Welcome!

Thank you very much for purchasing our AZ-Delivery Nano V3.0 Pro board with USB cable. On the following pages, we will introduce you to how to use and setup this handy device.

Have fun!

Areas of application
Education and teaching: Use in schools, universities and training institutions to teach the basics of electronics, programming and embedded systems. Research and development: Use in research and development projects to create prototypes and experiments in the fields of electronics and computer science. Prototype development: Use in the development and testing of new electronic circuits and devices. Hobby and Maker Projects: Used by electronics enthusiasts and hobbyists to develop and implement DIY projects.

Required knowledge and skills
Basic understanding of electronics and electrical engineering. Knowledge of programming, especially in the C/C++ programming language. Ability to read schematics and design simple circuits. Experience working with electronic components and soldering.

Operating conditions
The product may only be operated with the voltages specified in the data sheet to avoid damage. A stabilized DC power source is required for operation. When connecting to other electronic components and circuits, the maximum current and voltage limits must be observed to avoid overloads and damage.

Environmental conditions
The product should be used in a clean, dry environment to avoid damage caused by moisture or dust. Protect the product from direct sunlight (UV)

Intended Use
The product is designed for use in educational, research and development environments. It is used to develop, program and prototype electronic projects and applications. The Sensor product is not intended as a finished consumer product, but rather as a tool for technically savvy users, including engineers, developers, researchers and students.

Improper foreseeable use
The product is not suitable for industrial use or safety-relevant applications. Use of the product in medical devices or for aviation and space travel purposes is not permitted

disposal
Do not discard with household waste! Your product is according to the European one Directive on waste electrical and electronic equipment to be disposed of in an environmentally friendly manner. The valuable raw materials contained therein can be recycled become. The application of this directive contributes to environmental and health protection. Use the collection point set up by your municipality to return and Recycling of old electrical and electronic devices. WEEE Reg. No.: DE 62624346

electrostatic discharge
Attention: Electrostatic discharges can damage the product. Note: Ground yourself before touching the product, such as by wearing an anti-static wrist strap or touching a grounded metal surface.

safety instructions
Although our product complies with the requirements of the RoHS Directive (2011/65/EU) and does not contain any hazardous substances in quantities above the permitted limits, residues may still be present. Observe the following safety instructions to avoid chemical hazards: Caution: Soldering can produce fumes that can be harmful to health. Note: Use a soldering fume extractor or work in a well-ventilated area. If necessary, wear a respirator mask. Caution: Some people may be sensitive to certain materials or chemicals contained in the product. Note: If skin irritation or allergic reactions occur, stop use and, if necessary, consult a doctor. Caution: Keep the product out of the reach of children and pets to avoid accidental contact and swallowing of small parts. Note: Store the product in a safe, closed container when not in use. Attention: Avoid contact of the product with food and drinks. Note: Do not store or use the product near food to prevent contamination. Although our product complies with the requirements of the RoHS Directive (2011/65/EU) and does not contain any hazardous substances in quantities above the permitted limits, residues may still be present. Observe the following safety instructions to avoid chemical hazards: Caution: Soldering can produce fumes that can be harmful to health. Note: Use a soldering fume extractor or work in a well-ventilated area. If necessary, wear a respirator mask. Caution: Some people may be sensitive to certain materials or chemicals contained in the product. Note: If skin irritation or allergic reactions occur, stop use and, if necessary,

consult a doctor. Caution: Keep the product out of the reach of children and pets to avoid accidental contact and swallowing of small parts. Note: Store the product in a safe, closed container when not in use. Attention: Avoid contact of the product with food and drinks. Note: Do not store or use the product near food to prevent contamination. The product contains sensitive electronic components and sharp edges. Improper handling or assembly can result in injury or damage. Observe the following safety instructions to avoid mechanical hazards: Attention: The product's circuit board and connectors may have sharp edges. Use caution to avoid cuts. Note: Wear appropriate protective gloves when handling and assembling the product. Caution: Avoid excessive pressure or mechanical stress on the board and components. Note: Only mount the product on stable and flat surfaces. Use appropriate spacers and housings to minimize mechanical stress. Attention: Make sure the product is securely fastened to prevent accidental slipping or falling. Note: Use appropriate support or secure mounting in enclosures or on mounting plates. Caution: Make sure all cable connections are secure and correctly connected to avoid strain and accidental unplugging. Note: Route cables so that they are not under tension and do not pose a tripping hazard. The product operates with electrical voltages and currents that, if used improperly, can result in electric shocks, short circuits or other hazards. Observe the following safety instructions to avoid electrical hazards: Attention: Use the product only with the specified voltages. Note: The performance limits of the product can be found in the associated data sheet Caution: Avoid short circuits between the connectors and components of the product Note: Make sure that no conductive objects touch or bridge the circuit board. Use insulated tools and pay attention to the arrangement of connections. Caution: Do not perform any work on the product when it is connected to a power source. Note: Disconnect the product from power before making any circuit changes or connecting or removing components. Caution: Do not exceed the specified current ratings for the product's inputs and outputs. Note: The performance limits of the product can be found in the technical specifications or in the data sheet Attention: Make sure that the power sources used are stable and correctly sized. Note: Only use tested and suitable power supplies to avoid voltage fluctuations and overloads. Attention: Maintain sufficient distance from live parts to avoid accidental contact. Note: Ensure that the cabling is arranged safely and clearly according to the voltage used. Caution: Use insulating housings or protective covers to protect the product from direct contact. Note: Place the product in a non-conductive case to avoid accidental touching and short circuits. The product and the components on it may become warm during operation. Improper handling or overloading the product can result in burns, damage or fire. Observe the following safety instructions to avoid thermal hazards: Caution: Make sure the product is used within recommended operating temperatures. Note: The recommended operating temperature range is typically between-40°C and +85°C. Check the specific information in the product data sheet. Attention: Do not place the product near external heat sources such as radiators or direct sunlight. Note: Ensure that the product is operated in a cool and well-ventilated area. Attention: Make sure the product is well ventilated to avoid overheating. Note: Use fans or heat sinks when operating the product in a closed enclosure or in an environment with limited air circulation. Attention: Mount the product on heat-resistant surfaces and in heat-resistant housings. Note: Use enclosure materials that can withstand high temperatures to avoid damage or fire hazard. Caution: Implement temperature monitoring when using an enclosure and, if necessary, protection mechanisms that shut down the product if it overheats. Note: Note: Use temperature sensors and appropriate software to monitor the temperature of the product and shut down the system if necessary. Caution: Avoid overloads that can cause excessive heating of components. Note: To prevent overheating, do not exceed the specified current and voltage limits. Caution: Short circuits can generate significant heat and cause fires. Note: Make sure all connections are correct and secure and that no conductive objects can accidentally cause short circuits.

