Panel Multimeter

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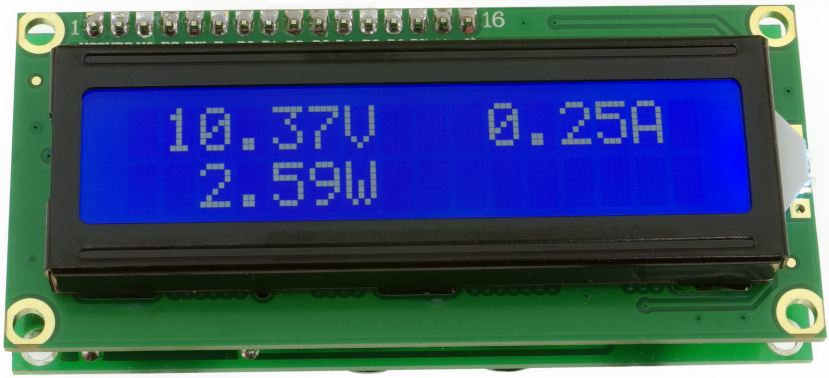
AVT 5333



ZOOM

ASSEMBLY DIFFICULTY

The multimeter combines the functions of a voltmeter, ammeter and rms power meter. It is a microprocessor-based system working with an A/D converter embedded in a microcontroller. This uncomplicated in construction, versatile and universal multimeter measures voltage in the range 0-50 V and current in the range 0-5 A.

Features

- voltage measurement in the range 0-50V, resolution approx. 50 mV
- current measurement in the range 0-5 A
- measurement of power consumption
- LCD 2×16
- power supply 7-16 VDC
- optional temperature measurement: -55 ... +125°C,
- works with DS1820/18S20/18B20 sensors (automatic recognition)

Circuit description

Multimeter schematic diagram is shown in Figure 1. It is powered by an external voltage source of 7-12 V and a current capacity of 100 mA (depending on the display used). Circuits on the multimeter board are supplied with 5 V derived from the 7805 stabiliser. Filter capacitors are used at the input and output of the stabiliser. "The heart" of this device is an ATmega8 microcontroller, equipped with a 6-channel A/D converter. The microcontroller is clocked by an 8 MHz clock signal obtained from an on-board RC generator. Alphanumeric display module with a resolution of 2 lines×16 characters is used to display the measurement results. Precision potentiometer PR2 and resistors R3 and R4 act as input voltage dividers. Due to it, the range of the measured voltage can be set precisely. The measuring input of the ammeter has a protection consisting of a resistor and a 5.1 V Zener diode. When the power is switched on, the display shows a welcome screen. After approximately 1sec, three (optionally four) values will be displayed on the screen:

- **voltage on the load, expressed in volts**
- **measured current, expressed in amperes**
- **power consumed by the load, expressed in watts**
- **optionally - after connecting temperature sensor type DS1820/18S20/18B20 - temperature, expressed in °C**

Measured voltage is applied to the input of the first channel of the A/D converter via a divider (resistors R3, R4, potentiometer PR2). To obtain a voltage measurement range of 0-50 V, adjust the potentiometer slide in such a way as to the input voltage was split 1:10.

This will be mentioned when describing the calibration procedure. To avoid 'oscillation' of the last digit of the measurement result, the voltage is measured 100 times and then the average value is calculated, converted to volts and displayed on the LCD. Current is measured indirectly by measuring the voltage drop across resistor R1 connected in series from the minus side of the supply to the circuit being measured. To obtain the current, the result of measuring the voltage drop across the resistor is divided by the resistance of the resistor. Again, 100 measurements are taken and their arithmetic mean is calculated.

