Application Note No. 031

A Low Noise Amplifier at 1.9 GHz offers +14 dBm Input Intercept Point

RF & Protection Devices

Never stop thinking

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Revision History: 2007-01-08, Rev. 2.0

Previous Version:

Page	Subjects (major changes since last revision)

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1 A Low Noise Amplifier at 1.9 GHz offers +14 dBm Input Intercept Point

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 Infineon SIEGET BFP450. The emphasis has been on high IP_{3in} -values

Data at 1.9 GHz (3 V and 24 mA / R1 = 33, R2 = 5.6 k)

Gain:	11 dB
IP_{3out}:	14 dBm
NF:	1.9 dB
$R_{Lin-out}$	>10 dB

Data at 1.9 GHz (3 V and 15 mA / R1 = 56, R2 = 8.2 k)

Gain:	10.5 dB
IP_{3out}:	10 dBm
NF:	1.8 dB
$R_{Lin-out}$	>10 dB

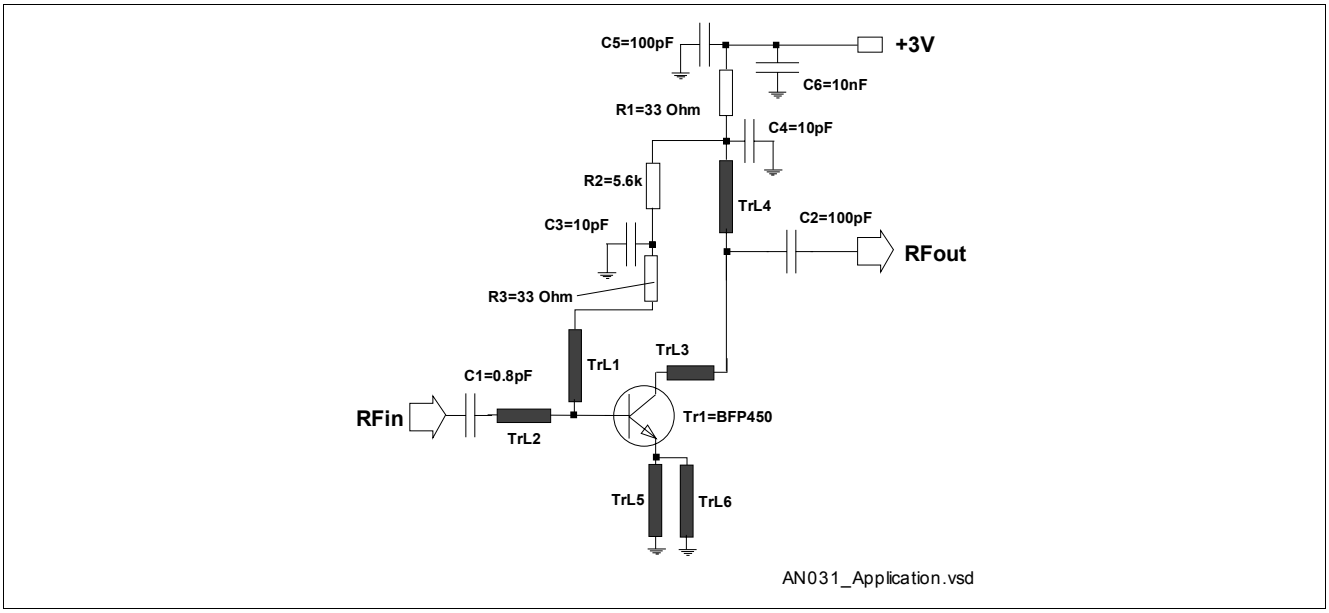

Figure 1 Application

This amplifier at 1.9 GHz has been realized by using microstrip lines for matching purposes. It offers a good compromise between low noise and high IIP_3 values.For optimizing and improving the circuit please observe the following abstract:

- The layout size can be reduced by using chip-inductors instead of the microstrip lines TrL1 and TrL4
- You are able to get a better stabilization behaviour versus temperature and a reduction of current gain distribution problems it you add a Infineon active bias controller BCR400W. This is easily done by replacing collector resistor R1 and by adding two capacitors. For further information please refer to application note No 014. However the resistor R1 and R2 are sufficient in most applications for stabilization purposes.

- The measured figures include losses of SMA-connectors and the relatively high loss of the microstrip lines on the epoxy-board.
- Resistor R3 is used get higher circuit-stability at low frequencies.

