

Single-Stage, High PF, Low THD Primary-Side AC/DC Controller with Integrated High Voltage Startup for LED Lighting Applications up to 90W

1 Description

The iW3677 is a single-stage high-performance AC/DC primary-side-regulation PWM controller with power factor correction (PFC). It is designed to support flyback and buck-boost topologies at output power levels up to 90W. The iW3677 integrates the high voltage startup circuit, reducing BOM count, simplifying design and improving overall reliability.

The iW3677 supports different types of loading including constant power (CP) loads such as a second-stage DC/DC converter; and constant resistance (CR) loads such as LED light strips.

The iW3677 uses Dialog's **PrimAccurate™** technology to provide accurate constant voltage (CV) and constant current (CC) regulation across AC line and load conditions. The digital control eliminates the need for external loop compensation while maintaining stability across all operating conditions. With Dialog's patented **PF-Boost™** technology, the iW3677 can achieve power factor (PF) greater than 0.9 and total harmonic distortion (THD) less than 20% at 50% or greater loading and across the entire AC line voltage range.

The iW3677 offers less than 150mW standby power loss while keeping excellent load transient response in CV mode. In addition, there is no audible noise during load transient or during startup, which is a typical shortcoming of most PFC CV controllers. Startup time is less than 0.25s with integrated high voltage startup circuit and advanced startup control in the iW3677.

The iW3677 also features various protections such as output over-voltage, output short-circuit, AC over-voltage, AC under-voltage, current-sense-resistor short, over-current and over-temperature protections. This ensures great system reliability.

2 Features

- Integrated high-voltage startup circuit
- Universal AC input voltage range $90V_{AC} \sim 305V_{AC}$
- Supports up to 90W output power in tiny SOIC-7 package
- CV mode AC line and load regulation $< \pm 3\%$
- CC mode AC line and load regulation $< \pm 5\%$
- $PF > 0.9$ and $THD < 20\%$ across AC line voltage for $> 50\%$ of full load
- Fast startup time $< 0.25s$
- Standby power $< 150mW$ at $230V_{AC}$ input up to 90W
- No audible noise across AC line and load conditions, and during load transient or startup
- Wide operating supply voltage (V_{VCC}) range from 8.0V to 20V
- Comprehensive protection features
 - » Output over-voltage protection
 - » Output short-circuit protection
 - » AC over-voltage protection
 - » AC under-voltage protection (Brown-out)
 - » Cycle-by-cycle peak current limit
 - » Current-sense-resistor short protection
 - » Over-temperature protection

3 Applications

- Two-stage or single-stage LED lighting drivers
- AC-DC adapters, TVs, monitor power supplies that require power factor

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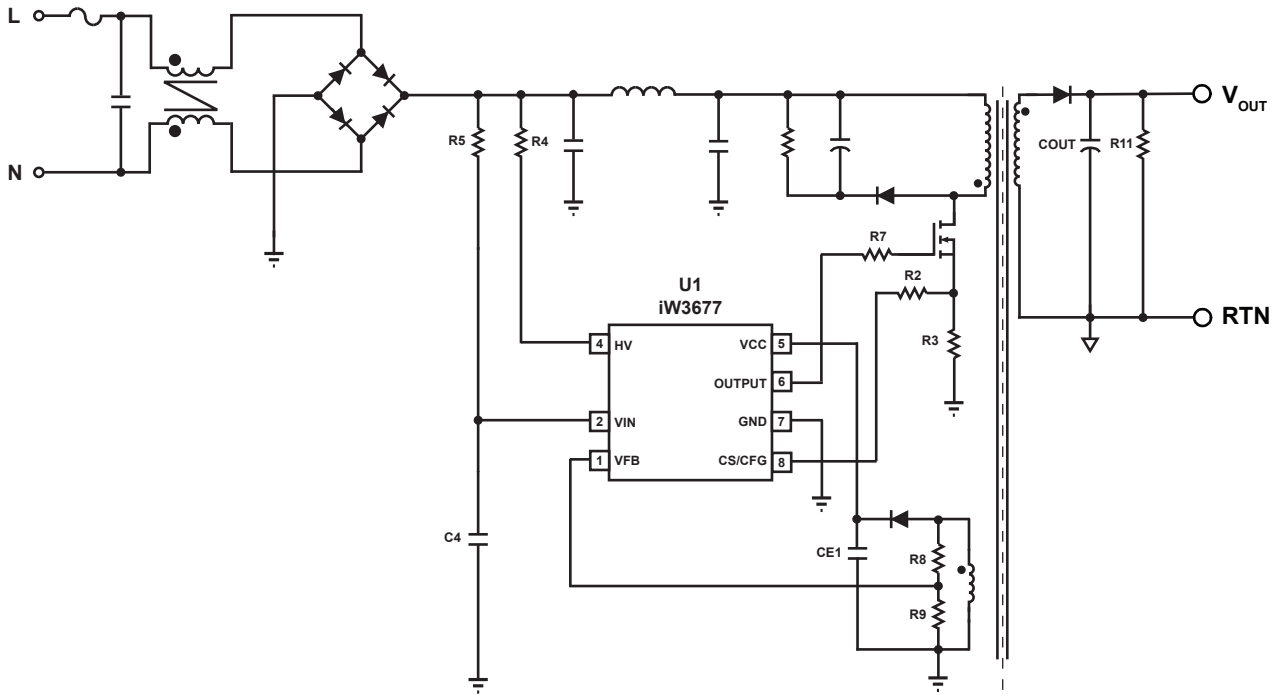


