

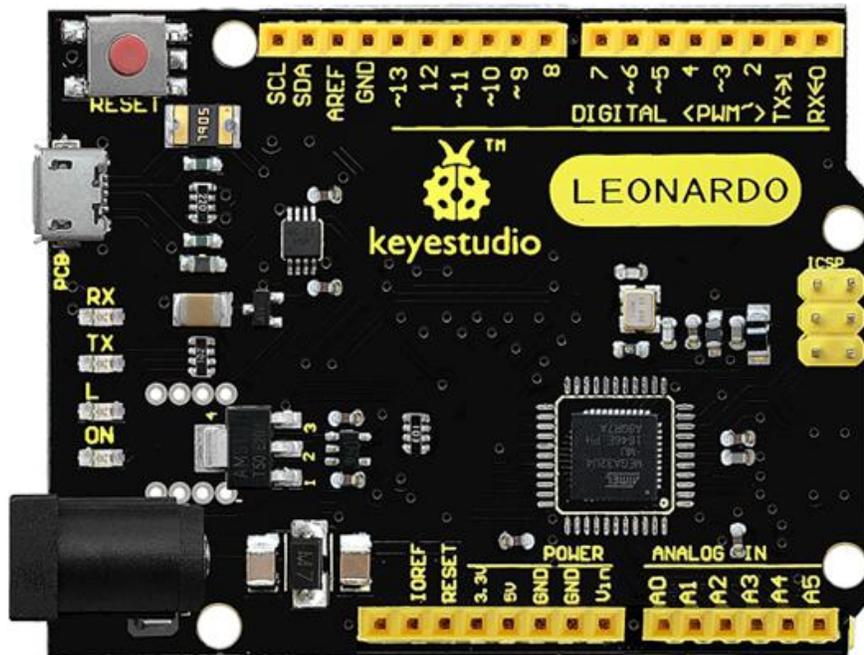
keystudio

Guide Content

Introduction:.....	2
TECH SPECS:.....	3
Details:.....	5
Element and Interfaces:.....	6
Specialized Functions of Some Pins:.....	7
Tips:.....	9
Detailed Use with ARDUINO Software as follows:.....	10
Step1 Download the Arduino IDE.....	10
Step2 Installing the Driver.....	18
Step3 Connect the board.....	25
Step4 Select the Arduino Board.....	25
Step5 Select your serial port.....	27
Step6 Upload the Code.....	29
Step7 Open the Serial Monitor.....	33
Package Included:.....	35
Resource Links:.....	36
Troubleshooting:.....	36

keystudio

Keystudio Leonardo R3 Development Board



Introduction:

The keystudio Leonardo is a microcontroller board based on the ATmega32u4 ([datasheet](#)). It is an easy-to-use open source hardware.

It has 20 digital input/output pins (of which 7 can be used as PWM outputs), 12 analog inputs, a 16 MHz crystal oscillator, a micro 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 a AC-to-DC adapter or battery to get started.

Note that ICSP (In-Circuit Serial Programming) header can not only program the

keystudio

firmware to Atmega32u4, but also be used as SPI communication interface.

The keystudio Leonardo can be powered via the micro USB connection, or via an external power supply jack (DC 7-12V) or even with female headers Vin /GND (DC 7-12V).

The Leonardo differs from other Arduino boards using separate USB-Serial chip in that the ATmega32u4 has built-in USB communication, eliminating the need for a secondary processor. This allows the Leonardo to appear to a connected computer as a mouse and keyboard.

TECH SPECS:

Microcontroller	Atmega32u4
Operating Voltage	5V
Input Voltage (recommended)	DC7-12V
Digital I/O Pins	20 (of which 7 provide PWM output)
PWM Digital I/O Pins	7
Analog Input Pins	12
DC Current per I/O Pin	40 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	32 KB (Atmega32u4) of which 4 KB used by bootloader
SRAM	2.5 KB (ATmega32u4)

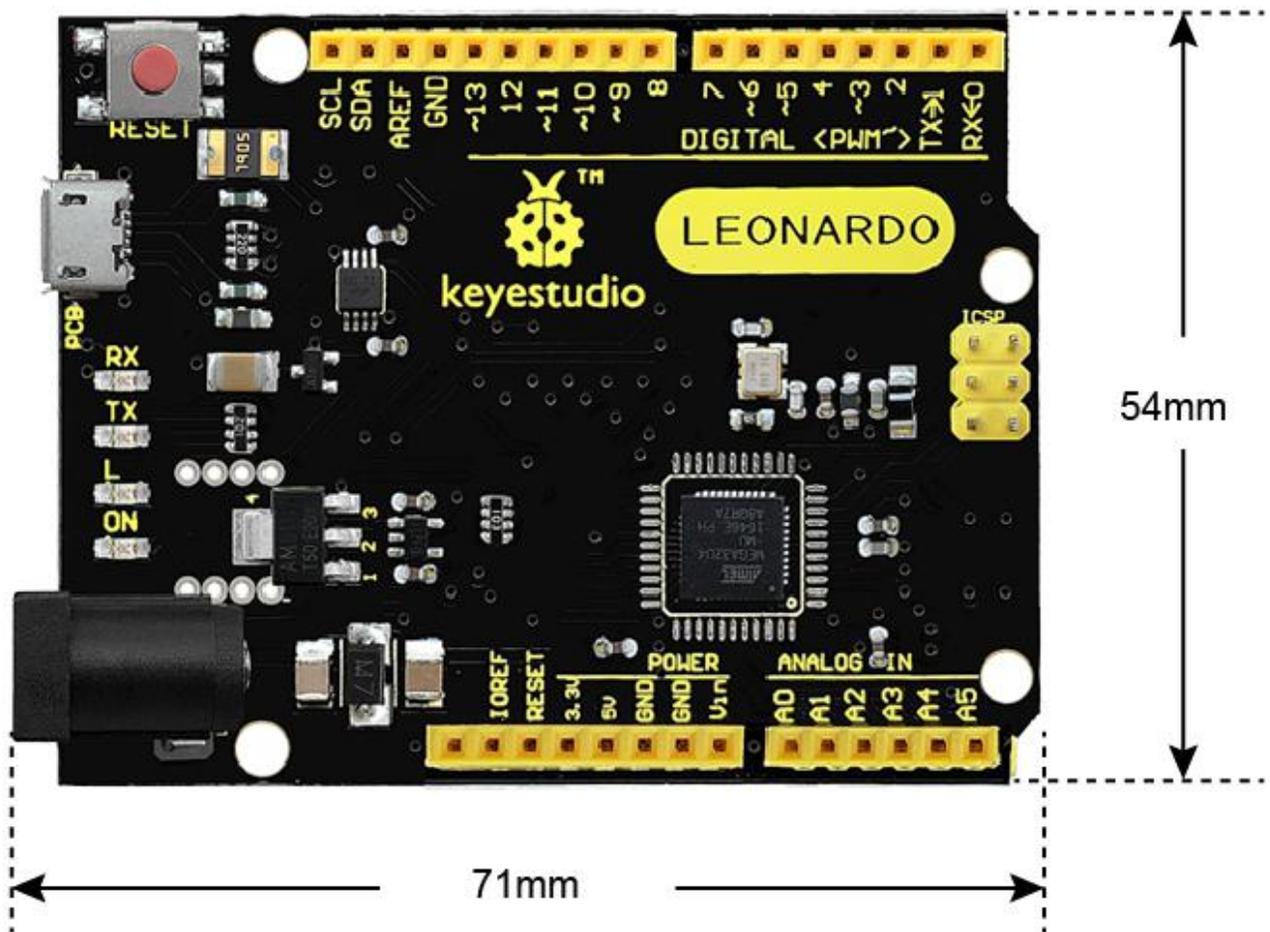
keystudio

EEPROM	1 KB (Atmega32u4)
Clock Speed	16 MHz
LED_BUILTIN	D13
Dimensions	71mm*54mm*15mm
Weight	18.4g

keystudio

Details:

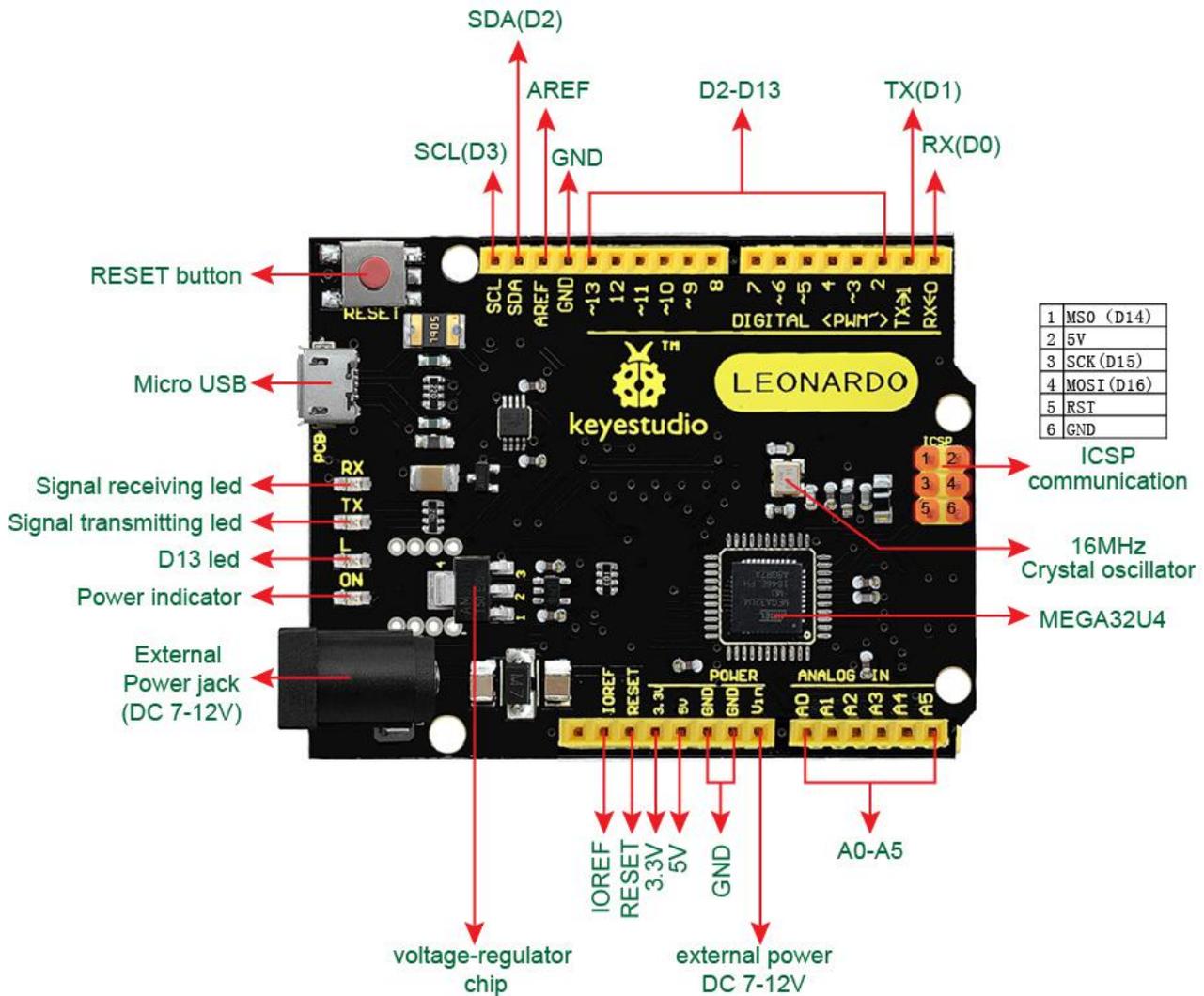
- PCB Dimensions: 71mm*54mm*15mm
- Weight: 18.4g



keystudio

Element and Interfaces:

Here is an explanation of what every element and interface of the board does:



keystudio

Specialized Functions of Some Pins:

Digital I/O pins	D0-D13 and A0-A5 (D18-D23); Note that if the digital pins are not enough, the ICSP pins can be used as digital pins. MISO (D14); SCK(D15); MOSI (D16).
Analog Inputs	<p>A0-A5, A6-A11 (on digital pins 4, 6, 8, 9, 10, and 12). That is, D4 (A6)、D6 (A7)、D8 (A8)、D9 (A9)、D10 (A10) and D12 (A11).</p> <p>Pins A0-A5 appear in the same locations as on the Uno; inputs A6-A11 are on digital i/o pins 4, 6, 8, 9, 10, and 12 respectively.</p> <p>Each analog input provide 10 bits of resolution (i.e. 1024 different values). By default the analog inputs measure from ground to 5 volts, though is it possible to change the upper end of their range using the AREF pin and the analogReference() function.</p>
PWM (Pulse-Width Modulation)	D3, D5, D6, D9, D10, D11 and D13. Provide 8-bit PWM output with the analogWrite() function.
External Interrupts	<p>D3 (interrupt 0); D2 (interrupt 1); D0 (interrupt 2), D1 (interrupt 3) and D7 (interrupt 4).</p> <p>These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value. See the attachInterrupt() function for details.</p>

keyestudio

Serial communication	D0 (RX) and D1 (TX).
SPI communication	<p>On the ICSP header. These pins support SPI communication using the SPI library.</p> <p>Note: the SPI pins are not connected to any of the digital I/O pins as they are on the Uno. They are only available on the ICSP connector. This means that if you have a shield that uses SPI, but does NOT have a 6-pin ICSP connector that connects to the Leonardo's 6-pin ICSP header, the shield will not work.</p>
AREF	<p>Reference voltage for the analog inputs. Used with analogReference(). Sometimes used to set the external reference voltage (0-5 volts) as the upper end of analog input pins.</p>
IOREF	<p>The voltage at which the i/o pins of the board are operating (i.e. VCC for the board). This is 5V on the Leonardo. Used to configure the operating voltage of microcontroller.</p>

keystudio

Tips:

- **Automatic (Software) Reset:**

Rather than requiring a physical press of the reset button before an upload, the Arduino Nano is designed in a way that allows it to be reset by software running on a connected computer.

