Evolution of Arduino Models

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What is Arduino?

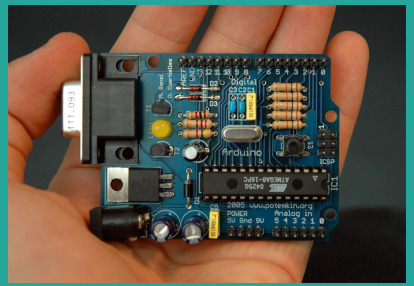
- Open - source electronics platform based on easy - to - use hardware and software.
- Microcontroller board that uses a variety of microprocessors and controllers to allow rapid prototyping involving electronics.
- There is a variety of models, each with a limitless amount of practical application.
- Arduino projects span a plethora of use cases.
- Easy to use for beginners, but also flexible enough for advanced users.

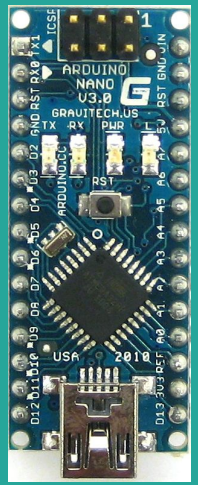
History of Arduino

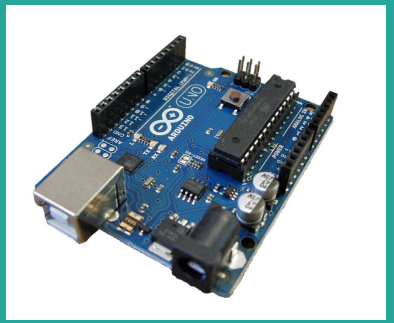
- Arduino was created in Ivrea Italy as a Masters thesis project.
- The goal of Arduino was to allow non-technical individuals to create technical projects of their own.
- The Arduino was intended to be affordable.
- Over 700,000 Arduino boards have been commercially produced since its founding.

