NOVELLUS SYSTEMS ANNOUNCES JOINT DEVELOPMENT PROGRAM ON COPPER THROUGH-SILICON-VIA (TSV) FOR 3-D SEMICONDUCTOR INTEGRATION

3-Dimensional Chip Stack Technology Enables High Performance and Small Form Factor Devices for 32nm and Beyond

San Jose, California - March 17, 2010 - Novellus Systems (NASDAQ: NVLS) today announced the establishment of a joint development program (JDP) with the IBM Corporation (NYSE: IBM) to design a manufacturing-worthy, copper-based, three dimensional (3-D) semiconductor Through-Silicon Via (TSV) process using Novellus' SABRE copper electroplating and VECTOR plasma-enhanced chemical vapor deposition (PECVD) systems. The new process will enable the 3-D integration of multiple semiconductor chips in advanced product applications that require both small form factors and lower power consumption.

There is a strong motivation for the semiconductor industry to move to 3-D integration using the TSV approach. Stacking multiple chips together in a "sandwich-like" structure - and connecting all layers together with conductive copper vias - allows the final module to be smaller in size through an increase in volumetric circuit density. The short interconnect length between each chip increases device speed and consumes less power. The stacked chip structure also allows for a greater range of device-specific functions, including heterogeneous integration, to meet the needs of today's ever-shrinking electronic products such as cell phones, PDAs, and laptop computers. However, there are several key challenges associated with integrating TSVs into existing semiconductor manufacturing processes so that the new structure is both highly reliable and can be cost-effectively manufactured. One of the integration challenges is in reducing the excess deposition of copper or "overburden" while achieving void-free fill of the extremely deep, high aspect ratio structures, where the overburden thickness varies as a function of TSV geometry. Another integration challenge requires the ability to deposit lower temperature dielectric films during the TSV manufacturing sequence so that the wafer thermal budget limit is not exceeded.

Novellus has developed a unique, high performance SABRE Electrofill TSV process that uses patented hardware and chemistries to achieve void-free fill with minimal excess copper deposition. Copper overburden is reduced by 75 percent, allowing conventional chemical-mechanical polishing (CMP) to be used instead of custom polishing slurries. Additionally, SABRE's optimized TSV chemistries have faster plating times, resulting in higher throughputs. To address the requirement of lower temperature dielectrics, Novellus' VECTOR platform with its patented multi-station sequential deposition architecture (MSSD) enables the deposition of stable dielectric films at temperatures less than 200 degrees C with the breakdown voltage, leakage performance, and wafer-to-wafer repeatability required for reliable, high yielding TSVs. The SABRE and VECTOR applications simplify the TSV manufacturing process and enable cost effective, high performance 3-D chip integration for a broad range of applications. Novellus and IBM will work together to evaluate and further develop the Novellus processes in IBM's 3-D integration program.

"IBM has a long-standing relationship with Novellus Systems in the area of Back End of Line (BEOL) copper damascene manufacturing, dating back to the mid-1990s when the two companies developed the initial tool sets for high volume manufacturing," said Dr. Subramanian Iyer, distinguished engineer and chief technologist of IBM's Semiconductor Research and Development Center. "We look forward to working with Novellus again on this joint development project, and leveraging the company's core competencies in copper electroplating and dielectric deposition technologies to this new 3-D integration application."

"Novellus is excited about this latest opportunity to work with IBM to develop breakthrough process technologies for an emerging market," said Tim Archer, Novellus' executive vice president of sales, marketing, and customer satisfaction. "Our SABRE system offers compelling and cost-effective copper fill technology for through-silicon-via applications. Similarly, our VECTOR system's MSSD architecture enables the deposition of stable dielectric films at temperatures less than 200 degrees C - a unique requirement for these new 3-D applications."

About Novellus:
Novellus Systems, Inc. (NASDAQ: NVLS) is a leading provider of advanced process equipment for the global semiconductor industry. The company's SABRE Electrofill system, introduced originally in 1998, is the Process Tool of Record in 9 out of the Top 10 copper fabs in the world. The VECTOR PECVD system, introduced in 2000, features patented multi-station sequential deposition architecture for unmatched film uniformity and high system throughput. More than 1000 VECTORs have been sold globally for a variety of dielectric film applications.

An S&P 500 company, Novellus is headquartered in San Jose, Calif. with subsidiary offices across the globe. For more information, please visit http://novellus.com/technews.aspx

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