Fraunhofer
IMS

Smart sensor solutions

Building a safe, secure, and sustainable future with Smart Sensor Systems

We create customized solutions for manifold microelectronics

In numerous state-of-the-art research laboratories, we work with more than 250 talented scientific employees and students on innovative microelectronic solutions. As a trusted research and development partner for industry, our goal is to develop customized sensor systems for your specific needs in the areas of biomedical sensors, optical systems, open source semiconductors, embedded AI, technology services, and even quantum technology.

The teams in the four business units – Health, Industry, Mobility, and Space and Security – are committed to implementing outstanding and versatile microelectronics that can be utilized across all your projects. For example, these solutions feature high integration capability, enormous energy efficiency and reliable functionality even under harsh conditions.

Want to become part of our team? Go to our career page here.

Glossary

ASIC	**A**pplication-**S**pecific **I**ntegrated **C**ircuit
CMOS	**C**omplementary **M**etal-**O**xide-**S**emiconductor
LiDAR	**Li**ght **D**etection **a**nd **R**anging
MEMS	**M**icro-**E**lectro-**M**echanical **S**ystems
SPAD	**S**ingle **P**hoton **A**valanche **D**iode
RISC-V	**R**educed **I**nstruction **S**et **C**omputers **F**ive
IoT	**I**nternet **o**f **T**hings
NRE	**N**on-**R**ecurring **E**ngineering Costs
PDK	**P**rocess **D**esign **K**it
PIC	**P**hotonic **I**ntegrated **C**ircuits
HMI	**H**uman **M**achine **I**nterface
SoC	**S**ystem **o**n **C**hip
IRFPAS	**I**nfrared **F**ocal **P**lane **A**rray **T**echnology
ANN	**A**rtificial **N**eural **N**etworks

Health

Affordable health through intelligent medicine

Highly-sensitive, smart medical sensors for care, hospitals and at home to improve prevention, diagnostics and therapy.

Industry

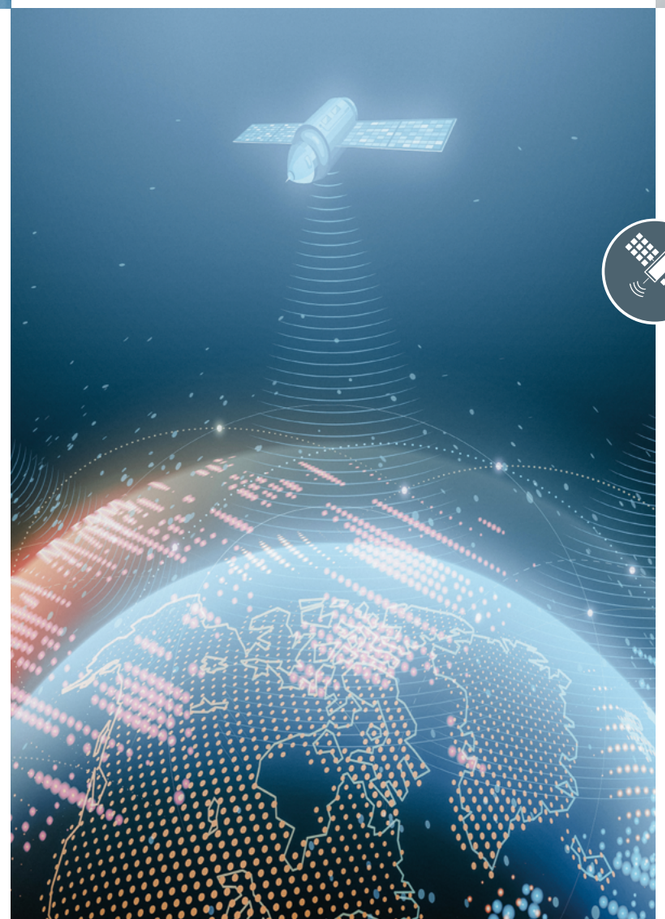
Production without downtime, emissions and cyber incidents

Smart industrial applications for industry control systems and monitoring in tough work environments to predict further work steps and make intelligent decisions.

Mobility

Sustainable and safe transportation for all users

Smart environmental detection for traffic safety, industrial robotics and environmental detection to enable a future mobility that is autonomous, smart, sustainable, and safe.



