Arduino Nano Pinout, Specifications, and Comparison

This article includes everything you need to know about each of the 5 currently available Arduino Nano boards.
The Arduino Nano was first released in 2008 and is still one of the most popular Arduino boards available. The Nano is a breadboard-friendly board, based on the ATmega328 8-bit microcontroller by Atmel (Microchip Technology). It has more or less the same functionality as the Arduino Uno but in a smaller form factor. The only thing that is missing is a DC power jack and it works with a Mini-B USB cable instead of a standard one.

The specifications of the latest version of the Arduino Nano can be found below.

Arduino Nano specifications

Microcontroller	ATmega328
Operating voltage	5 V
Input voltage (VIN)	6-20 V

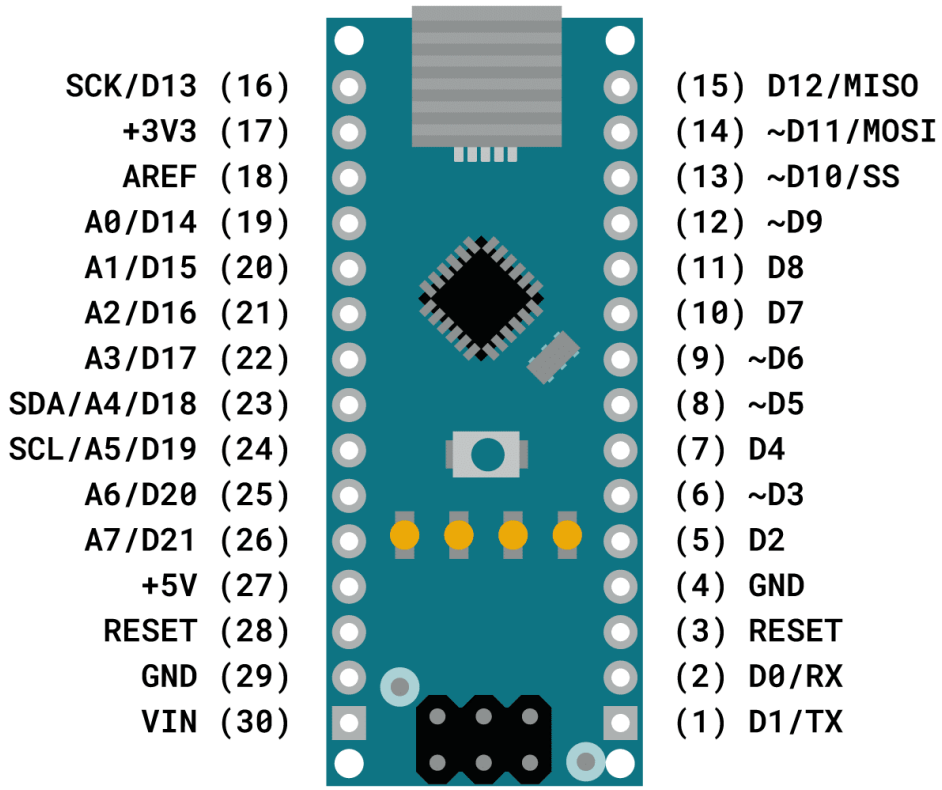
Power consumption	19 mA
Flash memory	32 KB of which 2 KB is used by bootloader
SRAM	2 KB
Clock speed	16 Mhz
EEPROM	1 KB
DC current per I/O pin	40 mA (20 mA recommended)
Digital I/O pins	22
PWM outputs	6 (D3, D5, D6, D9, D10, D11)
Analog input pins	8 (ADC 10 bit)
I2C	A4 (SDA), A5 (SCL)
SPI	D10 (SS), D11 (MOSI), D12 (MISO), D13 (SCK)
LED_BUILTIN	D13
PCB size	18 x 45 mm
Weight	7 g

If you want to compare the specifications and functionality of this board with the other boards of the Arduino Nano family, check out the comparison table at the end of this article.

The Arduino Nano is open-source hardware!

Arduino Nano pinout

The pinout of the Arduino Nano can be found in the diagram below:



All of the digital pins of the Arduino Nano can be used as input or output, using the functions pinMode(), digitalRead(), and digitalWrite(). They operate at 5 V and each pin can receive or provide a maximum of 40 mA of current.

All the digital and analog pins also have an internal pull-up resistor (disconnected by default) of 20-50 kOhms. To use this pull-up resistor, you can use:

```
void setup() {

pinMode(3, INPUT_PULLUP);

}
```

This can be useful when you don’t want a pin to be floating, e.g. when you connect a button to a pin.

Note that the analog pins can also be used as digital pins, using the aliases A0, A1, etc. The exception is the Arduino Nano’s A6 and A7 pins, which can only be used as analog inputs.

```
pinMode(A0, OUTPUT);
```

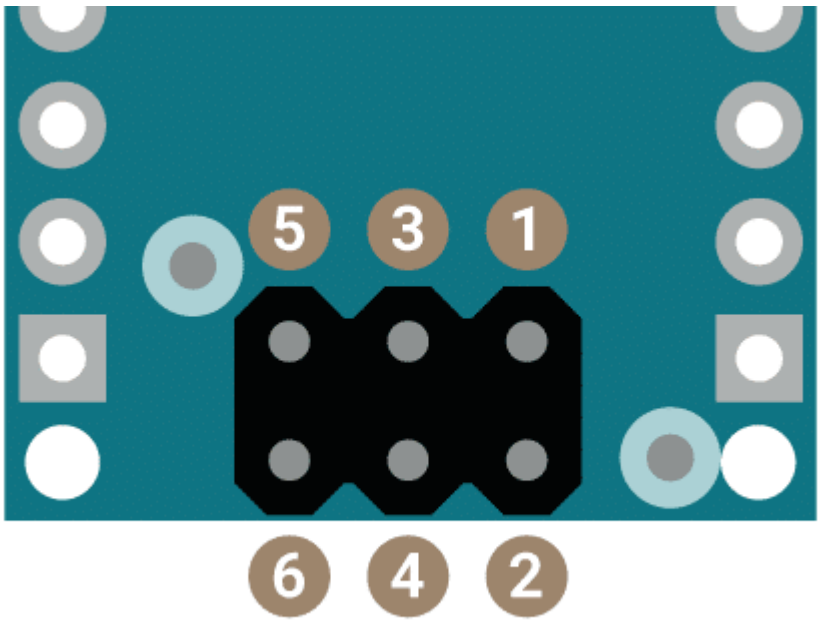
```
digitalWrite(A0, HIGH);
```

Some pins also have additional functions which you can find in the table below:

Pin number	Pin name	Type	Special function
1	D1/TX	Digital Pin	Serial communication (TX)
2	D0/RX	Digital Pin	Serial communication (RX)
3	RESET	Other pin	Reset (active LOW)
4	GND	Ground	
5	D2	Digital Pin	External interrupt
6	~D3	Digital Pin	External interrupt 8-bit PWM output
7	D4	Digital Pin	
8	~D5	Digital Pin	8-bit PWM output
9	~D6	Digital Pin	8-bit PWM output
10	D7	Digital Pin	
11	D8	Digital Pin	
12	~D9	Digital Pin	8-bit PWM output
13	~D10	Digital Pin	SPI communication (SS) 8-bit PWM output
14	~D11	Digital Pin	SPI communication (MOSI) 8-bit PWM output
15	D12	Digital Pin	SPI communication (MISO)
16	D13	Digital Pin	SPI communication (SCK) Connected to a built-in LED
17	+3V3	Power	
18	AREF	Analog Pin	Reference voltage for the analog inputs
19	D14 A0	Digital Pin Analog Pin	
20	D15 A1	Digital Pin Analog Pin	
21	D16	Digital Pin	

Pin number	Pin name	Type	Special function
	A2	Analog Pin	
22	D17 A3	Digital Pin Analog Pin	
23	D18 A4	Digital Pin Analog Pin	I2C communication (SDA)
24	D19 A5	Digital Pin Analog Pin	I2C communication (SCL)
25	D20 A6	Digital Pin Analog Pin	Cannot be used as a digital pin
26	D21 A7	Digital Pin Analog Pin	Cannot be used as a digital pin
27	+5V	Power	
28	RESET	Other pin	Reset (active LOW)
29	GND	Ground	Ground
30	VIN	Power	6 – 20 V input to the board

Arduino Nano ICSP pins



At the bottom of the Arduino Nano, you can find the ICSP (In-Circuit Serial Programming) header (6 pins). The pinout of this connector is as follows:

Pin number	Pin Name	Type	Function
1	MISO	Communication	Master in slave out
2	+5V	Power	Supply voltage
3	SCK	Communication	Clock
4	MOSI	Communication	Master out slave in
5	RESET	Other pin	Reset (active LOW)
6	GND	Ground	Supply ground

The ICSP connector can be used to program the microcontroller using Arduino ISP or similar (this bypasses the bootloader).

How to power the Arduino Nano?

The Arduino Nano can be powered in 3 ways:

1. **Mini-B USB connector**: The most popular way to power the Arduino Nano board is with a USB cable. You can use a Mini-B USB cable connected to the USB port of your laptop, PC, or 5 V USB power adapter. This cable is also used to program the Arduino Nano.
2. **VIN pin**: You can also power the Arduino Nano with an unregulated 6 – 20 V external power supply connected to the VIN pin (pin 30). This pin can also be used to power the microcontroller with a battery for example.
3. **+5V pin**: It is also possible to use a 5 V external regulated power supply connected to the +5V pin (pin 27). However, this is method is not recommended because it bypasses the voltage regulators. If you want to power the board in this way, you have to make sure that the voltage level is stable and does not exceed 5 V.

If you connect multiple voltage sources, the power source is automatically selected to the highest voltage source.

Programming the Arduino Nano

The easiest way to program the Arduino Nano is with the Arduino IDE or the Arduino Web Editor. The advantage of the Arduino Web Editor is that you don't need to install anything and your sketches are stored in the cloud.

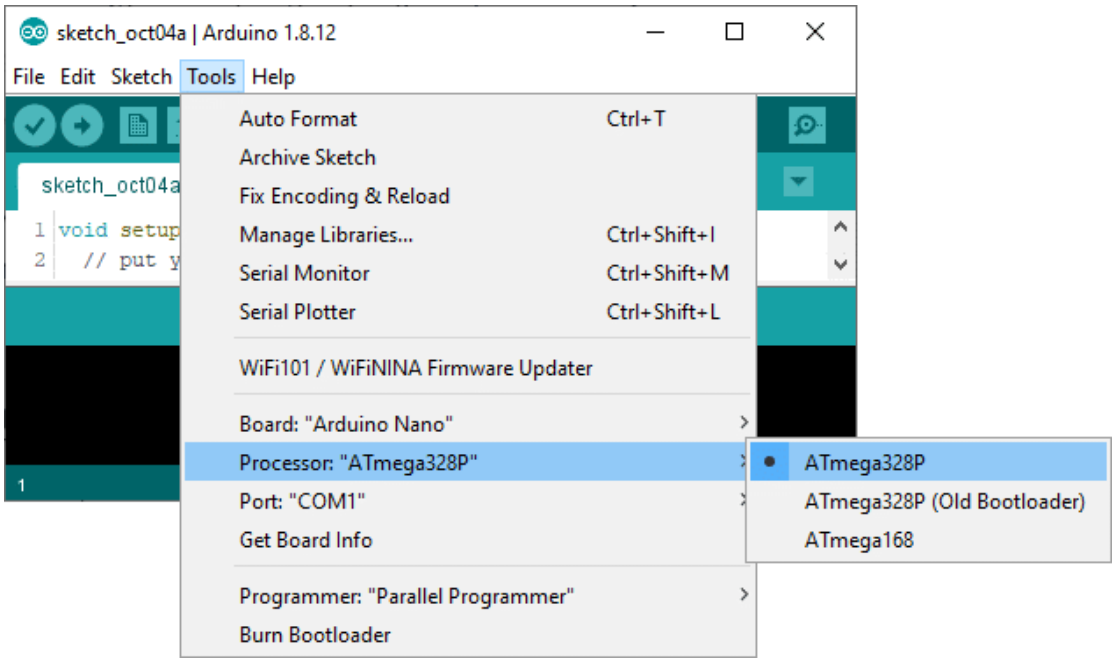
Selecting the right board type and processor/bootloader

In the desktop Arduino IDE, you have to select the right board type, processor, and port if you want to upload sketches to the Arduino Nano.

