Application Note No. 016

Low-Noise-Amplifier optimized for input and output return loss at 1.9 GHz using BFP420

RF & Protection Devices

Never stop thinking

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Low-Noise-Amplifier optimized for input and output return loss at 1.9 GHz using BFP420 Revision History: 2006-11-14, Rev. 2.0	
Previous Version:	
Page	**Subjects (major changes since last revision)**
All	Document layout change

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1 Low-Noise-Amplifier optimized for input and output return loss at 1.9 GHz using BFP420

This application note provides general information, print layout and list of used components, circuit layout and measured data of a low noise amplifier at 1.9 GHz using SIEMENS SIEGET®25 BFP420. This circuit is optimised for return loss values.

Data at 1.9 GHz (3 V and 5 mA)

Gain: 14 dB
IP_{3out}:: 8 dB
NF: 1.65 dB
$R_{Lin:}$: >13 dB
R_{Lout}: >18 dB

The amplifier application circuit has been optimised to achieve optimum noise figure and good stability at 1.9 GHz, combined with low operating current and voltage for use in handheld equipment.

The transistor is matched using microstrip lines at input and output in conjunction with capacitors to ground. The added emitter inductance reduces gain but it provides the best overall matching conditions for maximum gain and minimum noise figure. The active bias controller BCR400W is used to provide bias stability over the operating temperature range. For additional information on this part please refer to application note No.014. The collector resistor is used for increase stability for the RF-transistor and omits the need to use λ/4 transmission lines for biasing. In order to avoid AF oscillations for the BCR400W, the blocking capacitor at the base of the RF transistor should be at least ten times the value used at collector.

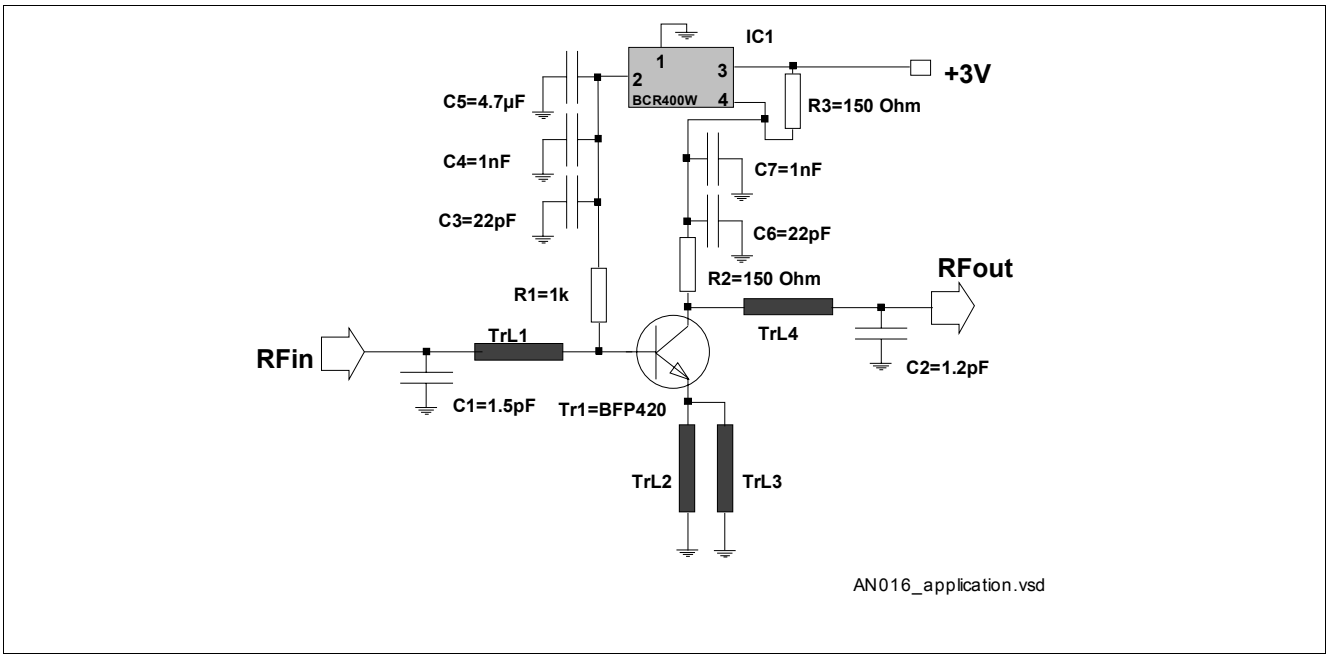
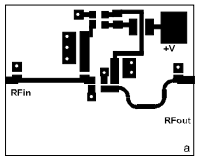


