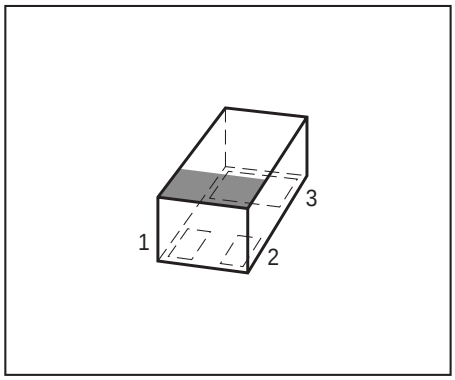
**NPN Silicon RF Transistor***




- Low voltage/ Low current operation
- For low noise amplifiers
- For Oscillators up to 3.5 GHz and Pout > 10 dBm
- Low noise figure: 1.0 dB at 1.8 GHz
- Pb-free (RoHS compliant) package[1)]
- Qualified according AEC Q101

* Short term description

AEC Qualified RoHS

**ESD** (**E**lectro**s**tatic **d**ischarge) sensitive device, observe handling precaution!

| Type | Marking | Pin Configuration | | | Package |
|---|---|---|---|---|---|
| BFR360L3 | FB | 1 = B | 2 = E | 3 = C | TSLP-3-1 |

**Maximum Ratings**

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Collector-emitter voltage | $V_{CEO}$ | 6 | V |
| Collector-emitter voltage | $V_{CES}$ | 15 | |
| Collector-base voltage | $V_{CBO}$ | 15 | |
| Emitter-base voltage | $V_{EBO}$ | 2 | |
| Collector current | $I_C$ | 35 | mA |
| Base current | $I_B$ | 4 | |
| Total power dissipation[2)] $T_S \leq 104°C$ | $P_{tot}$ | 210 | 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)] | $R_{thJS}$ | ≤ 220 | K/W |

[1]Pb-containing package may be available upon special request

[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°C, unless otherwise specified

| Parameter | Symbol | Values | | | Unit |
|---|---|---|---|---|---|
| | | min. | typ. | max. | |
| **DC Characteristics** | | | | | |
| Collector-emitter breakdown voltage<br>$I_C$ = 1 mA, $I_B$ = 0 | $V_{(BR)CEO}$ | 6 | 9 | - | V |
| Collector-emitter cutoff current<br>$V_{CE}$ = 15 V, $V_{BE}$ = 0 | $I_{CES}$ | - | - | 10 | µA |
| Collector-base cutoff current<br>$V_{CB}$ = 5 V, $I_E$ = 0 | $I_{CBO}$ | - | - | 100 | nA |
| Emitter-base cutoff current<br>$V_{EB}$ = 1 V, $I_C$ = 0 | $I_{EBO}$ | - | - | 1 | µA |
| DC current gain-<br>$I_C$ = 15 mA, $V_{CE}$ = 3 V, pulse measured | $h_{FE}$ | 90 | 120 | 160 | - |

