MicroLED Association

White paper:

MicroLED Wearable Displays

From First Product to Real Advantages

Non-members summary

November 2026

MicroLED Wearable Displays – From First Product to Real Advantages

By the MicroLED Industry Association (MIA)

Non-members summary

A technology, market and roadmap assessment of microLED for smartwatches and other wrist-worn devices.

*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*

About this summary

This is a summary of the MicroLED Industry Association's white paper *MicroLED Wearable Displays – From First Product to Real Advantages* (November 2026). It includes the paper's Executive Summary and an overview of each chapter. The full white paper, with the complete analysis, four data tables, the revised cost model and the MIA's roadmap to 2030, is available exclusively to MIA members.

Contents of the full white paper

Executive Summary

1. The Wearable Display Landscape in 2026
2. Best-in-Class OLED: A Moving Target
3. What MicroLED Brings — In Theory
4. Industry and Market Status
5. The First Product: A Necessary Reality Check
6. Cost: Revisiting the 2023 Analysis
7. Roadmap to 2030
8. Discussion: Where the Industry Should Focus
9. Conclusion

Tables

Table 1 — Incumbent wearable display technologies, 2026

Table 2 — Flagship wearable displays, 2025–2026

Table 3 — MicroLED wearable supply base, status as of mid-2026

Table 4 — Cost model: 2023 assumptions versus 2026 reality

3D MICROMAC · Advanced View · Aledia · ALLOS Semiconductors · beneq · BRILLINK · cea leti · COHERENT · comptek solutions · CORNING

Executive Summary

Three years ago, the MicroLED Industry Association published an analysis asking whether a microLED smartwatch display could be built at a viable cost. The question was hypothetical. It is no longer.

In September 2025, Garmin shipped the Fenix 8 Pro MicroLED — the first commercial wearable, and the first commercial consumer product of any kind, with a microLED display. The 1.4-inch, 454x454 panel is produced by AUO and reaches 4,500 nits. Reviewers were near-unanimous that it is the best-looking smartwatch screen ever made. That is a genuine milestone for the display industry.

It is also, on every metric other than image quality, a worse product than the AMOLED version sold alongside it. Battery life falls from 27 days to 10 days in smartwatch mode, and from 15 days to 4 days with always-on display enabled. The case is roughly 3 mm thicker. The launch price was $1,999, since permanently reduced to $1,699. The display that was supposed to be the efficient one draws on the order of three times the power of the OLED it replaced.

The gap between microLED's theoretical advantages and the Fenix 8 Pro's measured behavior is a system-integration gap, not a refutation of the technology. The Garmin panel pairs an immature microLED frontplane with an LTPS backplane, in a product where roughly 70% of display power is consumed by the backplane rather than the emitters. It carries the efficiency penalty of sub-10 µm red AlGaInP emitters without yet carrying the efficiency benefits that inorganic emitters should eventually deliver.

Meanwhile, the incumbent OLED technology is not standing still. Samsung Display's AMOLED for the Galaxy Watch Ultra 2 reaches 5,000 nits — brighter than AUO's microLED, at a much lower cost, in a 12% slimmer chassis.

White paper summary

- MicroLED's durable advantages in wearables are inorganic reliability (no burn-in, no differential aging, wide temperature tolerance), sustained rather than peak brightness, and long-term form-factor freedom — not headline nit counts.
- The near-term bottleneck is the backplane and the driving scheme, not the frontplane (the LEDs). LTPO or hybrid-oxide backplanes with PWM driving are the highest-leverage improvement available to the industry today.
- The second bottleneck is red emitter efficiency at wearable pixel pitches. AlGaInP EQE collapses below ~10 µm, and the red subpixel disproportionately sets system power in typical watch-face content.
- Volume production for wearables is credible from late 2027 onward: AUO is already shipping, PlayNitride is scaling to ~10,000 6-inch wafers/month, Samsung Display is building a 5.5-generation pilot line at Asan, targeting mass production in late 2027, and VueReal is commercializing a low-power cartridge-printed wearable platform.
- The industry should stop benchmarking against OLED's spec sheet and start benchmarking on nits-per-watt, sustained full-screen luminance, and lifetime — the axes on which microLED can actually win.

Inside the full white paper

The full white paper develops the conclusions of the Executive Summary over nine chapters:

1. The Wearable Display Landscape in 2026

Wearables still sustain five distinct display technologies in commercial volume: AMOLED, PMOLED, TFT LCD, memory-in-pixel LCD and E Ink. The chapter explains why the wearable market has always been segmented by power budget rather than by image quality, and why microLED is currently entering it on the wrong side of that axis.

