

# Lecture 3

# Sensor Types

Github link

**<https://goo.gl/UmJu1g>**

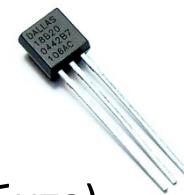
# Environmental Sensors

## Сензори за Околната среда

- Температура

- DS18B20

- Точност: +/- 0.5°
  - Резолюция: 0.06 (12 бита)
  - Протокол: 1-Wire
  - Повече от 10 сензора на един пин
  - -20° : 80°
  - 3 лв



- Температура/Влага/Налягане

- BME280

- Точност: +/- 0.5°
  - Резолюция: 0.01 (14 бита)
  - Протокол: I2C
  - 2 Сензор на шина
  - -25° : 125°
  - 9 лв



- Температура/Влага

- SI7021

- Точност: +/- 0.3°
  - Резолюция: 0.01 (14 бита)
  - Протокол: I2C
  - 1 Сензор на шина
  - -25° : 125°
  - 5 лв



- Температура

- PT100

- Протокол: Съпротивление
  - -20° : 500°
  - 2 лв



# Сензори за Околната среда

## Въглероден Диоксид

- MQ135

- Тип: Електро химичен
- Консумация: 150 ма
- Точност: +/- 30%
- Протокол:  
Съпротивление
- Цена: 5 лв



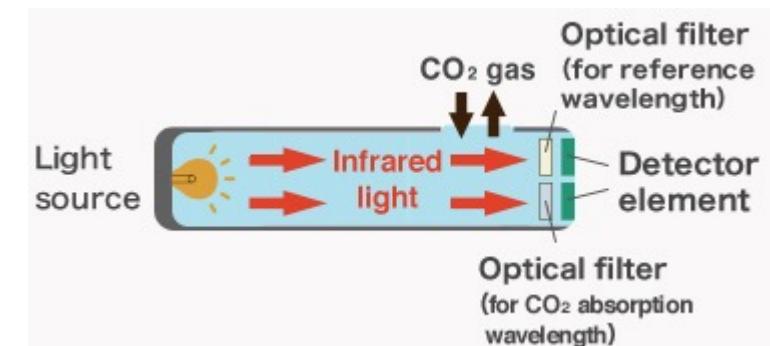
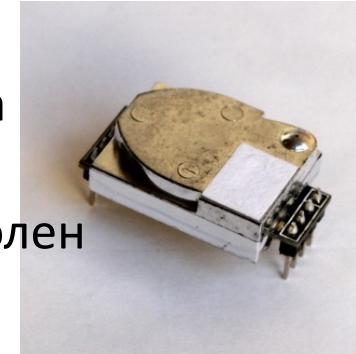
- Figaro CDM7160

- Тип: NDIR
- Консумация: 8 ма
- Точност: +/- 4%
- Фабрично калибриран
- Протокол: Сериен, I2C, PWM
- Цена: 100 лв



- Cubic CM1106

- Тип: NDIR
- Консумация: 60 ма
- Точност: +/- 5%
- Калибрация от околн  
въздух
- Протокол: Сериен
- Цена: 60 лв



# Сензори за Околната среда

## Прах

- Sharp gp2y1010au0f

- Тип: Оптичен
- Прокол: сложен
- Цена: 5 лв



- Cubic PM2005

- Тип: Лазерен
- Протокол: I2C
- Цена: 80 лв



- DSM510a

- Тип: Оптичен
- Протокол: ?
- Цена: 15 лв



# Сензори за Околната среда

## MQ Series

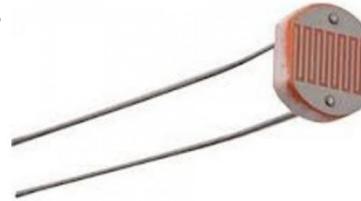
- Long preheat
- High power consumption
- Dependency to Temperature/Humidity



Semiconductor sensor for Flammable gas, Plastic or Metal cover	
Model	Target Gas
<a href="#">MQ-2</a>	General combustible gas
<a href="#">MQ-3</a>	Alcohol
<a href="#">MQ-4</a>	Natural gas, Methane
<a href="#">MQ-5</a>	LPG, Natural gas, Coal gas
<a href="#">MQ-6</a>	LPG, Propane
<a href="#">MQ-7</a>	Carbon Monoxide (CO)
<a href="#">MQ-8</a>	Hydrogen
<a href="#">MQ-9</a>	CO and Combustible gas
<a href="#">MQ216</a>	Natural gas\Coal gas
<a href="#">MQ306A</a>	LPG, Propane
<a href="#">MQ309A</a>	Carbon Monoxide (CO), Flammable Gas
<a href="#">MQ303A</a>	Alcohol
<a href="#">MQ131</a>	Ozone O3
<a href="#">MQ135</a>	Air Quality Control (NH3,Benzene,Alcohol,smoke)
Semiconductor sensor for Toxic gas	
<a href="#">MQ136</a>	Sulfureted Hydrogen (H2S)
<a href="#">MQ137</a>	Ammonia (NH3)
<a href="#">MQ138</a>	VOC (Mellow, Benzene, Aldehyde, Ketone, Ester )

