BFP520

Surface mount low voltage silicon NPN RF bipolar transistor

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Product description

The BFP520 is a low noise device based on a grounded emitter (SIEGET™) that is part of Infineon's established fifth generation RF bipolar transistor family. Its transition frequency f_T of 45 GHz, high gain, low noise and voltage characteristics at high frequencies make the device suitable for low voltage applications. It remains cost competitive without compromising on ease of use.

Feature list

- Minimum noise figure NF_{min} = 0.95 dB at 1.8 GHz, 2 V, 2 mA
- High gain G_{ms} = 24 dB at 1.8 GHz, 2 V, 20 mA
- OIP_3 = 25 dBm at 1.8 GHz, 2 V, 20 mA

Product validation

Qualified for industrial applications according to the relevant tests of JEDEC47/20/22.

Potential applications

- Radio-frequency oscillators such as an LNB local oscillator
- Broadband low noise amplifiers (LNAs) for CATV, DVB-T, DAB/DMB and FM/AM radio
- LNAs for wireless communications such as cordless phones

Device information

Table 1   Part information

Product name / Ordering code	Package	Pin configuration				Marking	Pieces / Reel
BFP520 / BFP520H6327XTSA1	SOT343	1 = B	2 = E	3 = C	4 = E	APs	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}	–	2.5	V	Open base
			2.4		T_A = -55 °C, open base
Collector emitter voltage	V_{CES}		10		E-B short circuited
Collector base voltage	V_{CBO}		10		Open emitter
Emitter base voltage	V_{EBO}		1		Open collector
Base current	I_B		5	mA	–
Collector current	I_C		50		
Total power dissipation [1]	P_{tot}		125	mW	$T_S \leq 105 °C$
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.**

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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**

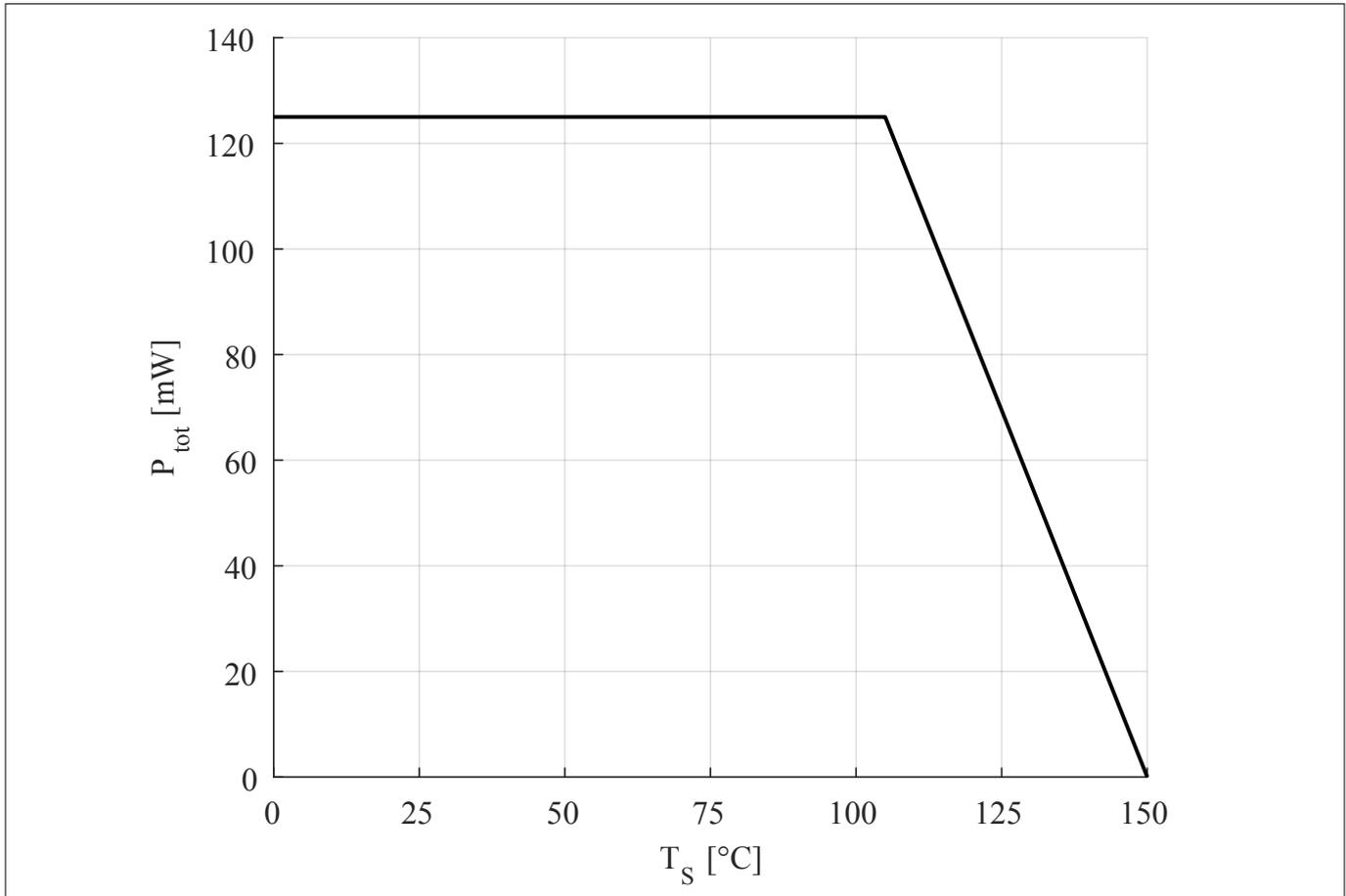| Parameter	Symbol	Values			Unit	Note or test condition
		Min.	Typ.	Max.		
Junction - soldering point	R_{thJS}	–	450	–	K/W	–

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

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	$V_{(BR)CEO}$	2.5	3	3.5	V	I_C = 1 mA, I_B = 0, open base
Collector emitter leakage current	I_{CES}	–	1	30 [2]	nA	V_{CE} = 2 V, V_{BE} = 0, E-B short circuited
			–	1000 [2]		V_{CE} = 10 V, V_{BE} = 0, E-B short circuited
Collector base leakage current	I_{CBO}			30 [2]		V_{CB} = 2 V, I_E = 0, open emitter
Emitter base leakage current	I_{EBO}		100	3000 [2]		V_{EB} = 0.5 V, I_C = 0, open collector
DC current gain	h_{FE}	70	110	170		V_{CE} = 2 V, I_C = 20 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	32	45	–	GHz	V_{CE} = 2 V, I_C = 30 mA, f = 2 GHz
Collector base capacitance	C_{CB}	–	0.07	0.13	pF	V_{CB} = 2 V, V_{BE} = 0, f = 1 MHz, emitter grounded
Collector emitter capacitance	C_{CE}		0.3	–		V_{CE} = 2 V, V_{BE} = 0, f = 1 MHz, base grounded
Emitter base capacitance	C_{EB}		0.33			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.

