

Zero Standby Power AC/DC Digital Quasi-Resonant Flyback Controller for RapidCharge™

1 Description

The iW9860/61 is a high-performance AC/DC primary-side digital flyback controller for secondary-side regulation (SSR) that can enable zero standby power consumption in 15W-63W rapid charge applications. The device operates in the Renesas' patented constant-frequency, quasi-resonant (QR) switching mode and adaptive multi-mode control (MMC). The iW9860/61 is optimized to work with Renesas' secondary-side controller, the iW760, which integrates SSR, synchronous rectification (SR) control and USB Power Delivery (PD) 3.0 with Programmable Power Supply (PPS) support. A typical 25W USB PD travel adapter (TA) built with the iW9860 and iW760 chipset can meet no-load power consumption of less than 5mW when the output USB cable is detached. When using the iW9861 with the iW760, BOM cost can be further reduced by removing the DFET and still achieve less than 20mW no-load power consumption when the output USB cable is detached in the same 25W application.

The iW9860/61's unique MMC mode of operation includes PWM, PFM and burst mode, which optimizes flyback converter performance including efficiency and EMI. And it also provides a number of key built-in protection features. The iW9860/61 and iW760 chipset can achieve tight multi-level constant voltage (CV) and multi-level constant current (CC) regulation in high resolution steps, with fast and smooth CV/CC transition upon request by mobile devices (MD). With SSR digital compensation, the chipset eliminates the need for external loop compensation components while maintaining stability under all operation conditions.

Besides zero standby power, Renesas' innovative proprietary technology ensures that power supplies designed with the iW9860/61 and iW760 chipset can achieve high efficiency, high accuracy voltage/current control and fast dynamic load response, all with the lowest system cost.

2 Features

- Zero standby power consumption with low system cost (< 5mW at 230V_{AC} when output USB cable is detached in a typical 25W USB PD travel adapter) - iW9860
- Lowest BOM cost with < 20mW no-load power consumption by removing the need for external startup DFET - iW9861
- Supports single-layer PCB design to reduce total system cost
- Supports Rapid Charge adapters applications of 15W-63W and other power profiles
- Uses Renesas' patented switching modes [adaptive quasi-resonant (QR) operation and adaptive multi-mode control (MMC)] and continuous conduction mode (CCM)
 - » Improves efficiency and eliminate audible noise
 - » Enables optimization for size, efficiency and EMI performance
- Supports voltage sensing with dual polarity of V_{VCC} auxiliary winding for improving EMI and simplifying transformer design
- Intelligent gate drive control to minimize driving loop and eliminate high voltage capacitor
- Max switching frequency range - 70kHz to 130kHz (by product option - see Section 7)
- Supports constant-voltage (CV) and constant-current (CC) regulation in fine steps using secondary-side regulation (SSR) control
- Built-in single-point fault protections against AC line voltage brown-in, brown-out, output short-circuit, output over-voltage, and optocoupler failure
- User adjustable internal OTP threshold for various thermal requirements
- 6-lead SOT-23 package supports compact power supply design

3 Applications

- Rapid-charging AC/DC adapters for smart phones, tablets, power tools and other portable devices

Zero Standby Power AC/DC Digital Quasi-Resonant Flyback Controller for RapidCharge™

