

Off-Line Digital Constant-Voltage LED Driver with Power Factor Correction

1 Description

The iW3627 is a high-performance single-stage AC/DC constant voltage (CV) controller with high power factor correction. It supports most commonly used isolated and non-isolated topologies including flyback, buck-boost, and buck. The device operates in constant on-time mode to achieve high power factor (>0.9) across a wide load range. It can achieve excellent output voltage regulation over line and load variation without the need for a secondary feedback circuit. It also eliminates the need for external loop compensation while maintaining stability over all operating conditions with different types of loads, including downstream DC-DC converter, constant current (CC) load, LED load, and constant resistive (CR) load. The iW3627 integrates a proprietary technique that adaptively adjusts output voltage limits to maintain overshoot and undershoot transients to less than 10% of the nominal output voltage for any load transient. The iW3627 operates in pulse-frequency-modulation (PFM) mode at light load to eliminate audible noise, and at the same time achieving less than 200mW no-load standby power consumption.

Dialog's innovative proprietary technology maximizes the iW3627 performance in a tiny SOT-23 package. The iW3627 provides maximum design flexibility by providing two multi-function pins that allow users to configure maximum and minimum switching frequencies with no cost or size impact. In addition to providing input voltage sensing for input under-voltage protection, the V_{IN} pin also enables the active start-up scheme to achieve the shortest possible start-up time without sacrificing active efficiency.

2 Features

- All-in-one low-cost off-line high power factor (PF) constant voltage (CV) controller supports flyback, buck-boost, and buck topologies in isolated or non-isolated designs
- Primary-side control achieves very tight line and load regulation ($\pm 3\%$)
- Enhanced MOSFET driver supports output power up to 90W or above in a tiny SOT-23 package
- User-configurable minimum switching frequency (600Hz/1kHz) ensures no-load standby power consumption $< 200\text{mW}$ or below
- Internal loop compensation ensures stable operation with different types of loads: downstream DC-DC converter, constant current (CC) load, LED load, and constant resistive (CR) load
- Supports wide range of output capacitance (with output voltage ripple ranging from 1% to 20% at full load)
- Supports universal AC input ($90V_{AC} - 277V_{AC}$) and DC input
- Adaptively adjusted output voltage limits accommodating different load conditions ensures $< 10\%$ overshoot and undershoot for any load transient
- User-configurable maximum PWM switching frequency (90kHz or 120kHz)
- 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 over-load, output over-voltage, output short and input voltage under-voltage protections
- Built-in over-temperature protection
- No audible noise over entire operating range

3 Applications

- Smart LED lighting
- LED lighting ballast
- Front-end pre-regulator



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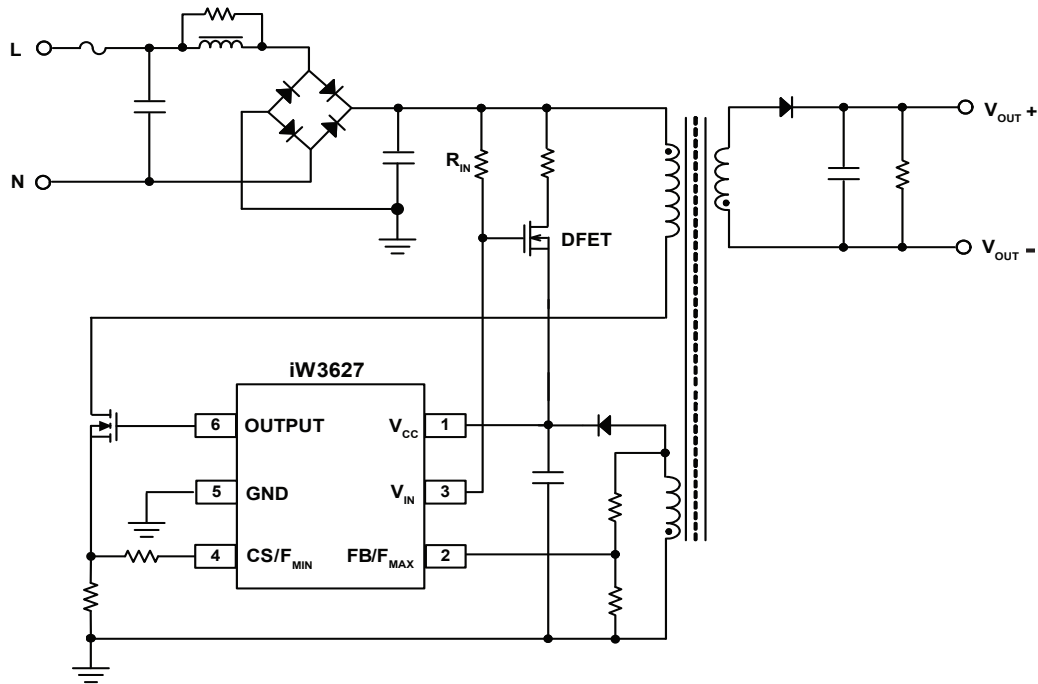


