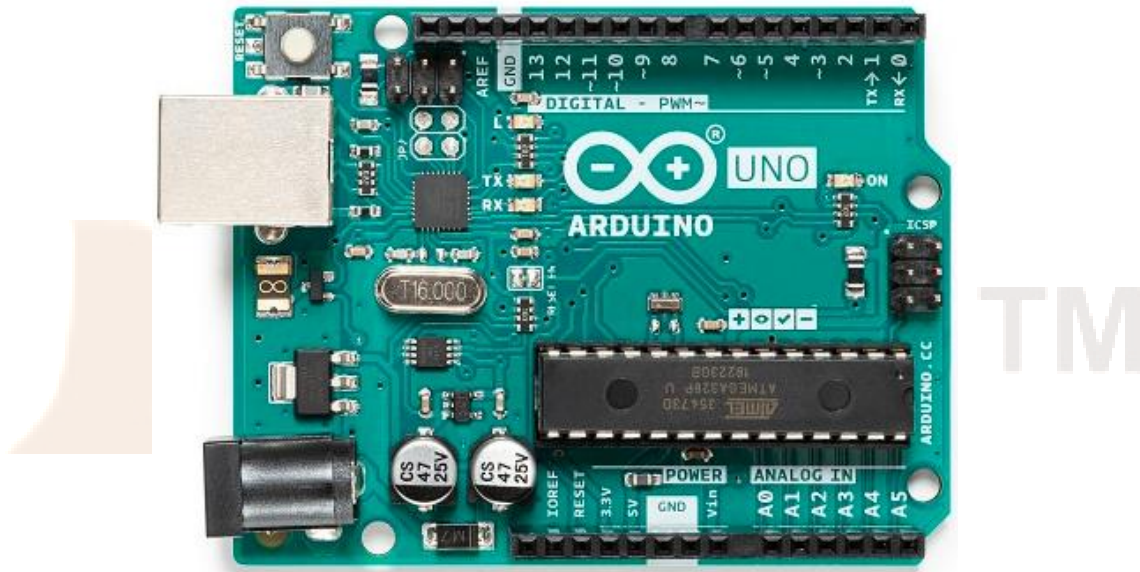## The Arduino Uno Rev3



This Arduino Uno is an original microcontroller board from Arduino officials based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started.. You can tinker with your UNO without worrying too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again.

"Uno" means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0. The Uno board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino, now evolved to newer releases. The Original Arduino Uno Rev3 board is the first in a series of USB Arduino boards and the reference model for the Arduino platform; for an extensive list of current, past or outdated boards see the Arduino index of boards.

**FEATURES:**

- It is an easy USB interface. This allows interface with USB as this is like a serial device.
- The chip on the board plugs straight into your USB port and supports on your computer as a virtual serial port. The benefit of this setup is that serial communication is an extremely easy protocol which is time-tested and USB makes connection with modern computers and makes it comfortable.

- It is easy-to-find the microcontroller brain which is the ATmega328 chip. It has more number of hardware features like timers, external and internal interrupts, PWM pins and multiple sleep modes.
- It is an open source design and there is an advantage of being open source is that it has a large community of people using and troubleshooting it. This makes it easy to help in debugging projects.
- It is a 16 MHz clock which is fast enough for most applications and does not speeds up the microcontroller.
- It is very convenient to manage power inside it and it had a feature of built-in voltage regulation. This can also be powered directly off a USB port without any external power. You can connect an external power source of up to 12v and this regulates it to both 5v and 3.3v.
- 14 digital pins and 6 analog pins. This sort of pins allows you to connect hardware to Arduino board externally. These pins are used as a key for extending the computing capability of the Arduino Uno into the real world. Simply plug your electronic devices and sensors into the sockets that correspond to each of these pins and you are good to go.
- This has an ICSP connector for bypassing the USB port and interfacing the Arduino directly as a serial device. This port is necessary to re-boot load your chip if it corrupts and can no longer used to your computer.
- It has a 32 KB of flash memory for storing your code.
- An on-board LED is attached to digital pin 13 to make fast the debugging of code and to make the debug process easy.
- Finally, it has a button to reset the program on the chip.

