BATTERY (with +ve postive and -ve negative terminals)

Contains Chemical that can generate Positive and Negative charged atoms. Often in a packaging with Negative and Positive terminal exposed.

AC to DC CONVERTER (with +ve postive and -ve negative terminals)

A device that is connected to AC Power Source (from the wall socket), which later convert the AC into DC.

CAPACITOR(with +ve postive and -ve negative terminals)

Capacitor cannot generate its own electricty. Capacitor collects and store electricity stored in Positive and Negative terminal. Once Positive and Negative terminal from the Capacitor is connected to a circuit, the electrons will flow into the circuit. Behaves almost like a battery, except that it discharge very fast and needs to be constantly charged. It is normally used together with Battery power or AC/DC source to ensure smooth current flow.

SOLAR PANEL (with +ve postive and -ve negative terminals)

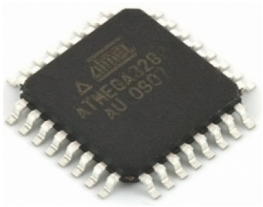
Contains Chemical that can generate Positive and Negative charged atoms when exposed to the Sunlight

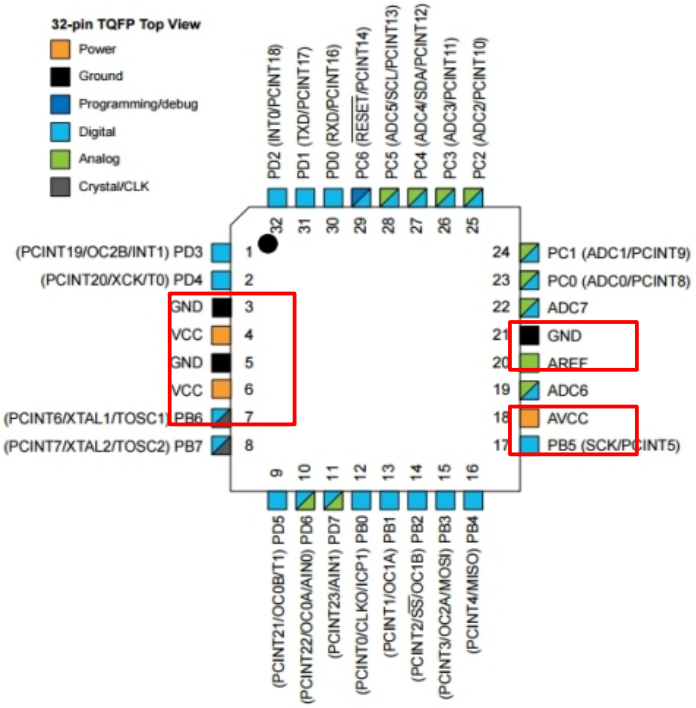
MOTOR (with +ve postive and -ve negative terminals)

When a MOTOR is applied with electricity, the MOTOR shaft will rotate.

However, when we rotate the MOTOR shaft manually, the MOTOR will generate electricity instead.

Things like Wind Turbine, Gas Turbine, Hydro-Turbine are all rotating the MOTOR shaft to generate electricity.





In order for the Atmega328P micro-controller to work, it needs to have DC Power Supply.

DC Power Supply +ve (VCC) Terminal to be connected to VCC and AVCC
DC Power Supply –ve (Ground) Termnial to be connected to GND

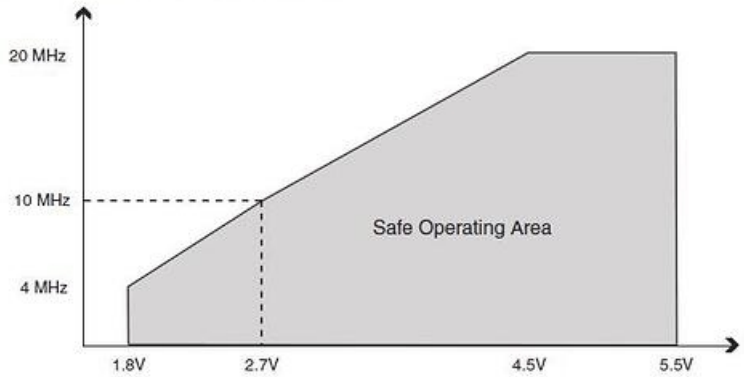
Note: AVCC is a special power supply for internal ADC (Analog Digital Converter) Pins (normally done for us when we use the Arduino board)

There Atmega328P micro-controller can work with 1.8V to 5.5V. That Atmega328P can run at different Clock Speed, ranging from 4Mhz to 20Mhz. Ability to run safely at different Clock Speed depends on the Voltage. Based on the chart below, when we want to run the Atmega328P micro-controller at higher Clock Speed, we will need Higher voltage.

