Valens VA7000 Series

MIPI® A-PHY-Compliant SerDes for High-Speed Sensor Connectivity

Overview

The VA7000 Series MIPI A-PHY-compliant Serializer/Deserializer (SerDes) chipsets offer multi-gig sensor connectivity.

For **automotive** applications, the ICs support long-reach connectivity for cameras, RADARs, and LiDARs based on CSI-2, with link speeds of up to 8Gbps. The ICs are interoperable with any serializer or deserializer devices that implement MIPI A-PHY standard interfaces. The chipsets also provide I2C and SPI bus tunneling, GPIO pins tunneling, and advanced clock and frame synchronization. They operate over standard, cost- effective, wires with varying bandwidth and reach combinations surpassing industry standards:

- 15m, 4 in-lines, over Coax up to 8Gbps
- 10m, 4 in-lines, over Shielded Differential Pair (SDP) to 8Gbps
- 10m, 4 in-lines, over Unshielded Twisted Pair (UTP) up to 4Gbps
- 40m, 4 in-lines, over Coax up to 4Gbps

For **video conferencing, medical** and **industrial** applications, the VA7000 Series also offers 8Gbps for 30 meters or 4Gbps for 40 meters over Coax or Category cable.
The chipset removes the need for an ISP within the camera module itself, which miniaturizes the camera form factor and avoids costly image processing and proprietary extension of interfaces. This allows for the implementation of multi-cam applications with centralized processing architectures that include only one ISP at the receiver instead of multiple ISPs at the edge devices.

Chipsets

VA7031 Serializer

Input: 1 x CSI-2
Output: 1 x 8Gbps A-PHY

VA7021 Serializer

Input: 1 x CSI-2
Output: 1 x 4Gbps A-PHY

VA7021R Serializer

Input: 1 x CSI-2
Output: 1 x 4Gbps CSI-2

VA7044 Quad Deserializer

Input: 4 x 8Gbps A-PHY, 1 x CSI-2
Output: 2 x CSI-2

VA7042A Dual Deserializer

Input: 2 x 8Gbps A-PHY,
Output: 2 x CSI-2

VA7004R Dual/Quad Deserializer

Input: 4 x 4Gbps
Output: 1 x 4Gbps CSI-2

VA7004 Dual/Quad Deserializer

Input: 2 x 8Gbps or 4 x 4Gbps A-PHY
Output: 1 x CSI-2

Highlights

MIPI Spec Compliant

Designed to meet the MIPI Alliance specifications for A-PHY version 1.1, D-PHY version 2.1, and C-PHY version 1.2, as well as PAL (Protocol Adaptation Layer) specifications for CSI-2, I2C, SPI, and GPIO I/Fs.

AEC-Q100 Qualified

Automotive Grade 2: -40°C to +105°C ambient operating temperature.

Power Consumption, low power dissipation

Ultra-low serializer power consumption, typically less than 220mW.

Power Over Coax/SDP/UTP

Coexisting with power over the channel, in accordance with the A-PHY specification, which removes the need for a dedicated power supply to the serializer.

EMC Performance

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

Real-Time Applications

- Uncompressed, near-zero latency (~10µs) to support time-sensitive, high throughput traffic for advanced computer processing.
- Advanced clock and frame synchronization

Functional Safety

With advanced data protection, diagnostics, and real-time monitoring, the chipsets meet functional safety requirements:

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

Low-Cost System Design

- Removing the need for a costly protocol conversion allowing small sensor form factor
- Dedicated modes for support of non-shielded cables and connectors
- Highly accurate and configurable Internal Pulse-Width Modulator (PWM) embedded within the deserializer, allowing for advanced clock and frame synchronization without the need for costly external programmable components.

