System Solution Guide - Preview

USB-C Battery Charger

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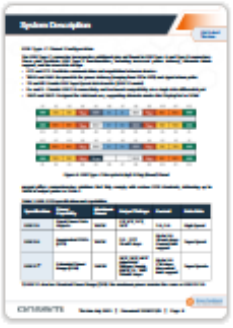
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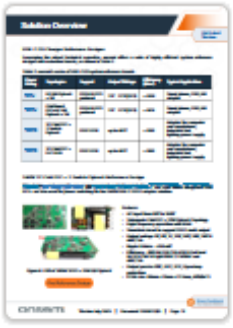
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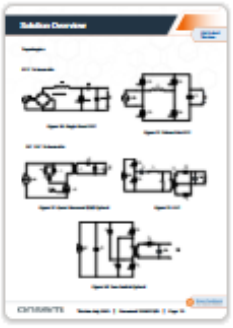
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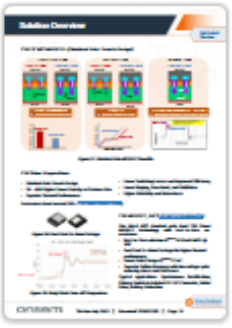
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Block Diagram - USB-C Battery Charger

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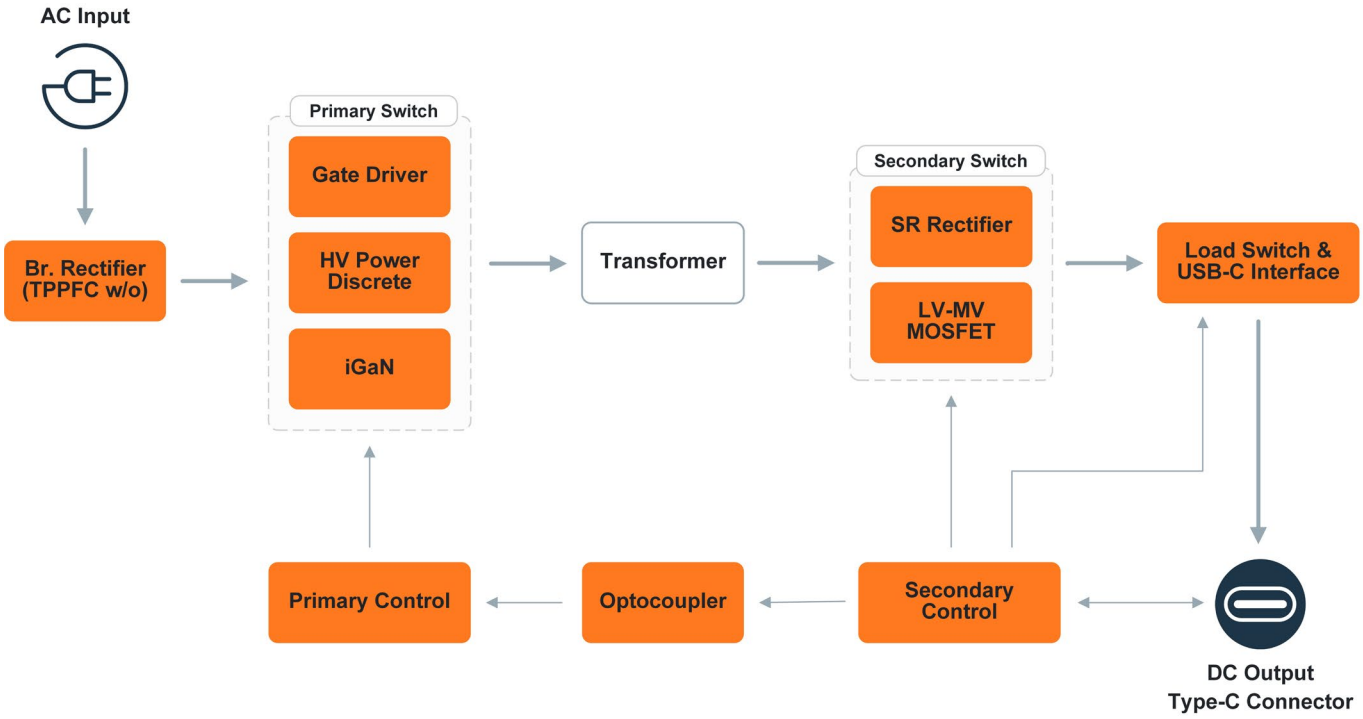
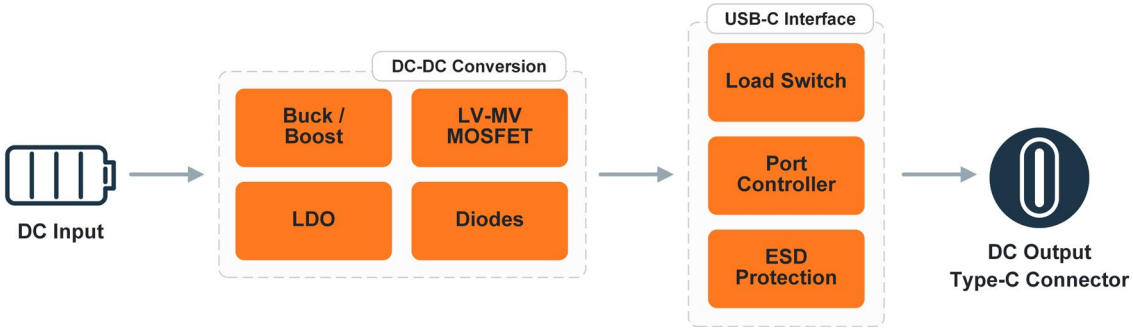
Block Diagram - USB-C Battery Charger

