

## ARDUINO MKR1000 - GETTING STARTED

**Arduino MKR1000** is a powerful board that combines the functionality of the Zero and the Wi-Fi Shield. It is the ideal solution for makers wanting to design IoT projects with minimal previous experience in networking.



Arduino MKR1000 has been designed to offer a practical and cost effective solution for makers seeking to add Wi-Fi connectivity to their projects with minimal previous experience in networking. It is based on the Atmel [ATSAMW25](#) SoC (System on Chip), that is part of the SmartConnect family of Atmel Wireless devices, specifically designed for IoT projects and devices.

The ATSAMW25 is composed of three main blocks:

- SAMD21 Cortex-M0+ 32bit low power ARM MCU
- WINC1500 low power 2.4GHz IEEE® 802.11 b/g/n Wi-Fi
- ECC508 CryptoAuthentication

The ATSAMW25 includes also a single 1x1 stream PCB Antenna.

The design includes a Li-Po charging circuit that allows the Arduino/Genuino MKR1000 to run on battery power or external 5V, charging the Li-Po battery while running on external power. Switching from one source to the other is done automatically. A good 32 bit computational power similar to [the Zero board](#), the usual rich set of I/O interfaces, low power Wi-Fi with a Cryptochip for secure communication, and the ease of use of the Arduino Software (IDE) for code development and programming.

**Warning:** Unlike most Arduino & Genuino boards, the MKR1000 runs at 3.3V. The maximum voltage that the I/O pins can tolerate is 3.3V. Applying voltages higher than 3.3V to any I/O pin could damage the board. While output to 5V digital devices is possible, bidirectional communication with 5V devices needs proper level shifting.

## Tech specs

Microcontroller	SAMD21 Cortex-M0+ 32bit low power ARM MCU
Board Power Supply (USB/VIN)	5V
Supported Battery(*)	Li-Po single cell, 3.7V, 700mAh minimum
Circuit Operating Voltage	3.3V
Digital I/O Pins	8
PWM Pins	12 (0, 1, 2, 3, 4, 5, 6, 7, 8, 10, A3 - or 18 -, A4 -or 19)
UART	1
SPI	1
I2C	1
Analog Input Pins	7 (ADC 8/10/12 bit)
Analog Output Pins	1 (DAC 10 bit)
External Interrupts	8 (0, 1, 4, 5, 6, 7, 8, A1 -or 16-, A2 - or 17)
DC Current per I/O Pin	7 mA
Flash Memory	256 KB
SRAM	32 KB
EEPROM	no
Clock Speed	32.768 kHz (RTC), 48 MHz
LED_BUILTIN	6
Full-Speed USB Device and embedded Host	
LED_BUILTIN	6
Length	61.5 mm
Width	25 mm
Weight	32 gr.

## Li-Po batteries, Pins and board LEDs

### Battery capacity

Li-Po batteries are charged up to 4,2V with a current that is usually half of the nominal capacity (C/2). For Arduino / Genuino MKR1000 we use a specialized chip that has a preset charging current of 350mAh. This means that the MINIMUM capacity of the Li-Po battery should be 700 mAh. Smaller cells will be damaged by this current and may overheat, develop internal gasses and explode, setting on fire the surroundings. We strongly recommend that you select a Li-Po battery of at least 700mAh capacity. A bigger cell will take more time to charge, but won't be harmed or overheated. The chip is programmed with 4 hours of charging time, then it goes into automatic sleep mode. This will limit the amount of charge to max 1400 mAh per charging round.

### Battery connector

If you want to connect a battery to your MKR1000 be sure to search one with female 2 pin JST PHR2 Type connector. Polarity : looking at the board connector pins, polarity is Left = Positive, Right = GND. Download here the [Connector datasheet](#). On the MKR1000, connector is a Male 2pin JST PH Type. **Vin** This pin can be used to power the board with a regulated 5V source. If the power is fed through this pin, the USB power source is disconnected. This is the only way you can supply 5v (range is 5V to maximum 6V) to the board not using USB. This pin is an INPUT. **5V** This pin outputs 5V from the the board when powered from the USB connector or from the VIN pin of the board. It is unregulated and the voltage is taken directly from the inputs. When powered from battery it supplies around 3.7 V. As an OUTPUT, it should not be used as an input pin to power the board.

