ElectronicDesign

The "Mortar Between the Bricks" — Interconnects in Open Standards



Presenter:
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KEY TAKEAWAYS

- Open standards enable shared, interoperable infrastructure for faster innovation.
- Samtec works collaboratively with four major industry standards bodies.
- Continued effectiveness of open standards depends on industry-wide collaboration.

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OVERVIEW

Open standards help ensure that components from different manufacturers can work together, reducing vendor lock-in, accelerating product development, and expanding the range of solutions available to system designers. This helps organizations of all sizes bring products to market more quickly, reduce development risk, maintain supply chain flexibility, and focus engineering resources on their distinctive capabilities rather than rebuilding common infrastructure.

As open standards typically define electromechanical system architectures, connector definition and selection remain a crucial and important part of the standards development process—they are the "mortar between the bricks."

Samtec is a global manufacturer of electronic interconnect solutions, such as high-speed board-to-board and cable connectors, active optical systems, compact micro-pitch connectors designed for harsh environments, and precision RF components. Samtec also participates in standards development and supports designers through technical experts, application engineers, and online design tools. The company is consistently ranked among top connector manufacturers by industry analysts.

CONTEXT

Matthew Burns explained the importance of open standards and highlighted four major standards bodies that Samtec has aligned with, contributing toward specification development and developing commercial solutions.

KEY TAKEAWAYS

Open standards enable shared, interoperable infrastructure for faster innovation.

Just as mortar holds bricks together in home and building construction, interconnects provide the crucial physical connections ("mortar") between silicon components ("bricks") that allow them to function together as a complete system. Without reliable interconnects, even the most advanced silicon components cannot deliver their intended capabilities.

Establishing open standards for these interconnects is also critical, as this enables companies to rapidly build interoperable, scalable, and cost-effective embedded computing systems.

An open standard is a publicly available specification or protocol developed through collaborative consensus that anyone can freely access, adopt, or implement. To develop an open standard, like-minded companies that have identified a shared market need will collaborate on a technical solution and work through an established standards organization to formalize the specification.

Four key characteristics define effective open standards:

- **Accessibility.** The standard specifications are available to the public for free or a nominal fee.
- **Interoperability.** The standard enables hardware, software, and systems from multiple vendors to work together.
- **Collaboration.** No single company leads the process. Companies work together, contributing technical expertise and developing specifications through transparent consensus.
- **Vendor neutrality.** Ensuring availability from multiple suppliers supports supply chain redundancy.

Open standards are especially valuable for small and medium-sized companies that lack the engineering resources, budget, and international reach of larger competitors. Rather than developing components in-house, these companies can leverage established platforms to help overcome significant deficits and invest more resources in delivering product differentiation and speeding time-to-market.

Standard specifications also improve both sides of the make-versus-buy equation—companies can either purchase existing modules to accelerate development or build a custom interoperable solution to meet an application-specific requirement.

In addition to a faster time-to-market, open standards enable supply chain flexibility and scalability. Multiple suppliers using the same form factor simplifies system-level design and helps mitigate market unpredictability and other disruptions. Future growth can also be more easily accommodated, as subsequent generations of the standard will continue to adhere to the same form factor.

> "If you are trying to scale something in a very short time frame, having the ability to get hardware and software from multiple sources can help you grow very quickly."
>
> – *Matthew Burns, Samtec*

Samtec works collaboratively with four major industry standards bodies.

Four industry standards bodies define the mechanical, electrical, and performance requirements for connectors and embedded computing modules. Each group's specifications address different needs. As a contributor to these organizations, Samtec also ensures its own products follow the same standards.

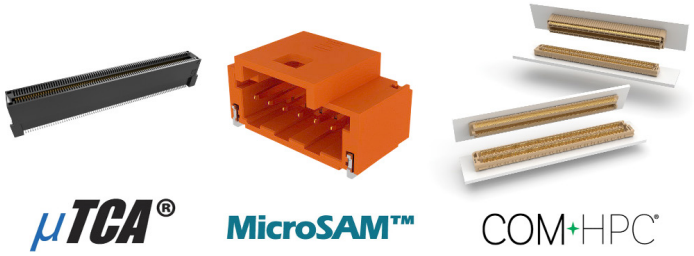
PICMG

Established in 1994, PICMG develops open standards for high-performance telecommunications, military, industrial, and general-purpose embedded computing applications. PICMG's core ecosystems include computer-on-modules and bladed systems. The organization has about 140 member companies and over 50 published standards.

