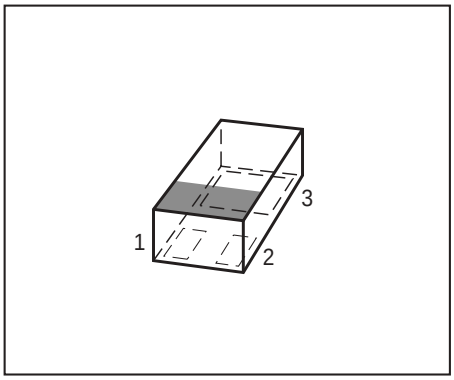
NPN Silicon Germanium RF Transistor



- 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
- Extremly small and flat leadless package, height 0.32 mm max.
- Pb-free (RoHS compliant) package[1)]
- Qualified according AEC Q101

AEC Qualified RoHS

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

Type	Marking	Pin Configuration			Package
BFR740L3RH	R9	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	30	mA
Base current	I_B	3	
Total power dissipation[1)]	P_{tot}	160	mW
$T_S \leq 99°C$			
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}	≤ 320	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	$V_{(BR)CEO}$	4	4.7	-	V
I_C = 1 mA, I_B = 0					
Collector-emitter cutoff current	I_{CES}	-	-	30	µA
V_{CE} = 13 V, V_{BE} = 0					
Collector-base cutoff current	I_{CBO}	-	-	100	nA
V_{CB} = 5 V, I_E = 0					
Emitter-base cutoff current	I_{EBO}	-	-	3	µA
V_{EB} = 0.5 V, I_C = 0					
DC current gain	h_{FE}	160	250	400	-
I_C = 25 mA, V_{CE} = 3 V, pulse measured					

[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°C, unless otherwise specified

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

[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

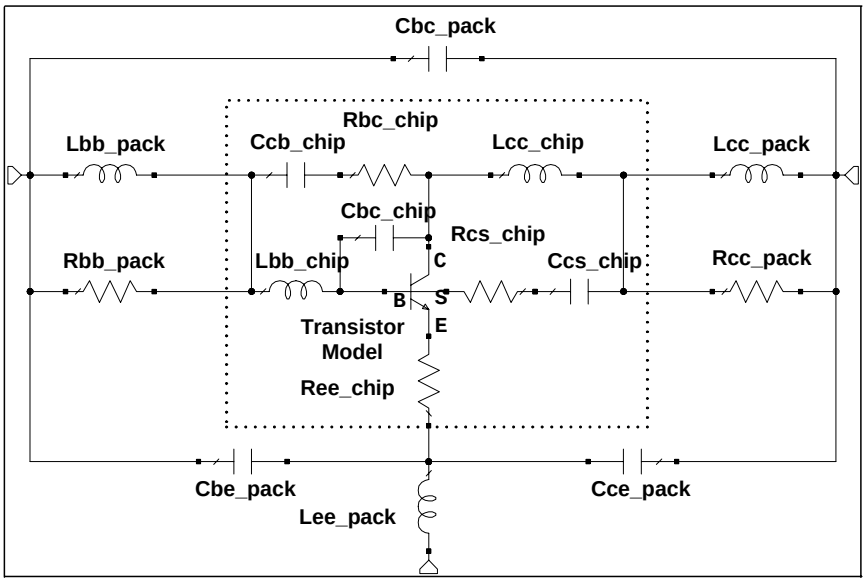
SPICE Parameter (Gummel-Poon Model, Berkley-SPICE 2G.6 Syntax):

Transistor Chip Data:

IS =	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	mΩ	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	°C
AF =	1	-	KF =	0				

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

Package Equivalent Circuit:

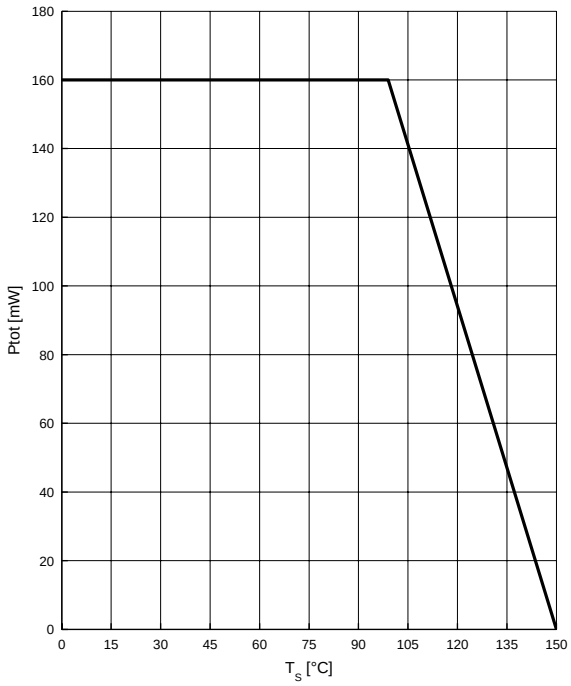


L_{bb_chip} =	0.1935	nH
L_{cc_chip} =	0.1822	nH
L_{ee_pack} =	0.2266	nH
L_{bb_pack} =	0.1064	nH
L_{cc_pack} =	0.001945	nH
C_{bc_chip} =	0.015	pF
C_{cb_chip} =	0.0269	pF
C_{bc_pack} =	0.00152	pF
C_{be_pack} =	0.0314	pF
C_{ce_pack} =	0.2256	pF
C_{cs_chip} =	0.1545	pF
R_{bc_chip} =	67230	Ω
R_{ee_chip} =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

