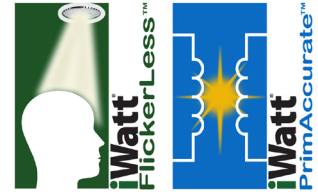


## AC/DC Digital Power Controller for Two-Channel High Power Factor Dimmable LED Drivers

### 1 Description

The iW3640 is a two-stage, high-performance AC/DC offline power supply controller for dimmable LED luminaires. It applies advanced digital control technology to detect the dimmer type and phase, which provides dynamic impedance to interface the dimmer and control the LED brightness at the same time. The iW3640 uses Dialog's unique digital **Flickerless™** technology to eliminate visible flicker in the entire dimming range and minimize low frequency output ripple current. The iW3640 drives two-channel outputs. The duty cycle of the second channel varies with the dimming ratio.



With advanced dimmer detection technology, the iW3640 can operate with most wall dimmers including leading-edge dimmers (R-type or R-L type) and trailing-edge dimmers (R-C type). In addition, the iW3640's cycle-by-cycle waveform analysis technology allows fast dimmer setting response. When no dimmer is on the line, the iW3640 optimizes the power factor and minimizes the current harmonic distortion to the AC line.

The iW3640 operates the main power converter that delivers constant current to the LED load in quasi-resonant mode to provide high power efficiency and minimize electro-magnetic interference (EMI). It uses Dialog's patented **PrimAccurate™** primary-side sensing technology to achieve excellent LED current regulation under different AC line and LED load voltages, without using a secondary-side feedback circuit and eliminating the need for an optocoupler.

The iW3640 minimizes the external components count by simplifying the EMI filter with Dialog's **EZ-EMI®** technology. The intelligent dimmer detection technology eliminates the need for a high-power bleeder. Additionally, the digital control loop of the iW3640 maintains stable overall operating conditions without the need for loop compensation components.

### 2 Features

- Isolated/non-isolated offline 120V<sub>AC</sub>/230V<sub>AC</sub> LED driver up to 25W output power
- Wide line frequency ranges (from 45Hz to 66Hz)
- Meets IEC61000-3-2 requirement
- Total harmonic distortion < 15% with PF > 0.95
- Wide dimmer compatibility
  - » Leading-edge dimmer
  - » Trailing-edge dimmer
  - » Digital dimmer
  - » Occupancy sensors and timers
- Under 20% output ripple current
- Wide dimming range from 1% to 100%
- **Flickerless™** LED dimming
- Resonant control to achieve high efficiency (typical > 85% without dimmer)
- Over-temperature LED current foldback
  - » Small solution size
  - » Two-stage topology enables small-size input and output filter capacitors
- » 200kHz maximum switching frequency enables small transformer
- » Intelligent dimmer interface eliminates dedicated high-power bleeder
- **PrimAccurate™** primary-side sensing eliminates the need for optocoupler feedback
- Tight LED current regulation ( $\pm 5\%$ )
- Fast start-up (< 0.5s without dimmer)
- Supports hot-plug LED module (Zhaga)
- Compatible with NEMA SSL6 dimming curve standard
- Supports wide LED output voltage range
- Multiple protection features:
  - » LED open-circuit and short-circuit protection
  - » Over-current and over-temperature protection
  - » Current sense resistor short-circuit protection
  - » AC line over-voltage/-frequency protection

### 3 Applications

- Dimmable LED retrofit lamps up to 25W
- Dimmable LED ballast and luminaires up to 25W

AC/DC Digital Power Controller for Two-Channel High Power Factor Dimmable LED Drivers