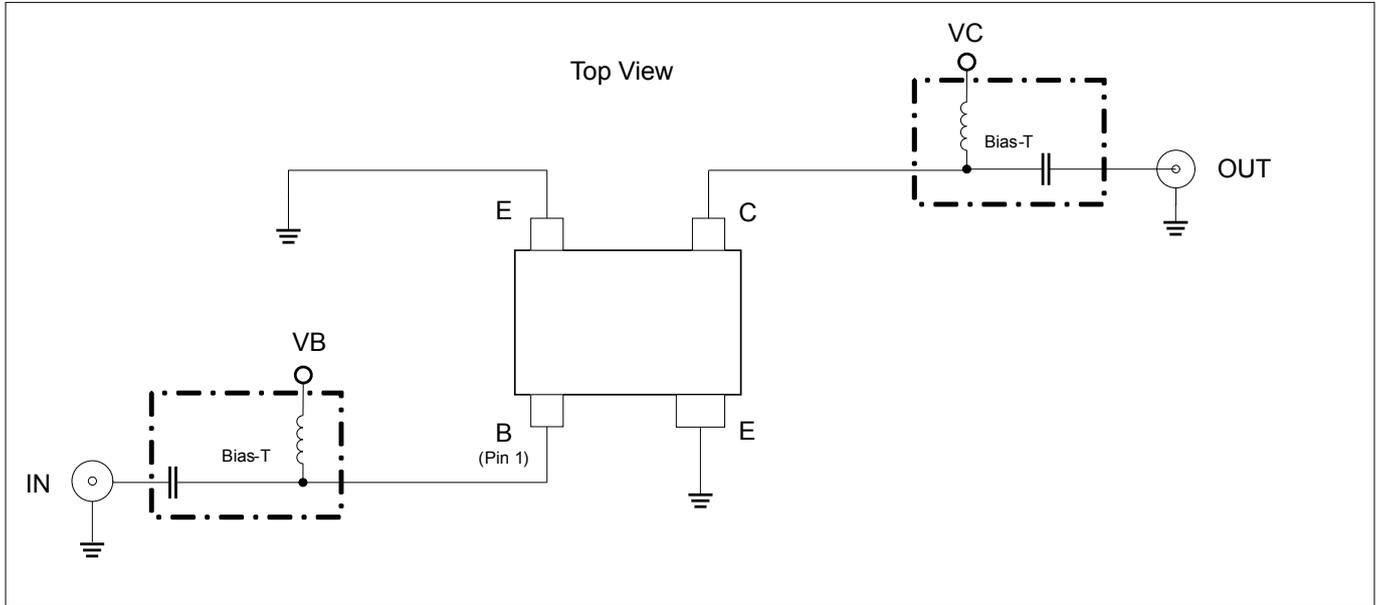**Figure 2** **Testing circuit**

Table 6 **AC characteristics, V_{CE} = 2 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} $\|S_{21}\|^2$	–	24 21.5	–	dB	I_C = 20 mA
Noise figure • Minimum noise figure	NF_{min}		0.95			I_C = 2 mA
Linearity • 3rd order intercept point at output • 1 dB gain compression point at output	OIP_3 OP_{1dB}		25 17 12 5		dBm	$Z_S = Z_{S,opt}$, $Z_L = Z_{L,opt}$ I_C = 20 mA I_C = 7 mA I_C = 20 mA I_C = 7 mA

Note: $G_{ms} = |S_{21} / S_{12}|$ for $k < 1$; $G_{ma} = |S_{21} / S_{12}|(k-(k^2-1)^{1/2})$ 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.

