APPLICATION NOTE

Performance of 30 W push-pull amplifier for freq. range 25 – 110 MHz with 2 MOS transistors BLF244

NCO8702

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CONTENTS

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1 INTRODUCTION

In application report NCO8701 a description is given of a wideband power amplifier for the frequency range 25 – 110 MHz. This amplifier is primarily designed for non-linear operation at an output power of 30 W. When this amplifier is used in VHF frequency hopping equipment for military communication purposes linearity is required to some extent, $d_3 < -26$ dB. Also its noise performance is important. To investigate these aspects of the amplifier additional measurements have been carried out.

2 LINEAR PERFORMANCE

A two-tone intermodulation distortion test has been performed on this amplifier. The tone separation was 10 KHz. Measurements were first carried out under nominal conditions, which are:

Supply voltage; V_{dd} = 28 V

Quiescent drain current; I_{dq} = 50 mA/transistor

Heatsink temperature; T_{hs} = 25 °C.

It appeared that the third-order intermodulation distortion product IMD(d3) was the strongest in the output signal. This was < –22.5 dB with reference to one of the two tones at the high end of the band. It also appeared that the IMD products increased at lower power levels. Linearity measurements were repeated at a higher quiescent drain current corresponding with class-AB operation. At I_{dq} = 125 mA transistor IMD(3d) improved to < –26.5 dB. It also turned out that the IMD products at lower power levels did not increase as in the previous case but stayed nearly constant or decreased. Figures 1, 2, 3 and 4 show IMD (d3) versus the peak envelope output power at four different frequencies. Curves are given for both I_{dg} = 50 mA and I_{dg} = 125 mA. Figures 5 and 6 powergain and efficiency versus frequency are given based on two-tone measurements. At I_{dg} = 125 mA the powergain is appr. 1 dB higher than the powergain at I_{dg} = 50 mA. The drain efficiency is approx. 3% lower. Input return loss and output second harmonic suppression at I_{dq} = 125 mA were better than –13.5 dB resp. –37.5 dB.

3 NOISE PERFORMANCE

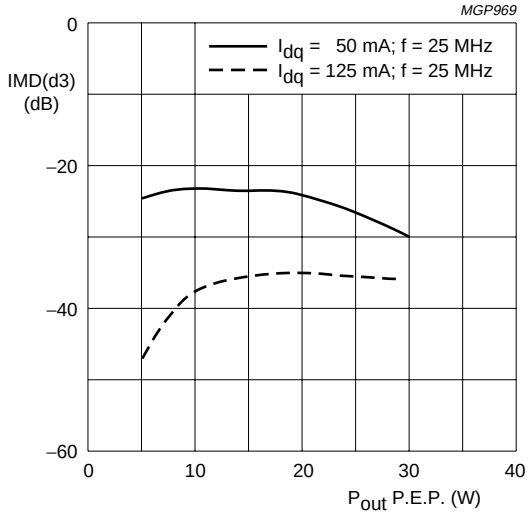
Noise measurements, were performed at several frequencies in the band. Laboratory facilities restricted the lowest frequency of measurement to 40 MHz. Table 1 contains the measured nois figure of the amplifier at four frequencies obtained with the noise generator method. The quiescent drain current was set to 500 mA per transistor.

Table 1

FREQ. (MHz)	F (dB)
40	4.8
50	4.3
90	4.4
110	4.3

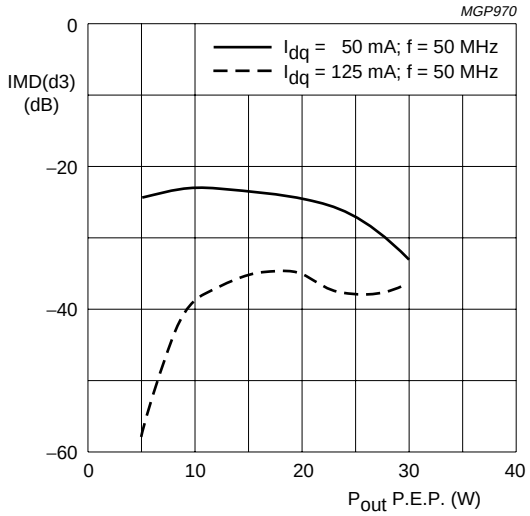
4 CONCLUSIONS

This amplifier can only meet the linearity requirement of < –26 dB over the whole frequency range 25 – 110 MHz if it is operated in class-AB with I_{dg} = 125 mA. When operation is considered only in the band 30 – 88 MHz its IMD is better than –31 dB. The measured noise figure at I_{dg} = 500 mA is 4 – 5 dB.