29.3 Speed Grades

Maximum frequency is dependent on V_{CC}. As shown in Figure 29-1, the Maximum Frequency vs. V_{CC} curve is linear between $1.8V < V_{CC} < 2.7V$ and between $2.7V < V_{CC} < 4.5V$.

Figure 29-1. Maximum Frequency vs. V_{CC}



The Atmega328 micro-controller on our Arduino Uno board is set to run at 16Mhz Clock Speed, that is why the Arduino Uno board is feeding 5V to the Atmega328P micro-controller on its board.

STEMKRAF - TUTORIAL - PARTS - POWER SUPPLY - ARDUINO UNO
https://github.com/teaksoon/stemkraf

The ATMEGA328P micro-controller on the ARDUINO UNO board requires 5V to operate safely with the 16Mhz Clock Speed (16Mhz Crystal on the ARDUINO UNO Board)

Why are we allowed to feed more than 5V to the Arduino Uno board ?

On the Arduino Uno board, there is a Power Regulator that will reduce Voltage coming in from DC Jack and Vin Pin to a stable 5V before feeding it to the ATMEGA328P micro-controller.

The POWER REGULATOR on the ARDUINO UNO board allows 6V to 20V input power supply. It is better not to use higher Voltage because it will produce more heat on the POWER REGULATOR (there are many cases where the POWER REGULATOR got burnt from high voltage). For input power, try use something that is nearer to 6V.

Also try not to use exactly 6V or 20V because, try have some buffer from the limits limits.

DC Jack
Inner = +7v to +12v
Outer = Outer Ground

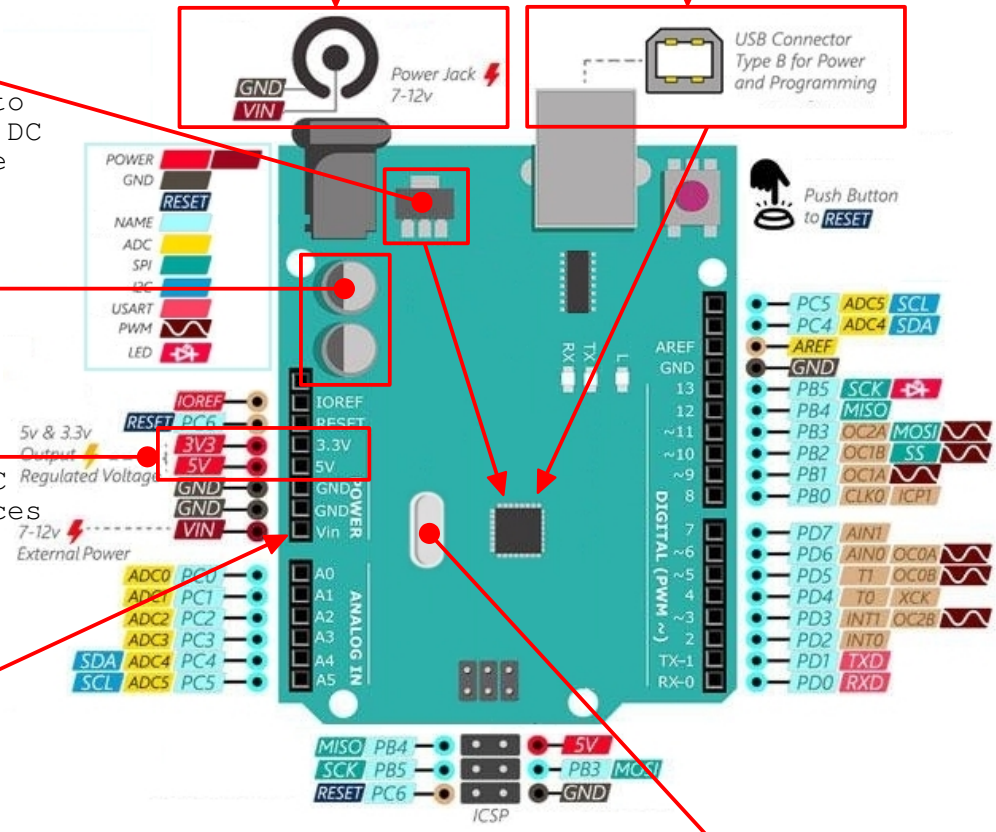
USB Cable
USB is always 5V

POWER REGULATOR
Reduce input power to stable 5v (Vin and DC Power Jack will come here)

CAPACITORS
To ensure smooth DC power supply to the micro-controller

OUTPUT POWER
These will supply DC power to other devices (3.3v and 5V)