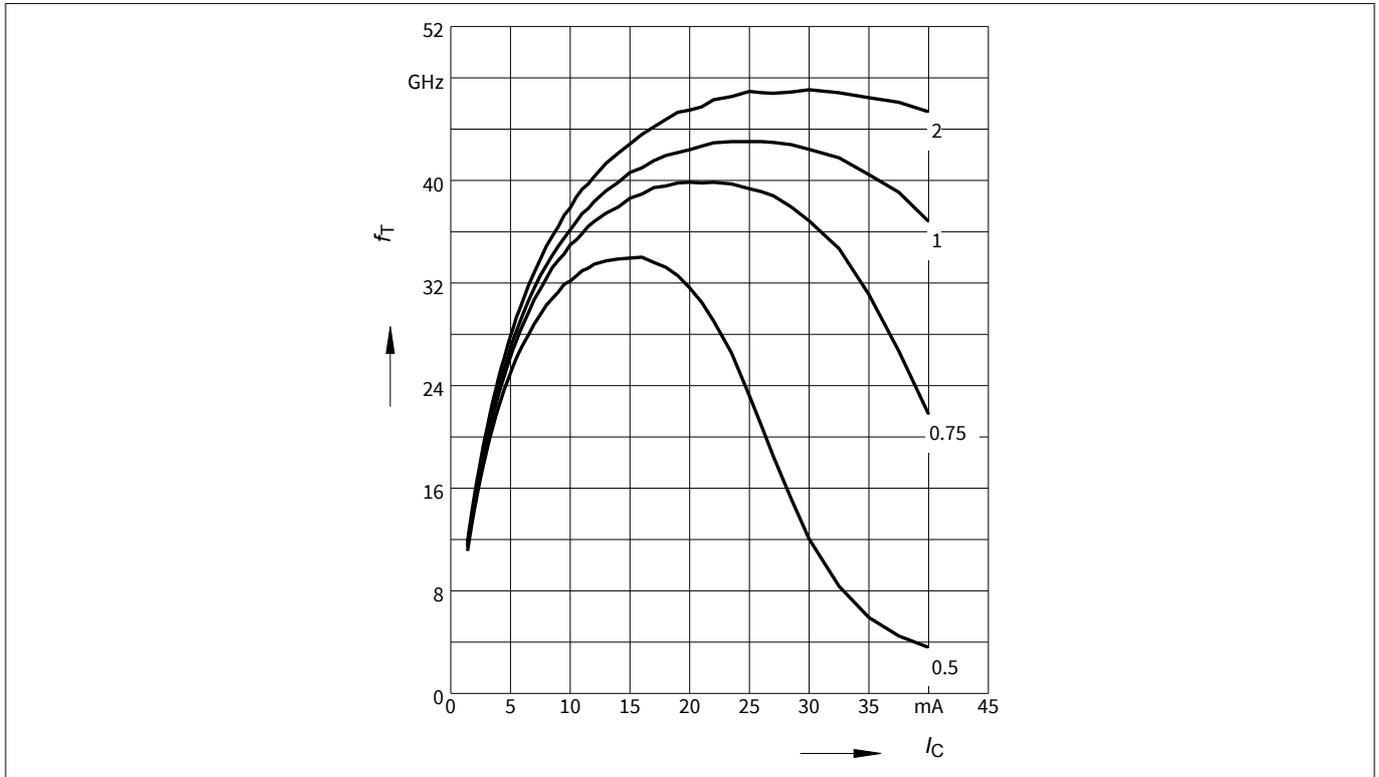## 3.4 Characteristic AC diagrams

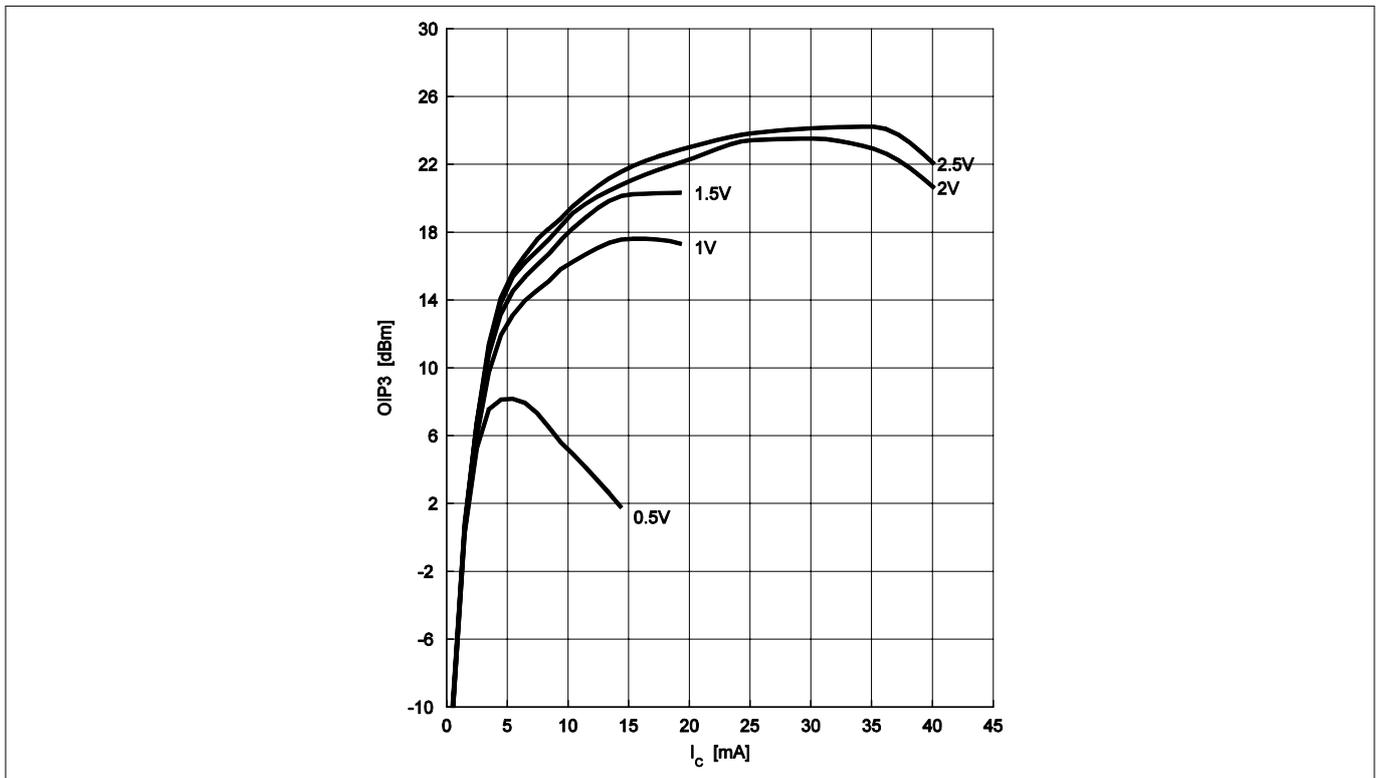**Figure 3**   Transition frequency f_T = f(I_C), f = 2 GHz, V_{CE} = parameter

Figure 4   3rd order intercept point OIP_3 = f(I_C), Z_S = Z_L = 50 Ω, f = 900 MHz, V_{CE} = parameter

