▶ **ADI** *Chronous*™

Scalable Ethernet, Timed to Perfection

Analog Devices' portfolio of edge-to-cloud Ethernet connectivity solutions is specifically designed to accelerate your path to Industry 4.0. ADI leverages rich factory domain expertise and advanced technologies to connect the industrial devices of the future and enable network convergence. Our solutions ensure your critical data is reliably delivered throughout your application, assuring seamless connectivity and operational efficiency.

SYNC
MOTOR ID
#4348
2.26.20 @ 16:56

SYNC
MOTOR ID
#4E4F
2.26.20 @ 16:56

SYNC
MOTOR ID
#524F
2.26.20 @ 16:56

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MOTOR ID
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2.26.20 @ 16:56

VISIT ANALOG.COM/CHRONOUS

▶ **ANALOG DEVICES**
AHEAD OF WHAT'S POSSIBLE™

Introducing **ADI Chronous** Industrial Ethernet Portfolio

ADI Chronous™ is a complete portfolio of Industrial Ethernet technologies, solutions, software, and security capabilities designed to connect the real world to factory networks and beyond to the cloud. ADI leverages over 50 years of experience partnering with factories and OEMs to solve the biggest, most difficult industrial challenges. Through this well-established center of expertise, we've long been developing and providing next-generation Industrial Ethernet technologies that provide seamless and secure edge-to-cloud connectivity.

ADI Chronous encompasses a range of advanced Industrial Ethernet technologies from real-time Ethernet switches to physical transceivers and network interface modules that include protocol stacks. Designed to support scalable and flexible system development, the ADI Chronous portfolio offers multiple port count, low power consumption, and flexible bandwidth. Being multiprotocol, these solutions are compatible with all existing protocols while also providing the ability to future-proof for TSN features. Get to market fast with predictable, trusted results you can depend on every time by building your design with ADI Chronous solutions.

Accelerating the Path to Industry 4.0

Industry 4.0 promises are creating a relentless demand for easy to use, reliable, and secure data. In response, Industrial Ethernet has proliferated as the technology of choice for industrial OEMs given the increased bandwidth and flexibility it can support. Analog Devices' Industrial Ethernet portfolio is designed to accelerate the transition to Industry 4.0 by enabling seamlessly connected devices with fast, secure, robust industrial communication. ADI is the trusted ally that can provide advanced products and technologies, as well as the industrial expertise to turn them into system-level solutions.

DETERMINISTIC
For precise system control.

ROBUST
Verified robust for the harshest conditions.

SCALABLE
For optimized system design over port count and bandwidth.

▶ **ADI** *Chronous*™
SCALABLE ETHERNET TIMED TO PERFECTION

COMPLETE
System-level solutions for faster time to market.

FLEXIBLE
For simple multiprotocol customization.

Physical Layer Devices

ADI's robust Ethernet physical layer devices (PHY) provide the industry's lowest power consumption and lowest latency technology in small package sizes. Supporting speeds of 10 Mbps, 100 Mbps, and 1 Gbps data rates, this technology is ideally suited to harsh environments and has been extensively tested for EMC and robustness. Specified for extended ambient temperature ranges up to 105°C, it provides the highest level of reliability for industrial applications.

▶ EMI/EMC Conformance Tested

▶ Industry-Leading Latency and Power Consumption

▶ 10BASE-Te/100BASE-TX/1000BASE-T IEEE® 802.3™ Compliant

Embedded Ethernet Switches

ADI embedded Industrial Ethernet switches support flexible port count, selectable bandwidth (10 Mbps, 100 Mbps, and 1 Gbps), and all major Industrial Ethernet protocols including the time sensitive networking features for the IEC/IEEE 60802 industrial profile. They enable connection to any processor type and support fast, convenient development of field devices and automation controllers. Designed to future-proof your system, all ADI multiprotocol Ethernet switches include software drivers that easily integrate with protocol stacks. Specified for extended ambient temperature ranges up to 105°C, ADI embedded Industrial Ethernet switches provide the highest level of reliability needed for industrial applications.
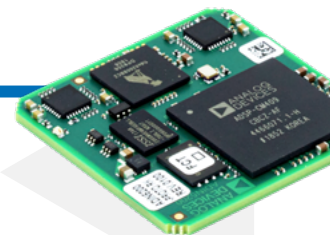
▶ Real-Time Ethernet, Multiprotocol

