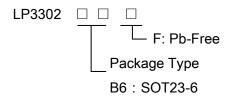
High Performance, Constant Current Switching Regulator For White LED

General Description

The LP3302 is a high frequency, asynchronous boost converter for constant current white LED driver applications. The internal MOSFET can support up to 8 White LEDs for backlighting and OLED power application, and the internal soft start function can reduce the inrush current. The LED current is initially set with the external sense resistor. To improve efficiency, the feedback voltage is set to 250mV, which reduces the power dissipation in the current setting resistor.

The LP3302 implements a constant frequency 1MHz PWM control scheme. Optimized operation frequency can meet the requirement of small LC filters value .Highly integration and internal compensation network minimizes as 5 external component counts.to provide the best solution for PCB space saving and total BOM cost. SOT23-6 packages.

Order Information



Marking Information

Device	Marking	Package	Shipping
LP3302B6F LPS		SOT23-6	3K/REEL
	F3XXX		

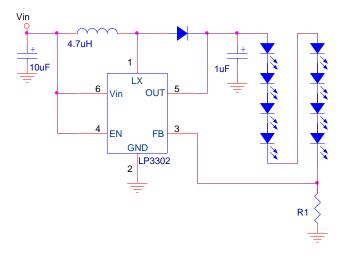
Features

- High Efficiency: 93%
- ◆ 1MHz Fixed-Frequency PWM Operation
- Maximum Output Voltage up to 29V
- Operating Range : 2.7V to 6V
- Shutdown Supply Current:<1uA
- Available in SOT23-6 Package
- ◆ Built-in Over Voltage Protection
- ◆ Minimize the External Component
- ◆ RoHS Compliant and 100% Lead Pb-Free

Applications

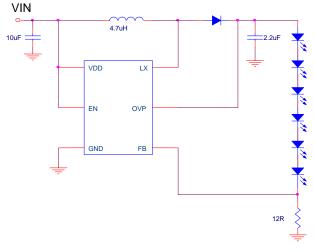
- ♦ WLED Backlight driver
- ♦ OLED Backlight driver
- ♦ PDA
- ♦ DSC
- ♦ Camera Flash WLED driver

