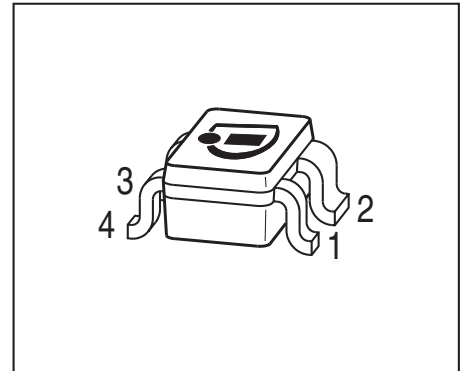


**NPN Silicon RF Transistor\***

- For ESD protected high gain low noise amplifier
- Excellent ESD performance  
typical value 1000 V (HBM)
- Outstanding  $G_{ms} = 21.5$  dB  
Noise Figure  $F = 0.9$  dB
- Gold metallization for high reliability
- SIEGET<sup>®</sup> 45 - Line
- Pb-free (RoHS compliant) package<sup>1)</sup>
- Qualified according AEC Q101

\* Short term description



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

Type	Marking	Pin Configuration						Package
BFP540ESD	AUs	1=B	2=E	3=C	4=E	-	-	SOT343

**Maximum Ratings**

Parameter	Symbol	Value	Unit
Collector-emitter voltage $T_A > 0^\circ\text{C}$ $T_A \leq 0^\circ\text{C}$	$V_{CEO}$	4.5 4	V
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>2)</sup> $T_S \leq 77^\circ\text{C}$	$P_{tot}$	250	mW
Junction temperature	$T_j$	150	$^\circ\text{C}$
Ambient temperature	$T_A$	-65 ... 150	
Storage temperature	$T_{stg}$	-65 ... 150	

<sup>1</sup>Pb-containing package may be available upon special request

<sup>2</sup> $T_S$  is measured on the collector lead at the soldering point to the pcb

**Thermal Resistance**

Parameter	Symbol	Value	Unit
Junction - soldering point <sup>1)</sup>	$R_{thJS}$	$\leq 290$	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 $I_C = 1 \text{ mA}, I_B = 0$	$V_{(BR)CEO}$	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 $I_C = 20 \text{ mA}, V_{CE} = 3.5 \text{ V}$ , pulse measured	$h_{FE}$	50	110	170	-

<sup>1)</sup>For calculation of  $R_{thJA}$  please refer to Application Note Thermal Resistance

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>AC Characteristics (verified by random sampling)</b>					
Transition frequency $I_C = 50\text{ mA}$ , $V_{CE} = 4\text{ V}$ , $f = 1\text{ GHz}$	$f_T$	21	30	-	GHz
Collector-base capacitance $V_{CB} = 2\text{ V}$ , $f = 1\text{ MHz}$ , $V_{BE} = 0$ , emitter grounded	$C_{cb}$	-	0.14	0.24	pF
Collector emitter capacitance $V_{CE} = 2\text{ V}$ , $f = 1\text{ MHz}$ , $V_{BE} = 0$ , base grounded	$C_{ce}$	-	0.41	-	
Emitter-base capacitance $V_{EB} = 0.5\text{ V}$ , $f = 1\text{ MHz}$ , $V_{CB} = 0$ , collector grounded	$C_{eb}$	-	0.59	-	
Noise figure $I_C = 5\text{ mA}$ , $V_{CE} = 2\text{ V}$ , $f = 1.8\text{ GHz}$ , $Z_S = Z_{Sopt}$ $I_C = 5\text{ mA}$ , $V_{CE} = 2\text{ V}$ , $f = 3\text{ GHz}$ , $Z_S = Z_{Sopt}$	$F$	-	0.9	1.4	dB
Power gain, maximum stable <sup>1)</sup> $I_C = 20\text{ mA}$ , $V_{CE} = 2\text{ V}$ , $Z_S = Z_{Sopt}$ , $Z_L = Z_{Lopt}$ , $f = 1.8\text{ GHz}$	$G_{ms}$	-	21.5	-	dB
Power gain, maximum available <sup>1)</sup> $I_C = 20\text{ mA}$ , $V_{CE} = 2\text{ V}$ , $Z_S = Z_{Sopt}$ , $Z_L = Z_{Lopt}$ , $f = 3\text{ GHz}$	$G_{ma}$	-	16	-	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$	16	18.5	-	dB
Third order intercept point at output <sup>2)</sup> $V_{CE} = 2\text{ V}$ , $I_C = 20\text{ mA}$ , $Z_S = Z_L = 50\Omega$ , $f = 1.8\text{ GHz}$	$IP_3$	-	24.5	-	dBm
1dB Compression point at output $I_C = 20\text{ mA}$ , $V_{CE} = 2\text{ V}$ , $Z_S = Z_L = 50\Omega$ , $f = 1.8\text{ GHz}$	$P_{-1dB}$	-	11	-	

