

Single-Stage LED Driver with PFC Supports Wide Range of Dimming Interfaces

1 Description

The iW3636 is a high-performance, single-stage AC/DC power controller for PWM dimmable LED driver with power factor (PF) correction. It supports most commonly used isolated and non-isolated flyback and buck-boost topologies. The device operates in constant on-time mode to achieve high power factor (> 0.9) across a wide load range. It uses Renesas' **PrimAccurate™** advanced primary-side sensing technology to achieve excellent output current regulation over line and load variation without the need for secondary feedback components. It also eliminates the need for external loop compensation while maintaining stability over all operating conditions.

The iW3636 offers a 1% to 100% dimming range and provides a dedicated PWM dimming input pin that supports a wide variety of dimming application interfaces such as wireless modules, MCUs or 0-10V interfaces. When working with Renesas' secondary-side SSL PWM signal generator IC, the iW339, the iW3636 adopts a proprietary technique to support accurate dimming by eliminating the impact from the non-ideal characteristics of optocouplers. In addition, the iW3636 accepts a secondary PWM or analog input to allow maximum output current configuration control.

Renesas' innovative proprietary technology maximizes the iW3636 performance in an SOIC-8 package. It provides two multi-function pins to configure IC functions such as the dimming curve and minimum dimming level. The iW3636 also enables the active start-up scheme to achieve the shortest possible start-up time without sacrificing active efficiency. By adaptively controlling the maximum operating frequency at different dimming levels, it helps eliminate audible noise and achieve low standby power consumption.

2 Features

- Universal AC input ($90V_{AC}$ - $305V_{AC}$) or DC input voltage
- Enhanced MOSFET driver supports up to 90W output power in an SOIC-8 package
- Primary-side control achieves very tight line and load regulation ($\pm 3\%$)
- $PF > 0.9$ and $THD < 20\%$ across wide output power range
- Dual dimming interfaces
- Supports fully isolated 0-10V dimming with Renesas' iW339 interface controller
- Low standby power
- Wide dimming range 1% - 100%
- Configurable 72kHz or 90kHz PWM switching frequency with quasi-resonant operation
- Configurable minimum dimming setting: dim-to-off, 1%, 5% or 10%
- Wide V_{CC} operating range from 7.5V to 30V
- Built-in over-temperature protection or by external NTC
- Configurable dimming curve: linear or logarithmic
- Built-in soft-start achieves fast and smooth start-up for all different operating conditions
- Active start-up scheme enables fastest possible start-up
- Built-in single-point fault protection features: output open, output over-voltage, output short and input voltage under-voltage protections
- Light-off mode with soft-off feature and configurable voltage regulation value

