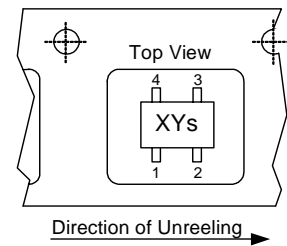
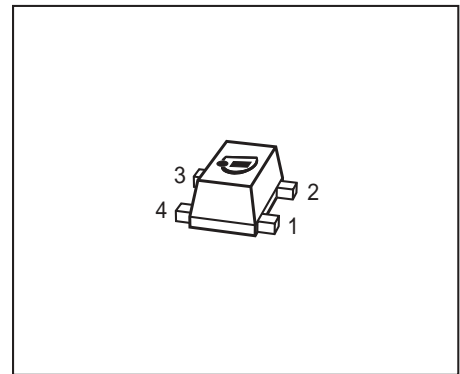


NPN Silicon Germanium RF Transistor*

- High gain low noise RF transistor
- Small package 1.4 x 0.8 x 0.59 mm
- Outstanding noise figure $F = 0.7$ dB at 1.8 GHz
Outstanding noise figure $F = 1.3$ dB at 6 GHz
- Maximum stable gain
 $G_{ms} = 21$ dB at 1.8 GHz
 $G_{ma} = 10$ dB at 6 GHz
- Gold metallization for extra high reliability
- Pb-free (RoHS compliant) package¹⁾
- Qualified according AEC Q101

* Short term description



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

Type	Marking	Pin Configuration						Package
BFP620F	R2s	1=B	2=E	3=C	4=E	-	-	TSFP-4

Maximum Ratings

Parameter	Symbol	Value	Unit
Collector-emitter voltage	V_{CEO}		V
$T_A > 0$ °C		2.3	
$T_A \leq 0$ °C		2.1	
Collector-emitter voltage	V_{CES}	7.5	
Collector-base voltage	V_{CBO}	7.5	
Emitter-base voltage	V_{EBO}	1.2	
Collector current	I_C	80	mA
Base current	I_B	3	
Total power dissipation ²⁾	P_{tot}	185	mW
$T_S \leq 96$ °C			
Junction temperature	T_j	150	°C
Ambient temperature	T_A	-65 ... 150	
Storage temperature	T_{stg}	-65 ... 150	

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

Thermal Resistance

Parameter	Symbol	Value	Unit
Junction - soldering point ¹⁾	R_{thJS}	≤ 290	K/W

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	

DC Characteristics

Collector-emitter breakdown voltage $I_C = 1 \text{ mA}, I_B = 0$	$V_{(BR)CEO}$	2.3	2.8	-	V
Collector-emitter cutoff current $V_{CE} = 7.5 \text{ V}, V_{BE} = 0$	I_{CES}	-	-	10	μA
Collector-base cutoff current $V_{CB} = 5 \text{ V}, I_E = 0$	I_{CBO}	-	-	100	nA
Emitter-base cutoff current $V_{EB} = 0.5 \text{ V}, I_C = 0$	I_{EBO}	-	-	3	μA
DC current gain $I_C = 50 \text{ mA}, V_{CE} = 1.5 \text{ V}$, pulse measured	h_{FE}	110	180	270	-

¹⁾For calculation of R_{thJA} please refer to Application Note Thermal Resistance

