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ANTARES

Working with ESP32

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Personal Background

Elektronika Instrumentasi (ELINS) **Universitas Gadjah Mada (UGM) - Robotics**

國立交通大學 National Chiao Tung University

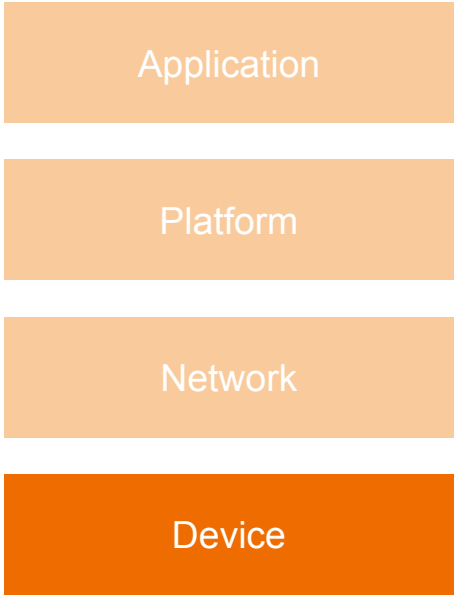
Electrical Engineering and Computer Science (EECS) **National Chiao Tung University (NCTU) - IoT**

Telkom Indonesia

the world in your hand

Enterprise Business **PT Telkom Indonesia - Senior Solution Architect**

IoT Stack

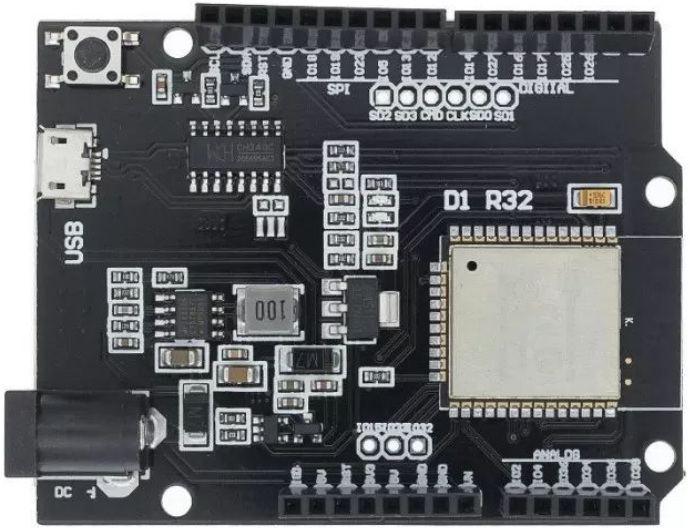


Apa itu ESP32?

