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Global CMOS Backplanes Supply, Demand and Key Producers, 2026-2032

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Abstracts

The global CMOS Backplanes market size is expected to reach $ 651 million by 2032, rising at a market growth of 23.9% CAGR during the forecast period (2026-2032).

CMOS silicon backplanes are high-density active-matrix semiconductor backplanes fabricated on monocrystalline silicon wafers using CMOS processes and designed to provide pixel-level driving, addressing, grayscale control, compensation and peripheral logic for Micro-OLED displays. Compared with glass-based LTPS or oxide TFT backplanes, CMOS silicon backplanes support substantially smaller pixel pitches and higher pixel densities, making them particularly suitable for compact near-eye displays. Commercial products are generally manufactured on 200 mm or 300 mm silicon wafers using mature and specialty CMOS nodes, with 180 nm, 110 nm and 65 nm representative of existing manufacturing platforms; advanced solutions increasingly incorporate low-leakage devices, high-voltage structures, temperature compensation and voltage compensation. The backplane is normally delivered as a processed wafer or backplane chip to Micro-OLED display manufacturers for subsequent anode formation, OLED deposition, encapsulation, color processing and module integration. This report focuses on CMOS silicon backplanes used in Micro-OLED/OLEDoS microdisplays, covering commercial and captive backplane manufacturing value for AR/VR/MR headsets, smart glasses, electronic viewfinders, defense and night-vision systems, medical displays and other professional microdisplay applications. Commercial backplanes can exceed 5,000 PPI, while next-generation designs are pushing toward smaller pixel pitches and higher-voltage architectures.

Key Findings

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In 2025, the global weighted average price of CMOS silicon backplanes was approximately US$2,500–3,200 per piece.

The overall industry gross margin was approximately 28%–40% in 2025.200 mm wafers are still primarily used for mature and specialty CMOS processes.

XR remains the largest downstream market, while AR smart glasses represent an important emerging application.

Market Trends

The technology roadmap is shifting from simple pixel-density competition toward simultaneous optimization of pixel pitch, power consumption, voltage capability, integration and manufacturing yield. Smaller CMOS nodes allow higher integration density, but the backplane remains fundamentally an analog/mixed-signal display device rather than a conventional logic chip, meaning that mature and specialty CMOS processes retain significant commercial value. Current foundry platforms span 180 nm and 65 nm, demonstrating that smaller nodes do not completely displace mature nodes; different display sizes, pixel structures and voltage requirements favor different process combinations.

High-voltage CMOS is becoming a notable technology direction for high-brightness Micro-OLED. Stacked OLED structures can increase luminance but require higher backplane driving voltage, creating demand for low-leakage high-voltage transistors and redesigned pixel circuits. Fraunhofer IPMS has demonstrated high-voltage CMOS backplanes supporting stacked OLED architectures and luminance above 10,000 cd/m², highlighting a path toward outdoor AR and other high-brightness near-eye applications.

Market Dynamics

The market is moving from a highly concentrated, customized supply model toward a broader combination of captive design, independent backplane suppliers and specialty foundry manufacturing. Backplane products remain highly customer-specific because display size, pixel arrangement, resolution, interface, OLED current requirements and compensation algorithms are defined early in the display architecture. Commercial shipments are therefore closely linked to downstream customer qualification cycles and individual XR product launches rather than only to generalized semiconductor capacity

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expansion. Whole-wafer delivery remains a typical commercial model because Micro-OLED manufacturers subsequently build the OLED device directly on the processed backplane wafer.

Drivers

Demand is primarily driven by the requirement for ultra-compact, high-resolution and low-power displays in XR devices. Monocrystalline silicon CMOS backplanes can achieve pixel densities far above conventional LTPS OLED backplanes, making them suitable for near-eye applications where small display area and high perceived resolution are required simultaneously. AI-enabled smart glasses and next-generation AR/VR products are also increasing requirements for higher integration, lower power consumption and smaller optical engines. Policy support in China is reinforcing this transition, with current next-generation display initiatives explicitly encouraging large-size CMOS driving, low-power/high-resolution CMOS driving and improved silicon-based OLED manufacturing.

Restraints

The main constraints are high customization costs, relatively concentrated downstream customers, long qualification cycles and dependence on suitable specialty CMOS manufacturing capacity. Backplane pricing also faces downward pressure as customer volumes rise. One major independent supplier's average selling price declined from RMB22,561 per wafer in 2024 to RMB17,953 per wafer in 2025 despite substantial shipment growth, illustrating the impact of customer scale, product mix and commercial pricing on revenue growth.

Opportunities

The strongest opportunities are concentrated in 300 mm manufacturing, higher-voltage CMOS architectures, finer pixel pitches and highly integrated backplanes for AI glasses and next-generation XR devices. 300 mm capacity can improve wafer-level manufacturing economics as volume increases, while advanced CMOS can integrate more driving, compensation and interface functions into the backplane. High-voltage architectures additionally expand the addressable market toward high-luminance outdoor AR. Dedicated commercial processes already demonstrate 5 ?m-class pixels, and research platforms are extending the technology toward 2.5 ?m pixels and stacked-

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OLED driving.

Challenges

Yield management remains a central challenge because the value of a CMOS backplane depends not only on semiconductor fabrication yield but also on its compatibility with subsequent OLED deposition, encapsulation and display processing. Larger die sizes, finer pixels and more integrated peripheral circuits increase design and manufacturing complexity. The industry must also manage technology substitution risk from Micro-LED-based microdisplays, particularly in applications emphasizing very high luminance and outdoor visibility. Micro-OLED retains advantages in maturity, efficiency, contrast and color performance, while ongoing high-voltage and stacked-OLED development is intended in part to narrow the brightness gap.

