Zyvex E-Beam Current Analysis Package

Probe-assisted SEM characterization

Overview

This package is the complete solution for Electron Beam Induced Current (EBIC) and Electron Beam Absorbed Current (EBAC) characterization. A host of failures in today's devices can be attributed to mismatched doping concentrations, misplaced dopants, opens, and shorts. These failure mechanisms can be located and characterized using the E-Beam Current (EBC) Analysis Package. The package consists of a two stage ultra high gain amplification system, an E-Beam scan control system, cables, interface hardware (for your specific SEM), and a software interface to contol it all.

The included E-Beam scan control system allows for ultimate flexibility in digital E-Beam control. A dual input feature allows the EBIC/EBAC signal and another imaging signal, such as a secondary electron detector, to be acquired and displayed simultaneously. The user is able to collect ultra-high resolution images through the scan control system for further image processing.

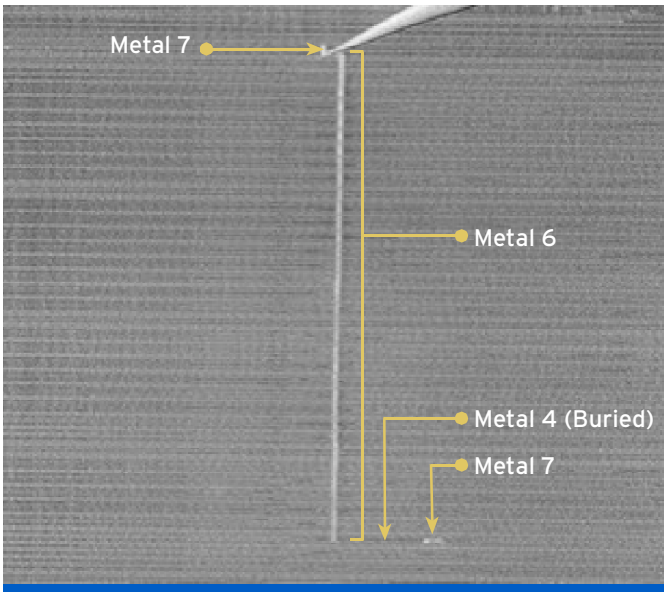
Both a real time and post processing digital zoom function allows increased magnification without altering SEM magnification. Post acquisition line profiles can be extracted from maps for advanced analysis with a choice of multiple autoscaling routines, a histogram tool, and user defined or predefined intensity look-up tables. Post image processing capability also includes false colorization and image overlay, as well as a wide range of mathematical functions which can be applied to the images and data set.

EBIC Characterization

The EBIC technique uses the E-beam to induce a charge into a PN junction. A pre-amplifier is connected to the sample stage or a probe tip and an image is gathered through this channel as the E-beam rasters across the sample. The resulting image is then mixed with the secondary electron detector image and yields varying contrast between the P and N regions. The dopant concentration and any irregularities are now characterized.

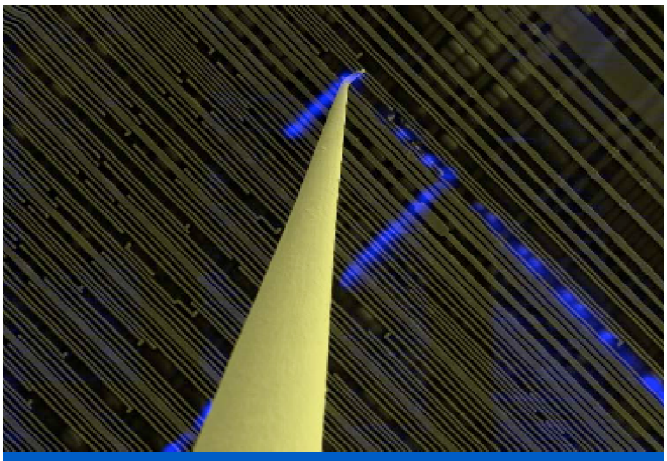
EBAC Characterization

The EBAC technique is similar to EBIC, but is used on metal lines and buried vias. During EBAC characterization, the metal line absorbs current from the E-beam. A probe is connected to the line and again routes through a pre-amplifier to capture an image as the E-beam rasters across the sample. This can be done on a metal line on the surface and it will yield a quantitative active voltage contrast image. The technique is more powerful than traditional AVC, since it allows you to locate and characterize buried faults up to four layers down. A line can be contacted at metal layer 4 and an image can be captured of that same line at layer 3 and 2. The EBC Package is highly sensitive and can detect small currents from the metal line through the dielectric. By increasing the beam voltage, a user can image deeper into the sample. Shorts and opens are located before destructive deprocessing eliminates the ability to detect them.



EBAC signal mixed with SEM signal to pinpoint opens in buried metal lines. Note the sample is only deprocessed to Metal 7.

An EBAC image overlaid on an SEM image. A break is present in the metal line and accounts for the abrupt stop of current.



A colorized EBAC image overlaid on an SEM image.

