

High Performance Step-Down DC/DC Controller with High-Resolution True DC Dimming for LED Lighting up to 78V

1 Description

The iW380 is a DC/DC step-down controller with tight current regulation and exceptional dimming performance for LED lighting. It is designed to be used in the high-side switching buck topology up to 78V input voltage and up to 98% of output voltage/input voltage ratio. With its advanced digital control, the iW380 offers Renesas' True DC Dimming from 100% down to 0.0625% with 0.0625% resolution and guaranteed linearity.

The iW380 features unique dual-dimming pins that significantly simplify application designs where multi-level maximum current settings are needed. The maximum LED current can be programmed through one dimming pin via the analog voltage level or an adjustable resistor. The other dimming port can be used for auto-detectable 3-in-1 dimming: analog voltage, PWM duty or resistor dimming. Internally, the iW380 processes the dimming inputs and regulates the output current percentage by $DIM1\% \times DIM2\%$.

A dedicated light-off mode in the iW380 turns off the output current when the dimming signal input is less than the light-off threshold. In the light-off mode, the iW380 consumes minimum power while still monitoring the dimming inputs. If the dimming signal input becomes higher than the light-on threshold, the iW380 can immediately wake up and resume output current regulation.

The iW380 provides flexibility to optimize dimming resolution and dimming signal noise immunity. When a noisy analog dimming level or jittering PWM dimming duty is supplied to the iW380, the iW380 can keep the output current stable with some tradeoff to dimming resolution by configuration. Also, the iW380 has configurable minimum startup voltage. This feature can effectively prevent light flicker/flash at power off across different applications.

2 Features

- Input DC voltage range: 22V ~ 78V
- Output/input voltage ratio: up to 98%
- Output power up to 150W
- Multiple operating mode product options:
 - Constant-current (CC) mode
 - Constant-voltage/constant-current (CV/CC) mode
 - Constant-power/constant-current (CP/CC) mode
- True DC dimming
 - Max dimming range: 0.0625% ~ 100%
 - Highest dimming resolution: 0.0625%
- CC line and load regulation < $\pm 3\%$
- CV line and load regulation < $\pm 3\%$
- Light-off current consumption < 1mA
- Over temperature current de-rating
- 3-in-1 dimming on both dimming ports
 - RSET resistor
 - PWM Dimming
 - Analog voltage
- Auto dimming signal types detection
- Configurable dimming signal hysteresis
- Configurable startup voltage
- Rich protections:
 - Output over voltage (OVP)
 - Output short circuit (OSP)
 - V_{VIN} over/under voltage
 - Over current protection (OCP)
 - Sense resistor short protection
 - Over temperature protection (OTP)

3 Applications

- Two-stage AC/DC general LED lighting drivers
- Two-stage AC/DC LED light strip drivers
- DC/DC general LED lighting drivers

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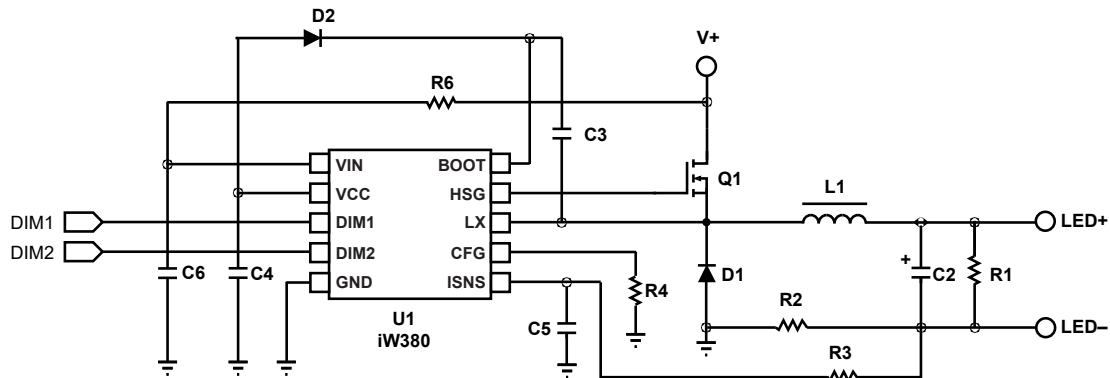


