

VelocityDRIVE™ Solutions

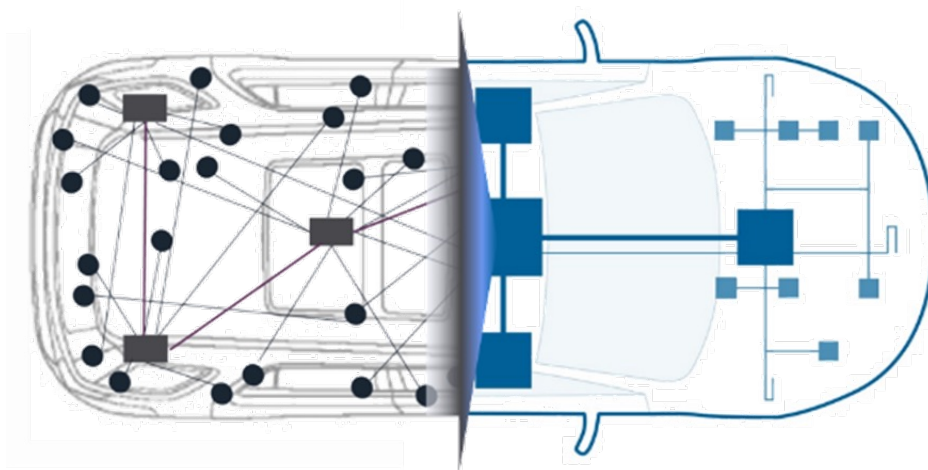
Accelerating Connectivity





Our Vision for the Future of Automotive Networking

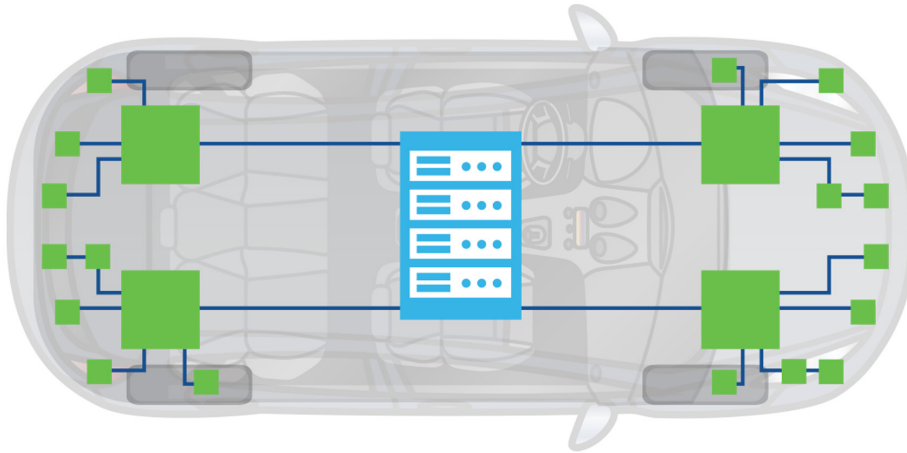
Software-Defined Vehicles (SDVs) and their interrelated In-Vehicle Networking (IVN) have continued to dominate the automotive innovation space as cars become ever more connected. With the advent of SDVs, designers have realized that the traditional approaches for vehicle design are no longer the most effective way to enable these highly advanced systems. Domain-based architectures, which group Electronic Control Units (ECUs) by their function, struggle with growing ECU counts, complex gateways and limited flexibility. Moving from domain-based architecture to zonal-based architecture, which instead groups ECUs based on physical location, unlocks significant advantages. This shift provides a foundation that is well-suited for centralized high-performance computing, modular designs and scalable system integration.



Through implementing an all-Ethernet system and zonal architecture, reductions in wiring harness complexity, cost and weight as well as accelerated time to market can be realized. By sticking to one protocol throughout the system, gateways and protocol translations are no longer required. Ethernet's scalability, standardization and ability to support high-bandwidth and time-sensitive traffic make it an excellent choice for enabling zonal SDV architectures.

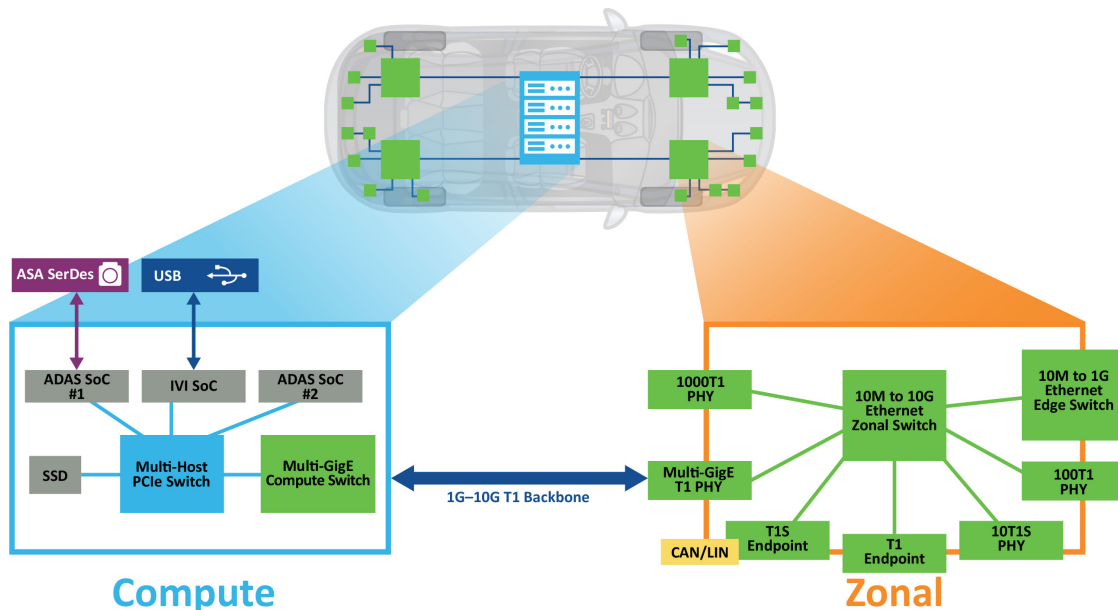
Zonal Architecture Elements

Zonal architectures to enable IVN and SDVs include three major components—the central compute module, zonal controllers and edge devices. Central compute modules are high-performance computing zones that serve as a powerful management consolidation of all the ECUs found throughout the vehicle. Zonal controllers act as an intermediary between the central compute and the edge devices, aggregating all sensors/actuators within a specific area or zone of ECUs, while maintaining local real-time control. Edge devices are the final connections that extend across the vehicle and in this model are generally connected via 10BASE-T1S due to its multidrop topology, which allows multiple nodes on a single bus to reduce complexity at the edge. In legacy/hybrid designs, CAN, LIN and other specialized protocols serve as connections to the edge, especially in simpler or more cost-sensitive applications.



