KUBE Electronics AG

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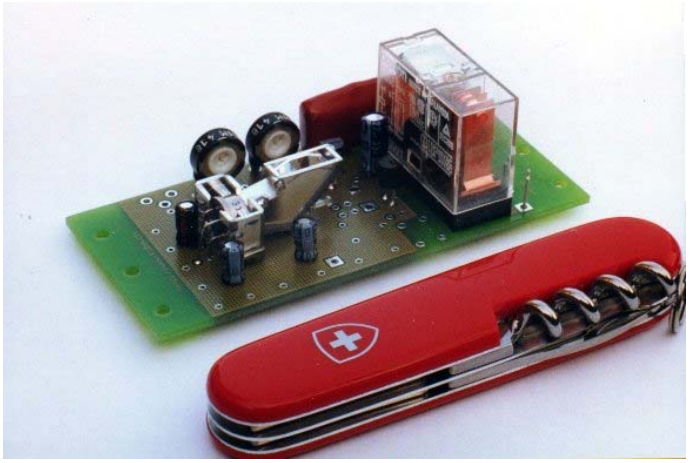
TR250 Evaluation Board

Using the most advanced cone optics TR230 and ASIC TR156



This board will help you to prototype PIR applications for alarms, automatic light switches, game cameras, door openers, and general motion detectors or people sensors for automation and robotics.

In the associated ZIP file, you find the Gerber data that will allow you to order the boards easily from your PCB manufacturer. For availability of boards and assembled prototypes from KUBE, please inquire at info@kube.ch.
The required components (chip, sensor, optics) can be ordered in the sample order section of http://www.kube.ch.

The TR250 board layout includes the **following options**, that are available by application-specific assembly of the board, by solder bridges and wire jumpers.

- All single channel (single sensor) applications
- Board holds TR230 cone optics, but can be used with any other lens or fresnel lens.
- Turn-off delay with potentiometer or fixed resistors
- Turn-on delay with potentiometer or fixed resistors
- Daylight photocell. Level set with potentiometer or fixed resistors. Holds phototransistors or LDR.
- Use of chip-internal default values
- Holds manual toggle switch
- LED's for output status and "presence" info
- Holds output transistor and standard 16 Amp changeover contact relay
- 5V supply, regulator on board and optional 115/230VAC supply
- Adaptive sensitivity scheme
- Jumpers to set all other chip options

The generic schematic on next page shows the board layout with all possible components. For specific applications, refer to our home page. Please note that part numbers of specific applications may not coincide with those on the generic circuit.

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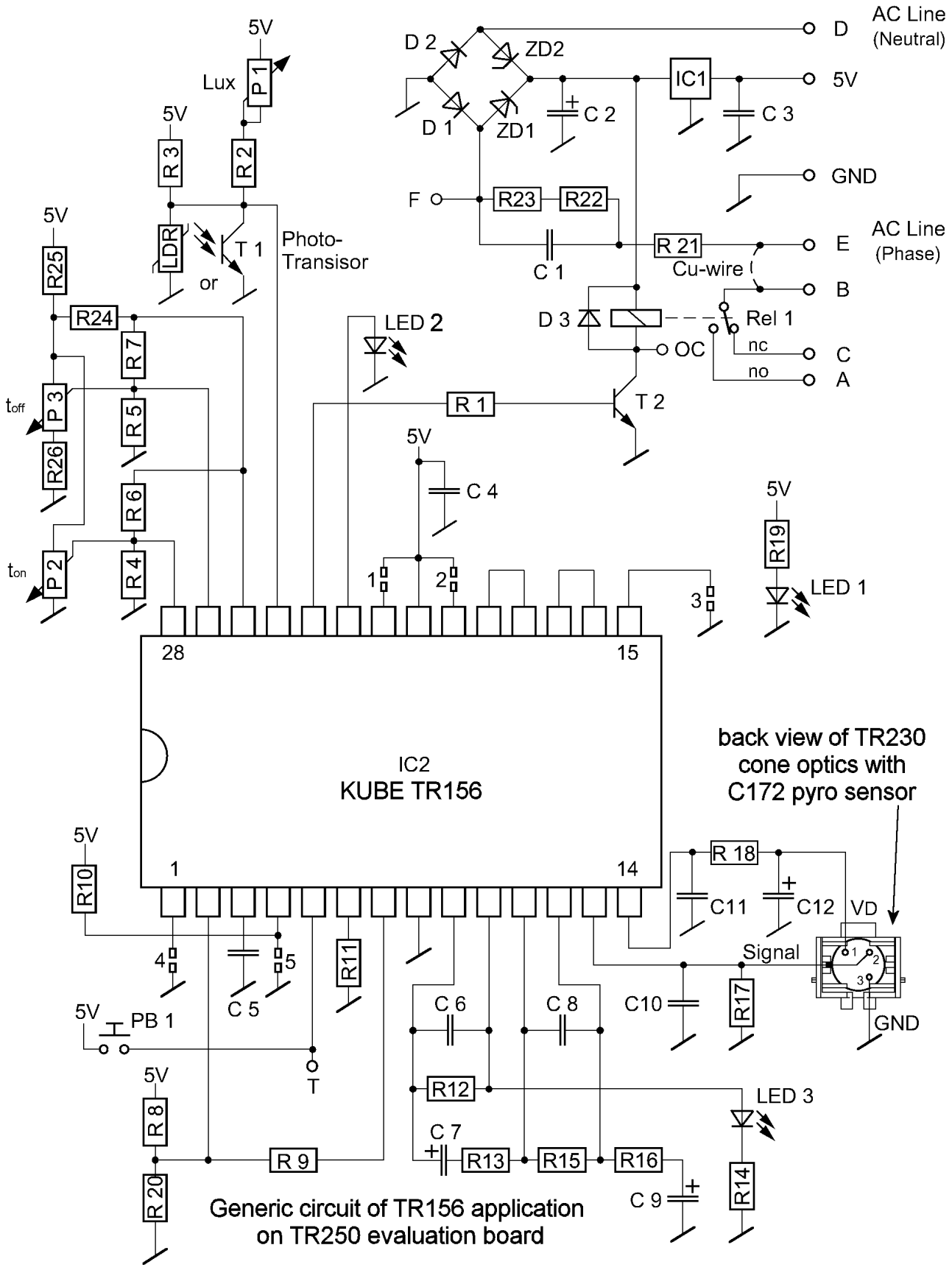

