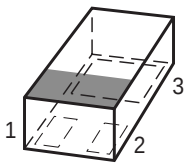
## NPN Silicon Germanium RF Transistor*




- High gain ultra low noise RF transistor
- Provides outstanding performance for a wide range of wireless applications up to 10 GHz
- Ideal for WLAN and all 5-6 GHz applications
- High $OIP_3$ and $P_{-1dB}$ for driver stages
- High maximum stable and available gain $G_{ms}$ = 21 dB at 1.8 GHz, $G_{ma}$ = 11.5 dB at 6 GHz
- 150 GHz $f_T$-Silicon Germanium technology
- Extremly small and flat leadless package, reduced height 0.32 mm max.
- Pb-free (RoHS compliant) package [1)]
- Qualified according AEC Q101

* Short term description

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

| Type | Marking | Pin Configuration | | | Package |
|---|---|---|---|---|---|
| BFR750L3RH | R8 | 1=B | 2=C | 3=E | TSLP-3-9 |

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

## Maximum Ratings

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Collector-emitter voltage | $V_{CEO}$ | | V |
| $T_A > 0°C$ | | 4 | |
| $T_A \leq 0°C$ | | 3.5 | |
| Collector-emitter voltage | $V_{CES}$ | 13 | |
| Collector-base voltage | $V_{CBO}$ | 13 | |
| Emitter-base voltage | $V_{EBO}$ | 1.2 | |
| Collector current | $I_C$ | 90 | mA |
| Base current | $I_B$ | 9 | |
| Total power dissipation[1)] $T_S \leq 96°C$ | $P_{tot}$ | 360 | 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[2)] | $R_{thJS}$ | ≤ 150 | K/W |

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

| Parameter | Symbol | Values | | | Unit |
|---|---|---|---|---|---|
| | | min. | typ. | max. | |
| **DC Characteristics** | | | | | |
| Collector-emitter breakdown voltage $I_C = 3$ mA, $I_B = 0$ | $V_{(BR)CEO}$ | 4 | 4.7 | - | V |
| Collector-emitter cutoff current $V_{CE} = 13$ V, $V_{BE} = 0$ | $I_{CES}$ | - | - | 100 | µA |
| Collector-base cutoff current $V_{CB} = 5$ V, $I_E = 0$ | $I_{CBO}$ | - | - | 100 | nA |
| Emitter-base cutoff current $V_{EB} = 0.5$ V, $I_C = 0$ | $I_{EBO}$ | - | - | 10 | µA |
| DC current gain $I_C = 60$ mA, $V_{CE} = 3$ V, pulse measured | $h_{FE}$ | 160 | 250 | 400 | - |