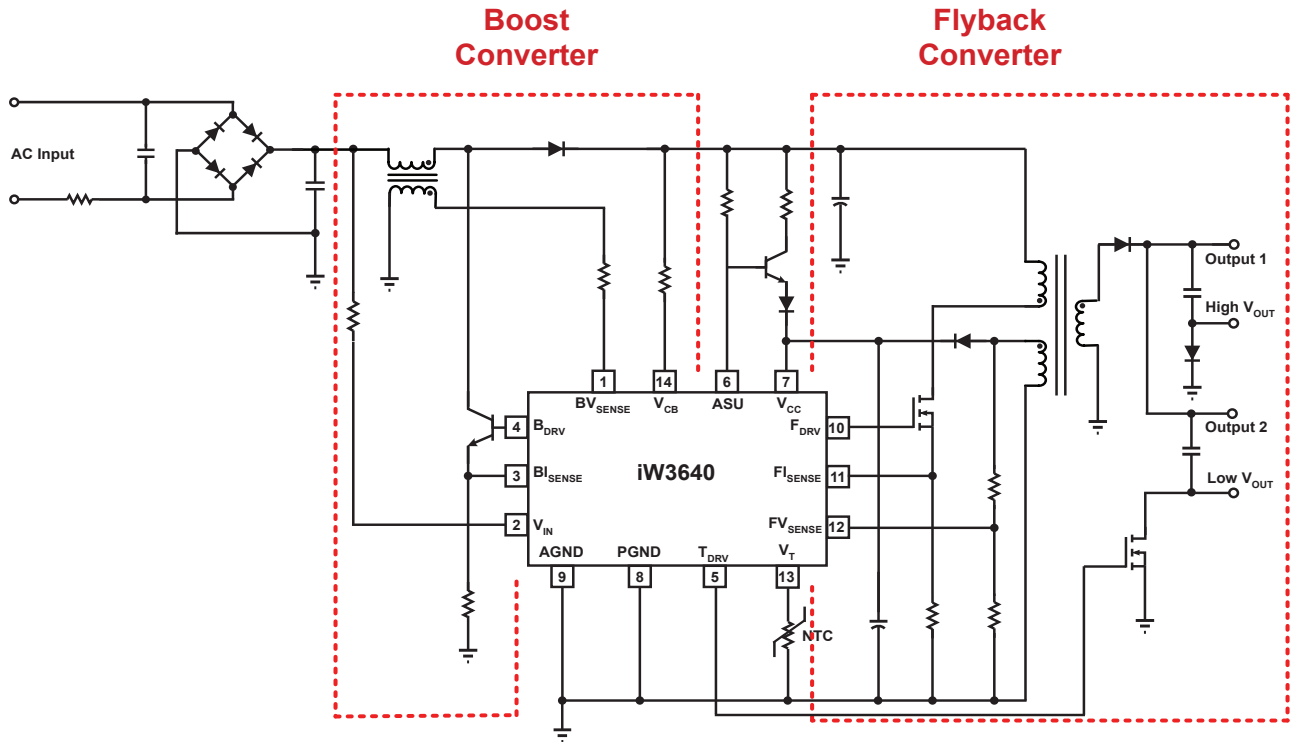


Figure 3.1 : iW3640 Simplified Schematic

## AC/DC Digital Power Controller for Two-Channel High Power Factor Dimmable LED Drivers

### 4 Pinout Description

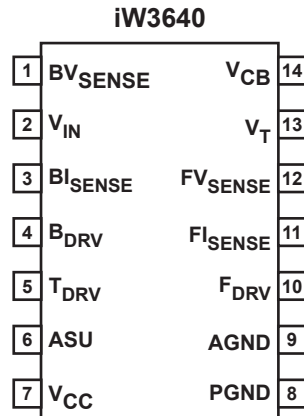


Figure 4.1 : 14-Lead SOIC Package

Pin Number	Pin Name	Type	Pin Description
1	BV <sub>SENSE</sub>	Analog Input	Boost inductor voltage feedback input
2	V <sub>IN</sub>	Analog Input	Rectified AC line voltage input
3	BI <sub>SENSE</sub>	Analog Input	Boost current sense input
4	B <sub>DRV</sub>	Output	Base drive output for boost BJT
5	T <sub>DRV</sub>	Analog In/Out	Driver parameter configuration pin and second channel driver
6	ASU	Output	Active start-up and bleeder control
7	V <sub>CC</sub>	Power	Power supply for control logic and voltage sense for power-on reset circuit
8	PGND	Ground	Power ground
