Amplifier circuit so that a GPIO-generated signal from your Raspberry Pi is boosted by the TSH82 op amp and then sent to a piezo transducer (speaker).

Components

• Raspberry Pi 4B (with the GPIO header available)

• TSH82 Dual Operational Amplifier

• Breadboard (for prototyping)

• Jumper Wires

• Resistors:

• One 10 kΩ resistor (for feedback from the inverting input to ground)

• One 100 kΩ resistor (for feedback from the op amp output to the inverting input)

• Piezo Transducer (Speaker)

• Power Supply: You can use the Raspberry Pi's 5V and Ground pins

Step-by-Step Wiring Instructions

1. Connect the Raspberry Pi to the Op Amp (Non-Inverting Input)

• GPIO Signal to Non-Inverting Input (+):

• Choose a GPIO pin to generate your audio signal (for example, GPIO18 which is available on physical Pin 12).

• Run a jumper wire from this GPIO pin directly to the non-inverting (+) input of the TSH82 op amp.

• Tip: On the op amp, there may be a pair of parallel pads for the non-inverting input; use the one that is marked as "+" or "non-inverting."

2. Mount the TSH82 on a Breadboard

• Carefully insert the TSH82 into the breadboard so that you can easily connect jumper wires to its pins.

• Ensure that the op amp's pins are accessible for wiring the inputs, outputs, power, and feedback network.

3. Establish the Signal Connection

• Direct Connection:

• Use a jumper wire to connect the op amp's non-inverting input (+) (from step 1) to the corresponding breadboard row where your GPIO signal is available.

4. Set Up the Feedback Network with the Resistors

• Feedback Resistor (R2 – 100 kΩ):

• Connect one end of the 100 kΩ resistor to the op amp's output pin.

• Connect the other end of this resistor to the inverting input (–) of the op amp.

• Ground Resistor (R1 – 10 kΩ):

• Connect one end of the 10 kΩ resistor to the same inverting input (–) of the op amp (where R2 is already connected).

• Connect the other end of the 10 kΩ resistor to the breadboard's ground rail.

This resistor network sets the amplifier's gain using the formula:

Gain A = 1 + {R2}/{R1}

For R2 = 100 kΩ and R1 = 10 kΩ, Gain ≈ 11.

5. Establish a Common Ground

• Connect a ground pin from your Raspberry Pi (for example, Pin 6) to the ground rail on your breadboard.

• Make sure that all components (the op amp and the piezo transducer) share this common ground.

6. Connect Power to the Breadboard

• VCC Connection:

• Connect the Raspberry Pi's 5V pin (e.g., Pin 2 or Pin 4) to the positive power rail on the breadboard.

• Ground Connection:

• Also, ensure that the ground from the Raspberry Pi is connected to the breadboard's ground rail.

• Then, wire the TSH82's VCC (positive power pin) to the breadboard's positive rail and its –VEE (negative supply) to the ground rail.

• In a single-supply configuration (which we're using here), the –VEE is tied to ground.

7. Connect the Op Amp Output to the Piezo Transducer

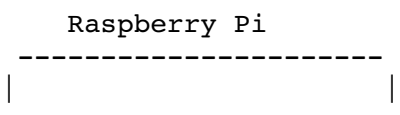
• Output Connection:

• Run a jumper wire from the op amp's output to the positive (+) terminal of the piezo transducer.

• Transducer Ground:

• Connect the negative (–) terminal of the piezo transducer to the breadboard's ground rail.

Visual Summary (Simplified Schematic)

