AVNET SILICA

FOR ENERGY EFFICIENT INNOVATIONS

THINK ON.

USB-C introduction

13th July 2020

Alessandro Maggioni

Agenda

- USB-C/Power Delivery Market and Segmentation
- Why Choose ON Semiconductor USB Type–C Solutions and portfolio
- Reference designs for supporting the designs

Agenda

- **USB-C/Power Delivery Market and Segmentation**
- Why Choose ON Semiconductor USB Type–C Solutions and portfolio
- Reference designs for supporting the designs

USB Evolution

1996	1998	2000	2008	2013-2016	2017-2018
USB1.0 1.5Mbps Low Speed	**USB1.1** 12Mbps Full Speed	**USB2.0** 480Mbps Hi Speed 2.5W Charging	**USB3.0** Super Speed: 5Gbps 7.5W Charging	**USB3.1** Super Speed+ Gen1 : 5 Gbps Type-C Gen2: 10 Gbps Type-C USB PD: 2.0 100W Type C: 1.2	**USB3.2** 20Gbps Super Speed+ USB PD: 3.0 (PPS) 100W Type C: 1.3

3 Specifications:

USB 3.x:	~ 630 pages
PD:	~ 599 pages
Type C:	~ 240 pages

Lot to Digest...
On Semiconductor can help

USB PD Programmable Power Supplies (PPS)

PPS Advantage:

Finer Voltage/Current granularity. This helps to optimize Charging Efficiency between the Source and Sink (phone/tablet).

PD Specification:	Power Capabilities	Voltage (V):	Current (A):
2.0	Fixed PDO's	5, 9, 15, 20	3A, 5A
3.0	PPS (Programmable Power Supply)	3.3 – 21, 20mV steps	Up to 5A, 50mA steps

Table 10-8 Programmable Power Supply Voltage Ranges

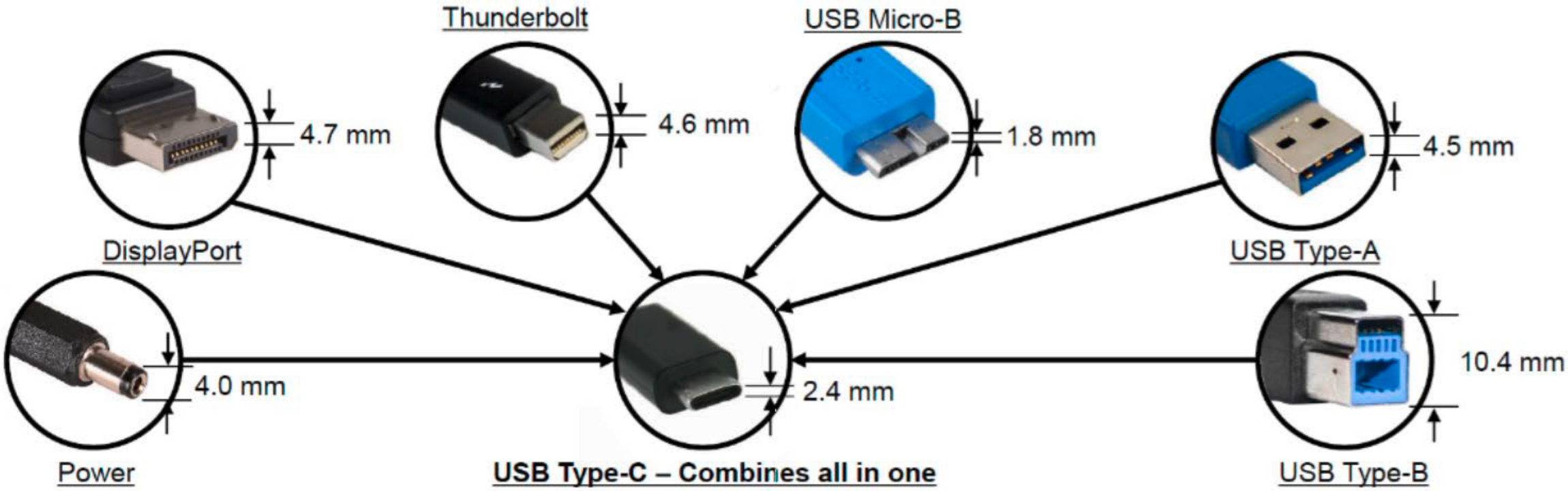
	Fixed Nominal Voltage			
	5V Prog	9V Prog	15V Prog	20V Prog
Maximum Voltage	5.9V	11V	16V	21V
Minimum Voltage	3V	3V	3V	3V

A maximum limit of 7 PDO's (Power Data Object), used to expose a Source Port's Power capabilities or a Sink's power requirements, can be transmitted within a message.

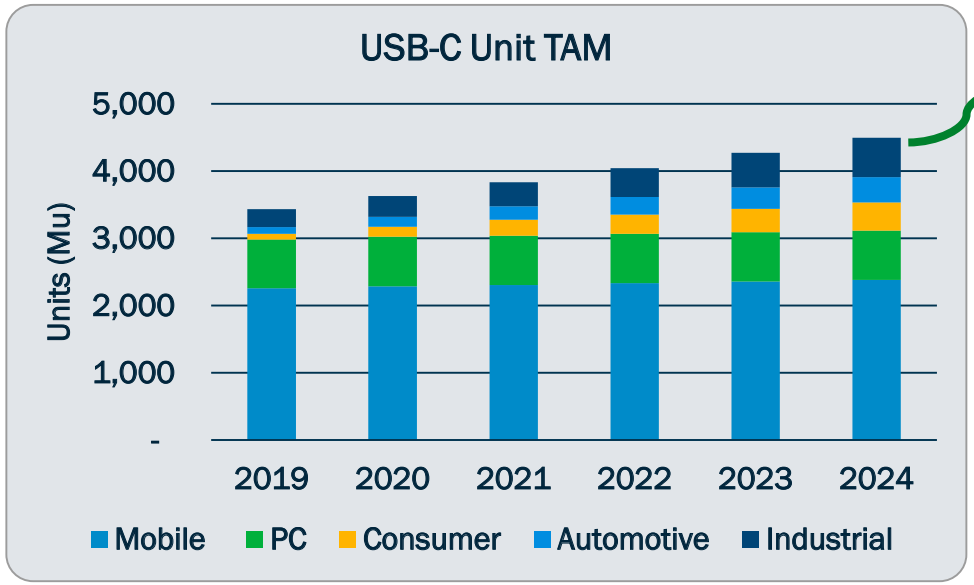
Table 6-22 Programmable Request Data Object

Bits	Description
B31	*Reserved – Shall* be set to zero
B30...28	Object position (000b is *Reserved* and *Shall Not* be used)
B27	*Reserved – Shall* be set to zero
B26	Capability Mismatch
B25	USB Communications Capable
B24	No USB Suspend
B23	Unchunked Extended Messages Supported
B22...20	*Reserved - Shall* be set to zero.
B19...9	Output Voltage in 20mV units
B8...7	*Reserved - Shall* be set to zero.
B6...0	Operating Current 50mA units

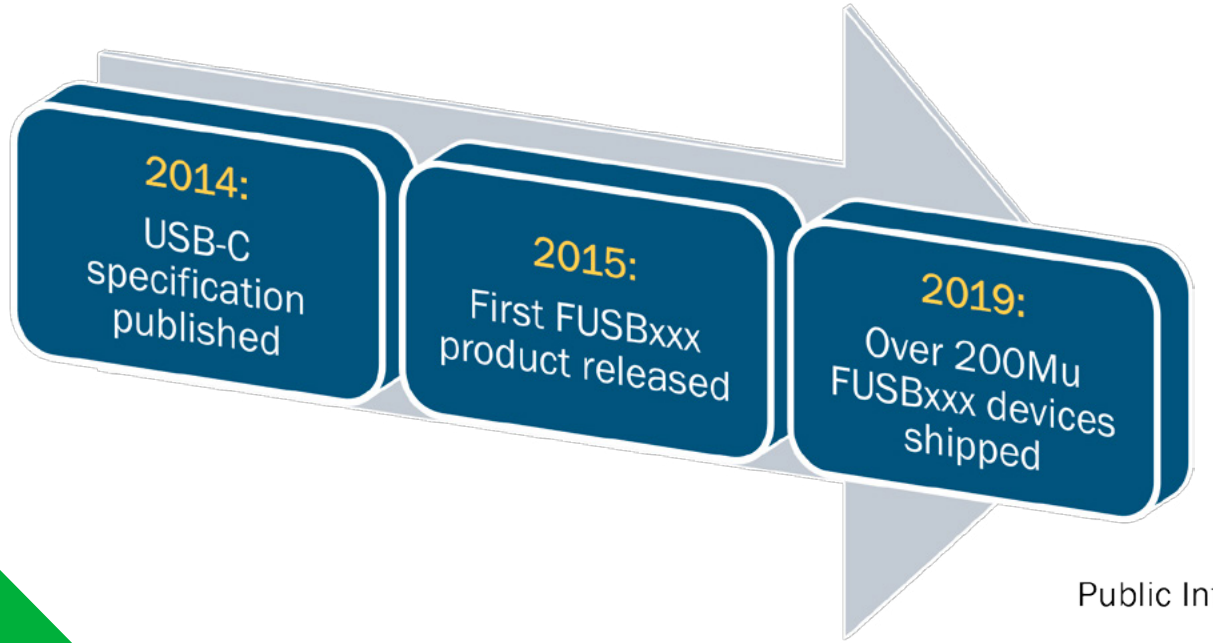
Value Proposition: USB Type-C… the universal connector



ON Semiconductor's Leadership in USB-C



4.5B units by 2024!



Solutions for all applications

- Programmable solutions for flexibility
- Fully integrated solutions for ease of implementation
- Switches for HV protection and audio performance

World class performance

- Lowest controller standby power
- Programmability through I2C to reduce MCU redundancy
- State machine based solutions to minimize power consumption

USB-C Standards Experts

- Early adopter of USB-C and seats on initial committees
- Current seats on multiple committees across key application areas
- Knowledge to anticipate spec changes