▶ Supports TSN Features

▶ Software Drivers for Easy Stack Integration

▶ Support Topology Flexibility

Platform Solutions

ADI platform solutions are complete, fully tested, precertified modules and embedded reference designs for industrial network interfaces. They seamlessly process the industrial protocols and network traffic in any application. Network protocol stacks are provided and a single hardware design supports the major industrial protocols including the time-sensitive networking features for the IEC/IEEE 60802 industrial profile. These solutions are the ideal choice for fast time to market requiring minimal design and integration effort.
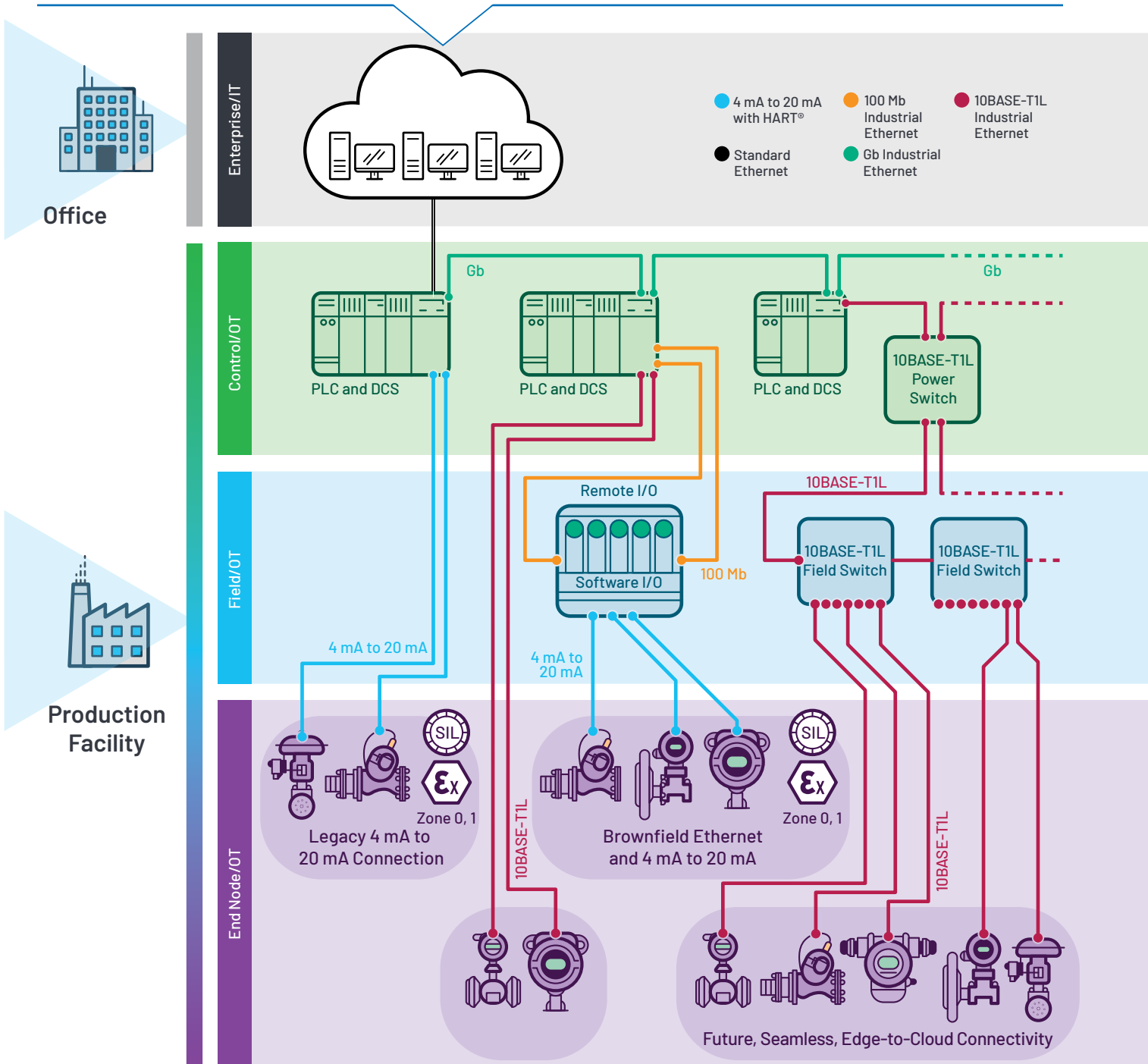
▶ API Library for Fast System Integration

