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Global SiC & GaN Wafer Defect Inspection System Market 2026 by Manufacturers, Regions, Type and Application, Forecast to 2032

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Abstracts

According to our (Global Info Research) latest study, the global SiC & GaN Wafer Defect Inspection System market size was valued at US$ 986 million in 2025 and is forecast to a readjusted size of US$ 3087 million by 2032 with a CAGR of 17.9% during review period.

The SiC & GaN Wafer Defect Inspection System industry is a narrowly defined segment of semiconductor metrology that covers only wafer-level defect inspection systems dedicated to silicon carbide (SiC) and gallium nitride (GaN) wafers across three process stages: SiC substrate, SiC epitaxy and SiC devices; GaN substrate, GaN epitaxy and GaN devices. In statistical terms, this segment includes automated tools that perform full-wafer or high-coverage defect detection and mapping on 100?200 mm SiC and GaN wafers used in power, RF and optoelectronic devices, but excludes generic silicon-only inspection tools and back-end/packaging inspection. Representative systems are explicitly marketed for SiC/GaN wafer defect inspection. KLA?s Candela? 8520 is an integrated surface- and photoluminescence-inspection platform for SiC and GaN substrates and epitaxial wafers, detecting particles, scratches, cracks, stains, pits, carrots, basal-plane dislocations (BPDs), micropipes, stacking faults, grain boundaries and threading dislocations up to 200 mm diameter. Lasertec?s SICA88 and next-generation SICA108 are SiC-only wafer inspection and review systems that integrate surface scatter and PL channels in a single tool to concurrently inspect and classify surface and crystallographic defects on SiC substrates and epi wafers. Onto Innovation?s Celero? PL system is designed specifically for subsurface and crystalline defect inspection and classification in SiC and GaN wafers, using a laser-based phase-detection PL architecture to meet growing demand from power-device and compound-semiconductor lines. On the X-ray side, Rigaku?s XRTmicron and XRTmicron Near-Fab

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systems provide fast, high-resolution X-ray topography for non-destructive imaging and mapping of dislocations, stacking faults, micropipes and grain boundaries in single-crystal wafers including SiC and GaN, bridging the gap between lab characterization and fab-compatible inspection.

Technically, these SiC & GaN wafer defect inspection systems combine several complementary modalities optimized for WBG materials and the six defined applications (SiC/GaN substrate, epi and devices). At the substrate and epitaxy stages, tool design is dominated by wide-field optical inspection with integrated photoluminescence (PL) and X-ray diffraction imaging/topography (XRDI/XRT). The latest PL systems illuminate SiC or GaN wafers with UV/blue lasers and capture variations in PL intensity and lifetime to map micropipes, BPDs, stacking faults and threading dislocations, while simultaneously using dark-field/bright-field scatter channels to capture surface defects such as pits, carrots and scratches?this is explicit in Candela 8520 and SICA88/108 datasheets. XRDI/XRT systems such as XRTmicron exploit diffraction contrast rather than absorption to produce full-wafer images of dislocation networks and grain boundaries, and are increasingly offered in ?Near-Fab? configurations with automated wafer handling for routine SiC/GaN substrate and epi-wafer qualification. At the device stage, the same WBG wafers are inspected by a mix of patterned-wafer optical defect tools and electron-beam systems (bright-field/dark-field optical, e-beam inspection, review SEM/CD-SEM, CL-SEM) that focus on lithography, etch and metallization defects but are tuned for the thicker, high-voltage SiC/GaN device topographies; these are not always branded as ?SiC/GaN-only?, but in this industry definition they are counted only when configured and deployed on SiC or GaN device lines. Complementary lab-scale methods such as optical microscopy/DIC, AFM and various failure-analysis techniques are essential for understanding defect physics and validating inline methods, but in market statistics they usually form a smaller, supporting share compared with high-throughput PL/XRT systems.

