QDm.1

Quantum Diamond Microscope

QuantumDiamonds QDm.1 systems are non-destructive, magnetic imaging systems for advanced failure analysis needs.

Built on brand new quantum sensing technology, QD m.1 enables fault localization in xy and z for complex and emerging technologies, such as advanced packaging and wide bandgap materials.

QUANTUM DIAMONDS
SENSOR TECHNOLOGY

The QDm.1

The QDm.1 is a high-resolution magnetic imaging system that visualizes current flow in semiconductor devices by detecting the magnetic fields generated by electrical currents. Using quantum defects in patented diamond sensor technology, the QD tool provides non-destructive imaging of current pathways with exceptional spatial resolution and sensitivity.

Example: Electrical activity image from the backside

Raw magnetic field data and overlay of the extracted current density on the IR image of a discrete device. Find our relevant publication through the QR.
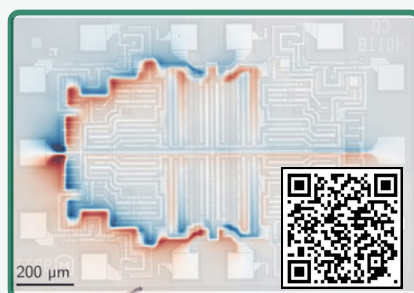
*Raw magnetic field overlay on backside IR*
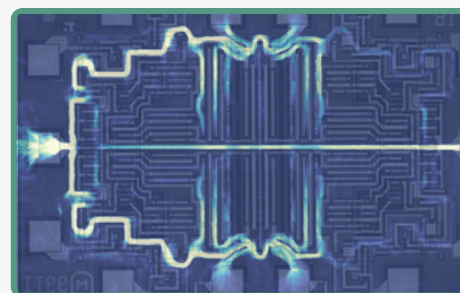
Translated electrical activity overlay on backside IR

Specifications

Lateral resolution (xy)	down to 1 µm (standoff-dependent)
Depth resolution (z)	down to 0.5 µm (~10% distance to sensor)
Field of view	up to 3 mm x 3 mm, automatic stitching up to 5 cm x 5 cm
Noise floor	150 nT (DC)
Defect types	Package and die: shorts (wide range), leakages, opens
Sensitivity	<10 µT/√Hz
Typical measurement time	5-10 minutes

Requirements

Voltage / Power	230 V (single phase) / 16 A
Mechanical stability	Optical table with suspension, stabilised sample region
Operating Temperature	15 - 40 °C
Environment	Ambient conditions (Room temperature and pressure)
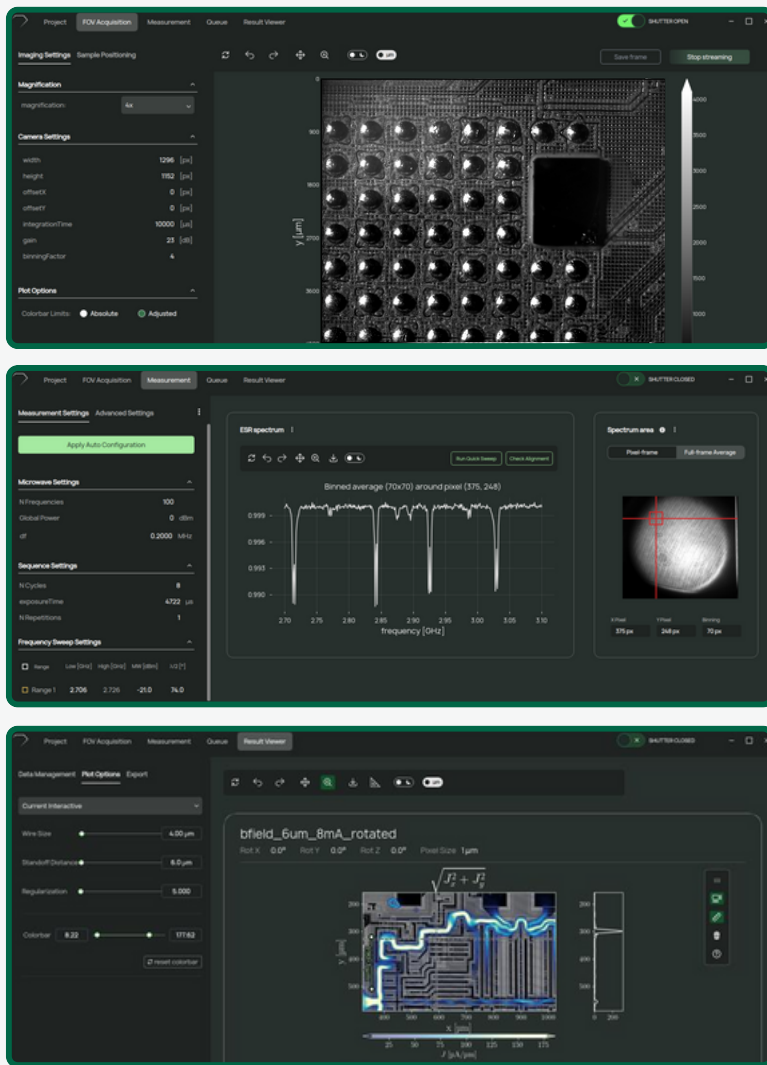
Intuitive UI/UX Design

