MicroLED: will Apple and Samsung disrupt the industry? ¹

OUTLINE:

- MicroLED developments: Yole Développement (Yole) estimates that more than US$5 billion has already been spent as of Q1 2020.
- MicroLED technology: Despite significant progress, roadblocks remain including power efficiency, transfer and assembly, yield management, driving. The challenges lie in yield, manufacturability and cost effectiveness of those solutions.
- COVID-19 outbreak: Impact on the global industry varies by applications. Despite the global COVID-19 health crisis, money is still flowing into the microLED ecosystems.
- Competitive landscape: Key players and inflexion points vary from one application to another. Apple will lead on smartwatches and Samsung on TVs which will evolve smoothly from luxury, products in excess of $100,000 towards high-end consumer devices. More visible efforts toward volume manufacturing: Aledia, Playnitride, CSOT, Sanan, Visionox, Apple, Samsung, JB Display and others.

“For many companies, interest in microLEDs lies beyond just the ability to offer the latest display technology”. asserts Eric Virey, PhD, Principal Analyst, Technology & Market, Displays at Yole Développement (Yole). “IP² analyses indicate that Apple is planning to forgo TFT³ backplanes, instead opting for Si-CMOS microdrivers. The implications go far beyond a technological choice. Apple’s microLED supply chain would eliminate reliance on display makers such as Samsung or LG”.

Apple can source microdrivers and microLED chips from foundry partners and assemble those components in-house or with other partners to create unique displays. Although it currently has more pressing battles to fight, the same logic applies to Huawei, with the possible added benefits of a 100% domestic display supply chain that doesn’t rely on restricted US technology.

¹ Extracted from: MicroLED Displays - Market, Industry and Technology Trends 2020, Yole Développement, 2020
² IP: Intellectual Property
³ TFT: Thin Film Transistor
In this context, Yole investigates disruptive technologies and related markets in depth, in order to point out the latest innovations and underline the business opportunities. Released today, the MicroLED Displays - Market, Industry and Technology Trends 2020 report provides a detailed update on the status of the microLED industry as of Q3-2020 and gives detailed analysis of the different microLED technologies. Including market trends and forecasts, roadmaps, cost analysis, technology status and trends, supply chain, competitive landscape and key player profiles, this new report aims to understand the microLED ecosystem and industry.

What is the status of the microLED technologies? What are the progresses and What are the remaining pinch points? What are the best yield management and repair strategies? Who’s taking the lead? Which applications could microLED display address and when?

Yole presents today its vision of the microLED industry.

As analyzed by Yole’s team in the new MicroLED Displays - Market, Industry and Technology Trends 2020 report, for SVD⁴, Samsung’s TV division, microLED would confer the ability for it to compete against OLED in the high end, large, TV segment with a technology that doesn’t rely on panels from China or its friendly enemy SDC⁵. SVD’s microLED technology still uses LTPS⁶ TFTs but, thanks to its modular design, only requires smartphone-sized tiles that could be sourced from existing G6 fabs.

Other display makers such as BOE or CSOT want to leverage their existing TFT infrastructure. Samsung Display is developing QNEDs, its own flavor of microLEDs that could fast track the technology and leverage most of its QD-OLED investments.

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⁴ SVD: Samsung Visual Display
⁵ SDC: Samsung Display
⁶ LTPS: Low Temperature Polysilicon
For AUO, microLED could be a matter of survival. The company has been successfully managing cash by limiting CapEx\textsuperscript{7} and focusing on high added value products. But China won the LCD war and the company never significantly invested in OLED capacity, making it difficult to pursue this strategy in the long term. MicroLED is AUO’s best shot at remaining relevant in high-end automotive and TV panels, without requiring the massive CapEx of an OLED fab. The company has already showed various automotive prototypes and could demo TV prototypes in 2021.

Availability of standard tools and processes enabled the commoditization of LCD and will soon do so for flexible RGB\textsuperscript{8} OLEDs. The lack of microLED process maturity and the proliferation of technology paths hinders the development of high volume manufacturing tools and the development of the supply chain. This complexity, however, is a welcome barrier to entry for companies such as Apple or Samsung. Both have the financial and technological strength to develop end-to-end solutions internally and acquire missing technology building blocks as needed.

