AOC Technology: Strong Driving Force for Consumer Electronics

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Introduction

With the continuous demand of high bandwidth and quality HD images, voices and massive data transmission, a variety of innovative transmission technologies are flourishing and struggling for more market share. As a result, the concept and initiative to integrate optical fiber technology into consumer electronic products are becoming prevalent. In other words, it is the focus in the transmission interface field.

1. Pros and cons of fiber optics communication technology in consumer electronics

Consumer electronic fiber optics technology, or Active Optical Cable technology (AOC), is basically to convert electrical signal into optical signal at Tx, then transfer signal through anti-electromagnetic fiber optics intermediate, and vice versa at Rx, so that high-speed optical signal can flow smoothly in both ends. The transmission bandwidth can be up to 100G while market mainstream is only 10Gbps currently. Moreover, transmission distance can breakthrough the 10 meters limit of copper cables to reach several hundred meters or even dozens of kilometers away. There are several superiorities for AOC technology: smart integration of optical and electrical interfaces thanks to the packaging design, bijou, hot-pluggable, convenient...... all these advantages have expanded its application, including high-speed data and video communications of high-performance computer (HPC). The main product types on the market are Thunderbolt, AOC, USB 3.0 AOC and HDMI AOC, etc.

At present, consumable copper cable still holds the leading position due to a low cost. However,
with the development of optical fiber technology, the prices of key components are coming down while production yield is going up. Consequently, AOC will inevitably become more and more popular. Frankly speaking, both consumers and supply chains are ready to take this market opportunity.

![High-Speed I/O Performance Chart]

2. **Situation of industrial giants for consumer AOC**

During the recent years, active optical cable technology (AOC) has been highly appreciated by industrial giants in interface transmission field. Let’s take the INTEL Thunderbolt as an example. In 2009, INTEL completed the AOC design. With a strong compatibility, it replaced and unified vast amount of PC connectors with various performances, such as SATA, USB and PCI Express. Thunderbolt combines the PCI Express data transfer technology and DisplayPort display technology to transmit data by two channels simultaneously; each channel provides bidirectional 10Gbps bandwidth. On the other hand, the AOC technology applied by Thunderbolt is equipped with high transmission capacity, long distance and 50Gbps bandwidth. Later on, Corning and Apple followed up and applied AOC to servers and hard disk communication. Hereto, a new chapter for high-speed video transmission and cloud computing is opened.
The third-generation Universal Serial Bus (USB 3.0) connector has increased the communication data rate from 480Mbit/s to 5Gbit/s and put various high-speed connectors into practice. Shenzhen Gigalight USB 3.0 AOC connectors mainly consist of three components: Firstly, the laser, normally vertical Cavity Surface Emitting Laser (VCSEL), for EO conversion; Secondly, the photoreceptor device for converting OE conversion; and finally, the optoelectronic transceiver for laser driving and output signal amplifying. Thanks to the optoelectronic transceivers, all the electrical signals are fully compatible with USB 3.0 connectors.

In January 2015, Shenzhen Gigalight Technology launched HDMI AOC. HDMI AOC supports 1920 * 1200, 4K (30P), HD 3D, transmission distance is up to 100M. It is one of the best solutions for the digital displays, large video conferences and medical image equipments.
The key technology of consumer AOC is parallel multimode transmission modules and chip process controlling. With high data rate, long transmission distance, low energy consumption, low latency, anti-electromagnetic interference and no effects by unknown ground loops...... Consumer AOC technology has attracted more and more manufacturers. However, there remain some challenging investment risks. On one hand, the technical threshold is high so that sophisticated technical support from upstream optical engine modules is required; on the other hand, the packaging is cost-consuming. As a result, the development scale is hard to be vigorous, and batch and stable manufacturers is relatively few. Shenzhen Gigalight Technology is one of the few bulk manufacturers.

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<th>Thunderbolt AOC</th>
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3. AOC technology in server & high-speed PC processor field

The new generation HD visual enjoyment and ultra high-speed computer operating
experience is the major requirements for young people and market trends for modern life.

Presently, the copper cable technology is still applied widely by servers and PC internal processors as well as data transfer between hard disks, such as SATA hard disk connection. However, with growing demand for high transmission bandwidth and zero errors, AOC technology may erode part of the server and PC market share, and needless to say, AOC providers will jumped ahead thanks to this differentiated competitive advantage.

4. **AOC technology application in the field of smart home**

Smart home includes building, network communication, information appliances and equipment automation, and integrates system, structure, service and management into one efficient, comfortable, safe and environmental-friendly living environment. Until now, smart home is still in the market promotion period. All the home network system, information collection system, security alarm system and automatic control system within three-dimensional smart home are basically based on USB connector data communication mode to connect multiple independent household subsystems, collect real-time household environment security information, and automatically any abnormal situation will be monitored and sent to the remote customer terminals.
Today, more and more home appliance manufacturers are joining in the smart home entrance battle. Without exception, they all select the USB connector in addition to WIFI function. AOC possesses advantages like longer transmission distance, easier for wiring, etc., obviously, it is more suitable for application on this occasion. Let’s take an example: if one would like to watch movies in the computer of study in the television of living room, while unfortunately, both the copper cable USB transmission distance and WIFI data rate and capacity are not enough for the real time watching. There is one perfect solution: USB 3.0 AOC, as you have known, the maximum transmission distance of which can be up to 100 meters.

Potentially, smart home system not only exists in family, but in the hotel system as well. Hotel high-definition interactive and hotel VOD video on demand platform are good examples for the application of USB 3.0 and HDMI AOC to help hotels realize intelligent management.

**Summary**

Looking forward to the future, AOC technology will penetrate deeply in a variety of consumer transmission applications, promote the high-end development of consumer electronics industry and improve people’s quality of life substantially.