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

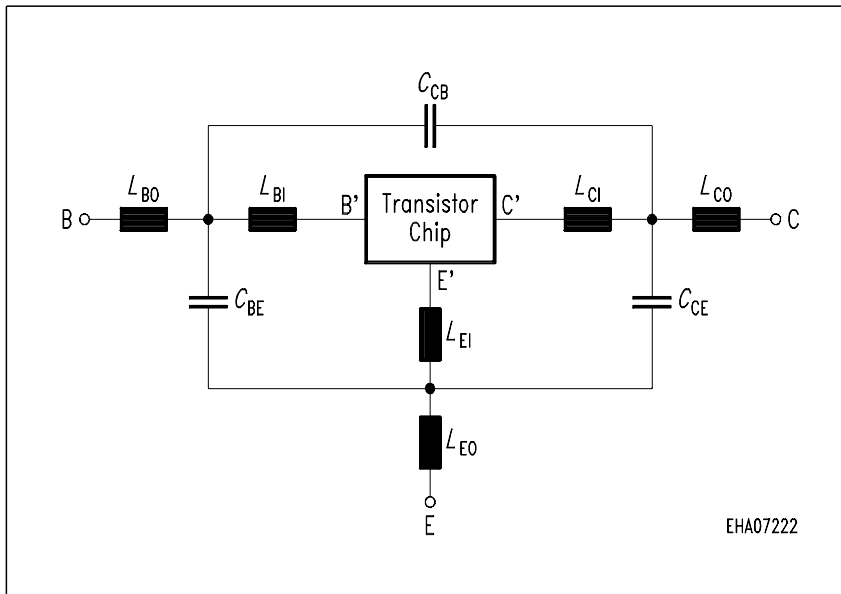
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC Characteristics (verified by random sampling)					
Transition frequency $I_C = 50\text{ mA}$, $V_{CE} = 1.5\text{ V}$, $f = 1\text{ GHz}$	f_T	-	65	-	GHz
Collector-base capacitance $V_{CB} = 2\text{ V}$, $f = 1\text{ MHz}$, $V_{BE} = 0$, emitter grounded	C_{cb}	-	0.12	0.2	pF
Collector emitter capacitance $V_{CE} = 2\text{ V}$, $f = 1\text{ MHz}$, $V_{BE} = 0$, base grounded	C_{ce}	-	0.2	-	
Emitter-base capacitance $V_{EB} = 0.5\text{ V}$, $f = 1\text{ MHz}$, $V_{CB} = 0$, collector grounded	C_{eb}	-	0.45	-	
Noise figure $I_C = 5\text{ mA}$, $V_{CE} = 1.5\text{ V}$, $f = 1.8\text{ GHz}$, $Z_S = Z_{Sopt}$ $I_C = 5\text{ mA}$, $V_{CE} = 1.5\text{ V}$, $f = 6\text{ GHz}$, $Z_S = Z_{Sopt}$	F	-	0.7 1.3	-	dB
Power gain, maximum stable ¹⁾ $I_C = 50\text{ mA}$, $V_{CE} = 1.5\text{ V}$, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$, $f = 1.8\text{ GHz}$	G_{ms}	-	21	-	dB
Power gain, maximum available ¹⁾ $I_C = 50\text{ mA}$, $V_{CE} = 1.5\text{ V}$, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$, $f = 6\text{ GHz}$	G_{ma}	-	10	-	dB
Transducer gain $I_C = 50\text{ mA}$, $V_{CE} = 1.5\text{ V}$, $Z_S = Z_L = 50\ \Omega$, $f = 1.8\text{ GHz}$ $f = 6\text{ GHz}$	$ S_{21e} ^2$	-	19.5 9.5	-	dB
Third order intercept point at output ²⁾ $V_{CE} = 2\text{ V}$, $I_C = 50\text{ mA}$, $Z_S = Z_L = 50\ \Omega$, $f = 1.8\text{ GHz}$	IP_3	-	25	-	dBm
1dB Compression point at output $I_C = 50\text{ mA}$, $V_{CE} = 2\text{ V}$, $Z_S = Z_L = 50\ \Omega$, $f = 1.8\text{ GHz}$	P_{-1dB}	-	14	-	

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 =	0.22	fA	BF =	425	-	NF =	1.025	-
VAF =	1000	V	IKF =	0.25	A	ISE =	21	fA
NE =	2	-	BR =	50	-	NR =	1	-
VAR =	2	V	IKR =	10	mA	ISC =	18	pA
NC =	2	-	RB =	3.129	Ω	IRB =	1.522	mA
RBM =	2.707	Ω	RE =	0.6	-	RC =	2.364	Ω
CJE =	250.7	fF	VJE =	0.75	V	MJE =	0.3	-
TF =	1.43	ps	XTF =	10	-	VTF =	1.5	V
ITF =	2.4	A	PTF =	0	deg	CJC =	124.9	fF
VJC =	0.6	V	MJC =	0.5	-	XCJC =	1	-
TR =	0.2	ns	CJS =	128.1	fF	VJS =	0.52	V
MJS =	0.5	-	NK =	-1.42	-	EG =	1.078	eV
XTI =	3	-	FC =	0.8	-	TNOM	298	K
AF =	2	-	KF =	7.291E-11	-			
TITF1	-0.0065	-	TITF2	1.0E-5	-			

