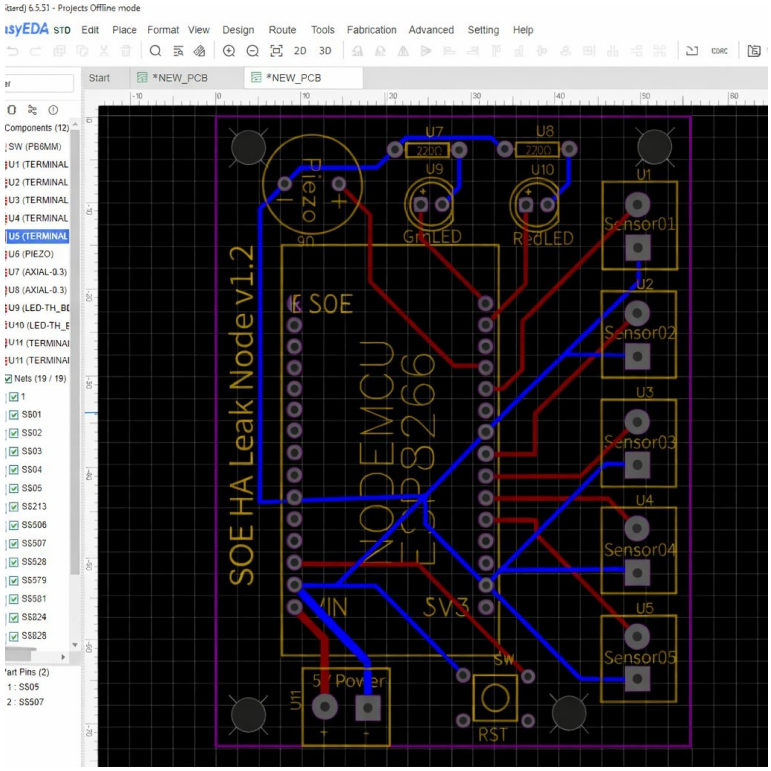
Water Leak Detector Wiring Diagram

Complete Connection Guide

PCB Layout Overview



PCB Layout

The PCB is designed with the following sections:

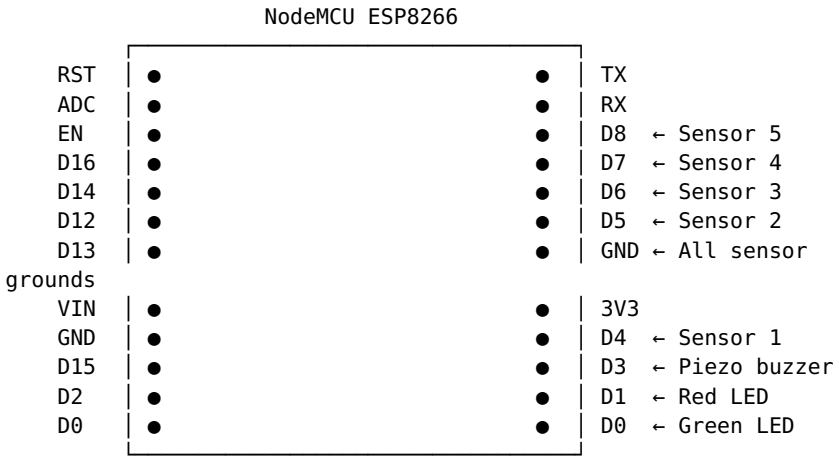
- **Left side:** NodeMCU ESP8266 socket (center-left)
- **Right side:** Five sensor terminal blocks (Sensor01 through Sensor05)
- **Top right:** Status LEDs (Green LED and Red LED)
- **Center:** Piezo buzzer (U6)
- **Bottom left:** Power input terminal

Component Key

Component	Label on PCB	Purpose
NodeMCU Socket	Center board section	ESP8266 microcontroller

		mount
Sensor Terminals	U1-U5	Screw terminals for five water sensors
Power Terminal	5V Power (bottom left)	5V DC power input
Green LED	U9 (LED-TH_BICOLOR)	Normal operation indicator
Red LED	U10 (LED-TH_BICOLOR)	Leak detected indicator
Piezo Buzzer	U6	120dB audible alarm

NodeMCU ESP8266 Pinout



Power Connections

5V DC Power Supply

Connect a 5V 2A wall adapter to the power terminal on the bottom left of the PCB:

- **Positive (+):** Connect to VIN on power terminal
- **Negative (-):** Connect to GND on power terminal

⚠ **CRITICAL:** Verify polarity before powering on. Reversed polarity will damage the ESP8266.