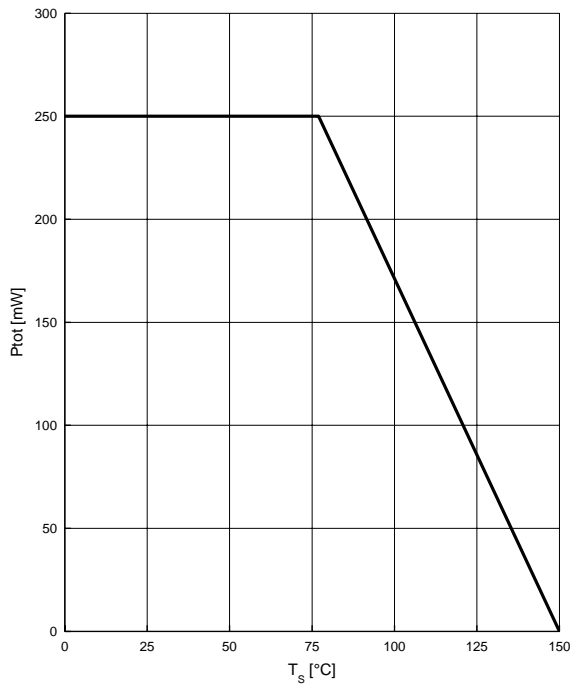
<sup>1)</sup> $G_{ma} = |S_{21e} / S_{12e}| (k - (k^2 - 1)^{1/2})$ ,  $G_{ms} = |S_{21e} / S_{12e}|$ 
<sup>2)</sup> $IP_3$  value depends on termination of all intermodulation frequency components.  
Termination used for this measurement is  $50\Omega$  from 0.1 MHz to 6 GHz

**Simulation Data**

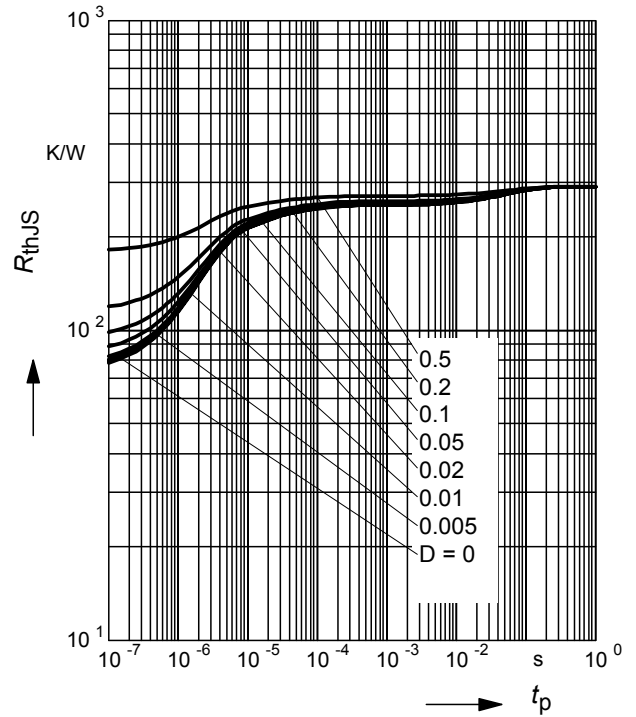
For SPICE-model as well as for S-parameters including noise parameters refer to our internet website: [www.infineon.com/rf.models](http://www.infineon.com/rf.models). Please consult our website and download the latest version before actually starting your design.

The simulation data have been generated and verified up to 8 GHz using typical devices. The BFP540ESD nonlinear SPICE-model reflects the typical DC- and RF-device performance with high accuracy.

