BFP620F

Low profile high gain silicon NPN RF bipolar transistor

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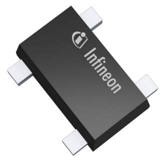
Product description

The BFP620F is a RF bipolar transistor based on SiGe:C technology that is part of Infineon's established sixth generation transistor family. Its high gain and low noise characteristics make the device suitable for frequencies as high as 6 GHz. It remains cost competitive without compromising on ease of use.



Feature list

- Minimum noise figure NF_{min} = 0.7 dB at 1.8 GHz, 1.5 V, 5 mA
- High gain G_{ms} = 21 dB at 1.8 GHz, 1.5 V, 50 mA
- OIP_3 = 25 dBm at 1.8 GHz, 2 V, 50 mA

Product validation

Qualified for industrial applications according to the relevant tests of JEDEC JESD47, JESD22, and J-STD-020.
Qualified for industrial applications according to the relevant tests of AEC-Q 101.

Potential applications

- Low noise amplifiers (LNAs) in SDARS receivers
- LNAs for wireless communications
- LNAs for ISM band applications

Device information

Table 1 Part information

Product name / Ordering code	Package	Pin configuration				Marking	Pieces / Reel
BFP620F / BFP620FH7764XTSA1	TSFP-4-1	1 = B	2 = E	3 = C	4 = E	R2s	3000

Attention: ***ESD (Electrostatic discharge) sensitive device, observe handling precautions***

Table of contents

1 Absolute maximum ratings

Table 2 Absolute maximum ratings at T_A = 25 °C (unless otherwise specified)

Parameter	Symbol	Values		Unit	Note or test condition
		Min.	Max.		
Collector emitter voltage	V_{CEO}	–	2.3	V	Open base
			2.1		T_A = -55 °C, open base
Collector emitter voltage	V_{CES}		7.5		E-B short circuited
Collector base voltage	V_{CBO}		7.5		Open emitter
Emitter base voltage	V_{EBO}		1.2		Open collector
Base current	I_B		3	mA	–
Collector current	I_C		80		
Total power dissipation [1)]	P_{tot}		185	mW	$T_S \leq 96$ °C
Junction temperature	T_J		150	°C	–
Storage temperature	T_{Stg}	-55			

Attention: ***Stresses above the max. values listed here may cause permanent damage to the device. Exposure to absolute maximum rating conditions for extended periods may affect device reliability. Exceeding only one of these values may cause irreversible damage to the integrated circuit.***

1 T_S is the soldering point temperature. T_S is measured on the emitter lead at the soldering point of the PCB.

2 Thermal characteristics

Table 3 Thermal resistance

Parameter	Symbol	Values			Unit	Note or test condition
		Min.	Typ.	Max.		
Junction - soldering point	R_{thJS}	–	290	–	K/W	–

