MARPOSS

WHITE PAPER

A SHARP IMPROVEMENT FOR DICING MACHINES

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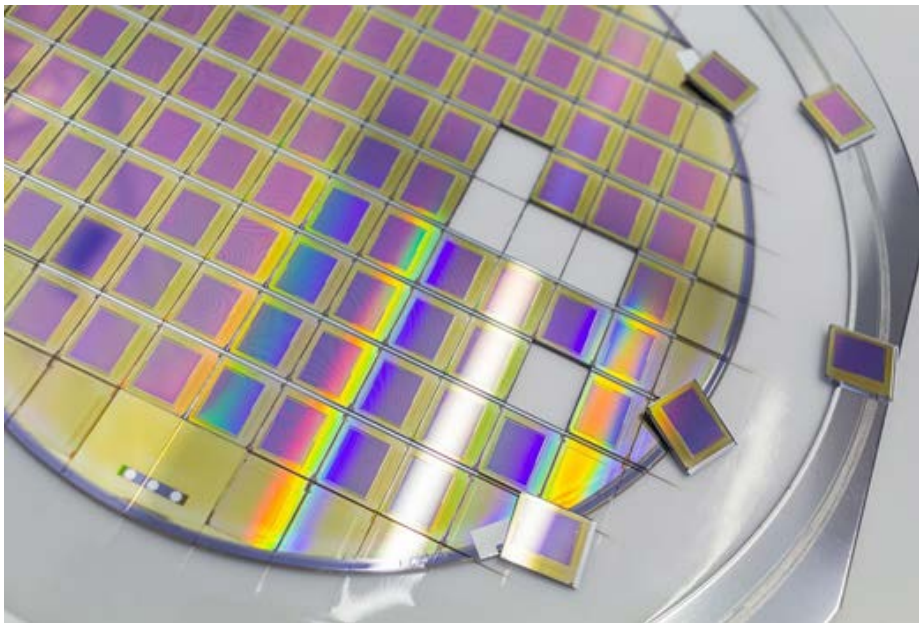
DICING A WAFER

Dicing machines for semiconductors are essential tools in the chip production process. Used to cut silicon wafers into individual dies, these machines must ensure extreme precision to avoid defects and increase production yield. Equipped with ultra-thin blades, dicing machines operate at high speeds and are designed to handle fragile materials with micrometric precision.

Advanced dicing machines are equipped with real-time monitoring systems to ensure precise cuts and reduce waste. These systems allow for the quick detection and correction of any issues. Regular maintenance is essential to maintain high performance and reliability. Preventive maintenance programs help identify and resolve potential problems before they cause significant production interruptions, ensuring continuous and optimal operation.

The blades, typically made from materials like diamond or resin-bonded abrasive, are engineered to perform clean cuts with minimal chipping. The edge of the blade is meticulously manufactured to maintain sharpness and durability, crucial for achieving high-precision cuts in the delicate wafer material. Cooling systems integrated into the dicing process help to manage blade temperature, thereby extending blade life and maintaining cutting accuracy.

Dicing machines are therefore crucial to maintaining the high standards required by the semiconductor industry, integrating advanced technologies to meet the sector's precision and reliability needs.



Semiconductor wafer ready for dicing machine cuts.

MARPOSS POINT OF VIEW

Marposs is known worldwide for finding advanced technological solutions that are simple to use. Our sensors have been used for decades to optimize and keep the semiconductor production process under control.

Each of our products are conceived and designed to improve a process. Our sensors for silicon ingot slicing machines, the ones for lapping machines and above all for back grinding machinery are well

known. The products we offer meet not only the stringent needs of reliability but, moreover, they implement strategies useful for improving the productivity of a machine.

For years now, our customers have been asking us questions about the problems encountered during wafer dicing. The best-known problem is that of backside chipping which fundamentally concerns the interaction of the grinding wheel with the wafer.

Why not apply the same strategies here as the other products widely used on other machinery? Why not introduce concepts such as measurement, data storage and smart data processing in the new line of sensors specifically designed for dicing machines, the machines most widely used in the chip production process?

