# 3A 380KHz 28V Buck DC to DC Converter XL1583

## Features

- Wide 3.6V to 28V Input Voltage Range
- Output Adjustable from 1.222V to 25V
- Maximum Duty Cycle 100%
- Minimum Drop Out 0.6V
- Fixed 380KHz Switching Frequency
- 3A 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
- Available in SOP8 package

## Applications

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

## General Description

The XL1583 is a 380KHz fixed frequency PWM buck (step-down) DC/DC converter, capable of driving a 3A 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.

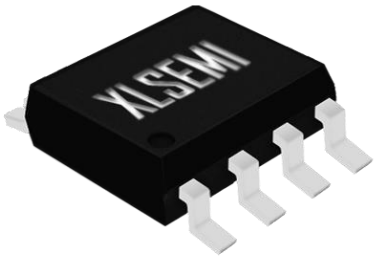



Figure1. Package Type of XL1583

## Pin Configurations

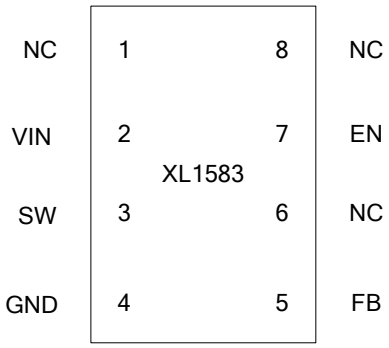



Figure2. Pin Configuration of XL1583 (Top View)

Table 1 Pin Description

| Pin Number | Pin Name | Description |
|---|---|---|
| 1,6,8 | NC | No Connected. |
| 2 | VIN | Supply Voltage Input Pin. XL1583 operates from a 3.6V to 28V DC voltage. Bypass Vin to GND with a suitably large capacitor to eliminate noise on the input. |
| 3 | SW | Power Switch Output Pin (SW). Output is the switch node that supplies power to the output. |
| 4 | 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 XL1583. |
| 5 | FB | Feedback Pin (FB). Through an external resistor divider network, Feedback senses the output voltage and regulates it. The feedback threshold voltage is 1.222V. |
| 7 | EN | Enable Pin. Drive EN pin low to turn off the device, drive it high to turn it on. Floating is default high. |

