Projects funded by the Free State of Saxony and the European Union:

Co-funded by the European Union

This project is co-financed from tax revenues on the basis of the budget adopted by the Saxon State Parliament.

Project	Duration	Summary
LOTSE Machine Learning to Improve the Technology Flow Path in Advanced Semiconductor Manufacturing	10.05.23-09.05.26	The goal of the LOTSE project is to establish an advanced Big Data-based production control system. This requires assessing quality already during the manufacturing process. Hidden quality deviations should be detected and corrected early using specialized methods from machine learning, artificial intelligence (AI), and mathematical optimization. The IT-related tasks are handled by highly specialized experts from universities and small and medium-sized enterprises (SMEs) in Saxony. This unique collaboration has set itself the goal of comprehensively examining two fundamental aspects of data processing: quality and risk minimization. Deviations are continuously and promptly recorded. Defective computer chips are identified during production and are not processed further. The project partners are convinced that the results will also be useful for other Saxon companies. The potential of this research and development work is very high and enables the region to be more competitive in the global market. Once the results are implemented in production after the completion of the LOTSE project, GlobalFoundries will be able to manufacture chips with higher quality and efficiency. This strengthens the regional economy and enables more efficient use of resources, which in the long term helps protect the environment.

Projects funded by IPCEI ME-CT:

Project	Duration	Inhalt
EUROFOUNDRY (IPCEI ME-CT) Funded by the European Union NextGenerationEU Supported by: Federal Ministry for Economic Affairs and Energy on the basis of a decision by the German Bundestag This project is co-financed from tax revenues on the basis of the budget adopted by the Saxon State Parliament.	28.12.22-31.12.27	**Development and Industrialization of High-End Semiconductor Technologies for Energy-Efficient, Sustainable, and Secure Chips for Europe (EUROFOUNDRY)** Motivation The demand for innovative microelectronic components, such as processors, microcontrollers, sensors, and power electronics, is steadily increasing. For companies in the automotive industry, renewable energy, medical technology, robotics, and telecommunications sectors, unrestricted access to trustworthy yet powerful, cost-effective, and multifunctional microchips is crucial. To continue developing and offering these competitively in Europe, chips must be tailored to customer needs promptly and on demand. This is particularly important for key technologies in the fields of Industry 4.0, energy systems, autonomous electric driving, medical technology, and the 5G mobile communications standard. Objectives As part of the project, GlobalFoundries Dresden Module One LLC & Co. KG (GlobalFoundries) plans to develop energy-efficient, sustainable, and secure microelectronics for European markets and transfer them into industrial production. The project thus supports Europe's strategic and digital autonomy as well as a sustainable industry and society in line with the European Green Deal. To achieve these goals, development and manufacturing competencies in microelectronics and semiconductor technology—particularly for processors, SoC (System on Chip, a microchip that integrates many elements of a computer system on a single chip) and SiP (System in Package, multiple chips housed in one package)—will be established. SiP and SoC technologies improve performance, reduce power loss, and help shrink systems while maintaining functionality. Approach GlobalFoundries plans to develop and industrially produce new functionalities and design environments for chips in technology nodes (a measure of the smallest manufacturable structure size) ranging from 55 nm to 28 nm. To reduce chip power consumption, the project will also advance the 22 nm FDX technology (a manufacturing technology for producing power-saving yet high-performance transistors). Furthermore, the current state of the art will be expanded by developing technologies and products for so-called non-volatile memory (memory that permanently retains data) and integrating them into secure customer applications. These functionalities will also enable new 5G/6G mobile communication standards. Strategies will be developed to make the new technologies useable for heterogeneous chips, allowing various electronic components to be integrated into a single system with improved performance. Additionally, artificial intelligence methods will be applied to manage and control the large volumes of data generated during manufacturing. Perspectives To disseminate the results, GlobalFoundries is cooperating with numerous European partners within the IPCEI Microelectronics and Communication Technologies (ME/KT). Extensive research and development contracts with subcontractors are also planned, including SMEs, start-ups, universities, and the Fraunhofer Society. This ensures maximum knowledge transfer within Europe. As a contract manufacturer, GlobalFoundries' business model provides that the developed technologies will be made available to customers across all industries, opening broad economic opportunities. Summary The EUROFOUNDRY project aims to develop and industrialize energy-efficient, sustainable, and secure semiconductor technologies for European markets, including automotive, industrial, 5G/6G, and defense sectors. This aligns with Europe's goals for digital sovereignty and the Green Deal. The project includes the following work packages: 1. Development of new trusted functionalities and differentiated non-volatile memory solutions for industrial markets. 2. Energy-efficient applications and new 5G/6G standards, advancing the 22FDX technology. 3. Development work for advanced packaging and far BEoL technologies. 4. Investment in infrastructure and equipment for energy-efficient microelectronics and SMART manufacturing with AI support. The project, which is scheduled to start in Q4 2022 and run until the end of 2027, was approved on December 28, 2022, and will be carried out by GlobalFoundries Dresden.

