

BFP620F

Low profile high gain silicon NPN RF bipolar transistor



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

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Absolute maximum ratings

1 Absolute maximum ratings

Table 2 Absolute maximum ratings at $T_A = 25\text{ °C}$ (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		$T_A = -55\text{ °C}$, 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	$T_S \leq 96\text{ °C}$
Junction temperature	T_J	–55	150	°C	–
Storage temperature	T_{Stg}				

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	–

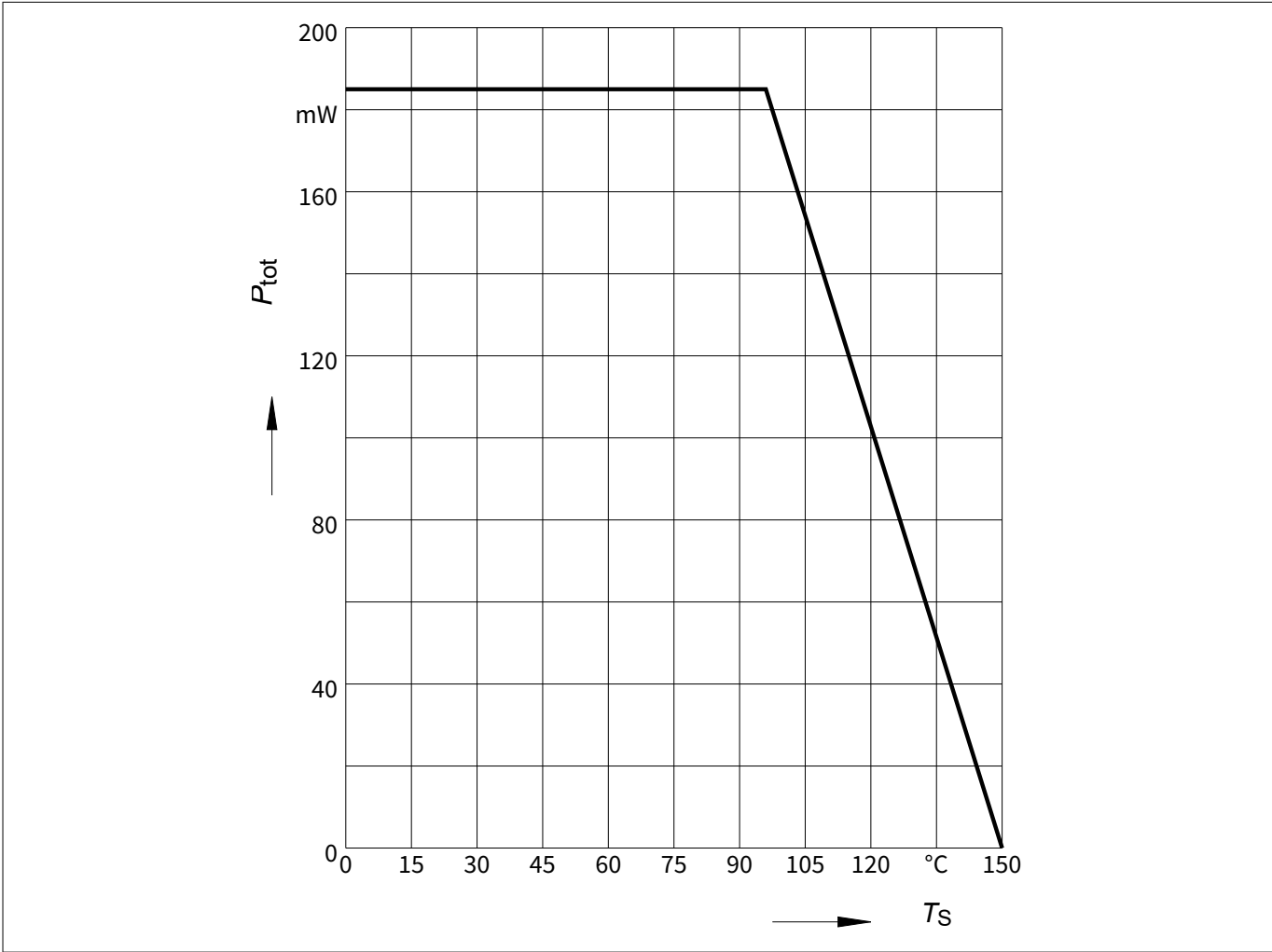


Figure 1 Total power dissipation $P_{tot} = f(T_S)$

Thermal characteristics

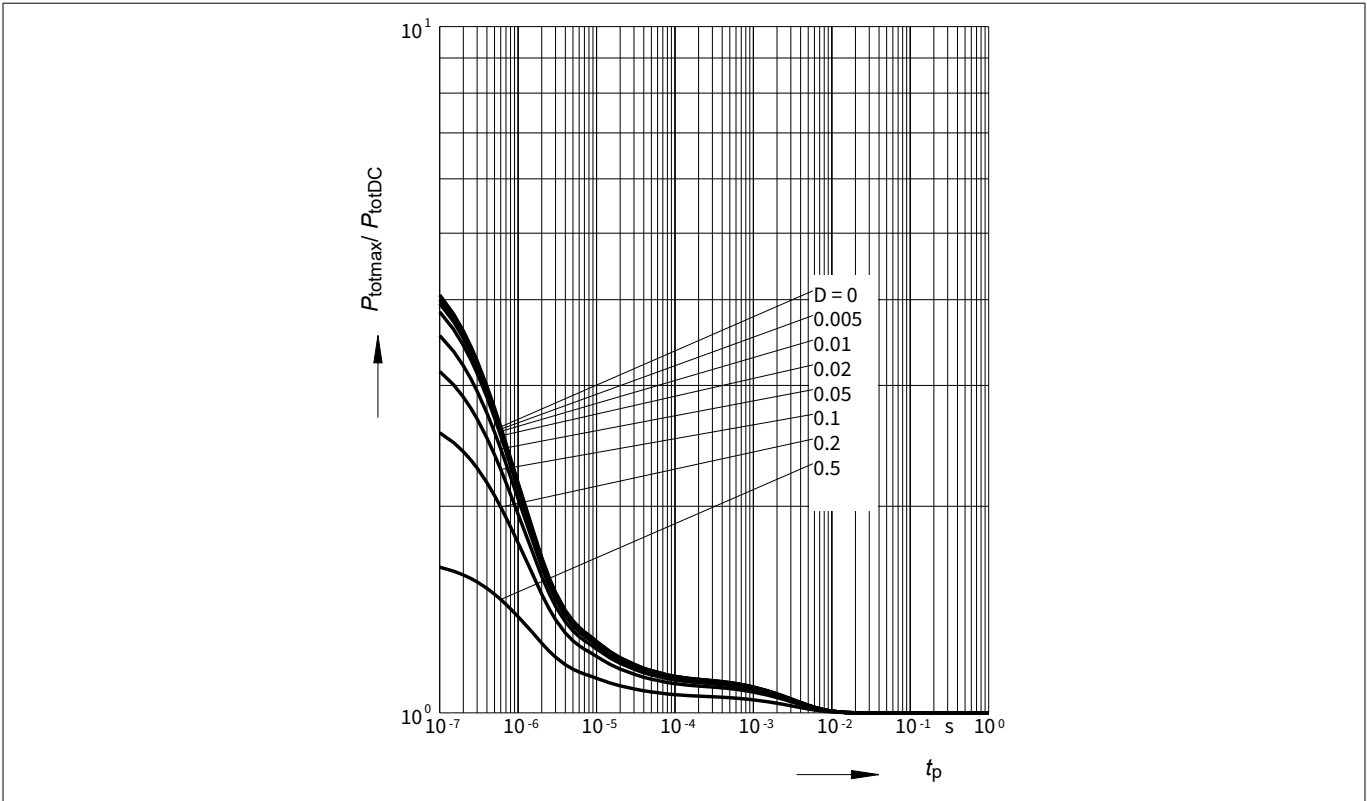


Figure 2 Permissible pulse load $P_{tot,max} / P_{tot,DC} = f(t_p)$

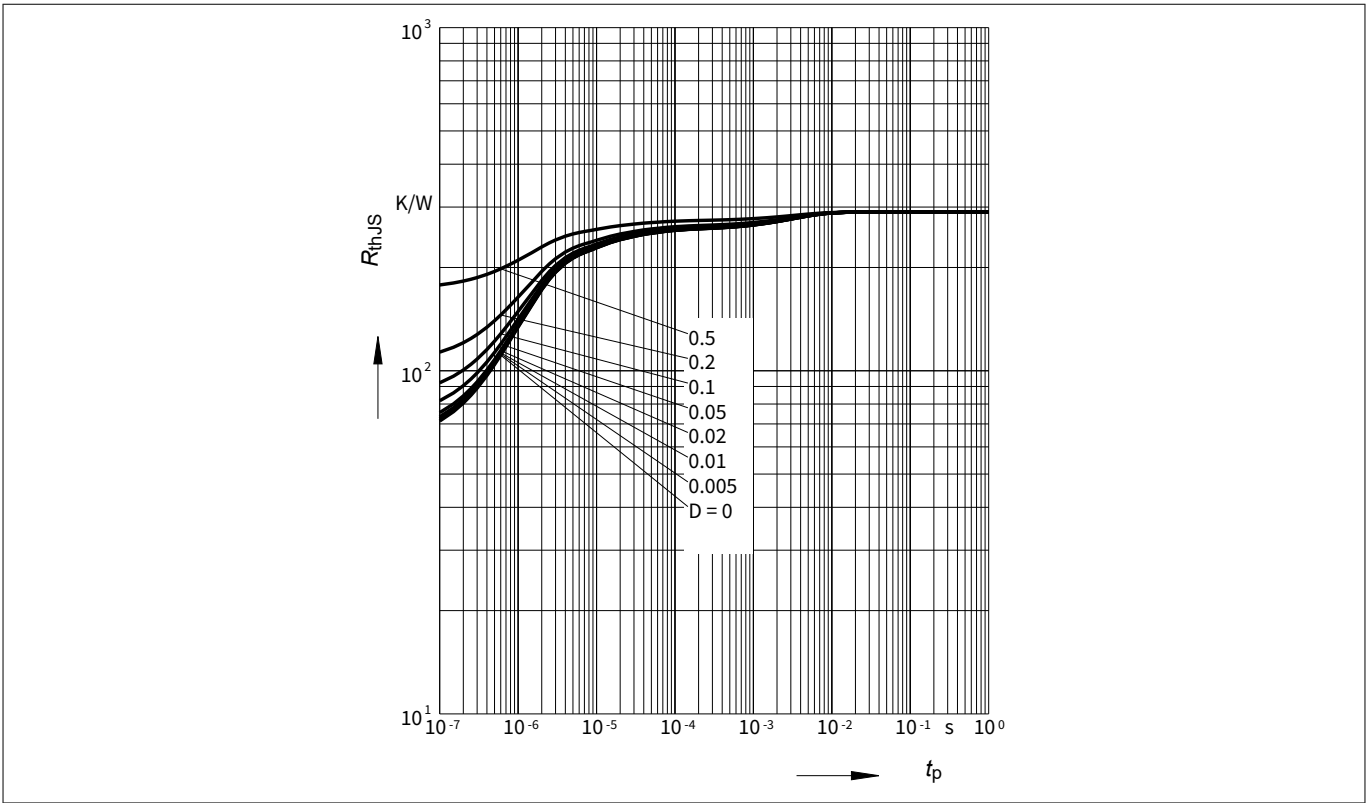


Figure 3 Permissible pulse load $R_{thJS} = f(t_p)$

Electrical characteristics

3 Electrical characteristics

3.1 DC characteristics

Table 4 DC characteristics at $T_A = 25\text{ °C}$

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

3.2 General AC characteristics

Table 5 General AC characteristics at $T_A = 25\text{ °C}$

Parameter	Symbol	Values			Unit	Note or test condition
		Min.	Typ.	Max.		
Transition frequency	f_T	–	65	–	GHz	$V_{CE} = 1.5\text{ V}$, $I_C = 50\text{ mA}$, $f = 1\text{ GHz}$
Collector base capacitance	C_{CB}		0.12	0.2	pF	$V_{CB} = 2\text{ V}$, $V_{BE} = 0$, $f = 1\text{ MHz}$, emitter grounded
Collector emitter capacitance	C_{CE}		0.2	–		$V_{CE} = 2\text{ V}$, $V_{BE} = 0$, $f = 1\text{ MHz}$, base grounded
Emitter base capacitance	C_{EB}		0.45			$V_{EB} = 0.5\text{ V}$, $V_{CB} = 0$, $f = 1\text{ MHz}$, 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, $T_A = 25^\circ\text{C}$.

