UNITED GRINDING North America

Precision Grinding for Semiconductor and Microchip Manufacturing: Opportunities to Drive Quality and Efficiency

Here's a statement that looks to remain true for the next couple of decades: the North American semiconductor industry is booming. The CHIPS and Science Act of 2022 is driving hundreds of billions of dollars of public and private investment in the semiconductor industry in the United States. The goals: bolster the entire domestic semiconductor production ecosystem, from materials to equipment to the semiconductors themselves.

As investment ramps up, it's an ideal time to find new opportunities to improve both part quality and production efficiency. And if you're in the decision making process for silicon carbide (SiC) chip manufacturing, you'll be happy to read that UNITED GRINDING offers multiple advanced grinding technologies that check both boxes in a big way.

In short, it's an exciting time to be in—or perhaps even get into—semiconductor manufacturing. If you have aspirations to be there, you're in the right place. This article will get your gears turning.

Note: a recent blog post of ours served as a plain-English explainer for how microchips are made. If you could use that refresher, you can read it here.

BLOHM MC7

STUDER S41

BLOHM PLANOMAT

BLOHM PROFIMAT MC

MÄGERLE MFP 30

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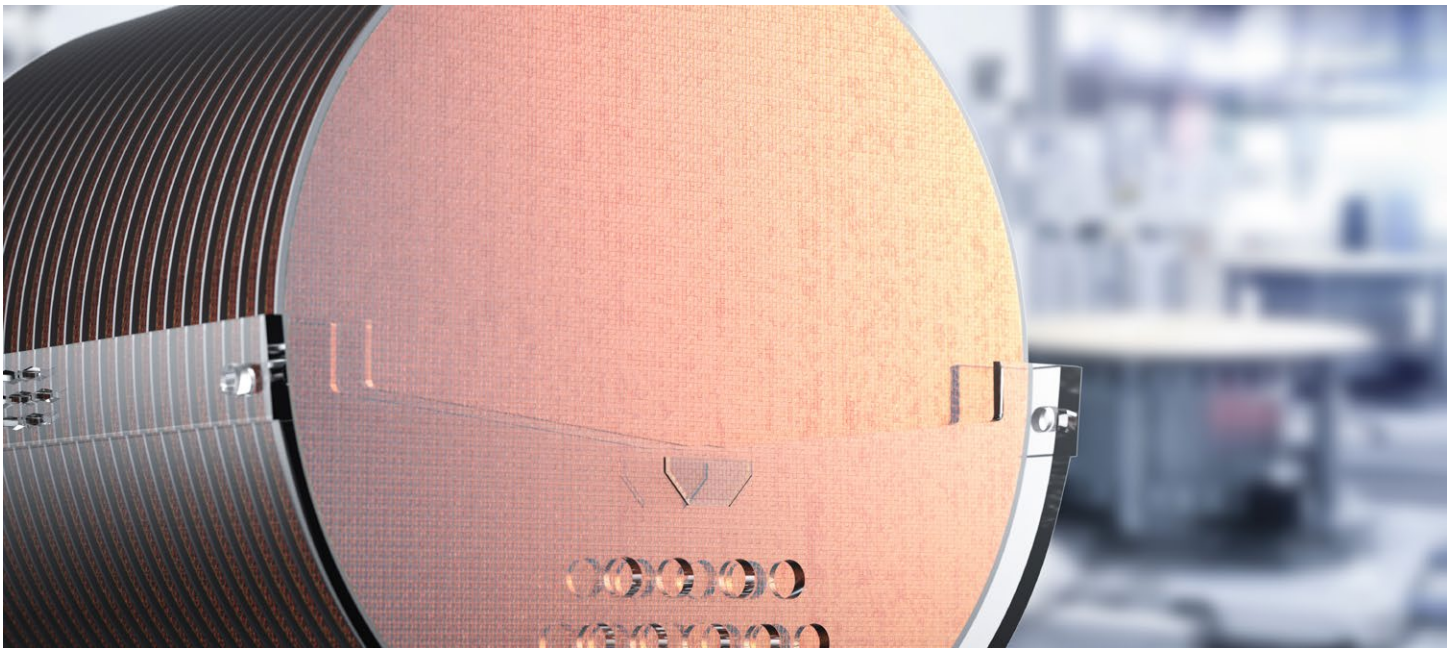
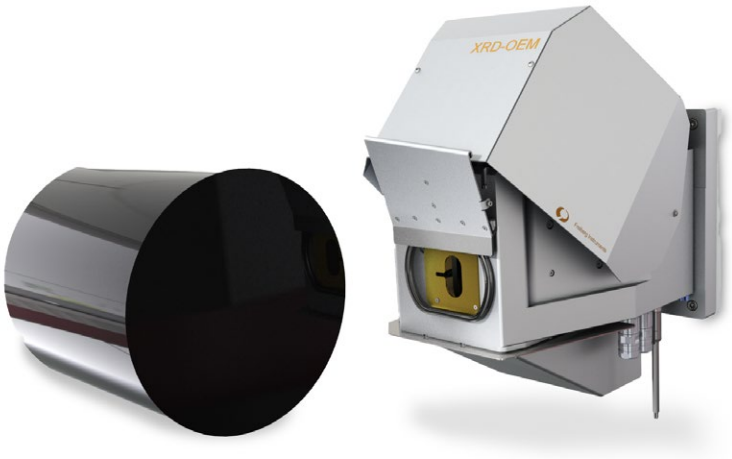


