DRIVING ETHERNET: EVERYTHING SAFE AND SECURE
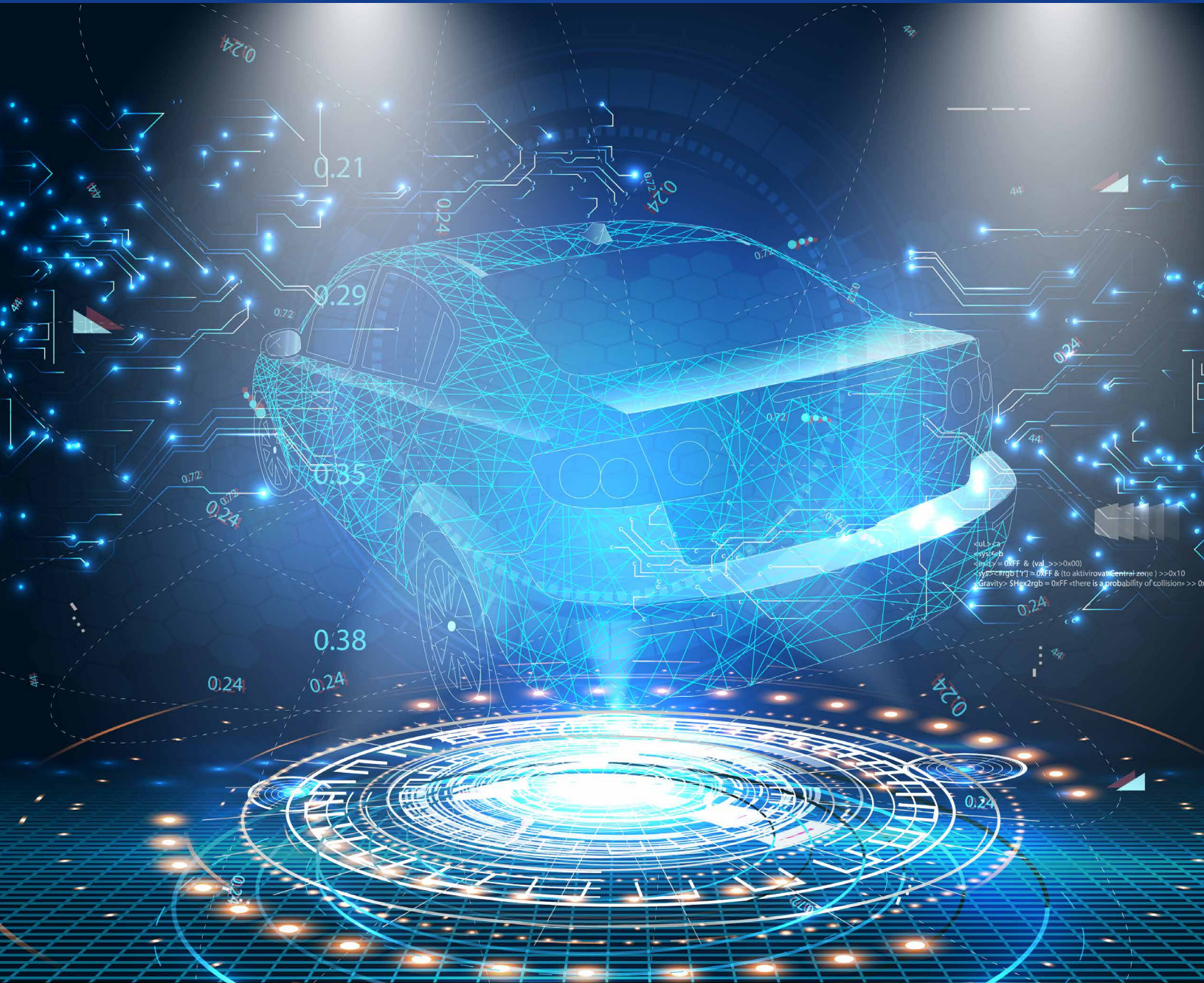
NXP

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Market Vision

RE-ARCHITECTING THE IN-VEHICLE NETWORK: EVOLUTION OR REVOLUTION?

Today's cars are equipped with dozens of fixed-function electronic control units (ECUs) and hundreds of sensors and actuators. Typically, every new function was introduced with its own ECU and a set of sensors and actuators that were connected through CAN and LIN buses. Starting in 2015, Ethernet was introduced to the in-vehicle network and since then it has spread across most ECUs. It enabled a first revolution that moved vehicle architectures from flat CAN-based network to hierarchical network split into several functional domains such as infotainment, powertrain, assisted driving, etc. The introduction of advanced driver assistance systems (ADAS) and autonomous driving (AD) solutions, as well as the megatrends of electrification and the service-oriented, software-defined car, are driving the next innovative steps in E/E architecture.

FROM DOMAIN TO ZONAL E/E ARCHITECTURES

As software becomes the major driver for OEM differentiation, hardware is no longer optimized for a single function. Next-generation vehicles will appear more like datacenters on wheels, with the hardware as the shared platform for flexible software modification and adaptation, surrounded by a cocoon of sensors and actuators. Application processing resources will be distributed and

data communication between compute resources will massively increase. Further, sophisticated ADAS functions and growing demand for onboard infotainment will strain the data capacity of the in-vehicle network (IVN). Increasing data traffic, soaring overall compute power in the ECUs and the growing complexity of the wire harness (with its associated indirect cost) pose a huge challenge.

The introduction of E/E architectures purely developed for electric vehicles creates the opportunity for legacy OEMs to introduce the disruptive solutions, which are already rolled out by a few new, green-field OEMs. The so-called "zonal network" E/E architecture is such a potentially disruptive technology.

