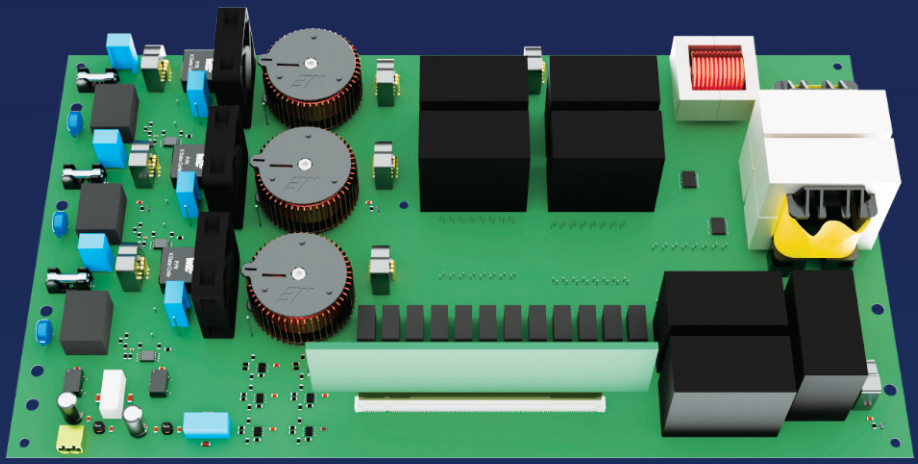
NOVELIC

POWER ELECTRONICS
SOLUTIONS

11 kW On-board charger



The EV on-board charger (OBC) recharges the high-voltage (HV) main battery from AC grids while the car is parked. Typical development targets are efficient power conversion for 400 V and 800 V systems, power density, reliability, and bi-directional power flow to enable V2L, V2H, and V2G.

Efficient three-phase OBC model based on SiC-MOSFET technology supports:

- fast charging (11 kW @ 400V battery)
- universal input with PFC operation
- three-phase and single-phase operation mode
- bidirectional operation for V2X modes
- quick and easy extension of functionality
- possibilites for customization

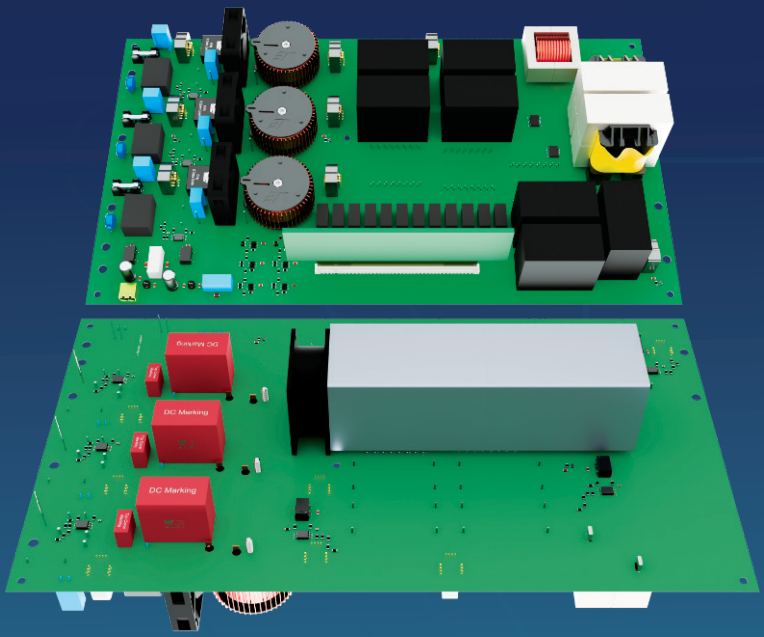
Version 1 | 2025/05/15

USE CASE

Hardware Platform

Designed on a single board featuring:

- Input relay at each phase
- Passive input EMC filter
- Three-phase bidirectional PFC stage for universal input
- Dual-active-bridge with ferrite transformer for galvanic isolation
- Polypropylene film capacitors used to avoid aging and thermal issues with electrolytic capacitors
- Separate power + measurement and control board
- Full galvanic isolation between power/measurement and control-board
- Forced-air cooling with long-life fans



USE CASE

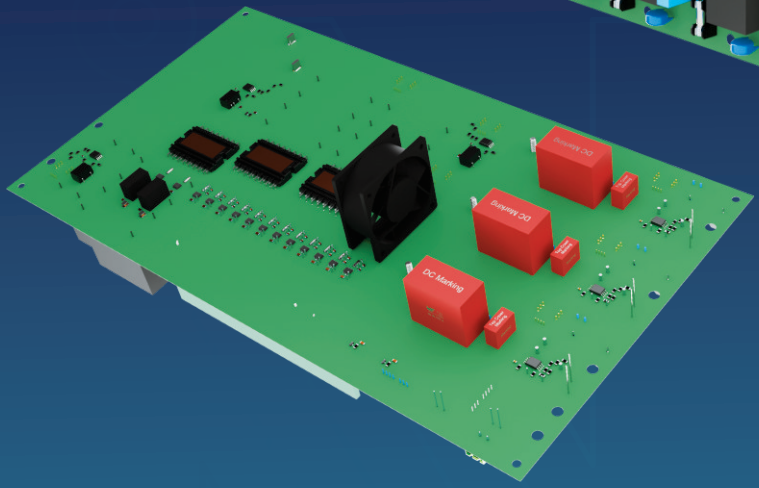
SiC Power Stage

A full SiC-MOSFET power stage provides improved efficiency and smaller volume.