## Function Block

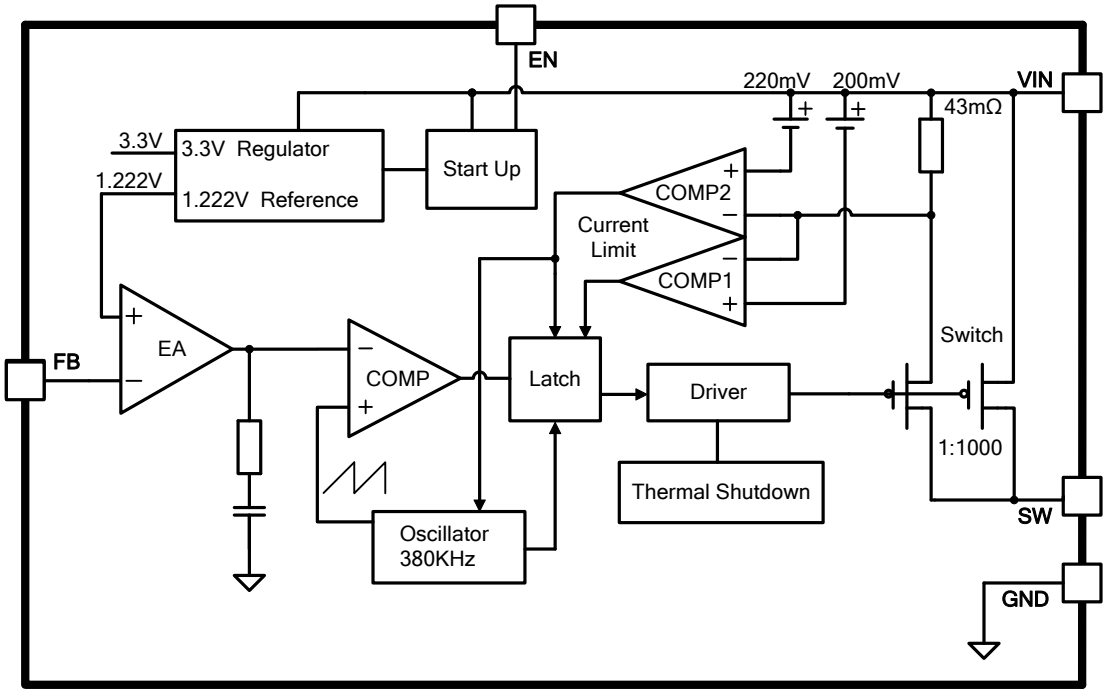



Figure3. Function Block Diagram of XL1583

## Typical Application Circuit

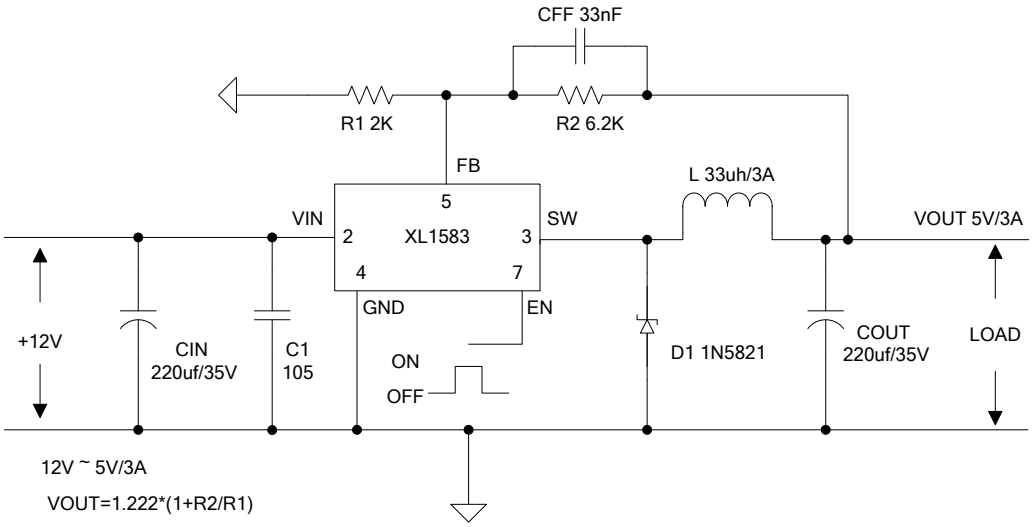



Figure4. XL1583 Typical Application Circuit 12V-5V/3A

## Ordering Information

| Order Information | Marking ID | Package Type | Packing Type Supplied As |
|---|---|---|---|
| XL1583E1 | XL1583E1 | SOP8 | 4000 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 | Vin | -0.3 to 32 | 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 | $V_{SW}$ | -0.3 to Vin | V |
| Power Dissipation | $P_D$ | Internally limited | mW |
| Thermal Resistance (SOP8)<br>(Junction to Ambient, No Heatsink, Free Air) | $R_{JA}$ | 100 | ℃/W |
| Operating Junction Temperature | $T_J$ | -40 to 125 | ℃ |
| Storage Temperature | $T_{STG}$ | -65 to 150 | ℃ |
| Lead Temperature (Soldering, 10 sec) | $T_{LEAD}$ | 260 | ℃ |
| 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.

## XL1583 Electrical Characteristics

$T_a$ = 25℃;unless otherwise specified.

| Symbol | Parameter | Test Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| System parameters test circuit figure4 | | | | | | |
| VFB | Feedback Voltage | Vin = 7V to 28V, Vout=5V Iload=0.2A to 3A | 1.186 | 1.222 | 1.258 | V |
| η | Efficiency | Vin=12V,Vout=5V Iout=3A | – | 89 | – | % |

## Electrical Characteristics (DC Parameters)

Vin = 12V, GND=0V, Vin & GND parallel connect a 220uf/50V capacitor; Iout=500mA, $T_a$ = 25℃; the others floating unless otherwise specified.

| Parameters | Symbol | Test Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Input operation voltage | Vin | | 3.6 | | 28 | 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 | | 323 | 380 | 437 | Khz |
| Switch Current Limit | $I_L$ | $V_{FB}$ =0V | | 4.7 | | 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 | | % |

