

Features

- Wide 8V to 36V Input Voltage Range
- Output Adjustable from 1.25V to 32V
- Maximum Duty Cycle 100%
- Minimum Drop Out 0.3V
- Fixed 180KHz Switching Frequency
- Maximum 3A Switching Current
- Internal Optimize Power MOSFET
- High efficiency
- Excellent line and load regulation
- With output constant current loop
- Built in thermal shutdown function
- Built in current limit function
- Built in output short protection function
- Available in SOP8L package

Applications

- Car Charger
- Battery Charger
- LCD Monitor and LCD TV
- Portable instrument power supply
- Telecom / Networking Equipment

General Description

The XL2009 is a 180 KHz fixed frequency PWM buck (step-down) DC/DC converter, capable of driving a 2.5A 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 over current protection function is built inside. When short protection function happens, the operation frequency will be reduced from 180KHz to 48KHz. An internal compensation block is built in to minimize external component count.



Figure1. Package Type of XL2009

Pin Configurations

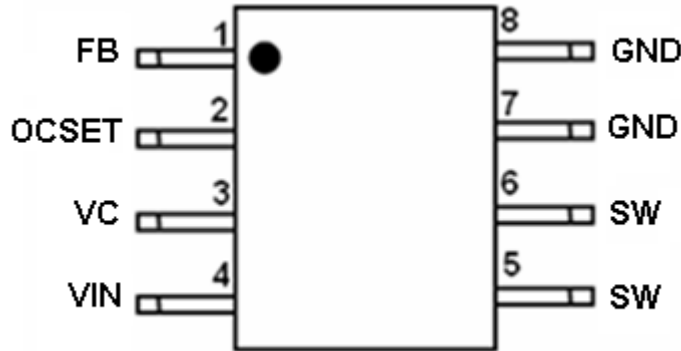


Figure2. Pin Configuration of XL2009 (Top View)

Table 1 Pin Description

| Pin Number | Pin Name | Description |
|------------|----------|--|
| 1 | FB | Feedback Pin (FB). Through an external resistor divider network, FB senses the output voltage and regulates it. The feedback threshold voltage is 1.25V. |
| 2 | OCSET | Output Constant Current Set Pin; |
| 3 | VC | Internal Voltage Regulator Bypass Capacity. In typical system application, The VC pin connect a 1uf capacity to VIN. |
| 4 | VIN | Supply Voltage Input Pin. XL2009 operates from a 8V to 36V DC voltage. Bypass Vin to GND with a suitably large capacitor to eliminate noise on the input. |
| 5,6 | SW | Power Switch Output Pin (SW). SW is the switch node that supplies power to the output. |
| 7,8 | GND | Ground Pin. Care must be taken in layout. This pin should be placed outside of the Schottky Diode to output capacitor ground path to prevent switching current spikes from inducing voltage noise into XL2009. |

