



System Solution Guide - Preview

Ultra Fast EV Charger



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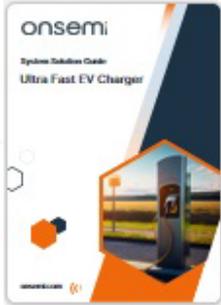
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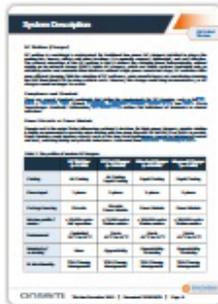
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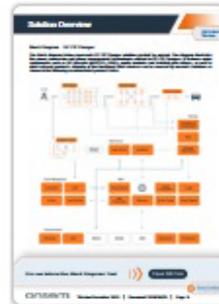
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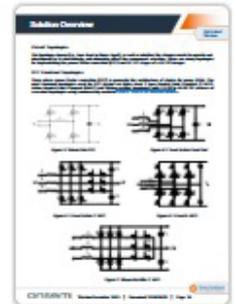
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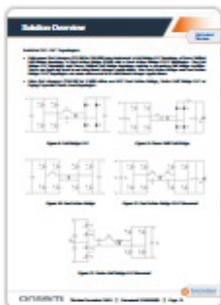
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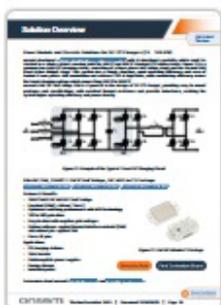
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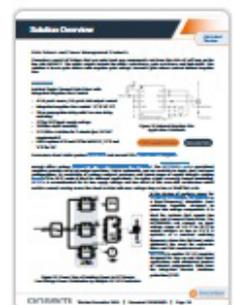
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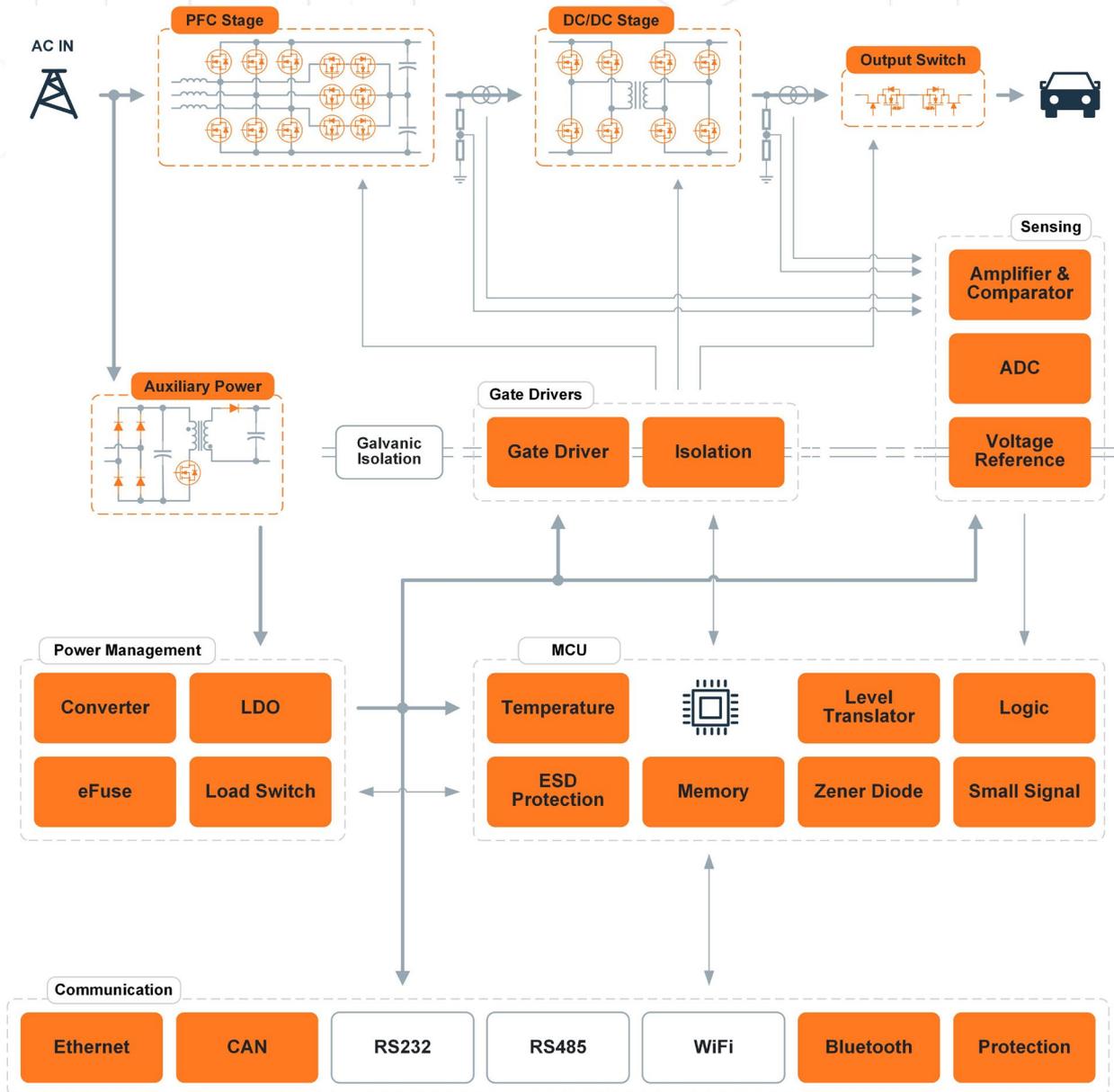
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Block Diagram - DC EV Charger

