



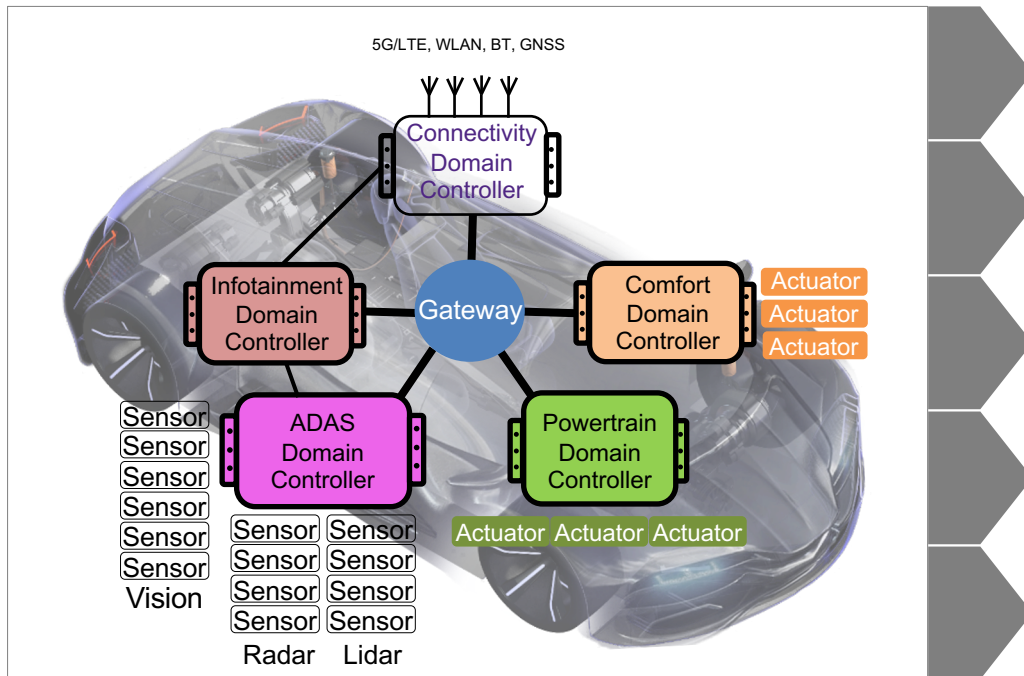
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Kelvin Xu, Synopsys
Product Marketing Manager

