iW3627

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 $V_{\text{IN}}$ 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$\text{AC}$ – 277V$\text{AC}$) and DC input
- Adapatively 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
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)
### Pinout Description

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

<table>
<thead>
<tr>
<th>Pin Number</th>
<th>Pin Name</th>
<th>Type</th>
<th>Pin Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>( V_{CC} )</td>
<td>Power Input</td>
<td>Power supply to control logic and MOSFET drive.</td>
</tr>
<tr>
<td>2</td>
<td>( FB/F_{MAX} )</td>
<td>Analog Input</td>
<td>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.</td>
</tr>
<tr>
<td>3</td>
<td>( V_{IN} )</td>
<td>Analog Input</td>
<td>Multi-function pin. Used to control active start-up device and sense line voltage.</td>
</tr>
<tr>
<td>4</td>
<td>( CS/F_{MIN} )</td>
<td>Analog Input</td>
<td>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.</td>
</tr>
<tr>
<td>5</td>
<td>GND</td>
<td>Ground</td>
<td>Ground.</td>
</tr>
<tr>
<td>6</td>
<td>OUTPUT</td>
<td>Output</td>
<td>Gate drive for external MOSFET switch.</td>
</tr>
</tbody>
</table>
5 Absolute Maximum Ratings

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

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Value</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC supply voltage range (pin 1, I_{CC} = 20mA max)</td>
<td>V_{CC}</td>
<td>-0.3 to 18.0</td>
<td>V</td>
</tr>
<tr>
<td>Continuous DC supply current at V_{CC} pin (V_{CC} = 15V)</td>
<td>I_{CC}</td>
<td>20</td>
<td>mA</td>
</tr>
<tr>
<td>V_{IN} (pin 3)</td>
<td></td>
<td>-0.3 to 18.0</td>
<td>V</td>
</tr>
<tr>
<td>OUTPUT (pin 6)</td>
<td></td>
<td>-0.3 to 18.0</td>
<td>V</td>
</tr>
<tr>
<td>FB/F_{MAX} input (pin 2, I_{FB/OTP} ≤ 10mA)</td>
<td></td>
<td>-0.7 to 4.0</td>
<td>V</td>
</tr>
<tr>
<td>CS/F_{MIN} input (pin 4)</td>
<td></td>
<td>-0.3 to 4.0</td>
<td>V</td>
</tr>
<tr>
<td>Maximum junction temperature</td>
<td>T_{JMAX}</td>
<td>150</td>
<td>°C</td>
</tr>
<tr>
<td>Operating junction temperature</td>
<td>T_{JOPT}</td>
<td>-40 to 150</td>
<td>°C</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>T_{STG}</td>
<td>-65 to 150</td>
<td>°C</td>
</tr>
<tr>
<td>Thermal resistance junction-to-ambient</td>
<td>\theta_{JA}</td>
<td>190</td>
<td>°C/W</td>
</tr>
<tr>
<td>ESD rating per JEDEC JESD22-A114</td>
<td></td>
<td>±2,000</td>
<td>V</td>
</tr>
<tr>
<td>Latch-up test per JESD78D</td>
<td></td>
<td>±100</td>
<td>mA</td>
</tr>
</tbody>
</table>
6 Physical Dimensions

7 Ordering Information

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
<th>Package</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>iW3627-00</td>
<td>$V_{PK(LOW)} = 0.16V$, maximum $NV_o$ up to 90V</td>
<td>SOT-23</td>
<td>Tape &amp; Reel</td>
</tr>
<tr>
<td>iW3627-01</td>
<td>$V_{PK(LOW)} = 0.2V$, maximum $NV_o$ up to 145V</td>
<td>SOT-23</td>
<td>Tape &amp; Reel</td>
</tr>
</tbody>
</table>

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