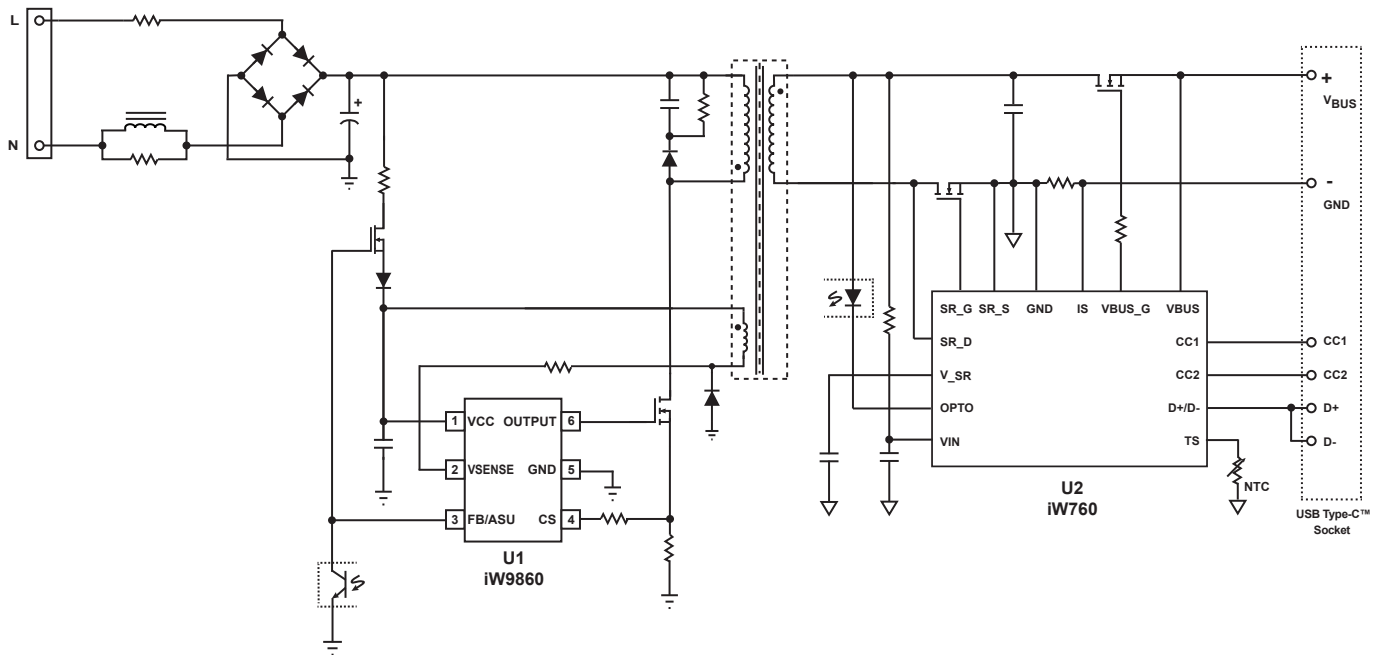


Figure 3.1 : iW9860 Typical Application Circuit with Active Start-up Circuit (Using iW760 as Secondary-Side Controller. Achieving < 5mW Standby Power Consumption at 230V_{AC})