Space and Security

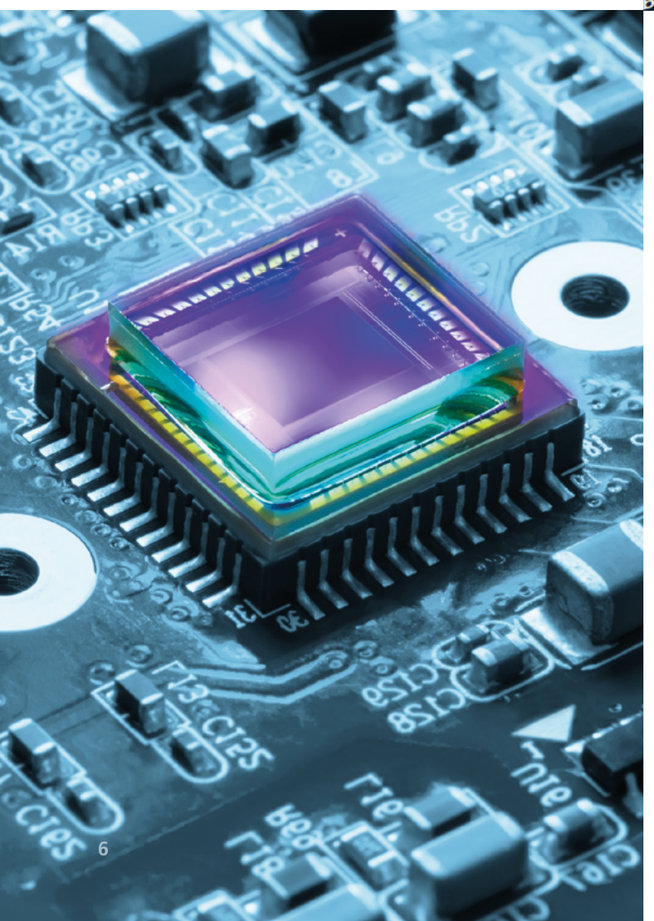
Protection from natural and human-made threats on our earth and in space

Imaging sensors for satellites and space robotics, as well as for space debris removal, to secure homes and public spaces.

Embedded Software and AI

Creating high performance AI software solutions for the next generation of smart systems

Providing easy to use and resource saving AI algorithms for small, energy efficient platforms with maximum data security.



Smart Sensor Systems

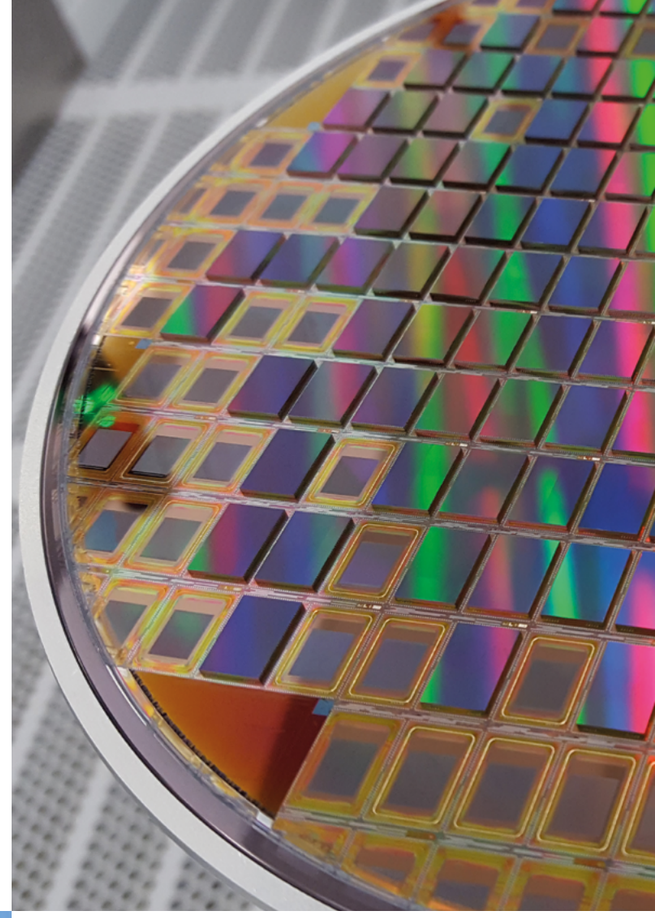
Creating the most innovative sensors for tomorrow's cutting-edge systems

