APPLICATION NOTE

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

NCO8704

Philips
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CONTENTS

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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 seperation 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; Idq = 0.6 A; Pout = 4 W PEP; Ths = 25 °C.

Batch RI50C (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). Pout 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 Pout = 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 ±0.4dB and IMD (d3) varies between –48 and –40.5 dB while the input return loss is better than –20 dB.

5 CONCLUSION

The BLF244 is suited for linear operation in Class-A in the HF-band. It has an IMD (d3) of better then –40 dB up to an output power of 4 W PEP throughout the band at Vds = 28 V and Idq = 0.6 A.

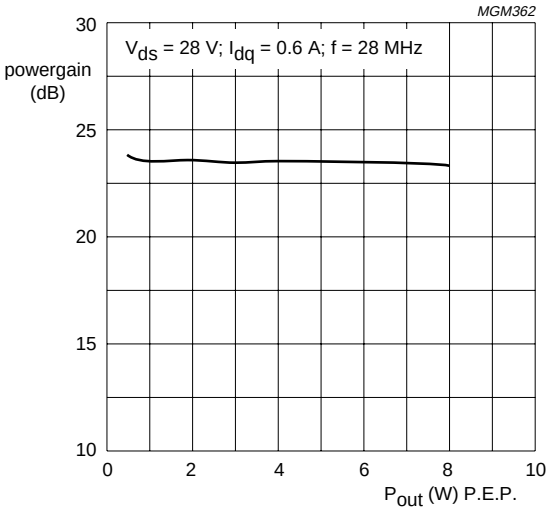

Fig.1 Powergain versus Pout.

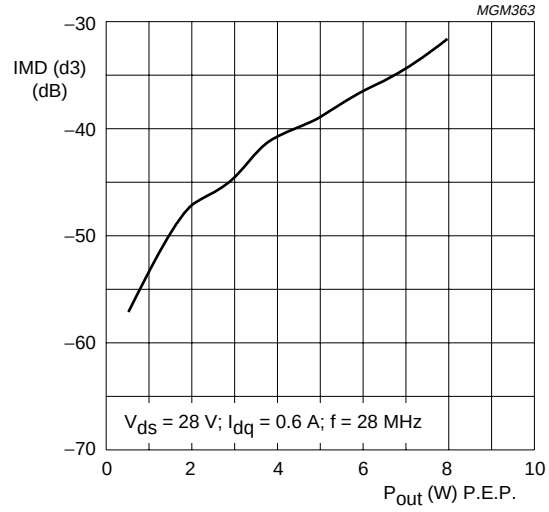

Fig.2 IMD (d3) versus Pout.

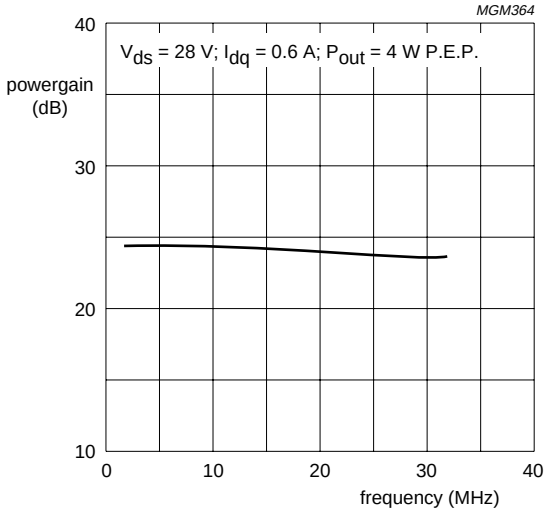

Fig.3 Powergain versus frequency.