NXP is an integral part of recent technological advances that help OEMs and TIER1s in all these transitional steps. As we anticipate future requirements for the self-driving car, the connected car, and the electrified car, we see enormous potential for automotive Ethernet in a newly architected in-vehicle network as the best solution for automotive data management. Ethernet enables broadband connectivity with the necessary latency and predictability required for advanced control functions and full-motion video. At the same time, it reduces vehicle weight, saves power, increases efficiency, and enables flexible software upgrades and hardware modularity. It makes autonomous driving more affordable.
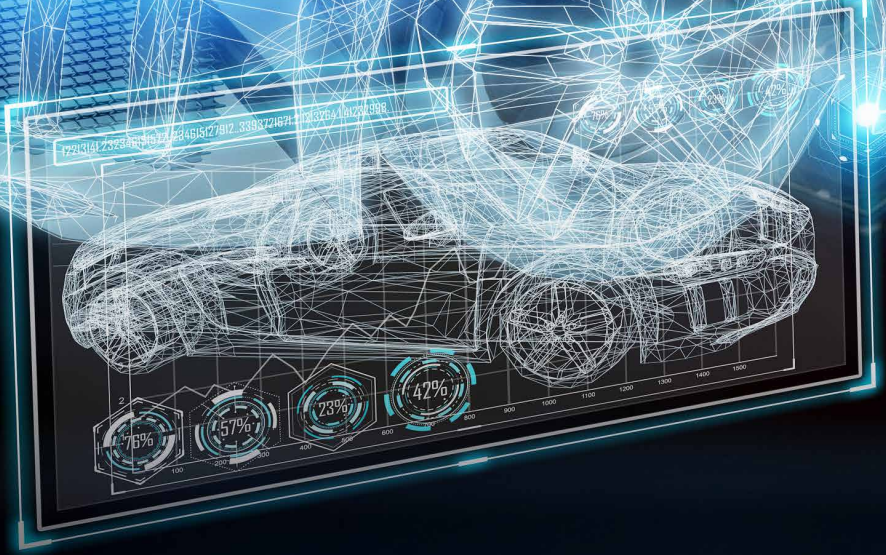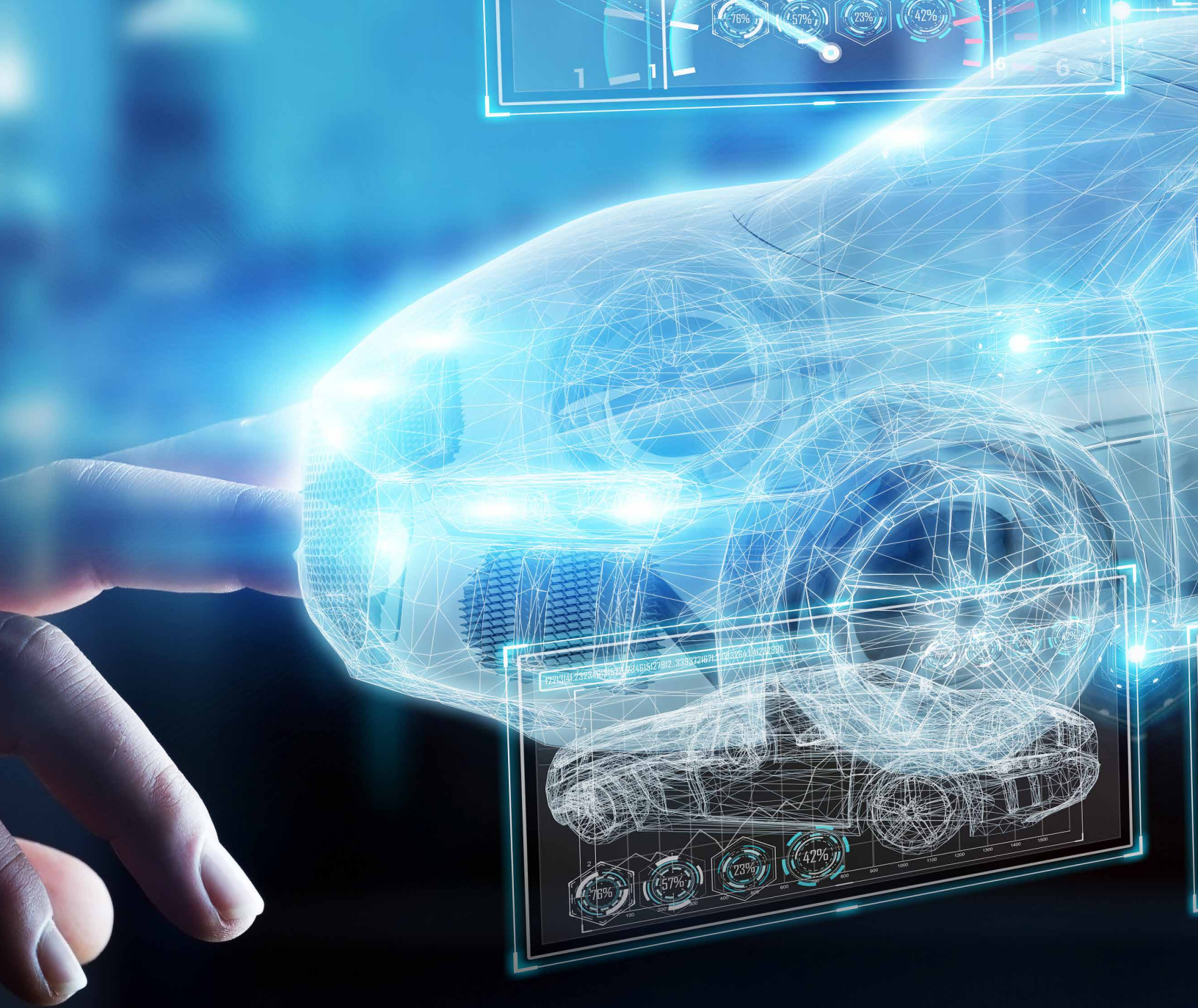
VEHICLE ARCHITECTURE TRANSFORMATION
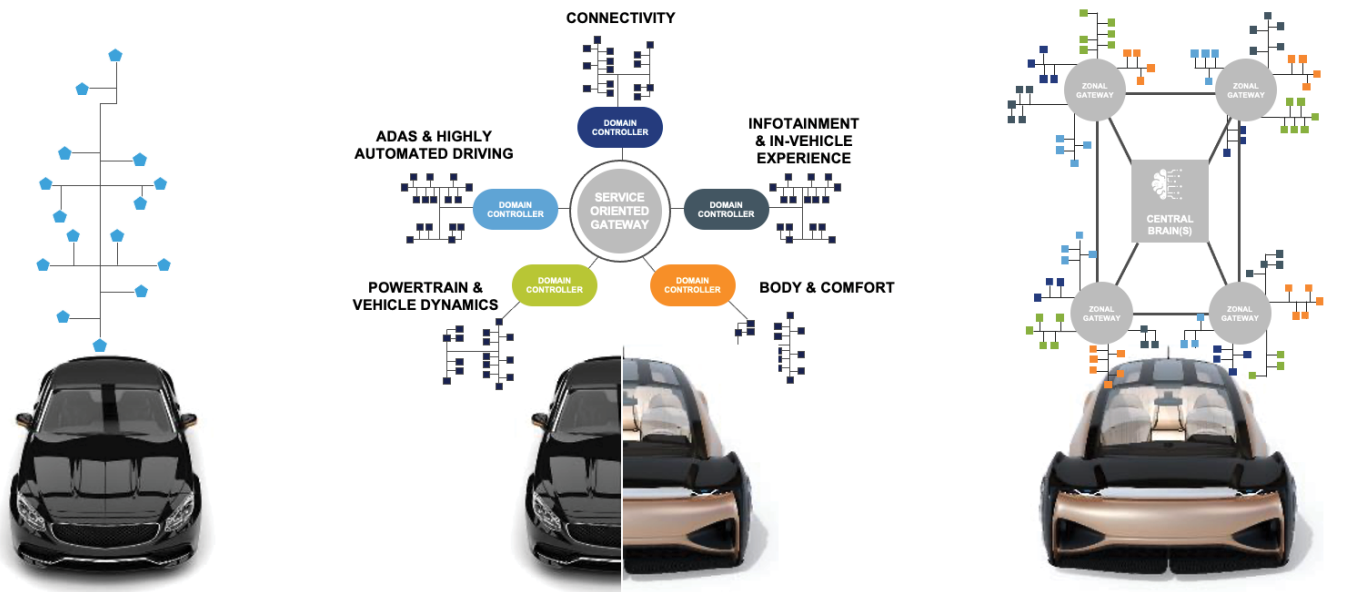
TODAY | FLAT
Unfit to future Mobility

LOGICAL RESTRUCTURE | DOMAINS
Enabling Autonomous Car

PHYSICAL RESTRUCTURE | ZONES
Enabling User-Defined Car

THE ZONAL VEHICLE NETWORK

In simple terms, a zonal IVN consists of the center and several zones, which we could also call the edge of the in-vehicle network. So rather than logically grouping the electronics, in a zonal network they are grouped by physical location. Sensors, actuators and, to some extent, functions (in terms of application processing), are locally connected to zonal input/output controllers. These can also be considered mini-gateways because this is where a CAN or LIN meets Ethernet.

The zonal I/O controllers are then connected through a high-speed Ethernet network backbone to the center, the brain of the car. It usually consists of several large, high-performance compute modules, where applications that once ran on dedicated ECUs now execute within virtual machines running on powerful multicore or even multiprocessor systems.

STEERING THE DEVELOPMENT OF EFFICIENT EDGE NODES

Along with higher speed grades for connections to the central brain, the creation of efficient gateway solutions for zonal nodes at the network edge is one of the key challenges in this transformation process. To reduce the complexity of the wiring harness, classic IVN buses will be terminated in the I/O controller. The conversion of bus signals to Ethernet packets enables the sharing of the same medium — a single, shielded twisted pair cable. This means that a large variety of data types simultaneously need to access the high-speed communication network.
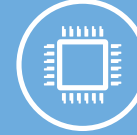
The need to aggregate very different data types, with varying requirements in terms of criticality, safety and security is not a new problem as such. But the dissolving of functions while maintaining the data execution pipeline of sense-think-act requires to enable both: accessing and exiting of the data highway, and finally also the reconversion of Ethernet packets into CAN or LIN bus signals without impacting the criticality, safety or security requirements of each bit of information.

Over a long period of time, NXP has developed the experience and necessary competence beyond understanding the special requirements of automotive data execution pipelines. NXP is able to translate those attributes into products which make zonal architectures not just possible, but also more efficient. We are building safe and secure solutions for the edge of the network.

