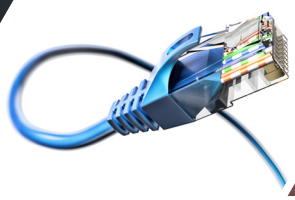
High-Throughput Ethernet Interface Solutions

High Performing, Power Efficient, Easy to Use



A Complete Portfolio Providing Reliable Ethernet Connectivity

Microchip's broad Ethernet portfolio extends from 10 Mbps transceivers, bridges and controllers up to 200 Gbps 64-port switches. Important features enabling Time Sensitive Networking (TSN), functional safety and data security are coupled with measures to reduce system level power consumption that enable designers to deliver solutions that help achieve environmental sustainability goals.

Ethernet Made Easy

- Development boards that make evaluation easy
- Application Notes and Code Examples
- Extensively tested for MPLAB® Harmony, Windows®, macOS and Linux® operating systems
- University of New Hampshire (UNH) InterOperability Laboratory compliance
- FreeRTOS

Our Ethernet Portfolio

Transceivers (PHYs)

- Speeds of up to 1 Gigabit for copper and 10 Gigabits for optical

Bridges/Controllers

- Enable Ethernet with your processor's USB or PCIe® port

Switches

- Up to 64 ports, up to 25 Gigabit speeds, time-sensitive networking, and industrial and automotive temperatures

Applications

5G

- Broadband modems and routers
- Network infrastructure (routers, switches, access points and bridges)
- Wireless 5G small cell

Industry 4.0

- Industrial automation
- EtherCAT & Ethernet Connected Sensors

Internet of Things (IoT)

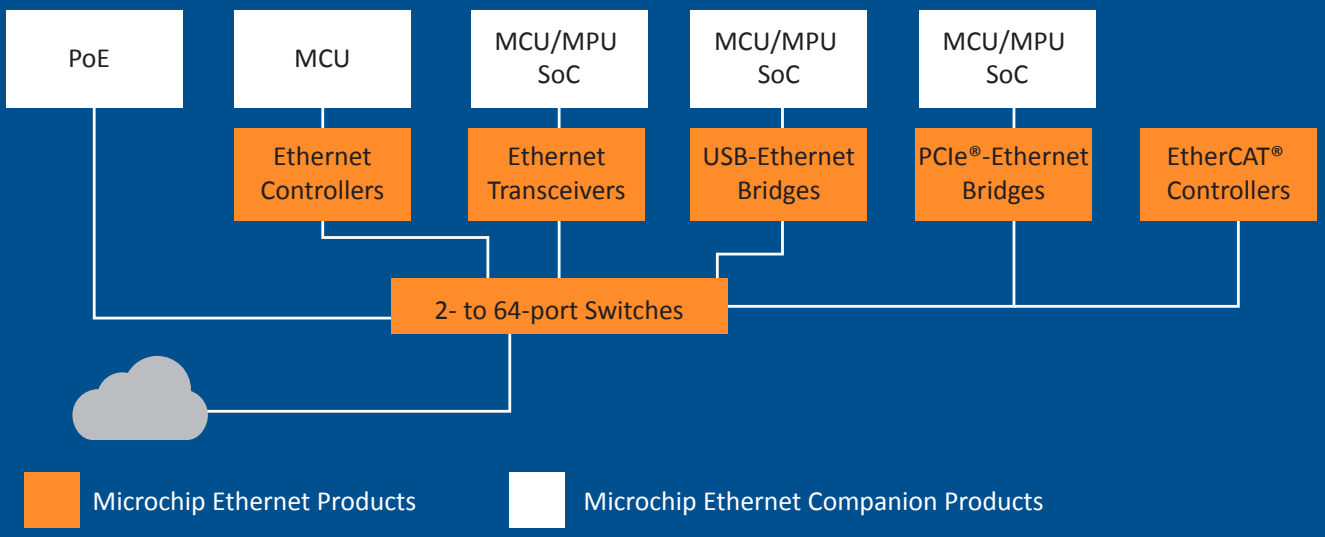
- Home/building/lighting automation

Automotive

- Automated Driver Assistance Systems (ADAS)
- Telematics
- In-Vehicle Networking (IVN)

Military, Aerospace and Defense

Our Ethernet Products



Software Drivers

We develop, test and certify software drivers for MPLAB Harmony, Microsoft Windows, MacOS, Linux OS, Autosar, FreeRTOS, QNX and many proprietary stacks used in MCU-, MPU- and SoC-based systems.

Visit our Embedded Software website for more information: http://www.microchip.com/mplab/embedded-software-center and Customizable and turnkey solutions shorten development cycles and reduce your costs. See our website for links to software drivers: www.microchip.com/design-centers/ethernet/software.

Transceivers (PHYs)

Microchip's 10/100, Gigabit PHY, multi-Gigabit and multi-port options seamlessly attach to SoCs, MCUs and CPUs with industry standard interfaces (GMII, RGMII, RMII, MII, SGMII).