**Enabling Long-Reach MIPI CSI-2 Connectivity
in Automotive with MIPI IP**

28-29
SEPTEMBER
2021

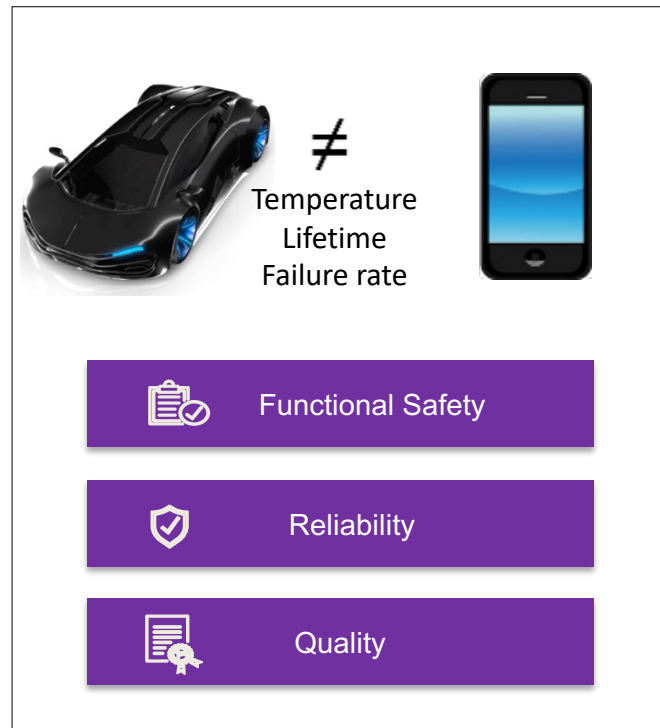
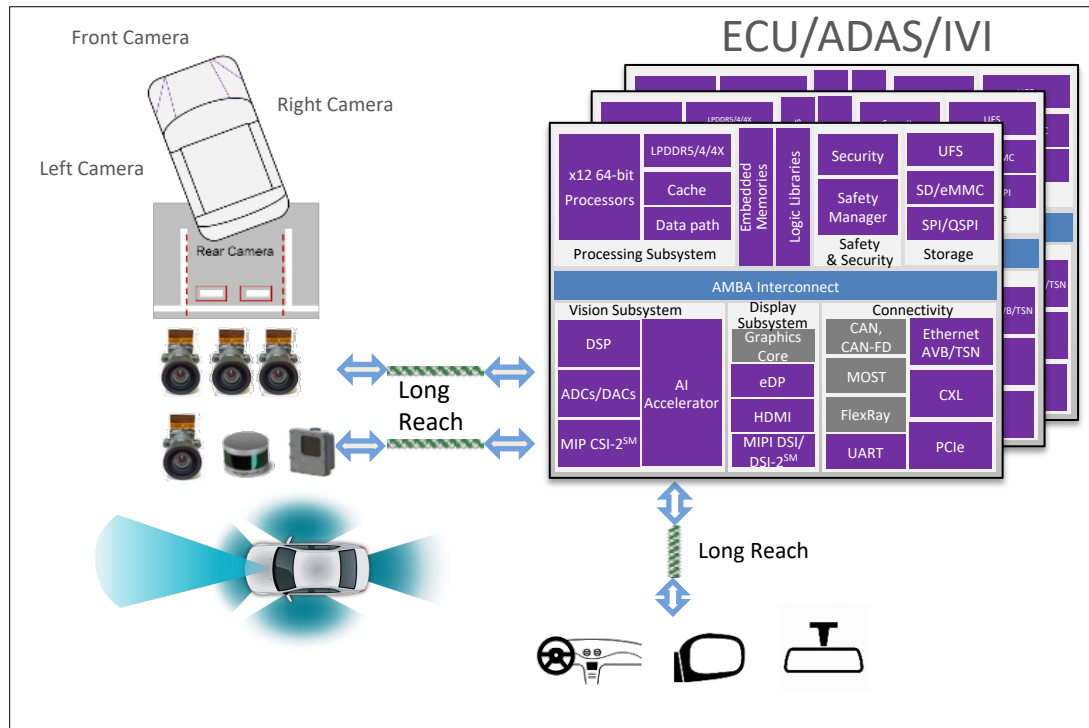
Trends & New Applications



- Transition from Distributed ECUs to centralized Domain Compute Modules
- New applications for ADAS, Infotainment, Connected Car & V2X
- Growing number & types of Sensors: Imaging, Lidar, Radar, Infra-Red
- System & SoC level Functional Safety and Reliability
- Requires High Performance FinFET Class Automotive SoCs

