



## PLAYNITRIDE - A Micro LED Industry Pioneer

May, 2023

Jonathan Chen, CS<sup>2</sup>O of PlayNitride (6854 TT)



**“As the courageous first mover, PlayNitride is at the frontier of Micro LED - the ultimate display technology. Based on our years of R&D, we will start showing how magnificent that our world can be displayed in a way that no one has ever experienced before.”**

Dr. Charles Li, Founder and Chairman of PlayNitride



Micro LED will start changing the display industry landscape since 2023.  
PlayNitride, **the world's first publicly-traded Micro LED company**, will be driving a decade-long paradigm shift in the global display technology.

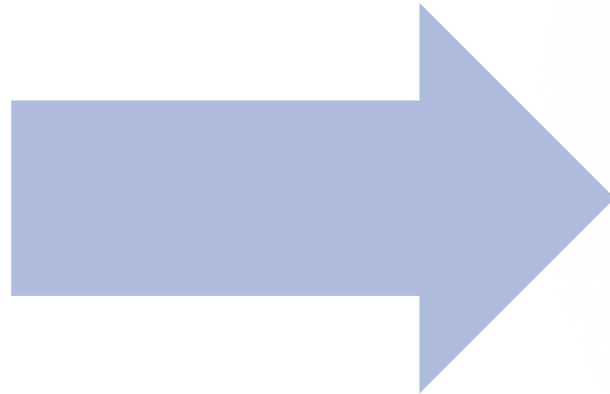
## OLED and LCD

BOE  
SAMSUNG



AUO  
INNOLUX

US\$310bn  
market cap



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# Outline

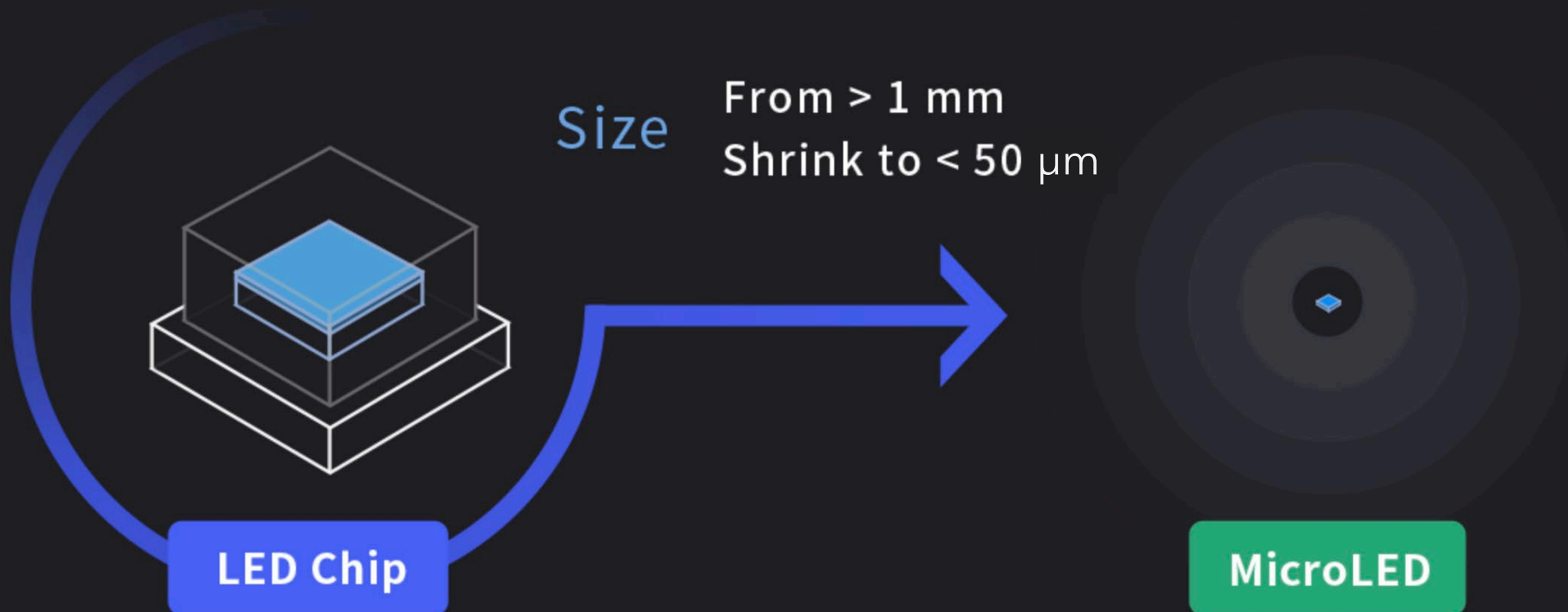
- I. What is Micro LED and Mass Transfer?**
- II. Micro LED – The Ultimate Display Technology**
- III. PlayNitride's Micro LED Leadership**
- IV. Appendix**