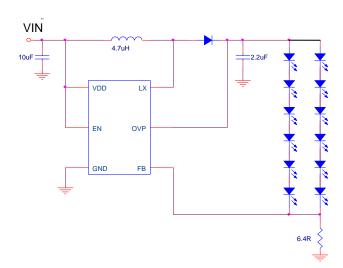
Typical Application Circuit



LP3302-02 Oct.-2013

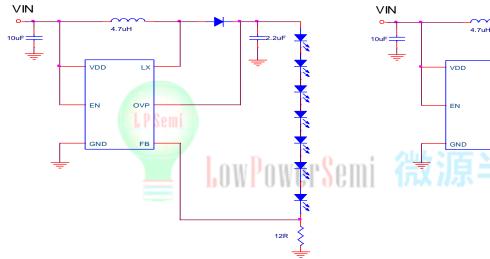
Application Circuits

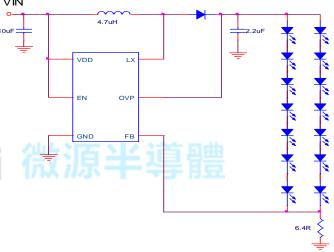




LP3302 for 6pcs Application Circuit

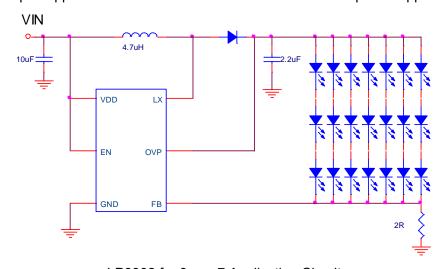
LP3302 for 6pcs×2 Application Circuit





LP3302 for 7pcs Application Circuit

LP3302 for 7pcs×2 Application Circuit



LP3302 for 3pcs×7 Application Circuit

LP3302-02

Oct.-2013



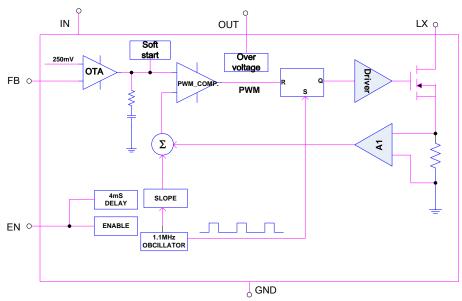
Functional Pin Description

Package Type	Pin Configurations		
SOT23-6	6 5 4 1 2 3 LX GND FB		

Pin Description

Pin	Name	Description
1	LX	Switch Pin. Connect this Pin to inductor and catch diode. Minimize the track area to reduce EMI.
2	GND	Ground Pin
3	FB	Feedback Reference Voltage Pin. Series connect a resistor between WLED and ground as a
3	ГБ	current sense. Sense the current feedback voltage to set the current rating.
		Chip Enable (Active High). Voltage sensing input to trigger the function of over voltage
4	EN	protection. Note that this pin is high impedance. There should be a pull low $100k\Omega$ resistor
		connected to GND when the control signal is floating.
		OVP Pin. Overvoltage Sense. When VOUT is greater than 29V, the internal N-channel
5	OUT	MOSFET turns off until VOUT drops below 28V, then the IC reenters start. Connect a 2.2uF
		capacitor from OUT to GND.
6	VIN	Supply Input Voltage Pin. Bypass 10uF capacitor to GND to reduce the input noise.

Function Block Diagram



LP3302-02 Oct.-2013 Email: <u>marketing@lowpowersemi.com</u> <u>www.lowpowersemi.com</u> Page 3 of 9



Absolute Maximum Ratings

	IN Pin to GND0.3V to 6.5V
	LX Pin to GND0.3V to 36V
	OVP Pin to GND0.3V to 36V
	The Other Pins $$ 0.3V to 5.5V
\diamondsuit	Storage Temperature Range (TJ)
	Maximum Soldering Temperature (at leads, 10sec) 260°C
\diamondsuit	Maximum Power Dissipation (PD,TA<40°C) 0.45W
\diamondsuit	Thermal Resistance (JA)250°C/W
	Maximum Junction Temperature 125°C
	Operating Junction Temperature Range (TJ)
\diamondsuit	ESD Susceptibility HBM(Human Body Mode) 2KV
	MM(Machine Mode) 200V

Electrical Characteristics

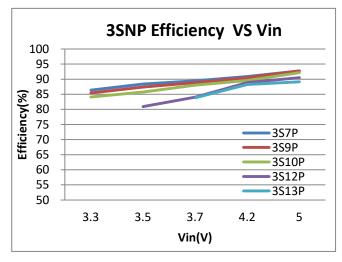
Parameter	Symbol	Test Condition	Min	Тур.	Max	Units
System Supply Input						
Operation voltage Range	VDD		2.7		6	V
Under Voltage Lock Out	VDD		2.2	2.4	2.6	V
Supply Current	IDD	NO LOAD	百斗	0.2	0.4	mA
Shut Down Current	IDD	VEN < 0.4V	ジー	0.1	1	uA
Oscillator						
Operation Frequency	FOSC			1		MHz
Maximum Duty Cycle			89	92	96	%
Dimming Frequency			100		1M	Hz
Feedback Voltage	LP3302		230	250	270	mV
MOSFET						
On Resistance of MOSFET	RDS(ON)			0.3		Ω
Protection						
OVP Threshold	VOVP		27	29	31	V
OVP Sink Current				5		μA
OCP				1100		mA
Shut Down Voltage	VEN				0.4	V
Enable Voltage	VEN		1.4			V

