BFP420

Surface mount wideband silicon NPN RF bipolar transistor

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Product description

The BFP420 is a low noise device based on a grounded emitter (SIEGET™) that is part of Infineon's established fourth generation RF bipolar transistor family. Its transition frequency f_T of 25 GHz, high gain and low current characteristics make the device suitable for oscillators up to 10 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, 2 V, 5 mA
- High gain G_{ms} = 21 dB at 1.8 GHz, 2 V, 20 mA
- OIP_3 = 22 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
- Broadband low noise amplifiers (LNAs) for CATV, DVB-T, DAB/DMB and FM/AM radio
- LNAs for sub-1 GHz ISM band applications

Device information

Product name / Ordering code	Package	Pin configuration				Marking	Pieces / Reel
BFP420 / BFP420H6327XTSA1	SOT343	1 = B	2 = E	3 = C	4 = E	AMs	3000
BFP420 / BFP420H6433XTMA1							10000

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

Table of contents

1 Absolute maximum ratings

Table 1 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}	–	4.5	V	Open base
			4.1		T_A = -55 °C, 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}		1.5		Open collector
Base current	I_B		9	mA	–
Collector current	I_C		60		
Total power dissipation [1]	P_{tot}		210	mW	$T_S \leq 98$ °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 2 Thermal resistance

Parameter	Symbol	Values			Unit	Note or test condition
		Min.	Typ.	Max.		
Junction - soldering point	R_{thJS}	–	250	–	K/W	–

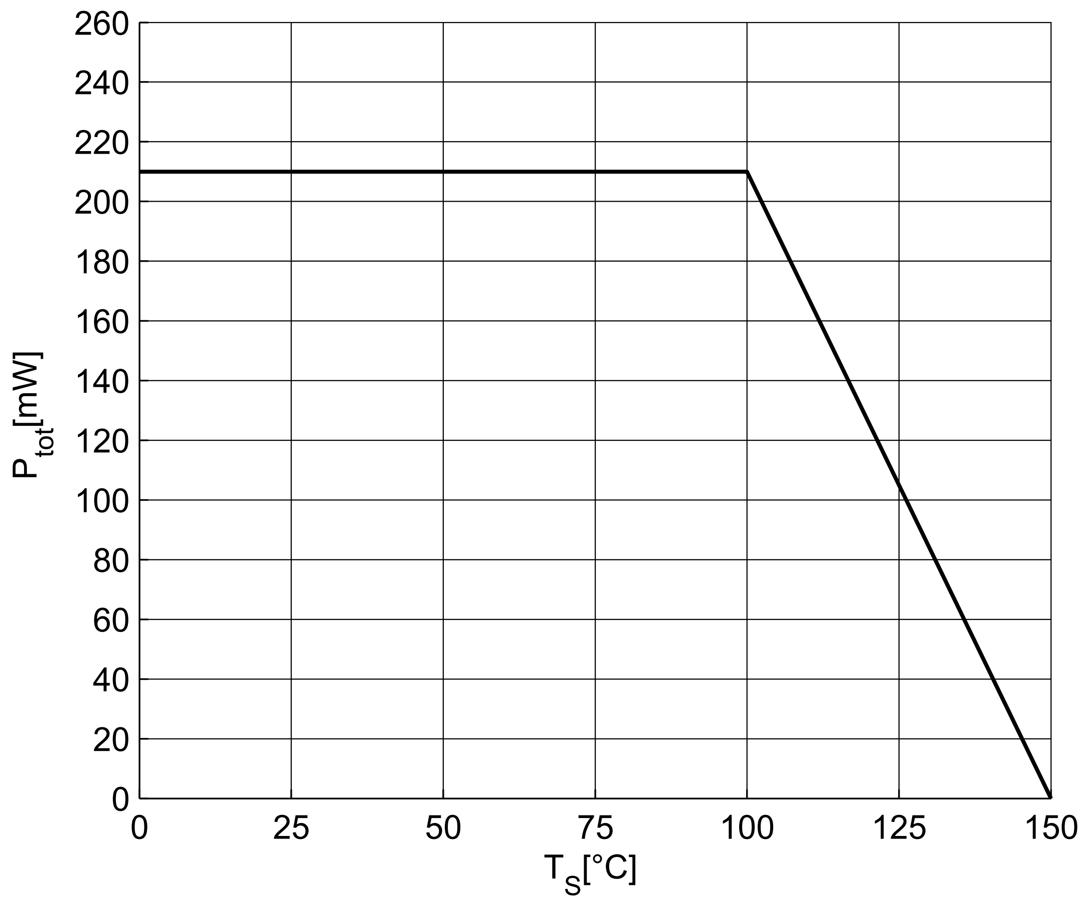

Figure 1 Total power dissipation P_{tot} = f(T_S)

