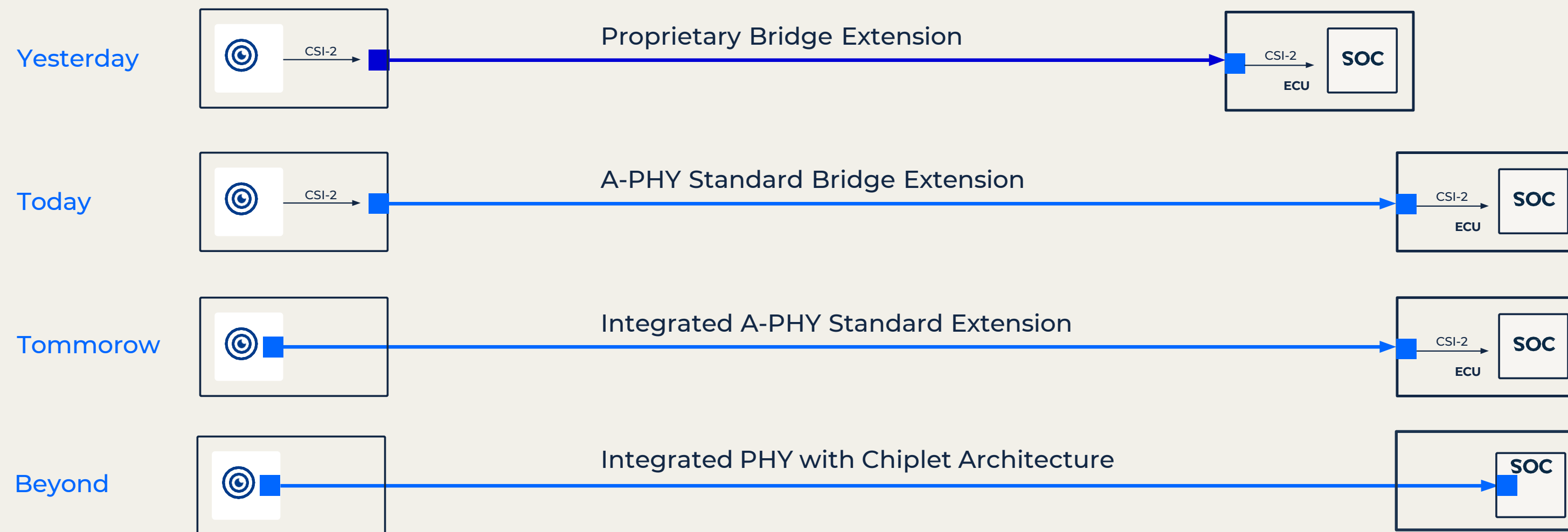


# mipi<sup>®</sup> alliance



# mipi alliance

- Defined A-PHY for CSI-2 and DSI-2 extension, which are widely used today in automotive
- Allows for the integration of A-PHY connectivity into the sensor
- Will form a standard connectivity solution for the SoC chiplet architecture





- Technology selected as the baseline for the MIPI A-PHY standard
- Introduced to market the first MIPI A-PHY-compliant chipsets, which offer:
  - Tunneling of CSI-2, GPIO, SPI, I2C
  - UTP for speeds up to 4Gbps per link; SDP, Coax for speeds up to 8Gbps per link
  - Extremely low packet error rate  $<1E^{-19}$
  - Clear roadmap to 16Gbps



#### VA7031 Serializer

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



#### VA7021 Serializer

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



#### VA7021R Serializer (40m)

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



#### VA7042 Dual Deserializer

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



#### VA7044 Quad Deserializer

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



#### VA7004 Dual/Quad Deserializer

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



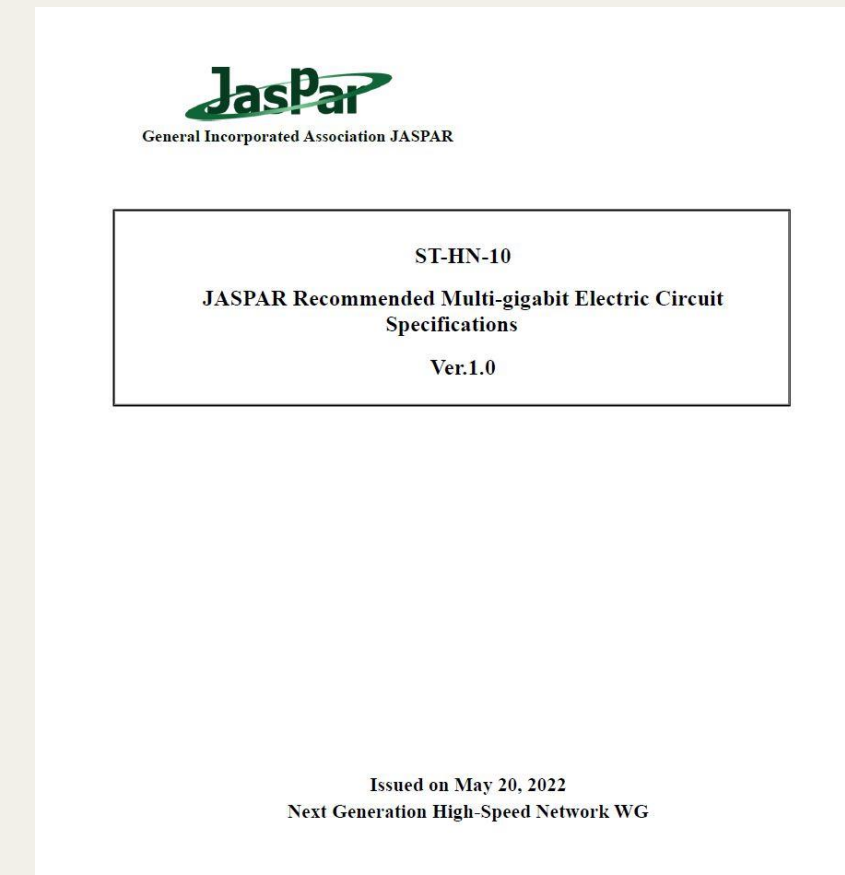
#### VA7004R Dual/Quad Deserializer (40m)

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



- Evaluated A-PHY via the Next Generation High-Speed Network WG.
- Published recommended Multi-gigabit Electric Circuit Specifications: ST-HN-10.
- Conducted a comprehensive suite of EMC tests.

Test Name	Standard	Results
Induction noise test	ISO 7637-3	✓
TEM Cell	ISO 11452-1, ISO 11452-3 (Class 3:200V/m)	✓
Antenna irradiation	ISO 11452-1, ISO 11452-2 (Class 3:200V/m)	✓
BCI	ISO 11452-1, ISO 11452-4 (Class 3:200V/m)	✓
Antenna irradiation radar band	Ford FMC1278 RI 14 (Class 2:600V/m)	✓
Wireless device test	ISO 11452-9 Ed1.0	✓
Conductive noise	CISPR25 (Class 5)	✓
Radiation noise	Ford FMC1278 RE 310 (Level2)	✓



Jaspar recommended Multi-gigabit Electric Circuit Specifications: ST-HN-10 >

■ “As car companies integrate next-generation ADAS and autonomous systems with sensors requiring ever-higher bandwidth, EMC is becoming increasingly important. Our EMC testing has shown that MIPI A-PHY is one of the most resilient technologies for electromagnetic interference.”

