

## Features

- Wide 4.5V to 40V Input Voltage Range
- Output Adjustable from 1.235V to 37V
- Minimum Drop Out 1.5V
- Fixed 150kHz Switching Frequency
- 2A Constant Output Current Capability
- Internal Optimize Power Transistor
- Excellent line and load regulation
- TTL shutdown capability
- ON/OFF pin with hysteresis function
- **With output constant current loop**
- Built in thermal shutdown function
- Built in current limit function
- **Built in output over voltage protection**
- SOP8-EP (Exposed PAD) package

## General Description

The XL4001 is a 150KHz fixed frequency PWM buck (step-down) DC/DC converter, capable of driving a 2A load with high efficiency, low ripple and excellent line and load regulation. Requiring a minimum number of external components, the regulator is simple to use and include internal frequency compensation and a fixed-frequency oscillator.

The PWM control circuit is able to adjust the duty ratio linearly from 0 to 100%. An enable function, an over current protection function is built inside. An internal compensation block is built in to minimize external component count.

## Applications

- Car Charger
- Battery Charger
- LED Constant Current Driver

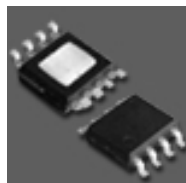


Figure1. Package Type of XL4001

**Pin Configurations**

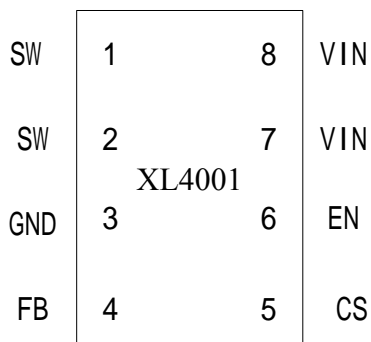


Figure2. Pin Configuration of XL4001 (Top View)

Table 1 Pin Description

| Pin Number | Pin Name | Description   |
|------------|----------|---|
| 1,2        | SW       | Power Switch Output Pin (SW). Output is the switch node that supplies power to the output.  |
| 3          | GND      | Ground Pin.(Note: <b>Connected the back exposed PAD to Pin3.</b> )  |
| 4          | FB       | Feedback Pin (FB). Through an external resistor divider network, Feedback senses the output voltage and regulates it. The feedback threshold voltage is 1.235V. |
| 5          | CS       | Output Current Sense Pin; (Iload=0.155V/Rcs)  |
| 6          | EN       | Enable Pin. Drive EN pin low to turn on the device, drive it high to turn it off. Floating is default low.  |
| 7,8        | VIN      | Supply Voltage Input Pin. XL4001 operates from a 4.5V to 40V DC voltage. Bypass Vin to GND with a suitably large capacitor to eliminate noise on the input.     |

