A LOW POWER 0.18µm CMOS TECHNOLOGY INTEGRATING DUAL-SLOPE ANALOG-TO DIGITAL CONVERTER

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ABSTRACT

In this thesis work, a 4-bit integrating dual slope analog-to digital converter (DS-ADC) is designed which consumes low power and simplicity but slow conversion time utilizing a Silvaco Electronic Design Automation (SEDA) tools with an advanced 0.18µm CMOS Technology using 1.8V power supply. Various and different types of ADC are provided in the literature review to assist the writer and reader in depth understanding of the ADC's system and function. Dual Slope ADC has its own name and famous for high accuracy, high resolution, inexpensive, good noise rejection and ideal for digitizing low bandwidth signal. The proposed DS- ADC contains three main components of integrator, comparator and control logic at which the integrator is realized with a two-stage operational amplifier (op-amp). An N-channel input two-stage op-amp was chosen in this project for its ICMR is near to the supply voltage and provides sufficient gain. Simulation confirms that the proposed ADC architecture consumes no external DAC module and shows a power efficiency of 2.47392mW at a conversion time of 1.06µs.

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CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

A modern world always comes with a contemporary civilization of culture, people and especially technology, in this case, electrical and electronics system. The rapid growing of this civilization demands for a better and advanced technology that induce designers and engineers interest to invent and innovate ideas of developing electronics instruments to specifically fulfill the need and hunger for latest electronics apparatus. The real world of signals are generally in physical values such that temperature, sound, humidity, moisture, intensity which can be measured as analog or continuous signals that can only be accessed by computers or other electronics equipments once the analog signals are converted into digital or discrete signals. Digital domain is the most preferable in processing any signals due to the advantages of fast processing time, accuracy, high reliability and user friendly for it consumes only binary values of 'high' and 'low'.

Circuits and systems to perform all these functions can be found in a great value of numbers in consumer devices such as digital cameras, digital multimeters, mobile phone, audio and video equipments and numerous others in the market. There are different types of ADCs which vary in terms of speed, accuracy, resolution and interface. Flash ADC, Successive Approximation ADC, Single-slope and Dual-slope ADC are among the most common and commercially available which will later be discussed in the literature review section. Integrating ADCs as proposed in this thesis is popular in the categories of low speed, low cost but high accuracy compared to Flash ADCs which is high in speed but consumes much power and less accurate.