

5A 300KHz 32V Buck DC to DC Converter**XL4005****Features**

- Wide 5V to 32V Input Voltage Range
- Output Adjustable from 0.8V to 30V
- Maximum Duty Cycle 100%
- Minimum Drop Out 0.6V
- Fixed 300KHz Switching Frequency
- 5A Constant Output Current Capability
- Internal Optimize Power MOSFET
- High efficiency
- Excellent line and load regulation
- TTL shutdown capability
- EN pin with hysteresis function
- Built in thermal shutdown function
- Built in current limit function
- Built in output short protection function
- Available in TO263-5L package

Applications

- LCD Monitor and LCD TV
- Digital Photo Frame
- Set-up Box
- ADSL Modem
- Telecom / Networking Equipment

General Description

The XL4005 is a 300KHz fixed frequency PWM buck (step-down) DC/DC converter, capable of driving a 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 enable function, an over current protection function is built inside. When short protection function happens, the operation frequency will be reduced from 300KHz to 60KHz. An internal compensation block is built in to minimize external component count.

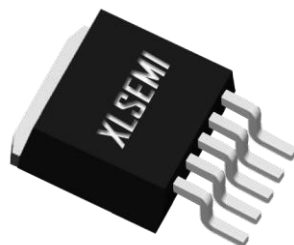


Figure1. Package Type of XL4005

5A 300KHz 32V Buck DC to DC Converter

XL4005

Pin Configurations

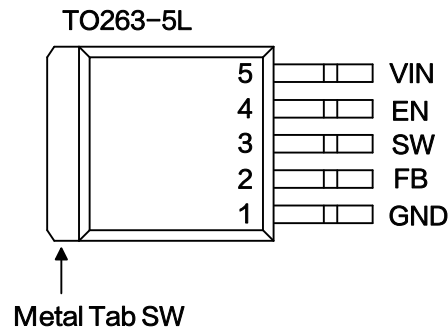


Figure2. Pin Configuration of XL4005 (Top View)

Table 1 Pin Description

| Pin Number | Pin Name | Description |
|------------|----------|--|
| 1 | 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 XL4005. |
| 2 | FB | Feedback Pin (FB). Through an external resistor divider network, FB senses the output voltage and regulates it. The feedback threshold voltage is 0.8V. |
| 3 | SW | Power Switch Output Pin (SW). SW is the switch node that supplies power to the output. |
| 4 | EN | Enable Pin. Drive EN pin high to turn on the device, drive it low to turn it off. |
| 5 | VIN | Supply Voltage Input Pin. XL4005 operates from a 5V to 32V DC voltage. Bypass Vin to GND with a suitably large capacitor to eliminate noise on the input. |

