Flexible flat cable

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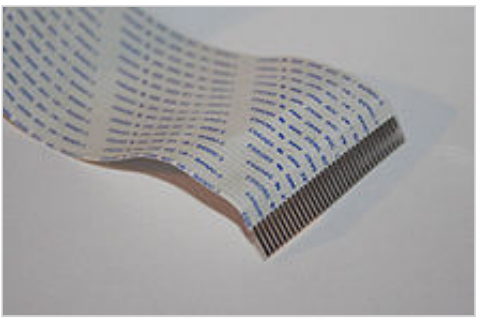
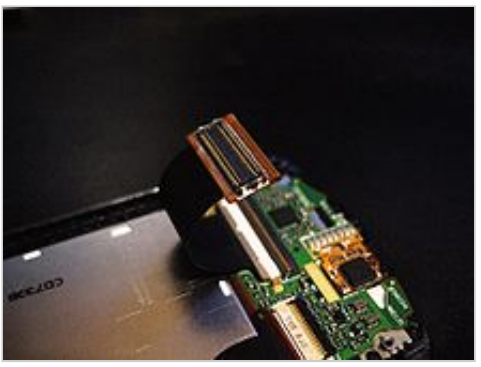
Flexible flat cable, or **FFC**, refers to any variety of electrical cable that is both flat and flexible. A flexible flat cable is a type of flexible electronics. However, the term FFC usually refers to the extremely thin flat cable often found in high density electronic applications like laptops and cell phones.



35 conductor flexible flat cable

Contents



FFC including connectors, used in the Samsung SGH-U700 mobile phone.

Overview

Sometimes the term FPC (flexible printed circuit) is even—somewhat inaccurately—used for any type of FFC, however this is more accurately used to describe circuits that incorporate components and are built onto a flexible material. FFCs are usually straight connections without any components.

FFC is a miniaturized form of ribbon cable, which is also flat and flexible. The cable usually consists of a flat and flexible plastic film base, with multiple metallic conductors bonded to one surface. Often, each end of the cable is reinforced with a stiffener to make insertion easier or to provide strain relief. The stiffener makes the end of the cable slightly thicker.

Flexible, flat cables are used in place of round cables for easy cable management, especially in high-flex applications. They usually take up less space than round cables, often offering better EMI/RFI suppression and eliminating wire coupling issues. In addition, because the wires are protected individually and not wrapped many times over by different materials as round cables are, they are lighter in weight and offer greater flexibility.[1]

The flexible flat cable was invented in 1956 by Cicoil Corporation, a company based in Chatsworth, California. The company's engineers figured out how to use a new material, silicone rubber, to 'mold' a flat cable containing multiple conductors of the same size. Since the cable looked like a flat ribbon or tape, it was named a ribbon cable. The ribbon cable allowed companies like IBM and Sperry/Univac to replace bulky, stiff round cables with sleek, flexible ribbon cables.

The early flat, ribbon cables were used in the mainframe computer industry, on card readers, card punching machines, and tape machines. Subsequently ribbon cables were manufactured by a number of different companies, including 3M. Methods and materials were developed to simplify and reduce the cost of ribbon cables, by standardizing the design and spacing of the wires, and the thickness of the

insulation, so that they could be easily terminated through the use of insulation displacement connectors (IDC). Due to the simplicity of ribbon cables, their low profile, and low cost due to standardization, ribbon cables are used today in most computers, printers, and many electronic devices.

During the 1960s and 1970s the company provided flat cables for NASA and the US Government. The Apollo astronauts used these cables during space walks, so Houston could monitor the astronaut's vital signs. Several of these cable harnesses are now in the Smithsonian.[2][3]

In the 1990s Cicoil developed a unique extrusion process to make ribbon cables and flat flexible cables out of wires, hollow tubing, coaxial cable, and fiber optics. These cables are used in applications including missiles, satellites, semiconductor manufacturing equipment, and medical equipment.

The conductors are insulated by a polyester (polyethylene naphthalenate), or silicone rubber.

Specifications

Pitch
: The spacing of the conductors. The pitch typically refers to the distance from the center of one conductor to the center of its neighboring conductor. A single FFC can have different pitches between different conductors on the same cable, however this is uncommon. FFC cables are available in many pitches, such as 0.500 mm, 0.625 mm, 0.635 mm, 0.800 mm, 1.00 mm, 1.25 mm, 1.27 mm, 2.00 mm, 2.54 mm, but the most common pitches are 0.500 mm and 1.00 mm.

Type
: Some cables (described as Type 1 by Wurth Electronik or Type A by Molex) have the exposed contacts on the same side at each end. Other cables (labelled Type 2 or Type D) have the exposed contacts on opposite sides of the cable (so that if the cable is lying flat, one end will have face-up contacts, and the other end will have face-down contacts).

Exposure length
: The length of the electrical contact that has been exposed at the termination of the cable.

Stiffener
: Most FFCs have some sort of extra material attached on the opposite side of the exposed length of the cable to facilitate ZIF or LIF connections.

Conductors size
: The width and thickness of the conductors

Now the FFC Cables are widely used in a variety of printer connection between the head and the motherboard, plotters, scanners, copiers, stereos, LCD appliances, fax machines, DVD players and other products, a variety of signal transmission and plate board connections. In the modern electrical equipment, almost everywhere.

See also

References

1. "An introduction to flat cables" (http://www.wireandcabletips.com/introduction-flat-cables/). *Wire & Cable Tips*.
2. airandspace.si.edu (http://airandspace.si.edu/collections/search/?fq=name:%22Cicoil%20Corporation%22)
3. airandspace.si.edu (http://collections.si.edu/search/record/nasm_A19791749000)

External links

- History of FFC (http://www.avx.com/docs/catalogs/ffchist.pdf), AVX
- Flat conductor cable applications (http://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/19720024572.pdf), George C. Marshall Space Flight Center, Process Engineering Laboratory

Wikimedia Commons has media related to ***Flexible flat cables***.

Manufacturers

- Hirose (http://www.hirose-connectors.com/connectors/H203SeriesCategorySearch.aspx?cat=09)
- Kyocera (http://www.kyocera-connector.com/en/prdct/list/fpcffc/)
- Molex (http://www.molex.com/molex/products/group?key=ffc_fpc_connectors&channel=products)

Distributors UK:

- Hitaltech UK (http://hitaltech.co.uk/flexible-interconnect-systems/)

Distributors Europe

- Hitaltech (http://hitaltech.com/flexible-interconnect-systems/)

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