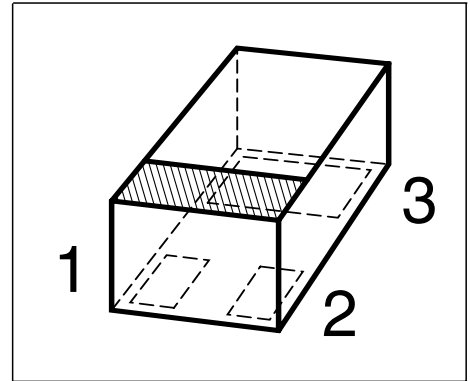


NPN Silicon RF Transistor

Preliminary data

- For low voltage / low current applications
- Ideal for VCO modules and low noise amplifiers
- Low noise figure: 1.1 dB at 1.8 GHz
- World's smallest SMD leadless package
- Excellent ESD performance (>1500V HBM)
- High f_T of 22 GHz


ESD: Electrostatic discharge sensitive device, observe handling precaution!

| Type | Marking | Pin Configuration | | | Package |
|----------|---------|-------------------|-------|-------|----------|
| BFR460L3 | AB | 1 = B | 2 = E | 3 = C | TSLP-3-1 |

Maximum Ratings

| Parameter | Symbol | Value | Unit |
|---|-----------|-------------|------|
| Collector-emitter voltage | V_{CEO} | 4.5 | V |
| Collector-emitter voltage | V_{CES} | 15 | |
| Collector-base voltage | V_{CBO} | 15 | |
| Emitter-base voltage | V_{EBO} | 1.5 | |
| Collector current | I_C | 50 | mA |
| Base current | I_B | 5 | |
| Total power dissipation ¹⁾²⁾ $T_S \leq 108^\circ\text{C}$ | P_{tot} | 200 | 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 ³⁾ | R_{thJS} | ≤ 210 | K/W |

¹⁾ P_{tot} due to Maximum Ratings

²⁾ T_S is measured on the collector lead at the soldering point to the pcb

³⁾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 $I_C = 1 \text{ mA}, I_B = 0$ | $V_{(BR)CEO}$ | 4.5 | 5 | - | V |
| Collector-base cutoff current $V_{CB} = 5 \text{ V}, I_E = 0$ | I_{CBO} | - | - | 100 | nA |
| Emitter-base cutoff current $V_{EB} = 0,5 \text{ V}, I_C = 0$ | I_{EBO} | - | - | 1 | μA |
| DC current gain $I_C = 20 \text{ mA}, V_{CE} = 3 \text{ V}$ | h_{FE} | 50 | 130 | 200 | - |