**SPECIFICATIONS:**

- Microcontroller: ATmega328P
- Operating Voltage: 5V
- Input Voltage(recommended): 7-12V
- Input Voltage(limit): 6-20V
- Digital I/O Pins: 14(of which 6 provide PWM output)
- PWM Digital I/O Pins: 6
- Analog Input Pins: 6
- DC Current per I/O Pin: 20ma
- DC Current for 3.3V Pin: 50ma
- Flash Memory: 32kb(ATmega328p) of which 0.5 kb used by bootloader
- SRAM: 2KB

- EEPROM: 1kb

- Clock Speed: 16MHz

- LED_BUILTIN: 13

- Size: 68.6x53.4mm

- Weight: 25g

**SCHEMATIC DIAGRAM OF ARDUINO UNO REV3:**
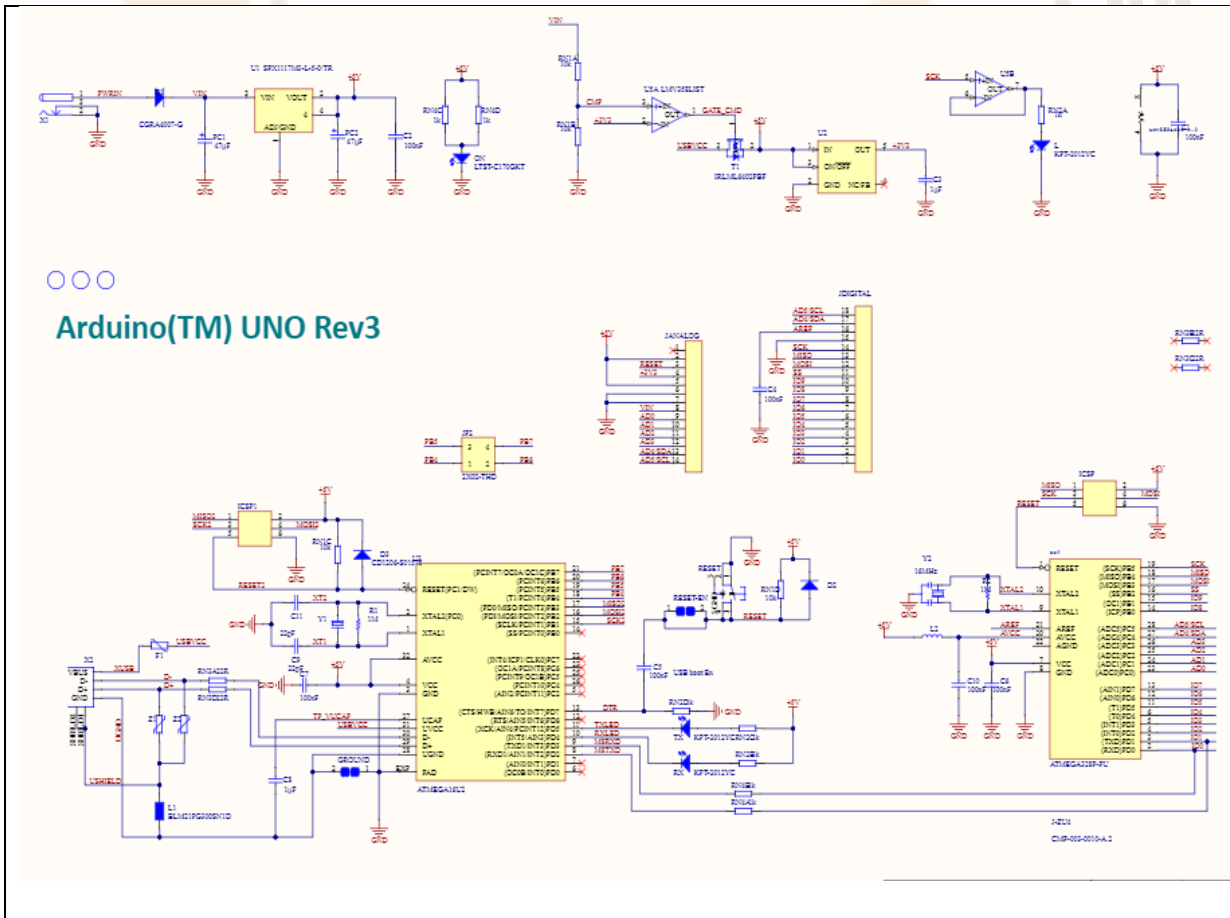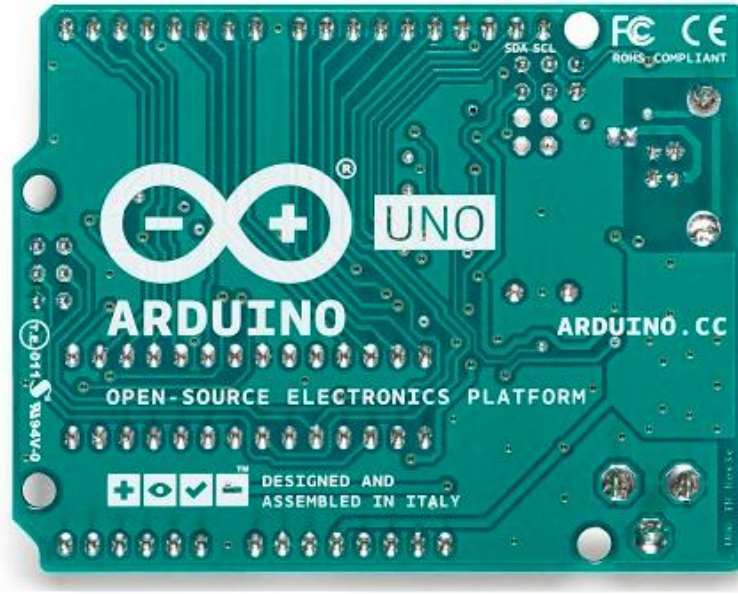
The Arduino Uno R3 board comprises 14-digit I/O pins. From these pins, 6-pins can be utilized like PWM outputs. This board includes 14 digital input/output pins, Analog inputs-6, a USB connection, quartz crystal-16 MHz, a power jack, a USB connection, resonator-16Mhz, a power jack, an ICSP header an RST button.