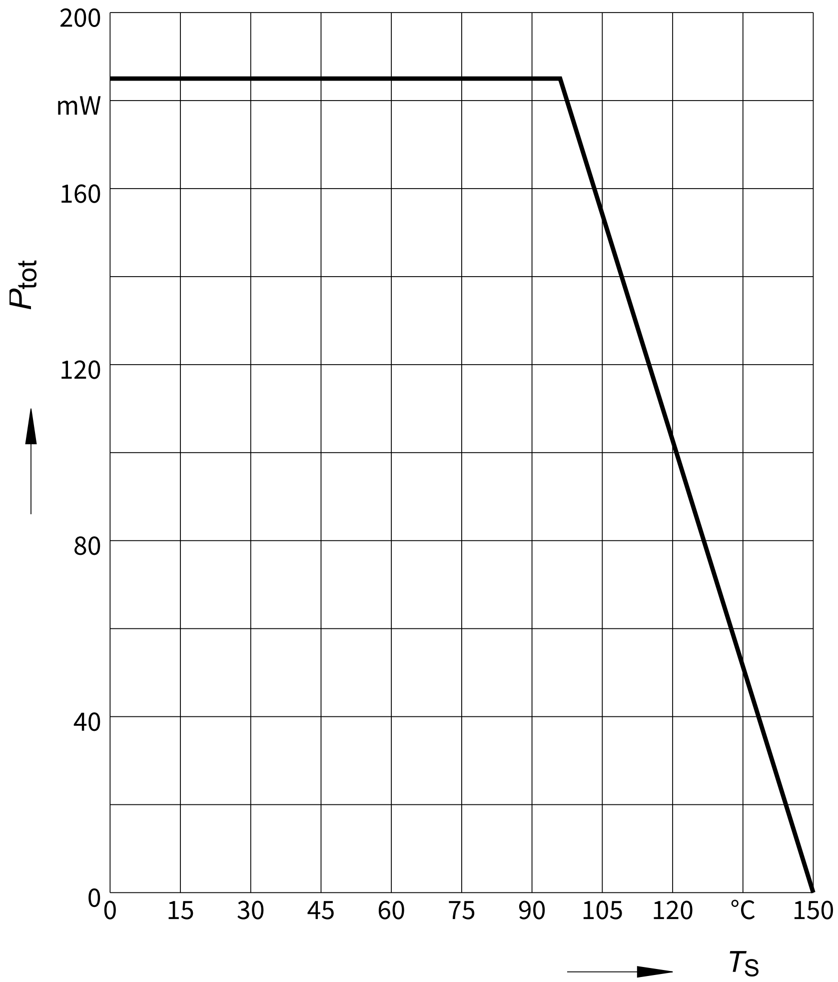


Figure 1 Total power dissipation P_{tot} = f(T_S)

