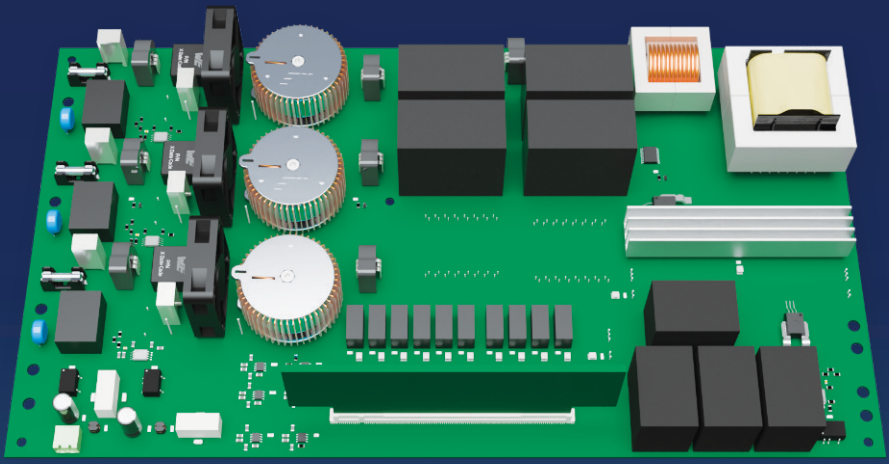
NOVELIC

POWER ELECTRONICS
SOLUTIONS

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



This on-board charger (OBC) is used to charge the battery in two- and three-wheelers from AC grid while the vehicle is parked. The development target is efficient power conversion for 72 V systems with increased power density and reliability. Additionally, a bidirectional power flow feature is implemented to support V2L and V2H operation as needed.

This efficient three-phase OBC model, based on SiC-MOSFET technology, supports:

- fast charging (6.6 kW @ 72V battery)
- universal input with PFC operation
- three-phase and single-phase operation mode
- bidirectional operation for V2L and V2H modes
- possibilities for customization and extension of functionality

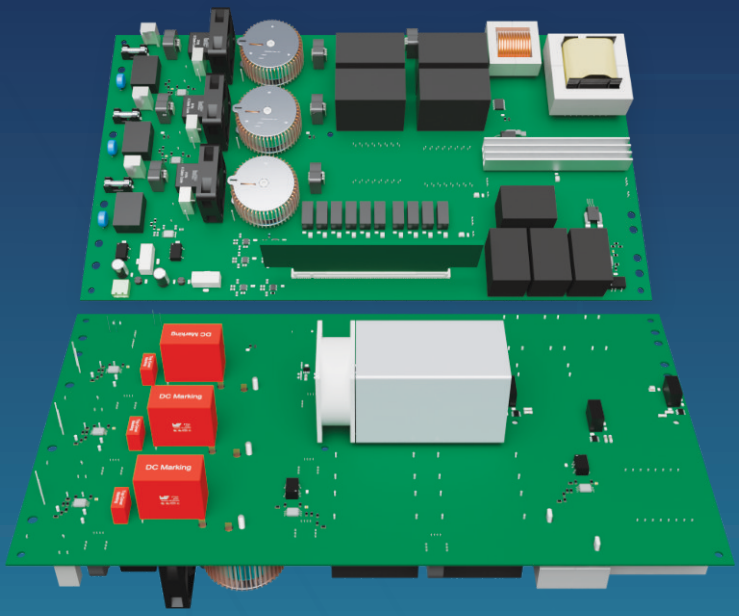
Version 1 | 2025/05/15

USE CASE

Hardware Platform

Designed on a single-board featuring:

- Full SiC AC-DC converter, including:
  - input relay at each phase
  - passive input EMC filter
  - three-phase bidirectional PFC stage for universal input
- Full SiC DC-DC converter based on Dual-Active-Bridge with ferrite transformer for galvanic isolation
- Polypropylene film capacitors in DC circuits used to avoid issues related to use of electrolytic capacitors
- Separate power + measurement and control board
- Full galvanic isolation between power/measurement and control-board
- External water-cooling or forced-air cooling with integrated long-life fans



