Fuse Saver

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This circuit will be particularly useful to those hobbyists who use a 'breadboard' to try out ideas and who also use a simple 'home-made' DC power supply consisting of a transformer, rectifier, smoothing capacitor and protective fuse, that is, one without overcurrent protection!

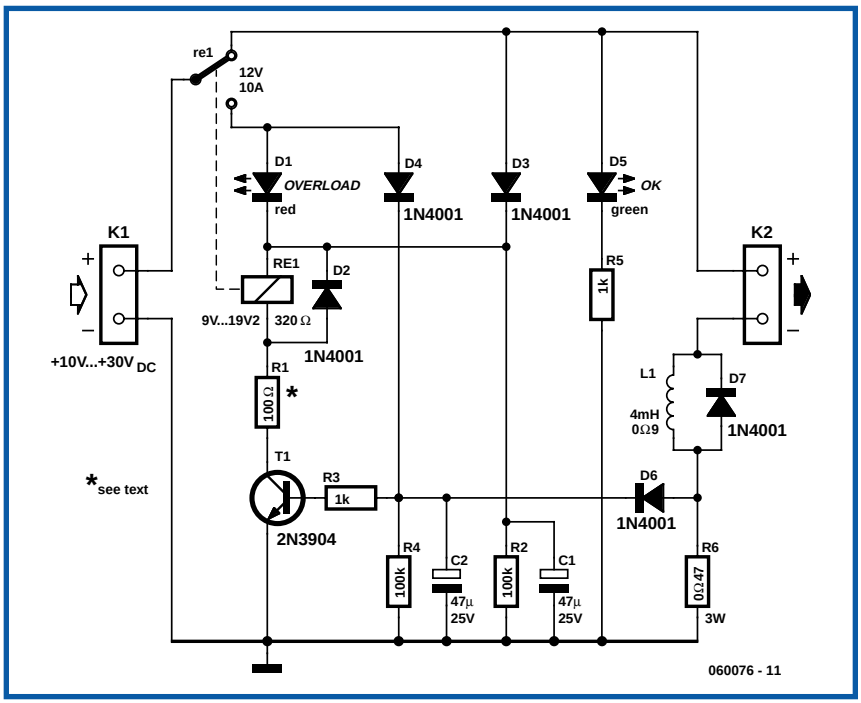
In this circuit, the detecting element is resistor R6. Under normal conditions, its voltage drop is not high enough to switch on transistor T1. The value of R6 can be altered to give a different cut-off current, as determined by Ohm's Law, if required. When a short circuit occurs in the load, the voltage rises rapidly and T1 starts to conduct. This draws in the relay, switching its contacts, which cuts off power to the external circuit, and instead powers the relay coil directly, latching it in this second state. The circuit remains in this state until the primary power supply is switched off.

Capacitors C1 and C2 hold enough charge (via D3, D4 and D6, which prevent the charge from being lost to the rest of the circuit, whichever state it is in) to keep T1 switched on and power the relay while it switches over, and R2 and R4 provide slow discharge paths. LEDs D1 (red) and D5 (green) indicate what state the circuit is in.

Inductor L1 slows the inrush of current when the circuit is switched on, which would otherwise cut off the circuit immediately. D2 and D7 provide the usual back-emf protection across the coils.

In use, the input of the circuit is connected to the main transformer-rectifier-capacitor-fuse power supply via K1, and the output is connected to the (experimental) load via K2. Note that the input voltage *must* be a floating supply if Vout– is grounded via the load, as Vin– and Vout– must not be connected together.

Some consideration needs to be given to



a number of components. First, the choice of relay Re1. For the prototype, this was obtained from Maplin, part number YX97F. This is has a coil resistance of 320 Ω, which with R1 forms the collector load for T1. Its allowed pull-in voltage range is nominally 9 V to 19 V, which limits the input power supply voltage to between around 10 V to 30 V (DC only). R1 could be replaced by a wire link for operation at input voltages below 10 V, or increased in value, as determined by either the application of Ohm's Law once more or trial and error, for an input voltage above 30 V.

Coil L1 was obtained from Farnell, part number 581-240. Finally, the protective fuse for the input power supply should be a 'slow-blow' type; 'fast' fuses will rupture before the relay has time to switch. Also note that this device is meant to save fuses, not replace them. A mains transformer must always be fused if it is not designed to run safely, i.e., without presenting a fire hazard, even if its output has a continuous short-circuit fault.

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