

AC/DC Secondary-Side Controller with Integrated Synchronous Rectification for USB PD 3.0 w/PPS and Qualcomm® Quick Charge™ 4+ (QC2.0/QC3.0/QC4)

1 Description

The iW709 is an AC/DC secondary-side controller for USB Power Delivery (PD) 3.0 with Programmable Power Supply (PPS) and Qualcomm® Quick Charge™ QC4+ (QC2.0/QC3.0/QC4) support which integrates a secondary-side regulation controller, interface protocol controller, USB V_{BUS} driver and synchronous rectifier controller into a single IC.

The iW709 allows rapid charge of USB PD PPS or QC-enabled mobile devices (MDs). It resides on the secondary side of an AC/DC travel adapter (TA) and allows the TA to be configured for multi-level output voltage and current.

The iW709 measures the output voltage and load current and sends the results to a digital compensator for closed-loop control of flyback converter. The digital control signal generated by the compensator is converted to an analog signal and transferred to primary controller via an optocoupler.

The iW709 is also an advanced synchronous rectifier (SR) controller with an integrated MOSFET driver. The device works with an external power MOSFET to replace the main rectifying diode on the secondary of a flyback converter. The SR control block optimizes the SR on/off timing and also uses proprietary technologies for timing control of ZVS or active clamp flyback topologies to achieve best efficiency when coupled with Dialog's ZVS-enabled primary-side controllers.

The iW709 can be paired with one of Dialog's high-performance flyback controllers that support either quasi-resonant (QR) control or QR and Zero Voltage Switching (ZVS) technology to achieve high efficiency, low no-load power consumption, accuracy voltage/current control and fast dynamic load response.

2 Features

- USB-IF certified: USB PD 3.0 with PPS
 - » Supports 3.3V to 21V in 20mV steps and output current in 50mA steps
- Optionally supports Qualcomm QC4+ (QC2.0/QC3.0/QC4)
- High resolution accuracy multi-level output voltage and current control
- Built-in digital loop compensation to minimize the external component count
- Built-in synchronous rectification controller with integrated driver
- Optimized V_{DS} -based SR timing and driving control for ZVS or active clamp flyback with wide output range
- NFET driver for V_{BUS} switch
- Programmable active fast discharge from a high voltage to 5V at MD unplug or from a high voltage level to a lower level upon request with built-in switch or external switch
- Intelligent low power mode enables very low no-load power consumption when paired with one of Dialog's primary-side controllers, the iW9801 or iW9809
- Supports DCM and CCM operation
- PD-based power derating feature
- Wide V_{VIN} operating range from 2.6V to 25V
- 16-Lead QFN package

3 Applications

- Direct-charge AC/DC adapters for USB PD enabled smart phones, tablets and other mobile devices

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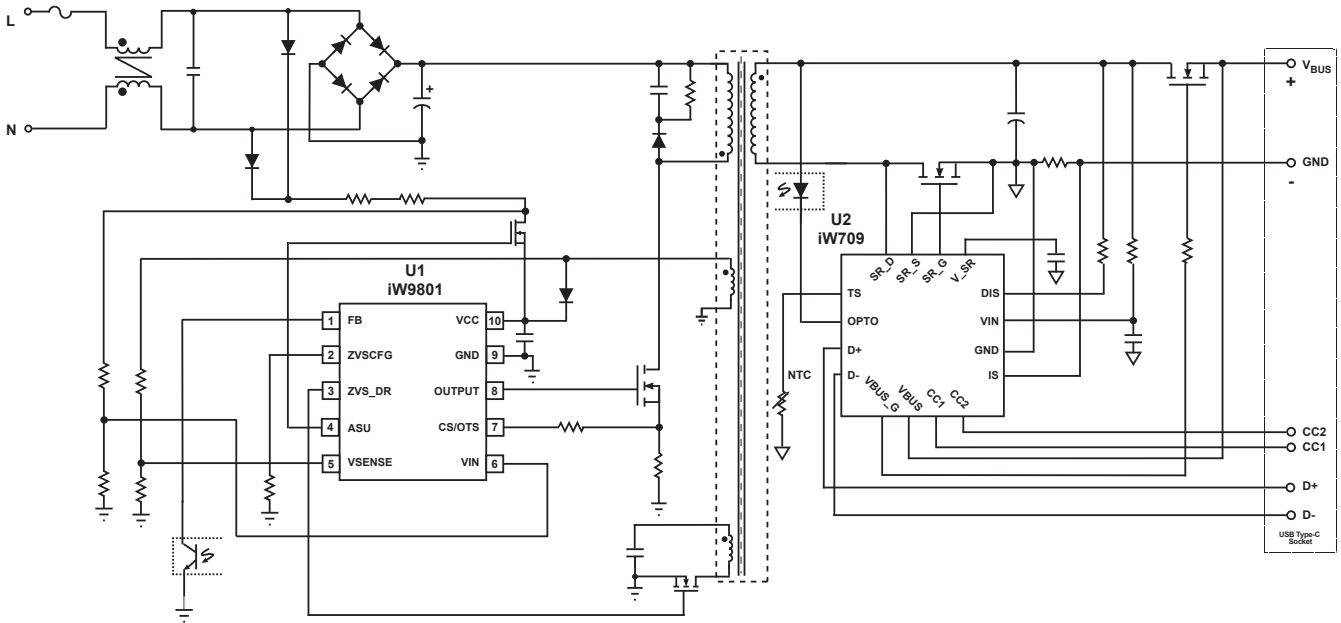


