

Improved cDAF for Reducing Adhesive Film Remains in Die Attach Pick-up Process

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I. INTRODUCTION

Nowadays, new technologies are getting augmented and improved in the semiconductor industry, and one of which is the development in die attach materials particularly the conductive die attach film material. Conductive die attach film, also known as cDAF, is mounted below the silicon die and is also used to connect into the circuit boards. However, this technology contributes numerous problems during development stage of the semiconductor package. Fig. 1 shows the standard assembly process flow with the concerned process at the die attach station. During die attach pick-up process of the silicon die, the requirement is that there must be no adhesive film remains in the wafer tape to get a good adhesion during die bonding into the semiconductor carrier, for this case the leadframe, and to also have a good reliability response.

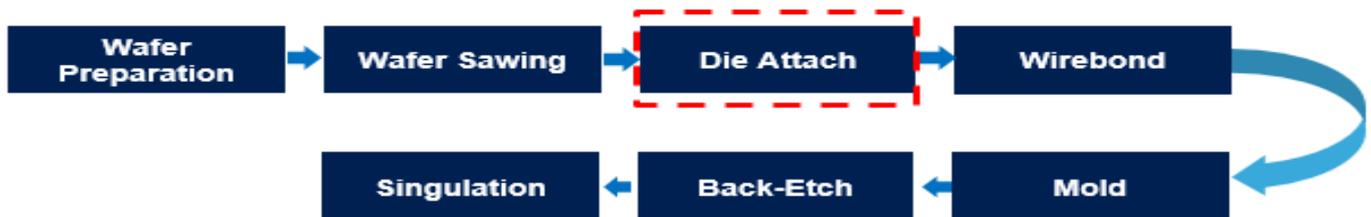


Fig. 1. Standard assembly process flow of the semiconductor package.

II. PROBLEM IDENTIFICATION

As earlier mentioned, one of the problems encountered during die attach pick-up process of a particular semiconductor package is the cDAF remains on the wafer tape. During the process as illustrated in Fig. 2, when the die ejector needle pushes up the silicon die which is then picked up by the rubber tip, there are cDAF material remains observed on the wafer tape. Fig. 3 depicts a sample of cDAF remains. The problem is mainly caused by the sticky wafer tape on the cDAF. During package development stage, process robustness is done through design of experiment (DOE) but unfortunately cDAF remains is still the top major contributor of assembly rejects in die attach process. The challenge now is to come-up with the enhancement on the process and an alternative solution of the material in order to have a good reliability response and eliminate the occurrence of cDAF remains.

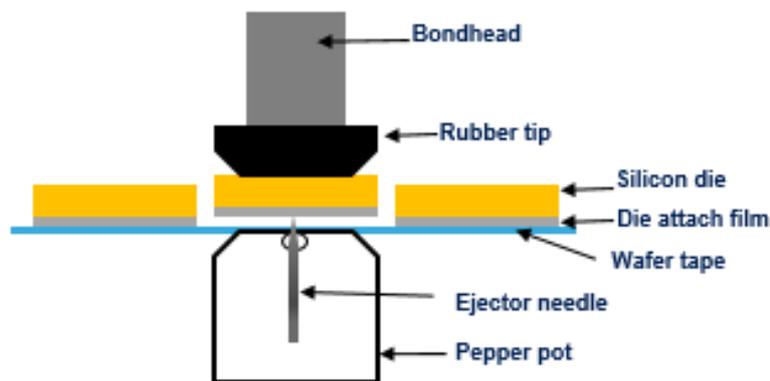


Fig. 2. Pick up process in die attach assembly process.

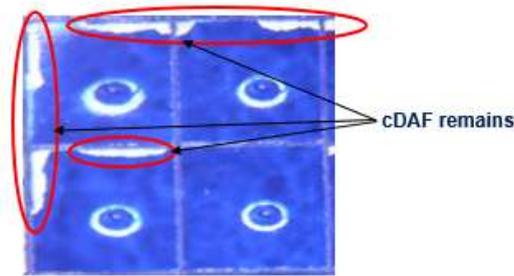


Fig. 3. cDAF remains on the wafer tape.

III. PROCESS DEVELOPMENT SOLUTION AND DISCUSSION OF RESULTS

An improved cDAF material was evaluated and eventually resolved the occurrence of assembly rejects particularly the top contributor which is the cDAF remains on the wafer tape. Fig. 4 shows the actual wafer tape picked with no cDAF remains.

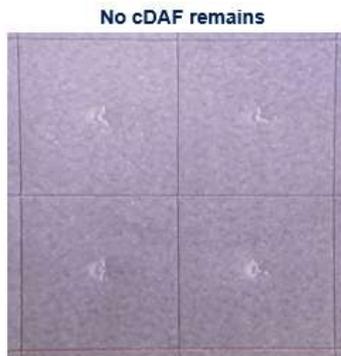


Fig. 4. Improved cDAF material showing no adhesive film remains on wafer tape.

Another advantage of the solution is the good adhesion on the leadframe and a better reliability response of the product. The incorporation of the new cDAF and dicing tape makes a more cohesive adhesion between the two materials resulting to non-separation of cDAF. The improved cDAF also has better thermal conductivity compared to the previous material. Comparison in Fig. 5 in terms of parts per million (PPM) level shows improvement with the improved cDAF material during pick-up process of silicon die in the wafer tape.

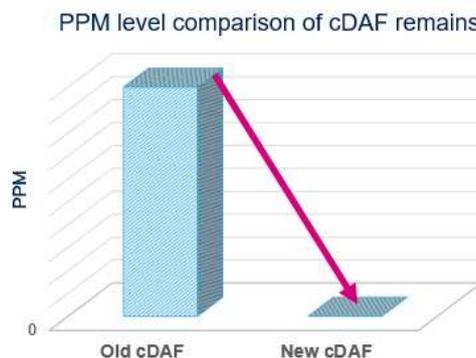


Fig. 5. PPM level of cDAF remains (actual values intentionally not shown).

IV. CONCLUSION

The paper presented a process solution and improvement with the improved cDAF, which significantly removed the occurrence of the top contributor assembly reject, that is the cDAF remains, during pick-up of silicon die in die attach assembly process. The improved material offered better adhesion on the semiconductor carrier and better reliability response.

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