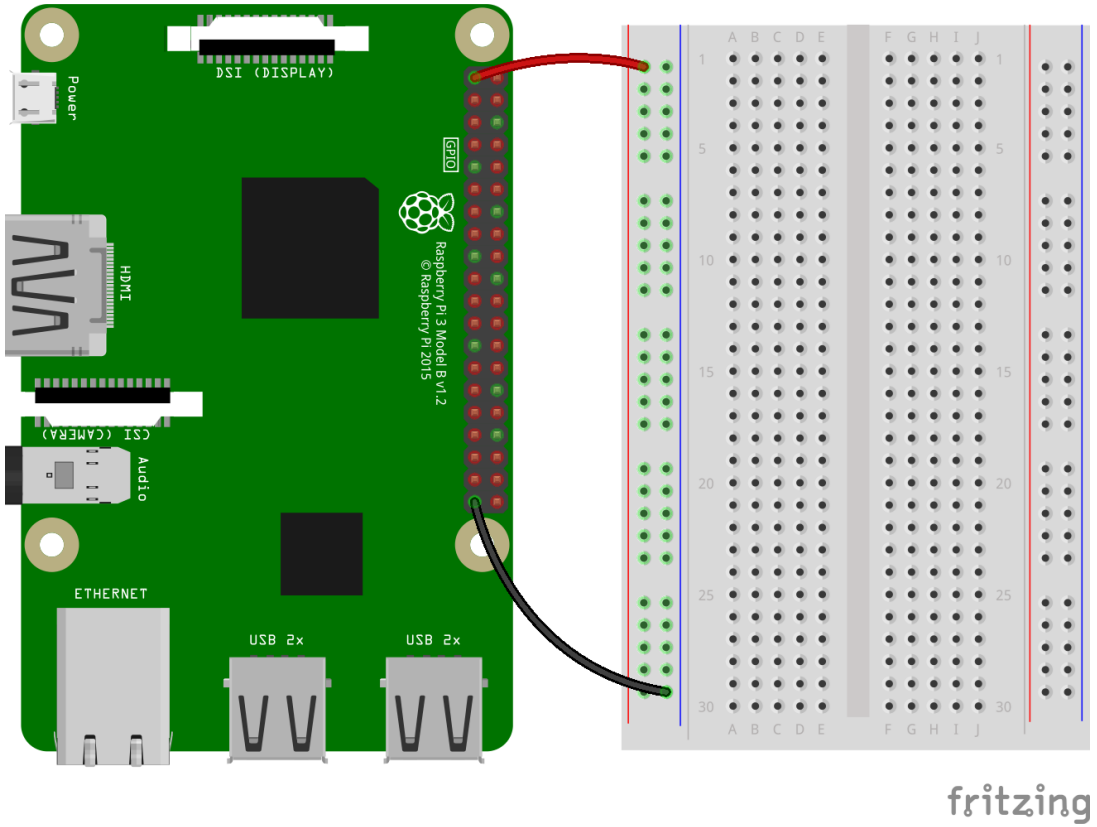
Hands On: Getting Started

Make a closed circuit:

1. Connect 3v3 pin with “red” column
2. Connect GND pin with “blue” column

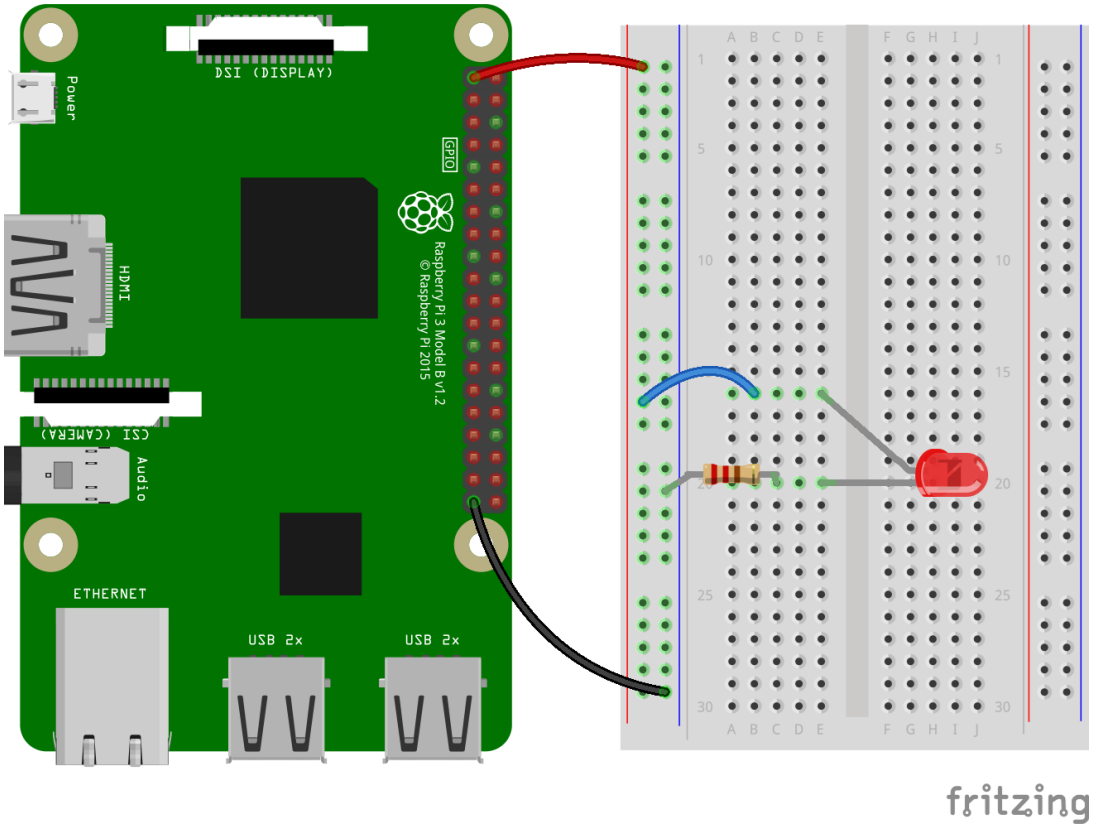


Hands On: LED

How to turn LED on?

1. Put the long side (kathode/+) of LED on E16, and short side (anode/-) of LED on E20
2. Put one end of the resistor on C20 and the other on any point near the “blue” column
3. Using a jumper wire, connect the “red” column with point B16

LED will now turn on!

