

## Off-Line Digital Power Controller for LED Driver with High Power Factor and Low-Ripple Current

### 1.0 Features

- All-in-one non-dimmable low-cost off-line LED driver (isolated and non-isolated applications)
- Supports universal input voltage range ( $90V_{AC}$  to  $277V_{AC}$ ) and output power up to 20W
- High power factor (PF) with low current-ripple control technology
- User-configurable power factor setting ( $>0.7$  to  $>0.9$ )
- User-configurable over-temperature protection (OTP) with temperature-current derating
- Very tight LED current regulation ( $\pm 5\%$ ) across line and load, and within primary inductance tolerance ( $\pm 20\%$ )
- Isolated design without opto-coupler
- Supports wide range of LED numbers with tight current regulation
- Stabilized LED current-ripple control without visible shimmer or flicker
- Active start-up scheme enables fastest possible start-up
- 72kHz maximum PWM switching frequency with quasi-resonant operation
- Dynamic base current control to drive low-cost BJT
- EZ-EMI® design enhances manufacturability
- Built-in single-point fault protection features: LED open-/short-circuit protection and over-current protection
- No audible noise over entire operating range

### 2.0 Description

The iW3628 is a high performance, single-stage AC/DC power controller for LED luminaires with power factor (PF) correction. The device uses digital control technology to build unique hybrid mode control in PWM flyback power supplies to achieve high power factor meanwhile minimizing LED current ripple. This distinctive control approach enables the capability for users to make trade-offs between PF and LED current ripple in a single-stage design. It can achieve excellent LED current regulation over line and load variation, without the need for secondary feedback circuit. The built-in temperature sensor along with control logic can automatically adjust output current in real-time without visible flicker during the process. The iW3628 operates in quasi-resonant mode to provide high efficiency along with a number of key built-in protection features while minimizing the external component count, simplifying EMI design, and lowering the total bill of material cost. It also eliminates the need for loop compensation components while maintaining stability over all operating conditions. The built-in power limit function enables optimized transformer design in universal off-line applications with input voltage from  $90V_{AC}$  to  $277V_{AC}$ .

Dialog's innovative proprietary technology maximizes the iW3628 performance in a thermal-enhanced SOIC-8 package. The iW3628 offers two multi-function pins allowing users to configure PF and OTP as required with no cost or size impact, thereby providing design flexibility. The active start-up scheme enables the shortest possible start-up time without sacrificing active efficiency.

### 3.0 Applications

- Solid-state LED lighting
- LED lighting ballast

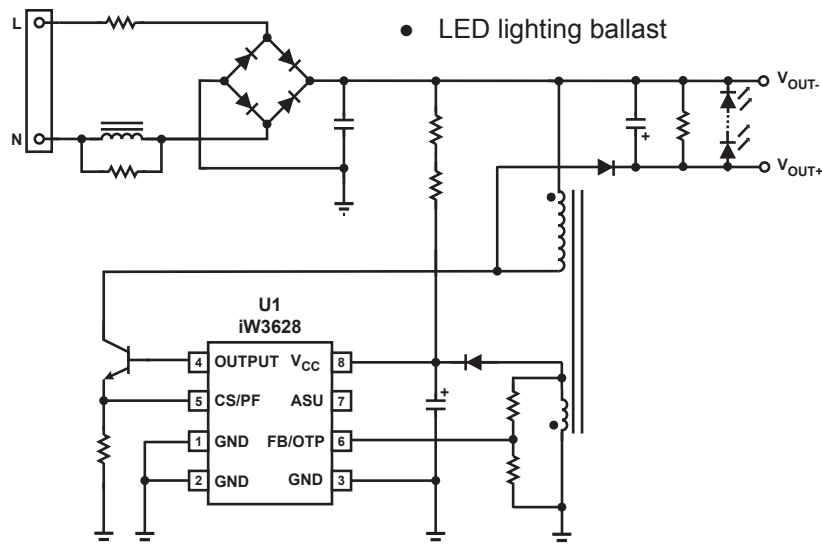


Figure 3.1: iW3628 Typical Application Circuit (Non-Isolated Application)

