



INFINEON AG

Efficient production lines for sensors for automotive applications and for the Internet of Things (IoT)

Infineon designs, develops, manufactures and markets a wide range of semiconductor solutions. Semiconductors have become an indispensable part of everyday life. Infineon's components play an essential role in the efficient generation, transmission and use of electrical energy. They also protect data communication, improve traffic safety and reduce automobile emissions. Infineon is Germany's largest semiconductor manufacturer with sites in Neubiberg near Munich, Warstein, Regensburg and Dresden, for example. Infineon operates worldwide.

Challenges

Sensors are used almost everywhere these days. Sensors are the main components that generate all the data transmitted in the so-called Internet of Things. The application areas of sensors include the measurement of air pressure, motion characteristics, volume, brightness, temperature, air humidity or distances in almost all areas of life, including motor vehicles. The requirements for safety in

motor vehicles are constantly increasing. The trend towards autonomous driving will also further accelerate innovation efforts with regard to sensor systems. For Infineon, the challenge is to serve the expected market increase with additional resources and capacities and to continue to hold its own in this market.

Objective

Infineon's work in the technology field of intelligent sensors is divided into sub-tasks. The overarching goals are the development of innovative sensor solutions in the areas of mobility, communication and security. Sensors are manufactured as microchips in complex semiconductor production processes with many hundreds of individual steps, fitted with a housing, tested, calibrated and finally packaged. These processes are mechanically complex, as appropriate stimuli must be generated during the measurements required for this (e.g. pressure, temperature, magnetic field, acceleration). The project aims to optimise

such processes in terms of process time and accuracy. Another goal is to qualify existing production capacities for the production of radar gypsum and to create new ones within the framework of the project, thus establishing a globally significant production facility for this high technology in Germany. Furthermore, assembly and connection technologies are to be optimised, because, for example, in pressure sensors, which are nowadays indispensable in motor vehicles (e.g. for tyre pressure monitoring or in the side air bag), any mechanical stress in the housing can affect the performance of the sensor. The same applies to magnetic sensors (e.g. for detecting steering angle and accelerator pedal position). The focus is on system integration, i.e. increasing the functionality with the same or even reduced space requirement.



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Approaches

The success of smart sensors depends on performance, features, price, quantity available on the market, reliability and safety. Sensors are the first element in the chain of safety-critical systems related to driving assistance, communication network control, authentication or health applications. If they do not provide accurate and reliable information, there is a risk of system failure. Infineon will therefore create new, efficient production lines for sensors with considerable research and development effort. This includes special process and material developments (e.g. silicon/germanium technologies for radar applications), the development of new assembly and connection technologies, the improvement of process stability, the introduction of new devices and measures to reduce defect density, the increase in yield of individual processes, advanced process control and the automation of individual process steps, as well as data integration based on Industry 4.0. Automated processes, which include robotics solutions, should also lead to an improvement in quality in sensitive wafer handling. Since a wafer box can weigh up to 15 kg, this will also relieve employees and improve working conditions.

Perspectives

In order to ensure the dissemination of the results, cooperation with universities and research institutions in the form of scientific papers and publications, particularly in relation to new materials, failure analysis and reliability are planned. The training of young scientists is promoted within the framework of doctoral, bachelor's and master's theses. Infineon regularly holds training courses for interested parties. Cooperation with modelling, simulation and co-design communities, including universities

and research institutes, also offers good prospects. Infineon enables European universities and companies to access the use of technologies developed in IPCEI by providing so-called process design kits (set of design files for own circuit designs). With the development of high-performance, energy-saving and cost-effective semiconductor solutions, Infineon's two projects contribute 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 can be used in all industries where sensors play a role.

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