5A 300KHz 32V Buck DC to DC Converter

XL4005

Function Block

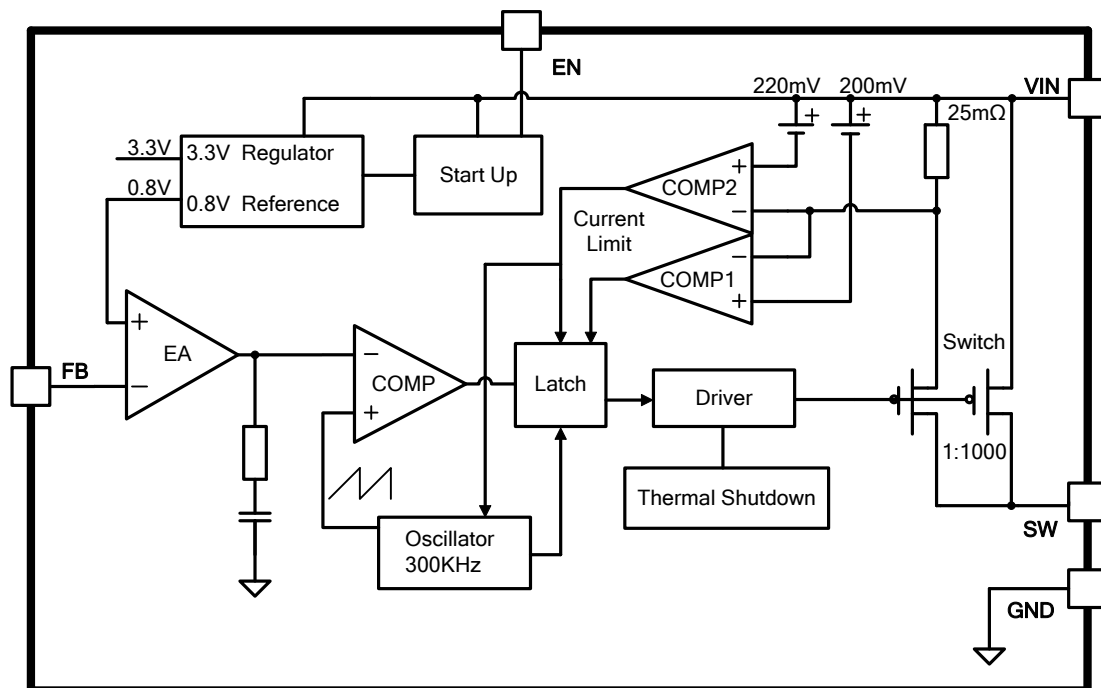


Figure3. Function Block Diagram of XL4005

Typical Application Circuit

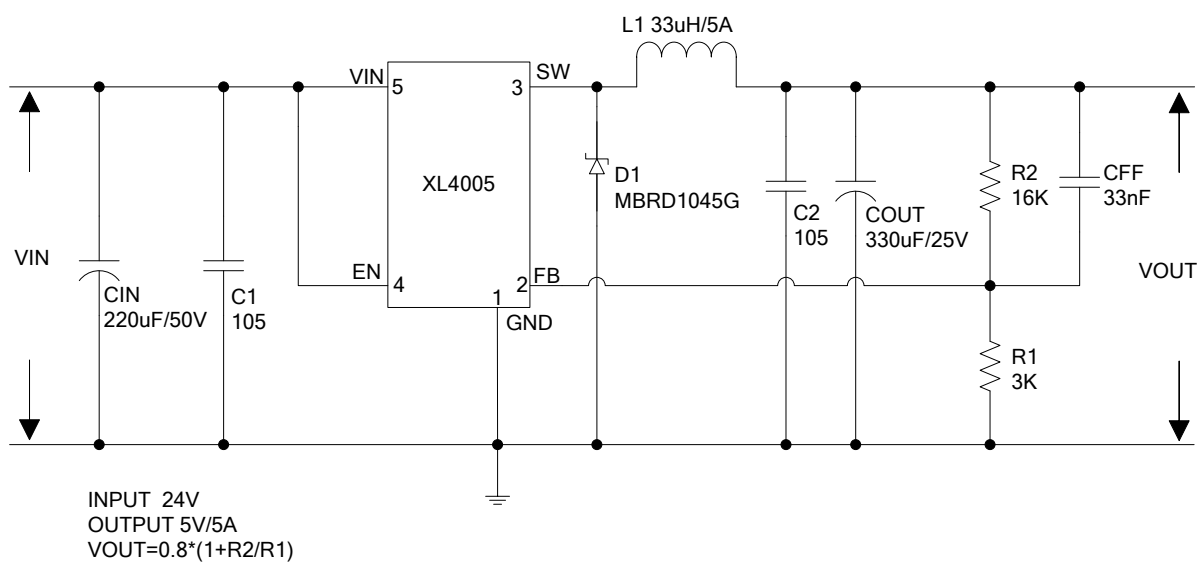


Figure4. XL4005 Typical Application Circuit (24V~5V/5A)

5A 300KHz 32V Buck DC to DC Converter

XL4005

Ordering Information

| Order Information | Marking ID | Package Type | Eco Plan | Packing Type Supplied As |
|-------------------|------------|--------------|-----------|--------------------------|
| XL4005E1 | XL4005E1 | TO263-5L | RoHS & HF | 800 Units on Tape & Reel |

Absolute Maximum Ratings (Note1)

| Parameter | Symbol | Value | Unit |
|---|-------------------|-------------------------|------|
| Input Voltage | V _{IN} | -0.3 to 35 | 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 _{SW} | -0.3 to V _{IN} | V |
| Power Dissipation | P _D | Internally limited | mW |
| Thermal Resistance (TO263-5L) (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.

