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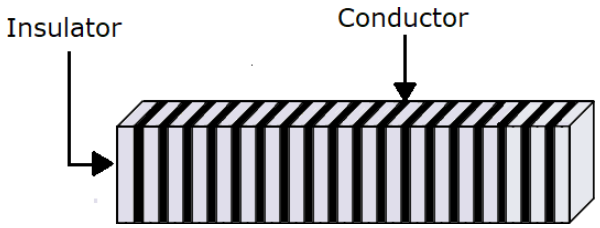
LCD Resources:

LCD Connection Types

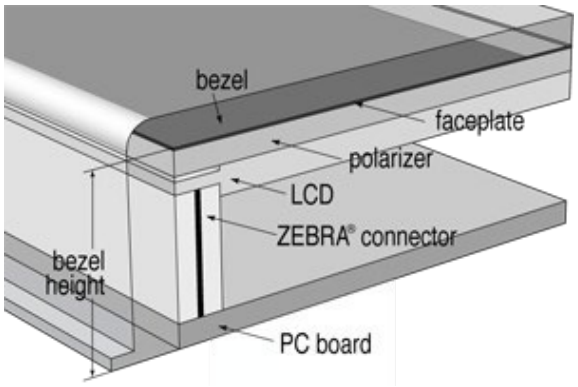
LCD Connection Types

ZEBRA Strips (Elastomeric Connectors)

Elastomeric connectors, also known as ZEBRA strips, are a common connection type for LCDs with surface mount connections. A ZEBRA strip connector is comprised of a malleable insulation strip with alternating conduction lines and can be used as a substitute for a hardwire connection. These connectors get their name from their alternating conduction lines that appear as stripes, similar to a Zebra.



ZEBRA strips are positioned between a display's connection ports and its controller. They then require a bezel to ensure a proper connection with the display. Once the bezel has been applied, the ZEBRA strips compress against an LCD's surface mount connection ports. The resulting pressure from the bezel allows for a solid connection between the conductive strips and the display.



ZEBRA Connector Diagram[1]

This connection type is a good option for testing and prototyping displays as there is no need to permanently connect pins to the display. ZEBRA strips are also a good option for thin, compact LCD and PCB designs. For example, if limited space is available within the enclosure, a ZEBRA strip can be used as an alternative to metal pins or ZIF connectors. ZEBRA connectors can also often be a cheaper alternative to other connection types.

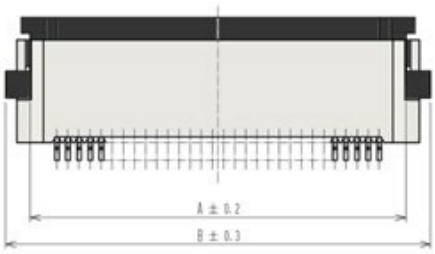
[1] *2020 Fujipoly - Thermal Interface Materials, https://www.fujipoly.com/usa/resources/design-guidelines/design-guidelines-connectors.html*

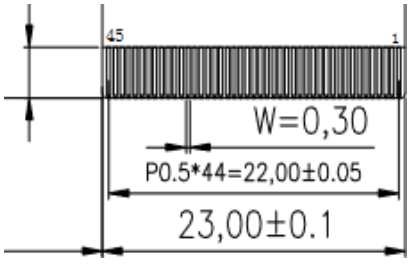
FPC/FFC Connectors

Flexible printed circuit (FPC) and flexible flat circuit (FFC) cables (hereinafter both interchangeably referred to as “FPC” or “FPC Cable”) are widely used connectors that provide access to the internal circuitry embedded in the display. Such connectors are standard in laptops and mobile phone displays.

FPC cables reduce the amount of area required by pins to interface with a display and can be integrated into PCB with minimal space and complexity by routing the signals through this cable.

FPC cables are directly routed to the embedded liquid crystal driver and the internal circuits required to drive the display. To access the contacts on an FPC, a ZIF connection port can be used to hold the cable in place and prevent damage to circuitry. The end of an FPC cable is placed into a ZIF connection port and locked into place by a clasp or plastic holder.





The flexibility of an FPC cable is ideal for compact devices. The cable is made of a flat, bendable material that insulates the conductive wire connected to the LCD. The conductive leads to the display are heat sealed between durable insulative strips.

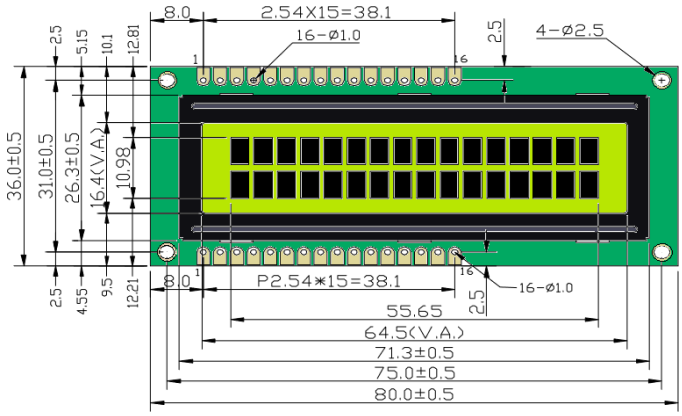
While FPCs are bendable connectors, it should be noted to avoid fully compressing the cable to prevent damage to its internal circuitry.