2A 150kHz 40V Buck DC/DC Converter With Constant Current Loop XL4001

**Function Block**

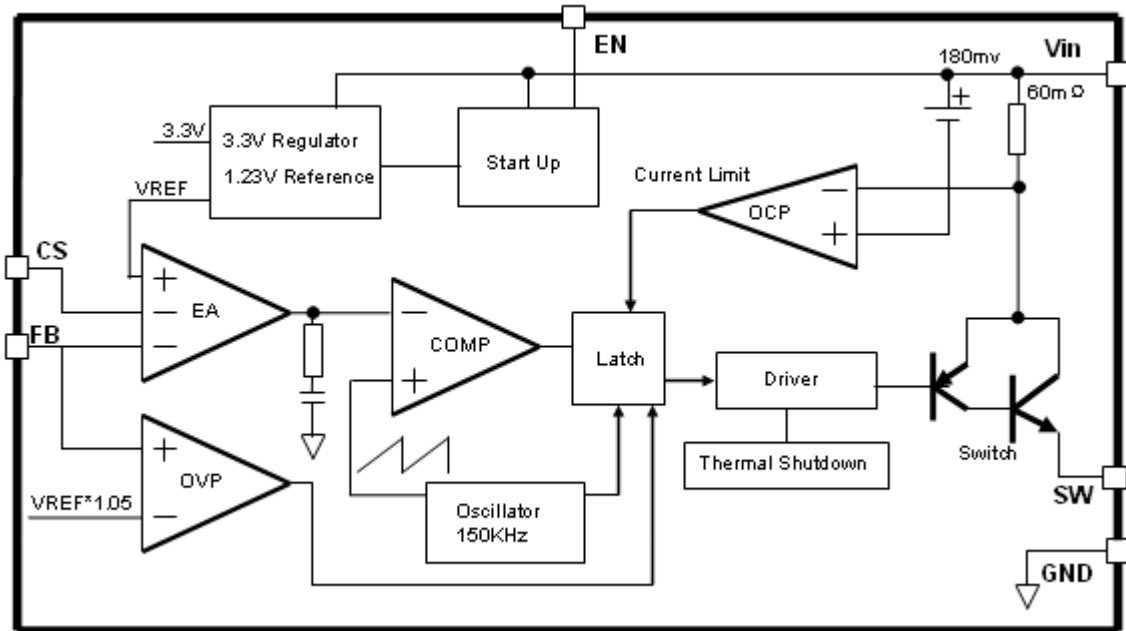


Figure3. Function Block Diagram of XL4001

**Typical Application Circuit (Car Charger)**

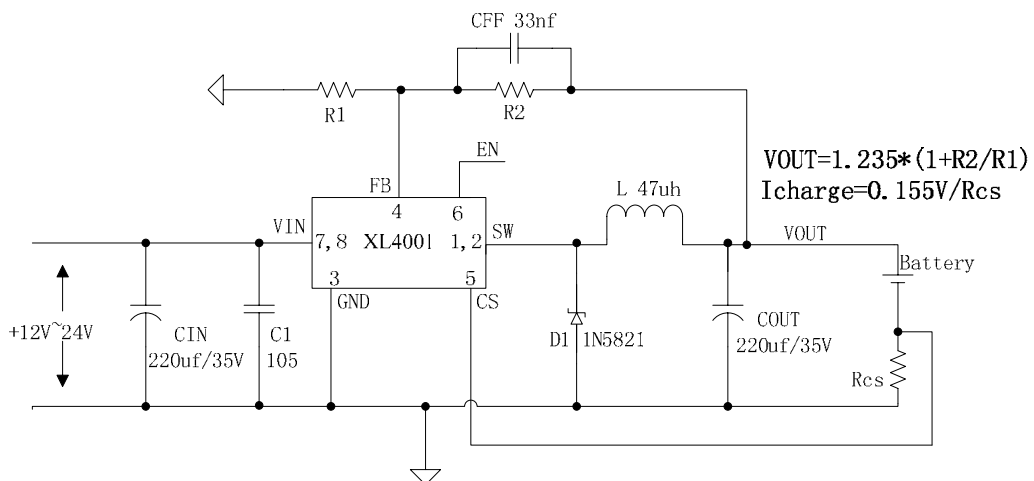


Figure4. XL4001 Typical Application Circuit (Li Battery Charger)

**2A 150kHz 40V Buck DC/DC Converter With Constant Current Loop** **XL4001**

**Typical Application Circuit (Buck LED Constant Current Driver)**

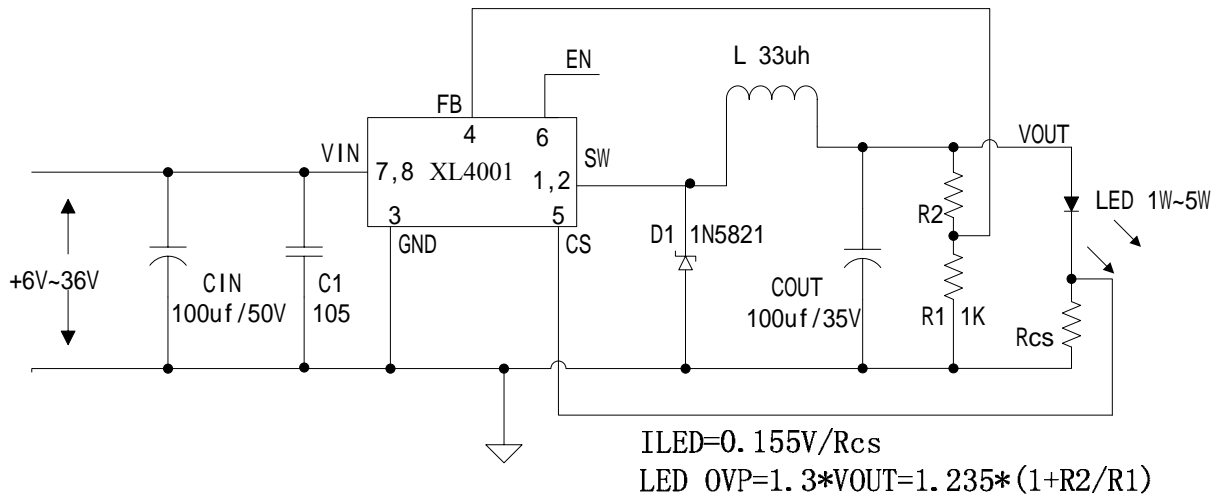


Figure5. XL4001 Typical Application Circuit (LED Constant Current Driver)