Figure 3.1 : iW380 Typical Application Circuit for CC only and CP/CC variants

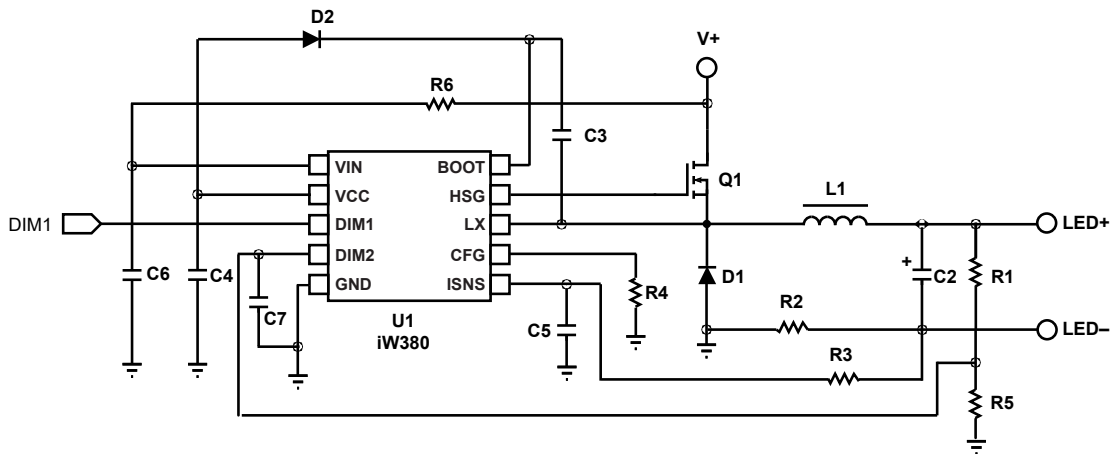


Figure 3.2 : iW380 Typical Application Circuit for CV/CC variants

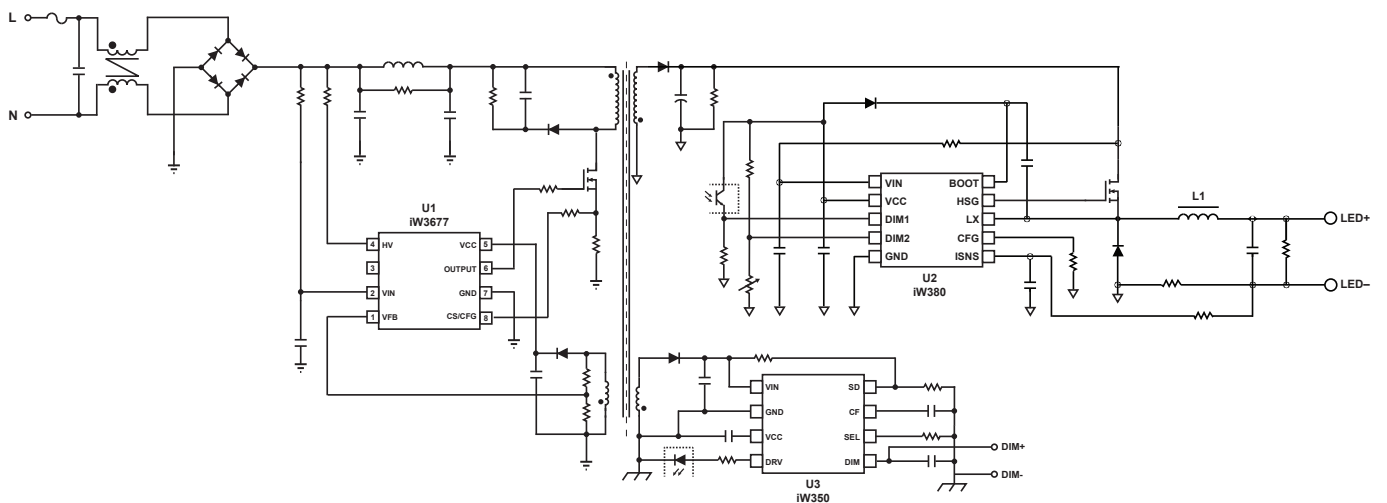


Figure 3.3 : iW380 Dimmable LED Driver Application with iW3677 Front-End Power Factor Correction Flyback and iW350 Interface IC

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4 Pinout Description

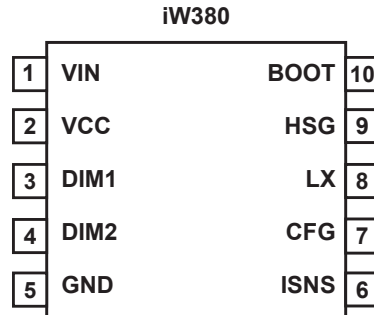


Figure 4.1 : 10-Lead SOIC Package

Pin Number	Pin Name	Type	Pin Description
1	VIN	Power	Power source and input voltage sensing
2	VCC	Power	IC power supply
3	DIM1	Analog Input	Dimming signal input port 1
4	DIM2	Analog Input	Dimming signal input port 2
5	GND	Ground	Ground reference
6	ISNS	Analog Input	Buck inductor current sensing
7	CFG	Analog Input	Configuration input
8	LX	Analog Input	Buck switching node, high-side power MOSFET source
9	HSG	Analog Output	High-side power MOSFET gate drive
10	BOOT	Power	Bootstrap high-side driver power supply

