MAR11-2010-008543

Abstract for an Invited Paper
for the MAR11 Meeting of
the American Physical Society

Semiconductor Circuit Diagnostics By Magnetic Field Imaging

T. VENKATESAN, National University of Singapore and Neocera

At the forefront of IC technology development are 3D circuit technologies such as system-in-package (SiP), wafer-level-packaging (WLP), through-silicon-vias (TSV), stacked die approaches, flex packages, etc. They integrate multiple devices, many times stacking them in layers with complex, intricate and very long interconnections in significantly reduced area, in addition to an ever-increasing number of opaque layers. We could very well say that the near future looks like the perfect nightmare for the Failure Analysis (FA) engineer with localization of defects becoming a major challenge. Magnetic field imaging (MFI) allows the fields generated by the circuit currents to go through various packaging layers and be imaged. I will describe in this talk Magma, a scanning magnetic field imaging system based on a high temperature superconducting SQUID device based on YBa2Cu3O7-δ. The HTS SQUIDs used have a noise level of $\sim$ 20pT/$\sqrt{}$(Hz) and for typical scanning conditions, a field sensitivity of about 0.7 nT. While current shorts are imaged with spatial resolution, up to 3 micron (with peak localization) resistive opens can also be imaged and currently different strategies are being adapted for imaging opens with large working distances of 50-100s of microns. Higher spatial resolution ($\sim$250nm) is obtained by the use of magneto-resistive devices as sensors though the working distance requirement is sever