Industry Chain Analysis

The upstream industry consists of electronic-grade silicon wafers, CMOS foundry capacity, semiconductor manufacturing equipment, EDA/IP, photomasks and specialty process materials. The midstream combines backplane architecture and pixel-circuit design with CMOS wafer fabrication, wafer testing and delivery. Depending on the business model, backplane design and wafer fabrication may be vertically integrated or separated between fabless backplane suppliers and specialty foundries. The downstream Micro-OLED manufacturer receives the processed CMOS wafer and performs OLED-related processes before assembling the display into an optical engine or module. Commercial filings confirm that Micro-OLED backplanes are commonly delivered as whole wafers specifically because downstream panel manufacturers process the wafer directly into display devices.

Value Chain Analysis

Value creation is concentrated in pixel-circuit architecture, compensation algorithms, customized interface design, CMOS process adaptation, wafer yield and customer qualification. Smaller process nodes can increase integration and pixel density, but higher-value products are not defined by node alone; wafer size, backplane area, voltage architecture, circuit complexity and expected production volume also influence ASP and profitability. The migration toward 12-inch wafers provides scale advantages but also requires sufficiently large customer programs to absorb capacity. In parallel,

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proprietary backplane design remains strategically important because it directly affects display power consumption, uniformity, refresh performance and image quality.

Segment Insights

By wafer size, 200 mm and 300 mm are the two principal commercial categories. 200 mm remains important for mature and specialty CMOS processes, while 300 mm is gaining importance in new high-volume Micro-OLED programs. By process node, the market can be segmented into 180 nm and above, 90–179 nm, and below 90 nm; more advanced nodes are particularly relevant where pixel density and peripheral integration are priorities. By voltage architecture, conventional CMOS remains the mainstream installed base, while high-voltage CMOS is developing as a higher-value route for stacked and high-luminance OLED structures.

By pixel pitch, 4–<6 ?m fine-pitch products occupy an important high-performance commercial range, while sub-4 ?m products represent the next technological frontier. By application, XR is the principal market, followed by established professional applications such as EVFs, defense/night vision, medical systems and industrial optics. Application mix directly influences backplane specifications: AR emphasizes brightness, power consumption and compactness, while VR/MR places greater emphasis on resolution, display area and refresh performance.

Downstream Market Opportunities

AR smart glasses represent the most strategically important incremental opportunity because the optical engine must simultaneously satisfy stringent requirements for size, power consumption, resolution and outdoor readability. This favors further development of fine-pitch, low-power and high-voltage CMOS backplanes. VR/MR remains important for larger-format and high-resolution backplanes, while defense, night vision and professional scopes provide a smaller but technically demanding market where performance and supply reliability can support higher product value. Samsung Display's OLEDoS manufacturing activities and ongoing industry expansion into XR provide additional evidence that commercialization is progressing beyond traditional EVF applications.

Regional Insights

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China is becoming the most active supply-expansion region, supported by the combination of CMOS foundry infrastructure, independent backplane development, Micro-OLED manufacturing capacity and downstream XR electronics. Policy support increasingly targets large-size CMOS driving, low-power and high-resolution CMOS circuits and silicon-based OLED mass production, strengthening the domestic supply chain. New 12-inch silicon-based OLED projects also indicate a shift toward higher-volume manufacturing infrastructure.

Japan remains an important high-end technology and captive-supply center, particularly in established OLED microdisplay applications such as EVFs and premium near-eye displays. South Korea is strengthening its OLEDoS manufacturing position as production expands for XR applications. Israel and Europe have strategic relevance through specialty CMOS foundry processes and advanced backplane R&D, including dedicated 180 nm/65 nm OLEDoS manufacturing platforms and high-voltage CMOS architectures.

Competitive Landscape Analysis

The competitive landscape is characterized by strong regional specialization rather than a large number of interchangeable suppliers. China has the broadest emerging ecosystem across independent backplane supply, wafer manufacturing and downstream Micro-OLED production, and is currently the most visible region for new capacity additions. Japan retains advantages in mature high-performance captive backplane technology and established microdisplay commercialization, while South Korea is increasing its position through vertically integrated OLEDoS production. Israel and Europe are more concentrated in specialty foundry platforms and advanced backplane technologies. As a result, competition is increasingly shifting from basic manufacturing availability toward pixel-circuit IP, high-voltage capability, 300 mm manufacturing, yield, customer qualification and the ability to support high-volume XR programs.

Report Scope

This report studies the global CMOS Backplanes production, demand, key manufacturers, and key regions.

This report is a detailed and comprehensive analysis of the world market for CMOS

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Backplanes and provides market size (US$ million) and Year-over-Year (YoY) Growth, considering 2025 as the base year. This report explores demand trends and competition, as well as details the characteristics of CMOS Backplanes that contribute to its increasing demand across many markets.

Highlights and key features of the study

Global CMOS Backplanes total production and demand, 2021-2032, (K Pcs)

Global CMOS Backplanes total production value, 2021-2032, (USD Million)

Global CMOS Backplanes production by region & country, production, value, CAGR, 2021-2032, (USD Million) & (K Pcs), (based on production site)

Global CMOS Backplanes consumption by region & country, CAGR, 2021-2032 & (K Pcs)

U.S. VS China: CMOS Backplanes domestic production, consumption, key domestic manufacturers and share

Global CMOS Backplanes production by manufacturer, production, price, value and market share 2021-2026, (USD Million) & (K Pcs)

Global CMOS Backplanes production by Type, production, value, CAGR, 2021-2032, (USD Million) & (K Pcs)

Global CMOS Backplanes production by Application, production, value, CAGR, 2021-2032, (USD Million) & (K Pcs)

This report profiles key players in the global CMOS Backplanes market based on the following parameters - company overview, production, value, price, gross margin, product portfolio, geographical presence, and key developments. Key companies covered as a part of this study include iRay Technology Company Limited, Tower Semiconductor Ltd., Semiconductor Manufacturing International Corporation, Nexchip Semiconductor Corporation, X-FAB Silicon Foundries SE, Samsung Display Co., Ltd., eMagin Corporation, Seiko Epson Corporation, LG Display Co., Ltd., etc.