Thermal characteristics

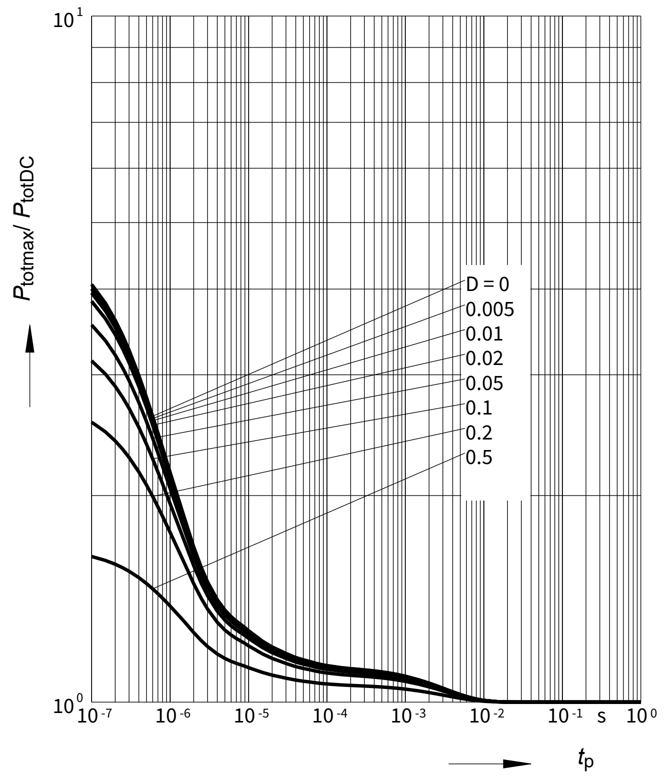


Figure 2 **Permissible pulse load $P_{tot,max}$ / $P_{tot,DC}$ = f(t_p)**

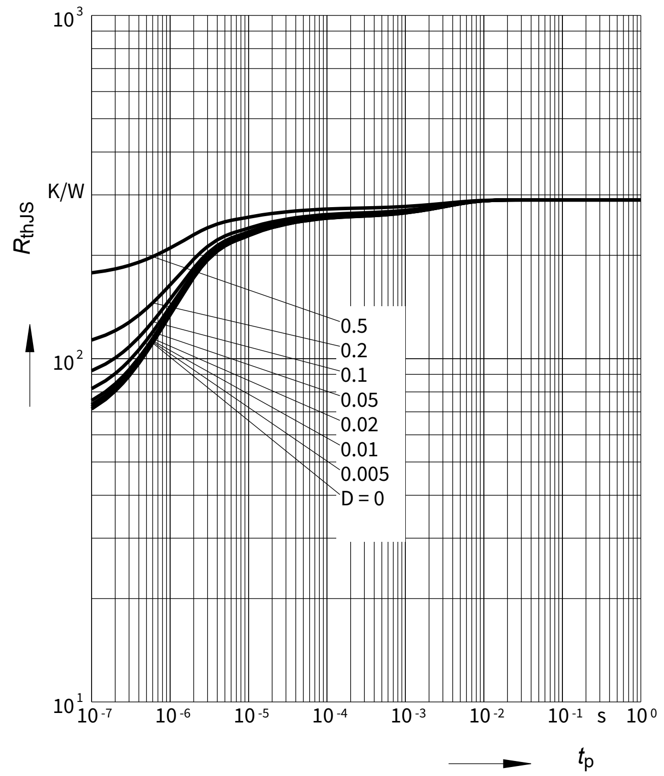


Figure 3 **Permissible pulse load R_{thJS} = f(t_p)**

3 Electrical characteristics

3.1 DC characteristics

Table 4 DC characteristics at T_A = 25 °C

Parameter	Symbol	Values			Unit	Note or test condition
		Min.	Typ.	Max.		
Collector emitter breakdown voltage	$V_{(BR)CEO}$	2.3	2.8	–	V	I_C = 1 mA, I_B = 0, open base
Collector emitter leakage current	I_{CES}	–	–	10 [2]	µA	V_{CE} = 7.5 V, V_{BE} = 0, E-B short circuited
Collector base leakage current	I_{CBO}			100 [2]	nA	V_{CB} = 5 V, I_E = 0, open emitter
Emitter base leakage current	I_{EBO}			3 [2]	µA	V_{EB} = 0.5 V, I_C = 0, open collector
DC current gain	h_{FE}	110	180	270		V_{CE} = 1.5 V, I_C = 50 mA, pulse measured

3.2 General AC characteristics

Table 5 General AC characteristics at T_A = 25 °C

Parameter	Symbol	Values			Unit	Note or test condition
		Min.	Typ.	Max.		
Transition frequency	f_T	–	65	–	GHz	V_{CE} = 1.5 V, I_C = 50 mA, f = 1 GHz
Collector base capacitance	C_{CB}		0.12	0.2	pF	V_{CB} = 2 V, V_{BE} = 0, f = 1 MHz, emitter grounded
Collector emitter capacitance	C_{CE}		0.2	–		V_{CE} = 2 V, V_{BE} = 0, f = 1 MHz, base grounded
Emitter base capacitance	C_{EB}		0.45			V_{EB} = 0.5 V, V_{CB} = 0, f = 1 MHz, collector grounded

2 Maximum values not limited by the device but by the short cycle time of the 100% test.

3.3 Frequency dependent AC characteristics

Measurement setup is a test fixture with Bias-T's in a 50 Ω system, T_A = 25 °C.

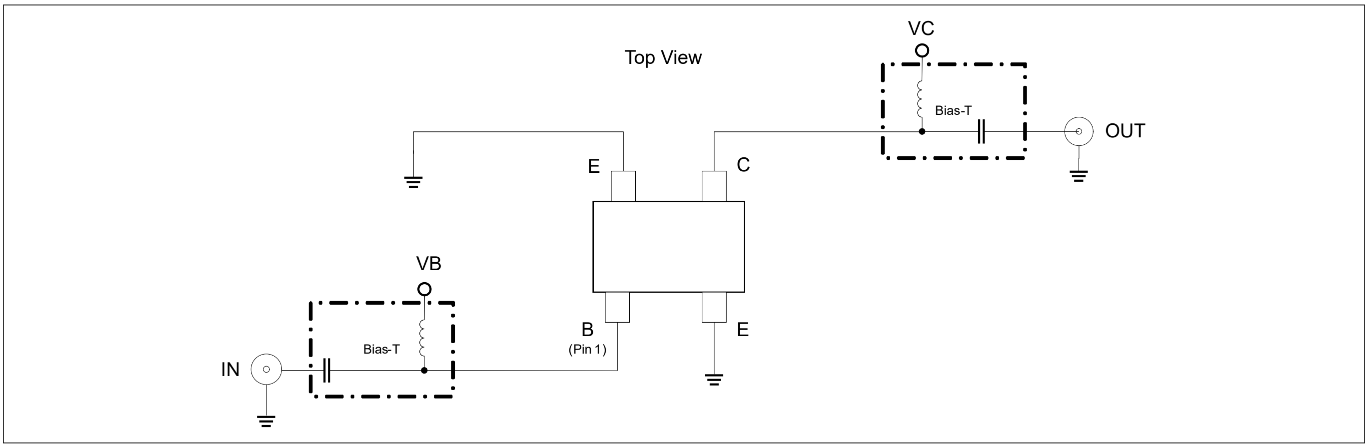


Figure 4 Testing circuit

Table 6 AC characteristics, V_{CE} = 1.5 V, f = 1.8 GHz

Parameter	Symbol	Values			Unit	Note or test condition
		Min.	Typ.	Max.		
Power gain • Maximum power gain • Transducer gain	 G_{ms} $\|S_{21}\|^2$	–	 21 19.5	–	dB	 I_C = 50 mA
Noise figure • Minimum noise figure	 NF_{min}		 0.7			 I_C = 5 mA
Linearity • 3rd order intercept point at output • 1 dB gain compression point at output	 OIP_3 OP_{1dB}		 25 14		dBm	 I_C = 50 mA, V_{CE} = 2 V, $Z_S = Z_L$ = 50 Ω

