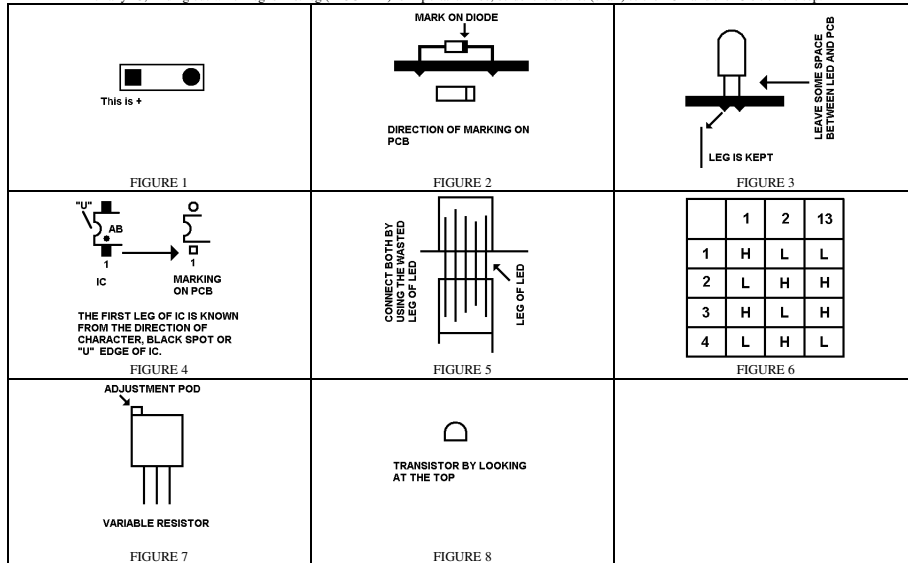# CAPACITIVE TOUCH LAMP WITH USB POWER

PRODUCT CODE: M00270044

DESCRIPTION: The LED would be switched on by touching the small PCB bar with three lighting pattern. The power is provided by USB receptacles from any computer.

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. Also, just keep around 6 pieces of wasted legs of LED after cutting out (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.

This is + **FIGURE 1**	MARK ON DIODE DIRECTION OF MARKING ON PCB **FIGURE 2**	LEAVE SOME SPACE BETWEEN LED AND PCB LEG IS KEPT **FIGURE 3**
"U" / AB / IC / MARKING ON PCB THE FIRST LEG OF IC IS KNOWN FROM THE DIRECTION OF CHARACTER, BLACK SPOT OR "U" EDGE OF IC. **FIGURE 4**	CONNECT BOTH BY USING THE WASTED LEG OF LED / LEG OF LED **FIGURE 5**	FIGURE 6 table below **FIGURE 6**
ADJUSTMENT POD VARIABLE RESISTOR **FIGURE 7**	TRANSISTOR BY LOOKING AT THE TOP **FIGURE 8**	

Figure 6 table:

	1	2	13
1	H	L	L
2	L	H	H
3	H	L	H
4	L	H	L

CIRCUIT EXPLANATION:
Please read the below together with the circuit diagram in Figure 9.
- Because human body can be assume this is a capacitor and behave as a little "earth". We can use this characteristic to trigger the switch for turning on any electric appliance.
1. Part 1 is a square wave generator. Using square wave because AC wave can pass through capacitor (Human Body), then the little "earth".
2. Part 2 is a current sensing circuit. The output voltage of leg of 7 of U1B would rise when there is any increasing current flow at R7.
3. When the user touch the green part of small PCB (Small PCB would be soldered with the big PCB as Figure 5), the square wave in part 1 would pass through R7, X1, small PCB, and then human body. This mean current flow increase in R7.
- Part 3, U1D, work as a buffer so as to isolate the circuit before and after this part.
- Part 4 is a smoothing circuit; any AC signal passing this part would change to DC for the later part.
- Part 5 is the comparator circuit; this is to adjust the sensitivity of the touch switch. From part 4, this has changed to DC signal. This DC signal would compare with the voltage of voltage divider of VR. If leg of 10 is higher than leg of 9 of U1C, the output of leg of 8 of U1C would become high. When leg of 10 is lower than leg of 9 of U1C, the output of leg of 8 of U1C would become low.
- In part 6, this is to act as a toggle switch to switch on and off for all the LED from L1 to L6.
1. U2A is a Flip Flop. A Flip Flop is normally uses as storing state information. But now we use Flip Flop as toggle switch. The output 1 of U2A would change state when pin 3 changes from low voltage to high voltage. This mean output 1 of U2A is acting as a switch. Finally, the LED in part 7 would all light "ON" or "OFF" due to the switch in part 6.
2. When the user touch the small PCB, the comparator of U1C would make the leg 8 of U1C becoming high. The Flip Flop changes its state. When the user leaves the small PCB, the comparator of U1C would make the leg 8 of U1C become low. But this time this would not change the state of Flip Flop. The state change of U2A is used to turn on and off for the LED from L1 to L6.
- Part 7 is the result coming out from part 6.
- In part 8, U2B also work as toggle switch happening as part 6. Please look at Figure 6, the truth table of leg of 1 of U2A, leg of 2 of U2A and leg of 13 of U2B is shown. As we said at part 6 above, the Flip Flop would change state when changing from low voltage ("L") to high voltage ("H"). Leg 13 of U2B would change state when leg 2 of U2A change from "L" to "H".
- Part 9 is the sources of power for the whole system. Of course, the power is coming from the USB receptacles of computer. The voltage is working at stable 5V and this is the standard of USB. Working at stable 5V is important because part 5 use the potential divider as working logic. If the voltage floats due to any reason, the final result may be not expected.

INSTALLATION:
Just install the component to the PCB M00260075 according to below table.

