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New ADAS Architectures for Software-defined Vehicles

The age of the Software Defined Vehicle (SDV) is rapidly approaching. Vehicles controlled primarily by the software layer, and customization, personalization, and over-the-air (OTA) updates, are set to become the new normal. The next generation of SDVs will take a completely new approach to radar sensor technology, leveraging information from a network of sensors around the vehicle rather than using standalone sensors. Each sensor will deliver detailed, rich, low level sensor data to a central ADAS (Advanced Driver-Assistance System) control unit located in the heart of the vehicle.

By placing greater emphasis on the software layer, configuration management will become fundamentally easier for OEMs. Equally, rather than updating each individual sensor, functionality can be updated centrally, making maintenance and updates simpler. Mid-range vehicles, representing the largest market segment, will come fully equipped with as many as five radar sensors as soon as 2025. These sensors will offer extended detection ranges, with the front radar sensor covering up to 300 meters, and each corner radar sensor operating at up to 200 meters. This will enable the detection of objects further in the distance, adding greater safety capabilities to the vehicle.

The premium market segment will see compelling innovation with as many as ten connected sensors positioned around the vehicle. These additional sensors will enable multimode operations with one sensor providing different modes of operation, performing different functions at different times. With such an expected proliferation of sensors in SDVs, OEMs must look for a sensor solution that is sufficiently scalable to enable them to build features across all points of the value chain. As such, radar sensor technology will need to be based on a shared architecture, using a common processing subsystem, common millimeter wave IPs across different use cases ranging from corner and front surround radar up until high resolution imaging radar, offering an optimal re-use of components and a faster time to market for OEMs. Within this common platform, the most optimum process node will be applied for individual use cases, such as 16 nm FinFET for the processors, and 28 nm RFCMOS for radar single chip.

Single-chip radar integration offers greater flexibility, including the integration of the millimeter wave front end featuring four transmit and four receive, short: 4T4R, antennas, along with a multi-core processor subsystem. With future cars being connected to a mobile network, today's radar chipsets are built to meet the latest security requirements through integrated HSE security and MACsec engine. Eventually, only through a thorough system thinking approach of future automotive radar technology, and as sensors become more connected, more adaptable, and upgradeable, will greater comfort for SDV drivers, and more flexibility for vehicle manufacturers be achieved.