Forschungsfabrik
Mikroelektronik
Deutschland

RESEARCH FAB MICROELECTRONICS GERMANY

FRAUNHOFER GROUP FOR MICROELECTRONICS IN COOPERATION WITH LEIBNIZ INSTITUTES FBH AND IHP

ONE-STOP-SHOP FOR TECHNOLOGIES AND SYSTEMS

Tailor-made R&D Services: Our Areas of Application

Digital Industry: More than Developing Products

The traditional industry sector is undergoing a rapid transition towards a digital industry caused by the megatrend digitalisation. The Research Fab Microelectronics Germany deals with this change by developing microelectronic components and systems to build up the intelligent factory of the future. Furthermore, our institutes provide tailor-made solutions to enable the digitisation process in existing factories (e.g. by sensing various manufacturing data) to increase production efficieny and to prevent machine maintenance times.

Civil Security and Occupational Safety: More than Creating a Safe and Secure Environment

Safety and security are fundamental elements of the modern digital world. The Research Fab Microelectronics Germany develops innovative technologies within this field to ensure safe and secure living and working environments for this digital world. Our experts are developing application-specific system solutions for structural and functional monitoring of machine parts and buildings, secure communication and failsafe hardware and software.

Digital Life: More than Connecting Devices

Intelligent digital services and applications build the basis of our digital life. Within the society there is an increasing demand for a broad variety of digital technologies such as VR, AR, IoT, AI and wireless communication technologies such as 5G. Our experts develop technology solutions to provide intelligent living and working environments for digitalized citizens. Examples are holography, microspeakers, personal assistants, smart homes, devices for AR applications: all together to ensure healthy and comportable spaces via microelectronic components.

For more Information, Contact our Program Managers

Christoph Galle
christoph.galle@mikroelektronik.fraunhofer.de

Health and Well-being: More than Providing Healthcare

Healthcare is facing the challenge of an aging and growing population accompanied by a trend towards urbanization.
The focus of our cross-institute work lies on the provision of decentralised and individualised solutions. Therefore our research is concentrated on smart implants in combination with compact and intelligent measuring devices.

Transport and Smart Mobility: More than Reaching Destinations

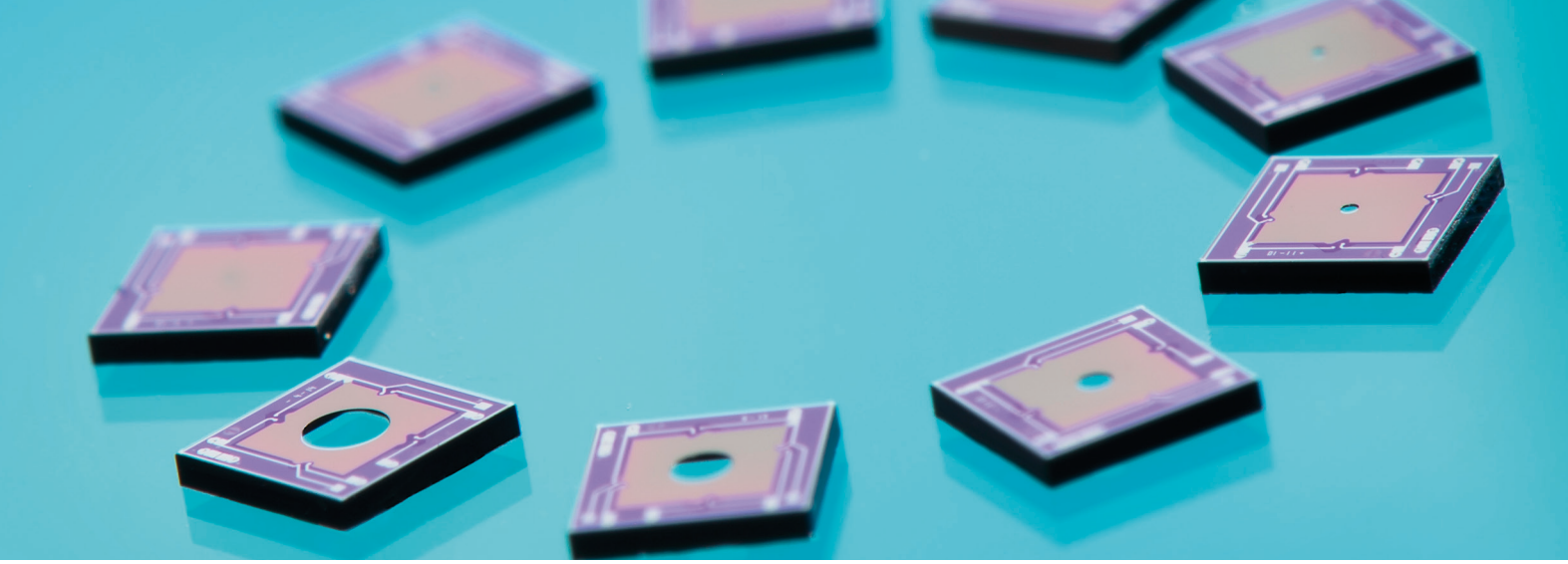
Transport and Smart Mobility are facing a fundamental process of transformation. We address this by providing solutions for electrified, connected and autonomous mobility. In the field of electromobility our experts develop intelligent drive systems and smart power electronics.
To meet the challenges in power electronics our institutes work on solutions based on wide-bandgap semiconductors as well as advanced optoelectronic devices. Furthermore, we provide ADAS sensors and systems for autonomous mobility such as LiDAR and RADAR.

