

## Digital Synchronous Rectifier Controller Optimized for Wide Range Outputs with Optional Active Voltage Position Control

### 1 Description

The iW676 is an advanced synchronous rectifier (SR) controller with an integrated MOSFET driver for discontinuous mode flyback converters. 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 conduction losses on the secondary. The iW676 uses lossless sensing by monitoring the voltage across the synchronous MOSFET to determine when to switch the FET, further improving efficiency. 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 iW676 has the ability to work at output voltages as high as 25V and as low as 3V under all conditions to accommodate a wide array of power supplies. It can sense drain voltages up to 100V, eliminating the need for an external clamping circuit in applications with multi-level output voltage applications up to 12V. A unique internal regulator circuit enables the iW676 to operate down to very low voltages on the output of the power supply, optimizing the device for Direct Charging applications down to sub-3V levels.

The iW676-3X/3XC integrates Dialog's unique Active Voltage Positioning (AVP) control for fast dynamic load response and very low no-load power consumption (non-rapid charge applications), without increasing the package size or pin count.

### 2 Features

- Supports system output voltages from 3V to 25V in multi-level output voltage and current applications
  - » Integrated pulse linear regulator (PLR) enables high efficiency SR operation down to 3V under all load conditions and below 2.4V under constant current (CC) mode condition
  - » Supports Direct Charge down to sub-3V levels
  - » Wide  $V_{IN}$  pin operating voltage up to 25V
- High voltage Drain sensing up to 100V with no additional external clamping circuits required
- 6-pin SOT23 package
- Digital adaptive turn-off control minimizes dead-time and eliminates the parallel Schottky diode
- Lossless MOSFET  $V_{DS}$  sensing for SR timing control
- Optimized 5V MOSFET gate driver
- Intelligent low power management achieves ultra-low no-load operating current
- Built-in Active Voltage Positioning (AVP) to provide fast system output voltage transient detection with no additional pins or external components required. (iW676-3X/3XC options)