The Nano V3.0 is great device intended for electronics learning or prototyping and learning programming. The Nano V3.0 is actually a microcontroller, but assembled in a way that you don't need extra components with it. If you use single microcontroller, you will need to build stable DC power supply, and external programmer, and reset circuit, and many other things. With this microcontroller you've got all of this in one board. And the most powerful thing about it is that there is Arduino IDE (Integrated Development Environment) with endless number of code examples already written for it, in a way that everyone can understand.

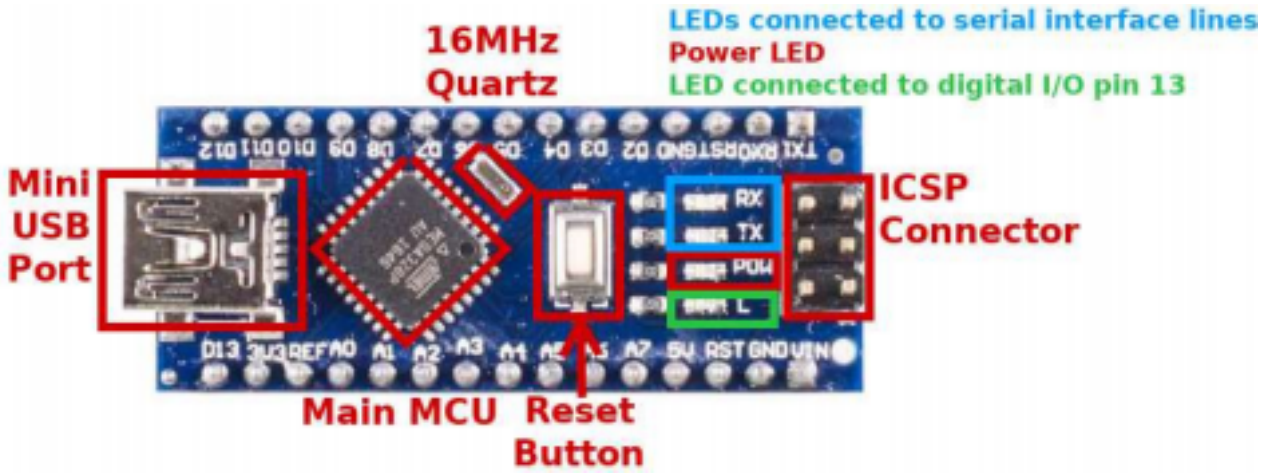
There is no need for you to learn internal working of onboard microcontroller in order to programm it. Just connect your Nano V3.0 board, via USB cable to your PC, install and start Arduino IDE, search and upload program that you need, to your board and that's it. There are endless code and library examples already written online, you just need to search for it. Also there are numerous other compatible boards, like shields, or many sensors built in a way so you can easily connect them to your Nano V3.0 board. Just search our online store www.az-delivery.com and you'll find more than you need.

The Nano V3.0 is a small, compatible, flexible and breadboard friendly microcontroller board based on ATmega328P. It comes with almost the same functionality as in Arduino Uno but in small size.

This Nano V3.0 board has CH340 chip and comes pre soldered with USB cable for connecting with PC.