### VCC

This pin outputs 3.3V through the on-board voltage regulator. This voltage is the same regardless the power source used (USB, Vin and Battery).

### LED ON

This LED is connected to the 5V input from either USB or VIN. It is not connected to the battery power. This means that it lits up when power is from USB or VIN, but stays off when the board is running on battery power. This maximizes the usage of the energy stored in the battery. It is therefore normal to have the board properly running on battery power without the LED ON being lit.

### CHARGE LED

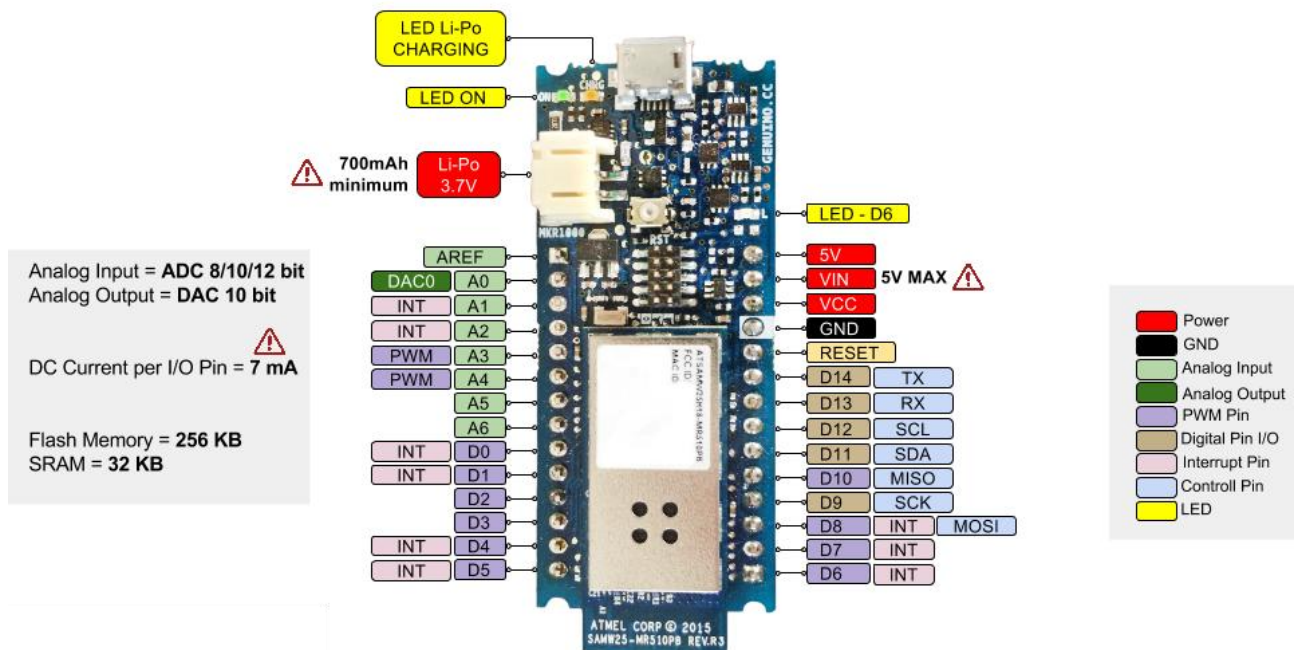
The CHARGE LED on the board is driven by the charger chip that monitors the current drawn by the Li-Po battery while charging. Usually it will lit up when the board gets 5V from VIN or USB and the chip starts charging the Li-Po battery connected to the JST connector. There are several occasions where this LED will start to blink at a frequency of about 2Hz. This flashing is caused by the following conditions maintained for a long time (from 20 to 70 minutes): - No battery is connected to JST connector. - Overdischarged/damaged battery is connected. It can't be recharged. - A fully charged battery is put through another unnecessary charging cycle. This is done disconnecting and reconnecting either VIN or the battery itself while VIN is connected.

### Onboard LED

On MKR1000 the onboard LED is connected to **D6** and not D13 as on the other boards. Blink example or other sketches that uses pin 13 for onboard LED may need to be changed to work properly.