The spacing between each metal contact on the ribbon cable is called the pin pitch. The pin pitch for a display's FPC cable can vary and is specified by each display. A common pin pitch for a display is 0.5 mm, but can range from 0.3 mm to 1.0 mm.

Through Holes

Through holes are a standard connection type for many displays that offer a connection through small holes on the PCB. This connection type is most common for LCDs that have an external PCB controller circuit mounted to the display, such as most character and segment LCDs. Typically, the PCB will include the required liquid crystal driver, a voltage converting circuit, and backlight control.

Through holes have conductive metal holes on PCB that can be connected to using solder or a bezel. A through hole connection gives many options for connecting and interfacing the display. Connecting the display via through holes is a good option for prototyping because the standard pitch between holes and wide range of options for connecting.

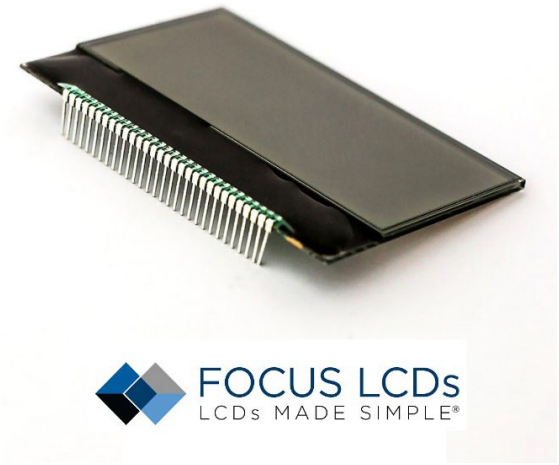


Through holes are not a good connection type for compact enclosures. They have a standard spacing that

requires a hardwire solder connection or a bezel to hold the interface pins to the holes. However, this standard spacing is advantageous for hardware to plug into breadboard or peripheral devices.

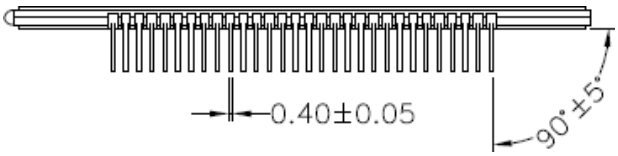
Metal Pins

Metal pins are a connection type for LCDs that have metal pins already mounted and connected to the display. Metal pins can be connected to the internal display controller or to the COM and Segment lines of an LCD. Typically, this connection type is used for character and segment LCDs.



The metal pins can be used for displays with or without an internal display controller. This makes metal pin displays a great option for prototyping. An external display controller can be used to control the liquid crystal through the COM and Segment pins directly. This enables the designer to choose the display controller based on their application.

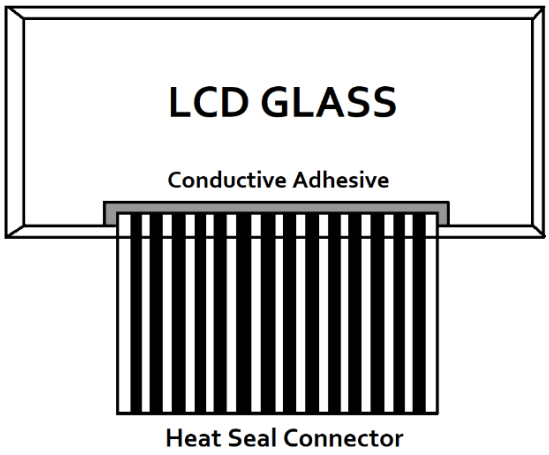
Metal pins are a reliable, sturdy connection type that can be mounted into similarly spaced devices. They are accessed by plugging the display into a socket or by soldering the display into conductive holes on a PCB. Similar to the through hole connection type, metal pins are spaced to be compatible with breadboards for prototyping.



Metal pins are good for applications that have standard pin mappings so that the display can be plugged into the controlling device. This connection type is less versatile than the previous LCD connection types as the pins are hardwired into place and cannot be moved unless unsoldered. The standard distance between pins is 2.54 mm.

Heat Seal

Heat seal connections for LCDs are a reliable connection type utilizing a flexible cable connector that is heated and sealed to a displays' interface ports. This connection uses a special heat seal paper that is then adhered to the display using a conductive glue and sealed by applying heat.



Heat seal connections are intended for hinged applications where the display is mounted at a different angle than the port and can be found in calculators and military grade devices.

Similar to FPCs, a heat seal cable is flexible and can be used for finely pitched pins. Therefore, they are another great option for compact display connections. However, heat seal cables have the added advantage of superior durability.

While FPC cables will degrade or become damaged with continuous bending, a heat seal connector will maintain the performance with continuous bending and will not become damaged.

Heat seal connections are similar in cost to the other connection types but are less expensive than the comparable FPC connection type. The heat seal connection is not changeable once adhered to the display. Once the cable is glued and sealed to the display it cannot be removed, replaced, or reused.

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