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# Micro Crack Resolution by Reverse Cutting Direction of Monocrystalline Wafers

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## I. OVERVIEW

- Wafers are typically formed by high purity mono crystalline material and their crystal structure are aligned to the surface on a relative direction called Miller Index
- As shown in Figure 1, chippings is mostly observed due to the cracking of these crystalline structures during mechanical dicing process, specifically thin dies.

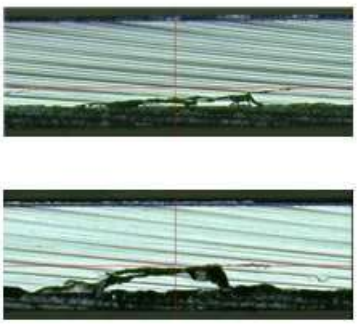

Fig. 1. Chippings vs Silicon plane misalignment

## II. PROBLEM IDENTIFICATION

- Wafers are typically sawn through by a mechanical diamond grit blades in order to grind silicon and successfully separate the so called “dies”
- However, chippings, typically observed caused by mechanical grinding happening during diamond and silicon friction during mechanical dicing process.

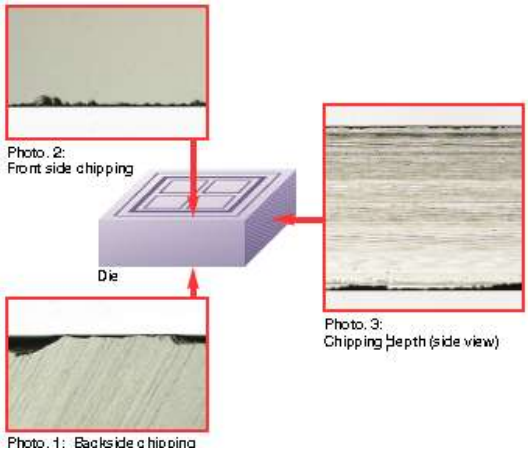


Fig. 2. Chippings occurred on a Conventional Mechanical Sawing.

## III. PROCESS SOLUTION

- A new process parameter, reverse cutting direction, is developed to ensure the alignment of the crystalline structure by wafer to be on a same direction with the respect to blade entrance

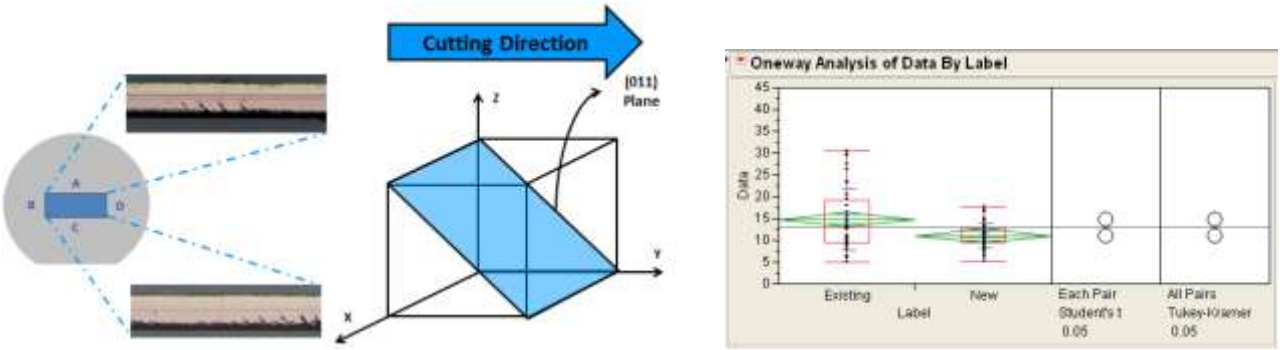


Fig. 3. Cutting Direction change and Anova analysis between the existing and new cutting direction

- New Cutting direction have minimized the effect of backside chippings and reduced its standard deviation which help improved process capability of mechanical dicing process.
- Therefore reverse cutting direction have helped increased the process capability of mechanical dicing for thin die applications



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