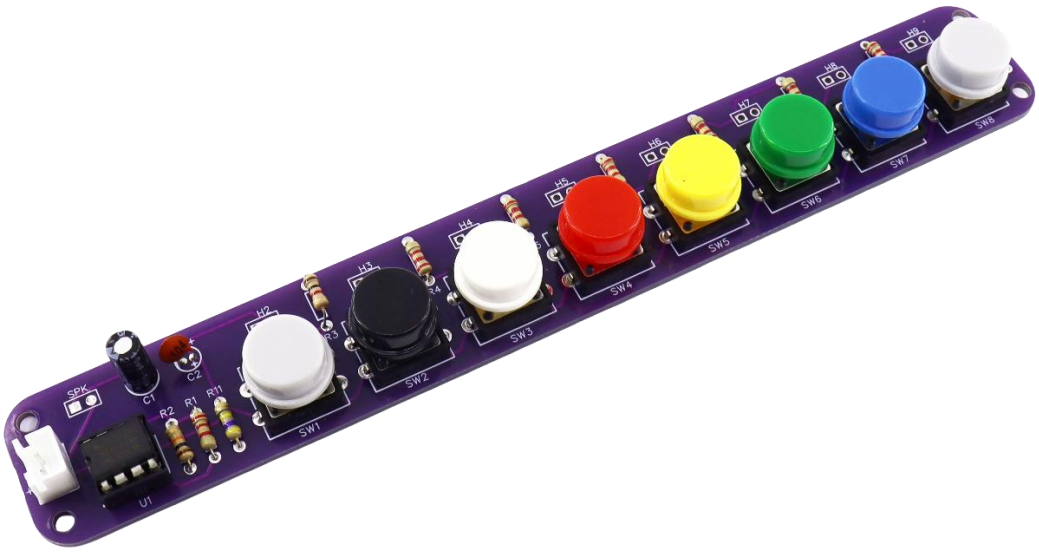

Piano DIY Kit User Guide

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Introduction

The Piano Module is a compact, beginner-friendly electronic sound generator designed to produce musical tones using the NE555 timer IC. Configured in astable mode, the 555 timer generates square-wave signals whose frequency is determined by resistor-capacitor (RC) combinations linked to individual piano keys. Each key corresponds to a distinct RC network, allowing the module to output different notes when pressed.

The board features a convenient, compact layout for easy assembly and user-friendly operation, making it suitable for both classroom demonstrations and hobbyist projects. By combining practical hardware design with musical creativity, the Piano module offers an engaging way to explore oscillators, frequency control, and audio electronics.

This makes the module ideal for beginners seeking a reliable solution for educational kits, DIY instruments, and sound experimentation projects.

Key Features

- Simple Design – Built around the popular 555 timer IC, requiring minimal external components.
- Musical Tone Generation – Produces distinct notes based on resistor-capacitor (RC) combinations.
- Hands-On Learning – Demonstrates frequency control, square wave oscillation, and audio output.
- Compact & Portable – Easy to integrate into DIY kits or classroom projects.
- Beginner-Friendly – No programming required; purely hardware-based tone generation.
- Can Be Wired Buttons and Used with Enclosure – Supports external button wiring and enclosure mounting for durable, user-friendly builds.

Typical Applications

- Educational Kits – Teaching oscillators, frequency response, and audio electronics.
- DIY Musical Toys – Simple piano-like instruments for hobby use.
- Science Exhibitions – Demonstrating sound generation with electronics.
- Prototype Development – Basis for electronic organ or synthesizer projects.
- Fun Experiments – Exploring how RC values affect pitch and tone.

Working Principle

This module integrates with an NE555 timer IC, configured in astable mode to generate continuous square-wave signals. The piano produces near sounds of “Sa, Ri, Ga, Ma, Pa, Da, Ni, Sa” by switching between different resistor-capacitor (RC) networks. Each key corresponds to a

unique RC combination, which sets the oscillation frequency of the 555 timer and thus determines the pitch of the note.

When a button is pressed, the associated RC network defines the output frequency. The generated square wave is then fed to a buzzer, producing an audible tone. The following frequencies are mapped to the eight keys:

- Key 1 (Sa) – 262 Hz
- Key 2 (Ri) – 272 Hz
- Key 3 (Ga) – 296 Hz
- Key 4 (Ma) – 326 Hz
- Key 5 (Pa) – 362 Hz
- Key 6 (Da) – 407 Hz
- Key 7 (Ni) – 465 Hz
- Key 8 (Sa – higher octave) – 541 Hz

