

Today's Connectivity Challenges Demand Flexible Options



The trend of miniaturization is increasingly affecting the design of components and devices in every market with demands for smaller package sizes and compact customized electronics. Alongside these requirements are consumer expectations for enhanced functionality and greater processing and connection speeds. Addressing the converging challenges of miniaturization and performance is a multifaceted balancing act for system designers. And with designers incorporating more components into today's devices, sourcing internal connectors that can deliver the required reliability and performance is a significant hurdle.

Design Challenges for Today's Electronics

Many of the latest electronic devices require components and interconnects capable of high data rates up to 10 Gbps. These demands will only become more pervasive with the proliferation of the Internet of Things (IoT) and devices capable of high-performance graphics. The high-speed connections required for these devices make signal integrity (SI) more important than ever — but also more of a challenge, largely due to design complexity.

Demands for increased functionality have led to the inclusion of more components within a given device. These components each produce electronic noise that can affect the SI of cables and connectors in proximity. Miniaturization itself exacerbates this effect — with cables and interconnects packaged so tightly together, it is far easier for electronic components to adversely impact the SI of adjacent cables.

An example of this issue is a golf simulator device. In-home golf simulators have been around for years, but the newest examples of these electronic devices are more sophisticated than ever. They feature high-resolution graphics projectors, sensors and cameras to analyze the golfer's swing, and a launch monitor that uses Doppler radar or camera-based sensing to track the trajectory of the golf ball. These cameras, sensors, processors and projectors are all built into miniaturized devices designed for easy transportation and flexible setup. Within those devices, the SI of the cables and connectors is key to ensuring proper, consistent and high-speed operation of the complete system.

New Options for Speed and Flexibility

High-speed flat flexible cables (FFCs) have been around for decades. This technology offers flexible yet durable cables with a variety of circuit count and amperage capacity options. The flat cable combines with low-profile wire-to-board connectors to enable compact connections ideal for display screens and graphics applications.

Today, a new type of high-speed FFC is available to meet increasing data transmission requirements: the low-voltage differential signal (LVDS) FFC. LVDS FFCs support high-speed miniaturized applications by delivering data speeds of 2 to 10 Gbps in the same compact and flexible form found in traditional FFCs. Where LVDS FFC jumpers differ from traditional FFCs is that they incorporate differential signaling with 100-Ohm controlled impedance. The differential signaling helps cancel out electronic noise and provides superior SI.

This enables LVDS FFC jumpers to meet demands for high-speed connectivity, particularly with high-resolution graphics applications. LVDS FFC technology is well suited not only for use in golf simulators and other gaming devices, but also in cameras, televisions, medical monitoring devices and vehicle infotainment systems.



Meeting Application-Specific Needs

FFC technology is more than mechanically flexible — it also offers design versatility. High-speed LVDS FFC jumpers share this versatility, providing solutions to a range of design challenges that may be specific to certain devices.

For miniaturized devices, LVDS FFC jumpers are available with customized folds to route the cable around components within the device. This reduces the space needed for cable routing and helps eliminate bending stresses which improves reliability. LVDS FFC jumpers are also available with electromagnetic interference (EMI) shielding to reduce electronic noise and improve SI. For high-speed, miniaturized applications where excellent SI is key and cable runs are adjacent to noise-producing components, this capability can be critical to optimizing performance.

FFC jumpers are also ideal for high-vibration applications such as in vehicles or handheld mobile devices. Round flat cables (RFCs) or hot bar soldered FFCs can be affixed directly to the board. This eliminates the connector, which saves space and improves the reliability of the connection. High-speed LVDS FFCs can also utilize positive-locking connectors for secure connections in applications prone to vibration or continuous shocks.

A Full Suite of Solutions

Although FFCs and connectors are sometimes sourced separately, using a single source for these components simplifies both system design and procurement while enhancing reliability. Molex offers a “one-stop shop” with a full suite of Premo-Flex FFC solutions, including high-speed LVDS jumpers and options such as EMI shielding, custom folding, Easy-On connectors with available positive locking and more.

By sourcing FFC jumpers and connectors together, designers can help ensure predictable performance and rigorously tested reliability. Collaborative engineering support from the Molex team of experts is also available to offer solutions customized to a specific application. Learn more about how Premo-Flex solutions support high-speed miniaturized electronics [here](#).

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