Table 7 AC characteristics, V_{CE} = 1.5 V, f = 6 GHz

Parameter	Symbol	Values			Unit	Note or test condition
		Min.	Typ.	Max.		
Power gain • Maximum power gain • Transducer gain	 G_{ma} $\|S_{21}\|^2$	–	 10 9.5	–	dB	 I_C = 50 mA
Noise figure • Minimum noise figure	 NF_{min}		 1.3			 I_C = 5 mA

Note: *$G_{ms} = IS_{21} / S_{12}I$ for $k < 1$; $G_{ma} = IS_{21} / S_{12} I(k-(k^2-1)^{1/2})$ for $k > 1$. In order to get the NF_{min} values stated in this chapter, the test fixture losses have been subtracted from all measured results. OIP_3 value depends on termination of all intermodulation frequency components. Termination used for this measurement is 50 Ω from 0.1 MHz to 6 GHz.*

3.4 Characteristic AC diagrams

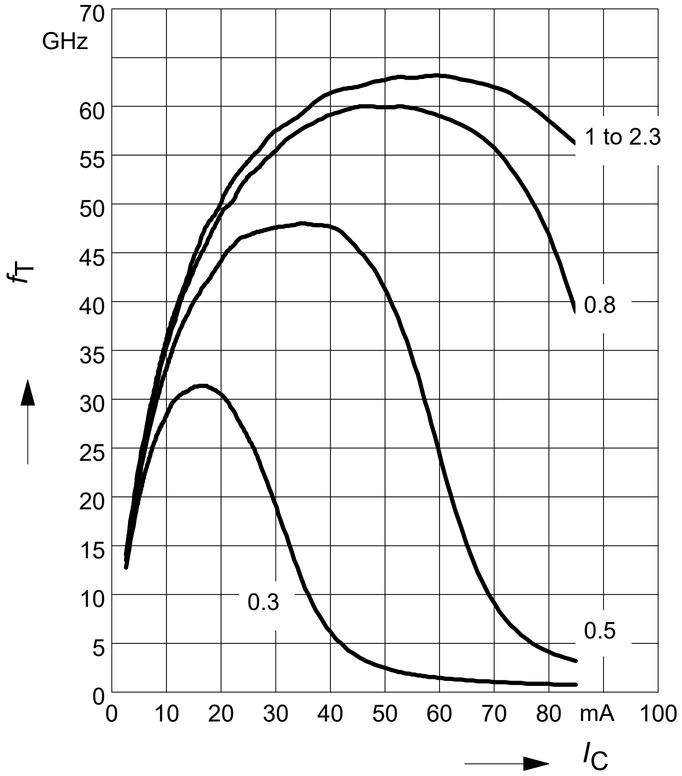


Figure 5 Transition frequency f_T = f(I_C), f = 1 GHz, V_{CE} = parameter in V

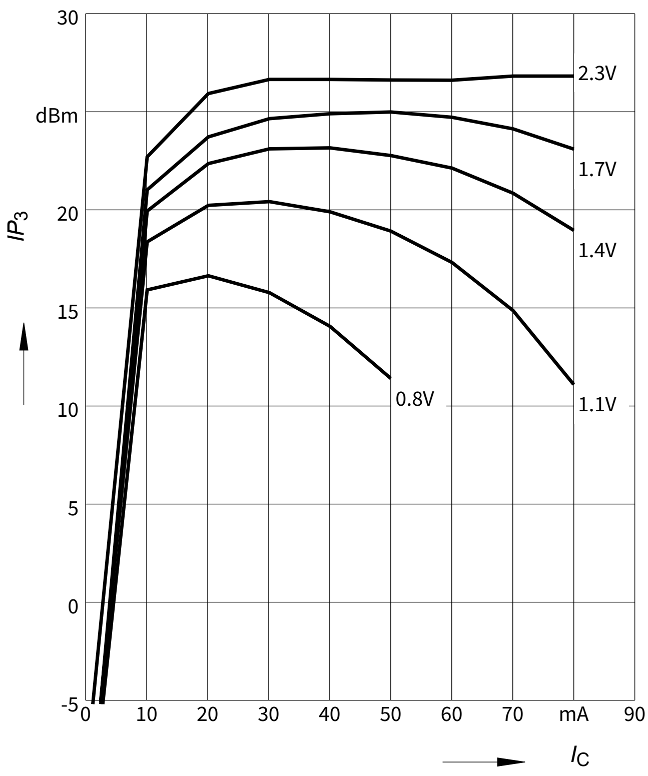


Figure 6 3rd order intercept point OIP_3 = f(I_C), Z_S = Z_L = 50 Ω, f = 1.8 GHz, V_{CE} = parameter

