

Experiment 3

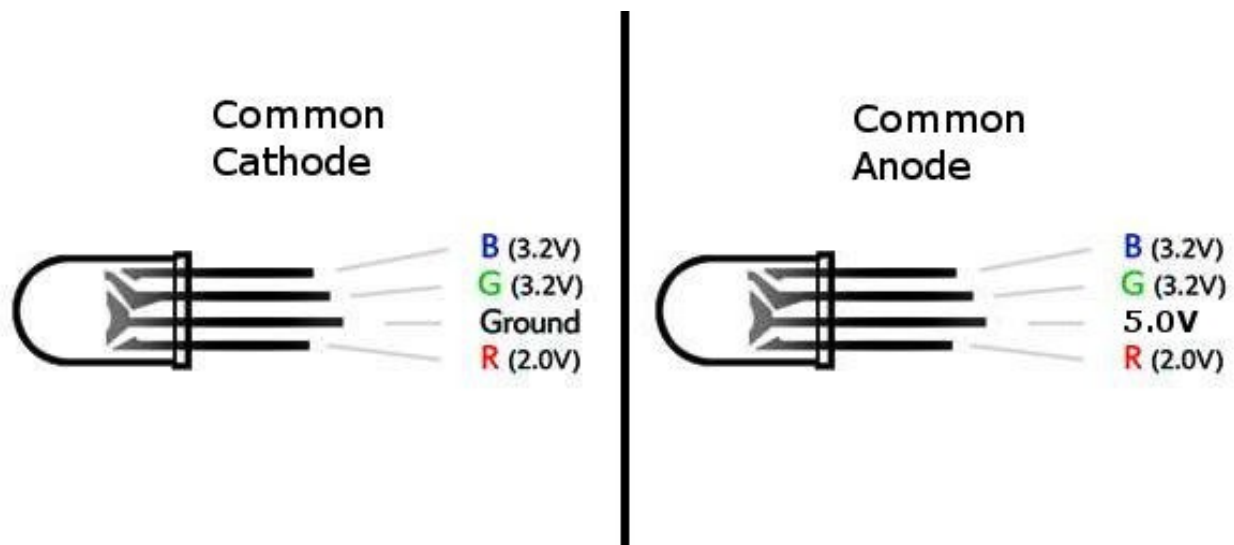
RGB LED / Push Buttons

Outline

In this experiment, it is expected from you to,

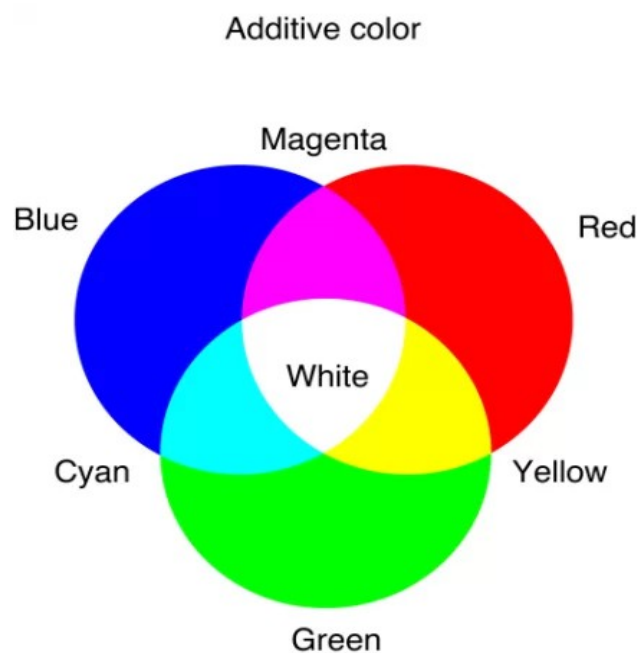
1. Learn the RGB (Red-Green-Blue) LED structure and usage
2. RGB LED types according to their common pin (anode/cathode)
3. Assemble and test the RGB LED circuit
4. Learn the push button structure and usage
5. Assemble and test the push button circuit
6. Modification

1. RGB LED



Structure of Anode/Cathode RGB LED

RGB LEDs are specialized LEDs which can emit a combination of red, green and blue colors. It is possible to emit wide variety of colors but some colors are out of the possible range of the result of these combinations.

