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FLEX CIRCUITS: THE WHAT, WHERE & WHY

INTRODUCTION

Flex circuits are known by many names including flex boards, flex PCBs, flexible circuit boards, flexible printed circuit boards and, more officially, flexible electronics. In general, the term flex circuit refers to the type of technology that allows for the mounting of electronic devices and circuits on flexible substrates. Simply put, a flex circuit is a flexible computer board.



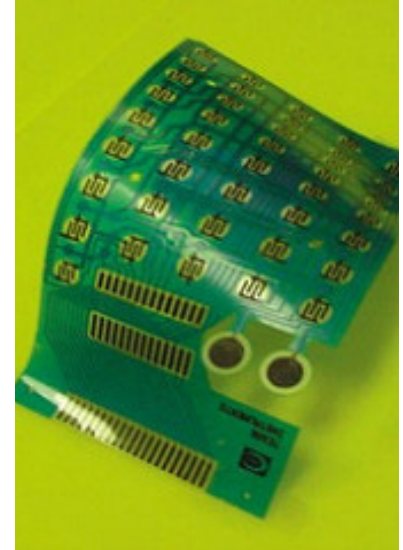
Flex circuits offer the same advantages of traditional PCBs including repeatability, reliability, and high density. However, flex circuits also offer flexibility and vibration resistance, both of which aren't available on traditional PCBs. The most important attribute, however, is the capability of a flex circuit to undertake three-dimensional configurations. Designing a flex circuit requires a slightly different approach when compared to traditional PCBs. While flex circuits may yield significant savings in manufacturing cost, in addition to reduced space and less weight, their designs must be optimized for materials and applications.

Similar to how semiconductors are manufactured, flex circuits are made using a semiconductor-industry technology called photolithography. Photolithographic technology is the process of transferring geometric shapes on a mask to a substrate. The use of this tried-and-true technology results in the lamination of etched copper traces in between two layers of dielectric film. The two layers are then glued together using an adhesive which is thermosetting, meaning the glue is activated using heat. Just like any other PCB, a flex circuit can be a single or multi-layer product, and can be made in an infinite number of shapes. In addition, flexible circuits can optionally be manufactured in conjunction with traditional PCBs. However, this hybrid technology carries its own unique name most commonly known as rigid flex circuits. Flex circuits can be designed to accommodate either surface-mount and/or through-hole devices, of which can be either active and/or passive components.



WHERE ARE THEY?

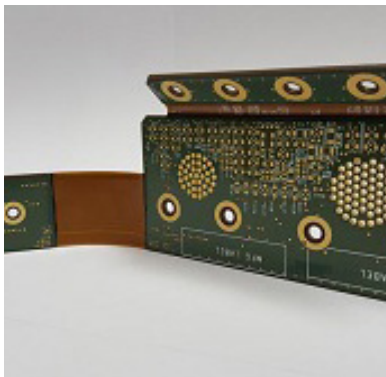
Flex circuits can be found in almost any high-tech device. In the medical market, for example, flex circuits can be found in wearable oxygen sensors used for monitoring the real-time oxygen levels of patients during surgery. Skin patch delivery devices, which are used for the delivery of drugs and insulin, also use flex circuit technology. And in the public domain, examples include many of the different personal training and athletic activity trackers. Cameras and smart phones also employ flex circuit as do GPS units. Solar panels are another growing industry that uses flex circuits, and with the ability to conform to virtually any shape, flex circuits are sure to expand into many more markets such as 3D Printers.



WHY ARE THEY POPULAR?

There are many advantages of using flex circuits rather than traditional PCBs. The most obvious advantage is their flexibility. Due to their ultra-thin material flex circuits can be bent and flexed millions of times; keep in mind these fully flexible circuits contain both electrical and mechanical devices. Other not-so-common advantages include:

- Flex circuits can be thinner than traditional PCBs.
- Flex circuits reduce weight and save space compared to wire harnesses.
- Flex circuits dissipate heat better than other dielectric material.
- Flex circuits can influence the aesthetics of the final product.
- Flex circuits make installation and repair easier and more cost effective.



Flex circuits are similar to traditional PCBs in terms of design, functionality, and manufacturing. They also both accept surface-mount and through-hole components. However, the advantage of using flex circuits over traditional PCBs is their element of flexibility. This flexibility allows the boards to conform to three-dimension configurations, which could significantly influence their aesthetics, weight, space, assembly and cost. A well-designed flex circuit can be lightweight, robust, easy to install, and suitable for a variety of applications.