iW662

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AC/DC Secondary-Side Synchronous Rectification and Rapid Charge™ Interface Controller for Qualcomm® Quick Charge™ 3.0

1 Description

The iW662 is an AC/DC secondary-side combo controller for Qualcomm® Quick Charge™ 3.0 (QC3.0) which includes USB interface, secondary-to-primary communication and synchronous rectification functions in a single IC.

The iW662 resides on the secondary side of an AC/DC power supply and allows the adapter to be configured for multi-level output voltages from 3.6V to 12V in 200mV increments, depending on the voltage requested by the mobile device (MD). It can be used in Dialog's primary-side controlled AC/ DC systems to achieve fast voltage transition, low no-load power consumption, and fast dynamic load response.

The iW662 uses Dialog's proprietary XM-Comm secondary-to-primary digital communication technology. When paired with one of Dialog's primary-side controllers, the iW1790 or iW1796, the optocoupler can be completely eliminated in the system. The iW662 transmits all necessary information for rapid charge through the power transformer, including output voltage requests, output current limits, output voltage undershoot, output over-voltage, and fault and reset signals.

The iW662 is also an advanced synchronous rectifier (SR) controller with an integrated MOSFET driver, enabling discontinuous mode flyback converters with high efficiency operation. The device works with an external power MOSFET to replace the main rectifying diode on the secondary of a flyback converter, improving efficiency by reducing secondaryside conduction losses. Dialog's digital adaptive turn-off control technology minimizes turn-off deadtime, eliminating the need for an additional Schottky diode that is typically needed in parallel with the synchronous MOSFET in conventional synchronous rectifiers.

The iW662 and iW1790/iW1796 provide double-layer cable protection. On the secondary side, the iW662 incorporates Dialog's proprietary D+/D- over-voltage protection to address V_{BUS} D+/D- soft shorts. On the primary side, the iW1790/ iW1796 uses Dialog's advanced fault control technology to reduce the average output power during soft shorts without latch.

Qualcomm® Quick Charge™ 3.0 is a product of Qualcomm Technologies, Inc.

2 Features

- XM-Comm proprietary secondary-to-primary digital communication transmits all information for rapid charge without an optocoupler: output voltage requests, output current limits, output voltage undershoot, over-voltage protection, and other fault and reset signals

- Lossless MOSFET V_{DS} sensing for SR timing control with digital adaptive turn-off control

- Optimized 5V MOSFET gate driver

- High-voltage drain sensing up to 100V with no additional external clamping circuits required

- Supports Qualcomm® Quick Charge™ 3.0 technology High Voltage Dedicated Charging Port (HVDCP) to provide V_{BUS} from 3.6V to 12V in 200mV increments

- Double-layer cable protection:

  » Secondary side (iW662): Proprietary D+/D- over-voltage protection (OVP) addresses V_{BUS} D+/D-soft shorts

  » Primary side (iW1790/iW1796): advanced fault control technology reduces average output power at fault conditions without latch

- Adaptive OVP/UV detection for most V_{BUS} levels

- Backward compatible with QC2.0 and USB Battery Charging Specification Revision 1.2 (USB BC1.2)

- Wide operating voltage range from 3V to 16V

- 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 < 20mW no-load power consumption

- 8-Lead SOIC package

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3 Applications

- 18W/24W QC AC/DC adapters for smart phones, tablets, and other portable devices
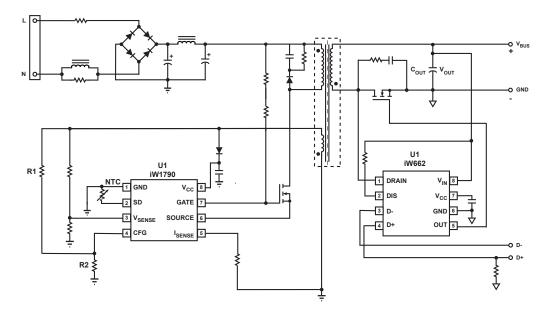

