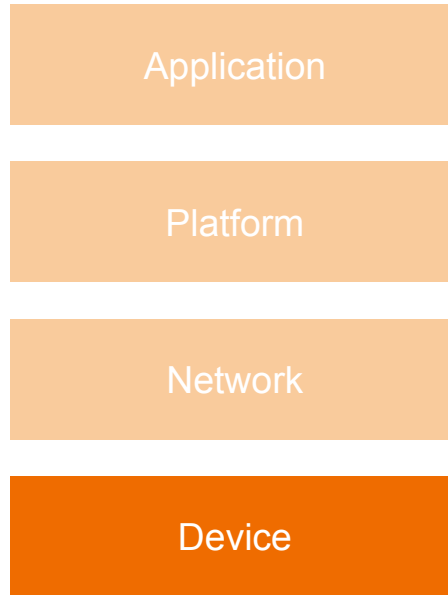

Working with ESP32

— Fariz Alemuda —

Personal Background



IoT Stack



Apa itu ESP32?



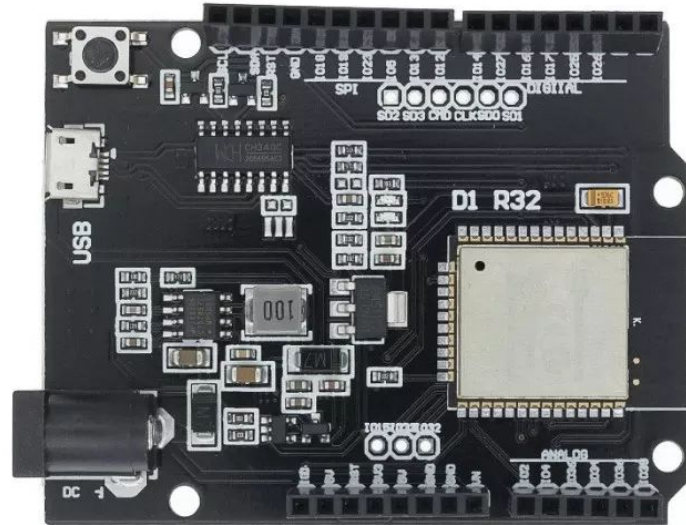
ESP32 merupakan produk buatan



ESPRESSIF

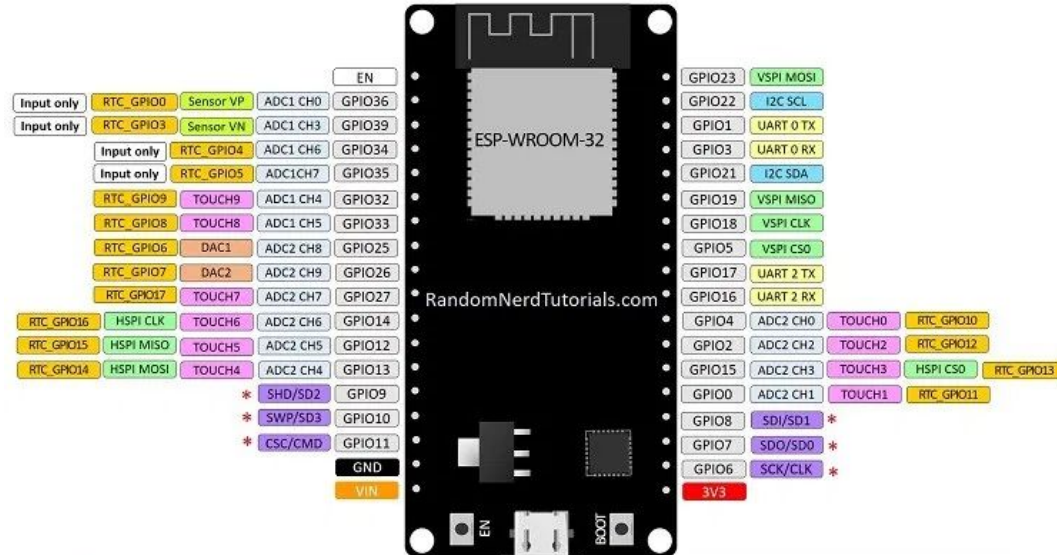
ESP32 adalah sebuah chipset dengan harga kompetitif, hemat daya namun telah dilengkapi dengan kapabilitas Wi-Fi dan dual-mode Bluetooth.

Ragam Bentuk ESP32 Dev. Board



Ragam Bentuk ESP32 Dev. Board

ESP32 DEVKIT V1 – DOIT version with 36 GPIOs



* Pins SCK/CLK, SDO/SD0, SDI/SD1, SHD/SD2, SWP/SD3 and CSC/CMD, namely, GPIO6 to GPIO11 are connected to the integrated SPI flash integrated on ESP-WROOM-32 and are not recommended for other uses.

