

# MicroLED Association

## White paper: MicroLEDs for Automotive HUDs

Non-member summary  
May 2026



# **MicroLED HUDs – White Paper and Discussion**

By the MicroLED Industry Association (MIA)

This is the open-access edition, providing an introduction to HUDs, and the different display engines that can be utilized. The full white paper is available for MicroLED Industry Association members only, and includes a detailed status report on microLED microdisplays for HUDs, roadmaps, a system-level constraints analysis, and more.

*This report was written by the **MicroLED Industry Association**, a collaborative consortium that aims to support the adoption of microLED display technologies. The Association brings together companies, academia and organizations active in the MicroLED space and provides a forum for solving common technology issues, fostering cooperation and sharing relevant information, resources and tools*

A heads-up display (HUD) provides an interface that presents important information for the viewer, without the need to divert the gaze. For the automotive industry, HUD displays are important as they can improve driving safety. HUD sales are growing and microLED displays could provide the next-generation display technology of choice for HUD developers.

# An introduction to Automotive HUDs

## Automotive HUD history and current market

HUD displays started, as many technologies do, in the defense sector, and specifically in military aviation – as early as in the 1960s. In the consumer automotive sector, the first commercial car to adopt an HUD was the 1988 Oldsmobile Cutlass Supreme.

HUD sales have grown steadily over the years, despite the technology never achieving widespread adoption in the automotive industry, due to challenges such as cost and volume requirements.

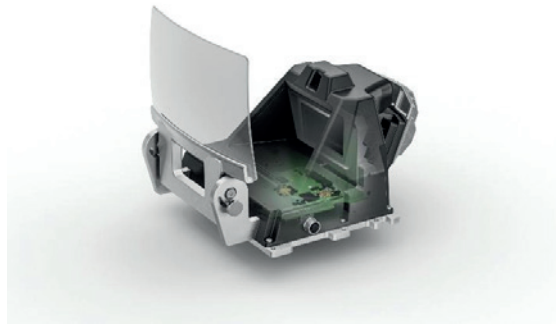
While not becoming a widespread display technology for many years, there has been substantial growth, and it is estimated that in 2024, sales of HUD systems reached around \$1.5 billion globally, and some analysts expect a growth of around 15% in the future, especially as the automotive industry evolves into higher adoption of EVs and autonomous vehicles.

## How do HUDs work?

An HUD is made from two main components:

- \* The image generator, which is a display panel that generates the image. This is usually referred to as the Picture Generation Unit (PGU).
- \* An optical system, usually a series of mirrors that magnify, and direct the image

The final image is projected onto the windshield, to be in front of the driver directly. In some systems, the image is projected into a separate combiner screen and not directly on the windshield.



*An HUD system (Continental)*

## How HUDs contribute to driving safety

The primary idea behind HUDs is to increase driving safety, and reduce the driver's cognitive load. Research indicates that over 90% of road fatalities stem from human error, with visual distraction playing a central role. By positioning speed, navigation, and advanced driver-assistance system alerts within the driver's natural field of view, HUDs eliminate the 0.3-0.5 second accommodation time required when shifting focus between instruments and the road. This continuous line-of-sight maintenance translates into measurably faster reaction times and reduced collision risk.

## HUDs – market landscape in early 2026

According to analysts, the total HUDs amounted to around \$1.5 billion in 2024, and it is growing at an estimated 10-15% CAGR. It is estimated that EVs increase adoption of HUDs, as displaying battery information, range estimation, and charging infrastructure data can relieve range-related anxiety.

Similarly to many automotive components, the HUD supply chain is concentrated around a small number of main suppliers (led by Nippon Seiki, AUMOVIO (Continental), Denso, Panasonic automotive, Visteon Corporation, Harman International and Valeo).

## Current HUD display engine technologies

The main vectors for HUD displays are:

- \* Very high brightness
- \* Optical efficiency: minimizing power consumption while achieving very high brightness
- \* Form factor: Reducing volume for dashboard integration
- \* Field of view
- \* Display latency (refresh rate)

Current HUD solutions use one of five possible display engine technologies, with microLEDs presenting the next-generation solution, soon to reach the market.