5A 300KHz 32V Buck DC to DC Converter

XL4005

XL4005 Electrical Characteristics

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

| Symbol | Parameter | Test Condition | Min. | Typ. | Max. | Unit |
|--|------------------|--|-------|------|-------|------|
| System parameters test circuit figure4 | | | | | | |
| VFB | Feedback Voltage | Vin = 5V to 32V, Vout=5V Iload=0.5A to 5A | 0.776 | 0.8 | 0.824 | V |
| η | Efficiency | Vin=12V, Vout=5V Iout=5A | – | 90 | – | % |

Electrical Characteristics (DC Parameters)

Vin = 12V, GND=0V, Vin & GND parallel connect a 220uf/50V capacitor; Iout=500mA, $T_a = 25^{\circ}\text{C}$; the others floating unless otherwise specified.

| Parameters | Symbol | Test Condition | Min. | Typ. | Max. | Unit |
|------------------------------|------------------|--|------|------------|------|------|
| Input operation voltage | Vin | | 5 | | 32 | V |
| Shutdown Supply Current | I _s | V _{EN} =0V | | 60 | 200 | uA |
| Quiescent Supply Current | I _q | V _{EN} =2V, V _{FB} =Vin | | 3 | 5 | mA |
| Oscillator Frequency | Fosc | | 240 | 300 | 360 | Khz |
| Switch Current Limit | I _L | V _{FB} =0V | | 8 | | A |
| 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) | | 1 | 15 | uA |
| | I _L | V _{EN} =0V (OFF) | | 1 | 15 | uA |
| Max. Duty Cycle | D _{MAX} | V _{FB} =0V | | 100 | | % |

5A 300KHz 32V Buck DC to DC Converter

XL4005

Test Circuit and Layout guidelines

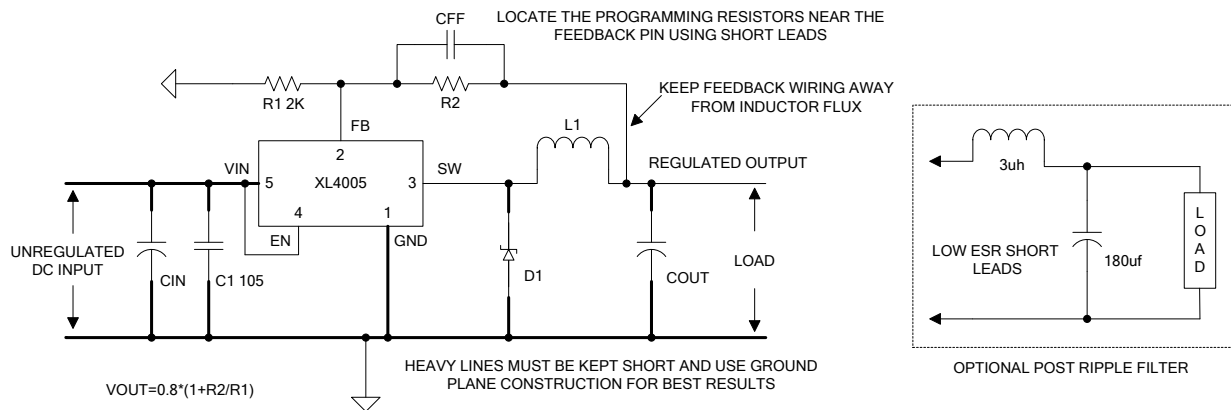


Figure5. Standard Test Circuits and Layout Guides

Select R1 to be approximately 2K, use a 1% resistor for best stability.