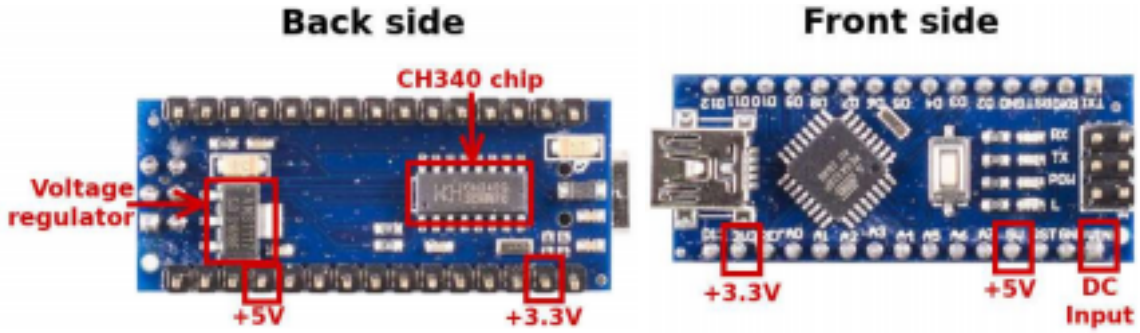
Specifications

Microcontroller: ATmega328
Operating Voltage: 5V
Input Voltage (recommended): 7÷12V
Input Voltage (limit): 6÷20V
Digital I/O Pins: 22 (6 of which are PWM) PWM Output: 6
Analog Input Pins: 8
DC Current per I/O Pin: 20mA
DC Current for 3.3V Pin: 50mA
Flash Memory: 32KB of which 2KB used by bootloader SRAM: 2KB (ATmega328P)
EEPROM: 1KB (ATmega328P)
Clock Speed: 16MHz
LED_BUILTIN: connected to digital I/O pin 13 Length: 18mm
Width: 45mm
Weight: 7g



The Nano V3.0 features main microcontroller ATMega328p with 16MHz quartz oscillator. It has mini USB port which can be used to program main microcontroller and to power the board. It also has ICSP connector (In Circuit Serial Programming), if you wish to program main microcontroller externally. It also have 4 SMD LEDs, two which are connected to receive and transmit lines of serial interface, one which is used for power indicator, and one which is connected to the digital input/output pin 13.

It have reset button (image above) and two reset pins (labeled RST).

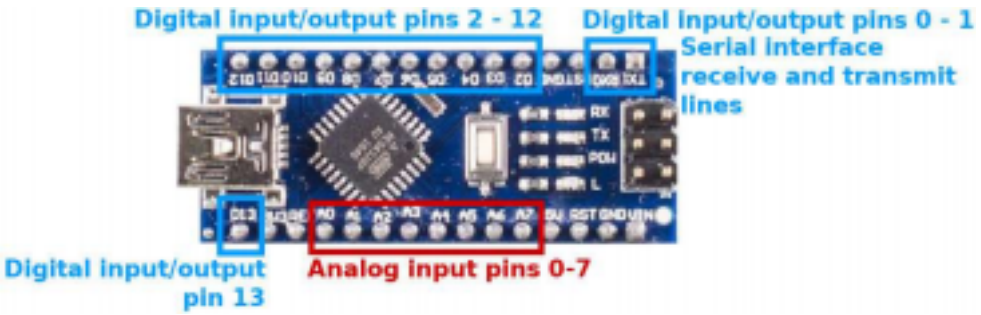


This Nano V3.0 board also features DC voltage regulator for +5V, VIN pin (DC Input on image on the left). You can connect external DC power supply to the VIN pin on board with voltage in range from 7V up to 12V, and voltage regulator will lower and stabilize it to the +5V. Output voltage of +3.3V we can get from CH340 chip, and it is NOT accurate thus NOT stable.

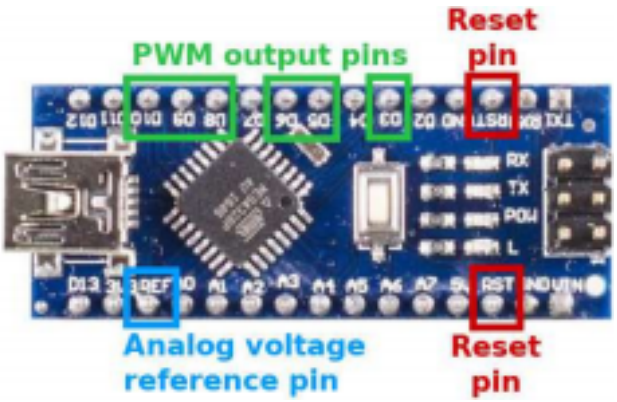
This Nano V3.0 uses CH340 chip to make communication like USART serial interface but via USB. CH340 chip connect PC's USB port with USART serial interface of microcontroller and thus enable us to program microcontroller via USB port.

CH340 Drivers can be downloaded here

Also you can mini USB port to power the Nano V3.0 board!



This Nano V3.0 is built in a way that separates digital input/output pins from analog input pins. So there are 8 analog input pins (Mikrocontroller board with ATmega328P, ATmega16U2 does not have pins A6 and A7), and separated 14 digital input/output pins.



6 of 14 digital input/output pins can be used as PWM outputs (Pulse Width Modulation). Those pins are D3, D5, D6, D9, D10, and D11. To reset main microcontroller you need to press reset button or you connect one of reset pins to the GND (0V).

By default when you are using analog to digital converter, analog voltage reference is used from VCC (=+5V), but you can use any analog voltage reverence you like. You just need to connect that voltage reference to the REF pin - Analog voltage reference pin (image above). Mikrocontroller board with ATmega328P, ATmega16U2 does not have this pin.

Digital I/O pins D0 and D1 are connected to receive and transmit lines of serial interface. On image above these pins are labeled RX and TX respectively. So we suggest never to use these digital I/O pins as digital inputs or outputs, because serial interface is used every time when you are uploading new program into you microcontroller on board Nano V3.0. Actually wherever you reprogram your Arduino Nano, or whenever you are using serial interface. By using these pins as digital inputs or outputs, you can get many errors while reprogramming, or cause your electronics parts or devices connected to them to work incorrectly.

