Arduino Interfacing

INTRODUCTION TO ARDUINO

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Arduino

- **Arduino is an open-source electronics platform based on easy-to-use hardware and software.**
- Arduino boards are able to read inputs (ex. light on a sensor, a finger on a button, or a Twitter message -)
- Turn it into an output (ex. activating a motor, turning on an LED, publishing something online)
- You can tell your board what to do by sending a set of instructions to the microcontroller on the board.
- To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE).

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History of Arduino

- Arduino is invented by **Massimo Banzi**.
- In the year **2005** the first ever Arduino board was born in the classrooms of the Interactive Design Institute in **Ivrea**, **Italy**.

Types of Arduino

- Leonardo
- Nano
- Micro
- Lily Pad
- Esplora
- Mega
- Uno etc.

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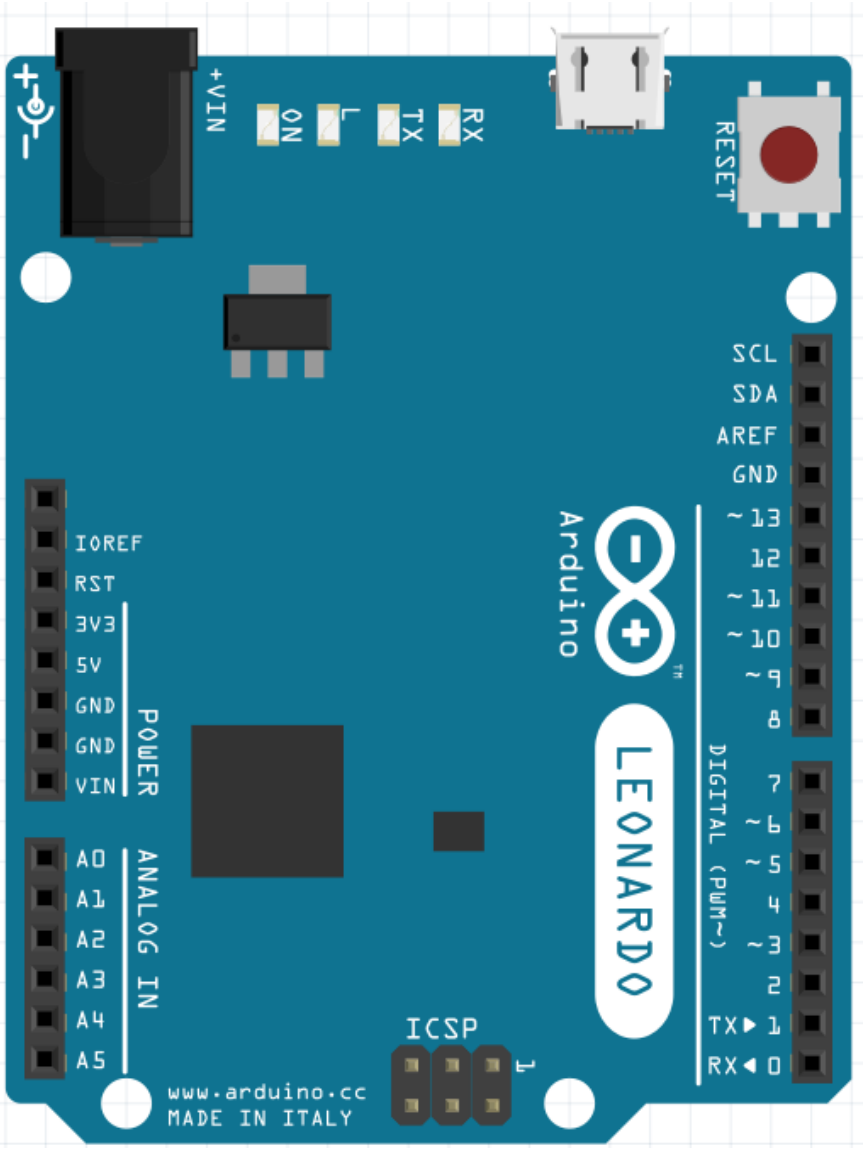
Leonardo

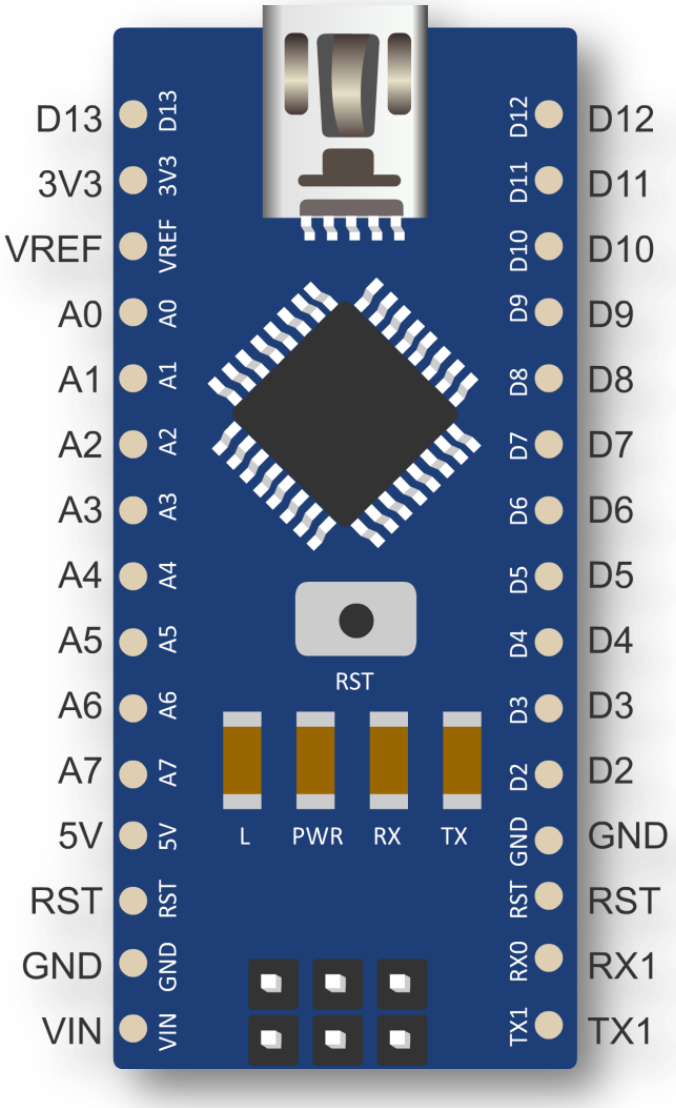


It is based on the **ATmega32u4 microprocessor**.

It has **20 digital input/output** pins (of which 7 can be used as PWM outputs and **12** as **analog inputs**)

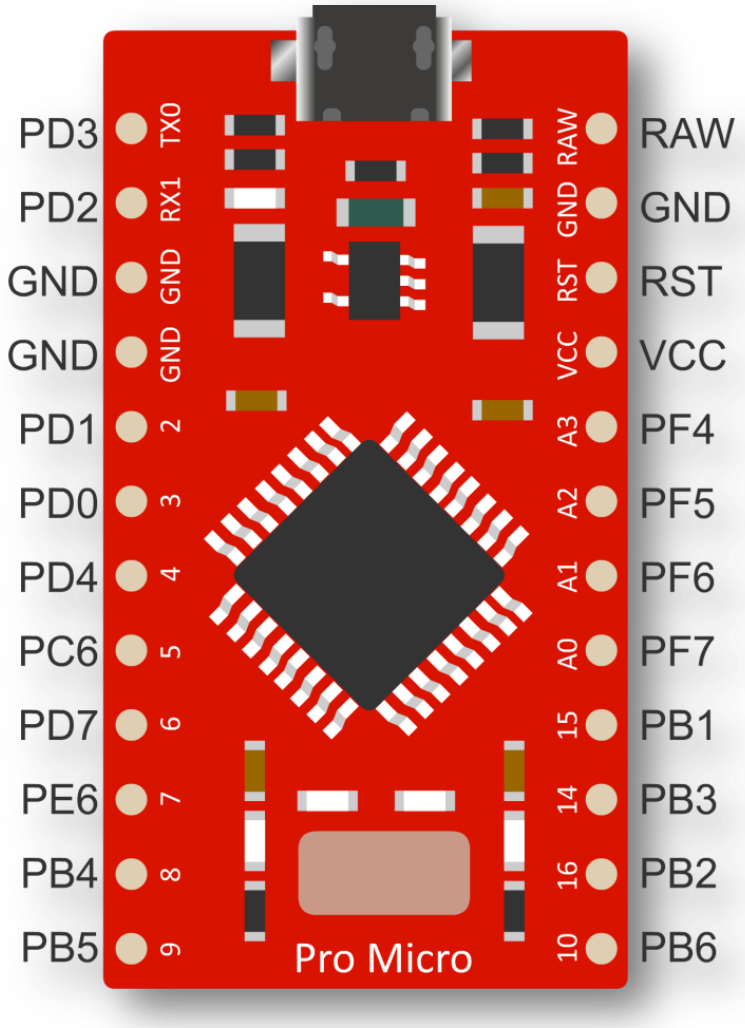
16 MHz crystal oscillator, a micro USB connection, a power jack, an ICSP header, and a reset button

Arduino Nano



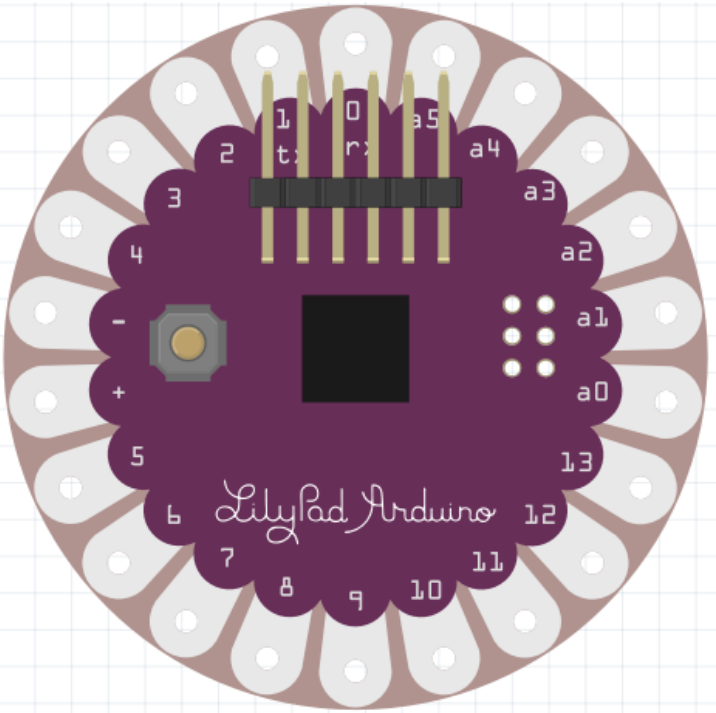
- It is based on the **ATmega328** or **ATmega168 microprocessor**.
- It can be powered via the Mini-B USB connection.

