

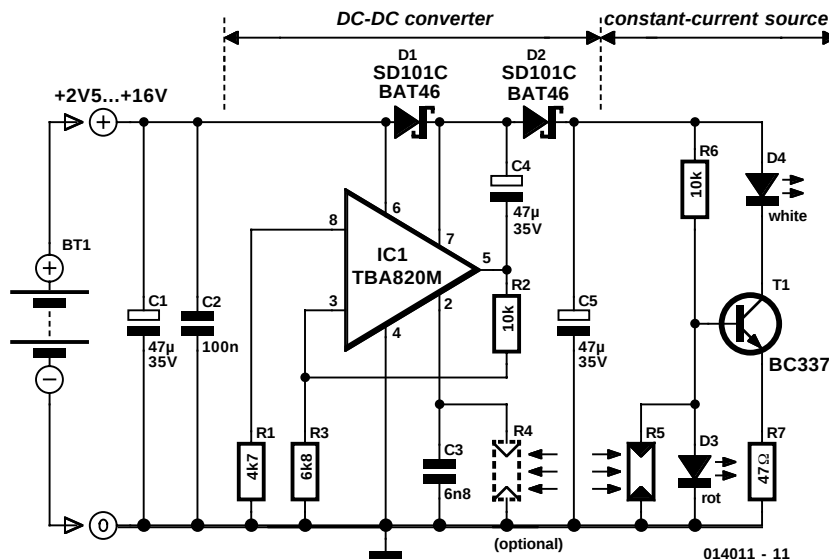
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More and more electronic devices are portable and run off batteries. It is no surprise, then, that so many flat batteries find their way into the bin — and often far too early. When a set of batteries can no longer run some device — for example, a flashgun — the cells are not necessarily completely discharged. If you put an apparently unserviceable AA-size cell into a radio-controlled clock with an LCD display it will run for months if not years.

Of course not every partially discharged cell can be put in a clock. The circuit presented here lets you squeeze the last Watt-second out of your batteries, providing a bright ‘night light’ — for free!

The circuit features a TBA820M, a cheap audio power amplifier capable of operating from a very low supply voltage. Here it is connected as an astable multivibrator running at a frequency of around 13 kHz. Together with the two diodes and electrolytic capacitor this forms a DC-DC converter which can almost double the voltage from between four and eight series-connected AA-, C- or D-size cells, or from a PP3-style battery.

The DC-DC converter is followed by a constant current source which drives the LED. This protects the expensive white LED: the voltages obtained from old batteries can vary considerably. With the use of the DC-DC converter and 20 mA constant current source a much greater range of usable input voltages is achieved, particularly helpful at the lower end of the range when old batteries are used.



With the constant current source on its own the white LED would not be adequately bright when run from low voltages.

An additional feature is the ‘automatic eye’. The LDR detects when the normal room lighting is switched on or when the room is lit by sunlight: its resistance decreases. This reduces the U_{BE} of the transistor below 0.7 V, the BC337 turns off and deactivates the LED. This prolongs further the life of the old batteries. A further LDR across capacitor C reduces the quiescent current of the circuit to just 4 mA (at 4 V). Light from the white LED must of course not fall on the LDR, or the current saving function will not work.

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