- **USB Overcurrent Protection:**

The Leonardo has a resettable polyfuse that protects your computer's USB ports from shorts and overcurrent. Although most computers provide their own internal protection, the fuse provides an extra layer of protection. If more than 500 mA is applied to the USB port, the fuse will automatically break the connection until the short or overload is removed.

keystudio

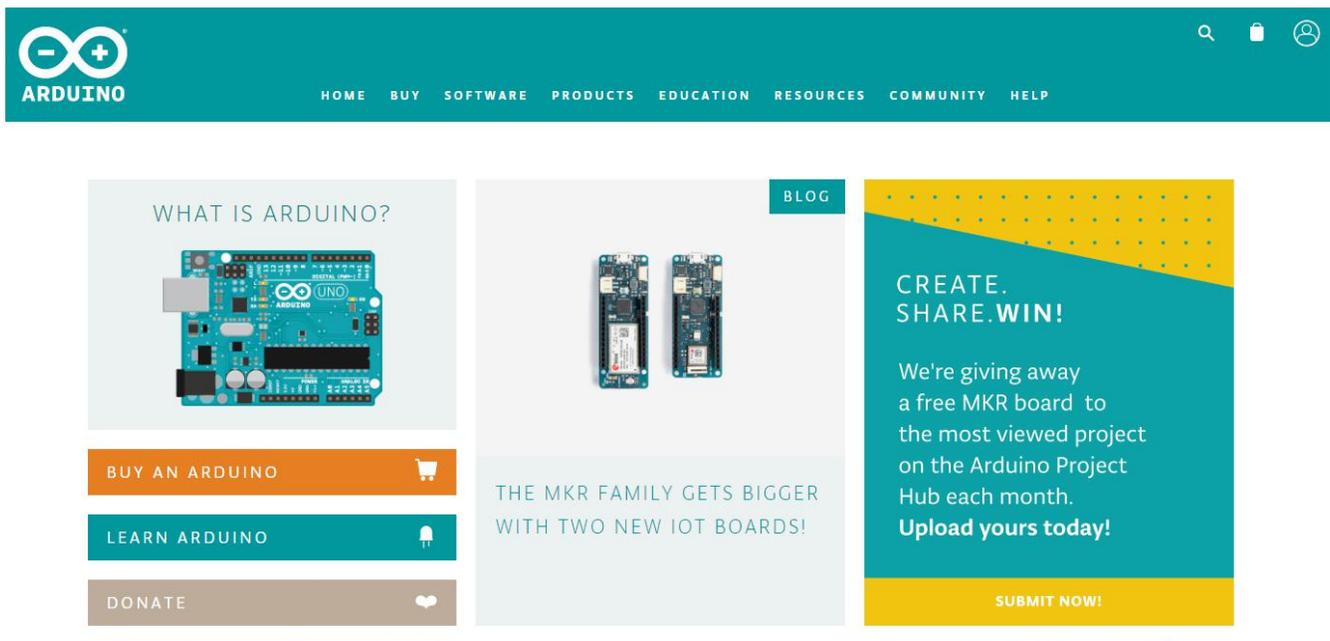
Detailed Use with ARDUINO Software as follows:

Step1 | Download the Arduino IDE

When you get the board, first you should install the Arduino software and driver. We usually use the Windows software Arduino 1.5.6 version. You can download it from the link below:

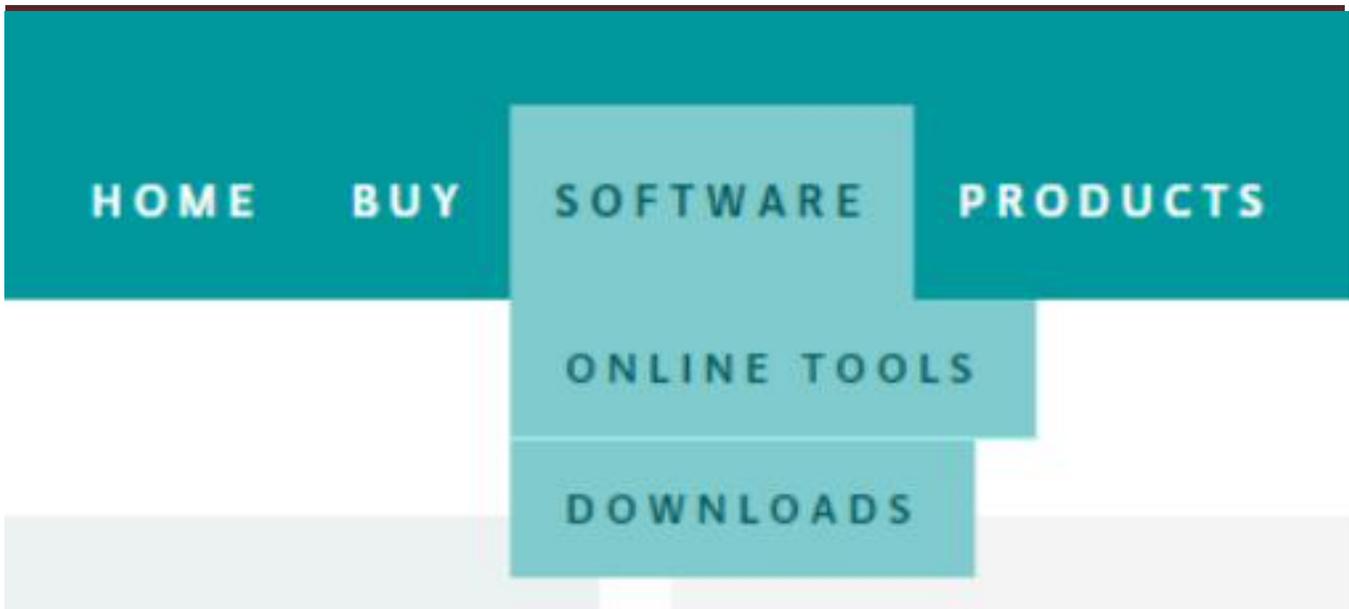
<https://www.arduino.cc/en/Main/OldSoftwareReleases#1.5.x>

Or you can browse the ARDUINO website to download the latest version from this link, <https://www.arduino.cc>, pop up the following interface.



Then click the **SOFTWARE** on the browse bar, you will have two options ONLINE TOOLS and DOWNLOADS.

keyestudio



Click **DOWNLOADS**, it will appear the latest software version of ARDUINO 1.8.5 shown as below.

Download the Arduino IDE

A screenshot of the Arduino 1.8.5 download page. On the left, there is a circular logo with a minus sign and a plus sign. To the right of the logo, the text reads: "ARDUINO 1.8.5", "The open-source Arduino Software (IDE) makes it easy to write code and upload it to the board. It runs on Windows, Mac OS X, and Linux. The environment is written in Java and based on Processing and other open-source software.", "This software can be used with any Arduino board. Refer to the [Getting Started](#) page for Installation instructions." On the right side, there is a teal sidebar with white text listing download options: "Windows Installer, for Windows XP and up", "Windows ZIP file for non admin install", "Windows app Requires Win 8.1 or 10" with a "Get" button, "Mac OS X 10.7 Lion or newer", "Linux 32 bits", "Linux 64 bits", "Linux ARM", "Release Notes", "Source Code", and "Checksums (sha512)".

In this software page, on the right side you can see the version of development software for different operating systems. ARDUINO has a powerful compatibility. You should download the software that is compatible with the operating system of your computer.

We will take **WINDOWS system** as an example here. There are also two options

keystudio

under Windows system, one is installed version, the other is non-installed version. For simple installed version, first click **Windows Installer**, you will get the following page.



Windows Installer, for Windows XP and up
Windows ZIP file for non admin install

Windows app Requires Win 8.1 or 10
Get 

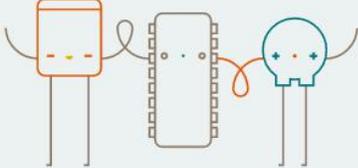
Mac OS X 10.7 Lion or newer

Linux 32 bits
Linux 64 bits
Linux ARM

[Release Notes](#)
[Source Code](#)
[Checksums \(sha512\)](#)

Contribute to the Arduino Software

Consider supporting the Arduino Software by contributing to its development. (US tax payers, please note this contribution is not tax deductible). [Learn more on how your contribution will be used.](#)



SINCE MARCH 2015, THE ARDUINO IDE HAS BEEN DOWNLOADED **24,353,248** TIMES. (IMPRESSIVE!) NO LONGER JUST FOR ARDUINO AND GENUINO BOARDS, HUNDREDS OF COMPANIES AROUND THE WORLD ARE USING THE IDE TO PROGRAM THEIR DEVICES, INCLUDING COMPATIBLES, CLONES, AND EVEN COUNTERFEITS. HELP ACCELERATE ITS DEVELOPMENT WITH A SMALL CONTRIBUTION! REMEMBER: OPEN SOURCE IS LOVE!

\$3 **\$5** **\$10** **\$25** **\$50** **OTHER**

JUST DOWNLOAD

CONTRIBUTE & DOWNLOAD

keystudio

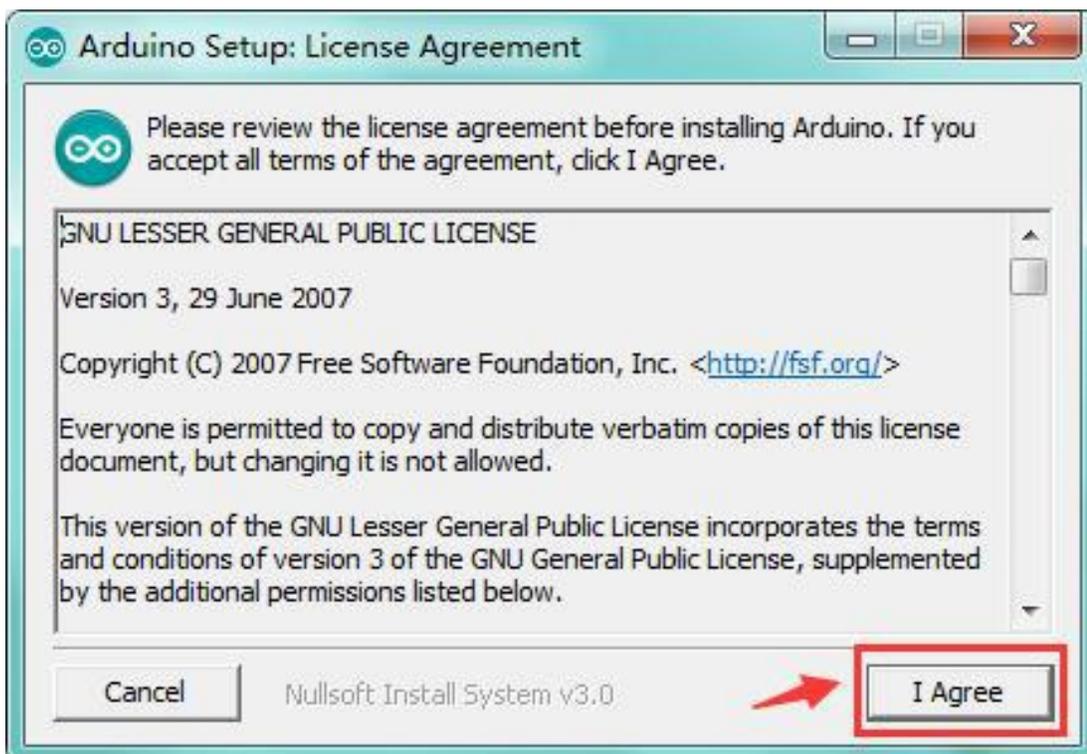
This way you just need to click JUST DOWNLOAD, then click the downloaded file to install it.

For non-installed version, first click Windows ZIP file, you will also get the pop-up interface as the above figure.

Click JUST DOWNLOAD, and when the ZIP file is downloaded well to your computer, you can directly unzip the file and click the icon of ARDUINO software to start it.