The block diagram below represents USB-C Battery Charger solution created by **onsemi**. The diagram illustrates the power management and power conversion technologies utilized in USB-C battery chargers. It features components such as the TP PFC controller, High-Frequency Quasi-Resonant Flyback / LLC controllers, gate drivers, synchronous rectification, as well as iGaN and MOSFET devices. These elements are categorized into primary and secondary stages to enhance system efficiency. Majority of the functional block devices can be sourced by the **onsemi** solutions as shown in the following device tables.

USB-C Battery Charger - AC Input



USB-C Battery Charger - DC Input (Auto)



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USB-C Charger Reference Designs

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USB-C PD Charger Reference Designs

Leveraging the robust technical expertise, **onsemi** offers a suite of highly efficient system reference designs and evaluation boards, as shown in Table 2.

*Table 2: **onsemi**'s series of USB-C PD system reference boards*

Power Rating	Topologies	Support	Output Voltage	Efficiency (Max.)	Typical Application
65 W	HF QR Flyback + SR	PD3.0 & PPS protocol	3 V - 21 V (PPS)	> 93%	Smart phone, PAD, NB adapter
100 W	CrM Boost PFC+HF QR Flyback + SR	PD3.0 & PPS protocol	3 V - 21 V (PPS)	> 92%	Smart phone, PAD, NB adapter
240 W	TP CrM PFC + 2 Switch Flyback	PD3.1 EPR	up to 48 V	> 95%	Adapter for computer and smartphone, Industrial and lighting power supply
240 W	TP CrM PFC + LLC UHD	PD3.1 EPR	up to 48 V	> 96%	Adapter for computer and smartphone, Industrial and lighting power supply

240W TP CrM PFC + 2 Switch Flyback Reference Design

This design used **onsemi**'s power management controllers including TP PFC controller, HF QR Flyback controller, half-bridge gate driver and synchronous rectified controller. The Gate driver integrated GaN FETs are also used for power switching for the 240W USB-C PD3.1 adapter solution.

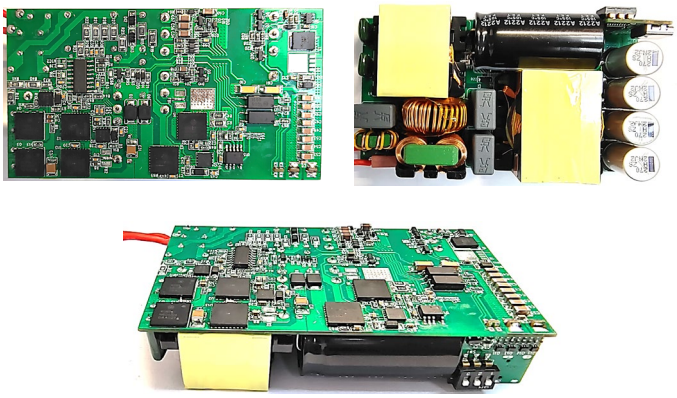

Figure 6: EVB of 240W TPFC + 2SW QR Flyback

Features

- AC input from 90V to 264V
- Totempole CrM PFC + 2SW Flyback Topology
- High Frequency operation with **iGaN**
- Simulated circuit to support PD3.1 multi-output
- Output voltage 5V, 9V, 12, 15V, 20V, 28V, 36V & 48V / 5A
- Ripple & Noise: <150 mV
- Efficiency: AVG 94.75% / 95.43% & Full load 95.12% / 96.17% @115VAC / 230VAC and 48V / 5A
- Output precise OVP, OCP, SCP, Open loop protection
- PCBA size: 89mm x 51mm x 21.5mm, 40W/in^3