- \* LCD
- \* DLP (Reflective micromirror arrays)
- \* LCOS (Reflective LC on CMOS)
- \* MEMS Laser Scanning (Pixel-by-pixel laser projection)
- \* OLEDs

In the following sections we quickly describe the different current display engine technologies.

### **LCD**

LCD displays, based on TFT backplanes (as opposed to LCOS which are LCDs on CMOS), are today's most common display technology, which offers good performance, an established supply chain - and a very low cost. The basic architecture of LCDs is a white LED backlighting unit, and a layer of transmissive liquid crystals that modulate the light's polarization.

While LCDs are common and easy to produce, they suffer from a relatively poor image quality (due to the constant backlighting), limited display density (resolution), optical and power inefficiency, and, especially, a limited contrast (due, again, to the backlighting).

### **DLP**

DLP (Digital Light Processing, a Texas Instruments patented technology) utilizes an array of small micromirrors on a chip that reflect LED or laser light. DLP displays offer excellent image performance and high contrast and are highly efficient. DLPs are also considered to be highly reliable and proven in large projector applications such as cinema displays.

DLP HUD display engines, however, suffer from several drawbacks. First of all, the chip itself is large and requires complex aspherical optics to match windshield curvature. It is also much more expensive than LCDs (about 3 to 4 times).

### **LCOS**

Liquid-Crystal on Silicon (LCoS) displays are similar to LCDs, but in these displays the frontplane is directly deposited on a high-end CMOS backplane, thus enabling much higher performance compared to LCD-TFTs, including a higher display density.

LCOS technology still suffers from poor contrast (due to the backlighting) and optical challenges due to the polarization inherent in LCD displays. LCOS is a mature technology, and while it is higher in cost compared to LCDs, it is still relatively affordable. Most premium HUD applications that require fine text rendering adopt LCOS display engines thanks to their superb resolution.

### **Laser Beam Scanning (LBS)**

In an LBS display, a single laser beam is used, with a raster scanning mirror (or two mirrors in some solution), creating one pixel at a time. Laser based systems offer high efficiency and brightness, very high contrast, and a compact footprint without the need for projection optics.

LBS solutions, however, suffer from speckle noise that arises from interference patterns from coherent laser light. While some technologies have been deployed to reduce the speckle, this is still noticeable in LBS based displays.

### **OLED**

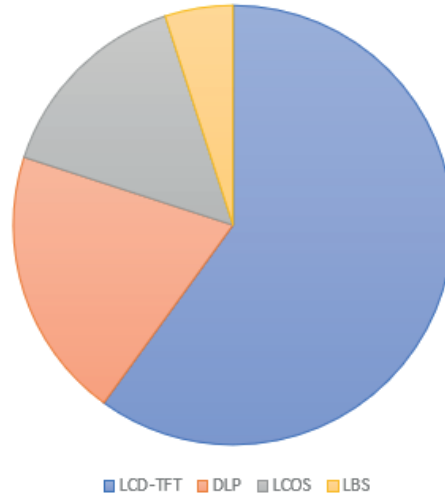
OLED displays, made from a stack of organic materials, have seen great success in replacing LCDs in many display applications, including smartphones, wearables, IT devices, TVs, and in automotive displays.

OLED microdisplays can be seen as comparable to LCOS displays, as these are also produced directly on CMOS backplanes. OLED microdisplays offer an improved image quality (much higher the contrast) and a smaller footprint (no need for backlighting), but suffer from the organic materials' poor durability (limited lifetime and temperature operating range). OLEDs are also limited in peak display brightness.

While OLED displays and microdisplays have seen a dramatic increase in performance over all key metrics in the past ~10

years, they haven't been adopted in any meaningful commercial automotive HUD solution.

2025 Automotive HUD estimated market share by display engine technology



## Early 2026 – HUD market share by technology

In a rough estimate, the HUD automotive market by display engine technology is still dominated by LCDs, with an estimated market share of around 60%.

The second most popular technology is DLP, which is a leader in premium/high-end AR-HUD deployments. DLP holds an approximate market share of around 20% of all HUD sales.

LCOS, at the third place, holds a market share of around 15%, while LBS is the minority technology with a 5% market share (but with a projected rapid growth).