Viewed under this narrow SiC/GaN scope, the SiC & GaN Wafer Defect Inspection System market is already a sizable and fast-growing niche within semiconductor metrology. Dedicated market studies for metrology and inspection equipment serving SiC and GaN estimate a market value of roughly US$ 958 million in 2025 with a ~18.34 % CAGR out to 2031, reflecting the combined spend on PL wafer inspectors, X-ray topography tools and related WBG-focused inspection/metrology platforms. This growth rate is several times higher than the broader wafer-inspection and semiconductor-metrology equipment markets, which are typically forecast in the mid-single-digit to high-single-digit CAGR range over similar horizons. The installed base is dominated by a small group of specialists: KLA (Candela series) for SiC/GaN substrate and epi

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PL/surface inspection; Lasertec (SICA88/SICA108) for SiC wafer inspection and review; Onto Innovation (Celero PL and compound-semi inspection portfolio) for subsurface and crystalline-defect mapping on SiC and GaN wafers; and Rigaku (XRTmicron family) for production-oriented X-ray topography on SiC and GaN substrates. Adoption is already broad among leading SiC substrate and epi suppliers and is spreading down the value chain into power-device fabs and GaN-device manufacturers, driven by the need to screen crystal and process defects that can trigger premature breakdown, current collapse or long-term reliability issues.

Looking ahead, the segment is shaped by a tension between rapid demand growth and significant technical/economic barriers. On the demand side, the ramp of EV traction inverters and onboard chargers, renewable-energy and grid-tied inverters, industrial motor drives, data-center power supplies and 5G/RF infrastructure is pushing SiC and GaN device shipments upward, and each incremental wafer start requires tighter control of BPDs, stacking faults, threading dislocations and surface defects?directly pulling through more PL/XRT capacity and more advanced inspection algorithms. On the technology side, vendors are moving from simple 2D surface/PL maps to subsurface and quasi-3D PL inspection, as exemplified by Celero PL and high-speed PL scanners, and from lab-only X-ray topography to Near-Fab automated XRT configurations, while increasingly embedding deep-learning-based defect classification and analytics in tools like Lasertec?s SICA108. Key drivers therefore include: the steep growth of SiC/GaN power markets, stricter automotive-grade quality and reliability standards, the migration to 200 mm SiC wafers, and OEM/IDM efforts to reduce scrap and energy use in support of broader sustainability goals. Counterbalancing this, the industry faces high tool cost and cost-of-ownership, limited throughput for XRT/XRDI relative to optical PL systems, a shortage of experienced WBG-materials engineers, and the still-immature state of standardized, fab-wide flows that link detailed defect maps to yield and lifetime specifications. As a result, SiC & GaN Wafer Defect Inspection remains a strategic, high-growth but technically demanding niche, where vendors compete less on raw throughput and more on physics-based sensitivity, subsurface visibility and actionable correlations to power-device performance and reliability.

This report is a detailed and comprehensive analysis for global SiC & GaN Wafer Defect Inspection System market. Both quantitative and qualitative analyses are presented by manufacturers, by region & country, by Technology Type and by Application. As the market is constantly changing, this report explores the competition, supply and demand trends, as well as key factors that contribute to its changing demands across many markets. Company profiles and product examples of selected competitors, along with market share estimates of some of the selected leaders for the year 2025, are provided.

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Key Features:

Global SiC & GaN Wafer Defect Inspection System market size and forecasts, in consumption value ($ Million), sales quantity (Units), and average selling prices (K US$/Unit), 2021-2032

Global SiC & GaN Wafer Defect Inspection System market size and forecasts by region and country, in consumption value ($ Million), sales quantity (Units), and average selling prices (K US$/Unit), 2021-2032

Global SiC & GaN Wafer Defect Inspection System market size and forecasts, by Technology Type and by Application, in consumption value ($ Million), sales quantity (Units), and average selling prices (K US$/Unit), 2021-2032

Global SiC & GaN Wafer Defect Inspection System market shares of main players, shipments in revenue ($ Million), sales quantity (Units), and ASP (K US$/Unit), 2021-2026

The Primary Objectives in This Report Are:
To determine the size of the total market opportunity of global and key countries
To assess the growth potential for SiC & GaN Wafer Defect Inspection System
To forecast future growth in each product and end-use market
To assess competitive factors affecting the marketplace

This report profiles key players in the global SiC & GaN Wafer Defect Inspection System market based on the following parameters - company overview, sales quantity, revenue, price, gross margin, product portfolio, geographical presence, and key developments. Key companies covered as a part of this study include KLA Corporation, Lasertec, Visiontec Group, Nanotronics, TASMIT, Inc., Bruker, LAZIN CO.,LTD, HORIBA (EtaMax), Spirox Corporation, Angkun Vision (Beijing) Technology, etc.

