# Digital Constant-Voltage Offline PWM Controller 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 (±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 < 200mW 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

- General-purpose AC/DC power supplies
- Smart LED lighting
- LED lighting ballast
- Front-end pre-regulator

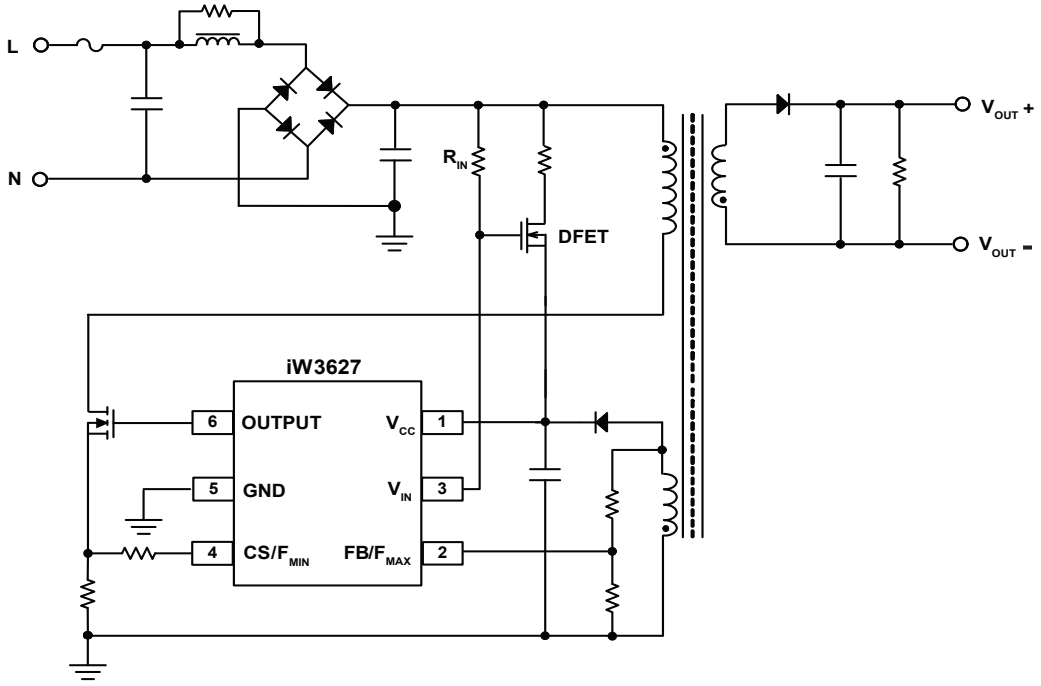



**Figure 3.1 : iW3627 Typical Application Circuit (Isolated Flyback Application)**

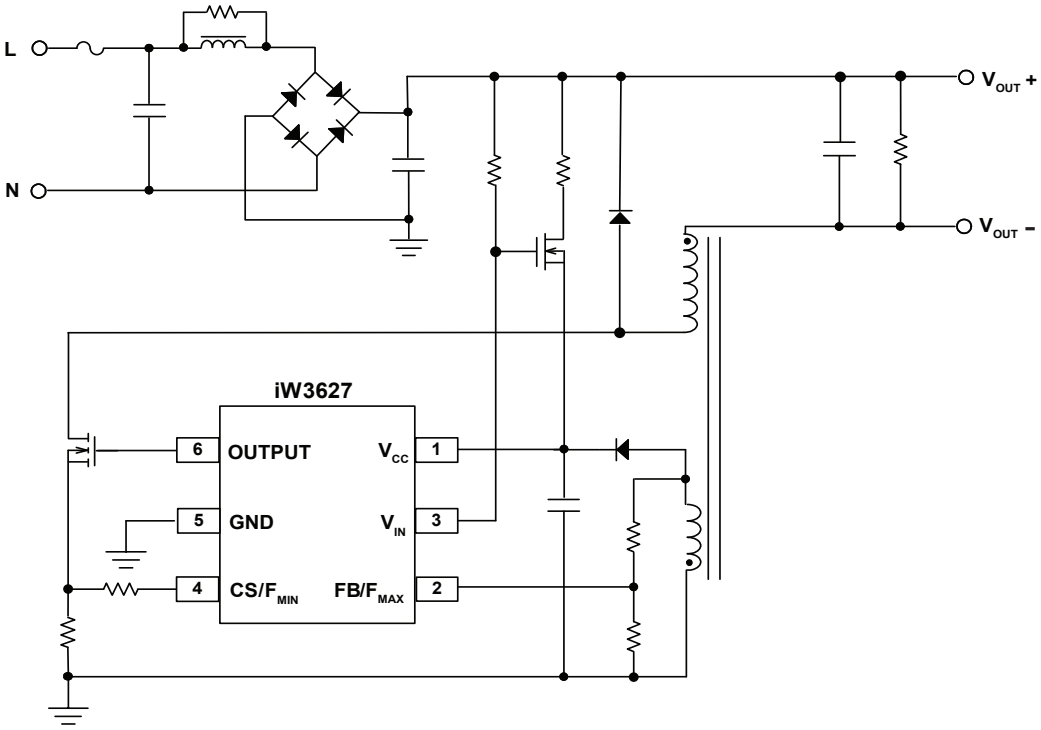



**Figure 3.2 : iW3627 Typical Application Circuit (Buck Application)**

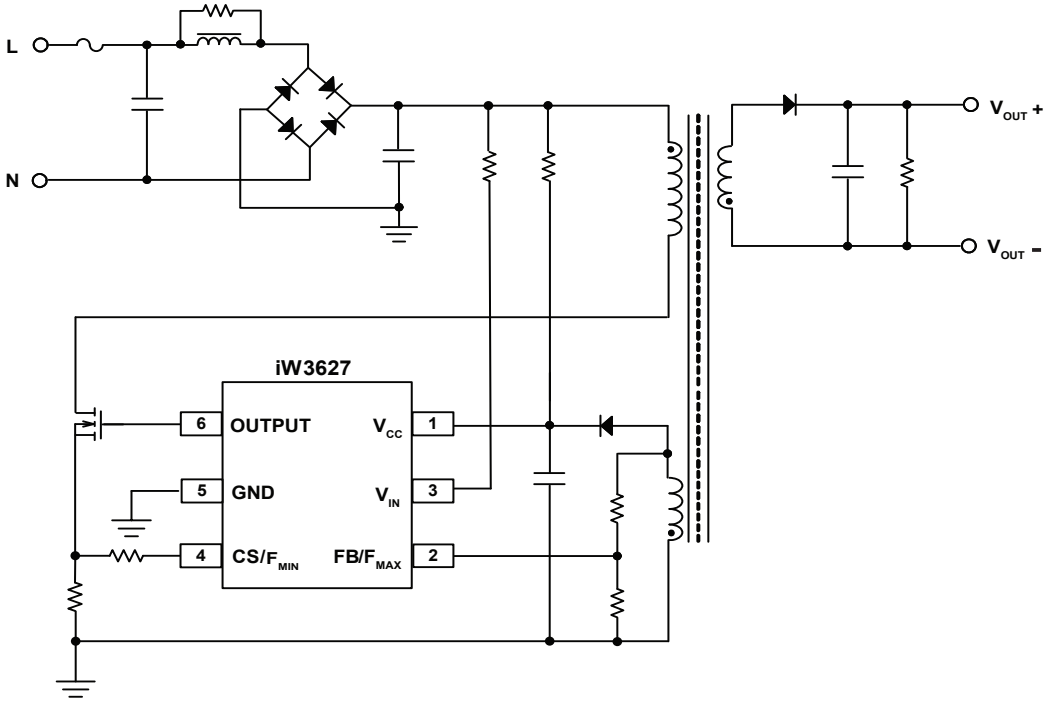



