Market Definitions and Methodology: Semiconductor Wafer Fab Equipment

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Initiatives: Technology Market Essentials

This document contains the segment methodology and definitions used in semiconductor wafer fab equipment forecasts and market share research.

What You Need to Know

This guide includes the market segmentation hierarchy and segment definitions used by our semiconductor wafer fab equipment analysts in preparing Gartner's Market Share and Forecast reports. Do note that our market share data is worldwide only, but we continue to forecast regional sales.

Introduction

The purpose of this guide is to enable readers of Gartner's semiconductor wafer fab equipment research to understand the segment definitions and segment hierarchy used in this research. These segments are used for our annual Market Share and quarterly Forecast publications.

Notable Changes

This update has minor changes to a few definitions to be current with existing forecast and market share segmentation.

Any modifications to our Market Share and Forecast segmentation and/or definitions are published as Update notes for the relevant Market Definitions and Methodology documents in the fourth quarter. Typically, these modifications are then applied in quarterly and annual Market Share publications, publishing in the second quarter, and subsequent forecast publications.

Market Methodology

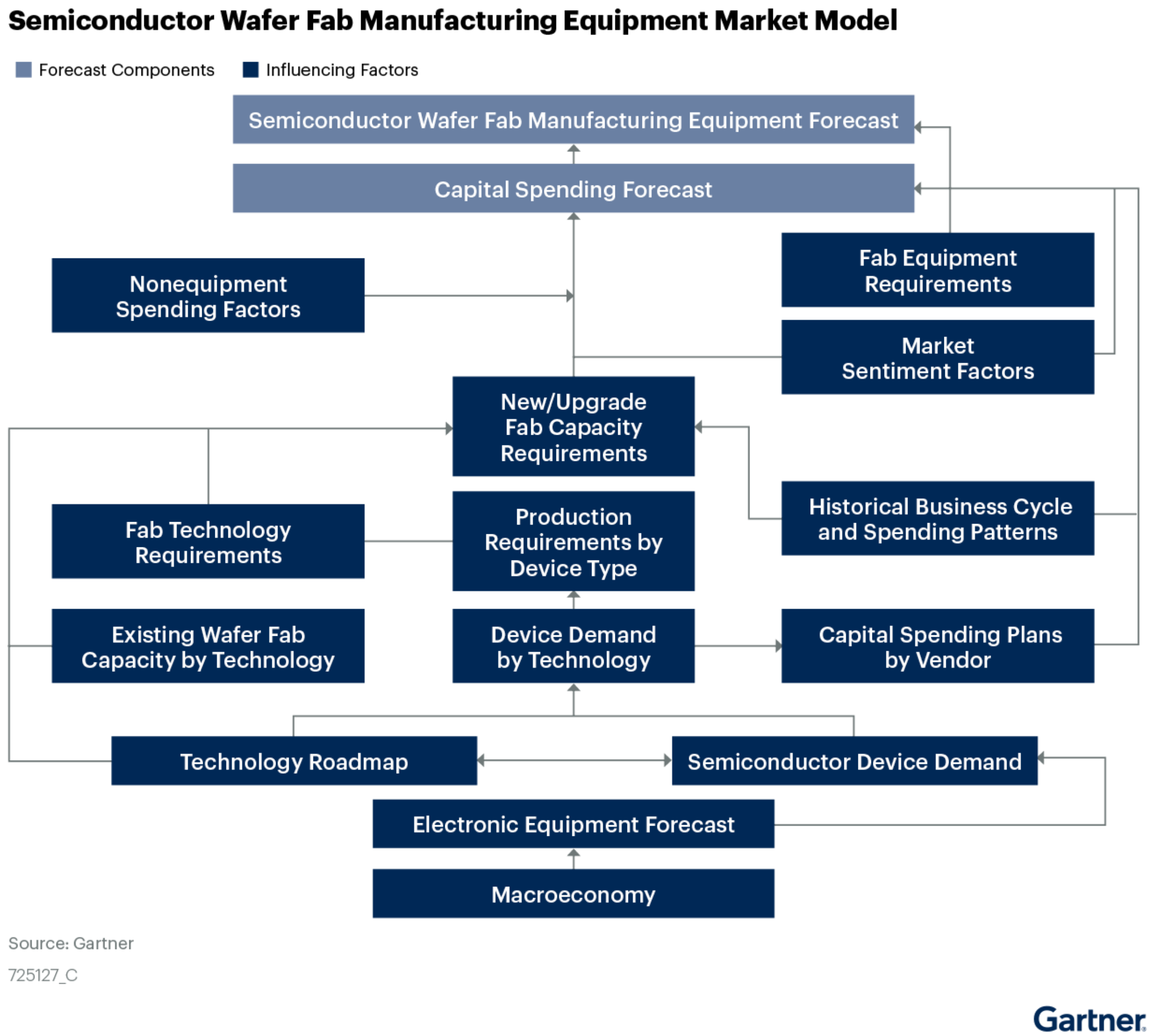
This document describes the methodology and segmentation applied to the semiconductor wafer fab equipment market. For Gartner's high-level Forecast and Market Share methodology, please refer to How Gartner Forecasts a Market and How Gartner Estimates Market Share.

