

**180KHz 60V 5A Switching Current Boost LED Constant Current Driver****XL6006****Features**

- Wide 5V to 32V 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 package

**Applications**

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

**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.

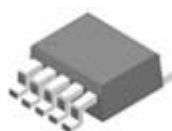


Figure1. Package Type of XL6006

## Pin Configurations

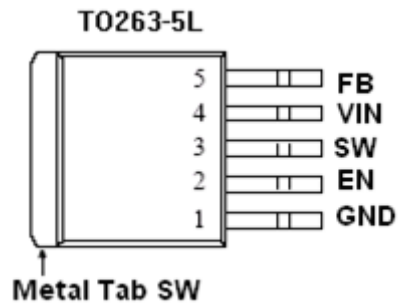


Figure2. Pin Configuration of XL6006 (Top View)

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 32V 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.                                                                                               |

## Function Block

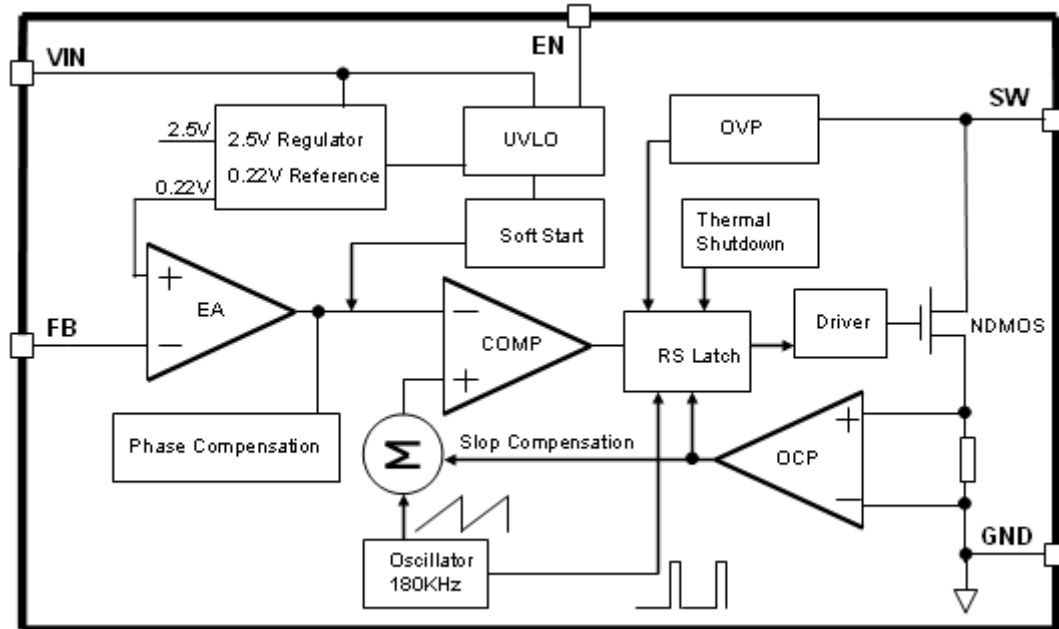


Figure3. Function Block Diagram of XL6006

## Typical Application Circuit

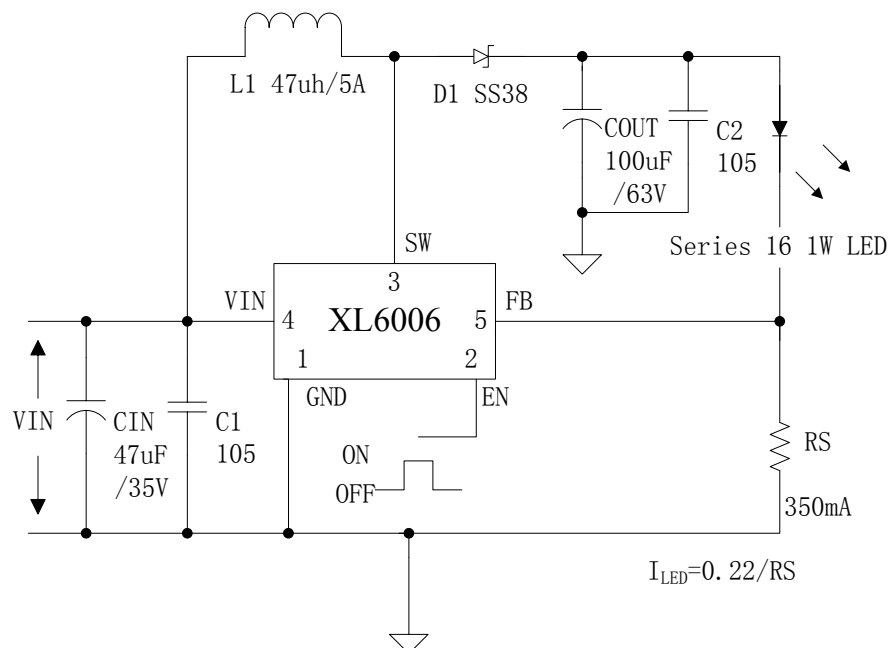


Figure4. XL6006 Typical Application Circuit

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

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## Ordering Information

| Order Information | Marking ID | Package Type | Packing Type Supplied As |
|-------------------|------------|--------------|--------------------------|
| XL6006E1          | XL6006E1   | TO263-5L     | 800 Units on 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                                                                 | $V_{in}$     | -0.3 to 36         | V    |
| Feedback Pin Voltage                                                          | $V_{FB}$     | -0.3 to $V_{in}$   | V    |
| EN Pin Voltage                                                                | $V_{EN}$     | -0.3 to $V_{in}$   | V    |
| Output Switch Pin Voltage                                                     | $V_{Output}$ | -0.3 to 60         | V    |
| Power Dissipation                                                             | $P_D$        | Internally limited | mW   |
