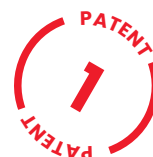




Power GaN



Efficient step-up power converter for fuel cell-batteries

What it is

CEA-Leti's high-yield DC-DC step-up converter system leverages a unique multi-level GaN conversion topology developed to effectively divide the total voltage among several levels to exploit the full capability of this wide bandgap material. Patented control software includes an intermediate position between the operating modes to improve conversion efficiency in low-to-medium power ranges. CEA-Leti also optimized the system's heat dissipation that is key in such environment.

Ideally dimensioned for coupling hydrogen fuel cells with batteries, this advance approach allows high-power conversion use cases to be addressed by GaN, a material that offers a wide variety of advantages from less heating to higher switching frequencies enabling a drastic size reduction of the converter.

What it can do

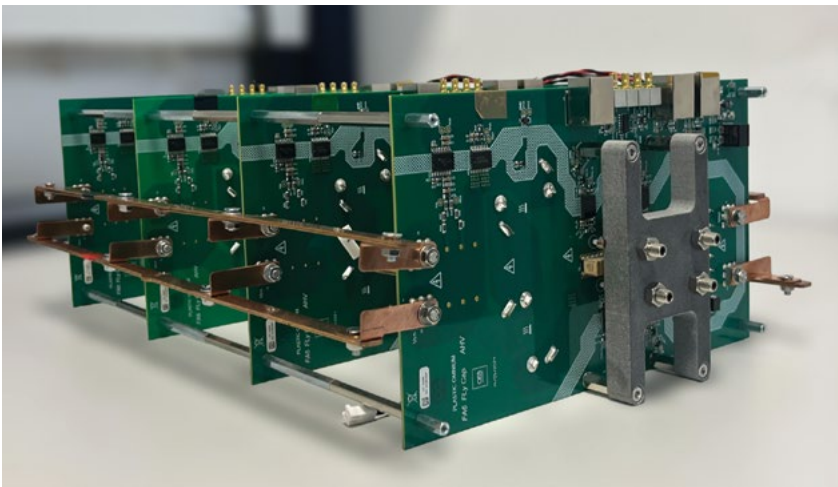
CEA-Leti's DC-DC step-up converter can be used wherever hydrogen fuel cells need to be coupled with batteries for heavy-duty use cases:

- Electric-powered heavy mobility (buses, trucks, construction vehicles, etc.) and aerospace systems where a fuel cell is required to respond to demand for higher power during phases like acceleration, for example
- Stationary energy storage systems to enable the integration of solar and other intermittent renewable energy sources
- Naval and maritime for onboard power systems that are more stable and for auxiliary battery charging
- Datacenter power systems and generators

What makes it unique

CEA-Leti's solution responds to high voltage need using today GaN technology by dividing the total output voltage over multiple levels, bringing the benefits of GaN to higher-power DC-DC conversion use cases. Less heating eliminates the need for bulky fans, and passive components can also be sized down for overall higher power density and more compact systems. CEA-Leti drew on broad expertise in materials (GaN and other wide-bandgap materials), electrical architecture, device topology, control algorithms, and overall system optimization to develop this advanced power conversion technology.

25 kW flying capacitor multilevel DC/DC converter ▼



Working with CEA-Leti

The CEA recently transferred this technology to an electric vehicle equipment manufacturer for integration into a future product. CEA-Leti is prepared to partner with maritime, aerospace, and other on-board equipment manufacturers and integrators to co-develop this technology for specific use cases. The converter topology can also be applied to other wide bandgap materials to enhance their existing power conversion systems.

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At a glance

- GaN technology
- Up to 99% efficiency
- Up to 1,000 V capability

Scientific publication

Bertin Riviere De La Souchere, T. (2025). *High-efficiency interleaved flying-capacitor for fuel cell and Li-ion battery charger*. PCIM2025.

Interested in this technology?

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