Figure 3.1 : iW3677 Typical Application for LED Power Supply

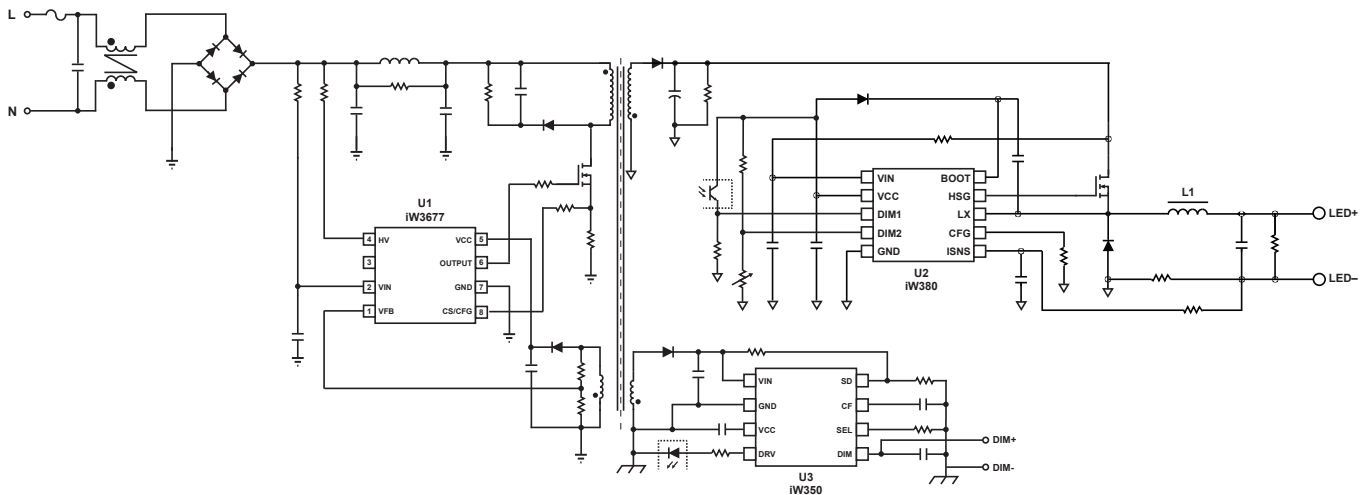


Figure 3.2 : iW3677 Application for 2-Stage Dimmable LED Driver with iW380 and iW350