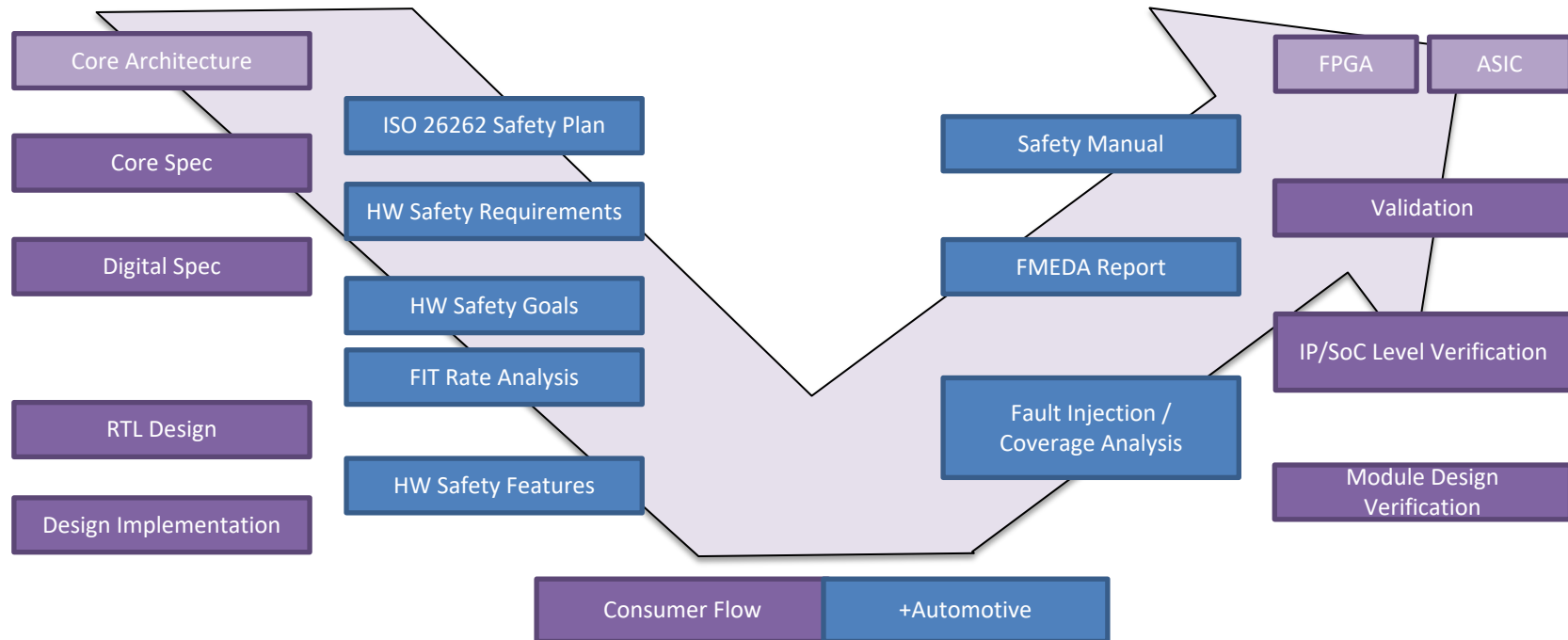
Safety-Critical Automotive Applications Using MIPI