To select the right board, go to **Tools > Board > Arduino AVR Boards > Arduino Nano**.

Since January 2018, Arduino Nano boards come with a new bootloader. If you have a genuine Arduino Nano that was purchased after this date, you have to select ATmega328P under **Tools > Processor > ATmega328P**.

If you have an older board (or an Arduino Nano compatible board/knockoff from Amazon, AliExpress, Banggood, etc.), you have to choose **Tools > Processor > ATmega328P (Old Bootloader)**.



If you get an error while uploading the sketch, try changing the processor until the program compiles and uploads properly.

Lastly, select the COM port to which the Arduino Nano is connected under **Tools > Port**.

Communication

The Arduino Nano has several default pins that are used for communication between the Arduino board and a computer or other devices.

Serial

Digital pins D0 (RX) and D1 (TX) are used to receive (RX) and transmit (TX) TTL serial data. These pins are connected to the corresponding pins of the FTDI USB-to-TTL Serial chip.

I2C

Analog pins A4 (SDA) and A5 (SCL) support I2C (TWI) communication using the Wire library. This library can be used to communicate between the Arduino Nano and sensors, displays, other Arduino boards, etc.

In the table below, you can find the I2C pins of some of the other Arduino boards.

Board	SDA	SCL
Arduino Uno	A4	A5
Arduino Nano	A4	A5
Arduino Micro	2	3
Arduino Mega 2560	20	21
Arduino Leonardo	2	3
Arduino Due	20	21

SDA and SCL pin locations on different Arduino boards.

SPI

Digital pins D10 (SS), D11 (MOSI), D12 (MISO), and D13 (SCK) support SPI communication. Although SPI communication is provided by the underlying hardware, it is not currently included in the Arduino language.

Note that most of the SPI pins can also be found at the ICSP header, the only pin that is missing is the slave select pin (SS). This header is for example used by the Pixy2 camera to talk to the Arduino over SPI.

Arduino Nano LEDs

The Arduino Nano has 4 LEDs; TX LED, RX LED, Power, and LED_BUILTIN.

The **TX and RX LEDs** will flash when data is being transmitted via the FTDI chip and USB connection to the computer (but not for serial communication on pins 0 and 1).

The **power LED** (ON) lights up when the board is powered up.

The **LED_BUILTIN** (L) is connected to digital pin 13 of the board. When this pin is HIGH, the LED is on, when the pin is LOW, it's off. You can also use the constant LED_BUILTIN in your code, e.g. when using digitalWrite(pin, value).

```
// the setup function runs once when you press reset or power the board

void setup() {

// initialize digital pin LED_BUILTIN as an output.

pinMode(LED_BUILTIN, OUTPUT);

}

// the loop function runs over and over again forever

void loop() {

digitalWrite(LED_BUILTIN, HIGH); // turn the LED on (HIGH is the voltage level)
```

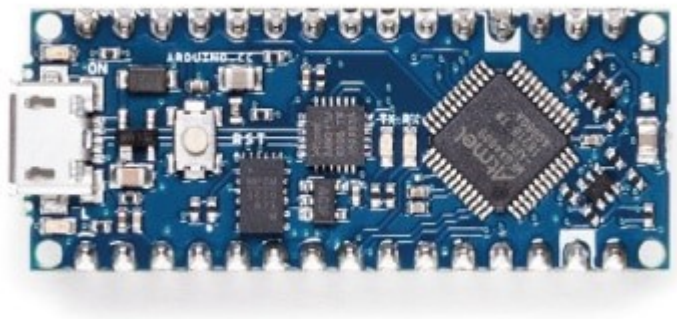
```
delay(1000); // wait for a second

digitalWrite(LED_BUILTIN, LOW); // turn the LED off by making the voltage LOW

delay(1000); // wait for a second

}
```

Arduino Nano Every



The Arduino Nano Every is one of the newer, more powerful Arduino Nano boards. It uses the ATmega4809 microcontroller and is the cheapest Arduino board you can buy!

This board is also 5 V compatible and has the same form factor as the original Arduino Nano (18 x 45 mm). The small size and low cost make it ideal for wearable projects, low-cost robotics, drones, and also general use to control smaller parts of larger projects.

The key feature of the Arduino Nano Every is its new processor with more RAM and flash memory. This means that you can make larger programs with more variables than with the Arduino Uno.

Arduino Nano Every specifications

Microcontroller	ATmega4809 (datasheet)
Operating voltage	5 V
Input voltage (VIN)	7-21 V
DC current per I/O pin	40 mA (20 mA recommended)
DC current for 3.3 V pin	50 mA

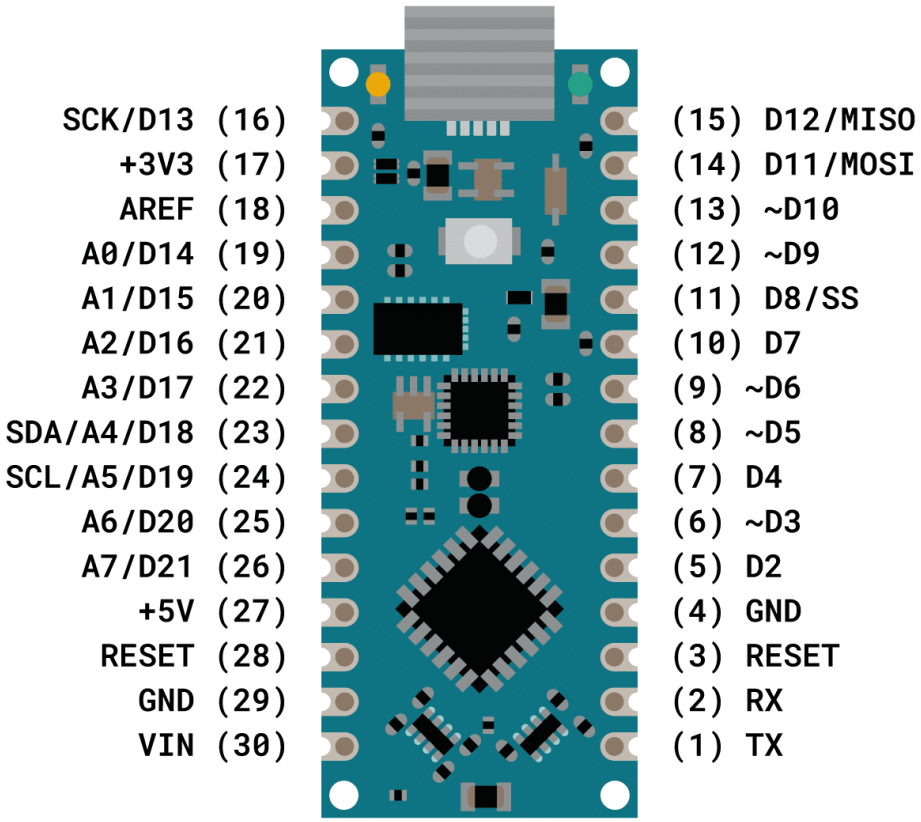
CPU flash memory	48 KB (ATMega4809)
SRAM	6 KB (ATMega4809)
Clock speed	20 MHz
EEPROM	256 byte (ATMega4809)
PWM pins	5 (D3, D5, D6, D9, D10)
UART	1
SPI	1
I2C	1
Analog input pins	8 (ADC 10 bit)
Analog output pins	Only through PWM (no DAC)
External interrupts	All digital pins
LED_BUILTIN	D13
USB	ATSAMD11D14A
PCB size	18 x 45 mm
Weight	5 g (with headers)