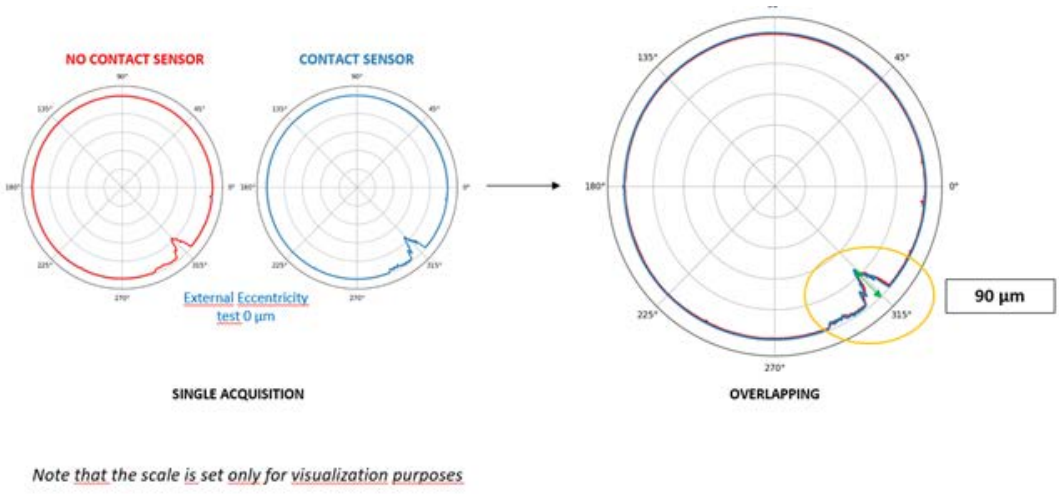
TECHNICAL ISSUES

We know how wafer cutting is a critical and a risky step. All the chips are already in position and well aligned on the silicon wafer, ready to be mounted in the most various ways. At this point, in the process the wafer has a high production cost and any error on it causes heavy economic losses.

The cutting of silicon or other materials such as glass, sapphire, up to the highly performing silicon carbide (SiC) and gallium nitride (GaN), now requires cutting precision and accuracy which requires accurate control of the blade. Furthermore, the operator must be able to carry out cutting control operations in complete safety, certain that the blade used is perfectly intact and free of defects.

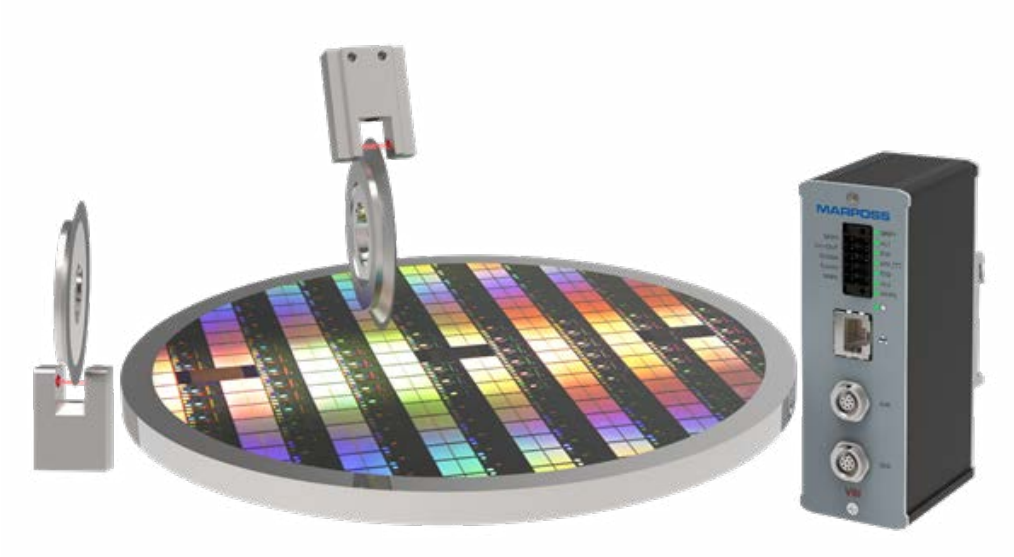
The blade consists of diamond abrasives and bond which binds that abrasives. These diamond abrasives occupy only the most external circumference of the blade which shape and aspect ratio are defined by the maker for every specific use of the dicing operation.