Arduino Micro



- It is based on the **ATmega32U4 microprocessor**.
- It has **20 digital input/output** pins (of which 7 can be used as PWM outputs and **12** as **analog inputs**)

LilyPad Arduino

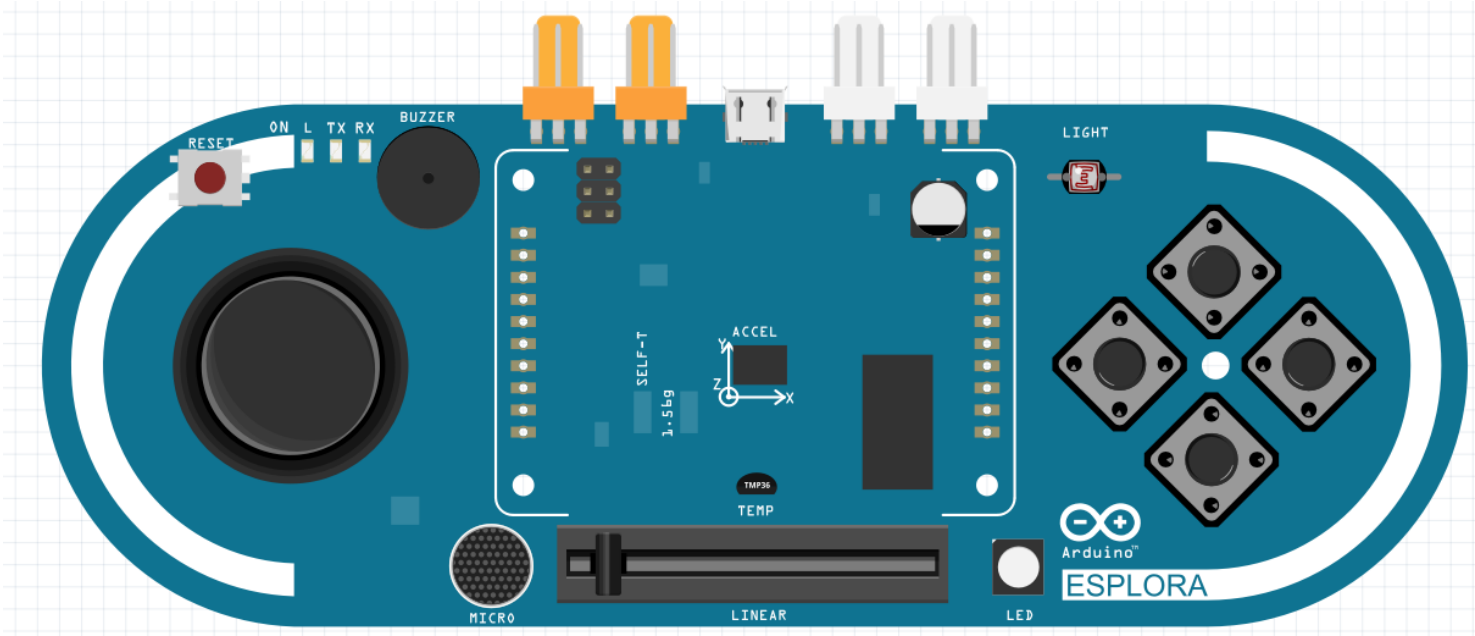


- It is based on the **ATmega168V** or **ATmega328V microprocessor**.
- It is designed for e-textiles and wearable projects.
- It can be sewn to fabric and similarly mounted power supplies, sensors and actuators with conductive thread

Arduino Esplora

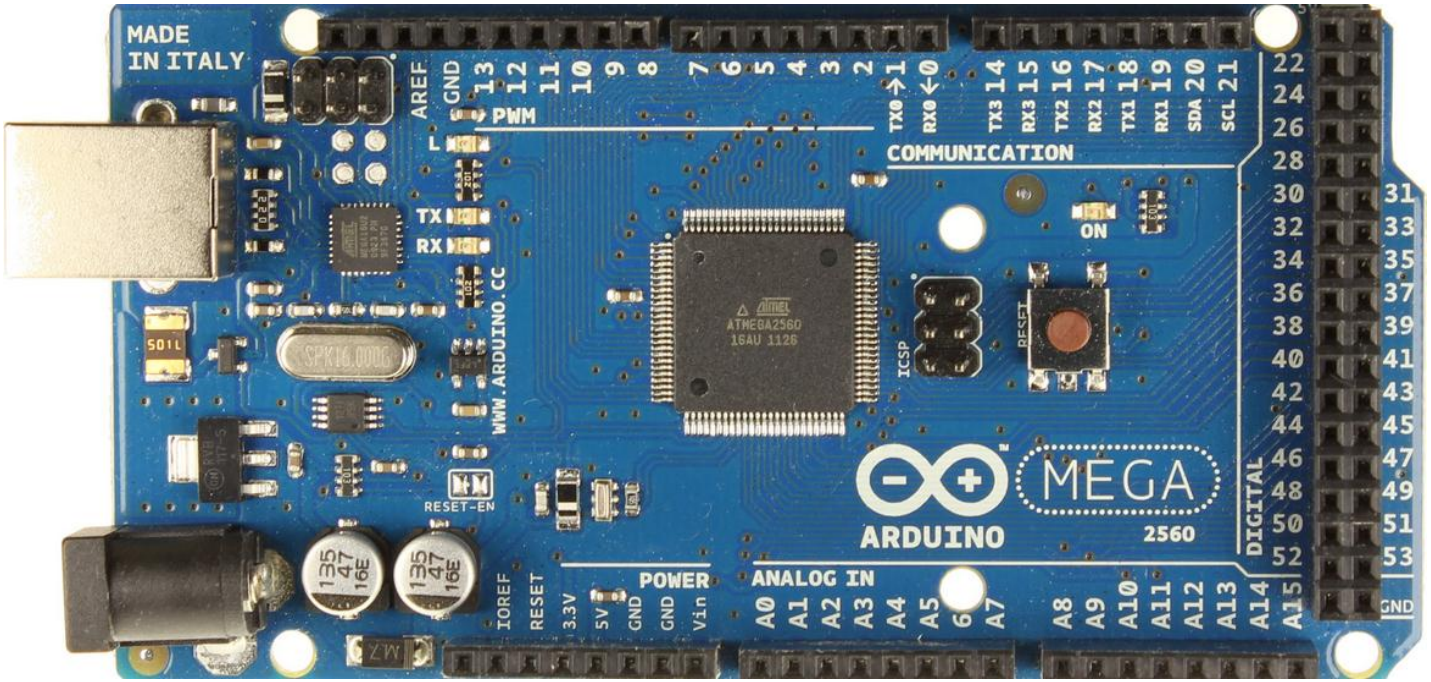
- The Arduino Esplora is an Arduino Leonardo based board with integrated sensors and actuators.

- It uses an **ATmega32U4 AVR microprocessor**.

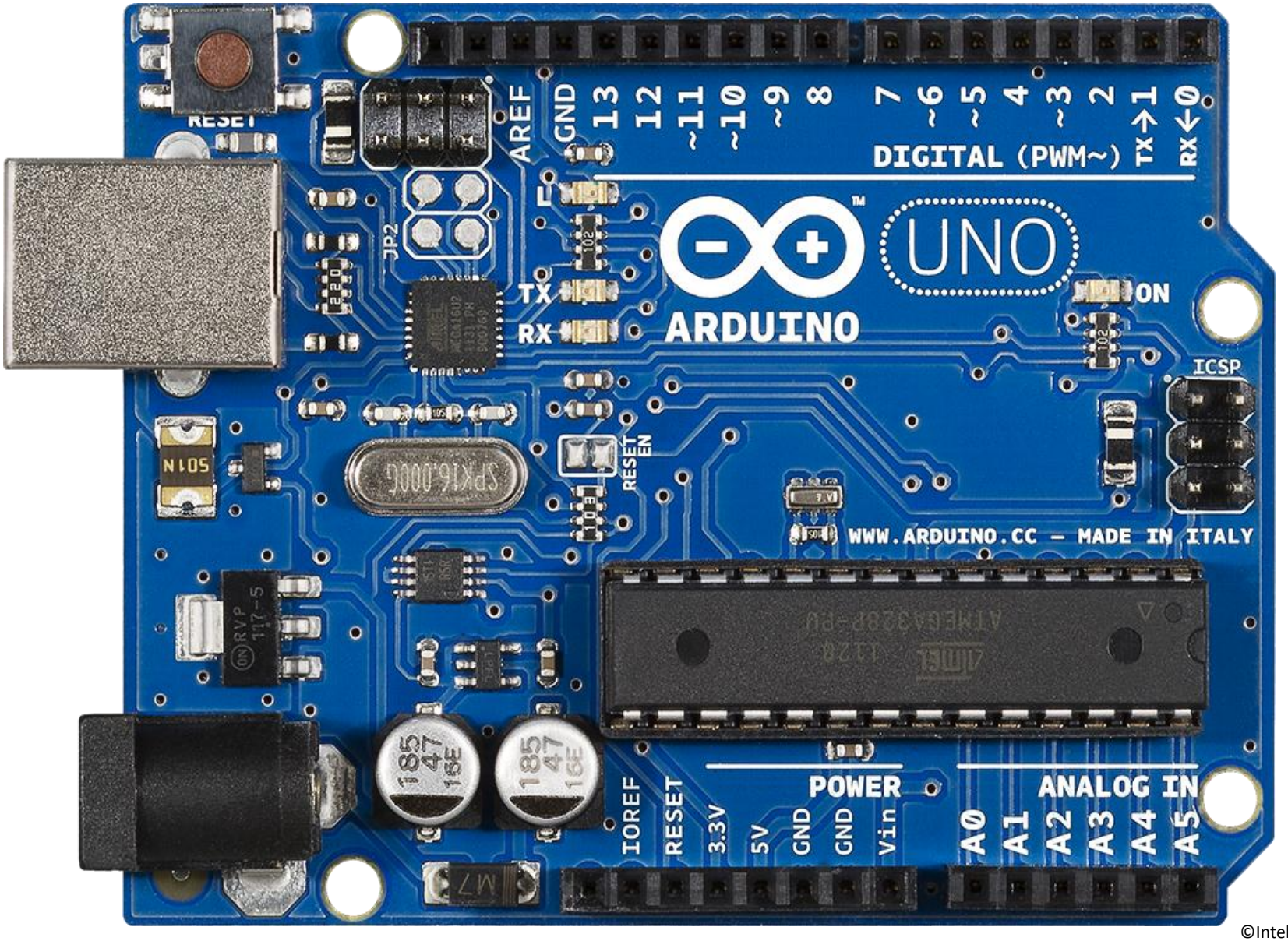


Arduino Mega

- It is based on the **ATmega168V** or **ATmega1280 microprocessor**.
- It has 54 digital input/output pins, 14 can be used as PWM.
- 16 analog inputs, 4 UARTs.



Arduino Uno R3



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Characteristics of Arduino Uno R3

- Inexpensive
- Cross-platform
- Simple, clear programming environment
- Open source and extensible software - The Arduino software is published as open source tools, available for extension by experienced programmers.
- Open source and extensible hardware - The plans of the Arduino boards are published under a Creative Commons license, so experienced circuit designers can make their own version of the module, extending it and improving it.