# I. What is Micro LED and Mass Transfer?



# LED Structure Miniaturization

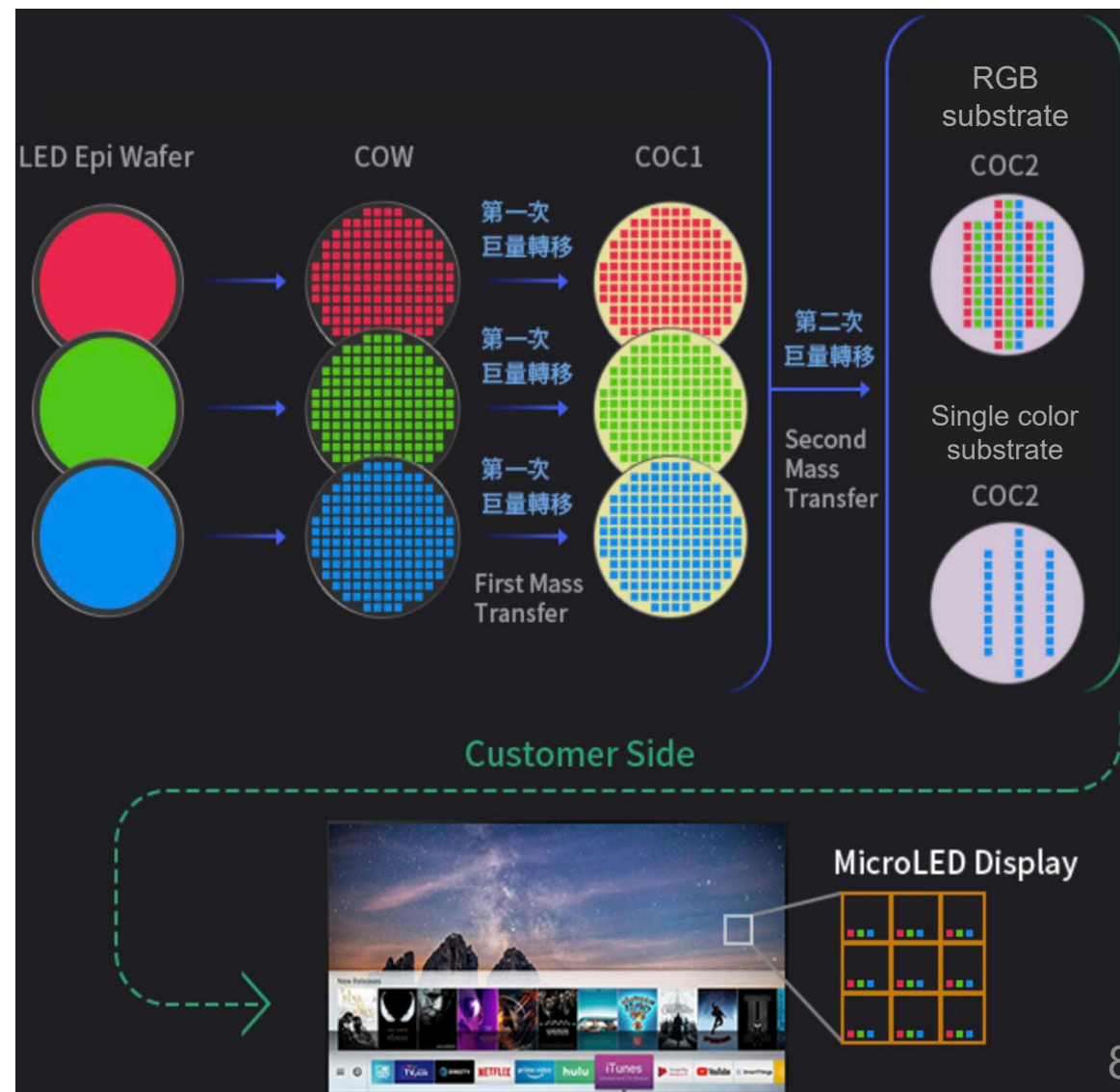
Micro LED, as the name suggests, is to miniaturize the structure of the LED by removing the LED package and substrate, so that the size of the LED device can be reduced to **less than 50 $\mu\text{m}$** . A major feature of Micro LED is that the LED substrate is removed, leaving only the epitaxial film, which provides the Micro LED chip that is light, thin and short. It can be used for mass transfer production and meet the pixel size of various displays.



# Mass Transfer and Chip on Carrier (COC)

During Micro LED display production, it is necessary to **mass transfer** the three-color chips of R/G/B from their respective epi wafers to the temporary substrate and arrange the chips to the correct **position** according to the pixel size of the display, so as to facilitate the process subsequent mass transfer process.

PlayNitride invented such already arranged temporary substrate called **Chip On Carrier (COC)**. COC has become the industry standard and a key process in Micro LED display production.



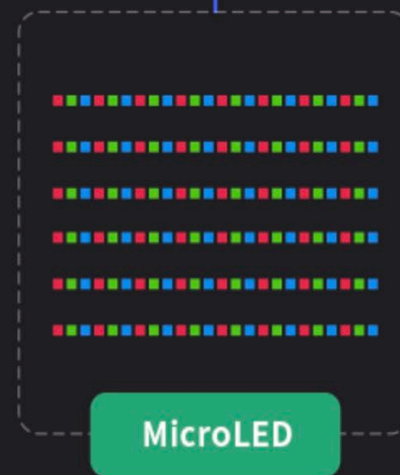
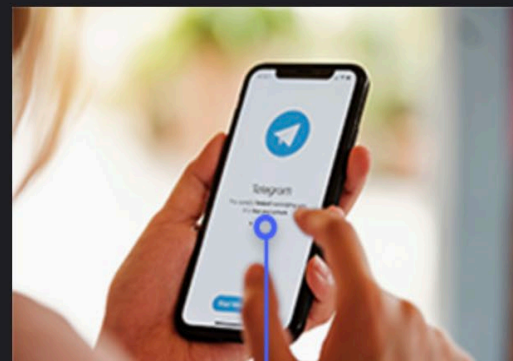


# **II. Micro LED – The Ultimate Display Technology**

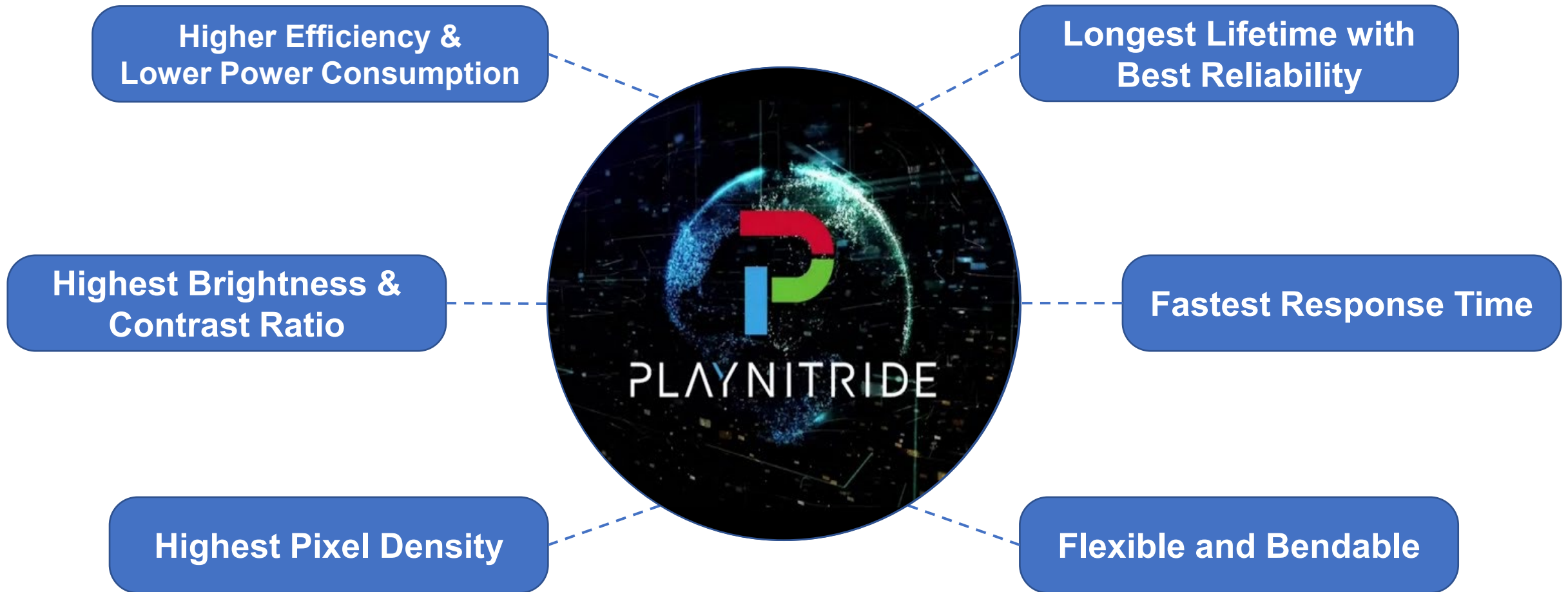
# Micro LED Display

The Micro LED display combines the technologies of **LED miniaturization and arraying**, and **directly mass transfers and bonds the Micro LED chips to the driving backplane**, which has circuit structure design.