Thermal characteristics

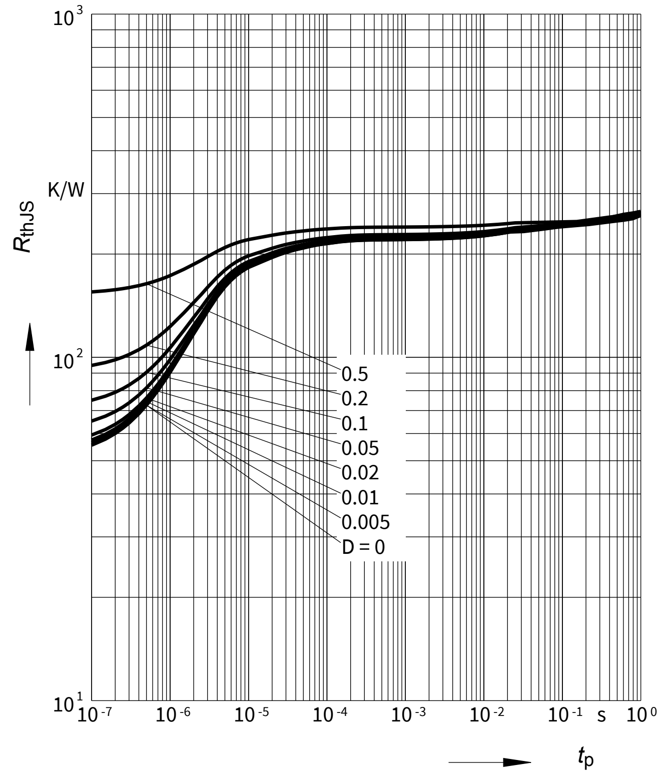

Figure 2 **Permissible pulse load $R_{thJS} = f(t_p)$**

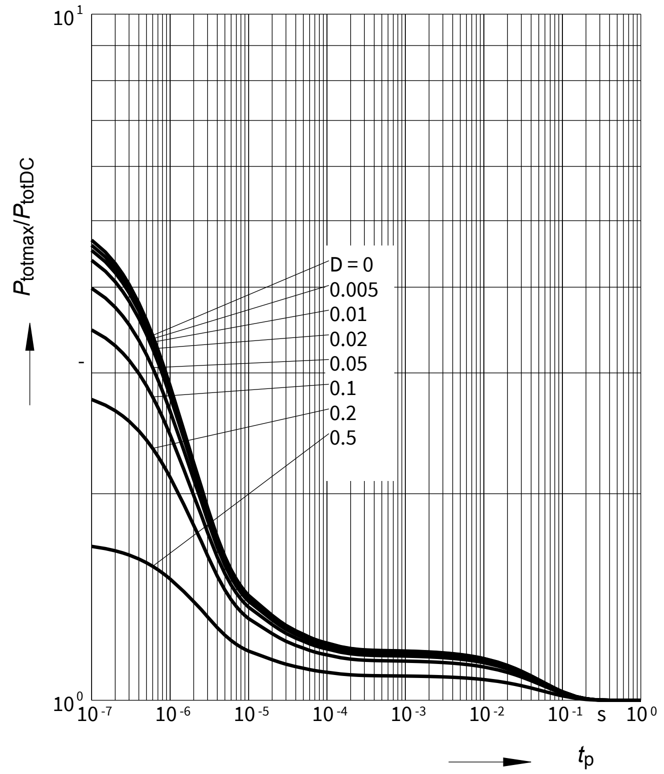

Figure 3 **Permissible pulse load $P_{tot,max} / P_{tot,DC} = f(t_p)$**

3 Electrical characteristics

3.1 DC characteristics

Table 3 DC characteristics at T_A = 25 °C

Parameter	Symbol	Values			Unit	Note or test condition
		Min.	Typ.	Max.		
Collector emitter breakdown voltage	$V_{(BR)CEO}$	4.5	5	–	V	I_C = 1 mA, I_B = 0, open base
Collector emitter leakage current	I_{CES}	–	–	10 [2]	µA	V_{CE} = 15 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}	60	95	130		V_{CE} = 4 V, I_C = 20 mA, pulse measured

3.2 General AC characteristics

Table 4 General AC characteristics at T_A = 25 °C

Parameter	Symbol	Values			Unit	Note or test condition
		Min.	Typ.	Max.		
Transition frequency	f_T	18	25	–	GHz	V_{CE} = 3 V, I_C = 30 mA, f = 2 GHz
Collector base capacitance	C_{CB}	–	0.15	0.3	pF	V_{CB} = 2 V, V_{BE} = 0, f = 1 MHz, emitter grounded
Collector emitter capacitance	C_{CE}		0.37	–		V_{CE} = 2 V, V_{BE} = 0, f = 1 MHz, base grounded
Emitter base capacitance	C_{EB}		0.55			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.

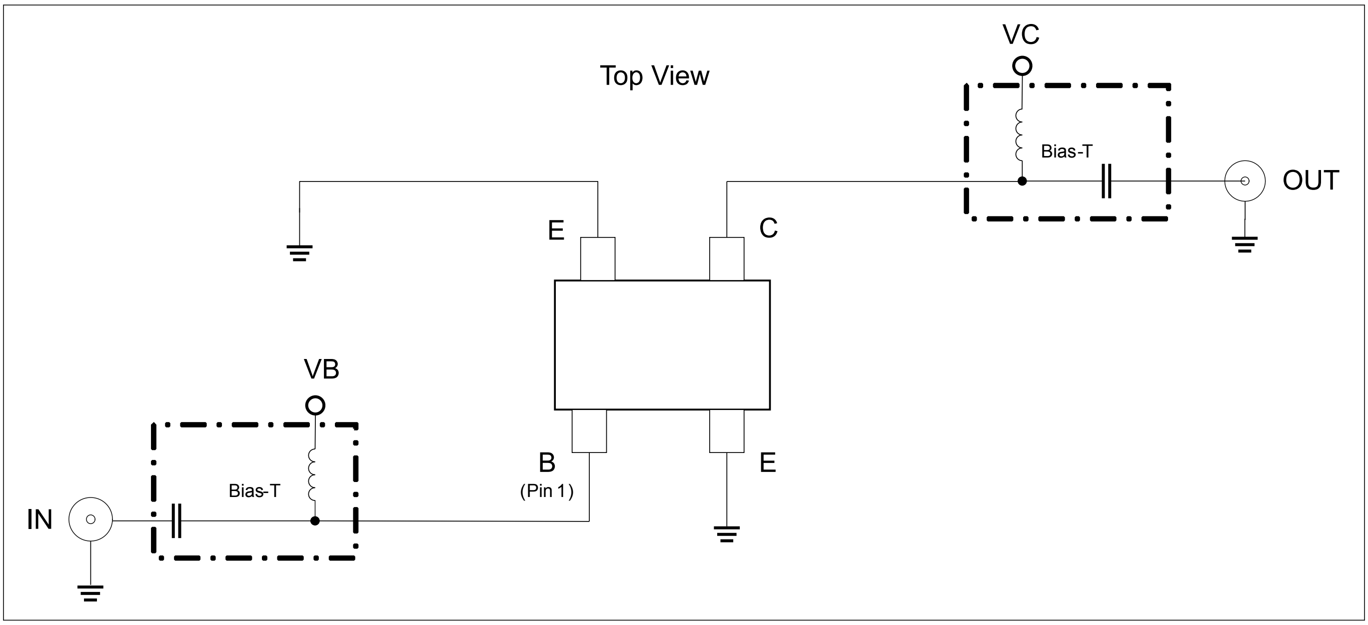

Figure 4 Testing circuit

Table 5 AC characteristics, V_{CE} = 2 V, f = 1.8 GHz

Parameter	Symbol	Values			Unit	Note or test condition
		Min.	Typ.	Max.		
Power gain				–	dB	
• Maximum power gain	G_{ms}	–	21			I_C = 20 mA
• Transducer gain	$\|S_{21}\|^2$	14	17			
Noise figure		–				
• Minimum noise figure	NF_{min}		1.1			I_C = 5 mA
Linearity					dBm	
• 3rd order intercept point at output	OIP_3		22			I_C = 20 mA, Z_S = Z_L = 50 Ω
• 1 dB gain compression point at output	OP_{1dB}		12			

