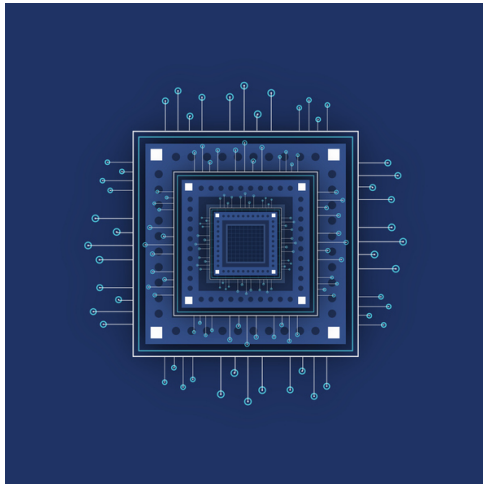




Non-Destructive Imaging of Integrated Circuits for Counterfeit Detection

TECHNOLOGY NUMBER: 2020-126



Technology ID

2020-126

Category

Hardware
Engineering & Physical Sciences
Semiconductor, MEMS, and
Electronics

Inventor

Parag Bhaskar Deotare
Zidong Li
Kanak Datta

Further information

Joohee Kim
jooheek@umich.edu

Learn more



OVERVIEW

Non-destructive 3D imaging for counterfeit detection in semiconductor ICs

- Provides reliable topography mapping without damaging circuits
- Detecting counterfeit ICs, mapping semiconductor layers, and electronics quality control

BACKGROUND

As technology advances, the proliferation of counterfeit electronics presents a growing threat to industries, particularly those reliant on semiconductor integrated circuits (ICs). Historically, the detection of counterfeit ICs involved destructive testing, visual inspections, or electrical testing methods, all with limitations. Destructive testing damages the IC and renders it unusable, while visual inspection is often insufficient for detecting sophisticated counterfeits. Electrical testing, though useful, may not reveal subtle forgeries and often requires a known standard for comparison. These methods can be cost-prohibitive and do not provide non-invasive insight into the ICs' structural layers. Consequently, there is an urgent need for a non-destructive, reliable, and scalable technique that provides detailed internal topographical maps for authenticating ICs. Such advancements are crucial to safeguarding the integrity of electronic devices across industries, including military, healthcare, and consumer electronics.

INNOVATION

Researchers at the University of Michigan have developed an imaging technology that utilizes excitonic properties in materials to non-destructively image integrated circuits, offering a significant advancement over traditional methods. By observing the changes in the photophysical properties of excitonic materials—such as emission intensity and diffusion—this technique effectively maps the topography of ICs, identifying buried interconnects. This method leverages the changes in local density of optical states caused by interference when excitons are near metal structures within circuits. The ability of excitons to respond to external electric fields enhances dynamic imaging, adding layers of detection reliability. Potential applications include robust counterfeit detection, detailed mapping of semiconductor layers in ICs, and advancements in electronics manufacturing quality control. The improved imaging technique provides a non-invasive, reliable solution highly applicable across sectors that demand high electronics integrity, such as defense, automotive, and telecommunications.

ADDITIONAL INFORMATION

INTELLECTUAL PROPERTY

[US11798157](#) "Non-destructive imaging techniques for integrated circuits and other applications"