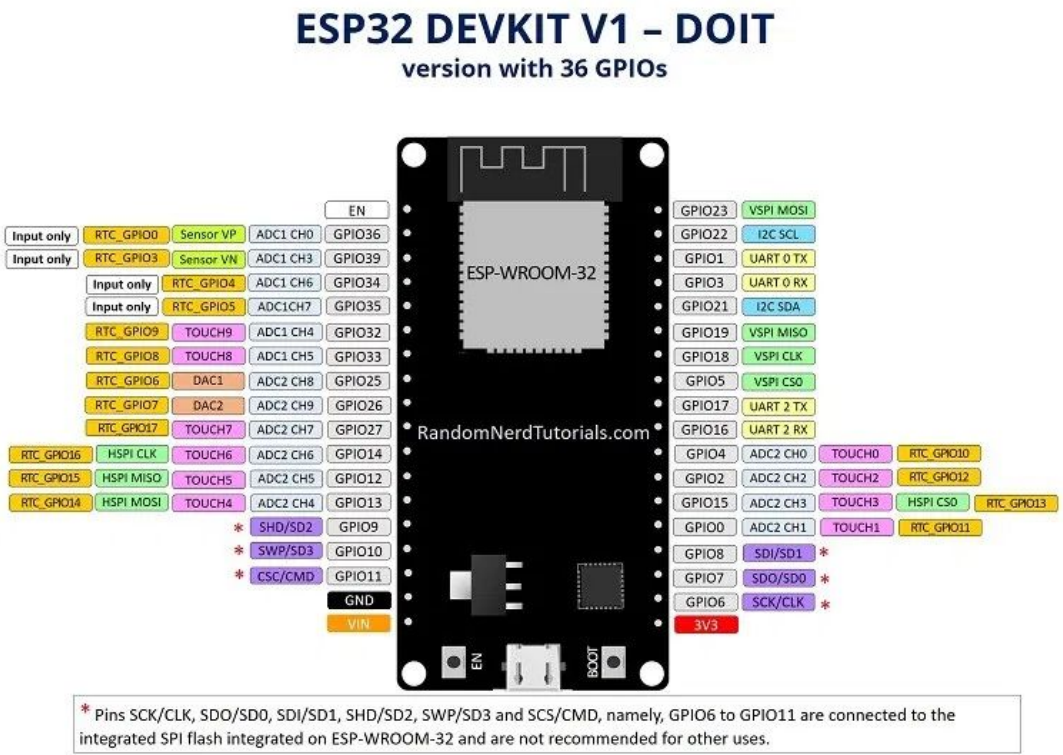
ESP32 merupakan produk buatan ESPRESSIF

ESP32 adalah sebuah chipset dengan harga kompetitif, hemat daya namun telah dilengkapi dengan kapabilitas Wi-Fi dan dual-mode Bluetooth.

Ragam Bentuk ESP32 Dev. Board



Ragam Bentuk ESP32 Dev. Board



Spesifikasi

- Single or Dual-Core 32-bit LX6 Microprocessor with clock frequency up to 240 MHz.
- 520 KB of SRAM, 448 KB of ROM and 16 KB of RTC SRAM.
- Supports 802.11 b/g/n Wi-Fi connectivity with speeds up to 150 Mbps.
- Support for both Classic Bluetooth v4.2 and BLE specifications.
- 34 Programmable GPIOs.
- Up to 18 channels of 12-bit SAR ADC and 2 channels of 8-bit DAC
- Serial Connectivity include 4 x SPI, 2 x I2C, 2 x I2S, 3 x UART.
- Ethernet MAC for physical LAN Communication (requires external PHY).
- 1 Host controller for SD/SDIO/MMC and 1 Slave controller for SDIO/SPI.
- Motor PWM and up to 16-channels of LED PWM.
- Secure Boot and Flash Encryption.
- Cryptographic Hardware Acceleration for AES, Hash (SHA-2), RSA, ECC and RNG.

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Let's Do Some Hands-On

Sesi Hands-On

- LED
- DHT22
- LDR

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LED

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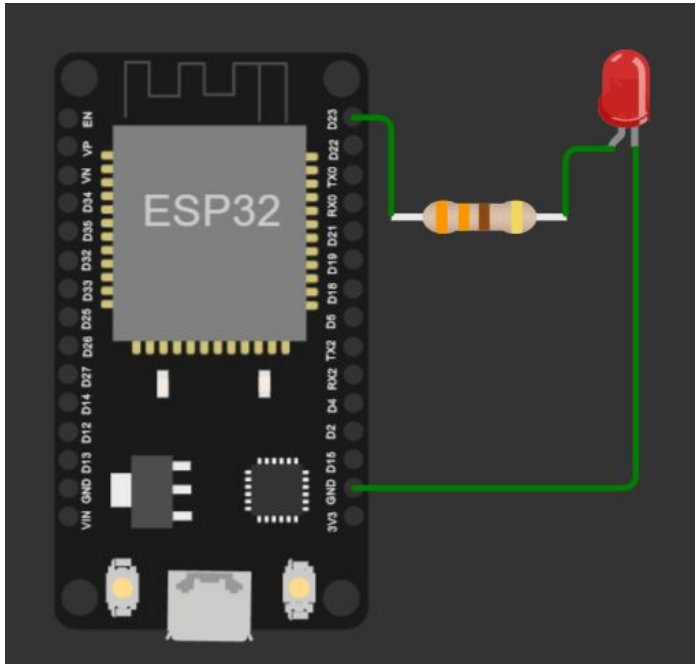
Ayo kita coba!!
Blink LED




```
// variable pin led
const int pinLED = 23;

void setup() {
  // inisiasi Serial Communication
  Serial.begin(115200);
  Serial.println("Hello, ESP32!");
   // deklarasi pin
  pinMode(pinLED, OUTPUT);
}

void loop() {
  // kode menghidupkan LED
  digitalWrite(pinLED, HIGH);
  delay(500);
  // kode mematikan LED
  digitalWrite(pinLED, LOW);
  delay(500);
}
```

