

Low Noise SiGe:C Bipolar RF Transistor

- Highly linear low noise RF transistor
- Provides outstanding performance for a wide range of wireless applications
- Based on Infineon's reliable high volume Silicon Germanium technology
- Ideal for CDMA and WLAN applications
- Collector design provides high linearity of 14.5 dBm OP1dB for low voltage application
- Maximum stable gain
 $G_{ms} = 21.5 \text{ dB at } 1.8 \text{ GHz}$
 $G_{ma} = 11 \text{ dB at } 6 \text{ GHz}$
- Outstanding noise figure $NF_{min} = 0.7 \text{ dB at } 1.8 \text{ GHz}$
 Outstanding noise figure $NF_{min} = 1.3 \text{ dB at } 6 \text{ GHz}$
- Accurate SPICE GP model enables effective design in process
- Pb-free (RoHS compliant) and halogen-free package with visible leads
- Qualification report according to AEC-Q101 available



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

Type	Marking	Pin Configuration						Package
BFP620	R2s	1=B	2=E	3=C	4=E	-	-	SOT343

Maximum Ratings at $T_A = 25\text{ °C}$, unless otherwise specified

Parameter	Symbol	Value	Unit
Collector-emitter voltage $T_A = 25\text{ °C}$ $T_A = -55\text{ °C}$	V_{CEO}	2.3 2.1	V
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 ¹⁾ $T_S \leq 95\text{ °C}$	P_{tot}	185	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}	300	K/W

Electrical Characteristics at $T_A = 25\text{ °C}$, 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 $V_{CE} = 7.5\text{ V}$, $V_{BE} = 0$ $V_{CE} = 5\text{ V}$, $V_{BE} = 0$	I_{CES}	- -	- 0.001	10 0.04	μA
Collector-base cutoff current $V_{CB} = 5\text{ V}$, $I_E = 0$	I_{CBO}	-	1	40	nA
Emitter-base cutoff current $V_{EB} = 0.5\text{ V}$, $I_C = 0$	I_{EBO}	-	10	900	
DC current gain $I_C = 50\text{ mA}$, $V_{CE} = 1.5\text{ V}$, pulse measured	h_{FE}	110	180	270	-

¹⁾ T_S is measured on the emitter lead at the soldering point to the pcb

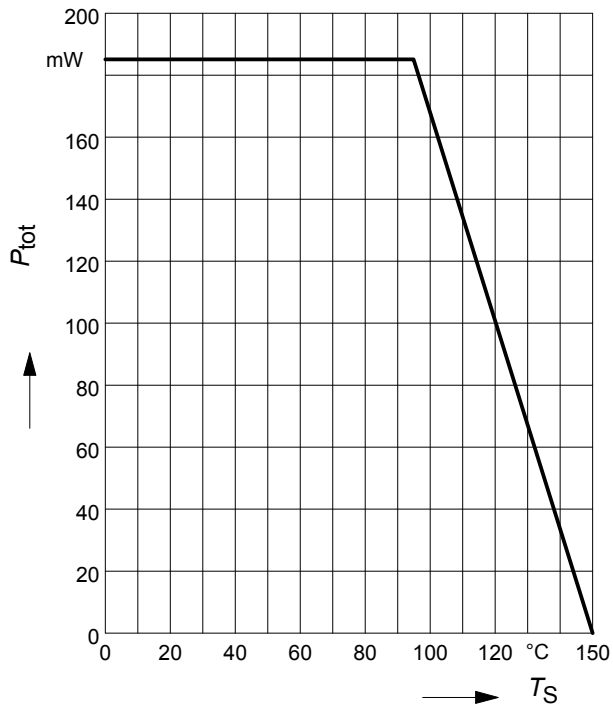
²⁾ For the definition of R_{thJS} please refer to Application Note AN077 (Thermal Resistance Calculation)