Find Reference Design

USB Port Controller

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USB-C Port Controllers

onsemi's USB-C port controllers deliver autonomous operation with high energy efficiency and voltage tolerance, enhancing system stability, performance, and cost-effectiveness. The fully configurable USB-C PD controller is designed for solutions up to 100W and 40x less power consumption than competitors, making them an ideal choice for modern electronic devices.

USB-C PD Controller FUSB302B/T

Target system designers looking to implement a DRP/SRC/SNK USB Type-C connector with low amount of programmability.

Key Features:

- USB Type-C 1.3 and Power Delivery (PD) 2.0, 3.0 Compatible
- Full open-source software support supporting all modes of operation and ARM, Linux and PIC hardware platforms
- Integrated VCONN to CCx Switch
- Robust BMC receiver tolerance
- Multiple product IDs for I2C slave address options
- Family Product Differences
  - FUSB302B - DRP, to enable charging in dead battery
  - FUSB302T - SRC, for power savings in travel adapters
- 14-lead MLP (2.50mm x 2.50mm), -B/T/VMPX
- 9-ball WCSP (1.260mm x 1.215mm), -BUCX

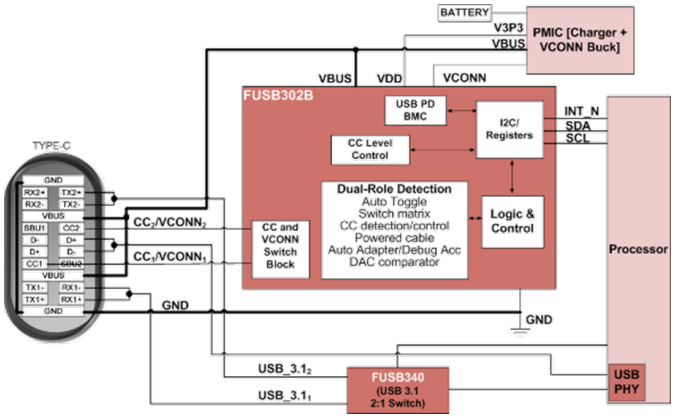
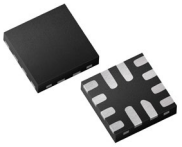


Figure 28: Typical Application Schematic



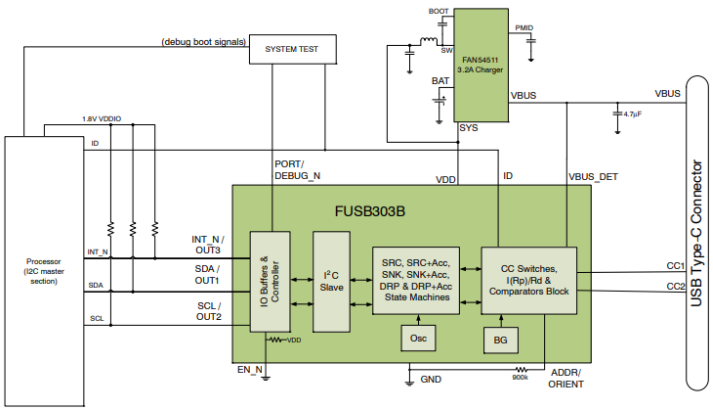


Figure 29: Typical I²C Application Schematic

USB-C Controller FUSB303B

Features configurable address I²C access to support multiple ports per system or it can operate autonomously configured by just pins.

Key Features:

- Fully autonomous configurable Type-C controller
  - Supports USB Type-CTM Specification Release 1.3
  - Configurable as Source, Sink, and DRP roles with Accessory support
  - Source and Sink preferred roles through Try.SRC and Try.SNK
  - Configuration through GPIO or I²C
- Unique detection algorithms to ensure stable attaches with illegal cables and devices
- Robust Max 28V DC and 4 kV HBM ESD on connector pins
- Wide 2.7V to 5.5V VDD supply operation
- 12-ld QFN (1.6mm x 1.6mm x 0.375mm)

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