

Features

- Wide 5V to 32V Input Voltage Range
- Positive or Negative Output Voltage Programming with a Single Feedback Pin
- Current Mode Control Provides Excellent Transient Response
- 1.25V reference adjustable version
- Fixed 400KHz Switching Frequency
- Maximum 4A Switching Current
- SW PIN Built in Over Voltage Protection
- Excellent line and load regulation
- EN PIN TTL shutdown capability
- Internal Optimize Power MOSFET
- High efficiency up to 94%
- Built in Frequency Compensation
- Built in Soft-Start Function
- Built in Thermal Shutdown Function
- Built in Current Limit Function
- Available in TO263-5L package

Applications

- EPC / Notebook Car Adapter
- Automotive and Industrial Boost / Buck-Boost / Inverting Converters
- Portable Electronic Equipment

General Description

The XL6009 regulator is a wide input range, current mode, DC/DC converter which is capable of generating either positive or negative output voltages. It can be configured as either a boost, flyback, SEPIC or inverting converter. The XL6009 built in N-channel power MOSFET and fixed frequency oscillator, current-mode architecture results in stable operation over a wide range of supply and output voltages.

The XL6009 regulator is special design for portable electronic equipment applications.



TO263-5L

Figure 1. Package Type of XL6009



Pin Configurations

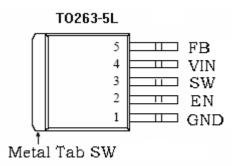


Figure 2. Pin Configuration of XL6009 (Top View)

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 | | | |
| 2 | LIN | high to turn it on. Floating is default high. | | | |
| 3 | SW | Power Switch Output Pin (SW). | | | |
| | | Supply Voltage Input Pin. XL6009 operates from a 5V to 32V | | | |
| 4 | VIN | DC voltage. Bypass Vin to GND with a suitably large | | | |
| | | Power Switch Output Pin (SW). Supply Voltage Input Pin. XL6009 operates from a 5V to DC voltage. Bypass Vin to GND with a suitably capacitor to eliminate noise on the input. Feedback Pin (FB). Through an external resistor di | | | |
| | | Feedback Pin (FB). Through an external resistor divider | | | |
| 5 | FB | network, FB senses the output voltage and regulates it. The | | | |
| | | feedback threshold voltage is 1.25V. | | | |



Function Block

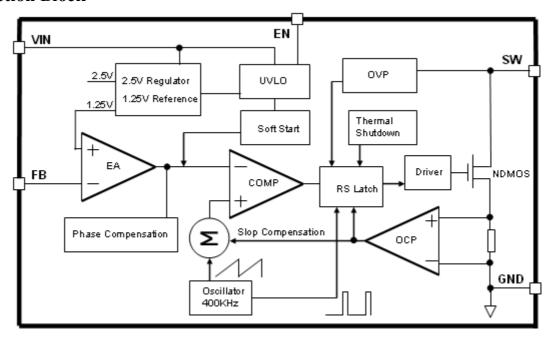


Figure 3. Function Block Diagram of XL6009

Typical Application Circuit

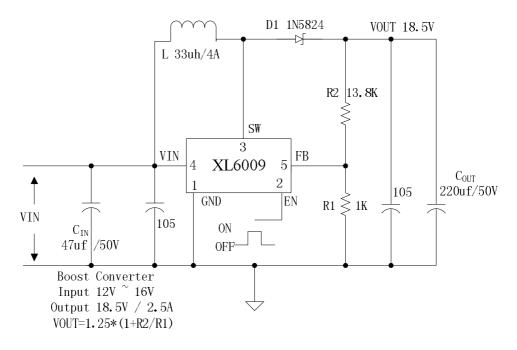


Figure 4. XL6009 Typical Application Circuit (Boost Converter)



Ordering Information

| | | Part Number | Marking ID | Packing Type |
|----------|-------------|-------------|------------|--------------|
| Package | Temperature | Lead Free | Lead Free | Tacking Type |
| 1 ackage | Range | XL6009E1 | XL6009E1 | Tube |
| | | XL6009TRE1 | XL6009E1 | 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 36 | V |
| Feedback Pin Voltage | V_{FB} | -0.3 to Vin | V |
| EN Pin Voltage | V_{EN} | -0.3 to Vin | V |
| Output Switch Pin Voltage | V_{Output} | -0.3 to 60 | V |
| Power Dissipation | P_{D} | Internally limited | mW |
| Thermal Resistance (TO263-5L) | R_{JA} | 30 | °C/W |
| (Junction to Ambient, No Heatsink, Free Air) | | | |
| Operating Junction Temperature | $T_{ m J}$ | -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.



XL6009 Electrical Characteristics

 $T_a = 25$ °C; unless otherwise specified.

| Symbol | Parameter | Test Condition | Min. | Тур. | Max. | Unit |
|--|--------------------------------|--|-------|------|-------|------|
| System parameters test circuit figure4 | | | | | | |
| VFB | Feedback Voltage | Vin = 12V to 16V, Vout=18V Iload=0.1A to 2A | 1.213 | 1.25 | 1.287 | V |
| Efficiency | vin=12V, Vout=18.5V Iout=2A | | - | 92 | - | % |

Electrical Characteristics (DC Parameters)

Vin = 12V, GND=0V, Vin & GND parallel connect a 220uf/50V capacitor; Iout=0.5A, T_a = 25 °C; the others floating unless otherwise specified.