For the Market Share and Forecast reports, only recognized revenue in millions of U.S. dollars is reported. For each company, the data reported is consistent with the revenue recognition policies used in the company's public financial reports. We do not attempt to reconcile different revenue recognition policies used by different companies.

Semiconductor Wafer Fab Equipment Forecast Methodology

Gartner's semiconductor wafer fab equipment methodology utilizes a top-down approach based on our forecasts of semiconductor capital spending. Our semiconductor capital spending forecast is derived from a combination of our semiconductor market forecasts, vendor capital spending plans, historical spending patterns and current market conditions. The capital spending forecast, combined with the differing equipment requirements of each major device technology, leads to the wafer fab equipment forecast. These factors are shown in Figure 1. Once each year, we use our market share process to finalize the actual spending for the prior year, and to use this as a starting point for future forecasts.

Figure 1: Semiconductor Wafer Fab Equipment Market Model



Market Share Methodology

Gartner's market statistics methodology combines primary and secondary sources to produce the market share statistics documents. We first identify major industry participants in the semiconductor equipment manufacturing industry worldwide with equipment revenue in excess of $50 million per year. We survey these participants for detailed revenue information about their calendar year equipment sales in each of the relevant product segments. This primary research is supplemented with additional research at a company level to verify market segment participation and revenue totals. Each survey response is compared with published financial data where available to ensure consistency with audited reports. In cases where a company does not respond to our survey, or is private, or otherwise does not publish financial data, we prepare an estimate of its market participation.

Final revenue numbers for each segment are created from the sum total of all survey responses and Gartner estimates at a company level.

Gartner market share includes the sale of both new and refurbished systems. It does not include revenue obtained from the sale of spare parts, upgrades or services.

Gartner believes that its market share statistics are the most accurate and meaningful available. Despite the care taken in gathering, analyzing and categorizing the data, careful attention must be paid to the definitions and assumptions, which are outlined below. Different companies and trade associations may use slightly different definitions of product categories and regional groupings, or they may include different companies in their summaries. These differences should be kept in mind when making comparisons between data and numbers provided by Gartner and those provided by other research organizations.

Vendor Revenue Profile

Gartner creates and maintains a high-level company model called a Vendor Revenue Profile for each of the vendors it covers in market share. Gartner Vendor Revenue Profiles represent Gartner's interpretation of a vendor's revenue mapped to Gartner's technology segmentation. The Vendor Revenue Profile provides a calendar year view of a vendor's merchant sales (that is, sales to external customers) across technology market segments. Technology segments featured in a Vendor Revenue Profile are not overlapping and are reconciled with the consolidated view of the vendor's public financial statements when available. Clients can access the online version of the Vendor Revenue Profiles on gartner.com.

Mergers and Acquisitions

In its vendor market share research, Gartner considers a merger/acquisition to have occurred on the first day of the quarter in which the deal was legally finalized. In the case in which all companies involved are already included separately in our market share databases, we report vendor market share for the original entities until the end of the quarter before the merger/acquisition is completed. We then report vendor units, revenue and market share for the new entity from the beginning of the quarter in which the deal is completed.

In the case in which a (typically larger) company that is in our market share database acquires another (typically smaller) company that is not in our market share database, we reflect the increased revenue for the acquiring company after the acquisition from the beginning of the quarter in which the transaction was finalized.

If, as part of a merger/acquisition, a vendor changes its name, the new name is applied both to the remaining entity and to the original entity historically in the market share database and related publications.

High-Level Definitions and Segmentation

Semiconductor Equipment Market Segmentation

Wafer Fab Equipment

Figures 2, 3 and 4 show the wafer fab equipment market segmentation.

