20 LED Stick Blinkie

aka LEDs-on-a-Stick
http://www.2dkits.com

The heart of this circuit is a 16F18313 "PIC"(*) produced by a company called Microchip. A PIC is a tiny, yet surprisingly powerful little computer.
 (*) (http://www.microchip.com/wwwproducts/en/PIC16F18313)

We have given it a sense of touch – a push button – and a way to communicate – twenty light emitting diodes (LEDs), in a variety of patterns we hope you will enjoy.

By building this blinkie, we hope you have a lot of fun, learn how easy it is to assemble and solder a circuit, and gain a desire to learn more – and maybe build other kits!

STEP 1: Open up the kit and review the contents as shown in the picture below.
        Note: at an event, the 3V batteries and chip will be supplied by a Blinkie Tech.
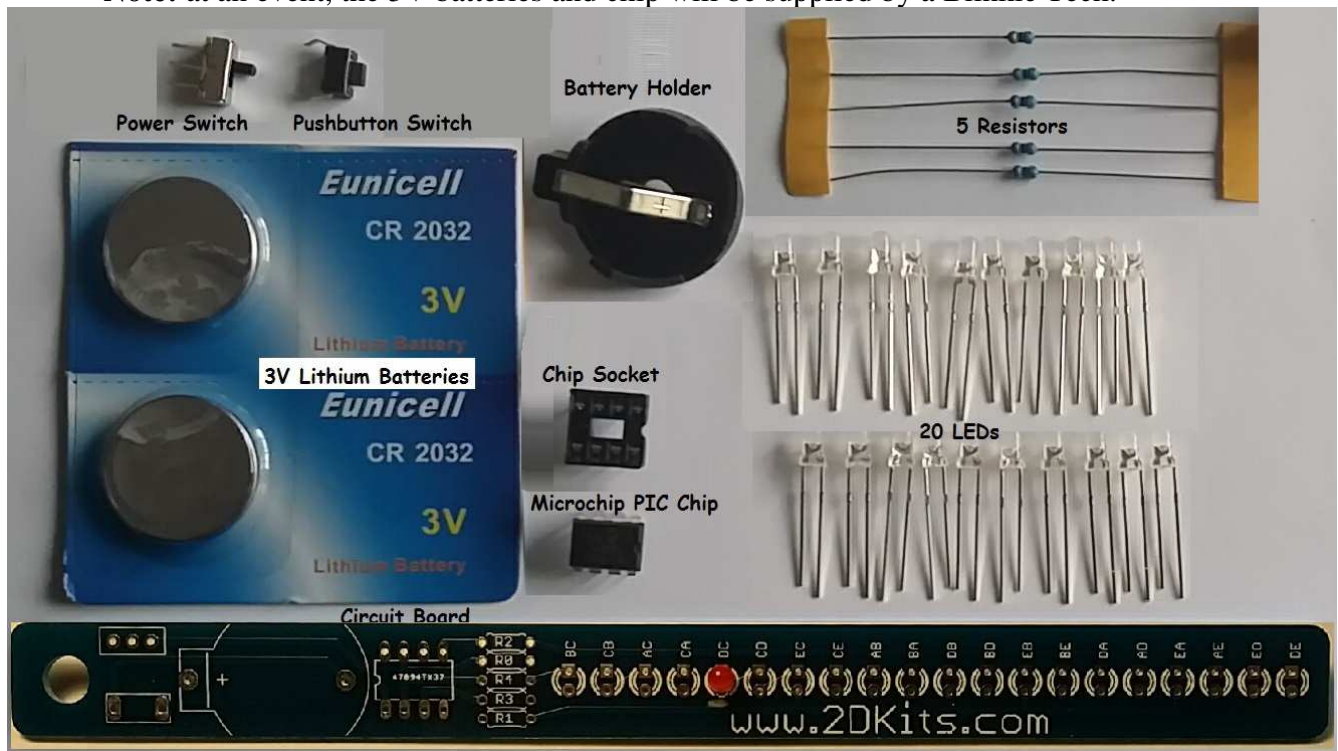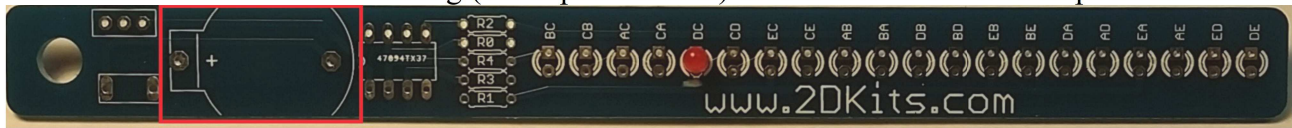

When completed, the board will look similar to this. LED colors may differ.