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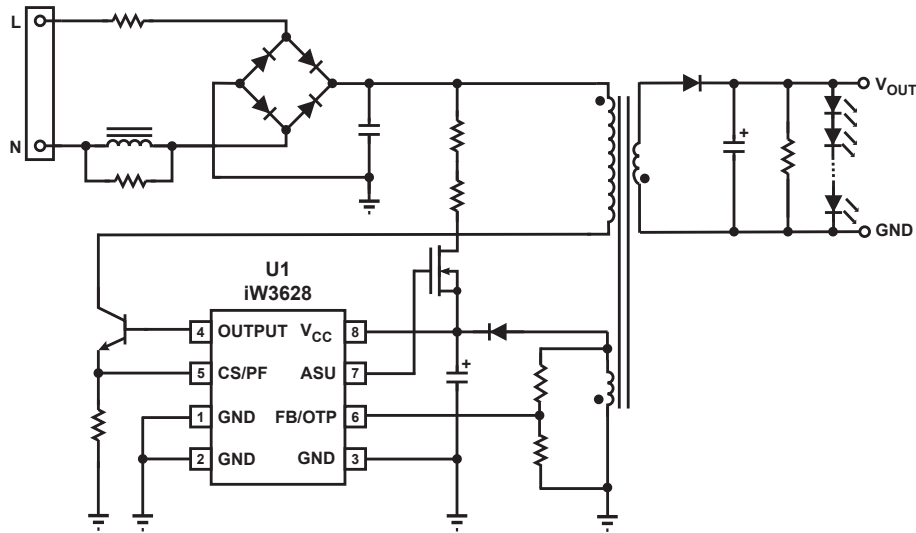


Figure 3.2: iW3628 Typical Application Circuit (Isolated Application)

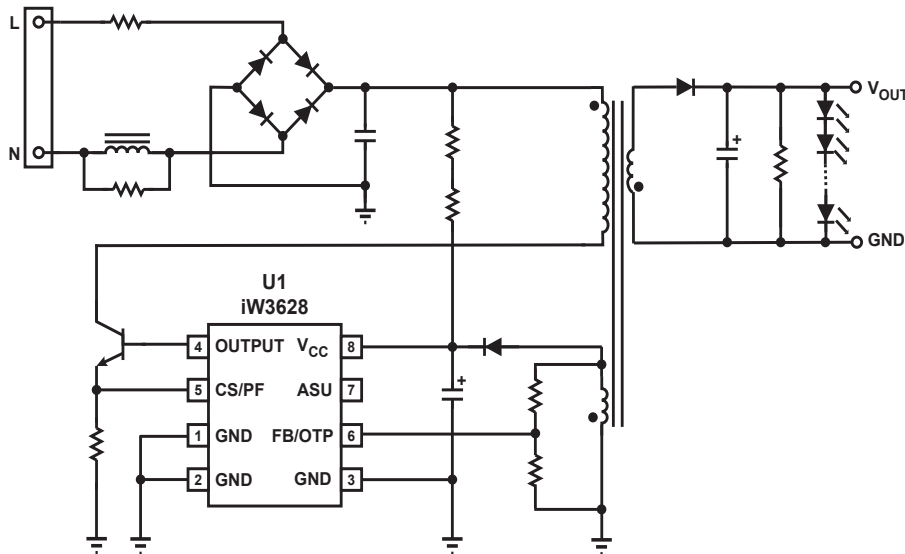


Figure 3.3: iW3628 Typical Application Circuit (Isolated Application without Using Active Start-Up Device )