NXP - Driving Ethernet™

Our total value proposition is based on our outstanding performance in six different dimensions:

Six Pillars of Excellence

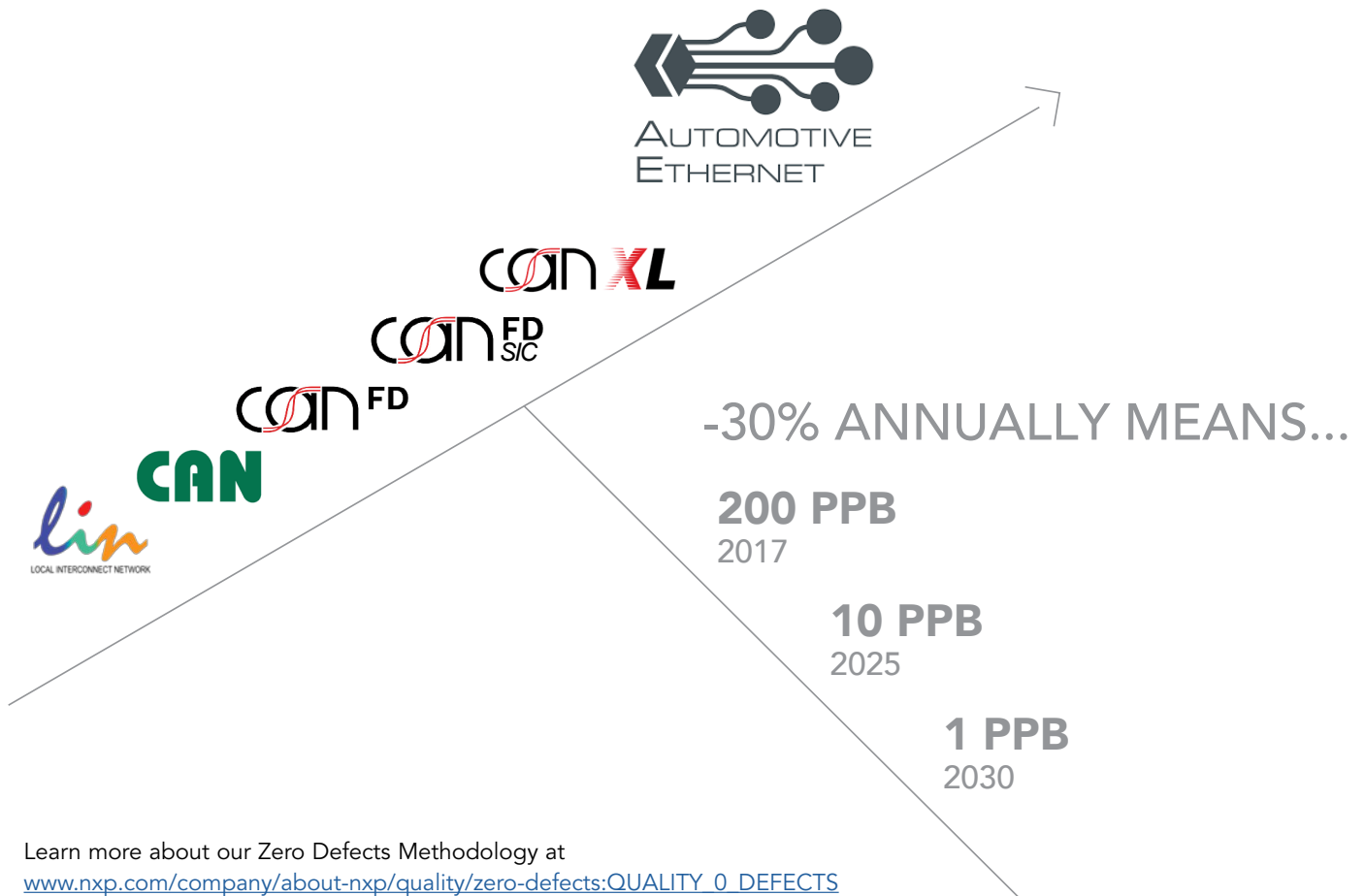| QUALITY	SUPPLY	SUPPORT	PRODUCTION	PORTFOLIO	INNOVATION
YoY consistent reduction of defects at OEMs	Multi-sourcing equals flexibility and agile supply	Excellent networking and application support	Planned capacity to cover market demand	One-stop-shop experience	Driving ideas for the future

and continuous improvments to exceed excellence in the future

These six IVN pillars of excellence create an effective one-shop experience for our customers who seek true automotive networking products. The continuous support strategy for all essential networking technologies — from CAN and LIN up to Ethernet — allows our customers to cover all their networking needs by NXP as trusted automotive supplier.

Total Quality is a core theme within NXP. It is present in all our projects, products and everything we do in our daily business. Within IVN, we live a Zero Defect mindset which has turned parts per million (PPM) into parts per billion (PPB) rates that decrease by 30% annually.

All that leads to robust, high-quality products that are well-suited for our customers' automotive applications and will help enable safe and secure connections within the car.

AUTOMOTIVE ETHERNET

CAN XL

CAN FD SIC

CAN FD

CAN

lin
LOCAL INTERCONNECT NETWORK

-30% ANNUALLY MEANS...

200 PPB
2017

10 PPB
2025

1 PPB
2030

Learn more about our Zero Defects Methodology at
www.nxp.com/company/about-nxp/quality/zero-defects:QUALITY_0_DEFECTS

SJA1110 Safe and Secure TSN Switch

The SJA1110 automotive Ethernet switch family offers innovative and dedicated safety and security features designed for optimal integration in auto ECUs. The four switch variants enable modular ECU design and platforms and support different automotive applications such as gateways, ADAS boxes, and infotainment ECUs.
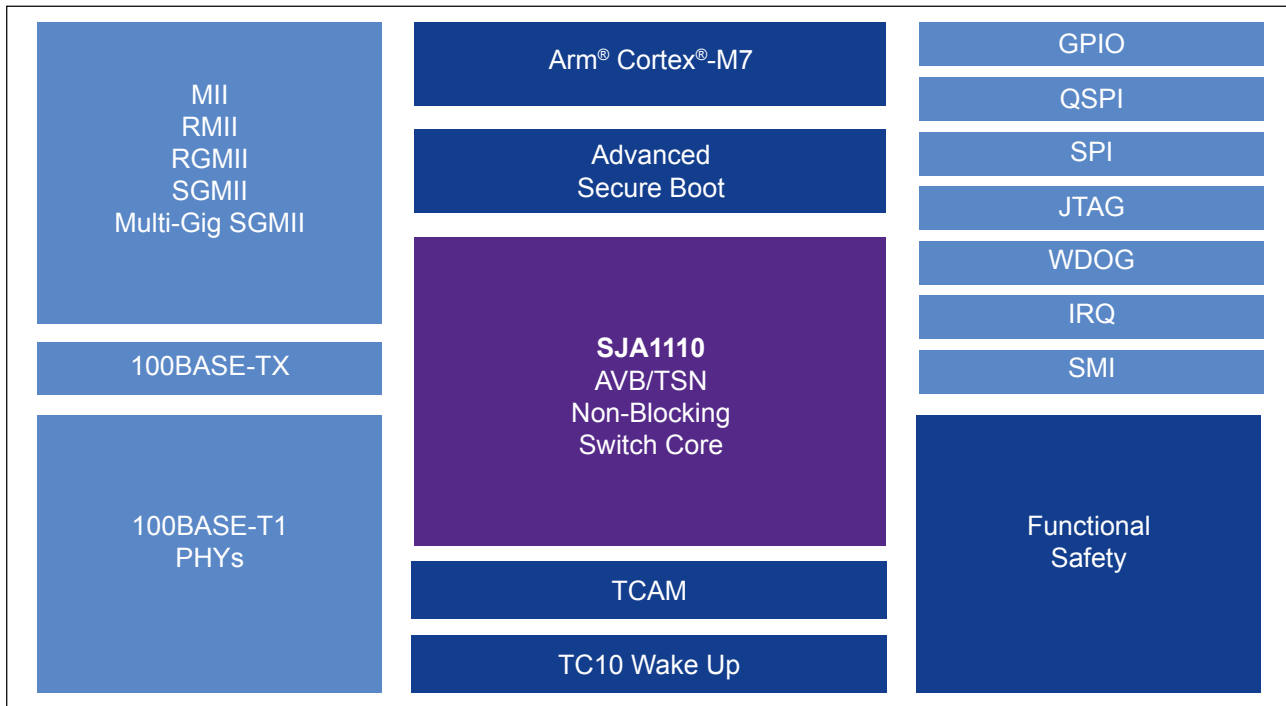
KEY FEATURES

- Integrated 100BASE-T1 and 100BASE-TX PHYs

- ASIL B rating

- Integrated Arm® Cortex®-M7 based core

- Layer 2/3/4/5 packet inspection and DoS prevention capabilities

- Advanced secure boot capabilities

- Support for Wake-over-Ethernet (OPEN TC10)

- Rich set of time-sensitive networking (TSN) standards

- Rich set of NXP original audio-video bridging (AVB) and AUTOSAR® software

- System solution with S32G vehicle networking processor and VR5510 power management unit