USB-C/Power Delivery Market

Automotive

DC-DC Converter
NCV81599
PD Controller
FUSB30xBV
FUSB302xV
FUSB3307
FUSB252TV

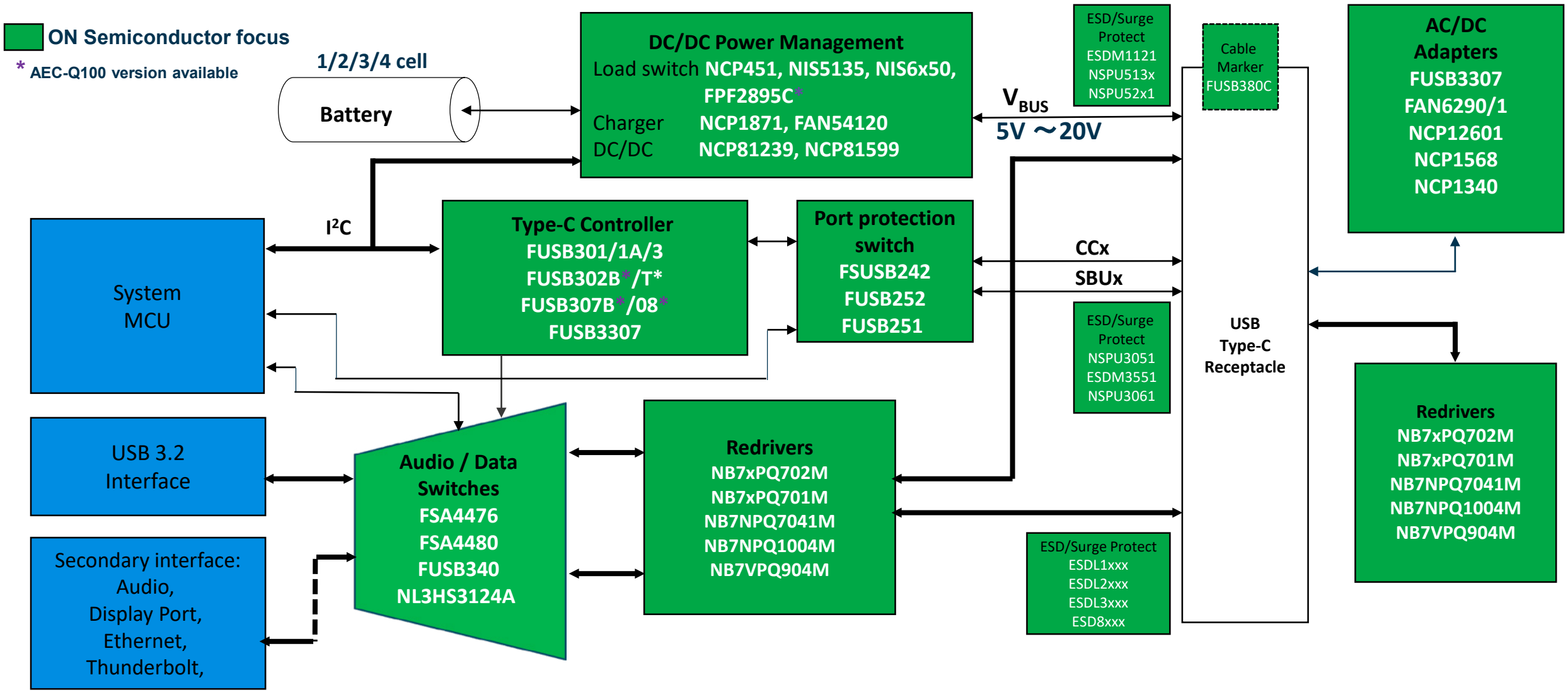
Industrial/Home appliance

AC-DC Converter
NCP1342
NCP12601
PD Controller
FUSB3307
FUSB30X
FUSB251
PD TA Device
FAN6390

Portable/Consumer

DC-DC Converter
NCP81599
PD Controller
FUSB302B

ON Semi USB Type-C/PD System Diagram



Agenda

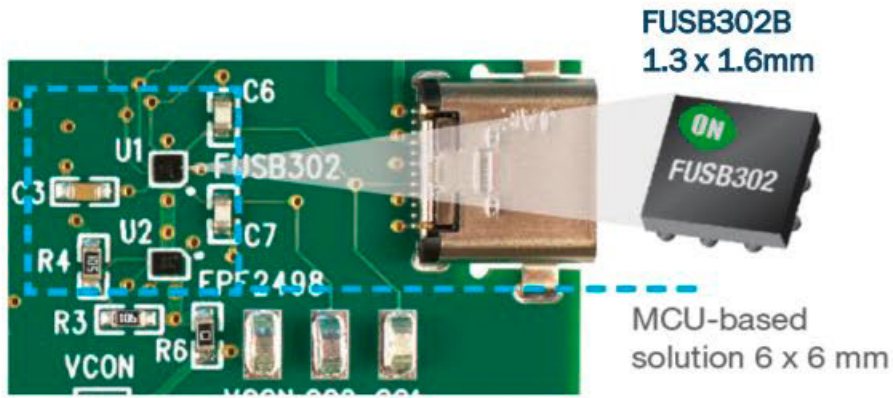
- USB-C/Power Delivery Market and Segmentation
- **Why Choose ON Semiconductor USB Type–C Solutions and portfolio**
- Reference designs for supporting the designs

On Semiconductor
USB Type C/PD Production Products

Why Choose ON Semiconductor USB Type–C Solutions

Compatibility and Flexibility

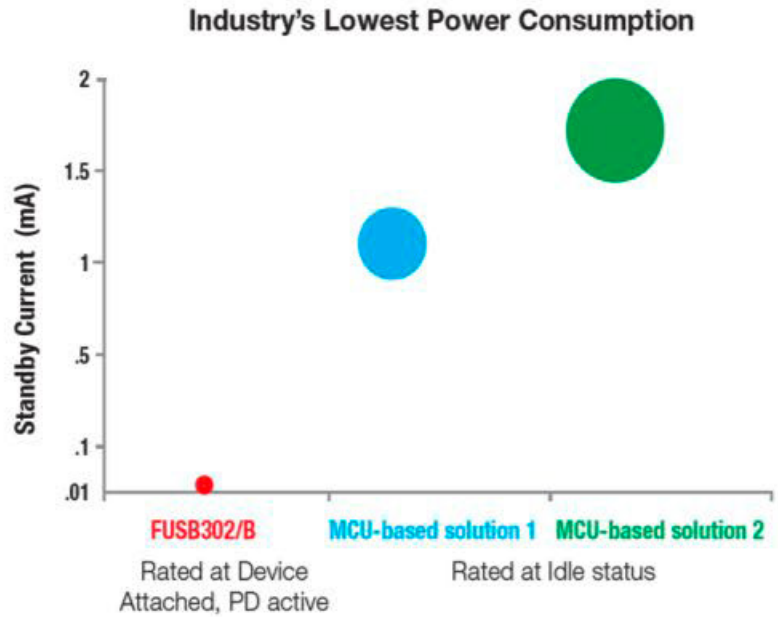
- Support latest Type-C and PD specifications
- Open source reference code which allows customer customizations
- Reference code maintained to latest USB PD compliance requirements
- Easy to integrate into the End System
- Lower system cost due to I2C interface



On Semi Solutions are the smallest on the market, 95% Smaller than MCU-based solutions

Market Leader

- In production in > 50 customers' solutions
- Automotive quality products available
- Smartphones, tablets, computers, dongles, cameras, powerbanks, hubs, drones, wall outlets ...

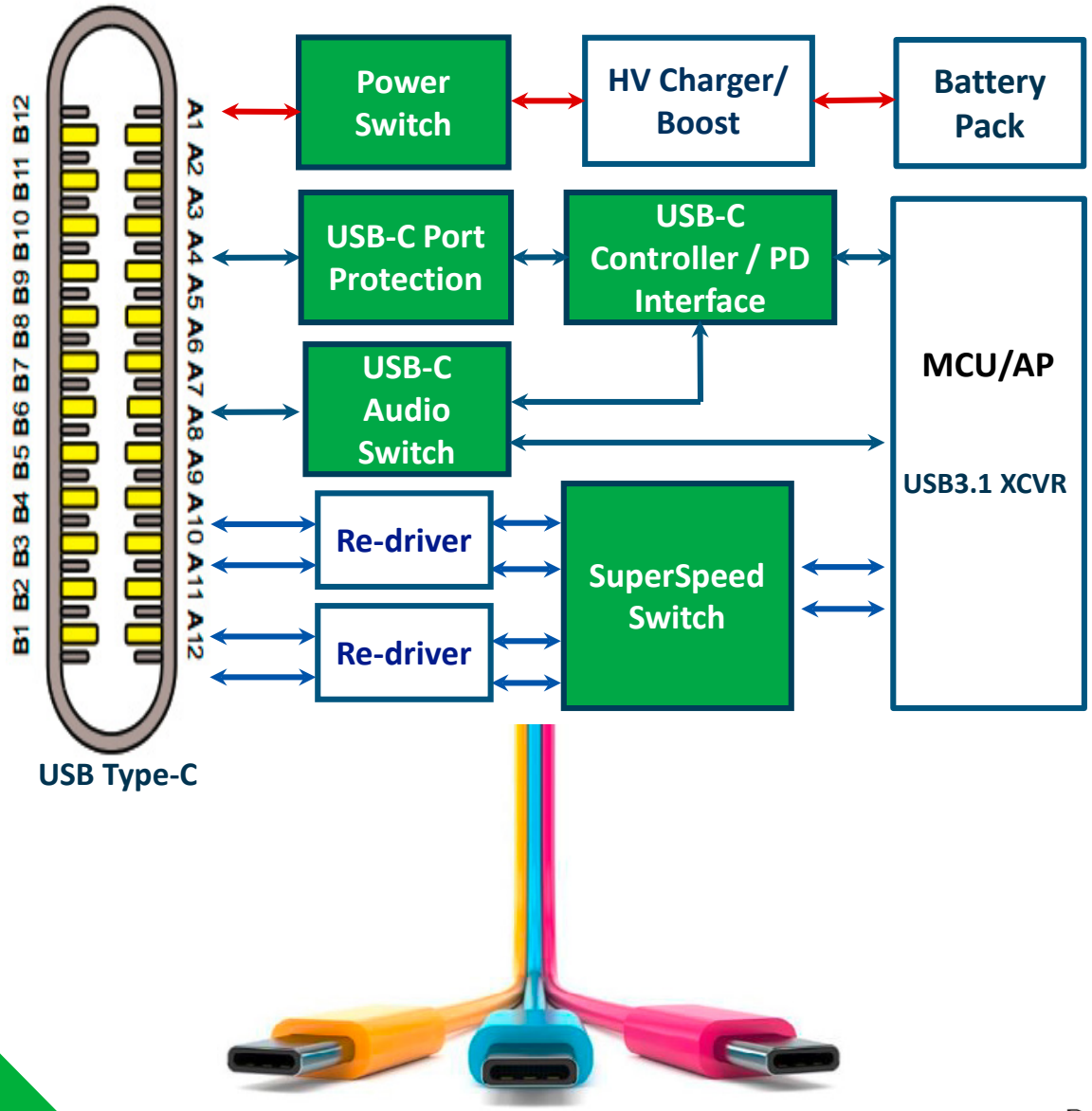


Ultra low power On Semi solutions preserve mobile device battery life

Complete solution for Type-C and USB PD

- Type-C and PD Controllers
- SuperSpeed Switches
- Port Protection
- Factory Testing and Debug

USB-C & PD Interface Products



Product Type	Product Number	Competitive Advantage
USB-C Only Controller	FUSB303	Small controller with power consumption 10x lower than competitors and compatible with the latest USB-C spec release 1.3.
USB-C PD Controller	FUSB302B/T	Full PD controller for solutions up to 100W and 40x power less than competitor. Automotive version also available.
	FUSB307B/08B	Full TCPC and PD 3.0 controller for multi port solutions including SNK/ SRC control lines and accessory debug. Automotive version also available.
	FUSB3307	Fully Autonomous & Compliant Rev 1.3 Type-C and Rev 3.0 Power Delivery with PPS Solution for DC-DC and AC-DC Power Sources
USB-C PD Cable Marker	FUSB380C	Full PD cable marker for passive and active cables with 28V tolerance on CC and VCONN pins. 5X customer programmability.
Dataline Protection Switch	FUSB251	USB-C CC and SBU High Speed Switch with HV tolerance, moisture detection and integrated IEC 61000 4-2 protection.
USB-C Audio Switch	FSA4480	USB-C switching and protection for analog audio while providing OMTP/CITA detection and pop suppression.
USB-C SS Switch	FUSB340	SuperSpeed switch compliant with USB 3.1 Gen2 data rates of 10Gbps. Small footprint and low power consumption
VBUS Protection Switch	FPF2895	28V/5A ILIM Switch w/ OVP & TRCB. Tolerant to HV on both sides without extra protection. Fully supports USB-C with PD