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This report also provides key insights about market drivers, restraints, opportunities, new product launches or approvals.

Stakeholders would have ease in decision-making through various strategy matrices used in analyzing the World CMOS Backplanes market

Detailed Segmentation:

Each section contains quantitative market data including market by value (US$ Millions), volume (production, consumption) & (K Pcs) and average price (US$/Pcs) by manufacturer, by Type, and by Application. Data is given for the years 2021-2032 by year with 2025 as the base year, 2026 as the estimate year, and 2027-2032 as the forecast year.

Global CMOS Backplanes Market, By Region:

United States

China

Europe

Japan

South Korea

ASEAN

India

Rest of World

Market Segmentation

Global CMOS Backplanes Market, Segmentation by Type:

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Backplane Wafer

Backplane Die / Chip

Others

Global CMOS Backplanes Market, Segmentation by Wafer Size:

200 mm (8-inch)

300 mm (12-inch)

Others

Global CMOS Backplanes Market, Segmentation by CMOS Process Node:

?65 nm

90–130 nm

?180 nm

Others

Global CMOS Backplanes Market, Segmentation by Application:

Electronic Viewfinders (EVF)

Scopes and Defense Displays

Medical Displays

Industrial and Professional Displays

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Others

Companies Profiled:

iRay Technology Company Limited

Tower Semiconductor Ltd.

Semiconductor Manufacturing International Corporation

Nexchip Semiconductor Corporation

X-FAB Silicon Foundries SE

Samsung Display Co., Ltd.

eMagin Corporation

Seiko Epson Corporation

LG Display Co., Ltd.

Key Questions Answered

1. How big is the global CMOS Backplanes market?
2. What is the demand of the global CMOS Backplanes market?
3. What is the year over year growth of the global CMOS Backplanes market?
4. What is the total value of the global CMOS Backplanes market?
5. Who are the Major Players in the global CMOS Backplanes market?
6. What are the growth factors driving the market demand?

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Contents

1 SUPPLY SUMMARY

1.1 CMOS Backplanes Introduction
1.2 World CMOS Backplanes Supply & Forecast
  1.2.1 World CMOS Backplanes Production Value (2021 & 2025 & 2032)
  1.2.2 World CMOS Backplanes Production (2021-2032)
  1.2.3 World CMOS Backplanes Pricing Trends (2021-2032)
1.3 World CMOS Backplanes Production by Region (Based on Production Site)
  1.3.1 World CMOS Backplanes Production Value by Region (2021-2032)
  1.3.2 World CMOS Backplanes Production by Region (2021-2032)
  1.3.3 World CMOS Backplanes Average Price by Region (2021-2032)
  1.3.4 North America CMOS Backplanes Production (2021-2032)
  1.3.5 Europe CMOS Backplanes Production (2021-2032)
  1.3.6 China CMOS Backplanes Production (2021-2032)
  1.3.7 Japan CMOS Backplanes Production (2021-2032)
  1.3.8 South Korea CMOS Backplanes Production (2021-2032)
1.4 Market Drivers, Restraints and Trends
  1.4.1 CMOS Backplanes Market Drivers
  1.4.2 Factors Affecting Demand
  1.4.3 CMOS Backplanes Major Market Trends

2 DEMAND SUMMARY

2.1 World CMOS Backplanes Demand (2021-2032)
2.2 World CMOS Backplanes Consumption by Region
  2.2.1 World CMOS Backplanes Consumption by Region (2021-2026)
  2.2.2 World CMOS Backplanes Consumption Forecast by Region (2027-2032)
2.3 United States CMOS Backplanes Consumption (2021-2032)
2.4 China CMOS Backplanes Consumption (2021-2032)
2.5 Europe CMOS Backplanes Consumption (2021-2032)
2.6 Japan CMOS Backplanes Consumption (2021-2032)
2.7 South Korea CMOS Backplanes Consumption (2021-2032)
2.8 ASEAN CMOS Backplanes Consumption (2021-2032)
2.9 India CMOS Backplanes Consumption (2021-2032)

3 WORLD MANUFACTURERS COMPETITIVE ANALYSIS

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3.1 World CMOS Backplanes Production Value by Manufacturer (2021-2026)
3.2 World CMOS Backplanes Production by Manufacturer (2021-2026)
3.3 World CMOS Backplanes Average Price by Manufacturer (2021-2026)
3.4 CMOS Backplanes Company Evaluation Quadrant
3.5 Industry Rank and Concentration Rate (CR)
  3.5.1 Global CMOS Backplanes Industry Rank of Major Manufacturers
  3.5.2 Global Concentration Ratios (CR4) for CMOS Backplanes in 2025
  3.5.3 Global Concentration Ratios (CR8) for CMOS Backplanes in 2025
3.6 CMOS Backplanes Market: Overall Company Footprint Analysis
  3.6.1 CMOS Backplanes Market: Region Footprint
  3.6.2 CMOS Backplanes Market: Company Product Type Footprint
  3.6.3 CMOS Backplanes Market: Company Product Application Footprint
3.7 Competitive Environment
  3.7.1 Historical Structure of the Industry
  3.7.2 Barriers of Market Entry
  3.7.3 Factors of Competition
3.8 New Entrant and Capacity Expansion Plans
3.9 Mergers, Acquisition, Agreements, and Collaborations

