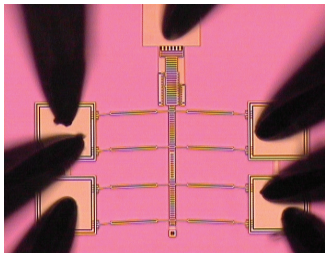
Piezoresistive Sensing of Bi-stable Micro Mechanism State

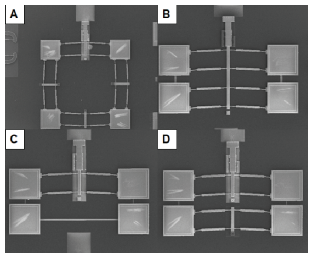
BYU #2005-41

DESCRIPTION

This technology is a microelectromechanical system (MEMS) capable of on-chip sensing of bi-stable mechanism state. This is accomplished using the piezoresistive properties of polysilicon. As the mechanism changes position, stress in the mechanism increases or decreases causing a change in the resistance of the mechanism, which can be measured to determine the position of the mechanism.

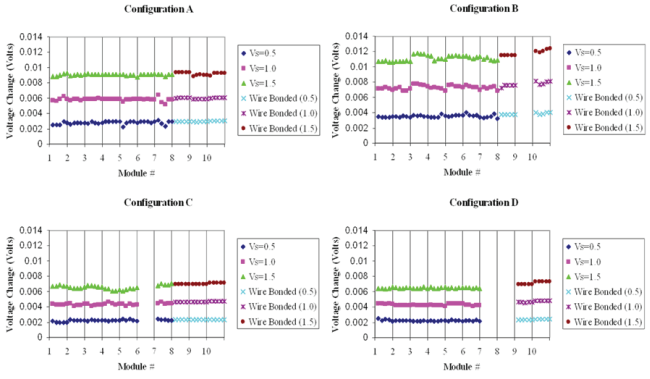


Probe Setup



Configurations

Testing Results



PROBLEM SOLVED

Electrical contacts are often used to determine the state of a mechanism. However, tolerances and fabrication variation lead to challenges with electrical contacts. Polysilicon is a poor contact material because it is too hard, and its resistivity is too high. This invention uses piezoresistive position sensing to eliminate reliability issues and errors associated with electrical contacts by completely eliminating the contact. On-chip sensing is integrated into the device design, and very low power is required to sense changes in mechanism position.

KEY ADVANTAGES

- ***Simplified manufacturing process***
- ***Increased reliability***
- ***Low power required***

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APPLICATIONS

Sensing the state of bi-stable mechanisms is critical for various applications, including high-acceleration sensing arrays (e.g. shock sensor) and alternative forms of non-volatile memory. Piezoresistivity may also be used to measure the dynamic response of a device by acquiring measurements as the device toggles.

Issued Patents:
US 7,554,342
US 7,616.013

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