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# Global Serial Embedded Modules Supply, Demand and Key Producers, 2026-2032

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## Abstracts

The global Serial Embedded Modules market size is expected to reach $ 509 million by 2032, rising at a market growth of 6.8% CAGR during the forecast period (2026-2032).

Serial Embedded Modules are compact communication modules designed for integration inside OEM equipment to convert UART, RS-232, RS-422, or RS-485 serial data into Ethernet, Wi-Fi, BLE, or TCP/IP network connectivity. The market mainly covers serial-to-Ethernet embedded modules, embedded serial device server modules, serial-over-IP modules, serial-to-Wi-Fi embedded modules, programmable serial networking modules, and custom OEM serial connectivity modules. These products enable legacy or embedded serial devices to support remote monitoring, data acquisition, virtual COM ports, protocol conversion, device configuration, and IoT connectivity. Typical modules integrate an MCU or MPU, Ethernet PHY or wireless chipset, serial interface circuitry, TCP/IP protocol stack, web server, device-management firmware, security functions, virtual COM drivers, and SDK support. Major applications include industrial automation equipment, instrumentation, medical and laboratory equipment, energy and metering devices, retail and kiosk systems, building automation, security systems, transportation equipment, and other OEM devices.

## Key Findings

Serial-to-Ethernet embedded modules remain the largest product category

Industrial automation is the largest downstream application

Legacy serial equipment modernization continues to support stable demand

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Security, wireless connectivity, and remote management are key upgrade directions

Lantronix, Moxa, Digi, WIZnet, and Tibbo form the leading supplier group

## Market Trends

The Serial Embedded Modules market is moving from basic UART-to-Ethernet conversion toward secure, configurable, wireless, and IoT-ready embedded connectivity. Traditional serial-to-Ethernet modules remain the core demand base because many industrial and instrumentation devices still rely on RS-232, RS-485, or TTL UART interfaces. However, customers increasingly require TLS support, secure boot, remote firmware updates, cloud connectivity, device-management tools, and easier integration with industrial IoT platforms.

Wireless serial embedded modules are also gaining relevance as OEMs add Wi-Fi, BLE, and multi-mode connectivity to equipment that previously used only wired serial ports. At the same time, long-lifecycle industrial designs continue to favor proven fixed-function modules because they reduce engineering effort, certification burden, and software maintenance. The market is therefore split between low-cost fixed-function serial networking modules and higher-value secure, programmable, and industrial-grade embedded communication modules.

## Market Dynamics

### Drivers

Demand is driven by the need to connect legacy serial devices to modern networks without redesigning the entire host system. Industrial automation, energy metering, medical equipment, laboratory instruments, building systems, and retail terminals often retain serial interfaces for control, diagnostics, or data output, while customers increasingly need Ethernet, Wi-Fi, TCP/IP, virtual COM, Modbus TCP, and remote configuration capabilities.

Another driver is the growth of industrial IoT and remote maintenance. Serial embedded modules allow OEMs to add network connectivity, monitoring, and data access to

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existing products with limited hardware and firmware changes. This lowers development risk and shortens time to market compared with redesigning equipment around a new embedded computing platform.

## Restraints

The market is restrained by competition from low-cost microcontrollers, Ethernet chips, Wi-Fi modules, and custom in-house embedded networking designs. Some OEMs may choose to integrate TCP/IP, wireless, and security functions directly into the main control board, reducing the need for a dedicated serial embedded module. Low-cost Asian module suppliers also create pricing pressure in basic UART-to-Ethernet applications.

Another restraint is the shrinking role of pure serial interfaces in newly designed high-end equipment. Some new systems are built directly around Ethernet, USB, CAN, industrial Ethernet, or wireless connectivity, bypassing serial conversion. This limits growth in applications where legacy serial architecture is being phased out.

## Opportunities

Opportunities are strongest in industrial IoT retrofits, secure remote maintenance, smart metering, energy management, medical equipment connectivity, laboratory automation, building automation, and wireless upgrades for legacy devices. Suppliers that can provide stable firmware, industrial temperature support, long product lifecycles, security features, virtual COM tools, SDKs, and cloud integration are better positioned to capture higher-value demand.

Emerging opportunities also exist in serial-to-single-pair Ethernet, 10BASE-T1L industrial connectivity, compact Wi-Fi serial modules, and programmable embedded gateway modules. These products can help OEMs modernize equipment while preserving existing serial device architectures.