**Hideki Goto**, Chair of the Next Generation High-Speed Network Working Group at JASPAR & Group Manager at Toyota

# mobileye

- EyeQ5 platform: A-PHY camera head and adaptor board are available on the market.
- Working on integration into future platforms.

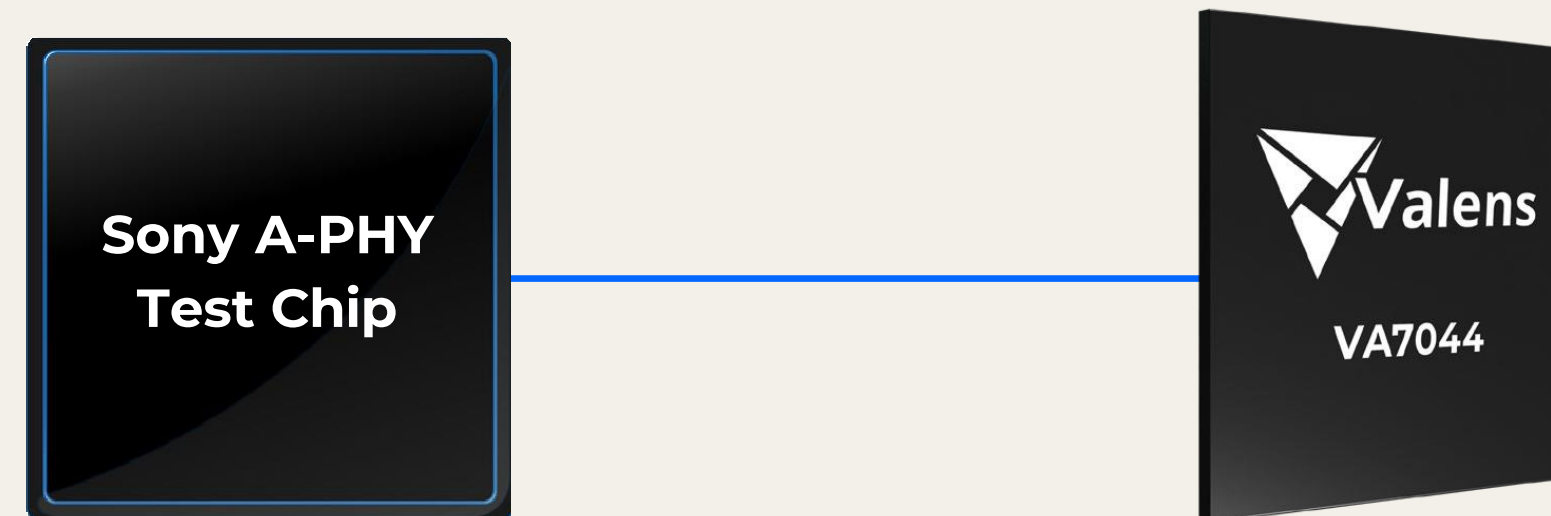


■ “We at Mobileye are working closely with Valens to make sure our next-generation platforms will comply with the MIPI A-PHY architecture.”

**Amnon Shashua**, Founder & CEO

# SONY

- Active member of MIPI working groups, specifically the security specs (CSE).
- Designing A-PHY TX to be integrated into future automotive sensors.
- Recently completed successful interoperability testing of Sony's A-PHY test chip against Valens RX.

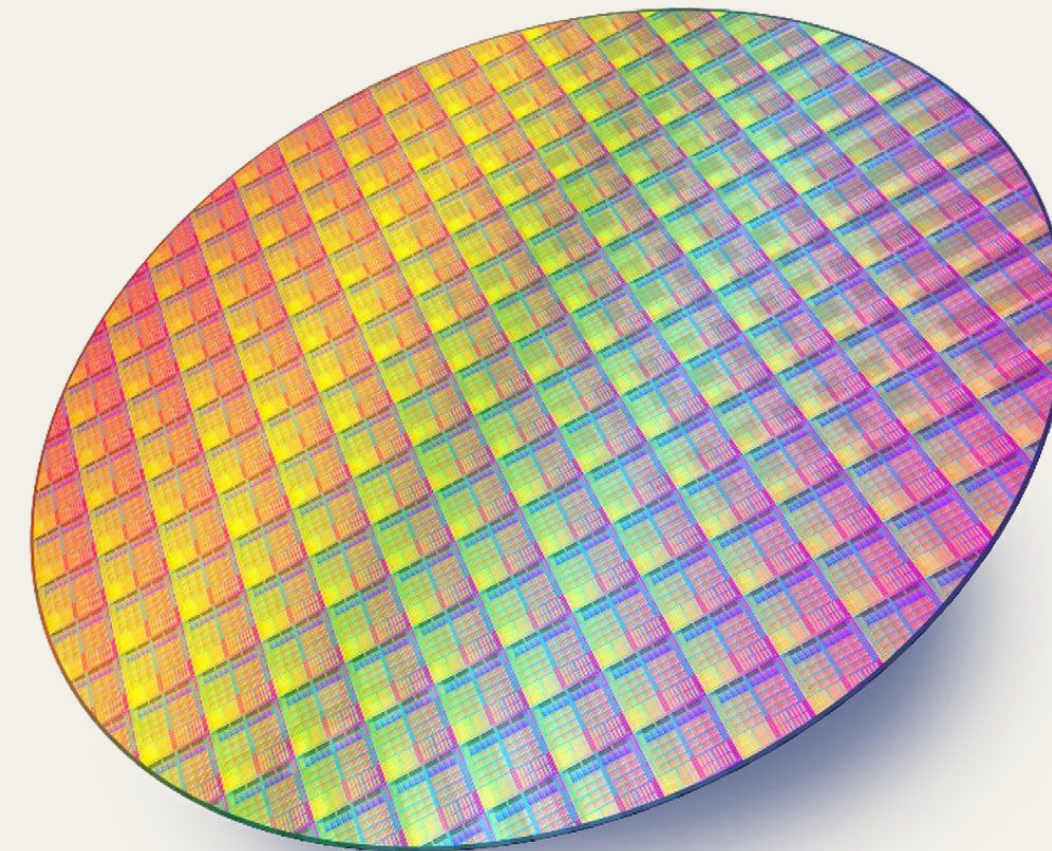


■ “Interoperability between multiple vendors’ components is crucial for the success of any standard, and we are happy to reach this important milestone with MIPI A-PHY. As market leaders, it is highly important for Sony Semiconductor Solutions to introduce cutting-edge technology into our image sensors, and MIPI A-PHY serializer integration will provide significant cost and performance benefits for our automotive customers.”