Figure 2: Wafer Fab Equipment Market Segmentation, Part One

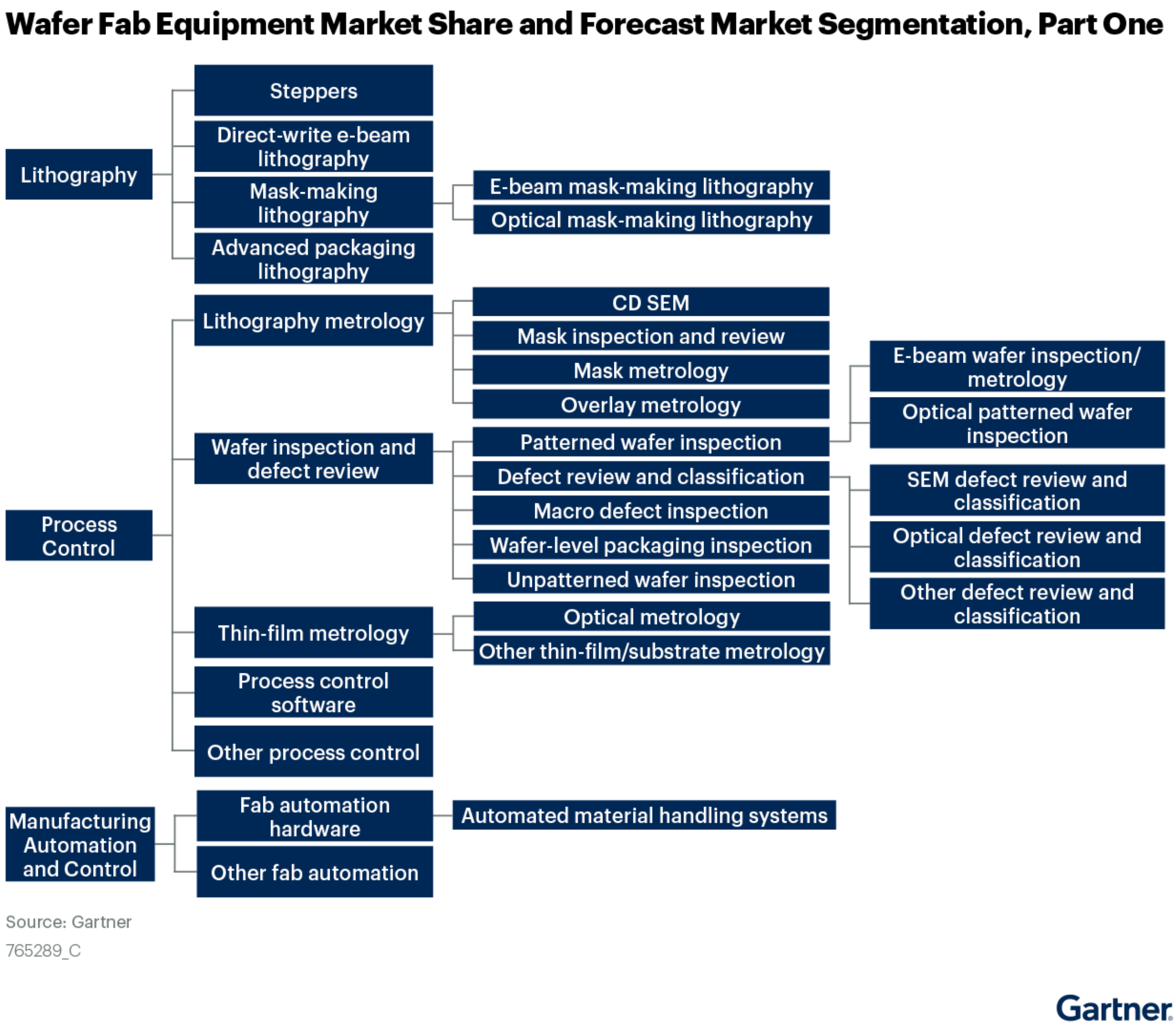
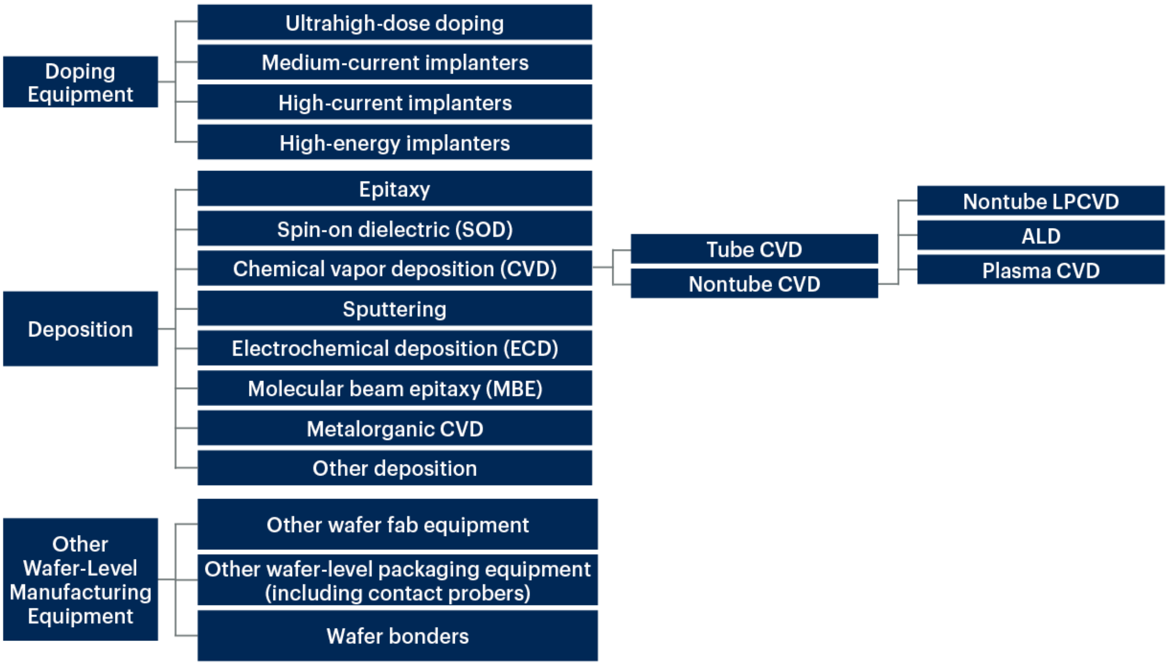