4 UNITED STATES VS CHINA VS REST OF THE WORLD

4.1 United States VS China: CMOS Backplanes Production Value Comparison
  4.1.1 United States VS China: CMOS Backplanes Production Value Comparison (2021 & 2025 & 2032)
  4.1.2 United States VS China: CMOS Backplanes Production Value Market Share Comparison (2021 & 2025 & 2032)
4.2 United States VS China: CMOS Backplanes Production Comparison
  4.2.1 United States VS China: CMOS Backplanes Production Comparison (2021 & 2025 & 2032)
  4.2.2 United States VS China: CMOS Backplanes Production Market Share Comparison (2021 & 2025 & 2032)
4.3 United States VS China: CMOS Backplanes Consumption Comparison
  4.3.1 United States VS China: CMOS Backplanes Consumption Comparison (2021 & 2025 & 2032)
  4.3.2 United States VS China: CMOS Backplanes Consumption Market Share Comparison (2021 & 2025 & 2032)
4.4 United States Based CMOS Backplanes Manufacturers and Market Share, 2021-2026
  4.4.1 United States Based CMOS Backplanes Manufacturers, Headquarters and

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Production Site (States, Country)
4.4.2 United States Based Manufacturers CMOS Backplanes Production Value (2021-2026)
4.4.3 United States Based Manufacturers CMOS Backplanes Production (2021-2026)
4.5 China Based CMOS Backplanes Manufacturers and Market Share
4.5.1 China Based CMOS Backplanes Manufacturers, Headquarters and Production Site (Province, Country)
4.5.2 China Based Manufacturers CMOS Backplanes Production Value (2021-2026)
4.5.3 China Based Manufacturers CMOS Backplanes Production (2021-2026)
4.6 Rest of World Based CMOS Backplanes Manufacturers and Market Share, 2021-2026
4.6.1 Rest of World Based CMOS Backplanes Manufacturers, Headquarters and Production Site (State, Country)
4.6.2 Rest of World Based Manufacturers CMOS Backplanes Production Value (2021-2026)
4.6.3 Rest of World Based Manufacturers CMOS Backplanes Production (2021-2026)

5 MARKET ANALYSIS BY TYPE

5.1 World CMOS Backplanes Market Size Overview by Type: 2021 VS 2025 VS 2032
5.2 Segment Introduction by Type
5.2.1 Backplane Wafer
5.2.2 Backplane Die / Chip
5.2.3 Others
5.3 Market Segment by Type
5.3.1 World CMOS Backplanes Production by Type (2021-2032)
5.3.2 World CMOS Backplanes Production Value by Type (2021-2032)
5.3.3 World CMOS Backplanes Average Price by Type (2021-2032)

6 MARKET ANALYSIS BY WAFER SIZE

6.1 World CMOS Backplanes Market Size Overview by Wafer Size: 2021 VS 2025 VS 2032
6.2 Segment Introduction by Wafer Size
6.2.1 200 mm (8-inch)
6.2.2 300 mm (12-inch)
6.2.3 Others
6.3 Market Segment by Wafer Size
6.3.1 World CMOS Backplanes Production by Wafer Size (2021-2032)

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6.3.2 World CMOS Backplanes Production Value by Wafer Size (2021-2032)
6.3.3 World CMOS Backplanes Average Price by Wafer Size (2021-2032)

7 MARKET ANALYSIS BY CMOS PROCESS NODE

7.1 World CMOS Backplanes Market Size Overview by CMOS Process Node: 2021 VS 2025 VS 2032
7.2 Segment Introduction by CMOS Process Node
7.2.1 ?65 nm
7.2.2 90–130 nm
7.2.3 ?180 nm
7.2.4 Others
7.3 Market Segment by CMOS Process Node
7.3.1 World CMOS Backplanes Production by CMOS Process Node (2021-2032)
7.3.2 World CMOS Backplanes Production Value by CMOS Process Node (2021-2032)
7.3.3 World CMOS Backplanes Average Price by CMOS Process Node (2021-2032)

8 MARKET ANALYSIS BY APPLICATION

8.1 World CMOS Backplanes Market Size Overview by Application: 2021 VS 2025 VS 2032
8.2 Segment Introduction by Application
8.2.1 Electronic Viewfinders (EVF)
8.2.2 Scopes and Defense Displays
8.2.3 Medical Displays
8.2.4 Industrial and Professional Displays
8.2.5 Others
8.3 Market Segment by Application
8.3.1 World CMOS Backplanes Production by Application (2021-2032)
8.3.2 World CMOS Backplanes Production Value by Application (2021-2032)
8.3.3 World CMOS Backplanes Average Price by Application (2021-2032)

9 COMPANY PROFILES

9.1 iRay Technology Company Limited
9.1.1 iRay Technology Company Limited Details
9.1.2 iRay Technology Company Limited Major Business
9.1.3 iRay Technology Company Limited CMOS Backplanes Product and Services

