

Semiconductor Fact Sheet

In the microelectronics industry, a semiconductor fabrication plant (commonly called a fab; sometimes foundry) is a factory where devices such as integrated circuits are manufactured.

Overview of U.S. Production U.S.-headquartered semiconductor firms were responsible for the largest share (47%) of the \$412 billion global market in 2019, as measured by sales. Six of the 15 largest semiconductor firms worldwide are headquartered in the United States: Intel, Micron Technology, Broadcom, Qualcomm, Texas Instruments, and Nvidia, though not all have manufacturing in the U.S.

U.S.-headquartered semiconductor companies conduct more than half of their front-end wafer processing operations in the United States. Only six semiconductor companies currently manufacture 300mm silicon wafers at 20 fabs in the United States.

Semiconductor Fabrication Plants



Since 2015 large semiconductor companies have been looking to produce a minimum of 20,000+ wafers a month, which typically requires a medium-sized facility or “megafab” (around 5-7 million square feet). Though companies like Taiwan Semiconductor Manufacturing Co. (TSMC) are looking to build “gigafabs” to keep up with the demand in just the U.S.



Latest fabs announced in the U.S. range from **550,000 to 7 million square feet**.



Due to exponential demand, companies are looking to **expand at their current facility or buy hundreds of acres** with an eye toward future expansion (see examples).



The average cost to build a fab in the U.S. starts at **\$1 billion**, with an advanced chip fab costing as much as \$20 billion. Due to this high cost compared to other countries strong public-private partnership is essential to balance cost.



An existing semi-conductor eco-system is important, with many companies choosing to expand on or near an existing facility.



Project timeline is at least **20-24 months**.

Key Terms:

Feature size describes the size of the transistor gate length as measured in billionths of a meter, or nanometers (nm). Feature size is often referred to as the semiconductor technology node, which is used to identify the technology generation of a chip. Generally, the smaller the feature size, the more powerful the chip, as more transistors can be placed on the same size area.

Wafer size refers to the diameter of a wafer measured in millimeters (mm). The diameter of a wafer determines its surface area, which determines how many chips can be made on it. A larger wafer diameter allows more amortization of fixed costs, resulting in a lower cost per chip. Since 2002, the largest wafers in full production have been 300 millimeters in diameter, and most semiconductors are made at this wafer size.

Semiconductor Latest Project Examples

Project Silicon Silver, Samsung Looking to Expand

Project Description: Samsung Foundry has filed documents with authorities in Arizona, New York, and Texas seeking to build a leading-edge semiconductor manufacturing facility in the USA. The potential fab near Austin, Texas, is expected to cost over \$17 billion and create 1,800 jobs.

- If Samsung were to choose Austin, TX, it would be an expansion to their current facility.
- 7 million square feet of new space built on 180 acres.
- Timeline: Decision by Q2 of 2021 with the expectation for production to begin Q4 of 2023.
- Samsung is evaluating the locations using four criteria: access to talent, existing semiconductor manufacturing ecosystem, speed to market, and strong public-private partnership (incentives).



Cree to build \$1 billion silicon carbide wafer plant Marcy, N.Y.

Project Description: Cree Inc. plans to invest \$1 billion to build a computer chip factory in Marcy, NY, a project that is expected to create 615 jobs. The highly automated plant in Marcy will make wafers with silicon carbide technology at the Marcy site to help meet demand in the electric vehicle, 4G/5G mobile and industrial markets.



- 639,000 square feet fab on 56.25 acres at the northern end of the 398-acre site, which will leave room for two additional fabrication facilities.
- Timeline: Started construction Q1 of 2020 with production anticipated to begin 2022.
- New York state's economic development arm, Empire State Development, will provide a \$500 million grant toward the project.