## Challenges

Key challenges include maintaining long-term firmware stability, supporting multiple protocols, ensuring cybersecurity, managing customer-specific configurations, and providing long lifecycle availability for industrial OEMs. Modules used in medical,

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industrial, or infrastructure equipment must remain available and supported for many years, which increases the importance of supply continuity and backward compatibility.

Suppliers must also balance ease of use with security and customization. Basic modules need to be inexpensive and simple to configure, while advanced modules require secure boot, encrypted communication, remote updates, device-management tools, and compliance with industrial reliability expectations.

## Industry Chain Analysis

The upstream chain includes MCUs, MPUs, Ethernet PHYs, Wi-Fi and Bluetooth chipsets, serial transceivers, flash memory, power management ICs, antennas, connectors, PCBs, embedded operating systems, TCP/IP stacks, security libraries, and firmware development tools. Midstream suppliers design and manufacture serial-to-Ethernet modules, serial-to-Wi-Fi modules, embedded device server modules, programmable serial networking modules, and OEM connectivity modules. Downstream customers include industrial automation equipment makers, instrument manufacturers, medical and laboratory equipment companies, utility metering suppliers, retail system vendors, building automation providers, security equipment makers, transportation equipment suppliers, and other OEM device manufacturers.

Value is created through protocol-stack reliability, configuration tools, virtual COM drivers, embedded security, firmware quality, industrial certifications, long lifecycle support, and application engineering. Hardware cost is important in basic modules, but higher-value products are differentiated by software stability, cybersecurity, remote management, wireless performance, and OEM integration support.

### Segment Insights

By connectivity type, serial-to-Ethernet embedded modules remain the largest segment because Ethernet is widely used in industrial and commercial equipment. Serial-to-Wi-Fi modules are growing as OEMs add wireless connectivity to portable, retrofit, or hard-to-wire devices. Programmable serial-over-IP modules occupy a higher-value niche because they allow customers to add custom logic, protocol handling, and device-specific behavior.

By application, industrial automation is the largest market because many controllers,

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drives, sensors, meters, and machines still use serial interfaces. Instrumentation, medical equipment, energy metering, retail terminals, and building automation are also important because these applications require stable connectivity, long product lifecycles, and manageable integration cost.

### Downstream Market Opportunities

The most attractive downstream opportunities are in applications where existing serial equipment needs network connectivity without full hardware redesign. Industrial controllers, test instruments, laboratory analyzers, medical devices, smart meters, energy equipment, access-control systems, POS terminals, kiosks, transportation devices, and building controllers are key demand areas.

Additional opportunities come from remote service business models. OEMs can use serial embedded modules to enable diagnostics, usage monitoring, firmware updates, cloud data collection, and preventive maintenance. This shifts module value from simple connectivity toward equipment lifecycle management and industrial IoT enablement.

## Regional Insights

North America is strong in branded OEM connectivity modules and programmable embedded networking products, supported by suppliers such as Lantronix, Digi, and NetBurner. Taiwan has a strong position in industrial serial connectivity and OEM module supply, represented by Moxa and Tibbo. South Korea participates through suppliers such as WIZnet and Sollae, which are active in serial-to-Ethernet modules and embedded networking products.

Mainland China is expanding in cost-effective serial-to-Ethernet and Ethernet-to-UART modules through suppliers such as USR IOT. Japan participates through embedded wireless and industrial connectivity suppliers such as Silex. Europe has a smaller but stable position in industrial embedded LAN and serial device server modules through companies such as AK-Nord. Regional competition is shaped by differences in price level, firmware maturity, industrial reliability, security features, and long-term support.

## Competitive Landscape Analysis

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The market is led by established embedded connectivity suppliers including Lantronix, Moxa, Digi, WIZnet, Tibbo, Silex, USR IOT, NetBurner, Sollae, and AK-Nord. Lantronix is strong in OEM serial-to-Ethernet modules and secure embedded IoT connectivity. Moxa has advantages in industrial serial connectivity and field-proven reliability. Digi is positioned around embedded networking systems and long-lifecycle industrial connectivity. WIZnet competes through hardware TCP/IP and cost-effective serial-to-Ethernet modules, while Tibbo is differentiated by programmable serial-over-IP modules.

