INTERFACING ELECTRONIC FOR MEASUREMENT, SIGNAL PROCESSING AND WIRELESS COMMUNICATION

Edited by

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CONTENTS

Chapter 16

CMOS OPERATIONAL AMPLIFIER FOR CAPACITANCE TO VOLTAGE CONVERTER

NURUL ARFAH BINTI CHE MUSTAPHA, AHM ZAHIRUL ALAM, SHEROZ KHAN

16.1. INTRODUCTION

Operational amplifier (Op amp) is the most integral part of an embedded circuit building block. In this paper, the testing of an integrated Op amp suitable for capacitance and high speed measuring system has been made. The Op amp testing (such as large signal differential transfer characteristic, frequency respond analysis, input common mode analysis, slew rate analysis) has been done using the PSpice OrCAD Version 16.0 circuit simulator and simulation results were compared with the design specification. The design of this Op amp for capacitive measuring system is to make use of 0.13 μm complementary metal-oxide-semiconductor (CMOS) technology. The simulation results and design specification confirmed each other. This high speed and low power consumption system design is suitable use in a measuring system for detection a wide and lower range of capacitance.

16.2. THE OPERATIONAL AMPLIFIER BLOCK

The proposed Op amp building block as in Fig. 16.1 consists of three stages: two-stage Op-amp, bias, and start-up stages. Some of the procedures developed in (Chiang, Wang, & Huang, 2008) are followed and readjusted accordingly to facilitate the design of Op amp. Table 1 shows the details of each width, W with length, $L = 0.13\ \mu m$.

Table 1: Summary of the Op-amp Transistors Width, W

Transistor	Width, W (μm)	Transistor	Width, W (μm)
M1and M2	0.195	M8	2.145
M3and M4	6.11	M11 and M12	6.175
M5	3.25	M10 and M13	0.13
M6	21.905	M9, M14 and Ms1	1.625
M7	5.85	Ms2, Ms3 and Ms4	0.13