

Pepper Pot Design Augmentation for Small Die Sizes

Edwin M. Graycochea Jr, Rennie S. Rodriguez, Bryan Christian S. Bacquian

Central Engineering and Development Department, Back-End Manufacturing & Technology, STMicroelectronics, Inc.
Calamba City, Laguna, Philippines 4027

Keywords— Micro Module packages; Semiconductor; Die Attach; Chip out: Silicon die.

I. OVERVIEW

- Nowadays, the die technology and die sizes becomes smaller from 1mm up to the range of 0.4 to 0.8mm for micro module semiconductor packages.
- As the die size requirement for incoming technology shifts, the die attach process becomes the challenging part of integrated circuit assembly.



Fig. 1. Assembly process for Module Package.

II. PROBLEM IDENTIFICATION

- Chip out/chippings issue is prevalent on thin die application wherein the fabricated circuit inside the silicon die is damaged due to the propagation of crack from the outer perimeter of the die, as shown in figure 2. B.

- Analyzing all the potential root cause identified that the die chip out defect is due to the die-to-die collision during pick up process.
- When the vacuum is activated, the neighboring die is drawn by the pepper pot vacuum near the die that will be picked. When the ejector needle ejects the die, it collides with the neighboring die resulting to chippings in the outer perimeter of the die, see figure 2. A.
- The growing demand of thin dies and small die sizes especially on module packages is a very big challenge during die pick-up process of the die bonder machine resulting to chip out.

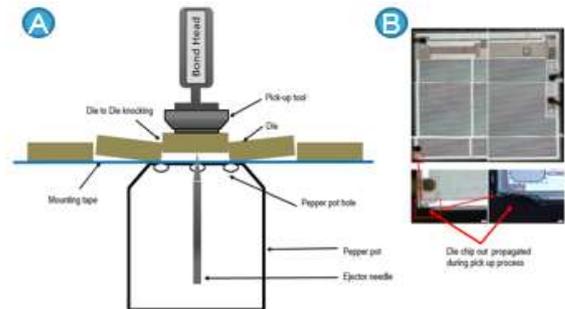


Fig. 2. Die chip out encountered during pick up process at die attach.

III. PACKAGE DESIGN SOLUTION

- The new pepper design is illustrated in Fig. 3 wherein the vacuum hole location is modified for smaller silicon die sizes.

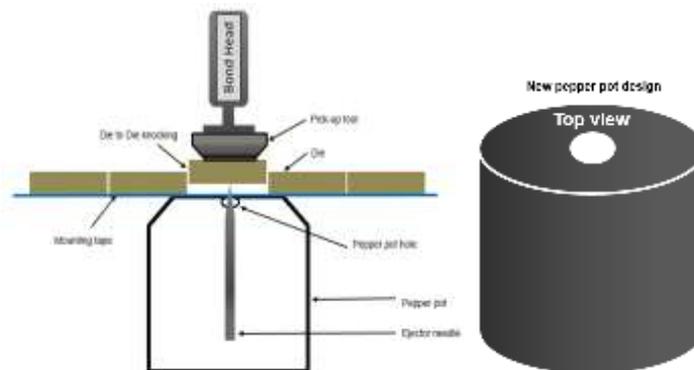


Fig. 3. New Pepper pot design, showing the process of die attach pick and place.

- The new improved pepper design covers all the small die sizes for micro module semiconductor packages.
- The improved pepper pot design eliminates the occurrence of die chip-out while providing good pick-up on small devices.