

A Practical activity Report submitted
for Engineering Design Project-II (UTA-024)

by

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Submitted to

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Experiment: 1

Objective:

To design and test pulse width modulation (PWM) based receiver circuit (to receive IR signals from gantries connected to transmitter circuit) on a printed circuit board (PCB).

Software Used: Eagle Software

Component Used:

Sr. No	Name of Components	Value	Specifications
1.	LM311D	-	Operational Amplifier
2.	MBD701	-	Photo Diode
3.	Capacitor	10pF	Electrolytic Capacitor
4.	22-23-2031		PBC Header
5.	Resistor (4)	120k Ω , 100k Ω , 22k Ω and 1k Ω	Carbon Resistors with 5% tolerance.

Theory :

1. LM311D:

LM 311 is basically a **voltage comparator having high speed**. It can operate over wide ranges of voltage i.e. from -15V to 15V, in case of operational amplifier. LM-311 can also operate on 5V for the logic systems. LM-311 output levels has the compatibility with Transistor Transistor Logic (TTL) levels circuits. At 50mA and at 50V too, LM-311 can operate lamps and relays. LM 311 can operate from 0 degree Celsius to 70 degrees Celsius. LM-311 has several different features. These features include fast response time, strobe capability, wide voltage supply ranges, maximum input current, operating at single 5V power supply ranges, low power consumption, large input differential voltages etc.

Several different applications are associated with LM 311 IC. These applications may include

- peak detectors,
- personal computers,
- white goods,
- building automation,
- body control modules etc



Figure 1

2. **MBD701**:

The Schottky diode is designed primarily for high efficiency UHF and VHF detector applications. It is readily adaptable to many other fast switching RF and digital applications. It is supplied in an inexpensive plastic package for low high-volume consumer and industrial/commercial requirements. It is available in a Surface Mount package.

Features

- Extremely Low Minority Carrier Lifetime - 15 ps (Typ)
- Very Low Capacitance - 1.0 pF @ VR = 20 V
- High Reverse Voltage - to 70 Volts
- Low Reverse Leakage - 200 nA (Max)
- Pb-Free Packages are Available
- S Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC Qualified and PPAP Capable



Figure 2



Figure 3

3. Resistor:

A resistor (also known as an electrical resistor) is defined as a two-terminal passive electrical element that provides electrical resistance to current flow. Resistance is a measure of the opposition to the flow of current in a resistor. The larger a resistor's resistance, the greater the barrier against the flow of current. There are many different types of resistors, such as a thermistor.

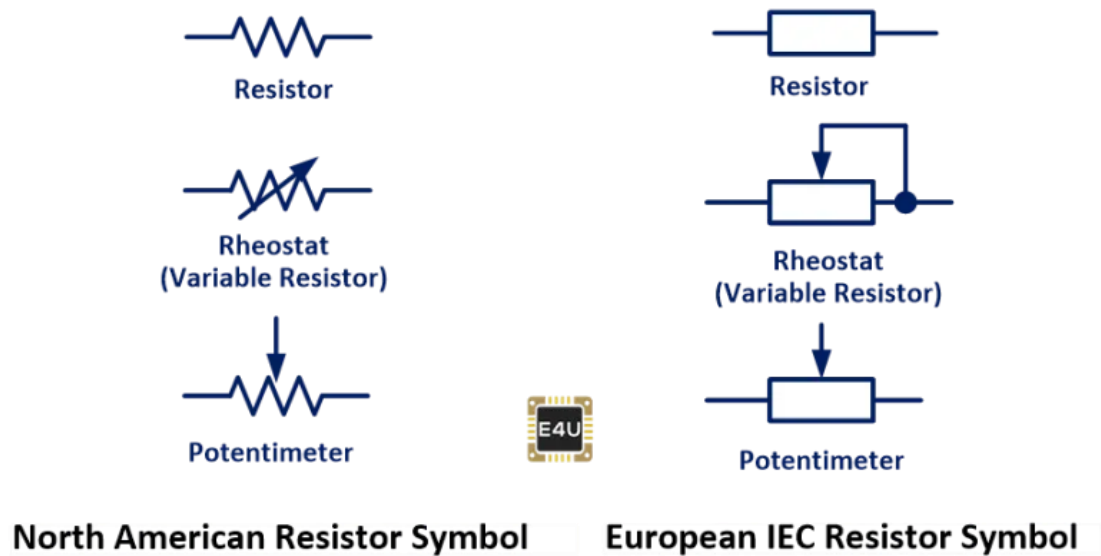


Figure 4

4. Capacitor:

Capacitor is an electronic component that stores electric charge. The capacitor is made of 2 close conductors (usually plates) that are separated by a dielectric material. The plates accumulate electric charge when connected to power source. One plate accumulates positive charge and the other plate accumulates negative charge.

