Marelli Motorsport and Politecnico di Torino cooperate on Gallium Nitride (GaN) technology developments for high voltage power converters

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Marelli Motorsport – the Motorsport business unit of the global automotive supplier Marelli, with an extensive experience in the development of hybrid and electric systems for major motorsport championships – and the Power Electronics Innovation Center (PEIC) of Politecnico di Torino are announcing a new collaboration, regarding the Gallium Nitride (GaN) technology area for power electronics, aimed at electric engines. The project is included in a wider framework research partnership between Marelli and Politecnico.

The collaboration is aiming at the design and prototyping of an innovative multi-level 900V high power inverter for electric traction based on GaN technology.

Gallium Nitride, a cutting-edge technology reaching unprecedented switching frequencies and low switching energy, allows a radical reduction of passive components (e.g. inductors, capacitors, transformers), while maintaining an outstanding efficiency. In the last years, the GaN technology has been evolving rapidly in terms of conduction and switching performance. In addition, since the lateral GaN devices are grown on standard silicon wafers, their cost is already highly competitive.

GaN technology opens new horizons in the power converter design innovations, in which the collaboration has the aim to excel in terms of high efficiency multilevel architectures, optimal and robust gate driving and device parallelization, high frequency and high temperature capacitor technologies, integration of capacitors and semiconductors on PCB (Printed Circuit Board) for cost reduction, advanced cooling solutions.

"The collaboration with Politecnico di Torino is enabling a more rapid pace of development with respect to innovative Wide-Bandgap technology applied to power converters." said Riccardo De Filippi, Head of Marelli Motorsport. *"In particular, GaN is proving to be very promising for what concerns high frequency switching devices, even at very high voltage and power levels. It looks like the new technology can have a bright future in the automotive electrification market."*

Radu Bojoi, Politecnico di Torino, chairman of Power Electronics Innovation Center (PEIC), commented: *"The collaboration with Marelli is a further demonstration of the multiple benefits and synergies possible between University and Industry when they join forces in fast tracking new technologies into cutting edge device development."*

The concept study started back in 2021 and at present it is in the prototyping phase, which is planning to undergo two development steps withing 2022. The GaN component supplier selected for the prototype phase is VisIC Technologies, a global leader in gallium nitride (GaN) solutions for high-voltage automotive applications.

"The project with Marelli and PEIC for the development of gallium nitride-based multi-level-power inverters in electric vehicles illustrates the break-through of gallium nitride technology in the automotive industry," said Tamara Baksht, CEO of VisIC. *"VisIC's D^{3}GaN technology was developed for the high reliability standards of the automotive industry and offers the lowest losses per RDS(on). It also simplifies the system solution and enables high-efficiency and affordable power train solutions. It is definitely the next step for the automotive electrical driveline."*

Beyond the motorsport domain, which is always at the forefront of innovation thanks to its capability to design and test technologies in a fast way and challenging conditions, the know-how and technologies developed in the frame of this collaboration, for Marelli will be crucial also to enable a technological flow-down to series production technologies.

About Marelli

MARELLI is one of the world's leading global independent suppliers to the automotive sector. With a strong and established track record in innovation and manufacturing excellence, our mission is to transform the future of mobility through working with customers and partners to create a safer, greener, and better-connected world. With around 54,000 employees worldwide, the MARELLI footprint includes 170 facilities and R&D centers across Asia, the Americas, Europe, and Africa, generating revenues of 1,380 billion JPY (10.6 billion EUR) in 2021.

About Politecnico di Torino

Politecnico di Torino (www.polito.it) was founded in 1906 and has its roots in the Technical School for Engineers created in 1859.
It is internationally ranked among the most important universities in Europe for engineering and architecture studies, with 37,000 students (out of which 15% are international students coming from over 100 different countries).
Politecnico is a center of excellence for education and research in engineering, architecture, design and planning and it works in close cooperation with the socio-economic system. It is a comprehensive Research University where education and research complement each other and create synergies in order to address the needs of the economic system, of the local community and, above all, of its students.
Politecnico is committed to a strong internationalization process of its teaching, research and technology transfer activities: not only does it work in cooperation with the best universities and research centers in world, but it has also been signing agreements and contracts with important international corporations, as well as local businesses, meaning to be for the latter a focal point for innovation.