

Photolithography machine optical module



Article Overview

The optical module in a photolithography machine projects and focuses light from a photomask onto a silicon wafer with nanometer-scale precision, enabling the creation of intricate semiconductor patterns.

Function of the Optical Module

The optical module is the core component of a photolithography system, responsible for transferring the pattern from a photomask (or reticle) onto a photosensitive layer on a silicon wafer. Light passes through or reflects off the photomask, and the optical system shrinks and focuses the image onto the wafer with extremely high precision, often down to a few nanometers. This process defines the layout of transistors, interconnects, and other microchip features.

Key Components

- **Projection Lenses:** High-precision lenses reduce the mask image and focus it onto the wafer. These lenses must minimize aberrations and maintain uniform illumination across the wafer.
- **Illumination System:** Provides uniform, high-intensity light, often in the ultraviolet (UV) or extreme ultraviolet (EUV) range. Shorter wavelengths allow finer feature resolution.
- **Mask Stage and Alignment:** Holds the photomask and ensures precise alignment with the wafer. The optical module works in conjunction with sensors to correct for distortions and maintain overlay accuracy.
- **Wafer Stage:** Moves the wafer in sub-nanometer increments to expose the entire surface, enabling step-and-repeat or scanning exposure methods

Article Content

Mar 02, 2026

Photolithography for Semiconductor

For periodic mask patterns, however, simple-form 3D optical disturbances can be obtained if the optical disturbance emerging from

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Photolithography | Stanford Nanofabrication Facility

Photolithography is the process used to transfer patterns of geometric shapes to a flat substrate. The substrates are first coated with

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Inside ASML, the company advanced chipmakers use for EUV

ASML is the only manufacturer of EUV lithography machines, which revolutionized semiconductors. Here's an inside

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Microsoft PowerPoint

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Measuring accuracy

Scanner metrology software uses computational models of machine processes in machines to predict and coordinate how the

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Programmable pupil correction method for photolithography illumination ...

The off-axis illumination (OAI) technology is one of the resolution enhancement technologies, and it used to reduce

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Lithography principles

A lithography (more formally known as "photolithography") system is essentially a projection system. Light is projected through a

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Photolithography in the overall process flow. This Intro to Photolithography module covers the basics of semiconductor

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Chapter 2 Optical Lithography

2.1 Introduction Since the planar processing for integrated circuit (IC) manufacturing started more than 60 years ago, optical

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The Development of Photolithographic Technology and Machines

Photolithography is the most complicated, accurate, expensive process in the manufacture of integrated circuits. The

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Lithography Equipment Selection Guide: Types, Features,

Lithography equipment used in micromachining can produce MEMS components for use in accelerometers and inkjet printers,

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Photolithography

Definition: Photolithography, also known as optical lithography, is a micro- and nanofabrication process widely used in semiconductor

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MicroWriter ML3 Pro | Durham Magneto Optics

MicroWriter ML3 Pro is our flagship machine within the MicroWriter ML family and is a compact, high-performance, direct-write

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Programmable pupil correction method for photolithography illumination ...

In order that the pupil characteristic parameters can always meet the requirements for a long time using, it is necessary

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Micro Optics for Photolithography

Photolithography became the key enabling technology of the new semiconductor industry. Both, the planar "wafer-based" process

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Mechanics & mechatronics

ASML's lithography machines feature some of the world's most advanced, precision-engineered mechanical and mechatronic systems.

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Lecture7-Optical Lithography

Lasers are used to increase resolution (near infinite source to mask spacing), and decrease the optical complexity for deep ultraviolet

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Optical Lithography and Technology | ZEISS SMT

ZEISS SMT is the global technology leader in the field of optical lithography, making it an enabler for the

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Photolithography, The Foundation of Modern Photolithography

Photolithography is a microfabrication technique that uses ultraviolet (UV) light to transfer a geometric pattern from a photomask onto

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Optical Lithography

Optical lithography is the mainstream patterning technology in today's fabs. A scanner makes use of an optical

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Target Audience This Intro to Photolithography module covers the basics of semiconductor photolithography process. NCGs (New

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Photolithography Process in Semiconductor Manufacturing (2026)

The photolithography process in semiconductor manufacturing isn't just about printing patterns, but about stacking

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An Introduction to Lithography Machine

As a fundamental equipment of integrated circuits manufacturing, the lithography machine has become a key research target for

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Power and Control Applications for Photolithography Machinery ...

Power and control are essential during the photolithography process to ensure precise and reliable operations of the machines.

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Lithography

It uses light to transfer a geometric pattern from a photomask (also called an optical mask) to a photosensitive (that is, light-sensitive)

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Optical lithography

The SPIE Digital Library offers a comprehensive collection of content on optical lithography, a critical technology in the

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Photolithography

Photolithography (also known as optical lithography) is a process that involves using light to transfer a

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Introduction to optical lithography

Optical lithography is also called photolithography or sometimes just lithography. Lithography refers to the process invented in 1796

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