- ADAS & IVI – Rear View, eMirror, Park Assist, Surround View



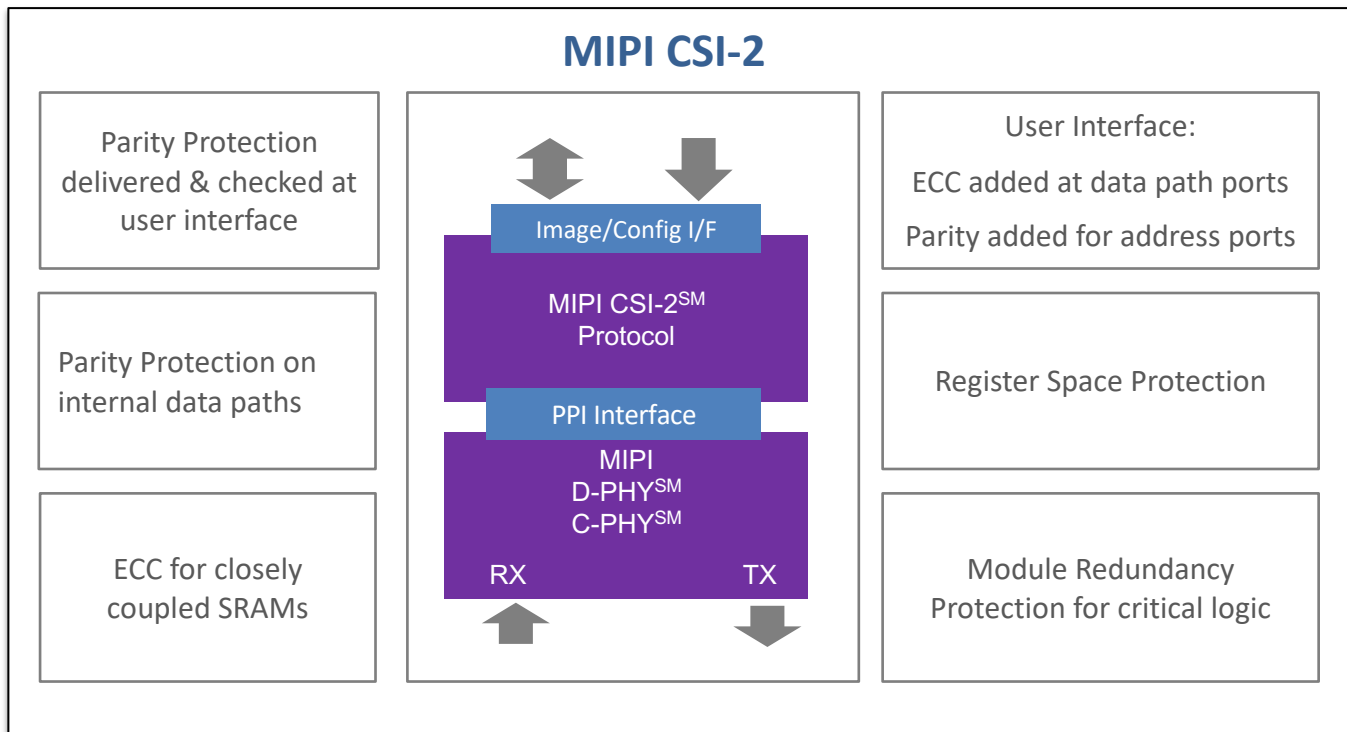
Development Flows for ISO 26262 Functional Safety