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Block Diagram - DC EV Charger

The block diagram below represents DC EV Charger solution created by **onsemi**. The diagram illustrates the power conversion and power management technologies utilized in DC EV Chargers. It features major components such as SiC discrete MOSFETs, IGBTs, power modules and isolated gate drivers, as well as other relevant products. Majority of the functional block devices can be sourced by **onsemi's** solutions as shown in the following recommended product tables.



Use our Interactive Block Diagrams Tool



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Evaluation Board & Reference Design

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Reference Design & Evaluation Board

onsemi delivers comprehensive system-level solutions for DC EV chargers. These platforms are engineered to accelerate development, simplify design validation, and ensure optimal performance for high-power charging applications. By integrating advanced semiconductor technologies with robust system architecture, **onsemi** provides a complete ecosystem that enables faster time-to-market and superior reliability.

100 kW Demo Design for MegaWatt DC Charging

onsemi's 100 kW DC Fast Charger (DCFC) reference design redefines high-power EV charging. It features the first 100 kW EV-C power module with high-voltage capability and bi-directional power flow for V2G applications. Delivering peak efficiency above 97% at 480 Vac and maintaining 96–97% across conditions, it supports an extended 400–1500 Vdc output range for ultra-fast charging of next-gen EVs, eBuses, and eTrucks. Optimized for parallel and serial configurations, the design ensures broad battery compatibility and meets EN55011 and FCC Class A harmonic standards for global compliance.

Featured Products:

- [NXH008T120M3F2PTHG](#) – T-NPC module
- [NXH003P120M3F2PTNG](#) – DAB module
- [NCD57000](#) / [NCP51752](#) – Gate drivers with isolation and negative bias

[Find More Details](#)

Evaluation Kit | [SEC-25KW-SIC-PIM-GEVK](#) Full SiC 25 kW DC EV charger platform

SEC-25KW-SIC-PIM-GEVK is a reference design kit for 25kW fast DC EV charger based on SiC power integrated module. This full SiC solution consists of PFC and DC-DC stages featuring multiple 1200V, 10 mohm half-bridge SiC modules.

Key Features:

- $V_{in}=400VAC$ (EU)/ $480VAC$ (US), $V_{out}=200VDC - 1000VDC$
- Max output power=25kW, efficiency > 96%
- Three-Phase PFC and DAB enables bidirectional power conversion for 400V / 800V battery
- Multiple protecting functions and communication interfaces
- Following EN55011 Class A & IEC 61851
- Compatible with the Universal Controller Board (UCB) FPGA/ARM
- [NXH010P120MNF1](#) - SiC Module, half bridge, 1200V, 10 mohm SiC M1 MOSFET
- [NCD57000](#) - Isolated high current and high efficiency gate driver

[Find Reference Design](#)

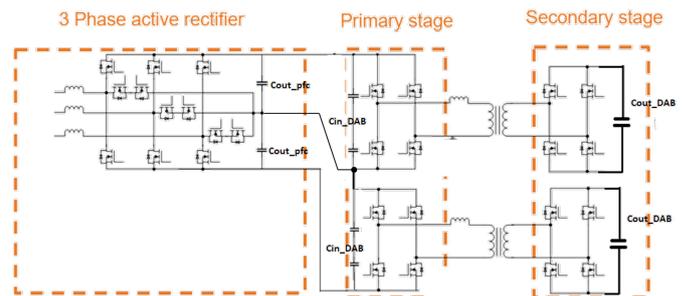
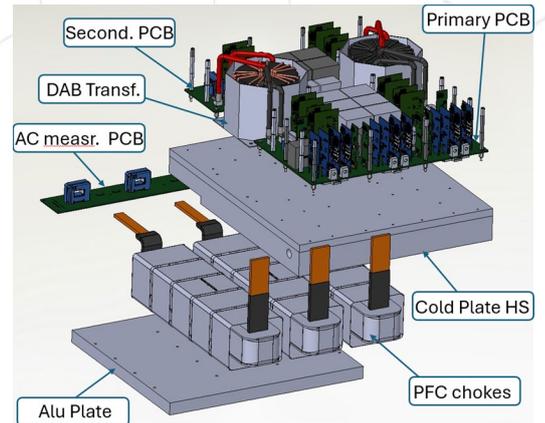


