cutoff current $V_{EB} = 1 \text{ V}, I_C = 0$ | I_{EBO} | - | - | 1 | μA |
| DC current gain $I_C = 30 \text{ mA}, V_{CE} = 8 \text{ V}$ | h_{FE} | 50 | 100 | 200 | - |

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

| Parameter | Symbol | Values | | | Unit |
|---|---------------|--------|------|------|------|
| | | min. | typ. | max. | |
| AC characteristics (verified by random sampling) | | | | | |
| Transition frequency $I_C = 50\text{ mA}$, $V_{CE} = 8\text{ V}$, $f = 500\text{ MHz}$ | f_T | 6 | 8 | - | GHz |
| Collector-base capacitance $V_{CB} = 10\text{ V}$, $f = 1\text{ MHz}$ | C_{cb} | - | 0.63 | 0.9 | pF |
| Collector-emitter capacitance $V_{CE} = 10\text{ V}$, $f = 1\text{ MHz}$ | C_{ce} | - | 0.33 | - | |
| Emitter-base capacitance $V_{EB} = 0.5\text{ V}$, $f = 1\text{ MHz}$ | C_{eb} | - | 1.8 | - | |
| Noise figure $I_C = 10\text{ mA}$, $V_{CE} = 8\text{ V}$, $Z_S = Z_{Sopt}$, $f = 900\text{ MHz}$ $f = 1.8\text{ GHz}$ | F | - | 1.3 | - | dB |
| | | - | 2.1 | - | |
| Power gain, maximum available ¹⁾ $I_C = 30\text{ mA}$, $V_{CE} = 8\text{ V}$, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$, $f = 900\text{ MHz}$ $f = 1.8\text{ GHz}$ | G_{ma} | - | 19.5 | - | |
| | | - | 13 | - | |
| Transducer gain $I_C = 30\text{ mA}$, $V_{CE} = 8\text{ V}$, $Z_S = Z_L = 50\Omega$, $f = 900\text{ MHz}$ $f = 1.8\text{ GHz}$ | $ S_{21e} ^2$ | - | 15 | - | |
| | | - | 9 | - | |

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

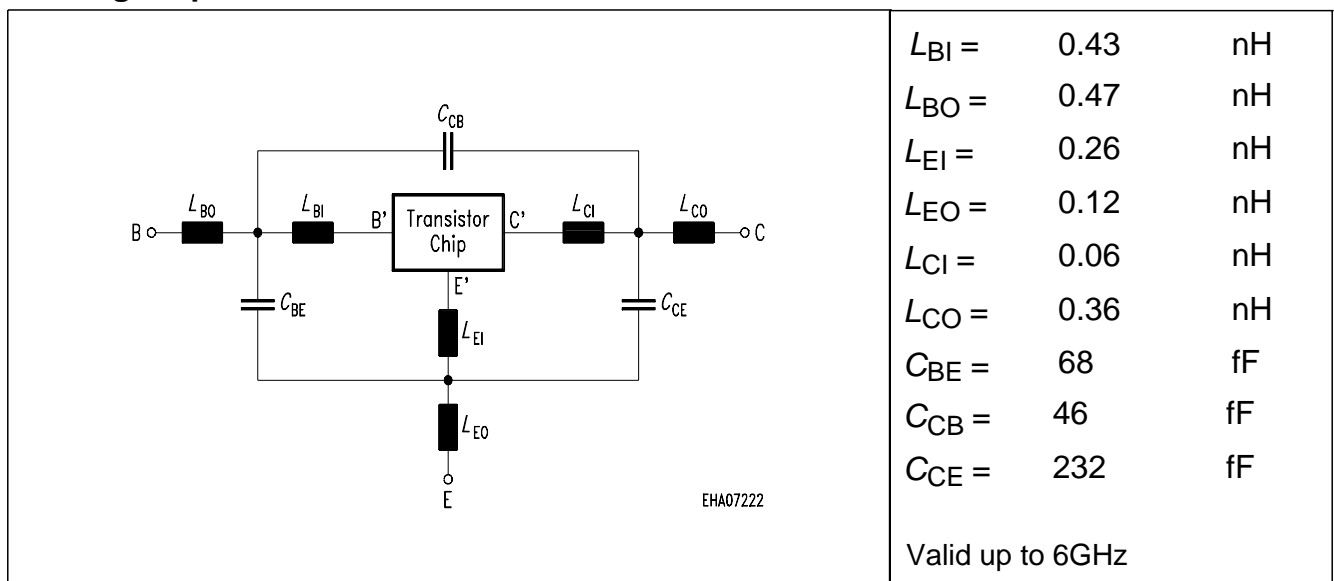
SPICE Parameters (Gummel-Poon Model, Berkley-SPICE 2G.6 Syntax) :

