Implementation of Time-based 3-axis Capacitive Accelerometer Using COMSOL Multiphysics®

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Abstract

Micro-Electro-Mechanical system (MEMS) can be understood as miniaturized mechanical and electromechanical elements that include sensors, actuators, and microelectronics. Capacitive accelerometers are the devices which measure the acceleration on a surface using capacitive sensing techniques. In this work, we present the design of pressure sensing beam based and a two-axis (X & Y axis) capacitive accelerometer using COMSOL Multiphysics®. The design of proof mass for the third axis (Z-axis) is also presented. These designs are tested for sensing the pressure over a proof mass. The results for displacement of the proof mass and acceleration are obtained and analyzed. The acceleration produced is calculated by sensing the voltage generated between capacitive plates. Considering the real-time performance of the system, a system for acceleration sensing of the capacitive accelerometer is proposed. The designed sensor could be employed in biomedical and automobile applications.

Figures used in the abstract

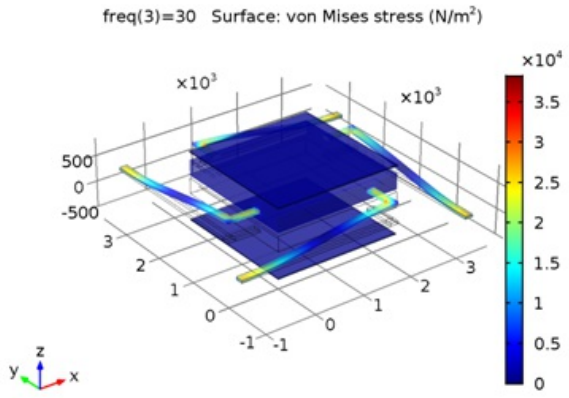

Figure 1: Proof mass design for 2-axis capacitive accelerometer.