| Thermal Resistance (TO263-5L)<br>(Junction to Ambient, No Heatsink, Free Air) | $R_{JA}$     | 30                 | °C/W |
| Operating Junction Temperature                                                | $T_J$        | -40 to 125         | °C   |
| Storage Temperature                                                           | $T_{STG}$    | -65 to 150         | °C   |
| Lead Temperature (Soldering, 10 sec)                                          | $T_{LEAD}$   | 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.

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

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#### XL6006 Electrical Characteristics

$T_a = 25^{\circ}\text{C}$ ; unless otherwise specified.

| Symbol                                        | Parameter        | Test Condition                                                                     | Min. | Typ. | Max. | Unit |
|-----------------------------------------------|------------------|------------------------------------------------------------------------------------|------|------|------|------|
| <i>System parameters test circuit figure4</i> |                  |                                                                                    |      |      |      |      |
| VFB                                           | Feedback Voltage | $V_{in} = 5\text{V to } 12\text{V}, V_{out}=24\text{V}$<br>$I_{load}=100\text{mA}$ | 209  | 220  | 231  | mV   |
| $\eta$                                        | Efficiency       | $V_{in}=12\text{V}, V_{out}=51.2\text{V}$<br>$I_{out}=350\text{mA}$                | -    | 92   | -    | %    |

#### Electrical Characteristics (DC Parameters)

$V_{in} = 12\text{V}$ ,  $\text{GND}=0\text{V}$ ,  $V_{in}$  &  $\text{GND}$  parallel connect a 100uf/50V capacitor;  $I_{out}=100\text{mA}$ ,  $T_a = 25^{\circ}\text{C}$ ; the others floating unless otherwise specified.

