KLA INSTRUMENTS

Candela® 8520

Unpatterned Wafer Inspection Solution for Power Device Applications

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Advanced Inspection for Power Device Materials and Applications

The Candela® 8520 2nd generation integrated surface and photoluminescence inspection system is designed for advanced characterization of substrate and epitaxial defects for the power device market and related applications.

Implementation of automated wafer inspection with statistical process control (SPC) methodology can significantly cut yield loss due to epi defects, minimize metal-organic chemical vapor deposition (MOCVD) reactor process excursions, and increase MOCVD reactor uptime.

The Candela 8520 is the successor to the Candela CS920, which was the first of its kind to integrate macro/micro detection for surface and crystal defects in a unified inspection platform. It employs proprietary optical technology to simultaneously measure scatter intensity at varying angles of incidence, topographic variations, surface reflectance, phase shift and photoluminescence for automatic detection and classification of a broad range of defects of interest (DOI).

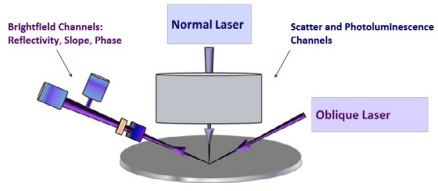

Figure 1: Candela 8520 optics overview

The Candela 8520 provides:

- Automated defect inspection for power device materials enabling enhanced quality control of substrates, fast time-to-root cause determination, and improved MOCVD process control.
- A single-tool solution that combines multiple optical inspection techniques in a single scan, for maximum efficiency in automated defect detection and classification.
- High sensitivity to yield-impacting defects across multiple compound semiconductor substrates.

The 8520 system's multiple detection channels enable understanding of process related issues and identification of yield-impacting defects. The inspection method achieves full-surface coverage in minutes with high-resolution images and wafer maps with automatically classified defects.

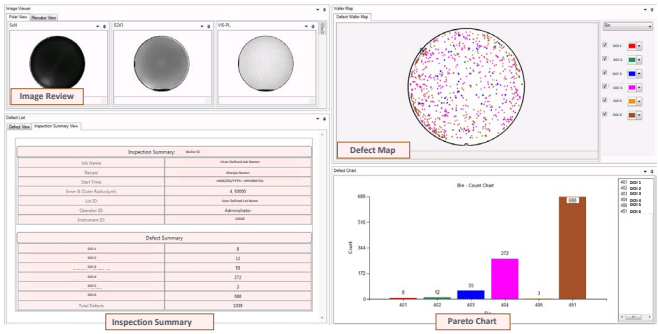

Figure 2: Typical Candela 8520 inspection output

The defect map highlights each defect location on the wafer by color code.

The defect pareto chart plots the number of defects by type.

The defect inspection summary (default view) displays defect statistics across the entire wafer.

The defect log file (switchable view) displays details such as location, pixel size, area, and defect type. It also displays a summary of defect counts by size bin along with total defect count. Both the report and the defect log file can be saved for production review.

The Candela 8520 software can also be used on offline computer to create analysis recipes.

Other engineering tools include pseudo die grid overlay (to determine the percent wafer area impacted by defect type), defect binning by size, surface uniformity, wafer sorting based

on pass/fail criteria, contour mapping (for spatial signature analysis), KLARF output, scribe (to mark defects for review) and factory automation setup.

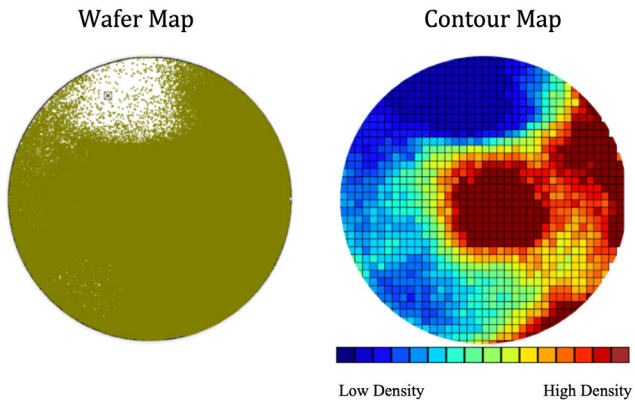

Figure 3: Contour map for high defect count excursions

Comparison to scatterometry systems

The Candela 8520 inspection system provides the option to save the raw data collected from multiple detectors.

Defect signatures seen by different detectors can vary by defect type, which can help process engineers to accurately classify defects.