Transistor Chip Data

| | | | | | | | | |
|-------|---------|----------|-------|----------|----------|--------|----------|----------|
| IS = | 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 | Ω | IRB = | 0.91763 | mA |
| RBM = | 1 | Ω | RE = | 0.76534 | | RC = | 0.11938 | Ω |
| 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 | - | XTB = | 0 | - | EG = | 1.11 | eV |
| XTI = | 3 | - | FC = | 0.72063 | - | TNOM | 300 | K |

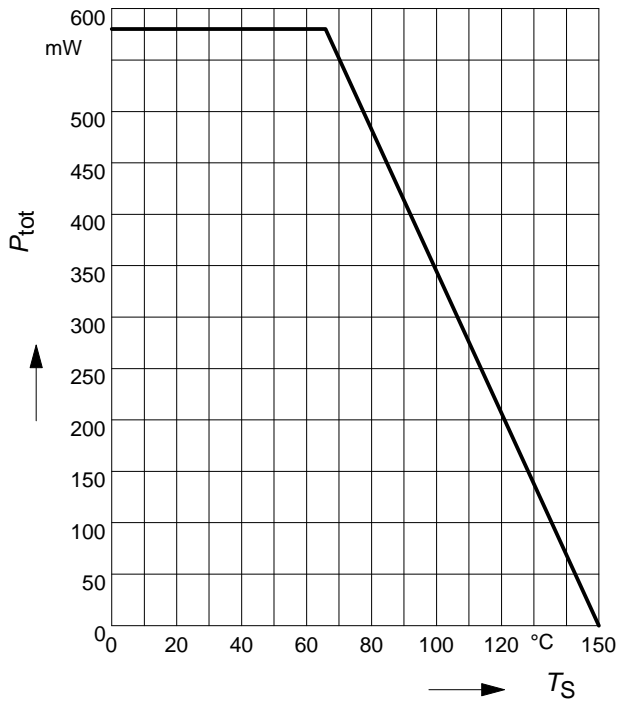
All parameters are ready to use, no scaling is necessary.
 Extracted on behalf of Infineon Technologies AG by:
 Institut für Mobil-und Satellitentechnik (IMST)

Package Equivalent Circuit:

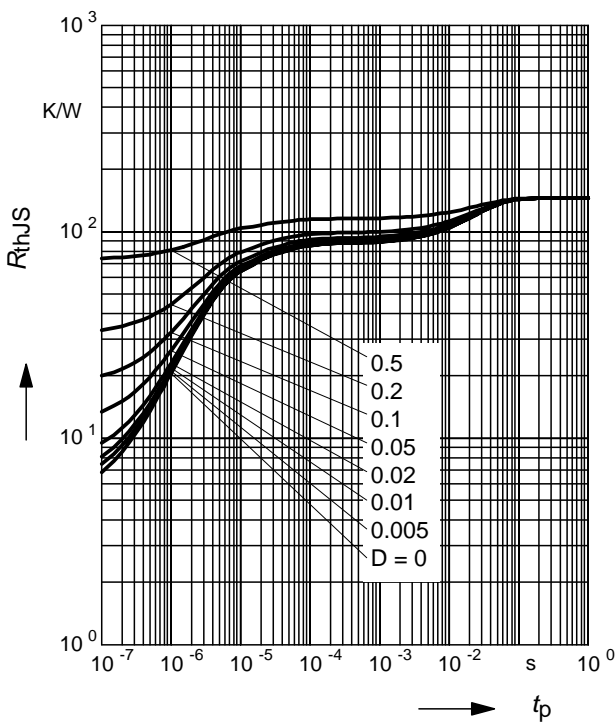


For examples and ready to use parameters please contact your local Infineon Technologies distributor or sales office to obtain a Infineon Technologies CD-ROM or see Internet: <http://www.infineon.com/silicondiscretes>