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 DC diagrams

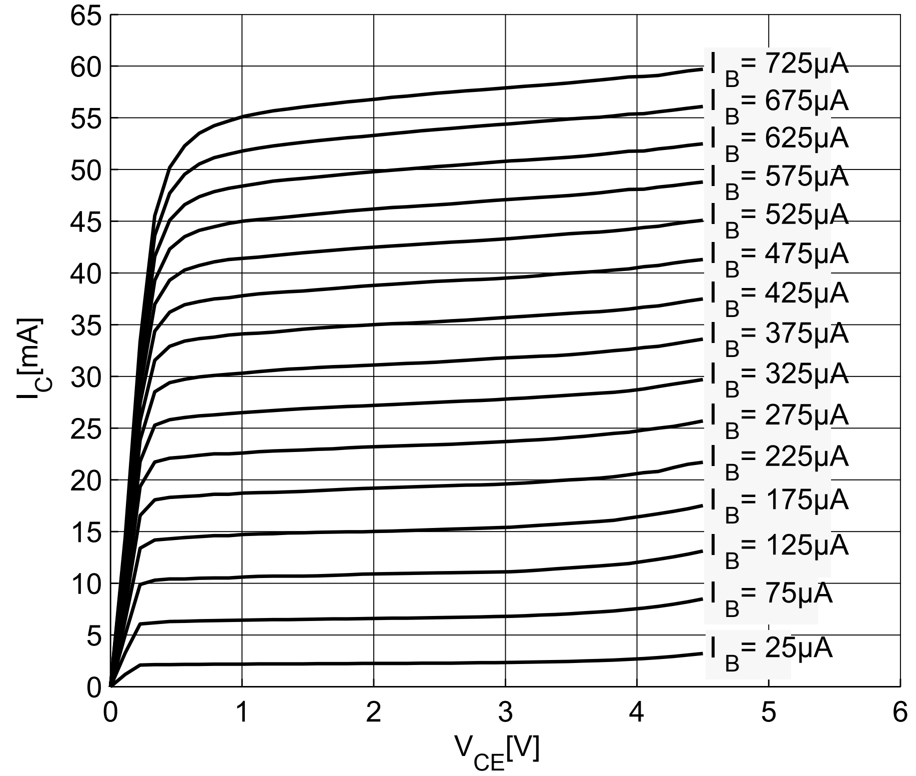

Figure 5 **Collector current vs. collector emitter voltage $I_C = f(V_{CE})$, I_B = parameter**

