

Special Report – Displays at CES 2025

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Automotive Displays @ CES 2025

- The **AUO** Smart Cockpit 2025 highlights the company's innovative approach to redefining in-car experiences through advanced display technologies-Micro LED. The concept includes the 14.3" Morphing Center Control, a stretchable Micro LED display for dynamic interactivity, and the 55" Virtual Sky Canopy, co-developed with Saint-Gobain Sekurit, offering an immersive, transparent sky view. Additionally, the 30" XR Interactive Window integrates augmented reality with Corning and Vitro's expertise, while the 14.6" Foldable Cruise Pilot and 47.5" Horizon Image Glass push the boundaries of flexible and frameless design. Completing the suite is the Interactive Matrix Display, a high-brightness, modular display for seamless integration into vehicle cockpits.
- The **BOE** HERO Smart Cockpit showcases a comprehensive integration of health monitoring, entertainment, and advanced HMI (Human-Machine Interface) technologies. Highlights include the Intelligent Steering Wheel, the first in-vehicle system with ultrasonic fingerprint recognition, ECG monitoring, and smart payment capabilities. The L-shape OLED with Haptic Feedback offers precise control through haptics and force sensing, while the Naked Eye 3D Display delivers an immersive, glasses-free experience with eye-tracking and gesture control. The P0.3 Micro LED Transformer Display features frameless sliding functionality and vibrant visuals with 2000-nit peak brightness. Complementing these is the 31.6-inch Spliced Slidable Display, a modular OLED system, and the 44.8-inch PHUD Intelligent Cockpit, which integrates 8K projection with local dimming for unmatched clarity.
- The **CarUX/JDI** eLeap Automotive Displays at CES 2025 highlighted a wide range of advanced display systems designed for modern vehicles. The Integrated Cockpit OLED System features eLeap OLED technology with ultra-high contrast, high luminance, and free-form designs, available in sizes like 31.9" and 49". Special features include maskless deposition for durability and efficiency. The Kinematics Solution - Multi-Axis Rotatable 11.1" Display introduces AI-based face tracking and gesture-controlled tilt and rotation. Additional innovations include the Haptics and Force Sensing Display, which offers dynamic feedback, and the 12.3" Free Zone Privacy View, ensuring enhanced privacy in shared environments. Cutting-edge applications include the Camera Behind Display (CBD) for driver and passenger monitoring and the 48" Full-Width Windshield Projective Display, which provides immersive visuals with warp-free distortion correction.
- **Continental** showcased groundbreaking innovations that prioritize personalization, emotional engagement, and advanced safety in automotive displays. The Rear Side Window Displays utilize a compact mini projector to transform exterior windows into dynamic communication tools, displaying content like EV charge levels or personalized messages. Their Emotional Cockpit integrates Swarovski Crystal displays and a customizable E-Ink trimline, offering a sensory-rich interior experience with stunning visual effects and energy efficiency. The Invisible Biometrics Sensing Display, developed with trinamiX, embeds an OLED-based biometric monitoring system for secure authentication, heart rate tracking, and safety enhancement.

Automotive Displays @ CES 2025 (cont.)

- **CSOT** presented a range of innovative automotive displays emphasizing visual performance and design integration. The Curved Wood-Infused Display (Dual 23.6") combines NTSC 110% wide color gamut, 3000 nits brightness, and ultra-narrow seams for seamless integration with interior aesthetics. The IR CUP (Camera Under Panel) Display (12.3") offers full-screen functionality with embedded cameras for driver monitoring. The Entertainment Display (17.3") delivers a high-refresh-rate gaming experience with 120Hz refresh capability and 4.2mm ultra-narrow borders. Advanced HUD technologies include the Brightest Micro LED Panoramic HUD (10.25"), with over 5000 nits brightness, and the 3D AR HUD, featuring immersive depth and 12,000 nits brightness for enhanced driver awareness.
- **GIS** showcased its Waveguide HUD offers a compact design with a reduced volume for space efficiency, enabling high visibility with local dimming for power savings. The TDM in Smart Cockpit integrates pillar-to-pillar Mini-LED BLU displays with AG/AR/AS surface coating for super-low reflection (<0.2%) and seamless color matching. Specifications for Cluster/Passenger Displays include sizes up to 23.6", 1000-nit brightness, 1,000,000:1 contrast ratio, and up to 768 dimming zones, delivering exceptional clarity and vibrant visuals.
- **Harman** Ready Displays introduced advanced in-car displays powered by Samsung Neo QLED technology, featuring automotive-qualified Quantum Dot and Blue Mini-LED local dimming. The NQ3 (14.6") delivers stunning performance with 1300 nits brightness, sleek 4.7mm bezels, and a slim 9.9mm profile. The NQ5 (15.6") enhances user interaction with customizable haptics, adjustable vibration strengths, and solenoid actuators for crisp tactile feedback. The NQ7 (14.6") offers HDR10+ readiness, dynamic tone mapping, and Vision Plus technology, achieving 2000 nits peak brightness for exceptional image quality.
- **Samsung Display** unveiled the Automotive UPC (Under Panel Camera) integrates a 13.6" FHD+ display with concealed camera technology, ensuring sleek design without compromising functionality. The Safety Visionary Flex Magic Pixel features a 13.6" FHD+ display optimized for driver alerts with a 600-nit brightness and advanced luminance cut-off technology. The Sight Twister Auto Foldable (18.1") offers dynamic QHD+ resolution and foldable versatility for adaptive in-car setups. Additionally, Samsung highlighted its Digital OLED Cockpit and Dolby Vision-certified OLED displays, delivering stunning color, infinite contrast, and cinematic visuals.
- **Sharp Display** highlighted its innovative automotive display technologies at CES 2025, focusing on energy efficiency, versatility, and enhanced user experience. The Multi Refresh Rate Display (12.3") allows variable refresh rates from 1 Hz to 60 Hz, reducing power consumption and heat generation. The GZO-4DeMUX LCD combines IGZO TFT with ultra-narrow borders and integrated gate-in-panel technology for cost efficiency. The Dual View Display (11.8") offers simultaneous touchable content with privacy mode, ideal for multi-user environments. Additionally, the Texture Display integrates 3D polycarbonate textures for enhanced interior aesthetics, while the Driver Monitoring Camera Integrated Display (12.3") uses flexible camera placement to track driver behaviors and alert for safety. Finally, the Multi-Depth HUD provides intuitive imaging with distance-switching levels for enhanced navigation and awareness, demonstrating Sharp's commitment to versatile and user-focused automotive display solutions.

