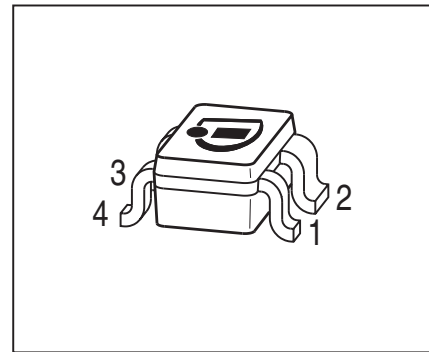


**NPN Silicon RF Transistor**

- Low current device suitable e.g. for handhelds
- For high frequency oscillators e.g. DRO for LNB
- For ISM band applications like Automatic Meter Reading, Sensors etc.
- Transit frequency  $f_T = 25$  GHz
- Pb-free (RoHS compliant) package
- Qualified according AEC Q101



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

Type	Marking	Pin Configuration						Package
BFP410	AKs	1=B	2=E	3=C	4=E	-	-	SOT343

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

Parameter	Symbol	Value	Unit
Collector-emitter voltage $T_A = 25$ °C $T_A = -55$ °C	$V_{CEO}$	4.5 4.1	V
Collector-emitter voltage	$V_{CES}$	13	
Collector-base voltage	$V_{CBO}$	13	
Emitter-base voltage	$V_{EBO}$	1.5	
Collector current	$I_C$	40	mA
Base current	$I_B$	6	
Total power dissipation <sup>1)</sup> $T_S \leq 100$ °C	$P_{tot}$	150	mW
Junction temperature	$T_J$	150	°C
Ambient temperature	$T_A$	-55 ... 150	
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>	$R_{thJS}$	335	K/W

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>DC Characteristics</b>					
Collector-emitter breakdown voltage $I_C = 1 \text{ mA}, I_B = 0$	$V_{(BR)CEO}$	4.5	5	-	V
Collector-emitter cutoff current $V_{CE} = 2 \text{ V}, V_{BE} = 0$ $V_{CE} = 5 \text{ V}, V_{BE} = 0, T_A = 85^\circ\text{C}$ (verified by random sampling)	$I_{CES}$	-	1	30	nA
		-	2	50	
Collector-base cutoff current $V_{CB} = 2 \text{ V}, I_E = 0$	$I_{CBO}$	-	1	30	
Emitter-base cutoff current $V_{EB} = 0.5 \text{ V}, I_C = 0$	$I_{EBO}$	-	0.001	0.6	$\mu\text{A}$
DC current gain $I_C = 13 \text{ mA}, V_{CE} = 2 \text{ V}$ , pulse measured	$h_{FE}$	60	95	130	-

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

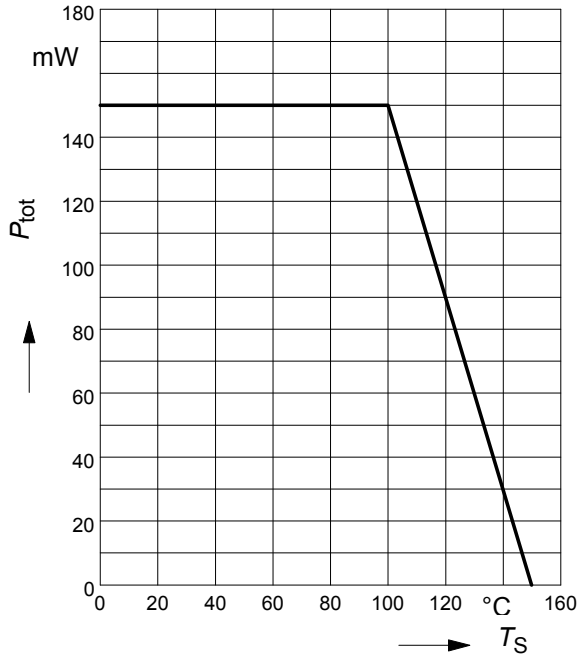
**Electrical Characteristics at  $T_A = 25^\circ\text{C}$ , unless otherwise specified**