The Microchip Difference

We are a leading automotive supplier with over 20 years of experience delivering automotive connectivity solutions to OEMs and Tier 1 manufacturers across the globe. We remain at the forefront of innovation while providing proven reliability, extensive support and complete documentation. We are equipped to support the full evolution of in-vehicle networks from beginning zonal designs and hybrid models to truly all-Ethernet based networks, through our broad portfolio and strong roadmap of future innovations. Beyond Ethernet, we provide the necessary complementary products to fully enable the future of automotive networking within our ecosystem. Committed to being a partner in this transition toward zonal architecture, we align to open standards, deliver robust feature sets and continue to support customers through a client-driven obsolescence process to enable design longevity and confidence.



Software Abstraction Accelerates SDV Development

The challenge of switch integration can lead to long design cycles and inflated costs. Standardized software is the solution that enables dynamic re-configuration and flexible vendor hardware design. Software abstraction through open standards reduces costs and complexity while speeding your time to market. Our VelocityDRIVE™ Software Platform (SP) is a turnkey, automotive switch software platform and allows you to configure without requiring previous specialized switch knowledge.



VelocityDRIVE Software Platform (SP)

VelocityDRIVE SP is a turnkey L3 switch application for managing our automotive TSN switches. It includes a binary code image that can be fully configured using the VelocityDRIVE Configuration Tool (CT). VelocityDRIVE SP is a cost-effective Real-Time Operating System (RTOS) that runs on memory-constrained systems with memory requirements of 512 KB to 2048 KB. VelocityDRIVE SP has full-switch feature support and offers a CORECONF/YANG-based management interface that implements standardized YANG models.



Standalone TSN Firmware Manageable Over CORECONF/YANG

Configuration
Tool



Modular



Small Memory
Footprint



FuSa, RTOS



Fast Boot



OS + HW
Agnostic



Automotive Qualified



Standard	Feature	Specification
802.ASds	Networking	MAC operating in half-duplex
802.1Qci	Networking	Per-Stream Filtering and Policing (PSFP)
802.1Qav	Networking	Forwarding and queuing for time-sensitive streams (CBS)
802.1Qbv	Networking	Enhancements for Scheduled Traffic (TAS)
802.1Qbu/802.3br	Networking	Frame preemption
802.1Q QoS	Networking	MAC table, VLAN support and QoS queue classification
Port Mirroring	Networking	Ingress and egress ports with TCAM and ACL
802.1AS	Time Distribution	Timing and synchronization of TSN networks
802.1Qcr	Networking	Asynchronous Traffic Shaping
DTLS	Management	Datagram Transport Layer Security (DTLS) with pre-shared keys
DHCP	Management	IPV4 DHCP Client
LLDP	Management	Link layer discovery protocol
Fast (Secure) Boot	Management	<140 ms boot from external QSPI Flash to Ethernet ready
Deep Packet Inspection (DPI)	Management	Ingress and egress TCAM, layer two to seven with access control list
YANG	Management	YANG status configurations and RPC support
CoAP Management Interface (CORECONF) Server	Management	CoAP for constrained environments
MUP1 and In-Band Host Management	Management	Serial UART, SPI or IPV4 in-band host management interfaces



Ethernet to the Edge

Connecting edge devices on a zonal, all-Ethernet architecture is crucial to enable the benefits of implementing this type of design. These edge connections can be achieved with a variety of protocols, most notably 10BASE-T1S. 10BASE-T1S is a type of Single Pair Ethernet (SPE) that is differentiated by its multidrop topology, allowing a single cable to connect at least eight nodes. Controls for a door, a seat or other localized functions can be configured with a single 10BASE-T1S bus, helping to reduce design complexity and weight.

LAN8660/1/2

This is a family of 10BASE-T1S endpoints with standards-based Remote Control Protocol (RCP) for bringing Ethernet connectivity to the edge. The LAN866x family directly bridges data between the 10BASE-T1S network and the peripheral, without the need for a gateway/MCU or any additional software programming requirements. These endpoints are well-suited solutions for any control ([LAN8660](#)), lighting ([LAN8661](#)) or audio ([LAN8662](#)) application.

Key features:

- RCP
- TC14/TC10
- Time synchronization with gPTP
- ASIL B



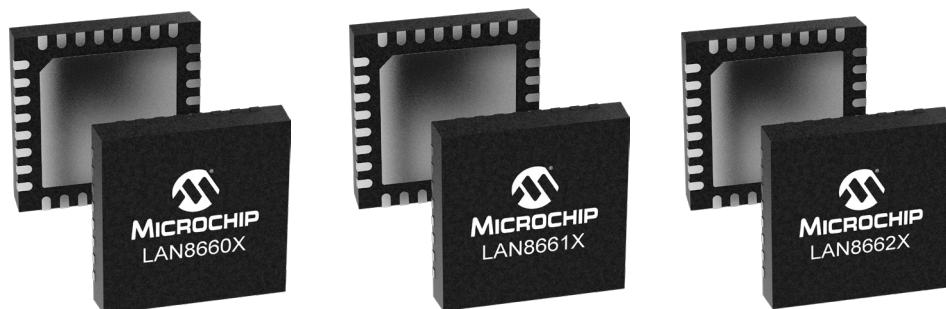


LAN8660X/1X/2X

This family includes 10BASE-T1S control ([LAN8660X](#)), lighting ([LAN8661X](#)) and audio ([LAN8662X](#)) endpoints with an integrated PMD transceiver, supporting standards-based RCP. The LAN866xx family directly bridges data between the 10BASE-T1S network and the peripheral, without the need for a gateway/MCU or any added software programming requirements.

