International Research Journal of Advanced Engineering and Science
ISSN (Online): 2455-9024

Reduction of Silicon Die Tilting Rejection through Indirect Material Enhancement

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

Keywords— *Silicon die; Semiconductor Die; Die Tilting; Process and Design Improvement.*

I. Overview

Bond pick-up tool is the assembly indirect material used to pick and bond the individually sawn die to a carrier material. This indirect material is attached to the bondhead assembly of a diebonder machine wherein it is controlled and supplied with defined pressure during contact to the silicon die. More often, the design and composition of this material is defined during innovation stage since on actual application this is directly correlated to some die attach responses corresponding with wetting and die tilting behaviour of the silicon die to the die attach adhesives. On the other hand, an undefined pick-up tool material during application is found to be the cause of some chronic assembly rejection for integrated circuit device.

II. Experiment/Methodology

A worst silicon die tilting is experienced during the development on a silicon die dimension of 4x4 mm which regardless of the parameter optimization and design of experiment performed, worst silicon die tilting manifest. Modification in the pick-up tool design is suggested to be evaluated and determine its effect on the tilting of the silicon die.

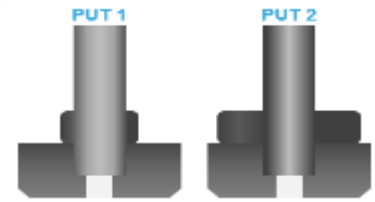

Fig. 1. Illustration of PUT 1 and PUT 2

Fig. 2. Methodology

PUT (pick-up tool) 1 is the existing design of the indirect material currently used on die attach process while the PUT 2 is modified with larger backside support.

III. Result

The silicon die tilting response is used by the researcher to measure the significance of both design of PUT since this criteria is independent from the machine parameter. The measurement will be achieved with the difference between the maximum and the minimum side of the silicon die.

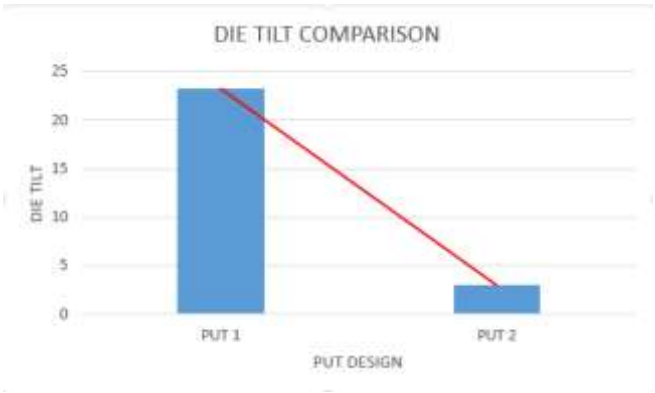

Fig. 3. Die Tilt Response

Comparison of the result for both PUT design shows improvement in the die tilt response which the second design of PUT is observed to have lower tilt. A PUT with enough support tends to improve the tilting behavior of the silicon die during the bonding process yet the existing material partnered with larger tool produces more variation during the process.

IV. Conclusion

As the silicon die dimension expands, a modification in the current indirect material such as PUT is needed to sustain its actual response within the controlled and specified limit. Parametric adjustment and design of experiment is not suitable in improving the assembly response of a silicon die unless the indirect material design is considered and corrected.

Rennier S. Rodriguez, "Reduction of Silicon Die Tilting Rejection through Indirect Material Enhancement," *International Research Journal of Advanced Engineering and Science*, Volume 4, Issue 3, pp. 358, 2019.