



**NEW HORIZON  
COLLEGE**

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## **“VOLTAGE LEVEL DETECTOR CIRCUIT”**

**A MINI PROJECT**

**REPORT**

*Submitted by*

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*In partial fulfillment for the award of the degree of*

**BACHELOR OF ENGINEERING**

**IN**

**ELECTRONICS AND COMMUNICATION**

**ENGINEERING**

**NEW HORIZON COLLEGE OF ENGINEERING**  
**DEPARTMENT OF ELECTRONICS AND COMMUNICATION**  
**ENGINEERING**



**CERTIFICATE**

Certified that the mini project work entitled “**VOLTAGE CONTROL SYSTEM**” carried out **S.VENKATA YASWANTH REDDY(1NH18EC744)** bonafide students of Electronics and Communication Department , New Horizon College of Engineering, Bangalore.

The mini project report has been approved as it satisfies the academic requirements in respect of mini project work prescribed for the said degree.

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# ACKNOWLEDGEMENT

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## **ABSTRACT**

Sometimes we would want to realize when a voltage exceeds a sure level. We should use a voltmeter, but we won't want to have a look at the Meter all of the time. The answer could be a circuit that would alert us by way of a LED or the Lamp, whilst voltages exceed sure tiers.

Here's a circuit that does just that. We can figure out how this Project works via looking on the schematic. "When the 2 long wires are linked to a voltage much less than 2 volts, nothing will appear. But whilst a voltage of overt 2 volts is implemented, LED 1 will mild up.

This is because the voltage is excessive sufficient to conquer the resistance of the 1K resistor related in series with LED 1. When the voltage rises to from everywhere 1 to 9volts, the Relay will function and the Lamp will come on.

We made this Project to make certain battery voltages are above positive stages. It also can be used to warn when voltages in a circuit have become too excessive. We can't use this circuit to measure voltages above 3 zero volts better voltages would possibly cause damage to the parts used inside the Project, we observe some few conditions where a circuit like this might be used. (An electric powered electricity producing facility is one instances)

## **CHAPTER-1**

### **INTRODUCTION**

The design came from the interest of finding a new technique of analog to virtual conversion. The kind of ADC (Analog to Digital Converter) that stimulated us inside the improvement of this circuit are Flash Type ADC and Successive Approximation Type ADC.

The Flash Type ADC is the fastest ADC available within the market (highest sampling charge one hundred twenty MSPS) however it uses a big variety of OP-AMPS. On the other hand, Successive Approximation Type ADC that uses fewer components but its pace is dependent upon the clock frequency provided to it. We changed into looking for a method that provide the trade-off among this two, the result of this circuit. The operating of this circuit is similar to that of decimal fraction to binary fraction conversion. For this cause, the circuit amplifies a sign and compares it to a reference voltage. The circuit can be divided into some of ranges. Number of degrees can be expanded or decreased in keeping with need. Each level consists of two OP-AMPs (TL084). One of them (OP-AMP on the left facet) is used for assessment purpose. The different (OP-AMP at the proper aspect) is used as a non-inverting amplifier with a fixed benefit (EXACTLY 2). The enter voltage is hooked up to the non-inverting pin/terminal of every OP-AMP. The virtual output is received from the output of the evaluating OP-AMP and the output of the amplifier OP-AMP is fed to the subsequent stage. To attain a reference voltage two resistor are used.

## CHAPTER-2

### LITERATURE SURVEY

In our technologically pushed society, we should make sure that what powers our homes and our manner of lifestyles is accurately controlled. Unfortunately, existence threatening incidences related to stray voltage resources happen extra frequently than they should. Though there are ways to discover these electrified assets, they're confined in their use and maximum devices available require bodily touch with the object. With this task, we hoped to bridge the distance between the handheld devices that require direct touch with the sources and the large, widespread region gadgets. Our aim changed into to develop a without difficulty transportable, hand-held tool that may come across stray voltage resources of 120V, 60Hz, from a distance of a few meters.

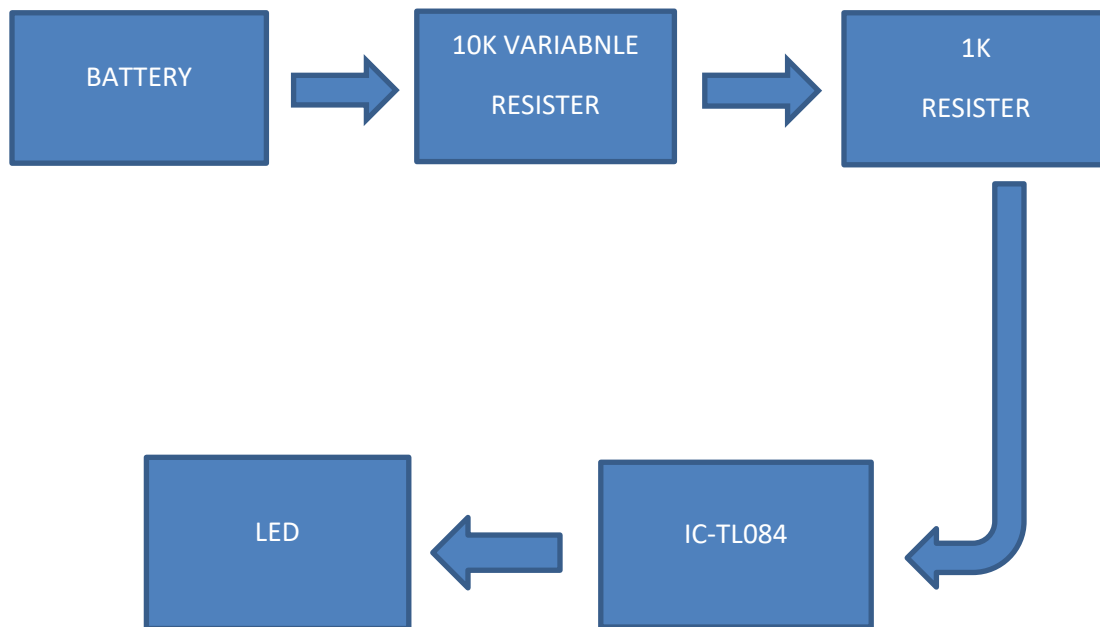
As our undertaking is a continuation of a preceding stray voltage venture, we desired to deal with the problems that remained unresolved. First, the previous yr.'s assignment wasn't a handheld tool. Second, it didn't clear up the problem of the capacitive coupling impact between the device and its surroundings. As our device is hand held, and thus has a "floating ground," capacitive coupling to numerous electric noise assets has an impact on our ground reference factor. To better understand how we ought to remedy this issue, we determined to begin at the beginning through a few preliminary experiments.