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Specifications of Arduino Uno R3

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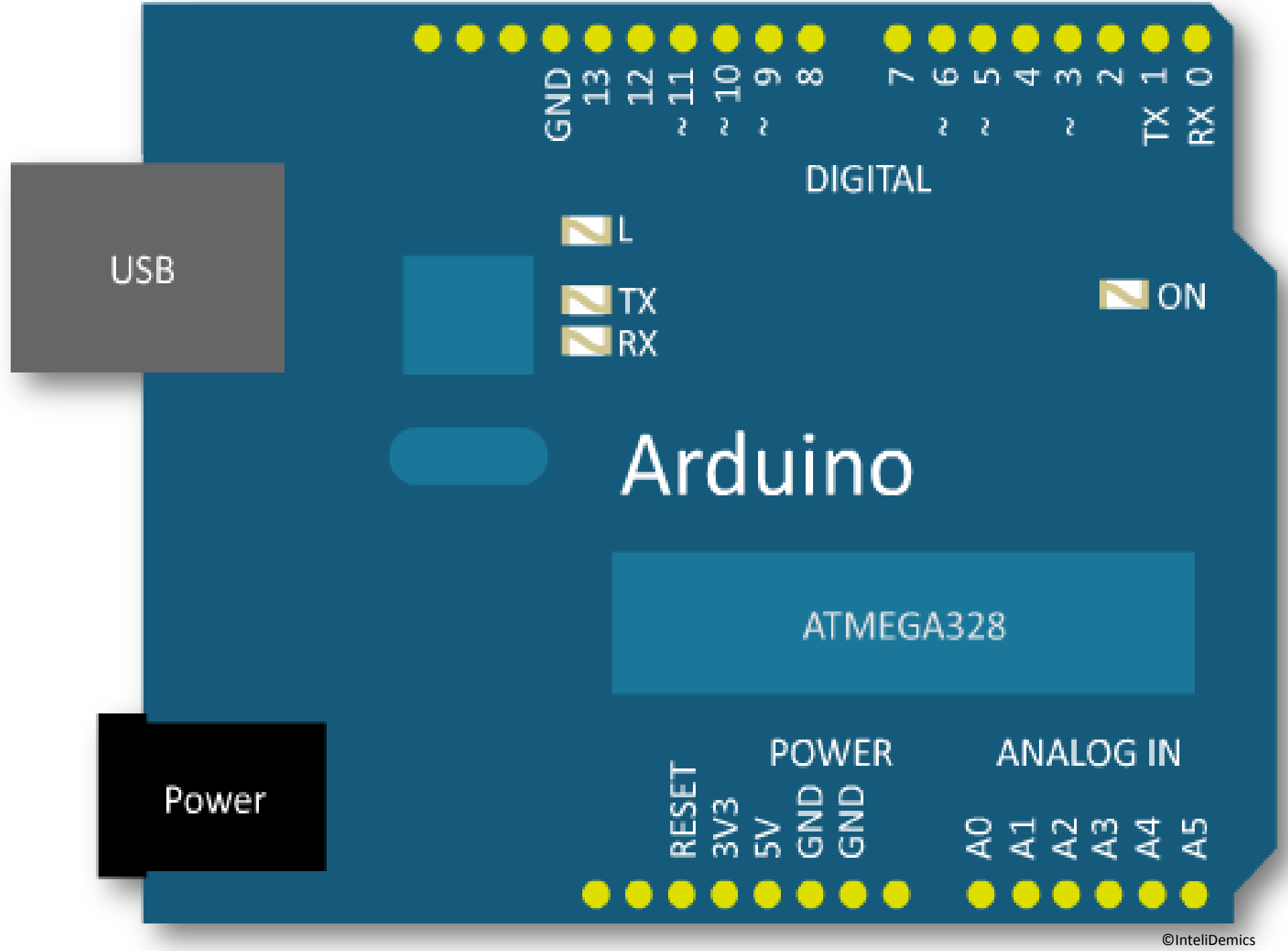

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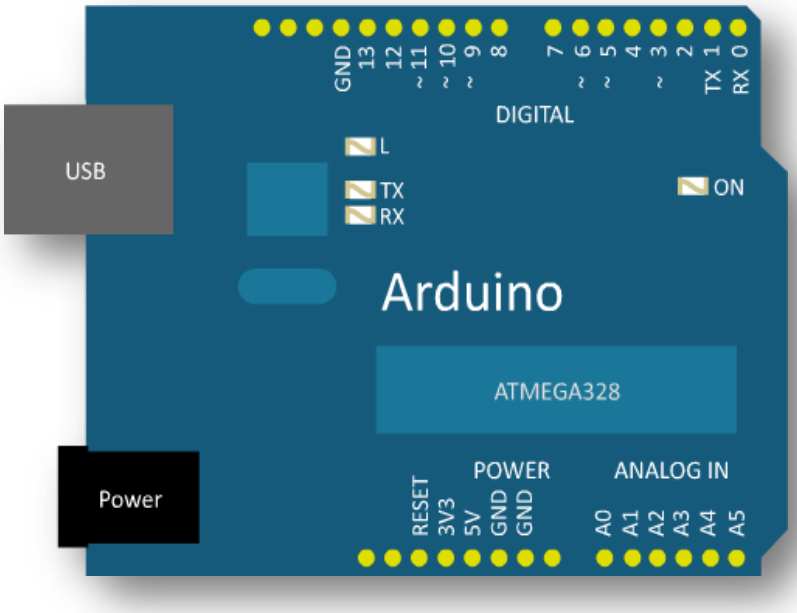
Powering to Arduino

- Operating Voltage : 5V
- Input Voltage (recommended): 7 – 12V
- Input Voltage (limit) : 6 – 20V



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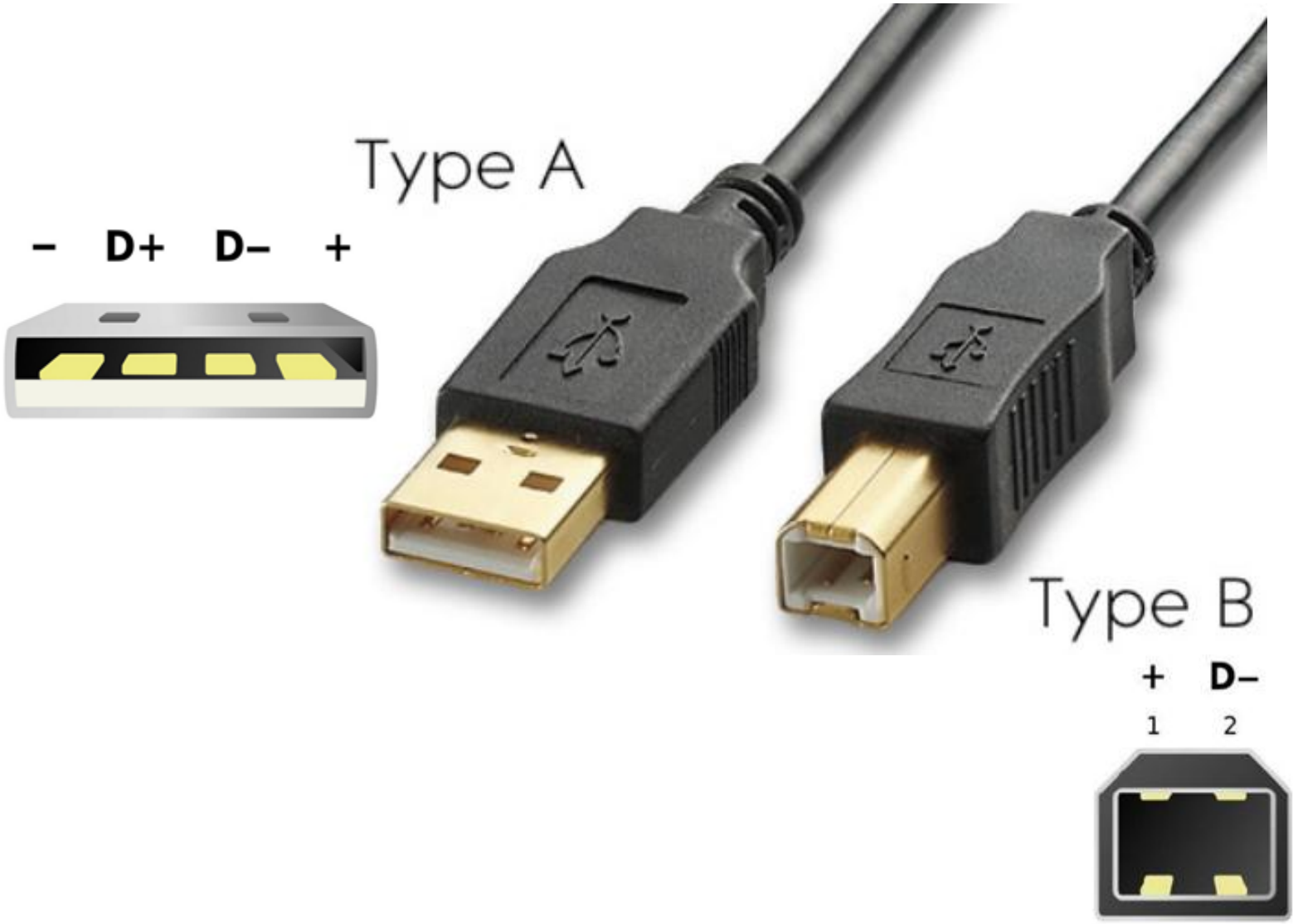
- **Through USB**



