COMPARATIVE STUDY ON TELESCOPIC DIFFERENTIAL AMPLIFIER AND FOLDED-CASCODE OPERATIONAL TRANSCONDUCTANCE (OTA) DESIGN USING 50 nm BSIM4 TECHNOLOGY

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ABSTRACT

Op-amps are among today's most widely used circuit blocks. They can be used as summers, integrators, differentiators, comparators, attenuators and much more. Nowadays, a lot of analog design techniques and methodologies have been advised to enable high performance analog signal processing. This thesis discusses on simulating and analysis of amplifier using telescopic and folded-cascode topologies. These amplifier topologies are focusing on gain and power dissipation and characterize the difference between both design models. This thesis presents the comparison between telescopic differential amplifier and folded-cascode (OTA) design using 50 nm BSIM4 Technology. The objective of this project is to compare the parameters of gain and power dissipation between these two design models. Implementation has been done in 50 nm BSIM4 Technology using LTSpice tools, and use 1.0V supply voltage. The simulation results show telescopic differential op-amp has gain of 96.1424 dB and power dissipation of 23.92 mV. The folded-cascode operational transconductance (OTA) has 47.1424 dB of gain and 60.8 mV of power dissipation. From the simulation results, the telescopic structure is better in gain and power dissipation than folded-cascode structure.

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CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Operational amplifiers are the backbone for many analog circuit designs. It is a fundamental building block for many circuit designs that utilize its high gain, high input impedance, low output impedance, high bandwidth and fast settling time. Operational amplifier is one of the basic and important circuits which have wide application in several analog circuits such as switched-capacitor filters, algorithmic, pipelined and sigma-delta A/D converter, sample-and hold amplifiers and etc. The speed and the accuracy of these amplifier circuits depend on the bandwidth and DC gain of the op-amp.

This thesis presents the amplifier topologies which are single stage folded-cascode and telescopic amplifier. The purpose of this project is to compare between telescopic differential amplifier and folded-cascode operational transconductance amplifier (OTA) design using 50 nm BSIM4 Technology. The main consideration of the amplifier design is to compare the parameters of gain and power dissipation between these two design models. Both amplifier are designed in single stage op-amp by using 50nm BSIM4 Technology and characterized the parameters by comparing between the two models of op-amp. Then the result will be compared which better in gain and power dissipation.