**Kenji Onishi, General Manager**, Automotive Business Department



- Intel Foundries will provide design and fabrication services for automotive suppliers implementing A-PHY.
- Allowing third parties from across the automotive industry to accelerate time to market for A-PHY systems, from Application Specific Integrated Circuits (ASICs) to System on Chip (SoC) solutions.



■ “As the most cutting-edge high-speed connectivity technology in the automotive industry, MIPI A-PHY is well positioned for large-scale integration in cars around the world. With our combination of advanced process technology and geographically diverse capacity, we are confident that we will be able to address the strong market interest in MIPI A-PHY solutions.”

**Dr. Randhir Thakur**, President of Intel Foundry Services



- Ensuring that Sumitomo Electric's wiring harness systems meet the channel requirements of the A-PHY specification.
- Providing differential/coaxial cables that meet the A-PHY specification.
- Expanding the variety of cabling options in the future.



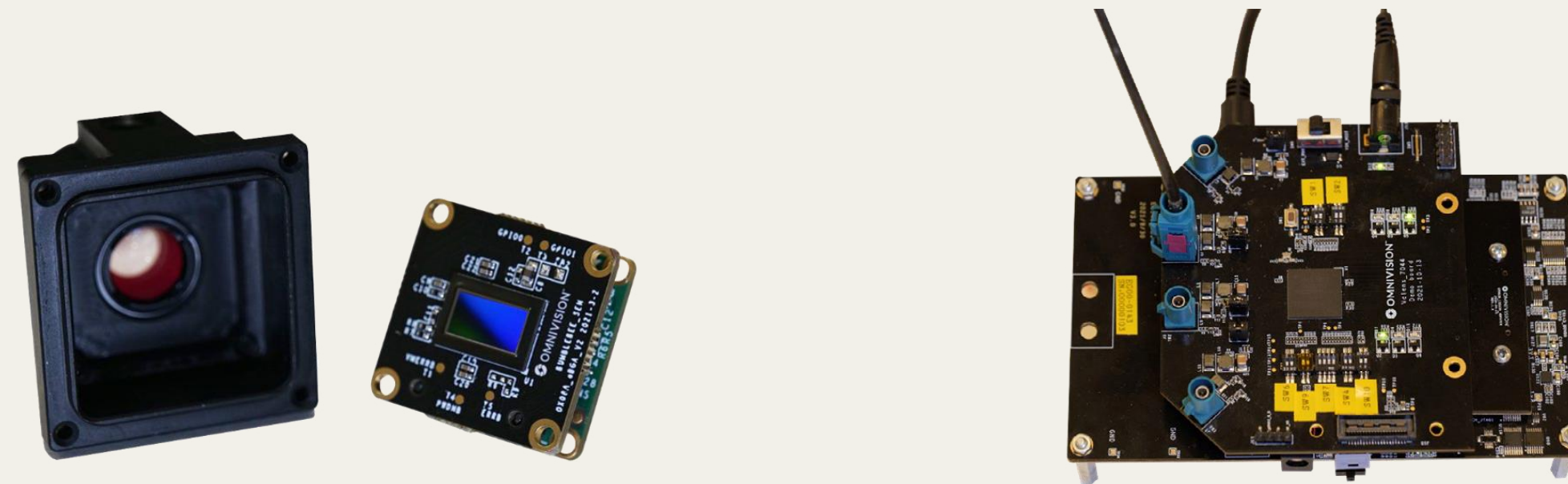
■ “At Sumitomo Electric, we view A-PHY as the connectivity infrastructure underlying the cars of tomorrow, so it was important for us to make sure our cables meet this standard’s channel requirements.”

**Hiroki Hirai**, Sumitomo Electric General Manager of CAS-EV Development Promotion Division





- Added A-PHY support to the ARDS evaluation kit.
- Paving the way for the development of A-PHY-compliant camera systems, allowing for smaller camera designs, reduced power consumption, lower camera cost, and interoperability with the wider A-PHY ecosystem.

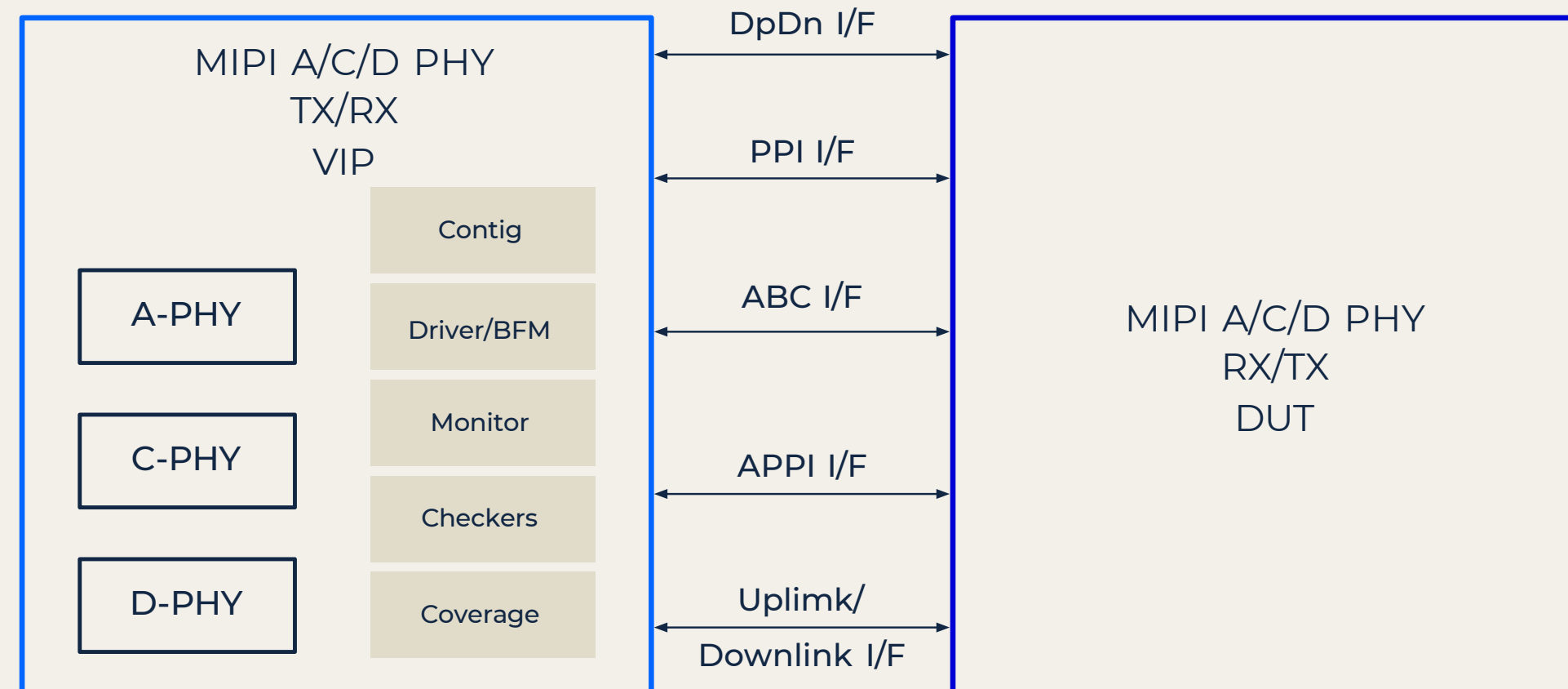


■ “It is a major step that the automotive industry can now work around a connectivity standard, which is built from the ground up to deal with the specific challenges in the car while bringing significant cost savings to the ecosystem as a whole. We look forward to taking our place in this impressive new development around MIPI A-PHY.”

