



Micro LED and flexible OLED are the key displays for the automotive application in SID 2020

Publication Date: August 21, 2020

Stacy Wu

Key findings

- Automotive has become a key application to adopt advanced display technologies. During the virtual Society for Information Display's (SID) Display Week 2020, held on August 3–7, 2020, several OLED and micro LED displays for the automotive application were demonstrated.
- Both OLED and micro LED display technologies can provide true-black, transparency, and flexible functions, which are essential to create an immersive user experience. However, doubts on the reliability of OLED and the high manufacturing cost of micro LED are still obstacles to these two technologies. LCDs with mini LED–based backlighting will be the transitioning technology.
- LG Display showed several flexible OLED solutions for vehicles, including cinematic sound instrument cluster display, transparent windshield display, and 27-inch co-drive display.
- AUO worked with PlayNitride and introduced a 9.4-inch flexible, large-sized micro LED dual-display. PlayNitride showed a 7.56-inch transparent micro LED display.
- Tianma demonstrated its local dimming thin-film-transistor liquid-crystal display (TFT-LCD) solutions, including the ARCUS-CURVE (dual-cell LCD) and LCD with mini LED–based backlighting.

SID's 57th Display Week took place on August 3–7, 2020 as an all-virtual event. Automotive was the main application to demonstrate the advantages of advanced display technologies. At the show, LG Display showed a series of flexible OLED solutions, while AUO and PlayNitride introduced the flexible, transparent, large-sized micro LED display. Tianma mainly focused on its TFT-LCD solutions and showed its ARCUS-CURVE (dual-cell LCD) and LCD with mini LED–based backlighting. For more information, please refer to links in the "Further reading" section of the Appendix.

LG Display showed a series of flexible OLED solutions

LG Display's plastic OLED (pOLED) is its key flexible OLED solution for the automotive market. At the show, LG Display demonstrated transparent OLED, cinematic sound OLED, and 27-inch center information display (CID) + co-drive display (CDD).

Figure 1: LG Display's flexible OLEDs for automotive

Transparent OLED for windshield display (top left image)

- 55-inch 1,920 x 1,080 (FHD)
- Brightness (Typ.): 400cd/m²
- Transparency (Typ.) : 38% (panel)

Cinematic sound OLED (bottom left image)

- SPL Sensitivity: 85dB/5w
- Frequency Response: 200Hz-20kHz

12.3" Cluster
Resolution: 2,400x900
Luminance: 750 nit

27" CID+CDD
Resolution: 5,500x900
Luminance: 750 nit

27-inch CID + CDD (up)

- Resolution: 5,500 x 900
- Brightness(Typ.): 750cd/m²

12.3-inch FHD cluster

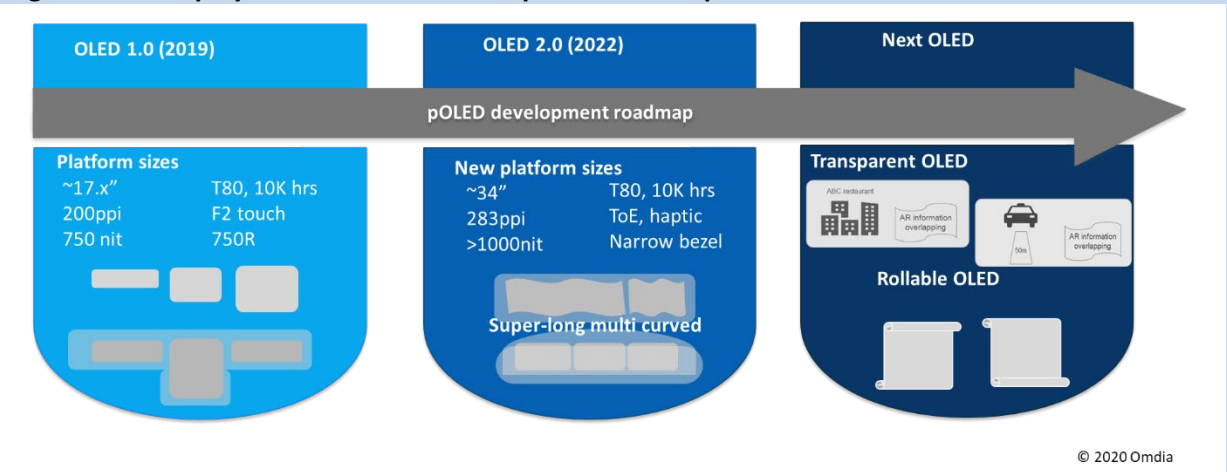
- Resolution: 2,400 x 900
- Luminance: 750 nits
- Unit: 20W dual-exciter and dual-tweeter units
- SPL sensitivity: 85dB/5w
- Frequency response: 200–20kHz
- In collaboration with Hyundai Motors, LG Display has developed the auto display

