

Applications Report: 3D Metrology Services for Electronics and MEMS

MEMS Defect Detection via Surface Roughness Measurement on Semiconductor Wafer Plates

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Executive Summary

Microelectromechanical systems (MEMS) require stringent surface quality and dimensional control to ensure device functionality and reliability. EDM Intelligent Solutions offers advanced 3D metrology services capable of detecting micro-scale surface irregularities that can impact MEMS performance. This report outlines our non-contact inspection process for detecting surface defects on a semiconductor wafer plate using high-resolution 3D scanning.

Overview of 3D Metrology Capabilities

Our surface metrology systems use optical scanning to capture highly detailed 3D surface maps of micro-scale features. Surface roughness is measured by analyzing the frequency and amplitude of microscopic peaks and valleys, enabling defect detection even on complex or reflective surfaces.

Key capabilities include:

- μm -scale resolution for non-contact surface roughness inspection
- Measurement of Ra and other surface texture parameters
- Form and roughness analysis for MEMS and semiconductor components
- Non-destructive testing of sensitive materials and microfeatures

Application Case Study: MEMS Surface Roughness Inspection

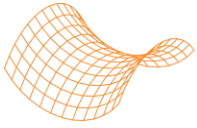
Component Overview

- Type: Semiconductor Wafer Plate
- Material: Steel
- Metrology System: MVi5 3D Metrology Center
- Metrology Services: Surface Roughness Measurement

Inspection Process

The semiconductor wafer plate was scanned using the MVi5 3D Metrology Center, capturing a full-resolution surface profile without physical contact. Profile lines were extracted to calculate roughness parameters including Ra, Rz, and surface waviness.

The data was then evaluated for uniformity and anomalies—such as scratches, pits, or coating inconsistencies—across the full surface area. These inspections help identify early-stage defects in MEMS production that could affect device reliability or yield.



Results & Value Delivered

- High-resolution defect detection on MEMS and semiconductor components
- Ra-based roughness data from sensitive micro-surfaces
- Full documentation for traceability and process feedback
- Improved production yields and quality assurance for electronics OEMs

Conclusion

MEMS components demand exacting surface specifications for proper functionality. EDM Intelligent Solutions' 3D metrology solutions provide detailed roughness analysis and defect detection—non-contact, repeatable, and precise. Our services support semiconductor and electronics manufacturers seeking to improve product quality and production consistency.

About EDM Intelligent Solutions

EDM Intelligent Solutions offers precision metrology and machining services across industries including MEMS, aerospace, medical, and electronics. Our high-resolution inspection platforms are integrated into advanced manufacturing workflows for enhanced performance, quality control, and innovation.