Function Block

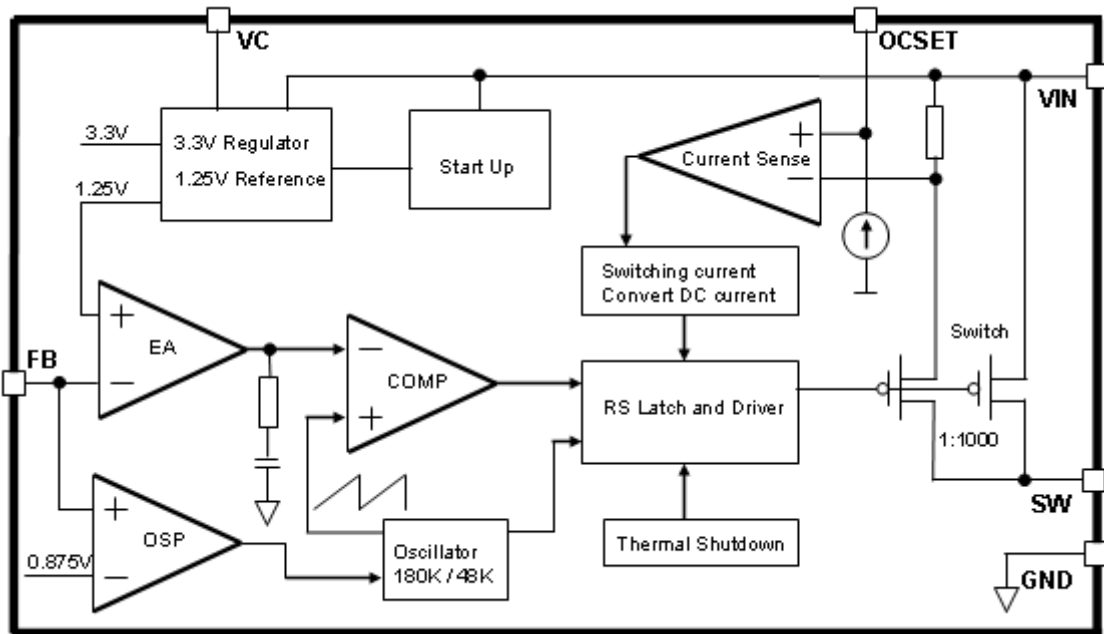


Figure3. Function Block Diagram of XL2009

Typical Application Circuit

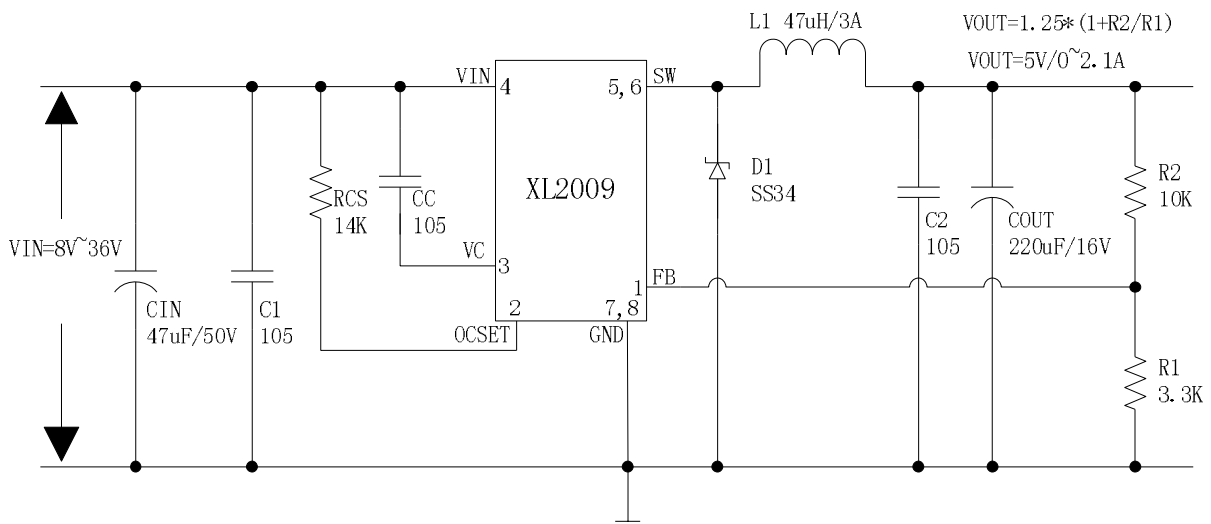


Figure4. XL2009 Typical Application Circuit (VIN=8V~36V, VOUT=5V/2.1A)

Ordering Information

| Package | Temperature Range | Part Number | Marking ID | Packing Type |
|---------|-------------------|-------------|------------|--------------|
| | | Lead Free | Lead Free | |
| | | XL2009E1 | XL2009E1 | |

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 40 | V |
| Feedback Pin Voltage | V _{FB} | -0.3 to V _{in} | V |
| Output Switch Pin Voltage | V _{Output} | -0.3 to V _{in} | V |
| Power Dissipation | P _D | Internally limited | mW |
| Thermal Resistance (SOP8L) (Junction to Ambient, No Heatsink, Free Air) | R _{JA} | 100 | °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.

3A 180KHz 36V Buck DC to DC Converter With CV/CC Loop

XL2009

XL2009 Electrical Characteristics

T_a = 25°C; unless otherwise specified.

| Symbol | Parameter | Test Condition | Min. | Typ. | Max. | Unit |
|---|------------------|--|-------|------|-------|------|
| <i>System parameters test circuit figure4</i> | | | | | | |
| VFB | Feedback Voltage | V _{in} = 8V to 36V, V _{out} =5V I _{load} =0.5A to 2.5A | 1.225 | 1.25 | 1.275 | V |
| Efficiency | η | V _{in} =12V , V _{out} =5V I _{out} =2.1A | - | 89 | - | % |

Electrical Characteristics (DC Parameters)