## CHAPTER-3

### PROPOSED METHODOLOGY

- Collecting components
- Understand the function of each component
- Construction of the circuit
- Observation of result and verification

### 3.1 BLOCK DIAGRAM



3.1 fig of block diagram

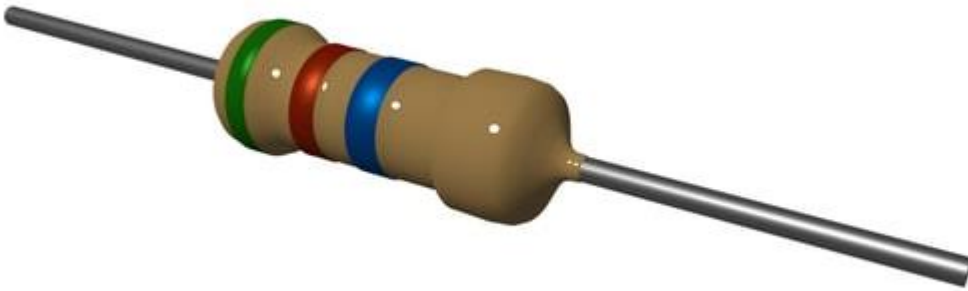


## 3.2 RESISTER

A resistor is a passive -terminal electrical thing that implements electrical resistance as a circuit detail. In electronic circuits, resistors are used to lessen current go with the flow, modify sign ranges, to divide voltages, bias lively factors, and terminate transmission traces, among other uses. High-electricity resistors which can dissipate many watts of electrical electricity as warmness, may be used as part of motor controls, in energy distribution systems, or as check loads for mills. Fixed resistors have resistances that handiest alternate slightly with temperature, time or operating voltage. Variable resistors can be used to adjust circuit elements (along with a quantity control or a lamp dimmer), or as sensing gadgets for heat, mild, humidity, pressure, or chemical interest.

Resistors are common elements of electrical networks and electronic circuits and are ubiquitous in digital equipment. Practical resistors as discrete additives can be composed of diverse compounds and paperwork. Resistors also are carried out within included circuits.

The electric feature of a resistor is certain by way of its resistance: common business resistors are manufactured over a range of greater than 9 orders of significance. The nominal price of the resistance falls in the manufacturing tolerance, indicated at the issue.



### 3.2 fig of resister

Resistors won't display the fee outs debut resistor color pattern via their resistance

Can be calculated. PTH (plated-thru-hollow) resistors use a color-coding machine (which without a doubt provides some flair to circuits), and SMD (floor-mount device) resistors have their personal price-marking system.

Following is a table with color code of resistors

Colour	Value
Black	0
Brown	1
Red	2
Orange	3
Yellow	4
Green	5
Blue	6
Violet	7
Grey	8
White	9
Gold	-
Silver	-
No band	-

## APPLICATIONS OF RESISTOR

- Wire wound resistors discover software in which balanced contemporary manage, high Sensitivity and accurate size are required like in shunt with ampere meter.
- Photo resistors locate utility in flame detectors, burglar alarm, in photographic devices and so forth.
- Resistors are used for controlling temperature and voltmeter.
- Resistors are utilized in virtual multi-meter, amplifiers, telecommunication, and oscillators.
- They also are used in modulators, demodulators, and transmitters.

### 3.3 LED



3.3 fig of LED

A light-emitting diode (LED) is a semiconductor device that emits light when current flows through it. Electrons inside the semiconductor recombine with electron holes, releasing energy in the form of photons. The color of the light (corresponding to the energy of the photons) is determined through the energy required for electrons to go from the valence band to the conduction band of the semiconductor. White light is achieved by using more than one semiconductor or a layer of light-emitting phosphor on the semiconductor device.

Appearing as practical electronic devices in 1962, the earliest LEDs emitted low-intensity infrared light. Infrared LEDs are used in remote-control circuits, such as the ones used with a wide range of consumer electronics. The first visible LEDs have been of low intensity and restricted to red. Modern LEDs are available across the visible, ultraviolet, and infrared wavelengths, with varying output.

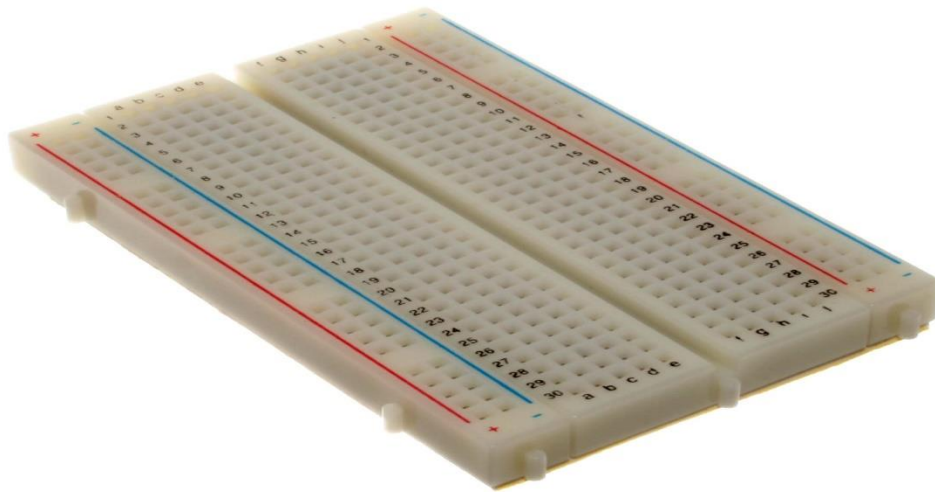
Early LEDs were often used as indicator lamps, replacing small incandescent bulbs, and in seven-segment displays. Recent trends have produced high-output white LEDs suitable for room and outdoor area lights. LEDs have brought about new shows and sensors, even as their high switching speeds are useful in advanced communications era.