Figure 1 Application



25mm x 20mm

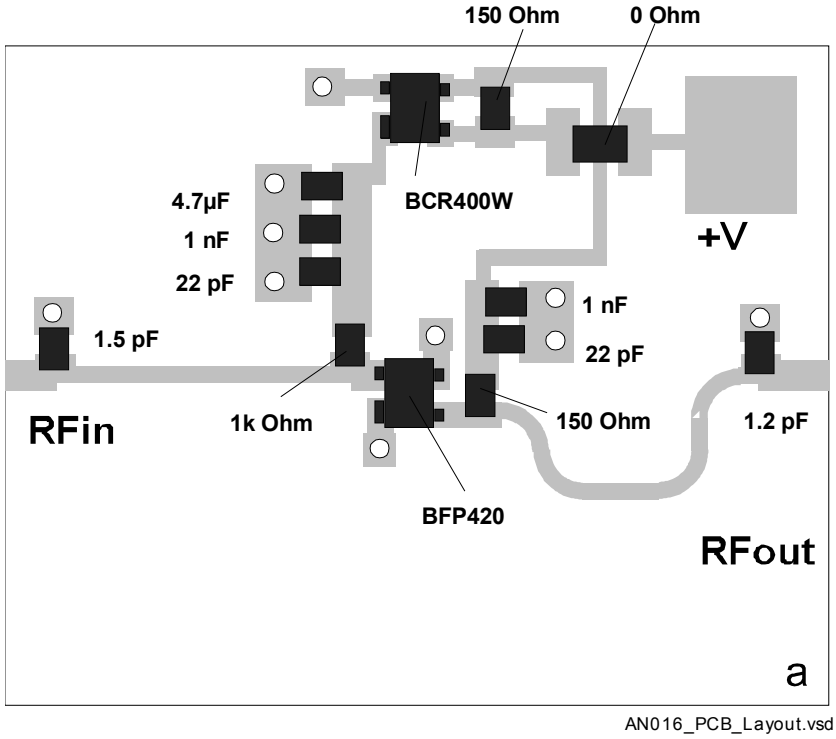


Figure 2 PCB Layout and Component Placement

Table 1 Component

Component	Value	Unit	Size	Comment
R1	1	kΩ	0603	Bias
R2	150	Ω	0603	To improve stability and output return loss
R3	150	Ω	0603	Bias resistor for BCR400W / collector current
C1	1.5	pF	0603	Input match
C2	1.2	pF	0603	Output match
C3	22	pF	0603	RF-short
C4	1	nF	0603	RF-short
C5	4.7	µF	0603	RF-short
C6	10	nF	0603	RF-short
C7	22	pF	0603	RF-short
C8	1	nF	0603	RF-short
Tr1			SOT343	SIEGET® BFP420
TrL1				Input match
TrL2				Emitter-microstrip-line
TrL3				Emitter-microstrip-line
TrL4				Output match
IC1			SOT343	BCR400W, active bias controller
Substrate	FR4			h = 0.5 mm, ε_r = 4.5