Communicaton interfaces

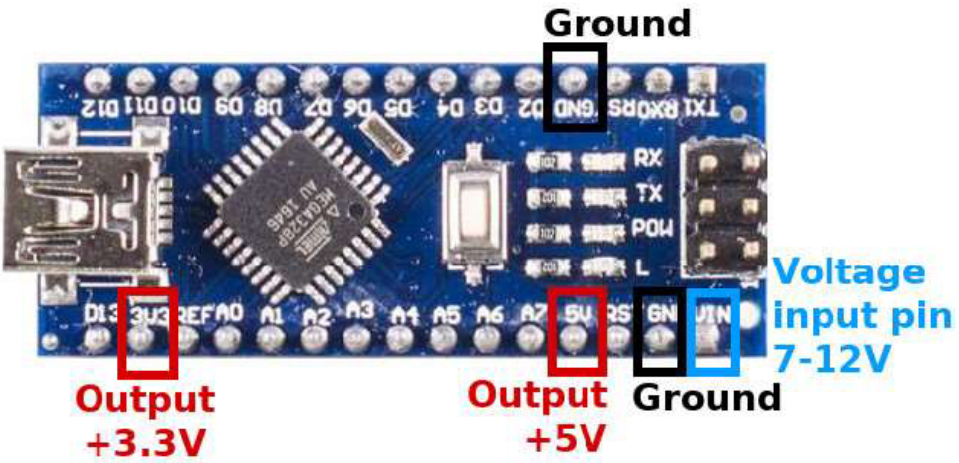
We already wrote that digital I/O pins D0 and D1 have alternative functions. They are connected to receive and transmit lines of serial interface.

There are two more communication interfaces supported by ATMega328P microcontroller, Serial Peripheral Interface - SPI and Inter-Integrated Circuit interface - I2C (or TWI - Two Wire Interface)

For SPI interface digital I/O pins D10, D11, D12 and D13 are used. Their functions are SS, MOSI, MISO and SCK respectively.

For I2C interface analog input pins A4 and A5 are used. Their functions are SDA and SCL respectively.

Power Pins



Nano V3.0 does not have power pin header like on the microcontroller board mit ATmega328P, ATmega16U2. It have +3.3V and +5V voltage output pins, two Ground (GND) pins, and VIN pin. We already wrote about VIN pin, which can be used as DC input pin for external power supply. We also wrote that the Nano V3.0 can be powered from mini USB port.

Nano V3.0 board can output voltages +5V (which is regulated and stable) and +3.3V which is not accurate thus not stable, so be careful when you are using sensitive electronics devices which for power need stable +3.3V.

Nano V3.0 Power, Current, and Voltage Limitations

Voltage Input Limits:

Input power: to power the board, you either plug it in to a USB port, or you input a voltage source to it via its “VIN” and “GND” pins. When powering the microcontroller via the VIN and GND pins, it has the following input voltage limitations:

» Recommended input voltage limits: 7~12V.

These input voltages can be sustained indefinitely

» Absolute voltage limits for powering the Nano V3.0: 6~20V - Below 7V may cause the 5V levels on the board to waver, fluctuate, or sag, causing board instability and less accurate analog readings when using analogRead().

- Sustained voltage levels above 12V will cause additional heating on the linear voltage regulator of the board, which could cause it to overheat. Short periods, however, are fine. Feel the voltage regulator with your finger. If it feels too hot to comfortably touch, you need to use a voltage source within the recommended limits in order to reduce heat buildup.

Caution!!!

Before touching any electro-static discharge (ESD) sensitive parts on the Nano V3.0 (which is pretty much all of the microcontroller), touch the metal part of the USB plug first to ground yourself out to the board and safely discharge any static voltage you have built up.

» Voltage limits on input/output pins: -0.5 to +5.5V max. If you need to read in a voltage on an Nano V3.0 board digital or analog input pin, ensure that it is between 0 and 5V. If it is outside these limits, you can bring down the voltage using a voltage divider. This scales the input voltage to allow for analog or digital readings of voltages otherwise outside the allowed range. If your input signal is digital, and you don't need to take scaled analog readings, another technique is to clip (cut the top off of) the input voltage, rather than scale it. Since AVR microcontrollers have internal clamping diodes, this can be done by simply adding a single resistor in series with the pin. By adding a 10kΩ resistor in series with the input pin (any input pin) permits input voltages as low as -10.5V or as high as +15.5V.

Current Output Limits

» Total maximum current draw from this board when powered from a USB port: 500mA

» The Nano V3.0 has a "resettable polyfuse that protects your computer's USB ports from shorts and overcurrent." » Total maximum current draw when powered via external power supply: 1A

Note: If not powered by USB, the total 5V current limit coming out of the Nano V3.0 is limited by the voltage regulator on your particular board,

and/or your input power supply, whichever provides less power. Let's assume your power supply going to the microcontroller can provide 7÷12V and >= 1A. If this is the case, the 5V power is limited strictly by your Nano V3.0 board's voltage regulator.

» Total max current draw across the Arduino "5V" pin and "GND": as specified above.

» Total max current per input/output pin: 40mA

» Sum of currents out of ALL input/output pins combined: 200mA!!!

