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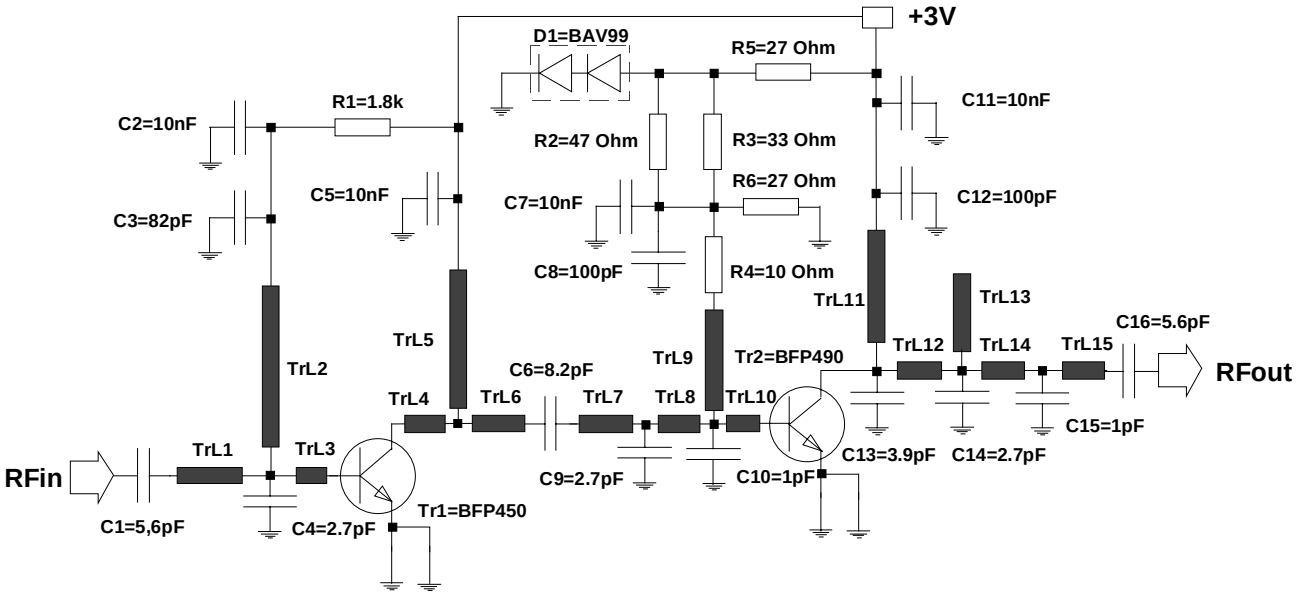
A Power-Amplifier module at 1.9 GHz using BFP450 and BFP490

This application note provides general information, print layout and list of used components, circuit layout and measured data of a power amplifier module at 1.9GHz for 3V-systems using Siemens SIEGET BFP450 and BFP490. The circuit offers a 1-dB compression point of 26dBm for a required input power of 7.5 dBm.

Data at 1.9 GHz, 3V pulsed at 10% duty cycle of period 33.3ms and *Input power=7.5dBm*:

Output power=26dBm / PAE=34.8% / Gain=18.5dB / Current=380mA



This power amplifier module operated at 1.9 GHz was realized by using microstrip lines as RFC and matching components. It offers a very good 1dB compression point and sufficient power for many wireless communication systems, e.g. DECT. Further improvement is possible. Some hints are provided as follows:

- The layout size can be reduced by using chip-coils instead of the microstrip lines like TrL2 and TrL9.
- A better stabilization behaviour versus temperature and a reduction of DC current gain distribution problems can be obtained if the resistive biasing circuit of the BFP450 transistor is replaced with Siemens active bias controller BCR400(W). For further information, please refer to the application note AN014. However, Siemens' BAV99 of

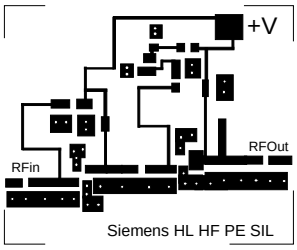
dual diodes and those biasing resistors are sufficient in most applications for stabilization purposes.