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

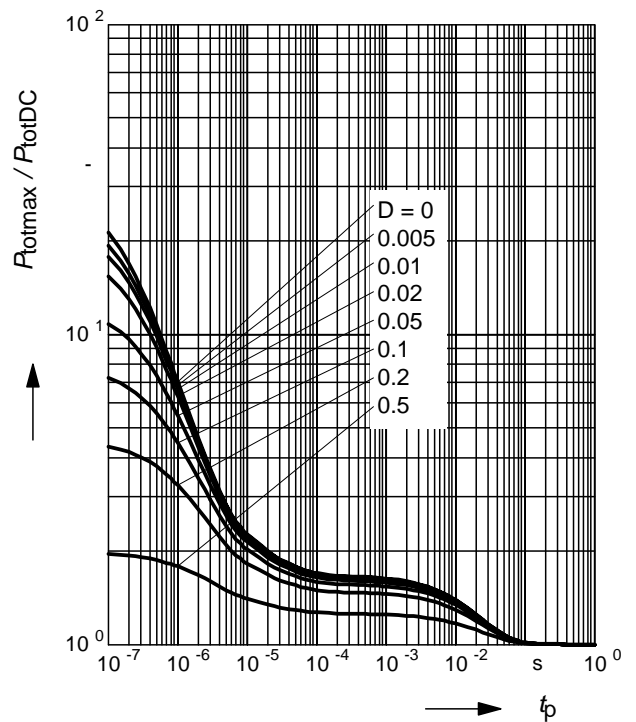


Permissible Pulse Load $R_{thJS} = f(t_p)$

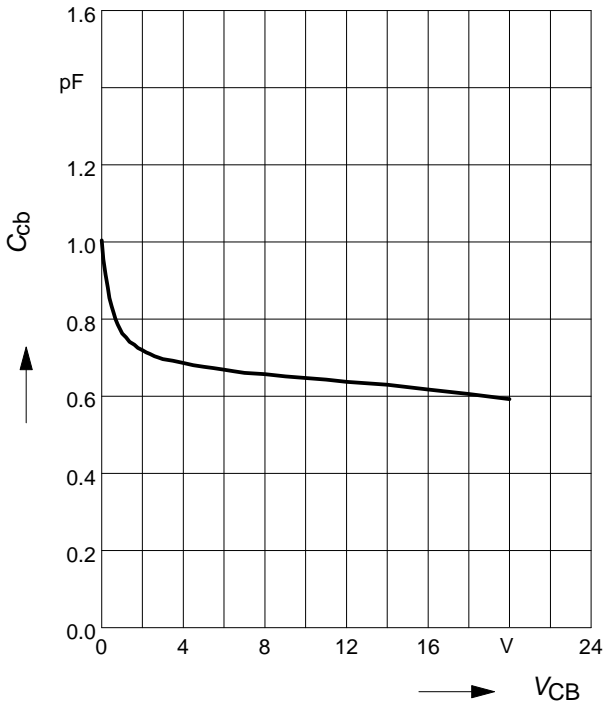


Permissible Pulse Load

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

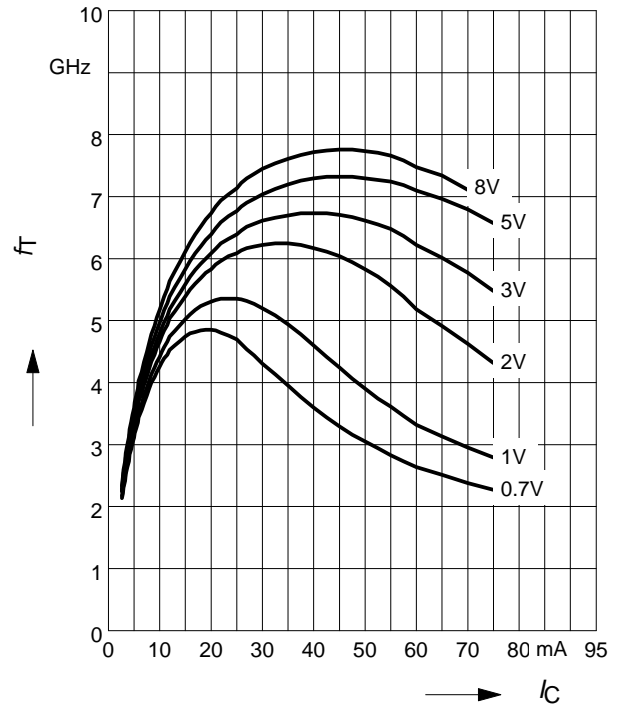


Collector-base capacitance $C_{cb} = f(V_{CB})$
 $f = 1\text{MHz}$



