

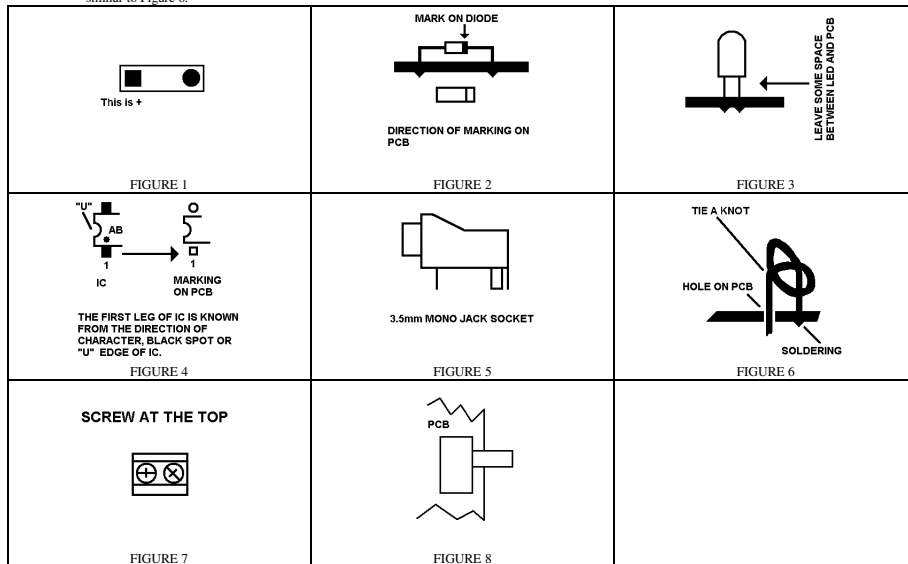
PIANO

PRODUCT CODE: M00270032

DESCRIPTION: Piano by using classical electronics chip, 555.

READ BEFORE INSTALLATION:

- Put the component on the side of screen printing and solder on the back of PCB without printing.
- Placing direction of component.
- 1. On component, longer leg is "+".
- 2. On PCB marking, square pad as Figure 1 is always "+".
- 3. For diode, please install as Figure 2.
- Do not put the LED to very bottom, just install as Figure 3.
- For any IC, finding out which leg is first leg (FIGURE 4) is important. Also, solder the socket (chair) to the PCB and the IC sit on the top.
- For 9V Battery Adaptor, Red is B+ and Black is B-. Also, please tie a knot after the red and black wire has passed the neighbors hole before soldering. This is similar to Figure 6.



CIRCUIT EXPLANATION:

Please read the below together with the circuit diagram in Figure 9.

Basic knowledge

Understand the function of 555 is almost understands 90% of this circuit. Learn 555 how to work have two methods. The first one is to forget the internal structure of 555 and just connect all the components as demo circuit. The second method is to learn the internal circuit. Then you would see 555 are, in fact, made of comparator, flip flop, not gate, NPN and PNP transistor... This mean you can build a 555 by using discrete components. In this explanation, I would use method 1. If the player is interested to the internal structure of 555, internet could give you better explanation. For human ear, we can hear the frequency at around 50Hz to 20000Hz. Different combination of resistor and capacitor, 555 can generate different frequency of square wave with different duration of "ON" and "OFF". From fourier transforming, we know every wave can be made of different sine wave. As a result, even 555 only give out square wave. But you can see this give out many sine waves. In this many sine waves, one of this have the highest amplitude. You can see such highest amplitude is the basic frequency that the 555 generated.

How does different frequency be generated when different Key is pushed?

From part 1, R1 to R8 can see as group A, R9 is group B, either C3 or C4 is group C. The combination of group A, group B and group C can give out different frequency.

By using the formula:
$$\text{Frequency} = \frac{1.44}{(\text{Resistance of group A} + 2 \times \text{Resistance of Group B}) \times \text{Capacitance of group C}}$$

For group A, if the player pushes K4, then the total resistance of group A would be R1 + R2 + R3 + R4. Similar, the total resistance of group A would become R1 + R2 when K2 is pushed.

For group B, this is fixed at 10K ohm.

For group C, you can take either value of capacitance by switching of S1. Then different range of frequency can be generated when pushing K1 to K8.

As a result, only pushing different key of K can give out different tone as Piano.

The function of C1 is to confirm the voltage after C1 would swing only around zero voltages such that the diaphragm of speaker can vibrate normally.

