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AVT 1980

Proximity switch with delayed output

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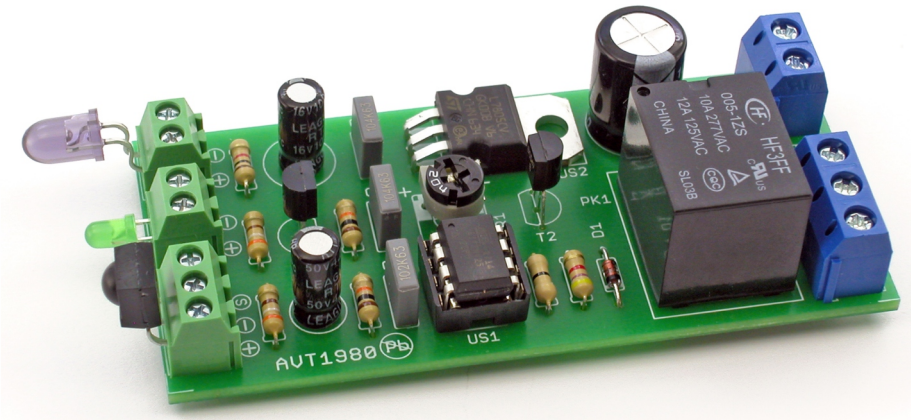

Having wet or dirty hands it is easier to turn on the light approaching the sensor than touching a typical switch. The proximity switch module is a component of home automation, whose operation is based on the principle of infrared light emitting by the transmitter and its reception by the receiver. The infrared light from transmitter illuminates the object and bounces off of its surface. A portion of the reflected infrared light goes to the receiver, where it is used to form the signal that activates the output of the module.

Specifications

- uses infrared radiation
- range about 15 centimeters
- switching time is adjustable from 0...8 seconds
- output relay with 5A/230VAC contacts (NO/NC)
- power supply: 12V DC

Functional description

Schematic of the proximity sensor is shown in Figure 1. The proximity switch module is powered by a voltage of 8...12V. Diode D2 protects the module against reverse polarity of the supply voltage. The power supply is stabilized by US2 integrated circuit. For the functionality of the switch is responsible the ATtiny25 microcontroller. As infrared receiver was used integrated circuit TSOP4836.
The microcontroller periodically generates a series of pulses with a frequency of 36 kHz, which illuminates the IR LED. If a part of the emitted IR radiation is reflected from the object, at the output of the TSOP4836 infrared receiver, a pulse sequence will occur. Then microcontroller measures the voltage on the PR1 potentiometer slide and activates the output relay. The time of the turn of delay depends on the voltage measured on the potentiometer. If the potentiometer slide is in position "-", the output is switched off without delay.

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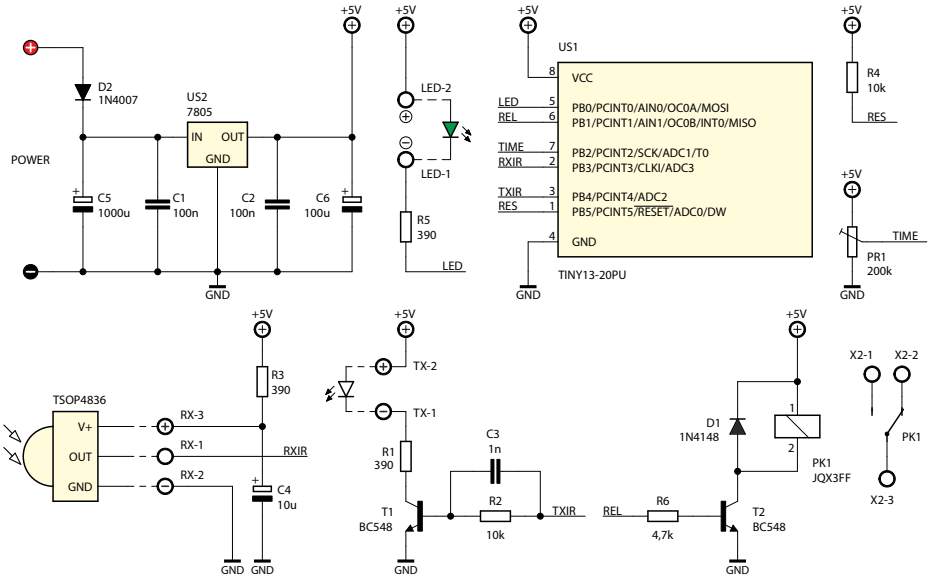

Figure 1. Schematic diagram

Assembly and test

The assembly is typical and It starts from smallest components and ends up with relay. The IR transmitter and the IR receiver must be separated in such a way, that the IR receiver cannot be illuminated by the IR diode via the side light. Thanks to the terminal connectors, the IR transmitter and the IR receiver can be connected via the cable and mounted away from the proximity switch board. The typical operating range for objects of a size close to the size of a hand is 15 centimeters. Air pollution and dirt of the optical system can reduce the range of the sensor. Figure 2 shows an example of using a module for switching on LED lighting.

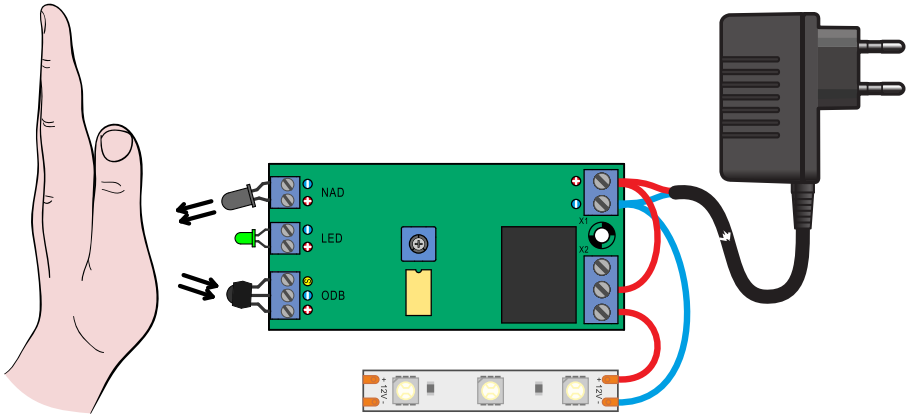

Figure 2. Connection example

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Start off by soldering the printed circuit elements in order from smallest to largest. The unit assembled flawlessly, using the supplied components will operate immediately after switching on the power supply.

Component list

Resistors:

R1:.....1kΩ (brown-black-red-gold)
R2, R4: .....10kΩ (brown-black-orange-gold)
R3, R5: .....390Ω (orange-white-brown-gold)
R6:.....4,7kΩ (yellow-violet-red-gold)
Z: .....0Ω (black)
PR1:.....200kΩ

Capacitors:

C1, C2: .....100nF (marked as 104)
C3:.....1nF (marked as 102)
C4:.....4.7µF !
C5:.....1000µF !
C6:.....100µF !

Semiconductors:

D1: .....1N4148 or similar !
D2: .....1N4007 or similar !
LD1:.....LED diode !
T1, T2:.....BC547 !
US1:.....ATtiny25 with 8-pin IC socket !
US2:.....7805 !

Others:

NAD, LED, X1:...2-pin terminal block connector
ODB, X2: .....3-pin terminal block connector
PK1:.....relay

While assembling the components marked with an exclamation mark attention should be paid to their polarity. Symbols of the components on the PCB as well as photos of assembled sets may come in useful. To access high-resolution images, download the PDF file.

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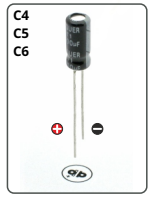
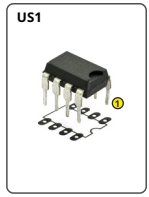
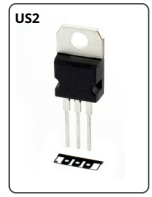
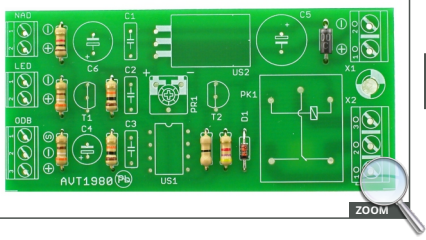




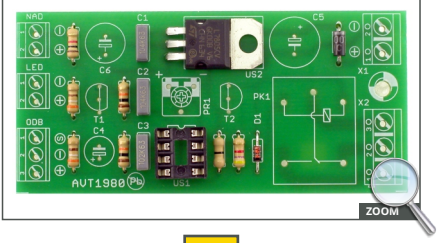


Assembly in 4 steps

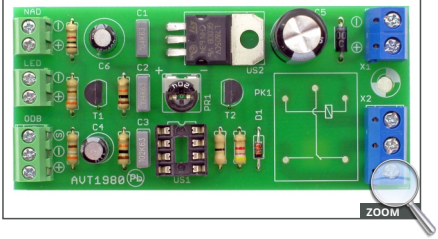
1 Solder resistor R1-R6, Z and diodes D1-D2



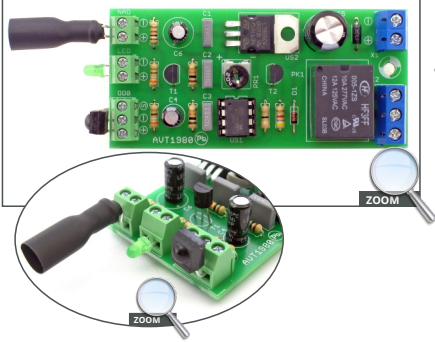
2 Solder IC soket, capacitors C1-C3 and US2



3 Solder transistors T1, T2, and capacitors C4-C6 and connectors



4 Solder relay, insert chip into socket, screw NAD, LED, ODB connector



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Notes

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• Battery or wall-adaptor are safe devices. They do not require special attention unless main voltage is connected to an output e.g. a relay.
• If the kit is used to switch currents greater than 24V it is necessary to have the installation and performed by a trained professional authorized for such work. The kit may only be used in such application if it was installed in a safe to touch enclosure.
• Never exceed the limits or ratings listed in the 'Specifications' section at the this user guide.
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