Ordinary LEDs can only be used in large video walls due to their large size, while **micron-scale Micro LED chips can be used in watches, mobile phones, cars, computer screens, TVs, AR/VR and other applications in various sizes and fields.**


















# We Are The Best Performer of Micro LED Display



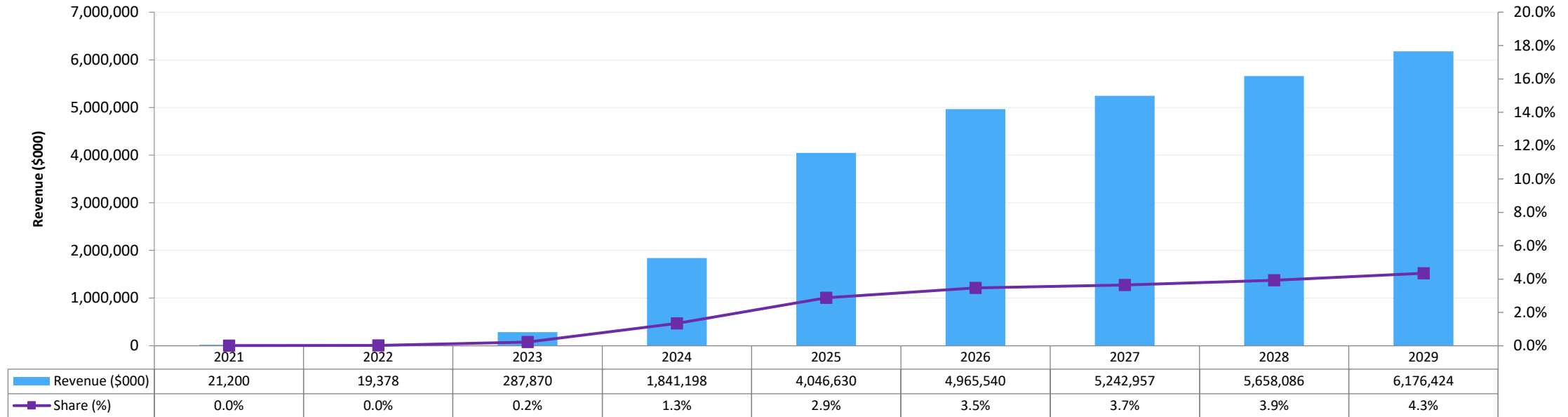


# Micro LED Display Is The Ultimate Display Technology

FEATURES	LCD	OLED	MicroLED
Self - Emissive	X	✓	✓
Contrast Ratio	5000:1	$\infty$	$\infty$
Life			
Response Time	ms	$\mu$ s	ns
Operating Temperature	 -40 ~ 100° C 	 -30 ~ 85°C 	 -100 ~ 120°C 
Power Consumption			
Viewing Angle	Low	Medium	High
Pixel Density	 Up to 1500ppi	 Up to 1000ppi	 Up to 6000ppi

# Micro LED Display Market: US\$6.2bn, 2029

Micro LED display revenue forecast (annual)



Annual revenue for Micro LED displays is about \$19.4mn in 2022 and is expected to reach \$287.9mn in 2023. Revenue from Micro LED displays will increase to **\$6.2bn in 2029** to account for **4.3%** of the total Flat Panel Display (FPD) revenue of \$143.6bn, with a **127.8% CAGR** during 2022–29.

Annual shipments of Micro LED displays are about 140 thousand units in 2022 and are expected to reach 382 thousand units in 2023. Shipments of Micro LED displays will increase to **12.7mn units in 2029** to account for **0.3%** of total FPD shipments, with a **410.7% CAGR** during 2022–29.



# Micro LED Displays Can Be Everywhere





# Micro LED TV at CES 2023



## Samsung Electronics unveiled its newest MICRO LED TV Lineup at CES 2023.

The 2023 MICRO LED lineup offers new models ranging from 50 to 140-inches (50, 63, 76, 89, 101, 114 and 140-inches) to provide consumers with a breadth of options for unparalleled picture quality and screen experience. Thanks to its modular nature, MICRO LED is not bound by shape, ratio and size, making it completely customizable to fit a consumer's desired set up. In addition, it comes without bezels, so regardless of configuration, the boundary between screen and real life is seamless.

In addition to the hardware innovations, the 2023 MICRO LED supports 20-bit greyscale depth. This means MICRO LED models can express every detail in a scene, offering the finest control with over 1 million steps of brightness and color levels, delivering a true HDR experience. It also expresses 100% of DCI and Adobe RGB color gamut, resulting in stunning, lifelike colors. Together with immersive design made possible by its 99.99% screen-to-body ratio, MICRO LED delivers revolutionary performance.