- Activities & Work Products for Automotive SoCs & IP



Additional Safety Mechanisms to Meet ASIL B & Beyond

- MIPI CSI-2 Lacks Native Functional Safety Capabilities

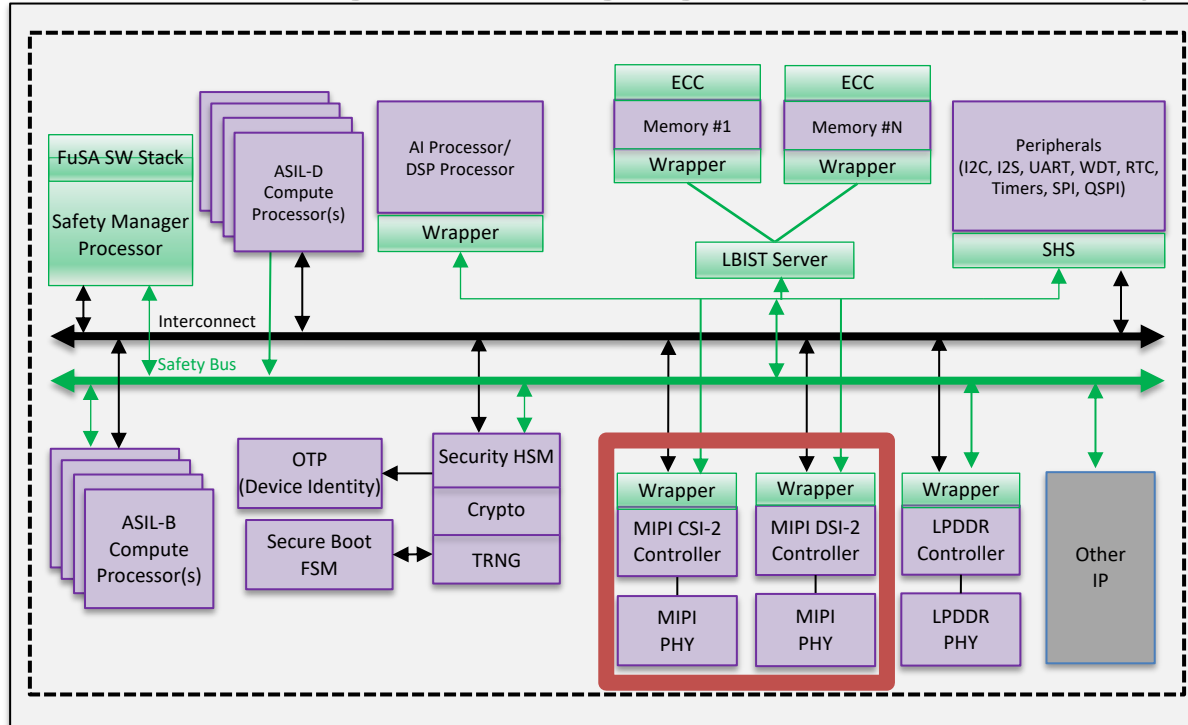


- Safety Mechanisms to achieve ASIL B Random HW Fault metrics
- Each Safety Mechanism has an associated Reaction Time: Fault Handling Time Interval and Error Flag



Safety Manager for SoC-Level Integration

- Monitoring & Managing Functional Safety Capabilities



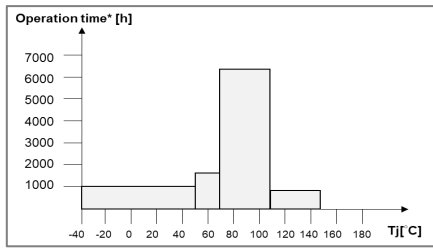
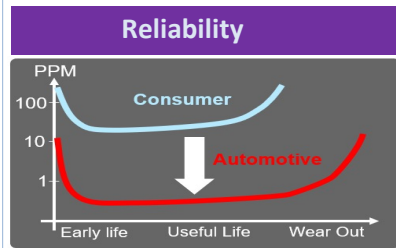
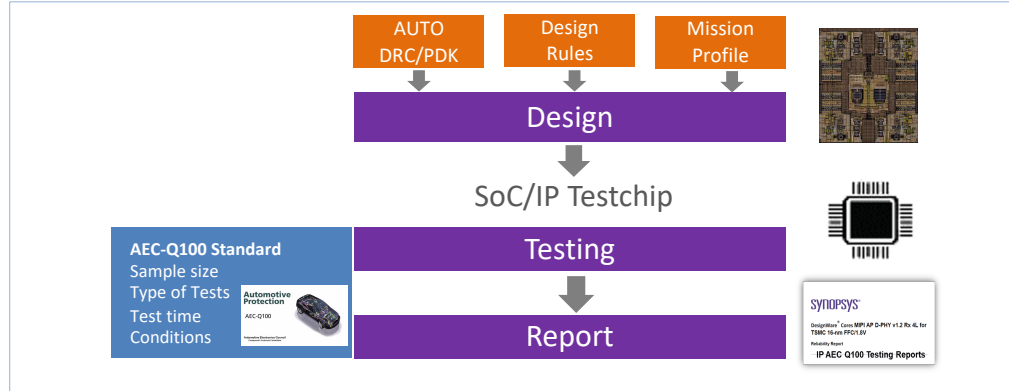
 Safety Network

- Safety Manager monitors & manages all system failures & real-time faults; safe boot & mission-mode testing

Need to Design for Reliability

- Handling the Stringent Operating Conditions

- Environmental
- Temperature
- Noise
- Vibration
- Long term operation
- Field rate (targeting 0%)