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>AC Characteristics (verified by random sampling)</b>					
Transition frequency $I_C = 20 \text{ mA}$ , $V_{CE} = 2 \text{ V}$ , $f = 2 \text{ GHz}$	$f_T$	18	25	-	GHz
Collector-base capacitance $V_{CB} = 2 \text{ V}$ , $f = 1 \text{ MHz}$ , $V_{BE} = 0$ , emitter grounded	$C_{cb}$	-	0.09	0.17	pF
Collector emitter capacitance $V_{CE} = 2 \text{ V}$ , $f = 1 \text{ MHz}$ , $V_{BE} = 0$ , base grounded	$C_{ce}$	-	0.35	-	
Emitter-base capacitance $V_{EB} = 0.5 \text{ V}$ , $f = 1 \text{ MHz}$ , $V_{CB} = 0$ , collector grounded	$C_{eb}$	-	0.45	-	
Noise figure $I_C = 2 \text{ mA}$ , $V_{CE} = 2 \text{ V}$ , $f = 2 \text{ GHz}$ , $Z_S = Z_{Sopt}$	$F$	-	1.2	-	dB
Power gain, maximum stable <sup>1)</sup> $I_C = 20 \text{ mA}$ , $V_{CE} = 2 \text{ V}$ , $Z_S = Z_{Sopt}$ , $Z_L = Z_{Lopt}$ , $f = 2 \text{ GHz}$	$G_{ms}$	-	21.5	-	dB
Insertion power gain $V_{CE} = 2 \text{ V}$ , $I_C = 20 \text{ mA}$ , $f = 2 \text{ GHz}$ , $Z_S = Z_L = 50 \Omega$	$ S_{21} ^2$	-	18.5	-	
Third order intercept point at output <sup>2)</sup> $V_{CE} = 2 \text{ V}$ , $I_C = 20 \text{ mA}$ , $f = 2 \text{ GHz}$ , $Z_S = Z_L = 50 \Omega$	$IP_3$	-	23.5	-	dBm
1dB Compression point at output $I_C = 20 \text{ mA}$ , $V_{CE} = 2 \text{ V}$ , $Z_S = Z_L = 50 \Omega$ , $f = 2 \text{ GHz}$	$P_{-1dB}$	-	10.5	-	

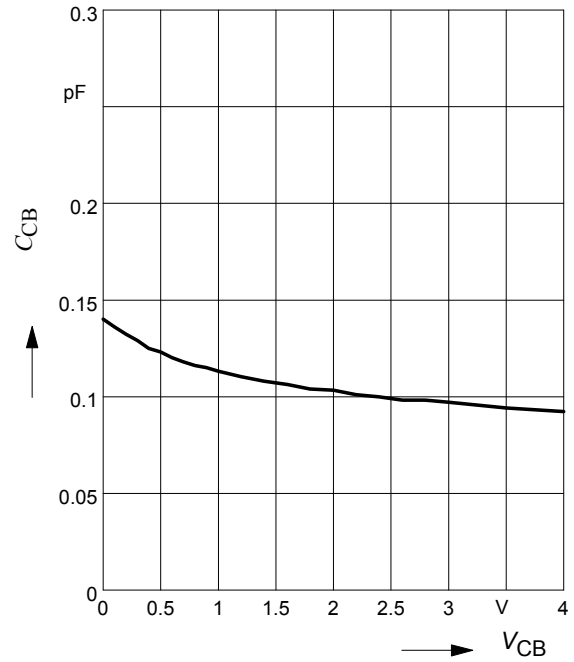
$$^1G_{ms} = |S_{21} / S_{12}|$$

<sup>2</sup>IP3 value depends on termination of all intermodulation frequency components.  
Termination used for this measurement is 50Ω from 0.1 MHz to 6 GHz