2. Best-in-Class OLED: A Moving Target

Since the MIA's 2023 analysis, the OLED benchmark has moved dramatically. The chapter reviews the latest flagship watch displays from Apple and Samsung, including a 5,000-nit OLED that is brighter than today's shipping microLED panel, and what this means for microLED's long-standing brightness pitch.

3. What MicroLED Brings — In Theory

An assessment of microLED's theoretical advantages in wearables (luminance headroom and sustained full-screen brightness, efficiency, durability and reliability, and form-factor freedom) and an honest summary of which of them are real today.

4. Industry and Market Status

Profiles of the wearable microLED supply base, covering AUO, Samsung Display, PlayNitride, VueReal and Apple, with a side-by-side comparison of their status, demonstrated wearable panels and capacity roadmaps.

5. The First Product: A Necessary Reality Check

A detailed analysis of the Garmin Fenix 8 Pro MicroLED: what shipped, where it falls short of its AMOLED sibling, and the three identifiable, individually addressable reasons for its high power consumption.

6. Cost: Revisiting the 2023 Analysis

The MIA's 2023 cost model is compared with 2026 market evidence: what the model got right, what it underestimated, and a revised outlook for the cost of a wearable microLED display relative to OLED.

7. Roadmap to 2030

The MIA's working view of wearable microLED development in three phases: consolidation of the first generation in 2026; backplanes, parity and differentiation in 2027–2029; and architectural advantage from 2030 onward.

8. Discussion: Where the Industry Should Focus

Five priorities for the microLED industry, from fixing the backplane and solving red emitter efficiency to changing the benchmark, co-designing at the system level and picking the right beachhead markets.

9. Conclusion

Why the industry's main risk is not technical failure but strategic drift, and why the next two years will decide whether microLED becomes the premium wearable display technology.

Innovation Semiconductor
INNOVISION 诺视科技
Instrument Systems KONICA MINOLTA Group
INZIV
ITRI Industrial Technology Research Institute
KETI
KONICA MINOLTA
LUMUS
MITSUI KINZOKU
mojo

Read the full white paper

The complete white paper, including all nine chapters, the four data tables, the revised cost model and the MIA's roadmap to 2030, is available exclusively to members of the MicroLED Industry Association. MIA members can download it from the association's website.

Why join the MicroLED Industry Association

- **Visibility:** your logo and link on the association website and in its publications, including white papers, the MicroLED Industry Roadmap and webinars.
- **Networking:** in-person association meetings, online meetups and webinars with on-demand access to past recordings, and a private members-only LinkedIn group.
- **Content and media:** publish brochures, presentations and technical content in the MicroLED Library, and receive spotlight articles and news coverage on MicroLED-Info.com.
- **Events:** support in securing speaking slots at industry events, and 20% off MicroLED-Connect passes and exhibition packages.
- **Resources:** a free enterprise license to the MicroLED Handbook and an annual one-on-one expert consultation.

Startups, small and mid-sized companies and university research groups can join at a significantly reduced rate.

Join the MIA

To learn more about membership and join the association, visit www.microledassociation.com/benefits

About the MicroLED Industry Association — The MIA was created to accelerate the adoption of microLED display technologies. It brings together companies, researchers and organizations active in the microLED industry, providing a forum for solving common technology issues, fostering cooperation, and sharing information, resources and tools. The association has grown to around 50 members, spanning display makers, LED and component suppliers, technology developers, start-ups and leading research institutes, and its activities include topical webinars, working groups, white papers and industry events.

NIPPON SANSO · NITRIDE SEMICONDUCTORS Co.,Ltd. · PALOMINO LABORATORIES · PHOTON WEAVE · Pixel~Flo · plessey · POLAR LIGHT TECHNOLOGIES · POLLEN · QNA · QustomDot

Member Directory

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

3D-Micromac

Laser equipment for µLED 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 creates MicroLED Technologies for the Displays of Tomorrow

Founded in 2011 and headquartered in Grenoble, France, Aledia develops next-generation microLED display solutions based on its proprietary 3D WireLED™ nanowire technology.

Aledia has developed three complementary nanowire-based MicroLED solutions: FlexiNova blue microLEDs grown on 8" and 12" silicon wafers, for direct-view displays including smartwatches; Native RGB microdisplays with a 2.475 µm pixel pitch for AR glasses and headsets; and Blue Digital LED (DLED) chips for local-dimming LCD backlights.

