BFR380F

Low profile linear silicon NPN RF bipolar transistor

Order now | Technical documents | Simulation | Support

Product description

The BFR380F is a low noise device based on Si that is part of Infineon’s established third generation RF bipolar transistor family. Its high current and low noise characteristics make the device suitable for a broad range of applications as high as 3.5 GHz. It remains cost competitive without compromising on ease of use.

Feature list

- Minimum noise figure NF_{min} = 1.1 dB at 1.8 GHz, 3 V, 8 mA
- High gain G_{ma} = 13.5 dB at 1.8 GHz, 3 V, 40 mA
- OIP_3 = 29 dBm at 1.8 GHz, 3 V, 40 mA

Product validation

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

Potential applications

- Low noise amplifiers (LNAs) for DVB-T/H
- LNAs for TV white space application
- Low noise, high linearity amplifiers for sub-1 GHz ISM band applications

Device information

Table 1 Part information

Product name / Ordering code	Package	Pin configuration			Marking	Pieces / Reel
BFR380F / BFR380FH6327XTSA1	TSFP-3-1	1 = B	2 = E	3 = C	FCs	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 Min.	Values Max.	Unit	Note or test condition
Collector emitter voltage	V_{CEO}	–	6	V	Open base
Collector emitter voltage	V_{CES}		15		E-B short circuited
Collector base voltage	V_{CBO}		15		Open emitter
Emitter base voltage	V_{EBO}		2		Open collector
Base current	I_B		14	mA	–
Collector current	I_C		80		
Total power dissipation [1)]	P_{tot}		380	mW	$T_S \leq 95$ °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}	–	145	–	K/W	–

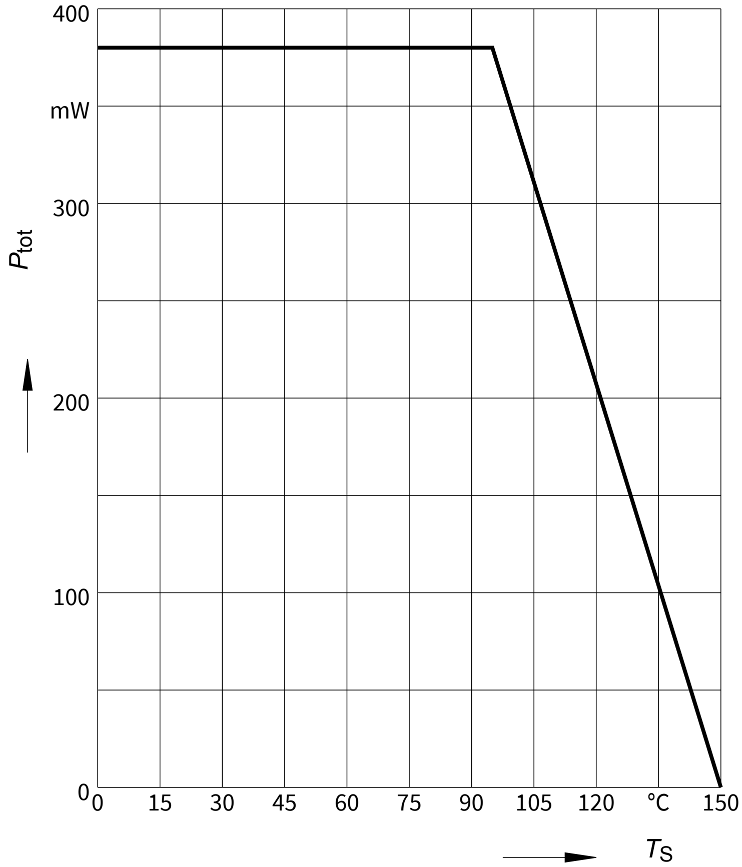

Figure 1 Total power dissipation P_{tot} = f(T_s)