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Functional explanation:

(refer also to TR156 data sheet)

P1/R2 or R3	Determines daylight threshold and must match photocell	Use either P1/R2 or fixed setting with R3
R1	Current limiter for output transistor	
P2 or fixed value R4/R6	Turn-on delay. Refer to datasheet TR156 for voltage Ground pin if T_{on} is not needed.	Voltage can be derived from pin 26 (read pulse output) or by inserting low value resistors R24 and R25
P3 or fixed value R5/R7	Turn off delay	Same Series resistors R26 and R25 allow restriction of potentiometer range
R8/R20	Trip threshold. Voltage at pin 2 can be 0.1V (high sensitivity) to 1.0V (low sensitivity)	R9 allows adaptive feedback: Sensitivity is increased while output is ON. Used in light switches.
C5 / R11	Internal oscillator	Use default values
R12/R13/C6/C7	Second amplifier stage	
R15/R16/C8/C9	First amplifier stage	
R14/LED3	Optional. Allows visualization of analog signal	
R18/C11/C12	Voltage stabilization for pyro sensor	
R17/C10	Sensor source resistor and RF protection	
T2/D3 and relay Rel1	Optional relay output	Pin 24 may be used directly as logic output to link to processor or other logic circuitry.
R19/LED1	Power supply monitoring	
IC1/C2/C3	Power regulator 5V	Chip TR156 needs 5V +/- 5%
D1/D2/ZD1/ZD2/C1/R21/R22/ R23	AC power supply 115/230 VAC	Use 0.5Watt resistors for R21/R22/R23
ABC	Relay contact outputs	Wire link available to power line (for light switches)
GND/5V	Power supply pins when stabilized 5V supply is available	
F/D	AC/DC low voltage power supply (7...30V) when regulator is used.	
E/D	Power connection for line voltage supply	
PB1/T	On-board toggle switch and connection for external push button.	
LED2	“presence” output monitoring	
Jumpers 1 and 2	Internal default time settings. Close to allow external settings with P2 and P3	
Jumper 3	Close for typical applications. Open when Op-Amp on pin 15/16/17 is used for any auxiliary purpose.	
Jumper 4	Close for normal applications. When open, intelligent time setting is active (for office light switches, extends toff when only little motion is detected)	
Jumper 5	Response time to photocell signal. See datasheet.	

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Hints for operation:

We trust that you can successfully evaluate your PIR application with this board. Here, a few hints how to operate it:

1. Since the pyroelectric sensor picks up very small temperature differences, the board must be mounted in an enclosure, such as a cardboard box to protect it from air drafts. Use a KUBE plastic window or plastic sheet right in front of the cone opening. Passive infrared detectors will not see through any other materials, such as glass. For a quick test, you may put the board in a transparent thin plastic bag. It will "see" at least a little bit through it.

2. Turn time potentiometers to the minimum (ground) and the daylight potentiometer P1 to the light maximum (lowest resistor value). The photocell (if any) has priority over the PIR sensor and will inhibit operation when ambient light level is above set level. In case of doubt, cover photocell with a black plastic tube or black tape.

3. Connect power: Double-check correct wiring to avoid damage. Check the right voltage and polarity for DC supply. Beware of electric shock when you operate AC supplied boards. The circuit is not isolated from mains.

4. Wait 30 to 60 seconds for the circuit to warm up and get in thermal equilibrium, then start your tests.

Typical settings:

In applications to switch electric equipment or lamps, t_{off} is set to several minutes (see TR156 datasheets for range available).

To control equipment like air-conditioners or coffee machines, for example, you may set t_{off} to 30 minutes., and also activate t_{on} to one minute or so. This would mean that simply walking-by would not activate the switch, but constant or repeated presence during t_{on} would switch it on, just what is intended to happen in this case.

If there is a "presence" LED (LED2) on the board, it will not coincide with the output. It signals the state of the internal intelligent processor. It is the most accurate information the circuit can give if it thinks that people are present.

Use of TR230 cone optics:

The main advantage of the cone is its very compact size. Furthermore, its front aperture is so small that PIR detectors are unobtrusive, mechanically stable and vandal proof. The cone receives all directions through the same opening. Consequently, most environmental effects such as from light and wind are compensated. Compared to detectors with fresnel lenses, a system with the KUBE cone will have a much lower false alarm rate, such as caused by direct sunshine or warm air when mounted above a heating radiator.

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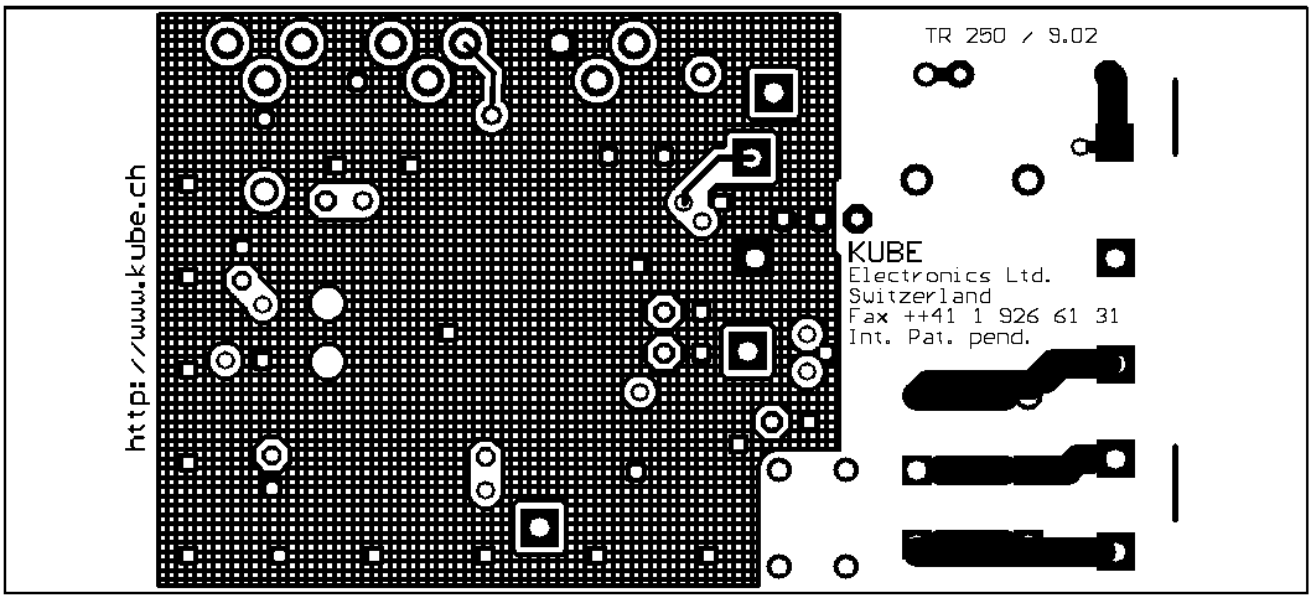
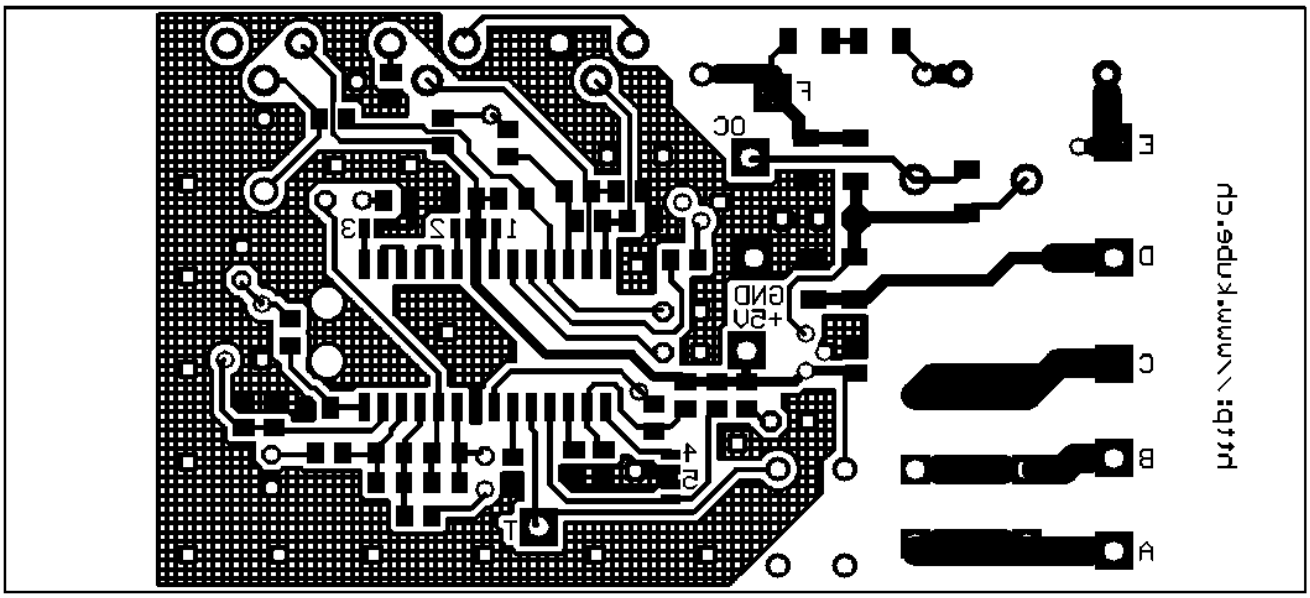
TR250 Drawings

Top layer:



Bottom layer:



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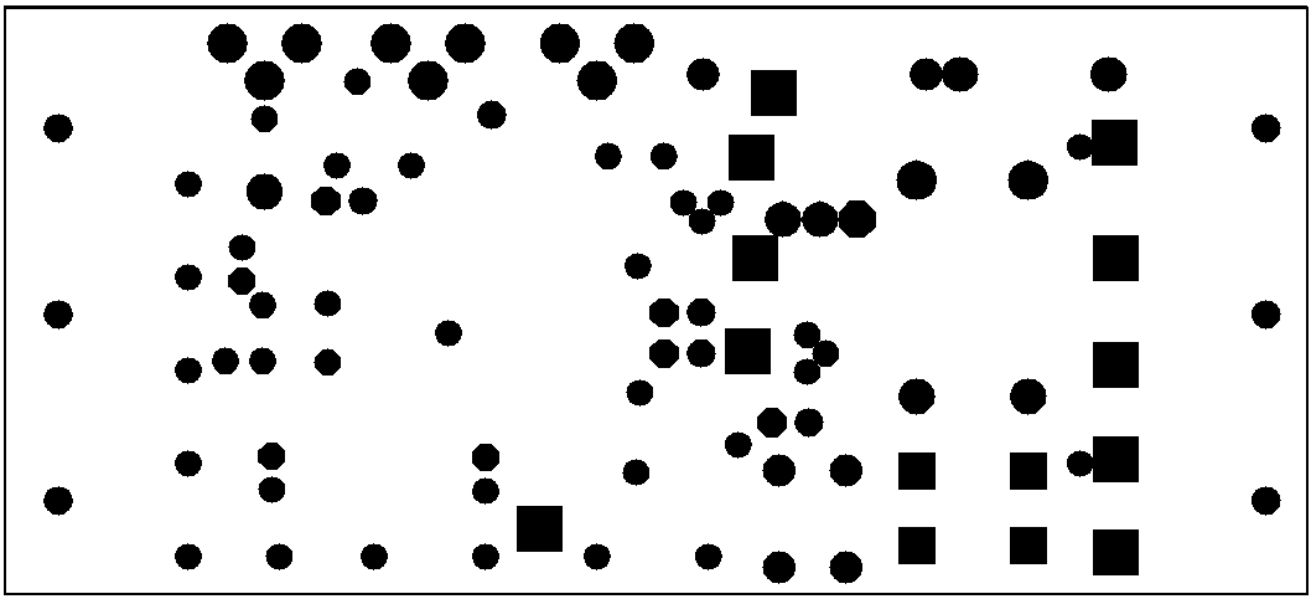
top mask:



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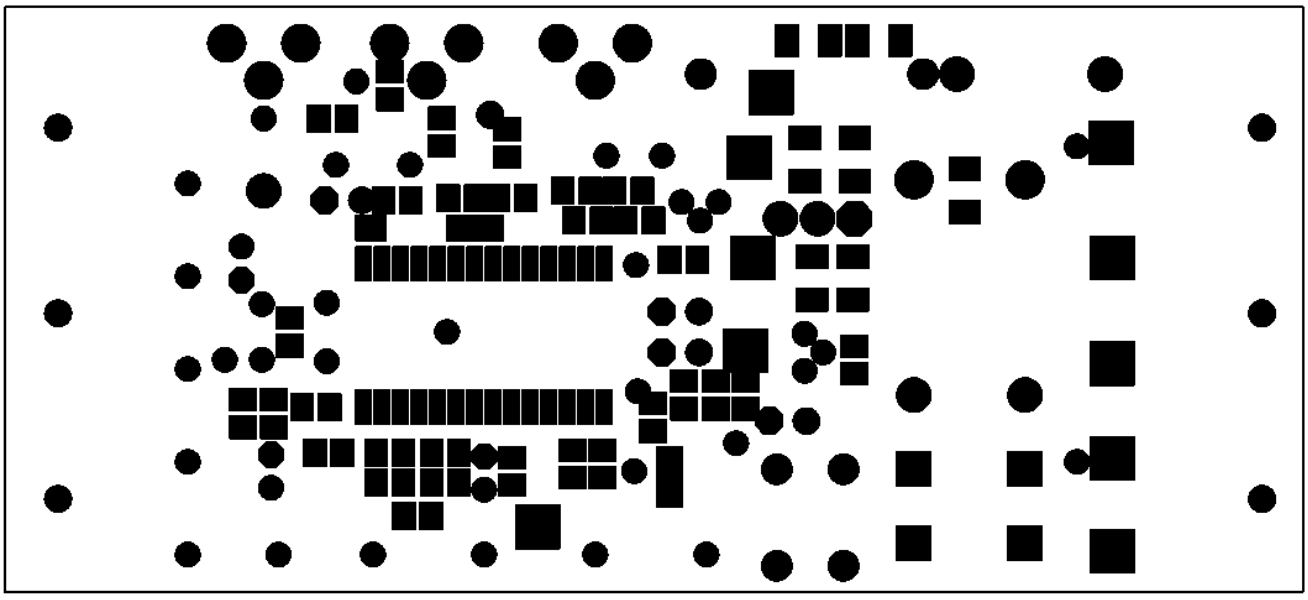

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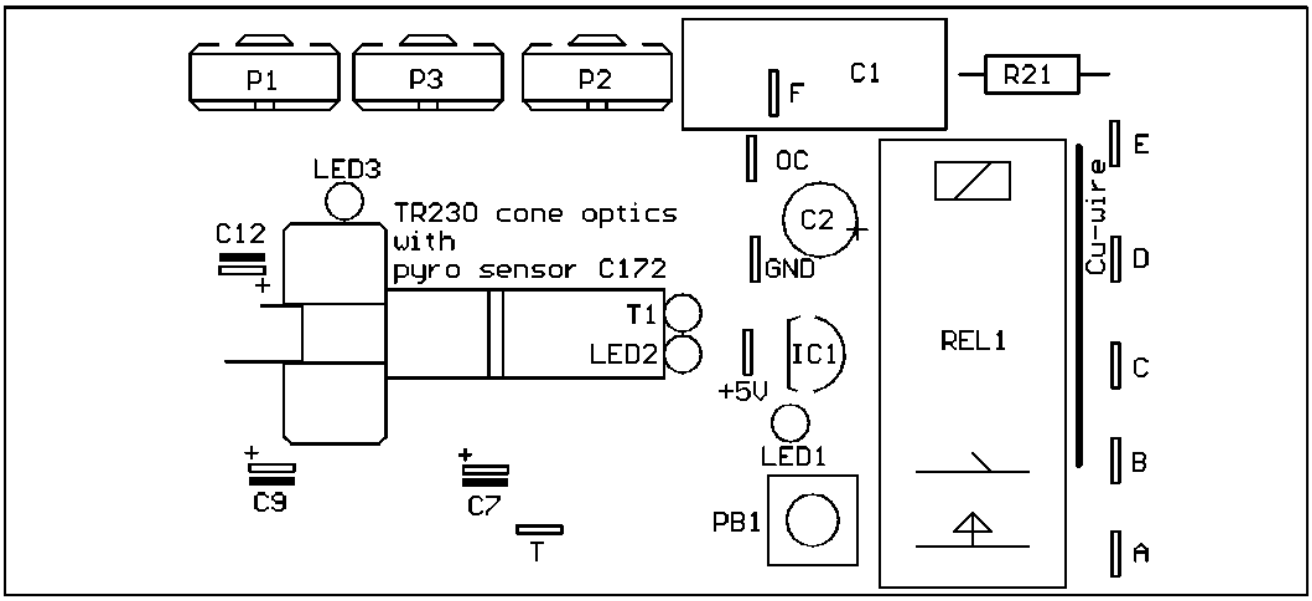
top placing:



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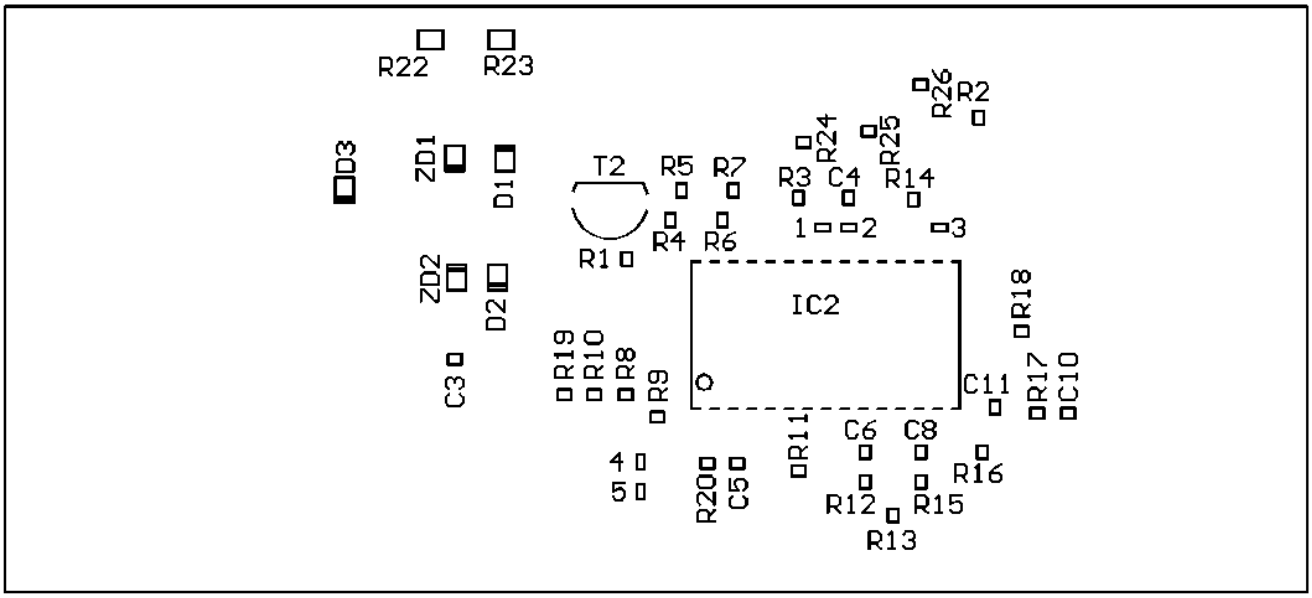

Troubleshooting:

- No operation: Check correct power supply, voltages and polarity. Check all the jumpers, bridges and solder joints.
- It does not switch off: Set time potentiometers to minimum, restart it (disconnect power for a few seconds). Make sure it is protected from air drafts.
- Range is not 90° as it should: Cone opening must be vertical for horizontal 90° coverage.
- Range is too large: Increase voltage on pin 2 up to 1 Volt (or vice versa)