

# BFP540FESD

## Low profile robust silicon NPN RF bipolar transistor



### Product description

The BFP540FESD 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 high gain and ESD structure make the device suitable for applications that requires highly robustness and high performance. It remains cost competitive without compromising on ease of use.



### Feature list

- Minimum noise figure  $NF_{min} = 0.9$  dB at 1.8 GHz, 2 V, 5 mA
- High gain  $G_{ms} = 20$  dB at 1.8 GHz, 2 V, 20 mA
- $OIP_3 = 24.5$  dBm at 1.8 GHz, 2 V, 20 mA
- High ESD robustness, typical 1 kV (HBM)

### Product validation

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

### Potential applications

- Radio-frequency oscillators such as local oscillator in LNB
- 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
BFP540FESD / BFP540FESDH6327XTSA1	TSFP-4-1	1 = B	2 = E	3 = C	4 = E	AUs	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	$V_{CEO}$	-	4.5	V	Open base	
			4		$T_A = -55\text{ °C}$ , 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	$I_B$		8		mA	-
Collector current	$I_C$		80			
Total power dissipation <sup>1)</sup>	$P_{tot}$		250		mW	$T_S \leq 80\text{ °C}$
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.*

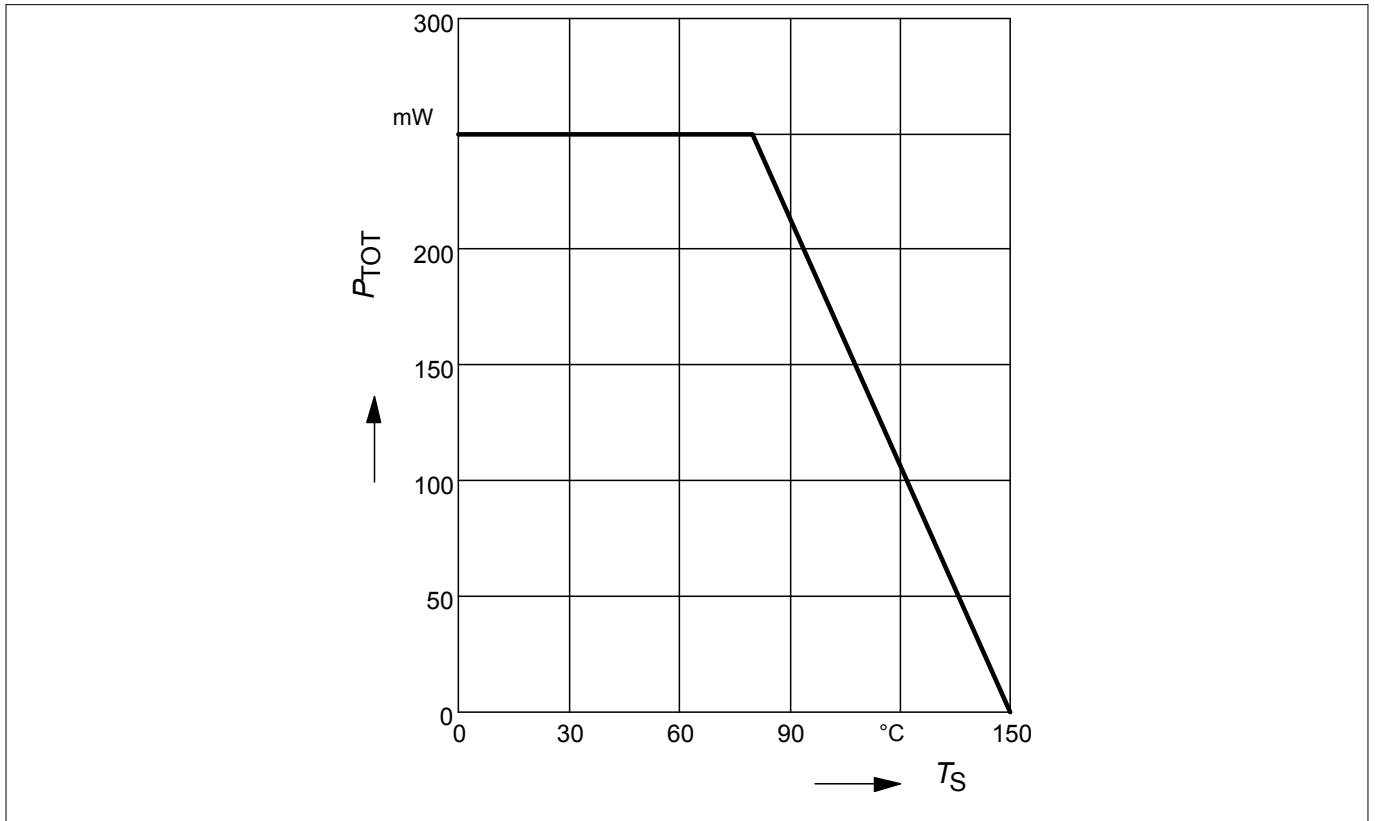
<sup>1</sup>  $T_S$  is the soldering point temperature.  $T_S$  is measured on the emitter lead at the soldering point of the PCB.

Thermal characteristics

## 2 Thermal characteristics

**Table 3 Thermal resistance**

Parameter	Symbol	Values			Unit	Note or test condition
		Min.	Typ.	Max.		
Junction - soldering point	$R_{thJS}$	-	280	-	K/W	-



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

**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	$V_{(BR)CEO}$	4.5	5	–	V	$I_C = 1\text{ mA}$ , $I_B = 0$ , open base
Collector emitter leakage current	$I_{CES}$	–	–	10 <sup>2)</sup>	μA	$V_{CE} = 10\text{ V}$ , $V_{BE} = 0$ , E-B short circuited
Collector base leakage current	$I_{CBO}$			100 <sup>2)</sup>	nA	$V_{CB} = 5\text{ V}$ , $I_E = 0$ , open emitter
Emitter base leakage current	$I_{EBO}$			10 <sup>2)</sup>	μA	$V_{EB} = 0.5\text{ V}$ , $I_C = 0$ , open collector
DC current gain	$h_{FE}$	50	110	170		$V_{CE} = 3.5\text{ V}$ , $I_C = 20\text{ mA}$ , pulse measured

**3.2 General AC characteristics**

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

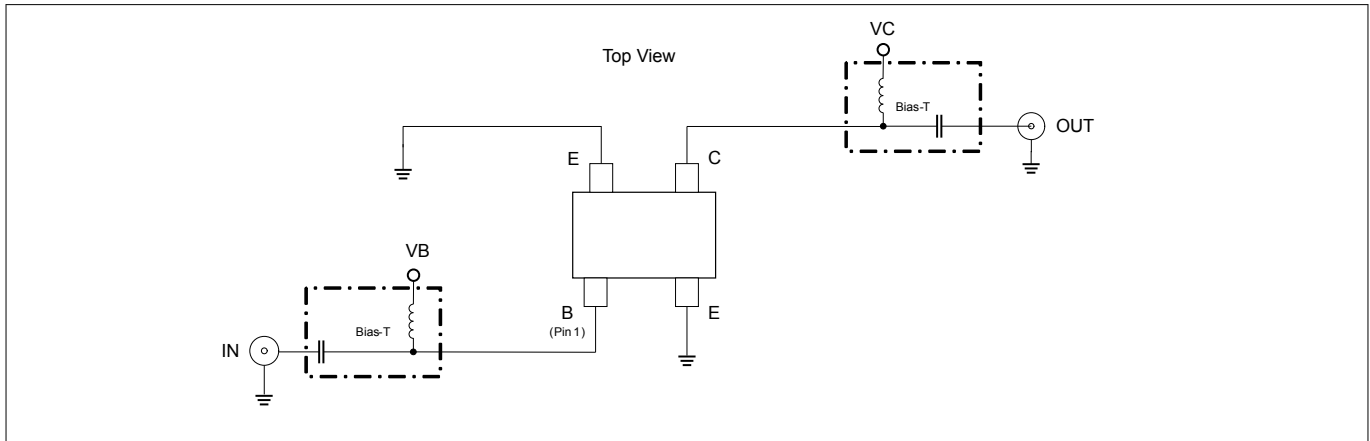
Parameter	Symbol	Values			Unit	Note or test condition
		Min.	Typ.	Max.		
Transition frequency	$f_T$	21	30	–	GHz	$V_{CE} = 4\text{ V}$ , $I_C = 50\text{ mA}$ , $f = 1\text{ GHz}$
Collector base capacitance	$C_{CB}$	–	0.16	0.26	pF	$V_{CB} = 2\text{ V}$ , $V_{BE} = 0$ , $f = 1\text{ MHz}$ , emitter grounded
Collector emitter capacitance	$C_{CE}$		0.4	–		$V_{CE} = 2\text{ V}$ , $V_{BE} = 0$ , $f = 1\text{ MHz}$ , base grounded
Emitter base capacitance	$C_{EB}$		0.55			$V_{EB} = 0.5\text{ V}$ , $V_{CB} = 0$ , $f = 1\text{ MHz}$ , collector grounded

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

**Electrical characteristics**

**3.3 Frequency dependent AC characteristics**

Measurement setup is a test fixture with Bias-T's in a 50 Ω system,  $T_A = 25\text{ }^\circ\text{C}$ .