- Optional AEC-Q100 Grade 1 (ambient temperature range: -40 °C to +125 °C) operation

ENABLEMENT

- Production-grade software development kit (SDK)

- Native integration with NXP Design Studio IDE

- Production-grade AUTOSAR drivers

- Production-grade AVB/802.1AS synchronization protocol middleware

- Evaluation board compatible with NXP's Smart Application Blueprint for Rapid Engineering (SABRE)

- Linux® drivers

SJA1110 ETHERNET SWITCH BLOCK DIAGRAM

| MII RMII RGMII SGMII Multi-Gig SGMII | Arm® Cortex®-M7 | GPIO |
	Advanced Secure Boot	QSPI
		SPI
	SJA1110 AVB/TSN Non-Blocking Switch Core	JTAG
100BASE-TX		WDOG
		IRQ
100BASE-T1 PHYs		SMI
	TCAM	Functional Safety
	TC10 Wake Up	

For more information visit **www.nxp.com/sja1110**

SJA1110 Safe and Secure TSN Switch

NETWORKING APPLICATIONS

- Optimized NXP chipset solution with S32G processor enables unmatched routing, firewalling, intrusion/detection/prevention capabilities

- Exceptional TCAM-based frame inspection for IDPS support, DOS prevention and advanced frames management

- BOM optimization features include compatibility with VR5510 PMIC, four pin-compatible variants and optimized cascaded configuration
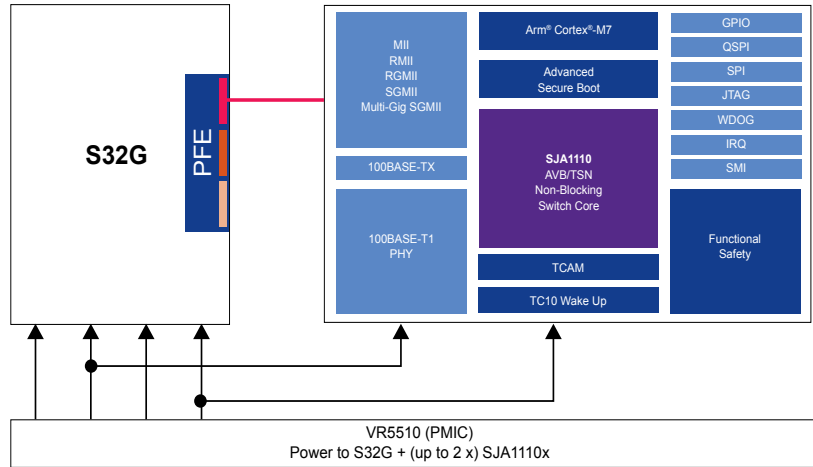
ADAS APPLICATIONS

- Functional safety-dedicated features improving ECU safety design

- Safety manual enable optimized safety design up to ASIL D ECUs

- Automotive Grade 1 (-40 °C to +125 °C) capability for optimized PCB design

- High-SGMII count for EMC friendly design

- Production-grade AUTOSAR® drivers

- Compatible with TTTech® MotionWise® middleware
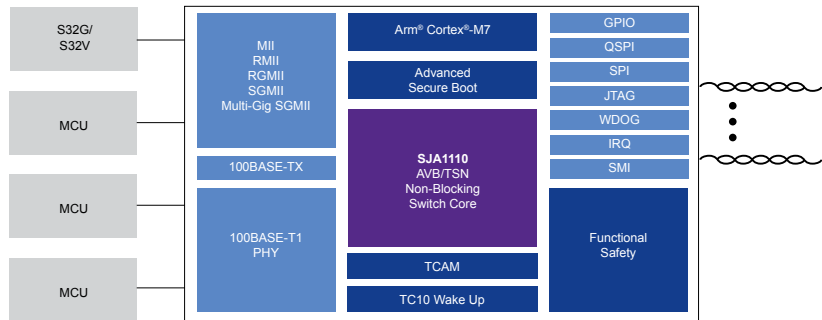
INFOTAINMENT/CLUSTER APPLICATIONS

- Multi-gigabit SGMII for external Gigabit and multi-Gigabit PHYs

- Autonomous operation support avoids dependency from untrusted external host

- Avnu®-Certified* AVB/gPTP stack for integrated controller

- Support for Wake over Ethernet (OPEN TC10)

- Integrated controller with programmable GPIOs
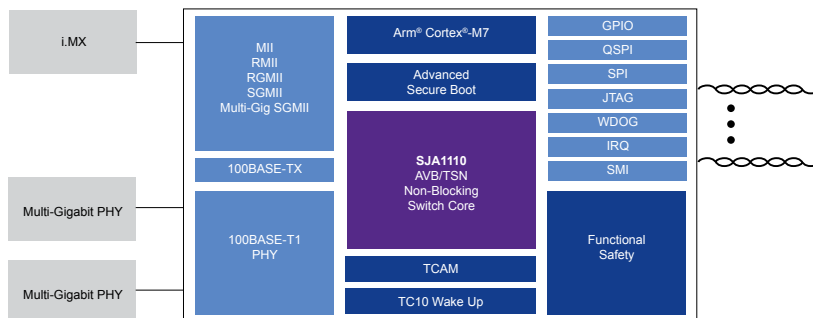
SJA1105 Ethernet Switch Family

ETHERNET SWITCHES: ENABLING FASTER IN-VEHICLE NETWORKS

The five-port automotive Gigabit Ethernet switch SJA1105x series targets automotive applications such as gateway, infotainment and ADAS fusion boxes with an array of configurable ports, advanced security features and a comprehensive, production-grade development ecosystem. Each switch's audio-video bridging support (AVB) feature fully leverages infotainment and advanced driver assistance systems.

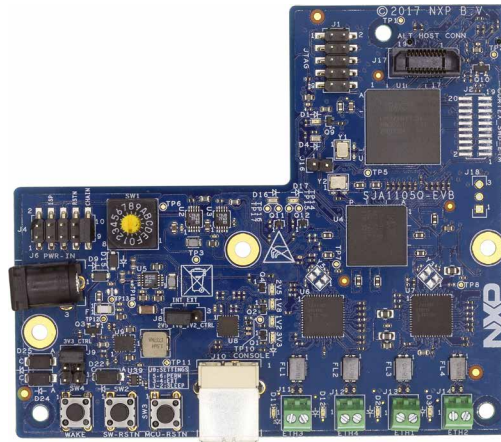## SJA1105P/ SJA1105Q/ SJA1105R/ SJA1105S ETHERNET SWITCH FAMILY

This Ethernet switch family extends the capability of the previous SJA1105EL/TEL switches with improved security-related features and extended interface options. The new frame listing feature limits the switch data processing to known sources, preventing the forwarding of erroneous or malicious data. The updated interfaces offer extended I/O voltage supply options and a new SGMII interface. These interfaces allow the switch to support any type of external PHY such as Fast Ethernet, Gigabit Ethernet or 100BASE-T1 PHYs like the TJA1101HN and TJA1102HN. The switch can also operate as an inter-processor communication device between multiple processors and the DSPs on the same board. All ports can operate at gigabit speed in a non-blocking mode.

Finally, the switches are delivered with a rich set of tools, including an evaluation board; original, production-grade AUTOSAR drivers and an AVB software stack.

GENERIC FEATURES

- Fully automotive AEC-Q100 qualified
- Automotive Grade 2 operation
- LFBGA-159 pin package (12 x 12 mm)
- Five ports, 10/100/1000 Mbit/s MII/RMII/RGMII and SGMII interfaces
- Non-blocking
- Support for AVB and TSN/802.1Qbv
- MAC address filtering
- TCAM based allow-listing/deny-listing of MAC addresses
- Learning process with one-short learn option
- Double VLAN tag, frame replication and retagging

SJA1105Q-EVB EVALUATION BOARD

The SJA1105Q-EVB is an evaluation system that supports the SJA1105P/Q/R/S automotive Ethernet switch family together with the TJA1102HN Ethernet PHY. The board enables the evaluation of the features common to the four switch family variants and facilitates the early development of the software required for the switch applications. In addition, the board supports the OPEN Alliance TC10 Wake-up Forwarding feature implemented by the TJA1102 dual 100BASE-T1 PHY. Finally, the board also offers a connector capable of mating with NXP processor motherboards such as i.MX 6, i.MX 8 and S32x processors families.

