**1. ESP Board (Microcontroller Unit)**

* **Definition:** The ESP board is a family of low-cost, Wi-Fi-enabled microcontrollers such as the ESP32 or ESP8266.
* **Function in the Project:** Acts as the main controller to process inputs from the sound sensor and control outputs like the NeoPixel LED. It also provides power-saving modes (like deep sleep) to reduce energy consumption, essential for battery-powered applications.

**2. 18650 Battery (1S2P Configuration)**

* **Definition:** A cylindrical lithium-ion rechargeable battery with a standard size of 18mm in diameter and 65mm in length. In a 1S2P configuration, two batteries are connected in parallel, maintaining the voltage (3.7V nominal) but doubling the capacity.
* **Function in the Project:** Serves as the primary power source, ensuring extended runtime for the bee sound sensor system.

**3. Reed Switch**

* **Definition:** A magnetically activated electrical switch made up of two ferrous reeds enclosed in a small glass tube.
* **Function in the Project:** Used as a wake-up function. When a magnetic field is applied, the switch closes, signaling the ESP board to wake from deep sleep mode, minimizing power usage when the device is inactive.

**4. TP4056 Charging Module**

* **Definition:** A lithium-ion battery charging module that supports constant current/constant voltage (CC/CV) charging and includes built-in overcharge, over-discharge, and short-circuit protection.
* **Function in the Project:** Provides safe and efficient charging for the 18650 batteries using an external power source (e.g., USB), ensuring long-term battery health.

**5. NeoPixel (LED Indicator)**

* **Definition:** A type of individually addressable RGB LED that integrates a driver chip within the LED package, often based on WS2812 or SK6812 technology.
* **Function in the Project:** Acts as a visual indicator for various system states (e.g., power on/off, detection activity, or charging status).

**6. SPH0645 (Sound Detector)**

* **Definition:** A MEMS (Micro-Electro-Mechanical System) digital microphone with an I2S interface, capable of detecting sound with high sensitivity and low power consumption.
* **Function in the Project:** Detects bee sounds and sends the audio data to the ESP board for processing, allowing the system to monitor the acoustic environment around the beehive.