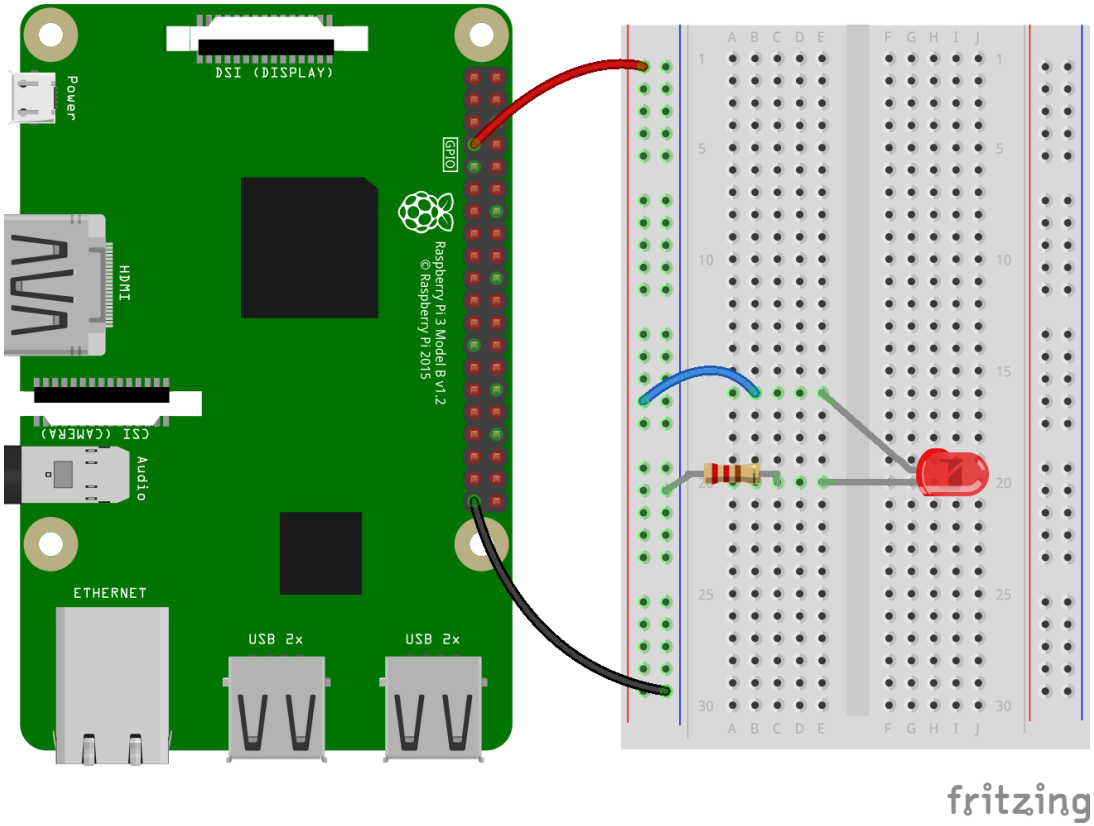


Hands On: LED

How to control LED using GPIO pins?

1. Move the jumper wire from 3v3 to GPIO4

LED will now turn off - but we can now control the LED’s behavior through code!



Hands On: LED

```
from gpiozero import LED

led = LED(4) # the GPIO pin from above

led.on() # turn on

led.off() # turn off
```

For references: https://gpiozero.readthedocs.io/en/stable/api_output.html#led

Hands On: LED

Break down in groups of 2-3 students to replicate the previous demonstration.

Challenges:

1. How to make LED blink 10 times?
   (Hint: use a combination of sleep() and a for loop)

1. How to make LED blink continuously?
   (Hint: use a combination of sleep() and a while loop)

Hands On: LED

1. How to make LED blink 10 times?

```
from gpiozero import LED
import time
led = LED(4)
for i in range(10):
    led.on()
    time.sleep(1)
    led.off()
    time.sleep(1)
```

```
from gpiozero import LED
led = LED(4)
led.blink(on_time=1, off_time=1, n=10)
```