Figure 3: Wafer Fab Equipment Market Segmentation, Part Two

Wafer Fab Equipment Market Share and Forecast Market Segmentation, Part Two



Source: Gartner
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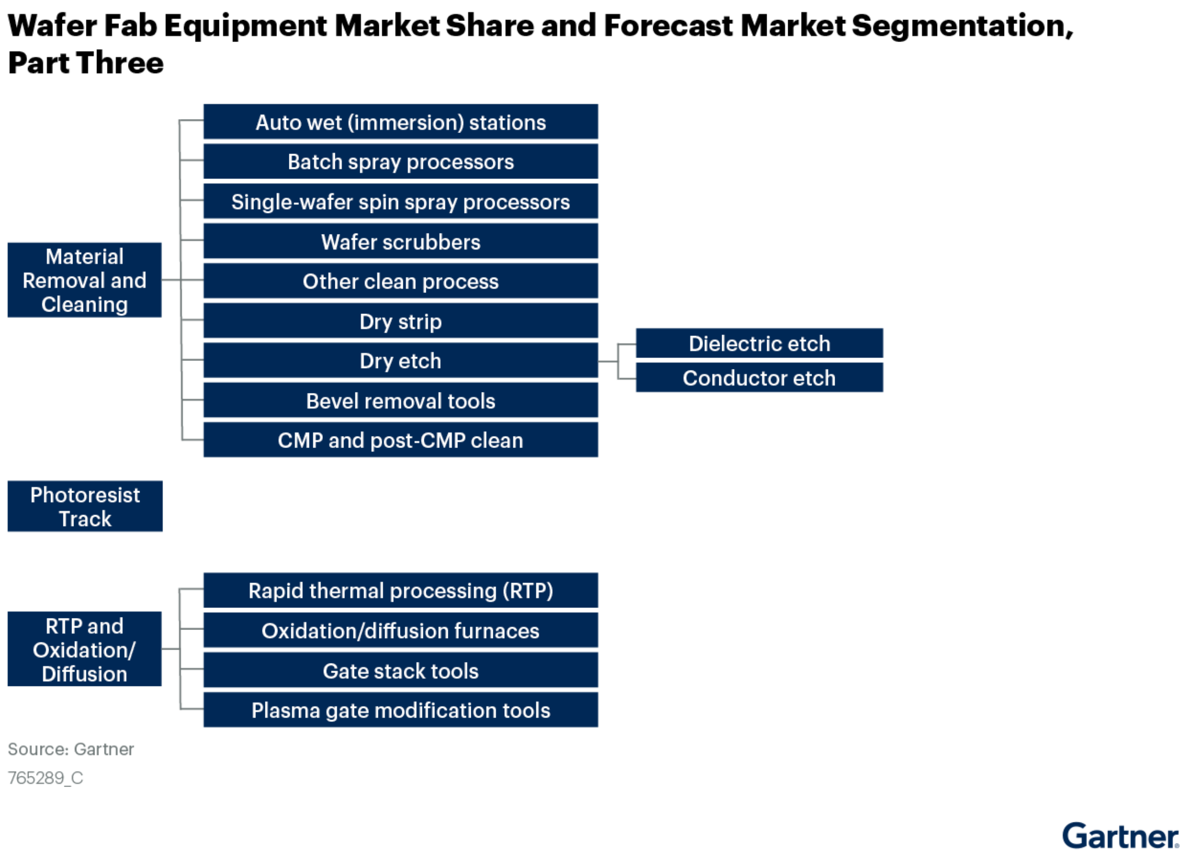
Figure 4: Wafer Fab Equipment Market Share and Forecast Market Segmentation, Part Three



Product Definitions

Wafer Fab Equipment

Wafer fab equipment is any type of semiconductor manufacturing equipment used to process wafers in an automated wafer fabrication facility. To be included in this category, all systems must be capable of accepting wafers in a standard front-opening unified pod (FOUP) for 300 mm wafers, or a standard cassette for 200 mm and smaller wafers.

Wafer fab equipment can be purchased as a stand-alone system by semiconductor manufacturers and installed by equipment vendors in semiconductor fabs. Wafer fab equipment is used in semiconductor fabs to manufacture semiconductors. Equipment intended for and used in a laboratory situation is not included in this definition. Examples of wafer fab equipment include the following:

- Lithography
- Photoresist processing (track)

- Doping equipment
- Rapid thermal processing (RTP) and oxidation/diffusion
- Deposition
- Material removal and cleaning
- Manufacturing automation and control
- Process control
- Other wafer-level manufacturing equipment

Lithography

Lithography is a type of equipment using lights, direct beams or other lithographic processes to pattern wafers in an automated wafer fabrication facility. The lithography equipment systems either transfer the desired patterns from a mask onto the wafer surface or directly write circuit patterns on the wafer surfaces. There are also lithography equipment systems utilized for mask making and advanced packaging.

Lithography equipment can be purchased as a stand-alone system for use by semiconductor manufacturers, mask manufacturers or assembly houses. Equipment intended for and used in a laboratory situation is not included in this definition. Examples of lithography systems include the following:

- Steppers
- Extreme ultraviolet (EUV) lithography
- Direct-write e-beam lithography
- Mask-making lithography
- E-beam mask-making lithography
- Optical mask-making lithography
- Advanced packaging lithography

Wafer lithography — Wafer lithography encompasses the lithographic processes used to pattern wafers.

