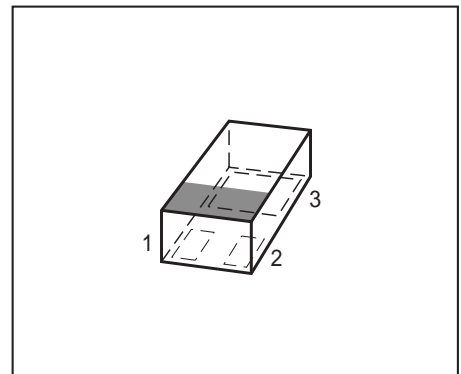


NPN Silicon Germanium RF Transistor

- High gain ultra low noise RF transistor
- Provides outstanding performance for a wide range of wireless applications up to 10 GHz and more
- Ideal for WLAN applications
- Outstanding noise figure $F = 0.5$ dB at 1.8 GHz
Outstanding noise figure $F = 0.8$ dB at 6 GHz
- High maximum stable and available gain
 $G_{ms} = 24.5$ dB at 1.8 GHz, $G_{ma} = 15$ dB at 6 GHz
- Gold metallization for extra high reliability
- 150 GHz f_T -Silicon Germanium technology
- Extremely small and flat leadless package, height 0.32 mm max.
- Pb-free (RoHS compliant) package¹⁾
- Qualified according AEC Q101



ESD (Electrostatic discharge) sensitive device, observe handling precaution!

Type	Marking	Pin Configuration			Package
BFR740L3RH	R9	1=B	2=C	3=E	TSLP-3-9

¹Pb-containing package may be available upon special request

Maximum Ratings

Parameter	Symbol	Value	Unit
Collector-emitter voltage $T_A > 0^\circ\text{C}$ $T_A \leq 0^\circ\text{C}$	V_{CEO}	4 3.5	V
Collector-emitter voltage	V_{CES}	13	
Collector-base voltage	V_{CBO}	13	
Emitter-base voltage	V_{EBO}	1.2	
Collector current	I_{C}	30	mA
Base current	I_{B}	3	
Total power dissipation ¹⁾ $T_{\text{S}} \leq 99^\circ\text{C}$	P_{tot}	160	mW
Junction temperature	T_{j}	150	$^\circ\text{C}$
Ambient temperature	T_{A}	-65 ... 150	
Storage temperature	T_{stg}	-65 ... 150	

Thermal Resistance

Parameter	Symbol	Value	Unit
Junction - soldering point ²⁾	R_{thJS}	≤ 320	K/W

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	

DC Characteristics

Collector-emitter breakdown voltage $I_{\text{C}} = 1 \text{ mA}, I_{\text{B}} = 0$	$V_{(\text{BR})\text{CEO}}$	4	4.7	-	V
Collector-emitter cutoff current $V_{\text{CE}} = 13 \text{ V}, V_{\text{BE}} = 0$	I_{CES}	-	-	30	μA
Collector-base cutoff current $V_{\text{CB}} = 5 \text{ V}, I_{\text{E}} = 0$	I_{CBO}	-	-	100	nA
Emitter-base cutoff current $V_{\text{EB}} = 0.5 \text{ V}, I_{\text{C}} = 0$	I_{EBO}	-	-	3	μA
DC current gain $I_{\text{C}} = 25 \text{ mA}, V_{\text{CE}} = 3 \text{ V}, \text{pulse measured}$	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

