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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
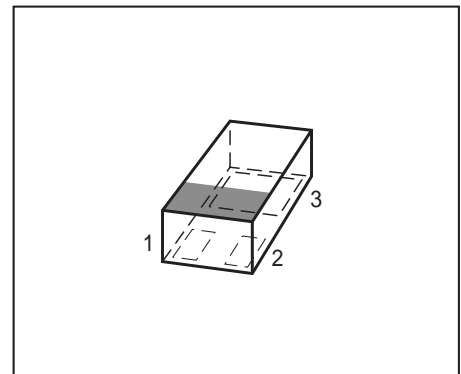
* Short term description

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	
$T_A \le 0°C$		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] $T_S \le 96°C$	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

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

[1] $G_{ma} = \lvert S_{21e} / S_{12e}\rvert (k-(k^2-1)^{1/2})$, $G_{ms} = \lvert S_{21e} / S_{12e}\rvert$
[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:
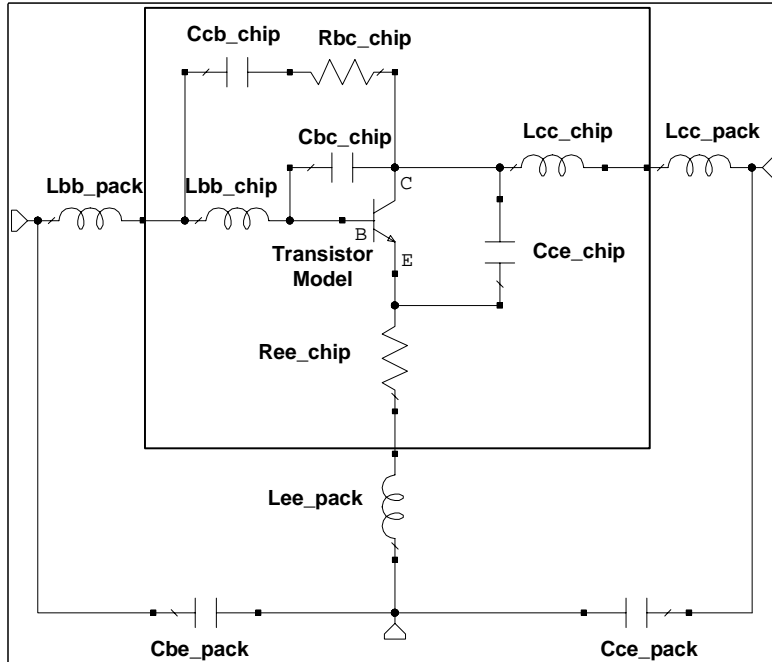
L_{bb_chip} =	0.212	nA
L_{cc_chip} =	0.07472	nH
L_{bb_pack} =	0.0184	nH
L_{cc_pack} =	0.277	nH
L_{ee_pack} =	0.239	nH
C_{bc_chip} =	0.015	pF
C_{cb_chip} =	0.013	pF
C_{ce_chip} =	0.282	pF
C_{be_pack} =	0.064	pF
C_{ce_pack} =	0.0492	pF
R_{bc_chip} =	7	Ω
R_{ee_chip} =	0.566	Ω