**Electrical Characteristics** at $T_A$ = 25°C, unless otherwise specified

| Parameter | Symbol | Values | | | Unit |
|---|---|---|---|---|---|
| | | min. | typ. | max. | |
| **AC Characteristics** (verified by random sampling) | | | | | |
| Transition frequency<br>$I_C$ = 15 mA, $V_{CE}$ = 3 V, $f$ = 1 GHz | $f_T$ | 11 | 14 | - | GHz |
| Collector-base capacitance<br>$V_{CB}$ = 5 V, $f$ = 1 MHz, $V_{BE}$ = 0 ,<br>emitter grounded | $C_{cb}$ | - | 0.26 | 0.4 | pF |
| Collector emitter capacitance<br>$V_{CE}$ = 5 V, $f$ = 1 MHz, $V_{BE}$ = 0 ,<br>base grounded | $C_{ce}$ | - | 0.15 | - | |
| Emitter-base capacitance<br>$V_{EB}$ = 0.5 V, $f$ = 1 MHz, $V_{CB}$ = 0 ,<br>collector grounded | $C_{eb}$ | - | 0.42 | - | |
| Noise figure<br>$I_C$ = 3 mA, $V_{CE}$ = 3 V, $Z_S$ = $Z_{Sopt}$, $f$ = 1.8 GHz<br>$I_C$ = 3 mA, $V_{CE}$ = 3 V, $Z_S$ = $Z_{Sopt}$, $f$ = 3 GHz | $F_{min}$ | <br>-<br>- | <br>1<br>1.3 | <br>-<br>- | dB |
| Power gain, maximum available[1)]<br>$I_C$ = 15 mA, $V_{CE}$ = 3 V, $Z_S$ = $Z_{Sopt}$ ,<br>$Z_L$ = $Z_{Lopt}$ , $f$ = 1.8 GHz<br>$I_C$ = 15 mA, $V_{CE}$ = 3 V, $Z_S$ = $Z_{Sopt}$ ,<br>$Z_L$ = $Z_{Lopt}$ , $f$ = 3 GHz | $G_{ma}$ | <br><br>-<br><br>- | <br><br>16<br><br>11.5 | <br><br>-<br><br>- | |
| Transducer gain<br>$I_C$ = 15 mA, $V_{CE}$ = 3 V, $Z_S$ = $Z_L$ = 50Ω ,<br>$f$ = 1.8 GHz<br>$f$ = 3 GHz | $\lvert S_{21e}\rvert^2$ | <br><br>-<br>- | <br><br>13.5<br>9 | <br><br>-<br>- | dB |
| Third order intercept point at output[2)]<br>$V_{CE}$ = 3 V, $I_C$ = 15 mA, $Z_S$=$Z_L$=50 Ω, $f$ = 1.8 GHz | $IP_3$ | - | 24 | - | dBm |
| 1dB Compression point at output<br>$I_C$ = 15 mA, $V_{CE}$ = 3 V, $Z_S$=$Z_L$=50 Ω, $f$ = 1.8 GHz | $P_{-1dB}$ | - | 9 | - | |

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

[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

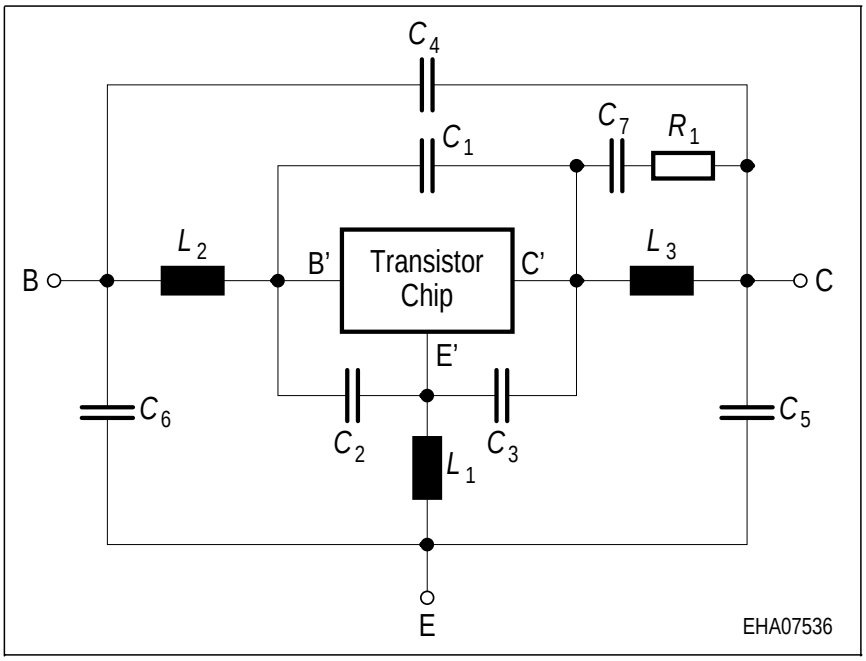
## SPICE Parameter (Gummel-Poon Model, Berkley-SPICE 2G.6 Syntax):

