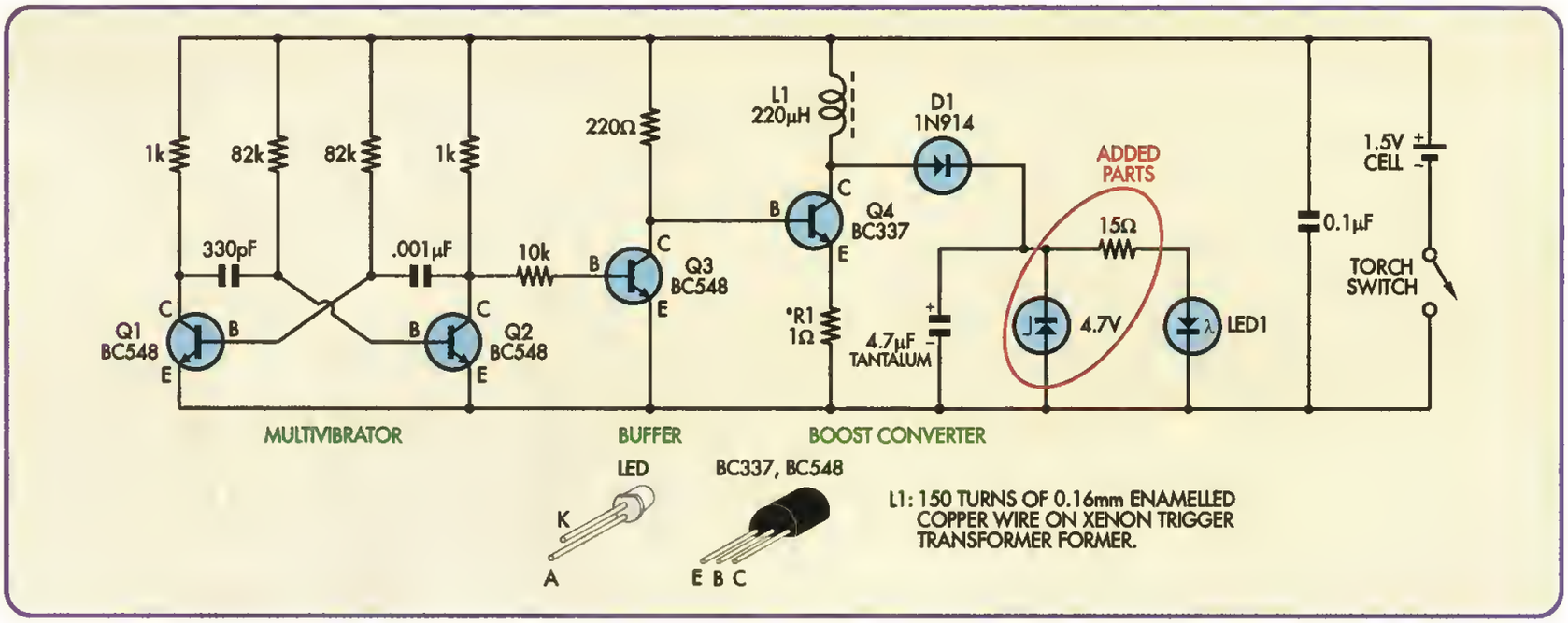
CIRCUIT NOTEBOOK

Interesting circuit ideas which we have checked but not built and tested. Contributions from readers are welcome and will be paid for at standard rates.



Protection for white LED in torch

The article on the LED Torch published in the December 2000 issue warns against powering up the circuit without the LED and then subsequently connecting the LED. This can destroy the white LED from over-current due to the over-charged tantalum capacitor. While this should be a "remote possibility" because the LED is hard-wired into the circuit, in fact that LED-destroying condition can occur fairly easily.

The problem arises when the screw-type torch is used and the wire twists off, as it inevitably will, from screwing and unscrewing to change the battery (or what is more likely, to show other interested parties what is inside!). Then, when investigating why the LED will not light, the LED can make momentary contact again and will immediately blow from over-current.

The suggested fix limits the voltage across the tantalum capacitor with a 4.7V zener diode (which normally does nothing because the LED holds the zener below its operating voltage) and uses a 15Ω limiting resistor in series with the LED to ensure that it can be safely connected or disconnected and at no time exceed the 200mA rated absolute maximum peak LED current.

The 15Ω resistor does waste some power but this amounts to less than 10% and is well worth sacrificing to help provide a fail-safe circuit for the expensive LED.

The zener also protects the tantalum capacitor from over-voltage breakdown that can otherwise occur when the LED is not in circuit.

The total cost of the modification is less than 50 cents and the additional components can be mounted on the existing PC board.

Rick Matthews,
Adelaide, SA. ($30)

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