Competition is moving from basic hardware conversion toward software tools, security, remote management, wireless connectivity, and industrial lifecycle support. Low-cost modules compete mainly on price and availability, while premium suppliers compete through firmware stability, certifications, OEM integration support, security functions, protocol flexibility, and long-term supply commitments.

## Report Scope

This report studies the global Serial Embedded Modules production, demand, key manufacturers, and key regions.

This report is a detailed and comprehensive analysis of the world market for Serial Embedded Modules and provides market size (US$ million) and Year-over-Year (YoY) Growth, considering 2025 as the base year. This report explores demand trends and competition, as well as details the characteristics of Serial Embedded Modules that contribute to its increasing demand across many markets.

## Highlights and key features of the study

Global Serial Embedded Modules total production and demand, 2021-2032, (K Units)

Global Serial Embedded Modules total production value, 2021-2032, (USD Million)

Global Serial Embedded Modules production by region & country, production, value, CAGR, 2021-2032, (USD Million) & (K Units), (based on production site)

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Global Serial Embedded Modules consumption by region & country, CAGR, 2021-2032 & (K Units)

U.S. VS China: Serial Embedded Modules domestic production, consumption, key domestic manufacturers and share

Global Serial Embedded Modules production by manufacturer, production, price, value and market share 2021-2026, (USD Million) & (K Units)

Global Serial Embedded Modules production by Serial Interface, production, value, CAGR, 2021-2032, (USD Million) & (K Units)

Global Serial Embedded Modules production by Application, production, value, CAGR, 2021-2032, (USD Million) & (K Units)

This report profiles key players in the global Serial Embedded Modules market based on the following parameters - company overview, production, value, price, gross margin, product portfolio, geographical presence, and key developments. Key companies covered as a part of this study include Lantronix, Inc., Moxa Inc., Digi International Inc., WIZnet Co., Ltd., Tibbo Technology Inc., Silex Technology, Inc., PUSR, NetBurner, Inc., Sollae Systems Co., Ltd., AK-Nord GmbH, etc.

This report also provides key insights about market drivers, restraints, opportunities, new product launches or approvals.

Stakeholders would have ease in decision-making through various strategy matrices used in analyzing the World Serial Embedded Modules market

## Detailed Segmentation:

Each section contains quantitative market data including market by value (US$ Millions), volume (production, consumption) & (K Units) and average price (US$/Unit) by manufacturer, by Serial Interface, and by Application. Data is given for the years 2021-2032 by year with 2025 as the base year, 2026 as the estimate year, and 2027-2032 as the forecast year.

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### Global Serial Embedded Modules Market, By Region:

United States

China

Europe

Japan

South Korea

ASEAN

India

Rest of World

## Market Segmentation

### Global Serial Embedded Modules Market, Segmentation by Serial Interface:

TTL UART Modules

RS-232 Modules

RS-485 Modules

RS-422 / RS-485 Combo Modules

### Global Serial Embedded Modules Market, Segmentation by Integration Level:

Fixed-Function Serial-to-Network Modules

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Configurable Embedded Device Server Modules

Programmable Application Modules

Secure IoT Gateway Modules

Wireless Gateway Modules

## Global Serial Embedded Modules Market, Segmentation by Connectivity Type:

Serial-to-Ethernet Embedded Modules

Serial-to-Wi-Fi Embedded Modules

Serial-over-IP Programmable Modules

Serial-to-Wireless Multi-Mode Modules

Serial-to-SPE / 10BASE-T1L Modules

## Global Serial Embedded Modules Market, Segmentation by Application:

Industrial Automation Equipment

Instrumentation and Test Equipment

Energy, Metering and Utilities

Medical and Laboratory Equipment

Retail, POS and Kiosk Systems

## Companies Profiled:

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Lantronix, Inc.

Moxa Inc.

Digi International Inc.

WIZnet Co., Ltd.

Tibbo Technology Inc.

Silex Technology, Inc.

PUSR

NetBurner, Inc.

Sollae Systems Co., Ltd.

AK-Nord GmbH

## Key Questions Answered

1. How big is the global Serial Embedded Modules market?
2. What is the demand of the global Serial Embedded Modules market?
3. What is the year over year growth of the global Serial Embedded Modules market?
4. What is the total value of the global Serial Embedded Modules market?
5. Who are the Major Players in the global Serial Embedded Modules market?
6. What are the growth factors driving the market demand?

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