Single-Pair Ethernet Solutions

Seamless Connectivity for the Future of Networking





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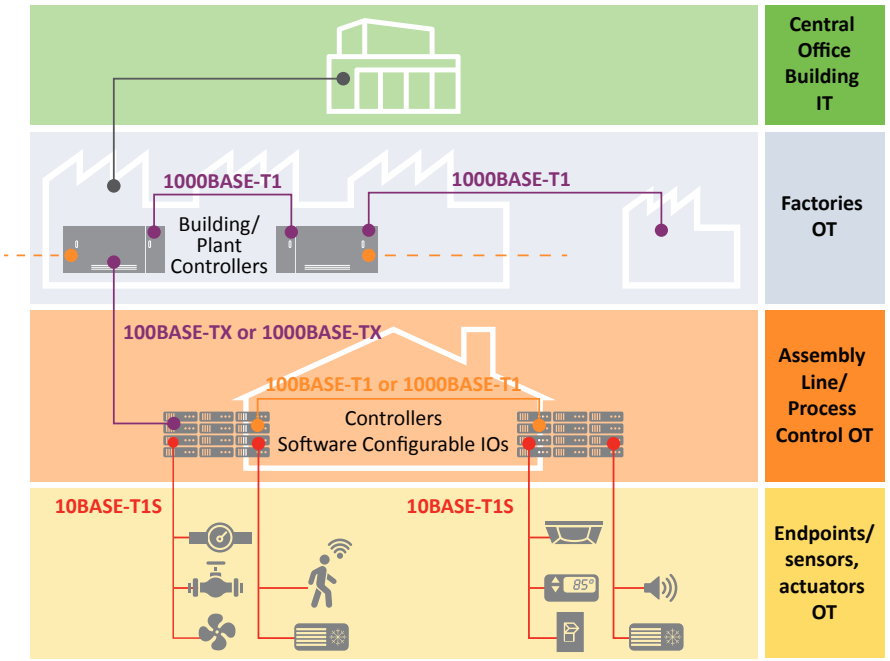
Single Pair Ethernet (SPE)

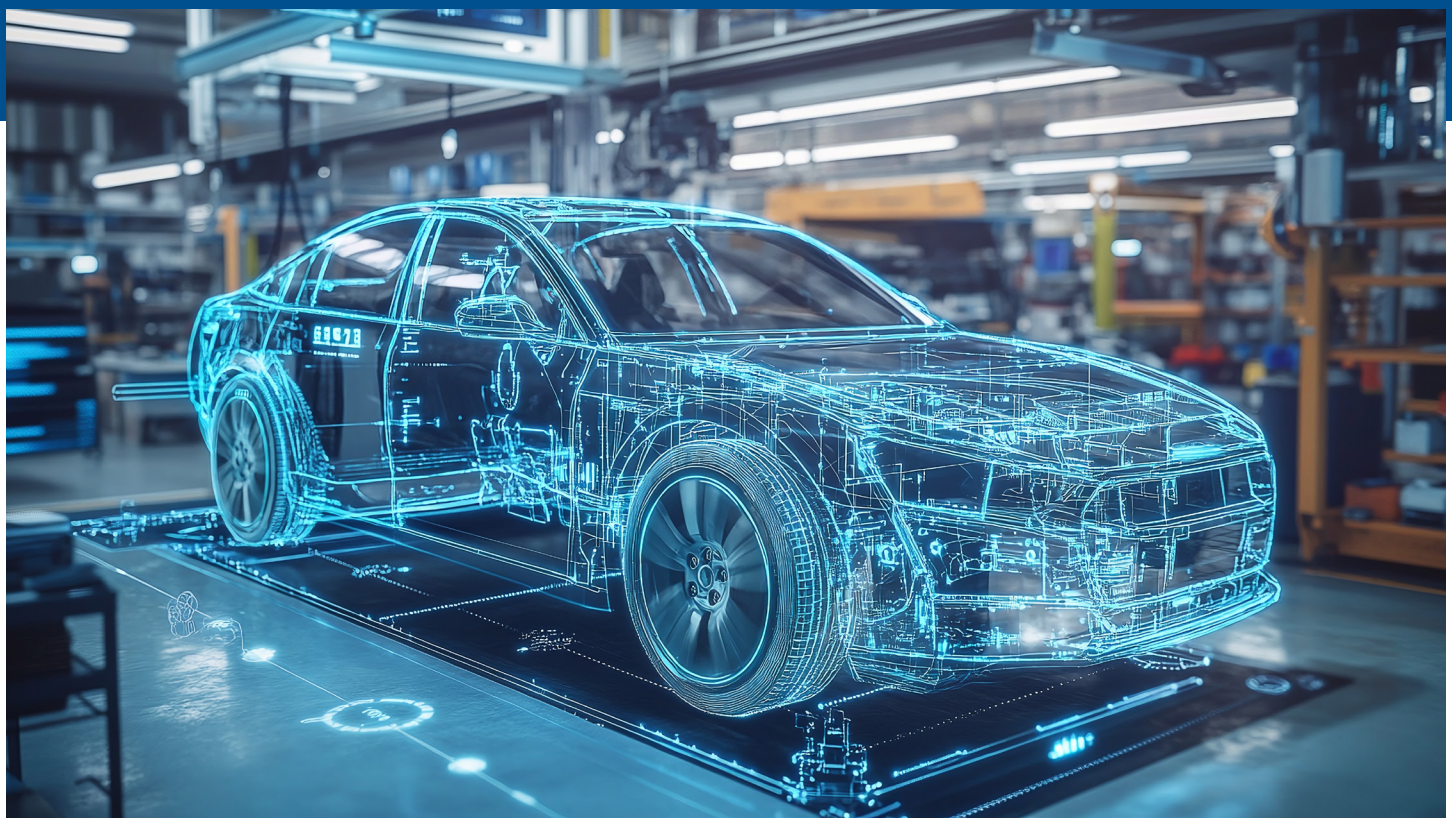
Single Pair Ethernet (SPE) is an Ethernet network implementation that uses a unique physical layer (PHY) transceiver over a single pair of wires. SPE reduces system cost, weight and wiring complexity when compared to traditional Ethernet multi-pair CAT5 cabling.