Aledia operates a high-volume epitaxial growth and LED processing facility near Grenoble, and is developing partnerships with key industry players in Asia and other regions.

https://www.aledia.com/

#Materials & technologies, #LED epiwafers

ALLOS Semiconductors

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

#Production equipment, #Materials & technologies

Beneq

The global leader in industrial and research atomic layer deposition (ALD) equipment since 1984

Beneq pioneered industrial ALD production, introducing the first commercial ALD equipment in 1984. The company provides specialty semiconductor manufacturing tools, research systems, batch coating equipment, and spatial ALD platforms including roll-to-roll systems.

For microLED applications, Beneq's ALD systems enable sidewall passivation, controlled surface passivation, transparent conductive oxides, and final passivation processes — delivering the conformality, material flexibility, and low-temperature processing required for high-volume manufacturing of next-generation displays.

https://beneq.com/

#Optical interconnects

Brillink

AI-driven high-speed optical communications and silicon photonics

Founded in 2025, Brillink specializes in AI-driven high-speed optical communications and silicon photonics, delivering comprehensive Scale-Out (120-channel 2D array PIC PDK/ADK) and Scale-Up (sub-0.5 pJ/bit integration via ultra-collimated Micro LEDs, VCSELs, and high-sensitivity APDs) solutions alongside global supply chain partners.

Guided by its vision, “Connecting Intelligence at the Speed of Light,” Brillink provides end-to-end system designs to power next-generation AI and data center infrastructure.

https://www.brillink.ai/

#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 10^7 cd/m^2.

http://www.cea.fr/english

#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

#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/

#MicroLED displays

Crystal Matrix

India's first miniLED and microLED display producer

Crystal Matrix Limited is a miniLED and microLED display developer.

In 2026, it was reported that the Indian Government has approved support for Crystal Matrix's $336 million project to build an LED display fab in Gujarat, that will produce 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/

#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

#Production equipment, #Materials & technologies

Evatec

Supplying production-proven thin film deposition tools and processes to the world's leading LED manufacturers

Evatec brings over 20 years of experience in thin film deposition technology, delivering solutions across TCOs (ITO, AZO, IZO, GZO), reflectors (metals and DBRs), metal contacts, and passivation layers.

The company's production platforms support evaporation, sputter, PECVD and PEALD processes on 4, 6 and 8-inch substrates, with cassette-to-cassette automation and customizable process control.

For microLED manufacturing specifically, Evatec focuses on the process innovations that address yield and cost — sidewall coverage optimization, hybrid DBR solutions, and ITO refinements that minimize particle contamination.

https://evatecnet.com/

#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

Fraunhofer IZM specializes in applied and industrial contract research, with a focus on packaging technology and the integration of multifunctional electronics into systems.

Its well-established wafer level pilot line can be utilized for prototyping and small volume production with advanced wafer level bumping, wafer level redistribution, 2.5D/3D integration, fine pitch flip chip assembly, or photonics and MEMS integration. Beyond silicon, the institute can process wide bandgap and III-V semiconductors as well as glass, ceramic, and molded wafers.

In the area of µLEDs, Fraunhofer IZM focuses on bumping below 10 µm pitch (indium, gold, gold/tin, nanoporous gold), on massive parallel assembly technologies for micro-LEDs, and on pixelated LED arrays.

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.

Hongshi's flagship Aurora Series includes a 0.12-inch micro-display reaching 10 million nits (green). A recent breakthrough in monolithic hybrid-stacked full-color technology, delivering 1.2 million nits of white light, earned the company the Silver Award at the 2025 CIOE.

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

#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

Inlighten Technologies

Fabless developer of microLED microdisplays

US-based Inlighten Tech, established in 2025, is a fabless developer of microLED display technology for AR applications.

Inlighten Tech has developed technologies related to microLED materials, pixel architecture, and integration processes.

https://www.inlightentech.com/

#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/

#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.

In 2026, the company’s Chimo M06 (0.03cc), the world’s smallest microdisplay optical engine, entered mass production.

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

Electro-optical testing and characterization systems for emissive and photonic devices

InZiv is a Jerusalem-based deep-tech company developing electro-optical testing and characterization systems for emissive and photonic devices. The company's roots are in microLED, where shrinking pixel dimensions, high densities and demanding yield targets push conventional inspection to its limits.

InZiv's microLED portfolio addresses both development and production. OmniPix is an all-in-one R&D characterization tool, combining PL, EL and nano-EL with measurements such as IV, LIV, EQE, angular distribution and wavelength, from full-wafer mapping down to individual pixels. R-EL Glide is a high-throughput, wafer-level EL inspection system that uses proprietary, non-damaging contact technology to deliver optical, spectral and electrical data for every chip at production speed.