| Parameters                   | Symbol     | Test Condition                              | Min. | Typ.       | Max. | Unit          |
|------------------------------|------------|---------------------------------------------|------|------------|------|---------------|
| Input operation voltage      | $V_{in}$   |                                             | 5    |            | 32   | V             |
| Shutdown Supply Current      | $I_{STBY}$ | $V_{EN}=0\text{V}$                          |      | 70         | 100  | $\mu\text{A}$ |
| Quiescent Supply Current     | $I_q$      | $V_{EN}=2\text{V}$ ,<br>$V_{FB}=V_{in}$     |      | 2.5        | 5    | mA            |
| Oscillator Frequency         | Fosc       |                                             | 144  | 180        | 216  | KHz           |
| Switch Current Limit         | $I_L$      | $V_{FB}=0$                                  |      | 5          |      | A             |
| Output Power NMOS            | $R_{dson}$ | $V_{in}=12\text{V}$ ,<br>$I_{sw}=5\text{A}$ |      | 35         | 40   | mohm          |
| EN Pin Threshold             | $V_{EN}$   | High (Regulator ON)<br>Low (Regulator OFF)  |      | 1.4<br>0.8 |      | V             |
| EN Pin Input Leakage Current | $I_H$      | $V_{EN}=2\text{V (ON)}$                     |      | 3          | 10   | $\mu\text{A}$ |
|                              | $I_L$      | $V_{EN}=0\text{V (OFF)}$                    |      | 3          | 10   | $\mu\text{A}$ |
| Max. Duty Cycle              | $D_{MAX}$  | $V_{FB}=0\text{V}$                          |      | 90         |      | %             |

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

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

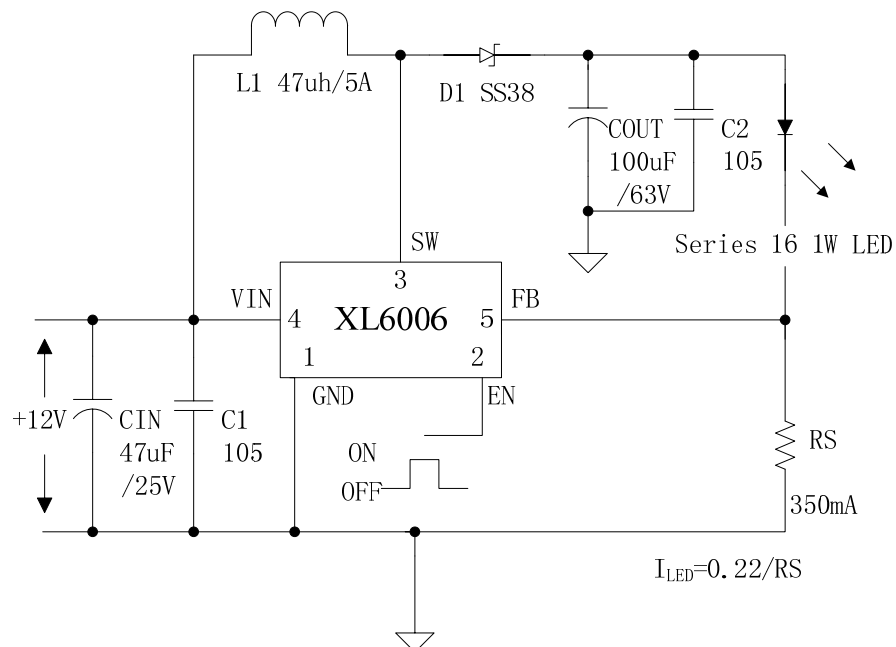


Figure5. XL6006 System Parameters Test Circuit (12V ~16 x 1W LED)