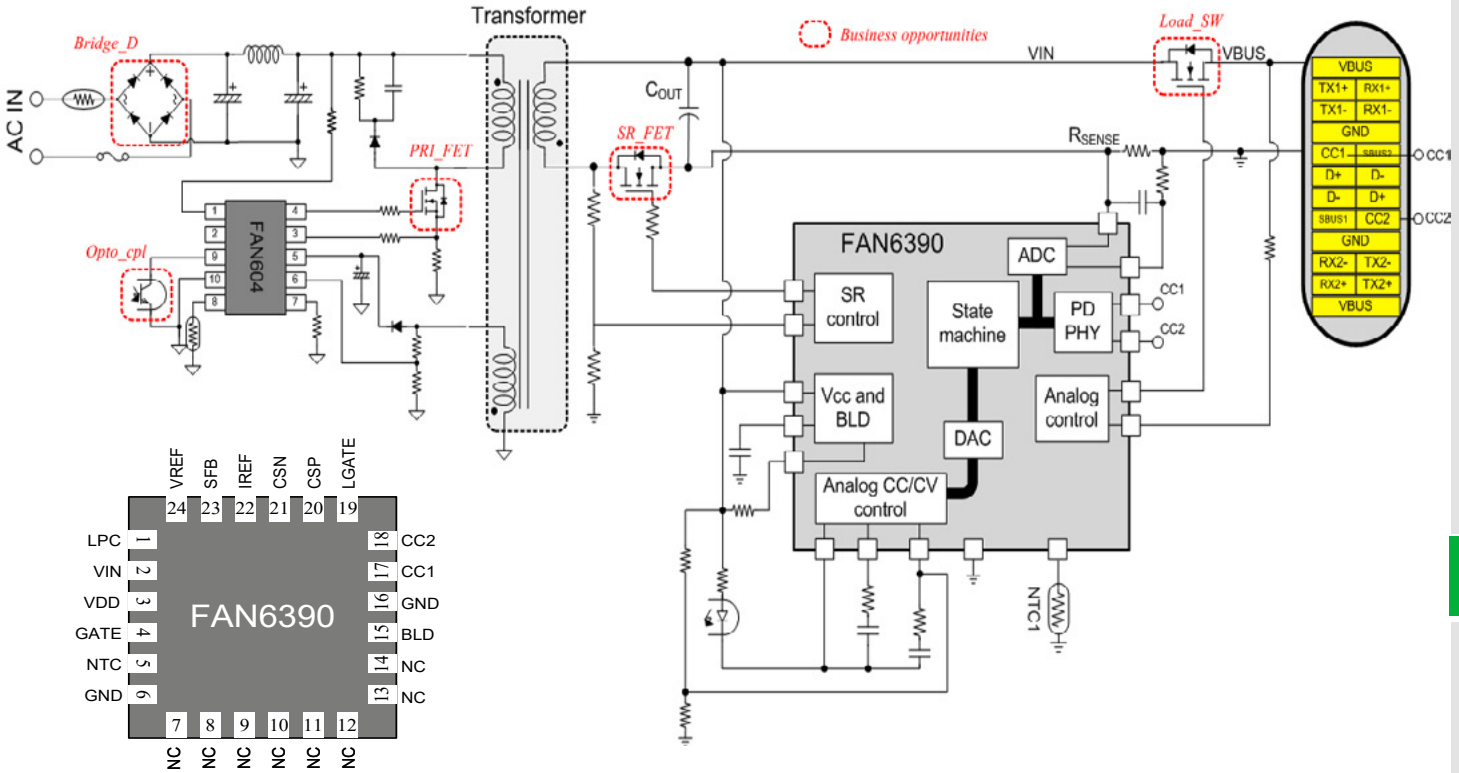
FAN6390

USB PD PPS protocol state machine controller with SR

In Production

Benefits

- USB PD3.0/PPS State Machine Engine
- Embedded SR Controller with Competitive Performance versus Independent SR Controller
- Support Low Cost N-FET for Load Switch



Features

- USB PD3.0 & PPS state machine controller with SR controller embedded
  - USB PD3.0 and PPS by state machine (no firmware required)
  - SR integration for easier secondary side system design
- 10bit DAC support
  - Min 20mV/step CV resolution for 3.3V~21V
  - Min 5mA/step CC resolution for up to 5A
- Support N-FET(back to back) for load SW
- Various options of protection modes for general power regulation and load switch control
- VBUS impedance detection to avoid cable burn-out
- NTC support temperature information
- Use 5mΩ Rsense for high efficiency
- 24-Lead QFNW (4.0mm x 4.0mm)

Applications

- Up To 100W USB PD 3.0 Applications
  - 20V Desktop/Notebook Adapters
  - Up to 20V Wall Outlet Embedded Chargers
  - Car Chargers, Power Banks Source Ports

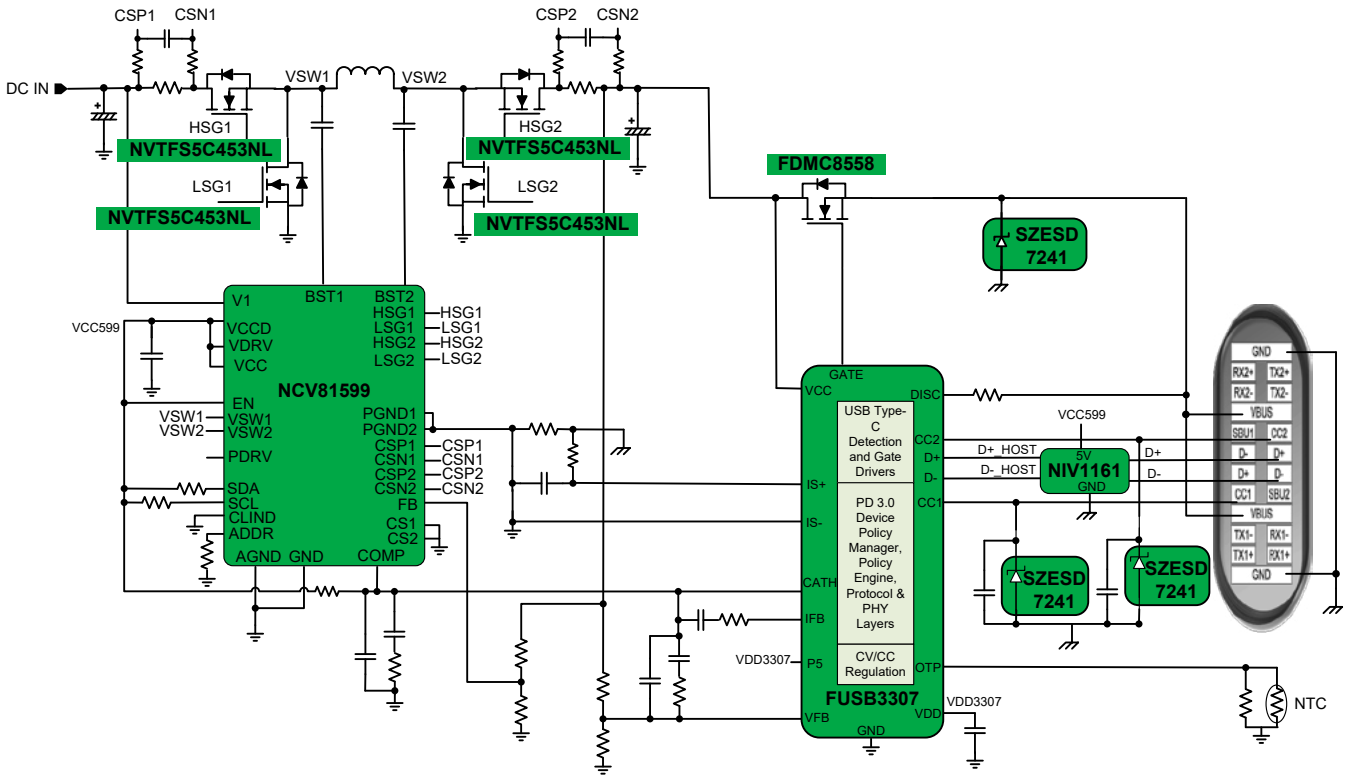
FUSB3307

USB Type-C & Power Delivery 3.0 Source Controller

Samples Now

Benefits

The FUSB3307 Enables a Fully Autonomous & Compliant Rev 1.3 Type-C and Rev 3.0 Power Delivery with PPS Solution for DC-DC and AC-DC Power Sources Delivering Pin Programmable Power From 16W to 100W



Features

- Full Autonomous PD 3.0 v1.2 Source
- VBUS 3V to 21V (20mV Steps); Current 5A (50mA Steps)
- Up to 7 Fixed & Programmable(PPS) Power Data Objects
- 1W Step Factory & Pin Programmable Power Choices
- Constant Voltage / Constant Current Regulation
- VBUS NFET Gate Drivers & VBUS Discharge
- Low Cost Hardware Solution – No MCU Needed
- OVP/OCP/UVP/OTP; VBUS & CC1/CC2 Short Tolerance
- Internal VDD and VCONN Supplies
- Very Low Active Power
- 14-Lead SOIC (8.75mm x 4.0mm x 1.75mm)
- 20-Lead QFNW (4.0mm x 4.0mm)

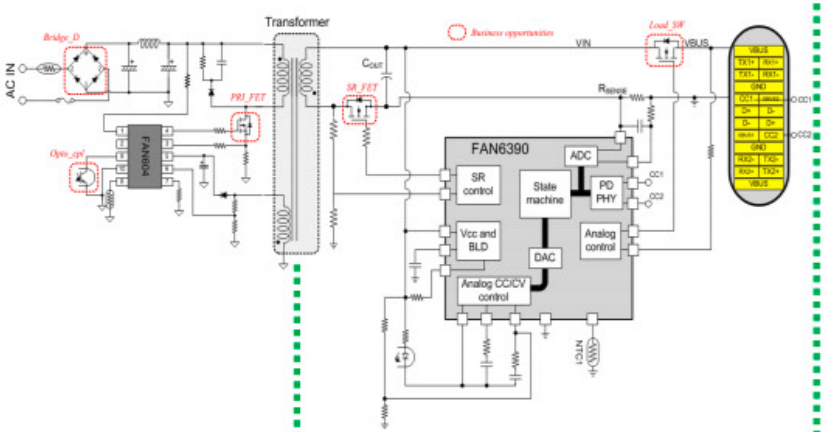
Applications

- Up To 100W USB PD 3.0 Applications
  - 20V Desktop/Notebook Adapters
  - Up to 20V Wall Outlet Embedded Chargers
  - Car Chargers, Power Banks Source Ports

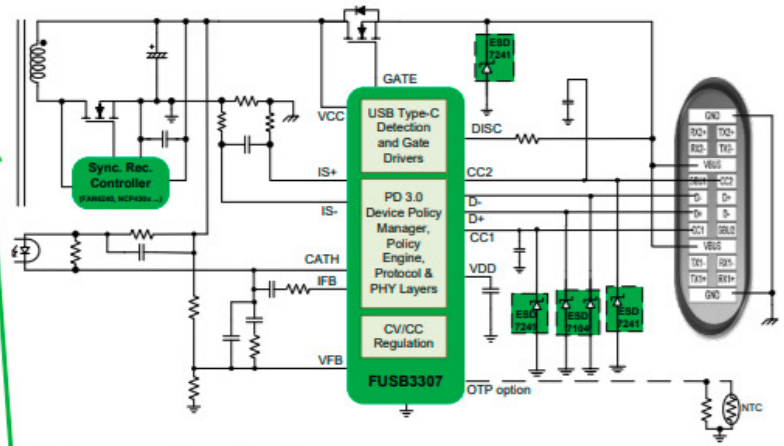
USB Type C/PD 3.0 (PPS) Sourcing Options