Other part of circuit

Part 2 is the circuit of power supply. The function of D1 is for preventing the reverse power supply. The function of C5 is to confirm the whole circuit is working at stable voltage. R10 and L1 are to tell the player if the Piano is on or not.

INSTALLATION:

Just install the component to the PCB M00260053 according to below table.

ITEM	SYMBOL ON PCB	DESCRIPTION	OUTLOOK	DIRECTION IS IMPORTANT?
1	R1	RESISTOR, 4.7K ohms	YELLOW, VIOLET, RED	NO
2	R2	RESISTOR, 4.7K ohms	YELLOW, VIOLET, RED	NO
3	R3	RESISTOR, 4.7K ohms	YELLOW, VIOLET, RED	NO
4	R4	RESISTOR, 4.7K ohms	YELLOW, VIOLET, RED	NO
5	R5	RESISTOR, 4.7K ohms	YELLOW, VIOLET, RED	NO
6	R6	RESISTOR, 4.7K ohms	YELLOW, VIOLET, RED	NO
7	R7	RESISTOR, 4.7K ohms	YELLOW, VIOLET, RED	NO
8	R8	RESISTOR, 4.7K ohms	YELLOW, VIOLET, RED	NO
9	R9	RESISTOR, 10K ohms	BROWN, BLACK, ORANGE	NO
10	R10	RESISTOR, 330 ohms	ORANGE, ORANGE BROWN	NO
11	D1	DIODE, IN4001	FIGURE 2	FIGURE 2
12	C1	CAPACITOR, 220uF	MARK WITH 220uF OR SAME MEANING OF VALUE	YES
13	C2	CAPACITOR, 10*10E3 pF	MARK WITH 103 OR SAME MEANING OF VALUE	NO
14	C3	CAPACITOR, 10*10E3 pF	MARK WITH 103 OR SAME MEANING OF VALUE	NO
15	C4	CAPACITOR, 10*10E4 pF	MARK WITH 104 OR SAME MEANING OF VALUE	NO
16	C5	CAPACITOR, 220uF	MARK WITH 220uF OR SAME MEANING OF VALUE	YES
17	L1	LED	ONE LONG LEG AND ONE SHORT LEG	YES
18	K1	PUSH BUTTON SWITCH	FOUR LEGS	NO
19	K2	PUSH BUTTON SWITCH	FOUR LEGS	NO
20	K3	PUSH BUTTON SWITCH	FOUR LEGS	NO
21	K4	PUSH BUTTON SWITCH	FOUR LEGS	NO
22	K5	PUSH BUTTON SWITCH	FOUR LEGS	NO
23	K6	PUSH BUTTON SWITCH	FOUR LEGS	NO
24	K7	PUSH BUTTON SWITCH	FOUR LEGS	NO
25	K8	PUSH BUTTON SWITCH	FOUR LEGS	NO
26	U1	DIP 8 SOCKET	8 LEGS	NO
27	SP	SOCKET FOR SPEAKER WIRE CONNECTION	FIGURE 7	YES
28	S1	SLIDE SWITCH	SIX LEGS	FIGURE 8
29	S2	SLIDE SWITCH	SIX LEGS	FIGURE 8
30	DCJACK	3.5mm MONO JACK SOCKET	FIGURE 5	YES
31	B+ B-	9V BATTERY ADAPTOR	RED WIRE, BLACK WIRE	YES
32	ON THE TOP OF ITEM 26	IC, 555	8 LEGS	FIGURE 4
33	/	HEX CAP SCREW AND IS THE LEG OF PIANO	LONG METAL	SEE BELOW
34	/	HEX CAP SCREW AND IS THE LEG OF PIANO	LONG METAL	SEE BELOW
35	/	HEX CAP SCREW AND IS THE LEG OF PIANO	LONG METAL	SEE BELOW
36	/	HEX CAP SCREW AND IS THE LEG OF PIANO	LONG METAL	SEE BELOW
37	/	HEX CAP SCREW AND IS THE LEG OF PIANO	LONG METAL	SEE BELOW
38	/	HEX NUTS, ON TOP OF ITEM 33	/	SEE BELOW
39	/	HEX NUTS, ON TOP OF ITEM 34	/	SEE BELOW
40	/	HEX NUTS, ON TOP OF ITEM 35	/	SEE BELOW
41	/	HEX NUTS, ON TOP OF ITEM 36	/	SEE BELOW
42	/	HEX NUTS, ON TOP OF ITEM 37	/	SEE BELOW
43	/	RED WIRE	RED WIRE	SEE BELOW
44	/	BLACK WIRE	BLACK WIRE	SEE BELOW
45	/	SPEAKER	CIRCLE IN OUTLOOK	SEE BELOW

