Abstract

To prevent yield loss is of high importance in any industry. The semiconductor industry is no exception. During this work three different defects have been studied: particles, chipping and a defect called drop due to its shape. The aim was to if possible remove the defects otherwise at least reduce them. In case of the particles, a reduction was achieved by using particle traps to determine which processes are the major contributors of contamination. EDX analysis were done to determine the sources of such particles. Solutions to reduce the particles were proposed but not all of them have been implemented. Concerning the chipping defect, an experiment without modifying the actual process (2 pass cut) but varying the blades was carried out to eliminate chipping and a design of experiment was conducted at a company specialized on dicing to improve the quality of the cut. Regarding the defect group called drops (different possible shapes of drops) one shape has been studied using visual inspection and FIB-analysis. Both analysis lead to the same conclusion that the source of the defect is a machine which does not properly strip the resist.

Motivation

Applications of high power semiconductors

- Electrical applications: Fast switching, low on-state voltage drop, high current density
- Non-electrical applications: High power, high efficiency, compactness

Results

- Though it is possible to minimize the number of particles in a cleanroom it is not possible to eliminate them all. Cleaning cycles in between two processes, automation and installation of Fan Filter Units (FFUs) were recommended and will be implemented.
- Chipping was successfully eliminated. Additionally it was shown that by changing the process from 2 pass cut to step cut, the quality of the cut can be greatly improved while keeping the throughput.
- A machine to remove the resist was identified as the cause of drops, however, no measurements have been taken yet.

Methods

An automated optical inspection (AOI) was performed with Rudolph NSX and Rudolph AXi in order to detect all defects.

The images obtained from the AOI were analyzed with a self developed program.

Conclusions

The program is a defect analysis system designed to harmoniously handle advanced macro frontside and edge inspection results. It also provided additional information on other defects which are critical in the failure of electrical test and visual inspection. Further studies have to be made to correct such defects.