LEDs have many benefits over incandescent light sources, consisting of lower energy intake, longer lifetime, stepped forward ruggedness, smaller size, and faster switching. LEDs are utilized in programs as numerous as aviation lighting, automotive headlamps, advertising and marketing, general lighting, visitor alerts, camera flashes, lighted wallpaper, plant growing light, and scientific gadgets.

Unlike a laser, the light emitted from an LED is neither spectrally coherent nor even incredibly monochromatic. However, its spectrum is sufficiently narrow that it seems to the human eye

as a natural (saturated) coloration. Nor, in contrast to most lasers, is its radiation spatially coherent, so that it cannot method the very high brightness function of lasers.

### 3.4 BREAD BOARD



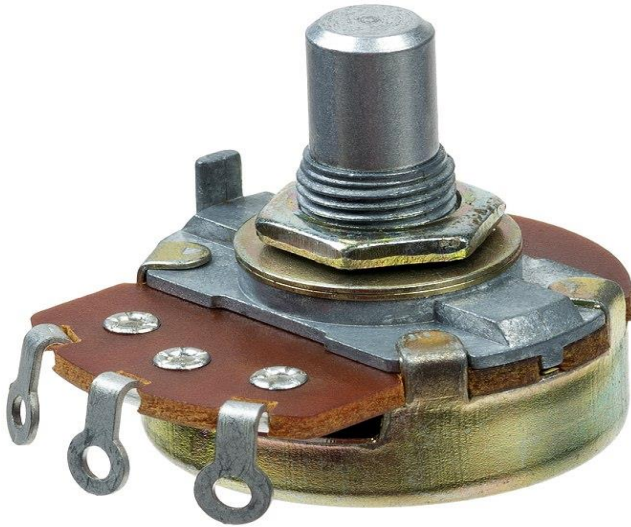
3.4 fig of bread board

A breadboard is a construction base for prototyping of electronics. Originally the word referred to a literal bread board, a polished piece of wooden used for reducing bread.[1] In the Nineteen Seventies the solderless breadboard (Plug board, a terminal array board) became available and these days the term "breadboard" is normally used to consult these.

Because the solderless breadboard does no longer require soldering, it is reusable. This makes it smooth to apply for growing temporary prototypes and experimenting with circuit design. For this purpose, solderless breadboards are also famous with students and in technological training. Older breadboard types did not have these belongings. A stripboard (Vero board) and similar prototyping printed circuit forums, which are used to construct semi-permanent soldered prototypes or one-offs, cannot without problems be reused. A kind of electronic structures can

be prototyped by using the use of breadboards, from small analog and digital circuits to finish crucial processing units (CPUs).

### 3.5 VARIABLE RESISTER



3.5 fig of variable resister

A potentiometer is a three-terminal resistor with a sliding or rotating contact that forms an adjustable voltage divider. If best terminals are used, one cease and the wiper, it acts as a variable resistor or rheostat.

The measuring instrument referred to as a potentiometer is essentially a voltage divider used for measuring electric ability (voltage); the factor is an implementation of the equal principle, consequently its name.

Potentiometers are usually used to govern electric devices which include volume controls on audio system. Potentiometers operated by a mechanism can be used as role transducers, as an

example, in a joystick. Potentiometers are rarely used to without delay control sizeable strength (greater than a watt), since the energy dissipated inside the potentiometer might be similar to the strength inside the managed load.

### 3.6 BATTERY

A regulated strength supply is an embedded circuit; it converts unregulated AC (Alternating Current) right into a constant DC. With the assist of a rectifier it converts AC supply into DC. Its function is to supply a solid voltage (or much less regularly modern-day), to a circuit or tool that have to be operated inside certain power supply limits. The output from the regulated strength supply can be alternating or unidirectional, however is sort of constantly DC (Direct Current)

The form of stabilization used can be constrained to making sure that the output remains within certain limits beneath diverse load d conditions, or it is able to also include reimbursement for version in its very own supplies. The latter is a great deal more not Unusable now a days.



3.6 fig of battery

### 3.7 WIRES



3.7 fig of wires

A wire is a single, usually cylindrical, flexible strand or rod of metal. Wires are used to bear mechanical loads or electricity and telecommunications signals. Wire is commonly formed by drawing the metal through a hole in a die or draw plate. Wire gauges come in various standard sizes, as expressed in terms of gauge numbers. The term wire is also used more loosely to refer to a bundle of such strands, as in multi-stranded wire, which is more correctly termed a wire rope in mechanics, or a cable in electricity.

Wire comes in solid core, stranded, or braided forms. Although usually circular in cross-section, wire can be made in square, hexagonal, flattened rectangular, or other cross-sections, either for decorative purposes, or for technical purposes such as high-efficiency voice coils in loudspeakers. Edge-wound coil springs, such as the Slinky toy, are made of special flattened wire.



## CHAPTER-4

### PROJECT DESCRIPTION

The circuit is built around with two IC-TL084, ONE VARIABLE resist, 18-1k resistors.

It is a quad IC.

