

SEMICAPS SOM

SCANNING OPTICAL MICROSCOPE SYSTEM



Features

- ~ Integrated multi-laser NIR scanning optical microscope
- ~ Analytical and tester docked models
- ~ Optimized for high laser power delivery
- ~ High resolution backside imaging
- ~ Multi-technique platform
- ~ Multi-detector capability
- ~ Open architecture platform
- ~ Customized solutions

SEMICAPS SOM

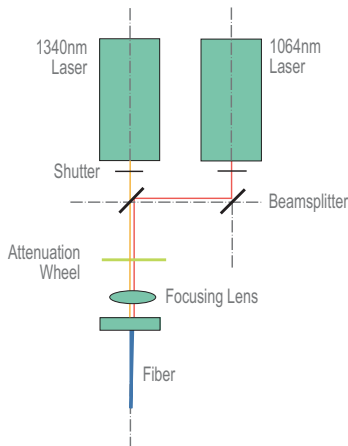
SCANNING OPTICAL MICROSCOPE SYSTEM

PRODUCT DESCRIPTION

SEMICAPS SOM is a scanning optical microscope used for fault localization of integrated circuits using laser induced phenomena. It is an integrated compucentric system designed for maximum ease of use and flexibility. The system is optimized for high laser power delivery, sensitivity and spatial resolution. The open architecture of the system allows the application of current and future laser induced techniques. The modular design facilitates customization of user requirements.

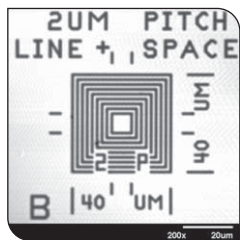
Multi-laser capability

The standard SEMICAPS SOM system uses two near-IR lasers. The 1064nm laser is capable of efficient electron-hole pair generation through backside silicon while the 1340nm laser is a high resolution thermal probe which allows localized heating. The laser multiplexer provides seamless selection, attenuation and pulsing of the lasers. Additional lasers can also be integrated into the system.



High laser power delivery

The laser power on the device is greater than 30mW for all conventional long working distance objectives.



High resolution laser scan image

Image resolution is up to 2048x2048. The spatial resolution is less than 0.8 μm for 1064nm lasers using a conventional long working distance objective.

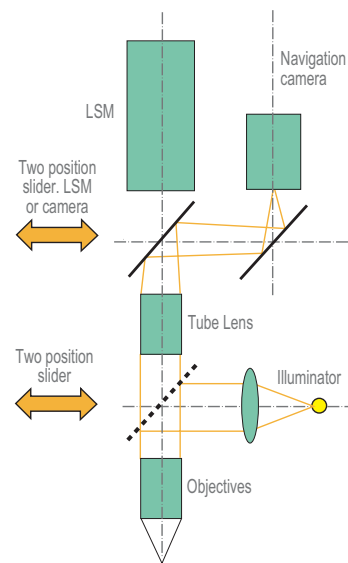
Higher spatial resolution can be achieved using the Solid Immersion Lens (SIL) option or Diffractive Lens Option.

Multi-technique capability

The system is compatible with the following thermal stimulation techniques: OBIRCH¹, TIVA², SEI, TBIP³, DReM⁴, SDL-RIL⁵; and the following carrier generation techniques: OBIC, SCOBIC⁶, LIVA² and LADA. The system is also upgradeable for future techniques.

TV-rate camera for navigation

The system incorporates a TV-rate navigation camera for real-time backside imaging to complement the slow scan rate of the laser scan module.



Multi-detector capability

The microscope module is custom designed to provide maximum flexibility for the optical components required for various detectors and sources, e.g. Si-CCD, InGaAs, MCT, Laser Marker, etc.

High resolution stage

The system comes with linear servo and linear encoder stages with 20nm resolution and repeatability better than 0.5 μm . The linear servo mechanism allows the user to move the stage with minimal vibration.

Proprietary laser induced signal digitization hardware

The system comes with a proprietary digitization hardware capable of providing the average, sum and string of values. The summing and averaging module is capable of 1 million samples and more than 8000 string values.

Flexible system configurations

SEMICAPS SOMs are offered in various configurations: analytical, inverted analytical, upright and inverted tester docked models.

