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Report nr. : RNR-T45-97-B-0787
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Date : 29 Sept 1997
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2GHz 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=2GHz.

Performance at f=2GHz, Vsup=3.6V, Isup~30mA, T=25^{0}C:
Power Gain ~15dB, Pout~15dBm (33mW), PEA>30%

Appendix I: Schematic of the circuit

Appendix II: Results of measurements

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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 2 GHz.

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

transistor: BFG425W

V_{SUP}=3.6V, I_{SUP}~30mA
freq=2GHz
PowerGain: ~15dB @Pout~15dBm
PAE>30% @Pout~15dBm
VSWRi<1:2
VSWRo<1:2

The in- and outputmatching is realised with a µ-strip/C-combination.

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

Appendix I: Schematic of the circuit

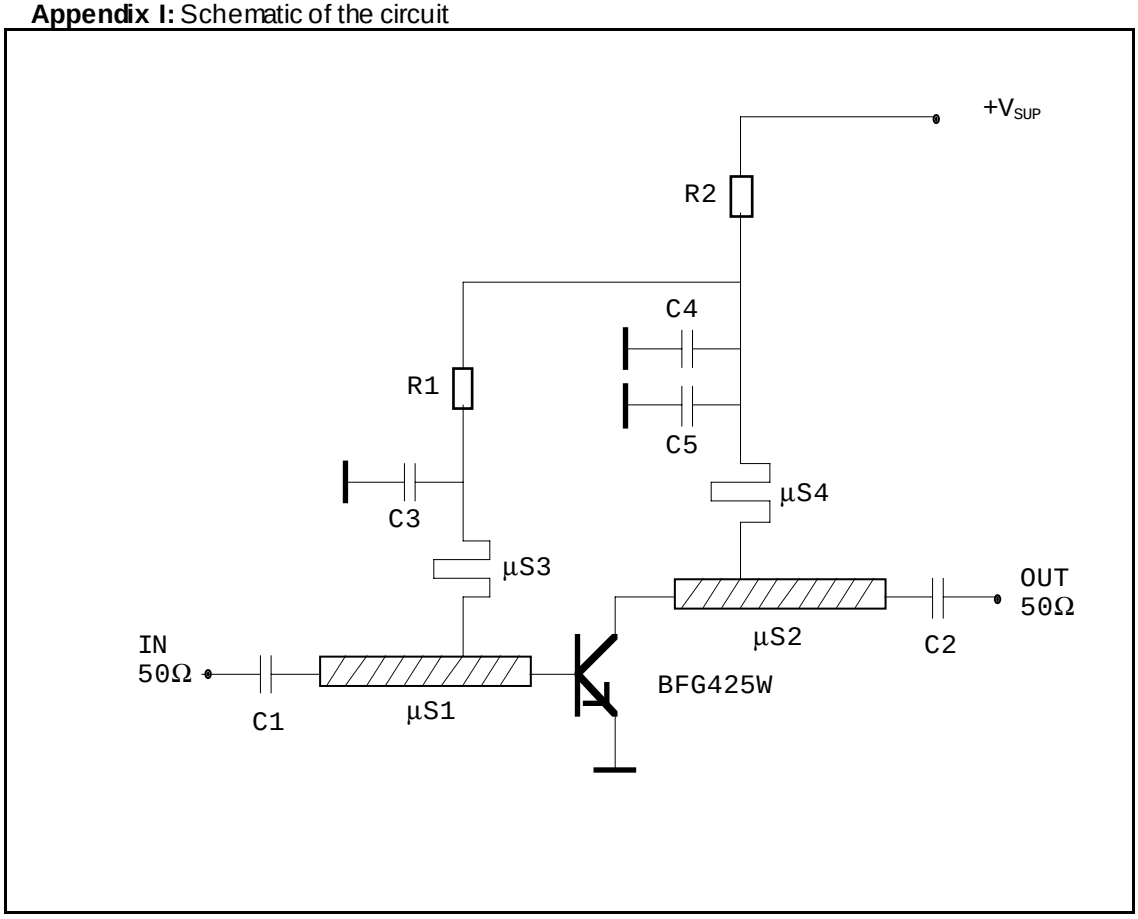

Figure 1: Driver circuit

2 GHz Driver Component list:

Component:	Value:	Comment:
R1	4.7 kΩ	Bias.
R2	22 Ω	DC-decoupling.
C1	12 pF	Input match.
C2	12 pF	Output match.
C3	5.6 pF	2GHz short.
C4	5.6 pF	2GHz short.
C5	1 nF	RF Decoupling
µS1	50Ω	micro stripline
µS2	50Ω	micro stripline
µS3	l=λ/4@2GHz	DC-feed @ 2GHz
µS4	l=λ/4@2GHz	DC-feed @ 2GHz
PCB		duroid, ε_r=6.8