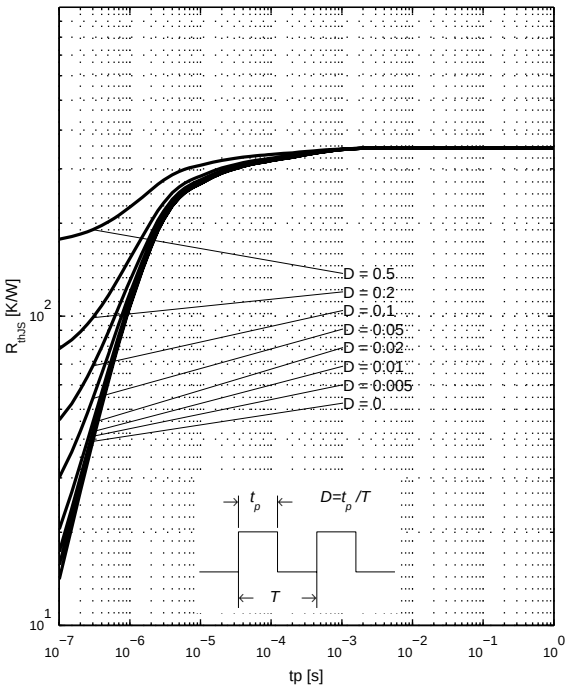
Valid up to 6GHz

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 $P_{tot} = f(T_S)$

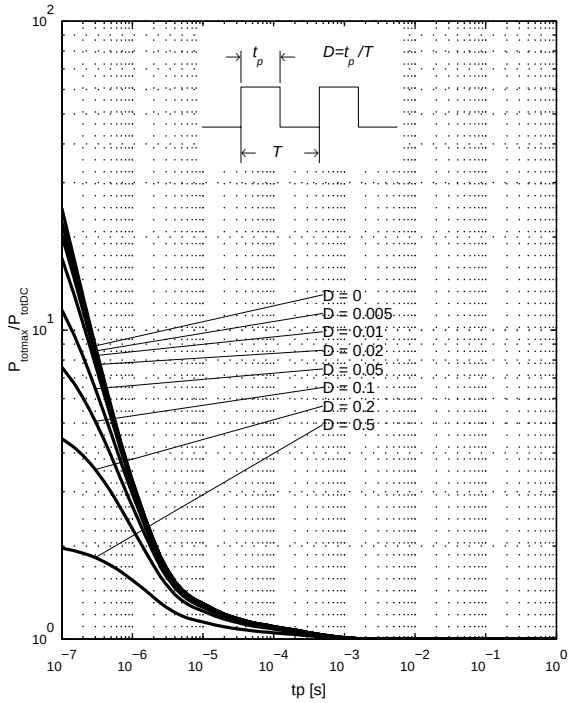


Permissible Puls Load $R_{thJS} = f(t_p)$



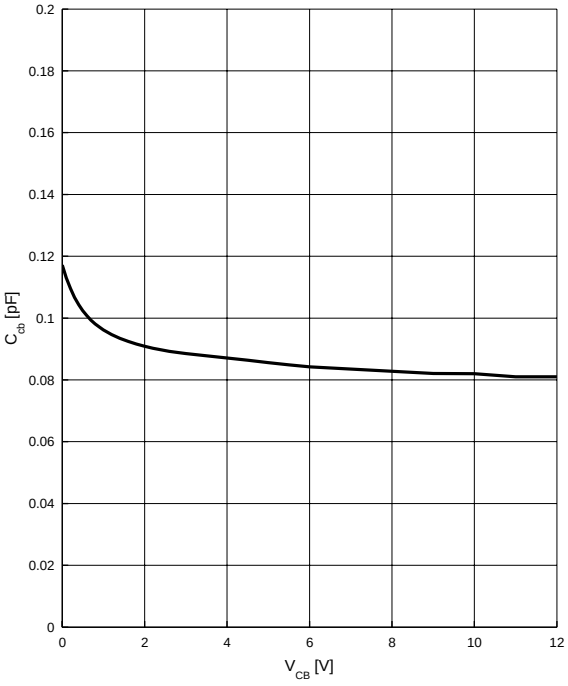
Permissible Pulse Load

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



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

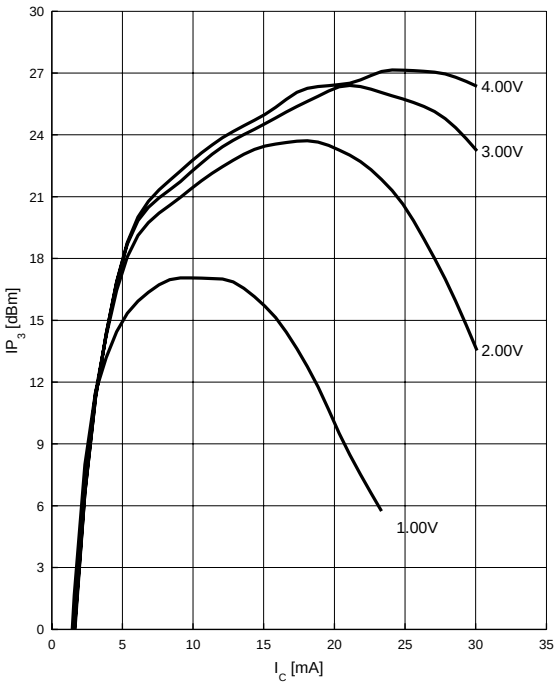
f = 1 MHz



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

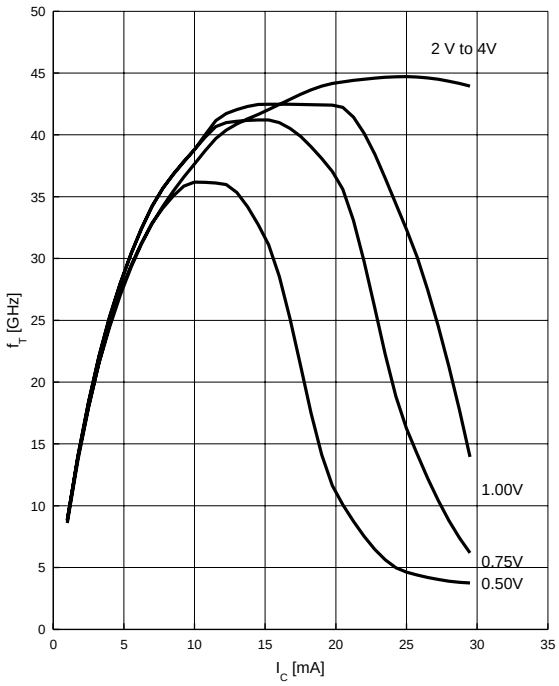
(Output, $Z_S = Z_L = 50\ \Omega$)