## Test Circuit and Layout guidelines

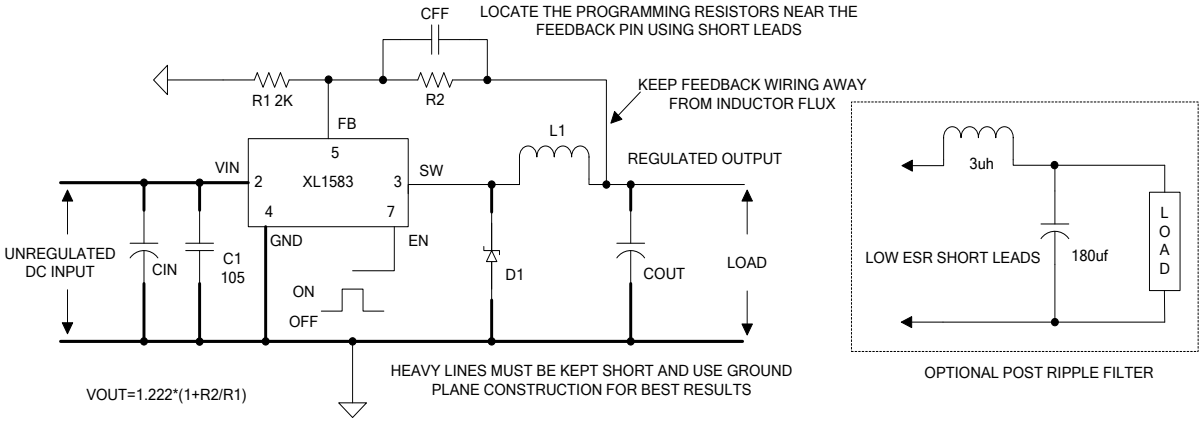



Figure5. Standard Test Circuits and Layout Guides

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.)

## 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 |

## Typical System Application for 12V ~ 5V/3A

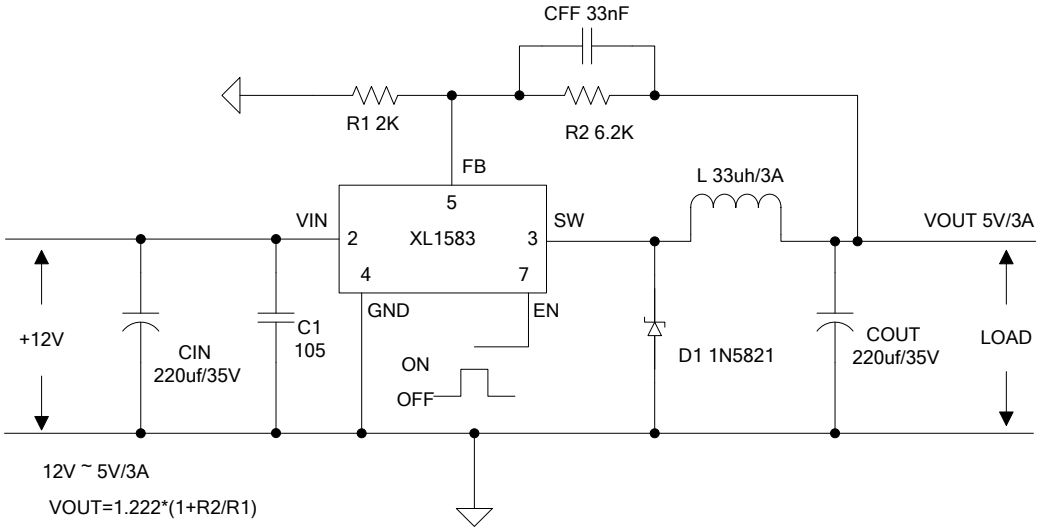



Figure6. XL1583 System Parameters Test Circuit (12V ~ 5V/3A)

