

Einführung Arduino

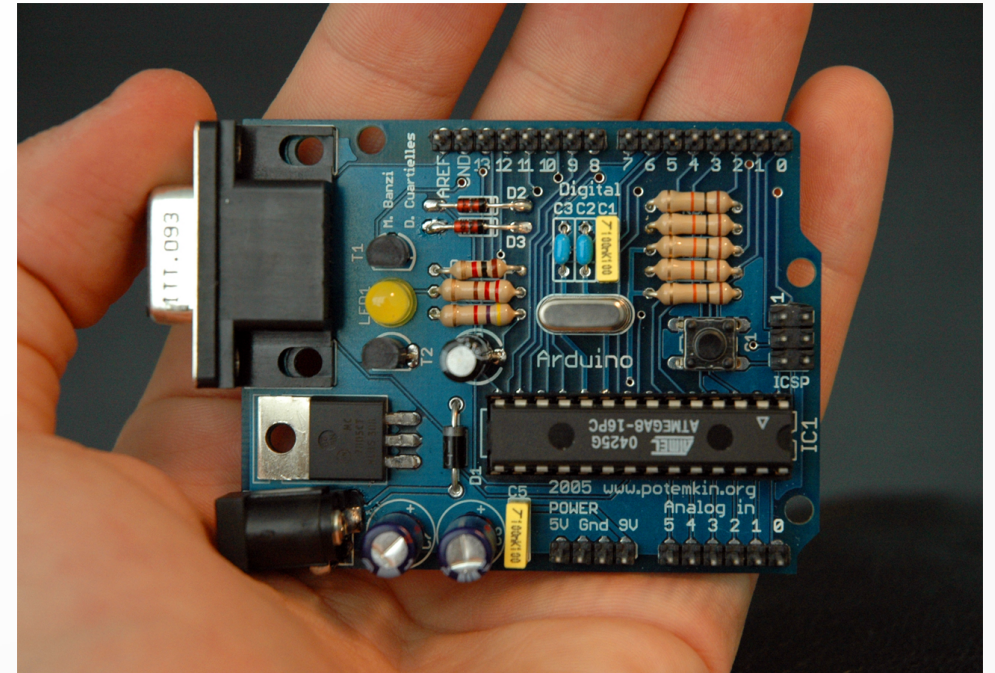
Boards, Microcontroller und Entwicklungsumgebung

Einführung Arduino

- Kurze Geschichtsstunde
- Überblick zu den unzähligen Boards
- Aufbau der Arduino-Hardware
- Microcontroller Crash-Kurs
- Arduino IDE
- Aufbau eines Arduino Programms

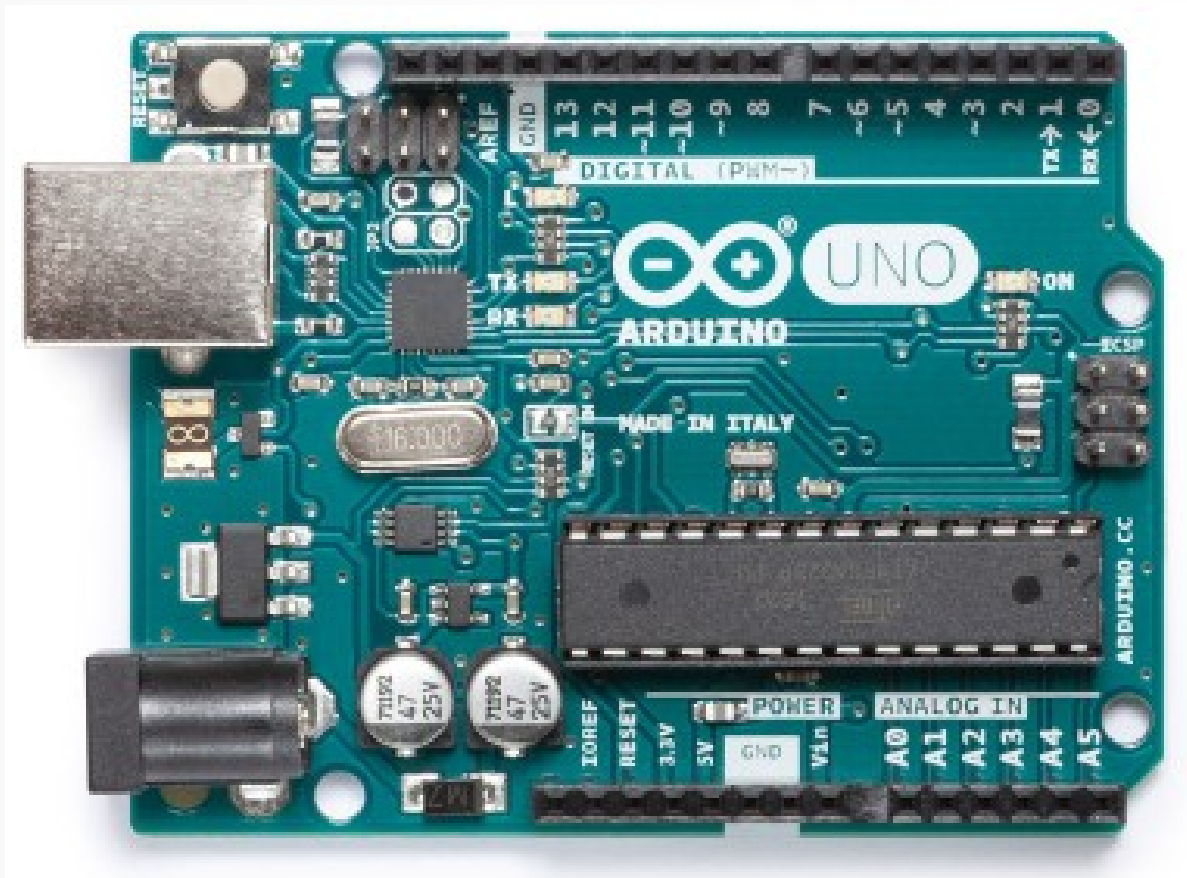
Kurze Geschichtsstunde

- 2005 erstes Arduino Board
- Günstige Hardware
- Simple Entwicklungsumgebung
- Erweiterbar durch Shields
- 2015 Rechtsstreit
 - Arduino ↔ Genuino
- [Arduino.cc](http://arduino.cc)

