Micro-LEDs maintain momentum despite Apple's withdrawal

New advances are needed in die technology, transfer equipment and micro-LED manufacturing, says Yole Développement.

The cancellation of Apple's project at the beginning of 2024 has shaken confidence in micro-LED technology, leaving the industry at a critical juncture. As delays continue and organic light-emitting diode (OLED) technology advances, the value proposition of micro-LEDs is shrinking, notes market analyst firm Yole Group. In response, companies are rethinking their strategies — some are slowing down or stopping, while others are accelerating their efforts, taking advantage of less competition. Alliances are forming along geographic lines, with about 30 fabs or pilot lines still moving forward.

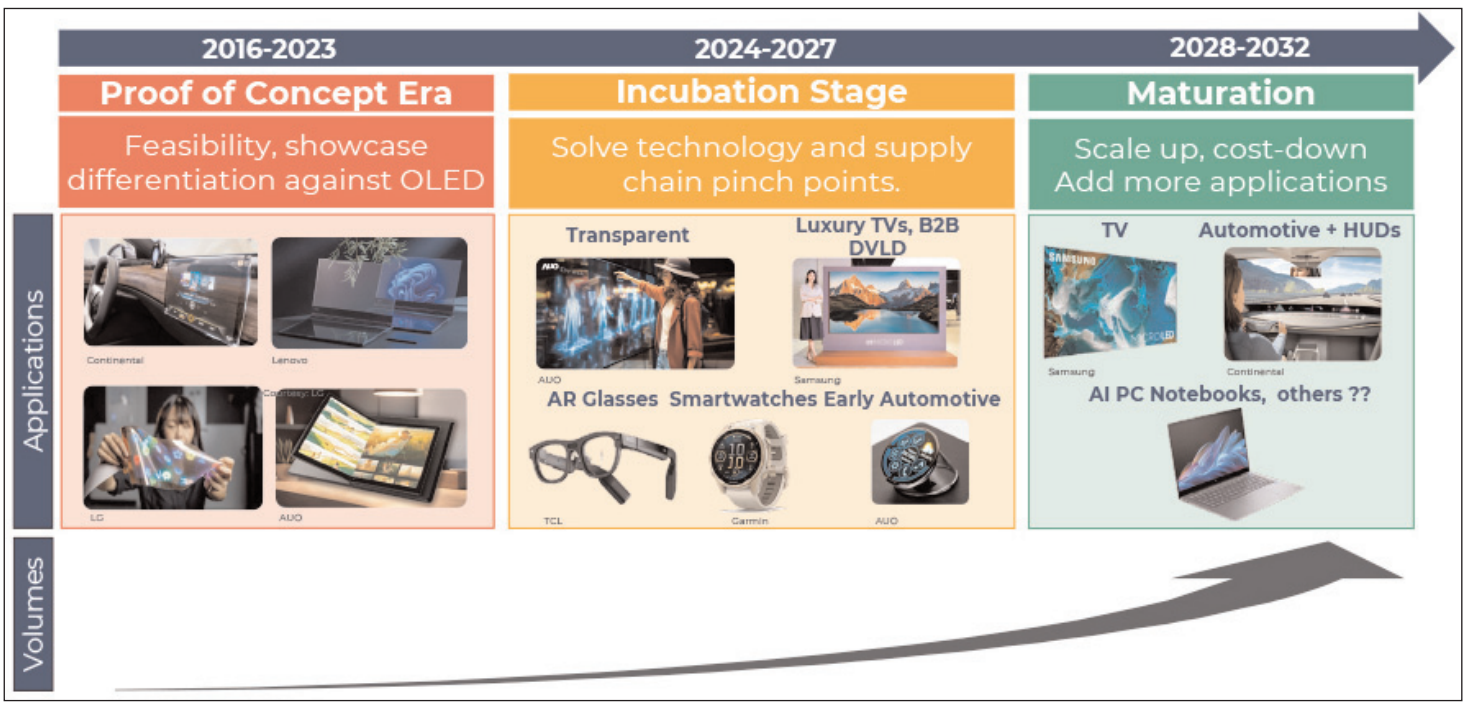
"The industry now faces the challenge of moving from proof-of-concept to mass production," says Eric Virey PhD, principal analyst, Display, at Yole Group. "It must prove it can deliver high-performance, defect-free displays at scale while achieving economies of scale to remain viable."

The immediate growth driver for micro-LEDs is LEDoS (micro-LED on silicon) micro-displays for augmented reality (AR), with artificial intelligence (AI) reigniting optimism after the 2021–2023 'AR winter', says Yole.