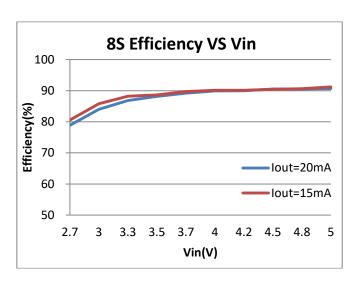
LP3302-02

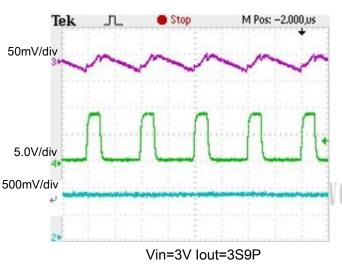
Oct.-2013

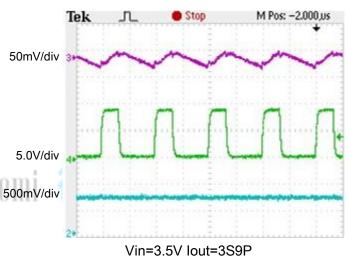


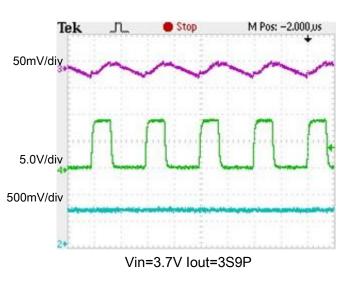
Typical Operating Characteristics

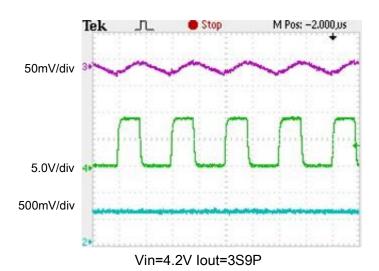




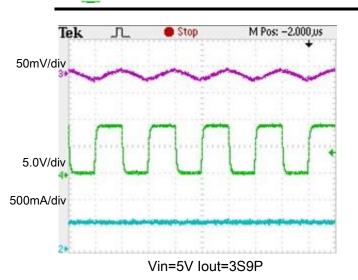


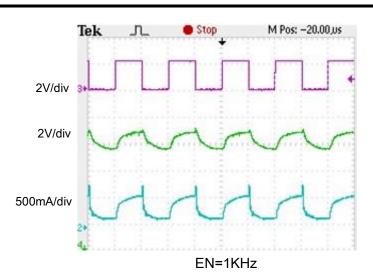


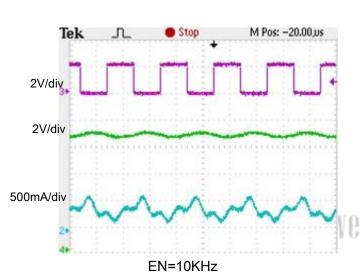


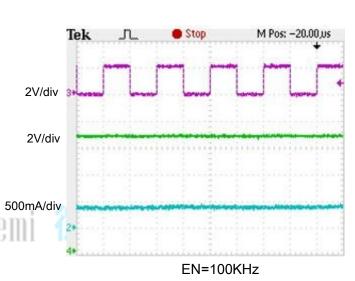


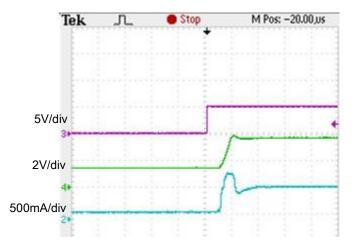
LP3302-02 Oct.-2013











LP3302

Applications Information

LED Current Control

The LP3302 regulates the LED current by setting the current sense resistor (R1) connecting to feedback and ground. The internal feedback reference voltage is 0.25V. The LED current can be set from following equation easily.

$I_{LED}=250mV/R1$

In order to have an accurate LED current, precision resistors are preferred (1% is recommended). The table for R2 selection is shown below.

R1 Resistor Value selection

ILED(mA)	R1(Ω)	
5	50	
10	25	
12	21	
20	12.5	

Inductor Selection

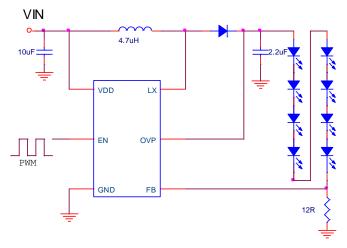
The recommended value of inductor for 2 to 8WLEDs applications are 4.7 to 22µH. Small size and better efficiency are the major concerns for portable device, such as LP3302 used for mobile phone. The inductor should have low core loss at 1MHz and low DCR for better efficiency. To avoid inductor saturation current rating should be considered.