FEATURES:

- Enables evaluation of SJA1105P/Q/R/S series (with exception of SGMII)
- Directly connect to PC via USB
- Connect to i.MX 6, i.MX 8 and S32x processor evaluation boards
- Compatible with OPEN Alliance TC10 wakeup-forwarding output
- Software and documentation available on DocStore nxp.com/SJA1105Q-EVB

SOFTWARE AND TOOLS

- Linux drivers
- AUTOSAR 4.3.0 drivers licensed separately
- AVB/gPTP software stack licensed separately
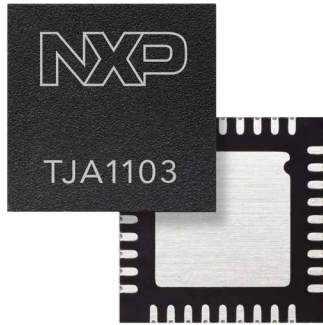- Customer evaluation board

NXP SJA1105 ETHERNET SWITCH SERIES SELECTION TABLE

	Features	SJA1105	T	P	Q	R	S	Benefits
Package and Interfaces	Operating temperature range: −40° C to +105° C (Automotive Grade 2)	●	●	●	●	●	●	Flexible ECU design Support for any type of Ethernet PHY such as 100/1000BASE-T1 and 1000BASE-TX Up to four cascaded switches controlled by a single host
	LFBGA159 12 x 12 mm², 0.8 mm pitc	●	●	●	●	●	●	
	MII (3V3)/RMII (3V3)/RGMII (3V3) interfaces	●	●					
	MII/RGMII (all 1V8, 2V5, 3V3) and RMII (2V5, 3V3) interfaces			●	●	●	●	
	RGMII internal delay line			●	●	●	●	
	SGMII interface					●	●	
	Pin compatibility	●	●	●	●	○	○	
	Software compatibility	●	●	○	○	○	○	
Switching	Hash-based L2 look-up table	●	●					Fine-grained control forwarding decisions in the network Powerful debugging and diagnostic capabilities
	TCAM-based frame filtering			●	●	●	●	
	Double VLAN tagging support			●	●	●	●	
	RMON RFC 2819 Ethernet counters			●	●	●	●	
	VLAN-based egress tagging/un-tagging	●	●	●	●	●	●	
	Frame mirroring and diagnostic features	●	●	●	●	●	●	
AVB/TSN	Credit-based shaping blocks for IEEE® 802.1Qav	10	10	16	16	16	16	Key hardware features to enable the implementation of a fully synchronized network for: • Lip-synched playback of audio and video streams • Data-transmission scheduling for TSN networks
	IEEE 802.1AS time stamping support	●	●	●	●	●	●	
	TSN IEEE 802.1Qbv: time-aware shaping			●		●		●	
	TSN IEEE 802.1Qci* (pre-standard): per-stream policing			●		●		●	
Security	Ingress rate limiting on a per-port and per-priority basis for unicast/multicast and broadcast traffic	●	●	●	●	●	●	Provisions for: • Authentication of the nodes connected to the network • Limiting the data generated by one or more connected devices
	Port reachability limitation and disabling address learning setting	●	●	●	●	●	●	
	MAC address allow-listing and deny-listing			●	●	●	●	
	Support for IEEE 802.1X-based authentication mechanism	●	●	●	●	●	●	
	Learn process with "one-shot" option			●	●	●	●	

Black dots: feature compatible with other similar black dots
White dots: feature compatible with other white dots but NOT compatible with black dots

TJA1103 ASIL B compliant 100BASE-T1 Ethernet PHY

TJA1103 is the third generation product of NXP's successful family of 100BASE-T1 Automotive Ethernet PHYs.

It is perfectly suited to support the rapid expansion of Ethernet to the edge of the network or provide robust connection to domain controllers in the center of the car.

TJA1103 complies to all state of the art conformance test specifications. To address all commonly used interface options it offers a (R)MII/RGMII and a SGMII version.

To support the safety goals on vehicle level, the TJA103 is designed according to ISO 26262 to meet ASIL B. Its enhanced monitoring and diagnostic features support fast event localization and swift system response.

KEY FEATURES

- Functional Safety ISO 26262 ASIL B compliant
- OPEN Alliance TC-1 advanced PHY features
- IEEE1588v2 / 802.1AS compliant time stamping
- OPEN Alliance TC-10 compliant sleep / wake up
- HVQFN36 (6 x 6 mm) with wettable flanks
- Optimized for automotive use cases
- 3.3 V single supply capability

For additional information and sample availability, contact your local sales office.
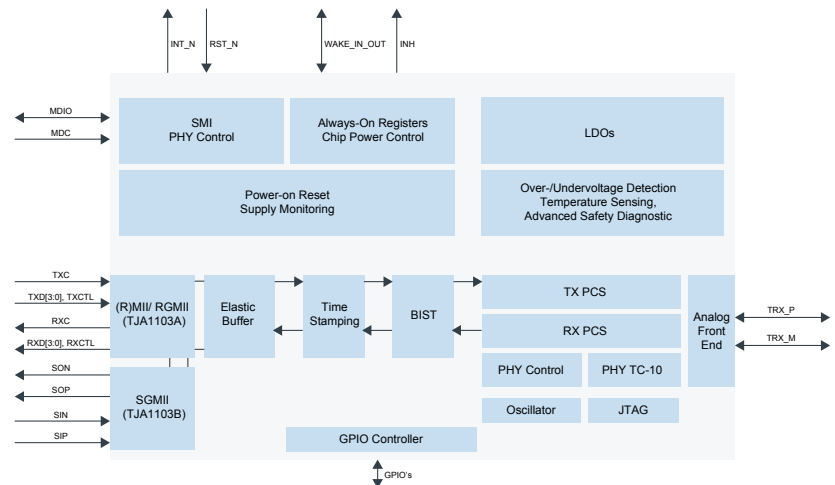
AUTOMOTIVE TARGET APPLICATIONS

- Radar systems
- Sound system
- Vision systems & cameras
- Car radio
- Ecockpit & head unit
- Remote tuner
- TCU
- Gateway & domain controller
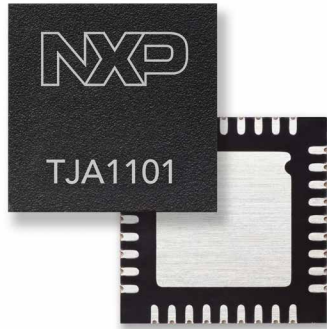- And many more…

TJA1103EVB – EVALUATION BOARD
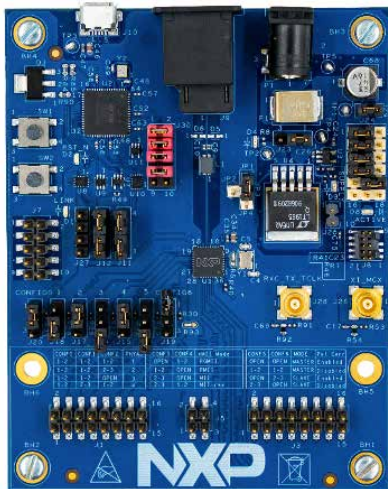
TJA1103 ETHERNET PHY BLOCK DIAGRAM

For more information visit https://www.nxp.com/TJA1103

TJA1101B & TJA1102A - 100BASE-T1 Ethernet PHYs

TJA1101B ETHERNET PHY

The IEEE 802.3bw (100BASE-T1) compliant TJA1101B Ethernet PHY provides 100 Mbit/s transmit and receive capability over unshielded twisted pair (UTP) cables to withstand the most taxing automotive applications, while still maintaining low-power consumption and system costs.

TJA110X APPLICATION

Both, TJA1101B and TJA1102A PHYs support TC-10 compliant sleep and wake forwarding over dataline. The always-on domain can be supplied by Vbat directly, without additional level shifting LDO.

TJA1102A DUAL ETHERNET PHY

The TJA1102A, the industry's first 100BASE-T1 compliant dual-port Ethernet PHY, enables superior system efficiency for high-speed networks. This robust and reliable PHY offers 100 Mbit/s per port full duplex and supports lightweight UTP cables of up to 30 m in repeater mode for challenging automotive applications.