## MicroLED for automotive HUD

MicroLED is a next-generation display technology that is highly promising due to its strong performance:

- \* High image quality, on par with the best OLED displays, offering high contrast, vivid colors, and fast refresh rates
- \* Extremely high brightness
- \* Very high pixel densities (resolution)
- \* High power efficiency, only lit pixels draw power
- \* High durability – long lifetime and a wide operation temperature range

# Member Directory

#Lasers, #Production equipment,  
#Mass transfer, #Inspection & repair



## 3D-Micromac

Laser equipment for  $\mu$ LED forward transfer, lift-off and repair process steps - ready for high volume production

Germany-based 3D-Micromac AG is the industry leader in laser micromachining and roll-to-roll laser systems. The company develops and manufactures processes and laser systems delivering powerful, user-friendly and leading-edge processes with superior production efficiency.

3D-Micromac systems and services have been successfully implemented in various high-tech industries worldwide. This includes semiconductor, photovoltaic, glass and display industry, electronics, as well as medical device technology.

For microLED display manufacturing, 3D-Micromac offers industrial laser solutions for mass production:

- Laser-Induced Forward Transfer (LIFT) which enables the transfer of hundreds of millions of microLEDs without having to apply mechanical forces
- Laser Lift-Off (LLO) which guarantees a highly uniform, force-free lift-off of different layers on wafer and panel substrates
- REPAIR: Single die repair process at every step of the microLED production process

<https://3d-micromac.com/>

#Materials & technologies #LED epiwafers



## Advanced View Technology

MicroLED wafers, display modules and foundry services.

Advanced View Technology was established in 2019 in Korea to develop microLED display technologies, based on submicron-sized high efficiency LEDs.

Advanced View offers microLED wafers, complete fabricated microLED display modules (using its own electrofluidic assembly technology), and various foundry services.

<http://www.advancedviewtech.com/>

#Microdisplays, #LED epiwafers



## ALEDIA

Aledia is a start-up company established in 2021 in the Grenoble area (France) to develop GaN nanostructure-based LEDs for Display applications. It has 220 people (30% PhDs), has more than 250 patent families granted or in application, and has raised €270M in four financing rounds.

Aledia has two nanowire LED platforms, one based on blue GaN nanowires on 8-inch wafers, and the second that utilizes RGB LEDs. The company targets a wide range of markets, from AR microdisplays to TVs and videowalls.

Aledia has built a factory near Grenoble (France) for high volume epitaxial growth and low volume LED processing manufacturing; high-volume manufacturing capacity is being implemented in different countries including in Asia, closer to the market.

<https://www.aledia.com/>

#Materials & technologies, #LED epiwafers



## GaN on Silicon microLED epiwafer supplier

ALLOS Semiconductors is a leading supplier of GaN-on-silicon epiwafers for microLEDs, for AI interconnects and display applications.

ALLOS operates fabless, leveraging a global network of qualified contract manufacturers and specialist suppliers. This allows the company to respond quickly to fast-growing markets and to offer flexible scaling options, including onshoring and on-site manufacturing.

<https://www.allos-semiconductors.com>

#MicroLED research



## CEA Leti

One of the world's largest microelectronics and nanotechnology organizations

CEA-Leti is a non-profit research institute based in Grenoble, France. CEA-Leti is one of the world's largest microelectronics and nanotechnology organizations.

Leti is developing micro LED displays, with a focus on high-performance microdisplays. Leti has implemented this LED technology to manufacture high-brightness uLED arrays hybridized on silicon circuit with a 10-um pixel pitch and the institute manufactures blue and green arrays offering a brightness of 107 cd/m<sup>2</sup>.

<http://www.cea.fr/english>

#Materials



## Brewer Science

Brewer Science develops and manufactures advanced materials, processes, and equipment that enable the reliable fabrication of cutting-edge microdevices for the semiconductor, electronics, and sensor industries.

For the MicroLED industry, Brewer Science offers its advanced hybrid bonding materials and solutions. The company offers both permanent and temporary bonding materials.

<https://www.brewerscience.com/>

#Lasers, #Production equipment,  
#Mass transfer



## Coherent

Laser-based solutions for the microLED industry: from a single laser source up to LLO, LIFT and repair systems

Coherent makes the amazing possible using the power of light. Performance, quality, and a global expert network support our customers in scientific, medical, electronics, and manufacturing markets.

