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Global FIB-SEM for Semiconductor Supply, Demand and Key Producers, 2026-2032

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Abstracts

The global FIB-SEM for Semiconductor market size is expected to reach $ 1904 million by 2032, rising at a market growth of 11.8% CAGR during the forecast period (2026-2032).

Semiconductor FIB-SEM refers to a focused ion beam–scanning electron microscope specifically configured for the analysis of wafers, semiconductor devices, advanced packages, and semiconductor materials. It integrates a focused ion beam column and a scanning electron microscope column within the same high-vacuum chamber. The SEM is primarily used for region-of-interest navigation, high-resolution surface and cross-sectional imaging, endpoint observation, and compositional or crystallographic analysis, while the FIB performs sputtering, trenching, delayering, cross-section preparation, TEM/STEM lamella thinning, localized deposition, and circuit modification. By aligning the electron and ion beams at, or close to, a common coincidence point, the system creates an integrated locate–mill–image–analyze workflow. Under a narrow market definition, semiconductor FIB-SEM excludes standalone single-beam FIB systems, conventional analytical SEMs, CD-SEMs, defect review SEMs, and e-beam inspection tools; its defining function is localized destructive micro- or nano-machining combined with simultaneous high-resolution structural observation. Commercial platforms such as Thermo Fisher Helios, ZEISS Crossbeam, and TESCAN SOLARIS are designed around site-specific cross-sectioning, TEM specimen preparation, and semiconductor physical failure analysis.

Semiconductor FIB-SEM systems can be divided principally into Ga-LMIS FIB-SEM, xenon plasma FIB-SEM, multi-ion PFIB, and laser-assisted FIB-SEM. Ga-LMIS platforms offer small probe sizes, high precision at low beam currents, and mature process recipes and automation, making them the dominant solution for site-specific

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analysis of advanced logic and memory devices and for ultra-thin TEM lamella preparation. Xenon PFIB provides much higher ion currents and faster bulk material removal, supporting cross-sectioning of TSVs, solder interconnects, HBM packages, chiplets, MEMS structures, SiC power devices, and thick packages. Multi-ion PFIB systems can switch among argon, nitrogen, oxygen, and xenon to optimize sputter behavior across metals, dielectrics, polymers, and compound semiconductors. Laser-assisted systems use a femtosecond laser to rapidly approach a deeply buried target before precision finishing by the ion beam. Product architectures are consequently separating into general-purpose laboratory tools, 300 mm wafer systems, automated TEM preparation workstations, high-current PFIB systems, and advanced-packaging-specific platforms. Thermo Fisher's Helios Hydra supports four ion species, TESCAN SOLARIS X 2 uses a high-current Xe PFIB for deep cross-sectioning and Ga-free lamella preparation, while ZEISS Crossbeam Samplefab and Crossbeam 750 emphasize automated preparation and uninterrupted "see while you mill" control.

The principal applications of semiconductor FIB-SEM are physical failure analysis, site-specific cross-sectioning, TEM/STEM sample preparation, three-dimensional device reconstruction, wafer delayering, circuit editing, process development, and large-area analysis of advanced packages and power devices. TEM/STEM lamella preparation and physical failure analysis remain the largest demand segments, while GAA transistors, backside power delivery, 3D NAND, and advanced DRAM are raising requirements for nanometer-scale targeting, low-damage thinning, and repeatable automated preparation. HBM, TSVs, hybrid bonding, micro-bumps, and thick heterogeneous packages are driving PFIB and laser-assisted systems faster than conventional general-purpose Ga FIB-SEM platforms. The market is shifting from operator-dependent laboratory instrumentation toward automated workflow platforms and, in selected cases, near-line process-support tools. Current systems increasingly incorporate defect-coordinate import, batch recipes, automated lift-out, traceable data management, and unattended operation to reduce the time between defect detection and TEM-based root-cause confirmation.

The global semiconductor FIB-SEM market is relatively concentrated. Thermo Fisher Scientific, building on FEI's installed base and intellectual property, leads with a broad portfolio spanning Ga DualBeam, Xe PFIB, multi-ion PFIB, and full-wafer platforms. ZEISS competes through Crossbeam, Samplefab, and LaserFIB solutions, with strengths in automated TEM preparation and correlated microscopy. Hitachi High-Tech is differentiated by orthogonal beam geometries, real-time cross-section observation, and semiconductor analysis capabilities, while JEOL benefits from integration with TEM workflows and automated specimen preparation. TESCAN has expanded through

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parallel Ga and Xe product lines, advanced-packaging applications, and competitively positioned platforms. Raith is concentrated in ion-beam nanofabrication and R&D applications, while Chinese suppliers such as CIQTEK and Shanghai Precision Measurement are entering through research laboratories, mature-node semiconductor applications, and selected failure-analysis workflows. Technology supply is centered in the United States, Germany, Japan, the Czech Republic, and China, whereas demand is concentrated in mainland China, Taiwan, South Korea, Japan, the United States, and Europe. SEMI expects global 300 mm fab-equipment investment to maintain double-digit growth in 2026 and 2027, while China is projected to retain the world's largest installed wafer-capacity base, keeping East Asia at the center of incremental FIB-SEM demand.

