Radar-based ADAS coming soon to entry-level vehicles

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While the high-end automotive marketplace has been enjoying the enhancements and safety features of ADAS (advanced driver assistance systems), it has not moved into the mainstream median and low-priced vehicles. The two main issues are price and complexity of implementing these systems.

Automotive radar falls into three categories - LRR, MRR and SRR (long range radar, medium range radar and short range radar) - which all need to exist in the vehicle at the same time for different functions. Most of these are currently using a common 77-GHz radar frequency, so a system that can process all of these signal levels and strength is needed to avoid the duplication of the data processing modules. These radar applications are used to address Adaptive Cruise Control, Surround View Park Assist System, Blind Spot Detection, Cross Traffic Alert, Emergency Braking Systems, and Side Impact Assistance, as complete system-level solutions.

Freescale has introduced a new ADAS targeted MCU and a multi-channel three-chip set for the 77-GHz Rx/Tx/VCO function for in-car radar. This scalable four-chip solution replaces a 12-chip solution that requires higher power levels and board layout/vehicle placement issues. The new controller, the Qorivva MPC577xK, brings the dual-core MCU, a lockstep dual core environment, the vehicle ECU and network interface, NVM, SRAMM an external memory interface and a 77-GHz radar processing platform.

The radar core includes a signal processing toolbox with an accelerated FFT engine, DMA control, and ADC block with multiple converters and DAC block. It is supported by the MRD2001 radar transceiver chipset. This chipset is made up of a three-channel Rx chip, two-channel Tx chip and a VCO forming a full radar signal processing solution (figure 1).
Technology advances in the automotive marketplace have been slow moving. The number of features and solutions possible with radar applications should not force them into the same over-one-decade adoption seen by anti-lock braking into vehicles. Anti-lock brake systems have remained a relatively fixed price option on vehicles, regardless of the vehicle cost, for a long time, and still have not fully migrated into entry-level vehicles, despite the safety benefits.

As radar-based ADAS systems have limited mechanical components, they benefit from having design solutions that can be usable over multiple vehicle models. This increases the amortization of the design and development costs and will drive the price of deployment down so these ADAS features should make an appearance even in entry-level vehicles in the near future.

One concern in modern cars is the amount of electrical power available to the whole vehicle. The Freescale chipset is very frugal on power using only about 2.5 W for a total chipset. The system MCU is also scalable with the ability to support 12 Rx channels and four Tx channels, so multiple features and subsystems can be put in the same car. The new systems also support a large variety of antenna designs. This means one core platform can be used for LRR, MRR, and SRR systems at the same time, depending on what is needed for the vehicle.