Figure 3.1 : iW3627 Typical Application Circuit (Isolated Flyback Application)

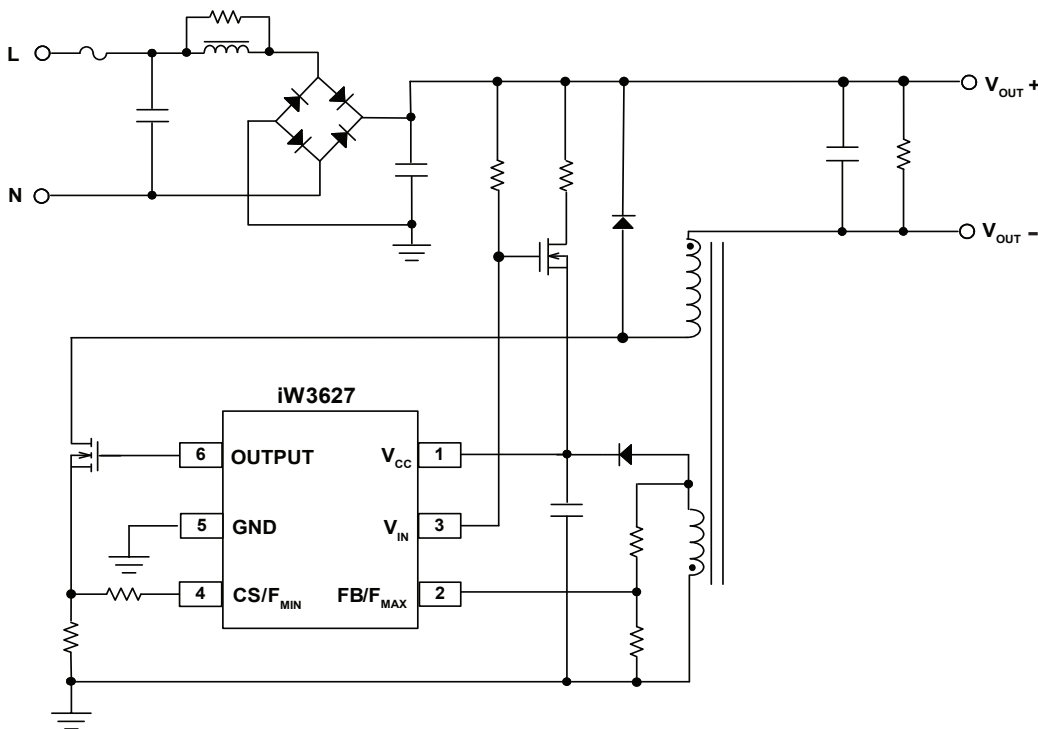


Figure 3.2 : iW3627 Typical Application Circuit (Buck Application)

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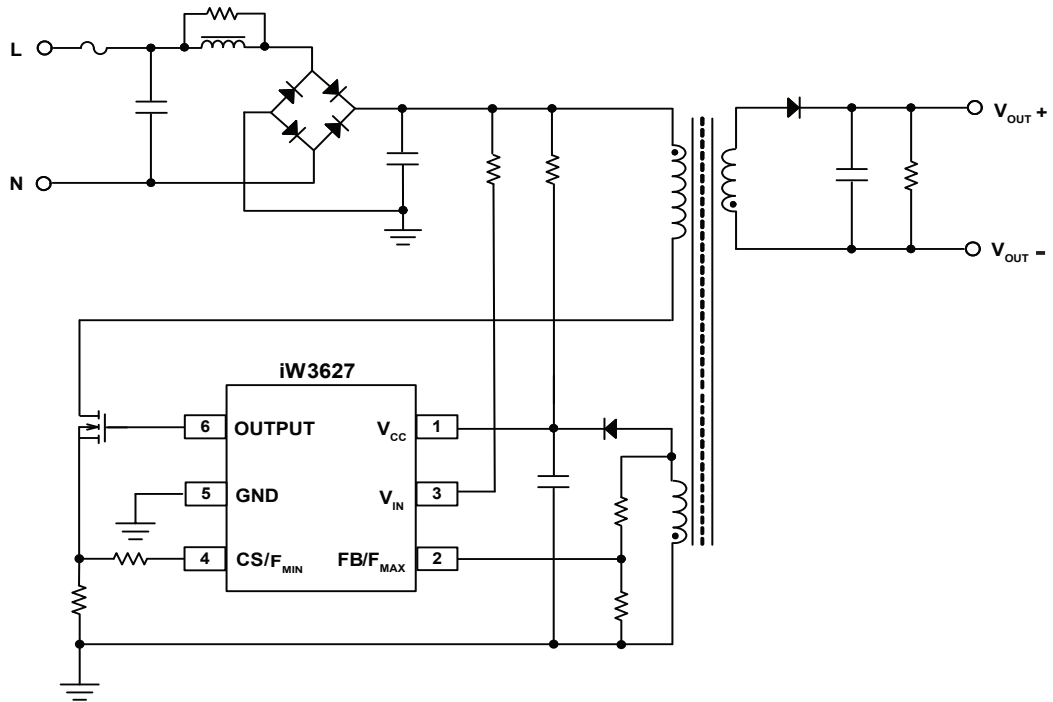