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Appendix II: Results of measurements:

BFG425W, V_{SUP}=3.6V, I_{SUP}~30mA@T=25°C

	Measurements PCB:	**Comment:**
f=2GHz		
$\|S_{21}\|^2$ [dB]	17	P_{IN}=-30dBm, T=25°C
G_P [dB]	~15	P_{IN}=0dBm, T=25°C
G_P [dB]	~15	P_{IN}=0dBm, T<<0°C (Freeze spray)
PAE	>30%	PAE = $[(P_{OUT}-P_{IN})/(V_{SUP}*I_{SUP})]*100\%$
VSWRi	<2	P_{IN}=-30dBm, T=25°C
VSWRo	<2	P_{IN}=-30dBm, T=25°C
Noise Figure [dB]	-	not measured
IP3 [dBm] (output)	-	not measured

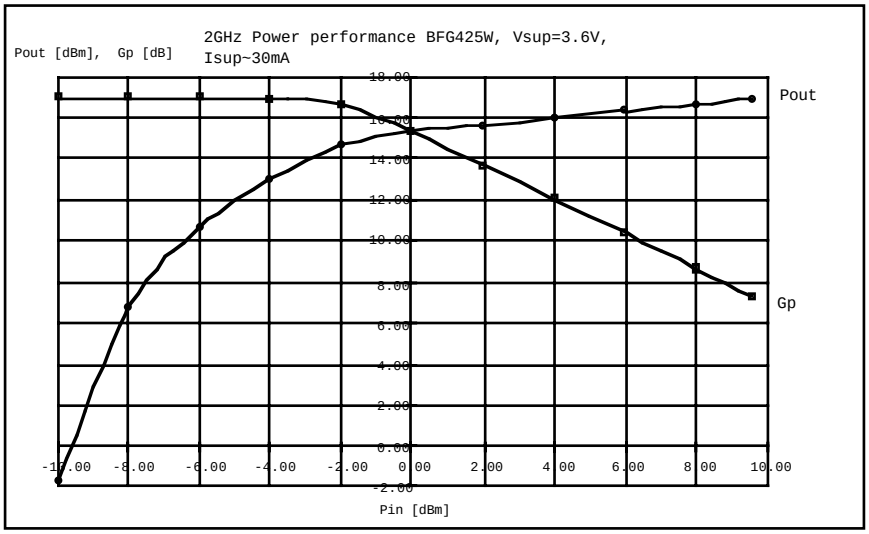

Figure 2: P_{OUT} [dBm] and Gp [dB] as function P_{IN} [dBm], f=2GHz, V_{SUP}=3.6V, I_{SUP}~30mA

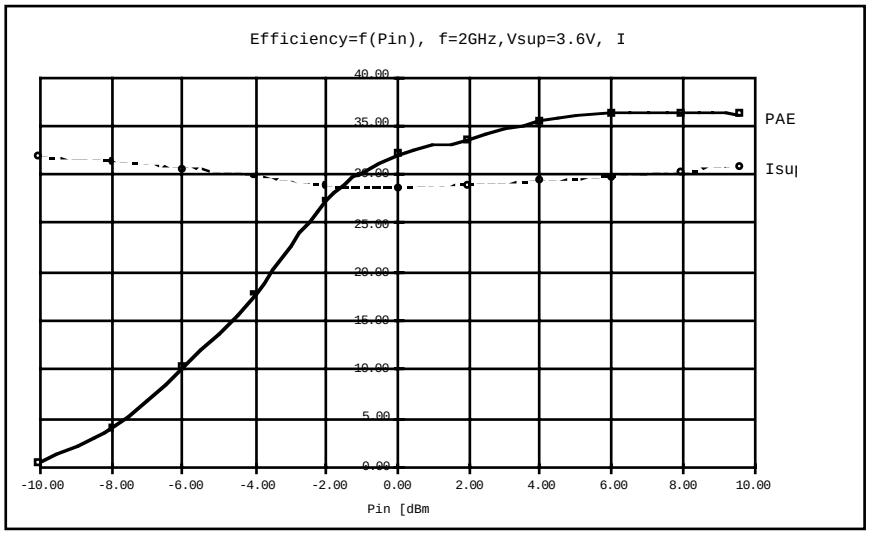

Figure 3: PAE [%] and I_{SUP} [mA] as function P_{IN} [dBm], f=2GHz, V_{SUP}=3.6V