DATACOM

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High-speed backplane connectors continue to be in great demand in supporting next-generation product development in the telecommunication, data networking, data storage, medical diagnostics and other market sectors. With data rates trending ever upwards, electronic OEM design engineers are seeking new ways to push the speed and density envelope of backplane interconnects, while neither busting the budget nor negatively impacting signal integrity and product reliability.

Backplane connectors are used to connect several connectors in parallel, so that each set of pins on one connector is linked to a corresponding set of pins on each of the other connectors. Thus interlinked, they provide a “backbone” to connect several PCB cards together to make up a complete system.

Over the past decade, the rapid and widespread growth of high-speed and broadband networks has brought signal integrity issues to the forefront. High-speed networks typically require closely-coupled high-speed links, which can introduce noise, cross-talk and signal degradation. This is because data transmission and signal integrity issues become magnified over longer links in backplanes, cables and PCB materials. Since signal integrity is paramount for reliable product performance, it is imperative for designers of communication system components and equipment and smart devices to find effective solutions to overcome these challenges.

Given the extremely broad market for backplane connectors, selecting the right interconnect for a particular electronic product can be challenging. Typically, selection and specification criteria for backplane connectors will include application requirements such as density, data rate options, physical size, number of differential pairs, component reliability and modularization and low applied cost. Also important is backward and forward compatibility, to ensure support of future speed upgrades, without costly architecture redesign.

Connector manufacturers are leading the way in overcoming these challenges. To keep pace with demand, some leading interconnect firms have been working on new and innovative backplane connector architecture design approaches to reduce channel length and improve signal transmission performance. Their efforts have led to the development of interconnect solutions that meet the market demands of high-speed, application-rich electronics.

ORTHOGONAL BACKPLANE CONNECTOR TECHNOLOGY OFFERS HIGH DENSITY, DESIGN FLEXIBILITY FOR OPTIMAL SIGNAL INTEGRITY

ORTHOGONAL CONNECTOR SYSTEM TECHNOLOGY

A prime example of an innovative, non-traditional approach is the introduction of orthogonal and orthogonal direct (midplane) connector designs that allow OEMs the ability to place more system boards within a compact mechanical chassis. Orthogonal backplane solutions are quickly emerging in traditional switch, server and storage applications, as OEMs seek new ways to improve their channel performance and lower overall costs.

Orthogonal midplane connector systems offer a broad-edge-coupled transmission design in which vertical add-in cards on one side of a midplane can be connected to horizontal add-in cards on the opposite side, allowing the PCBs to mate orthogonally. Orthogonal midplane technology simplifies backplane connections and can be deployed in high-density applications where standard backplane connections are difficult to implement due to space limitations and airflow constraints. In short, the technology enables greater architectural density to be achieved over traditional backplane connectors.

The new orthogonal connector architecture also has a positive effect on performance, enabling high-speed channel bandwidth, low
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insertion loss and cross-talk and minimal channel performance variation across every differential pair within the system. This is due to design improvements, such as the utilization of smaller compliant pins that improve the signal launch off the PCB, as well as lower mating force.

Smaller compliant pins serve to reduce the “stub” effect and allow the shrinking of the physical size of the drilled holes in the board, improving capacitance and impedance. As these holes are smaller and not as proximate to each other, cross-talk performance is similarly improved.

Mating force is another important design consideration in backplane selection. As more signals are packed into tighter packaging, a low mating force is highly desirable. With high insertion force backplane connectors, it often becomes necessary to consider alternative latching techniques, as well as chassis tolerances (e.g., rails and guides), which can pose greater potential for pin damage. Low insertion force, while maintaining end-of-life normal force, is optimal – yet another advantage of orthogonal connector systems.

In addition, orthogonal design architecture incorporates a cost-cutting angle for OEMs and their design teams, because it allows the continued use of standard PCB materials, rather than higher end, more expensive materials. Using more traditional printed circuit boards means signal length is shorter and signal integrity is improved. This greater density also allows for smaller packaging, which directly addresses customer need for smaller and more environmentally friendly solutions – at a cost-effective price point.

Orthogonal backplane and midplane architecture designs are available in a variety of different configurations and are designed for 20 Gbps and higher data rates. They offer great flexibility and allow for a matrix of communication channels. As a result, their potential markets and applications are broad and diverse. For example, they can be deployed in:

- Telecommunications equipment: hubs, switches, routers, central office, cellular infrastructure and multi-platform service systems;
- Data networking equipment, such as servers and storage;
- Test and measurement equipment; and
- Medical diagnostic equipment.

Design and Configuration Tools Available

Many leading interconnect manufacturers now offer convenient online tools that can assist OEM design engineers with backplane specification and configuration. Molex, for example, offers its Backplane Products Configurator, an easy-to-use tool that enables registered users to create custom daughtercard proposal drawings and bills of materials by selecting from a list of available components. In addition, S parameters, sales drawings, 3D models, product and application specifications are also readily available.

About the Author:

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