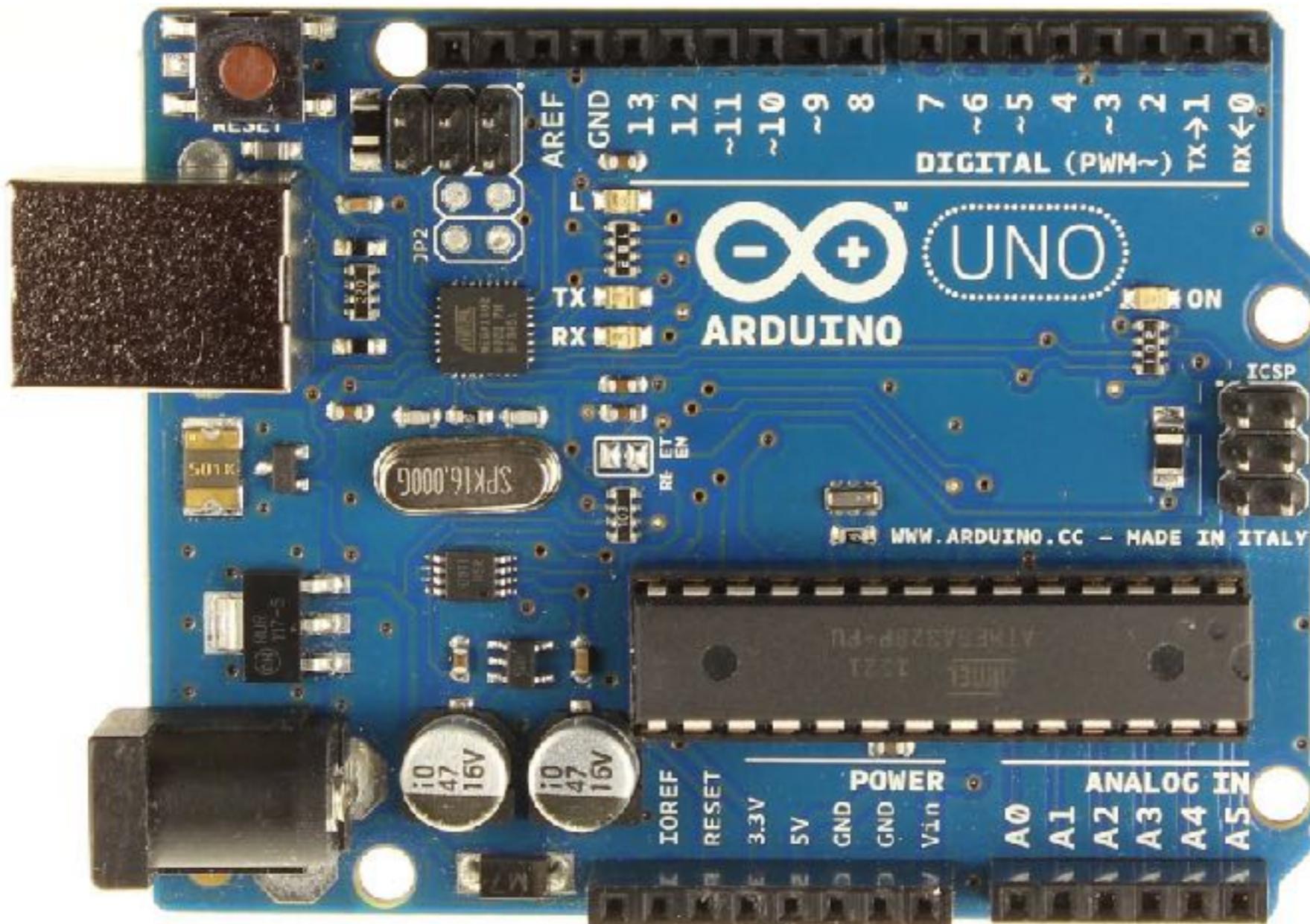


Getting Started with Arduino

What is Arduino?

Arduino is...

- Small, programmable microcontroller.
- Software that runs on Mac, PC, and Linux. (IDE)
- Learning platform (for electronics & programming).
- Community of people sharing code & ideas.