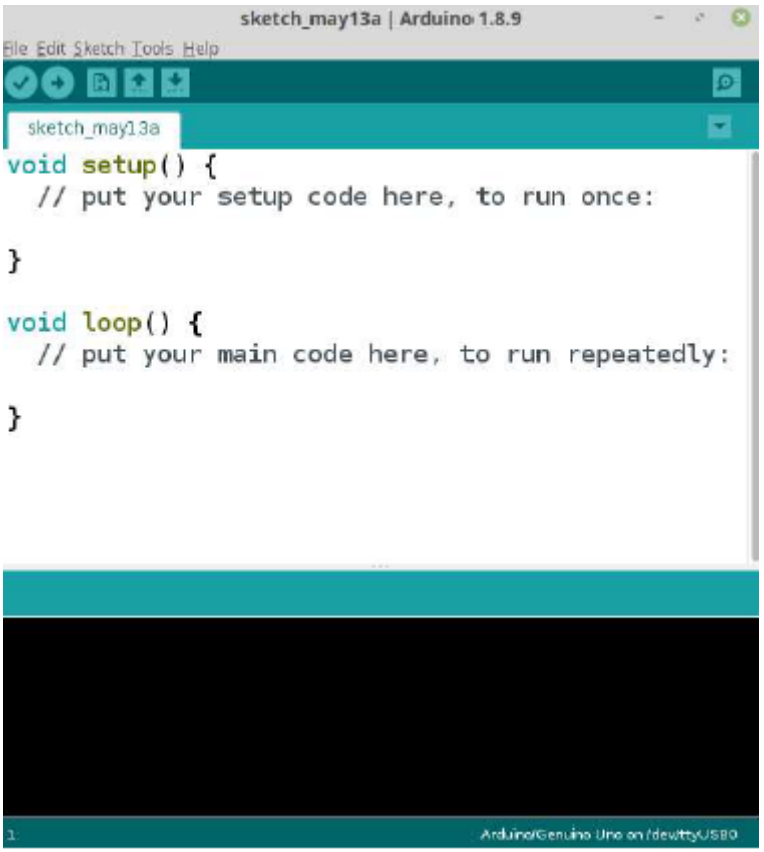
Note: this is the one that usually gets people, as it may be the least understood! Despite the fact that your voltage regulator on the Nano V3.0 may permit up to 1A draw across the "5V" and "GND" pins, the sum of all currents going into or out of the input/output pins (all Analog and Digital pins combined) of the ATMega328P microcontroller itself cannot exceed 200mA. So, if you are powering 10 LEDs at 20mA each, via your Analog or Digital pins, you just hit your limit! Any more than that and you may damage the microcontroller on the Nano V3.0 board.

A work-around if you need more current is to use transistors. The Nano V3.0 input/output pins can then use a very low current to activate a transistor, which then turns a higher current on and off from the 5V pin directly (which is connected straight to the output of the on-board linear voltage regulator), to the device you want to control. This way, you keep the

sum total output from the Nano V3.0 analog/digital pins below 200mA, while allowing up to the 500mA~1A limit from the 5V pin.

Arduino IDE

To program any of the Nano V3.0 or ATmega328P, ATmega16U2 or Mega 2560 R3 boards you need to have an IDE app (Integrated Development Environment). Arduino features Arduino IDE, which can be downloaded from https://www.arduino.cc/en/Main/Software Just find your operating system download it and install it. When you install it and open the app, this will be the starting window.

