

Infrared (IR) Microscope with Lock-In Thermography

A microchip is being analyzed using the infrared microscope.
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If a short circuit is present inside a chip, electrical current flows through the defect, causing localized heating (a hotspot). The resulting heat or emitted infrared radiation can be rapidly detected using infrared microscopy, allowing the short circuit to be precisely localized. With the specialized lock-in thermography technique, local hotspots with temperature differences as small as 0.001°C can be detected.

Infrared Microscope

The IR microscope can also be used to analyze encapsulated MEMS (Micro-Electro-Mechanical Systems) devices by imaging through the silicon cap. This is possible because silicon is transparent to infrared radiation. As a result, structures that are invisible under visible light can be observed.

Typical Samples

- Semiconductor devices
- Printed circuit boards (PCBs)
- Electronic circuits
- MEMS devices
- Individual chips as well as complete wafers

Features

- suitable for wafers up to 200 mm
- Max. sample size: 300 × 300 × 200 mm
- Requirement: Test structures must be clean and free of debris, loose fragments, or easily disintegrating particles
- Typical sample quantity: <100 samples

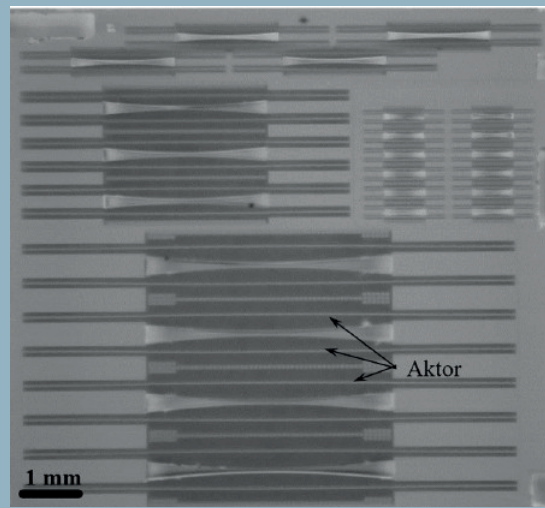
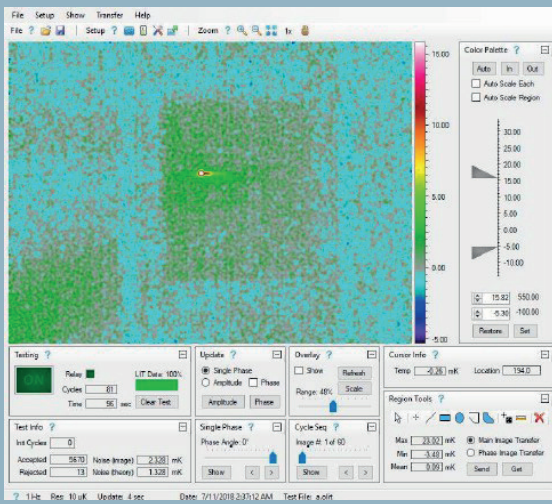
If you are interested in IR microscopy or lock-in thermography measurements, please feel free to contact us.

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Short-circuited MEMS chip. Lock-in thermography measurement using 1 Hz voltage pulses at 1 V with a current limit of 100 µA. The short-circuit temperature increase is approximately 2.5 mK, with the hotspot clearly visible.

MEMS chip preheated to 50°C, featuring beams (actuators) concealed beneath the 400 µm thick silicon lid. The beams and their movement can be observed and analyzed through the silicon lid.

Measured variables / Measurement ranges / Resolution	
Measurable temperature	-40...+500 °C
Measurement accuracy	+/- 2°C or +/-2% of the measured value
Lock-in Thermography (LIT)	Detection of low dissipation power levels > 50 µW Temperature resolution up to 0.001°C
Sensor	Uncooled LWIR (7–14 µm) Microbolometer: 320x240 pixels
Sampling frequency	up to 60 FPS

Lenses, Set, Magnifications	
Macroscopic	focusable 50x37.5° FOV, min 25mm WD, 0.05°C NETD
Microscopic 20 µm	fixed focus, 6.4x4.8mm FOV, 19mm WD, 0.15°C NETD
Microscopic 5 µm	fixed focus, 1.6x1.2mm FOV, 15mm WD, 0.25°C NETD

The microscope also features a Peltier element with a 0–80°C controller for preheating, as well as the capability for manual sample contacting using micromanipulators. OptoTherm Thermalyze analysis software is used for analysis.