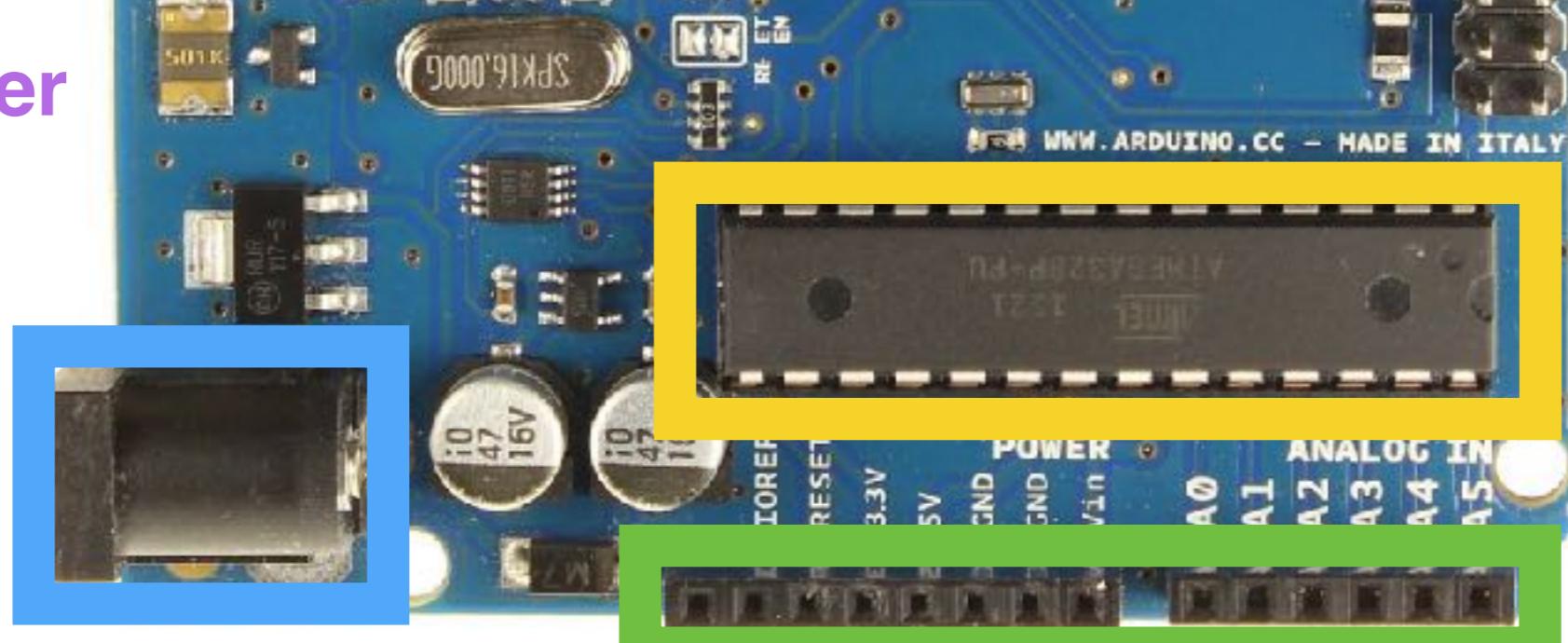
Arduino Hardware: UNO

Reset Button



Digital Inputs & Outputs

USB / Power



DC Power

Power & Analog Inputs

Arduino Hardware: UNO

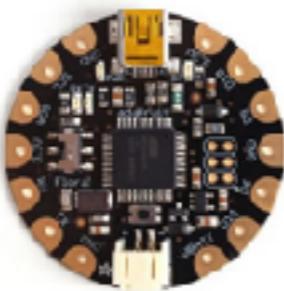
The Arduino Ecosystem



UNO



MEGA



FLORA

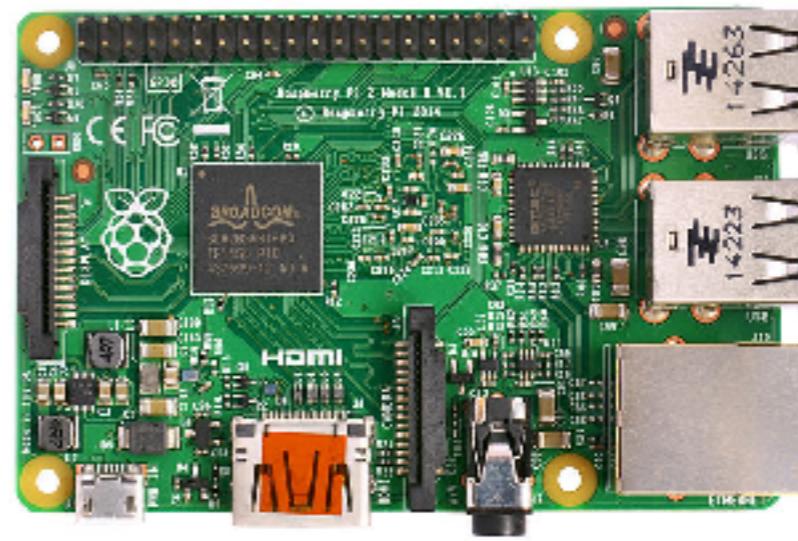


Pro Mini

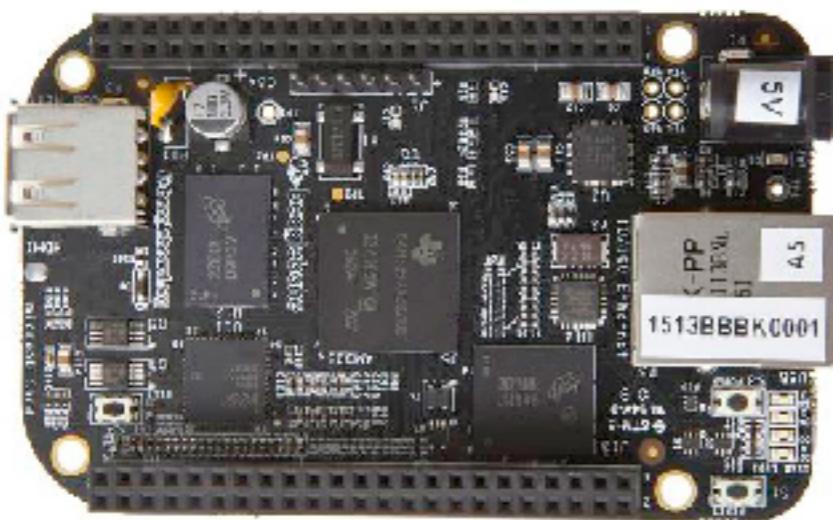
Arduino's Many Competitors



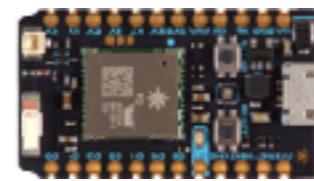
UNO



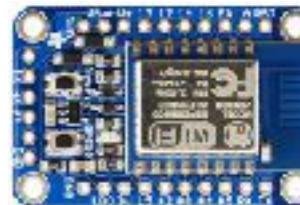
Raspberry Pi



BeagleBone Black



Particle Photon

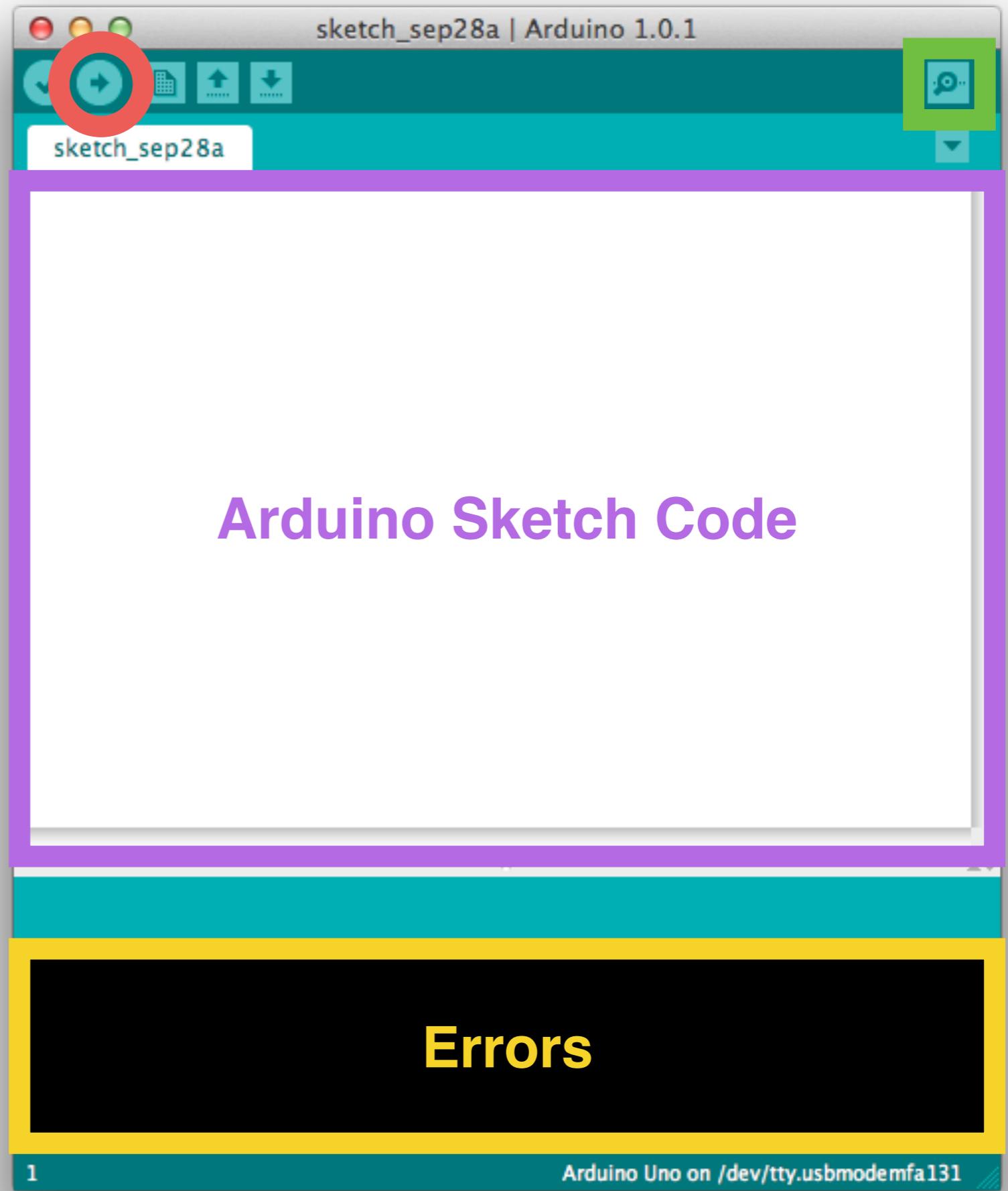


AdaFruit HUZZAH

Arduino Software

Upload

Serial Monitor



Anatomy of a Sketch

```
/*
Blink
Turns on an LED on for one second, then off for one second, repeatedly.

This example code is in the public domain.
*/



// the setup function runs once when you press reset or power the board
void setup() {
    // initialize digital pin 13 as an output.
    pinMode(13, OUTPUT);
}

// the loop function runs over and over again forever
void loop() {
    digitalWrite(13, HIGH); // turn the LED on (HIGH is the voltage level)
    delay(1000);           // wait for a second
    digitalWrite(13, LOW); // turn the LED off by making the voltage LOW
    delay(1000);           // wait for a second
}
```

Anatomy of a Sketch

/* Start Comment

Blink

Turns on an LED on for one second, then off for one second, repeatedly.

This example code is in the public domain.

*/ End Comment

Descriptive Comment

```
// the setup function runs once when you press reset or power the board
void setup() {
    // initialize digital pin 13 as an output.
    pinMode(13, OUTPUT);
}

// the loop function runs over and over again forever
void loop() {
    digitalWrite(13, HIGH); // turn the LED on (HIGH is the voltage level)
    delay(1000);           // wait for a second
    digitalWrite(13, LOW); // turn the LED off by making the voltage LOW
    delay(1000);           // wait for a second
}
```

File > Examples > Basics > Blink

Anatomy of a Sketch

Start Comment

Blink

Turns on an LED on for one second, then off for one second, repeatedly.

This example code is in the public domain.

End Comment

Descriptive Comment

Start Comment

```
// the setup function runs once when you press reset or power the board
void setup() {
    // initialize digital pin 13 as an output.
    pinMode(13, OUTPUT);
}
```

Line Comments

```
// the loop function runs over and over again forever
void loop() {
    digitalWrite(13, HIGH); // turn the LED on (HIGH is the voltage level)
    delay(1000);           // wait for a second
    digitalWrite(13, LOW); // turn the LED off by making the voltage LOW
    delay(1000);           // wait for a second
}
```

File > Examples > Basics > Blink

Anatomy of a Sketch

```
/*
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Turns on an LED on for one second, then off for one second, repeatedly.

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}

// the loop function runs over and over again forever
void loop() {
    digitalWrite(13, HIGH); // turn the LED on (HIGH is the voltage level)
    delay(1000);           // wait for a second
    digitalWrite(13, LOW); // turn the LED off by making the voltage LOW
    delay(1000);           // wait for a second
}
```

File > Examples > Basics > Blink

Anatomy of a Sketch

```
/*
Blink
Turns on an LED on for one second, then off for one second, repeatedly.

This example code is in the public domain.

*/
Hey Arduino,
here's how you setup

// the setup function runs once when you press reset or power the board
void setup() {
    // initialize digital pin 13 as an output.
    pinMode(13, OUTPUT);
}

// the loop function runs over and over again forever
void loop() {
    digitalWrite(13, HIGH); // turn the LED on (HIGH is the voltage level)
    delay(1000); // wait for a second
    digitalWrite(13, LOW); // turn the LED off by making the voltage LOW
    delay(1000);
}
```

File > Examples > Basics > Blink

Anatomy of a Sketch

```
/*
Blink
Turns on an LED on for one second, then off for one second, repeatedly.

This example code is in the public domain.
*/



// the setup function runs once when you press reset or power the board
void setup() {
    // initializes the digital pin as an output.
    pin
}

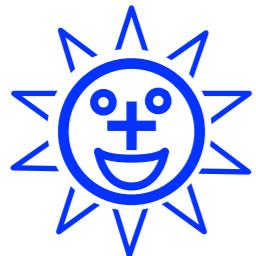
// the loop function runs over and over again forever
void loop() {
    digitalWrite(13, HIGH);           // turn the LED on (HIGH is the voltage level)
    delay(1000);                    // wait for a second
    digitalWrite(13, LOW);          // turn the LED off by making the voltage LOW
    delay(1000);
}
```

Hey Arduino,
here's how you **loop**

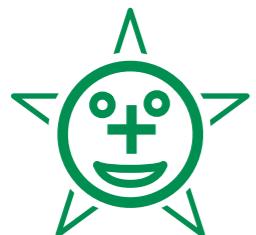
Code block for **loop**

Electronics is...