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.

Let's Do Some Hands-On

Sesi Hands-On

LED

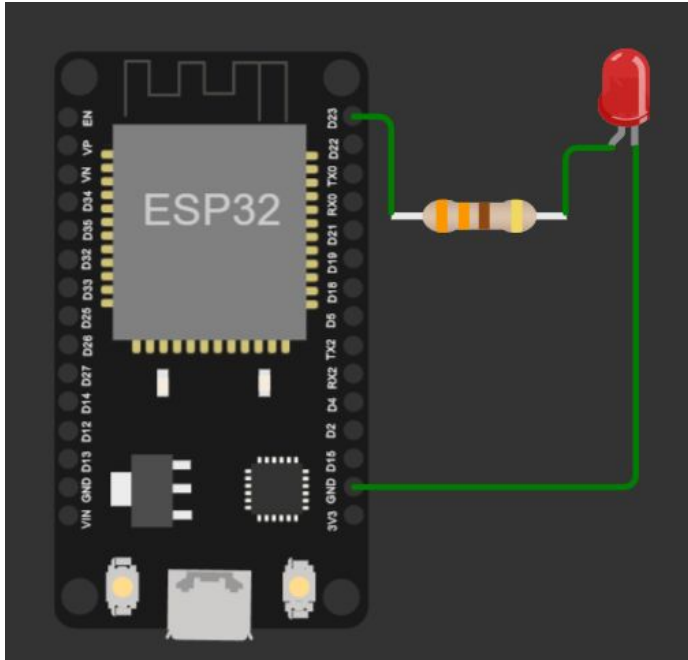
DHT22

LDR

LED

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 menhidupkan LED
    digitalWrite(pinLED, HIGH);
    delay(500);
    // kode mematikan LED
    digitalWrite(pinLED, LOW);
    delay(500);
}
```

DHT22

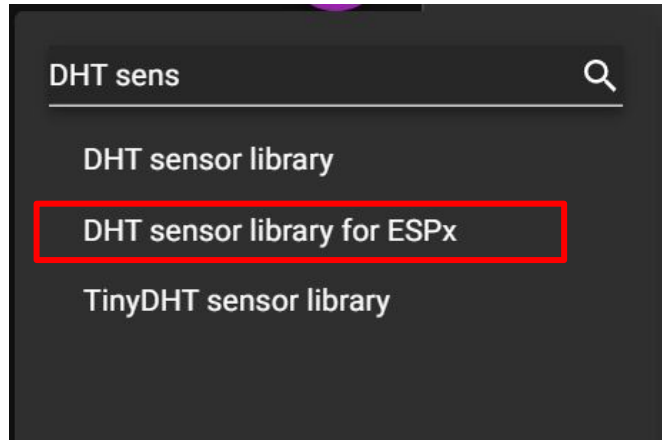
DHT22

Sensor Suhu & Kelembaban

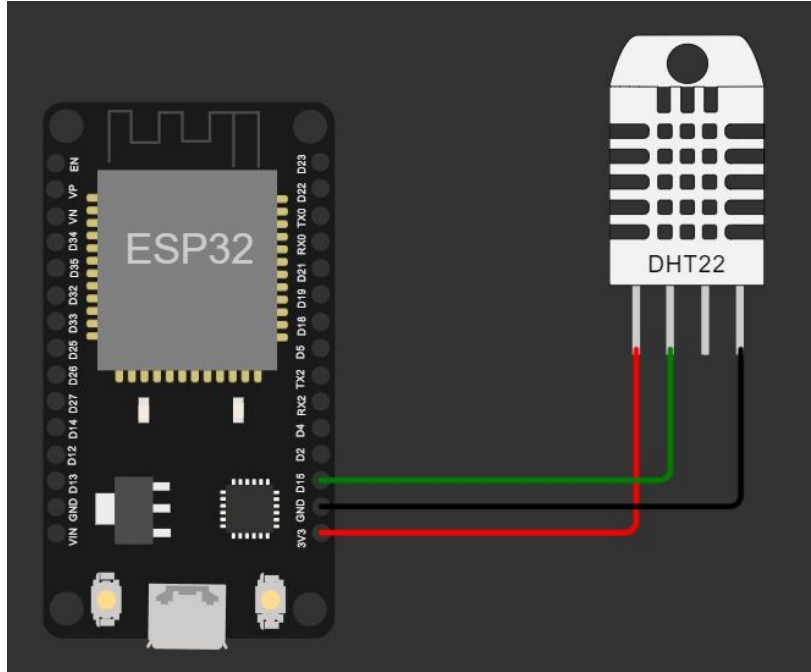


Model	DHT22
Power supply	3.3-6V DC
Output signal	digital signal via single-bus
Sensing element	Polymer capacitor
Operating range	humidity 0-100%RH; temperature -40~80Celsius
Accuracy	humidity +2%RH(Max +5%RH); temperature <+-0.5Celsius
Resolution or sensitivity	humidity 0.1%RH; temperature 0.1Celsius
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



