

RAILWAY CROSSING WARNING LIGHT

Engineering Practice



Jimoh ABdulbasit

c00278683

Group A, Electronics Engineering

**Introduction**

The aim of this project is to build a Railway crossing warning light on a strip board, with components neatly soldered on a stripboard, test it and graph the output with an oscilloscope.

Diagram, schematic

Description automatically generated

**Tasks**

1. Build and simulate the circuit above in ISIS. Graph the output with the oscilloscope or graph function. Experiment with different resistor/capacitor values to get different output waveforms.
2. Build and test the circuit on a breadboard. Use the lab oscilloscope and download a snapshot for your report. Sign off with your lecturer.
3. Calculate what values of the resistors you would need to get the led to stay on for 1s and off for 1s.
4. Calculate and design circuit with a frequency from 80mHz to 600mHz.
5. Prepare a planning sheet using software[diylayoutcreator].
6. Solder and test the circuit and sign off the finished board with lecturer prior to hand up.
7. Prepare a report recording all your work. Note. You will probably have used a data sheet in completing this so include it in your report[marks will be lost otherwise.

Components

* 555 timer and an IC socket
* Red LED
* 3 resistors (3.3k, 15k, 150k)
* 10 µF capacitor
* Connecting wires.

Procedures

I started by reading the questions and understanding what is being asked of me then I went straight to drawing the planning sheet. I made sure the circuit was compact but spacious in the sense that I didn’t waste any unnecessary space but also left room for the timer so that it won’t be over crowded and also to make it neat tidy and free from error. Then, I transferred my planning sheet on to my breadboard calculated the values for my resistor that will keep the frequency of the design between 80mHz to 600mHz. I chose 15k and 150k resistors cause they were two readily available resistors, fell between the range of the accepted frequency and R1 was one tenth of R2. I then tested the circuit on the breadboard, It worked and I showed it to my lecturer but forgot to take a picture of the circuit on the breadboard. The circuit worked and I was satisfied with the performance, so I went on to transfer it to a stripboard and solder it neatly. While soldering it I wanted to make the positive wire red and negative wire black, but I ended up switching them for each other, so I had a problem while testing the circuit. I started going through the whole circuit trying to figure out what was wrong, not knowing the problem was that I switched the positive and negative wire. After some time, I went through my planning sheet and my circuit again, then I saw the mistake and I was a little bit relieved that I hadn’t dismantled the circuit looking for a problem that doesn’t exist. I tested it one more time it was working and I was satisfied with the performance. After testing the circuit on the stripboard, I proceeded to connecting the circuit to the lab oscilloscope. I set the scale of the x-axis to 1s and proceeded to graph the output and took a snapshot of the output waveform.

Result

After testing the circuit, a square waveform was produced and as seen in the digital oscilloscope it takes approximately 1.5s for the led to stay on and 1.5s to stay off.

**Task 1**

Build and simulate the circuit in ISIS.

Diagram, schematic

Description automatically generated

Graph the output with the oscilloscope

Graphical user interface

Description automatically generated

Experiment with different resistor/ capacitor values

I changed the values of the two resistors to 10k and 50k and the capacitor to 5µF

Diagram, schematic

Description automatically generated

Graphical user interface

Description automatically generated

**Task 3**

Calculate what values of the resistors you would need to get the led to stay on for 1s and off for 1s.

Calculation

Formular

Tm = 1

R1 = ?

R2 = 10R1

C1 = 10µF

1 = 0.7 \* (R1 + 10R1) \* 0.000010

After getting the values of R1 and R2, I approximated the value for R1 to 13k and R2 to 130k and put the resistor values in the circuit built in proteus ISIS. I simulated the circuit and graphed the output below.

I built the circuit on ISIS using the values gotten from the calculation above to make the led go on for 1s and off for 1s and graphed the output on a digital oscilloscopeDiagram, schematic

Description automatically generated

A screenshot of a video game

Description automatically generated with medium confidence

After testing the circuit on a breadboard and and using the lab digital oscilloscope I found out the result wasn’t quite 1s it was greater so I tried changing R2 to one nineth of R1 I saw that the time reduced and was almost 1s so I reduced R2 to one eighth of R1 and I got a perfect 1s for Ts and Tm.