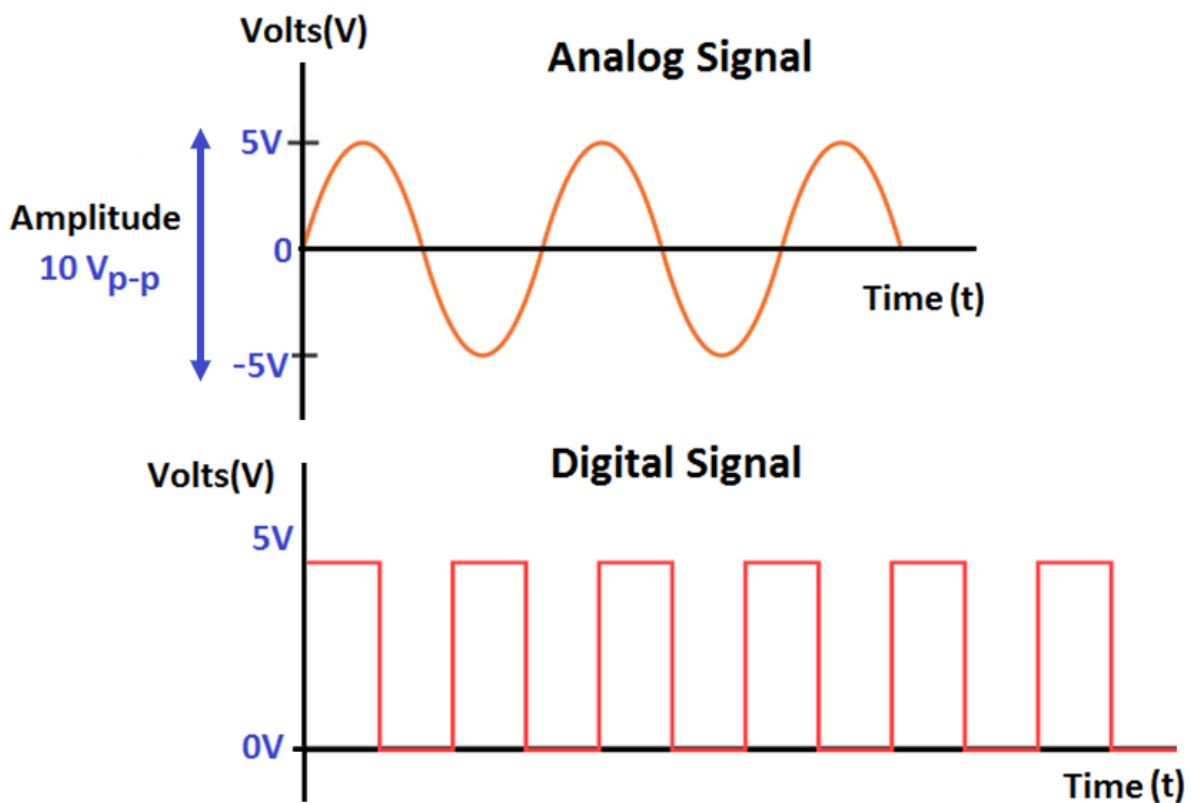


Color Space for RGB LEDs

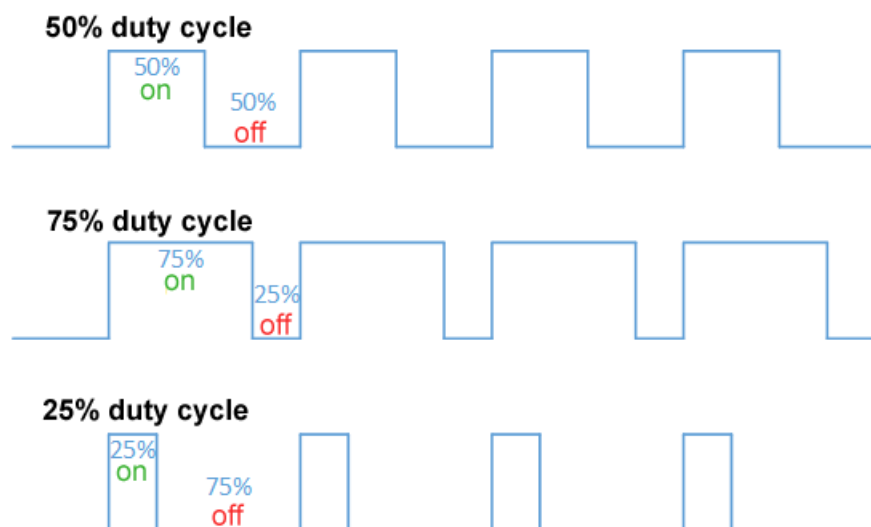
To achieve color combinations you need to use pwm (pulse-width modulation) signals which chops off the digital signals to on and off parts to determine how much power will be supplied with it. Power will determine the intensity of the color you are working on. Fraction of one period of time

t in which this signal is on called duty cycle. Duty cycle is expressed in percent and 100% being fully on.

