

180KHz 60V 5A Switching Current Boost / Buck-Boost / Inverting DC/DC Converter**Features**

- n Wide 5V to 32V Input Voltage Range
- n Positive or Negative Output Voltage Programming with a Single Feedback Pin
- n Current Mode Control Provides Excellent Transient Response
- n 1.25V reference adjustable version
- n Fixed 180KHz Switching Frequency
- n Maximum 5A Switching Current
- n SW PIN Built in Over Voltage Protection
- n Excellent line and load regulation
- n EN PIN TTL shutdown capability
- n Internal Optimize Power MOSFET
- n High efficiency up to 94%
- n Built in Frequency Compensation
- n Built in Soft-Start Function
- n Built in Thermal Shutdown Function
- n Built in Current Limit Function
- n Available in TO220-5L package

Applications

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

General Description

The XL6011 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 XL6011 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 XL6011 regulator is special design for portable electronic equipment applications.

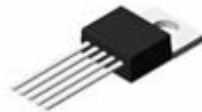
**TO220-5L**

Figure1. Package Type of XL6011

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Pin Configurations

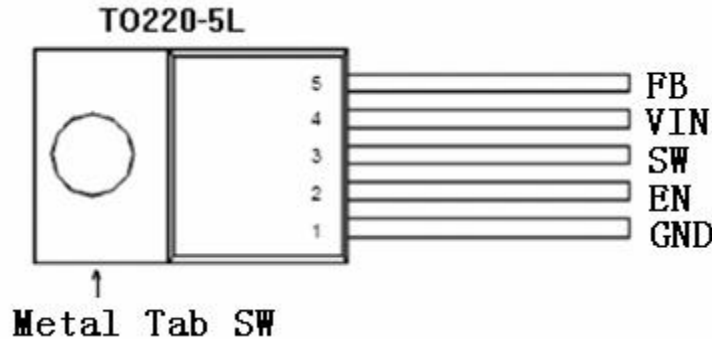


Figure2. Pin Configuration of XL6011 (Top View)

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. XL6011 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). Through an external resistor divider network, FB senses the output voltage and regulates it. The feedback threshold voltage is 1.25V. |

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Function Block

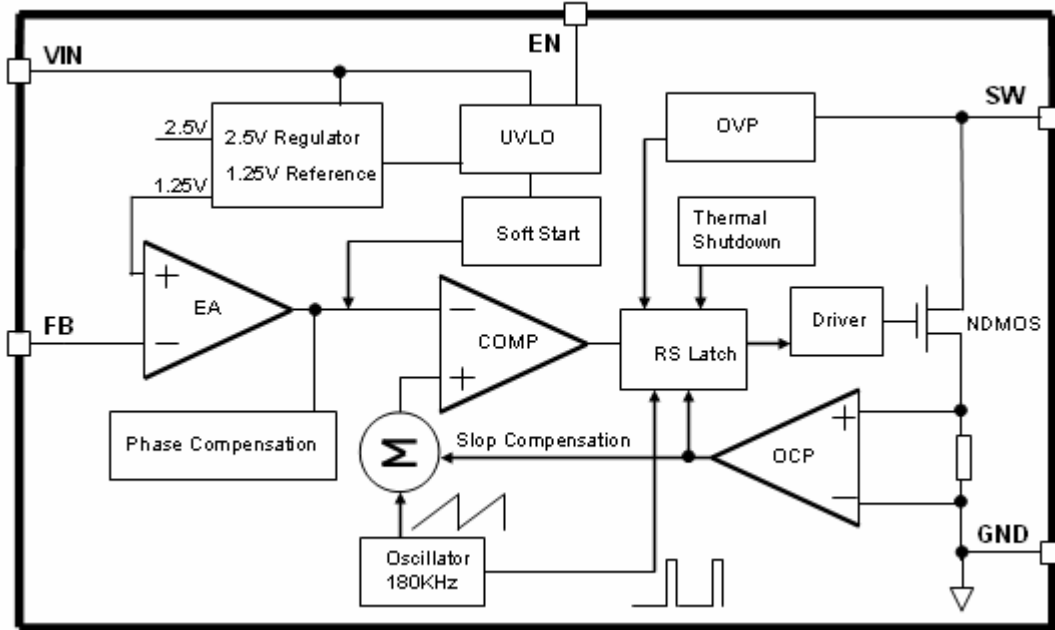


Figure3. Function Block Diagram of XL6011

Typical Application Circuit (Portable Notebook Car Adapter)