# Сензори за Светлина

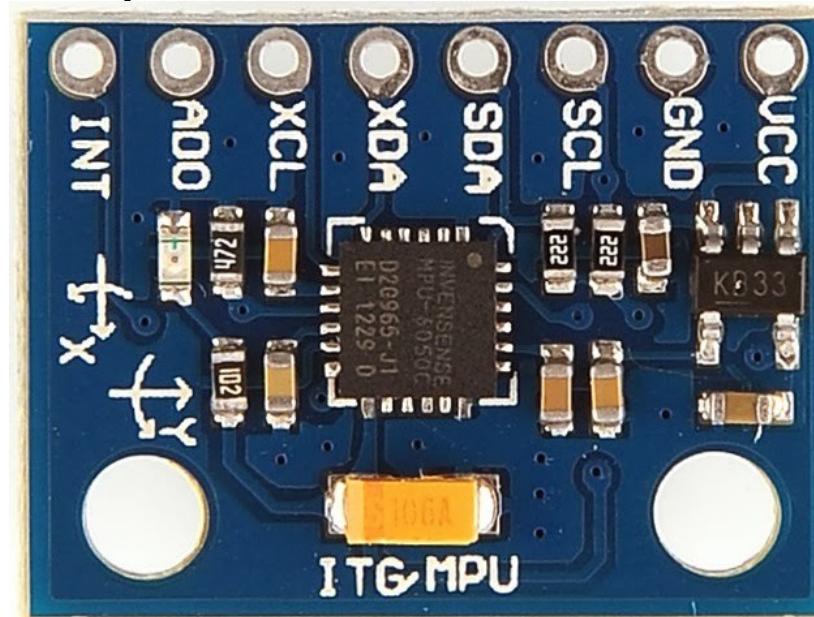
- BH1750
  - 1-120,000 LUX
  - I2C
  - 3 лв
- TSL2561
  - 0.1 – 60,000 Lux
  - + IR Light
  - I2C
  - 4 лв
- LDR (Light Dependent Resistor)
  - ??? LUX
  - Resistive Voltage Devider
  - 0.2 лв
- Ultra Violet Light
- InfraRed – (remote control)
- Color Sensor (RGB)



# Accelerometer/Gyroscope/Magnetometer

- MPU6050 – 6 DOF (Degrees Of Freedom)
  - Accelerometer / Gyroscope
- MPU-9250 9-DOF – 9 DOF
  - + Magnetometer / Compass
- Communication
  - SPI
  - Internal DSP (Digital Signal Processor)
- Info: How do accelerometers work

<https://diyhacking.com/arduino-mpu-6050-imu-sensor-tutorial/>



# Движение

- PIR Sensor (2 лв)



- Omron D6T (60 лв)
  - 1x8 или 4x4

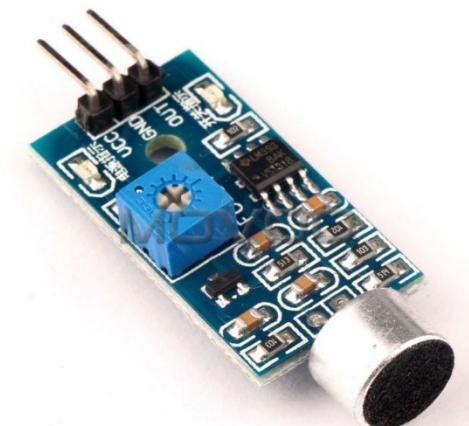


# Разстояние / Звук

- HC-SR04
  - ультразвук

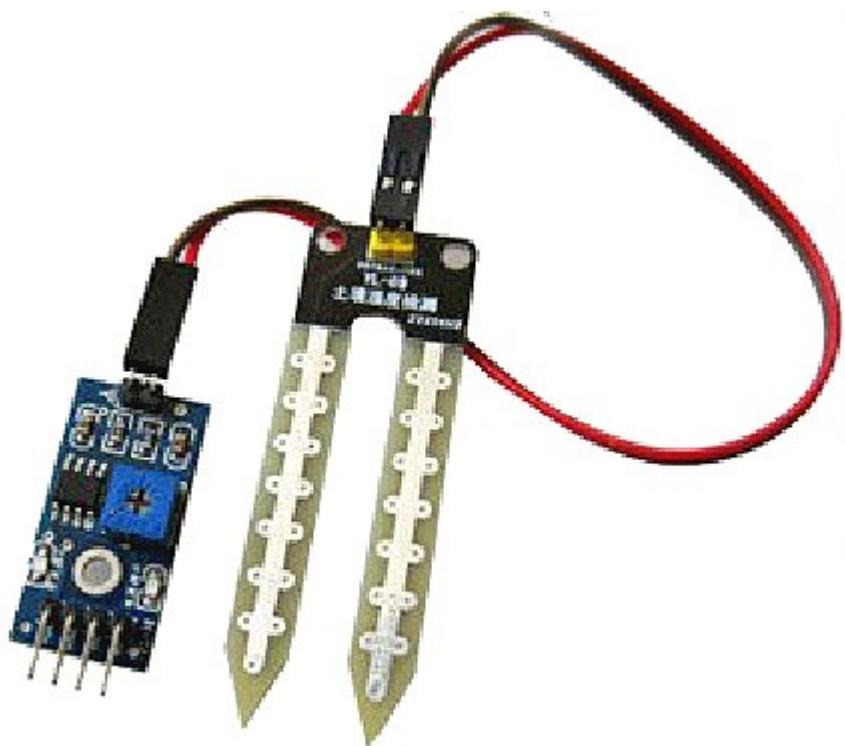


- Voice Recognition
- Noise Sensor
  - звук



# Влага в почвата

Soil Moisture Sensor (2 лв)