### 3 Applications

- Compact AC/DC adapters/chargers for media tablets and smart phones

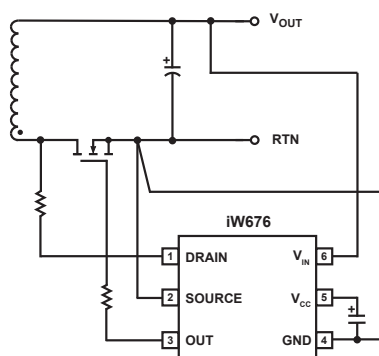
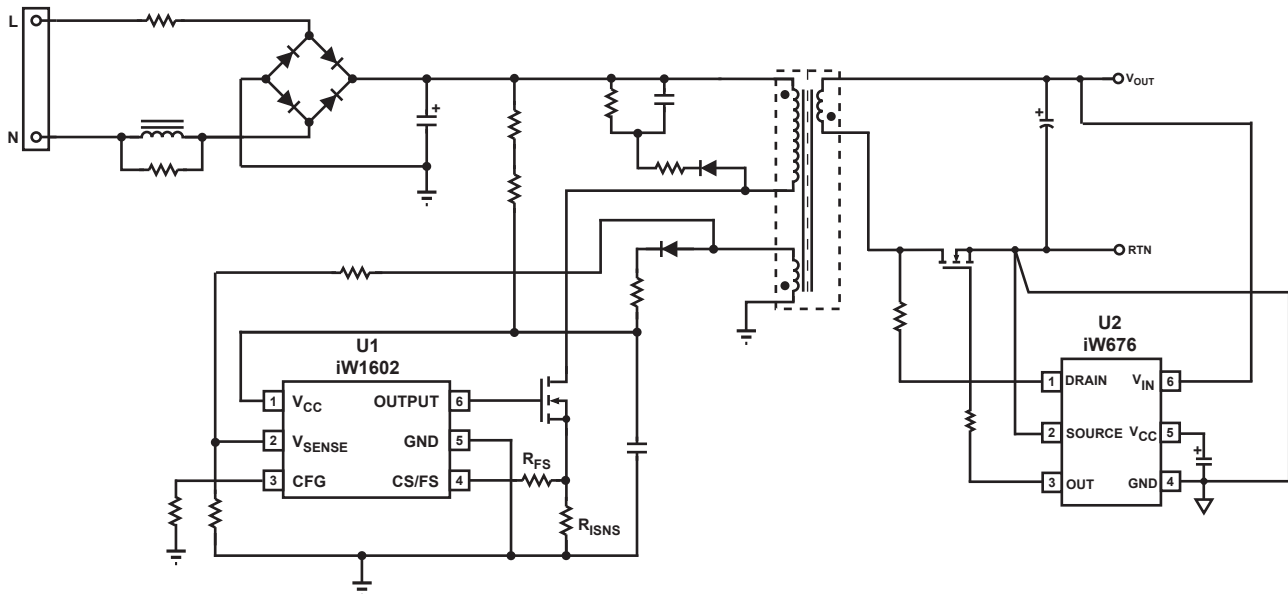
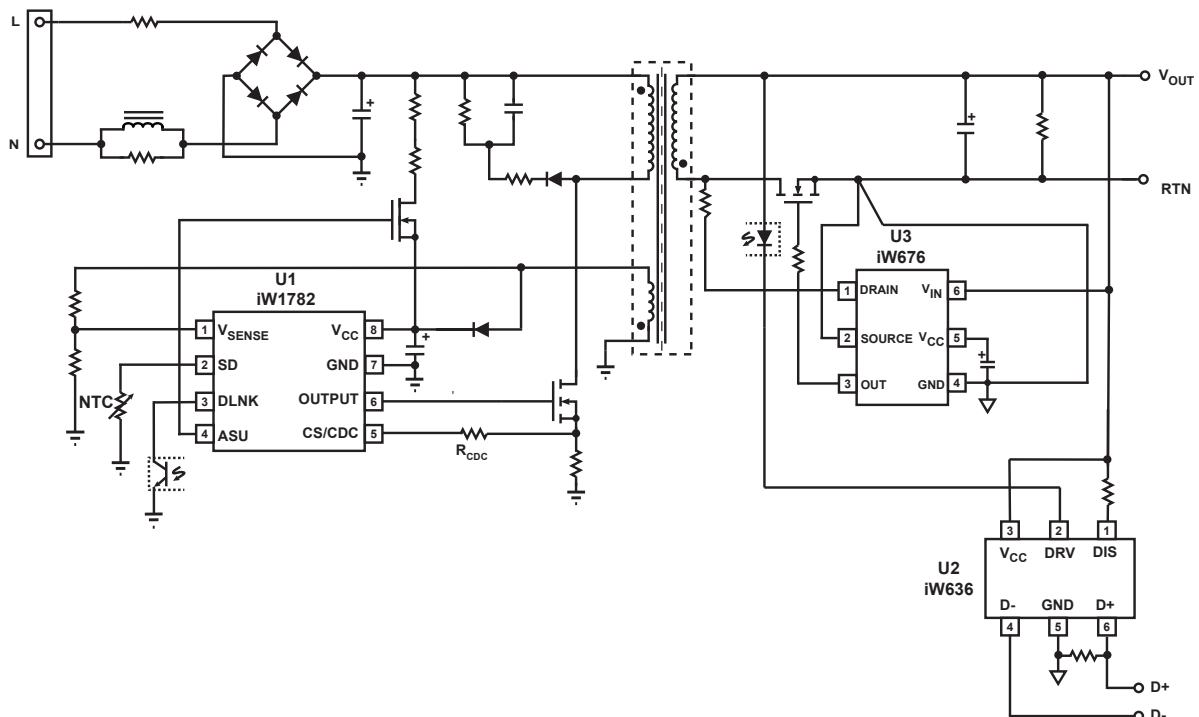