Key features:

- Integrated 10BASE-T1S PHY
- RCP
- TC14/TC10
- Time synchronization with gPTP
- ASIL B



LAN8650/1

This family of 10BASE-T1S MAC-PHYs includes an SPI interface and TSN support to enable low-cost MCUs to access 10BASE-T1S networks.

Key features:

- Integrated Media Access Controller (MAC)
- Physical Layer Collision Avoidance (PLCA)
- ASIL B





LAN8670/1

This 10BASE-T1S PHY family with MII and RMII interfaces supports TC14/TC10 topology discovery and wake/sleep.

Key features:

- TC10 Wake/Sleep
- Topology discovery
- Physical Layer Collision Avoidance (PLCA)
- ASIL B



Development tools:

EVB-LAN8670-USB-D (EV62B92A)

The EVB-LAN8670-USB-D interconnects a USB interface with a 10BASE-T1S Ethernet network interface. The adapter serves as a network card that connects applications via USB 2.0 to the 10BASE-T1S network interface.

EVB-LAN8670-RMII (EV06P90A)

The EVB-LAN8670-RMII enables 10BASE-T1S Ethernet communication when used with the [SAM E54 Curiosity Ultra Development Board](#) or the [SAM E70 Xplained Ultra Evaluation Kit](#).

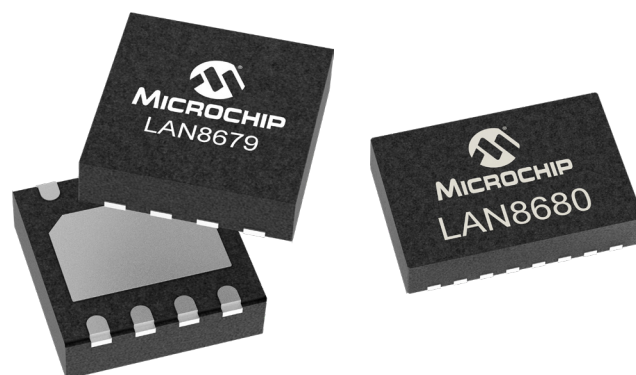
See also: EVB-LAN8670-RMII-D (EV52B40A)

LAN8679/LAN8680

These 10BASE-T1S Physical Medium Dependent (PMD) transceivers include TC14/TC10 support and an OA3P interface.

Key features:

- TC14/TC10
- ASIL B
- System Basis Chip (SBC) Features ([LAN8680](#) only)





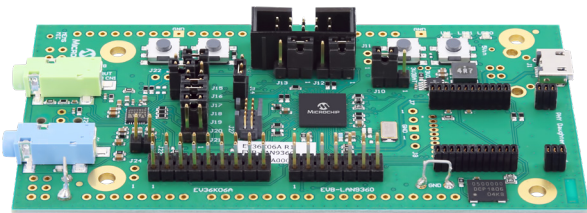
LAN9360

This is a single-chip, complete, 100 Mbps AVB/TSN solution for audio with Secure Boot, time synchronization via gPTP and qualified to IEEE® 1722 and 1733.

Key features:

- Time synchronization with gPTP
- High-bandwidth Digital Content Protection (HDCP)
- Secure Boot
- IEEE 1722 and 1733
- AEC-Q100 Grade 2

Development tool:



EV36K06A AVB Audio Endpoint Evaluation Board (EV36K06A)

The LAN9360 AVB Audio Endpoint Evaluation Board is an evaluation platform for digital audio transmissions over Ethernet AVB, with a set of AVB protocols integrated inside LAN9360.



Zonal Controllers

Zonal controllers aggregate all sensors/actuators within a defined area of the vehicle, which helps provide modularity to reduce complexity and can also help expedite automation of assembly.

LAN9370/1/2/3/4

This is a family of 5–8-port 100BASE-T1 Ethernet switches with AVB/TSN support and functional safety support to ISO 26262 ASIL B.

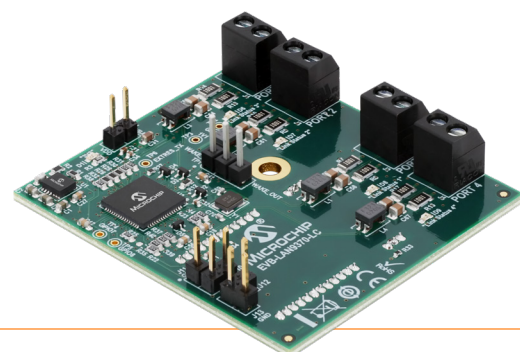
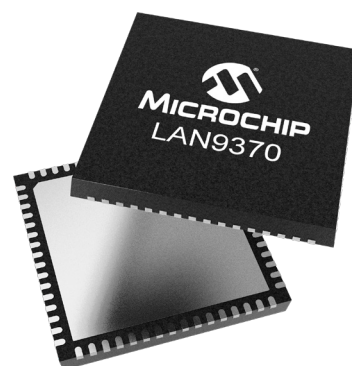
Key features:

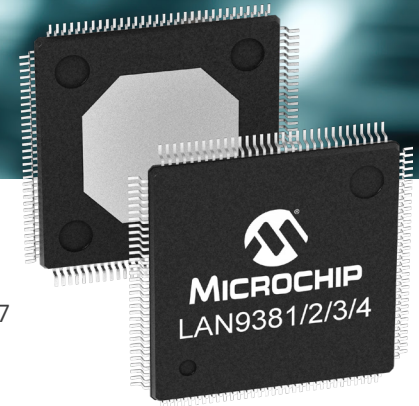
- Three to six integrated 100BASE-T1 PHYs
- AVB/TSN support
- RGMII/RMII/MII/SGMII options
- Deep packet inspection
- ASIL B

Development tool:

EVB-LAN9370 (EV64C55A)

The EVB-LAN9370 board is a 100BASE-T1 switch plug-in card for the SAMS70/E70/V70/V71 Xplained Ultra board. Together, the two boards enable the evaluation of the LAN9370 switch, including the low-power SLEEP feature.





LAN9381/2/3/4

These are seven-port 100BASE-T1 Ethernet switches with an integrated Arm® Cortex®-M7 CPU and AVB/TSN support.