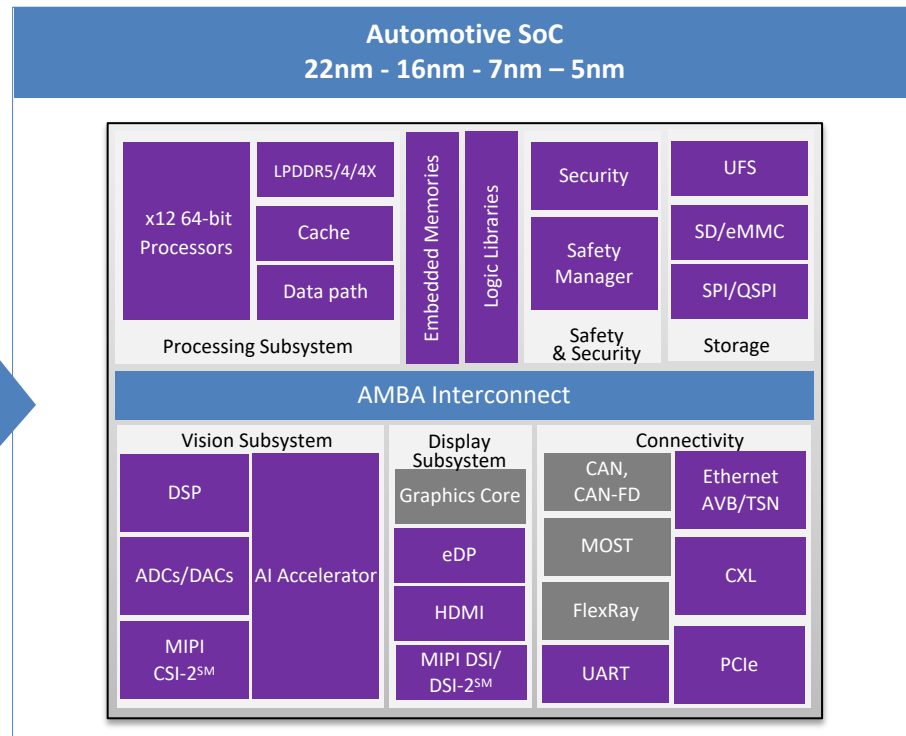
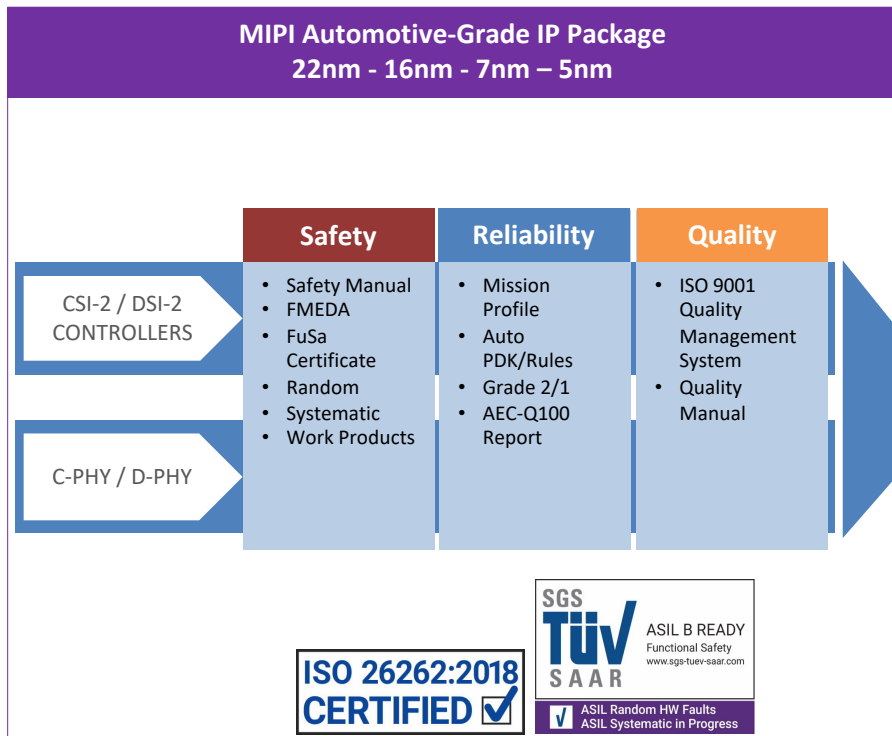


Grade	Ambient Operating Temperature Range
0	-40°C to +150°C
1	-40°C to +125°C
2	-40°C to +105°C
3	-40°C to +85°C

