

**TIN-BASED LEAD-FREE SOLDER BUMPS FOR FLIP-CHIP APPLICATION**

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**ABSTRACT**

This paper reviews the processing of tin-based lead-free solder bump for flip-chip application. Some of the processes, electroplated, stencil printed, evaporated, injection moulded and solder spheres shall be highlighted, while the technology on electroplating technique shall be reviewed. In general, the obstacle in the usage of tin-based lead-free solder alloy is due to the toxicity of lead. This has led to a legislation and control in the usage of lead as an alloying element. The solder bumping methods were compared relatively in terms of cost, quality, bump pitch, applicability and lead-free challenge. Electroplated process produces high quality, fine pitch bumps and has, however, low flexibility in handling with lead-free alloys and has relatively high production cost. On the contrary, the stencil printing method is a low-cost, producing coarse bump pitch and handles easily with lead-free alloys. Evaporation process provides high quality bumps at medium to high cost but is poorly suited for larger wafers and most lead-free alloys. Among the two processes, the electroplating method is the most suitable process to fabricate tin-based lead-free solder bumps, and has proven to be the most cost effective and versatile in application.

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