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ZXSC310 Solution to drive 8 LEDs connected in series

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Description

Low cost, small simple and low power multi-LED drive solutions are important in applications including LCD backlight, key illuminations and effects for handheld devices (e.g. cell phones), signage and indicators. The LED current is generally between 10mA to 30mA and is powered from a single cell Li-Ion or three cell alkaline/NiMH/NiCad batteries. For battery powered applications low shutdown quiescent current is important to conserve battery life.

Figure 1 shows a simple low cost boost convertor, ZXSC310, driving eight series connected LEDs. ZXSC310 is in a small SOT23-5 package. The design solution is for an application with an input voltage range of 4.5V to 2.5V (e.g. a single cell Li-Ion can have a voltage range of 4.3V to 2.6V) with LED current optimized at 20mA typical, at 4.0V supply. The LED current at 4V is chosen to match the 20mA typical forward current of the LED used.

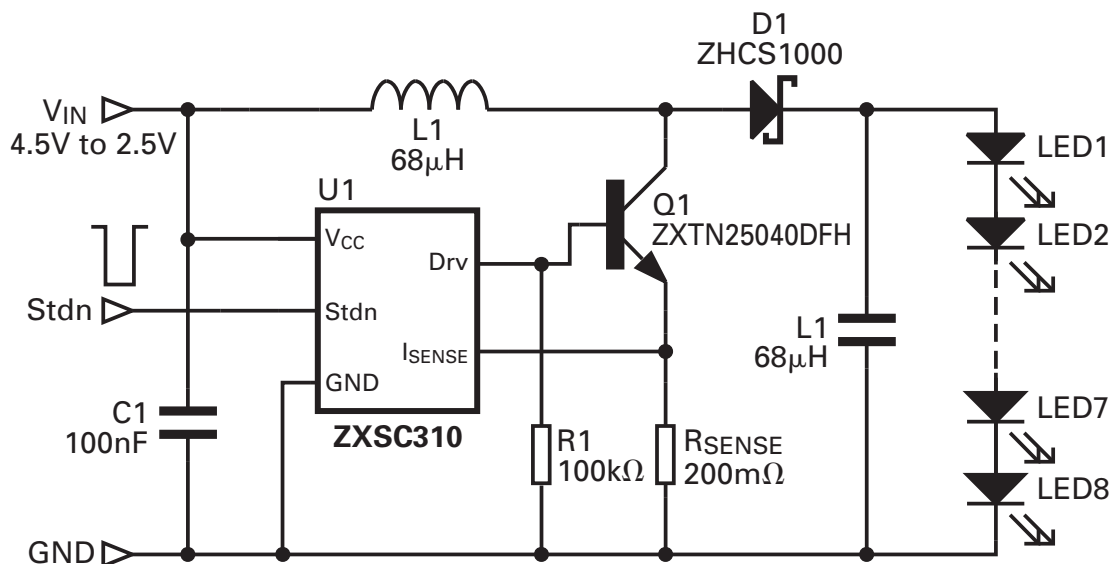


Figure 1 Schematic diagram

With a single cell Li-Ion battery, the circuit in Figure 1 can drive 3 or more series connected LEDs, the maximum number of LEDs limited by the breakdown voltage of the bipolar transistor Q1. Depending on the number of LEDs connected in series, the sense resistor, R_{SENSE} , will have to be adjusted to obtain the required LED current at a certain supply voltage.

The ZXSC310 can be shutdown by pulling the Stdn pin low. The quiescent current in the shutdown mode is typically 5µA. If shutdown feature is not required tie the Stdn pin to the V_{CC} pin.

Figure 2 shows the efficiency and the LED current against supply voltage. The LED current decreases with the supply voltage. This helps to draw less current from a discharged battery.

The bill of materials for the circuit in Figure 1 is shown in Table 1.

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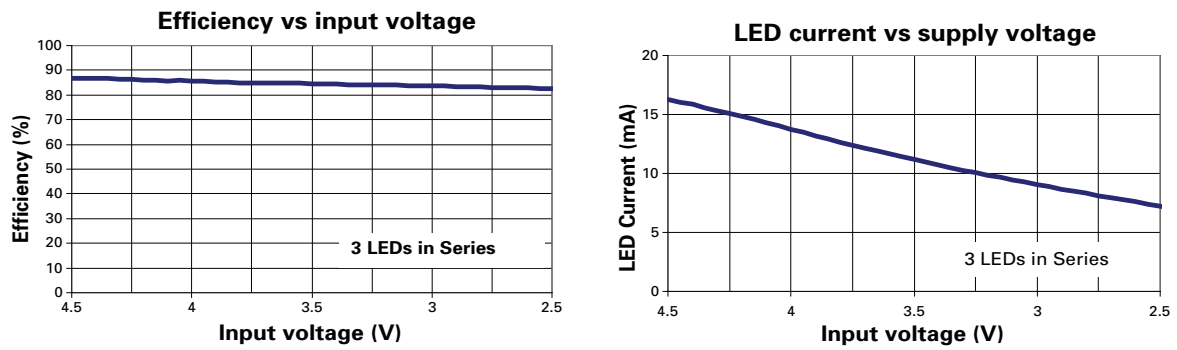


Figure 2 Performance graphs

Ref.	Part no.	Value	Manufacturer	Contact details
U1	ZXSC310E5	NA	Zetex	www.zetex.com
Q1	ZXTN25040DFH	NPN, $V_{CEO} = 40V$	Zetex	www.zetex.com
D1	ZHCS1000	1A, low forward voltage V_F	Zetex	www.zetex.com
R_{SENSE}	Generic	200m Ω	Generic	NA
R1	Generic	100k Ω	Generic	NA
C1	Generic	100nF, 6.3V, X7R	Generic	NA
C2	Generic	2.2 μ F, 35V	Generic	NA
L1	DO1608P-683	68 μ H	Coilcraft	www.coilcraft.com
LED1-8	NSPMW500BS	White LED	Nichia	www.nichia.com

Table 1 Bill of materials

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