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

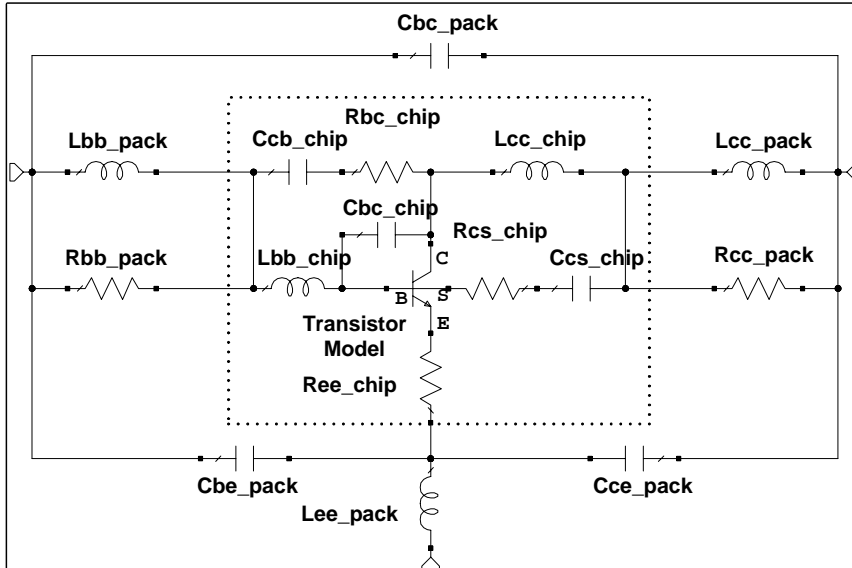
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC Characteristics (verified by random sampling)					
Transition frequency $I_C = 25\text{ mA}$, $V_{CE} = 3\text{ V}$, $f = 2\text{ GHz}$	f_T	-	42	-	GHz
Collector-base capacitance $V_{CB} = 3\text{ V}$, $f = 1\text{ MHz}$, $V_{BE} = 0$, emitter grounded	C_{cb}	-	0.09	0.15	pF
Collector emitter capacitance $V_{CE} = 3\text{ V}$, $f = 1\text{ MHz}$, $V_{BE} = 0$, base grounded	C_{ce}	-	0.18	-	
Emitter-base capacitance $V_{EB} = 0.5\text{ V}$, $f = 1\text{ MHz}$, $V_{CB} = 0$, collector grounded	C_{eb}	-	0.38	-	
Noise figure $I_C = 8\text{ mA}$, $V_{CE} = 3\text{ V}$, $f = 1.8\text{ GHz}$, $Z_S = Z_{Sopt}$ $I_C = 8\text{ mA}$, $V_{CE} = 3\text{ V}$, $f = 6\text{ GHz}$, $Z_S = Z_{Sopt}$	F	-	0.5 0.8	-	dB
Power gain, maximum stable ¹⁾ $I_C = 25\text{ mA}$, $V_{CE} = 3\text{ V}$, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$, $f = 1.8\text{ GHz}$	G_{ms}	-	24.5	-	dB
Power gain, maximum available ¹⁾ $I_C = 25\text{ mA}$, $V_{CE} = 3\text{ V}$, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$, $f = 6\text{ GHz}$	G_{ma}	-	15	-	dB
Transducer gain $I_C = 25\text{ mA}$, $V_{CE} = 3\text{ V}$, $Z_S = Z_L = 50\ \Omega$, $f = 1.8\text{ GHz}$ $f = 6\text{ GHz}$	$ S_{21e} ^2$	-	22 12.5	-	dB
Third order intercept point at output ²⁾ $V_{CE} = 3\text{ V}$, $I_C = 25\text{ mA}$, $Z_S = Z_L = 50\ \Omega$, $f = 1.8\text{ GHz}$	IP_3	-	25	-	dBm
1dB Compression point at output $I_C = 25\text{ mA}$, $V_{CE} = 3\text{ V}$, $Z_S = Z_L = 50\ \Omega$, $f = 1.8\text{ GHz}$	P_{-1dB}	-	11	-	

¹⁾ $G_{ma} = |S_{21e} / S_{12e}| (k - (k^2 - 1)^{1/2})$, $G_{ms} = |S_{21e} / S_{12e}|$
²⁾ IP_3 value depends on termination of all intermodulation frequency components.
Termination used for this measurement is $50\ \Omega$ from 0.1 MHz to 6 GHz

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

IS =	3.84 e-13	mA	BF =	1100	-	NF =	1.018	-
VAF =	400	V	IKF =	512.1	mA	ISE =	4.296 e-12	mA
NE =	1.586	-	BR =	62	-	NR =	1	-
VAR =	1.28	V	IKR =	5	mA	ISC =	3.85 e-12	mA
NC =	1.5	-	RB =	3.23	Ω	IRB =	10	A
RBM =	1.69	Ω	RE =	90	m Ω	RC =	6.88	Ω
CJE =	0.22	pF	VJE =	0.59	V	MJE =	0.07	-
TF =	0.00215	ns	XTF =	3	-	VTF =	1.32	V
ITF =	290	mA	PTF =	0.1	-	CJC =	0.0995	pF
VJC =	0.55	V	MJC =	0.152	-	XCJC =	0.01	-
TR =	0.013	ns	CJS =	0.0797	pF	VJS =	0.57	V
MJS =	0.18	-	XTB =	-2.2	-	EG =	1.11	
XTI =	0.91	-	FC =	0.959	-	TNOM	25	$^{\circ}\text{C}$
AF =	1	-	KF =	0	-			