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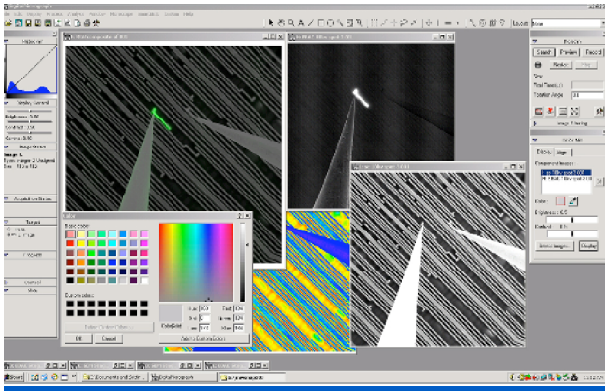


The EBC Package uses powerful software to process the images during and after acquisition. Each image can be mixed, colorized, and binned to reveal fault locations.

Zyvex EBC Technical Specifications

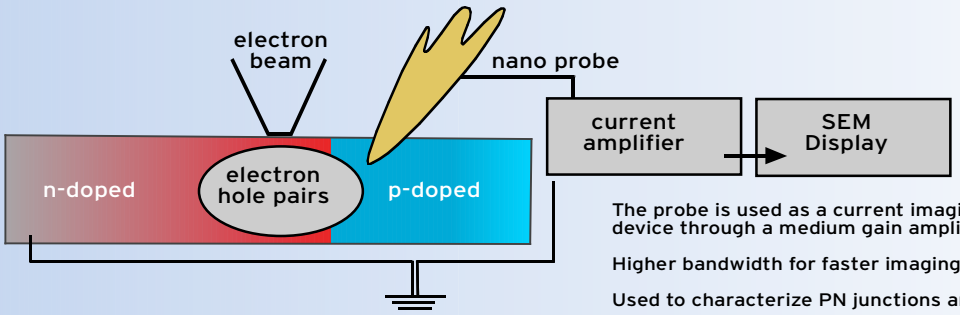
Components and Control

- Standard Low Noise Package (sold separately)
- PC-based software installed on Zyvex PC
- 2-Stage Amplifier
- Scan Controller
- Interface cabling available for SEMs

Electronics Capabilities	EBIC	EBAC
Transimpedance	10^3 - 10^8	10^7 - 10^9
Bandwidth [kHz]	200 - 500	1.2 - 50
Resolution	Better than 5 fA	Better than 5 fA
Accuracy	Better than 200 fA	Better than 200 fA
Bias Voltage	+/- 10V	+/- 10V

Imaging Capabilities	EBIC	EBAC
Resolution	Better than 10nm	Better than 5nm
Acg time	Reaction - 60s	30s - 540s
Pixel Resolution	8000 pixels per line	8000 pixels per line
Pixel dwell time	400nsec - 400 msec	400nsec - 400 msec
Bytes/pixel	1, 2, 4 (user selectable)	1, 2, 4 (user selectable)

EBIC



The probe is used as a current imaging device through a medium gain amplifier.

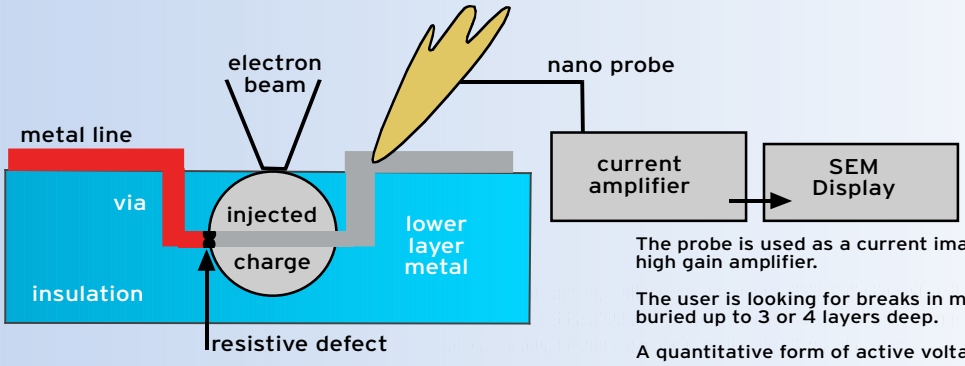
Higher bandwidth for faster imaging rates.

Used to characterize PN junctions and their dopant quality.

Can be used for planar EBIC or cross-sectional EBIC.

Electron Beam Induced Current

EBAC



The probe is used as a current imaging device through a high gain amplifier.

The user is looking for breaks in metal lines that may be buried up to 3 or 4 layers deep.

A quantitative form of active voltage contrast.

Can achieve femto-level sensitivity.

Electron Beam Absorbed Current

To place an order, call us toll-free at **1.877.ZYVEX99 (1.877.998.3999) ext. 271** or direct at **972.792.1671**. For the most up-to-date information, please visit our web site at **www.zyvex.com** or email **sales@zyvex.com.**

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