Over Voltage Protection

Safety devices like fuses provide protection against excess current, but do nothing for transients and short duration spikes of high voltage on the power supply lines. This circuit uses the "crowbar" method and provides fast protection against transient voltage spikes, transients that could cause damage to sensitive components.

The thyristor will trigger in a few microseconds. This is over 1000 times faster than an ordinary quick blow fuse. If the output voltage exceeds the limit set by the zener, then it will conduct. The voltage across the 4.7k resistor will rise, the thyristor switches on and the power rails are short circuited. The duration of the short circuit will be only a few milliseconds before the fuse blows. In these few milliseconds the voltage will be greatly reduced. Below is a simulated transient plot, using the TINA program. In the circuit above, and the graph the trip limit is set to 5.6 volts.
The input excitation to the circuit was a very slow triangular wave, superimposed on a 5volt dc supply. As can be seen, the instant the load voltage reaches 5.6 volt, the thyristor conducts and supply voltage to the load is zero. The thyristor is only on for a fraction of a millisecond and does not need a heatsink. Make sure that it can handle the current to blow the fuse. I managed to zoom in on the shear drop and measure the response time using the zoom features at 5 decimal places. The zoomed graph is below:
The response was 480ns or around 0.5 microseconds. Remember, this was simulated only, but the predicted results will be very close to real values. Using a faster thyristor, should decrease the response time further. There is a practical circuit in the Power circuits section. Click here to go there directly.

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