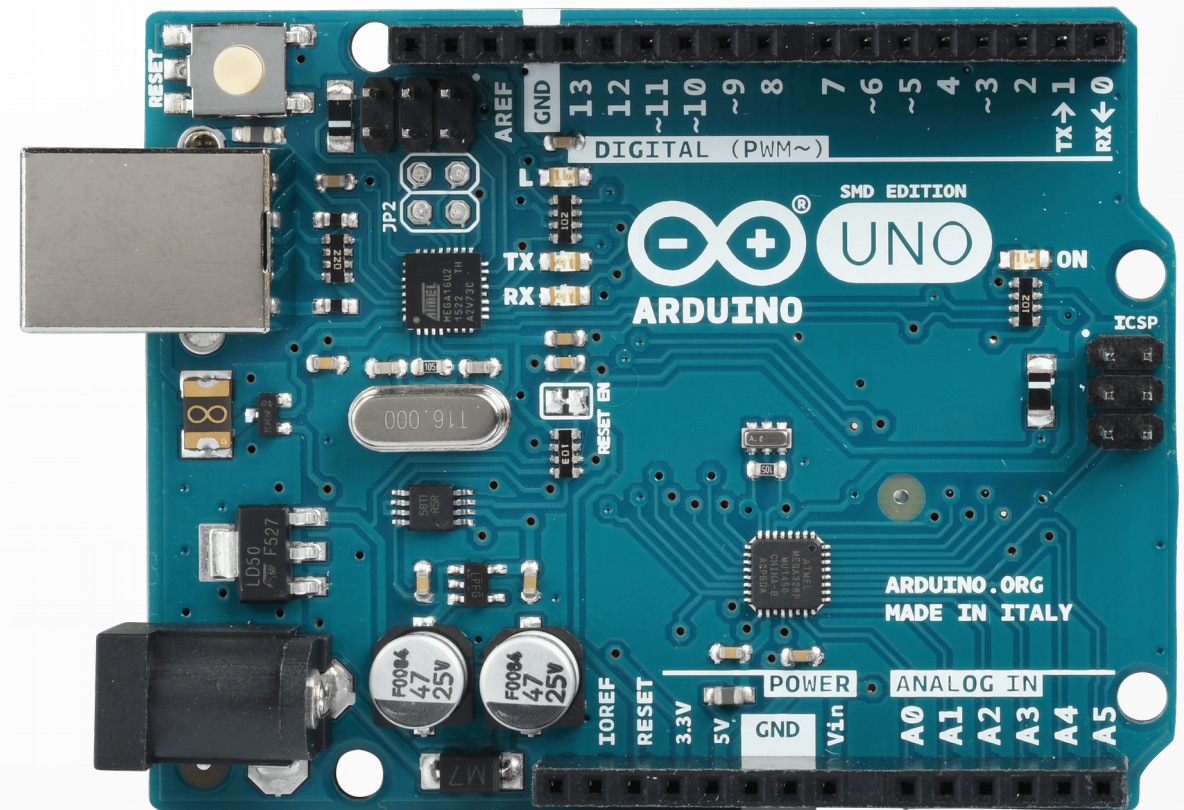


„Arduino Board - Serial Interface“ by arduino.cc is licensed under [CC BY-SA 3.0](https://creativecommons.org/licenses/by-sa/3.0/)

