APPLICATION INFORMATION

900 MHz driver amplifier with the BFG425W

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ABSTRACT

- Description of the product

  The BFG425W is one of the Philips double polysilicon wideband transistors of the BFG400W series.
- Application area

  Low voltage high frequency wireless applications.
- Presented application

  A driver amplifier for 900 MHz.
- Main results

  At a frequency of 900 MHz and an ambient temperature of 25° C, the amplifier has a power gain greater than 12 dB and a noise figure less than 2 dB.

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INTRODUCTION

With the Philips double polysilicon wideband transistor BFG425W, 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. This application note gives an example of a driver amplifier with the BFG425W for a frequency of 900 MHz.

CIRCUIT DESCRIPTION

The following initial conditions apply for the amplifier design:

- V_{supply} = 3.0 V
- $I_{supply} \approx$ 10 mA
- f = 900 MHz.

The circuit is designed to show the following performance:

- G_P > 12 dB
- $VSWR_{IN}$ < 2
- $VSWR_{OUT}$ < 2.

The input and output matching is realised with an RC combination. Also an extra emitter inductance (micro stripline) is used on both emitter leads to improve the matching. This emitter inductance is not necessary. The place of the via-holes is not critical.

CIRCUIT DIAGRAM

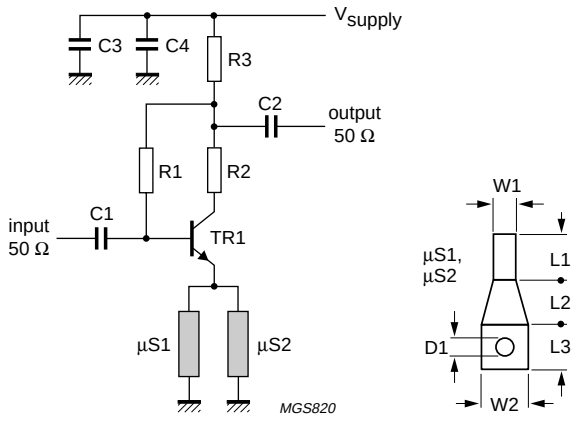

Fig.1 Circuit diagram.

900 MHz driver amplifier with the BFG425W

COMPONENT LIST

Table 1 Component list for the 900 MHz driver amplifier

COMPONENT	VALUE	UNIT	SIZE, MANUFACTURER	PURPOSE, COMMENT
TR1	BFG425W		SOT343R Philips	RF transistor
R1	3.3	kΩ	0603 Philips	bias
R2	10	Ω	0603 Philips	improving RF stability (K-factor)
R3	150	Ω	0603 Philips	
C1	150	pF	0603 Philips	input match
C2	150	pF	0603 Philips	output match
C3	27	pF	0603 Philips	900 MHz short
C4	1	nF	0603 Philips	RF decoupling
μS1	see Table 2			emitter induction: micro stripline and via-hole
μS2	see Table 2			emitter induction: micro stripline and via-hole
PCB	FR4			$\varepsilon_r \approx 4.6$; d = 0.5 mm

Table 2 Dimensions of the micro striplines μS1 and μS2 (see Fig.1)

COMPONENT	VALUE	UNIT	DESCRIPTION
L1	1.0	mm	length micro stripline; $Z_o \approx 48\Omega$
L2	1.0	mm	length interconnect micro stripline and via-hole area
L3	1.0	mm	length via-hole area
W1	0.5	mm	width micro stripline
W2	1.0	mm	width via-hole area
D1	0.4	mm	diameter of via-hole

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BOARD LAYOUT

An existing printed-circuit board, which was developed for low noise amplifier applications, has been adapted for this driver amplifier. The original board was designed with the Hewlett Packard Microwave Design System (HP-MDS).

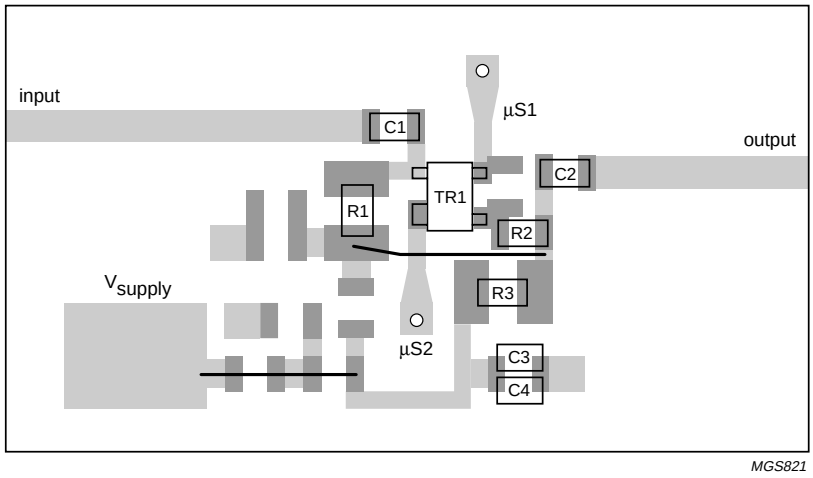

Fig.2 PCB layout.

MEASUREMENTS

The measurements have been done under the following conditions (unless otherwise specified):

- Supply voltage 3.0 V
- Supply current 11.0 mA
- Frequency 900 MHz
- Ambient temperature 25° C.

Table 3 Measuring results of the 900 MHz driver amplifier

SYMBOL	PARAMETER	CONDITION	VALUE	UNIT
$\|s_{21}\|^2$	insertion power gain	P_i = –30 dBm	16.7	dB
G_P	power gain	P_i = –10 dBm	14.4	dB
		P_i = –10 dBm; T_{amb} < 0 °C (freeze spray)	≈10	dB
$VSWR_{IN}$	input voltage standing wave ratio	P_i = –30 dBm	1.4	
$VSWR_{OUT}$	output voltage standing wave ratio	P_i = –30 dBm	1.8	
NF	noise figure	P_i = –30 dBm	<2.0	dB
$IP3_o$	third order intercept point	not measured	–	dBm

NOTES

NOTES

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