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STMicroelectronics and Leti Develop GaN-on-Silicon Technology for Power Conversion Applications

- *Cooperation to develop and industrialize advanced power GaN-on-Si diode and transistor architectures*
- *Process technology, benefiting from the results obtained in the IRT Nanoelec program, will be transferred from Leti's 200mm R&D line to an ST-operated 200mm-wafer pilot-line, operational by 2020*

Geneva, Switzerland, and Grenoble, France – September 24, 2018 –

STMicroelectronics (NYSE: STM), a global semiconductor leader serving customers across the spectrum of electronics applications, and Leti, a research institute of CEA Tech, today announced their cooperation to industrialize GaN (Gallium Nitride)-on-Silicon technologies for power switching devices. This power GaN-on-Si technology will enable ST to address high-efficiency, high-power applications, including automotive on-board chargers for hybrid and electric vehicles, wireless charging, and servers.

The collaboration focuses on developing and qualifying advanced power GaN-on-Silicon diode and transistor architectures on 200mm wafers, a market that the research firm IHS Markit estimates to grow at a CAGR of more than 20 percent from 2019 to 2024¹. Together, in the framework of IRT Nanoelec, ST and Leti are developing the process technology on Leti's 200mm R&D line and expect to have validated engineering samples in 2019. In parallel, ST will set up a fully qualified manufacturing line, including GaN/Si hetero-epitaxy, for initial production running in ST's front-end wafer fab in Tours, France, by 2020.

In addition, given the attractiveness of GaN-on-Si technology for power applications, Leti and ST are assessing advanced techniques to improve device packaging for the assembly of high power-density power modules.

“Recognizing the incredible value of wide-bandgap semiconductors, ST's contributions in Power GaN-on-Si manufacturing and packaging technologies

¹ IHS Markit, April 2018.

with CEA-Leti move to arm us with the industry's most complete portfolio of GaN and SiC products and capabilities, on top of our proven competence to manufacture high-quality, reliable products in volume," said Marco Monti, President Automotive and Discrete Group, STMicroelectronics.

"Leveraging Leti's 200mm generic platform, Leti's team is fully committed to supporting ST's strategic GaN-on-Si power-electronics roadmap and is ready to transfer the technology onto ST's dedicated GaN-on-Si manufacturing line in Tours. This co-development, involving teams from both sides, leverages the IRT Nanoelec framework program to broaden the required expertise and innovate from the start at device and system levels," said Leti CEO Emmanuel Sabonnadiere.

Note to editors:

As a wide-bandgap semiconductor material, GaN devices inherently allow operation at much higher voltages, frequencies, and temperatures than conventional semiconductor materials like silicon. ST is also working on two other wide-bandgap technologies: silicon carbide (SiC) and RF Gallium Nitride (GaN).

In GaN, in addition to this announcement with CEA-Leti, ST recently announced another development of GaN-on-Silicon for RF applications with MACOM, for MACOM's use across a broad range of RF applications and for ST's own use in non-telecom markets. While easy to confuse because both use GaN, the two efforts use structurally different approaches that have different application benefits. These include the suitability of the Power GaN-on-Si technology to be produced on 200mm wafers, while the RF GaN-on-Silicon is – for now, at least – better suited for 150mm wafers. Either way, because they produce low switching losses, GaN technologies suit higher frequency applications.

SiC devices, on the other hand, operate at higher voltages with a blocking voltage of more than 1700V, an avalanche rating over 1800V, and low on-resistance making it ideal for energy efficiency and thermal performance. With these characteristics, SiC is an excellent fit in applications like electric vehicles, solar inverters, and welding equipment.

About STMicroelectronics

ST is a global semiconductor leader delivering intelligent and energy-efficient products and solutions that power the electronics at the heart of everyday life. ST's products are found everywhere today, and together with our customers, we are enabling smarter driving and smarter factories, cities and homes, along with the next generation of mobile and Internet of Things devices. By getting more from technology to get more from life, ST stands for life.augmented.

In 2017, the Company's net revenues were \$8.35 billion, serving more than 100,000 customers worldwide. Further information can be found at www.st.com.

About Leti (France)

Leti, a technology research institute at CEA Tech, is a global leader in miniaturization technologies enabling smart, energy-efficient and secure solutions for industry. Founded in 1967, Leti pioneers micro- & nanotechnologies, tailoring differentiating applicative solutions for global companies, SMEs and startups. Leti tackles critical challenges in healthcare, energy and digital migration. From sensors to data processing and computing solutions, Leti's multidisciplinary teams deliver solid expertise, leveraging world-class pre-industrialization facilities. With a staff of more than 1,900, a portfolio of 2,700 patents, 91,500 sq. ft. of cleanroom space and a clear IP policy, the institute is based in Grenoble, France, and has offices in Silicon Valley and Tokyo. Leti has launched 60 startups and is a member of the Carnot Institutes network.

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CEA Tech is the technology research branch of the French Alternative Energies and Atomic Energy Commission (CEA), a key player in innovative R&D, defence & security, nuclear energy, technological research for industry and fundamental science, identified by Thomson Reuters as the second most innovative research organization in the world. CEA Tech leverages a unique innovation-driven culture and unrivalled expertise to develop and disseminate new technologies for industry, helping to create high-end products and provide a competitive edge.

About Nanoelec Research Technological Institute (IRT)

Nanoelec Research Technological Institute (IRT), headed by Leti conducts research and development in the field of information and communication technologies (ICT) and, specifically, micro- and nanoelectronics. Based in Grenoble, France, IRT Nanoelec leverages the area's proven innovation ecosystem to create the technologies that will power the nanoelectronics of tomorrow, drive new product development and inspire new applications – like the Internet of Things – for existing technologies. The R&D conducted at IRT Nanoelec provides early insight into how emerging technologies such as 3D integration, silicon photonics and power devices will affect integrated circuits. Visit www.irtnanoelec.fr.

IRT Nanoelec benefits from French Government aid under the "Programme Investissements d'Avenir" bearing reference ANR-10-AIRT-05.

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