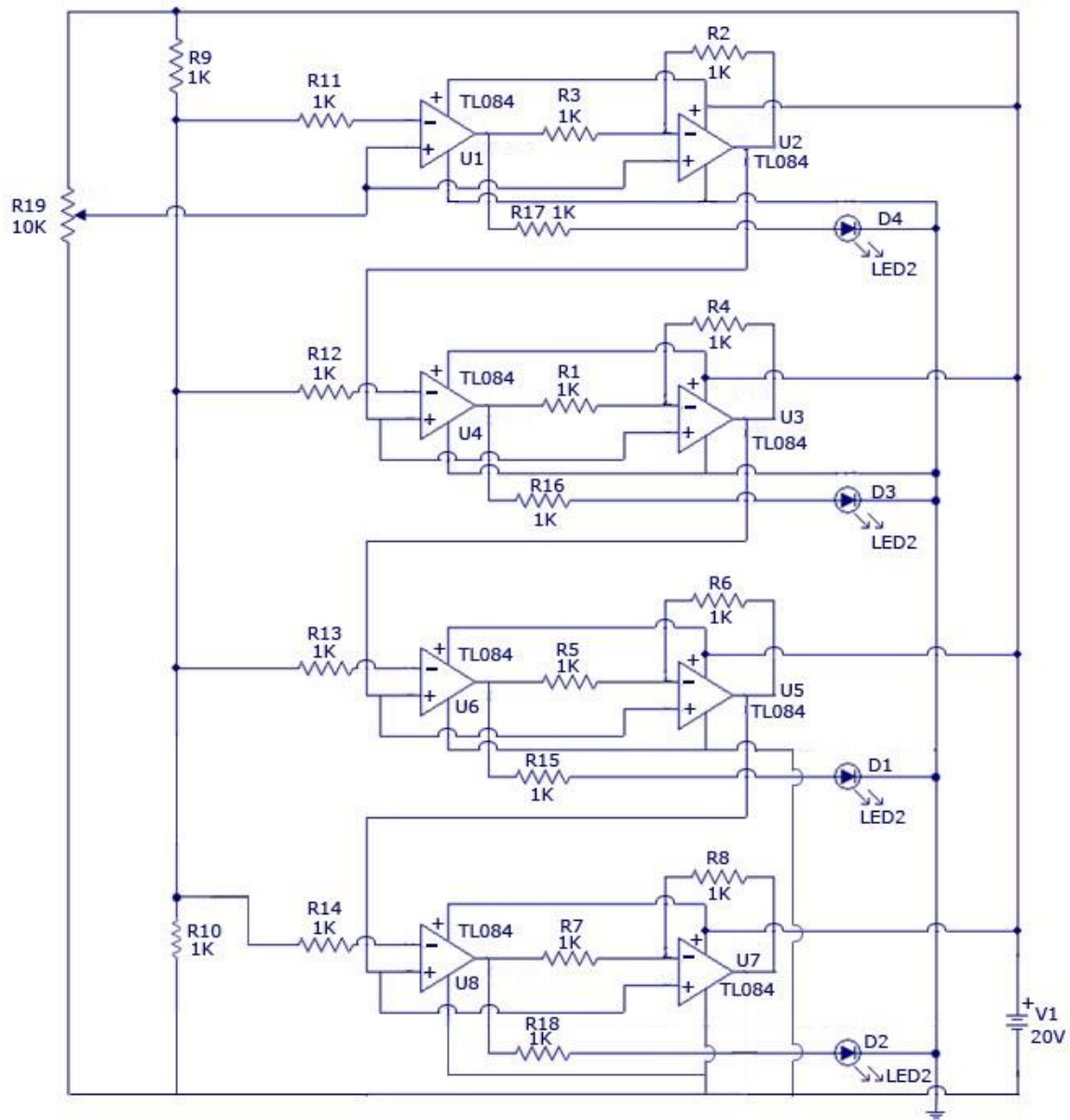
The operating of this circuit is much like that of decimal fraction to binary fraction conversion. For this reason, the circuit amplifies a sign and compares it to a reference voltage. The circuit can be divided into some of degrees. Number of tiers can be extended or decreased according to need. Each stage includes OP-AMPs (TL084). One of them (OP-AMP at the left side) is used for comparison reason. The other (OP-AMP at the right side) is used as a non-inverting amplifier with a fixed benefit (EXACTLY 2). The input voltage is attached to the non-inverting pin/terminal of each OP-AMP. The virtual output is obtained from the output of the evaluating OP-AMP and the output of the amplifier OP-AMP is fed to the input of the following level. To acquire a reference voltage, resistors are used.

#### 4.1 WORKING

An input voltage is carried out. The OP-AMP used as a comparator compares the input voltage with the reference level. If it exceeds a positive reference degree, the comparator output is going high and there is amplification together with subtraction operation is achieved via the amplifying OP-AMP. If the enter voltage is much less than the reference voltage, best the amplification operation is finished. The output of the amplifier OP-AMP is inherited to decrease stages.

The output of my hobby is the outputs acquired from the comparator OP-AMPs. They together constitute binary quantity.

## 4.2 CIRCUIT-DIAGRAM



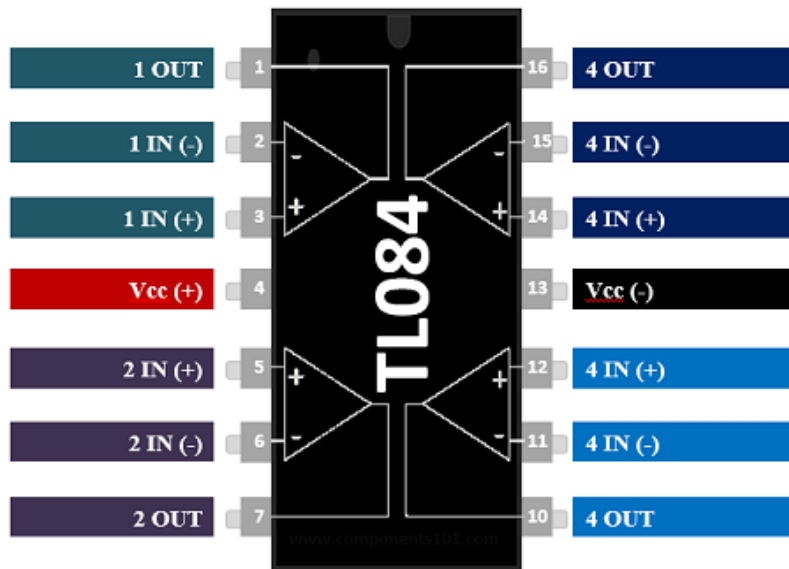
4.2 fig of circuit diagram

### 4.3 REQUIRED COMPONENTS

Count	Label-Value	PACKAGE	Designation
4	LED	SIP2	D1, D2, D3, D4
18	1k	AXIAL0.	R1 to R18
1	10k var	SIP3	R19
2	TL084	DIP14	U1, U3
1	20V or 9v		V1

