Application Note No. 001

SIEGET25 Low Noise Amplifier with BFP420 Transistor at 2.4 GHz

Small Signal Discretes

Never stop thinking

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

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1 Low Noise Amplifier with BFP420 Transistor at 2.4 GHz

The SIEMENS Grounded Emitter Transistor Line is a completely new generation of silicon bipolar junction RF-transistors. This application note describes a low-noise amplifier with the following characteristics[1)]:

- Gain: 13.6 dB
- Noise Figure: 1.4 dB
- unconditionally stable at all frequencies

In order to match the input and output ports, a well defined emitter inductance is used as negative feedback. This acts to stabilise the transistor, decreasing the usable gain. Without feedback the gain of the amplifier would be 17.5 dB but matching and stability would be degraded. As the feedback is lossless, the amplifier noise figure would remain 1.4 dB

A double-transistor active stabilisation is used for DC biasing, whose provides a temperature stable current source.

Figure 1 shows the circuit diagram. **Figure 2** shows the circuit layout whose substrate material is PTFE ε_r= 2.45, H = 0.38 mm, e.g. Di-CLAD 527, 15 mil; Scale: 2:1 (40 mm x 40 mm real size). **Figure 3** shows the part mounting plan.

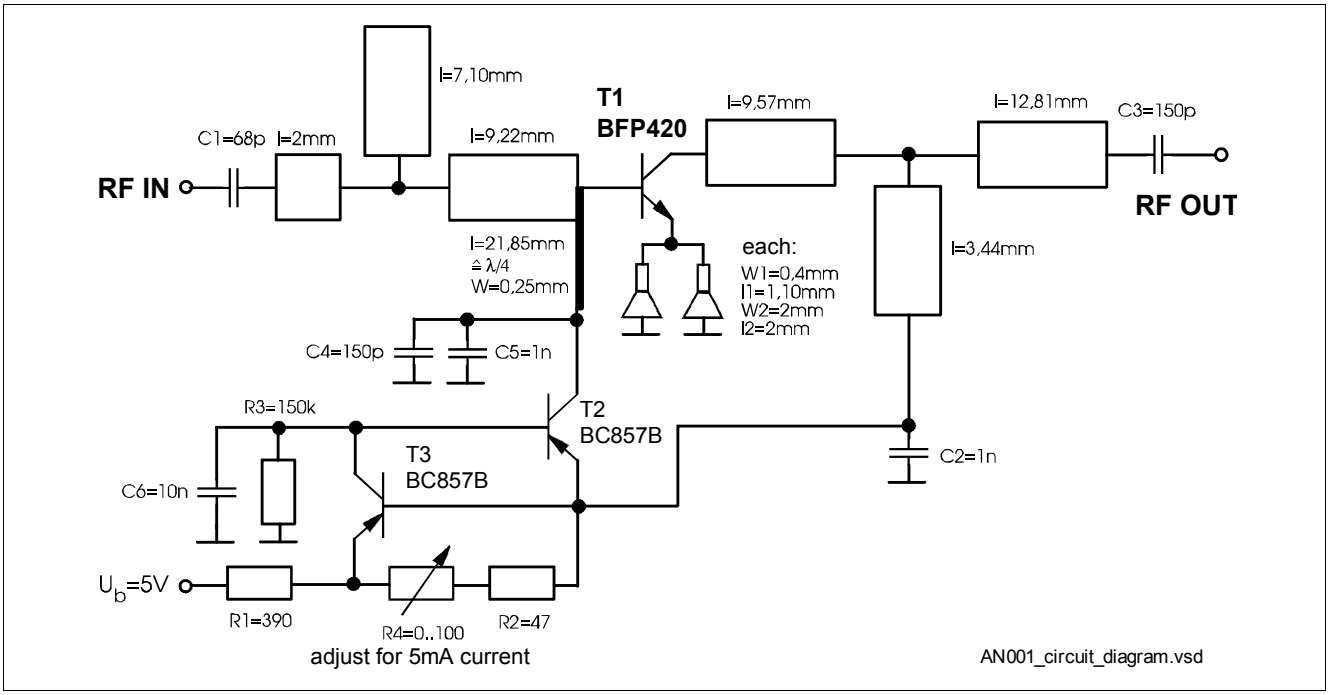

Figure 1 Circuit diagram

1) @ f = 2.4 GHz, Vce = 2.5 V, IC = 5 mA

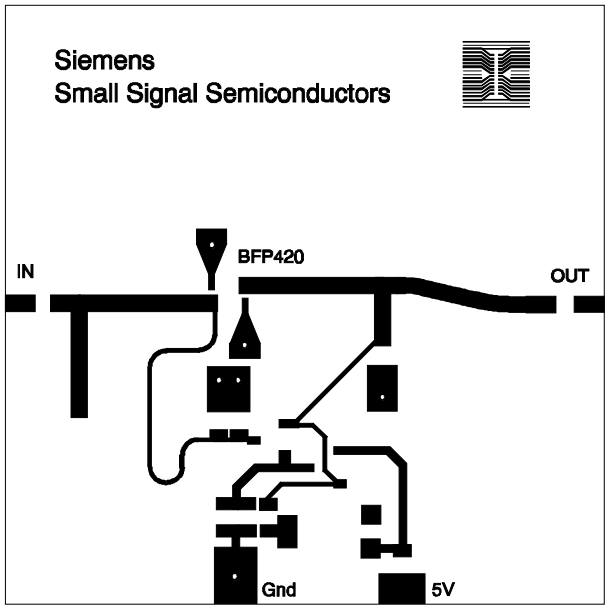

Figure 2 Circuit layout

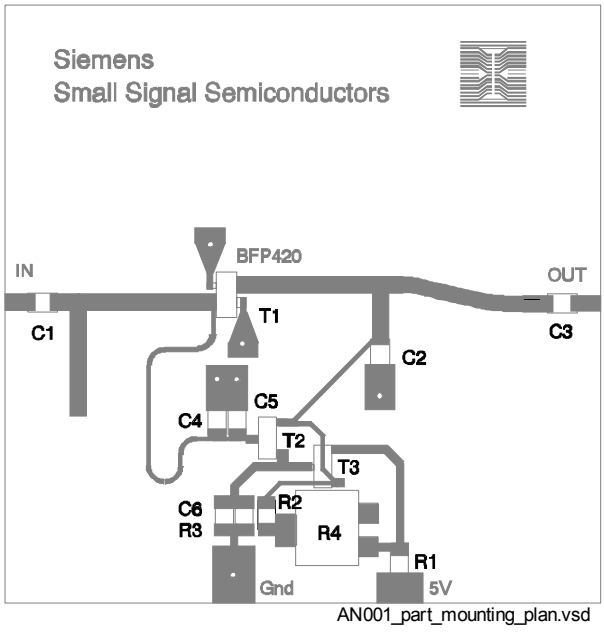

Figure 3 Part mounting plan

Table 1 List of all used SMD components

Name	Type, Package (Supplier)
C1	68 pF 0805 (Epcos)
C2	1 nF 0805 (Epcos)
C3	150 pF 0805 (Epcos)
C4	150 pF 0805 (Epcos)
C5	1 nF 0805 (Epcos)
C6	10 nF 0805 (Epcos)
R1	390 Ω 0805 (Epcos)
R2	47 Ω 0805 (Epcos)
R3	150 kΩ 0805 (Epcos)
R4	0...100 Ω Trimmer (Beckmann)
T1	BFP420 SOT343 (Infineon)
T2	BC857B SOT23 (Infineon)
T3	BC857B SOT23 (Infineon)