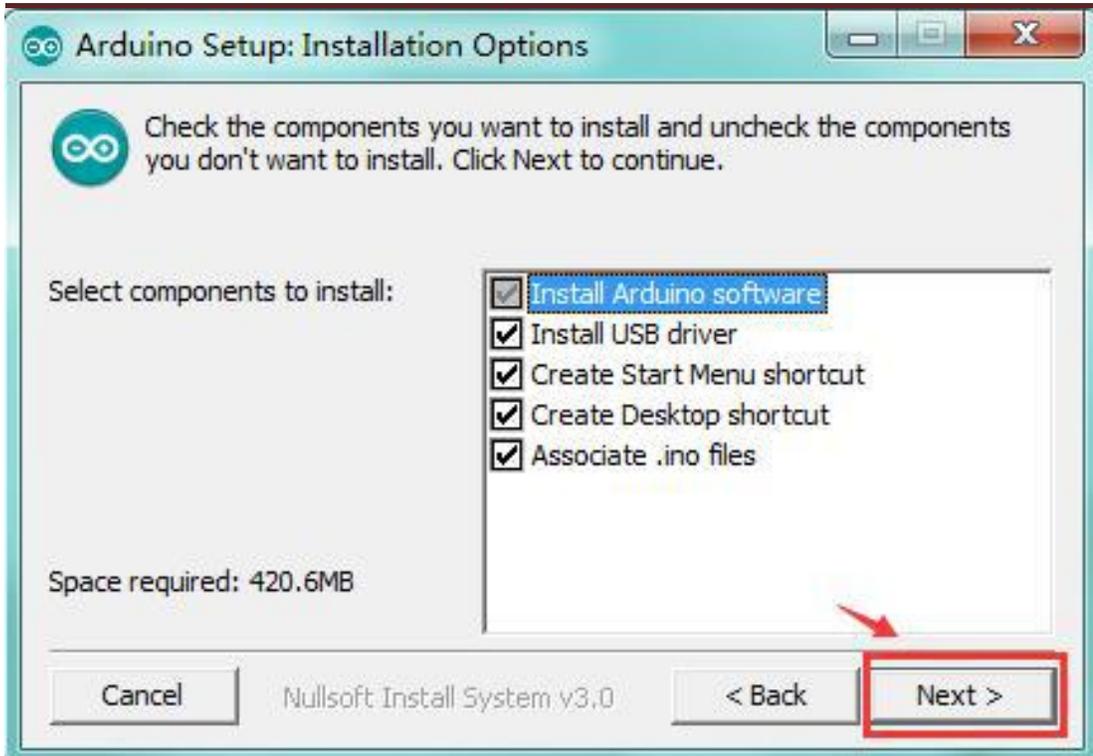
Installing Arduino (Windows):

Install Arduino with the exe. Installation package downloaded well.

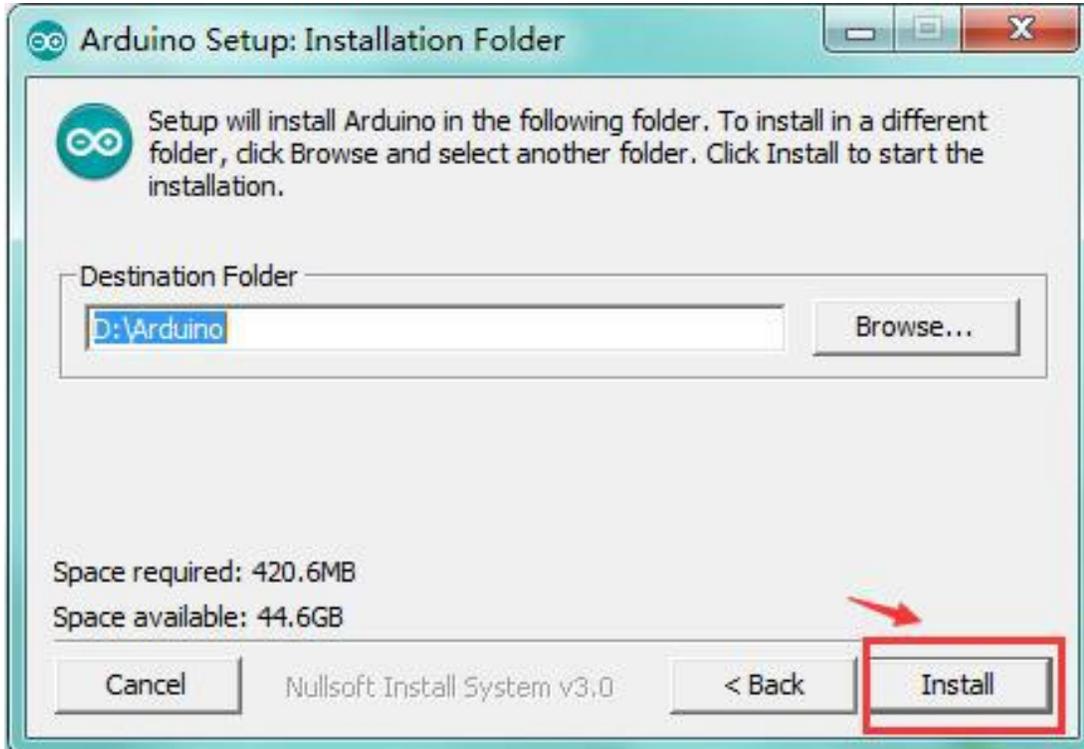


Click "I Agree" to see the following interface.

keystudio

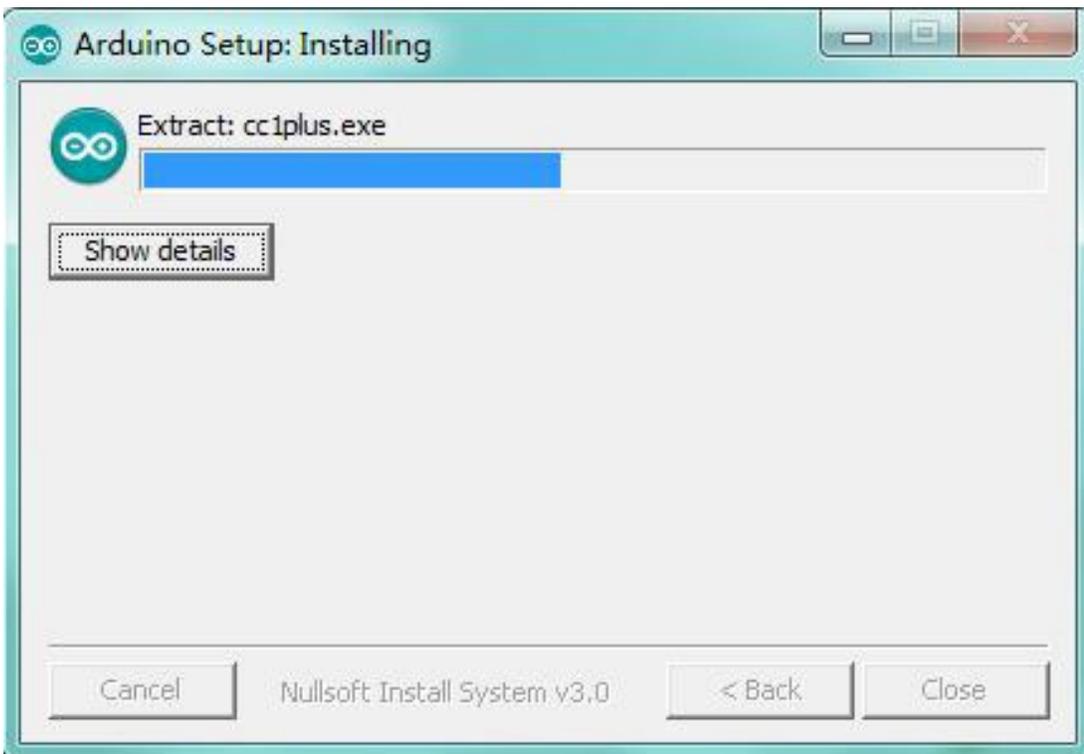


Click "Next". Pop up the interface below.

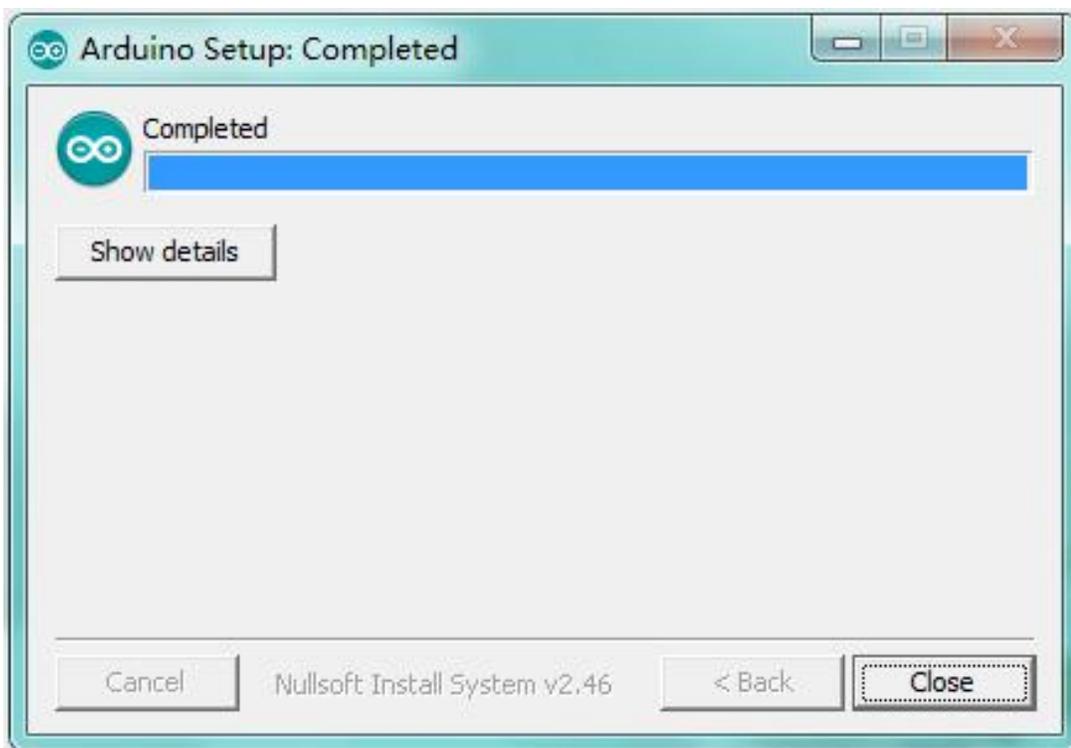


keyestudio

You can press Browse... to choose an installation path or directly type in the directory you want. Then click "Install" to initiate installation.



Wait for the installing process, if appear the interface of Window Security, just continue to click Install to finish the installation.



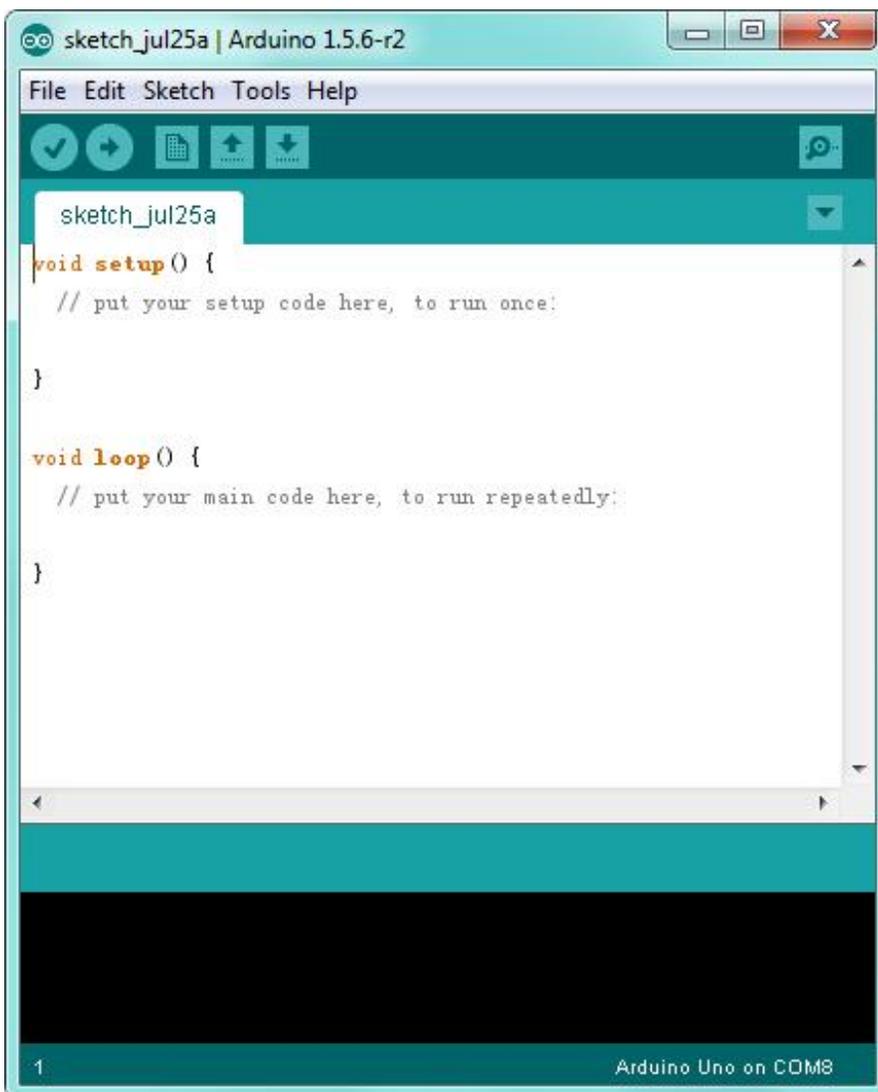
keystudio

Introduction for Arduino IDE Toolbar:

Double-click the icon of Arduino software downloaded, you will get the interface shown below.

