

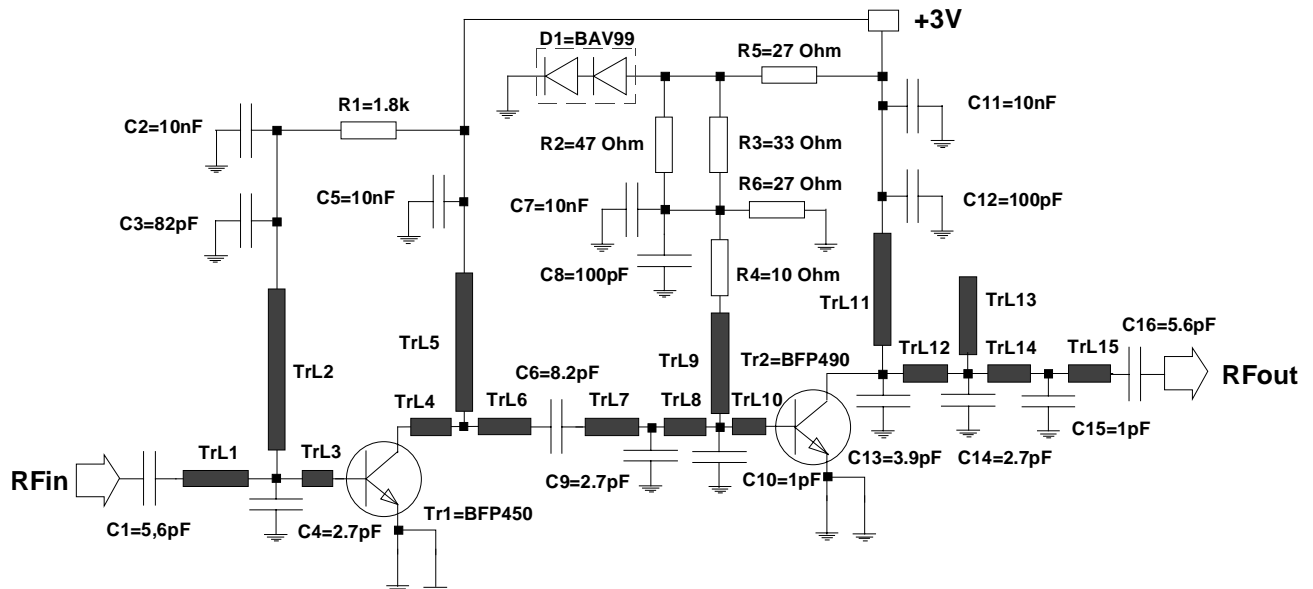
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# A Power-Amplifier module at 1.9 GHz using BFP450 and BFP490

*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

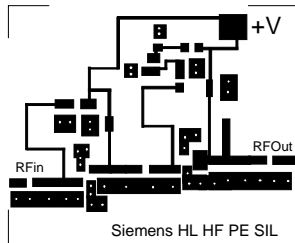
dual diodes and those biasing resistors are sufficient in most applications for stabilization purposes.

- 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.

