FOUR INDUSTRY TRENDS AFFECTING CONNECTIVITY DESIGN

TE connectivity

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Designers of electronic products are continually challenged to evolve those products, which requires incorporating the newest features while addressing trends toward higher density, greater speed, expanded connectivity, and improved power management. Facing increasingly short design cycles in an era where products are revised within months, developers turn to the Data and Devices division of TE Connectivity (TE) to incorporate advanced, reliable connectors and components that rapidly drive new generations of electronics.

From "Big Data" and the Internet of Things (IoT) to wearable devices, 4K television, and 5G wireless networks, market forces are driving the need to move more data faster than ever to more places. As a result, products are becoming faster, smaller, more connected, and more energy-efficient.

At the same time, the shelf life of products is becoming shorter. Companies are under constant pressure to get to market more quickly with products whose lifespans are becoming more limited, and they must manufacture with the speed and agility to roll out new products as the market demands them. Gone are the days when data center hardware was used for decades or consumer devices were replaced only once they broke. In this new, data-hungry world designers need components that allow them to easily upgrade within the same footprint, letting them quickly and efficiently scale to future user requirements.

TRENDS
Space-Savings
Speed
Everything Is Connected
Power Is Key

These changes are occurring across the whole spectrum of electronic devices. A 4K television requires a faster connection and more data, which impacts broadcaster and broadband TV providers' data centers. Innovation in one device drives requirements across the broader ecosystem:

- In data centers and enterprise networks, new generations of switches, routers, servers and storage devices are handling more data at higher rates of speed. This necessitates use of smaller, higher-speed internal and external connectivity solutions.
- In wireless and wireline networks, new base stations, antenna systems, switches and access platforms are enabling new levels of performance. Designers need faster input/output (I/O) connections and internal connections along with improved antenna components.

- In connected devices such as tablets, PCs, laptops, and smartphones, faster processors and larger memories drive new applications and faster response times. These advancements require new compact interfaces, more efficient power solutions, and faster, more compact memory sockets.

- In consumer electronics such as TVs, digital cameras, printers, set-top boxes and gaming consoles, new interface standards, display technologies, faster processors and more memory are improving responsiveness and image quality. Products require new types of internal and external connectors and memory sockets.

- In wearables, new types of connections, wireless charging, and haptic response mechanisms are rendering these devices more broadly useful in areas such as fitness, healthcare, sports, and entertainment. These devices are driving a need for miniature connectors, antennas, wireless power systems, and flexible printed circuit boards.

Designers need trusted partners to keep up with rapid changes in the marketplace. TE's Data and Devices division is at the heart of a continuously evolving and more connected life. TE's customers are among those companies building the devices and the infrastructure that are redefining what information technology means in the world. Our products help engineers push markets and address the ever-changing needs of an "always on," data driven life.

APPLICATIONS
• Servers
• Storage
• Switches/Routers
• Wireless/Mobile Networks
• Wireline Networks
• Smartphones
• Tablets
• PCs/Notebooks
• 2-in-1s
• HDTVs
• SetTop Box
• Digital Camera
• Gaming Console
• Printers & Business Equipment
• Wearables

This paper describes key trends that pose challenges to electronics designers, how those trends impact designs, and how TE's Data and Devices division helps designers deliver cutting-edge products with improved reliability and performance.

Trend 1 – Space-Saving Designs

The need for higher performance goes hand in hand with the drive toward greater density in electronic products. Multi-core processors and memory systems are rapidly evolving and virtualization is driving the need for more connections. But what doesn't change is the space available in which to implement those connections. If anything, space is shrinking, especially in consumer and connected devices such as wearable technology, smart phones, smart watches, tablets, and set-top boxes. In the data center, for example, 19- and 21-inch racks house routers and switches that sport a growing number of connections – yesterday's 12-port switches are today's 24-, 48- or 96-port switches.

For product developers, the only choice is to use smaller and smaller connectors throughout their designs. This includes everything from external I/O connectors and internal interconnects to wire-to-board connectors, memory connectors and sockets, shielding and grounding devices, and power connectors. The challenge is to find connectors and related components that deliver high performance and high reliability. Low weight and EMI shielding are factors in consumer connectors, while thermal issues, signal integrity (crosstalk), and backward compatibility are also issues facing designers when placing connectors closer together.

HIGHER BANDWIDTH IN SMALLER DEVICES REQUIRES COMPACT, HIGH-PERFORMANCE CONNECTORS

TE's Data and Devices division is a leader in driving density and miniaturization into the electronics marketplace. The Data and Devices division helps define and/or then leverages standards such as the QSFP+, Mini-SAS HD, HDMI, and USB Type-C standards. TE's Data and Devices division offers high-density connectors for data center equipment, wireless and wireline network equipment, consumer electronics, connected devices, and wearables.

Trend 2 – Faster and Faster

Throughout the electronics industry, one ongoing goal is to move more data more quickly. Data center equipment is rapidly moving from 10 Gigabits per second (Gbps) to 25, 40, 50, and 100 Gbps, while the advent of virtual reality and 4K TV drive a need for speed in consumer products – for example, a single virtual reality headset can move data at 12 Gbps.

HIGH-SPEED BACKPLANE CONNECTIVITY ARE KEY ENABLERS OF HIGH-PERFORMANCE SYSTEMS IN THE CORE

Connectors and cable assemblies continually evolve to address the need for greater speed, and the cutting edge quickly becomes the norm. Today's µQSFP (Micro Quad Small-Form-Factor Pluggable) connectors could be tomorrow's RJ45 connectors. From the largest customers to startups, companies look to provide high-speed systems and devices that connect reliably and cost-effectively.

