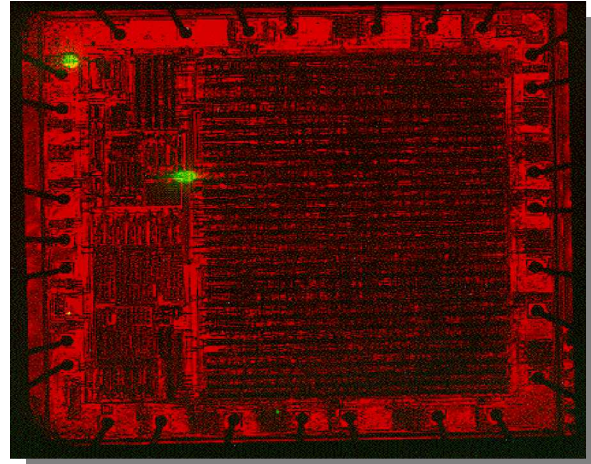
Emission Microscopy (EMMI)

Emission microscopy (EMMI) is an efficient optical analysis technique used to detect and localize certain integrated circuit (IC) failures. Emission microscopy is non-invasive and can be performed from either the front or back of devices.

Typical applications:

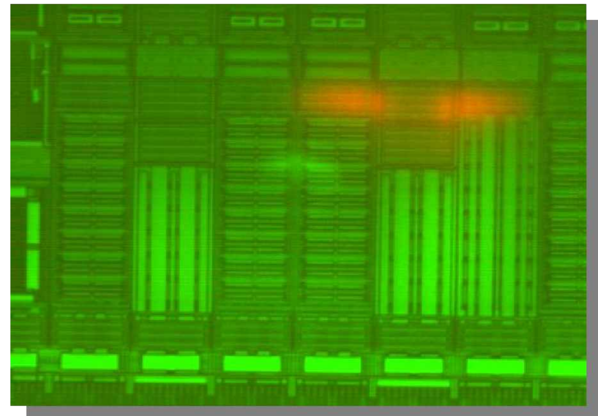
Detection of:
- Overcurrent or ESD-induced damage
- Hot electron susceptibility
- Leakage current
- Defective junctions
- Forward-biased bipolar transistors
- Latch-up
- Floating gates

Flip-chip failure analysis



Equipment:

Zeiss LSM 310 with Hamamatsu CCD camera
Alpha Innotech Portable Emission Microscope



Emission microscopy images showing light emission from failed devices at several sites. Top image:front side EMMI, bottom image: back-side EMMI.

Technical Description:

Many device defects induce faint light emission in the visible and near infrared (IR) spectrum. Emission microscopy uses a sensitive camera to view and capture these optical emissions, allowing device analysts to detect and localize certain IC defects. Since emissions can be detected from the back side, MuAnalysis uses an IR laser to create an overlay image of circuitry through the die. This allows failures to be related directly to circuit features, speeding failure resolution. A typical EMMI photo consists of an overlay of two images: the circuitry and the emission spots. Each is arbitrarily colorized a different way for clarity.

Emission microscopy is a powerful early-stage failure analysis techniques since it localizes failures non-invasively and requires little in the way of sample preparation. Flip-chip devices, difficult to study by other means, are easily studied through the die without decapsulation and often without thinning.

muanalysis.com
2301 St. Laurent Blvd. Suite 500, Ottawa, ON Canada   K1G 4J7 tel: (613) 721-4664 fax: (613) 721-4682
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