- Resistor R4 is for getting higher circuit-stability at low frequencies.
- The figures measured include losses of SMA-connectors and microstriplines .
- Making the PCB by proficient PCB manufacturer gets good plated-through holes and accurate microstripline dimensions.
- More output power and higher PAE is obtainable by modifying the output matching circuit.

Part List:

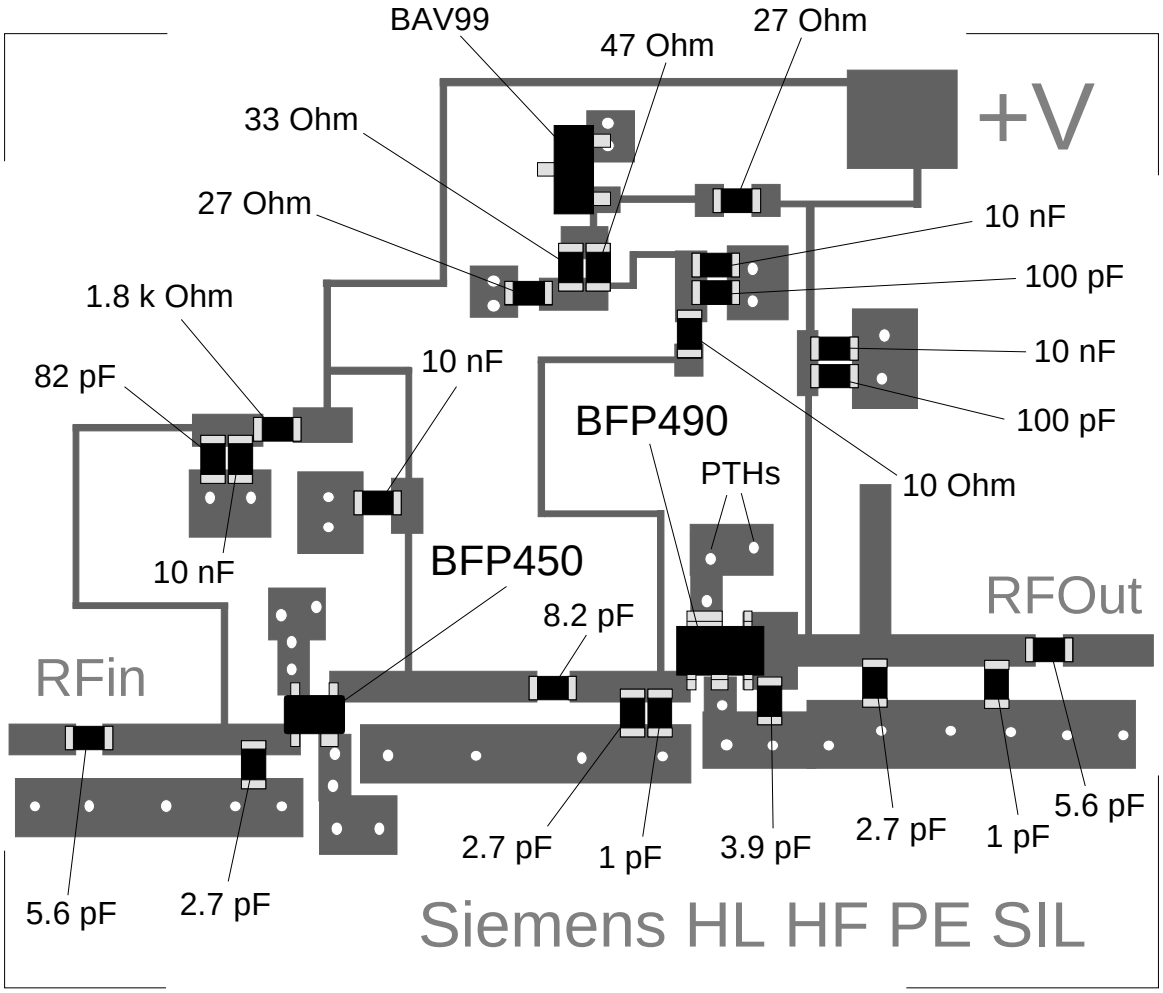
Component	Value	Unit	Size	Comment
R1	1.8	kΩ	0603	bias
R2	47	Ω	0603	bias
R3	33	Ω	0603	bias
R4	10	Ω	0603	to improve af-stability
R5	27	Ω	0603	bias
R6	27	Ω	0603	bias
C1	5.6	pF	0603/ 0805	input-match
C2	10	nF	0603/ 0805	rf-short
C3	82	pF	0603/ 0805	rf-short
C4	2.7	pF	0603/ 0805	input-match
C5	10	nF	0603/ 0805	rf-short
C6	10	nF	0603/ 0805	input-match
C7	10	nF	0603/ 0805	rf-short
C8	100	pF	0603/ 0805	rf-short
C9	2.7	pF	0603/ 0805	input-match
C10	1	pF	0603/ 0805	input-match
C11	10	nF	0603/ 0805	rf-short
C12	100	pF	0603/ 0805	rf-short
C13	3.9	pF	0603/ 0805	output-match
C14	2.7	pF	0603/ 0805	output-match
C15	1	pF	0603/ 0805	output-match
C16	5.6	pF	0603/ 0805	output-match
Tr1			SOT343	SIEGET BFP450, driver stage
Tr2			SCT595	SIEGET BFP490, output stage
D1			SOT23	BAV99, temperature compensation
TrL1			w=1mm	input-match
TrL2			w=0.2mm	quarter-wave transformer
TrL3			w=1mm	input-match
TrL4			w=1mm	interstage-match
TrL5			w=0.2mm	interstage-match
TrL6			w=1mm	interstage-match
TrL7			w=1 mm	interstage-match
TrL8			w=1 mm	interstage-match
TrL9			w=0.2mm	quarter-wave transformer
TrL10			w=1 mm	interstage-match
TrL11			w=0.2mm	output-match
TrL12			w=1 mm	output-match
TrL13			w=1mm	output-match
TrL14			w=1 mm	output-match
TrL15			w=1 mm	output-match
Substrate			h=0.5mm	Fr4, ε_r=4.5