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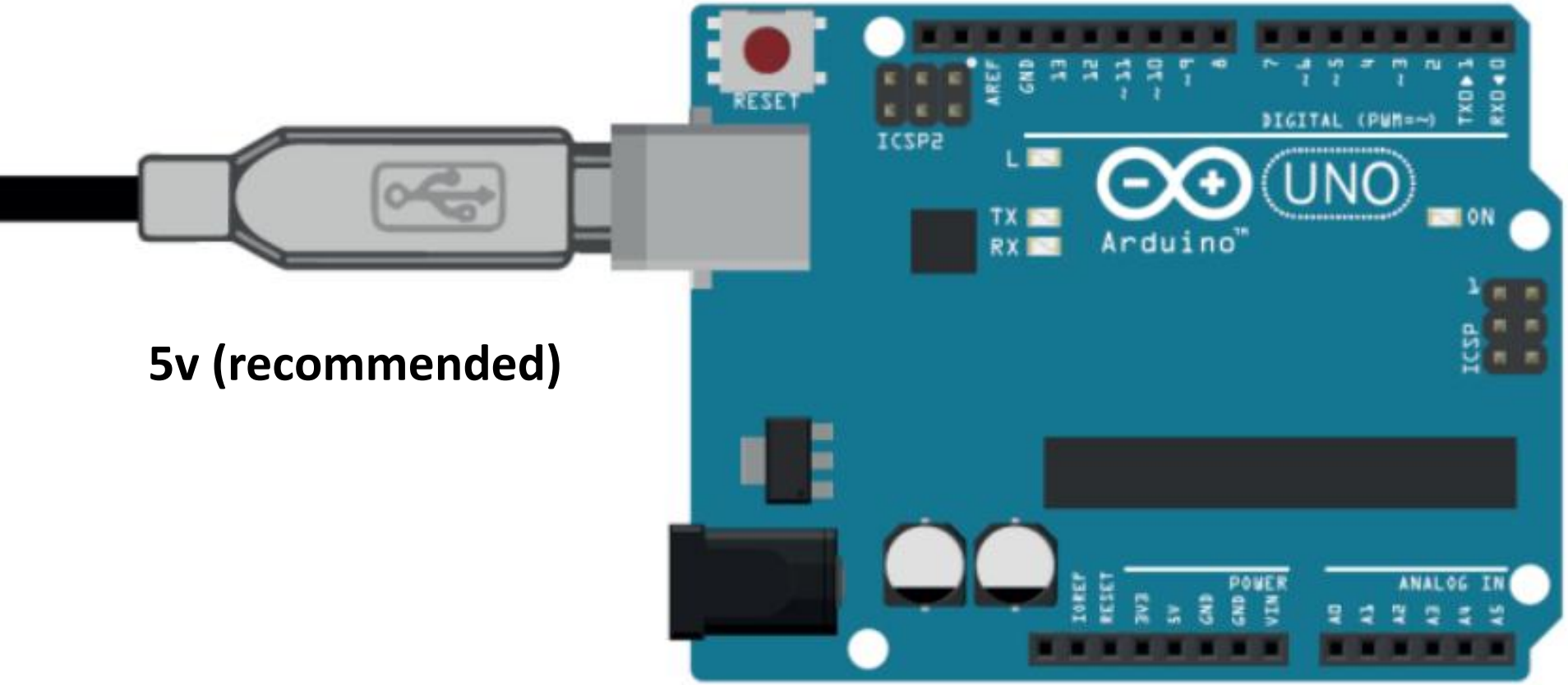
- **Through Type B USB**



5v (recommended)

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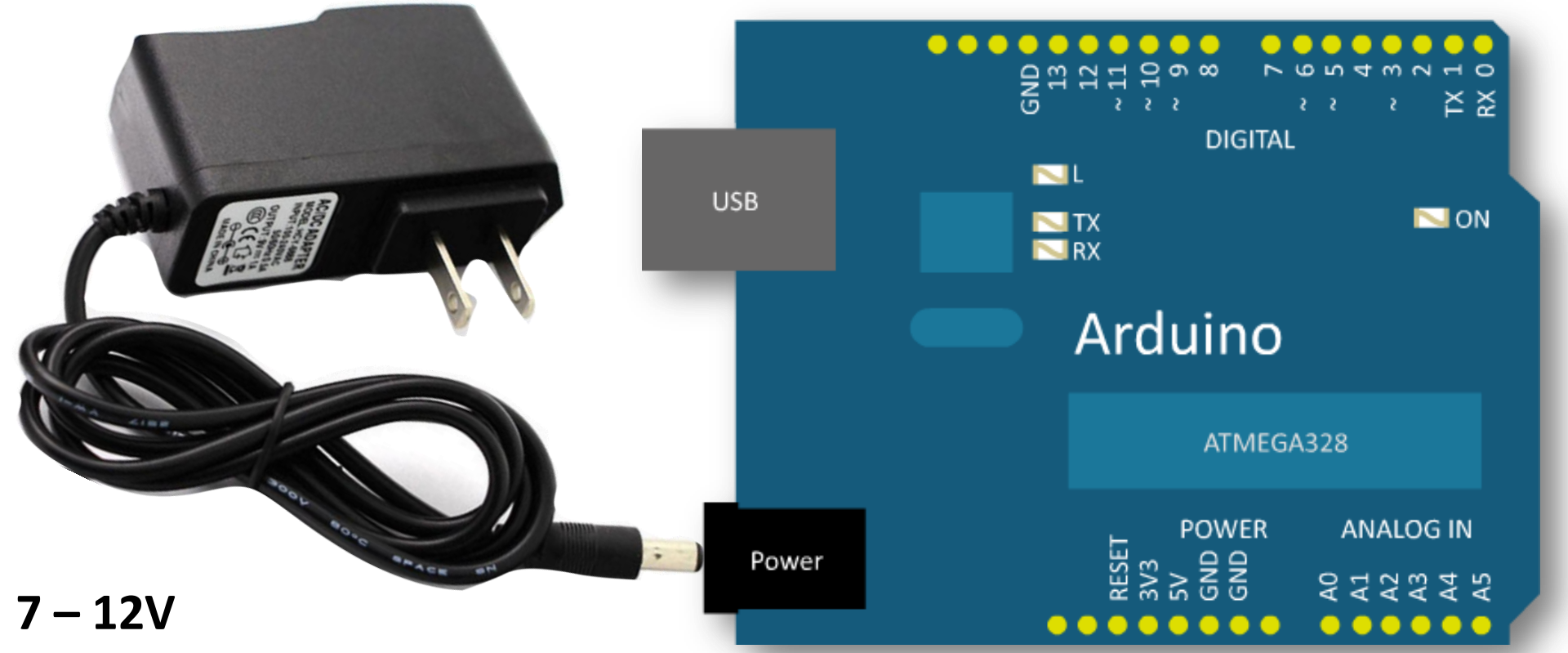
- **Through Adapter Power**



7 – 12V
(recommended)
6 – 20V
(limit)

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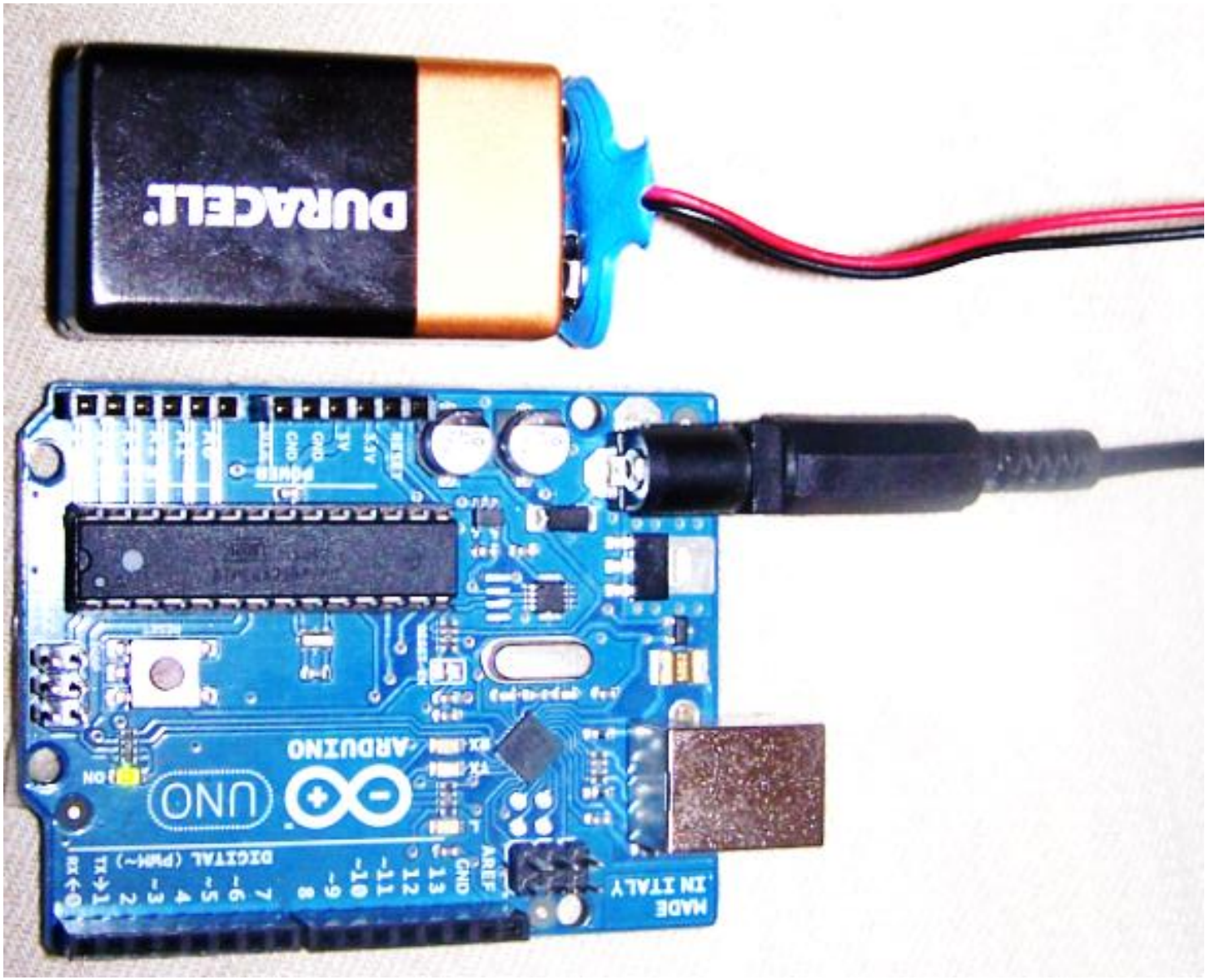
- **Through Battery**