+357 96 030922
info@marketpublishers.com

9.1.4 iRay Technology Company Limited CMOS Backplanes Production, Price, Value, Gross Margin and Market Share (2021-2026)
9.1.5 iRay Technology Company Limited Recent Developments/Updates
9.1.6 iRay Technology Company Limited Competitive Strengths & Weaknesses
9.2 Tower Semiconductor Ltd.
9.2.1 Tower Semiconductor Ltd. Details
9.2.2 Tower Semiconductor Ltd. Major Business
9.2.3 Tower Semiconductor Ltd. CMOS Backplanes Product and Services
9.2.4 Tower Semiconductor Ltd. CMOS Backplanes Production, Price, Value, Gross Margin and Market Share (2021-2026)
9.2.5 Tower Semiconductor Ltd. Recent Developments/Updates
9.2.6 Tower Semiconductor Ltd. Competitive Strengths & Weaknesses
9.3 Semiconductor Manufacturing International Corporation
9.3.1 Semiconductor Manufacturing International Corporation Details
9.3.2 Semiconductor Manufacturing International Corporation Major Business
9.3.3 Semiconductor Manufacturing International Corporation CMOS Backplanes Product and Services
9.3.4 Semiconductor Manufacturing International Corporation CMOS Backplanes Production, Price, Value, Gross Margin and Market Share (2021-2026)
9.3.5 Semiconductor Manufacturing International Corporation Recent Developments/Updates
9.3.6 Semiconductor Manufacturing International Corporation Competitive Strengths & Weaknesses
9.4 Nexchip Semiconductor Corporation
9.4.1 Nexchip Semiconductor Corporation Details
9.4.2 Nexchip Semiconductor Corporation Major Business
9.4.3 Nexchip Semiconductor Corporation CMOS Backplanes Product and Services
9.4.4 Nexchip Semiconductor Corporation CMOS Backplanes Production, Price, Value, Gross Margin and Market Share (2021-2026)
9.4.5 Nexchip Semiconductor Corporation Recent Developments/Updates
9.4.6 Nexchip Semiconductor Corporation Competitive Strengths & Weaknesses
9.5 X-FAB Silicon Foundries SE
9.5.1 X-FAB Silicon Foundries SE Details
9.5.2 X-FAB Silicon Foundries SE Major Business
9.5.3 X-FAB Silicon Foundries SE CMOS Backplanes Product and Services
9.5.4 X-FAB Silicon Foundries SE CMOS Backplanes Production, Price, Value, Gross Margin and Market Share (2021-2026)
9.5.5 X-FAB Silicon Foundries SE Recent Developments/Updates
9.5.6 X-FAB Silicon Foundries SE Competitive Strengths & Weaknesses

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info@marketpublishers.com

9.6 Samsung Display Co., Ltd.
9.6.1 Samsung Display Co., Ltd. Details
9.6.2 Samsung Display Co., Ltd. Major Business
9.6.3 Samsung Display Co., Ltd. CMOS Backplanes Product and Services
9.6.4 Samsung Display Co., Ltd. CMOS Backplanes Production, Price, Value, Gross Margin and Market Share (2021-2026)
9.6.5 Samsung Display Co., Ltd. Recent Developments/Updates
9.6.6 Samsung Display Co., Ltd. Competitive Strengths & Weaknesses
9.7 eMagin Corporation
9.7.1 eMagin Corporation Details
9.7.2 eMagin Corporation Major Business
9.7.3 eMagin Corporation CMOS Backplanes Product and Services
9.7.4 eMagin Corporation CMOS Backplanes Production, Price, Value, Gross Margin and Market Share (2021-2026)
9.7.5 eMagin Corporation Recent Developments/Updates
9.7.6 eMagin Corporation Competitive Strengths & Weaknesses
9.8 Seiko Epson Corporation
9.8.1 Seiko Epson Corporation Details
9.8.2 Seiko Epson Corporation Major Business
9.8.3 Seiko Epson Corporation CMOS Backplanes Product and Services
9.8.4 Seiko Epson Corporation CMOS Backplanes Production, Price, Value, Gross Margin and Market Share (2021-2026)
9.8.5 Seiko Epson Corporation Recent Developments/Updates
9.8.6 Seiko Epson Corporation Competitive Strengths & Weaknesses
9.9 LG Display Co., Ltd.
9.9.1 LG Display Co., Ltd. Details
9.9.2 LG Display Co., Ltd. Major Business
9.9.3 LG Display Co., Ltd. CMOS Backplanes Product and Services
9.9.4 LG Display Co., Ltd. CMOS Backplanes Production, Price, Value, Gross Margin and Market Share (2021-2026)
9.9.5 LG Display Co., Ltd. Recent Developments/Updates
9.9.6 LG Display Co., Ltd. Competitive Strengths & Weaknesses

10 INDUSTRY CHAIN ANALYSIS

10.1 CMOS Backplanes Industry Chain
10.2 CMOS Backplanes Upstream Analysis
10.2.1 CMOS Backplanes Core Raw Materials
10.2.2 Main Manufacturers of CMOS Backplanes Core Raw Materials

+357 96 030922
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10.3 Midstream Analysis
10.4 Downstream Analysis
10.5 CMOS Backplanes Production Mode
10.6 CMOS Backplanes Procurement Model
10.7 CMOS Backplanes Industry Sales Model and Sales Channels
10.7.1 CMOS Backplanes Sales Model
10.7.2 CMOS Backplanes Typical Distributors

11 RESEARCH FINDINGS AND CONCLUSION

12 APPENDIX

12.1 Methodology
12.2 Research Process and Data Source
12.3 Disclaimer

+357 96 030922
info@marketpublishers.com

List Of Tables

LIST OF TABLES

Table 1. World CMOS Backplanes Production Value by Region (2021, 2025 and 2032) & (USD Million)
Table 2. World CMOS Backplanes Production Value by Region (2021-2026) & (USD Million)
Table 3. World CMOS Backplanes Production Value by Region (2027-2032) & (USD Million)
Table 4. World CMOS Backplanes Production Value Market Share by Region (2021-2026)
Table 5. World CMOS Backplanes Production Value Market Share by Region (2027-2032)
Table 6. World CMOS Backplanes Production by Region (2021-2026) & (K Pcs)
Table 7. World CMOS Backplanes Production by Region (2027-2032) & (K Pcs)
Table 8. World CMOS Backplanes Production Market Share by Region (2021-2026)
Table 9. World CMOS Backplanes Production Market Share by Region (2027-2032)
Table 10. World CMOS Backplanes Average Price by Region (2021-2026) & (US$/Pcs)
Table 11. World CMOS Backplanes Average Price by Region (2027-2032) & (US$/Pcs)
Table 12. CMOS Backplanes Major Market Trends
Table 13. World CMOS Backplanes Consumption Growth Rate Forecast by Region (2021 & 2025 & 2032) & (K Pcs)
Table 14. World CMOS Backplanes Consumption by Region (2021-2026) & (K Pcs)
Table 15. World CMOS Backplanes Consumption Forecast by Region (2027-2032) & (K Pcs)
Table 16. World CMOS Backplanes Production Value by Manufacturer (2021-2026) & (USD Million)
Table 17. Production Value Market Share of Key CMOS Backplanes Producers in 2025
Table 18. World CMOS Backplanes Production by Manufacturer (2021-2026) & (K Pcs)
Table 19. Production Market Share of Key CMOS Backplanes Producers in 2025
Table 20. World CMOS Backplanes Average Price by Manufacturer (2021-2026) & (US$/Pcs)
Table 21. Global CMOS Backplanes Company Evaluation Quadrant
Table 22. World CMOS Backplanes Industry Rank of Major Manufacturers, Based on Production Value in 2025
Table 23. Head Office and CMOS Backplanes Production Site of Key Manufacturer
Table 24. CMOS Backplanes Market: Company Product Type Footprint
Table 25. CMOS Backplanes Market: Company Product Application Footprint