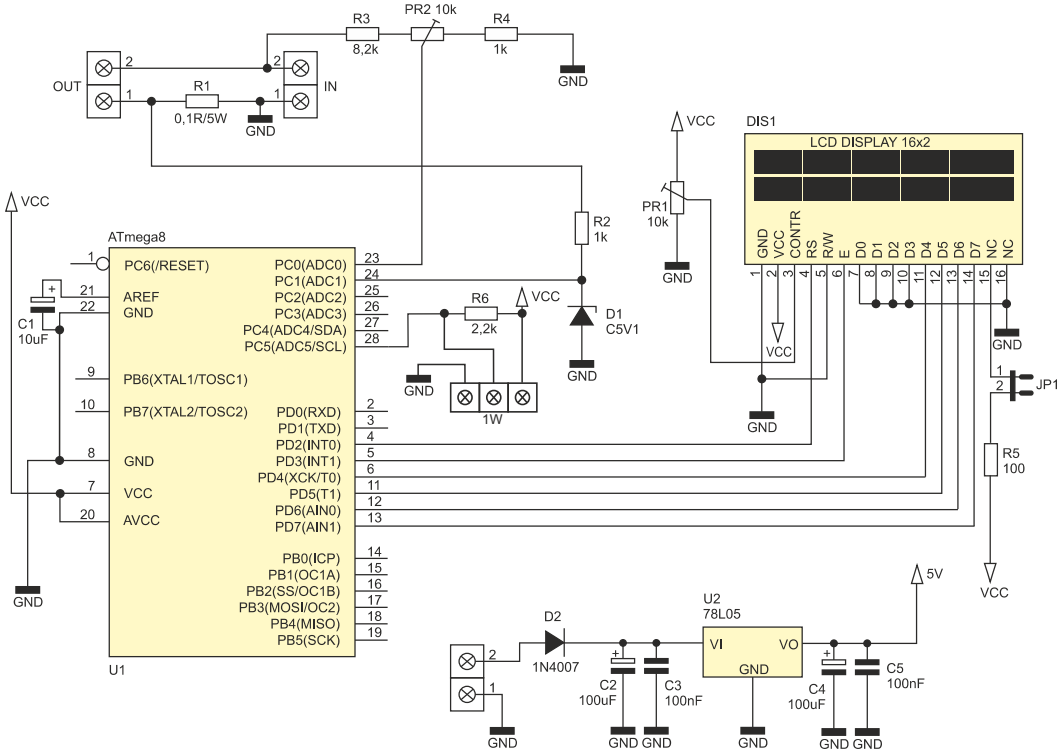


Fig. 1 Schematic diagram of the multimeter

Mounting and start-up

Multimeter mounting diagram is shown in Figure 2. First, solder the jumpers, then the resistors, capacitors and finally the ICs. Once the circuit is assembled, solder the goldpins to the display and connect to your circuit (Figure 3.)

The circuit has the backlight switched off; to switch it on, jumper ZW1 must be plugged in. Also, remember to adjust the contrast of the LCD display using potentiometer PR1.

After start-up, the meter must be calibrated. For this purpose, you will need any voltmeter (multimeter) or reference voltage source with a known value in the range 2.5-5 V, which works correctly. To carry out calibration, connect a reference voltage to the voltage measurement connector or in parallel switch on the voltmeter, whose readings you will take as a reference. Use it to measure the voltage and then turn the PR2 potentiometer until the value is as close as possible to that indicated by the reference meter. After calibration, the multimeter is ready for use. To correctly measure the current in the circuit, you need to correctly include your measurement resistor. The resistor including method is shown in Figure 4.

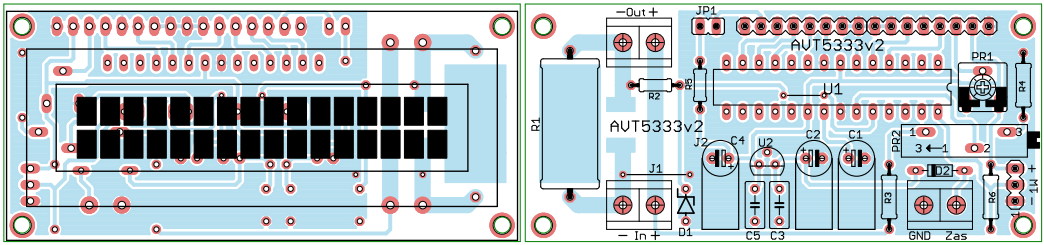


Fig. 2 Multimeter mounting diagram

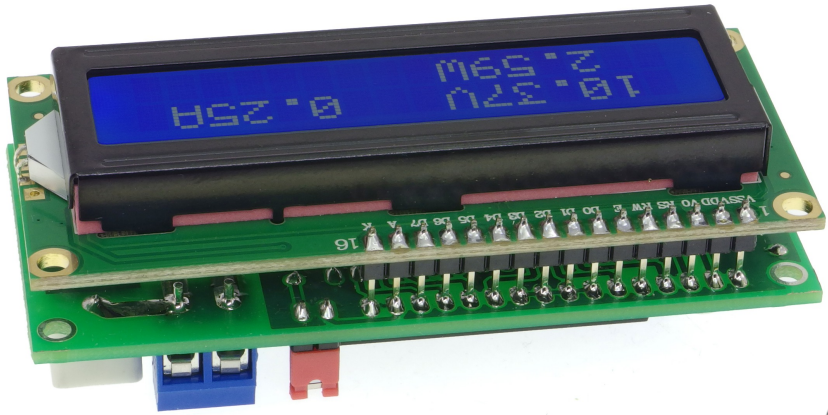


Fig. 3 Display mounting

Wykaz elementów

Resistors:
J1, J2:.....wire
PR1:.....10 kΩ (mounting potentiometer)
PR2:.....10 kΩ (multiturn potentiometer)
R1:..... 0.1 Ω / 5 W
R2, R4:.....1 kΩ
R3:.....8.2 kΩ
R5:.....100 Ω
R6:.....2.2 kΩ
Capacitors:
C1: .....10 uF
C2, C4:.....100 uF
C3, C5:.....100 nF

Semiconductors:
IC1:.....ATmega8
IC2:.....78L05
D1:.....Zener diode 5.1 V
D2:.....1N4007
Other:
IC2:.....LCD 2×16 characters
goldpins
Connector ARK2.....3 pcs
Jumper

Start mounting from soldering the components onto the board in order of size from smallest to largest. When mounting components marked with an exclamation mark, pay attention to their polarity. Wiring diagrams and symbols of the components on the PCB and photographs of the assembled kit may be helpful. To access the high-resolution images as links, download the PDF.

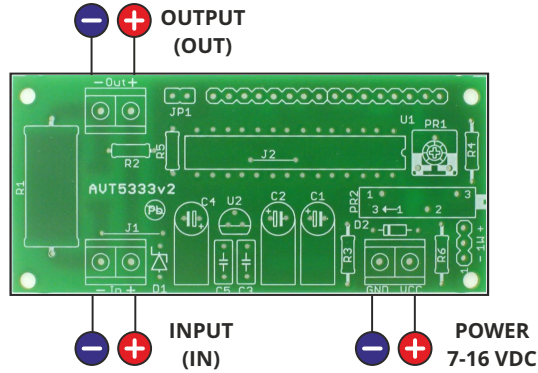
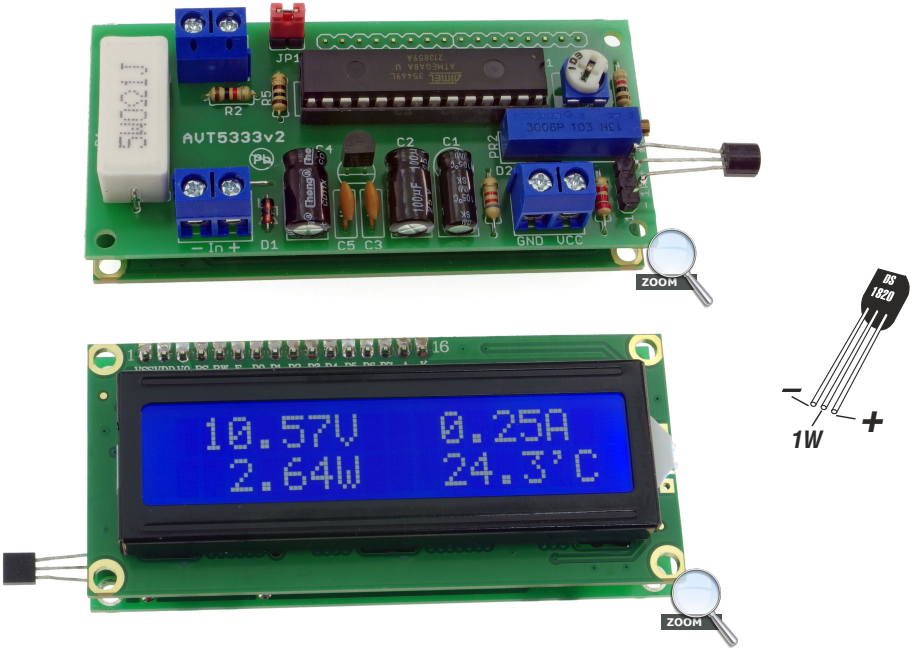


Fig. 4 Method of the meter integration into the measured circuit

Optionally, the multimeter can be equipped with any automatically recognised temperature sensor of the DS1820/18B20/18S20 type. Method of attaching the optional thermometer is illustrated in the photograph below.



AVT SPV Sp. z o.o.

Leszczynowa 11 Street,
03-197 Warsaw, Poland
https://sklep.avt.pl/

This symbol means do not dispose of your product with your other household waste. Instead, you should protect human health and the environment by handing over your waste equipment to a designated collection point for the recycling of waste electrical and electronic equipment.