These capabilities also support microLED-based optical I/O and AR microdisplays, and underpin InZiv's growing focus on silicon photonics testing with its Glide-SiPh and Omni-SiPh systems.

https://inziv.com/

#MicroLED research

ITRI

Taiwan's national research organization

Taiwan's ITRI (Industrial Technology Research Institute) is a national research organization, with a mission of conducting technological research, promoting industrial development, creating economic value and improving social welfare for Taiwan.

Established in 1973, ITRI is Taiwan's largest applied technology R&D institution. It is active across several microLED development areas including microdisplays, sensor platforms and tiled displays, with a current focus on microLED microdisplays, microLED-based optical I/O technologies, and QD for color conversion.

https://www.itri.org.tw/english/

#MicroLED research

KETI

Korea's electronics and IT industry research institute

KETI (Korea Electronics Technology Institute) is a government-funded research institute dedicated to advancing Korea's electronics and IT industries through technology development, commercialization support, and industry collaboration.

KETI's Display Research Center develops next-generation display technologies, including OLED, quantum-dot, MicroLED, flexible, stretchable and XR displays. In the MicroLED field, KETI focuses on panel fabrication processes, materials for transfer and bonding processes, and NanoLED technologies for future displays.

KETI is currently establishing shared process and equipment infrastructure to support MicroLED companies in prototype fabrication, process optimization, and technology commercialization.

https://www.keti.re.kr/eng/main/main.php

#Inspection & repair

Konica Minolta Sensing Americas

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.

In 2026, Konica Minolta Sensing Americas expanded significantly by combining multiple advanced sensing groups into a single, stronger team, bringing customers a single-source portfolio spanning the most trusted brands in the measurement and inspection market.

https://sensing.konicaminolta.us/us/

#AR optics

Lumus

Reflective waveguide optical engines for AR smart glasses

Israel-based Lumus, founded in 2000, is one of the earliest augmented reality hardware companies in the world. The company develops geometric (reflective) waveguide technology and optical engines for near-eye AR displays, serving consumer, enterprise, medical and defense applications.

Lumus' portfolio includes the Z-Lens and Maximus 2D-expansion waveguide optical engines (50° field of view) and the Z-30 30° optical engine introduced in 2025. Lumus waveguide technology is used in the Meta Ray-Ban Display glasses, launched in September 2025, and the company works with manufacturing partners including Quanta and SCHOTT.

https://lumus.com/

#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/

#Optical interconnects, #Microdisplays

Mojo Vision

Micro-LED platform powering AI infrastructure & next-gen displays

Mojo Vision is pioneering a highly flexible, wafers-in, wafers-out micro-LED platform to unlock AI applications across multiple high-growth markets. Built over a decade, the company's technology toolkit includes advanced 300mm silicon architecture, tiny GaN-on-silicon micro-LED emitters, efficient photodetectors, proprietary quantum dots, custom micro-lens arrays, multicore fiber bundles, and proprietary software, which can be configured in custom ways depending on the application.

Mojo Vision's scalable, manufacturing-ready platform resolves conventional trade-offs in size, brightness, bandwidth density, and power, enabling breakthrough products such as next-generation AI glasses and massively parallel optical interconnects for AI infrastructure.

https://www.mojo.vision/

#Production equipment, #Materials & technologies

Nippon Sanso

A leading supplier of MOCVD systems and industrial gases

The Nippon Sanso Group is the world's fourth-largest supplier of industrial, electronic and medical gases, operating across four geographic regions in more than 30 countries. Founded in 1910 and employing approximately 20,000 people, the group positions itself as "The Gas Professionals".

Nippon Sanso pioneered commercial MOCVD systems, introducing its self-developed equipment in 1983, and its production and R&D systems are recognized for performance and reliability. The company uniquely offers a comprehensive MOCVD solution, spanning purification and abatement equipment, specialty gases and gas handling systems.

https://jp.nipponsanso.com/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

#Optical interconnects, #Microdisplays

Palomino Laboratories

MicroLED based optical transceivers for high-speed efficient AI data center communication

Palomino Laboratories Inc., established in 2025, is a publicly traded fabless semiconductor company (OTCQB: PALX) focused on optical interconnect technology.

The company develops GaN-based microLED optoelectronics that deliver ultra-high-speed, energy-efficient optical interconnects for AI servers, data centers and high-performance computing, engineered to replace conventional copper and Ethernet infrastructure.

Palomino's proprietary microLED transceiver platform enables chip-scale optical I/O, targeting compact, lower-power and higher-bandwidth module designs.

https://palominolabs.ai/

#Optical interconnects

PhotonWeave

MicroLED optical I/O architecture for AI datacenters

PhotonWeave was established in 2026, as a spin-off from SiliconCore, to develop microLED optical I/O technologies for AI datacenters.

