

## AC/DC Advanced Digital Power Controller for Phase-Cut Compatible I<sup>2</sup>C Digital Dimming LED Drivers

### 1 Description

The iW3690 is a single-stage, high performance AC/DC off-line power supply controller for intelligent LED luminaires. A master controller can communicate with the iW3690 through the I<sup>2</sup>C bus interface to control the LED driver output current. With advanced digital control, the iW3690 regulates a constant current to an LED load over a 1% to 100% dimming range without flicker or shimmer. The driver can support either wired or wireless links via the master controller. Moreover, the master digital controller can set the iW3690 to sleep mode to achieve remote light off function at low standby power.

The iW3690 uses Dialog's proprietary Dual-Dim technology, which enables intelligent LED luminaires that are compatible with wall dimmers while offering superior performance. When a wall dimmer only is used, the LED driver output current is controlled based on the phase conduction angle of the dimmer. This same information is used to set the high limit of the LED current when a digital dimming command is received from the I<sup>2</sup>C bus. While the I<sup>2</sup>C bus has priority over the wall dimmer, the iW3690 can respond to both dimmer interfaces at the same time, allowing the driver to enter a stable sleep mode state at any wall phase conduction angle. Dialog's Dual-Dim technology allows the light output to be dimmed to 1% without flicker.

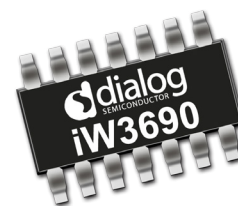
The iW3690 offers all the advanced features of Dialog's industry leading phase-cut dimming technology, including high efficiency and superior dimmer compatibility at low BOM cost. The iW3690 offers high performance, a wide dimming range and excellent dimmer compatibility while minimizing the external component count through high system-level integration. Dialog's EZ-EMI<sup>®</sup> technology works to simplify the input EMI filter, further reducing circuit size and cost while providing excellent noise rejection capability to AC line distortions.

### 2 Features

- Isolated/non-isolated off-line 120V<sub>AC</sub>/230V<sub>AC</sub> intelligent LED driver up to 25W output power
- I<sup>2</sup>C digital link dimmable and phase-cut (TRIAC) dimmable (Dual-Dim)
  - » Digital link dimming at any phase-cut conduction angle or no dimmer
  - » Remote on/off at any phase-cut conduction angle or no dimmer
- Resonant control to achieve high efficiency (typical > 85% without dimmer)
- Excellent AC line distortion immunity ensures high quality of light under real-life circumstances
- Over-temperature LED current foldback and shutdown
- Tight LED current regulation ( $\pm 5\%$ )
- Low standby power < 0.5W when I<sup>2</sup>C requests remotely off under no dimmer condition
- Wide 1% to 100% dimming range for both I<sup>2</sup>C dimming and phase-cut dimming
- Total harmonic distortion (THD) < 20%, PF > 0.92
- Advanced IC power management and voltage sensing enables use of off-the-shelf inductor
- Fast start-up (< 0.5s without dimmer)
- Multiple protection features include:
  - » LED open-circuit and short-circuit protection
  - » AC line over-voltage protection
  - » Over-current protection

### 3 Applications

- Dimmable LED intelligent lamps up to 25W
- Dimmable LED intelligent luminaires up to 25W



