

eet103

NMC EET103 Electrical Studies I

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EET103 Electrical Studies I

EET103 - Labs - 555 Timer

Lab 12: 555 Timer Investigation

Name: _____

Objectives

- Review the datasheet for a 555 timer
- Identify the pinout for the 555 timer
- Build a monostable 555 timer circuit
- Build an astable 555 timer circuit (oscillator)
- Operate an oscilloscope to take measurements on the signal

Materials

- 555 timer
- resistors - 220 Ω , 1 k Ω , , 100 k Ω , 1 M Ω
- capacitor, 10 μ F (x2)
- capacitor, 100 nF (104)
- LED, any color
- switch, pushbutton

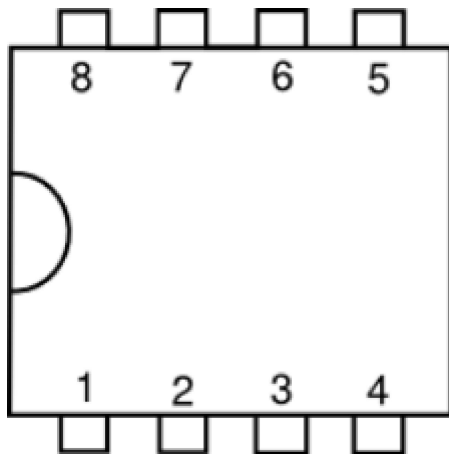
Resources

- [555 Lab - Introduction to the 555 Timer IC](#)
- [555 Lab - Monostable Multivibrator \(One-shot\)](#)
- [555 Timer Astable Oscillator Circuit](#)
- [TLC555 Data Sheet](#)
- [555 Monstable simulation](#)

Section I: Prelab (Refer to the 555 timer datasheet)

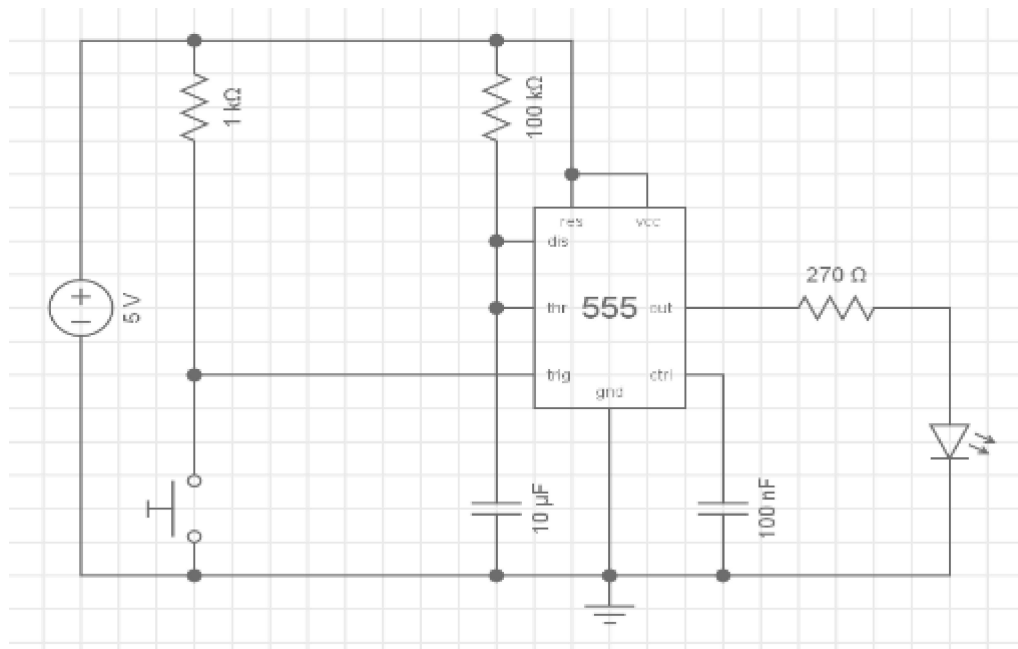
- Describe what an Integrated Circuit (IC) is.
- Refer to the data sheet provided in the Resources section to answer the following.
 - What is the recommended range for the supply voltage, V_{DD} ? (See section 5.3)
 - What is the maximum current that the discharge or output pins can *sink*? (See section 5.1)
 - What is the maximum current that the discharge or output pins can *source*? (See section 5.1)
 - What is the typical value for the trigger voltage with V_{DD} at 5V? (See section 5.6)
 - Which package type are we using? (See Package Information and class notes)

- Label the following pin functions on the image of the 555 DIP package below.
 - V_{DD} or (or V_{CC})
 - GND (ground)
 - TRIG (trigger)
 - DISCH (discharge)
 - THRES (threshold)
 - CONT (control voltage)
 - RESET
 - OUT (output)



Section II: Monostable

- The following 555 circuit is for a monostable (one stable state) output. When the switch is pressed, the time on in seconds is given by $T_{ON} = 1.1 * RC$



- Calculate T_{ON} for the circuit shown above.