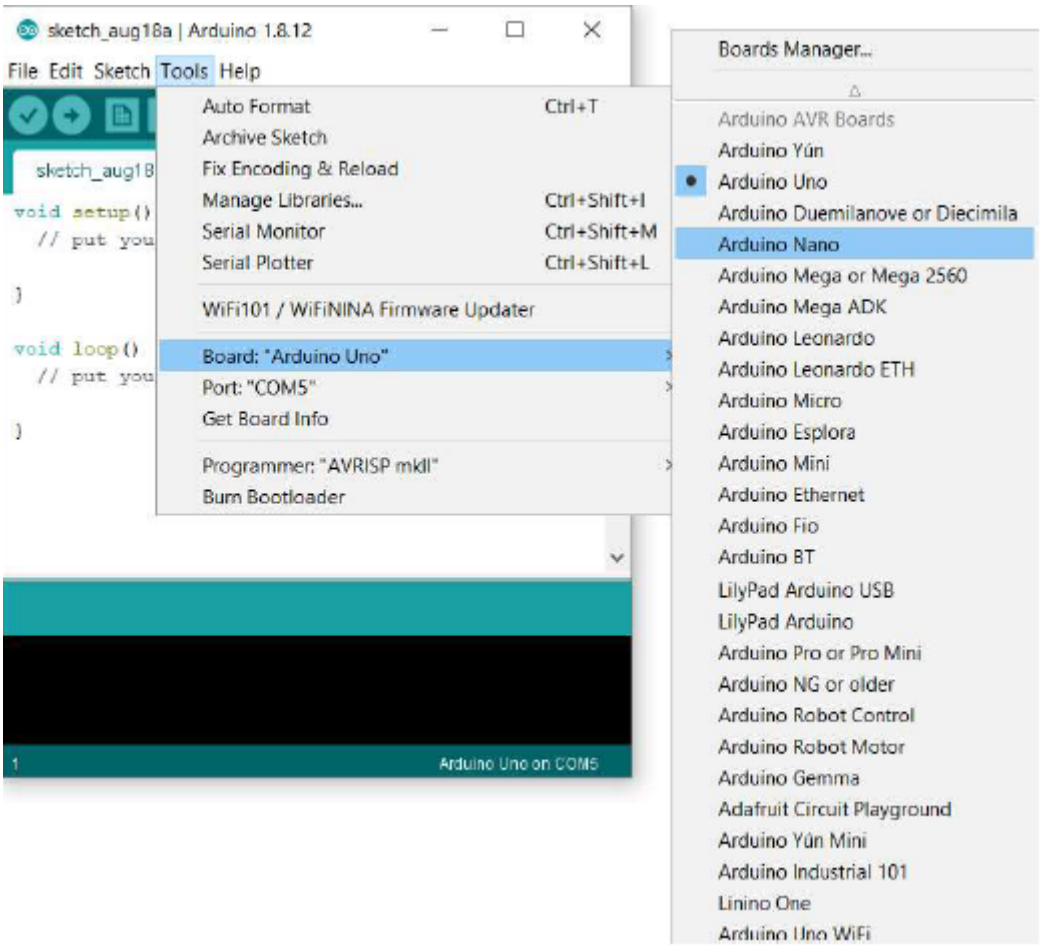


Opened program example is called empty sketch. A sketch is program example, where we write our code. It has two essential parts, setup() function and loop() function, and it can have any number of other functions as well.

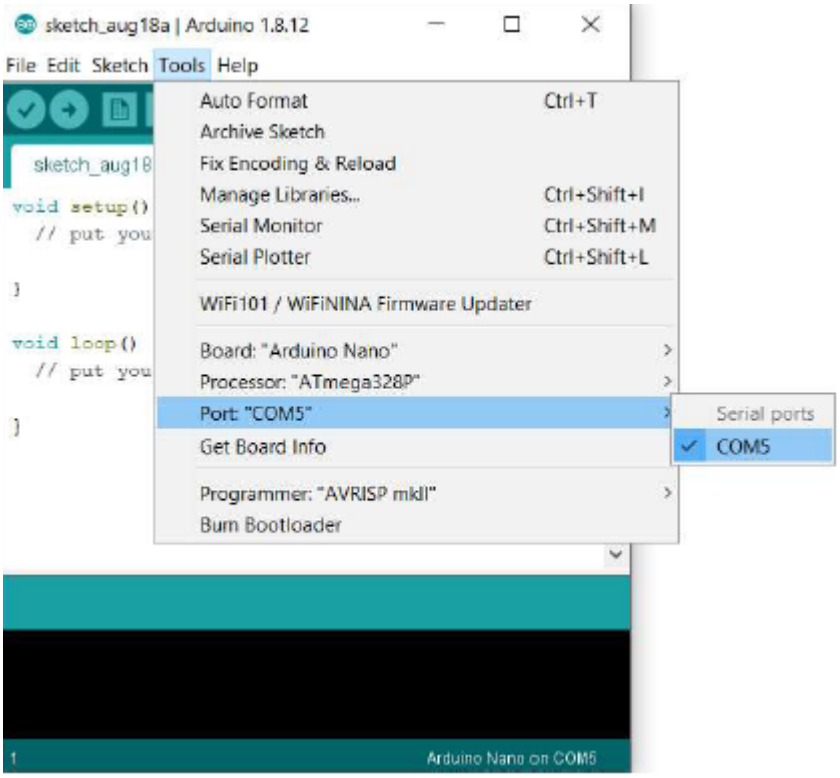
setup() function runs only once, at the beginning of program execution, when you power up the board, or when you reset the board. In this function we setup all initializations, for example declare the state of digital input/output pins or setting up analog input pins, or setting up serial interface for serial communication, etc.

loop() function runs after setup() and it runs indefinitely, over and over again, so called “endless” loop function. Actually it runs all time while the board is connected to the power. This is because programs in electronics devices should never reach the end, because if that happen that means your device is as good as turned off. Here we write the logic, algorithms on which our application for Nano V3.0, ATmega328P, ATmega16U2, Mega 2560 R3 Board and other boards works.

When we connect our Nano V3.0 via USB cable to the PC, first thing we should do in Arduino IDE is select the Arduino Nano in the menu unter Tools / Board.