Figure 3.1 : iW662 18W/24W Typical Application Circuit for Multi-Level Output Voltage and Current (Using iW1790 as Primary-Side Controller. Achieving < 20mW No-Load Power Consumption.)
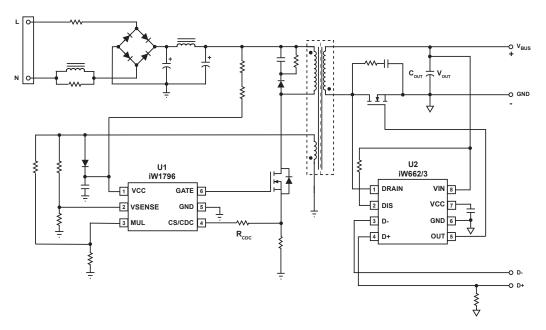

Figure 3.2 : iW1796 Typical Application Circuit for Multi-Level Output Voltage and Current (Using iW662/3 as Secondary-Side Controller for Rapid Charge Protocols. Achieving < 75mW No-Load Power Consumption (with ample margin) in Typical 15W Design.)

AC/DC Secondary-Side Synchronous Rectification and Rapid Charge™
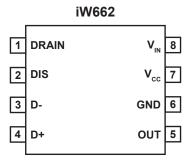**Interface Controller for Qualcomm® Quick Charge™ 3.0**

4 Pinout Description

iW662

1	DRAIN	V_{IN}	8
2	DIS	V_{CC}	7
3	D-	GND	6
4	D+	OUT	5

Figure 4.1 : 8-Lead SOIC Package

Pin No.	Pin Name	Type	Pin Description
1	DRAIN	Analog Input	Synchronous rectifier MOSFET drain voltage sensing and the Pulse Linear Regulator (PLR) input.
2	DIS	Analog Output	Discharging circuit. Used for fast discharging of output capacitor.
3	D-	Analog Input	USB D- signal.
4	D+	Analog Input	USB D+ signal.
5	OUT	Output	Synchronous rectifier MOSFET driver.
6	GND	Ground	Ground.
7	V_{CC}	Power Input	LDO and PLR output. Connect this pin to a capacitor.
8	V_{IN}	Analog Input	Input of the internal LDO and output voltage sensing circuit. Connect to adapter/charger output for bias voltage. The internal LDO clamps the V_{CC} voltage at 5V when $V_{IN} > 5V$.

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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.

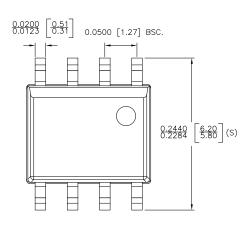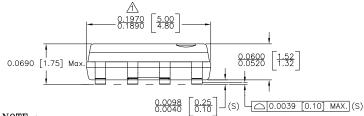| Parameter	Symbol	Value	Units
V_{IN} DC supply voltage range (I_{CC} = 15mA max)	V_{IN}	-0.3 to 33	V
Continuous DC supply current at V_{IN} pin (V_{IN} = 25V)	I_{VO}	15	mA
Continuous DC supply current at V_{CC} pin (V_{CC} = 5.5V)	I_{VCC}	15	mA
Gate peak output current	I_G	±3	A
DRAIN pin voltage (Note 1)	V_D	-1.5 to 100	V
DRAIN pin peak current	I_{DRAIN}	-40 to 350	mA
OUT pin voltage	V_{OUT}	-0.6 to V_{CC} +0.6	V
V_{CC} pin voltage	V_{CC}	-0.6 to 6	V
DIS pin voltage	V_{DIS}	30	V
D+ pin voltage	V_{D+}	-0.3 to 7	V
D- pin voltage	V_{D-}	-0.3 to 7	V
Junction temperature	T_J	-40 to 150	°C
Storage temperature		-65 to 150	°C
ESD rating per JEDEC JESD22-A114 (D+ and D- pins)		± 6,000	V
ESD rating per JEDEC JESD22-A114 (all other pins)		± 2,000	V

Notes:

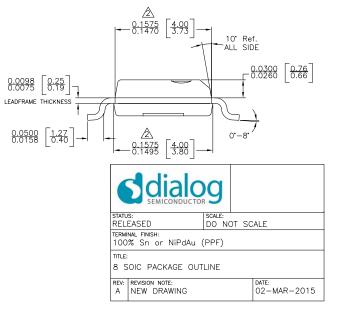Note 1: The DRAIN pin voltage should not be below -0.6V for more than 500ns.