Item	Application	Device	Max Power	PPS	20V/5A	Description	Buck/Boost	Samples	Status
1	AC/DC	FAN6390	60W	YES	YES	STATE MACHINE	N/A	YES	RTM
2	AC/DC	FUSB3307	100W	YES	YES	STATE MACHINE	N/A	YES	Q3'20
3	DC/DC	FUSB3307	100W	YES	YES	STATE MACHINE	N/A	YES	Q3'20

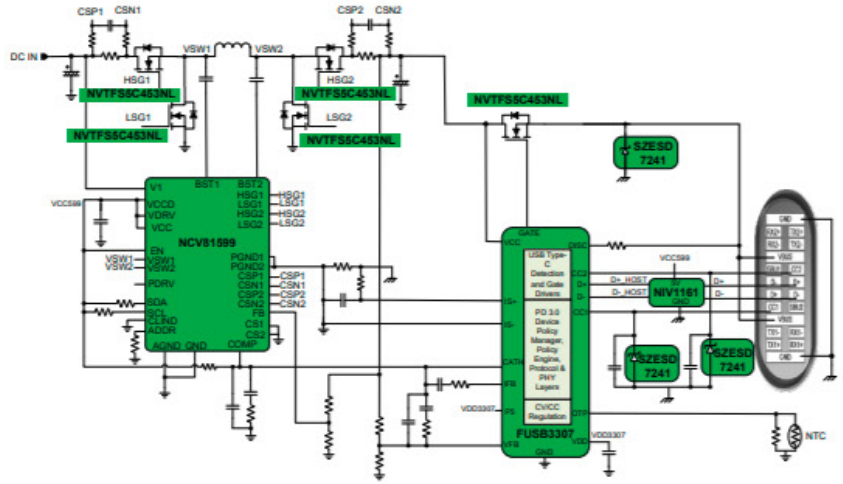
Item #1 (AC/DC):



Item #2 (AC/DC):



Item #3 (DC/DC):



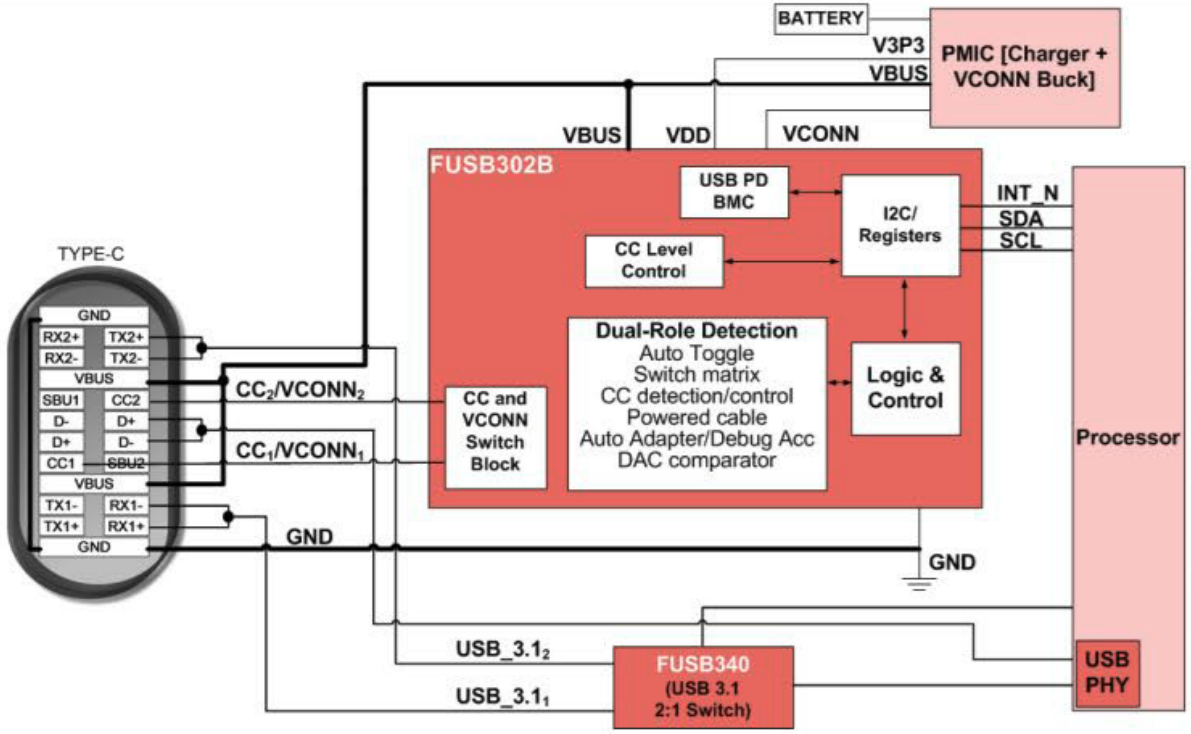
FUSB302B/T/V

Programmable USB Type-C Controller with Power Delivery

In Production

Benefits

- Fully configurable USB PD controller integrating timing critical features of the USB PD specification.
- **Open-source reference code that is configurable to implement all standard features of USB PD.**



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
  - FUSB302V – DRP, AEC–Q100 Automotive Qualified Temperature Grade 2: (–40 C to +105 C)
- 14-lead MLP (2.50mm x 2.50mm), FUSB302B/T/VMPX
- 9-ball WCSP (1.260mm x 1.215mm), FUSB302BUCX

Applications

- Smartphones, Notebooks, Travel Adapters, Source only applications
- Automotive

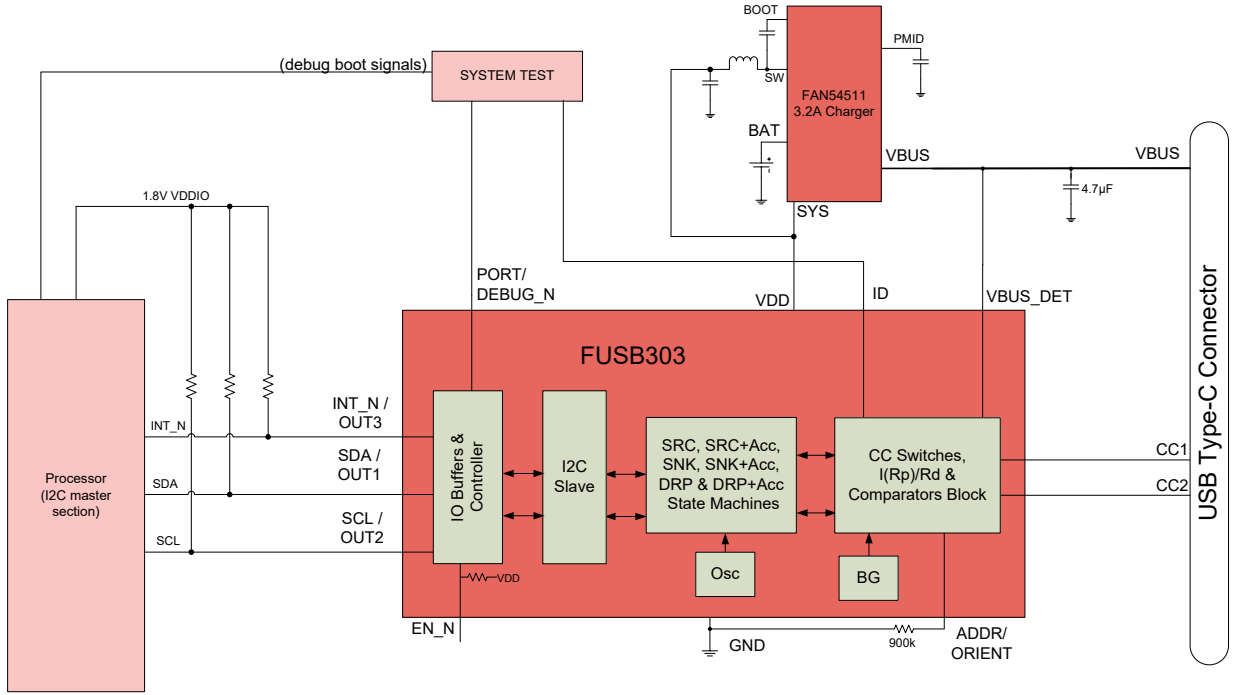
FUSB303B

Autonomous USB Type-C Controller

In Production

Benefits

- **Fully autonomous Type-C controller providing a seamless transition from USB to USB-C**
- Full V1.3 state machines with no software interaction required
- Low power (<10uA) and robust high voltage tolerance



Features

- Fully autonomous configurable Type-C controller
  - Supports USB Type-C™ 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 I^2C
- **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)

Applications

- Smartphones, Tablets
- Laptops, Accessories, Power Banks
- Industrial, Ultraportable Applications

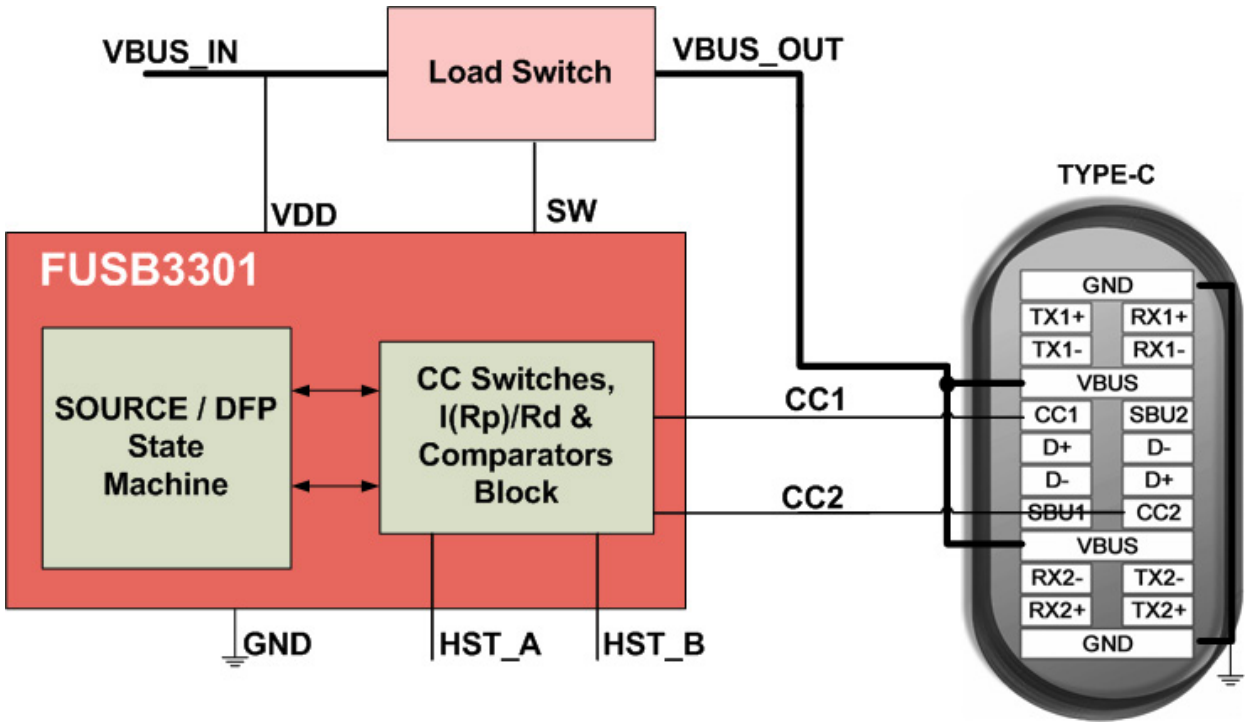
FUSB3301

Source Only Type-C Controller for 5V Power Adapter

In Production

Benefits

- Enables a simple low cost Type-C compliant solution for 15W Power Adapters



Features

- Auto CC detection and control logic
- Supports Type-C Version 1.1
- Selectable Host Current (900mA, 1.5A, 3.0A)
- VBUS Load Switch Enable Output
- Low Standby Power (5µA, typical)
- 10-ld MLP – 0.5mm pitch
  - 3mm(W) x 3mm(L)