You have already used both analog and digital signals. The difference between these two signal types is that digital signals are discrete (0/1 or on/off) while analog signals are continuous (range of values). You can not generate analog signal output by using analog pins.



Analog vs Digital Signal



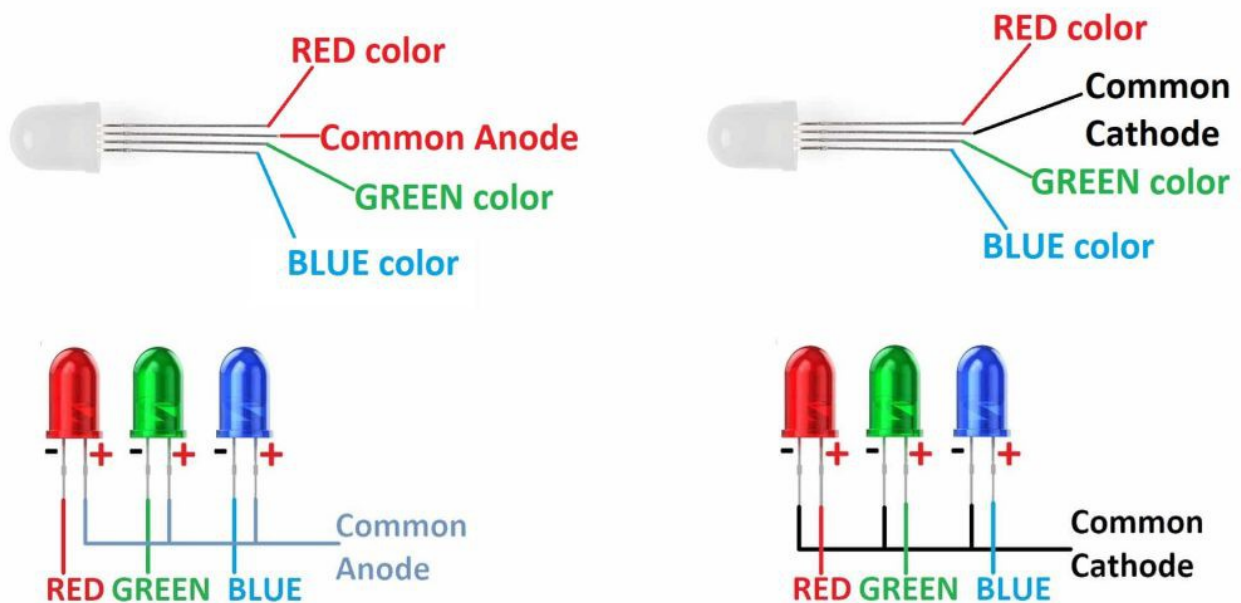
Duty Cycle

2. RGB LED Types (Anode/Cathode)

RGB LEDs are divided into two groups as anode and cathode ones. While rest of the structure is same the only difference between anode and cathode RGB LEDs is how they utilize their common pin.

Cathode RGB LEDs are consists of red, green and blue anode terminals and the common pin which is utilized as ground (GND). It is called as common cathode because of all the anode pins are shorted internally to the common pin.

Anode RGB LEDs are consists of red, green and blue cathode terminals and the common pin which is utilized as power (5.0V). It is called as common anode because of all the cathode pins are shorted internally to the common pin.