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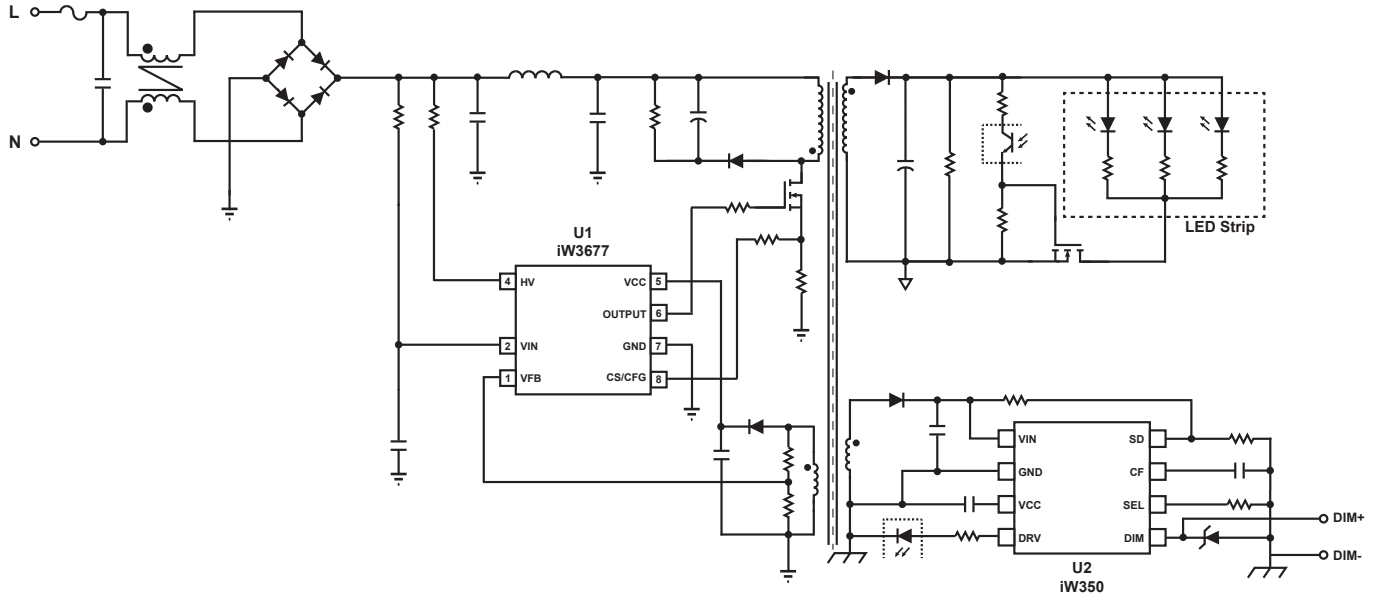


Figure 3.3 : iW3677 Application for Dimmable LED Light Strip Driver with iW350

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4 Pinout Description

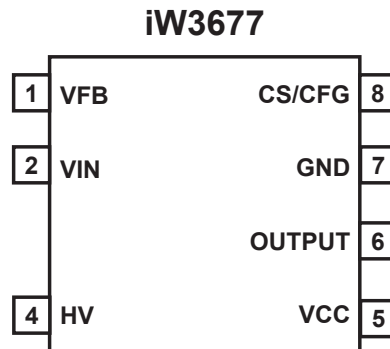


Figure 4.1 : 7-Lead SOIC Package

Pin Number	Pin Name	Type	Pin Description
1	VFB	Analog input	Output voltage and transformer reset sense
2	VIN	Analog input	Input AC line voltage sense
4	HV	Analog input	High voltage startup
5	VCC	Power	IC power supply
6	OUTPUT	Analog output	Power MOSFET gate drive
7	GND	Ground	Ground reference
8	CS/CFG	Analog input	Power MOSFET current sense and configuration