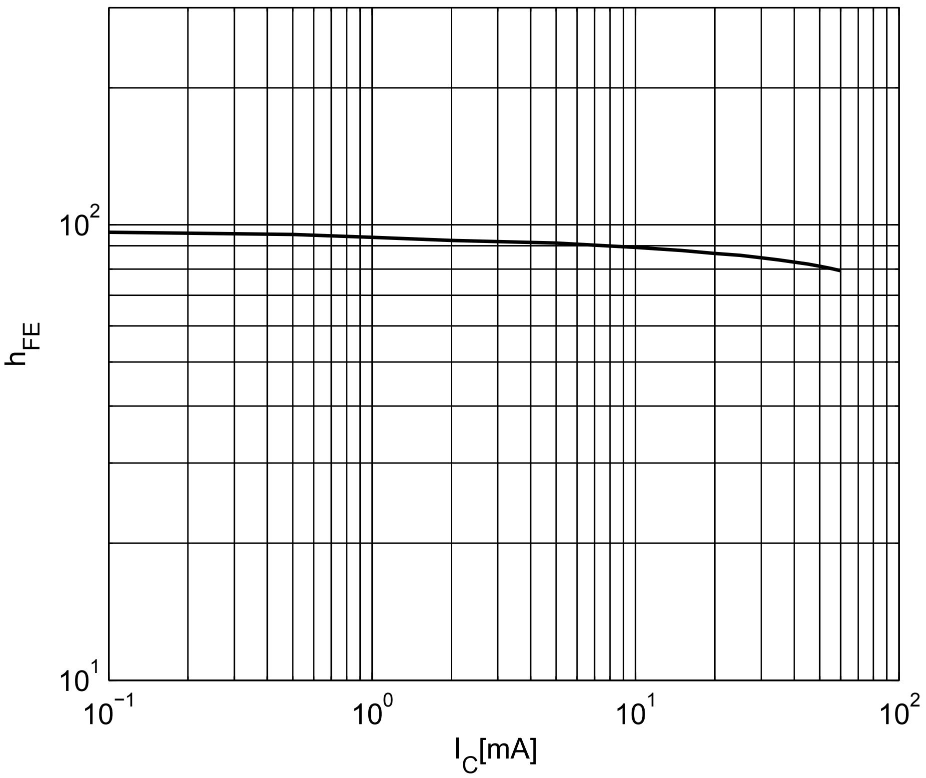

Figure 6 **DC current gain $h_{FE} = f(I_C)$, $V_{CE} = 3$ V**

Electrical characteristics

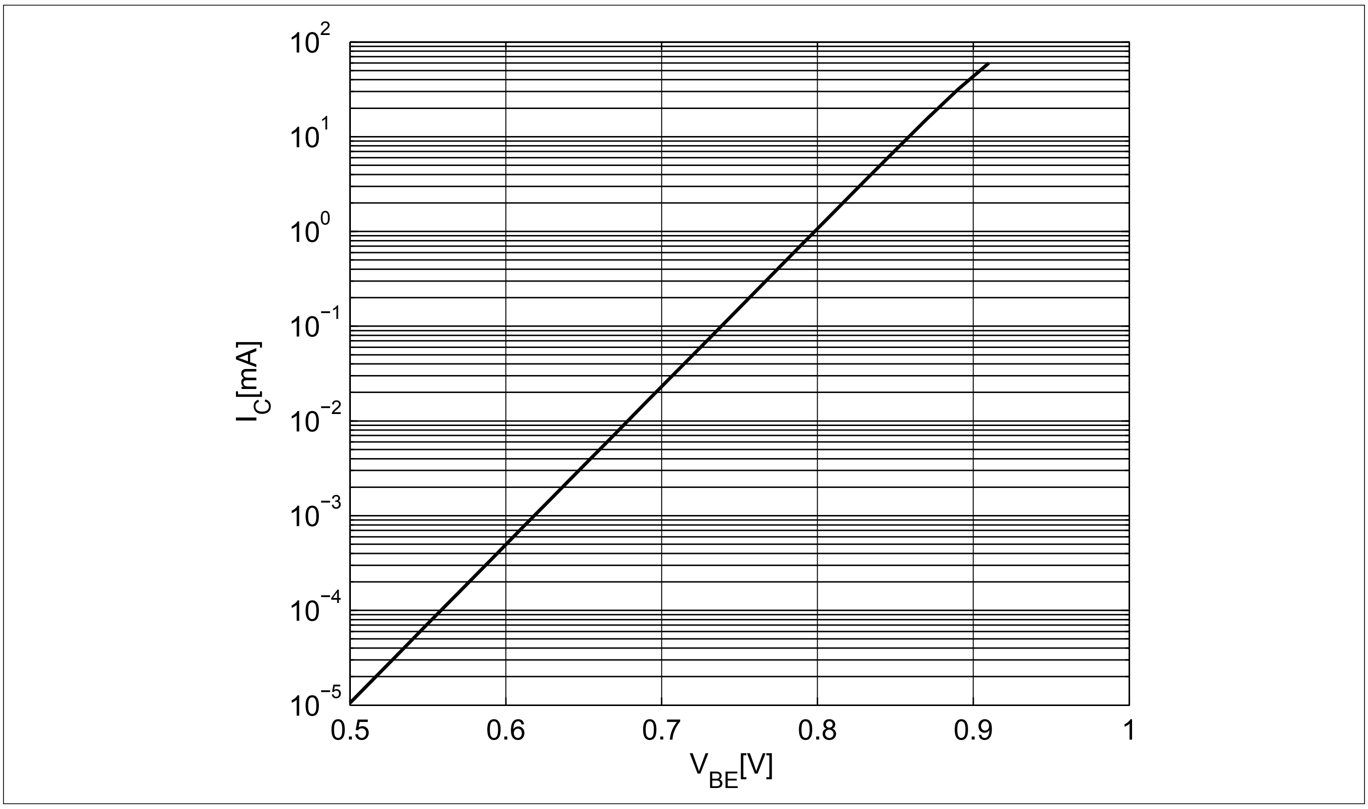

Figure 7 **Collector current vs. base emitter forward voltage $I_C = f(V_{BE})$, $V_{CE} = 3$ V**