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

Package Equivalent Circuit:


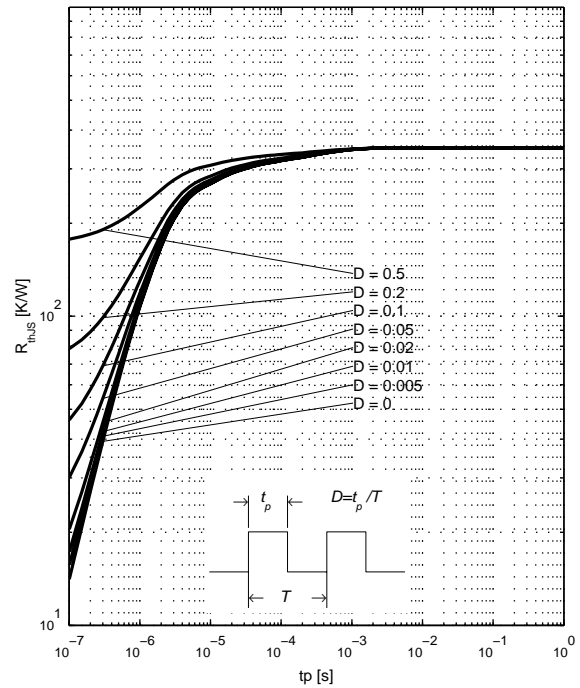
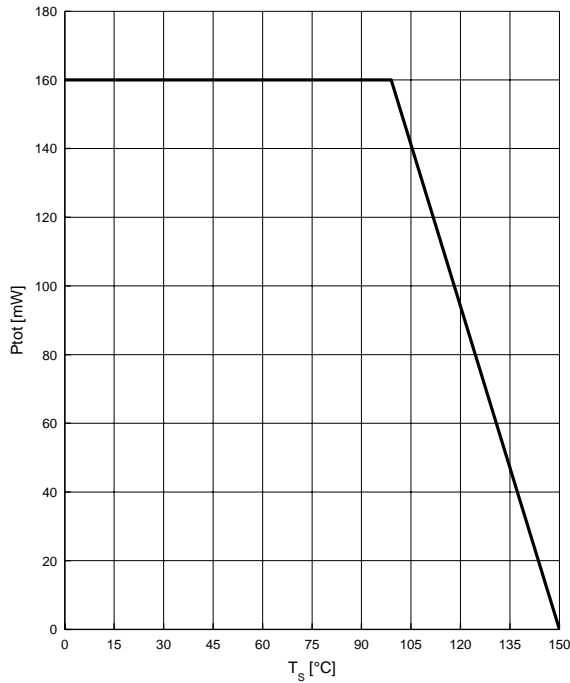
L_{bb_chip}	=	0.1935	nH
L_{cc_chip}	=	0.1822	nH
L_{ee_pack}	=	0.2266	nH
L_{bb_pack}	=	0.1064	nH
L_{cc_pack}	=	0.001945	nH
C_{bc_chip}	=	0.015	pF
C_{cb_chip}	=	0.0269	pF
C_{bc_pack}	=	0.00152	pF
C_{be_pack}	=	0.0314	pF
C_{ce_pack}	=	0.2256	pF
C_{cs_chip}	=	0.1545	pF
R_{bc_chip}	=	67230	Ω
R_{ee_chip}	=	0.76	Ω
R_{bb_pack}	=	0.52	Ω
R_{cc_pack}	=	0.572	Ω
R_{cs_pack}	=	0.116	Ω