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

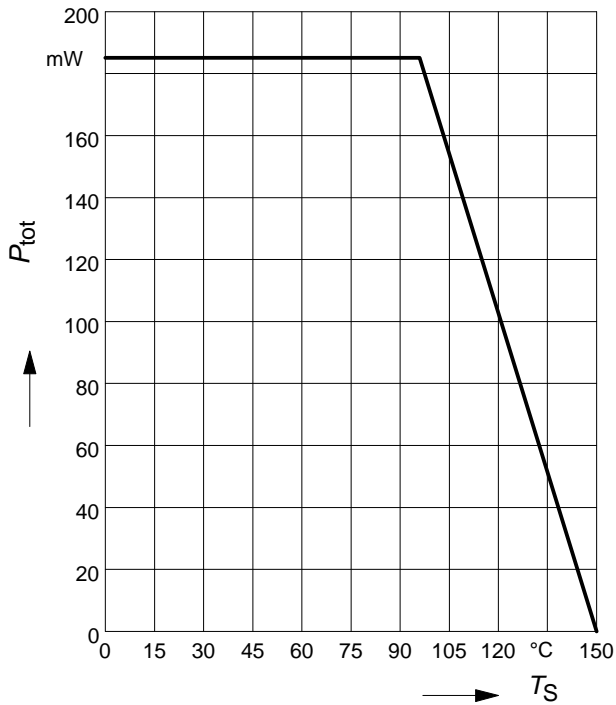
Package Equivalent Circuit:


To avoid high complexity of the package equivalent circuit, both emitter leads of TSFP-4 are combined in one electrical connection. R_{Lx} are series resistors for the inductances L_{xI} and K_{xa-yb} are the coupling coefficients between the inductances L_{xa} and L_{yb} .

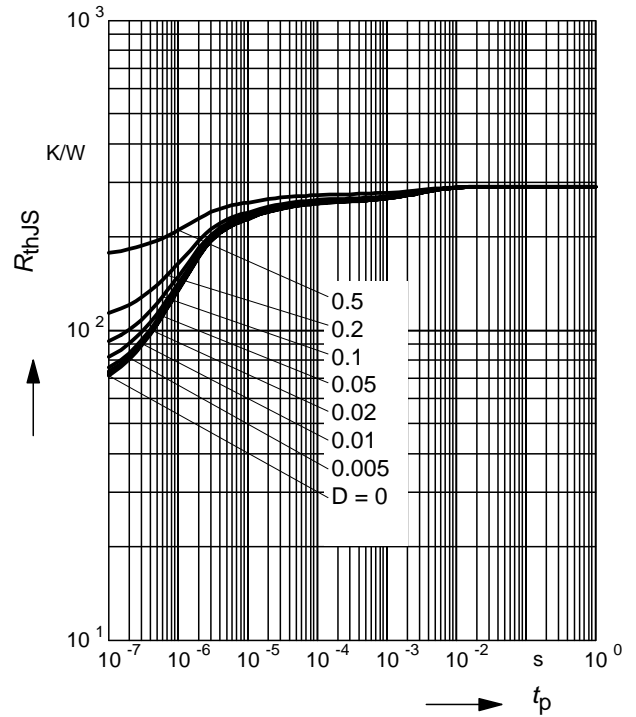
L_{B0} =	0.22	nH
L_{E0} =	0.28	nH
L_{C0} =	0.22	nH
K_{B0-E0} =	0.1	-
K_{B0-C0} =	0.01	-
K_{E0-C0} =	0.11	-
C_{BE} =	34	fF
C_{BC} =	2	fF
C_{CE} =	33	fF
L_{BI} =	0.42	nH
R_{LBI} =	0.15	Ω
L_{EI} =	0.26	nH
R_{LEI} =	0.11	Ω
L_{CI} =	0.35	nH
R_{LI} =	0.13	Ω
K_{BI-EI} =	-0.05	-
K_{BI-CI} =	-0.08	-
K_{EI-CI} =	0.2	-