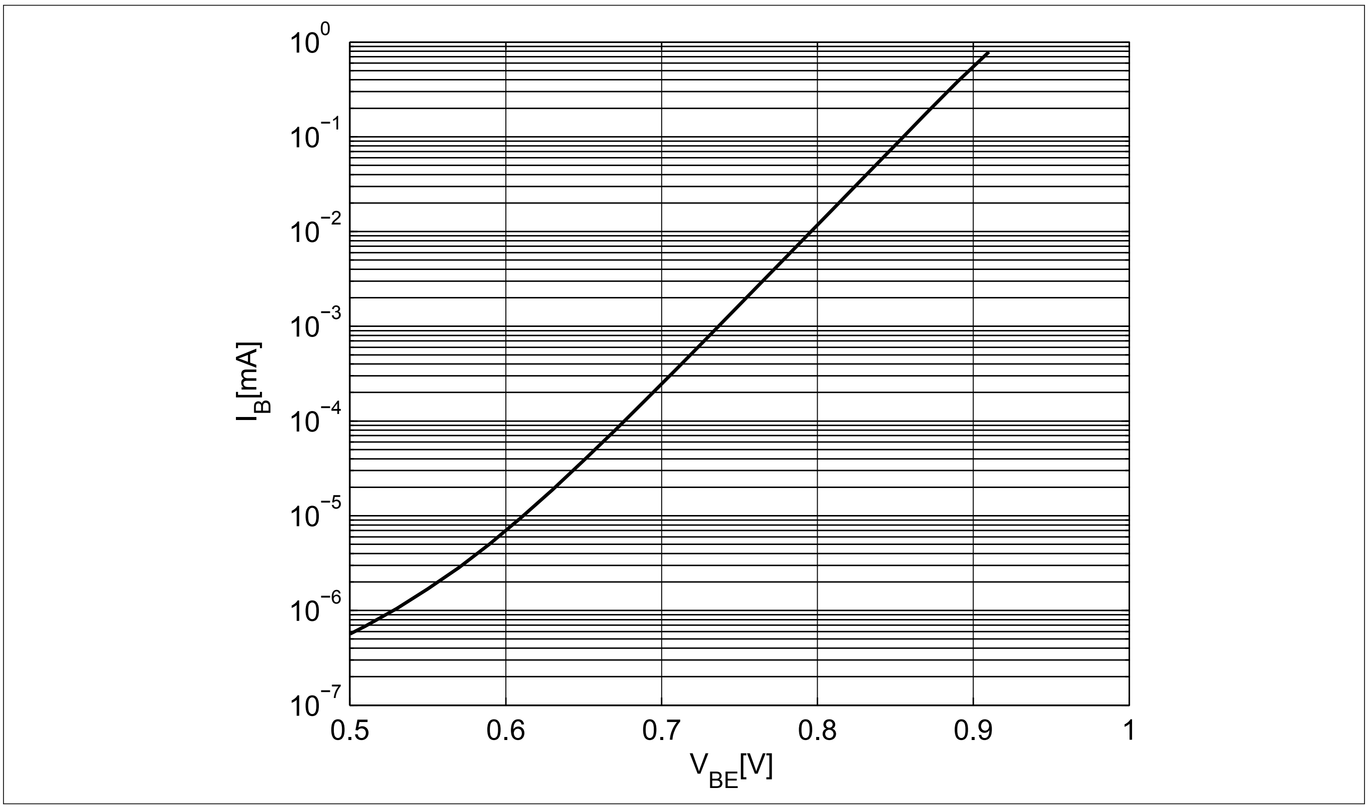

Figure 8 **Base current vs. base emitter forward voltage $I_B = f(V_{BE})$, $V_{CE} = 3$ V**

Electrical characteristics

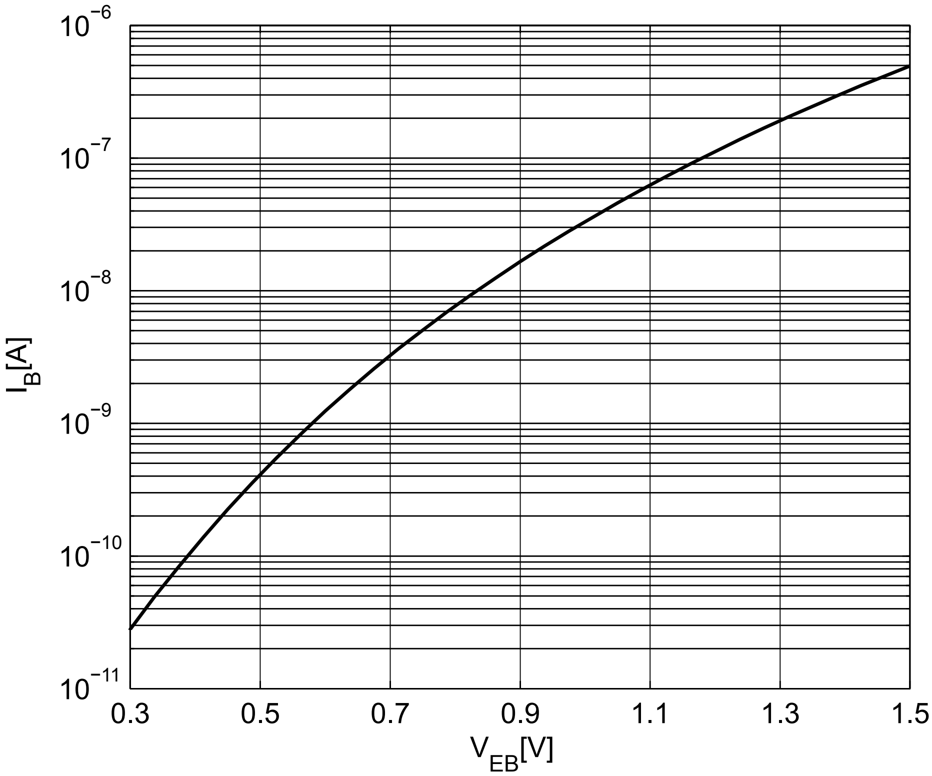

Figure 9 **Base current vs. base emitter reverse voltage $I_B = f(V_{EB})$, $V_{CE} = 3$ V**

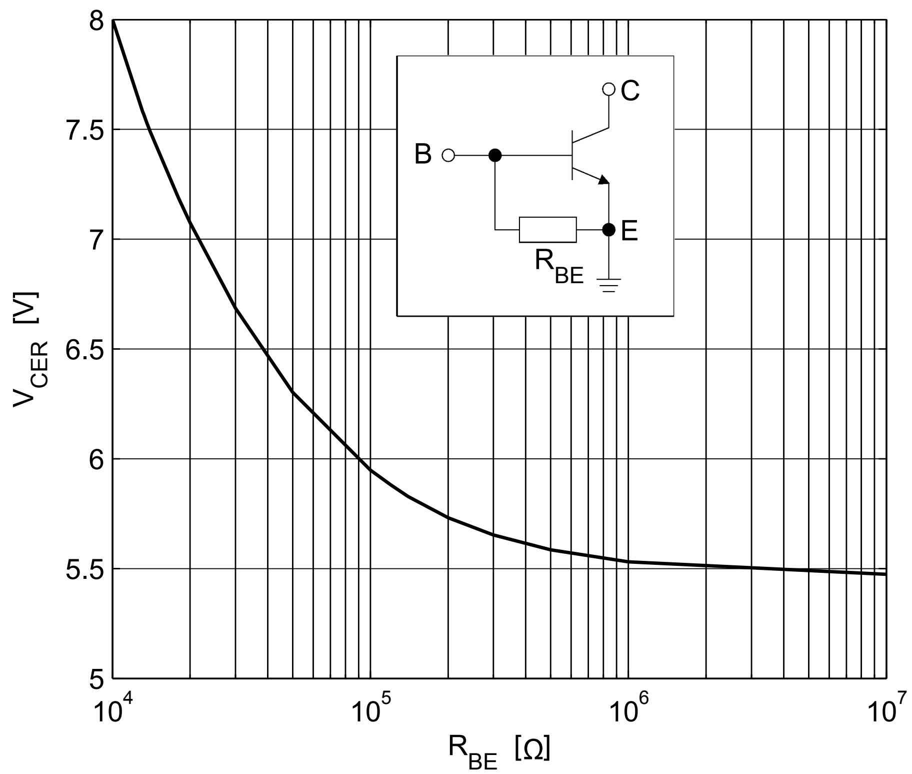

Figure 10 **Collector emitter breakdown voltage $V_{CER} = f(R_{BE})$, $I_C = 1$ mA**