Figure 13: 100kW DCFC Schematic

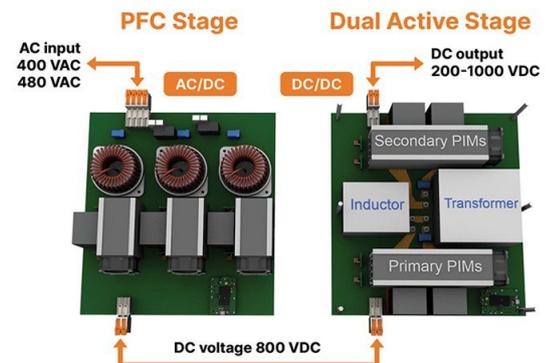


Figure 14: SEC-25KW-SIC-PIM-GEVK

Solution Recommendations

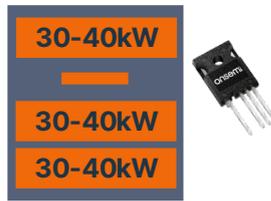
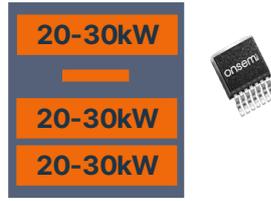
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Solution Recommendations for DC EV Charger

The DC EV Charger market encompasses various use cases, catering to different power levels and charging times for residential and commercial applications.

As a proven leader in power semiconductor industry, **onsemi** offers tailored solutions for DC fast charging (DCFC) applications, providing comprehensive recommendations for various power levels. From DC Wallbox systems under 22 kW to Ultra-fast EV Charging systems above 350 kW, **onsemi's EliteSiC** MOSFETs and Field Stop 7 IGBTs ensure higher efficiency and power density, together with the isolated gate drivers enhancing safety and reliability.

Table 3: **onsemi's** Solution Recommendation

DC EV Charger Power Level	Phase Input	Discrete Solutions	Module Solutions	Gate Driver Solutions
> 350 kW (Ultra-fast EV Charger)	3-phase	Generally, not preferred for high power	 50-100kW 50-100kW 50-100kW F2 PIM	NCP51563/ NCP51561 <ul style="list-style-type: none"> Isolated Dual channel - dual low side / high-side or half-bridge
150 - 350 kW	3-phase	 30-40kW 30-40kW 30-40kW	 30-40kW 30-40kW 30-40kW F1, F2	NCP51563/ NCP51561 <ul style="list-style-type: none"> Isolated Dual channel - dual low side / high-side or half-bridge
50 - 150 kW	3-phase	 20-30kW 20-30kW 20-30kW	 20-30kW 20-30kW 20-30kW F1, F2	NCP51752/ NCP51152 <ul style="list-style-type: none"> Isolated Single channel (with integrated negative bias)
< 22 kW (DC Wallbox)	1-phase	<ul style="list-style-type: none"> 1200V FS7 IGBT 650V & 1200V M3S & M3P EliteSiC MOSFET 	Generally, not preferred for low power	NCP57080/ NCP57090 <ul style="list-style-type: none"> Isolated Single channel

Ultra Fast EV Charger

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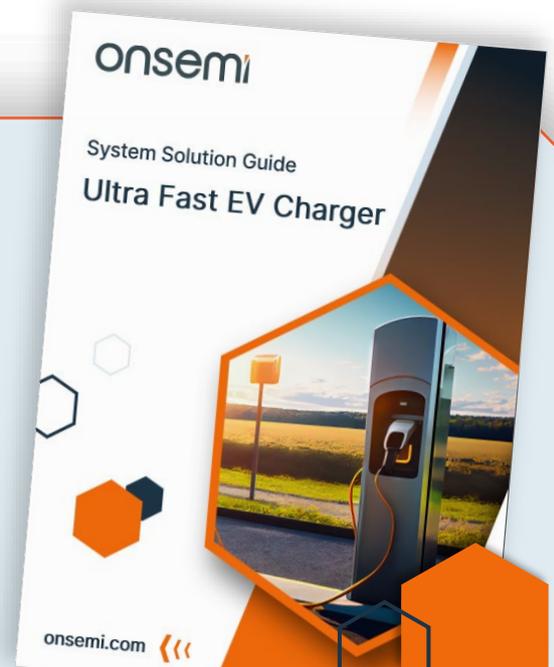
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