

APPLICATION NOTE

**Linear performance of BLF244
in S.S.B. class-A operation**

NCO8704

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1 INTRODUCTION

This report contains results of measurements carried out on the BLF244 in S.S.B. Class-A operation. Linear measurements have been performed on six transistors from batch R150C (ass. nr. 3030). Each transistor was taken from a different slice.

2 TESTCIRCUIT

Measurements have been done in a wideband amplifier designed for the frequency range 1.6 – 28 MHz. The circuit diagram and component list are given in Fig.6 and Table 1. Negative feedback (R2) has been employed to attain a flat gain of the amplifier. A shunt resistor (R1) between gate and source takes care of stable operation and also decreases the input resistance to 12.5 Ω . Matching to 50 Ω is accomplished with a 4 : 1 broadband transformer.

At the output side a broadband load of 50 Ω is provided to the transistor. A more detailed description of this kind of amplifiers is given in application report NCO8705.

3 TESTCONDITIONS

The quiescent drain current for class-A operation is set to 0.6 A at a supply voltage of 28 V. This is below the maximum allowable DC-current for a heatsink temperature of 70 °C which is 0.9 A for this device.

Linearity measurements have been performed with two tones of equal amplitude with a frequency separation of 1 kHz. The intermodulation distortion products d3 and d5 are referred to the amplitude of one of the two tones.

The transistors have been tested at a nominal output power of 4 W PEP, with a heatsink temperature of 25 °C.

4 TESTRESULTS

The table below contains results of measurements at $f = 28$ MHz of 6 devices.

Conditions: $V_{ds} = 28$ V; $I_{dq} = 0.6$ A; $P_{out} = 4$ W PEP; $T_{hs} = 25$ °C.

Batch R150C (ass.nr.3030)

DEV.NO.-SLICENO.	PIN (mW)	GP (dB)	D3 (dB)	D5 (dB)	INPUT RET.LOSS (dB)
2 – 2	9.0	23.5	–40.5	–60	–20.5
18 – 3	9.0	23.5	–41.0	–60	–22.0
27 – 10	8.8	23.6	–40.5	–60	–24.5
32 – 12	8.9	23.5	–40.5	–60	–22.5
44 – 19	8.8	23.6	–40.5	–60	–24.0
52 – 21	8.8	23.6	–40.5	–60	–23.0

Measurements have also been performed versus output power at $f = 28$ MHz. Figures 1 and 2 show the powergain and IMD (d3) of a typical device (dev.no.52 from slice 21). P_{out} is varied between 0.5 W and 8 W P.E.P which resulted in a gain variation of approximately 0.5 dB. IMD (d3) exceeds the level of –40 dB for an output power greater than 4.3 W PEP. The amplifier performance versus frequency has also been measured at $P_{out} = 4$ W PEP with the same device. Figures 3, 4 and 5 show the powergain, IMD (d3) and input return loss versus frequency. The measuring frequency extends from 1.6 to 32 MHz. The resulted powergain is 24 dB $\pm$ 0.4dB and IMD (d3) varies between –48 and –40.5 dB while the input return loss is better than –20 dB.

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5 CONCLUSION

The BLF244 is suited for linear operation in Class-A in the HF-band. It has an IMD (d3) of better than -40 dB up to an output power of 4 W PEP throughout the band at $V_{ds} = 28$ V and $I_{dq} = 0.6$ A.

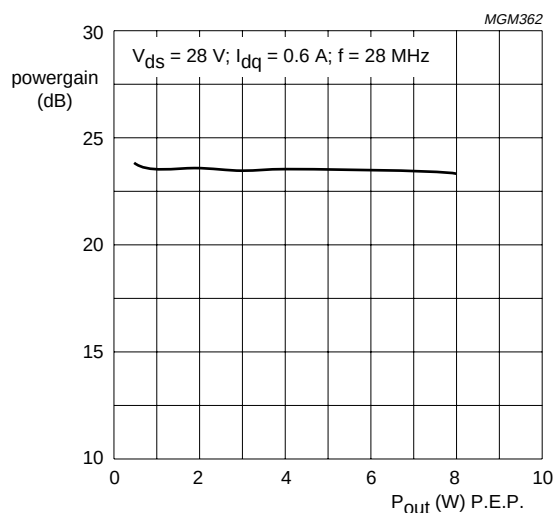


Fig.1 Powergain versus P_{out} .