9	AGND	Ground	Signal ground. It should be connected to the power ground on PCB.
10	F <sub>DRV</sub>	Output	Gate drive output for flyback MOSFET
11	FI <sub>SENSE</sub>	Analog Input	Flyback current sense (used for cycle-by-cycle peak current control and limit)
12	FV <sub>SENSE</sub>	Analog Input	Flyback voltage sense (used for primary-side regulation and ZVS)
13	V <sub>T</sub>	Analog Input	External power limit shutdown control and external over-temperature power derating
14	V <sub>CB</sub>	Analog Input	Boost output voltage feedback input

## AC/DC Digital Power Controller for Two-Channel High Power Factor Dimmable LED Drivers

### 5 Absolute Maximum Ratings

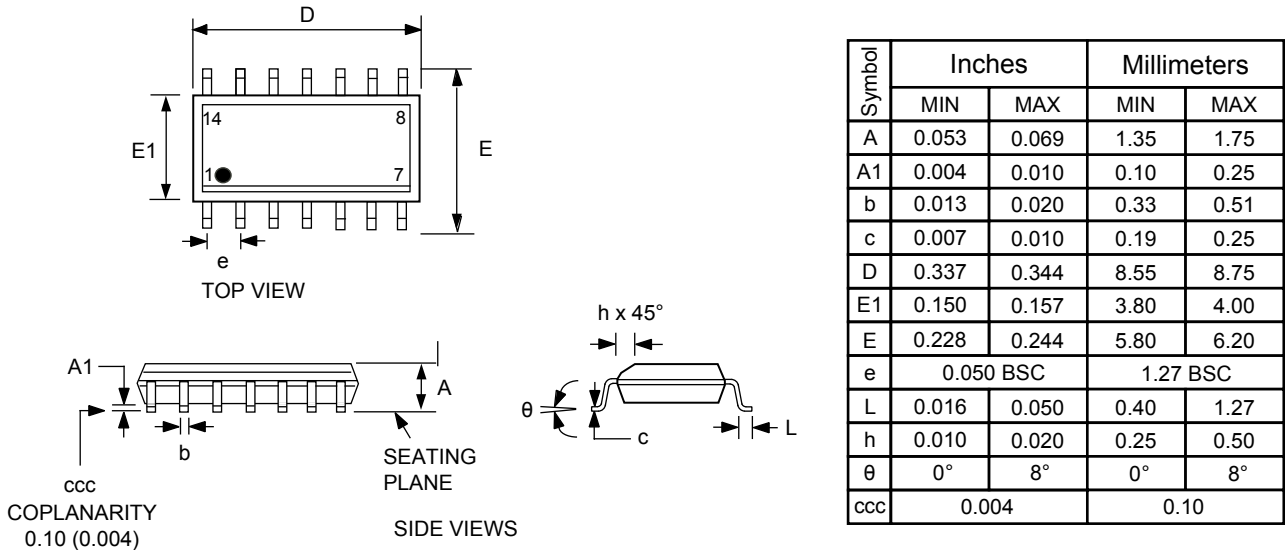
Absolute maximum ratings are the parameter values or ranges which can cause permanent damage if exceeded. For maximum safe operating conditions, refer to Electrical Characteristics in Section 6.