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6 Physical Dimensions

NOTE :

⚠️1 DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH, PROTRUSIONS AND GATE BURRS SHALL NOT EXCEED .006 INCH PER SIDE.

⚠️2 DOES NOT INCLUDE INTER-LEAD FLASH OR PROTRUSIONS. INTER-LEAD FLASH AND PROTRUSIONS SHALL NOT EXCEED .010 INCH PER SIDE.

3. THIS PART IS COMPLIANT WITH JEDEC SPECIFICATION MS-012.

4. LEAD SPAN/STAND OFF HEIGHT/COPLANARITY ARE CONSIDERED AS SPECIAL CHARACTERISTIC.(S)

5. CONTROLLING DIMENSIONS IN INCHES. [mm]

dialog SEMICONDUCTOR

STATUS: RELEASED		SCALE: DO NOT SCALE	
TERMINAL FINISH: 100% Sn or NiPdAu (PPF)			
TITLE: 8 SOIC PACKAGE OUTLINE			
REV: A	REVISION NOTE: NEW DRAWING		DATE: 02-MAR-2015

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7 Ordering Information

Part no.	Options				Package	Description
	V_{BUS} Range	k_{CC}	Primary-Side Controller	OVP Level		
iW662-00-SO8	3.6V to 12V	0.422 for V_{BUS} = 3.6V to 8V Determined by constant max power for 8.2V to 12V	iW1790-08/ iW1796-08	Note 1	SOIC-8	Tape & Reel[2]
iW662-01-SO8	3.6V to 12V	0.5 for V_{BUS} = 3.6V to 6V Determined by constant max power for 6.2V to 12V	iW1790-09/ iW1796-09	Note 1	SOIC-8	Tape & Reel[2]
iW662-02-SO8	3.6V to 12V	0.5 for V_{BUS} = 3.6V to 8V Determined by constant max power for 8.2V to 12V	iW1790-09/ iW1796-09	Note 1	SOIC-8	Tape & Reel[2]
iW662-03-SO8	3.6V to 12V	0.5 for V_{BUS} = 3.6V to 6V Determined by constant max power for 6.2V to 12V	iW1790-19/ iW1796-19	14.76V	SOIC-8	Tape & Reel[2]
iW662-05-SO8[3]	3.6V to 9V	0.422 for V_{BUS} = 3.6V to 9V	iW1790-08	Note 1	SOIC-8	Tape & Reel[2]
iW662-08-SO8[3]	3.6V to 9V	0.422 for V_{BUS} = 3.6V to 9V	iW1796-08	Note 1	SOIC-8	Tape & Reel[2]
iW662-18-SO8[3]	3.6V to 9V	0.422 for V_{BUS} = 3.6V to 9V	iW1790-18	11.07V	SOIC-8	Tape & Reel[2]

Note 1: The OVP threshold is adjusted according to the nominal output voltage. For details, see the Discharge/UV/OV section of the electrical characteristics table in section 6.
Note 2: Tape & Reel packing quantity is 2,500/reel. Minimum packing quantity is 2,500.
Note 3: This option is a customized product option with 12V disabled. Adapters designed with this product option may not pass QC2.0 HVDCP compliancy test.

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IMPORTANT NOTICE AND DISCLAIMER

RoHS Compliance

Dialog Semiconductor's suppliers certify that its products are in compliance with the requirements of Directive 2011/65/EU of the European Parliament on the restriction of the use of certain hazardous substances in electrical and electronic equipment. RoHS certificates from our suppliers are available on request.

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Corporate Headquarters

TOYOSU FORESIA, 3-2-24 Toyosu
Koto-ku, Tokyo 135-0061, Japan
www.renesas.com

Contact Information

For further information on a product, technology, the most up-to-date version of a document, or your nearest sales office, please visit:
www.renesas.com/contact/

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Product Summary   **Rev. 1.3**   **09-Feb-2022**