Full-CMOS 2.4GHz LNA and VCO for ISM Band Wireless Communication

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ABSTRACT

In this thesis, we present a low noise amplifier and a voltage-controlled oscillator with 2.5V supply voltage for the ISM (Industrial Scientific and Medical) band heterodyne receiver. Here, the performances of the low noise amplifier and the voltage-controlled oscillator are simulated by the Advanced Design System (ADS) software with the 0.25 μ m CMOS process parameters. The operating frequency of the low noise amplifier is located at 2.4GHz. Because the low noise amplifier is at the first stage of a receiver, the noise figure and the gain of this amplifier circuit will dominate the performance of the noise figure of the whole receiver. Thus, the designing goals of a low noise amplifier must own high voltage gain and low noise. This low noise amplifier is principally composed of a cascode amplifier and a common-source amplifier. Design simulation results show the high gain of 21.083dB, low noise figure of 2.74dB and good impedance match. We adopted the LC tank architecture to design the voltage-controlled oscillator. With a 2.5V supply, the tuning frequency is from 2.156GHz to 2.377GHz with 9.8% tuning range. The phase noise is —120.3dBc/Hz at 1MHz frequency offset.

Keywords : Low noise amplifier ; Voltage-controlled oscillator ; Heterodyne receiver ; High voltage gain ; Low noise ; Cascode amplifier ; Common-source amplifi ; Phase noise

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