```
// 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(2000);
}
```

Output Data DHT22

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

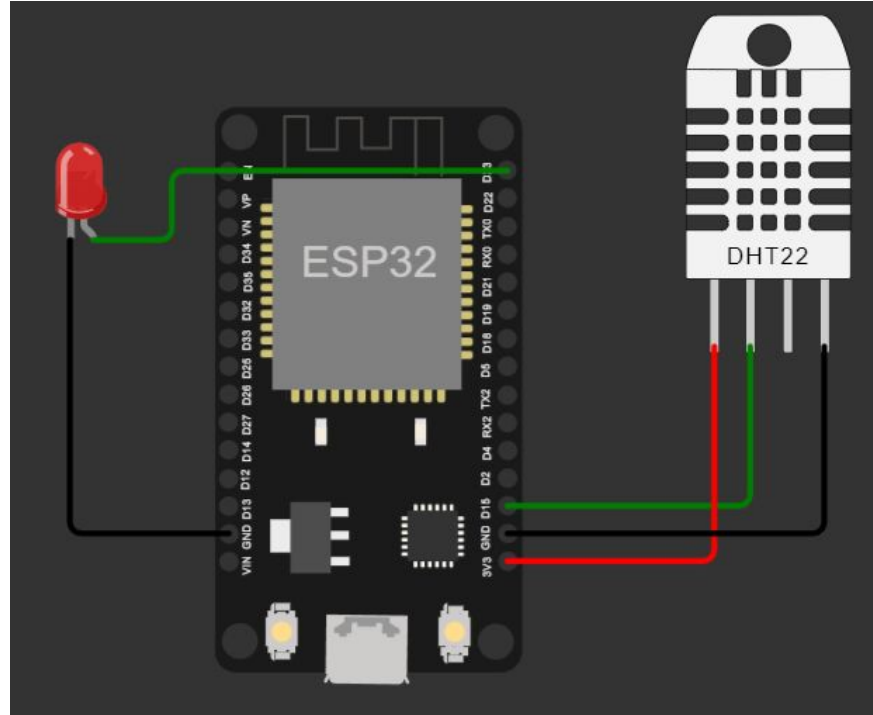

QUIZ 1

Membuat sebuah sistem pendeteksi kebakaran. Jika Suhu $>40^{\circ}\text{C}$, 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);
    }

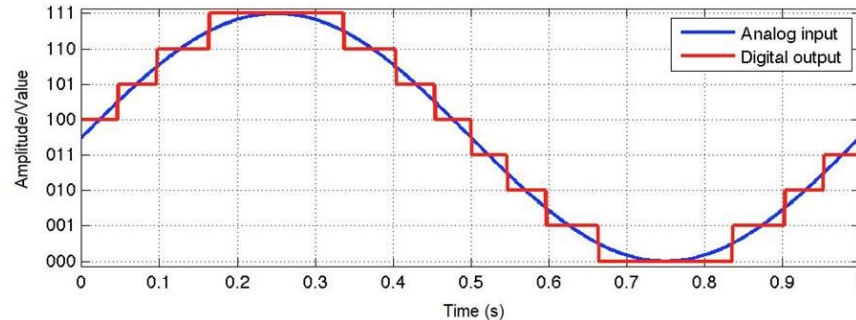
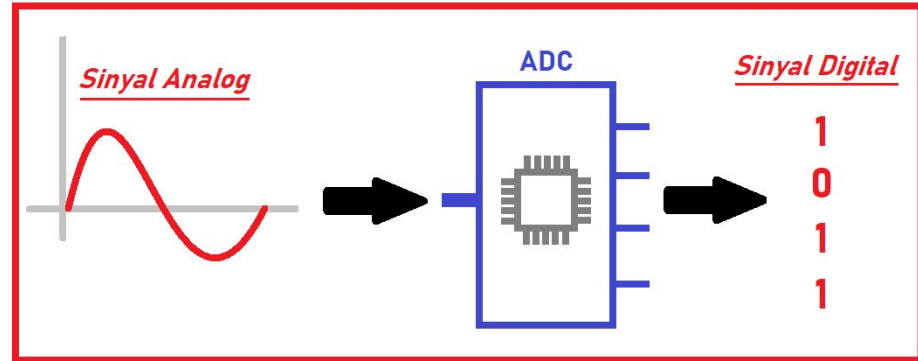
    // waktu jeda sampling data
    // minimal 2 detik
    delay(20000);
}
```