The critical issues that are commonly encountered in the field range from the imperfect grinding of the blade, the wear of the cutting edge not always known, same for the compensation of the wear but also the simple control of having carried out a correct blade replacement, without having accidentally damaged it . These are all factors to consider to ensure that the cut, can be made to the correct depth and thus minimize backside chipping.



Metrology room test comparing acquisitions made with the VBI (No contact sensor) Taylrond TR2000 (Contact Sensor)

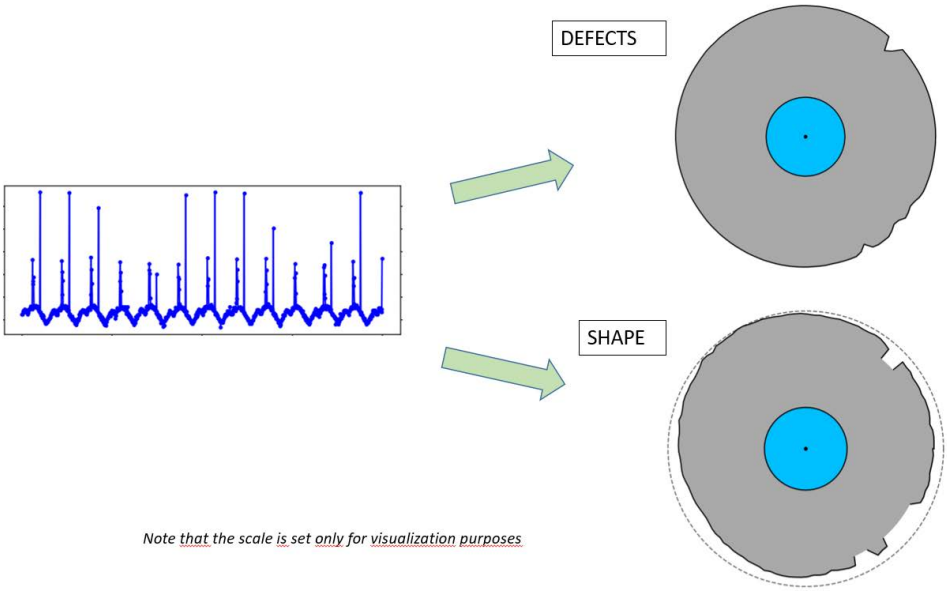
VBI SENSOR



VBI Application. The probe on the left refers to NCS functionality, the probe in the centre BBD functionality, on the right the unit interface.

Having a sensor capable of measuring the entire extension of the cutting edge (exposure) without stopping the machine for manual repositioning so that it can be used not only for standard hub blades but also in perhaps the most critical case of hubless blades, was the target of our project.

But there is perhaps another aspect that should not be overlooked, the dicing blade in its continuous use, in addition to being able to break, wear or otherwise, could and even ended up taking on oval shapes with immediate consequences in the cutting capacity of the machine itself.



Shape and defect of the blade

With the new and innovative VBI sensor, Marposs wants to give a concrete answer to all these needs. The advanced engineering of the sensor has made it possible to develop a total digital sensor at very

high sampling speed. An optical sensor already digitized starting from the head of the measurement chain, capable of transmitting, in process, the status of the blade that is rotating at 40-60 thousand RPMs. And that can not only recognize the integrity and position of the blade but also its shape or micrometric defects.

CONCLUSIONS

Those who work in the semiconductor field know very well how important is the quality and above all the tracking of the data relative to state of the machine in order to arrive at an immediate solution of the problem. Marposs knows the importance of this aspect and the VBI itself is not just a simple sensor but a product capable of storing high frequency data, processing it and securing it in a retentive memory so as to be available to the operator for subsequent analysis.

As with other products conceived and designed for use in chip production, VBI is our solution that we think can help in the continuous and constant improvement of the production processes, a factor that Marposs solutions aim to and we work on daily for more than 70 years.

Marposs was founded in 1952 and since then has provided shop-floor solutions for the quality check in the production environ-ment. Marposs' solutions include gauging equipment of mechanical components, before, during and after the production process, monitoring solutions on machine tools, assembly and testing for many industry sectors and automatic machines and checking stations for production lines.

Marposs is one of the main supplier of the major car makers, but operates as well in the aerospace, biomedical, HVAC-R, hi-tech and glass industries.

Marposs Group employs more than 3500 people around the world and is present in thirty-four countries with more than eighty sales offices.

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