Energy: More than Generating Power

The utility industry is facing a fundamental transformation. The future energy system is sustainable, decentralized, integrated and digital. The smart energy systems must balance fluctuating ressources in the grid with flexible loads from EV, prosumers and larges businesses.
The second challenge is energy efficiency in the public and private sector. Our experts have solutions for both intelligent energy systems (e.g. DC microgrids, batterymanagement, micro inverter) and for energy efficient components (e.g. energy management systems, low power IoT devices, a wide range of power electronics, energy harvester technologies in autonomous sensor networks).

Jörg Stephan
joerg.stephan@mikroelektronik.fraunhofer.de

Dr. Dietmar Laß
dietmar.lass@mikroelektronik.fraunhofer.de



Silicon-based Technologies

The technology park "Silicon-based Technologies" covers the area of silicon-based microelectronics and microsystem technology. Integrating new material systems for MEMS and NEMS sensors and actuators and combining them with CMOS processes is one of the technology park's main focuses.

These technologies allow, in particular, the development and pilot manufacturing of intelligent sensor nodes, cyber-physical systems, and hardware-oriented Industrial Internet-of-Things solutions.

The range of technologies is complemented with high-frequency-capable MEMS and SiGe elements. Within More-Moore technologies, the technology park offers a unique selection of tools for 300 mm wafer diameters, including, in particular, the development of new types of devices in the Back-End-of-Line (BEoL) segment and system integration by 3D integration technologies.

Our Key Core Competencies

- Integrating new material systems for MEMS and NEMS sensors and actuators and combining them with CMOS processes
- Development and pilot manufacturing of intelligent sensor nodes, cyber-physical systems, and hardware-oriented Industrial Internet-of-Things solutions
- High-frequency-capable MEMS and SiGe elements
- 300 mm wafer diameter based Back-End-of-Line (BEoL) devices and system integration by 3D integration technologies