Applications

Automotive Applications

- High resolution front cameras
- Rear view cameras
- Surround view cameras
- Mirror replacement cameras
- In-cabin sensing and monitoring
- RADARs
- LiDARs
- SoC-to-SoC video multi-streaming (DSI to CSI connectivity)
- Trucks
- Long vehicles

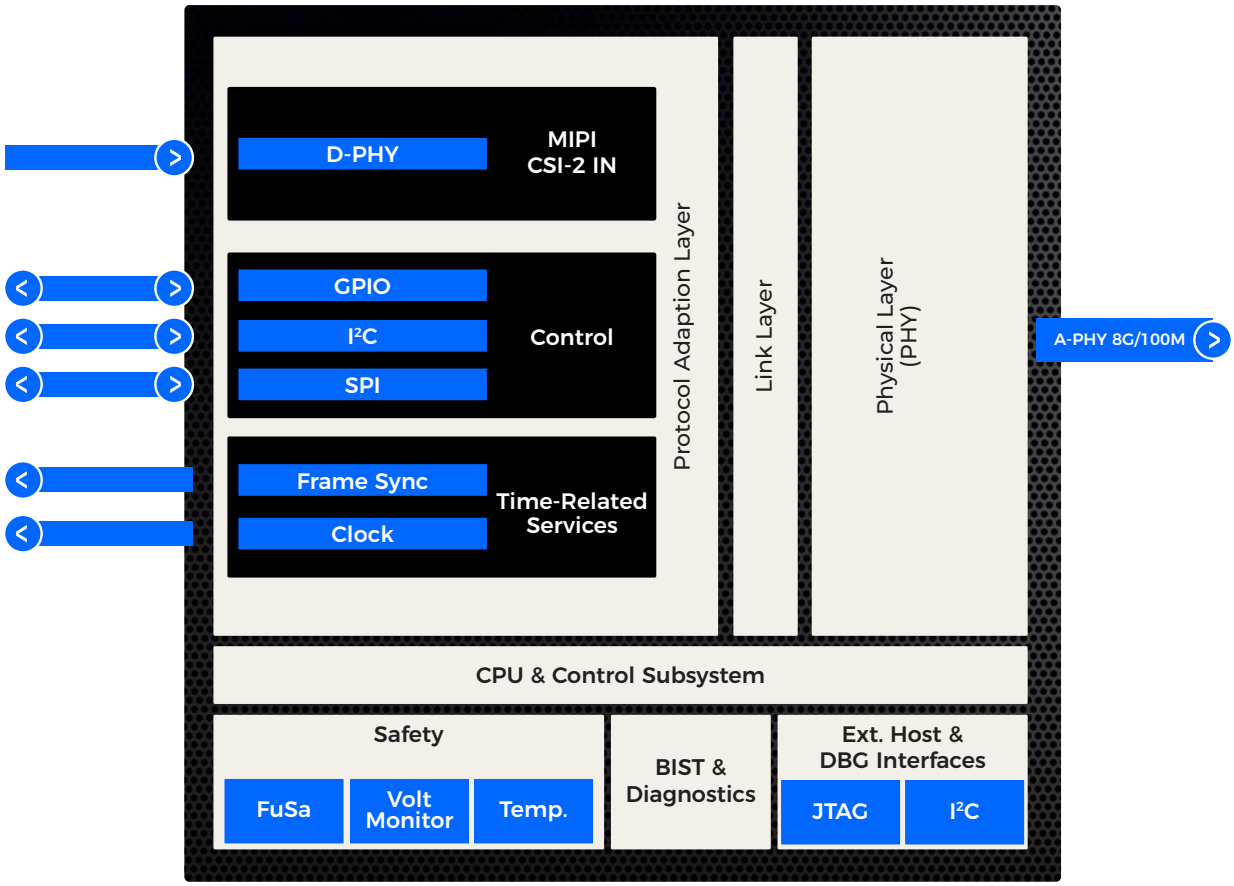
Video conferencing

Machine vision

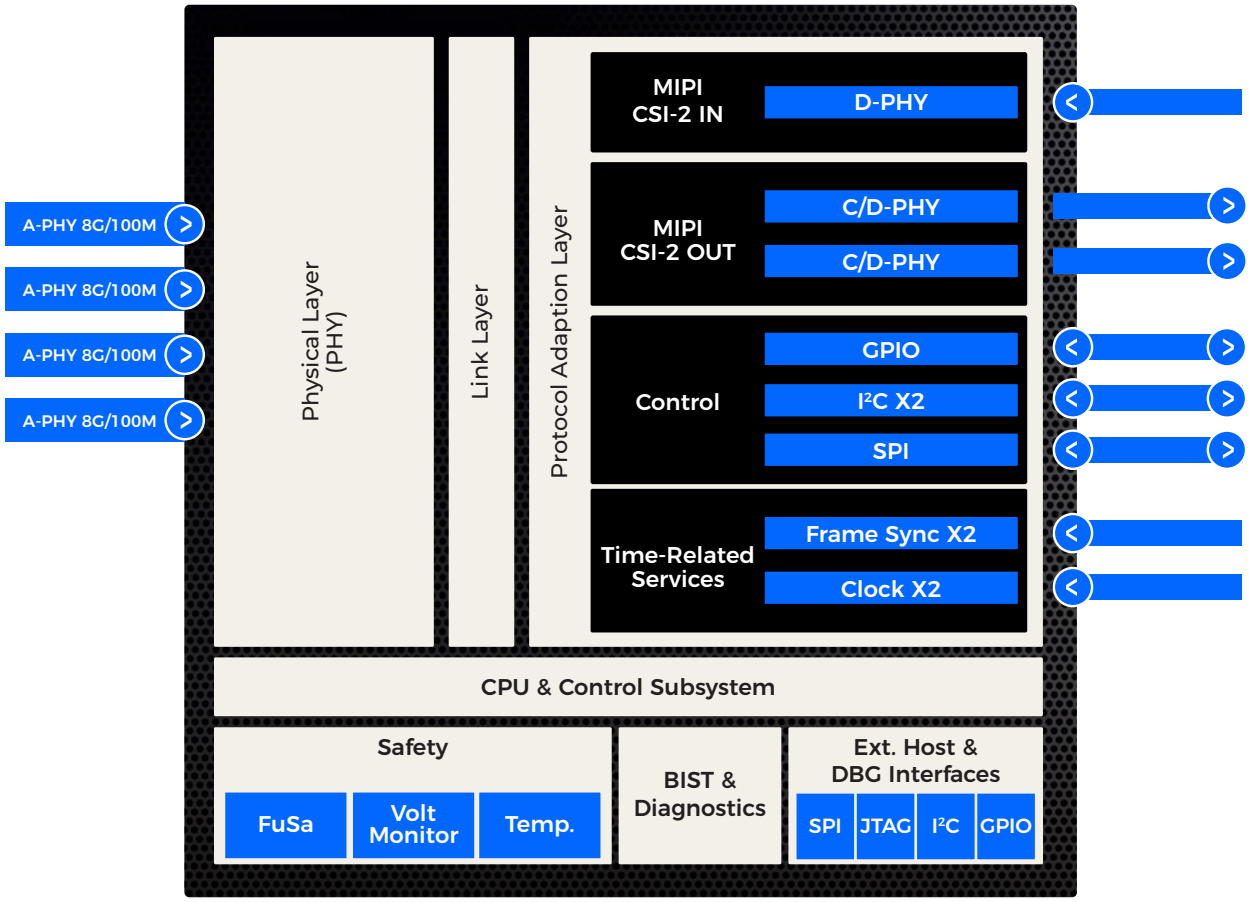
Medical imaging

Block Diagram

VA7031 Serializer



VA7044 Quad Deserializer



Key Technical Highlights

			VA7031	VA7021	VA7044	VA7042A	VA7004		VA7021R	VA7004R
			Serializer	Serializer	Quad Deserializer	Dual Deserializer	Quad Deserializer	Dual Deserializer	Serializer	Quad Deserializer
Link										
Specification			MIPI® A-PHY (V1.1) compliant						N/A	N/A
# of A-PHY Links			1	1	4	2	4	2	1	4
Configurable PHY	Main Channel		2Gbps, 4Gbps, 8Gbps	2Gbps, 4Gbps	2Gbps, 4Gbps, 8Gbps		2Gbps, 4Gbps	2Gbps, 4Gbps, 8Gbps	4Gbps	4Gbps
	Return Channel		100Mbps						100Mb	
Infrastructure	Automotive	Coax	Up to 15 meters/50 feet, with up to four inline connectors						Up to 40meters/132 feet with up to four inline connectors	
		SDP	Up to 10 meters/33 feet, with up to four inline connectors						N/A	
		UTP	Up to 10 meters/33 feet, with up to four inline connectors (Up to 4Gbps)							
