

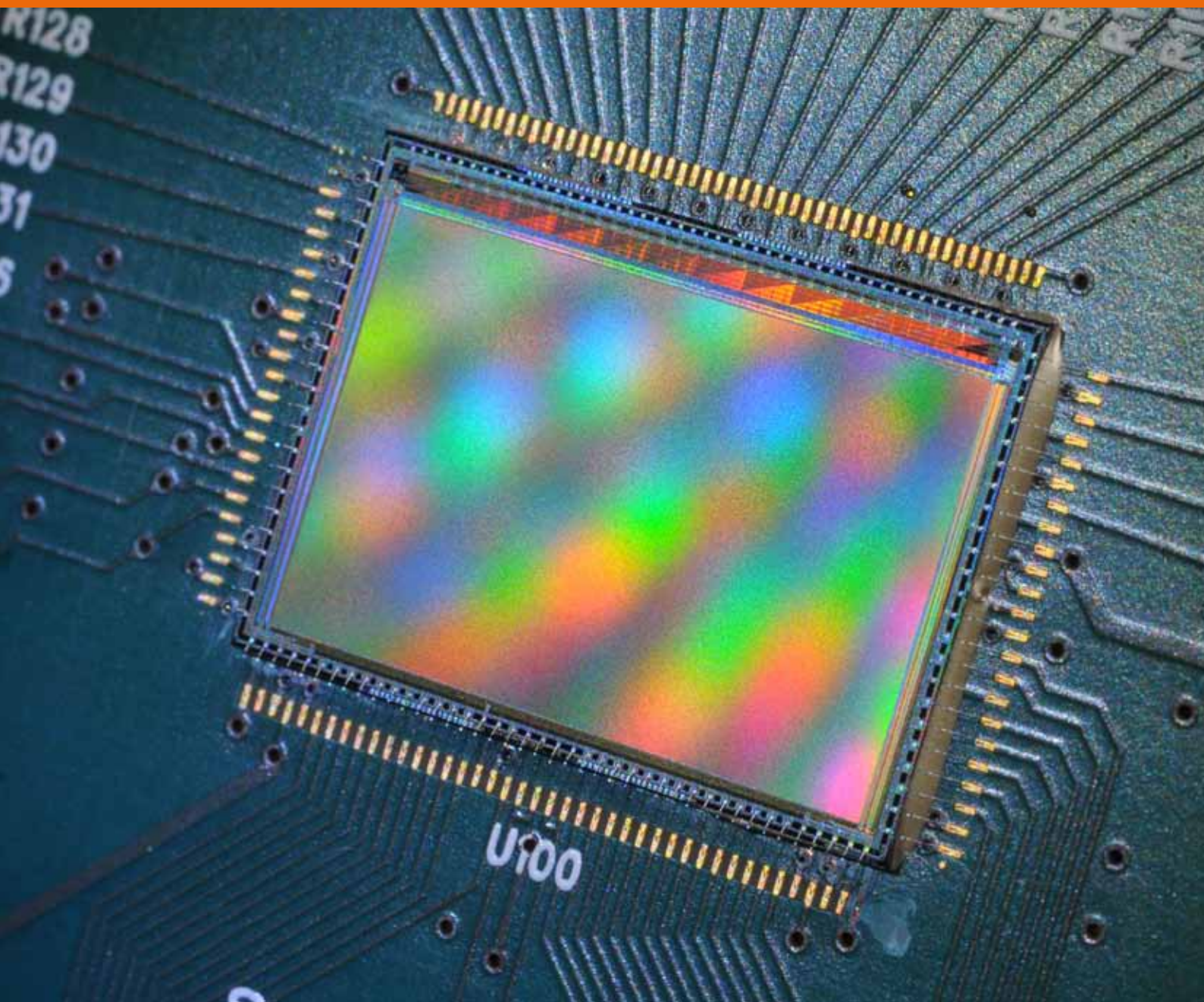


Fraunhofer

IIS

FRAUNHOFER-INSTITUTE FOR INTEGRATED CIRCUITS IIS

INTEGRATED CIRCUITS AND SYSTEMS – ICS



„FROM AN IDEA TO A FINISHED PRODUCT“

WE ARE:

- CUSTOMER-ORIENTED**
- PROFESSIONAL**
- TIME-TO-MARKET-FOCUSED**
- NETWORKED**

WE OFFER:

- SYSTEM SOLUTIONS**
- FEASIBILITY STUDIES**
- IC AND SYSTEM DESIGN**
- SUPPORT FOR SMALL-SERIES PRODUCTION**



AREAS OF EXPERTISE:

EMBEDDED SENSORS

SOC & ASIC DESIGN

COMMUNICATION TECHNOLOGY

RF AND MICROWAVE

WIRELESS TECHNOLOGIES

ENERGY EFFICIENCY

**MEASUREMENT AND CONTROL
TECHNOLOGY**

AUTOMOTIVE

NANO-OPTIC SENSORS

CMOS IMAGE SENSORS



EMBEDDED SENSORS

HallinOne® – robuster than ever

HallinOne® magnetic field sensors control a contact-free joystick sensor from Datatec, regardless of any external fields. They allow for robust and long-term control of construction machinery.

We can offer you complete solutions for intelligent integrated sensor systems.

Embedded sensor systems for you:

- 3D magnetic field sensors
- Imaging sensors with photo and color sensing
- Current sensing
- Optical sensing
- Signal processing
- Position sensing

Embedded sensors are a focus of mixed-signal ASICs within standard CMOS technology.

SOC & ASIC DESIGN

Top technology for navigational precision

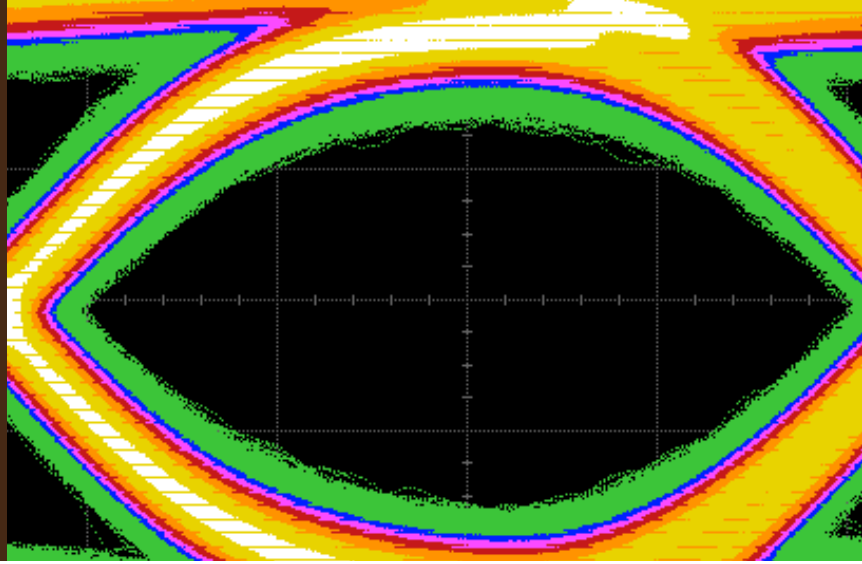
The HIGAPS II GPS Galileo Glonass satellite navigation system combines three navigation standards. It contains two 32-bit microprocessors, 2.1 million gates, 3-Mbit RAM in 90-nm CMOS ASIC technology.

We are the right people to talk to about everything from system development to chip design. Our customer-specific SOC developments include single- and multi-chip solutions as well as "system in package" (SiP).

SOC & ASIC design for you:

- Turn-key design in nanometer technology (180, 90, 65, 40 nm)
- Single- and multi-chip solutions

We can realize multi-gigabit data transmission for robust automotive and industry systems, or complex mixed-signal ASICs for industry and automation.



