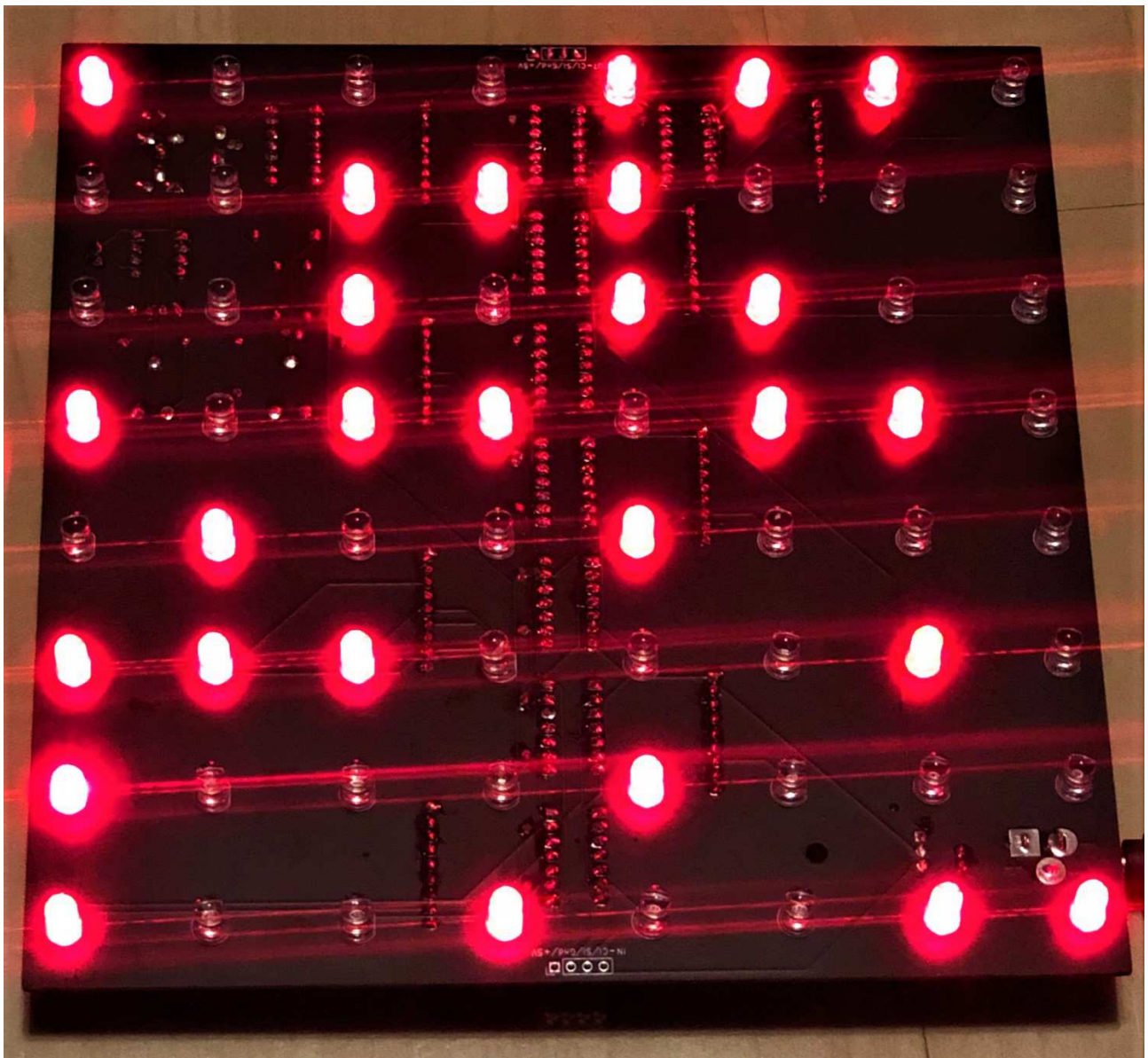# BudgeTronics

RANDOM RETRO BLINKER

A great random light effect that reminds of the science fiction movie look of panels with blinking computer lights.

INTRODUCTION

Every time you look at the blinking panel (17cm by 18cm) you see a different light pattern. In fact the pattern will never be the same because with 64 LED's there are a whopping **18446744073709551615** possible light patterns it can generate (yes a number with 20 digits).

A *64-bit* number (every LED can be seen as a bit) can hold 2^{64} distinct values. A number so high that it is higher then the number of grains of sand on Earth and cells in the human body. So you will understand that you will never see the same light pattern during your life, even if you watched it all the time. Even better if a new light pattern was generated every second since the beginning of the universe it still had not shown every possible pattern. This is somewhat depending on how you adjust the light patterns. There are two separate pot-meters on the PCB that control the stream of pulses put through to the LEDs. The speed of the patterns can be adjusted (from very fast to slow) and the flow of random pulses (more or less LED's lighting up at a time.)