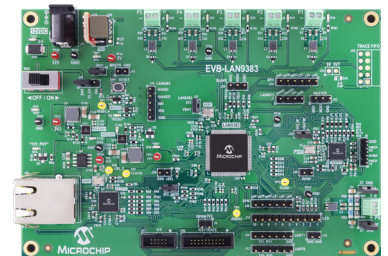
Key features:

- AVB/TSN support
- Arm Cortex-M7 core with integrated Flash memory
- Up to five integrated 100BASE-T1 PHYs
- RGMII/RMII/MII/SGMII options
- Crypto security engine
- Deep packet inspection
- ASIL B

Development tool:

EVB-LAN9383 (EV04C47A)

The LAN9383 Evaluation Board provides an evaluation platform for our seven-port family of TSN Gigabit Ethernet (GbE) switches. This evaluation board comes with five integrated 100BASE-T1 PHYs and an RGMII port that connects to a KSZ9131 PHY, which enables a standard 100/1000BASE-T uplink. An on-board LAN867x 10BASE-T1S PHY supports a multidrop 10BASE-T1S network with up to eight nodes.





LAN8870/1/2

These 1000BASE-T1 Ethernet PHYs include RGMII and SGMII MAC interfaces and TC10 low-power wake/sleep. LAN8870 is a dual-speed 100/1000BASE-T1 transceiver, with a type-B option for extended cable reach beyond 40m.

Key features:

- TC10
- RGMII/SGMII Interfaces
- Type-B Extended Cable Reach (LAN8870 only)
- ASIL B

Development tools:

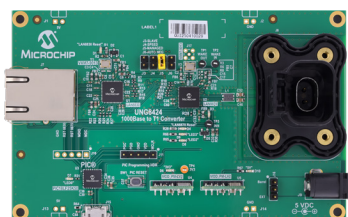
EVB-LAN8870B-MC (EV49A29A)

The EVB-LAN8870B-MC is a 100BASE-T1/1000BASE-T1 to 100BASE-TX/1000BASE-T media converter, for use in evaluating the LAN8870B VelocityDRIVE 100BASE-T1/1000BASE-T1 Ethernet transceiver.

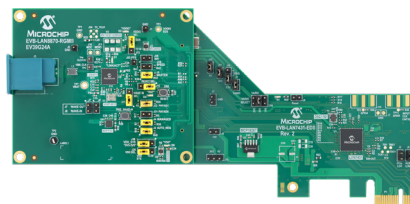
EVB-LAN8870-RGMII (EV39G24A)

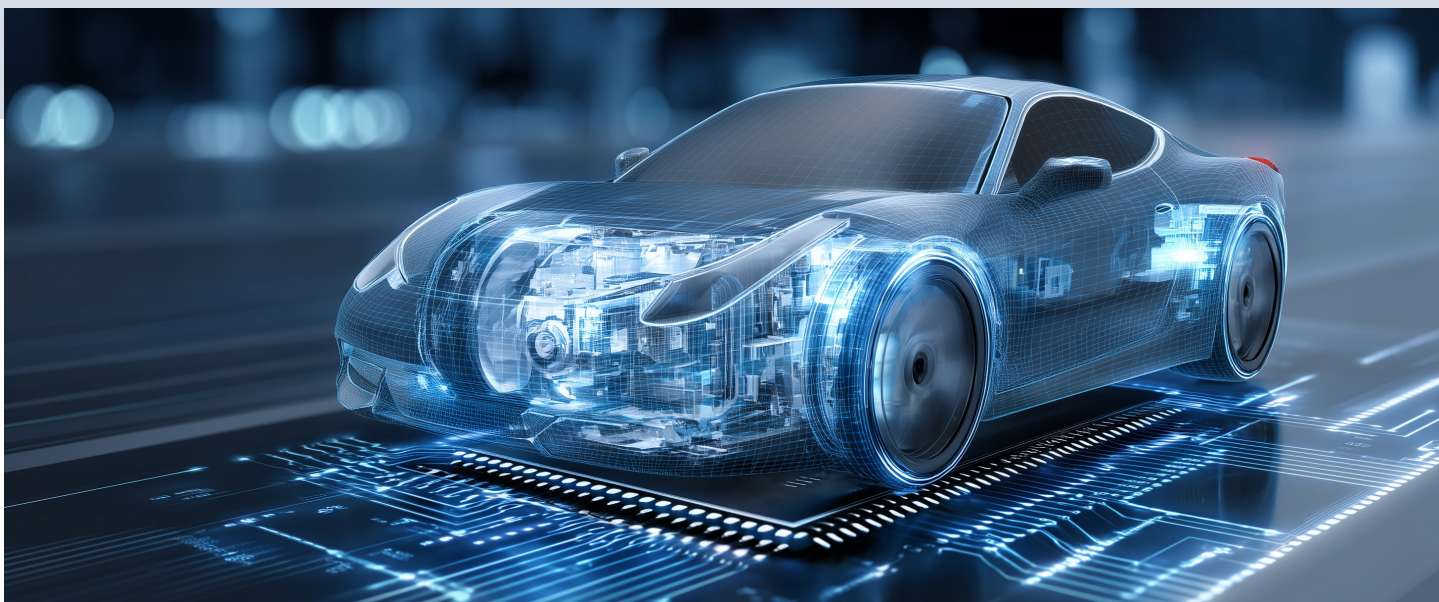
The EVB-LAN8870-RGMII Evaluation Board is a plug-in card that interfaces directly with our host processor controller board. This evaluation board, together with either the [EVB-LAN7801-EDS](#) or the [EVB-LAN7431-EDS](#), provides a highly flexible platform for the evaluation of basic PHY features via static Control-Status registers.

EVB-LAN8870B-MC (EV49A29A)



EVB-LAN8870-RGMII (EV39G24A)





LAN8770

This 100BASE-T1 transceiver comes with MII/RMII/RGMII interfaces and TC10 low-power wake/sleep support.

Key features:

- TC10
- flexPWR® technology for power management
- SMI management
- ASIL B

Evaluation tools:

EVB-LAN8770M_MC (EV02N47A)

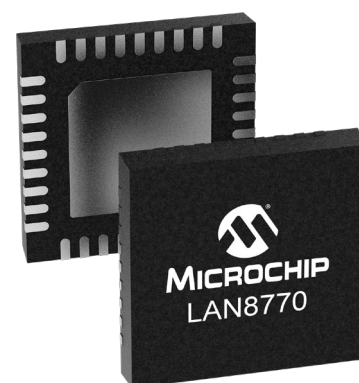
The EVB-LAN8770M-MC provides a simple method to exercise the LAN8770M 100BASE-T1 PHY by driving the common 100BASE-TX PHY via RJ45 connector.