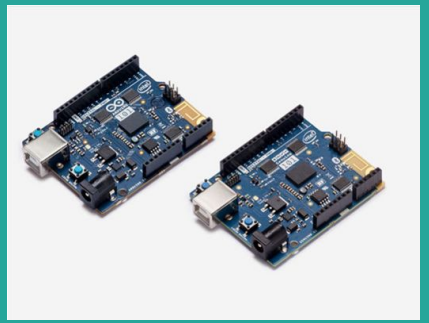
Arduino Models

- Serial Arduino
- Arduino Nano
- Arduino Uno
- Arduino 101

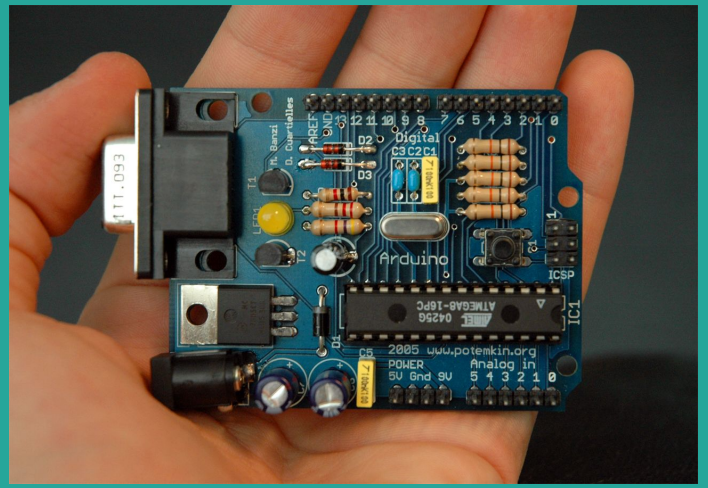








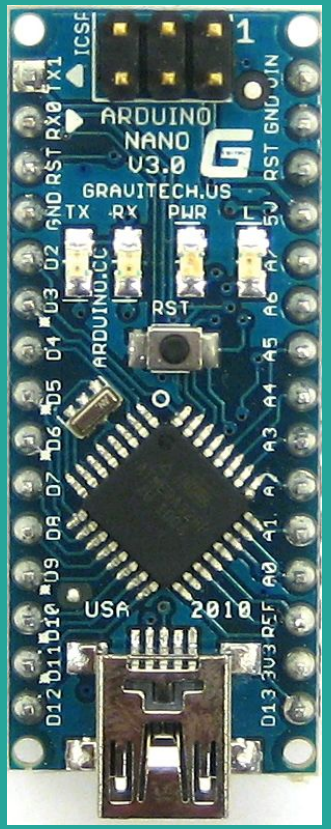
Serial Arduino



- Release Year - **2005**
- Processor - **ATmega8**
- Frequency - **16MHz**
- Host Interface - **DE-9 Serial Connection**
- **Uses RS232 as an interface for programming or communication with a computer.**
- **Specifically designed to be easily assembled with the most simple components.**

Arduino Nano

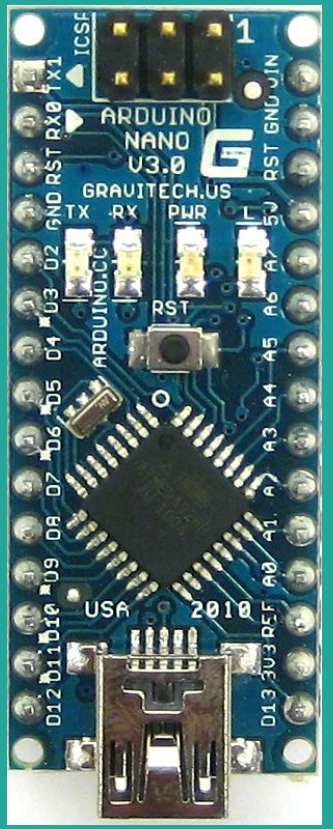
- Release Date - May 15, 2008
- Processor - ATmega328 (ATmega168 before v3.0)
- Frequency - 16 MHz
- Host Interface - USB
- Uses a surface - mounted processor
- Lacks only a DC power jack and uses a Mini-B USB instead of standard on



Arduino Nano

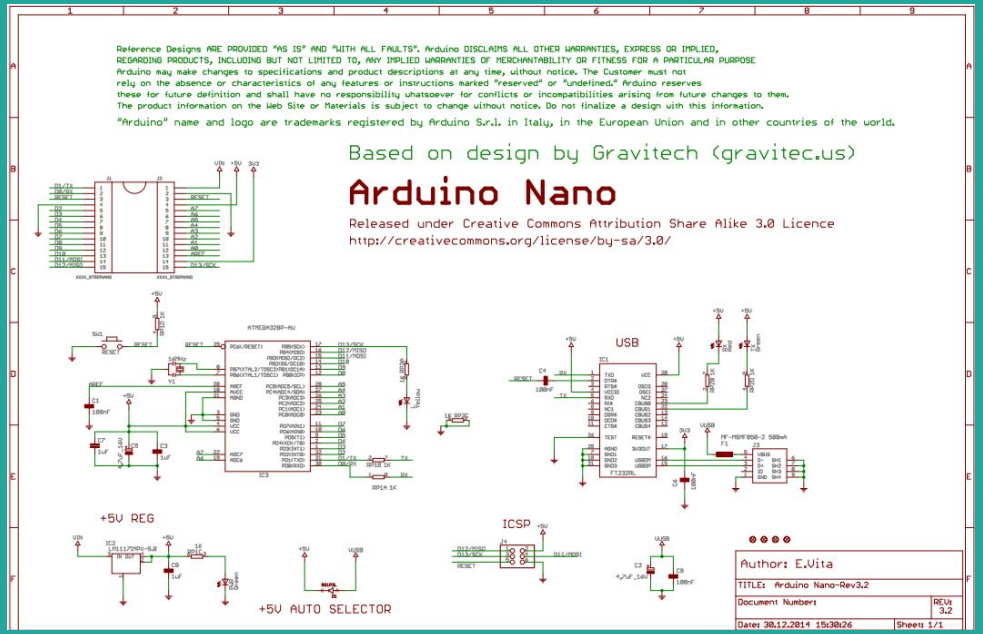
Technical specs

Microcontroller	ATmega328
Architecture	AVR
Operating Voltage	5 V
Flash Memory	32 KB of which 2 KB used by bootloader
SRAM	2 KB
Clock Speed	16 MHz
Analog I/O Pins	8
EEPROM	1 KB
DC Current per I/O Pins	40 mA (I/O Pins)
Input Voltage	7-12 V
Digital I/O Pins	22
PWM Output	6
Power Consumption	19 mA
PCB Size	18 x 45 mm
Weight	7 g
Product Code	A000005