▶ Highly Configurable

▶ Architecture Supporting TSN Features

Process Control and Factory Automation

The increased data throughput in PLC and DCS controllers necessitates the adoption of gigabit PHYs and switch technologies. Deterministic network performance is the requirement and ADI Chronous delivers off-the-shelf, full featured solutions that reduce development effort and time to market when adopting new standards.

To secure the benefits of Industry 4.0, Industrial Ethernet is required as a replacement for the low bandwidth, slow 4 mA to 20 mA loop or bipolar voltage industrial communications standards. The ADI Chronous portfolio is designed to accelerate this transition to seamless Ethernet connectivity at the edge with 10BASE-T1L PHY, which is ideal for field instruments, field switches, or PLC/DCS developments.
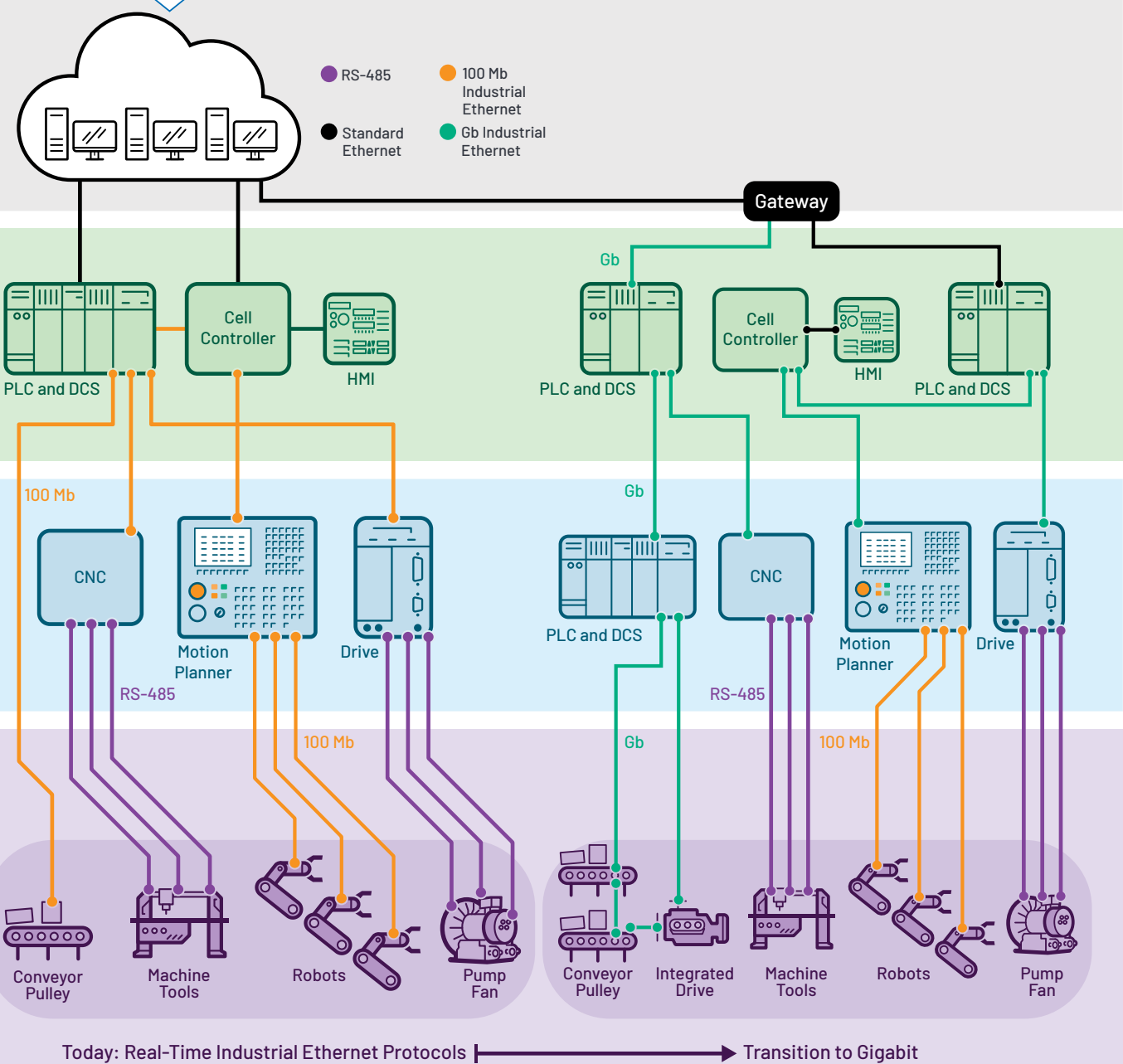
Connected Motion and Robotics Control