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>

Valid up to 6GHz

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

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

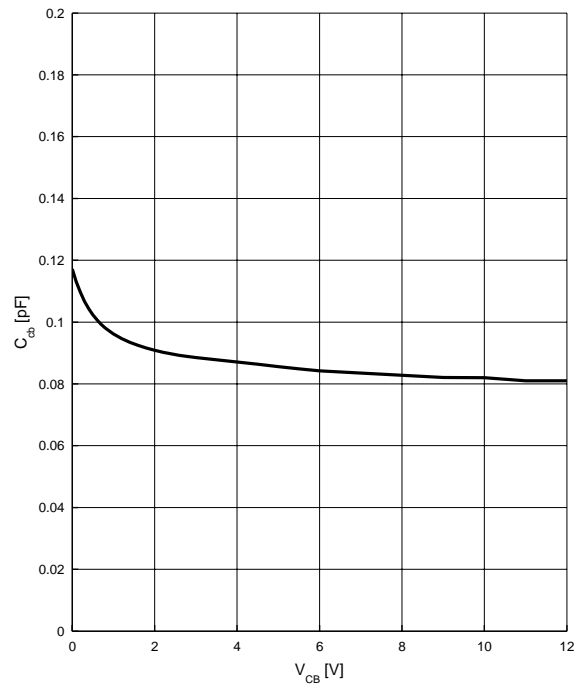
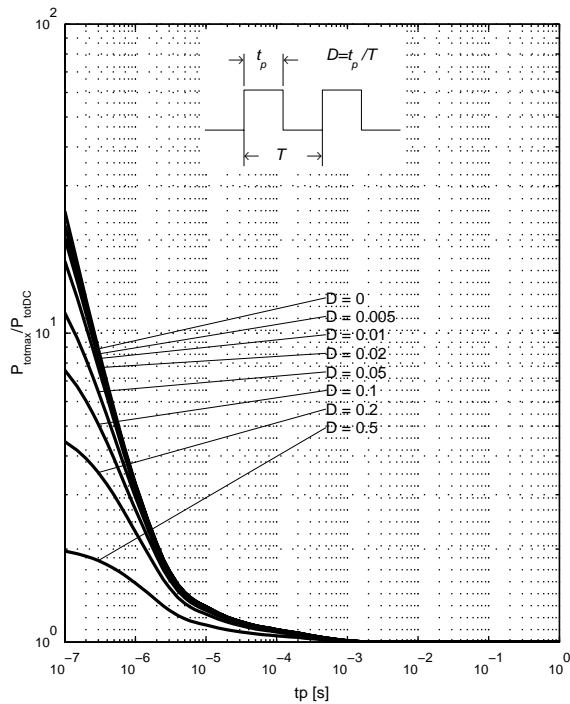


Permissible Pulse Load

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

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

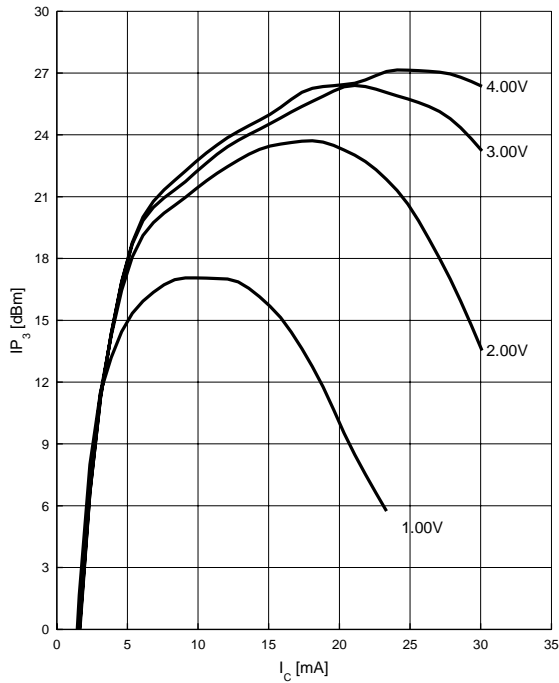
$f = 1$ MHz



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

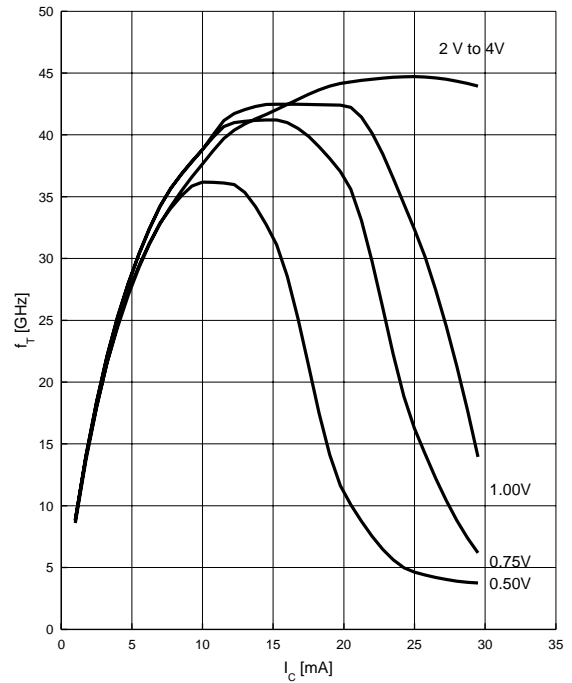
(Output, $Z_S = Z_L = 50 \Omega$)

