

Reducing the See-saw Effect of Un-balanced Die-Pad Architecture for COSL Device

Rennier S. Rodriguez

Back-End Manufacturing & Technology, STMicroelectronics, Inc.
Calamba City, Laguna, Philippines 4027

Keywords— Silicon die; Semiconductor Die; COSL; See-saw effect; Non-conductive Film.

I. OVERVIEW

- COSL or Chip-on-single-lead is a kind of architecture from QFN (Quad Flat No-lead) devices wherein the silicon die is attached to a single lead instead of leadframe pads.
- Often COSL design is recommended for small package dimension (< 1mm) wherein there is minimal number of I/O count.

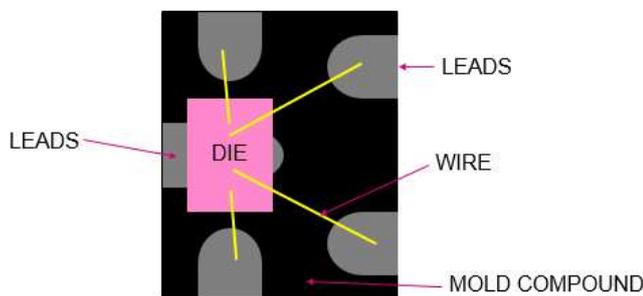


Fig. 1. COSL

- A device of COSL is composed of silicon die that is attached to a lead wherein its' bond pads is connected to I/O pin or Leads through wire.
- The overall device is encapsulated by an epoxy molding compound.

II. PROBLEM IDENTIFICATION

- In some cases, the architecture of the unit is required with a silicon die larger than the leads' effective area creating a "see-saw" structure on the package.



Fig. 2. COSL architecture

- Often the wirebonding process for this kind of structure is challenging and difficult to optimize.
- In Fig. 2, the force used to form intermetallic bond between wire and bondpad pushes the unit on one side at the same time.

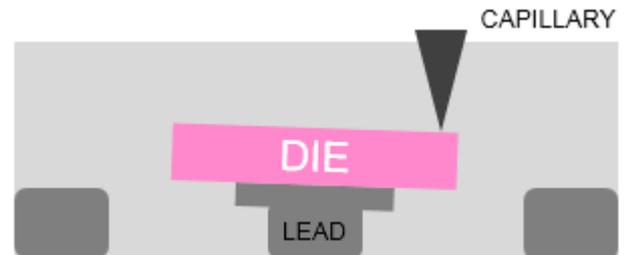


Fig. 2. See-saw effect

- The "see-saw" effect produces higher count of NSOP (Non-stick on Pad) rejection during assembly.

III. PROCESS SOLUTION AND IMPROVEMENT

- The proposed solution is to incorporate a non-conductive film that will be attached to the bottom part of the leadframe.
- The non-conductive film will act as a conductive encapsulation for the bottom part of the device.



Fig. 3. Method

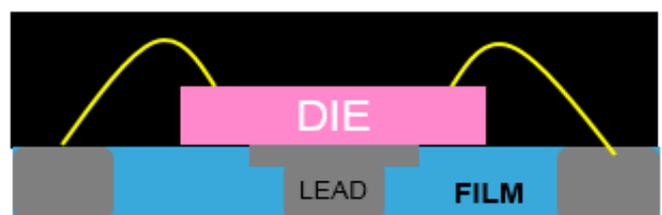


Fig. 4. Proposal

- In Fig. 3 shows the application of non-conductive film on the bottom part of the leadframe using thermo-compression.
- Fig. 4 shows the cross section illustration of the proposal wherein the film is visible on the bottom part of the unit.
- The non-conductive film will support the protruded part during die attach and wirebond process.