

**MEDIA RELEASE**  
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**A\*STAR'S IME ADVANCES 3D PACKAGING WITH CHIP-ON-WAFER BONDING TECHNOLOGIES**

*IME forms consortium to focus on developing new capabilities in bonding technologies to improve 3D chipsets to pave the way for higher-performance, slimmer and more cost-effective electronic devices*

**Singapore** - A\*STAR's Institute of Microelectronics (IME) has formed a Chip-on-Wafer (CoW) Consortium to enable semiconductor firms to develop commercially-viable capabilities for making 3D chipsets.

The consortium focuses on enhancing a Chip-on-Wafer bonding technique with the use of Copper-Copper (Cu-Cu) diffusion bonding technology.

The members of the new consortium are ON Semiconductor, KLA-Tencor, Panasonic Factory Solutions Asia Pacific (Panasonic), Singapore Epson Industrial Pte Ltd (Plating Division), Tera Probe, Inc, and Tokyo Electron Ltd.

With the rising demand for smaller IC packages with increased functionalities, there is a pressing need to advance bonding technologies used in making memory stacks and other heterogeneous integrated circuit integration.

Conventional Chip-on-Wafer bonding techniques used for making 3D chipsets rely on a solder-assisted thermo-compression bonding process that takes more than 15 seconds and at a minimum of 300 degrees Celsius to complete. This method, which attaches the chip to a piece of semiconductor wafer, slows the overall production process and results in higher manufacturing costs.

There are also capability limitations in existing solder-assisted bonding technologies to support shrinking microelectronic systems. Melted solder bonding tends to spread and bridge with neighbouring solders, and this prevents the scaling down of the pitch, or distance between wirings in an integrated circuit.

The consortium is working on overcoming such challenges by using low temperature Cu-Cu diffusion bonding. This technique involves the diffusion of copper atoms to form metallic bonding and eliminates the long solder-assisted bonding process. This reduces

overall manufacturing time and costs, and enables higher levels of 3D chipset integration.

IME and its partners have successfully demonstrated Chip-on-Wafer bonding with Cu-Cu diffusion bonding technology at a lower temperature of 200 degrees Celsius. This reduced the pitch from the average of 40  $\mu\text{m}$  to 10  $\mu\text{m}$ , and also lowered production costs. This allows chip device manufacturers to better integrate 3D chipsets such as CMOS image sensors, signal processors, logic and memory, and memory stacks. The consortium aims to reduce the pitch further to 6  $\mu\text{m}$  to open up new possibilities in microelectronics.

Prof. Dim-Lee Kwong, Executive Director of IME, said, "We are excited to be taking the lead in this research collaboration with leading industry players by equipping them with a ready Chip-on-Wafer packaging technology. We will continue to work towards pushing the frontiers of 3D chip integration and drive market competitiveness in the value chain."

"Joining A\*STAR's IME CoW Consortium presents a unique opportunity for KLA-Tencor to closely collaborate with leading-edge peers and share nearly 40 years of market leadership in semiconductor inspection and metrology," said Ms. Lena Nicolaidis, Vice President and General Manager of SWIFT Division at KLA-Tencor. "We're proud to be a part of this group where our technology will enable higher yields and faster time-to-market capabilities that will lead to the creation of better performing 3D chipsets."

"Panasonic looks forward to contribute to the consortium our expertise and experience in flip chip bonding technologies and sophisticated processes. By working closely with the consortium members, we desire to develop the next generation state-of-the-art microelectronics machine, to lead and keep abreast of the market technological trends", said Mr. Hideki Baba, Managing Director of Panasonic.

"We strongly believe that CoW bonding technology with Cu-Cu bonding will be the breakthrough technology for future 3D IC integration. We also expect that CoW bonding technology will contribute to improve productivity and cost reduction, in addition to technology development. By combining this innovation with our WLP technology, we will like to pursue Chip-Size-Package solution for CMOS Image Sensor and Memory products," said Mr. Yuichiro Watanabe, CEO of Tera Probe. Inc.

"Singapore Epson Plating Division is proud to be part of the Chip-on-Wafer Consortium. We believe this will serve as a key platform in advancing the development of the microelectronics industry as a whole and we certainly look forward to contributing our technological expertise together with the partners of the consortium," said Dr. Fang Shunong, Senior General Manager of Singapore Epson Industrial Pte Ltd (Plating Division).

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### **About the A\*STAR 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 on IME, please visit [www.ime.a-star.edu.sg](http://www.ime.a-star.edu.sg).