2 Wire DC Power
+7v to +12v to Vin
-ve goes to GND

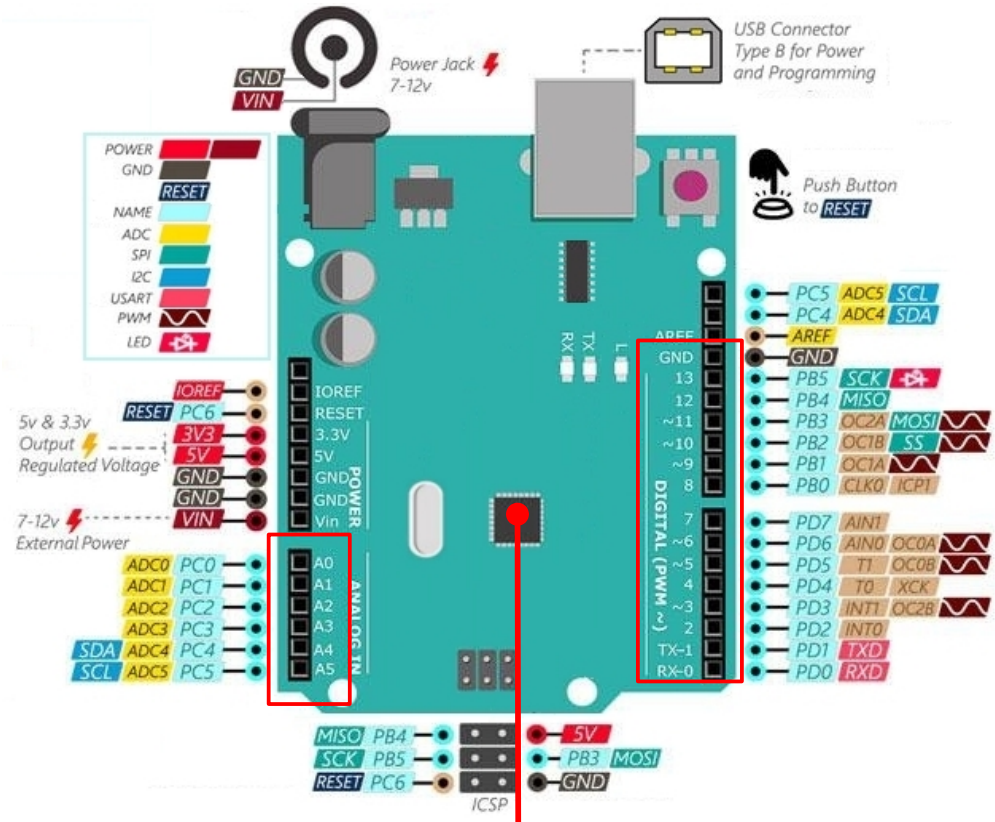


16Mhz Crystal
Atmega328P Clock Speed

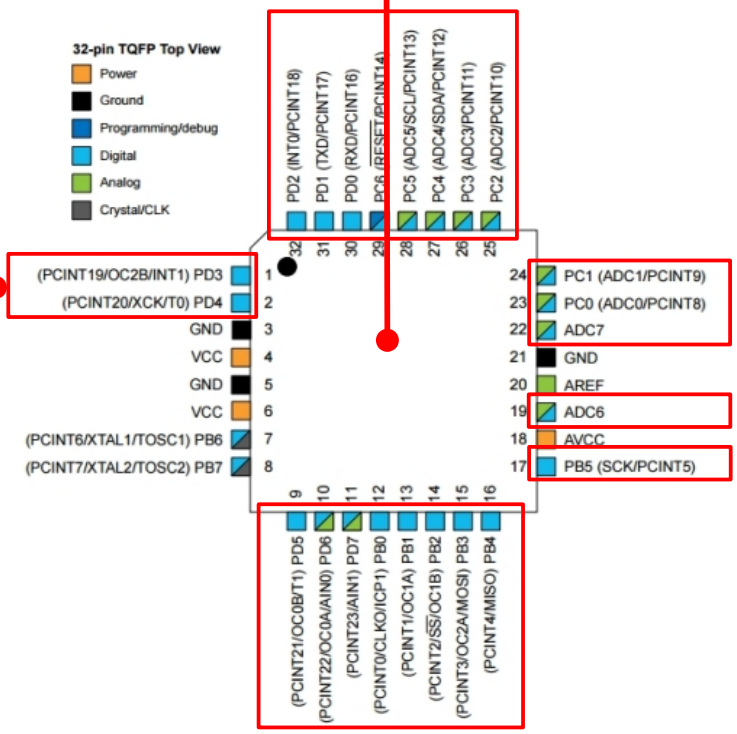
The ATMEGA328P micro-controller have many I/O Pins that are connected to the ARDUINO UNO board Pins.

Unlike the Vin, 5V, 3.3v, Gnd and the AVcc Power Pins fixed behaviour, the I/O Pins behaviour dealing with Power can be programmed.

Depending on how the I/O Pins is programmed, they can receive Power (Input Pin) and at the same time can also supply Power (Output Pin)



INPUT(I)/OUTPUT(O) PINS



These two are also I/O pin, however they are dedicated to the 16Mhz External Crystal on ARDUINO UNO board