Valid up to 6GHz

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

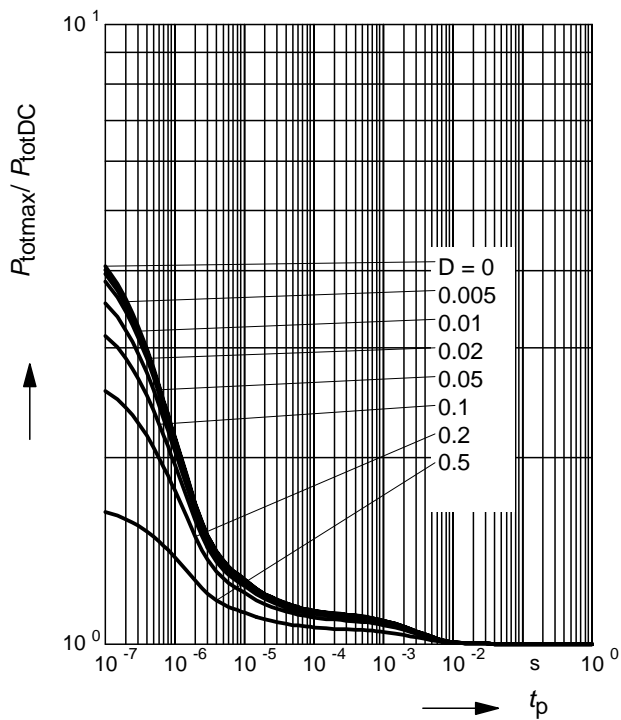


Permissible Pulse Load $R_{thJS} = f(t_p)$



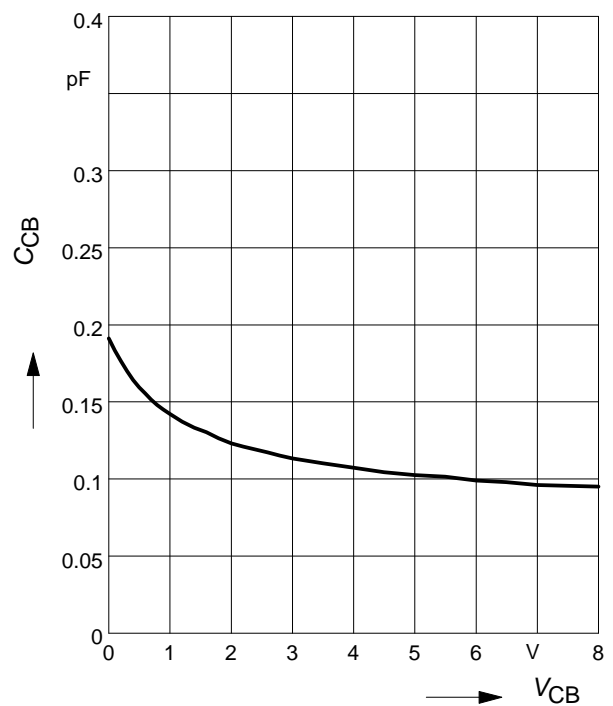
Permissible Pulse Load

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



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