Arduino Nano Every pinout

The pinout of the Arduino Nano Every can be found in the diagram below. Note that the Arduino Nano Every is almost 100% pin-compatible with the original Arduino Nano and it also runs on 5 V. The important differences are:

- This board doesn't have PWM on D11 and therefore it supports only 5 PWM outputs instead of 6.
- SPI SS is on pin D8 instead of D10.
- External interrupts are allowed on all pins, not just pin D2 and D3.
- Analog pins A6 and A7 can also be used as digital pins.

The green LED on the board (right) is the power LED and the orange LED (left) is LED_BUILTIN.

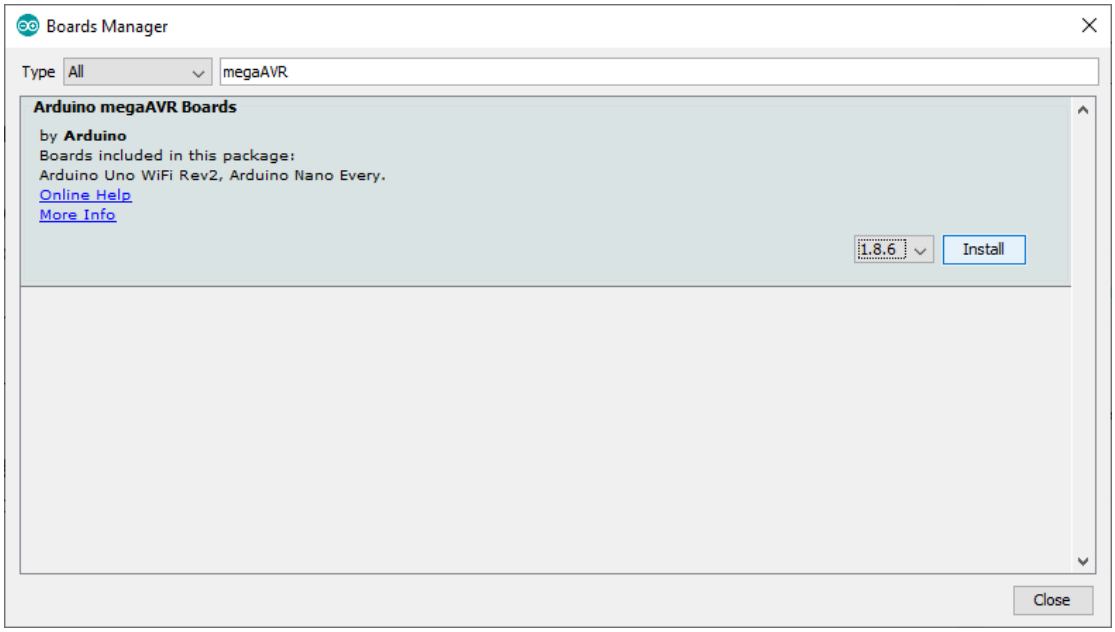


Programming the Arduino Nano Every

If you want to use the desktop Arduino IDE to program the Arduino Nano Every, you have to follow a couple of steps before you can upload sketches to the board.

Install megaAVR core and drivers

First, you need to add the Arduino MegaAVR core to the Arduino IDE. To do this go to **Tools > Board > Boards Manager**. Now search for 'megaAVR' and select **Arduino megaAVR Boards** by **Arduino**. Select the latest version and click Install.



After you have installed the megaAVR core, the drivers will install automatically once you connect the Arduino Nano Every to your computer with a USB cable.