3 Applications

- Intelligent and wireless LED lighting
- Dimming LED ballast

Single-Stage LED Driver with PFC
Supports Wide Range of Dimming Interfaces

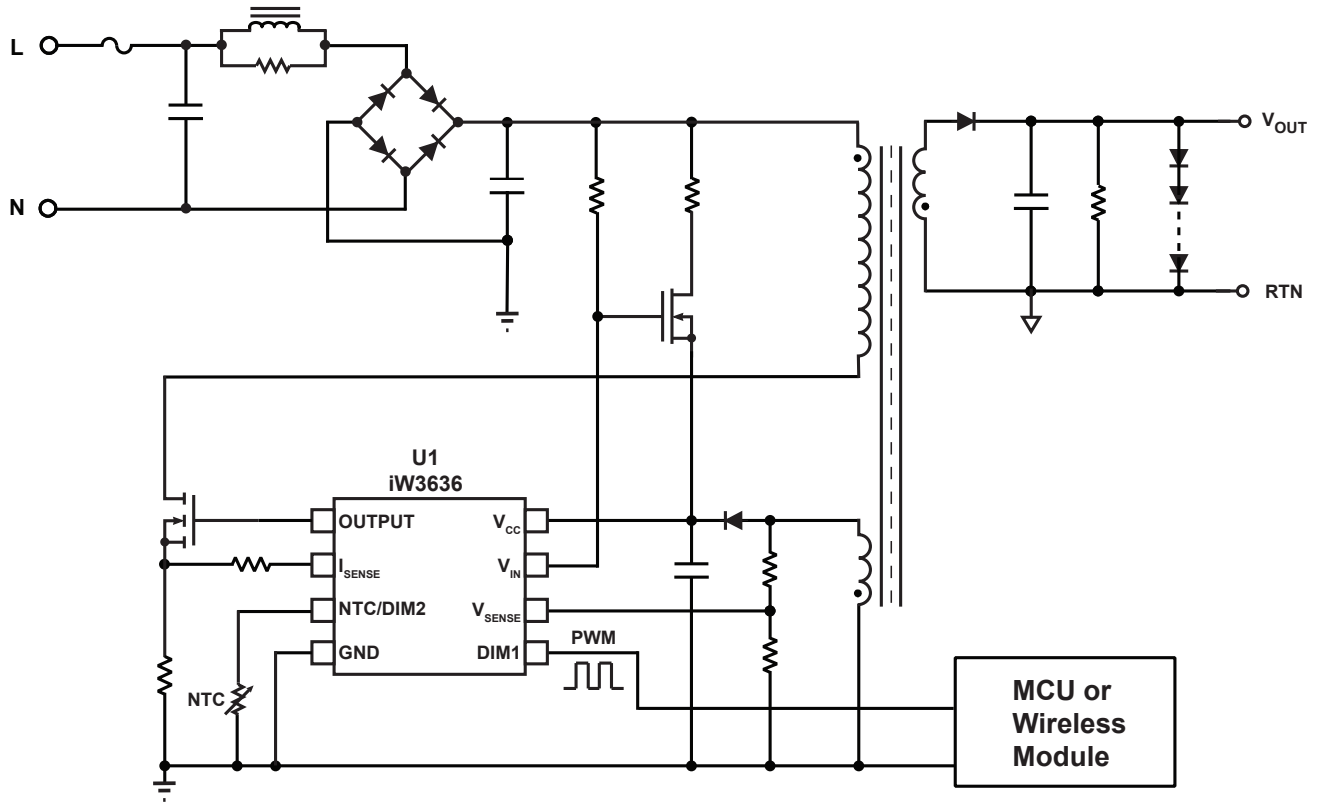


Figure 3.1 : iW3636 Typical Application Circuit (Wireless Dimming with NTC Derating Using Depletion-mode FET as Active Start-up Device).

