

Application Note No. 019

A Low-Noise-Amplifier with good IP3out-performance at 1.9 GHz using BFP405

RF & Protection Devices



Never stop thinking

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Page	Subjects (major changes since last revision)
All	Document layout change

Trademarks

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1 A Low-Noise-Amplifier with good IP3out-performance at 1.9 GHz using BFP405

This application note describes a low noise amplifier at 1.9 GHz using SIEMENS SIEGET[®]25 BFP405. The design emphasis has been on achieving high output intercept point. A circuit description, schematic, PCB layout and components list are shown below together with measured performance data.

Data at 1.9 GHz (3 V and 8.5 mA)

Gain:	19.5 dB
IP_{3out} :	15 dBm
NF:	2.3 dB
$R_{Lin-out}$	>15 dB

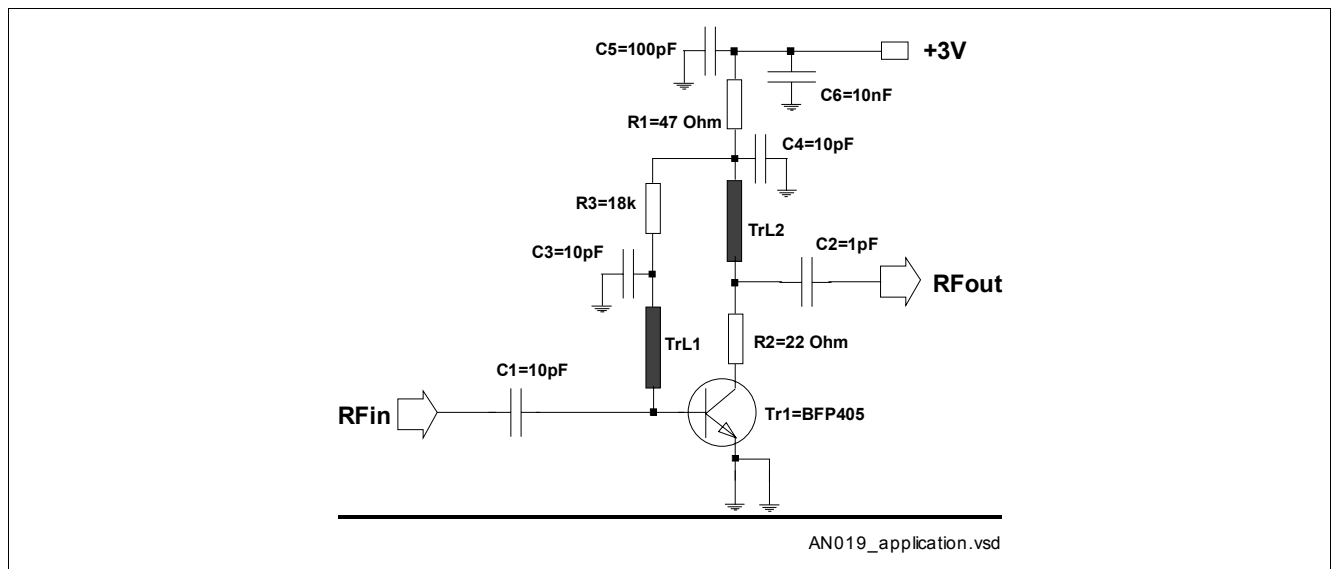


Figure 1 Application

This amplifier at 1.9 GHz has been realized by using microstrip lines as matching elements. The design offers a good compromise between high IIP_3 values, high gain and return loss values.

In order to optimize the design for a particular application please observe the following points:

- The layout size can be reduced by using chip-coils instead of the microstrip lines TrL1 and TrL2
- Improved stabilization behaviour versus temperature and reduced variation in amplifier performance due to the device's Beta (current gain) distribution can be achieved by using an active bias circuit. Such a circuit is available as a single device from Infineon - BCR400W. For further information please refer to Application Note No.14. However, the resistors R1 and R3 are sufficient in most applications for stabilization purposes.
- This circuit is not optimized, for low noise figure values. The measured figures include losses of SMA-connectors and the relatively high loss of the microstrip lines on the epoxy-board.
- The use of teflon material would provide an improvement of ≈ 0.1 dB.
- Resistor R2 is used to improve RF-circuit-stability and return loss values at the output. It also affects the output intermodulation performance.

