

## iW9861

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

The **iW9861** is a high-performance AC/DC primary-side digital flyback controller for secondary-side regulation (SSR) that can enable ultra-low 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 iW9861 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 iW9861 and iW760 chipset can meet no-load power consumption of less than 20mW when the output USB cable is detached, while using the lowest BOM count solution.

The iW9861'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 iW9861 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 ultra-low standby power, Renesas' innovative proprietary technology ensures that power supplies designed with the iW9861 and iW760 chipset can achieve high efficiency, high accuracy voltage/current control and fast dynamic load response, all with the lowest system cost.

## Features

- Lowest BOM cost with < 20mW no-load power consumption when output USB cable is detached in a typical USB PD travel adapter
- 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
- Supports constant-voltage (CV) and constant-current (CC) regulation in fine steps using secondary-side regulation (SSR) control
- Max switching frequency range - 70kHz to 130kHz (by product option - see [section 7](#))
- 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

## Applications

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

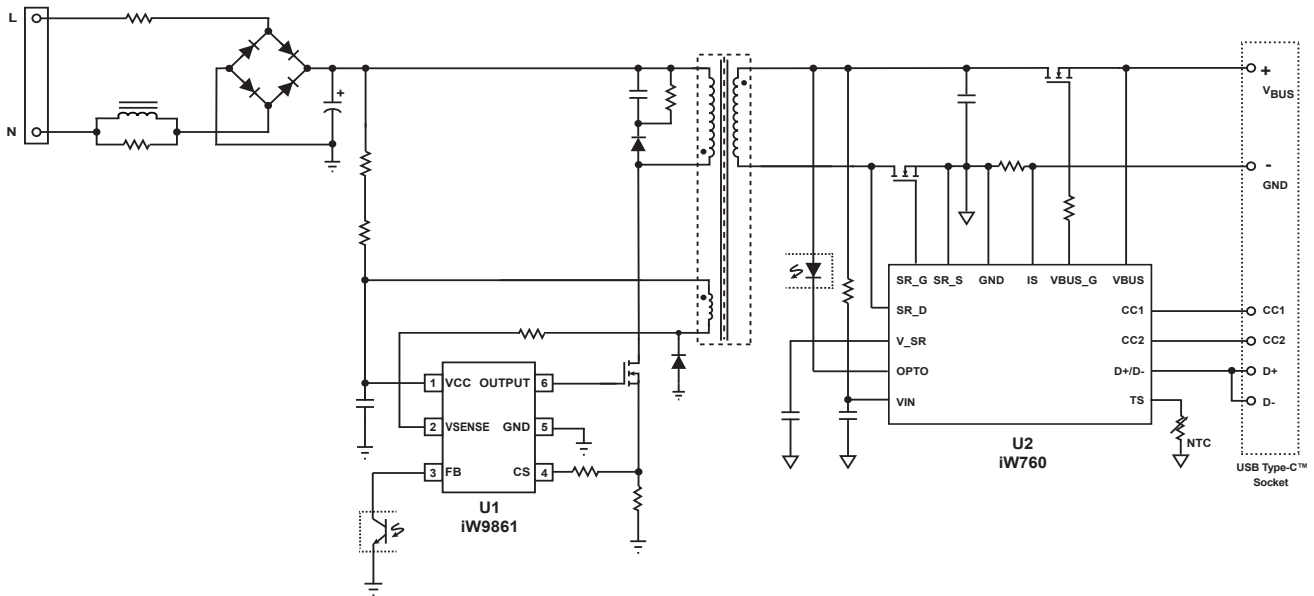
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# 1. Overview

## 1.1 Typical Application



**Figure 1. iW9861 Typical Application Circuit without Active Start-up Circuit**  
 (Using iW760 as Secondary-Side Controller. Achieving < 20mW Standby Power Consumption at 230V<sub>AC</sub>)

## 2. Pin Information

### 2.1 Pin Assignments

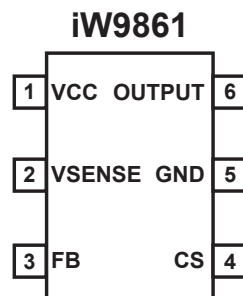


Figure 2. SOT23-6 Package (Top View)

### 2.2 Pin Descriptions

Pin Number	Pin Name	Type	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	Analog input	Feedback voltage. Used for determining multi-mode control
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

### 3. Specifications

#### 3.1 Absolute Maximum Ratings

**CAUTION:** Do not operate at or near the maximum ratings listed for extended periods of time. Exposure to such conditions can adversely impact product reliability and result in failures not covered by warranty.