Arduino Boards – UNO

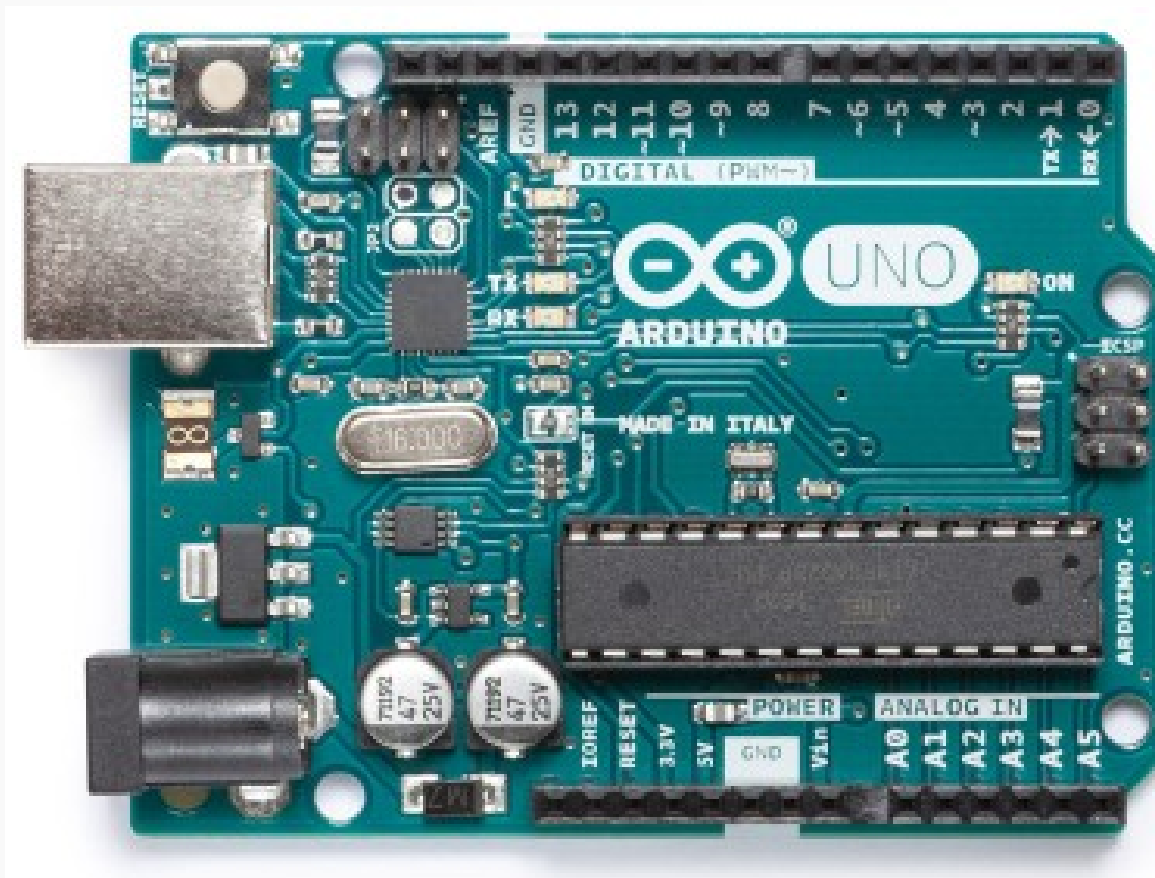


„Arduino Uno Board“ by [arduino.cc](https://www.arduino.cc) is licensed under [CC BY-SA 3.0](https://creativecommons.org/licenses/by-sa/3.0/)

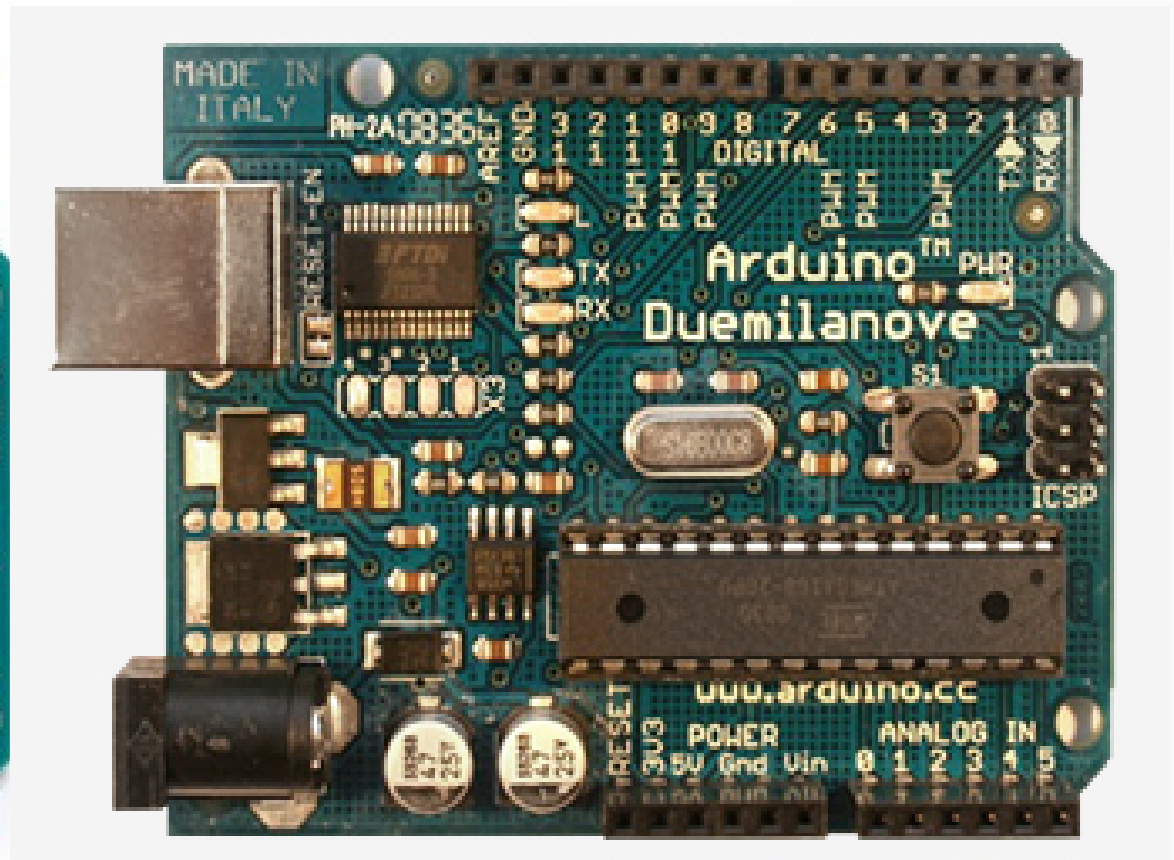


„Arduino Uno SMD Board“ by [arduino.cc](https://www.arduino.cc) is licensed under [CC BY-SA 3.0](https://creativecommons.org/licenses/by-sa/3.0/)