Projects funded by the Federal Ministry of Research, Technology and Space (BMFTR):

Federal Ministry of Research, Technology and Space

Project	Duration	Inhalt
QSolid Quantum Computer in the Solid State: Quantum Computer Hardware Integration: Electronics and Chip Assembly Optimized for Cryogenic Use Cases	01.01.22-31.12.26	In the QSolid project, concepts for electronic components based on nanoscale FDSOI FETs are being researched to enable effective qubit control with extremely low power consumption. Furthermore, concepts for thermally insulating interconnections are being developed, which provide sufficiently high contact density for operation within the quantum system. The FDSOI transistor type, with its dynamically adjustable back-biasing function, offers extremely low power consumption and, consequently, low heat dissipation—an essential factor for optimal qubit fidelity. Manufacturers can then develop the desired functionality following the fabrication and functional testing of cryogenic circuits, as demonstrated in QSolid, thereby ensuring effective know-how protection throughout the entire supply chain.
ReDesign Open-Source-Design-Tool Kit and Libraries for New Transistor Technologies	01.05.24-30.04.27	The ReDesign project aims to provide a development environment for novel electronic solutions based on Reconfigurable Field-Effect Transistors (RFETs). To achieve this, an openly accessible library for digital and, if applicable, analog basic circuits using RFETs will be created. For circuit verification, the cell library must be supplemented with a scalable transistor model compatible with the development environment. These models and libraries will be based on the design of real cells and transistors with relaxed geometries, enabling experimental contract manufacturing using GlobalFoundries' (GF) 22nm FDSOI technology by the end of the project. Since commercial EDA tools are insufficiently adapted to the new possibilities and conditions of RFETs, an open-access EDA tool flow will be developed to enable experimental chip development based on this new technology. Furthermore, because real systems face a variety of potential attack scenarios, it is planned to test both individual cells and tool flows early on with regard to their security features. By enabling RFET integration into CMOS, GF would be able to add a security option to its current offering for the 22nm FDSOI platform and its derivatives. RFET-based hardware security is not part of any existing product line. It opens a new area, as developers would have the ability to use RFETs at critical circuit points to protect their intellectual property. Since there is currently no technological solution on the market that prevents reverse engineering through side-channel attacks, GF would be the first foundry to offer this option. This would be a significant competitive advantage and make GF's FDSOI technologies highly attractive for the 'Secure Connected Edge' market.

Project funded by the EUROPEAN UNION:

Project	Duration	Summary
NIMFEIA (HORIZON EUROPE) Nonlinear Magnons for Reservoir Computing in Reciprocal Space Funded by the European Union	01.10.22-30.09.26	NIMFEIA aims to provide a hardware solution for brain-inspired computing using magnetic materials at the nanoscale combined with advanced spintronic technologies. It is based on the groundbreaking concept of reciprocal-space computing, which leverages nonlinear interactions of quantized magnetic excitations. In the presence of nontrivial spin structures, such as magnetic vortices, these nonlinear interactions can be efficiently utilized for memory-computing tasks like pattern recognition and time-series prediction with minimal preprocessing of input data. By exploiting quantum interactions in reciprocal space, computing is performed within single spatially confined devices—such as a single ferromagnetic disk—without the need to transport information data in real space. Within the NIMFEIA project, GlobalFoundries' advanced MRAM (Magnetic Random-Access Memory) technology will be used for electrical detection of the magnetization dynamics generated in the ferromagnetic disk. The project is being carried out in collaboration with, among others, HZDR and Infineon Dresden.