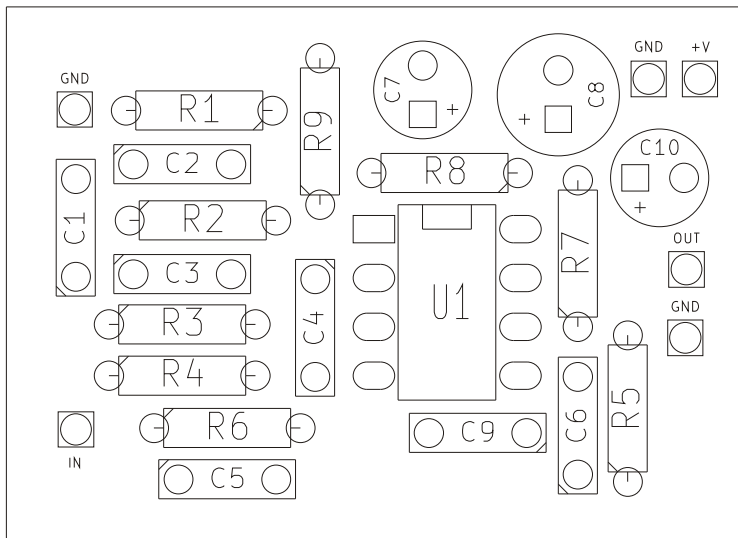
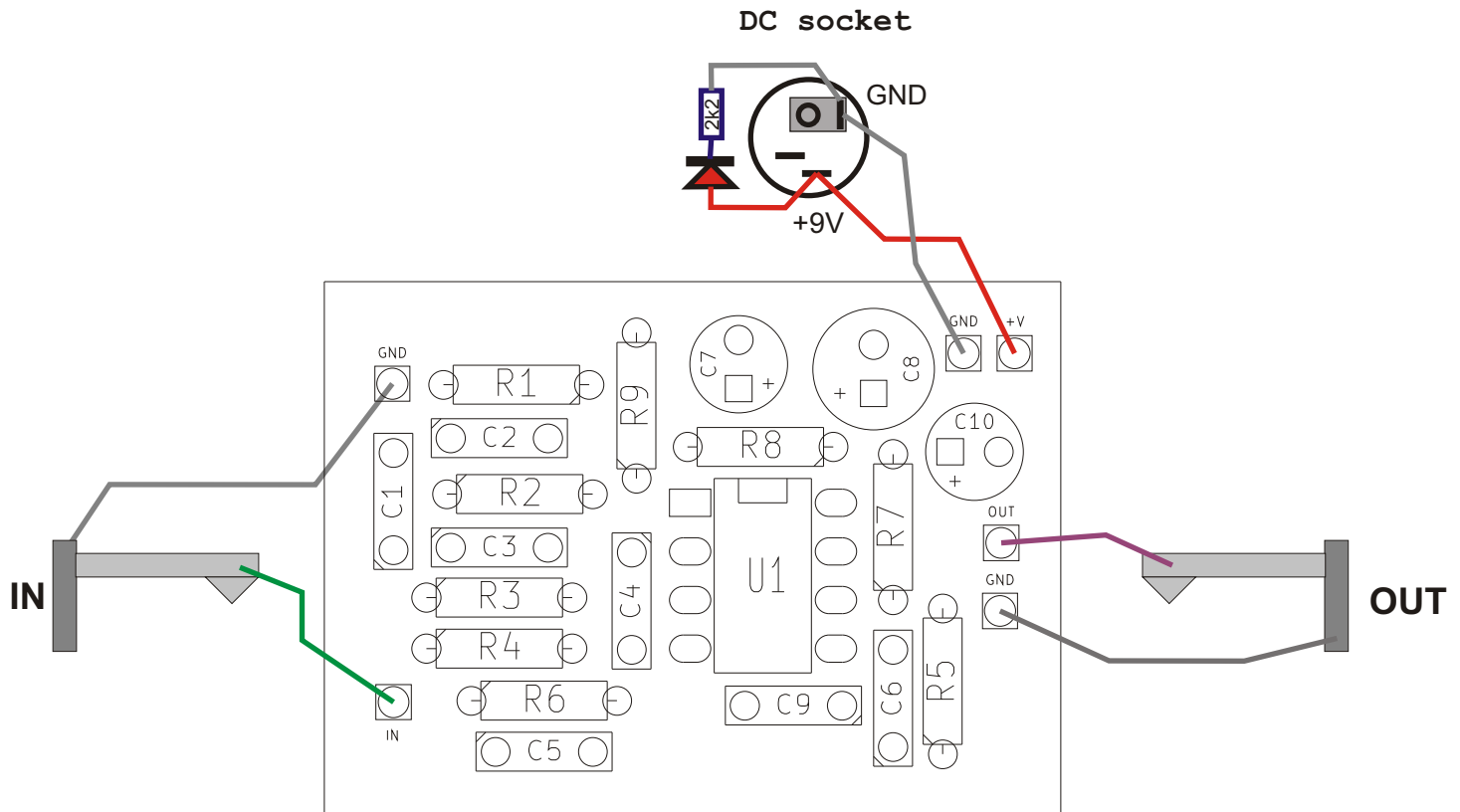


PCB parts placement diagram:



R1 100k	C1 100n	U1 TL072
R2 47k	C2 100n	
R3 220k	C3 100n	
R4 100k	C4 100n	
R5 47k	C5 100n	
R6 220k	C6 100n	
R7 100R	C7 10u	
R8 33k	C8 47u	
R9 33k	C9 100n	
	C10 10u	

Wiring (bottom view):



Use metal enclosure connected to ground.  
Power supply: 9V DC

Bill of materials:

**Resistors:**

2k2 1pcs. "LED"  
100R 1pcs. "R7"  
33k 2pcs. "R8 R9"  
47k 2pcs. "R2 R5"  
100k 2pcs. "R1 R4"  
220k 2pcs. "R3 R6"

**Semiconductors:**

TL072 1pcs. "U1"  
LED 1pcs.

**Capacitors:**

100n 7pcs. "C1 C2 C3 C4 C5 C6 C9"

**Electrolytic capacitors:**

47u 1pcs. "C8"  
10u 2pcs. "C7 C10"

**Other:**

Jack socket NYS230 2pcs.  
DC socket 5.5/2.1 1pcs.

## Resistor color code:



$$390 \times 10\Omega = 3,9k\Omega$$

Color	Band 1	Band 2	Band 3	Multiplier	Tolerance
Black	0	0	0	1 $\Omega$	
Brown	1	1	1	10 $\Omega$	1%
Red	2	2	2	100 $\Omega$	2%
Orange	3	3	3	1k $\Omega$	
Yellow	4	4	4	10 k $\Omega$	
Green	5	5	5	100 k $\Omega$	0,5%
Blue	6	6	6	1 M $\Omega$	0,25%
Purple	7	7	7	10 M $\Omega$	0,1%
Gray	8	8	8	100 M $\Omega$	0,05%
White	9	9	9	1 G $\Omega$	
Gold				0,1 $\Omega$	5%
Silver				0,01 $\Omega$	10%

## Capacitors markings:

$$471 = 47 \times 10^1 \text{ pF} = 470 \text{ pF}$$

$$472 = 47 \times 10^2 \text{ pF} = 4700 \text{ pF} = 4,7 \text{ nF}$$

$$473 = 47 \times 10^3 \text{ pF} = 47000 \text{ pF} = 47 \text{ nF}$$

$$474 = 47 \times 10^4 \text{ pF} = 470000 \text{ pF} = 470 \text{ nF}$$

$$100 \text{ pF} = 100 \text{ p} = 100 = 101$$

$$220 \text{ pF} = 220 \text{ p} = 220 = 221$$

$$4,7 \text{ nF} = 4 \text{ n}7 = 0.0047 = 472$$

$$10 \text{ nF} = 10 \text{ n} = 0.01 = 103$$

$$100 \text{ nF} = 100 \text{ n} = 0.1 = 104$$

$$220 \text{ nF} = 220 \text{ n} = 0.22 = 224$$

$$470 \text{ nF} = 470 \text{ n} = 0.47 = 474$$

$$1000 \text{ nF} = 1 \mu\text{F} = 1 \mu = 105$$