Samtec provides products for three of PICMG's standards:

- **COM Express.** The "workhorse" of embedded computing solutions. Tens of millions of COM Express modules are currently installed in applications worldwide. However, its architecture caps at PCIe 4.0, which limits its ability to accommodate newer, higher-bandwidth applications.
- **COM-HPC** is the next-generation open standard for embedded computing modules that provides server-class bandwidth, power, and performance missing from COM Express. It is offered in various sizes and configurations suitable for high-end IoT and edge server applications.
- **•µTCA.** A legacy architecture gaining renewed relevance in applications such as quantum computing due to its scalability, modularity, and compactness.

Figure 1: Samtec PICMG standards products



SGET

Founded approximately 15 years ago, SGET also focuses on embedded computing architectures, but in applications that complement rather than compete with PICMG, such as ARM processors, RISC-V platforms, and FPGA-based systems. SGET standards include SMARC, Qseven, embedded NUC, UIC, OSM, oHFM, and sCRUVI. SGET has approximately 85 members globally.

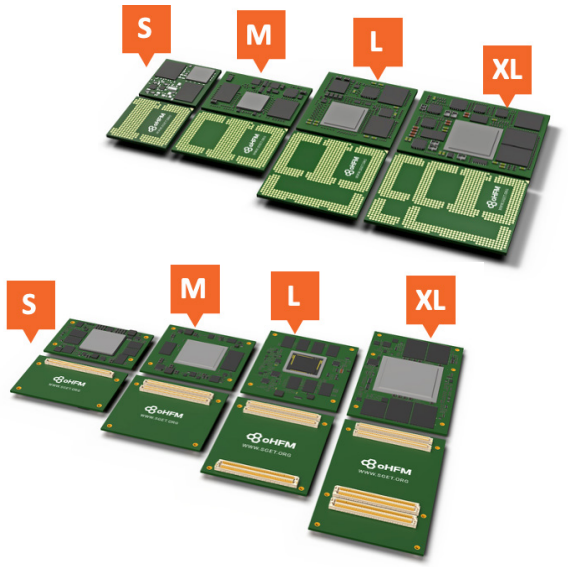
In January 2026, SGET launched the Open Hardware for FPGA Modules (oHFM) specification. Prior to this, FPGA system-on-modules typically relied on solutions from some FPGA suppliers and board developers, effectively restricting developers to a specific vendor.

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Samtec provides products for the two substandards that comprise oHFM—a divergence purposely designed to accommodate the broad diversity of FPGA solutions available in the market:

- **oHFM.s.** Uses the solder-on-module technology championed by the OSM specification. Targets small-to-medium FPGAs. Eliminating the connector reduces cost, simplifies the BOM, and improves reliability, making it ideal for compact, harsh, and high-vibration environments.
- **oHFM.c.** A connector-based design for medium- to high-end FPGAs requiring more I/O and higher-speed interfaces. Ideal for prototyping, device evaluation, and field upgrades. Reusable across platforms, enabling faster iteration and easier scaling.