**Boyd Fowler**, Chief Technology Officer at OMNIVISION

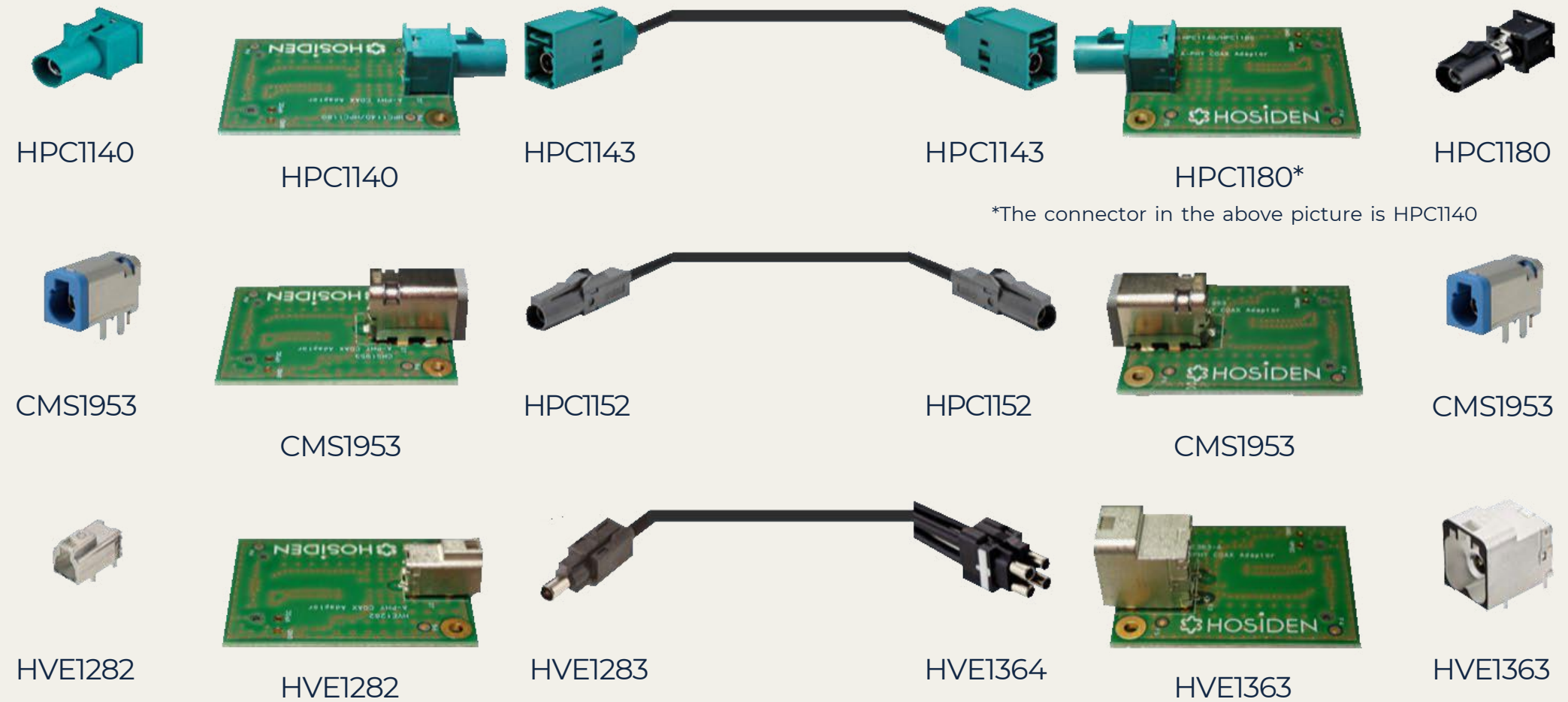
# cādence®

- Providing a mature and comprehensive Verification IP (VIP) for D-PHY/C-PHY/A-PHY.
- Helps reduce time to test, accelerate verification closure, and ensure end-product quality.
- Supports A-PHY v1.0 and v1.1.



# HOSIDEN

- Developed a comprehensive set of connectors and cables supporting the A-PHY standard.
- Created adaptor boards for A-PHY evaluation kits.



■ "Hosiden's electronic components, which support increasingly sophisticated automotive electronics, are undergoing continuous technological development and quality improvement. MIPI-A-PHY is an important means to realizing the future in-vehicle sensor networks, and Hosiden will continue to provide products to support this."

**Mr. Hayato Kondo**, R&D Section Manager at Hosiden Corporation



## SUNNY OPTICAL TECHNOLOGY

- Integrating MIPI A-PHY-compliant chipsets into next-generation camera modules.
- The ADAS module utilizes an 8MP sensor.
- The Surround View module utilizes a 3MP sensor and connects to an ECU via UTP channels.



■ “We acknowledge the momentum MIPI A-PHY standard is gaining in the industry, and the significant business opportunity it represents for our company.”

**Bob Zhang**, General Manager at Sunny Smartlead, Sunny Optical



- Designed the first off-the-shelf A-PHY-based camera module on the market.
- Serves as a design house for machine vision, ADAS, and autonomous systems based on A-PHY.
- Plans on adding additional sensors and drivers to support other processors in response to market requirements.



■ “We’ve seen strong demand for MIPI A-PHY-based connectivity solutions... The new connectivity standard offers a number of key technological breakthroughs – including in bandwidth, link distance, and resilience to Electro Magnetic Interference (EMI) – all of this fuels our expectation that this module will generate significant interest from our automotive customers and partners.”

**Bill Pu**, CEO at [Leopard Imaging](#)

# CHEMTRONICS

- Integrated A-PHY into an e-mirror system;
  - Front-view: Recording for insurance purposes.
  - Rear-view: For rear-facing visibility.
- Connectivity leveraging UTP wiring.
- A-PHY project being designed specifically for an automotive OEM.

