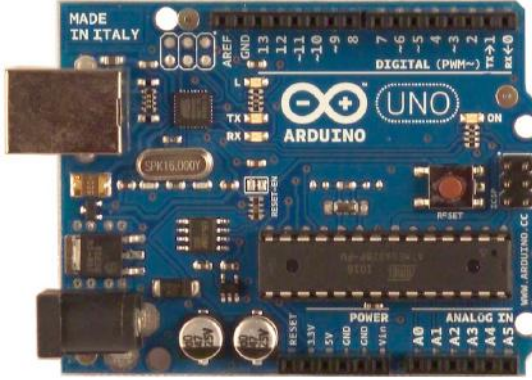


Mikroişlemci ve Gömülü Sistem Eğitim Sisteminin Tanıtımı

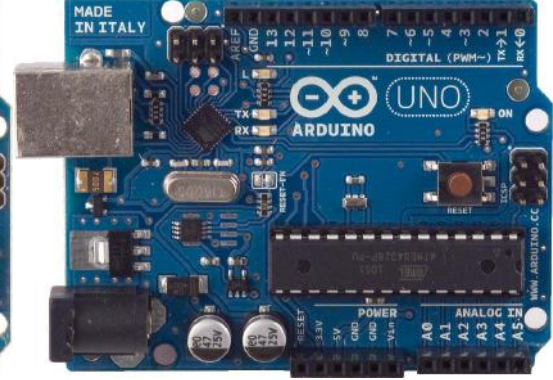
Eğitim sistemi donanımı ve yazılımı olarak: üzerinde tümleşik geliştirme ortamı (Integrated Development Enviroment, IDE) çalıştırılan bir kişisel bilgisayar (personal Computer, PC) ile Arduino tek kart bilgisayar (Single Board Computer, SBC) bağlanarak oluşturulmuş bir sistem kullanılacaktır. Uygulama donanımı: deney tablasında uygulamaya yönelik devre elamanları eklenmesini, giriş/çıkış uçlarının/portların ve çevre birimlerinin kullanılmasını, uygulama devresinin kurulmasını sağlayacaktır. Ayrıca, tek kart bilgisayar donanımının kullanılarak incelenmesi ve geliştirme yazılımı ile uygulamanın amacına yönelik olarak programlanması yapılacaktır.

