Visions to Products

StressSens

CMOS integrated stress sensor chip with telemetric interface

The CMOS integrated stress sensor chip can measure mechanical stress, strain, force, or torque. Power and data are transferred wirelessly using a 13.56 MHz telemetric interface, similarly to conventional RFID systems.

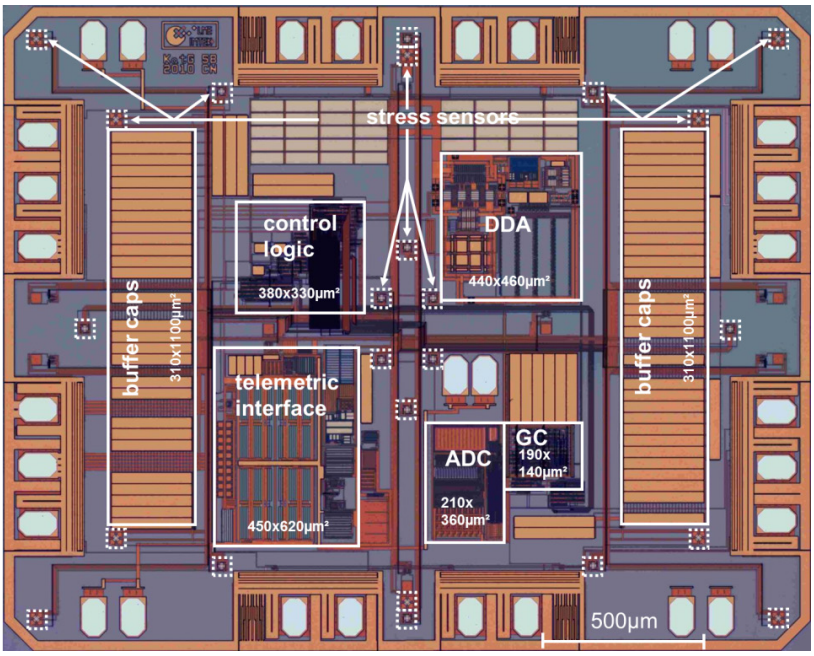

Fig. 1: Micrograph of the StressSens chip.

Compared to conventional strain gauges, the StressSens chip has several advantages: (i) Due to integration of the sensor elements, the processing unit and the telemetric interface in one device, these components have been designed to fit perfectly to each other (see Fig. 1). Moreover, the StressSens chip can be handled easily and reduces overall cost. (ii) The StressSens chip has been designed for wireless energy and data transfer, but a wired connection is also possible if needed. (iii) By means of proper calibration, it is possible to measure 2D or 3D forces and/or torques with one single device. (iv) Since the StressSens chip acts like a passive RFID transponder, no local battery is required. It is powered exclusively by the near field energy transmitted by the RFID reader.
One Wheatstone bridge composed of four PMOS FETs represents one sensor element. In order to get a stress map, 32 sensor elements are distributed over the chip surface. In combination with an external reader, the StressSens chip behaves like a passive transponder in an RFID system. A coil is the only external component.
Due to its small size and the telemetric interface, many

Key features

- Chip size: 2.0 x 2.5 x 0.3 mm³
- Technology: X-Fab XH035
- Power consumption: 1.75 mW (without telemetry)
- Sensors: Piezoresistive PMOS FETs
- ADC resolution: 10 Bit ≡ 11 kPa minimum
- Telemetry: 13.56 MHz

Fields of application

- Process control
- Structural health monitoring
- Predictive Maintenance
- Medical engineering
- Automotive

StressSens chips can be distributed over the material surface body or even integrated into the body which has to be monitored. Possible applications comprise process control (e.g. failure analysis in IC packages), medical engineering (e.g. osteosynthesis), and structural health monitoring (e.g. in gears or wind turbines).

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