



Applied Materials' Innovative Pattern-Shaping Technology Reduces the Cost, Complexity and Environmental Impact of Advanced Chip Manufacturing

February 28, 2023

- *The new Centura® Sculpta® patterning system provides a simpler, faster and more cost-effective alternative to EUV double patterning*

SANTA CLARA, Calif., Feb. 28, 2023 (GLOBE NEWSWIRE) -- Applied Materials, Inc. today unveiled a breakthrough in patterning technology that allows chipmakers to create high-performance transistors and interconnect wiring with fewer EUV lithography steps, thereby lowering the cost, complexity and environmental impact of advanced chipmaking.

Customers increasingly use EUV double patterning to print chip features smaller than the resolution limits of EUV to optimize chip area and cost. Using EUV double patterning, chipmakers split a high-density pattern in half and produce two masks that adhere to the resolution limits of EUV. Both halves of the pattern are combined on intermediate patterning films and then etched into the wafer. While double patterning is effective at increasing feature density, it adds design and patterning complexity along with process steps that consume time, energy, materials and water – and increase the cost of wafer fabs and wafer production.

Introducing the Applied Materials Centura® Sculpta® Patterning System

To help chipmakers continue shrinking designs without the added cost, complexity, and energy and materials consumption of EUV double patterning, Applied Materials worked closely with leading customers to develop the [Centura Sculpta patterning system](#). Chipmakers can now print a single EUV pattern and then use the Sculpta system to elongate the shapes in any chosen direction to reduce the space between features and increase pattern density. Because the final pattern is created from a single mask, design cost and complexity are reduced, and the yield risk from double-patterning alignment errors is eliminated.

EUV double patterning requires a number of added manufacturing process steps that generally include CVD patterning film deposition, CMP cleaning, photoresist deposition and removal, EUV lithography, eBeam metrology, patterning film etching and wafer cleaning. For each EUV double patterning sequence it replaces, the Sculpta system can provide chipmakers with:

- Capital cost savings of approximately \$250 million per 100K wafer starts per month of production capacity
- Manufacturing cost savings of approximately \$50 per wafer
- Energy savings of more than 15 kwh per wafer
- Direct greenhouse gas emissions reduction of more than 0.35 kg of CO₂ equivalent per wafer
- Water savings of approximately 15 liters per wafer

"The new Sculpta system is a great example of how advances in materials engineering can complement EUV lithography to help chipmakers optimize chip area and cost while also tackling the growing economic and environmental challenges of advanced chipmaking," said Dr. Prabu Raja, Senior Vice President and General Manager of the Semiconductor Products Group at Applied Materials. "The Sculpta system's unique pattern-shaping technology combines Applied's deep expertise in ribbon-beam and materials removal technologies to create a breakthrough innovation for the patterning engineer's toolkit."

Customer and Industry Comments

"As Moore's Law drives us to ever-greater compute performance and density, pattern shaping is proving to be an important new technology that can help reduce manufacturing cost and process complexity, and conserve energy and resources," said Ryan Russell, corporate vice president for logic technology development at Intel Corp. "Having collaborated closely with Applied Materials in the optimization of Sculpta around our process architecture, Intel will be deploying pattern-shaping capabilities to help us deliver reduced design and manufacturing costs, process cycle times and environmental impact."

"Three critical issues must be considered when pushing the limits of patterning: tip-to-tip spacing, pattern bridge defects and line edge roughness," said Jong-Chul Park, Master of Foundry Etch Technology Team at Samsung Electronics. "As an early development partner on the innovative pattern-shaping technology, I believe Applied's Sculpta system is a fascinating breakthrough that addresses these patterning challenges and reduces manufacturing costs for chipmakers worldwide."

"Applied Materials' new Sculpta system is a revolution in patterning that brings an entirely new capability to chipmakers," said Dan Hutcheson, Vice Chair, TechInsights. "As the industry keeps pushing the limits of chip scaling, we need breakthroughs like Applied's pattern-shaping technology that can improve chip power, performance, area and cost while also reducing design cost, and energy and materials consumption. Sculpta is the most innovative new process step in wafer fabrication since the introduction of CMP."

The Sculpta system is receiving high interest from leading chipmakers and has been selected as a production tool of record for multiple steps in

high-volume logic manufacturing.

Additional information about Applied's Sculpta system will be discussed at the company's "[New Ways to Shrink: Advanced Patterning Products Launch](#)" event being held today.

Forward-Looking Statements

This press release contains forward-looking statements, including those regarding anticipated growth and trends in our businesses and markets, industry outlooks and demand drivers, technology transitions, our market share positions, our development of new products and technologies, our products' expected cost savings and environmental benefits, and other statements that are not historical facts. These statements and their underlying assumptions are subject to risks and uncertainties and are not guarantees of future performance.

Factors that could cause actual results to differ materially from those expressed or implied by such statements include, without limitation: the introduction of new and innovative technologies, and the timing of technology transitions; our ability to develop, deliver and support new products and technologies; market acceptance of existing and newly developed products; our ability to obtain and protect intellectual property rights in key technologies; the level of demand for our products, our ability to meet customer demand, and our suppliers' ability to meet our demand requirements; consumer demand for electronic products; the demand for semiconductors; customers' technology and capacity requirements; our ability to accurately forecast cost savings and environmental benefits from using our products; and other risks and uncertainties described in our SEC filings, including our recent Forms 10-Q and 8-K. All forward-looking statements are based on management's current estimates, projections and assumptions, and we assume no obligation to update them.

About Applied Materials

Applied Materials, Inc. (Nasdaq: AMAT) is the leader in materials engineering solutions used to produce virtually every new chip and advanced display in the world. Our expertise in modifying materials at atomic levels and on an industrial scale enables customers to transform possibilities into reality. At Applied Materials, our innovations make possible a better future. Learn more at www.appliedmaterials.com.

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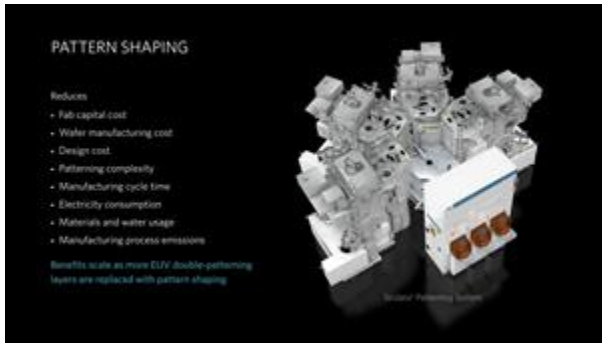


Applied Materials Centura® Sculpta® Patterning System



The new Centura® Sculpta® patterning system reduces EUV double-patterning steps to lower the cost, complexity and environmental impact of leading-edge chipmaking.

Pattern-shaping technology: a breakthrough innovation for the patterning engineer's toolkit.



Applied Materials' pattern-shaping technology brings an entirely new capability to chipmakers, enabling them to replace EUV double-patterning steps and reduce the cost, complexity and environmental impact of leading-edge chipmaking.

Source: Applied Materials, Inc.