COMMUNICATION TECHNOLOGY

With our help, you can realize ASICs for analog and digital technology, telecommunications, and digital media. Our range comprises ASICs for wireless networks, for wired networks, and for optical technologies.

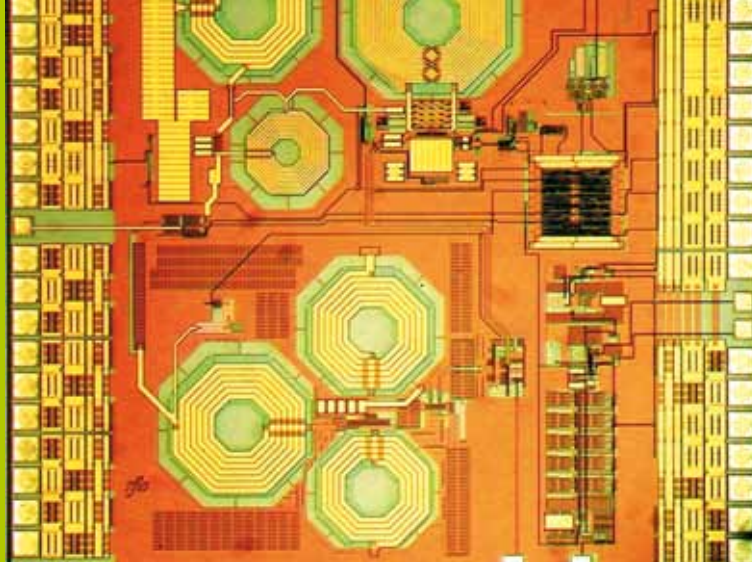
Communication ASICs for you:

- Integrated equalizers and power coding
- High-speed ASICs
- RF ASICs
- High-performance RF ASICs

Video and multimedia applications demand higher and higher data rates. Transmission with conventional cables is becoming more and more difficult. This is why Fraunhofer investigated various equalizer concepts and combinations thereof to transmit at data rates of 1.25 Gbit/s and 3.3 Gbit/s, and implemented them in CMOS technology.

Fast data transporter

Automotive Pixel Link APIX2 is a high-speed bus system that transmits large volumes of data at high speed via a 2-cable connection. Video and peripheral data for displays and camera applications can be transmitted at rates of up to 3 Gbit/s. APIX2 is a joint development with semiconductor manufacturer Inova Semiconductors GmbH, and it is used in automotive technology.



RF AND MICROWAVE

Silicon-based radar system

Microwave ASICs up to a frequency range of 60 GHz are currently being developed in preliminary projects at Fraunhofer IIS. They form the basis for cost-efficient silicon-based radar and sensor applications.

Within application-specific integrated RF circuits (RFIC), our focus is on the range of frequencies between a few 100 MHz and 60 GHz. The circuits are manufactured within ultra-modern silicon and GaAs technologies from commercial semiconductor producers.

RF and microwave IC design for you:

- High-efficiency wireless
- High-performance RF ASICs
- Microwave ASICs in silicon

As an independent design house, we select the most suitable semiconductor technology according to technical and economic criteria.