Available Features

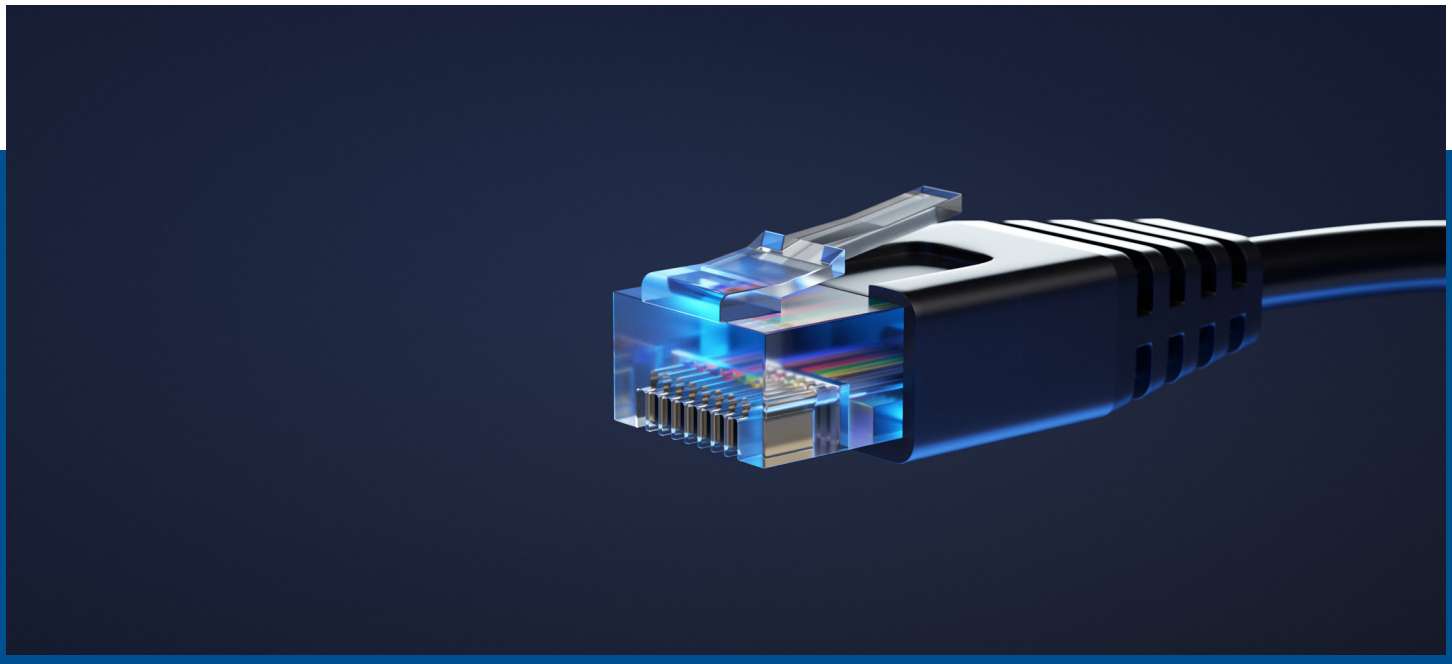
- Standard Media Access Control (MAC) interface
- Single Pair Ethernet (SPE)
- On-chip termination
- Wake on LAN
- Energy-efficient Ethernet (802.3az)
- LinkMD+ with signal quality indicator
- MACsec
- TC10 remote low power sleep and wake
- High precision IEEE 1588v2
- EtherCAT® Approved
- Signal Quality Indicator (SQI)

Ethernet PHYs – 10/100

Feature	KSZ8041	KSZ8041F	KSZ8051	KSZ8081	KSZ8091	LAN8770	LAN8670/1/2
AEC-Q100	✓	–	✓	–	–	✓	✓
Interface	MII/RMII	MII	MII/RMII	MII/RMII	MII/RMII	MII/RMII/ RGMII	MII/RMII
Ethercat	–	–	✓	✓	–	–	–
Fiber Support	–	✓	–	–	–	–	–
EEE	–	–	–	–	✓	–	–
Single Supply?	–	–	✓	✓	✓	✓	✓
WoL	–	–	–	–	✓	TC10	✓
Linux® Driver	Mainline	Mainline	Mainline	Mainline	Mainline	-	✓
Temp. Min.	–40	–40	–40	–40	–40	–40	–40
Temp. Max.	+85	+85	+105	+85	+85	+125	+125
Packages	32-QFN	48-TQFP	32-QFN	24-VQFN, 48-VQFN	24/32-VQFN, 48-VQFN	32-VQFN, 36-VQFN	24/32/36-VQFN

Ethernet PHYs – 10/100/1000

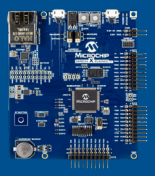
Feature	KSZ9031	KSZ9131	LAN8830	LAN8831	LAN8840	LAN8841	LAN887x	VSC8211	VSC8221	VSC8531	VSC8541
AEC-Q100	✓	✓	–	–	–	–	✓	–	✓	–	–
Interface	MII, RGMII, GMII	MII, RGMII, GMII	RGMII	MII, RGMII, GMII	RGMII	MII, RGMII, GMII	RGMII / SGMII, RGMII, SGMII	MII, RGMII, MII, SGMII	SGMII	RMII/ RGMII	RMII/ RGMII/ GMII
1588v2	–	–	–	–	✓	✓	✓	–	–	–	✓
Ethercat	–	–	–	–	–	–	–	–	–	✓	✓
Fiber Support	–	–	–	–	–	–	–	✓	–	–	–
EEE	–	✓	✓	✓	✓	✓	?	–	–	✓	✓
Single Supply?	✓	✓	✓	✓	✓	✓	✓	–	✓	–	–
Linux® Driver	Mainline	Mainline	Mainline	Mainline	Mainline	Mainline	Mainline	Mainline	Mainline	MCHP	MCHP
Temp. Min.	–40	–40	–40	–40	–40	–40	–40	0	0	–40	–40
Temp. Max.	+105	+105	+105	+105	+105	+105	+105	+100	+100	+125	+125
Packages	48-VQFN, 64-VQFN	48-VQFN, 64-VQFN	48-VQFN	64-VQFN	48-VQFN	64-VQFN	48-VQFN	117-LBGA	100-TFBGA	48-VQFN	68-VQFN



PHY Evaluation Boards

Getting started with our Ethernet PHYs is easy. Several development board options are available, from MCU/MPU boards with a specific on-board PHY, to modular development boards accommodating one of the PHY Daughter boards.