**Figure 3.3 : iW3627 Typical Application Circuit (Isolated Flyback Application Without Using Active Start-up Device)**

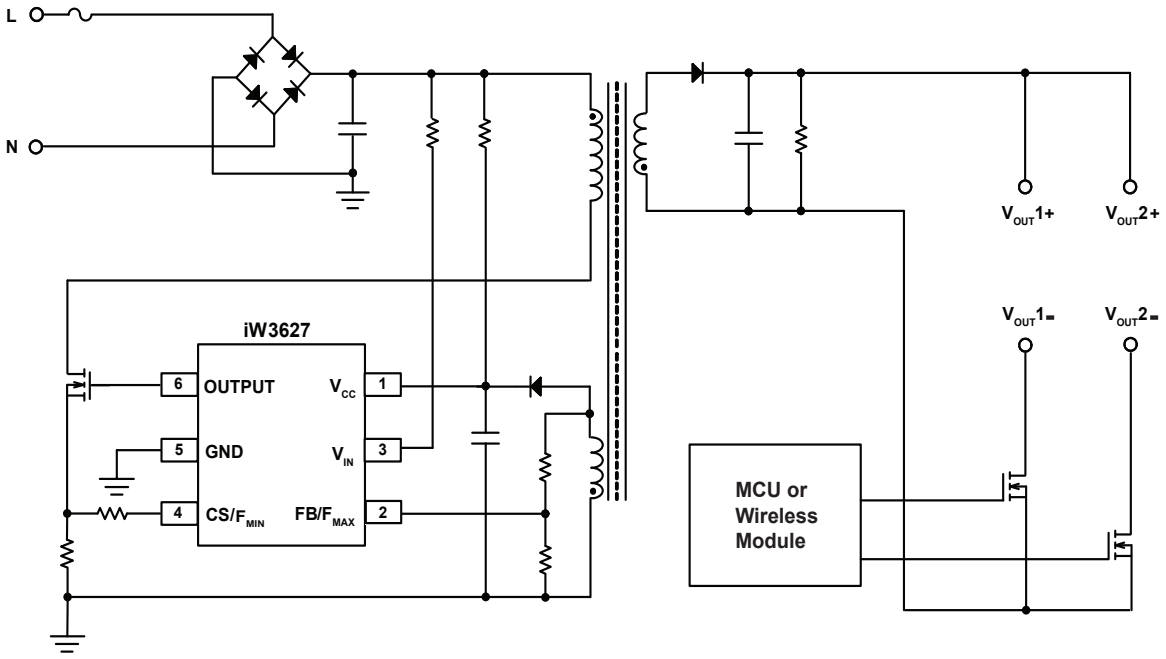



**Figure 3.4 : iW3627 Typical Application Circuit (Smart Lighting)**

## 4 Pinout Description

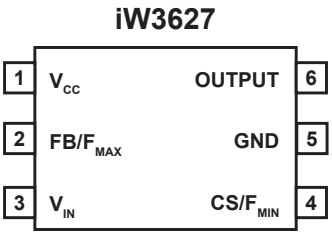



**Figure 4.1 : 6-Lead SOT23 Package**

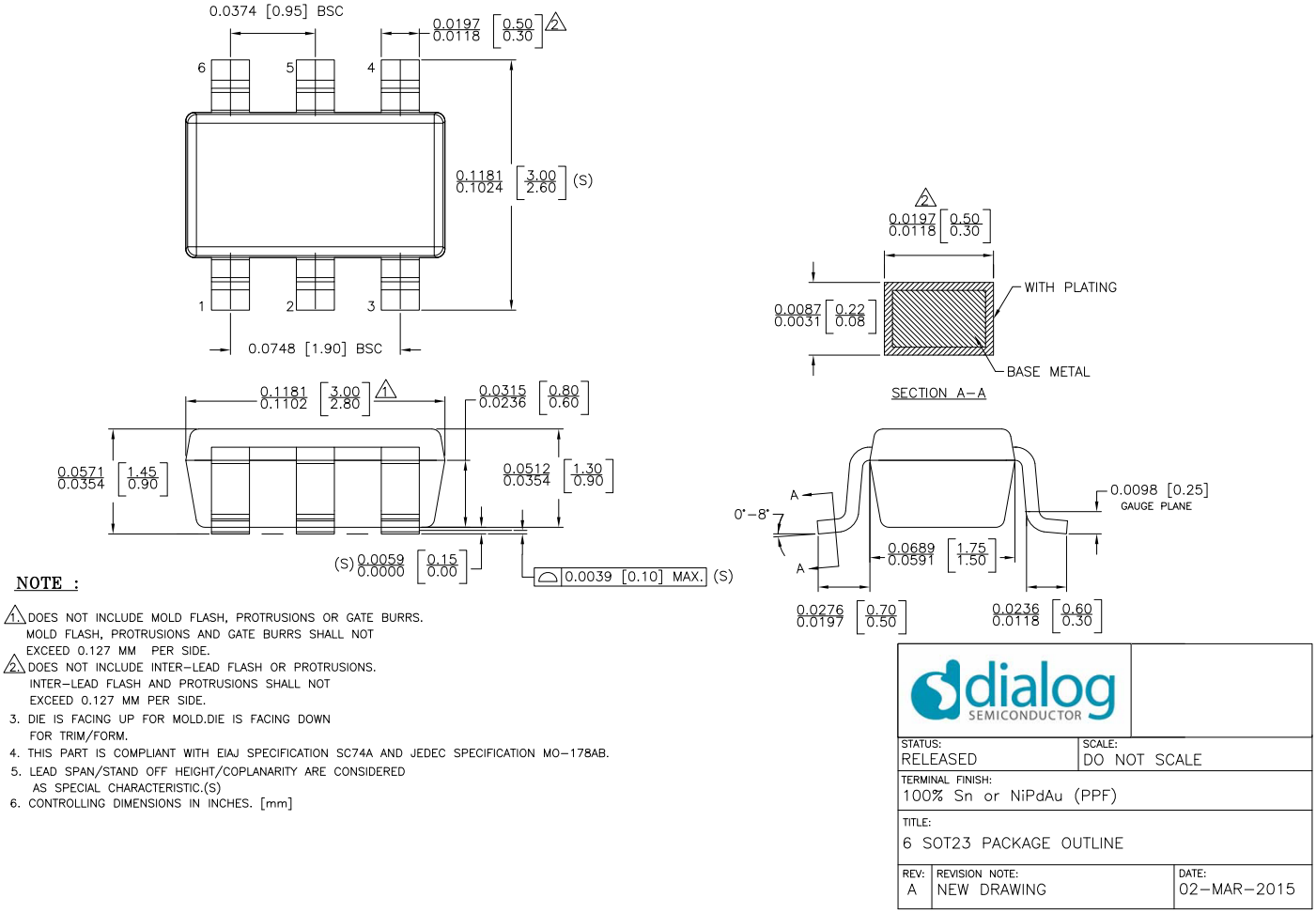
| Pin Number | Pin Name | Type | Pin Description |
|---|---|---|---|
| 1 | $V_{CC}$ | Power Input | Power supply to control logic and MOSFET drive. |
