

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
- Supports buck topology for high efficiency ($> 90\%$)
- Supports universal input voltage range ($90V_{AC} - 277V_{AC}$) and output power up to 45W
- High power factor (PF) with low current-ripple control technology
- User-configurable power factor setting (> 0.7 to > 0.95)
- Able to achieve low THD ($< 20\%$)
- User-configurable internal or external over-temperature protection (OTP) with temperature-current derating
- Tight LED current regulation ($\pm 5\%$) across line and load, and within power inductance tolerance ($\pm 20\%$)
- Stabilized LED current-ripple control without visible shimmer or flicker
- Active start-up scheme enables fastest possible start-up
- 72kHz nominal PWM switching frequency with quasi-resonant operation
- **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 iW3625 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 control in PWM buck power supplies to achieve high power factor while minimizing the LED current ripple. This distinctive control approach enables the capability for users to make trade-offs between the 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. Alternatively, the external NTC thermistor is placed close to the hot spots in a design to provide thermal protection in the similar pattern by derating LED current. The iW3625 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.



Dialog's innovative proprietary technology maximizes the iW3625 performance in a tiny SOT-23 package. The iW3625 offers two multi-function pins allowing users to configure PF and LED current derating as required with no cost or size impact, thereby providing design flexibility. In addition to providing the temperature sensing via an NTC resistor, the MULTI pin also enables active start-up scheme to achieve the shortest possible start-up time without sacrificing active efficiency.

3.0 Applications

- Solid-state LED lighting
- LED lighting ballast

iW3625 Product Summary

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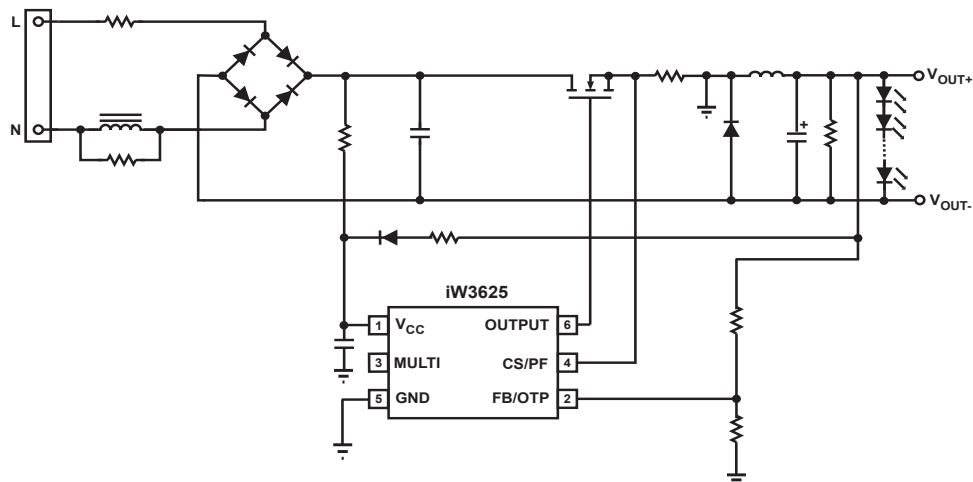


Figure 3.1: iW3625 Typical Application Circuit (Non-Isolated Floating Buck Application)

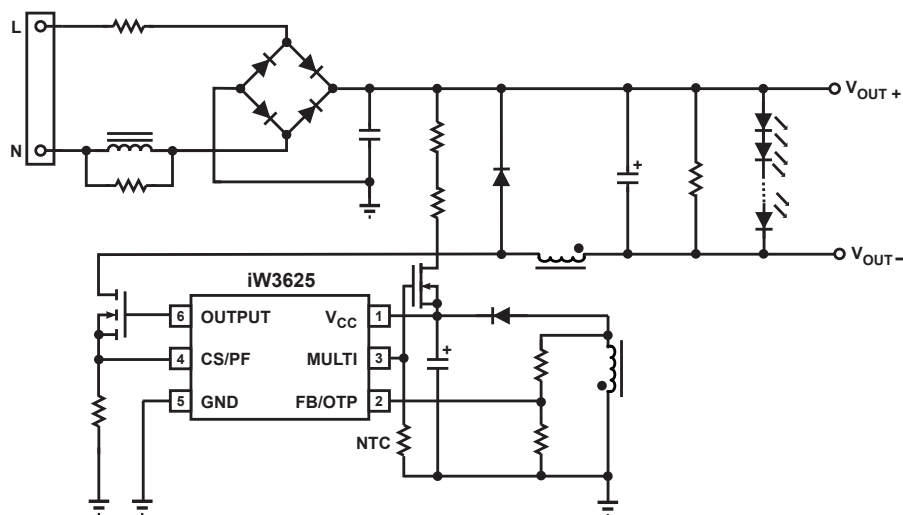


Figure 3.2: iW3625 Typical Application Circuit (Non-Isolated Non-Floating Buck Application)