Applications

- Travel Adapters, Wall Outlets
- Power Banks, Automotive

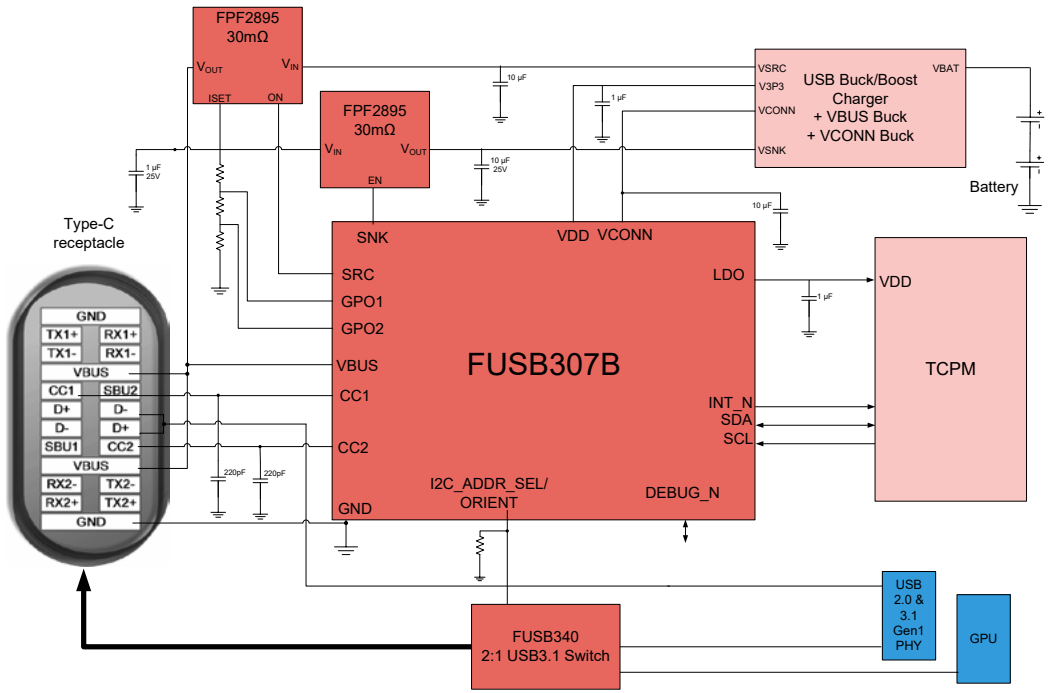
FUSB307B

Programmable USB Type-C Port Controller with Power Delivery

In Production

Benefits

- TCPC compliant USB PD port controller integrating timing critical features of the USB PD specification.
- **Open-source TCPM reference code that is configurable to implement all standard features of USB PD.**



Features

- Certified USB PD 3.0 compliant TCPC port controller supporting
  - USB Type-C Dual-Role Functionality
  - Automatic GoodCRC and Retry Packet Responses
  - Supports All SOP* types
  - VBUS Source and Sink Control with VBUS discharge
  - Integrated VCONN to CCx Switch
  - 2 Programmable GPIOs
  - Debug Accessory Detection and Fast Role Swap supported
- Full open-source software support supporting all modes of operation and ARM, Linux and PIC hardware platforms
- Automotive AEC-Q100, Temp Grade 2
- 16-Lead QFN (3.0mm x 3.0mm)

Applications

- Notebooks, Laptop, Accessories
- Travel Adapters, Automotive

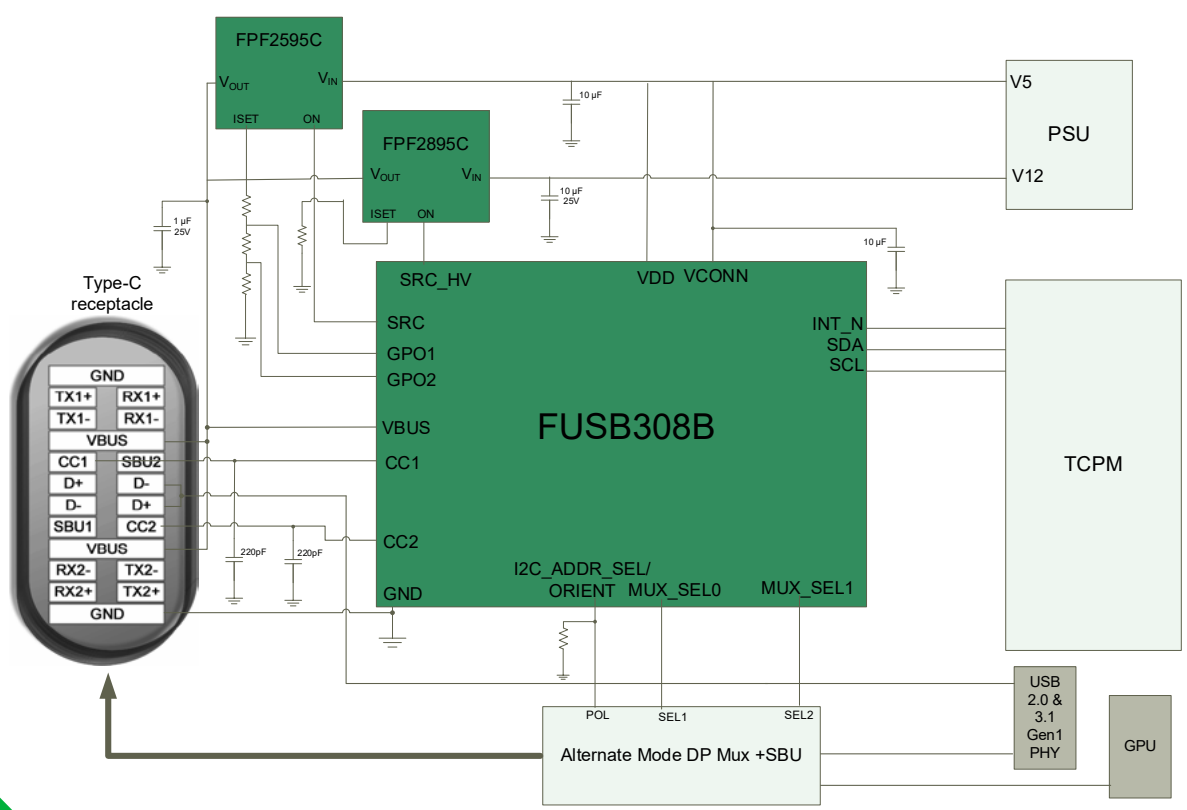
FUSB308BV

Source Specific Programmable USB Type-C Port Controller with Power Delivery

In Production

Benefits

- Discrete solution for integration of four USB Type-C port controllers with USB PD capabilities.
- Compliant with USB PD Inter-Block Specification (TCPC) for a standardized interface with a Type-C Port Manager (TCPM).



Features

- Source application in typical for Type-C 1.3
- USB-PD Inter-Block Specification Support
  - Automatic GoodCRC Packet Response
  - Automatic Retries for Sending Packets
  - All SOP* types supported
- Control for 2 VBUS Sources (5V + High Voltage)
- CC Terminations Disabled when Unpowered
- 16 pin QFN package (0.5mm pitch)
- 2 Programmable GPIOs
- 4 Selectable I2C Addresses for Multiple Ports
- Integrated VBUS ADC and Discharge circuits
- Integrated VCONN to CCx Switch
- Automotive AEC-Q100, Temp Grade 2

Applications

- Automotive Modules
- Source for Adapters
- Source for Desktops
- DRP/Sink for Power Banks & Docks

USB-C Interface Products Home Slide

FUSB303 Outstanding Among Type C Controllers

Features	FUSB303	FUSB301/A	Comp1
Function	CC Controller	CC Controller	CC Controller
Standard Compatibility	USB Type-C Spec 1.3	USB Type-C Spec 1.1	USB Type-C Spec 1.1
Configuration	I2C/GPIO	I2C	I2C/GPIO
CC Pin Voltage Tolerance	28V Max	6V Max	6V Max
Recommended VBUS_DET Voltage	4V-22V	3.7V-21V	Need external resistor
Istand-by (unattached, internal toggling)	20μA Max	20μA Max	70μA Max
Package	1.6mm x 1.6mm x 0.4mm	1.6mm x 1.6mm x 0.4mm	1.6mm x 1.6mm x 0.4mm

FUSB30X PD System Integration

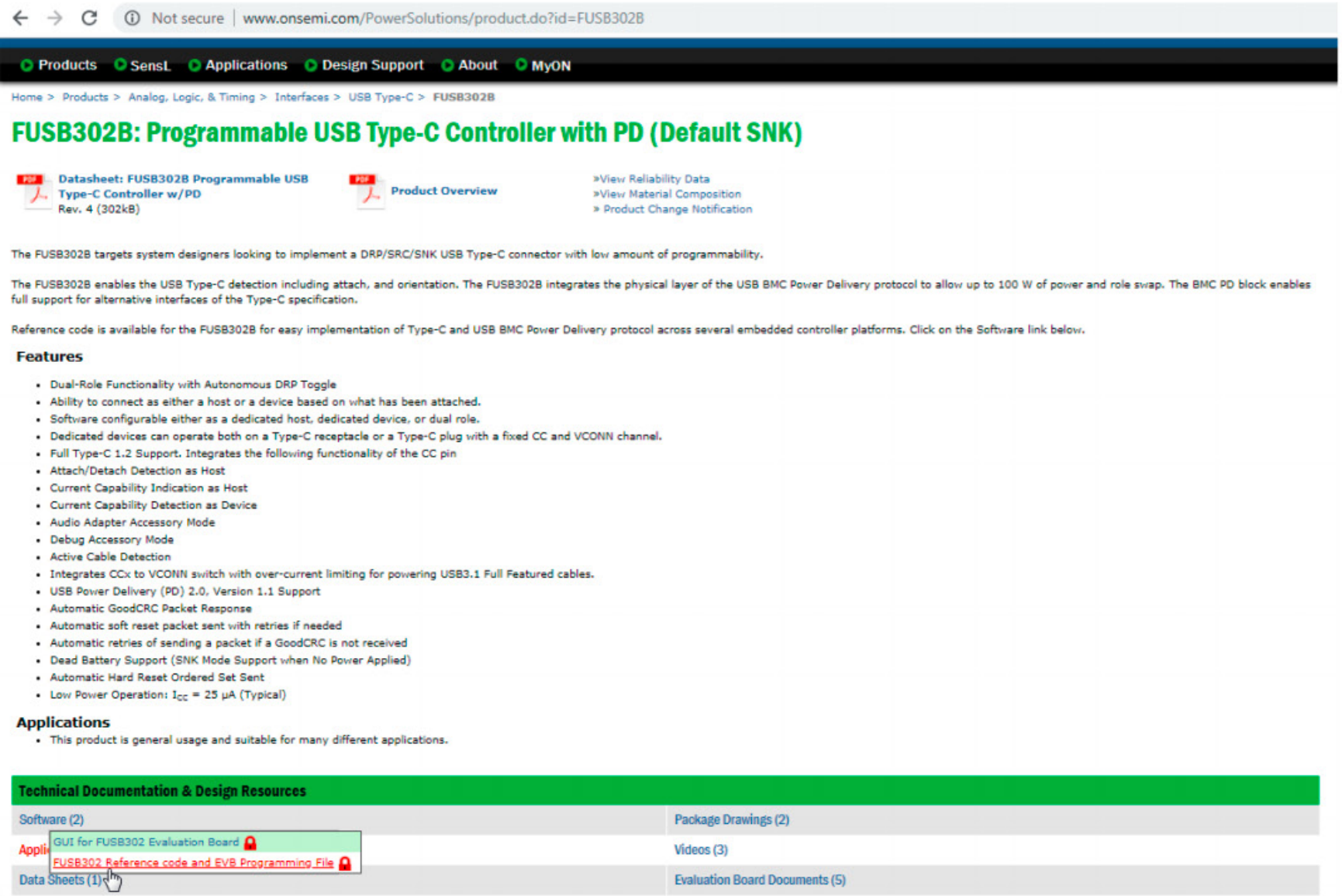
ON Semiconductor provides full reference code for the FUSB302B