# Large-size Micro LED Display (Modular PCB)

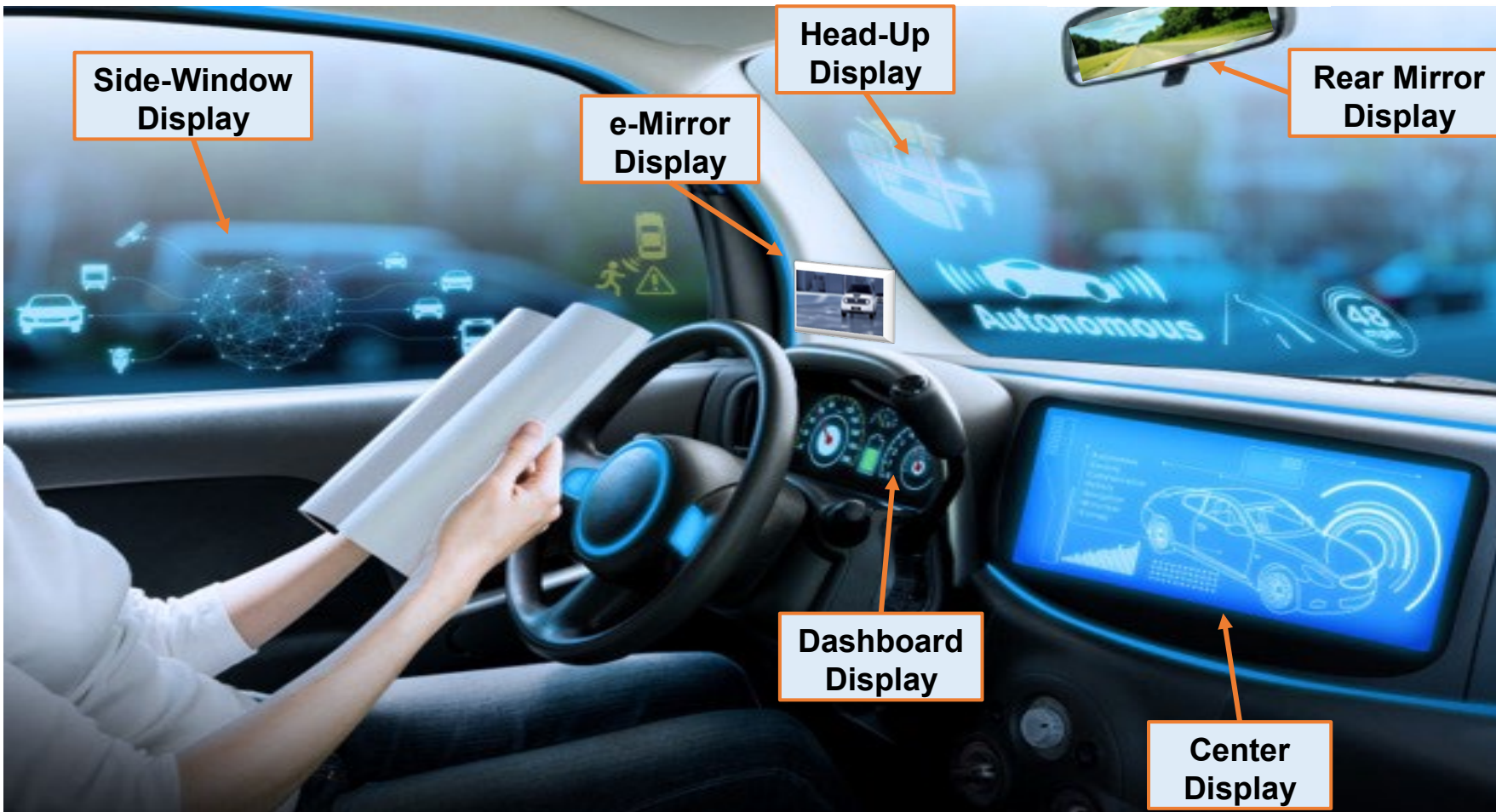


89" 5K 32:9 P0.43 Curved Micro LED Display





# Transparent Display Technology Is the Future of Automotive Display





