

PRESS RELEASE

Total of 4 pages

A*STAR AND EDB LAUNCH 3-DIMENSIONAL THROUGH-SILICON VIA CONSORTIUM TO BOOST NEXT GENERATION WAFER MANUFACTURING CAPABILITY FOR SINGAPORE SEMICONDUCTOR INDUSTRY

Singapore, 8 September 2009 - The Institute of Microelectronics (IME), a research institute of the Agency for Science, Technology and Research (A*STAR), today announced the launch of a 3-Dimensional (3D) Through-Silicon Via (TSV) consortium to boost next generation 300mm wafer manufacturing capability for Singapore semiconductor industry to meet technology and product needs. The consortium is a national initiative and supported by the Singapore Economic Development Board (EDB) and A*STAR. IME is teaming up with A*STAR's Institute of High Performance Computing (IHPC) and Nanyang Technological University (NTU) in the consortium which consists of two phases with a duration of eighteen months for each phase. IME is leading Phase 1 of the consortium with participating companies that include Chartered Semiconductor Manufacturing Ltd. (Nasdaq: CHRT, SGX-ST: CHARTEREDSC), STATS ChipPAC Ltd. (SGX-ST: STATSchP) and United Test and Assembly Center Ltd. The consortium will also leverage on strategic materials and equipment suppliers for support in its endeavours.

For more than forty years, the semiconductor industry has relied on Moore's Law to steadily increase the number of transistors by shrinking its geometry thus allowing more functions to be designed in an integrated circuits (IC) chip. The demand for miniaturisation and greater functionality in electronic devices has driven transistor geometries so small, we are soon reaching the scaling limit for semiconductor process technology. To put in perspective, the size of the state-of-the-art transistor is in the order of 30 nanometres which is about 3000 times smaller than the diameter of a strand of human hair. An approach to circumvent the continued shrinking of planar ICs and scaling limitation by stacking of IC chips or packages vertically is known as 3-Dimensional (3D) IC integration. One of the enabling technologies for 3D IC integration is Through-Silicon Via (TSV). TSV is a vertical electrical connection that passes completely through a silicon wafer or chip to create 3D ICs or packages. The drivers for market adoption of 3D ICs are increased performance, reduced form factor and cost reduction.

The goal of Phase 1 is to establish TSV design and processes for 200mm and 300mm TSV wafers 3D IC assembly, and train a pool of skilled personnel in the semiconductor supply chain companies to support manufacturing of new products with 3D TSVs. Phase 2 will demonstrate the integration of fully functional mobile devices with TSV on a 300mm wafer process line.

Professor Dim-Lee Kwong, Executive Director of IME, said "The launch of this consortium is timely as the semiconductor industry is grappling to find solutions to extend the limit of transistor scaling beyond Moore's Law. TSV opens up new possibilities to add complex and multi-functional features to electronic devices by

allowing integrated circuits or packages to be stacked vertically. Over the last few years, IME has established deep competencies and process capabilities for TSV carriers. What is unique in this consortium is that we are able to gather key companies across the Singapore semiconductor supply chain to establish cost-effective TSV process integration and manufacturing capability on 300mm wafers to help accelerate the industry adoption of 3D ICs with TSV."

Dr. Raj Thampuran, Executive Director of IHPC, added "IHPC is delighted to be a part of this consortium. Modelling and simulation capabilities will certainly help to predict and optimise the performance in the complex design of the TSV carriers."

According to Professor Kam Chan Hin, Chair of School of Electrical and Electronic Engineering at NTU, "This consortium has also provided Nanyang Technological University a platform and new opportunity to work more closely with our partners to bring academic research to the industry."

Commenting on the value creation of R&D to industry, Professor Chong Tow Chong, Executive Director of A*STAR's Science and Engineering Research Council, added "One of A*STAR's objectives is to promote R&D in fields that add value and grow the Singapore's manufacturing industry. This consortium exemplifies how A*STAR research institutes work with companies and institutes of higher learning to identify and develop next-generation capabilities and technology to enhance the competitiveness of the semiconductor industry in Singapore."