MicroLEDs represents an exciting opportunity, potentially lowering the costs for very large area displays as well as some small area display applications. High energy, ultraviolet lasers are the key to success to cut production costs, increase throughput, and improve quality. Coherent provides several solutions from a single laser source, optical systems up to an integrated system for the three vital processes in MicroLED fabrication: Laser Lift-Off (LLO), Laser-Induced Forward Transfer (LIFT), and Repair/Trimming. Coherent also covers more process steps of the entire MicroLED production chain from laser cutting by ultrashort pulse lasers to Laser Assisted Bonding (LAB) by diode lasers.

<http://www.coherent.com/>

#Materials & technologies, #LED epiwafers



## Comptek Solutions

Develops quantum technology that boosts the performance of devices such as microLEDs and lasers

Founded in 2017 as a spin-off from the university of Turku, Finland, Comptek Solutions develops quantum technology (branded as Kontrox) that boosts the performance of devices such as microLEDs and lasers and makes their manufacturing process easier by solving the problem of aggressive oxidation of compound semiconductor materials.

Kontrox results in a high-quality passivation layer with substantially reduced defect densities that help to greatly decrease the surface recombination phenomena which is a predominant mechanism for such small devices.

Comptek says that MicroLED efficiencies increase significantly with Kontrox, the company has demonstrated up to 250% EQE (external quantum efficiency) improvements.

<http://www.comptek-solutions.com>

#microLED Displays



## Crystal Matrix

India's first microLED display developer

Crystal Matrix is embarking on a journey to become a leading next-generation LED display maker.

In 2026, Crystal Matrix launched a government-supported \$336 million project to build an LED display fab in Gujarat, that will produce a 6-inch GaN microLED and miniLED wafers, and will utilize these to produce mini-LED and micro-LED displays.

<https://www.crystalmatrix.in/>

#Production equipment  
#Materials & technologies



## Element 3-5

Novel low-temperature in-line GaN deposition

Germany-based Element 3-5 develops production equipment based on a novel low-temperature in-line deposition technology for the production of wide-bandgap semiconductors.

The company's technology can be used to deposit and pattern AlN and GaN (LED stacks) on large-area substrate.

<https://www.element3-5.com/>

#Materials & technologies



## Corning

Corning develops and produces specialty glass, ceramics, and related materials and technologies including advanced optics, primarily for industrial and scientific applications. For the display industry, Corning supplies both rigid and flexible glass substrates, glass carriers and cover glass.

Together with its customers, Corning evaluates opportunities in the microLED industry, where a glass solution aligns with its deep materials science expertise.

<https://www.corning.com/>

#Mass transfer



## eLux

Massively parallel fluidic assembly of microLED displays

eLux Inc. was established in 2016 in the USA as a spin-out from Sharp Labs of America. eLux expertise and intellectual property development focus on the massively parallel assembly processes that enable low cost manufacturing of microLED displays.

<https://www.eluxdisplay.com/>

#MicroLED Research  
#Mass transfer



## ETRI

Korea's national research institute

ETRI is Korea's national research institute conducting advanced R&D across ICT, semiconductors, AI, and digital technologies.

Among its diverse research areas, ETRI is advancing MicroLED displays through SITRAB (Simultaneous Transfer and Bonding), a laser-assisted technology enabling high-throughput, precise, and scalable MicroLED integration.

<https://www.etri.re.kr/eng/main/main.etri>

#Materials & technologies,  
#MicroLED Research



## Fraunhofer IZM

One of the world's leading institutes for applied research and the development and system integration of robust and reliable electronics

For 30 years, more than 440 employees have been finding technological solutions in cooperation with partners from industry and academia. Emerging challenges are addressed in branches such as automotive and industrial electronics, medical engineering, ICT and semiconductor technology.

Our technologies connect the individual components, protect components and devices from vibration and moisture, and reliably dissipate heat. Fraunhofer IZM thus ensures that electronic devices continue to function reliably in even the harshest conditions. Modern packaging technologies make developing smaller and smaller products possible. We process ICs thinner than a sheet of paper. The institute, founded in 1993, disposes of a lab area of over 8,000 sqm. About 80 percent of our turnover in 2021 was earned through contract research.

