TDA2x ADAS System-on-Chip

Texas Instruments

Key Features and Benefits

- Heterogeneous, scalable architecture providing optimal mix of performance, low power and ADAS vision analytics
- Integration of peripherals – Multi-camera interfaces (parallel, serial), display, CAN, GigB Ethernet AVB
- Innovative Vision AccelerationPac (with EVEs) which delivers more than 8× improvement in performance capabilities
- Supports Front Camera, Park Assist and Radar Sensor Fusion technologies
- For Front Camera, optimal mix of performance and power
- For Surround View, multiple flexible video input and output ports. Gig Ethernet AVB to support LVDS- and Ethernet-based Surround View systems
- For Radar Sensor Fusion, capability to support Radar on dual ARM® Cortex™-A15 and vision analytics on Vision AcclerationPac
- Evaluation board and daughter card to enable Front Camera, Surround View and Sensor Fusion applications

Overview

TI's new TDA2x System-on-Chip (SoC) is a highly optimized and scalable family of devices designed to meet the requirements of leading Advanced Driver Assistance Systems (ADAS). The TDA2x family enables broad ADAS applications in today's automobile by integrating an optimal mix of performance, low power and ADAS vision analytics processing that aims to facilitate a more autonomous and collision-free driving experience.

The TDA2x SoC enables sophisticated embedded vision technology in today's automobile by enabling the industry's broadest range of ADAS applications including front camera, park assist, surround view and sensor fusion on a single architecture. Front camera applications include high-beam assist, lane-keep assist, adaptive cruise control, traffic sign recognition, pedestrian / object detection, and collision avoidance. Park assist applications include intelligent 2D and 3D surround view and rear collision warning and detection. The TDA2x SoC is also capable of the fusion of radar and camera sensor data, allowing for a more robust ADAS decision-making process in the automobile.

TDA2x Architecture

The TDA2x SoC incorporates a heterogeneous, scalable architecture that includes a mix of TI's fixed- and floating-point TMS320C66x digital signal processor (DSP) generation cores, Vision AccelerationPac, ARM Cortex-A15 MPCore™ and dual-Cortex-M4 processors. The integration of a video accelerator for decoding multiple video streams over an Ethernet AVB network, along with graphics accelerators for rendering virtual views, enable a 3D viewing experience. And the TDA2x SoC also integrates a host of peripherals including multi-camera interfaces (both parallel and serial) for LVDS-based surround view systems, displays, CAN and GigB Ethernet AVB.

The TDA2x SoC includes TI's new Vision AccelerationPac which delivers more than 8× improvement in compute performance for advanced vision analytics than existing ADAS systems at same power levels. The Vision AccelerationPac for this family of products includes multiple embedded vision engines (EVEs) offloading the vision analytics functionality from the application processor while also reducing the power footprint. The Vision AccelerationPac is optimized for

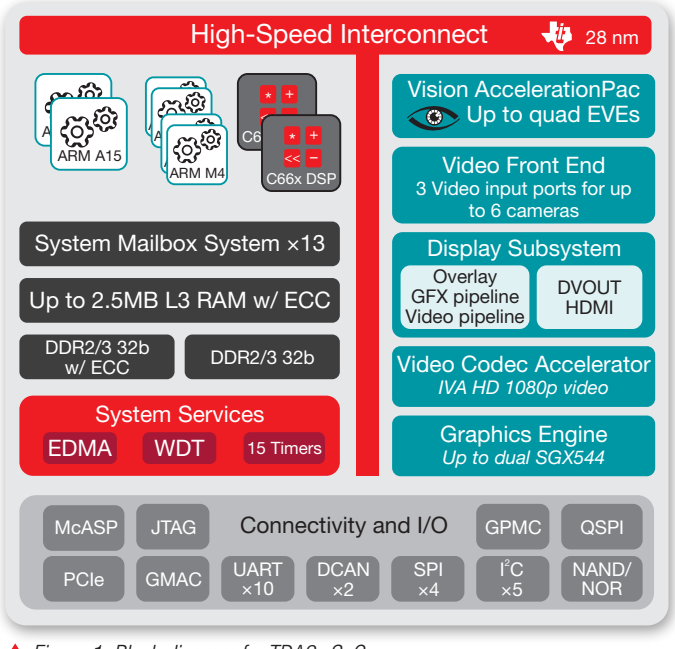
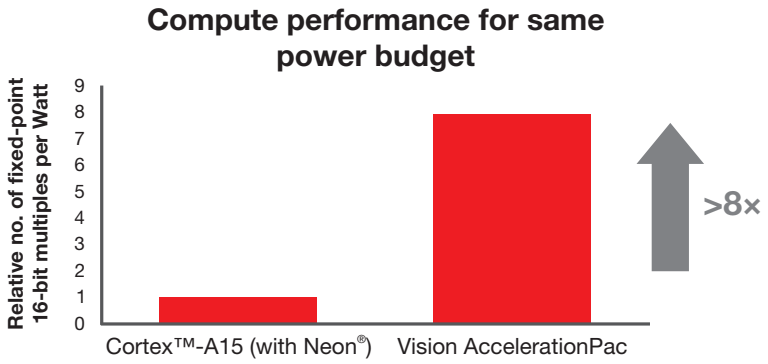