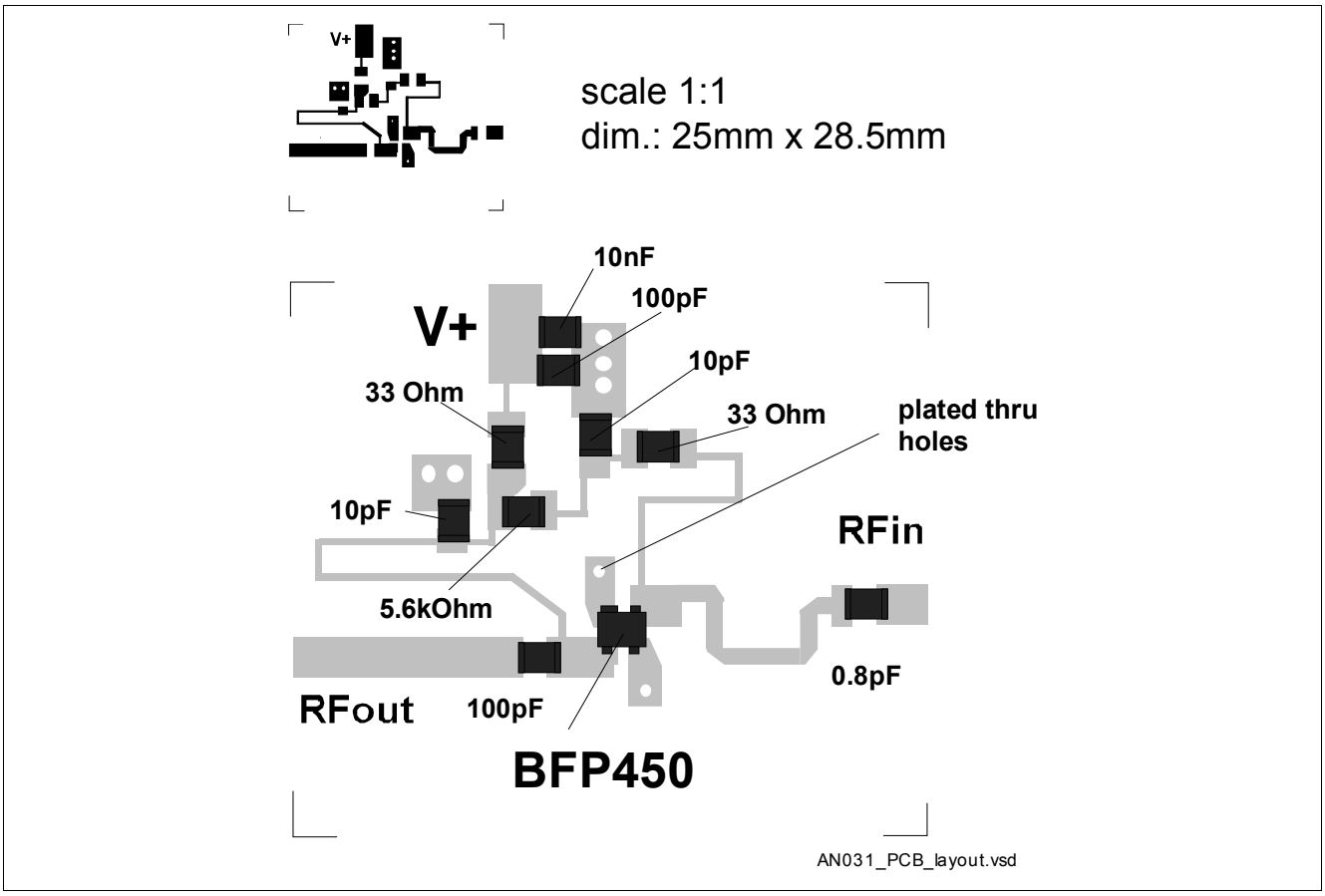

Figure 2 PCB Layout and Component Placement

Table 1 Component

Component	Value	Unit	Size	Comment
R1	33	Ω	0603/0805	Bias / collector-resistance / $V_{R1} \cong 0.7$ V
R2	5.6	kΩ	0603/0805	Bias
R3	33	Ω	0603/0805	To improve AF-stability
C1	0.8	pF	0603/0805	Input match
C2	100	pF	0603/0805	DC-block
C3	10	pF	0603/0805	RF-short
C4	10	pF	0603/0805	RF-short
C5	100	pF	0603/0805	RF-short
C6	10	nF	0603/0805	RF-short
Tr1			SOT343	SIEGET® BFP450
TrL1				Input match, w = 0.3 mm
TrL2				Input match, w = 0.8 mm
TrL3				Output match, w = 1.9 mm
TrL4				Output match, w = 0.3 mm
TrL5				Emitter inductance, w = 1.9 mm
TrL6				Emitter inductance, w = 1.9 mm
Substrate	FR4			h = 1 mm, e_r = 4.5