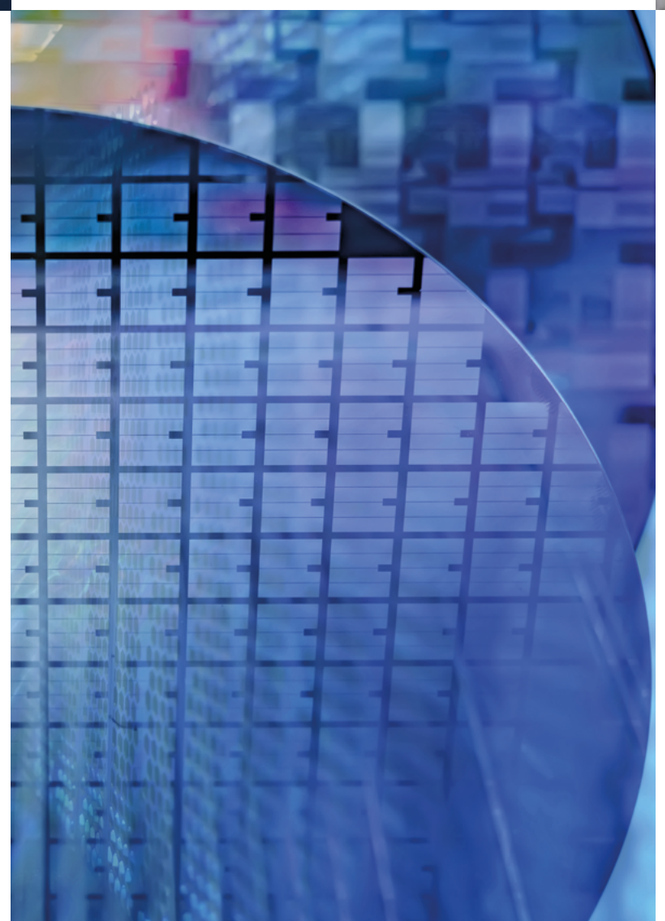
Leveraging advance research to engineer systems to be more than the sum of their parts by combining application specific sensors and intelligent readout circuits.

Technology

Enabling smart sensors through superior technology

Developing, simulating and evaluating CMOS devices, microsystems and bionanosensors with material and physical stability and possible system integration in mind creates building blocks for new systems.





Center for Sensor Technology

Transferring ideas into silicon

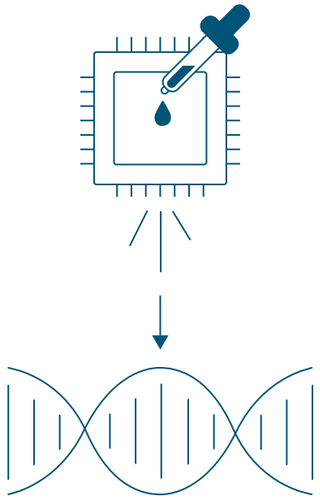
A large infrastructure and modern facilities provide the technological basis for the production and development of sensor systems including automated assembly, calibration and testing.

Smart sensor solutions

Customizable smart sensor solutions

Our technological offers and solutions for versatile solutions in Health, Industry, Mobility, Space and Security

Biomedical Sensor Systems



Single-photon optical sensor arrays
for diagnostic applications

Chip-based time-resolved single photon counting enables highly sensitive molecular detection in advanced microfluidic diagnostic systems

Technology
Optical sensor systems based on SPAD-arrays with extremely low-noise and ps-time resolution

Branche
Health

Application fields
In-vitro diagnostics, environmental testing, food testing, single cell analysis

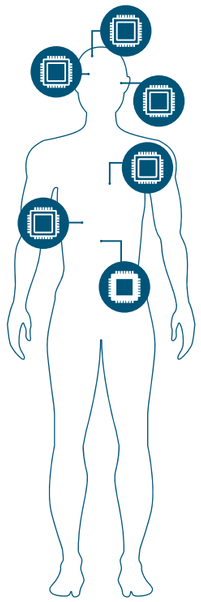
PostCMOS pressure sensor systems
for medical implants

Highly-sensitive low power pressure sensors combined with wireless readout enable next-generation closed-loop implants