+357 96 030922
info@marketpublishers.com

Table 26. CMOS Backplanes Competitive Factors
Table 27. CMOS Backplanes New Entrant and Capacity Expansion Plans
Table 28. CMOS Backplanes Mergers & Acquisitions Activity
Table 29. United States VS China CMOS Backplanes Production Value Comparison, (2021 & 2025 & 2032) & (USD Million)
Table 30. United States VS China CMOS Backplanes Production Comparison, (2021 & 2025 & 2032) & (K Pcs)
Table 31. United States VS China CMOS Backplanes Consumption Comparison, (2021 & 2025 & 2032) & (K Pcs)
Table 32. United States Based CMOS Backplanes Manufacturers, Headquarters and Production Site (States, Country)
Table 33. United States Based Manufacturers CMOS Backplanes Production Value, (2021-2026) & (USD Million)
Table 34. United States Based Manufacturers CMOS Backplanes Production Value Market Share (2021-2026)
Table 35. United States Based Manufacturers CMOS Backplanes Production (2021-2026) & (K Pcs)
Table 36. United States Based Manufacturers CMOS Backplanes Production Market Share (2021-2026)
Table 37. China Based CMOS Backplanes Manufacturers, Headquarters and Production Site (Province, Country)
Table 38. China Based Manufacturers CMOS Backplanes Production Value, (2021-2026) & (USD Million)
Table 39. China Based Manufacturers CMOS Backplanes Production Value Market Share (2021-2026)
Table 40. China Based Manufacturers CMOS Backplanes Production, (2021-2026) & (K Pcs)
Table 41. China Based Manufacturers CMOS Backplanes Production Market Share (2021-2026)
Table 42. Rest of World Based CMOS Backplanes Manufacturers, Headquarters and Production Site (State, Country)
Table 43. Rest of World Based Manufacturers CMOS Backplanes Production Value, (2021-2026) & (USD Million)
Table 44. Rest of World Based Manufacturers CMOS Backplanes Production Value Market Share (2021-2026)
Table 45. Rest of World Based Manufacturers CMOS Backplanes Production, (2021-2026) & (K Pcs)
Table 46. Rest of World Based Manufacturers CMOS Backplanes Production Market Share (2021-2026)

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Table 47. World CMOS Backplanes Production Value by Type, (USD Million), 2021 & 2025 & 2032
Table 48. World CMOS Backplanes Production by Type (2021-2026) & (K Pcs)
Table 49. World CMOS Backplanes Production by Type (2027-2032) & (K Pcs)
Table 50. World CMOS Backplanes Production Value by Type (2021-2026) & (USD Million)
Table 51. World CMOS Backplanes Production Value by Type (2027-2032) & (USD Million)
Table 52. World CMOS Backplanes Average Price by Type (2021-2026) & (US$/Pcs)
Table 53. World CMOS Backplanes Average Price by Type (2027-2032) & (US$/Pcs)
Table 54. World CMOS Backplanes Production Value by Wafer Size, (USD Million), 2021 & 2025 & 2032
Table 55. World CMOS Backplanes Production by Wafer Size (2021-2026) & (K Pcs)
Table 56. World CMOS Backplanes Production by Wafer Size (2027-2032) & (K Pcs)
Table 57. World CMOS Backplanes Production Value by Wafer Size (2021-2026) & (USD Million)
Table 58. World CMOS Backplanes Production Value by Wafer Size (2027-2032) & (USD Million)
Table 59. World CMOS Backplanes Average Price by Wafer Size (2021-2026) & (US$/Pcs)
Table 60. World CMOS Backplanes Average Price by Wafer Size (2027-2032) & (US$/Pcs)
Table 61. World CMOS Backplanes Production Value by CMOS Process Node, (USD Million), 2021 & 2025 & 2032
Table 62. World CMOS Backplanes Production by CMOS Process Node (2021-2026) & (K Pcs)
Table 63. World CMOS Backplanes Production by CMOS Process Node (2027-2032) & (K Pcs)
Table 64. World CMOS Backplanes Production Value by CMOS Process Node (2021-2026) & (USD Million)
Table 65. World CMOS Backplanes Production Value by CMOS Process Node (2027-2032) & (USD Million)
Table 66. World CMOS Backplanes Average Price by CMOS Process Node (2021-2026) & (US$/Pcs)
Table 67. World CMOS Backplanes Average Price by CMOS Process Node (2027-2032) & (US$/Pcs)
Table 68. World CMOS Backplanes Production Value by Application, (USD Million), 2021 & 2025 & 2032
Table 69. World CMOS Backplanes Production by Application (2021-2026) & (K Pcs)

