



TECHNOLOGY

Scanning Single Electron Transistor Microscope for Imaging Room Temperature Objects

OVERVIEW

The occurrence of wiring defects in computer chips and multi-chip modules is a serious manufacturing problem. Most types of circuit faults can only be localized to more-or less definite regions on a chip simply because they produce failures in a region of the circuit. However, if the circuit defect could be precisely located, then the likely cause could be ascertained, and changes could be made in the computer chip design or fabrication process to correct the problem.

The most common type of fault which manufacturers encounter in present day chips is an unintended electrical open. An open can arise for a variety of reasons such as a failed connection between chip layers. If the open can be precisely located, then there are a wide variety of well established powerful analysis techniques which can be used to diagnose and correct the cause of the problem. Thus, there is a need for a tool which will allow for such precise location of open faults.

University of Maryland researchers have developed a near-field scanning Single Electron Transistor (SET) microscope for imaging computer chips. The SET is placed in a "cold finger" and mounted in a vacuum enclosure fitted with bellows and a thin window. Samples are then positioned to the air side of the window using a conventional z-translation stage, as in an optical microscope. One merely applies a voltage to the suspect open line and scans the sample while recording the output from the SET. Since the SET is extremely sensitive to voltage or to induced charge, the location of the open will show up as an abrupt change in the field along the wire. The result is that the instrument can non intrusively resolve fine details in microcircuit wiring, even if the wiring layers are hidden under a chip. Other long-range applications for the invention include looking at neurological signals in biological systems, and detecting chemical reactions which cause corrosion of metal.

See US Patent No. 6,516,281

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Additional Information

INSTITUTION

University of Maryland, College Park

PATENT STATUS

Patent(s) pending

LICENSE STATUS

Contact OTL for licensing information

CATEGORIES

- Microelectronics
- Imaging devices

EXTERNAL RESOURCES

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