© 2020 Omdia

Source: LG DISPLAY—photos taken by Stacy Wu/Omdia in the SID Display Week 2020, August 3–7, 2020

Although there are a couple of car models with OLEDs (please refer to links in the “Further reading” section of the Appendix for more details), cost, durability, and luminance issues are still the main hurdles for the mass adoption of OLED in the automotive market. LG Display has planned to introduce OLED 2.0 in 2022 to enhance the specification and to bring up the next OLED concepts for the automotive application.

Figure 2: LG Display's flexible OLED development roadmap for automotive

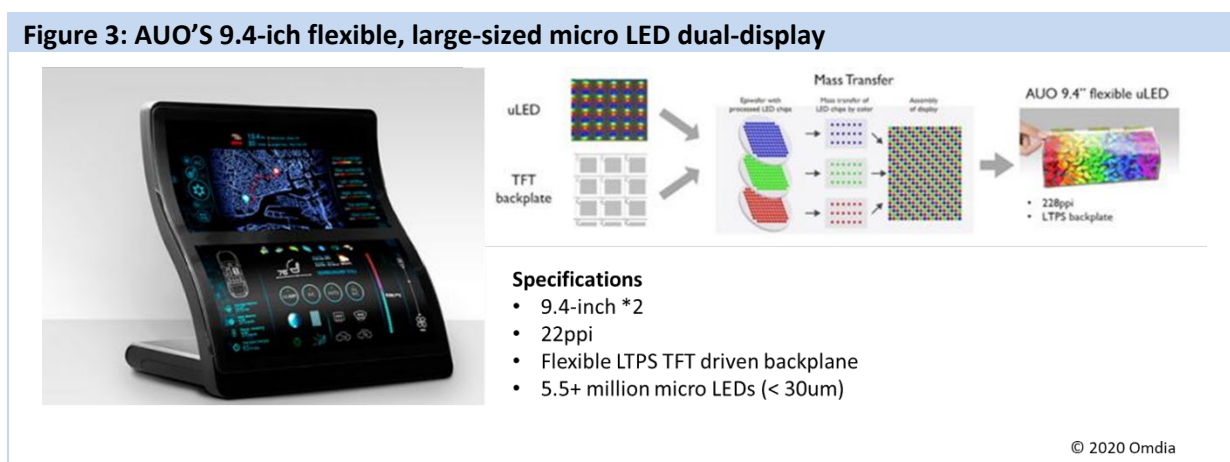


Source: Omdia

AUO introduced a 9.4-inch flexible, large-sized micro LED duo display

Those used in automotive interiors are required to endure harsh environmental conditions, such as extreme temperatures, high humidity, and prolonged UV exposure. OLED is an organic-based display technology and needs several special designs to meet the requirements. The market is looking for another display technology, and micro LED is regarded as a potential advanced display technology for automotive. At the show, AUO, which worked with PlayNitride, introduced a 9.4-inch flexible, large-sized micro LED dual-display, which consists of two 9.4-inch panels combined into one. The panel features an ultra-high pixel density of 228ppi and is S-curved. AUO also showed another V-shaped, rigid micro LED display, combined with a 12.1-inch cluster display and a 12.1-inch center stack display.

Figure 3: AUO'S 9.4-ich flexible, large-sized micro LED dual-display



Source: AUO—photos taken by Stacy Wu/Omdia in the SID Display Week 2020, August 3–7, 2020

PlayNitride, a Taiwan-based micro LED solution provider, worked with Tianma and showed a 7.56-inch transparent, flexible, micro LED display.

Figure 4: PlayNitride’s micro LED display at SID 2020

7.56" flexible micro LED display

- 7.56 inches
- 720 x 480
- 114ppi
- RGB 3-color chip
- Flexible LTPS TFT LCD backplane

7.56" transparent micro LED display

- 7.56 inches
- 720 x 480
- 114ppi
- RGB 3-color chip
- Rigid LTPS TFT LCD backplane

What is PixeLED Matrix

(1) MicroLED Process → (2) Mass Transfer → (3) Cutting → (4) PixeLED Matrix

PixeLED Matrix Features

- Utilize MicroLED chips and mass transfer for express production
- Compatible to SMT Process
- Similar sorting / binning / repair capability as LED chips
- Achievable Technology of MicroLED on PCB
- With tiny MicroLED chip size, most of display can fill on black material to reach ultra high contrast
- PixeLED Matrix - 95% Mini LED - 75%
- Could fit to curved surface
- Reduce SMD pads from 64 pads to 16 pads

© 2020 Omdia

Source: PLAYNITRIDE—photos taken by Stacy Wu/Omdia in the SID Display Week 2020, August 3–7, 2020


AUO indicated that commercial micro LED products will hit the market in one to two years, and will be for consumer electronic applications (possibly wearables). The automotive display product is also under development. PlayNitride stated that its PixeLED Matrix would be approved in the second half of 2020 (2H20) for TV walls and automotive exterior lighting and that it aims to cut micro LED cost by 95% in five years.