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



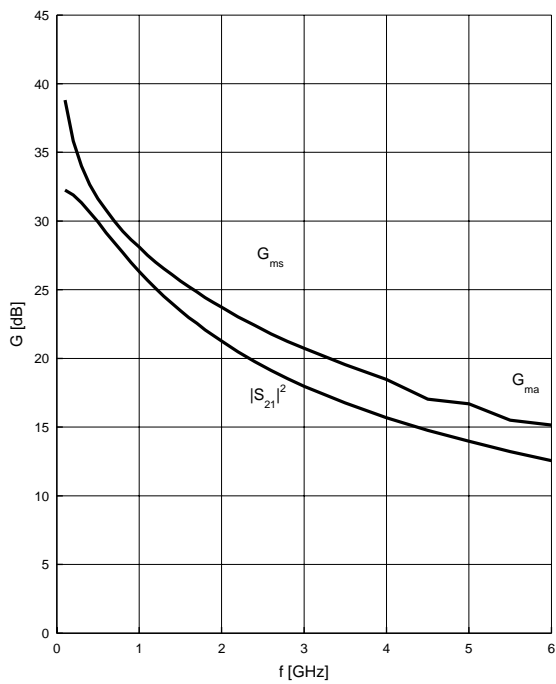
Transition frequency $f_T = f(I_C)$

$V_{CE} = \text{parameter}, f = 2 \text{ GHz}$



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

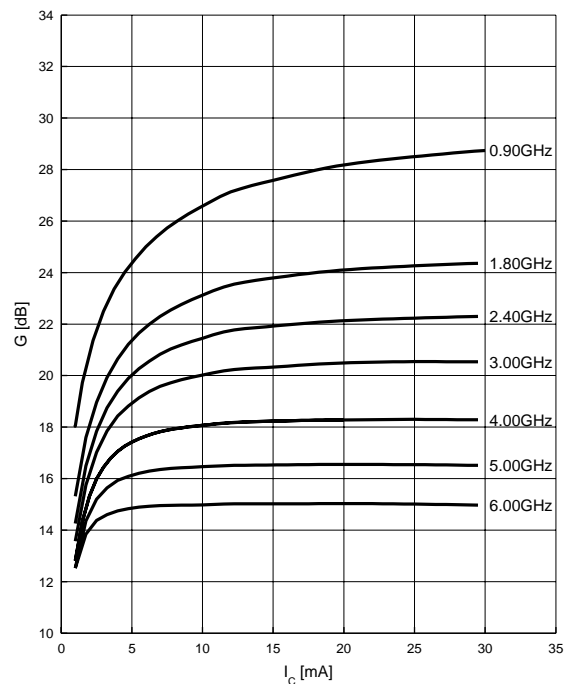
$V_{CE} = 3 \text{ V}, I_C = 25 \text{ mA}$



