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Critical Insights in the Effect of Tool Dimension to the Tilting Behavior of Silicon Die

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Keywords— *MEMS die; ASIC die: Tool Dimension; Correlation Study.*

I. OVERVIEW

- MEMS or (Micro-Electromechanical System) Packaging is one of the technology under surface mount devices.
- Typically the architecture of a MEMS package is composed of 2 kinds of silicon die: (1) MEMS die which is fabricated with the microscopic moving parts and (2) the ASIC die that contains the functional circuit for the MEMS.

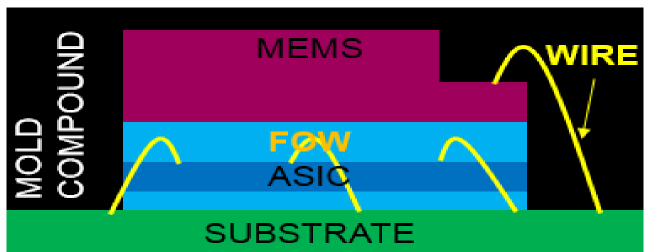


Fig. 1: MEMS Device.

- A specialized film or FOW (Film-on-Wire) material is used to attach the MEMS die to ASIC surface through thermo-compression process.

II. PROBLEM IDENTIFICATION

- When heated, the FOW material become very soft that it can able to conform to the topside wiring of the ASIC die.
- A die tilting is encountered when the bonding of the MEMS die is not planar/flat corresponding to the ASIC die.

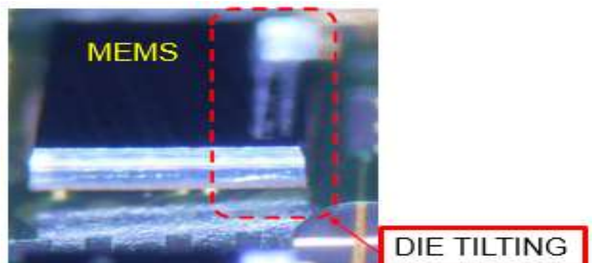
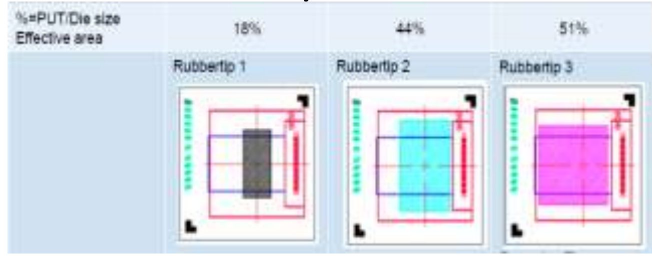


Fig. 2: Standard assembly flow for semiconductor device

III. DESIGN OF EXPERIMENT

- 3 kinds of tool dimension is included in this study to determine its actual effect in the tilting behaviour of the MEMS die during die attach process.

Table 1: Standard assembly flow for semiconductor device



%=PUT/Die size Effective area	18%	44%	51%
	Rubbertip 1	Rubbertip 2	Rubbertip 3

- Different color in Table 1 shows the different dimension of tool that will be going to be used in the evaluation.

IV. PROCESS SOLUTION AND IMPROVEMENT

- In Fig 3, shows the correlation study of tool dimension and die tilting behaviour of the MEMS die.
- As the tool dimension becomes larger in dimension, a less die tilting likely to happen in the actual MEMS die.
- Die tilting can be minimized if the tool dimension is controlled to a certain limit during die attach process to minimized the tilting into allowable limit.

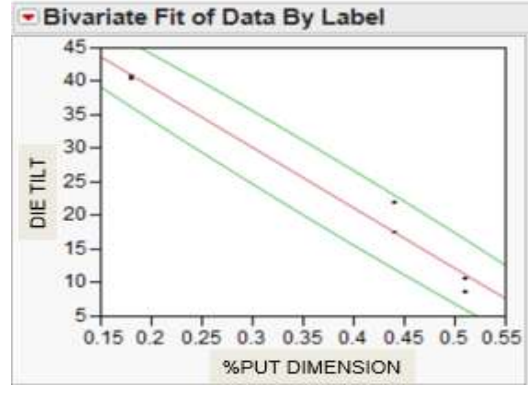


Fig. 3: Correlation

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