

# **INTEGRATED READOUT CIRCUIT USING ACTIVE BRIDGE FOR RESISTIVE-BASED SENSING**

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## **ABSTRACT**

An integrated Readout Interfacing Circuit (ROIC) for resistive-based sensors using Silterra CMOS 0.13  $\mu\text{m}$  technology that reads resistance shift and converts it to voltage was designed. In conventional practice, resistive-based sensors are interfaced with Wheatstone bridge to transform the sensor signal to voltage. Due to low sensitivity of Wheatstone bridge, the output voltage of shifted resistance is not significant. The objective of this project is to propose an integrated interfacing circuit using Wheatstone bridge with improved sensitivity. The project scope focuses on integrated circuit design of readout circuitry for resistive-based sensors. An active bridge, a modification of standard Wheatstone bridge using active components was used as ROIC. The analog circuit module was designed using fully custom integrated circuit design approach from schematics to layout using Mentor Graphics Pyxis IC design platform and Silterra's CL130G technology (0.13  $\mu\text{m}$  CMOS Logic Generic). The sensitivity of the circuit is defined as percentage change in output voltage of the circuit to the changes in resistance of the sensor. Results show that, the active bridge circuit is almost four times more sensitive compare to conventional bridge circuit. The sensitivity improvement would allow any resistive-based sensors to be integrated with ROIC to produce more significant output voltage of shifted resistance.

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# **CHAPTER 1**

## **INTRODUCTION**

### **1.1 INTRODUCTION**

In this chapter, background of study or overview of the project will be described. The methodology used in this project are also described. Besides that, the problem statement were stated and come up with several objectives for this project. This chapter also will describe on the scope of the project work, and the organization of the thesis.

### **1.2 BACKGROUND OF STUDY**

Readout Interfacing Circuit (ROIC) refers to integrated circuit that is specifically used for reading detectors of a particular type [1]. These are used in detectors where the sensitivity of the circuit is very low and using discrete devices will introduce more noise due to impedance matching.

In recent years, greater interests among the designer towards designing integrated readout interface circuit in chip level. An integrated circuit (also referred to an IC, a chip or a microchip) is a set of electronic circuits on one small plat of semiconductor material, normally silicon. This IC can be made much smaller than a discrete circuit which made from independent electronic components. A ICs can be made very compact, having up to several billion transistors and other electronic components in an area the size of a fingernail. There are many advantage of integrated