Electrical characteristics
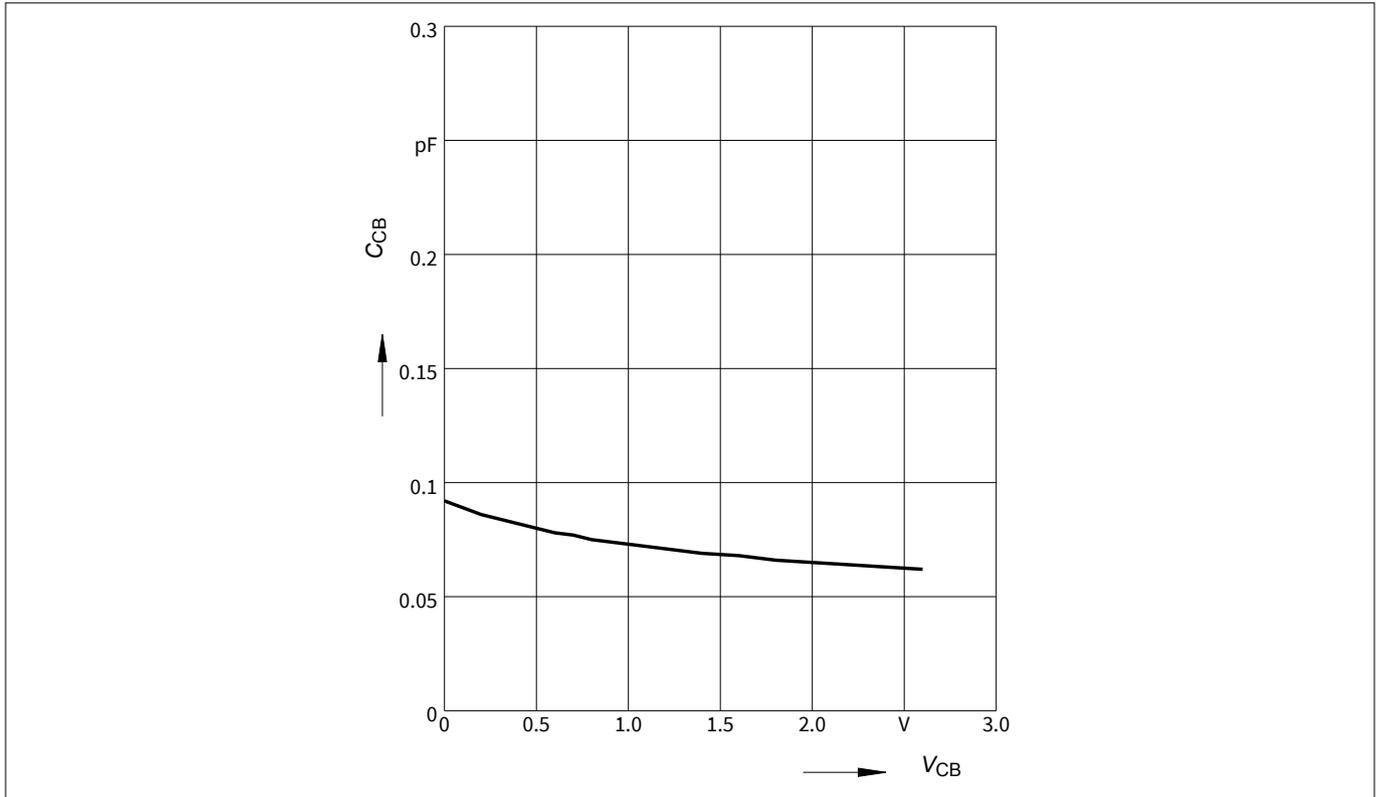

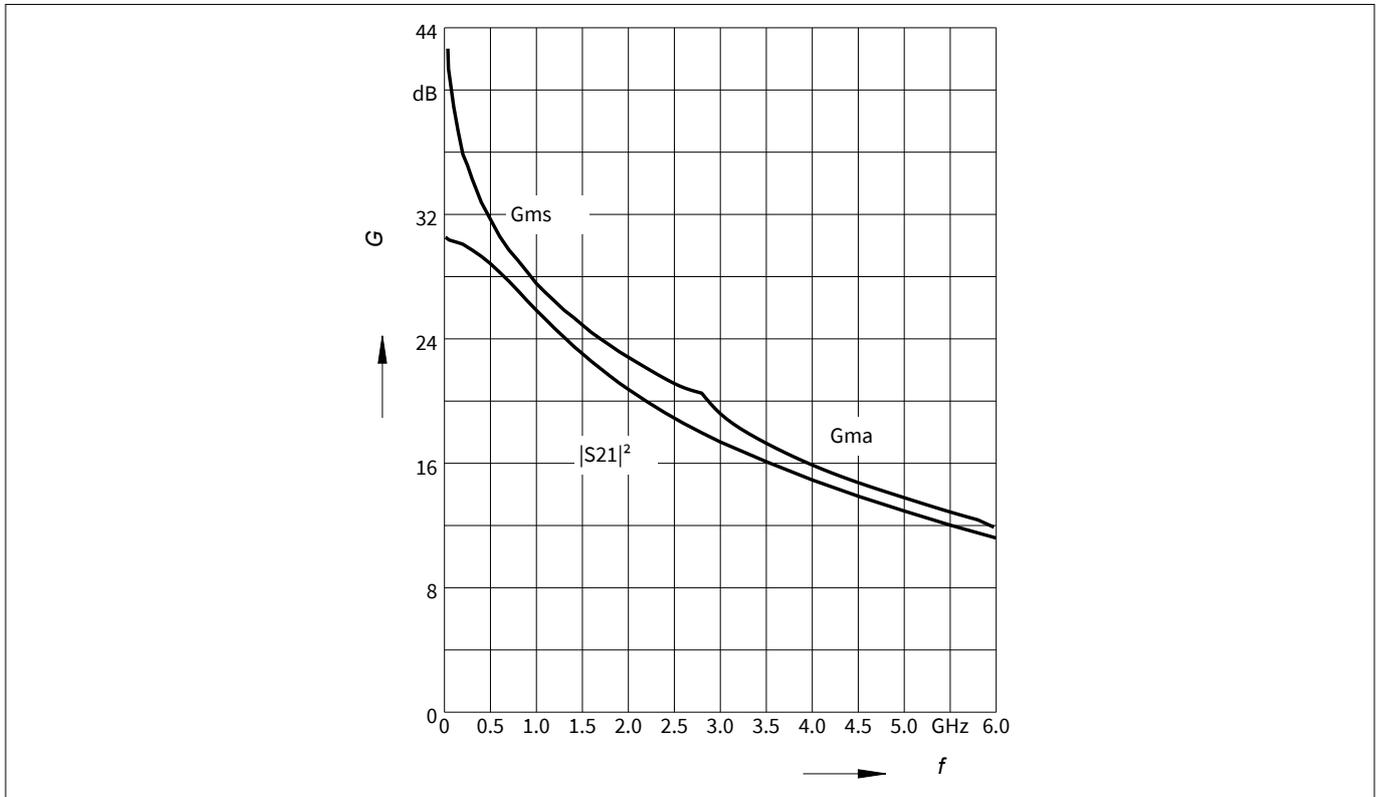**Figure 5**   Collector base capacitance C_{CB} = f(V_{CB}), f = 1 MHz