ITEM	SYMBOL ON PCB	DESCRIPTION	OUTLOOK	DIRECTION IS IMPORTANT?
1	R1	RESISTOR, 100K ohms	BROWN, BLACK, YELLOW	NO
2	R2	RESISTOR, 10K ohms	BROWN, BLACK, ORANGE	NO
3	R3	RESISTOR, 10K ohms	BROWN, BLACK, ORANGE	NO
4	R4	RESISTOR, 10K ohms	BROWN, BLACK, ORANGE	NO
5	R5	RESISTOR, 10K ohms	BROWN, BLACK, ORANGE	NO
6	R6	RESISTOR, 1M ohms	BROWN, BLACK, GREEN	NO
7	R7	RESISTOR, 1M ohms	BROWN, BLACK, GREEN	NO
8	R8	RESISTOR, 1M ohms	BROWN, BLACK, GREEN	NO
9	R9	RESISTOR, 100K ohms	BROWN, BLACK, YELLOW	NO
10	R10	RESISTOR, 1M ohms	BROWN, BLACK, GREEN	NO
11	R11	RESISTOR, 1M ohms	BROWN, BLACK, GREEN	NO
12	R12	RESISTOR, 1M ohms	BROWN, BLACK, GREEN	NO
13	R13	RESISTOR, 330 ohms	ORANGE, ORANGE BROWN	NO
14	R14	RESISTOR, 330 ohms	ORANGE, ORANGE BROWN	NO
15	R15	RESISTOR, 330 ohms	ORANGE, ORANGE BROWN	NO
16	R16	RESISTOR, 330 ohms	ORANGE, ORANGE BROWN	NO
17	R17	RESISTOR, 330 ohms	ORANGE, ORANGE BROWN	NO
18	R18	RESISTOR, 330 ohms	ORANGE, ORANGE BROWN	NO
19	R19	RESISTOR, 1K ohms	BROWN, BLACK, RED	NO
20	R20	RESISTOR, 100K ohms	BROWN, BLACK, YELLOW	NO
21	R21	RESISTOR, 330 ohms	ORANGE, ORANGE BROWN	NO
22	R22	RESISTOR, 330 ohms	ORANGE, ORANGE BROWN	NO
23	R23	RESISTOR, 330 ohms	ORANGE, ORANGE BROWN	NO
24	R24	RESISTOR, 330 ohms	ORANGE, ORANGE BROWN	NO
25	R25	RESISTOR, 330 ohms	ORANGE, ORANGE BROWN	NO
26	R26	RESISTOR, 330 ohms	ORANGE, ORANGE BROWN	NO
27	R27	RESISTOR, 1K ohms	BROWN, BLACK, RED	NO
28	R28	RESISTOR, 100K ohms	BROWN, BLACK, YELLOW	NO
29	D1	DIODE, IN4148	FIGURE 2 (MOSTLY TRANSPARAENT RED)	FIGURE 2
30	D2	DIODE, IN4148	FIGURE 2 (MOSTLY TRANSPARAENT RED)	FIGURE 2
31	C1	CAPACITOR, 10uF	MARK WITH 10uF OR SAME MEANING OF VALUE	YES
32	C2	CAPACITOR, 10*10E2pF	MARK WITH 102 OR SAME MEANING OF VALUE	NO
33	C3	CAPACITOR, 10*10E3pF	MARK WITH 103 OR SAME MEANING OF VALUE	NO
34	C4	CAPACITOR, 10*10E4pF	MARK WITH 104 OR SAME MEANING OF VALUE	NO
35	C5	CAPACITOR, 10*10E3pF	MARK WITH 103 OR SAME MEANING OF VALUE	NO
36	C6	CAPACITOR, 10*10E3pF	MARK WITH 103 OR SAME MEANING OF VALUE	NO
37	Q1	TRANSISTOR, NPN	FIGURE 8	YES
38	Q2	TRANSISTOR, NPN	FIGURE 8	YES
39	Q3	TRANSISTOR, NPN	FIGURE 8	YES
40	L1	LED	ONE LONG LEG AND ONE SHORT LEG	YES
41	L2	LED	ONE LONG LEG AND ONE SHORT LEG	YES
42	L3	LED	ONE LONG LEG AND ONE SHORT LEG	YES
43	L4	LED	ONE LONG LEG AND ONE SHORT LEG	YES
44	L5	LED	ONE LONG LEG AND ONE SHORT LEG	YES
45	L6	LED	ONE LONG LEG AND ONE SHORT LEG	YES
46	L7	LED	ONE LONG LEG AND ONE SHORT LEG	YES
47	L8	LED	ONE LONG LEG AND ONE SHORT LEG	YES
48	L9	LED	ONE LONG LEG AND ONE SHORT LEG	YES
49	L10	LED	ONE LONG LEG AND ONE SHORT LEG	YES
50	L11	LED	ONE LONG LEG AND ONE SHORT LEG	YES
51	L12	LED	ONE LONG LEG AND ONE SHORT LEG	YES
52	U1	DIP 14 SOCKET	14 LEGS	NO
53	VR	VARIABLE RESISTOR, 1M ohms	FIGURE 7	NO
54	U2	DIP 14 SOCKET	14 LEGS	NO
55	USB	USB TYPE B RECEPTACLES	BIG RECTANGLE BOX	YES
56	ON THE TOP OF ITEM 52	IC, LM324	14 LEGS	YES
57	ON THE TOP OF ITEM 54	IC, 4013	14 LEGS	YES
58	M00260042	THIS IS A SWITCH	A SMALL RECTANGLE PCB	READ BELOW

- After you have finished the soldering the component from 1 to 57 of above table, now you need to solder the PCB M00260042 to M00260075 as Figure 5 by using the wasted leg of LED.
- After you have installed all the component in above, now we need to turn this to working condition. Because the user may not have an oscilloscope, we would use the stupid method to adjust this equipment.
1. When you connect this lamp to the computer by USB cable, the LED should by on any state in Figure 6. H is "ON" and L is "OFF". You just need to look at leg 13 and leg 1 are ok because this represent which set of LED is "ON".
2. Turn the item 53, VR, to either clockwise or anti-clockwise direction until you heard some the sound of "clip clip". The "clip clip" mean you have turn the VR to the max or min of its resistance value.
3. Turn maybe 1/2 cycle of VR in opposite direction.
4. Touch the green part of PCB, M00260042, and check if the pattern of LED is changed or not.
5. Go back to step 3 until you can activate the LED by only touching the green part of PCB, M00260042. If you adjust the VR to too high in sensitivity, the LED would change their status even your finger is only almost touching the plate.