Thermal characteristics

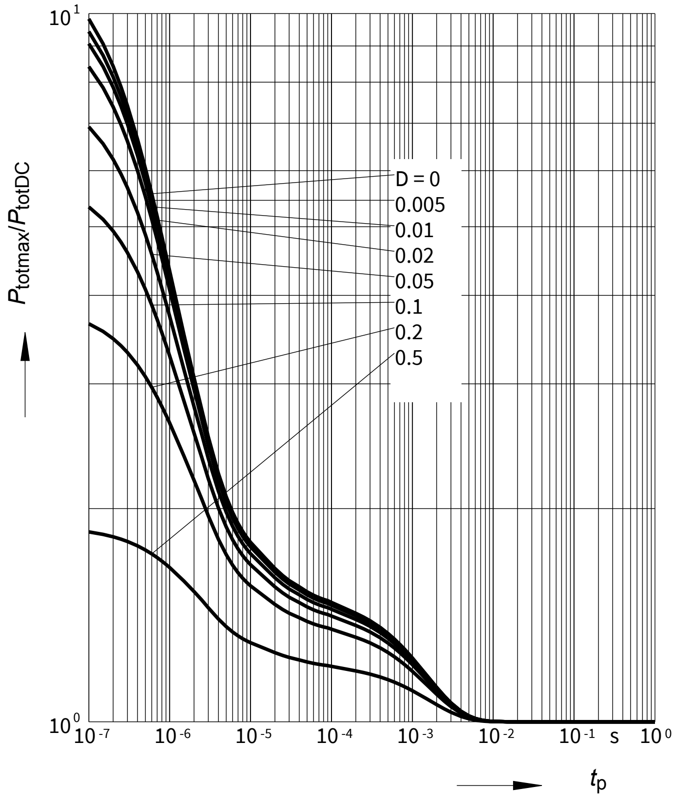

Figure 2 **Permissible Pulse Load $P_{tot,max} / P_{tot,DC} = f(t_p)$**

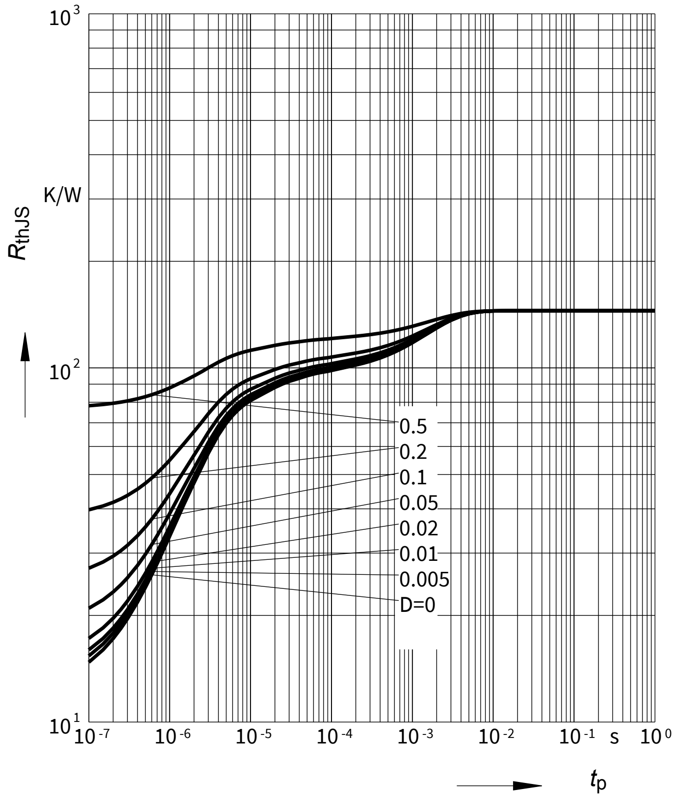

Figure 3 **Permissible Pulse Load $R_{thJS} = f(t_p)$**

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	$V_{(BR)CEO}$	6	9	–	V	I_C = 1 mA, I_B = 0, open base
Collector emitter leakage current	I_{CES}	–	1	30 [2]	nA	V_{CE} = 5 V, V_{BE} = 0, E-B short circuited
			–	1000 [2]		V_{CE} = 15 V, V_{BE} = 0, E-B short circuited
Collector base leakage current	I_{CBO}			30 [2]		V_{CB} = 5 V, I_E = 0, open emitter
Emitter base leakage current	I_{EBO}		1	500 [2]		V_{EB} = 1 V, I_C = 0, open collector
DC current gain	h_{FE}	90	120	160		V_{CE} = 3 V, I_C = 40 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	11	14	–	GHz	V_{CE} = 3 V, I_C = 40 mA, f = 1 GHz
Collector base capacitance	C_{CB}	–	0.5	0.7	pF	V_{CB} = 5 V, V_{BE} = 0, f = 1 MHz, emitter grounded
Collector emitter capacitance	C_{CE}		0.2	–		V_{CE} = 5 V, V_{BE} = 0, f = 1 MHz, base grounded
Emitter base capacitance	C_{EB}		1			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.