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

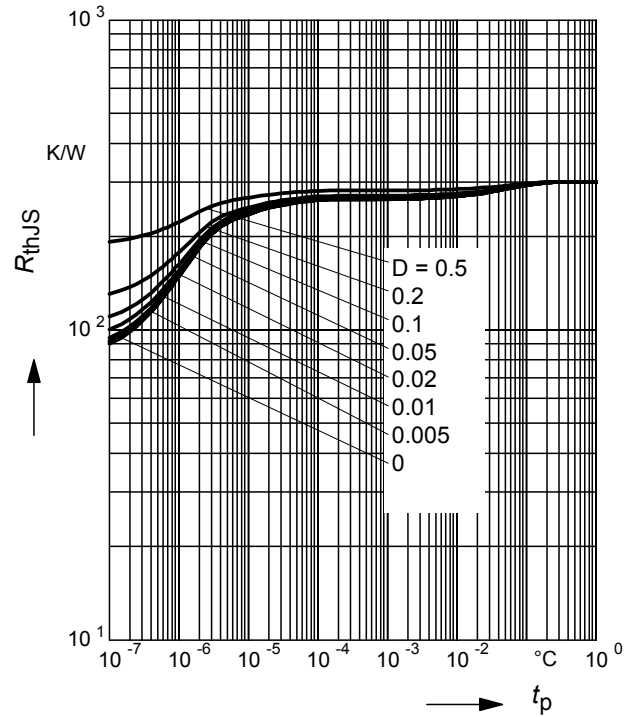
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC Characteristics (verified by random sampling)					
Transition frequency $I_C = 50\text{ mA}$, $V_{CE} = 1.5\text{ V}$, $f = 1\text{ GHz}$	f_T	-	65	-	GHz
Collector-base capacitance $V_{CB} = 2\text{ V}$, $f = 1\text{ MHz}$, $V_{BE} = 0$, emitter grounded	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}	-	0.22	-	
Emitter-base capacitance $V_{EB} = 0.5\text{ V}$, $f = 1\text{ MHz}$, $V_{CB} = 0$, collector grounded	C_{eb}	-	0.46	-	
Minimum noise figure $I_C = 5\text{ mA}$, $V_{CE} = 1.5\text{ V}$, $f = 1.8\text{ GHz}$, $Z_S = Z_{Sopt}$ $I_C = 5\text{ mA}$, $V_{CE} = 1.5\text{ V}$, $f = 6\text{ GHz}$, $Z_S = Z_{Sopt}$	NF_{min}	- -	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}	-	21.5	-	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}	-	11	-	dB
Transducer gain $I_C = 50\text{ mA}$, $V_{CE} = 1.5\text{ V}$, $Z_S = Z_L = 50\text{ }\Omega$, $f = 1.8\text{ GHz}$ $f = 6\text{ GHz}$	$ S_{21e} ^2$	- -	20 9.5	- -	dB
Third order intercept point at output ²⁾ $V_{CE} = 2\text{ V}$, $I_C = 50\text{ mA}$, $Z_S = Z_L = 50\text{ }\Omega$, $f = 1.8\text{ GHz}$	$IP3$	-	25.5	-	dBm
1dB compression point at output $I_C = 50\text{ mA}$, $V_{CE} = 2\text{ V}$, $Z_S = Z_L = 50\text{ }\Omega$, $f = 1.8\text{ GHz}$	P_{-1dB}	-	14.5	-	

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 $50\text{ }\Omega$ from 0.1 MHz to 6 GHz