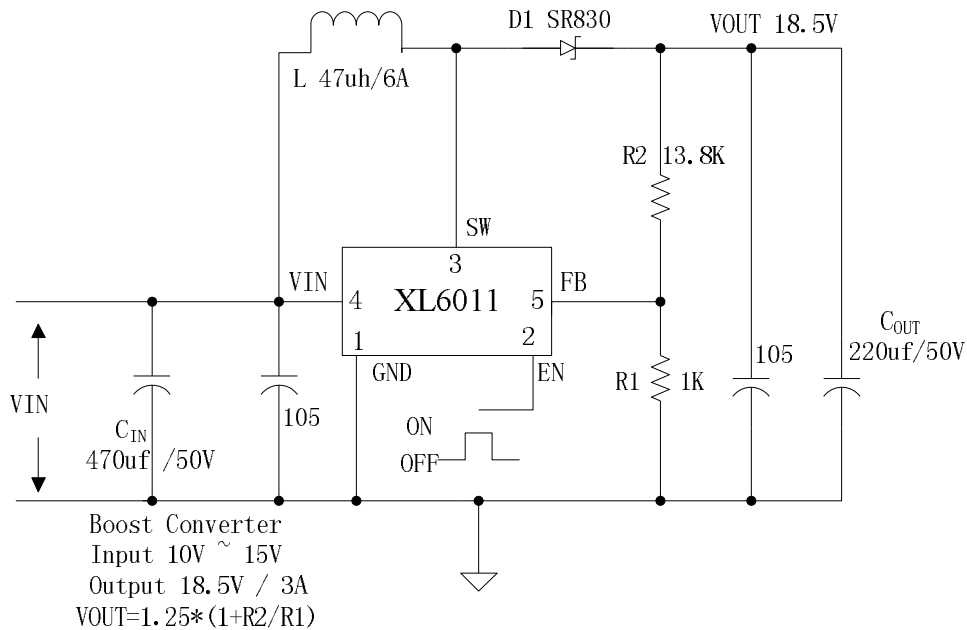


Figure4. XL6011 Typical Application Circuit (Boost Car Adapter)

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Ordering Information

| Package | Temperature Range | Part Number | Marking ID | Packing Type |
|---------|-------------------|-------------|------------|--------------|
| | | Lead Free | Lead Free | |
| | | XL6011E1 | XL6011E1 | |

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 (TO220-5L) (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.



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XL6011 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} = 12V to 16V, V _{out} =18V I _{load} =0.1A to 4A | 1.213 | 1.25 | 1.287 | V |
| Efficiency | η | V _{in} =12V , V _{out} =18.5V I _{out} =3A | - | 93 | - | % |

Electrical Characteristics (DC Parameters)

V_{in} = 12V, GND=0V, V_{in} & GND parallel connect a 220uf/50V capacitor; I_{out}=0.5A, T_a = 25 °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} =0V | | 70 | 100 | uA |
| Quiescent Supply Current | I _q | V _{EN} =2V, V _{FB} =V _{in} | | 2.5 | 5 | mA |
| Oscillator Frequency | F _{osc} | | 144 | 180 | 216 | Khz |
| Switch Current Limit | I _L | V _{FB} =0 | | 5 | | A |
| Output Power NMOS | R _{dson} | V _{in} =12V, I _{sw} =5A | | 35 | 40 | mohm |
| EN Pin Threshold | V _{EN} | High (Regulator ON) Low (Regulator OFF) | | 1.4 0.8 | | V |
| EN Pin Input Leakage Current | I _H | V _{EN} =2V (ON) | | 3 | 10 | uA |
| | I _L | V _{EN} =0V (OFF) | | 3 | 10 | uA |
| Max. Duty Cycle | D _{MAX} | V _{FB} =0V | | 90 | | % |

