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AVT 5589



ASSEMBLY DIFFICULTY

The circuit is used to maintain and monitor the temperature at four points. Because the switch on/off temperature of the relays is set independently, the device offers virtually unlimited application possibilities. The thermostat can operate in both heating and cooling mode with almost any hysteresis loop width. In addition, the user has the option of setting for each temperature sensor separate alarm level, the exceeding of which will be signalled by a buzzer.

Features

- 4 measurement channels
- temperature measurement and control range: -55°C...+125°C in steps of 0.1°C
- 4 independent control outputs 4×1A/230VAC
- independently adjustable on and off temperature for each relay
- independently adjustable alarm temperature for each of the 4 channels
- power supply: 9-16 VDC / 0.2 A

Circuit description

Schematic diagram of the thermostat is shown in Figure 1. An ATmega8 microcontroller clocked by an internal clock waveform is responsible for its functionality. The device should be supplied with a DC voltage of 9-16 V applied to the VCC connector. It can be supplied by any 2.1mm / 5.5mm plug-in power supply with a current capacity of at least 200 mA. Diode D1 protect from incorrect polarity of the input voltage. Stabiliser U2 provides 5V, and components C1-C4 ensure adequate filtering of this voltage. Temperature measurement results are displayed on a 4-line × 16-character LCD display. Due to the use of this type of display, it is possible to show all parameters at the same time, both during normal operation, when their labels are displayed

along with the temperature readings, and in set-up and configuration mode. The LCD data lines are connected to the PB0-PB5 pins of the microcontroller. Temperature display is updated every 2 seconds. Backlighting of the display is controlled by a PWM signal via transistor Q1. A circuit type ULN2003A was used as the output amplifier for the individual thermostat outputs, which allows direct control of the relays.

Due to the relatively low contact load of the relays (1 A / 230 VAC), an additional relay or contactor with a correspondingly higher contact load must be used when controlling loads with considerable power or a strong inductive or capacitive character. For the user interface, the thermostat is equipped

with S1-S4 buttons. Signalling the alarm temperature is provided by a buzzer with a generator. Each temperature sensor is connected to a separate

pin of the microcontroller. With this solution, the sensors are ready for operation as soon as they are connected and there is no need to register them.