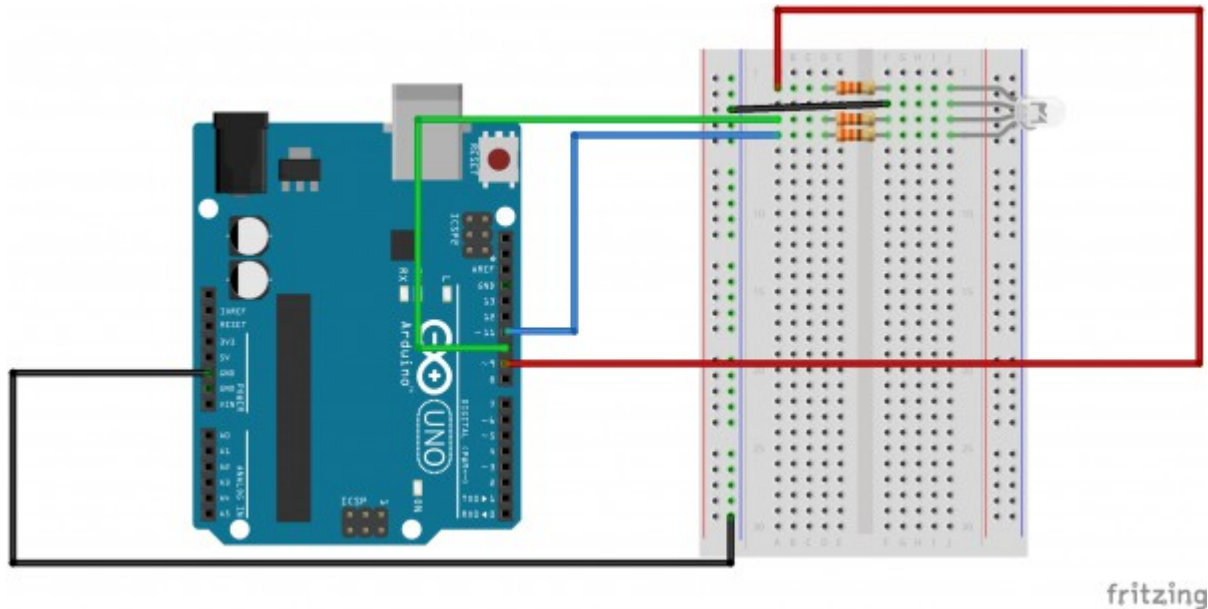


Visualization of Common Anode/Cathode Pin

3. Assembling the RGB LED Circuit

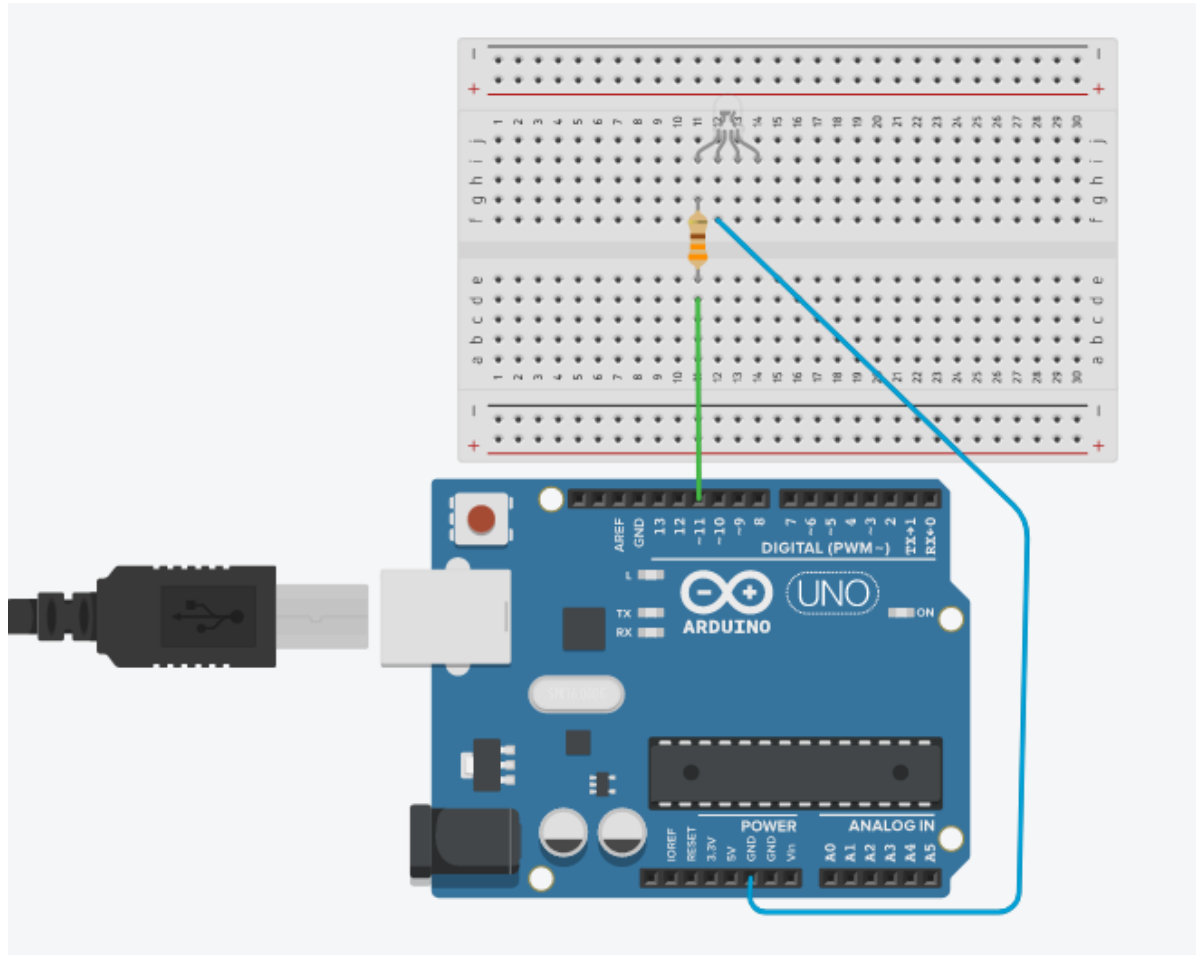


Required Parts



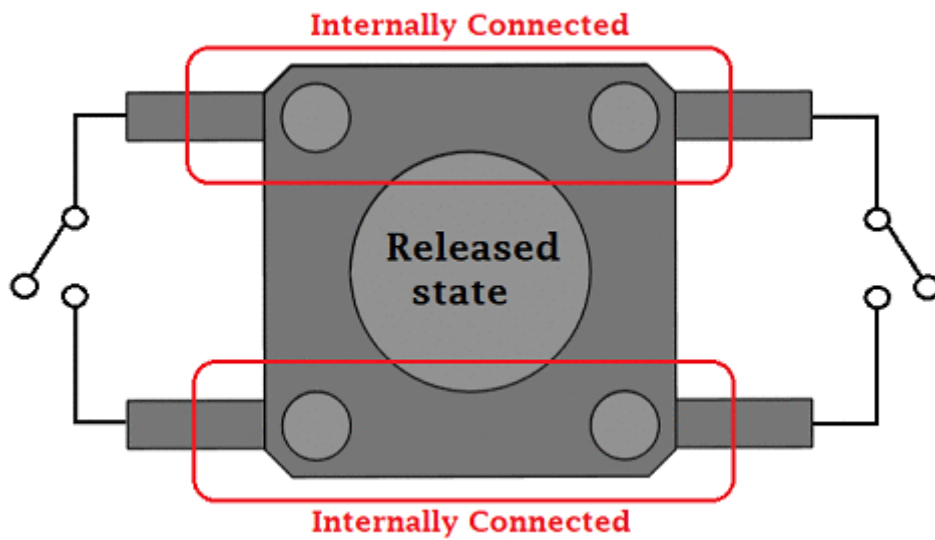
4. Testing The RGB LED Circuit

1. Try to find the how your RGB LED utilize its common pin.