TJA1101B

• Single-port IEEE 802.3bw (100BASE-T1) PHY

• HVQFN-36 pin package (6 x 6 mm^2)

TJA1102A, TJA1102A/S

• Dual/single-port IEEE 802.3bw (100BASE-T1) PHY

• HVQFN-56 pin package (8 x 8 mm^2)

• Drop-in-compatible single-port product TJA1102A/S

TJA1101B, TJA1102A COMMON FEATURES

• AEC-Q100 Grade 1 qualified

• MII- and RMII-compliant interfaces

• Diagnosis of cabling errors (shorts and opens)

• MDI Polarity: swap, detect and optionally correct

• ESD & EMC robust MDI:

   – Passes IEC62228-5 - EMC Class IV

   – Protected according to IEC61000-4-2

      • +/- 8kV for TJA1101B

      • +/- 6kV for TJA1102A

PARTIAL NETWORKING

• OPEN-Alliance-TC10-compliant sleep-and-wake-up forwarding solution

   – Global system wake-up

   – Robust remote wake-up detection via bus lines

   – Wake-up forwarding on PHY level

   – Go-to-sleep hand shaking

   – Saves an additional wake-up line

• Local wake-up pin for wake-up line

LOW-POWER MODE

• Sleep mode current: 45 µA

• Dedicated PHY enable/disable input pin to minimize power consumption

• Inhibit-pin for voltage regulator control

• Single 3.3 V supply

• External 1.8 V supply option
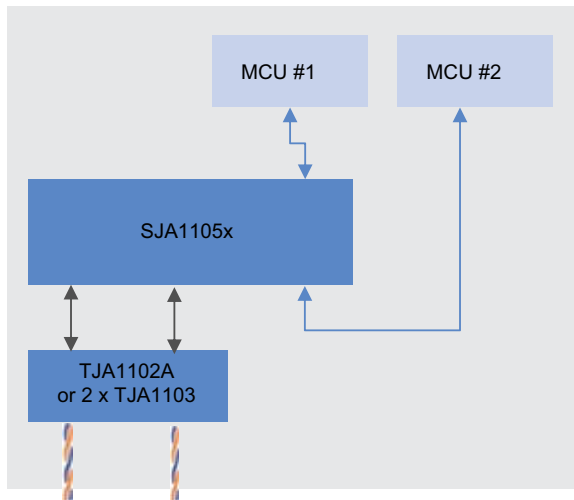
SOFTWARE AND TOOLS

• Linux and low-level drivers

• AUTOSAR 4.3.0 drivers

• Customer evaluation board

AUTOMOTIVE APPLICATIONS

• Gateway

• IP camera, radar and LiDAR links

• Driver assistance systems

• Cluster and infotainment

TJA110x Use Cases



SMALL PORT COUNT SWITCHING

The SJA1105x in combination with TJA1102A or TJA1103 provides a powerful and extremely efficient small port count switch solution. The combination offers high-speed on-board connectivity over 1Gbps RGMII or SGMII interfaces to connect multiple processors and external PHYs according your needs. Depending on the focus on area or cost constraints either one TJA1102A dual port PHY or two TJA1103 PHYs are perfectly suited to enable efficient small port count switching

Optional TJA1102A or TJA1102A/S PHYs enable scalable 100BASE-T1 port expansion
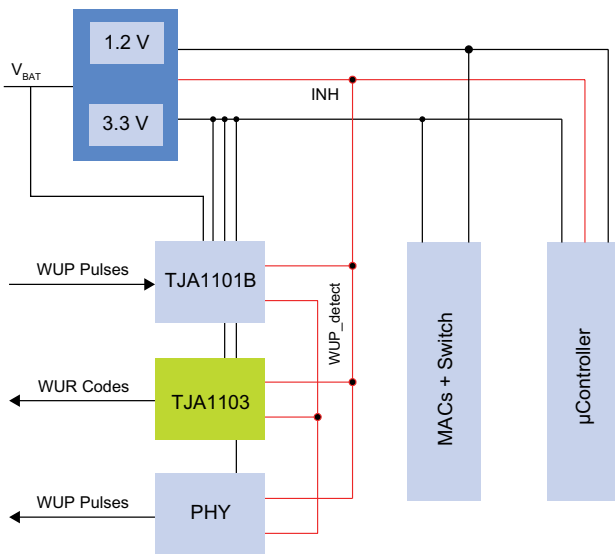
PARTIAL NETWORKING

- TJA1103, TJA1102A and TJA1101B enable self-contained sleep and wake-up signaling over data line

- OPEN Alliance TC-10 compliant sleep-and-wake-up

- The wake-up forwarding function allows fast signal propagation without intervention of a switch, MAC or µC

- The wake-up can be forwarded via non-active links (blue PHYs in the figure) but also active links (green PHY in the figure)

- Saves an additional wake-up line

- TJA1101B and TJA1102A support direct Vbat connection saving an additional LDO (application dependent)
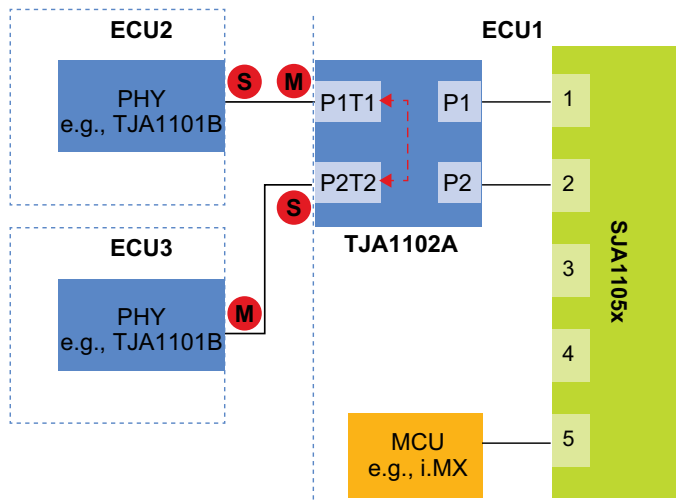
REPEATER MODE

- The TJA1102A dual-port PHY supports internal reverse MII to operate the device in repeater mode

- Example applications:

  – ECU2 and ECU3 can quickly start to communicate ahead of MCU/switch boot up on ECU1

  – Fall-back mode for security purposes, bypassing the switch

  – Duplicate max cable length up to 30 m

NXP 100BASE-T1 ETHERNET PHY FAMILY

Family	Feature	TJA1101B	TJA1102A/S	TJA1102A	TJA1103	Description
Automotive	Package	HVQFN36	HVQFN56	HVQFN56	HVQFN36	Small size, saves PCB board space
		6 x 6 mm	8 x 8 mm	8 x 8 mm	6 x 6 mm	
	Temperature range	-40 to +125 °C	-40 to + 125 °C	-40 to +125 °C	-40 to +125 °C	Automotive Grade 1, high robustness to support automotive applications
	Unshielded twisted pair (UTP) channel length up to at least	15 m	15 m	15 m	15 m	Low-weight cable, high flexibility and low cost Proper cable length fit for most automotive requirements
	Repeater mode		2 x 15 m			Max cable length in repeater mode up to at least 30 m
	Interface	MII/RMII	MII/RMII	MII/RMII	MII/RMII/RGMII(-ID)/SGMII	Standard interfaces
	Supply voltage	3.3 V	3.3 V	3.3 V	3.3 V or 2.5 V	Single supply, no need for external voltage regulators
	Additional supply enabled	1.8 V	1.8 V	1.8 V	2.5 V, 1.1 V	Save power on component level
	Data rate	100 Mbit/s	100 Mbit/s	100 Mbit/s	100 Mbit/s	Sufficient data rate to meet infotainment, ADAS requirements
	Ethernet ports	1	1	2	1	Dual port solution saves ECU board place, simplifying system layout and config
	Pin strapping	•	•	•	•	Hardware config during start-up, allows autonomous operation
	Signal quality indicator (SQI)	•	•	•	•	Makes channel effects visible
	PTP time stamping				•	Industry leading accuracy for global time synchronization
	ISO262622	ASIL A			ASIL B	Adequate safety features have been implemented on-chip, to support functional safety concepts on system level.
	TC-10 compliant partial networking	•	•	•	•	OPEN-Alliance TC-10 compliant wakeup-and-sleep concept
Diagnosis	Overtemperature protection	•	•	•	•	Prevent device from getting damaged by overtemperature
	Cabling error detection (shorts and opens)	•	•	•	•	Remote diagnosis
	Supply undervoltage detection with fail-silent behavior	•	•	•	•	Prevents the PHY from running in an undefined state Increases system-level functional safety
	Internal, external and remote loopback mode	•	•	•	•	Allows system diagnostics of the communication path
	OPEN TC1 advanced PHY features				•	Specification for advanced features of an 100BASE-T1 automotive Ethernet PHY, e.g. for diagnostic purposes
	Dedicated enable (EN) pin	•	•	•		Emergency shutdown for system safety, e.g., block suspicious ECU
Low Power Mode	Low-power sleep mode	50 µA	45 µA	45 µA	35 µA	Low power consumption to ensure battery level
	INH switch controls ECU supply	•	•	•	•	Set automotive power modes
	Local wake-up support	•	•	•	•	Most common and secured wake-up option