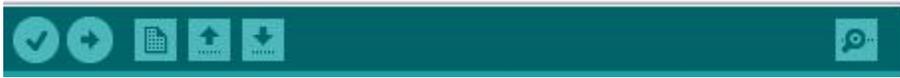


(**Note:** if the Arduino software loads in the wrong language, you can change it in the preferences dialog. See [the environment page](#) for details.)



keyestudio

The functions of each button on the Toolbar are listed below:

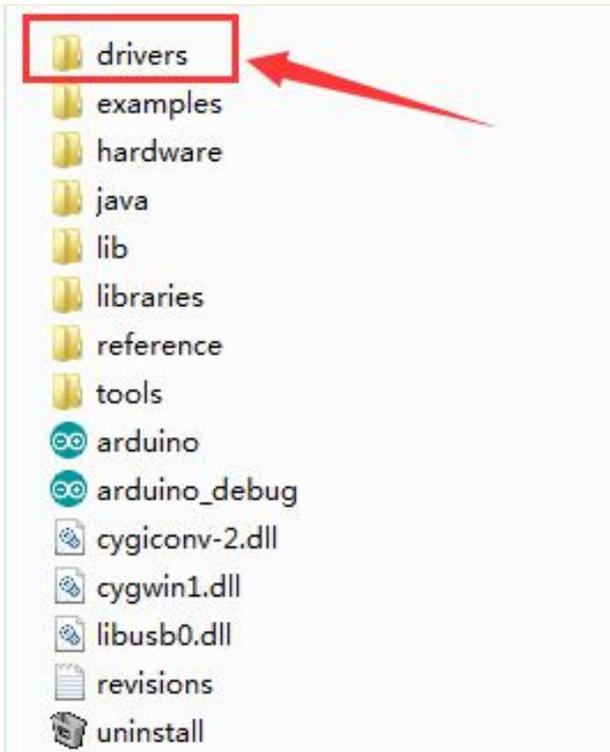


 Verify/Compile	Check the code for errors
 Upload	Upload the current Sketch to the Arduino
 New	Create a new blank Sketch
 Open	Show a list of Sketches
 Save	Save the current Sketch
 Serial Monitor	Display the serial data being sent from the Arduino

keystudio

Step2| Installing the Driver

Installed well the Arduino, the next step is to install the driver. The Arduino folder contains both the Arduino program itself and the drivers that allow the Arduino to be connected to your computer with a USB cable.

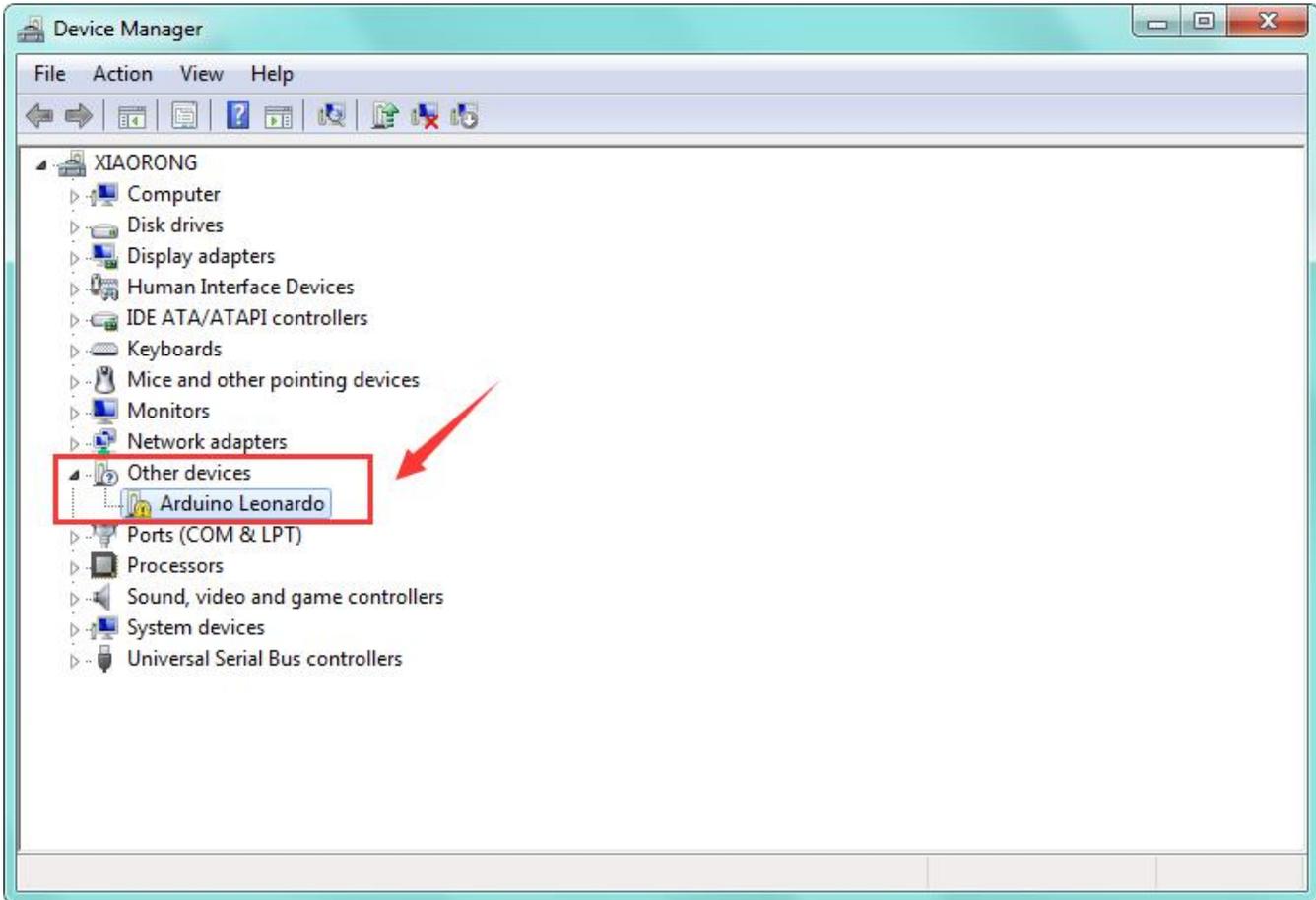


In different systems, the driver installation is similar. Here we start to install the driver on the Win7 system.

Plug one end of your USB cable into the keystudio Leonardo and the other into a USB socket on your computer.

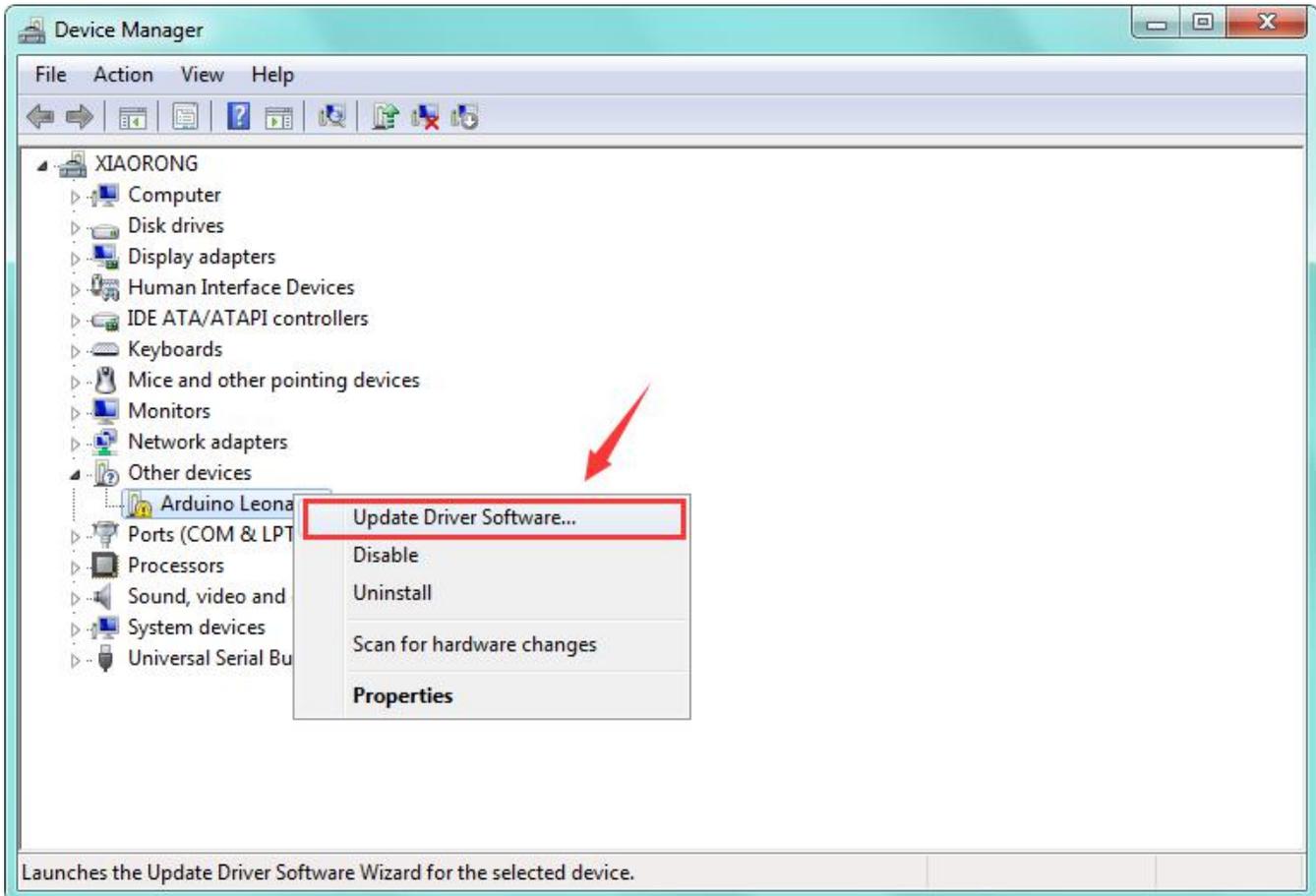
keystudio

When you connect the board to your computer at the first time, right click your "Computer" →for "Properties"→ click the "Device manager", under Other devices, you should see the "Arduino Leonardo".



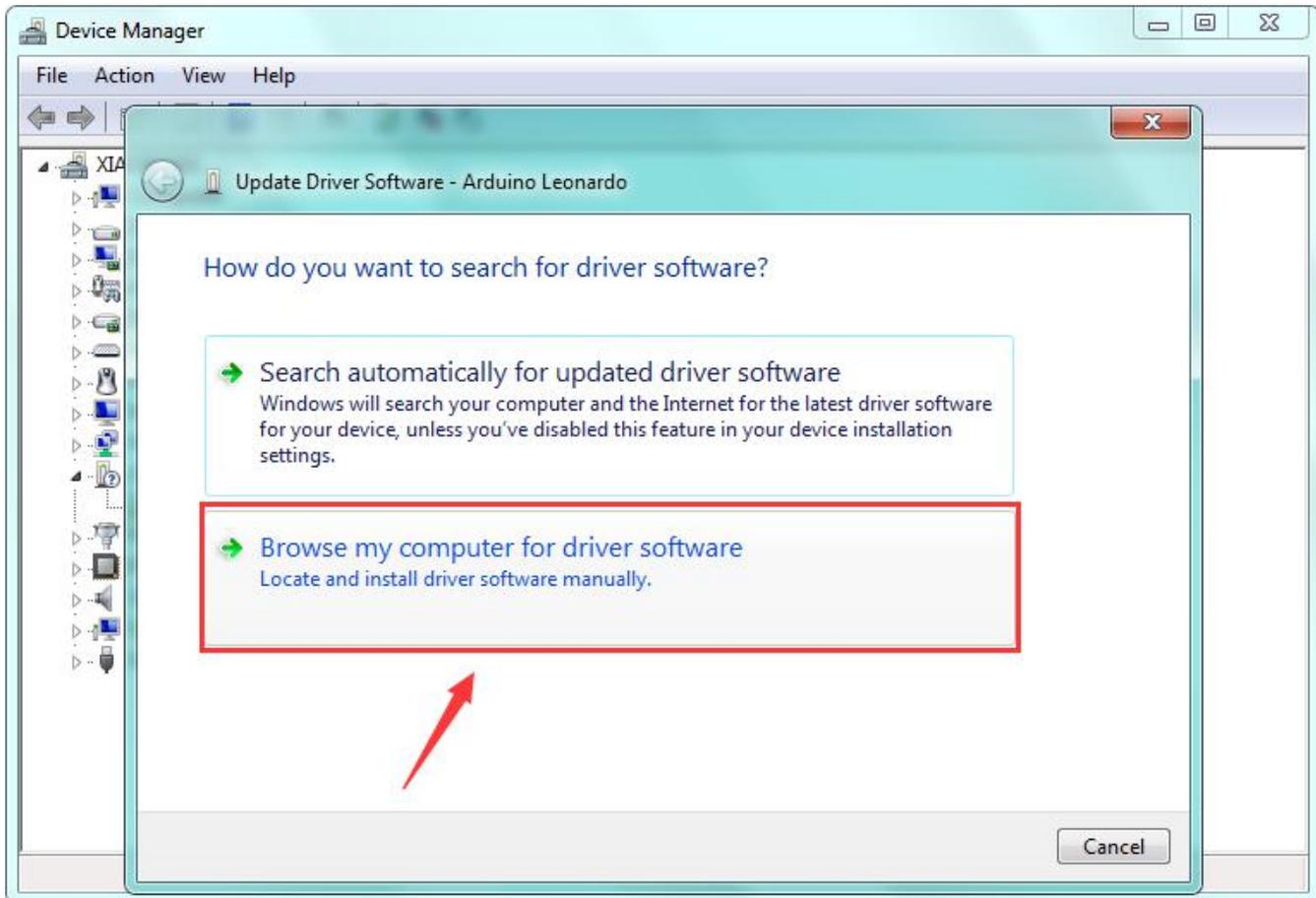
keystudio

Then right-click on the Arduino Leonardo and select the top menu option (Update Driver Software...) shown as the figure below.