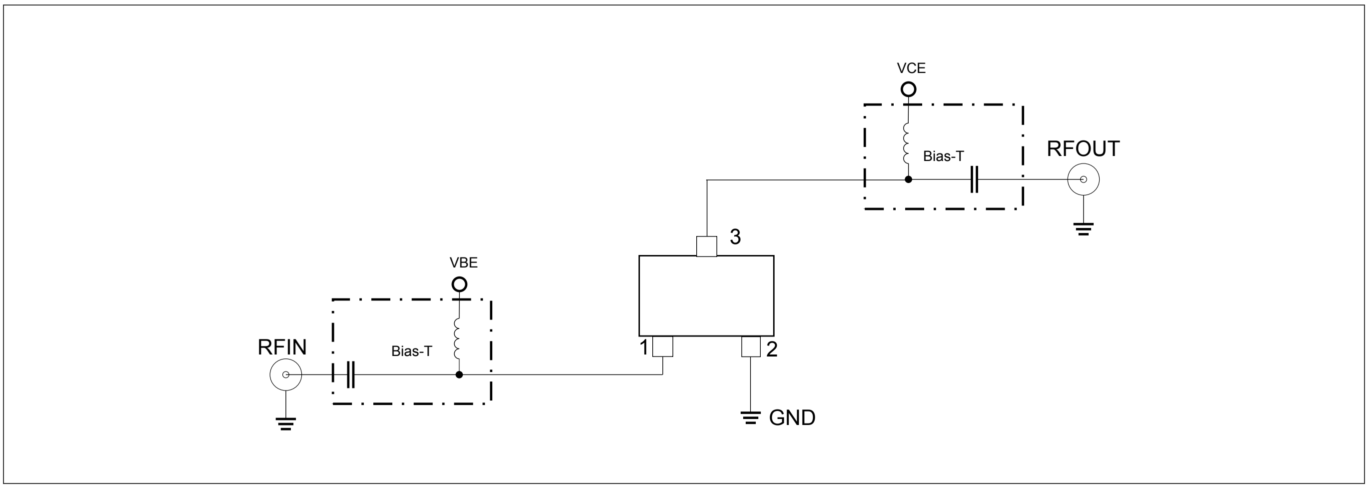

Figure 4 **Testing circuit**

Table 6 **AC characteristics, V_{CE} = 3 V, f = 1.8 GHz**

Parameter	Symbol	Values			Unit	Note or test condition
		Min.	Typ.	Max.		
Power gain		–		–	dB	
• Maximum power gain	G_{ms}		13.5			I_C = 40 mA
• Transducer gain	$\|S_{21}\|^2$		11			
Noise figure						
• Minimum noise figure	NF_{min}		1.1			I_C = 8 mA
Linearity					dBm	I_C = 40 mA,
• 3rd order intercept point at output	OIP_3		29			$Z_S = Z_L$ = 50 Ω,
• 1 dB gain compression point at output	OP_{1dB}		17			
	OP_{1dB}		19.5			$Z_S = Z_{S,opt}$, $Z_L = Z_{L,opt}$

Table 7 **AC characteristics, V_{CE} = 3 V, f = 3 GHz**

Parameter	Symbol	Values			Unit	Note or test condition
		Min.	Typ.	Max.		
Power gain		–		–	dB	
• Maximum power gain	G_{ms}		9.5			I_C = 40 mA
• Transducer gain	$\|S_{21}\|^2$		7			
Noise figure						
• Minimum noise figure	NF_{min}		1.6			I_C = 8 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

