

# ZXSC310EV3 USER GUIDE

## DESCRIPTION

The ZXSC310 is a single or multi cell LED driver in an SOT23-5 package. The use of an external switching BJT or Mosfet enables various circuit topologies.

The ZXSC310EV3 is configured as a buck-boost converter to drive a 1W LED from 3 NiCd/NiMH or Alkaline batteries.

## FEATURES

- Drives a 1W white LED at 350mA
- Typical efficiency of 75%

## APPLICATIONS

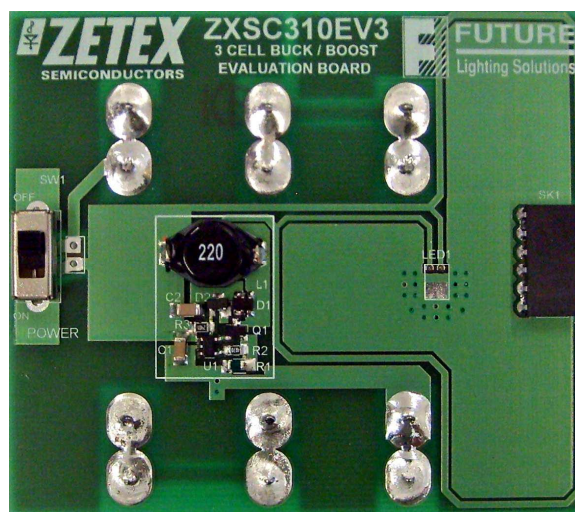
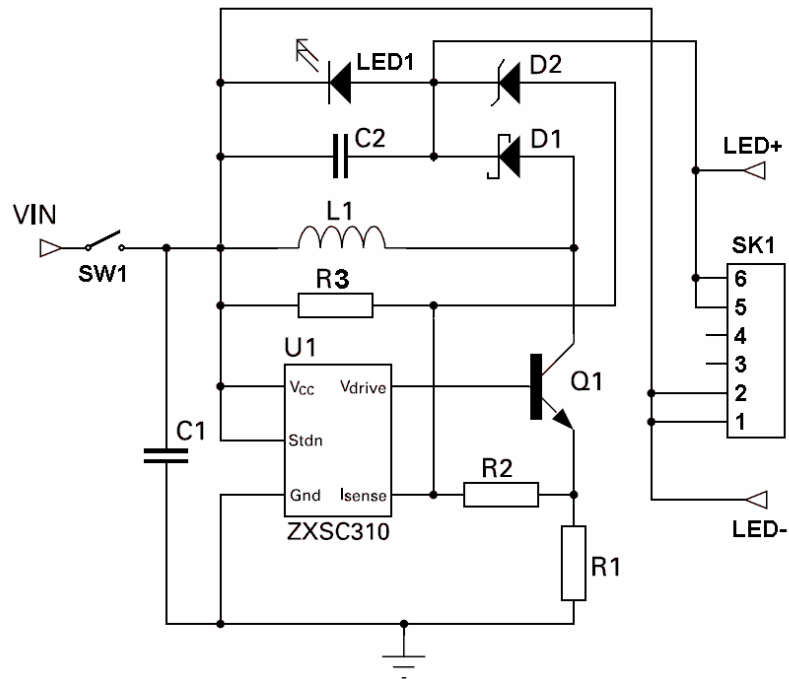
- LED torches
- High Power LED driving

## ORDERING INFORMATION

ORDER NUMBER
ZXSC310EV3

Please note evaluation boards are subject to availability and qualified leads.