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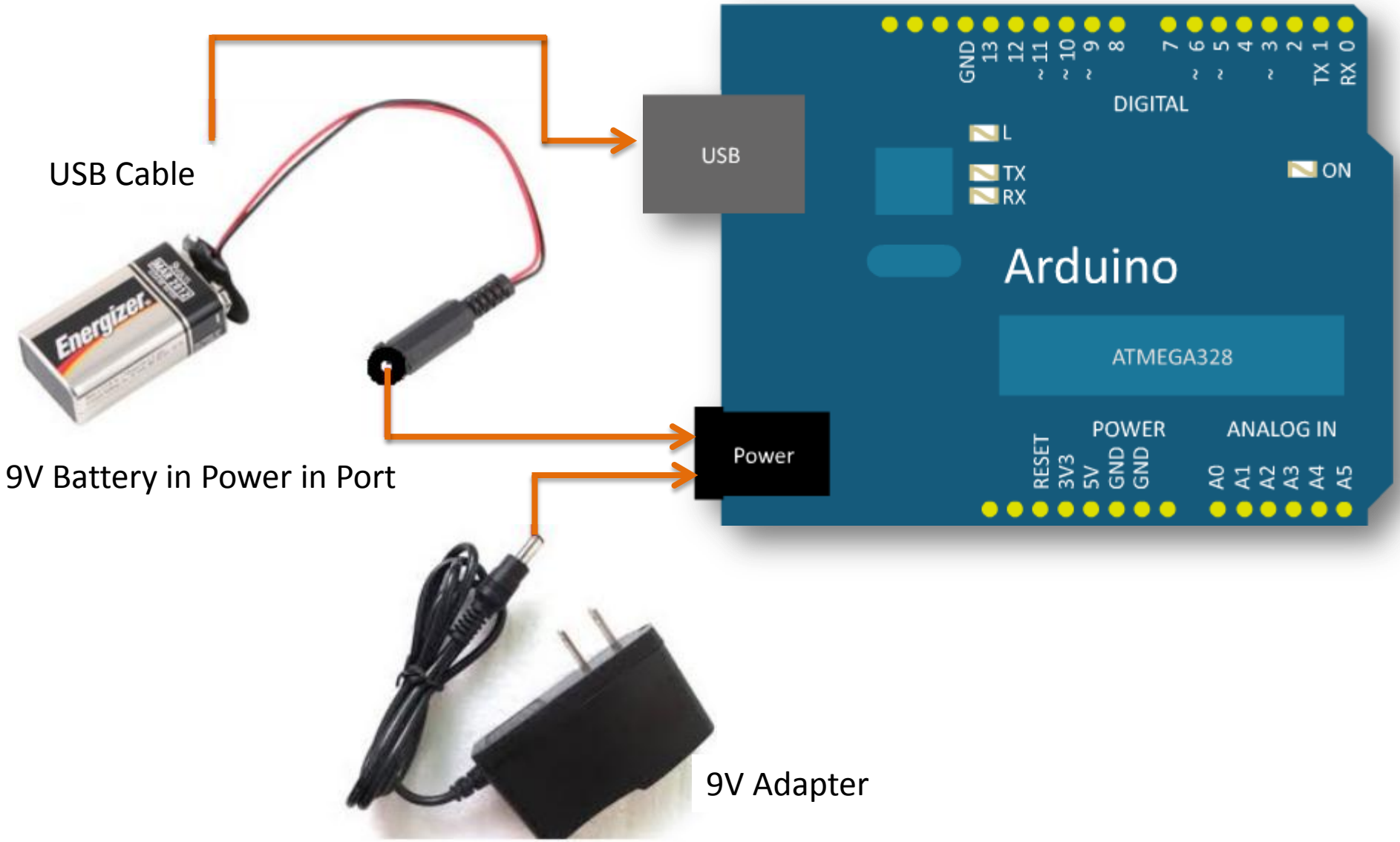
Arduino Uno Powering Options (One at a Time)



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This is the brain of Arduino

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ATMEGA 328 IC

- Operating Voltage : 1.8 to 5V
- Clock Speed : 20MHz(Max)
- Flash Memory : 32KB
- SRAM : 2KB
- EEPROM : 1KB
- 8 Bit Microcontroller
- Inbuilt 10 bit A/D Coverter
- 6 PWM channels

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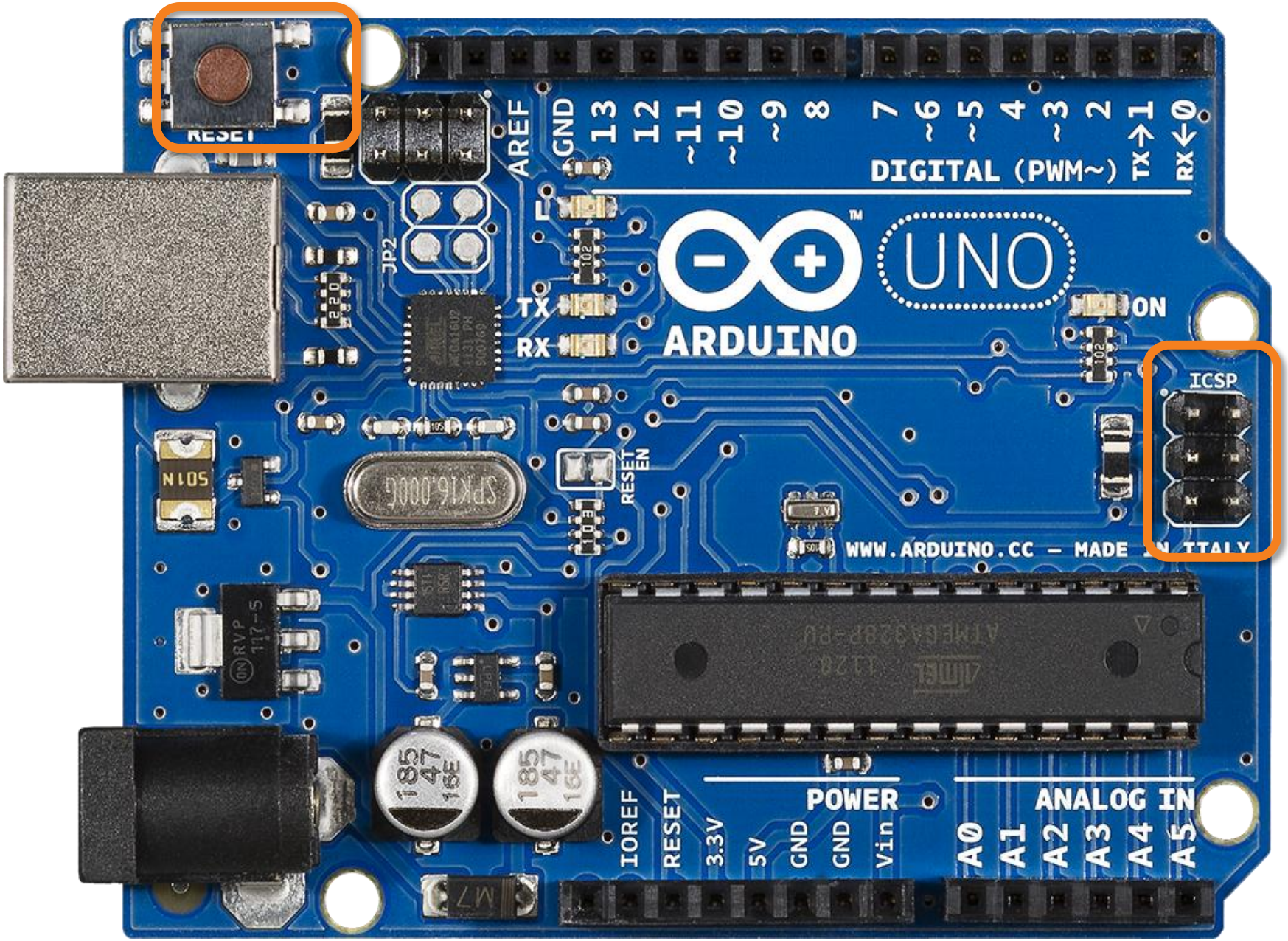
Arduino Uno R3



14 digital pins (**D0 – D13**) can be set as **input** or **output.**

DC Current per I/O Pin : **30mA**

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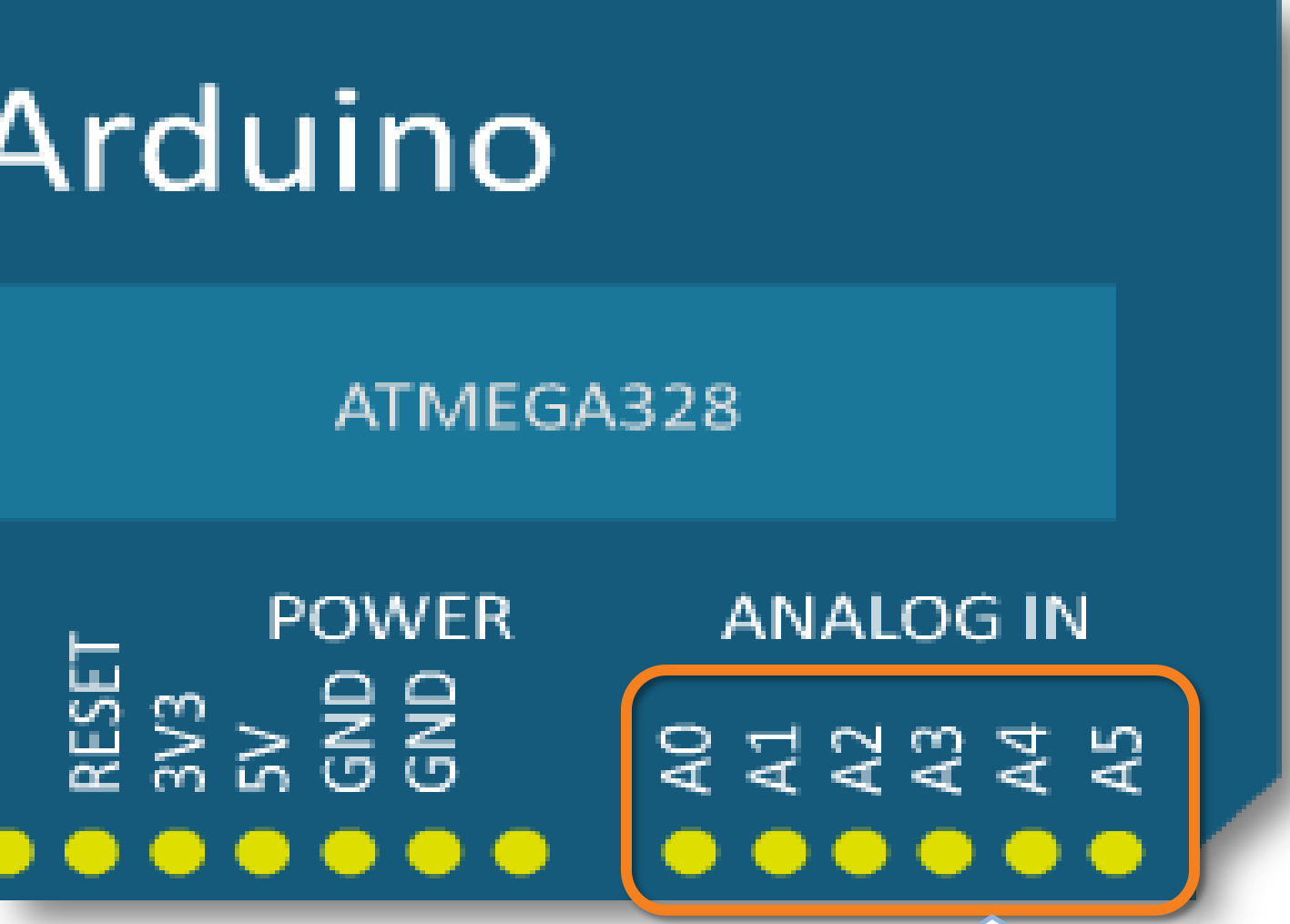

6 analog pins (**A0 – A5**) can be used to **Analog INPUT(Read)**, also used for **Digital OUTPUT**