# Micro LED Displays for Automotive

AUO



PIXELED  
Display

AUO



Micro LED Display

# Micro LED Displays for Automotive

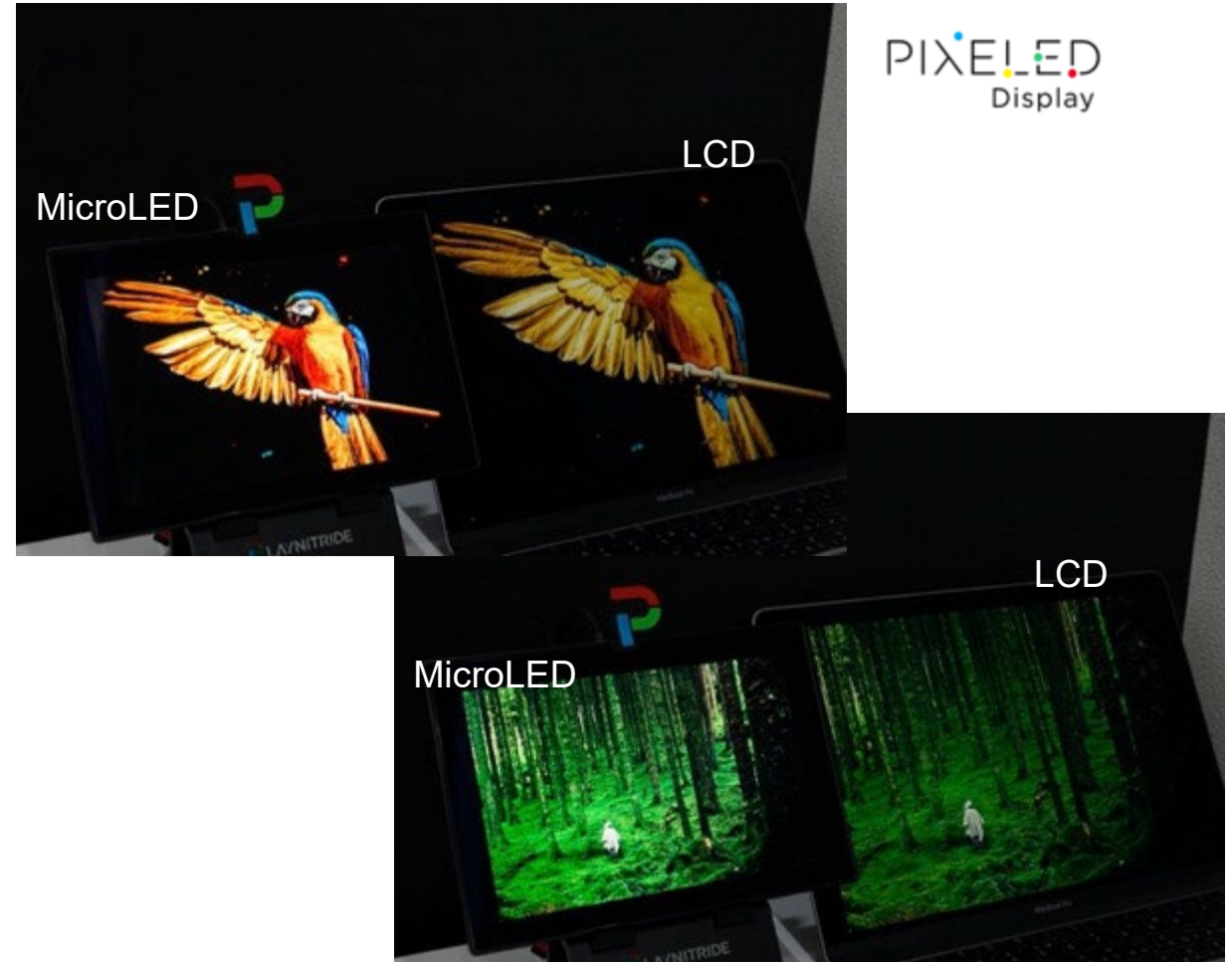
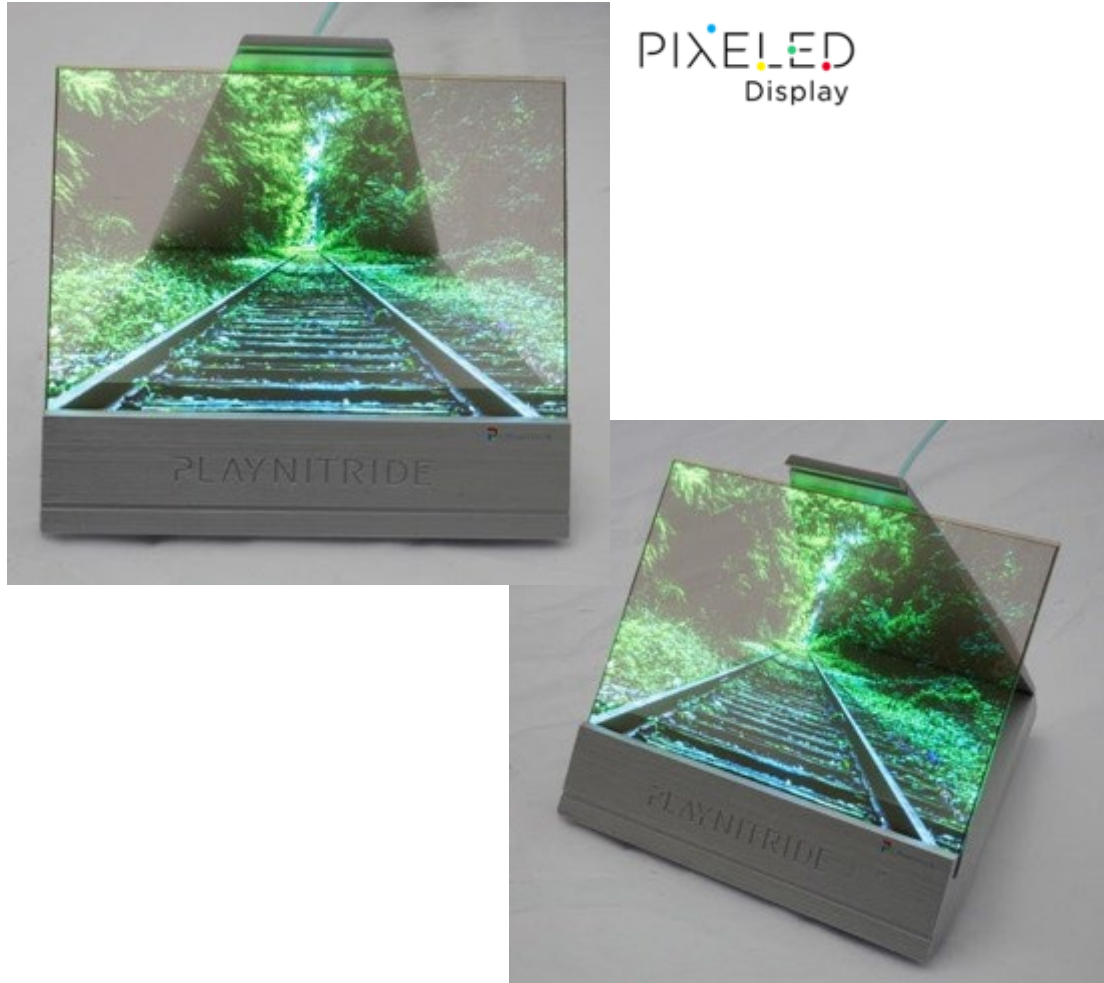