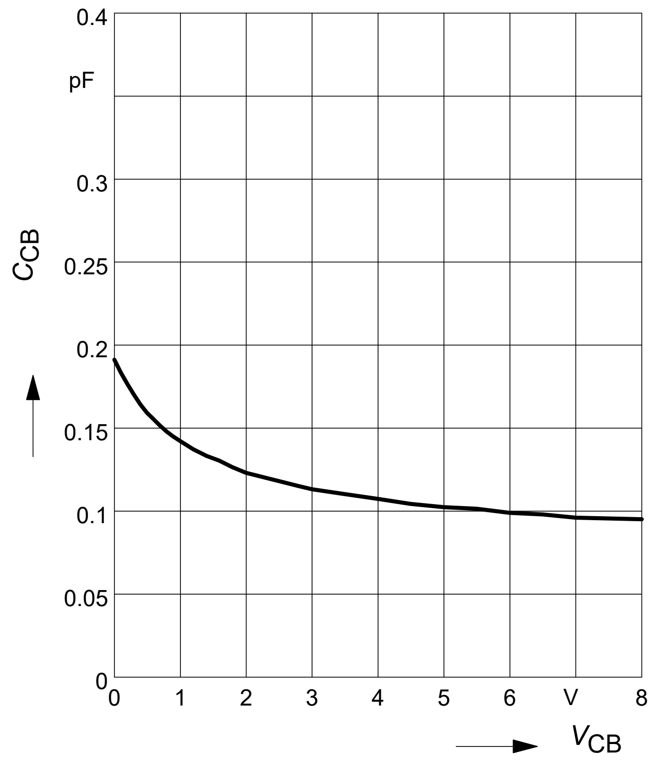


Figure 7 **Collector base capacitance C_{CB} = f(V_{CB}), f = 1 MHz**

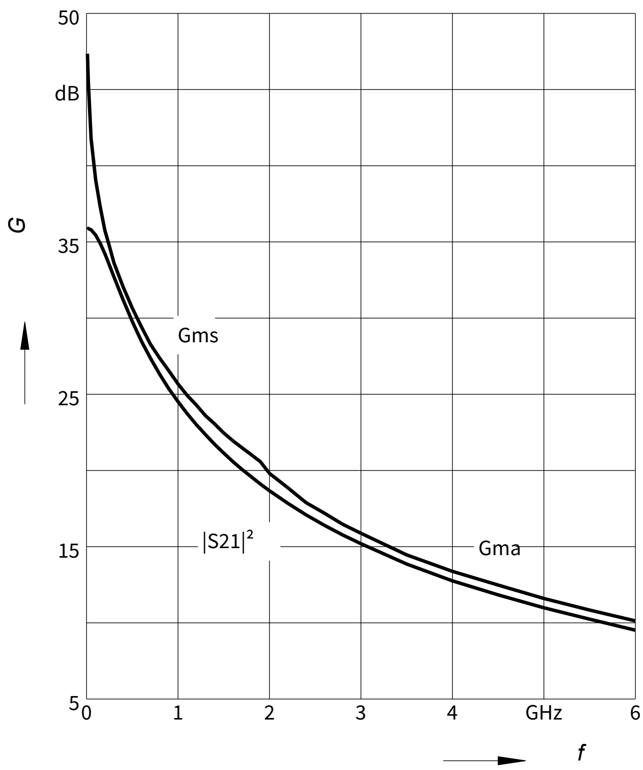


Figure 8 **Gain G_{ma}, G_{ms}, $|S_{21}|^2$ = f(f), V_{CE} = 1.5 V, I_C = 50 mA**