Figure 3.1 : iW709 Typical Application Circuit for Multi-Level Voltage and Current Control with ZVS Technology (Using iW9801 as ZVS-enabled Primary-Side Controller.)

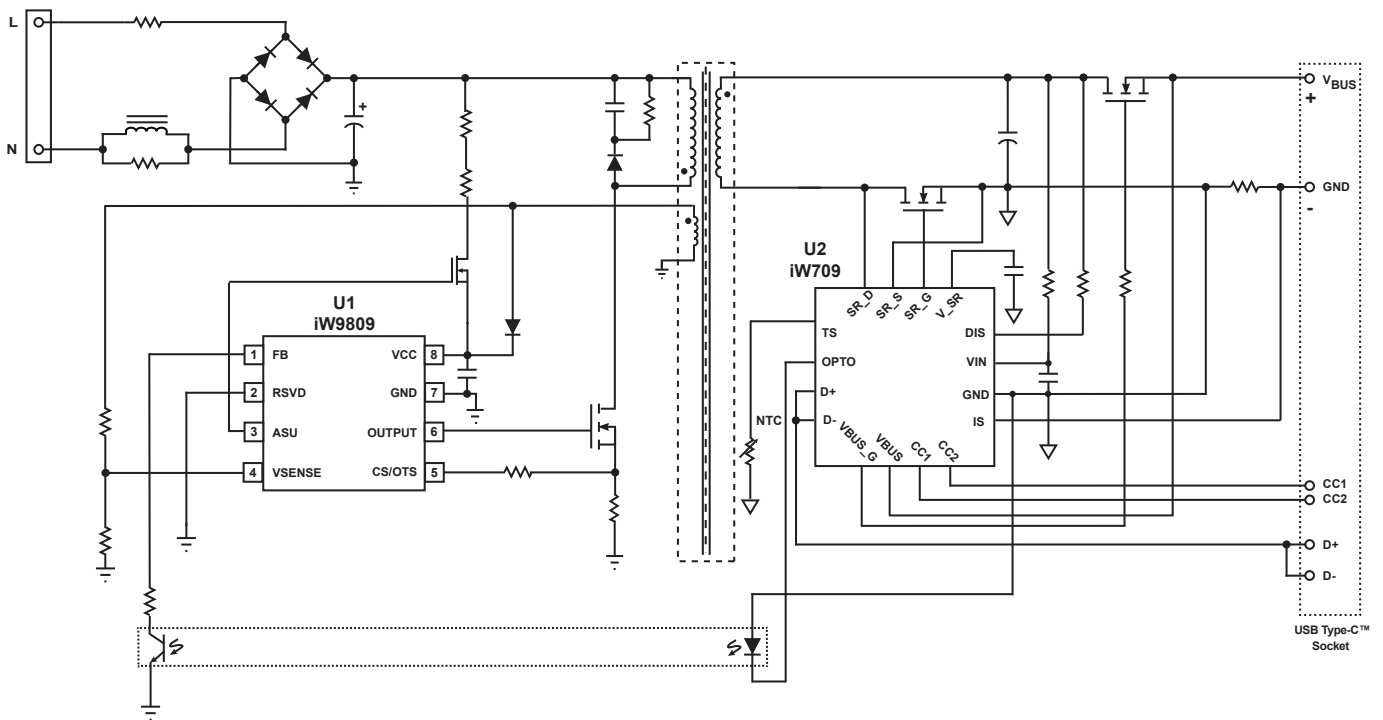


Figure 3.2 :iW709 Typical Application Circuit with Active Start-up Circuit (Using iW9809 as Primary-Side Controller. Achieving Multi-Level CV/CC Regulation and <20mW No-load Power Consumption in a Typical 25W Design)