Therefore, for Ts and Tm to be 1s R1 = 13kΩ, R2 = 100kΩ, C1 = 10µF

Below is the picture of the breadboard and digital oscilloscope.

A close-up of a circuit board

Description automatically generated with medium confidence

Diagram

Description automatically generated

**Task 4**

I designed my circuit with resistor values 15k and 150k, so to verify my frequency is between the range of 80mHz to 600mHz.

Formular

F = ?

R1 = 15k

R2 = 150k

C1 = 10µF

From the above calculation it shows that the frequency of my Railway crossing warning light is between the approved range.

**Task 5**

Planning sheet

Diagram

Description automatically generated with medium confidence

**Task 6**

**Task 6**

**The circuitcleanly soldiered on a stripboard**

**A picture containing text

Description automatically generated**

**Snapshot of the graphed output using the Labs oscilloscope**

**Diagram, timeline

Description automatically generated**

**Task 7: Data Sheet**

**555 Timer Planning Sheet**

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Graphical user interface, application, Teams

Description automatically generated

|  |  |  |  |
| --- | --- | --- | --- |
| Ordering Number | | Package | Packing |
| Lead Free | Halogen Free |
| NE555L-D08-T | NE555G-D08-T | DIP-8 | Tube |
| - | NE555G-S08-R | SOP-8 | Tape Reel |