Parameter	Symbol	Value	Units
DC supply voltage range (pin 7)	$V_{CC}$	-0.3 to 18	V
$F_{DRV}$ output (pin 10)		-0.3 to 18	V
$B_{DRV}$ output (pin 4)		-0.3 to 4.0	V
$T_{DRV}$ input (pin 5)		-0.3 to 4.0	V
$T_{DRV}$ output (pin 5)		-0.3 to 18	V
$FV_{SENSE}$ input (pin 12, $I \leq 10\text{mA}$ )		-0.7 to 4.0	V
$BV_{SENSE}$ input (pin 1, $I \leq 3\text{mA}$ )		-0.7 to 4.0	V
$V_{IN}$ input (pin 2)		-0.3 to 18	V
$V_{CB}$ input (pin 14)		-0.3 to 18	V
$FI_{SENSE}$ input (pin 11)		-0.3 to 4.0	V
$BI_{SENSE}$ input (pin 3)		-0.3 to 4.0	V
ASU output (pin 6)		-0.3 to 18	V
$V_T$ input (pin 13)		-0.3 to 4.0	V
Maximum junction temperature	$T_{JMAX}$	150	°C
Operating junction temperature	$T_{JOPT}$	-40 to 150	°C
Storage temperature	$T_{STG}$	-65 to 150	°C
Thermal Resistance Junction-to-PCB Board Surface Temperature	$\psi_{JB}$	45	°C/W
ESD rating per JEDEC JESD22-A114		±2,000	V
Latch-up test per JESD78A		±100	mA

**AC/DC Digital Power Controller for Two-Channel High Power Factor Dimmable LED Drivers**

**6 Physical Dimensions**

14-Lead SOIC Package



Compliant to JEDEC Standard MS12F

Controlling dimensions are in inches; millimeter dimensions are for reference only

This product is RoHS compliant and Halide free.

Soldering Temperature Resistance:

[a] Package is IPC/JEDEC Std 020D Moisture Sensitivity Level 1

[b] Package exceeds JEDEC Std No. 22-A111 for Solder Immersion Resistance; package can withstand 10 s immersion < 260°C

Dimension D does not include mold flash, protrusions or gate burrs. Mold flash, protrusions or gate burrs shall not exceed 0.15 mm per end. Dimension E does not include interlead flash or protrusion. Interlead flash or protrusion shall not exceed 0.25 mm per side.

The package top may be smaller than the package bottom. Dimensions D and E are determined at the outermost extremes of the plastic body exclusive of mold flash, tie bar burrs, gate burrs and interlead flash, but including any mismatch between the top and bottom of the plastic body.

**Figure 6.1 : 14-Lead SOIC Package**

**7 Ordering Information**

Part no.	Options	Package	Description
iW3640-00	Low line (120V <sub>AC</sub> ) phase cut color mixing	SOIC-14	Tape & Reel <sup>1</sup>
iW3640-01	High line (230V <sub>AC</sub> ) phase cut color mixing	SOIC-14	Tape & Reel <sup>1</sup>

**Note 1: Tape & Reel packing quantity is 2,500/reel.**

## AC/DC Digital Power Controller for Two-Channel High Power Factor Dimmable LED Drivers

### Disclaimer

Information in this document is believed to be accurate and reliable. However, Dialog Semiconductor does not give any representations or warranties, expressed 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.

Applications, software, and semiconductor products described in this document are for illustrative purposes only. Dialog 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 excludes all liability in this respect.

Customer notes that nothing in this document may be construed as a license for customer to use the Dialog 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 are 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 and the Dialog logo are trademarks of Dialog Semiconductor plc or its subsidiaries. All other product or service names are the property of their respective owners.

© Copyright 2016 Dialog Semiconductor. All rights reserved.

### RoHS Compliance

Dialog Semiconductor complies to European Directive 2001/95/EC and from 2 January 2013 onwards to European Directive 2011/65/EU concerning Restriction of Hazardous Substances (RoHS/RoHS2).

Dialog Semiconductor's statement on RoHS can be found on the customer portal <https://support.diasemi.com/>. RoHS certificates from our suppliers are available on request.

## Contacting Dialog Semiconductor

#### United Kingdom

*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 88 22

#### 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 5425 4567

#### Taiwan

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

#### Web site:

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

#### Singapore

*Dialog Semiconductor Singapore*  
Phone: +65 648 499 29

#### Hong Kong

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

#### Korea

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

#### China

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

*Dialog Semiconductor (Shanghai)*

Phone: +86 21 5424 9058