- Allows customers to quickly implement drivers for Type-C™ and USB PD interfaces for their products
- Flexibility to customize software for specific hardware platform requirements
- Organized source code allowing separation between USB PD and hardware specific functions
  - Core folders contain code common across all platforms
  - Platform folders contain code unique to that platforms hardware requirements (GPIOs, timing, etc)
- All major platforms supported
  - Microchip (PIC32MX795F512 example)
  - ARM (STM32F072 example)
  - Linux/Android (Dragonboard 810 example)
  - A “None” platform for a generic build example
- Full documentation and Integration Guide
  - Explains driver build options: Sink, Source, or Dual Role Power, Accessory Mode, Alt-Mode VDMs, Display Port support
  - Platform build configurations
  - Introduction to the provided core and platform functions

PD System Integration - Continued

- The reference code provides a basis for implementing various target applications
  - PD Source with the ability to change data role (DR_SWAP) from source to sink (i.e. Android Auto or Apple CarPlay)
  - Dual role power (DRP) port with Try.SRC or Try.SNK support enabled for preferred attaches as either a source or sink
  - Additional configurations supported per the USB Type-C and PD specifications
- Supports Alternate Modes through Vendor Defined Messages (VDMs)
  - Support for Display Port (DP) handled with alt-mode VDMs
- Quickly and easily build various USB Type-C™ and USB Power Delivery (PD) configurations using a vendor_info.h file
  - Follows the Vendor Information File (VIF) format that the USB-IF uses for their USB Workshops
  - Configure the Type-C™ port role
  - Configure the source and sink Power Data Objects (PDOs) offered as a USB PD device
  - Other programmable features
- All build configurations validated against full suite of USB-IF Type-C and PD compliance testers
- Linux/Android build functionally validated on Intrinsyc's Dragonboard 810 development kit

FUSB30X Reference Code



- Reference code available through FUSB302B, FUSB307B product pages on external webpage
- Automatic notifications when updates are released
  - Updated on quarterly basis
- Reference code is same code used for USB-IF compliance
- Latest Versions
  - FUSB302B: 4.1.1
  - FUSB307B: 1.2.0

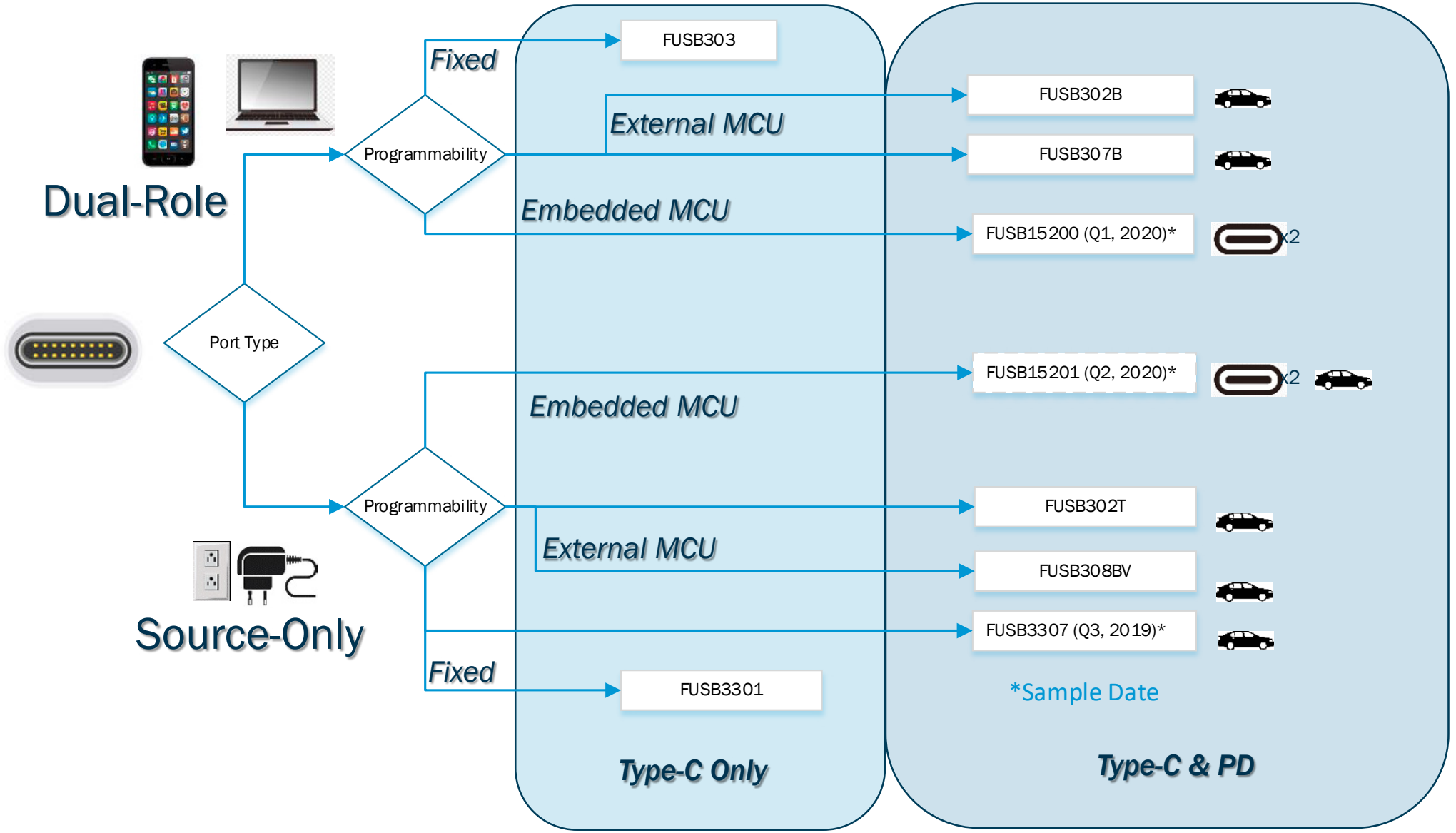
Type C/PD Controller Product Mapping

	Type-C Only			Type-C and PD					
	FUSB301/A	FUSB3301	FUSB303	FUSB302B/V	FUSB302T/V	FUSB307B/V	FUSB308BV	FUSB3307	FUSB380
Programmable or State Machine?	State Machine			Programmable				State Machine	
Role	DRP	Source	DRP	DRP (SNK default)	DRP (SRC default)	DRP	SRC	SRC	Cable Marker
Automotive Quality Available?	-	-	-	Yes	Yes	Yes	Yes	-	-
USB Type-C Spec Compatibility	1.1	1.1	1.3	1.3	1.3	1.3	1.3	1.3	1.3
USB PD Spec Compatibility	-	-	-	2.0,3.0	2.0,3.0	2.0, 3.0	2.0/3.0	3.0 PPS	3.0
USB TCPC Spec Compatibility	-	-	-	-	-	1.2	1.2	-	-
Package	TMLP-10 TMLP-12	MLP-10	TMLP-12	MLP-14 / CSP-9	MLP-14	MLP-16	MLP-16	SOIC-14/ WQFN-20	CSP-12
SNK/SRC Path Controls	-	-	-	-	-	SNK, SRC	SRC, HV SRC	SRC	-
DP Mux Select	FUSB301	-	Yes	-	-	-	Yes	-	-
Integrated VCONN Switch	-	-	-	Yes	Yes	Yes	Yes	Yes	-
VBUS Discharge	-	-	-	-	-	Yes	Yes	Yes	-
# of I2C Addresses	1	-	1	4 (FSIDs)	4 (FSIDs)	4 (Selectable)	4 (Selectable)	-	-
# of Ports in Application	Single	Single, Multi	Single	Single, Multi	Single, Multi	Single, Multi	Single, Multi	Single	Single

Development

Production

ON Semiconductor Type-C Portfolio



Agenda

- USB-C/Power Delivery Market and Segmentation
- Why Choose ON Semiconductor USB Type–C Solutions and portfolio
- **Reference designs for supporting the designs**

Reference Designs

Automotive:

- **100W**, Dual Port USB-C PD Charger
- **60W** DC/DC USB-C 3.0 and PPS Charger

Industrial:

- **65W**, USB-C PD 3.0 AC/DC Charger
- **60W**, USB-C 3.0 and PPS DC/DC Charger, 60W
- **45W**, PoE and USB-C Isolated DC/DC Charger

Computing:

- **90W**, USB-C PD AC/DC Charger
- **65W**, USB-C PD AC/DC Charger
- 60W, USB-C PD UHD AC/DC Charger, 60W
- **45W**, USB-C PD 3.0 / QC 3.0 Charger

Consumer:

- **200W**, 4-Port USB-C PD AC/DC Source 200W
- **60W**, AC/DC Charger, 60-W
- **45W**, USB-C PD 3.0 / QC 3.0 Charger

USB-PD 100W Dual Port

USB-PD Compliant Downstream Facing Port (DFP)

In Production

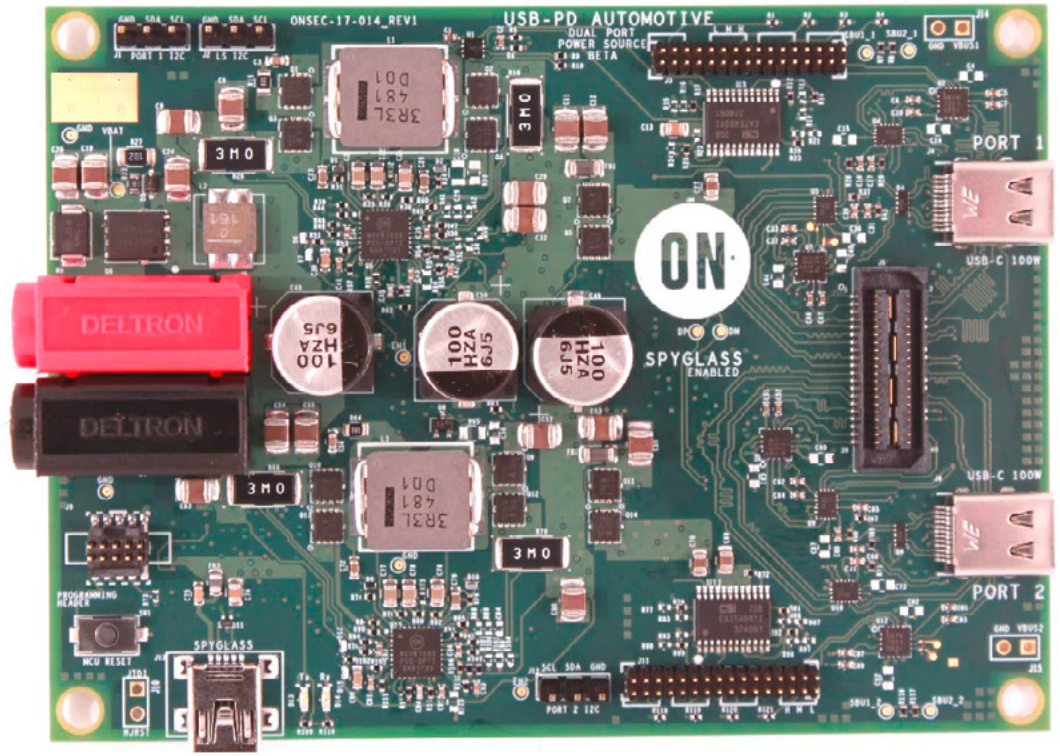
Value Proposition

This Strata based charging system demonstrates ON Semiconductor's broad portfolio of USB-PD and Power Solutions. The Strata software provides full control over the system and allows the user to experiment with various fault and foldback features, change power profiles on each port, and monitor telemetry while charging various load devices. Design collateral available including schematics, PCB layout, and test reports.

