

# Semiconductor Substrate-based Package with Exposed Copper Diepad

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## I. BACKGROUND OF THE STUDY

- Substrate material played a very important role in packaging industry, not only because it represents a great portion of the cost but also has a great influence on package performance
- Semiconductor substrate-based packages in Fig. 1 have stack-up made of a core dielectric material, prepreg material, copper traces and vias for signal connections, and the protected with top and bottom soldermask material

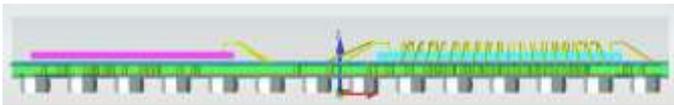


Fig. 1. Cross-sectional view of a semiconductor substrate-based package.

## II. PROBLEM IDENTIFICATION

- Die delamination occurrences were recorded on a substrate-based package in Fig. 2, and some packages have low adhesion between the substrate pad and the adhesive glue

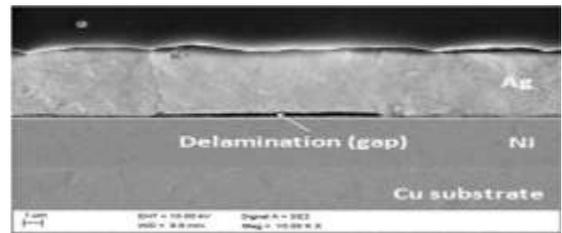


Fig. 2. Die delamination on substrate-based package.

- Aside from the delamination, contaminated leads were encountered on the package, with contaminants coming from the adhesive glue
- Contaminated leads may cause risks on wirebond process anomalies like lifted stitch and non-stick on lead (NSOL)

## III. PACKAGE DESIGN SOLUTION

- The semiconductor substrate-based package is augmented in Fig. 3 with exposed copper diepad to improve the adhesion between the die attach glue and the diepad
- The improved design contributes to better thermal conductivity and package reliability

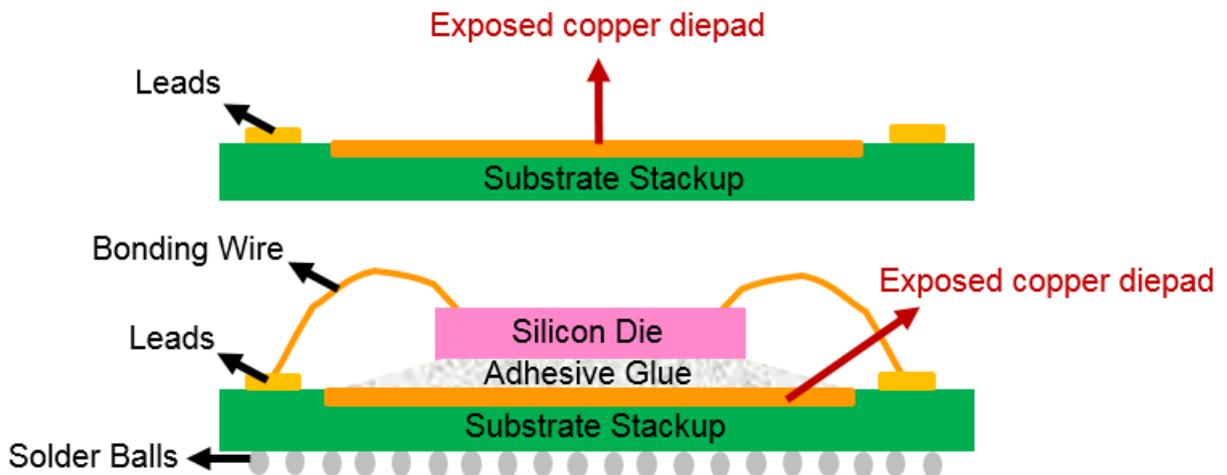


Fig. 3. Improved semiconductor substrate-based package with the exposed copper die attach pad.

- The design also prevents lead contamination, and help mitigate wirebond-related process defects such as lifted stitch and non-stick on pad or lead