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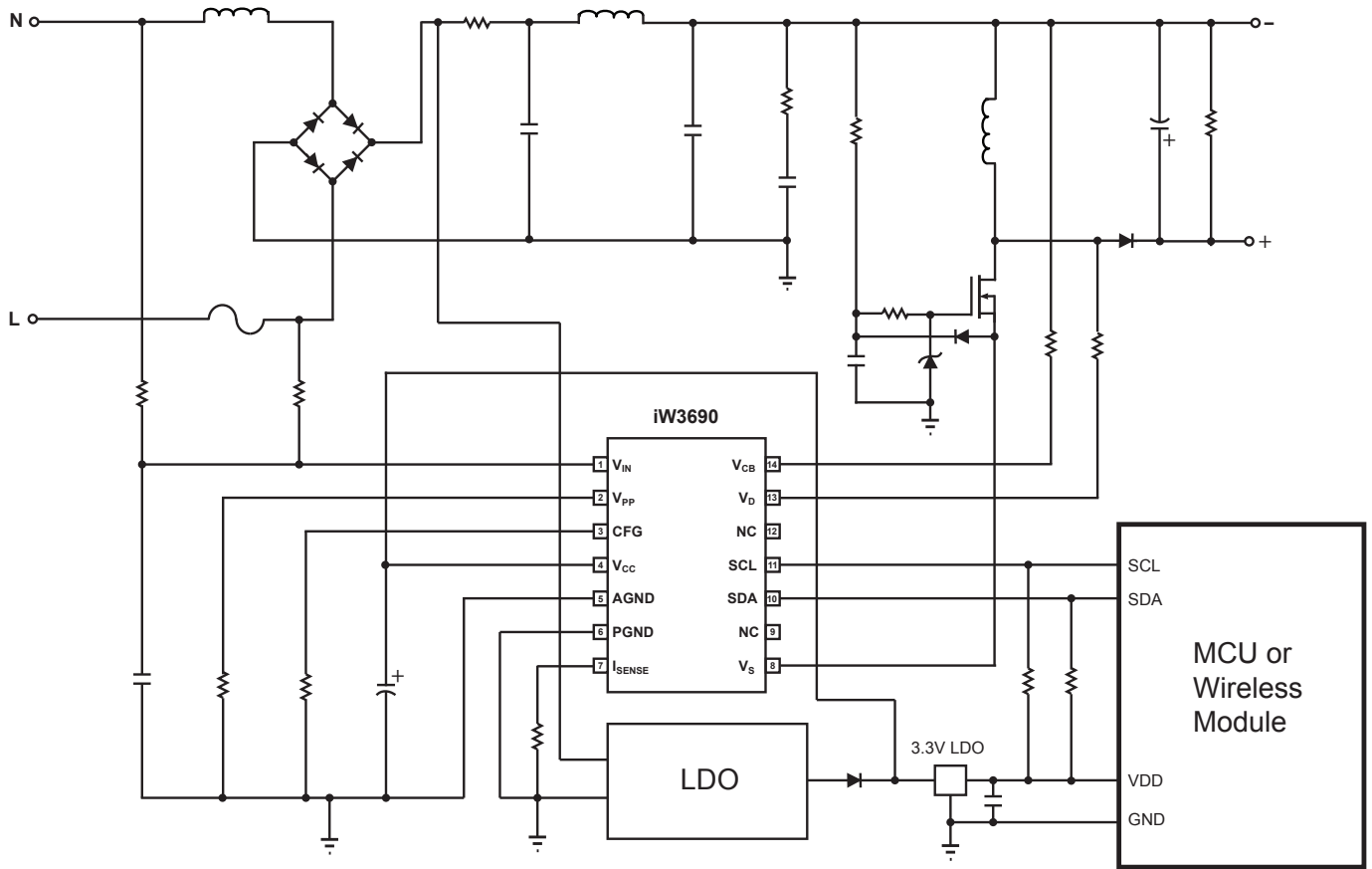
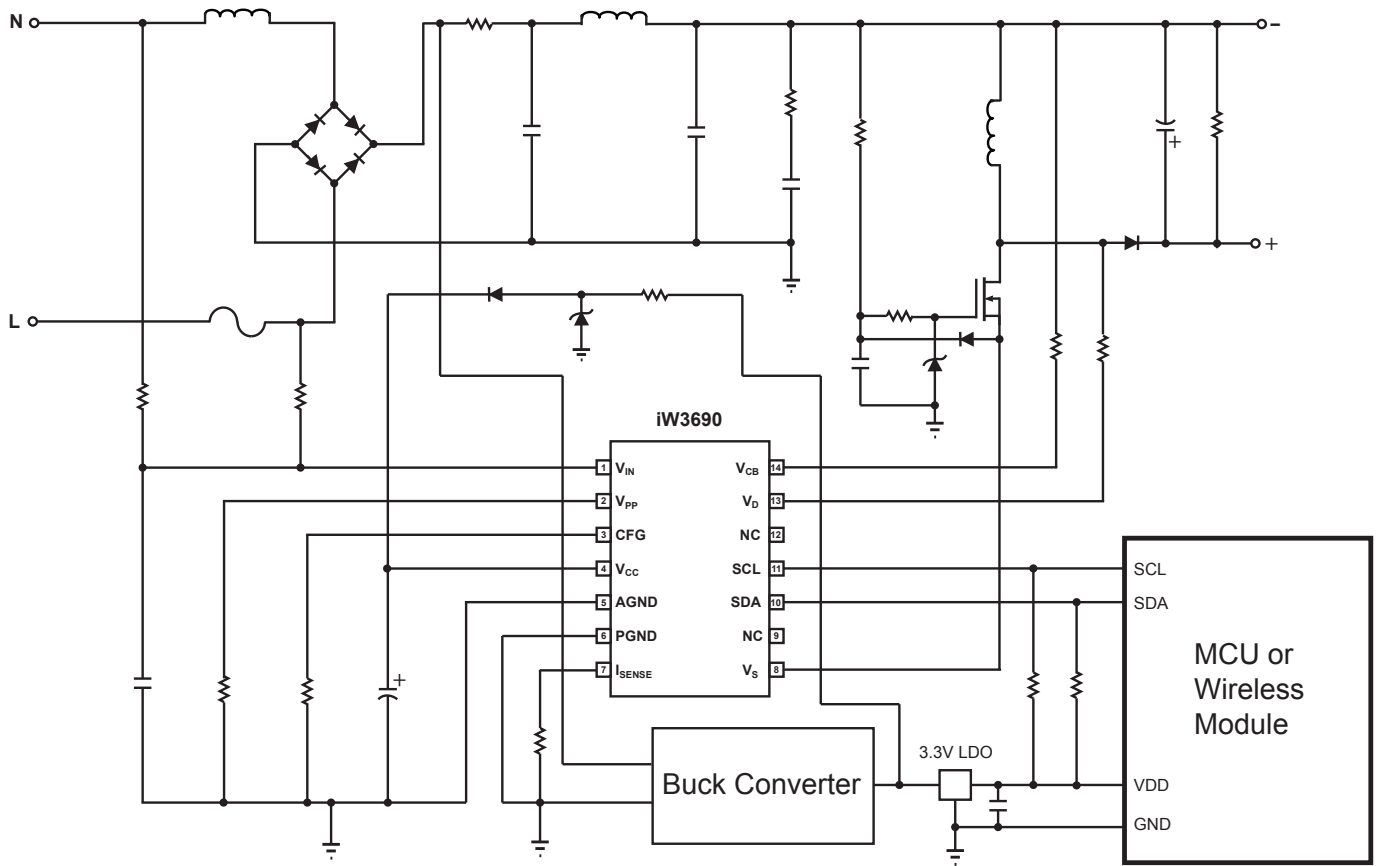


