VA7021 Product Brief

The Leading MIPI® A-PHY Compliant CSI-2 Serializer Supporting Long-Reach, High-Speed, Cost-Optimized Automotive Connectivity

Overview

The Valens VA7021 automotive chip is a MIPI A-PHY compliant serializer offering multi-gig asymmetric sensor connectivity.

The VA7021 integrated circuit (IC) serializer supports connectivity of CSI-2-based cameras, RADARs, LIDARs, and other sensors, with link speeds of up to 4Gbps. The IC can connect to any deserializer devices that implement standard long-reach MIPI A-PHY interfaces.

The IC operates over standard, cost-effective, in-vehicle wires for up to 15 meters (50 feet) over a Coax cable and up to 10 meters (33 feet) over a Shielded Differential Pair cable, with 4 inline connectors. The IC includes a special mode enabling connectivity over an unshielded twisted pair cable at speeds of up to 4Gbps to support the upcoming MIPI A-PHY v1.1 spec.

The VA7021 IC also provides I²C and SPI bus tunneling, GPIO pins tunneling, and advanced timing services, such as the distribution of a remote central clock and provisioning of a precise frame sync signal.

Optimized for Automotive

AEC-Q100 Qualified – Device temperature grade 2: -40°C to +105°C ambient operating temperature.

MIPI Spec Compliant – Designed to meet the MIPI Alliance specifications for A-PHY version 1.0, D-PHY version 2.1, and C-PHY version 1.2, as well as draft PAL (Protocol Adaptation Layer) specifications for CSI-2, I²C, SPI, and GPIO I/Fs.

Functional Safety
Meets functional safety requirements:

- ASIL-B compliant, according to ISO 26262.
- MIPI Alliance draft Specification for Camera Service Extensions (CSE℠).

With advanced data protection, diagnostics, and real-time monitoring.

Power Consumption – Ultra-low power consumption, typically less than 300mW.

Power Over Coax/SDP/UTP – Supporting power delivery over different types of cables, further reducing system cost.

Performance – Designed to handle harsh automotive EMC and environmental interferences as well as cable degradation resulting from aging, temperature changes, and physical impact.

Real-Time Applications – Near-zero latency to support time-sensitive, high throughput traffic for advanced computer processing.

Low Cost System Design

- Device pins confined only to the outer rows, allowing simple, low-cost PCB design.
- Dedicated modes for support of non-shielded cables and connectors.

Applications

Advanced Driver Assistance Systems (ADAS) and In-Vehicle Infotainment (IVI) Systems

- High resolution front cameras
- Rear view cameras
- Surround view cameras
- Mirror replacement cameras
- Monitoring and other in-cabin cameras
- RADARs
- LIDARs
- SoC-to-SoC video multi-streaming (DSI to CSI connectivity)

Non-Automotive Applications

Smart street infrastructure sensors

Surveillance and security sensors

Machine vision

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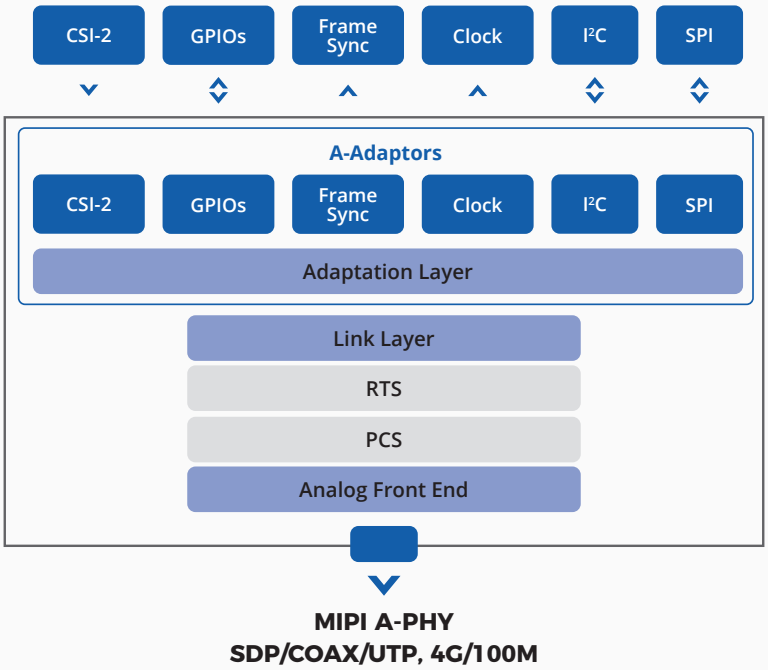
VA7021 Functional Block Diagram

True to size



Key Technical Highlights

Link	MIPI® A-PHY (V1.0) compliant with speed of up to 4Gbps
Configurable PHY	› Main Tx channel: 2Gbps, 4Gbps › Return channel: 100Mbps
Infrastructure	› Operating over MIPI® A-PHY channel • Coax cable - Transmission distance of up to 15 meters/50 feet, with up to four inline connectors • Shielded differential pair (SDP) - Transmission distance of up to 10 meters/33 feet, with up to four inline connectors › Special mode for working over UTP channel
MIPI CSI-2	› D-PHY, CSI-2 Input • 4 data lanes • Up to 2.5Gbps on each lane • Supporting up to 16 virtual channels
I²C	› An I²C channel for remote control by a deserializer › Operating frequency of 100KHz-1MHz › An option for local host I²C management
SPI	› SPI interface for remote control by a deserializer › Operating frequency of up to 40Mhz
Clock	Precision clock output, generated locally or via a remote centralized clock
Frame Sync	Enabling synchronization of different remote sensors
GPIOs	› Up to 3 general purpose output pins › Up to 4 general purpose I/O pins
Functional Safety	› ISO-26262, ASIL-B compliant › MIPI® Alliance draft specification for Camera Service Extensions (CSE℠)
Power Consumption	Typical 300mW
Package	6mm x 6mm FO-CLP
Temperature	AEC-Q100, Automotive Grade 2
Power Supply Rails	1.8V, 0.8V

Valens

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