<https://www.izm.fraunhofer.de/en.html>

#LED Epiwafers



## Hexagem

Patterned mask-base growth of high quality GaN microLEDs on Silicon wafers

Hexagem AB was founded in 2015 as a spin out from Lund University and the research directed by Professor Lars Samuelson on GaN coalescence technology.

Hexagem is focused on the microLED industry, and develops technology to grow small 1-micron (or below) nano-LED microLED platelets, that offer high efficiency and high brightness, and the ability to deposit all three colors on the same wafer.

<https://www.hexagem.se/>

#Microdisplays



## Hongshi

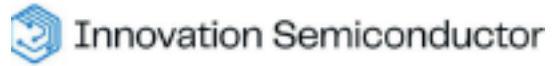
MicroLED microdisplay chip, panel and light engine producer

Founded in 2017, Hongshi Intelligent Technology Co., Ltd. (HS-MicroLED) is a global pioneer in the R&D and mass production of MicroLED micro-display chip, panel and light engine.

As one of only two companies worldwide to achieve sustained commercial-scale shipments, Hongshi operates a full-value-chain platform—from 8-inch silicon-based CMOS bonding to advanced module integration.

<https://www.hongshizn.com/en/>

#Materials & technologies,  
#LED epiwafers



## Innovation Semiconductor

Innovation Semiconductor has developed novel technologies to facilitate higher yield fabrication of microLEDs and microLED displays of improved performance.

The company's patented and patent pending advances enable monolithic fabrication of LEDs and transistors without mass LED transfer. The prototype color-tunable LEDs based on novel architectures offer full native color without conversion, single LED pixels for high resolution, high efficiency (including red) and compatibility in existing process flows.

<https://www.innovationsemi.com/>

#LED epiwafers  
#Materials & technologies



## Ingantec

Novel red, green and blue high-efficiency microLED InGaN deposition technology

Ingantec, established in 2022 in the US, develops next-generation microLED solutions based on novel GaN technologies. Ingantec focuses on the development of small-size, highly efficient GaN red microLED devices.

In March 2024, Ingantec announced an exclusive patent licensing agreement with the University of California Santa Barbara (UCSB), that cover innovative systems and methods to deposit devices using MOCVD and other processes.

<https://www.ingantec.com/>

#Microdisplays



## Innovision Technology

MicroLED microdisplay producer

Centered around the VSP (Vertical Stacked Pixel) solution, Innovision develops, produces, and sells GaN on Si based Micro-LED micro-displays, modules, and optical engines, following its "Chip, Display, Lighting, All in One" strategy.

Operating under the IDM model, Innovision has full control over product design, R&D, production, assembly, and testing.

<https://en.innvist.com/>

#Inspection & repair



## Instrument Systems

Develops and produces high-end light measurement technology, (AR/VR) displays, mLED wafers, VCSEL/laser systems, automotive lighting and LED/SSL modules.

Instrument Systems GmbH, founded in Munich in 1986, develops and produces high-end light measurement technology that is indispensable for the manufacturers of consumer electronics, (AR/VR) displays, mLED wafers, VCSEL/laser systems, automotive lighting and LED/SSL modules. All solutions benefit from our CAS series of high-precision spectroradiometers that are recognized and in use all over the world. In combination with 2D imaging colorimeters, integrating spheres and goniometer systems, they enable high-precision and accurate measurements in the entire range from UV to IR, traceable to PTB or NIST.

Today, Instrument Systems is one of the world's leading manufacturers of light measurement technology. At its Berlin facility, the "Optronik Line" of products is developed and marketed for the automotive industry and traffic technology. Our subsidiary in Korea supplements the product portfolio with the "Kimsoptec Line" for the Korean light & display market.

Instrument Systems has been a wholly-owned subsidiary of the Konica Minolta Group since 2012.

<https://www.instrumentsystems.com/en/>

#Inspection & repair



## InZiv

Testing and inspection tools for the microLED industry.

InZiv provides testing and inspection tools for the microLED industry. InZiv's technology offers one comprehensive platform for both full wafer mapping and individual chip testing and characterization at the highest resolution. Automated PL and EL provide today's most critical measurements, including EQE and angular measurements, and Nano-PL and Nano-EL enable the user to zoom in on individual chips and sub-pixel features and defects with 100nm resolution.