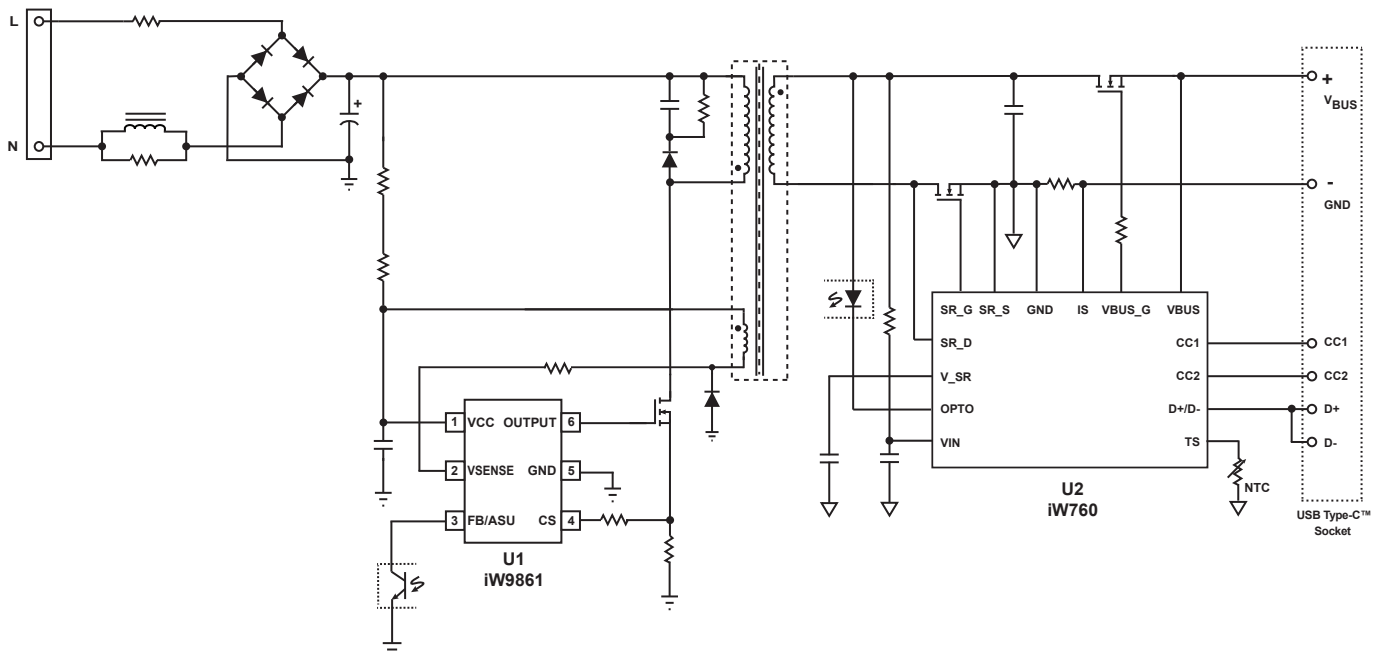


Figure 3.2 : iW9861 Typical Application Circuit without Active Start-up Circuit (Using iW760 as Secondary-Side Controller. Achieving < 20mW Standby Power Consumption at 230V_{AC})

Zero Standby Power AC/DC Digital Quasi-Resonant Flyback Controller for RapidCharge™

4 Pinout Description

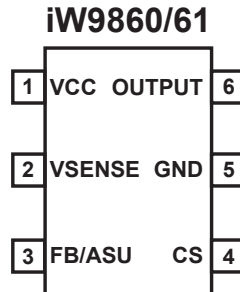


Figure 4.1 : SOT23-6 Package

Pin Number	Pin Name	Type	Pin Description
1	VCC	Power input	IC power supply
2	VSENSE	Analog input	Voltage sensing. Used for adapter output voltage sensing, valley mode switching and input bulk capacitor voltage sensing
3	FB/ASU	Analog input/output	Feedback voltage and active startup control. Used for determining multi-mode control and for controlling active start-up device (depletion mode NFET)
4	CS	Analog input	Current sensing and internal OTP setting
5	GND	Ground	IC power ground and signal ground
6	OUTPUT	Analog output	Gate drive for main power switch

Zero Standby Power AC/DC Digital Quasi-Resonant Flyback Controller for RapidCharge™

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.