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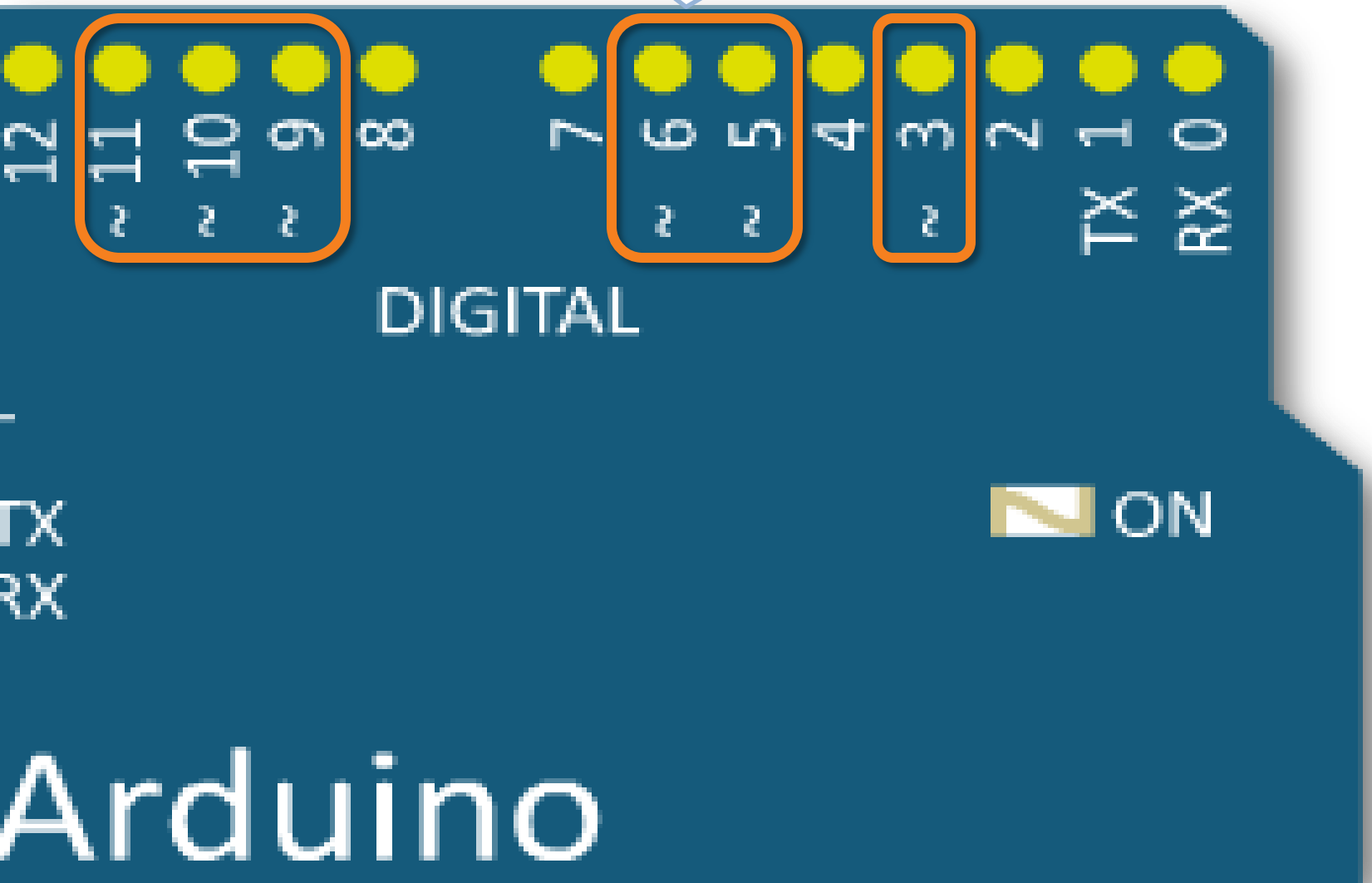
Tilt(~) pins as **PWM** pins
for **Analog OUTPUT**



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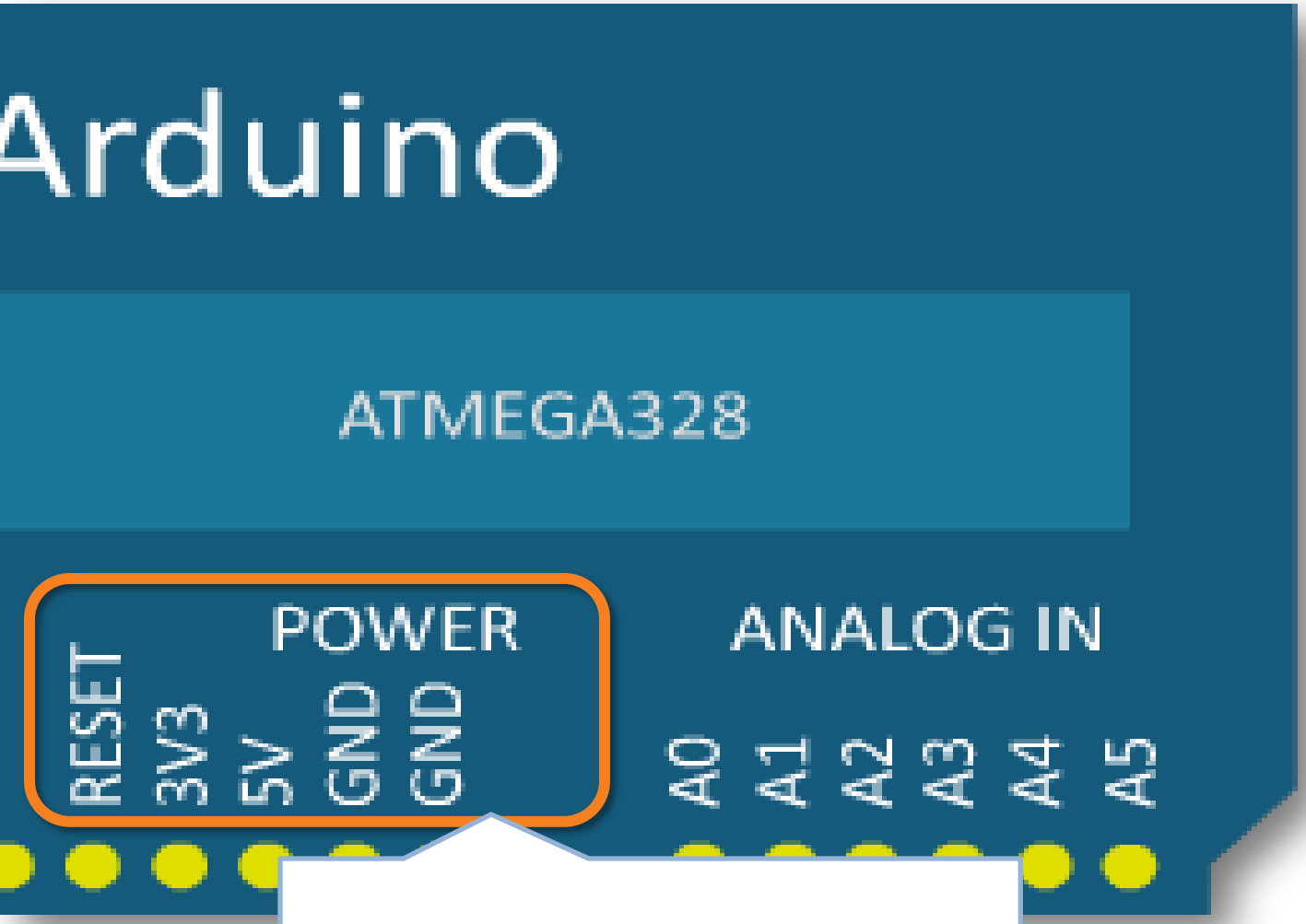
Powering External Devices



Can use for Powering External Devices

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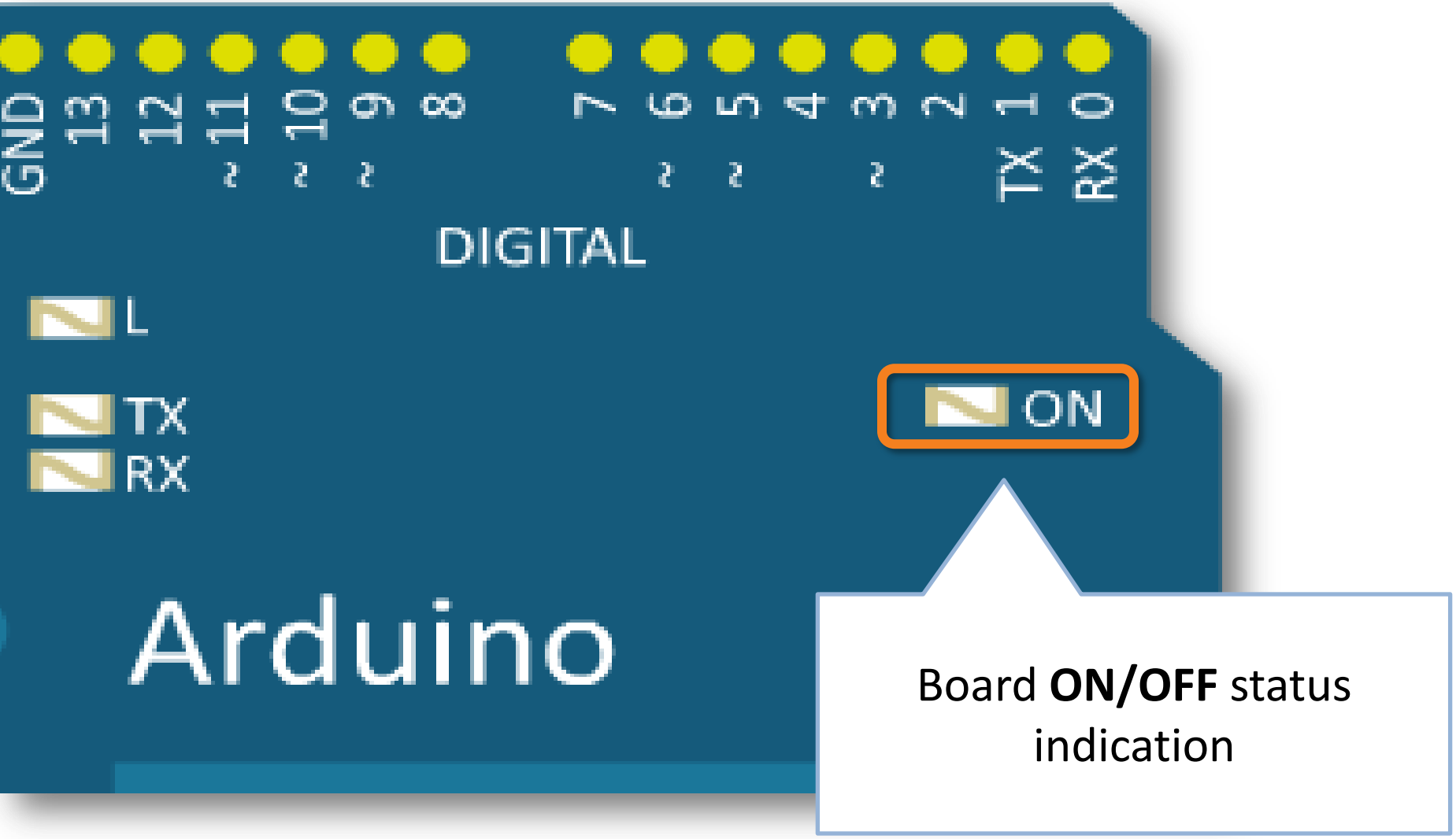

