ANALYSIS AND DESIGN OF MATCHED-IMPEDANCE WIDE-BAND AMPLIFIERS WITH MULTIPLE FEEDBACK LOOPS USING 0.35μm TSMC COMPLIMENTARY METAL OXIDE SEMICONDUCTOR TECHNOLOGY

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ABSTRACT

This project is report on the design and analysis of matched-impedance wideband amplifiers with multiple feedback loops using **0.35μm** complimentary metal oxide semiconductor technology. Nowadays, wideband amplifiers are uses in many varieties of modern electronic systems such as microwave and lightwave in communication and instrumentation system also in wireless system. There are used in many radio frequency (RF) and high-data rate communication systems including satellite transceivers, pulsed radar systems, optical receivers, etc. For such applications, a distributed amplifier topology is often used because it can overcome the classical amplifier gain-bandwidth tradeoff by combining the outputs from several active gain elements in an additive fashion. Among the many versions of wideband amplifiers, the Kukielka circuit configuration had been chosen because this is the one of the popular circuit and has a compact circuit in design. Recently, CMOS technology has attracted much attention because it is potentially a low cost process. Therefore, this paper presents the design and analysis of the Kukielka wideband amplifier using CMOS process. Multiple feedback loops were used to achieve terminal impedance matching and wideband simultaneously. Capacitive technique was also used to overcome the intrinsic over-damped frequency response of the Kukielka amplifiers and thus enhance the bandwidth. A method for estimating the s-parameters of active circuits using hand analysis and simulation are used. This method involves the determination of s-parameters from the poles of voltage-gain transfer function. It is found that the information on the frequency responses of input and output return loss, input and output impedance, and reverse isolation is all hidden in the poles or equivalently in the denominator of the voltage-gain transfer function of a circuit system.

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CHAPTER I

INTRODUCTION

1.0 Introduction

The main purpose of this project is to design and analysis of matched-impedance wideband amplifiers with multiple feedback loops using CMOS technology. In communications, wideband is a relative term used to describe a wide range of frequencies in a spectrum. A system is typically described as wideband if the message bandwidth significantly exceeds the channel's coherence bandwidth. A wideband amplifier has a precise amplification factor over a wide range of frequencies, and is often used to boost signals for relay in communications systems. A narrowband amp is made to amplify only a specific narrow range of frequencies, to the exclusion of other frequencies. Impedance matching is function to minimize reflections and maximize power transfer over a (relatively) large bandwidth (also called reflection less matching or broadband matching) is the most commonly used. To prevent all reflections of the signal back into the source, the load (which must be totally resistive) must be matched exactly to the source impedance (which again must be totally resistive).

In this case, if a transmission line is used to connect the source and load together, $Z_{load} = Z_{line} = Z_{source}$, where Z_{line} is the characteristic impedance of the transmission line. Although source and load should each be totally resistive for this form of matching to work, the more general term 'impedance' is still used to describe the source and load characteristics. Any and all reactance actually present in the source or the load will affect the 'match'. Multiple feedback topologies are an electronic filter topology which is used to implement an electronic filter by adding two poles to the transfer function. "CMOS" refers to both a particular style of digital circuitry design, and the family of processes used to implement that circuitry on integrated circuits (chips). CMOS logic on a