

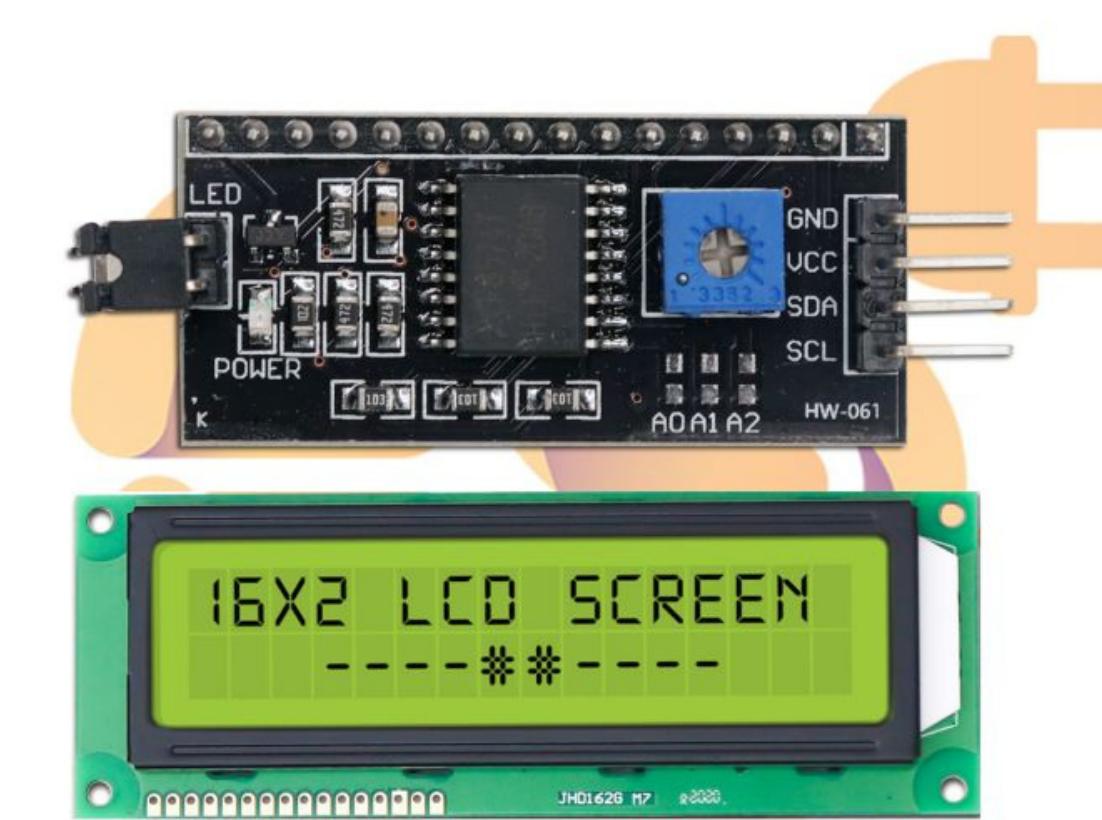
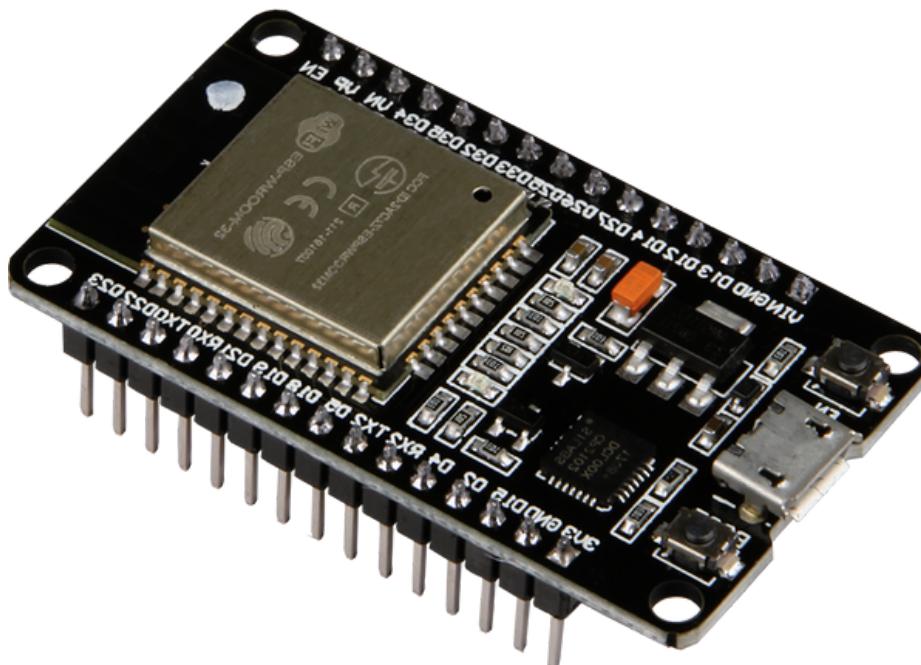
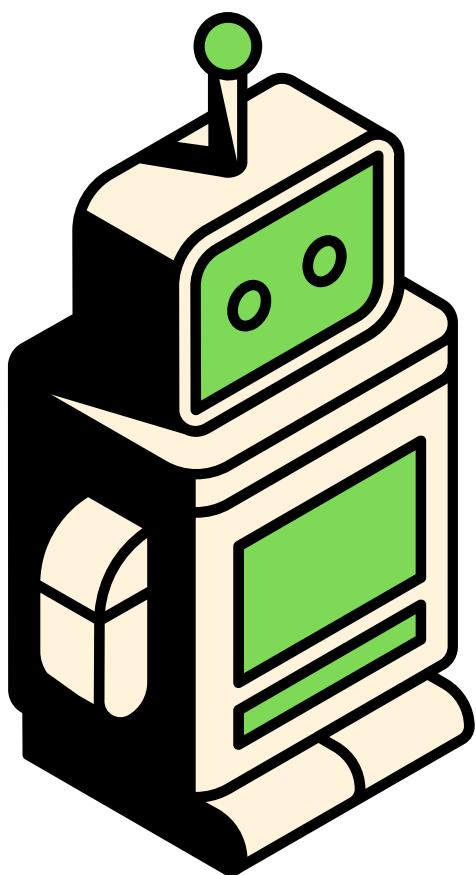