**(\*) Note : DO NOT CONNECT to the male JST connector present on the board anything else than a Li-Po battery whose characteristics are compliant with those indicated above. Please DO NOT POWER VIN with more than 5V.**

# MKR1000 PINOUT



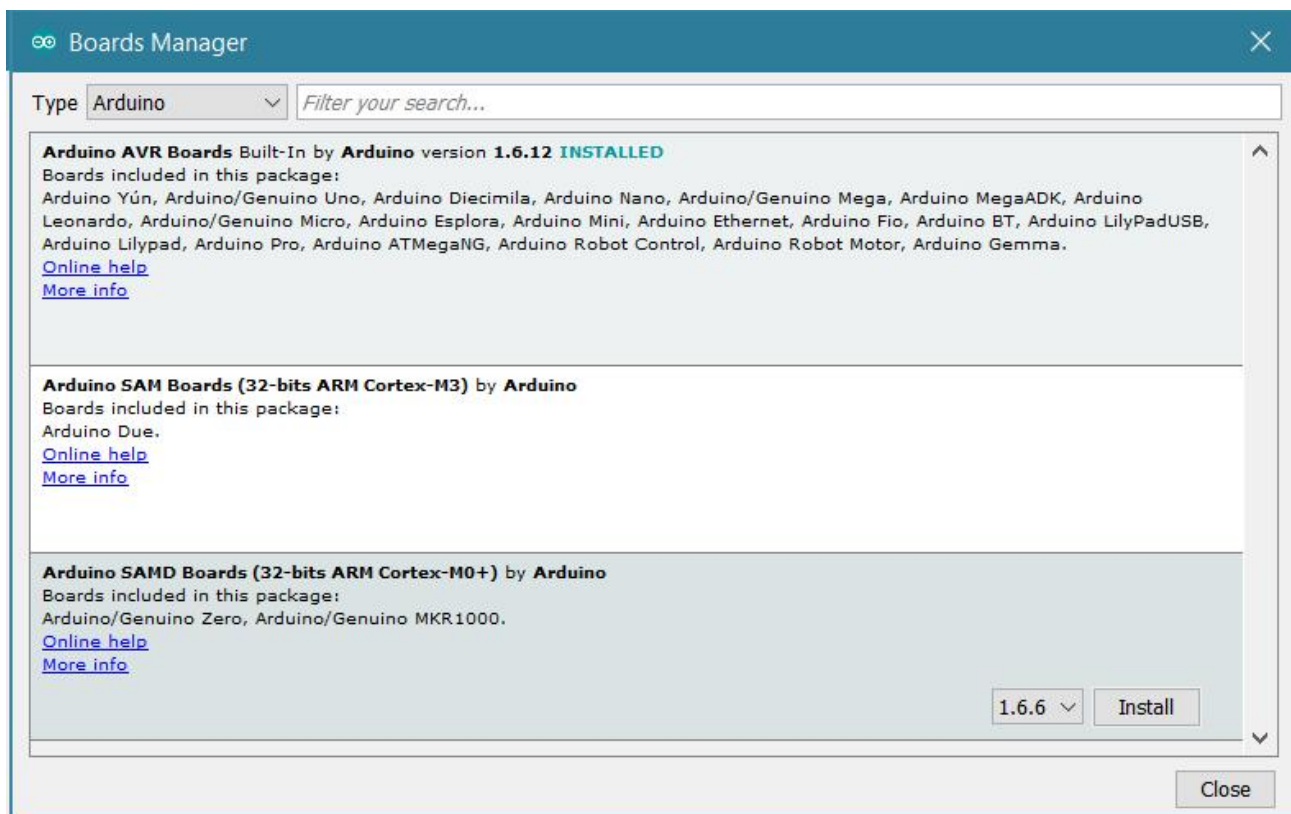
## Use your Arduino/Genuino MKR1000 on the Arduino Web IDE

All Arduino and Genuino boards, including this one, work out-of-the-box on the [Arduino Web Editor](#), no need to install anything.

The Arduino Web Editor is hosted online, therefore it will always be up-to-date with the latest features and support for all boards. Follow this [simple guide](#) to start coding in the browser and upload your sketches onto your board.