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



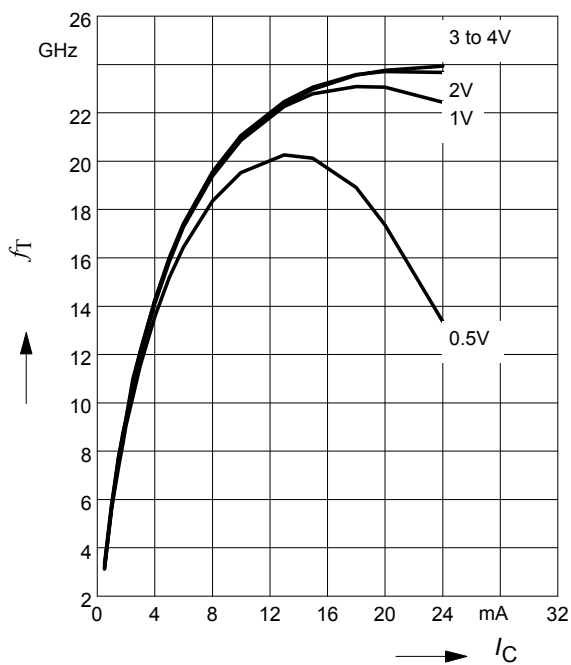
**Collector-base capacitance  $C_{cb} = f(V_{CB})$**   
 $f = 1\text{MHz}$



