Application Note No. 021

A Low-Noise-Amplifier shows good Noise Figure performance at 1.9 GHz using BFP405

RF & Protection Devices

Never stop thinking

Edition 2006-11-08

Published by
Infineon Technologies AG
81726 München, Germany

LEGAL DISCLAIMER

THE INFORMATION GIVEN IN THIS APPLICATION NOTE IS GIVEN AS A HINT FOR THE IMPLEMENTATION OF THE INFINEON TECHNOLOGIES COMPONENT ONLY AND SHALL NOT BE REGARDED AS ANY DESCRIPTION OR WARRANTY OF A CERTAIN FUNCTIONALITY, CONDITION OR QUALITY OF THE INFINEON TECHNOLOGIES COMPONENT. THE RECIPIENT OF THIS APPLICATION NOTE MUST VERIFY ANY FUNCTION DESCRIBED HEREIN IN THE REAL APPLICATION. INFINEON TECHNOLOGIES HEREBY DISCLAIMS ANY AND ALL WARRANTIES AND LIABILITIES OF ANY KIND (INCLUDING WITHOUT LIMITATION WARRANTIES OF NON-INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS OF ANY THIRD PARTY) WITH RESPECT TO ANY AND ALL INFORMATION GIVEN IN THIS APPLICATION NOTE.

Information

For further information on technology, delivery terms and conditions and prices please contact your nearest Infineon Technologies Office (**www.infineon.com**).

Warnings

Due to technical requirements components may contain dangerous substances. For information on the types in question please contact your nearest Infineon Technologies Office.

Infineon Technologies Components may only be used in life-support devices or systems with the express written approval of Infineon Technologies, if a failure of such components can reasonably be expected to cause the failure of that life-support device or system, or to affect the safety or effectiveness of that device or system. Life support devices or systems are intended to be implanted in the human body, or to support and/or maintain and sustain and/or protect human life. If they fail, it is reasonable to assume that the health of the user or other persons may be endangered.

A Low-Noise-Amplifier shows good Noise Figure performance at 1.9 GHz using BFP405 Revision History: 2006-11-08, Rev. 2.0	
Previous Version: 2000-07-28	
Page	**Subjects (major changes since last revision)**
All	Document layoout change

Trademarks

SIEGET® is a registered trademark of Infineon Technologies AG.

1 Low-Noise-Amplifier shows good Noise Figure 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 a low noise figure. 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 4.8 mA)

Gain:	16 dB
IP_{3out}:	8 dBm
NF:	1.6 dB
$R_{Lin-out}$	>10 dB

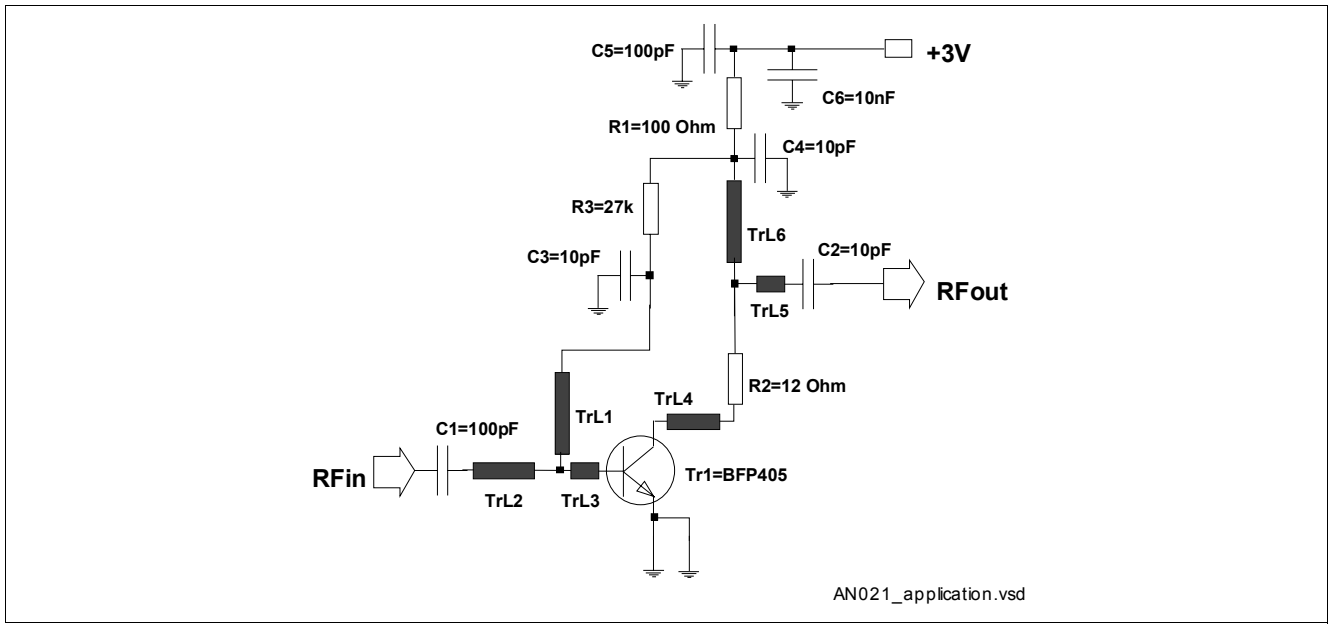
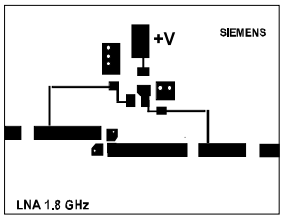