 - You can use just single color pin and common pin as if they are single color LED's anode and cathode pins
 - Set up the circuit given below and try to light the RGB LED.

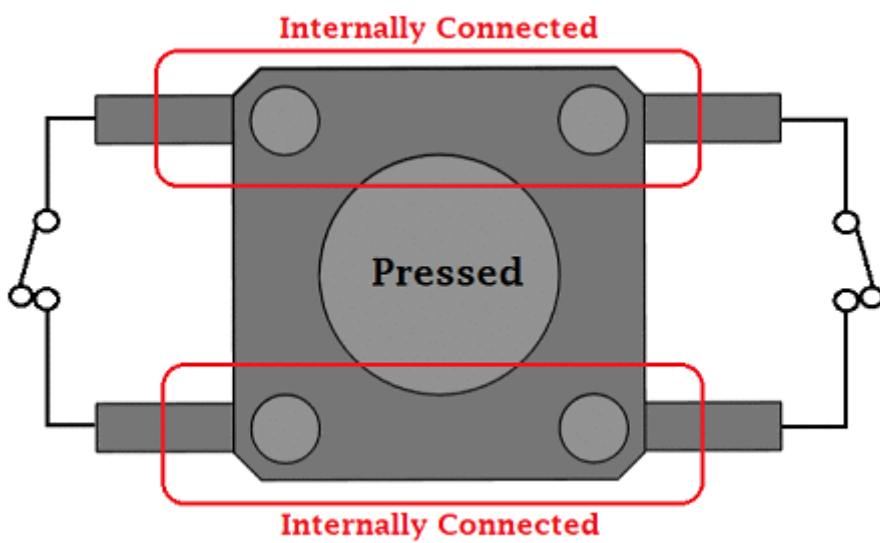


- If the RGB LED emits light that means the type is cathode and anode otherwise.