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

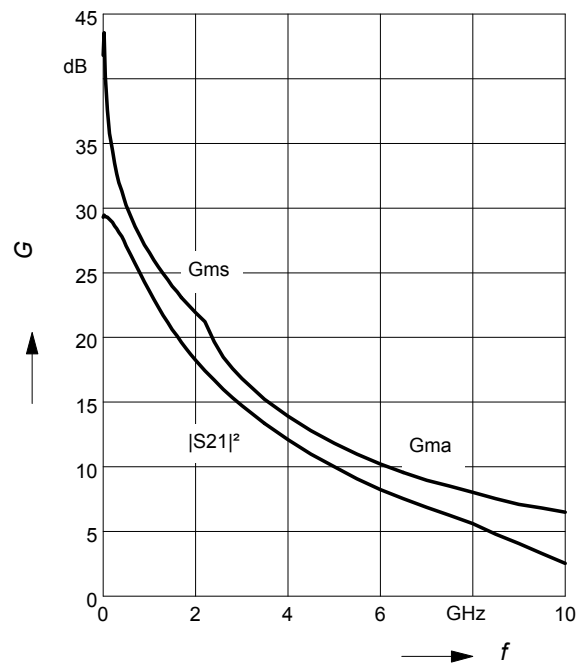
$f = 2\text{GHz}$

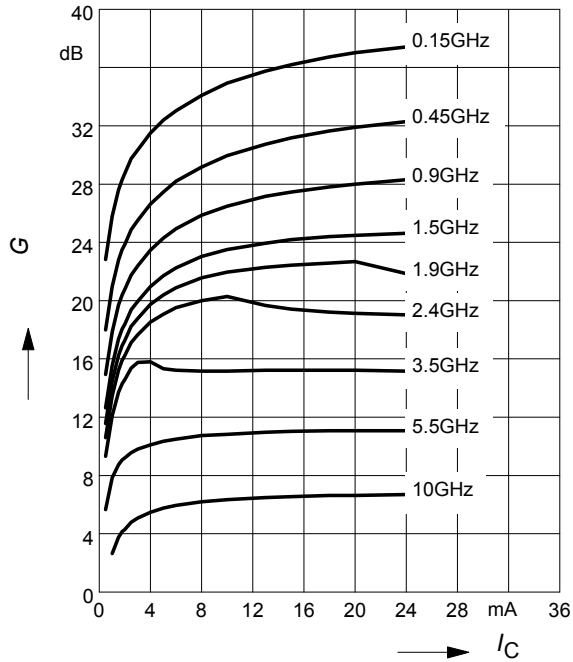
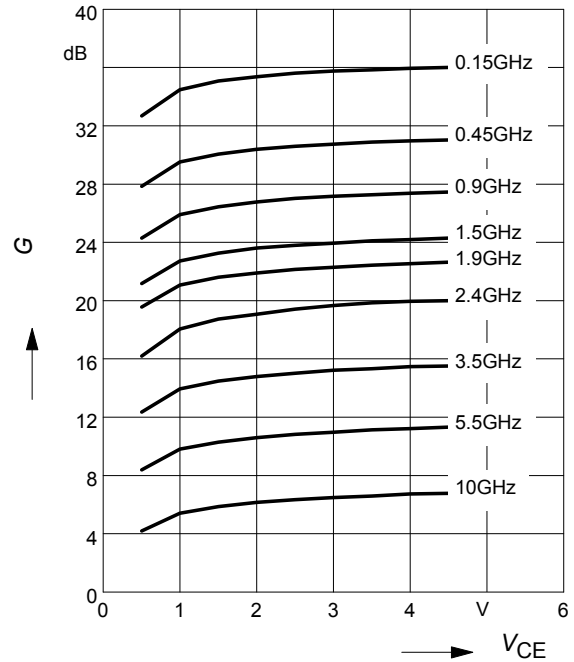
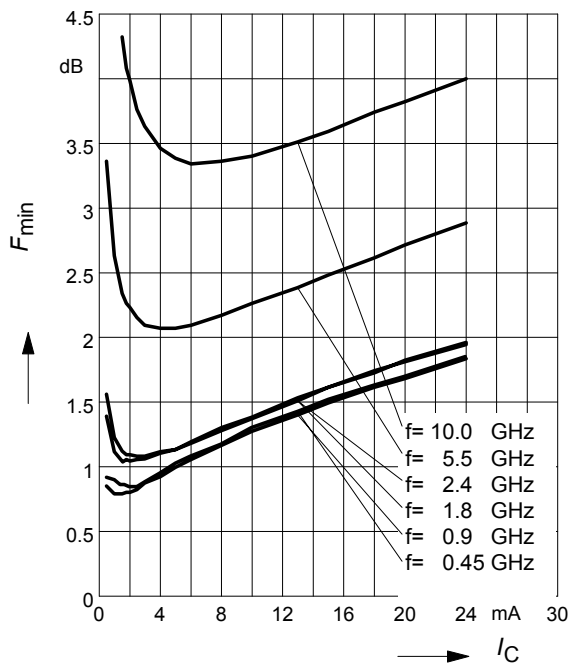
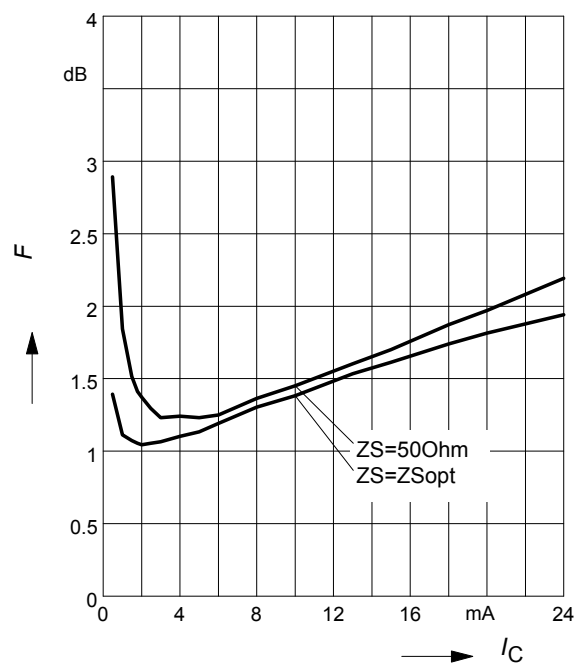
$V_{CE} = \text{parameter in V}$