Figure 1 Schematic Diagram

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, low noise figure and high return loss.

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

- The layout size can be reduced by using chip-inductors instead of the microstrip lines TrL1 and TrL6
- 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, it is only meant as a first step to a good design. 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.



scale 1:1
dim.: 37mm x 28mm

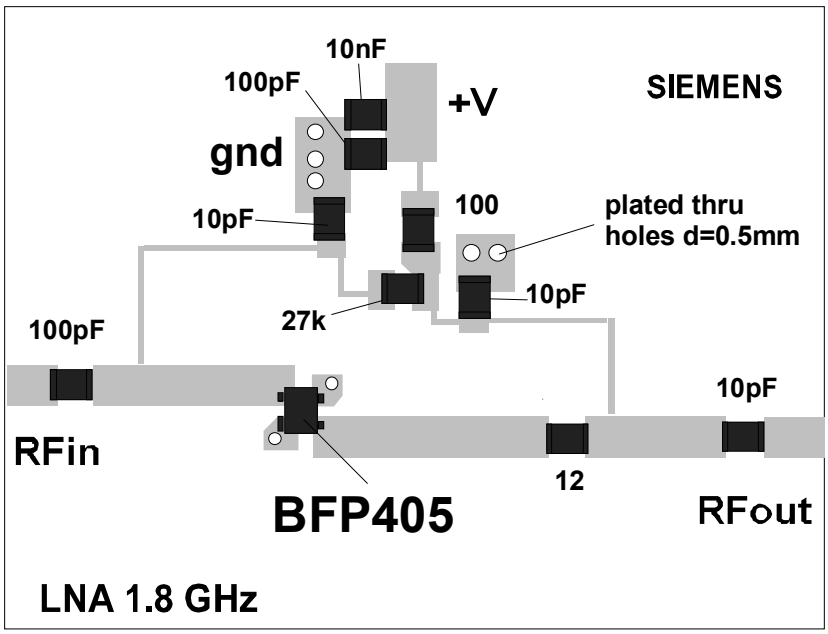


Figure 2 PCB Layout and Component Placement

Table 1 Component

Component	Value	Unit	Size	Comment
R1	100	Ω	0603	Bias / collector-resistance / $V_{R1} \cong 0.5$ V
R2	10	Ω	0603	To improve stability and output return loss
R3	39	kΩ	0603	Bias / base-resistor
C1	22	pF	0603	Input match
C2	10	pF	0603	Output match
C3	33	pF	0603	RF-short
C4	33	pF	0603	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				Input match, w = 0.95 mm
TrL3				Input match, w = 0.95 mm
TrL4				Output match, w = 0.95 mm
TrL5				Output match, w = 0.95 mm
TrL6				Output match, w = 0.3 mm
Substrate	FR4			h = 1 mm, ε_r = 4.5