Moving Charge



Highly energetic charge particle

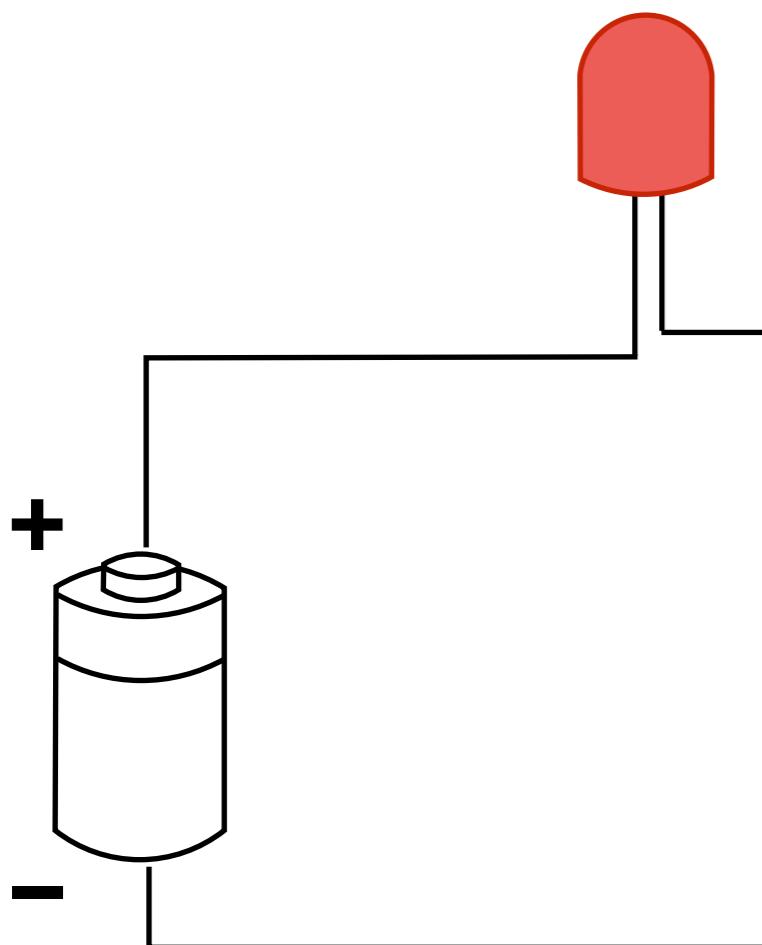


Less energetic charge particle

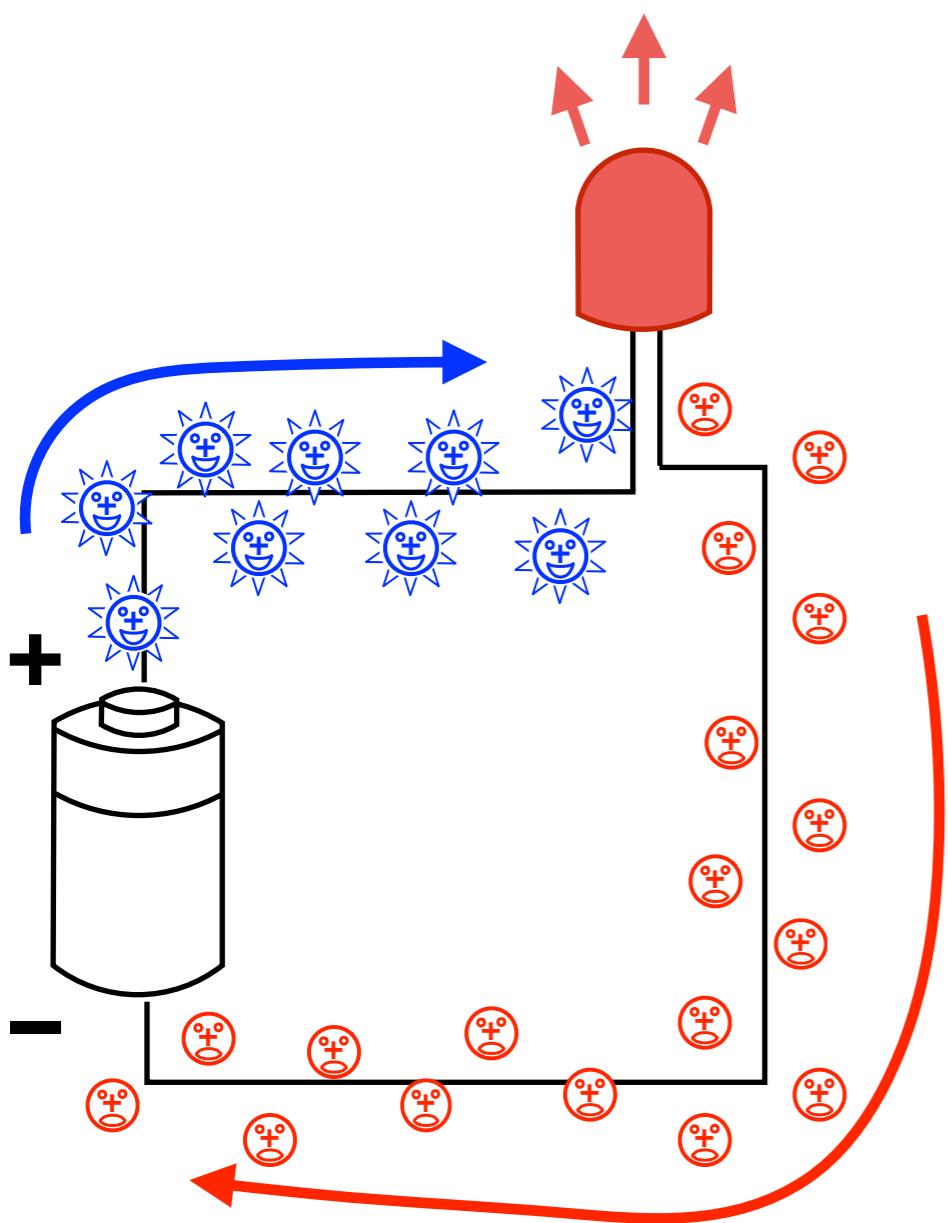


Exhausted charge particle

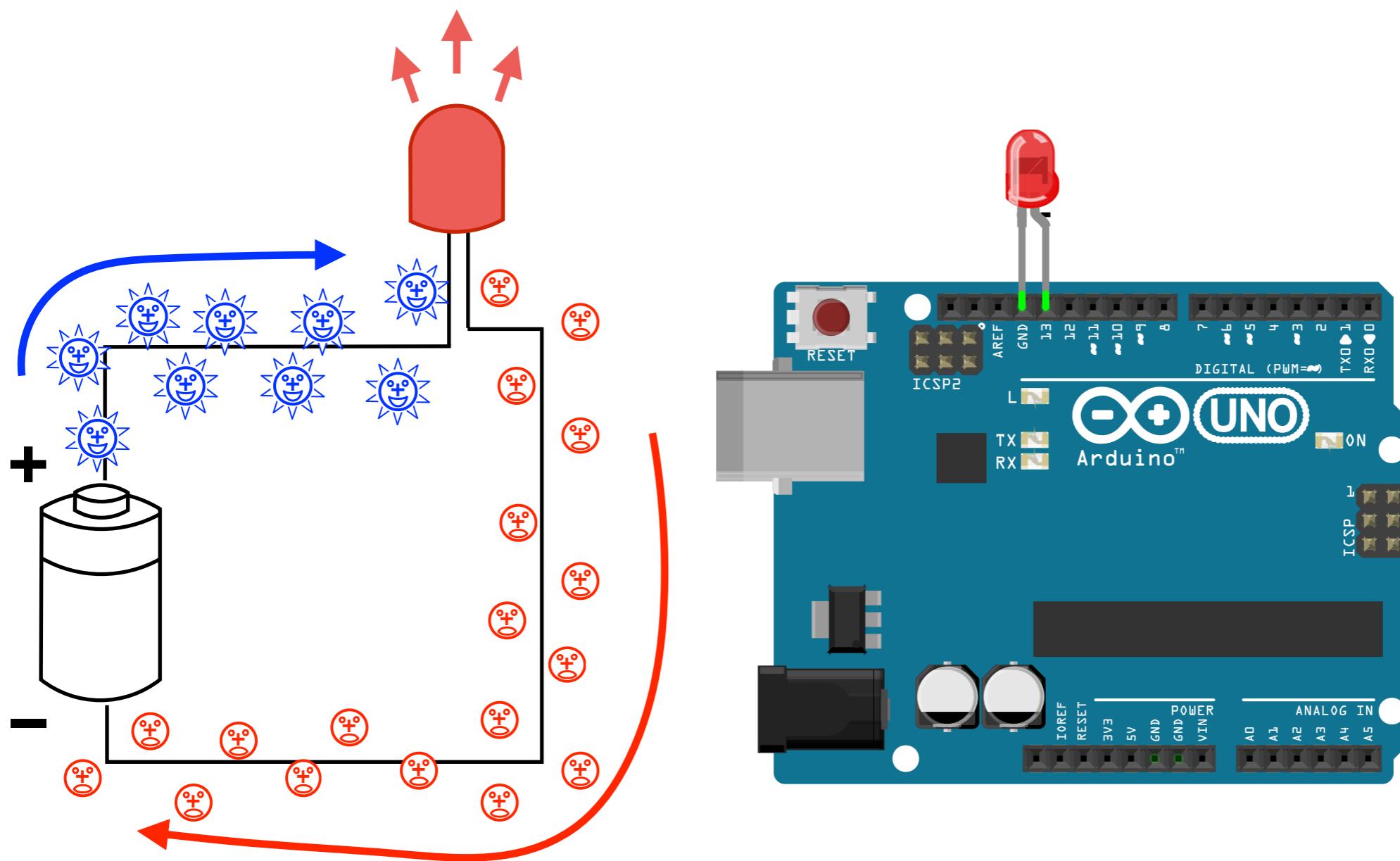
