ABSTRACT:

Microstructural Evolution in Pb-free Solders by X-ray Microtomography: Real-Time Imaging, Quantification, and Reliability

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Heterogeneous integration in packaging (HIP) offers a power-efficient approach to achieving high-density three-dimensional system integration along with improved bandwidth density and energy efficiency. Advanced metrologies and predictive multiscale modeling tools are critical for solving complex problems and accelerating manufacturing and integration. These tools need to not only capture defects within HI packages at multiple length scales – ranging from the millimeters to the nanometers – but also help us predict which defects will be the most critical to device failure.

In this presentation, I will talk about novel, non-destructive techniques for real-time imaging, detection, and characterization of thermal cycling-induced damage in 3D HIP. I will cover examples of the use of such techniques applied to solder micro bumps, through silicon vias (TSVs), and hybrid copper-copper bonding. Time-resolved imaging to understand the role of defects, such as cracking of interconnects, surface delamination, void formation, and solder joint failures on reliability will be discussed.