WIRELESS TECHNOLOGIES

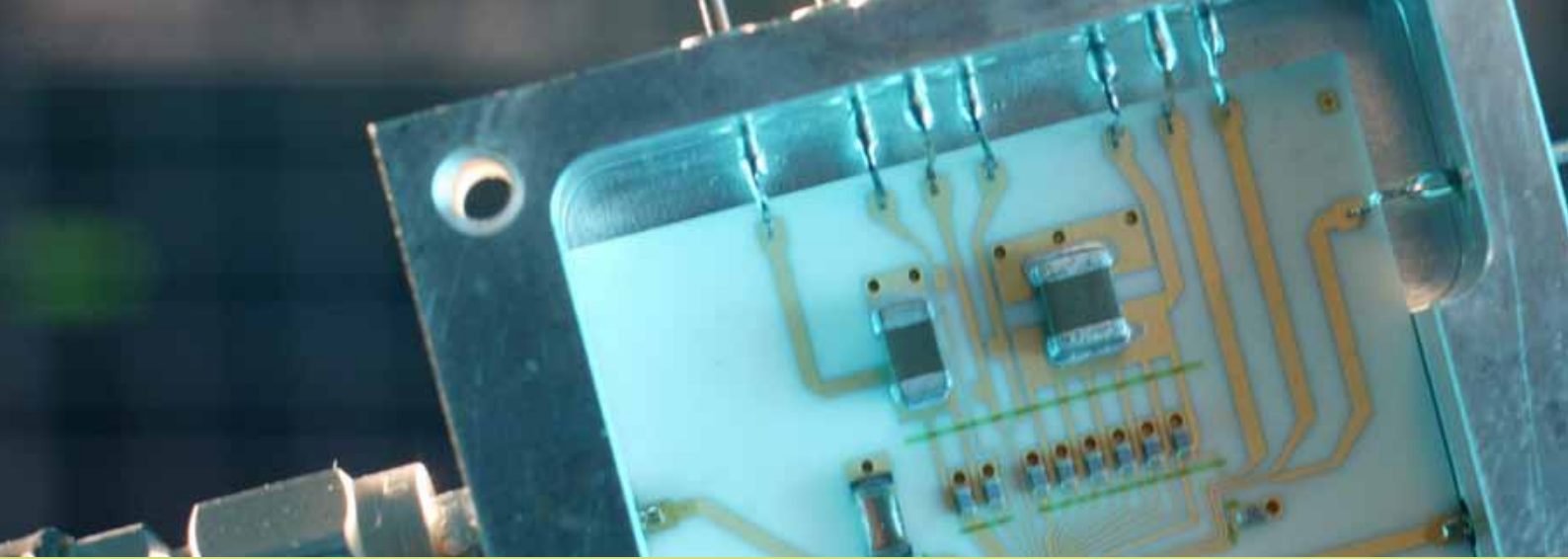
And it runs and runs

Wake-up receivers increase the operating time and reduce the reaction time of wireless sensor networks. With power consumption of only 10 μ A at 3 V operational voltage, the wake-up receiver developed at Fraunhofer IIS allows battery-operated radio applications to run for up to ten years.

You can realize integrated transceivers for distance maintenance, status monitoring, and telemetry with our power-saving solutions. These transceivers are ideal for low-maintenance long-term applications.

Our wireless transceiver solutions operate for the most part within license-free ISM bands at 433 MHz, 868 MHz, 915 MHz and 2.4 GHz.

Integrated transceivers are the key to the best possible flexibility and interference immunity. Wireless data transmission allows sensors to be placed in locations that are hard to reach with electric wires. Broken wires or rusted contacts will become a thing of the past.



ENERGY EFFICIENCY

Our energy efficiency solutions include wireless power capture at devices, collection and evaluation of sensor data and self-organizing networks equipped with wake-up circuits.

Energy-efficiency for you:

- Complex digital design in submicron and deep submicron
- Mixed-signal design such as AD converters (ADU), motor control, sensor-signal processing, and RF
- Manufacture of very small ASIC batches

You can use our ASICs to reduce your product's energy consumption. Continuous power monitoring and immediate consumption information as well as early detection of faults make efficient energy management much easier.

Turn everything down to low!

Optimized circuits and system architectures for low-power ICs can operate at supply voltages below 1 V. Low-power and low-voltage design allow alternative energy supplies, such as solar cells, to be used.



MEASUREMENT AND CONTROL TECHNOLOGY

ASIC regulates drive

The 5 V CMOS ASIC comprises five 14-bit SD ADCs to measure to phase currents, motor voltage, and the temperature of the power electronics and the electric motor. A short-circuit protector and overvoltage protection circuit are integrated. Two additional 14-bit ADCs and two 11-bit DACs are planned to cover other control functions.