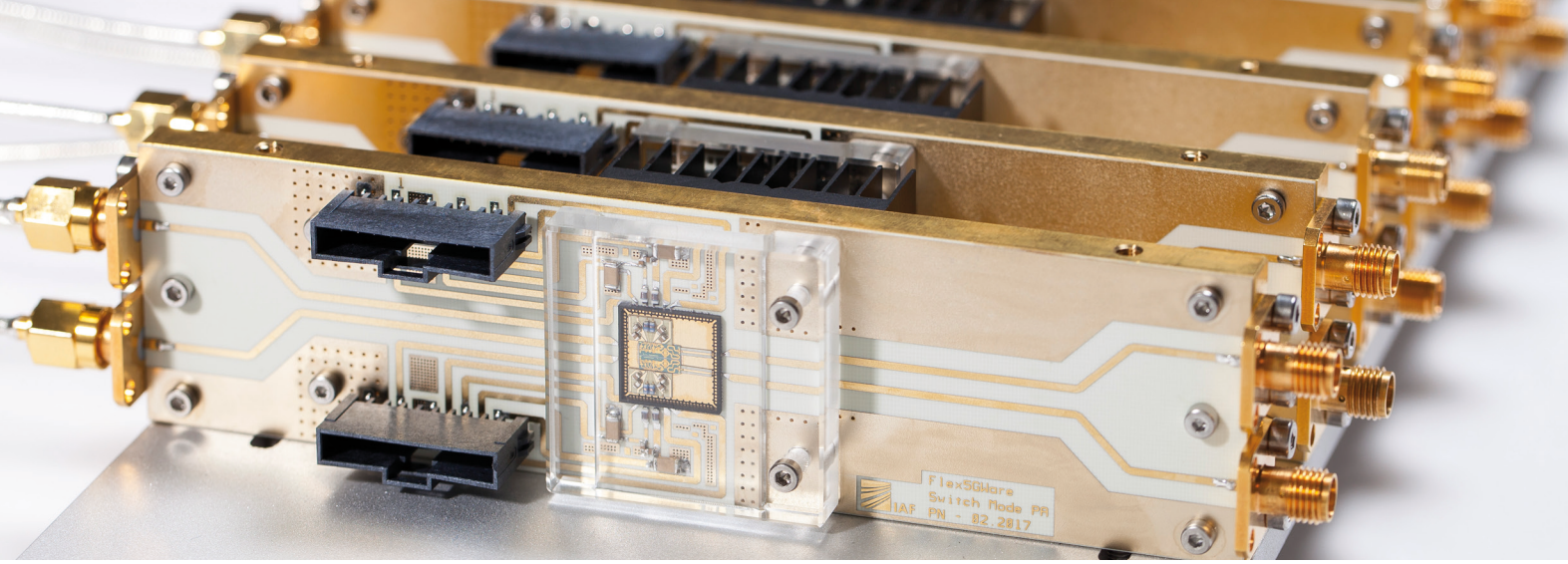
Contact

Bernd Hintze
Head of Technology Park Silicon-based Technologies

bernd.hintze@mikroelektronik.fraunhofer.de

Our Cooperating Institutes

Infrastructure and know-how in silicon-based technologies (200 / 300 mm silicon) from the Fraunhofer institutes EMFT, ENAS, IMS, IPMS, ISIT, IZM and Leibniz IHP.



Compound Semiconductors

The special properties of compound semiconductors enable the realization of leading-edge devices and circuits for frequencies of up to 800 GHz, high-power transistors based on wide-bandgap semiconductors, as well as advanced optoelectronic devices.

The role of the technology park "Compound Semiconductors" is on the one hand the provision of III-V wafers and chips for heterointegration with silicon electronics. Since compound semiconductors are not compatible with silicon-based technologies when it comes to wafer diameter and process control. On the other hand, we work on the monolithic integration of compound semiconductors in Si-based technology, which gives rise to the superior characteristics of a III-V device but on Si. Furthermore, the technology park features silicon carbide (SiC) and gallium nitride on silicon (200 mm GaN-on-Si) which can be processed both in a Si-based technology line.
This will allow customers to make practical use of the advantages offered by devices and circuits based on compound semiconductors.

Additionally, the development of special substrates such as silicon carbide (SiC) and aluminium nitride (AlN) required for next-generation power devices is driven in this technology park. Other new developments such as power electronics based on the semiconductor gallium oxide (GaO) or semiconducting diamond are being pursued well ahead of time.

Contact

Dr. Andreas Grimm
Head of Technology Park Compound Semiconductors

andreas.grimm@mikroelektronik.fraunhofer.de

Our Key Core Competencies

- High Frequency Devices and Circuits
- Optoelectronic Devices for Data Communication
- Integration of III-V Materials on Si
- Wide-bandgap Power Electronics

Our Cooperating Institutes

Fraunhofer institutes HHI and IAF as well as ISIT (200 mm GaN-on-Si), Leibniz FBH and, in the field of SiC power electronics and SiC materials research, Fraunhofer IISB.

Heterointegration

Heterointegration is the bonding of all parts and components of a system into a single functional unit – either as prototype or as finished product. When it comes to modern electronic products, this technology approach gives rise to numerous challenges: On the one hand, dissimilar technologies, feature size and materials have to be taken into account; on the other hand, handling, electrical and mechanical interconnection and protection from external influences have conflicting requirements.

We are currently experiencing a fundamental shift in the subdivision of the value chain. Interaction between parts and component manufacturers and electronic system suppliers is increasing – and with this, the complexity of technology processes.

The technology park develops and harmonizes all processing steps relevant to functional integration, which is then made available to our project partners in the form of transparent integration lines.

They can be used for anything from constructing first prototypes, to small series manufacturing, or as starting points for developing new technologies customized to one's own product range.

Our services cater to both companies and higher education institutions. We work closely with the processes of our project partners to advance product ideas, implement production chains and, where necessary, facilitate cooperation with the other technology parks.