- **Power Supply**: The power supply of the Arduino can be done with the help of an exterior power supply otherwise USB connection. The exterior power supply (6 to 20 volts) mainly includes a battery or an AC to DC adapter. The connection of an adapter can be done by plugging a center-positive plug (2.1mm) into the power jack on the board. The battery terminals can be placed in the pins of Vin as well as GND. The power pins of an Arduino board include the following.

**VIN**: The input voltage or VIN to the Arduino while it is using an exterior power supply opposite to volts from the connection of USB or else RPS (regulated power supply)**.** By using this pin, one can supply the voltage.

**5Volts:** The RPS can be used to give the power supply to the microcontroller as well as components which are used on the Arduino board. This can approach from the input voltage      through a regulator.

**3V3:** A 3.3 supply voltage can be generated with the onboard regulator, and the highest draw current will be 50 mA.

**GND:** GND (ground) pins

- **Memory:** The memory of an ATmega328 microcontroller includes 32 KB and 0.5 KB memory is     utilized for the Boot loader), and also it includes SRAM-2 KB as well as EEPROM-1KB.

- **Input and Output**: We know that an arguing Uno R3 includes 14-digital pins which can be used as an input otherwise output by using the functions like pin Mode (), digital Read(), and digital Write(). These pins can operate with 5V, and every digital pin can give or receive 20mA, & includes a 20k to 50k ohm pull up resistor. The maximum current on any pin is 40mA which cannot surpass for avoiding the microcontroller from the damage. Additionally, some of the pins of an Arduino include specific functions.

 **Serial Pins**: The serial pins of an Arduino board are TX (1) and RX (0) pins and these pins can be used to transfer the TTL serial data. The connection of these pins can be done with the equivalent pins of the ATmega8 U2 USB to TTL chip.

**External Interrupt Pins:** The external interrupt pins of the board are 2 & 3, and these pins can be arranged to activate an interrupt on a rising otherwise falling edge, a low-value otherwise a modify in value.

**PWM Pins**: The PWM pins of an Arduino are 3, 5, 6, 9, 10, & 11, and gives an output of an 8-bit PWM with the function analog Write ().

**SPI (Serial Peripheral Interface) Pins**: The SPI pins are 10, 11, 12, 13 namely SS, MOSI, MISO, SCK, and these will maintain the SPI communication with the help of the SPI library.

**LED Pin**: An arduino board is inbuilt with a LED using digital pin-13. Whenever the digital pin is high, the LED will glow otherwise it will not glow.

**TWI (2-Wire Interface) Pins:** The TWI pins are SDA or A4, & SCL or A5, which can support the communication of TWI with the help of Wire library.

**AREF (Analog Reference) Pin:**  An analog reference pin is the reference voltage to the inputs of an analog i/ps using the function like analog Reference().

**Reset (RST) Pin:** This pin brings a low line for resetting the microcontroller, and it is very useful for using an RST button toward shields which can block the one over the Arduino R3 board.

- **Communication:**
The communication protocols of an Arduino Uno include SPI, I2C, and UART serial communication**.**

**UART**: An Arduino Uno uses the two functions like the transmitter digital pin1 and the receiver digital pin0. These pins are mainly used in UART TTL serial communication.

**I2C**: An Arduino UNO board employs SDA pin otherwise A4 pin & A5 pin otherwise SCL pin is used for I2C communication with wire library. In this, both the SCL and SDA are CLK signal and data signal.

**SPI Pins:** The SPI communication includes MOSI, MISO, and SCK.

**MOSI (Pin11):** This is the master out slave in the pin, used to transmit the data to the devices

**MISO (Pin12):** This pin is a serial CLK, and the CLK pulse will synchronize the transmission of which is produced by the master.

**SCK (Pin13):** The CLK pulse synchronizes data transmission that is generated by the master. Equivalent pins with the SPI library is employed for the communication of SPI. ICSP (in-circuit serial programming) headers can utilized for programming ATmega328 microcontroller directly with the boot loader.