SEMATECH and Synopsys to Develop Advanced OPC Models For 45 nm and Below Immersion Lithography

October 4 2005

Synopsys, Inc. and SEMATECH today announced a joint program to develop advanced optical proximity correction (OPC) models that will enable the extension of optical lithography.

A key goal of the program, part of SEMATECH's 193 nm Immersion Lithography Extendibility Project, is to facilitate better understanding of the challenges in process nodes beyond 45 nm so that participants can develop software and manufacturing processes that will meet these challenges. The program leverages Synopsys' industry-leading Proteus mask synthesis software.

The program's preliminary modeling results have been strong, indicating that immersion tools using a 1.3 numerical aperture (NA) can be image-corrected for use at the 45-nm half-pitch. The objective is to eventually enable the extension of immersion lithography to the 32 nm half-pitch, and extend models for optical tools with numerical aperture 1.55 and greater.

"Since advanced immersion tools are just now being developed, modeling is critical to determining how far we can go with immersion lithography. The Synopsys tools have proven useful in developing the OPC models that will allow us to push the immersion frontier," said Shane Palmer, SEMATECH senior technologist and Texas Instruments assignee. "SEMATECH's project is geared toward preparing tools for

the next generation of immersion scanner that will use higher index fluids, NA above 1.3 and full polarization control. The results will help SEMATECH member companies make informed decisions about appropriate imaging tools for advanced technology cycles."

In immersion lithography systems, the immersion liquid (such as pure water) is placed between an exposure tool's projection lens and a wafer, and the liquid's refractive properties are used to create higher resolution images than a "dry" lens system will allow. Immersion also allows a lens to be designed with an NA greater than 1, which permits even further resolution improvement. Accurate modeling of the optical distortions introduced by these "hyper-NA" projection systems is required in order to validate designs, perform OPC, and add reticle enhancement technologies (RET) that enable high yield in manufacturing.

Synopsys' Proteus software facilitates high-speed accurate modeling by enabling engineers to simulate electromagnetic diffraction and scattering through the photomask. The software also provides the flexibility for engineers to progress through the various modeling steps required for immersion lithography. The resulting silicon image helps process development engineers better understand the predictability and yield of their processes.

"Together, Synopsys and SEMATECH are addressing the escalating need for accurate, high-speed OPC modeling at the 45 nanometer node," said Anantha Sethuraman, vice president of DFM Solutions at Synopsys, Inc. "We expect this will be one of a number of collaborations in which Synopsys will link its comprehensive DFM software solution to technology-leading researchers like SEMATECH, to advance complex technology issues such as immersion lithography and help our customers achieve their production and yield goals at process nodes beyond 45 nanometers."

Source: SEMATECH

Citation: SEMATECH and Synopsys to Develop Advanced OPC Models For 45 nm and Below Immersion Lithography (2005, October 4) retrieved 1 May 2024 from https://phys.org/news/2005-10-sematech-synopsys-advanced-opc-nm.html