	Industrial, Medical, ProAV * Special firmware required	Cat Cable/ RJ45	Up to 40 meters/132 feet, 4Gbps Over a single pair							
		Coax	Up to 30 meters/98 feet (Up to 8Gbps) Up to 40 meters/131 feet (up to 4Gbps) Up to 50 meters/164 feet (up to 2Gbps)							
		UTP	Up to 13 meters/42 feet (Up to 4Gbps)							
Converged Interfaces										
MIPI CSI-2	Input		1 CSI-2 port (D-PHY I/F) • 4 data lanes • Up to 2.5Gbps on each lane • Supporting up to 16 virtual channels			N/A	N/A	N/A	• 1 CSI-2 port (D-PHY I/F) • 4 data lanes • Up to 2.5Gbps on each lane • Supporting up to 16 virtual channels	N/A
	Output	Ports	N/A		2		1		N/A	1
		Features	N/A	N/A	• Supports up to 16 virtual channels • Incoming video stream can be dynamically routed or duplicated to any of the CSI-2 output ports • Ports can be configured as C-PHY or D-PHY I/F: **C-PHY:** • 3 data lanes (each lane is a C-PHY trio) • Up to 5.7Gbps on each lane **D-PHY:** • 4 data lanes • Up to 2.5Gbps per lane		• Supports up to 16 virtual channels • Port can be configured as C-PHY or D-PHY I/F: **C-PHY:** • 3 data lanes (each lane is a C-PHY trio) • Up to 5.7Gbps on each lane **D-PHY:** • 4 data lanes • Up to 2.5Gbps per lane		N/A	• Supports up to 16 virtual channels • Port can be configured as C-PHY or D-PHY I/F: **C-PHY:** • 3 data lanes (each lane is a C-PHY trio) • Up to 5.7Gbps on each lane **D-PHY:** • 4 data lanes • Up to 2.5Gbps per lane
