

APPLICATIONS

Technological Break-through for Semiconductor Laser Dicing

High-end Motion Control and Visual Analysis Integration

The stock price of the semiconductor industry has soared, and Taiwan Semiconductor Manufacturing Company (TSMC), the leading semiconductor company in Taiwan, has even been hailed as Taiwan's "sacred mountain of protection of the country." What is TSMC's strength? In terms of process, TSMC's 5nm/7nm advanced process leads other foundries and has even exceeded 2nm. Process breakthroughs are of great significance to the electronics industry. Specifically, the smaller the process, the better, the faster the chip performance, the less heat, and the more power-savings.

Take the iPhone as an example. The iPhone 4 launched in 2010 is equipped with an Apple A4 processor with a 40-nanometer process, while the iPhone 11 with Apple A13 processor is equipped with a 7-nanometer process; the latest iPhone 12 uses a 5-nanometer chip.

Wafer Dicing is a Key Technology for Packaging and Testing

A smaller process can put more computing units in the same space, resulting in better performance, less heat generation, and more power savings. Compare one of today's mobile phones with one that you used three years ago, and you can clearly see and feel the difference in performance and heat dissipation. Due to the miniaturization of the semiconductor manufacturing process, the packaging and testing process is a vital stage, especially the accuracy of the wafer dicing technology.



Challenges for Laser Dicing

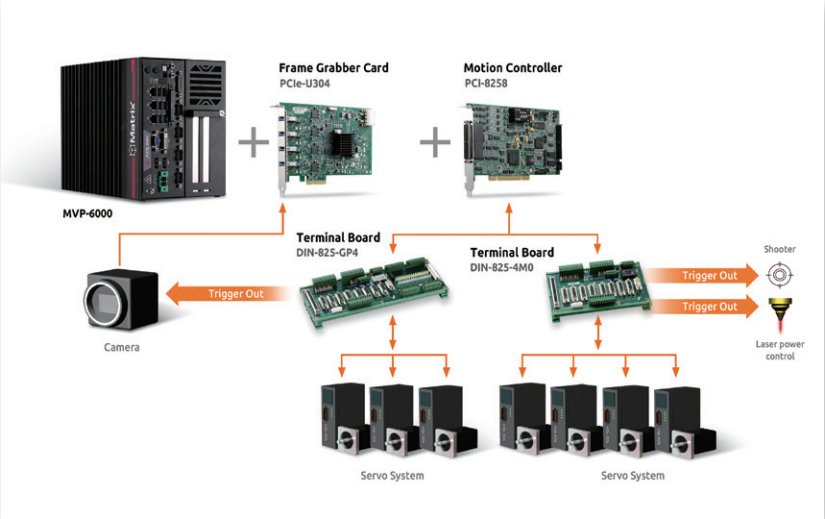
The current challenges for laser dicing include: poor accuracy, difficult to achieve high-precision motion trajectory, hard to adjust laser power, time-consuming speed planning, inability to provide real-time trigger control feedback, images analysis and motion control that cannot be fully integrated, for example.

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Integrate Visual Alignment and Motion Control to Improve the Efficiency of Laser Dicing

In response to the above-mentioned laser dicing technology issues, ADLINK has launched a solution integrating visual alignment and motion control that includes the PCIe-U304 image capture card and PCI-8258 motion controller. This solution not only achieves quickly positioning, but also matches sensors; it can also control laser intensity, easily switch and adjust laser power, and help avoid the laser dicing system operating repeatedly in the same path. In addition, in order to enhance the accuracy of laser dicing, the PCI-8258 uses a PID control system and full closed loop control to minimize tracking errors. To shorten the time of PID adjustment, users can use the program to assist in recalling the best PID parameter setting quickly, greatly improve performance, and simplify operation.

Moreover, chip design tends to be lighter, thinner, and have three-dimensional heterogeneous integration, with cuts that are becoming more and more complex. Simple speed planning can no longer meet the demands required by modern chips, especially when the motor encounters long geometric lines or arcs during the cutting process that often need to be continuously cut. Acceleration and deceleration can easily cause vibration with the machine, making it difficult to maintain stability. The PCI-8258 has a built-in speed planning function, which is very easy to set. The user only needs to determine the maximum speed, acceleration and upper limit of the speed of the overall dicing movement. Without complicated command settings, the motor can be kept stable during the dicing process, solving the problems of over-dicing, jitter and speed planning of laser cutting machines in the past.

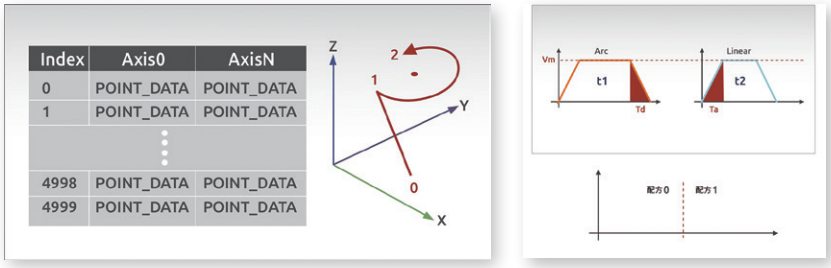


ADLINK's Laser Dicing Solution

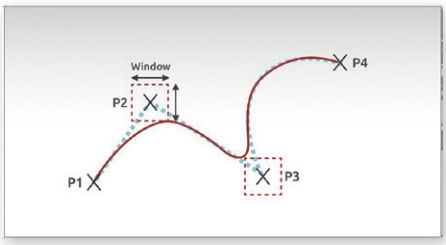
Improve Laser Dicing Speed and Smoothness Through Continuous Dynamic Multi-Point Comparison Trigger and Other Technologies

In terms of laser dicing speed and smoothness, the built-in algorithm of the PCI-8258 includes a continuous movement and point table, allowing users to define the connection speed and position by themselves, and can plan multi-axis paths, so that the laser dicing machine can switch to different

multi-axis paths, omitting unnecessary paths; a continuous dynamic multi-point comparison trigger can set trigger conditions and trigger ranges between multiple axes, making it suitable for irregular graphics, where flexibility in changing paths becomes an asset. Therefore, according to the graphic data provided by the user, the optimized graphic path can be automatically planned, unnecessary paths can be shortened, and the cutting speed and smoothness can be improved. This can reduce unnecessary work and greatly enhance productivity.



Continuous movement and point table



Continuous dynamic multi-point comparison trigger

The wafer dicing process has changed from traditional diamond knives to the introduction of laser dicing technology. Because laser dicing technology has the advantages of non-contact processing, it can avoid material surface damage. With the continuous miniaturization of chips, laser dicing equipment will inevitably move toward having higher precision, higher stability, higher integration, faster positioning, a simpler operating interface, easier speed planning, and instant trigger control feedback.

ADLINK has been deeply involved in the field of motion control and visual analysis for more than twenty years. Its products have already entered the military market which requires high precision and high reliability. The planning and laser intensity calculation are all placed on the motion control card, and the user can plan the path of the CAM without having to worry about complicated mathematical operations. Our solution also provides easy-to-use application tools for free, including an abundant motion controlling functions, as well as user diagnostic and operation interfaces, which can achieve higher speed and high precision motion control capabilities. Machine users can save up to 25-50% cost, while maintaining excellent output and accuracy, improving overall performance by more than 10%.

Learn more about ADLINK motion control solutions：https://www.adlinktech.com/en/Motion_Control

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