COMPARATIVE STUDY OF PERFORMANCE OF CMOS DIFFERENTIAL AMPLIFIER WITH DIFFERENT TYPE OF CURRENT SOURCES

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ABSTRACT

In this work, the performance of Complementary Metal Oxide Semiconductor (CMOS) differential amplifier have been studied and analyzed based on AMI 1.6μ technology using different load and different constant current sources. The constant current sources are designed based on total current equal to 200μA with W/L value of CMOS transistor being defined from the I-V characteristics curve. PSPICE simulator tools are used to simulate and verify the circuit. The higher the values of Common Mode Rejection Ratio (CMRR) will contribute to the best performance of the CMOS differential amplifier. From the simulation, it is found that differential amplifier with active load and Wilson current source has the best performance.

TABLE OF CONTENT

CHAPTER 1

INTRODUCTION

1.1 Introduction

Differential amplifiers are class of amplifiers that process a difference between two signals rather than the absolute value of those signals. The differential amplifier is used on the input of an amplifier to allow input voltages to move around so that biasing of the gain stages is not affected. In integrated circuits, differential signals are often used to remove unwanted signals that are common to both sources. For example, if the information of a particular physical quantity is carried by the difference between signal A and signal B, any unwanted signals that adds directly to both input signals will be rejected when the difference of those signals is processed. The Metal Oxide Semiconductor Field Effect Transistor (MOSFET) transistor is used in this project in analyzing differential amplifier. A MOSFET device can be made small and it occupies a small silicon area in an IC chip. There are two types of enhancement MOSFETs which are n-channel and p-channel. An n-channel enhancement is referred to as an NMOS and p-channel enhancement is referred to as PMOS. The CMOS differential amplifiers are analysed using different load which is passive, active and Lee load. Various types of current sources are also used in analysis the CMOS differential amplifier such as basic current source, cascade current source, Widlar current source and Wilson current source.

1.2 Research Objective

The objective of this project is to determine the performance of CMOS differential amplifier by using a different load and different current source that consider the highest Common Mode Rejection Ratio (CMRR). All the parameters that are used in this project are based on AMI 1.6μ technology level three. The current sources are designed based on total current equal to 200μA where the value of W/L CMOS transistor is defined from I-V characteristics curve. The best performance of CMOS differential amplifier is achieved when the highest value of CMRR is produced.