High-Performance and Low-Power Tensilica Processors for ADAS Designs

Plus a wide range of silicon-proven interface, memory, sensor IP for automotive safety and driver awareness

Overview

It’s a challenge to keep up with the technology requirements in the race towards autonomous vehicles or self-driving cars. Consumers have reacted very favorably to advanced driver assistance system (ADAS) applications that make vehicles much more aware of the surrounding driver environment and much safer to drive. Demand for these features is growing as fast as the technology can evolve to provide sensors, cameras, and sensor fusion software to perform obstacle detection and lane departure warnings, automatically read street signs to display speed limits, control speed and distance to the car in front of you, and other vital functions. In addition, cars will exchange more and more information with other cars and their environment to make a smarter driving experience possible. These essential driver-assistance technologies are evolving at a very fast rate, and Cadence is ready to help you with flexible IP and tools that enable you develop smarter and safer cars.

Cadence in ADAS Designs

In addition to providing the tools to design innovative new chips, Cadence offers a wealth of proven, tested intellectual property (IP) that can speed the design cycle for tomorrow’s ADAS chip designs. With optimizable Cadence® Tensilica® DSPs and the associated software partner ecosystem, applications for communication, audio, imaging, computer vision, and neural networks can be implemented in the most efficient way possible, saving up to half of the silicon area and half of the power consumption of other solutions.

Figure 1: ADAS applications supported by Tensilica DSPs and partner ecosystem
Take advantage of the wide range of Tensilica DSPs and the associated software partner ecosystem (Figure 1) to speed your ADAS design:

- Support real-time data processing for sensors and cameras in safety-critical systems with the high-performance, low-power Tensilica Vision P6 DSP for imaging, computer vision, and neural networks
- Enable automated parking, lane departure, vehicle-to-vehicle (V2V) or car-to-object (Car2X) communications, and many more ADAS applications
- Receive all the documentation needed to manage your ISO 26262 system development

Imaging, Computer Vision Processing, and Neural Networks

In order to make cars safer and more comfortable, ADAS applications are becoming more and more popular. Since many of these systems are camera based, there is a huge amount of video data to process.

In addition, the future human-machine interface (HMI) will dramatically change to a more software-defined cockpit with a very different use model of how we control the car.

These trends will lead to an ever-increasing number of HD displays, and, as shown in Figure 2, efficient DSPs will be essential to implement all this new functionality in real time and within the power budgets available.

The Tensilica Vision P6 DSP has been specifically optimized to offload the host processor and handle the huge amount of data required for imaging, computer vision, and convolutional neural network (CNN) tasks in:

- Traffic sign recognition
- Passenger detection
- Lane assistance
- Car2X or V2V communication
- Parking assistance
- 360° surround view (Figure 3)
- Camera-based rear mirror
- Gesture recognition (HMI)
- High dynamic range processing
- Low-light image enhancement
- Vision enhancement
Radar, Lidar, and Communications

In order to enable autonomous driving, cars need to fully sense the surrounding environment. As a consequence, cars will be equipped with an increasing number of radar and lidar sensors that produce a huge amount of data.

In addition, companies are already working on communications systems that will allow vehicles and roadside units to exchange information, such as safety or traffic information. These Car2X and V2V communications systems require high-throughput DSPs to handle the heavy data communication bandwidth.

The Tensilica family of ConnX DSPs supports the required communication protocols like IEEE 802.11p and LTE Advanced, providing the responsiveness and throughput needed for low-latency and high-bandwidth communication standards, including:

- 360 degrees of awareness
- Radar/lidar sensor processing
- Vehicular communications systems (Car2X or V2V)
- Adaptive cruise control
- Emergency breaking

Benefits

- Scalable DSPs to match your application
- Performance for handling large communications loads
- Lower power through higher efficiency than the application processor to a Tensilica DSP

Ethernet and Other Standards-Based IP

In addition to scalable Tensilica DSPs, Cadence offers a wide range of system, interface, and memory IP to facilitate the design of ADAS applications. Relevant IP includes industry-leading DDR controller and PHY, automotive Ethernet MAC controller, MIPI camera/display controller/PHY, analog, and more.

Automotive Ethernet for high-speed in-vehicle communication is critical to ADAS applications. The specialized audio/video queuing allows video streams captured by multiple ADAS cameras to be transferred with guaranteed bandwidth and low latency. The precise timing synchronization allows camera image capture for a 360-degree or surround-view vision system.
Benefits

- Saves significant design and verification time
- Large library of IP available from one source

Pre-Silicon Functional VIP

The increasing number and complexity of interfaces in automotive SoCs makes it difficult to thoroughly verify designs. Cadence Verification IP (VIP) boosts quality by providing VIP components that check compliance with standard interface specifications such as CAN, LIN, Ethernet, DDR, Flash, USB, and dozens of other interfaces.

Benefits

- The proven VIP provider, chosen by over 500 customers
- VIP available for over 100 interface and memory standards
- Verifies compliance to standard interface specifications for mission-critical designs

Pre-Silicon Validation

ADAS SoCs are some of the most complex ICs in a car and are usually realized in an advanced process technology. Test chips (silicon) usually are available very late and re-spins are very expensive. Pre-silicon validation with FPGA-based rapid prototyping is essential for early success.

To learn more about Cadence IP options for automotive, visit www.cadence.com/automotive.