Technology
Post-CMOS low power, implantable pressure sensor

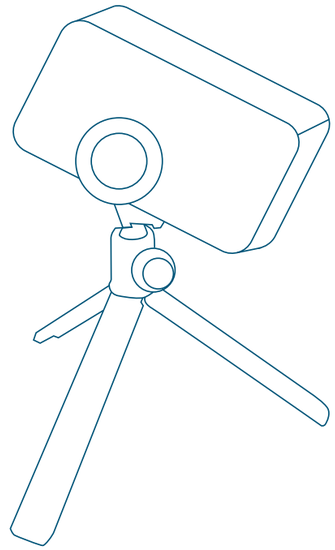
Branche
Health

Application field
Medical implants



Smart sensor solutions

Optical Imagers



3D LiDAR cameras
for a detailed and fast 3D environment detection for autonomous driving or industry monitoring

High measurement accuracy and innovative data processing (TimestampsAI) to allow closer working distances

Technology
Design of Flash LiDAR cameras for environment detection and object recognition

Branches
Mobility, Industry

Application fields
Transportation, logistics and traffic across different types of mobility, bodily integrity

LiDAR target emulator ATLAS
for comparable, virtual real tests and time-saving verification of LiDAR-based driver assistance systems

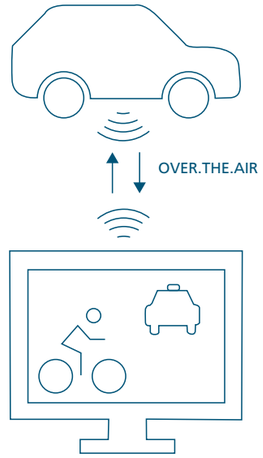
A method based on a novel concept of virtual representation of objects in real space

Technology
A physical testing by stimulated and reproducible scenarios specific for the LiDAR camera under test

Branches
Mobility, Industry, Space, Security

Application fields
Hardware-in-the-Loop tests of autonomous driver functions, generation of machine learning training data, end-of-line testing

ATLAS – Automatically Testing of LiDAR Applicative Situations



Smart sensor solutions

Open Source Semiconductors

- Industry Control Systems
- Safety & Security
- Medical Sensing
- High-speed LiDAR Data Processing

RISC-V processors with AI extension (AIRISC Family)

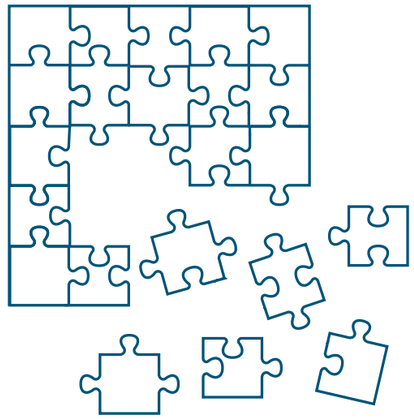
for industry control, medical sensing, safety and many more

A wide range of embedded AI applications with highly configurable and customizable RISC-V processor systems

Technology
Open-source RISC-V processor and SoC

Branches
Health, Industry, Mobility, Space, Security

Application fields
Smart patches and wearables for vital signs monitoring, power Converters, predictive maintenance, AI assisted pre-processing of LiDAR data, flight controller UAVs



IC designs based on open standards

for industrial and medical sensors

Optimal performance through domain specific and energy efficient designs based on open source hardware

Technology
Template-based rapid SoC design for signal processing tasks provides optimum performance per watt and significant reduction in development time and NRE cost

Branches
Industry, Health

Application fields
Industrial sensing, IoT, medical wearables

Add-on sensors

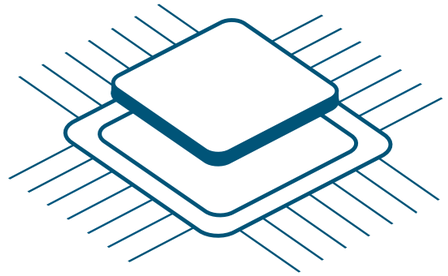
for CMOS circuits

Integration of sensors into any kind of chips, also from external fabrication

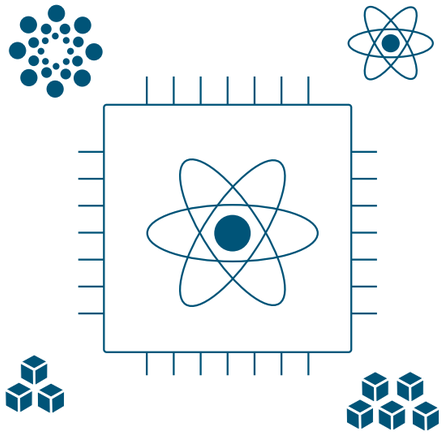
Technology
Primitive devices and IP cells for our post-CMOS SPADs, microbolometer, pressure sensors and gas sensors in popular open source PDKs