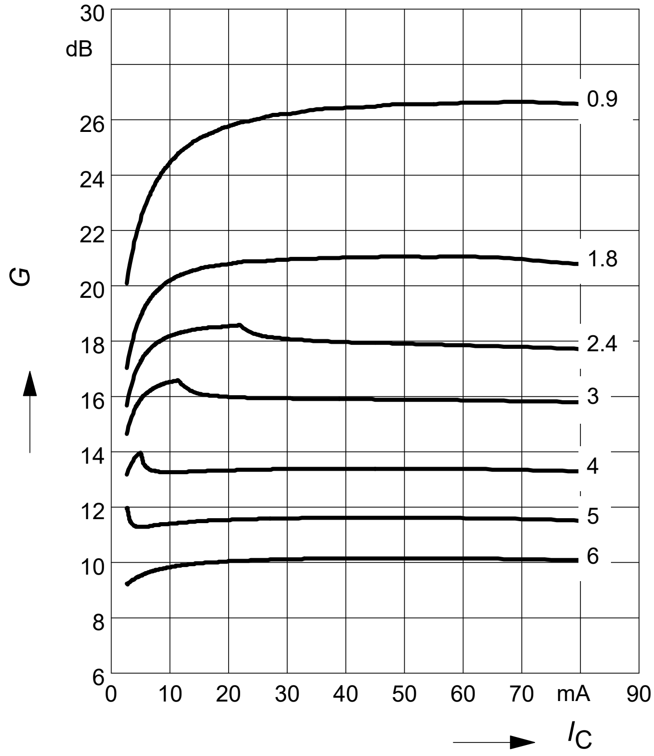


Figure 9 **Maximum power gain G_{max} = f(I_C), V_{CE} = 1.5 V, f = parameter in GHz**

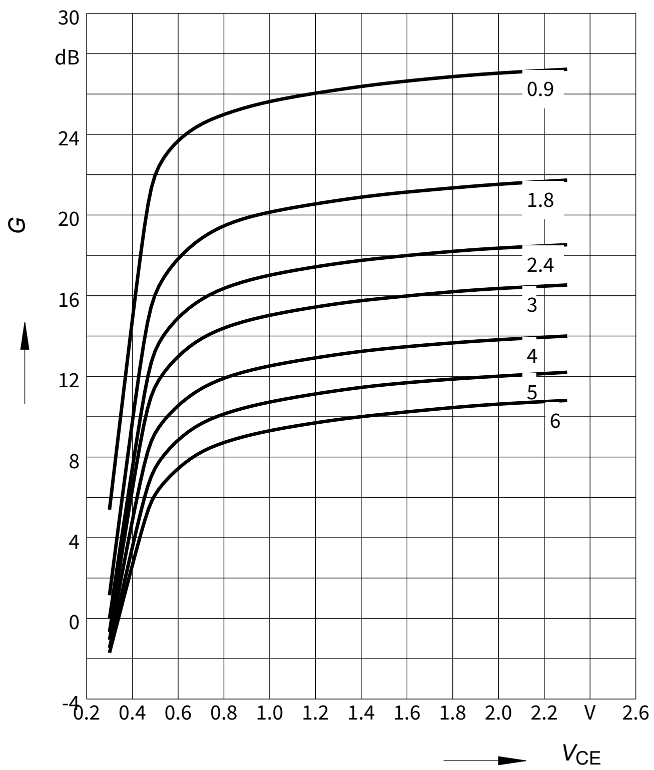


Figure 10 **Maximum power gain G_{max} = f(V_{CE}), I_C = 50 mA, f = parameter in GHz**

