THE CHALLENGES OF MANAGING TEST: STANDARDIZATION

Hwei-tsui Ann Luh
Taiwan Semiconductor Manufacturing Company
HTLUH@tsmc.com.tw

Semiconductor vertical integrated business flow that covers design to final test is gradually being replaced by vertical collaboration (as the figure shown below). In vertical collaboration model, fab, testing and assembly can be outsourced/foundried by specialized companies with better cost, cycle time and/or performance. This trend has created complex mesh linking between each party. Foundries deal with different requirements/specs before (and after) their process while product companies deal with different foundries both vertically and horizontally (two or more foundries in the same process). Standardization, therefore, has become an even more important task in this industry and a challenge for testing management.

From testing point of view, standardization covers tester specification, test program generation/format, equipment OS, supporting hardware, data formats, process flows, etc. Here, we would like to discuss two flow changes that will be win-win solutions for related parties: one being changing the timing of backside grinding, the other being eliminating the inking process. This is especially important as the 300mm (12") wafers are marching towards production stage and we see greater impact and benefit in standardizing this process flow in the foundry supply chain.

Backside grinding is to reduce wafer thickness to the assembly or product requirement. Typically, it is the last process in fab. However, thin and large wafers create issues in wafer shipment and handling. For example; an 8" thin (12 mil) wafer, while lying flat in cassette, sags 8.1 mil in the wafer center due to gravity, which is 65 mils more than a thick (28 mil) wafer. This creates a risk for prober transfer arm in mixed-thickness wafer production (a typical situation in test foundry). This problem, though being still manageable in 8" case, is too severe to handle for 300 mm wafers. Furthermore, during shipment and handling, the risk of breakage or crack is much higher that it bares a higher cost. Therefore, the backside grinding for 300 mm wafer should not be done in fab; instead, it should be done prior the die saw process or, even after in assembly.

This process flow change will have minimum impact to product companies, but will create great value in minimizing the risk even for 8" wafers. It is therefore proposed to standardize it as a normal process flow whenever possible.

Inkless process can shorten the cycle time, has cost benefit and eliminates quality and rework issues related with inking. The benefits will be even more scaled up in 300 mm process (e.g., inking could take 6 hours for a lot). Plus the reduction of other potential issues, inkless is another process that ought to be standardized in 300mm backend process.

Currently, many companies do not use it because they are prohibited by the unavailability in one or two of their assembly providers, or lack of confidence in the correct matching between sort data and wafers. The worry over correctness should be unnecessary. TSMC, for example, has been promoting inkless for 3 years. Totally more than 30,000 wafers from 26 companies have been produced through this process at 8 assembly sites from Taiwan, Singapore and Korea. Incorrectness in wafer-data matching has never occurred.

Lack of a standard inkless data format is the biggest barrier in implementing the inkless process throughout the industry. Therefore, it is proposed to define an inkless standard format and pave the road for a standard inkless process.

---


2 Ink bake and ink cleaning process also add up the inefficiency, cost and risk.

The vertical collaboration of semiconductor industry.