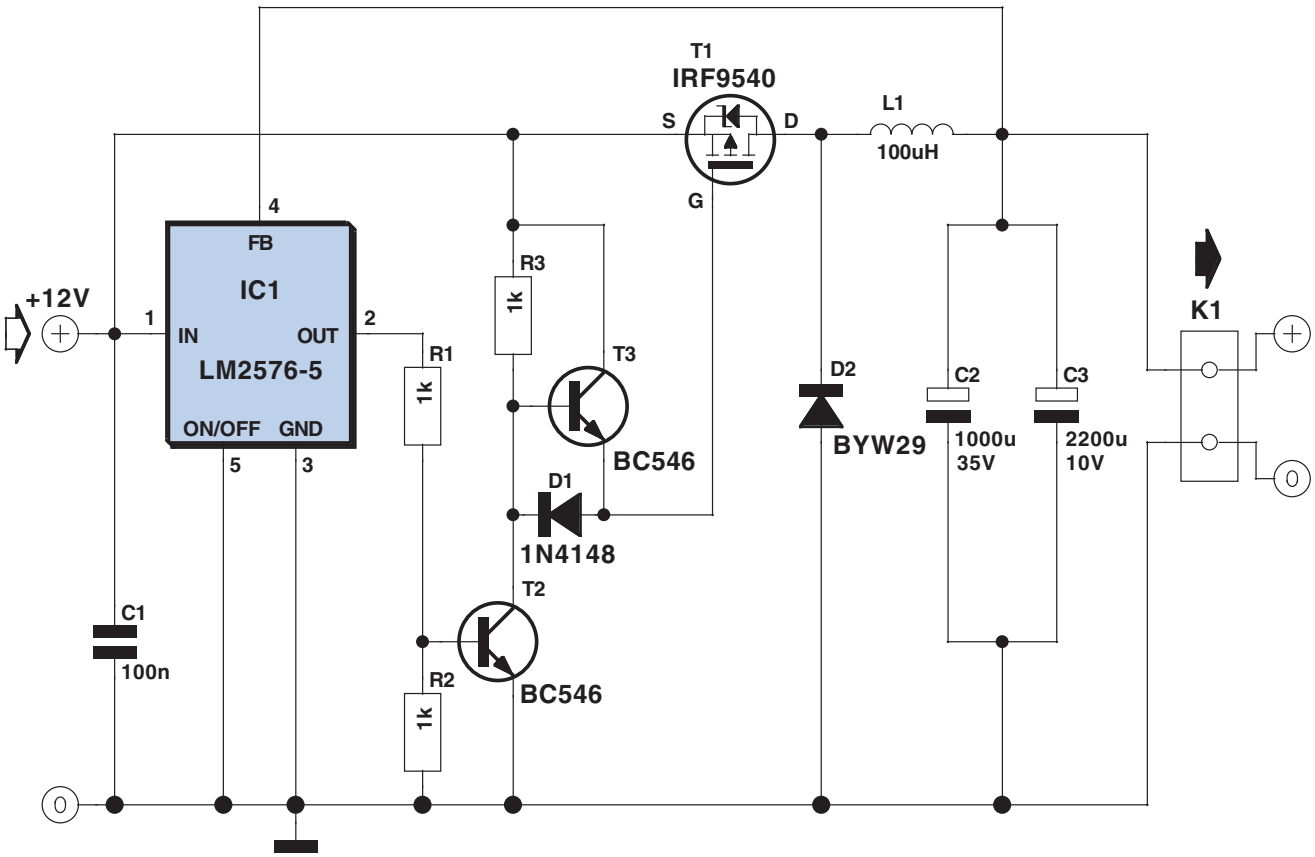
Free E-Weekly Circuit

More Current from an LM2575



FCKT0053

Theory

A. Vogel

The LM2575 is a 'Simple Switcher' from National Semiconductor, which means it's a switch-mode controller IC that's relatively easy to use. The members of the Simple Switcher family are designed for output currents of 1 A, 3 A and 5 A. However, sometimes even more current is necessary. A 'professional' designer solves this problem by using a PWM controller with an external power MOSFET, but such controllers (and integrated controllers with even higher output currents) are rather expensive, difficult to obtain and highly susceptible to design errors.

The best solution is thus to increase the output current of a Simple Switcher. This can be done by using the output signal to drive an external power switch in the form of a p-channel MOSFET with a low 'on' resistance. The Simple Switcher, in this case an LM2576, is only used as a switching circuit. When its output is on (High), transistor T2 conducts and pulls the gate of the MOSFET to ground potential via D1. By contrast, T2 is cut off when the output of the switching controller is low. The gate capacitance is then discharged via T3 and D1, causing the MOSFET to quickly switch off. Without this emitter follower, the gate capacitance could only be discharged much more slowly via R3. Seen from the outside, the circuit acts the same as a simple LM2575 (aside from the increased output current, of course).

We must also mention a drawback of this arrangement: the circuit does not have short-circuit protection or overtemperature protection. This must be taken into account when it is used.

The BC546 used for T2 is not especially fast. The power dissipation of T1 decreases if the edges of the gate signal are steeper. It would thus be better to use a BS170 for T2, since it is faster. If a BS170 is used for T1, the value of R1 must be chosen to keep the gate voltage below 12 V. If the input voltage is 12 V, R1 can be replaced by a wire bridge.

Naturally, the output inductor must be suitable for the desired output current, and the core (as well as the output capacitors) must be suitable for use with high-frequency signals.

The following considerations must be borne in mind in designing the circuit board. First, conductors carrying high currents must be as short and broad as possible. In addition, currents flowing into the inductor and electrolytic capacitors must be kept separate from currents flowing out of these components. Finally, the feedback path must never pass through the magnetic field of the inductor.