The Candela 8520 system can detect and classify both macro and micro defects. Micro defect classification is done based on comparison of the optical signature from the normal- and oblique-incidence illumination. Macro defect classification uses optical signatures and defect attributes.

MOCVD processes produce a variety of defects when epi is grown on different substrate materials (SiC, GaN, etc.). The Candela 8520 system is sensitive to common yield-impacting defects including micro-pits, cracks, hexagonal bumps, showerhead droplets, crescents, scratches and other topographic defects. Accurate classification is critical to driving key corrective actions for process control. The image gallery (Fig. 4) shows examples of different types of detected defects.

The Candela 8520 system's high sensitivity, throughput and versatility provide a cost-effective solution suitable for both process development and high volume manufacturing process control.

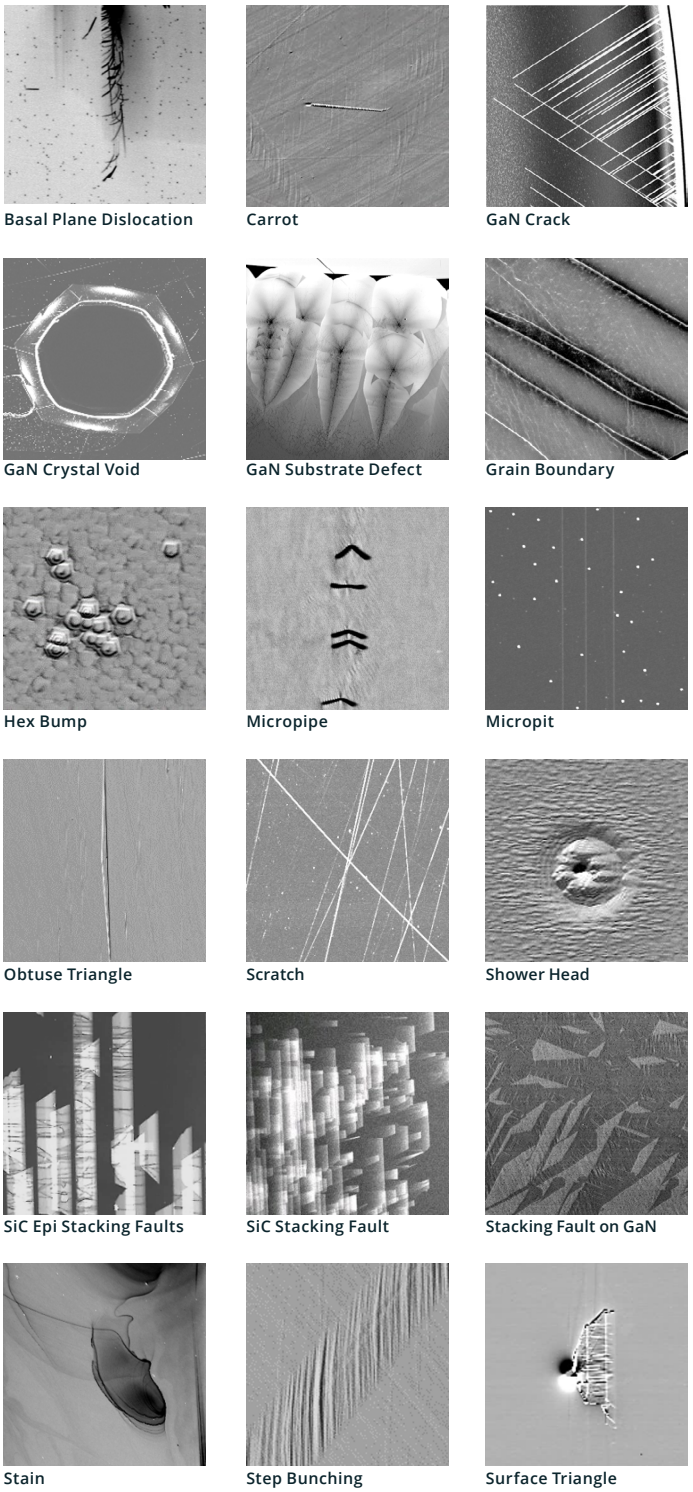

Figure 4: Example defect images

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KLA SUPPORT

Maintaining system productivity is an integral part of KLA's yield optimization solution. Efforts in this area include system maintenance, global supply chain management, cost reduction and obsolescence mitigation, system relocation, performance and productivity enhancements, and certified tool resale.

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www.kla.com
Printed in the USA
Rev 1_2020_05_04