

# ZXSC380 EV1

## ZXSC380EV1 EVALUATION BOARD USER GUIDE

### DESCRIPTION

The ZXSC380EV1, Figure 1, is a PCB for evaluating the simple ZXSC380 constant current pulse LED driver. Applications requiring step-up voltage from a low voltage source such as 1.2v or 1.5v button cells can use this chip with minimal components.

The ZXSC380 and a single small inductor are the only components needed to drive a higher voltage LED. Since the ZXSC380 part controls the current in this inductor (internal current sensing is used), it will operate without damage to the chip if the LED or load is removed. The flyback voltage (internal  $V_{ce}$  breakdown) multiplied by the current is not enough energy to damage the robust low saturation drive transistor.

The start-up voltage for the ZXSC380 is 1 volt. Typical applications include flashlights and torches and because of its high efficiency, wind-up products needing a step-up voltage source will benefit from this low cost part.

Power between 1 and 6 volts can be applied at J8 (positive) and J4 (negative). With the jumper J5 in place, the left most led will illuminate. Moving the jumper through J6 and J7 shows 2 and 3 LEDs illuminated respectively. With no jumper inserted, an external LED can be connected at A and K (anode / cathode). If the ZXSC380 is to be used create a higher voltage supply (maybe for op-amps or similar), then a Zener diode and capacitor could be connected to A and K in place of the external LED.

The ZXSC380 controls the current peak in the inductor and will turn off the drive transistor when the current reaches 80mA approximately. The energy in the inductor is now released into the load and the inductor current will fall for around  $2.2\mu s$ , whereby the ZXSC380 drives the transistor again until the peak is reached. The frequency of operation is determined by the load conditions and will rise when the load is higher, up to a maximum of 200kHz.

To help integrate this part into larger designs, a small prototype area is included on the PCB, above the LEDs.