The random stream of pulses is generated by a transistor that is connected in a wrong way. Its emitter is reverse-biased using 12-18VDC passing through. Normally you do not use a transistor in this way, but as connected here, no damage will occur, and random pulses will be created by electrons forcing their way through the silicon NP junction. This behavior is absolutely unpredictable, being determined by quantum mechanics.

You can choose the color of the used 5mm LED's yourself, <u>they are not included in the kit</u>. If you want you can also mix colors.

Contents building kit

The kit contains the following components:
1x PCB 17,2 cm x 18 cm
8x 74164 shift registers
1x NE555 timer
1x 7414 pulse cleaner
1x Zener diode 4,7 Volts
3x transistor 2N3904
1x pot-meter 10K
1x pot-meter 100K
1x Electrolytic capacitor 4,7 uF
5x ceramic capacitor 100nF
11x 1K resistor (brown, black, red)
1x 4K7 resistor (yellow, purple, red)
1x 1M resistor (brown, black, green)
8x resistor network 8x 150 Ohm
1x Power barrel jack
1x 5 volts regulator
Also needed 64x LEDs *(NOT INCLUDED)*
NO LEDS IN THE KIT. This is because everyone wants to use another color of LEDs. So to complete this kit you have to buy an extra 64 – 5mm LED's in the color you want. This does not have to be the same color. If you want you can mix colors. You can use standard LED's but also bright LEDs in any color you like. Beware that bright LED's can be to much for the eye to look at. Most friendly for the eye are the standard (and lowest priced) LED's.

BUILDING INSTRUCTIONS

On the PCB you can see exactly where all the components go. We will give you a step by step instruction here and tips what to watch out for. **FIRST READ AND ONLY SOLDER IF YOU HAVE DONE THE READING!!**

1. Solder all the resistors and yes R79 is also 1K :-)
2. Solder the Zener Diode and place the stripe of the diode at the same side as printed on the PCB.
3. Solder the 5 ceramic capacitors of 100nF
4. Solder the 4,7uF elco and watch the polarity!! So the negative sign on the elco at the negative side on the PCB.
5. Solder in the two pot-meters and notice one has a bigger value then the other. Normally there will be a 10K and a 100K pot-meter in the kit but sometimes the values are a bit different. In that case the lower value go's in the 10K spot and the higher value in the 100K spot.
6. Solder the 555 IC and make sure the little notch on top is placed as shown on the PCB. So notch down.
7. Solder the 7414 IC in place and also watch that the notch is at the correct side before you solder.
8. Solder in all the 8 shift registers 74164 also watching carefully that you align the notch with the printing on the PCB.
9. Now solder in the 3 transistors but WATCH OUT! Solder exactly as printed on the PCB. The flat side of the transistor is clearly printed on the PCB.
10. Now solder all the resistor networks. They have to be orientated correctly on the PCB. If you look at the network part you see it has **a small dot** on one side. This dot has to be placed in the small square on one side of the parts spot, which you can see on the PCB printing. To keep you sharp there is ONE NETWORK PART ON THE PCB THAT IS PLACED DIFFERENTLY. Seven network parts are aligned the same but one is the other way around. Look on the PCB and you will see it. Do this right because if you place them the wrong way around a section of LED's will not light up.
11. Place the barrel jack and use enough solder.
12. Place the voltage regulator. On the board there is stated LM7805 but we have put in a much better and more expensive regulator. You only have to watch out that you solder it in the right way otherwise it will burn out and you have to buy a new one. Look at the regulator and see it has 3 pins. You will see on the **left side,** above one of the pins, a **small DOT.** Look at the picture below how to place the voltage regulator. In the picture it floats a bit in the air , this was done for the picture, but if you solder it in put it all the way down in the holes.

13. After you have chosen which LED's to use you can solder them in **ON THE OTHER SIDE** of the board. You could solder them on the component side but that will not look very nice. At the other side you will have a clean display with no components to destroy the view.
Watch closely that you orientate the LED's in the correct way. They have a polarity. On the PCB print you see that one side is flat. Every 5mm LED also has a flat side. So align the flat side of the LED's with the flat side LED print on the PCB.

Now that all soldering is finished you can power it up if you have the right power supply. The circuit has to have at least 12 Volts and this works fine. But the randomness of the pulses get even better if you can get your hands on a power supply that gives a bit more say 15-18 Volts. This higher voltage is for the random noise circuit. The rest of the circuit just works on 5 Volts which is regulated with the power regulator.
The power supply plug must have a positive center and a negative mantle.

At startup you can use the pot-meters to adjust the speed and the amount of pulses which lights the LED's. Best to set it a bit faster with one pot-meter and the adjust the other to loo how the amount of lighted LED's change. A nice balance is 50% on and 50% off but it is up to you. After this you can adjust the speed of the pulses to very slow or so fast you cannot see the different patterns anymore.

HAVE FUN!