Select the right board and port

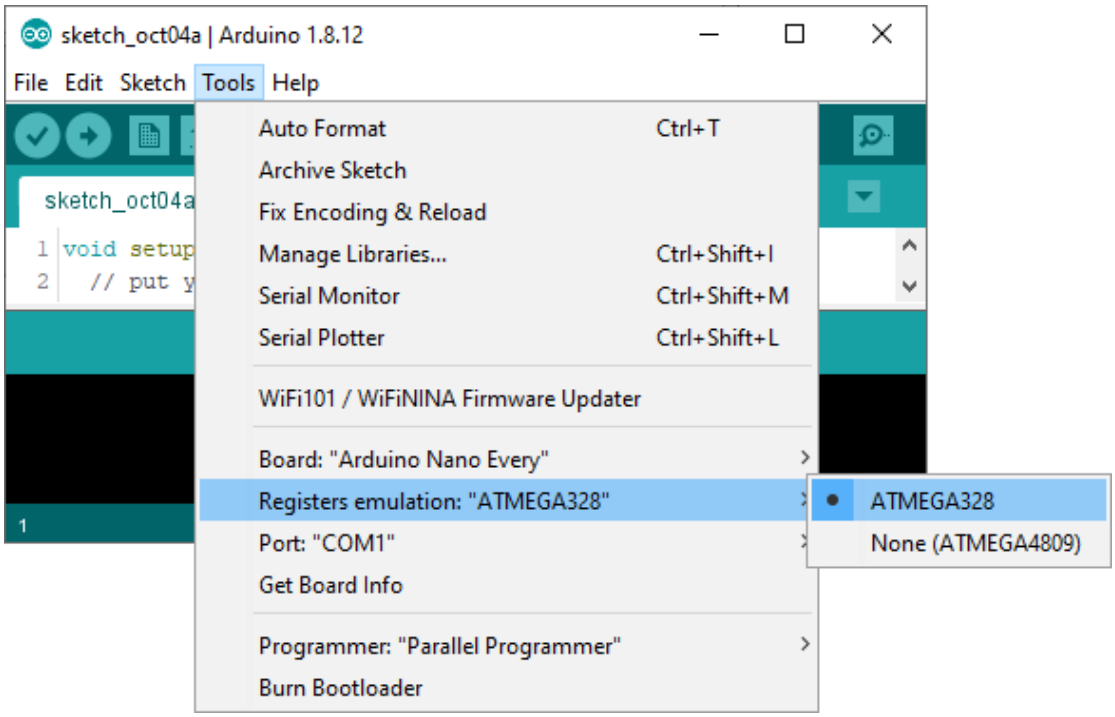
Now select **Arduino Nano Every** under **Tools > Board > Arduino megaAVR Boards**.

Next, select the right COM port under the **Tools > Port** menu. If you disconnect and reconnect your board while looking at the menu, you should be able to see which entry is the Arduino board.

Compilation errors? Try “Register emulation”

Although the Arduino Nano Every is fully electrically compatible with the original Arduino Nano (it also works at 5 V), you might run into issues if your (old) code uses third-party libraries that don’t manage the pin mapping of the microcontroller.

If you have compilation errors you can try to turn on the “Register emulation” mode to emulate ATmega328P registers in the ATmega4809 while compiling.



Arduino Nano 33 IoT

Arduino Nano 33 IoT (Source: Arduino)

The Arduino Nano 33 IoT is one of the 3.3 V variants of the Arduino Nano family. It features an Arm Cortex-M0+ microcontroller, pre-certified ESP32-based WiFi and Bluetooth module from u-blox, and an onboard ECC608A crypto chip which provides IoT security. The board also features an LSM6DS3 6-axis IMU.

The Nano 33 IoT is essentially an MKR WiFi 1010, but it sacrifices a battery charger and shield compatibility in favor of a smaller footprint and lower cost. It costs even less than the original Arduino Nano!

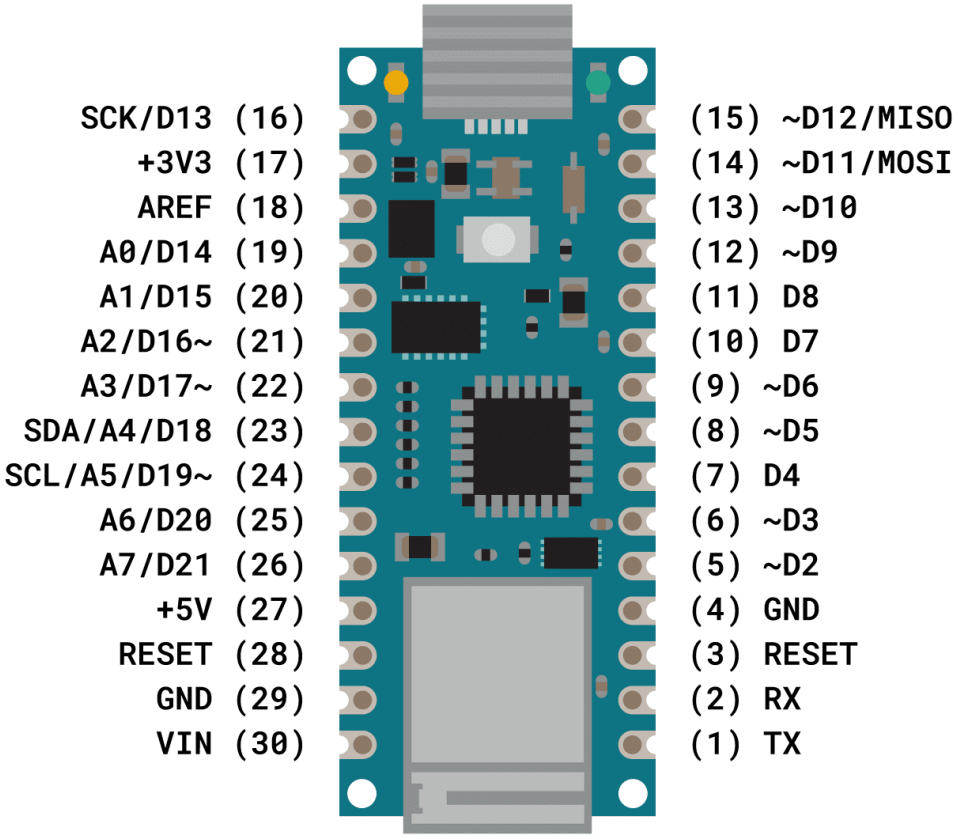
Arduino Nano 33 IoT specifications

Microcontroller	SAMD21 Cortex®-M0+ 32bit low power ARM MCU

Radio module	u-blox NINA-W102
Secure element	ATECC608A
Operating voltage	3.3 V
Input voltage (VIN)	5-21 V
DC current per I/O pin	7 mA
CPU flash memory	256 KB
SRAM	32 KB
Clock speed	48 MHz
EEPROM	None
Digital I/O pins	14
PWM pins	11 (2, 3, 5, 6, 9, 10, 11, 12, 16 / A2, 17 / A3, 19 / A5)
UART	1
SPI	1
I2C	1
Analog input pins	8 (ADC 8/10/12 bit)
Analog output pins	1 (DAC 10 bit)
External interrupts	All digital pins (all analog pins can also be used as interrupt pins, but will have duplicated interrupt numbers)
LED_BUILTIN	D13
USB	Native in the SAMD21 processor
Inertial measurement unit (IMU)	LSM6DS3 (6-axis)
PCB size	18 x 45 mm
Weight	5 g (with headers)

Arduino Nano 33 IoT pinout

The pinout of the Nano 33 IoT is almost exactly the same as the original Nano board (see diagram below).