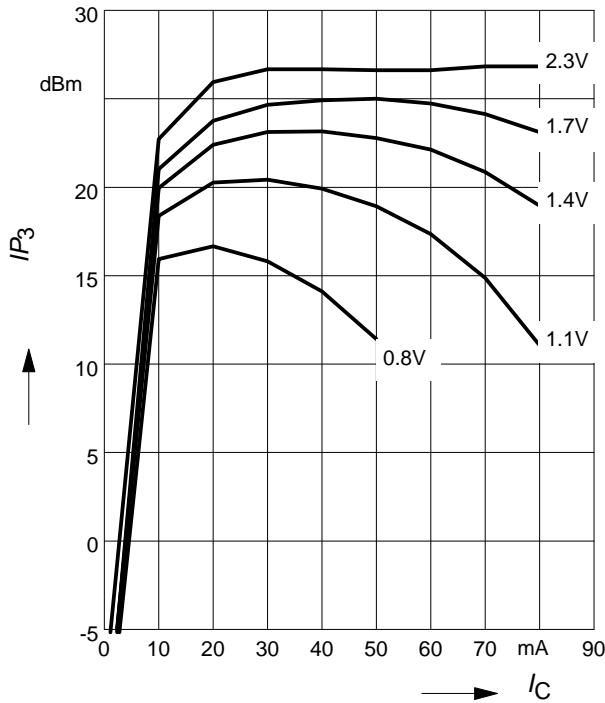
$f = 1\text{MHz}$



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

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

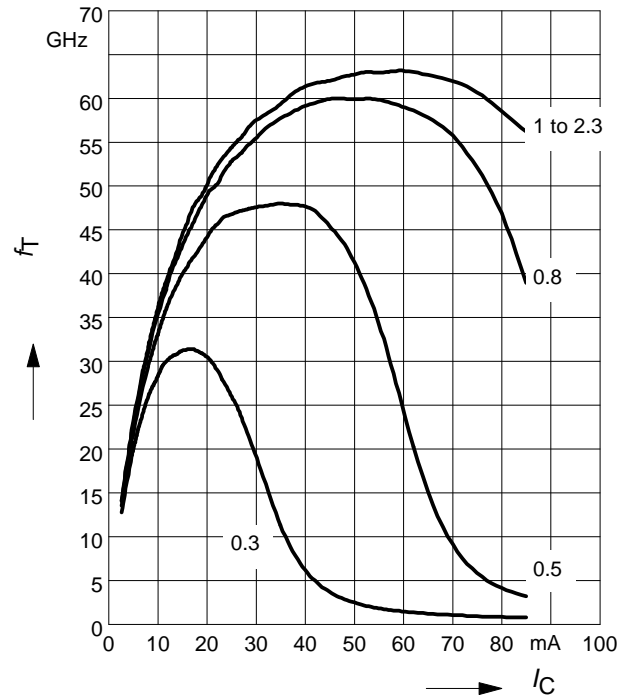
V_{CE} = parameter, $f=1.8\text{GHz}$



Transition frequency $f_T=f(I_C)$

$f = 1\text{GHz}$

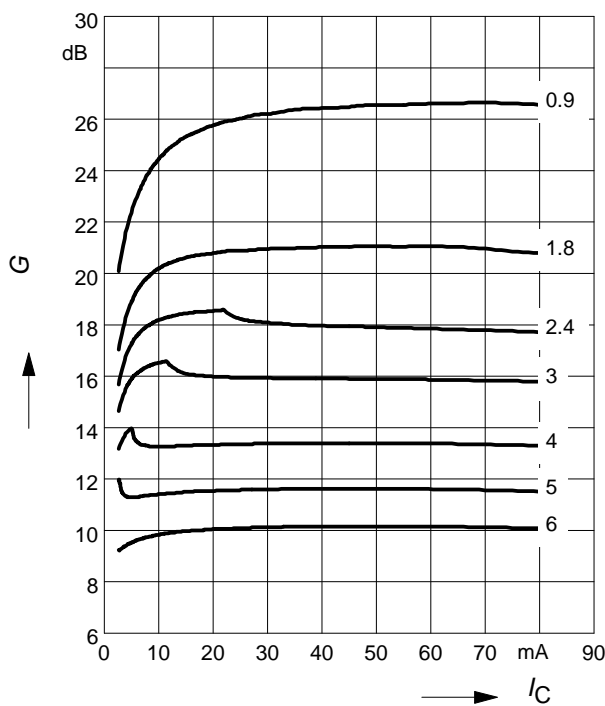
V_{CE} = Parameter in V