## Use your Arduino/Genuino MKR1000 on the Arduino Desktop IDE

If you want to program your MKR1000 while offline you need to install the [Arduino Desktop IDE](#) and add the Atmel SAMD Core to it. This simple procedure is done selecting Tools menu, then Boards and last Boards Manager, as documented in the [Arduino Boards Manager](#) page.



### Installing Drivers for the MKR1000

With the SAMD core installed, you now proceed with the driver installation.

#### OSX

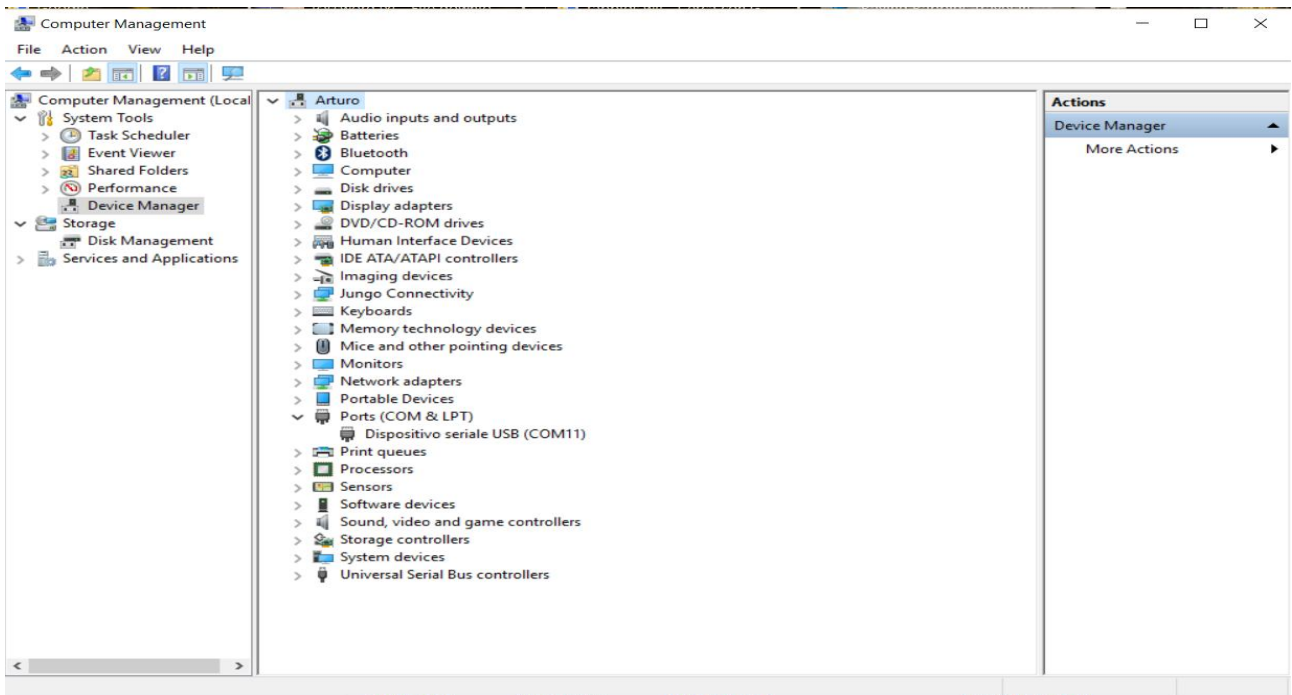
No driver installation is necessary on OSX. Depending on the version of the OS you're running, you may get a dialog box asking you if you wish to open the "Network Preferences". Click the "Network Preferences..."