3.5 Characteristic AC diagrams

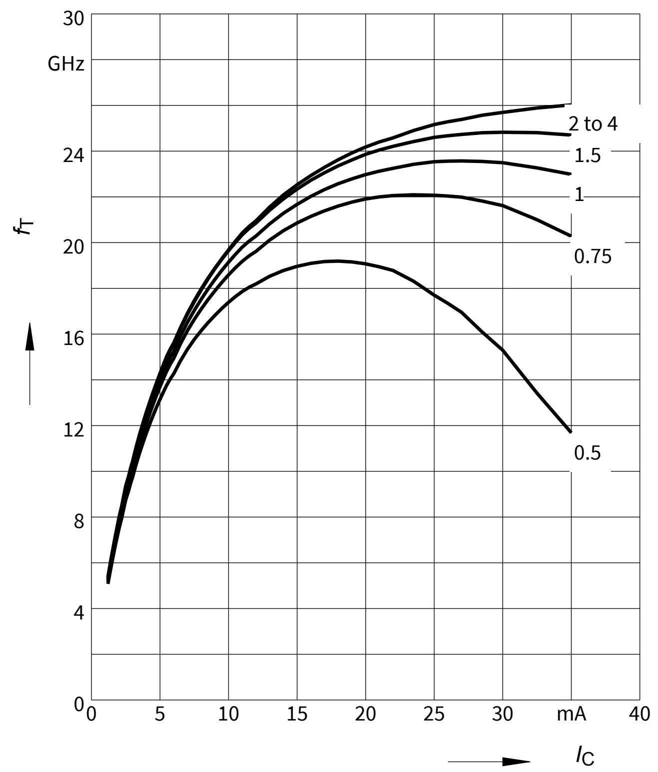

Figure 11 Transition frequency $f_T = f(I_C)$, $f = 2$ GHz, V_{CE} = parameter

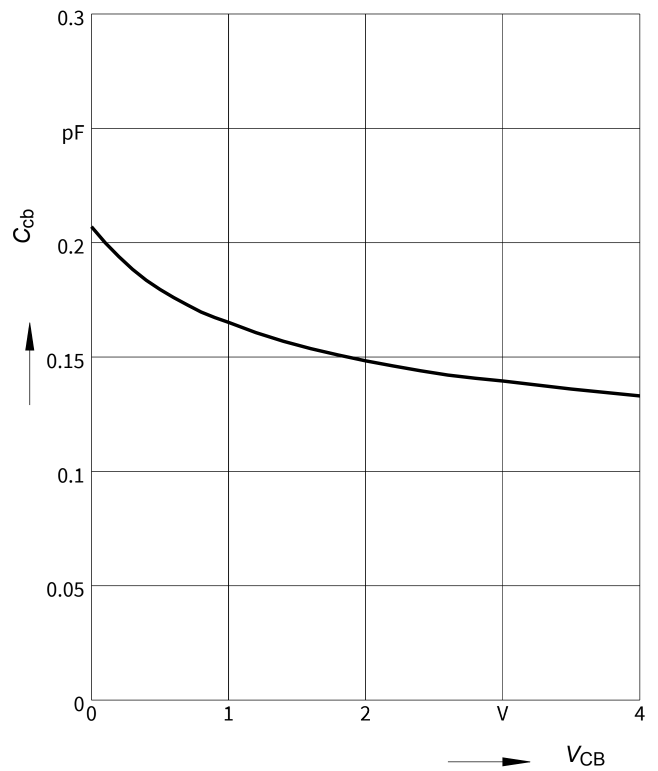

Figure 12 Collector base capacitance $C_{CB} = f(V_{CB})$, $f = 1$ MHz

Electrical characteristics

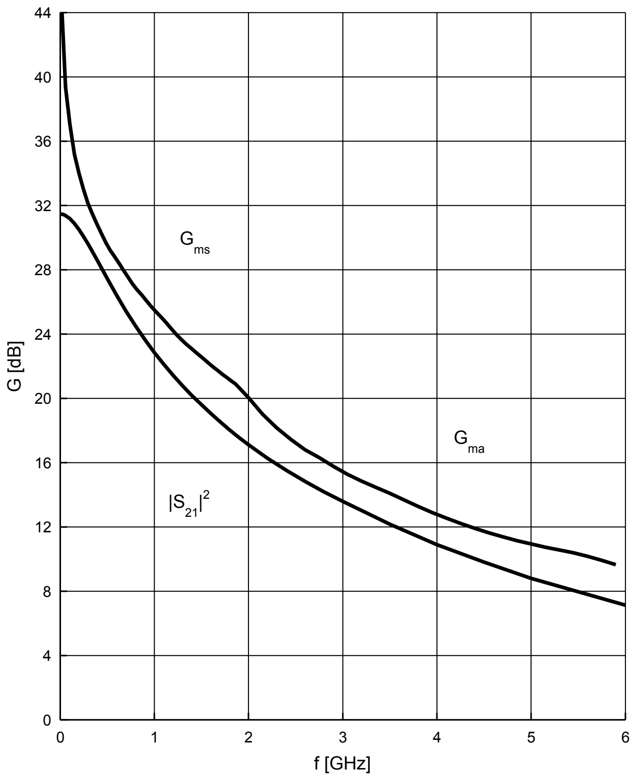

Figure 13 **Gain G_{ma}, G_{ms}, $|S_{21}|^2$ = f(f), V_{CE} = 2 V, I_C = 20 mA**