Development boards With On-Board PHYs



ATSAME54-XPRO

An XPro development board based on the SAM E54 high performance micro-controller series featuring a 32-bit Arm® Cortex®-M4F processor, running up to 120 MHz with the on-board KSZ8081 10/100 PHY.

VSC8541 Evaluation Board

VSC8541EV provides a way to evaluate the VSC8541 and VSC8531 devices in multiple configurations. Two RJ-45 connectors are provided for the copper media interface from each device. The MAC interface is exposed through 0.1 inch pin-headers. For standalone access to all device features, an external microcontroller is used to configure both the VSC8541 and the VSC8531 through the MDIO bus.

EVB-LAN8814 (EV53D52A)

The EVB-LAN8814 supports the evaluation of LAN8814 and LAN8804. It is useful for initial hardware bring-up and software driver integration. It provides full access to the LAN8814/04 I/Os on a managed platform. Linux kernel driver and User space API support. Demo application is provided to aid setup and connection to PTP link partners.

Ethernet Bridges

For SoCs and MPUs/CPUs that have USB or PCIe but no Ethernet-standard interface, we offer a portfolio of bridge devices. These devices are fully integrated with on-chip USB or PCIe and Ethernet MAC/PHYs to minimize application size and BOM costs.

Our Ethernet bridge devices are compatible with USB 2.0, USB 3.1 Gen1, PCIe and HSIC, delivering up to Gigabit performance.

Feature	LAN9730	LAN9500A	LAN9512/3/4	LAN7500	LAN7850	LAN7800	LAN7801	LAN7430	LAN7431
Ethernet Bridge	HSIC to 10/100	USB 2.0 to 10/100		USB 2.0 to 10/100/1000	USB 2.0/ HSIC to 10/100/1000	USB 3.1 Gen1 to 10/100/1000		PCIe® to 10/100/1000	
Integrated Ethernet PHY	✓	✓	✓	✓	✓	✓	–	✓	–
NetDetatch™ Technology	✓	✓	–	✓	✓	✓	✓	✓	✓
WoL	✓	✓	✓	✓	✓	✓	✓	✓	✓
PME Support	✓	✓	–	✓	✓	✓	✓	✓	✓
EEE	–	–	–	–	✓	✓	✓	✓	✓
IEEE® Standard 1588	–	–	–	–	–	–	–	✓	✓
Temperature	–40 to 85°C	–40 to 85°C	–40 to 85°C	–40 to 85°C	–40 to 85°C	–40 to 85°C	–40 to 105°C (AEC-Q100)	–40 to 105°C (AEC-Q100)	–40 to 105°C, (AEC-Q100)
Packages	56-pin QFN	56-pin VQFN	64-pin QFN	56-pin QFN	56-pin QFN	48-pin QFN	64-pin QFN	48-pin SQFN	72-pin SQFN
MAC I/F	MII and Turbo MII		–	–	GMII, MII	–	RGMII	–	RMII/RGMII

Bridge Evaluation Boards

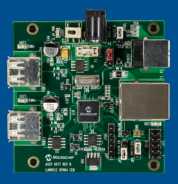
The low-cost dongle format of USB-to-Ethernet bridges makes it easy to get started. We provide a complete suite of software drivers for Linux, MacOS and Windows.

LAN7500 High-Speed USB 2.0-to-10/100/1000 Ethernet Evaluation Board (EVB-LAN7500)

This board is a fully functional, bus-powered USB-to-Ethernet solution with on-board Ethernet RJ45 and USB Type A connectors. The on-board 4K EEPROM loads the USB configuration parameters and MAC address. Software drivers for Windows, MacOS and Linux operating systems are available.

LAN7800 Super-Speed USB-to-Ethernet Low-Cost Evaluation Board (EVB-LAN7800-LC1)

With an ultra-low cost BOM, this evaluation board integrates the USB Type-C connector to implement a super-speed data transfer to Gigabit Ethernet with an on-board RJ45 connector. Linux, MacOS and Windows drivers are available.



LAN9512 High-Speed USB Hub-to-Ethernet Evaluation Board (EVB9512)

This board provides a two-port USB 2.0 hub with an integrated 10/100 Ethernet controller and USB connectivity via one Type B upstream USB connector and two Type A downstream USB connectors. An RJ-45 Ethernet jack with integrated magnetics and link/activity LEDs provides 10/100 Ethernet connectivity. The board supports both bus-powered and self-powered modes of operation.

Switches

You can implement managed or unmanaged networks using our portfolio of 10/100, Gigabit and multi-Gigabit switches. These L2+ switches feature multiple ports, extensive advanced switch functionality and a small footprint, assuring optimal network performance.

Available Features

Time-Sensitive Networking with Single-Chip Ethernet Switch

- Our new family of Ethernet Switches provides the industry's most complete Time-Sensitive Networking (TSN) feature set.

Ethernet Switches

Gigabit Switch Family

Feature	LAN937x	LAN938x	LAN9646	KSZ9477[1]	KSZ956x	KSZ989x
Bandwidth	100BASE-TX/T1	100 Mbps T1	10Base-T/100Base-TX/1000Base-T			
Ports	3-6	7	6	7	3, 7	3, 6, 7
Interface	RGMII/RMII/MII or SGMII	2x RGMII/RMII/MII or 1xSGMII	SGMII/RGMII/RMII/MII	SGMII/RGMII/GMII/RMII/MII		
LinkMD Technology'	LinkMD+ w/signal quality indicator	LinkMD+ w/signal quality indicator	✓	✓	LinkMD+ with signal quality indicator	✓
IEEE® 1588 v2/802.1AS	✓	✓	–	✓	✓	–
AVB	✓	✓	–	✓	✓	–
TSN	✓	✓	–	✓	✓	–
Time Aware Scheduler	✓	✓	–	✓	✓	–
Low-Latency Cut-Through	✓	✓	–	✓	✓	–
Network Fault Recovery (DLR/HSR)	✓	✓	–	✓	–	–
EEE/WoL/TC10	✓	✓	–	✓	✓	✓
Temperature	−40°C to +105°C (AEC-Q100)	−40°C to +105°C (AEC-Q100)	−40°C to +85°C	−40 to 85°C		
Packages	64-pin VQFN, 128-pin TQFP	128-pin TQFP	132-pin DVQFN	128-pin TQFP	64-pin QFN, 128-pin LQFP, 128-pin TQFP	64-pin QFN, 128-pin LQFP, 128-pin TQFP