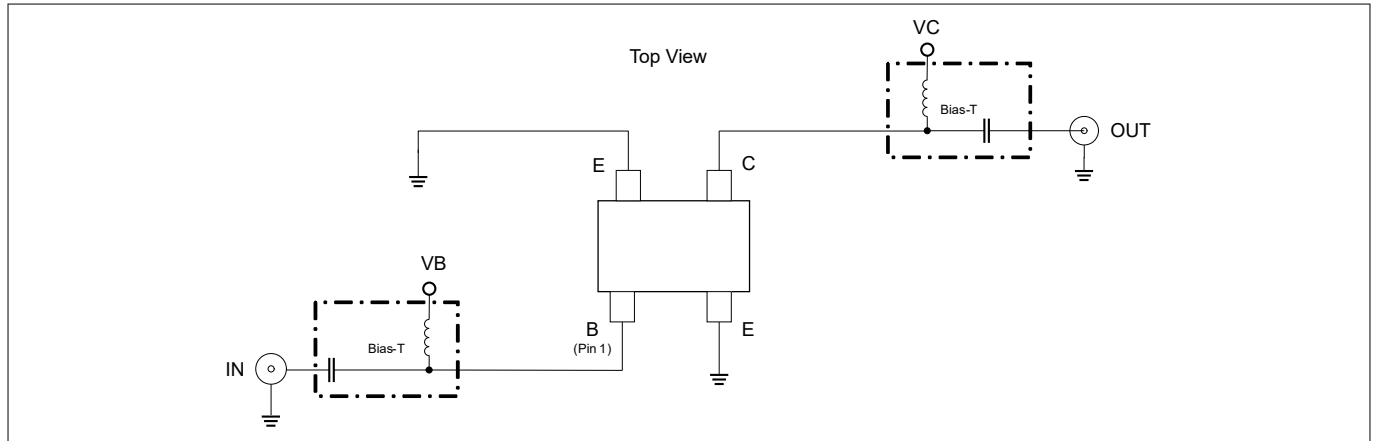


Figure 4 **Testing circuit**

Table 6 **AC characteristics, $V_{CE} = 1.5\text{ V}$, $f = 1.8\text{ GHz}$**

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

Table 7 **AC characteristics, $V_{CE} = 1.5\text{ V}$, $f = 6\text{ GHz}$**

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

Note: $G_{ms} = |S_{21}|^2 / |S_{11}|^2$ for $k < 1$; $G_{ma} = |S_{21}|^2 / |S_{11}|^2 (k^2 - 1)^{1/2}$ 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

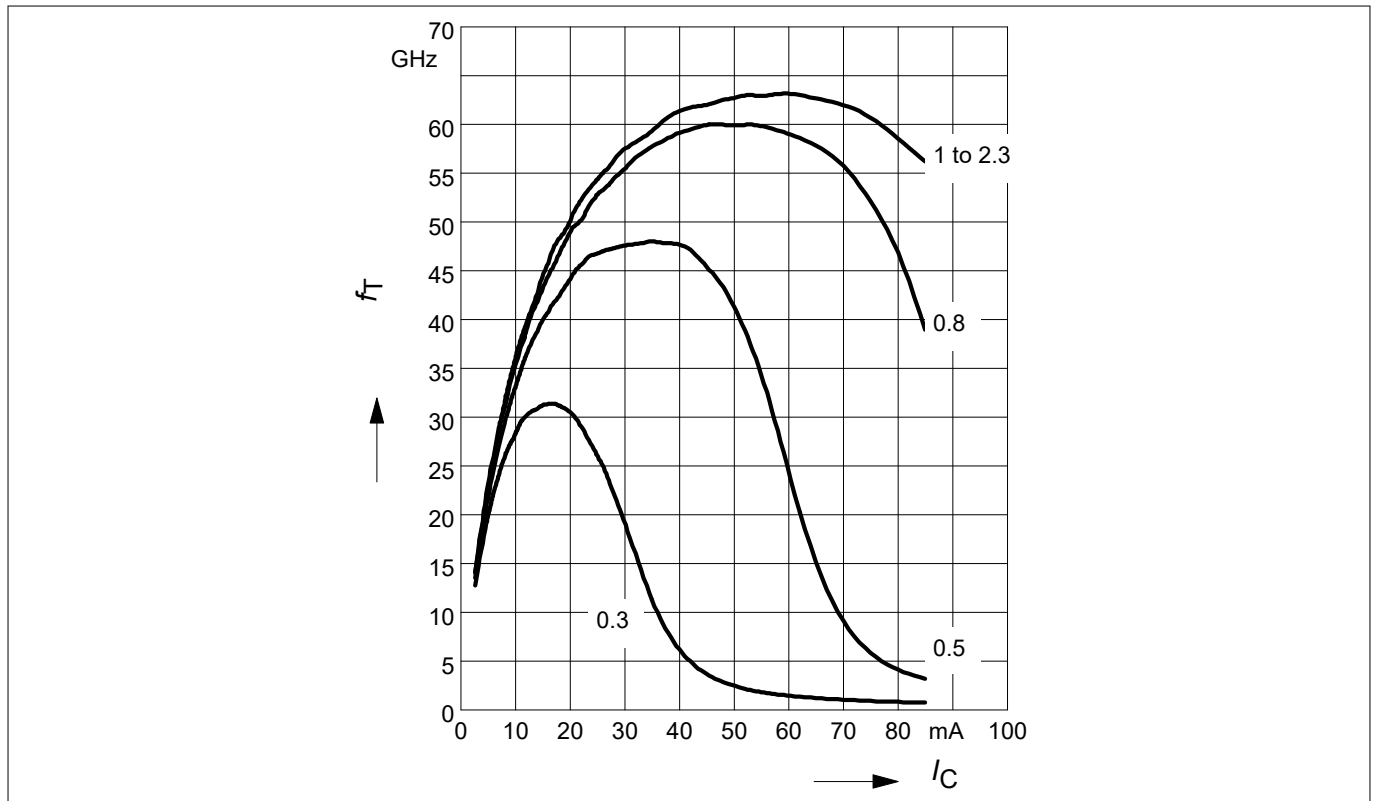


Figure 5 Transition frequency $f_T = f(I_C)$, $f = 1$ GHz, $V_{CE} =$ parameter in V