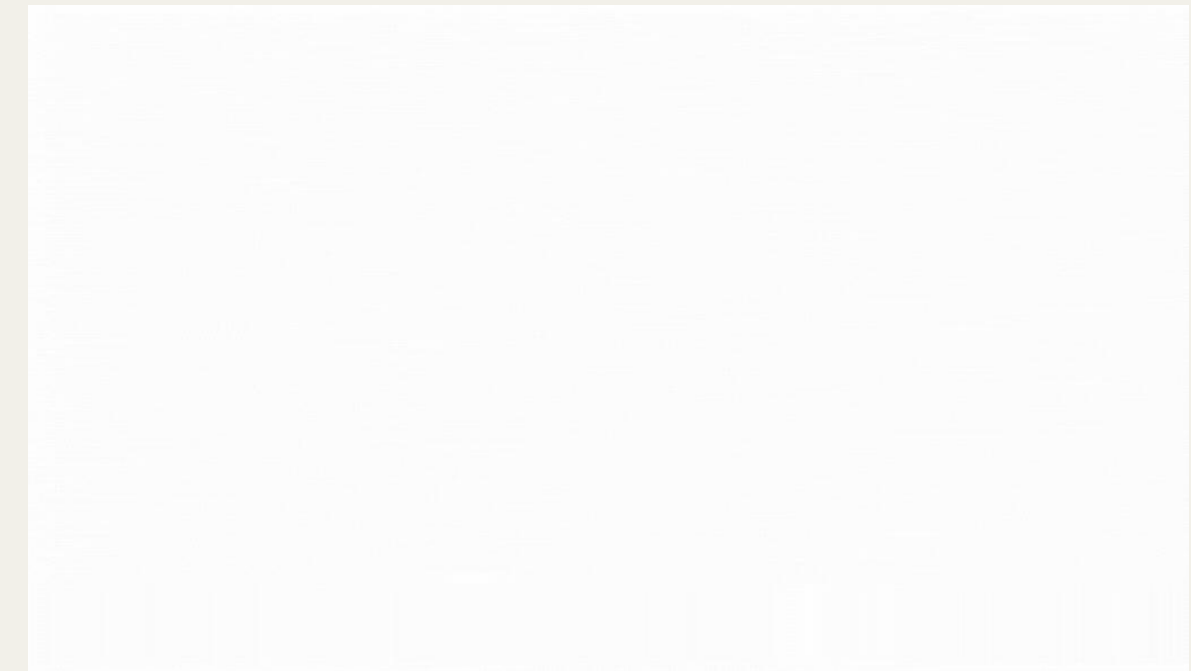


■ “The MIPI A-PHY-based solution allows us to integrate cameras with unprecedented resolutions and to connect them over unshielded cables and connectors. We’re happy to be part of this fast-growing ecosystem.”

**Mr. Soonkwon Paik**, Senior Vice President, Automated Driving Group at Chemtronics



- Developed the first A-PHY compliance testing solution to ensure interoperability based on the MIPI A-PHY specification.
- Enables automakers and their suppliers to stress the receiver and validate its performance.
- Collaborated with BitifEye Digital Test Solutions GMBH and Wilder Technologies.



■ "At Keysight, we recognize that it is critical to address the growing market demands for high-speed digital interfaces for next- generation in-vehicle networks. This new solution from Keysight represents yet another way we are supporting the evolution and standardization of technologies for our automotive customers."

**Thomas Goetzl**, vice president and general manager of Keysight's Automotive and Energy Solutions business unit



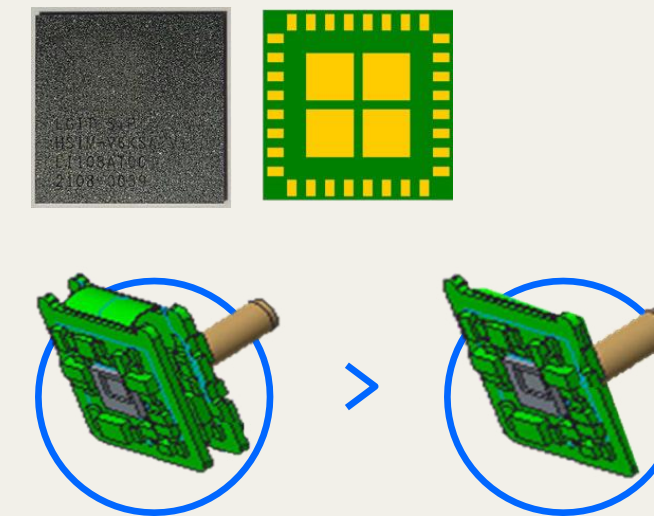
- First in the industry with A-PHY-compliant SiP modules.
- Highly integrated module enabling simplified, small form factor product designs.

#### MIPI A-PHY Tx SiP Module

- 5.0 x 5.0 x 1.0mm, QFN 32-Pin
- Support Automotive Temp. Grade2 (-40 ~ +1050C)
- Target MP : Apr., 2024-

#### MIPI A-PHY Rx SiP Module

- 9.0 x 9.0 x 1.8mm, QFN 64-Pin
- Support Automotive Temp. Grade2 (-40 ~ +1050C)
- Target MP : Apr., 2024



#### In Sensor Module (Camera/Radar)

- Low Cost
- Reduced Thickness

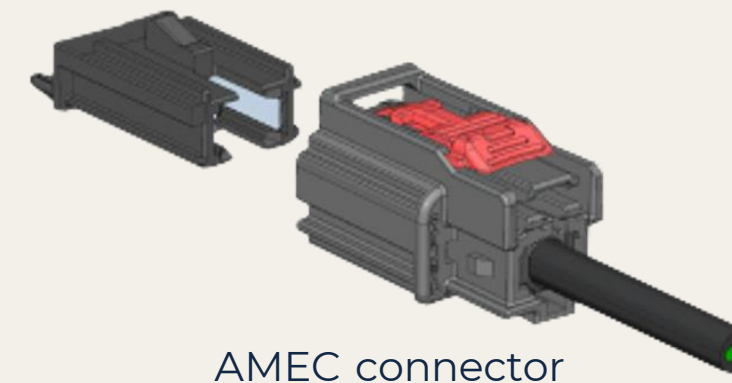
■ “The automotive market is racing towards standardization, and A-PHY is far and away the leading connectivity solution. LG Innotek’s SiP modules will be at the forefront of A-PHY-based technological innovation.”

**Insoo Ryu**, VP, Head of the Automotive Components & Electronics Business Division at LG Innotek



# • APTIV •

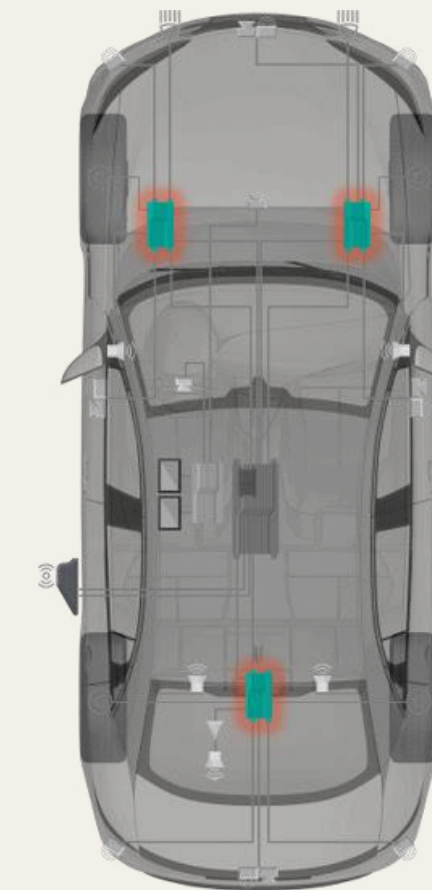
- A-PHY chipsets are embedded into Aptiv's SVA's Power Data Center (PDC) modules and sensors, reducing the number of connections and individual devices within vehicles.
- Aptiv's platform supports high resolution sensors and enables sensor fusion of cameras and radars for enhanced safety.



