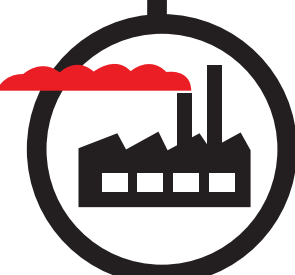
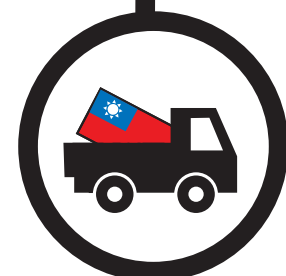


**JAPAN IS STILL A PLAYER**



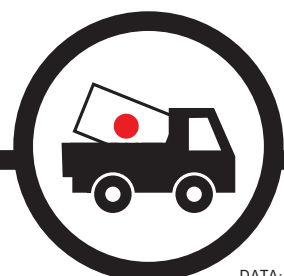
Japan's companies dominate the market for many materials needed to make chips of all sorts. A look at its role in producing chips for customers.

—Bruce Einhorn and Tim Culpan



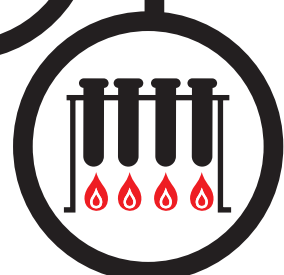
**MADE IN TAIWAN WITH A BOOST FROM JAPAN**

Chips made in foundries such as Taiwan Semiconductor Manufacturing power laptops that are assembled in China. To make those chips, TSMC relies on Japanese materials.



**IN THE BEGINNING**

Japanese companies such as Namiki Precision Jewel and Shin-Etsu Chemical develop the crystals that are turned into silicon wafers.



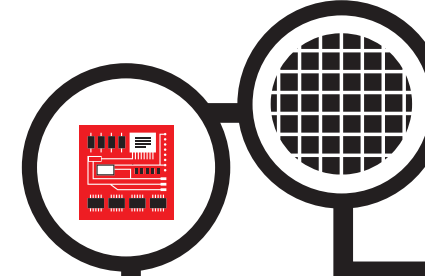
**POLISHING THE WAFER**

Hitachi Chemical has 70 percent of the global market for a type of slurry used by chipmakers to polish wafers and remove imperfections. Hitachi makes the slurry at a plant damaged by the tsunami.



**FROM WAFER TO CHIP**

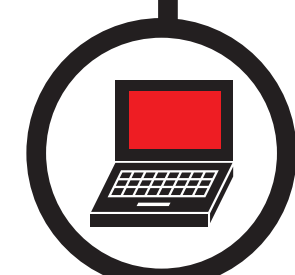
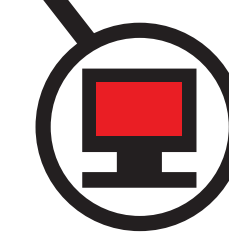
Chips are etched onto silicon wafers made in Japanese factories run by Shin-Etsu, Sumco, and others: They supply 50 percent of the world's un-etched raw wafers. Chip foundries buy millions of Japan's 12-inch wafers.



**AFTER THE CHIP**

Other laptop parts are made from Japanese components:

- Japanese companies Kyocera and Namiki Precision Jewel supply about half of the silicon wafers used by Epistar, the Taiwanese producer of light-emitting diodes (LEDs) used in laptop displays.
- Hitachi Chemical and Sony Chemical are the dominant suppliers of ACF, a special type of adhesive used in liquid-crystal display production.
- Sony makes 10 percent of the world's laptop batteries.



**THE FINAL PRODUCT**

TSMC uses these materials to produce specialized semiconductors for customers such as Nvidia, the U.S. company that outsources production of its graphics chips. Nvidia then sells the finished product for use in laptops made by Hewlett-Packard and others.



**PACKAGING THE CHIP**

Hitachi Chemical and Mitsubishi Gas Chemical have a combined 90 percent market share for BT (bismaleimide triazine) resin. This is used in the packaging that connects the chip to the circuit board.