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4.0 Pinout Description

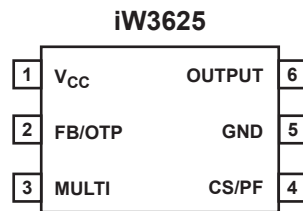


Figure 4.1: 6-Lead SOT-23 Package

Pin #	Name	Type	Pin Description
1	V _{CC}	Power Input	Power supply for control logic and MOSFET drive.
2	FB/OTP	Analog Input	Multi-function pin. Used for internal or external OTP current derating configuration at the beginning of start-up and to provide output voltage sense for regulation during normal operation.
3	MULTI	Output	Multi-function pin. Used to control active start-up device and for external temperature sensing via an NTC resistor.
4	CS/PF	Analog Input	Multi-function pin. Used for PF configuration at the beginning of start-up and to provide power switch current sense for cycle-by-cycle peak current control and limit during normal operation.
5	GND	Ground	Ground.
6	OUTPUT	Output	Gate drive for external MOSFET switch.

5.0 Absolute Maximum Ratings

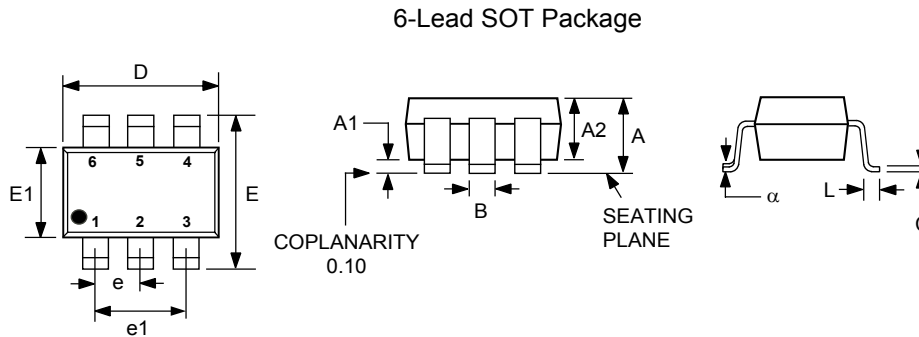
Absolute maximum ratings are the parameter values or ranges which can cause permanent damage if exceeded.

Parameter	Symbol	Value	Units
DC supply voltage range (pin 1, I _{CC} = 20mA max)	V _{CC}	-0.3 to 18.0	V
Continuous DC supply current at V _{CC} pin (V _{CC} = 15V)	I _{CC}	20	mA
MULTI (pin 3)		-0.3 to 18.0	V
OUTPUT (pin 6)		-0.3 to 18.0	V
FB/OTP input (pin 2, I _{FB/OTP} ≤ 10mA)		-0.7 to 4.0	V
CS/PF input (pin 4)		-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	θ _{JA}	190	°C/W
ESD rating per JEDEC JESD22-A114		±2,000	V
Latch-up test per JESD78A		±100	mA

iW3625 Product Summary

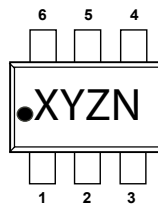
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6.0 Physical Dimensions



Symbol	Millimeters	
	MIN	MAX
A	-	1.45
A1	0.00	0.15
A2	0.90	1.30
B	0.30	0.50
C	0.08	0.22
D	2.90 BSC	
E	2.80 BSC	
E1	1.60 BSC	
e	0.95 BSC	
e1	1.90 BSC	
L	0.30	0.60
α	0°	8°

SOT23-6 devices are marked with a 4-digit code. Orientation of Pin 1 is shown below:



Compliant to JEDEC Standard MO-178AB

Controlling dimensions are in millimeters

This package 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; packages 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 0.25 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 and interlead flash, but including any mismatch between top and bottom of the plastic body.

7.0 Ordering Information

Part Number	Options	Package	Description
iW3625-00	Internal OTP derating, 72kHz switching frequency	SOT-23	Tape & Reel ¹
iW3625-01	NTC OTP derating, 72kHz switching frequency	SOT-23	Tape & Reel ¹

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

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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

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 8178 6222

Web site:

www.dialog-semiconductor.com

Singapore

Dialog Semiconductor Singapore
Phone: +65 64849929

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 5178 2561