We offer integrated circuits for measuring, control, and regulation technology in the form of complex mixed-signal systems, high-definition AD converters, signal capturers, low-noise amplification and signal-filtering technology. The devices are produced in industrial CMOS and BiCMOS standard technologies with structure widths of up to 65 nm.

ASICs for you:

- AD converters
- Intelligent sensor systems
- Low-power, low-voltage design
- System-level design
- Smart-power design
- Evaluation circuit for capacitive sensing

We carry out fundamental research in the areas listed above. We use system simulations with AHDL/VHDL and mixed-signal simulations with SPECTRE-Verilog in our design process.

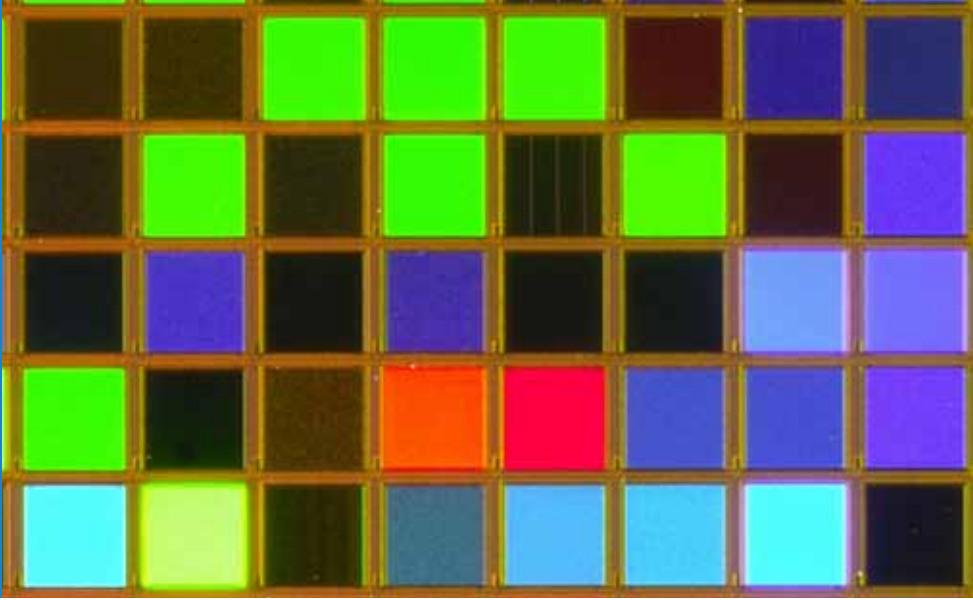
AUTOMOTIVE

Nothing gets stuck

The contact-free anti-entrapment function prevents accidents with motorized door and window openers. The measuring process detects the tiniest capacitive field changes in the fF range, such as those that occur when a body part or object approaches. The closing movement is stopped before someone or something is trapped.

Our circuits for highly robust ASICs offer you very precise and reliable evaluation of measured values and signals. Fraunhofer IIS is a leading IC design house for digital and mixed-signal ASICs, and can offer a wide-range spectrum of expertise. Our know-how in system integration is one of our outstanding core skills.