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4 Pinout Description

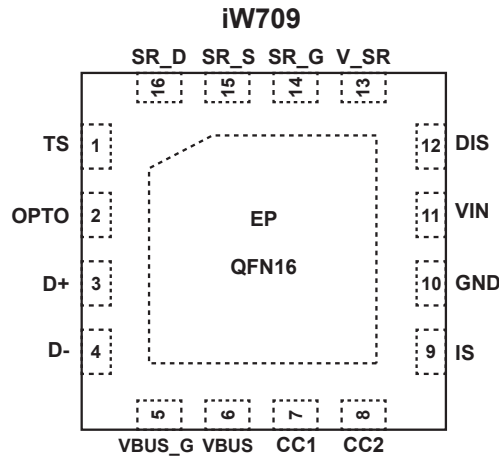


Figure 4.1 : 16-Lead QFN Package

Pin No.	Pin Name	Type	Pin Description
1	TS	Analog Input/ Output	Temperature sensing pin. Connect to an external NTC resistor to measure the power adapter temperature.
2	OPTO	Analog Output	Optocoupler driver to transfer the output regulation control signal to primary side.
3	D+	Analog Input/ Output	USB D+ signal.
4	D-	Analog Input/ Output	USB D- signal.
5	VBUS_G	Analog Input/ Output	Gate drive for external N-FET switch.
6	VBUS	Analog Input/ Output	Connect to V_{BUS} after N-FET switch.
7	CC1	Analog Input/ Output	Communication channel 1.
8	CC2	Analog Input/ Output	Communication channel 2.
9	IS	Analog Input	Output Current sensing , connect to current sensing resistor "+" terminal.
10	GND	Ground	Ground, connect to current resistor "-" terminal.
11	VIN	Power Analog Input	Input of the internal LDO and output voltage sensing circuit.
12	DIS	Analog Output	Discharging circuit. Used for fast discharging of output capacitor.
13	V_SR	Power	Voltage supply for SR drive. Connect this pin to a capacitor.
14	SR_G	Analog Output	Synchronous rectifier MOSFET driver.
15	SR_S	Analog Input	Synchronous rectifier MOSFET source input.
16	SR_D	Analog Input	Synchronous rectifier MOSFET drain voltage sensing and the Pulse Linear Regulator (PLR) input.

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5 Absolute Maximum Ratings

Absolute maximum ratings are the parameter values or ranges which can cause permanent damage if exceeded. For maximum safe operating conditions, refer to Electrical Characteristics in Section 6.