SPE Brings Ethernet to the Edge of Industrial and Automotive Networks

Microchip's Single Pair Ethernet devices implement the 10BASE-T1S, 100BASE-T1 and 1000BASE-T1 physical layer. These products bring Ethernet all the way to the edge of networks.

SPE defines the transceiver part of an Ethernet system. All the higher software layers remain unchanged, regardless of the speed grade. SPE is also referred to as T1, which means one balanced pair of wires. Some applications use a twisted pair of wires, but others use just two wires running alongside each other. The IEEE standard defines a channel in terms of its electrical characteristics and not the specific physical wires.





Networking is moving from distributed systems defined primarily by the hardware involved, to more centralized, software-defined systems. The trend is to connect everything with Ethernet:

- Domain-specific hardware architectures give way to zones connected to each other and to a centralized computing platform.
- Multiple application-specific buses are replaced by an IP-based and ubiquitous Ethernet network.
- Gateways or controllers required to translate between different hardware approaches and which require complex wiring are eliminated. Low-cost, single pair cabling then brings Ethernet all the way to the edge of the network. All this results in a more powerful, more flexible network to meet industrial challenges.

Key SPE Applications

- Industrial Control and Automation
- In-Vehicle Networking
- Robotics
- Building Automation
- Data Centers
- Aerospace
- Aviation
- Transportation
- Drones

Advantages of SPE Technology

- Support your entire system using Ethernet
- Worldwide standards-based architecture
- Speed design cycles while reducing costs and risks
- Large ecosystem of suppliers and applications
- Single port to support several connections
- Proven security infrastructure