InZiv integrates multiple inspection modalities in one system, and provides a comprehensive analysis of both the whole wafer and its sub-pixel features. This unique combination empowers microLED developers and manufacturers with the ability to better understand the relationship between light, color, current, and structure – directly addressing today's most critical challenges in microLED.

<https://inziv.com/>

#Inspection & repair



## Konica Minolta Sensing America

Industry leading optical and imaging measurement solutions

Konica Minolta Sensing Americas delivers industry leading optical and imaging measurement solutions that help organizations evaluate color & appearance, light & display performance, surface quality, hyperspectral characteristics, gas composition, and manufacturing integrity with exceptional precision.

The company's technologies support research laboratories, manufacturing facilities, and global brands seeking to meet strict quality standards, improve productivity, and reduce waste.

<https://sensing.konicaminolta.us/us/>

#Color conversion



## Mitsui Kinzoku

Produces functional engineered materials and electronic materials, nonferrous metal smelting.

Japan-based Mitsui Mining & Smelting (also known as Mitsui Kinzoku) produces functional engineered materials and electronic materials, nonferrous metal smelting, minerals resource development, precious metal recycling, raw material related businesses, manufacturing and sale of automotive parts/components, etc.

For the MicroLED Industry, Mitsui Kinzoku developed a sulfide phosphor for color conversion. The material is highly durable and does not contain any hazardous material. As of 2023, the company is sampling the material for microLED developers.

<https://www.mitsui-kinzoku.co.jp/mlab/en/>

#LED epiwafers  
#Materials & technologies



## Nitride Semiconductors

World's leading UV LED developer

Nitride Semiconductors was established in Japan in 2000, to focus on the development of UV LED wafers, chips and lighting solutions. The company targets several applications, including currency validation and UV curing.

The company is developing UV microLEDs, for color-conversion display architectures.

<https://www.nitride.co.jp/english/index.html>

#Mass transfer



## Pixel-Flo

Next-generation continuous fluidic microLED transfer process

UK-based Pixel-Flo was established in 2025 as a spin-out from the University of Sheffield, to commercialize its next-generation continuous fluidic microLED transfer process.

The Pixel-Flo transfer process offers extremely high continuous throughput and scalability to populate the largest panel sizes.

<https://pixel-flo.com/>

#Materials & Technologies



## Mojo Vision

Developing RGB Micro-LED displays

The Future of Micro-LED Technology is Here

Mojo Vision is focused on developing and commercializing world-class micro-LED technology for consumer, enterprise, and government applications. Developed as a critical component of Mojo Lens and first announced in 2019, the Mojo Vision Micro-LED Display is the smallest, densest dynamic display ever made, and the Micro-LED technology platform underlying it is powerful and flexible enough to serve a wide range of applications from next generation wearables all the way up to future televisions and video walls. We believe Micro-LED will disrupt the entire \$160B display industry and our unique technology puts us at the forefront of this disruption.

<https://www.mojo.vision/>

#Materials & Technologies  
#Microdisplays



## Plessey

UK-based technology leader specialising in advanced microLED microdisplay solutions

With a long-standing legacy in semiconductor innovation and a vertically integrated design and manufacturing capability, Plessey delivers high-performance, scalable microLED technologies from its state-of-the-art facility in Devon.

Plessey's proprietary monolithic processes enable the development of ultra-bright, energy-efficient displays with exceptional pixel density, uniformity, and integration flexibility. These capabilities support demanding applications in wearable optics, AR/MR systems, and emerging display architectures, where brightness, power efficiency, and form factor are critical.

<https://plessey.com/>

#Color conversion



## QNA Technology

Quantum dots for the display industry, based on unique surface engineering and QD inks

Poland-based QNA Technology, established in 2016, develops and produces quantum dots for the display industry. The company optimizes its QDs for two applications: electroluminescence display devices (QD-EL) and for microLED displays devices based on UV microLEDs.

QNA developed QD surface engineering to enable the delivery of its materials in various solvents, such as polar, non-polar, monomers, powders, and more. The company is also developing QD inks for ink-jet printing and for UV-curable inks.