The traditional way:
a lot of time and a pricey diamond saw

Way before silicon is wafered and etched into miniscule integrated circuits, the raw material is grown in a crucible. The end result is an ingot of pure silicon, also known as a boule, roughly the shape of a rugby ball.

The good stuff is near the center, and there are two useless dome ends that need to be removed. Historically, that removal has been done with a diamond saw. It may sound like a simple process, but it can take two or three hours to complete. On top of that, a good diamond saw will run you somewhere in the neighborhood of $2 million.



The UNITED GRINDING way:
from hours to minutes

UNITED GRINDING has an incredible solution in its Surface & Profile division. The BLOHM PLANOMAT creep feed grinder tackles that two or three hour job in just 15 minutes. You can read up on the PLANOMAT here.

The grinding process to remove the domes on the boule is fully automated. The boule is held in place during the grinding process with an innovative photo-activated adhesive fixturing system, which provides secure clamping without damaging or distorting the workpiece.

Best of all: a new BLOHM PLANOMAT is far less expensive than a diamond saw, and can do the work of multiple saws in larger production facilities.

Once dome removal is complete, it moves to cylindrical grinding. Here, STUDER machinery integrates X-rays into one of the tool positions in the wheel head, which rotates on the B-axis.

The wheel head swings around to position the X-ray relative to the part, then the STUDER's C-axis workhead aligns the part to where the crystal structure is best suited to deliver the desired chip performance.

These parts usually require a flat on the OD, which STUDER creates using an OD wheel and out-of-round grinding software. Another frequent requirement is grinding a notch, and STUDER uses a horizontal wheel mounted in a third position in the wheel head to get this done.

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The traditional way: a consistent potential for error

Now our next step begins: determining the lay of the crystal plane.

The structural and electronic properties of the crystal vary each time, and their orientation differs. Also, you can't predict the orientation of the crystal plane ahead of time. It's quite the puzzle.

To solve it, X-rays are needed. Historically, an operator writes down the data revealed by the X-ray, then hand types it into the control. A slip here or a misplaced decimal point there, and you have a mistake that costs you dearly.

The UNITED GRINDING way: sweet peace of mind

This is where the Surface & Profile division at UNITED GRINDING comes through once again. The 5-axis BLOHM PROFIMAT MC and the MÄGERLE MFP 30 each have integrated X-ray capability.

On both machine models, the X-ray and accompanying software automatically determines crystal plane orientation. Then, the multi-axis interpolation of the worktable guarantees that it grinds parallel to the plane. Troublesome manual calculations and data entry are completely removed.

Where UNITED GRINDING flexibility comes in

This application calls for diamond wheels, and at UNITED GRINDING, we're up for using anything from resin bond to vitrified to plated. We've even gone as far as using segmented abrasives.

Flexibility in action: we have a customer who prefers a swirl pattern on their part, so we grind with the side of the grinding wheel instead of the periphery. Long story short: we develop the process around unique customer preferences.

Grinding silicon for semiconductor and microchip manufacturing is here

UNITED GRINDING North America works with some of the largest semiconductor manufacturers in the business, and our expert staff is ready to help you launch—or improve—that segment of your portfolio as well. Talk to our team any time to take the first step in this near-limitless industry.

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