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

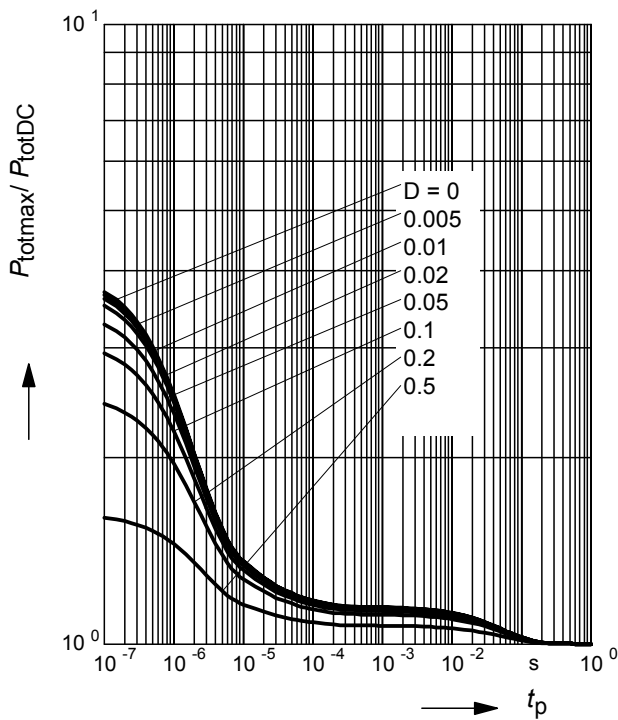


**Permissible Pulse Load  $R_{thJS} = f(t_p)$**



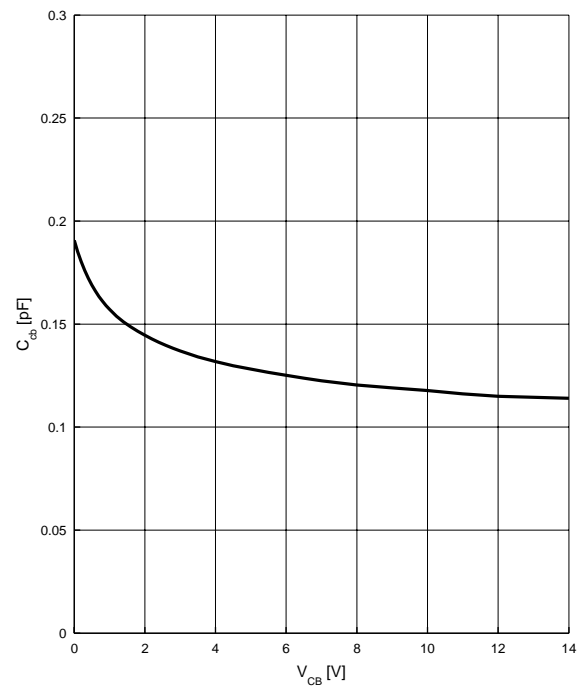
**Permissible Pulse Load**

$P_{totmax}/P_{totDC} = f(t_p)$



**Collector-base capacitance  $C_{cb} = f(V_{CB})$**

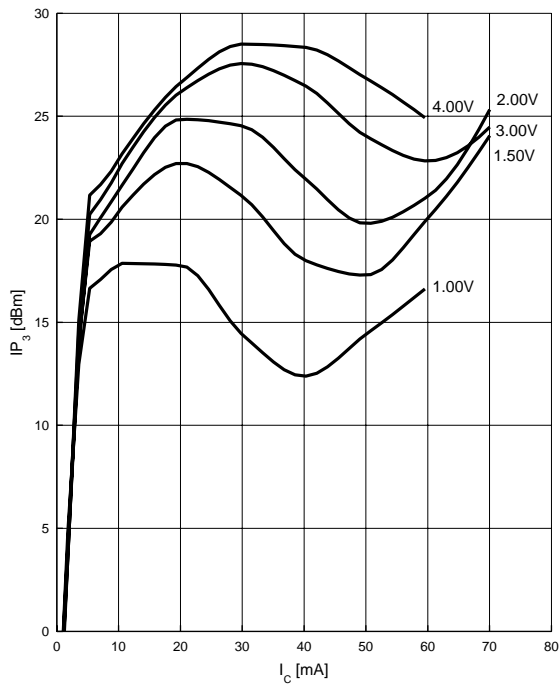
$f = 1 \text{ MHz}$