Figure 1. Block diagram for TDA2x SoC

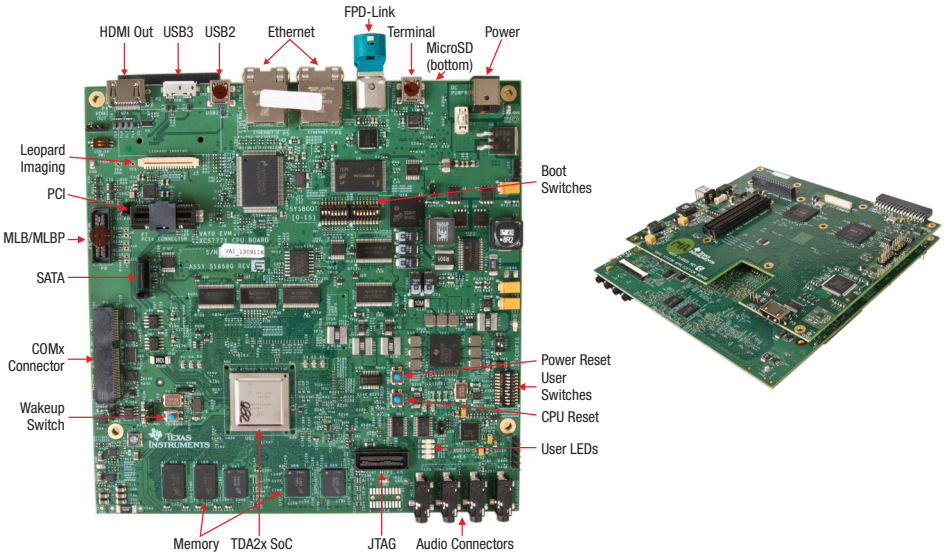


▲ *Figure 2. Vision AccelerationPac: >8× Compute performance for same power budget with respect to Cortex-A15*

vision processing with a 32-bit RISC core for efficient program execution and a vector coprocessor for specialized vision processing. With each core operating a 16 MAC-per-cycle computing engine up to 650 MHz (8 bit or 16 bit), the Vision AccelerationPac is able to deliver over 10.4 GMACs per core, for a total of >40 GMACs for quad EVEs devices. This provides the most efficient vision analytics for real-time vision-based automotive applications and allows the most 16 bit × 16 bit multiplies as compared to other processor architectures.

The TDA2x SoC includes a broad range of cores. It includes dual next-generation C66x fixed-/floating-point DSP cores that operate at up to 750 MHz to support high-level signal processing, and up to 750-MHz Cortex™-A15 cores for control and general-purpose processing. With 200 MHz of processing performance, the Cortex-M4 cores deliver efficient control and processing camera stream. TI's IVA-HD core is an imaging and video codec accelerator running at up to 532 MHz to enable full HD video encode and decode.

The TDA2x SoC has up to 2.5 MB of on-chip L3 RAM with Single Error Correct and Double Error Detect (SECDED) support to minimize impact of Soft Error Rate (SER).



▲ *Figure 3. TDA2x Evaluation Module*

Another key component of the TDA2x SoC is the integrated peripherals. Three video input ports, each with two 16-bit sub-ports, provide 4–6 camera inputs needed for LVDS-based surround vision applications. The integrated high-performance Gigabit Ethernet with AVB enables Ethernet-based surround view.

Tools and software

TI's ADAS-related Vision Software Design Kit (SDK) enables customers to quickly and easily integrate the Vision AccelerationPac and DSP algorithms and then benchmark and partition them across multiple processing elements. The AV BIOS/Vision SDK is a set of software development APIs, framework, tools and documentation that allows the creation of vision and analytics applications for the TI TDA2x hardware platform. In addition to the SDK, TI also has a number of libraries available for vision kernels on Vision AccelerationPac and DSP. The SDK and libraries reduce development efforts and time to market while enabling customers to innovate and differentiate on their solution.

TDA2x family – development tools

TDA2x EVM is an evaluation platform designed to speed up development efforts and reduce time to market for ADAS applications.

The main board integrates the key peripherals such as Ethernet, FPD-Link and HDMI, while the imager daughter board provides interfaces for popular imagers. Get started today with these boards to evaluate and develop solutions for TDA2x SoCs.

For product details, white papers, other documentation and videos for TDA2x SoC, visit **www.ti.com/TDA2x** or contact your TI sales representative today.

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