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

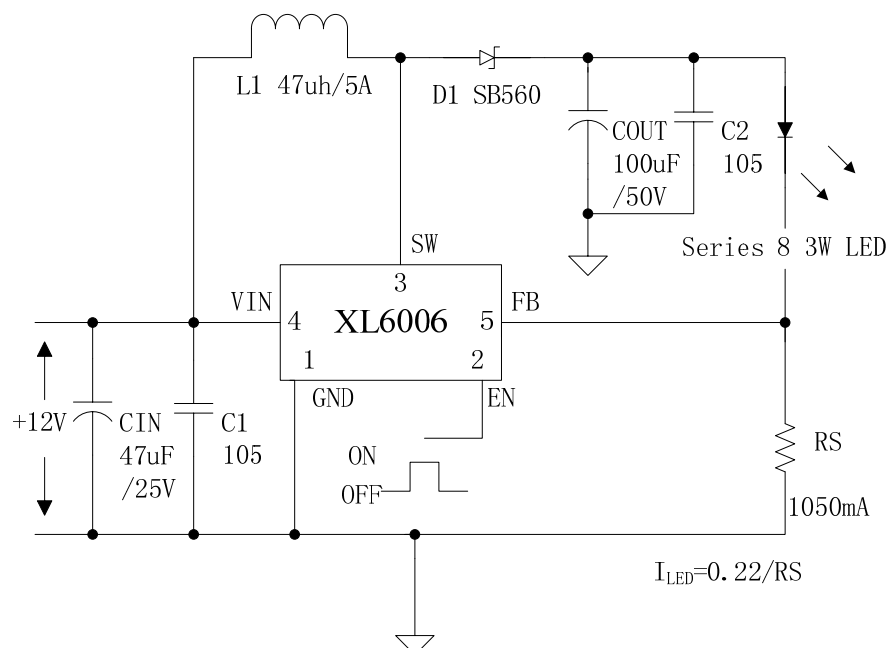


Figure6. XL6006 System Parameters Test Circuit (12V ~8 x 3W LED)

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

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

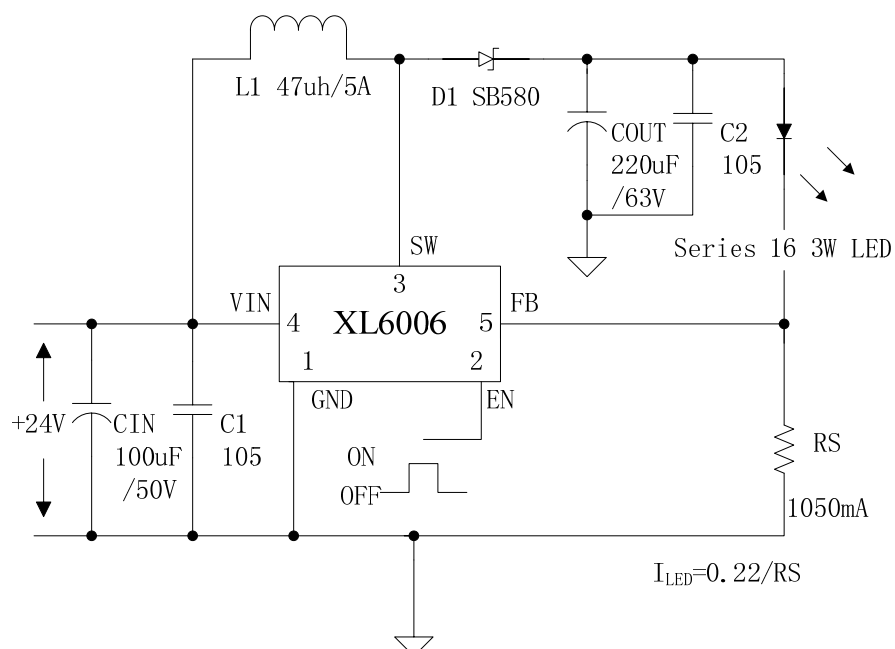


Figure7. XL6006 System Parameters Test Circuit (24V ~ 16 x 3W LED)