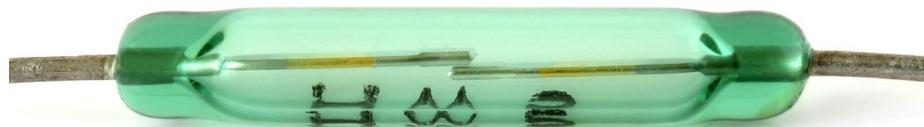


Xiaomi MI Plant (20 лв)

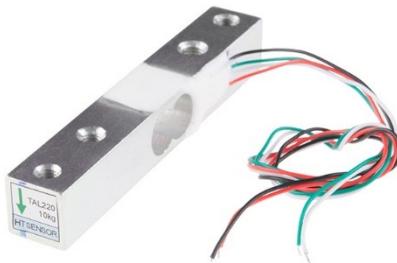


# Други

- Reed Switch (Magnetic Switch)



- Load Cell (Тегло)



- Gesture Sensor (APDS9960)

- UP, DOWN, LEFT, RIGHT, FAR, NEAR

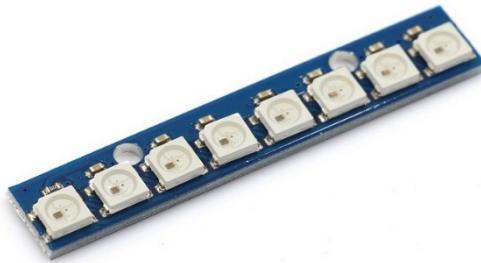


# Други

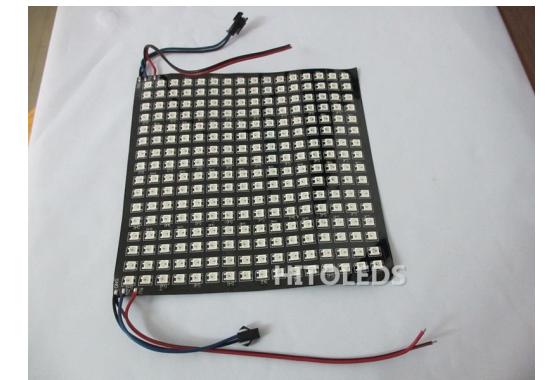
- Светковици
- Радиация (Гайгер мюлерови тръби)
- Камери
- Термо Камери
- Напрежение, Ток
- Heart Rate Sensor
- Line Follower
- GPS
- RFID / NFC
- Wind Meter

# Светодиоди

- Светодиоди (1 цвят) (0.1 лв)
  - Консумация: 0-20 ма
  - Резистор: 100-1000 ома



- RGB (WS2812b) (0.2лв / bit)
  - Консумация: 0-60 ма
  - 1 пин може да управлява 500 + лед-а
  - 4, 8, 16, 256 bit, LED Strip



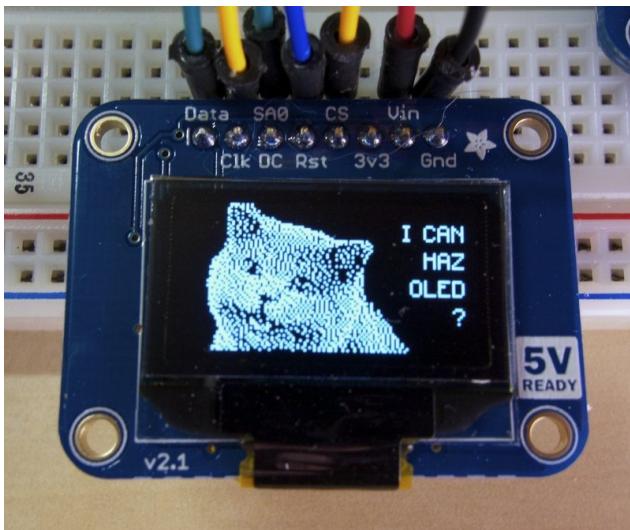
# Character Display

- LCD Display
  - 1x8, 2x10, 2x16, 2x20, 4x40
  - Protocol I2C or Parallel
  - Backlight on/off
  - Only Characters / no Graphics
  - 2x20 (i2c) - ~5 лв