Transition frequency $f_T = f(I_C)$

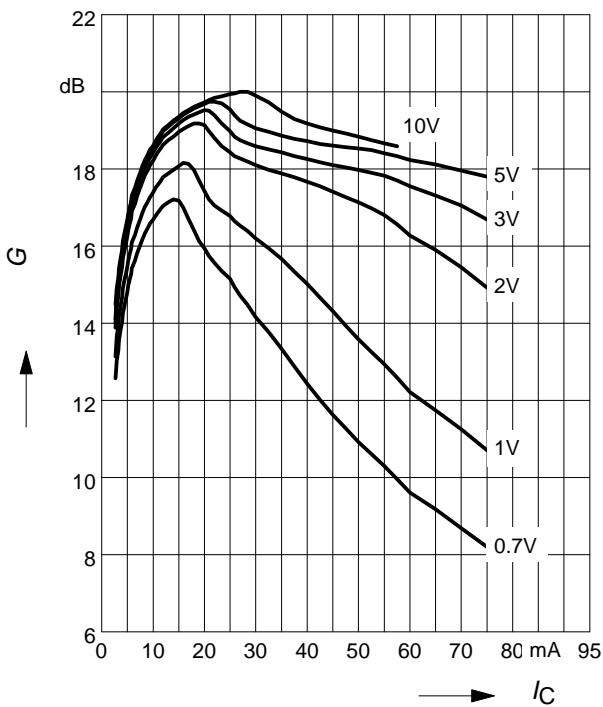
$V_{CE} = \text{Parameter}$



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

$f = 0.9\text{GHz}$

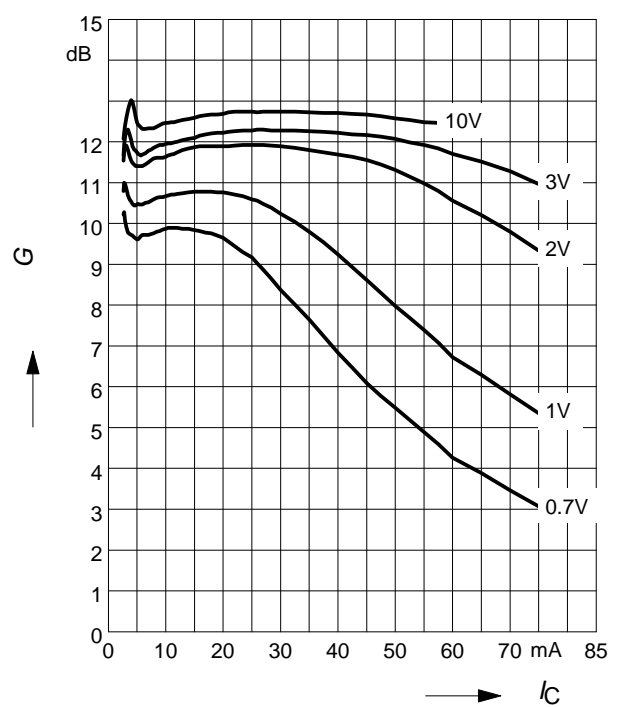
$V_{CE} = \text{Parameter}$



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

$f = 1.8\text{GHz}$

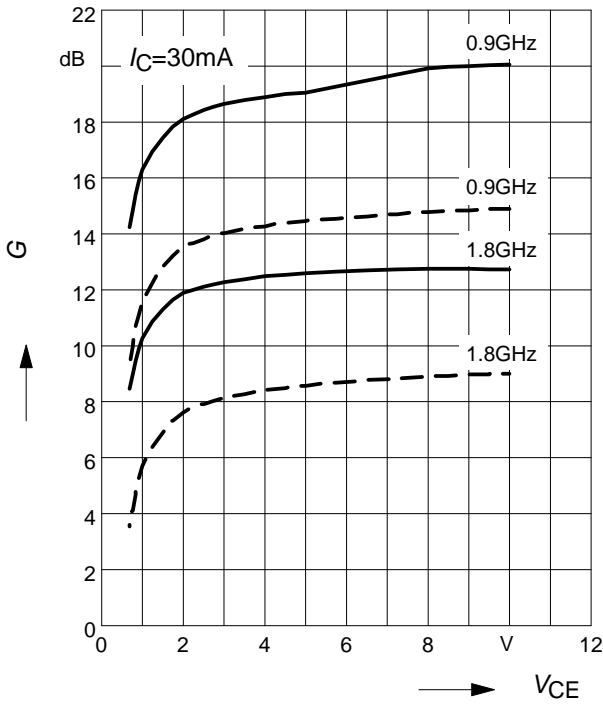
$V_{CE} = \text{Parameter}$