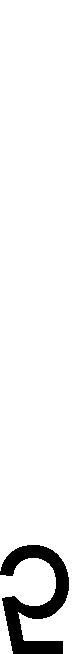
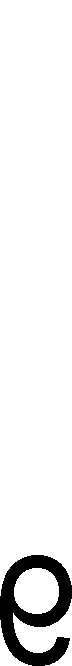
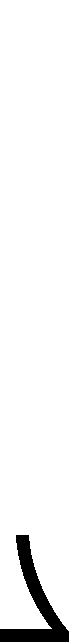
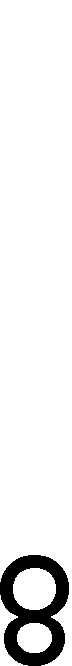
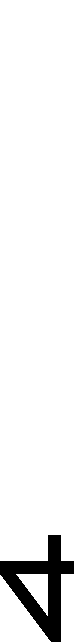
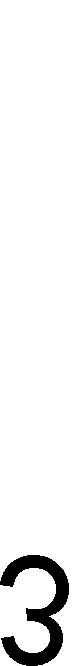
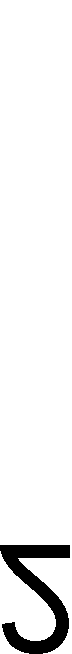
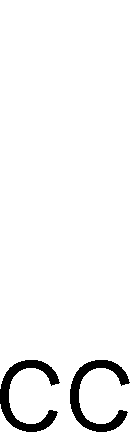
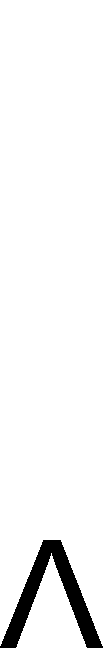
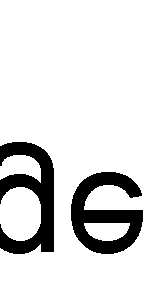
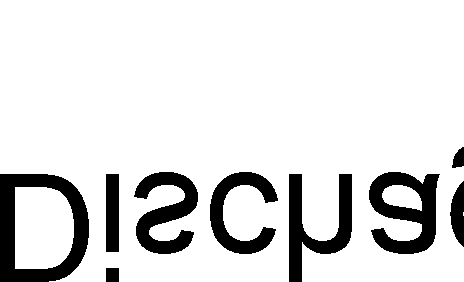
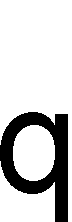
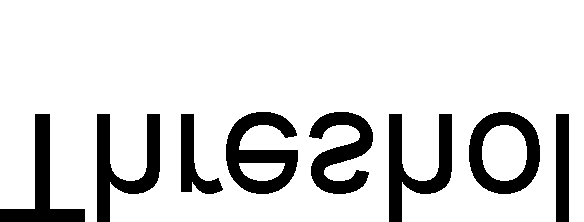
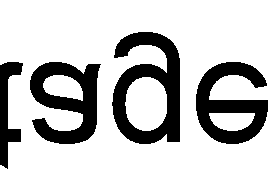
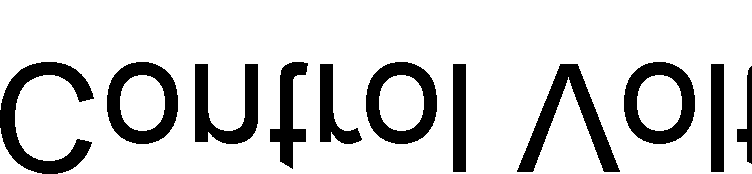
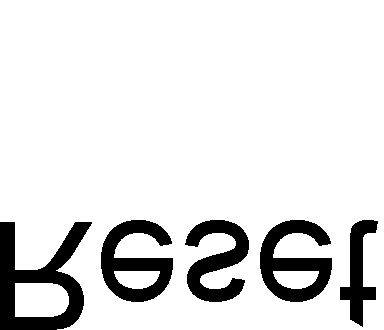
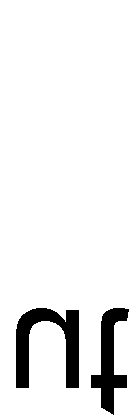
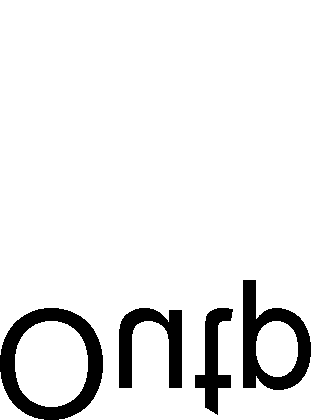
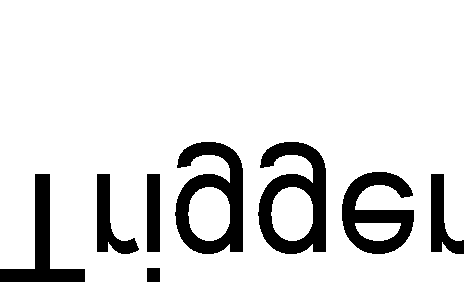
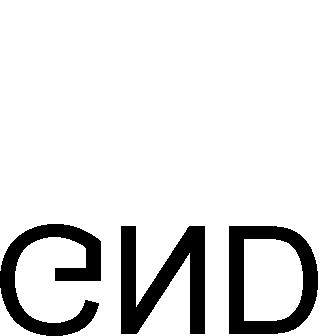
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Description automatically generated

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# PIN CONFIGURATION



# BLOCK DIAGRAM

Graphical user interface, application

Description automatically generated

# ABSOLUTE MAXIMUM RATINGS

|  |  |  |  |
| --- | --- | --- | --- |
| PARAMETER | SYMBOL | RATINGS | UNIT |
| Supply Voltage | VCC | 16 | V |
| Power Dissipation | PD | 600 | mW |
| Junction Temperature | TJ | +125 | °C |
| Operating Temperature | TOPR | -20 ~ +85 | °C |
| Storage Temperature | TSTG | -40 ~ +150 | °C |

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.

**Conclusion**

After a week of building and testing, my railway crossing warning light performs greatly and its frequency 444mHz falls between the accepted range which is 80mHz to 600mHz and it takes approximately 1.5s to stay on and 1.5s to stay off, so the project was a success the circuit is clean and working. It’s a good railway warning crossing light.