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

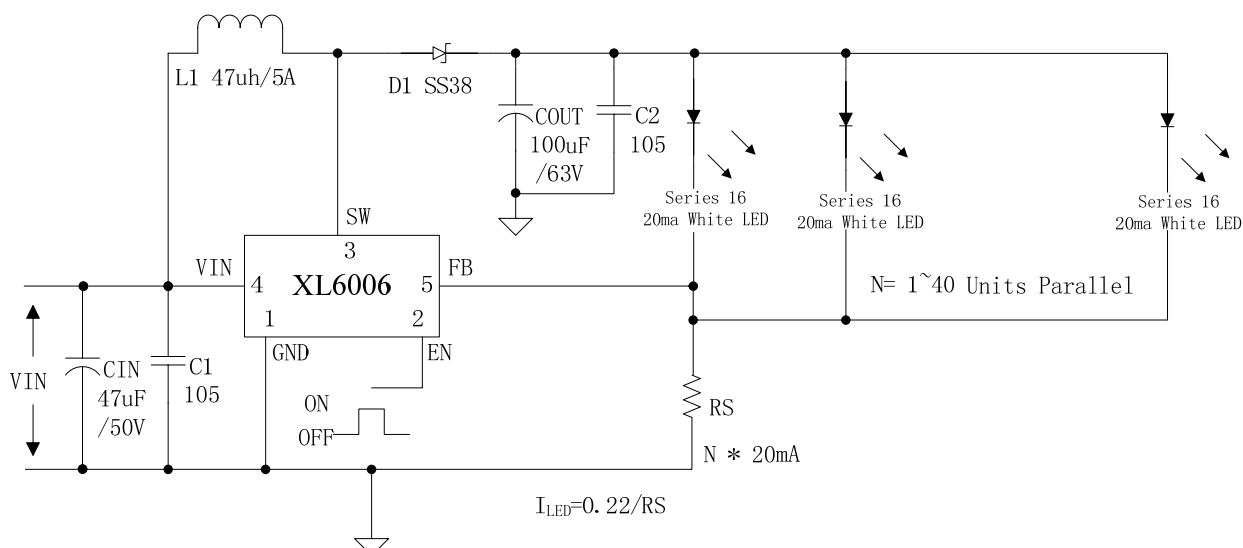


Figure8. XL6006 System Parameters Test Circuit (VIN>=12V ~ 16 x 40 White LED)