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

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

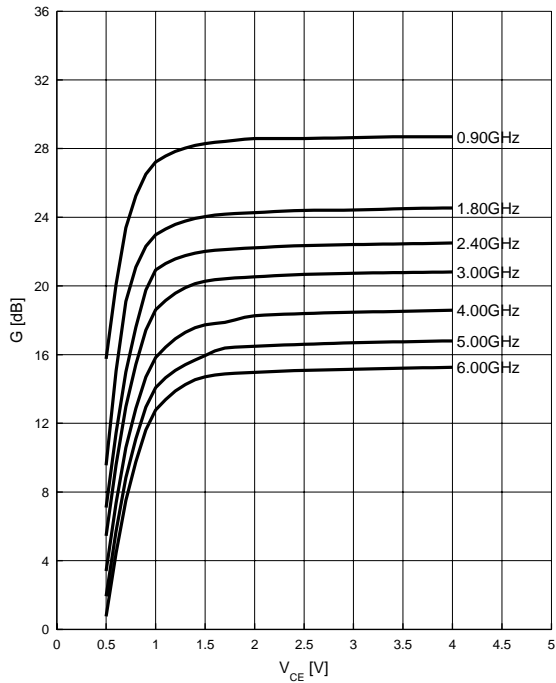
$f = \text{parameter}$



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

$I_C = 25 \text{ mA}$

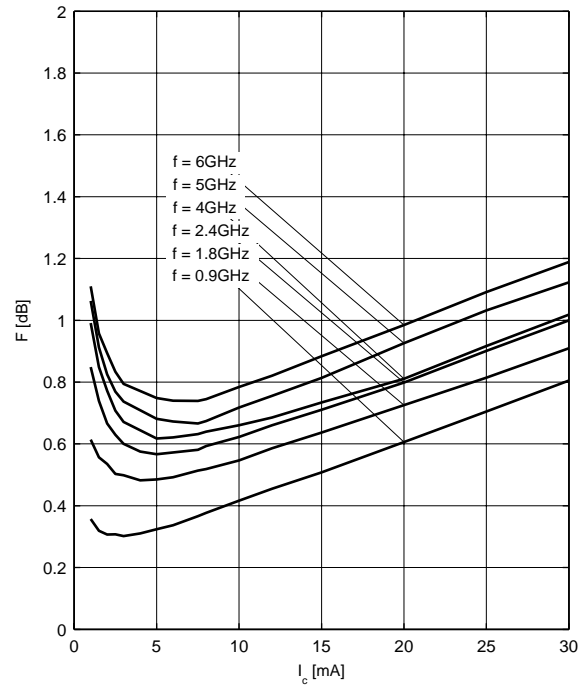
$f = \text{parameter}$



Noise figure $F = f(I_C)$

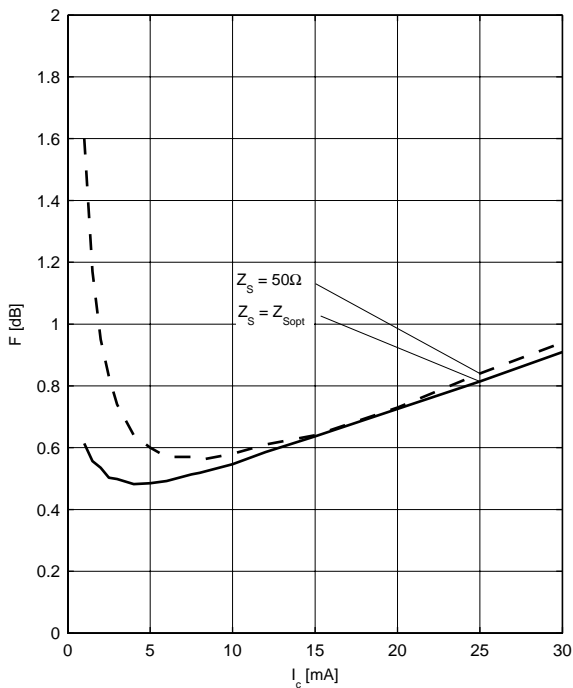
$V_{CE} = 3 \text{ V}$, $f = \text{parameter}$