[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

$R_{thJS}$ demanded by $P_{tot}$ and $T_S$, to be fulfilled by design

**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>$I_C$ = 60 mA, $V_{CE}$ = 3 V, $f$ = 2 GHz | $f_T$ | - | 37 | - | GHz |
| Collector-base capacitance<br>$V_{CB}$ = 3 V, $f$ = 1 MHz, emitter grounded | $C_{cb}$ | - | 0.24 | 0.42 | pF |
| Collector emitter capacitance<br>$V_{CE}$ = 3 V, $f$ = 1 MHz, base grounded | $C_{ce}$ | - | 0.31 | - | |
| Emitter-base capacitance<br>$V_{EB}$ = 0.5 V, $f$ = 1 MHz, collector grounded | $C_{eb}$ | - | 0.97 | - | |
| Noise figure<br>$I_C$ = 25 mA, $V_{CE}$ = 3 V, $f$ = 1.8 GHz, $Z_S = Z_{Sopt}$<br>$I_C$ = 25 mA, $V_{CE}$ = 3 V, $f$ = 6 GHz, $Z_S = Z_{Sopt}$ | $F$ | <br>-<br>- | <br>0.6<br>1.1 | <br>-<br>- | dB |
| Power gain, maximum stable[1)]<br>$I_C$ = 60 mA, $V_{CE}$ = 3 V, $Z_S = Z_{Sopt}$,<br>$Z_L = Z_{Lopt}$ , $f$ = 1.8 GHz | $G_{ms}$ | - | 21 | - | dB |
| Power gain, maximum available[1)]<br>$I_C$ = 60 mA, $V_{CE}$ = 3 V, $Z_S = Z_{Sopt}$,<br>$Z_L = Z_{Lopt}$, $f$ = 6 GHz | $G_{ma}$ | - | 11.5 | - | dB |
| Transducer gain<br>$I_C$ = 60 mA, $V_{CE}$ = 3 V, $Z_S = Z_L$ = 50 Ω,<br>$f$ = 1.8 GHz<br>$I_C$ = 60 mA, $V_{CE}$ = 3 V, $Z_S = Z_L$ = 50 Ω,<br>$f$ = 6 GHz | $\lvert S_{21e}\rvert^2$ | <br><br>-<br><br>- | <br><br>18<br><br>8 | <br><br>-<br><br>- | dB |
| Third order intercept point at output[2)]<br>$V_{CE}$ = 3 V, $I_C$ = 60 mA, $f$ = 1.8 GHz,<br>$Z_S = Z_L$ = 50 Ω | $IP_3$ | - | 29.5 | - | dBm |
| 1dB Compression point at output<br>$I_C$ = 60 mA, $V_{CE}$ = 3 V, $Z_S = Z_L$ = 50 Ω,<br>$f$ = 1.8 GHz | $P_{-1dB}$ | - | 16.5 | - | |

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

[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

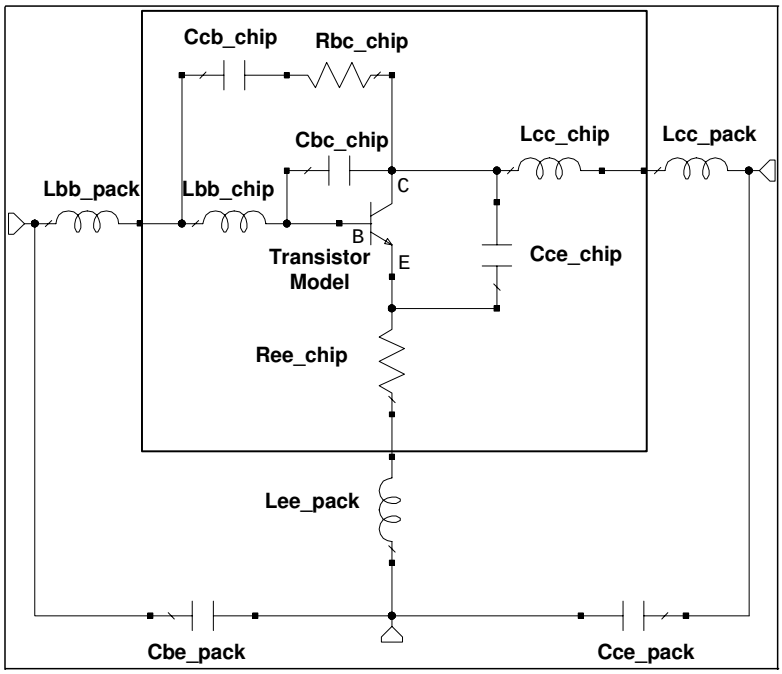
## SPICE Parameter (Gummel-Poon Model, Berkley-SPICE 2G.6 Syntax):

