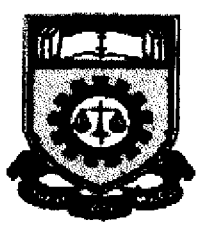
PREAMPLIFIER ANALYSIS FOR LOW-NOISE CMOS INSTRUMENTATION AMPLIFIER BY USING MENTOR GRAPHICS

Thesis is presented in partial fulfilment for the award

of the Bachelor Electrical Engineering (Hons.)

Institute of Technology Mara



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ABSTRACT

This thesis presents a partial fulfilment of the requirement for the Bachelor of Electrical Engineering program and titled "Preamplifier analysis for low-noise CMOS instrumentation amplifier by using Mentor Graphics". This project was taken from IEEE Journal Solid- State Circuits, vol 32, no. 7, July 1997 [1] where the performance of preamplifier circuit is being analyzed. The preamplifier circuit is part of the CMOS instrumentation amplifier. The circuit has its requirement that must be observed. The circuit is first drawn in Design Architect (DA) where all the rules and regulation for the electrical codes are obeyed. ACCUSIM is used to simulate the circuit. The circuit has been analyzed using 1.2-µm n-well CMOS process. A CMRR is less than 70dB. The total power consumption for this circuit is 1.4163mW.

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CHAPTER 1
INTRODUCTION

1.1 BACKGROUND

Advances in IC technologies in recent years have not only lead to a tremendous increase in performance of scaled down digital and analog VLSI (see appendix A) circuits but also stimulate rapid development of silicon based integrated microsensors. The term very large integration (VLSI) reflects the capabilities of the semiconductor industry to fabricate a complex electronic circuit consisting of thousands of components on a single substrate. The growth of semicondutor technology in recent years has been described by 'Moore's Law' enunciated in the late 1960's which projected quadrupling of component density in a chip every three or four years.

The integrated microsensors will use less power and area and will be more reliable than their counterparts in a discrete or hybrid sensor system solution However this microsensors tend to have lower sensitivity than those in specialized sensor technologies. Therefore the need to have a very highly sensitive instrumentation amplifier must be fulfilled. CMOS is the most useful technology to implement analog functions. CMOS devices feature high input impedance, low offset, high packing density, low power consumption and easily scaled. CMOS amplifier is also known for its high flicker-noise and offset.

The purpose of this project is to study and analyse the preamplifier suggested and obtained the same performance as [1] by using Mentor Graphics software. The circuit has been analyzed using 1.2-μm single poly n-well CMOS process.

1.2 PROBLEM STATEMENT

The preamplifier circuit is used for low-frequency noise and offset. The circuit being analyzed is part of CMOS instrumentation amplifier. It consists of two modulators