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PCB Processing Has Been Quite Different In the Wearable Era

December 10, 2014 - Wearable devices are changing the trend of consumer electronics and will be met with rising demand in wide fields including health care, sports, fitness, fashion, entertainment, mobile communications, and the entire Internet of Things as people's lifestyles change, thus powerfully driving the growth of this technology market. According to a research report of Research & Markets, the global wearable electronics market currently has a value of approximately USD 3.5 billion, which is expected to reach approximately USD 8.4 billion by 2018, representing a compound annual growth rate of up to 17.71%. In addition to chips, sensors, integrated design and other technologies which have received a lot of attention, printed circuit board (PCB), a basic electronics component of wearable devices, is also set to get great development opportunities.

Challenges facing PCBs for wearable devices

Multek is a leading PCB manufacturer. According to David Hunter, Vice President of Operations for Multek's Asia Operations, "The fabrication of a printed circuit board usually involves over one hundred steps, and wearable devices' requirements for PCBs are even higher." As a wholly-owned subsidiary of Flextronics, Multek has a diversity of product lines, including the design and manufacturing of traditional PCBs, flexible PCBs, rigid-flex, flexible circuit assemblies, touch solutions, optical &electronics materials, and printed electronics. A primary problem encountered by Multek when it developed the first PCB prototype for wearable devices was fragility. "The wearable devices were very fragile. If they fell to the ground, their electronic components would immediately break. To cope with that, we developed a patented technology called 'Ripstop' to protect electronic components and printed circuit boards from being damaged or breaking in the case of falling to the ground."

For traditional flexible PCBs which generally can only flex in one direction, such flexibility is far from being enough for wearable devices. "For a wearable device which is attached to the skin for measurement of health conditions, its built-in PCB needs to adopt an innovative stretchable technology so that it can continue to do the measurement when the skip stretches," said Hunter by way of example. To meet such needs, based on its existing technologies, Multek has developed PCBs with dynamical flexibility which comes in three options, i.e. foldable PCBs, stretchable PCBs and bendable PCBs. All these ensure that PCBs can be folded, stretched and bended at any angle. Another major challenge faced by PCBs is heat dissipation as they contain increasingly powerful chips in an increasingly tiny space to fit into wearable devices which are often very small.

As an important part of the future Internet of Things, wearable devices set high requirements on connectivity in terms of both speed and precision. With the increasing speed of digital signal transmission, the transmission speed of circuits will have a bearing on the integrity of high-speed signals. Speaking of this, Hunter said: "What can really help substantially increase the transmission speed of the signal is the material. With close partnerships with leading material suppliers, Multek has been working to introduce new materials to improve the quality of signal transmission. Meanwhile, the fabrication of some high-speed transmission materials also presents some challenges. We will invest in new fabrication equipment and processes to provide customers with appropriate design and manufacturing solutions, helping them do the best in cost control and maintain good competitiveness in the market." At present, Multek's solutions have achieved a transmission speed of up to 100Gb/s in 50GHz, making it one of the few suppliers of the next-generation 50-GHz PCBs. In other words, with Multek's technology, manufacturers can enter the 5G era in advance and embrace the next revolution of the communications technology.

Stronger development strength of Chinese manufacturers

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In the global wearables market, in addition to popular products such as smart watches and bands, health care wearables have also seen fast growth. Another trend which merits attention is the growing presence of Chinese manufacturers in this market.

"Our customers used to be dominated by manufacturers from America and Europe, but now some subtle changes are taking place, i.e. the increasing share of Chinese manufacturers among our customers and the fast growth of Chinese manufacturers," said Hunter. "These local manufacturers are not copycatting as they did in the past but have increasingly strong innovation capabilities." According to him, Multek is cooperating with Chinese manufacturers to develop wearable devices related to vehicle electronics and health care.

To increase support for local manufacturers, Multek established its second Interconnect Technology Center (ITC) in Zhuhai this year, following the ITC in Silicon Valley in the US. The move makes Multek the first among its peers to set up such a center in Asia. The purpose is to strengthen communication and cooperation with local manufacturers and help them turn their design concepts into actual products.

"We make the move because we have seen Chinese manufacturers are becoming an increasingly important force in this emerging technology area in recent years. Our ITC in Zhuhai has three main tasks, namely to help local players complete the design, development and production of wearable products in the shortest time possible, to introduce our advanced manufacturing technologies in the US to the Chinese market in a fast and reliable way and to ensure stable and reliable manufacturing processes and excellent product quality," said Hunter.

Speaking of the development of the emerging wearable market, Hunter said that the current market is led by some well-known international companies which have leveraged their strong market influence to bring the application of wearable technologies to a new height. In recent years, Chinese brands have grown very fast. For example, some sportswear brands which have gained a growing reputation in overseas markets. Multek will build close ties with more brands to jointly expand the wearable market.

End-to-end supply chain service system

As part of Flextronics' end-to-end supply chain solutions, Multek's plant in Zhuhai is located in Flextronics Zhuhai Industrial Park. With a fast manufacturing ability which enables it to complete PCB design, manufacturing and delivery in five days, Multek is strongly positioned in the consumer electronics market where the customers are setting increasingly high requirements on the product development cycle. The completed PCBs are sent to the neighbouring Flextronics plant for the assembly of metal and mechanical pieces, molding, testing and packaging, before they become part of the finished wearable products such as smart watches. Therefore, Flextronics and Multek can provide customers with a full range of solutions for the production of wearable devices.

Meanwhile, Multek's local ITC enables it to build closer ties with customers by turning their needs into specific PCB designs and, through various steps such as in-depth simulation, modelling, material selection, and mechanical/ thermal/electrical testing, delivering quick turnaround from concept to mass production.

Increased investment in Chinese plants

Since 1994, Multek has been in China for 20 years with five factories in Zhuhai with annual manufacturing capacity of approximately 1.49 million square meters. In addition, Multek also has operations in the US and the Philippines.

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Multek is the first PCB producer to grasp the High Density Interconnect (HDI) technology. Now it owns 11 CU18 production lines and over 130 laser drilling machines with a domestically leading scale.

The global PCB industry has grown at an annual rate of approximately 4.5% in recent years. In the same period, Multek has seen a much higher growth rate than the industry average, which is expected to reach approximately 20% from 2014 to 2017. In the coming three years, Multek will invest USD 150 million in its Zhuhai operations, with the focus on leading technologies such as automation, environment management, eco-friendly production, laser drilling and laser direct imaging (LDI), which will not only increase production efficiency and lower cost but also improve product quality.

According to Hunter, China remains an important market for Multek's future growth. The company will accelerate its production equipment upgrade and further strengthen employee training in China to keep pace with the rapid development of electronics manufacturing technologies.

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