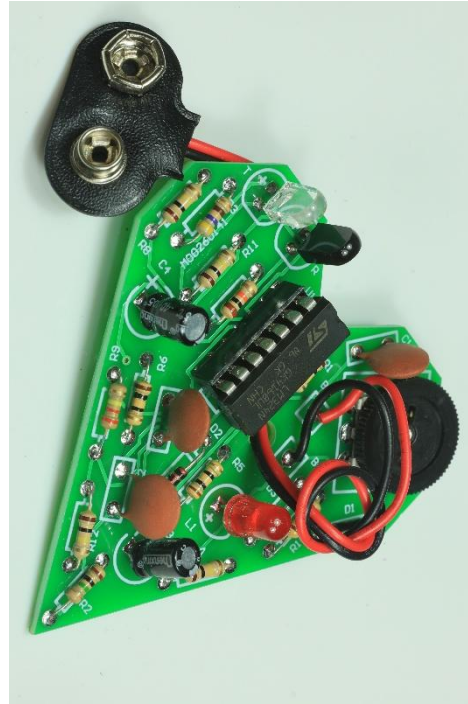


MY HEARTBEAT

PRODUCT CODE: M00270086

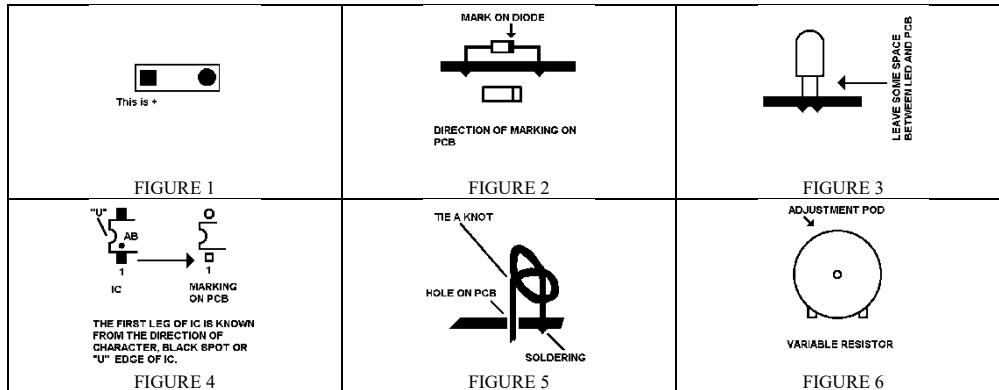
FEATURE:

- When you put your finger to the IR transmitter and receiver, beating of your heart would show as beating of LED.
- Assembly is needed.



READ BEFORE INSTALLATION:

- Put the component on the side of screen printing and solder on the back of PCB without printing.



INSTALLATION:

Just install the component to the PCB M00260141 according to below table.

ITEM	SYMBOL ON PCB	DESCRIPTION	OUTLOOK	DIRECTION ON INSTALLATION? AND OTHER
1	R1	RESISTOR, 100K ohms	BROWN, BLACK, YELLOW	NO
2	R2	RESISTOR, 1M ohms	BROWN, BLACK, GREEN	NO
3	R3	RESISTOR, 470 ohms	YELLOW, VIOLET, BROWN	NO