Contact

Dr.-Ing. Stephan Guttowski
Head of Technology Park Heterointegration

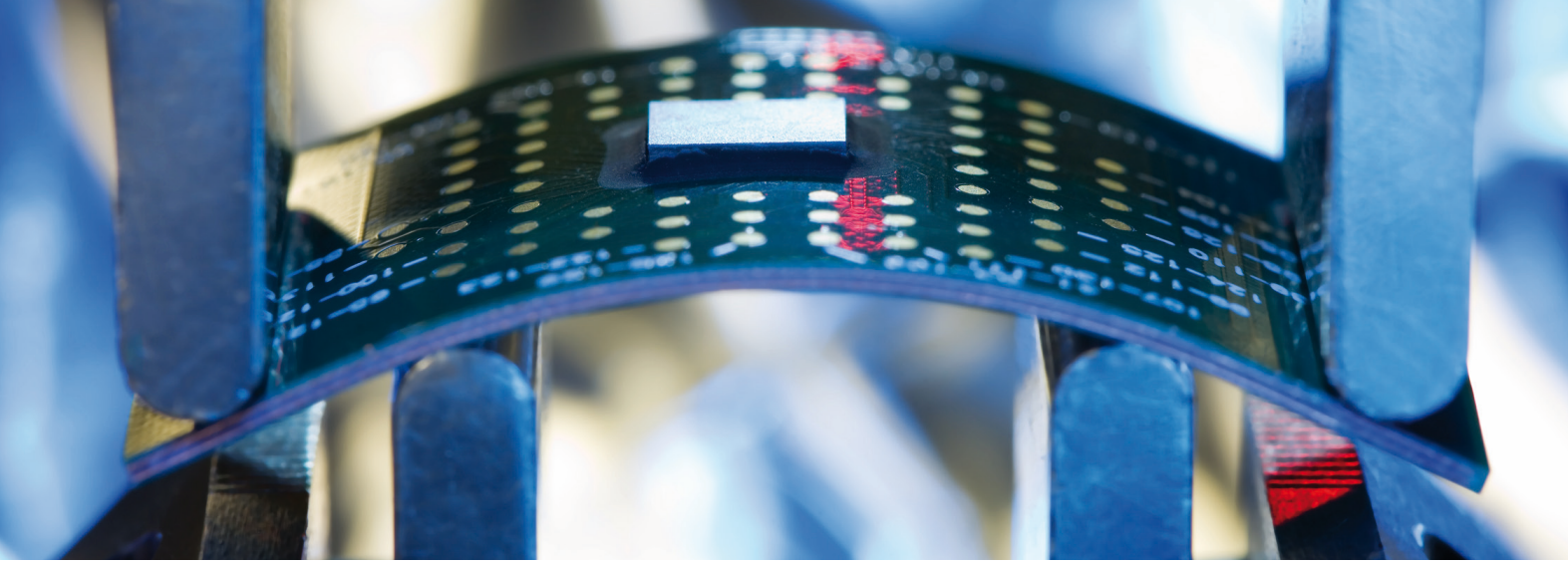
stephan.guttowski@mikroelektronik.fraunhofer.de

Our Key Core Competencies

- Packaging and interconnection including encapsulation
- Panel Level Packaging based on embedding technologies
- Substrate technologies – from rigid to flex using high-density routing systems
- Technologies needed for functional integration
- Adaptively shaped systems using multi-material packages

Our Cooperating Institutes

Infrastructure, skills and know-how of the Fraunhofer institutes EMFT, ENAS, FHR, IAF, IISB, IPMS, ISIT, IZM and the Leibniz institutes FBH and IHP.



Design, Test and Reliability

The ever-increasing complexity of microelectronic systems poses an enormous challenge for the design and the manufacturing of those systems. Novel requirements regarding energy efficiency, performance, size, and – most notably – reliability must be taken into account from the very beginning.

In the "Design, Test and Reliability" technology park, novel scientific approaches will be developed in the following focal topics in close cooperation with the other three technology parks:

- Design of systems and components in areas like sensor and actuator technology, power electronics, ultra-high frequency circuits and systems, broadband data transmission
- Metrological characterization of new materials and devices, performance analysis in conjunction with development, testing and verification of circuits and systems, as well as comprehensive testing of innovative solutions within the application context
- Evaluation of reliability and service life considering the requirements from the application point of view

The exceptional multi-disciplinary cooperation within this technology park enables us to develop innovative, adaptable and reliable system solutions together with our customers.