Arduino Uno Boards Technical Specifications

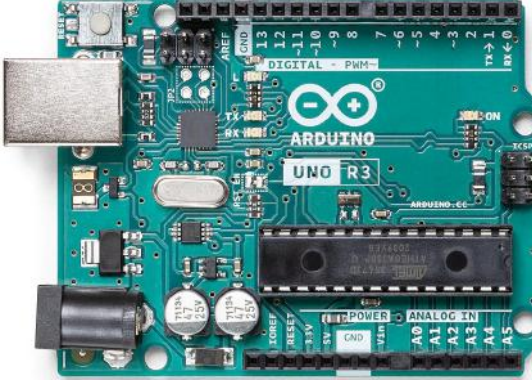
Arduino Uno R1 to R3



Arduino Uno R1 DIP



Arduino Uno R2 DIP



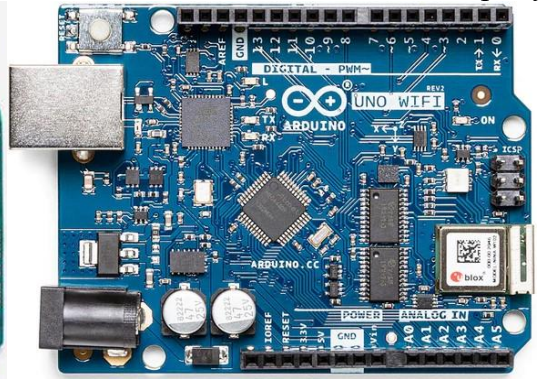
Arduino Uno R3 DIP



Arduino Uno R3 SMD clone, 3rd party



Arduino Uno WiFi DIP



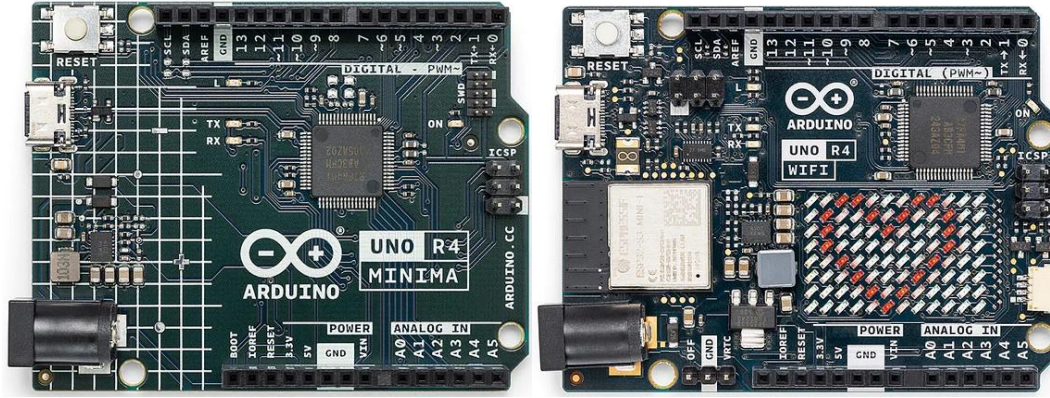
Arduino Uno R2 WiFi SMD

Common features on Arduino Uno R3 boards:

Microcontroller (MCU):

- IC: Microchip ATmega328P (8-bit AVR core)
- Clock Speed: 16 MHz on Uno board, though IC is capable of 20 MHz maximum at 5 Volts
- Flash Memory: 32 KB, of which 0.5 KB used by the bootloader
- SRAM: 2 KB
- EEPROM: 1 KB
- USART peripherals: 1 (Arduino software default configures USART as a 8N1 UART)
- SPI peripherals: 1
- I²C peripherals: 1
- Operating Voltage: 5 Volts
- Digital I/O Pins: 14
- PWM Pins: 6 (Pin # 3, 5, 6, 9, 10 and 11)
- Analog Input Pins: 6
- DC Current per I/O Pin: 20 mA
- DC Current for 3.3V Pin: 50 mA
- Size: 68.6 mm x 53.4 mm
- Weight: 25 g
- ICSP Header: Yes
- Power Sources:
 - USB connector. USB bus specification has a voltage range of **4.75 to 5.25 volts**. The official Uno boards have a USB-B connector, but 3rd party boards may have a miniUSB / microUSB / USB-C connector.
 - 5.5mm/2.1mm barrel jack connector. Official Uno boards support **6 to 20 volts**, though **7 to 12 volts** is recommended. The maximum voltage for 3rd party Uno boards varies between board manufactures because various voltage regulators are used, each having a different maximum input rating. Power into this connector is routed through a series diode before connecting to **VIN** to protect against accidental reverse voltage situations.
 - VIN pin on shield header. It has a similar voltage range of the barrel jack. Since this pin doesn't have reverse voltage protection, power can be injected or pulled from this pin. When supplying power into VIN pin, an external series diode is required in case barrel jack is used. When board is powered by barrel jack, power can be pulled out of this pin.
 - In the Official Uno boards, ATmega328P MCU in DIP-28 package for processor and ATmega16U2 MCU in SMD package for USB serial interface.
 - In the 3rd party Uno boards, ATmega328P MCU in SMD-32 package for processor and CH340 in SMD package for USB serial interface.

Arduino Uno R4



Arduino UNO R4 Minima

Arduino UNO R4 WiFi

Two Uno R4 boards are available: Uno R4 Minima and Uno R4 WiFi.

The later has a WiFi coprocessor and LED matrix, but the Minima doesn't.

Common features on both Uno R4 Minima and Uno R4 WiFi boards:

- **Microcontroller (MCU):**
 - IC: Renesas R7FA4M1AB (32-bit ARM Cortex-M4F core with single-precision FPU)
 - Clock Speed: 48 MHz
 - Flash Memory: 256 KB + bootrom
 - SRAM: 32 KB (16 KB ECC) (16 KB parity)
 - EEPROM: 8 KB (data flash)
 - USART peripherals: 4
 - SPI peripherals: 2
 - I²C peripherals: 2
 - Operating Voltage: 5 Volts
- USB-C connector.
- Barrel jack connector and VIN pin on shield header supports up to a maximum of 24 volts DC.

