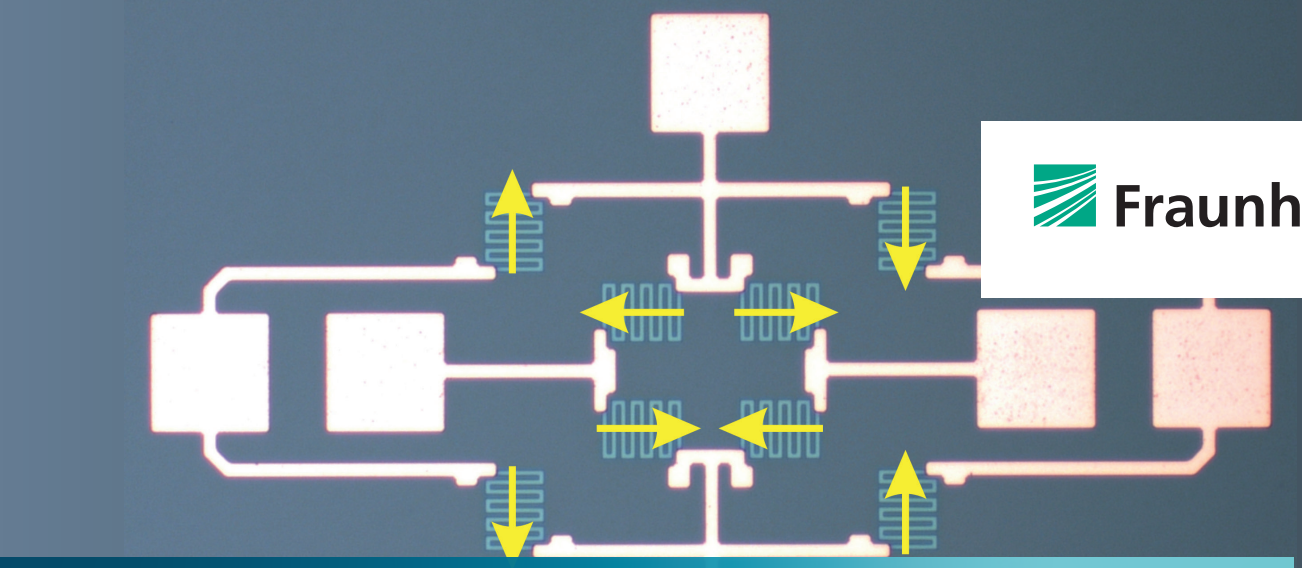


Fraunhofer ENAS

Component

Monolithic Integrated 2D Magnetic Field Sensors

Fast Facts

- Contact-free
- No wear and tear
- Harsh environments (e.g. dust, moisture, radiation, temperature)
- Small component size
- Customized magnetic properties
- Application specific design