Specifications and Features

- USB-PD Compliant Downstream Facing Port (DFP)
- Primary Components
  - NCV81599 4-Switch Buck-Boost
  - FUSB302T USB-PD Port Controller
  - FUSB252 Type-C Protection Switch
- Voltage Profiles: 5V, 7V, 8V, 9V, 12V, 15V, 20V @ 5A max
- VCONN rail for EMarked cables
- Cable compensation
- Input and output power monitoring
- Temperature monitor
- Reverse battery protection
- Reprogrammable to support any output voltage and current up to 20V 5A (per USB-PD spec)

Demo Board Photo



https://www.onsemi.com/support/evaluation-board/str-usbc-2port-100w-evk

Applications

- DC/DC Applications

Markets

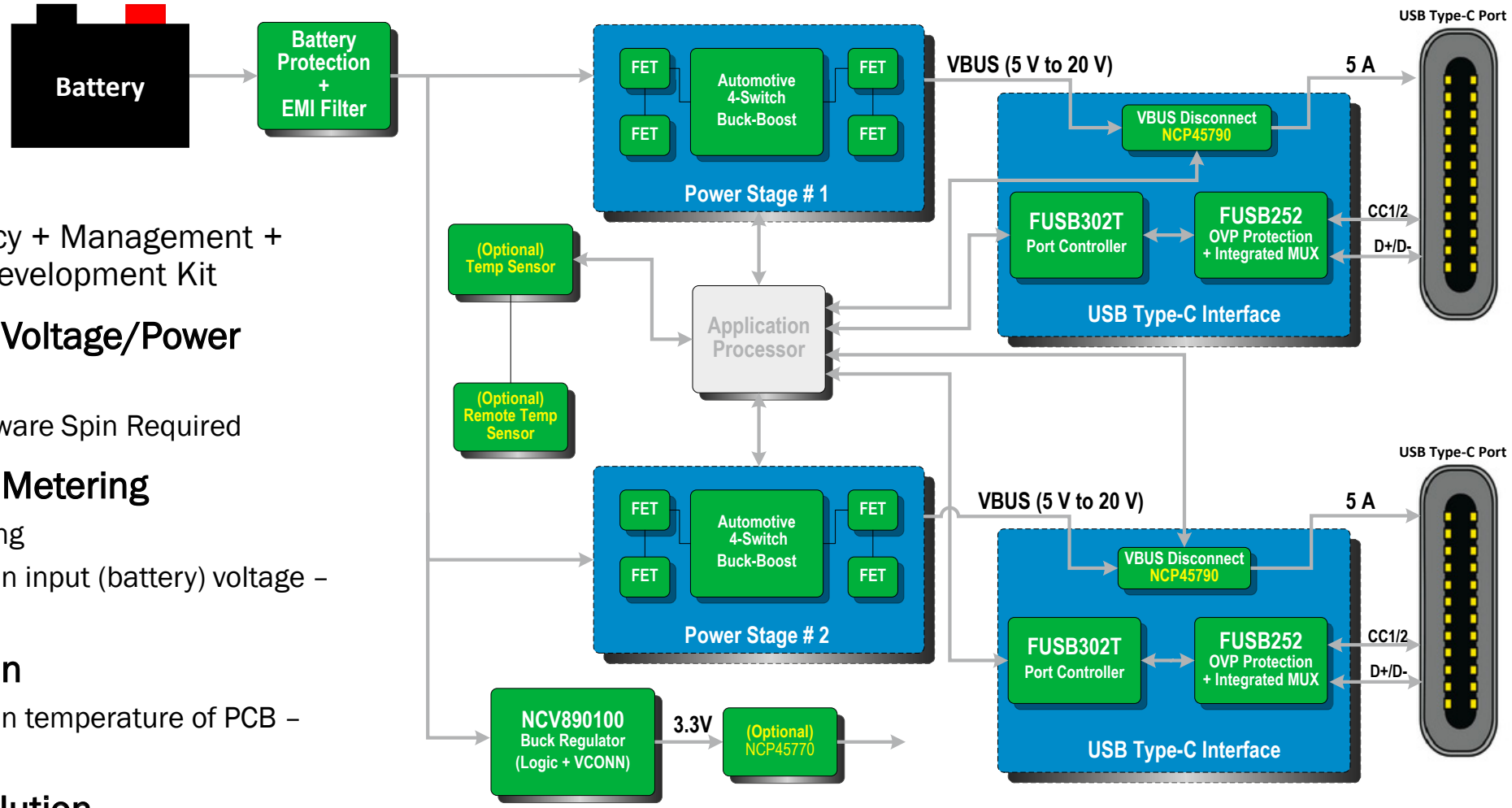
Automotive

USB-PD 100W Dual Port

Solution Advantages

- **Full ON Semi Solution**
  - Power + Port + Policy + Management + Protection w/ SW Development Kit
- **Future Ready = 100% Voltage/Power Coverage**
  - SW Update = No Hardware Spin Required
- **Power Management / Metering**
  - Input voltage monitoring
  - De-rate power based on input (battery) voltage – customizable limit
- **Temperature Protection**
  - De-rate power based on temperature of PCB – customizable limit
- **Scalable Multi-Port Solution**
  - 1 MCU = 2, 3, 4, etc ports
  - Copy + Paste Power Stage (Power + Port Control)

Link to external web detail



Block Diagram

(Optional blocks in yellow)

NCV81599 + FUSB3307

60W USB PD3.0 w/PPS Demo Board

In Development

Value Proposition

This design demonstrates the potential of a 4-switch synchronous buck boost controller along with a fully compliant USB Type-C r1.4 and PD3.0 adaptive source charging controller utilizing ON Semiconductor's NCV81599 and FUSB3307 in a 60W ultra-high density design. It is 4.5V – 32V input and 5V, 9 V, 12 V, 15 V and 20 V output for USB PD applications.

Specifications and Features

- Automotive Single Port PD Power Solution
- USB PD 3.0 with Programmable Power Supply (PPS) with ECRs v1.2+ compliant
- 100% Duty Cycle Operation
- Very Low Standby Power
- Dual Edge Current Mode Modulation
- Input and Output Voltage and Current Monitoring
- Integrated 5V LDO
- Four integrated drivers to control low cost external NFETs
- Pin Programmable Power
- OVP/OCP/UVP/OTP, VBUS & CC OVP Protection
- Self Powered (Operation 32V, Protection 40V)
- State machine driven, no mcu required

Applications

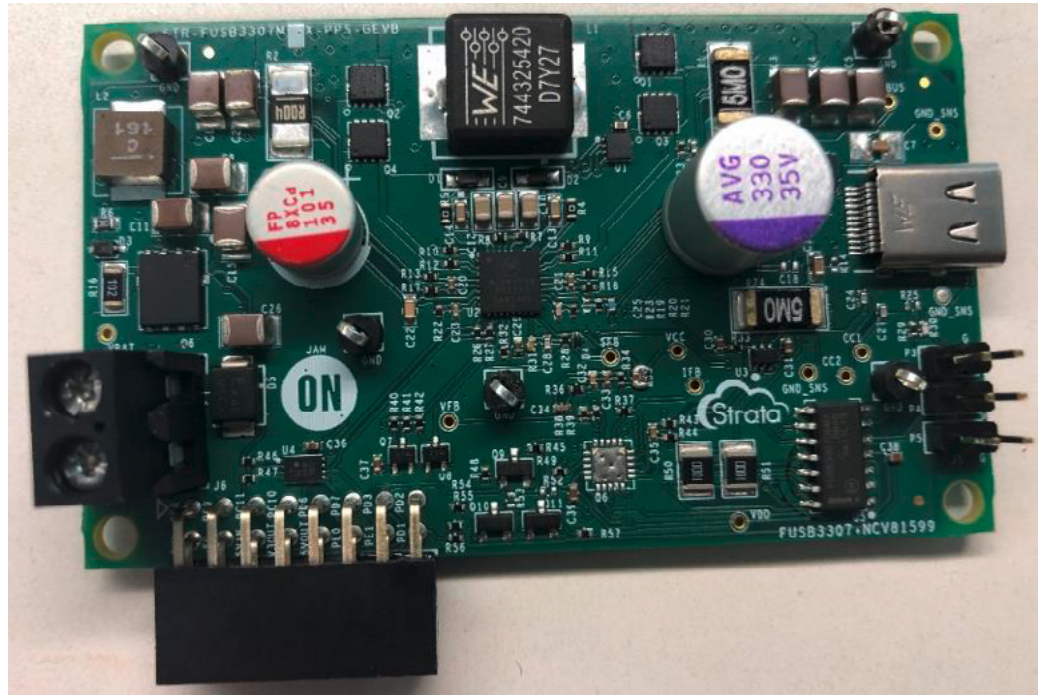
- DC/DC Applications

Markets

Automotive

Industrial

Demo Board Photo



- Design/Apps Note: Available

NCP12601 + FUSB3307

65-W USB PD Evaluation Board

Value Proposition

The NCP12601 is a multi-mode controller which implements valley switching mode with a proprietary lockout scheme for noise-free operations. In high power conditions, the part operates in continuous conduction mode (CCM). As the load decreases, the converter enters discontinuous conduction mode (DCM). The NCP12601 controller is optimized for USB PD applications with the integration of high-voltage start-up, X2 discharge, auto-tuning OCP, and low loss dynamic self-supply.