5. Push Button



Off State



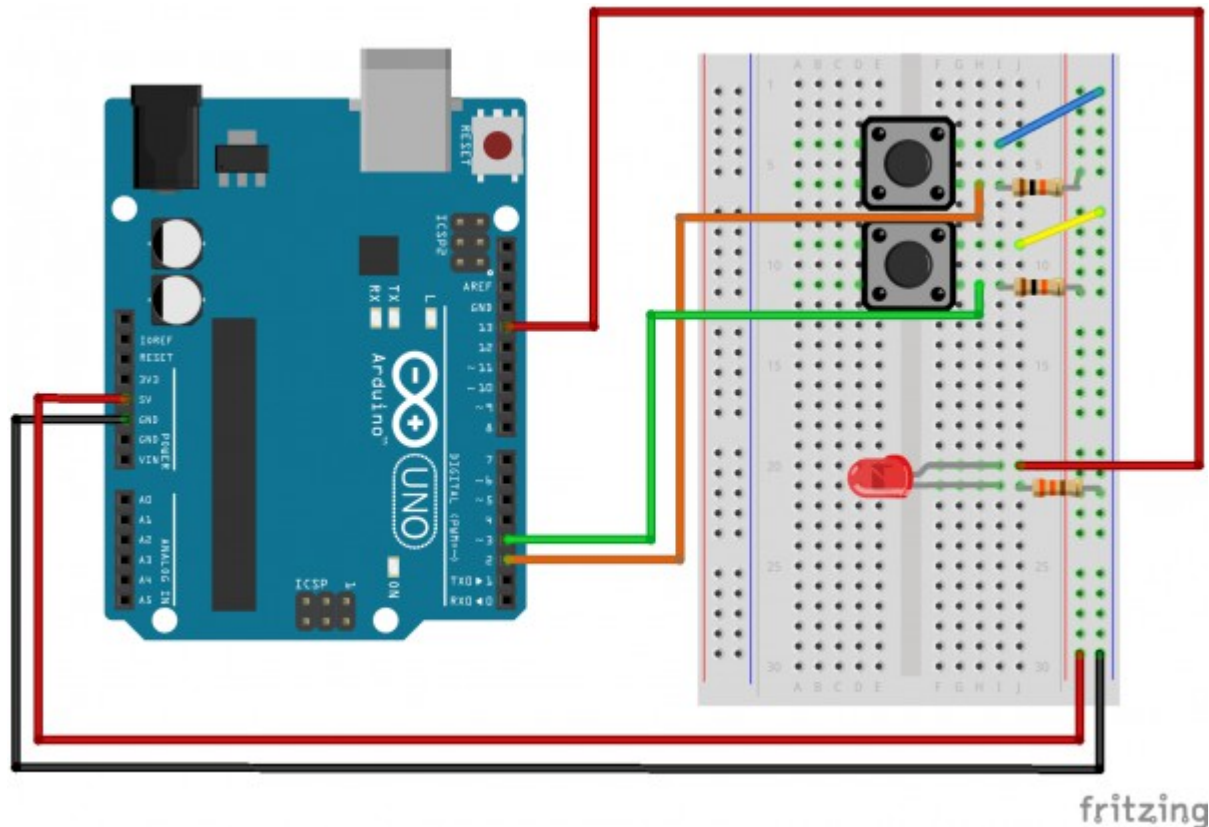
On State

As shown above push buttons are used to complete a circuit by using the internally connected parts.