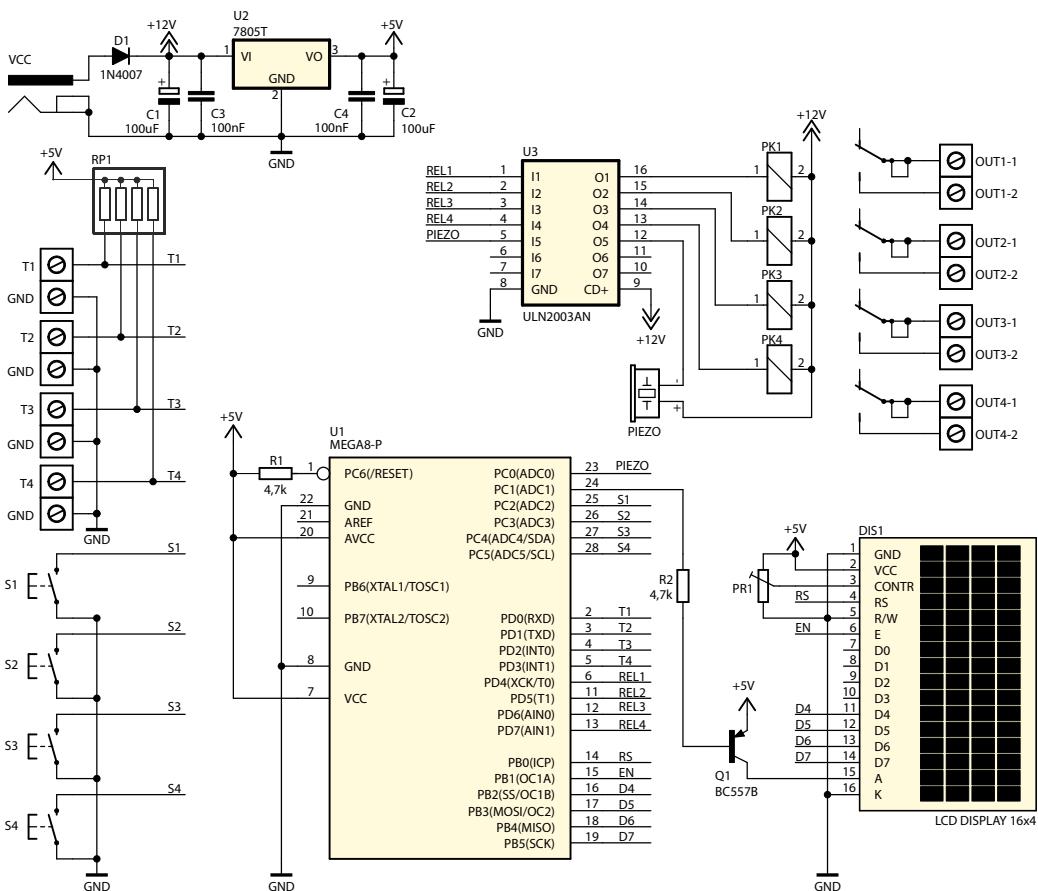


Fig. 1 Electrical diagram

Mounting and start-up

The circuit is mounted on a single-sided 100×62 mm PCB, the mounting diagram of which is shown in Figure 2. Mounting of the thermostat is typical except for the LCD display and the S1-S4 buttons, which need to be soldered from the print side. Installation of the LCD display is shown in Photo 3. A properly assembled thermostat will not require any start-up steps and, once the sensors have been connected and the power switched on, it can begin operation immediately. Temperature sensors must be connected to the PCB by connecting their outer leads to the point marked 'GND' and the centre lead to the point marked T1-T4. The circuit passed positive tests with a 30-metre cable. If you are only to measure the temperature of the air, it is sufficient to shield the

sensors from possible atmospheric influences or mechanical damage using heat shrink tubing. When measuring the temperature of liquids, care must be taken to reliably protect the sensor and its contacts from moisture. Once the sensors are connected to the board, switch on the power supply and adjust the display contrast using potentiometer PR1. The display will show the assigned names, and, after a while, all the temperatures currently read (Figure 4). When working with fewer sensors, the display in the right place will not show any value. Operation of the thermometer is indicated by a flashing dot in front of the channel name. Operation of the device is easy and intuitive, and is carried out using 4 buttons. To enter the setting mode, use the "↑" (S2) or "↓" (S3)

button to set the arrow next to the channel whose parameters you want to change and then confirm the selection with "OK" (S4). In the configuration menu (Figure 5), you can set the channel name (maximum 10 characters) and, in the next line, the relay triggering temperature. Further, set the switch-off temperature and, as the last one, the alarm temperature. Changes are made analogously with the "↑" (S2) and "↓" (S3) keys and confirmed with "OK" (S4). The "ESC" button (S1) is used to exit the setting mode. Once the settings have been confirmed, all parameters will be saved to non-volatile memory and the thermostat will return to displaying the current temperatures. After approximately 20 seconds, the

display backlighting will gently dim. The fact that the relay is switched on will be indicated by the square symbol in front of the channel name. If an alarm temperature value has been set in the configuration menu, an acoustic signal will be triggered when a particular sensor detects that temperature. In addition, its value will flash. The alarm signal can be switched off by pressing any button.

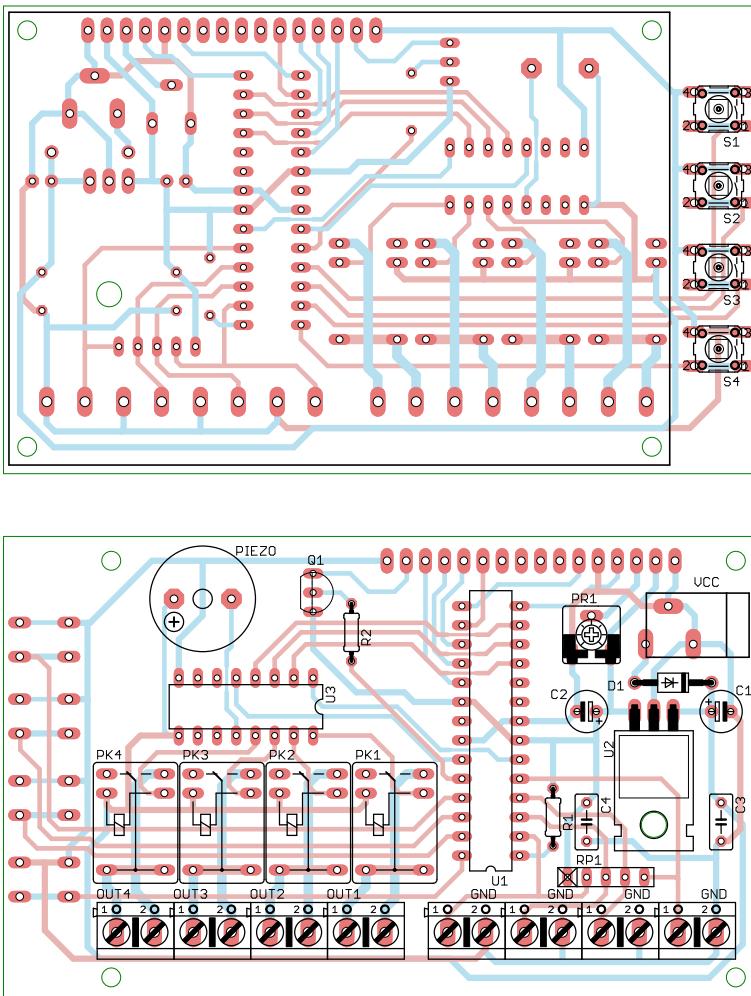


Fig. 2 Mounting diagram

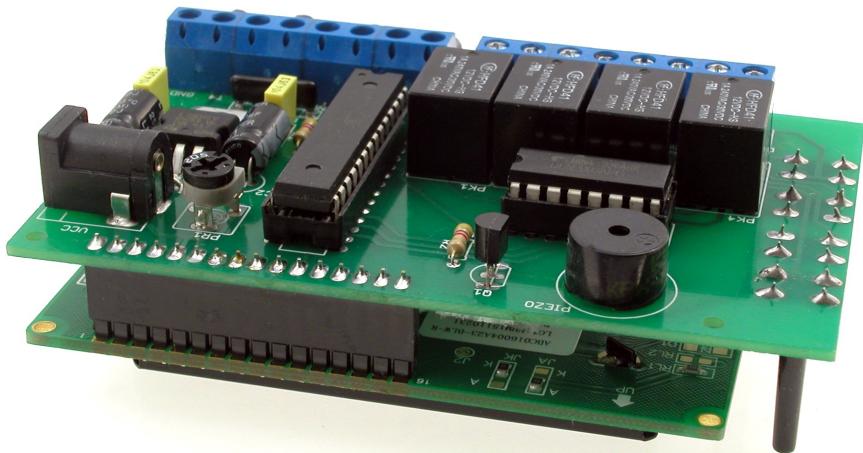


Photo 1. Mounting of the LCD display

List of components

Resistors:

R1, R2: 4,7 kΩ
 RP1: RPACK 3x4,7 kΩ
 PR1: 10 kΩ (mount. potentiometer)

Capacitors:

C1, C2: 100 μ F / 25 V
 C3, C4: 100 nF

Semiconductors:

D1: 1N4007
 U1: ATmega8
 U2: 7805
 U3: ULN2003A
 Q1: BC557

DS18B20 – 4 pcs

Other:

DIS1: LCD 4x16
 S1 – S4: mini buttons
 PK1 – PK4: relay HM4100/12 VDC
 Piezo: buzzer with 12 V generator
 VCC: socket DC2,1/5,5
 Connector ARK2 – 8 pcs
 Goldpin strip 1x16



Fig. 3 Temperature display

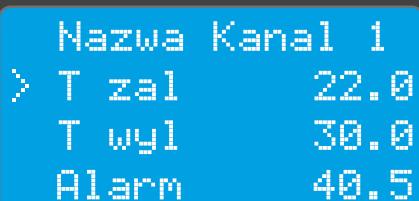


Fig. 4 Configuration menu



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Zestawy do samodzielnego montażu są przeznaczone wyłącznie do celów edukacyjnych i demonstracyjnych. Nie są przeznaczone do użytku w zastosowaniach komercyjnych. Jeśli są one używane w takich zastosowaniach, nabywca przyjmuje całą odpowiedzialność za zapewnienie zgodności ze wszystkimi przepisami.