Automotive Displays @ CES 2025 (cont.)


- **Tianma** showcased its innovative Smart Cockpit and advanced automotive displays, emphasizing high performance and versatile applications. The 27"+12.3" InvisiVue™ LTPS Mini-LED display delivers 850 cd/m² brightness and a dynamic contrast ratio ≥200,000:1. The 12.3" 3D Cluster integrates light field 3D technology with eye-tracking for enhanced depth perception. Tianma's IRIS HUD provides >1,000 cd/m² brightness and wide NTSC color gamut, while the 3D HUD blends 3D visuals with AR for safer driving. Tianma's 15.6" Wide Refresh Rate Display boasts 2300 cd/m² brightness and dynamic frame rates (40Hz–120Hz), and the Dual-13" Multi-Curved Color Match OLED Display offers a stunning 2,000,000:1 contrast ratio. Other innovations include the 14.6" ALS and NFC Integrated Display, the 14.6" High Transmittance Display optimized for visibility, and the 8" HUD Micro-LED Display, delivering exceptional brightness at 10,000 cd/m².
- **Visteon** presented advanced automotive display solutions focusing on visibility, style, and privacy. The Sunlight Readable OLED Display features proprietary AR technology and vertical integration for superior sunlight readability, a seamless black appearance, and ultra-thin design for premium aesthetics. The Large Curved OLED Display delivers a premium viewing experience with superior black levels, low reflectivity, and consistent performance across lighting conditions, leveraging Visteon's proprietary manufacturing expertise. Additionally, the Segmented Active Privacy technology offers scalable privacy solutions adaptable to various display types, ensuring brightness leakage below 0.5%, reduced power consumption, and consistent color performance.

Automotive displays

AUO Smart Cockpit 2025: Infinite Future · Unlimited Possibilities

- At CES 2025, AUO unveiled its "Infinite Future, Infinite Possibilities" Smart Cockpit 2025 concept, featuring Micro LED transparent displays, a deformable console, and a foldable steering wheel. Collaborating with partners like BHTC, Saint-Gobain Sekurit, and Corning, AUO emphasized immersive, sustainable in-car experiences with eco-friendly materials and energy-efficient designs, showcasing its leadership in smart mobility.

AUO Smart Cockpit 2025 Specifications

14.3" Morphing Center Control <ul style="list-style-type: none"> Stretchable Micro LED Resolution: 1280 x 640 pixel Pixel Density: 100 PPI Brightness: >1,000 cd/m² Stretchable Ability: Multi-stretchable area Interactivity: Dynamically activated / Information center / Function Control 	30" XR Interactive Window <ul style="list-style-type: none"> Work together with Corning and Vitro Resolution: 960 x 540 pixel Active Area: 678.14 x 408.70 mm Transmittance: 25% Touch: TIP film 0.375 mm Brightness: 500 cd/m² Color Gamut: >110% NTSC Transparency Adjustment: PDLC (50% / 9%) Pixel Pitch: 0.69 mm 	47.5" Horizon Image Glass <ul style="list-style-type: none"> Resolution: 4 x 1920 x RGB x 1080 pixel Pixel Density: 163 PPI Transmittance: >55% Border: 0.3 / 0.3 / 0.3 mm Tiling Pitch: 0.9 mm Brightness: 1000 cd/m² Color Gamut: >100% NTSC LED Size: <30 μm 
55" Virtual Sky Canopy <ul style="list-style-type: none"> Co-developed with Saint-Gobain Sekurit Resolution: 1680 x 1080 pixel Active Area: 1186.7 x 817.4 mm Transmittance: 15% Brightness: 500 cd/m² Color Gamut: >110% NTSC Transparency Adjustment: PDLC (30% / 2%) Pixel Pitch: 0.69 mm 	14.6" Foldable Cruise Pilot <ul style="list-style-type: none"> Resolution: QHD 2560 x RGB x 1440 pixel Pixel Density: 202 PPI Pixel Configuration: Color conversion Brightness: >1,000 cd/m² Reflection: <1% (SCI), <0.8% (SCE) LED Size: <30 μm Viewing Angle: 89° / 89° / 89° / 89° 	Interactive Matrix Display <ul style="list-style-type: none"> Developed by Ennostar Red / Green / Blue / White Lumen: 2.1 / 4.5 / 0.49 / 7.1 lm/ea Resolution: 1140 x 120 pixel Module Size: 60 x 60 mm (38 pcs) Brightness: 5,000 cd/m² Pitch: 1 mm Gray Level: 16 bits Contrast Ratio: 10,000:1 

Source: AUO

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AUO Smart Cockpit 2025: Infinite Future · Unlimited Possibilities (cont.)