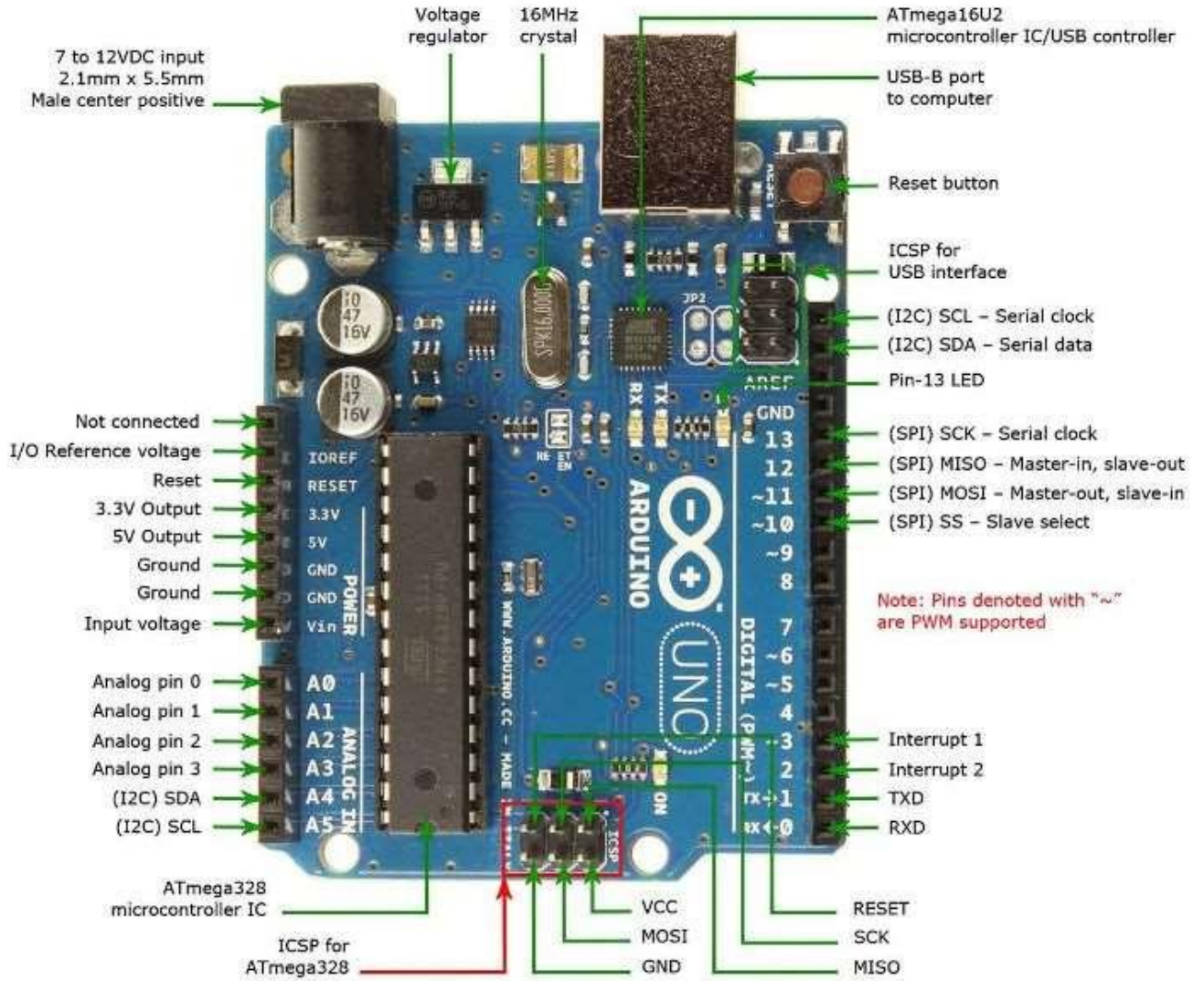
Additional features only available on the **Uno R4 Minima** board:

- SWD programming connector. This is a 10-pin 5x2 1.27mm header for connecting the microcontroller (R7FA4M1AB) to an external SWD (serial wire debug) programming / debugging device.

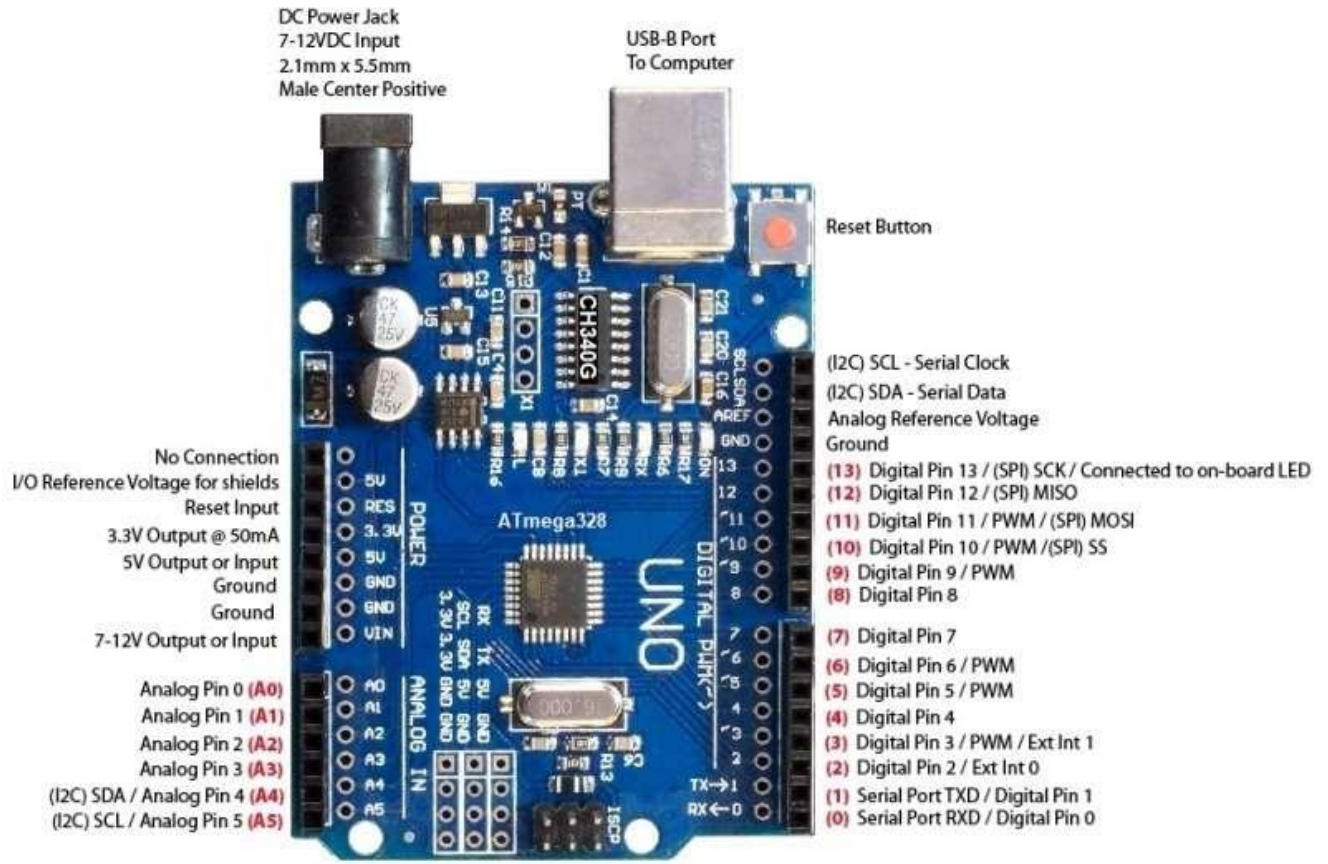
Additional features only available on the **Uno R4 WiFi** board:

- WiFi coprocessor - 240 MHz Espressif ESP32-S3-MINI (IEEE802.11 b/g/n WiFi and Bluetooth 5 LE) and a 6-pin 3x2 2.54mm header for external programming.
- 12x8 LED matrix - it is driven by 11 GPIO pins using a charlieplexing scheme.
- Qwiic I²C connector. This 4-pin 1.00mm JST SH connector provides external connection to a 3.3 volt I²C bus. Don't attach 5 volt I²C devices directly to this connector.
- RTC battery header pin (VRTC). This pin connects an external battery to the RTC (real-time clock) inside the microcontroller (R7FA4M1AB) to keep clock running when board is powered down. Connect this pin to positive side of 1.6 to 3.6 volt battery and negative side of battery to ground header pin (GND), such as a 3 volt lithium coin battery.
- Remote-Off header pin (OFF). This pin disables the 5 volt buck switching voltage regulator (SL854102) when powered the barrel jack or VIN header pin. Connect this pin to ground header pin (GND) to disable this voltage regulator.

Arduino Uno Geliştirme Kartı (Orijinal DIP MCU)



Arduino Uno Geliştirme Kartı (Eğitim Sistemi)



Arduino Uno Kartının Kişisel Bilgisayara USB kablo ile bağlantısı