EVB-LAN8770-RMII (EV48S68A)

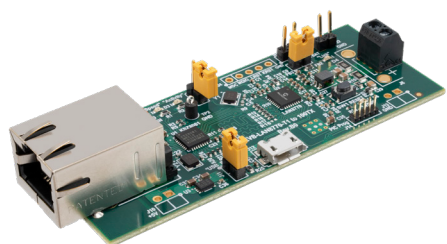
The EVB-LAN8770-RMII board is a 100BASE-T1 Ethernet PHY plug-in card for the SAM E70/E70/V70/V71 Xplained Ultra board. Together, the two boards enable the evaluation of the LAN8770 PHY, including the low-power sleep feature.

EVB-LAN8770-RGMII (EV68M25A)

The EVB-LAN8770-RGMII board is a 100BASE-T1 Ethernet PHY plug-in card for the SAM E70/E70/V70/V71 Xplained Ultra board.



EVB-LAN8770M_MC
(EV02N47A)

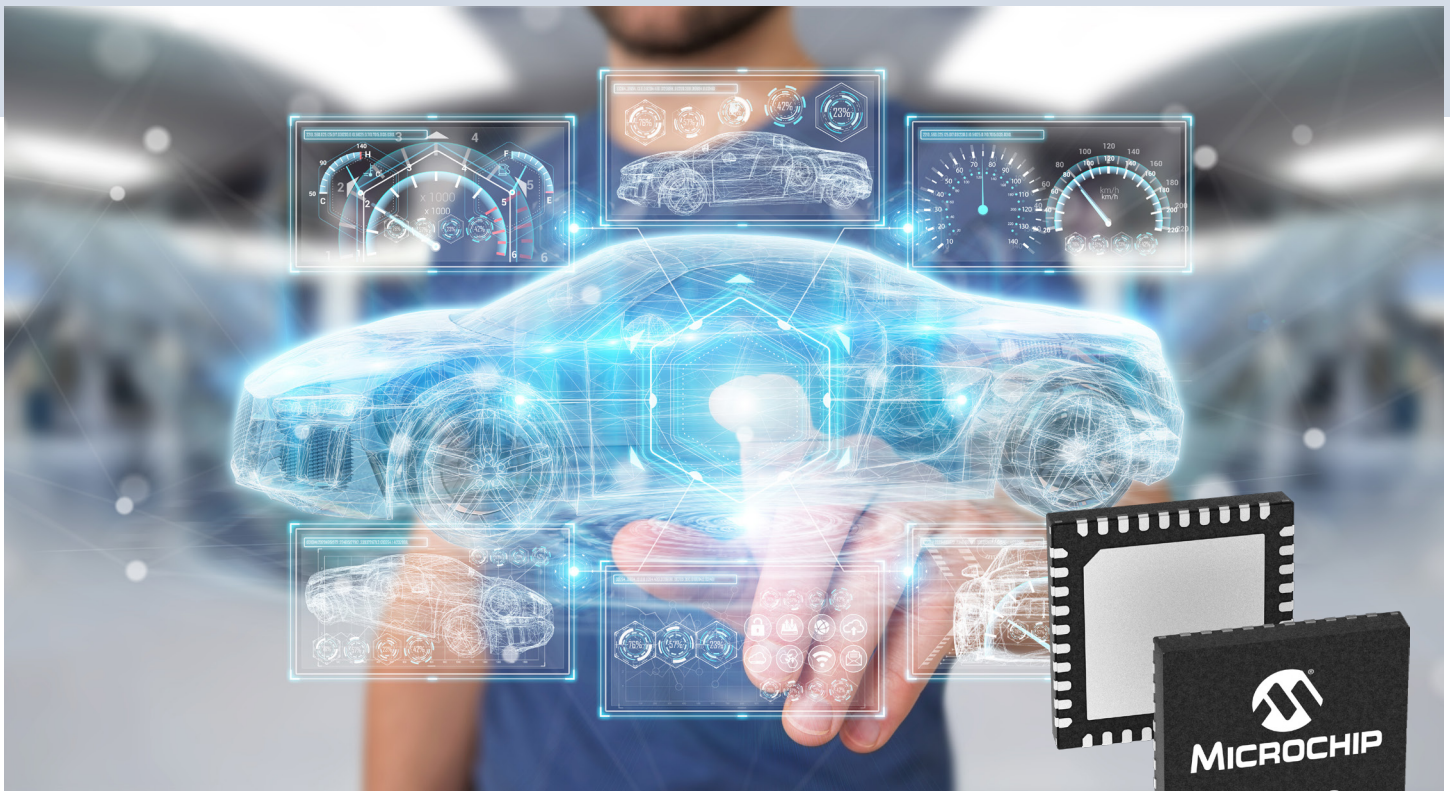


EVB-LAN8770-RMII
(EV48S68A)



EVB-LAN8770-RGMII
(EV68M25A)





Backbone Connections

Gigabit and multi-Gigabit Ethernet serve as the backbone of a zonal, all-Ethernet design and can efficiently enable real-time communications across the vehicle, connecting the central compute module and the various zonal controllers.

LAN8881/2/3/4

This 1000BASE-T1 PHY family with MACsec, TSN and TC10/TC12 support is well suited for ADAS, IVN backbone and infotainment solutions. LAN8883/4 are dual-speed 100/1000BASE-T1 PHYs with RGMII and SGMII support, respectively.