C1 and CFF are optional; in order to increase stability and reduce the input power line noise, C1 must be placed near to VIN and GND;

For output voltages greater than approximately 10V, an additional capacitor CFF is required. The compensation capacitor is typically between 100 pf and 33 nf, and is wired in parallel with the output voltage setting resistor, R2. It provides additional stability for high output voltage, low input-output voltages, and/or very low ESR output capacitors, such as solid tantalum capacitors.

$CFF = 1 / (31 * 1000 * R2)$; This capacitor type can be ceramic, plastic, silver mica, etc. (Because of the unstable characteristics of ceramic capacitors made with Z5U material, they are not recommended.)

5A 300KHz 32V Buck DC to DC Converter

XL4005

Typical System Application for 24V ~ 12V/4A

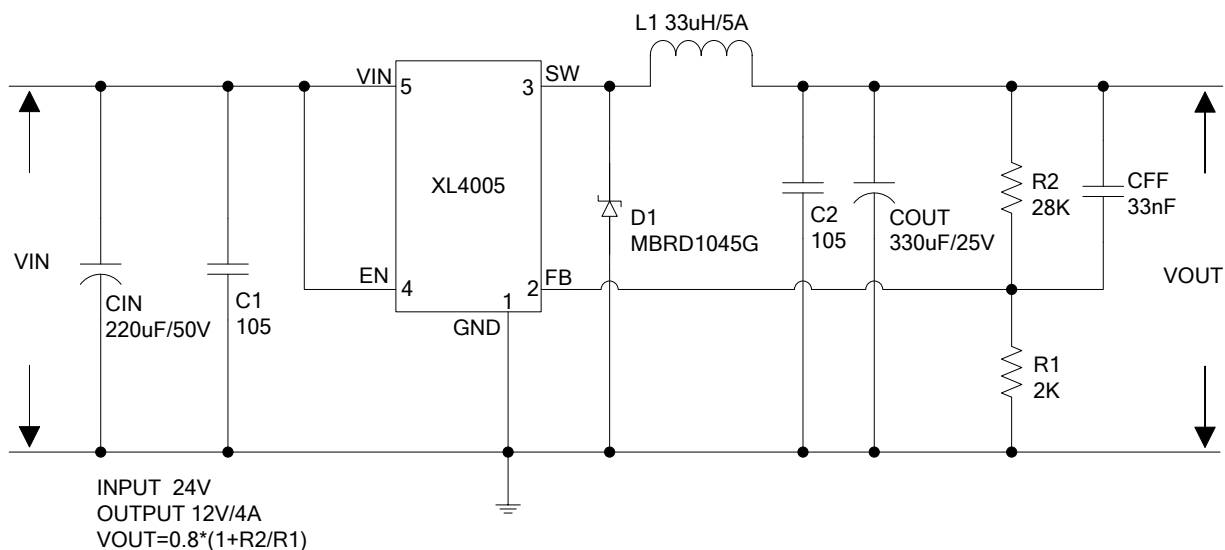


Figure6. XL4005 System Parameters Test Circuit (24V ~ 12V/4A)

