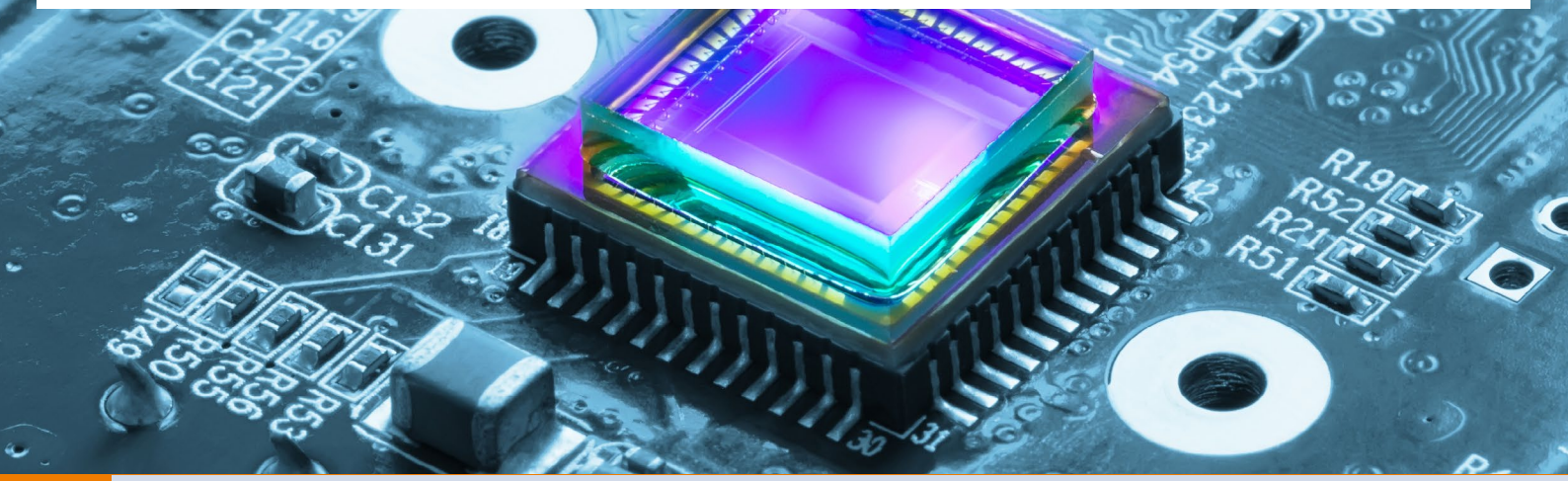
Federal Ministry
for Economic Affairs
and Climate Action

IPCEI
on Microelectronics



ELMOS SEMICONDUCTOR AG

Integrated system solutions for vehicles and industrial plants

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

Challenges

With the ongoing development of autonomous driving, the requirements for the sensor systems needed in the vehicle are also increasing. Basic sensor principles such as LIDAR, optical sensors for gesture recognition or temperature detection have already been researched and the first systems are on the market. With the increasing requirements, however, the sensor systems must be constantly developed further and economically viable and reliable production methods are introduced.

Elmos is therefore pushing ahead with the development of its own components in the areas of environment detection and gesture control in its sub-project „eSens“ on the one hand, which can then also be used in Industry 4.0 or medical technology. On the other hand, the company is working on the development of new innovative, so-called mixed-signal sensor systems, whose potential marketability has been tested in studies in advance.

Objective

The goal of Elmos in the technology field of integrated sensors is to develop new and intuitive human-machine interfaces with innovative mixed-signal sensor system solutions combining acoustic, optical, electromagnetic, thermal and haptic components. These can be used, for example, to optimise gesture control by the driver or to monitor the passenger compartment. Among other things, new and innovative solutions for environment detection are being researched and implemented. A new ToF (Time of Flight) technology enables new applications for gesture control. More powerful and faster ultrasonic sensors enable car manufacturers to secure parking procedures and to introduce emergency braking functions in all vehicle classes. Thermal presence sensors, e.g. to control lighting, heating, air conditioning, etc. in the vehicle or house according to demand are also to be developed. Another important component is the new flexible test platforms at the Dortmund location. Here, both electrical and all necessary physical variables such as pressure, light, temperature, etc. can be tested. This is particularly important for the new mixed-signal systems, which combine many functions in one system.

Approaches

With heir many years of experience in the field of ultrasonic sensor evaluation in parking sensors, the company is now using those – with increased functionality – for autonomous driving. For this purpose, innovative high-speed ultrasonic sensors are being developed that can very precisely and completely detect the reflections of the transmitted ultrasonic pulses and pass them on to the vehicle. Thus, they contribute to significantly

Project coordinator
Dr. Roland Krumm
Elmos Semiconductor SE
Heinrich-Hertz-Straße 1
44227 Dortmund
Phone: +49 (0)231 / 75 49 - 585
Roland.Krumm@elmos.com
www.elmos.com

Project duration
01/17 – 12/21

Funding code
16IPCEI609

Location
Dortmund

faster and more reliable communication and data transmission. By implementing a stochastic coding of the ultrasonic signals, the reliability of the detection as well as the resolution of near objects can be improved in order to realise, for example, a more reliable emergency braking function. Optical sensor systems are also being newly developed for the success of autonomous driving. Elmos plans to develop a new LIDAR (light detection and ranging) sensor system for the three-dimensional detection of the environment based on optical detectors. Another innovation is thermopile-based sensor systems that not only measure temperatures but can also detect movements. These coordinated sensor elements can, for example, detect several people when they move in different directions. These functions are useful in vehicles as well as in home automation and could also be used in the flow measurement of gases. A new ToF (time-of-flight) technology in combination with new evaluation procedures, aims to enable more comprehensive and reliable gesture recognition in the vehicle, using methods such as artificial intelligence (machine learning). This project from the technology field of intelligent sensors is strongly interwoven with the second Elmos project from the technology field of power semiconductors. A new, flexible test platform is being developed and set up for both projects on which the necessary process and quality controls, verifications and functional tests of the new systems are carried out. This is the prerequisite for industrial use, aimed for the results of both projects.

Perspectives
In order to ensure the dissemination of the results, cooperative ventures are planned with universities and research institutions in the form of scientific papers and articles, as well as cooperations with SMEs and start-ups. Within the framework of doctoral, bachelor's and master's theses, the training of young scientists and researchers will be promoted. Elmos offers selected universities e.g. in Dortmund, Duisburg, and Aachen so-called multi-project wafer (MPW) services that share the cost of manufacturing integrated circuits. The necessary sharing of the process design kit (set of design files) results in a large transfer of knowledge. The two projects of Elmos contribute to advancing the key technology of micro- and nanoelectronics as a common European goal and to addressing the societal challenge of digitalisation with the development of high-performance, energy-saving and low-cost semiconductor solutions. The solutions developed for the automotive sector can also be used in other industries, e.g. in the automotive industry, „smart homes“ or in medical technology.

Contact
Federal Ministry for Economic Affairs and Climate Action (BMWK)
Dr. Uwe Sukowski
Phone: +49 (0)30 18625-7695
BUERO-IVA2@bmwi.bund.de

VDI/VDE Innovation + Technik GmbH
(Project Management Agency for the IPCEI on Microelectronics of the German Federal Ministry)
Christoph Reich
Phone: +49 (0)30 310078-5763
Christoph.Reich@vdivde-it.de

Imprint

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

Status
January 2021

Editing and design
VDI/VDE Innovation + Technik GmbH

Picture credits
© asb63/AdobeStock

The project is funded within the framework of IPCEI. - bmwi.de/editorial/EN/article/industry/microelectronics.html