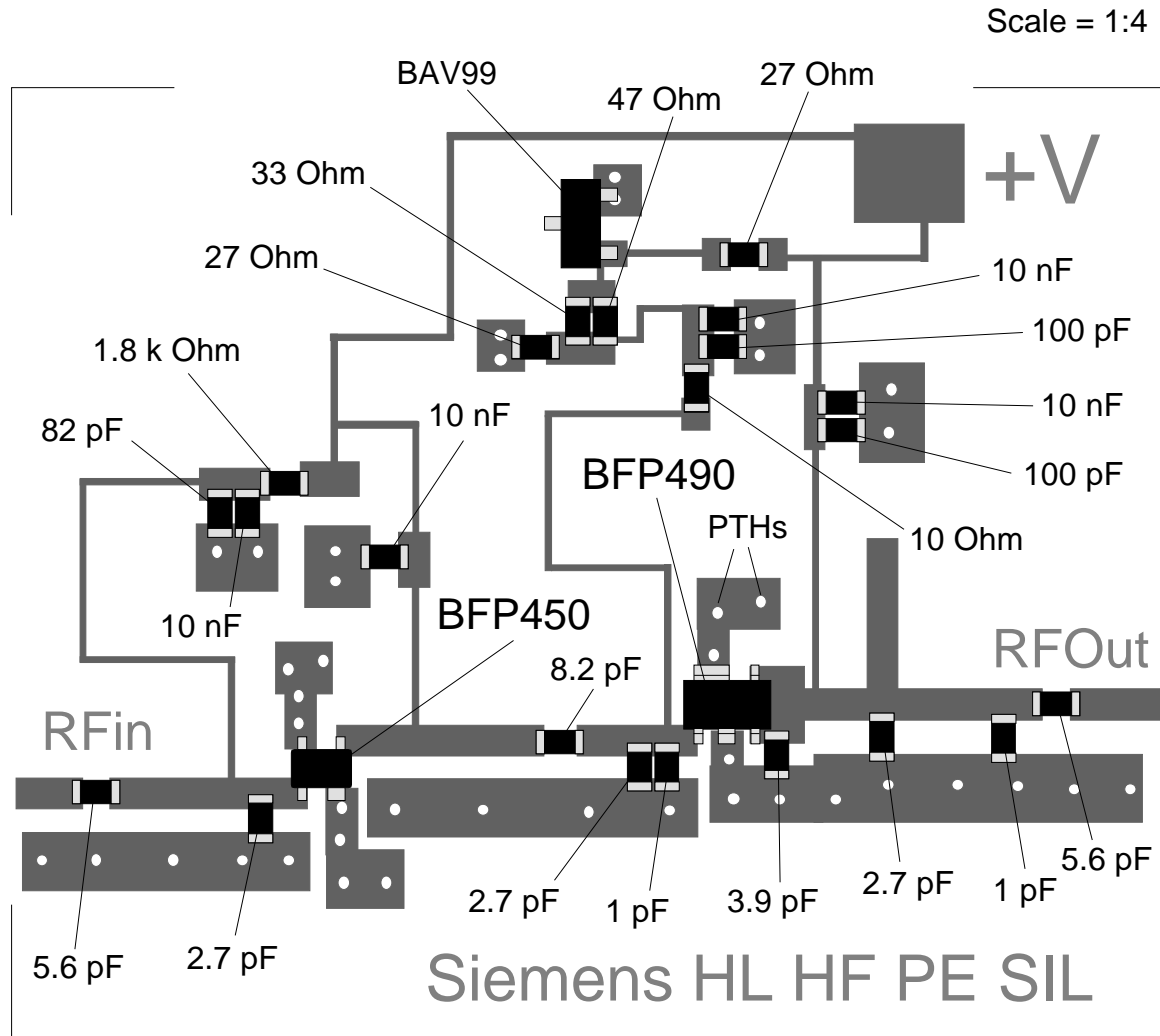
### Part List:

| Component | Value | Unit       | Size       | Comment                         |
|-----------|-------|------------|------------|---------------------------------|
| R1        | 1.8   | k $\Omega$ | 0603       | bias                            |
| R2        | 47    | $\Omega$   | 0603       | bias                            |
| R3        | 33    | $\Omega$   | 0603       | bias                            |
| R4        | 10    | $\Omega$   | 0603       | to improve af-stability         |
| R5        | 27    | $\Omega$   | 0603       | bias                            |
| R6        | 27    | $\Omega$   | 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, $\epsilon_r=4.5$           |