**Figure 2 Testing circuit**

**Table 6 AC characteristics,  $V_{CE} = 2\text{ V}$ ,  $f = 1.8\text{ GHz}$**

Parameter	Symbol	Values			Unit	Note or test condition
		Min.	Typ.	Max.		
Power gain					dB	$I_C = 20\text{ mA}$
<ul style="list-style-type: none"> <li>Maximum stable power gain</li> <li>Transducer gain</li> </ul>	$G_{ms}$ $ S_{21} ^2$	– 15.5	20 18	–		
Noise figure					dBm	$I_C = 5\text{ mA}$
<ul style="list-style-type: none"> <li>Minimum noise figure</li> </ul>	$NF_{min}$	–	0.9	1.4		
Linearity					dBm	$I_C = 20\text{ mA}$ , $Z_S = Z_L = 50\text{ }\Omega$
<ul style="list-style-type: none"> <li>3rd order intercept point at output</li> <li>1 dB gain compression point at output</li> </ul>	$OIP_3$ $OP_{1dB}$		24.5 11	–		

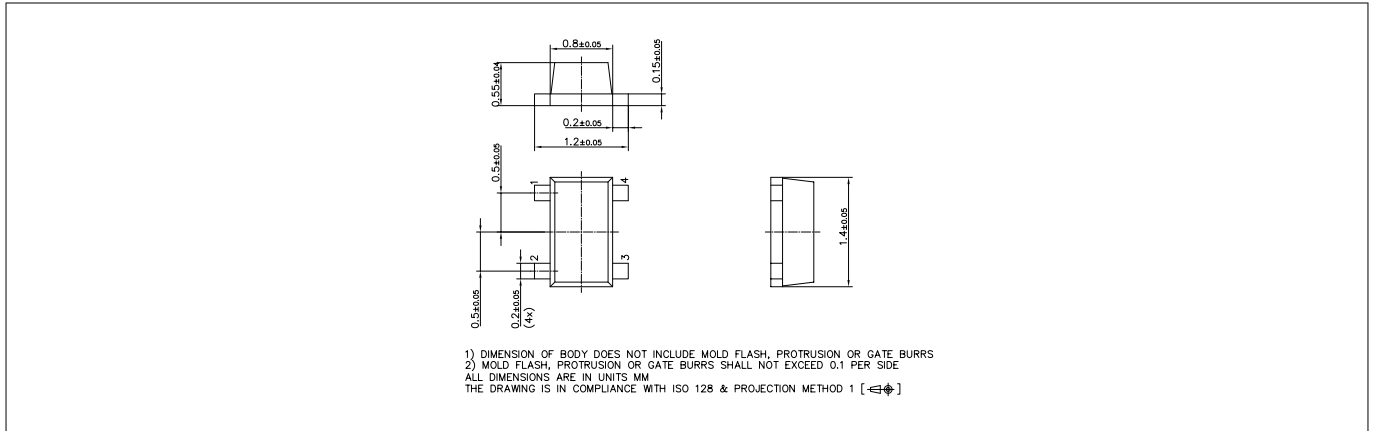
**Table 7 AC characteristics,  $V_{CE} = 2\text{ V}$ ,  $f = 3\text{ GHz}$**

Parameter	Symbol	Values			Unit	Note or test condition
		Min.	Typ.	Max.		
Power gain					dB	$I_C = 20\text{ mA}$
<ul style="list-style-type: none"> <li>Maximum available power gain</li> <li>Transducer gain</li> </ul>	$G_{ma}$ $ S_{21} ^2$	–	14.5 13	–		
Noise figure						$I_C = 5\text{ mA}$
<ul style="list-style-type: none"> <li>Minimum noise figure</li> </ul>	$NF_{min}$		1.3			

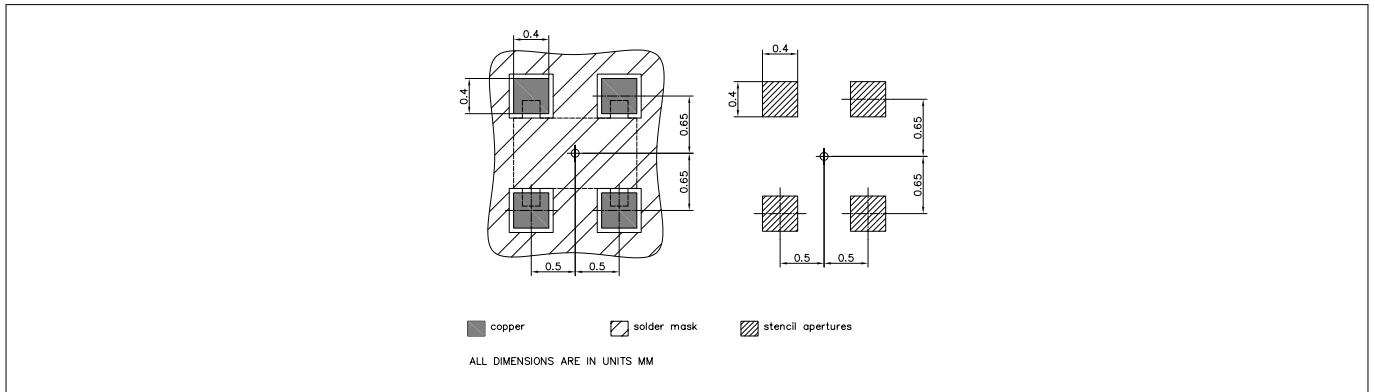
Note:  $G_{ms} = |S_{21} / S_{12}|$  for  $k < 1$ ;  $G_{ma} = |S_{21} / S_{12}| (k - (k^2 - 1)^{1/2})$  for  $k > 1$ . In order to get the  $NF_{min}$  values stated in this chapter, the test fixture losses have been subtracted from all measured results.  $OIP_3$  value depends on termination of all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

**Package information TSFP-4-1**

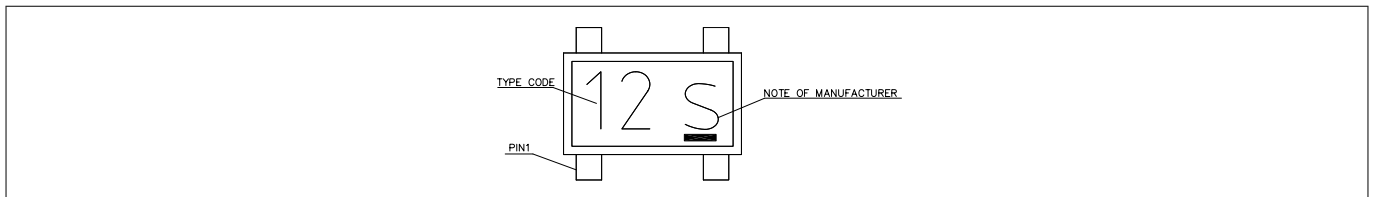
**4 Package information TSFP-4-1**



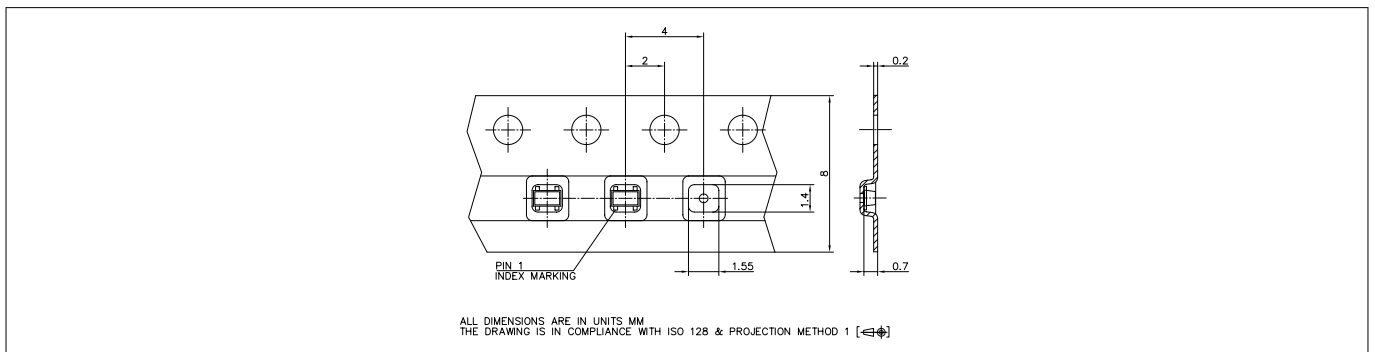
**Figure 3 Package outline**



**Figure 4 Foot print**



**Figure 5 Marking layout example**



**Figure 6 Tape dimensions**

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Revision history

## Revision history

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



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**Edition 2019-01-25**

**Published by**  
**Infineon Technologies AG**  
**81726 Munich, Germany**

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**Document reference**  
**IFX-pcg1525441545262**

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