3-Port Switches

Feature	KSZ8863	KSZ8873	KSZ8463	KSZ8563	LAN9303	LAN9353	LAN9355
Bandwidth	10Base-T/100Base-TX/100Base-FX			10Base-T/100Base-TX		10Base-T/100Base-TX/100Base-FX	
Interface	MII/RMII			MII/RMII/RGMII	MII/RMII/ Turbo MII	SPI/SQI/RMII/MII	MII
EEE	–	–	✓	✓	–	✓	✓
VDD I/O	1.8/2.5/3.3				3.3	1.6–3.3	
LinkMD® Technology	✓	✓	✓	✓	–	✓	✓
IEEE® 1588	–	–	✓	✓	–	✓	✓
Power	520 mW		330 mW	–	640 mW	555 mW	
Temperature	–40 to 85°C	–40 to 85°C (AEC-Q100)		–40 to 105°C (AEC-Q100)	–40 to 85°C		
Packages	48-pin LQFP	64-pin LQFP		64-pin QFN	56-pin QFN	64-pin QFN, 64-pin TQFP-EP	88-pin QFN, 80-pin TQFP-EP

4-Port to 9-Port Switches: KSZ Models

Feature	KSZ8864	KSZ8895	KSZ8794	KSZ8795	KSZ8775	KSZ8765	KSZ8565	KSZ8567	KSZ8999
Bandwidth	10/100Base-T/TX, 100Base-FX		10/100Base-T/TX with GigE Uplink			10/100BASE-T/TX, 100BASE-FX with GigE Uplink	10/100BASE-T/TX with GigE Uplink		10/100BASE-T/TX, 100BASE-FX
Number of Ethernet Ports	4	5	4	5				7	9
Interface	MII/RMII (×2)		RGMII MII/RMII	GMII/RGMII MII/RMII	RGMII MII/RMII	GMII/RGMII MII/RMII	RGMII/MII/ RMII	RGMII/MII/ RMII/SGMII	MII, SNI
EEE/WoL	–	–	✓	✓	✓	✓	✓	✓	–
IEEE® 802.1X	–	–	–	–	–	–	✓	✓	–
VDD I/O	1.8/2.5/3.3								3.3
LinkMD® Technology	✓	✓	✓	✓	✓	✓	LinkMD+ with signal quality indicator		–
Power	253 mW	435 mW	430 mW	560 mW	460 mW	560 mW	–	–	1472 mW
Temperature	–40 to 85°C (AEC-Q100)		–40 to 85°C				–40 to 105°C (AEC-Q100)	–40 to 105°C (AEC-Q100)	–40 to 85°C
Packages	64-pin QFN	128-pin LQFP	64-pin QFN	80-pin LQFP			128-pin TQFP		208-pin PQFP

4-Port to 64-Port Switches

Features	VSC7511	VSC7512	VSC7513	VSC7514	VSC7440	LAN969x	VSC754x	VSC755x
Bandwidth	10/100/1000/2500 Mbps	10/100/1000/2500 Mbps	10/100/1000/2500 Mbps	10/100/1000/2500 Mbps	10/100/1000/2500 Mbps 10 Gbps	10/100/1000/2500 Mbps 5/10 Gbps	10/100/1000/2500 Mbps 5/10 Gbps	10/100/1000/2500 Mbps 5/10/25 Gbps
Ports	4	10	8	10	10	30	64	64
Interface	SGMII 1000Base-T (4)	SGMII, QSGMII 1000Base-T (4)	SGMII, QSGMII 1000Base-T (4)	SGMII, QSGMII 1000Base-T (4)	SGMII 1000Base-T XFI	SGMII, QSGMII, USGMII, USXGMII, XFI	SGMII, QSGMII, USGMII, USXGMII, XFI	SGMII, QSGMII, USGMII, USXGMII, XFI
EEE	✓	✓	✓	✓	–	✓	✓	✓
V_{DD} I/O (V)	1.0/1.2/2.5	1.0/1.2/2.5	1.0/1.2/2.5	1.0/1.2/2.5	1.0/1.2/2.5	0.9/1.5/1.8/3.3	0.9/1.5/1.8/3.3	0.9/1.5/1.8/3.3
LinkMD® Technology	✓	✓	✓	✓	✓	–	–	–
IEEE 1588	✓	✓	✓	✓	✓	✓	✓	✓
Temperature	–40 to +125°C	–40 to +125°C	–40 to +125°C	–40 to +125°C	–40 to +125°C	–40 to +105°C	–40 to +105°C	–40 to +110°C
Packages	172 VQFN	172 VQFN	256 PBGA	256 PBGA	172 VQFN	356 FCBGA	888 FCBGA	888 FCBGA

