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900MHz DRIVER-AMPLIFIER WITH THE BFG425W

Abstract:
This application note contains an example of a Driver-Amplifier with the new BFG425W Double Poly RF-transistor. The driver is designed for a frequency f=900MHz.
Performance at f=900MHz, T=25^{0}C: Power Gain >12dB, Noise Figure NF<2dB.

Appendix I: Schematic of the circuit

Appendix II: Results of simulations and measurements

Appendix III: Printlayout and list of used components & materials

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Introduction:
With the new Philips silicon bipolar double poly BFG400W series, it is possible to design driver-amplifiers for high frequency applications with a low current and a low supply voltage. These amplifiers are well suited for the new generation low voltage high frequency wireless applications. In this note an example of such an amplifier will be given. This driver-amplifier is designed for a working frequency of 900MHz.

Designing the circuit:
The circuit is designed to show the following performance (target):

transistor: BFG425W

V_{SUP}=3V, I_{SUP}~10mA
freq=900MHz
PowerGain: >12dB
VSWRi<1:2
VSWRo<1:2

The in- and outputmatching is realised with a RC-combination. Also extra emitter-inductance on both emitter-leads (µ-strips) are used to improve the matching. This emitter inductance is not necessary. The place of the via-holes is not critical.

Designing the layout:
A lay-out has been designed with HP-MDS. Appendix III contains the printlayout.

Measurements:
Measurements of the total circuit (epoxy PCB) are done (Appendix II).

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Appendix I: Schematic of the circuit