Single-Pair Ethernet Portfolio

Ethernet Transceivers/PHYs

Product	Ethernet Type	Host Interface	Temp Min (°C)	Temp Max (°C)	Packages
LAN8670	10BASE-T1S PHY	MII/RMII	–40	+125	32 VQFN
LAN8671	10BASE-T1S PHY	RMII	–40	+125	24 VQFN
LAN8770	100BASE-T1 PHY	RGMII/MII/RMII	–40	+125	32 VQFN, 36 VQFN
LAN8870	1000BASE-T1 PHY	RGMII/SGMII	–40	+105	48 VQFN
LAN8870B*	100/1000BASE-T1	RGMII/SGMII	–40	+105	48 VQFN
LAN8871	1000BASE-T1 PHY	RGMII	–40	+105	48 VQFN
LAN8872	1000BASE-T1 PHY	SGMII	–40	+105	48 VQFN
LAN8881	1000BASE-T1 with MACsec	RGMII	–40	+125	40 VQFN
LAN8882	1000BASE-T1 with MACsec	SGMII	–40	+125	40 VQFN
LAN8883	100/1000BASE-T1 with MACsec	RGMII	–40	+125	40 VQFN
LAN8884	100/1000BASE-T1 with MACsec	SGMII	–40	+125	40 VQFN
LAN8781	100BASE-T1 with MACsec	MII/RMII/RGMII	–40	+125	40 VQFN
LAN8782	100BASE-T1 with MACsec	SGMII	–40	+125	40 VQFN
LAN8679	10BASE-T1S PMD	PMD	–40	+125	8 VDFN
LAN8680	10BASE-T1S PMD	PMD	–40	+125	16 VDFN

* Type B/ Longer Reach

SPE Switches

Product	Ethernet Type	Host Interface	Temp Min (°C)	Temp Max (°C)	# of Integrated PHYs	Total # of Ports	Packages
LAN9381/2/3/4	100BASE-T1 Switch	2x RGMII/RMII/MII or 1x SGMII	–40	+105	4-5	7	128 TQFP
LAN9370/1/2/3/4	100BASE-T1 Switch	RGMII/RMII/MII or SGMII	–40	+105	3-6	5-8	64 VQFN, 128 TQFP

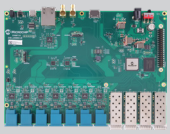
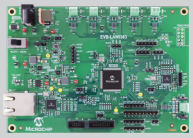
SPE Endpoints

Product	Ethernet Type	Network Interface	Temp Min (°C)	Temp Max (°C)	Packages
LAN8660 (Control)	10BASE-T1S	OA3p	–40	+125	32 VQFN
LAN8661 (Lighting)	10BASE-T1S	OA3p	–40	+125	32 VQFN
LAN8662 (Audio)	10BASE-T1S	OA3p	–40	+125	32 VQFN
LAN9360	10BASE-T1S/100BASE-T	RMII	–40	+105	100 TFBGA

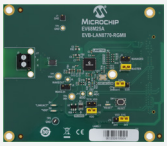
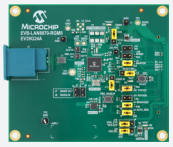
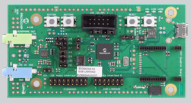
SPE Bridges and Controllers

Product	Ethernet Type	Host Interface	Single Pair Ethernet
LAN7431	10/100/1000 Ethernet Bridge	PCIe to RGMII/MII	RGMII or MII MAC port provides direct connectivity to 100BASE-T1 transceivers
LAN7801	10/100/1000 Ethernet Controller	USB to RGMII	RGMII port provides support for connection of an external gigabit PHY
LAN8650/1	10BASE-T1S MAC-PHY	SPI	10BASE-T1S MAC-PHY

SPE Development Tools/Reference Designs

	Product + Part Number	Description
	**EVB-LAN9381 Dual-T2 (EV74W41A)**	The EVB-LAN9381 Dual-T2 is a multi-rate Single-Pair Ethernet evaluation kit which includes both 10BASE-T1S ports and 100BASE-T1 ports to help evaluate Microchip SPE products.
	**VelocityDRIVE/ LAN9692 Evaluation Board (EV09P11A)**	The EVB-LAN9692 (EV09P11A) is a 12-port evaluation board that demonstrates the Automotive TSN Ethernet Switch Architecture and the VelocityDRIVE™ Software Platform and Configurator Tool.
	**EVB-LAN9370 (EV64C55A)**	The EVB-LAN9370 board is a 100BASE-T1 Switch plugin 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.
	**EVB-LAN9383 (EV04C47A)**	The LAN9383 Evaluation Board provides a convenient and small-form-factor evaluation platform for our seven-port, safe and secure family of Time-Sensitive Networking (TSN) Gigabit Ethernet switches.
	**EVB-LAN8670-USB (EV08L38A)**	The EVB-LAN8670-USB 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 with for instance the SAM E54 Curiosity Ultra Development Board or the SAM E70 Xplained Ultra Evaluation Kit.