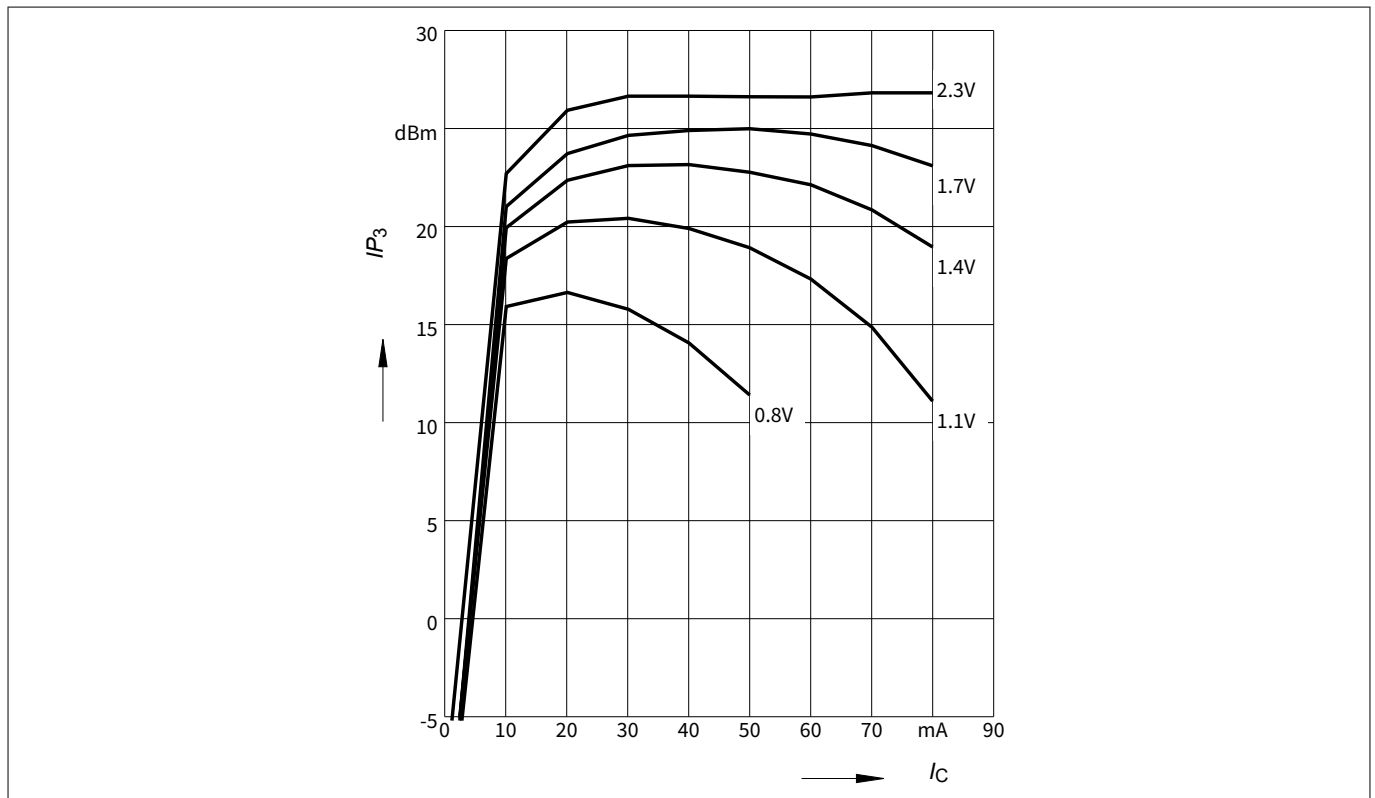


Figure 6 3rd order intercept point $OIP_3 = f(I_C)$, $Z_S = Z_L = 50 \Omega$, $f = 1.8$ GHz, $V_{CE} =$ parameter