I²C	Number of channels		1		2				1	2
	Frequency		100KHz-1MHz							
SPI	Number of channels		1							
	Frequency		Up to 40MHz							
Precision Clock			1 Output		2 input				1 output	2 inputs
Frame Sync			1 Output		2 input				1 output	2 inputs
GPIOs	Output pins		Up to 3		Up to 13				Up to 3	Up to 13
	I/O pins		Up to 4		Up to 12				Up to 4	Up to 12
Other										
External Host & Debug	Interfaces		JTAG, I²C		SPI, GPIO, JTAG, I²C				JTAG, I²C	SPI, GPIO, JTAG, I²C
	Link testing		BIST & Diagnostics							
Functional Safety			• ISO-26262, ASIL-B compliant • MIPI® Alliance specification for Camera Service Extensions (CSE℠)							
Power Consumption (Typical)			230mW	210mW	2.5W	1.6W	1.85W	1.5W	210mW	1.85W
Package			6mm x 6mm FC-CSP		15mm x 15mm FC-CSP	11mm x 11mm FC-CSP			6mm x 6mm FC-CSP	11mm x 11mm FC-CSP
Temperature			• AEC-Q100, Automotive Grade 2 • Internal temperature monitor							
Power Supply Rails			• v1.8, 0.8V • Internal voltage monitor							

Valens 8 Hanagar St., POB 7152 | Hod Hasharon 4501309, Israel | Tel: +972-9-762-6900 | info@valens.com | www.valens.com