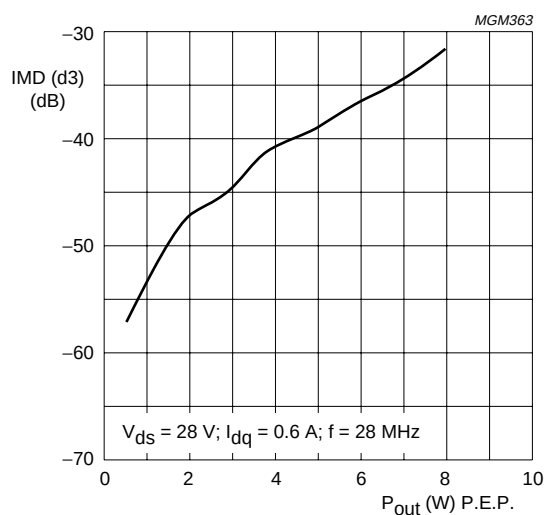


Fig.2 IMD (d3) versus P_{out} .

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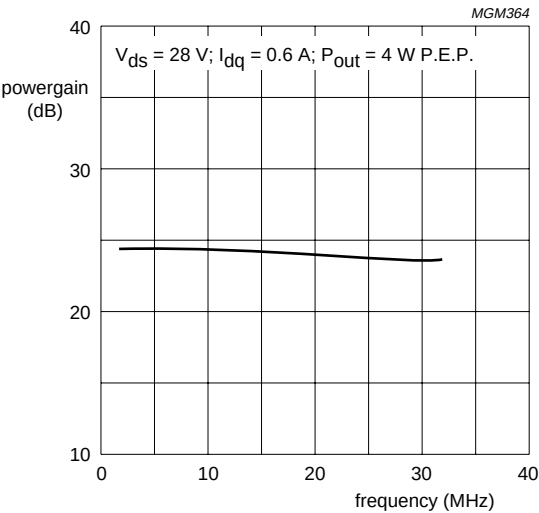


Fig.3 Powergain versus frequency.

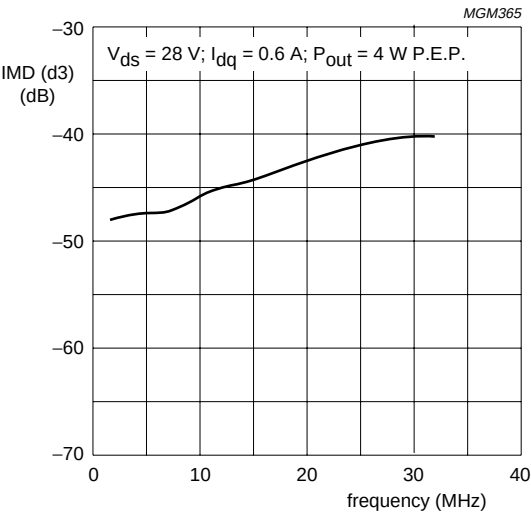


Fig.4 IMD (d3) versus frequency.

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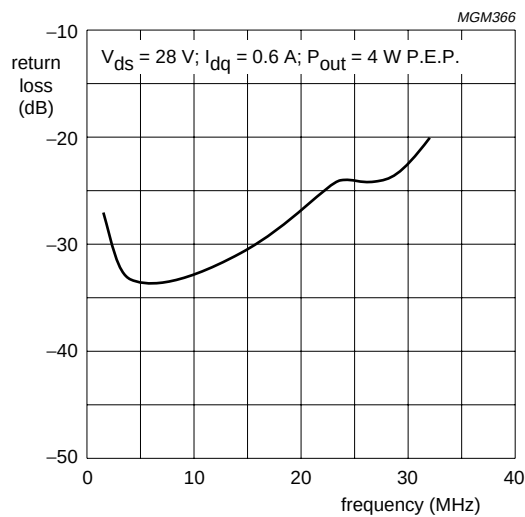


Fig.5 Input return loss versus frequency.