D Y PATIL
INTERNATIONAL
UNIVERSITY
AKURDI PUNE

EMBEDDED SYSTEM DESIGN PRACTICAL - 2

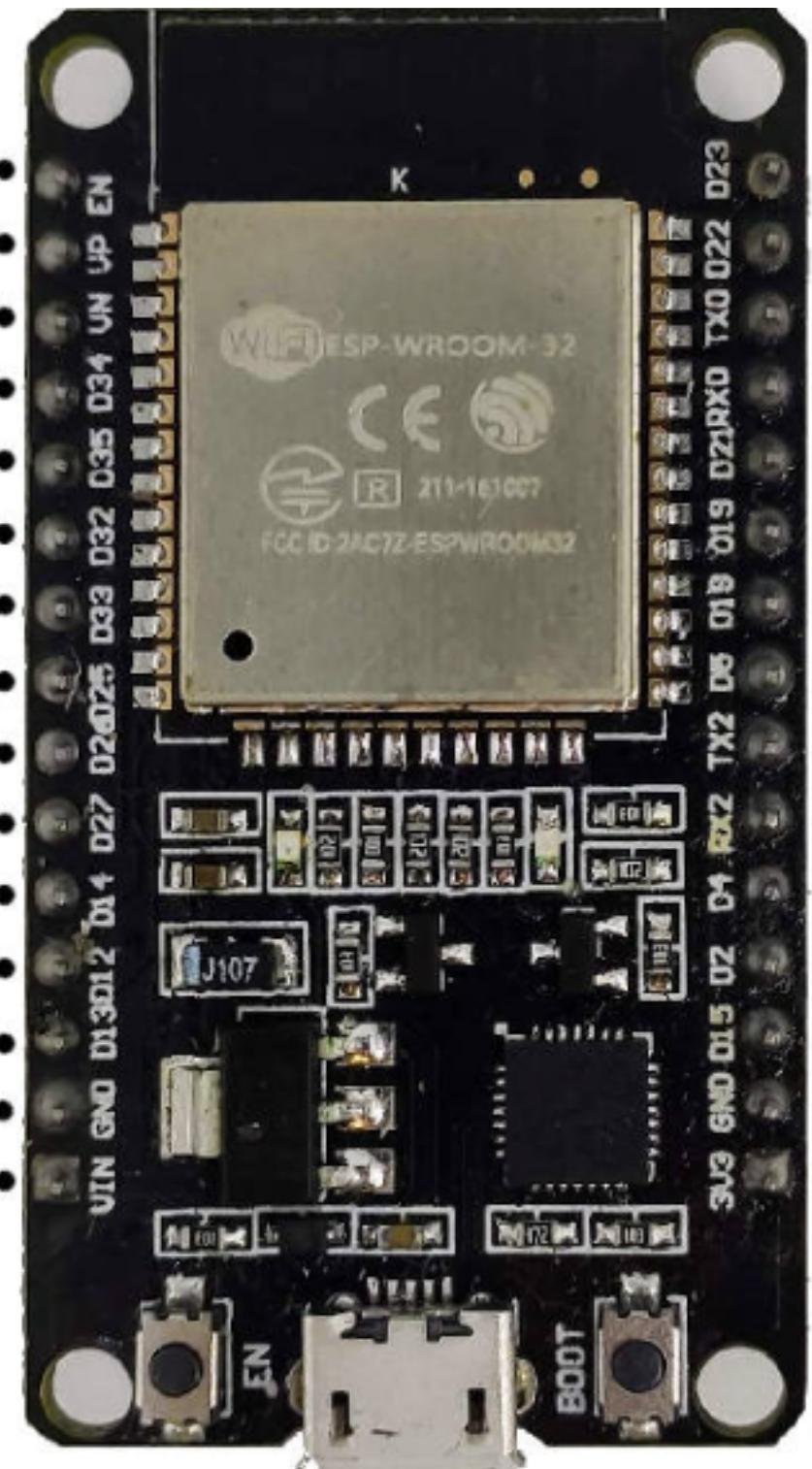
INTERFACING I²C LCD

By Divesh Jadhwanı



ESP32 PINOUT

Input only	RTC GPIO0	SensVP	ADC1_0	GPIO36	5
Input only	RTC GPIO3	SensVN	ADC1_3	GPIO39	8
Input only	RTC GPIO4	ADC1_6	GPIO34	10	
Input only	RTC GPIO5	ADC1_7	GPIO35	11	
RTC GPIO9	Xtal32P	Touch9	ADC1_4	GPIO32	12
RTC GPIO8	Xtal32N	Touch8	ADC1_5	GPIO33	13
DAC 1	RTC GPIO6	ADC2_8	GPIO25	14	
DAC 2	RTC GPIO7	ADC2_9	GPIO26	15	
RTC GPIO17	Touch7	ADC2_7	GPIO27	16	
RTC GPIO16	Touch6	HSPI_CLK	ADC2_6	GPIO14	17
RTC GPIO15	Touch5	HSPI_Q	ADC2_5	GPIO12	18
RTC GPIO14	Touch4	HSPI_ID	ADC2_4	GPIO13	20
			GND		
			VIN		



36	GPIO23	V_SPI_D	MOSI
39	GPIO22	V_SPI_WP	SCL
41	GPIO1	TXD 0	CLK3
40	GPIO3	RXD 0	CLK2
42	GPIO21	VSPI_HD	SDA
38	GPIO19	V_SPI_Q	MISO
35	GPIO18	V_SPI_CLK	SCK
34	GPIO5	V_SPI_CS0	SS
27	GPIO17	TXD 2	
25	GPIO16	RXD 2	
24	GPIO4	ADC2_0	HSPI_HD
22	GPIO2	ADC2_2	HSPI_WP0
21	GPIO15	ADC2_3	HSPI_CS0
		GND	Touch3
		3.3v	RTC GPIO13

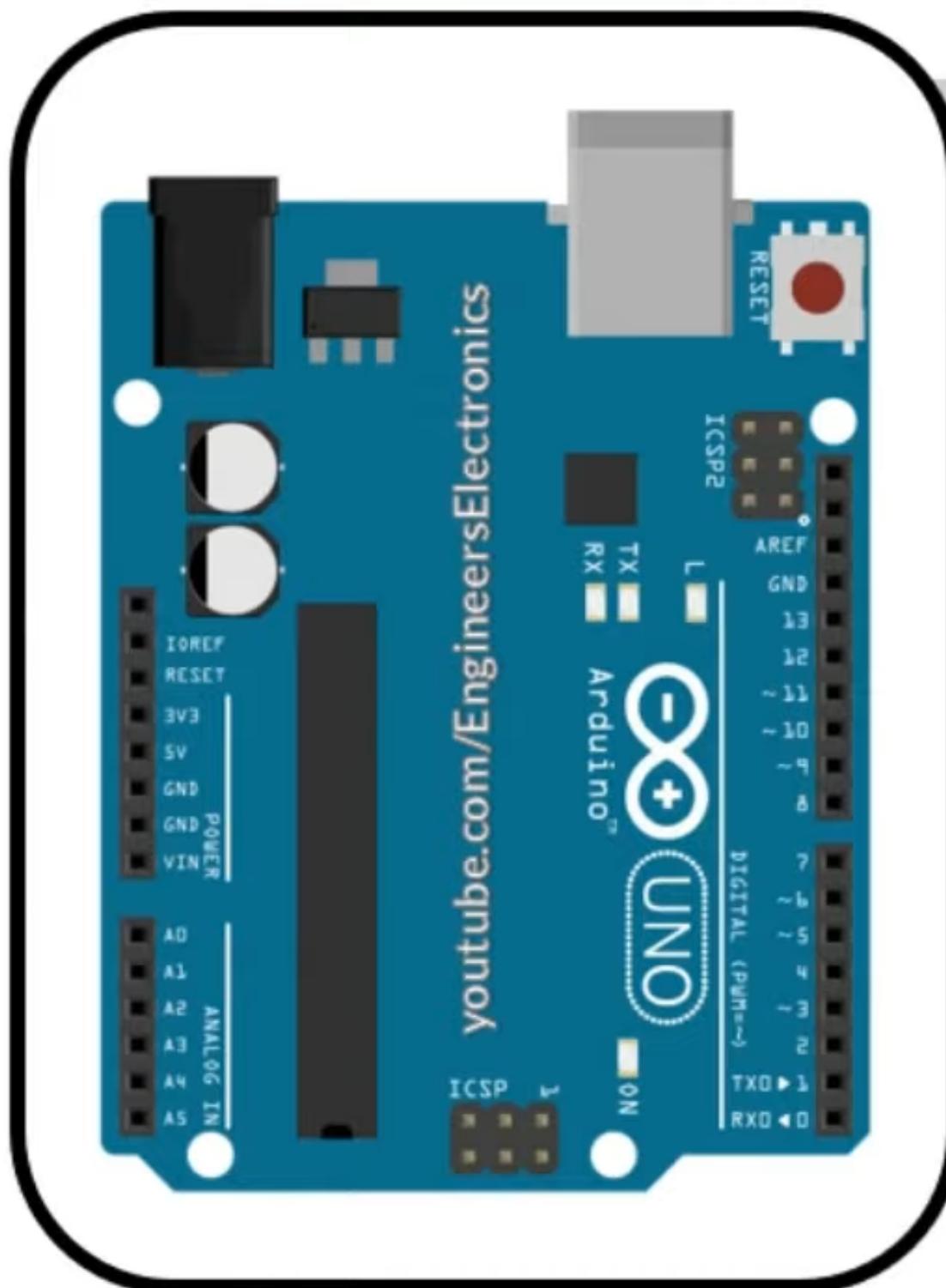
**240 MHZ (DUAL CORE
PROCESS
4MB FLASH MEMORY
520 KB RAM**