The QD software is designed with the failure analysis engineer in mind, offering an intuitive interface that makes data acquisition and interpretation straightforward. Clear visualization tools and guided workflows simplify complex tasks, while advanced features remain available for expert users who require deeper customization and analysis flexibility. This balance ensures both ease of use for routine investigations and powerful capabilities for demanding analysis challenges.
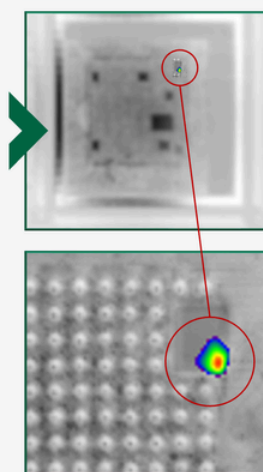
Software Features

- Automatic calibration, magnetic field analysis, and current reconstruction
- Interactive magnetic field and current data
- Automated stitching of large areas
- Multiple post-processing options
- Diverse data export options to cross-correlate with other techniques
- Overlay functionality and super-imposed images (e.g. optical, infrared, design file)
- Additional super-user features

Example use-case

Once an IV test reveals anomaly at a pin, generic imaging techniques such as LIT can be used to obtain hotspots. The QD tool complements these techniques by revealing electrical activity around the area and give layer information by analyzing the signal or matching the layout.
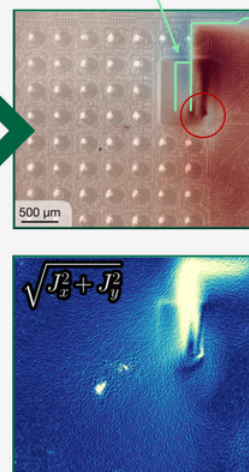
This worfklow is especially valuable for package-level non-destructive analysis before proceeding to sample preparation for root cause.
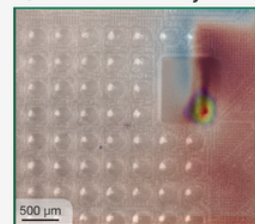

Lock-in Thermography

QDM image of buried RDL

Physical analysis

Data from QDM can be used to do layout-informed matching for faster turnover and higher success rate in sample preparation

LIT hotspot suggestive of a short beneath IPD

QDM images of buried RDL in Magnetic Field and Current

QDM + LIT overlay

QDM + LIT overlay showing suspect metal line for target cut

Applications

The QD tool can address a variety of technologies such as; conventional packaging, advanced packaging, wide bandgap materials, and HBMs. It can perform advanced imaging and diagnostics for ohmic and low-ohmic shorts, leakage pathways, open circuits, bond wire failures, and interconnect reliability issues.
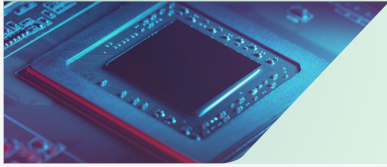
Advanced Packaging & HBM

Advanced packaging solutions such as 2.5/3D integration and chiplets, are becoming essential. However, they complicate access and introduce new failure modes including interconnect verticals. There is a need for novel and robust testing platforms.

Wide Band-Gap Materials (GaN, SiC)

Wide band-gap materials are being adopted more and more for high-power and frequency applications. These materials, as well as their potential combination with Silicon, introduces new and complex failures that require novel analysis methods.
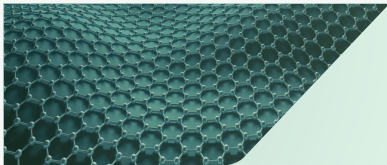
Material Science

Characterisation of promising new materials for the semiconductor industry, such as graphene or transition metal dichalcogenides, require a new approach. Quantum materials require quantum solutions.

The QD m.1 complies with CE marking requirements. QuantumDiamonds ensures that the product meets all relevant EU directives and standards, and provides appropriate documentation and labeling as required for CE conformity. When using this product, follow all applicable guidelines and regulations to ensure safe and proper operation.

CE

The QD m.1 is a Class 1 laser product. QuantumDiamonds classifies laser diodes and provides appropriate safety measures and labels according to the classification as required for manufacturers according to IEC 60825-1. When using this product, follow all safety measures according to the IEC.

CLASS 1 LASER PRODUCT

Exclusive: QuantumDiamonds 2026 Demo Tool Program

- QuantumDiamonds is partnering with select companies and research institutes for a demo program. Secure early access to the brand new QD m.1 for your failure analysis needs.

- On-site installation and training to accelerate your team's adoption. Keep the device for up to 8 weeks, with clear KPIs and mid-point review.

- Applications and Field support for getting up to speed in exploring your relevant use-cases, and ensuring you get the most out of QD m.1.

Interested in learning more?

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