The oscillation frequency of the 555 timer in astable mode can be calculated using the standard equation:

$$f = \frac{1.44}{(R_A + 2R_B) \times C}$$

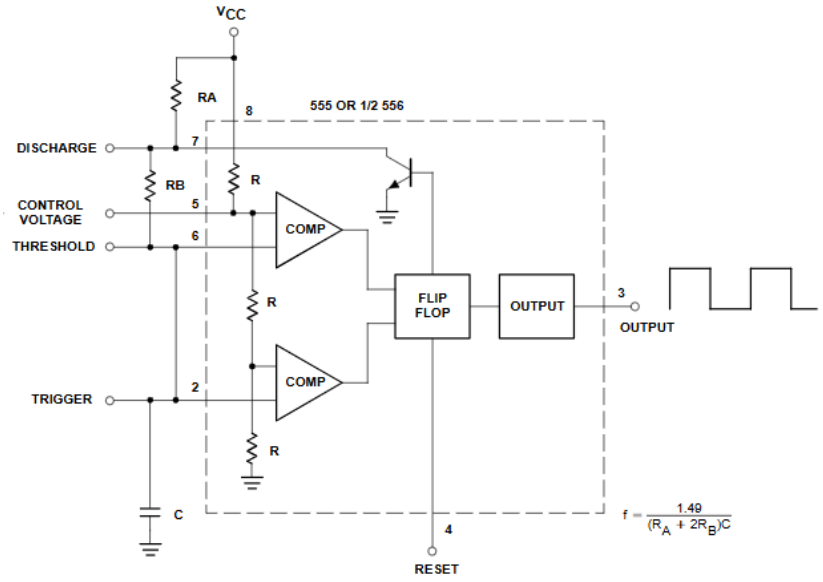

Figure 1: Resistor and Capacitor diagram

As shown in the above image, R_A is the resistance between VCC and the discharge (pin 7). R_B is the total resistance between the discharge (pin 7) and the threshold (pin 6). C is the capacitor connected to the trigger (pin 2).

For example, when SW8 is pressed:

$$R_A = 1k$$

$$R_B = 12.2k$$

$$C = 100nF$$

Substituting these values into the equation yields approximately 541 Hz, which corresponds to the higher octave “Sa” note.

Thus, by pressing different keys, the user selects different RC networks, and the 555 timer generates the corresponding musical frequencies. These signals are converted into sound through the buzzer, allowing the module to function as a simple electronic piano.

If you want to connect buttons externally, you can wire them to the H2–H9 connectors.

