3D-IC Opens a New Era of IC Packaging and Testing

SEMI

Singapore – April 30, 2012 – In the process of 2.5D/3D-IC commercialization, many challenges must be overcome to help manufacturers achieve the anticipated yield rates. At a 2.5D/3D-IC forum organized by SEMI and IME at SEMICON Singapore 2012, featured speakers from leading companies — such as Aptina, ASE, Hitachi Chemical, Lam Research, Novellus, SEMATECH, Silecs International, SPTS, STATS ChipPAC, Tech Search International, Tezzaron Corporation and Xilinx — shared their viewpoints.

Moore’s law has reliably driven silicon scaling for several decades. As the semiconductor manufacturing world moves into the “More than Moore” 2.5D/3D space, more opportunities exist that further increase the functionality and performance of semiconductor ICs. Enabled by 2.5D and 3D IC technology, designers can now design and build high-performance and energy-efficient systems using heterogeneous technologies such as CMOS (including multiple logic, memory technology nodes), MEMS, Si Photonics, etc. According to Yole Développment, the shipment volume of 3D-IC wafers will reach 10 million units in 2012.

Dr. Ho-Ming Tong, general manager and chief R&D officer of ASE, noted: “Despite progress in 3D-IC development over the past years, challenges remain in the areas of cost control, design, mass production and testing in the lead-up to commercialization. Given the readiness of silicon interposer-based 2.5D-IC technology to move to the next stage, its deployment will expedite

migration from the 40-nm node to 28-nm. With computing and smart devices fueling growth of the market, commercialization of 2.5D and 3D-ICs may take place in 2013.”

"To address the challenges of taking 2.5D/3D systems to high-volume manufacturing, collaborative partnerships are very critical. IME has established strategic partnerships with leading players in the semiconductor ecosystem to co-develop cost effective 3D-IC integration and process technologies in Singapore," said Professor Dim-Lee Kwong, executive director of IME. “Our new 300mm advanced packaging facility will provide deeper and broader capabilities to our partners to overcome the challenges in 3D-IC.”

2.5D and 3D-IC: On the Way to HVM

A panel discussion about packaging services moderated by Jan Vardaman, president of TechSearch International, featured a lively discussion among a distinguished list of panel members:

- Mr. Sesh Ramaswami, managing director of Strategy, Applied Materials
- Dr. Itsuo Watanabe, executive officer, Hitachi Chemical Co., Ltd.
- Dr. Rajendra Phendse, vice president and chief marketing officer, STATS ChipPAC
- Mr. Robert Patti, CTO and VP of Design Engineering, Tezzaron Corporation
- Mr. Vincent Tong, senior VP, Xilinx

Panelists provided insight into key issues such as limiting 3D TSV HVM and the need for

standardization. Seth Ramaswami of Applied Materials outlined the clear need for the OSATs to be involved in setting the standards and issued a call for working with SEMI to help develop standards that will move the industry along. Issues with the supply chain emerged as a common theme. Xilinx is working with TSMC and OSATs and wants both models to be successful. Cost/yield is the biggest challenge. According to Robert Patti, “It’s complicated,” and standardization is needed, even in areas that people have not thought about yet, such as what is the center of the wafer? STATS ChipPAC sees the OSATS as the integrator that procures and manages inventory. The hand-off point needs to be clear. The end customer can help define who does what. Dr. Watanabe from Hitachi Chemicals described the issues facing material suppliers to gain insight from a single source on the needs for materials.

The panelists agreed that temporary bonding is an area that still requires work. The use of interposers (as a long-term solution or as a stepping stone) was discussed, with mixed responses. The potential for laminate substrates with fine feature sizes as a future alternative was raised as a possibility. Thermal issues and the needs for known good substrates and known good die were pointed out as areas for future work. The panel agreed that while progress has occurred, much work remains.

About SEMI

SEMI is the global industry association serving the nano- and microelectronics manufacturing supply chains. SEMI member companies are the engine of the future, enabling smarter, faster and more economical products that improve our lives. Since 1970, SEMI has been committed to helping members grow more profitably, create new markets and meet common industry challenges. SEMI maintains offices in Beijing, Bengaluru, Berlin, Brussels, Grenoble, Hsinchu, Moscow, San Jose, Seoul, Shanghai, Singapore, Tokyo, and Washington, D.C. For more information, visit www.semi.org [1]

About SEMICON Singapore

Singapore is a world-class electronics manufacturing hub with end-to-end R&D capabilities – which makes SEMICON Singapore the most important exposition for the semiconductor industry in Southeast Asia. The show connects the decision makers from the industry, demonstrates the most advanced products and brings in the most up-to-date market and technology trends, visit www.semiconsingapore.org [2]

About Institute of Microelectronics

The Institute of Microelectronics (IME) is a research institute of the Science and Engineering Research Council of the Agency for Science, Technology and Research (A*STAR). Positioned to bridge the R&D between academia and industry, IME's mission is to add value to Singapore's semiconductor industry by developing strategic competencies, innovative technologies and intellectual property, enabling enterprises to be technologically competitive, and cultivating a technology talent pool to inject new knowledge to the industry. Its key research areas are in integrated circuits design, advanced packaging, bioelectronics and medical devices, MEMS, nanoelectronics, and photonics. For more information, visit IME at http://www.ime.a-star.edu.sg.

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