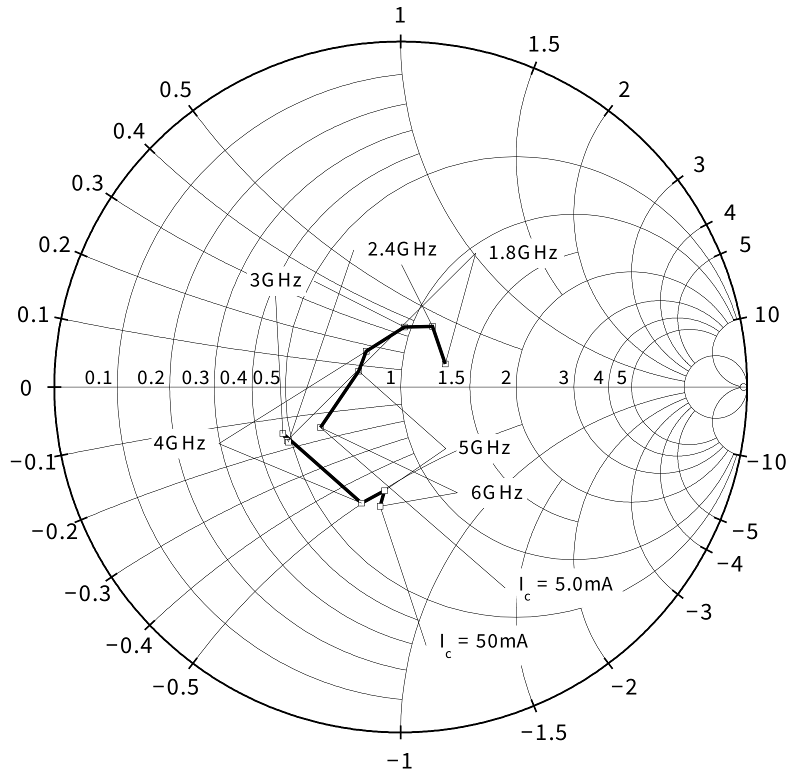


Figure 11 **Source impedance for minimum noise figure $Z_{S,opt}$ = f(f), V_{CE} = 1.5 V, I_C = 5 / 50 mA**

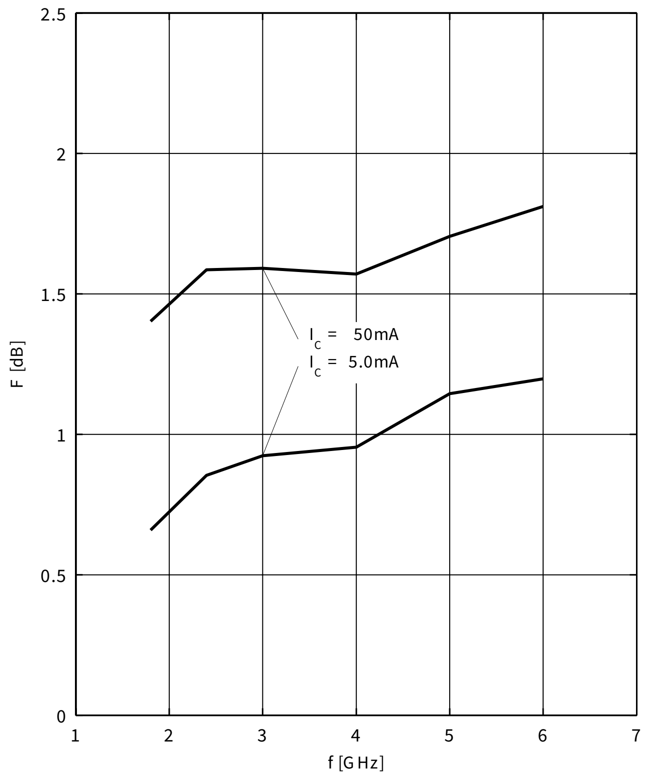


Figure 12 **Noise figure NF_{min} = f(f), Z_S = $Z_{S,opt}$, V_{CE} = 1.5 V, I_C = 5 / 50 mA**

Electrical characteristics

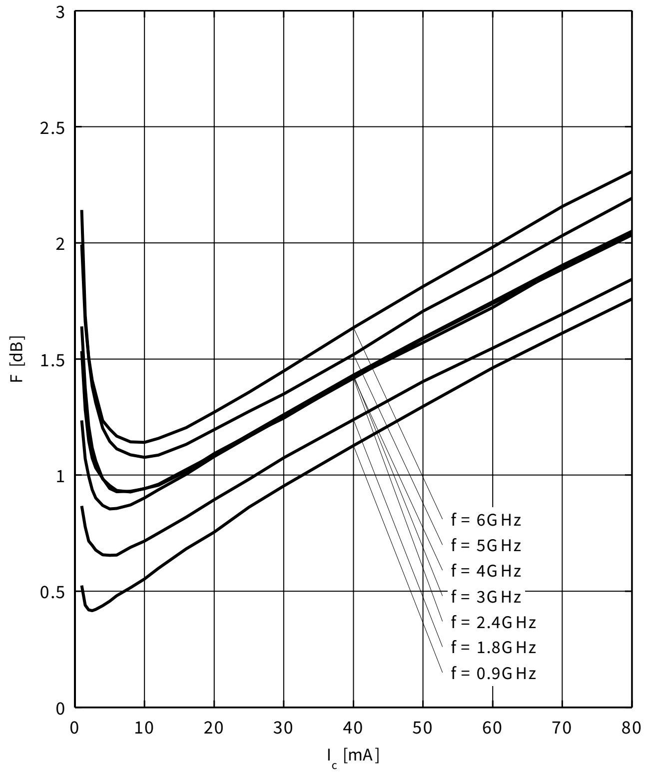


Figure 13 **Noise figure NF_{min} = f(I_C), Z_S = $Z_{S,opt}$, V_{CE} = 1.5 V, f = parameter in GHz**