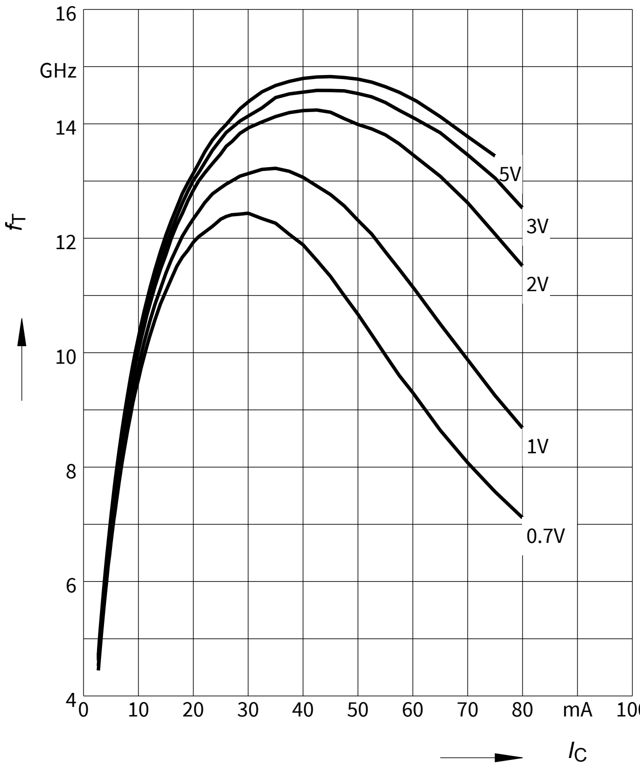

Figure 5 Transition frequency $f_T = f(I_C)$, $f = 1$ GHz, V_{CE} = parameter

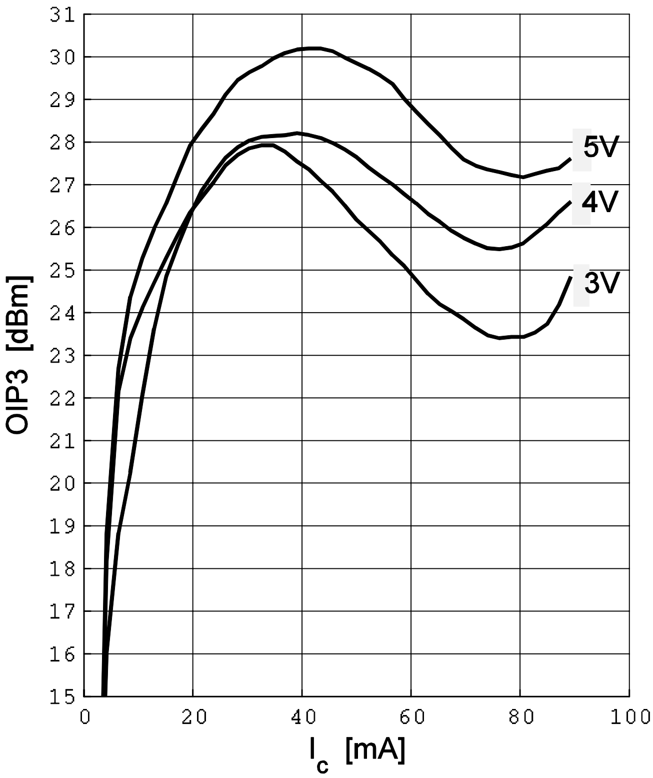

Figure 6 3rd order intercept point $OIP_3 = f(I_C)$, $Z_S = Z_L = 50\ \Omega$, $f = 900$ MHz, V_{CE} = parameter

Electrical characteristics

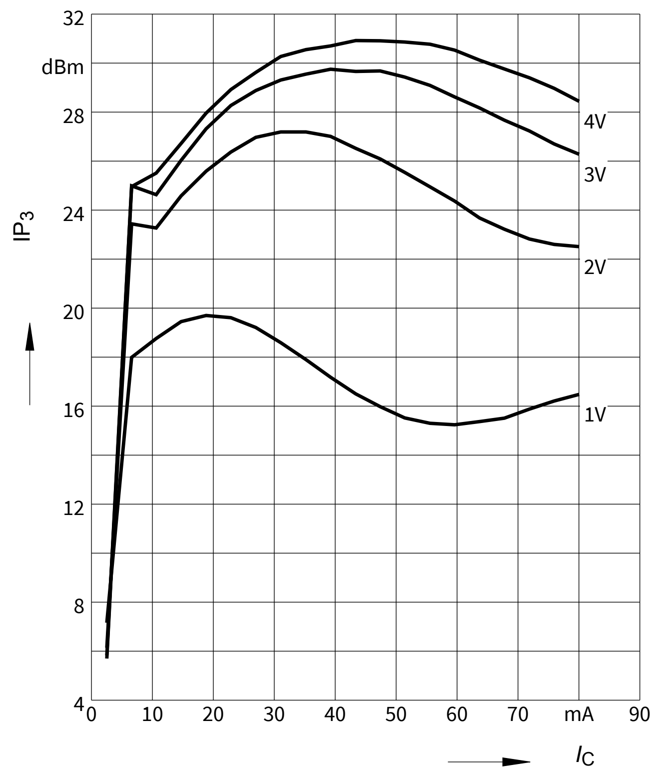

Figure 7 3rd order intercept point $OIP_3 = f(I_C)$, $Z_S = Z_L = 50\ \Omega$, $f = 1.8$ GHz, V_{CE} = parameter