Sensor Connections

Each sensor connects to a dedicated screw terminal (U1 through U5 on the right side of the PCB).

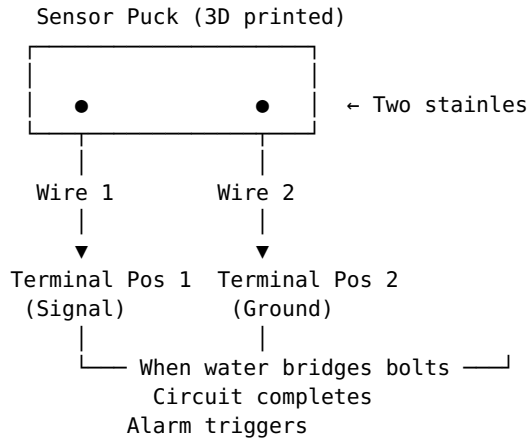
Sensor Terminal Wiring

Each 2-position screw terminal has: - **Position 1 (Signal):** Connects to one bolt on sensor puck → routes to GPIO pin - **Position 2 (Ground):** Connects to other bolt on sensor puck → routes to GND

Sensor Assignments

PCB Terminal	GPIO Pin	Sensor Zone	Typical Location
U1 (Sensor01)	D4	Zone 1	Water Heater
U2 (Sensor02)	D5	Zone 2	Sump Pump
U3 (Sensor03)	D6	Zone 3	AC Condensate
U4 (Sensor04)	D7	Zone 4	Washing Machine
U5 (Sensor05)	D8	Zone 5	Dishwasher

How Each Sensor Works



Status LED Connections

Green LED (Normal Operation)

- Located at U9 (top right area of PCB)
- **Anode (+):** Connected to GPIO D0 through 220Ω resistor
- **Cathode (-):** Connected to GND
- **Function:** Illuminated when system is operating normally

Red LED (Leak Detected)

- Located at U10 (top right area of PCB)
- **Anode (+):** Connected to GPIO D1 through 220Ω resistor
- **Cathode (-):** Connected to GND
- **Function:** Illuminated when water is detected by any sensor

LED Installation Note: The long leg is the anode (+), short leg is cathode (-). The flat side of the LED housing indicates the cathode.

Piezo Buzzer Connection

- Located at U6 (center of PCB)
- **Positive (+):** Connected to GPIO D3
- **Negative (-):** Connected to GND
- **Output:** 120dB pulsing alarm (0.5s on, 0.5s off pattern)

Wire Specifications

Sensor Wires

- **Gauge:** 18-22 AWG two-conductor cable
- **Maximum length:** 20 feet per sensor
- **Type:** Stranded copper preferred for flexibility
- **Insulation:** PVC or similar for indoor use

Wire Color Coding Recommendations

For easier troubleshooting, use consistent color pairs:

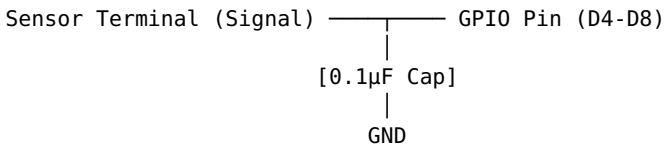
Zone	Wire Pair Colors
Zone 1	Red/Black
Zone 2	Blue/Black
Zone 3	Green/Black
Zone 4	Yellow/Black
Zone 5	White/Black

Label both ends with zone number using wire labels or tape.

