Introduction:

Have you ever struggled to find the correct cable for programming your Arduino? Do you frequently use I2C LCDs as interfaces for your projects? Have you wished for built-in buttons to test your program's logic? If so, this Arduino-compatible microcontroller addresses these exact issues. It's a solution tailored for tech enthusiasts and makers like us.

Description:

This UNO (Type-C and Micro port) compatible microcontroller board is a compatible variant of the Arduino UNO, utilizing the 8-bit ATmega328P microcontroller. Featuring a RISC architecture, it operates at a maximum clock speed of 16MHz. With 32KB of flash memory for code storage and 2KB of SRAM, supplemented by an additional 1KB of EEPROM, it offers ample memory resources. Boasting a total of 20 GPIOs along with 2 analog inputs, all accessible via standard 2.54mm-pitched female pin headers and tactile buttons, it ensures versatility in connectivity.

While closely resembling the Arduino Uno R3 in design, it incorporates several enhancements. Fully compatible with the Arduino Software/IDE, it seamlessly integrates with various applications, hardware, and sketches designed for the Arduino Uno. Essentially, it embodies all the standard features of the Arduino Uno, with the added benefit of expanded functionality.
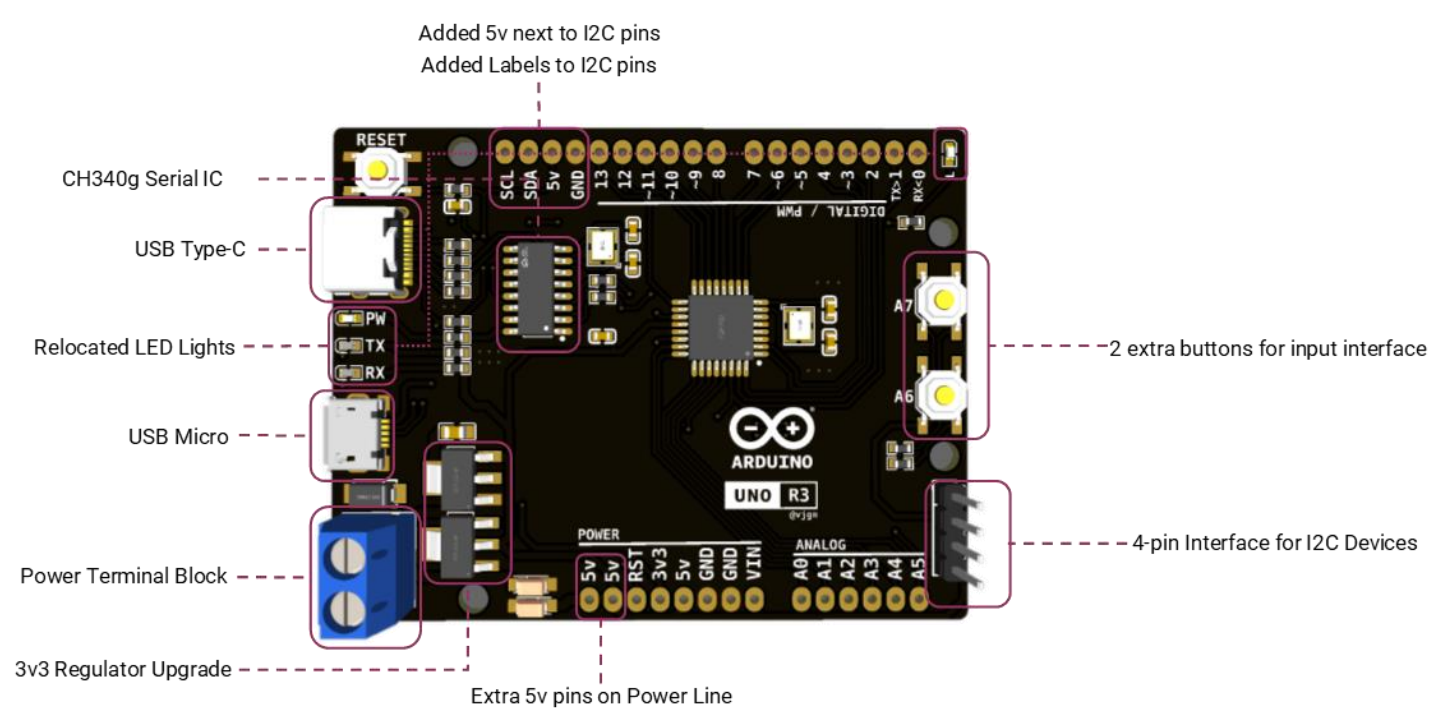

Figure 1: Uno Compatible Microcontroller Design

Initial Setup:

This board uses the popular CH340G chip as its USB-UART interface controller. For those who are using the LEGACY IDE, users will need to do a one—time driver installation for the computer to recognize the board. For those who are using the Arduino IDE 2.3.x and above, the microcontroller is ready to use out of the box.

To install the CH340g drivers, you need to download and install the driver installation files from the following links:

Windows Users:

https://sparks.gogo.co.nz/assets/_site_/downloads/CH34x_Install_Windows_v3_4.zip

Mac OS Users:

https://github.com/adrianmihalko/ch340g-ch34g-ch34x-mac-os-x-driver

Since this microcontroller meets all the criteria of compatibility with the Arduino IDE and Arduino Web Editor, programming the microcontroller follows the same procedure as any other Arduino UNO board. To get started, download and install the official release of the Arduino IDE from:

https://www.arduino.cc/en/software

Updates and Enhancements

1. **USB Type-C programming interface**
   a. Updated the old and bulky **USB-B** interface to a more common USB type. You can interchange with the other USB type to program this microcontroller.
2. **USB Micro-B programming interface**
   a. Updated the old and bulky **USB-B** interface to a more common USB type. You can interchange with the other USB type to program this microcontroller.
3. **LEDs have been moved to the side of the microcontroller for easier access**
   a. This is more convenient specially when using shields on the microcontroller.
4. **Updated the regulator for 3.3v output**
   a. The 3.3V pin has a capacity of approximately 800mA, a significant increase compared to the Arduino's 50mA limit. This higher current output facilitates direct powering of certain 3.3V circuits, like the ESP8266, without the need for additional regulators, which may require currents exceeding 50mA.
5. **Replaced DC Jack to Terminal Block**
   a. As DC barrel jacks are hard to find nowadays, the power connector of the microcontroller is replaced with a 5mm terminal block for easier access.
6. **Added multiple 5v pins on Power line**
   a. Enables the microcontroller to support multiple devices.
7. **Replaced USB—Serial interface from the ATMEGA16u2 to the CH340g**
   a. Following thorough evaluation and research of this chip, no notable performance disparities were observed compared to pricier alternatives. Thus making the production cost of the controller less.
8. **Labelled I2C header after pin D13**
   a. The original Arduino UNO, the SCL and SDA pins are not labelled. Also added an extra 5v pin for a more efficient wiring.
9. **Extra I2C header near pin A5**
   a. Pins are intended mainly intended for quick interface with I2C LCDs and also other I2C Devices
10. **Added 2 extra buttons interfaced with the pins A6 and A7**
    a. Made use of the extra interface of the ATMega328p to add extra buttons configured as a pull-down button. This enables the user to have a ready-made button to test their design.
11. **Replaced the Resonator with a Crystal Oscillator**
    a. a. In place of a ceramic resonator, this UNO microcontroller utilizes higher accuracy crystal oscillators to achieve optimal timing performance.