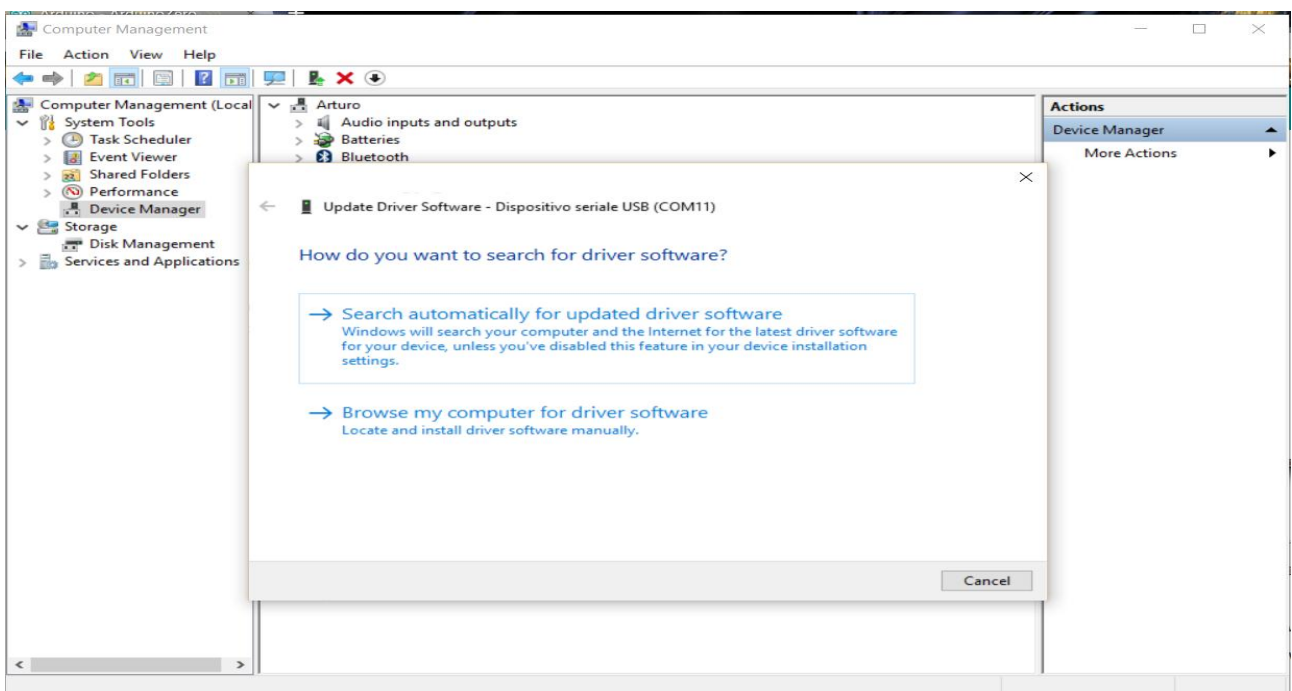
button, then click "Apply". The MKR1000 will show up as "Not Configured", but it is still working. You can quit the System Preferences.

### Windows (tested on 7, 8 and 10)

Connect the MKR1000 to your computer with a USB cable. Windows should initiate its driver installation process once the board is plugged in, but it won't be able to find the driver on its own. You'll have to tell it where the driver is. Click on the Start Menu and open the Control Panel. Navigate to "System and Security". Click on System, and open the Device Manager. Look for the listing named "Ports (COM & LPT)". You should see an open port named "MKR1000". Right click on the "MKR1000" and choose "Update Driver Software".