Figure 3.1 : iW676 Typical Application Circuit

## Digital Synchronous Rectifier Controller Optimized for Wide Range Outputs with Optional Active Voltage Position Control



**Figure 3.2 : iW676 Typical Application Circuit Using iW1602 as the Primary-Side Controller**  
(Achieving < 30mW No-Load Power Consumption in 5V, 2.5A Adapter Designs with Fast Dynamic Load Response, and Supporting Constant Current Operation at Low System Output)



**Figure 3.3 : iW676 Typical Application Circuit for Multi-Level Output Voltage and Current**  
(Using iW1782 as Primary-Side Controller and iW636 as Secondary-Side Controller for Qualcomm® Quick Charge™ 3.0)  
(Achieving < 20mW No-Load Power Consumption)

© 2019 Dialog Semiconductor

## Digital Synchronous Rectifier Controller Optimized for Wide Range Outputs with Optional Active Voltage Position Control

### 4 Pinout Description

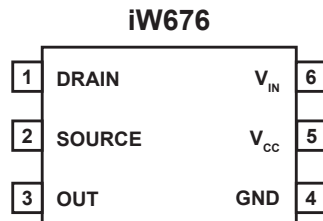


Figure 4.1 : 6-Pin SOT23 Package

Pin No.	Pin Name	Type	Pin Description
1	DRAIN	Analog Input	Synchronous rectifier MOSFET drain voltage sensing and the Pulse Linear Regulator (PLR) input. For iW676-3X/3XC, it is also the secondary-side Active Voltage Positioning function input and output.
2	SOURCE	Analog input	Synchronous rectifier MOSFET source voltage sensing input. In the iW676-xxC, this pin is internally connected to GND.
3	OUT	Output	Synchronous rectifier MOSFET driver.
4	GND	Ground	Ground.
5	V <sub>CC</sub>	Power Input	Output of internal LDO and PLR. It provides bias voltage for the internal logic circuit and the MOSFET driver. Connect this pin to a capacitor.
6	V <sub>IN</sub>	Analog Input	Input of internal LDO and system output voltage sensing circuit. Connect to adapter/charger output for bias voltage. The internal LDO clamps the V <sub>CC</sub> voltage at 5V when V <sub>IN</sub> > 5V. V <sub>IN</sub> is also the input for the PLR enable comparator and the SR enable comparator.

## Digital Synchronous Rectifier Controller Optimized for Wide Range Outputs with Optional Active Voltage Position Control

### 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 <sub>IN</sub> DC supply voltage range (pin 6, I <sub>CC</sub> = 15mA max)	V <sub>IN</sub>	-0.3 to 33	V
Continuous DC supply current at V <sub>IN</sub> pin (V <sub>IN</sub> = 30V)	I <sub>VO</sub>	15	mA
Continuous DC supply current at V <sub>CC</sub> pin (V <sub>CC</sub> = 5.5V)	I <sub>VCC</sub>	15	mA
Gate peak output current	I <sub>G</sub>	±3	A
DRAIN pin voltage (Note 1)	V <sub>D</sub>	-1.5 to 100	V
DRAIN pin peak current	I <sub>DRAIN</sub>	-40 to 300	mA
SOURCE pin voltage (Note 2)	V <sub>SOURCE</sub>	-0.6 to 1	V
V <sub>CC</sub> pin voltage	V <sub>CC</sub>	-0.6 to 6	V
Junction temperature	T <sub>J</sub>	-40 to 150	°C
Storage temperature		-65 to 150	°C
Thermal resistance junction-to-ambient	θ <sub>JA</sub>	190	°C/W
ESD rating per JEDEC JS-001-2017		±2,000	V