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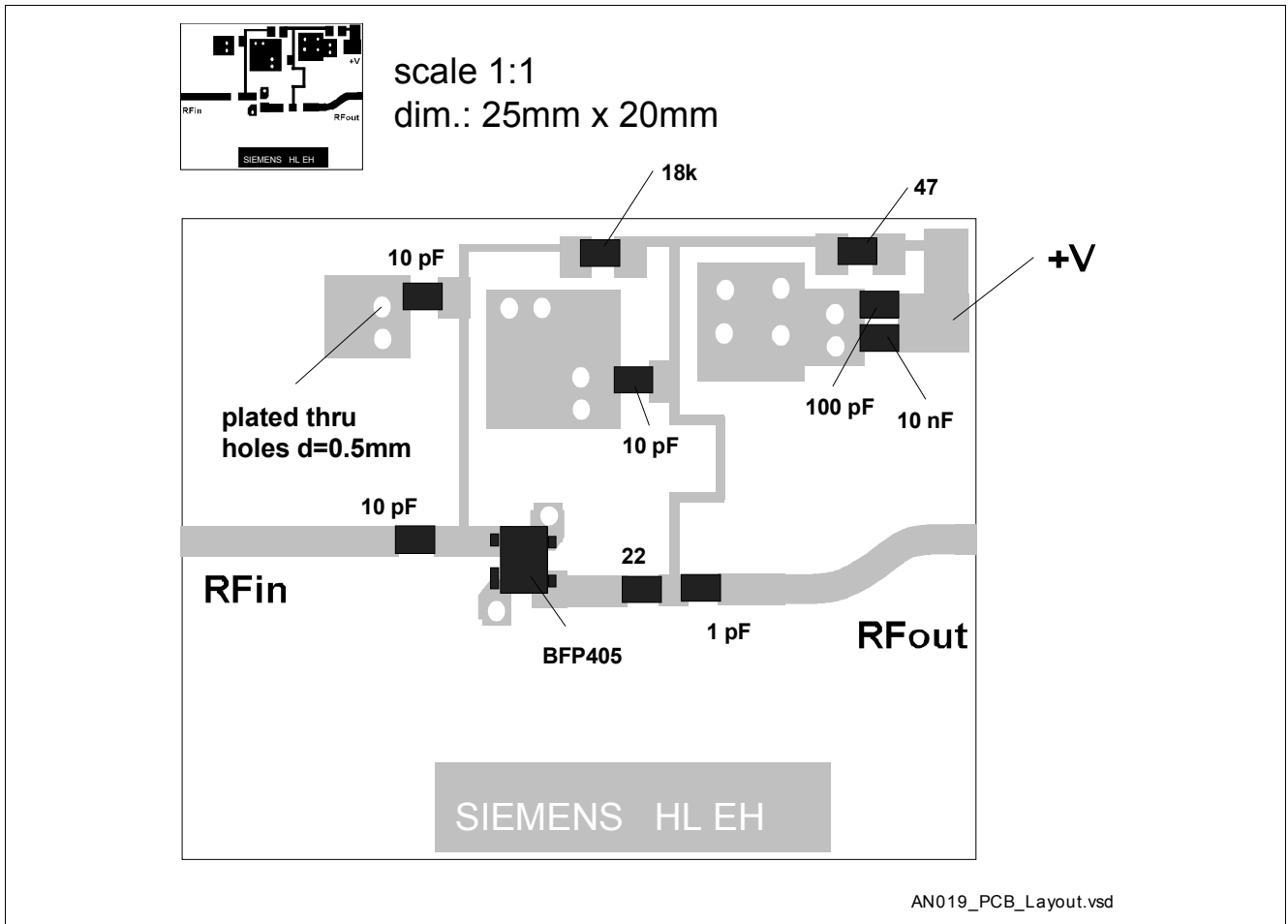


Figure 2 PCB Layout and Component Placement

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Table 1 Component

Component	Value	Unit	Size	Comment
R1	47	Ω	0603	Bias / collector-resistance / $V_R \cong 0.5 \text{ V}$
R2	22	Ω	0603	To improve stability and output return loss
R3	18	$k\Omega$	0603	Bias / base-resistor
C1	10	pF	0603	Input match
C2	1	pF	0603	Output match
C3	10	pF	0603	RF-short
C4	10	pF		Output match
C5	100	pF	0603	RF-short
C6	10	nF	0603	RF-short
Tr1			SOT343	SIEGET [®] BFP405
TrL1				Input match, w = 0.3 mm
TrL2				Output match, w = 0.3 mm
Substrate	FR4			$h = 0.5 \text{ mm}$, $\epsilon_r = 4.5$; 50 Ω microstrip-line w = 0.95 mm

