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USB Type-C Is Revolutionizing the Market

USB Implementers (USB-IF) has developed the USB type-C with a small, reversible connector that is expected to grow fast in the mobile, consumer electronics, and computer markets.

When USB 1.0 was released in 1996, it delivered 1.5 Mbps. Through the years, it has increased transfer rates up to 10 Gbps. The latest USB 3.1 can support a wide range of USB peripherals. The new Type-C will support multiple standards (e.g., USB 2.0, 3.0, 3.1, Thunderbolt, etc.) and it will bring consolidation to a market tangled with so many different cables. Consumers will be able to eventually buy one cable that will serve as a universal connector (*see figure below*).

In 2012, USB-IF created a specification called USB Power Delivery. Power Delivery protocols have been updated to facilitate USB Type-C to provide power delivery along with data over a single cable. USB Power Delivery offers multiple features such as: increased power levels from existing USB standards up to 100 W; power direction that is no longer fixed; and optimized power management across multiple peripherals.

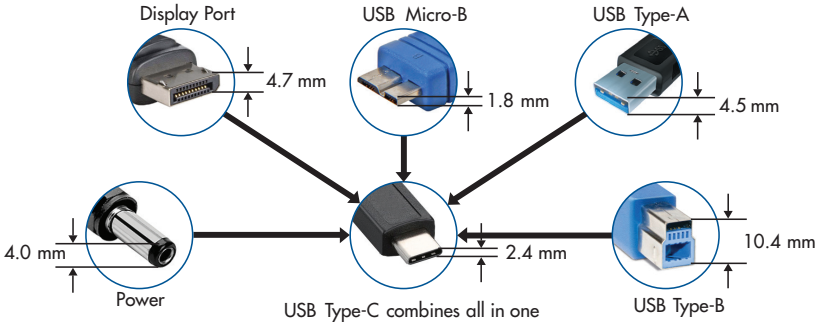
USB TYPE-C DESIGN CHALLENGES

With increased simplicity for end users comes increased complexity from a design and engineering perspective. Keysight Technologies' Marketing Manager Brig Asay pointed out some of the design challenges that this new technology will create. For starters, the PHY layer presents a challenge because now the connector is reversible and supporting higher rates and power. A Cable Detect (CD) function is implemented and CC1 and CC2 help determine if they are connected to the Downstream Facing Port (DFP) or Upstream Facing Port (UFP) as well as the orientation of the cable. There are now two high-speed data paths to handle data rates up to 10 Gbits/s.

Implementing USB type-C and USB 3.1 also creates a signal challenge, due to the signal complexity required across the 24-pin connector. Channel response is affected by loss, reflection, cross-talk, and mode conversions. Consequently, signals are severely degraded in the channel and many tests need to be implemented. They include BERT error detection and performing high-speed interconnect analysis including impedance, S-parameters, etc. At the same time, EMI and RFI levels from the cable assembly need to be controlled.

USB Type-C and USB 3.1 are backward-compatible with USB 3.0 and USB 2.0. Adapters will allow you to plug your legacy devices into a Type-C port. Because USB Type-C is a new technology, be aware that there are non-compliant Type-C new adapters and cables in the market that are using a 10-kΩ resistor instead of the 56 kΩ that should be standard for Type-C cables. In other words, a connected device may attempt to draw 3 A, when the power source (the USB port on your computer, a third-party wall charger, etc.) is only rated to supply 2A, potentially damaging your power source.

It will take time for USB Type-C to become as popular as the current USB Type-A. But with the expanding presence of smartphones and wearables in our modern lives, consumers will finally have one cable for any device, for data, and for video and power connections. ed



This USB Type-C connector can be used as universal connector. *(Courtesy of Cypress)*