Latecomers or smaller companies are eager to see microLED processes converge and off-the-shelf tools become available. Equipment makers such as Toray Engineering, TDK, V-Technology, Besi, SET and others are making the first attempts while technology providers such as Playnitride, XDC and many others can license key processes and components.

For high volume consumer applications, economics drive die sizes to below 5 µm with stringent yields requirement for which traditional LED fabs are not suited. A paradigm shift is required toward a semiconductor-like manufacturing mindset with high efficiency, automation, end-to-end defect prevention and management strategies.

\textsuperscript{7} CapEx : Capital Expenditure
\textsuperscript{8} RGB : Red/Green/Blue
This is creating an additional push toward adoption of larger diameter substrates. Going from 6” to 8” is especially desirable as it grants access to battle-tested, retrofitted semiconductor equipment. This also increases the appeal for GaN-On-Si platforms that are readily available in 8” and already looking toward 12”. While more challenging, 8” sapphire and GaAs platforms however remain credible options.

All year long, Yole Développement publishes numerous display-related reports and monitors. In addition, experts realize various key presentations and organize key conferences. Make sure to be aware of the latest news coming from the industry and get an overview of our activities, including interviews with leading companies and more on i-Micronews. Stay tuned!

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About our analyst

Eric Virey, PhD., serves as a Principal Display Market and Technologies Analyst within the Photonics, Sensing & Display division at Yole Développement (Yole). Eric is a daily contributor to the development of the Display activity at Yole, with a large collection of market and technology reports on display technologies, Quantum Dots, MicroLEDs, TFT backplanes as well as multiple custom consulting projects: business strategy, identification of investments or acquisition targets, due diligences (buy/sell side), market and technology analysis, cost modelling, technology scouting, etc. Eric has spoken in more than 50 industry conferences worldwide over the last 10 years. He has been interviewed and quoted by leading media over the world including: The Wall Street Journal, CNN, Fox News, CNBC, Bloomberg, Financial Review, Forbes, Technology Review, etc. He is also a regular contributor to various display industry media and organizations. Previously Eric has held various R&D, engineering, manufacturing and business development positions with Fortune 500 Company Saint-Gobain in France and the United States. Eric Virey holds a PhD in Optoelectronics from the National Polytechnic Institute of Grenoble. He is currently based in Portland, OR.

As a Technology & Market Analyst, Displays, Zine Bouhamri, PhD is a member of the Photonics, Sensing & Display division at Yole Développement (Yole). Zine manages the day to day production of technology & market reports, as well as custom consulting projects. He is also deeply involved in the business development of the Displays unit activities at Yole. Previously, Zine was in charge of numerous R&D programs at Aledia. During more than three years, he developed strong technical expertise as well as a detailed understanding of the display industry. Zine is author and co-author of several papers and patents. Zine Bouhamri holds an Electronics Engineering Degree from the National Polytechnic Institute of Grenoble (France), one from the Politecnico di Torino (Italy), and a Ph.D. in RF & Optoelectronics from Grenoble University (France).

About the report

MicroLED Displays - Market, Industry and Technology Trends 2020

MicroLED equipment and manufacturing infrastructure: a cornerstone for microLED and a key strategic lever for Apple and Samsung to disrupt the industry. – Performed by Yole Développement

Companies cited:


Related reports:

- Microdisplays – Market, Industry and Technology Trends 2020
- MicroLED Displays – Intellectual Property Status & Landscape 2020
- Next Generation TV Panel Technology and Market Trends 2020
- Displays and Optics for AR & VR 2020

About Yole Développement

Founded in 1998, Yole Développement (Yole) has grown to become a group of companies providing marketing, technology and strategy consulting, media and corporate finance services, reverse engineering and reverse costing services and well as IP and patent analysis. With a strong focus on emerging applications using silicon and/or micro manufacturing, the Yole group of companies has expanded to include more than 80 collaborators worldwide,… More

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