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### 4.0 Pinout Description

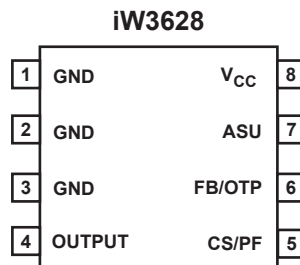


Figure 4.1: 8-Lead SOIC-8 Package

Pin #	Name	Type	Pin Description
1	GND	Ground	Ground.
2	GND	Ground	Ground.
3	GND	Ground	Ground.
4	OUTPUT	Output	Base drive for BJT.
5	CS/PF	Analog Input	Multi-function pin. Used for PF configuration at the beginning of start-up and to provide primary current sense for cycle-by-cycle peak current control and limit during normal operation.
6	FB/OTP	Analog Input	Multi-function pin. Used for OTP current derating configuration at the beginning of start-up and to provide auxiliary voltage sense for primary regulation during normal operation.
7	ASU	Output	Control signal for active start-up device (BJT or depletion mode NFET).
8	$V_{CC}$	Power Input	Power supply for control logic and BJT drive.

### 5.0 Absolute Maximum Ratings

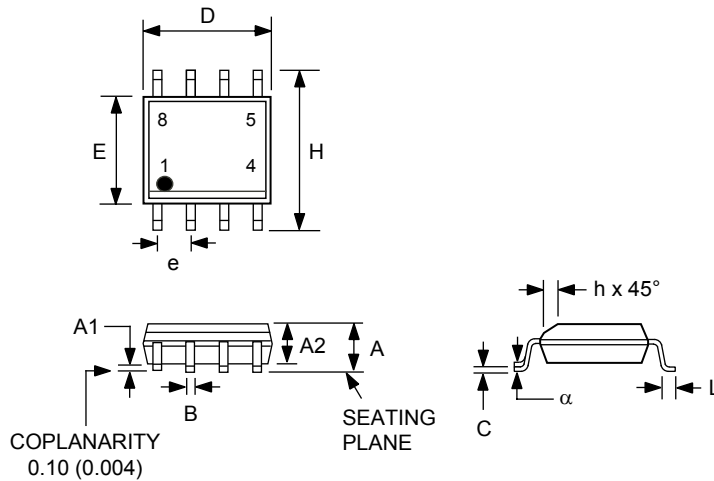
Absolute maximum ratings are the parameter values or ranges which can cause permanent damage if exceeded.

Parameter	Symbol	Value	Units
DC supply voltage range (pin 8, $I_{CC} = 20\text{mA max}$ )	$V_{CC}$	-0.3 to 18.0	V
Continuous DC supply current at $V_{CC}$ pin ( $V_{CC} = 15\text{V}$ )	$I_{CC}$	20	mA
ASU output (pin 7)		-0.3 to 18.0	V
OUTPUT (pin 4)		-0.3 to 4.0	V
FB/OTP input (pin 6, $I_{FB/OTP} \leq 10\text{mA}$ )		-0.7 to 4.0	V
CS/PF input (pin 5)		-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-ambient	$\theta_{JA}$	155	°C/W
ESD rating per JEDEC JESD22-A114		$\pm 2,000$	V
Latch-up test per JESD78A		$\pm 100$	mA

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### 6.0 Physical Dimensions

#### 8-Lead Small Outline (SOIC) Package



Symbol	Inches		Millimeters	
	MIN	MAX	MIN	MAX
A	0.053	0.069	1.35	1.75
A1	0.0040	0.010	0.10	0.25
A2	0.049	0.059	1.25	1.50
B	0.014	0.019	0.35	0.49
C	0.007	0.010	0.19	0.25
D	0.189	0.197	4.80	5.00
E	0.150	0.157	3.80	4.00
e	0.050 BSC		1.27 BSC	
H	0.228	0.244	5.80	6.20
h	0.10	0.020	0.25	0.50
L	0.016	0.049	0.4	1.25
$\alpha$	0°	8°		

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 E1 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 E1 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.

### 7.0 Ordering Information

Part Number	Options	Package	Description
iW3628-00	Maximum driver current = 60mA	SOIC-8	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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