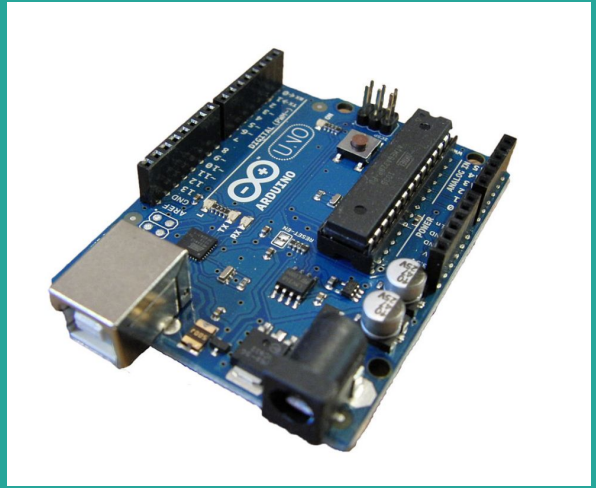
Arduino Nano

- Schematic
- Each pin has different usage
  - Serial, Interrupts, PWM, SPI, LED
- 8 Analog inputs with 10 bit resolution
  - Digital pins
- Reference voltage for analog inputs
- Reset button



Arduino Uno

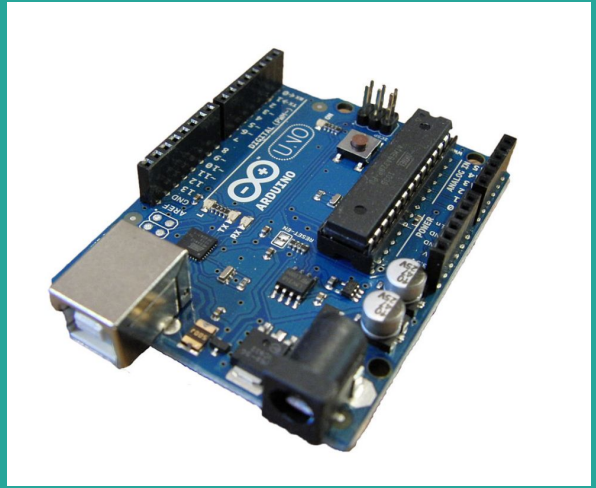
- Release Date - September 24, 2010
- Processor - ATmega328P
- Frequency - 16 MHz
- Host Interface - USB
- Uses FTDI chip for USB