AUO Smart Cockpit 2025 Photos

14.3" Morphing Center Control



30" XR Interactive Window



47.5" Horizon Image Glass



55" Virtual Sky Canopy



14.6" Foldable Cruise Pilot



Interactive Matrix Display



Source: AUO

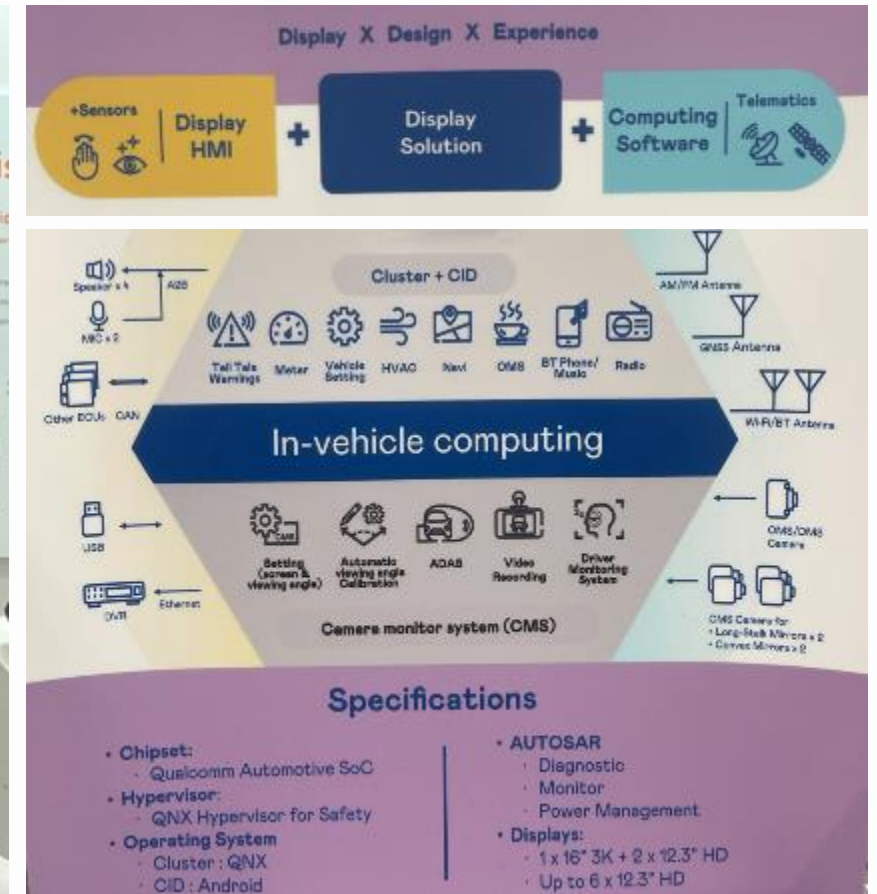
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AUO Smart Cockpit Solution: Display x Design x Experience

AUO Smart Cockpit Solution



Source: AUO, Photos taken by Omdia at CES 2025



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BHTC Automotive Displays Products

HaptiFold Display

Seamless Design. Ultimate Flexibility. Perfect Function. Crafted for Automotive Interiors.

- Seamless integration for an elevated driving experience with AUO 14.6" flexible Micro LED touch display.
- Active haptics and force sensing for intuitive control.
- 3D-shaped plastic cover lens for avant-garde design with narrow folding edges.
- Slim, freestanding design for space efficiency and comfort.



Source: AUO, BHTC, Photos taken by Omdia at CES 2025

Display Behind Wood

Delivering Exceptional Visuals When Needed.

A Premium, On-demand Display.

- Seamless, wood-like surface with on-demand HMI display.
- Transmissive film with high color saturation for a premium visual experience.
- 12.3" LCD display with 1700 cd/m² luminance and local dimming for clear, safe driving visibility.
- Invisible border breaks tradition, enabling an organic and user-friendly design.



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BOE HERO Smart Cockpit: Healthiness, Entertainment, Relaxation, and Office



① Intelligent Steering Wheel: The world's first on-board ultrasonic fingerprint technology offers 2% FRR, 1/50,000 FAR, and supports ECG monitoring, one-click setup, smart payment, and health tracking.

- Resolution: 1116 × 2480
- Luminance: Normal: 600 nit; HBM: 1020 nit
- Contrast: 500,000:1
- ECG Monitoring Noise: <12.5 μ Vpp
- Identify: 20 mm × 30 mm

② L-shape OLED with Haptic and Force Sensing: An automotive-grade f-OLED display system with a small bending radius, integrated haptic feedback, and force sensing.

- Resolution: 2560 × 1600
- Luminance: 800 nit
- Contrast: 1,000,000:1
- Bending Radius: 35 mm
- Acceleration: 5g



③ Naked Eye 3D Display with Gesture Recognition and Interaction

Parameters

- Resolution: 4800 × 1800
- PPI: 417
- Luminance: 800 nits
- 3D Viewing Angle: $\pm 40^\circ$
- Eye Tracking Response Time: 50 ms

⑤ Vehicle Intelligent Interactive Light-SMT: A high-reliability exterior display with R1000 curvature, flexible substrate, splicing, and smart 'Auto + Person' interaction.

- Dimension (mm): 960 × 90
- Refresh Rate (Hz): 3840
- Resolution: 640 × 60
- Luminance: 5000 nits
- Contrast Ratio: $\geq 3000:1$
- Thickness: 11.6 mm

⑥ P0.3 Micro LED Transformer Display: Curved frameless sliding display with high color gamut, high refresh rate, and HDR contrast ratio.

- Pitch/mm: 0.3
- Brightness (nit): 2000 (Peak) / 1000 (Typ.)
- Color Gamut: NTSC 110%
- Module Radian: 10°
- Refresh Rate (Hz): 90



④ 10.95" Glasses-free 2D/3D Switchable Handheld Game Console

- Resolution: 2560 × 1600
- Viewing Distance: 50–70 cm
- Viewing Point: Double
- Refresh Rate: 120 Hz

Source: BOE Varitronix, Photos taken by Omdia at CES 2025

BOE Varitronix: Transformable OLED Automotive Displays

- 31.6-inch Spliced Slidable Display:** The industry's largest modular sliding display features a dynamically adjustable screen size.
 - Resolution: $1672 \times 3536 \sim 1672 \times 5944$
 - Size (inch): 29.4" ~ 24.5" ~ 19.6"
 - Aspect Ratio: 34:10 ~ 28:10 ~ 21:10
 - Slide Distance: >260 mm
 - Sliding Radius: R5 mm
- Foldable + Curable Flexible Automotive Display:** Customizable screens with foldable and R400 curved display technology, blending seamlessly with interior aesthetics.
 - Resolution: $2972 \times 1672 / 2560 \times 1600$
 - Size: 17 inch / 15.05 inch
 - Bending Radius: R400 mm
 - Folding Radius: R5 mm
- 17.3-inch ceiling screen:** An ultra-slim, ultra-narrow bezel ceiling-mounted entertainment screen with 3K HD display, featuring integrated backlight die-casting technology and 2-in-1 PCBA design.
 - Resolution: 2880×1620
 - Angle Adjustment: Continuous angle adjustment
 - Contrast: 1500:1
 - Color Gamut: 95% NTSC
 - Flip Structure: Direct drive with worm gear reducer



Source: BOE Varitronix, Photos taken by Omdia at CES 2025

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BOE Varitronix: Special featured automotive displays



44.8" PHUD Intelligent Cockpit (Single screen P-P PHUD): with P-P continuous large screen, featuring BOE 8K+ system, BOE Share application, and projection distortion correction

- Oxide TFT LCD based
- Resolution: 8960 × 634
- Luminance (Typ./Peak): 5000/7000 nits
- Local Dimming: 2850 zones
- Color Gamut: 85% NTSC
- Contrast Ratio: 1,000,000:1
- Reflectivity of P-light: 25%



Switchable Privacy Display

- Resolution: 2560 × 1440
- Luminance:
 - Share mode: 800 nit
 - Privacy mode: 480 nit
- Contrast: 1500:1
- Share Mode (Left/Right):
 - H= ±40°: 40% (TYP.)
 - H= ±50°: 25% (TYP.)
- Privacy Mode (Left):
 - H= -25°: 1.20% (TYP.)
 - H= -45°: 0.45% (TYP.)