### Transistor Chip Data:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| IS = | 0.0689 | fA | BF = | 147 | - | NF = | 1 | - |
| VAF = | 20 | V | IKF = | 77.28 | mA | ISE = | 150 | fA |
| NE = | 2.4 | - | BR = | 6 | - | NR = | 1 | - |
| VAR = | 60 | V | IKR = | 0.3 | A | ISC = | 20 | fA |
| NC = | 1.4 | - | RB = | 0.1 | Ω | IRB = | 74 | µA |
| RBM = | 7.31 | Ω | RE = | 78.2 | mΩ | RC = | 0.35 | Ω |
| CJE = | 400 | fF | VJE = | 1.3 | V | MJE = | 0.5 | - |
| TF = | 9.219 | ps | XTF = | 0.115 | - | VTF = | 0.198 | V |
| ITF = | 1.336 | mA | PTF = | 0 | deg | CJC = | 473 | fF |
| VJC = | 0.864 | V | MJC = | 0.486 | - | XCJC = | 0.129 | - |
| TR = | 1.92 | ns | CJS = | 0 | fF | VJS = | 0.75 | V |
| MJS = | 0 | - | XTB = | 0 | - | EG = | 1.11 | eV |
| XTI = | 0 | - | FC = | 0.954 | | NK = | 0.5 | K |
| AF = | 1 | - | KF = | 1E-14 | | | | |

All parameters are ready to use, no scalling is necessary.

### Package Equivalent Circuit:

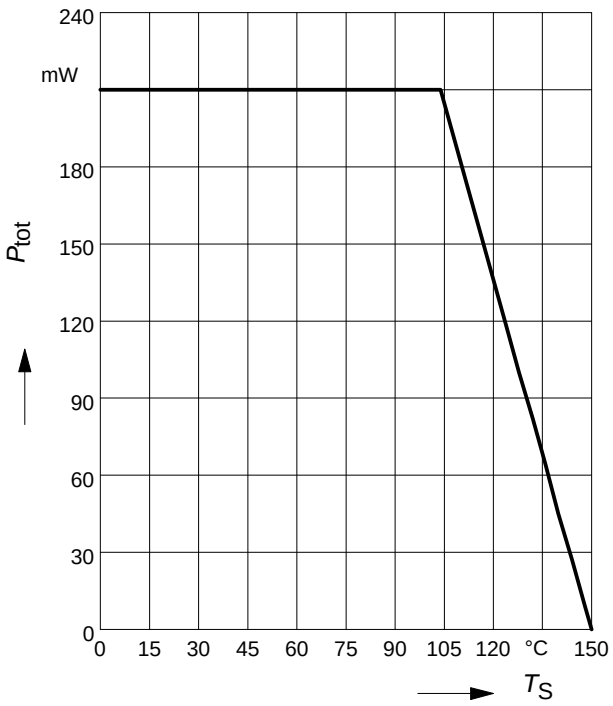



| | | |
|---|---|---|
| $L_1$ = | 0.575 | nH |
| $L_2$ = | 0.575 | nH |
| $L_3$ = | 0.275 | nH |
| $C_1$ = | 33 | fF |
| $C_2$ = | 28 | fF |
| $C_3$ = | 131 | fF |
| $C_4$ = | 8 | fF |
| $C_5$ = | 8 | fF |
| $C_6$ = | 24 | fF |
| $C_7$ = | 300 | fF |
| $R_1$ = | 204 | Ω |