LDR

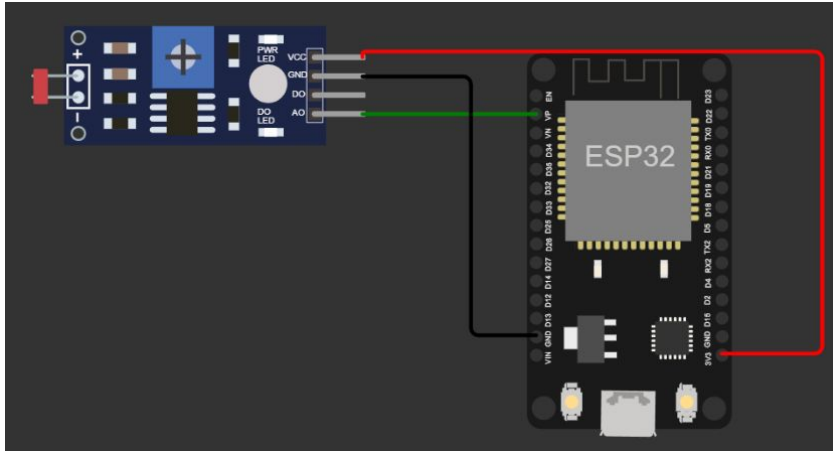
Analog to Digital Converter (ADC)

ADC memungkinkan sinyal analog
dikonversi menjadi sinyal digital

Fitur ADC ini ada di dalam internal
chip ESP32



Akuisisi Data LDR



```
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);
}
```



ANTARES



Edspert.id

powered by widyaeu

Output Data LDR

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

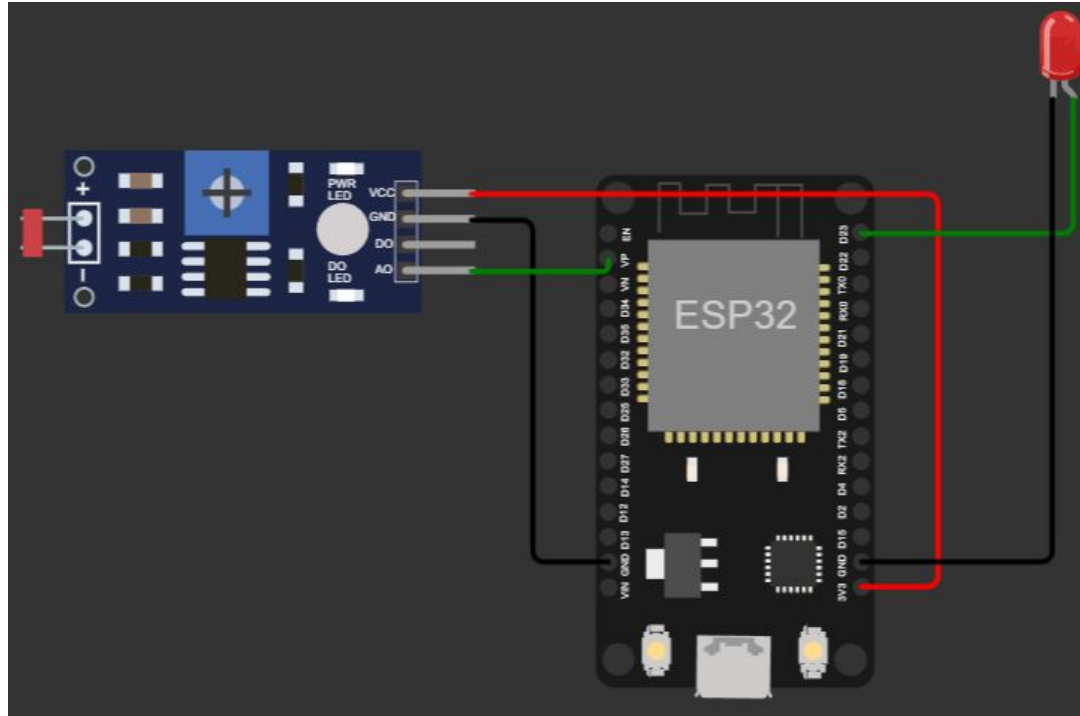
QUIZ 2

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 $< 30^{\circ}\text{C}$, lampu LED Hijau menyala, suhu $30-50^{\circ}\text{C}$ lampu LED Kuning menyala, suhu $> 50^{\circ}\text{C}$ lampu LED Merah menyala.

HINT

Gunakan LED RGB

TANTANGAN

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

HINT

Fungsi ADC ke Lux, tidak Linier.