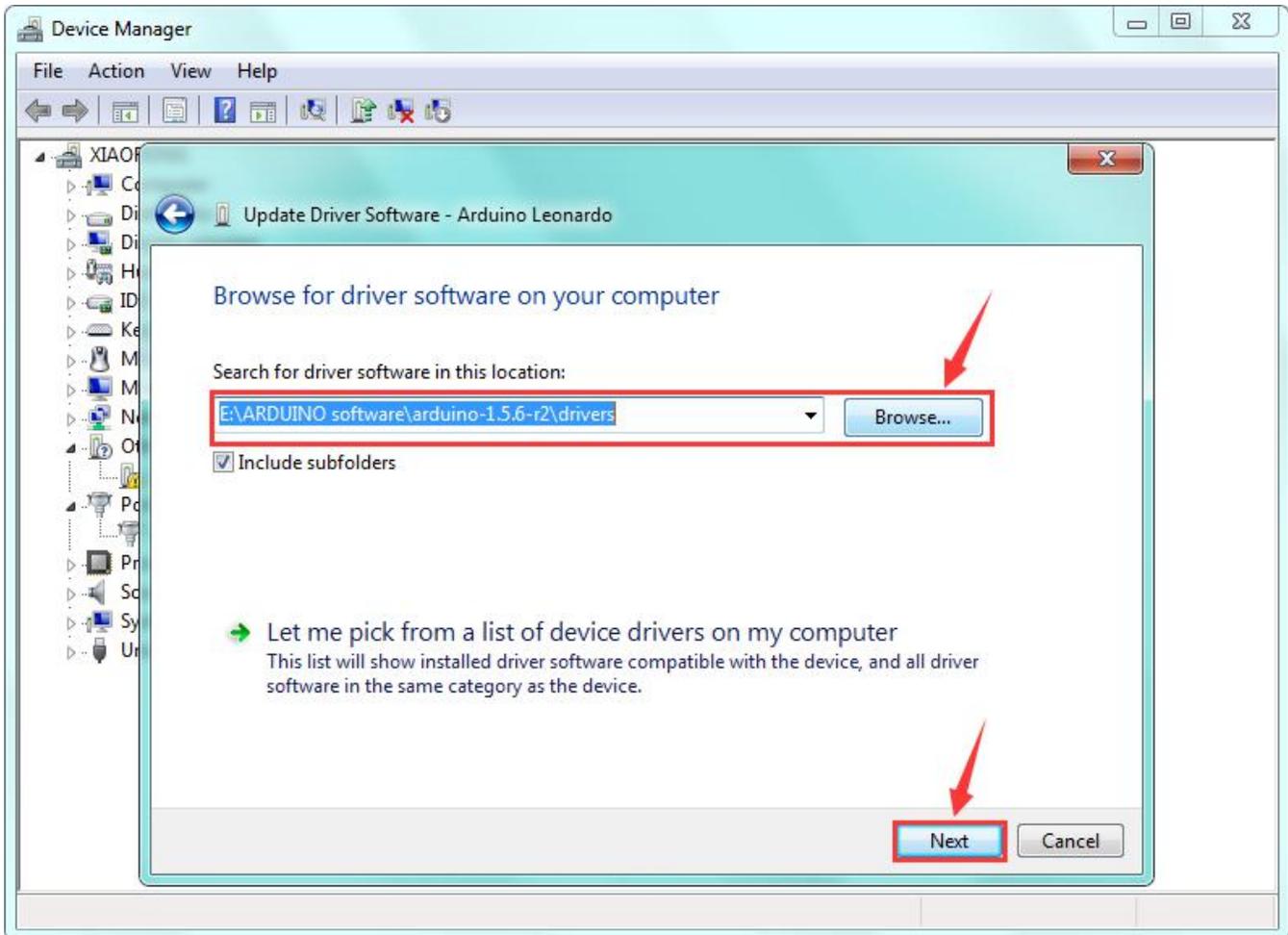
keystudio

Then it will be prompted to either "Search Automatically for updated driver software" or "Browse my computer for driver software". Shown as below. In this page, select "Browse my computer for driver software".



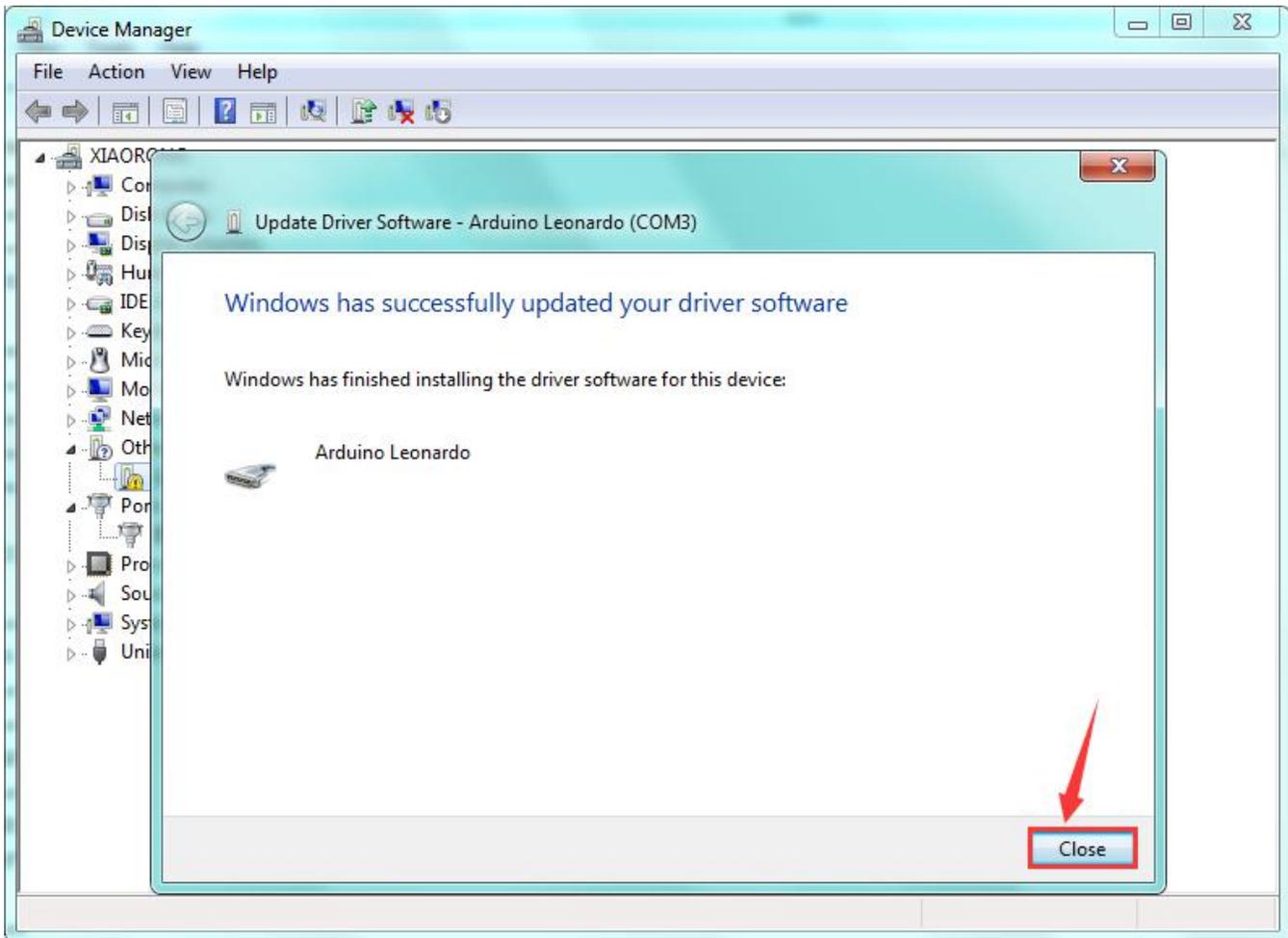
keystudio

After that, select the option to browse and navigate to the "drivers" folder.



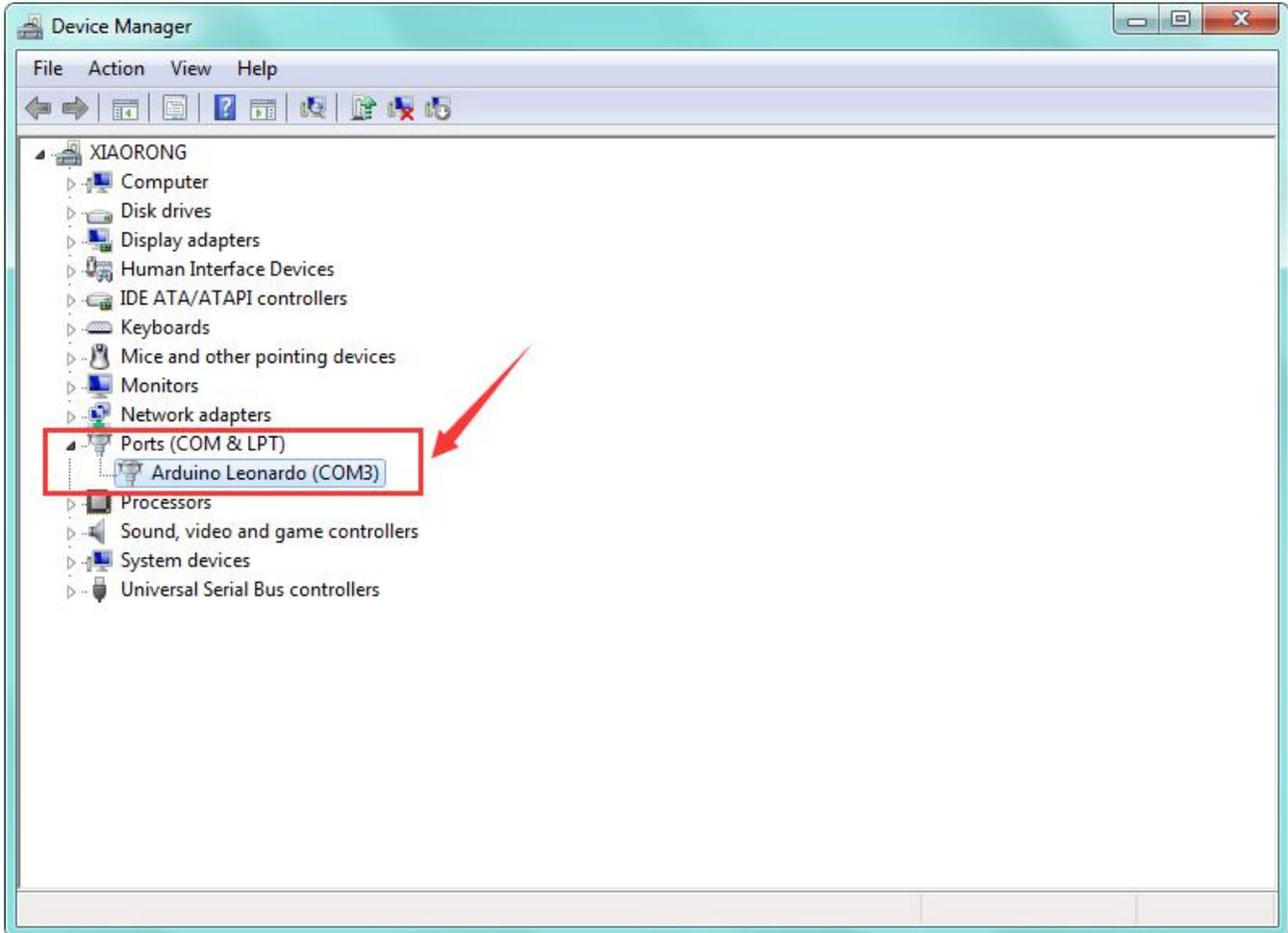
keystudio

Once the software has been installed, you will get a confirmation message. Installation completed, click "Close".



keystudio

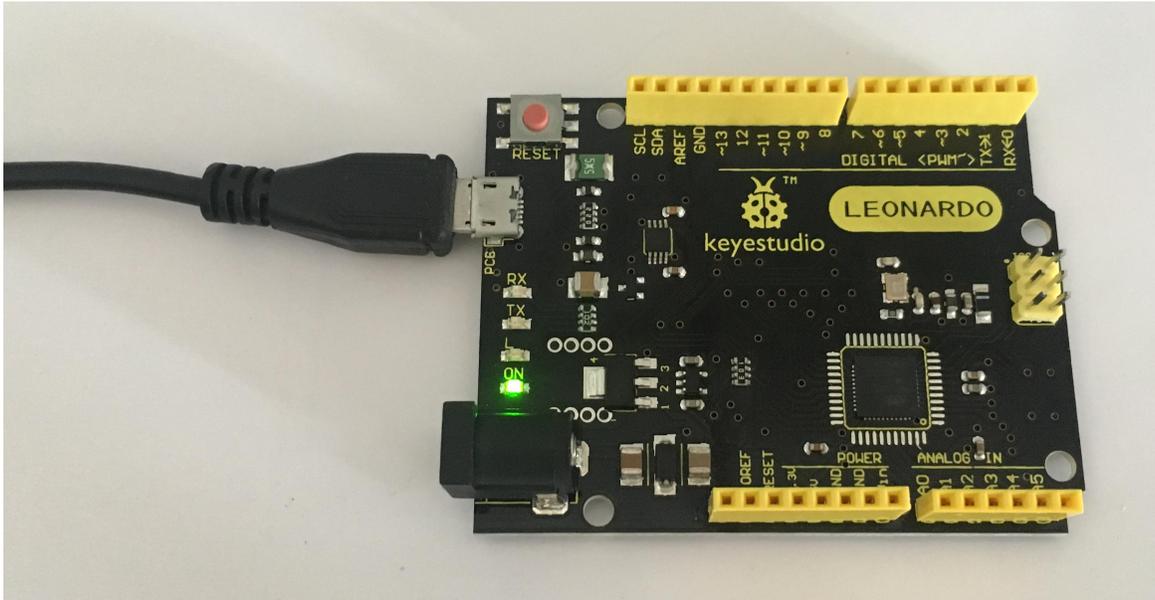
Up to now, the driver is installed well. Then you can right click "Computer" —>"Properties"—>"Device manager", you should see the device as the figure shown below.



keystudio

Step3| Connect the board

Connect the Leonardo board to your computer using the USB cable. The power LED should go on.