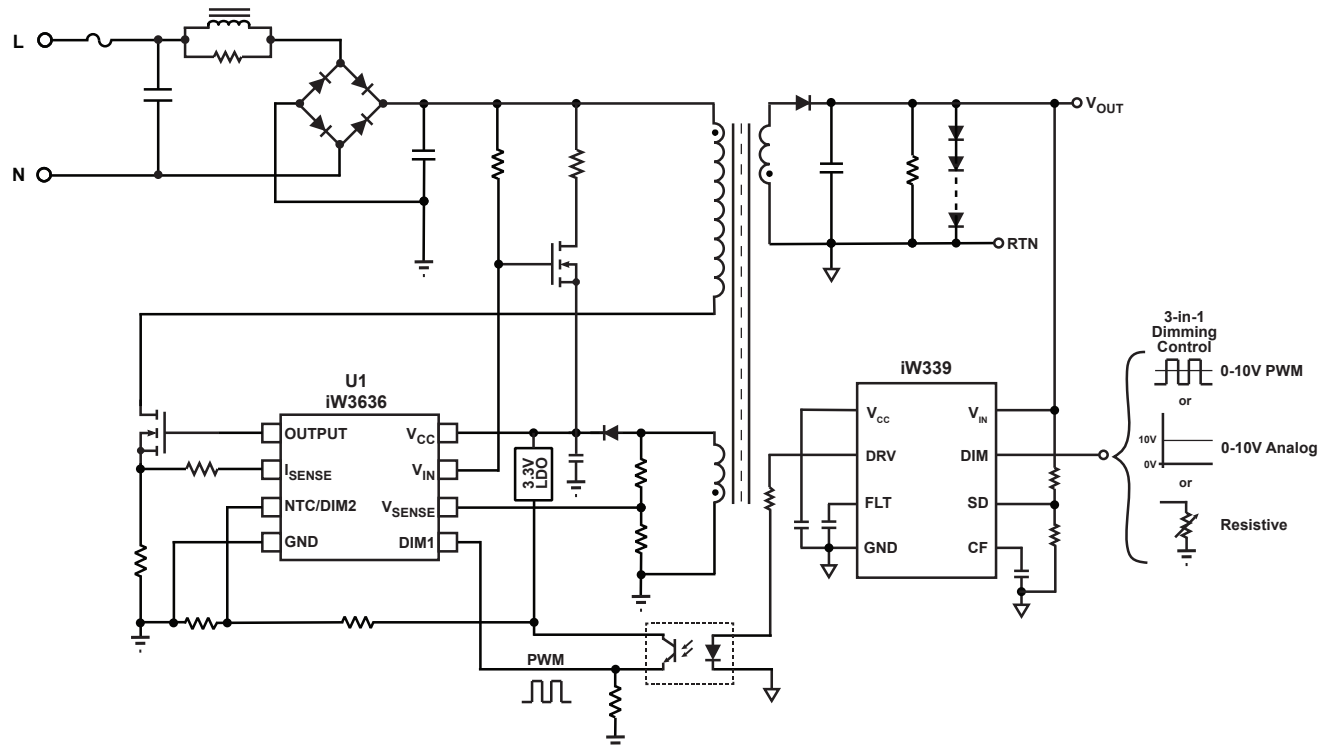


Figure 3.2 : iW3636 Typical Application Circuit (3-in-1 Dimming with Maximum Current Modulated by the Voltage at NTC/DIM2 Pin and Using Enhancement-mode FET as Active Start-up Device).

Single-Stage LED Driver with PFC Supports Wide Range of Dimming Interfaces

4 Pinout Description

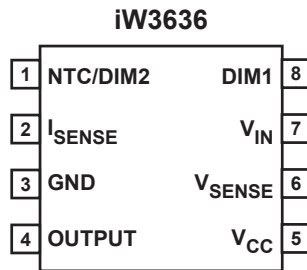


Figure 4.1 : 8-Lead SOIC-8 Package

Pin Number	Pin Name	Type	Pin Description
1	NTC/DIM2	Digital Input / Analog In/Out	Used for external temperature sensing via an NTC resistor, or to provide a 2nd dimming interface via PWM signal or analog signal (0 – 1.8V).
2	I _{SENSE}	Analog Input	Provides primary current sense for cycle-by-cycle peak current control and limit during normal operation, and serves as a configuration pin during startup.
3	GND	Ground	Ground.
4	OUTPUT	Output	Gate drive for external MOSFET switch.
5	V _{CC}	Power	IC power supply.
6	V _{SENSE}	Analog Input	Provides output voltage sense for primary regulation during normal operation, and serves as a configuration pin during startup.
7	V _{IN}	Analog Input	Dual function. Used to control active start-up devices and sense line voltage.
8	DIM1	Digital Input	PWM dimming input detection.

Single-Stage LED Driver with PFC Supports Wide Range of Dimming Interfaces

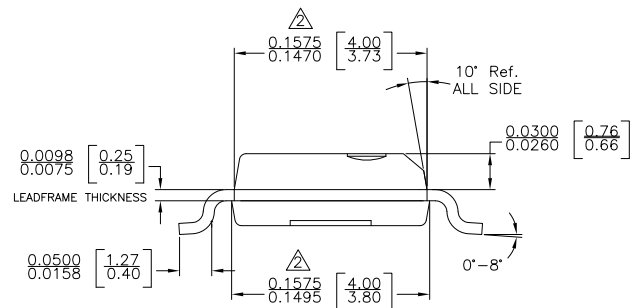
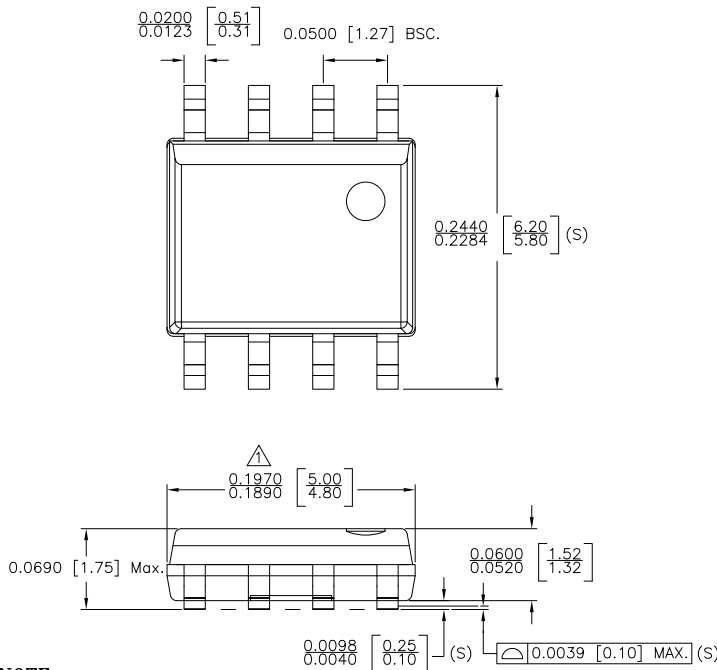
5 Absolute Maximum Ratings