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

Market Segmentation

SiC & GaN Wafer Defect Inspection System market is split by Technology Type and by Application. For the period 2021-2032, the growth among segments provides accurate

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calculations and forecasts for consumption value by Technology Type, and by Application in terms of volume and value. This analysis can help you expand your business by targeting qualified niche markets.

Market segment by Technology Type

- Optical Inspection System (Photoluminescence)
- X-ray Diffraction Imaging (XRDI) System
- Optical Microscopy (OM) / DIC
- Atomic Force Microscopy (AFM)
- Others

Market segment by Type

- Unpatterned Inspection
- Patterned Inspection
- Others

Market segment by End Market

- Automotive Electronics
- Consumer Electronics
- Industrial
- Communication
- Others

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Market segment by Application

SiC Substrate, Epitaxy and Devices

GaN Substrate, Epitaxy and Devices

Major players covered

KLA Corporation

Lasertec

Visiontec Group

Nanotronics

TASMIT, Inc.

Bruker

LAZIN CO.,LTD

HORIBA (EtaMax)

Spirox Corporation

Angkun Vision (Beijing) Technology

Shenzhen Glint Vision

CETC Fenghua Information Equipment

CASI Vision Technology (Luoyang) Co., Ltd

Shanghai Youruipu Semiconductor Equipment

Dalian Chuangrui Spectral Technology Co., Ltd

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T-Vision.AI (Hangzhou) Tech Co.,Ltd.

HGTECH

Olympus (Evident)

Nikon

Leica Microsystems

Rigaku

Skyverse Technology

Attolight

Oxford Instruments

Park Systems

Hitachi High-Tech

Market segment by region, regional analysis covers
North America (United States, Canada, and Mexico)
Europe (Germany, France, United Kingdom, Russia, Italy, and Rest of Europe)
Asia-Pacific (China, Japan, Korea, India, Southeast Asia, and Australia)
South America (Brazil, Argentina, Colombia, and Rest of South America)
Middle East & Africa (Saudi Arabia, UAE, Egypt, South Africa, and Rest of Middle East & Africa)

The content of the study subjects, includes a total of 15 chapters:

Chapter 1, to describe SiC & GaN Wafer Defect Inspection System product scope, market overview, market estimation caveats and base year.

Chapter 2, to profile the top manufacturers of SiC & GaN Wafer Defect Inspection System, with price, sales quantity, revenue, and global market share of SiC & GaN Wafer Defect Inspection System from 2021 to 2026.

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Chapter 3, the SiC & GaN Wafer Defect Inspection System competitive situation, sales quantity, revenue, and global market share of top manufacturers are analyzed emphatically by landscape contrast.

Chapter 4, the SiC & GaN Wafer Defect Inspection System breakdown data are shown at the regional level, to show the sales quantity, consumption value, and growth by regions, from 2021 to 2032.

Chapter 5 and 6, to segment the sales by Technology Type and by Application, with sales market share and growth rate by Technology Type, by Application, from 2021 to 2032.

Chapter 7, 8, 9, 10 and 11, to break the sales data at the country level, with sales quantity, consumption value, and market share for key countries in the world, from 2021 to 2026.and SiC & GaN Wafer Defect Inspection System market forecast, by regions, by Technology Type, and by Application, with sales and revenue, from 2027 to 2032.

Chapter 12, market dynamics, drivers, restraints, trends, and Porters Five Forces analysis.

Chapter 13, the key raw materials and key suppliers, and industry chain of SiC & GaN Wafer Defect Inspection System.

Chapter 14 and 15, to describe SiC & GaN Wafer Defect Inspection System sales channel, distributors, customers, research findings and conclusion.

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