Arduino Boards – UNO

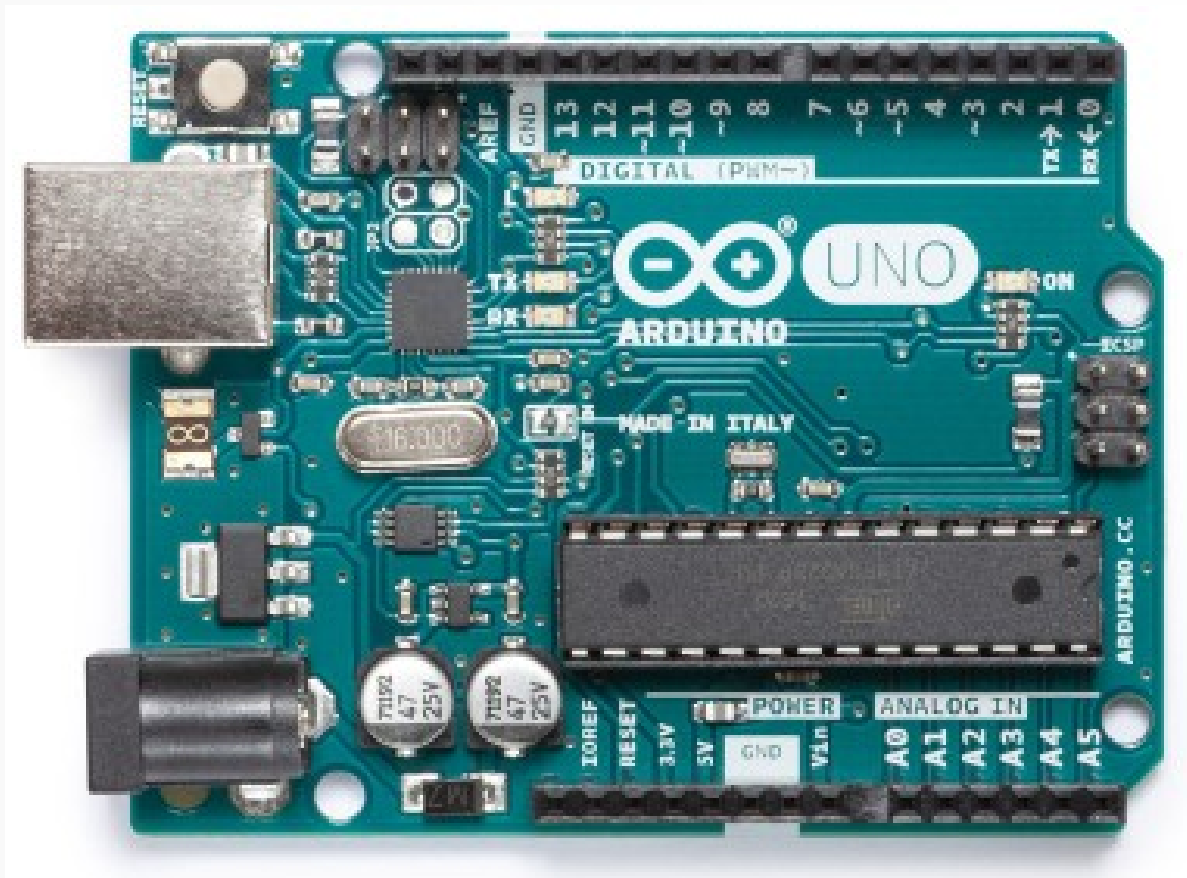


„Arduino Uno Board“ by arduino.cc is licensed under [CC BY-SA 3.0](https://creativecommons.org/licenses/by-sa/3.0/)



„Arduino Duemilanove Board“ by arduino.cc is licensed under [CC BY-SA 3.0](https://creativecommons.org/licenses/by-sa/3.0/)

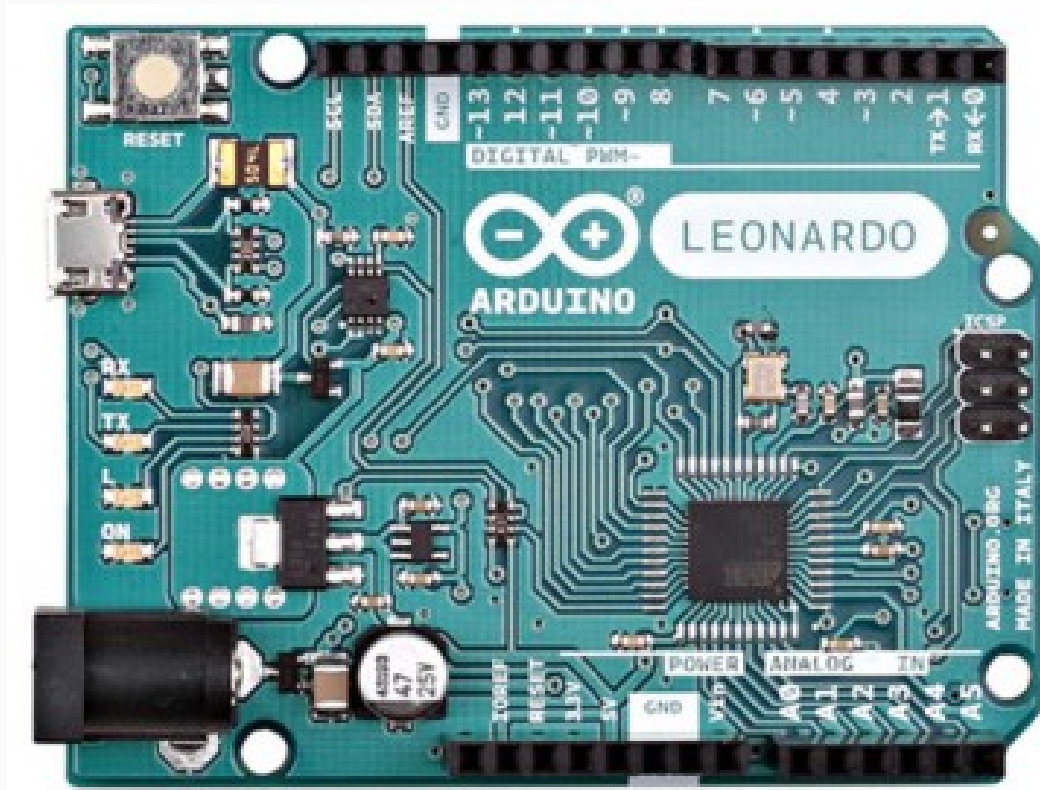
Arduino Boards – UNO



„Arduino Uno Board“ by arduino.cc is licensed under [CC BY-SA 3.0](https://creativecommons.org/licenses/by-sa/3.0/)