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

The Agency for Science, Technology and Research (A\*STAR) is Singapore's lead public sector agency that fosters world-class scientific research and talent to drive economic growth and transform Singapore into a vibrant knowledge-based and innovation driven economy.

In line with its mission-oriented mandate, A\*STAR spearheads research and development in fields that are essential to growing Singapore's manufacturing sector and catalysing new growth industries. A\*STAR supports these economic clusters by providing intellectual, human and industrial capital to its partners in industry.

A\*STAR oversees 18 biomedical sciences and physical sciences and engineering research entities, located in Biopolis and Fusionopolis, as well as their vicinity. These two R&D hubs house a bustling and diverse community of local and international research scientists and engineers from A\*STAR's research entities as well as a growing number of corporate laboratories.

For more information on A\*STAR, please visit [www.a-star.edu.sg](http://www.a-star.edu.sg).

## **About KLA-Tencor**

KLA-Tencor Corporation, a leading provider of process control and yield management solutions, partners with customers around the world to develop state-of-the-art inspection and metrology technologies. These technologies serve the semiconductor, LED and other related nanoelectronics industries. With a portfolio of industry-standard products and a team of world-class engineers and scientists, the company has created superior solutions for its customers for more than 35 years. Headquartered in Milpitas, Calif., KLA-Tencor has dedicated customer operations and service centers around the world.

For more information on KLA-Tencor, please visit [www.kla-tencor.com](http://www.kla-tencor.com)

## **About ON Semiconductor**

ON Semiconductor (Nasdaq: ONNN) is driving energy efficient innovations, empowering customers to reduce global energy use. The company offers a comprehensive portfolio of energy efficient power and signal management, logic, discrete and custom solutions to help design engineers solve their unique design challenges in automotive, communications, computing, consumer, industrial, LED lighting, medical, military/aerospace and power supply applications. ON Semiconductor operates a responsive, reliable, world-class supply chain and quality program, and a network of manufacturing facilities, sales offices and design centers in key markets throughout North America, Europe, and the Asia Pacific regions.

For more information, visit <http://www.onsemi.com>.

## **About Panasonic Factory Solutions Asia Pacific**

Panasonic Factory Solutions Asia Pacific (PFSAP), a registered business of Panasonic Asia Pte. Ltd., is a total solutions provider, delivering innovative solutions that strongly add value to its customer production and process, thereby enhancing customers' throughput and production.

PFSAP has manufactured Auto Insertion (AI) machine in-house since 1989. Over the years, PFSAP has added Surface Mount Technology (SMT) machines and Microelectronics machines to its product range. More recently from 2011, PFSAP acquired the manufacturing capabilities to develop Microelectronics machines in-house through technological transfer from Panasonic Factory Solutions Co., Ltd. in Japan.

For more information about PFSAP, please visit [www.pfsap.panasonic.com.sg](http://www.pfsap.panasonic.com.sg)

## **About Singapore Epson Industrial Pte Ltd**

For over 30 years, Singapore Epson Industrial Pte Ltd is recognised as one of the leading surface treatment company in Singapore serving customers from the Electronics, Semiconductors, Automotive, Medical and Aerospace Industries.

ISO 9001 and 14001 qualified as well as TS 16949 certified, our experienced team of engineers constantly seek to innovate and develop unique surface treatment techniques to deliver quality products that exceed customers' expectations while integrating environmental considerations into our corporate activities. Equipped with a state-of-the-art laboratory and clean room facilities, we offer a variety of surface treatment services tailored specifically to customer's requirements. Services include precious metal plating, physical vapour deposition (PVD) technology and high hardness anti-reflective (AR) multi-layer coating.

## **About Tera Probe. Inc.**

Tera Probe is a leading provider of semiconductor testing and packaging services. The provided packaging services include wafer level package (WLP) and flip-chip interconnection bonding solutions with Cu-Pillar processing. Tera Probe's WLP technologies have supported high reliability of customers' products since 2001.

For more information about Tera Probe, please visit <http://www.teraprobe.com/english/>

## **About Tokyo Electron Ltd**

Tokyo Electron Ltd., established in 1963, is a leading global supplier of innovative semiconductor production equipment (SPE). Product lines include coater/developers, thermal processing systems, etch systems, single wafer deposition systems, surface preparation systems, gas cluster ion beam technology, and test systems. The company also handles flat panel display (FPD) production equipment, employing the expertise it has developed in the SPE field. The bulk of Tokyo Electron Ltd.'s SPE and FPD production equipment has captured a large share of the global market. To support the company's diverse product base, Tokyo Electron Ltd. has a global network of strategically located research & development, manufacturing, sales, and service locations in 19 countries in North America, Europe and Asia.