

Innovation in the Wiring Technique for SMT and Similar Application

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I. OVERVIEW

- Galvanic corrosion is a form of electrochemical process which turns one metal to corrode when it is in contact with another metal in the presence of an electrolytic solution.
- Dissimilar metals have different electrode potential that when connected electrically, one behaves as anode and the other as cathode.
- The metal that act as anode corrodes at the amount of potential difference between metal.
- The smaller the potential differences between metals, the lesser it allow galvanic current or there is less probability of corrosion.

II. PROBLEM IDENTIFICATION

- In semiconductor assembly, the occurrence of corrosion has a detrimental effect especially on sections with intermetallic connection such as bond pads and bonding wire interface or wire to lead connection which would result to functionality and reliability issue.
- Fig. 1 shows a bond pad contamination due to galvanic corrosion that produces a test “open” or no connection rejection.



Fig. 1. Bond pad contamination

- Cross section analysis for the affected bond pad as shown in Fig. 2A, confirms delamination between the intermetallic layer of pad and wire.
- Elemental mapping identifies key element for galvanic corrosion to manifest in the affected unit, as shown in Fig. 2B.

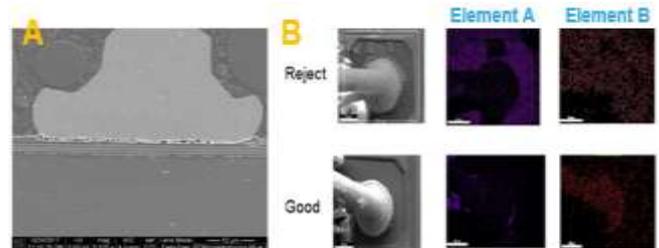


Fig. 2. (A) Delamination, (B) Elemental mapping

III. DESIGN SOLUTION AND IMPROVEMENT

- An alternative wirebonding technique is suggested wherein a ball bumps is fabricated separately followed by a reverse bonding of the 2nd wire to connect the leadframe lead to the bond pad of the silicon die.
- The material used to fabricate the ball bumps is made from a noble metal which can resist corrosion more.

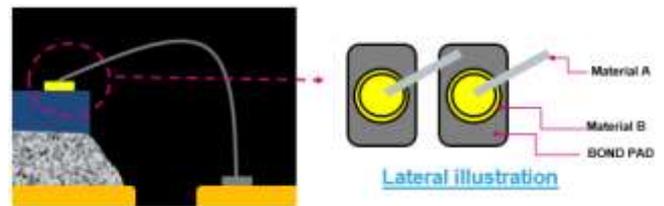


Fig. 3. Wire bonding Technique

- The new wirebonding technique can be done through using dual machine set-up; which the 1st machine will do the ball bumps on the bonding pad and the 2nd machine to establish the wiring of the leadframe lead and ball bumps.

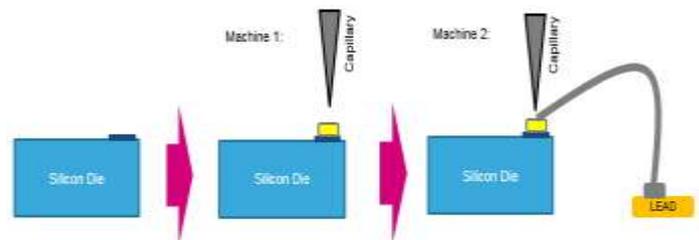


Fig. 4. Method

- Realization of this technique for surface mount technology and similar application is beneficial and improves the reliability characteristic as well.