Measurements

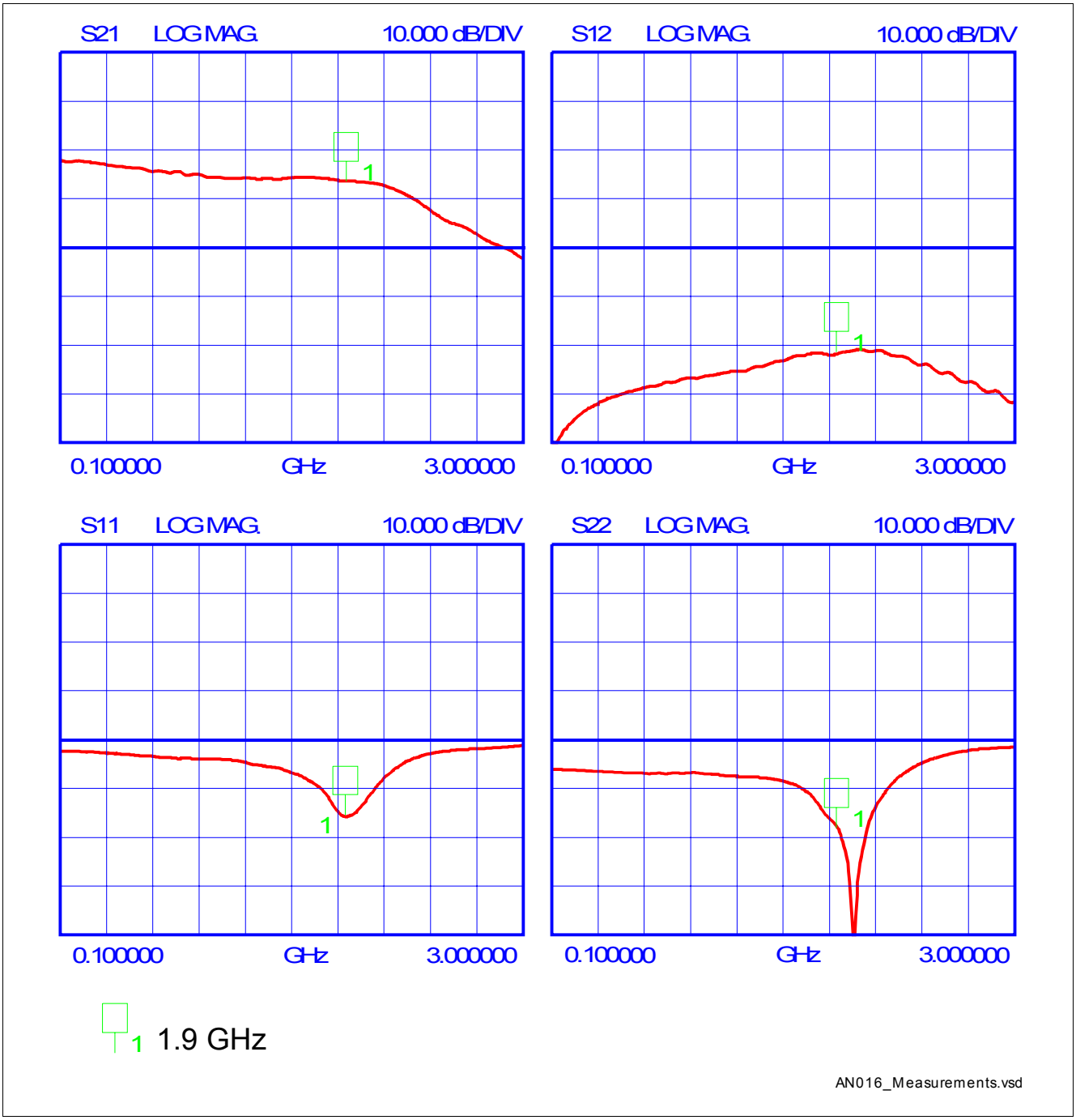


Figure 3 Measurements