Electrical characteristics

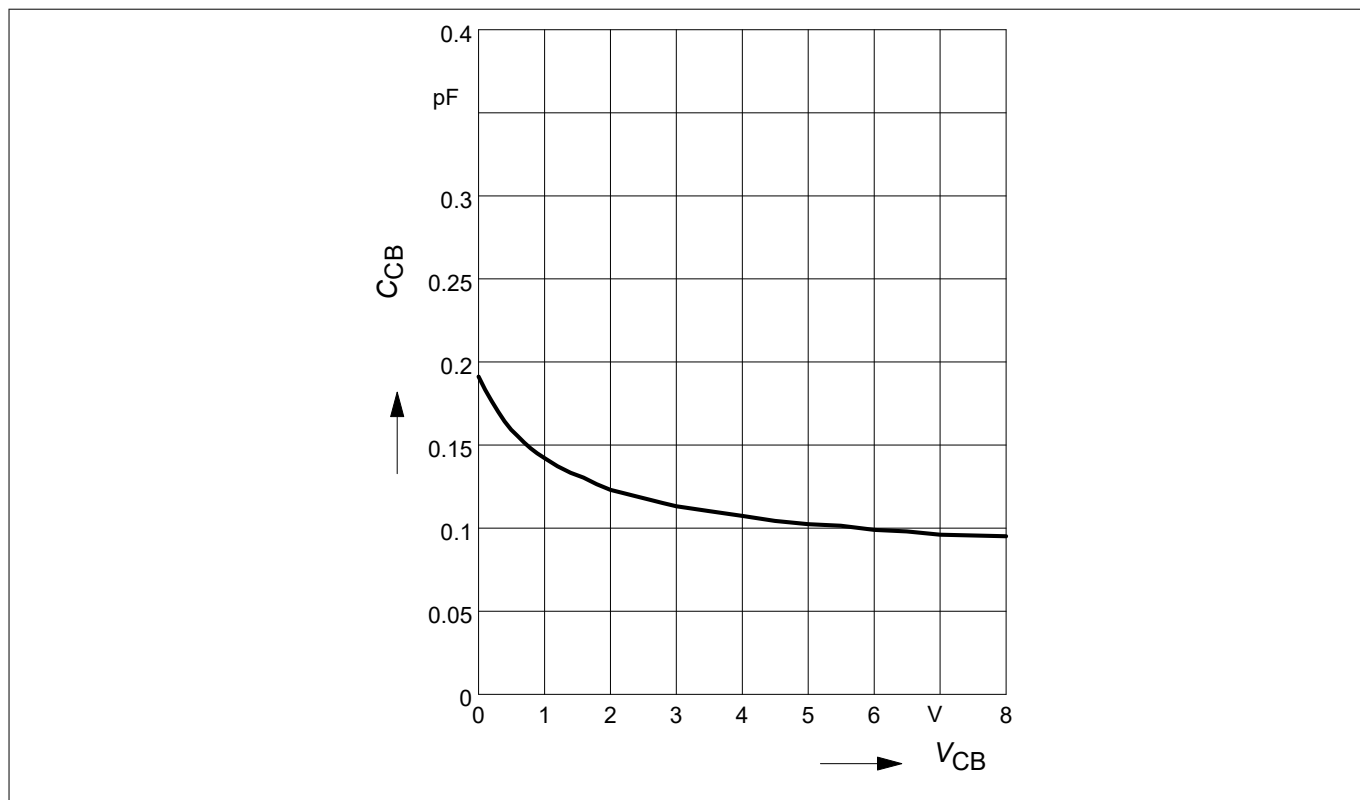


Figure 7 Collector base capacitance $C_{CB} = f(V_{CB})$, $f = 1$ MHz

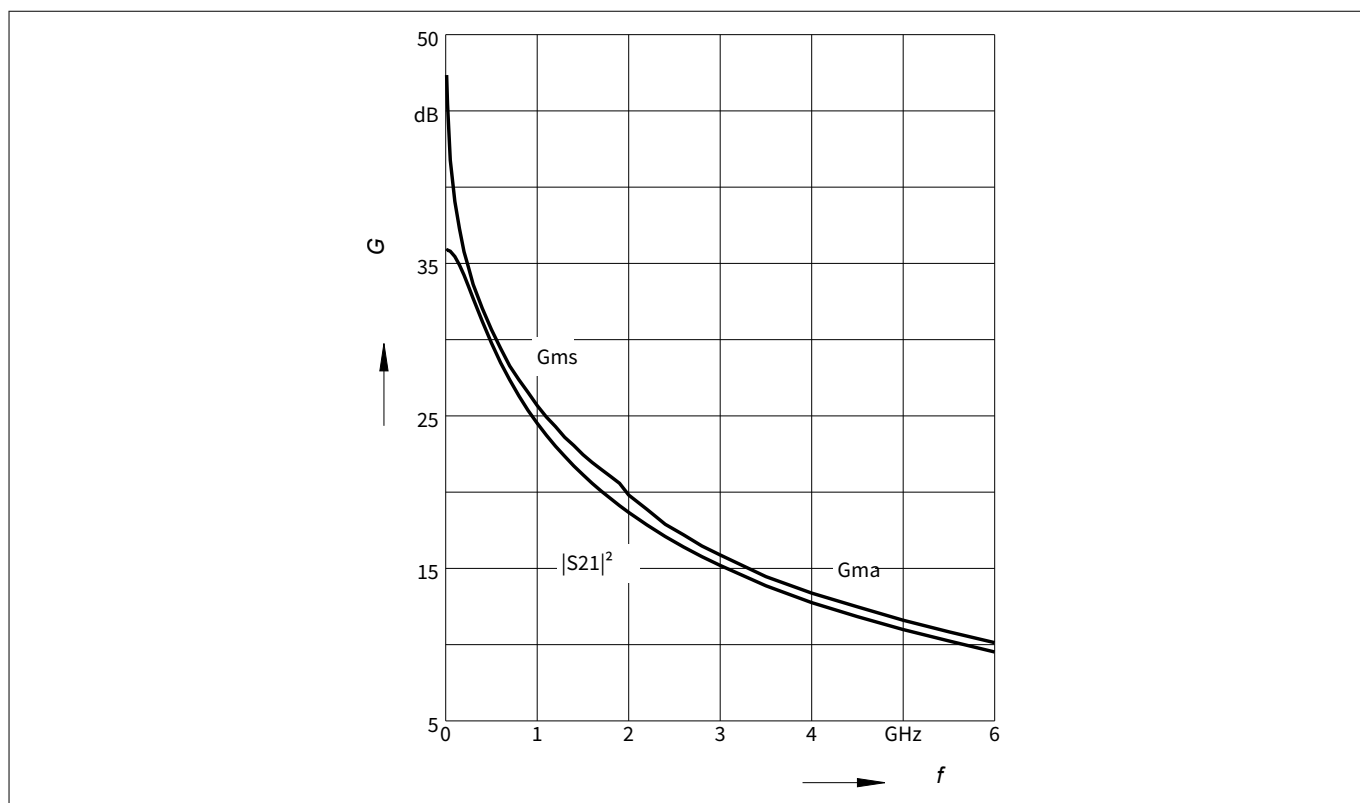


Figure 8 Gain G_{ma} , G_{ms} , $|S_{21}|^2 = f(f)$, $V_{CE} = 1.5$ V, $I_C = 50$ mA

Electrical characteristics

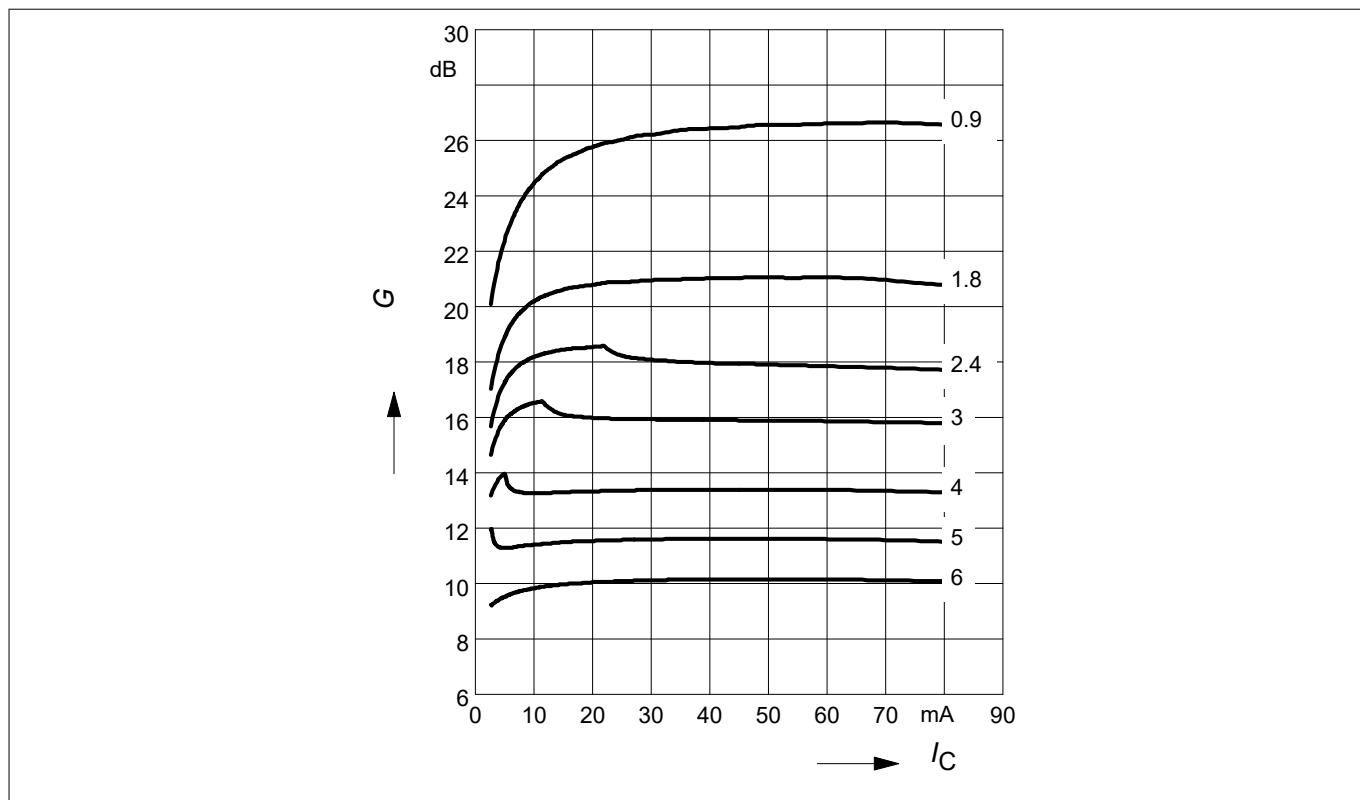


Figure 9 Maximum power gain $G_{\max} = f(I_C)$, $V_{CE} = 1.5$ V, $f =$ parameter in GHz