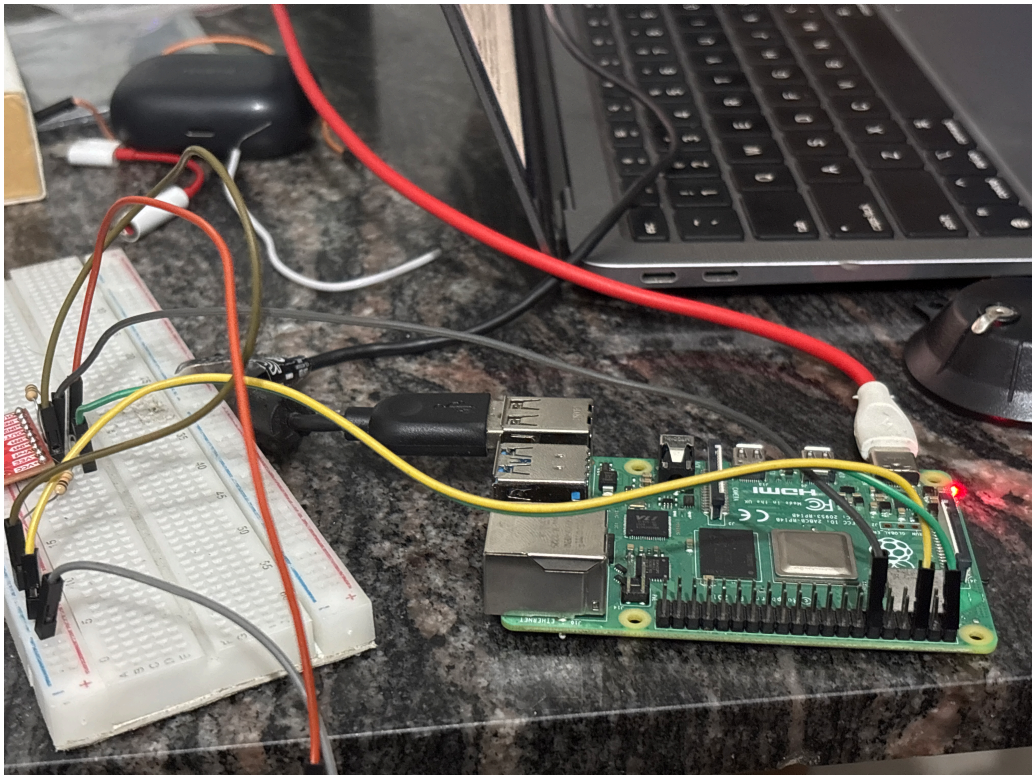


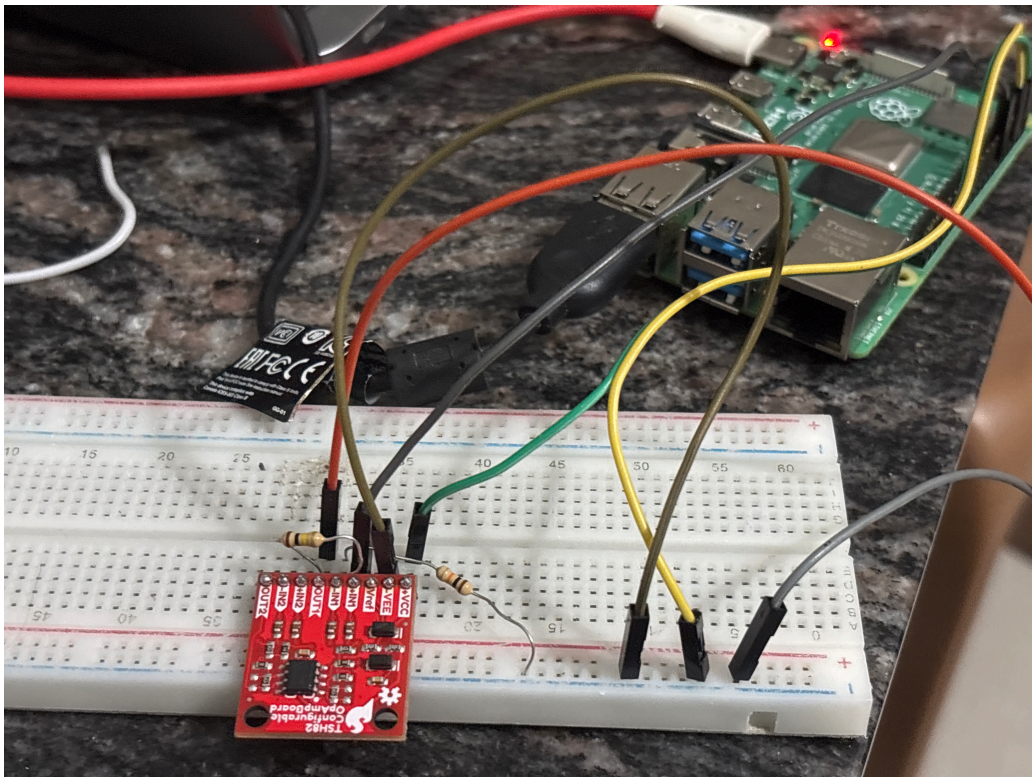
```
        |  GPIO (e.g., GPIO18) |----> [Jumper] ----> (Non-
Inverting Input of TSH82)
        |                      |
         ----------------------
               |      |
               |  5V & GND from Pi
               |      |
        [5V] ----+      +---- [GND]
                  |
          -------------------
          |  TSH82 Op Amp    |
          |                  |
          |   +       -      |
          |   |       |      |
          |   |       |      |<-- R1 (10 kΩ) --> GND
(breadboard)
          |   |       |      |
          |<--|       |------|
          |   |       |      |
          |   |<--- R2 (100 kΩ) ---|
          |   |                    |
          |   |     Output         |----> [Jumper] ----> Piezo
Transducer (+)
          |                  |
          -------------------
                     |
                Piezo Transducer (–) to GND
```

Note: The op amp's VCC and –VEE should be connected to the breadboard's 5V and Ground rails, respectively.

Given Below is the connection I made

This will be useful for reference




VOUT2
IN2-
IN2+
VOUT1
GND
IN1+
VEE
VCC
TSH82
Configurable
OpAmpBoard