Arduino Uno

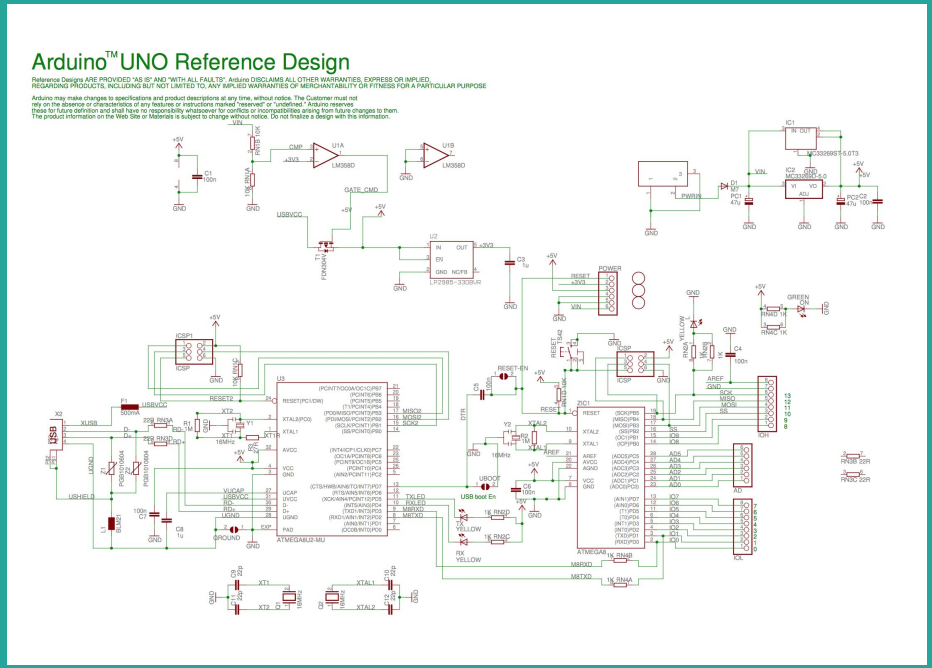
Technical specs

Microcontroller	ATmega328P
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limit)	6-20V
Digital I/O Pins	14 (of which 6 provide PWM output)
PWM Digital I/O Pins	6
Analog Input Pins	6
DC Current per I/O Pin	20 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	32 KB (ATmega328P) of which 0.5 KB used by bootloader
SRAM	2 KB (ATmega328P)
EEPROM	1 KB (ATmega328P)
Clock Speed	16 MHz
LED_BUILTIN	13
Length	68.6 mm
Width	53.4 mm
Weight	25 g



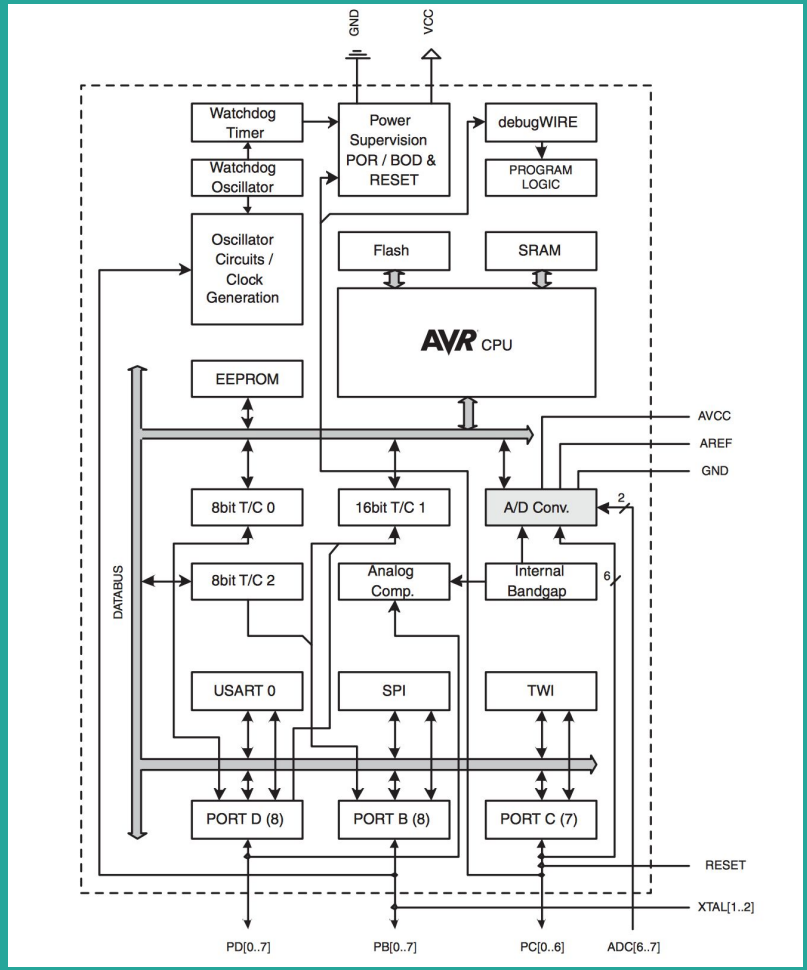
Arduino Uno

- Schematic
- 14 Digital I/O pins
  - 6 pins used for PWM
  - 6 analog inputs
  - 16 MHz quartz crystal
  - USB connection
  - Power jack
  - ICSP header
  - Reset