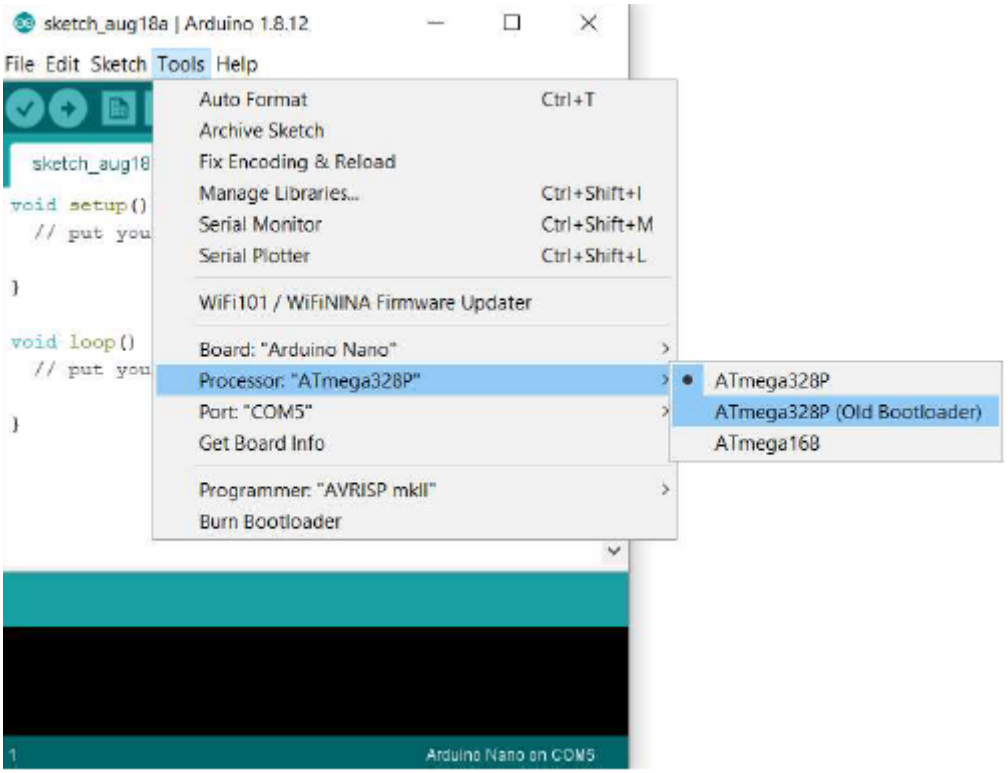


Then we need to select the COM port, again under Tools / then Port.



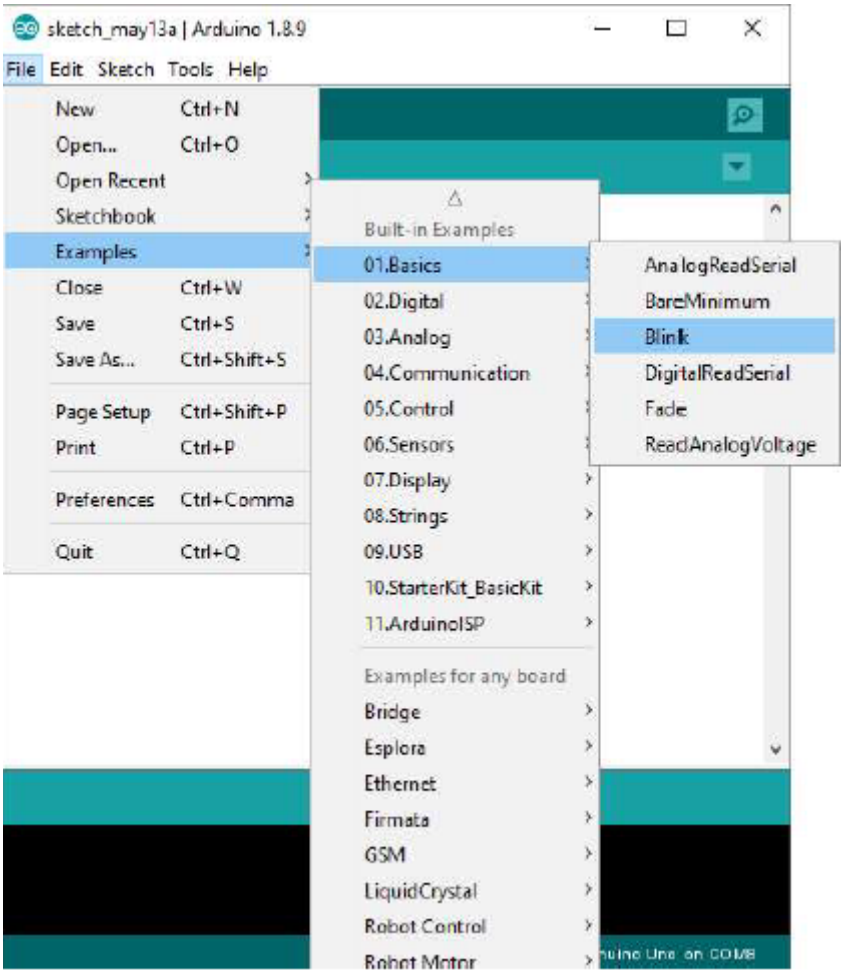
Almost all modern operating systems automatically detect the USB to COM interface. If this is not the case and you do not see any COM port, you need to install the driver for the CH340 chip (the one below the board). Simply go to the search engine in your browser and look for CH340 & your operating system. Download, installation and restart take about five minutes.

Finally, we select under Tools / Processor the Atmega328P (Old Bootloader).