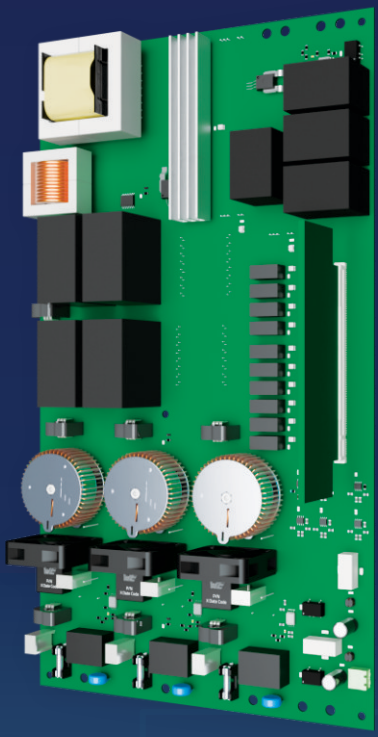
USE CASE

SiC Power Stage

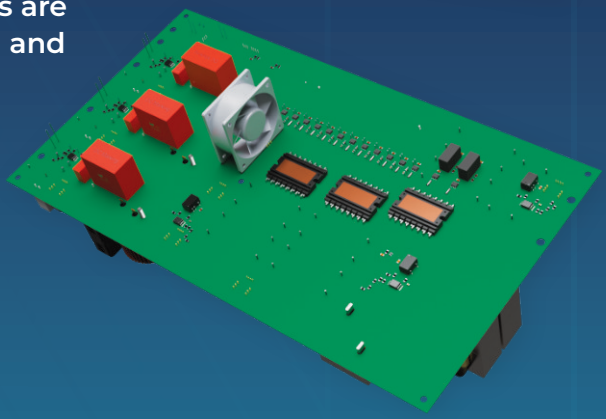
A full SiC-MOSFET power stage provides improved efficiency and smaller volume.

The application of top-side cooled compact semiconductor modules and transistors offers additional advantages:

- Lower board space
- Lower losses due to paralleling transistors on high-current side of DC-DC converter
- Top-side cooling for easier and cost-effective assembly of heatsinks
- Separate power + measurement and control board
- Better integration of switches for decreased stress and EMI issues



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

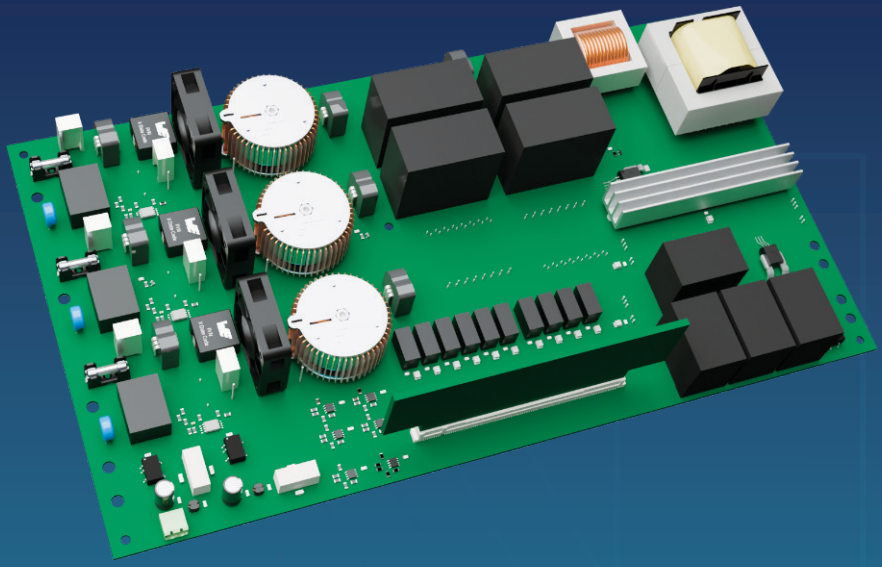


USE CASE

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 a CAN interface
- Wide-range of additional communication capabilities



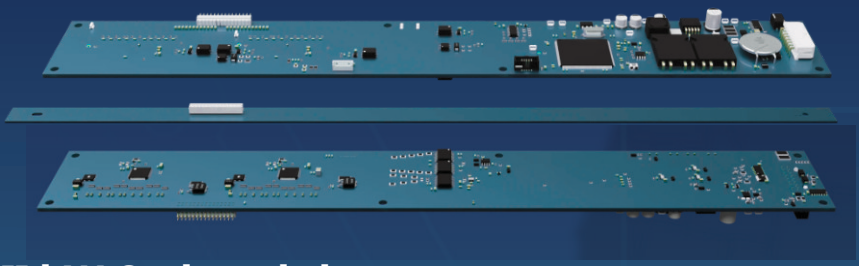
Customization

The OBC can be customized to fit the specific design requirements. As the design owners, we can easiliy modify the solution according to:

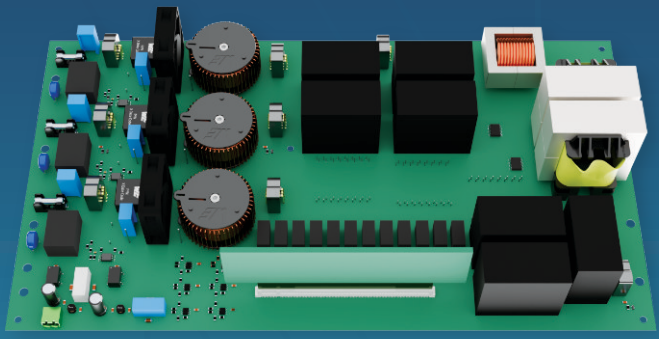
Design	single-board or modular, for space-saving design
Cooling type	forced-air or water based
Stacking	possible, to increase the output power level

See also:

Battery Management System for eMobility



11 kW On-board charger



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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.

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300+ SUCCESSFUL PROJECTS
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180+ EMPLOYEES