## TYPICAL APPLICATION CIRCUIT



ZXSC310EV3 EVALUATION BOARD

# ZXSC310EV3

ISSUE 1 - September 2007

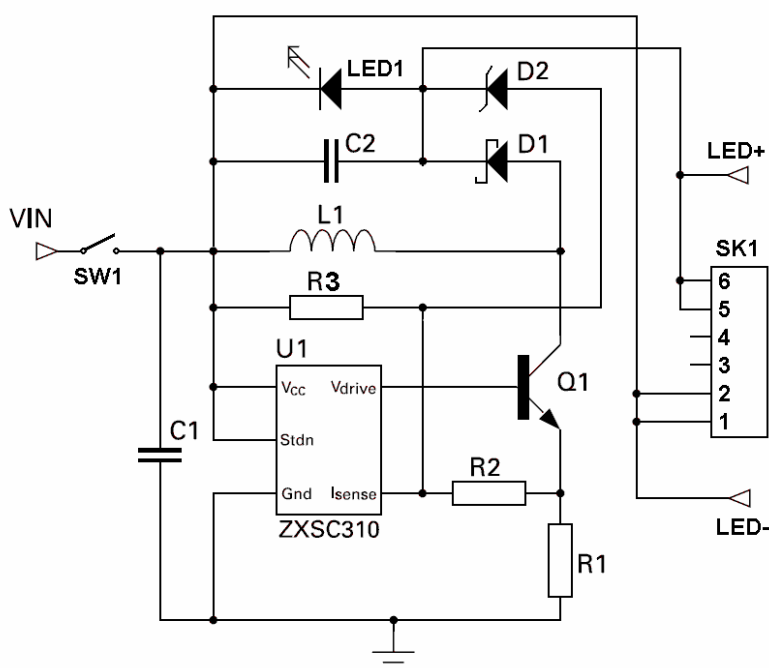
## REFERENCE DESIGN

The ZXSC310EV3 is configured to the reference design below. The use of buck-boost topology enables the input voltage to range from below to above the LED voltage. The target application is a 1W white LED being driven from a 3 NiCd/NiMH or alkaline battery input, for torches and high powered LED driving. R1,R2 and R3 form an input voltage feed-forward network, which lowers the effective Isense threshold when input voltage goes high. This provides flatter response of LED current against input voltage. Zener diode D3 causes Isense to be held high (above 20mV) when the output is over voltage. This acts as open circuit protection.

The supply voltage for ZXSC310EV3 is: VIN=2.6V ~ 5V.  
For other reference designs or further applications information please refer to the ZXSC310 datasheet.

**WARNING: Exposed battery connections exist on the front and back of the board. Do not cause the batteries to short-circuit by placing it on a conductive surface or allowing other conductive materials to come into contact with it.**

### Schematic Diagram

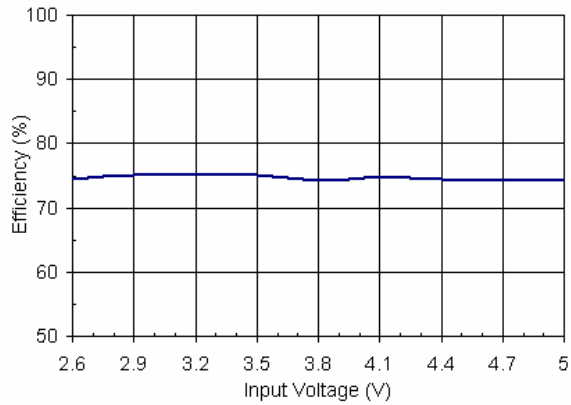


### Parts List

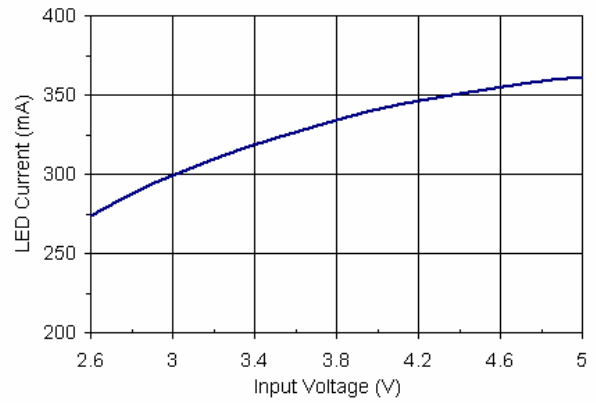
Ref	Value	Package	Part Number	Manufacturer	Notes
U1	N/A	SOT23-5	ZXSC310E5	Zetex	Boost LED Driver
Q1	N/A	SOT23	ZXTN25012EFH	Zetex	Low sat NPN transistor
D1	40V / 2A	SOT23-6	ZHCS2000	Zetex	Schottky diode
D2	12V/0.25W	SOT23	BZX84C12	Generic	Zener diode
L1	22uH / 2.5A	N/A	NPI31W220MTRF	NIC Components	SMT Inductor
R1	18mΩ	0805		Generic	1% tolerance
R2	4.7Ω	0805		Generic	1% tolerance
R3	2.4kΩ	0805		Generic	1% tolerance
C1,C2	4.7μF / 10V	1206	GRM31CR71A475KA01L NMC1206X7R475K10TRLPF	Murata NIC Components	X7R
SW1	n/a	n/a			Slide switch
SK1	n/a	6 way	5535676-5	Tyco	