NXP Takes Networks From Concept to Production

PRODUCT EVALUATION

- OM14500/TJA1101 PHY evaluation
- OM14500/TJA1102 dual PHY evaluation
- SJA1105Q-EVB switch evaluation with NXP MCU/MPU daughter card support option
- SJA1110-EVM evaluation board
- TJA1103EVB PHY evaluation

SYSTEM PROTOTYPING

- SJA1105SMBEVM prototyping platform
- SJA1105Q-EVB switch evaluation
- ADTJA1101-RMII adapter board to S32x and i.MX processors
- BlueBox automotive high-compute development platform
- GoldBox vehicle networking development platform
- GreenBox vehicle electrification development platform
- TJA1103SDB SABRE development board
- RDDRONE-T1ADAPT Ethernet media converter
- S32K344-WB evaluation board

PRODUCTION

- TJA1101B/TJA1102A single/dual 100BASE-T1 PHYs
- SJA1105P/Q/R/S Ethernet switch series
- AUTOSAR drivers
- AVB software stack
- Linux drivers

COMING SOON

- TJA1103 ASIL B compliant single 100BASE-T1 PHY
- Development boards featuring SJA1110 or TJA1103
- SJA1110 - 10-port Ethernet switch series

# 2nd Generation TC10 Sleep/Wake Forwarding System Development Kit

NXP'S ETHERNET PHY AND SWITCH PORTFOLIO WITH SLEEP AND WAKE-UP FORWARDING OVER DATALINE. STANDARD COMPLIANT AND INTEROPERABLE ACCORDING TO OPEN ALLIANCE TC-10.

NXP continues to integrate the innovative solution into the full Ethernet portfolio. Beyond 100BASE-T1 PHYs (TJA1103, TJA1102, TJA1101), now also available with the switch family SJA1110. The technology allows to dynamically manage power modes of the individual PHYs, whole ECUs and even the full EE-system.

It propagates sleep requests and forwards wake-up pulses over the Ethernet data line (single twisted pair cable). It saves a dedicated wake-up line, and hence additional cost, weight and real estate for cables and connectors.

The system-level evaluation of the technology is simplified by NXP's 2nd generation TC-10 development kit, which is available on nxp.com. The kit combines OPEN TC10 enabled hardware with out-of-the-box software examples: easy to load, configure and modify via common SDK, NXP's S32 Design Studio.

System engineers may scale the complexity up or down and adjust the sample code to apply full custom system requirements, to orchestrate the wake-up sequence and to define forwarding rules.

SJA1110-EVM

ADTJA1101-RMII Adapter Card

S32K148-EVB

www.nxp.com/ETHERNET
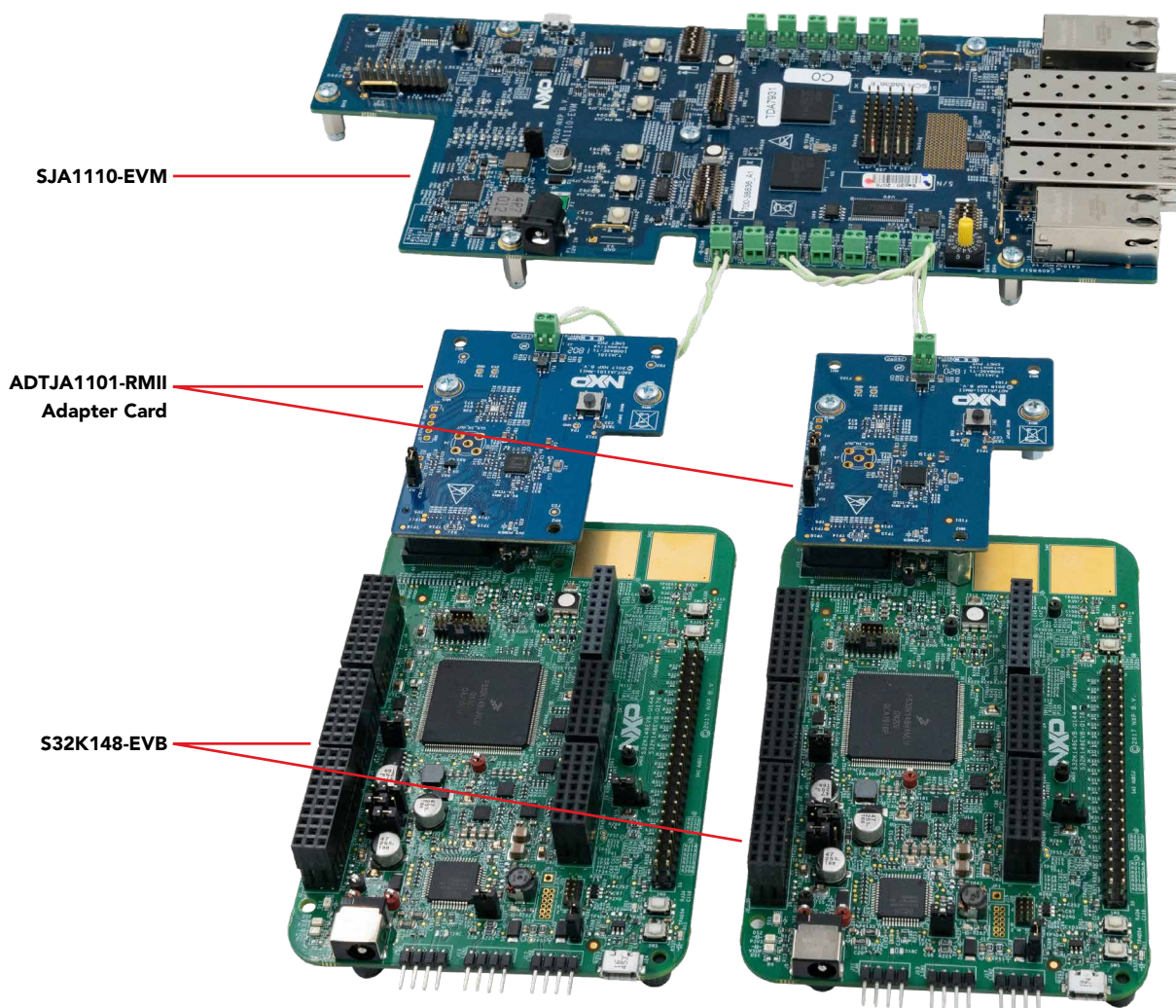
S32G GoldBox Vehicle Networking Development Platform (S32G-VNP-GLDBOX)

GoldBox vehicle networking development platform
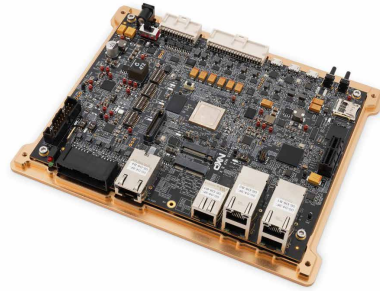
Vehicle network processing reference design board 2

SUPPORTS SERVICE-ORIENTED GATEWAYS, VEHICLE COMPUTE AND DOMAIN CONTROL APPLICATIONS

The S32G-VNP-GLDBOX is a compact, highly optimized and integrated reference design featuring the S32G vehicle network processor. With its high-performance computing capacity and rich set of I/Os, the GoldBox platform can provide reference for a variety of typical automotive applications, such as service-oriented gateways, vehicle central compute, domain controllers, safety processors and black boxes.

The GoldBox implements NXP's in-vehicle networking system solution based on the S32G processor, the SJA1110 safe and secure TSN Ethernet switch and the VR5510 power management unit.

Carmakers, suppliers and software ecosystem partners can directly use the GoldBox platform to help accelerate development for shorter time-to-market.

