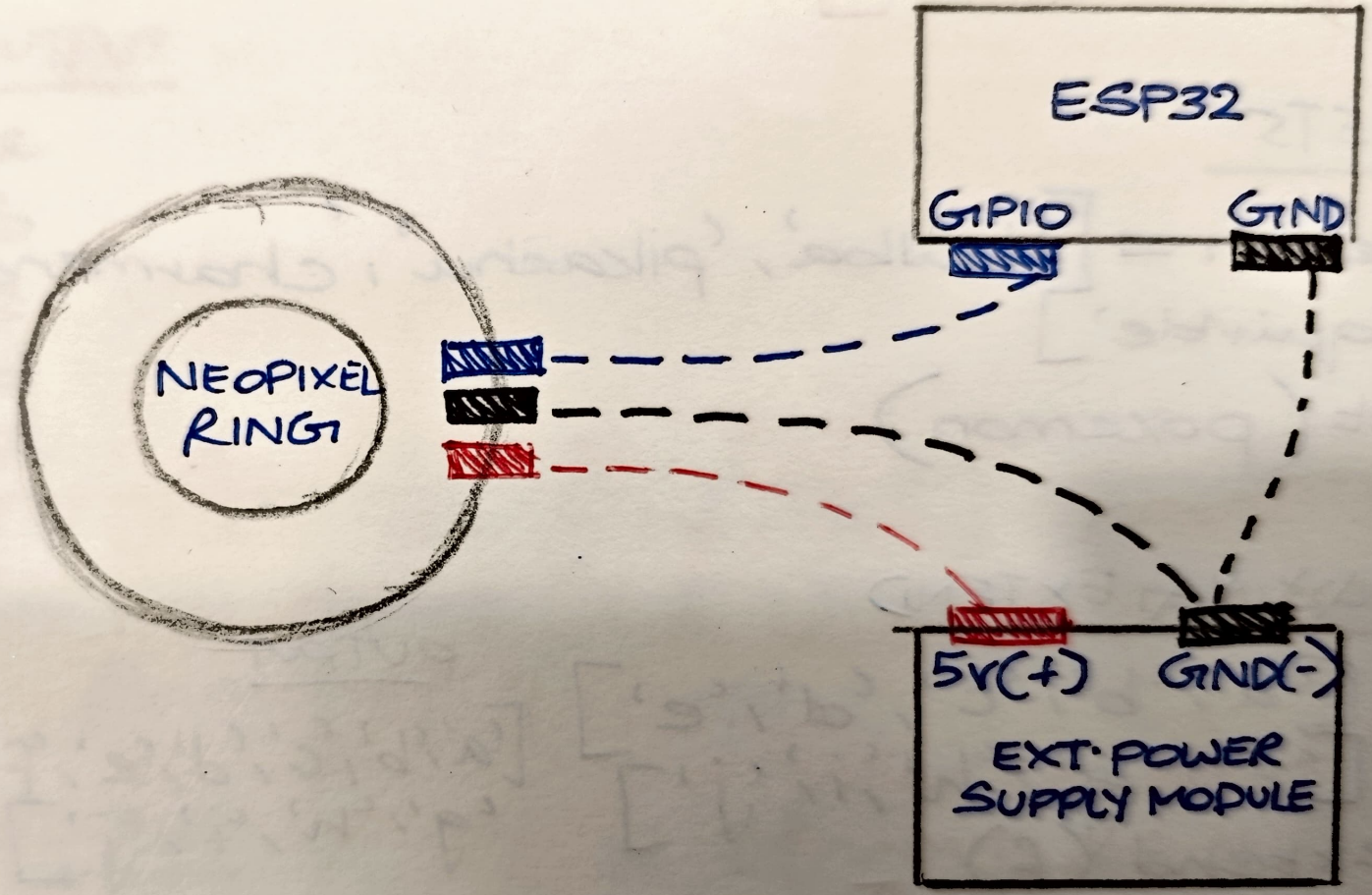
* NEOPIXEL RING



1) DUTY CYCLE – Varying on & off time

$$\text{Duty Cycle \%} = \frac{\text{On time} \times 100}{\text{On + Off time}}$$