- Power über USB oder 7-12V
- Programmierbar über USB
- 16 MHz Takt
- 32KB Flash (0.5KB Boot)
- 2 KB SRAM
- 1 KB EEPROM
- 14 digitale I/O Pins
- 6 analoge Eingänge

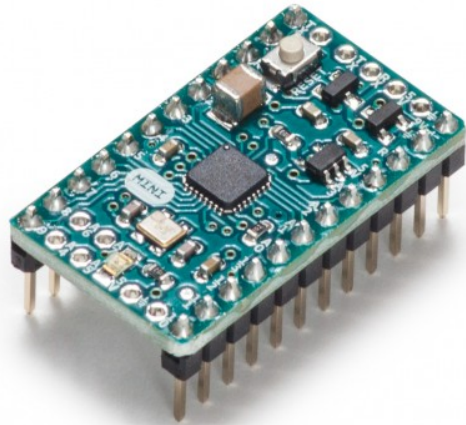
Arduino Boards – Leonardo



„Arduino Leonardo Board“ by arduino.cc is licensed under [CC BY-SA 3.0](https://creativecommons.org/licenses/by-sa/3.0/)

- Power über USB oder 7-12V
- Programmierbar über USB
- 16 MHz Takt
- 32KB Flash (4KB Boot)
- 2.5 KB SRAM
- 1 KB EEPROM
- Direkte USB Verbindung zu μC

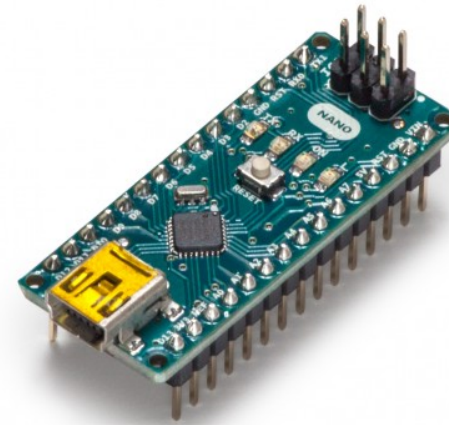
Arduino Boards – die Kleinen



Mini

- Power 7-9V
- Kein USB
- Arduino Uno

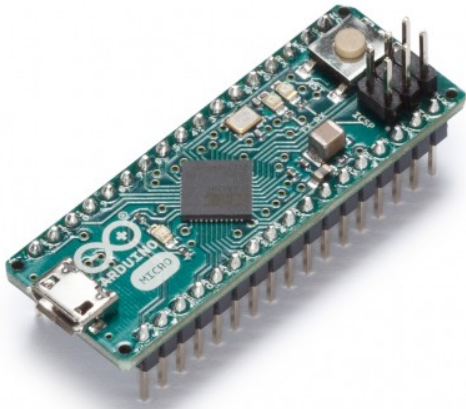
„Arduino Mini“ by arduino.cc is licensed under [CC BY-SA 3.0](https://creativecommons.org/licenses/by-sa/3.0/)



Nano

- Power 7-12V
- oder USB 5V
- Arduino Uno

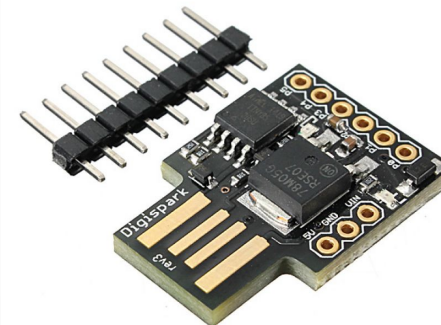
„Arduino Nano“ by arduino.cc is licensed under [CC BY-SA 3.0](https://creativecommons.org/licenses/by-sa/3.0/)



Micro

- Power 7-12V
- oder USB 5V
- Arduino Leonardo

„Arduino Micro“ by arduino.cc is licensed under [CC BY-SA 3.0](https://creativecommons.org/licenses/by-sa/3.0/)

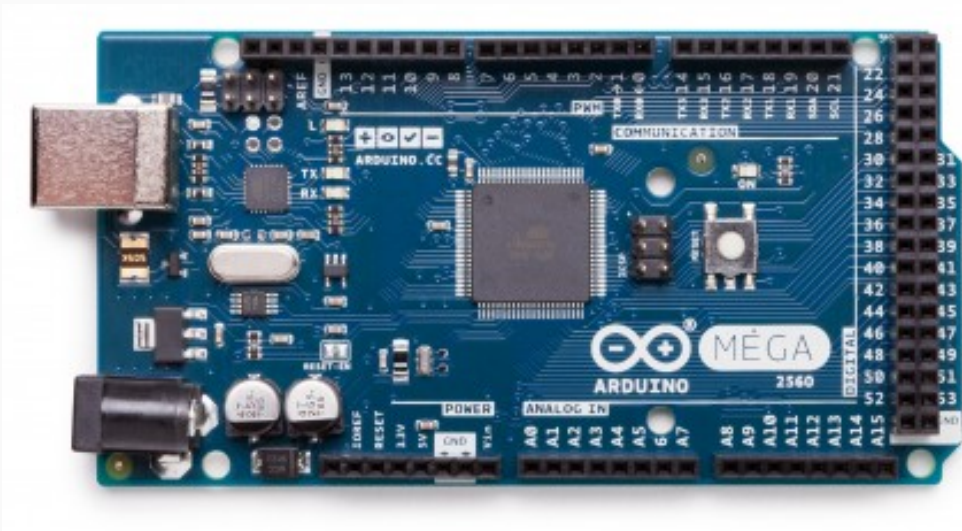


Digispark

- Power 7-12V
- oder USB 5V
- ATTiny85

„Digisparks“ by [tharindurc](https://tharindurc.com) is licensed under [CC BY-NC-SA 2.5](https://creativecommons.org/licenses/by-nc-sa/2.5/)

