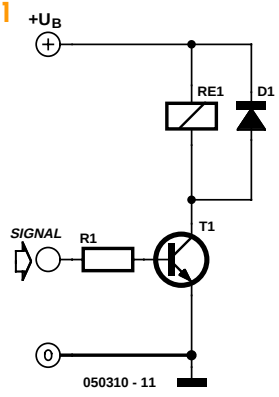
Energy recovery

1



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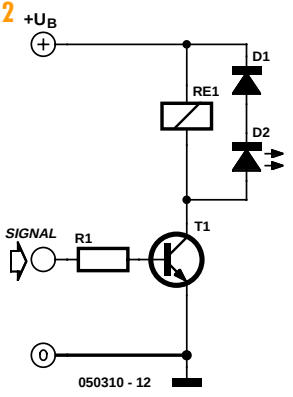

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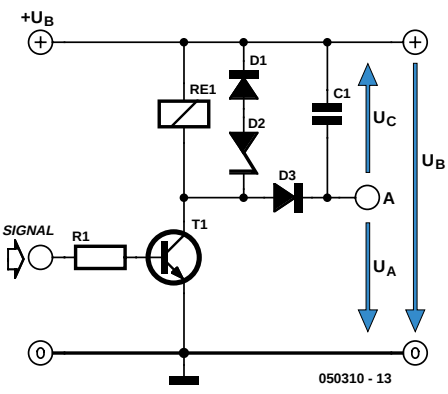

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Energy is becoming more and more expensive, and so we are always on the lookout for ways to save energy in circuits. The author has decided to look at how to recovery energy from a relay switching circuit.

If a relay is driven by a transistor switching stage it is usual to connect a flywheel diode in parallel with the coil to short out the back EMF produced when the relay current is switched off (**Figure 1**). If an LED is wired in series with the flywheel diode (**Figure 2**) it will flash every time there is an inductive spike with the transistor turns off. The duration and brightness of the flash (and indeed, whether the spike is large enough to destroy the LED!) depend on the rate of change of the current in the relay coil and its inductance:

$u_i = -L\ di / dt$

So far we have not actually recovered any energy. **Figure 3** shows a theoretical design where the energy stored in the relay coil is recovered so that it can be used to supply a (low-power) circuit. The greater the inductance of the coil and the more frequently it is switched, the more energy is stored in capacitor C. The zener diode (in series with the flywheel diode) limits the maximum voltage to which the capacitor can be charged. Measured relative to ground the open-circuit voltage at point A is the sum of the capacitor voltage due to the recovered energy and the supply voltage. In particular, the voltage at point A is higher than the supply voltage.

The author would be interested in discussing these ideas further with readers. His e-mail address is info@peterlay.de.

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