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Table 70. World CMOS Backplanes Production by Application (2027-2032) & (K Pcs)
Table 71. World CMOS Backplanes Production Value by Application (2021-2026) & (USD Million)
Table 72. World CMOS Backplanes Production Value by Application (2027-2032) & (USD Million)
Table 73. World CMOS Backplanes Average Price by Application (2021-2026) & (US$/Pcs)
Table 74. World CMOS Backplanes Average Price by Application (2027-2032) & (US$/Pcs)
Table 75. iRay Technology Company Limited Basic Information, Manufacturing Base and Competitors
Table 76. iRay Technology Company Limited Major Business
Table 77. iRay Technology Company Limited CMOS Backplanes Product and Services
Table 78. iRay Technology Company Limited CMOS Backplanes Production (K Pcs), Price (US$/Pcs), Production Value (USD Million), Gross Margin and Market Share (2021-2026)
Table 79. iRay Technology Company Limited Recent Developments/Updates
Table 80. iRay Technology Company Limited Competitive Strengths & Weaknesses
Table 81. Tower Semiconductor Ltd. Basic Information, Manufacturing Base and Competitors
Table 82. Tower Semiconductor Ltd. Major Business
Table 83. Tower Semiconductor Ltd. CMOS Backplanes Product and Services
Table 84. Tower Semiconductor Ltd. CMOS Backplanes Production (K Pcs), Price (US$/Pcs), Production Value (USD Million), Gross Margin and Market Share (2021-2026)
Table 85. Tower Semiconductor Ltd. Recent Developments/Updates
Table 86. Tower Semiconductor Ltd. Competitive Strengths & Weaknesses
Table 87. Semiconductor Manufacturing International Corporation Basic Information, Manufacturing Base and Competitors
Table 88. Semiconductor Manufacturing International Corporation Major Business
Table 89. Semiconductor Manufacturing International Corporation CMOS Backplanes Product and Services
Table 90. Semiconductor Manufacturing International Corporation CMOS Backplanes Production (K Pcs), Price (US$/Pcs), Production Value (USD Million), Gross Margin and Market Share (2021-2026)
Table 91. Semiconductor Manufacturing International Corporation Recent Developments/Updates
Table 92. Semiconductor Manufacturing International Corporation Competitive Strengths & Weaknesses

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Table 93. Nexchip Semiconductor Corporation Basic Information, Manufacturing Base and Competitors
Table 94. Nexchip Semiconductor Corporation Major Business
Table 95. Nexchip Semiconductor Corporation CMOS Backplanes Product and Services
Table 96. Nexchip Semiconductor Corporation CMOS Backplanes Production (K Pcs), Price (US$/Pcs), Production Value (USD Million), Gross Margin and Market Share (2021-2026)
Table 97. Nexchip Semiconductor Corporation Recent Developments/Updates
Table 98. Nexchip Semiconductor Corporation Competitive Strengths & Weaknesses
Table 99. X-FAB Silicon Foundries SE Basic Information, Manufacturing Base and Competitors
Table 100. X-FAB Silicon Foundries SE Major Business
Table 101. X-FAB Silicon Foundries SE CMOS Backplanes Product and Services
Table 102. X-FAB Silicon Foundries SE CMOS Backplanes Production (K Pcs), Price (US$/Pcs), Production Value (USD Million), Gross Margin and Market Share (2021-2026)
Table 103. X-FAB Silicon Foundries SE Recent Developments/Updates
Table 104. X-FAB Silicon Foundries SE Competitive Strengths & Weaknesses
Table 105. Samsung Display Co., Ltd. Basic Information, Manufacturing Base and Competitors
Table 106. Samsung Display Co., Ltd. Major Business
Table 107. Samsung Display Co., Ltd. CMOS Backplanes Product and Services
Table 108. Samsung Display Co., Ltd. CMOS Backplanes Production (K Pcs), Price (US$/Pcs), Production Value (USD Million), Gross Margin and Market Share (2021-2026)
Table 109. Samsung Display Co., Ltd. Recent Developments/Updates
Table 110. Samsung Display Co., Ltd. Competitive Strengths & Weaknesses
Table 111. eMagin Corporation Basic Information, Manufacturing Base and Competitors
Table 112. eMagin Corporation Major Business
Table 113. eMagin Corporation CMOS Backplanes Product and Services
Table 114. eMagin Corporation CMOS Backplanes Production (K Pcs), Price (US$/Pcs), Production Value (USD Million), Gross Margin and Market Share (2021-2026)
Table 115. eMagin Corporation Recent Developments/Updates
Table 116. eMagin Corporation Competitive Strengths & Weaknesses
Table 117. Seiko Epson Corporation Basic Information, Manufacturing Base and Competitors
Table 118. Seiko Epson Corporation Major Business

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Table 119. Seiko Epson Corporation CMOS Backplanes Product and Services
Table 120. Seiko Epson Corporation CMOS Backplanes Production (K Pcs), Price (US$/Pcs), Production Value (USD Million), Gross Margin and Market Share (2021-2026)
Table 121. Seiko Epson Corporation Recent Developments/Updates
Table 122. Seiko Epson Corporation Competitive Strengths & Weaknesses
Table 123. LG Display Co., Ltd. Basic Information, Manufacturing Base and Competitors
Table 124. LG Display Co., Ltd. Major Business
Table 125. LG Display Co., Ltd. CMOS Backplanes Product and Services
Table 126. LG Display Co., Ltd. CMOS Backplanes Production (K Pcs), Price (US$/Pcs), Production Value (USD Million), Gross Margin and Market Share (2021-2026)
Table 127. LG Display Co., Ltd. Recent Developments/Updates
Table 128. LG Display Co., Ltd. Competitive Strengths & Weaknesses
Table 129. Global Key Players of CMOS Backplanes Upstream (Raw Materials)
Table 130. Global CMOS Backplanes Typical Customers
Table 131. CMOS Backplanes Typical Distributors