ESP32 PINOUT

- 34 PROGRAMMABLE GPIOS
- 18 12-BIT ADC CHANNELS
- 2 8-BIT DAC CHANNELS
- 16 PWM CHANNELS - INTENSITY
- 3 UART INTERFACES - ADD
- 3 SPI INTERFACES - MEMORY
- 2 I2C INTERFACES - SDA AND SCL
- 10 CAPACITIVE TOUCH SENSING GPIOS
- 16 RTC GPIOS - DATE AND TIME

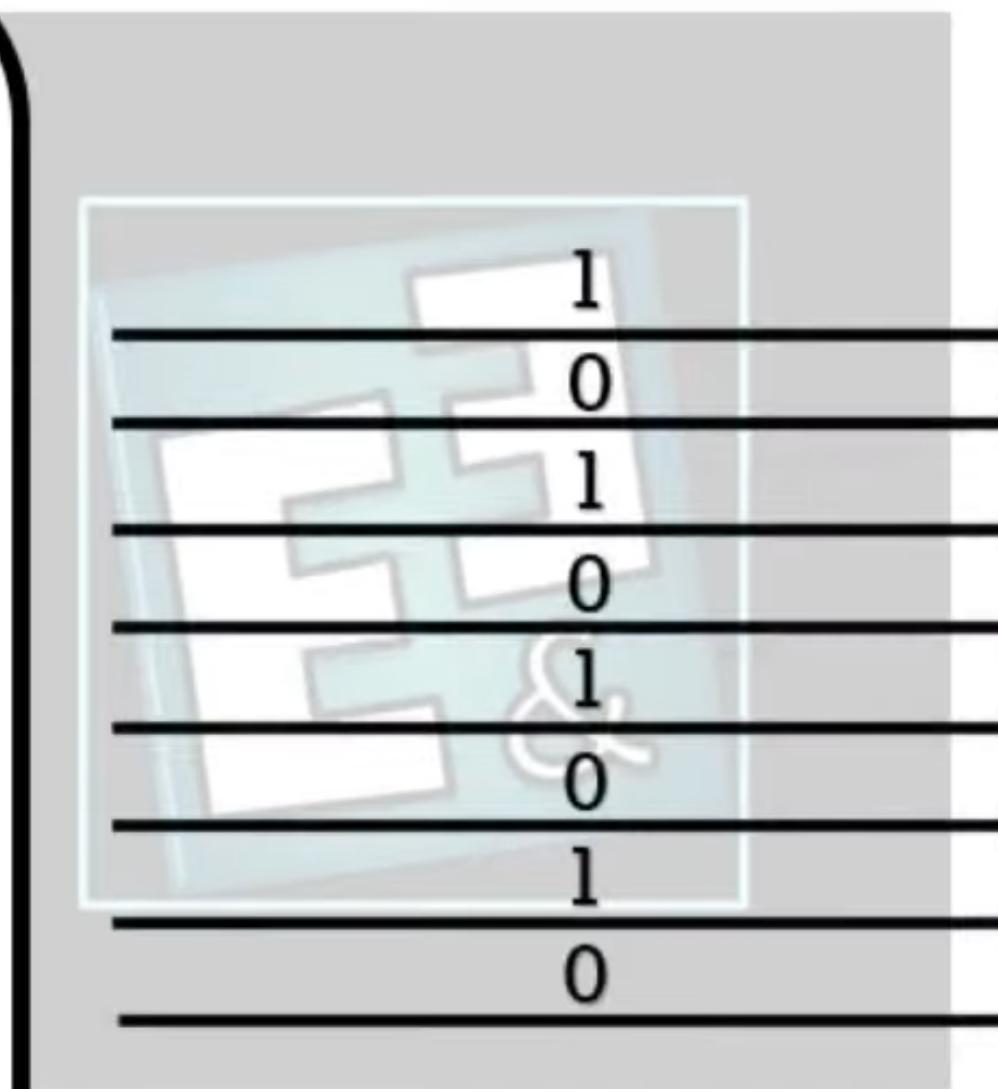
Data to send

10101010



Microcontroller

8 bit Data

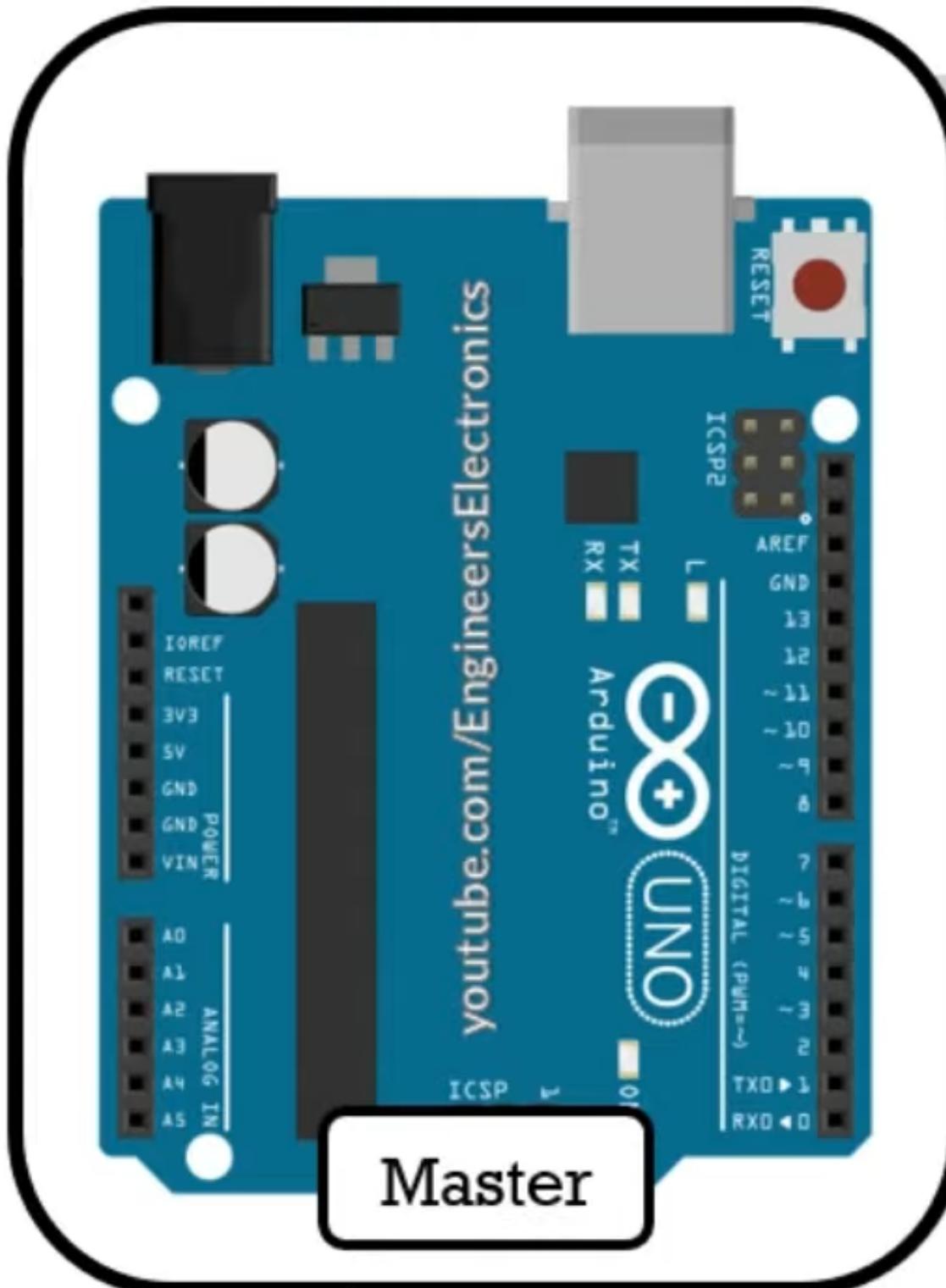


Device

Requires a lot of Pins
Can't connect more devices

Data to send

10101010



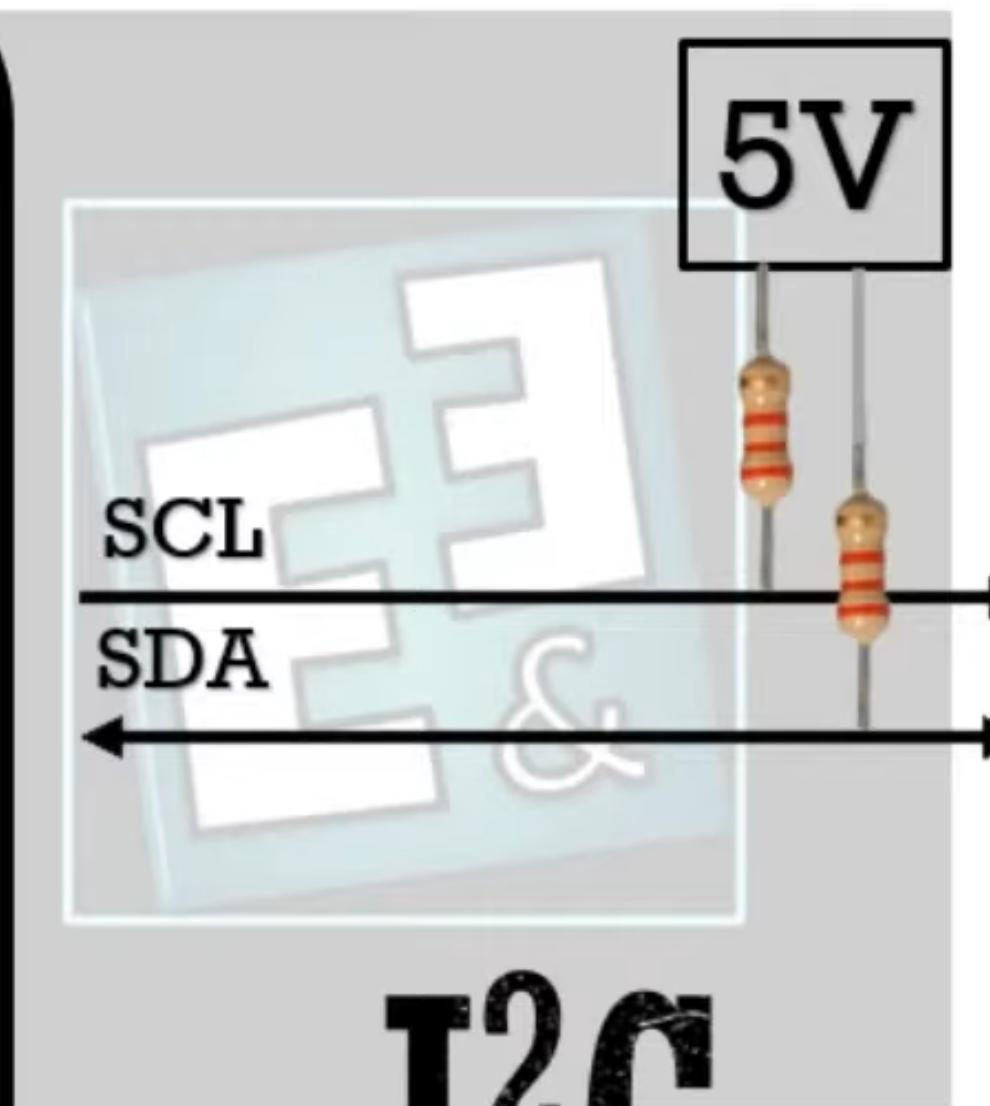