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

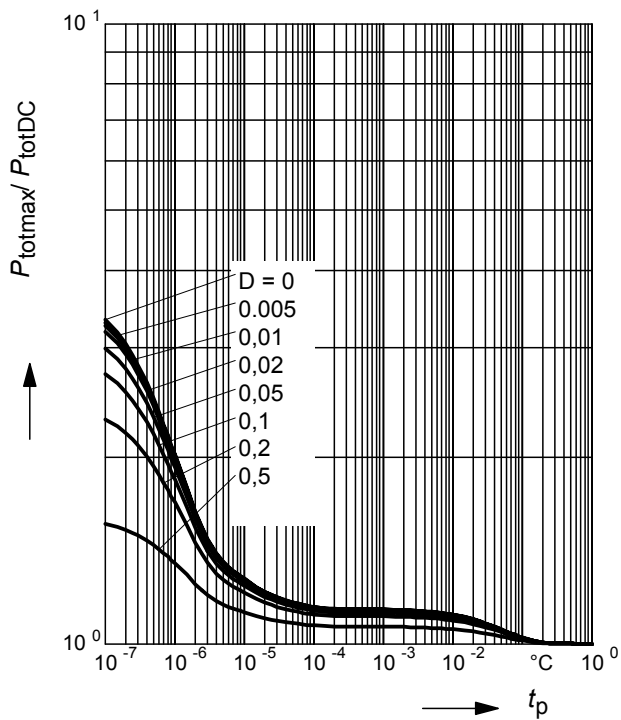


Permissible Pulse Load $R_{\text{thJS}} = f(t_p)$



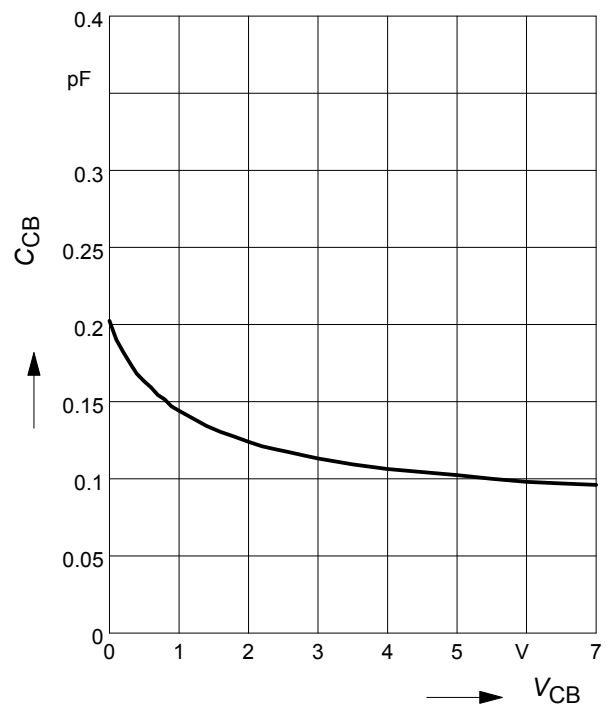
Permissible Pulse Load

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



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

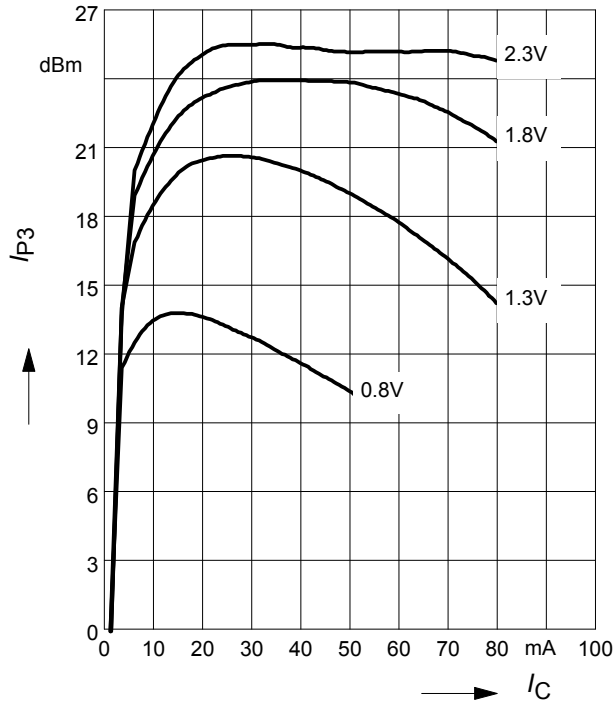
$f = 1\text{MHz}$



Third order Intercept Point $IP3 = f(I_C)$

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

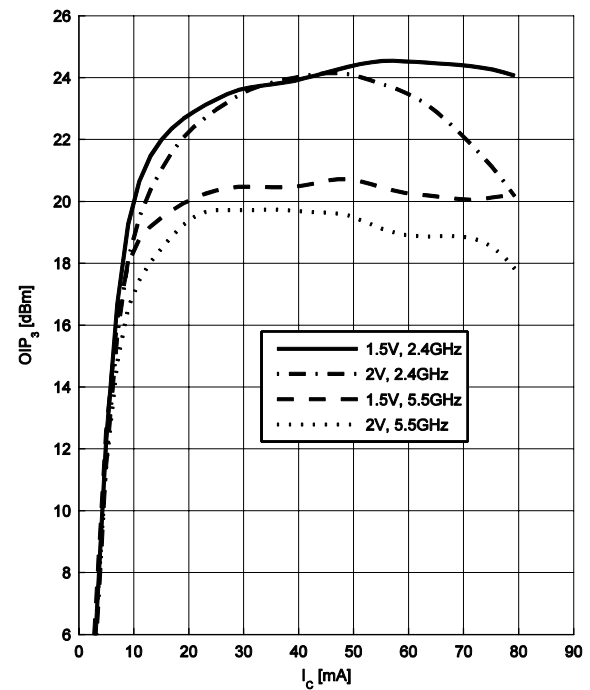
V_{CE} = parameter, $f = 900 \text{ MHz}$