Typical System Application for 24V ~ 5V/5A

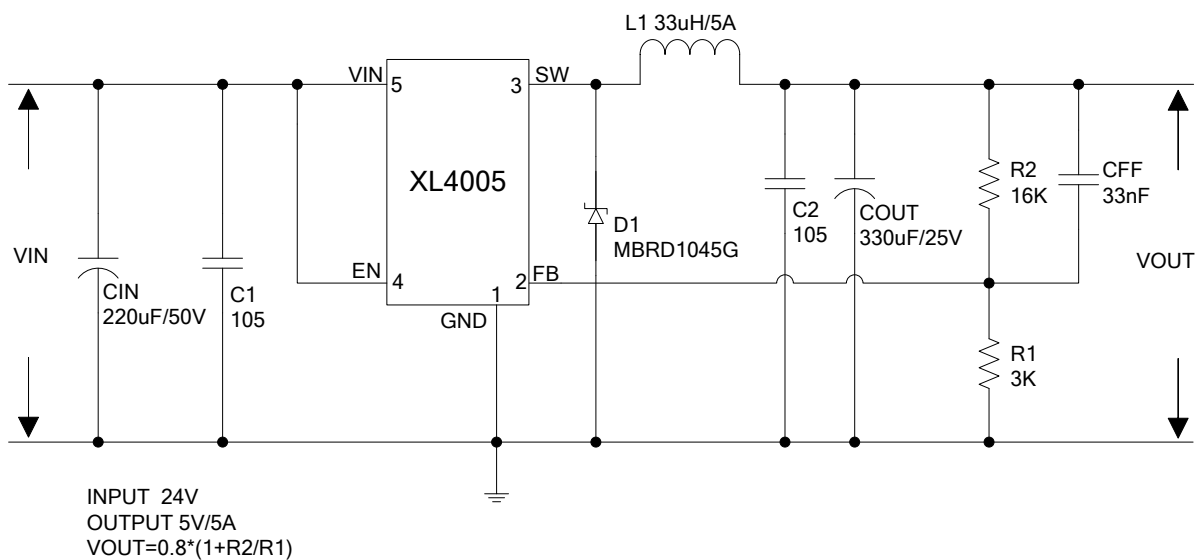


Figure7. XL4005 System Parameters Test Circuit (24V ~ 5V/5A)