Dual-cell LCD and LCD with mini LED–based backlighting are the transitioning products

Besides micro LED displays, Tianma showed a series of TFT-LCD solutions for automotive. Its ARCUS-CURVE LCD uses dual-cell dimming technology to achieve a high contrast ratio, while its LCD with mini LED–based backlighting is another way to accomplish thousands of dimming zones, high color gamut, and low-power consumption.

Figure 5: Tianma’s local dimming TFT LCD for automotive


Tianma’s 12.3” ARCUS-CURVE LCD display (curved dual-cell LCD)



Display Technology	LTPS
Resolution (Pixel)	2880*1080
PPi	250
Luminance (cd/m²)	750
Contrast Ratio	>30,000:1 (Dynamic CR)
Viewing Angle (U/D/L/R)	80/80/80/80
NTSC	100%
Radius (mm)	1000
Interface	eDP
Operating Temp.	-40℃~+85℃
Storage Temp.	-40℃~+90℃
Application	Automotive

■ ACBUS Display


The LCD uses a dual - screen dimming technology, to help achieve a contrast ratio > 30,000:1 and a seamless effect.



- Color panel CR = 1,000:1
- Monochrome panel
- ACBUS display CR=30,000:1

- High contrast ratio >30000:1
- Seamless
- Local dimming


Tianma’s 8” mini LED backplane LCD



Display Technology	Mini LED
Resolution (pixel)	1280*768
Luminance (cd/m²)	1000
Contrast Ratio	>10000:1 (Dynamic)
Viewing Angle (U/D/L/R)	80/80/80/80
NTSC	>100%
Interface	LVDS
Power Consumption	<8W (Average)
Operating Temp.	-40℃~+85℃
Storage Temp.	-40℃~+90℃
Application	Automotive

■ Mini LED

The display module consists of a TFT glass backplane with thousands of Mini LEDs, a color conversion film and TFT-LCD to achieve high dynamic contrast, excellent display effect and low power consumption.



- LCD
- Color conversion
- Mini LED Backplane
- Thousands of mini LEDs

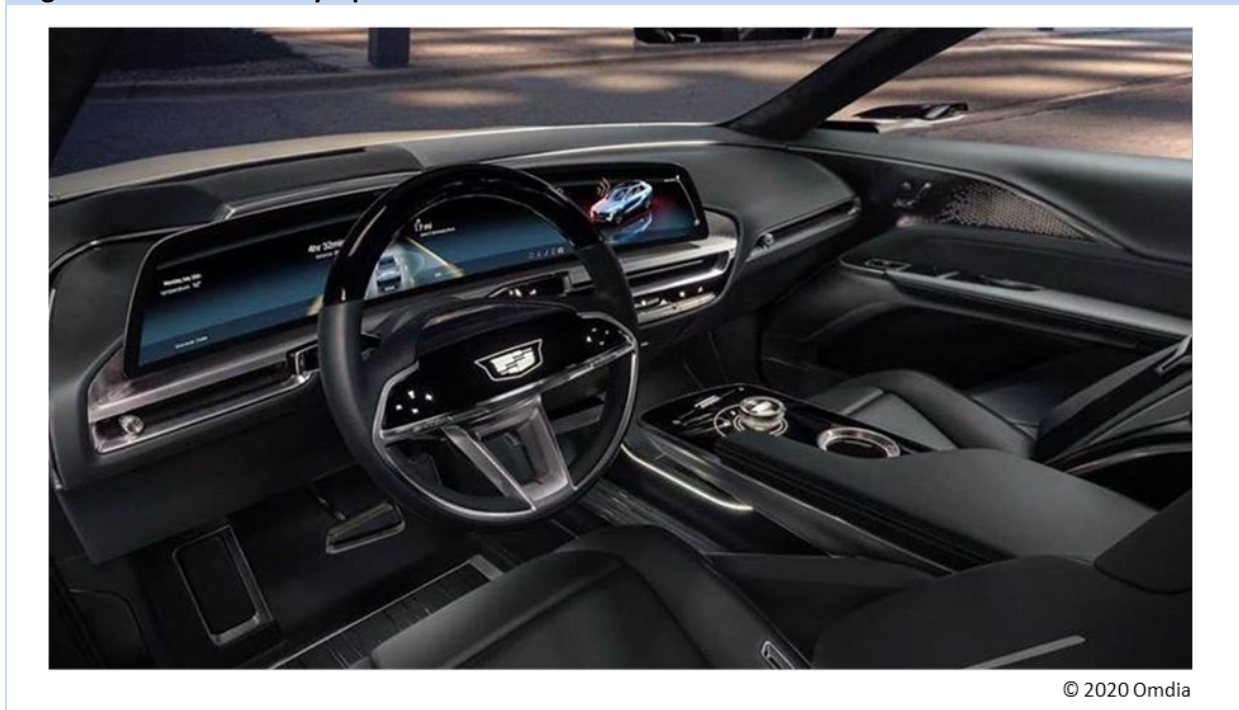
- Low power consumption : ↓ 50%
- High dynamic contrast >10000:1
- AM TFT glass substrate
- High color gamut