Contact

Dr. Michael Galetzka
Head of Technology Park Design, Test and Reliability

michael.galetzka@mikroelektronik.fraunhofer.de

Our Key Core Competencies

- Advanced design capability at system and component level
- Powerful methods for metrological characterization of new materials and devices
- Evaluation of reliability and service life based on the knowledge of aging and fault mechanisms
- Holistic consideration of the system function across various levels of abstraction

Our Cooperating Institutes

System know-how, design and test capabilities, and technological expertise from all participating Fraunhofer and Leibniz institutes.

The Reasearch Fab Microelectronics Germany is a cooperation of

Fraunhofer MIKROELEKTRONIK

Leibniz Ferdinand Braun Institut

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Benefit from the Largest Cross-site R&D Cooperation for Micro and Nanoelectronics in Europe!

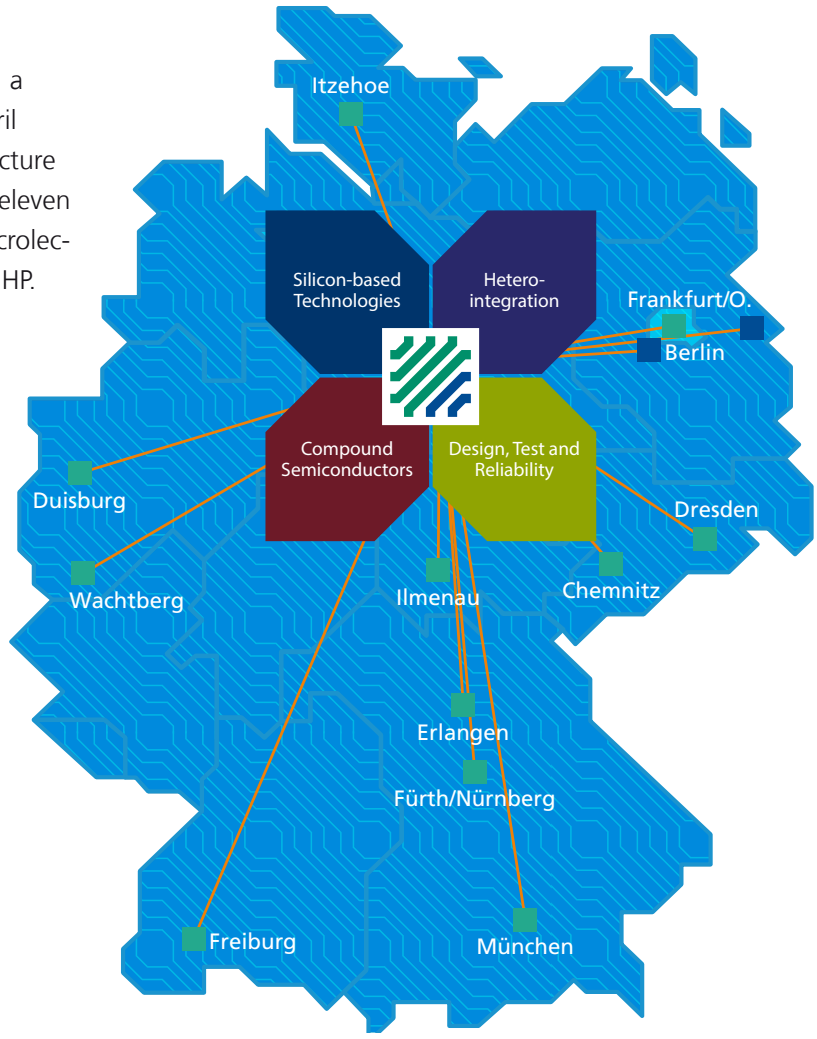
The Research Fab Microelectronics Germany (FMD), a cross-location cooperation that was founded in April 2017, links the research and development infrastructure and the technological know-how of, at last count, eleven Fraunhofer institutes from within the Group for Microlectronics, as well as two Leibniz institutes – FBH and IHP.

For the modernization and expansion of their research facilities to keep up with technical developments, the 13 founding participants will receive around 350 million euros from Germany's Federal Ministry of Education and Research over the next few years.

In order to advance future-relevant research topics as efficiently and quickly as possible, the FMD is organized into four technology parks :

- Silicon-based Technologies
- Compound Semiconductors
- Heterointegration
- Design, Test and Reliability

The existing locations will be retained, while expansion and operation will be organized by a shared business office in Berlin.



Contact

Research Fab Microelectronics Germany
Anna-Louisa-Karsch-Strasse 2
10178 Berlin, Germany

info@forschungsfabrik-mikroelektronik.de
www.forschungsfabrik-mikroelektronik.de/en

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