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Measurements

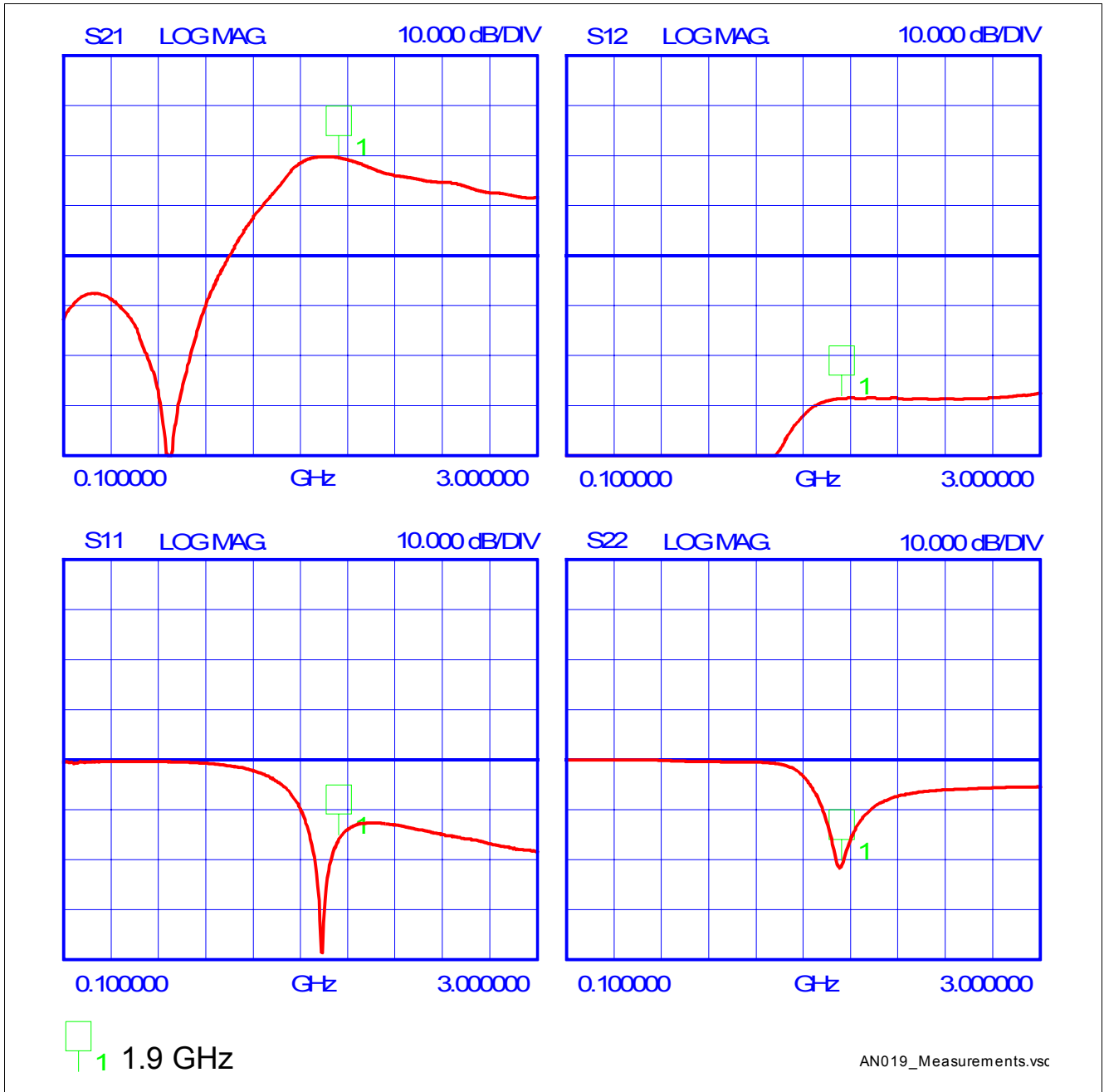


Figure 3 Measurements