



# System design trends drive advances in Power Connector Technology

Increased performance demands for telecom, data, industrial, instrumentation and medical equipment is driving a trend in connector design today toward channeling more power and signals in less space. Maximizing linear current density means higher power in smaller connector footprints with advanced functionality. These features are the result of fast-paced changes and growing expectations within overall system design in the above market segments.

## Smaller, More Portable End Products

Equipment form factors are being reduced on a regular basis, and to make the end products smaller, component manufacturers are being asked to design more compact, lower-profile packages. However, as the number of processors, memory and other integrated circuits in a system continues to increase, more heat is generated making thermal management an important consideration in system design. For power connector manufacturers, these factors create a unique set of challenges with respect to balancing increased power requirements while offering reduced package sizes. Components with reduced height and width allow better airflow in addition to freeing up space for the placement of additional components. One example of an industry trend toward reduced size is the denser blade form factor replacing rack-mount servers in data centers. Greater power and signal density is needed to run these more compact systems.

Current density, profile heights and widths and airflow are key considerations for power connector manufacturers because, while processors are becoming more energy-efficient and consume less power, the increased number of processors in a single system leads to a net increase in power usage. Also, increased rack density and higher wattage power supplies require higher power density connector solutions.

## High Current Applications

Connector manufacturers have responded by developing power connectors with increased power density built on the foundation of now standard, but very cost effective, stamped-and-formed power contacts. Stamping and forming makes higher power densities possible and is a cost-effective alternative to expensive screw-machine contacts for high-current applications. Incorporation of high conductivity copper alloys, optimized power contact designs and ventilated housings have elevated performance to meet and exceed the demands of higher power applications.



*High Speed and Power Family*

For example, one connector supplier designed a new power connector system that included a number of features from an existing SSI-compliant connector that is standard for AC/DC power supply interfaces and power distribution. However, a new and enhanced power contact design enabled a single power contact to achieve 82 amps per contact based on a 30°C temperature-rise and zero airflow while slightly decreasing the power contact centerline pitch. The resulting connector was ideal for high-wattage power supplies, servers, storage enclosures, communications equipment and hot-swap redundant N+1 power distribution systems. In addition, power contacts for power distribution and signal contacts for power control in a single connector give incredible flexibility to system designers. A modular tooling approach facilitates highly customizable configurations to meet a variety of power application needs.

Another trend toward higher power density is in host-to-card applications (in a midplane-to-blade or controller card interface, for example). Combining power delivery capabilities and signal connector products is particularly beneficial in high-speed applications. One available product, for example, is a signal/power connector employing shieldless technology (to increase signal density) in versions for both backplane and orthogonal midplane applications. This combined high-speed/power connector in a single housing allows signal and power IMLAs (Insert-Molded-Leadframe-Assemblies) to be mixed within the same connector offering flexible pin configurations with the greatest signal and power density in all three dimensions. This solution addresses systems designers' thermal, mechanical and high-speed requirements in a single, configurable product without the need for new tooling and long leadtimes.



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## Plug-and-Play Capabilities

In some host-to-card applications, elevated power requirements are such that separate, stand-alone power connectors are needed adjacent to high-speed signal connectors. For these applications, modularity is needed for plug-and-play of high-speed, signal, power and other types of connectors. Connector manufacturers have responded by creating “stackable” parts—power connectors designed to stack beside other host-to-card connectors providing for end-to-end stackable solutions. These products allow flexibility for stacking high speed and power modules adjacent to one another along the card edge.



*Hard Metric High Power Airmax vs®*

## Power Connector Expertise

To minimize design time and speed the connector selection process, system design engineers prefer working with connector suppliers that offer innovative technical solutions, outstanding support and highly configurable solutions that meet a wide range of application requirements including board-to-board, cable-to-board and cable-to-cable solutions. This is particularly true in the power connector market where manufacturers with a wide breadth of product can offer one-stop shopping. The leading power connector suppliers offer a broad range of power supply and host-to-card solutions as well as bus bars and cable assemblies for power distribution. Product breadth demonstrates a commitment to satisfying customer’s power needs as well as the supplier’s understanding of evolving market requirements. Connector suppliers must continue to provide innovative and cost-effective solutions that enable increased power density and improved thermal properties.

## Customer Service & Satisfaction

As end users’ design cycle times and resource availability continue to shrink, system designers require suppliers whose power solutions are competitively priced, are available with short lead times and offer superior customer support and service. Procurement teams require products that are multi-sourced so as to ensure continuity of supply and competitive price negotiations. Also, safety agency approvals (such as UL, CSA, TUV, etc) demonstrate a commitment to safety and are often needed for overall system safety compliance.

In addition to the items noted above, ensuring customer satisfaction also requires connector suppliers to assist with specifying existing (or designing new) products, quoting, sampling and procurement activities to enhance the customer’s overall experience. In addition to on-site support, this process can be streamlined with a web-based guide to finding the product that best fits a specific application. Online information can address a wide variety of commonly asked questions regarding product features and capabilities. In addition, by providing easy access to 3D models, performance parameters, data sheets and application notes, connector suppliers help system design engineers streamline the design-in process and speed time-to-market. Connector manufacturers with innovative designs as well as those who offer quick and easy-to-use support functions including e-business will distinguish themselves in today’s market. These attributes help suppliers to serve global customers on a local level and ensure customer satisfaction and success.