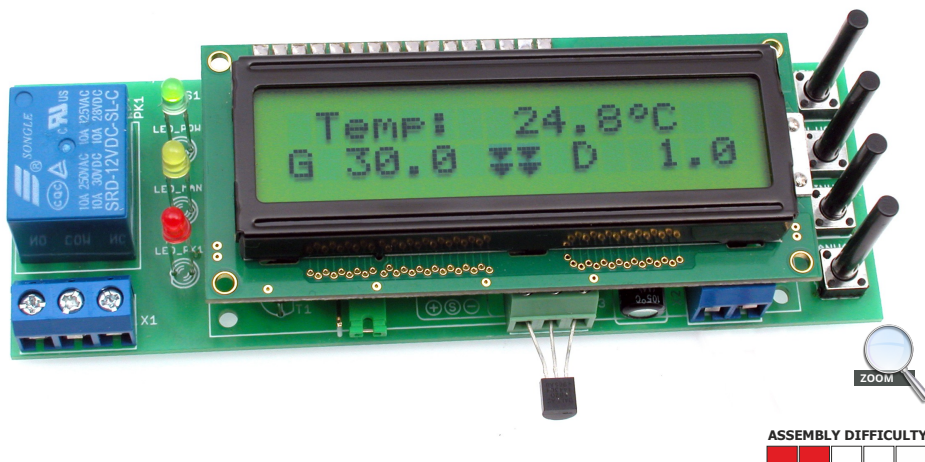




The device is used to maintain a specific temperature in a controlled area. Thermostat can operate in both heating and cooling modes. This circuit contains few components and is simple to make and use.

Features

- for heating or cooling equipment
- two modes of operation:
 - "hysteresis" mode with user-settable temperature and hysteresis values
 - "up/down" mode with user-defined relay on/off temperature
- status indication: LEDs
- executive component: relay 8A/230V
- power supply: 9-12 VDC
- measuring range: -55°C...+125°C, setting step: 1°C
- PCB size: 39×118 mm

Circuit description

Schematic diagram of the thermostat is shown in Figure 1. The operations performed by the device are controlled by an ATmega8 microcontroller. It is clocked by an internal RC oscillator at 8 MHz. The circuit is powered by 12 VDC. This voltage is internally decreased and stabilised by the US2 chip (LM7805). For the user interface or to enter settings, the thermostat is equipped with an LCD display, 3 LEDs and 4 buttons. The DS18B20 fused temperature sensor connected to the X3 communicates with the microcontroller via a 1-Wire interface. The role of the actuator is performed by a relay that can control the power supply to the connected load via NO and NC contacts. Operation of the thermostat is uncomplicated.

Its user menu allows setting of two upper and lower limit temperatures. When the temperature measured by the DS18B20 sensor is less than or equal to the set lower temperature, the relay and LED_PK1 are activated. However, when the measured temperature reaches value equal to or greater than the set upper temperature, then the relay is switched off.

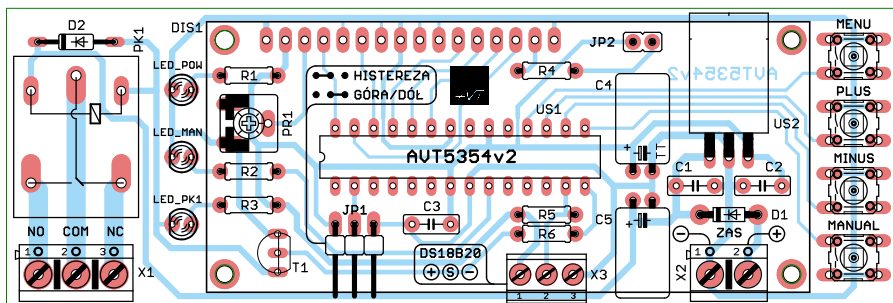


Fig. 2 Arrangement of components on the PCB

Operation

Adjustments are made using the four buttons on the right-hand side of the display. To enter the settings, shortly press the MENU button. To change the values of temperatures and hysteresis, use PLUS and MINUS buttons. Each short press of the MENU button will switch to the next parameter. As the last setting, select whether the thermostat is to be operated with a heating unit (scrolling up arrow) or a cooling unit (scrolling down arrow). When this parameter is selected and the MENU button is pressed again, the settings are saved and the main thermostat screen is accessed.

The use of the fourth button requires to be explained yet. It is used to manually control the relay independently of the thermostat's settings (this function can be used to test operation of the device connected to the relay). A long press on the MANUAL button will switch on the LED_MAN and display (in the second line of the display) information on manual control (Ctrl. manual). Briefly pressing the MANUAL button in this mode will switch the relay. To exit this mode and switch to the main thermostat screen, long press on the MANUAL button.