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

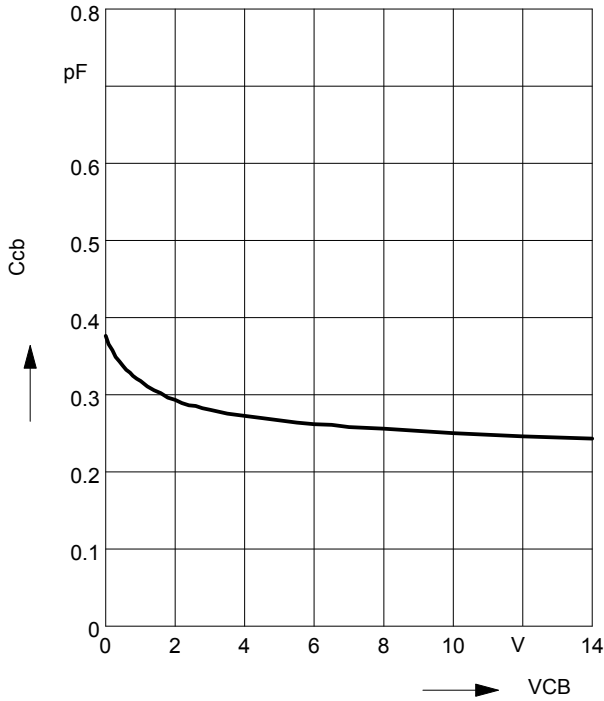
| Parameter | Symbol | Values | | | Unit |
|---|---------------|--------|------|------|------|
| | | min. | typ. | max. | |
| AC Characteristics (verified by random sampling) | | | | | |
| Transition frequency $I_C = 30\text{ mA}$, $V_{CE} = 3\text{ V}$, $f = 1\text{ GHz}$ | f_T | 16 | 22 | - | GHz |
| Collector-base capacitance $V_{CB} = 3\text{ V}$, $f = 1\text{ MHz}$, emitter grounded | C_{cb} | - | 0.3 | 0.45 | pF |
| Collector emitter capacitance $V_{CE} = 3\text{ V}$, $f = 1\text{ MHz}$, base grounded | C_{ce} | - | 0.14 | - | |
| Emitter-base capacitance $V_{EB} = 0.5\text{ V}$, $f = 1\text{ MHz}$, collector grounded | C_{eb} | - | 0.55 | - | |
| Noise figure $I_C = 5\text{ mA}$, $V_{CE} = 3\text{ V}$, $Z_S = Z_{Sopt}$, $f = 1.8\text{ GHz}$ $I_C = 5\text{ mA}$, $V_{CE} = 3\text{ V}$, $Z_S = Z_{Sopt}$, $f = 3\text{ GHz}$ | F | - | 1.1 | - | dB |
| | | - | 1.35 | - | |
| Power gain, maximum stable ¹⁾ $I_C = 20\text{ mA}$, $V_{CE} = 3\text{ V}$, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$, $f = 1.8\text{ GHz}$ | G_{ms} | - | 16.0 | - | dB |
| Power gain, maximum available ¹⁾ $I_C = 20\text{ mA}$, $V_{CE} = 3\text{ V}$, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$, $f = 3\text{ GHz}$ | G_{ma} | - | 11 | - | dB |
| Transducer gain $I_C = 20\text{ mA}$, $V_{CE} = 3\text{ V}$, $Z_S = Z_L = 50\Omega$, $f = 1.8\text{ GHz}$ $I_C = 20\text{ mA}$, $V_{CE} = 3\text{ V}$, $Z_S = Z_L = 50\Omega$, $f = 3\text{ GHz}$ | $ S_{21e} ^2$ | - | 14 | - | dB |
| | | - | 10 | - | |
| Third order intercept point at output ²⁾ $V_{CE} = 3\text{ V}$, $I_C = 20\text{ mA}$, $f = 1.8\text{ GHz}$ | IP_3 | - | 27 | - | dBm |
| 1dB Compression point at output $I_C = 20\text{ mA}$, $V_{CE} = 3\text{ V}$, $f = 1.8\text{ GHz}$ | P_{-1dB} | - | 11.5 | - | |

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

²⁾IP3 value depends on termination of all intermodulation frequency components.
Termination used for this measurement is 50Ω from 0.1 MHz to 6 GHz

