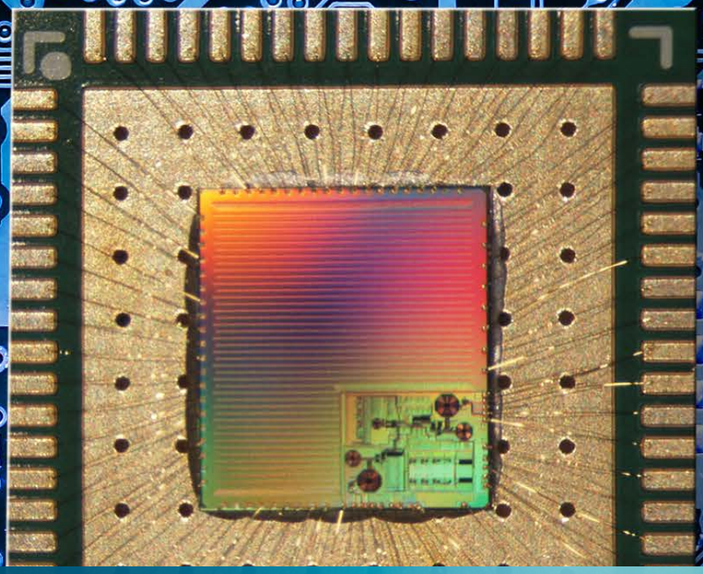
Fraunhofer
IIS

Fraunhofer Institute for
Integrated Circuits IIS



Integrated Circuits and Systems

Fraunhofer Institute for Integrated Circuits IIS

Management of the institute
Prof. Albert Heuberger (executive)
Prof. Bernhard Grill
Prof. Alexander Martin

Am Wolfsmantel 33
91058 Erlangen, Germany
Phone +49 9131 776-0
info@iis.fraunhofer.de
www.iis.fraunhofer.de

Contact
Phone +49 9131 776-4401
ic-design@iis.fraunhofer.de

www.iis.fraunhofer.de/ic-design

Range of Research and Development Services

Specification engineering

- Development of optimal ASIC requirements specification
- System and feasibility studies to provide insight into critical parameters and necessary functionality
- Development of implementation specifications
- Risk analysis, accurate NRE- and chip cost estimations, time plan
- CMOS process selection with Fraunhofer IIS operating fab-less and fab-independent

ASIC and system design

- Established design flow to avoid redesigns and to reduce development costs and time
- Detailed evaluation before transfer to volume production
- Production test planning and FMEA
- Design according to common standards in different sectors

IP development and reuse

- Use and reuse of silicon proven circuit blocks for reduction of project risks
- Design of circuit blocks with special requirements for different CMOS foundries and technologies from 0.8 µm to 22 nm
- Cooperation in shared designs, partitioning and provision of analog, mixed signal or digital IP