Microcontroller

SCL - Serial Clock

SDA - Serial Data

--- SYNCHRONIZATION

--- ONE BIT AT A TIME



I²C

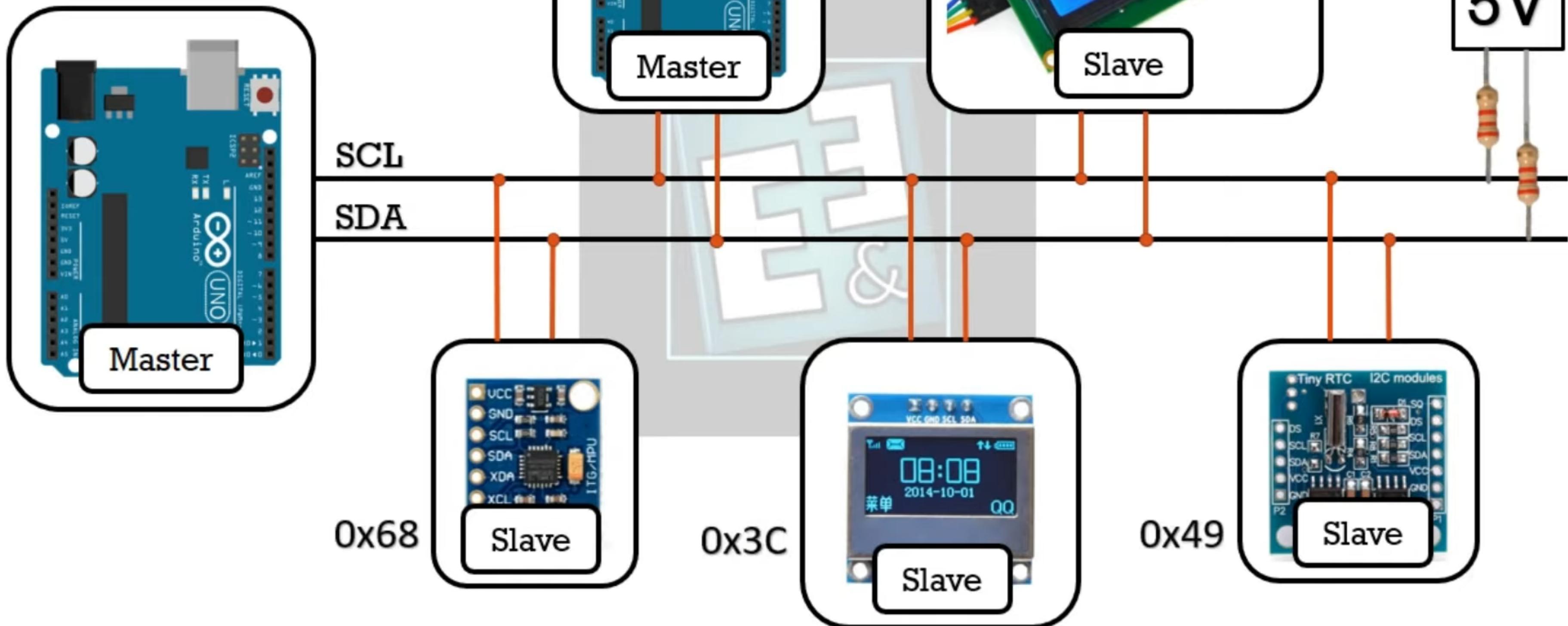
COMES INTO
THE PICTURE



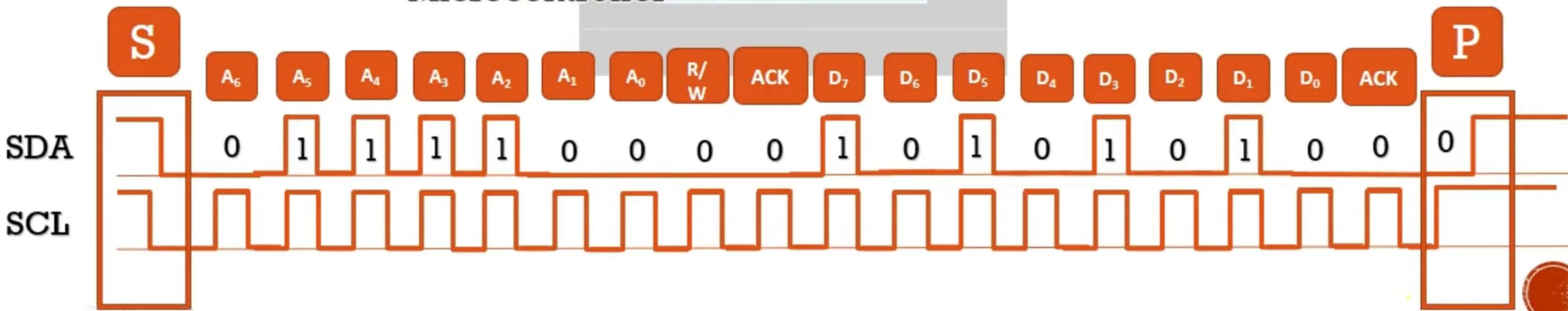
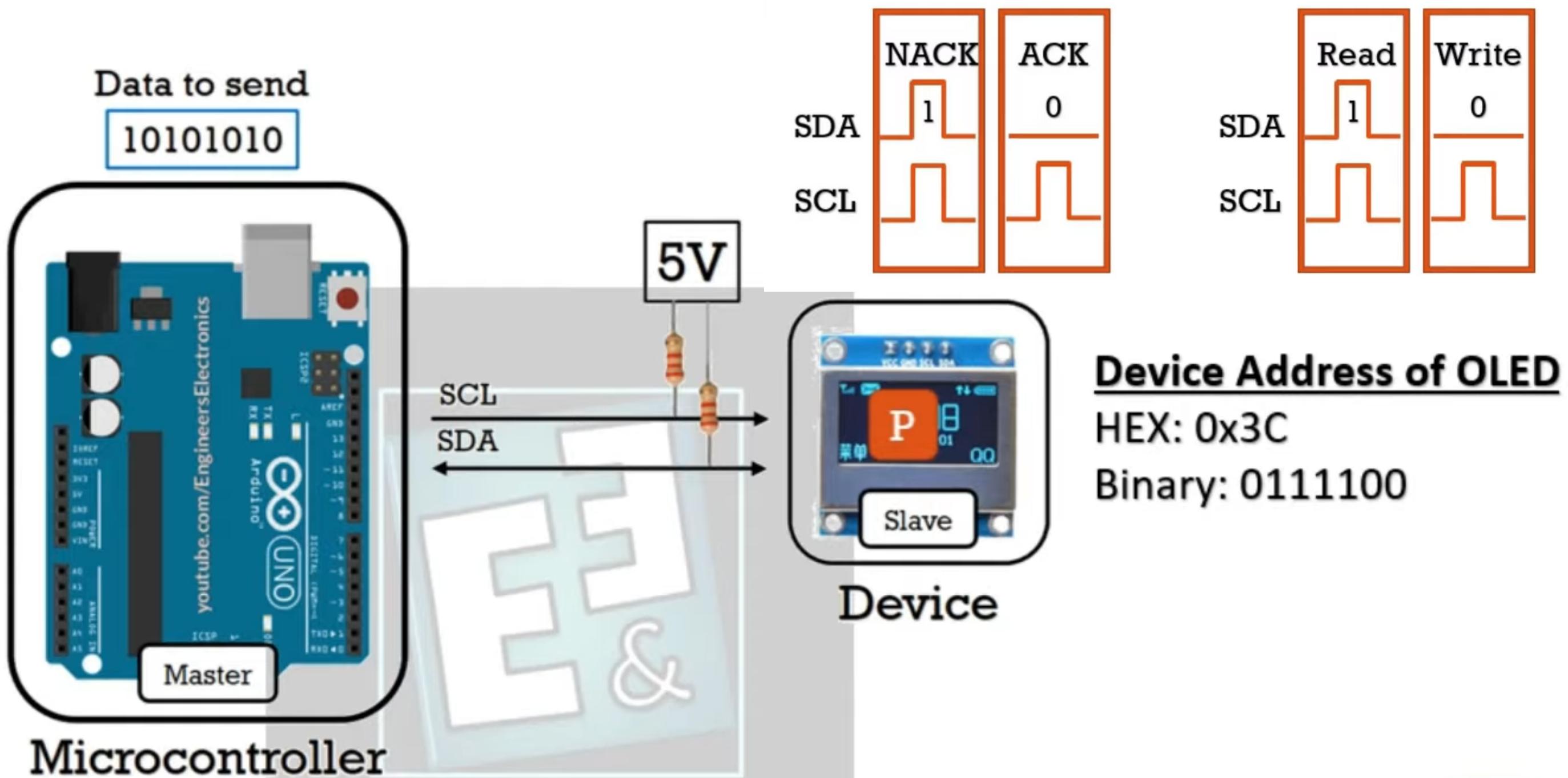
Device