Figure 6   Gain G_{ma}, G_{ms}, IS_{21}I^2 = f(f), V_{CE} = 2 V, I_C = 20 mA

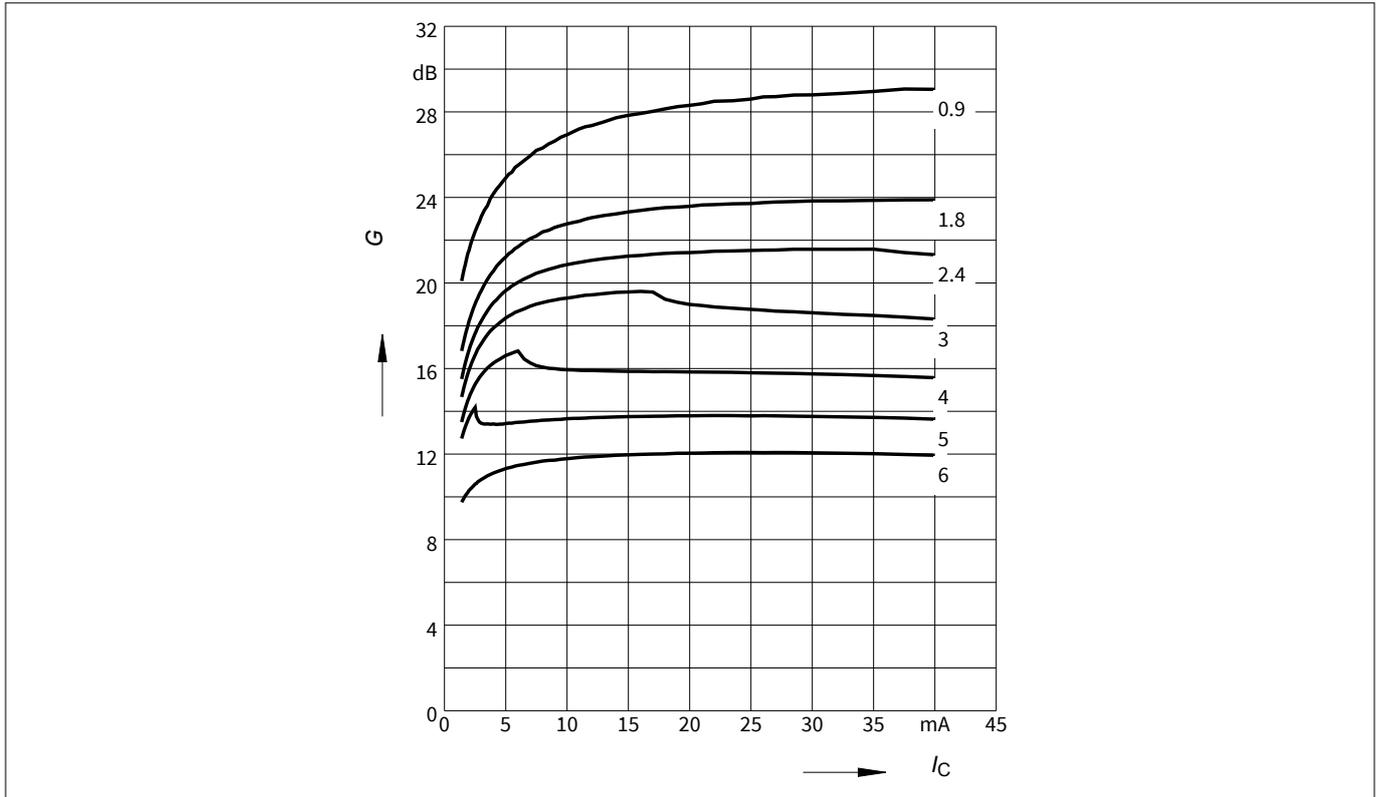**Electrical characteristics**

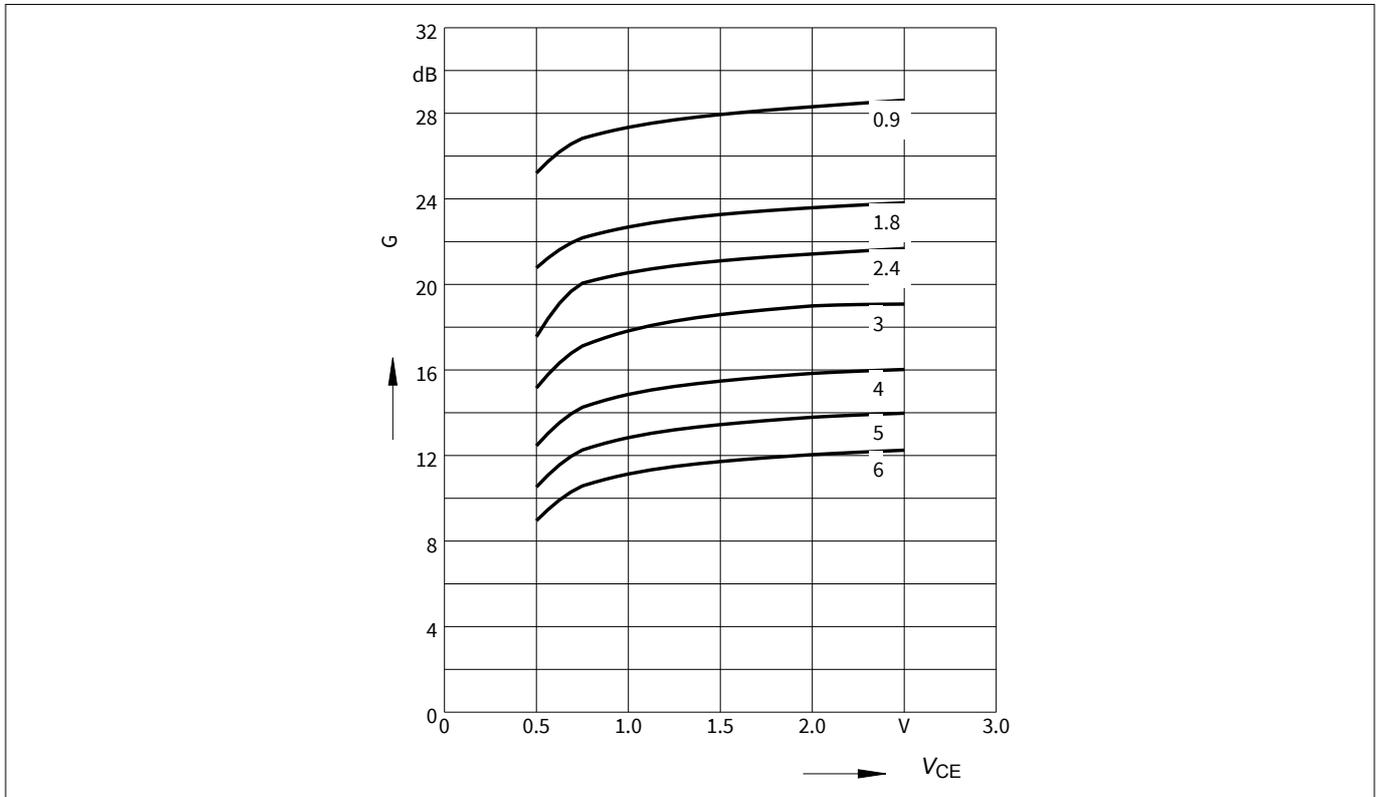**Figure 7** **Maximum power gain G_{max} = f(I_C), V_{CE} = 2 V, f = parameter in GHz**