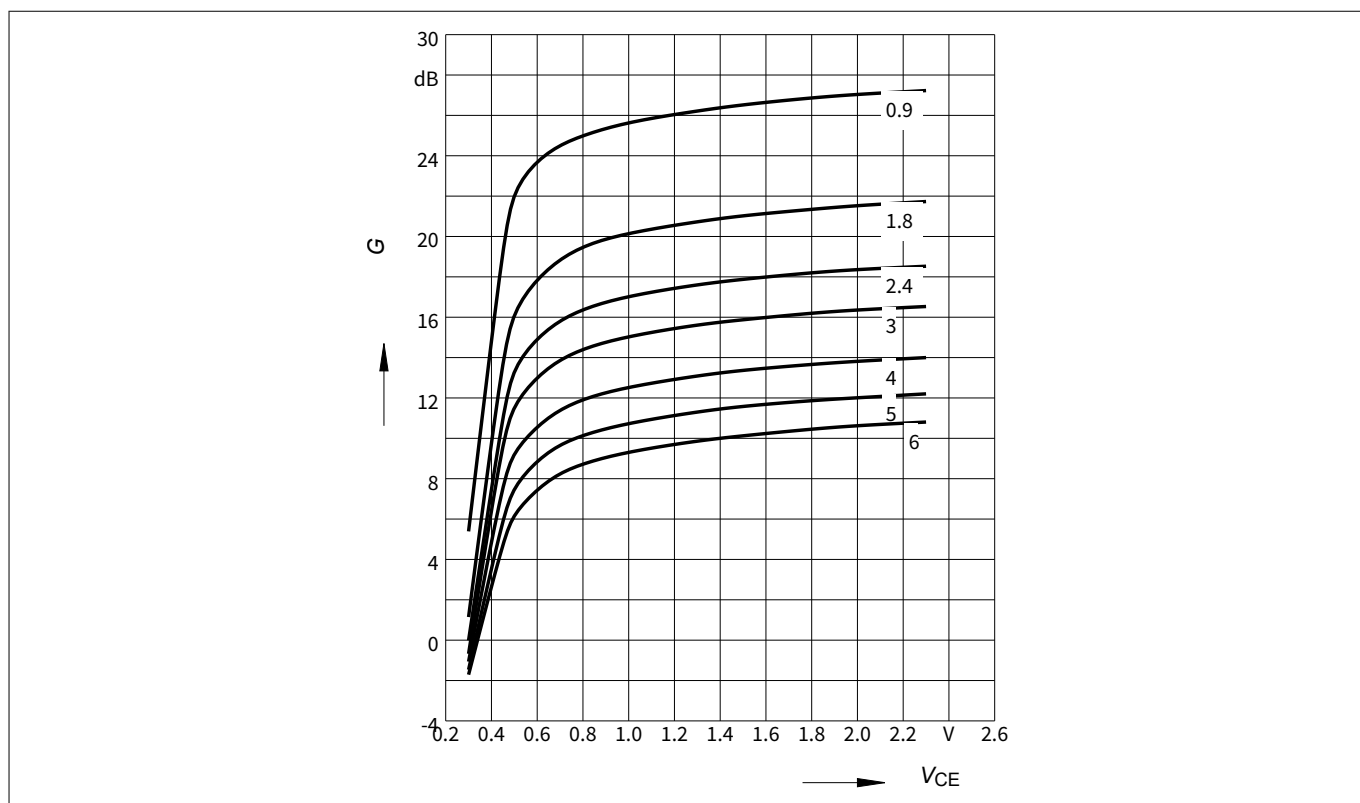


Figure 10 Maximum power gain $G_{\max} = f(V_{CE})$, $I_C = 50$ mA, $f =$ parameter in GHz

Electrical characteristics

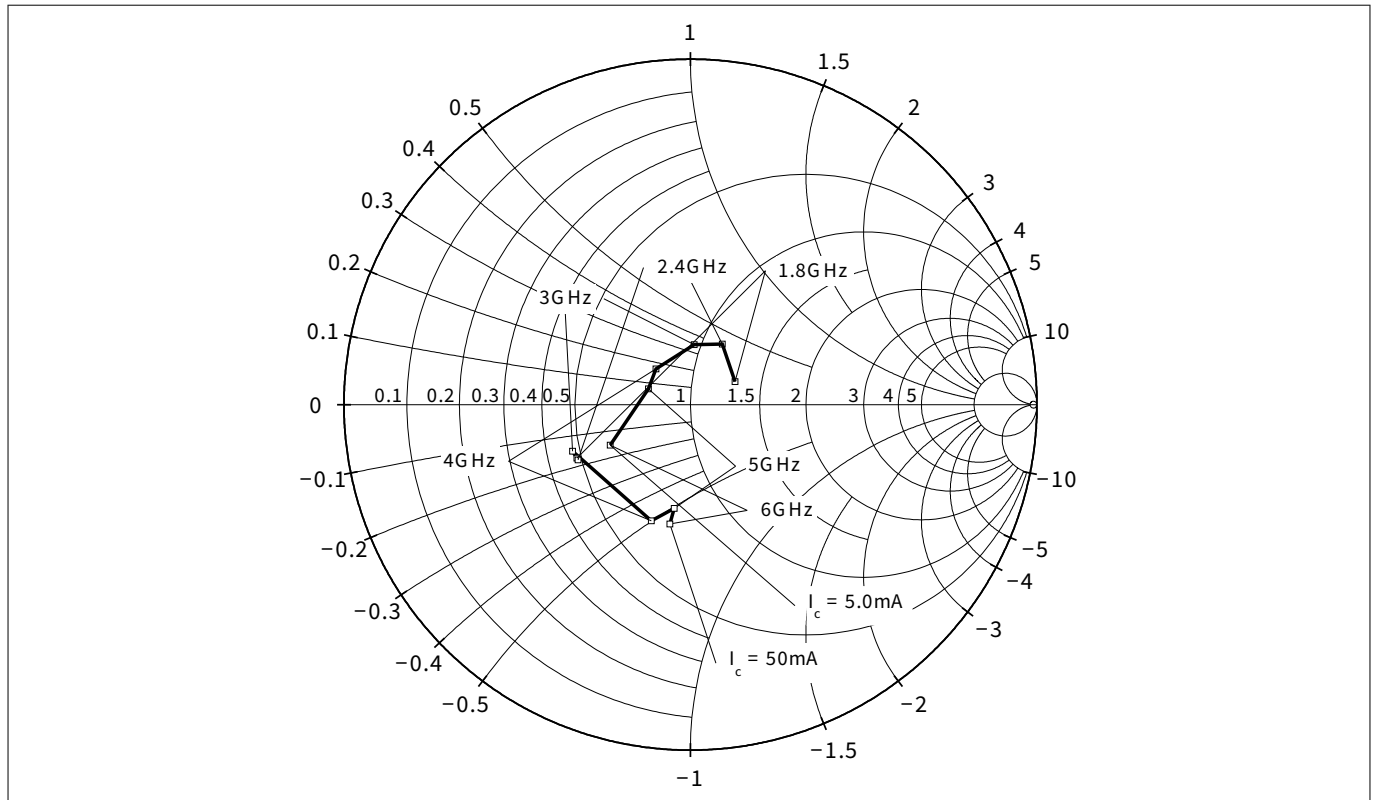


Figure 11 Source impedance for minimum noise figure $Z_{s,opt} = f(f)$, $V_{CE} = 1.5 \text{ V}$, $I_c = 5 / 50 \text{ mA}$