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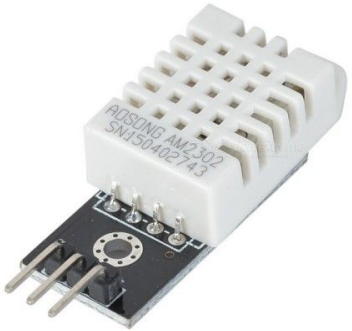
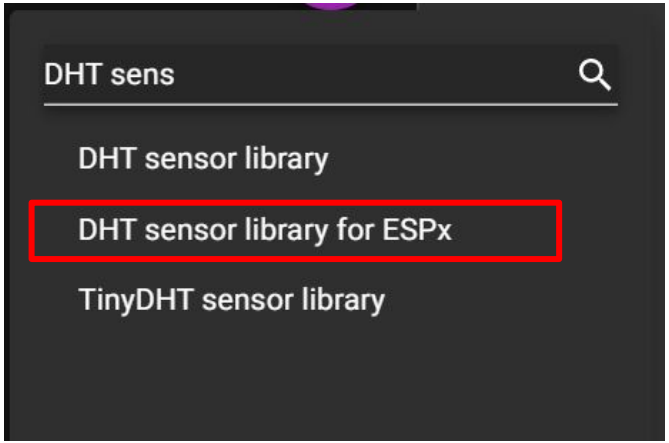
DHT22

DHT22
Sensor Suhu & Kelembaban

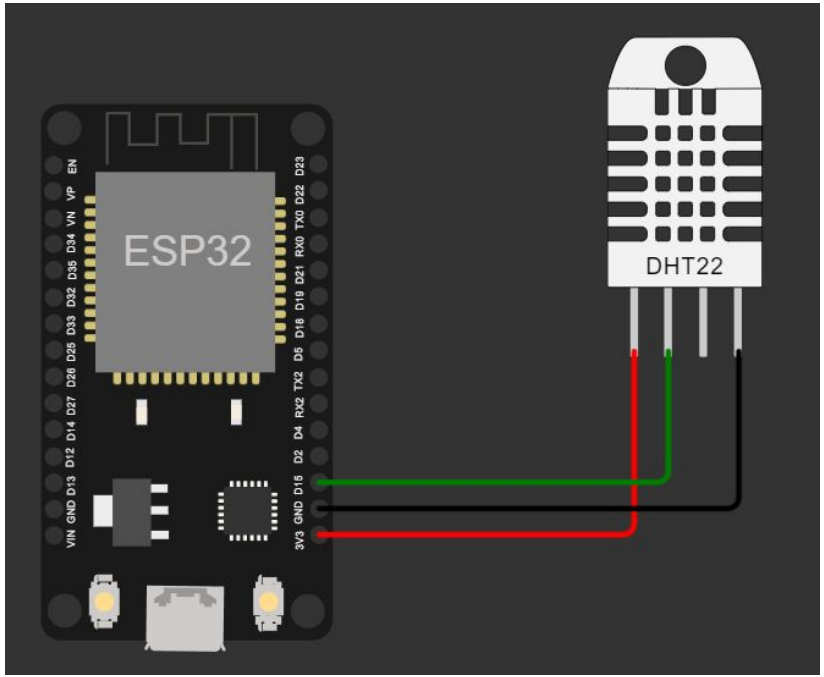


Model	DHT22
Power supply	3.3-6V DC
Output signal	digital signal via single-bus
Sensing element	Polymer capacitor
Operating range	humidity 0-100%RH; temperature -40~80Celsius
Accuracy	humidity +-2%RH(Max +-5%RH); temperature <+-0.5Celsius
Resolution or sensitivity	humidity 0.1%RH; temperature 0.1Celsius
Repeatability	humidity +-1%RH; temperature +-0.2Celsius
Humidity hysteresis	+-0.3%RH
Long-term Stability	+-0.5%RH/year
Sensing period	Average: 2s
Interchangeability	fully interchangeable
Dimensions	small size 14*18*5.5mm; big size 22*28*5mm

