KLA-Tencor Introduces Comprehensive Reticle CD Control System For Sub-0.13-Micron Device Production And Development

Advanced reticle CD SEM with new SEM image analysis and automatic recipe generation capabilities expands KLA-Tencor’s Litho Process Module Control solution

SAN JOSE, Calif., Sept. 25, 2000—KLA-Tencor Corp. (Nasdaq: KLAC) today introduced its latest generation critical dimension scanning electron microscope (CD SEM) for advanced reticle measurement and control—the 8250-R. The 8250-R is based on KLA-Tencor’s 8200/8400-Series wafer CD SEMs and is the newest addition to its Litho Process Module Control (PMC) solution. Using the company’s proprietary CEq™ charge equalization technology, the 8250-R produces stable measurements and images on even the most challenging and advanced reticles needed for 0.13-micron device production and 0.10-micron device development. Along with a new recipe generation capability, SEMScript™, the 8250-R addresses complex reticle metrology requirements for sub-wavelength lithography.

KLA-Tencor today also introduced a new SEM image analysis module (SIAM) option for its Klarity ProDATA lithography data modeling and analysis software that enhances 8250-R functionality for both mask manufacturing operations and wafer fabs. Incorporating SIAM, the Klarity ProDATA software enables the 8250-R to compare and measure reticle features against the original reticle design data. This results in the greater range of analysis needed to optimize, monitor and control sub-0.13-micron pattern fidelity and critical dimensions (CDs).

For mask manufacturers and chipmakers alike, understanding and optimizing the lithography process is critical to successfully and rapidly introducing new technologies such as sub-wavelength lithography, where feature sizes printed onto the wafer are significantly smaller than the wavelength of light used. Reticles used in sub-wavelength lithography require extremely tight specifications for CD control and uniformity across the reticle to ensure variations on the reticle do not equate to defects on the wafer. This, in turn, is driving the need for more accurate CD SEM tools to measure, characterize and quantify the quality of reticles. KLA-Tencor’s 8250-R reticle CD SEM, combined with SIAM, provides the high-performance measurement capability needed for advanced reticle production and control, as well as for lithography management.

“Subtle differences in reticle structures, such as those used for optical proximity correction (OPC), are critical to the lithographic performance of the mask,” stated Dr. John Allgair, technical staff engineer for Motorola’s Advanced Process Research and Development Laboratory. “With the SEM image overlay and critical shape measurement capabilities of KLA-Tencor’s SIAM software, we can quickly quantify two-dimensional reticle and wafer effects using KLA-Tencor’s 8250-R CD SEM images to significantly reduce the time required for OPC process development.”

The 8250-R incorporates a new laser stage that provides a 25 percent improvement in throughput and measurement acquisition time compared with KLA-Tencor’s 8100-Series CD SEM. The laser stage is the same as that used on KLA-Tencor’s 8250 wafer CD SEM, enabling users to measure the exact same features at both the reticle and wafer level. For the wafer manufacturer, this capability allows the fab engineer to compare data obtained from the two tools and ensure the reticle design has been transferred properly onto the wafer—enabling tighter lithography process control and optimal device performance. KLA-Tencor’s CEq technology, incorporated in the 8250-R, alleviates automation and imaging difficulties for challenging substrates such as chrome on glass and molybdenum silicide reticles. The combination of CEq and the precise e-beam column provides a measurement precision of better than 2 nm.

“As fabs move to lower levels of sub-wavelength lithography to produce advanced semiconductors, and the complexity and critical nature of leading-edge reticles increases, more attention is being given to providing reticle total quality management (TQM),” stated Scott Ashkenaz, vice president of strategic marketing for KLA-Tencor’s Lithography Module Solutions Group. “The 8250-R’s connectivity to our newly introduced TeraScan™ 570 DUV reticle inspection system enables the review and measurement of defects captured during inspection. In addition, by combining the 8250-R and Klarity ProDATA with SIAM, we are offering our customers a comprehensive reticle metrology analysis solution that facilitates effective and cost-efficient reticle TQM. For foundries, in particular, this combination can increase productivity, while helping to keep the process window at its maximum.”

While the lithography process window continues to tighten, it becomes increasingly important to precisely quantify the
contribution of the reticle to the total process window. KLA-Tencor’s new SIAM feature takes two-dimensional measurements of reticle feature shapes and provides the ability to compare and measure the feature shapes against both the original design data and the resist pattern on the wafer in the fab, following the lithographic process. SIAM accomplishes this by importing high-quality, charge-free images captured by the 8250-R as well as the appropriate design data. This capability allows the mask manufacturer to extend process control beyond CDs to enable users to quantify shape errors on the reticle, which is critical at 0.13-micron design rules and below.

“SIAM enables the mask manufacturer to help the wafer lithography engineer better understand pattern inputs, shorten the time for lithography process development and better assess the impact of the reticle on the wafer,” added Ashkenaz. “This can accelerate the cycle of optically extended lithography development and can ensure minimum negative impact from production reticles.”

The 8250-R is also available with SEMScript, a new recipe-generation tool that automates and simplifies recipe creation for advanced reticles. SEMScript works with CATS™ data and image files to allow design or mask layout engineers to specify measurement control locations in the design data and pass this information to the SEM measurement recipe. This significantly shortens the time required to prepare and measure the reticle. CATS software is provided by Transcription Enterprises (TEI), a wholly owned subsidiary of Numerical Technologies.

“We are very excited about supporting the new SEMScript capability for KLA-Tencor’s 8250-R CD SEM,” stated Tom Rosa, director of field applications for TEI. “As reticle technology extends down into sub-wavelength specifications, advanced metrology tools will be needed to adequately assure mask quality. TEI’s metrology marking option, partnered with the 8250-R CD SEM, the most advanced reticle metrology tool available today, makes a formidable combination that can address future reticle metrology requirements.”

Production shipments of the 8250-R reticle CD SEM will be available beginning in December 2000. Klarity ProDATA with SIAM and SEMScript are both currently available.