4-Port to 64-Port Switches: TSN Models

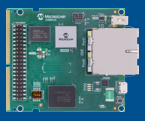
Features	LAN9662[1]	LAN9668[1]	LAN969xTSN[1]	LAN969xRED	VSC754xTSN	VSC755xTSN[1]
Bandwidth	10/100/1000/2500 Mbps	10/100/1000/2500 Mbps	10/100/1000/2500 Mbps 5/10 Gbps	10/100/1000/2500 Mbps 5/10 Gbps	10/100/1000/2500 Mbps 5/10 Gbps	10/100/1000/2500 Mbps 5/10/25 Gbps
Ports	4	8	30	30	64	64
Interface	SGMII 1000Base-T (2)	RGMII, SGMII, QSGMII 1000Base-T (2)	SGMII, QSGMII, USGMII, USXGMII, XFI	SGMII, QSGMII, USGMII, USXGMII, XFI	SGMII, QSGMII, USGMII, USXGMII, XFI	SGMII, QSGMII, USGMII, USXGMII, XFI
EEE	✓	✓	✓	✓	✓	✓
TSN	✓	✓	✓	✓	✓	✓
V_{DD} I/O (V)	1.1/2.5/3.3	1.1/2.5/3.3	0.9/1.5/ 1.8/3.3	0.9/1.5/ 1.8/3.3	0.9/1.5/ 1.8/3.3	0.9/1.5/ 1.8/3.3
LinkMD® Technology	✓	✓	–	–	–	–
IEEE 1588	✓	✓	✓	✓	✓	✓
Temperature	–40 to +85°C	–40 to +85°C	–40 to +105°C	–40 to +105°C	–40 to +105°C	–40 to +110°C
Packages	256 HSBGA	256 HSBGA	356 FCBGA	356 FCBGA	888 FCBGA	888 FCBGA

1: PROFINET compatible parts, to learn more about PROFINET and our compatible offerings please visit: https://www.microchip.com/en-us/products/high-speed-networking-and-video/ethernet/profinet-technology

Switch Evaluation Boards

EVB-LAN9668 (EV18W53A)

The EVB-LAN9668 is the evaluation board for the LAN9668 TSN Switch. The EVB-LAN9668 implements 8 Gigabit Ethernet ports with the LAN9668 Switch and LAN8814 PHYs.



EVB-LAN9662 (EV09D37A)

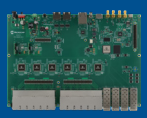
The EVB-LAN9662 CPU board is the evaluation board for the LAN9662 TSN switch.

EVB-LAN9662-Carrier (EV44Z97A)

The EVB-LAN9662-Carrier is the carrier for the CPU board.

EVB-LAN9646 EDS2 Daughter Card for the Curiosity Platform (EV94T99A)

The EVB-LAN9646 evaluation board is a plug-in daughter card that directly interfaces the SAM9X75 host processor on the Curiosity Platform over a EDS2 SODIMM card edge interface.



LAN969x 24x1G + 4x 10G EVB (EV23X71A)

The LAN969x EVB (EV23X71A) is a 24x 1G + 4x 10G Ethernet development system that can be used to demonstrate the LAN9694, LAN9696 and LAN9698 Ethernet Switches.

EtherCAT® Controllers

Microchip's LAN925x are 2/3-port EtherCAT device controllers with dual integrated Ethernet PHYs which each contain a full-duplex 100BASE-TX transceiver and support 100 Mbps (100BASE-TX) operation.

Product Features	LAN9252	LAN9253	LAN9254	LAN9255
Number of ports available	1,2,3, 4	1,2,3,4	1,2,3,4	1,2,3,4
Number of PHY available	2 PHY, 1 MII	2 PHY, 1 MII	2 PHY, 1 MII	2 PHY, 1 MII
Integrated MCU	–	–	–	✓
Integrated Arm® Cortex®-M4F MCU	–	–	–	✓
10/100 Ethernet MAC (RMII)	–	–	–	✓
SPI/SQI	✓	✓	✓	✓
Link status LED	✓	✓	✓	✓
EtherCAT Error LED	–	✓	✓	✓
EEPROM size (in bits)	1K to 4M	1K to 4M	1K to 4M	1K to 4M
EEPROM emulation	–	✓	✓	✓
Fiber support	✓	–	–	–
Auto MDIX	✓	✓	✓	✓
EtherCAT Wake Up	✓	✓	✓	✓
Power Over EtherCAT (EtherCAT P)	✓	✓	✓	✓
Target cycle time	125 µSec	76.9 µSec	76.9 µSec	76.9 µSec
Package	64 QFN, 64 TQFP	64 QFN	80 TQFP	128 TQFP
Extended Industrial Version	–40 to +105°C	–40 to +105°C	–40 to +105°C	–40 to +105°C

EtherCAT Development Tools

	Development Tool	Part Number	Description
	**Add-On for EL9800 Development Platform**	EVB-LAN9252-ADD-ON	This is designed to be used as an add-on board (ESC board) with the Beckhoff EL9800 EtherCAT® Evaluation Board. This board supports the SPI and DIGIO PDI modes of the LAN9252.
	**PICtail™ Plus for Explorer 16 Platform**	EVB-LAN9252-PICTAIL	This board is used to evaluate the LAN9252. It is an expansion board for the Explorer 16 Development Board (DM240001).

Find out more at https://www.microchip.com/en-us/products/high-speed-networking-and-video/ethernet/ethercat-technology-solutions.

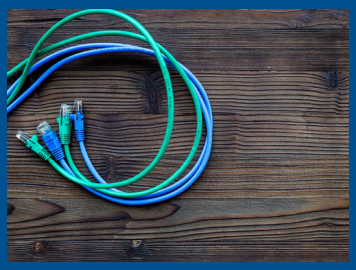
VelocityDRIVE™

Our VelocityDRIVE™ solutions deliver secure, safe and proven hardware and software to simplify development effort and reduce cost and risk.

VELOCITY DRIVE™
Accelerating Connectivity

VelocityDRIVE Software Platform (SP) is a turnkey L3 switch application for managing Microchip 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 is designed to run on memory-constrained systems with memory requirements in the 512 KB to 2048 KB range. VelocityDRIVE SP contains full-switch feature support and offers a CORECONF/YANG-based management interface that implements standardized YANG models.