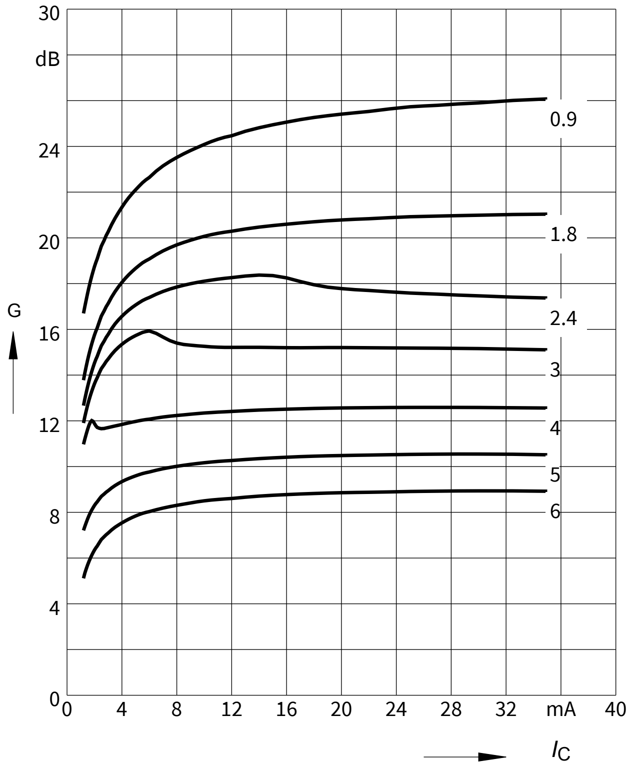

Figure 14 **Maximum power gain G_{max} = f(I_C), V_{CE} = 2 V, f = parameter in GHz**

Electrical characteristics

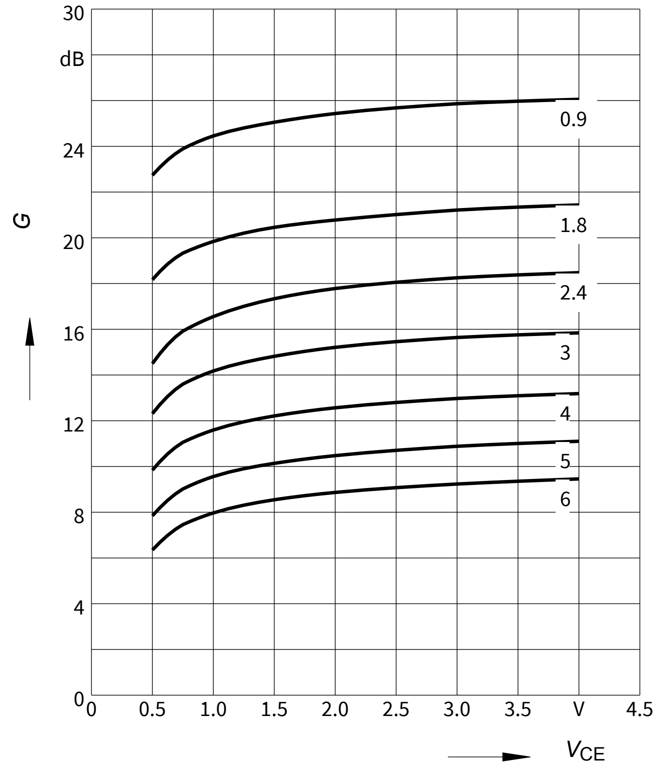

Figure 15 **Maximum power gain G_{max} = f(V_{CE}), I_C = 20 mA, f = parameter in GHz**

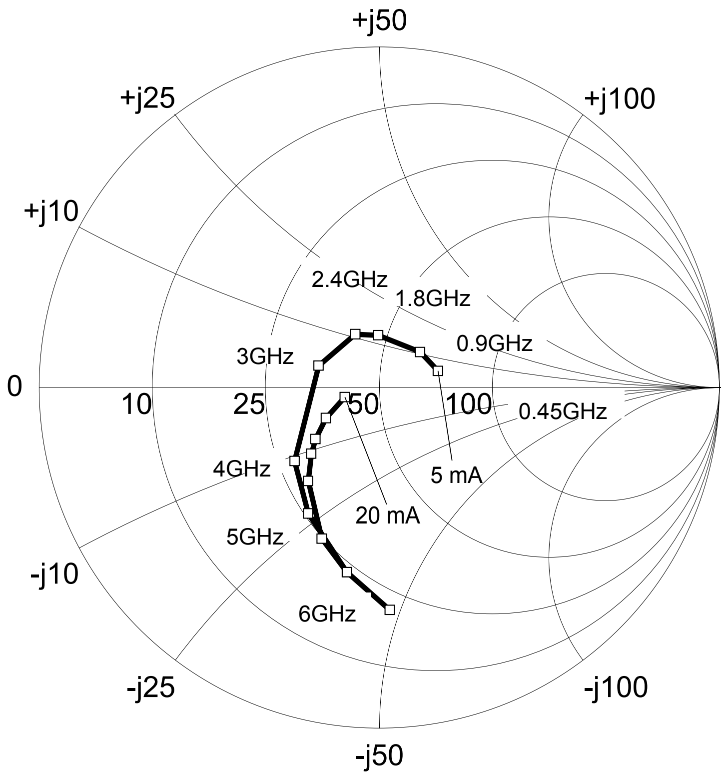

Figure 16 **Source impedance for minimum noise figure $Z_{S,opt}$ = f(f), V_{CE} = 2 V, I_C = 5 / 20 mA**

Electrical characteristics

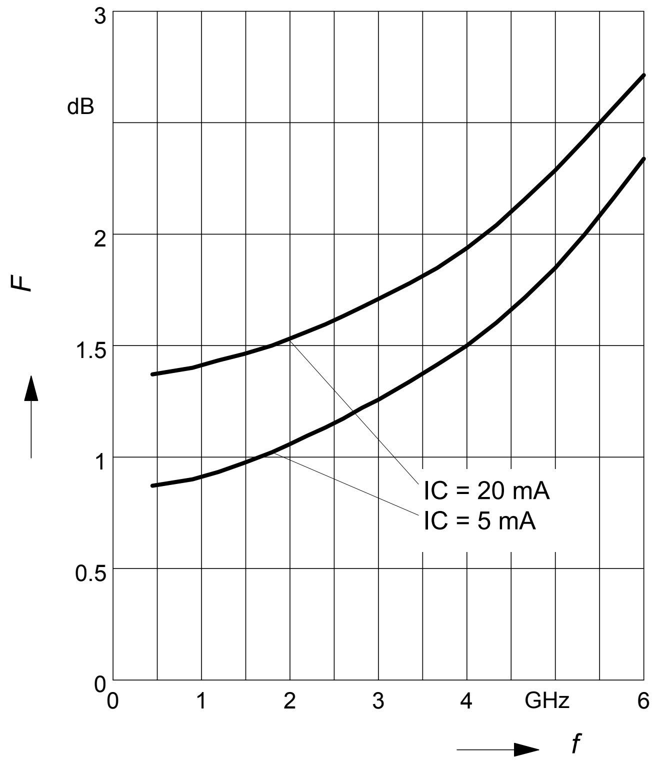

Figure 17 **Noise figure NF_{min} = f(f), V_{CE} = 2 V, Z_S = $Z_{S,opt}$, I_C = 5 / 20 mA**