- Fixed this LED light to the edge of computer monitor by using sticker or glue. Just using small PCB bar (M00260042) as fixing point.
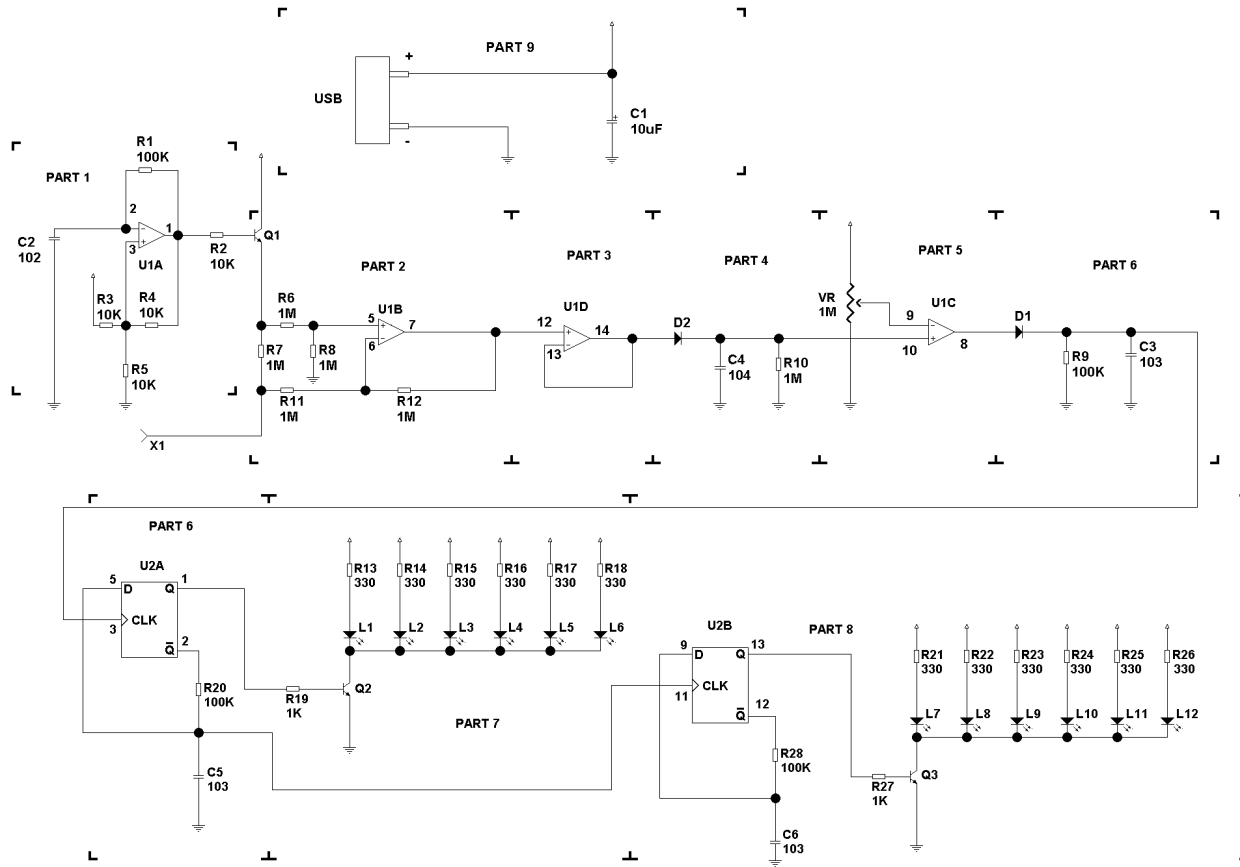
CIRCUIT DIAGRAM:

FIGURE 9