Find out more at: https://www.microchip.com/en-us/products/high-speed-networking-and-video/ethernet/automotive-ethernet-products.

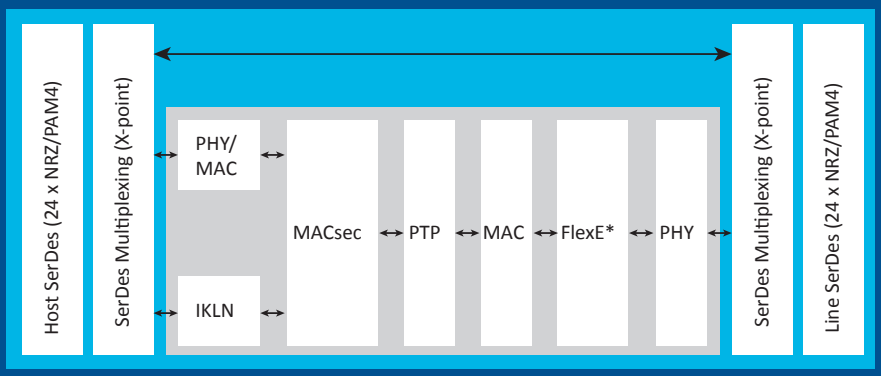


META-DX1 Family

1.2T Ethernet MAC/PHYs Supporting MACsec and FlexE with Retimer, Gearbox and Crosspoint

The META-DX1 family devices are multi-purpose Ethernet MACs/PHYs supporting rates from 1 GE to 400 GE.

META-DX2L Block Diagram



*Optional

Applications

- High-density Ethernet line cards
- Data center, service provider and enterprise routers and switches
- Working/protect switches requiring hitless mux
- Ethernet transponders and muxponders
- Encryption appliances
- FlexE line cards

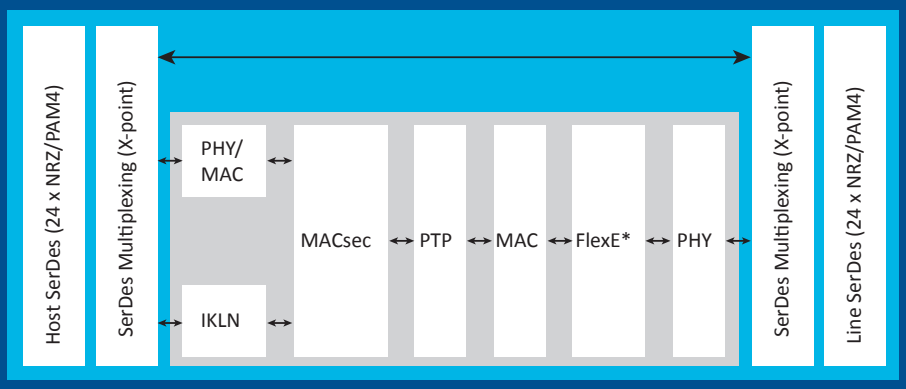
Highlights

- Up to 1.2 Tbps capacity throughput in a single device
- Ethernet client support from 1 GE to 400 GE
- Flexible Ethernet support

META-DX1 Device Family

Part #	Analog Retimer	PCS retimer	Gearbox	Crosspoint	2:1 mux	PTP	Interlaken	MACsec	FlexE	SerDes	Ethernet Rate Support	Max Capacity (PAM4)	Max Capacity (NRZ)
PM6110	✓	✓	✓	✓	✓	✓	✓	✓	✓	48	1 GE to 400 GE	1.2T	600G
PM6108	✓	✓	✓	✓	✓	✓	✓	✓		48	1 GE to 400 GE	1.2T	600G
PM6104	✓	✓	✓	✓	✓	✓				48	1 GE to 400 GE	1.2T	600G

META-DX2L: 1.6T Ethernet Retimer, Gearbox and Hitless 2:1 Mux



META-DX2+ Family

1.6T Ethernet MAC/PHYs Supporting MACsec/IPsec Encryption and Port Aggregation With Retimer, Gearbox, Hitless 2:1 Mux and Crosspoint

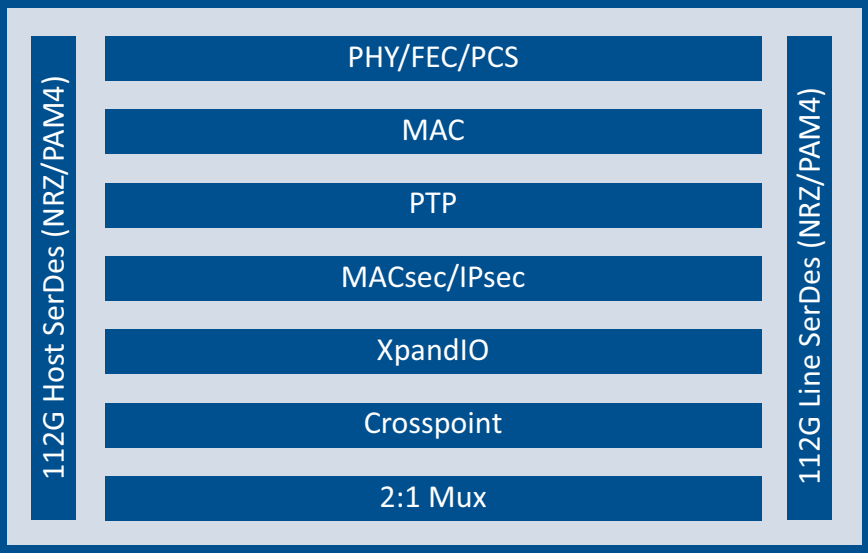
Summary

The META-DX2+ family of devices are multi-purpose 1.6T Ethernet MAC/PHYs supporting rates from 1 GbE to 800 GbE and 112G PAM4 long reach SerDes. These versatile devices support encryption, port aggregation, Class C/D PTP and hitless 2:1 multiplexing, as well as SerDes crosspoint functionality that enables connectivity to a variety of optical modules, Direct Attach Copper (DAC) cables, packet processors and Ethernet switches.