© 2020 Omdia

Source: TIANMA—photos taken by Stacy Wu/Omdia in the SID Display Week 2020, August 3–7, 2020

Innolux, which did not exhibit in this year’s Display Week, is the leading supplier of LCDs with active matrix (AM)-type, mini LED–based backlighting for automotive. The company has worked with General Motors since 2017. The latest release of General Motors—2023 Cadillac Lyriq EV—will be equipped with Innolux’s solution.

Figure 6: 2023 Cadillac Lyriq EV



Source: General Motors

Appendix

Further reading

Stacy Wu, *Automotive Displays at SID - 2020*, Omdia presentation, <https://technology.informa.com/625823/automotive-displays-at-sid-2020>

Stacy Wu, "Flexible OLED will take a small step into the automotive market late in 2019," Omdia Display Dynamics, <https://technology.informa.com/616728/display-dynamics-flexible-oled-will-take-a-small-step-into-the-automotive-market-late-in-2019>

Stacy Wu, "Four major trends will change the automotive display market in 2020," Omdia Display Dynamics, <https://technology.informa.com/625761/display-dynamics-four-major-trends-will-change-the-automotive-display-market-in-2020>

Stacy Wu, "Mercedes-Benz launches new MBUX in-vehicle system with flexible OLED screen and notch-design 3D LCD," Omdia Display Dynamics, <https://technology.informa.com/625724/display-dynamics-mercedes-benz-launches-new-mbux-in-vehicle-system-with-flexible-oled-screen-and-notch-design-3d-lcd>

Stacy Wu, "Virtual transparent A-pillar display allows Chinese panel makers to penetrate OLED automotive market," Omdia Display Dynamics, <https://technology.informa.com/619724/display-dynamics-virtual-transparent-a-pillar-display-allows-chinese-panel-makers-to-penetrate-oled-automotive-market>

Author

Stacy Wu, Principal Research Analyst, Displays
askananalyst@omdia.com

Citation Policy

Request external citation and usage of Omdia research and data via citations@omdia.com.

Omdia Consulting

We hope that this analysis will help you make informed and imaginative business decisions. If you have further requirements, Omdia's consulting team may be able to help you. For more information about Omdia's consulting capabilities, please contact us directly at consulting@omdia.com.

Copyright notice and disclaimer

The Omdia research, data and information referenced herein (the "Omdia Materials") are the copyrighted property of Informa Tech and its subsidiaries or affiliates (together "Informa Tech") and represent data, research, opinions or viewpoints published by Informa Tech, and are not representations of fact.

The Omdia Materials reflect information and opinions from the original publication date and not from the date of this document. The information and opinions expressed in the Omdia Materials are

subject to change without notice and Informa Tech does not have any duty or responsibility to update the Omdia Materials or this publication as a result.

Omdia Materials are delivered on an “as-is” and “as-available” basis. No representation or warranty, express or implied, is made as to the fairness, accuracy, completeness or correctness of the information, opinions and conclusions contained in Omdia Materials.

To the maximum extent permitted by law, Informa Tech and its affiliates, officers, directors, employees and agents, disclaim any liability (including, without limitation, any liability arising from fault or negligence) as to the accuracy or completeness or use of the Omdia Materials. Informa Tech will not, under any circumstance whatsoever, be liable for any trading, investment, commercial or other decisions based on or made in reliance of the Omdia Materials.



CONTACT US

[omdia.com](https://www.omdia.com)

askananalyst@omdia.com