Collector-base capacitance $C_{cb} = f(V_{CB})$

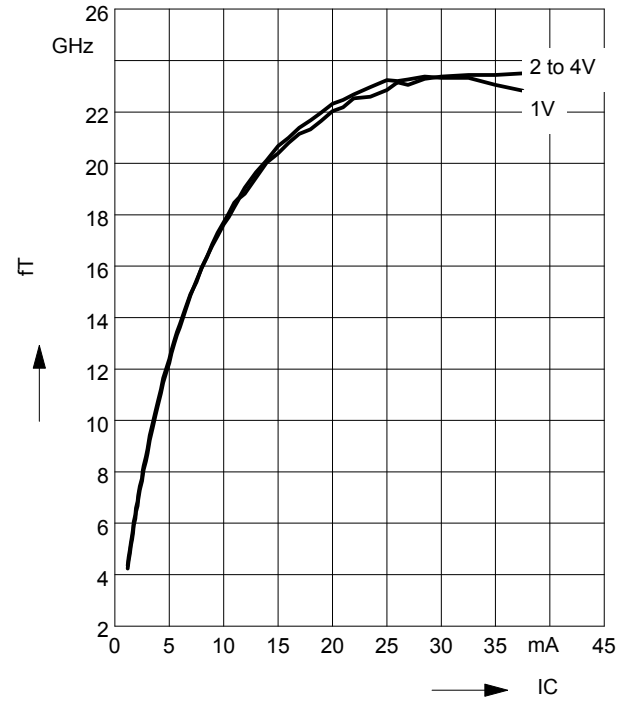
$f = 1\text{MHz}$



Transition frequency $f_T = f(I_C)$

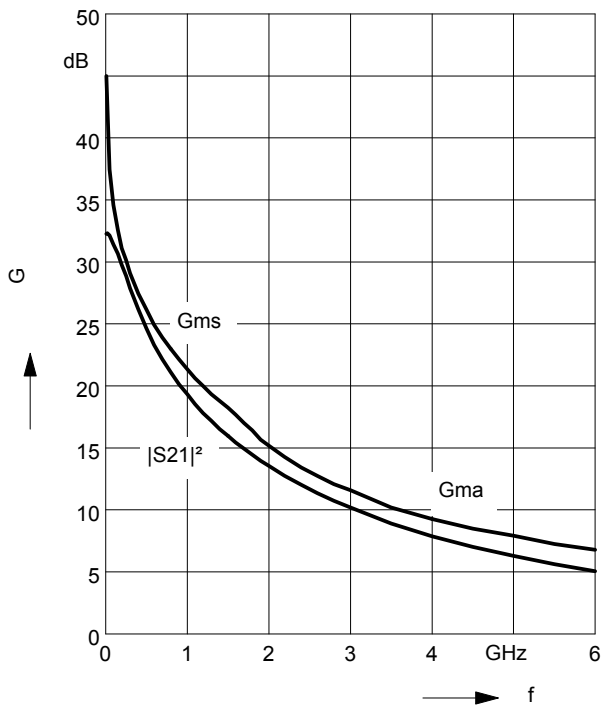
$f = 1\text{GHz}$

$V_{CE} = \text{parameter in V}$



Power gain $G_{ma}, G_{ms}, |S_{21}|^2 = f(f)$

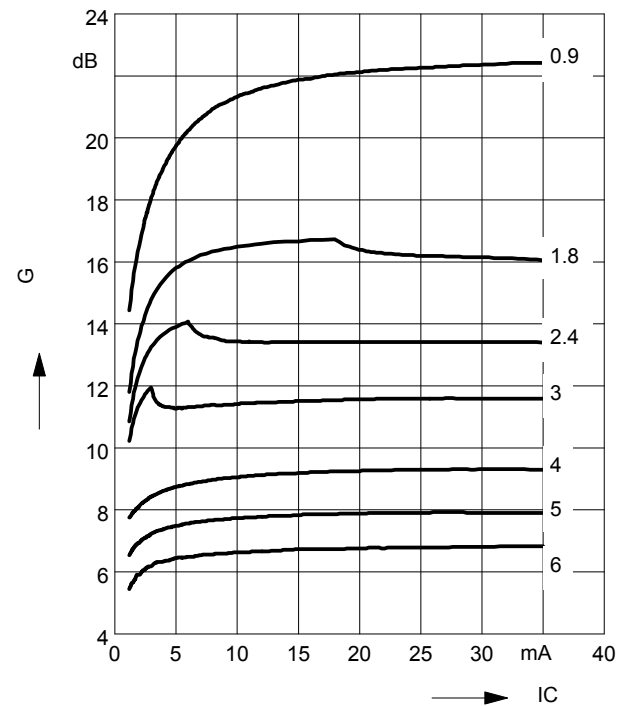
$V_{CE} = 3\text{V}, I_C = 20\text{mA}$



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

$V_{CE} = 3\text{V}$

$f = \text{parameter in GHz}$



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

$I_C = 20 \text{ mA}$

$f =$ parameter in GHz