<https://qnatechnology.com/en/>

#LED epiwafers  
#Materials & technologies



## Polar Light Technologies

Polar Light Technologies develops a novel monolithic approach used to develop microLEDs with exceptional performance at a sub-micron size. Polar Light Technologies' microLEDs are based on InGaN/GaN pyramidal structures. These pyramidal structures are grown by a novel bottom-up technique, which in contrast to the conventional top-down technique does not require etching. This technique allows for sub- $\mu\text{m}$  sized LED dimensions with maintained exceptional properties and performance.

The pyramidal LED design additionally provides narrow light lobe characteristics, which will further enhance the microLED's efficiency since a larger fraction of the light can be used.

The same InGaN/GaN material system is used for the red, green and blue (RGB) emissions, allowing integration with electronics by means of mass transfer, flip-chip or other monolithic integration techniques.

<https://www.nscinnovation.com>

#Color conversion



## Qustomdot

Cadmium-free quantum dots technology for microLED displays

Belgium-based QustomDot brings unmatched colors through quantum dot (QD) color conversion to microLED applications. The team combines QD synthesis, surface engineering and ink/photoresist formulation into patterned color conversion layers for microLED displays. QustomDot's patented technology is cadmium free and can withstand high light intensities.

<https://www.qustomdot.com>

#Microdisplays



## Raysolve

High-performance monolithic full-color Micro-LED micro-displays

Raysolve Optoelectronics (Suzhou) is committed to developing and manufacturing high-performance full-color Micro-LED micro-displays, targeting emerging display technologies, particularly for AR glasses.

Raysolve's proprietary QDs-based full-color technology enables full-color display on a single chip, while also setting a new world record for both its tiny size and high pixel density.

<https://www.raysolve.com/index.html>

#Materials & Technologies



## Smartkem

Seeking to reshape the world of electronics with a revolutionary semiconductor platform that enables the next generation of low-cost displays and sensors.

SmartKem's patented TRUFLEX® inks are solution deposited at a low temperature, on low-cost substrates to make organic thin-film transistor (OTFT) circuits. The company's semiconductor platform can be used in a number of applications including mini- and micro-LED displays, AMOLED displays, AR and VR headsets, fingerprint sensors and integrated logic circuits. SmartKem develops its materials at its research and development facility in Manchester, UK, and its semiconductor manufacturing processes at the Centre for Process Innovation (CPI) at Sedgefield, UK. The company has an extensive IP portfolio including over 124 issued patents across 19 patent families.

<https://www.smartkem.com>

#MicroLED Displays



## SiliconCore

High performance and ultra-low power MicroLED displays

SiliconCore is a manufacturer of fine pixel pitch displays, globally recognized for engineering displays with unmatched performance and energy efficiency. As the only LED display manufacturer designing its own driver chips, SiliconCore uniquely optimizes each pixel for maximum performance, color uniformity, and operational efficiency.

SiliconCore is expanding its reach beyond the large format and moving into MicroLED technology. The company also offers a revolutionary microLED driver design to reduce power consumption and maximize performance.

<https://www.silicon-core.com/>

#MicroLED research, #LED epiwafers



## Solid State Lighting & Energy Electronics Center

Researchers to advance solid-state lighting and energy efficient power switching using wide-bandgap semiconductors.

The Solid State Lighting & Energy Electronics Center (SSLEEC) at UC Santa Barbara is a collaborative center, which partners key industry leaders and UCSB researchers to advance solid-state lighting and energy efficient power switching using wide-bandgap semiconductors.

SSLEEC is focused on new semiconductor based technologies for disinfection, advanced mobile displays, energy efficient lighting, and power electronics. The objective of the SSLEEC is to provide a forum for its members – key industry partners and the faculty and student researchers at the University of California, Santa Barbara – to work in collaboration and across scientific disciplines to address the most challenging problems in these important and timely areas of research.

<https://ssleec.ucsb.edu>

#MicroLED displays



## STRATACACHE

Digital signage systems developer, microLED display producer

STRATACACHE is a digital signage, merchandising and customer engagement systems developer, targeting the retail, restaurants, banking and financing, gaming, events and education markets.

STRATACACHE is constructing the first US-based complete display production facility in Eugene, Oregon, the future MicroLED E4 fab.

<https://www.stratacache.com/en/>

#Production equipment



## Tokyo Electron (TEL)

Global semiconductors production equipment maker

Tokyo Electron Limited (TEL) is a Japanese electronics and semiconductor company headquartered Tokyo, established in 1963. TEL supplies equipment to fabricate ICs, photovoltaic cells and flat panel displays. TEL is considered to be the world's largest manufacturer of IC and FPD production equipment.

