
Arduino Dimmer

Objective:
Control the brightness of a light (like an LED or lamp) using a **dimmer circuit** controlled by Arduino.

Types of Dimming:

1. **For DC Loads (like LEDs):**
    - Uses **PWM (Pulse Width Modulation)** to control brightness.
    - The duty cycle of the PWM signal determines how bright the LED appears.
2. **For AC Loads (like lamps or fans):**
    - Requires **phase angle control** using a **triac** and **optocoupler (like MOC3021)**.
    - Zero-cross detection is used to synchronize with the AC waveform.

Components Required (DC Dimmer):

- Arduino Uno
- LED
- Resistor
- Potentiometer (for adjusting brightness)

Components Required (AC Dimmer):

- Arduino Uno
- Triac (e.g., BT136)
- Optoisolator (MOC3021)
- Zero-cross detection circuit
- AC bulb or fan

Working Principle:

- For **DC dimming**, Arduino reads a potentiometer value and outputs a PWM signal to control LED brightness.

- For **AC dimming**, Arduino delays the triac firing after each zero-cross to control power delivery to the load.

Use Cases:

- Adjustable LED lights
- Fan speed controllers
- Light automation systems
- Smart home lighting projects

Safety Tip:
When working with **AC power**, always take proper electrical safety precautions!