Simple Circuit



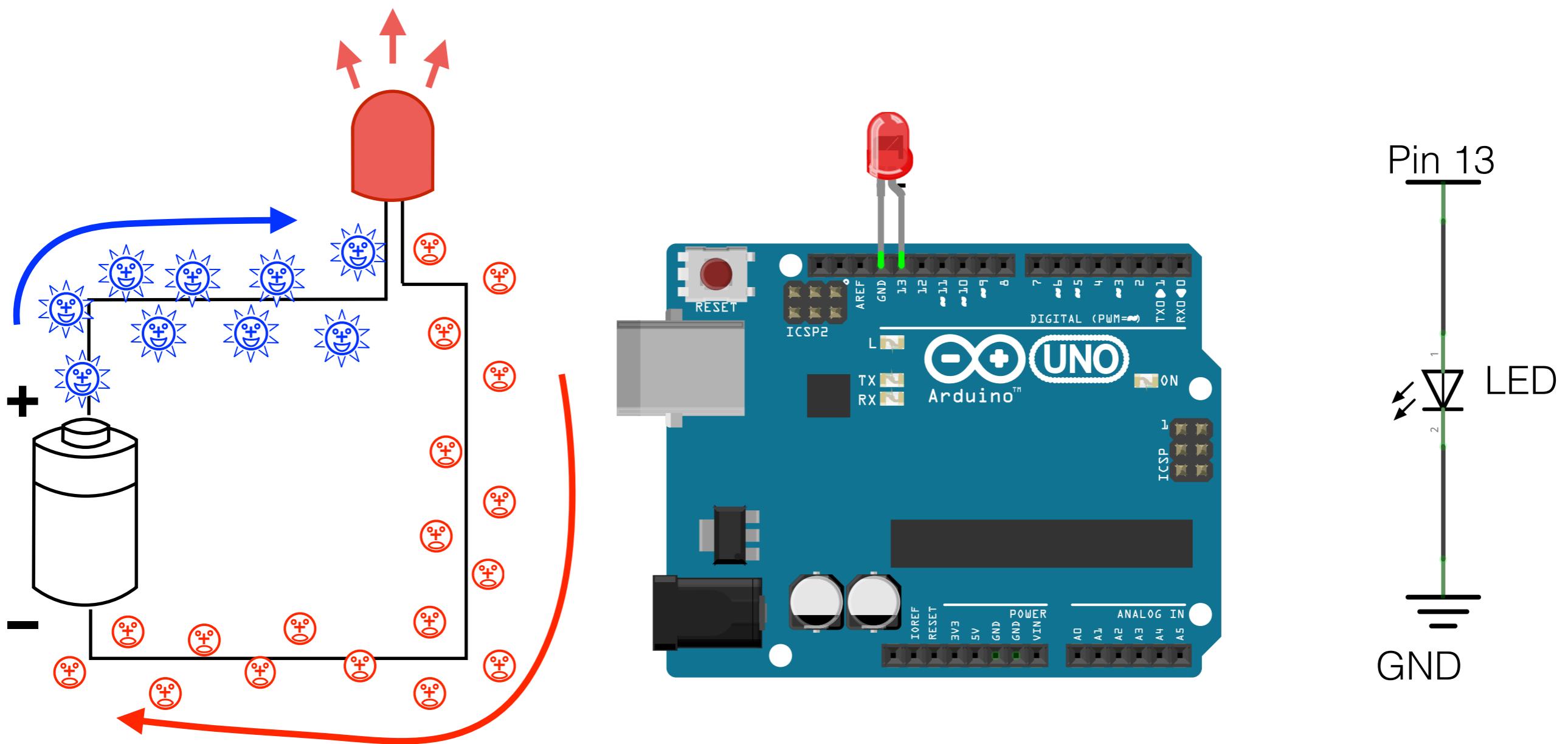
Simple Circuit



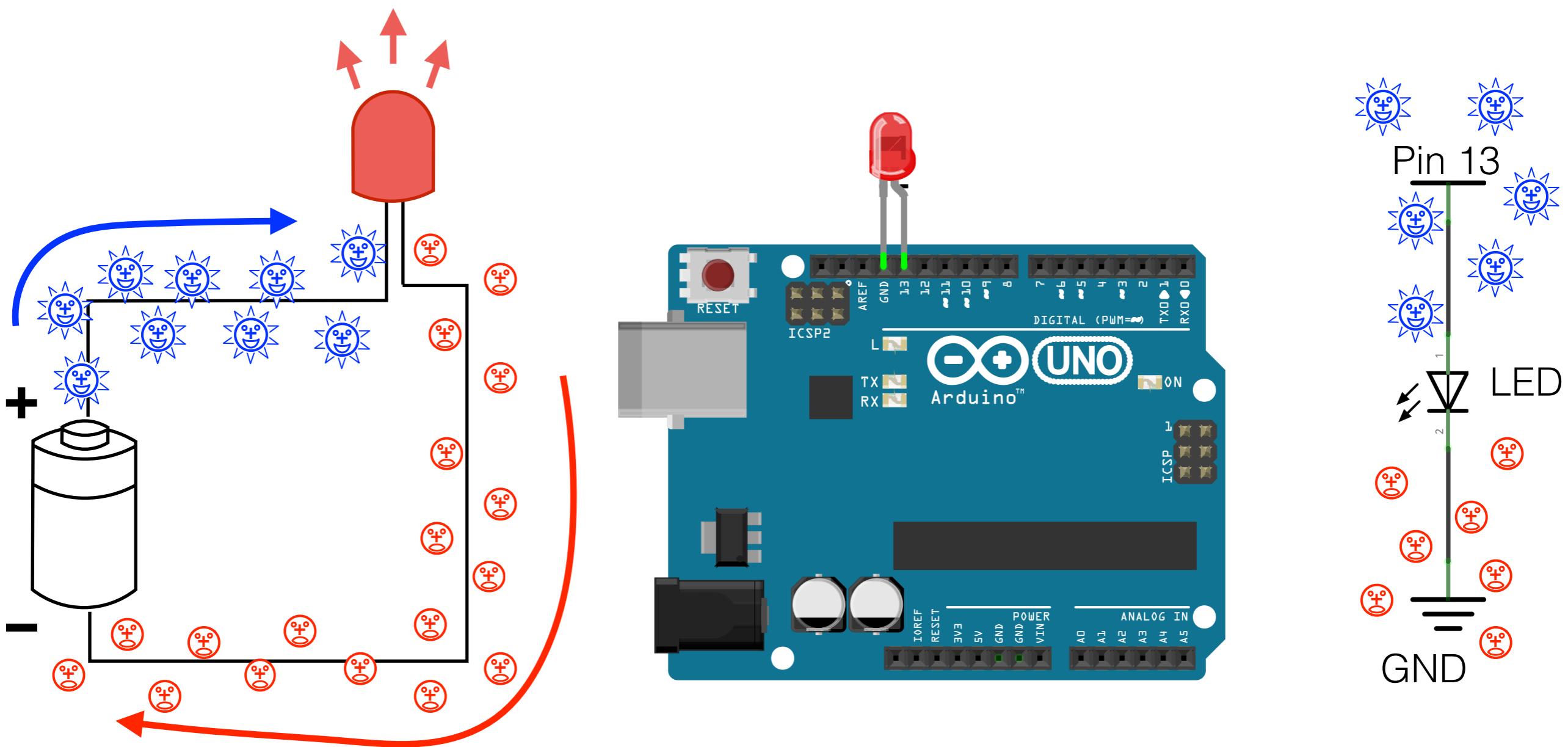
Simple Circuit



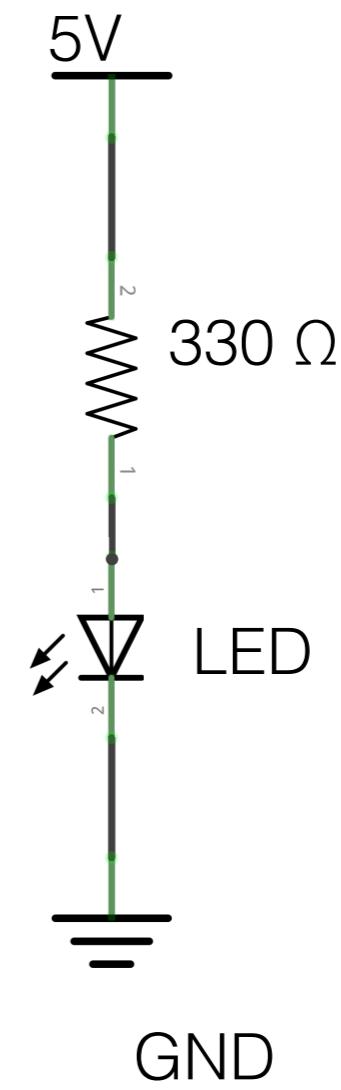
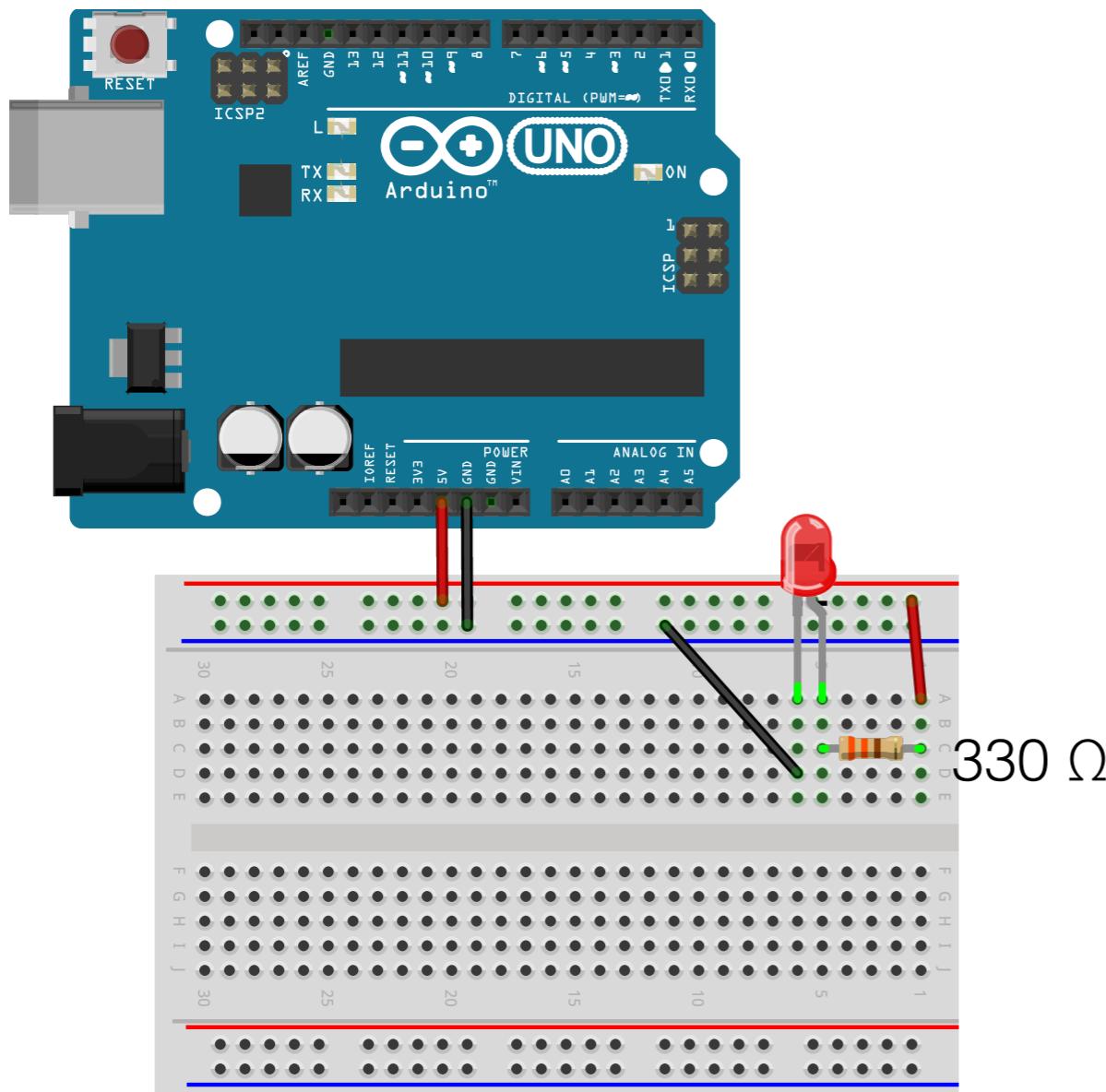
Simple Circuit