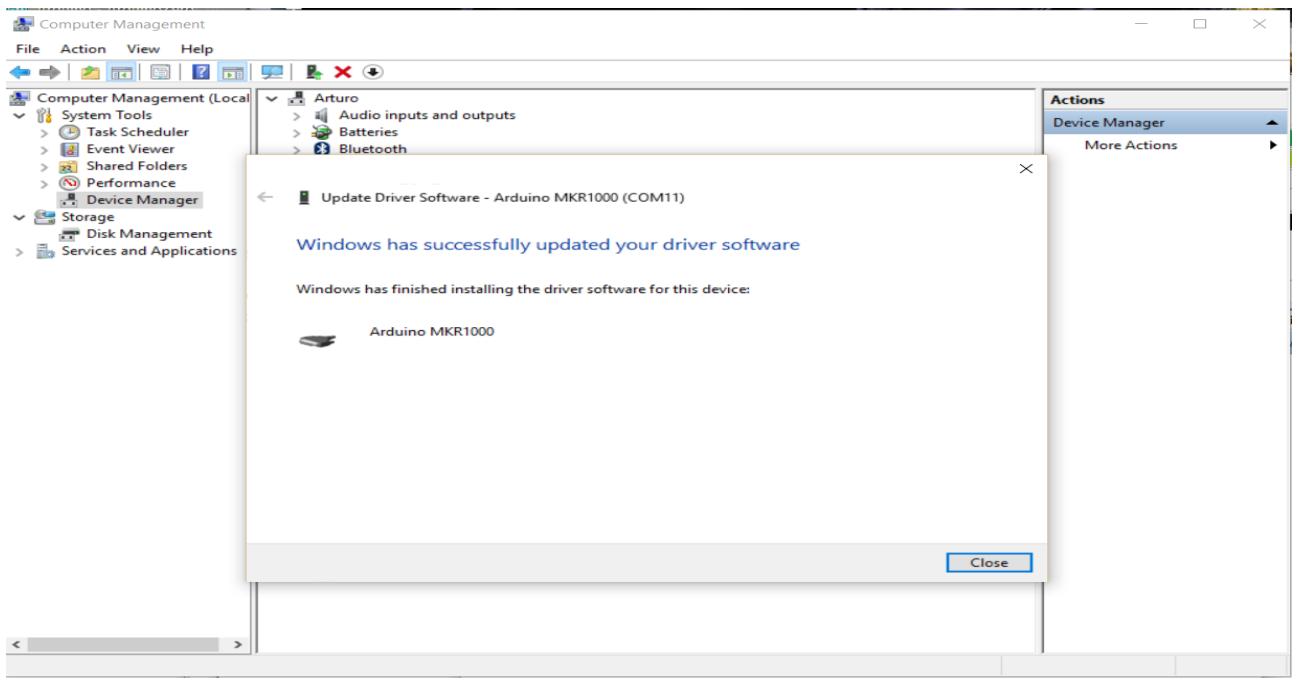
Select the "Browse my computer for Driver software" option.



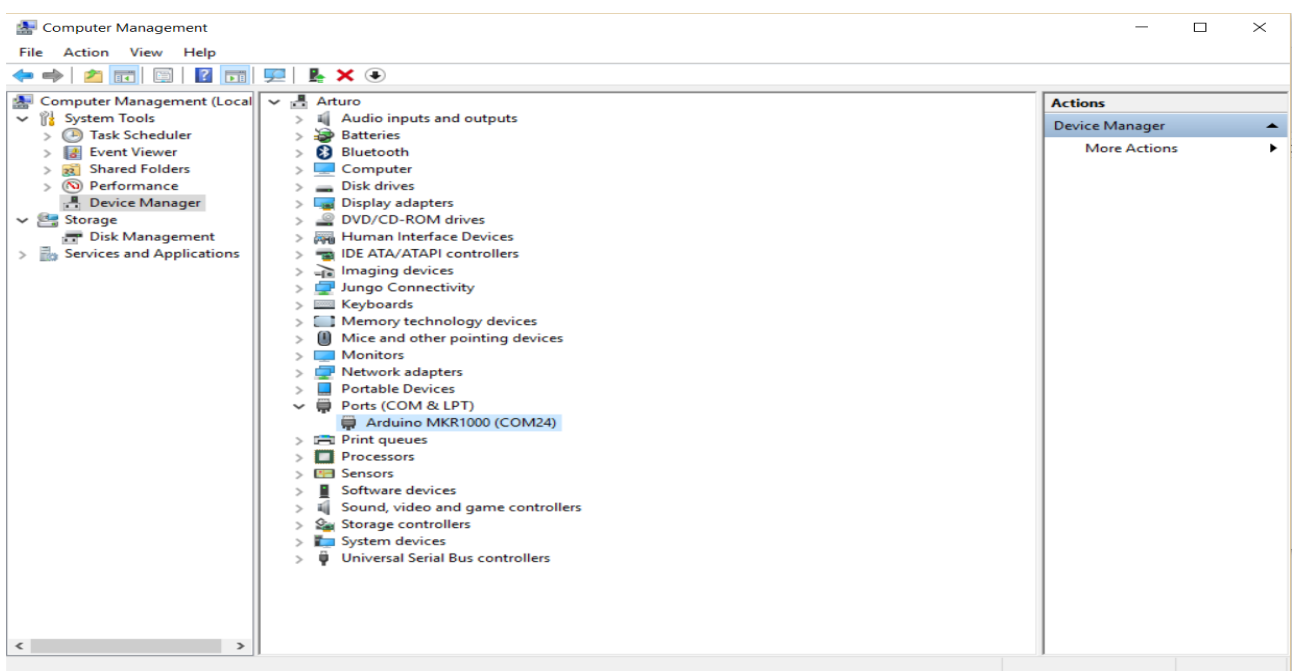
Navigate to the folder with the Arduino Software (IDE) you downloaded and unzipped earlier. Locate and select the “Drivers” folder in the main Arduino folder (not the “FTDI USB Drivers” sub-directory). Press “OK” and “Next” to proceed.

