

NEWS RELEASE

Applied Materials and A*STAR's Institute of Microelectronics to Advance R&D in Fan-Out Wafer-Level Packaging

- *The organizations announce a five-year extension of their research collaboration at the Centre of Excellence in Advanced Packaging in Singapore*
- *Fan-Out Wafer-Level Packaging is a key technology inflection in the semiconductor industry expected to help make chips and end-user devices smaller, faster and more power efficient*
- *Joint R&D Centre set to meet growing demand for use of fan-out multi-die packaging in mobile devices*

SINGAPORE, September 19, 2016, [Applied Materials, Inc.](#) and the [Institute of Microelectronics](#) (IME), a world-renowned research institute under the [Agency for Science, Technology and Research](#) (A*STAR), today announced a five-year extension of their research collaboration at the Centre of Excellence in Advanced Packaging in Singapore. The organizations will expand the scope of their R&D collaboration to focus on advancing Fan-Out Wafer-Level Packaging (FOWLP), a key technology inflection expected to help make chips and end-user devices smaller, faster and more power efficient.

With an anticipated additional S\$188 million of combined investment, the Centre will expand to a second location at Fusionopolis 2, in addition to the existing facility at Singapore's Science Park II. The two facilities combined will span an area of approximately 1,700 square meters and be staffed by a team of close to 100 researchers, scientists and engineers. The Centre was built to develop new capabilities in advanced packaging through a full line of Applied Materials' Wafer-Level Packaging (WLP) processing equipment, and has successfully delivered advancements in semiconductor hardware, process and device structures.

"Our collaboration with A*STAR over the past five years has been instrumental in establishing Applied Materials' presence in Singapore and building up our R&D capabilities," said Russell Tham, Regional President, Applied Materials South East Asia. "With the entire R&D value stream from ideation to product development being carried out locally via this joint lab, the expansion will further Applied Materials' development of new technologies and products for global markets, while remaining a key contributor to Singapore's innovation economy."

Dr. Raj. Thampuran, Managing Director, A*STAR, said, "Our relationship with Applied Materials transcends a new milestone with the extension of our collaboration in R&D into new areas. The progress we have made from our initial collaboration is a testament to the successful partnership A*STAR has with Applied Materials. As we look towards the future, we remain committed to advancing innovations in the semiconductor industry and being at the forefront of leading edge ideas in this rapidly evolving technological landscape."

The Internet of Things (IoT) and Big Data are driving forces in today's market of interconnected and multi-functional electronic devices. FOWLP is considered a key technology platform for system scaling, enabling multiple chips to be integrated in a small form factor on a single package. With FOWLP capable of providing significant benefits for the mobile and wireless markets, increased investment in the sector could help propel Singapore's standing as a global hub for semiconductor R&D. Through a successful alliance with its private sector partners across the value chain, A*STAR has contributed to Singapore's vibrant research, innovation and enterprise ecosystem. In 2014, A*STAR and 10 other industry partners launched four Advanced Semiconductor Joint Labs to provide an integrated platform for complex microchip manufacturing R&D. These global partnerships together with the Applied Materials – A*STAR joint R&D Centre will continue to strengthen Singapore's capabilities in semiconductor R&D and contribute to the creation of high-value jobs and competitiveness of the industry.

The Singapore Centre conducts WLP research across Applied Materials for its global customers. The Centre undertakes complex multi-disciplinary research to develop new innovations in advanced packaging including bump,

TSV, 2.5D interposers and now FOWLP. Through its work at the Centre, Applied Materials has developed technology that has been successfully implemented in several of its semiconductor equipment products. In addition, the extension of the collaboration highlights the important role a successful public-private partnership plays in creating value and building up differentiated competencies for Singapore.

“Applied Materials’ leading expertise in materials engineering drives the development of highly differentiated products and solutions that make new technologies possible,” said Dr. Prabu Raja, Group Vice President and General Manager of the Patterning and Packaging Group, Applied Materials. “We are excited to expand our collaboration with A*STAR and leverage our complementary strengths to solve challenges in advanced packaging and build new capabilities for future innovations.”

A*STAR takes a long-term vision towards strategic investments in industry-ready R&D that contribute to Singapore’s economic growth. It is home to one of the premier advanced packaging and wafer-level packaging research facilities in Asia. IME’s leading research capabilities in advanced chip packaging are focused on meeting the challenging requirements in complex and sophisticated chip packaging, in order to develop slimmer devices with greater system capabilities such as ultra-low power consumption, increased memory and bandwidth, and diverse functionality.

Dr. Tan Yong Tsong, Executive Director, IME, said, “Our long standing collaboration with Applied Materials demonstrates the value of public-private partnership under open innovation, and underscores the readiness and competitiveness of IME’s research capabilities for the industry. Through this joint lab, we will continue to push the envelope through our differentiated R&D competencies to deliver breakthrough technologies.”

###

Editorial/Media Contacts

Applied Materials:

Kevin Winston (USA)
+1 (408) 235-4498
kevin_winston@amat.com

Seraphina Seng (Singapore)
+65 63117531
seraphina_seng@amat.com

Institute of Microelectronics:

Lynn Hong
Agency for Science, Technology and Research
+65 6419 6597
hongxl@scei.a-star.edu.sg

Investor Relations Contact

Applied Materials:

Michael Sullivan
+1 (408) 986-7977
michael_sullivan@amat.com

About Applied Materials, Inc.

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 the technology shaping the future. Learn more at www.appliedmaterials.com.

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, A*STAR 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 about IME, please visit 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 spearheads economic oriented research to advance scientific discovery and develop innovative technology. Through open innovation, we collaborate with our partners in both the public and private sectors to benefit society.

As a Science and Technology Organisation, A*STAR bridges the gap between academia and industry. Our research creates economic growth and jobs for Singapore, and enhances lives by contributing to societal benefits such as improving outcomes in healthcare, urban living, and sustainability.

We play a key role in nurturing and developing a diversity of talent and leaders in our Agency and Research Institutes, the wider research community and industry. A*STAR oversees 18 biomedical sciences and physical sciences and engineering research entities primarily located in Biopolis and Fusionopolis.

For more information on A*STAR, please visit www.a-star.edu.sg.