



**Faculty of Engineering**  
**Second year Communication Department**  
**Academic year: 2020/2021**

**Report Project measurement**

**Report title: Digital Voltmeter**

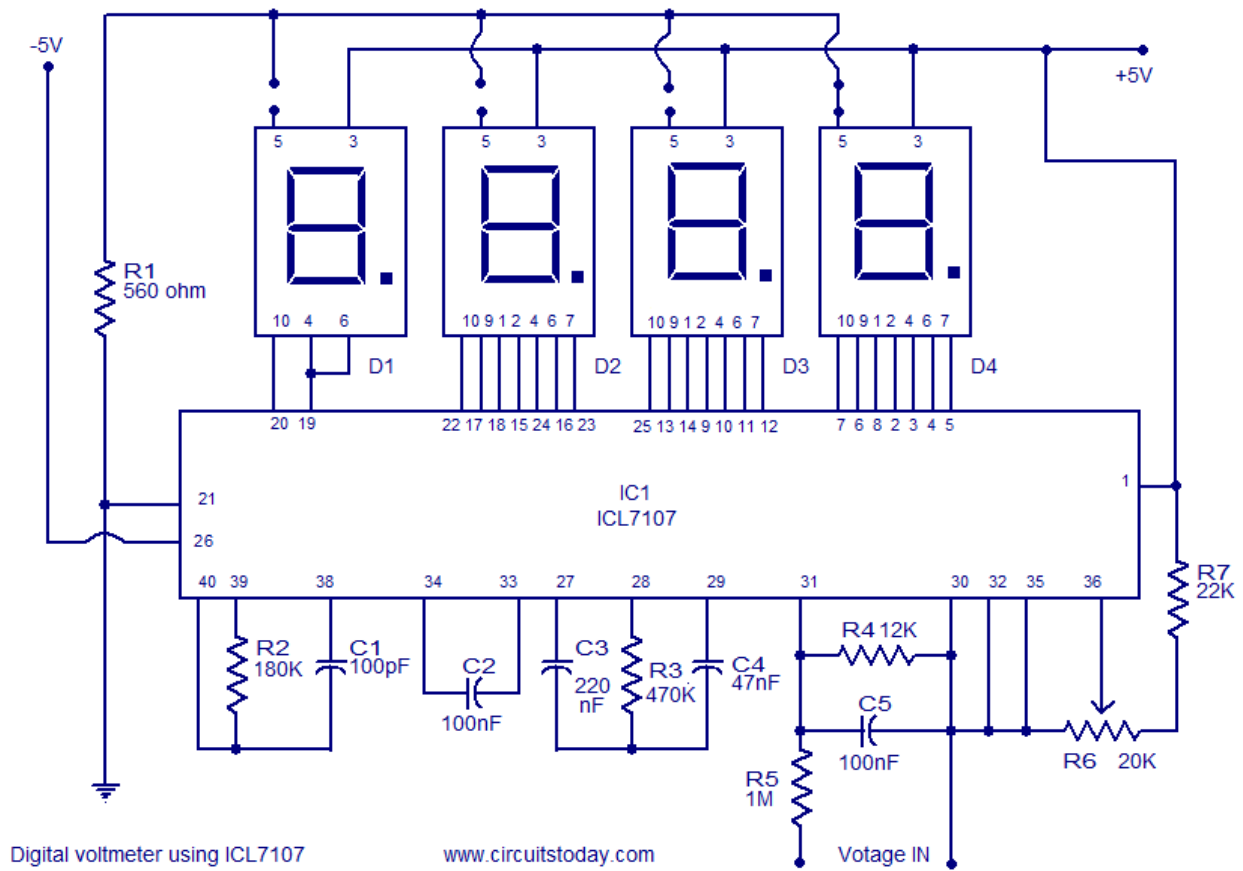
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Voltmeter is an electrical measuring instrument used to measure potential difference between two points. The voltage to be measured may be AC or DC. Two types of voltmeters are available for the purpose of voltage measurement and analog and digital. Analog voltmeters generally contain a dial with a needle moving over it according to the measure and hence displaying the value of the same. With time analog voltmeters are replaced by **digital voltmeters** due to the same advantages associated with digital systems. Although digital voltmeters do not fully replace analog voltmeters, still there are many places where analog voltmeters are preferred over digital voltmeters. Digital voltmeters display the value of AC or DC voltage being measured directly as discrete numerical instead of a pointer deflection on a continuous scale as in analog instruments. In this project our **digital voltmeter** will measure dc voltage only.