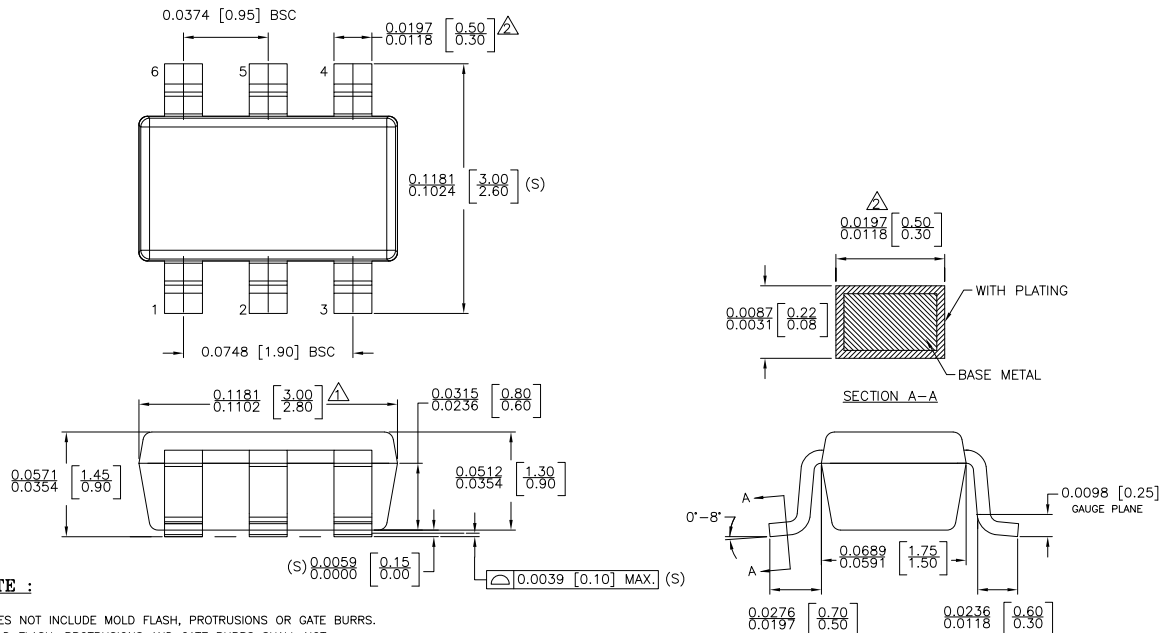
#### Notes:

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

Note 2: Only applies to iW676-XX. In iW676-XXC, this pin is internally connected to GND.

## Digital Synchronous Rectifier Controller Optimized for Wide Range Outputs with Optional Active Voltage Position Control

### 6 Physical Dimensions



### 7 Ordering Information

Part no.	Options	Package	Description
iW676-00	No Active Voltage Positioning (AVP) function Not Recommended for New Designs, please use the iW676-00C	SOT23	Tape & Reel <sup>(1)</sup>
iW676-00C	No Active Voltage Positioning (AVP) function Recommended for New Designs	SOT23	Tape & Reel <sup>(1)</sup>
iW676-30	With secondary Active Voltage Positioning (AVP) function, under-voltage threshold ( $V_{UV}$ ) = 4.75V <sup>(2)</sup> . Not recommended for new designs, please use the iW676-30C.	SOT23	Tape & Reel <sup>(1)</sup>
iW676-30C	With secondary Active Voltage Positioning (AVP) function, under-voltage threshold ( $V_{UV}$ ) = 4.75V <sup>(2)</sup> . Recommended for new designs.	SOT23	Tape & Reel <sup>(1)</sup>
iW676-32	With secondary Active Voltage Positioning (AVP) function, under-voltage threshold ( $V_{UV}$ ) = 11.2V <sup>(2)</sup>	SOT23	Tape & Reel <sup>(1)</sup>

#### Notes:

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

Note 2: For availability of additional  $V_{UV}$  options, please contact marketing.