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 5, $I_{CC} = 10\text{mA max}$)	V_{CC}	-0.3 to 31	V
Continuous DC supply current at V_{CC} pin	I_{CC}	20	mA
V_{IN} (pin 7)		-0.3 to 31	V
Output (pin 4)		-0.3 to 31	V
V_{SENSE} input (pin 6, $I_{VSENSE} \leq 10\text{mA}$)		-0.3 to 7	V
I_{SENSE} input (pin 2)		-0.3 to 7	V
NTC/DIM2 (pin 1)		-0.3 to 7	V
DIM1 (pin 8)		-0.3 to 7	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}	170	°C/W
ESD rating per JEDEC JS-001-2017		$\pm 2,000$	V
Latch-up test per JESD78E		± 100	mA

**Single-Stage LED Driver with PFC
Supports Wide Range of Dimming Interfaces**

6 Physical Dimensions



NOTE :

- 1. DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH, PROTRUSIONS AND GATE BURRS SHALL NOT EXCEED .006 INCH PER SIDE.
- 2. DOES NOT INCLUDE INTER-LEAD FLASH OR PROTRUSIONS. INTER-LEAD FLASH AND PROTRUSIONS SHALL NOT EXCEED .010 INCH PER SIDE.
- 3. THIS PART IS COMPLIANT WITH JEDEC SPECIFICATION MS-012.
- 4. LEAD SPAN/STAND OFF HEIGHT/COPLANARITY ARE CONSIDERED AS SPECIAL CHARACTERISTIC.(S)
- 5. CONTROLLING DIMENSIONS IN INCHES. [mm]

STATUS: RELEASED		SCALE: DO NOT SCALE
TERMINAL FINISH: 100% Sn or NiPdAu (PPF)		
TITLE: 8 SOIC PACKAGE OUTLINE		
REV: A	REVISION NOTE: NEW DRAWING	DATE: 02-MAR-2015

7 Ordering Information

Part no.	Options	Package	Description
iW3636-01	PWM DIM2 Interface	SOIC-8	Tape & Reel ¹
iW3636-02	NTC DIM2 Interface	SOIC-8	Tape & Reel ¹
iW3636-03	Analog DIM2 Interface	SOIC-8	Tape & Reel ¹
iW3636-31	Analog DIM2 Interface (Internal OTP Disabled)	SOIC-8	Tape & Reel ¹

Note 1: Tape and reel packing quantity is 2,500/reel. Minimum packing quantity is 2,500.

Single-Stage LED Driver with PFC Supports Wide Range of Dimming Interfaces

IMPORTANT NOTICE AND DISCLAIMER

RENESAS ELECTRONICS CORPORATION AND ITS SUBSIDIARIES (“RENESAS”) PROVIDES TECHNICAL SPECIFICATIONS AND RELIABILITY DATA (INCLUDING DATASHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES “AS IS” AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for developers skilled in the art designing with Renesas products. You are solely responsible for (1) selecting the appropriate products for your application, (2) designing, validating, and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, or other requirements. These resources are subject to change without notice. Renesas grants you permission to use these resources only for development of an application that uses Renesas products. Other reproduction or use of these resources is strictly prohibited. No license is granted to any other Renesas intellectual property or to any third party intellectual property. Renesas disclaims responsibility for, and you will fully indemnify Renesas and its representatives against, any claims, damages, costs, losses, or liabilities arising out of your use of these resources. Renesas’ products are provided only subject to Renesas’ Terms and Conditions of Sale or other applicable terms agreed to in writing. No use of any Renesas resources expands or otherwise alters any applicable warranties or warranty disclaimers for these products.

© 2023 Renesas Electronics Corporation. 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.

(Rev.1.0 Mar 2020)

Corporate Headquarters

TOYOSU FORESIA, 3-2-24 Toyosu
Koto-ku, Tokyo 135-0061, Japan
www.renesas.com

Contact Information

For further information on a product, technology, the most up-to-date version of a document, or your nearest sales office, please visit:
www.renesas.com/contact/

Trademarks

Renesas and the Renesas logo are trademarks of Renesas Electronics Corporation. All trademarks and registered trademarks are the property of their respective owners.