Co-fabrication of Micro-Coaxial Interconnects and Substrate Junctions for Multi-Chip Microelectronic Systems

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Abstract

Micro-coaxial cables (MCCs), with outer diameter of 100µm or less, enable a new microelectronics packaging platform that will greatly reduce the time required to design and fabricate complex multi-chip microelectronic assemblies. Low-inductance MCCs for DC power and 50Ω MCCs for signals eliminate the need for lengthy simulations because each individually shielded MCC provides sufficient isolation to prevent coupling, electro-magnetic interference (EMI), and crosstalk. The in-situ fabrication method presented here utilizes only conventional wire bonding and microfabrication techniques, providing a high-feasibility path toward a new interconnect paradigm based on MCCs.

Each cable measured consists of a 25.4µm gold bond wire coated first with a dielectric and then a 5µm thick gold shield. For DC power distribution, the dielectrics evaluated are 1µm Parylene and 100nm HfO_2. Their characteristic impedances are 2.0-3.5 Ω and 0.07-0.13 Ω, respectively. A third MCC, appropriate for signals, has 38µm Parylene and a characteristic impedance of 45-52 Ω. Further characterization includes crosstalk isolation and thermal shock reliability.