Figure 8 **Maximum power gain G_{max} = f(V_{CE}), I_C = 20 mA, f = parameter in GHz**
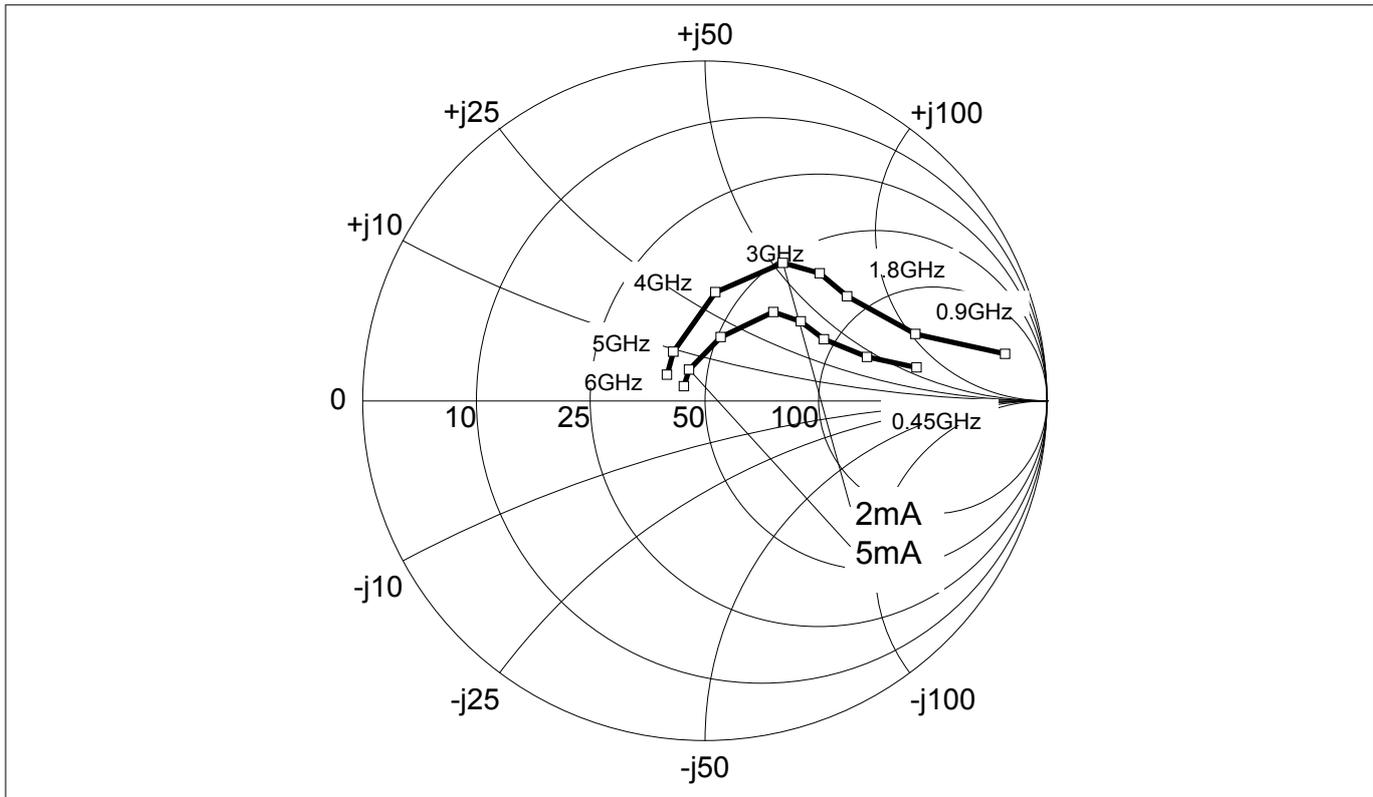
Electrical characteristics

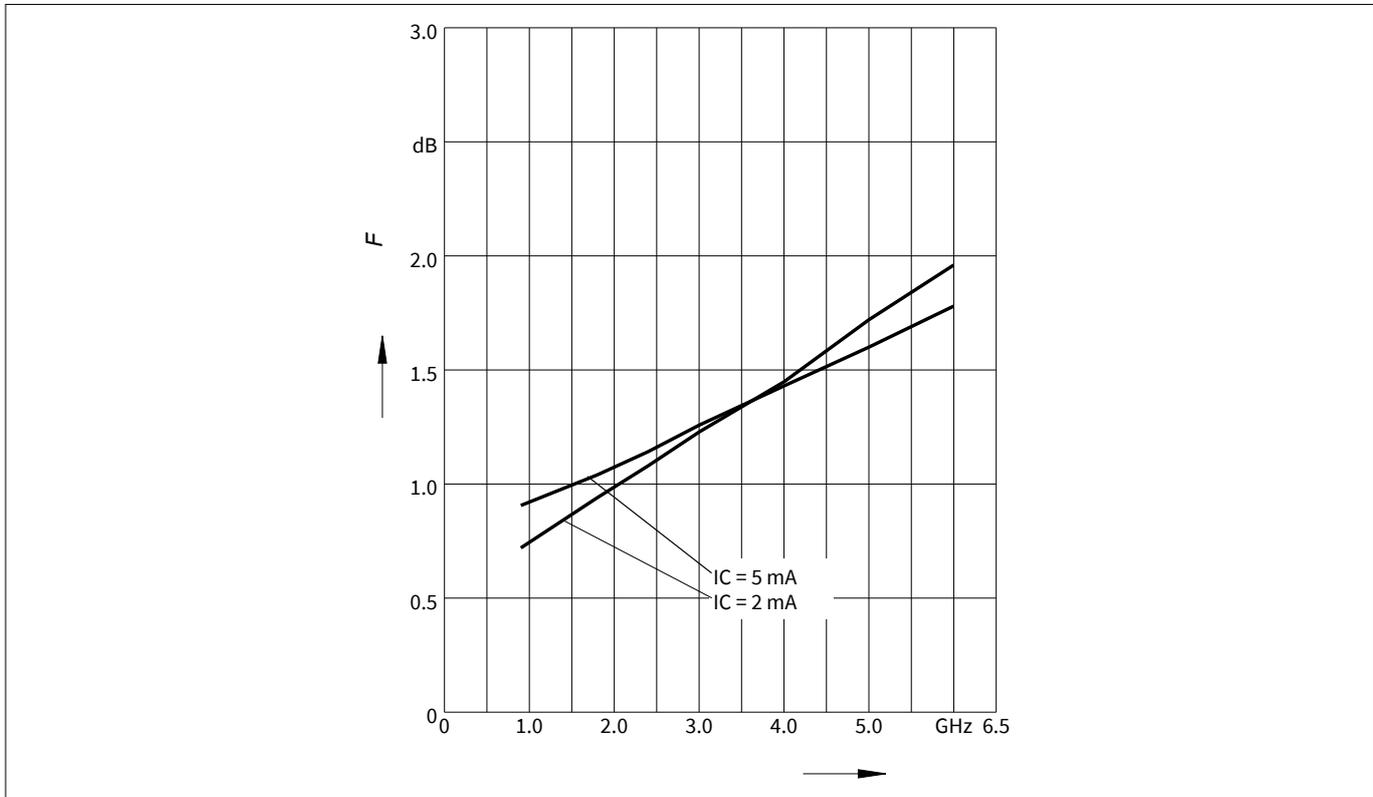**Figure 9**   **Source impedance for minimum noise figure $Z_{S,opt}$ = f(f), V_{CE} = 2 V, I_C = 2 / 5 mA**