A couple of important things to remember are:

- The Arduino Nano 33 IoT only supports 3.3 V for the GPIO pins, so it is **not 5 V tolerant** like most of the other Arduino boards. Connecting more than 3.3 V to the GPIO pins will damage the board!
- **The +5V pin on the board is not connected by default.** If you want to use this pin, you have to short the VBUS jumper on the back of the board. Note that this pin only outputs 5 V from the board when powered from the USB connector. If you power the board from the VIN pin, you won't get any regulated 5 V, even if you do the solder bridge.

- As opposed to other Arduino Nano boards, pins A4 and A5 have an internal pull-up and default to be used as an I2C bus. **So, usage as analog inputs is not recommended.**

Programming the Arduino Nano 33 IoT on the Arduino IDE

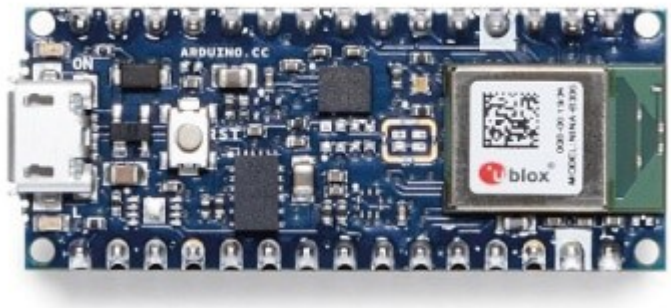
If you want to program this board with the Arduino desktop IDE, you need to add the Arduino SAMD Core to it. To do this go to **Tools > Board > Boards Manager**. Now search for 'SAMD' and select **Arduino SAMD Boards (32-bits ARM Cortex-M0+)** by **Arduino**. Select the latest version and click Install.

If you properly installed the SAMD Core, Windows should initiate its driver installation process automatically once you connect the board to your computer with a micro USB cable.

Before you can upload your program to the board, select **Arduino NANO 33 IoT** under **Tools > Board > Arduino SAMD (32-bits ARM Cortex-M0+) Boards**.

Next, select the right COM port under the **Tools > Port** menu. If you disconnect and reconnect your board while looking at the menu, you should be able to see which entry is the Arduino board.

Arduino Nano 33 BLE



The Arduino Nano 33 BLE is based on the powerful Nordic nRF52840 microcontroller with advanced Bluetooth capabilities. The board features a u-blox NINA B306 module and also includes a 9-axis inertial measurement unit (IMU). The IMU is an LSM9DS1, which is a 3-axis accelerometer, 3-axis gyroscope, and 3-axis magnetometer. You can use the example sketches in the ArduinoLSM9DS1 library to use the sensor.

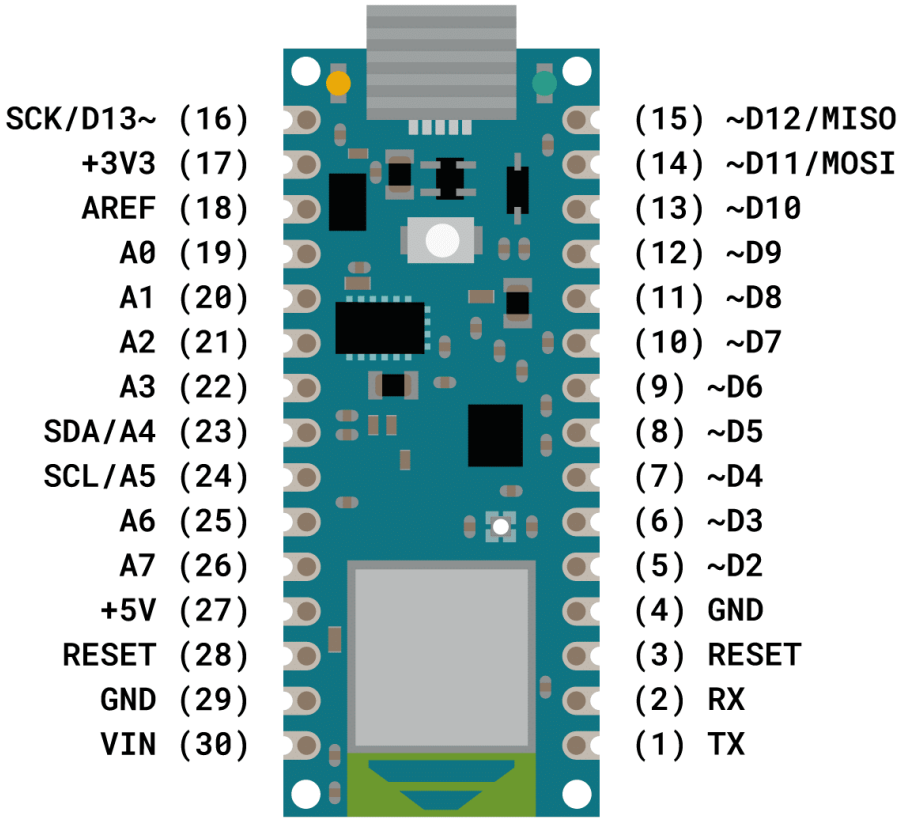
The main processor is a lot more powerful than the one from the standard Arduino Nano (it has 1 MB of program memory and 256 KB of RAM) and runs at a much higher clock speed. It also includes other amazing features like Bluetooth pairing via NFC and ultra low power consumption modes.

