



ELMOS SEMICONDUCTOR AG

Integrated system solutions for vehicles and industrial plants

Elmos Semiconductor AG develops, manufactures and distributes semiconductors and sensors primarily for the use in automobiles. The electronic components developed, communicate, measure, regulate and control various functions in order to make vehicles safer and more comfortable and the powertrains more energy-efficient. Elmos is a globally operating company specializing among other things in the manufacture of customer and application specific integrated circuits (IC) for motor control and motor drivers as well as energy management.

Challenges

Modern drive systems are not only used in the automotive sector, but also for applications within Industry 4.0. The software is needed, for example, in the control of machines, medical technology or in smart homes, where intelligent building technology is used, for example, to control the heat supply or door communication. Rapid developments and ever-faster innovation cycles require that the software in electronic components can be quickly adapted to new needs: e.g.

by updating a control component instead of replacing it. This avoids maintenance windows in which the applications are not available. At least in the automobile this is the case for components of the periphery outside of control devices is not yet state of the art. But since customers want to use electronic components in as many different ways as possible, Elmos takes a new approach here: Intelligent control electronics, sensors, memory and switches are combined in a single electronic component. According to the „More-than-Moore“ approach, the integration depth is increased and a multifunctional system is created that can be used flexibly. The challenges are on the one hand in the high reliability and robustness of the microchip housings, which must be designed for the harsh environmental conditions in a car. On the other hand, new integrated safety concepts must be developed with regard to autonomous driving.

Objective

The goal of Elmos is to develop intelligent motor control systems and to evolve as a manufacturer of integrated system

solutions, so-called „More-than-Moore mixed signal system solutions“ for autonomous driving. To this end, the company will also adapt its business model to the new challenges. The new engine control systems consist of several individual microchips housed in a common package. These can be used both in the control of electric motors, the energy supply of controllers and sensors in the vehicle and in industrial plants. A large number of such multi-chip packages already exist for consumer applications, such as in smartphone memories. For applications in the automotive sector, however, they must be much more reliable and robust, because the requirements are much higher due to the difficult environment - for example in extreme heat, cold or wet. The requirements for power supplies for safety-relevant applications in the automotive sector are also much higher in the automobile: Against the background of autonomous driving, the systems must be developed to be intrinsically safe. This means that vehicles must be in a safe operating state under all circumstances.



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Project duration

01/17 – 12/20

Funding code

16IPCEI608

Location

Dortmund



Approaches

Elmos will develop new key technologies for intelligent and efficient motor control and power supply systems with considerable research and development (R&D) effort. This includes both the development of high-voltage technologies for the automotive sector and the development of new assembly and connection technologies for combining different silicon technologies in one system. In parallel, algorithms for controlling the motor are being investigated and improved in order to obtain optimum interaction between the hardware and software of the control elements. This makes the control of the engines more efficient, more precise and more reliable, because the better the elements are coordinated with each other, the less „friction loss“ there is. These improved algorithms reduce the electromagnetic interference of the electric motors and thereby increase the maximum power of the motor. Another focus of the project is the testing and development of innovative concepts for functional safety, which explicitly deal with the technology mix and the software. The functional safety of the systems is a fundamental factor in being able to use them for autonomous driving.

This project from the technology field of power semiconductors is strongly interwoven with the second project of Elmos, which is part of the IPCEI technology field of intelligent sensors. A new, flexible test platform is being developed and set up for both projects, on which process and quality controls, verifications and functional tests of the systems are carried out. This is the prerequisite for industrial use, which is the aim for the results of both projects.

Perspectives

To ensure the dissemination of the results, cooperation with universities and research institutions is planned in the form of scientific papers and articles. The education of young scientists is promoted within the framework of doctoral, bachelor and master theses. Elmos also cooperates with subcontractors, especially SMEs and start-ups, who have not been among its business partners so far. Elmos offers so-called „multi project wafer“ (MPW) services to selected universities, e.g. in Dortmund, Duisburg, and Aachen, sharing the costs for the production of integrated circuits. The necessary sharing of the process design kit (set of design files) results in a great transfer of knowledge. With the development of high-performance, energy-saving and low-cost semiconductor solutions, Elmos contributes to advancing the key technology of micro- and nanoelectronics as a common European goal and to addressing the societal challenge of digitalisation. The solutions developed for the automotive sector can also be used in other industries.

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Imprint

Editor
Federal Ministry for Economic Affairs and Climate Action (BMWK), Public Relations
11019 Berlin
www.bmwk.de

Status
July 2020

Editing and design
VDI/VDE Innovation + Technik GmbH

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