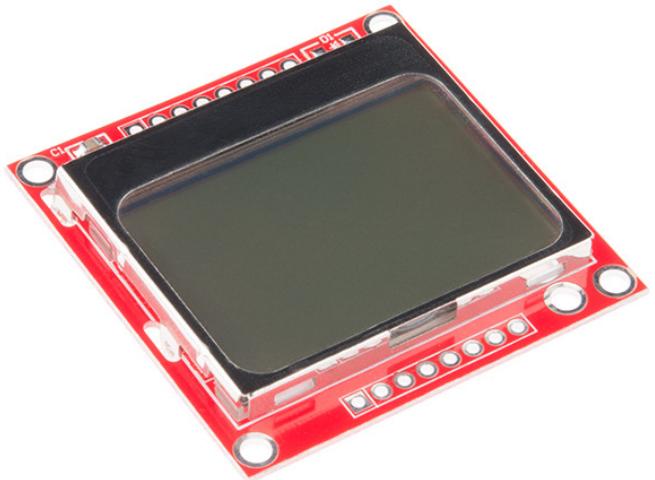
# OLED B/W

- Protocol: I2C or SPI
- Types: 128x64, 128x32, 64x32
- Black/White, Black/Blue, Black/Yellow/Blue
- Цена: 10 лв



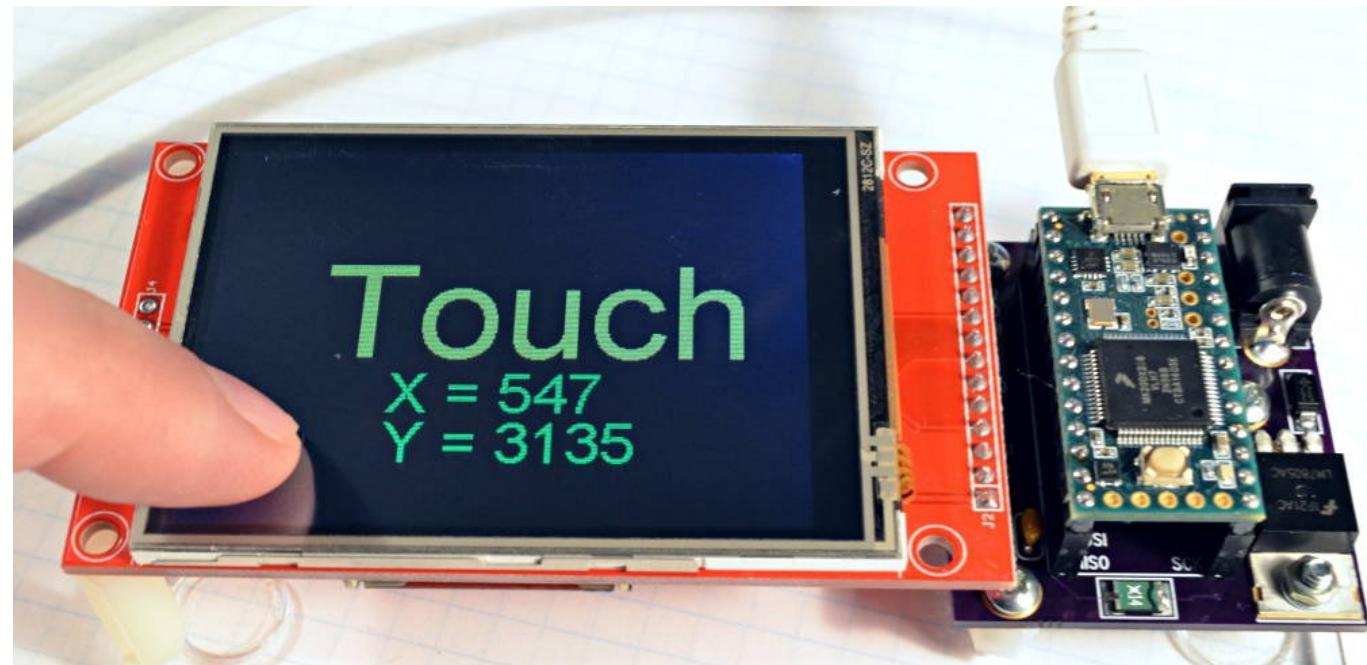
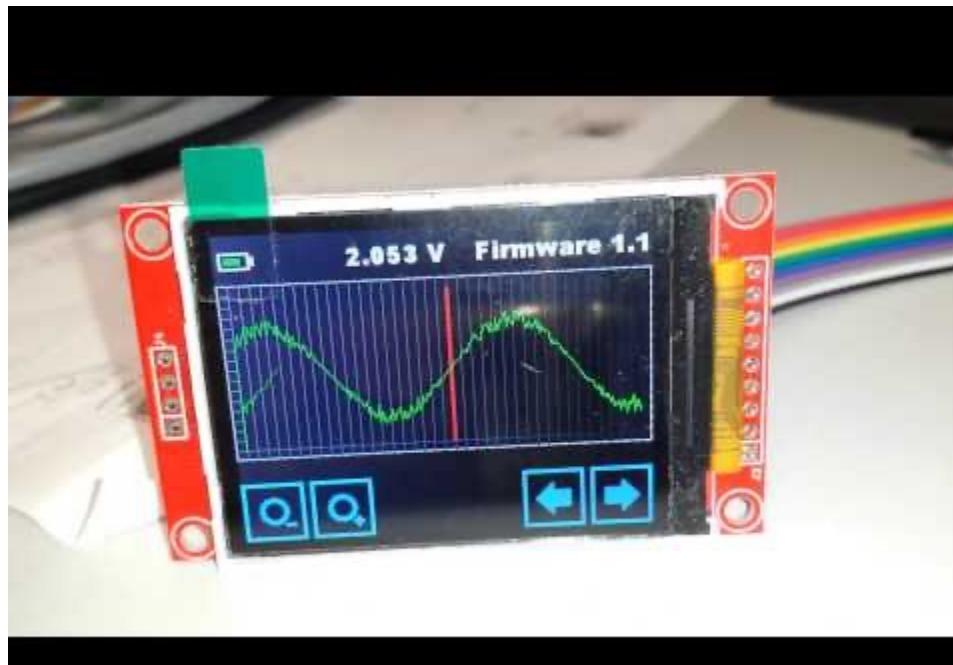
# Nokia 5110