Instalasi Library DHT, Adafruit



Akuisisi Data DHT22




```ino
// proses include library
#include "DHTesp.h"

// deklarasi variable
// set pin yang digunakan
#define DHTPIN 15

// deklarasi object sensor
// set tipe DHT dan pin yang digunakan
DHTesp dht;

void setup() {
  // put your setup code here, to run once:
  // inisiasi interface serial
  // deklarasi interface serial
  Serial.begin(115200);
  Serial.println("EDSPERT - Akuisisi sensor DHT22 via ESP32");

  // inisiasi sensor DHT
  dht.setup(DHTPIN, DHTesp::DHT22);
}

void loop() {
  // deklarasi objek untuk menampung data
  // temperatur dan kelembapan dari DHT22
  TempAndHumidity data = dht.getTempAndHumidity();

  // ekstrak data temperature
  float temp = data.temperature;
  // ekstrak data humidity
  float hum = data.humidity;

  // menampilkan data di serial
  Serial.println("Suhu: " + String(temp, 2) + "°C");
  Serial.println("Kelembaban: " + String(hum, 1) + "%");
  Serial.println("---");

  // waktu jeda sampling data
  // minimal 2 detik
  delay(20000);
}
```

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Output Data DHT22

```
EDSPERT - Akuisisi sensor DHT22 via ESP32
Suhu: 24.00°C
Kelembaban: 40.0%
```

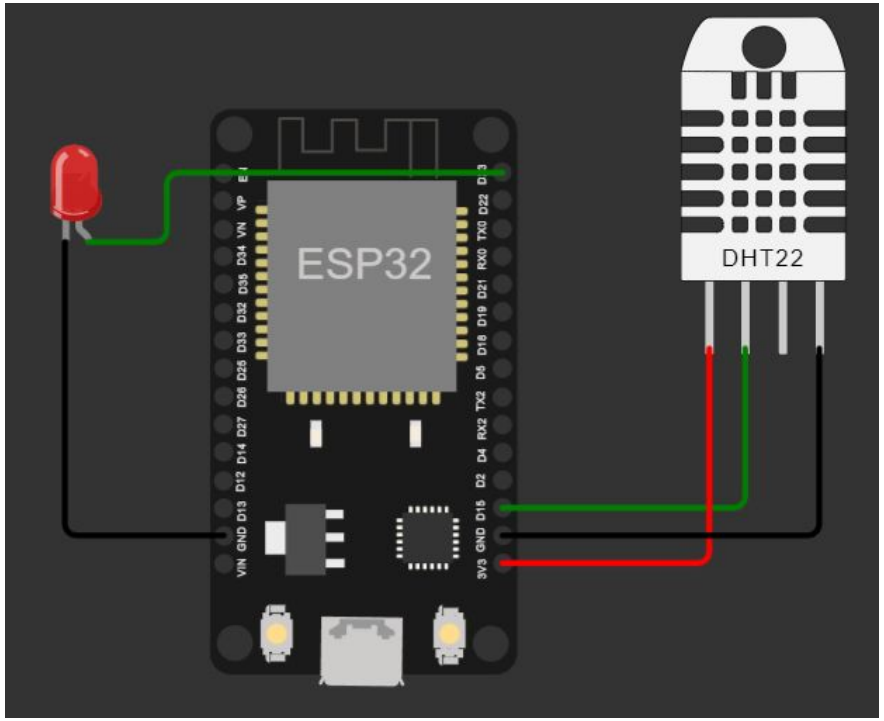
QUIZ 1

Membuat sebuah sistem pendeteksi kebakaran. Jika Suhu >40C, maka lampu LED Merah akan berkedip

HINT

```
if(variable>kondisi){
        Action;
} else {
        Normal;
}
```

Quiz 1



Quiz 1

```
// proses include library
#include "DHTesp.h"

// deklarasi variable
// set pin yang digunakan
#define DHTPIN 15
#define LEDPIN 23

// deklarasi object sensor
// set tipe DHT dan pin yang digunakan
DHTesp dht;

void setup() {
  // put your setup code here, to run once:
  // inisiasi interface serial
  // deklarasi interface serial
  Serial.begin(115200);
  Serial.println("EDSPERT - Akuisisi sensor
DHT22 via ESP32");

  // inisiasi sensor DHT
  dht.setup(DHTPIN, DHTesp::DHT22);

  pinMode(LEDPIN, OUTPUT);
}
```

```
void loop() {
  // deklarasi objek untuk menampung data
  // temperatur dan kelembapan dari DHT22
  TempAndHumidity data = dht.getTempAndHumidity();

  // ekstrak data temperature
  float temp = data.temperature;
  // ekstrak data humidity
  float hum = data.humidity;

  // menampilkan data di serial
  Serial.println("Suhu: " + String(temp, 2) + "°C");
  Serial.println("Kelembaban: " + String(hum, 1) + "%");
  Serial.println("---");

  if(temp>=40.00){
    Serial.println("WARNING");
    digitalWrite(LEDPIN, HIGH);
  } else {
    Serial.println("NORMAL");
    digitalWrite(LEDPIN, LOW);
  }
  // waktu jeda sampling data
  // minimal 2 detik
  delay(20000);
}
```