Figure 10   **Noise figure NF_{min} = f(f), V_{CE} = 2 V, Z_S = $Z_{S,opt}$, I_C = 2 / 5 mA**
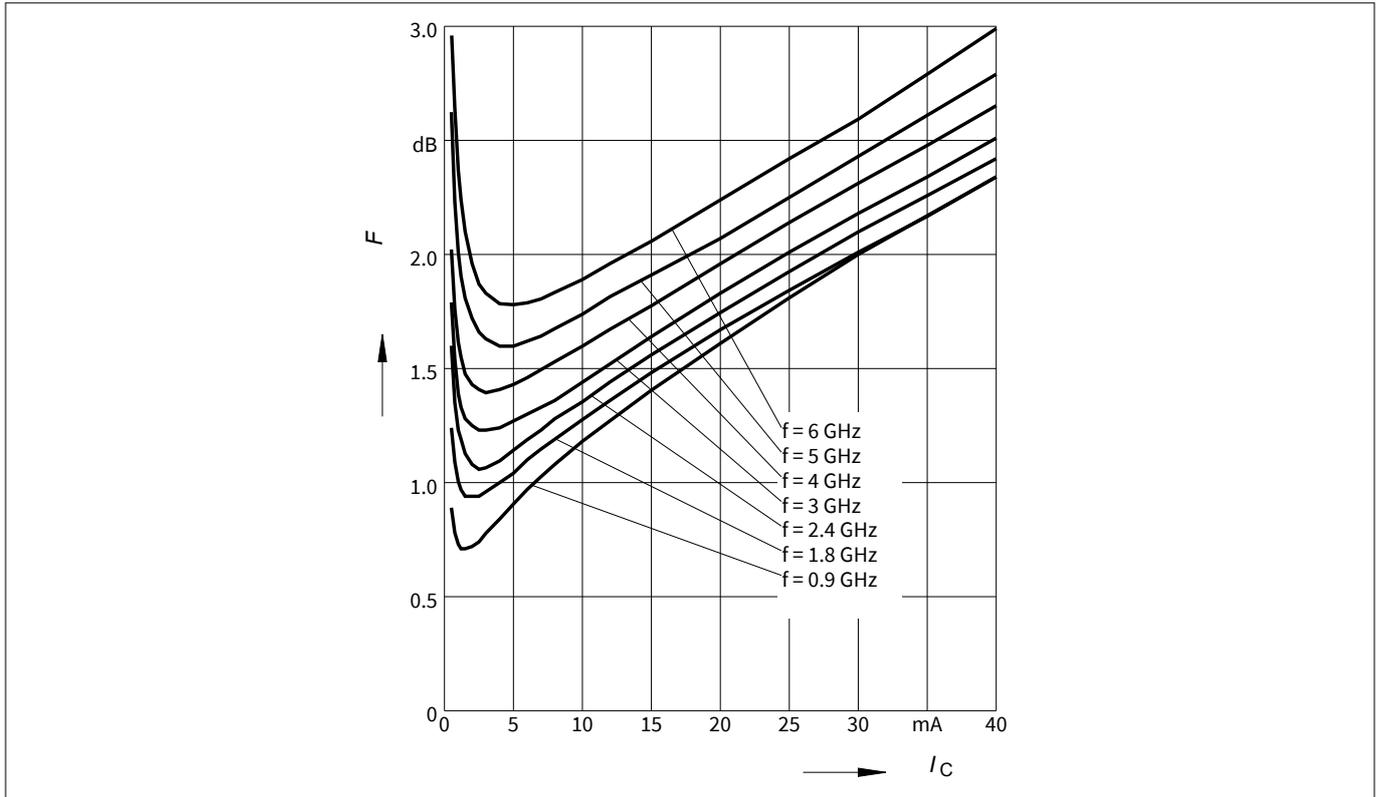
Electrical characteristics

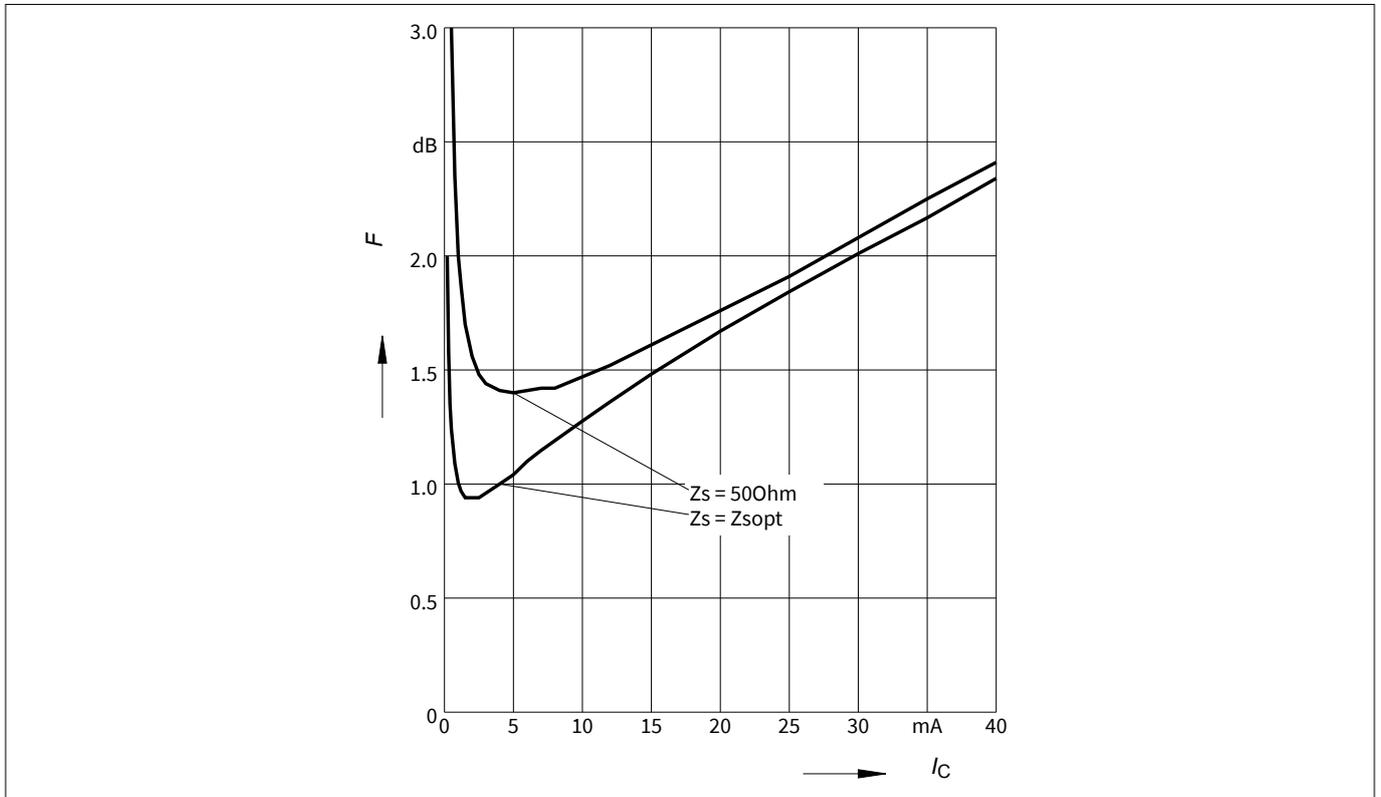**Figure 11**   Noise figure $NF_{min} = f(I_C)$, $V_{CE} = 2$ V, $Z_S = Z_{S,opt}$, f = parameter in GHz

Figure 12   Noise figure $NF_{50} = f(I_C)$, $Z_S = 50$ Ω, $NF_{min} = f(I_C)$, $Z_S = Z_{S,opt}$, $V_{CE} = 2$ 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 SOT343