Device Address

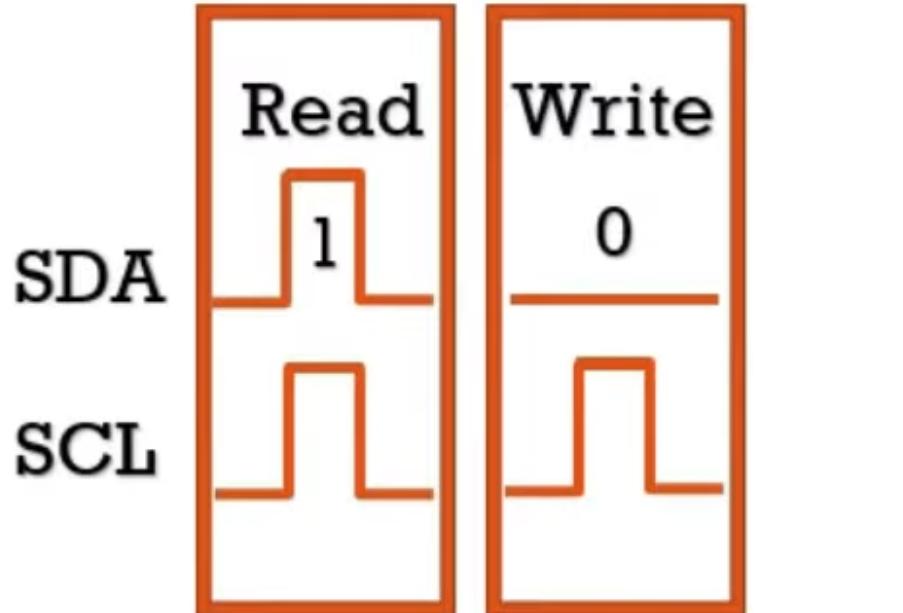
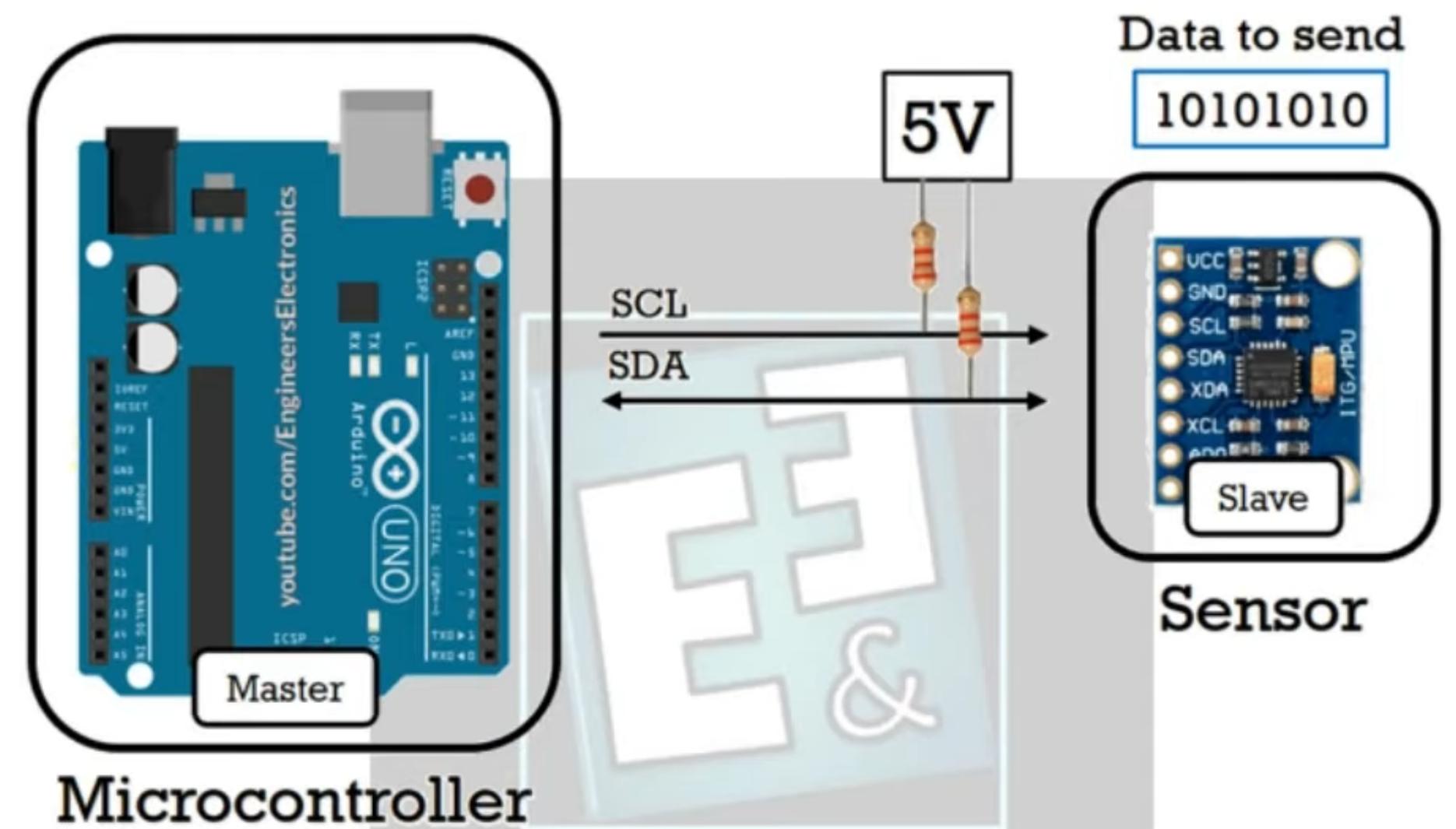
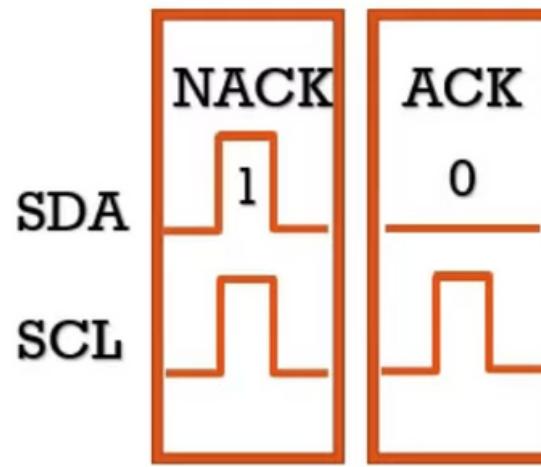
UPTO 128 DEVICES BUT WHY 128 ?



