

Reduction of Copper(II) Oxide on Bare Leadframe Through N₂ Atmosphere Curing

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QFN Quad Flat No leads

I. OVERVIEW

- One of the recognized candidate for the base material of leadframe is copper due to its abundance in resources and inexpensive cost as compared to other noble material such as silver and gold.
- Leadframe is the direct material used for Quad Flat No-lead (QFN) and Quad Flat No-lead packages (QFP) assembly.
- During manufacturing, the leadframe is used to carry the silicon die and wire until the unit is encapsulated.
- Illustrated in Fig. 1 is the QFN Assembly process flow.

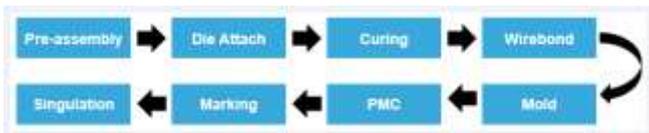


Fig. 1. QFN/QFP Assembly process flow.

II. PROBLEM IDENTIFICATION

- The excessive oxidation rate of bare copper leadframe during IC assembly is the cause of reliability issue such as delamination.
- Two section of IC assembly is identified to contribute to the excessive growth of oxide: Die attach cure and Wirebonding which both uses higher temperature (>150°c) during process.
- The oxidation is categorized into 2 compound: Copper (I) oxide which is identified as good oxide while Copper (II) oxide is brittle in structure and easily delaminates.

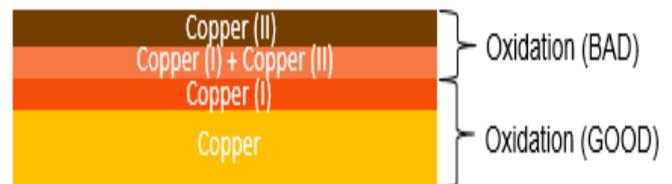


Fig. 2. Oxidation of Copper Leadframe

III. DESIGN SOLUTION AND IMPROVEMENT

- A modification in the current assembly procedure is proposed to minimize the occurrence of excessive oxidation for copper leadframe.
- N₂ (Nitrogen) atmosphere oven is used to replace conventional oven during curing. Nitrogen is supplied to the internal chamber of the machine bringing down the PPM level of oxygen before the temperature reaches the curing temperature of the glue.
- In Fig. 3 shows an example of oxidized copper leadframe after curing. The change in color for the copper leadframe signifies the presence of oxidation.

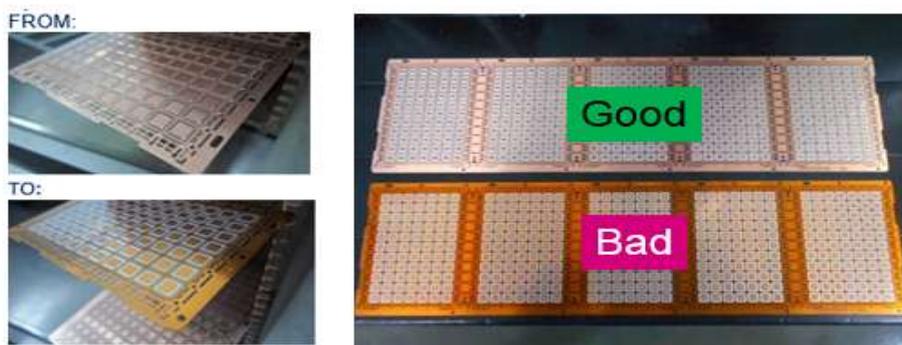


Fig. 3. Leadframe status after curing process