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5 Absolute Maximum Ratings

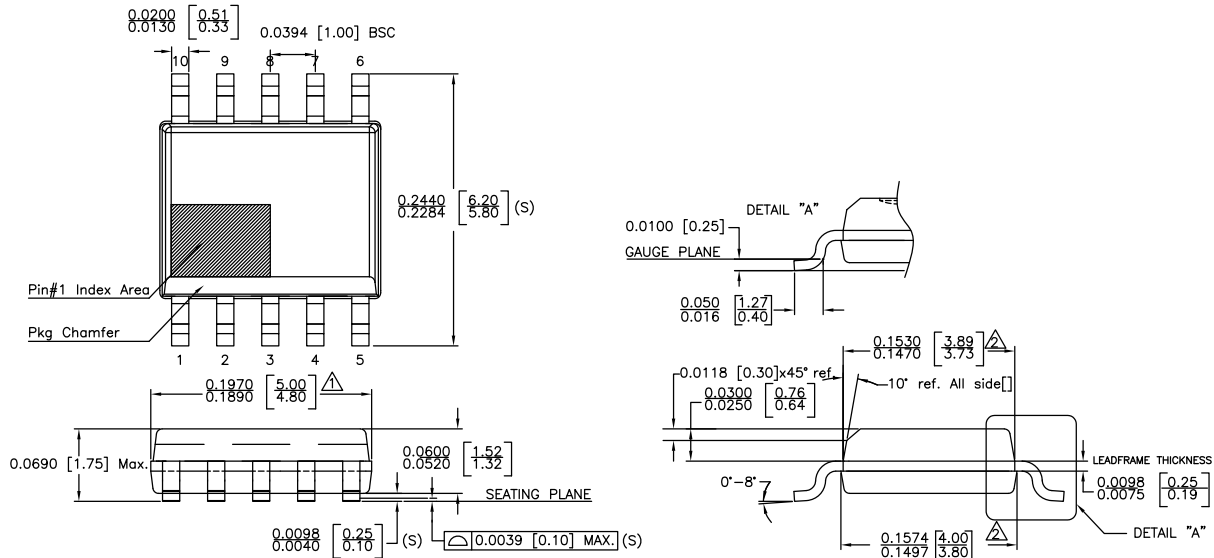
Absolute maximum ratings are the parameter values or ranges which can cause permanent damage if exceeded.

Parameter	Symbol	Value	Units
DC supply voltage range	V_{VCC}	-0.3 to 6.5	V
Continuous DC supply at VCC pin	I_{VCC}	20	mA
VIN pin		-0.3 to 82	V
DIM1 and DIM2 pin		-0.3 to 6.5	V
ISNS pin		-0.3 to 6.5	V
CFG pin		-0.3 to 6.5	V
LX pin		-0.7 to 82	V
HSG pin (Note 1)		-0.3 to 87	V
BOOT pin (Note 1)		-0.3 to 87	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}	209	°C/W
ESD rating per JEDEC JS-001-2017		±2000	V
Latch-up test per JESD78E		±100	mA

Note 1. BOOT pin and HSG pin respect to LX pin < 5.5V.

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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 EXCEPT LEAD PITCH.
- 4. LEAD SPAN/STAND OFF HEIGHT/COPLANARITY ARE CONSIDERED AS SPECIAL CHARACTERISTIC(S)
- 5. CONTROLLING DIMENSIONS IN INCHES.[mm]
- 6. PHYSICAL APPEARANCE OF PACKAGE (E-PIN, DIMPLE, CHAMFER) MAY VARY DUE TO ASSEMBLY TOOLINGS

STATUS: RELEASED	
TERMINAL FINISH: PPF or 100% Sn	
TITLE: SOP 10L 150ML PACKAGE OUTLINE	
REV: C	REVISION NOTE: STANDARDIZED PDD

Figure 6.1 : 10-Lead SOIC Package Outline Drawing

7 Ordering Information

Part Number	Status	Options	Package	Description
iW380-00	Active	CC only	SOIC-10	Tape & Reel ¹
iW380-00B	Recommended for New Designs	CC only	SOIC-10	Tape & Reel ¹
iW380-01	Active	CC only, 0.125% lowest dimming startup threshold	SOIC-10	Tape & Reel ¹
iW380-01B	Recommended for New Designs	CC only, 0.125% lowest dimming startup threshold	SOIC-10	Tape & Reel ¹
iW380-02	Active	CC only, 0.125% lowest dimming startup threshold, OTP de-rating disabled	SOIC-10	Tape & Reel ¹
iW380-02B	Recommended for New Designs	CC only, 0.125% lowest dimming startup threshold, OTP de-rating disabled	SOIC-10	Tape & Reel ¹
iW380-12B	Recommended for New Designs	CC only, 0.125% lowest dimming startup threshold, OTP de-rating disabled, extra 100ms start up delay	SOIC-10	Tape & Reel ¹
iW380-20	Active	CV/CC variant, DIM2 as feedback	SOIC-10	Tape & Reel ¹
iW380-20B	Recommended for New Designs	CV/CC variant, DIM2 as feedback	SOIC-10	Tape & Reel ¹
iW380-31B	Recommended for New Designs	CP/CC variant, CP constant = 70%	SOIC-10	Tape & Reel ¹

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

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