

## Circuit Notebook – Continued

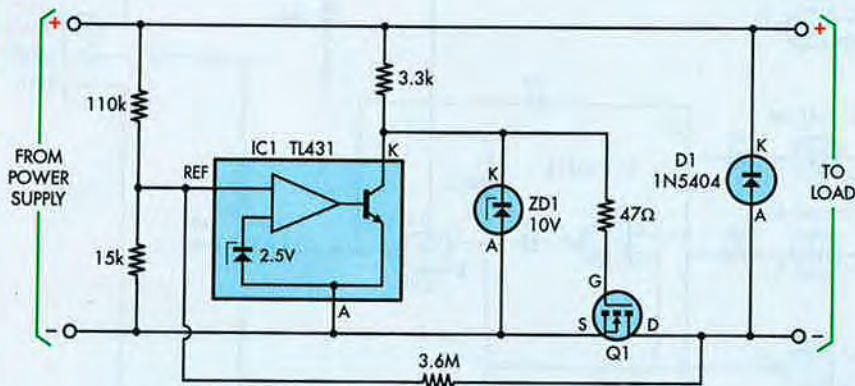


FIG. 1

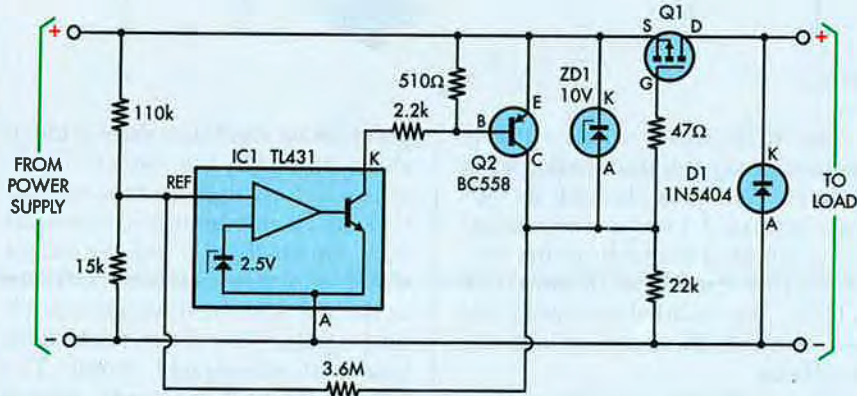


FIG. 2



### Over-voltage protection for DC loads

The popular Triac or SCR crowbar circuit has long been used for over-voltage protection. An over-voltage triggers the crowbar, shorting out the supply. The fuse then blows or the supply current limits to protect the load.

This works but then you have to

switch off the supply and maybe replace the fuse to restart. This can be a real nuisance, particularly if you have a badly behaved power supply with a surge at power on.

The circuit in Fig.1 cuts power to the load and automatically reconnects when the over-voltage condition has passed, ie, no fuses are blown and there is no need to reset the circuit when the overload

condition has passed.

IC1 is a TL431 adjustable shunt regulator used here as a voltage level detector. With the resistor values shown, the supply is cut off at about 21V. For other voltages, replace the 110kΩ with a value calculated to give 2.5V at TL431's reference pin. The 3.6MΩ resistor applies positive feedback and hence hysteresis to speed switching.

The N-channel Mosfet can be any with suitable voltage, current and on resistance ( $R_{DS(on)}$ ) ratings. It may need a heatsink, depending on the load current and  $R_{DS(on)}$ . For example, an IRF540 with an  $R_{DS(on)}$  of .044Ω should have a heatsink at currents more than 5A. However, an IRF1405 with an  $R_{DS(on)}$  of .0053Ω should be OK for currents in excess of 10A without a heatsink. The Mosfet's voltage rating should exceed the input voltage (including spikes).

D1 is only required to suppress the back-EMF from inductive loads. If your supply voltage is less than about 10V, use a logic-level Mosfet such as the FDP7030L (available from Worldwide Electronic Components).

If you want a common negative rail between the power supply and load, then use the circuit in Fig.2. The P-channel Mosfet could be an IRF9540. It should have a heatsink at currents above about 3A. In this circuit, the input voltage should be limited to well below the ratings of the TL431 (37V) and the Mosfet.

Very often, you can find the TL431 IC voltage reference and its clones in switchmode power supplies in PCs and monitors. The uPC1093 is an equivalent to the TL431. They are available from Futurlec and Rockby Electronics: [www.futurlec.com](http://www.futurlec.com) and [www.rockby.com.au](http://www.rockby.com.au)

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