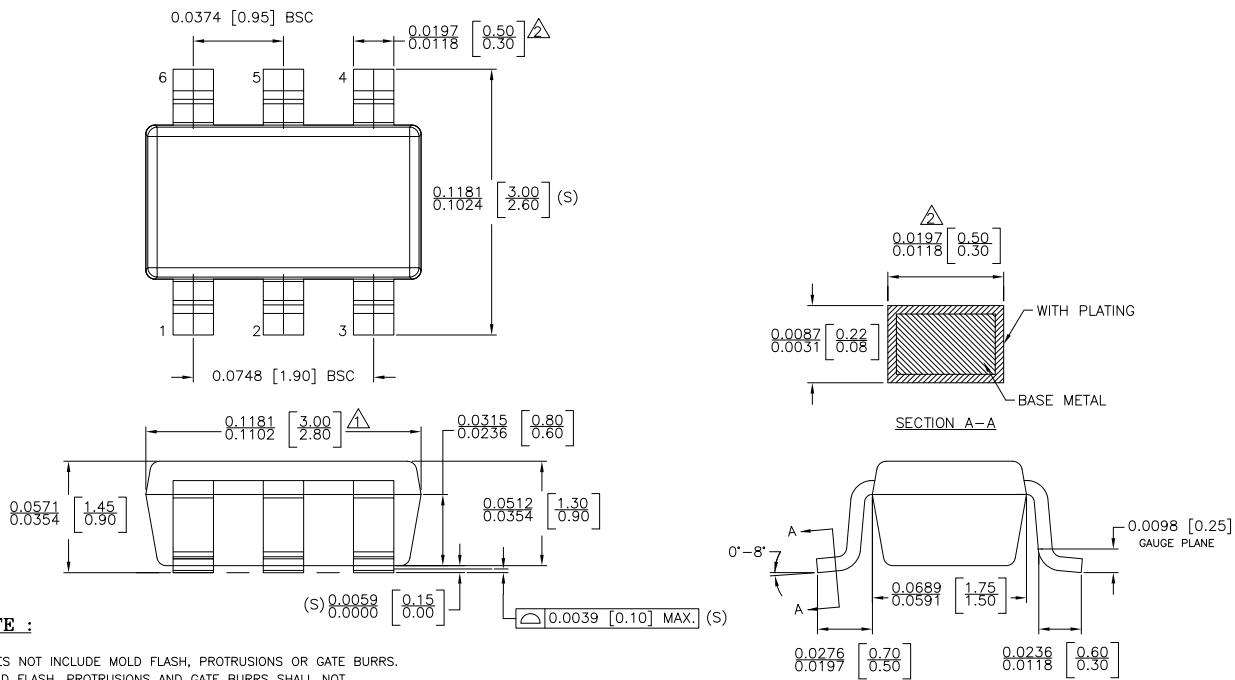
Parameter	Symbol	Value	Units
DC supply voltage range	V_{VCC}	-0.3 to 45	V
Continuous DC supply current at VCC pin ($V_{VCC} = 15V$)	I_{VCC}	20	mA
VSENSE input		-0.7 to 45	V
FB/ASU voltage		-0.3 to 20	V
CS voltage		-0.3 to 5.5	V
OUTPUT voltage		-0.3 to 20	V
Maximum junction temperature	T_{JMAX}	150	°C
Operating junction temperature	T_{JOPT}	-40 to 150	°C
Storage temperature	T_{STO}	-65 to 150	°C
Thermal Resistance Junction-to-Ambient	θ_{JA}	208	°C/W
ESD rating per JEDEC JS-001-2017		±2,000	V
Latch-up test per JESD78E		±100	mA

Notes:

- Note 1. Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. These are stress ratings only, so functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specification are not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Zero Standby Power AC/DC Digital Quasi-Resonant Flyback Controller for RapidCharge™

6 Physical Dimensions



NOTE :

- 1. DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH, PROTRUSIONS AND GATE BURRS SHALL NOT EXCEED 0.127 MM PER SIDE.
- 2. DOES NOT INCLUDE INTER-LEAD FLASH OR PROTRUSIONS. INTER-LEAD FLASH AND PROTRUSIONS SHALL NOT EXCEED 0.127 MM PER SIDE.
- 3. DIE IS FACING UP FOR MOLD. DIE IS FACING DOWN FOR TRIM/FORM.
- 4. THIS PART IS COMPLIANT WITH EIAJ SPECIFICATION SC74A AND JEDEC SPECIFICATION MO-178AB.
- 5. LEAD SPAN/STAND OFF HEIGHT/COPLANARITY ARE CONSIDERED AS SPECIAL CHARACTERISTIC(S)
- 6. CONTROLLING DIMENSIONS IN INCHES. [mm]

