

Greg Johnson / Carl Zeiss

"Defect Localization Technique Selection for Reliability and Functional Fails "

Complete understanding of reliability fails requires physical characterization of the precise element that is failing. Given an "alphabet soup" of acronyms, the choice of the appropriate technique for fault isolation and failure analysis can be very challenging. Additional challenges are provided by the industry moving to advanced technology nodes, novel device architectures, and 3D-stackings at chip and wafer level. Thus, it will be increasingly important to understand not only the cutting-edge techniques but also which existing ones are due to become obsolete.

Drawing on experience from reliability and device array failure analysis across multiple nodes, this talk will provide a physics overview of seven basic concepts, and the defect localization techniques based on them: 1) Electron Beam Absorbed Current, 2) Optical/Electrical/Ion Beam Induced Current, 3) Passive Voltage Contrast, 4) Optical/Electrical/Ion Beam Induced Resistance Change, 5) Thermography, 6) Photon Emission Microscopy, and 7) Probing, as used in techniques like Conductive Atomic Force Microscopy. This whirlwind tour of the FA application space will then be summed up with a decision tree to explain which techniques are best suited for a wide range of defect types seen in FEOL processing. FA examples as well as the strengths and limitations of each technique will be given. This talk will be especially useful for engineers working in electrical characterization and design.

Greg Johnson is a Senior Application Development Engineer in the Probing Group of Carl Zeiss Process Control Solutions. In previous experience at both IBM and GLOBALFOUNDRIES, he led FEOL defect localization across eight successful technology node qualifications. He serves on review committees of both ISTFA and IPFA. He has a B.S. in materials engineering from Virginia Tech, has authored over a dozen papers on novel fault isolation techniques, and is an inventor on 19 U.S. Patents.