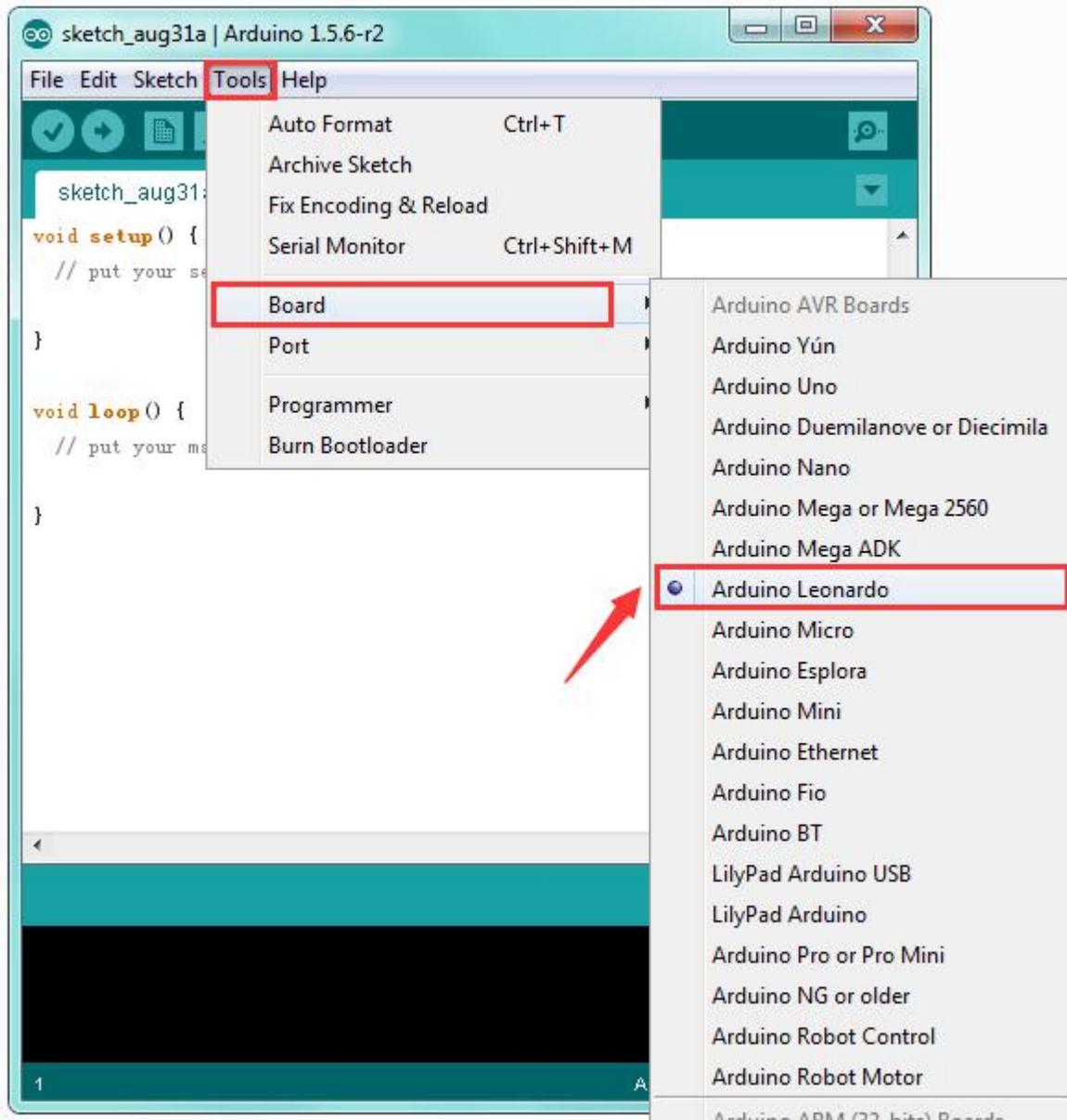


Step4| Select the Arduino Board

Open the Arduino IDE, you'll need to click the "Tools", then select the Board that corresponds to your Arduino.



keystudio

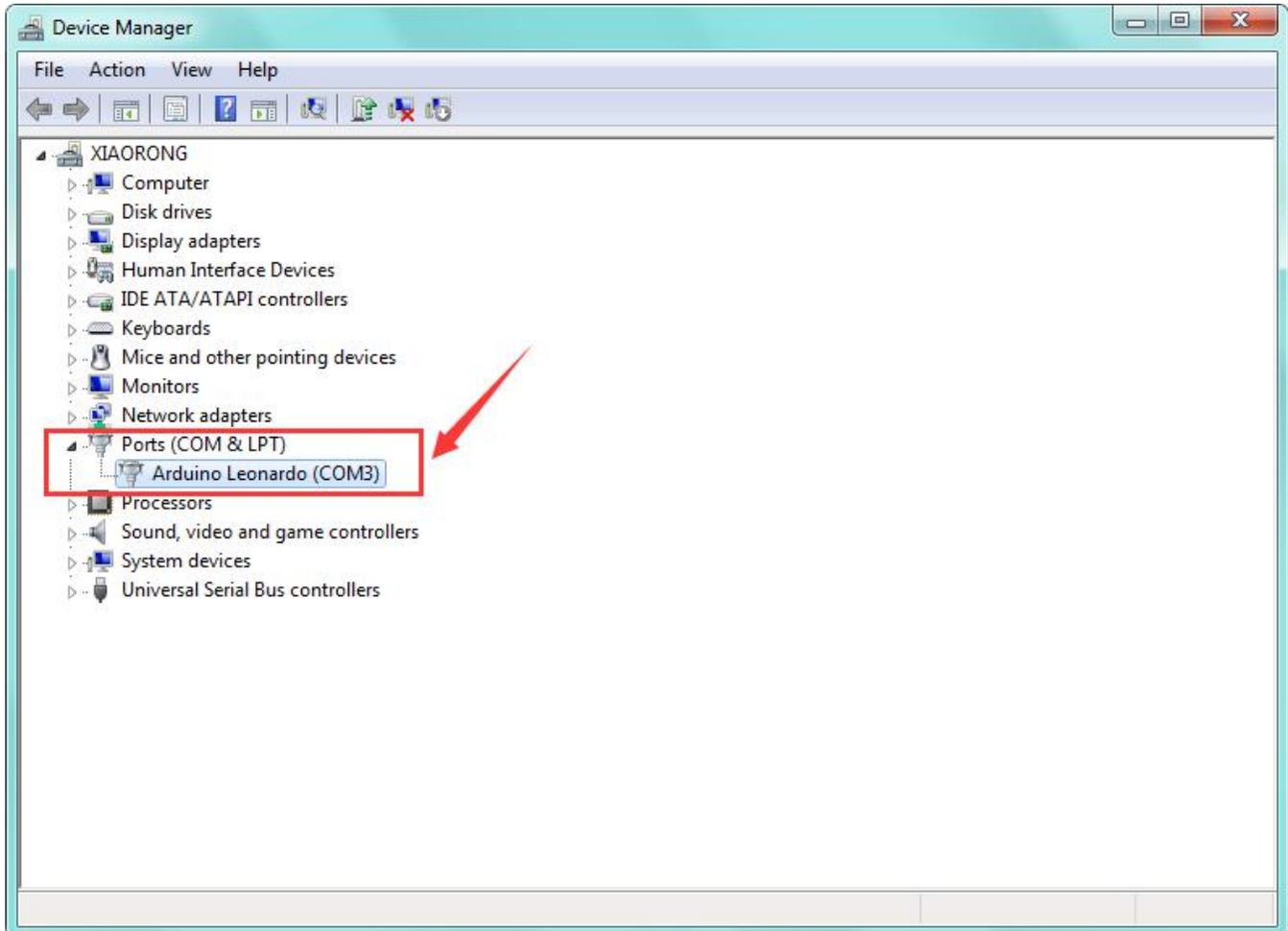


keyestudio

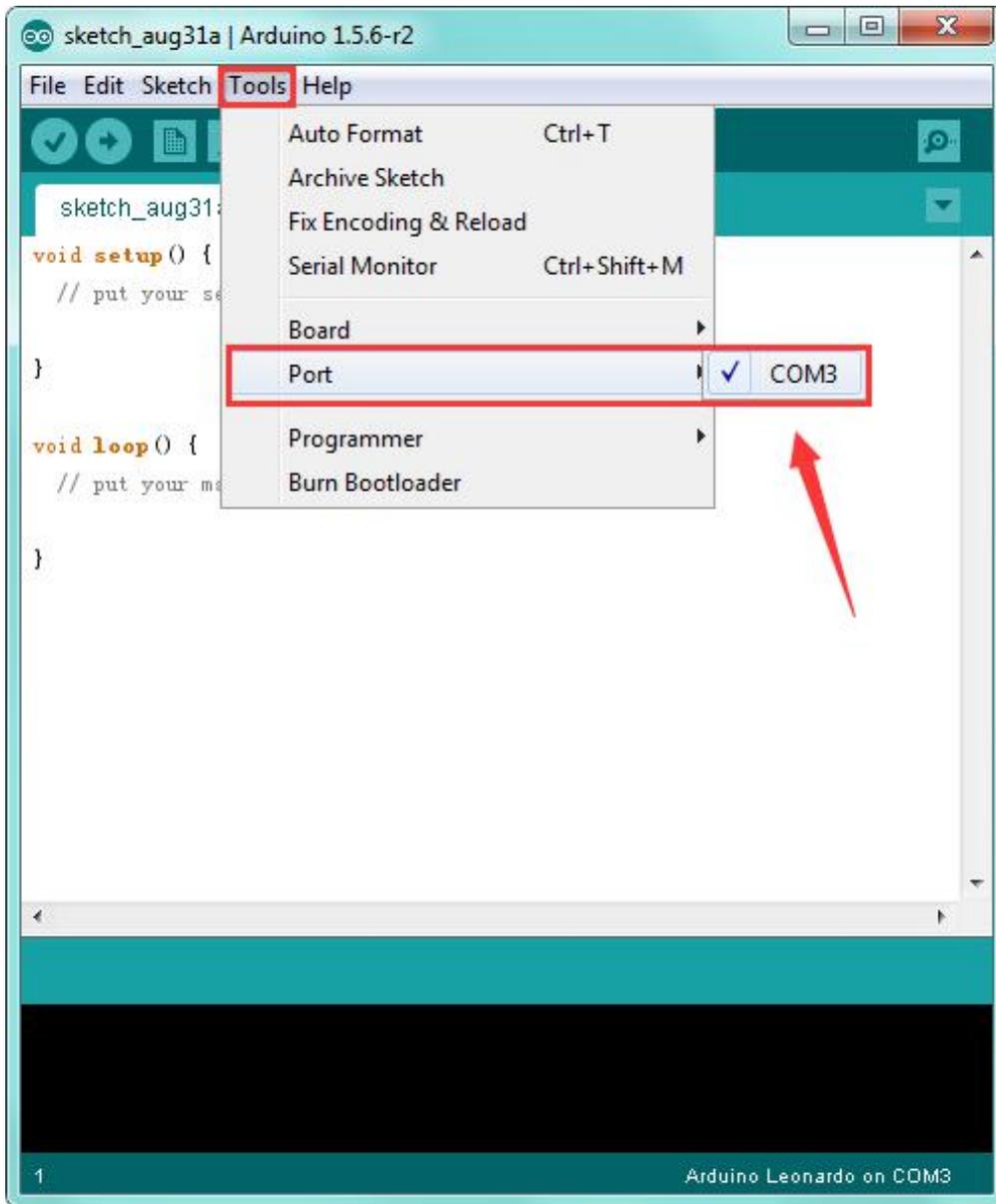
Step5| Select your serial port

Select the serial device of the Arduino board from the **Tools | Serial Port** menu.