Mr. Damian Chan, Director of Electronics Cluster at Singapore Economic Development Board, said "Our vibrant semiconductor ecosystem consisting of IC design, wafer fabrication, advanced assembly and test, and supported by a strong base of suppliers offers a "Plug and Play" environment. The concentrated ecosystem allows semiconductor companies to easily find their business partners while enjoying access to the international market." He added that "R&D is the key to strong growth in the future. This industry-public research collaboration is a unique opportunity for global players such as Chartered, STATS ChipPAC and UTAC to leverage on each other's unique expertise and co-develop this emerging technology to address the needs of the industry."

Below are comments from some of the consortium members on the impact of the 3D TSV consortium in addressing the needs of the Singapore semiconductor industry supply chain:

"Chartered understands that our customers need technology and solutions that address their requirements in performance, cost and scaling. The 3D TSV Consortium allows Chartered to focus on our core competency in TSV silicon integration while leveraging the expertise of our partners in material research, design, bonding, packaging and testing. The result is a proven 3D TSV infrastructure from design to tested package," said Dr. Liang-Choo "LC" Hsia, Senior Vice President of Technology Development at Chartered. "In joining the consortium, Chartered will be part of the significant 3D TSV Infrastructure value chain in Singapore."

"We believe the depth of expertise at IME and the consortium members, combined with the knowledge we have on driving integration technology and flexibility at the silicon level will provide important momentum in developing 3D TSV technology into high volume IC packaging solutions. Our involvement with the 3D TSV consortium will

complement the research and development activities we have been working on in advanced wafer integration technology," said Il Kwon Shim, Vice President, Technology Innovation of STATS ChipPAC Ltd.

"The new capabilities acquired from this strategic consortium will help UTAC increase our service offerings to our customers. The innovative capabilities and technologies will provide greater efficiencies in our delivery of customer focused solutions. UTAC believes in partnering our customers to provide leading edge semiconductor solutions through teamwork and enterprising spirit. We are committed to meet our customer's expectations by providing quality products and services through the creative involvement of our employees and a culture of continuous improvement to offer higher value added services to our customers," said Dr. Anthony Sun, Group Vice President of R&D of UTAC.

About the Agency for Science, Technology and Research (A*STAR)

The Agency for Science, Technology and Research (A*STAR) is the lead agency for fostering world-class scientific research and talent for a vibrant knowledge-based Singapore. A*STAR actively nurtures public sector research and development in Biomedical Sciences, and Physical Sciences and Engineering, and supports Singapore's key economic clusters by providing intellectual, human and industrial capital to our partners in industry and the healthcare sector. It oversees 23 research institutes, consortia and centres located in Biopolis and Fusionopolis, and the area in their vicinity, and supports extramural research in the universities, hospitals, research centres, and with other local and international partners. For more information about A*STAR, please visit www.a-star.edu.sg.

About the Institute of Microelectronics (IME)

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 on the Internet: <http://www.ime.a-star.edu.sg>.

About the Singapore Economic Development Board (EDB)

EDB is the lead government agency for planning and executing strategies to enhance Singapore's position as a global business centre and grow the Singapore economy. We dream, design and deliver solutions that create value for investors and companies in Singapore. In so doing, we generate economic opportunities and jobs for the people of Singapore; and help shape Singapore's economic future.

'Host to Home' articulates how EDB is sharpening its economic development strategies to position Singapore for the future. It is about extending Singapore's value proposition to businesses not just in helping them improve their bottom line, but also in helping them grow their top line. EDB plans to build on existing strengths and add new layers of capabilities to enable Singapore to become a 'Home for

Business', a 'Home for Innovation' and a 'Home for Talent'. For more information on how EDB can help your business, please visit www.sedb.com.

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