The capacitance is the amount of electric charge that is stored in the capacitor at voltage of 1 Volt. The capacitance is measured in units of Farad (F). The capacitor disconnects current in direct current (DC) circuits and short circuit in alternating current (AC) circuits. Capacitors come in all shapes and sizes, but they usually have the same basic components.

There are the two conductors (known as plates, largely for historic reasons) and there's the insulator in between them (called the dielectric). The two plates inside a capacitor are wired to two electrical connections on the outside called terminals, which are like thin metal legs you can hook into an electric circuit.

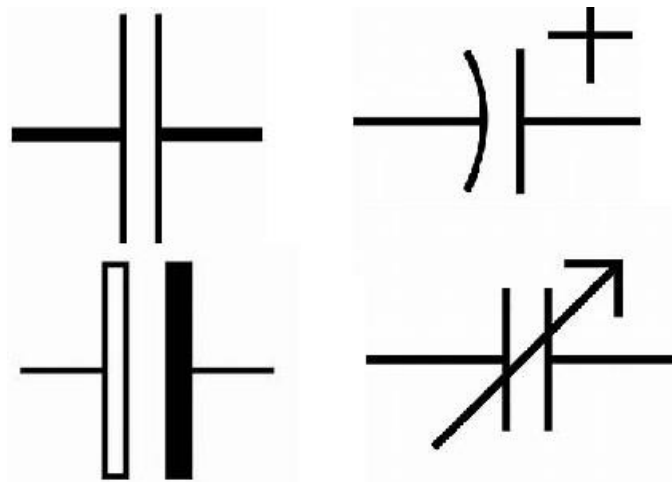


Figure 5

5. 22-23-2031:

PCB (Printed circuit board) headers are a type of electrical connector that allows you to join connections to a PCB using a single block. Typically headers have one side that is designed to be surface mounted and soldered onto the board with the other side allowing connections. Pins on the header can also be surrounded by a shroud to make the unit more secure, prevent pins from bending and allow locking.

Schematic diagram:

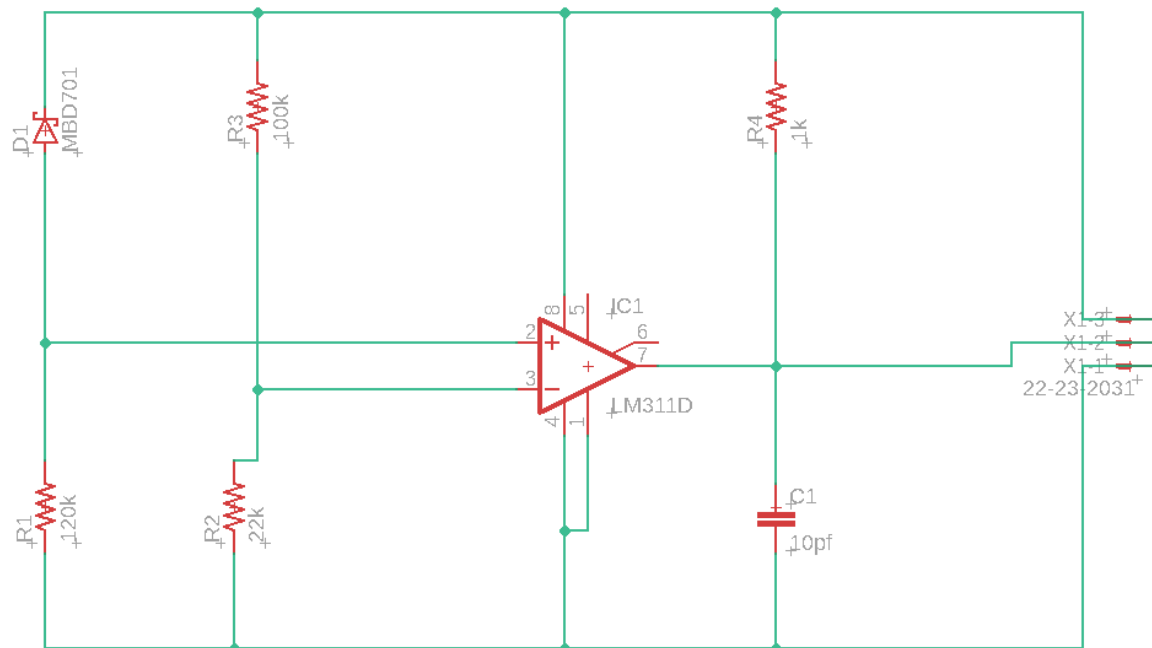


Figure 6

Printed Circuit Board layout:

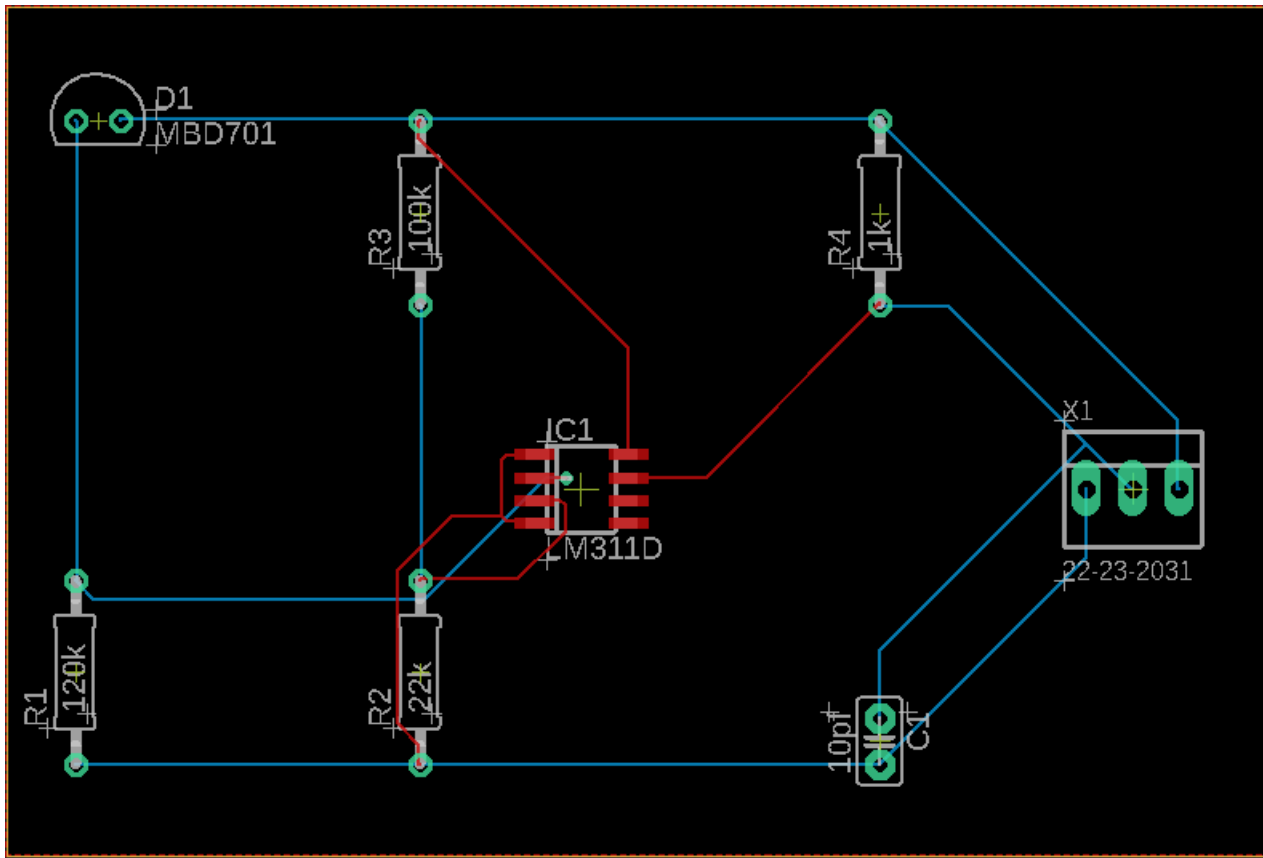


Figure 7

Discussion:

In this experiment we have learnt the simulation of pulse-width-modulator (PWM) receiver circuit using Autodesk Eagle. We have made the schematic of the receiver circuit and the PCB layout of the receiver circuit with the help of operational amplifier, photodiode, PCB header, resistors, and capacitors.

Signature of Faculty member