Multiaxis synchronization and precision motion control are critical to high quality manufacturing and machining in Industry 4.0. Increasing demands on production throughput and output quality is in turn driving the need for faster response times and higher precision from servo motor drives. This improved system performance requires even tighter synchronization of servo motor axes used within the end equipment.

Today, real-time Ethernet is widely used in motion control systems. However, the synchronization only involves data traffic between the network master and slaves. ADI's Chronous portfolio enables synchronization across the boundary of the network into the application, from sub-1 μs right down to the PWM outputs within the servo motor control. This improves machining and production accuracy in multiaxis applications such as robotics and CNC machines.

Legend:
- ● RS-485
- ● 100 Mb Industrial Ethernet
- ● Standard Ethernet
- ● Gb Industrial Ethernet

Gateway

Gb

PLC and DCS   Cell Controller   HMI   PLC and DCS   Cell Controller   HMI   PLC and DCS

100 Mb   Gb

CNC   Motion Planner   Drive   PLC and DCS   CNC   Motion Planner   Drive

RS-485   RS-485

100 Mb   Gb   100 Mb

Conveyor Pulley   Machine Tools   Robots   Pump Fan   Conveyor Pulley   Integrated Drive   Machine Tools   Robots   Pump Fan

Today: Real-Time Industrial Ethernet Protocols ⟶ Transition to Gigabit

Cyber Security for Trusted Data

Security must be inherent throughout the system—within edge devices, controllers, gateways, and further up the stack. ADI's Chronous portfolio offers security at each node point within the system, while minimizing trade-offs in power, performance, and latency. ADI's understanding of network architectures coupled with our application knowledge of how data is collected, processed, and used throughout an operation all serve to inform the security features present in the ADI Chronous offerings. ADI Chronous aligns and complies with well-established industrial security standards, namely IEC 62443, NIST SP 800-82, ISO/IEC 27001, and protocol specific security approaches.

