

## Low Noise Silicon Bipolar RF Transistor

- For ESD protected high gain low noise amplifier
- Excellent ESD performance  
typical value 1000 V (HBM)
- Outstanding  $G_{ms} = 20$  dB  
Minimum noise figure  $NF_{min} = 0.9$  dB
- Pb-free (ROHS compliant) and halogen-free thin small flat package with visible leads
- Qualification report according to AEC-Q101 available



**ESD (Electrostatic discharge) sensitive device, observe handling precaution!**

Type	Marking	Pin Configuration						Package
BFP540FESD	AUs	1=B	2=E	3=C	4=E	-	-	TSFP-4

**Maximum Ratings** at  $T_A = 25$  °C, unless otherwise specified

Parameter	Symbol	Value	Unit
Collector-emitter voltage $T_A = 25$ °C	$V_{CEO}$	4.5	V
$T_A = -55$ °C		4	
Collector-emitter voltage	$V_{CES}$	10	
Collector-base voltage	$V_{CBO}$	10	
Emitter-base voltage	$V_{EBO}$	1	
Collector current	$I_C$	80	mA
Base current	$I_B$	8	
Total power dissipation <sup>1)</sup> $T_S \leq 80$ °C	$P_{tot}$	250	mW
Junction temperature	$T_J$	150	°C
Storage temperature	$T_{Stg}$	-55 ... 150	

<sup>1</sup> $T_S$  is measured on the emitter lead at the soldering point to the pcb

**Thermal Resistance**

Parameter	Symbol	Value	Unit
Junction - soldering point <sup>1)</sup>	$R_{thJS}$	280	K/W

**Electrical Characteristics** at  $T_A = 25^\circ\text{C}$ , unless otherwise specified

Parameter	Symbol	Values			Unit
		min.	typ.	max.	

**DC Characteristics**

Collector-emitter breakdown voltage $I_C = 1 \text{ mA}, I_B = 0$	$V_{(\text{BR})\text{CEO}}$	4.5	5	-	V
Collector-emitter cutoff current $V_{CE} = 10 \text{ V}, V_{BE} = 0$	$I_{CES}$	-	-	10	$\mu\text{A}$
Collector-base cutoff current $V_{CB} = 5 \text{ V}, I_E = 0$	$I_{CBO}$	-	-	100	nA
Emitter-base cutoff current $V_{EB} = 0.5 \text{ V}, I_C = 0$	$I_{EBO}$	-	-	10	$\mu\text{A}$
DC current gain $I_C = 20 \text{ mA}, V_{CE} = 3.5 \text{ V}, \text{pulse measured}$	$h_{FE}$	50	110	170	-

<sup>1)</sup>For the definition of  $R_{thJS}$  please refer to Application Note AN077 (Thermal Resistance Calculation)

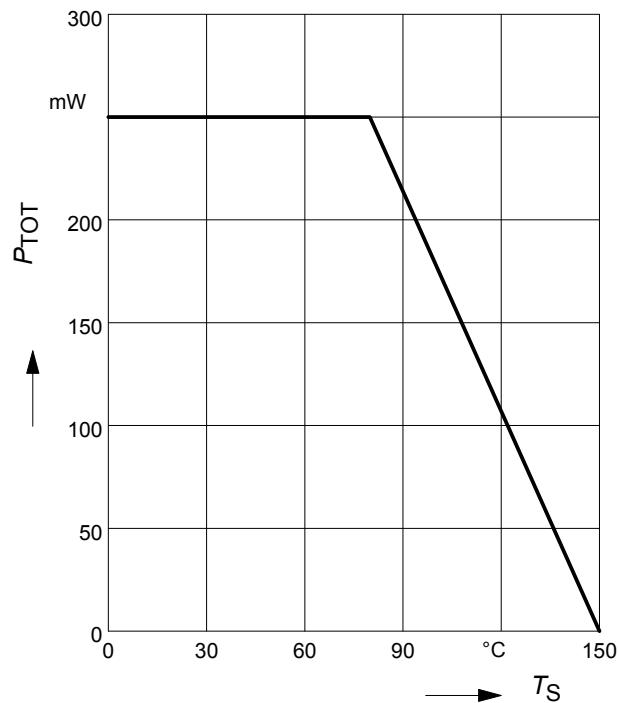
**Electrical Characteristics** at  $T_A = 25^\circ\text{C}$ , unless otherwise specified