PIXELED  
Display



PIXELED  
Display

# Transparent and HDR Micro LED Displays



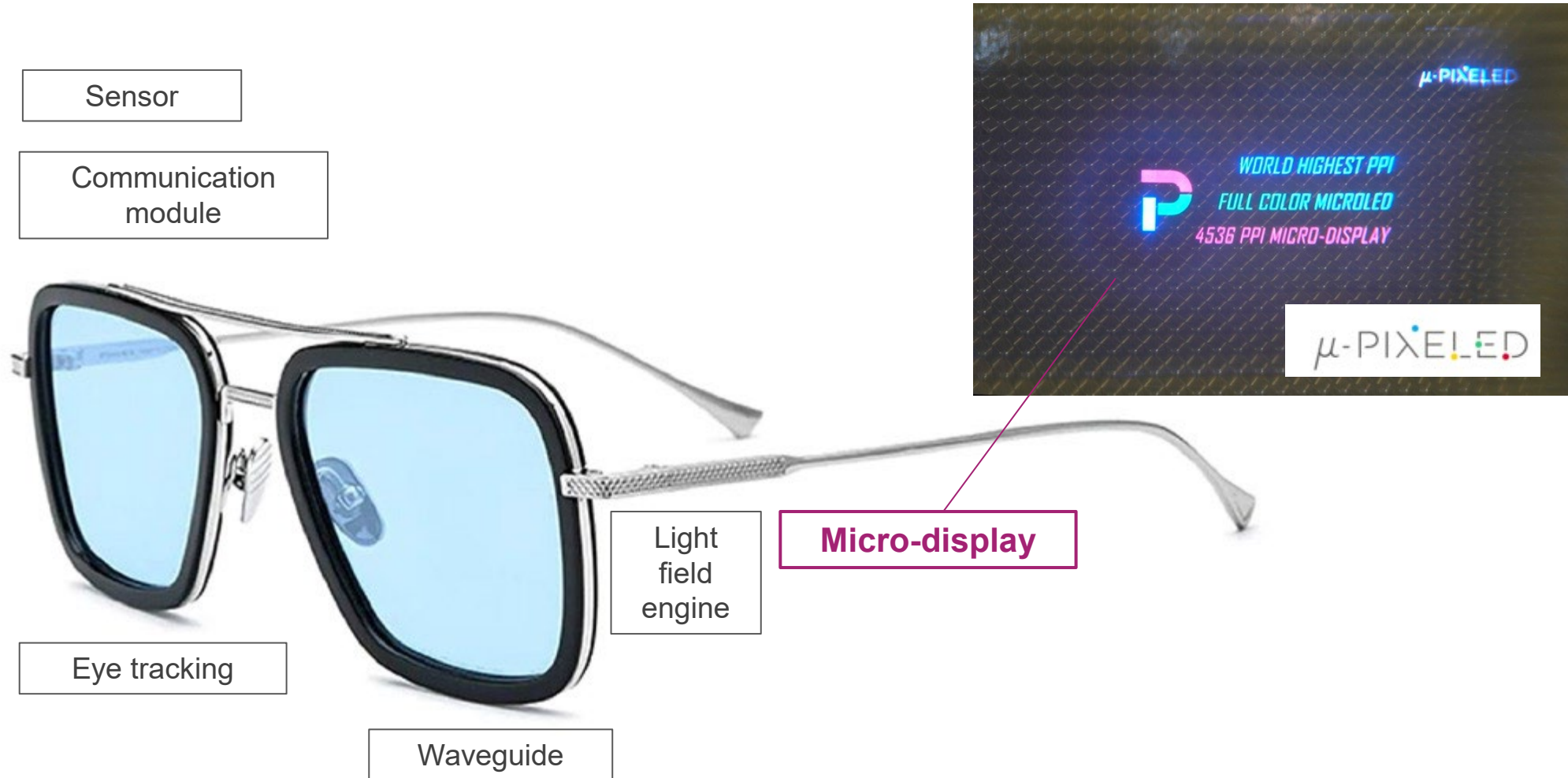


# Wearable Micro LED Display



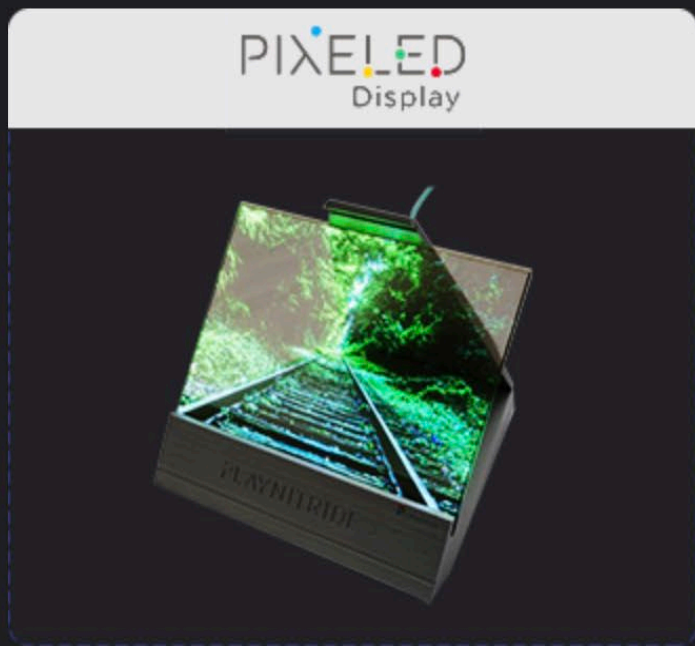
1.39" 338ppi Micro LED Circular Display

# Micro LED Micro-Display Is the Key for AR Glasses



# Driving Technologies Lead to Various Applications

## MicroLED on TFT



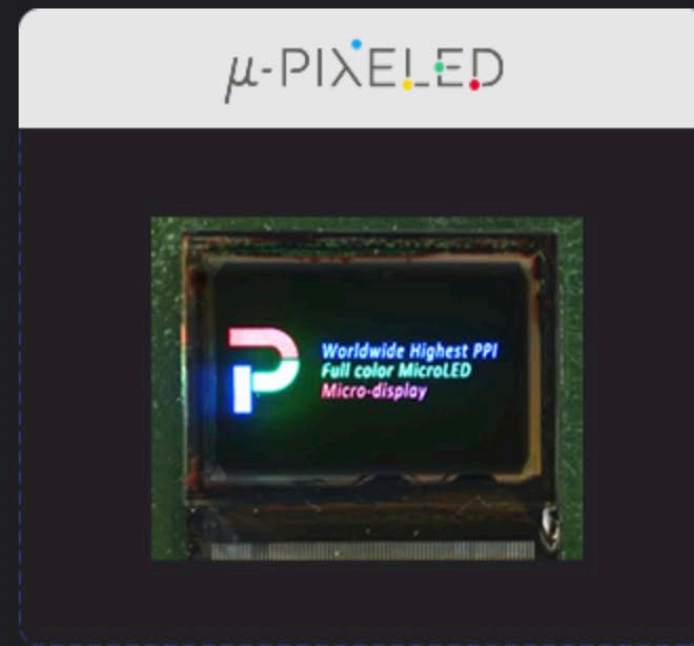
Using TFT-driven PixeLED Display technology, transparent displays, curved PixeLED Films, and various common display applications can be made.

## MicroLED on PCB



Using PCB-driven PixeLED Matrix technology, it can be borderless tiling into PixeLED Tile displays of any size and aspect ratio

## MicroLED on Silicon

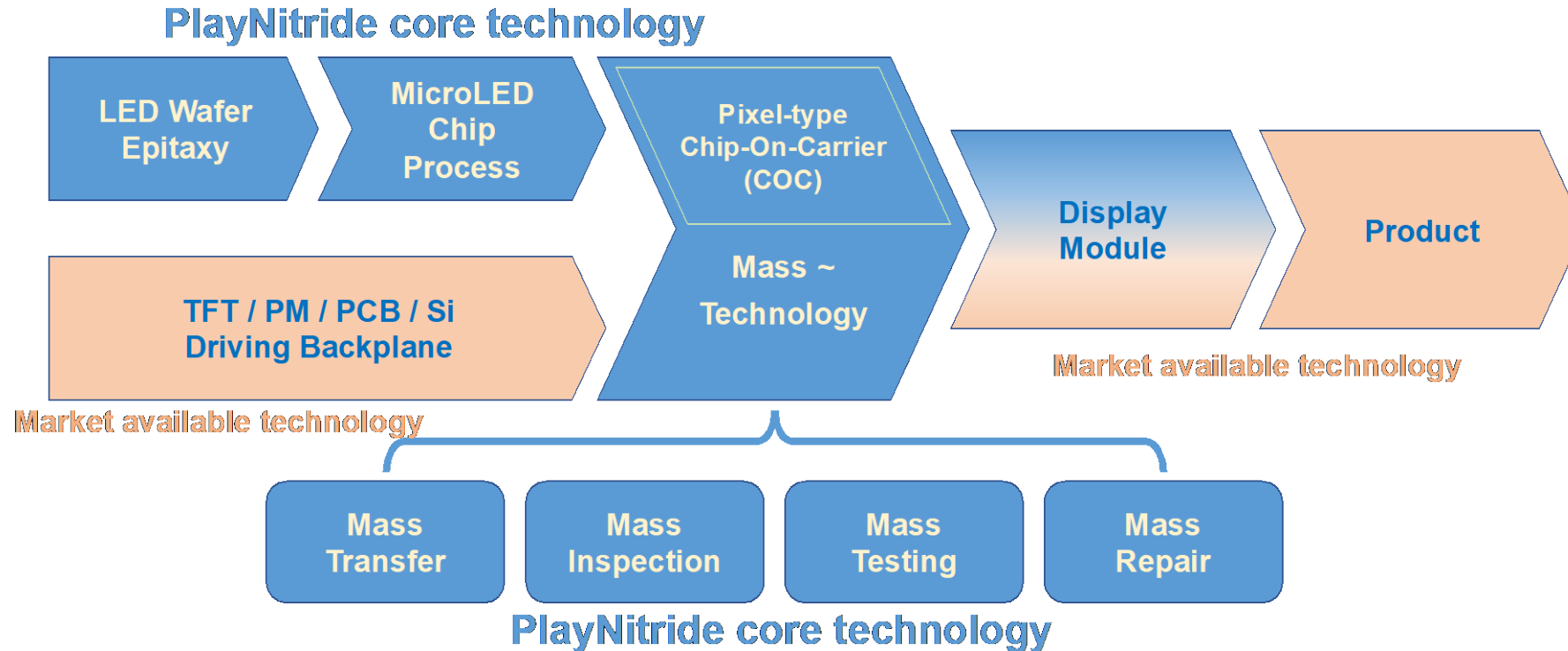


Using  $\mu$ -Pixel LED technology driven by silicon chip, with ultra-high brightness and ultra-fine picture quality, it can be used in AR glasses and projection HUD