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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 | SR306 |
| 5A | | √ | 1N5823 | 1N5824 | 1N5825 | | |
| | | √ | SR502 | SR503 | SR504 | SR505 | SR506 |
| | | √ | SB520 | SB530 | SB540 | SB550 | SB560 |
| | √ | | | 50WQ03 | 50WQ04 | 50WQ05 | |
| 8A | | √ | SR820 | SR830 | SR840 | SR850 | SR860 |

Typical System Application for EPC/Notebook Car Adapter – Boost (Output 18.5V/3A)

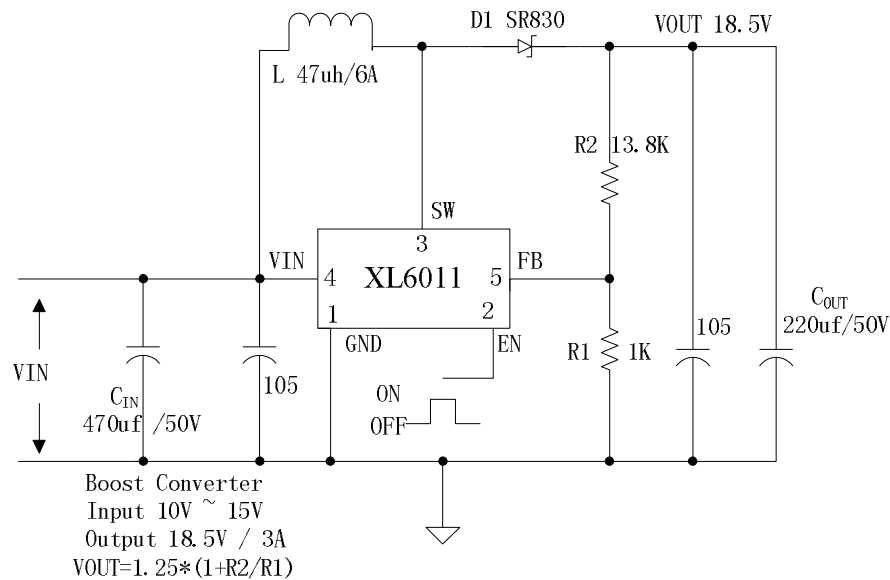


Figure5. XL6011 Typical System Application (Boost Car Adapter)

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**Typical System Application for Portable Notebook Car Adapter
– SEPIC Buck-Boost Topology (Input 10V~30V, Output 12V/4A)**

