

Global Semiconductor FIB-SEM Market Growth 2026-2032

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Abstracts

The global Semiconductor FIB-SEM market size is predicted to grow from US\$ 708 million in 2025 to US\$ 1883 million in 2032; it is expected to grow at a CAGR of 12.6% from 2026 to 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-SEM, 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

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

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

LP Information, Inc. (LPI) ' newest research report, the "Semiconductor FIB-SEM Industry Forecast" looks at past sales and reviews total world Semiconductor FIB-SEM sales in 2025, providing a comprehensive analysis by region and market sector of projected Semiconductor FIB-SEM sales for 2026 through 2032. With Semiconductor FIB-SEM sales broken down by region, market sector and sub-sector, this report

provides a detailed analysis in US\$ millions of the world Semiconductor FIB-SEM industry.

This Insight Report provides a comprehensive analysis of the global Semiconductor FIB-SEM landscape and highlights key trends related to product segmentation, company formation, revenue, and market share, latest development, and M&A activity. This report also analyzes the strategies of leading global companies with a focus on Semiconductor FIB-SEM portfolios and capabilities, market entry strategies, market positions, and geographic footprints, to better understand these firms' unique position in an accelerating global Semiconductor FIB-SEM market.

This Insight Report evaluates the key market trends, drivers, and affecting factors shaping the global outlook for Semiconductor FIB-SEM and breaks down the forecast by Primary Ion Source Technology, by Application, geography, and market size to highlight emerging pockets of opportunity. With a transparent methodology based on hundreds of bottom-up qualitative and quantitative market inputs, this study forecast offers a highly nuanced view of the current state and future trajectory in the global Semiconductor FIB-SEM.

This report presents a comprehensive overview, market shares, and growth opportunities of Semiconductor FIB-SEM market by product type, application, key manufacturers and key regions and countries.

Segmentation by Primary Ion Source Technology:

Ga-LMIS FIB-SEM

Plasma FIB-SEM

Laser-assisted FIB-SEM

Multi-Ion LMAIS FIB-SEM

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

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

Segmentation by 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

This report also splits the market by region:

Americas

United States

Canada

Mexico

Brazil

APAC

China

Japan

Korea

Southeast Asia

India

Australia

Europe

Germany

France

UK

Italy

Russia

Middle East & Africa

Egypt

South Africa

Israel

Turkey

GCC Countries

The below companies that are profiled have been selected based on inputs gathered from primary experts and analysing the company's coverage, product portfolio, its market penetration.

Hitachi High-Tech

Thermo Fisher Scientific (FEI)

Carl Zeiss Microscopy GmbH

JEOL

TESCAN

Raith

Applied Materials

CIQTEK

Shanghai Precision Measurement Semiconductor Technology

Key Questions Addressed in this Report

What is the 10-year outlook for the global Semiconductor FIB-SEM market?

What factors are driving Semiconductor FIB-SEM market growth, globally and by region?

Which technologies are poised for the fastest growth by market and region?

How do Semiconductor FIB-SEM market opportunities vary by end market size?

How does Semiconductor FIB-SEM break out by Primary Ion Source Technology, by Application?

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