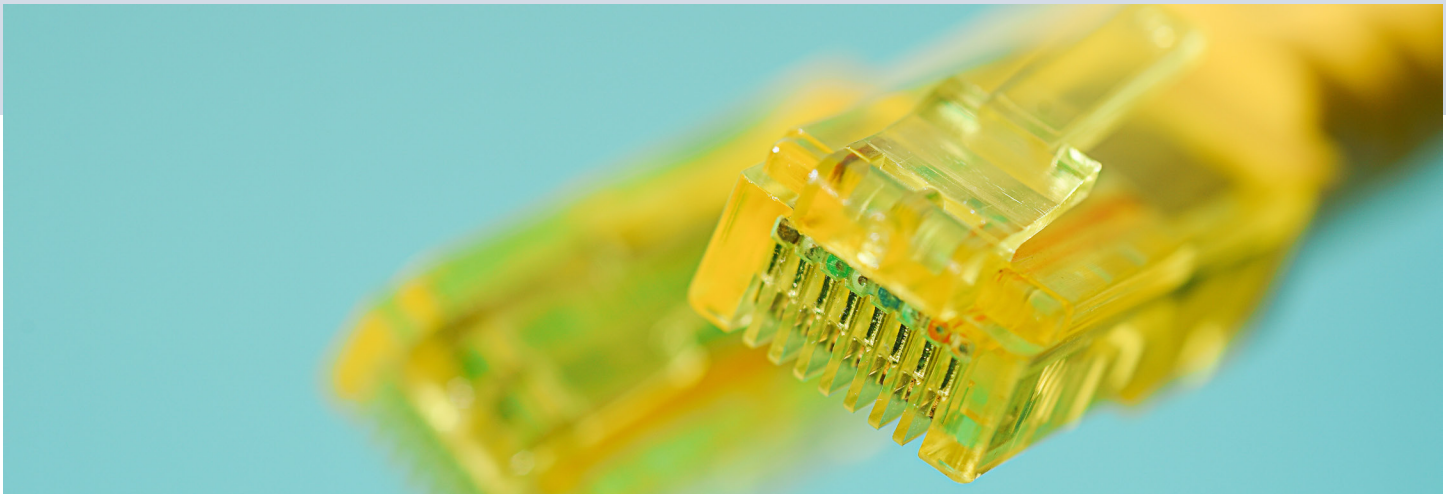
Highlights

- 1.6T gearbox and retimer configurations
- 1.6T hitless 2:1 mux for working/protect architectures
- Dual 800G ETC (Ethernet Technology Consortium), Quad 400 GbE and 16x 1/10/25/40/50/100 GbE MAC/PHYs
- Integrated 1.6T MACsec/IPsec encryption engines

META-DX2+ Block Diagram



META-DX2 Family Variant	Part #	Retimer / Gearbox	Crosspoint	ShiftIO	Hitless 2:1 Mux	MACsec/IPsec	XpandIO	# of SerDes	Max Capacity (Retimer)	Max Capacity (Gearbox)	Package Size (mm)
META-DX2L	PM6200	✓	✓		✓			32	1.6T	800G	23 × 30
META-DX2+	PM6216	✓	✓	✓	✓	✓		32	1.6T	800G	23 × 30
	PM6210	✓	✓	✓	✓	✓	✓	32	1.6T	800G	23 × 30
	PM6214	✓	✓	✓	✓			48	1.6T	1.6T	33 × 33
	PM6218	✓	✓	✓	✓	✓		48	1.6T	1.6T	33 × 33



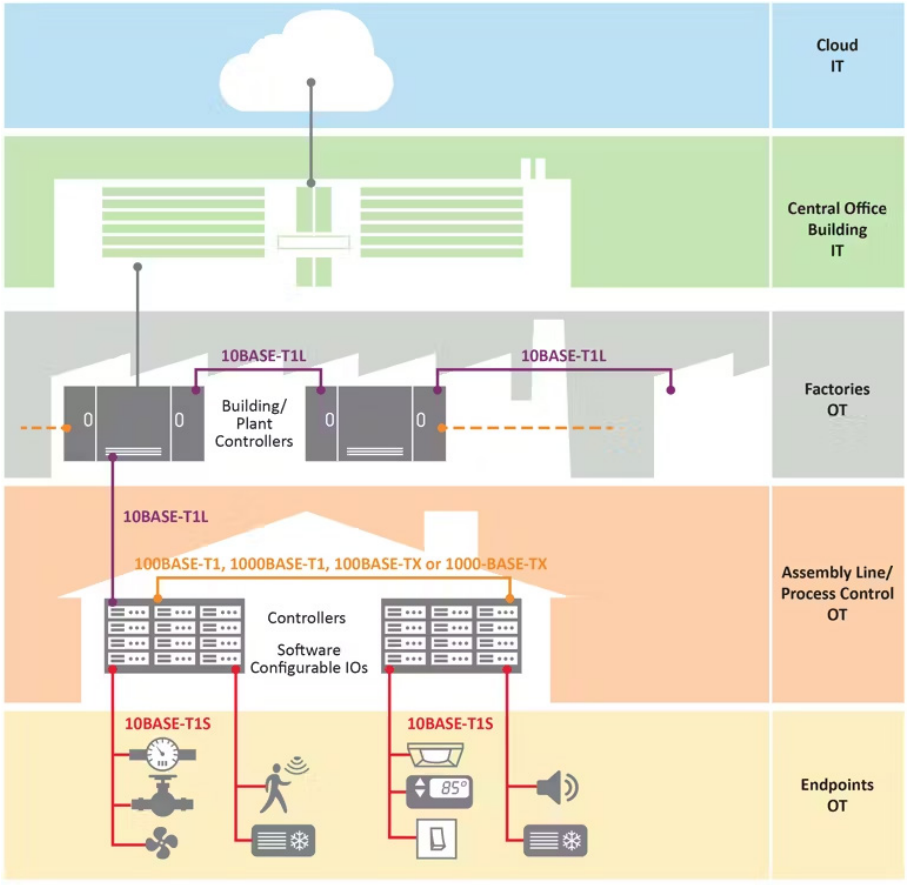
Single Pair Ethernet (SPE)

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.