Arduino Boards – Noch meeeehr

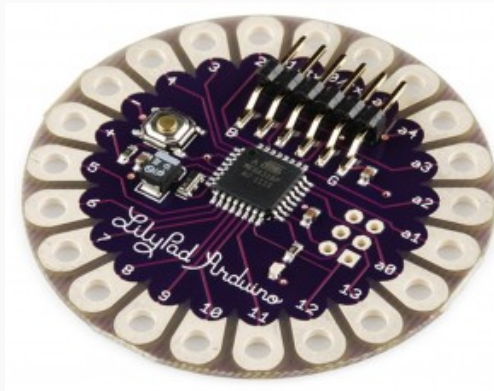


„Arduino Mega“ by arduino.cc is licensed under CC BY-SA 3.0

Mega

- Power 7-12V
- oder USB
- 256KB Flash
- 8KB SRAM
- 4KB EEPROM

- Watterott
- Adafruit
- Olimex
- Seeed Studio
- Sparkfun
- TinyCircuits
- Pololu
- ...

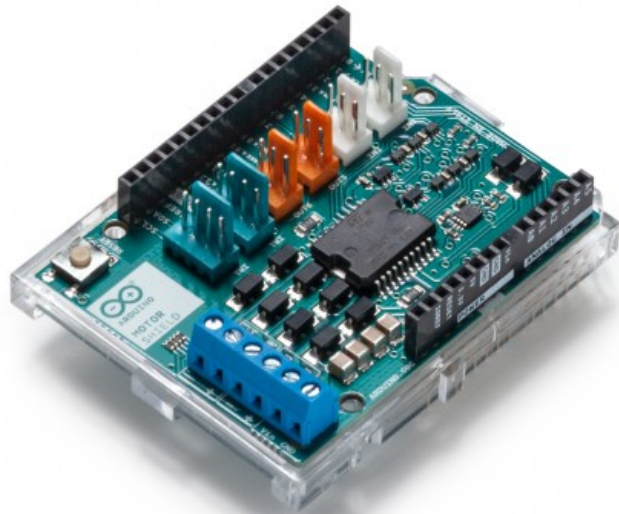


„Arduino LilyPad“ by arduino.cc is licensed under CC BY-SA 3.0

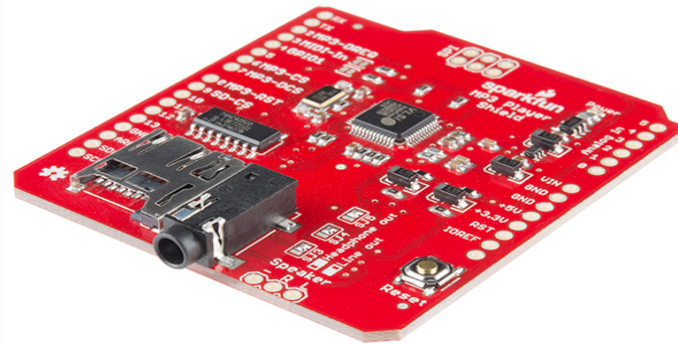
LilyPad

- Wearables
- Nähen statt löten
- versch. Varianten

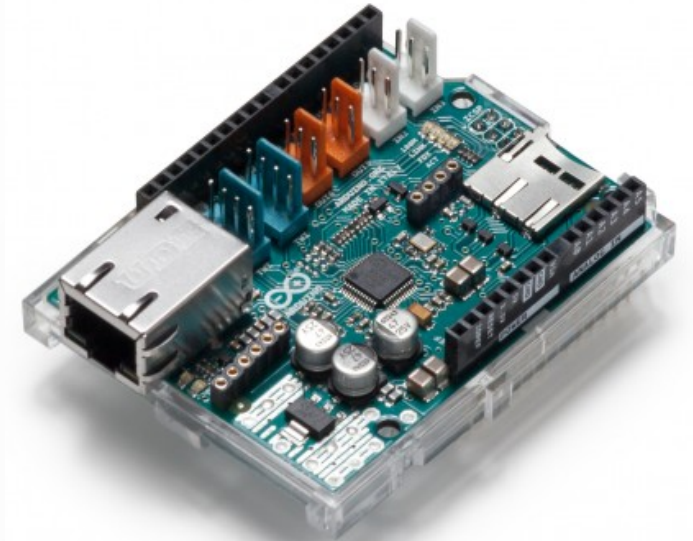
Arduino Boards – Shields



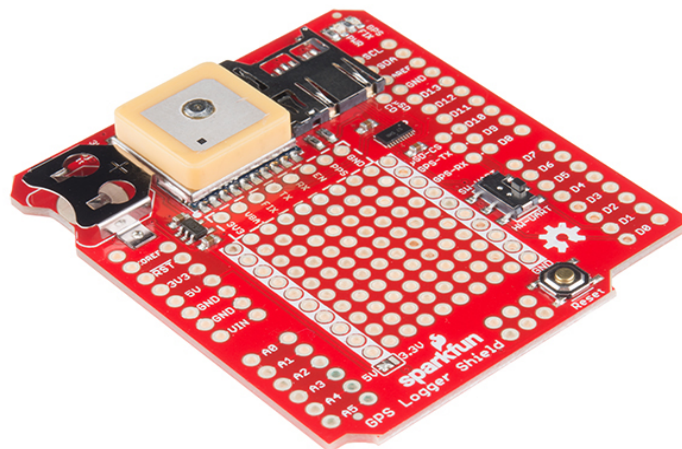
„Motor Shield“ by [arduino.cc](#) is licensed under [CC BY-SA 3.0](#)