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

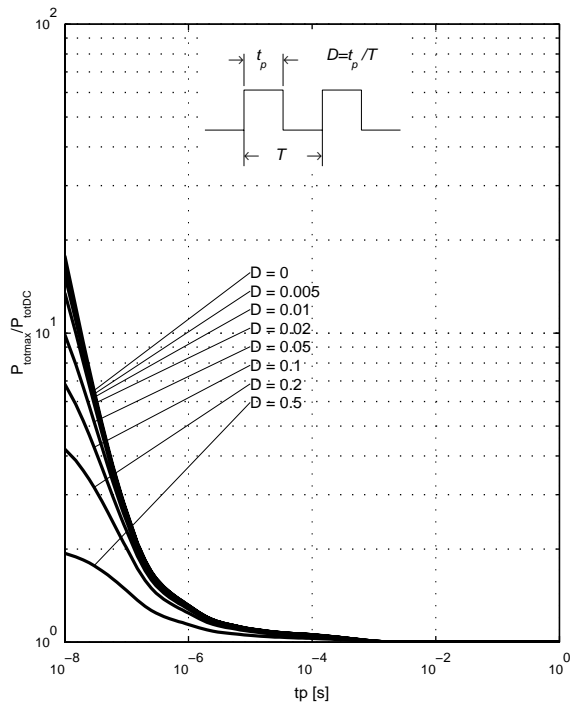**Total power dissipation** $P_{tot} = f(T_S)$
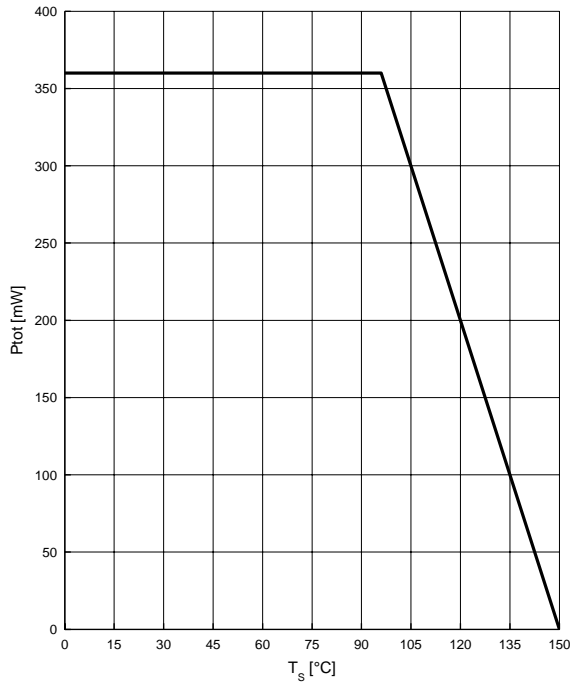
Permissible Puls Load $R_{thJS} = f(t_p)$
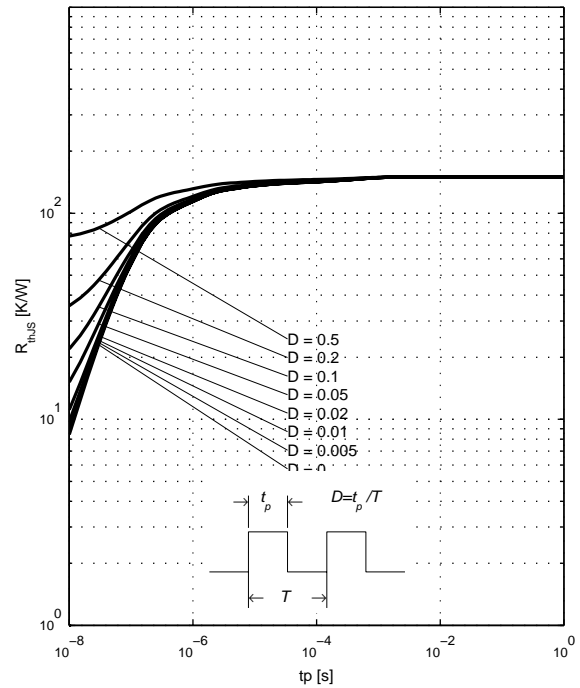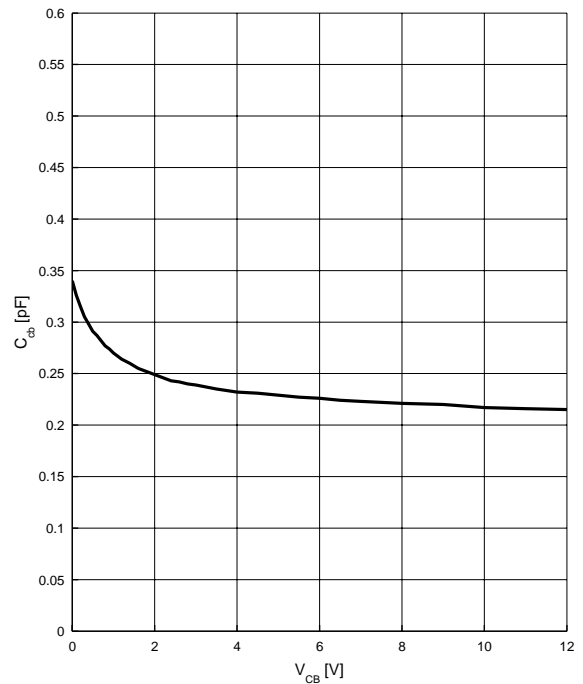