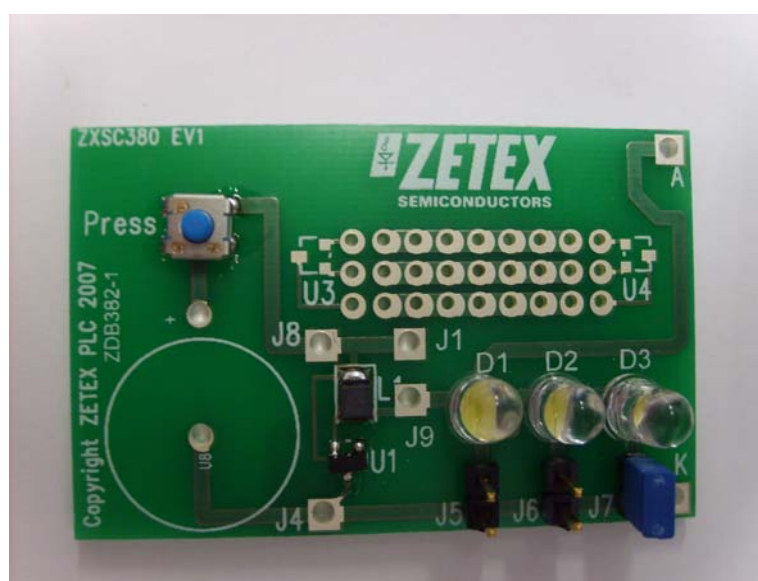


Figure 1: ZXSC380EV1 evaluation board

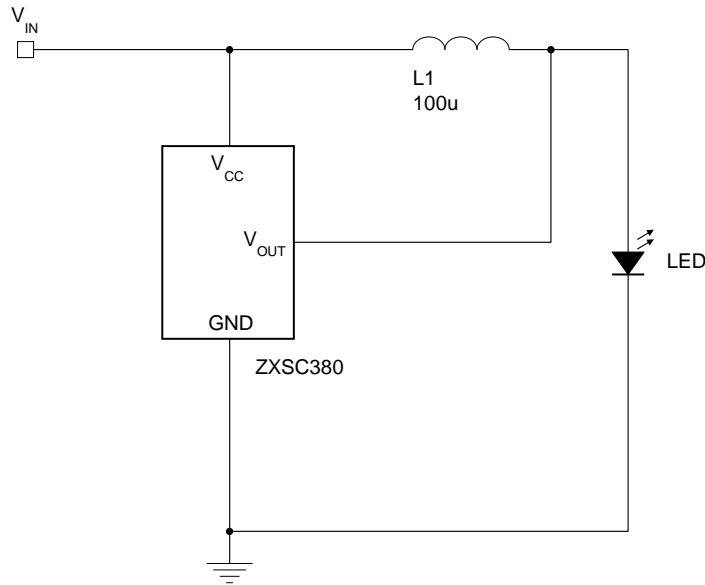


Fig 2 Basic Circuit

**Internal device block diagram**

The ZXSC380 is non-synchronous Pulse Frequency Modulation DC-DC controller IC, which, when combined with a high performance internal transistor, enables the production of a high efficiency boost converter for use in single cell applications.

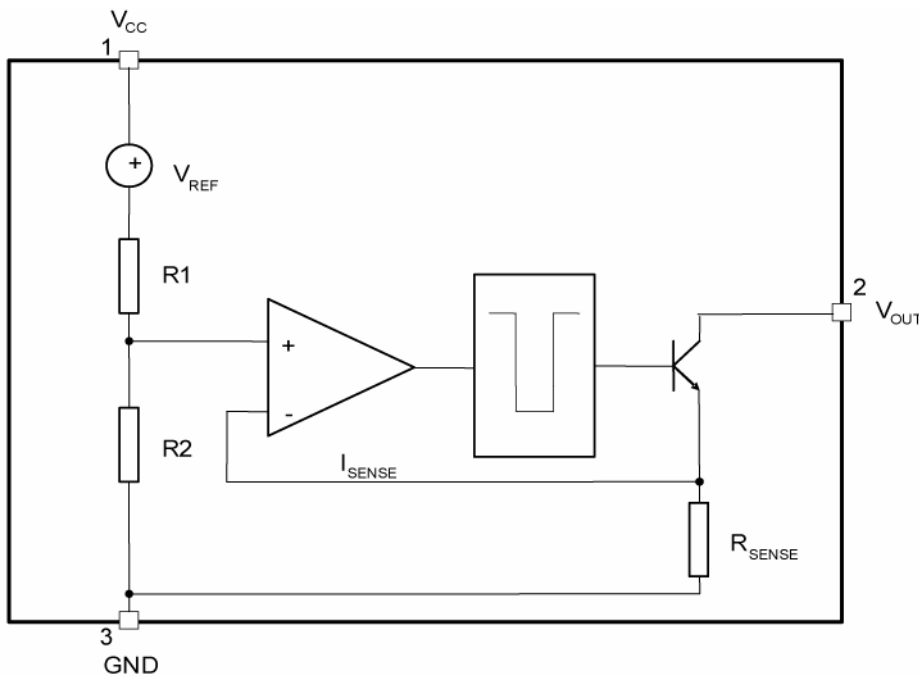


Fig 3. ZXSC380 Block Diagram

The on-chip comparator forces the driver circuit and therefore the internal switching transistor to switch off when the voltage at  $I_{SENSE}$  exceeds 20mV. This threshold is set by an internal reference circuit and divider. The voltage at  $I_{SENSE}$  is taken from a current sense resistor connected in series with the emitter of the switching transistor. This resistor is chosen to give an emitter current switching current of 80mA.

## ZXSC380 EV1

A monostable following the output of the comparator forces the turn-off time of the output stage to be typically 2.2 $\mu$ s. This ensures that there is sufficient time to discharge a significant proportion of the energy stored in the inductor coil before the next 'on' period.