V_{in} = 12V, GND=0V, V_{in} & GND parallel connect a 100uf/50V capacitor; I_{out}=500mA, T_a = 25°C; the others floating unless otherwise specified.

| Parameters | Symbol | Test Condition | Min. | Typ. | Max. | Unit |
|--------------------------|-------------------|---|------|------|------|------|
| Input operation voltage | V _{in} | | 8 | | 36 | V |
| Quiescent Supply Current | I _q | V _{FB} =V _{in} | | 2.1 | 5 | mA |
| Oscillator Frequency | F _{osc} | | 144 | 180 | 216 | KHz |
| Output Short Frequency | F _{osp} | | | 48 | | KHz |
| Switch Current Limit | I _L | V _{FB} =0 | | 4 | | A |
| Max. Duty Cycle | D _{MAX} | V _{FB} =0V | | 100 | | % |
| Output Power PMOS | R _{dson} | V _{FB} =0V, V _{in} =12V, I _{SW} =3A | | 60 | 80 | mohm |

Typical System Application (VOUT=5V/2.1A)

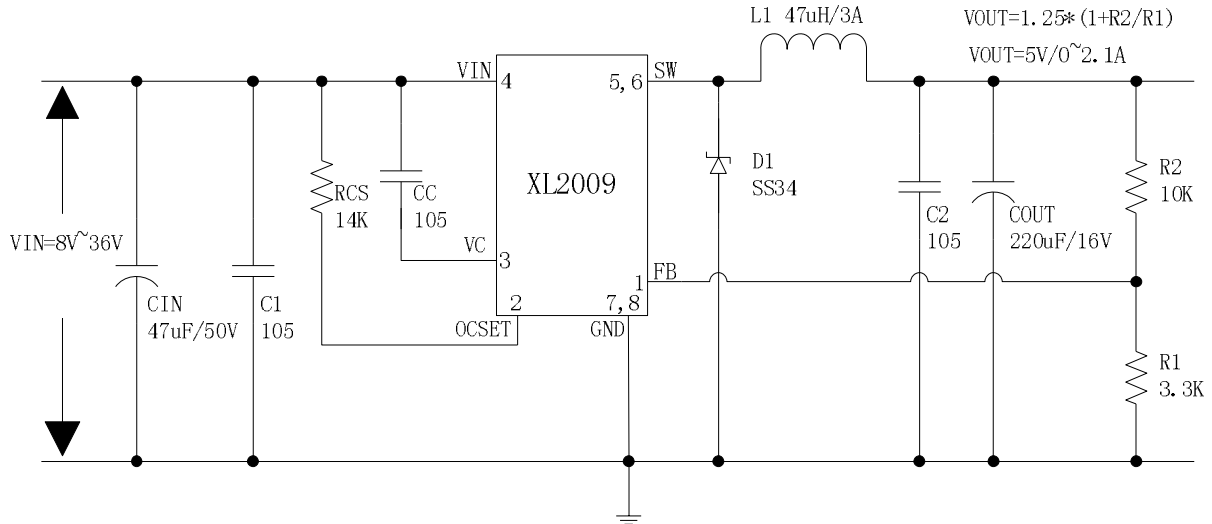


Figure5. XL2009 System Parameters Test Circuit (VIN=8V~36V, VOUT=5V/2.1A)