- Put item 33 to 37 to the five hole of PCB. This is the leg of Piano. Then screw item 38 to 42 on the top of this.
- At one end, connect red and black wire to the "+" and "-" of SP, the other end is connected to the two terminal of speaker. Because there is only one speaker and is a mono system, you can ignore the polarity of speaker. In stereo system, polarity is important because you need to consider the interference of sound from two speakers.
- S1 is the choice of frequency range by the choice of capacitance C3 and C4.
- After installation, you can use external DC adaptor as power sources. You can use our product M00270013 or other similar adaptor.

CIRCUIT DIAGRAM:

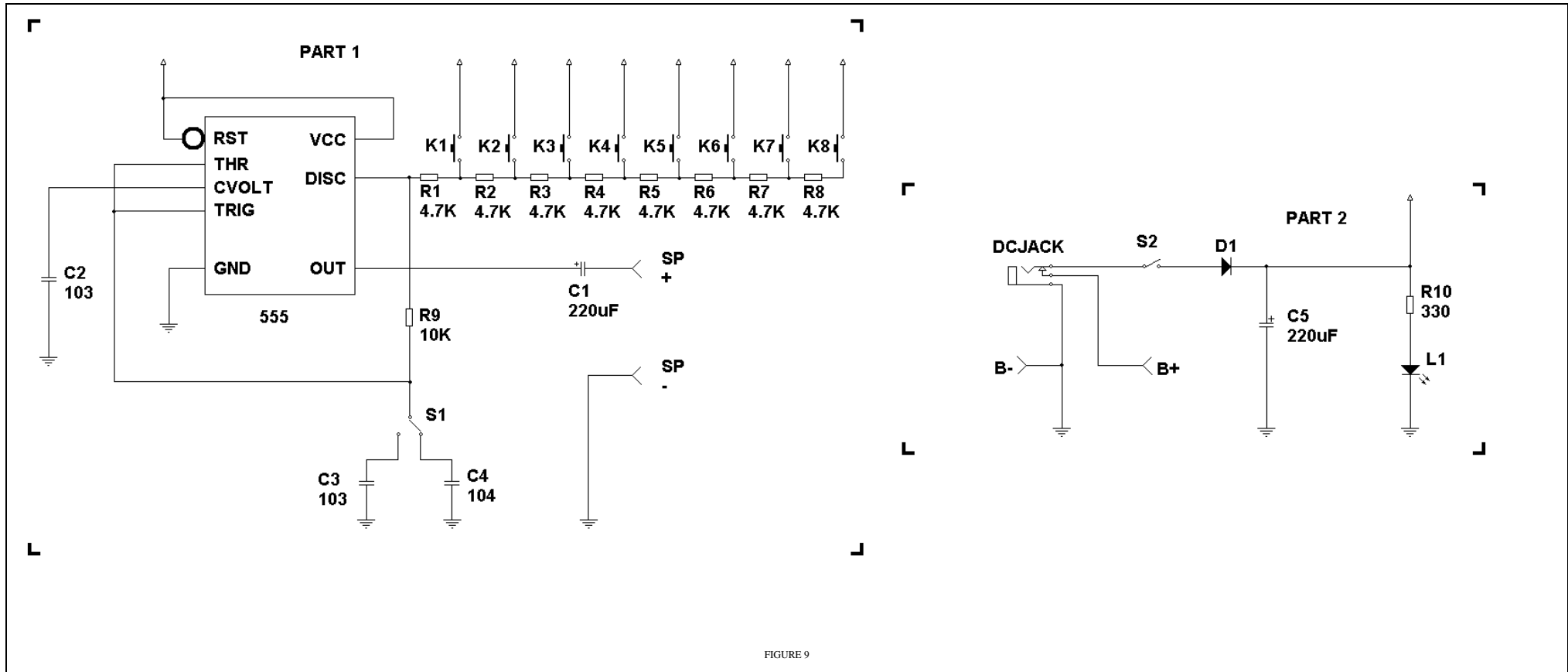


FIGURE 9