The company's architecture combines high-density microLED arrays, spatial and phase-aligned signaling that removes the need for power-hungry SerDes, and package-level integration.

http://www.photonweave.com/

#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, #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/

#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-µm 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.polar-light-technologies.com

#Inspection & repair

Pollen Metrology

Collaborative AI for MicroLED Process Control

Pollen is a French deep-tech software company providing AI-powered solutions for metrology, inspection and process control in advanced manufacturing.

Its Smart3 Collaborative AI Platform enables MicroLED manufacturers and equipment makers to analyze complex and multimodal data — including optical and electron microscopy images, spectra, signals and process data — within a unified environment.

From R&D to manufacturing, Pollen helps accelerate metrology, automate defect inspection and classification, correlate process and measurement data, and improve yield. Smart3 can connect to existing and third-party equipment, enabling manufacturers to build equipment-independent AI workflows across the MicroLED production chain.

https://www.pollen-software.com/en

#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/

#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/eindex.html

#Inspection & repair, #Production equipment

Seichi Technology

A leading innovator in semiconductor test and inspection equipment and system solutions

Founded in 2011, Shenzhen SEICHI Technologies Co., Ltd. is a semiconductor equipment innovator listed on the SSE STAR Market in 2023 (stock code 688627).

The company operates R&D and manufacturing bases across Shenzhen, Changsha and Shanghai, plus international R&D centers in South Korea and Japan. Its proprietary capabilities span electronic system design, software algorithms, precision mechanical automation and precision optics, positioning it as an equipment foundation for the AI era.

https://www.seichitech.com/en/

#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/

#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 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

#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/

#Optical interconnects, #Microdisplays

Tera Electronics

Next-gen microLED optical interconnect solutions for AI infrastructure, high-performance computing, and data center applications

Tera Electronics Corporation, established in 2024, is headquartered in Hsinchu Science Park, Taiwan. Its founding team brings over three decades of combined expertise in optoelectronics, semiconductors, IC design and advanced packaging.

The company develops microLED-based optical interconnect solutions for AI infrastructure, high-performance computing (HPC) and data center applications, integrating high-speed microLED arrays with wafer-level integration and novel optical coupling structures to achieve low-power, cost-effective connectivity.

Its product line spans Optical I/O, Near Package Optics (NPO), Active Optical Cables (AOC) and chiplet-to-chiplet optical links, offering lower power consumption, simplified system architecture, improved reliability, and scalability from 1.6T to 3.2T and beyond.

https://www.teraec.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

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

#MicroLED research, #LED epiwafers

Unipress

Leading research institute in GaN-based technologies from substrates and epitaxy to device prototyping

The Institute of High Pressure Physics of the Polish Academy of Sciences (IHPP PAS, UNIPRESS) is a leading research institute based in Warsaw, Poland, specializing in semiconductor physics and advanced materials. The institute is internationally recognized for pioneering work on gallium nitride (GaN) crystal growth and III-nitride technologies, covering the full value chain from bulk substrates and epitaxy to optoelectronic devices such as LEDs and laser diodes.

With over 50 years of experience, IHPP PAS develops high-quality GaN materials and device technologies that support next-generation photonics and microLED applications.

https://unipress.waw.pl/en

#Production equipment, #LED epiwafers

Veeco

MOCVD tools for microLED epiwafer deposition

Veeco Instruments manufactures process equipment serving the LED, photovoltaic and data storage sectors. Its offerings for display applications encompass Metal Organic Chemical Vapor Deposition (MOCVD) equipment and Molecular Beam Epitaxy (MBE) products.

Veeco's MOCVD deposition technology supports microLED manufacturing, and the company has supplied multiple systems to microLED developers.

https://www.veeco.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. In 2026, Verticle started to offer wet-etching foundry services.

https://www.verticle-inc.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 provides an end-to-end data and yield analytics platform designed to manage large-scale, high-dimensional semiconductor manufacturing data for MicroLED, image sensor, and AR/VR/XR products with full lifecycle traceability.

The platform unifies and correlates data across the full manufacturing lifecycle, from fab process and pixel-level parametrics through assembly, module, and final test. Proven in high-density MicroLED production with over 10 billion data points per wafer, yieldWerx provides pixel-level clustering analytics, ASIC and pixel data correlation, defect image overlay, AI-driven outlier detection, and end-to-end traceability from wafer to pixel to module to device.

https://yieldwerx.com/