### **Advantages of digital voltmeter:**

- Read out of digital voltmeter measures is easy as it eliminates observational errors in measurement committed by operators.
- Error on account of parallax and approximation is entirely eliminated.
- Reading can be taken very fast.
- Output can be fed to memory devices for storage and future computations.
- Versatile and accurate.
- Compact and cheap.
- Low power requirements.
- Portability increased.

## Diagram of The Circuit



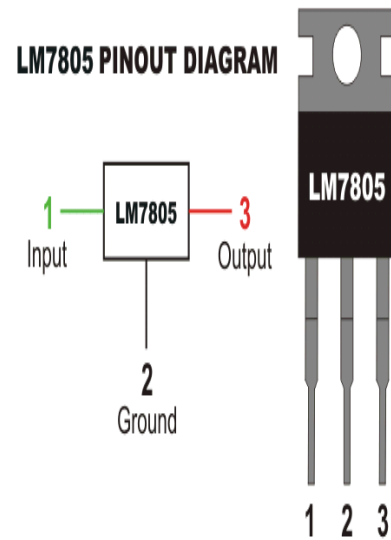
## Components

- IC 7107 & 7660
- Regulator LM 7805
- Variable resistance 20k
- Capacitors 100nf (2) / 100pf / 220nf / 470nf
- Resistors 180k / 470k / 12k / 22k / 560

## Components function

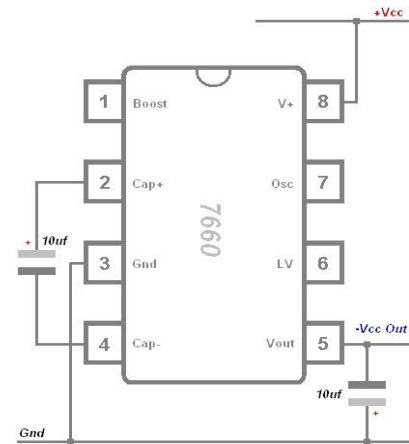
### - LM 7805:

- 5V Positive Voltage Regulator
- Minimum Input Voltage is 7V
- Maximum Input Voltage is 25V
- Operating current ( $I_Q$ ) is 5mA
- Internal Thermal Overload and Short circuit current limiting protection is available.
- Junction Temperature maximum 125 degree Celsius



### - IC 7660:

The 7660 is a *negative voltage converter* IC that converts positive voltage to negative voltage. Generating negative output from positive voltage is very easy using this chip. The circuit shown will convert a positive voltage in the range of +1.5 V to +10 V, into a corresponding negative voltage in the same range -1.5 V to -10 V.



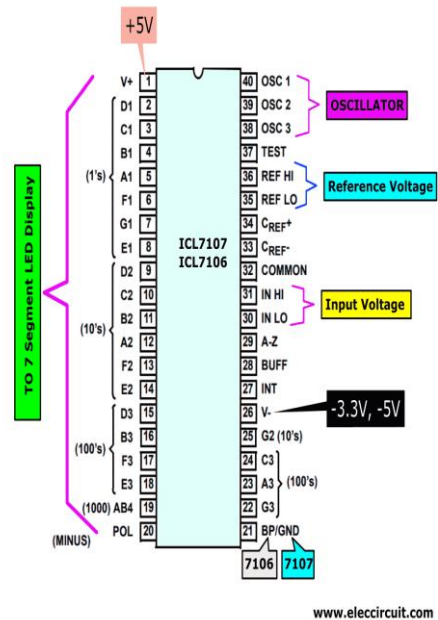
The application for this chip is very simple and requires just two electrolytic capacitors of 10-µF value. The circuit is ideal if you need a negative DC voltage.

For example, if the supply voltage  $V_{cc}$  at Pin 8 was +5 V, then the corresponding output on Pin 5 will be -5 V.

## - IC 7107:

It is a high performance, low power, 3.5 digits analog to digital converter (ADC). It has an internal circuitry for seven segment decoders, display drivers, reference voltage source and a clock. The power dissipation is less than 10mW and high display stability.