Circuit Diagram

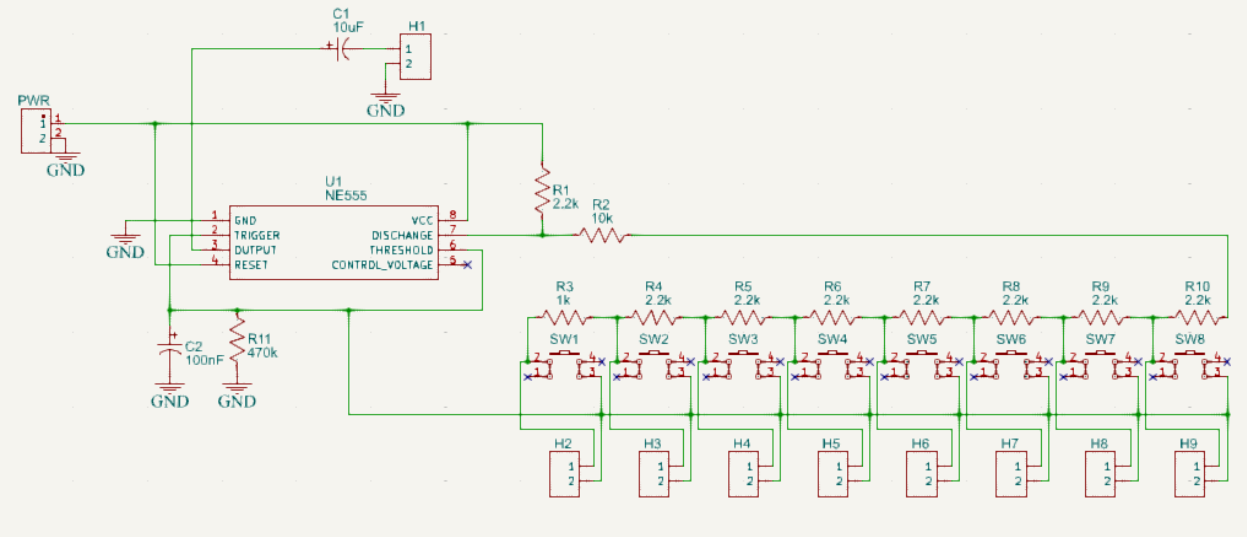

Figure 2: Circuit diagram

Power Supply

Supply voltage: 5V

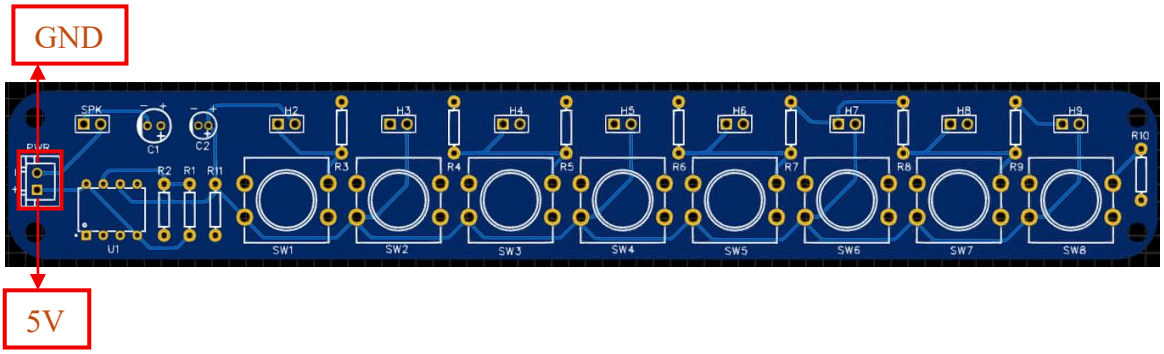

Figure 3: Power supply connection diagram

IMPORTANT: Ensure the power supply is connected with the correct polarity: 5V to the positive terminal and GND to the negative terminal.

Required Components

Value	Designator	Quantity	Image
10uF	C1	1	
100nF	C2	1	
Connector	PWR	1	
2.2k	R1, R4, R5, R6, R7, R8, R9, R10	8	
10k	R2	1	

1k	R3	1	
470k	R11	1	
Push button	SW1 to SW8	8	
NE555	U1	1	
8 pin IC base	U1	1	
Button caps	-	8	
5V buzzer	SPK	1	
Wires	-	2 pcs	

- After soldering the buttons to the PCB, place caps on all 8 buttons.
- Connect the buzzer to the SPK using two wires.

Assembly Instructions

When building electronic kits, it is best practice to install components from the shortest (lowest profile) to the tallest. This makes soldering easier because the components stay flush against the PCB when you flip it over.

1. Resistors (R1 - R11): These are the flattest components and should be installed first.
2. 8-pin IC Base (U1): Install the IC base to allow for easy replacement of the NE555 chip if needed.
3. Capacitors (C1, C2): Be sure to check the polarity of the 10uF capacitor (C1) as shown in your diagram.
4. Push Buttons (SW1 - SW8): These are taller and should come next.
5. Buzzer (SPK): Since this requires external wiring, it should be one of the final steps.
6. Button Caps: These are the final touch once all soldering is complete.

Pin Assignments

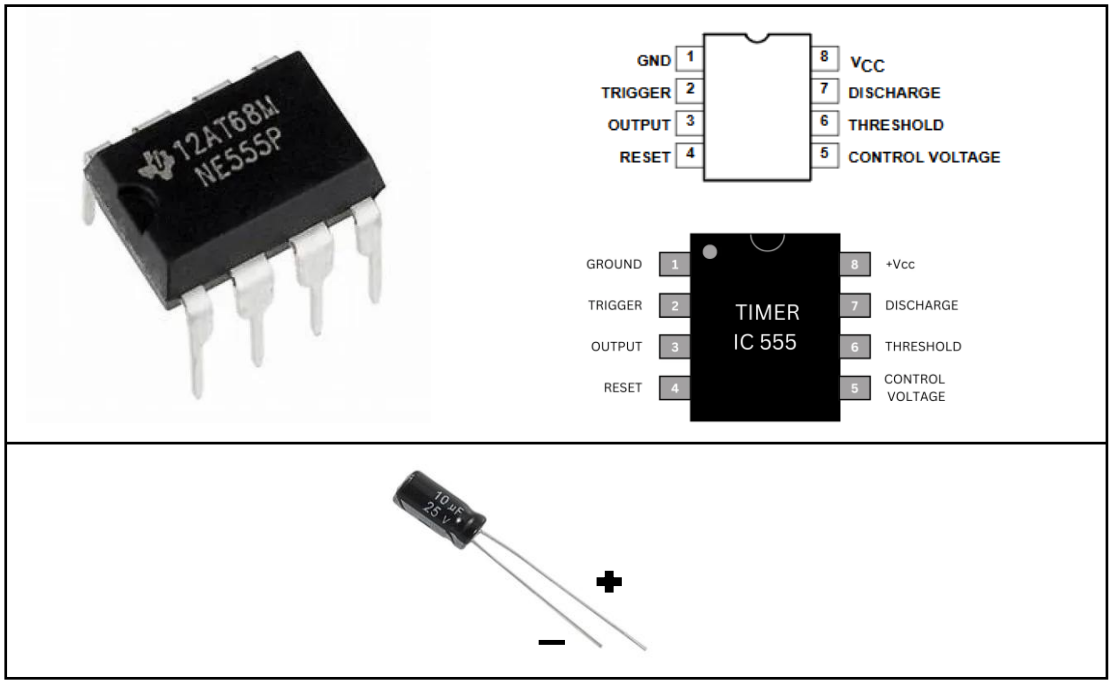

Figure 4: Pin assignments

Components and Final Assembly

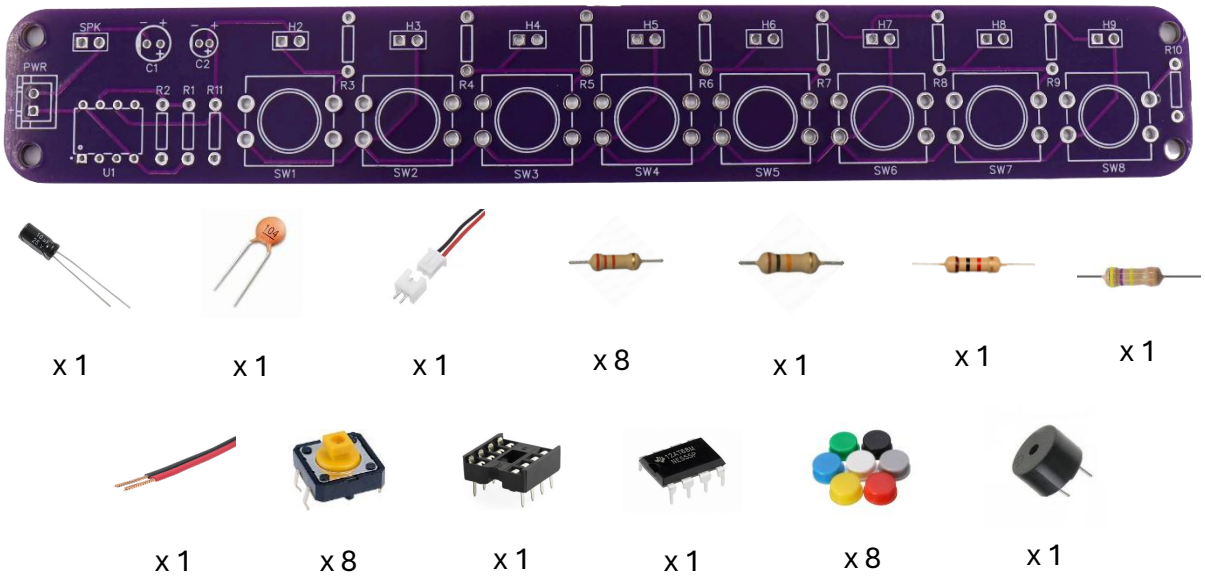

Figure 5: PCB and required components

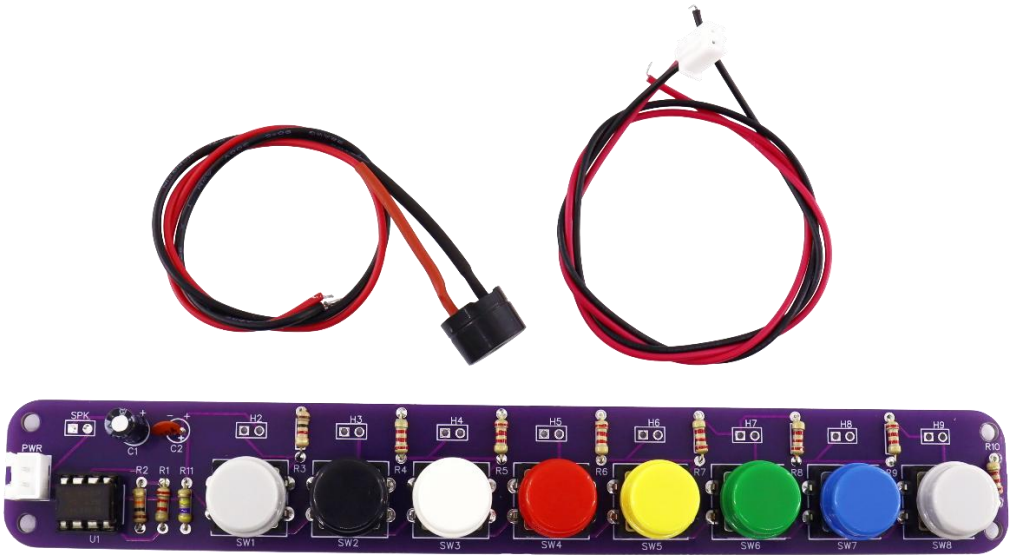

Figure 6: Final assembly

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