Analysis Of Die Products Assembly Techniques - Die Attach

A wide variety of die assembly methods and materials are available for implementation into high yield, high reliability systems. Some of the options for COB die attach are reviewed here for comparison.

Thermoset Adhesive

Advantages: low cure temperature, low modulus of elasticity, high strength, relatively inexpensive, wide process window (bondline, curetime)
Disadvantages: resin bleed, level of thermal/electrical conductivity, limited reworkability, limited internal water vapor (RGA) performance
Process Considerations: cure profile, bleedout evaluation, material compatibility, design rules, pot life and storage, dispensing considerations/patterns/voiding, bondline control, placement accuracy/planarity

Thermoplastic Adhesive

Advantages: low cure temperature, low modulus of elasticity, relatively inexpensive, reworkable
Disadvantages: limited strength, electrical/thermal conductivity, limited internal water vapor (RGA) performance, manufacturing logistics in handling
Process Considerations: force, time, pressure, placement accuracy/planarity/bondline, thermal hierarchy

Metal-Filled Glass

Advantages: high thermal/electrical conductivity, high temperature tolerance, excellent internal water vapor performance (RGA), strength, mid-range modulus of elasticity
Disadvantages: bond line control, cost, non-reworkable, fillet control, die size limitations, high temperature organic burn-out
Process Considerations: bond line control, OBO profile, dispense control/voiding, placement accuracy, die size, metallurgy of die backside

Au-Si Eutectic

Advantages: high thermal/electrical performance, strength, RGA, temperature tolerance, reworkable
Disadvantages: cost, high modulus of elasticity, limited die size, potential for chip damage, high process temperature, narrow process window
Process Considerations: process profile, environment (N2, forming gas), die size, metallurgy(type & oxidation), voiding, collet size/design

Soft Solder

Advantages: good thermal/electrical performance, reworkable, good matching for dissimilar CTEs.
Disadvantages: special backside metalization required, typically need forming gas and nitrogen atmosphere, die placement issues
Process Considerations: level of O2 in atmosphere, oxidation on surfaces, solder splash during placement, voiding

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