**Third order Intercept Point  $IP_3 = f(I_C)$**

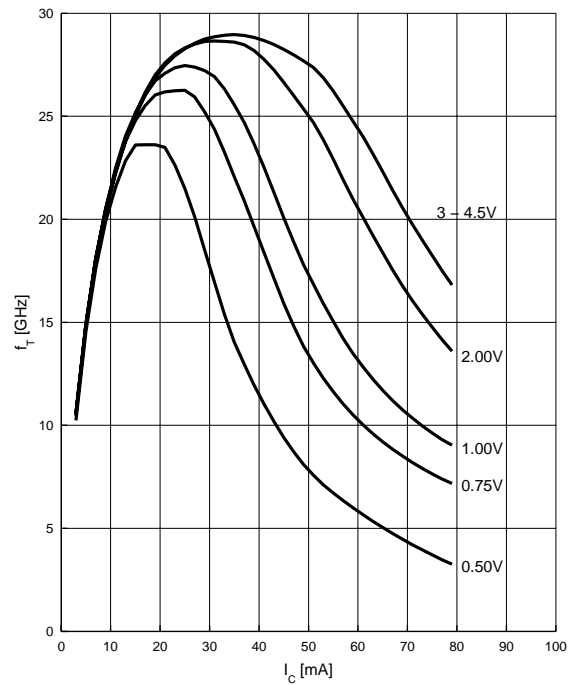
(Output,  $Z_S = Z_L = 50 \Omega$ )

$V_{CE}$  = parameter,  $f = 900 \text{ MHz}$



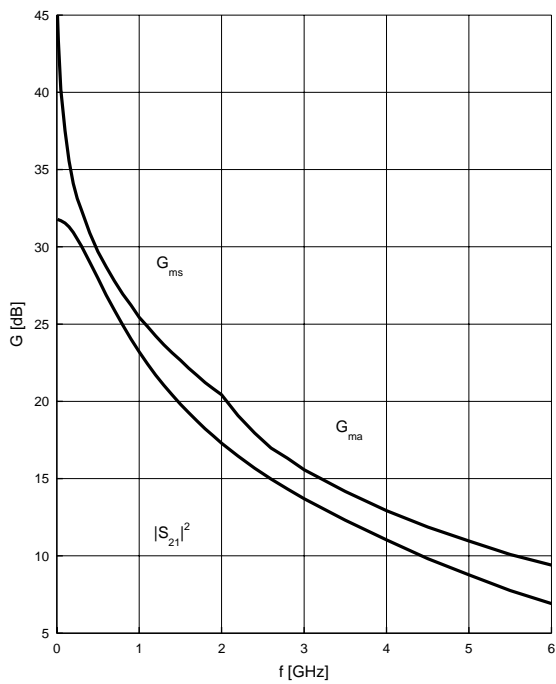
**Transition frequency  $f_T = f(I_C)$**

$V_{CE}$  = parameter in V,  $f = 2 \text{ GHz}$



**Power gain  $G_{ma}, G_{ms} = f(f)$**

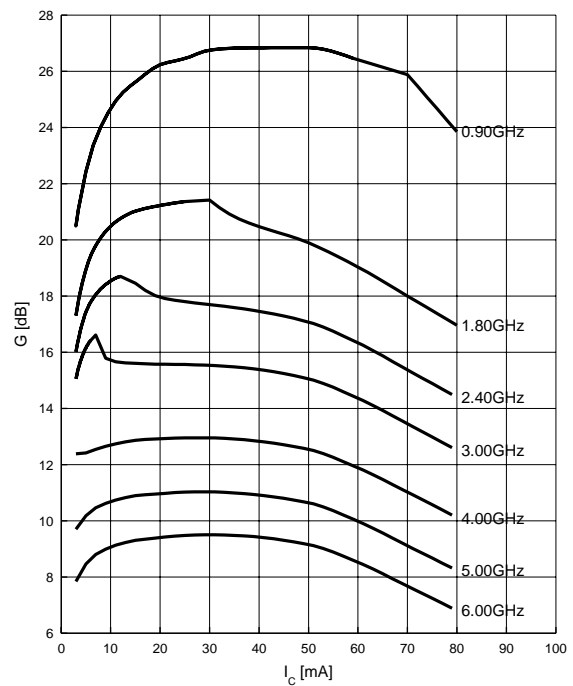
$V_{CE} = 3 \text{ V}, I_C = 25 \text{ mA}$