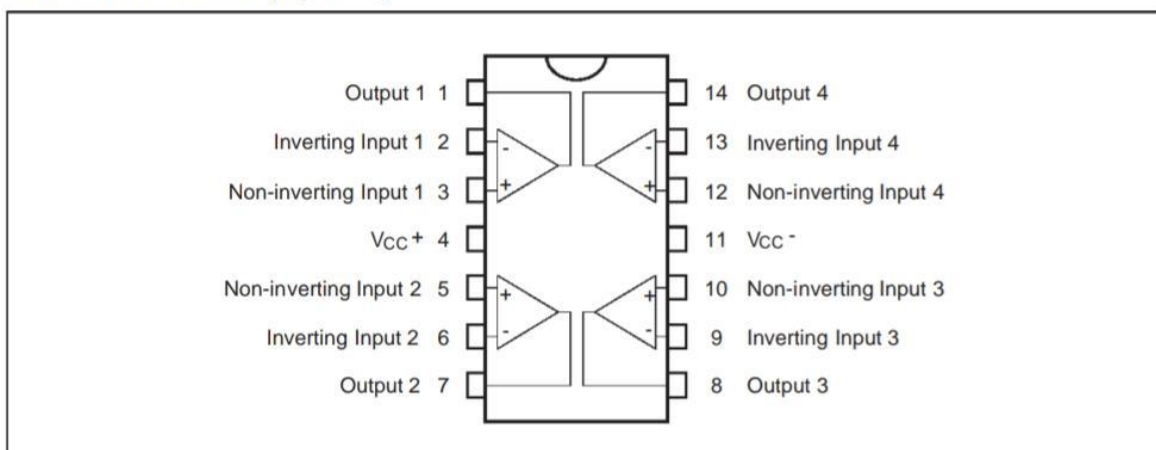
4.3 fig of required components

## 4.4 PIN DIAGRAM



4.4 fig of pin diagram of tl084 in color view

### PIN CONNECTIONS (top view)



4.4 fig of pin diagram of tl084 in without color view

## 4.5 FEATURES OF JEFET-OP AMP

JFET Input Op-Amp Quad Package

Typical Operating Voltage: +18V to -18V

Minimum Operating Voltage: 7V

Input Bias Current: 20pA

Input Offset Voltage: 3mV

Common mode Rejection Ratio CMRR: 86dB

Gain: 200 V/mV

Bandwidth: 4MHz

Output Short circuit protection

Available in 14-pin PDIP, SO-14, TSSOP programs

## 4.6 ABOUT TL084 Op Amp

The TL084 is a Quad Package Operational Amplifier, meaning it has four Op-Amps interior it and every Op-Amp may be used independently.

The fundamental distinguishing feature of the TL084 Op-Amp is they contain excessive-voltage JFET and bipolar transistors which enables the transistor to have very high input impedance and low bias contemporary. Also, this Op-Amp has low noise and harmonic distortion making it a perfect preference for audio pre-amplifiers. So, in case you are looking for an Op-Amp IC with Quad package deal and JFET pushed then this IC might be the right desire for you.

## 4.7 PIN CONFIGURATION

Pin Number	Pin Name	Description
1,7,10,16	Op-Amp Output Pins	These are the output pins of the four Op-Amps
2,6,11,15	Input Inverting Pins	These are the input inverting pins of the four Op-Amps
3,5,12,14	Input Non-Inverting Pins	These are the input non-inverting pins of the four Op-Amps
4	Vcc (+)	Positive Supply Rail of the Op-Amp
13	Vcc (-)	Negative Supply Rail of the Op-Amp

## 4.8 USE OF TL-084 OP-AMP

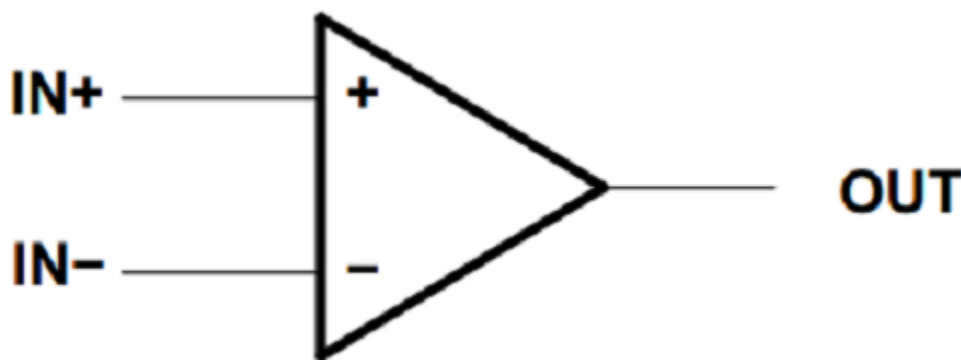
TL084 Op amp could be very similar to the LM324 Op-Amp, they both have four Op-Amps inner them and have the exact equal pinouts. The TL084 however isn't always intended for common 5V operation because it calls for not less than 7V to function. So Unlike LM324 or other op-amps,

in case you are using the Op-Amp in unmarried supply mode, ensure you offer not less than 7V for the Op-Amp to function generally.

If you are curious to learn about few basic application circuits of this IC then you can examine thru how LM324 is used since each the IC shares the identical programs

## 4.9 OP-AMP DESIGN CONSIDERATION

The Op-Amps were recognized as work horse for most electronics circuit designs. There are a plethora of software circuits for Op-Amp each having its traits and significance in its own manner. But every Op-Amp design can have some commonplace design considerations or tips which can be common amongst them and we are able to discuss the equal similarly.



4.9 fig of op-amp design consideration

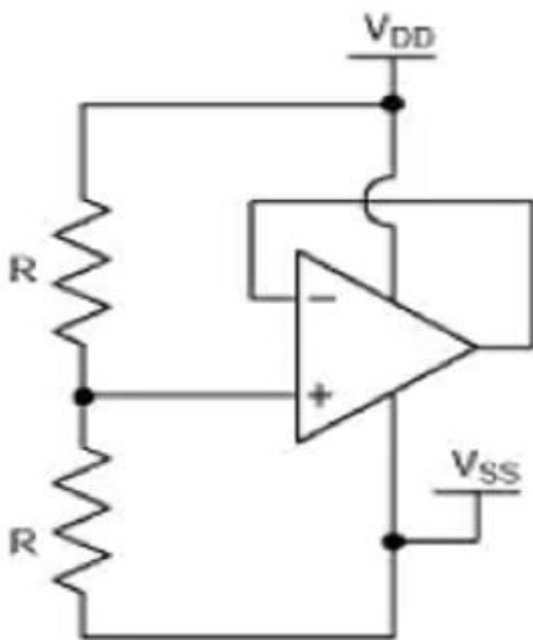
Inputs: Op-Amps are known for its high input impedance, that means it will not draw any current (or disturb) the sign this is being given to the Input pin. The enter degree of an Op-Amp is in most cases complicated since it entails many degrees. The Input not unusual-mode range fee ought to be considered even as providing voltage alerts due to the fact the input voltage need to by no means exceed the rail voltage else it will create a latch-up condition which in go back will create a brief circuit of the deliver voltage and for this reason negative the circuit completely. Also the

distinction among the voltage values of the Inverting and the Non-Inverting pin need to not be more than the Differential Input Voltage Rating.