- Construct the above circuit and test it to be sure it functions as expected. (Note: substitute the 270Ω resistor with your 220Ω resistor)
 - Instructor sign-off _____
- Measure T_{ON} and record it below.

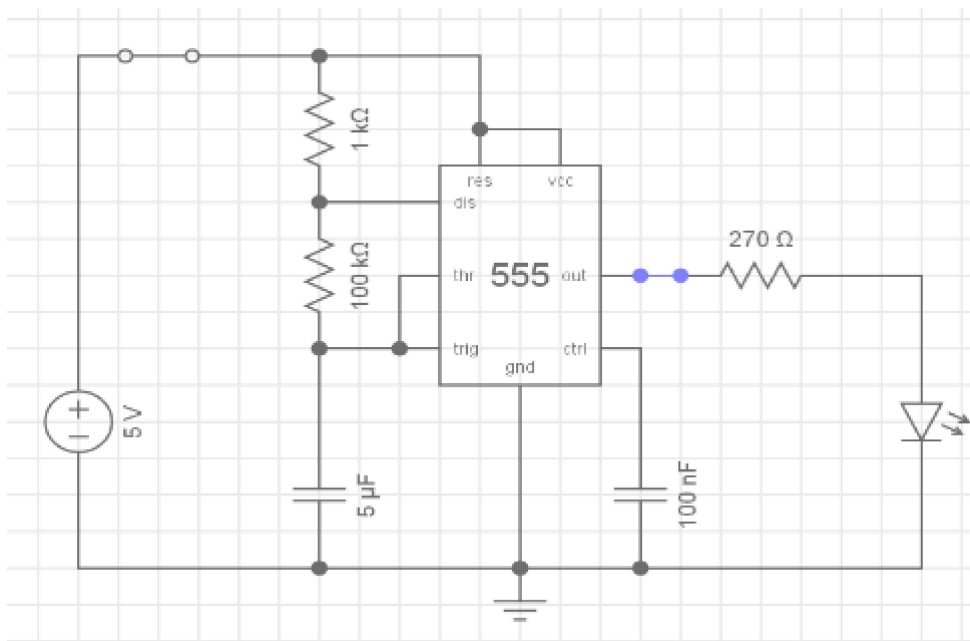
- Replace R with a 1 MΩ resistor. Calculate T_{ON} .

- Measure T_{ON} and record it below.

- Are the measured T_{ON} values as expected? If they are significantly different, double check the wiring and component values.

Section III: Astable

- The following 555 circuit is for an astable (no stable state) output. When powered, the operating frequency (in Hz) is calculated as follows:
 - $F = 1 / T$
 - $T = T_{ON} + T_{OFF}$
 - $T_{ON} = 0.693 * (R_1 + R_2) * C$
 - $T_{OFF} = 0.693 * R_2 * C$



- Calculate the operating frequency for the circuit shown above.

- Construct the circuit and test it to be sure it functions as expected. (Note: Use two 10 μ F capacitors in series to create the 5 μ F value. Be sure to note polarity.)
 - Instructor sign-off _____
- Connect the output to an oscilloscope and measure the frequency.
- Replace R2 with a 10 k Ω resistor. Calculate the new operating frequency.
- Measure the operating frequency and record it below.
- Are the measured frequencies as expected? If not, why?

Section IV: Postlab

- List three applications for a 555 timer.
- How are RC time constants used to control the frequency or T_{ON} of a 555 timer circuit?

- You have an application that requires an output pulse of 60 seconds. Using a 1000 μF capacitor, calculate a resistor value that will meet the circuit requirements.
- You have an application that requires an operating frequency of 60 Hz. Using $R1 = 1\text{k}\Omega$ and $R2 = 100\text{k}\Omega$, calculate a capacitor value that will meet the circuit requirements.
- If $R1 = R2 = 1\text{k}\Omega$, and $C = 5\text{ }\mu\text{F}$, calculate the following:
 - T_{ON} :
 - T_{OFF} :
 - Frequency:

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