Hands On: LED

2. How to make LED blink continuously?

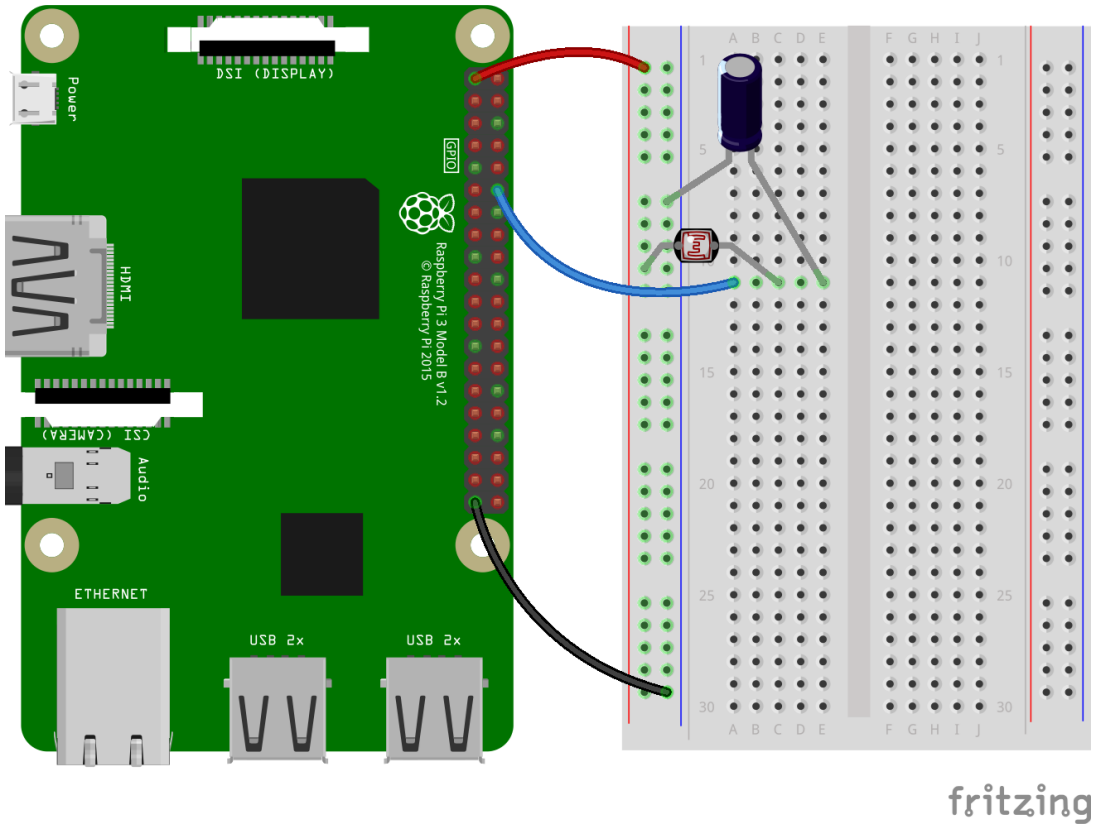
```
from gpiozero import LED
import time
led = LED(4)
while True:
    led.on()
    time.sleep(1)
    led.off()
    time.sleep(1)
```

```
from gpiozero import LED
led = LED(4)
led.blink(on_time=1, off_time=1)
```

Hands On: LDR

How to use a light sensor?

1. Put long side (kathode/+) of capacitor on E11 and short side of capacitor (anode/-) on “blue” column
2. Connect GPIO18 to A11
3. Put LDR on point C11 and “red” column



Hands On: LDR

```
from gpiozero import LightSensor

ldr = LightSensor(18)  # the GPIO pin from above

while True:

    print(ldr.value) # number between 0 (dark) and 1 (light)
```

For references: https://gpiozero.readthedocs.io/en/stable/api_input.html#lightsensor-ldr

Hands On: LDR

Break down in groups of 2-3 students to replicate the previous demonstration.

Challenges:

1. Make a program output/print something (e.g. “It’s light!”) when the LDR value exceeds a certain threshold.
   (Hint: use a combination of while loop and print)

