LED Driver

Description

The HWL380 is a continuous mode inductive step-down converter, designed for driving single or multiple series connected LEDs efficiently from a voltage source higher than the LED voltage. The device operates from an input supply between 8V and 30V and provides an externally adjustable output current.

The HWL380 includes a high-side output current sensing circuit, which uses an external resistor to set the nominal average output current.

The $\overline{PWM}$ pin accepts low-frequency PWM control signal to achieve the dimming of the LEDs. Applying a voltage of 0.5V or lower to the EN pin puts the device into power down mode.

Features

- Simple low parts count
- PWM low-frequency dimming via $\overline{PWM}$ pin
- High efficiency
- Wide input voltage range: 8V to 30V

Applications

- Low voltage halogen replacement LED
- Automotive lighting
- Low voltage industrial lighting
- LED back-up lighting
- Illuminated signs

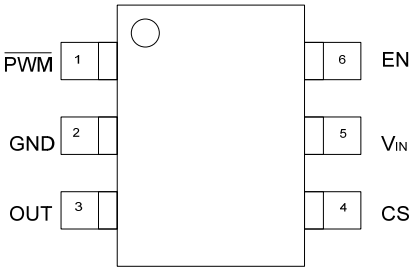
Absolute maximum ratings (voltage to GND unless otherwise stated)

Input voltage (VIN)	-0.3V to +30V
CS voltage (VCS)	+0.3V to -4V (measured with respect to VIN)
OUT voltage	-0.3V to +7V

Electrical characteristics (V_{IN} =12V, T_{amb} =25℃)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_{IN}	Input voltage		8		30	**V**
I_{PD}	Power down current	EN pin low		20		**uA**
V_{CS}	Mean current sense threshold voltage	VIN-VCS	95	100	105	**mV**
V_{CSHYS}	Sense threshold hysteresis			+/-15		%
Ics	CS pin input current	VCS=VIN-		9		uA
V_{OUT}	Output voltage			4.5		**V**
T_{ONmin_REC}	Recommended minimum switch 'ON' time			500		**ns**
f_{max}	Recommended maximum operating frequency				1	**MHz**
V_{IH}	Input high voltage		2			**V**
V_{IL}	Input low voltage				0.5	**V**

Pin description



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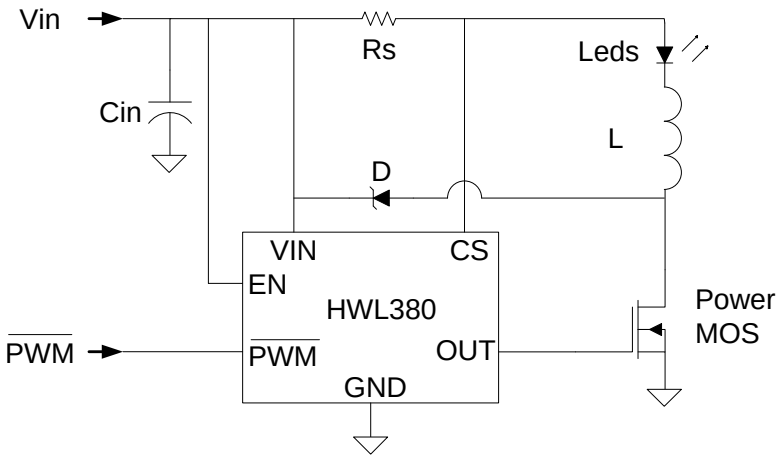
Top View

Name	Pin no.	Description
PWM	**1**	PWM control pin (low active)
GND	**2**	Ground (0V)
OUT	**3**	Output pin (for driving power MOSFET)
CS	**4**	Current sense pin (connect resistor Rs from this pin to V_{IN} to define nominal average output current I_{OUT}nom = 0.1/Rs)
VIN	**5**	Input voltage
EN	**6**	Chip enable pin (high active)

Note : PWM and EN pins should not left floating.

Typical application



Device operation

When input voltage **V_{IN}** is first applied and over the minimum operating voltage

(8V), the device will start to operate. As soon as the starting delay time is reached, the device will turn on the external power MOSFET, causing current to flow from VIN to ground, via **Rs**, **L** and the **LED(s)**. The current rises at a rate determined by **VIN** and **L** to produce a voltage ramp (**VCS**) across **Rs**. When this voltage reaches the upper threshold voltage (115mV), the power MOSFET will be turned off. As the power MOSFET is off, the current in **L** continues to flow through schottky diode **D** and the **LED(s)** back to **VIN**. The current decays at a rate determined by the **LED(s)** and schottky diode forward voltages. When the voltage across **Rs** (**VCS**) ramps down to the lower threshold voltage (85mV) , the device will turn on the power MOSFET again. This cycle of events repeats, with the voltage across **Rs** (**VCS**) ramping between limits of 100mV +/- 15%.

Switching thresholds

The average output current **IOUT**nom is defined by :

IOUTnom = 100mV/ **Rs**

Nominal ripple current is (+/-15mV) / **Rs**

Adjusting output current

By adjusting the duty cycle of the **PWM** (low-active) pin, the average output current can be adjusted.

Auto re-activate

As input voltage **VIN** is above the minimum operating voltage (8V), the device is always monitoring the current in **L**. If the current in **L** could not reach the upper limit, the device will stop for a few ms. After the delay, HWL380 will re-activate again.