ESP32-WROOM-32 Overview

ESP32-WROOM-32 is a microcontroller by Espressif with **Wi-Fi and Bluetooth** capabilities, widely used in **IoT projects, robotics, and smart devices**.

Key Specs

- **Processor:** Dual-core Xtensa® 32-bit LX6, up to 240 MHz
- **Memory:** 520 KB SRAM, 4 MB Flash
- **Wireless:** Wi-Fi 802.11 b/g/n, Bluetooth v4.2 (BR/EDR & BLE)
- **GPIOs:** ~34 programmable pins
- **Interfaces:** SPI, I2C, UART, PWM, I2S
- **ADC/DAC:** Analog input/output support

Features

- Dual connectivity (Wi-Fi + Bluetooth)
- Supports many protocols and peripherals
- Large community and ready-to-use libraries
- Programmable with **Arduino IDE, MicroPython, ESP-IDF**

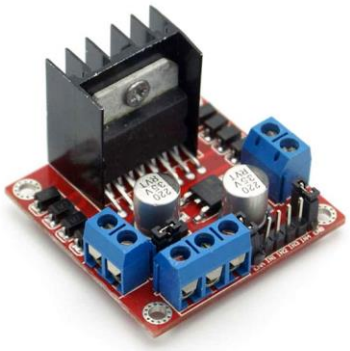
Common Uses

- Robotics (smart/moving cars)
- Smart home systems
- Remote measurement and control devices
- IoT data collection and transmission

L298N (Motor Driver Module) Overview

The **L298N** is a **dual H-bridge motor driver module** that allows you to **control the speed and direction of DC motors and stepper motors**. It's widely used in **robotics and DIY electronics projects**.

Key Specs



- **Type:** Dual H-Bridge
- **Motor Voltage:** 5V – 35V DC
- **Current:** Up to 2A per channel (continuous)
- **Control:**
  - **Direction:** via IN1, IN2, IN3, IN4 pins
  - **Speed:** via PWM (ENA, ENB pins)
- **Supports:** 2 DC motors or 1 stepper motor

Features

- Controls **speed and rotation direction** of motors
- Can drive **two motors independently**
- Built-in **heat sink** for protection
- Easy to interface with **Arduino, ESP32, Raspberry Pi**

Common Uses

- Robotics (car robots, moving platforms)
- Motorized projects (fans, pumps, conveyor belts)
- Stepper motor control in small CNC or 3D printers

- ## HC-SR04 Ultrasonic Sensor Overview
- The **HC-SR04** is a popular **ultrasonic distance sensor** that measures the distance to objects by sending ultrasonic waves and calculating the time it takes for the echo to return. It's cheap, simple, and widely used in **robotics and obstacle detection**.
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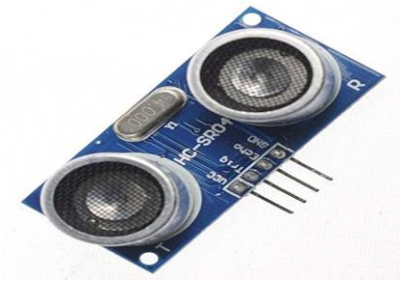
- ## Key Specs



- **Type:** Ultrasonic distance sensor
- **Operating Voltage:** 5V DC
- **Current:** ~15 mA
- **Range:** 2 cm – 400 cm
- **Accuracy:** ±3 mm
- **Interface Pins:**
  - **VCC** → Power (5V)
  - **GND** → Ground
  - **TRIG** → Trigger input
  - **ECHO** → Echo output
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- ## Features

- Simple 4-pin interface
- Measures distance using **time of flight of sound waves**
- Works well for **obstacle avoidance** in robots
- Low cost and widely available

- ## Common Uses

- Obstacle detection in **robotic cars**
- Distance measurement projects
- Parking assistance systems
- Level detection (water tanks, containers)
-

Pixy 2.1 (CMUcam5) Overview

The **Pixy 2.1** is a **smart vision sensor** (camera) that can **detect and track objects by color or shape**. It's widely used in **robotics, automation, and computer vision projects**.

