

ams OSRAM to benefit from Apple adopting micro-LEDs

The Apple Watch is likely to be first of the firm's products to feature micro-LED displays, from 2024, says TrendForce.

According to market research firm TrendForce, Apple is expected to adopt micro-LEDs for its consumer electronic products in the near future. The Apple Watch will likely be the first of its products to feature a micro-LED display, and adoption is expected to occur in 2024. Then, during 2026–2030, the scope of application of micro-LEDs could expand to encompass artificial reality (AR) headset displays, smartphone displays, automotive displays etc.

The Apple Watch as a product line was launched in 2015 and has been on the market for more than eight years. The latest model (Apple Watch Ultra) was released near the end of 2022 and offers improvements to display specifications. Apple enlarged the display size to 1.93-inches and raised the display brightness level to 2000nits. These upgrades indicate that smartwatch brands continue to seek a larger and sharper display that can show texts clearly in an outdoor setting.

TrendForce believes that Apple will make a breakthrough for its smartwatch in 2024 by incorporating micro-LEDs. With this technology, the Apple Watch's display could exceed 2-inches and achieve an even higher contrast level. Such improvements would satisfy the viewing needs of professionals and enthusiasts of various outdoor sporting activities.

Apple Watch to facilitate entry of micro-LED displays into mainstream consumer electronics market

TrendForce points out that Apple has always been careful about adopting a new technology, and its process for evaluating a new technology is very lengthy. On the other hand, once Apple has decided to use a particular technology, the company usually tries to apply it across different product lines.

Take organic light-emitting diode (OLED) displays as an example. Besides being incorporated into the Apple Watch and the iPhone, the OLED display is expected to be featured in iPad models for 2024 and the MacBook models for the 2025–2026 period. With the penetration of OLEDs among Apple's products serving as the prime case study, TrendForce believes that Apple will begin the gradual introduction of micro-LEDs, starting in 2024.

Whether micro-LEDs are incorporated into smartwatches, AR headsets or smartphones, two major factors will determine the market competitiveness of this technology, reckons TrendForce.

The first factor involves lowering the costs of micro-LED chips. A notable solution to making the production of micro-LED chips much more economical is to enlarge the wafers that they are made from. Currently, the production lines for mainstream micro-LED chips take 6-inch wafers. Switching to 8-inch wafers will certainly result in a considerable cost reduction.

The second factor is flexibility. The micro-LED has to work with different types of backplanes that contain glass, CMOS, etc. A reliable semiconductor manufacturing process is needed to serve as the basis for scaling up production. Such a process is also critical for the provisioning of a total solution (i.e. from chip production to mass transfer, inspection, and repair).

Among suppliers of LED chips, ams OSRAM has formed the tightest collaborative relationship with Apple in the field of micro-LEDs at this time because it has advantages in addressing the two aforementioned factors. In the future, ams OSRAM will very likely become Apple's key partner in supplying the micro-LED components that are embedded in next-generation displays, reckons TrendForce.

Micro-LEDs remain Apple's first choice for future display technologies due to considerations of loss of display brightness and impactful product innovations

Looking at the new kinds of display technologies that have emerged lately, micro-OLED and micro-LED are the ones capable of meeting the demand for a high number of pixels per inch (PPI). However, micro-OLEDs cannot reach the higher level of brightness that micro LED can achieve due to some inherent material-related limitations.

Currently, there is a market rumor saying that Apple will be unveiling a headset device featuring a micro-OLED display this year. Nevertheless, in the development of AR headsets over the medium to long term, TrendForce believes that making a headset with a completely transparent display will require optical

waveguide technology. However, incorporating optical waveguides will reduce the original brightness of a display by as much as 99%. Therefore, micro-LEDs — due to their huge brightness advantage — can provide the sufficient leeway to compensate for this massive loss of brightness. If Apple wants to release an AR headset or a pair of AR glasses that features a completely transparent display in the future, then micro-LEDs are most likely its first choice for the display technology.

Turning to the smartphone market, most brands in the Android camp have made foldable OLED displays a main design feature for their upcoming flagship models. However, as the second largest smartphone brand, Apple has yet to enter the much-discussed market

segment for foldable OLED models. TrendForce believes a possible reason as to why Apple is slow to enter this segment is its focus on micro-LEDs. In addition to rigid backplanes that have glass and CMOS, micro-LED are also highly suitable for flexible backplanes made of PI or other kinds of material with similar attributes. Also, by adopting micro-LEDs, Apple may be able to make iPhone displays foldable, rollable and even 'stretchable' in the future. Hence, micro-LEDs have the potential to be the key technology that Apple will use to realize game-changing product innovations and thereby get further ahead of other brands in the market, reckons TrendForce. ■

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