77 GHz Silicon Germanium Chipset Enables Vehicles to Sense Potential Crash Situations

Freescale Semiconductor is now providing samples of 77 GHz silicon germanium (SiGe) integrated chipsets to select customers for use in automotive radar systems. Freescale's radar solutions provide long- and mid-range functionality, allowing automotive systems to monitor the environment around the vehicle to help prevent crashes.

The automotive industry's efforts to achieve a goal of zero automotive-related fatalities, along with consumer demand and government legislation, are driving adoption of advanced automotive safety systems. Advanced driver assistance systems (ADAS), radar and camera systems are expected to become government-mandated in the future.

"77 GHz is likely to be the European Union's radar band of choice in 2013, with China and the United States expected to follow," said Demetre Kondylis, vice president and general manager of Freescale's Sensor & Actuator Solutions Division.

"Advanced SiGe mixed-signal technology is a critical differentiator for our radar business. It gives us a distinctive advantage to offer our customers exceptional product functionality and capability, such as various modulation schemes in a standalone mode of operation, high-speed frequency ramp up, competitive power consumption and best-in-class reliability."

Freescale Xtrinsic radar chipsets are the most advanced SiGe technology on the market, consisting of a transmitter and a multi-channel receiver with an integrated phase-locked loop (PLL).

Freescale's 77 GHz technology allows a device to switch between long- and short-range functionality simply by issuing a serial peripheral interface (SPI) command. This enables the same radar module to be used for multiple safety systems, such as adaptive cruise control, headway alert, collision warning and mitigation. Long-range radar, used for adaptive cruise control and lane departure warnings, has long and narrow coverage directly in front and back of the car. Short-range radar, ideal for blind spot detection, pre-crash and stop-and-go applications, monitors the car's immediate surroundings with a wide spatial view that covers shorter distances.

Freescale's radar system is based on multi-channel receivers and transmitters that allow high-level integration and complex signal generation and processing. A typical Freescale RF front-end solution consists of a transmitter chip with an integrated PLL, power amplifier and local oscillator (LO) output and an on-chip ramp generator, along with one or several multi-channel receivers that provide the low-noise down-conversion of the radar signals into the intermediate frequencies (IF) domain.

The chips are manufactured in Freescale's 0.18µ BiCMOS technology, which allows the combination of high-speed bipolar devices with the high integration level of CMOS. This technology is ideal for automotive safety systems and is also applicable for aerospace, military and industrial markets. Several tier one automotive suppliers are currently sampling the chipsets, and Freescale plans to have standard products available by 2012.

Freescale is showcasing its radar technology this week at electronica 2010 in Munich, Germany. The overall system functionality is demonstrated through the use of radar in a rescue helicopter. A forward-looking synthetic aperture radar, based on digital beam forming, demonstrates the advantages of the multi-channel approach with modern signal generation and processing.

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