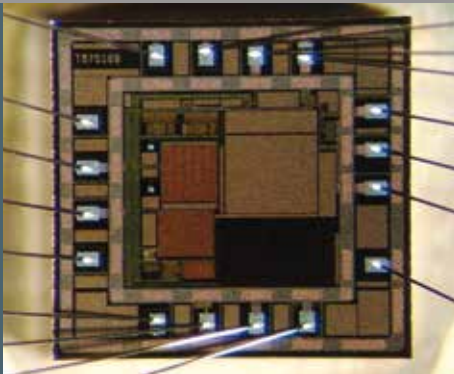




- 1 Chipphoto of the demonstrator IC.
- 2 Functional Demonstrator of the high temperature proximity switch.

HIGH TEMPERATURE 250°C INDUCTIVE PROXIMITY SENSOR

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Proximity sensors are basic sensing elements in a wide range of applications. Due to its robustness the inductive method for proximity detection is especially used in industrial practice. However, for harsh environments and particularly for high temperature applications up to 250°C there are only products with separate electronics available. IMS has developed some of the basic building blocks for an integrated proximity sensor based on the IMS high temperature CMOS SOI technology. These circuits are capable to show the basic function of sensing metallic targets at temperatures up to 250°C and more using an oscillator approach.

The first prototype chip with oscillator and detector circuit has already been tested successfully. These components are suitable to give a proof of the concept, especially covering the temperature range from -40°C

to 250°C. A chip photo with the integrated oscillator and detector is shown in figure 1. More components will be added in future versions including analog blocks e.g. for precise temperature compensation but also digital circuitry for more complex functions like analog to digital conversion, calibration or interfacing. Non volatile memory for permanent storage of calibration data is also available in the actual IMS high temperature technology.

Based on the first components, a demonstrator has been constructed with an M18 housing which features the IMS high temperature IC (figure 2). This version comprises the Fraunhofer IMS prototype IC and a few external elements. Future versions of the IC may contain the complete circuitry in a single chip ideally leaving only the coil as an external element.



Features of the proximity sensor

- Detection of metal targets
- Inductive principle
- Oscillator method
- High temperature capable up to 250°C
- HT-CMOS SOI technology

High temperature ASIC development

Fraunhofer IMS in Duisburg has more than a decade of expertise in the design and wafer processing of high temperature integrated circuits and systems. Based on numerous existing analog and digital IP blocks we realize application specific integrated circuits usually including full custom design blocks. Our designs range from highly specialized sensor read-out electronics to System on Chip solutions including analog compo-

nents for signal conditioning, analog/digital converters and even embedded microcontrollers.

Technology basis

The technology used for high temperature electronics is a dual gate oxide 0.35 μm thin film Silicon-On-Insulator (SOI) CMOS technology for mixed signal integrated circuits. It is dedicated for use in high temperature applications with operating temperatures up to 250°C. A robust metallization based on tungsten provides extended reliability with respect to electromigration even at these elevated temperatures. Various backend and assembly options are available, e.g. gold plating for reliable high temperature pad metallization.

Technology features

- Structure size: min. 0.35 μm
- 4 layer tungsten metallization
- Fully dielectric isolated devices
- 5V analog grade CMOS devices
- 3.3V digital devices
- Gate density: 8500 gates/ mm^2
- Passive devices R, C, PIN diode
- Non volatile memory (EEPROM)
- One time programmable memory (OTP)