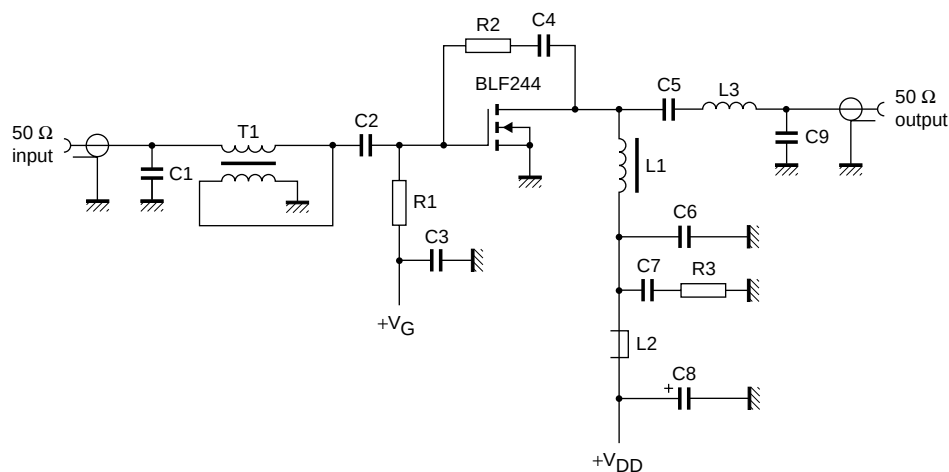


Fig.6 Circuit diagram of the wide band amplifier for BLF244.

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Table 1

LIST OF COMPONENTS	
Capacitors	
C1 = 3.9 pF;	multilayer ceramic chip capacitor; note 1
C2 = 3×10 nF;	multilayer ceramic chip capacitor; (cat. nr. 2222 852 47103)
C3 = C4 = C6 = 100 nF;	multilayer ceramic chip capacitor; (cat. nr. 2222 852 47104)
C5 = 10 nF;	multilayer ceramic chip capacitor; (cat. nr. 2222 852 47103)
C7 = 3×100 nF	multilayer ceramic chip capacitor; (cat. nr. 2222 852 47104)
C8 = 10 μ F (63 V);	Aluminium electrolytic capacitor; (cat. nr. 2222 030 28109)
C9 = 24 pF;	multilayer ceramic chip capacitor; note 1
Inductors	
L1 = 20 μ H	drain choke, 36 turns enamelled Cu-wire (0.7 mm) wound on a Ferroxcube rod grade 4B1, dimensions (5 $\times$ 30) mm
L2 = Ferroxcube RF choke, grade 3B (cat. nr. 4312 020 36640)	
L3 = 189 nH;	8 turns enamelled Cu-wire (1.0 mm); int.dia. = 5.0 mm, length = 9.5 mm; leads 2 $\times$ 3.0 mm
Resistors	
R1 = 16 Ω ;	metal film resistor; 0.4 W
R2 = 1500 Ω ;	metal film resistor; 0.4 W
R3 = 10 Ω ;	metal film resistor; 0.4 W
Transformer	
T1 – 4 : 1 transformer	18 turns of twisted pair of 0.25 mm enamelled Cu-wire (10 twists per cm) wound on a toroidal core grade 4C6, dimensions (9 $\times$ 6 $\times$ 3) mm; (cat. nr. 4322 020 97171)
Printed circuit board: double sided Cu-clad epoxy fibreglass laminate ($\epsilon_r = 4.5$). Thickness 1/16 inch.	

Note

1. American technical ceramics capacitors type 100B.

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