- Resolution: 84x84
- Low Power
- Custom Driver



# Display TFT / Small / ILI9341 / 2.2" – 3.2"

- 320x240 resolution
- 15/16 bit color
- SPI (5+ wires communication)
- Resistive Touch support (on some models)
- Цена: 10-20 лв



# Nextion Displays

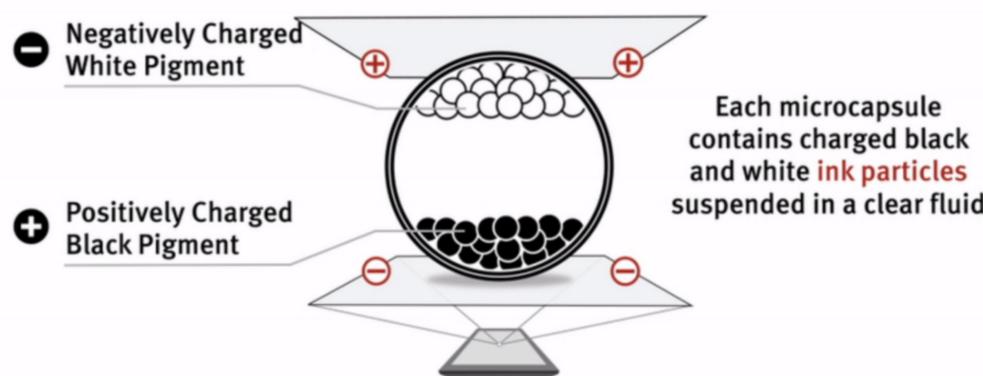
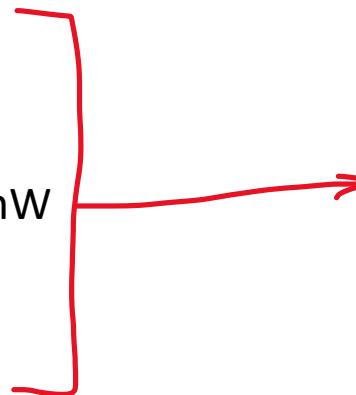
- Protocol: Custom 2 wires
- Size: 2.4" (20\$) – 7.0" (80\$)
- IDE for visual design
- Compatible with Arduino / ESP8266
- Integrated 48 Mhz – 108Mhz processor



Nextion 4

# E-Ink / E-Paper Displays

- Resolution: 296x128
- Power supply: **3,3V**
- Refresh current: 85mA
- Standby power: 0,017mW
- Interface: SPI
- Full refresh: 2 s
- Price: 20\$



