

SEMICONDUCTORS

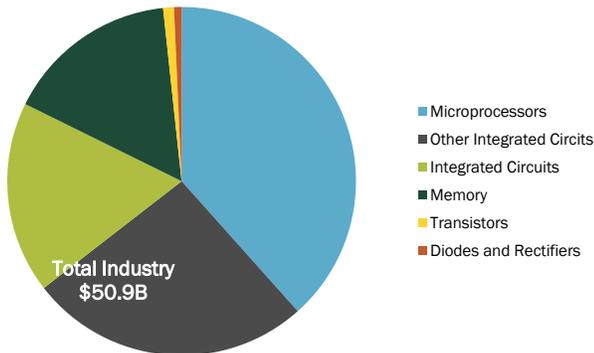
CURRENT TRENDS

- Increased consumer demand for electronic devices has led to a semiconductor manufacturing equipment supply shortage.
- Demand for data memory and storage is driving spending on NAND and dynamic random-access memory manufacturing equipment.
- Global semiconductor industry component sales were \$43.6 billion in May 2021, an increase of 26.2% over May 2020 and up 4.1% from April 2021.
- Experts predict global sales of semiconductor manufacturing equipment will exceed \$100 billion in 2022 compared to \$71.1 billion in 2020.
- The value of both 200- and 300-millimeter semiconductor tools remains relatively stable.
- The semiconductor tool secondary market is significant, generating an estimated \$5 to \$10 billion annually and comprises nearly 10% of the overall equipment market.

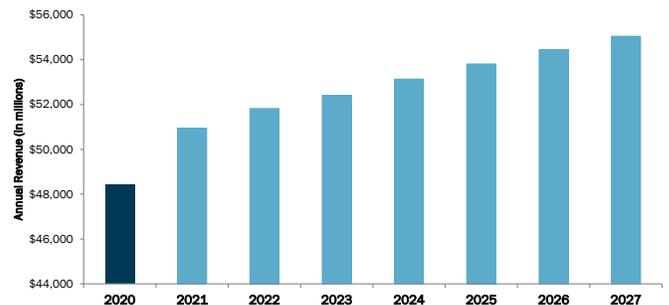
PROJECTED VALUES (12-MONTH OUTLOOK)



INDUSTRY PRODUCTS AND SERVICES SEGMENTATION - 2021



U.S. SEMICONDUCTOR & CIRCUIT MANUFACTURING REVENUE AND FORECAST



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CHIP SUPPLY SHORTAGE: Demand for chips decreased early last year in response to the COVID-19 pandemic. However, demand rebounded by mid-2020, fueled by consumers' growing needs for electronic devices like computers and TVs to support remote work and schooling. This momentum has continued in 2021 with rising chip demand in the automotive and smartphone markets.

Surging demand has resulted in supply shortages and extended lead times for many types of semiconductor equipment. According to *Semiconductor Engineering* magazine, lead times for 300-millimeter (mm) equipment have increased from three to six months to a year or more.

SEMICONDUCTOR FABRS REQUIRE SIGNIFICANT INVESTMENT:

Integrated circuits are manufactured at semiconductor fabrication plants or "fabs." The manufacturing takes place in a cleanroom, or a controlled environment containing the tools used to process silicon wafers.

Semiconductor manufacturing tools are expensive to purchase, operate and maintain. The most sophisticated tools cost up to \$50 million each, and a typical fab may require several hundred. Processes include lithography, deposition, etching, diffusion, ion implantation and metrology.

Global semiconductor industry component sales were \$43.6 billion in May 2021, an increase of 26.2% over May 2020 sales of \$34.6 billion and up 4.1% from April 2021.

SEMI, the global industry association for electronics manufacturing, forecast global sales of semiconductor manufacturing equipment by original manufacturers to exceed \$100 billion in 2022. If met, this forecast would represent a new high over the 2021 forecast of \$95.3 billion and the actual sales of \$71.1 billion in 2020.

WAFER SIZES ARE IMPORTANT: Fabs and tools are typically referenced in terms of the size of the wafers they handle, measure and process. The number of devices on a wafer increases geometrically with its diameter, making its size critically important.

The industry's top chip manufacturers use state-of-the-art wafers measuring 300mm, sizing first introduced in the mid-2000s. Many fabs have transitioned to 300mm tools because larger wafers can increase productivity and decrease costs. However, 200mm tools are still widely used across the industry.

The value of both 200 and 300mm tools has remained relatively stable since 2019. Older semiconductor equipment producing 150mm and smaller wafers is still in use in some research environments but is of little value on the secondary market.

EQUIPMENT IS VALUABLE ON THE SECONDARY MARKET: The secondary market for semiconductor tools is significant, generating an estimated \$5 billion to \$10 billion annually and comprises nearly 10% of the overall equipment market. Semiconductor tools are refurbished and sold through a highly fragmented supply chain.

In addition to the original equipment manufacturers, semiconductor manufacturers, re-furbishers, dealers and brokers buy and sell equipment. One piece of equipment can change hands several times before it re-enters a production or research facility.

Lenders should consider the following:

- Experts recommend a six-month minimum for the orderly liquidation of semiconductor equipment; large tool sets and complete facilities may require more time
- Liquidation expenses will include facilities and personnel maintenance, which are essential to protecting the tools from contamination.
- Objects connected on the Internet of Things (IoT) use 200mm wafers, driving demand for those tools in recent years. If available, used equipment can be an inexpensive starting point to fulfill the demand; however, some types of used equipment are in short supply.
- Experts predict demand for 200mm wafers will continue to rise amid the increasing fabrication of image sensors, analog products, microcontrollers, display drivers and other legacy items associated with the IoT.
- Equipment is subject to both technological obsolescence and cycles of the industry, with obsolescence varying by tool and technology.

The Expert: Paul Smith



Paul Smith specializes in the appraisal of high technology machinery and equipment and inventory for Gordon Brothers. His experience includes the valuation of equipment and inventory of manufacturers and resellers of computer memory, server and network equipment and solar power equipment. Read his full bio [here](#).



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