**Ordering Information**

| Order Information | Marking ID | Package Type | Packing Type Supplied As  |
|-------------------|------------|--------------|---------------------------|
| XL4001E1          | XL4001E1   | SOP8-EP      | 2500 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 <sub>in</sub>   | -0.3 to 45              | V    |
| FB Pin Voltage   | V <sub>FB</sub>   | -0.3 to V <sub>in</sub> | V    |
| EN Pin Voltage   | V <sub>EN</sub>   | -0.3 to V <sub>in</sub> | V    |
| SW Pin Voltage   | V <sub>SW</sub>   | -0.3 to V <sub>in</sub> | V    |
| Power Dissipation  | P <sub>D</sub>    | Internally limited      | mW   |
| Thermal Resistance<br>(Junction to Ambient, No Heatsink, Free Air) | R <sub>JA</sub>   | 60                      | °C/W |
| Operating Junction Temperature                                     | T <sub>J</sub>    | -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.

2A 150kHz 40V Buck DC/DC Converter With Constant Current Loop

XL4001

**XL4001 Electrical Characteristics**

T<sub>a</sub> = 25 °C ; unless otherwise specified.

| Symbol  | Parameter        | Test Condition   | Min. | Typ.  | Max. | Unit |
|---|------------------|--|------|-------|------|------|
| <i>System parameters test circuit figure4</i> |                  |  |      |       |      |      |
| VFB   | Feedback Voltage | V <sub>in</sub> = 8V to 32V, V <sub>out</sub> =5V<br>I <sub>load</sub> =0.2A to 2A | 1.21 | 1.235 | 1.26 | V    |
| Efficiency                                    | η                | V <sub>in</sub> =12V , V <sub>out</sub> =5V<br>I <sub>out</sub> =2A                | -    | 83    | -    | %    |

**Electrical Characteristics (DC Parameters)**

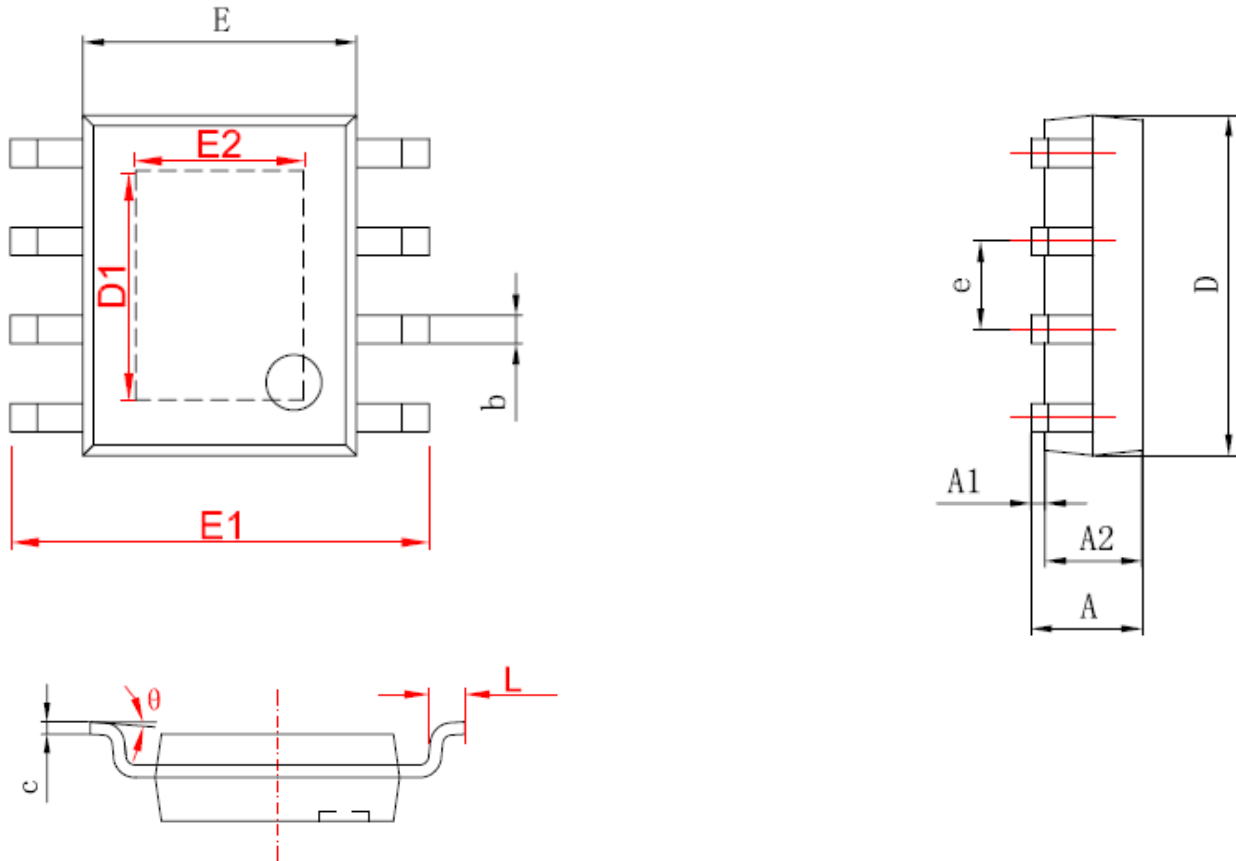
V<sub>in</sub> = 12V, GND=0V, V<sub>in</sub> & GND parallel connect a 220uf/50V capacitor; I<sub>out</sub>=500mA, T<sub>a</sub> = 25 °C ; the others floating unless otherwise specified.