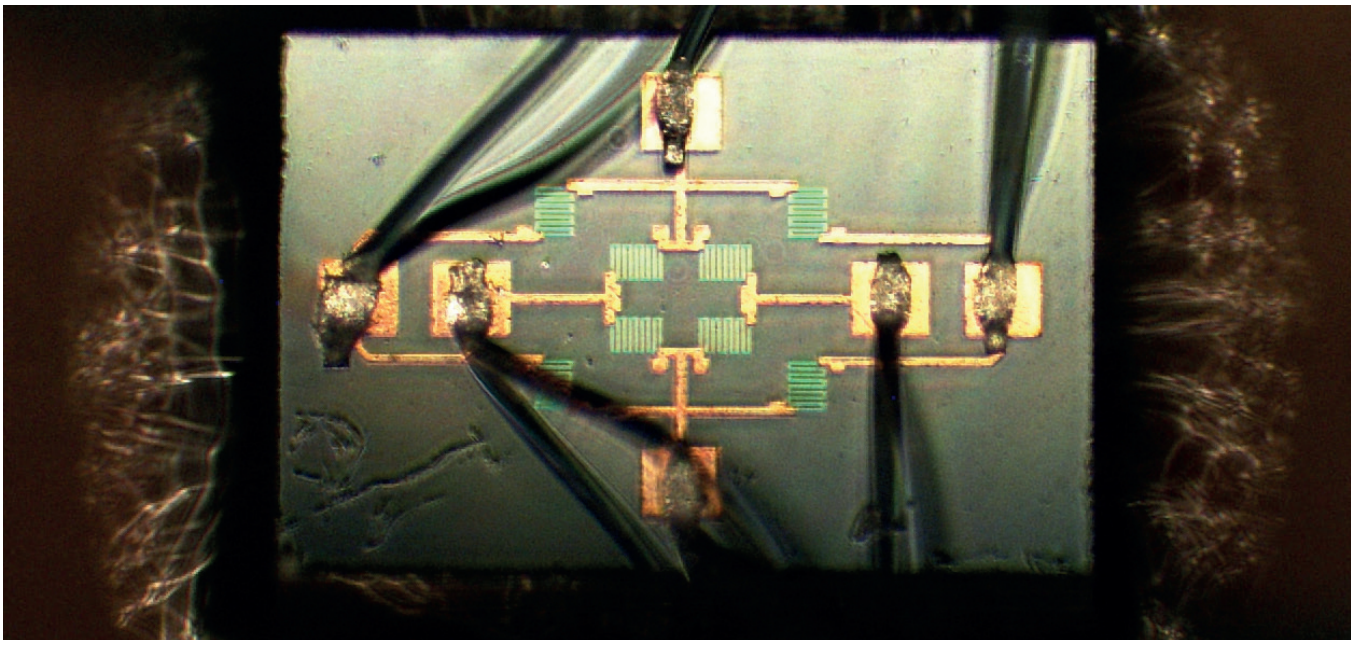
General Description

Magnetic field sensors work contact-free and without producing wear and tear, are resistant to temperature effects and chemical degradation, and also have a low component size. They have now been in use for a few years in mobile navigation – in the form of electronic compasses. The giant magneto-resistance (GMR) effect offers excellent prerequisites to satisfy the industrial demand for greater miniaturization, better energy efficiency, and increased precision and resolution.

At the Fraunhofer ENAS two-dimensional magnetic field sensors based on GMR spin valves have been manufactured in monolithical integration. The layer stack used for this purpose comprises ultra-thin metal films with thicknesses in the nano- and subnanometer range that are subject to customized magnetic coupling. The sensors are manufactured starting with a single wafer onto which individual meanders are structured geometrically using microtechnological etching processes. Each sensor consist of eight of these individual meanders, which form two Wheatstone bridges connected in parallel and possess individual magnetic sensitivity axes. Neighboring meanders have anti-parallel magnetic axes and the individual bridges are turned at 90° to each other. On the one hand, the signal-to-noise ratio in the dimension in question is maximized and, on the other hand, 2D sensitivity is attained. This individual magnetization is accomplished by means of a microscopically resolved, local laser manipulation and was developed jointly by Fraunhofer ENAS and the Laser Institute at the Mittweida University of Applied Sciences.

Suggested Applications

- Smart systems
- Position and distance sensor
- Angle sensor
- Current sensor
- E-compass
- Switches



Specifications

Parameter	Value
Working range	up to 90 mT
Supply voltage	3 V – 5 V usually
Bridge resistance	kΩ range
Sampling rate	up to MHz
Die size	< 1 mm³
Operating ambient temperature	–40 °C ... + 150 °C

In cooperation with

ZfM Zentrum für Mikrotechnologien

TECHNISCHE UNIVERSITÄT CHEMNITZ

HOCHSCHULE MITTWEIDA UNIVERSITY OF APPLIED SCIENCES

Fraunhofer ENAS is part of

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Photo acknowledgments: Fraunhofer ENAS