STANDARDS-BASED DESIGN & ELECTRONIC PACKAGING SOLUTIONS

By: Marc Caiola
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To ensure consistent, high-speed data transfer and system reliability, sensitive electronic components require effective packaging solutions. These solutions are not only employed to protect against environmental factors, such as dust, moisture, shock and vibration, and potential structural damages, but also to protect electronics against thermal challenges that can lead to overheating and system failure.

All market segments are facing cost pressures along with the need to keep up with rapid technology changes and high-bandwidth capacity issues. In an effort to reduce costs, a focus on Total Cost of Ownership (TCO)—which includes lifecycle maintenance and upgrade costs—points to an ideal scenario for specifying and using standards-based solutions across multiple systems and applications. Utilizing a standards-based electronic packaging solution reduces upfront development costs and technical risk, while providing the latest proven technologies in a cost-effective platform solution. Furthermore, working with the standards community allows access to a vendor ecosystem that has future-proofed product roadmaps to help mitigate risks in today's constantly changing market.

From components ranging from card guides, retainers and conduction-cooled assemblies (CCAs) to subracks and cabinets, design engineers can assemble a packaging solution to enclose, shield and cool electronics in a variety of applications.

Realizing the Benefits of Standards-Based Design

An organization can achieve significant benefits by developing open standards-based solutions. Open standards organizations have established comprehensive equipment design specifications, which are also supported with a large supplier ecosystem. Two notable standards-based design committees include the PCI Industrial Computer Manufacturers Computer Group (PICMG) and VME International Trade Association (VITA).

In today's rapidly changing technology trends, coupled with a highly cost-conscious business climate, standards-based design can significantly reduce product development costs while accelerating time-to-market. Standards-based design also delivers the promise of interoperability and future-proof, while providing access to an extensive range of pre-certified, configurable, Commercial-Off-The-Shelf (COTS) electro-mechanical hardware and components. Thus, design engineers and their respective organizations can leverage the power of open standards to complement in-house core competencies—no longer needing to completely design, build or integrate proprietary electronic solutions.

Designing the System

A complete standards-based packaging solution typically consists of a system chassis or electronic subrack, backplane, Printed Circuit Boards (PCB), power supply, thermal management—such as a fan tray or assembly—and electro-mechanical hardware – such as card guides, retainers, front panels and PCB accessories. Some examples of standards-based bus architectures include AdvancedTCA, CompactPCI, CompactPCI Plus IO, VME, VME64 and VPX.

In addition to mechanical, thermal management and power requirements, design engineers should first consider the required mounting configuration when specifying a system or subrack electronic packaging solution. Vertical and horizontal dimensions are specified in Rack Units (RU) and Horizontal Pitch (HP), respectively. One rack unit equals 1.75 inches (44.45 mm) high. For example, a subrack might be available in sizes ranging from 3U to 12U. The Eurocard PCB standard uses HP to measure the horizontal width of rack mounted electronic equipment. One HP unit equals 0.2 inches (5.08 mm) wide. For instance, a standard 19" system chassis covers 95HP and typically allows for 84HP of usable horizontal space.

Card-Lok Retainers
A secure clamping force is essential in avoiding damage to board module assemblies or printed circuit boards (PCBs). Card-lok retainers are designed to secure PCBs when shock or vibration is present. These conditions typically cause the PCB channel to flex, which can result in system failure or accidental ejection of the board. The card-lok retainer provides force to ensure secure clamping at the connector side, the backplane side and the top and bottom edges of the PCB. Card-lok retainers are available in various lengths, individual wedge dimensions, mounting configurations and finishes to satisfy diverse application requirements.

Conduction-Cooled Assemblies
CCAs are generally used when passive free air convection or active forced air cooling is not possible, such as in space applications, or where creating airflow with moving parts might affect the reliability of the system. Featuring a robust, lightweight aluminum design, CCAs deliver high thermal conductivity, while ensuring sufficient structural support. CCAs also assist in avoiding exposure of critical electronics to dust or contaminants. CCAs are available in numerous configuration sizes and finishes to fit various platform and application requirements, including, but not limited to, VME, CompactPCI, VPX and AdvancedMC.

Subracks
A standard subrack consists of two side panels and at least four horizontal rails. For a benign environment, a simple subrack featuring a sheet of metal and snap-in plastic guides should be used. For areas requiring a more ruggedized solution, subracks are available in models that can achieve shock resistances from 1g up to 25g to satisfy diverse applications, ranging from standard industrial to robust transportation, light military use and rugged-level products. Some models feature a multi-function system

with integral electromagnetic interference (EMI) shielding that does not use separate gaskets, but is built into the chassis extrusions and construction. This ensures the protection of sensitive data from interference radiation. Many subracks are designed to meet PICMG, VITA, IEEE and IEC standards—making them ideal for use in a broad range of applications.

Front Panels
Front panels are attached to the PCB and typically include IO connection and LED cutouts, labels, locking screws, inserter and extractor hardware for inserting and extracting the PCB to backplane assembly. Front panels may also be configured with an EMI gasket to provide Electro-Magnetic Compatibility (EMC) protection. In addition to customized configurations, a wide range of modifiable PICMG, VITA, IEEE and IEC compliant front panels are readily available throughout the supplier ecosystem.

Cabinets
All of these components—card-lok retainers, conduction-cooled assemblies and subracks—are placed in a chassis, which consists of an internal framework that supports the components. This configuration makes up a system. Examples of common systems include AdvancedTCA, CompactPCI, AdvancedMC, MicroTCA, VME, VXS and VPX.

Cabinets are available in all shapes and sizes and offer a variety of housing options and features. Designed to deliver high-performance protection for sensitive electronics, cabinets are available in Electro-Magnetic Compatibility (EMC), shock, vibration and seismic configurations, Ingress Protection (IP) and NEMA-rated solutions for sealing against water or airborne contaminants.

Conclusion

In today's highly competitive business climate, it is important for organizations to be empowered and focused on developing flexible, leading-edge solutions. Standards-based design addresses this requirement while delivering a competitive advantage, reliable path to reduced development costs and accelerated time-to-market. With a comprehensive range of standards-based electronic packaging solutions, design engineers are equipped with the capability to rapidly develop and deploy innovative electronic solutions to the market.

About the Author

Marc Caiola is the North America Channel & Vertical Marketing Manager with Schroff, a brand of Pentair Equipment Protection. Marc holds a Bachelor of Science in Business/Marketing and he has over 20 years marketing and management experience within Security/Defense, Electronics, Telecom and Datacom industries.

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