With every 'on' pulse the switching transistor is kept on until the voltage across the current-sense resistor exceeds the threshold of the I<sub>SENSE</sub> input. The 'on' pulse length, and therefore the switching frequency, is determined by the programmed peak current, the input voltage and the input to output voltage differential. The driver circuit supplies the internal switching transistor with a fixed drive current. To maximise efficiency the internal transistor is switched quickly, typically being forced off within 30ns.

### PIN DESCRIPTIONS

Pin No.	Name	Description
1	Gnd	Ground
2	V <sub>OUT</sub>	Switch output external inductor/LED
3	V <sub>CC</sub>	Supply voltage, generally Alkaline, NiMH or NiCd single cell

### PINOUT DIAGRAM

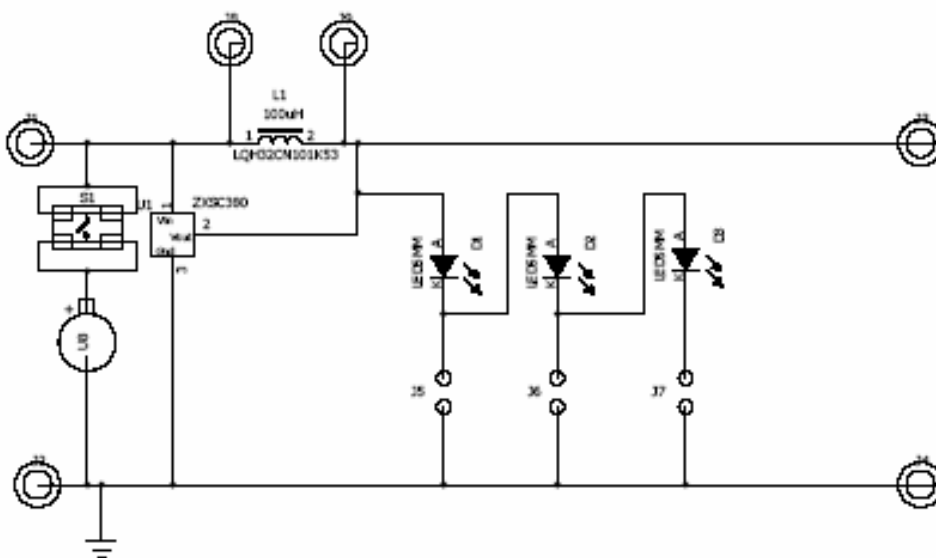
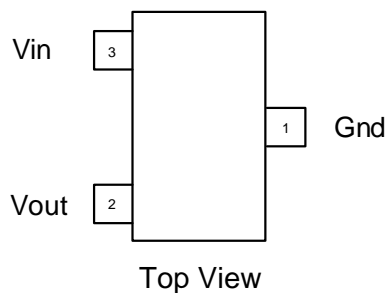


Figure 4 shows the schematic for the ZXSC380EV1 evaluation board.

# ZXSC380 EV1



---

## Product change

Zetex Semiconductors reserves the right to alter, without notice, specifications, design, price or conditions of supply of any product or service. Customers are solely responsible for obtaining the latest relevant information before placing orders.

---

## Applications disclaimer

The circuits in this design/application note are offered as design ideas. It is the responsibility of the user to ensure that the circuit is fit for the user's application and meets with the user's requirements. No representation or warranty is given and no liability whatsoever is assumed by Zetex with respect to the accuracy or use of such information, or infringement of patents or other intellectual property rights arising from such use or otherwise. Zetex does not assume any legal responsibility or will not be held legally liable (whether in contract, tort (including negligence), breach of statutory duty, restriction or otherwise) for any damages, loss of profit, business, contract, opportunity or consequential loss in the use of these circuit applications, under any circumstances.