- Driver assistance camera
- APIX bus system
- Battery power sensing



NANO-OPTIC SENSORS

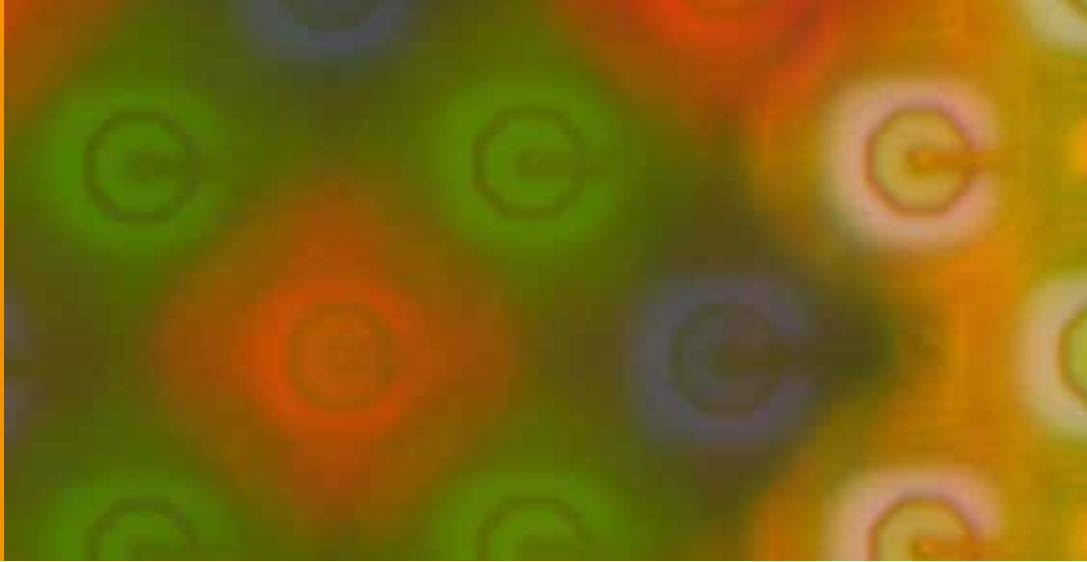
Sensors with optical functionality offer you various options for use. Integrated spectral sensors, for example, monitor and regulate LEDs for lighting situations. Integrated polarization sensors detect manufacturing errors in glasses.

We use the nanostructuring of metal layers in CMOS technologies to obtain optical functionality. In this way, the usual photo sensors have additional functions such as color or polarization sensitivity. This approach makes it possible to set the spectral function of a filter simply by structuring a metal layer laterally with a constant layer thickness. Periodically arranged hole structures, in particular, play a role in color sensors. The sensors can also be arranged in rows or in arrays, as required. This makes multispectral sensors possible.

In a similar manner to the realization of color filters, line grids with a polarization-selective effect can be realized. A pixel-by-pixel arrangement of polarization sensors makes it possible to build polarization image sensors. This means that the Stokes vector in every pixel can be determined, which represents a dimension for polarization. This technique was used at Fraunhofer IIS to develop a polarization camera that won second place at the Embedded Award 2011.

Caution, ice!

The polarization camera PolKa is based on a sensor that detects vibrations of light on a pixel-by-pixel basis. The PolKa is suitable for non-destructive testing. The camera can also distinguish between dry road surfaces and wet or frozen ones. It can be fitted in cars or be used to detect black ice at airports.



CMOS IMAGE SENSORS

Small shape factors

Applications with a small installation space, e.g. in endoscopy, require special sensors. Pixels with read-out transistors of several photo diodes ("shared pixel") allow high image definition.

We can offer you CMOS image sensors with a special shape factor. These include very small image sensors with an edge length below 1 mm. We also produce image sensors for industrial imaging with high definition and a high recording speed of 1000 fps.