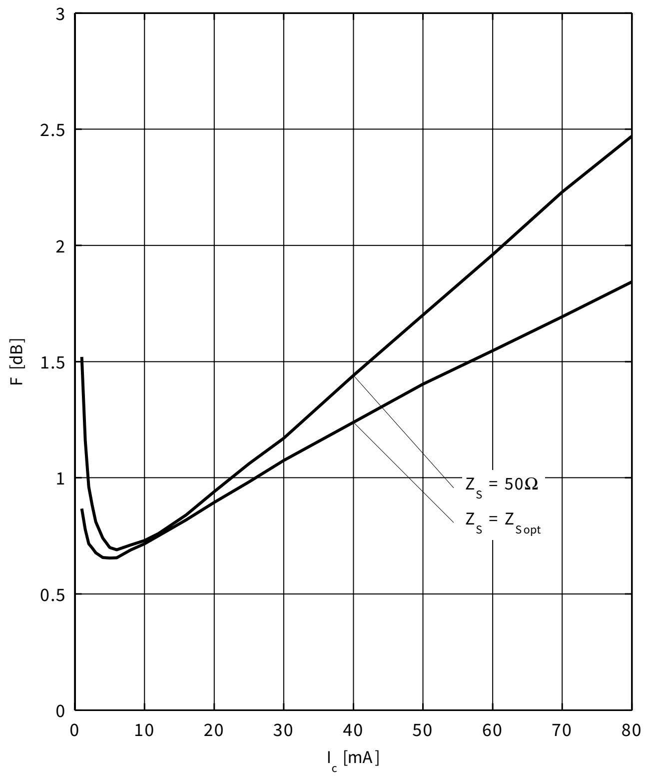
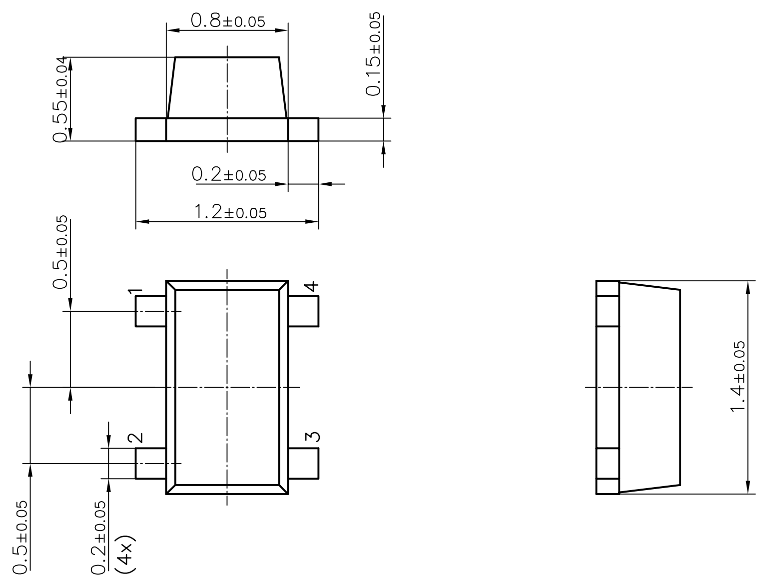


Figure 14 **Noise figure NF_{min} = f(I_C), Z_S = $Z_{S,opt}$, NF_{50} = f(I_C), Z_S = 50 Ω, V_{CE} = 1.5 V, f = 1.8 GHz**

Note: *The curves shown in this chapter have been generated using typical devices but shall not be considered as a guarantee that all devices have identical characteristic curves. T_A = 25 °C.*

4 Package information TSFP-4-1



1) DIMENSION OF BODY DOES NOT INCLUDE MOLD FLASH, PROTRUSION OR GATE BURRS
2) MOLD FLASH, PROTRUSION OR GATE BURRS SHALL NOT EXCEED 0.1 PER SIDE
ALL DIMENSIONS ARE IN UNITS MM
THE DRAWING IS IN COMPLIANCE WITH ISO 128 & PROJECTION METHOD 1 [ ]

Figure 15 **TSFP-4-1 package**

Note: *For package information including footprint, packing and assembly recommendation refer to:*

https://www.infineon.com/packages/TSFP-4-1/

Revision history

Document version	Date of release	Description of changes
Revision 2.0	2019-01-25	New datasheet layout.
Revision 3.0	2024-07-01	Updated product validation

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