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STMicroelectronics unveils new generation of silicon carbide power technology tailored for next-generation EV traction inverters

- *Smaller, more efficient products to ramp-up in volumes through 2025 across 750V and 1200V classes, will bring the advantages of silicon carbide beyond premium models to mid-size and compact electric vehicles.*
- *ST plans to introduce multiple silicon carbide technology innovations through 2027, including a radical innovation.*

Geneva, Switzerland, September 24, 2024 – STMicroelectronics (NYSE: STM), a global semiconductor leader serving customers across the spectrum of electronics applications, is introducing its fourth generation STPOWER silicon carbide (SiC) MOSFET technology. The Generation 4 technology brings new benchmarks in power efficiency, power density and robustness. While serving the needs of both the automotive and industrial markets, the new technology is particularly optimized for traction inverters, the key component of electric vehicle (EV) powertrains. The company plans to introduce further advanced SiC technology innovations through 2027 as a commitment to innovation.

"*STMicroelectronics is committed to driving the future of electric mobility and industrial efficiency through our cutting-edge silicon carbide technology. We continue to advance SiC MOSFET technology with innovations in the device, advanced packages, and power modules*," said Marco Cassis, President, Analog, Power & Discrete, MEMS and Sensors Group. "*Together with our vertically integrated manufacturing strategy, we are delivering industry leading SiC technology performance and a resilient supply chain to meet the growing needs of our customers and contribute to a more sustainable future.*"

As the market leader in SiC power MOSFETs, ST is driving further innovation to exploit SiC's higher efficiency and greater power density compared to silicon devices. This latest generation of SiC devices is conceived to benefit future EV traction inverter platforms, with further advances in size and energy-saving potential. While the EV market continues to grow, challenges remain to achieve widespread adoption and car makers are looking to deliver more affordable electric cars. 800V EV bus drive systems based on SiC have enabled faster charging and reduced EV weight, allowing car makers to produce vehicles with longer driving ranges for premium models. ST's new SiC MOSFET devices, which will be made available in 750V and 1200V classes, will improve energy efficiency and performance of both 400V and 800V EV bus traction inverters, bringing the advantages of SiC to mid-size and compact EVs — key segments to help achieve mass market adoption. The new generation SiC technology is also suitable for a variety of high-power industrial applications, including solar inverters, energy storage solutions and datacenters, significantly improving energy efficiency for these growing applications.

Availability
ST has completed qualification of the 750V class of the fourth generation SiC technology platform and expects to complete qualification of the 1200V class in the first quarter of 2025. Commercial availability of devices with nominal voltage ratings of 750V and 1200V will follow, allowing designers to address applications operating from standard AC-line voltages up to high-voltage EV batteries and chargers.

Use cases
ST's Generation 4 SiC MOSFETs provide higher efficiency, smaller components, reduced weight, and extended driving range compared to silicon-based solutions. These benefits are critical for achieving widespread adoption of EVs and leading EV manufacturers are engaged with ST to introduce the Generation 4 SiC technology into their vehicles, enhancing performance and energy efficiency. While the primary application is EV traction inverters, ST's Generation 4 SiC MOSFETs are also suitable for use in high-power industrial motor drives, benefiting from the devices' improved switching performance and robustness. This results in more efficient and reliable motor control, reducing energy consumption and operational costs in industrial settings. In renewable energy applications, the Generation 4 SiC MOSFETs enhance the efficiency of solar inverters and energy storage systems, contributing to more sustainable and cost-effective energy solutions. Additionally, these SiC MOSFETs can be utilized in power supply units for server datacenters for AI, where their high efficiency and compact size are crucial for the significant power demands and thermal management challenges.

Roadmap
To accelerate the development of SiC power devices through its vertically integrated manufacturing strategy, ST is developing multiple SiC technology innovations in parallel to advance power device technologies over the next three years. The fifth generation of ST SiC power devices will feature an innovative high-power density technology based on planar structure. ST is at the same time developing a radical innovation that promises outstanding on-resistance RDS(on) value at high temperatures and further RDS(on) reduction, compared to existing SiC technologies.

ST will attend ICSCRM 2024, the annual scientific and industry conference exploring the newest achievements in SiC and other wide bandgap semiconductors. The event, from September 29 to October 04, 2024, in Raleigh, North Carolina will include ST technical presentations and an industrial keynote on ‘High volume industrial environment for leading edge technologies in SiC’. Find out more here: ICSCRM 2024 - STMicroelectronics.

Technical Note to Editors
The fourth generation SiC MOSFETs from STMicroelectronics represent a significant leap forward in power conversion technology compared to previous generations. These devices are engineered to deliver superior performance and robustness, addressing the stringent demands of future EV traction inverters. The Generation 4 SiC MOSFETs feature a significantly lower on-resistance (RDS(on)) measured against prior generations, minimizing conduction losses, and enhancing overall system efficiency. They offer faster switching speeds, which translate to lower switching losses, crucial for high-frequency applications and enabling more compact and efficient power converters. The Generation 4 technology provides extra robustness in Dynamic Reverse Bias (DRB) conditions, exceeding the AQG324 automotive standard, ensuring reliable operation under harsh conditions.

With Generation 4 ST continues to deliver outstanding RDS(on) x die-area figure of merit to ensure high current-handling capability with minimal losses. The average die size of Generation 4 devices is 12-15% smaller than that of Generation 3, considering an RDS(on) at 25 degrees Celsius, allowing for more compact power converter designs, saving valuable space, and reducing system costs. The improved power density of these devices supports the development of more compact and efficient power converters and inverters, essential for both automotive and industrial applications. In addition, this is particularly beneficial for power supply units in server datacenters for AI, where space and efficiency are critical factors.

As an industry leader in this technology, ST has already supplied STPOWER SiC devices for more than five million passenger cars worldwide in a range of EV applications including traction inverter, OBC (onboard charger), DC-DC converter, EV charging station, and e-compressor application, significantly enhancing the performance, efficiency, and range of NEVs. ST's SiC strategy, as an integrated device manufacturer (IDM), ensures quality and security of supply to serve carmakers' strategies for electrification. With the recently announced fully vertically integrated SiC substrate manufacturing facility in Catania, expected to start production in 2026, ST is moving quickly to support the rapid market transition towards e-mobility and higher efficiency in industrial applications.

For further information about ST's SiC portfolio, please visit www.st.com/sic-mosfets

About STMicroelectronics

At ST, we are over 50,000 creators and makers of semiconductor technologies mastering the semiconductor supply chain with state-of-the-art manufacturing facilities. An integrated device manufacturer, we work with more than 200,000 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 cloud-connected autonomous things. We are committed to achieving our goal to become carbon neutral on scope 1 and 2 and partially scope 3 by 2027. Further information can be found at www.st.com.

For further information, please contact:

INVESTOR RELATIONS:
Céline Berthier
Group VP, Investor Relations
Tel: +41.22.929.58.12
celine.berthier@st.com

MEDIA RELATIONS:
Alexis Breton
Corporate External Communications
Tel: +33.6.59.16.79.08
alexis.breton@st.com