STATUS: RELEASED	SCALE: DO NOT SCALE	
TERMINAL FINISH: 100% Sn or NiPdAu (PPF)		
TITLE: 6 SOT23 PACKAGE OUTLINE		
REV: A	REVISION NOTE: NEW DRAWING	DATE: 02-MAR-2015

Figure 6.1 : SOT23-6 package outline drawing

7 Ordering Information

Part Number	Options								Package	Description
	Output Voltage Range	Secondary Side Controller	Standby Power	OTP	Max f _{sw}	CCM/DCM	N _{PS}	Aux Winding Polarity		
iW9860-01	Supports 3.4V up to 21V	iW760	< 5mW ²	TBD	TBD	TBD	TBD	TBD	SOT23-6	Tape & Reel ¹
iW9860-21	Supports 3.4V up to 20V	iW760	< 5mW ²	141°C	80kHz	CCM at Low-Line	5.75~6.75	GND	SOT23-6	Tape & Reel ¹
iW9861-01	Supports 3.4V up to 21V	iW760	< 20mW	TBD	TBD	TBD	TBD	TBD	SOT23-6	Tape & Reel ¹

Note 1: Tape & Reel packing quantity is 3,000/reel. Minimum packing quantity is 3,000.

Note 2: Typically with 25W power supplies when using start-up D-FET.

iW9860, iW9861

Zero Standby Power AC/DC Digital Quasi-Resonant Flyback Controller for RapidCharge™

8 Top Marking

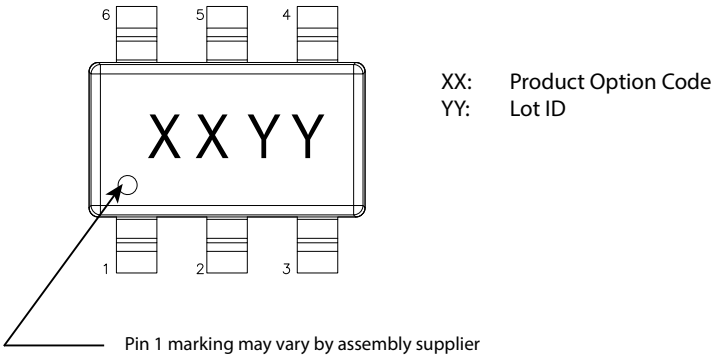


Figure 8.1 : Top Marking for the iW9860/61

Zero Standby Power AC/DC Digital Quasi-Resonant Flyback Controller for RapidCharge™

IMPORTANT NOTICE AND DISCLAIMER

RENESAS ELECTRONICS CORPORATION AND ITS SUBSIDIARIES (“RENESAS”) PROVIDES TECHNICAL SPECIFICATIONS AND RELIABILITY DATA (INCLUDING DATASHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES “AS IS” AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for developers skilled in the art designing with Renesas products. You are solely responsible for (1) selecting the appropriate products for your application, (2) designing, validating, and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, or other requirements. These resources are subject to change without notice. Renesas grants you permission to use these resources only for development of an application that uses Renesas products. Other reproduction or use of these resources is strictly prohibited. No license is granted to any other Renesas intellectual property or to any third party intellectual property. Renesas disclaims responsibility for, and you will fully indemnify Renesas and its representatives against, any claims, damages, costs, losses, or liabilities arising out of your use of these resources. Renesas’ products are provided only subject to Renesas’ Terms and Conditions of Sale or other applicable terms agreed to in writing. No use of any Renesas resources expands or otherwise alters any applicable warranties or warranty disclaimers for these products.

© 2022 Renesas Electronics Corporation. All rights reserved.

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.

(Rev.1.0 Mar 2020)

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/

Trademarks

Renesas and the Renesas logo are trademarks of Renesas Electronics Corporation. All trademarks and registered trademarks are the property of their respective owners.