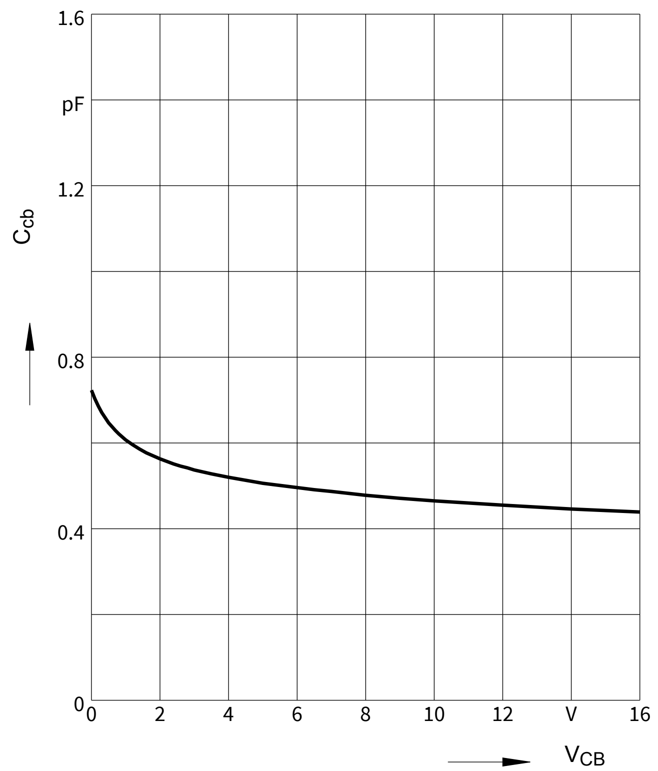

Figure 8 Collector base capacitance $C_{CB} = f(V_{CB})$, $f = 1$ MHz

Electrical characteristics

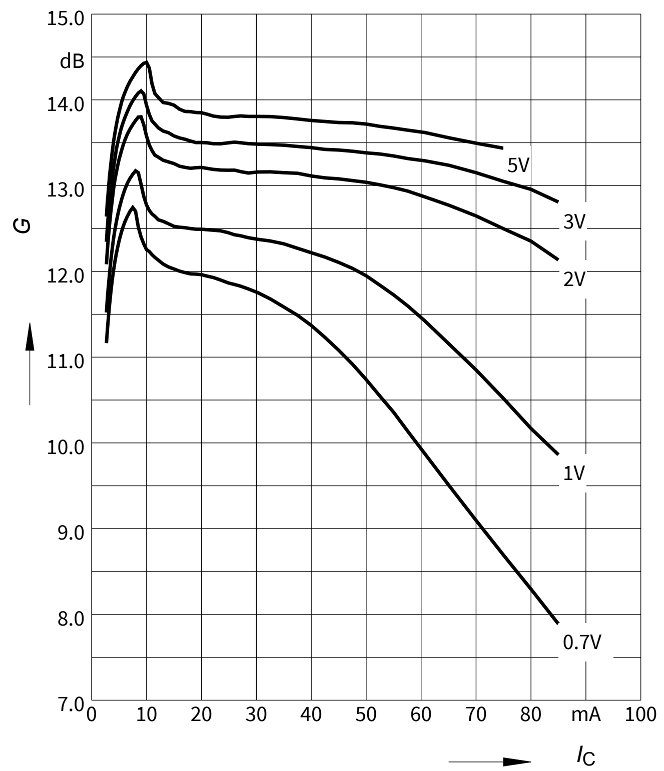

Figure 9 **Gain G_{ma}, G_{ms} = f(I_C), f = 1.8 GHz, V_{CE} = parameter**

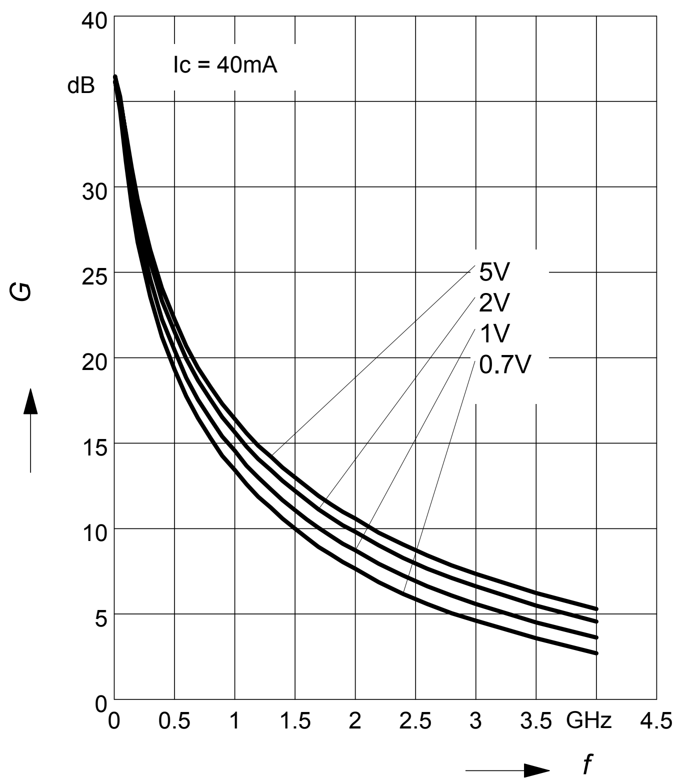

Figure 10 **Gain $|S_{21}|^2$ = f(f), I_C = 40 mA, V_{CE} = parameter**

Electrical characteristics