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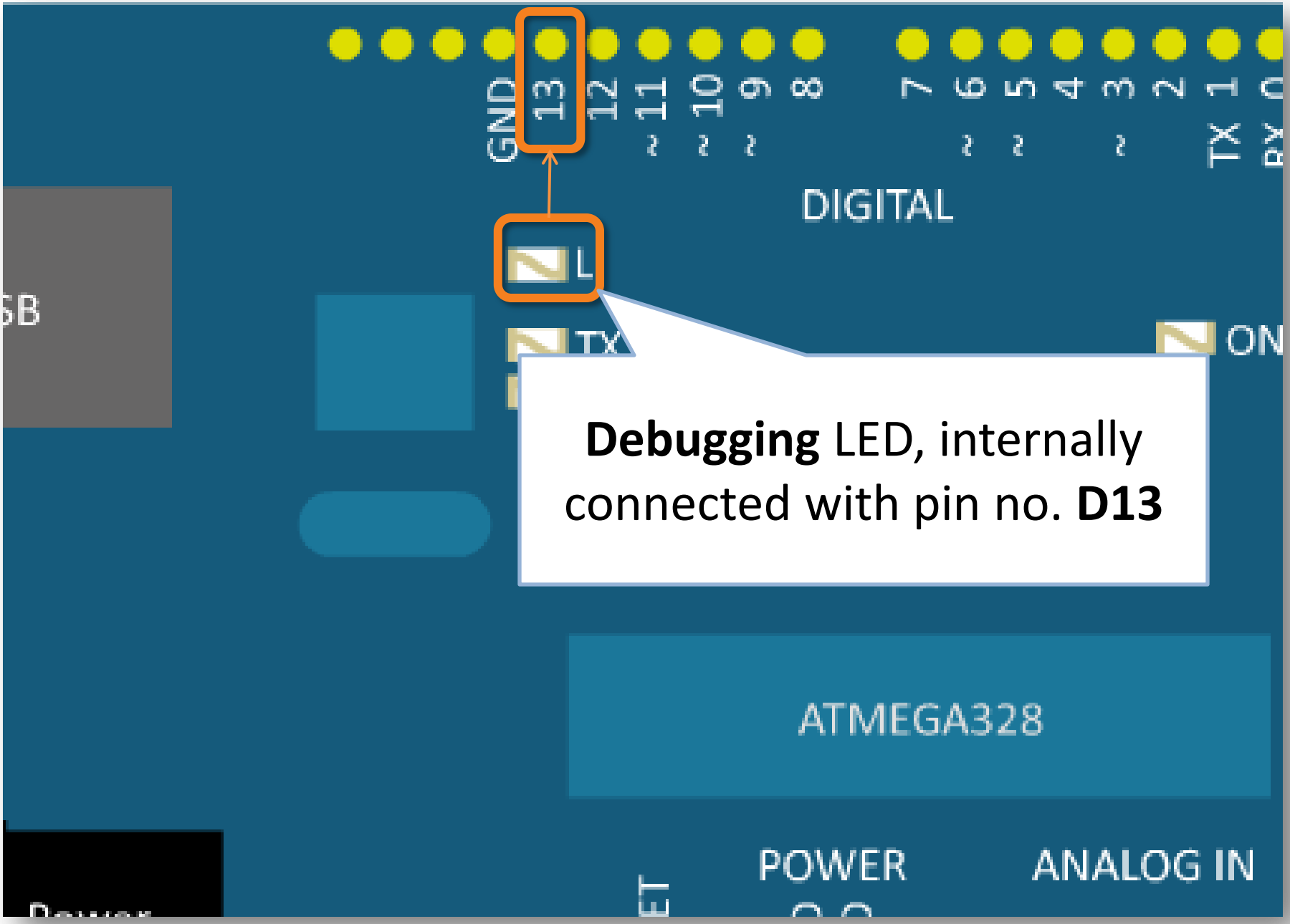

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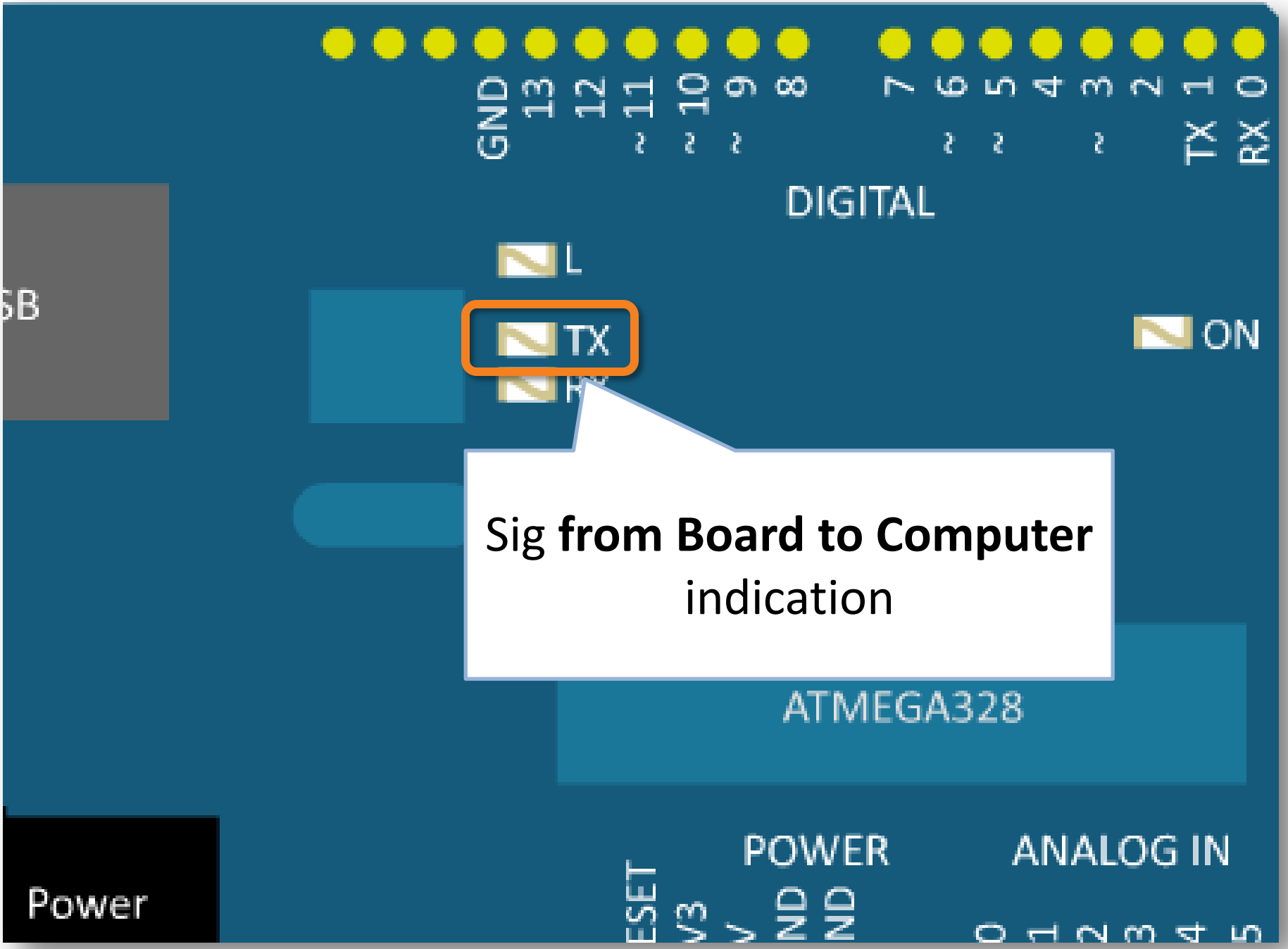

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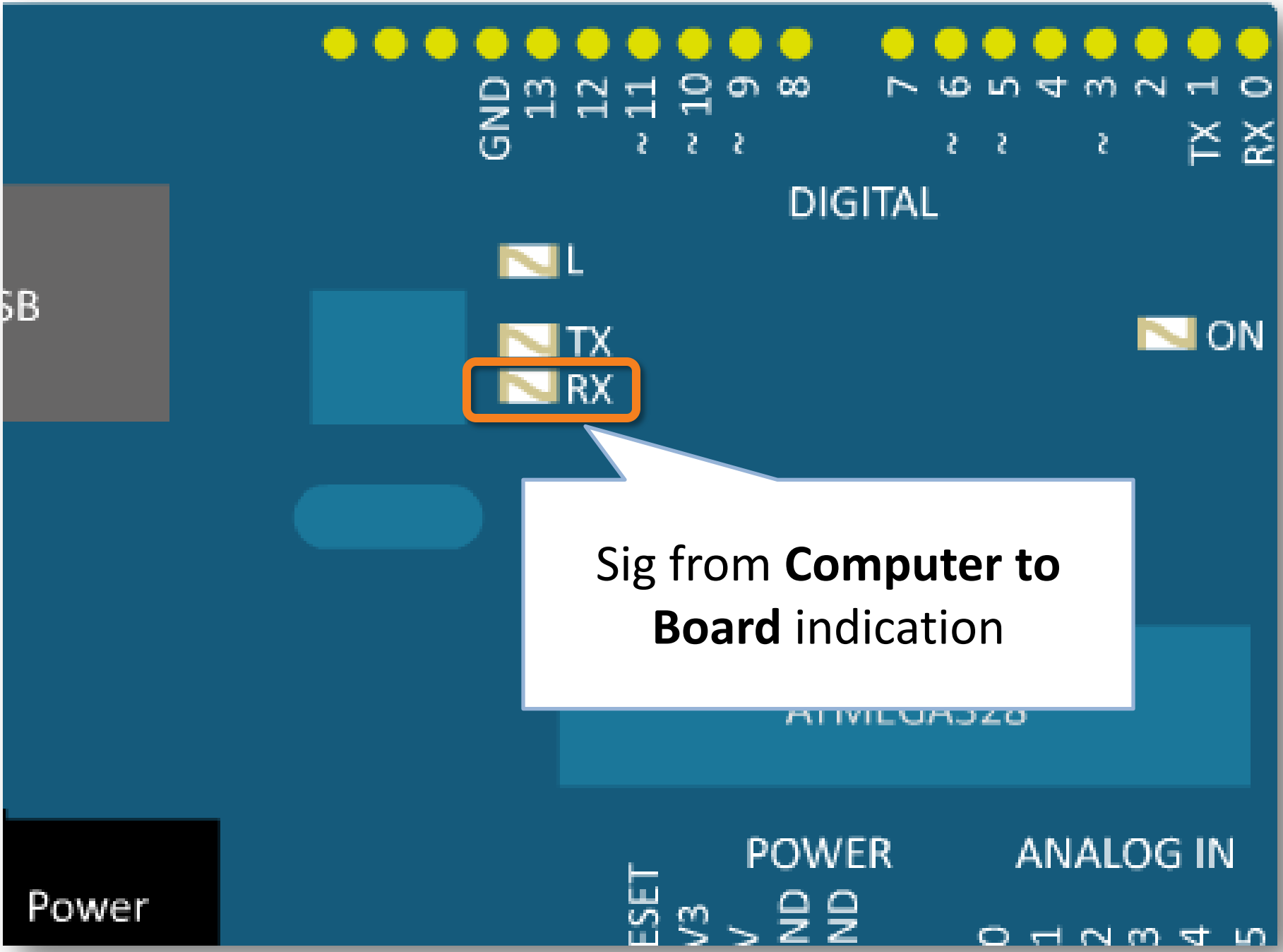

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Specifications of Arduino Uno R3

- Microcontroller : ATmega328
- Operating Voltage : 5V
- Input Voltage (recommended): 7 – 12V
- Input Voltage (limit) : 6 – 20V
- Digital Input Pins : 14
- Digital Output Pins : 20
- PWM Output Pins : 6
- Analog Input Pins : 6
- DC Current per I/O Pin : 30mA
- DC Current for 3.3V Pin : 50mA.

