Overview

Organization

Flextronics Integrated Network Solutions

Profile of customer

Flextronics designs, builds and delivers high-performance enterprise computing hardware for leading OEMs around the world.

Situation

The Flextronics Server and Storage team sought an alternative approach to reducing cable congestion, increasing compute and storage density, and lowering total cost of ownership (TCO) without detracting from system performance.

3M Solution

3M™ Twin Axial Cable Assemblies

Benefits

- Easily routable, enabling higher density designs.
- Folding does not negatively impact signal performance.
- Testing showed good performance up to 20 Gbps.
- Customized for Flextronics design requirements.

Results

3M Twin Axial Cable Assemblies allowed Flextronics to achieve higher-density, high-performing designs and reduced TCO.

Flat, Foldable, High-Speed Cable Helps Flextronics Design High-Density Servers and Reduce TCO

The Challenge

Flextronics designs, builds and delivers high-performance enterprise computing hardware for leading OEMs around the world. Systems designers in Flextronics' Integrated Network Solutions business unit are continually seeking innovative approaches to improve functionality, achieve higher compute and storage density, and obtain better electrical performance in enterprise server and storage designs.

> *"The cable has memory, so it stays out of the way. This clears space for more components in the system without compromising signal quality."*
>
> *–Shaily Deva, Flextronics*

"We look at any opportunity to achieve higher electrical performance, higher density and cleaner designs while achieving a lower total cost of ownership for the customer," said Shaily Deva, Director of Server and Storage Architecture at Flextronics.

Historically, Flextronics engineers would specify standard round twin axial cables to connect components such as hard disk drives, midplanes and motherboards inside their high-performance server and storage reference designs. More recently, with enterprise-class computing consumers demanding denser computing and storage solutions, Flextronics has sought ways to design systems that can support higher-density computing and storage while achieving lower power and TCO targets. In higher-density designs, Flextronics found that conventional twin axial cabling solutions have presented challenges in terms of cable routing, thermal management, cost-management and aesthetics.

"During the design phase, thermal simulations don't fully take into account the effect of a round cable," Deva said. "There is always deterioration in terms of thermal performance from the results of your simulation (without cables) as compared to the system's actual performance."

In most traditional server and storage system design efforts, cables and cable routing are typically given less consideration than key sub-assemblies, are often designed-in toward the end of the product-development cycle and are not adequately modeled in thermal simulations. In high-density designs, cables can have a significant impact on system-level thermal performance and even cost (e.g., if a design must be altered to accommodate the cable selection).

Flextronics server with 3M™ High Routability Internal miniSAS Twin Axial Cable Assembly inside

3M™ High Routability Internal miniSAS Cable Assembly

3M™ Passive Twin Axial Cable Assembly for SFP+ Applications

3M™ High Routability Internal SATA Cable Assembly

Conventional round cables are bulky—typically 4 mm to 8 mm thick—relative to other components inside a server. Using round cables, it's nearly impossible to interconnect components without creating cable congestion inside the box and detrimentally affecting air flow. Despite a design team's best intention, cable congestion can block heat sinks and obstruct air flow. If too much heat accumulates inside a system, the system could potentially throttle down or shut down entirely.

A designer's ability to produce high-density designs could be limited because round cables require generous bend radii. If cables are bent too tightly, signal performance can degrade due to distortion in the shielding structure. Therefore, plenty of space must be typically allocated for cable pathway and routing inside a system. In some cases, the integration of conventional cables in high-density solutions can become more challenging, leading to longer assembly times and higher costs.

The Solution

In recent high-density designs, Flextronics has sought an alternative approach to reducing cable congestion, increasing compute and storage density, and raising system performance. The Flextronics Server and Storage team evaluated samples of the 3M™ Twin Axial Cable Assemblies and realized that 3M's innovative technology might be the ideal solution for Flextronics' system designs.

As a first step, the Flextronics design team tested the cable's performance. "Electrical performance tests we conducted showed good performance up to 20 Gbps, even when the cable was folded," Deva said. "We were satisfied with that and knew that we could use this cable technology in a number of high-speed applications, both internal and external to the enclosure in our system designs."

Currently, Flextronics reference-platform server and storage designs include 3M Twin Axial Cables Assemblies for SFP+, miniSAS, SATA and Ethernet applications.

At .88 mm thick, the flat, ribbon-style cable is considerably thinner than conventional round twin axial cable, taking up less space in a system. The 3M cable uses a longitudinal shielding construction that allows it to be bent and folded without affecting the signal. In Flextronics' designs, the cables can be bent, folded and routed along sheet metal walls and air-flow channels, out of the air-flow path of heat sinks.

As a valued partner to Flextronics, 3M customized the cable assemblies for Flextronics' reference-design requirements. "3M made it easy for us to prove out the use of its twin axial technology by making the cables for our evaluations to the exact lengths that we required and with all the connector types that we needed," Deva said.

The Results

"We are able to form the 3M Twin Axial Cable into corners and route it though small recesses and around components so that the cables are out of the way," Deva said. "The cable has memory, so it stays out of the way. This clears space for more components in the system without compromising signal quality. We are able to achieve the same high level of electrical and thermal performance that we would expect based on our simulations."

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