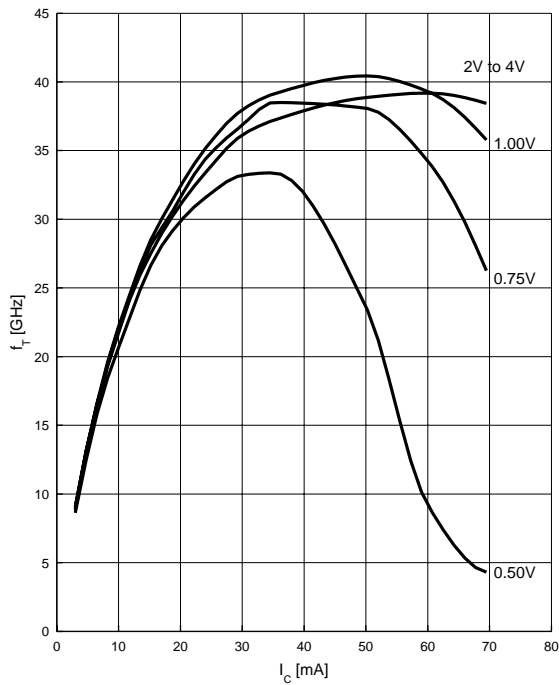**Permissible Pulse Load**

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

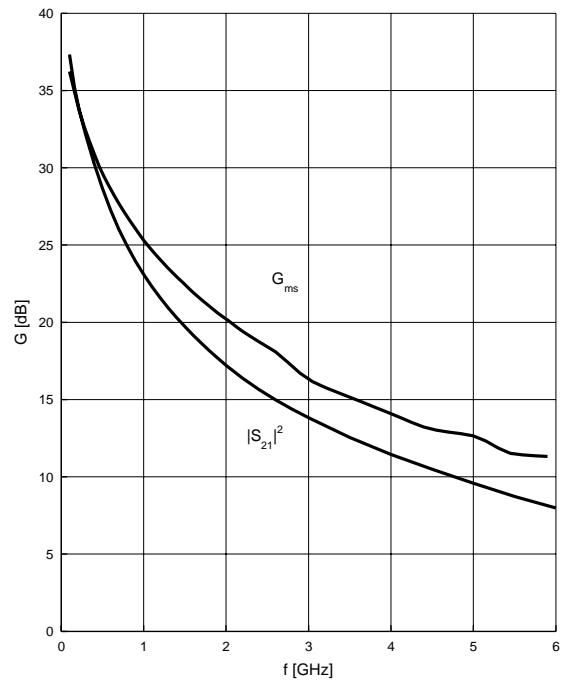**Collector-base capacitance** $C_{cb} = f(V_{CB})$

$f = 1$ MHz

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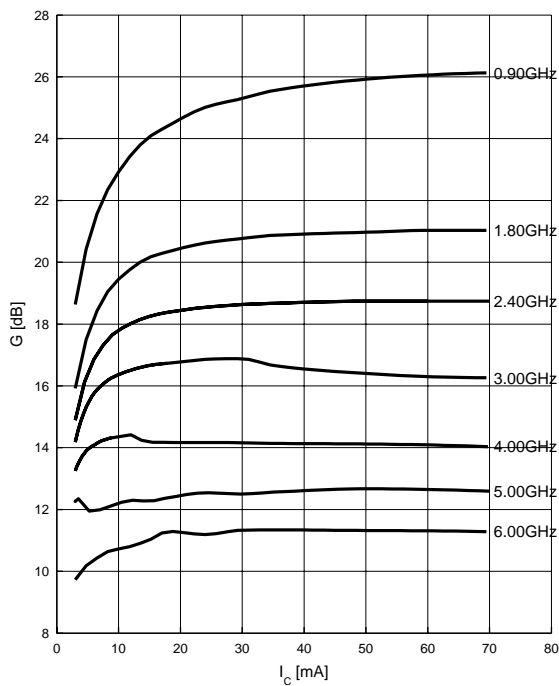
Power gain G_{ma}, $G_{ms} = f(V_{CE})$

I_C = 60 mA

f = parameter

Package Outline

Top view

Bottom view

$0.31^{+0.01}_{-0.02}$

0.6 ± 0.05

0.5 ± 0.035 [1])

0.4 ± 0.035 [1])

0.575 ± 0.05

1 ± 0.05

3

2

1

0.35 ± 0.05

$2 \times 0.15 \pm 0.035$ [1])

$2 \times 0.25 \pm 0.035$ [1])