AEC-Q100 Qualification						
Accelerated Lifetime Simulation Tests			Electrical Verification Tests			
HTOL	ELFR	ESD HBM	ESD CDM	IC Latch Up	E D	CHAR

Need for a Comprehensive Automotive-Grade IP Portfolio

- Saving Time-to-Market





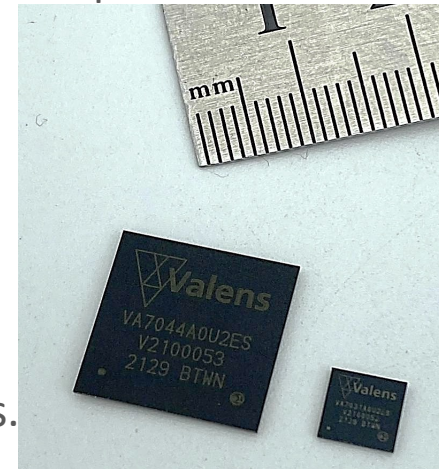
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Valens Design Example Using Synopsys DesignWare MIPI IP

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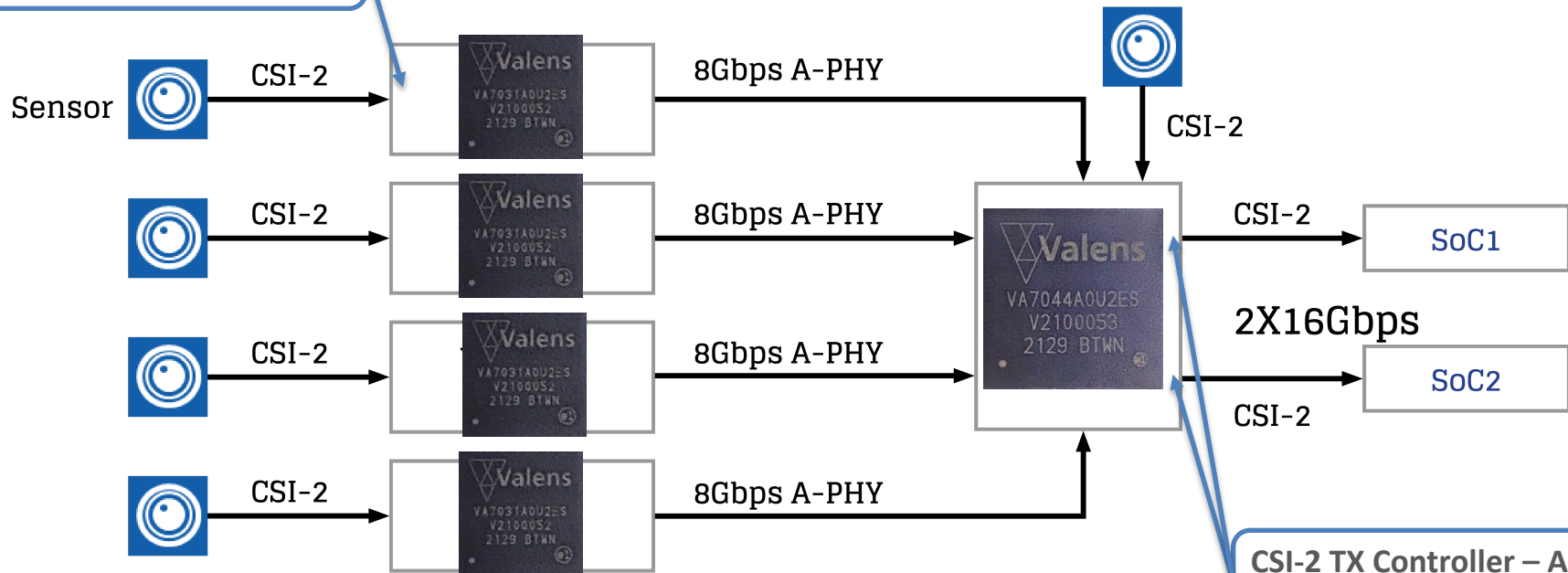
Valens A-PHY Products