Measured data

+V = 3 Vdc / I = 24 mA ($R1$ = 33 Ω, $R2$ = 5.6 kΩ)

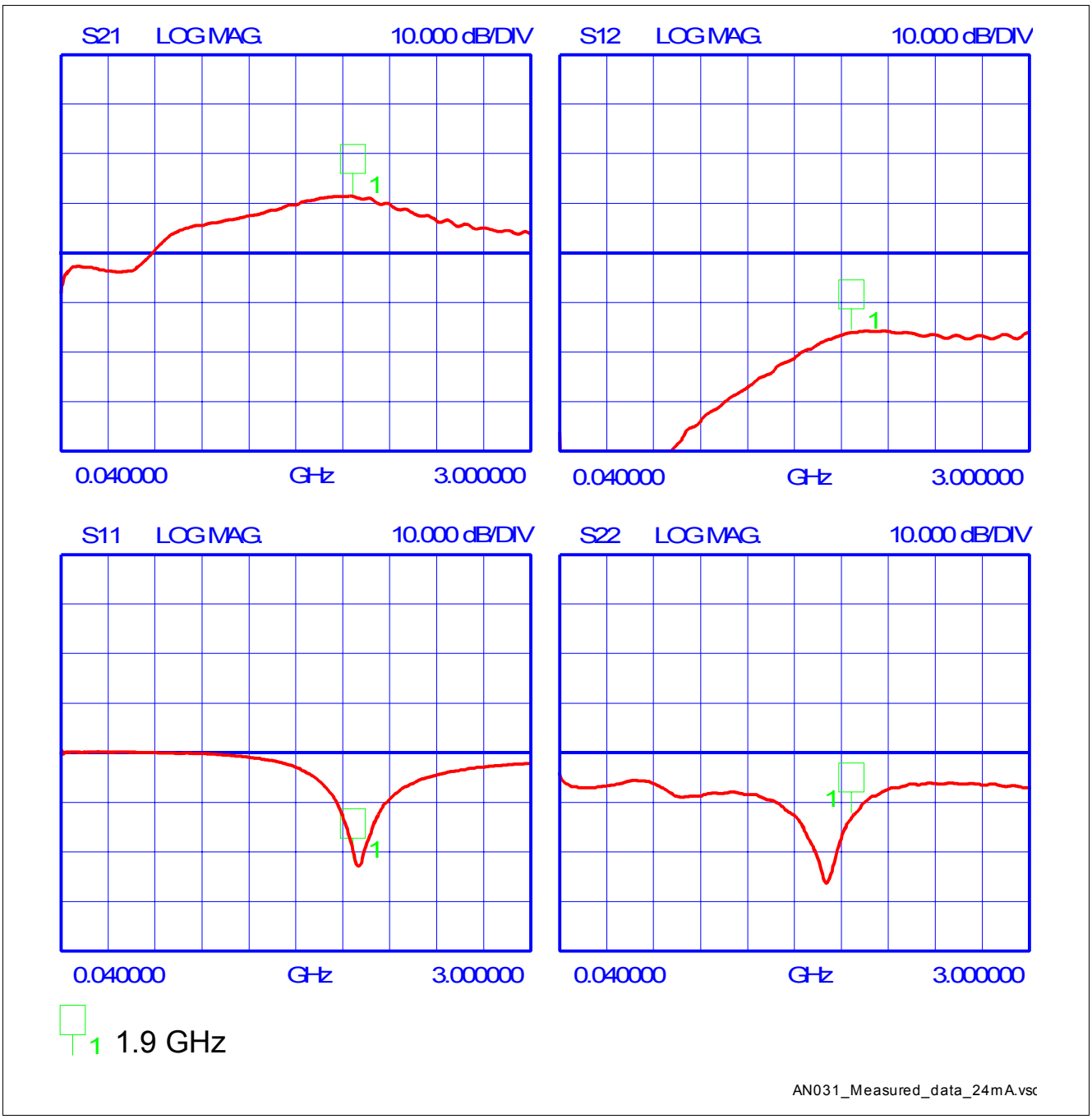

Figure 3 Measured data

Measured data

+V = 3 Vdc / I = 15 mA ($R1$ = 56 Ω, $R2$ = 8.2 kΩ)