Figure 2: Samtec oHFM.s (top) and oHFM.c (bottom) products



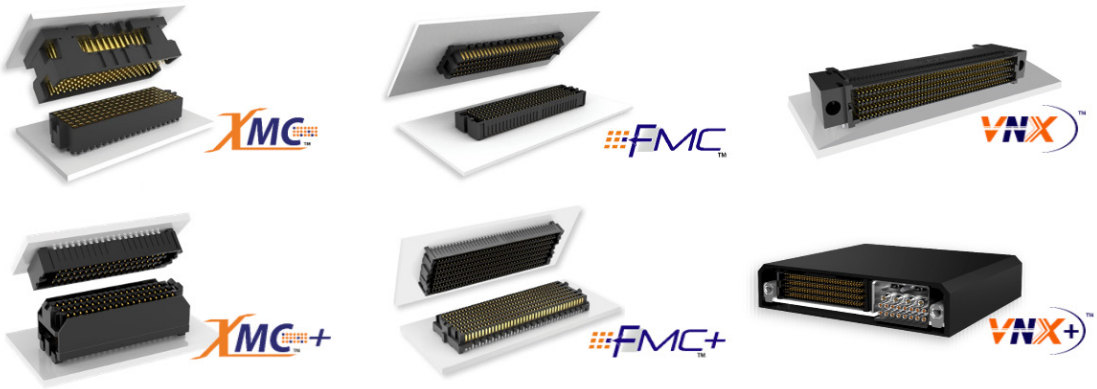
VITA

VITA was established in 1982 with an original focus on the VMEbus. It subsequently developed standards for rugged embedded computing used in defense, aerospace, industrial control, and medical imaging. VITA is ANSI-accredited, adding formal oversight to its standards, including a requirement for specifications to undergo formal updates every five years. VITA has more than 100 specifications, either published or under development.

VITA standards most relevant to Samtec products include:

- **VPX/OpenVPX** for established architectures supporting rugged, high-performance embedded computing. The standards are widely deployed in military and other demanding environments.
- **FMC and FMC+** defines a compact electro-mechanical expansion interface for a daughter card to a FPGA baseboard, allowing developers to select an FPGA platform and then add functionality using a broad ecosystem of compatible cards.
- **VNX+** brings the scalability and interoperability of VPX into a smaller form factor for applications where size, weight, and performance are critical.
- **QMC** defines a compact, high-speed mezzanine solution designed to be modular and interoperable across multiple form factors, including VNX+, VPX, cPCI, and PCI.