AMEC connector



PDC module



SVA™ topology

■ “A-PHY will help accelerate the transition to software-defined vehicles, supported by intelligently connected architectures such as Aptiv’s Smart Vehicle Architecture™. These architectures, and the software they support, are the foundation for delivering on our mission of enabling a safer, greener, more connected future of mobility.”

**Glen De Vos**, Senior Vice President and Chief Technology Officer of Aptiv

## SMART RADAR SYSTEM

- Developed radars geared to centralized processing with MIPI A-PHY connectivity, transferring raw data from the radar's MMICs to the centralized ECU.
- Utilizing the fast SPI control interface offered by A-PHY.
- A-PHY project being designed specifically for an automotive OEM.



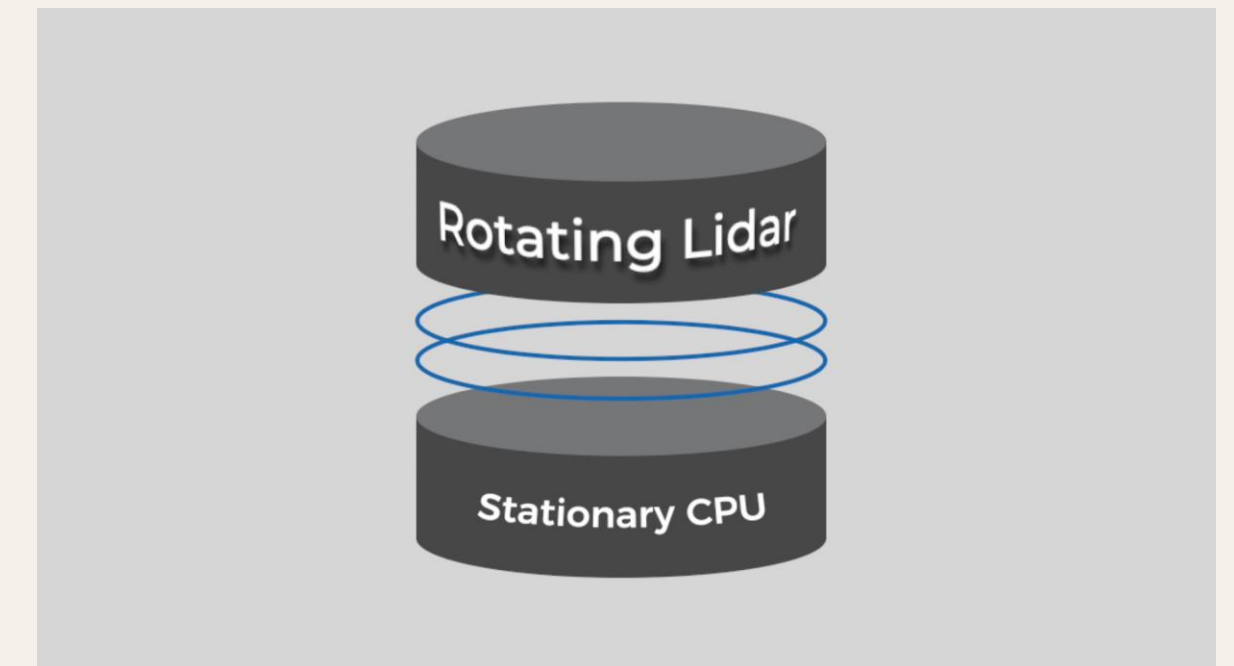
■ “Due to the lack of an efficient connectivity technology, radars have been forced to include built-in processing at the edge – adding cost and complexity to system design. MIPI A-PHY is changing that, with major advances to link bandwidth and distance, this technology will create a new generation of centralized radars for the automotive industry.”

**Yong-Jae Kim**, CTO of Smart Radar Systems (SRS)

# INNOVIZ™

## TECHNOLOGIES

- Integrated A-PHY connectivity in the state-of-the-art Innoviz 360o lidar.
- The robust A-PHY connectivity solution has allowed for Innoviz to transfer raw lidar data through the challenging rotating transformer connection, maintaining signal integrity through a 0.3µm gap of air.



■ **“Our LiDAR will benefit from standardized solutions that can seamlessly and effectively manage the high bandwidth they extend to cars... We are excited to partner with Valens Semiconductor, which will play a vital role with its [A-PHY-compliant] chipsets... in enabling the next stages of ADAS.”**

**Omer Keilaf**, Co-Founder and CEO of Innoviz

## CHEMI-CON

- Developed an A-PHY camera module for the automotive market.
- Applications include vehicle recording, Advanced Driver-Assistance System (ADAS), and surround view.



■ “Nippon Chemi-Con foresees growing demand for our new camera module equipped with a MIPI A-PHY-compliant chipset, Valens Semiconductor’s high-performance VA7000. We believe embedding this highly reliable technology will drive adoption by customers focused on ADAS and autonomous driving.”

**Mr. Katsunori Nogami**, Senior Executive Officer and CTO



# PROTOCOL INSIGHT

- Created the Marlin A200 protocol analyzer and exerciser, which supports the A-PHY 2.0 specification.
- Marlin A200 has industry leading analyzer features, providing time correlated packets of uplink and downlink traffic, and packet statistics.



Protocol Insight's Marlin A200 protocol analyzer and exerciser



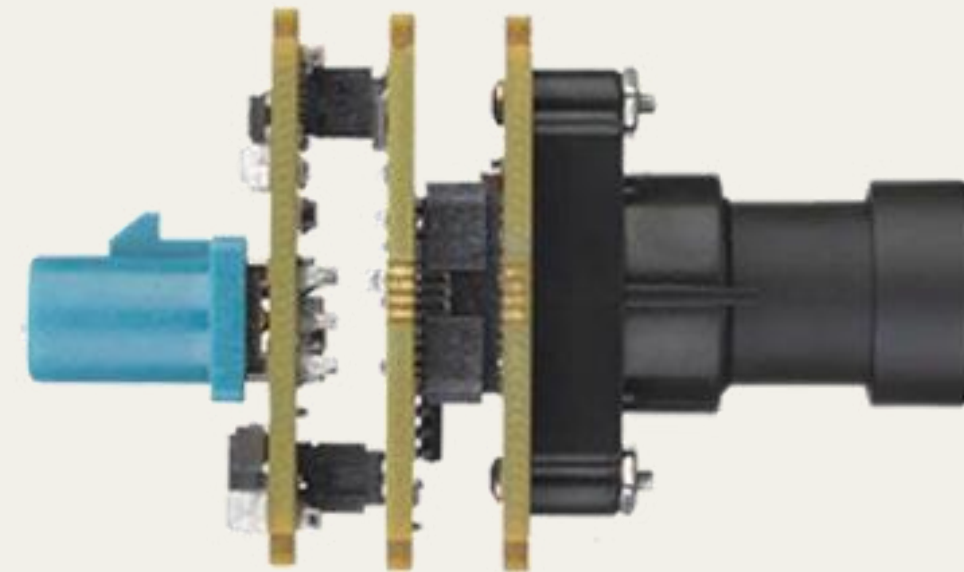
- Selected Valens VA7000 MIPI A-PHY chipset family for its next generation camera system project.
- A-PHY will form the underlying connectivity solution between multiple camera sensors and LGE's cutting-edge next generation camera system.
- A-PHY will enable the seamless display of multifunctional information to augment driver decision-making and enhance passenger safety.