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

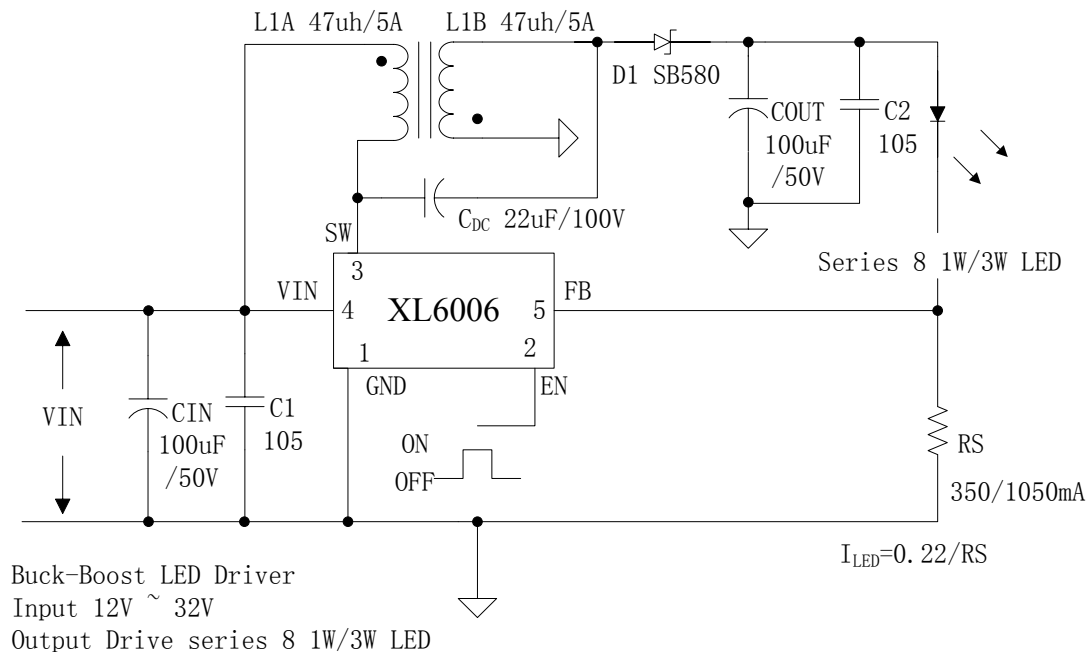


Figure9. XL6006 System Parameters Test Circuit (Buck-Boost LED Driver)

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

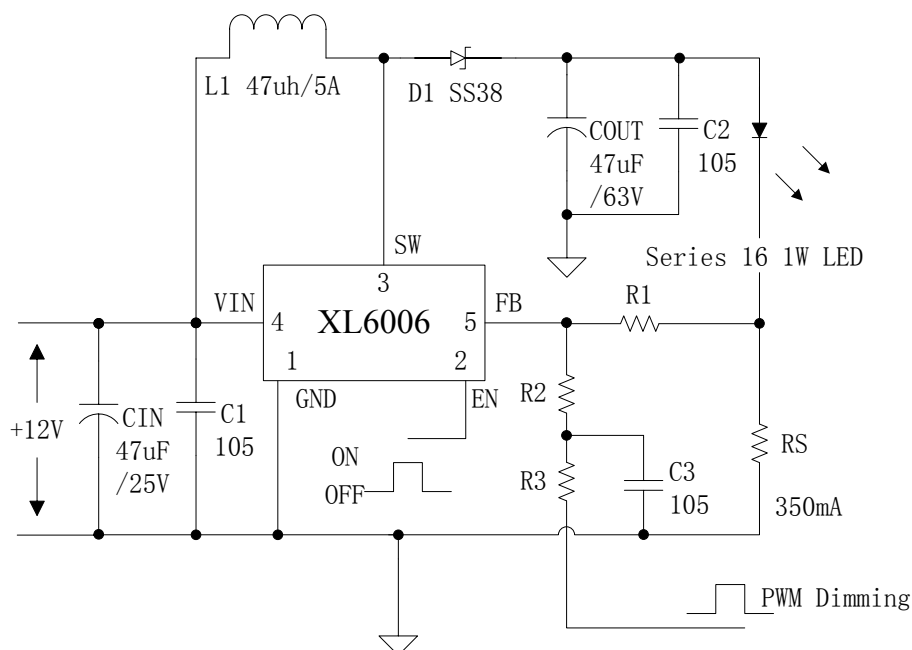


Figure10. XL6006 System Test Circuit (12V ~16 x 1W LED with Dimming Function)

## Typical System Application (LED OVP)

LED OVP function can be used in typical system application with external components. The output voltage can be limited in a suitable value by choose different zener diode when the output LED open. the zener diode voltage choosed by output led voltage's 1.3 times.