## PERFORMANCE

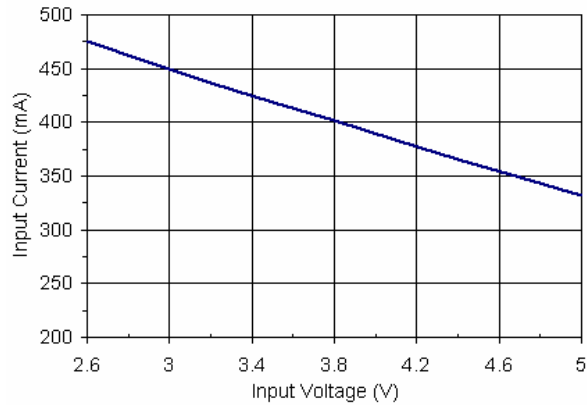
### Graphs



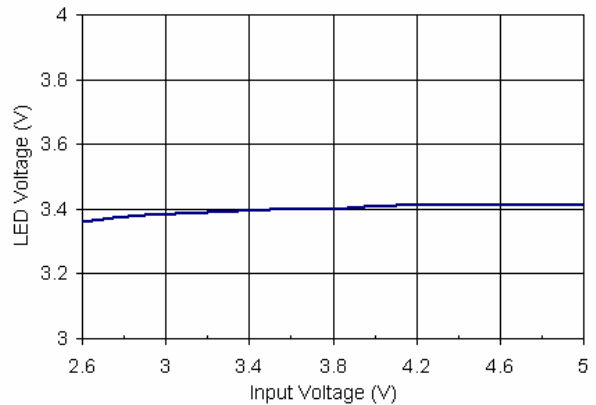
Efficiency vs Input Voltage



LED Current vs Input Voltage



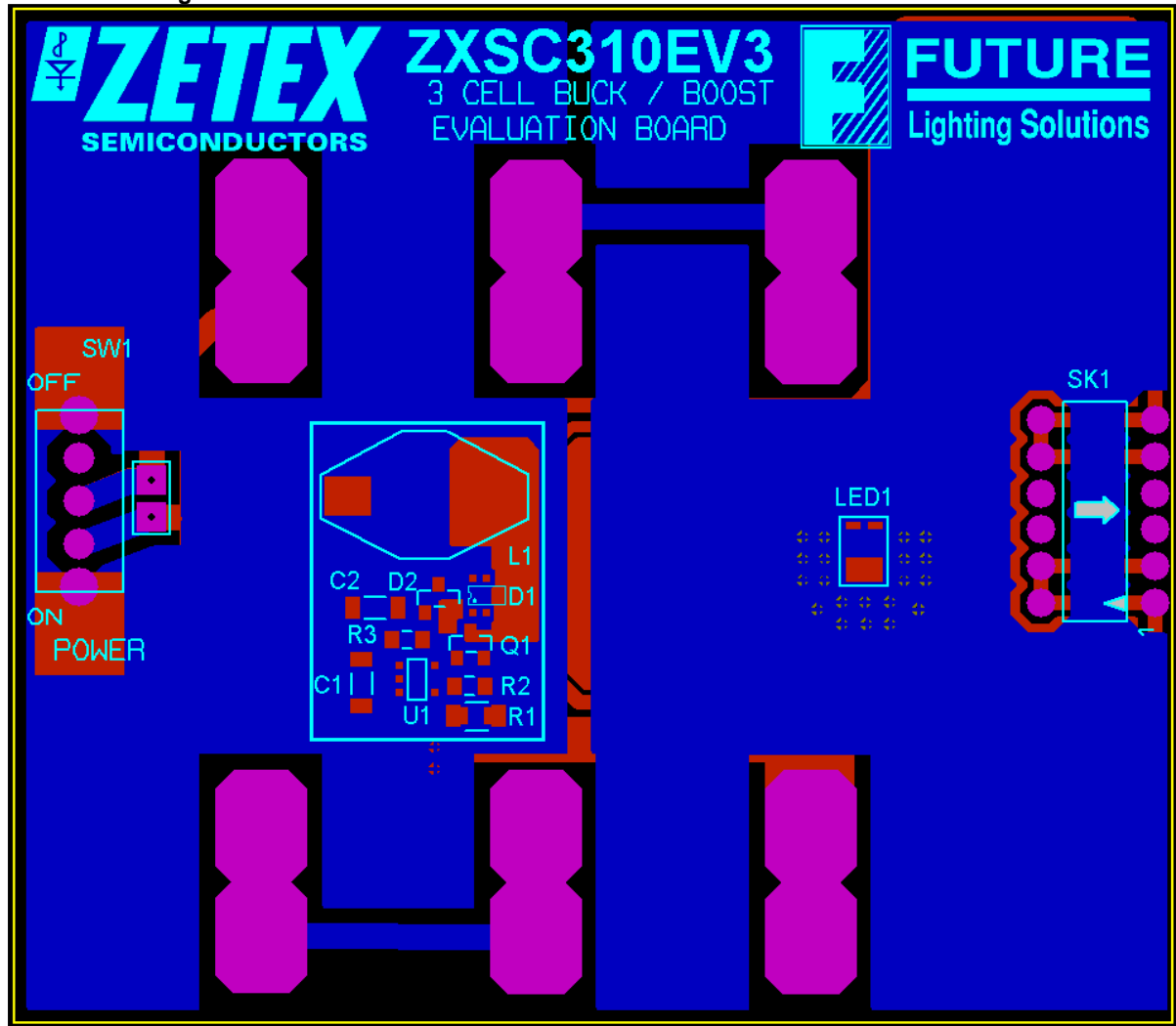
Input Current vs Input Voltage



LED Voltage vs Input Voltage

## ZXSC310EV3 OPERATION

### Connection diagram



### ZXSC310EV3 Set-up and Test

**WARNING: Exposed battery connections exist on the front and back of the board. Do not cause the batteries to short-circuit by placing it on a conductive surface or allowing other conductive materials to come into contact with it.**

1. Ensure that the 'POWER' switch is set to 'OFF'
2. Insert three 'AA' size alkaline or NiCd/NiMH batteries as depicted on the rear of the board, or connect a power supply to the battery clips. (positive to BAT1 + and negative to BAT3 - )
3. Set the PSU to 4.5V (if used).
4. Connect a suitable Lumileds™ Luxeon® emitter board to connector SK1. (The LED must be capable of handling 350mA)
5. Turn on the PSU (if used).
6. Turn the 'POWER' switch to 'ON'
7. The LED should illuminate, and the LED current should be regulated at 350mA +/-10%.
8. The input current should measure between 300mA ~ 400mA - **THIS IS A FUNCTIONAL BOARD.**