6. Assembling the Push Button Circuit



Required Parts



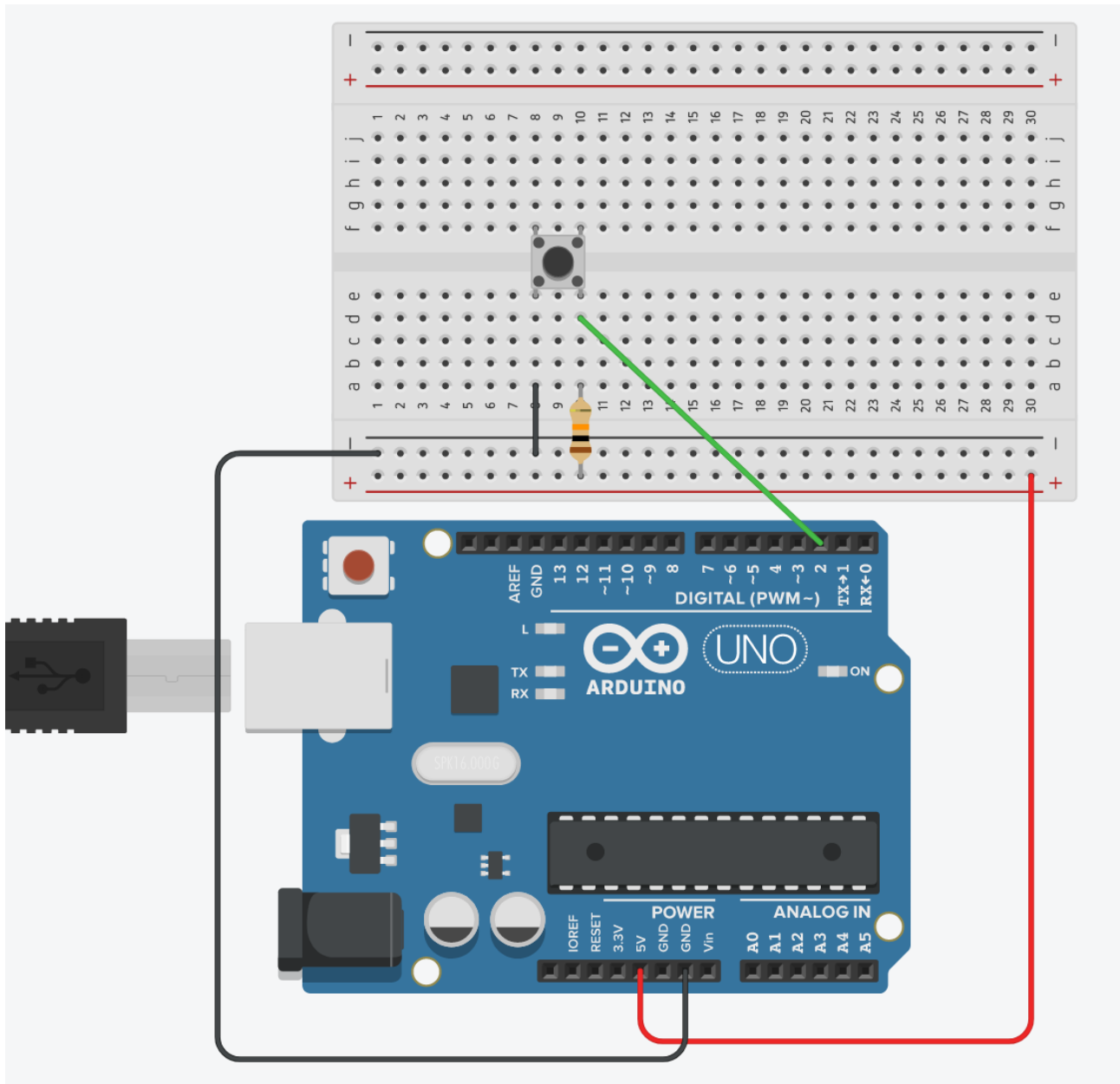
Fritzing Diagram of the Circuit

1. Select your resistors (330 Ω and 10k Ω) by using the color code table
2. Connect your LED according to anode/cathode direction
3. Connect your push buttons. Buttons are designed according to the gap in breadboard so internally connected legs will always end up in different sides of the bread board.
4. Verify and upload your code to the arduino board
5. Observe the result and compare it with the expected outcome

Expected Outcome: You should see the LED turn on if you press either button, and off if you press both buttons.

7. Testing The Push Button Circuit

1. You can test your push buttons by setting up the circuit below and trying to print something to serial monitor each time button is pushed.



Modification

Use a RGB LED and three buttons as follows

1. First button will be used to cycle the spectrum (smoothly change color) of RGB LED while pressed
2. Second button will be used to determine this cycle speed (color change speed)
3. Third button will be used to determine on/off state of the RGB LED