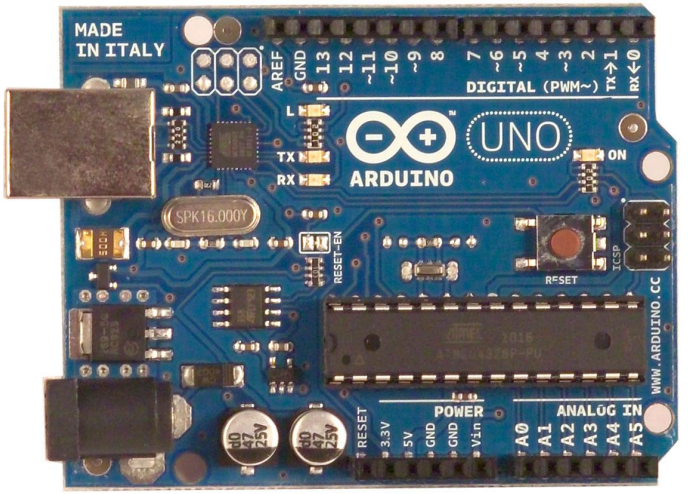
Arduino : Introduction & Programming

What is an Arduino ?

- **Open Source** electronic prototyping **platform** based on flexible **easy to use** hardware and software.

- It's intended for artists, designers, hobbyists, and anyone interested in creating interactive objects or environments.

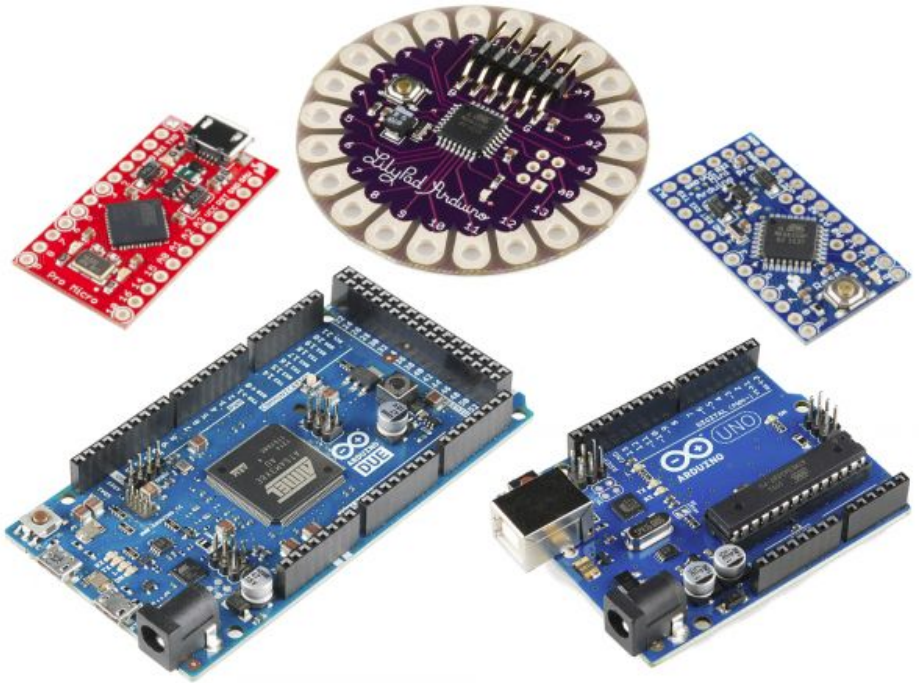


What is a microcontroller?

- A microcontroller is often described as a ‘computer-on-a-chip’.
- It is a low-cost integrated circuit that contains memory, processing units, and input/output circuitry in a single unit.
- Microcontrollers are programmed with a specific control program and build into a product to make it more intelligent and easier to use.
- Examples: Microwave oven, Elevators

Open Source Hardware

- "Open hardware," or "open source hardware," refers to the design specifications of a physical object which are licensed in such a way that said object can be studied, modified, created, and distributed by anyone.