Steppers — Steppers refer to an optical exposure system that projects reticle images onto the wafer, stepping to cover the wafer with the reticle image. Steppers are differentiated by the wavelength of their exposure source: g-line (436 nm), i-line (365 nm), 248 nm argon fluoride (ArF) deep ultraviolet (DUV), 193 nm krypton fluoride (KrF) DUV, 193 nm KrF immersion (KrFi) DUV, and 13.5 nm extreme ultraviolet (EUV). Steppers use an exposure approach that transfers reticle images by projecting the entire reticle onto the wafer. The wafer is subsequently stepped with respect to the reticle to cover the entire wafer with reticle images.

Direct-write e-beam lithography — Direct-write e-beam tools use an electron beam to transfer circuit patterns directly to wafer surfaces.

Mask-making lithography — Mask-making lithography encompasses the lithographic processes used to pattern photomasks.

E-beam mask-making lithography — E-beam mask-making equipment uses an electron beam to transfer desired circuit patterns to a photoresist-coated photoblank.

Optical mask-making lithography — Optical mask-making equipment uses a laser to transfer desired circuit patterns to a photoresist-coated photoblank.

Advanced packaging lithography — This category includes equipment used to pattern wafers as part of the semiconductor wafer-level packaging process which typically begins after the wafer has completed the wafer probe.

Photoresist Track

Photoresist track is a type of equipment used to coat, bake and develop photoresist material on wafer surfaces. This type of equipment is a series of process modules to implement sequential processes on wafers automatically. These sequential processes mainly include photoresist coating, baking and developing.

Photoresist track equipment can be purchased as a stand-alone system for use by semiconductor manufacturers or assembly houses. Equipment intended for and used in a laboratory situation is not included in this definition.

Photoresist track equipment — This equipment is used to coat, bake and develop photoresist material on wafer surfaces.

Doping Equipment

Doping equipment is a type of equipment using ion implantation to introduce doping chemicals to modify the properties of the wafer. This type of equipment uses an ion implantation process in which impurities are introduced into wafer substrates by means of ion bombardment to achieve desired electrical properties in defined areas of a wafer. Ion implantation tools are differentiated by the ion energies they can generate and the ion doses they can deliver.

Doping equipment can be purchased as a stand-alone system for use by semiconductor manufacturers. Equipment intended for and used in a laboratory situation is not included in this definition. Examples of doping equipment could include:

- Medium-current implanters
- High-current implanters
- High-energy implanters
- Ultrahigh-dose doping equipment

Ultrahigh-dose doping — These tools are designed for ultrahigh-dose applications. These include nonbeamline tools, such as plasma doping (PLAD). Doses begin at 1 E16 ions per square centimeter (cm^2) and higher.

Medium-current implanters — Medium-current implanters are ion implant tools capable of generating singly charged ion energies of less than 750 kiloelectron volts (keV) and delivering implant doses less than or equal to 1 E14 ions per cm^2.

High-current implanters — High-current implanters are ion implant tools capable of generating singly charged ion energies of less than 200keV and delivering implant doses greater than 1 E14 ions per cm^2 but typically between 1 E14 ions and 1 E18 ions per cm^2.

High-energy implanters — High-energy implanters are ion implant tools capable of generating singly charged ion energies greater than 500keV and double-charge ion energies of 4.0 megaelectron volt (MeV) and delivering implant doses less than or equal to 1 E15 ions per cm^2.

Rapid Thermal Processing (RTP) and Oxidation/Diffusion

Rapid thermal processing (RTP) and oxidation/diffusion is a type of equipment used to perform a variety of processes that modify wafer substrates and thin films. These processes include oxidation, diffusion and silicidation, among others. Wafer substrates and thin films are normally exposed to high-temperature environments in RTP tools and oxidation/diffusion furnaces, to get the desired modification.

RTP and oxidation/diffusion equipment can be purchased as a stand-alone system for use by semiconductor manufacturers. Equipment intended for and used in a laboratory situation is not included in this definition. Examples of RTP and oxidation/diffusion equipment could include:

- RTP
- Oxidation/diffusion furnaces
- Gate stack tools
- Plasma gate modification tools

RTP — RTP tools are used to perform modifying thermal processes over short periods. The equipment accomplishes this by exposing wafers to rapid, but tightly controlled, changes in temperature and environment. RTP tools generally process single wafers or small batches of wafers at a time.

Oxidation/diffusion furnaces — Oxidation/diffusion furnaces are also used to perform various thermal processes. Although processing times are typically longer than for RTP tools, furnaces can process much-larger batches of wafers.

Gate stack tools — These tools perform the gate deposition in situ. Tools include preclean dielectric deposition and gate material deposition, both with anneals.

Plasma gate modification tools — These tools use plasma and ions to modify the surface of the transistor and other areas. This group includes tools that are used for nitridation and oxidation.

Deposition

Deposition equipment is a type of equipment using various processes to deposit a blanket of materials on the surface of wafers. Deposition tools create layers of materials mainly including dielectric and metal, which are widely used in semiconductor device fabrication and advanced packaging.