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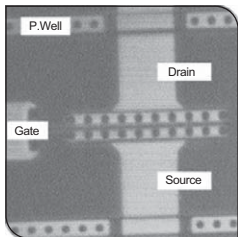
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APPLICATIONS

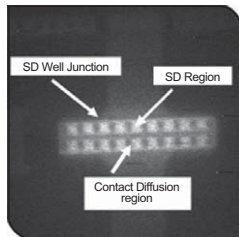
Recent developments have seen the use of scanned NIR laser beams to actively localize failures which are sensitive to electron-hole pair generation or thermal stimulation. SCOBIC is an example of the electron-hole pair generation technique while OBIRCH¹ and TIVA² are thermal stimulation techniques used for detecting interconnect failures.

SCOBIC⁶ Image

The single contact optical beam induced current (SCOBIC) technique overcomes the limitation of OBIC which requires contacts to both sides of the junction for imaging and characterization. SCOBIC needs only one contact, usually the substrate, to image and characterize all the junctions that are connected directly or indirectly to the contract.



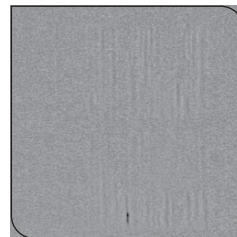
Backside reflected image of NMOS transistor



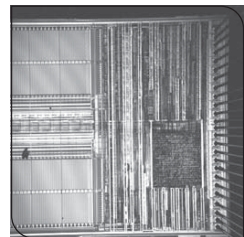
Backside SCOBIC image of NMOS transistor

TBIP⁴ Image

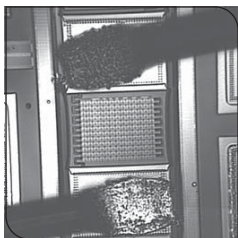
The patented TBIP techniques overcome the limitations of conventional laser induced techniques using TIVA² and OBIRCH¹ by introducing an inductor to achieve voltage bias and voltage detection. Dwell time control together with pulsing and lock-in detection result in better localization accuracy and higher sensitivity.



Pulsed TBIP image of a defect that cannot be detected by OBIRCH¹ or TIVA²



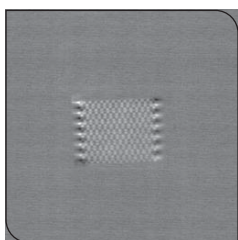
Overlay of reflected image with pulsed TBIP image of a defect that cannot be detected by OBIRCH¹ or TIVA²



Reflected image

DReM⁵ Image

The Differential Resistance Monitor (DReM) is a patented dc coupled amplifier which provides voltage bias and voltage detection. This amplifier provides higher sensitivity and reduces the distortions in the images from conventional ac coupled amplifiers.



DReM image

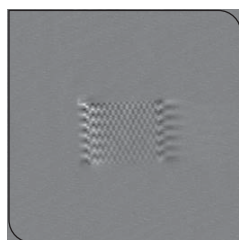
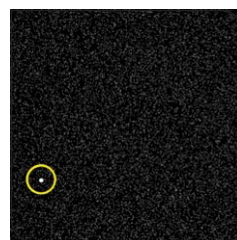


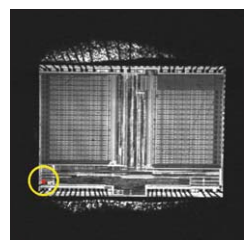
Image from ac coupled amplifier

SDL³ Image

The Soft Defect Localization (SDL) technique uses the tester as a detector of laser induced effects. At each pixel location, the tester is programmed to run the relevant portion of the test program for a specified number of cycles. The pass-fail data is then used to construct the SDL image for fault localization.



SDL image



Overlay of reflected image and SDL image

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SOM 1100
Multi-laser
Analytical SOM



SOM 2000
Multi-laser Upright
Tester-docked SOM



SOM 3000
Multi-laser Inverted
Tester-docked SOM



SOM 4000
Multi-laser Inverted
Analytical and
Tester-docked SOM



SEMICAPS COMMITMENT

SEMICAPS, an innovator and manufacturer of failure analysis equipment, is dedicated to research and development programs to bring you the latest products for integrated circuit failure analysis.

All specifications are subject to change without prior notice.

Note:

1. OBIRCH is a patented technique by NEC
2. TIVA and LIVA are patented techniques by Sandia National Laboratory
3. TBIP is a set of patented techniques by Advanced Micro Devices and SEMICAPS Pte Ltd
4. DReM is a patented technique by SEMICAPS Pte Ltd
5. SDL and RIL are patented techniques by Advanced Micro Devices, Sandia National Laboratory and University of New Mexico
6. SCOBIC is a patented technique by National University of Singapore

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