Chapter 9

Review on 60GHz Low Noise Amplifier for Low Power and Linearity

Siva Sankar Yellampalli
UTL Technologies Ltd, India

Rashmi S. B.
Don Bosco Institute of Technology, India

ABSTRACT

In the extremely high frequency radio spectrum of 30-300 GHz, the band from 57-64 GHz has been deregulated. The biggest challenge in designing products at this frequency is the design of CMOS based transceiver circuit components. This chapter deals with the review of 60 GHz LNA design. LNA was chosen as this is the first component of the receiver circuit and its performance affects the transceiver efficiency. In this chapter the review is done on 60GHz LNA’s design addressing the linearization, and low power challenges. To address these challenges, in literature there are many LNA architectures such as simple cascode topology, Current reuse topology etc. The major advantage of current reuse topology is its load transistor shares the same bias current of driver which results in reduced power dissipation by maintaining the maximum gain. The main objective of this chapter is to address gain, power dissipation and linearization challenges by reviewing the different current reuse architectures and linearization techniques used to implement 60GHz LNA.

INTRODUCTION

The unlicensed frequency band from 57GHz to 63GHz is highly influenced bandwidth for high speed wireless application such as wireless personal area network (WPAN) and high-definition television (HDTV). The unlicensed frequency band is as depicted in Figure 1. (Lee, Park, Chang, & Yun, 2012).

The authors Borremans et al. (2009) discusses the characteristic feature of this unlicensed band is short range communication, large bandwidth, less crowded and high data rate. This high data rate and large bandwidth leads to high speed communication. The design of transreceiver at this frequency range

DOI: 10.4018/978-1-5225-0773-4.ch009
attains interesting because of its free of cost communication. At the same time it is very challenging to address design issues pertaining to transmitter and receiver at this bandwidth. This frequency comes under the category of IEEE 802.11at which handles Ultra Wide Band frequency (UWB). The typical block diagram of RF transceiver is as depicted in Figure 2.

Cohen et al. (2008) discusses the components present in the general RF receiver are Low noise amplifier (LNA), mixer, low pass filter (LPF), data converter, oscillator, IF amplifiers and demodulator. The important and the critical block in the receiver chain is low noise amplifier as it is the first active amplifying component, which amplifies the received signal from the antenna without adding much noise to the amplifier. The noise figure of the entire receiver is mainly dependent on the noise figure of the LNA. It is highly challenging to design LNA with minimum noise figure. The noise present at the output of the antenna cannot be avoided; however the noise generated by amplifier can be minimized to reduce the overall noise figure of the receiver. To design LNA along with the noise figure, gain, power dissipation, linearity, reverse isolation are also equally important. In this chapter a detailed review is presented on current reuse architecture and linearization techniques to reduce the power dissipation and maintain the same gain as compared with regular cascode LNA. The chapter is organized as follows. Chapter

![Diagram](image1.png)

Figure 1. Unlicensed frequency band
(Lee, Park, Chang, & Yun, 2012)

![Diagram](image2.png)

Figure 2. Typical architecture of the receiver
(Cohen et al., 2008)