Visions to Products

Sensors and Actuators

Micromechanical Systems in MID Technology

Molded Interconnect Devices (MIDs) are selectively metalized polymer parts, including electrical and mechanical functions. Within the last years, MID Technology become more and more important because of great variety in three-dimensional design. Hahn-Schickard is engaged in micro assembly technology based on MID Technology since 1998. Furthermore Hahn-Schickard investigates the suitability of the innovative technology for sensors and actuators. Acceleration Sensors, inclination sensors, touch sensors and microvalves have been developed, as well as a new concept for a high resolution optical angular resolver.

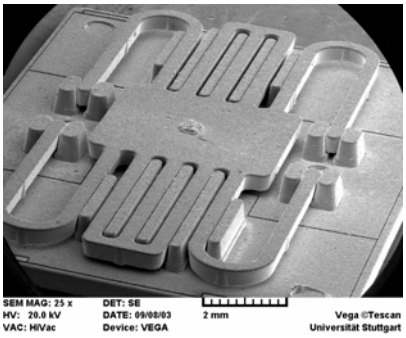

Fig. 1: Capacitive acceleration sensor

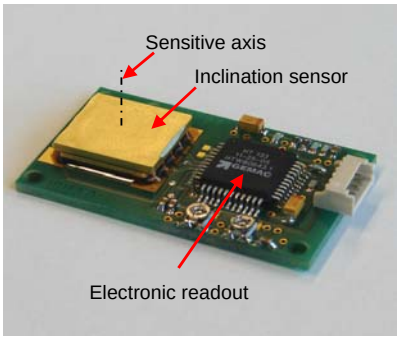

Fig. 2: Capacitive inclination sensor

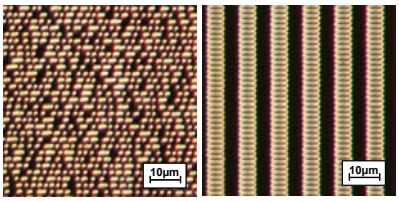

Fig. 3: Bits/bytes compared to geometrical positioned microstructures

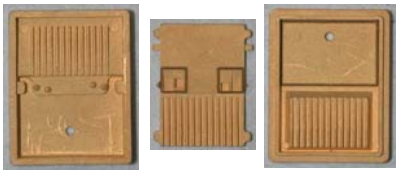

Fig. 4: Top cap, actuator, bottom cap

Products

- Capacitive acceleration sensor
- Capacitive inclination sensor
- Optical angular resolver
- Electrostatic microvalve
- Capacitive touch sensor
- Capacitive length measurement

Applications

- Automotive industry
- Medical technology
- Automation
- Technical analysis

Fig. 1 shows a SEM-micrograph of an accelerometer made from selectively metalized polymer. The accelerometer is based on a spring-mass-system. With a measuring range up to 50 g. The seismic mass is movable and only anchored to the baseplate using four U-shaped springs. A differential capacitance arrangement is formed by the electrodes on the seismic mass and two insulated arrays of electrodes on the baseplate. By moving the seismic mass due to acceleration, the capacitance of one capacitor increases while the other capacitance decreases. The acceleration can be measured with high accuracy.
Fig. 2 shows a fluidic based capacitive uniaxial inclination sensor with electronic readout and a measuring range of ±90°. The sensor consists of two MID-parts. Both MID-parts form an enclosed cylindrical cavity. Half of the cavity is filled with a dielectric fluid. Two semi circular shaped electrodes are manufactured on one front end of the cylindrical cavity, one common circular shaped electrode is on the opposite. If inclination of the housing occurs, the fluid keeps the horizontal position. The change of the two capacitors can be measured with a differential capacitance to voltage converter.
Fig. 3 shows a solid measure for an optical angular resolver. The diffractive solid measure is produced by using the cost effective manufacturing process for CDs/DVDs. The detection of the solid measure is done by optical interference. The mechanically stiff reading unit consists of laser diode, lens and photo diodes. Results with an experimental setup show that even pitches smaller than 12 µm can be detected by a 10 µm laser spot. New concepts for the detection of the rotation direction, for an absolute encoded system and for a low cost assembly in MID-technology have been investigated.
Fig. 4 shows the selectively metalized polymer parts of an electrostatic driven 3/2 way valve. The valve consists of a housing and a rotating actuator. In normal position the actuator is driven by a spring and the supply port is closed. By applying a voltage on the electrodes, the actuator rotates with the result that the supply port is opened and the exhaust port is closed. By switching of the voltage, the actuator rotates back into normally closed position driven by the spring.

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