<https://www.tel.com>

#Microdisplays



## Sundiode

Stacked-RGB based microLED microdisplays  
US-based Sundiode develops microLED microdisplays based on its unique stacked-RGB pixel structure.

In 2021, in collaboration with KOPTI and Jasper Display, Sundiode unveiled a microdisplay prototype that features 200 PPI and 100um pixels. The display is an array of stacked-RGB micro-LED pixels on a single chip bonded directly onto a Si CMOS backplane. In 2023 the company successfully grew a monolithic all-InGaN stacked-RGB LED structure.

<https://www.sundiode.com/>

#Inspection & repair



## Teradyne

Fast, accurate and flexible production-ready solutions for microarray testing

Teradyne designs, develops, and manufactures automated test equipment and advanced robotics systems. Teradyne is leveraging its expertise to help the microLED industry meet the challenges and throughput requirements for testing of microLED microarrays, including microdisplays, with fast, accurate and flexible production-ready solutions.

<https://www.teradyne.com/>

#Mass transfer, #Materials & technologies



## Terecircuits corporation

Photo-polymer mass transfer system for microLED production

Terecircuits develops technologies and manufacturing processes for microassembly based on a new class of photo-chemical polymers.

The company focuses on the development of a microLED photo-chemical mass transfer process.

<http://terecircuits.com/>

#Production equipment



## Verticle Inc.

Wet etching for high-efficiency microLED growth

US-based Verticle Inc. was established in 2004, with an aim to develop unique LED technologies and processes. For the microLED industry, the company developed wet chemical etching technology that can lead to faster and more efficient chip processing, and in addition enable higher-performance microLEDs. The company has demonstrated how its wet chemical etching can result in higher-efficiency AlGaInP native red microLEDs, as it mitigates sidewall defects.

<https://www.verticle-inc.com/>

#Market Research



## UBI Research

UBI Research, based in Korea, provides display industry market insights, with a focus on the OLED, MicroLED and AR/VR industries in Korea, Japan and China.

UBI Research also provides consultation services, and organizes a yearly display industry trade show in Korea.

<https://ubiresearch.com>

#MicroLED displays, #Mass transfer,  
#Microdisplays



## Vuereal

Micro-LED display technologies and display production

Canada-based VueReal is a startup company that develops Micro-LED display technologies. VueReal developed a cartridge-based microLED printing process that can produce high density displays at high production yields.

In addition to microLED technologies, VueReal also produces microLED displays, and offers custom display production done at its pilot production line in Waterloo, Canada.

<https://www.vuereal.com>

#Inspection & repair



## WEVE

World-class inspection of Epi Wafers, Micro LED CoWs, and OLED

WEVE is a South Korea-based company with industry-leading expertise in Epi wafer and CoW inspections. We are trusted by world-leading display and wafer manufacturers in South Korea and Taiwan. Our contactless and nondestructive technology performs AOI, PL, and Color Difference (xyY, WD) analysis in a single run. Conducting such a complex analysis is meaningless if inspection time greatly exceeds the realities of mass production. We provide crucial data set under acceptable time 6-inch CoW – under 10 minutes, 6-inch Epi Wafer – under 12 minutes. Being involved in big-scale productions we have accumulated great experience that helps our technology to be extremely useful in real environments. WEVE is among the very few in the world in terms of the total number of wafers inspected. We are always open to partnerships and new business development.

<https://en.theweve.com>

#Materials & technologies



## YieldWerx

Predictive analytics and automation software for semiconductor manufacturing

US-based yieldWerx is a software developer that provides software solutions for semiconductor manufacturing. The yieldWerx platform combines test data with predictive analytics and automation to boost yield, reliability, and time to market.

For the microLED industry, the yieldWerx software take in electrical and optical wafer acceptance data, pixel-level parametrics, coupon die measurements, ASIC parameters, assembly & module results, and final test outcomes, and offers combined analysis of ASIC + LED + image-sensor devices, including bonded wafers, in a single environment—delivering system-level intelligence from discrete wafers to final modules.

<https://yieldwerx.com/>