Hands On: LDR

1. Make a program output/print something (e.g. “It’s light!”) when the LDR value exceeds a certain threshold.

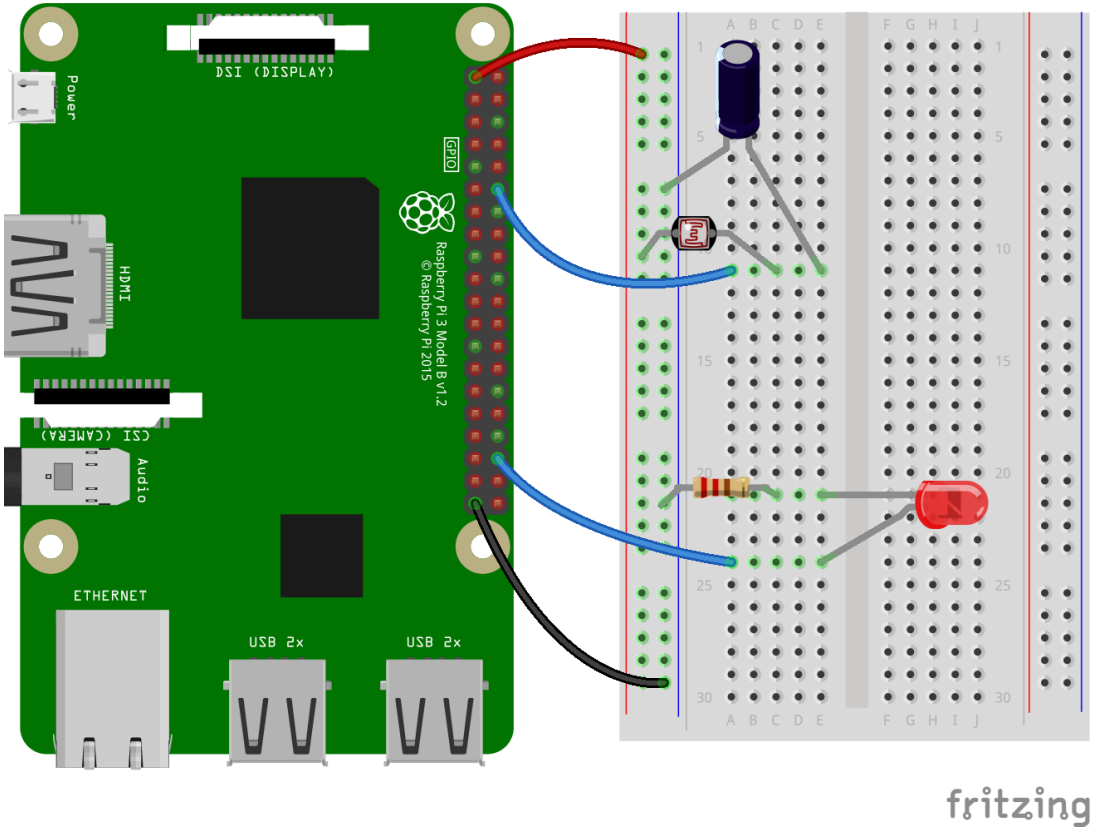
```
from gpiozero import LightSensor

ldr = LightSensor(18)

while ldr.value < 0.5:

    continue

print("It's light!")
```

```
from gpiozero import LightSensor

ldr = LightSensor(18, threshold=0.5)

ldr.wait_for_light()

print("Light detected!")
```

Hands On: Smart Lamp

How to make a smart lamp?
(cont. from previous schematics)

1. Put resistor on “blue” column and C21
2. Put LED’s long side (kathode/+) on E24, and the short side (anode/-) on E21
3. Connect GPIO16 to A24



Hands On: Smart Lamp

```
from gpiozero import LightSensor, LED
from signal import pause

sensor = LightSensor(18)
led = LED(16)

sensor.when_dark = led.on
sensor.when_light = led.off

pause()
```

Hands On: Smart Lamp

Break down in groups of 2-3 students to replicate the previous demonstration.

Challenges:

1. Instead of making the LED turn on or off, adjust the brightness of the LED according to the value read by the LDR
   (Hint: use PWMLED here instead of LED)
   a) When it's bright, LED is also bright. When it's dark, LED is dim.
   b) When it's dark, LED is bright. When it's bright, LED is dim.

Hands On: Smart Lamp a)

```
from gpiozero import LightSensor, PWMLED

from signal import pause


sensor = LightSensor(18)

led = PWMLED(16)


led.source = sensor


pause()
```

Hands On: Smart Lamp b)

```
from gpiozero import LightSensor, PWMLED

from signal import pause


sensor = LightSensor(18)

led = PWMLED(16)


def opposite(sensor_object):

    for v in sensor_object.values:

        yield 1 - v


led.source = opposite(sensor)

pause()
```

Bonus Challenge

Integrate Motion Sensor with
your Smart Lamp system

Smart Lamp Bonus Challenge

- Integration of Motion Sensor with your existing LDR + LED Smart Lamp circuit
  - Set up Motion Sensor + LED
    - Example idea:
    - When there is motion -> turn on light
    - When there is no motion -> turn off light
  - Set up Motion Sensor + LDR + LED
    - Example idea:
    - Night light turns on/off based on both:
      - The environment’s brightness
      - The detected motion

Refer to the Bonus slides for more details