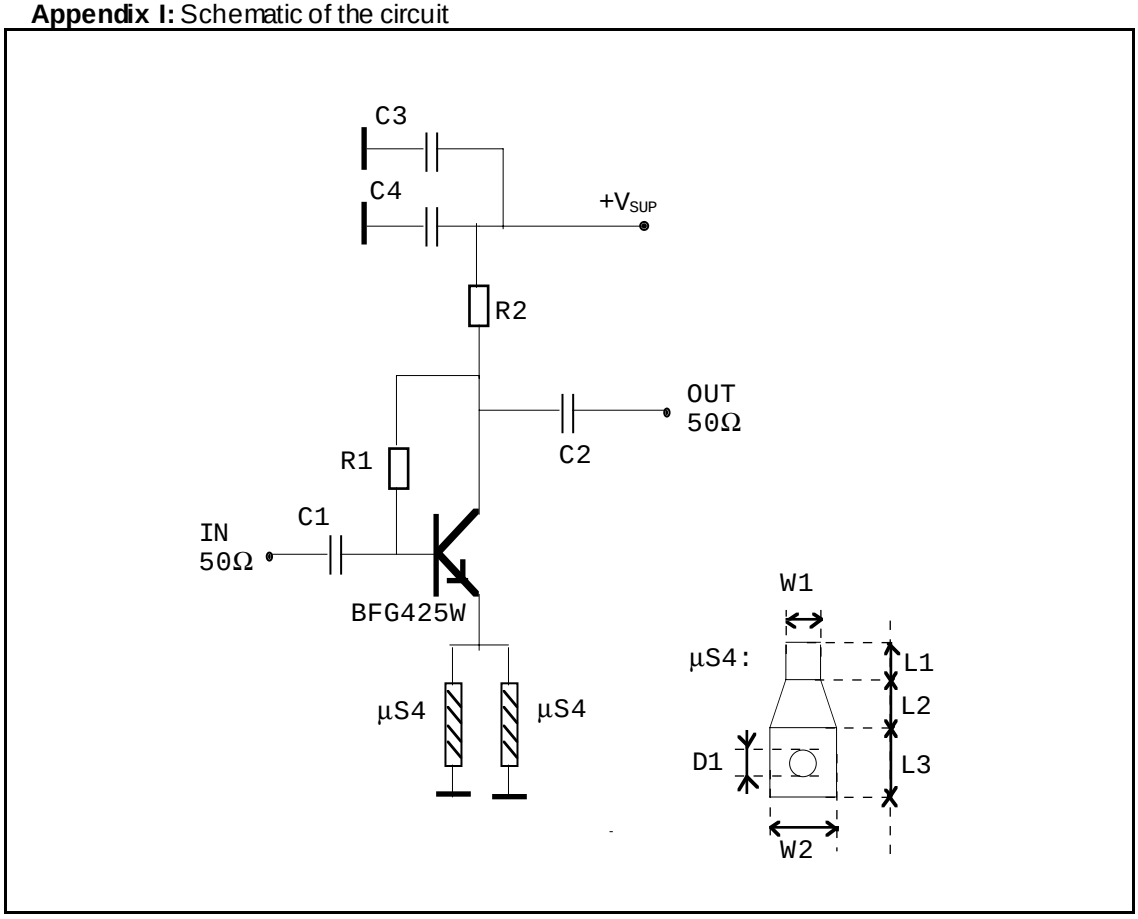

Figure 1: Driver circuit

900MHz Driver Component list:

Component:	Value:	Comment:
R1	3.3 kΩ	Bias.
R2	150 Ω	
C1	150 pF	Input match.
C2	150 pF	Output match.
C3	27 pF	900MHz short.
C4	1 nF	RF Decoupling
µs4	(next table)	Emitter induction: µ-stripline + via

µS4 Emitter induction (µ-stripline + via):

Name	Dimension	Description
L1	1.0mm	length µ-stripline; Z_0~48Ω (PCB: ε_r ~4.6, H=0.5mm)
L2	1.0mm	length interconnect stripline and via-hole area
L3	1.0mm	length via-hole area
W1	0.5mm	width µ-stripline
W2	1.0mm	width via-hole area
D1	0.4mm	diameter of via-hole

Appendix II: Results of simulations and measurements:

BFG425W, V_{SUP}=3.0V, I_{SUP}~10.0mA@T=25°C

	Measurements PCB:	**Comment:**
f=900MHz		
$\|S_{21}\|^2$ [dB]	17	P_{IN}=-30dBm, T=25°C
G_P [dB]	14	P_{IN}=-10dBm, T=25°C
G_P [dB]	~10	P_{IN}=-10dBm, T<<0°C (Freeze spray)
VSWRi	1.8	P_{IN}=-30dBm, T=25°C
VSWRo	1.5	P_{IN}=-30dBm, T=25°C
Noise Figure [dB]	<2.0	P_{IN}=-30dBm, T=25°C
IP3 [dBm] (output)	-	not measured

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Appendix III: Printlayout and list of used components & materials

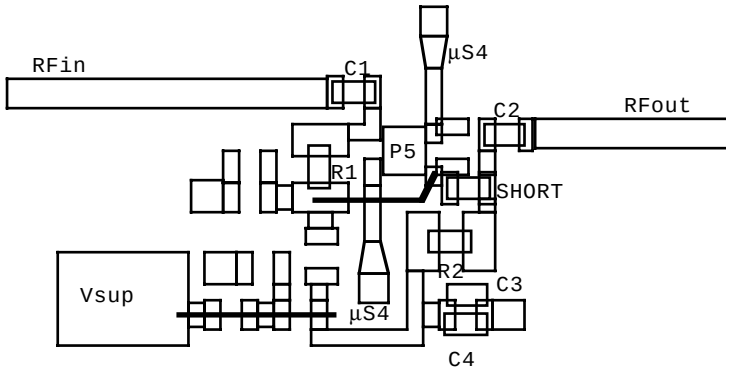

Figure 2: Printlayout

900MHz Driver Component list:

Component:	Value:	size:
R1	3.3 kΩ	0603 Philips
R2	150 Ω	0603 Philips
C1	150 pF	0603 Philips
C2	150 pF	0603 Philips
C3	27 pF	0603 Philips
C4	1 nF	0603 Philips
P5	BFG425W	SOT343R Philips
PCB	ε_r ~4.6, H=0.5mm	FR4

note 1: The used PCB was designed for Low Noise Amplifier applications. Shorts and wires are used to adapt the PCB for this driver application.

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