TECHNICAL HIGHLIGHTS

- SJA1110 ASIL B automotive Ethernet switch with TSN and advanced security capabilities

- Multiple network interfaces with 12 Ethernet ports and 18 CAN/CAN FD transceivers

- Ideal for development, evaluation and proof-of-concept demonstrations

- Rugged enclosure with integrated thermal management

- S32G vehicle network processor with hardware security engine (HSE), Ethernet package forwarding engine (PFE) and low-latency communications engine (LLCE)

- M.2 slot support for SSD storage and AI/ML acceleration modules

SYSTEM BLOCK DIAGRAM

Learn more at https://www.nxp.com/GoldBox
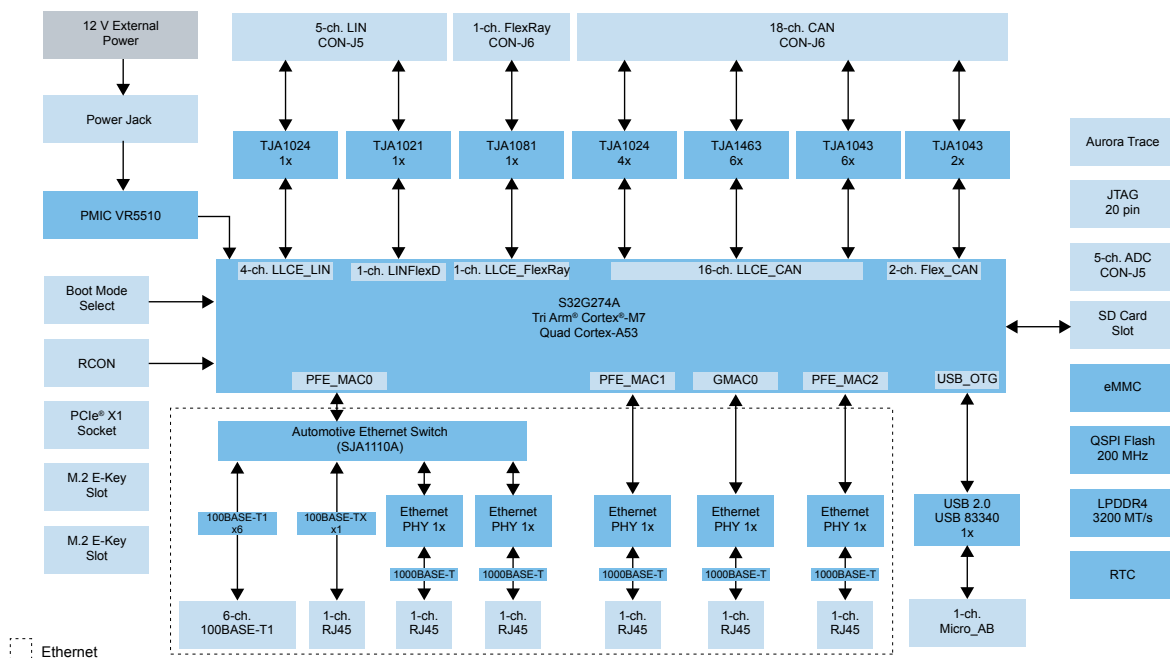
NXP BlueBox Third-Generation, Automotive High-Performance Compute (AHPC) Development Platform

BlueBox 3.0 platform

The BlueBox 3.0 embedded development platform series prototypes existing and future automated driving (AD) and new EE architectures such as zonal and central EE architectures.

Based on the high-performance LX2 automotive microprocessor and the S32G gateway microprocessor, the BlueBox 3.0 system provides the enhanced performance required to prototype AD and central compute workloads in a modular and scalable open platform with system-level safety implementation and a software SDK.

This system offers three SJA1110 safe and secure Ethernet switches supporting the latest TSN standards, 100/1000/2500 Mbit/s Ethernet connectivity and ASIL B functional safety rating.
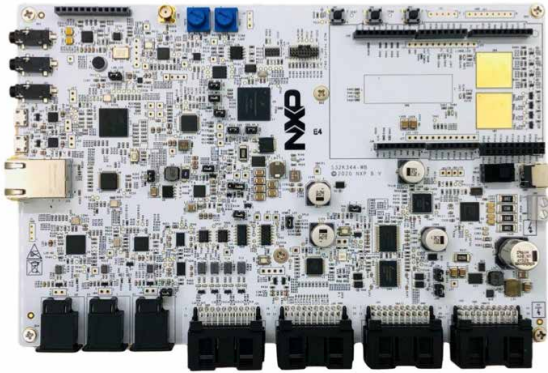
TECHNICAL HIGHLIGHTS

- High-performance LX2160A automotive processor with up to 16 Arm® Cortex®-A72 cores

- S32G274 gateway processor with ASIL D Functional Safety

- SJA1110 ASIL B automotive Ethernet switch with TSN support

- Modular and scalable open platform supporting rich expansion options to prototype various configurations and connections to multiple ECUs and sensors

  - Up to 6 PCIe® expansion slots

  - Up to 8 (multi) Gigabit BASE-T Ethernet ports

  - Up to 18 100BASE-T1 Ethernet ports

- Supports Kalray MPPA for Math and Neural Network acceleration with SW integration

- True automotive embedded platform featuring end-to end automotive-grade system-on-chip ICs

- System-level safety implementation with the device-level safety collaterals

SYSTEM BLOCK DIAGRAM
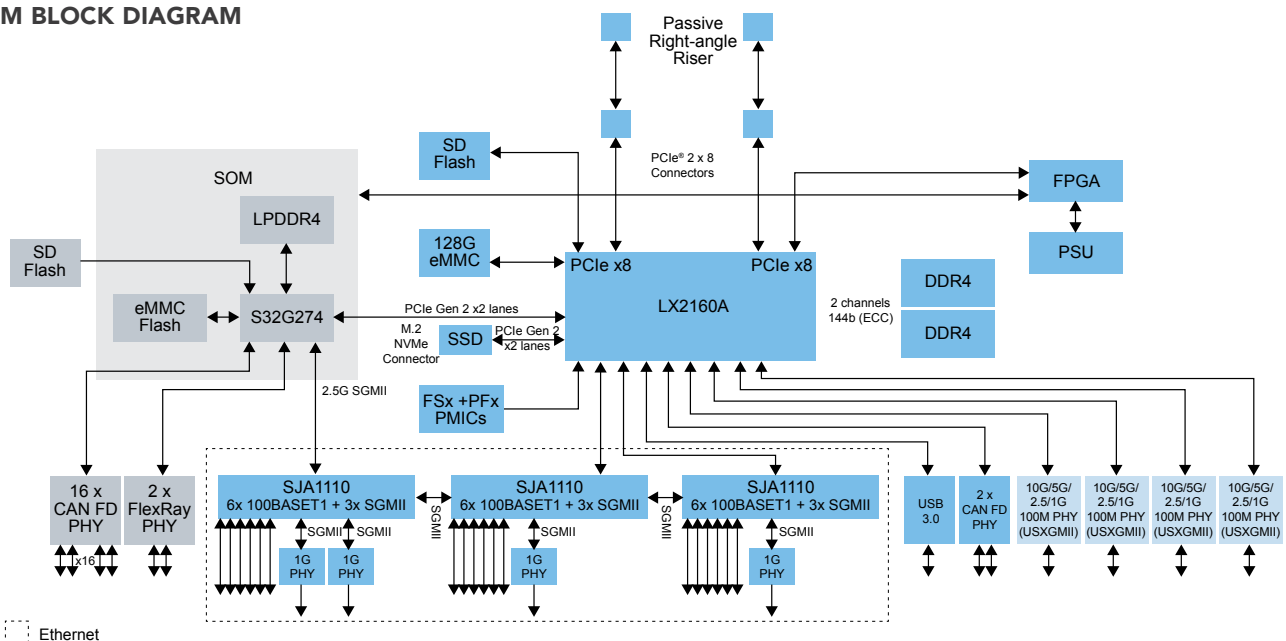
Learn more at www.nxp.com/bluebox

S32K3 White Board (S32K344-WB)

KEY FEATURES:

- Gateway: Multiple communication interfaces including 4 CAN, 8 LIN, 3 Ethernet interfaces

- Various resources to make it suitable for body domain controller or zonal controller evaluation

- Functional safety: MCU + SBC chipset to target ASIL D safety level

- BCM: Various resources for BCM application, including PEPS circuits, HS/LS driver, digital/analog signals inputs

- AVB: audio codec is integrated for AVB evaluation

- Motor control: extension board socket for GD3000 EVB which can be used for motor control demo

S32K344-WB is an evaluation board based on the automotive MCU S32K344 and multiple automotive products from NXP. It can be used for various automotive applications evaluation, including BCM, zonal controller, gateway, T-box and others.

The White Board provides three 100BASE-T1 automotive Ethernet connections using NXPs SJA1105 switch and TJA110x PHYs

SYSTEM BLOCK DIAGRAM