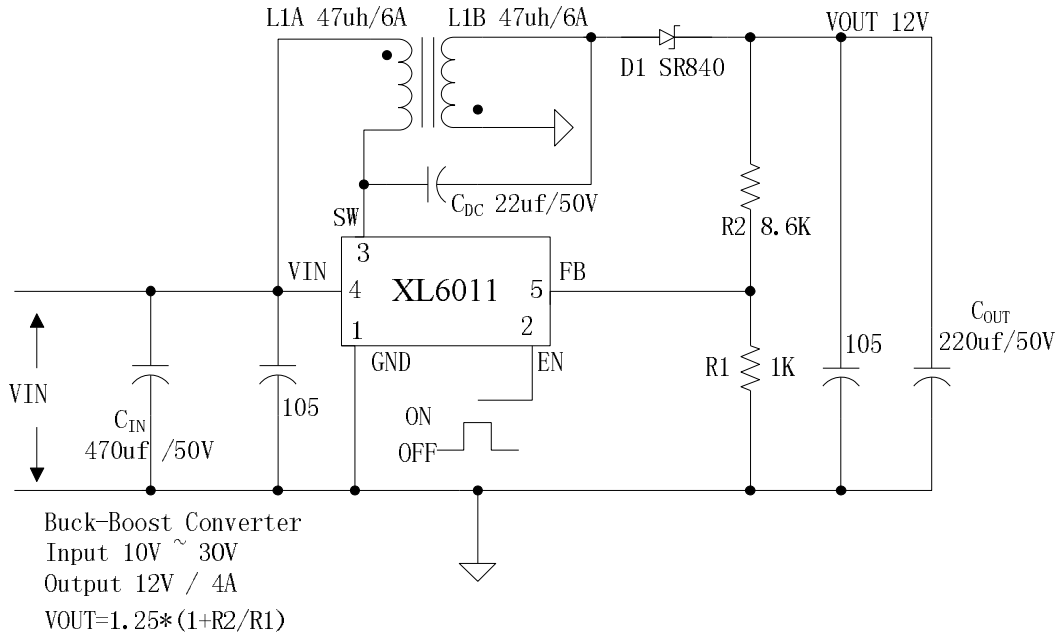


Figure6. XL6011 Typical System Application (SEPIC Buck-Boost Converter)

**Typical System Application for Portable Notebook Car Adapter
– SEPIC Buck-Boost Topology (Input 10V~30V, Output 18.5V/3A)**

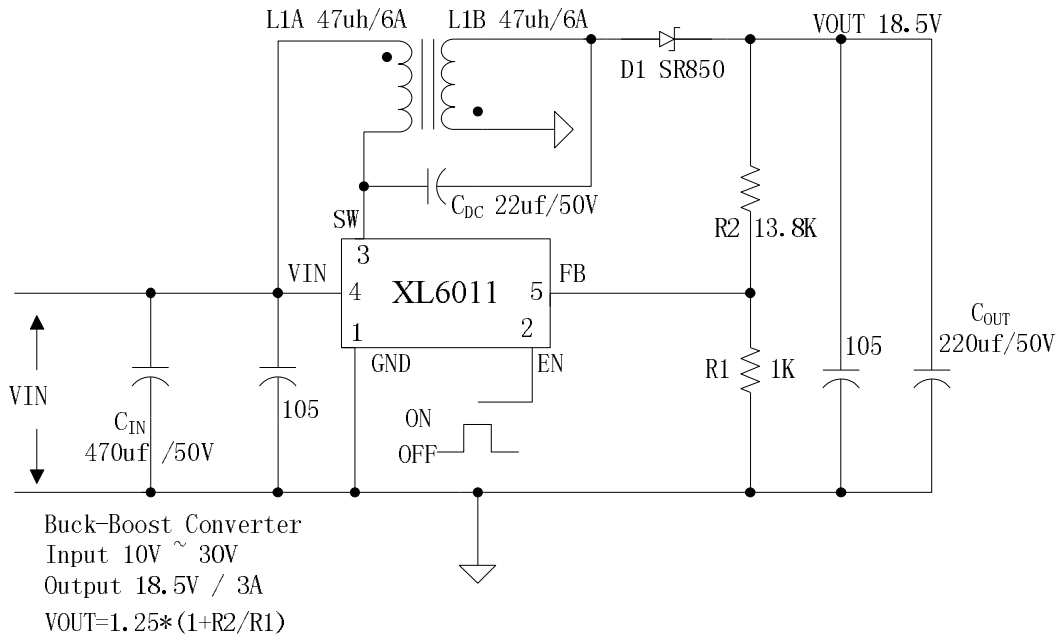


Figure7. XL6011 Typical System Application (SEPIC Buck-Boost Converter)

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Typical System Application for Inverting Converter

– SEPIC Inverting Topology (Input 10V~30V, Output + -12V/2A)

