Application Brief

Accelerating Industrial Connectivity: Simplifying Multiprotocol Ethernet Integration with TICS100MOD

Abstract

Design teams face severe implementation challenges as factory automation migrates from traditional serial fieldbuses to Industrial Ethernet (IE). Furthermore, global market fragmentation requires equipment such as motor drives to support multiple protocols, primarily PROFINET®, EtherCAT®, and EtherNet/IP™, across different geographic regions.

The TICS100MOD helps designers solve these challenges, serving as an integrated, multiprotocol communication bridge.

This article discusses the hardware architecture of the TICS100MOD and explores its pre-certified multiprotocol switching capabilities.

The challenge for industrial connectivity

For many industrial applications, the transition from traditional serial-based fieldbuses to IE has become a practical necessity. The demand for high-bandwidth, low-latency communication is increasing as factory floors take on more connected, data-driven roles. According to research from HMS Networks, in 2026, IE is accounting for 79% of newly installed factory automation nodes worldwide with PROFINET, EtherNet/IP, and EtherCAT having the most market share. This shift is technically demanding for designers managing low-to-mid volume projects.

Even after implementation, designers must undergo rigorous validation through industry plugfests to ensure interoperability with other vendors and complete the certification processes required by various IE consortia.

Design teams often face four key challenges during the development process:

- **Hardware complexity:** designers can struggle to integrate complex MAC/PHY layers while managing limited PCB real estate.
- **Software burden:** Managing protocol-specific code and maintaining heavy software stacks adds to development overhead.
- **Certification hurdles:** Typically, the most resource-intensive and unpredictable phase of the development cycle.
- **Protocol rigidity:** Adoption of IE varies across regions. As a result, redesigning hardware and maintaining separate PCB variants for each region introduces substantial development and inventory overhead.

How can design teams avoid these challenges?

A modular approach offers an easier path when compared to a complete system redesign every time a protocol requirement changes. This approach utilizes a dedicated, multiprotocol communication module, helping designers separate their application logic from the complexities of the industrial network.

Designers can use the TICS100MOD as a high-performance bridge, allowing an existing MCU or MPU to communicate across major industrial protocols through a single, unified API.

Figure 1 shows this architecture, including the host processor that is connected to the TICS100MOD via SPI/QSPI, which in turn interfaces with the IE network.

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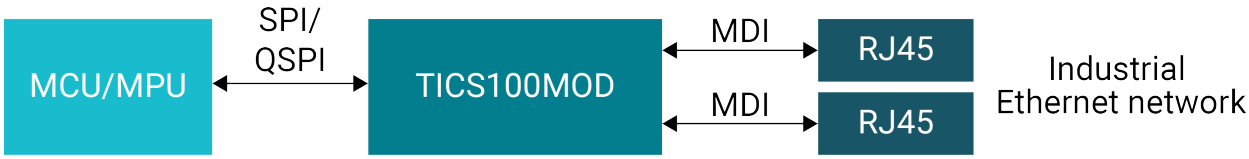


Figure 1. Diagram showing a host processor (MCU/MPU) connected via SPI/QSPI to the TICS100MOD

TICS100MOD overview

The TICS100MOD is a dedicated communication system-on-module built on the AM2612microcontroller (MCU) and DP83826AI Ethernet physical layer. The module handles protocol management, power regulation, and clocking, removing these responsibilities from the host processor, so designers can focus on their core application logic.

Compact, all-in-one architecture

The TICS100MOD (Figure 2) is a highly integrated solution featuring an onboard MCU, two 100Mbit IE PHYs, 8MB flash memory, and integrated clocking and power management. TI designed the module to draw power directly from the 3.3V rail on the host board, eliminating the need for additional power circuitry.

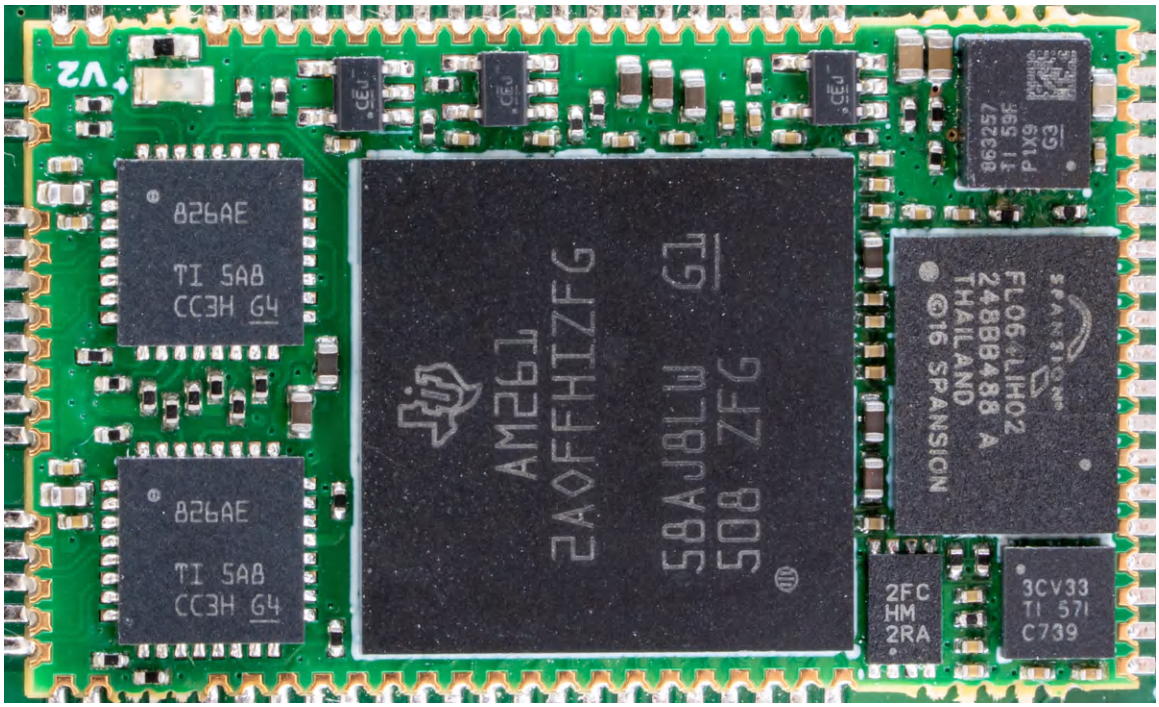


Figure 2. TICS100MOD board

To interface with the host system, the TICS100MOD offers two distinct pathways for process data exchange:

- **Standard SPI:** Ideal for standard control tasks and low-to-medium data rates.
- **High-Speed QSPI:** For bandwidth-intensive applications, the QSPI interface provides four data lines compared to the single data line for SPI. This is critical when an application requires the rapid exchange of large TCP/IP telegrams or high-density process data.

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Long-term protocol flexibility

Protocol requirements vary across customers and regions. The software-defined approach of the TICS100MOD allows designers to switch between EtherCAT, PROFINET, and EtherNet/IP simply by loading a different software stack onto the module. TI provides complete, optimized software for all three major protocols, ensuring a product can adapt to changing factory floor requirements.

Reducing certification burden

TI handles core compliance and interoperability requirements at the module level, so designers can accelerate their design process.

TI provides:

- **Pre-certified module hardware:** The TICS100MOD arrives with pre-certified status, as TI completes baseline physical and protocol compliance testing before distribution.
- **Consortia compliance testing:** TI manages exhaustive compliance testing across major industry consortia, including the EtherCAT Technology Group (ETG), PROFIBUS and PROFINET International (PI), and ODVA (EtherNet/IP).
- **Plugfest validation:** TI actively participates in industry plugfests to verify stack interoperability against diverse third-party controllers and network equipment.
- **Certification overhead reduction:** Engineering teams can declare product compliance with significantly lower test cycles, engineering effort, and certification costs by building on hardware and stacks that have already completed formal validation.

High-level system integration

The TICS100MOD acts as an intelligent intermediary between the application processor and the industrial network.

When a programmable logic controller (PLC) on the network exchanges process data with the host device, it communicates directly with the TICS100MOD.

The module manages the protocol intricacies and makes that data immediately available in memory. The host MCU or MPU then accesses this data through a simple, unified API via the SPI or QSPI interface. This means the host processor reads and writes process data through standard API calls. Figure 3 shows this data flow architecture.

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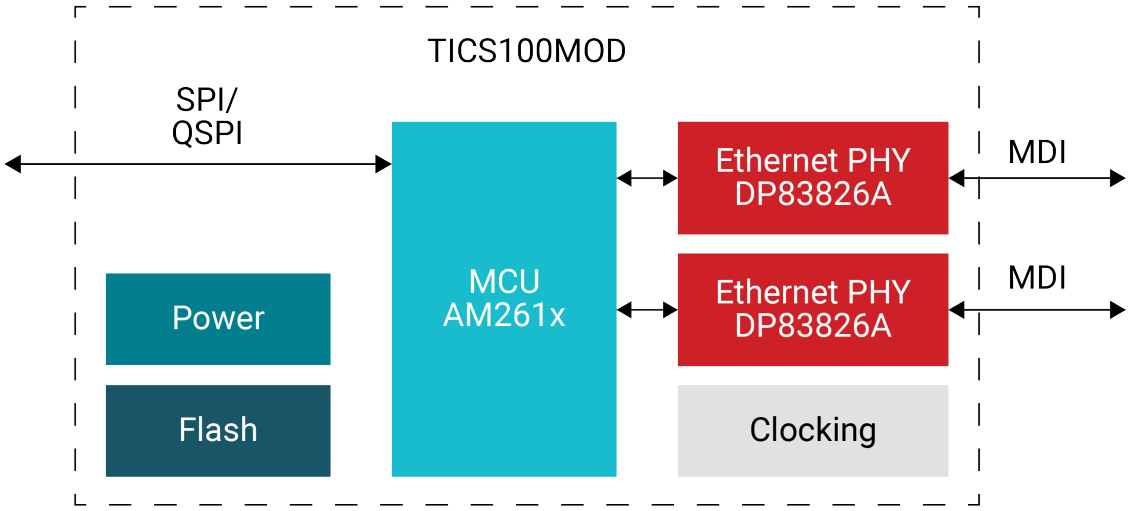


Figure 3. High-Level System Architecture Diagram

Simplified API integration

The TICS100MOD simplifies the complexity of the underlying protocol stack behind a common, unified API. The host MCU or MPU does not need to understand the nuances of PROFINET or EtherCAT; it simply makes standard API calls to read or write process data. The TICS100MOD driver manages SPI or QSPI communication and data integrity. This allows designers to create an application independent of the underlying protocol.

TICS100MOD at electronica 2026

TI will display its multiprotocol industrial communications technology at electronica, Nov. 10-13, in Munich, Germany. The TICS100MOD will be featured at TI's exhibit in Hall C4, booth 159, in two demonstrations:

- **TICS100MOD multiprotocol IE:** Reduce complexity and speed up time-to-market by seamlessly integrating multiprotocol IE into any system with TI's certified, production-ready module.
- **New industrial communication technologies and trends:** Create a seamless, future-ready industrial networking ecosystem by leveraging the latest Ethernet and IO-Link protocols, integrated neural processing units and time-sensitive networking.

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