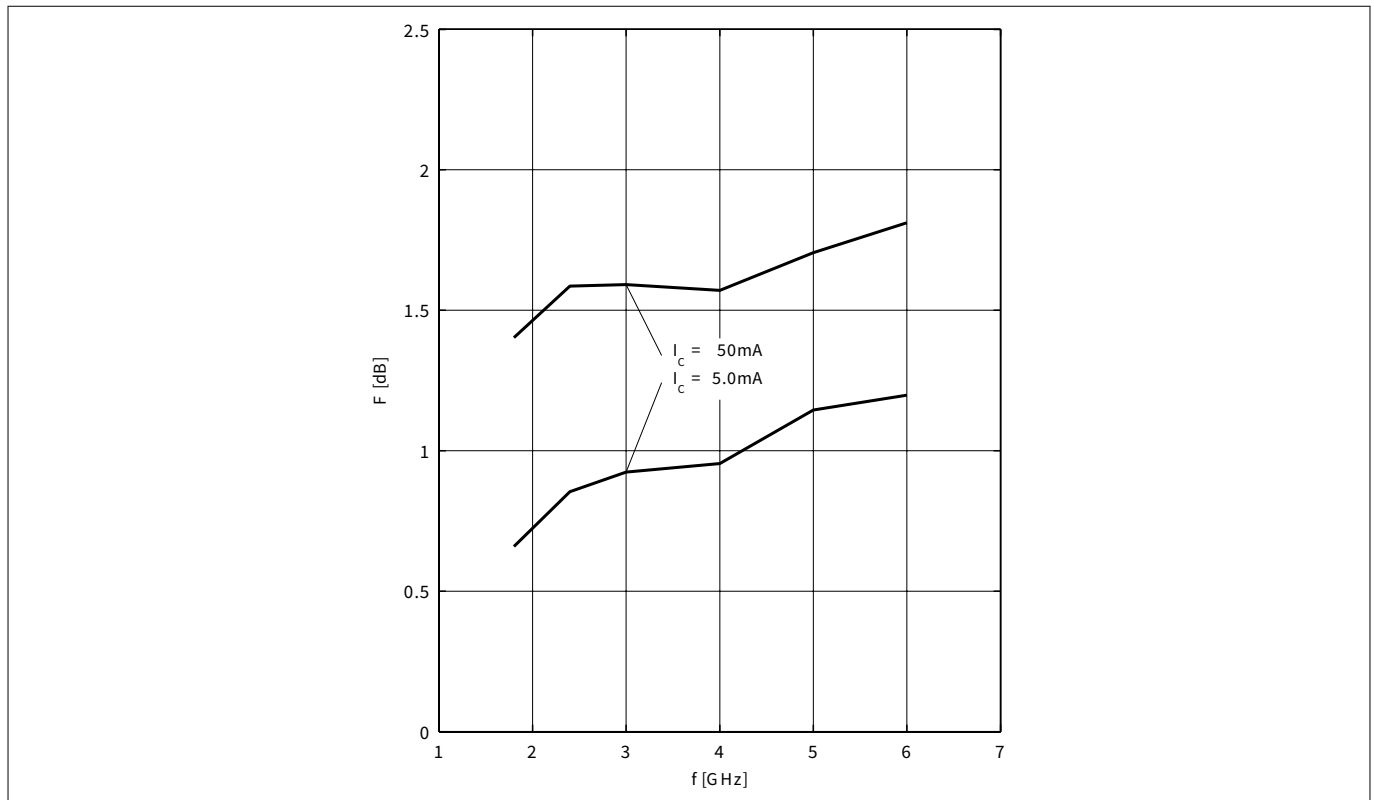


Figure 12 Noise figure $NF_{min} = f(f)$, $Z_s = Z_{s,opt}$, $V_{CE} = 1.5 \text{ V}$, $I_c = 5 / 50 \text{ mA}$

Electrical characteristics

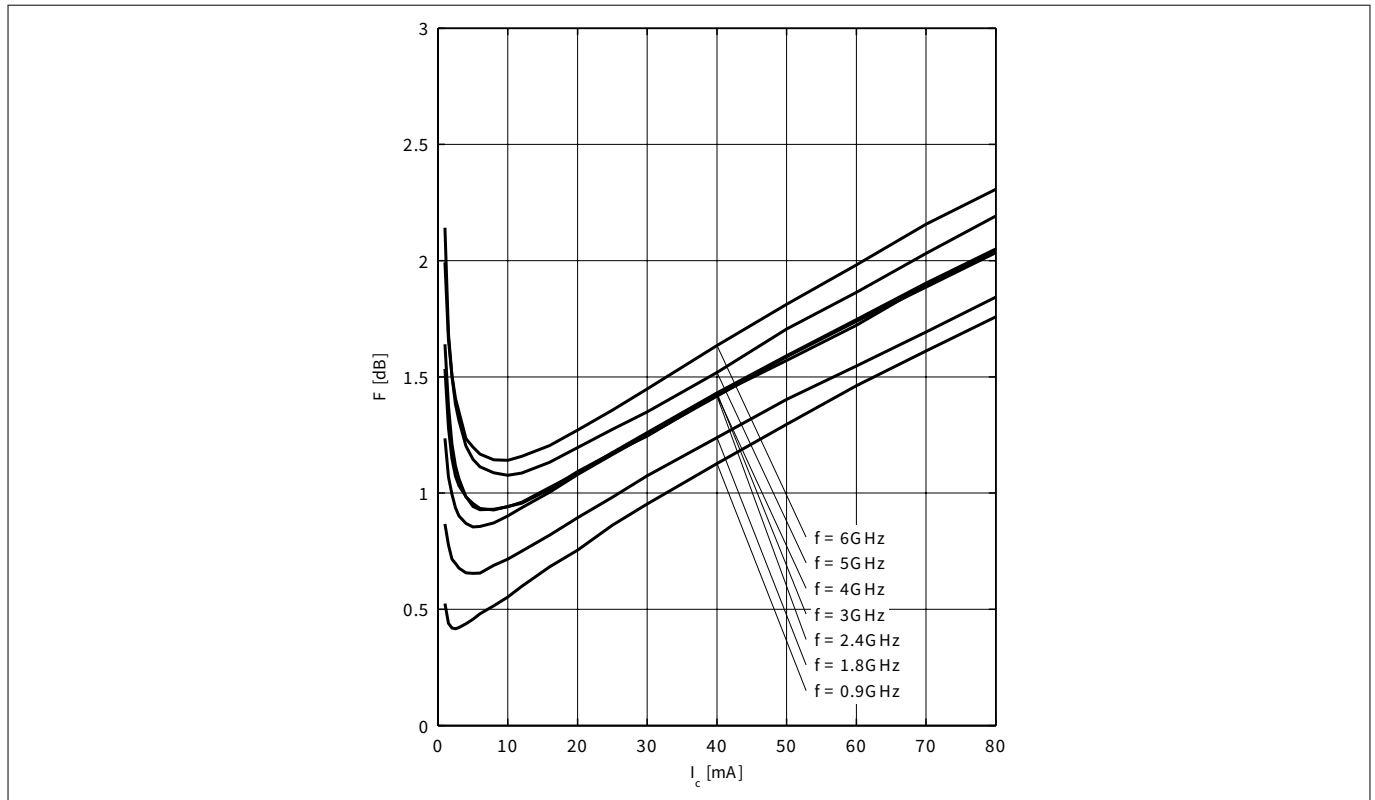


Figure 13 Noise figure $NF_{min} = f(I_c)$, $Z_S = Z_{S,opt}$, $V_{CE} = 1.5 \text{ V}$, $f =$ parameter in GHz