Pin 1 marking

1

2

3
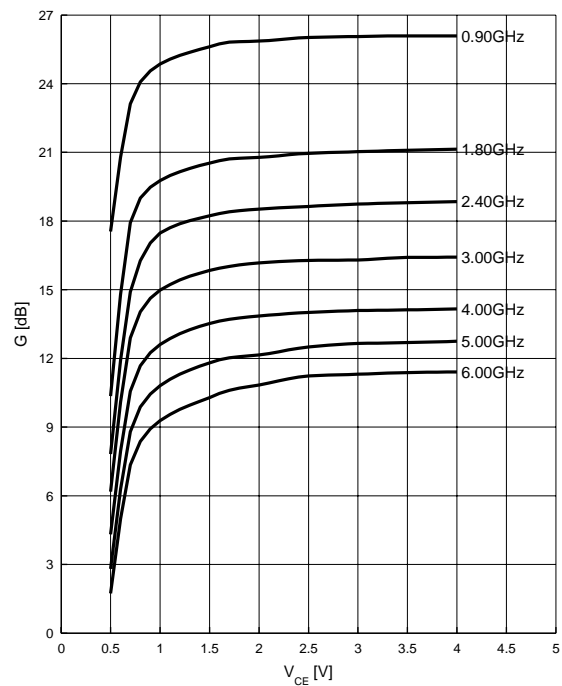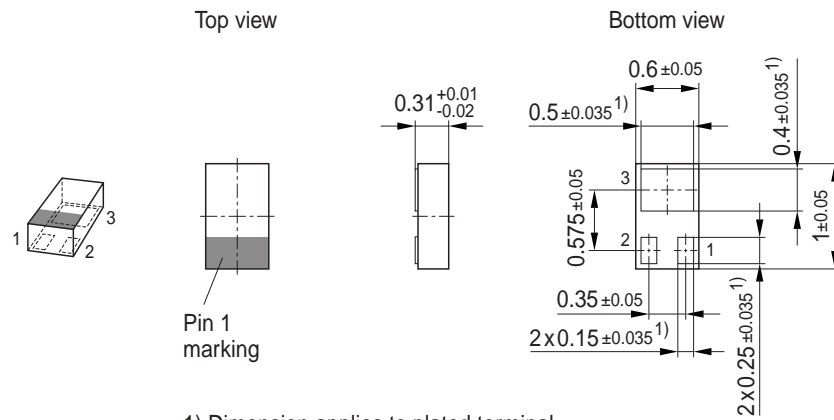
1) Dimension applies to plated terminal

Foot Print

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

0.6

0.45

0.2

1

0.35

0.225

0.225

0.15

R0.19

0.5

0.38

0.255

0.315

0.95

0.2

R0.1

0.2

0.17

■ Copper   ▢ Solder mask   ▨ Stencil apertures

Marking Layout (Example)

R1

BFR705L3RH
Type code

Pin 1 marking
Laser marking
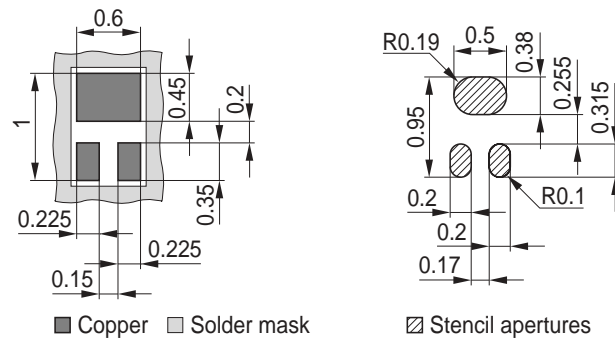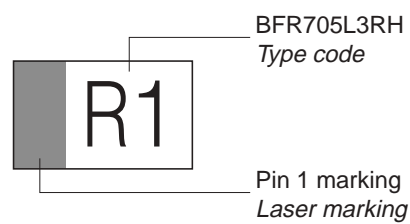
Standard Packing

Reel ø180 mm = 15.000 Pieces/Reel
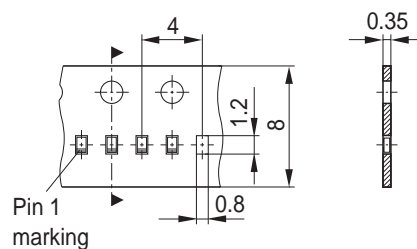
4

0.35

1.2

8

Pin 1 marking

0.8

Attention please!

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Warnings