# **III. PlayNitride's Micro LED Leadership**



# We Facilitate The Micro LED Ecosystem



- PlayNitride is one of the few companies that owns and integrates the key technologies of Micro LED displays. We've completed technical know-how to quickly optimize production and solve new technical challenges.
- In each technical link, PlayNitride has a strong team to innovate and develop our proprietary technology.
- PlayNitride is in a leading position in the market, and widely deploys patents and shortened learning curve.

# Core of R&D And Technical Advantages

## High uniformity 6-inch R/G/B LED wafer

- Uniform brightness across wavelengths, no need for binning

## High yield R/G/B Micro LED chips

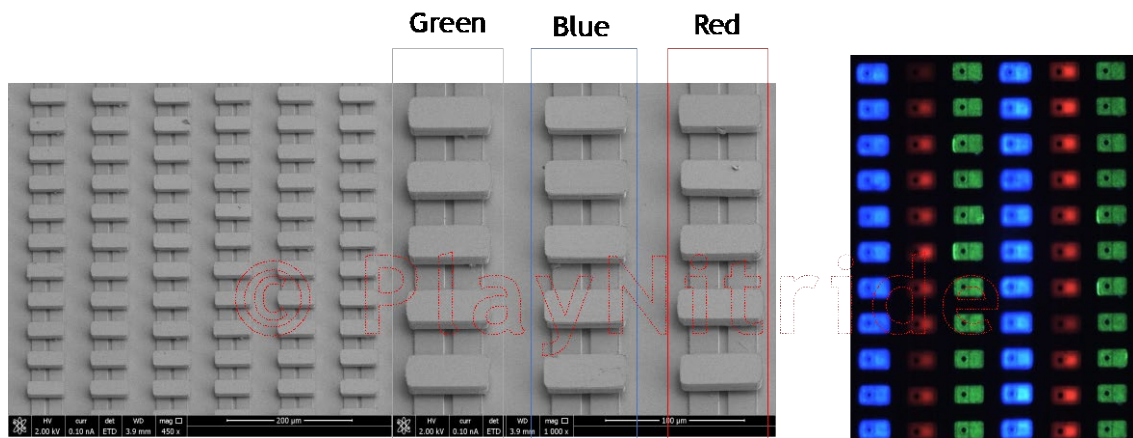
- Chip on wafer yield > 99%
- LED wafer utilization > 80%

## Industry-leading mass transfer, inspection and testing

- Self-made automatic mass transfer equipment
- Massive addressing repair technology

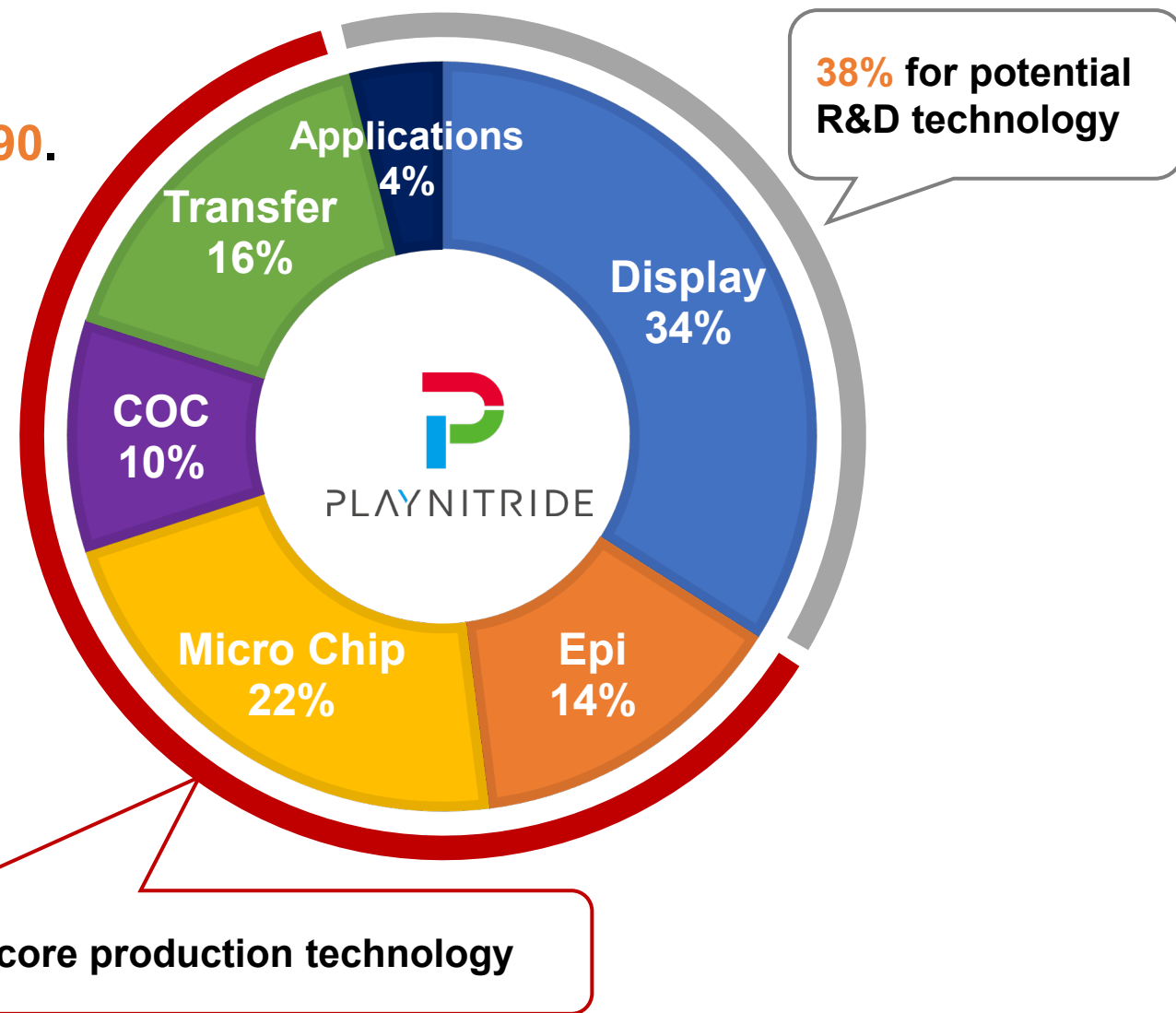
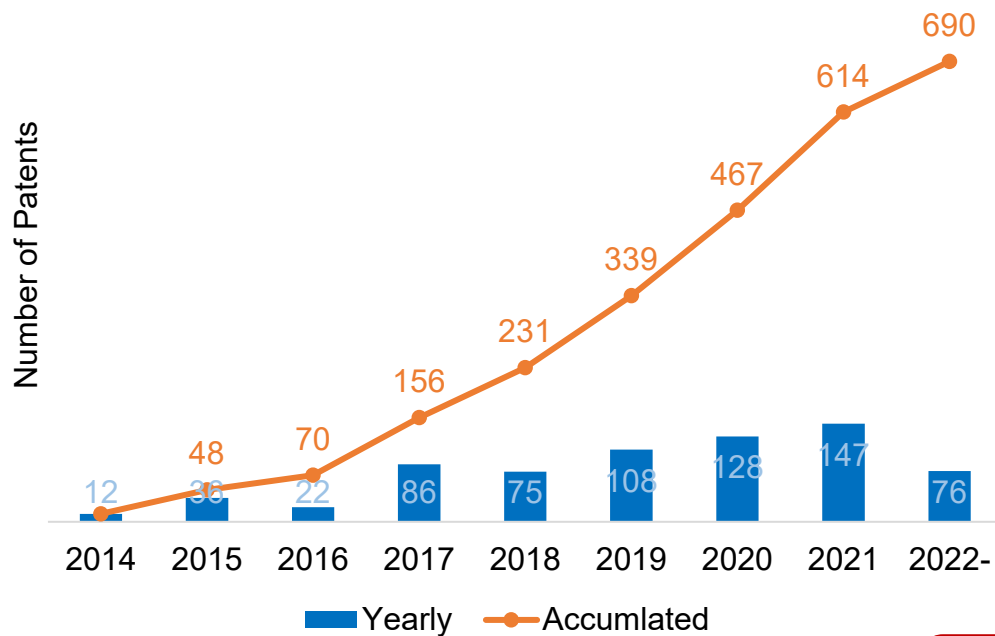
## Self-developed Micro LED one-stop solutions

