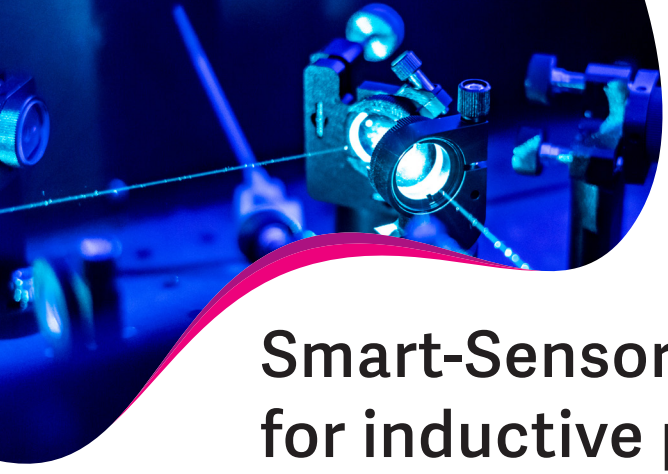

IMES | Institute for Microelectronics, Embedded Systems and Sensors

OST Eastern Switzerland University of Applied Sciences

Smart-Sensor - Integrated electronics for inductive probes

Microelectronics and Sensors

The company Peter Hirt GmbH in Nänikon manufactures probes for length measurement with a precision of less than one micrometer (Figure 1). The probes contain two coupled coils and a movable soft iron core, which changes the coupling factors between the coils depending on the mechanical position.

The Principle

The coils are excited with an alternating signal, and the ratio of the two measured voltage amplitudes is evaluated. Todays probes partly use a complex and expensive analog IC, which also has large measurement errors with temperature changes (Figure 2).

The Idea

With a proprietary ASIC (Application Specific Integrated Circuit), which mainly works digitally thanks to the use of sigma-delta converters, temperature dependence and costs can be significantly reduced.

The Project

In the project co-financed by the Commission for Technology and Innovation (CTI, now Innosuisse), the entire system from the sensor to the connection to the measuring computer is being developed. The ASIC DTNA forms the heart of a new product family of probes, which contain the measuring electronics as well as a microcontroller for calibration and data transmission to the measuring computer.

The Product

The present electronics meet the highest accuracy requirements: The standard deviation of the measured values is 5 nm with a measuring range of 10 mm.

The electronics are integrated into the probe and have a width of only 6.5 mm. It contains an ASIC, microcontroller, RS485 interface IC, and some passive components.

Image 1: Inductive probe (Source Peter Hirt GmbH)

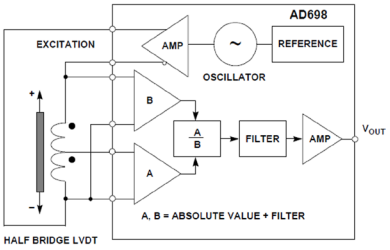

Image 2: Block diagram of discrete electronics (Source Analog Devices)

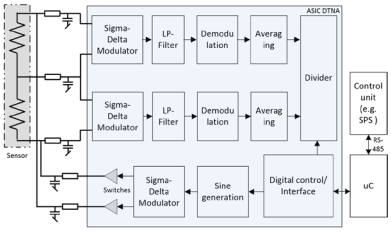

Image 3: Block diagram of functional model

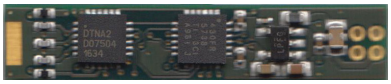

Image 4: Photo of electronics with ASIC and µCC (30mm x 6.5mm)

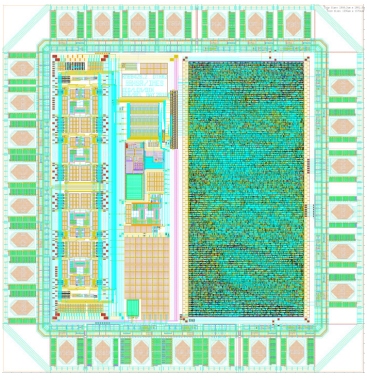

Image 5: Chip plot (1.85x1.88mm²)

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