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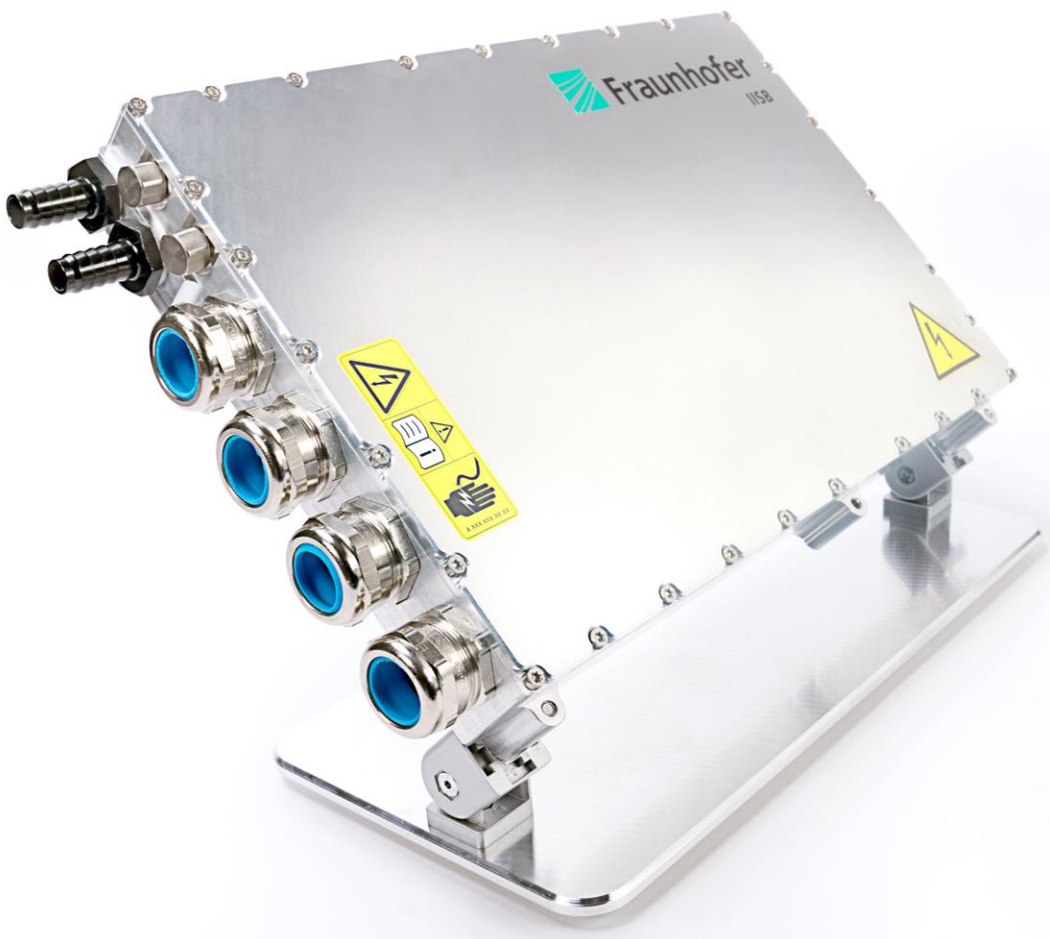
FRAUNHOFER INSTITUTE FOR INTEGRATED SYSTEMS AND DEVICE TECHNOLOGY

Full SiC Traction 600 A DC-DC Converter

for Electric, Hybrid, and Fuel Cell Vehicles



Description

This Full SiC 6 Phase Half Bridge converter is suitable for electrical power train application. It's topology can provide bidirectional power transfer connecting a super cap or a fuel cell to a drive inverter.

By it's SiC technology, it can deliver currents of 400 A continuous at high voltages of at least 850 V. It is capable of a high overdrive for several minutes, providing extra power for braking or acceleration.

It's high performance FPGA based digital control can handle very high dynamic distortion and reference values and is fully configurable by the Fraunhofer IISB team based on system theory approaches as well as by the customer for tuning real time on the testbench or in the electric vehicle.

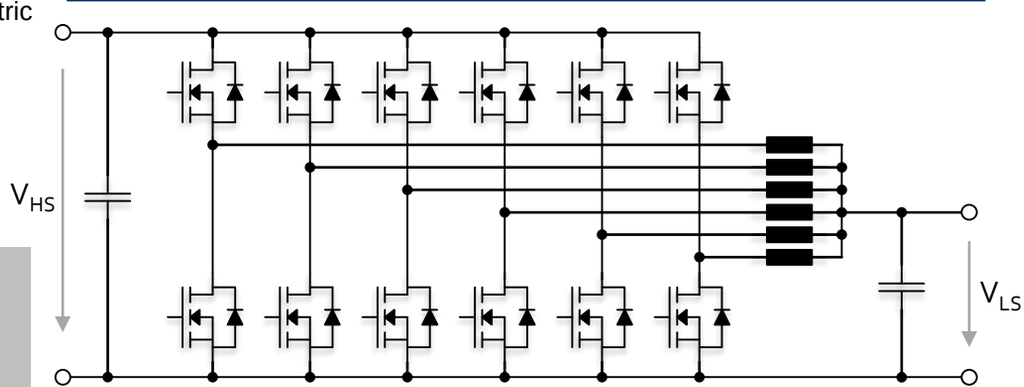
Technical Data

Highside Voltage Range V_{HS}	20 to 850 V
Lowside Voltage Range V_{LS}	10 V to V_{HS}
Lowside Current peak	600 A (5 min)
Lowside Current	400 A
Maximum Output Power	360 kW (@ 600 V Input Voltage)
Coolant Temperature	-25°C to 85 °C
Switching Frequency	100 kHz
Dimension	~40 x 25 x 5 cm³ (~5 dm³)
Weight	~12 kg
Power Density	> 50 kW/dm³
Efficiency	98 - 99 %
Isolation	2,4 kV

Features

- High power density
- Wide input and output voltage range
- High efficiency
- Overload features and temperature derating
- Over current protection
- Phase switch-off function for high light load efficiency
- Wide coolant temperature range
- Fully digital controlled via CAN-Bus
- Programmable control loop parameters
- Active discharge of capacitors
- EMI filtered auxiliary voltage input (12 or 24 V systems)
- High isolation voltage between HV-net and housing

Topology and Technology



The converter is designed for fixed-frequency hard switching. To minimize hard-switching loss, low inductive cells and module integrated gate drivers are used. Oszillations are minimized by optimized parasitic element constellation as well as distributed RC-Snubbers.
The benefit of this hard-switched technology is zero blind loads compared to resonant converters. It also allows a wide range of voltages, currents and conversation ratio.

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