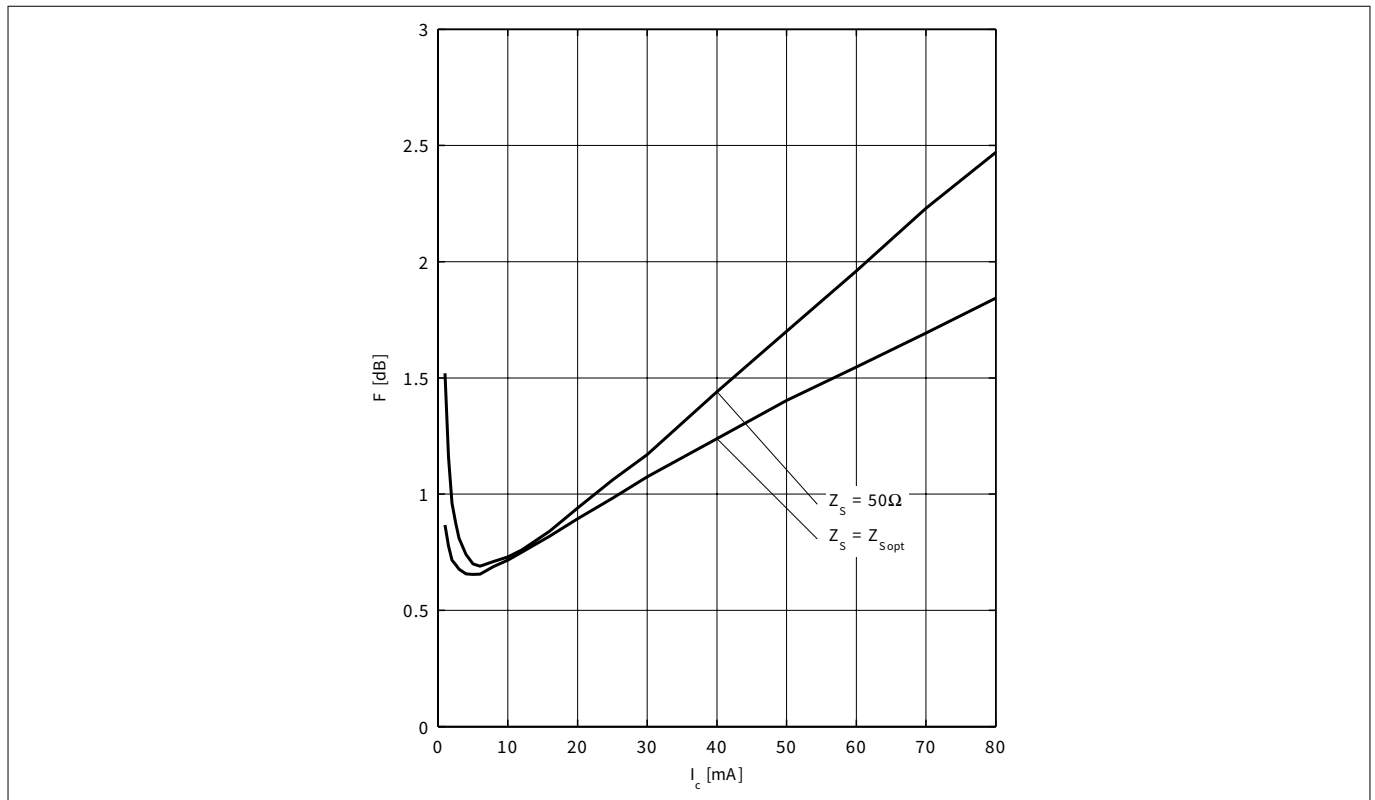


Figure 14 Noise figure $NF_{min} = f(I_c)$, $Z_S = Z_{S,opt}$, $NF_{50} = f(I_c)$, $Z_S = 50 \Omega$, $V_{CE} = 1.5 \text{ V}$, $f = 1.8 \text{ GHz}$

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. $T_A = 25^\circ \text{C}$.

4 Package information TSFP-4-1

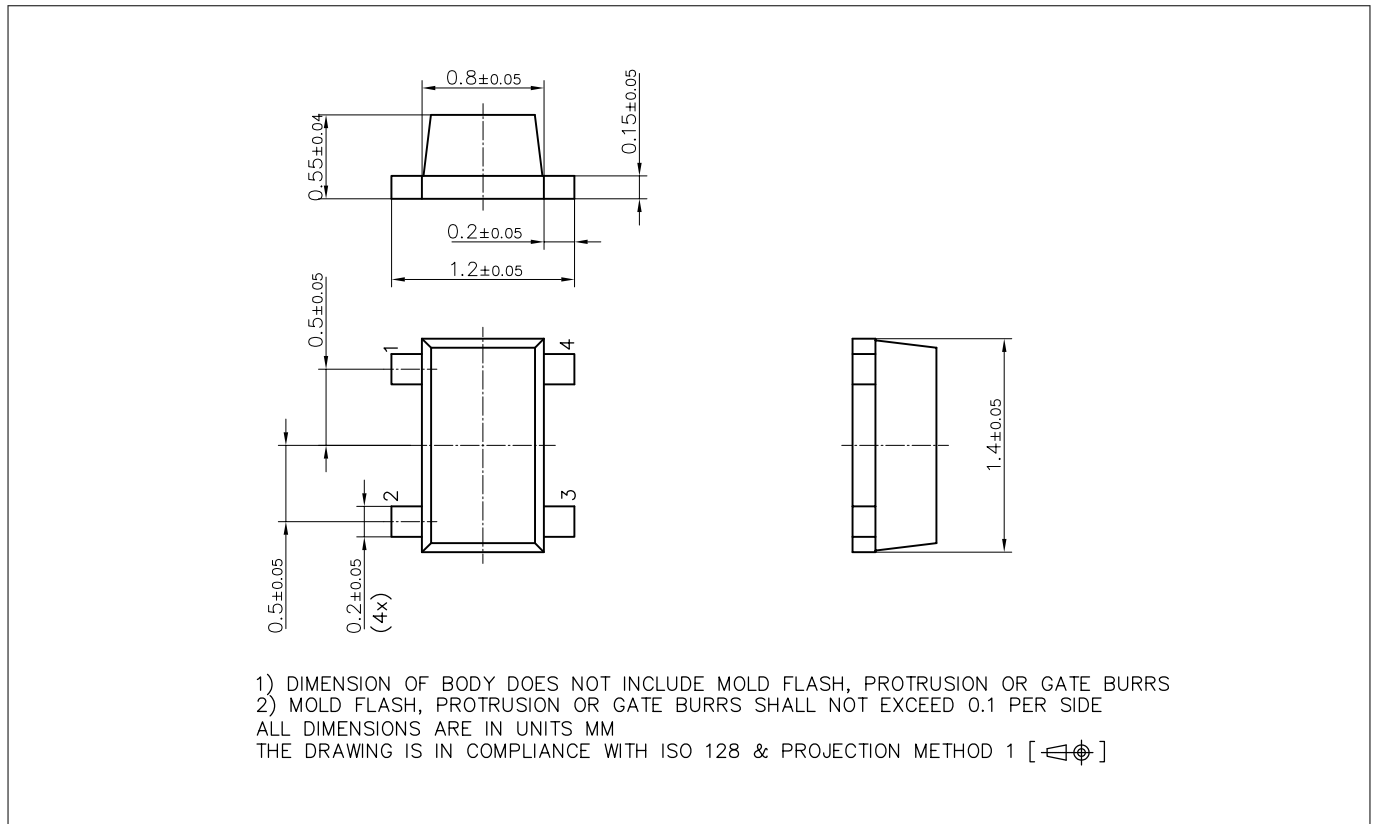


Figure 15 TSFP-4-1 package

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

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

Revision history

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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