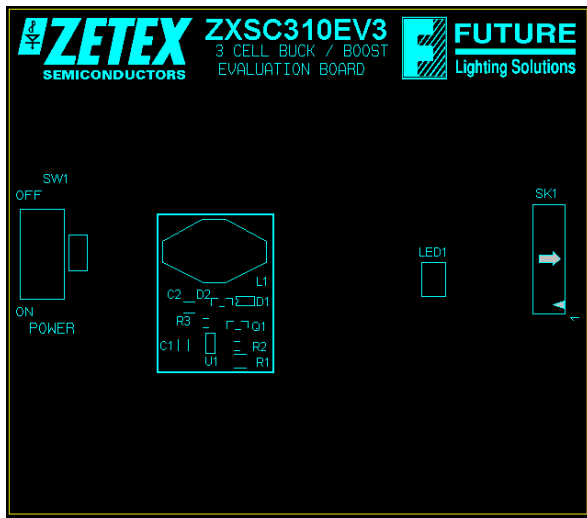
## ZXSC310EV3

ISSUE 1 - September 2007

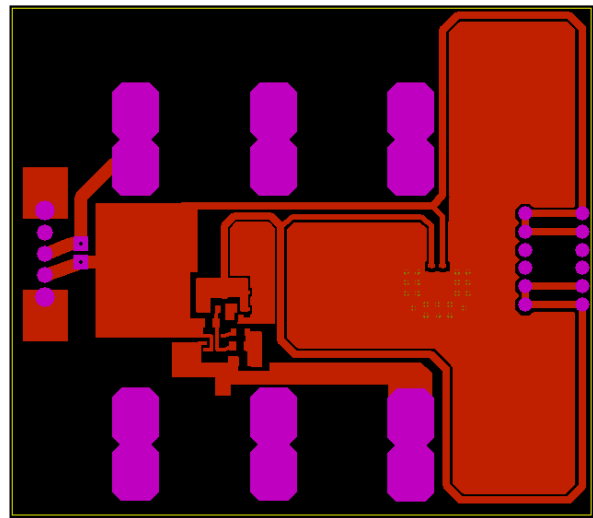
## Layout considerations

PCB tracks should be kept as short as possible to minimise ground bounce, and the ground pin of the device should be soldered directly to the ground plane. It is particularly important to mount the inductor and the input/output capacitors close to the device to minimise parasitic resistance and inductance, which will degrade the efficiency. The FB pin is a high impedance input, so PCB track lengths to this should also be kept as short as possible to reduce noise pickup. Excess capacitance from the FB pin to ground should be avoided.

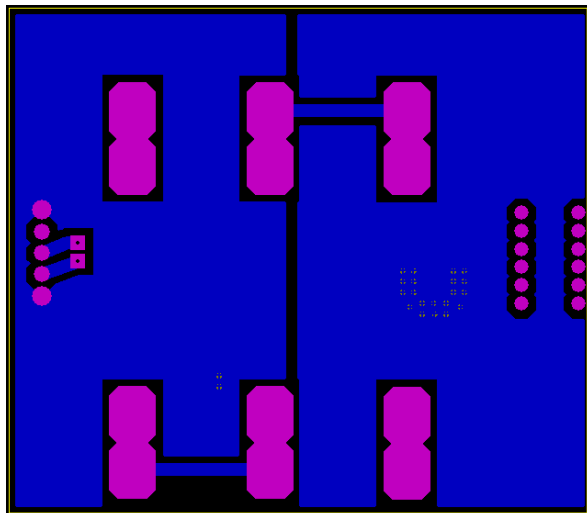
Below (contained within the box), is the recommended layout of the ZXSC310 driver circuitry.



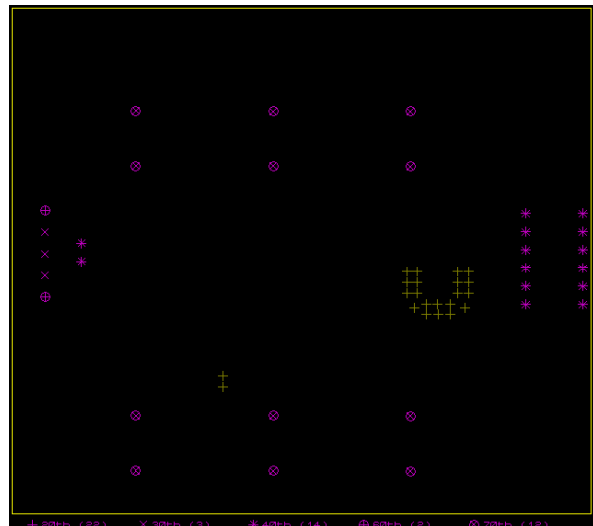
Top Silk



Top Copper



Bottom Copper



Drill File

## Definitions

### 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 Telephone: (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.