Transfer to production

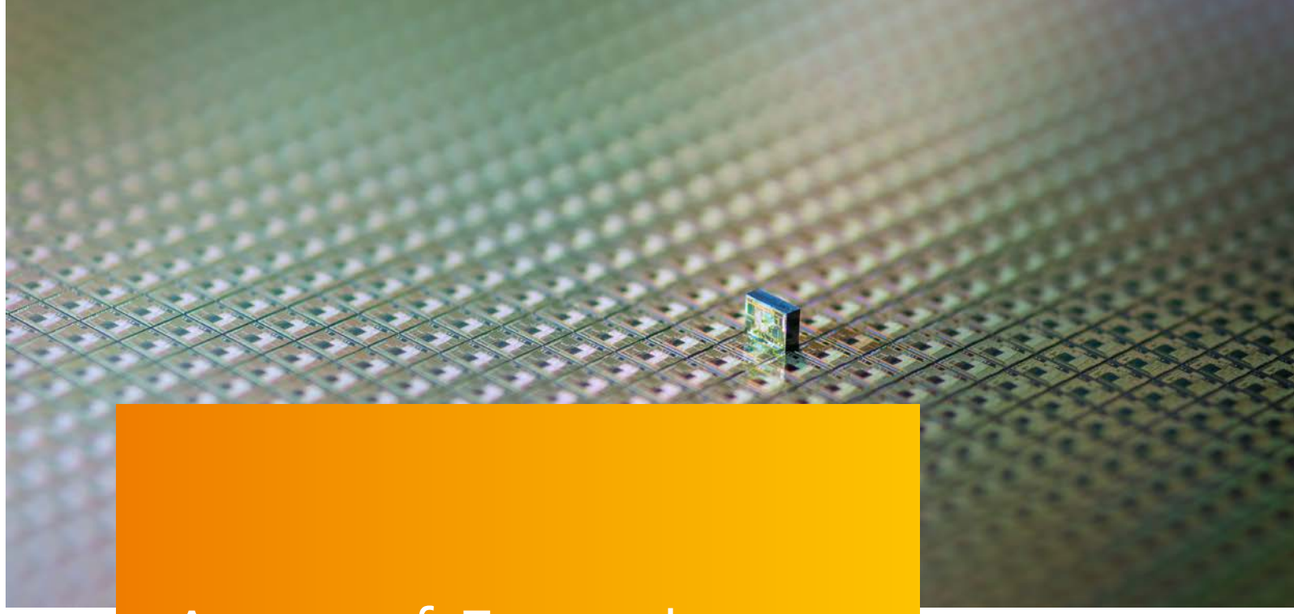
- Development of production test specification and qualification plan
- Selection of qualification and test service provider
- Support for test implementation
- Data analysis

Supply chain management

- Establishment of supply chain with different commercial CMOS foundries, test and packaging partners
- Provision of small volume production and prototype services

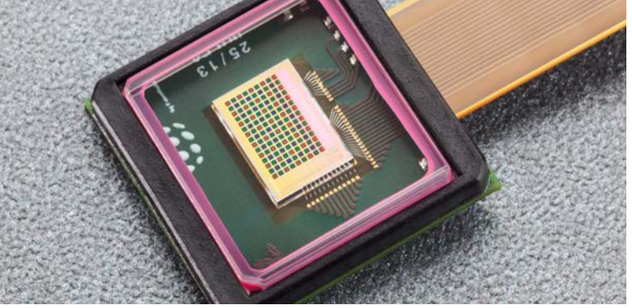
Access to public funding

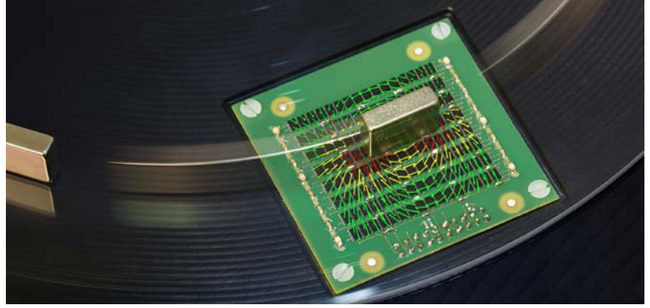
- Independent and unbiased solutions
- Easy access to public funding for scientific pre-competitive research projects



Areas of Expertise

- Optical and Image Sensors
- 3D Magnetic Field Sensors
- RFIC
- Mixed-Signal ASICS and Sensor Interfaces
- SoC and ASIC Design
- Communication Technology
- Virtual ASIC Foundry
- IP Core Development and Services





Applications

- Precise ambient light color control
- Low cost spectrometer for sorting and inspection
- Smart farming
- Multi-aperture camera systems
- Systems for distance and vehicle-environment monitoring
- 3D mapping
- Endoscopy

Optical and Image Sensors

We develop application-specific optical sensors and image sensors. Our ASICs feature integrated color and polarization filters, photodiodes of different kind, analog and digital signal processing and communication interfaces.