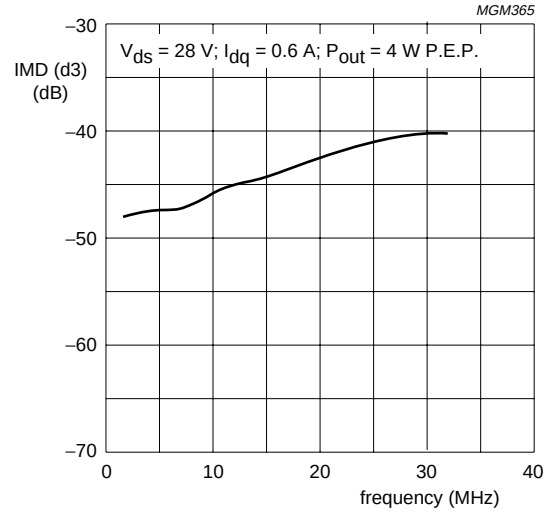

Fig.4 IMD (d3) versus frequency.

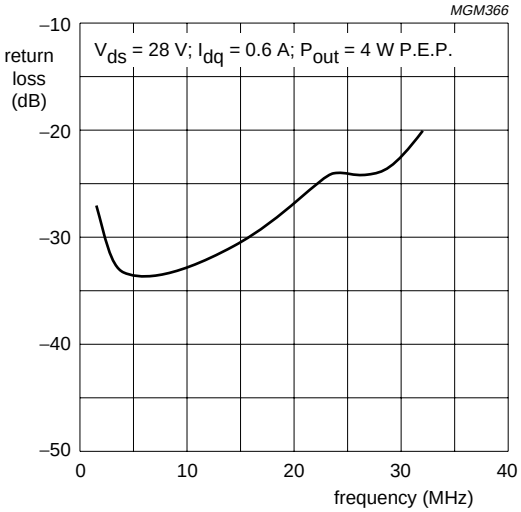

Fig.5 Input return loss versus frequency.

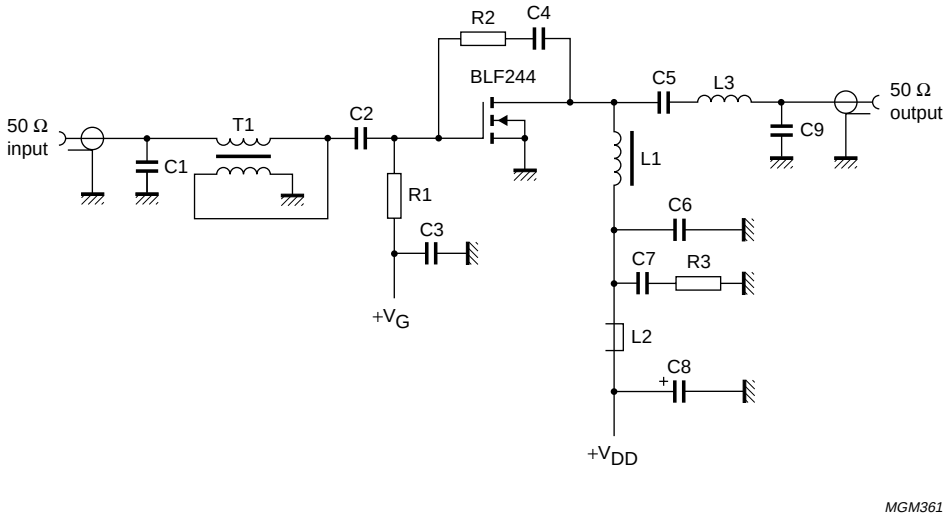

Fig.6 Circuit diagram of the wide band amplifier for BLF244.

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 μF (63 V);	Aluminium electrolytic capacitor; (cat. nr. 2222 030 28109)
C9 = 24 pF;	multilayer ceramic chip capacitor; note 1
Inductors	
L1 = 20 μH	drain choke, 36 turns enamelled Cu-wire (0.7 mm) wound on a Ferroxcube rod grade 4B1, dimensions (5 × 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 × 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 × 6 × 3) mm; (cat. nr. 4322 020 97171)
Printed circuit board: double sided Cu-clad epoxy fibreglass laminate (ε_r = 4.5). Thickness 1/16 inch.	

Note

1. American technical ceramics capacitors type 100B.

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