### Transistor Chip Data:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| IS = | 2.66 e-12 | mA | BF = | 753 | - | NF = | 1.015 | - |
| VAF = | 95 | V | IKF = | 292 | mA | ISE = | 1.54 e-11 | mA |
| NE = | 1.8 | - | BR = | 76 | - | NR = | 1 | - |
| VAR = | 1.33 | V | IKR = | 1.33 | mA | ISC = | 1 e-27 | mA |
| NC = | 2 | - | RB = | 1 | Ω | IRB = | 1 e15 | A |
| RBM = | 0.9 | Ω | RE = | 20 | mΩ | RC = | 0.9 | Ω |
| CJE = | 0.475 | pF | VJE = | 0.69 | V | MJE = | 0.085 | - |
| TF = | 0.0021 | ns | XTF = | 3 | - | VTF = | 2.1 | V |
| ITF = | 2540 | mA | PTF = | 0.5 | | CJC = | 0.173 | pF |
| VJC = | 0.45 | V | MJC = | 0.31 | | XCJC = | 0.01 | - |
| TR = | 1.2 | ns | CJS = | 0.325 | pF | VJS = | 0.65 | V |
| MJS = | 0.25 | - | XTB = | -2.2 | - | EG = | 1.11 | |
| XTI = | 0.436 | - | FC = | 0.5 | | TNOM | 25 | °C |
| AF = | 1 | - | KF = | 0 | - | | | |

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

### Package Equivalent Circuit:

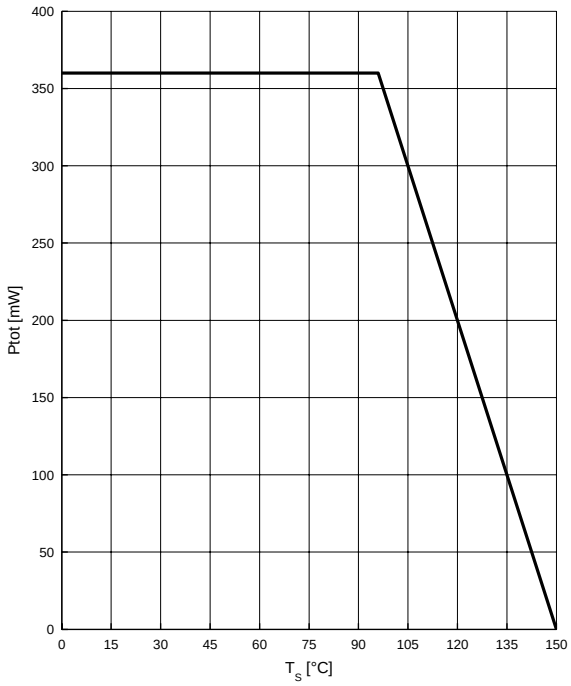



| | | |
|---|---|---|
| $L_{bb\_chip}$ = | 0.212 | nA |
| $L_{cc\_chip}$ = | 0.07472 | nH |
| $L_{bb\_pack}$ = | 0.0184 | nH |
| $L_{cc\_pack}$ = | 0.277 | nH |
| $L_{ee\_pack}$ = | 0.239 | nH |
| $C_{bc\_chip}$ = | 0.015 | pF |
| $C_{cb\_chip}$ = | 0.013 | pF |
| $C_{ce\_chip}$ = | 0.282 | pF |
| $C_{be\_pack}$ = | 0.064 | pF |
| $C_{ce\_pack}$ = | 0.0492 | pF |
| $R_{bc\_chip}$ = | 7 | Ω |
| $R_{ee\_chip}$ = | 0.566 | Ω |