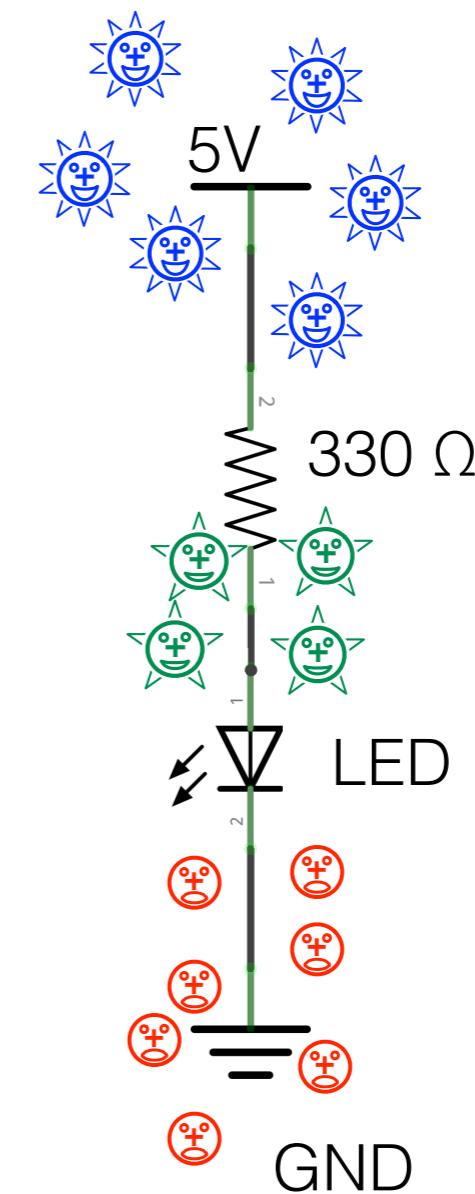
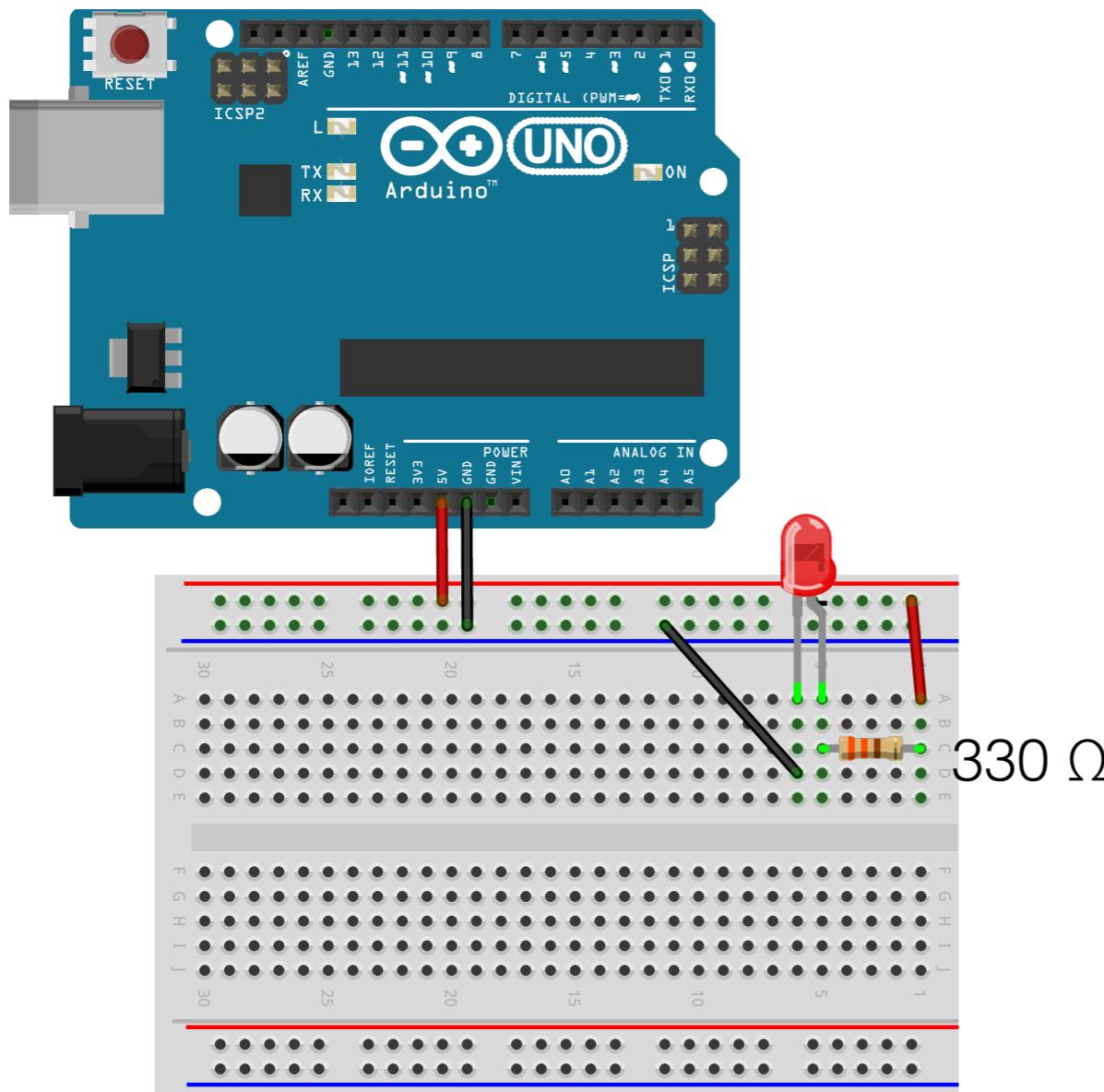
Simple Circuit



A Happier LED

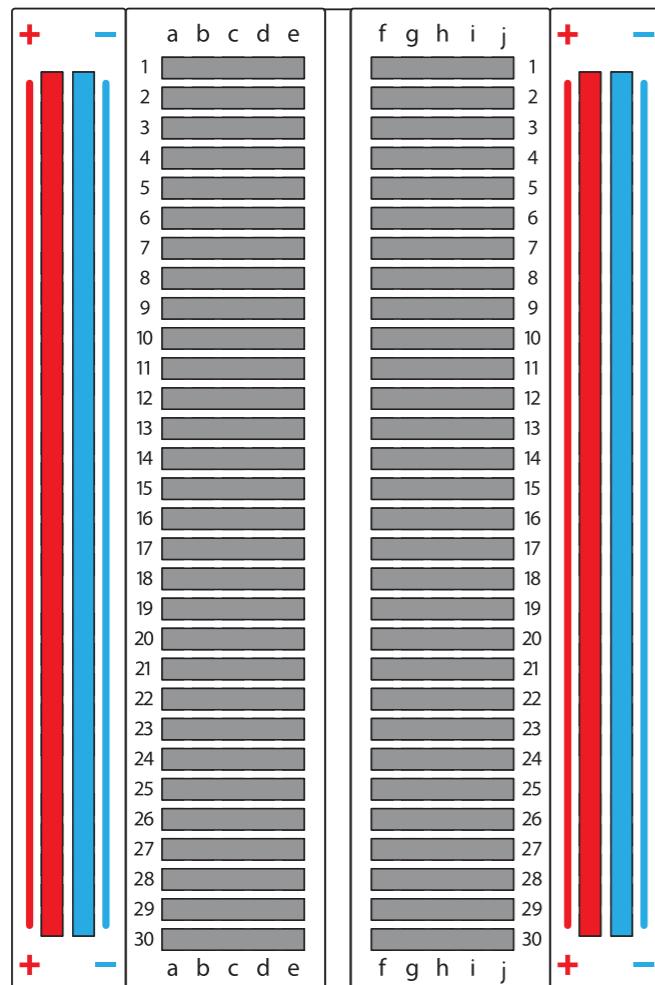


A Happier LED

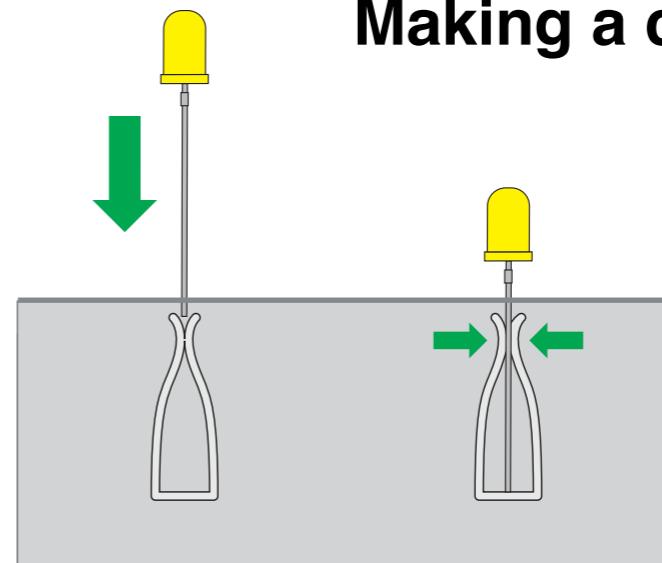


The Breadboard

- + Runs power along column
- Runs ground along column
- Each numbered row has 5 connected sockets