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>AC Characteristics</b> (verified by random sampling)					
Transition frequency $I_C = 50 \text{ mA}, V_{CE} = 4 \text{ V}, f = 1 \text{ GHz}$	$f_T$	21	30	-	GHz
Collector-base capacitance $V_{CB} = 2 \text{ V}, f = 1 \text{ MHz}, V_{BE} = 0 \text{ V}$ , emitter grounded	$C_{cb}$	-	0.16	0.26	pF
Collector emitter capacitance $V_{CE} = 2 \text{ V}, f = 1 \text{ MHz}, V_{BE} = 0 \text{ V}$ , base grounded	$C_{ce}$	-	0.4	-	
Emitter-base capacitance $V_{EB} = 0.5 \text{ V}, f = 1 \text{ MHz}, V_{CB} = 0 \text{ V}$ , collector grounded	$C_{eb}$	-	0.55	-	
Minimum noise figure $I_C = 5 \text{ mA}, V_{CE} = 2 \text{ V}, f = 1.8 \text{ GHz}, Z_S = Z_{\text{Sopt}}$ $I_C = 5 \text{ mA}, V_{CE} = 2 \text{ V}, f = 3 \text{ GHz}, Z_S = Z_{\text{Sopt}}$	$NF_{\text{min}}$	-	0.9	1.4	dB
-		-	1.3	-	
Power gain, maximum stable <sup>1)</sup> $I_C = 20 \text{ mA}, V_{CE} = 2 \text{ V}, Z_S = Z_{\text{Sopt}}$ , $Z_L = Z_{\text{Lopt}}, f = 1.8 \text{ GHz}$	$G_{\text{ms}}$	-	20	-	dB
Power gain, maximum available <sup>1)</sup> $I_C = 20 \text{ mA}, V_{CE} = 2 \text{ V}, Z_S = Z_{\text{Sopt}}$ , $Z_L = Z_{\text{Lopt}}, f = 3 \text{ GHz}$	$G_{\text{ma}}$	-	14.5	-	dB
Transducer gain $I_C = 20 \text{ mA}, V_{CE} = 2 \text{ V}, Z_S = Z_L = 50\Omega, f = 1.8\text{GHz}$ $I_C = 20 \text{ mA}, V_{CE} = 2 \text{ V}, Z_S = Z_L = 50\Omega, f = 3\text{GHz}$	$ S_{21e} ^2$	15.5	18	-	dB
-		-	13	-	
Third order intercept point at output <sup>2)</sup> $V_{CE} = 2 \text{ V}, I_C = 20 \text{ mA}, Z_S = Z_L = 50\Omega, f = 1.8\text{GHz}$	$IP3$	-	24.5	-	dBm
1dB compression point at output $I_C = 20 \text{ mA}, V_{CE} = 2 \text{ V}, Z_S = Z_L = 50\Omega, f = 1.8\text{GHz}$	$P_{-1\text{dB}}$	-	11	-	

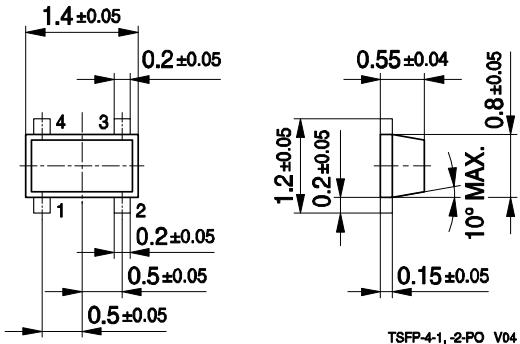
<sup>1</sup> $G_{\text{ma}} = |S_{21e}| / S_{12e}$  ( $k - (k^2 - 1)^{1/2}$ ),  $G_{\text{ms}} = |S_{21e}| / S_{12e}$ 
<sup>2</sup>IP3 value depends on termination of all intermodulation frequency components.

Termination used for this measurement is  $50\Omega$  from 0.1 MHz to 6 GHz

**Total power dissipation  $P_{\text{tot}} = f(T_S)$**

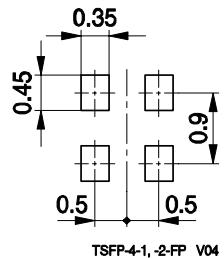


### Package Outline



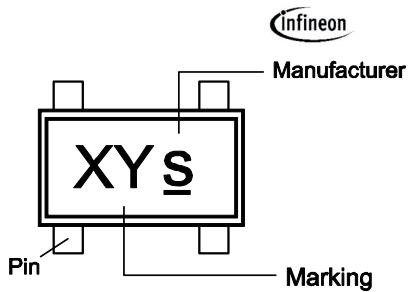
TSFP-4-1, -2-PO V04

### Foot Print



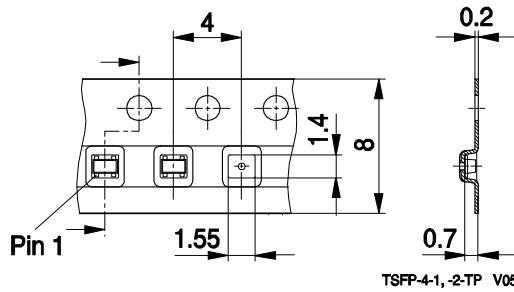
TSFP-4-1, -2-FP V04

### Marking Layout (Example)



### Standard Packing

Reel ø180 mm = 3.000 Pieces/Reel  
 Reel ø330 mm = 10.000 Pieces/Reel



TSFP-4-1, -2-TP V05

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**Edition 2009-11-16**

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

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