

ELECTRICAL, ELECTRONICS AND COMMUNICATIONS ENGINEERING

**MUR DM 117/EPC Corporation - Investigation of multilevel
converters with new generation GaN FET to increase efficiency in
energy conversion applications for sustainable development**

Funded By	MINISTERO DELL'UNIVERSITA' E DELLA RICERCA [P.iva/CF:97429780584] Politecnico di TORINO [P.iva/CF:00518460019] EPC ITALY SRL [P.iva/CF:12169750010]
Supervisor	MUSUMECI SALVATORE - salvatore.musumeci@polito.it
Contact	ing. Marco Palma (EPC) mail: marco.palma@epc-co.com
Context of the research activity	Title: "Investigation of multilevel converters with new generation GaN FET to increase efficiency in energy conversion applications for sustainable development" Innovative power devices application in multilevel power converters for solar panels, electric traction and industrial applications Progetto finanziato nell'ambito del PNRR - DM 117/2023 - CUP E14D23002000004
Objectives	The target of increasing energy efficiency and reliability while reducing the overall size of the developed solutions is paramount in modern power electronics applications for energy conversion, both from renewable and traditional sources. Wide bandgap (WBG) switching devices for converter applications have emerged to address these sustainable development challenges in recent years. Among the WBG devices currently on the market, high electron mobility gallium nitride (GaN) transistors (HEMTs) offer significant advantages end perspective over existing silicon-based alternatives, such as super-junction transistors (MOSFETs) or IGBTs. Multilevel power converters are attractive topologies to increase input voltage management, improve output waveform quality and reduce harmonic content. Using GaN FET as switches obtains significant energy efficiency increases and reduces the size or total elimination of the output and input filters. Typical energy conversion applications include AC/DC controlled rectifiers, inverters for solar panels and AC motor drives for traction and industrial systems. The research activities involve one of the leading international companies designing and developing GaN FET devices, the

Efficient Power Conversion Corporation (EPC). The research activity will be conducted closely with the EPC Center of Excellence on motor control applications with GaN FET devices. The research will concern the investigation and development of a modular circuit cell based on power devices with GaN technology and auxiliary driving and protection circuits, susceptible to integration for applications on multilevel converters. The integrated modular circuit cell will enable high efficiency, reduced overall dimensions, high dynamic performance and high reliability to develop energy conversion systems based on flexible and more efficiently designed multilevel converters.

Skills and competencies for the development of the activity

Electrical and Electronics Engineers and experimental Physicists interested in electrical engineering systems in the fields of power devices and power converter applications for simulation and experimental activity on the development of innovative topologies and the last generation of devices applications