V_{CE} = parameter, f = 1.8 GHz



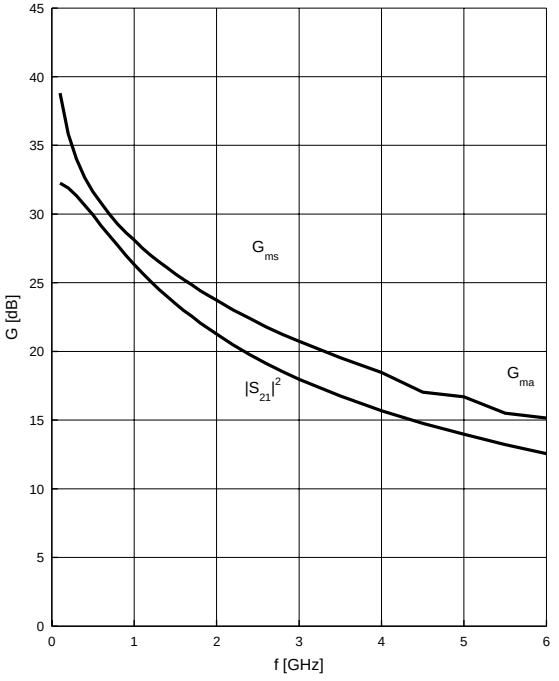
Transition frequency $f_T = f(I_C)$

V_{CE} = parameter, f = 2 GHz



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

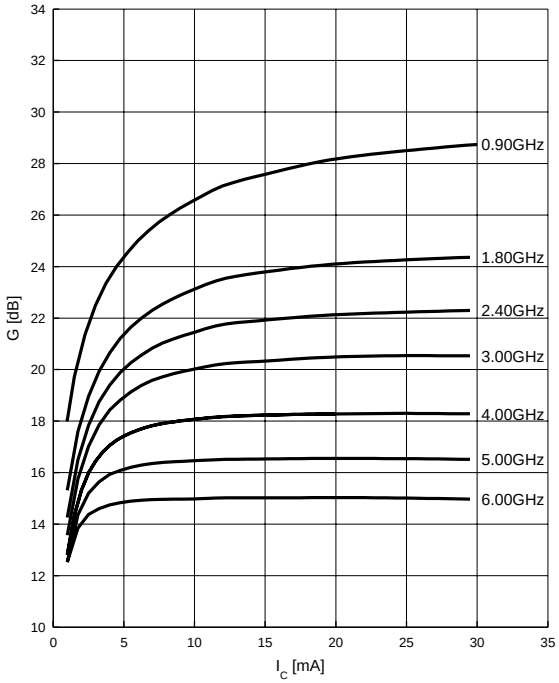
V_{CE} = 3 V, I_C = 25 mA



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

V_{CE} = 3 V

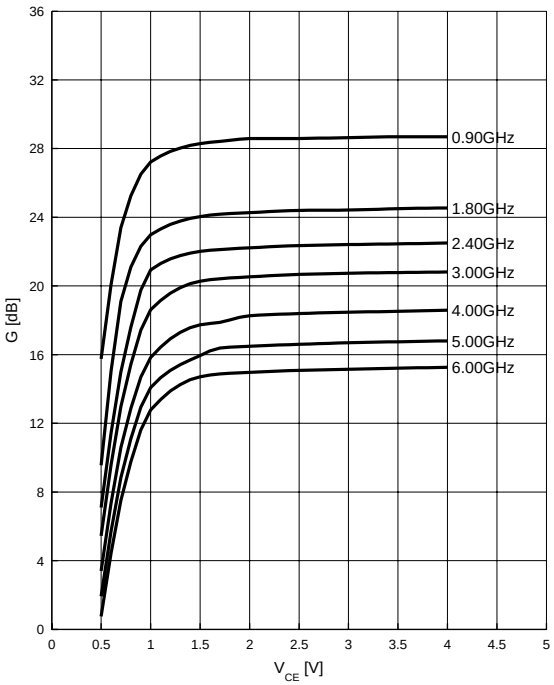
f = parameter



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

