Agency Contact:
Angie Kellen
MCA
Tel: +1-650-968-8900, ext. 120
E-mail: akellen@mcapr.com

D2S AND JEOL PARTNER TO REDUCE WRITE TIMES FOR ADVANCED PHOTOMASK PRODUCTION

D2S to Provide Design for E-beam (DFEB) Mask Technology for JEOL's JBX-3200MV System

SAN JOSE, Calif., **April 13, 2010**—D2S™, an emerging design and software company, today announced a partnership with fellow eBeam Initiative member JEOL Ltd. to provide a new mask data preparation (MDP) infrastructure that is optimized for JEOL's new JBX-3200MV mask writing system. JEOL, a world leader in electron optical equipment and instrumentation, will use D2S' patent-pending, model-based MDP technology for both variable-shaped beam (VSB) lithography and the newly-announced circular aperture option for its JBX-3200MV tool. Together, JEOL's system hardware and D2S DFEB mask technology will enable the use of circular main features and curvilinear assist features on advanced photomasks—essentially extending the use of optical lithography for 22-nanometer-and-below integrated circuit (IC) processing.

As the semiconductor industry migrates to the 22-nm node, the depth of focus of the contacts and vias become a large issue. Curvilinear assist features on photomasks aid in producing higher depth of focus. In addition, circular main features as the contacts and vias, instead of squares, helps with critical dimension uniformity, another important manufacturability criterion. Traditionally, higher mask costs resulting from increased shot counts have prevented curvilinear assist features and circular main features. D2S DFEB mask technology enables the connection between manufacturing and design to provide a solution that leverages the rounding nature of e-beams to significantly reduce shot count and write times for curvilinear assist features. JEOL's JBX-3200MV writer is equipped with circular apertures to shoot circular e-beam shots of various sizes efficiently. Together, photomasks with circular main features and curvilinear assist features can be shot efficiently. This allows masks of reasonable cost and yield to produce the best yielding wafers for the 22-nm logic node.

General Manager of Advanced Technology Department at HOYA Corporation, H. Kinoshita, noted, "We have been using JEOL's new JBX-3200MV system at our facility and have experienced positive results. We feel this system can help remove the e-beam roadblock for 22-nanometer-and-below nodes. As a result, our partnership with JEOL provides us with a cost-effective solution that enables our product roadmap for advanced photomask production."

General Manager of Semiconductor Equipment Business Operations at JEOL, W. Wakamiya, explained, "Our new JBX-3200MV system is an example where together with D2S' model-based MDP technology, we were able to produce a mask writer that is particularly suitable for the 22-nm node where circular main features and curvilinear assist features will become increasingly desirable. We value our partnership with D2S as we continue to develop cost-effective solutions for the production of advanced optical photomasks."

"This announcement is an example of how a fruitful partnership between design and manufacturing can advance the state of the art for mask-writing technology," stated Aki Fujimura, president and CEO of D2S. "To break down the barrier to using circles, it required both manufacturing and design working together. We look forward to working with JEOL and all of our global partners to provide innovations that bridge the gap between design and manufacturing with e-beam technologies to enable cost-effective optical lithography at future nodes."

At Photomask Japan 2010, eBeam Initiative members JEOL and D2S will present a paper titled "Best Depth of Focus on 22-nm Logic Wafers with Less Shot Count" on April 15, during the Mask-related Lithography session from 10:30-10:50 a.m. In addition, Initiative members JEOL, Petersen Advanced Lithography and D2S will present a paper titled "Writing 'Wavy' Metal 1 Shapes on 22-nm Logic Wafers with Less Shot Count" on April 15, during the EDA, DFM and MDP session from 11:10-11:30 a.m. Photomask Japan 2010 will be held April 13-15 at Pacifico Yokohama in Yokohama, Japan. Both papers represent the first published examples of DFEB mask technology being successfully deployed on advanced photomasks in fewer shot counts and less write-time than traditional e-beam writing techniques. This demonstrates the ability of DFEB mask technology to help extend optical lithography to the 22-nm logic node in a practical manner.

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About JEOL Ltd.

JEOL is a world leader in electron optical equipment and instrumentation for high-end scientific and industrial research and development. Core product groups include electron microscopes (SEMs and TEMs), instruments for the semiconductor industry (electron beam lithography and a series of defect review and inspection tools), and analytical instruments including mass spectrometers, NMRs and ESRs. For more information about JEOL Ltd. or any JEOL products, visit www.jeol.com.

About D2S, Inc.

D2S is an emerging company providing semiconductor IP and software 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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