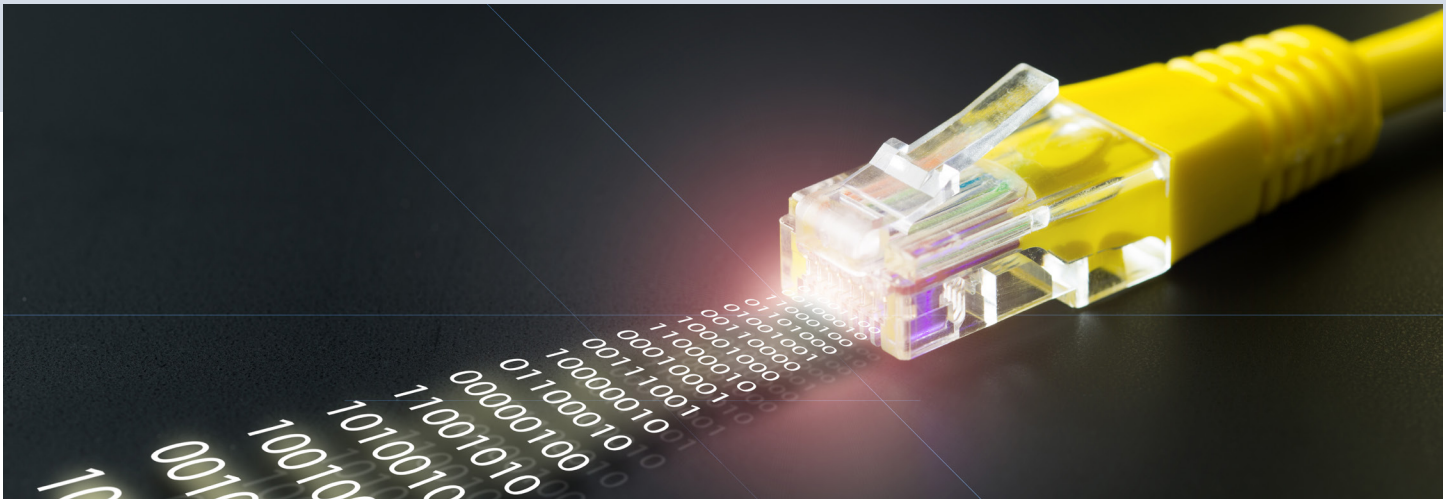
SPE Brings Ethernet to the Edge of Industrial Networks

Microchip's industrial-grade 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 industrial 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.



https://www.microchip.com/en-us/solutions/ethernet-technology/single-pair-ethernet



The megatrend in networking is to move 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.

Advantages of 10BASE-T1S Technology

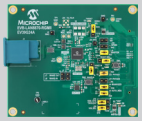
- Support Your Entire System Using Ethernet
- Reduce Costs
- Reduce Risk
- Utilize Full Bandwidth

SPE Applications

- Industrial Control and Automation
- Building Automation
- Data Centers
- Automotive
- Industrial Robotics

Single Pair Ethernet Devices

Product	Ethernet Type	Automotive	Host Interface	Temp. Range Min	Temp. Range Max	Packages
LAN8650/1	10 BASE-T1S MAC-PHY	Yes	SPI	–40	+125	32 VQFN
LAN8670	10 BASE-T1S PHY	Yes	MII/RMII	–40	+125	32 VQFN
LAN8671	10 BASE-T1S PHY	Yes	RMII	–40	+125	24 VQFN
LAN8672	10 BASE-T1S PHY	Yes	MII	–40	+125	36 VQFN
LAN8770	100 BASE-T1 PHY Transceiver	Yes	RGMII/MII/RMII	–40	+125	32 VQFN, 36 VQFN
LAN9381/2/3/4	100 BASE-T1 Ethernet Switch	Yes	2x RGMII/RMII/MII or 1x SGMII port	–40	+105	128 TQFP
LAN9370/1/2/3/4	100BASE-TX/T1	Yes	RGMII/RMII/MII or SGMII	–40	+105	64 VQFN, 128 TQFP
LAN8870/8870B	1000Base-T1 Ethernet Transceiver	Yes	RGMII/SGMII	–40	+105	48 VQFN
LAN8871	1000Base-T1 Ethernet Transceiver	Yes	RGMII	–40	+105	48 VQFN
LAN8872	1000Base-T1 Ethernet Transceiver	Yes	SGMII	–40	+105	48 VQFN

	Development Tool	Part Number	Description
	**EVB-LAN8670-USB**	EV08L38A	The EVB-LAN8670-USB interconnects a USB interface with a 10BASE-T1S Ethernet network interface.
	**EVB-LAN8670-RMII**	EV06P90A	The EVB-LAN8670-RMII enables 10BASE-T1S Ethernet communication with the SAM E54 Curiosity Ultra Development Board or the SAM E70 Xplained Ultra Evaluation Kit.
	**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.
	**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-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.

https://www.microchip.com/en-us/products/high-speed-networking-and-video/ethernet/single-pair-ethernet.

DS00002285G