## Typical System Application for 12V ~ 3.3V/3A

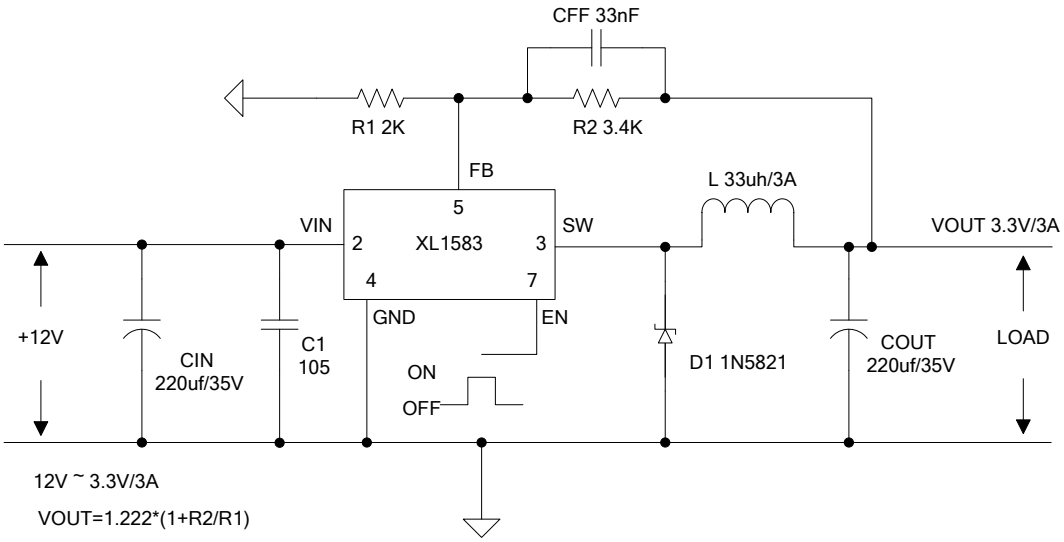
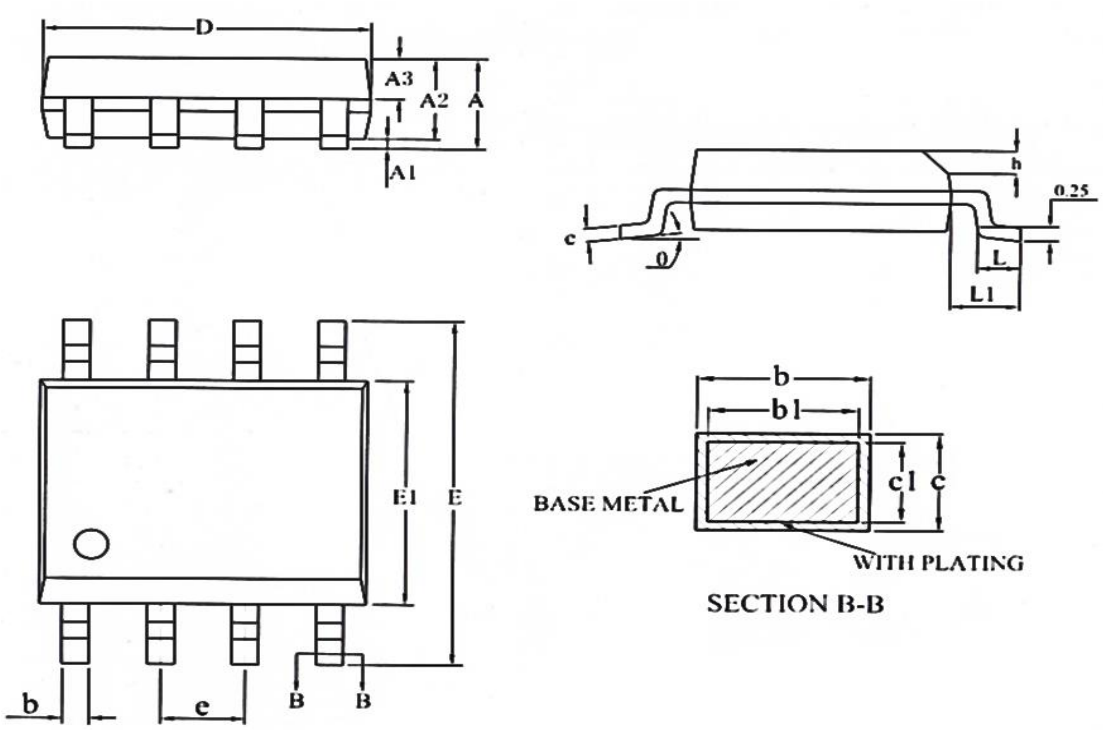



Figure7. XL1583 System Parameters Test Circuit (12V ~ 3.3V/3A)

## Package Information

### SOP8




| Symbol | Dimensions In Millimeters | | | Dimensions In Inches | | |
|---|---|---|---|---|---|---|
| | Min. | Nom. | Max. | Min. | Nom. | Max. |
| A | 1.35 | 1.55 | 1.75 | 0.053 | 0.061 | 0.069 |
| A1 | 0.05 | – | 0.25 | 0.002 | – | 0.010 |
| A2 | 1.25 | 1.40 | 1.65 | 0.049 | 0.055 | 0.065 |
| A3 | 0.50 | 0.60 | 0.70 | 0.019 | 0.024 | 0.028 |
| b | 0.30 | – | 0.51 | 0.012 | – | 0.020 |
| b1 | 0.29 | 0.41 | 0.48 | 0.011 | 0.016 | 0.018 |
| c | 0.17 | – | 0.25 | 0.007 | – | 0.010 |
| c1 | 0.17 | 0.20 | 0.23 | 0.007 | 0.008 | 0.009 |
| D | 4.70 | 4.90 | 5.10 | 0.185 | 0.193 | 0.200 |
| E | 5.80 | 6.00 | 6.20 | 0.228 | 0.236 | 0.244 |
| E1 | 3.80 | 3.90 | 4.00 | 0.150 | 0.154 | 0.157 |
| e | 1.14 | 1.27 | 1.40 | 0.045 | 0.050 | 0.055 |
| h | 0.25 | – | 0.50 | 0.010 | – | 0.020 |
| L | 0.45 | – | 0.80 | 0.017 | – | 0.031 |
| L1 | 0.82 | 1.03 | 1.23 | 0.032 | 0.040 | 0.048 |
| θ | 0 | – | 8° | 0 | – | 8° |

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