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Wireless Design Drives 3D Packaging

By Hari Chakravarthula

Hari Chakravarthula, Director, Systems Engineering, Tessera, Inc.

The challenges faced by 3D system designers include: Design: Current layout tools support single substrates stacked with one or more chips. Carrying out an integrated design across many substrates and types of interconnects required for a 3D package is challenging due to lack of simulation capability across the 3D structure.

Thermal management: Multiple high power density chips are in close proximity. The conduction to the outer surface of the 3D package is poor because of high thermal resistivity materials (substrate, over mold and die-attach). Current techniques use a large number of interconnects as thermal paths, PCBs with higher copper content or the system case as heat spreader.

Assembly: It's a challenge to maintain a low warpage structure (substrate, package, etc.) during processing of the 3D system, assure materials compatibility across the 3D structure and develop equipment capabilities for non-standard parts. The impact on reliability and yield is critical due to the high cost of losing a multi-chip system.

Performance: A 3D system typically offers electrical performance advantages due to shorter trace length, but faces challenges of low-noise power delivery and routing congestion. Performance simulation is especially important for systems consisting of multiple technologies (RF, high speed digital, analog, etc.).

Reliability: Expected reliability is lower for 3D systems compared to single chip packages due to thin chips, smaller interconnects, more materials and processing. In mobile systems, drop, vibration and bend specifications are important. Reliability issues are addressed through mechanical and structural simulation and materials testing. Current simulation software is intended for bulk materials, not suited for multiple layers of very thin materials with fine features. Software tools to support thin materials representation, adhesion modeling, failure modeling of fine features and lifetime prediction are needed for better design and assembly optimization to facilitate faster time to market.

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