🔒 Securing the edge of the factory control network to establish a **RESILIENT** and **TRUSTED** architecture
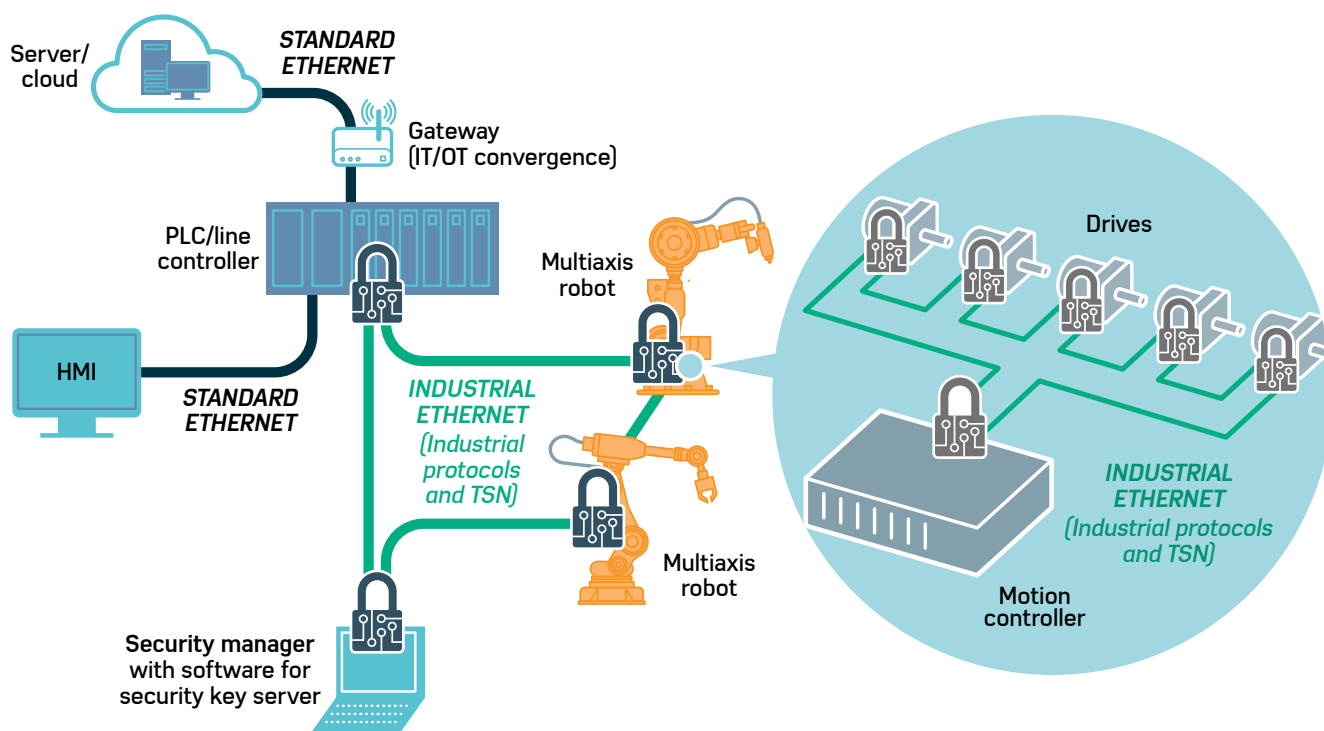
🔒 Allowing for **SECURE CONNECTIVITY** of robots, drives, and production machines within an integrated OT/IT TSN network

🔒 Providing means for authentication and encryption (as required) in a highly **TIME CRITICAL** environment

OPERATIONAL ENVIRONMENT

🔒 **ACCELERATING THE PATH TO INDUSTRY 4.0 BY ASSURING:**

- Machine/worker safety
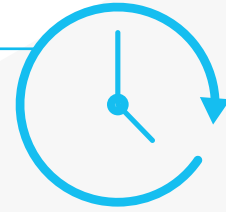- Reliable operation
- Product quality
- Uptime and throughput
- Production efficiency
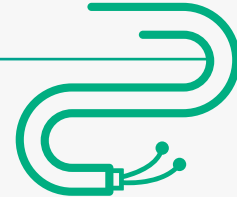- Production metrics and insights

Time Sensitive Networking

Time sensitive networking, or TSN, refers to a group of IEEE 802.1™ standards developed to provide deterministic performance within standard Ethernet. It is being developed at an industry level to eliminate interoperability problems between protocols. It will unify current protocols to allow reliable deterministic communication and scalability across applications, bandwidths, and enterprises all the way to the edge node. Visit *analog.com/chronous* for more technical and application information.
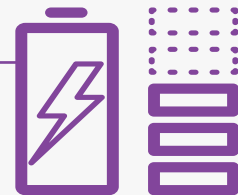
10BASE-T1L

ADI has been actively involved in the development of the IEEE 802.3cg™ standard for 10BASE-T1L, which will enable 10 Mbps communication and power up to 1 km over a single twisted pair cable. This will replace traditional 4 mA to 20 mA or bipolar analog voltage communications that proliferate within field devices today. 10BASE-T1L provides up to 500 mW of power in intrinsically safe applications and up to 60 W (cable dependent) in nonintrinsically safe applications. These standards will provide unified communication and power protocols, with a common networking infrastructure for edge nodes. The complementary Power over Data Lines standard enables delivery of power and data to the full 1 km distance, thus optimizing cable costs.