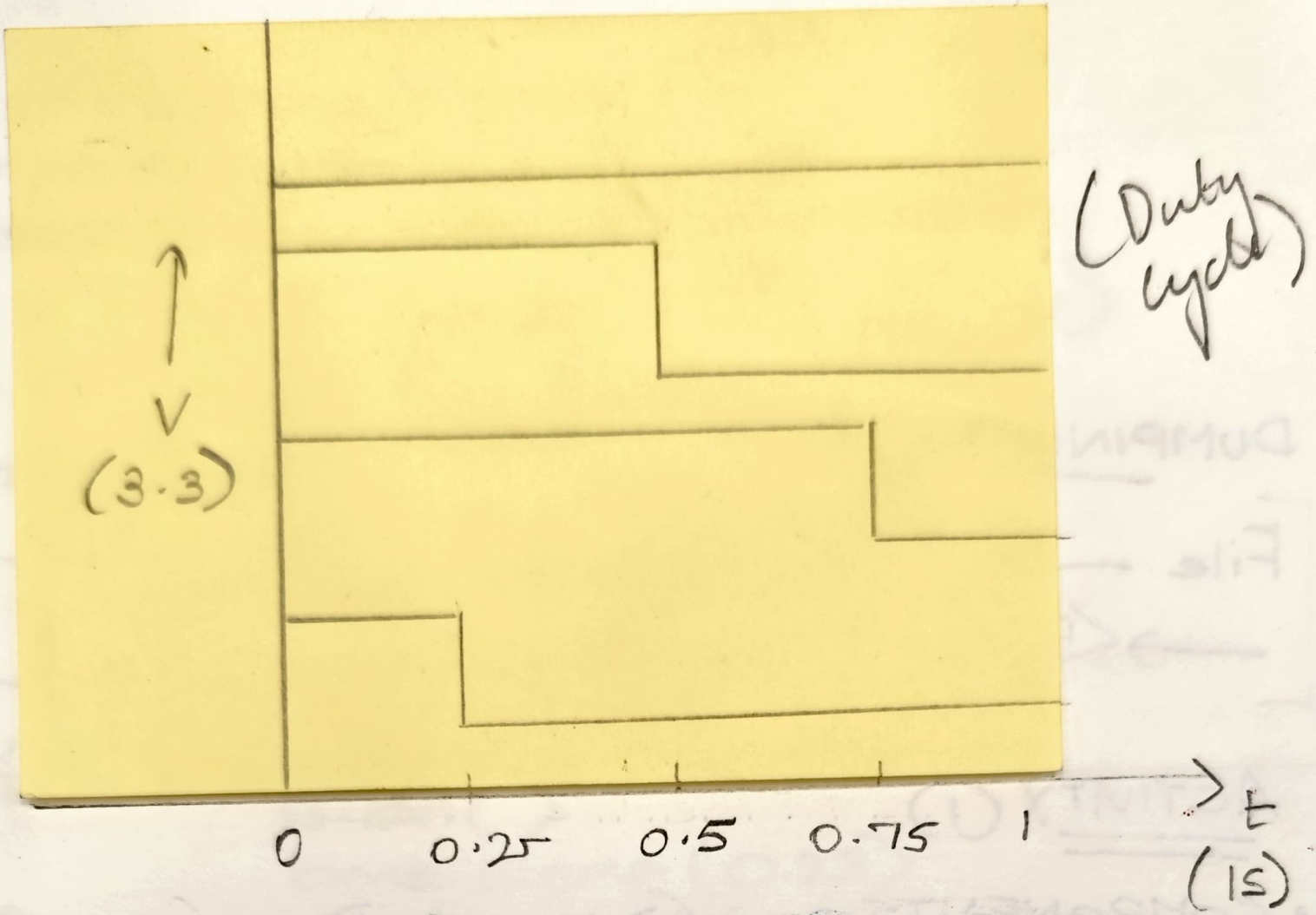
Duty Cycle – PWM in Micropython (ESP32)

Duty Cycle	Value
100	1023
75	768
50	512
25	256
0	0

{LED → ↑ than 60 Hz}

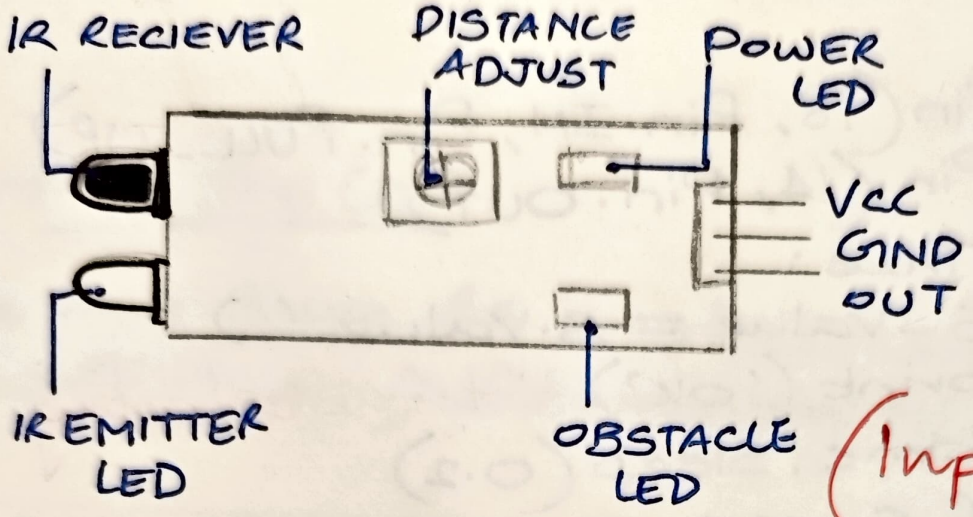
2) FREQUENCY

- No. of repetitions per unit time (here, 1s)
- At ↑ frequency, duty cycle corresponds to the brightness of the LED
- [Duty Cycle ∝ LED brightness]


V
(3.3)
(Duty cycle)
0
0.25
0.5
0.75
1
t
(1s)

the buzzer

IR Obstacle Detection Sensor



(Input)

ESP 32	Sensor
3.3V	Vcc
GND	GND
GPIO	out

INTERFACING → Connecting everything

```
from machine import Pin
import time
Sensor = Pin(14, Pin.IN, Pin.PULL_UP)
Sensor_value = Sensor.value()
print (Sensor_value)
```

Value will be 1 until an object is placed infront of it, after which its 0

- Range (2-30cm)

IR waves are emitted, bounce back from the