Customer benefits of sensors with optical nanostructures

- Low production cost – independent from number of optical channels
- High temperature capability
- No drift, ageing or bleaching

Customer benefits of application specific image sensors

- Realization of unusual shapes and geometries
- Replacement of discontinued products
- Specific solutions for prototypes or low volume
- Realization of micro lens arrays or other non-standard optical systems
- Customer IP protection in shared designs

Applications

- Rotation angle and linear position measurement technology
- Multi-dimensional position measurement systems
- Measurement technology
- Current sensors

3D Magnetic Field Sensors

Our integrated 3D Hall sensors measure the magnetic field using a single sensor chip. The integration of sensors together with analog and digital signal processing allow for small systems and ensure low-noise operation, high precision and the use of complex functions and algorithms. Sources for the magnetic field can be permanent or electrical magnets or electrical current flowing in a wire. Thus, our technology determines values like position, vibrations, angle or current and power – contactless and free of mechanical wear.

Customer benefits

- High-immunity systems, independent of temperature and external stray fields
- Low-cost series test and a minimum of drift with age
- Suitable for safety-critical applications due to self-testing capabilities
- Low-cost production of large quantities in standard CMOS technology
- System development services: selection and dimensioning of magnetic sources and geometries

RFIC

Within application-specifc integrated RF circuits, our focus is on the range of frequencies between a few 100 MHz and 20 GHz. The circuits are manufactured in commercial semiconductor technologies from 130 nm CMOS to 22 nm FD-SOI.

RF and microwave IC design

- ASICs and IPs for professional applications
- Ultra-low power receiver technology RFicient®
  - WakeUp Receiver: IP, ASIC and standalone chip
  - RF Sensors: Frequency scanner and radio standard detector

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

Application example RFicient® Ultra-low power receiver technology

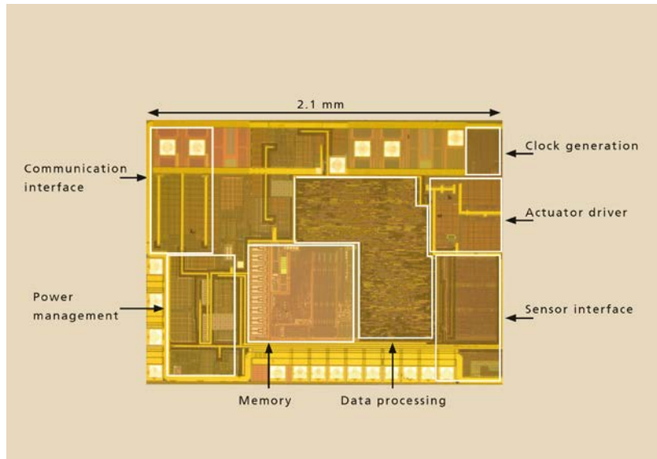
WakeUp Receivers increase the operating time and reduce the reaction time of wireless sensor networks. With current consumption of only 2.5 µA the wake-up receiver developed at Fraunhofer IIS allows battery-operated radio applications to run for up to ten years.

Mixed-Signal ASICs and sensor interfaces

In mixed-signal ASICs two worlds are combined: application optimized high performance analog circuits with extensive digital signal processing. By using additional integrated high voltage electronics, selected A/D converters or power management circuits countless functions can be realized on a single chip. The combination of our IC development experience and sensor system know-how allows us to explore your application specific benefits of an integrated circuit solution. System and requirement analysis in close cooperation with our customers enables us to present the best partitioning and integration strategy for your system ideas and solutions.

Customer benefits

- Reduced system size
- Low power consumption
- Optimized performance due to perfect application adaption
- Knowledge protection by integration and certification functions
- Developed in CMOS technology: reduced cost at large volume



Applications

- Sensor interfaces for capacitive, resistive, inductive, and charge-based sensors
- Drivers
- Converters
- Communications interfaces
- Power management solutions

Application example
Top technology for industrial sensor data fusion systems

The Universal Sensor Platform USeP SoC delivers industrial interfaces and processing power with 1 + 8 32-bit RISC-V cores for data preprocessing and communication including a secure data zone. The right mix for next generation edge computing.