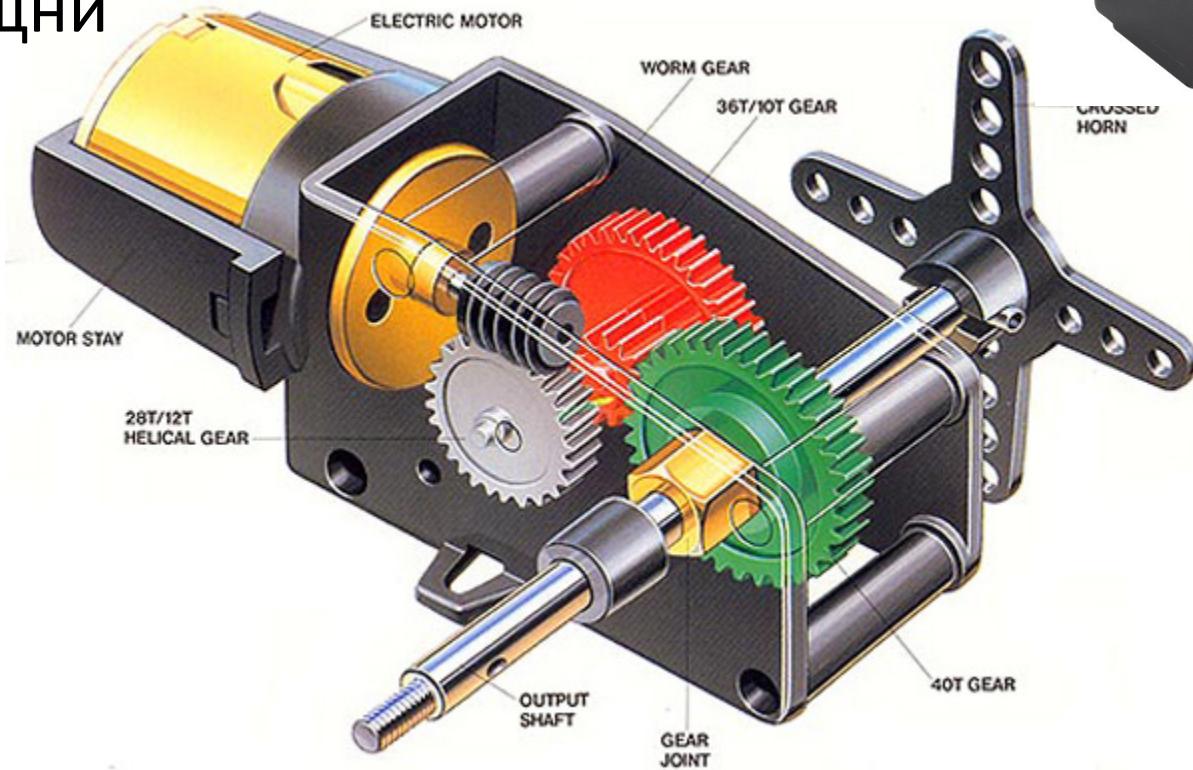
# Актуатори / Бутони

- Бутони
- Превключватели
- Сензорни бутони
- Takt Switch, Push Button



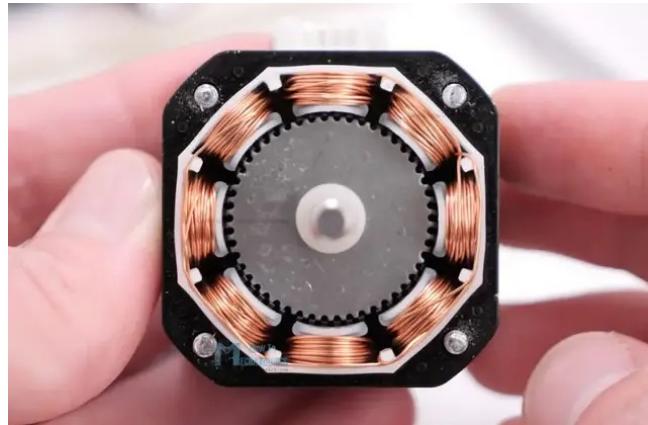
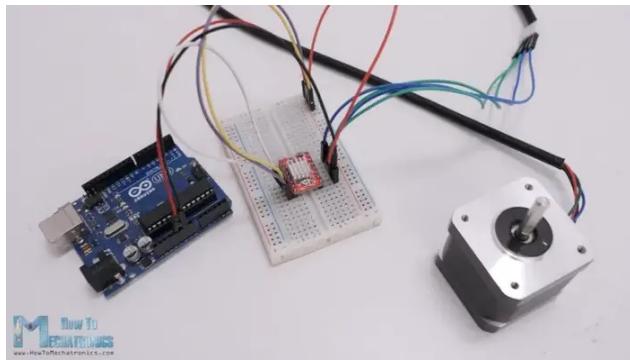
# Серво