Key features:

- MACsec
- TSN support
- TC10/TC12
- ASIL B

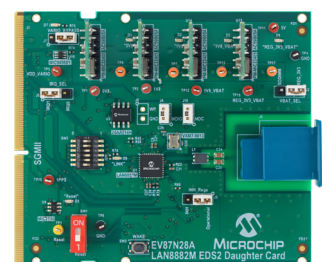
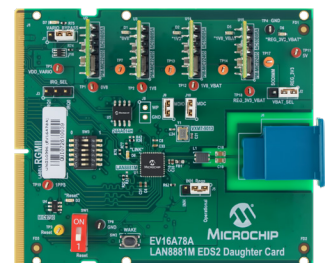
Development tools:

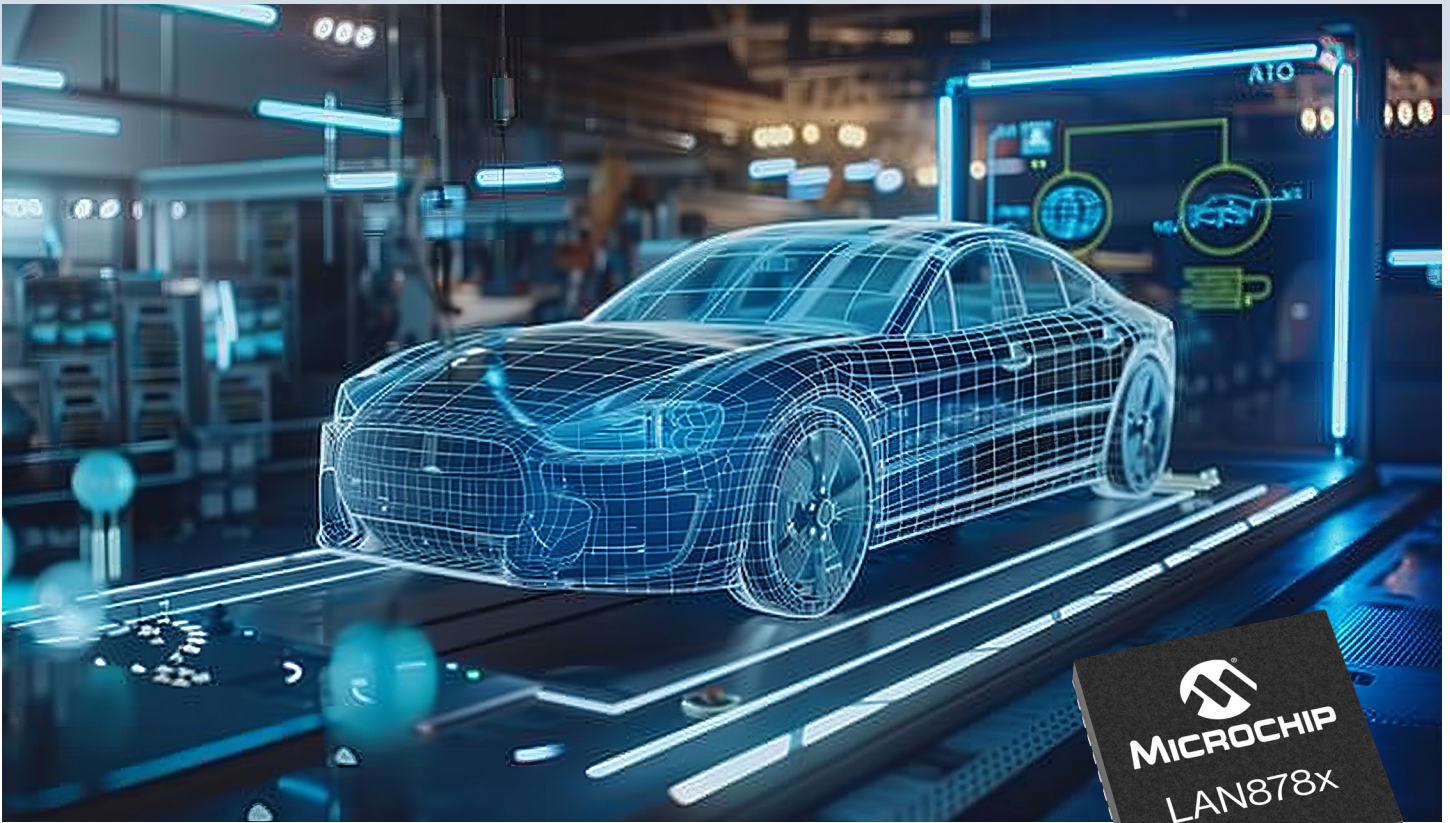
LAN8881M EDS2 Daughter Card (EV16A78A)

The LAN8881M EDS2 Daughter Card is designed for evaluation of the LAN8881, with RGMII communication through the SODIMM (Small Outline Dual In-Line Memory Module) interface.

LAN8882M EDS2 Daughter Card (EV27N28A)

The LAN8882M EDS2 Daughter Card is designed for evaluation of the LAN8882, with SGMII communication through the SODIMM interface.





LAN8781/2

This is a 100BASE-T1 PHY family with MACsec, TSN and TC10 support and is pin-compatible with the LAN888x family.

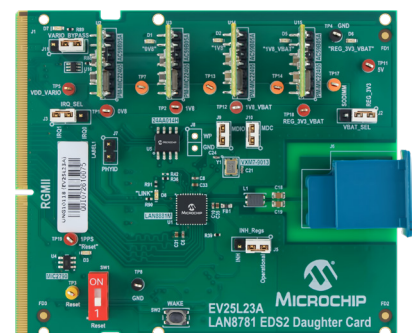
Key features:

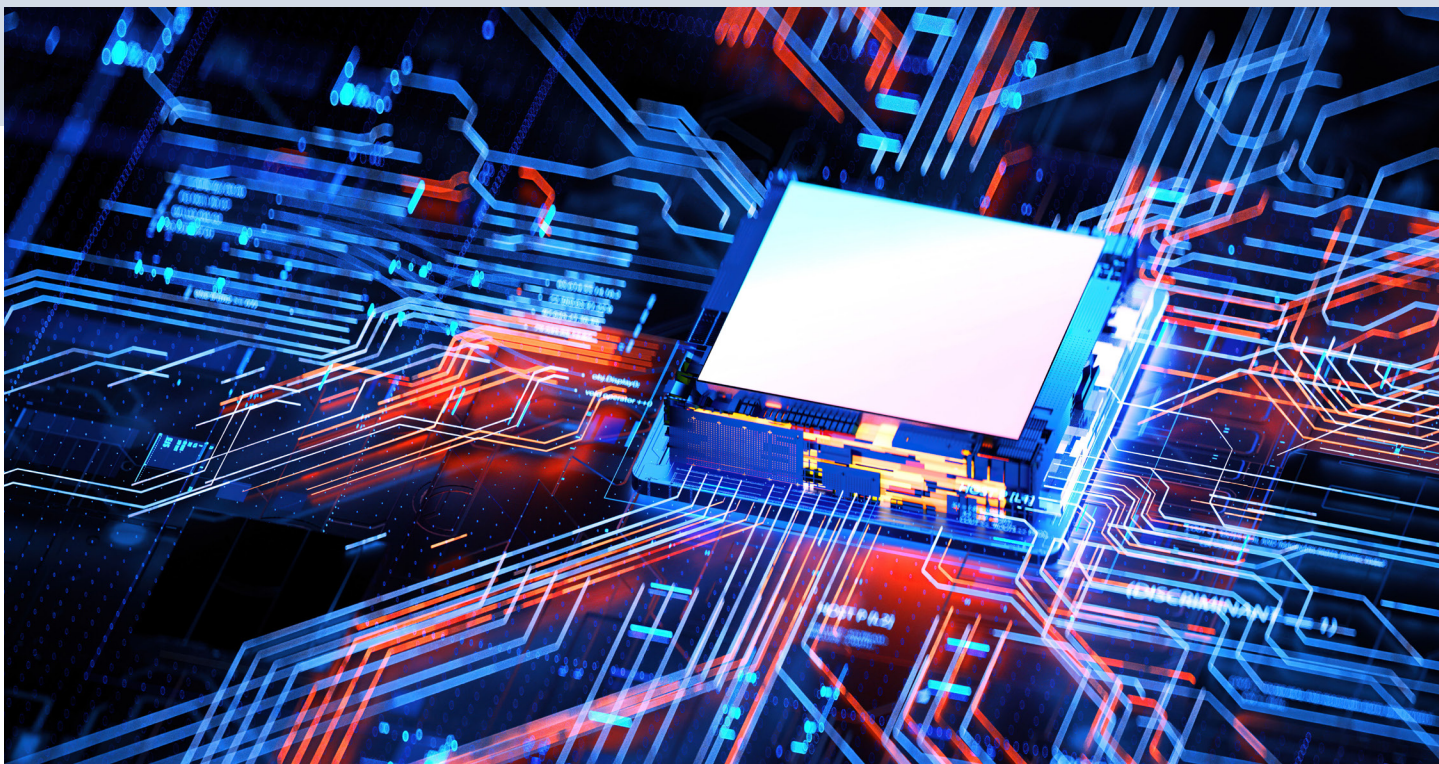
- MACsec
- TSN support
- TC10
- ASIL B

Development tool:

LAN8781M EDS2 Daughter Card (EV25L23A)

The LAN8781M EDS2 Daughter Card is designed for evaluation of the LAN8781, with RGMII communication through the SODIMM interface.





The Central Compute Module

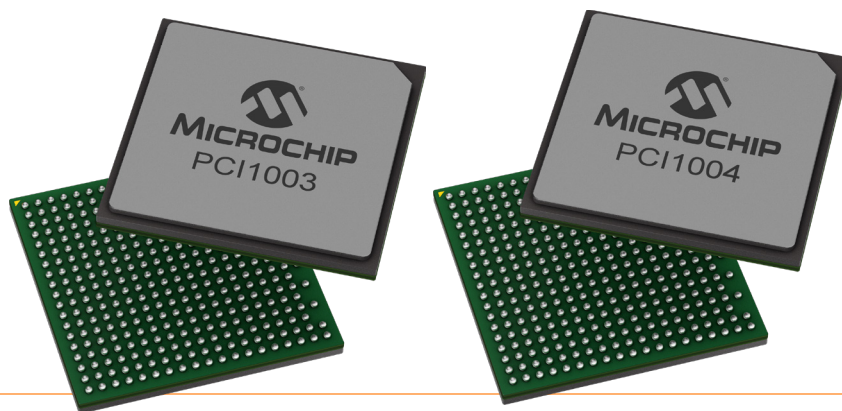
Central compute modules are the brains of a next-generation car and require high performance and low latency for real-time communication across the vehicle. Multiple SoCs come together using PCIe® and Ethernet to form this central module, which enables the SDV.

PCI1003/4

These are low-lane-count PCIe switches with up to 16 lanes operating at 16GT/s and include Non-Transparent Bridging (NTBs) options.

Key features:

- Full line rates on all ports
- Up to 256 Gbps switching capacity
- Advanced Error Reporting (AER) on all ports
- Extended temperature capability
- ASIL B





LAN9691/2/3

This scalable, multi-Gigabit TSN switch family includes up to 30 ports and is supported by our turnkey automotive Ethernet switch software, VelocityDRIVE.

Key features:

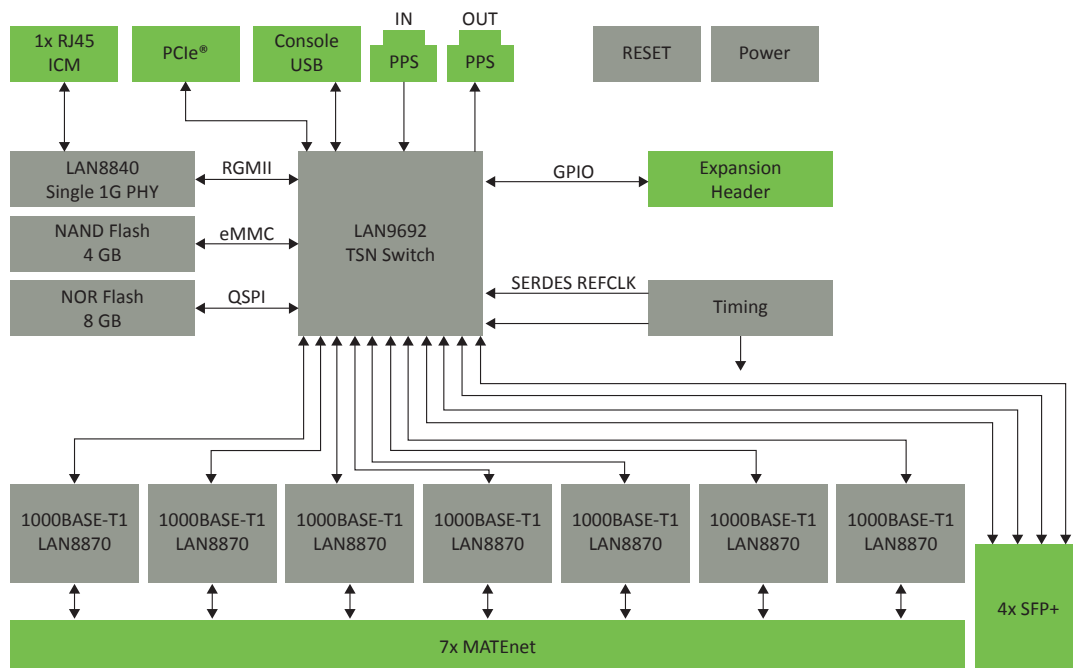
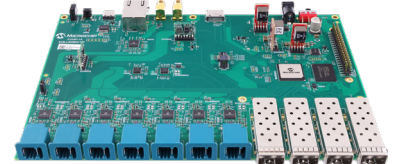
- 46-102G scalable bandwidth with multiple port options
- Fully managed L2 switching and L3 forwarding
- TSN support
- ASIL B