Atmel 328/P

- High Performance, low power Atmel®AVR® 8-Bit Microcontroller Family
- Advanced RISC architecture
  - Up to 20 MIPS throughput at 20 MHz
  - 32 x 8 General Purpose registers
  - Most Single Clock Cycle Execution



Arduino 101

- **Release Date - October 16, 2015**
- **Processor - Intel® Curie**
- **Frequency - 32 MHz**
- **Host Interface - USB**

Arduino 101

- Module contains two tiny cores, an x86 (Quark)
- 32 - bit ARC architecture core
- RTOS - Real Time Operating Systems and frameworks developed by Intel
- 14 digital input/output pins (4 can be used for PWM)
  - 6 analog inputs
  - USB connector for serial communication
  - Power jack
  - ICSP header with SPI signals
  - I2C dedicated pins

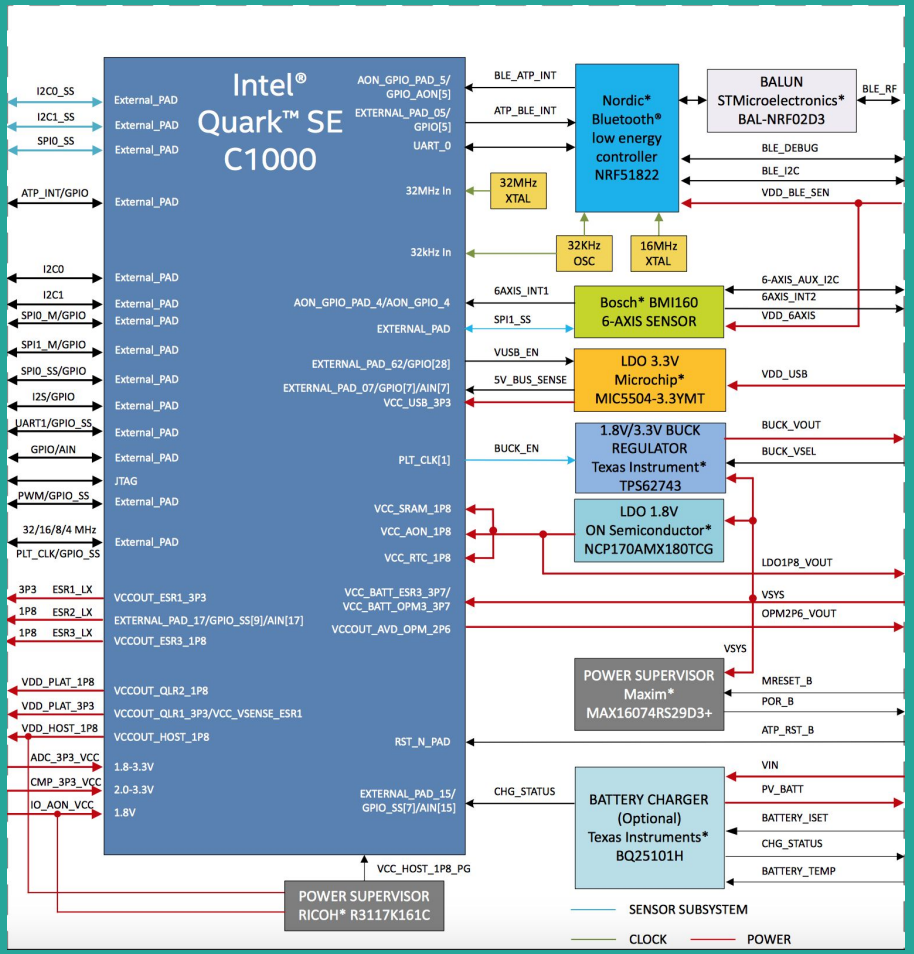
Arduino 101

Technical specs

Microcontroller	Intel Curie
Operating Voltage	3.3V (5V tolerant I/O)
Input Voltage (recommended)	7-12V
Input Voltage (limit)	7-17V
Digital I/O Pins	14 (of which 4 provide PWM output)
PWM Digital I/O Pins	4
Analog Input Pins	6
DC Current per I/O Pin	20 mA
Flash Memory	196 kB
SRAM	24 kB
Clock Speed	32MHz
LED_BUILTIN	13
Features	Bluetooth LE, 6-axis accelerometer/gyro
Length	68.6 mm
Width	53.4 mm
Weight	34 gr.

