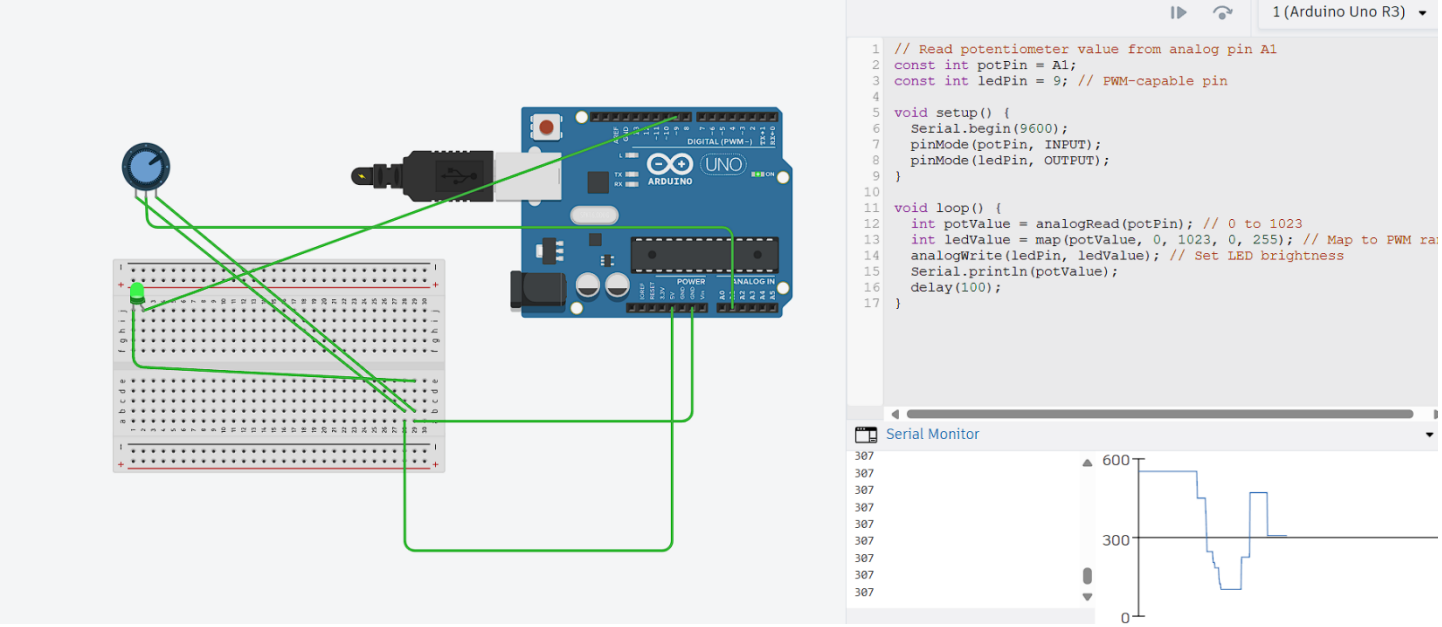
Electronic Basics #1: The Multimeter

1. Voltage = Current * Resistance

Electronic Basics #2: Dimming all kinds of LEDs!?

1. PWM - Pulse Width Modulation
2. Lowering the voltage will result in dimming the LED.
3. Using a potentiometer will do but not always.
4. Using PWM



1. **` #include <Arduino.h>` **

   Includes the Arduino core library, giving access to functions like `pinMode`, `analogRead`, and `analogWrite`.

2. **` const int potPin = A1;` **

   Sets the analog pin A1 as the input pin for the potentiometer.

3. **` const int ledPin = 9;` **

   Sets digital pin 9 (which supports PWM) as the output pin for the LED.

4. **` void setup() { ... }` **

   - `Serial.begin(9600);`

     Starts serial communication at 9600 baud for debugging/output.

   - `pinMode(potPin, INPUT);`

     Sets the potentiometer pin as an input.

   - `pinMode(ledPin, OUTPUT);`

     Sets the LED pin as an output.

5. **` void loop() { ... }` **

- ` int potValue = analogRead(potPin);`

  Reads the potentiometer value (0–1023).

- ` int ledValue = map(potValue, 0, 1023, 0, 255);`

  Maps the potentiometer value to a PWM range (0–255).

- ` analogWrite(ledPin, ledValue);`

  Sets the LED brightness according to the potentiometer.

- ` Serial.println(potValue);`

  Prints the potentiometer value to the Serial Monitor.

- ` delay(100);`

  Waits 100 milliseconds before repeating.

On Arduino, you can simulate analog output on certain digital pins using ** PWM (Pulse Width Modulation) **. PWM rapidly switches the pin between HIGH and LOW, creating an average voltage that devices like LEDs or motors perceive as analog.