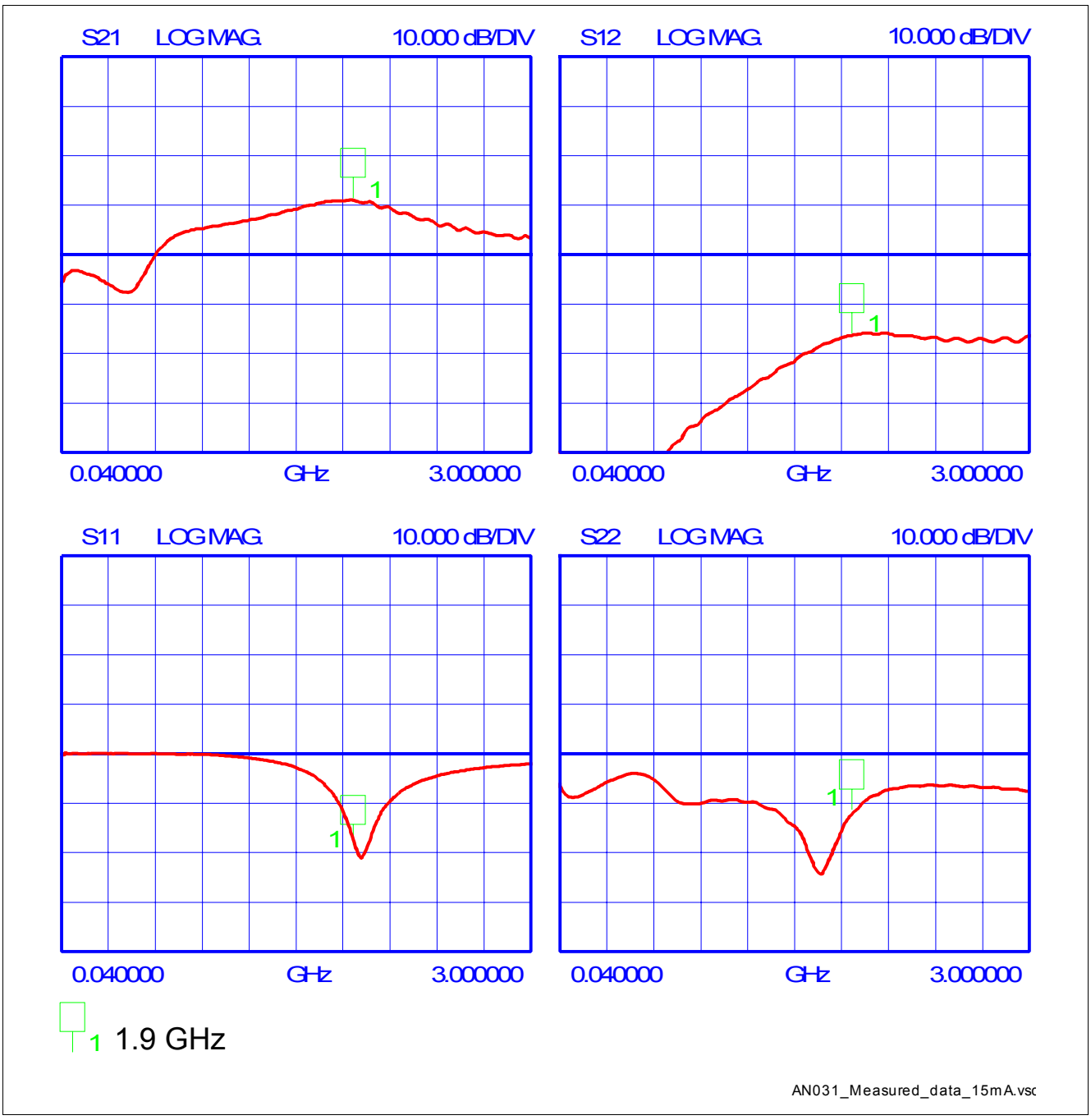

Figure 4 Measured data