Third order Intercept Point $IP3 = f(I_C)$

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

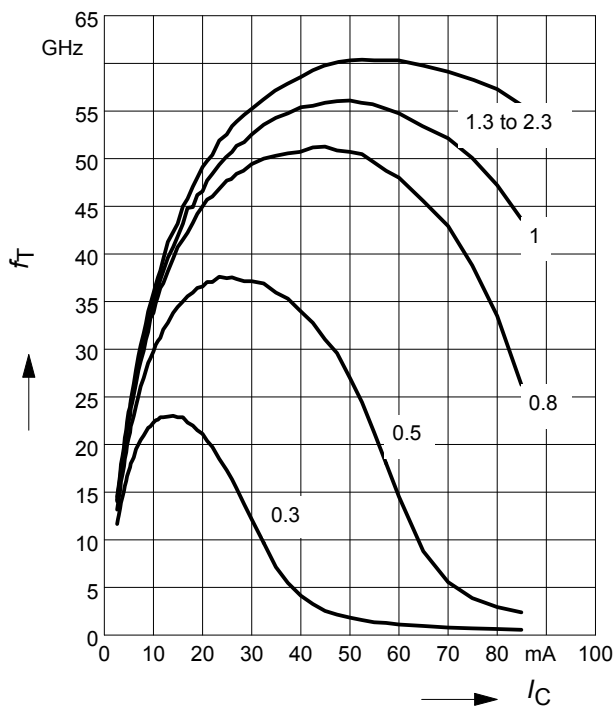
V_{CE} = parameter, f = parameter



Transition frequency $f_T = f(I_C)$

$f = 1 \text{ GHz}$

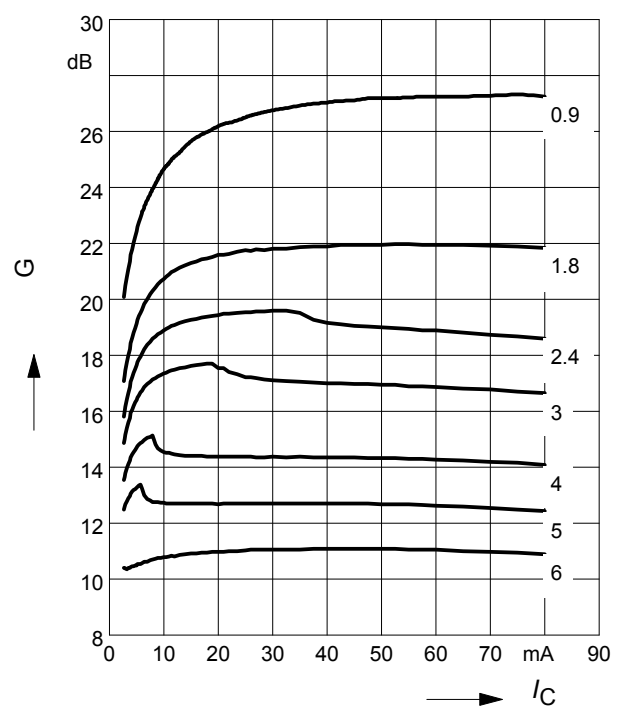
V_{CE} = Parameter in V



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

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

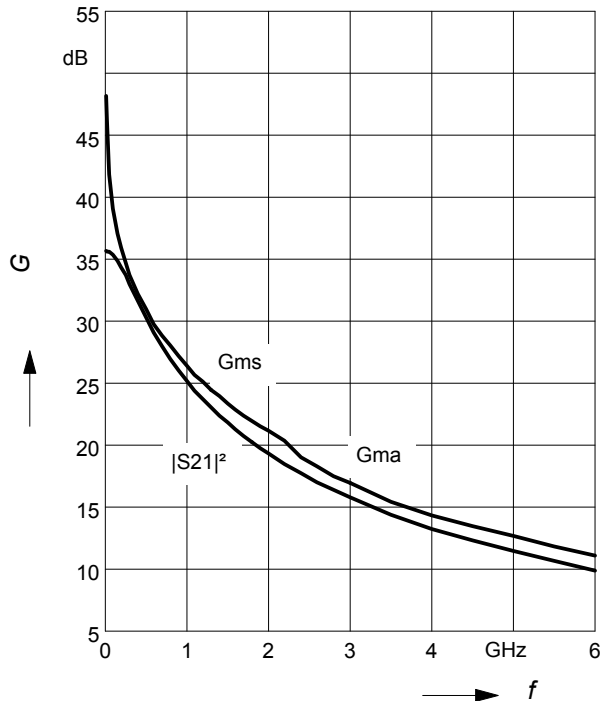
f = Parameter in GHz



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

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

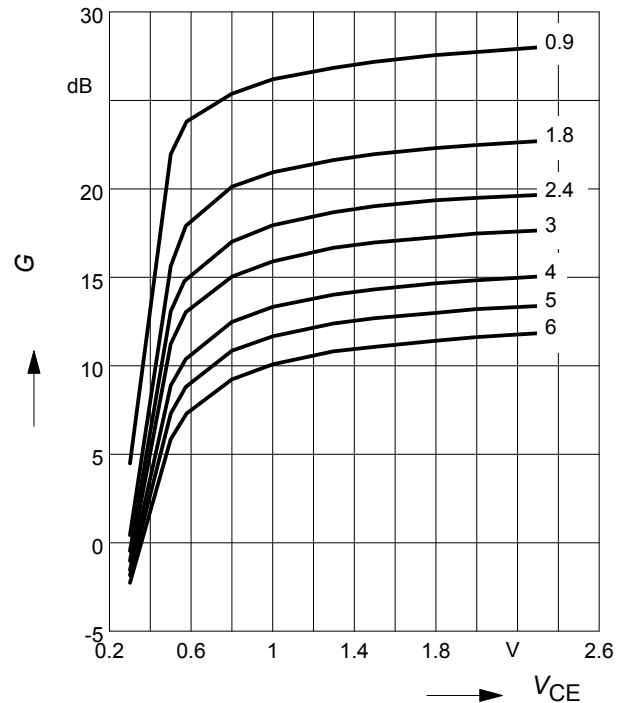
$V_{CE} = 1.5V, I_C = 50mA$



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

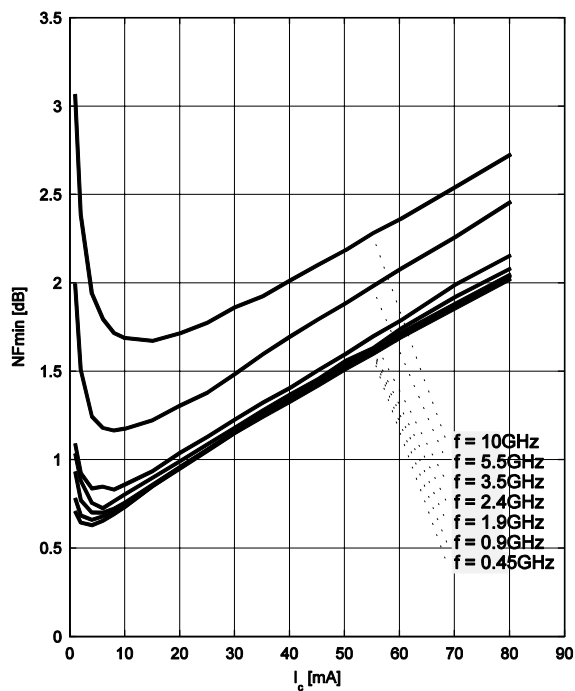
$I_C = 50mA$

f = Parameter in GHz



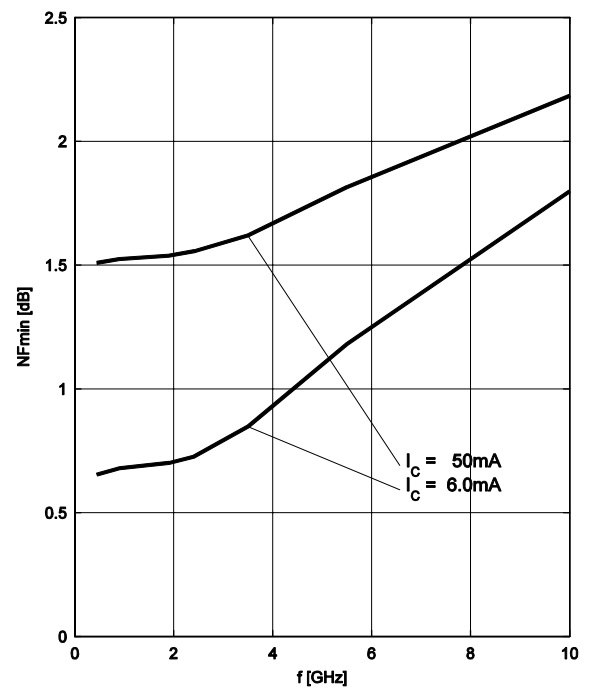
Minimum noise figure $NF_{min} = f(I_C)$

$V_{CE} = 2V, Z_S = Z_{Sopt}$



Minimum noise figure $NF_{min} = f(f)$

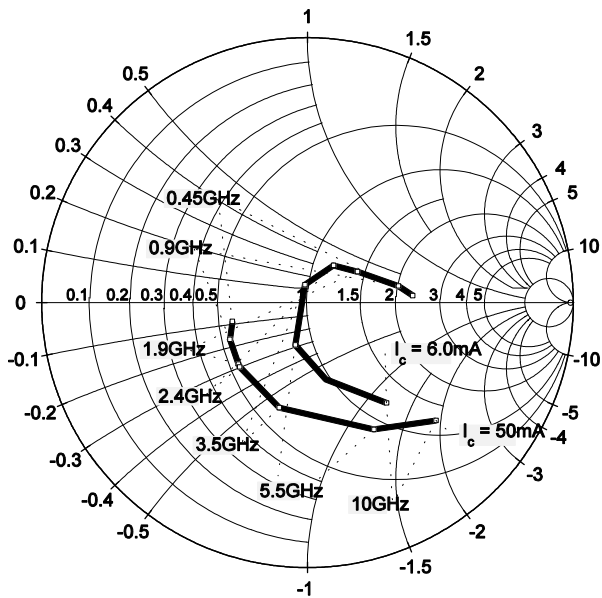
$V_{CE} = 2V, Z_S = Z_{Sopt}$



Source impedance for min.

noise figure vs. frequency