Output: The TL084 isn't a rail to rail Op-Amp hence the output voltage will now not attain the most tremendous or maximum negative voltage when saturated. It will usually be  $\sim 2V$  less than the supply voltage, this voltage drop happens because of the VCE voltage drop of the transistors gift within the Op-Amp. Also take into account that a saturated Op-Amp will relatively draw more contemporary and as a result outcome in strength loss.

Gain/Feedback: Op-Amps are known for his or her very big Open-Loop Gain, however unfortunately this gain is accompanied by way of noise therefore most of the circuits are designed the usage of Closed-Loop. A Closed-Loop device offers comments to the enter this restricting the gain fee of the Op-Amp and the noise associated with it. A Negative feedback is generally favored because it has predictable nature and has strong operation.

#### 4.10 TERMINATING UNUSED OP-AMP PINS





#### 4.10 fig of terminating unused op-amp

For ICs like TL084 that has a Quad Op-Amp style bundle, frequently there is a great threat that the design does now not utilize all of the available 4 Op-Amps. In that case it is very vital to terminate the unused Op-Amp well. Else, the unused pins will develop some live capacitance which may choose up noise and affect the performance, additionally non terminated Op-Amps will eat greater power thus lowering the performance of the design. There are many ways to terminate an Op-Amp based to your layout, but the maximum commonplace used technique is proven.

### 4.11 TESTING

To see if the circuit is working or not, use a potentiometer. Fix it to the end of 2 pole of the battery, join the wiper to the first degree of the circuit. Now as the potentiometer is swiped across its variety depend can be located represented by way of the four LED's. It will be a binary remember upward or downward.

### 4.12 Shortcomings

The gain of the amplifier has to be 2. Small blunders in better ranges will become worse the performance of lower stages and is un-avoidable due to the fact that nearly a gain, precisely 2 is un-obtainable. Even the 4-degree circuit will show up level loss.

### 4.13 IMPORTANTS

Any other popular purpose OP-AMP can be used in this circuit; Using TL084 reduces the quantity of connections and makes it less difficult.

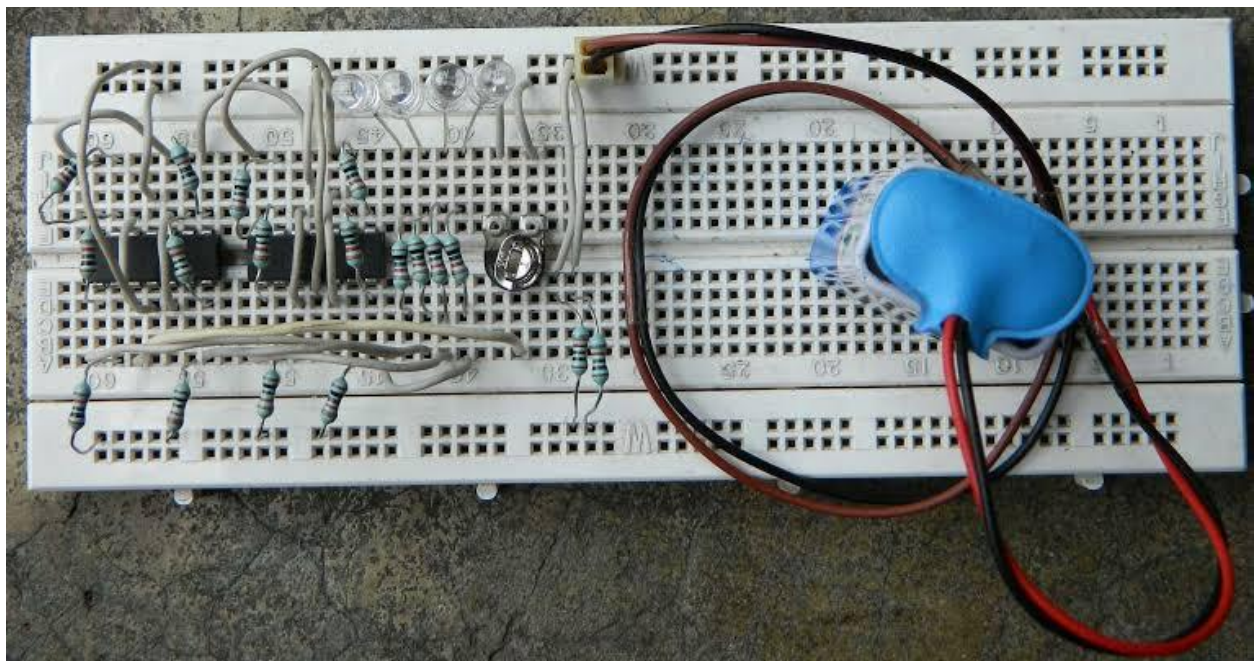
Resistors with equal cost of resistance can be used. Resistances with price of 1k to 10k may be used. Just they want to have identical price. If the tolerance is low, it is ideal for the circuits.

There isn't any need to have a floor connection. Treat it as the bad give up of the battery. All the connections to ground are connected to the negative supply of the battery.

