

ARDUINO

Arduino boards come in various types, such as the

Uno, Nano, Mega, and Due, each with different microcontrollers and form factors. The classic **Arduino Uno** architecture centers on the ATmega328P microcontroller and features digital and analog pins, memory, a crystal oscillator, and communication interfaces.

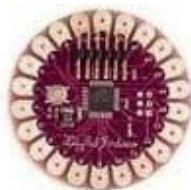
Types of Arduino Boards

Arduino offers a wide range of boards tailored for different project requirements, from basic prototyping to advanced IoT applications.

- **Arduino Uno (R3, R4):** The most popular and widely used board, ideal for beginners due to its simplicity, extensive documentation, and robust design.
- **Arduino Nano:** A smaller, breadboard-friendly version of the Uno, suitable for compact projects.
- **Arduino Mega (R3):** Features a larger number of I/O pins and more memory, making it ideal for complex projects requiring many sensors and actuators, such as 3D printers and robotics.
- **Arduino Leonardo:** Differs from the Uno as its microcontroller has built-in USB communication, allowing it to emulate a keyboard or mouse.
- **Arduino Due:** The first Arduino board based on an ARM Cortex-M3 core microcontroller (32-bit), offering higher performance and more advanced features than the AVR-based boards.
- **Arduino Micro:** A small board similar to the Nano but with the Leonardo's ability to act as a USB Human Interface Device (HID).
- **Specialized Boards:** Other types include the LilyPad (wearable electronics), Esplora (gamepad-style), and various IoT-focused boards like the Uno WiFi Rev2 and MKR series, which integrate connectivity options like Wi-Fi and Bluetooth.