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List Of Figures

LIST OF FIGURES

Figure 1. CMOS Backplanes Picture
Figure 2. World CMOS Backplanes Production Value: 2021 & 2025 & 2032, (USD Million)
Figure 3. World CMOS Backplanes Production Value and Forecast (2021-2032) & (USD Million)
Figure 4. World CMOS Backplanes Production (2021-2032) & (K Pcs)
Figure 5. World CMOS Backplanes Average Price (2021-2032) & (US$/Pcs)
Figure 6. World CMOS Backplanes Production Value Market Share by Region (2021-2032)
Figure 7. World CMOS Backplanes Production Market Share by Region (2021-2032)
Figure 8. North America CMOS Backplanes Production (2021-2032) & (K Pcs)
Figure 9. Europe CMOS Backplanes Production (2021-2032) & (K Pcs)
Figure 10. China CMOS Backplanes Production (2021-2032) & (K Pcs)
Figure 11. Japan CMOS Backplanes Production (2021-2032) & (K Pcs)
Figure 12. South Korea CMOS Backplanes Production (2021-2032) & (K Pcs)
Figure 13. CMOS Backplanes Market Drivers
Figure 14. Factors Affecting Demand
Figure 15. World CMOS Backplanes Consumption (2021-2032) & (K Pcs)
Figure 16. World CMOS Backplanes Consumption Market Share by Region (2021-2032)
Figure 17. United States CMOS Backplanes Consumption (2021-2032) & (K Pcs)
Figure 18. China CMOS Backplanes Consumption (2021-2032) & (K Pcs)
Figure 19. Europe CMOS Backplanes Consumption (2021-2032) & (K Pcs)
Figure 20. Japan CMOS Backplanes Consumption (2021-2032) & (K Pcs)
Figure 21. South Korea CMOS Backplanes Consumption (2021-2032) & (K Pcs)
Figure 22. ASEAN CMOS Backplanes Consumption (2021-2032) & (K Pcs)
Figure 23. India CMOS Backplanes Consumption (2021-2032) & (K Pcs)
Figure 24. Producer Shipments of CMOS Backplanes by Manufacturer Revenue ($MM) and Market Share (%): 2025
Figure 25. Global Four-firm Concentration Ratios (CR4) for CMOS Backplanes Markets in 2025
Figure 26. Global Four-firm Concentration Ratios (CR8) for CMOS Backplanes Markets in 2025
Figure 27. United States VS China: CMOS Backplanes Production Value Market Share Comparison (2021 & 2025 & 2032)

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Figure 28. United States VS China: CMOS Backplanes Production Market Share Comparison (2021 & 2025 & 2032)
Figure 29. United States VS China: CMOS Backplanes Consumption Market Share Comparison (2021 & 2025 & 2032)
Figure 30. United States Based Manufacturers CMOS Backplanes Production Market Share 2025
Figure 31. China Based Manufacturers CMOS Backplanes Production Market Share 2025
Figure 32. Rest of World Based Manufacturers CMOS Backplanes Production Market Share 2025
Figure 33. World CMOS Backplanes Production Value by Type, (USD Million), 2021 & 2025 & 2032
Figure 34. World CMOS Backplanes Production Value Market Share by Type in 2025
Figure 35. Backplane Wafer
Figure 36. Backplane Die / Chip
Figure 37. Others
Figure 38. World CMOS Backplanes Production Market Share by Type (2021-2032)
Figure 39. World CMOS Backplanes Production Value Market Share by Type (2021-2032)
Figure 40. World CMOS Backplanes Average Price by Type (2021-2032) & (US$/Pcs)
Figure 41. World CMOS Backplanes Production Value by Wafer Size, (USD Million), 2021 & 2025 & 2032
Figure 42. World CMOS Backplanes Production Value Market Share by Wafer Size in 2025
Figure 43. 200 mm (8-inch)
Figure 44. 300 mm (12-inch)
Figure 45. Others
Figure 46. World CMOS Backplanes Production Market Share by Wafer Size (2021-2032)
Figure 47. World CMOS Backplanes Production Value Market Share by Wafer Size (2021-2032)
Figure 48. World CMOS Backplanes Average Price by Wafer Size (2021-2032) & (US$/Pcs)
Figure 49. World CMOS Backplanes Production Value by CMOS Process Node, (USD Million), 2021 & 2025 & 2032
Figure 50. World CMOS Backplanes Production Value Market Share by CMOS Process Node in 2025
Figure 51. ?65 nm
Figure 52. 90–130 nm

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Figure 53. ?180 nm
Figure 54. Others
Figure 55. World CMOS Backplanes Production Market Share by CMOS Process Node (2021-2032)
Figure 56. World CMOS Backplanes Production Value Market Share by CMOS Process Node (2021-2032)
Figure 57. World CMOS Backplanes Average Price by CMOS Process Node (2021-2032) & (US$/Pcs)
Figure 58. World CMOS Backplanes Production Value by Application, (USD Million), 2021 & 2025 & 2032
Figure 59. World CMOS Backplanes Production Value Market Share by Application in 2025
Figure 60. Electronic Viewfinders (EVF)
Figure 61. Scopes and Defense Displays
Figure 62. Medical Displays
Figure 63. Industrial and Professional Displays
Figure 64. Others
Figure 65. World CMOS Backplanes Production Market Share by Application (2021-2032)
Figure 66. World CMOS Backplanes Production Value Market Share by Application (2021-2032)
Figure 67. World CMOS Backplanes Average Price by Application (2021-2032) & (US$/Pcs)
Figure 68. CMOS Backplanes Industry Chain
Figure 69. CMOS Backplanes Procurement Model
Figure 70. CMOS Backplanes Sales Model
Figure 71. CMOS Backplanes Sales Channels, Direct Sales, and Distribution
Figure 72. Methodology
Figure 73. Research Process and Data Source

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