## Digital Synchronous Rectifier Controller Optimized for Wide Range Outputs with Optional Active Voltage Position Control

### Disclaimer

Unless otherwise agreed in writing, the Dialog Semiconductor products (and any associated software) referred to in this document are not designed, authorized or warranted to be suitable for use in life support, life-critical or safety-critical systems or equipment, nor in applications where failure or malfunction of a Dialog Semiconductor product (or associated software) can reasonably be expected to result in personal injury, death or severe property or environmental damage. Dialog Semiconductor and its suppliers accept no liability for inclusion and/or use of Dialog Semiconductor products (and any associated software) in such equipment or applications and therefore such inclusion and/or use is at the customer's own risk.

Information in this document is believed to be accurate and reliable. However, Dialog Semiconductor does not give any representations or warranties, express or implied, as to the accuracy or completeness of such information. Dialog Semiconductor furthermore takes no responsibility whatsoever for the content in this document if provided by any information source outside of Dialog Semiconductor.

Dialog Semiconductor reserves the right to change without notice the information published in this document, including, without limitation, the specification and the design of the related semiconductor products, software and applications. Notwithstanding the foregoing, for any automotive grade version of the device, Dialog Semiconductor reserves the right to change the information published in this document, including, without limitation, the specification and the design of the related semiconductor products, software and applications, in accordance with its standard automotive change notification process.

Applications, software, and semiconductor products described in this document are for illustrative purposes only. Dialog Semiconductor makes no representation or warranty that such applications, software and semiconductor products will be suitable for the specified use without further testing or modification. Unless otherwise agreed in writing, such testing or modification is the sole responsibility of the customer and Dialog Semiconductor excludes all liability in this respect.

Nothing in this document may be construed as a license for customer to use the Dialog Semiconductor products, software and applications referred to in this document. Such license must be separately sought by customer with Dialog Semiconductor.

All use of Dialog Semiconductor products, software and applications referred to in this document is subject to Dialog Semiconductor's [Standard Terms and Conditions of Sale](#), available on the company website ([www.dialog-semiconductor.com](http://www.dialog-semiconductor.com)) unless otherwise stated.

Dialog, Dialog Semiconductor and the Dialog logo are trademarks of Dialog Semiconductor Plc or its subsidiaries. All other product or service names and marks are the property of their respective owners.

Qualcomm is a trademark of Qualcomm Incorporated, registered in the United States and other countries. Qualcomm Quick Charge is a trademark of Qualcomm Incorporated. All Qualcomm Incorporated marks are used with permission.

© 2019 Dialog Semiconductor. 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.

## Contacting Dialog Semiconductor

**United Kingdom (Headquarters)**  
*Dialog Semiconductor (UK) LTD*  
Phone: +44 1793 757700

**Germany**  
*Dialog Semiconductor GmbH*  
Phone: +49 7021 805-0

**The Netherlands**  
*Dialog Semiconductor B.V.*  
Phone: +31 73 640 8822

**Email**  
[info\\_pcbg@diasemi.com](mailto:info_pcbg@diasemi.com)

**North America**  
*Dialog Semiconductor Inc.*  
Phone: +1 408 845 8500

**Japan**  
*Dialog Semiconductor K. K.*  
Phone: +81 3 5769 5100

**Taiwan**  
*Dialog Semiconductor Taiwan*  
Phone: +886 281 786 222

**Web site:**  
[www.dialog-semiconductor.com](http://www.dialog-semiconductor.com)

**Hong Kong**  
*Dialog Semiconductor Hong Kong*  
Phone: +852 2607 4271

**Korea**  
*Dialog Semiconductor Korea*  
Phone: +82 2 3469 8200

**China (Shenzhen)**  
*Dialog Semiconductor China*  
Phone: +86 755 2981 3669

**China (Shanghai)**  
*Dialog Semiconductor China*  
Phone: +86 21 5424 9058

# Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

[Dialog Semiconductor:](#)

[iW676-00](#) [iW676-30](#) [iW676-32](#)