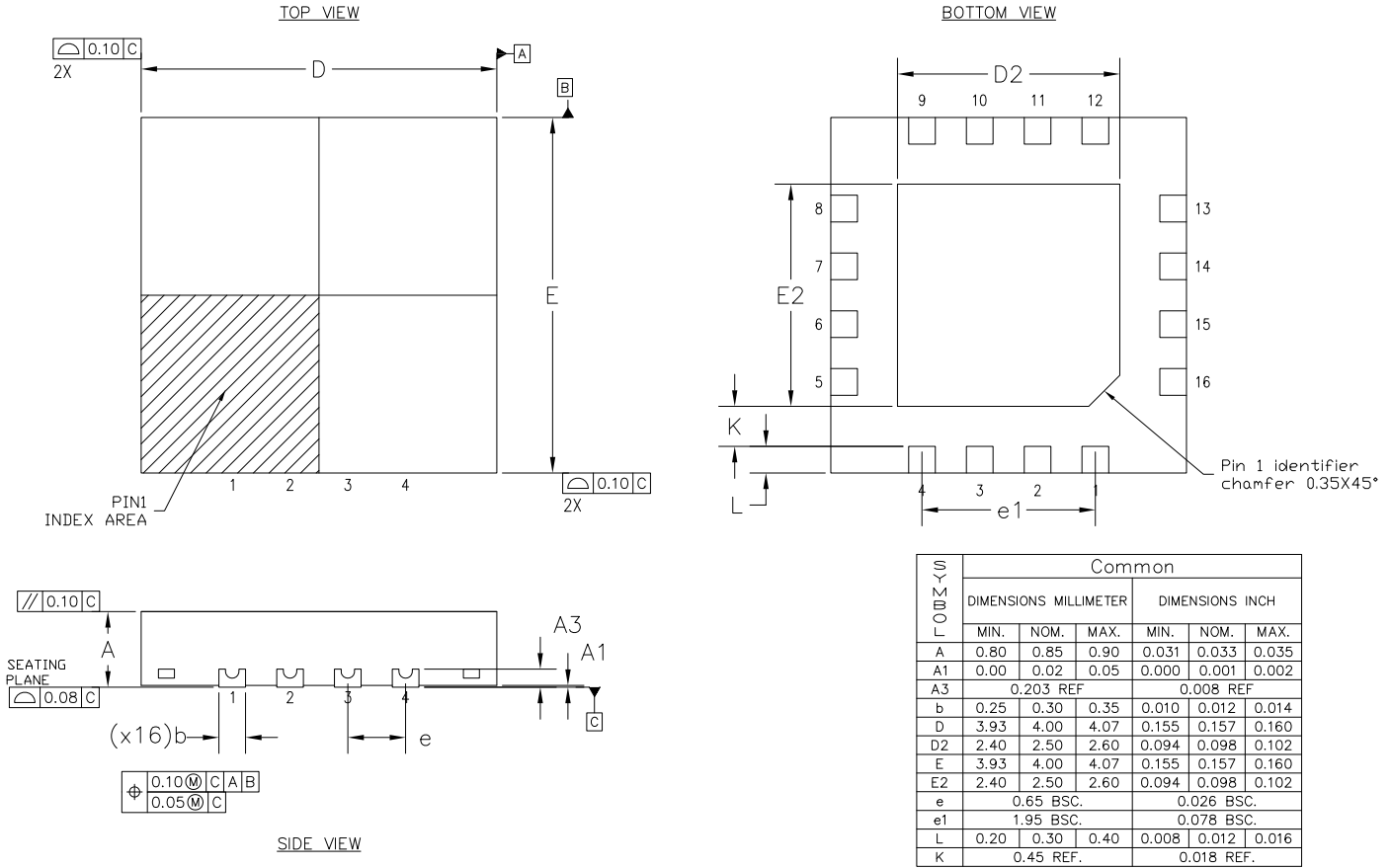
Parameter	Symbol	Value	Units
V _{VIN} DC supply voltage range (I _{VIN} = 15mA max)	V _{VIN}	-0.3 to 30	V
Continuous DC supply current at VIN pin (V _{VIN} = 12V)	I _{VO}	15	mA
SR_G peak output current	I _G	±2	A
SR_G voltage	V _G	-0.6 to 10	V
SR_D voltage (Note 1)	V _D	-1.5 to 120	V
SR_D peak current	I _{DRAIN}	-40 to 300	mA
SR_S voltage	V _S	-0.5 to 6	V
V _{SR} voltage	V _{V_SR}	10	V
DIS voltage	V _{DIS}	30	V
Peak current at DIS pin	I _{DIS}	600	mA
OPTO voltage	V _{OPTO}	-0.6 to 30	V
D+ voltage	V _{D+}	-0.3 to 25	V
D- voltage	V _{D-}	-0.3 to 25	V
CC1 voltage	V _{CC1}	-0.3 to 25	V
CC2 voltage	V _{CC2}	-0.3 to 25	V
IS voltage	V _{IS+}	-0.3 to 7	V
TS voltage	V _{SD}	-0.3 to 7	V
VBUS voltage	V _{VBUS}	-0.7 to 30	V
VBUS_G voltage	V _{VBUS_G}	-0.7 to 35	V
Junction temperature	T _J	-40 to 150	°C
Storage temperature		-65 to 150	°C
Thermal Resistance Junction-to-Ambient	θ _{JA}	66.9	°C/W
ESD rating per JEDEC JS-001-2017 (CC1/CC2/D+/D- pins)		± 8,000	V
ESD rating per JEDEC JS-001-2017 (all other pins)		± 2,000	V

Notes:

Note 1. The DRAIN pin voltage should not be below -0.6V for more than 500ns.

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6 Physical Dimensions



7 Part Number Code Description

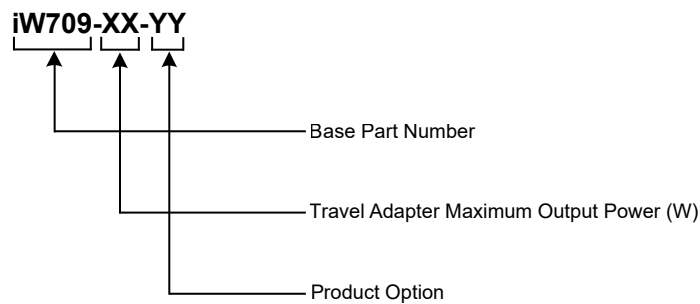


Figure 7.1 : iW709 Part Number Decoder

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