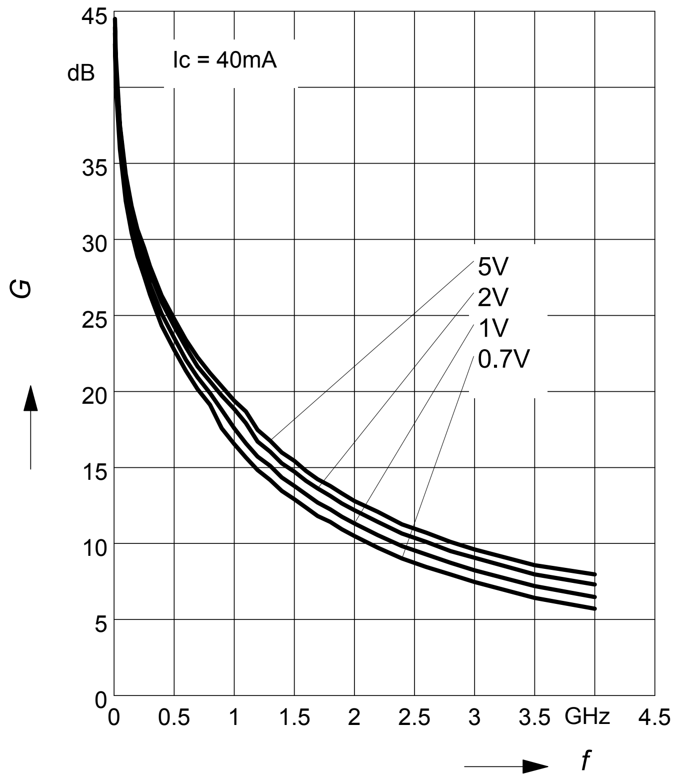

Figure 11 **Gain G_{ma}, G_{ms} = f(f), I_C = 40 mA, V_{CE} = parameter**

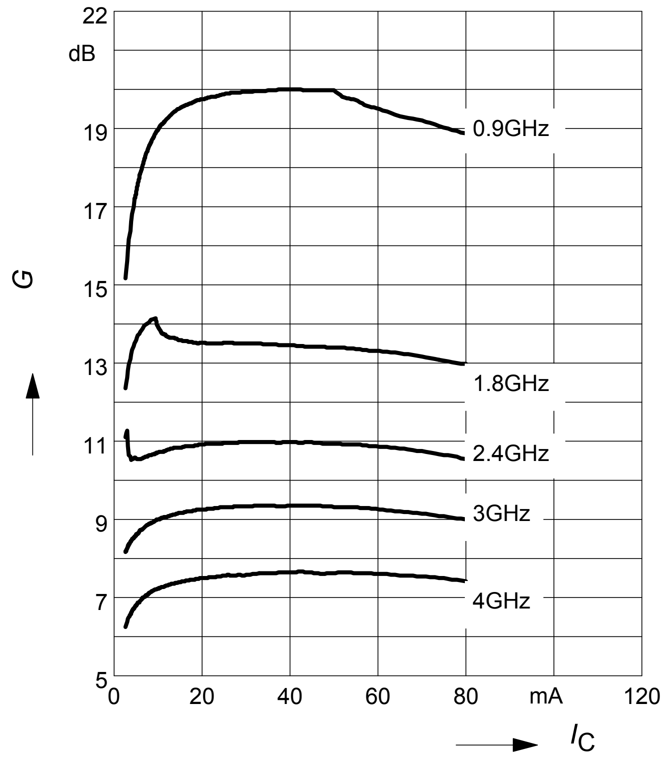

Figure 12 **Maximum power gain G_{max} = f(I_C), V_{CE} = 3 V, f = parameter in GHz**

Electrical characteristics

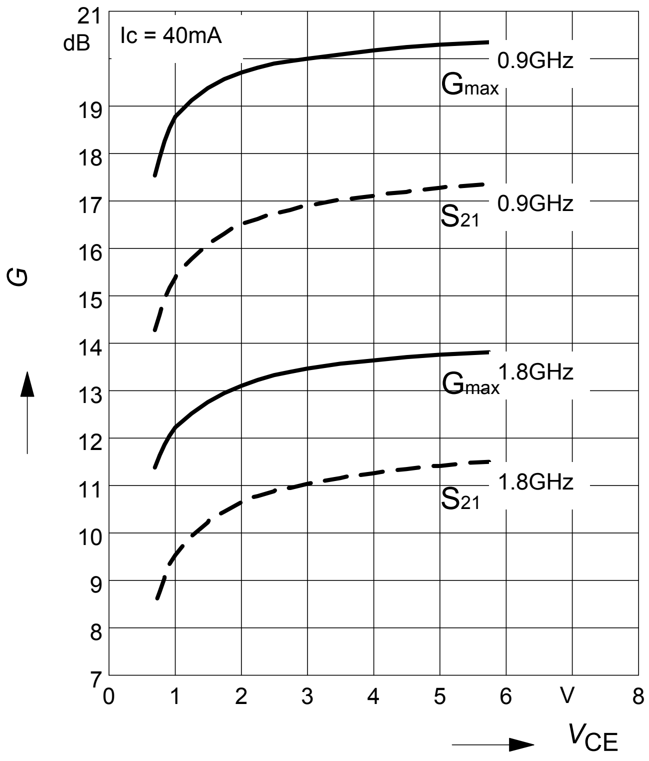

Figure 13 Maximum power gain G_{max} = f(V_{CE}), transducer gain $|S_{21}|^2$ = f(*f*), I_C = 40 mA, *f* = parameter in GHz