■ "We expect this groundbreaking offering to be ready for mass production for Automotive OEMs in 2026 and are looking forward to further expanding our collaboration towards broad adoption of the MIPI A-PHY standard."

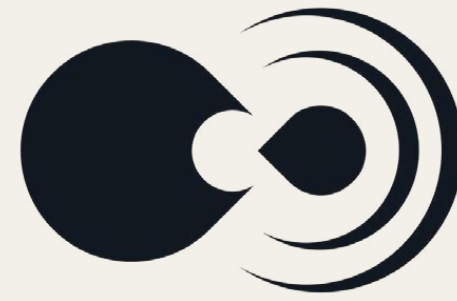
**Juneun Park**, VP of the Head Unit Development at LG VS Company

# onsemi

- Onsemi is including A-PHY inside the modular automotive reference system (MARS)
- MARS gives engineers and software developers the fundamental building blocks needed to create next generation imaging systems, while reducing the design effort and resources required to develop a working solution

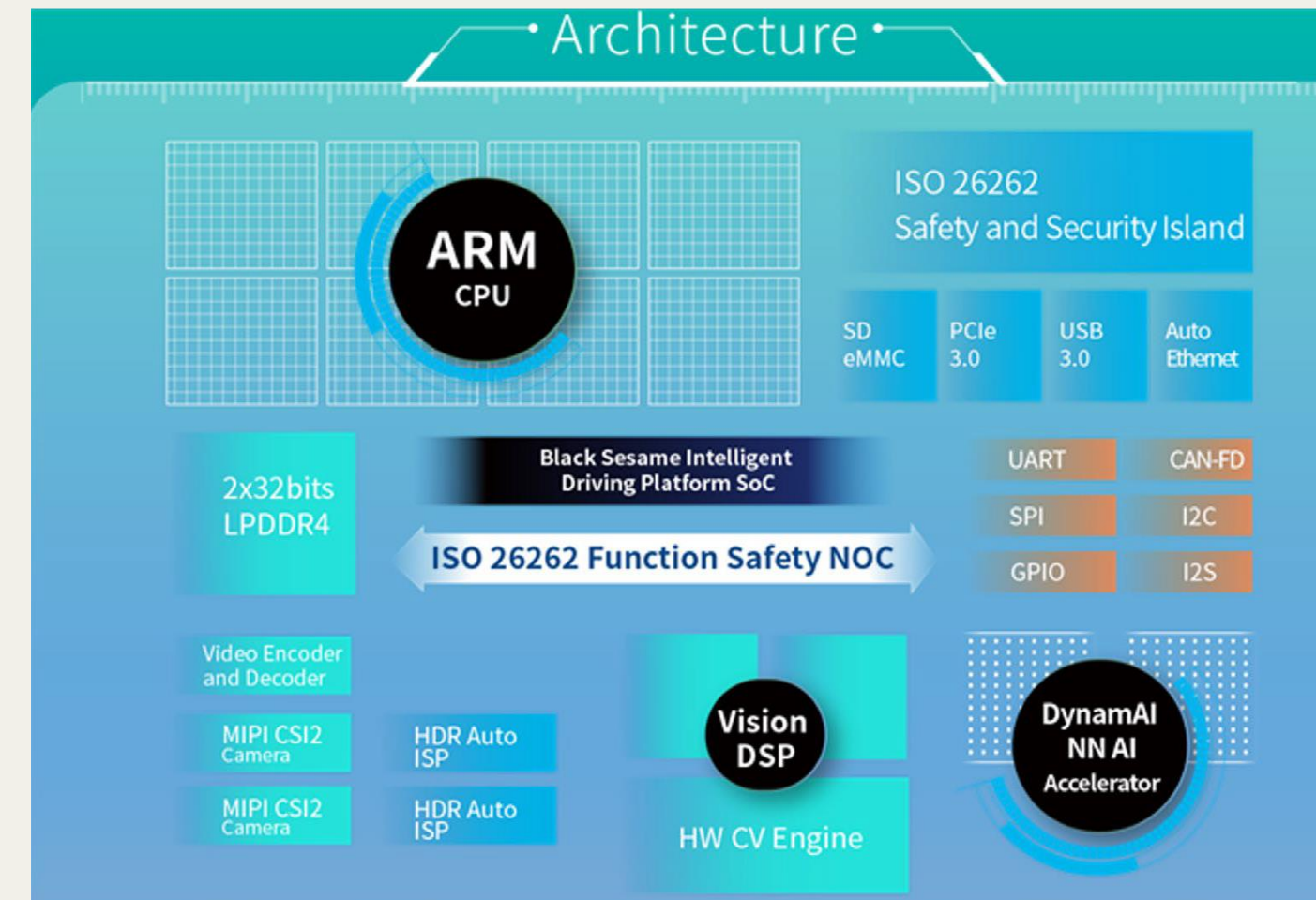


■ **“As a member of the MIPI Alliance, onsemi is engaged in advancing ultra-high-speed transmission in the connected car. As the baseline of the MIPI A-PHY standard, Valens’ technology is a key element in our efforts towards addressing the demands of the automotive sector.”**