Deposition equipment can be purchased as a stand-alone system for use by semiconductor manufacturers or assembly houses. Equipment intended for and used in a laboratory situation is not included in this definition. Examples of deposition equipment could include:

- Chemical vapor deposition (CVD)
- Metalorganic CVD
- Epitaxy
- Sputtering
- Electrochemical deposition (ECD)
- Molecular beam epitaxy (MBE)

Epitaxy — Silicon epitaxy is a process for depositing single-crystal silicon on wafer substrates by decomposing silicon precursor gases — such as silane, silicon tetrachloride or dichlorosilane — on the substrate. A dopant precursor gas, such as diborane or phosphine, is frequently mixed with the silicon precursor gas used in the epitaxy process to produce single-crystal silicon with specific electrical properties.

SOD — Spin-on dielectric (SOD) is a process for depositing dielectric thin films on wafer surfaces by spin-coating the material in liquid form, and then thermally treating the wafer to cure the film. Typically, but not necessarily, the thermal treatment is done within the deposition tool.

CVD — Chemical vapor deposition (CVD) is a process for depositing a variety of thin films on wafers that function as dielectrics, conductors or semiconductors. In CVD, the constituents in the vapor phase react chemically, with the aid of either elevated temperatures or plasma, on the wafer surface to deposit the solid film. Gaseous byproducts of the reaction are removed (pumped away) from the chamber.

Tube CVD — Tube CVD tools perform CVD processes in which wafers are heated and processed in batches in a tube furnace (an isothermal reactor). This category includes batch ALD.

Nontube CVD — Nontube CVD tools perform CVD processes in which wafers are heated and processed individually or in small groups within a nonisothermal reactor.

Nontube LPCVD — Nontube low-pressure chemical vapor deposition (LPCVD) tools perform a CVD process in which the reaction and deposition occur at an elevated temperature and low pressure. Tools include tungsten deposition and tantalum nitride processes.

ALD — Atomic layer deposition (ALD) refers to tools that are capable of depositing one layer at a time. By definition, it includes plasma-assisted systems. Tools can be single-wafer or multiwafer, but tools that are 25 wafers or larger are considered batch ALD.

Plasma CVD — This category consists of the merged categories of low-density and high-density plasma CVD tools used in the wafer fabrication process. Low-density plasma CVD tools perform the CVD process using a low-density plasma at reduced pressure and elevated temperature. High-density plasma CVD tools perform the CVD process using a high-density plasma at reduced pressure and elevated temperature.

Sputtering — Sputtering is a method of depositing a thin film of material, usually metal, on wafer surfaces. A given material (target) is bombarded with ions generated in a radio frequency (RF) plasma in high vacuum. The ions dislodge atoms from the target material, which in turn deposit themselves on the wafer surface.

ECD — Electrochemical deposition (ECD) is a plating process for depositing metallic thin films on wafer surfaces.

Other deposition — This category includes all deposition-processing equipment not explicitly classified previously. Examples include metalorganic CVD, molecular beam epitaxy and evaporation.

Molecular beam epitaxy (MBE) — MBE is a process in which a thin single crystal layer is deposited on a single crystal substrate using atomic or molecular beams contained in an ultrahigh-vacuum chamber.

Metalorganic CVD — MOCVD equipment is a CVD process for growing crystalline layers to create complex semiconductor multilayer structures.

Material Removal and Cleaning

Material removal and cleaning equipment is a type of equipment using plasma, chemicals or other processes to remove unwanted materials on the surface of wafers. This type of tools uses wet or dry processes to physically or chemically (or combined) remove resist, contamination or other unwanted material, to achieve the purpose of cleaning or forming patterns. The material removal could be selective or conformal.

Material removal and cleaning equipment can be purchased as a stand-alone system for use by semiconductor manufacturers or assembly houses. Equipment intended for and used in a laboratory situation is not included in this definition. Examples of material removal and cleaning equipment could include:

- Automated wet (immersion) stations
- Wafer cleaning spray processors
- Dry strip
- Dry etch
- CMP and post-CMP clean

Automated wet (immersion) stations — Automated wet (immersion) stations are automated cleaning equipment in which individual wafers or batches of wafers are automatically transported through the equipment to undergo various immersion types of wet and cleaning steps.

Batch spray processors — Batch spray processors are stand-alone equipment (manual or automated) that uses nozzles inside a chamber to spray liquid cleaning/etching chemicals over a carrier of wafers. This is a cleaning/etching application on the wafer surface and does not include chemical reprocessors that reclaim spent chemicals from the manufacturing process.

Single-wafer spin spray processors — This stand-alone equipment (manual or automated) uses nozzles inside a chamber to spray or dispense liquid cleaning/etching chemicals over a single wafer for the purpose of cleaning/etching residues and/or films on the wafer.

Wafer scrubbers — This system uses mechanical force, such as brushes or high-pressure spray with dilute chemicals or water, to remove particles from the wafer surface.

Other clean process — Other clean process equipment includes all cleaning process equipment not explicitly categorized. The category includes all stand-alone processing equipment used for cleaning wafers. Examples include manual wet benches, rinsers/dryers, megasonic cleaners and scrubbers.