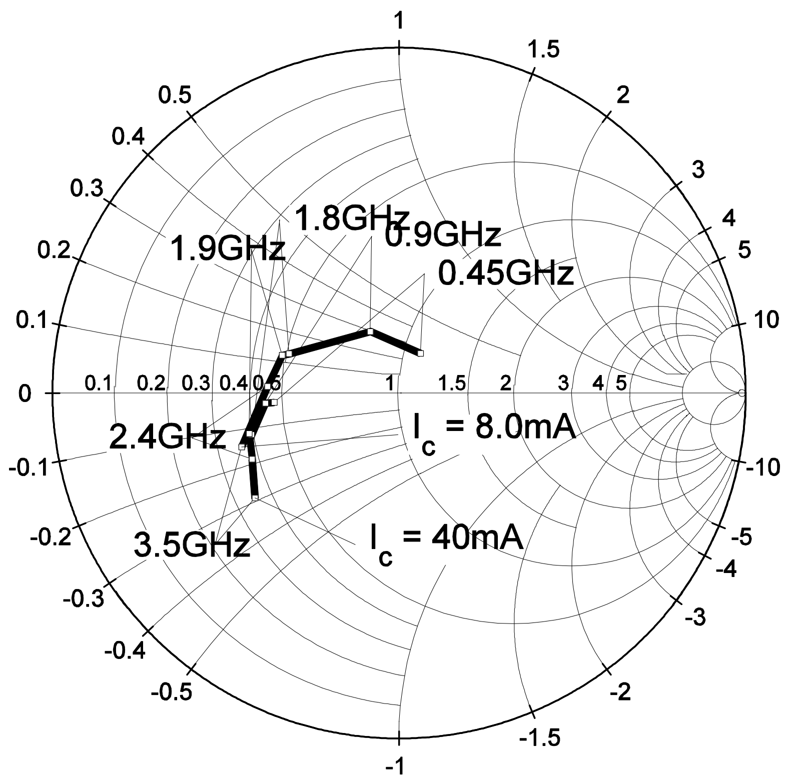

Figure 14 Source impedance for minimum noise figure $Z_{S,opt}$ = f(*f*), V_{CE} = 3 V, I_C = 8 / 40 mA

Electrical characteristics

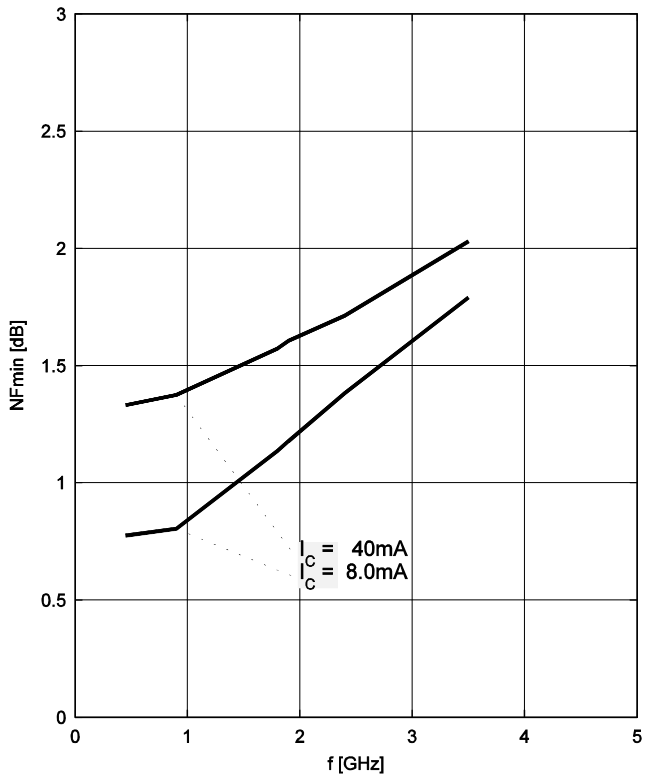

Figure 15 Noise figure NF_{min} = f(f), V_{CE} = 3 V, Z_S = $Z_{S,opt}$, I_C = 8 / 40 mA