The following diagrams show power-gain, input- and output matching

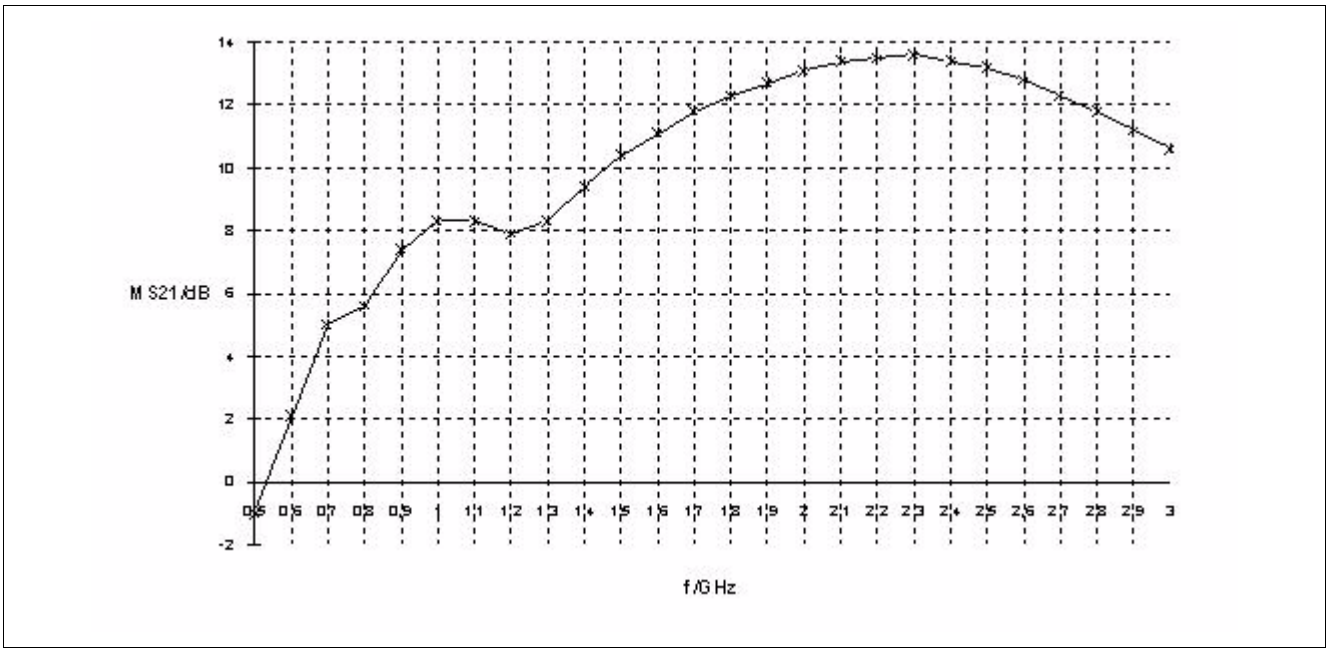

Figure 4 Power gain over frequency

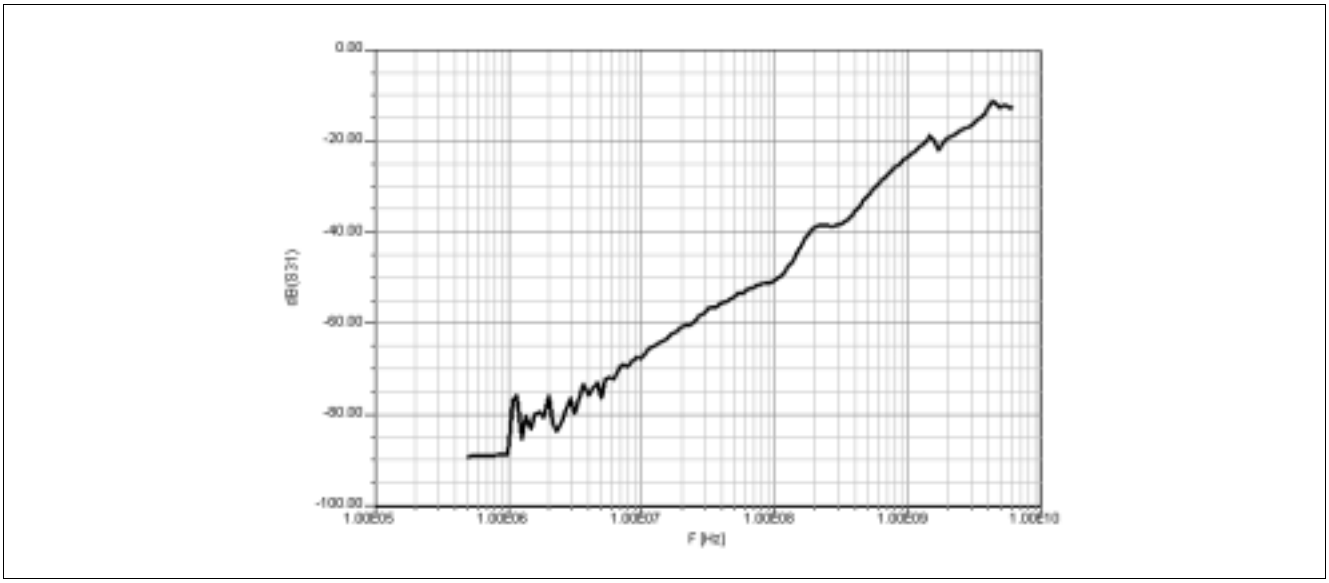

Figure 5 Input match

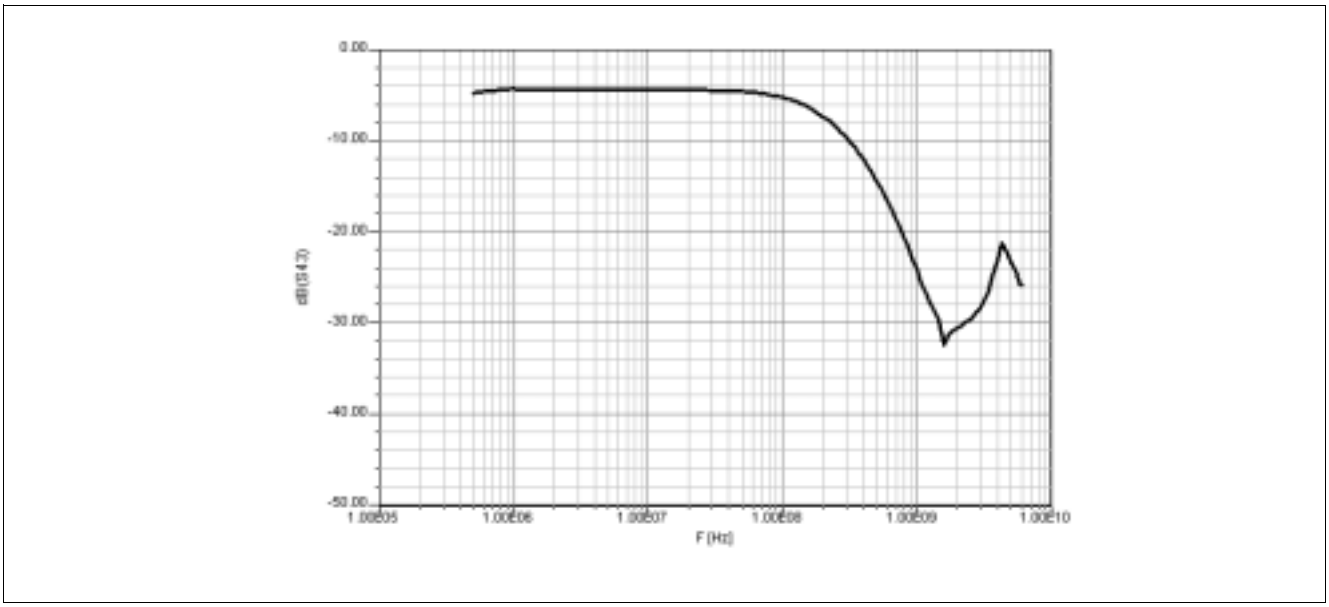

Figure 6 Output-match

Table 2 Measured noise figure

f/GHz	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0
NF/dB	1.4	1.4	1.6	1.5	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.5	1.5	1.5	1.4	1.4	1.4	1.4	1.4	1.5	1.6