| 2 | FB/$F_{MAX}$ | Analog Input | Multi-function pin. Used to configure maximum switching frequency ($F_{MAX}$), and to enable/disable over-load protection (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. |

## 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, $I_{CC}$ = 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 |
| $V_{IN}$ (pin 3) | | -0.3 to 18.0 | V |
| OUTPUT (pin 6) | | -0.3 to 18.0 | V |
| FB/$F_{MAX}$ input (pin 2, $I_{FB/OTP}$ ≤ 10mA) | | -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 | $\theta_{JA}$ | 190 | °C/W |
| ESD rating per JEDEC JESD22-A114 | | ±2,000 | V |
| Latch-up test per JESD78D | | ±100 | mA |

## 6 Physical Dimensions




NOTE :

1. DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH, PROTRUSIONS AND GATE BURRS SHALL NOT EXCEED 0.127 MM PER SIDE.
2. 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]

dialog SEMICONDUCTOR

| STATUS: | SCALE: |
|---|---|
| RELEASED | DO NOT SCALE |

TERMINAL FINISH: 100% Sn or NiPdAu (PPF)

TITLE: 6 SOT23 PACKAGE OUTLINE

| REV: | REVISION NOTE: | DATE: |
|---|---|---|
| A | NEW DRAWING | 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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