15.05" edge OLED: Automotive-grade f-OLED with a super small bending radius for an enhanced control experience.

- Resolution: 2560 × 1600
- Luminance: 800 nits
- Contrast Ratio: 1,000,000:1
- Color Gamut: 104% NTSC
- Bending Radius: R35mm

Source: BOE Varitronix, Photos taken by Omdia at CES 2025

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CarUX/ JDI eLeap Automotive Displays



Integrated Cockpit OLED System

- Ultra-high contrast
- High color saturation and resolution
- Slim design compared to LCD
- Specifications:
 - Size: 31.9" (1-in-1)
 - Technology: eLEAP OLED
 - Back Plane: HMO (High mobility oxide)
 - Shape: Free-form
 - Resolution: 6460 RGB x 880
 - PPI: 205
 - Aperture Ratio: 63%
 - Brightness (nits): >1,000



Integrated Cockpit OLED System

- Environment Positive
- Extreme Long Life, Low Power, High Luminance
- Maskless Deposition, Shape Patterning
- Specifications:
 - Size: 49" (14-inch 3-in-1)
 - Technology: eLEAP OLED, eLEAP with Privacy/2 Vision Display
 - Resolution: 2880 RGB x 1080 (Cluster), 2880 RGB x 1440 (PID)
 - PPI: 171 ~ 242
 - Brightness: 800 nits

Source: CarUX, Photos taken by Omdia at CES 2025

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CarUX Special Featured Automotive Displays

Kinematics Solution - Multi-Axis Rotatable 11.1"

Display: features include AI-based face tracking, voice and gesture recognition with tracking, UI or voice-triggered rotation, and gesture-triggered tilt.

- Size: 11.1"
- Motion Type: Rotate (Portrait/Landscape), Tilt (Up/Down), Lateral Tilt (Left/Right)
- UI or Voice Trigger Rotation
- Gesture Trigger Tilt



Haptics and Force Sensing: Enhancing user experience and safety with powerful haptic feedback across the entire display surface, triggered by touch and force sensing (>300g) with a single finger.

- Size: 10.2" Actuator Type: LRA
- Displacement Direction: Lateral
- Haptic Acceleration: 1.6g p-p
- Force Sensing (g): 100~600



12.3" Free Zone Privacy View: Free Zone Privacy Solution with a privacy ratio under 1% at 30°~60°, supporting adjustable light direction based on location.

- Size: 12.3"
- Model Name: DD123SA-01A
- Technology: TFT LCD, a-si AAS



Source: CarUX, Photos taken by Omdia at CES 2025

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CarUX Special Featured Automotive Displays (cont.)

Camera Behind Display (CBD)/ Camera Embedded in Display System



•Features:

- Integrated design concepts consisting of IR Camera / Algorithm / Display System.
- High image-quality transmission by CarUX proprietary IR-Window design on the display panel.
- Flexible design with customized IR-window and camera location in the display module.
- Reduces personal privacy concerns with CarUX Object Hidden Solution (OHS).

•Applications:

- Driver Monitoring System (DMS).
- Occupant Monitoring System (OMS).
- Driver/Passenger Face Authentication System.
- Other IR Image Applications In-Cabin.

Windshield Reflective Solution



9.6" Light Field AR Display

•Features:

- Immersive Driving Experience
- uLED Base ARHUD
- Light Field AR Technology

•Specifications:

- Size: 9.6"
- Brightness: >10,000 nits
- 3D Depth: 2m ~ 15m

48" Full-Width Windshield Projective Display

•Features:

- Warp-Free Distortion Correction
- High Luminance, Ghosting-Free, No Significant Aberration
- Smaller Volume vs. HUD

•Specifications:

- Size: 48"
- Brightness: ~14,000 nits
- Resolution: 3840 x 374

Source: CarUX, Photos taken by Omdia at CES 2025

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Continental Rear Side Window Displays

- Continental's Window Projection technology, introduced at CES 2025, enables content to be projected onto a vehicle's rear side windows, visible from the outside. This feature supports displaying information such as EV charge levels, route details, or personalized graphics, enhancing communication between the vehicle and its surroundings.
- The system utilizes a compact and efficient mini projector that requires less than half a liter of installation space. Integrated into the vehicle's roof lining, it delivers high-quality visuals on electrically darkened windows optimized for projection.
- Continental provides the necessary technology, seamless system integration, and software components to support this solution. The included eTravel.companion software uses data such as driving habits and weather to generate context-based suggestions and content. Developed in partnership with the banbutsu platform and WPP network, the system delivers relevant and personalized content tailored to real-time conditions and user preferences.
- By combining efficient hardware, tailored software, and seamless integration, the Window Projection system aims to enhance in-vehicle communication and offer adaptable functionality for various use cases. This technology highlights advancements in projection systems while prioritizing space efficiency and personalization.

Window Display: A small projector transforms the side window into an exterior display for a unique user experience.



Simple personalization: the logo of the person's favorite sports club appears on the side window.



A mini projector in the roof lining displays the content on the side window in excellent quality.



Personalized welcome message thanks to the integration of the AI-based eTravel.companion.

