Piero Buzzer

A **piezo buzzer** is an electronic sound-emitting device that uses the **piezoelectric effect** to convert electrical energy into mechanical vibrations, which in turn produce sound. The core component of a piezo buzzer is a **piezoelectric ceramic disc** attached to a metal diaphragm. When a voltage is applied across the disc, it deforms slightly. Applying an alternating current (AC) causes the disc to rapidly expand and contract, generating vibrations in the diaphragm that produce sound waves in the air.

Types of Piezo Buzzers:

1. **Active Piezo Buzzers**:
    - Contain an internal oscillator circuit.
    - Produce a sound when a DC voltage is applied.
    - Ideal for simple alert applications like alarms and timers.
    - Require only a power source—no complex signal generation is needed.
2. **Passive Piezo Buzzers**:
    - Do **not** have an internal oscillator.
    - Require an external AC signal or a PWM (Pulse Width Modulation) signal to produce sound.
    - Offer more control over tone and frequency, making them suitable for musical notes and custom sound patterns.

Key Features:

- **Low power consumption**: Ideal for battery-operated devices.
- **Compact and lightweight**: Easy to integrate into small electronic devices.
- **Durable and reliable**: No moving parts, which increases lifespan and resistance to mechanical wear.
- **Wide frequency range**: Typically operates in the audible range (2 kHz – 5 kHz), but can vary depending on the design.
- **Simple interfacing**: Easily driven by microcontrollers (like Arduino or ATtiny85) using digital or PWM signals.

Common Applications:

- Alarms and warning systems (e.g., smoke detectors)
- Timers and notifications (e.g., microwave ovens, washing machines)
- Toys and novelty items
- Electronic projects and DIY kits
- Medical devices
- Industrial equipment status indicators

Advantages:

- Easy to use and integrate into electronic circuits
- Long operational life
- Cost-effective solution for sound generation
- Available in various sizes and shapes to suit different needs