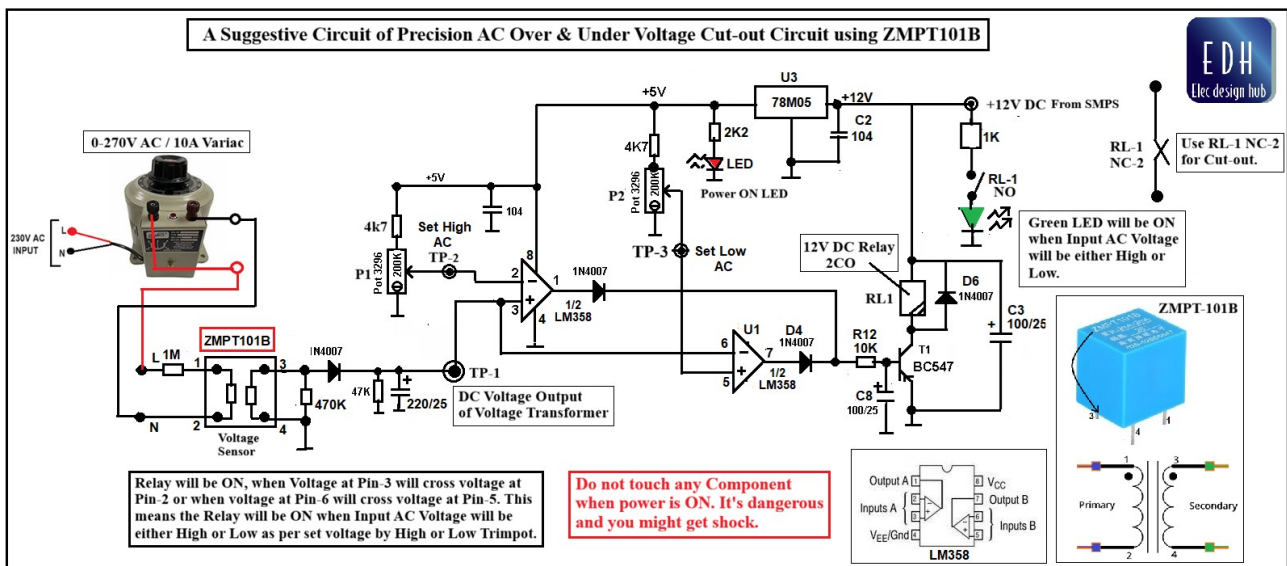


Over / Under AC Voltage Protection Circuit using ZMPT101B

Elec Design Hub has provided an “**Easy to Build**” Over-Under AC Voltage protection Circuit using the popular Voltage Sensor – **ZMPT101B**. The circuit is free, fully tested and a good gesture to OEMS, Young Electronics Engineers and also may be useful for professional electronics engineers. You may use this circuit to protect any Electronic Product from Over & Under AC Voltage input.



[Note: If you find it difficult to read the above circuit, click the “+” button to enlarge it.]

The **ZMPT101B** is a highly popular, active single-phase AC voltage sensor module. It uses a micro-precision voltage transformer to safely measure AC voltages (up to 250V) and step them down to a safe, low-voltage analog signal that microcontrollers like Arduino, ESP32, or Raspberry Pi can read.

About the Over-Voltage & Under-Voltage Protection Circuit using ZMPT101B.

The **ZMPT101B** voltage sensor, **LM358** operational amplifier, and a **12V / 2CO DC relay** is combined to create a fast-acting, adjustable over-under voltage protection circuit. The **ZMPT101B** outputs an analogue voltage proportional to detected input AC Voltage, the LM358 acts as a voltage comparator to detect when that under or over voltage exceeds a pre-set limit. As soon as the Sensor output voltage crosses the pre-set limit, the Relay RL-1 will be activated and the load will be disconnected through the RL-1 NC2 Contact.

Circuit Diagram Description:

- **ZMPT101B Sensor Pins:** The Sensor has 4 Pins. We have marked the Pins as **1, 2, 3 & 4**. We will supply the Sensor ZMPT101B with Pins marked so that you do not have to test and find out the pins. It's best to observe polarity and use the pins as per marking. 1 & 2 are primary pins, connect AC (L) to pin-1 and AC (N) to Pin-2. The input AC Voltage is supplied through a Variac (0-270V – 10A or 5A). The Variac is used to set Trimpots P1 & P2 for Low & High AC Voltage as per your choice. Pin-4 is connected to GND and Pin-3 is connected to a specially designed AC to DC Filter circuit. The AC Output voltage at Pin-3 will be converted to DC Voltage and connected to non-inverting input pins 3 & 6 of LM358. A 200K Trimpot is used to get variable DC Voltage at inverting input Pin 2 of LN358 to set the High AC Voltage. Similarly, a 200K Trimpot is used to get variable DC Voltage at inverting input Pin 5 of LN358 to set the Low AC Voltage.
- **Output Driver:** Connect the LM358 Output (Pin 1) & (Pin 7) together and through a 10k Ω resistor and a 100mfd / 25V Capacitor to the base of an NPN transistor BC547.

- **Relay Stage:** Connect the transistor's collector to one of the terminal of the 12V relay coil, and the transistor's emitter to GND. Connect the other terminal of the relay coil to +12V DC. Wire a 1N4001 freewheeling diode in parallel with the relay coil and an anti-chattering Capacitor 100mfd as shown in the circuit.

Follow the Circuit diagram and details in the diagram, test it and you'll be able to build a precision AC Over & Under Voltage Cut-out Circuit using ZMPT101B.

Should you require any Help or Clarifications, please send a detailed mail to: designer@elecdesignhub.com

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Thanks for reading this document.

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