1. START Bit
2. Device Address
3. Read/Write
4. Acknowledge
5. Send Data
6. Acknowledge
7. STOP Bit



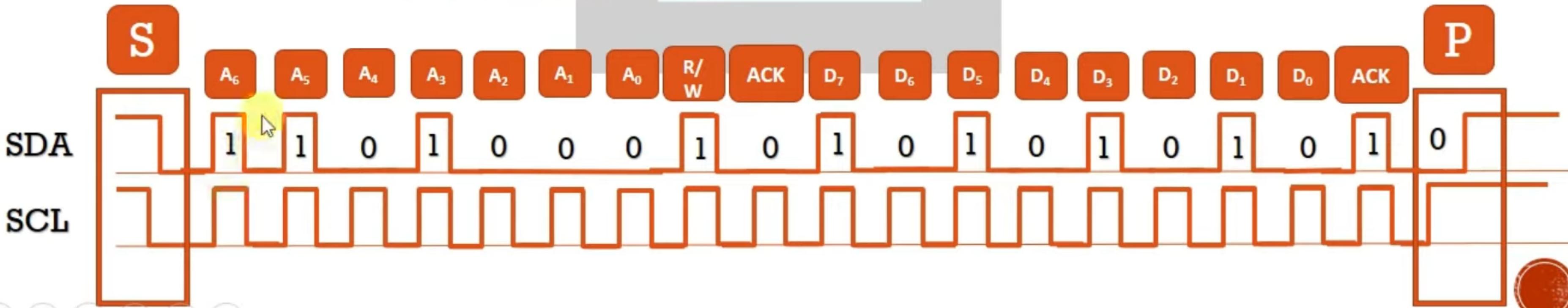
1. START Bit
2. Device Address
3. Read/Write
4. Acknowledge
5. Send Data
6. Acknowledge
7. STOP Bit