Source: Continental, Photos taken by Omdia at CES 2025

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Continental Emotional Cockpit: Swarovski Crystal and EINK Trimline

- Continental unveiled the “Emotional Cockpit,” blending advanced display technology with innovative design for a personalized, sensory in-car experience. With a focus on emotional engagement, the cockpit integrates intuitive displays and customizable features, enhancing the user experience. A dedicated area for AI assistants and interactive widgets provides real-time information, reflecting the growing importance of emotionally connected vehicle interiors.
- A key highlight is the integration of Swarovski Crystals into two dashboard displays. These displays combine aesthetic appeal with advanced functionality, including a 12.3-inch TFT LCD display featuring full-array local dimming for exceptional brightness and deep blacks. The centerpiece, the “Widget Crystal,” uses 3.5-inch micro LED technology for a floating visual effect. Swarovski’s “Aurora Borealis” coating adds emotive color gradients, creating a captivating ambiance through light reflections.
- Continental also partnered with E Ink to introduce a 1.30-meter-wide Prism display using ePaper technology. This lightweight, energy-efficient solution offers endless customization options, from patterns and graphics to functional data like charge levels. Its low power consumption and durability make it ideal for electric vehicles. Together, these innovations highlight a holistic approach to vehicle interiors, emphasizing both aesthetic sophistication and functional advancements for the future of automotive design.

Emotional Cockpit: Displays integrated in unique Swarovski crystals and the world-first-customizable E-Ink trimline intensify the emotional bond between the driver and the vehicle



Source: Continental, Photos taken by Omdia at CES 2025

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Continental Invisible Biometrics Sensing Display

- Continental and trinamiX showcase the Invisible Biometrics Sensing Display, integrating biometric monitoring seamlessly into vehicle interiors. This innovative solution features an invisible 1.5 MP near-infrared camera and laser projector embedded behind a high-resolution OLED screen. It enables contactless tracking of passengers' vital parameters, such as heart rate, while ensuring user acceptance and maintaining interior design aesthetics.
- Key functionalities include 3D distance mapping for optimized airbag deployment and seat belt detection, as well as monitoring stress or medical emergencies to trigger safety measures. The system combines biometric imaging and AI to process data efficiently, offering advanced safety and comfort features in a single, invisible module.
- Recognized as a CES Innovation Award Honoree in "Vehicle Tech and Advanced Mobility," this collaboration between Continental and trinamiX highlights the integration of advanced sensor systems into displays, advancing safety and user experience in automotive interiors.

Invisible Biometrics Sensing Display: The Invisible Biometric Sensing Display integrates secure authentication, advanced safety, health and well-being features behind an OLED display



Source: Continental, Photos taken by Omdia at CES 2025

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CSOT Automotive Displays



(Up) Curved Wood-Infused Display (Dual 23.6\")

•Specifications:

- Resolution: 3840 × 720 × 2
- Brightness: NTSC 110%, 3000 nits
- Mini-LED OD: 3 mm

•Highlights:

- Ultra-narrow seam down to 1.0 mm
- Wide color gamut and hidden wooden display integration



(LEFT)IR CUP (Camera Under Panel) Display (12.3\")

•Specifications:

- Resolution: 1920 × 720
- FOV: 60°
- Camera Position: Anywhere under the screen

•Highlights:

- Full-screen display, no cutouts
- DMS system for real-time fatigue detection

(Down) Entertainment Display 120Hz (17.3\")

•Specifications:

- Resolution: 3072 × 1920
- Refresh Rate: 60Hz/120Hz
- PPI: 209
- Contrast Ratio: 1500:1, Brightness: 1000 nits

•Highlights:

- High refresh rate for gaming experience
- 4.2 mm ultra-narrow border

(RIGHT) Curved Wood-Infused Display (Dual 23.6\")

•Specifications:

- Resolution: 3840 × 720 × 2
- Brightness: NTSC 110%, 3000 nits
- Mini-LED OD: 3 mm

•Highlights:

- Ultra-narrow seam down to 1.0 mm
- Wide color gamut and hidden wooden display integration

Source: CSOT, Photos taken by Omdia at CES 2025

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CSOT Automotive Displays (cont.)



The Brightest Micro LED Panoramic HUD (10.25")

• Specifications:

- Brightness: 5000+ nits
- Contrast Ratio: 1,000,000:1

• Highlights:

- High brightness and ultra-clear viewing



Panoramic HUD with Built-in ALS (11.98")

• Specifications:

- Resolution: 1500 × 256
- Brightness: Typ. 11000 nits
- Transmittance: 65.5%

• Highlights:

- Integrated ALS, replaces cluster display



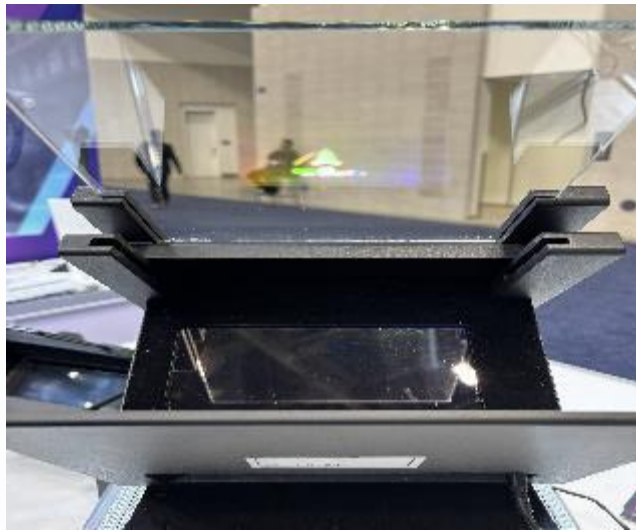
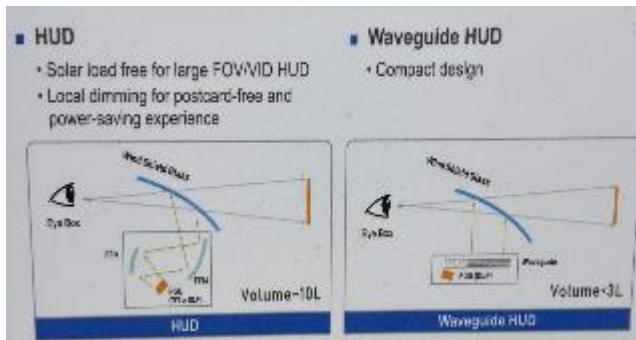
3D AR HUD

• Specifications:

- 5.1-inch TFT LCD
- Resolution: 2560 × 1440
- FOV: 11° × 5.4°
- Image Size: 866.6 mm × 424.4 mm
- Brightness: ≥12,000 nits
- VID: ≥4.5 m
- Contrast Ratio: ≥1,500:1

GIS Automotive Display Products

Waveguide HUD



TDM in Smart Cockpit

Features:

- Surface coating capability: AG/AR/AS
 - Super-low reflection ($R_{sc}(Y) < 0.2\%$)
 - Low chromatic aberration ($\Delta a^* < 3, \Delta b^* < 3$)
 - Color matching for seamless design
- Pillar-to-pillar (1,500 mm)
- Mini-LED BLU
- Multi-display lamination
- 3D cover glass



Specifications:

•Cluster/Passenger Display:

- **Surface:** AG: Haze 5%, AR: $R_{sc}(Y) < 0.2\%$, AS: WCA 110°
- **Size:** 12.3" / 23.6"
- **Resolution:** 1920 × 720 / 3840 × 720
- **Contrast Ratio:** 1,000,000:1
- **Brightness:** 1,000 nits
- **Dimming Zones:** 384 zones / 768 zones



Source: GIS, Photos taken by Omdia at CES 2025

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Harman Ready Displays

HARMAN Ready Display, powered by Samsung Neo QLED technology. It features automotive-qualified cadmium-free Quantum Dot technology and Blue Mini LED-based local dimming, delivering enhanced brightness, intelligent algorithms, and a sleek design that brings home-theater quality to vehicles.

NQ3 – 14.6"

•Industry First

- Cadmium-free Quantum Dot and Blue Mini-LED technology

•Stunning Performance

- Overall brightness: 1300 nits
- Single zone: 120 nits

•Sleek Design

- Bezel: 4.7 mm
- Slim profile: 9.9 mm



Source: Harman, Photos taken by Omdia at CES 2025

NQ5 – 15.6"

Confident Touch

- Solenoid actuator for crisp vibration

•Adjustable Haptics

- Configurable and uniform haptics

•Customizable Feedback

- Adjustable vibration strengths, sensations, and durations



NQ7 – 14.6"

HDR10+ Automotive Ready

- Dynamic tone-mapping and decoding

•Image Quality Enhancement

- Pixel compensation and Vision Plus technology

•Performance Boost

- Overall brightness: 2000 nits
- Single zone: 600 nits



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Hyundai Mobis Holographic Windshield Display

- Hyundai Mobis has introduced its Holographic Windshield Display, a technology designed to transform the vehicle's windshield into a transparent display. By utilizing HOE (Holographic Optical Element) film, the system projects content such as navigation, driving information, and media directly onto the windshield, eliminating the need for traditional in-cabin display devices. The display provides high brightness and color reproduction for clear visibility, even in bright conditions, and features a privacy mode that limits content visibility to selected occupants. Its flexible design allows customization for various windshield sections, enabling dynamic use cases like curved-edge functionality.
- This innovative solution is the result of Hyundai Mobis's collaboration with German optical company ZEISS, combining expertise in optical engineering with a focus on driver-centric display technologies. Pre-development has been completed, with plans for mass production by 2027. The Holographic Windshield Display highlights Hyundai Mobis's strategy to expand its premium display offerings, which include QLED and rollable displays.
- At CES 2025, Hyundai Mobis demonstrated the technology in a Kia EV9, offering live presentations to showcase its application and potential. This unveiling reflects Hyundai Mobis's efforts to advance in-vehicle display technologies and strengthen its position in the global automotive display market.



Source: Hyundai Mobis, Photos taken by Omdia at CES 2025

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Samsung Display OLED Automotive Display Products

Automotive UPC (Under Panel Camera)

- Display: 13.6" FHD+
- Resolution: 2504 × 1148
- PPI: 200 (Non-UPC Area) | 100 (UPC Area)



Source: Samsung Displays, Photos taken by Omdia at CES 2025

Safety Visionary Flex Magic Pixel

- Display: 13.6" FHD+
- Resolution (ppi): 2504 × 1148 (200)
- Brightness (nit): Typ. 600
- Cut-off Luminance Ratio: 1% @ 30°



Sight Twister Auto Foldable 18.1"

- Display: 18.1" QHD+
- Resolution (PPI): 2,800 × 2,464 (184)



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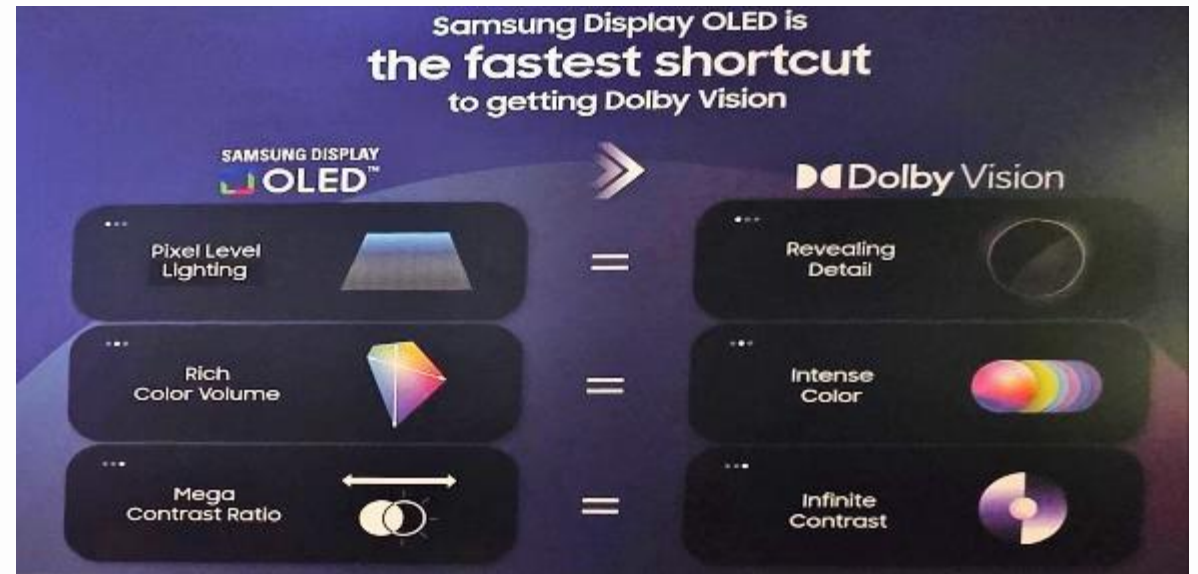
Samsung Display OLED Automotive Products (cont.)