**BLACK  
SESAME**  
TECHNOLOGIES

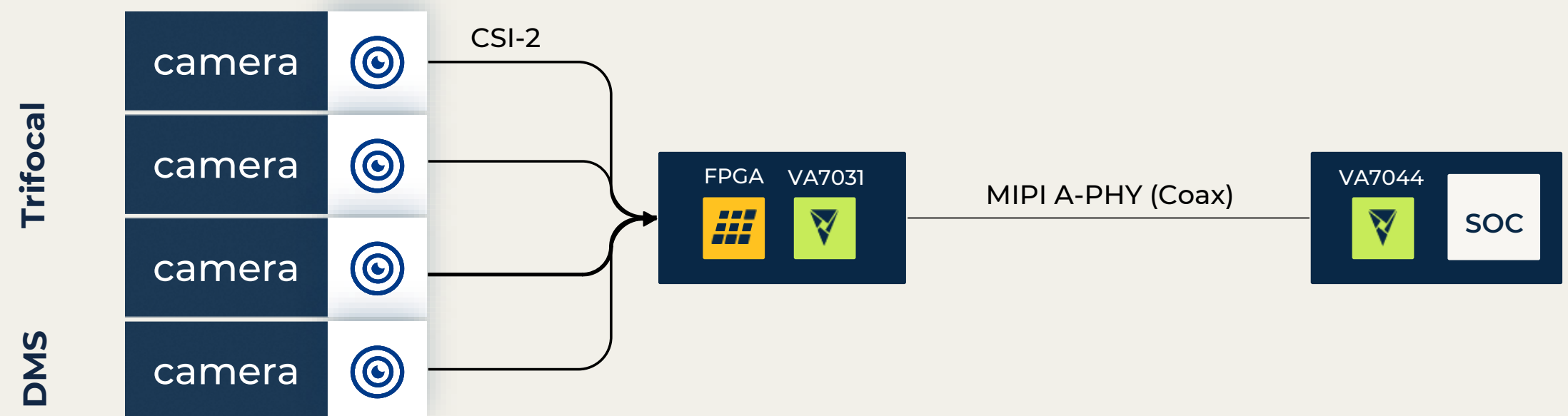
- Added support for A-PHY to its Huashan-2 A1000 L Autonomous Driving Perception Chip
- Huashan-2 A1000 L SoC supports L2/L2+ ADAS solutions





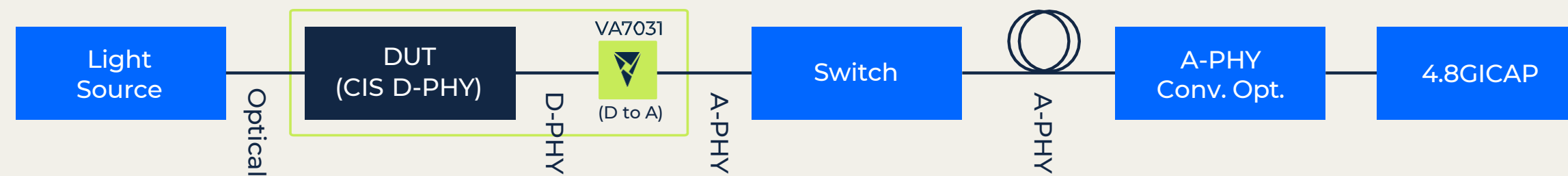


- Lattice CrossLink™-NX supports 4 to 1 MIPI D-PHY Video Aggregation to MIPI A-PHY
- Valens solution adds:
  - Linux / Windows
  - x64 / ARM
  - CPU / GPU / Lattice FPGA
  - SDK in C / C++ / Python
  - Customizable
  - Hardware Independent



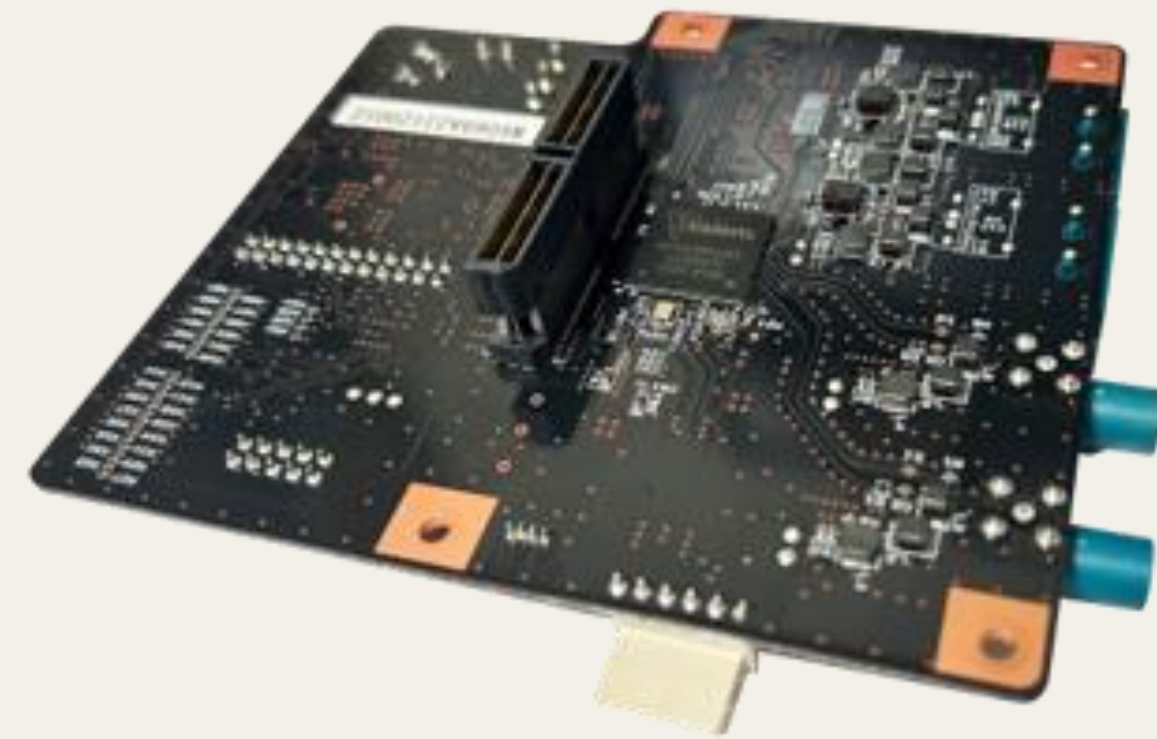
# ADVANTEST

- Developed an A-PHY Converter option using Valens Semiconductor's A-PHY-compliant VA7044 deserializer.
- The CMOS Image Sensor (CIS) A-PHY Test Solution can be constructed by combining with existing CIS test equipment (C-PHY, D-PHY).





- Adding support of MIPI A-PHY (API-7044) to its SerDes Interface Board (SVM-06)
- The board supports:
  - 2x FAKRA
  - 2x TE MATEnet (or other UTP Connectors)
  - USB (UVC) Output (~3.2Gbps)
  - HDMI Output
  - 2 x D-PHY connectors
  - Direct connection to Local MIPI D-PHY Sensor
- Next-generation model will support
  - MIPI CSI-2 D-PHY 2.5Gbps/lane and 10Gbps USB 3.1 Gen 2





- Created a 4D mmWave radar with centralized processing, based on A-PHY
- Leveraging the VA7000 chipset series by Valens, the radar is able to operate over UTP cables
- The software-defined radar is low-cost, low-energy, and highly efficient



■ “At G-Pulse, our mission is to foster the development of the automotive industry in China with cutting-edge offerings. We are highly impressed by Valens Semiconductor’s VA7000 MIPI A-PHY compliant chipsets, which address the increasing requirements for safer and automated driving. Specifically, Valens Semiconductor’s high-performance connectivity solution will boost a new paradigm of radar and camera sensor fusion.”

**Sam Qin**, Vice General Manager at Shanghai G-Pulse Electronics Technology