**Power gain  $G_{ma}, G_{ms} = f(I_C)$**

$V_{CE} = 3 \text{ V}$

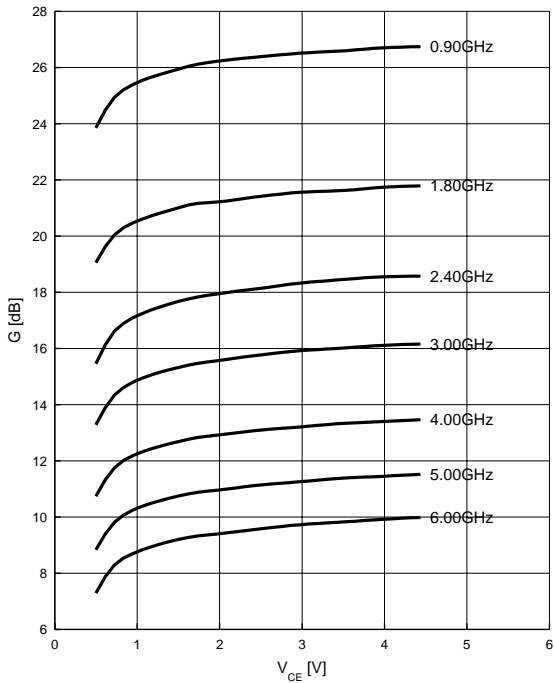
$f$  = parameter in GHz



**Power gain  $G_{ma}$ ,  $G_{ms} = f(V_{CE})$**

$I_C = 20 \text{ mA}$

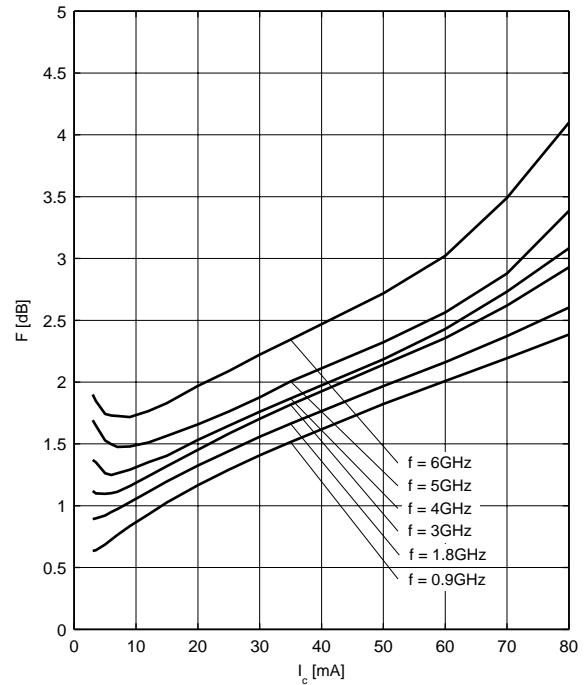
$f = \text{parameter in GHz}$



**Noise figure  $F = f(I_C)$**

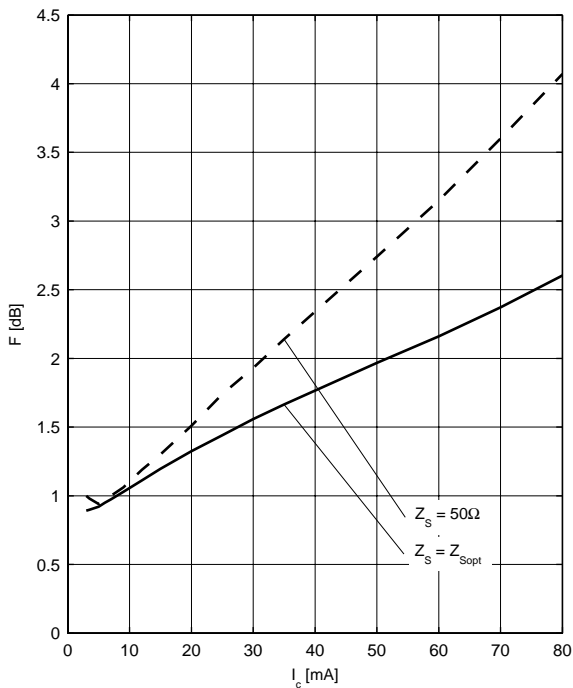
$V_{CE} = 3 \text{ V}$ ,  $f = \text{parameter in GHz}$