Arduino Nano 33 BLE specifications

Microcontroller	nRF52840
Operating voltage	3.3 V
Input voltage (VIN)	5-21 V
DC current per I/O pin	15 mA
CPU flash memory	1 MB (nRF52840)
SRAM	256 KB (nRF52840)
Clock speed	64 MHz
EEPROM	None
Digital I/O pins	14
PWM pins	All digital pins
UART	1

SPI	1
I2C	1
Analog input pins	8 (ADC 12 bit 200 k samples)
Analog output pins	Only through PWM (no DAC)
External interrupts	All digital pins
LED_BUILTIN	D13
USB	Native in the nRF52840 processor
Inertial measurement unit (IMU)	LSM9DS1 (9-axis)
PCB size	18 x 45 mm
Weight	5 g (with headers)

Arduino Nano 33 BLE pinout

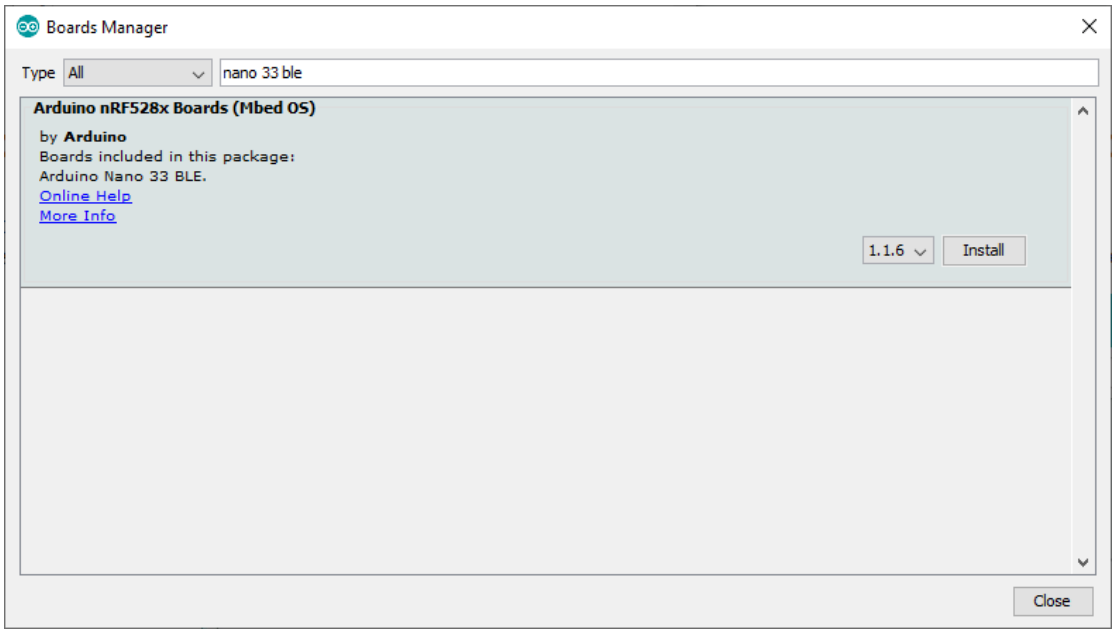


Just like the Arduino Nano 33 IoT, you need to short the VBUS jumper on the back of the board if you want to use the +5V output.

You can connect an external NFC antenna between pins D7 and D8 to activate Bluetooth pairing of the board over NFC.

Programming the Arduino Nano 33 BLE/Sense with the Arduino IDE

If you want to use the Arduino Nano 33 BLE or BLE Sense with the Arduino Desktop IDE, you need to add the Arduino nRF528x mbed Core to it. To do this go to **Tools > Board > Boards Manager**. Now search for 'nano 33 ble' and select **Arduino nRF528x Boards (Mbed OS)** by **Arduino**. Select the latest version and click Install.



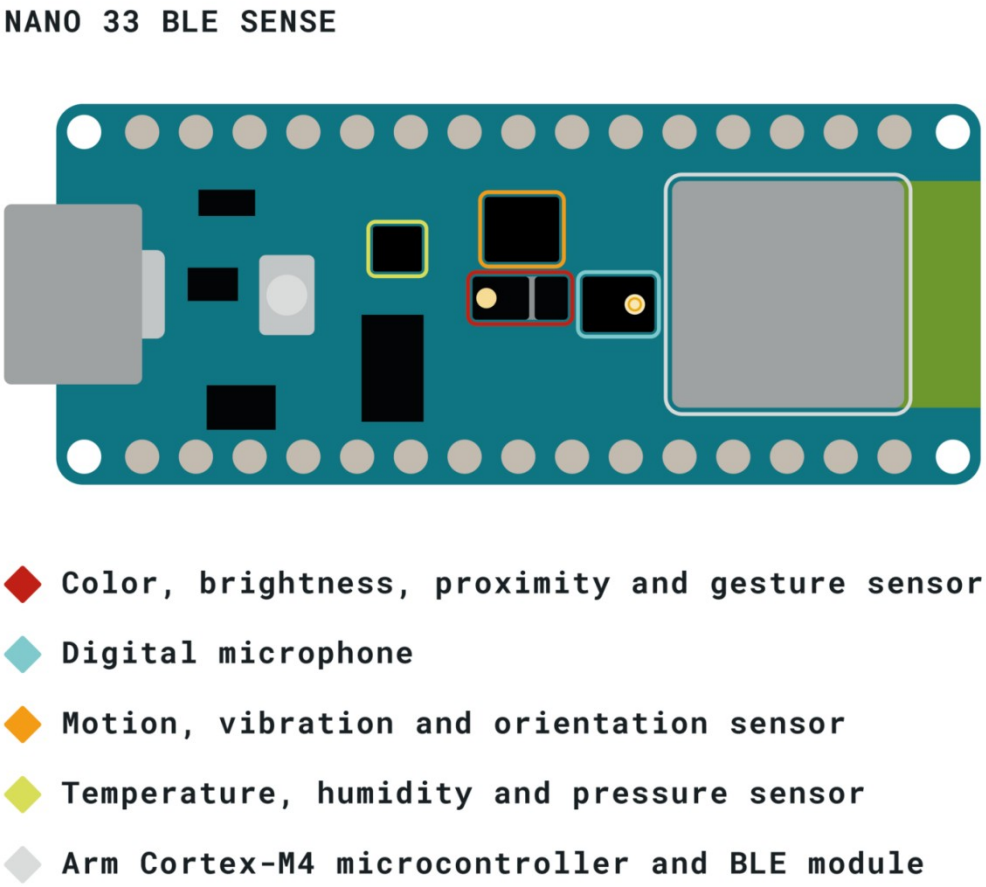
If you properly installed the nRF528x Core, Windows should initiate its driver installation process automatically once you connect the board to your computer with a micro USB cable.

Before you can upload your program to the board, select **Arduino NANO 33 BLE** under **Tools > Board > Arduino nRF528x Boards (Mbed OS)**.

