ANALYSIS AND OPTIMIZATION OF 3 TO 5 GHz CMOS LOW NOISE AMPLIFIER FOR ULTRA-WIDEBAND SYSTEMS

This project thesis is presented in partial fulfilment for the award of the

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ABSTRACT

This project presents an analysis for single stage Ultra-wideband CMOS Low Noise Amplifier interfacing interstage matching inductor cascade inductive source degeneration. Cadence SpectraRF design tool is used in the analysis and to optimize the simulation gain and noise performance base on transistor size and inductor. The LNA was analysed using Siltera 0.18μm CMOS technology for a 3 to 5 GHz ultra-wideband system.

By carefully optimization of the size of transistor and inductor, it can increase the overall broadband gain while maintaining a low level of noise figure. The LNA UWB achieved stability factor's more than 1, power gain +11.27dB and noise figure of 2.15 dB at frequency 4.5GHz. For the S-parameter analysis the bandwidth is 2.8 – 5.1 GHz with input (S11) and output matching (S22) below than -2.25 dB and -1.4 dB respectively.

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CHAPTER 1

INTRODUCTION

1.0 BACKGROUND OF STUDY

The LNA function plays an undisputed importance in the receiver design. Its main function is to amplify extremely low signals without adding noise, thus preserving required signal to noise ratio of the system at extremely low power levels. Additionally, for large signal levels, the LNA amplifies the received signal without introducing any distortions, hence eliminating channel interference. Proper LNA design is crucial in today's communication solutions. Due to complexity of the signals in today's digital communications, additional design considerations need to be addressed during a LNA design procedure. For this project, an ultra-wideband Low Noise Amplifier (LNA) is designed by concentrating on the interstage inductor cascade amplifier. The analysis on the gain and noise is important in optimize the ultra-wideband LNA. In addition, S-parameter analysis was done properly in design the low noise amplifier.

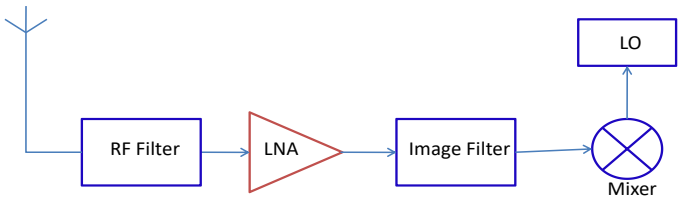

Figure 1.1: Block diagram of Low Noise Amplifier for Ultra-wideband System.