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STMicroelectronics Establishes World's First "Lab-in-Fab" to Advance Adoption of Piezoelectric MEMS in Singapore in Partnership with A*STAR and ULVAC

- *Collaboration with A*STAR's Institute of Microelectronics (IME) and Japanese manufacturing tool vendor ULVAC, focuses on Piezo MEMS technology*
- *First-of-its-kind concept aims to accelerate the transition from proofs of concept to volume production, and advance the adoption of piezoelectric (Piezo) MEMS in new applications like AR/VR, medical, and 3D printing*
- *First wafers expected in Q2 2021, with volume production forecast at the end of 2022.*

Singapore, October 28, 2020 – STMicroelectronics (NYSE: STM), a global semiconductor leader serving customers across the spectrum of electronics applications and a world leader in Micro-Electromechanical Systems (MEMS) technology, announces a collaboration with A*STAR's IME, a research institute in Singapore, and ULVAC, a leading Japanese manufacturing-tool vendor, to jointly setup and operate an 8-inch (200mm) R&D line focused on Piezo MEMS technology within ST's existing manufacturing facility in Singapore. The first of its kind in the world, this "Lab-in-Fab" R&D line brings together three partners with leading-edge and complementary competencies in Piezo materials, Piezo MEMS technologies, and wafer-fab tools to boost innovation and accelerate development of new materials, process technologies, and ultimately, products for industry customers.

The Lab-in-Fab consists of a new cleanroom area within ST's Ang Mo Kio campus and will host tools and dedicated resources from the three parties, which include MEMS R&D and process scientists and engineers. IME's knowledge base and industrial drive in piezo-MEMS device design, process integration, and system integration will add value to the development of the line. IME will also contribute state-of-the-art tools to help ensure a smooth product flow through to production, all within the same location. The new R&D line will also leverage existing ST resources, benefiting from the economies of scale of ST's wafer fabs on the same campus. The "Lab-in-Fab" facility is forecast to be ready and operational with first wafers in Q2 2021 and volume production at the end of 2022.

"*We want to build the world's leading R&D center for Piezo MEMS materials, technologies, and products with IME and ULVAC, with whom we have been working for a long time. This world first will be hosted in our Singapore site, a strategic location for ST,*" said Benedetto Vigna, President, Analog, MEMS and Sensors Group, STMicroelectronics. "*The Lab-in-Fab will offer our customers the capability to more easily go from a feasibility study to product development and high-volume manufacturing.*"

This collaboration enhances the existing manufacturing-process portfolio of ST Singapore and will accelerate the adoption of Piezo MEMS actuators in promising new fields of application,

including MEMS Mirrors for Smart Glasses, AR Headsets and LIDAR systems, Piezoelectric Micromachined Ultrasonic Transducers (PMUT) for emerging medical applications, and Piezo Heads for Commercial and industrial 3-D Printing.

*"The public-private partnership between IME, ST and ULVAC has led to the creation of a unique R&D line, which will bring about novel products using piezo materials, and boost the competitiveness of our partners. These efforts will continue to anchor high-value R&D activities in Singapore and demonstrate that Singapore continues to be an attractive environment for industry leaders to innovate and grow their businesses. A*STAR is also committed to helping local SMEs tap into our technologies. We welcome companies to collaborate with IME and leverage our Lab-in-Fab facilities for proof of concept,"* said Prof. Dim-Lee Kwong, Executive Director of IME.

"We are proud of being a "Lab-in-Fab" partner of ST and IME in developing advanced Piezo-MEMS for numerous promising future applications. This is also a strong proof of ULVAC's leadership in providing manufacturing technology solutions to the Piezo-MEMS industry. We are looking forward to working closely with our partners for a successful collaboration," said Dr. Koukou SUU, Executive Officer and Senior Fellow of ULVAC.

Note to editors

Piezo-based components have been widely used for decades to build actuators or sensors out of bulk piezo material. Over the past years, innovations in process technologies have allowed the MEMS industry to design and manufacture products at the wafer level using thin piezo films, opening the door for continued miniaturization, performance improvements, and cost reduction.

The "Lab-in-Fab" facility comes a year after ST celebrated its 50th anniversary in Singapore in 2019, in conjunction with the opening of its brand new 8-inch (200mm) wafer fabrication facility (SG8E) in Singapore.

About STMicroelectronics
At ST, we are 46,000 creators and makers of semiconductor technologies mastering the semiconductor supply chain with state-of-the-art manufacturing facilities. An independent device manufacturer, we work with our 100,000 customers and thousands of partners to design and build products, solutions, and ecosystems that address their challenges and opportunities, and the need to support a more sustainable world. Our technologies enable smarter mobility, more efficient power and energy management, and the wide-scale deployment of the Internet of Things and 5G technology. Further information can be found at www.st.com.

About the Institute of Microelectronics (IME)
The Institute of Microelectronics (IME) is a research institute 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 Heterogeneous Integration, System-in-Package, Sensor, Actuators and Microsystems, RF & mmWave, SiC/GaN-on-SiC Power Electronics, and MedTech. For more information on IME, please visit www.ime.a-star.edu.sg.

About ULVAC
ULVAC, Inc., founded in 1952, contributes to the development of industry through its comprehensive vacuum technologies. We created ULVAC SOLUTIONS based on these unique technologies and long years of research, development and production innovation. We offer

these solutions, for equipment, materials, vacuum components, analytic evaluation and various other services, to manufacturers of electronic components, semiconductors, solar cells, flat panel displays and other industrial equipment. For more information, please visit www.ulvac.co.jp/en/.

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