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

$V_{CE} = 1.5\text{V}$

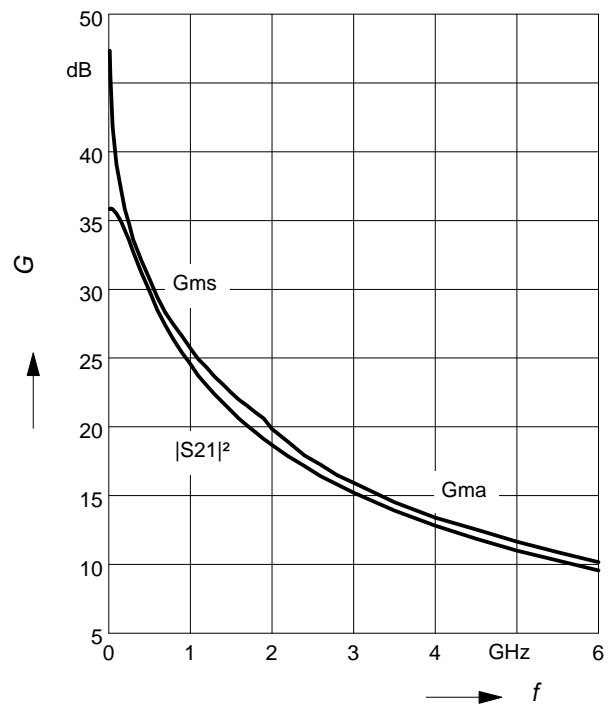
f = Parameter in GHz



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

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

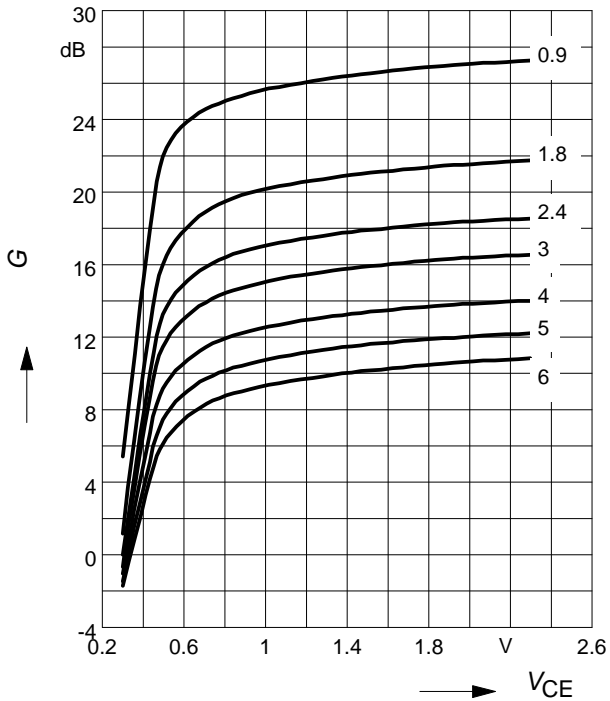
$V_{CE} = 1.5\text{V}, I_C = 50\text{mA}$