**Power gain  $G_{ma}, G_{ms}, |S_{21}|^2 = f(f)$**

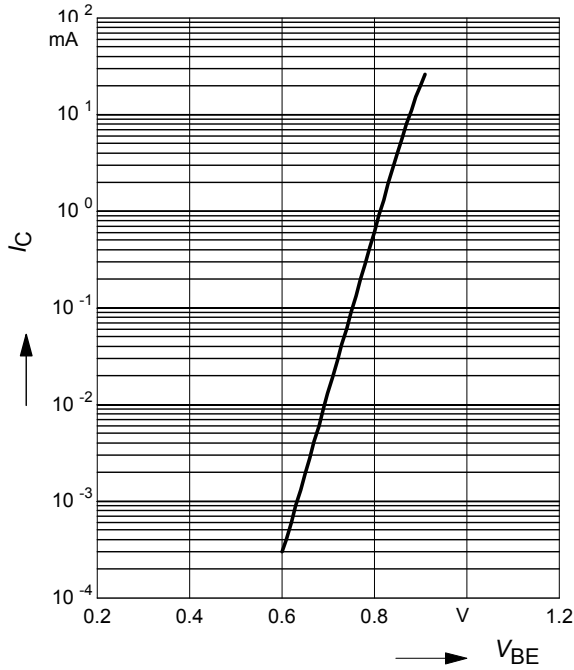
$V_{CE} = 2\text{V}, I_C = 13\text{mA}$



**Power gain  $G_{ma}, G_{ms} = f(I_C)$** 
 $V_{CE} = 2V$ 
 $f = \text{parameter in GHz}$ 

**Power gain  $G_{ma}, G_{ms} = f(V_{CE})$** 
 $I_C = 13 \text{ mA}$ 
 $f = \text{parameter in GHz}$ 

**Noise figure  $F = f(I_C)$** 
 $V_{CE} = 2V, Z_S = Z_{Sopt}$ 

**Noise figure  $F = f(I_C)$** 
 $V_{CE} = 2V, f = 2 \text{ GHz}$ 


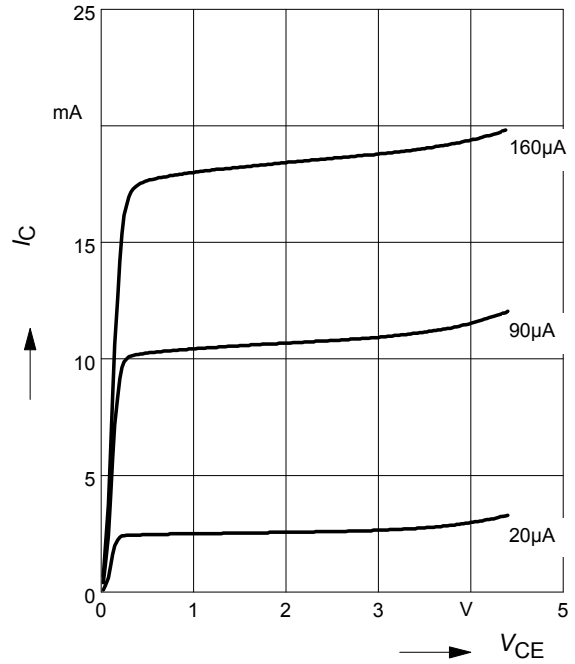
Collector current  $I_C = f(V_{BE})$

$V_{CE} = 2\text{ V}$



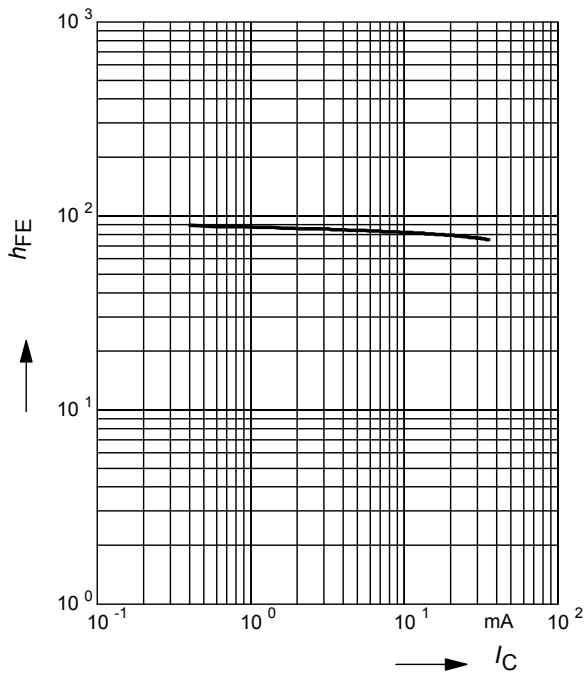