Power Over Ethernet

ADI's portfolio of power over Ethernet solutions enables power delivery on the same cable as the data signals, making this technology ideal for servicing remote locations. ADI's solutions for both power sourcing and powered devices are compliant and interoperable with the latest standards, delivering up to 90 W of power to a device. Visit *analog.com/PoE* for more details.

ADI Chronous' Software Suite for Fast Development and Seamless Operation

The ADI Chronous portfolio is supported by a host of software elements that simplify the adoption and increase the reliability of each product offering. Supporting multiple protocols, ADI offers a choice of fully tested and verified, production-ready software protocol stacks for the majority of commonly available industrial network standards. This software accompanies our hardware solutions. ADI's new TSN agent is designed to support users with the configuration and management of new TSNs. From host software drivers to APIs and development tools, ADI has the software needed to make the adoption of new standards and technology quick and simple.

EtherNet/IP™

Modbus

ETHERNET POWERLINK

PROFINET®

EtherCAT®

Physical Layer Devices

	Bandwidth	Distance	Power	Package	Temperature Range
ADIN1200	10 Mbps/100 Mbps	180 m	139 mW	32-lead, 5 mm × 5 mm LFCSP	−40°C to 105°C
ADIN1300	10 Mbps/100 Mbps/1 Gbps	150 m	330 mW	40-lead, 6 mm × 6 mm LFCSP	−40°C to 105°C

Embedded Switches

	Port Count	Protocol Support	TSN Features	Package	Power
fido5100	2	PROFINET, Ethernet/IP,® POWERLINK,® Modbus® TCP	802.1AS (Time synchronization); 802.1Qbv (Scheduled traffic); 802.1CB (Redundancy); 802.1Qcc (Configuration)	144-ball, 10 mm × 10 mm CSP_BGA	160 mW
fido5200	2	EtherCAT,® PROFINET, Ethernet/IP, POWERLINK, Modbus TCP	802.1AS (Time synchronization); 802.1Qbv (Scheduled traffic); 802.1CB (Redundancy); 802.1Qcc (Configuration)	144-ball, 10 mm × 10 mm CSP_BGA	160 mW

Platform Solutions

	Port Count	Protocol Support	TSN Features	Package	Power
ADIN2299BBCZ SAMPLING	2	EtherCAT, PROFINET, Ethernet/IP, POWERLINK, Modbus TCP	802.1AS (Time synchronization); 802.1Qbv (Scheduled traffic); 802.1CB (Redundancy); 802.1Qcc (Configuration)	194-ball CSP_BGA	840 mW

Reference Designs

	Port Count	Protocol Support	TSN Features	Products Included
EV-RPG2-ECZ EV-RPG2-PNZ EV-RPG2-ENZ EV-RPG2-PLZ EV-RPG2-MBZ	2	EtherCAT, PROFINET, Ethernet/IP, POWERLINK, Modbus TCP	802.1AS (Time synchronization); 802.1Qbv (Scheduled traffic); 802.1CB (Redundancy); 802.1Qcc (Configuration)	ADIN1200, fido5200, ADSP-CM409

Complementary Power Management Products

	V_{IN} (V)	V_{OUT} (V)	I_{OUT} (A)	Topology	Package
ADP5135	3.0 to 5.5	0.8 to 3.8	3 × 1.8	Buck regulator	24-lead, 4 mm × 4 mm LFCSP
ADP5023	2.3 to 5.5	0.8 to 3.8	2 × 0.8 buck and 0.3 LDO regulator	Dual buck with LDO regulator	24-lead, 4 mm × 4 mm LFCSP
ADP2441	4.5 to 36	0.6 to 0.9	1	Buck regulator	12-lead, 3 mm × 3 mm LFCSP
LTC3549	1.6 to 5.5	0.85 to 1.8	0.25	Buck regulator	6-lead, 2 mm × 3 mm DFN
ADP5304	2.15 to 6.50	0.8 to 5.0	0.05	Buck regulator	24-lead, 4 mm × 4 mm LFCSP

Engage with the ADI technology experts in our online support community. Ask your tough design questions, browse FAQs, or join a conversation.

ADI EngineerZone™

ez.analog.com

The Developer Portal provides support for registered users who are evaluating and developing with ADI Chronous solutions. Registered users have access to downloads, additional product information, software, and schematics.

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