Dimming control

a. Using a PWM Signal to EN Pin

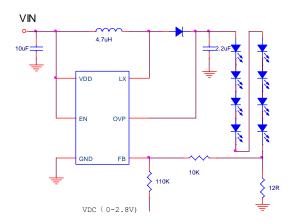
To control the brightness of LED, the LP3302 can perform the dimming control by applying a PWM signal to EN pin. The internal soft-start and wide range dimming frequency from 100Hz to 1MHz can insignificantly reduce audio noise when dimming.

The average LED current is proportional to the PWM signal duty cycle. The magnitude of the PWM signal should be higher than the maximum enable voltage of EN pin, in order to let the dimming control perform correctly.



b. Using a DC Voltage

Using a variable DC voltage to adjust the brightness is a popular method in some applications. The dimming control using a DC voltage circuit is shown below . According to the Superposition Theorem, as the DC voltage increases, the voltage contributed to VFB increases and the voltage drop on R1 decreases, i.e. the LED current decreases. For example, if the VDC range is from 0V to 2.8V, the selection of resistors below sets dimming control of LED current from 20mA to 5.5mA.



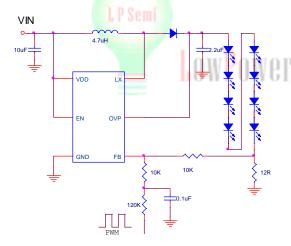
Oct.-2013 Email: marketing@lowpowersemi.com



c. Using a Filtered PWM signal

Another common application is using a filtered PWM signal as an adjustable DC voltage for LED dimming control. A filtered PWM signal acts as the DC voltage to regulate the output current. The recommended application circuit is shown in the Figure . In this circuit, the output ripple depends on the frequency of PWM signal. For smaller output voltage ripple (<100mV), the recommended frequency of 2.8V PWM

signal should be above 2kHz. To fix the frequency of PWM signal and change the duty cycle of PWM signal can get different output current. According to the application circuit of Figure , output current is from 20.5mA to 5.5mA by adjusting the PWM duty cycle from 10% to 90%.



Thermal Considerations

For continuous operation, do not exceed absolute maximum operation junction temperature. The maximum power dissipation depends on the thermal resistance of IC package, PCB layout, the rate of surroundings airflow and temperature difference between junction to ambient.

The maximum power dissipation can be calculated by following formula:

$$PD(MAX) = (TJ(MAX) - TA)/qJA$$

Where TJ(MAX) is the maximum operation junction temperature, TA is the ambient temperature and the qJA is the junction to ambient thermal resistance. For the recommended operating conditions specification of LP3302, the maximum junction temperature of the die is 125 °C. The junction to ambient thermal resistance qJA is layout dependent. The junction to ambient thermal resistance for TSOT-23-6 package is 250 °C/W on the standard JEDEC51-3 single layer thermal test board. Themaximum power dissipation at TA = 25 °C can be calculated by following formula:

$$PD(MAX) = (125^{\circ}C - 25^{\circ}C) / (250^{\circ}C/W) = 0.4W$$

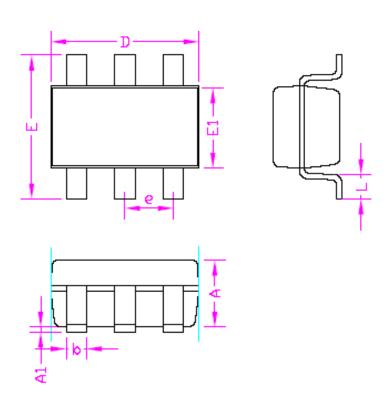
The maximum power dissipation depends on operating ambient temperature for fixed TJ(MAX) and thermal resistance qJA.

LP3302-02

Oct.-2013

Packaging Information

SOT23-6



SYMBOLS	MILLIMETERS		INCHES		
STIVIDOLS	MIN.	MAX.	MIN.	MAX.	
Α	-	1.45	-	0.057	
A1	0.00	0.15	0.000	0.006	
b	0.30	0.50	0.012	0.020	
D	2.90		0.114		
E1	1.60		0.063		
е	0.95		0.037		
E	2.60	3.00	0.102	0.118	
L	0.3	0.60	0.012	0.024	

LP3302-02 Oct.-2013