

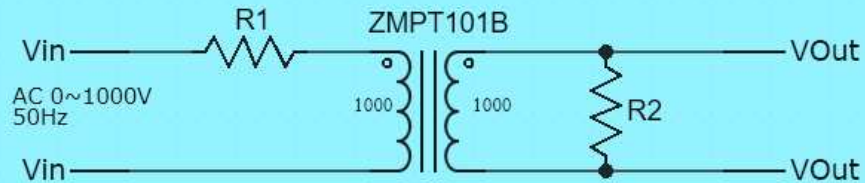


# ZMPT101B

MICRO PRECISION VOLTAGE TRANSFORMERS

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## ZMPT101B schematic/ Wiring Diagram



Vin : Input Voltage      R1 : Limiting Resistor  
 VOut : Output Voltage    R2 : Sampling Resistor

$$V_{out} = (V_{in}/R1) \times R2$$

## Description

ZMPT101B AC Voltage Sensor is the best for the purpose of the DIY project, where we need to measure the accurate AC voltage with voltage transformer. ZMPT101B is an ideal choice to measure the AC voltage using Arduino/ESP8266/Raspberry Pi like an opensource platform. In many electrical projects, engineer directly deals with measurements with few basic requirements like

- High galvanic isolation
- Wide Range
- High accuracy
- Good Consistency

ZMPT101B is a high precision voltage Transformer. This module makes it easy to monitor AC mains voltage upto 1000 volts. A tiny little thing the size of a bouillon cube. Holds up

to 4kV per breakdown voltage, the ratio of turns is 1: 1, but this is a current transformer of 2mA: 2mA. That is, we feed it a current and remove the current. The input current is simply set by the resistor in series R1, and a sampling resistor R2 is used in parallel to obtain the output voltage.

## ZMPT101B Calculation

R1 is chosen so that the current through the winding does not exceed 2mA, it holds a maximum of 10mA, but after 2mA linearity is lost and the output will be clear that.

### Step 1: Determination of maximum output rms voltage

V<sub>Outmax</sub> is decided by the ADC peak voltage in the sampling loop of Microcontroller.

#### For Bipolar ADC

$$V_{Outmax} = \frac{\text{Peak Voltage}}{\sqrt{2}} \text{ For example}$$

As for  $\pm 5V$  ADC, the maximum rms voltage of the transformer:

$$V_{Outmax} = \frac{\text{Peak Voltage}}{\sqrt{2}} = \frac{5V}{\sqrt{2}} = 3.53V$$

#### For Unipolar ADC

$$V_{Outmax} = \frac{\text{Peak Voltage}}{2\sqrt{2}}$$

For example

As for 0-3.3V ADC, the maximum rms voltage of the transformer:

$$V_{Outmax} = \frac{\text{Peak Voltage}}{2\sqrt{2}} = \frac{3.3V}{2\sqrt{2}} = 1.16V$$

## Step 2: Determination of input current-limiting resistor R1

Current-limiting resistor

$$R1 = \frac{V_{in}}{I}$$

Where

$V_{in}$  : Rated input voltage

$I$  : Rated operating current ( when Coil resistance is compared with current-limiting resistor R1, it can be ignored.)

**ZMPT101B** usually working at rated current: **1~2mA**.

When Rated input voltage  $\leq 100V$  , Usually choosing the operating current  $I=2mA$ ;

When Rated input voltage  $\geq 220V$ , To reducing the resistor power, usually choosing the operating current **1 mA  $\leq I \leq 2$  mA**.

for example:  $V=100V$ ,  $I=2$  mA,

$$R1 = \frac{V_{in}}{I} = \frac{100}{0.002} = 50k\Omega$$

for example:  $V=220V$ ,  $I=1.1$  mA,

$$R1 = \frac{V_{in}}{I} = \frac{220}{0.0011} = 200k\Omega$$

To improve reliability, the current-limiting resistor selected usually is greater than its 4times the rated power, and generally use a high temperature coefficient metal film resistor.

### Step 3: Determination of the sampling resistor R<sub>2</sub>

$$R_2 = \frac{V_{Outmax}}{I} = \frac{V_{Outmax}}{V_{in}} \times R_1 \ \Omega$$

for example:  $V_{outmax} = 3.53V$ ,  $V_{in} = 100V$

$$R_2 = \frac{V_{Outmax}}{I} = \frac{V_{Outmax}}{V_{in}} \times R_1 = \frac{3.53}{100} \times 50 \text{ k}\Omega = 1.765 \text{ k}\Omega$$

- Above formula is also suitable for the two ways of active and passive output.
- When selecting the sampling resistor, Resistor should not exceed

$$R_2 = \frac{V_{Outmax}}{I} = \frac{V_{Outmax}}{V_{in}} \times R_1 \ \Omega$$