Note: to avoid errors, the COM Port should keep the same as the Ports shown on Device Manager.



keystudio

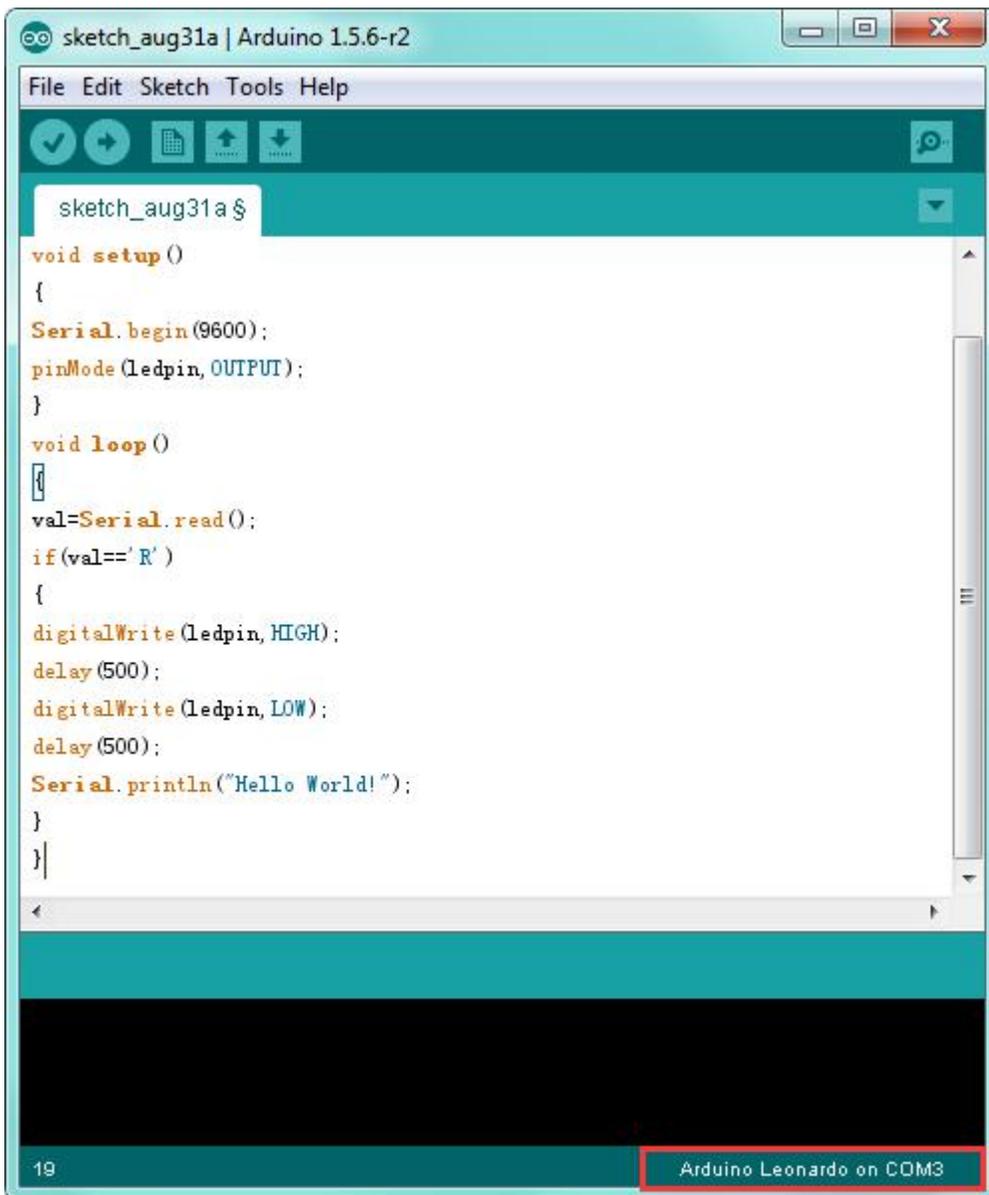


Step6 | Upload the Code

Below is an example code for displaying the Hello World!
Copy and paste the code to the Arduino environment IDE.

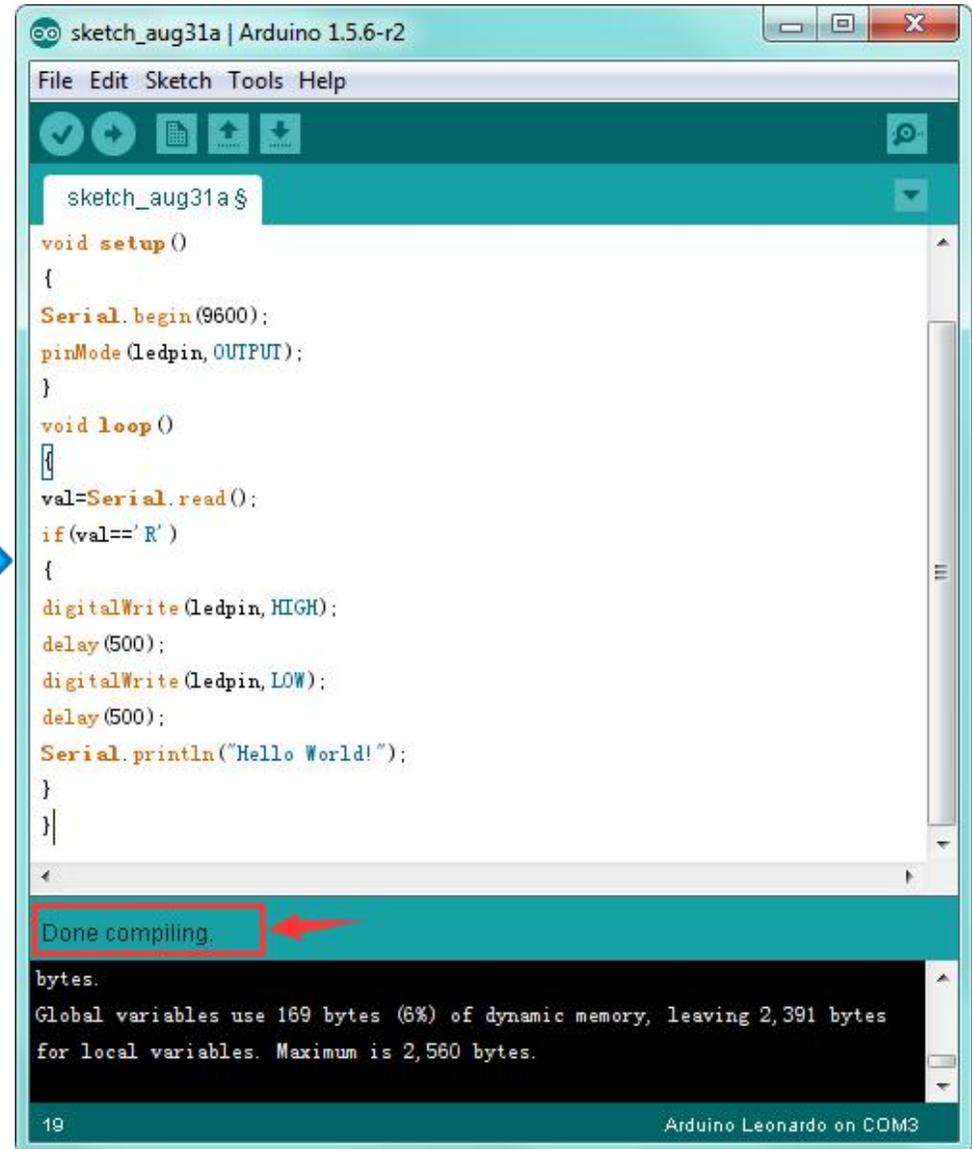
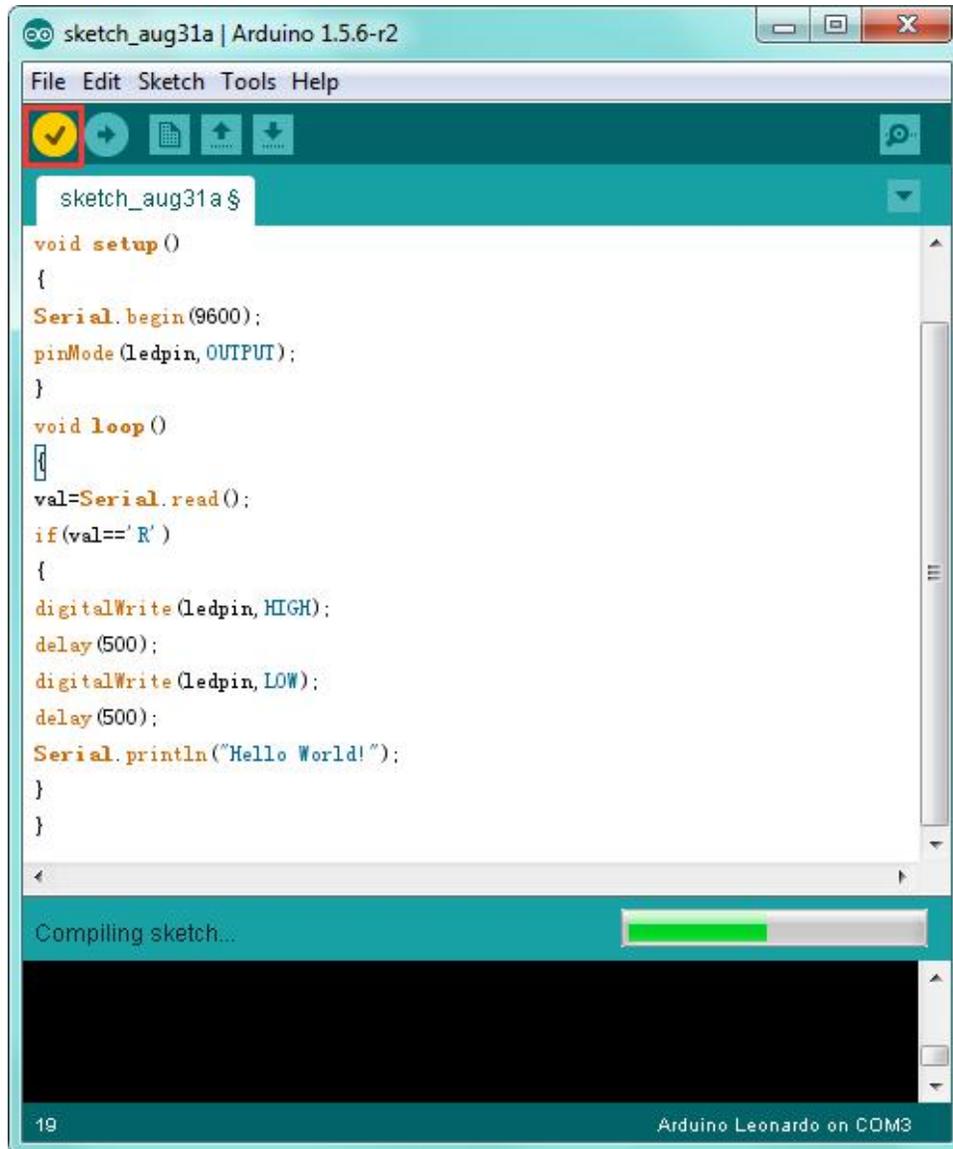
```
////////////////////////////////////  
int val;  
int ledpin=13;  
void setup()  
{  
Serial.begin(9600);  
pinMode(ledpin,OUTPUT);  
}  
void loop()  
{  
val=Serial.read();  
if(val=='R')  
{  
digitalWrite(ledpin,HIGH);  
delay(500);  
digitalWrite(ledpin,LOW);  
delay(500);  
Serial.println("Hello World!");  
}  
}  
////////////////////////////////////
```