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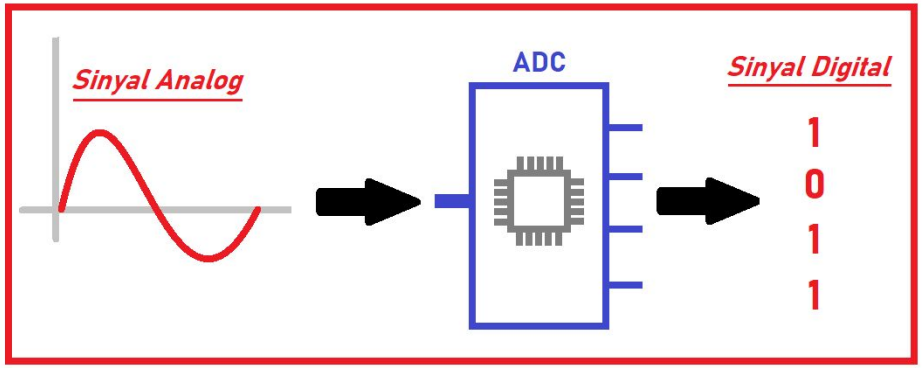
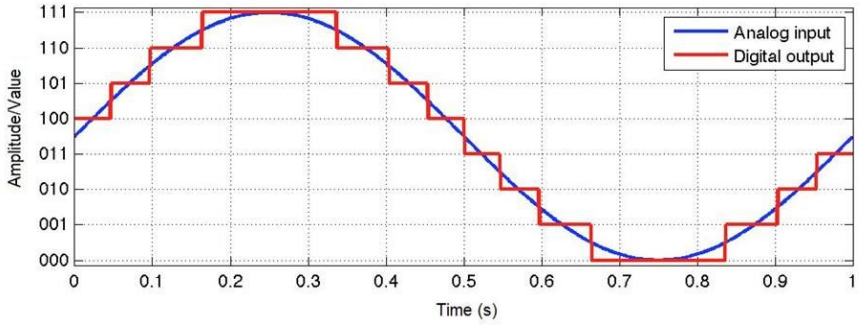
LDR

Analog to Digital Converter (ADC)

ADC memungkinkan sinyal analog dikonversi menjadi sinyal digital

Fitur ADC ini ada di dalam internal chip ESP32





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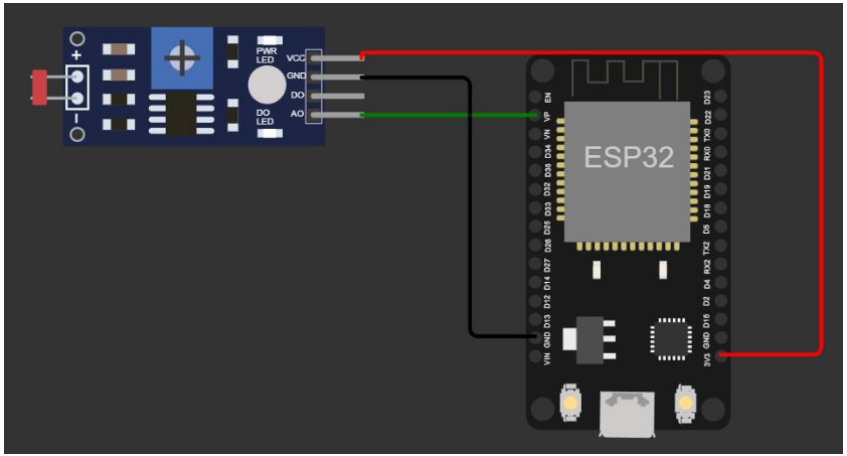
Akuisisi Data LDR




```ino
const int pinSensor = A0;
int adcValue = 0;

void setup()
{
  // inisiasi Serial comm dengan baud rate 115200
  Serial.begin(115200);
}

void loop()
{
  // akuisisi nilai ADC sensor LDR
  adcValue = analogRead(pinSensor);
  // cetak nilai adc ke serial monitor
  Serial.println(adcValue);
  // jeda akuisisi data
  delay(1000);
}
```