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

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

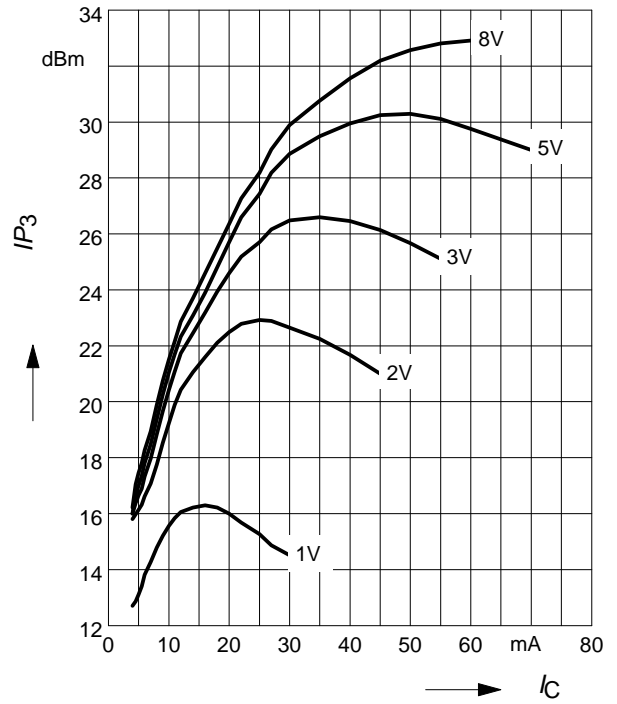
$f =$ Parameter



Intermodulation Intercept Point $IP_3 = f(I_C)$

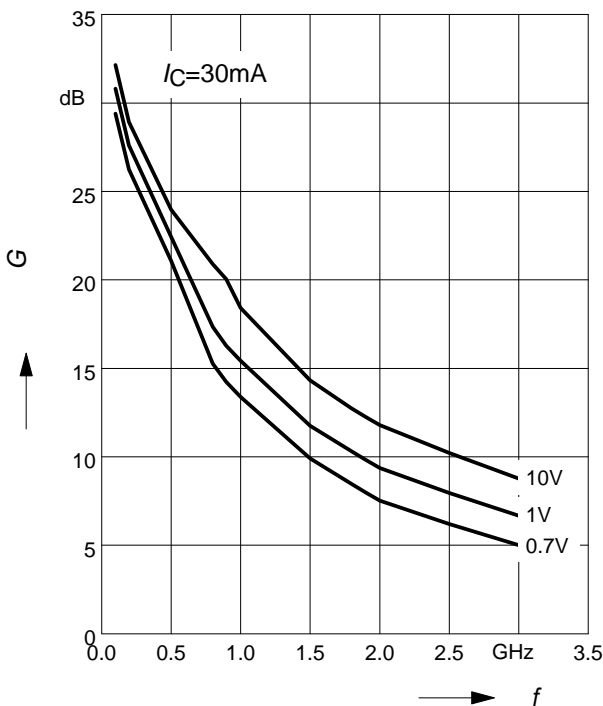
(3rd order, Output, $Z_S = Z_L = 50\Omega$)

$V_{CE} =$ 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