Key Specs

- **Type:** Vision sensor / camera
- **Resolution:** 320×200 pixels
- **Frame Rate:** Up to 60 fps
- **Interfaces:** SPI, I^2C, UART, USB
- **Object Tracking:** Can track multiple objects simultaneously
- **Power Supply:** 5V DC
- **Special Feature:** Built-in processor for **real-time object recognition**

Features

- Detects **colored objects** and **lines**
- **Tracks multiple objects** at the same time
- Sends **coordinates directly** to microcontrollers like **Arduino or ESP32**
- Can follow objects **without heavy processing on the main board**
- Compact and easy to integrate into robots

Common Uses

- Line-following robots
- Object detection and sorting robots
- Interactive projects (games, tracking, automation)
- Educational robotics and AI experiments

- ## Weeemake Wheel Overview
- The Weeemake Wheel is a robot wheel designed for small to medium-sized educational and DIY robots. It provides reliable traction and smooth movement on various surfaces.

- ## Key Specs

- **Wheel Diameter:** 65 mm
- **Tire Type:** Medium, rubber material
- **Color:** Black
- **Weeemake Part Number:** WW-065
- **Compatibility:** Compatible with standard DC motors and robot chassis

- ## Features

- **Provides good traction for educational robots** – ensures stable movement on different surfaces.
- **Fits standard motor shafts and robot hubs** – easy integration into various robot designs.
- **Durable rubber tire suitable for repeated use** – long-lasting for multiple projects.
- **Ideal for DIY robotics and STEM projects** – perfect for educational and maker applications.
- ## Common Uses
- **Wheels for Weeemake robots and small vehicles** – suitable for robotics kits and mini vehicles.
- **Educational robotics projects** – ideal for STEM learning and classroom projects.
- **DIY and maker robotics kits** – great for hobbyists and custom robot builds.

- ## GM25 370 Motor Overview

- The **GM25 370** is a **DC geared motor** commonly used in **small robotics and DIY projects**. It provides **high torque at low speed**, making it ideal for driving wheels or mechanical arms.

- ## Key Specs

- **Type:** DC Geared Motor
- **Voltage:** 6V DC
- **No-load Speed:** ~260 RPM
- **Torque:** Moderate, suitable for small robots
- **Shaft Diameter:** ~4 mm
- **Mounting:** Standard motor mounting holes for small chassis
- with hall encoder

- ## Features

- Compact and lightweight
- High torque output at low speed
- Reliable for **robotic cars and small mechanical systems**
- Can be paired with **motor drivers like L298N**

- ## Common Uses

- Driving wheels in **small robots or cars**
- DIY **robotic arms or conveyor belts**
- Educational projects requiring **precise low-speed motion**

- ## MG996R Servo Motor Overview
- The MG996R is a high-torque digital servo motor widely used in robotics, RC cars, and mechanical projects. It provides strong rotation force and reliable performance.

- ## Key Specs

- Type: Digital servo motor
- Operating Voltage: 4.8 – 7.2V DC
- Stall Torque: ~9.4 kg·cm (4.8V), ~11 kg·cm (6V)
- Speed: 0.17 sec/60° (4.8V), 0.14 sec/60° (6V)
- Rotation Angle: ~120° (standard), up to 180° modified
- Motor Type: Core motor with metal gears
- Dimensions: 40.7 × 19.7 × 42.9 mm
- Weight: ~55 g

- ## Features

- High torque suitable for heavy-duty applications
- Durable metal gear construction
- Stable and precise movement control
- Compatible with Arduino, Raspberry Pi, and robotics kits
- **Common Uses**
- Robotic arms and grippers
- Steering in RC cars
- Pan/tilt camera systems
- DIY robotics and automation projects

EV3 LEGO Technic Set Pieces Overview

The **LEGO Technic EV3 pieces** are **modular building elements** used to construct **robots, vehicles, and mechanical structures**. They form the structural framework for EV3 robots and allow **integration of motors, sensors, and controllers**.

Key Components

- **Beams & Liftarms:** For building the robot's frame and chassis
- **Axles & Connectors:** To connect beams and enable rotating parts
- **Gears & Pulleys:** For motion transfer and mechanical advantage
- **Pins & Bushings:** To securely attach parts together
- **Special Parts:** Mounts for **motors, sensors, and wheels**

Features

- **Modular and reusable** parts for multiple designs
- Compatible with **EV3 motors, sensors, and controllers**
- Supports **mechanical movements** (rotation, steering, lifts)
- Enables **custom robotics and STEM projects**

Common Uses

- Building **LEGO EV3 robots and vehicles**
- Creating **mechanical linkages and robotic arms**
- Educational projects in **STEM and robotics learning**
- Prototyping **custom LEGO-based mechanisms**