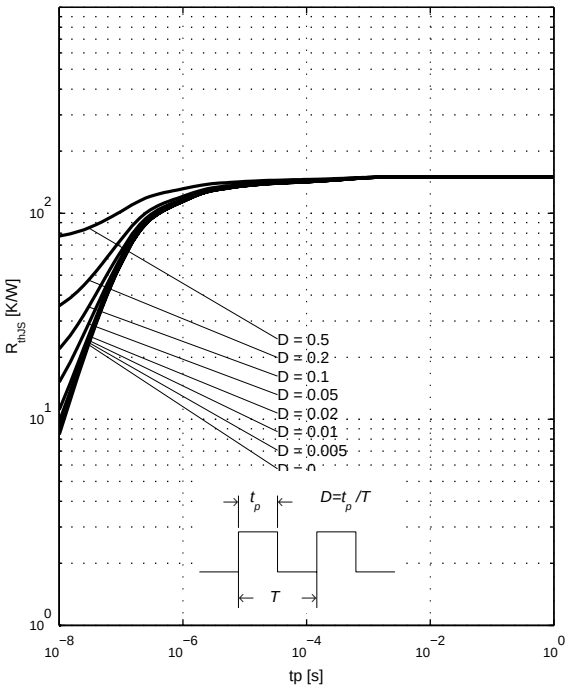
Valid up to 6GHz

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

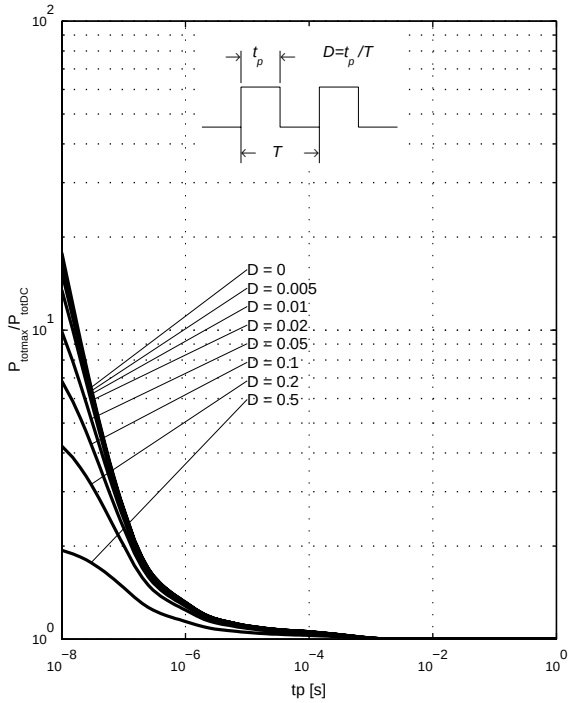



**Permissible Puls Load $R_{thJS} = f(t_p)$**



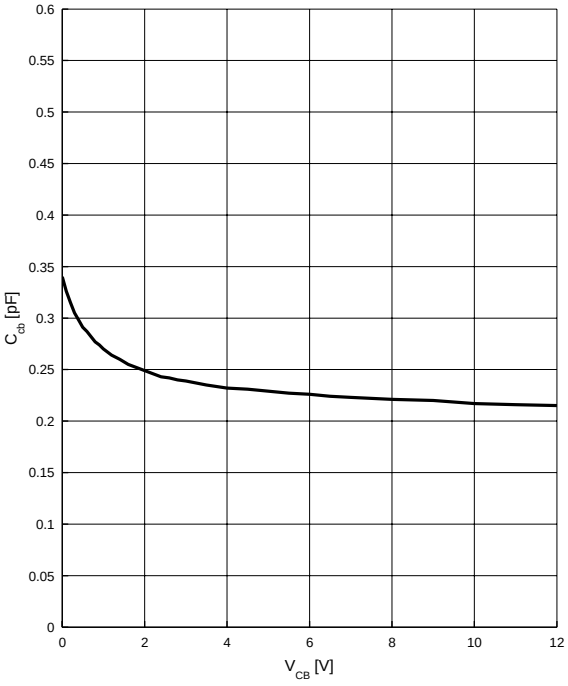

**Permissible Pulse Load**

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



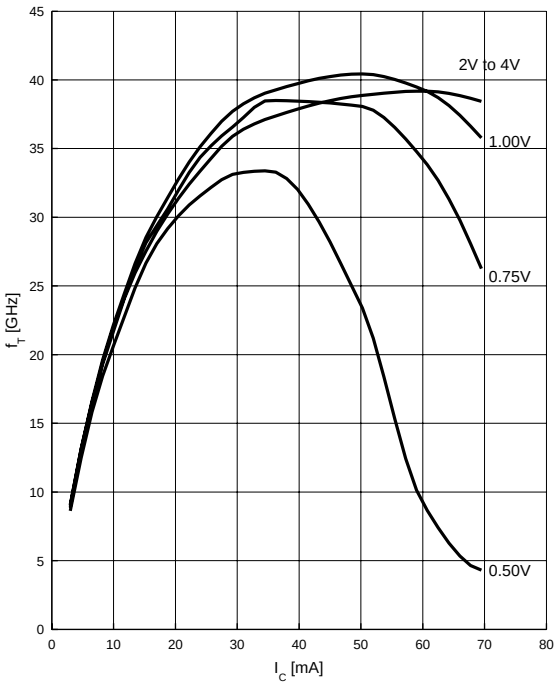

**Collector-base capacitance $C_{cb} = f(V_{CB})$**

**$f$ = 1 MHz**



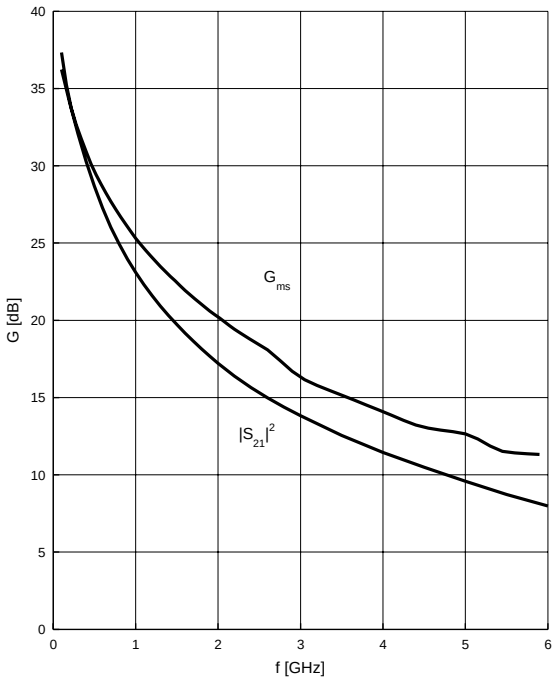