Output Data LDR

```
nilai adc: 1001
nilai adc: 1001
nilai adc: 1001
nilai adc: 2531
nilai adc: 2340
nilai adc: 2340
nilai adc: 2340
```

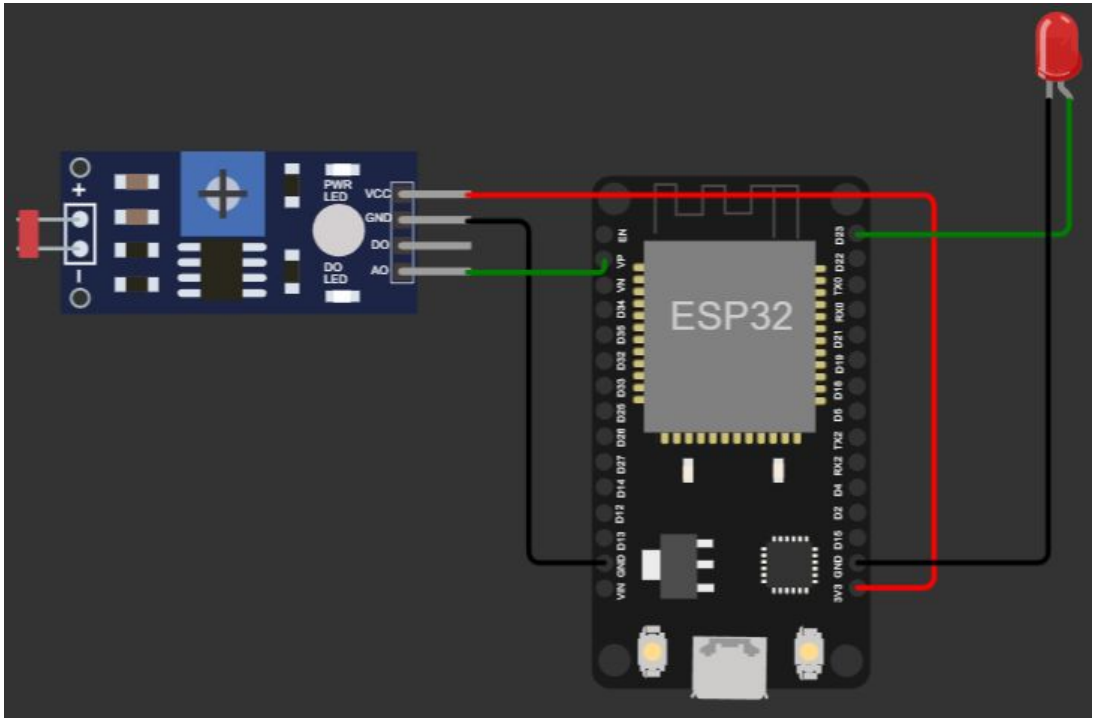
QUIZ 2

Membuat sebuah sistem otomatis lampu. Jika LDR <10 Lux, maka lampu LED Merah akan menyala

HINT

```
if(variable>kondisi){
        Action;
} else {
        Normal;
}
```

Quiz 2



Quiz 2

```
const int pinSensor = A0;
const int pinLED = 23;
int adcValue = 0;

void setup()
{
  // inisiasi Serial comm dengan baud rate 115200
  Serial.begin(115200);
  pinMode(pinLED, OUTPUT);
}
```

```
void loop()
{
  // akuisisi nilai ADC sensor LDR
  adcValue = analogRead(pinSensor);
  Serial.println(adcValue);
  if(adcValue>=3413){
    Serial.println("NIGHT");
    digitalWrite(pinLED, HIGH);
  } else {
    Serial.println("DAY");
    digitalWrite(pinLED, LOW);
  }

  // jeda akuisisi data
  delay(1000);
}
```

TUGAS

Membuat sebuah sistem lampu peringatan berbasis suhu ruangan. Jika suhu <30C, lampu LED Hijau menyala, suhu 30-50C lampu LED Kuning menyala, suhu >50C lampu LED Merah menyala.

HINT
Gunakan LED RGB

TANTANGAN

Membuat monitoring nilai LUX dari LDR Sensor. Jika setting LDR bernilai 10 Lux, mka di Serial Monitor juga 10 Lux. Berlaku untuk seluruh nilai Lux.

HINT
Fungsi ADC ke Lux, tidak Linier.