- Pins 1 & 26 are  $\pm$  Voltage supply
- Pins 2 to 25 are for 7-segment display
- Pin 27 is signal integrate
- Pin 28 & 29 voltage buffer
- Pin 30 & 31 for the measured voltage
- Pin 21 & 32 connected to ground
- Pin 33 & 34  $\pm$  reference capacitance
- Pin 37 is a test pin
- Pin 38 & 39 & 40 to set oscillator frequency



ICL7107 / 7106 Pinout

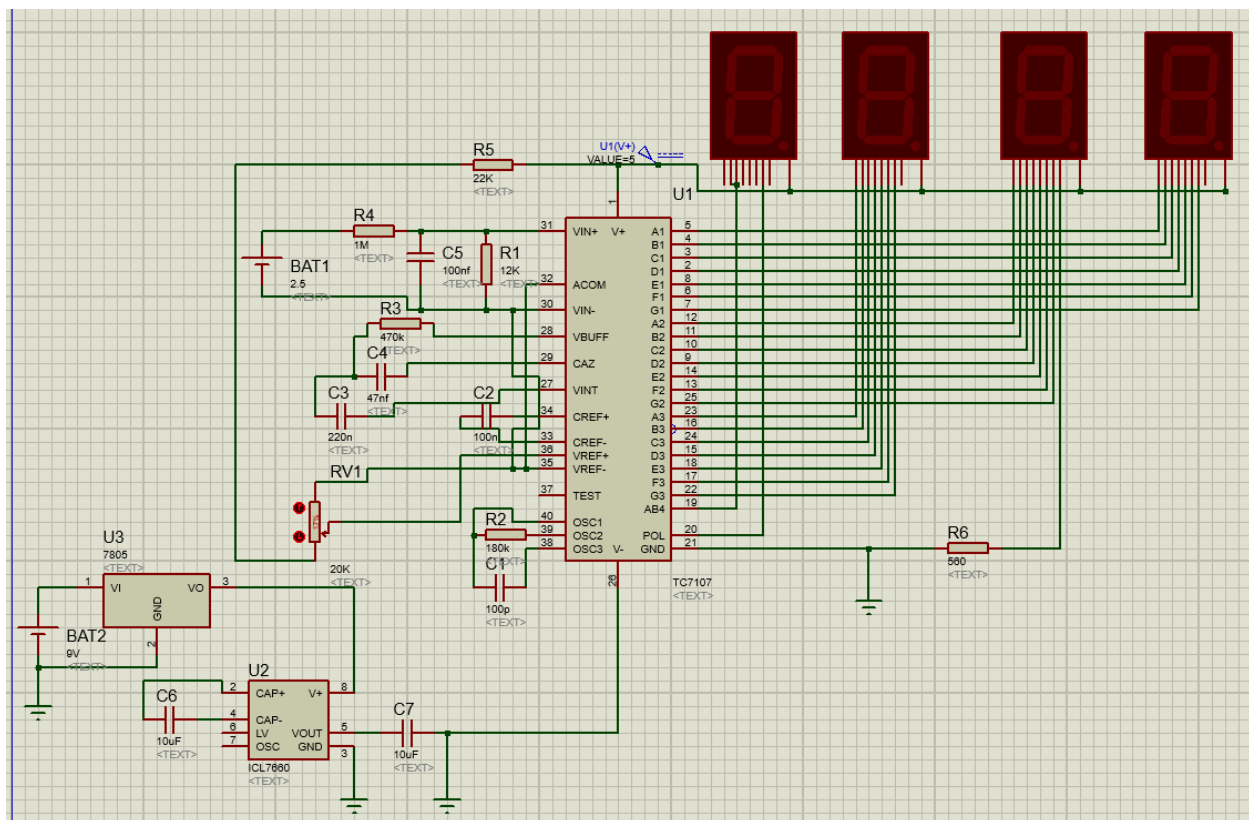
## Description of how this circuit work

The circuit given here is of a very useful and accurate digital voltmeter with LED display using the ICL7107 from Intersil. The ICL7107 is a high performance, low power, 3.5 digits analog to digital converter. The IC includes internal circuitry for seven segment decoders, display drivers, reference voltage source and a clock. The power dissipation is less than 10mW and the display stability is very high.

The resistor R2 and C1 are used to set the frequency of IC's internal clock. Capacitor C2 neutralizes the fluctuations in the internal reference voltage and increases the stability of the display. R4 controls the range of the voltmeter. Right most three displays are

connected so that they can display all digits. The left most display is so connected that it can display only “1” and “-“.The pin5(representing the dot) is connected to ground only for the third display and its position needs to be changed when you change the range of the volt meter by altering R4. (R4=1.2K gives 0-20V range, R4=12K gives 0-200V range). The resistor R2 and C1 are used to set the frequency of IC’s internal clock. Capacitor C2 neutralizes the fluctuations in the internal reference voltage and increases the stability of the display. The left most display is so connected that it can display only “1” and “-“.The pin5(representing the dot) is connected to ground only for the third display .

## Proteus design



## Examples:

