Datasheet

### 180KHz 60V 5A Switching Current Boost LED Constant Current Driver

XL6006

### Features

- Wide 5V to 48V Input Voltage Range
- Maximum Boost Output Up to 60V
- 0.22V FB adjustable LED drive current
- Directly drive 16 Series 1W/3W LED at VIN=24V
- Fixed 180KHz Switching Frequency
- Max. 5A Switching Current Capability
- Up to 94% efficiency
- Excellent line and load regulation
- EN PIN TTL shutdown capability
- Internal Optimize Power MOSFET
- Built in Soft-Start Function
- Built in Frequency Compensation
- Built in Thermal Shutdown Function
- Built in Current Limit Function
- Available in TO263-5L & TO220-5L package

### **General Description**

The XL6006 regulator is fixed frequency PWM Boost (step-up) LED constant current driver, capable of driving Series 1W/3W/5W LED units with excellent line and load regulation. The regulator is simple to use because it includes internal frequency compensation and a fixed-frequency oscillator so that it requires a minimum number of external components to work.

The XL6006 could directly drive 16 Series 1W/3W LED units at VIN=24V .

The PWM control circuit is able to adjust the duty ratio linearly from 0 to 90%. An enable function, an over current protection function is built inside. An internal compensation block is built in to minimize external component count.

### Applications

- LED Lighting
- Boost constant current driver
- TFT LED Backlighting

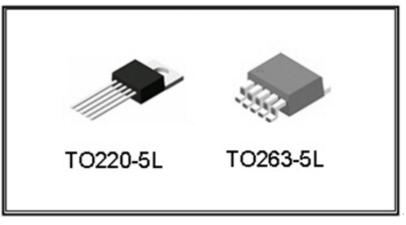
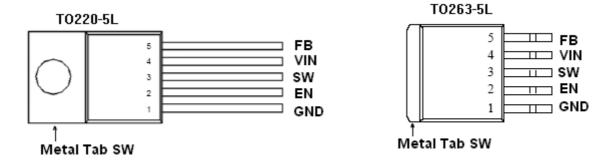


Figure1. Package Type of XL6006

# **Pin Configurations**



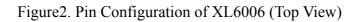


Table 1 Pin Description

Pin Number	Pin Name	Description
1	GND	Ground Pin.
2	EN	Enable Pin. Drive EN pin low to turn off the device, drive it high to turn it on. Floating is default high.
3	SW	Power Switch Output Pin (SW).
4	VIN	Supply Voltage Input Pin. XL6006 operates from a 5V to 48V DC voltage. Bypass Vin to GND with a suitably large capacitor to eliminate noise on the input.
5	FB	Feedback Pin (FB). The feedback threshold voltage is 0.22V.

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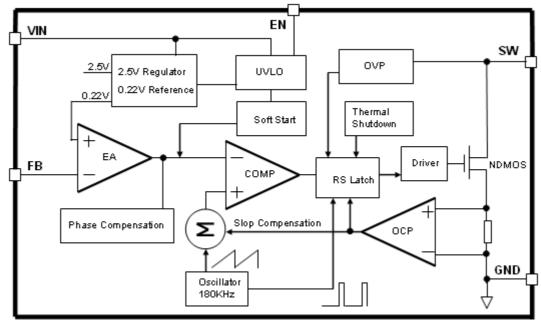


Figure3. Function Block Diagram of XL6006

# **Typical Application Circuit**

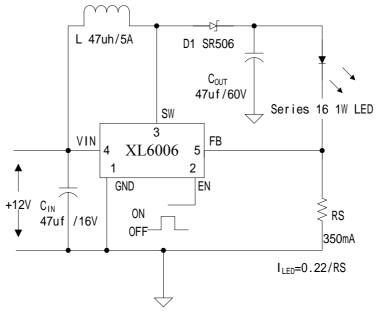


Figure 4. XL6006 Typical Application Circuit

**Function Block** 

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### **Ordering Information**

		Part Number	Marking ID	Packing Type
Dackago	Temperature	Lead Free	Lead Free	I acking Type
Package	Range	XL6006TE1	XL6006TE1	Tube
		XL6006SE1	XL6006SE1	Tape & Reel

XLSEMI Pb-free products, as designated with "E1" suffix in the par number, are RoHS compliant.

### Absolute Maximum Ratings (Note1)

Parameter	Symbol	Value	Unit
Input Voltage	Vin	-0.3 to 48	V
Feedback Pin Voltage	V <sub>FB</sub>	-0.3 to Vin	V
EN Pin Voltage	$V_{EN}$	-0.3 to Vin	V
Output Switch Pin Voltage	V <sub>Output</sub>	-0.3 to 60	V
Power Dissipation	P <sub>D</sub>	Internally limited	mW
Thermal Resistance (TO220-5L/TO263-5L) (Junction to Ambient, No Heatsink, Free Air)	R <sub>JA</sub>	30	°C/W
Operating Junction Temperature	TJ	-40 to 125	°C
Storage Temperature	T <sub>STG</sub>	-65 to 150	°C
Lead Temperature (Soldering, 10 sec)	T <sub>LEAD</sub>	260	°C
ESD (HBM)		2000	V

**Note1:** Stresses greater than those listed under Maximum Ratings may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operation is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

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### **XL6006 Electrical Characteristics**

 $T_a = 25$  ;unless otherwise specified.

Symbol	Parameter	Test Condition		Тур.	Max.	Unit
System parameters test circuit figure4						
VFB	Feedback Voltage	Vin = 5V to 12V, Vout=24V Iload=100mA	209	220	231	mV
Efficiency	ŋ	Vin=12V ,Vout=51.2V Iout=350mA	-	92	-	%

### **Electrical Characteristics (DC Parameters)**

Vin = 12V, GND=0V, Vin & GND parallel connect a 100uf/50V capacitor; Iout=100mA,  $T_a = 25$ ; the others floating unless otherwise specified.

Parameters	Symbol	Test Condition	Min.	Тур.	Max.	Unit
Input operation voltage	Vin		5		48	V
Shutdown Supply Current	I <sub>STBY</sub>	$V_{\rm EN}=0V$		70	100	uA
Quiescent Supply Current	Iq	V <sub>EN</sub> =2V, V <sub>FB</sub> =Vin		2.5	5	mA
Oscillator Frequency	Fosc		144	180	216	KHz
Switch Current Limit	$I_L$	$V_{FB} = 0$		5		А
EN Pin Threshold	$\mathbf{V}_{\mathrm{EN}}$	High (Regulator ON) Low (Regulator OFF)		1.4 0.8		V
EN Pin Input Leakage	I <sub>H</sub>	$V_{EN} = 2V (ON)$		3	10	uA
Current	$I_L$	$V_{\rm EN} = 0V (OFF)$		3	10	uA
Max. Duty Cycle	D <sub>MAX</sub>	V <sub>FB</sub> =0V		90		%

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Schottky Diode Selection Table								
Current	Surface	Through	VR (The sa	VR (The same as system maximum input voltage)				
	Mount	Hole						
			20V	30V	40V	50V	60V	
1A			1N5817	1N5818	1N5819			
			1N5820	1N5821	1N5822			
			MBR320	MBR330	MBR340	MBR350	MBR360	
3A			SK32	SK33	SK34	SK35	SK36	
JA				30WQ03	30WQ04	30WQ05		
				31DQ03	31DQ04	31DQ05		
			SR302	SR303	SR304	SR305	SR306	
			1N5823	1N5824	1N5825			
5A			SR502	SR503	SR504	SR505	SR506	
			SB520	SB530	SB540	SB550	SB560	
				50WQ03	50WQ04	50WQ05		

Typical System Application for VIN=12V to driver 16 x 1W series LED units

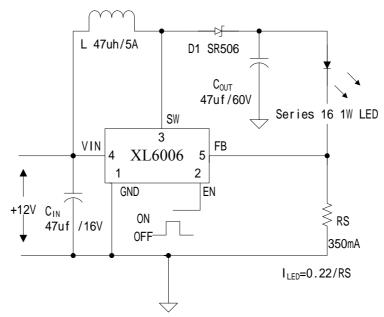


Figure 5. XL6006 System Parameters Test Circuit (12V ~16 x 1W LED)

### Typical System Application for VIN=12V to driver 8 x 3W series LED units

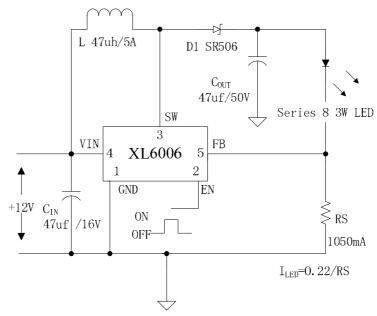


Figure6. XL6006 System Parameters Test Circuit (12V ~ 8 x 3W LED)

### Typical System Application for VIN=24V to driver 16 x 3W series LED units

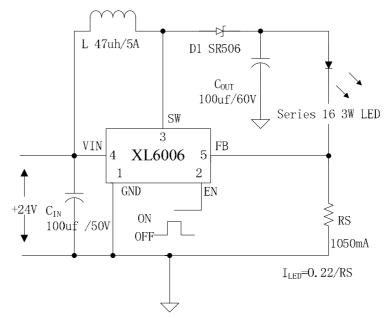


Figure7. XL6006 System Parameters Test Circuit (24V ~ 16 x 3W LED)