Layout and Component Placement:



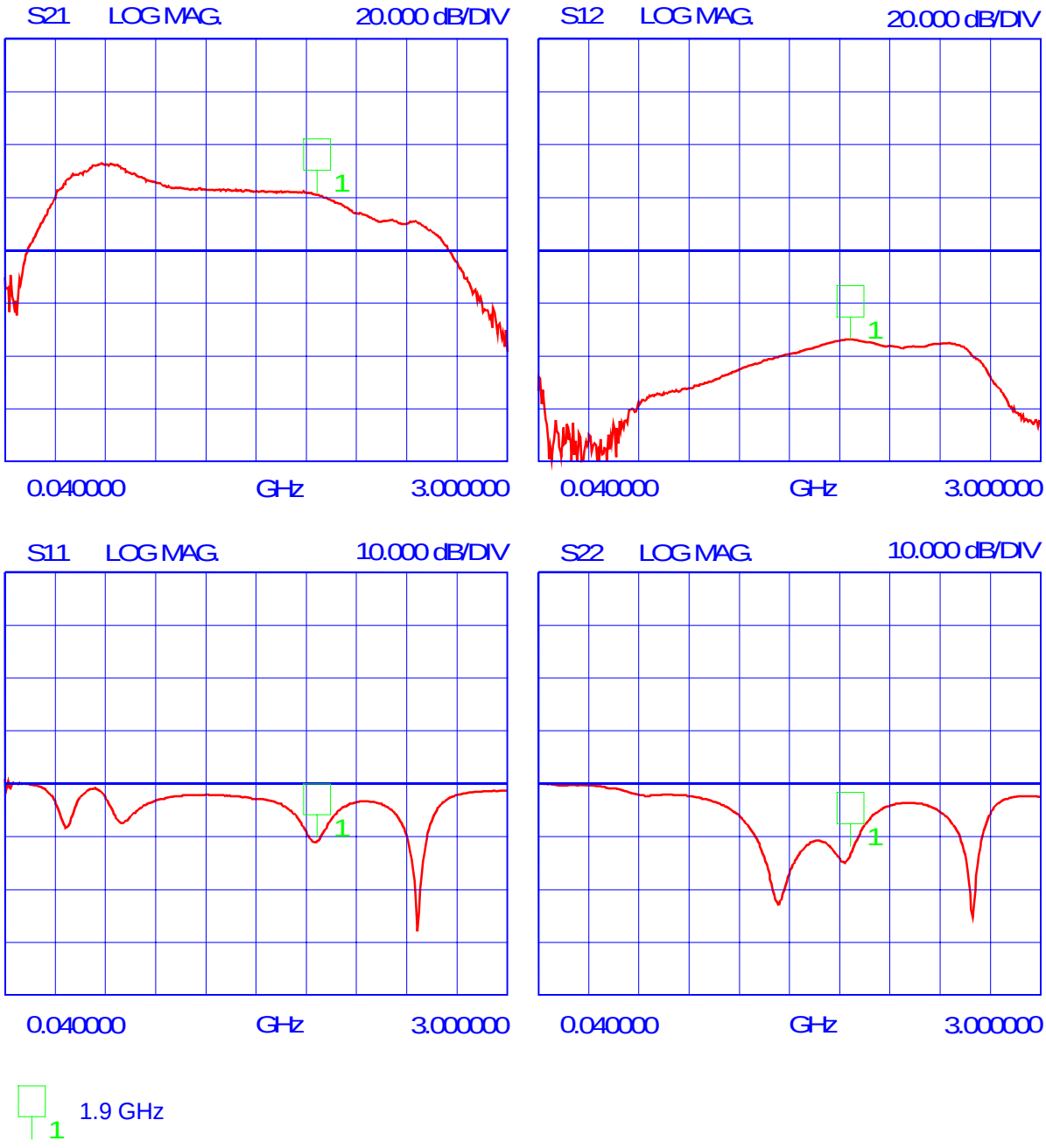
Scale = 1:1
dim.: 38mmx31.5mm

Scale = 1:4

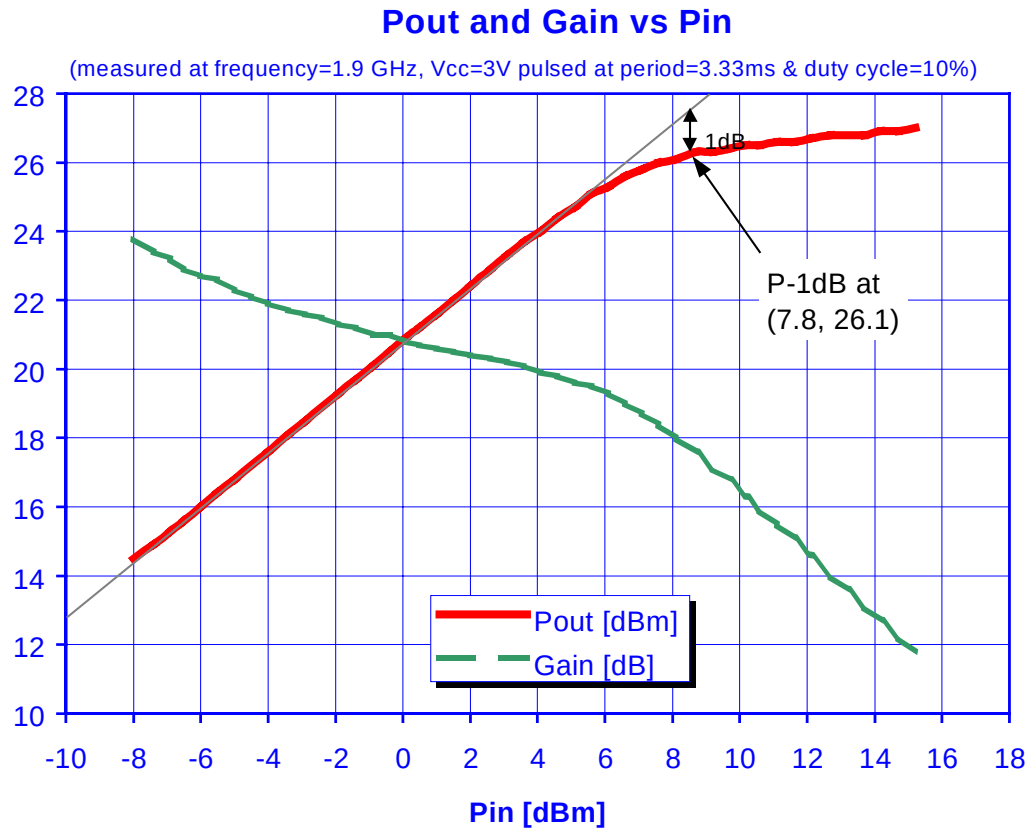


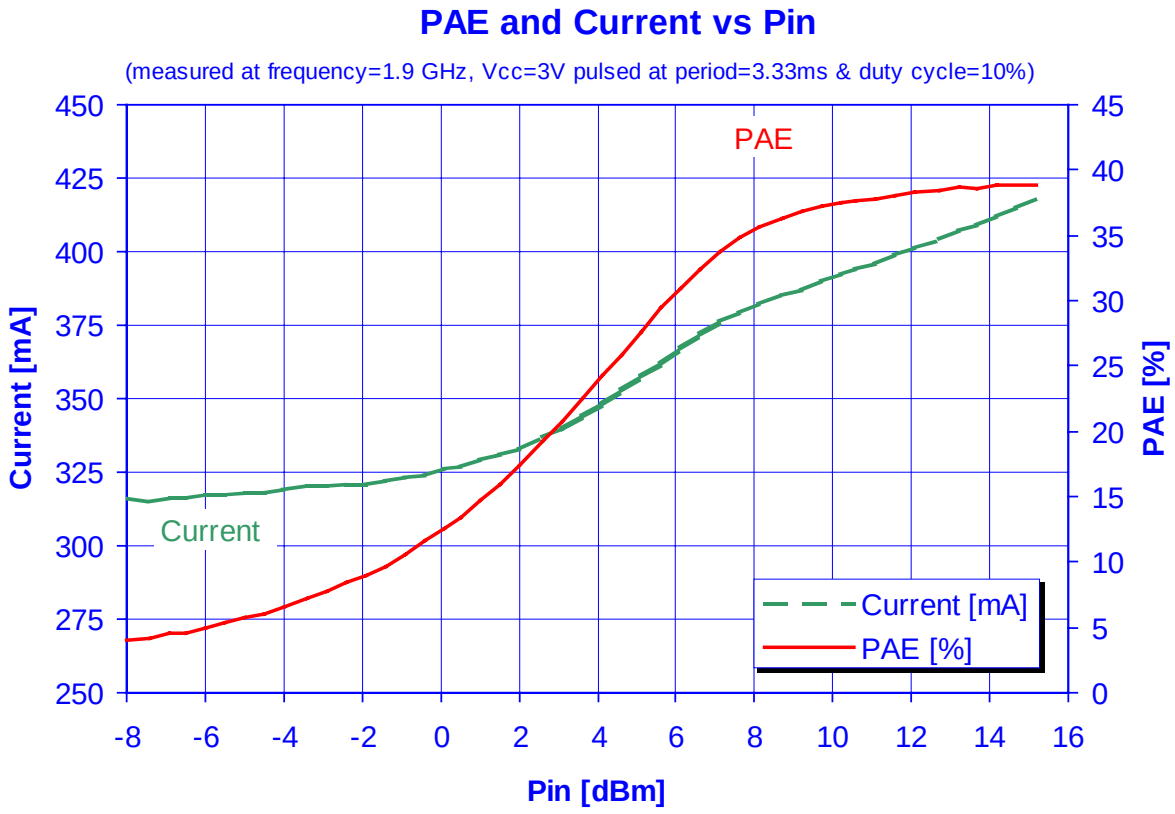
Measured data:

Small signal S-parameters:



Input Power Sweep:





Published by Siemens AG, Bereich Bauelemente, Vertrieb, Produkt-Information, Balanstraße 73, D-81541 München