5A 300KHz 32V Buck DC to DC Converter

XL4005

Typical System Application for 24V ~ 20V/5A

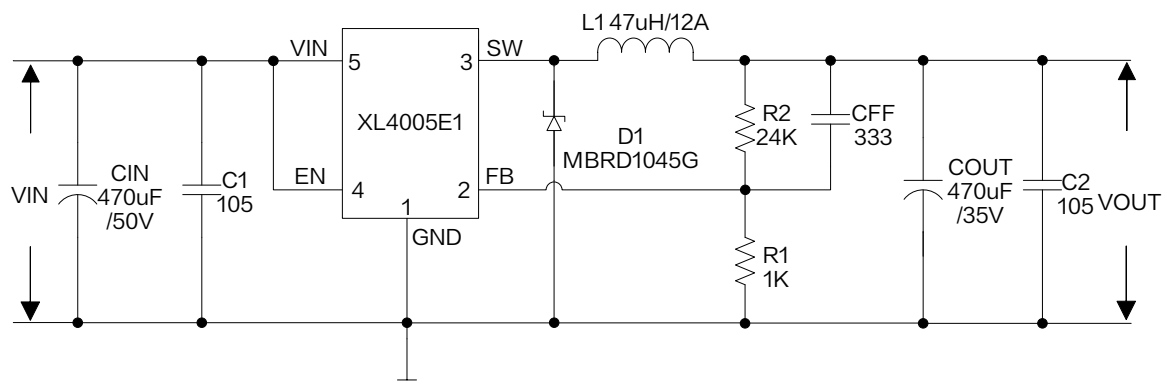


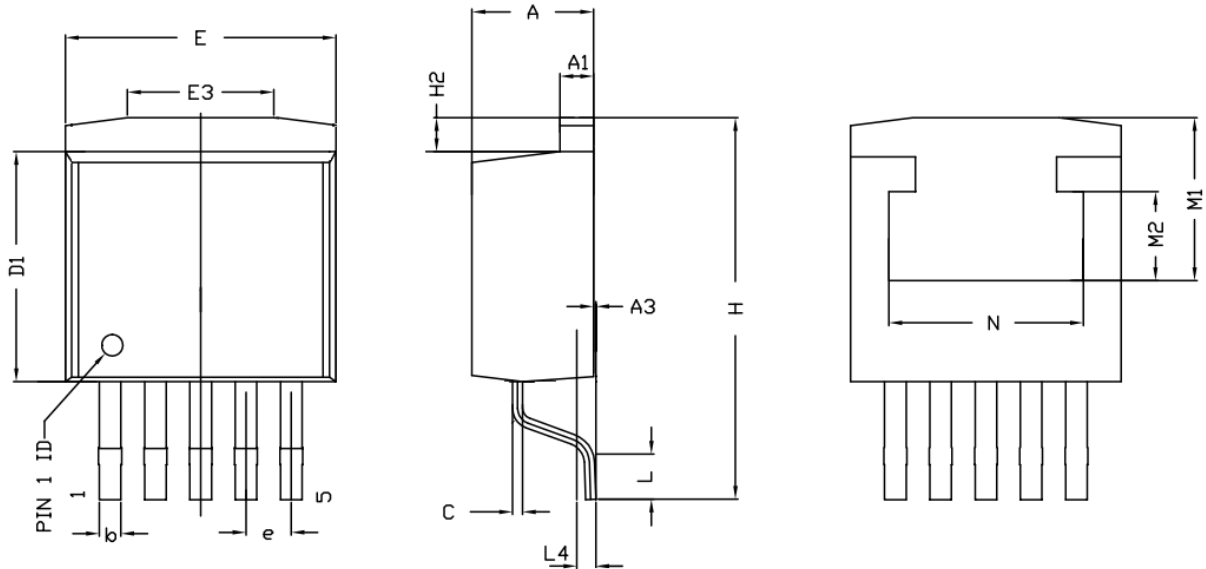
Figure8. XL4005 System Parameters Test Circuit (24V ~ 20V/5A)

5A 300KHz 32V Buck DC to DC Converter

XL4005

Package Information

TO263-5L



| Symbol | Dimensions In Millimeters | | | Dimensions In Inches | | |
|--------|---------------------------|-------|-------|----------------------|-------|-------|
| | Min. | Nom. | Max. | Min. | Nom. | Max. |
| A | 4.45 | 4.60 | 4.70 | 0.175 | 0.181 | 0.185 |
| A1 | 1.22 | 1.27 | 1.32 | 0.048 | 0.050 | 0.052 |
| A3 | 0.00 | — | 0.15 | 0.000 | — | 0.006 |
| b | 0.71 | — | 0.97 | 0.028 | — | 0.038 |
| c | 0.38 | — | 0.76 | 0.015 | — | 0.030 |
| D1 | 8.38 | 8.70 | 9.00 | 0.330 | 0.343 | 0.354 |
| E | 9.91 | 10.16 | 10.39 | 0.390 | 0.400 | 0.410 |
| E3 | 5.00 | 6.50 | 8.00 | 0.197 | 0.256 | 0.315 |
| e | 1.70 REF. | | | 0.067 REF. | | |
| H | — | — | 14.35 | — | — | 0.565 |
| H2 | 0.90 | 1.27 | 1.42 | 0.035 | 0.050 | 0.056 |
| L | — | 1.98 | — | — | 0.078 | — |
| L4 | — | 0.76 | — | — | 0.030 | — |
| M1 | — | 6.12 | — | — | 0.241 | — |
| M2 | — | 3.35 | — | — | 0.132 | — |
| N | — | 7.30 | — | — | 0.287 | — |

5A 300KHz 32V Buck DC to DC Converter**XL4005****Important Notice**

XLSEMI reserve the right to make modifications, enhancements, improvements, corrections or other changes without notice at any time. XLSEMI does not assume any liability arising out of the application or use of any product described herein; neither does it convey any license under its patent rights, nor the rights of others. XLSEMI assumes no liability for applications assistance or the design of Buyers' products. Buyers are responsible for their products and applications using XLSEMI components. To minimize the risks associated with Buyers' products and applications, Buyers should provide adequate design and operating safeguards. XLSEMI warrants performance of its products to the specifications applicable at the time of sale, in accordance with the warranty in XLSEMI's terms and conditions of sale of semiconductor products. Testing and other quality control techniques are used to the extent XLSEMI deems necessary to support this warranty. Except where mandated by applicable law, testing of all parameters of each component is not necessarily performed.

For the latest product information, go to www.xlsemi.com.