Arduino Uno



Arduino LilyPad



Arduino Mega 2560



Arduino Leonardo



Arduino Mega ADK



Arduino Ethernet



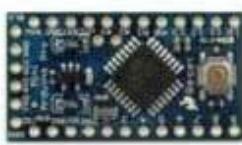
Arduino Pro



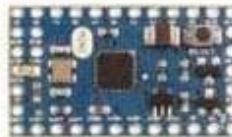
Arduino Nano



Arduino BT



Arduino Pro Mini



Arduino Mini



Arduino Fio

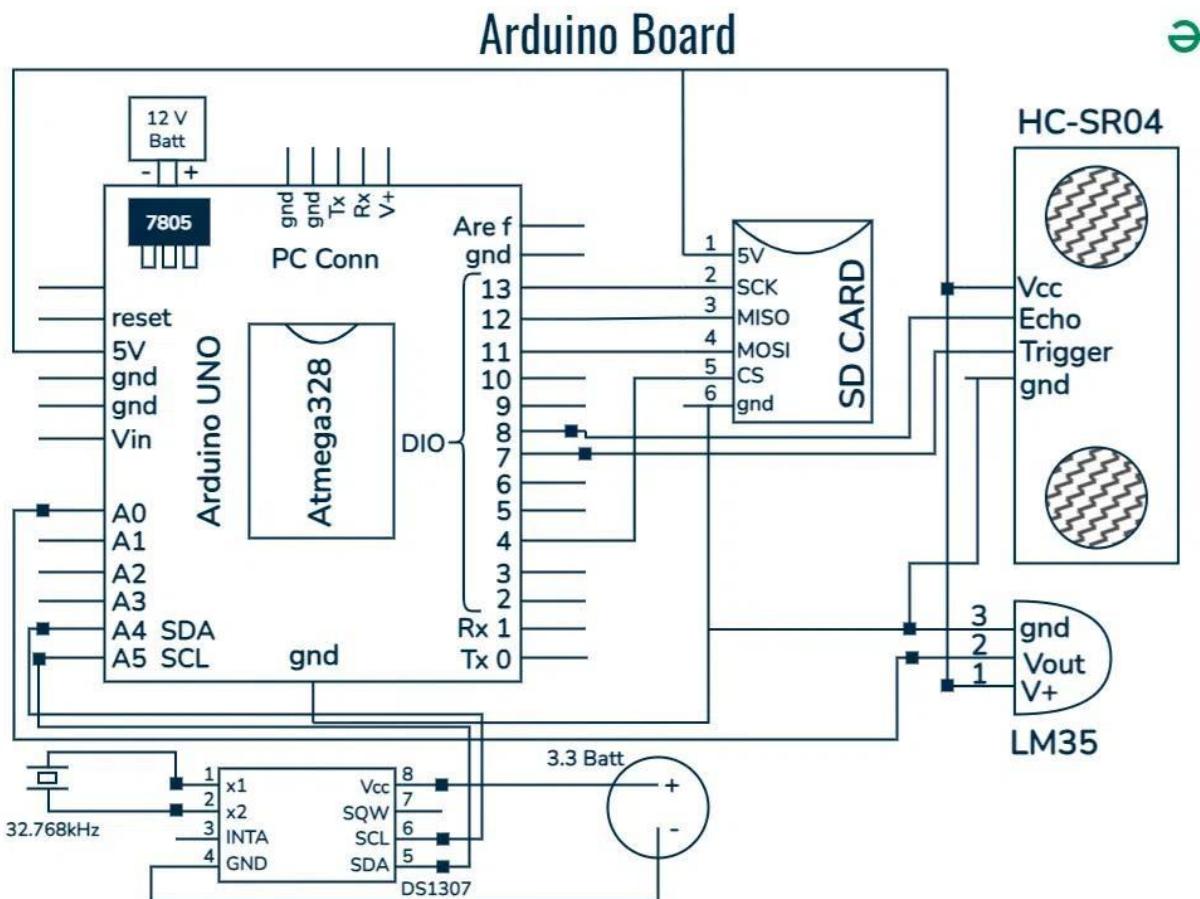
Arduino Uno Architecture

The classic Arduino Uno (Rev3) is an open-source physical computing platform with a straightforward architecture designed for ease of use. Its key components and pin functions are:

- **Microcontroller:** The **ATmega328P** is the "brain" of the board, an 8-bit AVR RISC processor that executes the uploaded program (sketch).
- **Memory:**
 - **Flash Memory (32 KB):** Used for storing the program code, with 0.5 KB reserved for the bootloader.
 - **SRAM (2 KB):** Used for dynamic data during program execution (volatile memory).

- **EEPROM (1 KB):** Used for storing data that must persist even when the board is powered off (non-volatile memory).

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- **Input/Output (I/O) Pins:**

- **Digital I/O Pins (14):** Configurable as either input or output, operating at 5V. Six of these can provide Pulse Width Modulation (PWM) output (pins 3, 5, 6, 9, 10, 11) for analog-like control.
- **Analog Input Pins (6):** Labeled A0 through A5, these pins read continuous analog values (e.g., from sensors) and convert them into a digital value (10-bit resolution).

- **Communication Interfaces:**

- **Serial (UART):** Pins 0 (RX) and 1 (TX) are used for receiving and transmitting serial data. An onboard ATmega16U2 chip acts as a USB-

to-serial converter, allowing communication with a computer over USB.

- **SPI:** Supported on pins 10 (SS), 11 (MOSI), 12 (MISO), and 13 (SCK) for high-speed data transfer.
- **I²C (TWI):** Supported on analog pins A4 (SDA) and A5 (SCL) for multi-device communication using only two wires.
- **Power Circuitry:** The board can be powered via a USB connection or an external power supply (7-12V recommended range) through a power jack or the Vin pin. A voltage regulator ensures stable 5V operation for the microcontroller.
- **Crystal Oscillator:** A 16 MHz crystal oscillator provides the clock signal for the ATmega328P, ensuring precise timing for all operations.
- **Reset Button:** A physical button allows the user to restart the program currently running on the board.