### XL6006

# Typical System Application for VIN=12V to driver 16 series x 40 parallel White LED Array

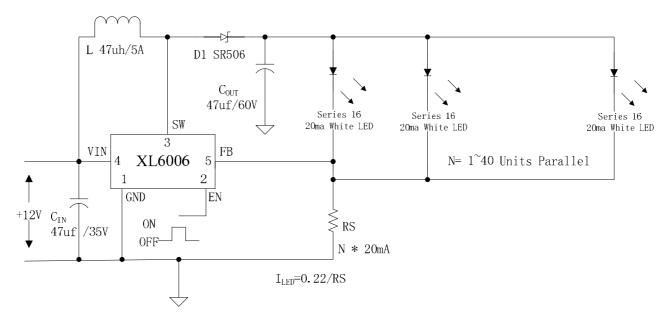


Figure8. XL6006 System Parameters Test Circuit (12V ~ 16 x 40 White LED)

### **Typical System Application for SEPIC Buck-Boost LED Driver**

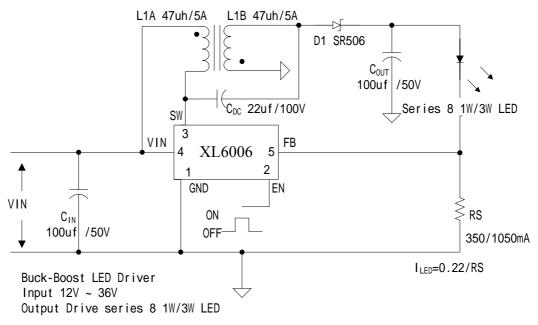


Figure 9. XL6006 System Parameters Test Circuit (Buck-Boost LED Driver)

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### Typical System Application for VIN=12V to driver 16 x 1W series LED units With Dimming Function

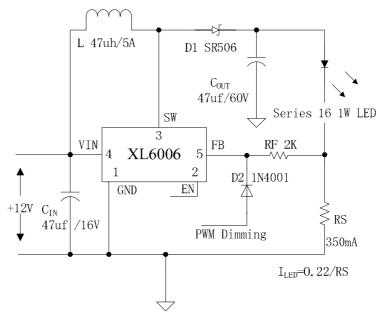
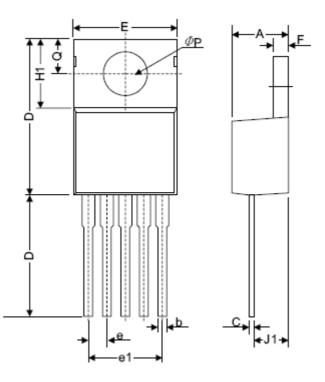


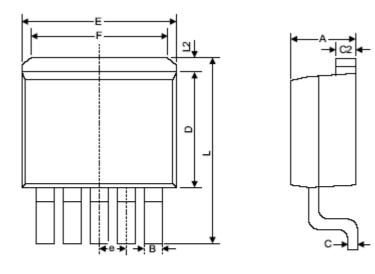
Figure10. XL6006 System Test Circuit (12V ~16 x 1W LED with Dimming Function)

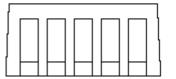
# Package Information TO220-5L



Symbol	Dimensions I	n Millimeters	Dimension	s In Inches
Symbol	Min.	Max.	Min.	Max.
Α	4.06	4.83	0.160	0.190
b	0.76	1.02	0.030	0.040
С	0.36	0.64	0.014	0.025
D	14.22	15.49	0.560	0.610
E	9.78	10.54	0.385	0.415
е	1.57	1.85	0.062	0.073
e(1)	6.68	6.93	0.263	0.273
F	1.14	1.40	0.045	0.055
H(1)	5.46	6.86	0.215	0.270
J(1)	2.29	3.18	0.090	0.125
L	13.21	14.73	0.520	0.580
ФР	3.68	3.94	0.145	0.155
Q	2.54	2.92	0.100	0.115

# Package Information TO263-5L





Symbol	Dimensions	n Millimeters	Dimensions In Inches		
Symbol	Min.	Max.	Min.	Max.	
A	4.06	4.83	0.160	0.190	
В	0.76	1.02	0.030	0.040	
С	0.36	0.64	0.014	0.025	
C2	1.14	1.40	0.045	0.055	
D	8.64	9.65	0.340	0.380	
E	9.78	10.54	0.385	0.415	
е	1.57	1.85	0.062	0.073	
F	6.60	7.11	0.260	0.280	
L	15.11	15.37	0.595	0.605	
L2	-	1.40	-	0.055	