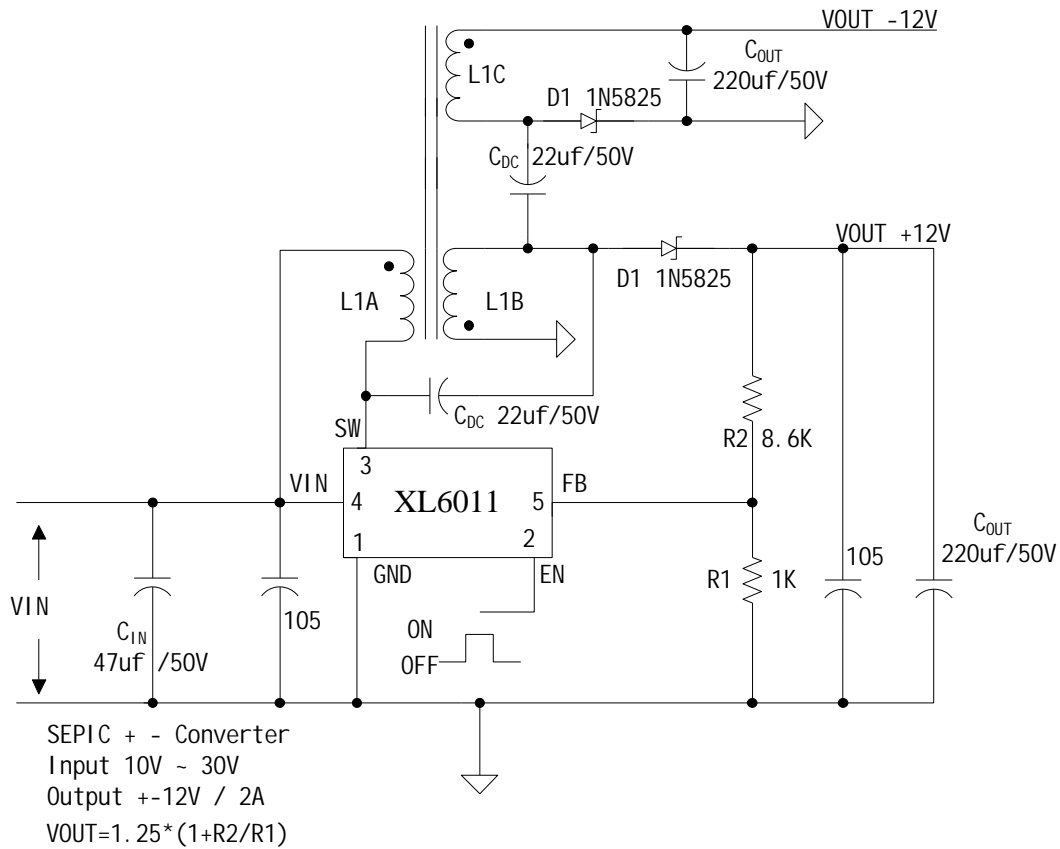
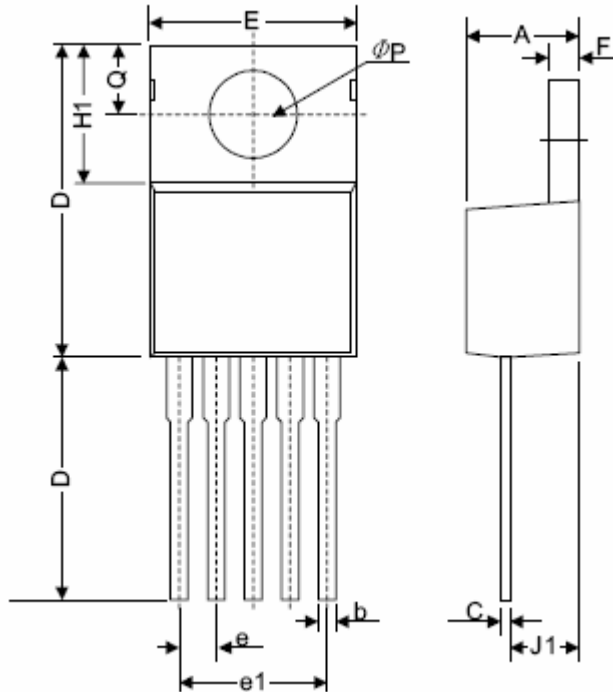


Figure8. XL6011 Typical System Application (SEPIC Inverting Converter)

180KHz 60V 5A Switching Current Boost / Buck-Boost / Inverting DC/DC Converter

Package Information

TO220-5L



| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|----------|---------------------------|-------|----------------------|-------|
| | Min. | Max. | Min. | Max. |
| A | 4.06 | 4.83 | 0.160 | 0.190 |
| b | 0.76 | 1.02 | 0.030 | 0.040 |
| C | 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 |
| e | 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 |
| ϕP | 3.68 | 3.94 | 0.145 | 0.155 |
| Q | 2.54 | 2.92 | 0.100 | 0.115 |