Figure 3.1 : Simplified Application Circuit:  
iW3690 Supporting External MCU or Wireless Module Powered from LDO

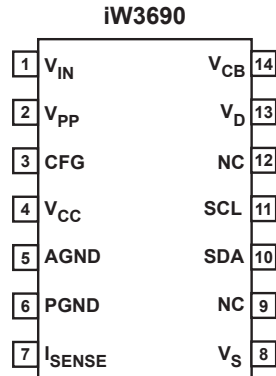
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**Figure 3.2 : Simplified Application Circuit:  
iW3690 Supporting External MCU or Wireless Module Powered from Buck Converter**

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### 4 Pinout Description



**Figure 4.1 : 14-Lead SOIC-14 Package**

Pin Number	Pin Name	Type	Pin Description
1	V <sub>IN</sub>	Analog Input	Rectified AC line voltage input.
2	V <sub>PP</sub>	Analog Input	Connects an 18kΩ resistor to GND.
3	CFG	Analog Input	Configures OTP threshold on start-up. See the applications section for configuration information.
4	V <sub>CC</sub>	Power	Power supply for control logic.
5	AGND	Ground	Signal ground. It should be connected to the power ground on PCB.
6	PGND	Ground	Power ground.
7	I <sub>SENSE</sub>	Analog Input	Current sense.
8	V <sub>S</sub>	Analog Input	Source voltage of MOSFET.
9	NC	No Connection	Not internally connected.
10	SDA	Digital Input/ Output	I <sup>2</sup> C data signal, connected to external controller.
11	SCL	Digital Input/ Output	I <sup>2</sup> C clock signal, connected to external controller.
12	NC	No Connection	Not internally connected.
13	V <sub>D</sub>	Analog Input	Drain voltage of MOSFET.
14	V <sub>CB</sub>	Analog Input	Input capacitor voltage after EMI filter.