SoC and ASIC Design

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 and ASIC design

- Turn-key design in nanometer technology (180, 90, 65, 40, 28 nm CMOS, 22 nm FD-SOI)
- Single- and multi-chip solutions
- RISC-V based designs: single- and multi-core
- High-performance accelerators for high-performance computing and deep learning applications

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

Application example
Fast data transporter

Automotive Pixel Link APIX® is a high-speed bus system that transmits large volumes of data via a 2-cable connection. Video and peripheral data for displays and camera applications can be transmitted at rates of up to 6 Gbit/s. APIX® is a joint development with semiconductor manufacturer Inova Semiconductors GmbH and it is deployed with 100+ million nodes on the road.

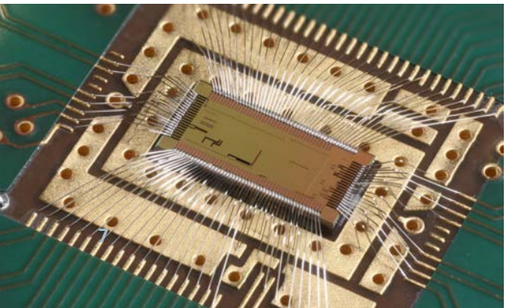
Communication Technology

With our support, 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, ranging from kbit/s ULP RF wakeup receivers to ASICs for 1 Tbit/s optical transmitters.

Communication ASICs

- Integrated equalizers and error correction coding
- High-speed 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 IIS has investigated and develops various equalizer concepts and combinations for data rates from 10 Mbit/s to 16 Gbit/s. With a focus on CMOS technologies from 350 nm to 22 nm and lower, we are proficient in analog SerDes as well as mixed-signal and heavy DSP designs.

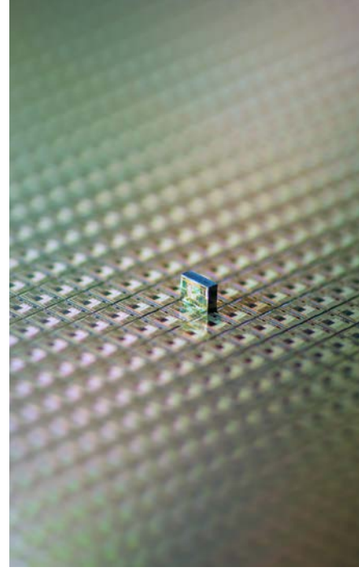


Virtual ASIC Foundry

Our Virtual ASIC Foundry offers the entire design flow: design kits of various semiconductor manufacturers for analog, digital and mixed-signal designs as well as the option of ASIC production in very small volumes. Fraunhofer IIS has specialized in offering ASICs in small volume and gives therefore small and medium enterprises access to commercial semiconductor technologies. Packaged and tested ASICs are available in quantities of a few hundred.

Service portfolio

- Access to PDKs
- ASIC prototypes
- ASICs in small volume
- Supply chain management for small volume (assembly, test, delivery)



From prototype to small volume

The EUROPRACTICE IC Service offers European industry and academic institutions a safe path toward ASICs.

IP Core Development and Services

In the development of ASIC and SoC solutions, IPs and macros reduce the development time, design risk and costs. As an independent design house, we can offer our customers solutions tailored to their requirements. In addition, we enable fast and reliable integration of our IPs into the desired overall system. Our customers benefit from a wide variety of silicon proven IPs which were created as part of our project work over many years. Our special know-how helps us to support our partners’ projects for safety-relevant applications as well as for applications at elevated temperatures.

Service portfolio

- Customized adaptation to improve the performance of your system
- Quick integration into overall system
- Development of IPs in desired technology
- High reliability thanks to silicon proven IPs
- Fast availability of IPs

Selection of available IP-Cores

- ADC
- DAC
- PLL
- Ultra-low power receiver
- Sensor interfaces
- Digital functions