(Bottom) Samsung Display Digital OLED Display Cockpit

(Right) Samsung Display Dolby Vision Certificated OLED Displays



Source: Samsung Displays, Photos taken by Omdia at CES 2025



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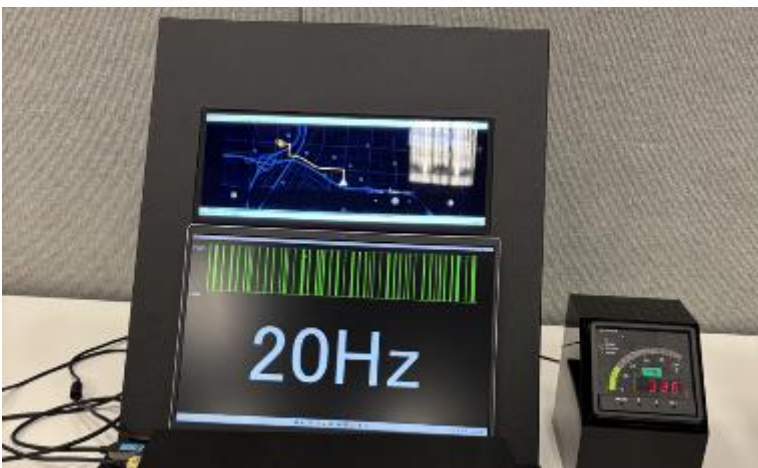
Sharp Display Automotive Display Products

Multi Refresh Rate (1 Hz ~ 60 Hz) Display

Optimizing (slowing down) the image processing speed for each content suppresses system power consumption and heat generation on the vehicle side.

Prototype Specifications:

- Size: 12.3"
- Resolution: 1920 (RGB) × 720
- Refresh Rate: Variable refresh rate (1 Hz ~ 60 Hz)
- Backplane: IGZO TFT
- LC: New material to meet in-vehicle reliability at 1 Hz



Source: Sharp Display, Photos taken by Omdia at CES 2025

GZO-4DeMUX LCD

narrow bottom border by area reduction for wiring and lower cost by numbers reduction of S-Dr IC .

Prototype Specifications:

- Display Size: 12.3", 1920 (RGB) × 720
- TFT: IGZO
- Gate: GIP (Gate In Panel)
- Source: 4DeMUX 1chip
- Border (L/R): 2 mm
- Bottom: 6.8 mm
- Frequency: 60 Hz
- Touch Panel: InCell TP



Dual View

Two touchable contents can be displayed on one screen. Privacy mode can be realized simultaneously.

Prototype Specifications:

- Screen Size: 11.8"
- A.A. Size: 180 (H) x 240 (V) mm
- Pixel Pitch: 75 μm (H) x 75 μm (V)
- Display Format: 2,400 x 3,200 (RGB)
- Resolution: 170 ppi (Base panel: 340 ppi)
- Color Gamut: DCI-P3 90%
- Touch Panel: In-cell TP with IR sensor



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Sharp Display Automotive Display Products (cont.)

Texture Display

The combination of 3D textured panels and LCDs provides a more attractive interior space.

Prototype Specifications:

- Display : 12.3" 1920 (RGB) x 720 (167 ppi) Edge-lit
- Luminance with Texture Panel: 500 nit
- Contrast: 1800:1
- Touch Panel: In-cell capacitance type
- Texture Panel: Polycarbonate, thickness = 3 mm
- Texture Pattern: Black stone
- Texture Transparency: 70% (NDH-2000 Nippon Denshoku)
- 3D Molding Method: Thermal transfer



Source: Sharp Display, Photos taken by Omdia at CES 2025

Driver Monitoring Camera Integrated Display

The camera identifies signs of drowsiness, inattention, and other driver behaviors, alerting the driver via alarms.

Prototype Specifications:

Display:

- Size: 12.3"
- Resolution: 1,920 (RGB) x 720

Area of display affected by the camera:

- 2 mm diameter (1 mm diameter achievable).
- Display pixels (RGB) are active.
- Camera placement is flexible.

Camera:

- Field of View (FOV): 58° (Horizontal); 40° (Vertical)
- Resolution: 1,920 x 1,280 pixels (IR).

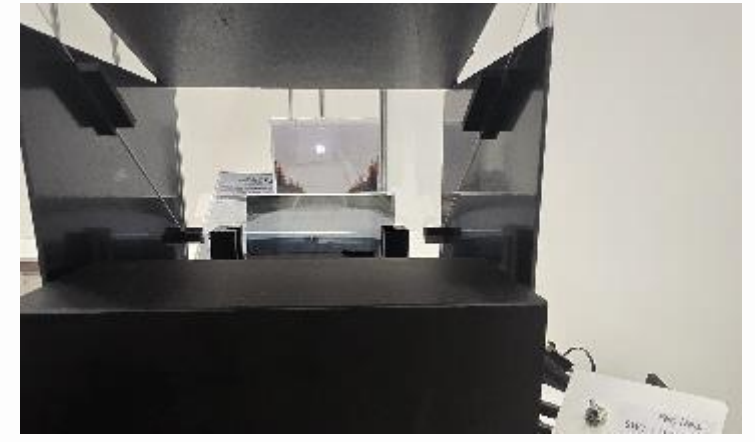


Multi-Depth HUD

Multi depth HUD can show more intuitive image by utilizing SDTC's LC technology.