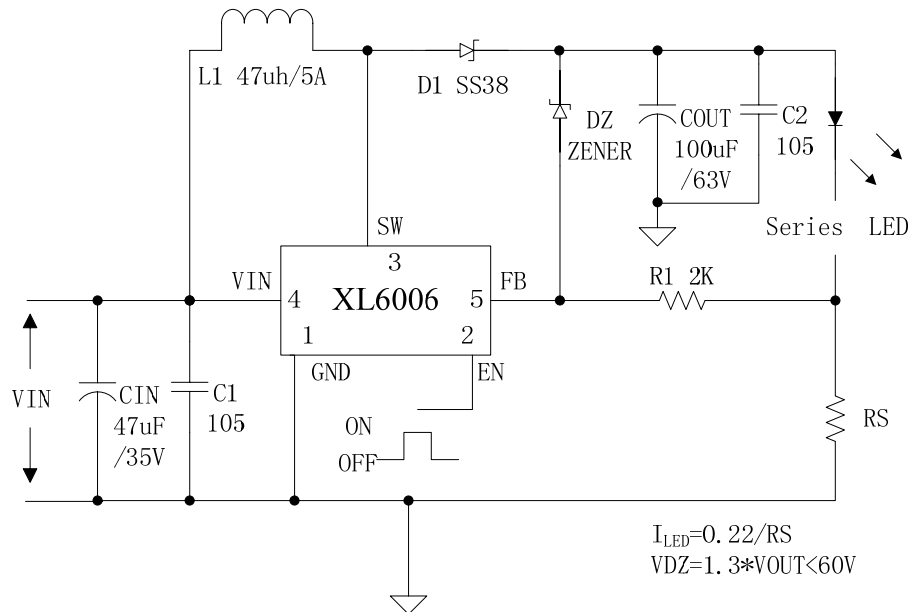


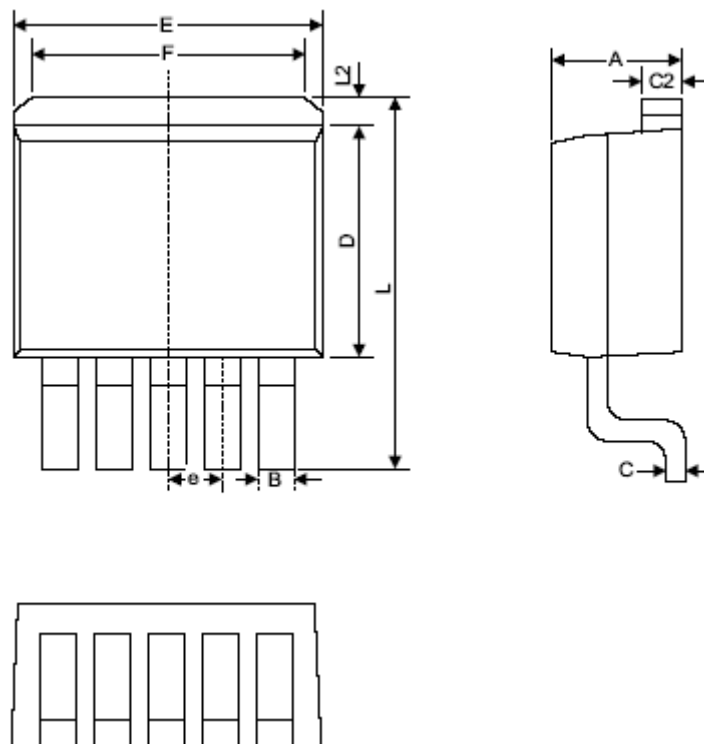
Figure11. XL6006 System Test Circuit (LED OVP)

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

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#### Package Information

TO263-5L



| Symbol | Dimensions In Millimeters |       | Dimensions In Inches |       |
|--------|---------------------------|-------|----------------------|-------|
|        | Min                       | Max   | Min                  | Max   |
| A      | 4.06                      | 4.83  | 0.160                | 0.190 |
| B      | 0.71                      | 1.02  | 0.030                | 0.040 |
| C      | 0.36                      | 0.64  | 0.014                | 0.025 |
| C2     | 1.14                      | 1.40  | 0.045                | 0.055 |
| D      | 8.39                      | 9.65  | 0.330                | 0.380 |
| E      | 9.78                      | 10.54 | 0.385                | 0.415 |
| e      | 1.55                      | 1.85  | 0.061                | 0.073 |
| F      | 6.36                      | 7.36  | 0.250                | 0.290 |
| L      | 13.95                     | 15.37 | 0.549                | 0.605 |
| L2     | 1.12                      | 1.42  | 0.044                | 0.056 |

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