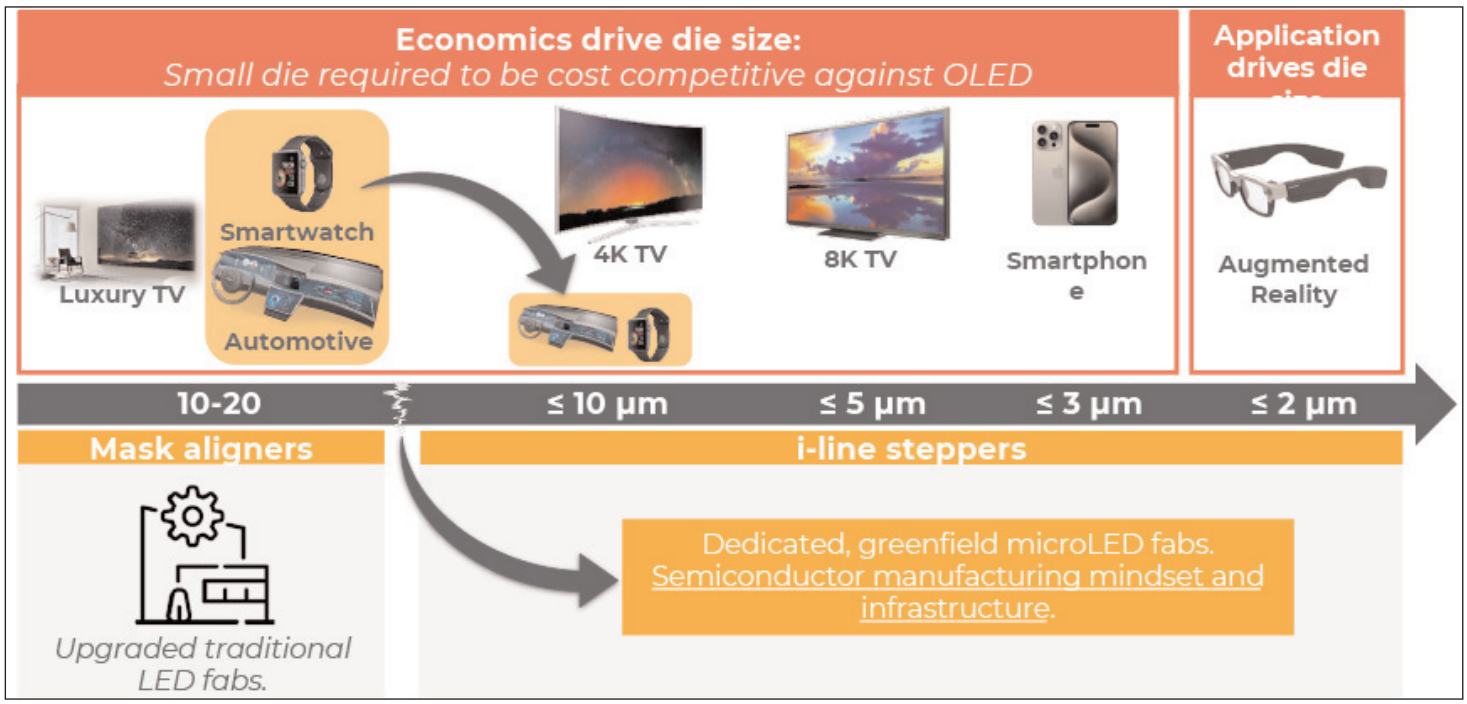
AUO is supplying smartwatch samples to Tag Heuer and Garmin, while Century Display is setting up a pilot line. However, OLEDs dominate the smartphone market, leaving little room for micro-LEDs to compete. Without Apple, no company seems capable of pushing micro-LEDs forward in smartphones or creating a suitable supply chain, says Yole. In TVs, OLEDs and mini-LEDs also overshadow micro-LEDs, though there is potential for ultra-large screens over 100-inches, it adds.

In parallel, automotive applications hold promise, but high costs and an immature supply chain are delaying adoption. The transparency and modularity for micro-LEDs offer potential for niche applications in areas like retail, transportation and military simulators, Yole reckons.

To succeed, micro-LEDs must deliver superior performance at a cost comparable to OLEDs. "This requires breakthroughs in efficiency for small die sizes and a robust supply chain, including specialized fabs,"



Micro-LED industry roadmap, 2016–2032.



Micro-LED costs drive the need for small die sizes.

says Virey.

With the closure of Osram's micro-LED fab and Apple's exit, the industry faces a familiar dilemma: mass production will require significant investment to drive prices down and make the technology viable.

However, Apple is unlikely to re-enter the micro-LED space unless third-party solutions meet its high standards, concludes Yole. ■

www.yolegroup.com/product/report/microled---manufacturing-2024