I_C = 25 mA

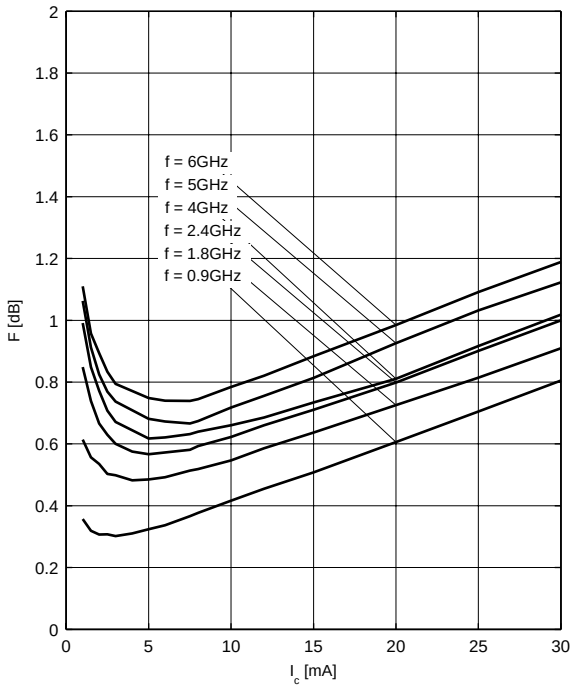
f = parameter



Noise figure $F = f(I_C)$

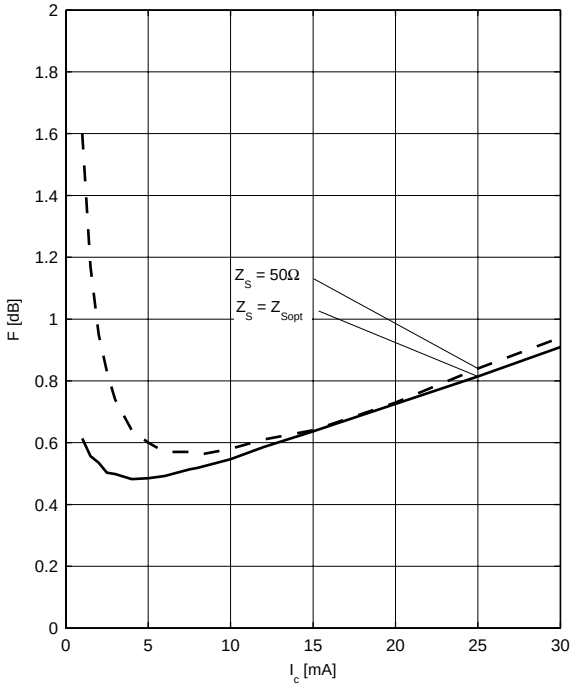
V_{CE} = 3 V, f = parameter

$Z_S = Z_{Sopt}$



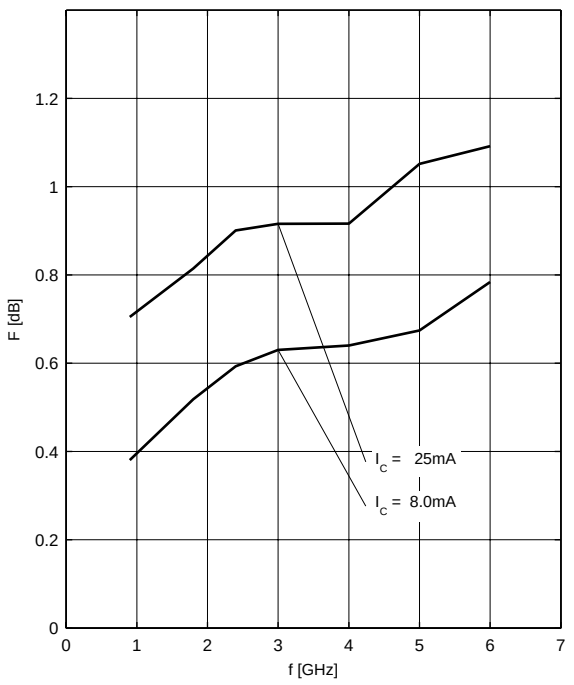
Noise figure $F = f(I_C)$

V_{CE} = 3V, f = 1.8 GHz

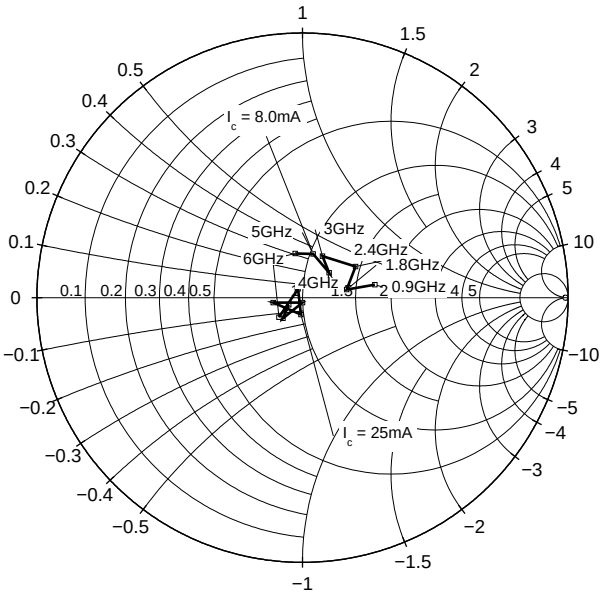


Noise figure $F = f(f)$

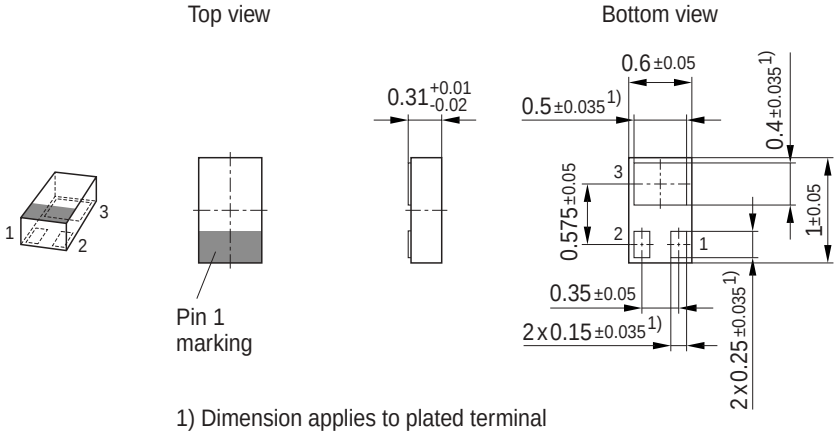
V_{CE} = 3V, $Z_S = Z_{Sopt}$



Source impedance for min.