Figure 3: Samtec VITA standards products

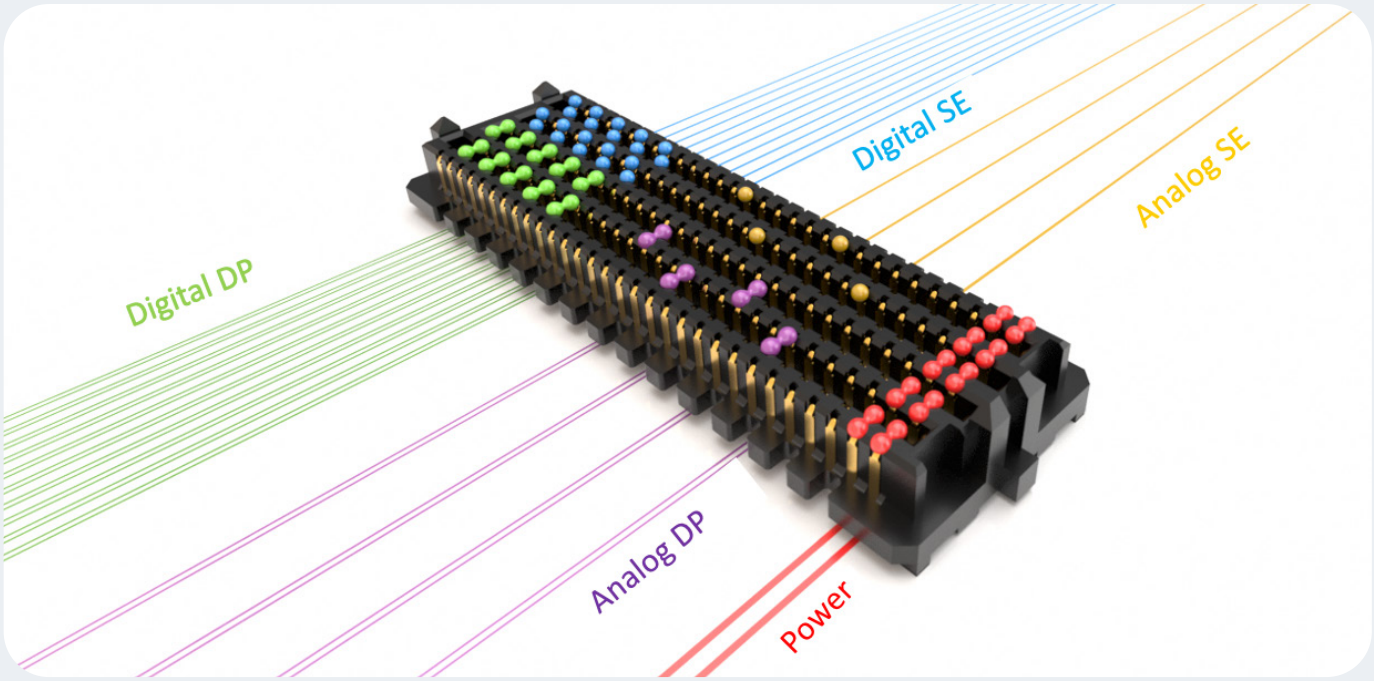


Open-Pin-Field Arrays

Samtec's open-pin-field array technology forms the foundation for accommodating most mezzanine interconnect open standards. Any pin in the array can support power, ground, analog and RF signals, and digital signals (assuming appropriate design and optimization). This flexibility supports connectors for different applications across different vendors while maintaining the requirements of the relevant standard.

> "[Samtec] backs our interconnect solutions . . . with a team of technical experts, application engineers, online design tools, and world-class customer service to support your design."
>
> – *Matthew Burns, Samtec*

Figure 4: Samtec open-pin-field array

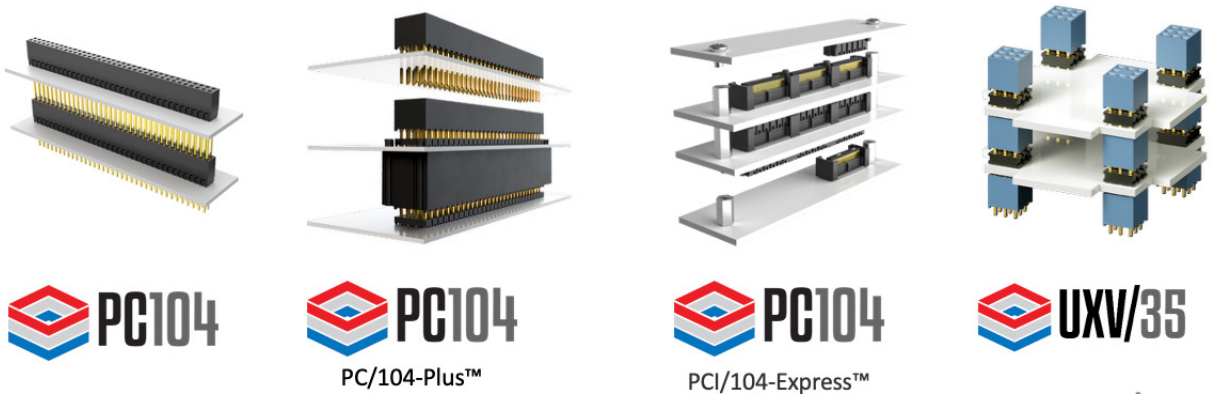


RMS

Formerly PC/104, RMS (Rugged, Modular, and Stackable) standards support stackable electronics architectures. Samtec provides products for PC104, PC104+, and PC104 Express standards from RMS and or the RMS UXv/35 standard, which targets unmanned vehicles such as drones.

Many existing drone designs are application specific, making interoperability and reuse difficult. UXv/35 uses a stackable circuit board approach, with standardized interconnects providing the necessary electrical connections. Its compact, rugged architecture is intended to accommodate different unmanned vehicle requirements.

Figure 5: Samtec RMS Consortium standards products



Continued effectiveness of open standards depends on industry-wide collaboration.

Across all four standards organizations, connectors are essential components of system architecture. They must support required data rates, signal integrity, power delivery, density, and mechanical reliability.

To ensure continued connector interoperability and compatibility, connector manufacturers must collaborate closely with silicon vendors, board designers, and other standards ecosystem participants to evolve connector specifications to meet the changing needs of the market.

ADDITIONAL INFORMATION

To learn more, visit Samtec at TTI.com

BIOGRAPHY



Matthew Burns
Global Director, Technical Marketing
Samtec

Matthew Burns develops go-to-market strategies for Samtec's Silicon-to-Silicon solutions. Over the course of 25+ years, he has been a leader in design, applications engineering, industry standards, technical sales and marketing in the telecommunications, medical and electronic components industries. He currently serves as Secretary at PICMG. Mr. Burns holds a B.S. in Electrical Engineering from Penn State University.

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