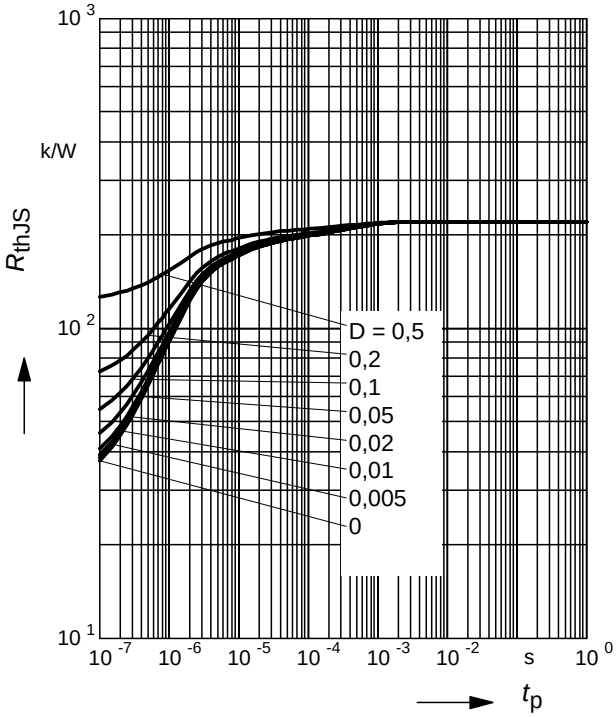
Valid up to 6GHz

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 $P_{tot} = f(T_S)$**

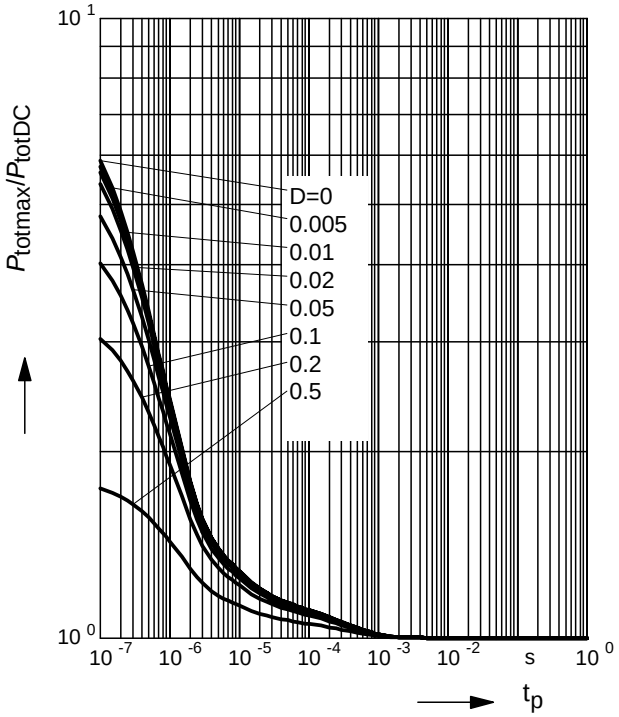



**Permissible Pulse Load $R_{thJS} = f(t_p)$**



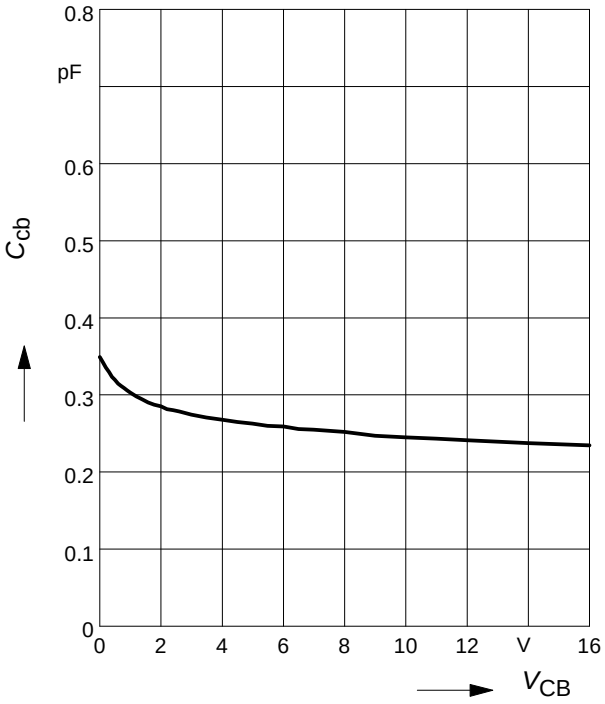

**Permissible Pulse Load**

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




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

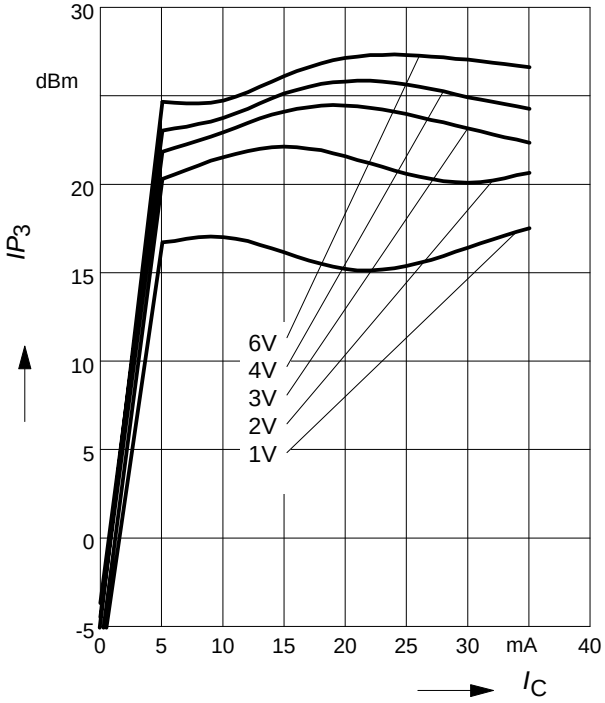
**$f$ = 1MHz**



**Third order Intercept Point** $IP_3=f(I_C)$

(Output, $Z_S=Z_L=50\Omega$)