Dry strip — Dry strip is a process that removes material (usually photoresist) from a wafer's surface after etching using an oxygen or ozone plasma. Traditionally, dry strip has referred to the removal of photoresist from wafers after etching, but the term also refers to the use of plasma to remove other materials, such as oxide, from the wafer.

Dry etch — Dry etch is a process that selectively removes unwanted material from a wafer's surface by means of low- or high-density plasma as the primary etch medium. Dry etch includes plasma etching (barrel and planer), reactive ion etch (RIE) and sputter etching.

Dielectric etch — These etch tools are used exclusively to etch dielectric films. The tools include silicon dioxide, silicon nitride, high-k dielectrics and low-k dielectrics.

Conductor etch — This category is the merged segment of silicon etch and metal etch tools used in the wafer fabrication process.

Bevel removal tools — This category refers to systems that remove the outer 3 to 6 mm of material from a wafer that builds up during deposition processes. Such tools can use plasma or wet chemistry.

CMP and post-CMP clean — CMP/post-CMP clean is a two-step process in which unwanted dielectric or metal material is removed from a processed wafer's surface to make the surface as planar as possible (dielectric surfaces) or to create inlaid patterned structures (metal surfaces). CMP is accomplished by polishing the surface with an abrasive material in conjunction with chemically active liquid slurry to remove the material. Completed wafers are then cleaned to remove all chemical and particle residue from the wafer. The process is carried out by a single integrated tool that performs both the polishing and cleaning steps in situ.

Manufacturing Automation and Control

Manufacturing automation and control equipment is a type of equipment that enables semiconductor fab automation. This type of equipment includes a variety of hardware and control systems that physically transport wafers and reticles through the manufacturing process, as well as fab automation software systems.

Manufacturing automation and control equipment can be purchased as a stand-alone system for use by semiconductor manufacturers or assembly houses. Equipment intended for and used in a laboratory situation is not included in this definition.

Fab automation hardware — Fab automation hardware encompasses a variety of hardware and control systems that physically transport wafers and reticles through the manufacturing process.

AMHS — Automated material handling systems (AMHSs) are responsible for the complete automated movement of wafers throughout the fab, including temporary storage of wafers waiting for equipment and the associated hardware needed for complete implementation.

Other fab automation — This category includes tool automation hardware and fab automation software systems.

Process Control

Process control equipment is a type of equipment used to monitor the production processes in semiconductor manufacturing. This type of equipment provides inspection and metrology for all types of patterns and features on the wafer, including thin film, critical dimensions, overlay, defects and so forth, during the various steps of processes in semiconductor manufacturing. Bare wafers, substrates and masks can also be inspected and measured by this type of equipment.

Process control equipment can be purchased as a stand-alone system for use by semiconductor manufacturers or assembly houses. Equipment intended for and used in a laboratory situation is not included in this definition. Examples of process control equipment could include:

- Lithography metrology
- Thin film metrology
- Wafer inspection and defect review

Lithography metrology — Lithography metrology refers to tools used to measure key process parameters of the lithography process. These include critical dimensions (CDs) of features on a wafer, overlay or registration of circuit layers, and mask characterization and inspection.

CD SEM — The CDs of a semiconductor device are circuit lines, elements or features that must be manufactured and controlled to tight specifications. CD scanning electron microscope (SEM) tools verify the various CDs of semiconductor devices.

Mask inspection and review — This category groups together the variety of tools used for mask defect and particle inspection and mask pattern defect review. Like their counterparts in the wafer inspection category, the tools in this group are variously dedicated to mask defect inspection and particle inspection.

Mask metrology — This category groups together the variety of tools used for mask metrology. Like their counterparts in the wafer metrology category, this group encompasses tools variously dedicated to mask overlay and CD metrology. Mask CD metrology includes both optical- and SEM-based systems.

Overlay metrology — Overlay metrology equipment is used to measure wafers after lithographic exposure to check for layer-to-layer overlay. The measurements taken by these optical tools are nondestructive to the processed wafer.

Wafer inspection and defect review — This segment encompasses a group of tools used to detect, observe and classify process defects in wafers during the fabrication process. The tools are used to identify defect type, location, size and severity. The category includes tools used to review patterned and processed wafers, as well as bare or unpatterned wafers.

Patterned wafer inspection — Patterned wafer inspection tools are automated equipment used to detect defects or particle contaminants in patterned (processed) wafers. This category includes defect detection tools using both optical and e-beam technologies. In some cases, individual tools are capable of inspecting both patterned and unpatterned wafers; such systems are classified as patterned wafer inspection tools because this represents a more complex technology.

E-beam wafer inspection/metrology — This segment includes patterned wafer inspection tools using electron beam techniques to detect defects and perform measurements on SEM generated images. E-beam tools can resolve significantly smaller features than optical inspection tools, but they are significantly slower than optical tools and are typically used during initial mask qualification. Recently, however, these tools are used to generate metrology data for applications such as line edge roughness, overlay, feature slope, etc.

Optical patterned wafer inspection — This segment includes all inspection tools using optical means to detect defects on patterned wafers. It includes both bright-field and dark-field inspection systems.