**Transition frequency** $f_T = f(I_C)$

$V_{CE}$ = parameter, $f$ = 1 GHz




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

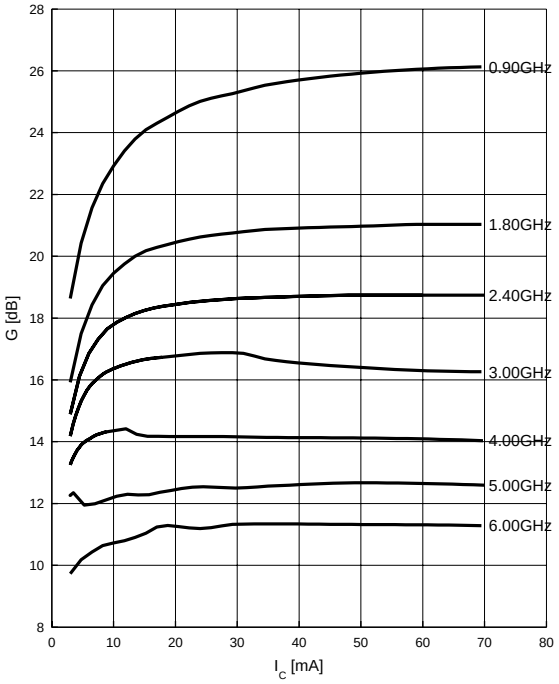
$V_{CE}$ = 3 V, $I_C$ = 60 mA




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

$V_{CE}$ = 3 V

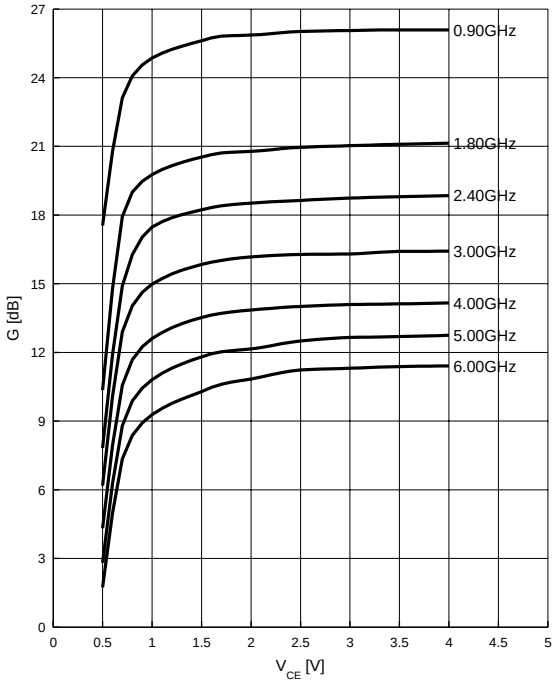
$f$ = parameter



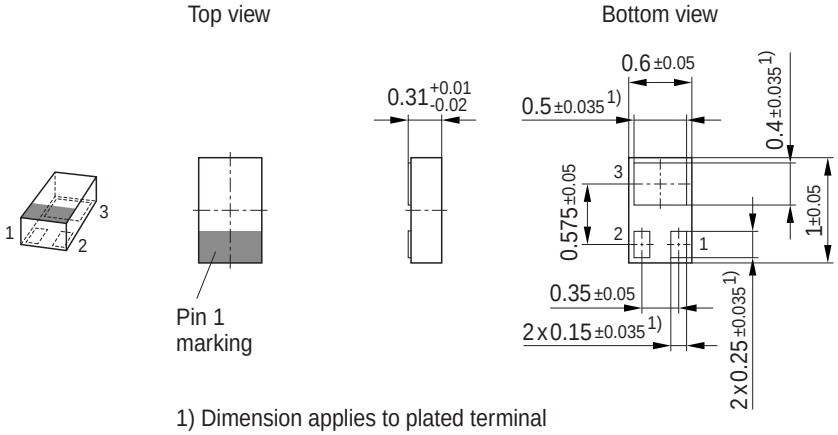

**Power gain** $G_{ma}$, $G_{ms} = f(V_{CE})$

$I_C$ = 60 mA

$f$ = parameter