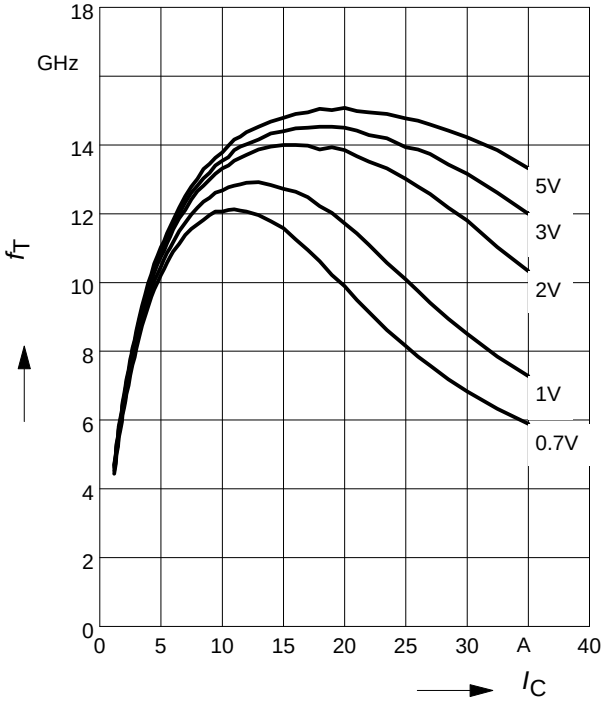
$V_{CE}$ = parameter, $f$ = 1.8 GHz




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

$f$ = 1 GHz

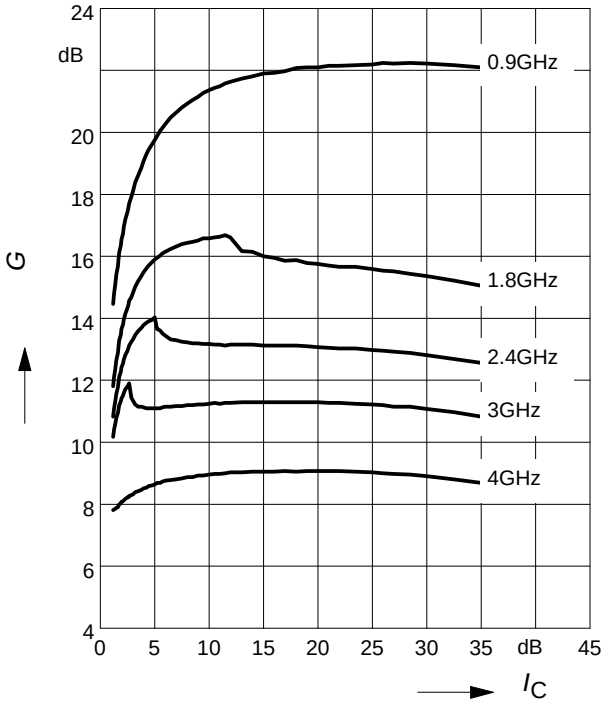
$V_{CE}$ = parameter




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

$V_{CE}$ = 3 V