Next, select the right COM port under the **Tools > Port** menu. If you disconnect and reconnect your board while looking at the menu, you should be able to see which entry is the Arduino board.

Arduino Nano 33 BLE Sense

The Arduino Nano 33 BLE Sense features the same 32-bit ARM Cortex-M4 processor as the Arduino Nano 33 BLE, but also includes a bunch of onboard sensors: a 9-axis IMU, temperature, pressure, humidity, light, color, gesture sensors, and even a microphone that are managed through several specialized Arduino libraries.

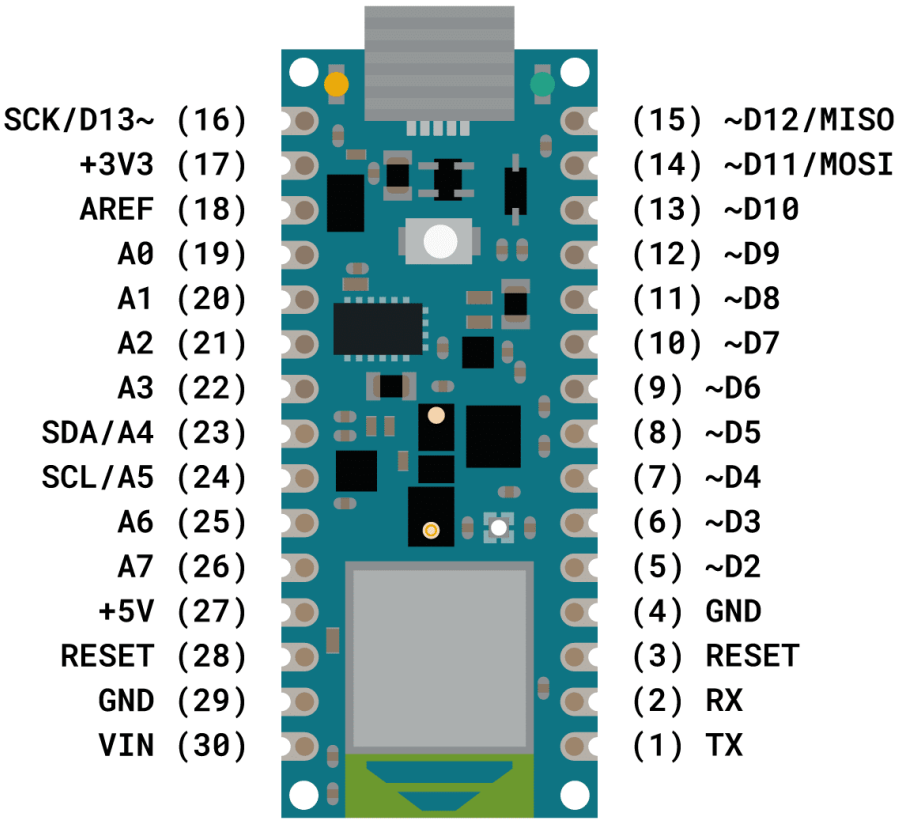


Arduino Nano 33 BLE Sense specifications

Microcontroller	nRF52840
Operating voltage	3.3 V

Input voltage (VIN)	5-21 V
DC current per I/O pin	15 mA
CPU flash memory	1 MB (nRF52840)
SRAM	256 KB (nRF52840)
Clock speed	64 MHz
EEPROM	None
Digital I/O pins	14
PWM pins	All digital pins
UART	1
SPI	1
I2C	1
Analog input pins	8 (ADC 12 bit 200 k samples)
Analog output pins	Only through PWM (no DAC)
External interrupts	All digital pins
LED_BUILTIN	D13
USB	Native in the nRF52840 processor
Inertial measurement unit (IMU)	LSM9DS1 (9-axis)
Microphone	MP34DT05
Gesture, light, proximity	APDS9960
Barometric pressure	LPS22HB
Temperature, humidity	HTS221
PCB size	18 x 45 mm
Weight	5 g (with headers)

Arduino Nano 33 BLE Sense Pinout



Programming the Arduino Nano 33 BLE Sense with the Arduino IDE

You can use the same procedure as for the Arduino Nano 33 BLE to install the Arduino nRF528x mbed Core (see above). Because the Arduino Nano 33 BLE Sense is a hardware variation of the Arduino Nano 33 BLE, both boards are recognized as the Arduino nano 33 BLE and this is normal. **In the board manager and the board selection, you will only find Arduino Nano 33 BLE.**

Are you wondering which Arduino Nano board would work best for your project? Check out the table below for a comparison.

Arduino Nano comparison table

Property	Arduino Nano	Arduino Nano Every	Arduino Nano 33 IoT	Arduino Nano 33 BLE	Arduino Nano 3 BLE Sense
Microcontroller	ATmega328	ATMega4809	SAMD21 Cortex®-M0+ 32bit low power	nRF52840	nRF52840

Property	Arduino Nano	Arduino Nano Every	Arduino Nano 33 IoT	Arduino Nano 33 BLE	Arduino Nano 3 BLE Sense
			ARM MCU		
Operating voltage	5 V	5 V	3.3 V	3.3 V	3.3 V
Input voltage (VIN)	6-20 V	7-21 V	5-21 V	5-21 V	5-21 V
Clock speed	16 Mhz	20 MHz	48 MHz	64 MHz	64 MHz
Flash	32 KB	48 KB	256 KB	1 MB	1 MB
RAM	2 KB	6 KB	32 KB	256 KB	256 KB
Current per pin	40 mA	40 mA	7 mA	15 mA	15 mA
PWM pins	6	5	11	All	All
IMU	No	No	LSM6DS3 (6-axis)	LSM9DS1 (9-axis)	LSM9DS1 (9-axis)
Other sensors	No	No	No	No	Microphone, ges light, proximity, barometric pressu temperature, humidity
WiFi	No	No	Yes	No	No
Bluetooth	No	No	Yes	Yes	Yes
USB type	Mini	Micro	Micro	Micro	Micro

Comparison of Arduino Nano boards

With their small form factor and low cost, the Arduino Nano boards are a great choice for many electronics projects. The newer boards add several awesome features to the original Arduino Nano, like WiFi and Bluetooth connectivity, an IMU, and several other onboard sensors.