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Contd…

Memories & Clock Speed

- Flash Memory : 32KB of which 0.5 KB used to bootloader.
- SRAM : 2KB
- EEPROM : 1KB
- Clock Speed : 16MHz

Physical Specifications

- Length : 68.6mm
- Width : 53.4mm
- Weight : 25g

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Arduino IDE(Software)

- The Arduino Software or an IDE(Integrated Development Environment);

  - A text editor,
  - A toolbar,
  - An inbuilt compiler,
  - Serial Monitor

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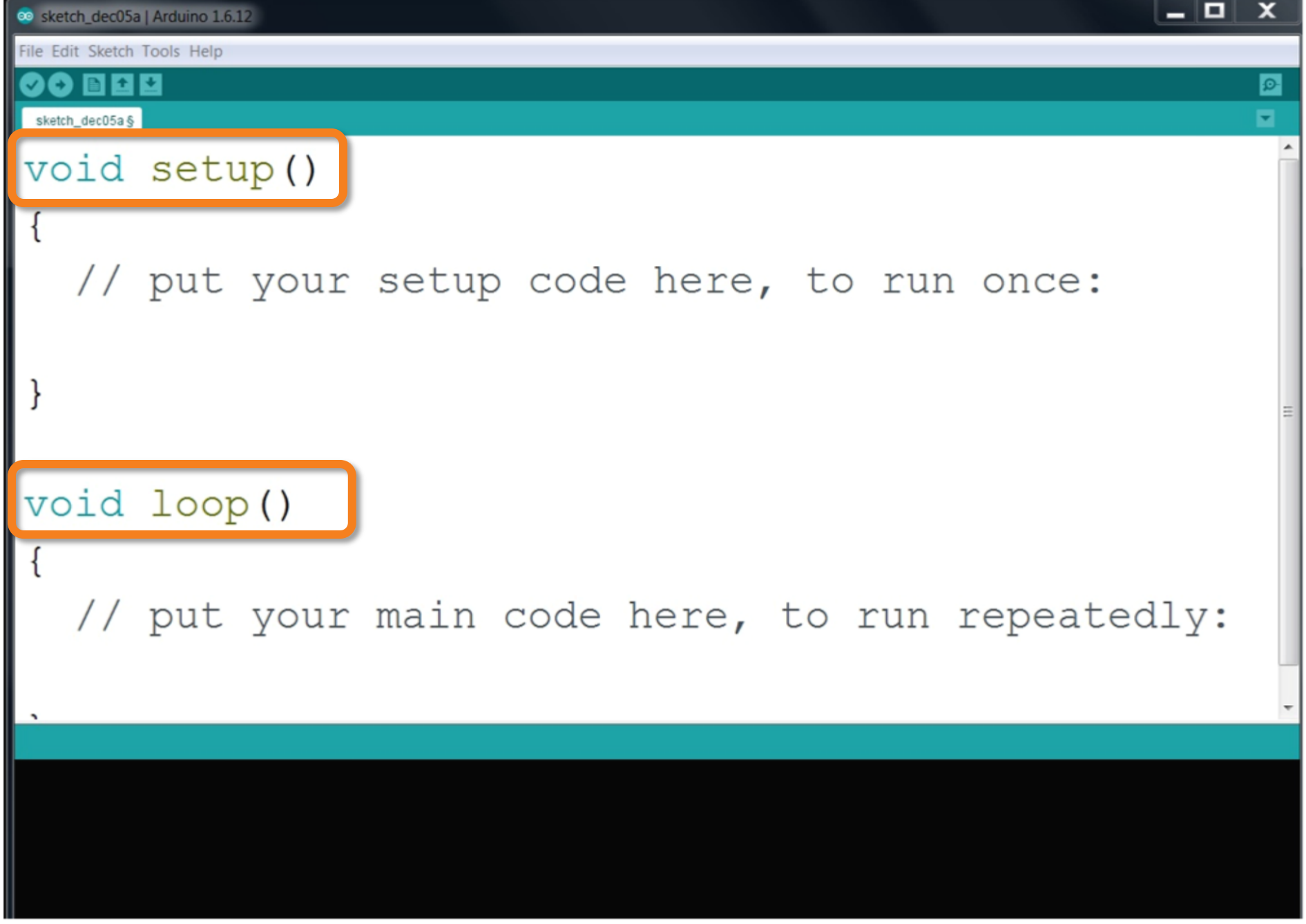

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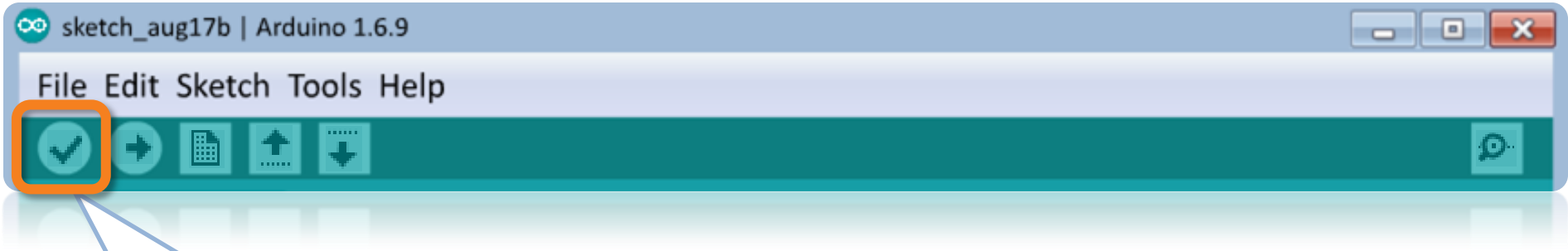

Save and **compile** the **program**

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Upload the **program**

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Arduino Program Basics

- **Two functions:**
  - void setup()
  - void loop()
- **Declare variables globally or locally**
    - E.g. int sensorValue;
- **Instructions to be written in void setup():**
  - pinMode (pin number, function)
    - E.g. pinMode (13, OUTPUT)
    - E.g. pinMode (5, INPUT)

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Arduino Program Basics

- **Instructions to be written in void loop():**
  - digitalWrite(pin no., status)
    - E.g. digitalWrite (13, HIGH);
    - E.g. digitalWrite (13, LOW)
  - digitalRead (pin no)
    - digitalRead (5)
  - analogRead(pin no)
    - analogRead (A0)

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Pulse Width Modulation(PWM)

- Technique for getting **analog results** with **digital means**.
- Instruction and command:
  - analogWrite (pin no, value);

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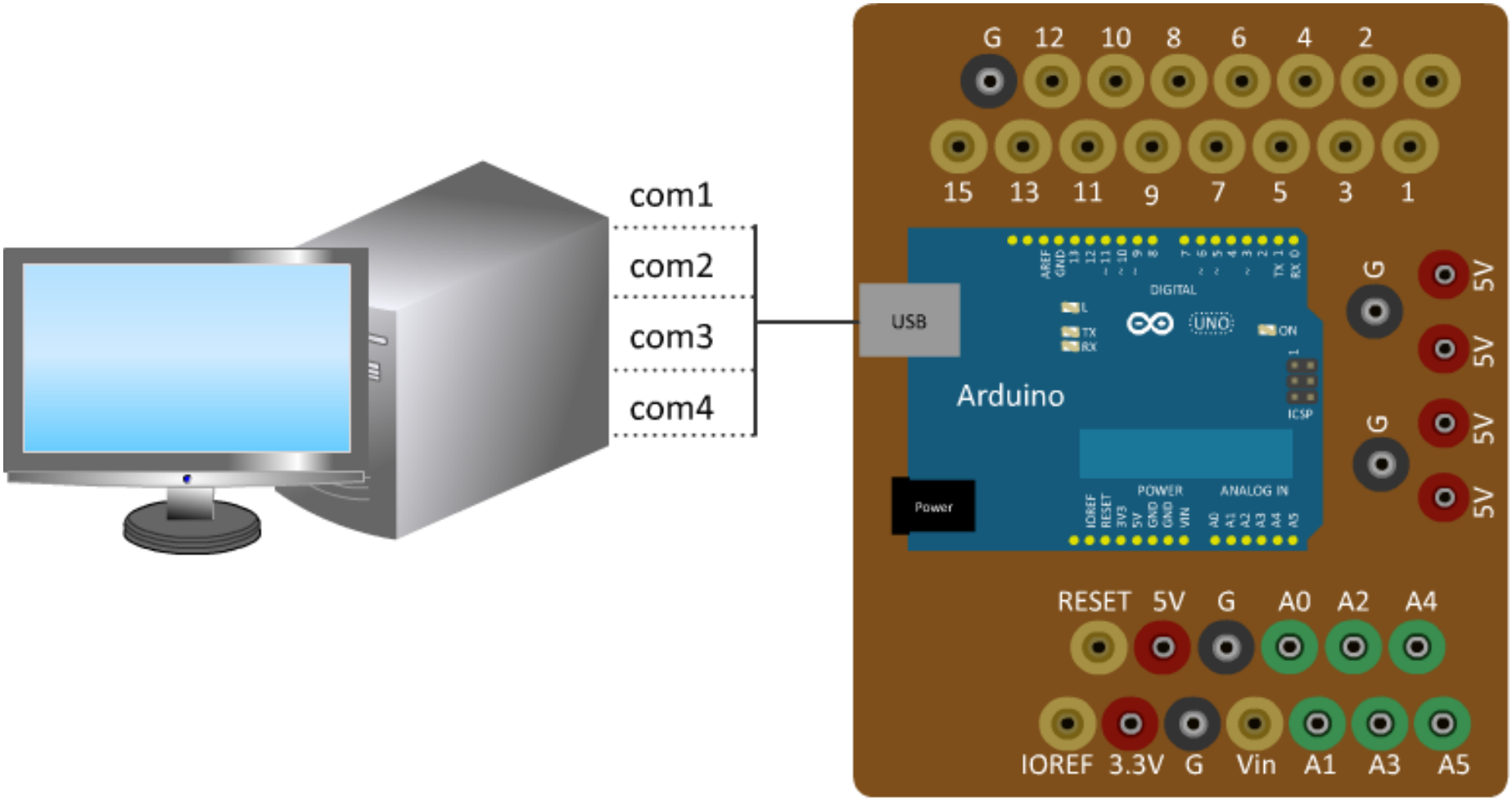
Interfacing Diagram



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Thank You