INTERFACING ELECTRONIC FOR MEASUREMENT, SIGNAL PROCESSING AND WIRELESS COMMUNICATION

Edited by

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Chapter 15

PRINCIPLE OF CAPACITANCE TO VOLTAGE CONVERTER

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

Capacitance measurement system is a mature technology employed in thousands of products. A newer application of such capacitive systems which is gaining widespread use is in the consumer products of human-to-machine interfaces such as on the mobile phone, PC peripherals, portable digital entertainment devices, appliances, remote controls, access control and digital cameras. It is also reported that this technique has been used in industrial applications for many years to measure liquid levels, humidity, and material composition. Capacitive measuring system is essentially important technology in the sensor transducer system. The motivation behind using capacitive measuring system is that it easily provides an efficient conversion of changes in the parameter of interest into a wide range of capacitance changes, which are in turn changed into proportional voltage or frequency changes. The advantage here is that these conversions are taking place without functionality loss compared to other systems such as the inductive or resistive measuring system.

15.1. INTRODUCTION TO CAPACITIVE SENSOR

A capacitive sensor is a device that is able to detect a change in capacitance when moving objects come near to it, and this detectable change is converted into digital values that can be processed, manipulated and interpreted (Seguine, R., 2007). The main idea behind this design is to produce a system that is able to function in high frequency environment while using less voltage supply and power consumption. This work focuses on using the technique already reported in (Chiang, Wang, & Huang, 2008). However, here in this work, added features have been made to the circuitry design. This is done using third generation Berkeley Short-channel insulated gate FET (IGFET) Model 3 (BSIM3) version 3.2 of 0.13 μm technology. In this paper, CVC design and performance is presented. The improved converter is compact, robust and suitable for use in higher frequency environments.

15.2. OPERATION OF THE CVC

To meet such expectations, the design of a sensor transducer is designed using 0.13 μm CMOS technology. Fig. 15.1 shows the actual schematic of the designed CVC. Capacitance C_x is the most important part in this circuit where it operates as a detected sensor. Any changes in the capacitance value is detected and recorded. The designed