- +/- 90/180/360 градуса
- Връща се пак на 0, само
- Различно мощни



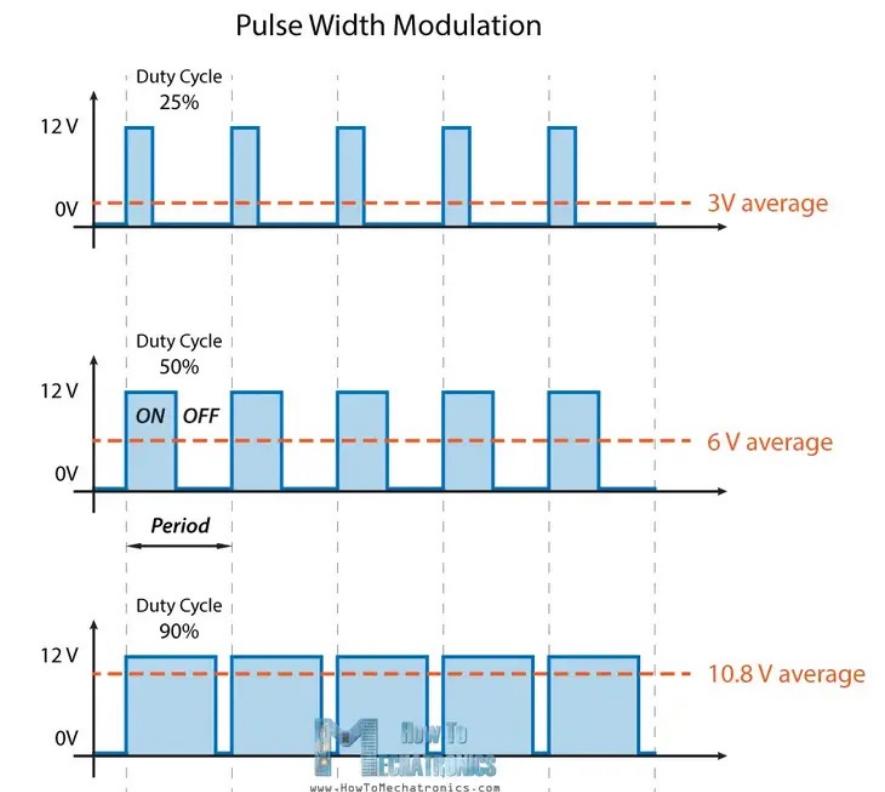
# Stepper (стъпков) Мотор

- Може да се контролира колко точно стъпки да се завърти, например 10 градуса, 20, 30, не се връща сам обратно
- Обичайни стъпки на завъртане  $0.9^\circ$ ,  $1.8^\circ$ ,  $3.6^\circ$  и  $4.5^\circ$ , най-разпространени  $1.8^\circ$
- Контролер на стъпков мотор



# DC Motor

- Controlled by PWM and ESC (Electronic Speed Control)



# Linear Actuator

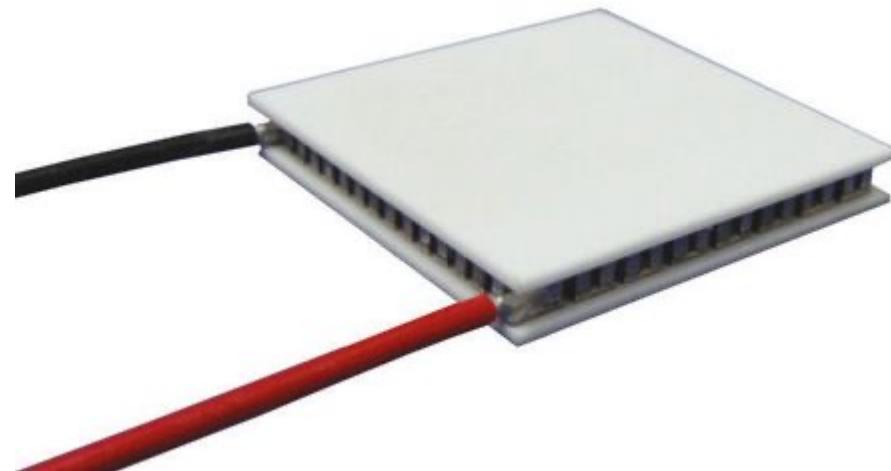


GoMotorWorld@gmail.com

[www.GoMotorWorld.com](http://www.GoMotorWorld.com)

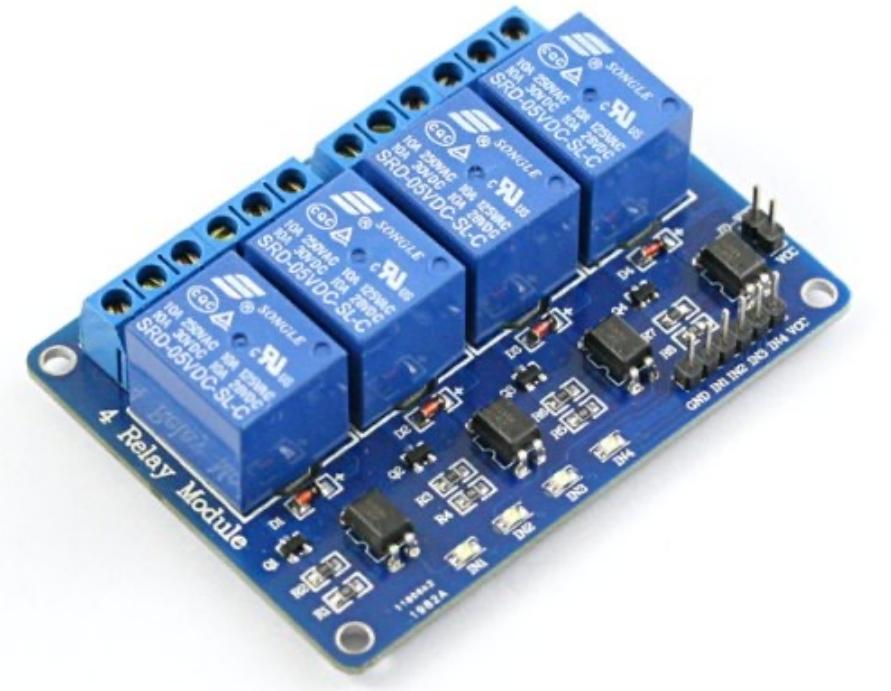
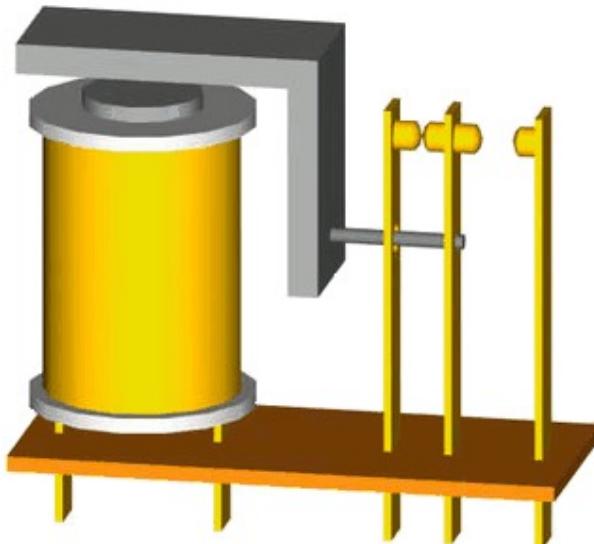
# Peltier Module