Defect review and classification — Defect review and classification systems are used to identify and classify defects and contaminants in patterned wafers. This category includes automatic defect review and automatic defect classification (ADC) equipment. This category includes both optical- and SEM-based systems. These tools typically feature automated interfaces with wafer inspection tools and can find and analyze defects detected by the inspection systems.

SEM defect review and classification — This segment includes SEM-based tools that automatically identify and classify defects found on wafer inspection tools.

Optical defect review and classification — These tools use traditional microscope-based optics to analyze and classify defects.

Other defect review and classification — This segment includes defect review and classification tools not included in the other segments. It includes dual-beam tools, which use both an SEM and a focused ion beam (FIB) for additional analysis capabilities. In these tools, the FIB capabilities are frequently used to cut away part of the wafer, thereby enabling the analysis of buried defects.

Macro defect inspection — Macro inspection tools are designed to detect large defects, ranging from tens of microns up to wide-area defects that cover a significant fraction of the wafer surface. These defects may not be easily detected by patterned wafer inspection tools, which look for submicron defects.

Wafer-level packaging inspection — These tools are similar to macro defect inspection tools but are specifically designed for process steps occurring in wafer-level packaging, like bump inspection.

Unpatterned wafer inspection — Auto unpatterned wafer inspection tools are automated measurement equipment used to locate defects and contaminants in bare (unprocessed) wafers, or after a blanket deposition or CMP step on a wafer where a pattern is not visible.

Thin-film metrology — This category refers to a broad range of tools that measure specific characteristics of the thin films used to manufacture semiconductors. Typical measurements include electrical characteristics of the film, film thickness, or critical dimensions on the wafer.

Optical metrology — Optical metrology tools encompass a wide range of measurement tools that use optical means to measure the characteristics of various films and processes used to manufacture semiconductors. Typical parameters measured by these tools include the composition, thickness and quality of transparent thin films deposited on wafers. These tools are also used to measure CDs in lithography and etch process steps, referred to as optical CD or “OCD” applications. All these tools use similar technology for a wide range of metrology needs that occur throughout the whole range of wafer processing. A recent development has been the addition of nonoptical measurement capabilities, such as X-ray, to some optical metrology tools. Since the primary function of these new tools is still mainly optical, they will continue to be included in the optical metrology category.

Other thin-film/substrate metrology — This segment includes a wide variety of metrology tools that are used to characterize thin films (metallic or nonmetal) not captured under “nonmetal thin-film metrology,” such as optical-based metal thin-film measurement tools, stress measurement, resistivity measurement and implant dose measurement.

Process control software — This category incorporates all segments of software that collects, stores, organizes and analyzes data from process control tools and the processing equipment that is being monitored. This includes what was traditionally called “yield management software” and newer advanced process control (APC) systems and more-traditional parameter-monitoring functions. The main function of this software is to monitor, analyze, understand and help determine corrective action in fab processes; in essence, it is a set of software tools to make process control easier. For the purposes of market share data collection, this category is limited to software which is sold on a stand-alone basis and is not included in the purchase price of other tools.

Other process control — This category encompasses the broad array of other wafer process equipment not explicitly categorized. Included are the various thin-film metrology tools specifically excluded from the thin-film measurement category, as well as a wide variety of process-monitoring tools and analytical instrumentation for both wafers and photomasks; for instance, photomask repair tools. This is generally a highly fragmented equipment segment, with dozens of companies selling into many noncompetitive market niches.

Other Wafer-Level Manufacturing Equipment

Other wafer-level manufacturing equipment captures all other equipment types used for wafer-level semiconductor manufacturing not mentioned above. It includes wafer bonders and other equipment used in wafer-level packaging.

This type of equipment can be purchased as a stand-alone system for use by semiconductor manufacturers or assembly houses. Equipment intended for and used in a laboratory situation is not included in this definition.

Other wafer fab equipment — This category captures all other equipment types not specifically noted elsewhere.

Other wafer-level packaging equipment (including contact probers) — This category includes wafer-level packaging equipment not called out elsewhere and includes contact probers defined below.

Wafer bonders — Included in this category are permanent and temporary wafer-bonding tools. In these processes, a thermal compression bond is used to stack multiple wafers on each other.

Document Revision History

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Market Definitions and Methodology: Semiconductor Wafer Fab Equipment - 17 January 2017

Market Definitions and Methodology: Semiconductor Manufacturing Equipment - 12 January 2016

Market Definitions and Methodology: Semiconductor Manufacturing Equipment - 8 January 2015

Market Definitions and Methodology: Semiconductor Manufacturing Equipment - 14 January 2014

Market Definitions and Methodology: Semiconductor Manufacturing Equipment - 10 January 2013

Market Definitions and Methodology: Semiconductor Manufacturing Equipment - 18 January 2012

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Market Share: Semiconductor Wafer Fab Equipment, Worldwide, 2021

Market Share Analysis: Semiconductor Wafer Fab Equipment, Worldwide, 2021

Forecast: Semiconductor Capital Spending, Wafer Fab Equipment and Capacity, Worldwide, 1Q22 Update

How Gartner Estimates Market Share

How Gartner Forecasts a Market