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D2S AND NUFLARE PARTNER TO REDUCE WRITE TIMES FOR COMPLEX 22-NM PHOTOMASKS

D2S Option to NuFlare EBM-7000 System Enables Design for E-beam (DFEB) Mask Technology

SAN JOSE, Calif., March 1, 2011—Fellow eBeam Initiative members D2S™, an emerging supplier of computational design platforms, and NuFlare Technology, Inc., a world leader in electron beam mask writing systems, today announced a partnership to provide a D2S option for the NuFlare EBM-7000 mask writing system. A new interface developed between NuFlare and D2S enables the overlapping of shots that was previously not allowed in NuFlare machines. Further, NuFlare today announced that the EBM-7000 and its next-generation variable-shaped beam (VSB) systems will become field upgradable in the future with another new option to provide seven dose levels per VSB shape to utilize a wide variety of mask-process-correction (MPC) applications exploiting modulated doses.

Currently, NuFlare VSB systems do not control the dose on a per-VSB-shape basis. By combining the dose control option with the D2S option, the D2S design for e-beam (DFEB) mask technology can take advantage of per-shot dose control. With D2S DFEB mask technology, NuFlare's EBM-7000 and next-generation systems will be able to write complex mask patterns in acceptable write times—improving wafer yield while reducing the overall manufacturing cost of complex 22-nm photomasks. This partnership demonstrates the continued adoption and support for DFEB mask technology to further extend optical lithography to the 22-nm node.

Complex sub-resolution assist features (SRAFs) on photomasks aid in producing higher depth of focus, which is critical for wafer yield at the 22-nm node. Higher mask costs result from increased shot counts and limit the usage of complex SRAFs. D2S and NuFlare worked together to create a new interface and enhance the EBM-7000 and next-generation systems to accept overlapping shots. As a result, when using the D2S option, the NuFlare system's VSB-12 reader accepts overlapping shots.

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In addition to improved write times, the overlapping shot technique leads to better critical dimension uniformity on the mask, particularly for small SRAFs less than 80 nm in width, which in turn leads to better uniformity on the wafer, and can result in higher wafer yield.

Hirokazu Yamada, senior manager for strategic planning, Mask Lithography Division, NuFlare Technology, Inc., explained, “Our EBM-7000 system together with D2S DFEB mask technology enables our customers to reduce the shot count required to write complex masks and is particularly suitable for the 22-nm node. The ability to optimize the DFEB mask technology for the EBM-7000 and next-generation systems using overlapping shots will help broaden the adoption. We value our partnership with D2S as we continue to develop cost-effective solutions for the production of advanced optical photomasks.”

“D2S and NuFlare’s collaboration is critical for accelerating the adoption of DFEB mask technology for our customers,” stated Aki Fujimura, president and CEO of D2S and managing sponsor of the eBeam Initiative. “The validation of our DFEB mask capability for the EBM-7000 system means that most semiconductor companies worldwide will have the ability to evaluate new and improved paths to 22 nm using optical lithography. This is once again evidence of the need and potential for design-to-manufacturing collaboration.”

At the Alternative Lithographic Technologies III Conference during the 2011 SPIE Advanced Lithography Symposium, eBeam Initiative members NuFlare and D2S will present a paper titled “Model-based Mask Data Preparation and Impact on Resist Heating” during Session 8 on Wednesday, March 2. In addition, Aki Fujimura of D2S will deliver the keynote address “A Comparison of Maskless Technologies” during Session 1 on Tuesday, March 1. SPIE Advanced Lithography 2011 will be held February 27-March 3 at the San Jose Convention Center in San Jose, Calif.

About NuFlare Technology, Inc.

NuFlare Technology, Inc. is a supplier of mask writing systems, mask inspection systems, and epitaxial reactor systems. NuFlare has the world’s top market share in e-beam mask writing systems and is a technology leader in mask writing systems with its production, R&D and support sites in Japan, USA, Germany, Korea and Taiwan. In fiscal year 2009/2010, NuFlare Technology, Inc. generated consolidated revenues of over JPY 20 billion, and the company has over 400 employees. NuFlare Technology, Inc. is listed on the Osaka Securities Exchange (JASDAQ). For further information, see: www.nuflare.co.jp.

About D2S, Inc.

D2S is an emerging company providing a computational design platform to maximize existing e-beam technology to reduce mask costs for both low- and high-volume applications. D2S advanced design-for-e-beam (DFEB) mask solution reduces mask write times for high-volume designs with complex and circular features using existing e-beam mask writing equipment. D2S DFEB direct write solution virtually eliminates the costs of masks for low-volume applications and can speed time-to-market by shortening the design-to-lithography process flow. D2S is the managing sponsor of the eBeam Initiative. Headquartered in San Jose, Calif., the company was founded in 2007. For more information, see: www.design2silicon.com.

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