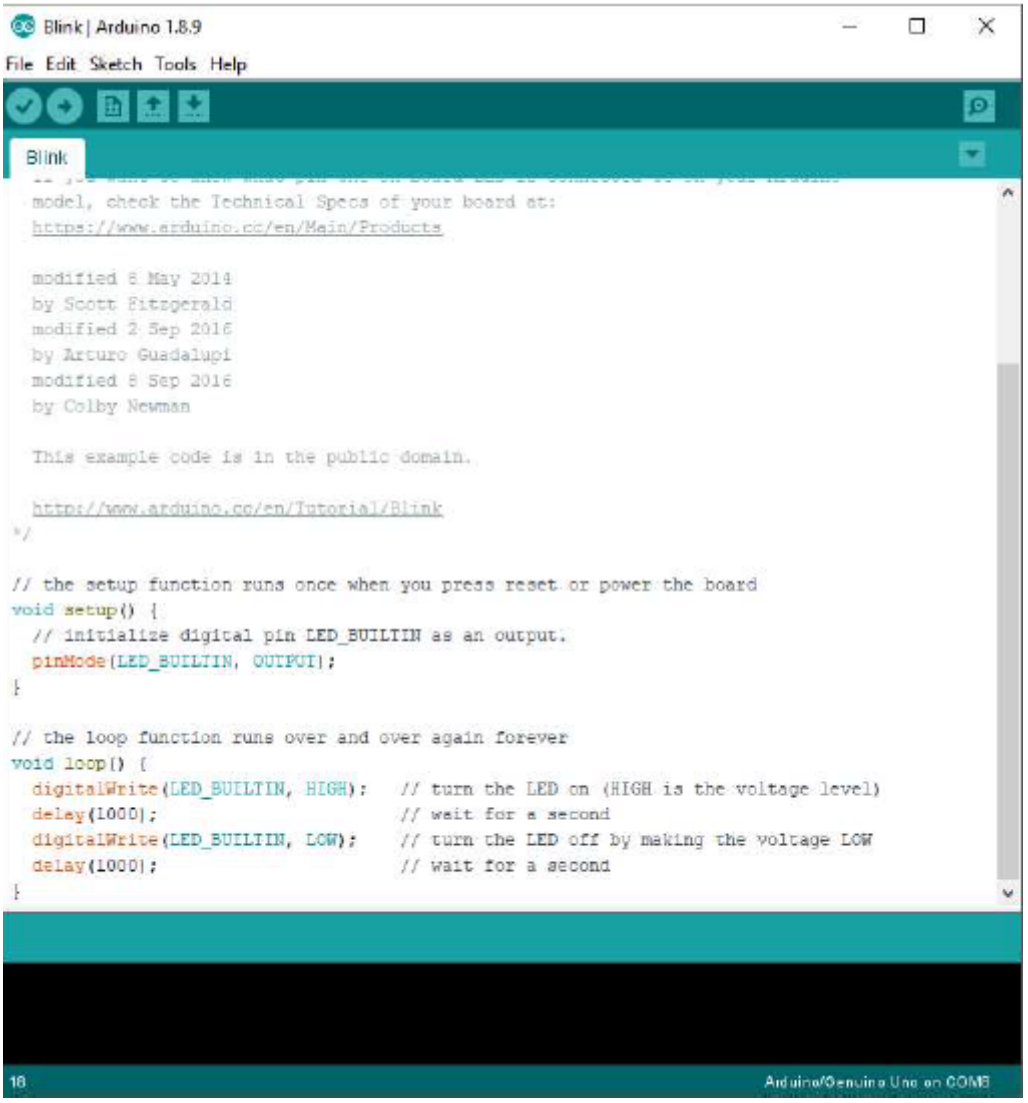


Application example

And now we can start programming. Arduino IDE comes with dosen prewritten sketch examples, which you can use. Here we will use BLINK sketch example. Go to File > Examples > 01.Basics > Blink.

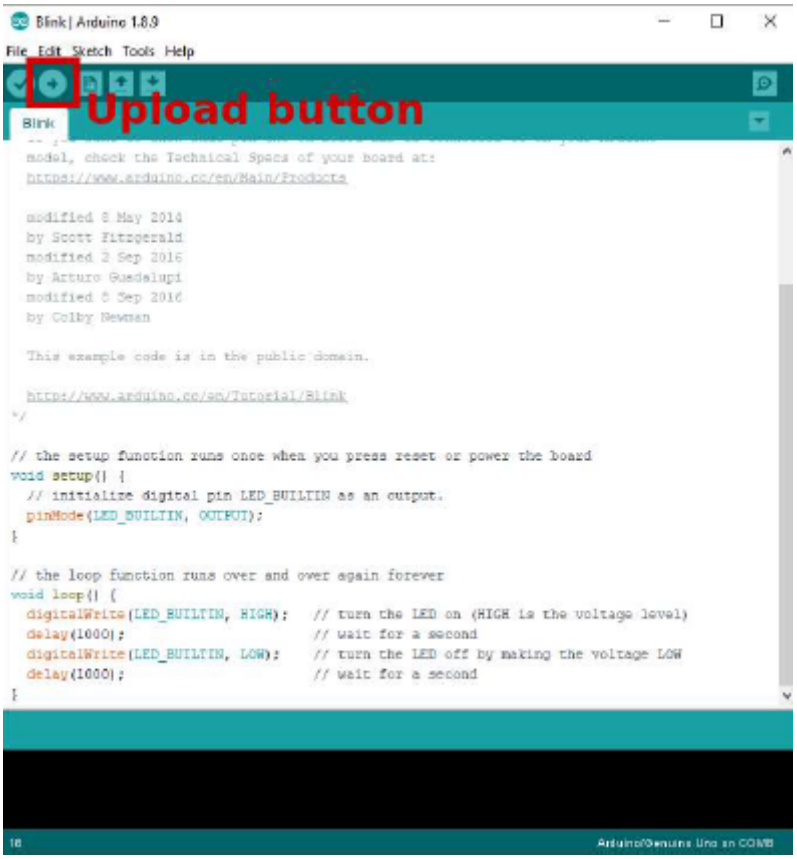


A new window with new sketch example will open:



What this sketch does is turn ON an LED on board connected to the digital I/O pin 13, for one second, and than turn it OFF for one second. This turning on and off is called blinking, thus this sketch name.

When we are done programing, to compile and upload sketch to your Nano V3.0 board, you press upload button.



After this, on board LED should start blinking in interval of one second.

You've done it, you can now use your module for your projects.

Now it is time to learn and make the Projects on your own. You can do that with the help of many example scripts and other tutorials, which you can find on the internet.

If you are looking for the high quality microelectronics and accessories, AZ-Delivery Vertriebs GmbH is the right company to get them from. You will be provided with numerous application examples, full installation guides, eBooks, libraries and assistance from our technical experts.

https://az-delivery.de

Have Fun!

Impressum

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