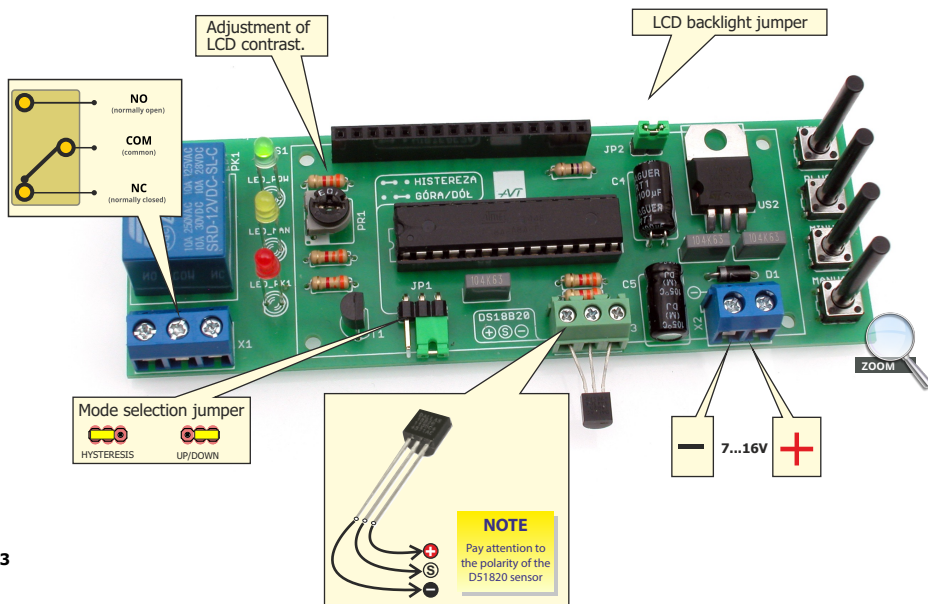


Fig. 3



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.



PDF
DOWNLOAD

List of components

Resistors:

R1, R2, R3, R5, R6:.....3.3 k Ω (orange-orange-red-gold)
 R4:.....47 Ω (yellow-violet-black-gold)
 PR1:.....potentiometer 10 k Ω

Capacitors:

C1, C2, C3:.....100 nF (104)
 C4, C5:.....100 μ F !

Semiconductors:

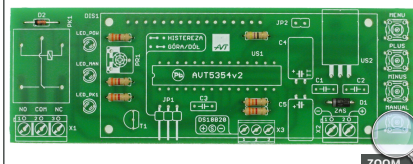
D1:.....1N5817 !
 D2:.....1N4148 !
 LED_POW:.....green LED !
 LED_MAN:.....yellow LED !
 LED_PK:.....red LED !
 T1:.....BC547 !
 US1:.....ATmega8 !
 US2:.....LM7805 !
 X3:.....DS18B20 !

Other:

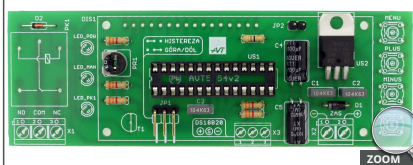
DIS1:.....LCD 2x16
 JP1:.....3xgoldpin+jumper
 JP2:.....2xgoldpin+jumper
 X1:.....DG301/3
 X2:.....DG301/2
 X3:.....DG381/3
 PK1:.....RELAY 12 V
 microswitch buttons - 4pcs

Recommended mounting sequence

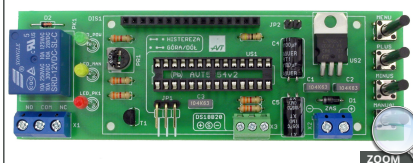
1 Solder resistors R1-R6 and diodes D1 and D2



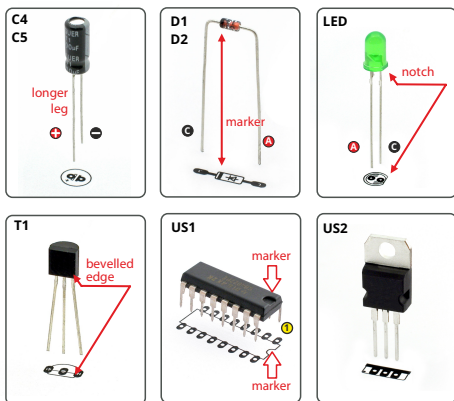
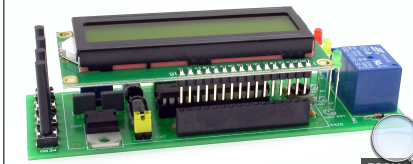
2 Solder socket US1, capacitors C1-C5, potentiometer PR1, US2, goldpin JP1 and JP2



3 Solder screw connectors, display socket, relay, LEDs and buttons

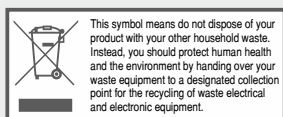


4 Solder goldpins to the display, insert IC into socket, connect display



AVT SPV Sp. z o.o.

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



AVT SPV reserves the right to make changes without prior notice. Installation and connection of the appliance not in accordance with the instructions, unauthorised modification of components and any structural alterations may cause damage to the appliance and endanger persons using it. In such a case, the manufacturer and its authorised representatives shall not be liable for any damage arising directly or indirectly from the use or malfunction of the product. The self-assembly kits are intended for educational and demonstration purposes only. They are not intended for use in commercial applications. If they are used in such applications, the purchaser assumes all responsibility for ensuring compliance with all regulations