noise figure vs. frequency
V_{CE} = 3 V, I_C = 8 mA / 25 mA



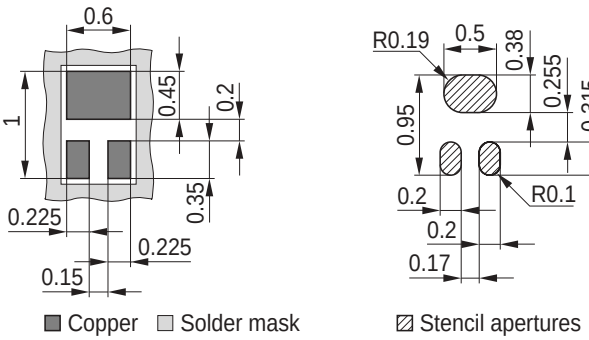
Package Outline



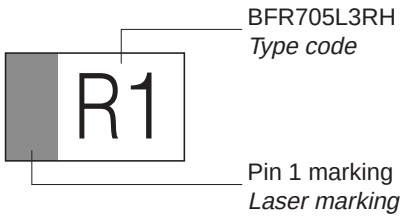
1) Dimension applies to plated terminal

Foot Print

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

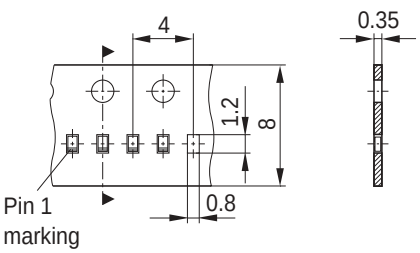


Marking Layout (Example)



Standard Packing

Reel ø180 mm = 15.000 Pieces/Reel



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