- Valens is the first company to introduce A-PHYSM compliant products
- It was important to make sure Valens will work with mature and established IP partner in order to focus our efforts on the core technology and meet its goals.
- Valens selected Synopsys as IP partner for their mature MIPI IP and complete automotive package including safety and AEC-Q100 qualification.
- First samples will be available to leading customers by Q4/2021.
 - **VA7031** - CSI-2 extension (Serializer) over MIPI A-PHY channel (Up to 8Gbps)
 - **VA7044** - Dual-receiver of CSI-2 (Deserializer) over MIPI A-PHY channel (Up to 8Gbps per port)
 - **VA7042** - Quad-receiver of CSI-2 (Deserializer) over MIPI A-PHY channel (Up to 8Gbps per port)
- Valens is already working on the next generation of A-PHY products.



Valens Use of Synopsys DesignWare D-PHY/C-PHY IP

CSI-2 RX Controller – ASIL B
C-PHY/D-PHY RX – Grade 2



CSI-2 TX Controller – ASIL B
C-PHY/D-PHY TX – Grade 2



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Summary

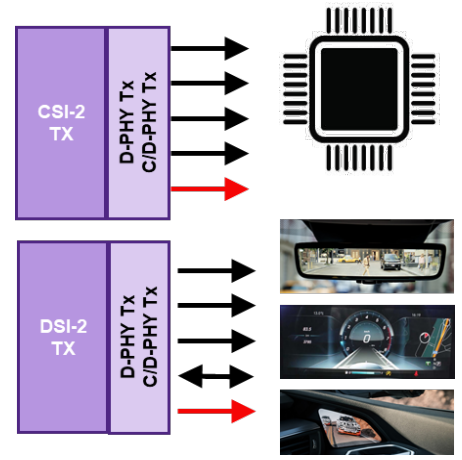
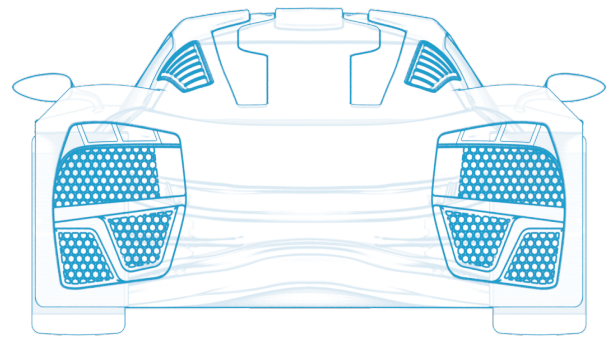
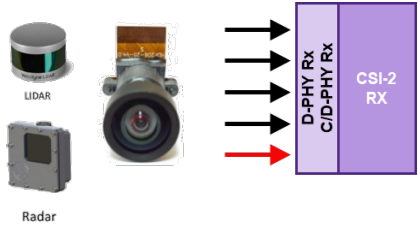
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Summary

- Trends in the automotive industry are driving new SoC architectures on more advanced FinFET processes
- MIPI IP in Automotive: safety-critical applications require ASIL B/D ISO 26262 Ready MIPI IP with safety package, enabling designers to save time and improve time-to-market
- IP that meets automotive quality requirements and is AEC-Q100 tested accelerates SoC-level qualification and design
- Synopsys' automotive-grade MIPI camera and display IP helped accelerate Valens' Automotive SoC design

DesignWare MIPI IP Portfolio for Automotive SoC

MIPI Automotive-Grade IP Package In 22nm - 16nm - 7nm



ADDITIONAL RESOURCES

- Web page
 - <https://www.synopsys.com/designware-ip/interface-ip/mipi.html>
- Web page
 - <https://www.synopsys.com/designware-ip/ip-market-segments/automotive.html>
- Valens automotive
 - <https://www.valens.com/automotive-solutions>
- Valens VA70xx
 - <https://www.valens.com/va7000-family>



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THANK
YOU!

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