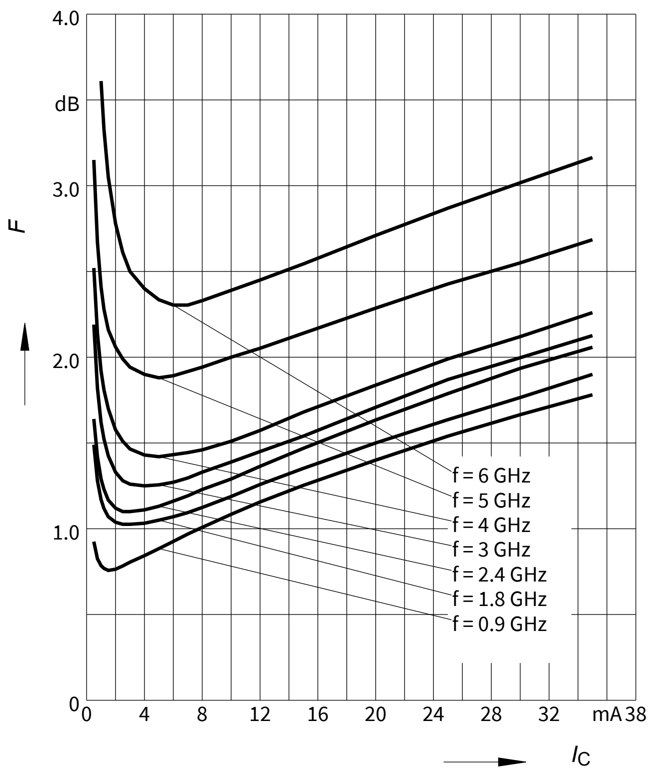

Figure 18 **Noise figure NF_{min} = f(I_C), V_{CE} = 2 V, Z_S = $Z_{S,opt}$, f = parameter in GHz**

Electrical characteristics

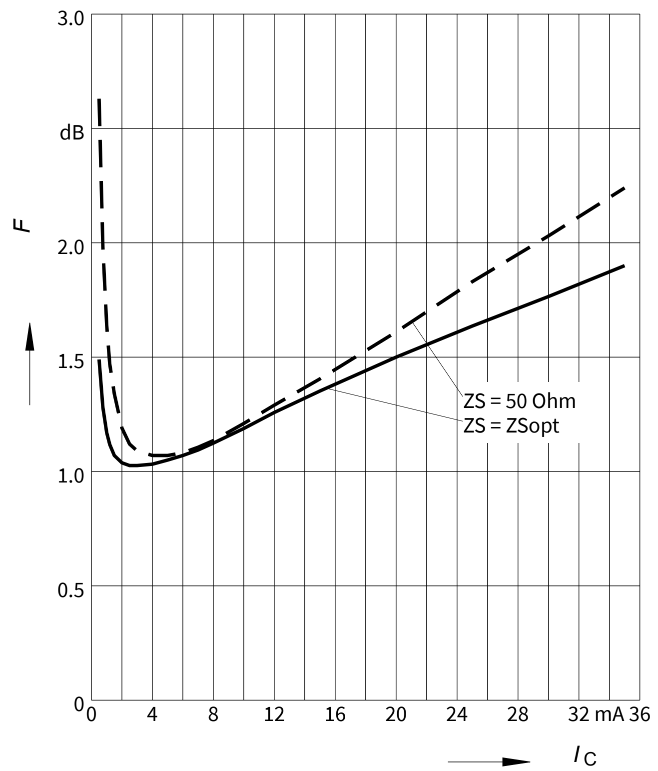

Figure 19 **Noise figure NF_{min} = f(I_C), $Z_S = Z_{S,opt}$, NF_{50} = f(I_C), Z_S = 50 Ω, V_{CE} = 2 V, f = 1.8 GHz**

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

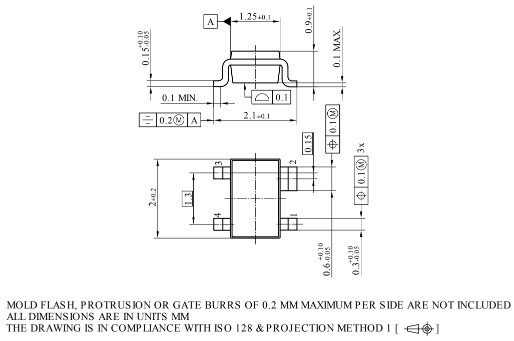

Figure 20 Package outline

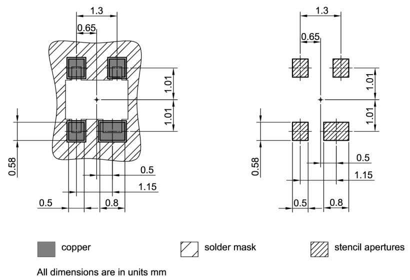

Figure 21 Foot print

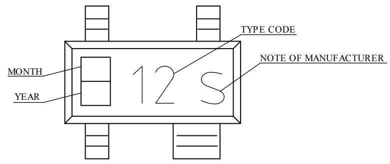

Figure 22 Marking layout example

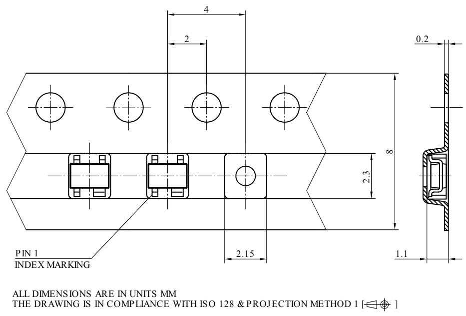

Figure 23 Tape dimensions

Revision history

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

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