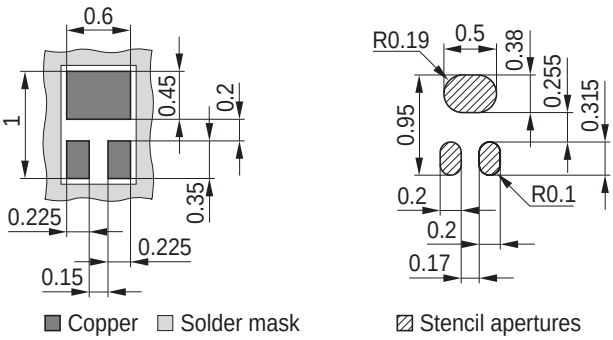
## Package Outline



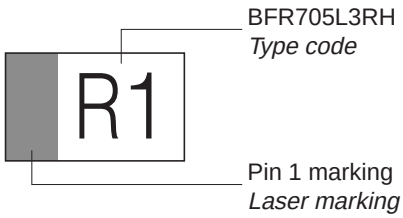

1) Dimension applies to plated terminal

## Foot Print

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

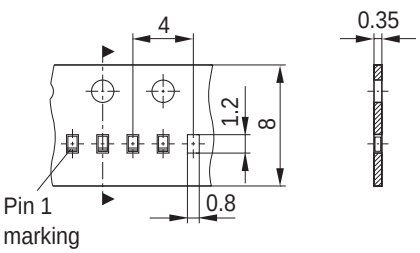



## Marking Layout (Example)




## Standard Packing

Reel ø180 mm = 15.000 Pieces/Reel



Edition 2006-02-01
Published by
Infineon Technologies AG
81726 München, Germany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