Semiconductor FIB-SEM will continue to evolve toward higher automation, lower sample damage, larger-volume material removal, full-wafer compatibility, multimodal characterization, and software intelligence. Ga-LMIS will not be fully displaced by plasma FIB; instead, the industry is moving toward hierarchical workflows in which lasers provide rapid bulk access, PFIB performs high-volume removal, and Ga FIB completes precision finishing. Automated TEM preparation will progress from automated individual steps to unattended bulk-to-grid workflows, while machine learning will increasingly support target recognition, beam tuning, endpoint detection, drift correction, and lamella quality assessment. Demand is being driven by AI and high-performance computing investments in advanced logic and HBM, increasing 3D NAND layer counts, GAA and backside-power architectures, chiplets and hybrid bonding, power and compound semiconductor growth, and the localization of semiconductor manufacturing capacity. SEMI's latest outlook indicates that AI-related demand is pushing front-end, test, assembly, and advanced-packaging equipment investment to new records. As a critical tool for yield learning, failure analysis, and advanced sample preparation, semiconductor FIB-SEM should outgrow conventional research electron microscopy, although high acquisition costs, beam-induced damage, recipe-transfer limitations, shortages of experienced operators, and lengthy semiconductor customer qualification cycles will continue to constrain adoption.

Report Scope

This report studies the global FIB-SEM for Semiconductor production, demand, key manufacturers, and key regions.

This report is a detailed and comprehensive analysis of the world market for FIB-SEM for Semiconductor and provides market size (US$ million) and Year-over-Year (YoY)

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Growth, considering 2025 as the base year. This report explores demand trends and competition, as well as details the characteristics of FIB-SEM for Semiconductor that contribute to its increasing demand across many markets.

Highlights and key features of the study

Global FIB-SEM for Semiconductor total production and demand, 2021-2032, (Units)

Global FIB-SEM for Semiconductor total production value, 2021-2032, (USD Million)

Global FIB-SEM for Semiconductor production by region & country, production, value, CAGR, 2021-2032, (USD Million) & (Units), (based on production site)

Global FIB-SEM for Semiconductor consumption by region & country, CAGR, 2021-2032 & (Units)

U.S. VS China: FIB-SEM for Semiconductor domestic production, consumption, key domestic manufacturers and share

Global FIB-SEM for Semiconductor production by manufacturer, production, price, value and market share 2021-2026, (USD Million) & (Units)

Global FIB-SEM for Semiconductor production by Primary Ion Source Technology, production, value, CAGR, 2021-2032, (USD Million) & (Units)

Global FIB-SEM for Semiconductor production by Application, production, value, CAGR, 2021-2032, (USD Million) & (Units)

This report profiles key players in the global FIB-SEM for Semiconductor 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 Hitachi High-Tech, Thermo Fisher Scientific (FEI), Carl Zeiss Microscopy GmbH, JEOL, TESCAN, Raith, Applied Materials, CIQTEK, Shanghai Precision Measurement Semiconductor Technology, etc.

This report also provides key insights about market drivers, restraints, opportunities,

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new product launches or approvals.

Stakeholders would have ease in decision-making through various strategy matrices used in analyzing the World FIB-SEM for Semiconductor market

Detailed Segmentation:

Each section contains quantitative market data including market by value (US$ Millions), volume (production, consumption) & (Units) and average price (US$/Unit) by manufacturer, by Primary Ion Source Technology, 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 FIB-SEM for Semiconductor Market, By Region:

United States

China

Europe

Japan

South Korea

ASEAN

India

Rest of World

Global FIB-SEM for Semiconductor Market, Segmentation by Primary Ion Source Technology:

Ga-LMIS FIB-SEM

Plasma FIB-SEM

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Laser-assisted FIB-SEM

Multi-Ion LMAIS FIB-SEM

Global FIB-SEM for Semiconductor Market, Segmentation by Sample and Wafer Handling Format:

Logic and Foundry

Memory

Advanced Packaging and Heterogeneous Integration

Power and Compound Semiconductor

CIS, MEMS and Optoelectronics

Mature-Node and Specialty Process

Semiconductor Equipment, Materials and R&D

Global FIB-SEM for Semiconductor Market, Segmentation by Target Application:

300 mm Full-Wafer FIB-SEM

150/200 mm Wafer-Compatible FIB-SEM

Package and Large-Specimen FIB-SEM

Die and Wafer-Coupon FIB-SEM

Small-Specimen and Standard-Stub FIB-SEM

Global FIB-SEM for Semiconductor Market, Segmentation by

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Application:

TEM/STEM Sample Preparation

PFA / Site-specific Cross-section

3D Structural Characterization / Process Development

Large Cross-Section for Advanced Packaging & Power Devices

Circuit Editing / Nanofabrication & Others

Companies Profiled:

Hitachi High-Tech

Thermo Fisher Scientific (FEI)

Carl Zeiss Microscopy GmbH

JEOL

TESCAN

Raith

Applied Materials

CIQTEK

Shanghai Precision Measurement Semiconductor Technology

Key Questions Answered:

1. How big is the global FIB-SEM for Semiconductor market?
2. What is the demand of the global FIB-SEM for Semiconductor market?

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3. What is the year over year growth of the global FIB-SEM for Semiconductor market?
4. What is the production and production value of the global FIB-SEM for Semiconductor market?
5. Who are the key producers in the global FIB-SEM for Semiconductor market?
6. What are the growth factors driving the market demand?

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