



# OVER-/UNDER-VOLTAGE PROTECTION OF ELECTRICAL APPLIANCES

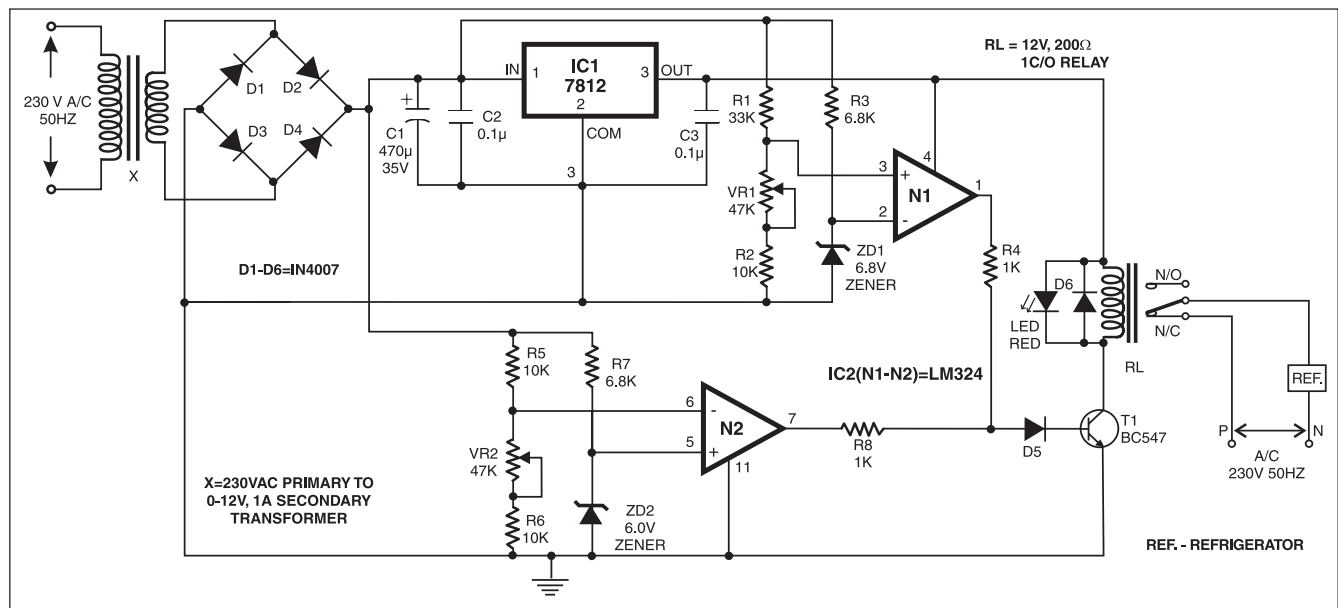
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This circuit protects refrigerators as well as other appliances from over- and under-voltage. Operational amplifier IC LM324 (IC2) is used here as a comparator. IC LM324 consists of four operational amplifiers, of which only two op-

amplifier is zero and transistor T1 remains off. The relay, which is connected to the collector of transistor T1, also remains de-energised. As the AC supply to the electrical appliances is given through the normally closed (N/C) terminal of the relay, the supply is not disconnected during normal operation.

are protected against over-voltage.

Now let's consider the under-voltage condition. When the line voltage is below 180V, the voltage at the inverting terminal (pin 6) of operational amplifier N2 is less than the voltage at the non-inverting terminal (6V). Thus the output of operational amplifier N2 goes high and it



erational amplifiers (N1 and N2) are used in the circuit.

The unregulated power supply is connected to the series combination of resistors R1 and R2 and potmeter VR1. The same supply is also connected to a 6.8V zener diode (ZD1) through resistor R3.

Preset VR1 is adjusted such that for the normal supply of 180V to 240V, the voltage at the non-inverting terminal (pin 3) of operational amplifier N1 is less than 6.8V. Hence the output of the operational

When the AC voltage increases beyond 240V, the voltage at the non-inverting terminal (pin 3) of operational amplifier N1 increases. The voltage at the inverting terminal is still 6.8V because of the zener diode. Thus now if the voltage at pin 3 of the operational amplifier is higher than 6.8V, the output of the operational amplifier goes high to drive transistor T1 and hence energise relay RL. Consequently, the AC supply is disconnected and electrical appliances turn off. Thus the appliances

energises the relay through transistor T1. The AC supply is disconnected and electrical appliances turn off. Thus the appliances are protected against under-voltage. IC1 is wired for a regulated 12V supply.

Thus the relay energises in two conditions: first, if the voltage at pin 3 of IC2 is above 6.8V, and second, if the voltage at pin 6 of IC2 is below 6V. Over-voltage and under-voltage levels can be adjusted using presets VR1 and VR2, respectively.

This circuit costs around Rs 110.