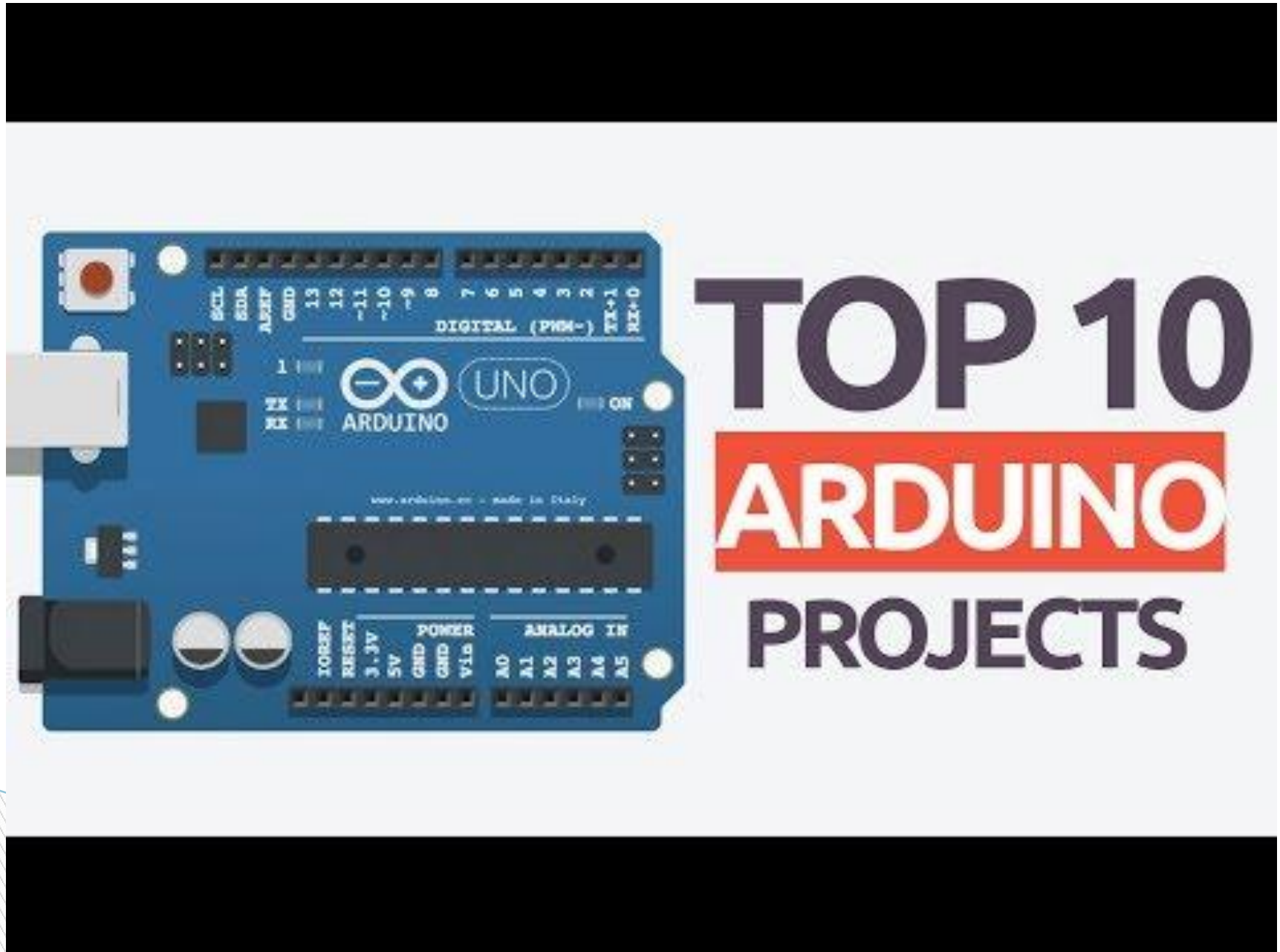


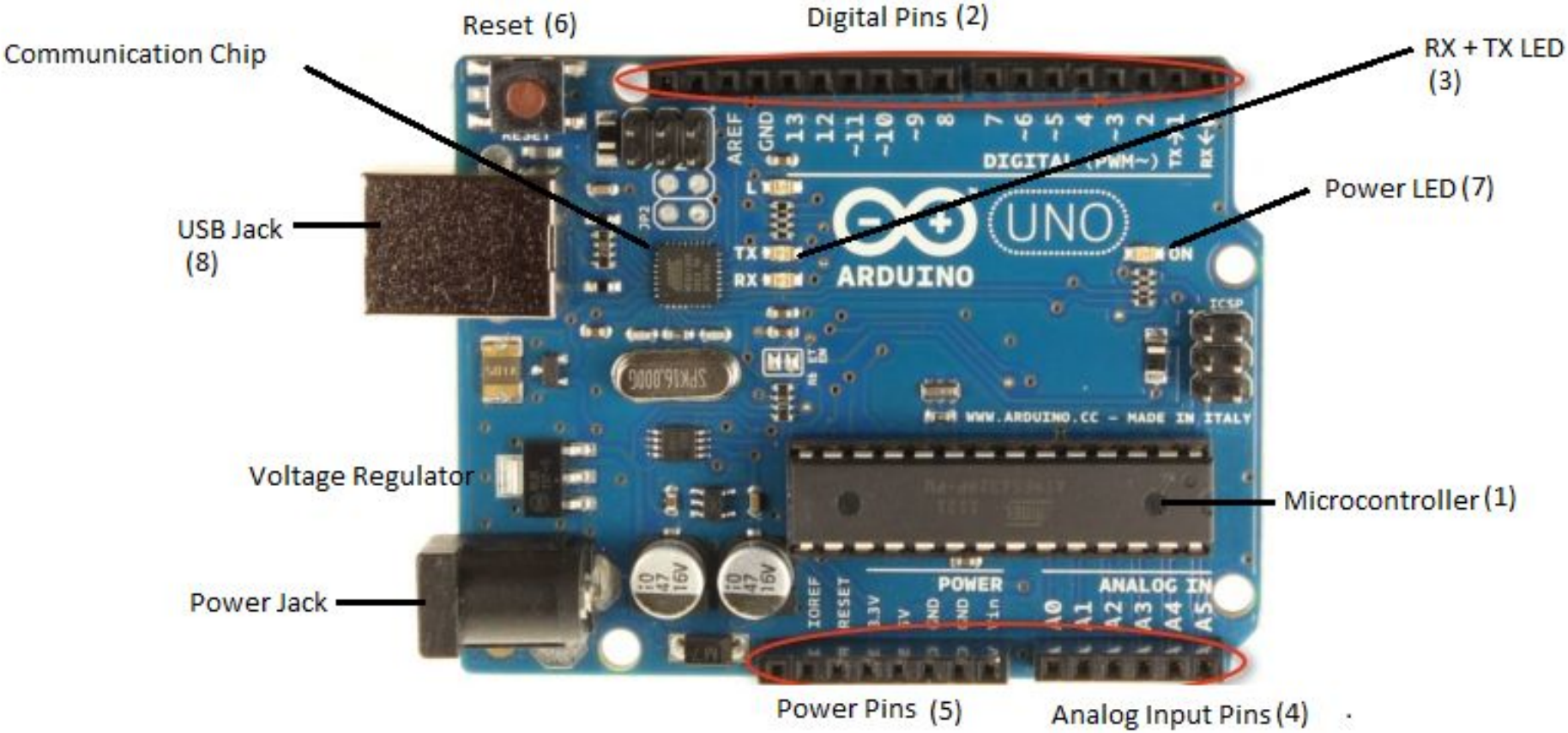
History

- In 2005, a project was initiated to make a device for controlling student-built interactive design projects that was less expensive than other prototyping systems at the time.

- Founders Massimo Banzi and David Cuartielles named the project after Arduin of Ivrea and began producing boards in a small factory

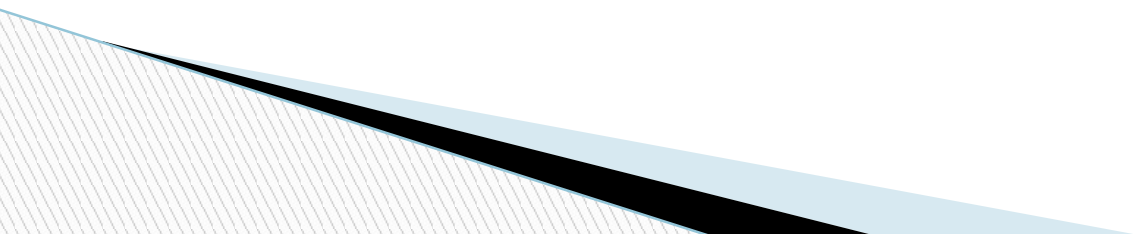
Interesting Arduino Projects




Communication Chip
Reset (6)
Digital Pins (2)
RX + TX LED
(3)
USB Jack
(8)
Power LED (7)
Voltage Regulator
Microcontroller (1)
Power Jack
Power Pins (5)
Analog Input Pins (4)
UNO
ARDUINO
DIGITAL (PWM~)
POWER
ANALOG IN
WWW.ARDUINO.CC – MADE IN ITALY

- Microcontroller - ATmega328
- Operating Voltage - 5V
- Input Voltage (recommended) – 7 to12V
- Digital I/O Pins - 14 (of which 6 provide PWM output)
- Analog Input Pins - 6
- DC Current per I/O Pin - 40 mA
- DC Current for 3.3V Pin - 50 mA
- Flash Memory - 32 KB (ATmega328) of which 0.5 KB used by bootloader
- SRAM - 2 KB (Atmega328)
- EEPROM - 1 KB (Atmega328)
- Clock Speed - 16 MHz

Getting started with Programming



Bare minimum code

```
/*  This is a header – update the info for each new program
Author:         Mr. Di Iorio
Date:           December 5, 2018
Description:  This example is meant to show you the
                initial code you start with.
*/
void setup()
{
    // put your setup code here, to run once:
}
void loop()
{
    // put your main code here, to run repeatedly:
}
```

Bare minimum code

- setup : It is called only when the Arduino is powered on or reset. It is used to initialize variables and pin modes

- loop : The loop functions runs continuously till the device is powered off. The main logic of the code goes here. Similar to while (1) for microcontroller programming. The number 1 evaluates to TRUE. 0 would evaluate to FALSE.

Writing To The Console:

```
void setup()
{
    Serial.begin(9600);
    Serial.println("This will only run once");
}
void loop()
{
    Serial.println("This will run repeatedly.");
}
```

PinMode

- A pin on arduino can be set as input or output by using pinMode function.
- pinMode(13, OUTPUT); // sets pin 13 as output pin
- pinMode(13, INPUT); // sets pin 13 as input pin

Reading/writing digital values

- digitalWrite(13, LOW); // Makes the output voltage on pin 13 , 0V
- digitalWrite(13, HIGH); // Makes the output voltage on pin 13 , 5V
- int buttonState = digitalRead(2); // reads the value of pin 2 in buttonState