The usage of compact semiconductor modules offers additional advantages:

- Lower board space
- In-line positioning for better utilization of heat-sinks
- Top-side cooling for easier and cost-effective assembly
- Better integration of switches for decreased stress and EMI issues

All gate-driver ciruits are galvanically isolated and provide a high CMI immunity level.

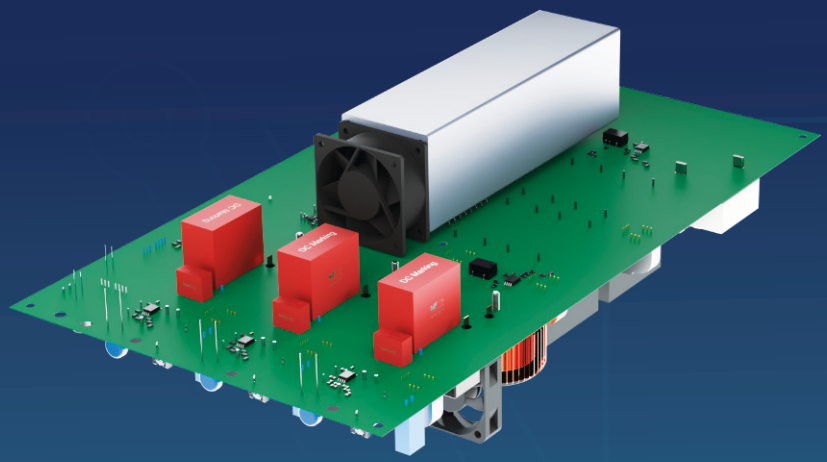


USE CASE

Control section

Each converter is controlled by a dedicated 32-bit high-performance microcontroller designed for digital power conversion:

- Wide range output voltage regulation and accurate charge current control,
- High-precision measurement and control,
- Floating point unit with math accelerators support for quick and efficient execution of demanding control algorithms,
- High-resolution PWM timers for precise generation of driving signals,
- Main communication with vehicle control system using CAN interface,
- Wide-range of additional communication capabilities.

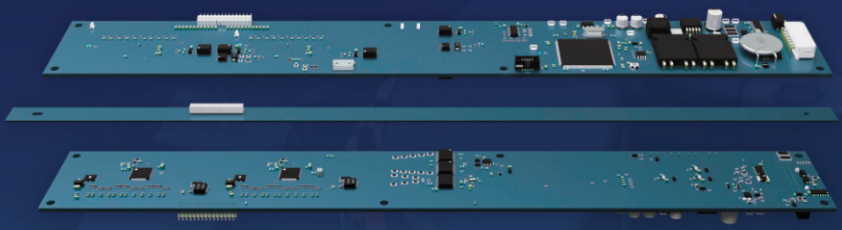


Customization

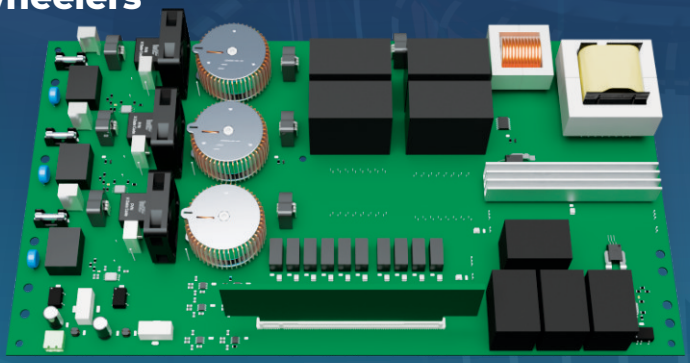
Battery voltage	400V or 800V
Power level	6.6kW, 11kW, or 22kW
Design	single-board or modular, for space-saving design
Cooling type	forced-air or water based
Stacking	possible, to increase the output power level

See also:

Battery Management System for eMobility



72V / 6.6 kW On-board charger for 2- and 3-wheelers



NOVELIC

POWER ELECTRONICS

Version 1 | 2025/05/15

Founded in 2012, NOVELIC gathers the finest talent in embedded hardware and software engineering, forming a strong foundation for creating end-to-end turnkey solutions in power electronics and embedded systems.

6 ENGINEERING CENTERS
300+ SUCCESSFUL PROJECTS
160+ SATISFIED CUSTOMERS
180+ EMPLOYEES