Branches
Industry, Mobility, Health, Space, Security

Application fields
Integrated pressure sensors, LiDAR detectors, uncooled IRFPAS, miniaturized and smart gas sensors



Quantum Technology



Quantum sensing
for applications and designs

Development of quantum sensing systems with high sensitivity

Technology
PIC for post-CMOS quantum-based sensors with sub-16 nm analog-, RF- and mixed signal ASIC designs

Branches
Industry, Space, Security, Health

Application fields
Bioreactors, safety sensors, point-of-care diagnostics

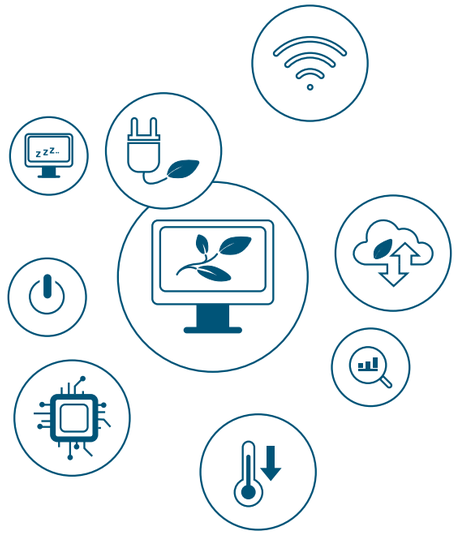
Next-generation computing and quantum-cryptography
for energy efficient computing architectures

Future-proof development of photonic components versatile systems

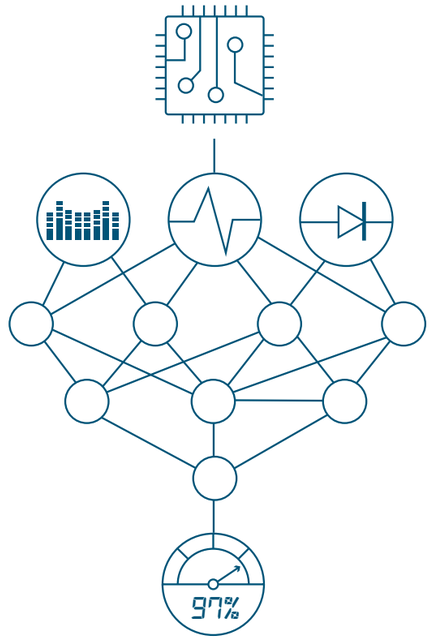
Technology
Neuromorphic computing and post-quantum cryptography accelerators

Branches
Industry, Space, Security

Application fields
Computer vision, LiDAR and robotics, security-hardened electronics



Embedded AI



Open source AI software framework
for embedded systems

Training of KNNs on almost any hardware with our open source AI software framework AIfES® (AI for Embedded Systems)

Technology
TinyML software framework for on-device training, and feature extraction on embedded Systems

Branches
Health, Industry, Mobility, Space, Security

Application fields
AI based HMIs, sensor-based condition monitoring and predictive maintenance, medical applications

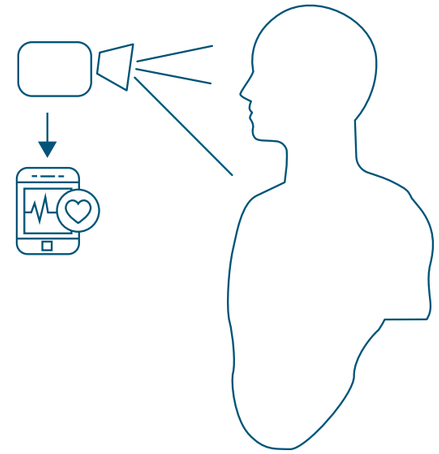
Vital parameter monitoring to ensure human safety
for AI library based extraction

Smart and affordable sensors and algorithms for contactless and energy efficient vital sign monitoring of patients, drivers or employees

Technology
AI software framework for vital parameter monitoring from sensor signals

Branches
Health, Industry, Mobility, Space, Security

Application fields
Mobile healthcare applications, self-treatment at home, driver assistance systems, safe work environments



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