Optional EMI Protection

If experiencing false alarms from static discharge or lightning, add 0.1µF ceramic capacitors:

Capacitor Placement



Installation: - Solder one leg to the signal trace between terminal and GPIO pin - Solder other leg to nearest ground point - Can be added on back of PCB if needed - Requires five capacitors total (one per sensor input)

Assembly Steps

1. Install Screw Terminals

Install all six 2-position screw terminals: - Five for sensors (right side: U1-U5) - One for power (bottom left)

2. Install NodeMCU Socket

Install 2×15 pin header socket in center position. The NodeMCU plugs into this socket (not soldered directly).

3. Install LEDs

Green LED (U9): - Long leg to anode pad - Short leg to cathode pad - Orientation critical!

Red LED (U10): - Long leg to anode pad - Short leg to cathode pad - Orientation critical!

4. Install Resistors

Install two 220Ω resistors for LED current limiting (located near LEDs).

5. Install Piezo Buzzer

Install piezo buzzer at U6 position, observing polarity (red wire typically positive).

6. Insert NodeMCU

After all components are soldered, insert NodeMCU ESP8266 into socket, ensuring all pins align properly.

Connection Checklist

Before powering on, verify:

- ☐ Power polarity correct (+ to VIN, - to GND)
- ☐ All sensor wires connected to correct terminals
- ☐ LED polarity correct (long leg to anode)
- ☐ Piezo buzzer polarity correct
- ☐ No shorts between VIN and GND
- ☐ NodeMCU seated fully in socket

Testing Procedure

Initial Power-Up Test

1. Connect 5V power supply
2. Verify green LED illuminates (or check ESPHome configuration)
3. Verify no alarm sounds
4. Check that device appears on WiFi network

Sensor Functionality Test

For each sensor:

1. Prepare wet paper towel
2. Touch to sensor puck bolts
3. Verify:
   - Red LED turns on
   - Green LED turns off
   - Piezo buzzer sounds (pulsing pattern)
4. Remove water source
5. Verify:
   - Buzzer stops
   - Red LED turns off
   - Green LED returns

Complete System Test

1. Disconnect WiFi or turn off router
2. Trigger any sensor with water
3. Verify alarm still functions (proves local operation)
4. This confirms the system works without network dependency

Troubleshooting

No Power / LEDs Don't Light

- Check power supply output (should be 5V DC)
- Verify power terminal connections
- Check for shorts between VIN and GND
- Measure voltage at NodeMCU VIN pin

Sensor Not Detecting Water

- Check sensor wire connections at terminal block
- Verify sensor bolts are clean and not corroded
- Test continuity with multimeter (should show connection when wet)
- Check GPIO pin assignment in ESPHome configuration

False Alarms

- Add 0.1µF ceramic capacitors to sensor inputs
- Route sensor wires away from AC power lines
- Check for moisture/condensation on sensors
- Verify sensor placement (not in areas with normal moisture)

Buzzer Not Sounding

- Check piezo buzzer polarity
- Verify connection to GPIO D3
- Test buzzer separately with 3.3V source
- Check ESPHome script configuration

Safety Warnings

⚠ **Electrical Safety** - Use only 5V DC power supply - Never use AC power directly - Verify polarity before connecting power - Keep away from water sources when powered

⚠ **Installation Safety** - Route wires safely away from sharp edges - Protect wires from physical damage - Keep sensor wires away from AC mains wiring - Use appropriate wire management (cable ties, conduit)

⚠ **Operating Safety** - Do not submerge PCB or electronics - Install in dry location away from direct water exposure - Ensure adequate ventilation around ESP8266 - Do not block access to power disconnect

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Technical Specifications

Parameter	Value
Supply Voltage	5V DC ±5%
Current Draw	<500mA typical
PCB Dimensions	220mm × 290mm
PCB Layers	2-layer
Sensor Input Type	Conductivity (INPUT_PULLUP)
Sensor Response Time	<100ms
Maximum Sensor Wire Length	20 feet (6 meters)
Alarm Output Level	120dB
Operating Temperature	0°C to 50°C
Storage Temperature	-20°C to 70°C

Document Information

Version: 1.0
Date: January 2026
For: Water Leak Detection System Build Guide
PCB Design: EasyEDA
Manufacturer: JLCPCB (or equivalent)