4	R4	RESISTOR, 10K ohms	BROWN, BLACK, ORANGE	NO
5	R5	RESISTOR, 10 ohms	BROWN, BLACK, BLACK	NO
6	R6	RESISTOR, 10 ohms	BROWN, BLACK, BLACK	NO
7	R7	RESISTOR, 100K ohms	BROWN, BLACK, YELLOW	NO
8	R8	RESISTOR, 100K ohms	BROWN, BLACK, YELLOW	NO
9	R9	RESISTOR, 330K ohms	ORANGE, ORANGE, YELLOW	NO
10	R10	RESISTOR, 1K ohms	BROWN, BLACK, RED	NO
11	R11	RESISTOR, 100K ohms	BROWN, BLACK, YELLOW	NO
12	R12	RESISTOR, 100K ohms	BROWN, BLACK, YELLOW	NO
13	D1	DIODE, IN4001	FIGURE 2 (MOSTLY BLACK)	FIGURE 2
14	D2	DIODE, IN4148	FIGURE 2 (MOSTLY TRANSPARENT RED)	FIGURE 2
15	D3	DIODE, IN4148	FIGURE 2 (MOSTLY TRANSPARENT RED)	FIGURE 2
16	V1	VARIABLE RESISTOR, 100K ohms	FIGURE 6	YES
17	C1	CAPACITOR, 22*10E4 pF	MARK WITH 224 OR SAME MEANING OF VALUE	NO
18	C2	CAPACITOR, 22*10E4 pF	MARK WITH 224 OR SAME MEANING OF VALUE	NO
19	C3	CAPACITOR, 10uF	MARK WITH 10uF OR SAME MEANING OF VALUE	YES, FIGURE 1, NOTE 1
20	C4	CAPACITOR, 10uF	MARK WITH 10uF OR SAME MEANING OF VALUE	YES, FIGURE 1, NOTE 1
21	C5	CAPACITOR, 22*10E4 pF	MARK WITH 224 OR SAME MEANING OF VALUE	NO
22	T	IR TRANSMITTER	FIGURE 3 (TRANSPARENT)	YES, FIGURE 1, FIGURE 3, NOTE 1
23	R	IR RECEIVER	FIGURE 3 (BLACK)	YES, FIGURE 1, FIGURE 3, NOTE 1
24	L1	LED	RED	YES, FIGURE 1, FIGURE 3, NOTE 1
25	U1	DIP 14 SOCKET	14 LEGS	NO
26	ON THE TOP OF ITEM 25	IC, LM324	14 LEGS	FIGURE 4
27	B+ B-	9V BATTERY ADAPTOR	RED WIRE, BLACK WIRE	YES, NOTE 2

- NOTE 1: On component, longer leg is “+”.
- NOTE 2: 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.

HOW TO PLAY?

The Voltage of 9V plugs into the “B+”, “B-”. Put one finger on top of “T” and “R” together. Then turn “V1” clockwise or anti-clockwise until LED is either all on or off. After that, turn “V1” on reverse direction slower. The LED would vibrate at the same rate as your heartbeat. The LED just show you the real time heartbeat. The working logic would be explained on circuit description.

CIRCUIT DESCRIPTION:

Our finger contains blood vessel. More blood would flow in the blood vessel for each pulse due to the pumping from heart. The “T” would send out infrared red light, “R” is to detect if there is more blood flow into the blood vessel in real time. When more blood, more signal would be got in “R”.

Now we look at Figure 7.

“C3” work as a DC filter so that only AC signal would go into inverting operational amplifier “U1A” for amplification. “C1” work as low pass filter. “R8” and “R11” is to let the amplified voltage at “1” would swing in the voltage at “3” because “3” and “2” would be almost at the same voltage and this is the characteristic of operational amplifier. “U1B” go ahead to amplify the signal from “U1A”. Basically, “U1A” and “U1B” is working at same function.

“U1C” is a voltage follower. Infinity input resistance and zero output resistance. Signal have nothing change but totally isolate the signal interference before and after “U1C”.

“C5”, “D2” and “D3” work together. This part could be understood as shaping of signal from “U1C”. I assume now the signal got from “U1B” after amplification is like a pulse and swing at around the voltage of “5” of “U1B”. When voltage at “8” of “U1C” is high, “+” charge would push to “D2” and go to “R7”. When voltage at “8” is low, “+” charge would pull from the ground to “D3” and go to “C5”. The result is that the final shape would be similar to Figure 8. The modified signal is easier to be used for final display.

The function of “U1D” is a voltage comparator circuit. From Figure 8, three mountain is the signal due to pulse of heartbeat appear at “12”. There is a line in the middle which is adjusted by “V1” and would be appeared at “13”. The mountain filled with black ink is the voltage at “12” higher than “13”. The result is that this would let “14” becoming high and the LED becoming “ON”. This is the reason the LED vibrate as heartbeat. On the other hand, the mountain is slim at top and fat at bottom. This means how long the LED is at “ON” or “OFF” status could be controlled by “V1”. This is also the answer to “HOW TO PLAY” on adjustment of “V1”. Too high the adjustment would let all LED becoming “OFF” and too low would let all LED becoming “ON”. Because the thickness of skin, elasticity of blood vessel and other factor is different from people to people. The player could adjust “V1” to their wanted working condition for each case.

The function of “D1” is a reverse power protection diode.

CIRCUIT DIAGRAM:

