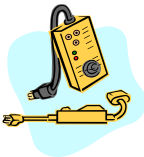


# Optical Indicator for Voltage Level with Opamp



## I. OBJECTIVE

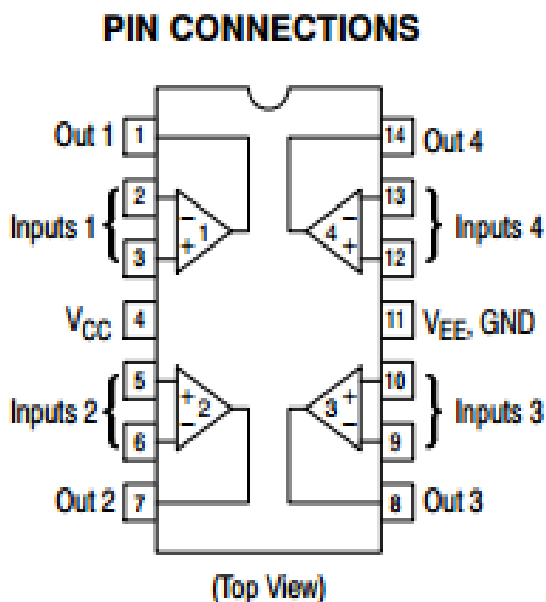
- a) To assemble an electronic circuit with multiple simple comparators with OpAmp, that visually indicates the level of the input voltage.



## II. COMPONENTS AND INSTRUMENTATION

We use a breadboard, an LM324 integrated circuit ([single supply quad operational amplifier](#)) which contains 4 OpAmps, several resistors and 4 LEDs, with different colors. The dc voltage for the power supplies and for the dc input is obtained from the triple power supply. The sinusoidal input voltage is obtained from the signal generator and visualized on the oscilloscope.

The configuration of the pins for the LM324 is presented in Fig. 1.



Inputs 1, 2, 3, 4 – inputs for OpAmps 1, 2, 3, 4  
Out 1, 2, 3, 4 – outputs for OpAmps 1, 2, 3, 4  
 $V_{CC}$  - positive power supply  
 $V_{EE}$ , GND – negative power supply or ground.

Fig. 1. Configuration of the pins for LM 324

### III. EXPLORATION AND RESULTS



#### Exploration

Build the schematic in Fig. 2.

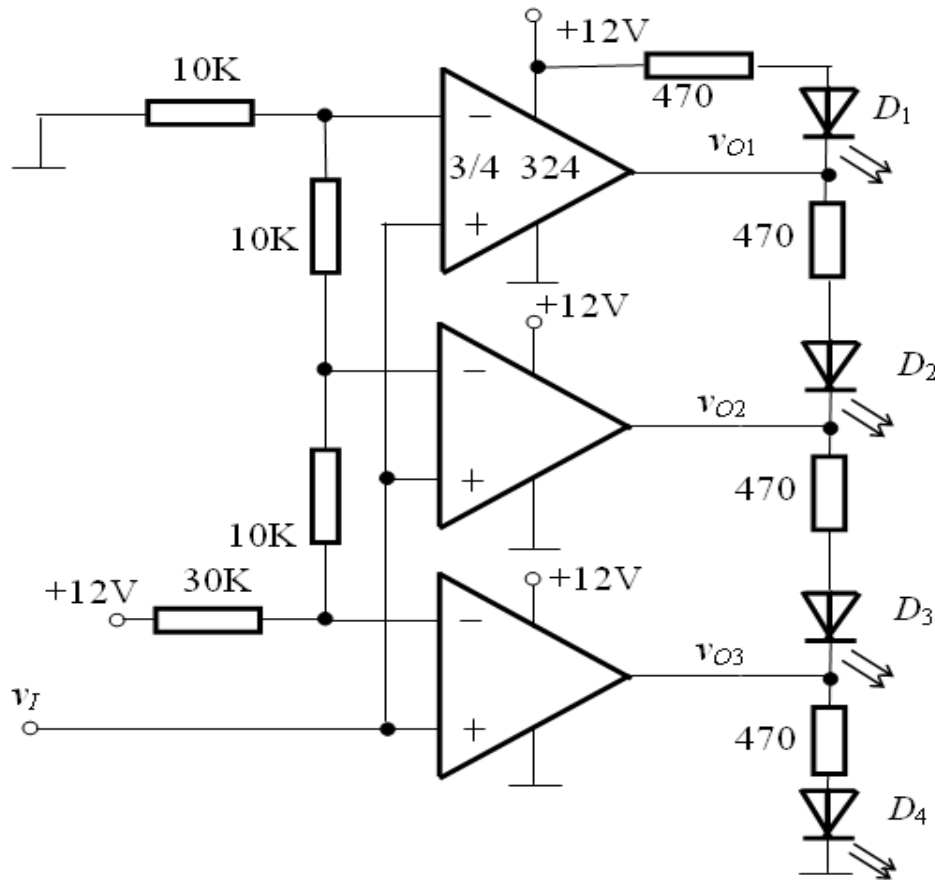


Fig. 2 – Optical indicator for voltage level with OpAmp

- From the 4 OpAmps available in the LM324, you will use only 3.
- The circuit is supplied with  $+V_{PS}=12V$ ,  $-V_{PS}=0V$  from the tripple power supply.

#### a) Optical indicator for the level of a DC voltage

- $v_I$  is a DC voltage, obtained from the triple power supply, and it can take values between 0 and 12V.



#### Results

- For what range of values of  $v_I(t)$  does each LED light up?

#### b) Optical indicator for the level of an AC voltage

**Note:** because the integrated circuit LM324 is supplied with  $+V_{PS}=12V$ ,  $-V_{PS}=0V$ , the input voltage  $v_I$  will have to include a d.c. component of +5V. So,  $v_I = 5Vd.c. + 4\sin 2\pi \cdot 10t$  [V], [Hz] from the signal generator. The amplitude A can vary between 1.5V and 10V.

- Visualise  $v_I(t)$  on the oscilloscope, set on Y-t mode..



## Results

- For what frequency range of  $v_I(t)$  do the LEDs light up gradually?
- For what frequency range of  $v_I(t)$  do the LEDs light up continuously?

## REFERENCES

1. Oltean, G., Electronic Devices, Editura U.T. Pres, Cluj-Napoca, ISBN 973-662-220-7, 200
2. <http://www.bel.utcluj.ro/dce/didactic/ed/ed.htm>