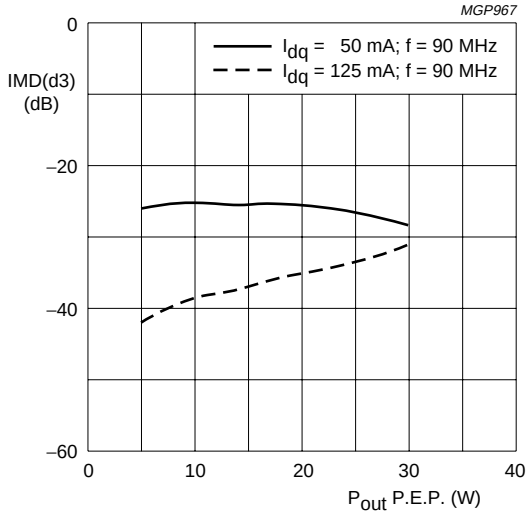
Tone seperation = 10 kHz.

Fig.1 3rd order IMD versus Pout at f = 25 MHz.



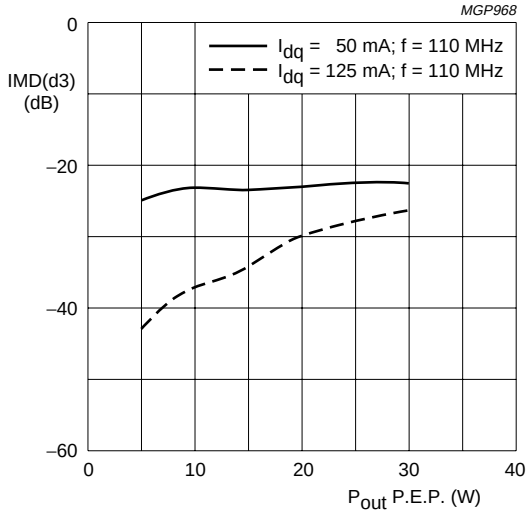
Tone seperation = 10 kHz.

Fig.2 3rd order IMD versus Pout at f = 50 MHz.



Tone seperation = 10 kHz.

Fig.3 3rd order IMD versus Pout at f = 90 MHz.



Tone seperation = 10 kHz.

Fig.4 3rd order IMD versus Pout at f = 110 MHz.

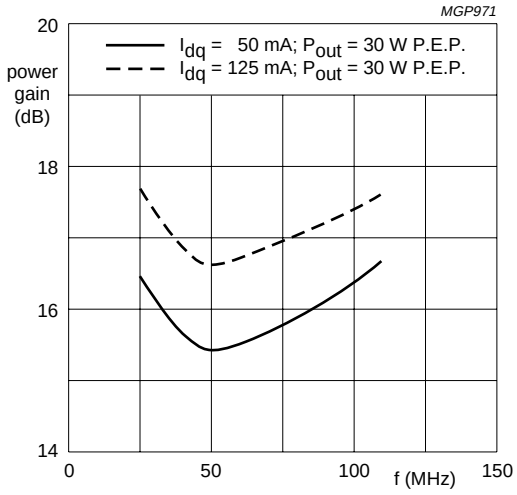


Fig.5 Powergain versus frequency.

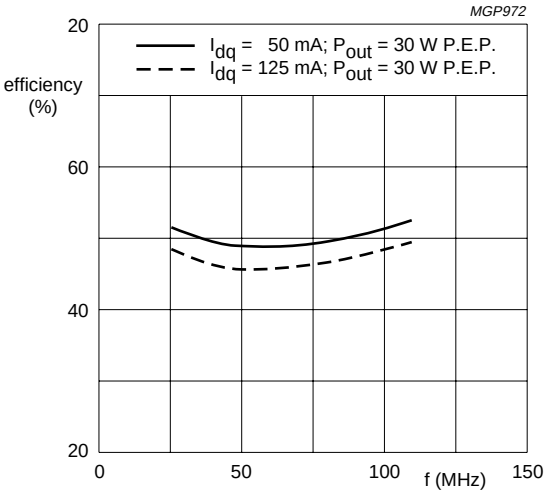


Fig.6 Drain efficiency versus frequency.

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