

White LED shines from piezoelectric-oscillator supply

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LED drivers that receive their power from a single cell are receiving a great deal of attention. To generate the high voltage for illuminating a white LED from a low-voltage power supply basically requires some form of an electronic oscillator, and one of the simplest is a piezoelectric buzzer. An unusual application of a piezoelectric transducer serves as an oscillator and drives a white LED (Figure 1). The piezoelectric diaphragm, or bender plate, comprises a piezoelectric ceramic plate, with electrodes on both sides, attached to a metal plate made of brass, stainless steel, or a similar material with conductive ad-

hesive. The circuit uses a three-terminal piezoelectric transducer. In this transducer, the diaphragm has a feedback tab on one of its electrodes. The oscillation is a result of the resonance between the inductor and the element, which is capacitive. The frequency of operation is: $f_{OSC} = 1/(2\pi\sqrt{LC})$, where L is the value of the inductor and C is the capacitance of the piezoelectric element.

With the initial application of potential to the circuit in Figure 1, transistor Q_1 turns on. When the transistor conducts, the current through inductor L_1 increases gradually, and the potential across the plates flexes the piezoelectric ceramic. This flexing generates a negative potential at the feedback tab, which feeds back to the base of the transistor. The transistor then switches off. When turn-off occurs, the stored energy in the inductor dumps into the LED. This flyback voltage is sufficient to light the LED.

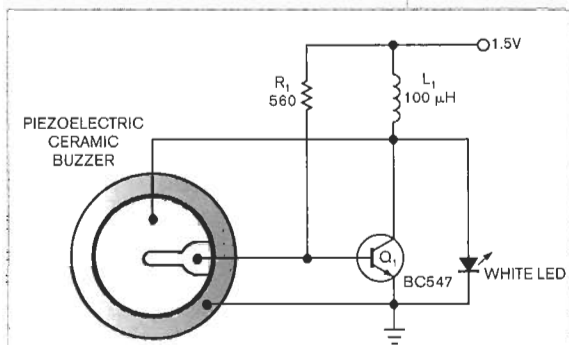
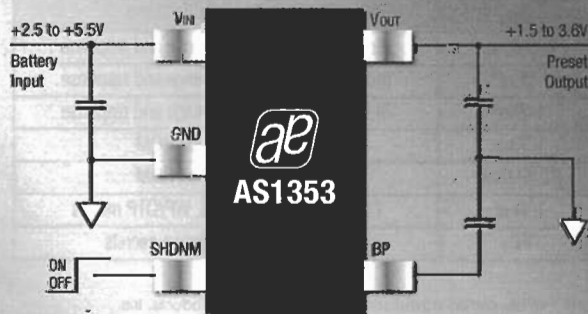


Figure 1 A piezoelectric ceramic buzzer serves as the oscillator in this flyback supply that lights a white LED using a single cell (not shown).

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