| Parameters | Symbol | Test Condition | Min. | Тур. | Max. | Unit |
|--------------------------|--------------|--|------|------------|------|------|
| Input operation voltage | Vin | | 5 | | 32 | V |
| Shutdown Supply Current | I_{STBY} | V _{EN} =0V | | 70 | 100 | uA |
| Quiescent Supply Current | I_q | $V_{EN} = 2V,$ $V_{FB} = Vin$ | | 2.5 | 5 | mA |
| Oscillator Frequency | Fosc | | 320 | 400 | 480 | Khz |
| Switch Current Limit | I_{L} | V _{FB} =0 | | 4 | | A |
| Output Power NMOS | Rdson | Vin=12V, I _{SW} =4A | | 110 | 120 | mohm |
| EN Pin Threshold | $V_{\rm EN}$ | High (Regulator ON) Low (Regulator OFF) | | 1.4 0.8 | | V |
| EN Pin Input Leakage | I_{H} | $V_{EN} = 2V (ON)$ | | 3 | 10 | uA |
| Current | I_{L} | $V_{EN} = 0V (OFF)$ | | 3 | 10 | uA |
| Max. Duty Cycle | D_{MAX} | V _{FB} =0V | - | 90 | | % |



Schottky Diode Selection Table

| Current | Surface | Through | 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 |
| ЗA | √ | | | 30WQ03 | 30WQ04 | 30WQ05 | |
| | | √ | | 31DQ03 | 31DQ04 | 31DQ05 | |
| | | √ | SR302 | SR303 | SR304 | SR305 | SR306 |
| | | • | | • | 1 | | • |
| | | √ | 1N5823 | 1N5824 | 1N5825 | | |
| 5A | | √ | SR502 | SR503 | SR504 | SR505 | SR506 |
| | | √ | SB520 | SB530 | SB540 | SB550 | SB560 |
| | √ | | | 50WQ03 | 50WQ04 | 50WQ05 | |

Typical System Application for EPC/Notebook Car Adapter – Boost (Output 18.5V/2.5A)

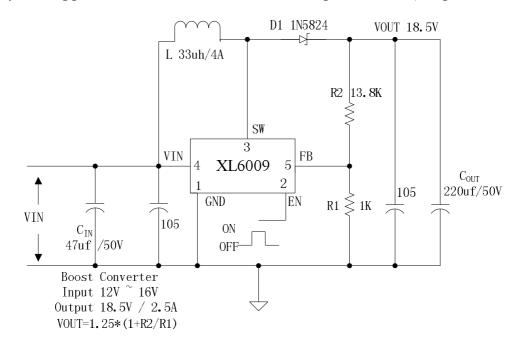


Figure 5. XL6009 Typical System Application (Boost Converter)



Typical System Application for Portable Notebook Car Adapter

- SEPIC Buck-Boost Topology (Input 10V~30V, Output 12V/2A)

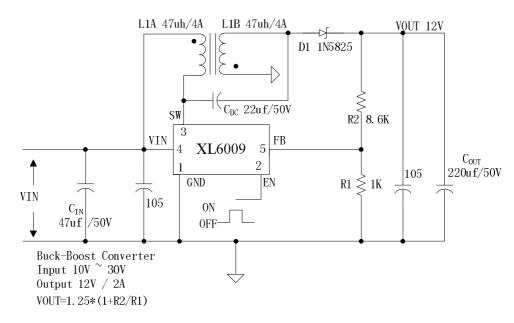


Figure 6. XL6009 Typical System Application (SEPIC Buck-Boost Converter)

Typical System Application for Inverting Converter

- SEPIC Inverting Topology (Input 10V~30V, Output + -12V/1A)

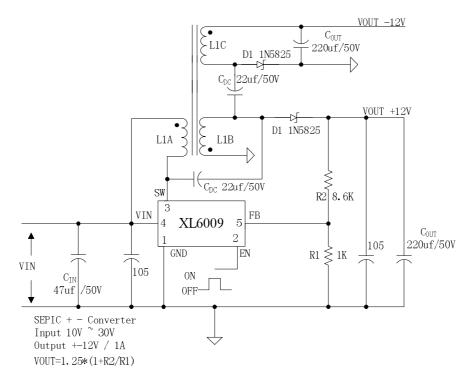
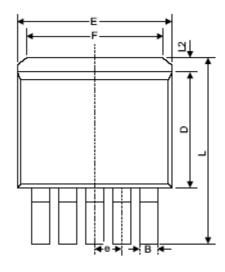
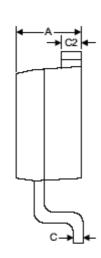


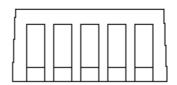
Figure 7. XL6009 Typical System Application (SEPIC Inverting Converter)



Package Information TO263-5L







| Symbol | Dimensions 1 | In Millimeters | Dimensions In Inches | | |
|--------|--------------|----------------|----------------------|-------|--|
| | Min | Max | Min | Max | |
| A | 4.440 | 4.650 | 0.175 | 0.183 | |
| В | 0.710 | 0.970 | 0.028 | 0.038 | |
| С | 0.360 | 0.640 | 0.014 | 0.025 | |
| C2 | 1.255 | 1.285 | 0.049 | 0.051 | |
| D | 8.390 | 8.890 | 0.330 | 0.350 | |
| Е | 9.960 | 10.360 | 0.392 | 0.408 | |
| e | 1.550 | 1.850 | 0.061 | 0.073 | |
| F | 6.360 | 7.360 | 0.250 | 0.290 | |
| L | 13.950 | 14.750 | 0.549 | 0.581 | |
| L2 | 1.120 | 1.420 | 0.044 | 0.056 | |