Advanced Packaging Concepts for Manufacturing

Homi Dalal - Analog Devices Inc., Chelmsford, MA 01824
Consulting Engineer (retired)

E-Mail: hormazdyar.dalal@analog.com

Abstract

IC package manufacturing spans from micro miniature implants to Peta-flops supercomputer; the common theme is *smaller, lighter, cheaper* and *performance compliant* products. There is a myriad of factors affecting these four driving forces; however, single most important controlling factor is 'Interconnection'; whether it is on-chip, between chips, to board, between boards or between systems. IC packaging has so far mostly used electrical interconnects; wire bond, solder bumps, copper pillars, thin film interconnects and Through Silicon Vias (TSV) are used in first level packaging; Pin Through Holes (PTH), Surface Mount Technology (SMT) and Connectors are used in second level packaging. However, the increasing clock speed and wiring density inside systems require replacement of electrical interconnections with optical interconnections, just like the optical fiber which took over the task of long distance communications from electrical cables.

The second most important factor in IC packaging is ' process technology'; the same interconnect technology can be accomplished using different process technologies; for example, bumping can be achieved by 'Parallel Processing' like stencil printing or by 'Discrete Processing' like individual solder ball deposition technique. The low throughput of 'Discrete Processing' can be alleviated by the advancements in laser, optical and electro-mechanical (robotic) techniques. Most tools make use of 'Data Control' to some degree; a tool designed with proper Data Control, robotics and optical or laser controls, produces higher synergy in production and thereby, lowest cost of yielded product.

A pragmatic approach to analysis of advanced packaging technologies to meet the future needs of commercial products will be presented.