### Layout and Component Placement:

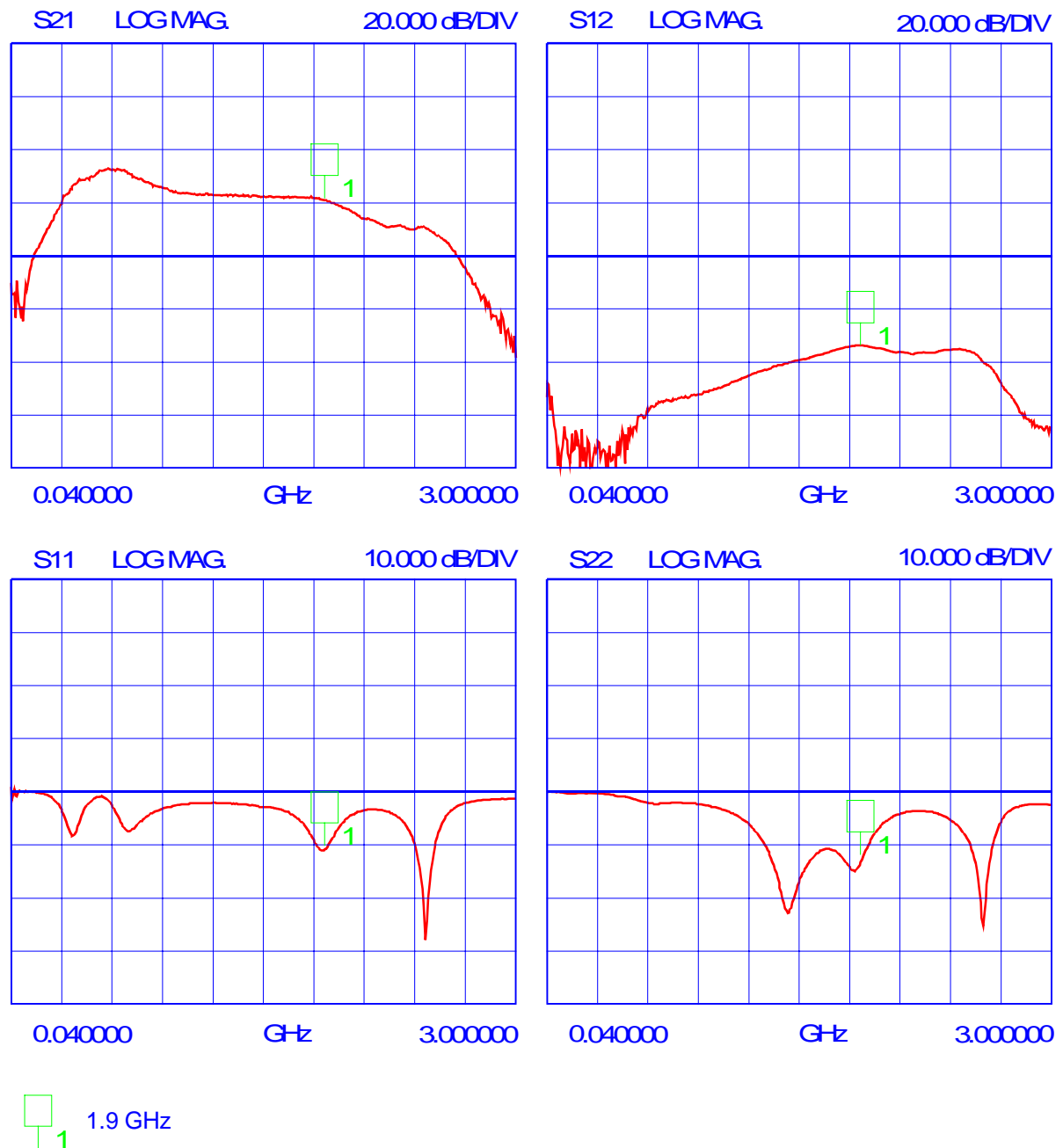


Scale = 1:1  
dim.: 38mmx31.5mm



### Measured data:

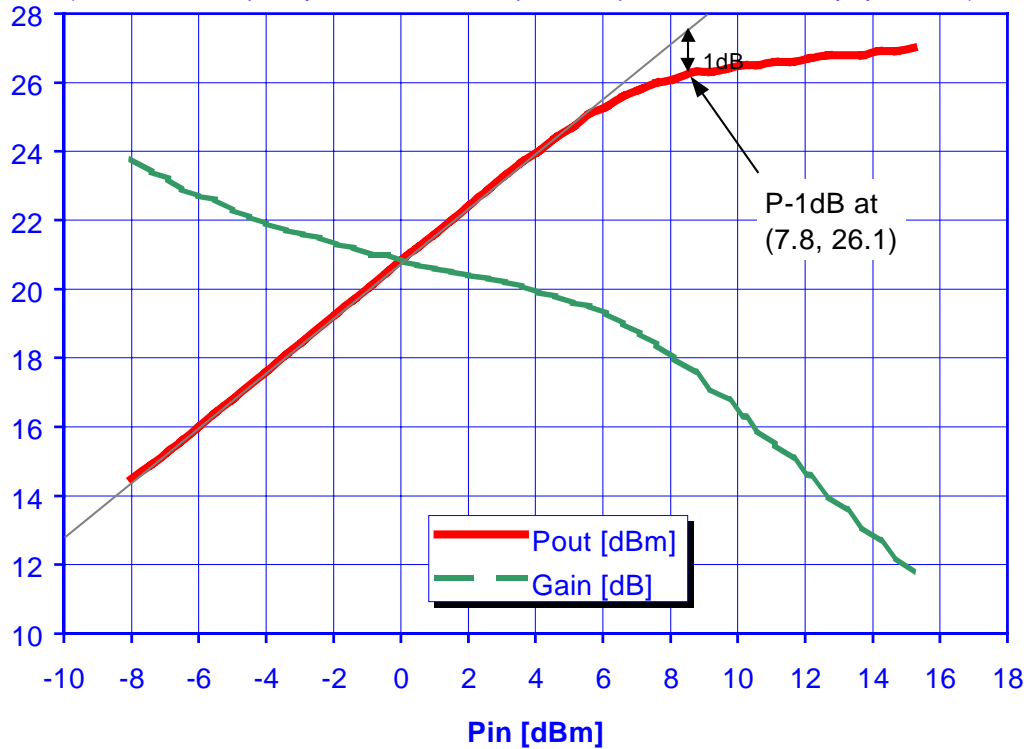
Small signal S-parameters:



Input Power Sweep:

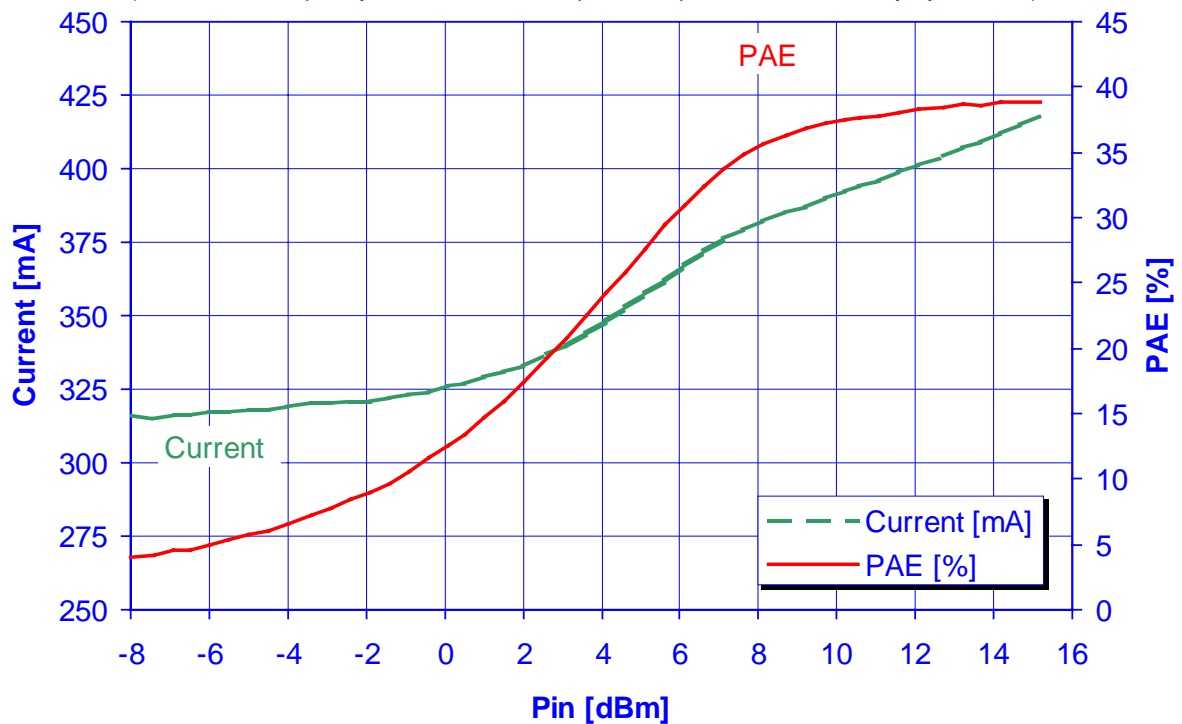
### Pout and Gain vs Pin

(measured at frequency=1.9 GHz, Vcc=3V pulsed at period=3.33ms & duty cycle=10%)



### PAE and Current vs Pin

(measured at frequency=1.9 GHz, Vcc=3V pulsed at period=3.33ms & duty cycle=10%)



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