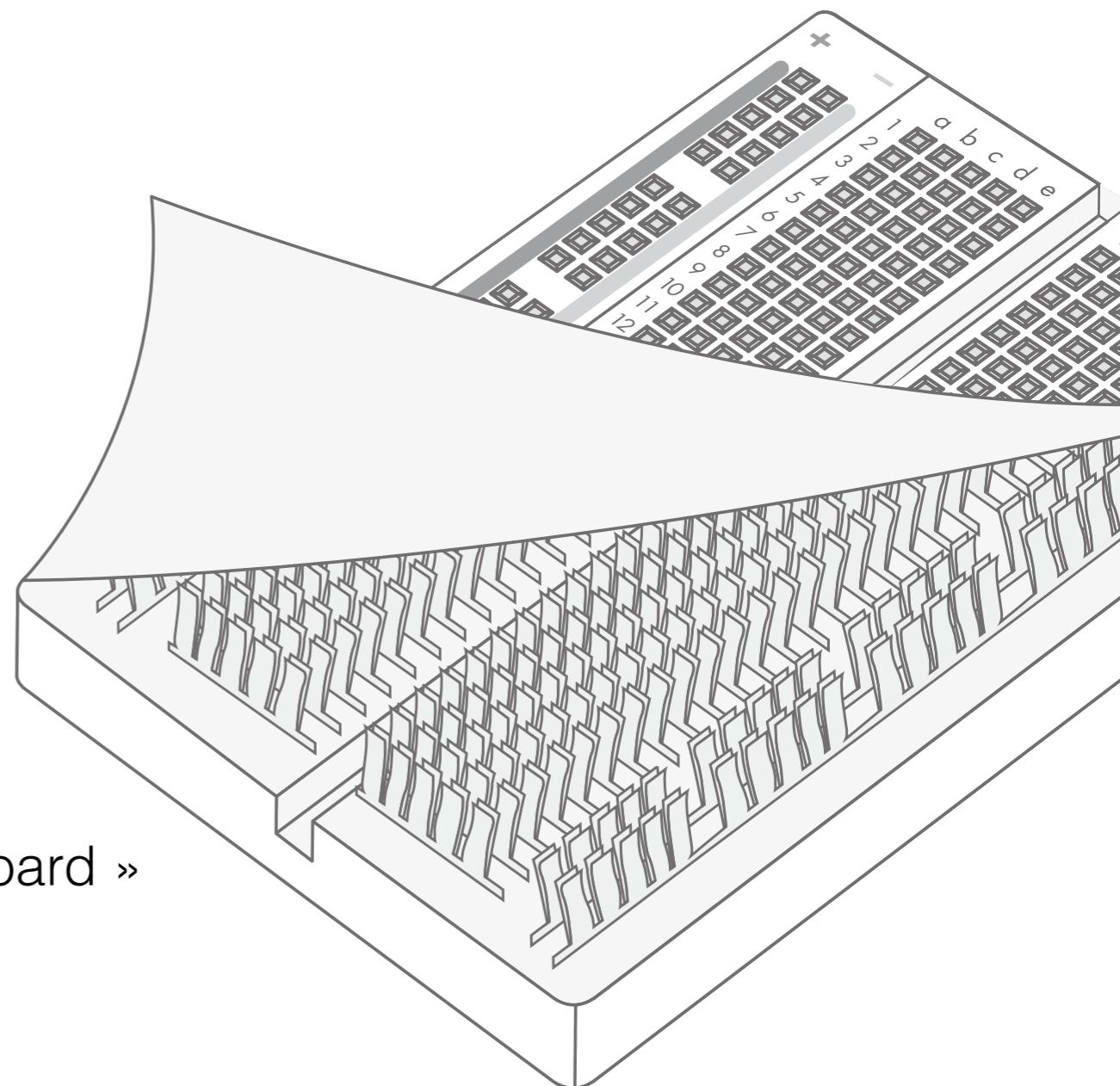


Making a connection



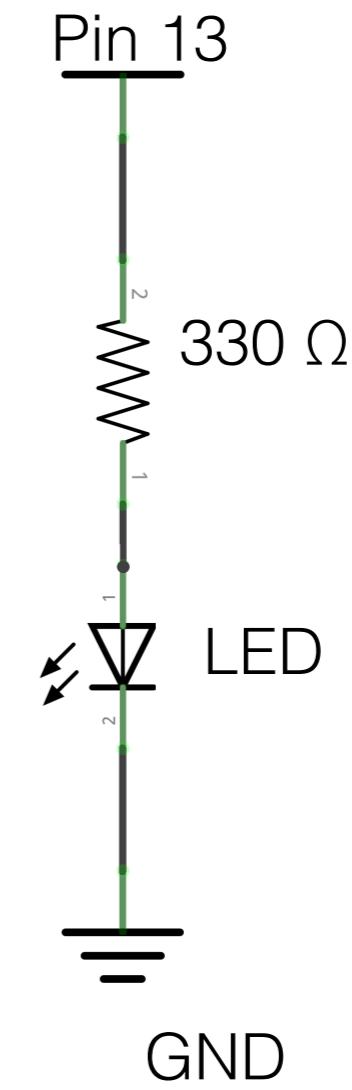
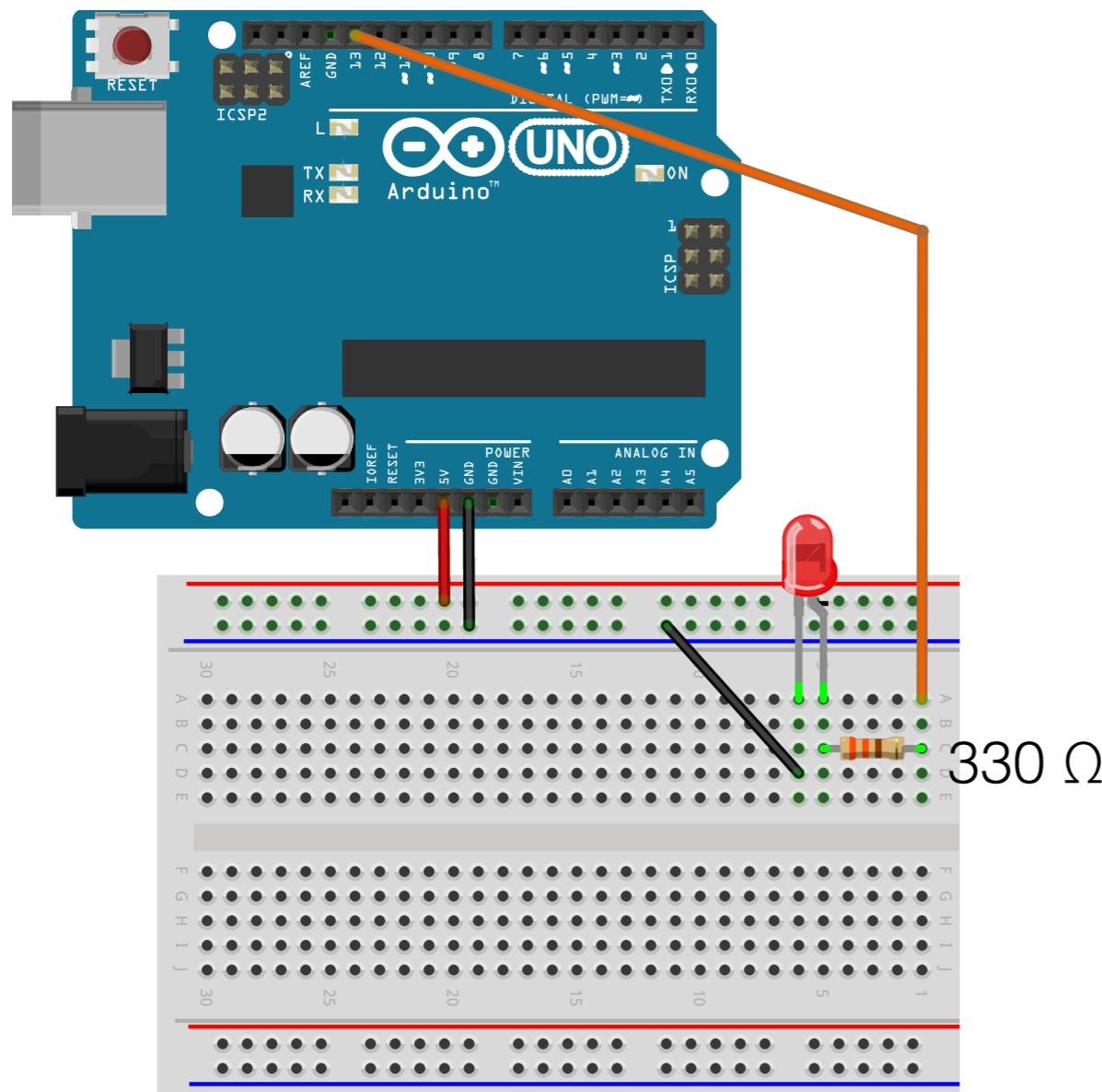
Above the board

