INTEGRATED CIRCUIT DESIGN OF READOUT INTERFACING CIRCUIT FOR MEMS RESONATOR CHARACTERIZATION

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Abstract

This project presents the integrated circuit design for MEMS resonator with focused investigation on its application in on-chip MEMS resonator characterization. It is reported that MEMS resonator sensors vibrate at specific natural frequencies under different conditions. A readout interface circuit to capture this response that is designed for integrated circuits to reduce a lot of interference and for convenience of on-chip characterization.The analog circuit module will be designed using custom integrated circuit design approach from schematics to layout using Mentor Graphics tools and Silterra 0.13 μm technology files. The main sub circuit involved is operational amplifiers. The series RLC equivalent circuit is used to emulate the MEMS resonator to characterize the behavior of resonator. The drive frequency will be swept and match to the resonant frequency of MEMS resonator will cause the MEMS resonator produce the maximum current signal.

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

This chapter will be focused on background of Micro Electro Mechanical Systems (MEMS). Also the issues that arise in the design of readout interfacing circuit. In addition, the objectives and scope of work are included.

1.2 INTRODUCTION

MEMS is defined as Micro Electro Mechanical Systems. MEMS is a technology that in its general form can be defined as miniaturized mechanical and electrical elements that are made using the techniques of microfabrication. The physical dimension of MEMS devices can vary from below 1μm up to several millimetres. The types of MEMS devices can vary from relatively simple structures having no moving elements, to extremely complex electromechanical systems with multiple moving elements under the control of integrated microelectronics. The integration of MEMS devices with microelectronic circuits is a promise of miniaturization and modular system on chip design for the next few years. The most prominent elements in MEMS are the micro sensors and micro actuators which are appropriately categorized as transducers that convert energy from one form to another. The micro sensors typically converts a measured mechanical signal into an electrical signal. MEMS researchers and developers have demonstrated an extremely