keystudio



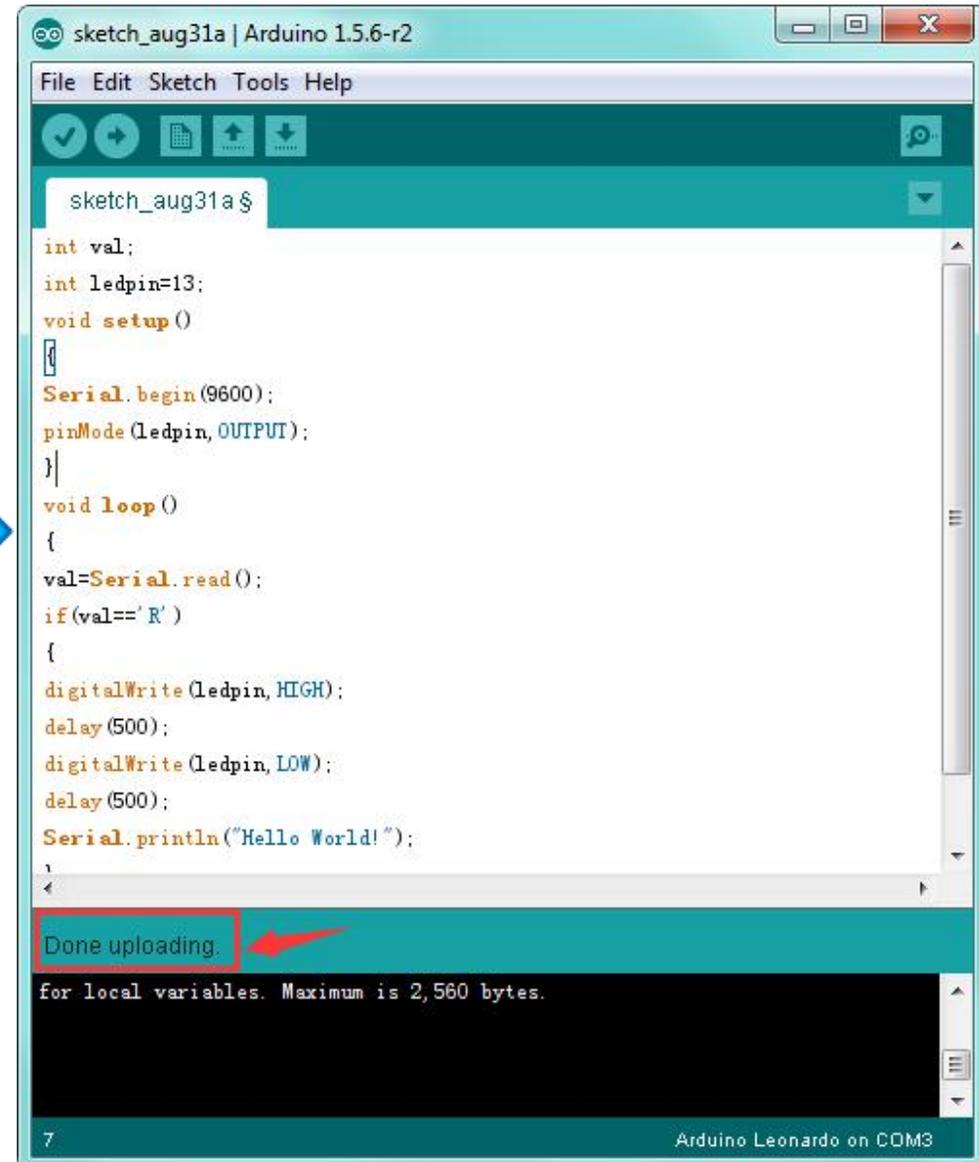
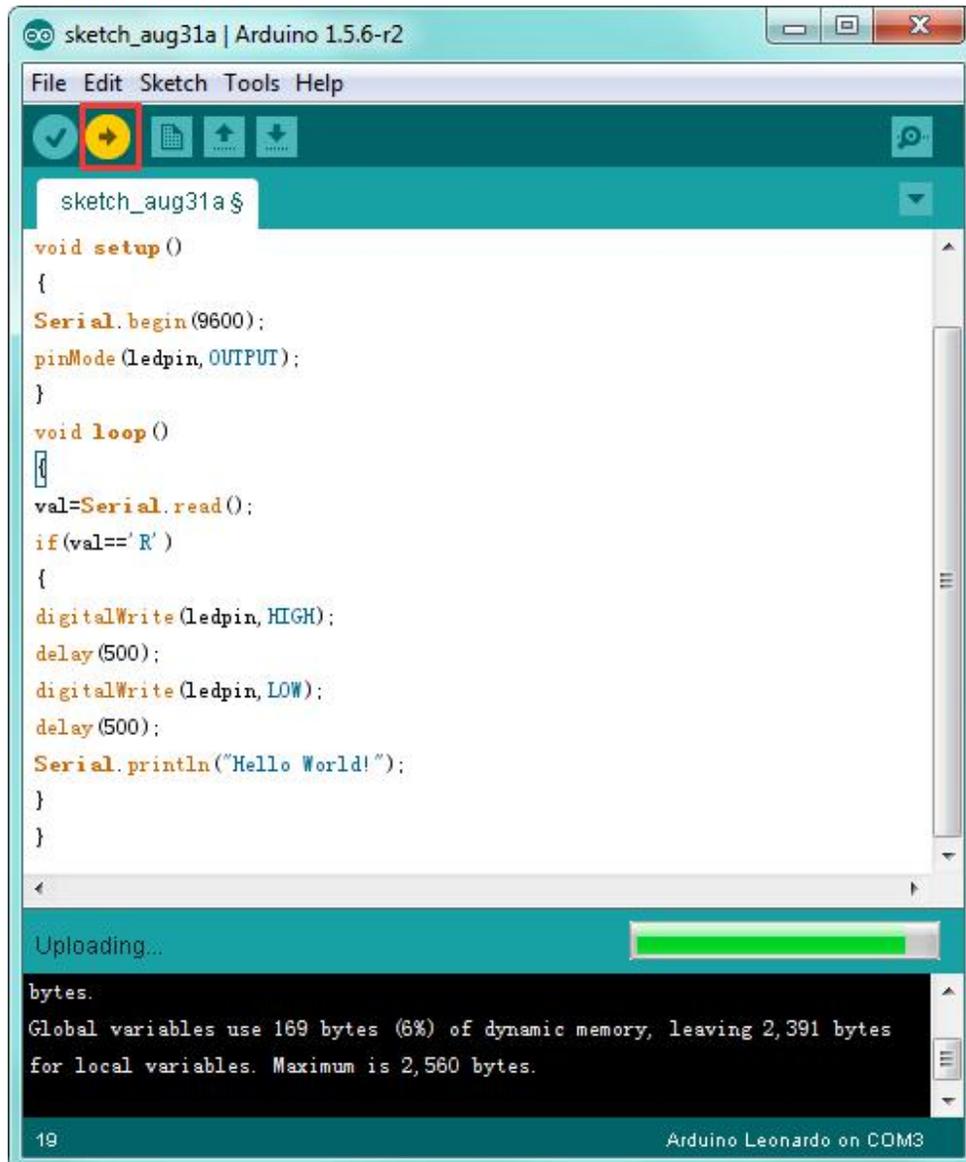
Then click verify button to check the errors. If compiling successfully, the message "Done compiling." will appear in the status bar.

keystudio



keyestudio

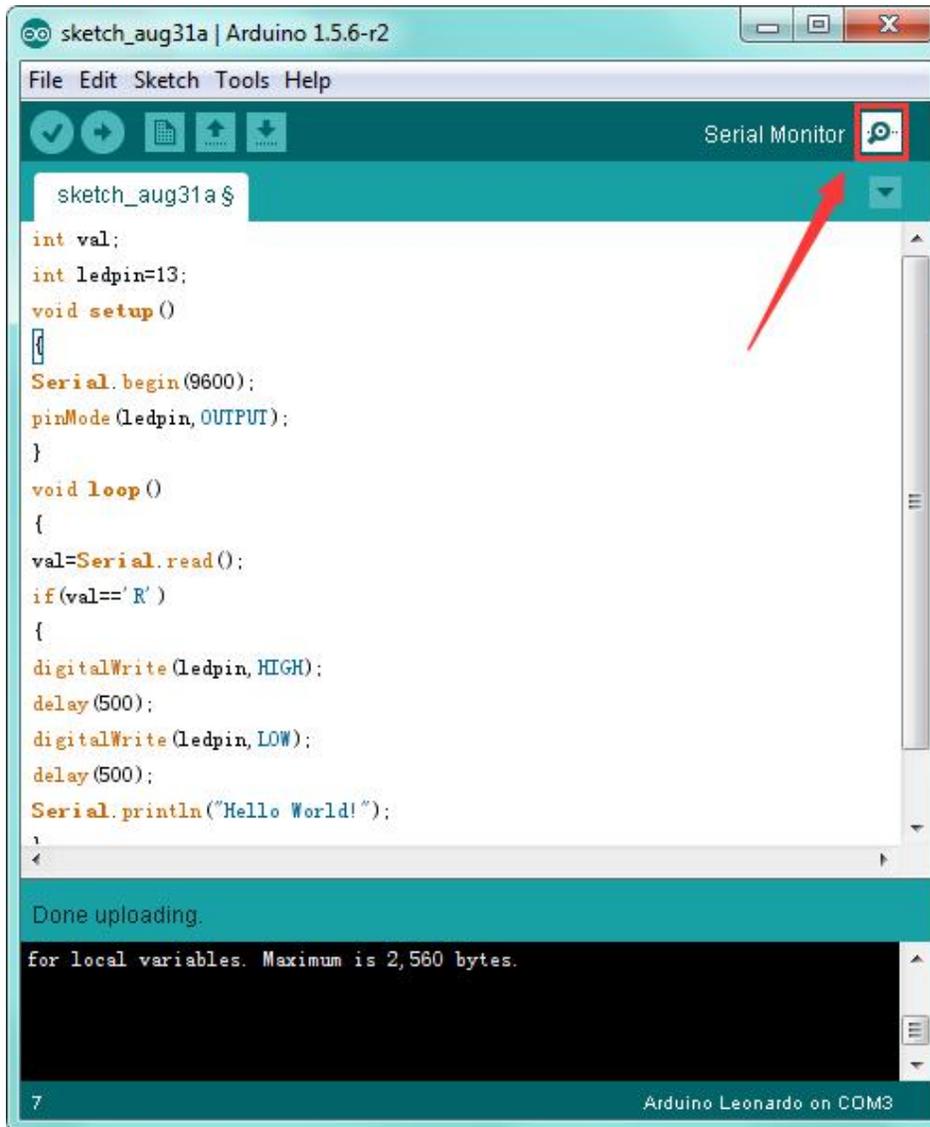
After that, click the "Upload" button to upload the code. If the upload is successful, the message "Done uploading." will appear in the status bar.



keyestudio

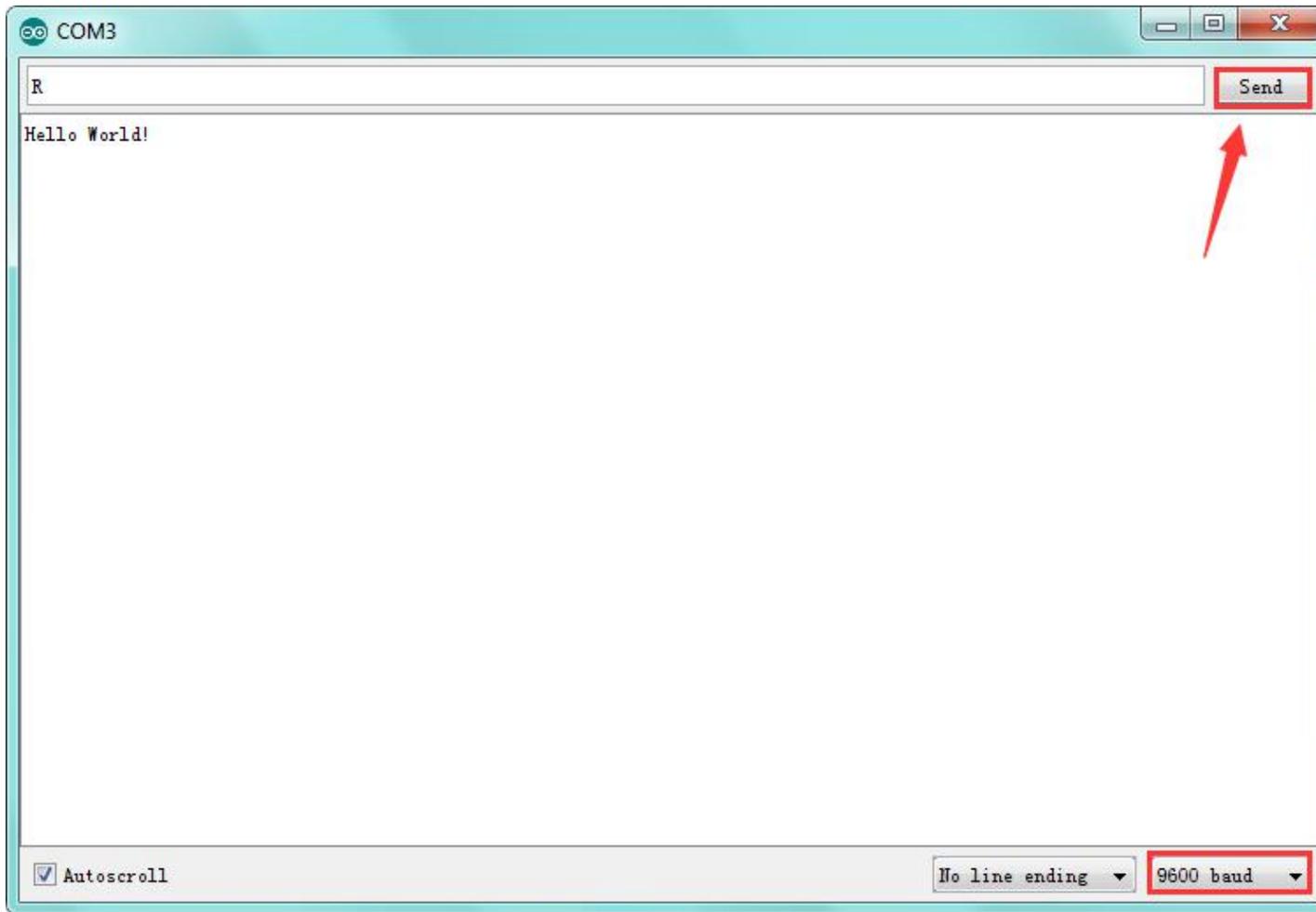
Step7 | Open the Serial Monitor

After that, click the button to open the serial monitor.



keyestudio

Then set the baud rate to 9600, enter an "R" and click Send, that is, the computer will send the character R. When the board receives it, you should see the RX led on the board flash once, and then D13 led flash once; when keyestudio Leonardo R3 board successfully sends "Hello World!" to the computer, you should see the "Hello World!" is showed on the monitor, and TX led on the board flash once.



keystudio

Package Included:

- keystudio Leonardo R3 board * 1pcs
- Black micro USB cable 1m * 1pcs



keystudio

Resource Links:

You can download the datasheet from the link:

<https://drive.google.com/open?id=1fikRPqsnIBHzVaAgCX0QBcCTpWg9BcQP>

You might also want to look at:

[the reference](#) for the Arduino language;

Download ARDUINO Software:

<https://www.arduino.cc/en/Main/OldSoftwareReleases#1.5.x>

Or download the software and driver from the link below:

<https://drive.google.com/open?id=12D-JkXdNm03Qt4dIPQr3RP6OmgXqpvHc>

Troubleshooting:

If you have problems, please see the [troubleshooting suggestions](#).