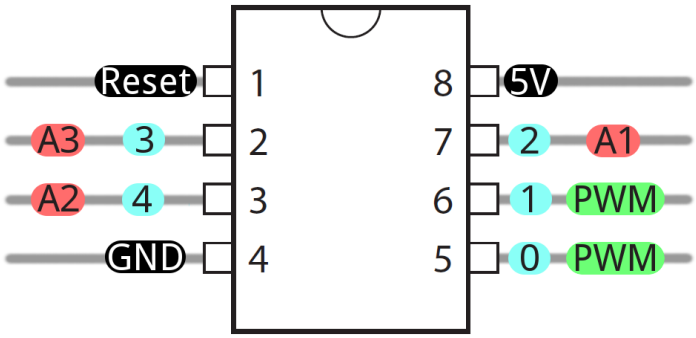
You use the ` analogWrite(pin, value) ` function, where `value` is from 0 (always off) to 255 (always on). Only specific digital pins (marked with `~` on the board, like pin 9) support PWM.

** Summary: **

This code reads a potentiometer, uses its value to set the brightness of an LED with PWM, and prints the potentiometer value to the Serial Monitor every 100 ms.

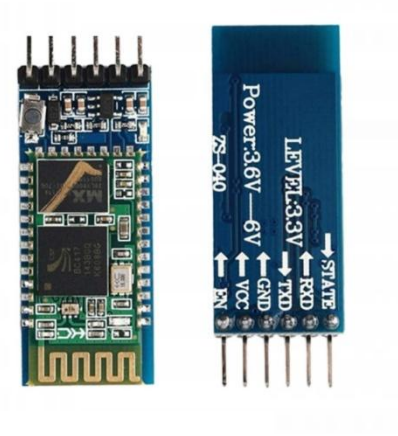
Electronic Basics #3: Programming an Attiny+Homemade Arduino Shield

1. Programming Attiny85
2. Arduino acts as a programmer
3. Arduino > Tools > Board > Attiny85



Electronic Basics #4: Arduino+Bluetooth+Android=Awesome

1. TX = Transfer Pin
2. RX = Receive Pin



🔧 Typical Connections (with Arduino)

Bluetooth Module	Arduino UNO
VCC	5V (or 3.3V if labeled)
GND	GND
TXD	RX (pin 0)
RXD	TX (pin 1) via voltage divider (1kΩ + 2kΩ recommended)

Electronic Basics #5: How to Multiplex

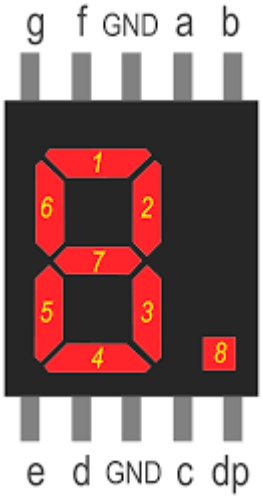
1. Making an LED matrix
2. MOSFET as a switch

Electronic Basics #6: Standalone Arduino Circuit

1. No reset switch
2. Only 5V input
3. No USB > Serial connection
4. No short circuit protection
5. No overvoltage protection

Electronic Basics #7: 7 Segment Display

1. Using a display driver
2. Two npn transistors



Electronic Basics #8: Everything about LEDs and current limiting resistors

1. Using a resistor (Value can be determined by Kirchhoff's Voltage Law)
2. V = IR
3. Power = VI

Electronic Basics #9: Diodes & Bridge Rectifiers

1. Diodes allow current to flow only one way
2. In AC circuit, it works as a rectifier
3. AC > DC

Electronic Basics #10: Digital to Analog Converter (DAC)

1. DAC = Digital to Analog Converter
2. Digital signal – Only two states (0 and 1)
3. 8bit = 2^8
4. Analog signal example – Sine waves

Electronic Basics #11: Sending SMS with Arduino || TC 35 GSM Module

Typical GSM Module Pins (e.g., SIM800L / SIM900)

GSM Pin	Function
VCC	Power supply (usually **3.7V–4.2V** for SIM800L)
GND	Ground
TXD	Transmit data (to Arduino RX)
RXD	Receive data (from Arduino TX)
RST	Reset (optional)
Net	Antenna (SMA or wire)

Basic Wiring (SIM800L to Arduino UNO)

GSM Module	Arduino UNO
VCC	**External 4V Power** (NOT directly to 5V!)
GND	GND
TXD	Pin 10 (SoftwareSerial RX)
RXD	Pin 11 (SoftwareSerial TX) — via voltage divider or level shifter
RST	Not connected (optional)

Electronic Basics #12: Coils / Inductors (Part 1)

1. Current carrying wires produce magnetic field around it.
2. To enhance the magnetic field, ferromagnetic element is used as a core.
3. Unit of Inductance is Henry.
4. Voltage leads current in the circuit due to Lenz's law.

Electronic Basics #13: Coils / Inductors (Part 2) || Reactance

1. Reactance: opposition to the AC current due the inductor
2. $X_l = 2\pi fL$
3. Inductive reactance increases as the frequency increases

Electronic Basics #14: Capacitors

1. Store and release electrical energy
2. Two conductive plates separated by an insulating material (dielectric)
3. Unit Farads