Unique Features

- Multi-mode Operation
- Valley lockout
- Low loss DSS
- Auto-tuning OCP
- Quiet Skip

Benefits

- Improved efficiency
- Eliminates valley jumping
- Enables wide variable Vout
- OCP adjusts with variable Vout
- Reduces audible noise

Demo Board Photo

- Transformer Type: RM10
- Power Density: 11 W/in3
- Board Dimensions: 100x40x24mm

- Design Note Available; Boards Available June 2020

Other Features

- High−Voltage Startup Circuit with Brownout Detection
- X2 Capacitor Discharge
- Valley switching in DCM for improved efficiency
- 65, 100 or 130 kHz fixed-frequency operation
- Frequency foldback down to 25 kHz
- Frequency jitter for improved EMI signature
- OTP on dedicated pin or combined on CS pin

Applications

- USB PD Adapters
- Notebook Computer Adapters
- Printer Adapters

Markets

Computing

Industrial

NCP1568 + FUSB3307

60 W UHD USB PD Demo Board

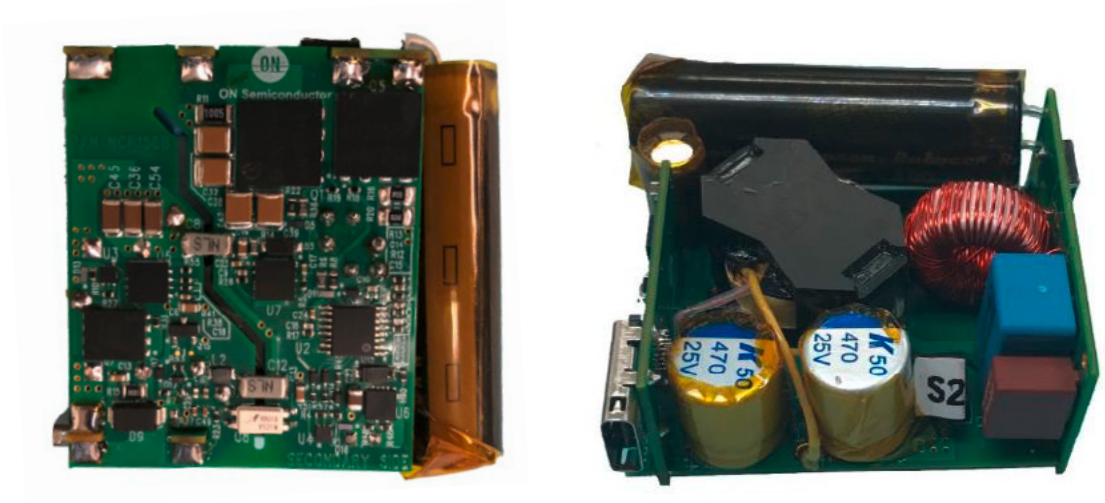
Value Proposition

This design demonstrates the potential of the active-clamp flyback topology utilizing ON Semiconductor's NCP1568 PWM controller, NCP51530 HB Driver, NCP4305 SR controller in a 60W ultra-high density design. It is universal input and 5V, 9 V, 12 V, 15 V and 20 V output for USB PD applications. High switching frequency allows the use of an RM 8 LP transformer

Specifications and Features

- 60W, 3A max output
- Universal AC input operation: 90 -265 Vac
- Output Voltage: 5V/9V/12V/15V/20V
- High frequency operation up to 450 kHz
- RM 8 LP Transformer
- High full load and average efficiency
- Low standby power
- Very low ripple and noise
- Inherent SCP and OCP protection
- Thermal and OVP protection
- Adaptive frequency operation based on AC input and output load conditions
- Adaptive ZVS operation.
- Smaller EMI components.
- Multiple probe points for evaluation
- Smooth startup operation

Demo Board Photo



- Transformer Type: RM 8 LP
- Power Density: 29 W/in3
- Board Dimensions: 1.66" x 1.78" x 0.70

Applications

- USB PD Adapters
- Notebook Computer Adapters

Markets

Computing

Portable Smart Speaker Reference Design

Value Proposition

This is a fully integrated, stand alone audio smartspeaker reference design for IoT including Voice Command, Beamforming, Noise Cancellation, Acoustic Echo Cancellation, WiFi / Bluetooth, 5 speakers, 4 mics, and USB-C capability. This will highlight the new Class D "smart" amp. The Class D audio amp is a digital input audio amplifier with real time, integrated current and voltage sensing of the loudspeaker it's driving.

Specifications and Features

- Key Products
  - NCP81239 – High Efficiency Buck/Boost
  - FUSB307B – USB Type C Port Controller w/ Power Delivery
  - LC82345x – Audio Processor w/ ARM Cortex – M3 Dual Core and proprietary DSP core
  - ONA10IV – 16W digital input class D amplifier with speaker sensing
  - ONA40A – 40W analog input class D amplifier
  - FAN3852 – Microphone Pre-Amplifier w/ Digital Output
- Voice Command: Alexa (AVS), Beamforming (BF), Noise Cancellation (NC), and Acoustic Echo Cancellation (AEC)
- Strata GUI
- WiFi / Bluetooth - 5 speakers
- 4x ONA10, 1x ONA40
- 4 mics (FAN3852)
- USB-C Source / Sink Interface w/ Power Delivery

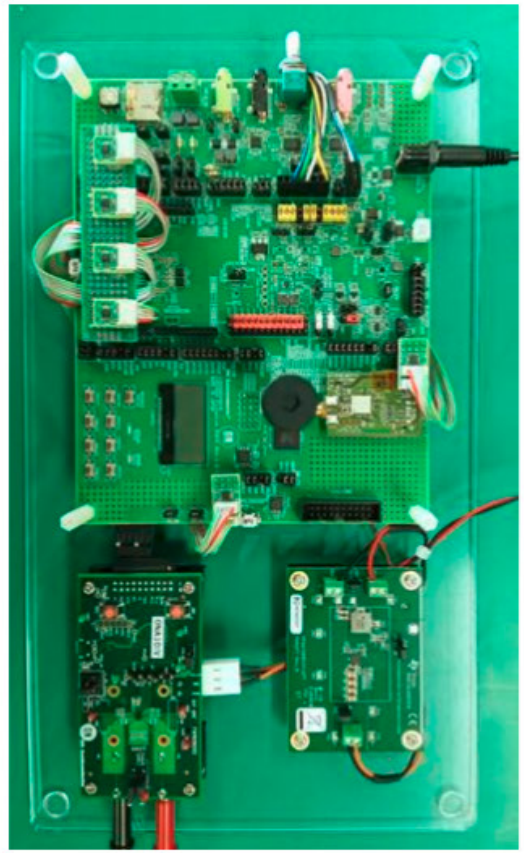
Market & Applications

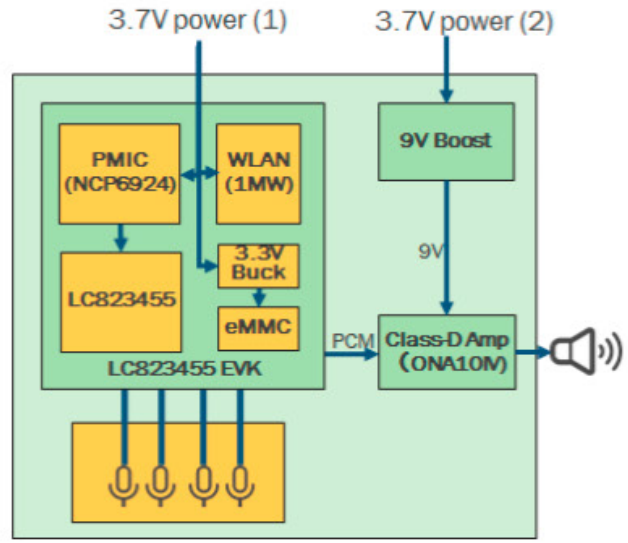
- Smart Speaker
- IoT

Consumer

Industrial

Demo Board Photo





USB-PD 200W Four Port AC/DC Charger

USB-PD Compliant Downstream Facing Port (DFP)

In Production

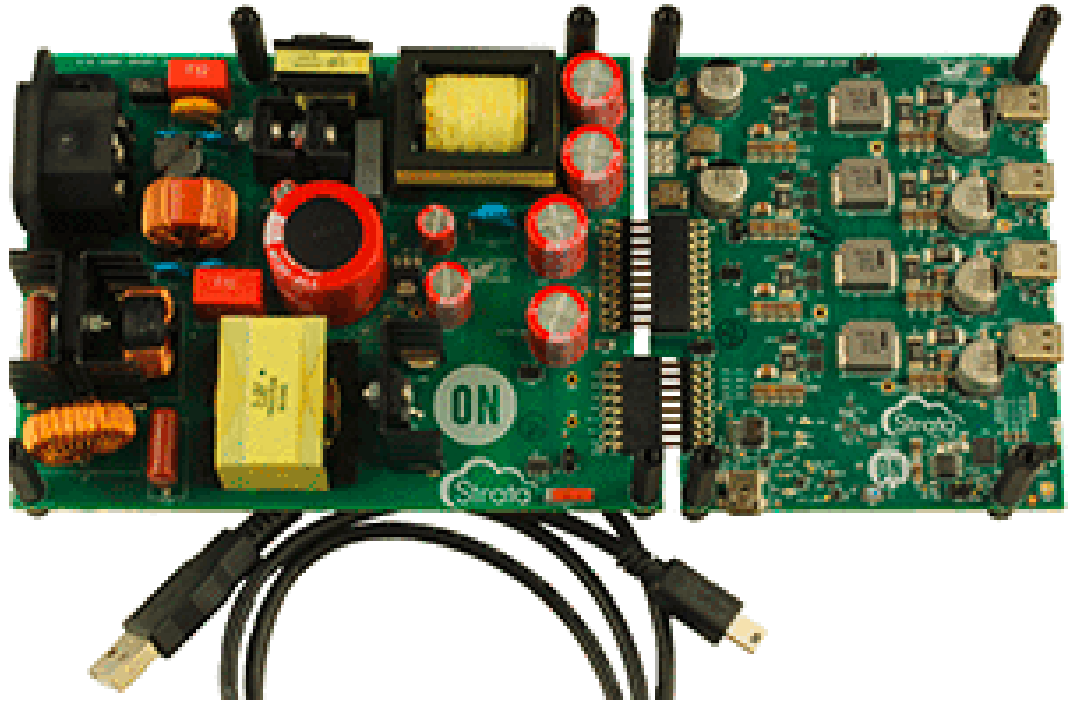
Value Proposition

The 4-Port USB-PD Source showcases ON Semiconductor's broad portfolio of USB-PD power solutions. All ports are 100W capable with a total max system power limited to 200W using our First Come First Served power management algorithm. The Strata software provides powerful controls to test power profile configurations such as optional "assured" port 1 power, experiment with various fault and foldback features, and monitor system telemetry while charging various load devices. Design collateral such as schematics, PCB layout, test reports, etc. are supplied in the same Strata interface to ease evaluation.

Specifications and Features

- USB-PD Compliant Downstream Facing Port (DFP)
- Primary Components
  - NCP1399 LLC controller
  - NCP1615 PFC
  - NCP4305 secondary SR controller
  - NCP81239 4-Switch Buck-Boost
  - FUSB307B USB-PD Port Controller
  - FUSB252 Type-C Protection Switch
- Supports USB Power Delivery up to 100W Per Port
- Power Management Algorithm to Intelligently Deliver 200W Across Four USB-C Output Ports
- Default PDO's = 5V, 7V,8V, 9V, 12V, 15V, 20V at 5A
- Input and Output Power Monitoring
- Thermal Protection, Overcurrent Protection

Demo Board Photo



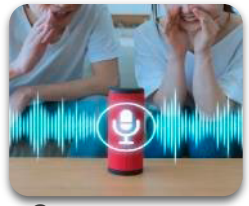
https://www.onsemi.com/PowerSolutions/evalBoard.do?id=STR-USBC-4PORT-200W-EVK

Applications

- Consumer Electronics
- Computing
- USB Type-C PD Systems

Markets

Computing



Consumer

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