Figure 3.3 : iW3627 Typical Application Circuit (Isolated Flyback Application Without Using Active Start-up Device)

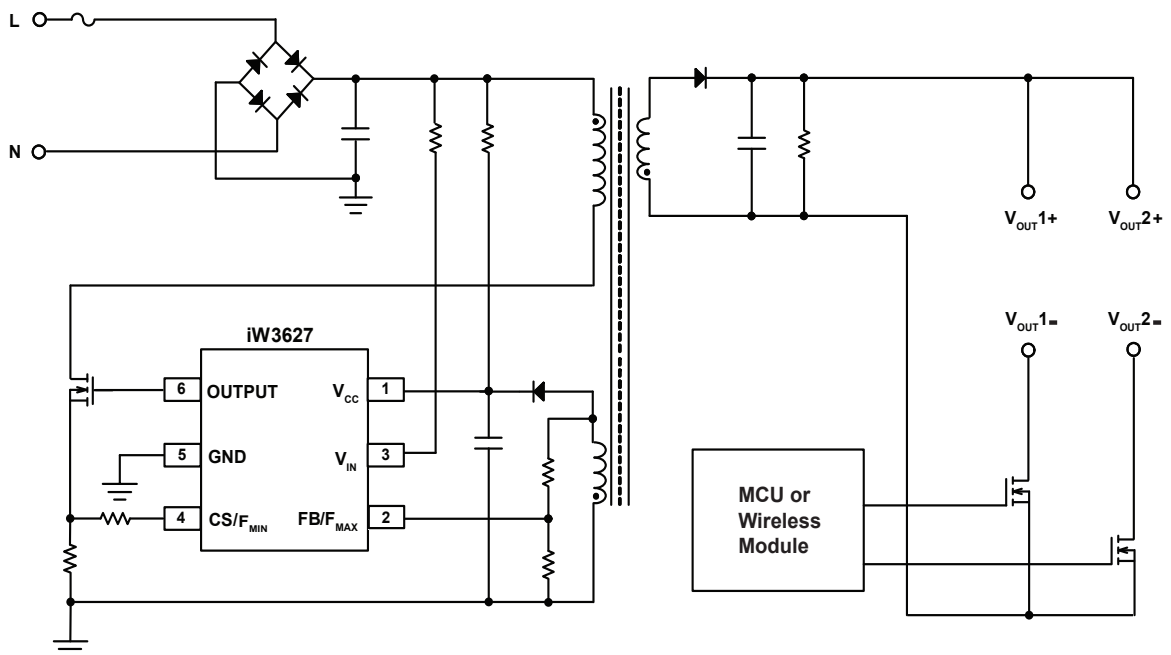


Figure 3.4 : iW3627 Typical Application Circuit (Smart Lighting)

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4 Pinout Description

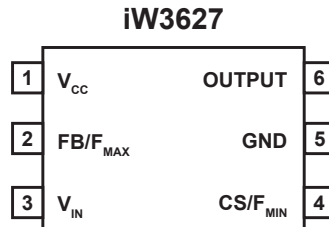


Figure 4.1 : 6-Lead SOT23 Package

Pin Number	Pin Name	Type	Pin Description
1	V_{CC}	Power Input	Power supply to control logic and MOSFET drive.
2	FB/F_{MAX}	Analog Input	Multi-function pin. Used to configure maximum switching frequency (F_{MAX}), and to enable/disable over-load protection (OLP) at the beginning of start-up. It also provides output voltage sense for primary regulation during normal operation.
3	V_{IN}	Analog Input	Multi-function pin. Used to control active start-up device and sense line voltage.
4	CS/F_{MIN}	Analog Input	Multi-function pin. Used to configure minimum switching frequency (F_{MIN}) at the beginning of the start-up. It also provides primary 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.