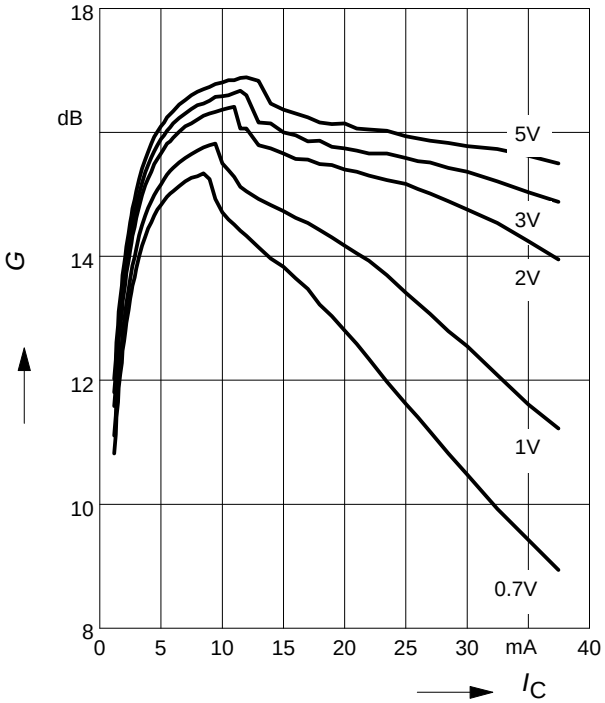
$f$ = parameter in GHz




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

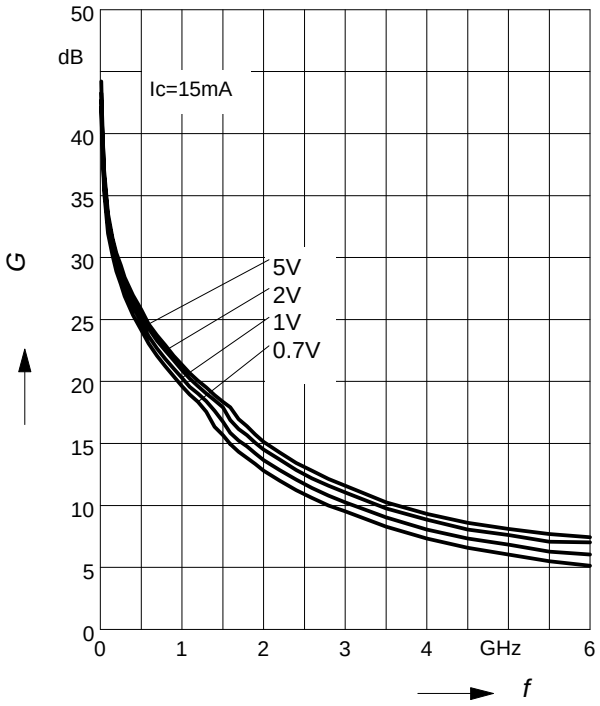
$f$ = 1.8GHz

$V_{CE}$ = parameter



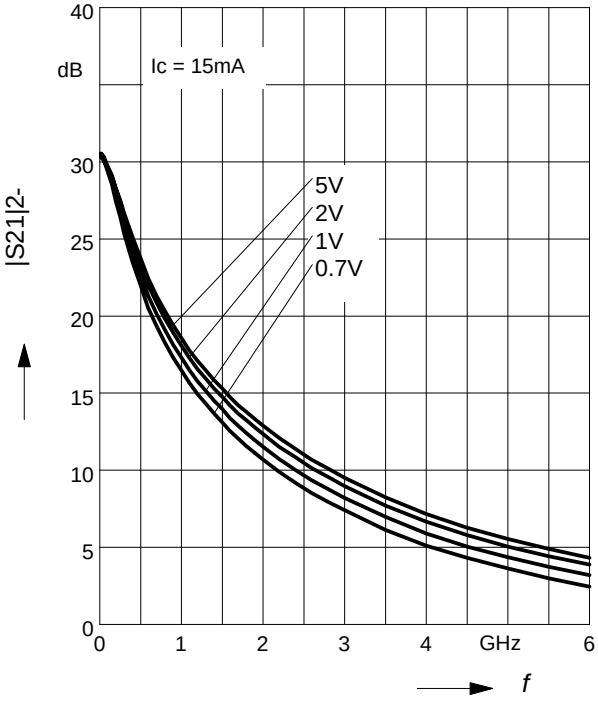
**Power Gain** $G_{ma}$, $G_{ms}$ = $f(f)$