TE's Data and Devices division works closely with manufacturers across industries and around the world to design and implement connectors and cable assemblies, memory connectors and sockets, antennas, and other enabling technologies that allow high-speed performance with low interference. TE's proven designs give electronics manufacturers speed and agility so they can quickly roll out new generations of products.

Trend 3 – Everything is Connected

While it was once a simple matter of cabling between devices, today's environment incorporates the cloud, the IoT, wearable technology, remote sensors, and lower-power processors that must all be connected somehow. Designers want to be able to focus on core features of the new products they develop in these areas without worrying about the speed, reliability, or robustness of internal and external connections.

For example, TE offers one of the industry's largest portfolio of spring fingers (also known as shield fingers, grounding springs, universal ground contacts, or clips) for a wide variety of board-to-board connectivity applications. All TE spring fingers require very limited space on a printed circuit board and accommodate soldering as well as pick and place capability using standard equipment. With the availability of spring fingers across a variety of industries, TE helps reduce design costs and accelerate time to market.

AS SERVERS, STORAGE, SWITCHES, AND ROUTERS SUPPORT DATA RATES OF 25 GBPS AND ABOVE, NEW GENERATIONS OF COPPER AND OPTICAL I/O CONNECTORS

From miniaturized I/O connectors for wearable devices to antennas and wireless charging systems and from flexible printed circuit boards and sensors through internal and external cable assemblies, TE's Data and Devices division leverages the latest standards to implement innovative solutions to connectivity needs. TE offers solutions for I/O, consumer device internals, wire-to-board, board-to-board, circuit protection, power and sockets connectivity, providing resources for designers to implement their projects with low risk and high performance.

Trend 4 – Power is Key

As electronics become faster and more powerful, typically they demand more power and produce more heat. Designers must ensure that systems and devices don't generate so much heat that deploying them becomes prohibitively expensive or ergonomically impossible. The need is for a new generation of connectors that consume less space while delivering more power within allowable heat signatures.

For example, TE Connectivity's MULTI-BEAM XLE connectors feature a new 3-beam contact, made from a thicker/higher conductivity material than the original single beam or 4-beam designs, compared to the original MULTI-BEAM XL connector. The new 3-beam design allows for hot-pluggability and blind mating and offers a lower mating force.

In addition, MULTI-BEAM XLE connectors offer a slimmer housing design that reduces the overall PCB footprint and has the option of using a low power contact – the industry proven Universal Power Module (UPM) contact. The new contacts and housing design allows more power in the same footprint – over 40% more current in the same space. MULTI-BEAM XLE connectors are as modular as the original MULTI-BEAM XL connectors in that they can be designed to fit specific customer needs.

MULTI-BEAM XLE POWER CONNECTORS USE HIGH-CONDUCTIVITY CONTACTS AND ADVANCED THERMAL MANAGEMENT TO ACHIEVE HIGH CURRENTS DENSITIES IN A COMPACT FORM FACTOR

MULTI-BEAM XLE connectors are also available as pre-assembled cable assemblies.

Power connectors also present engineering challenges. First is the application. Does the application require a board-to-board, wire-to-board, wire-to-wire, bus bar, card edge, or a combination of these types of connectors? Some applications require a combination of power and signal, while others are power only. Hot-pluggability is another consideration in applications where connectors will be mated while under electrical load. TE offers solutions for most of these challenges.

Why TE Connectivity

TE's Data and Devices division has one of the largest portfolios of connectors, sockets, sensors, antennas, and cable assemblies for a vast array of electronics applications. Whether for data center equipment, connected devices, consumer products, wearables, or communications infrastructure, TE's engineers work closely with customers and channel partners of all sizes to rapidly develop and deploy solutions that address engineering and market needs.

- Data and Devices *listens* – Through its teams of field application engineers, customer focus groups, product teardowns, and other methods, TE listens to the market to understand and anticipate its needs. Because of our broad reach and deep industry relationships, we are able to identify industry trends in their infancy, design our products around these issues and make them available to all customers.

- Data and Devices *acts* – TE participates in numerous multi source agreements (MSAs) and standards bodies to help define and implement the latest connectivity solutions and provide them to the marketplace. TE works with innovative customers of all sizes and serving many markets to develop the right tooling and processes for reliable yet cost-effective connectivity solutions.

- Data and Devices *leads* – Dollar for dollar, TE reinvests more into R&D than many other connector manufacturers, conducting basic research into industry developments and pushing trends such as connectivity and remote charging solutions for the coming IoT and the Connected Home. By participating in standards bodies and MSAs, TE gains early knowledge of the latest solutions so it can implement them quickly.

PRODUCT CATEGORIES

Input/Output Interconnects
From cloud to consumer applications, TE has a broad range of I/O solutions from high speed data standards to consumer-friendly reliability.

Internal Interconnects
TE's high speed, high density interconnects are designed for today's miniaturized market.

High Speed Backplane Connectors
These connectors are the backbone of data center architectures. TE solutions can provide high speed and scalability for what's next.

Power Connectors
Low profile, bus bar, cable, hot-pluggable, blind mating – flexible solutions for almost any design.

TE Connectivity is a global technology leader with more than 75,000 employees, 7,300 engineers, and 21 design centers. TE's Data and Devices division exemplifies the TE tagline: EVERY CONNECTION COUNTS.

FOR MORE INFORMATION

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