- Cooperating with industry-leading panel display manufacturers
- Providing various Micro LED chips for various displays including ultra-micro, tiling, highly transparent and flexible Micro LED displays.
- Supporting customers design needs for different applications



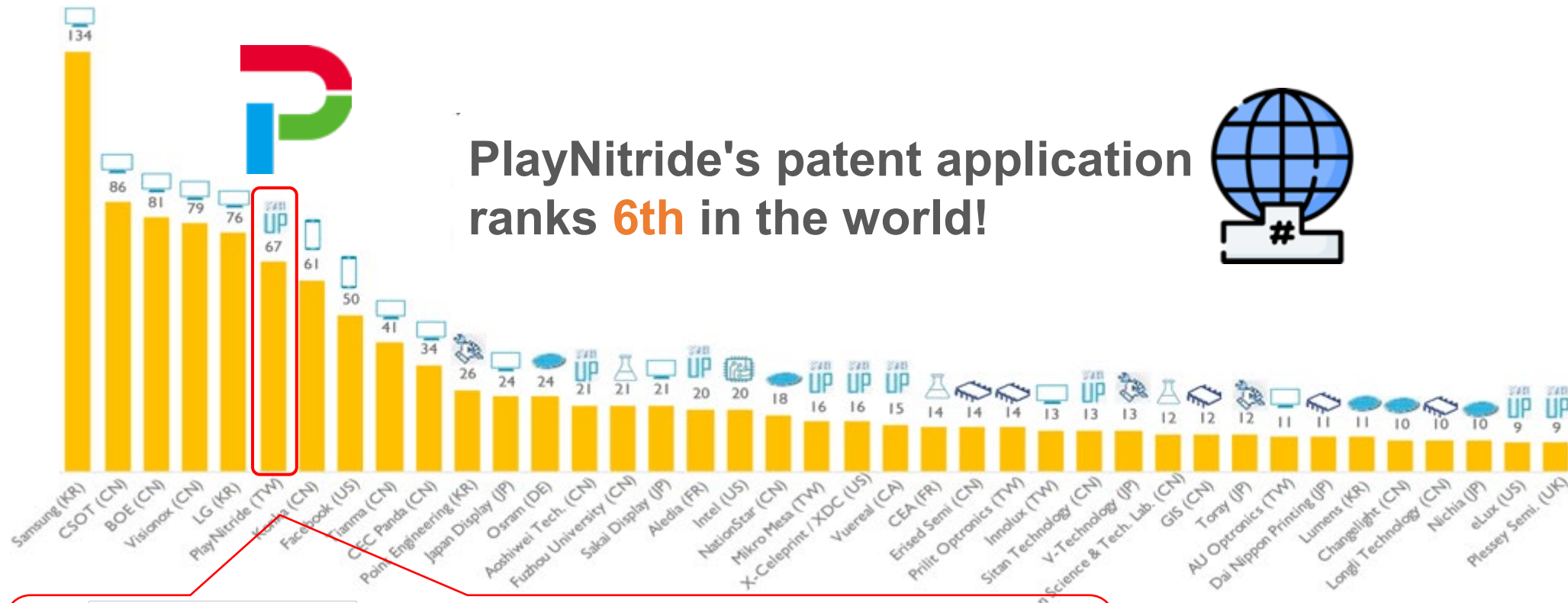
# Patent Portfolio

**PlayNitride** total patent applications reached **690**.  
Covering the entire Micro LED ecosystem.





# Global Patent Ranking



**Display Daily**

"PlayNitride is very active, challenging leading panel makers or OEMs like Facebook."

From Yole Développement  
《 MicroLED Displays Market, Industry and Technology Trends 2021 report 》

# Product Milestones



Pixel type Chip-on-Carrier of large displays

- Pilot run in 2022



Pixel type Chip-on-Carrier of commercial displays

- Pilot run in 2022



Pixel type Chip-on-Carrier of automotive displays

- Prototype demonstrated in 2022



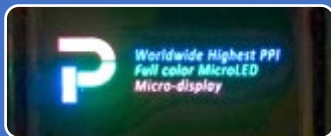
Flexible mid-size display for automotive

- Prototype demonstrated in 2022



Wearable display

- Pilot run in 2023



Micro-display for AR/VR

- Prototype demonstrated in 2022  
( 2022 SID Best New Display Technology Award)



**PLAYNITRIDE**

Q&A Session



Website