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Breakthrough KLA-Tencor Technology Enables Advanced Mask Inspection by Separating Printable Defects

SAN JOSE, Calif.--(BUSINESS WIRE)--

KLA-Tencor (NASDAQ:KLAC) today introduced its latest mask inspection technology, called Wafer Plane Inspection (WPI), a unique mask inspection technology that, for the first time in the industry, provides the versatility in a single system to find all defects on a mask and also shows the defects that will print on the wafer. Besides overcoming yield-critical 32nm mask defect challenges, WPI also operates up to 40% faster than previous inspection systems, potentially reducing the percentage of total mask manufacturing time devoted to inspection.

"32nm-generation mask inspection increasingly requires multiple inspection modes to identify all defects," noted Harold Lehon, vice president and general manager of KLA-Tencor's Reticle and Photomask Inspection Division. "With the TeraScan HR and its WPI capability, maskmakers and chipmakers can now use their inspection system to find all defects of interest, and also accurately distinguish which mask defects are likely to transfer to the printed circuit on the wafer. Using the unique technology of the TeraScanHR, customers have a cost-effective, direct link between mask inspection and fab yield."

Using the industry-standard TeraScanHR mask inspection platform, advancements in software algorithm and image computing technologies allow users to access three distinct inspection planes - reticle, aerial and wafer. The algorithms responsible for WPI's unparalleled modeling capabilities also offer the unique ability to automatically increase the system's sensitivity in critical regions of the photomask where defects that can reduce chip yield are typically found. Testing performed at multiple customers' sites validates the ability of the system to use a larger and faster inspection pixel size in cases where the conventional mode would have required a smaller inspection pixel for the most advanced node in development, cutting mask inspection time by up to 40% for improved cost of ownership.

WPI has been shown to meet chipmakers' critical 32nm-generation defect sensitivity requirements and the WPI technology is undergoing advanced beta testing in conjunction with leading chipmakers in the US and Taiwan. WPI-equipped systems have been shipped to multiple customers.

About KLA-Tencor: KLA-Tencor is the world leader in yield management and process control solutions for semiconductor manufacturing and related industries. Headquartered in San Jose, California, the Company has sales and service offices around the world. An S&P 500 company, KLA-Tencor is traded on the NASDAQ Global Select Market under the symbol KLAC. Additional information about the Company is available at http://www.kla-tencor.com.

Wafer Plane Inspection - Technical Details

High-resolution reticle inspection can detect both yield-limiting mask defects as well as defects which are not immediately yield-limiting.

KLA-Tencor's WPI inspection technology combines the TeraScanHR system's ultra-high sensitivity image acquisition technology and powerful supercomputer with state-of-the-art computational lithography algorithms. This computation-intensive technology takes transmitted and reflected light pattern and defect information from the mask (called 'mask or reticle plane') to create a comprehensive, high-resolution model of the mask. Computational lithography techniques transform the mask pattern into a highly accurate model of the eventual printed image on the wafer (called 'wafer plane'). The success of WPI depends on its access to ultra-high-resolution transmitted and reflected light images from the TeraScanHR inspection system, along with a rigorous mathematical approach to reconstructing the actual mask pattern in its final form. Wafer Plane Inspection (WPI) technology also permits mask manufacturers to identify the lithographically-significant defects while ignoring other non-lithographically-significant defects.

1) Mask Pattern Recovery is the first step in the wafer plane inspection procedure. A new computational lithography algorithm converts the transmitted and reflected light images from the inspection system into a modeled representation of the actual mask pattern, including pattern defects on the mask. This critical first step requires the use of both transmitted and reflected light high resolution images for modeling an accurate mask pattern. The mask recovery is the most critical step, enabling WPI to generate its highly accurate results.

2) An intermediate step - Aerial Image Modeling - is performed using the recovered mask pattern, by creating a model of the imaging process of the 193nm scanner to generate an 'aerial' image of the mask as it appears in air. This unique modeling method provides a high degree of control and flexibility in the formation of the aerial image, including the ability to use both arbitrary source illumination profiles and actual measured scanner illumination profiles, instead of idealized profiles.

3) Wafer-plane Modeling and Defect Detection - The aerial image is translated into a resist or 'wafer' plane image by calculating where the resist is exposed. After the system creates full mask images, in the wafer plane or the resist plane, defect detection is calculated at the photoresist (wafer) plane, because only defect detection on the resist plane shows a linear relationship between the defect signal and the wafer CD error for all geometries. To accomplish this, a new algorithm converts the transmitted and reflected light images into an accurate representation of the mask as it appear at the wafer. Thus, a full process window inspection across a broad range of focus and exposure points requires only the single inspection scan.

Source: KLA-Tencor