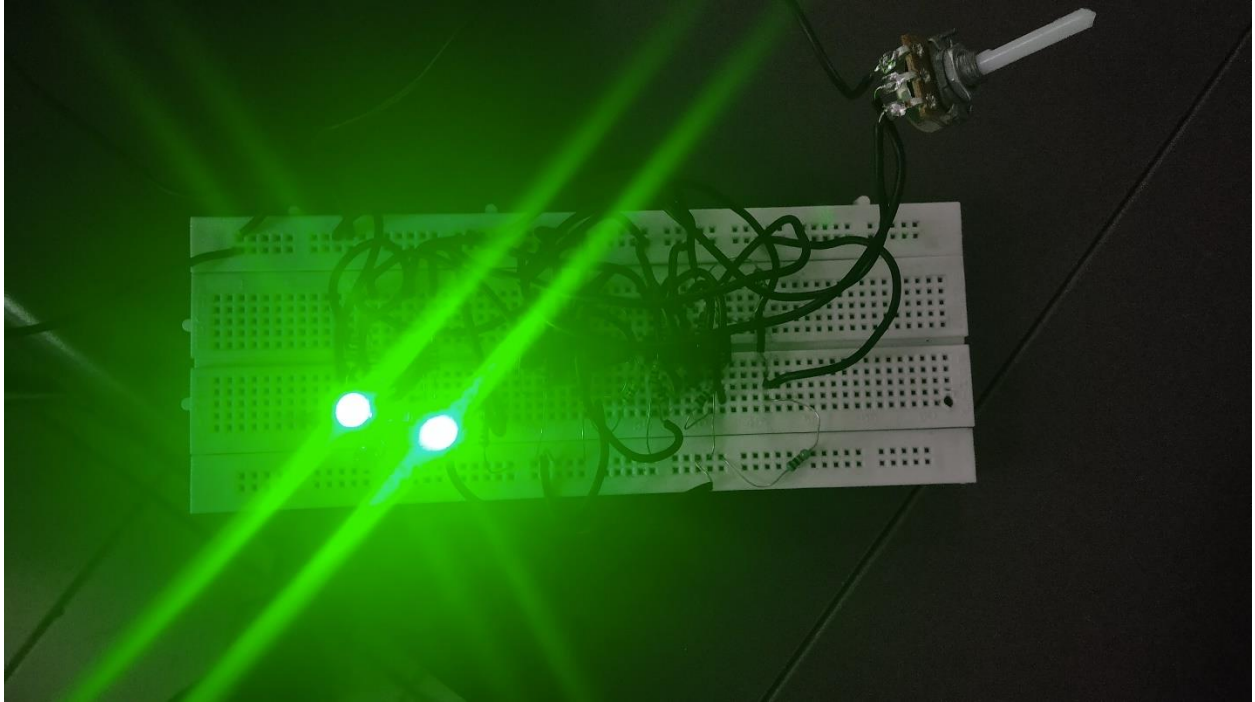
## CHAPTER-5

### RESULT AND DISCUSSION

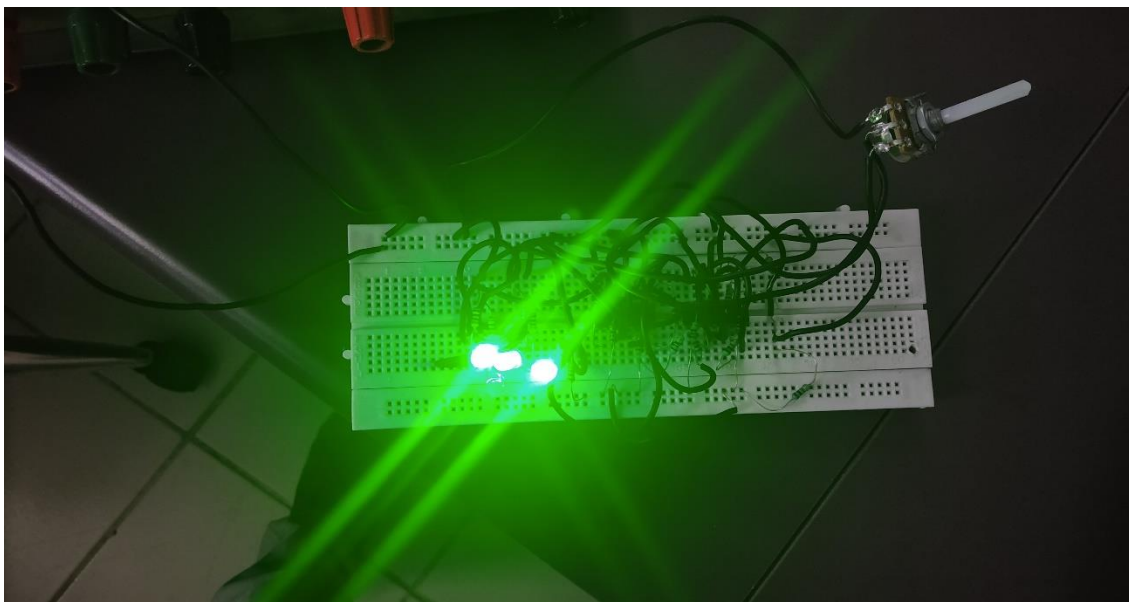
- In input we will give DC voltage.
- By operating 10k variable resistor we will give certain voltage.
- By using the variable resistor, we can give values from 1 to 9v.
- In led lights we can see that when we change it will decrease or increase, we will see that led will change and indicates the voltage level that we had given to the circuit in the binary values