$Z_S = Z_{Sopt}$



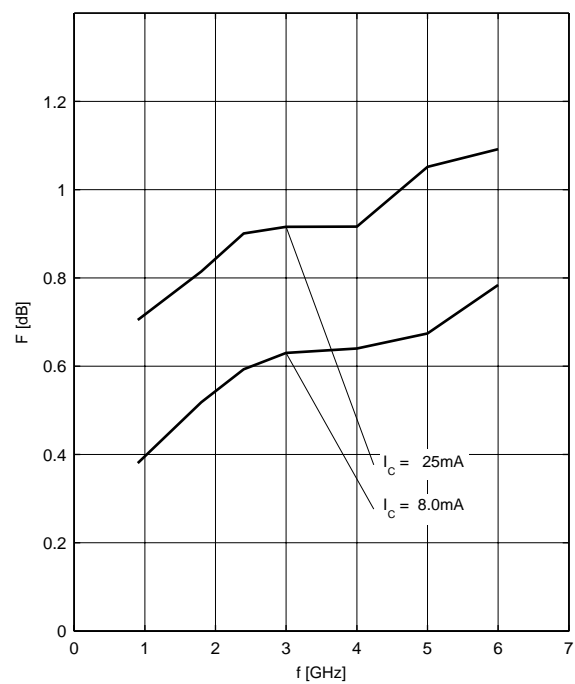
Noise figure $F = f(I_C)$

$V_{CE} = 3 \text{ V}$, $f = 1.8 \text{ GHz}$



Noise figure $F = f(f)$

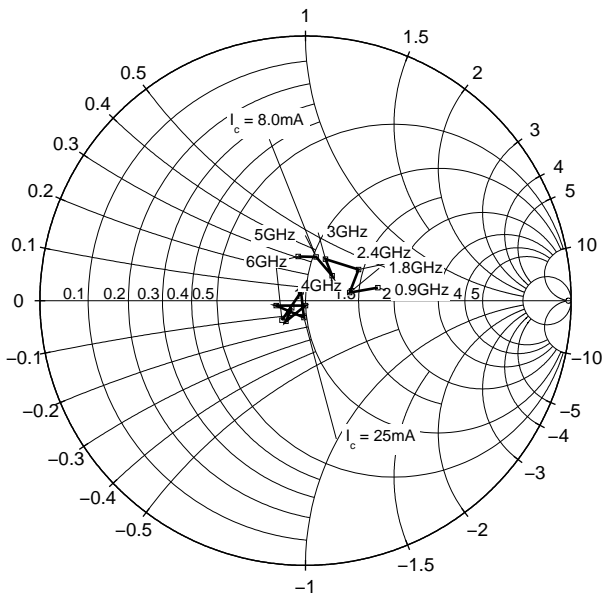
$V_{CE} = 3 \text{ V}$, $Z_S = Z_{Sopt}$



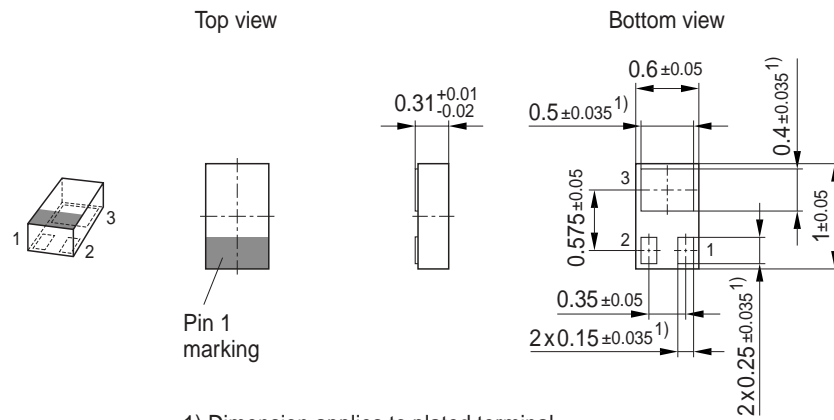
Source impedance for min.

noise figure vs. frequency

$V_{CE} = 3\text{ V}$, $I_C = 8\text{ mA} / 25\text{ mA}$



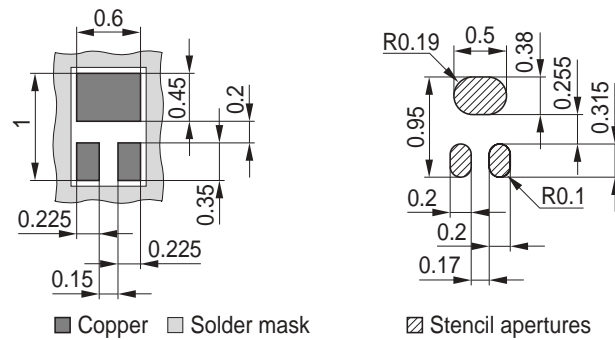
Package Outline



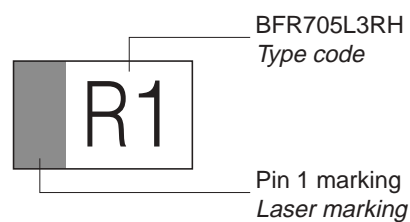
1) Dimension applies to plated terminal

Foot Print

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

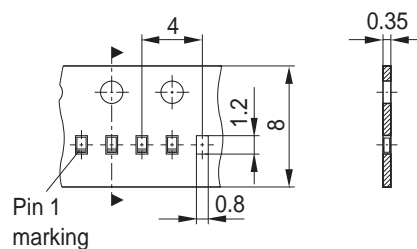


Marking Layout (Example)



Standard Packing

Reel ø180 mm = 15.000 Pieces/Reel



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