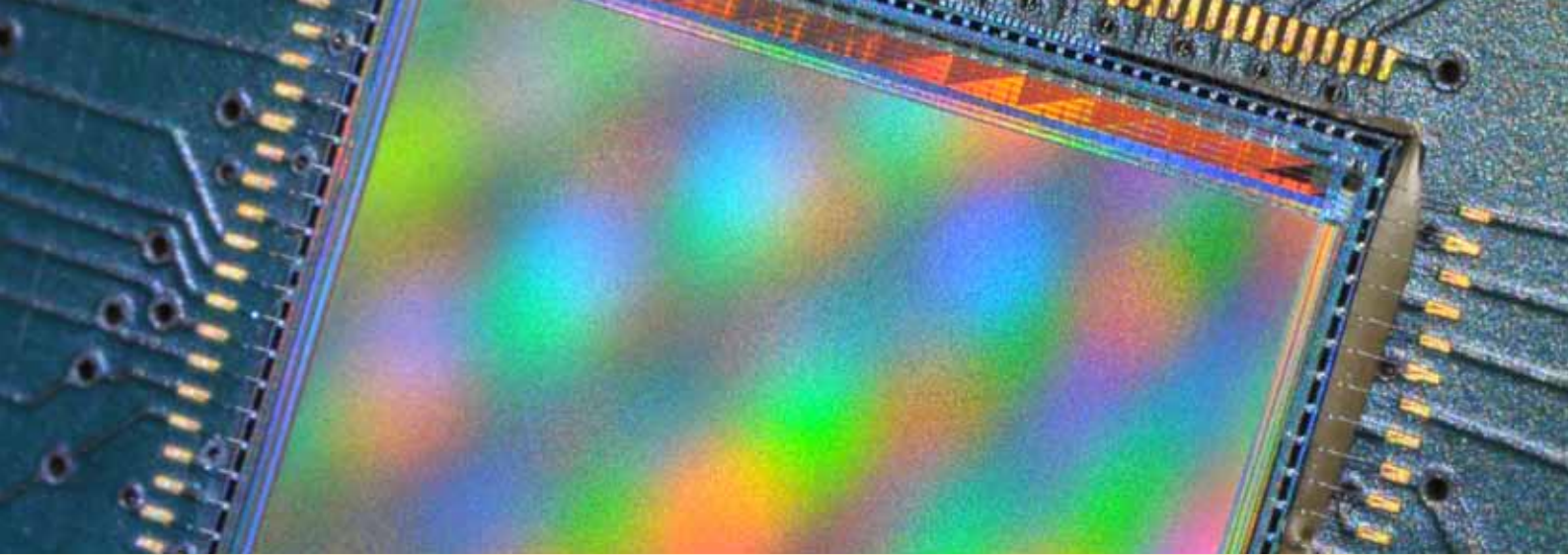
You will benefit from our networking with our departments at Fraunhofer IIS and various manufacturers. Expansions of standard CMOS processes, for example, make high light-sensitivity and very low dark currents. "Pinned photodiodes" result in low-noise sensors.

In conjunction with the Development Center for X-ray Technology (EZRT), a department of Fraunhofer IIS, fast x-ray sensors are being developed (300 frames per second).

Specially adapted AD converters for image sensors are a focus of our research.

CMOS imagers for you:

- Special shape factor
- Sensors with short edge length
- X-ray technology
- Fast image sensors



RESEARCH AND DEVELOPMENT RANGE

The Fraunhofer Institute for Integrated Circuits IIS offers IC design independent of technology and manufacturers.

Our customers benefit from our long-time experience in the areas of multimedia, digital communication, image processing, and sensor systems. Our technology know-how covers the range from CMOS, BiCMOS, and SiGe to GaAs.

The IC design activities at Fraunhofer IIS comprise complex digital design such as submicron and deep submicron as well as mixed-signal design such as AD converters, motor control, sensor signal processing and RF.

Our Virtual ASIC Foundry offers small volume and prototyping.

Fraunhofer IIS is one of Europe's leading IC design facilities.

A SELECTION OF INDUSTRIAL PARTNERS WITH WHOM WE HAVE WORKED FOR MANY YEARS:

- AUSTRIAMICROSYSTEMS AMS AG
 - BALLUFF GMBH
 - DELTATECH CONTROLS
 - INOVA SEMICONDUCTORS GMBH
 - MARQUARDT GMBH
 - MICRO-EPSILON MESSTECHNIK GMBH
 - SEUFFER GMBH & CO. KG
 - ROHDE & SCHWARZ GMBH & CO. KG
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