Wideband Low Noise Amplifier for 80-960MHz Ultra-wideband Transceiver
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1. Introduction

Ultra-wideband (UWB) technology is getting attention as a low-power solution for short-range wireless communication in ubiquitous electronics. In the FCC regulations [1], there are two allowed bands for transmitting UWB signal. The more popular one is 3.1-10.6GHz, which is suitable for high-speed applications. Another band is from DC to 960MHz. For low-power applications, this band is more proper than the previous one because the circuits can be simpler.

Front-end low noise amplifier (LNA) must have low-noise, high-gain, and 50-Ohms input impedance feature over the wide band. This paper presents a novel design technique for the wideband low noise amplifier (LNA) which covers 80-960MHz band.

2. Proposed wideband LNA design concept

Pulse-based UWB communication is based on time-domain waveforms to transmit signals, and usually peak-height of the signal is of importance. Thus, linearity is not the first priority and the gain is more important.

Common-gate amplifier has wide band matching but its gain is low. On the other hands, common-source structure has high gain but it is difficult to do wideband impedance matching. The proposed circuit concept in figure 1 is to combine advantages of both structures. Input impedance is 1/(g_m*A) and gain is approximately -A.

This amplifier has one more advantage in terms of noise figure. Noise from input node is directly coupled to the output node while inverting amplifier inverts phase of the noise to the output node. These two noise signals cancel each other and result in output noise reduction.

3. Simulation results

Figure 2 shows the calculated S-parameters of the proposed LNA. The power gain, S21, is 6.6-7.7dB for 58-960MHz. The return loss, S11, is less than -10dB over 80-2.06GHz. The noise figure (NF) is less than 1.6dB in the frequency range above 80MHz. The circuit is simulated by using 0.18μm CMOS technology with 1.8V supply voltage. Total current consumption is 2.9mA. The result shows that the proposed LNA has high wideband gain and achieves impedance matching over a wideband while a noise figure is lower than the previous work [2]-[3].

4. Conclusions

A technique to design a LNA for 80-960MHz UWB RF transceiver is presented. The proposed LNA can achieve impedance matching over 80-2.06GHz and 6.6-7.7dB of power gain for 58-960MHz. The LNA provides lower noise figure than the previous works with comparable power consumption.

5. References