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### 5 Absolute Maximum Ratings

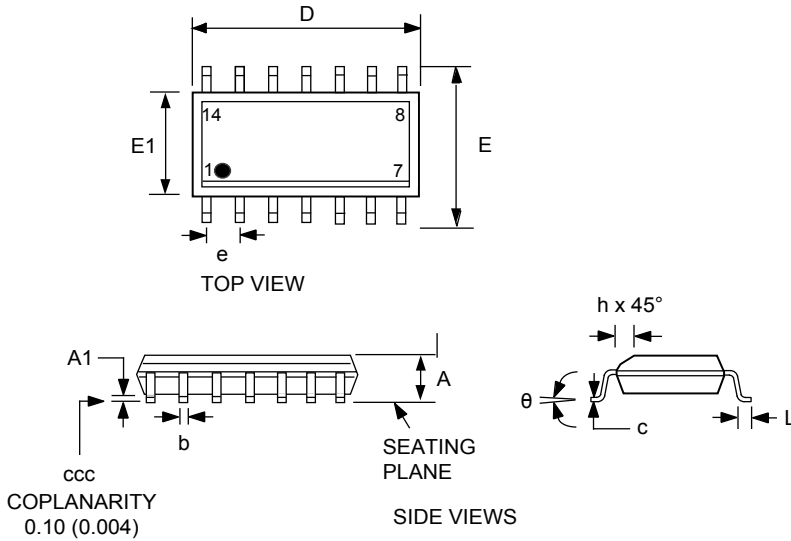
Absolute maximum ratings are the parameter values or ranges which can cause permanent damage if exceeded.

Parameter	Symbol	Value	Units
DC supply voltage range (pin 4)	$V_{CC}$	-0.3 to 6	V
$V_{IN}$ input (pin 1)		-0.3 to 6	V
CFG input (pin 3)		-0.3 to 6	V
$V_{PP}$ input (pin 2)		-0.3 to 20	V
$I_{SENSE}$ input (pin 7)		-0.3 to 6	V
$V_S$ input (pin 8)		-0.3 to 20	V
SDA input (pin 10)		-0.3 to 6	V
SCL input (pin 11)		-0.3 to 20	V
$V_D$ input voltage (pin 13)		-0.3 to 6	V
$V_{CB}$ input voltage (pin 14)		-0.3 to 6	V
Maximum $V_D$ input current (pin 13)	$I_{IN(VD)}$	750	$\mu$ A
Maximum $V_{CB}$ input current (pin 14)	$I_{IN(VCB)}$	750	$\mu$ A
Maximum junction temperature	$T_{JMAX}$	150	$^{\circ}$ C
Operating junction temperature	$T_{JOPT}$	-40 to 150	$^{\circ}$ C
Storage temperature	$T_{STG}$	-65 to 150	$^{\circ}$ C
Thermal resistance junction-to-PCB [gnd lead]	$\psi_{JB}$	45	$^{\circ}$ C/W
ESD rating per JEDEC JESD22-A114		$\pm$ 1,000	V
Latch-up test per JESD78A		$\pm$ 100	mA

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**6 Physical Dimensions**

14-Lead SOIC Package



Symbol	Inches		Millimeters	
	MIN	MAX	MIN	MAX
A	0.053	0.069	1.35	1.75
A1	0.004	0.010	0.10	0.25
b	0.013	0.020	0.33	0.51
c	0.007	0.010	0.19	0.25
D	0.337	0.344	8.55	8.75
E1	0.150	0.157	3.80	4.00
E	0.228	0.244	5.80	6.20
e	0.050 BSC		1.27 BSC	
L	0.016	0.050	0.40	1.27
h	0.010	0.020	0.25	0.50
theta	0°	8°	0°	8°
ccc	0.004		0.10	

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
iW3690-00	120V <sub>AC</sub> Input for up to 25W	SOIC-14	Tape & Reel <sup>1</sup>

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

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