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

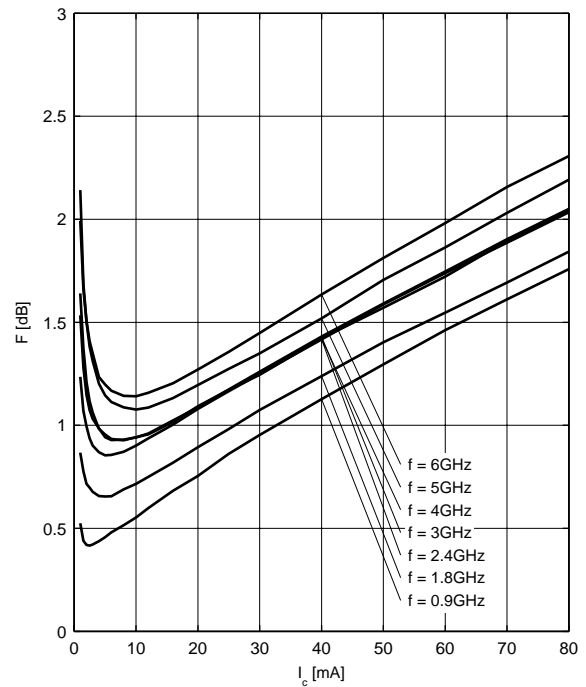
$I_C = 50\text{mA}$

$f = \text{Parameter in GHz}$



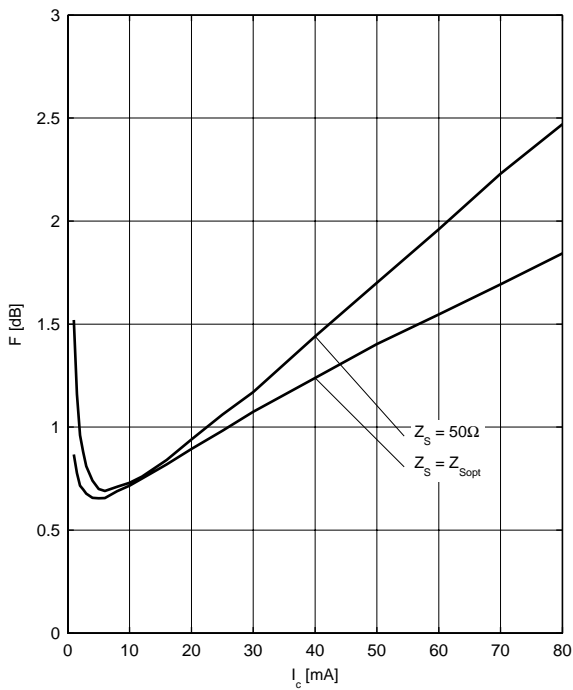
Noise figure $F = f(I_C)$

$V_{CE} = 1.5\text{V}$, $Z_S = Z_{Sopt}$



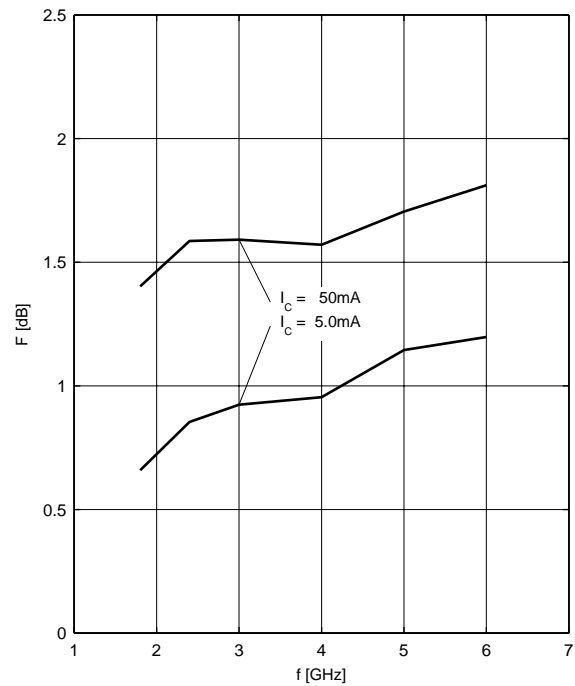
Noise figure $F = f(I_C)$

$V_{CE} = 1.5\text{V}$, $f = 1.8\text{ GHz}$



Noise figure $F = f(f)$

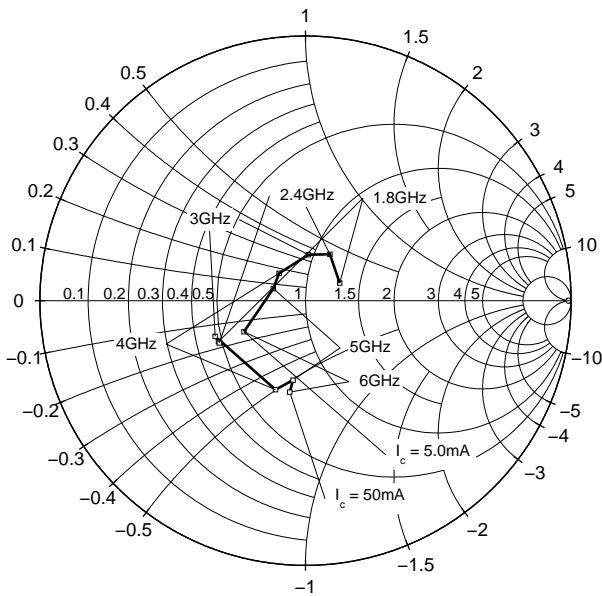
$V_{CE} = 1.5\text{V}$, $Z_S = Z_{Sopt}$



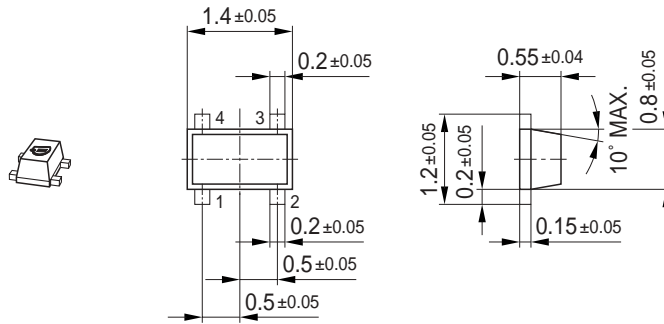
Source impedance for min.

noise figure vs. frequency

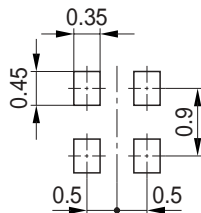
$V_{CE} = 1.5V, I_C = 5.0mA/50.0mA$



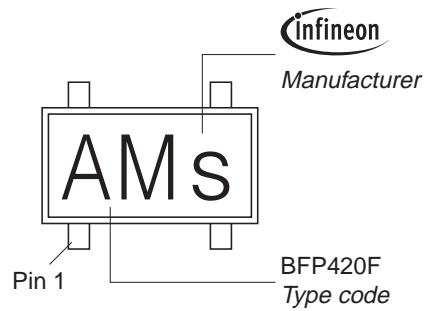
Package Outline



Foot Print

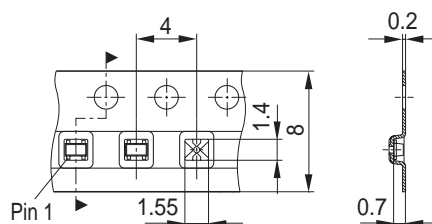


Marking Layout (Example)



Standard Packing

Reel \varnothing 180 mm = 3.000 Pieces/Reel
 Reel \varnothing 330 mm = 10.000 Pieces/Reel



Edition 2006-02-01

Published by

Infineon Technologies AG

81726 München, Germany

© Infineon Technologies AG 2007.

All Rights Reserved.

Attention please!

The information given in this dokument shall in no event be regarded as a guarantee of conditions or characteristics ("Beschaffenheitsgarantie"). With respect to any examples or hints given herein, any typical values stated herein and/or any information regarding the application of the device, Infineon Technologies hereby disclaims any and all warranties and liabilities of any kind, including without limitation warranties of non-infringement of intellectual property rights of any third party.

Information

For further information on technology, delivery terms and conditions and prices please contact your nearest Infineon Technologies Office (www.infineon.com).

Warnings

Due to technical requirements components may contain dangerous substances. For information on the types in question please contact your nearest Infineon Technologies Office.

Infineon Technologies Components may only be used in life-support devices or systems with the express written approval of Infineon Technologies, if a failure of such components can reasonably be expected to cause the failure of that life-support device or system, or to affect the safety or effectiveness of that device or system.

Life support devices or systems are intended to be implanted in the human body, or to support and/or maintain and sustain and/or protect human life. If they fail, it is reasonable to assume that the health of the user or other persons may be endangered.