$Z_S = Z_{Sopt}$



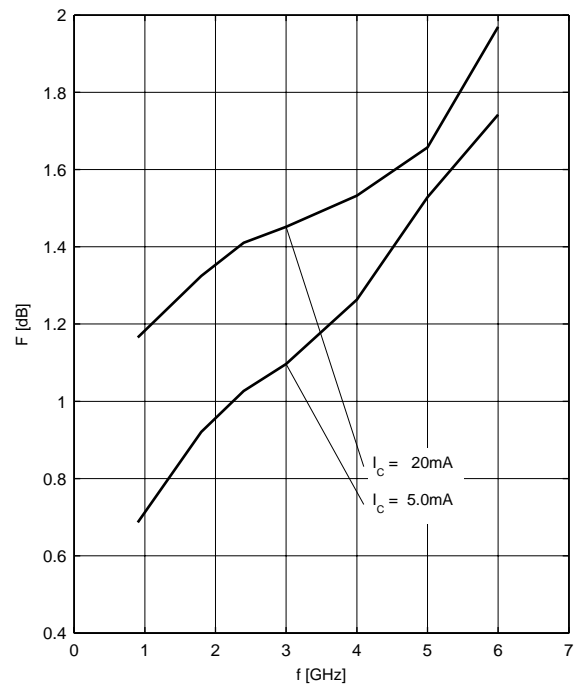
**Noise figure  $F = f(I_C)$**

$V_{CE} = 3 \text{ V}$ ,  $f = 1.8 \text{ GHz}$



**Noise figure  $F = f(f)$**

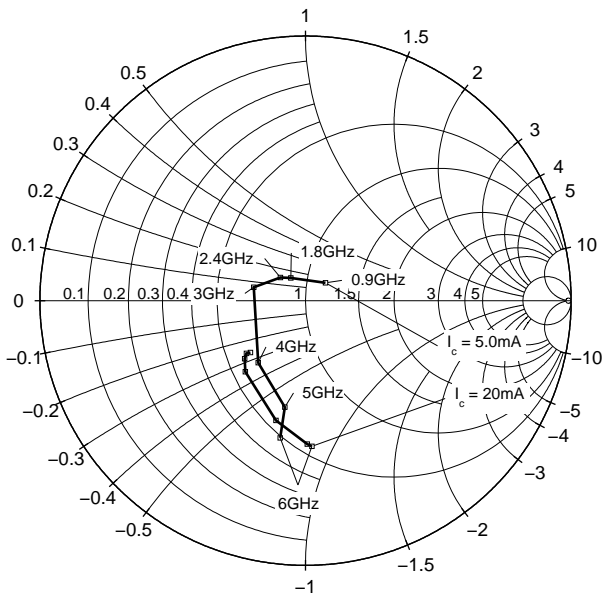
$V_{CE} = 3 \text{ V}$ ,  $Z_S = Z_{Sopt}$



**Source impedance** for min.

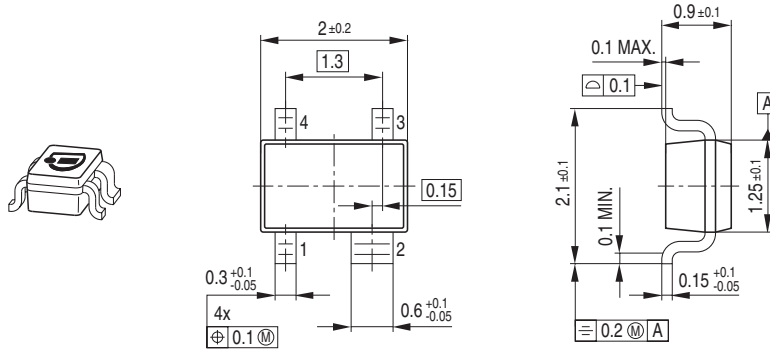
noise figure vs. frequency

$V_{CE} = 3\text{ V}$ ,  $I_C = 5\text{ mA} / 20\text{ mA}$

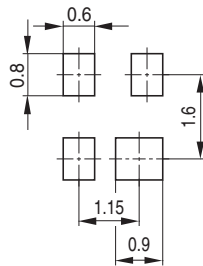




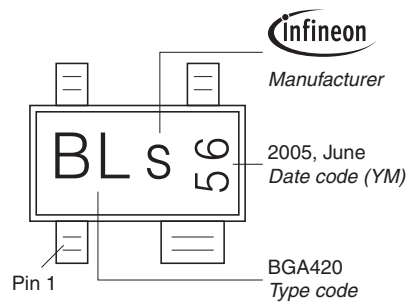
Package Outline



Foot Print

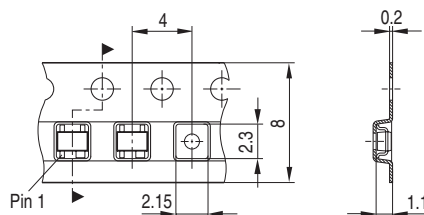


Marking Layout (Example)



Standard Packing

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



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