| Parameters                     | Symbol            | Test Condition   | Min.  | Typ.       | Max.  | Unit |
|--------------------------------|-------------------|--|-------|------------|-------|------|
| Input operation voltage        | V <sub>in</sub>   |  | 4.5   |            | 40    | V    |
| Shutdown Supply Current        | I <sub>STBY</sub> | V <sub>EN</sub> =5V                                      |       | 80         | 200   | uA   |
| Quiescent Supply Current       | I <sub>q</sub>    | V <sub>EN</sub> =0V,<br>V <sub>FB</sub> =V <sub>in</sub> |       | 2          | 5     | mA   |
| Oscillator Frequency           | F <sub>osc</sub>  |  | 127   | 150        | 172   | Khz  |
| Switch Current Limit           | I <sub>L</sub>    | V <sub>FB</sub> =0                                       |       | 3          |       | A    |
| EN Pin Threshold               | V <sub>EN</sub>   | High (Regulator OFF)<br>Low (Regulator ON)               |       | 1.4<br>0.8 |       | V    |
| Output Saturation Voltage      | V <sub>CE</sub>   | V <sub>FB</sub> =0V<br>I <sub>sw</sub> =2A               |       | 1.1        | 1.4   | V    |
| Constant current sense Voltage | V <sub>CS</sub>   |  | 0.140 | 0.155      | 0.170 | V    |

**Schottky Diode Selection Table**

| Current | Surface Mount | Through Hole | VR (The same as system maximum input voltage) |        |        |        |        |
|---------|---------------|--------------|---|--------|--------|--------|--------|
|         |               |              | 20V   | 30V    | 40V    | 50V    | 60V    |
| 1A      |               |              | 1N5817  | 1N5818 | 1N5819 |        |        |
| 3A      |               |              | 1N5820  | 1N5821 | 1N5822 |        |        |
|         |               |              | MBR320  | MBR330 | MBR340 | MBR350 | MBR360 |
|         |               |              | SK32  | SK33   | SK34   | SK35   | SK36   |
|         |               |              |   | 30WQ03 | 30WQ04 | 30WQ05 |        |
|         |               |              |   | 31DQ03 | 31DQ04 | 31DQ05 |        |
|         |               |              |   | SR302  | SR303  | SR304  | SR305  |

**Package Information (SOP8-EP)**



| 字符 | Dimensions In Millimeters |       | Dimensions In Inches |       |
|----|---------------------------|-------|----------------------|-------|
|    | Min                       | Max   | Min                  | Max   |
| A  | 1.350                     | 1.750 | 0.053                | 0.069 |
| A1 | 0.050                     | 0.150 | 0.004                | 0.010 |
| A2 | 1.350                     | 1.550 | 0.053                | 0.061 |
| b  | 0.330                     | 0.510 | 0.013                | 0.020 |
| c  | 0.170                     | 0.250 | 0.006                | 0.010 |
| D  | 4.700                     | 5.100 | 0.185                | 0.200 |
| D1 | 3.202                     | 3.402 | 0.126                | 0.134 |
| E  | 3.800                     | 4.000 | 0.150                | 0.157 |
| E1 | 5.800                     | 6.200 | 0.228                | 0.244 |
| E2 | 2.313                     | 2.513 | 0.091                | 0.099 |
| e  | 1.270 (BSC)               |       | 0.050 (BSC)          |       |
| L  | 0.400                     | 1.270 | 0.016                | 0.050 |
| θ  | 0°                        | 8°    | 0°                   | 8°    |