„MP3 Shield“ by Sparkfun is licensed under [CC BY 2.0](#)



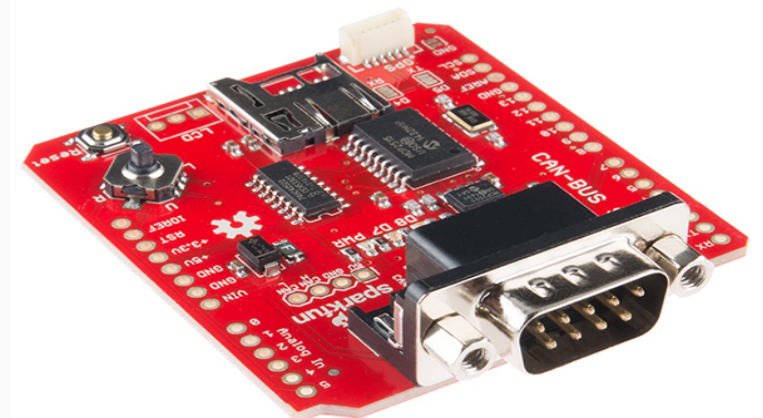
„Ethernet Shield“ by [arduino.cc](#) is licensed under [CC BY-SA 3.0](#)



„GPS Shield“ by Sparkfun is licensed under [CC BY 2.0](#)

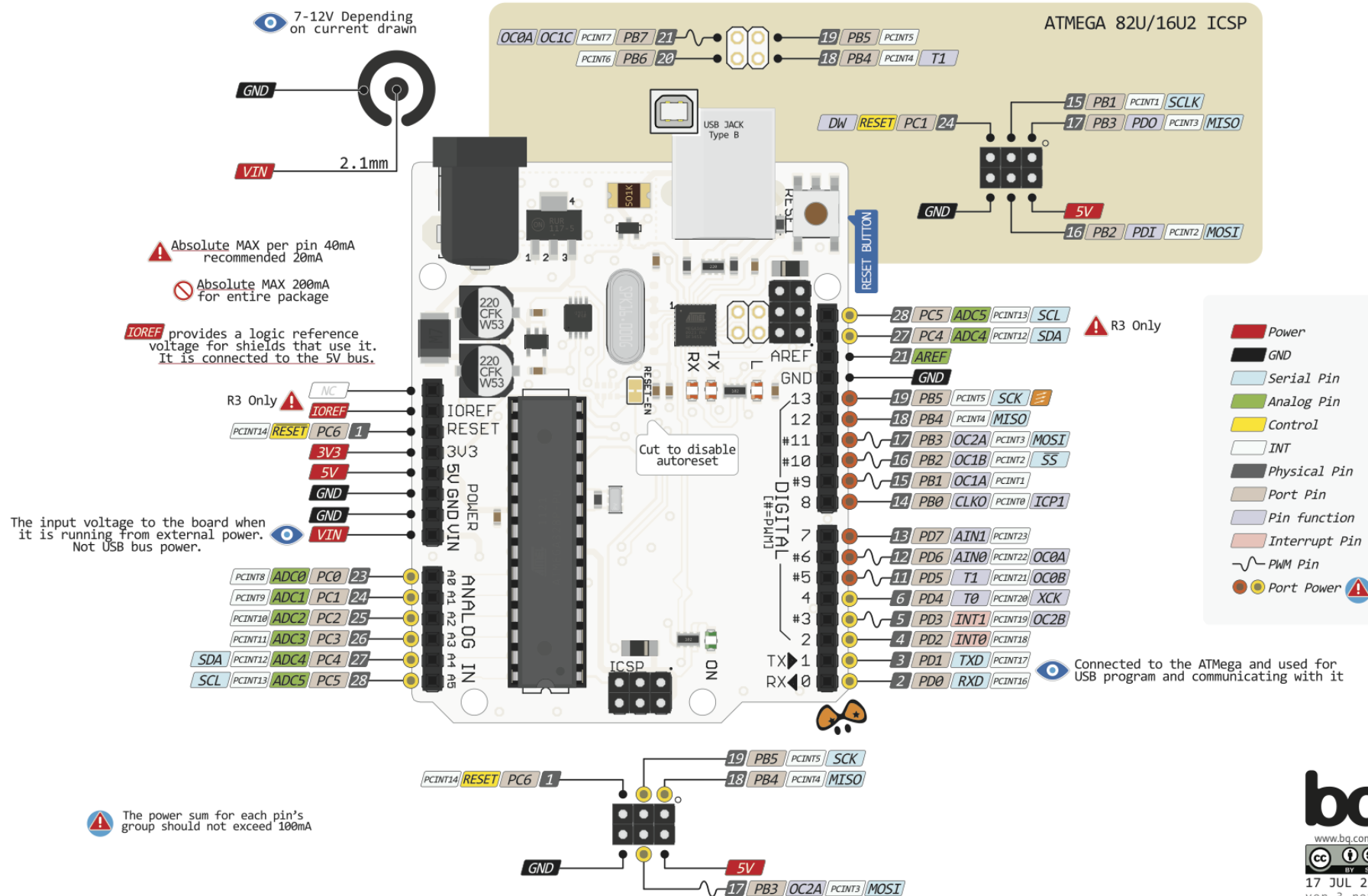


„GSM Shield“ by [arduino.cc](#) is licensed under [CC BY-SA 3.0](#)