- Може се стопля или охлажда

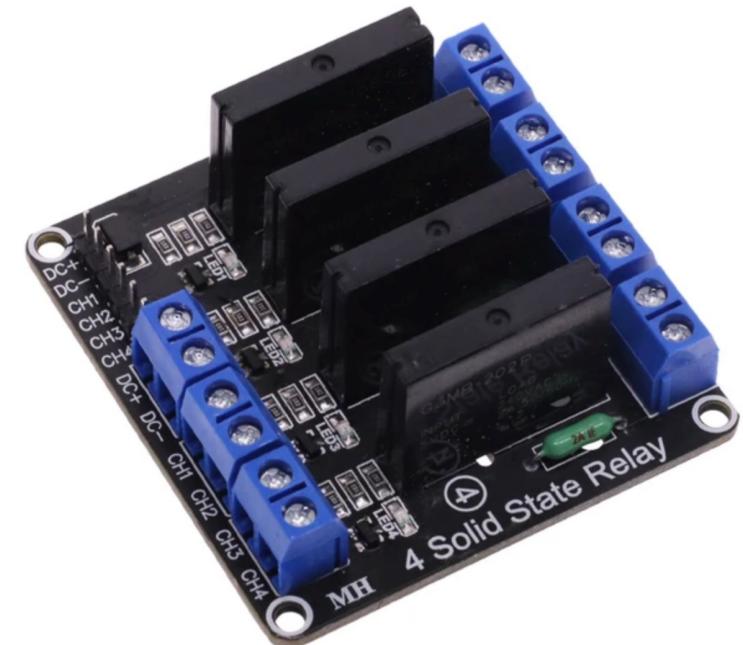
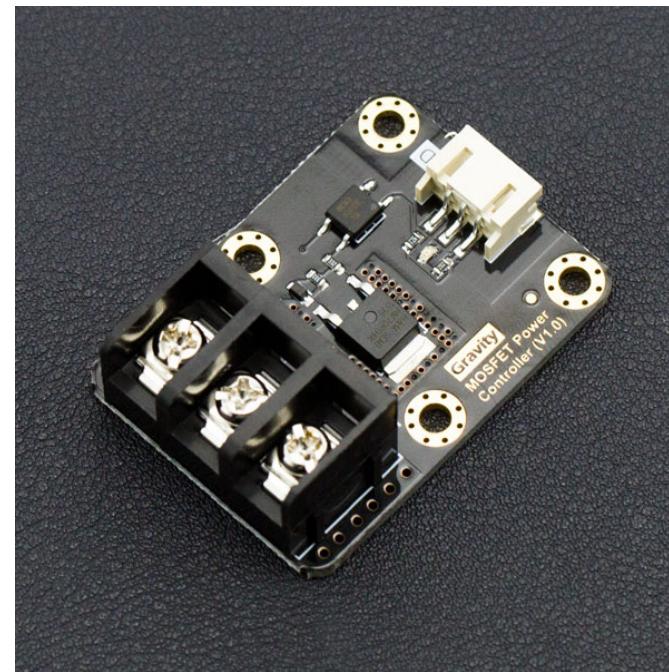
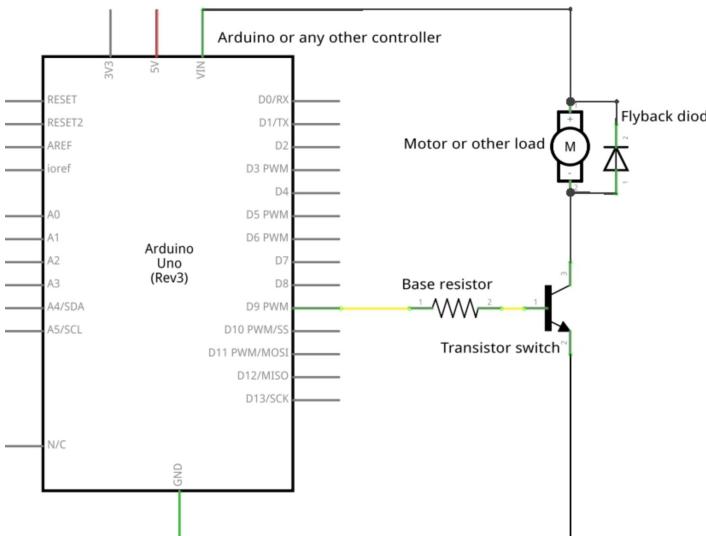


# Релета

- Контролира се с 5/12v, и може да превключва 220v AC/DC
- Интегрирани ESP релета



# Електронни ключове / Solid State Relay



# Others

- Electronic Locks
- Electromagnets
- Solenoids
- Pumps
- Valves