Parameter	Symbol	Minimum	Maximum	Unit
DC supply voltage range	$V_{VCC}$	-0.3	45	V
Continuous DC supply current at VCC pin ( $V_{VCC} = 15V$ )	$I_{VCC}$		20	mA
VSENSE input		-0.7	45	V
FB voltage		-0.3	20	V
CS voltage		-0.3	5.5	V
OUTPUT voltage		-0.3	20	V

#### 3.2 ESD Ratings

ESD Model/Test	Rating	Unit
JEDEC JS-001-2017 (HBM)	±2,000	V
Latch-up test per JESD78E	±100	mA

#### 3.3 Thermal Specifications

Thermal Resistance (Typical)	$\theta_{JA}$ (°C/W)
SOT23-6 Package	208

#### 3.4 Recommended Operating Conditions

Parameter	Symbol	Minimum	Maximum	Unit
Maximum junction temperature	$T_{JMAX}$		150	°C
Operating junction temperature	$T_{JOPT}$	-40	150	°C
Storage temperature	$T_{STO}$	-65	150	°C

## 4. Package Outline Drawings

The package outline drawings are located at the end of this document and are accessible from the Renesas website. The package information is the most current data available and is subject to change without revision of this document.

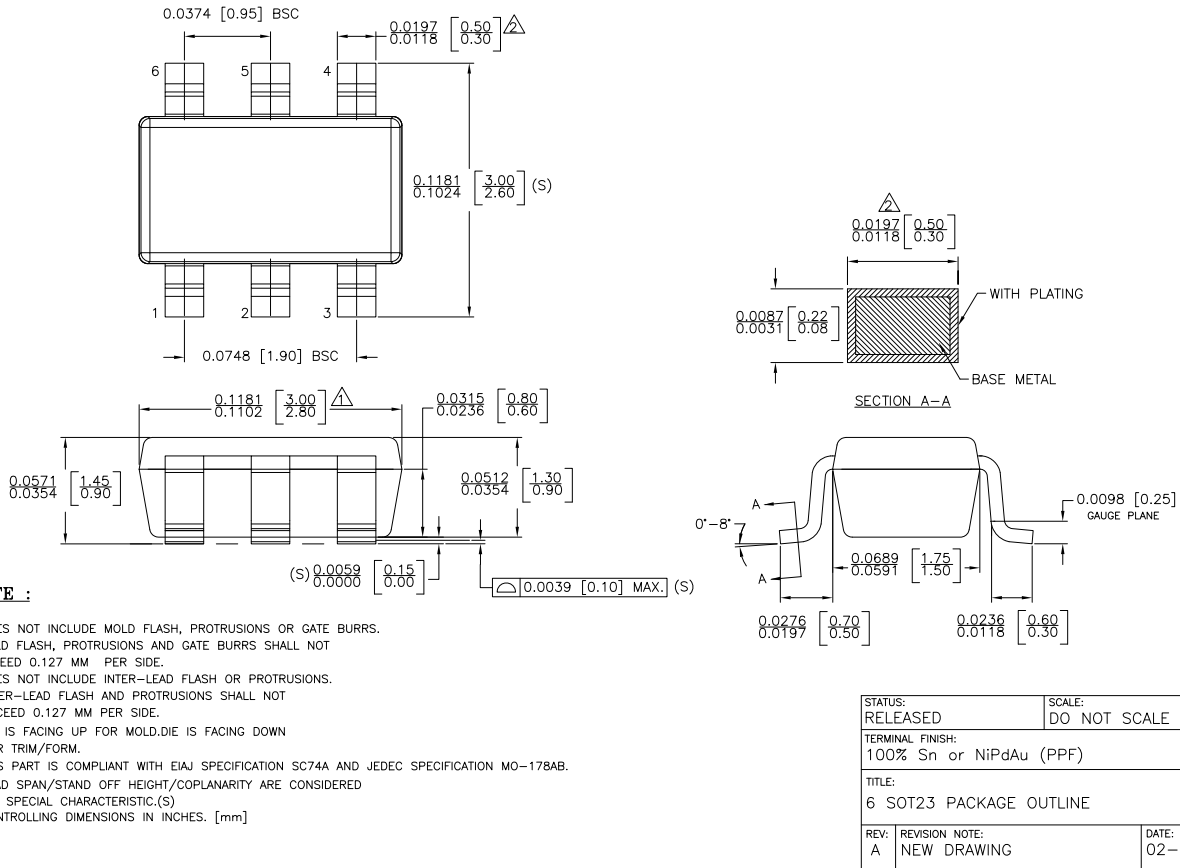


Figure 3. SOT23-6 Package

## 5. 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		
iW9861-01	Supports 3.4V up to 21V	iW760	< 20mW	TBD	TBD	TBD	TBD	TBD	SOT23-6	Tape & Reel <sup>1</sup>

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

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