„CAN-Bus Shield“ by Sparkfun is licensed under [CC BY 2.0](#)

Arduino Hardware



Microcontroller Crash-Kurs

- Ein μC ist wie ein kompletter kleiner Computer
- CPU – 16MHz, 131 Befehle (meist single cycle)
- FLASH – 32KBytes, davon 0.5KBytes Bootloader
- SRAM – 2KBytes, Arbeitsspeicher
- EEPROM – 1KBytes, Datenspeicher
- Schnittstellen
 - I/O Pins, analoge Eingänge, RS232, I²C, SPI, externe Interrupts

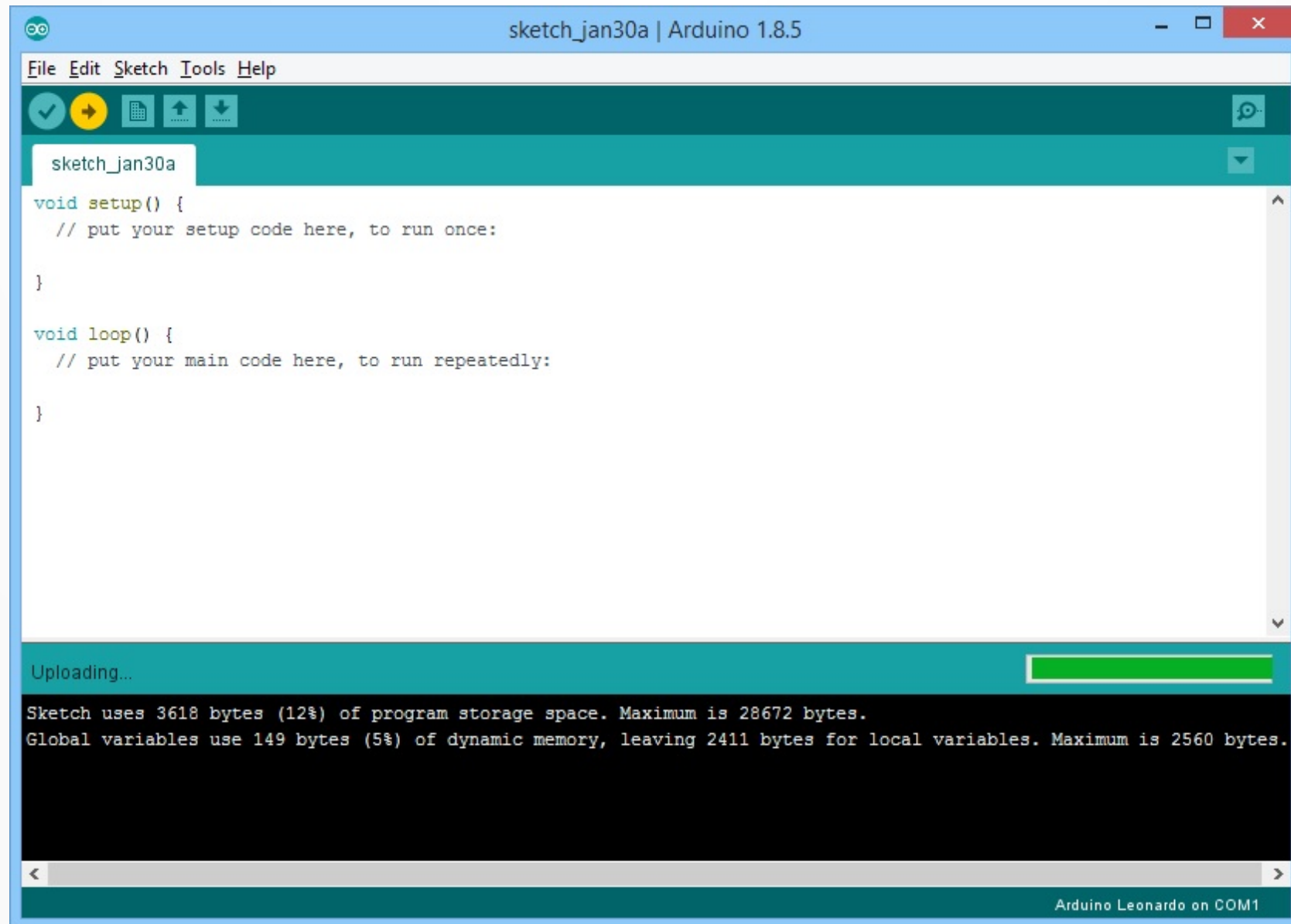
Microcontroller Crash-Kurs

- **ATMega328P** – Arduino Uno, USB über Zusatz-IC
- **ATMega32u4** – Arduino Leonardo, USB direkt
- **ATMega2560** – Arduino Mega
- **ATTiny85** – Digispark und alles was winzigst ist
- Atmel gekauft durch Microchip

Arduino IDE

- Entwicklungsumgebung für alle Arduino Boards
- Direkte Verbindung mit Arduino über USB (seriell)
- Beinhaltet Compiler, Flasher und serielle Konsole
- Viele Beispiele mit an Bord
- Erweiterbar durch unzählige Bibliotheken von Shield-Herstellern
- <https://www.arduino.cc/en/Main/Software>

Arduino IDE



Aufbau eines Arduino Programms

```
#define LED_PIN 13           // Pin number attached to LED.

void setup() {
  pinMode(LED_PIN, OUTPUT); // Configure pin 13 to be a digital output.
}

void loop() {
  digitalWrite(LED_PIN, HIGH); // Turn on the LED.
  delay(1000);                 // Wait 1 second (1000 milliseconds).
  digitalWrite(LED_PIN, LOW);  // Turn off the LED.
  delay(1000);                 // Wait 1 second.
}
```