Intel® Curie

- Block diagram
- 6-axis accelerometer/gyroscope
- Bluetooth low energy capabilities

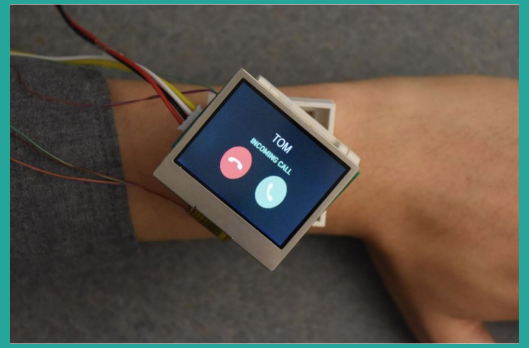


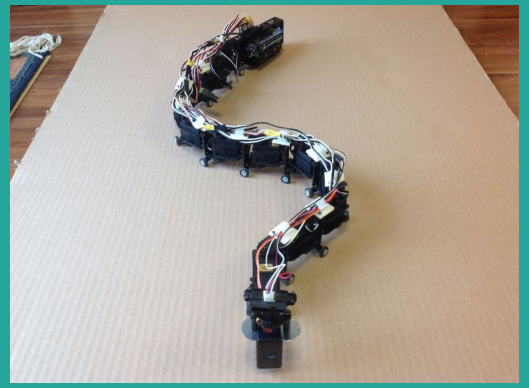
Arduino vs Raspberry Pi

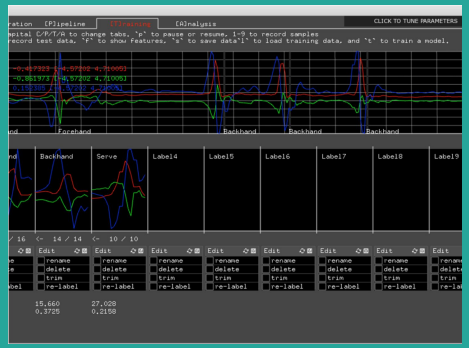
- Raspberry Pi
  - Fully functional computer, system-on-chip that runs on a Linux OS
  - Advantages
    - Powerfulness
    - Networking
    - No need for deep electronics knowledge
- Arduino
  - Microcontroller which is not as powerful as Raspberry Pi
  - Advantages
    - Simplicity
    - Robustness
    - Power Consumption
    - Price

Arduino Usage

- Robot automation
- Applications and the boards used
  - Smartwatch (Arduino Due)
  - Lake Erie Mamba
  - Gesture Recognition using Accelerometer







Conclusion

- Arduino can used for a variety of projects
- Good for elementary and advanced applications
- Different models available
- Good for someone with electronics background and embedded programming

References

- https://www.arduino.cc/en/guide/introduction
- https://en.wikipedia.org/wiki/Arduino#Software
- https://www.arduino.cc/en/Main/ArduinoBoardSerial
- https://www.arduino.cc/en/Main/arduinoBoardNano
- http://download.arduino.org/products/NANO/Arduino%20Nano-Rev3.2-SCH.pdf
- https://www.arduino.cc/en/main/arduinoBoardUno
- https://www.arduino.cc/en/Main/ArduinoBoard101
- http://www.intel.com/content/dam/support/us/en/documents/boardsandkits/curie/intel-curie-module-datasheet.pdf
- https://circuitdigest.com/article/arduino-vs-raspberryp-pi-difference-between-the-two
- https://blog.arduino.cc/2017/05/09/smartwatch-convenience-moves-to-the-next-level/
- https://create.arduino.cc/projecthub/mellis/gesture-recognition-using-accelerometer-and-esp-71faa1