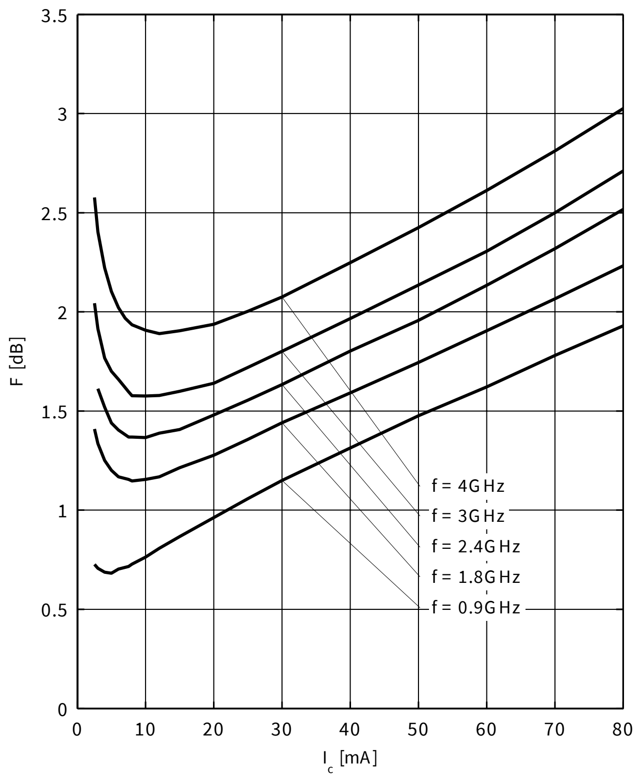

Figure 16 Noise figure NF_{min} = f(I_C), V_{CE} = 3 V, Z_S = $Z_{S,opt}$, f = parameter in GHz

Electrical characteristics

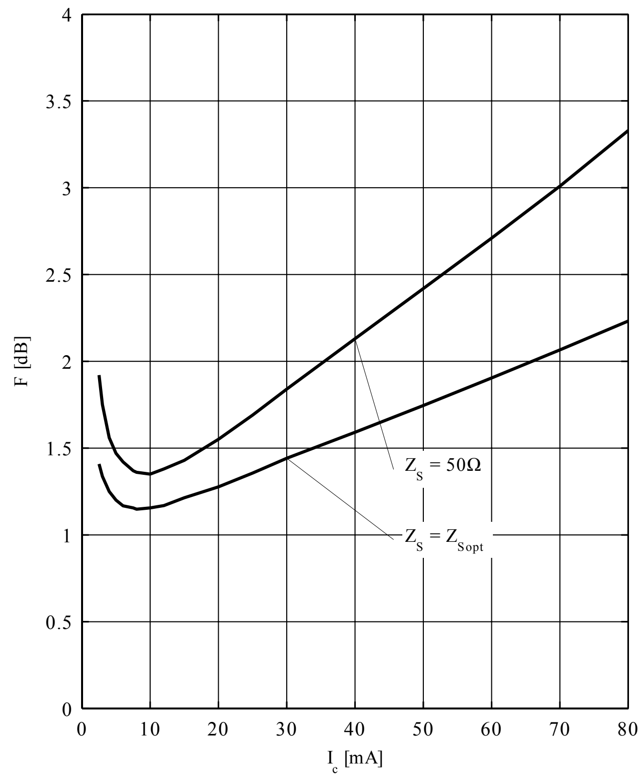

Figure 17 **Noise figure NF_{min} = f(I_C), $Z_S = Z_{S,opt}$, NF_{50} = f(I_C), Z_S = 50 Ω, V_{CE} = 3 V, f = 1.8 GHz**

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-3-1

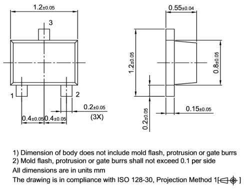

Figure 18 **Package outline**

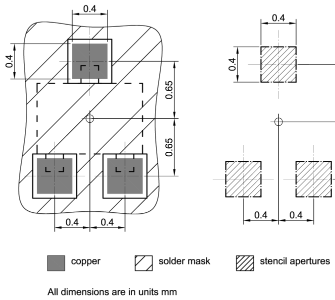

Figure 19 **Foot print**

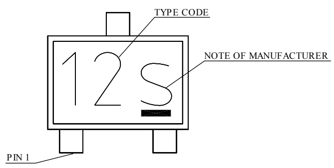

Figure 20 **Marking layout example**

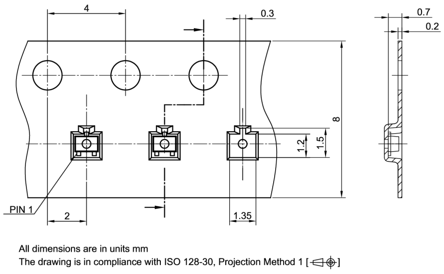

Figure 21 **Tape information**

Revision history

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

Trademarks

All referenced product or service names and trademarks are the property of their respective owners.

Edition 2019-01-25

Published by

Infineon Technologies AG

81726 Munich, Germany

Do you have a question about any aspect of this document?

Email: erratum@infineon.com

Document reference
IFX-bfl1526274633746