Collector current  $I_C = f(V_{CE})$

Parameter  $I_B$

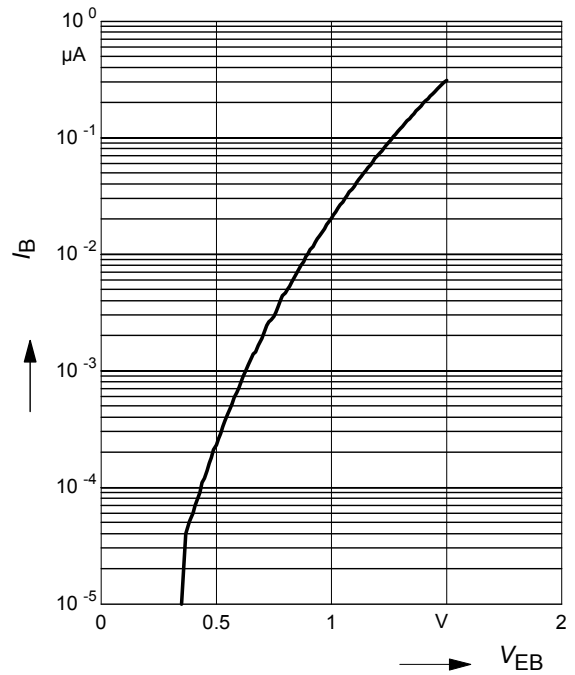


DC current gain  $h_{FE} = f(I_C)$

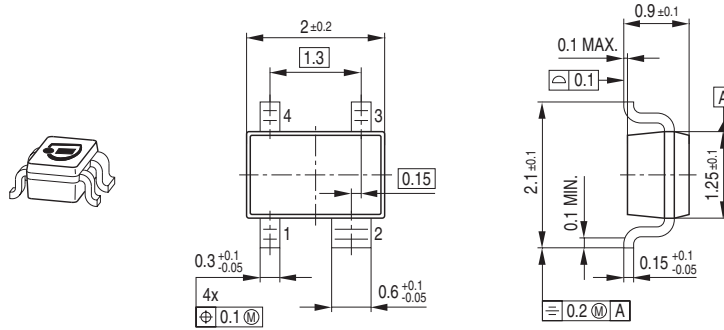
$V_{CE} = 2\text{ V}$



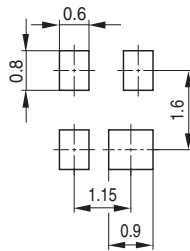
Base current reverse  $I_B = f(V_{EB})$



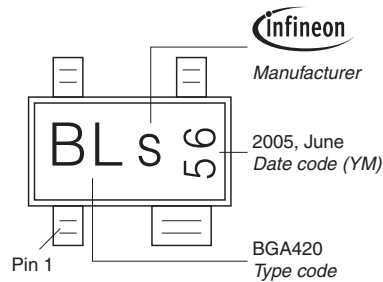
Package Outline



Foot Print

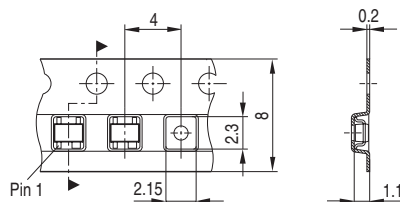


Marking Layout (Example)



Standard Packing

Reel  $\varnothing$ 180 mm = 3.000 Pieces/Reel  
 Reel  $\varnothing$ 330 mm = 10.000 Pieces/Reel



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