

Considerations in choosing a Flex Connector

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Although introduced in the 1970s, flexible cable connectors are still widely used in many applications. Today's connector manufacturers have continued to evolve and improve their performance, most often by designing advanced insertion and retention features.

Early versions used direct solder techniques and then crimped contacts, followed by card-edge style contacts. More recent versions have utilized low insertion force (LIF) and zero insertion force (ZIF) designs. Each of the latest technologies has its particular benefits, depending on the requirements of the application, so design engineers are closely evaluating the expectations of the end system prior to specifying the appropriate connector.

Cable Types

Design engineers are employing three primary cable types: flat flexible cable (FFC), flexible printed circuit (FPC), and conductive ink circuit (CIC). Based on these cable types, connector manufacturers now offer families of products that ensure easy, stable connection and retention.



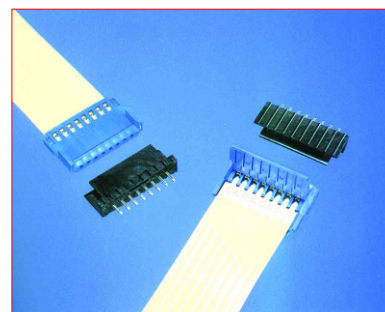
Flex Family Connectors

Flat flexible cable is comprised of flat, rectangular, metal conductors laminated between two dielectric films (typically made of polyester or polyamide). It provides the highest current carrying capability, is the most robust of the cable options, and is ideal for straight one-to-one connections. Flexible printed circuits are chemically etched copper conductors on a base film of Mylar or similar material. They are lighter, require a stiffener for termination into the board connector, and are typically custom-made. Conductive ink circuits utilize a conductive paste of carbon or silver, laminated with Mylar or polyester film.

They are the lightest in weight (making them soft and therefore easily damaged), have the lowest current-carrying capability, and require stiffener for termination.

Connector Types

Flex connectors are available in low-insertion-force (LIF) and zero-insertion-force (ZIF) varieties. LIF refers to the low insertion force required to attach the cable's conductor into the connector. The product design is fairly simple, the insertion process is straight-forward, and the contact positioning provides reliable and easy mating operation. LIF connectors tend to be smaller in size and lower in price.



Clincher™ Connector

ZIF connectors require very little insertion force to attach the cable's conductor to the connector. The design, in which a "flip" top closes over the conductor once it is placed inside the connector, prevents foil buckling and avoids excessive scraping of the contact surface. It allows for the highest number of mating cycles, and the slider activation ensures a smooth insertion and firmly locked connection. Compared to LIF technology, ZIF connectors offer better reliability and durability, due to the innovations possible with the actuator design.

A front-flip actuator ensures secure insertion and locking, while a back-flip actuator enables one-handed insertion and locking. The back actuator can be further enhanced by modifying the connector housing to provide visual confirmation that the flex cable is mated properly. A "visual check slot" enables a quick visual inspection to ensure the FPC is inserted completely.

Because the cable-to-connector dynamic already imposes limits on design options, connector manufacturers have developed flex connector innovations that offer customers as much versatility as possible. Standard flex connector families will offer ZIF and LIF connections; top and bottom contact options (allowing for different positioning of PCBs and easy routing of the cable); and surface-mount or through-hole terminations in contact spacing options down to 0.3mm pitch.

There are specialty features available as well, such as cable locks for proper alignment during mating (even if the cable is inserted at a slight angle) and preventing accidental cable release, and additional mounting devices, which ensure a flex solution for just about any application, no matter how demanding. By offering such a variety of solutions, suppliers ensure that customers can find a flex connector that fits the necessary footprint, while maximizing the performance of the overall application.

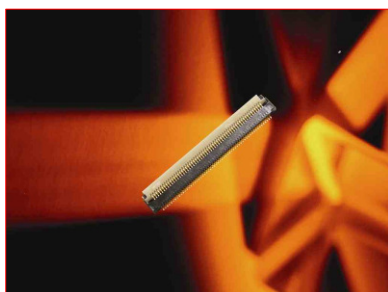
Choosing a Supplier

When specifying a flex connector, all design engineers will evaluate a standard list of features and capabilities:

SMT Technology Surface-mount flex connectors are growing in popularity, due to the cost-effectiveness of the termination process. If the product being designed can withstand the surface-mount process, design engineers will likely opt for this solution.

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Flex Connector GLH-series

Miniaturization As with just about every application and product, system sizes are shrinking and designers are looking for components to get smaller as well. Most often, the smaller a connector's profile and footprint, the better. Smaller pitch sizes, reduced weight, and lower profiles are all standard considerations when choosing a flex connector.

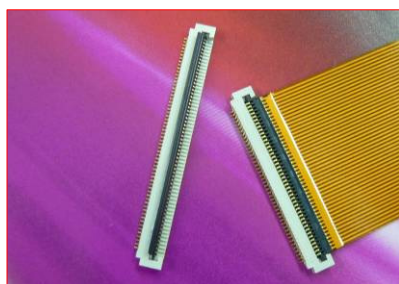
Higher Speeds While connectors are getting smaller, the demand for higher-speed signal requirements continues to increase. More demanding systems require higher-speed, higher-density connector solutions.

Multi-source Supply With design cycle times greatly reduced and the need for ensured uptime and greater productivity, OEMs can't depend on components available through a single source. The smartest option is choosing a flex connector with a footprint that is supported by multiple suppliers.

Once these considerations have been addressed, designers can look for special functionality in connectors that enhances an application, improves reliability, increases mating cycles, and the like.

Special Features

In addition to special features like cable locks, visual assurance of cable insertion, and error-free insertion (poka yoke), a number of innovative new technologies make today's connectors flexible enough to be effective in a number of diverse applications.



Flex Connector VLK-series

ZIF connectors with prehold provide slight retention after the flex insertion, holding the cable in place until the actuator is deployed. This feature prevents the cable from slipping out during the manufacturing process, resulting in fewer defects and higher output quality.

Backside flip actuation designs make insertion and actuation a one-handed process. The user can insert the cable and close the actuator in one smooth motion, resulting in a higher-quality end-product because it ensures the cable is properly inserted.

Effective cable lock alignment systems provide effective strain relief for demanding applications; customers should request documentation that the systems have passed the most rigorous customer drop test specifications in the industry, however.

Finally, solder wicking prevention addresses a concern with lower-profile applications, where solder can sometimes wick in the contact and cause shorts or mechanical failures. One solution is a nickel barrier to prevent solder wicking in both the contact and actuator locations.

The market for flex connectors will grow quite a bit in the next few years, particularly in automation, instrumentation, telecom, automotive, and consumer segments. To ensure high performance levels in the navigation systems, vending machines, printers, flat screen TVs, mobile phones, set-top boxes, and other equipment that will use this technology, OEMs will look for suppliers that are committed not just to manufacturing flex connectors, but to continuing to improve on their design and performance, offer an extensive product range with options, and provide superior service and support, in addition to competitive pricing.

Gijs Werner is the global market manager at FCI. For more information on FCI's flex connectors, visit www.fci.com/flex