$V_{CE}$ = parameter



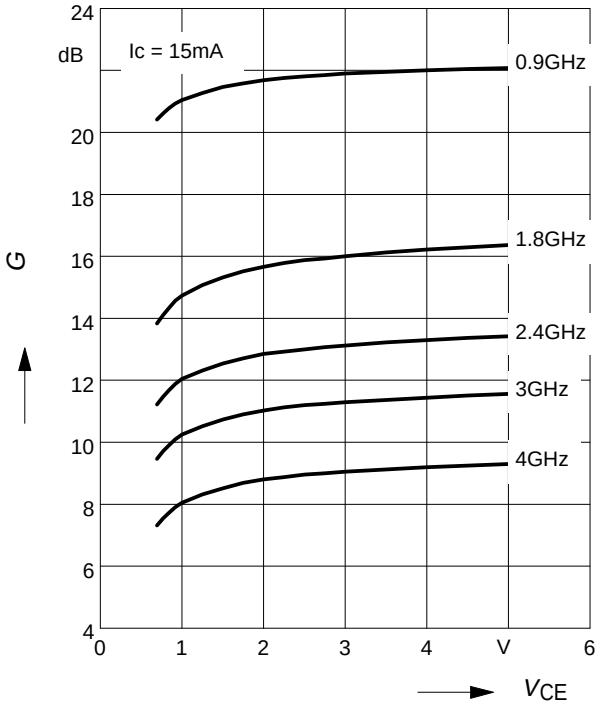

**Power Gain** $|S_{21}|^2$ = $f(f)$

$V_{CE}$ = parameter

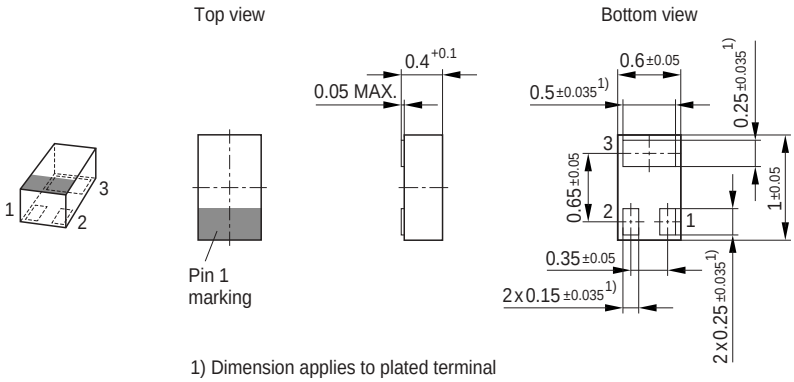



**Power Gain** $G_{ma}$, $G_{ms}$ = $f(V_{CE})$:

$f$ = parameter



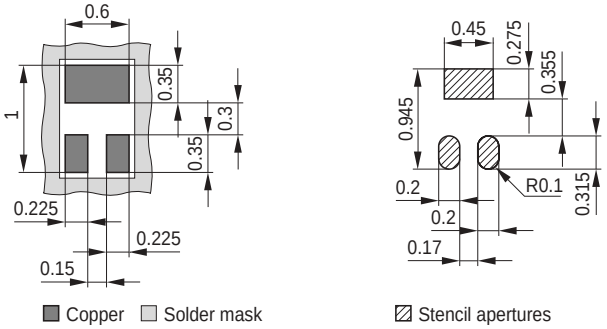
## Package Outline



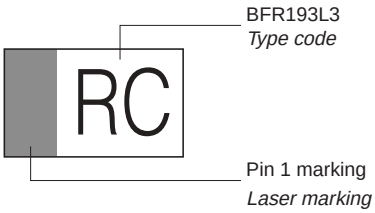

1) Dimension applies to plated terminal

## Foot Print

For board assembly information please refer to Infineon website "Packages"

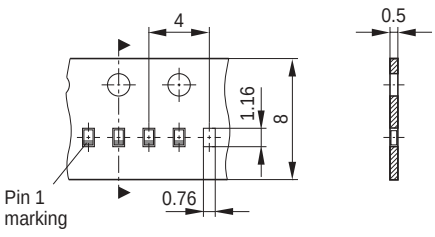



## Marking Layout (Example)




## Standard Packing

Reel ø180 mm = 15.000 Pieces/Reel



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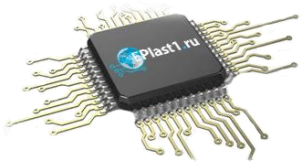
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.

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