Development tool:

LAN9692 Automotive 12-Port EVB/VelocityDRIVE Software Platform (EV09P11A)

The LAN9692 EVB is a 12-port evaluation board that demonstrates the automotive TSN Ethernet switch architecture and can be used to evaluate the LAN9691, LAN9692 and LAN9693 Ethernet switches.





Bridges Between Ethernet + Related Technologies

Bridging is required to transmit data seamlessly between the Ethernet network and a host processor such as PCIe or USB, enabling high-performance and flexible networking.

LAN7430/1

Single-chip PCIe 3.1 to GbE bridge, supporting 10BASE-T and 100/1000BASE-T with an integrated MAC.

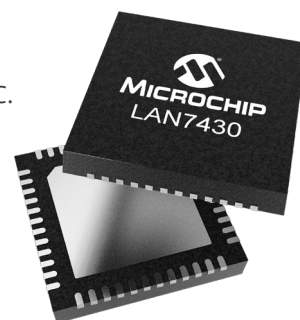
Key features:

- Precision Time Protocol (PTP)
- Low-Power Sub State (LPSS)
- Single 25 MHz crystal required

Development tool:

LAN7430 PCIe 3.1 AT 2.5GTS TO 10/100/1000 Ethernet Evaluation Board (EVB-LAN7430)

EVB-LAN7430 is a fully featured, single-lane PCIe adapter that enables the evaluation of LAN7430. EVB-LAN7430 answers customer requests toward evaluation of basic networking through to 1588 PTP, JTAG test coverage and General-Purpose Input Output (GPIO) access.





LAN7801

This is a USB 3 Gen 1 to 10/100/1000 GbE controller with One-Time Programmable (OTP) memory and energy efficient Ethernet.

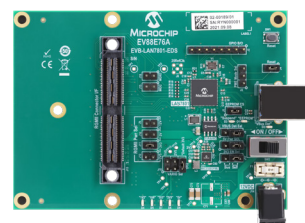
Key features:

- Always On Always Connected (AOAC)
- RGMII support
- AEC-Q100 Grade 2

Development tool:

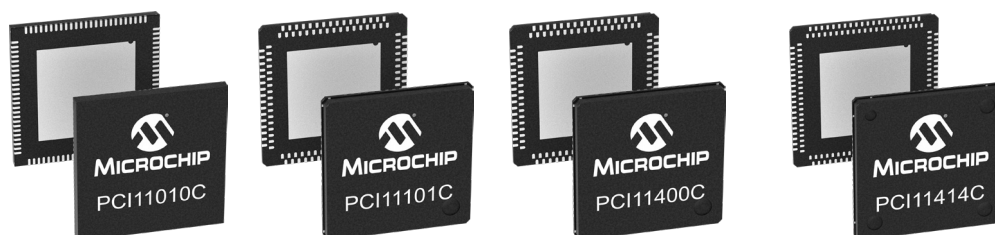
EVB-LAN7801-EDS-EVALUATION-BOARD (EV88E76A)

EVB-LAN7801-EDS is full-featured evaluation board that utilizes LAN7800 to provide a fully functional, bus-powered USB Type A-to-GbE interface.



PCI11xxxC

These are PCIe at 8 Gigatransfers per second (GT/s) bridges to USB 2, USB 3, 2.5G MAC, UART/ GPIO/serial communication.



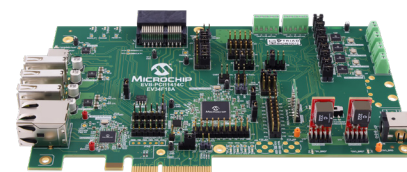
Key features:

- PCIe Gen 4 at 8 GT/s
- Networking MAC (PCI11414C and PCI11010C)
- Extended temperature ranges

Development tools:

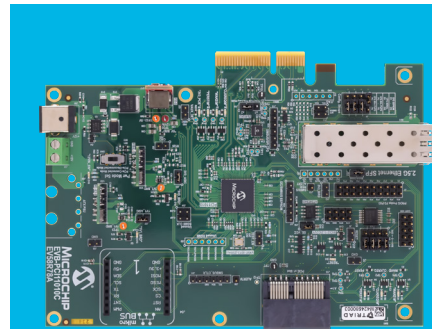
EVB-PCI11414C (EV34F18A)

The EVB-PCI11414C is a demonstration and evaluation platform for evaluating the PCI11414C, a single-chip PCIe switch with an integrated USB 3.2 Gen 2 host controller.



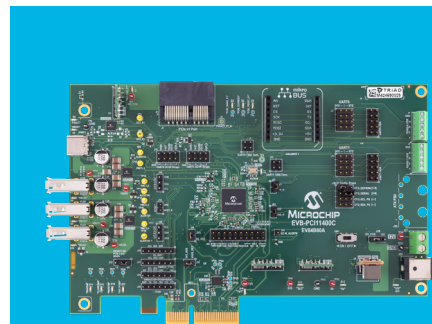
EVB-PCI11010C (EV58R78A)

The EVB-PCI11010C is a demonstration and evaluation platform for evaluating the PCI11010C, a single-chip PCIe switch with RGMII/SGMII Ethernet MAC.



EVB-PCI11400C (EV84B60A)

The EVB-PCI11400C is a demonstration and evaluation platform for evaluating the PCI11400C, a single-chip PCIe switch with an integrated USB 3.2 Gen 2 host controller.



EVB-PCI11101C (EV25P01A)

The EVB-PCI11101C is a demonstration and evaluation platform for evaluating the PCI11101C, a single-chip PCIe switch with an integrated USB 3.2 Gen 2 host controller.