Device Address of MPU6050

HEX: 0x68

Binary: 1101000

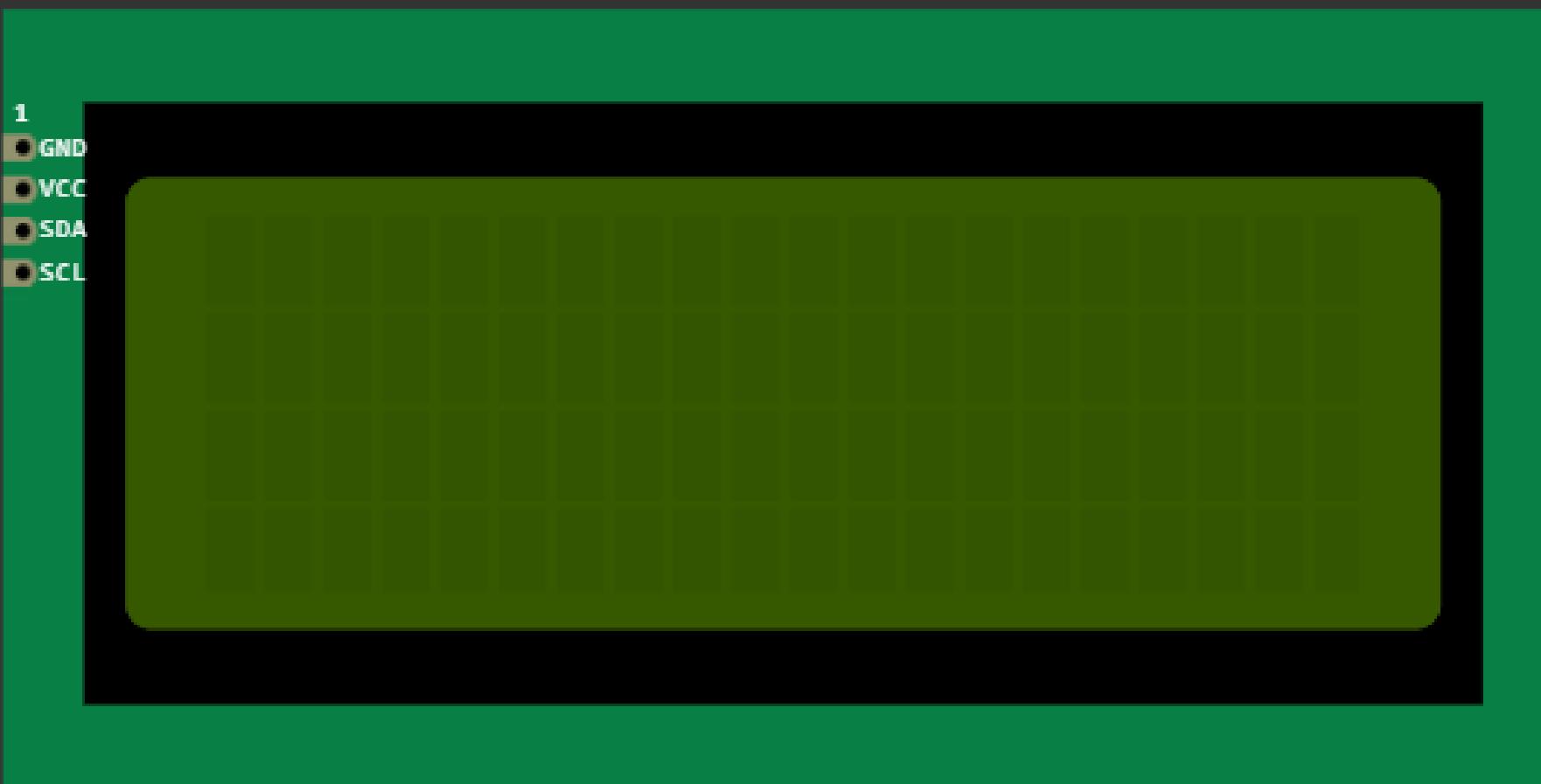


LCD & VARIATIONS

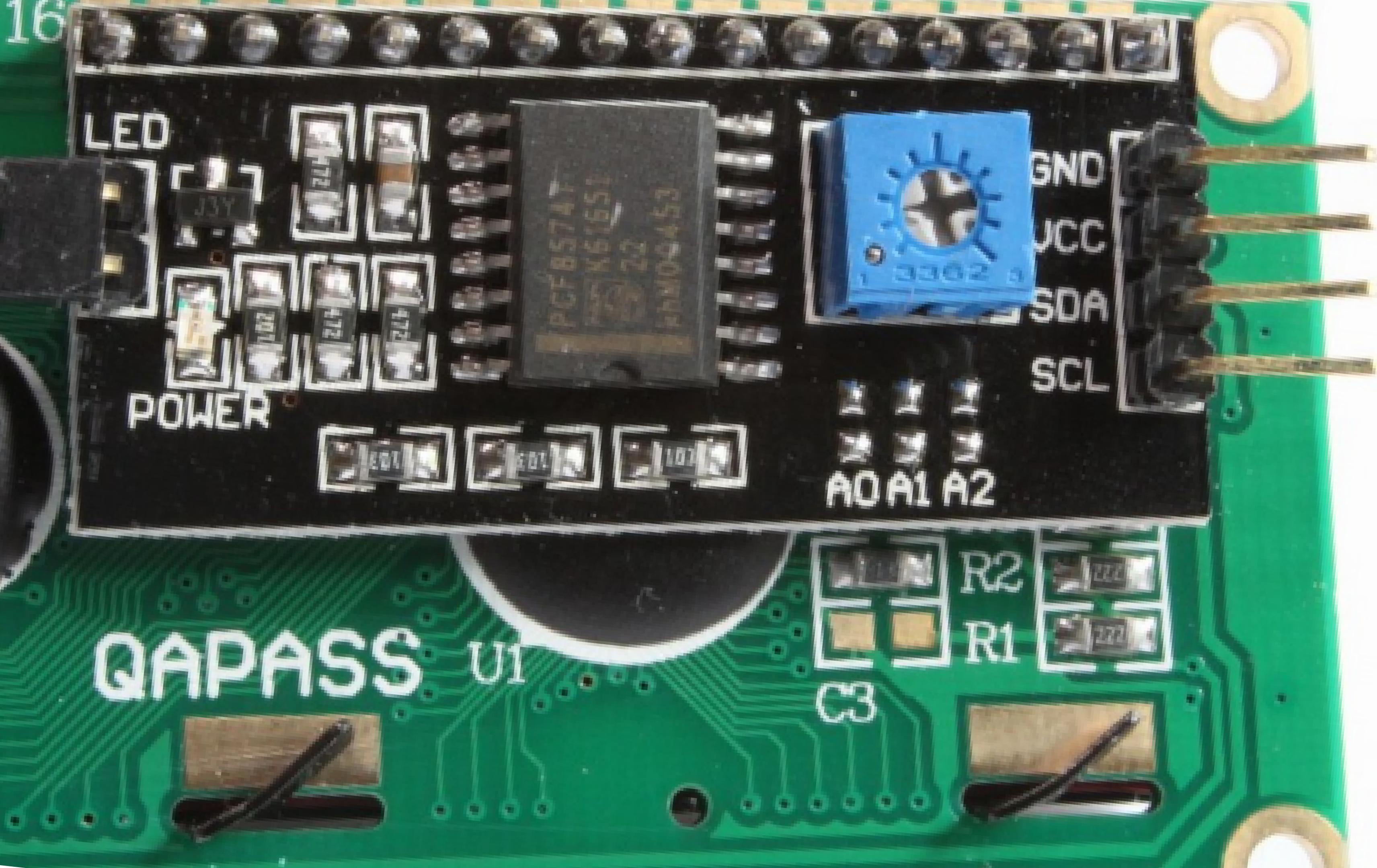


16 * 2

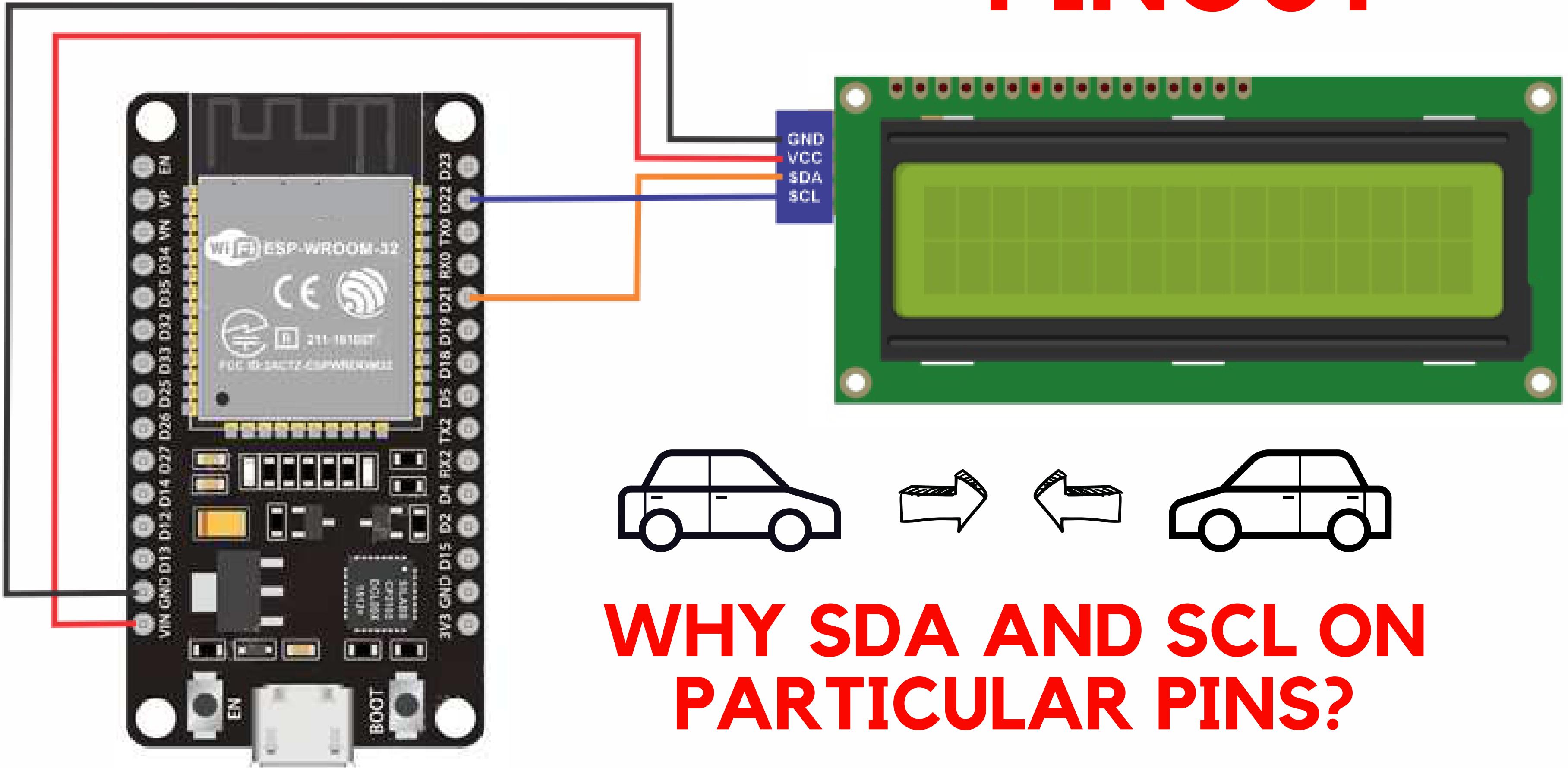
LIQUID CRYSTAL DISPLAY



16 * 4



PINOUT



```
1 import machine
2 from machine import Pin, SoftI2C
3 from lcd_api import LcdApi
4 from i2c_lcd import I2cLcd
5 from time import sleep
6
7 I2C_ADDR = 0x27
8 totalRows = 2
9 totalColumns = 16
10
11 #initializing the I2C method for ESP32
12 i2c = SoftI2C(scl=Pin(22), sda=Pin(21), freq=10000)
13
14 lcd = I2cLcd(i2c, I2C_ADDR, totalRows, totalColumns)
15
16 while True:
17     lcd.putstr("CRAZY BTECH")
18     sleep(2)
19     lcd.clear()
```

TASK 1 :
DISPLAY HELLO WORLD IN THE
SECOND ROW ON THE THIRD
COLUMN

GAME
ON

GAME
ON

TASK 2 :
ON AND OFF LED
DISPLAY LED ON/OFF
on the screen while the
operation performs

THANK YOU

dypiu.ac.in