Prototype Specifications:

- Active Area Size: Approx. 1.8 inches
- LCD Resolution: Approx. 390 ppi
- LC Lens Diameter: 50 mm
- Virtual Image Distance: 1 m (from windshield) to 6 inches (near view).
- Distance Switching Levels: 4 Levels



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Tianma Smart Cockpit



❶ 27" + 12.3" InvisiVue™:

- Technology: LTPS Mini-LED
- Resolution: 4032x756
- Brightness: 850 cd/m²
- Dynamic Contrast Ratio: ≥200,000:1
- Curve Radius: R5000
- Applications: Automotive

❷ 12.3" 3D Cluster:

- Technology: LTPS
- Resolution: 5760x2160
- Brightness: 900 cd/m²
- 3D Viewing Angle: 30°
- Features: Light Field 3D, 2D/3D switch, Eye-tracking
- Applications: Automotive Cluster

❸ 12.3" InvisiVue™:

- Technology: LTPS OD Mini-LED
- Resolution: 1920x720
- Brightness: 800 cd/m²
- Dynamic Contrast Ratio: ≥600,000:1
- Applications: Automotive

❹ IRIS HUD:

- Display Size: 12-inch x 3
- Brightness: >1,000 cd/m²
- Color Gamut: >80% NTSC
- Volume: <1L
- Applications: Automotive

Source: Tianma, Photos taken by Omdia at CES 2025

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Tianma Automotive Displays

3D HUD

The 3D HUD combines 3D visuals with AR, offering realistic depth and parallax for enhanced driver awareness and safety.

Specifications:

- PGU: 4.1-inch TFT
- Image Size: 77 inches
- FOV (Field of View): $10^{\circ} \times 5^{\circ}$
- Eyebox: 130mm \times 50mm
- VID (Virtual Image Distance): 10 meters
- 3D Depth: -3m to +50m
- Volume: <13L



Source: Tianma, Photos taken by Omdia at CES 2025

15.6" Wide Refresh Rate Display

- Display Technology: LTPS
- Resolution: 2880 \times 1620
- Dynamic Frame Rate: 40Hz - 120Hz
- Dimming Zones: 1196
- Color Gamut (NTSC): 125%
- Brightness: 2300 cd/m²
- Static Contrast Ratio: >1,000,000:1
- Image Contrast Ratio: 1800:1
- Halo Contrast Ratio: >10,000:1
- Operating Temperature Range: -40°C to +85°C
- Storage Temperature Range: -40°C to +95°C



Dual-13" Multi-Curved Color Match OLED Display

- Display Technology: AMOLED
- Resolution: 2560 \times 1440 (227 ppi)
- True-black delta E*ab (D65): 0.78
- Low Reflectivity: 0.5%
- Contrast Ratio: 2,000,000:1
- Color Gamut (NTSC): >103%
- Response Time: ≤ 1 ms
- Multi-Curved Radius (mm): Left: R800/ Middle: R1140/ Right: R2160



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Tianma Automotive Displays (Cont.)

14.6" Ambient Light Sensor (ALS) and Near Field Communication (NFC) Integrated Display

- Display Technology: LTPS
- Resolution: 2560 × 1440
- Panel Border: 2.0/2.0/2.0/0.7 mm
- Color Gamut (NTSC): 100%
- ALS Precision: 15 lux
- ALS Accuracy: $\pm 15\%$
- ALS Detect Range: 0–50k lux
- Color Temperature Accuracy: $\pm 250K$
- Color Temperature Range: 2500K–7000K
- NFC Detect Distance: 2–4 cm



Source: Tianma, Photos taken by Omdia at CES 2025

14.6" High Transmittance Display

- Display Technology: LTPS
- Resolution: 1920 × 1080
- Brightness: 1000 cd/m²
- Color Gamut (NTSC): 90%
- Contrast Ratio: >1200:1
- Transmittance: 6.5%
- Backlight Power Consumption (Max): 10W
- Surface Temperature @ Ambient: $\Delta = 15^{\circ}\text{C}$



8" HUD Micro-LED Display

- Technology: Micro-LED
- TFT Type: LTPS
- Drive Method: Active Matrix (AM)
- Resolution: 1204 × 608
- PPI: 167
- Brightness: 10,000 cd/m²

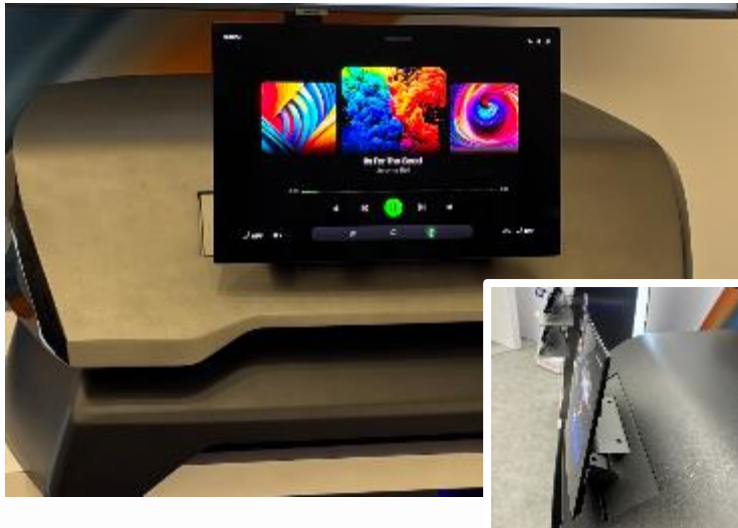


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Visteon Automotive Display Products

Sunlight Readable OLED Display

- Utilizes proprietary AR technology and vertical integration for premium display solutions.
- Ultra-thin profile for sleek designs.
- Superior sunlight readability ensuring clear visibility.
- Seamless black appearance for a refined, modern look.



Large Curved OLED Display

- Custom-designed curved OLED displays utilizing: Visteon's proprietary manufacturing and optical expertise.
- Premium viewing experience with: Superior black levels. Low reflectivity.
- Consistent performance across all lighting conditions.



Segmented Active Privacy

- Proprietary scalable active privacy technology: compatible with TFT, Local Dimming, and OLED displays. Adaptable to various sizes and resolutions.
- Customizable privacy zones with superior performance.
- Brightness leakage of less than 0.5%.
- Lower power consumption compared to multi-backlight solutions.
- Consistent color across different viewing angles.



Source: Visteon, Photos taken by Omdia at CES 2025

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BMW new iDrive – HUD and new display with special rectangle form factor

- The BMW Vision Neue Klasse X showcases a refined user interaction approach with the new BMW iDrive. The BMW Panoramic Vision projects information across the full width of the windscreen. Paired with the Central Display, the multifunction steering wheel and the BMW 3D Head-Up Display, every interaction becomes seamless.



Source: photo taken by Omdia analysts in CES 2025

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