# Application Brief: Automotive Vision Systems

High-Performance Automotive Vision Processing and Streamlined Development Efficiency for Advanced Driver Assistance Systems

## KEY APPLICATIONS

▶ Front View Camera

▶ Surround View

▶ Driver monitoring systems (DMS) and occupant monitoring systems

## ADDITIONAL APPLICATIONS

▶ Pedestrian detection

▶ Lane keeping/departure warning and assistance

▶ Traffic sign recognition (TSR)

▶ Collision warning and avoidance

▶ Blind spot monitoring

## NXP'S SOLUTION FOR AUTOMOTIVE VISION SYSTEM PROCESSING

▶ NXP S32V2 automotive processing platform multi-camera vision processing

Accelerating innovation in automotive vision technology is fueling a transformation in advanced driver assistance systems (ADAS) and will ultimately help to enable the achievement of fully autonomous L5 vehicles. With front-facing vehicle cameras set to become ubiquitous for detecting and identifying pedestrians, objects, roadway lanes and street signs, the automotive industry is poised to expand these functions to encompass 360-degree 'surround sight' capabilities, as well as internal-facing cameras to help monitor driver alertness.

As these cameras proliferate throughout the vehicle and camera pixel density continues to increase to enable higher resolution vision, the attendant data and bandwidth demands are growing exponentially. This growth is putting significant strain on the underlying vision system processing platform, underscoring the urgent need to implement automotive-specialized processors that strike the optimal balance of processing performance, power efficiency and cost. In parallel, time-to-market considerations in this highly competitive market have exposed a pressing need for more efficient development workflows that afford system engineers new levels of design agility.

## KEY NXP BENEFITS

### Processing Efficiency and Acceleration

S32V2 users can easily provision task scheduling to the best-suited onboard compute engines, leveraging all available CPU/GPU cores and dual APEX-2 vision processing accelerators with maximum efficiency. This helps to ensure that every layer of the vision processing pipeline is serviced by the most appropriate embedded compute resources, thereby optimizing performance-per-watt, thermal management agility and cost savings.

### Expansive Multi-Camera Support

With the S32V2, users can deploy one SOC per camera, or support up to four cameras with a single SOC (4 x 1-megapixel cameras). This enables a variety of flexible deployment configurations including 'stereo' front-facing cameras for precision depth disparity measurement, and can help to enable a seamless field of view from one camera to another with unified video stream synthesis.

### Farther, Faster Vision Processing

NXP's S32V2 platform is optimized to accommodate increasing pixel densities for front-facing cameras and 'surround sight' applications requiring high-precision object detection and identification. This capability is particularly well suited for longer-range automotive vision requirements targeted to enable autonomous vehicle operation in high-speed driving conditions.

### Seamless Security Protections

The onboard security engine within the S32V2—coupled with Arm® TrustZone® technology—protects against IP theft and malicious hacking, leveraging advanced encryption capabilities that isolate and protect critical firmware, private information and other assets.

### Development and Deployment Agility

S32V2 users can leverage open software standards and open development tools with standard APIs, or take advantage of NXP's S32 Design Studio Integrated Development Environment (IDE) to fine tune core and memory utilization for added processing performance and efficiency. NXP software, along with the S32 Design Studio, provides a comprehensive enablement environment that shortens design and development cycles, and includes a compiler, debugger, Vision SDK, Linux BSP, and graph tools.

### Proven Automotive-grade Functional Safety

NXP simplifies the functional safety certification process by enabling S32V2 users to meet the most stringent international safety standards, including ISO 26262 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, allowing system engineers to design with confidence and efficiently achieve system-level compliance.

### Advanced AI Automotive Enablement

With NXP's eIQ™ Auto deep learning software development and deployment toolkit, S32V2 users can achieve ease-of-use for the implementation of deep learning algorithms, neural networks and an automotive-grade inference engine. This dramatically accelerates customers' time-to-market with sophisticated artificial intelligence (AI) capabilities for autonomous vehicles, leveraging NXP's advanced automotive vision, radar and LiDAR processing capabilities.

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