



Application Brief: Automotive Radar Processors

KEY APPLICATIONS

- ▶ Blind spot detection
- ▶ Automated emergency brake
- ▶ Adaptive cruise control
- ▶ Crossing traffic alert
- ▶ Lane keep
- ▶ Parking assist

NXP'S SOLUTION FOR AUTOMOTIVE RADAR PROCESSORS

- ▶ [NXP S32R26/7](#) Designed for safety-critical low- to high-range radar applications, including collision avoidance, lane change assist and autonomous emergency braking.
- ▶ [NXP S32R37](#) Designed for low- to mid-range radar applications, including side-looking and surround sensors, lane change/keeping assist blind spot detection and rear-traffic-crossing alert.

OPTIMIZED PERFORMANCE-PER-WATT FOR HARDWARE-ACCELERATED, HIGH-RESOLUTION AUTOMOTIVE RADAR PROCESSING

Heightening regulatory standards targeted to improve driver, passenger and pedestrian safety will require increasingly adept radar sensor implementations that in turn will impose exponentially greater performance demands on the underlying processing platform. Stringent safety requirements are evolving to encompass advanced radar-driven capabilities ranging from cross-traffic automated emergency braking (AEB) and occluded object classification to pedestrian detection in low light. These requirements will only continue to expand on the pathway to achieving fully-autonomous L5 vehicles.

At the radar processing layer, these safety features require the utmost attention to performance-per-watt efficiencies that can't be met with power-hungry, general-purpose processor cores. To achieve longer range, higher resolution and accuracy for radar-driven, safety critical applications such as collision avoidance, lane change assist and AEB, system designers require a scalable, streamlined and highly-integrated processing platform that strikes the optimal balance of compute agility and power efficiency for next-generation radar systems.



THE NXP ADVANTAGE

NXP's scalable portfolio of hardware and software compatible S32R27 and S32R37 MCUs is designed to enable advanced radar signal processing capabilities, meeting the high-performance computational demands required by modern beamforming, fast chirp modulation radar systems by offering unique signal processing acceleration together with a powerful multi-core architecture. These devices offer significant performance-per-watt improvements over a traditional DSP by integrating a highly-efficient, specialized hardware accelerator—NXP's proprietary Signal Processing Toolbox (SPT). In addition, NXP's RDK-S32R274 Radar Reference Platform offers a complete automotive radar development environment to accelerate design workflows and time to market.

KEY NXP BENEFITS

Optimized Signal Processing Acceleration

NXP's Signal Processing Toolbox enables high-performance, power-efficient processing. This processing leverages a powerful, dedicated acceleration engine integrating signal processing operations, including fast Fourier transform (FFT), histogram calculation, 2D peak search, and mathematical operations on vector data. SPT is driven by a user-oriented instruction set with programmability to ensure wide flexibility for modifications of the signal processing pipeline.

Seamlessly Integrated Subsystem

The SPT is a part of a highly optimized radar processing subsystem that utilizes an advanced, high-performance master bus and peripheral bus. The system bus master interface is used for fast data transfers between external memory and local RAM, while the peripheral interface is used to set configurations, get status information, and provide basic control of SPT and trigger interrupts—all of which helps to enhance automotive radar processing performance. This is enabled in part by a high-bandwidth MIPI CSI2 interface (four data lanes) for high data rate transfers.

Development and Deployment Agility

Built in partnership with Colorado Engineering Inc., NXP's RDK-S32R274 radar reference platform allows the rapid prototyping of high-performance radar systems. The platform offers a complete automotive radar solution including a high-performance NXP MCU, a 77 GHz radar transceiver and automotive-qualified radar software, affording designers an open and flexible development platform using a modular architecture.

Extreme Power Efficiency

NXP S32R27 and S32R37 MCUs leverage a dual Power Architecture® configuration with e200z 32-bit CPUs. This helps to enable higher performance per watt over legacy NXP devices, reducing thermal management strains and thereby increasing component integration flexibility for designers of next-generation automotive radar modules.

Proven Automotive-grade Functional Safety

NXP simplifies the functional safety certification process by helping enable users to meet the most stringent international safety standards, from ISO-26262 to ASIL D functional safety requirements. This helps to eliminate reliability risks, while reducing time to market, cost and complexity from development to manufacturing. NXP's SafeAssure® functional safety program is aligned with the international standards at the heart of automotive safety applications, helping system engineers to design with confidence and efficiently achieve their design goals.

NXP RDK-S32R274

