

# Broadband Performance of a 6W Pushpull Power Amplifier on the VHF-UHF Band

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## ABSTRACT

In this paper, a broadband 100-700 MHz power amplifier was designed. The results of simulation are compared with the measurements. The shunt feedback of power amplifier module provides the linear and broadband frequency amplification. The push-pull topology with ferrite balun provides enhanced efficiency and high power generation. In this work, a commercially available LDMOS transistor (D2003UK) is used. The amplifier can deliver 6W to a 50 ohm load and has 14dB gain. Broadband high power amplifiers are considered as key components in next generation software-defined radio communication systems. In principle, application of a linear, highly efficient wide band amplifier can replace several narrow band power amplifiers, yielding reduced costs and form factor. This paper uses D2003UK, a transistor, to achieve a 6 Watt amplifier for broadband.

## KEYWORDS

Broadband Transformer Ferrite, LDMOSfet, Pushpull Power Amplifier

## INTRODUCTION

Broadband high power amplifiers are considered as key components in next generation software defined radio communication systems. In principle, application of a linear, highly efficient wide band amplifier can replace several narrow band power amplifiers, yielding reduced costs and form factor, This paper uses D2003UK a transistor to achieve a 6 Watt amplifier for broad band. <http://www.semilab.co.uk/>

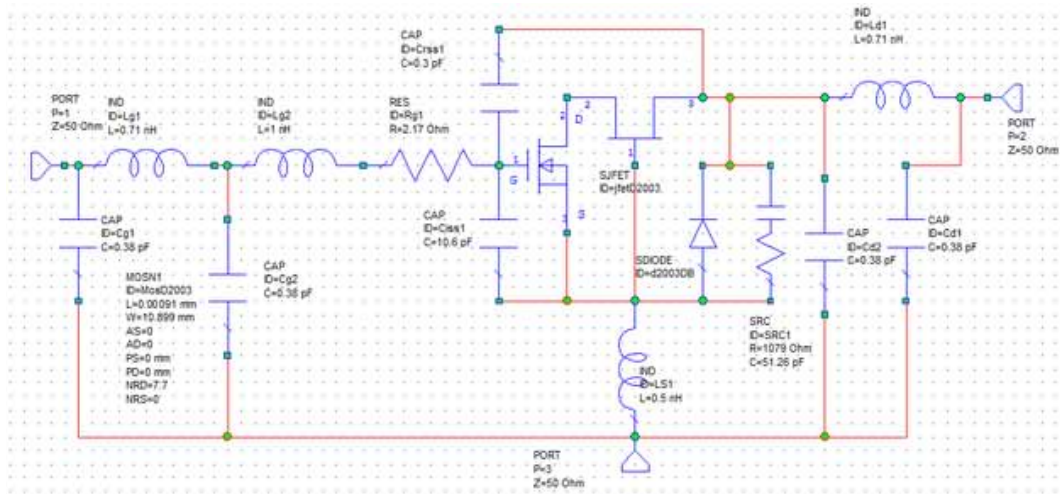
It is a Laterally Diffused Metal Oxide Transistor (LDMOS) and is developed by the company SEMILAB by spice model of figure 1, In this design, RC network and balun are used for the input-output matching circuit. In the following section, the design procedure of the amplifier is discussed. In the final section, the operation results of the fabricated amplifier is shown.

Push-pull technique is utilized to achieve the multi-octave bandwidth. Although these techniques can improve the bandwidth, they deteriorate the efficiency and the linearity of the PA. A shunt-feedback technique enables the broadband operation in its input match, output match, and gain flatness.the 50 ohm balun is 50 ohm to 25 ohm coaxial transformer are surrounded by a material 61 binuclear

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Figure 1. Spice model of D2003uk



ferrite with permittivity of 125 (E. C. Snelling., 1969) The ferrite are used to prevent common mode currents in the coaxial cables (Mack, R., & Sevvick, J.,2014).

## DESIGN OF THE BROADBAND POWER AMPLIFIER

The Push-pull amplifier module consists of two power amplifier modules, each implemented with a custom-built RC shunt-feedback Idmosfet transistor, Bandwidth, power output and Linearity are the most critical parameters in high power amplifier design. The designer has to make a trade-off between gain and VSWR of broad band width, which improves one of them The D2003UK was produced for push-pull applications, After the benefit of the Technical data sheet of transistor.

In a typical well designed amplifier, a mismatch to either the input or the output ports will not result in instability. In addition to high temperature resulting from the amplification power and so balun offers a degree of match, isolation and stability.

### Balun Design

In the push-pull configuration the main factor is the balun. The balun functions as a splitter in the input circuit and blends the voltages in the output circuit, which are distorted out of phase. It is a passive splitter / combiner with a phase difference of 180 ° between the output / input ports.

A Balun is a device that is used to join a balanced line to an unbalanced line. A balanced line is one that has two terminals, neither of which are connected to the ground, whereas an unbalanced line has one terminal connected to ground. Broadband balun with a transformation ratio of 1:1 impedance is used to provide the input and output of each individual system with 25 impedances, When the PA 's operating frequency is high enough and the PA's bandwidth is narrow (Mack, R., & Sevvick, J.,2014).

Taking advantage of the push-pull structure and the compensating matching network at the input, almost flat the compensating matching network at the right, almost flat gain was achieved over broad frequency range, The best length of balun with two ferrite fitting samples is 66 mm for the corresponding high cut-off frequenc 800MHz.

### Biasing Circuit Design

Biasing circuit provides a suitable power to the gate and drain DC bias for the Idmosfet modules, which is important for ensuring the device's reliability and preventing instability. And we designed a choke

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