Inside the board

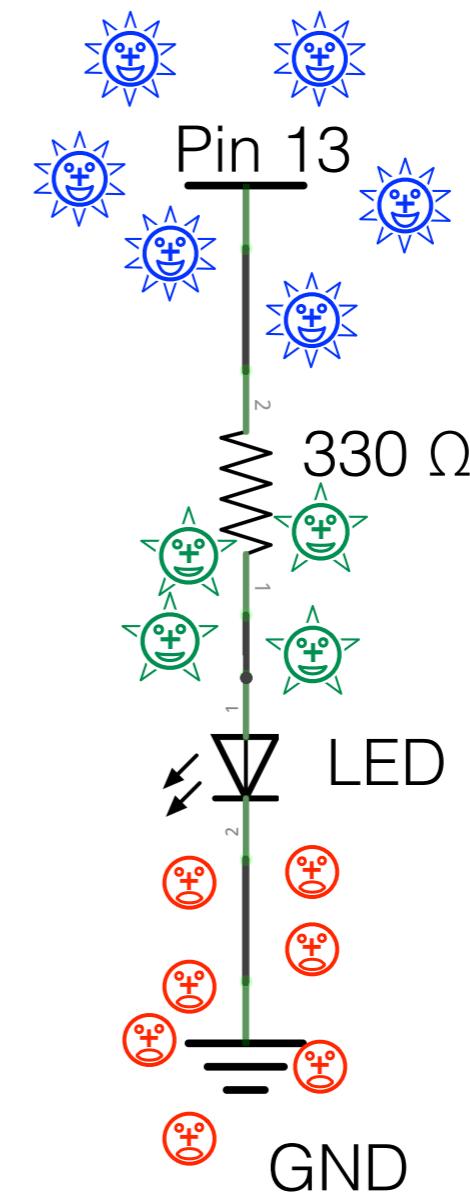
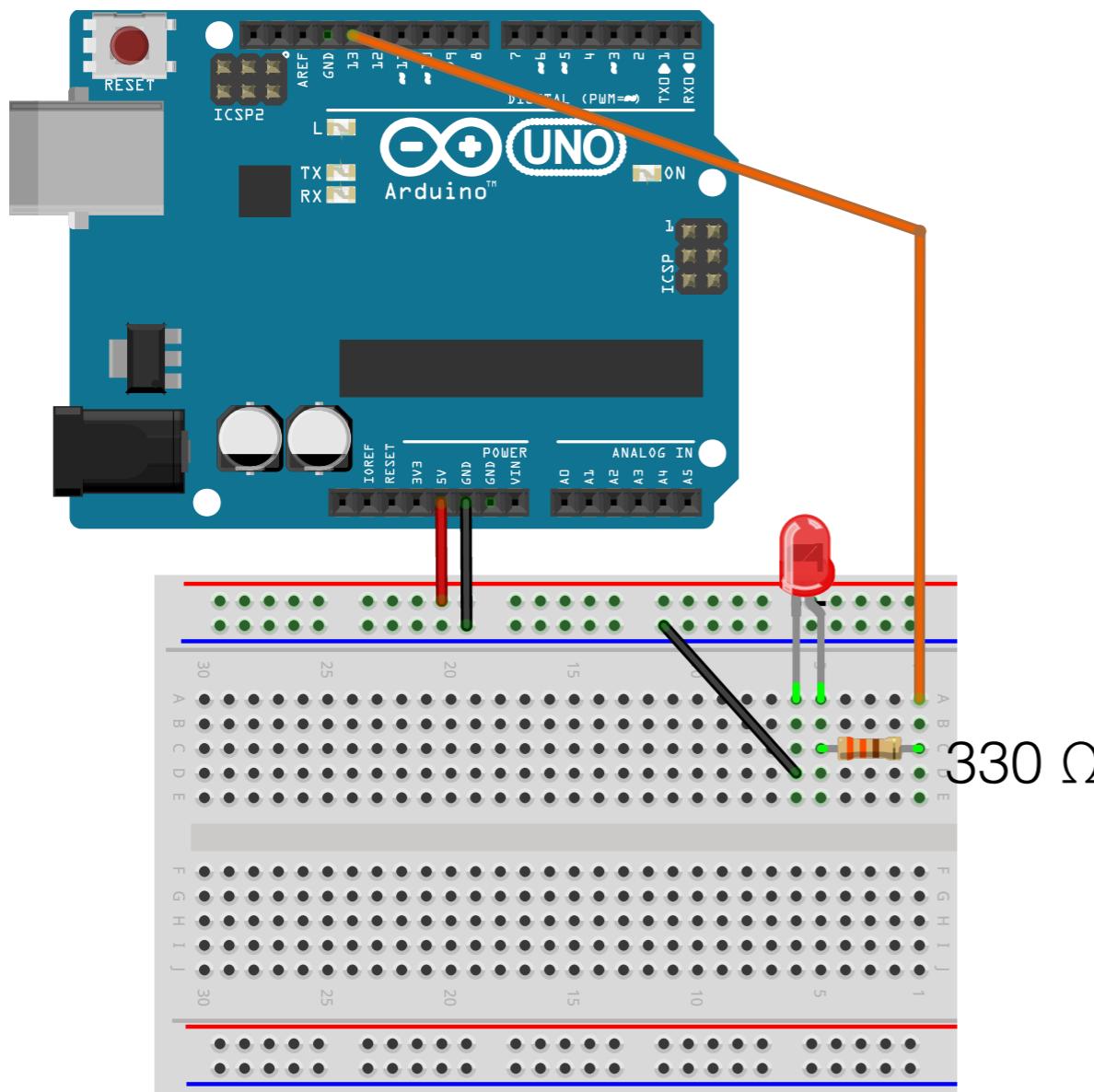


Inside the board »

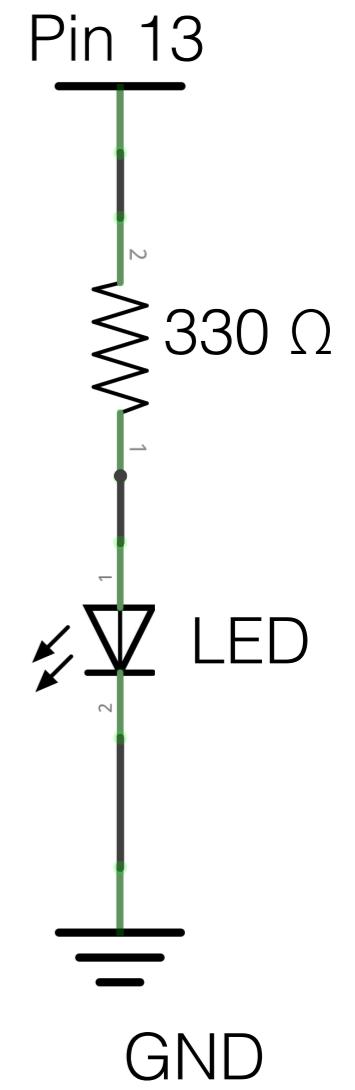
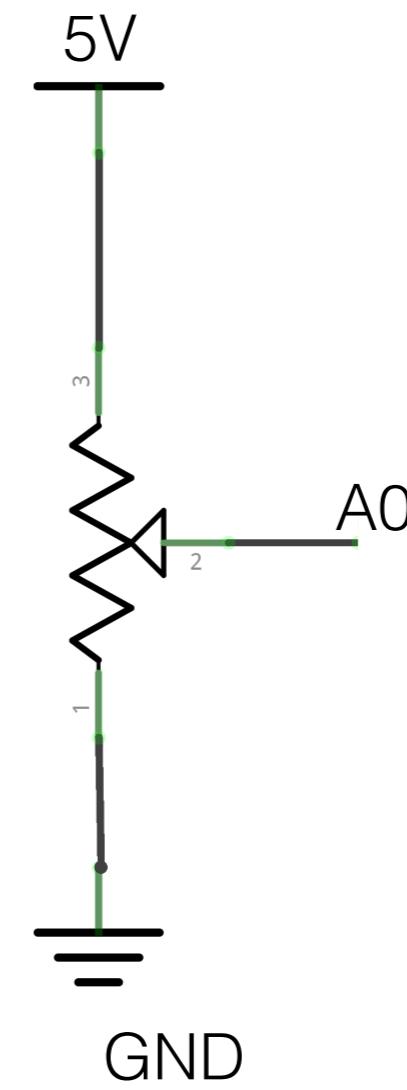
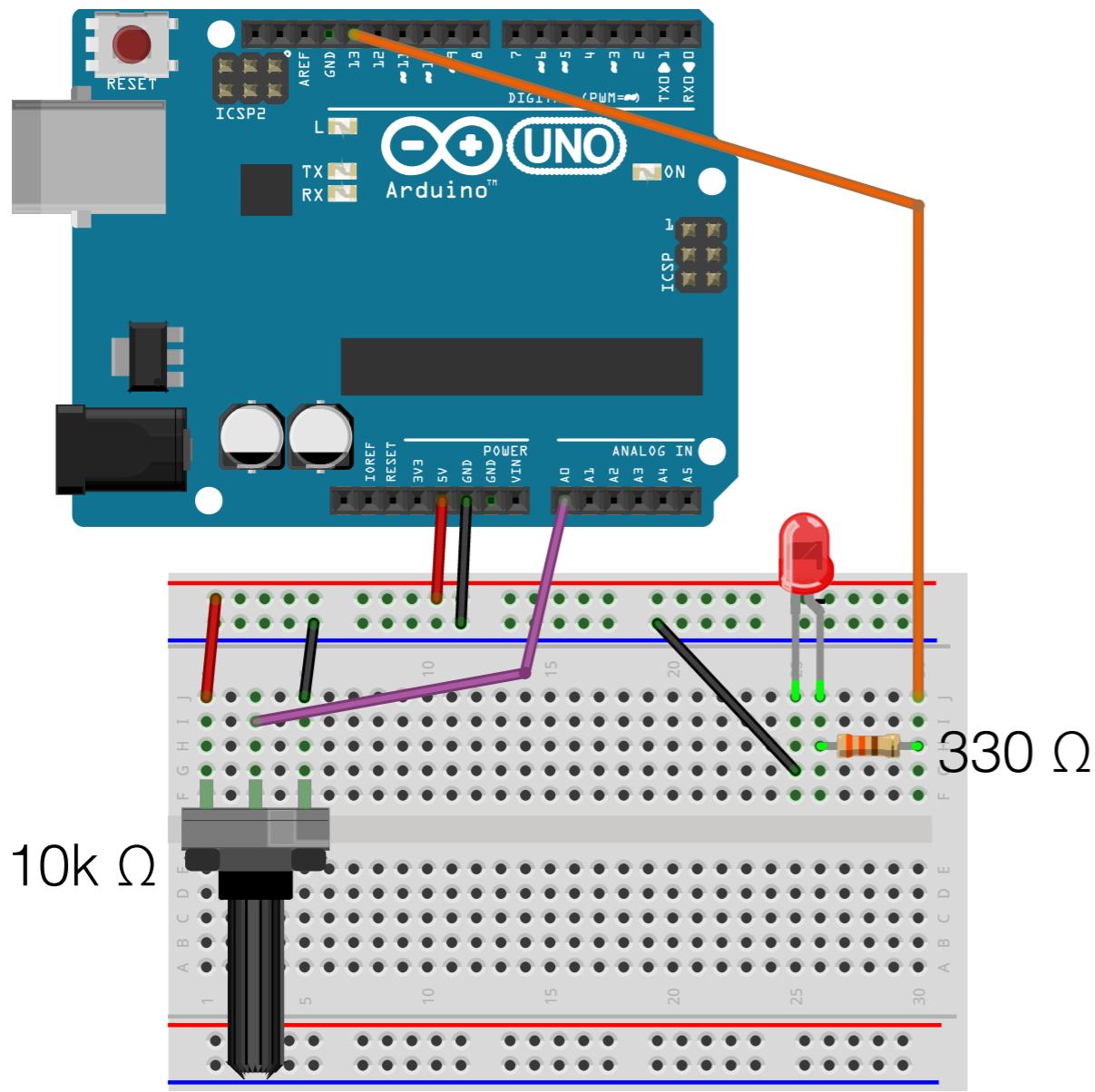
A Blinking LED