MOLD FLASH, PROTRUSION OR GATE BURRS OF 0.2 MM MAXIMUM PER SIDE ARE NOT INCLUDED
ALL DIMENSIONS ARE IN UNITS MM
THE DRAWING IS IN COMPLIANCE WITH ISO 128 & PROJECTION METHOD 1 [⊕]
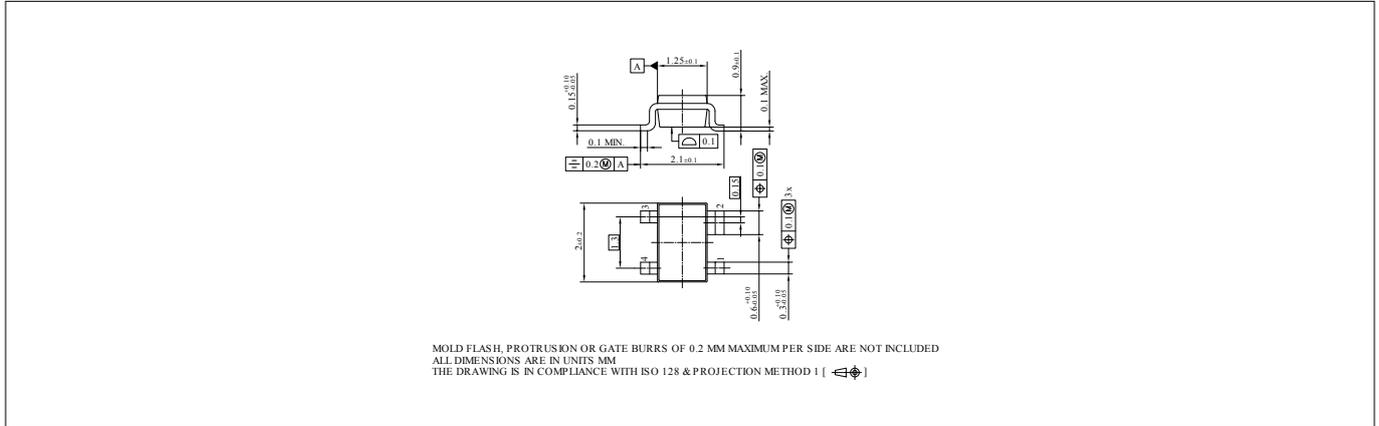
Figure 13 **Package outline**

copper   solder mask   stencil apertures

All dimensions are in units mm

Figure 14 **Foot print**

TYPE CODE
NOTE OF MANUFACTURER
MONTH
YEAR
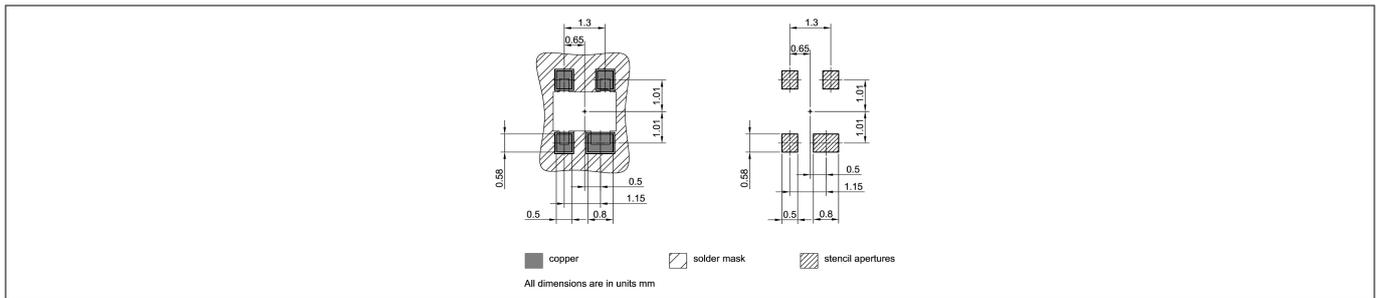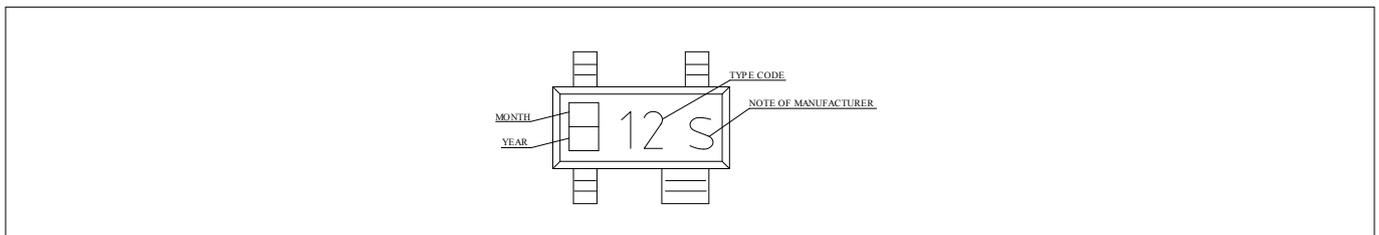
Figure 15 **Marking layout example**

PIN 1
INDEX MARKING

ALL DIMENSIONS ARE IN UNITS MM
THE DRAWING IS IN COMPLIANCE WITH ISO 128 & PROJECTION METHOD 1 [⊕]

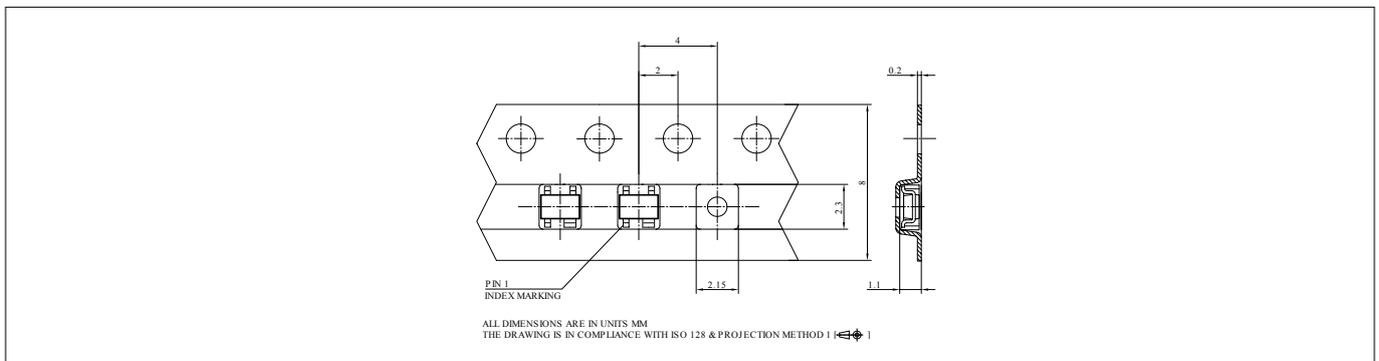**Figure 16** **Tape dimensions**

Revision history

Document version	Date of release	Description of changes
Revision 2.0	2019-01-25	New datasheet layout.

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