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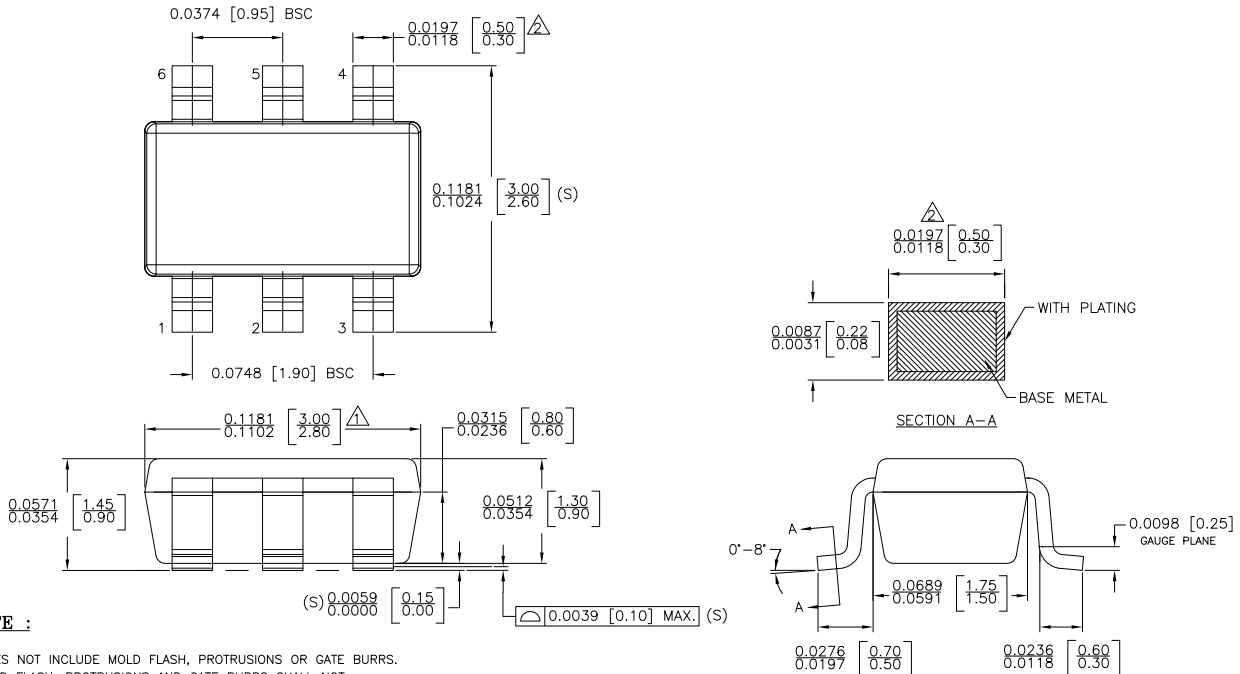
5 Absolute Maximum Ratings

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 1, $I_{CC} = 20\text{mA max}$)	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
V_{IN} (pin 3)		-0.3 to 18.0	V
OUTPUT (pin 6)		-0.3 to 18.0	V
FB/ F_{MAX} input (pin 2, $I_{FB/OTP} \leq 10\text{mA}$)		-0.7 to 4.0	V
CS/ F_{MIN} 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		$\pm 2,000$	V
Latch-up test per JESD78D		± 100	mA

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6 Physical Dimensions



NOTE :

- △ DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH, PROTRUSIONS AND GATE BURRS SHALL NOT EXCEED 0.127 MM PER SIDE.
- △ DOES NOT INCLUDE INTER-LEAD FLASH OR PROTRUSIONS. INTER-LEAD FLASH AND PROTRUSIONS SHALL NOT EXCEED 0.127 MM PER SIDE.
- 3. DIE IS FACING UP FOR MOLD. DIE IS FACING DOWN FOR TRIM/FORM.
- 4. THIS PART IS COMPLIANT WITH EIAJ SPECIFICATION SC74A AND JEDEC SPECIFICATION MO-178AB.
- 5. LEAD SPAN/STAND OFF HEIGHT/COPLANARITY ARE CONSIDERED AS SPECIAL CHARACTERISTIC.(S)
- 6. CONTROLLING DIMENSIONS IN INCHES. [mm]

STATUS: RELEASED	SCALE: DO NOT SCALE
TERMINAL FINISH: 100% Sn or NiPdAu (PPF)	
TITLE: 6 SOT23 PACKAGE OUTLINE	
REV: A	DATE: 02-MAR-2015

7 Ordering Information

Part Number	Description	Package	Description
iW3627-00	$V_{IPK(Low)} = 0.16V$, maximum NV_O up to 90V	SOT-23	Tape & Reel ¹
iW3627-01	$V_{IPK(Low)} = 0.2V$, maximum NV_O up to 145V	SOT-23	Tape & Reel ¹

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

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