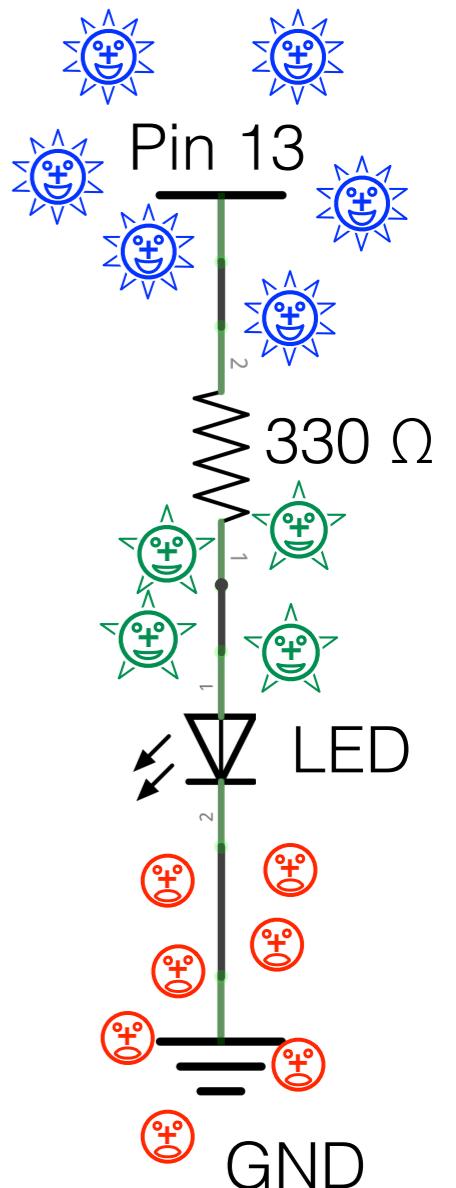
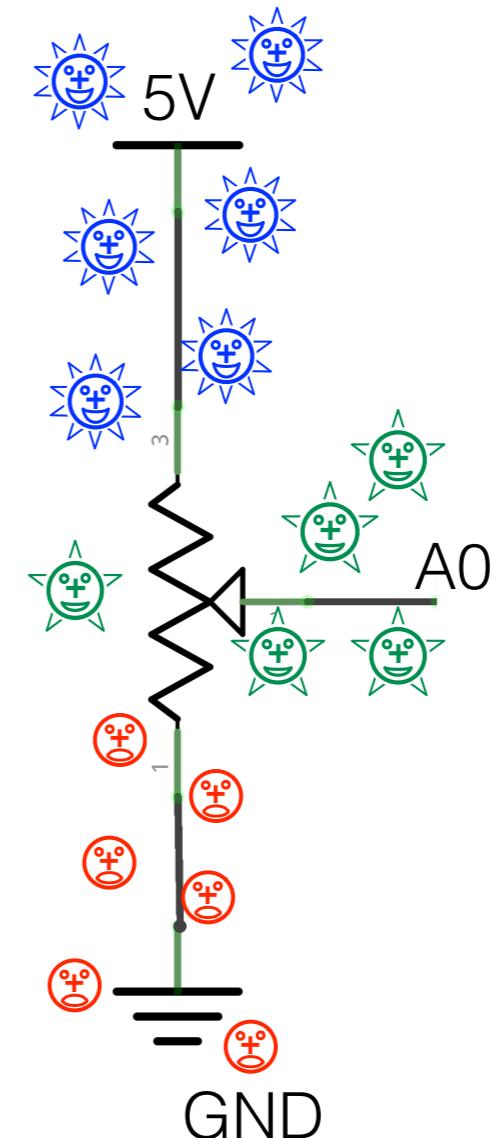
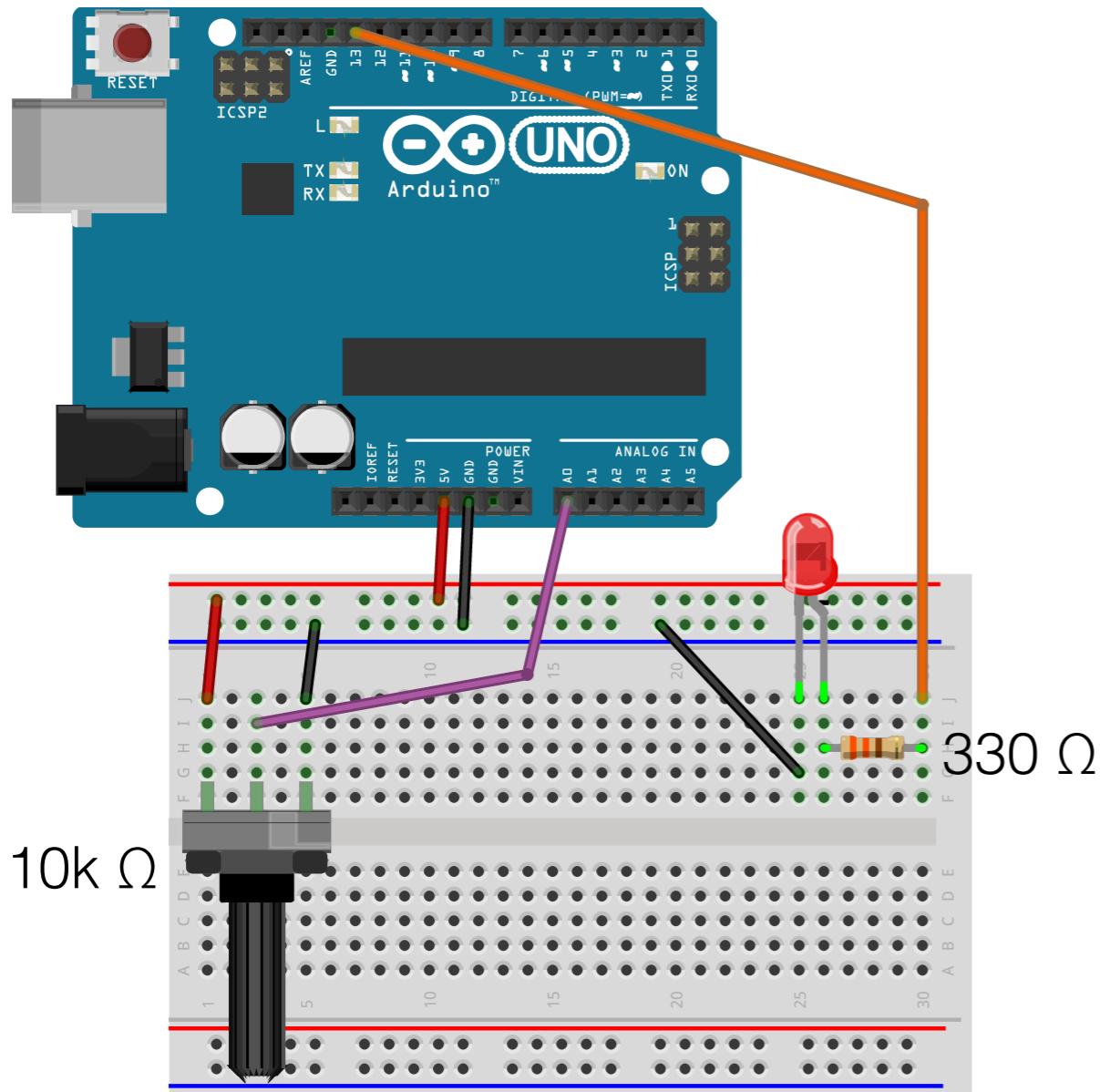
A Blinking LED



Control the Blinking



Control the Blinking



Control the Blinking, Code

```
/*
Analog Input
[ ... ]

This example code is in the public domain.

*/
int sensorPin = A0;      // select the input pin for the potentiometer
int ledPin = 13;         // select the pin for the LED
int sensorValue = 0;     // variable to store the value coming from the sensor

void setup() {
  // declare the ledPin as an OUTPUT:
  pinMode(ledPin, OUTPUT);
}

void loop() {
  // read the value from the sensor:
  sensorValue = analogRead(sensorPin);
  // turn the ledPin on
  digitalWrite(ledPin, HIGH);
  // stop the program for <sensorValue> milliseconds:
  delay(sensorValue);
  // turn the ledPin off:
  digitalWrite(ledPin, LOW);
  // stop the program for for <sensorValue> milliseconds:
  delay(sensorValue);
}
```

File > Examples > Analog > AnalogInput

Debug the Blinking

```
/*
Analog Input
[...]

This example code is in the public domain.

*/

int sensorPin = A0;      // select the input pin for the potentiometer
int ledPin = 13;         // select the pin for the LED
int sensorValue = 0;     // variable to store the value coming from the sensor

void setup() {
  // declare the ledPin as an OUTPUT:
  pinMode(ledPin, OUTPUT);
  // open a 9600-baud serial connection:
  Serial.begin(9600);
}

void loop() {
  // read the value from the sensor:
  sensorValue = analogRead(sensorPin);
  // write the sensor value to the serial interface:
  Serial.println(sensorValue);
  // turn the ledPin on
  digitalWrite(ledPin, HIGH);
  // stop the program for <sensorValue> milliseconds:
  delay(sensorValue);
  // turn the ledPin off:
  digitalWrite(ledPin, LOW);
  // stop the program for for <sensorValue> milliseconds:
  delay(sensorValue);
}
```

File > Examples > Analog > AnalogInput

Examples!

- Make the potentiometer control brightness instead of blink rate.
*Hint: try flashing the LED really quickly! The **analogWrite** function might help!*
- Wire up 8 LEDs to 8 digital output pins. Use the potentiometer to control how many of the LEDs are on — a level meter!
- Control the red, green, and blue components of an RGB LED using three potentiometers.
- *Challenge:* Blink two LEDs, controlling the rate of each independently with its own potentiometer. *Hint: You can't use **delay()** anymore! Look at the **millis()** function and the **BlinkWithoutDelay** example.*

Arduino is...

- ✓ Small, programmable microcontroller.
- ✓ Software that runs on Mac, PC, and Linux. (IDE)
- Learning platform (for electronics & programming).
- Community of people sharing code & ideas.