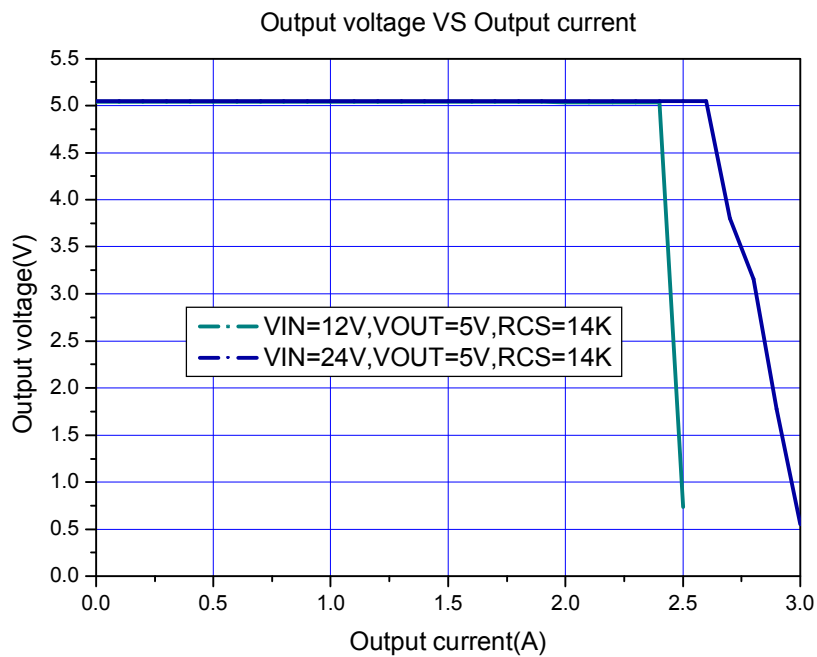


Figure6. XL2009 System Output Constant Current Curve

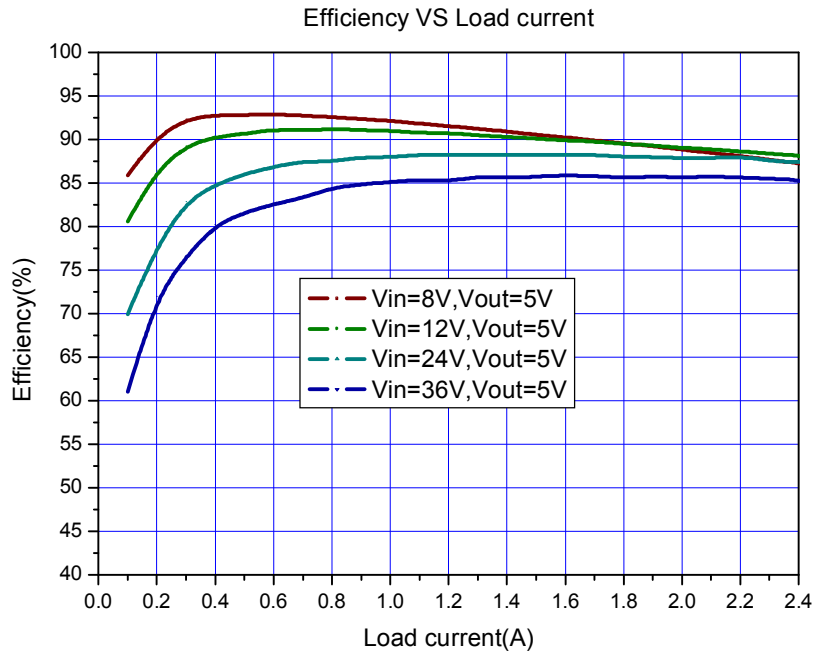


Figure7. XL2009 System Efficiency Curve

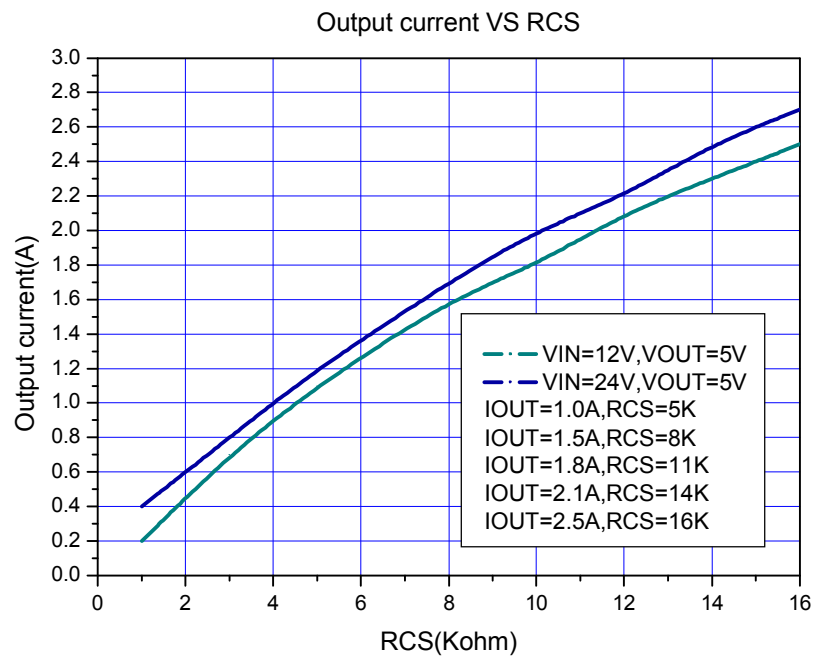


Figure8. RCS VS Output Current Select Curve

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 Package Mechanical Dimensions

SOIC-8

Unit: mm(inch)