$V_{CE} = 2\text{ V}$, $I_C = 6\text{ mA} / 50\text{ mA}$



SPICE GP Model

For the SPICE Gummel Poon (GP) model as well as for the S-parameters (including noise parameters) please refer to our internet website

www.infineon.com/rf.models.

Please consult our website and download the latest versions before actually starting your design. You find the BFP620 SPICE GP model in the internet in MWO- and ADS-format, which you can import into these circuit simulation tools very quickly and conveniently. The model already contains the package parasitics and is ready to use for DC and high frequency simulations. The terminals of the model circuit correspond to the pin configuration of the device. The model parameters have been extracted and verified up to 15 GHz using typical devices. The BFP620 SPICE GP model reflects the typical DC- and RF-performance within the limitations which are given by the SPICE GP model itself. Besides the DC characteristics all S-parameters in magnitude and phase, as well as noise figure (including optimum source impedance, equivalent noise resistance and flicker noise) and intermodulation have been extracted.

The technical drawing shows two views of the component:

- Top View:** A rectangular package with four pins labeled 1, 2, 3, and 4. Dimensions include a total width of 2 ± 0.2 , a pin pitch of 1.3 , a body width of 0.15 , a pin height of $0.3^{+0.1}_{-0.05}$, and a pin length of $0.6^{+0.1}_{-0.05}$. There are also markings for $4x$ and $\oplus 0.1 \text{ (M)}$.
- Side View:** Shows the profile of the package with a maximum standoff of 0.1 MAX. , a minimum standoff of 0.1 MIN. , a total height of 2.1 ± 0.1 , a mounting hole diameter of 0.9 ± 0.1 , a mounting hole offset of 1.25 ± 0.1 , and a base thickness of $0.15^{+0.1}_{-0.05}$. Surface finish symbols are present.

Diagram illustrating the marking on a 16-pin DIP package:

- Date code (YM):** 56 (2005, June)
- Manufacturer:** XY
- Type code:** s
- Pin 1** is indicated at the bottom left.
- The **Infineon** logo is shown to the right.

Edition 2009-11-16

**Published by
Infineon Technologies AG
81726 Munich, Germany**

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