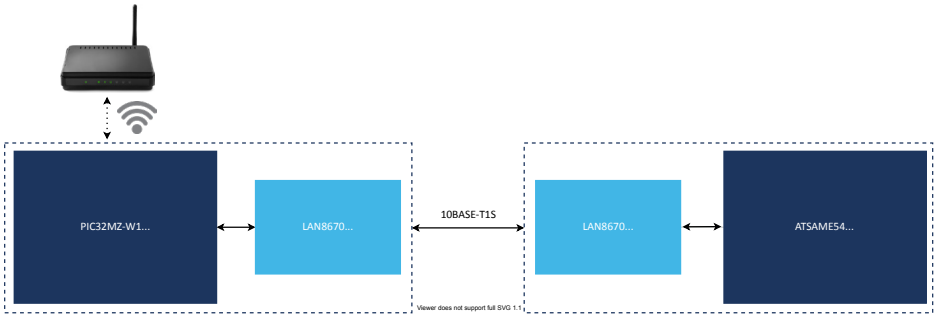
SPE Development Tools/Reference Designs (Continued)

	Product + Part Number	Description
	**EVB-LAN8770-RGMII (EV68M25A)**	The EVB-LAN8770-RGMII board is a 100BASE-T1 Ethernet PHY plug-in card for the SAMS70/E70/V70/V71 Xplained Ultra board.
	**EVB-LAN8770-RMII (EV48S68A)**	The EVB-LAN8770-RMII board is a 100BASE-T1 Ethernet PHY plug-in card for the SAMS70/E70/V70/V71 Xplained Ultra board. Together, the two boards enable the evaluation of the LAN8770 PHY, including the low power SLEEP feature.
	**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-LAN8870-MC (EV75E52A)**	The EVB-LAN8870-MC Evaluation Board is a 1000BASE-T1 (Single-Pair Ethernet) to 1000BASE-T (Gigabit Ethernet) media converter used in evaluating the LAN8870 1000BASE-T1 Ethernet transceiver.
	**EVB-LAN8870-RGMII (EV39G24A)**	The EVB-LAN8870-RGMII Evaluation Board is a plug-in card that interfaces directly with a mating Microchip host processor controller board, such as the SAMA5D3 Ethernet Development System (EDS) board.
	**EVB-LAN9360 (EV36K06A)**	The LAN9360 AVB Audio Endpoint Evaluation Board is an evaluation platform for Digital Audio Transmissions over Ethernet AVB. Configuration of LAN9360 can be done using MPLAB Network Creator. Note: An Ethernet PHY module must be purchased separately.



SPE Demos

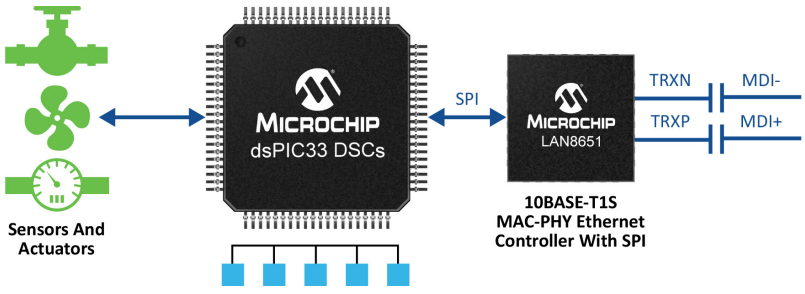
Wi-Fi to 10BASE-T1S Bridge Demonstration Application



Need to connect wireless and deterministic wired systems? This demo makes it easy, bridging Wi-Fi and 10BASE-T1S networks in a single, IP-based architecture. It uses our PIC32MZ-W1, Wi-Fi microcontroller and the LAN8670 in a cost-effective bridge solution that supports bidirectional data transfer for edge-to-cloud connectivity.

Learn More

dsPIC33 DSC Demo



Jump-start your designs that require 10BASE-T1S Single-Pair Ethernet (SPE) communication and high-performance cores with deterministic response and rich peripherals. Our 10BASE-T1S Ethernet demo uses a dsPIC33CK DSC and a LAN8651-based 10BASE-T1S SPI Click board™.

Learn More



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