Measurements

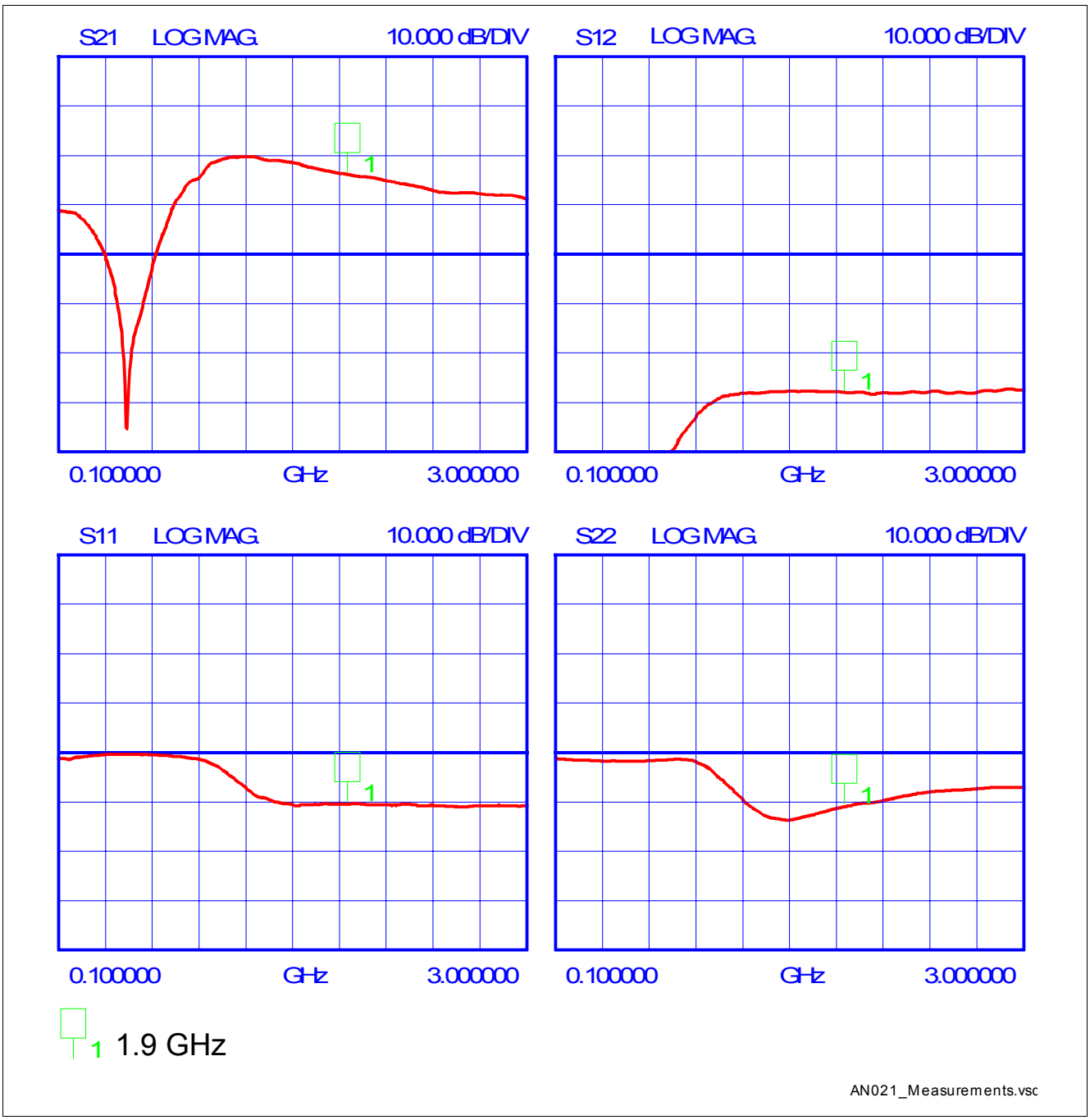


Figure 3 Measurements