

# LDR\_Light\_Switch4 -- Overview



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## OBJECTIVES

After performing this lab exercise, learner will be able to:

- Interface a pushbutton with Arduino
- Program Arduino board to:
  - Detect switch (push button) press
  - Count the seconds elapsed while switch is pressed
- Use digital oscilloscope to measure the pulse width (duration)

## EQUIPMENT

To carry out this experiment, you will need:

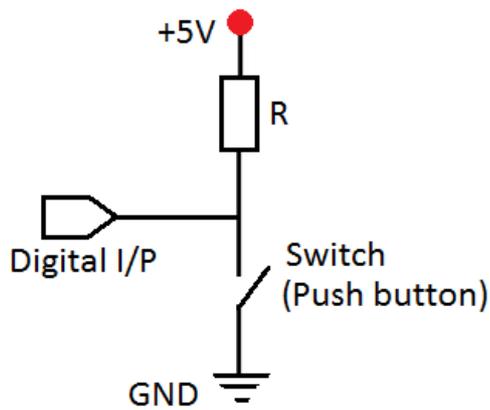
- TBS1KB-Edu Digital Oscilloscope from Tektronix
- Arduino Duemilanove or Uno board
- Voltage probe (provided with oscilloscope) / BNC cables
- Breadboard and connecting wires
- Simple circuit components – Resistor 10k & 470 Ohms, LEDs and Push button (switch)



## THEORY

Key points:

- A push button is a switch that changes state (Normally open to close or vice versa) with the button press. The state change is retained till switch is kept pressed. Upon release of the switch, it comes back to its normal switching position.
- A switch can be interfaced with Arduino by making use of 'internal pull-up resistor' of a digital IO pin. Without pressing the switch, the value at digital input pin remains HIGH (5V) due to pull-up resistor. When switch is pressed, the input is connected to ground and voltage becomes 0V.



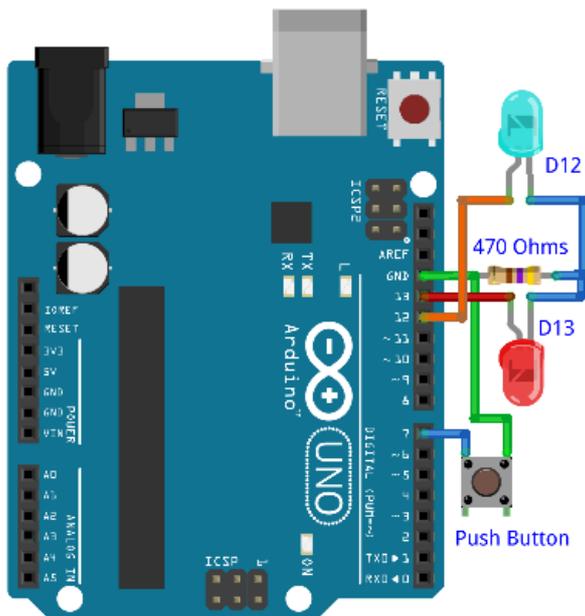
- Arduino can read the input pin level (HIGH or LOW) and detect the switch press.

## LDR\_Light\_Switch4 -- Procedures

### Step 1

#### DUT Setup: Arduino - Push Button Circuit

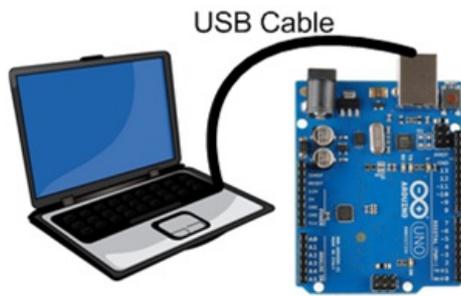
Prepare the circuit (using push button, LEDs, Resistor and Arduino) as shown below:



### Step 2

#### DUT Setup: Connecting Arduino with Computer

- Connect the Arduino to computer using USB cable.

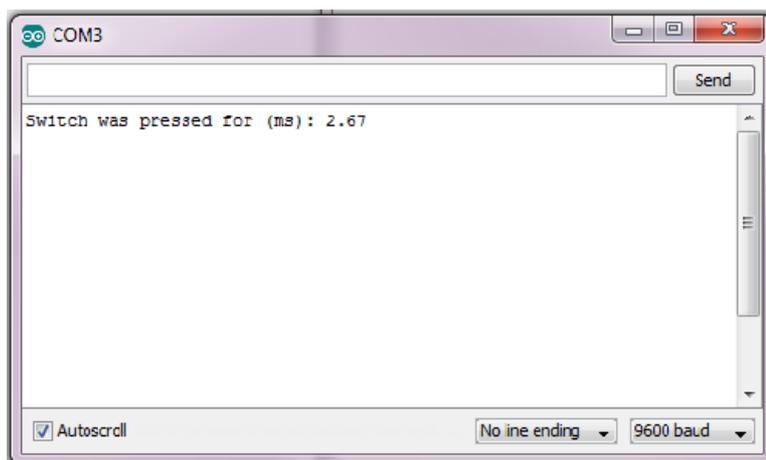


- Launch Arduino IDE and ensure correct USB port number and Board name for establishing the connection.

## Step 3

### DUT Setup: Programming Arduino

- Open the code - "Ligh\_Switch\_4.ino" - in Arduino IDE
- Compile and upload the program on Arduino board for execution
- Once the program is uploaded and running on Arduino, open serial monitor



## Step 4

### Scope and DUT Connection:

- Channel 1 probing at Push Button (pin D7 of Arduino)
- Channel 2 probing at LED output (pin D13 of Arduino)

## Step 5

### Scope Settings: Horizontal / Vertical Scale & Trigger

- Horizontal scale = 500 ms/div
- Channel 1 & 2:
  - Vertical scale = 1V/div
  - Vertical position = -3V (-3 divisions)

- Trigger on CH1, Falling Edge
- Horizontal Position (Pre-trigger) = 10% (1st div from left side)
- Take Single Acquisition (no free run)

## Step 6

### Scope Settings: Measurements

Using 'measure' menu, add following measurements to CH2:

- Positive Width

## Step 7

- Ensure that Serial Monitor is turned on, press SINGLE (on the scope front panel)
- Press the 'push button' - keep it pressed for 2-3 seconds (approximately) and then release it. the LED at pin 13 would glow while push button is pressed.

## Step 8

When the push button is released, Serial Monitor will print the time for which the push button was pressed. Verify this value (from Serial Monitor) against the Positive Width measurement on CH2 (= LED on period).

## Step 9

You can try pressing the button for different interval of time and verify the value indicated by Arduino Serial monitor against scope's Positive Width measurement.