- If you are prompted with a warning dialog about not passing Windows Logo testing, click “Continue Anyway”.

Windows now will take over the driver installation.



You have installed the driver on your computer. In the Device Manager, you should now see a port listing similar to “MKR1000 (COM24)” If you have multiple COM devices, the MKR1000 will probably be the COM port with the highest number.

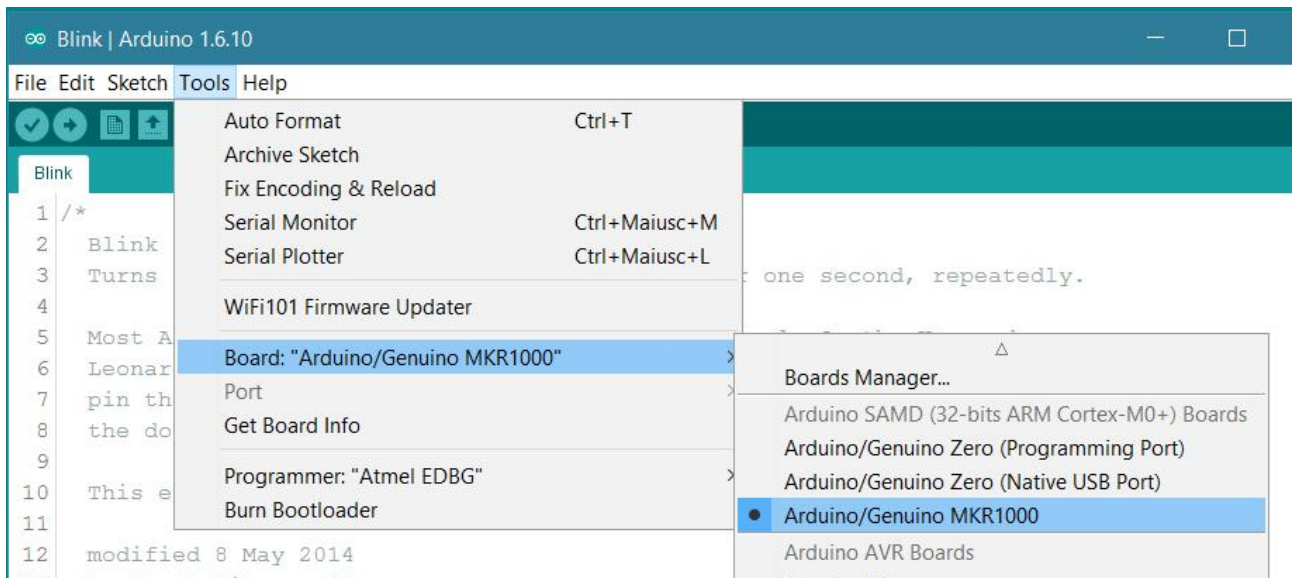


## Linux

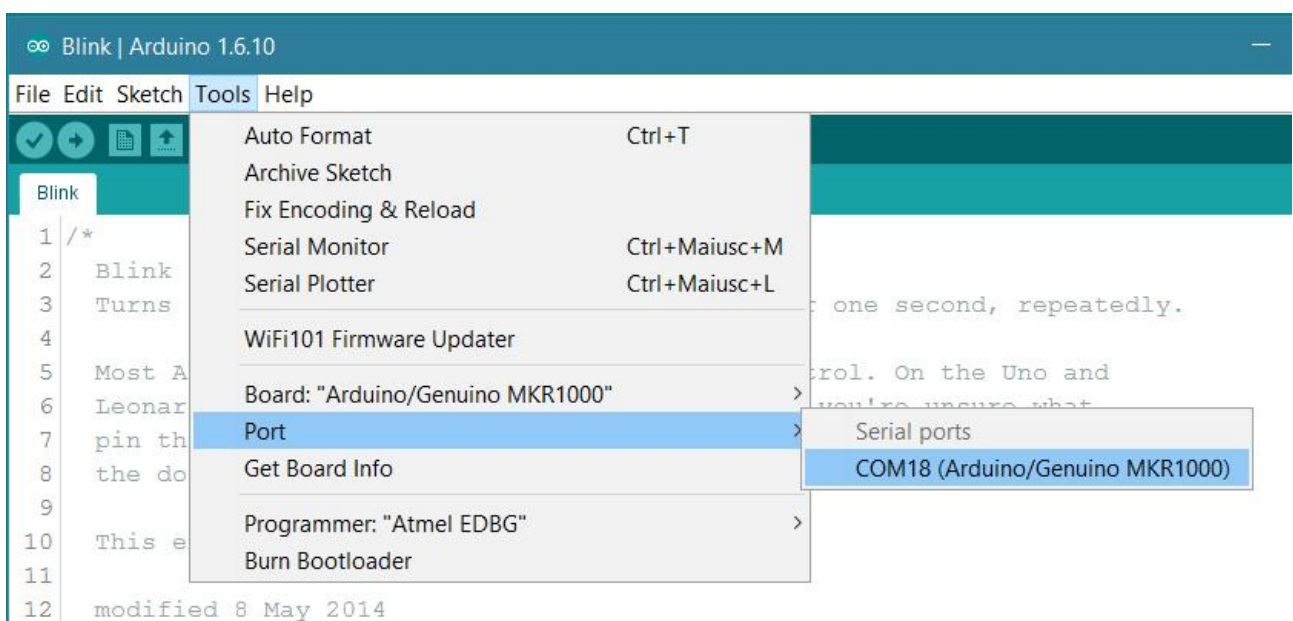
No driver installation is necessary for Linux.

### Select your board type and port

You'll need to select the entry in the Tools > Board menu that corresponds to your Arduino or Genuino board.



Select the serial device of the board from the Tools | Serial Port menu. This is likely to be COM3 or higher (COM1 and COM2 are usually reserved for hardware serial ports). To find out, you can disconnect your board and re-open the menu; the entry that disappears should be the Arduino or Genuino board. Reconnect the board and select that serial port.





## Please Read...

The microcontroller on the MKR1000 runs at 3.3V, which means that you must never apply more than 3.3V to its Digital and Analog pins. Care must be taken when connecting sensors and actuators to assure that this limit of 3.3V is never exceeded. Connecting higher voltage signals, like the 5V commonly used with the other Arduino boards, will damage the MKR1000.

### *Features*

#### Serial ports on the MKR1000

The USB connector of the board is directly connected to the USB host pins of the SAMD21. This routing enables you to use the MKR1000 as a client USB peripheral (acting as a mouse or a keyboard connected to the computer) or as a USB host device so that devices like a mouse, keyboard, or an Android phone can be connected to the MKR1000. This port can also be used as a virtual serial port using the "Serial" object in the Arduino programming language.

#### ADC and PWM resolutions

The MKR1000 has the ability to change its analog read and write resolutions (defaults to 10-bits and 8-bits, respectively). It can support up to 12-bit ADC/PWM and 10-bit DAC resolutions. See the [analog write resolution](#) and [analog read resolution](#) pages for more information.

WiFi on the MKR1000 This board is fully compatible with the [WiFi101 library](#) and examples originally made for the Arduino WiFi101 Shield.

### *Upgrading Firmware and uploading SSL certificates*

When it is needed, the WiFi101 library is updated to implement new features. This usually requires an update of the WiFifirmware with a specific tool. The board comes with a number of root certificates that allow the secure connection with a wide variety of websites. If you need to use different certificates, you need to use the same tool. Please refer to the Firmware Updater sketch and plug-in documentation, available from the [WiFi101 library page](#).