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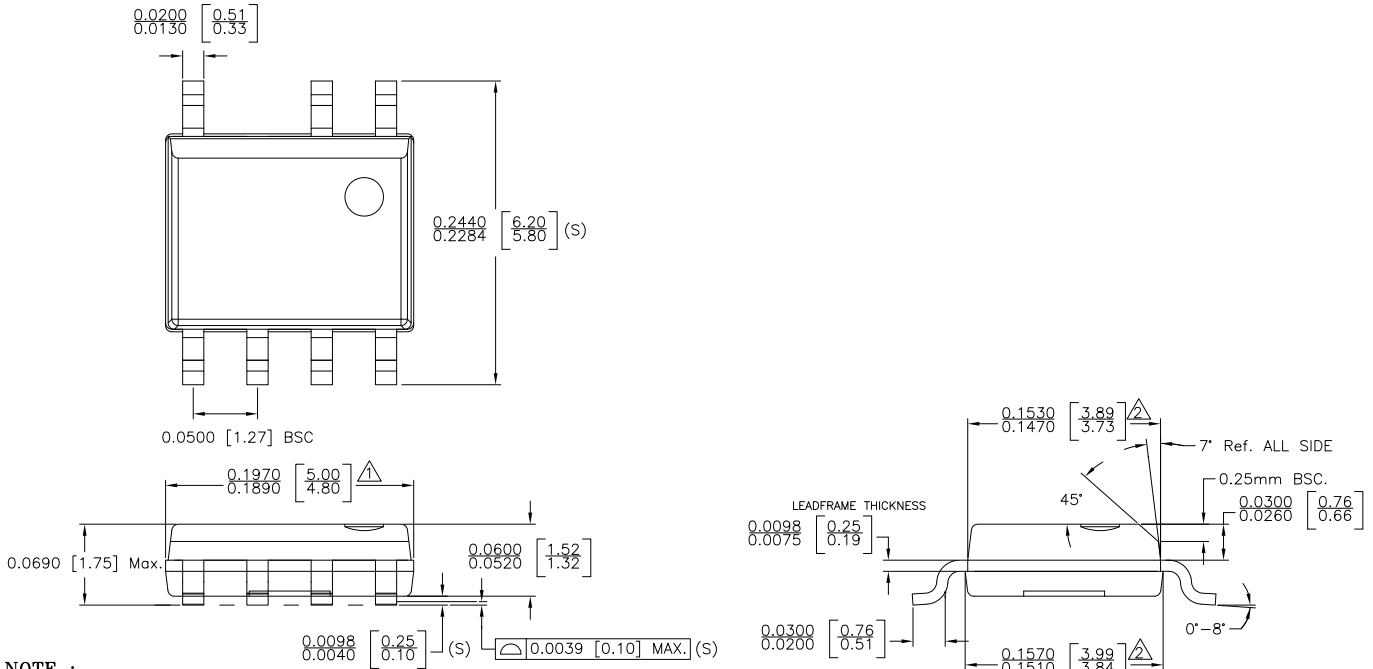
5 Absolute Maximum Ratings

Absolute maximum ratings are the parameter values or ranges which can cause permanent damage if exceeded. For maximum safe operating conditions, refer to Electrical Characteristics in Section 6.

Parameter	Symbol	Value	Units
DC supply voltage range (pin 5, $I_{VCC} = 20\text{mA max}$)	V_{VCC}	-0.3 to 22.0	V
Continuous DC supply current at VCC pin ($V_{VCC} = 15\text{V}$)	I_{VCC}	20	mA
V_{VIN} (pin 2)		-0.3 to 20.0	V
OUTPUT (pin 6)		-0.3 to 20.0	V
V_{VFB} (pin 1, $I_{VFB} \leq 10\text{mA}$)		-0.7 to 5.0	V
CS/CFG input (pin 8)		-0.3 to 5.0	V
HV startup voltage (pin 4)		-0.3 to 600	V
HV startup current (pin 4)		25	mA
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}	100	°C/W
ESD rating per JEDEC JS-001-2017		±2,000	V
Latch-up test per JESD78E		±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 .006 INCH PER SIDE.
- △ DOES NOT INCLUDE INTER-LEAD FLASH OR PROTRUSIONS. INTER-LEAD FLASH AND PROTRUSIONS SHALL NOT EXCEED .010 INCH PER SIDE.
- 3. PACKAGE DIMENSION CONFORM TO 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: 7 SOIC (NO PIN 3) PACKAGE OUTLINE	
REV: C	DATE: 01-JUNE-2015

7 Ordering Information

Part Number	Description	Package	Description
iW3677-001 iW3677-00C	Optimized for 1-stage or 2-stage CV applications	SOIC-7	Tape & Reel ²

Note 1: Not recommended for new designs, please use the -xxC version.

Note 2: Tape & Reel packing quantity is 2,500/reel. Minimum packing quantity is 2,500.

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