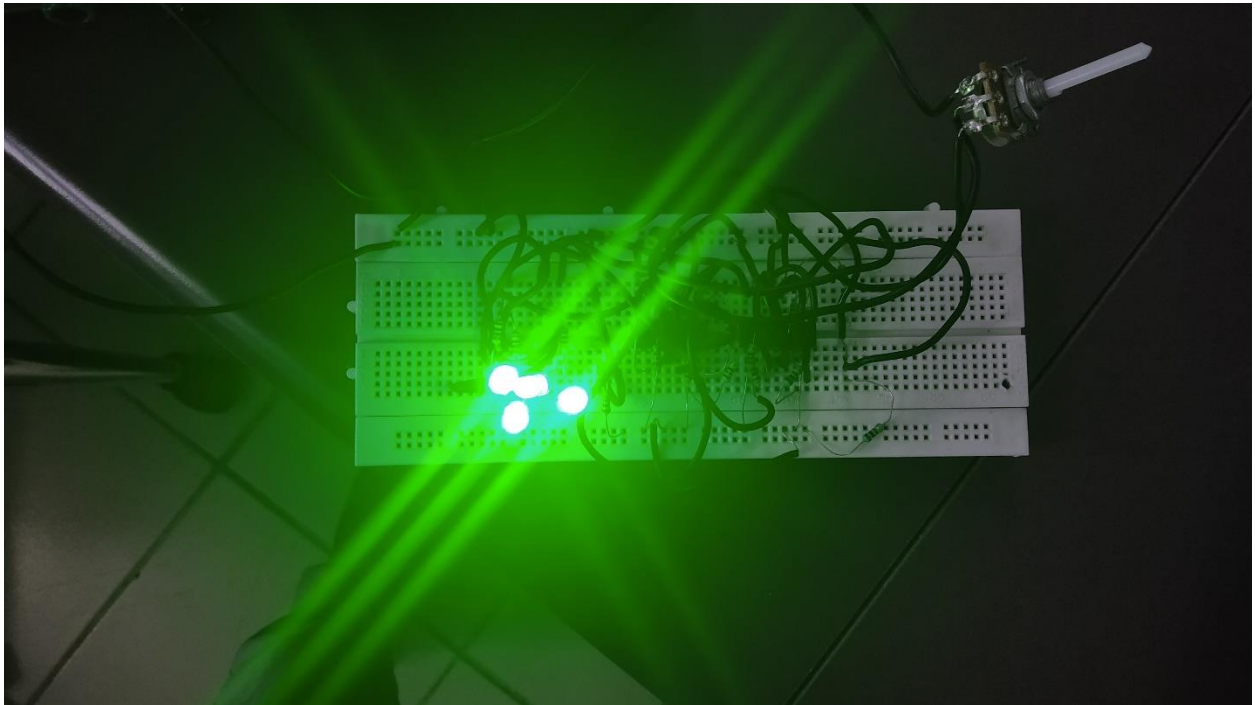
**Case1:** When VCC is 12v and variable resistor is at initial condition.



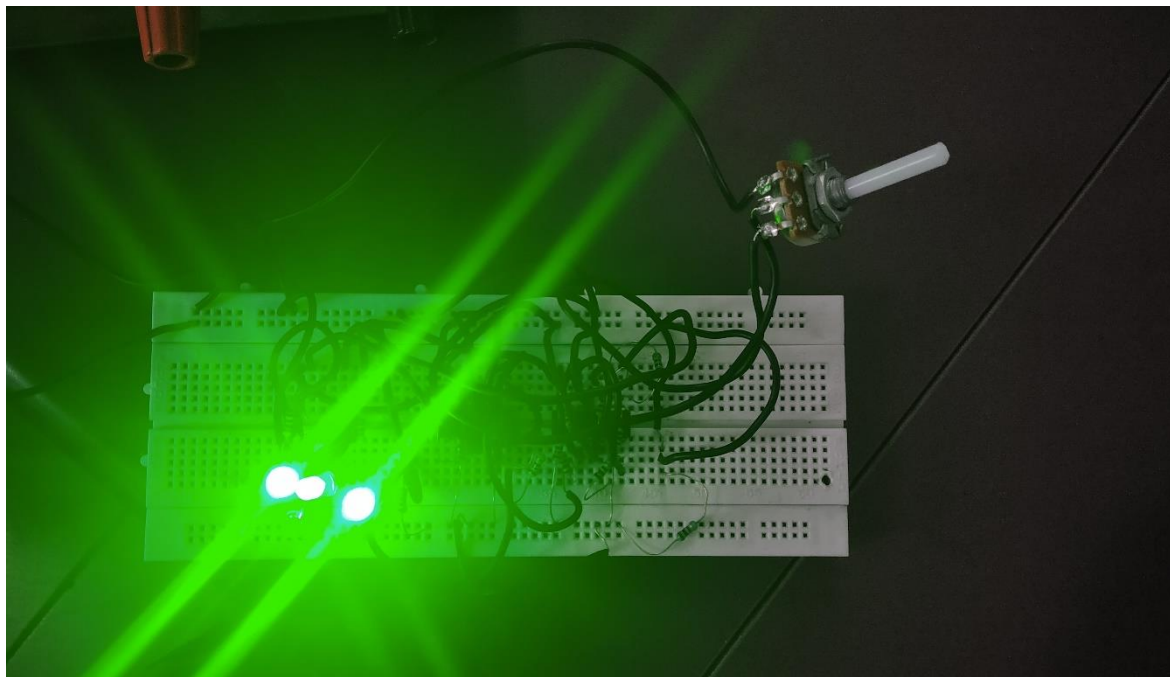
**Case 2:** When VCC is 12v and variable resistor is start varying.



**Case 3:** When VCC is 12v and variable resistor is at varying some more.



**Case 4:** When VCC is 12v and variable resistor is at final condition, only three leds lights will glow.



## **CHAPTER-6**

### **CONCLUSION**

Digital Voltmeter presentations the voltage readings of a circuit numerically. Initially analog voltmeters were used to take the readings of the voltage wherein in a pointer or indicator actions across a scale in percentage to the voltage of the circuit and later, virtual voltmeters have been delivered which gives the numerical display of voltage with accuracy. This article will speak what is Digital Voltmeter, how does its paintings include little by little features, its kinds, applications, benefits and drawbacks.

## **FUTURE SCOPE**

- It has been used in voltmeter, which is used to measure the amount of current used or amount of current measure.
- It also shows the working of meter by blinking of lights.
- By this detector, we can know, how much current or voltage is passing.
- Without using detectors, we can't find the current or voltage.

## REFERENCES

1. <http://www.circuitstoday.com/analog-to-digital-converter-voltage-level-detector-circuit-circuit>
2. [https://www.alldatasheet.com/view.jsp?Searchword=TL084&gclid=Cj0KCQiAtrnuBRDXARIsABiN-7CQP\\_ox1TPm43O779us3WPrAZs3RWW3Kbes0H6SaOKFhLHvdNiWZrEaAg-BEALw\\_wcB](https://www.alldatasheet.com/view.jsp?Searchword=TL084&gclid=Cj0KCQiAtrnuBRDXARIsABiN-7CQP_ox1TPm43O779us3WPrAZs3RWW3Kbes0H6SaOKFhLHvdNiWZrEaAg-BEALw_wcB)