---

## Life support

Zetex products are specifically not authorized for use as critical components in life support devices or systems without the express written approval of the Chief Executive Officer of Zetex Semiconductors plc. As used herein:

- A. Life support devices or systems are devices or systems which:
1. are intended to implant into the body
- or
2. support or sustain life and whose failure to perform when properly used in accordance with instructions for use provided in the labeling can be reasonably expected to result in significant injury to the user.
- B. A critical component is any component in a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or to affect its safety or effectiveness.
- 

## Reproduction

The product specifications contained in this publication are issued to provide outline information only which (unless agreed by the company in writing) may not be used, applied or reproduced for any purpose or form part of any order or contract or be regarded as a representation relating to the products or services concerned.

---

## Terms and Conditions

All products are sold subjects to Zetex' terms and conditions of sale, and this disclaimer (save in the event of a conflict between the two when the terms of the contract shall prevail) according to region, supplied at the time of order acknowledgement. For the latest information on technology, delivery terms and conditions and prices, please contact your nearest Zetex sales office.

---

## Quality of product

Zetex is an ISO 9001 and TS16949 certified semiconductor manufacturer.

To ensure quality of service and products we strongly advise the purchase of parts directly from Zetex Semiconductors or one of our regionally authorized distributors. For a complete listing of authorized distributors please visit: [www.zetex.com/salesnetwork](http://www.zetex.com/salesnetwork)

Zetex Semiconductors does not warrant or accept any liability whatsoever in respect of any parts purchased through unauthorized sales channels.

---

## ESD (Electrostatic discharge)

Semiconductor devices are susceptible to damage by ESD. Suitable precautions should be taken when handling and transporting devices. The possible damage to devices depends on the circumstances of the handling and transporting, and the nature of the device. The extent of damage can vary from immediate functional or parametric malfunction to degradation of function or performance in use over time. Devices suspected of being affected should be replaced.

---

## Green compliance

Zetex Semiconductors is committed to environmental excellence in all aspects of its operations which includes meeting or exceeding regulatory requirements with respect to the use of hazardous substances. Numerous successful programs have been implemented to reduce the use of hazardous substances and/or emissions.

All Zetex components are compliant with the RoHS directive, and through this it is supporting its customers in their compliance with WEEE and ELV directives.

---

## Product status key:

"Preview"	Future device intended for production at some point. Samples may be available
"Active"	Product status recommended for new designs
"Last time buy (LTB)"	Device will be discontinued and last time buy period and delivery is in effect
"Not recommended for new designs"	Device is still in production to support existing designs and production
"Obsolete"	Production has been discontinued

---

## Datasheet status key:

"Draft version"	This term denotes a very early datasheet version and contains highly provisional information, which may change in any manner without notice.
"Provisional version"	This term denotes a pre-release datasheet. It provides a clear indication of anticipated performance. However, changes to the test conditions and specifications may occur, at any time and without notice.
"Issue"	This term denotes an issued datasheet containing finalized specifications. However, changes to specifications may occur, at any time and without notice.

---

Europe	Americas	Asia Pacific	Corporate Headquarters
Zetex GmbH Kustermann-park Balanstraße 59 D-81541 München Germany Telefon: (49) 89 45 49 49 0 Fax: (49) 89 45 49 49 49 europe.sales@zetex.com	Zetex Inc 700 Veterans Memorial Highway Hauppauge, NY 11788 USA Telephone: (1) 631 360 2222 Fax: (1) 631 360 8222 usa.sales@zetex.com	Zetex (Asia Ltd) 3701-04 Metroplaza Tower 1 Hing Fong Road, Kwai Fong Hong Kong Telephone: (852) 26100 611 Fax: (852) 24250 494 asia.sales@zetex.com	Zetex Semiconductors plc Zetex Technology Park, Chadderton Oldham, OL9 9LL United Kingdom Telephone (44) 161 622 4444 Fax: (44) 161 622 4446 hq@zetex.com

---

© 2006 Published by Zetex Semiconductors plc.