Got everything to start? If not, give us a shout.

Assembly

Orient the board so the silk screening (white part outlines) is as shown in the various pictures below.

- Insert the battery holder on the board where the red outline above shows.
- Make sure the squared-off left end lines up with the white silk-screening on the board.
- Turn the board over, and solder the two battery holder leads to the board, making sure the holder stays flat on the board. They are sharp and you may wish to trim them off.
- If you've not soldered before or need a refresher, a Blinkie Tech will be happy to demonstrate.

- Insert the 19 remaining LEDs into the board where the red outline above shows.

For EACH LED: The **long** LED lead goes in the hole with the **round** pad as shown in the following close-up, then the short lead goes in the hole with the square pad. **REMEMBER: Long=>Round**


- To hold each LED on the board before soldering, flip the board over, pull the leads so the LED is seated, and spread them into a "V" (See picture below) so they don't fall out, and for easy soldering. Each lead will be 45° to the board. Do NOT flatten them to the board, as they will be too hard to solder and trim off.
- When you have inserted all 20 LEDs, turn the board over and spread all 40 leads, and solder them.

Then trim the LED leads – holding each as you do so they don't fly off.


- Place the power switch into the board where the red outline above shows
- The direction doesn't matter – the switch will work either way.
- Hold the switch in, and flip the board over
- It will help if you use the pliers or a thumbnail to bend the middle lead slightly to one side, and the 2 outer leads slightly to the other side.
- Solder the switch in place.
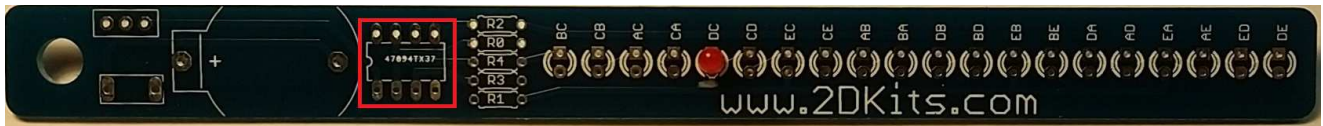
•   Insert the socket into the board where the red outline above shows. The little notch in the middle of the end should be facing toward the battery holder matching the notch in the white silk-screened outline.

•   Hold the socket to the board and flip the board over.

•   With a pliers or your thumbnail, bend two opposite corner leads out a bit to hold the socket against the board.

•   Solder the 8 pins of the socket

•   Place the push button where the red outline above shows. This is a little tricky as the leads are wider than the board holes, but this is intentional as it will hold itself in place when pressed in.

•   Turn the board over and solder the 2 push button leads
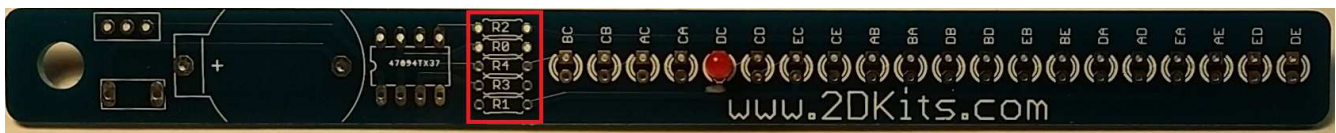
•   Insert the five 56 ohm resistors (green, blue, black) where the red outline above shows.

•   Hold each resistor to the board and bend the leads on the other side to 45°. The two leads will form a "V" as you did with the LEDs, to hold them in and make soldering easy.

•   Orientation does not matter unless, for looks, you may want them to all face the same way.

•   Solder the five resistors to the board.

•   Trim the leads

•   Before installing the batteries and PIC chip, check all solder connections, and make sure there are no solder bridges. If everything looks good, move onto the next step.

•   At an event the batteries and PIC chip will be supplied by the Blinkie Techs. They will double check your soldering and give you these parts.
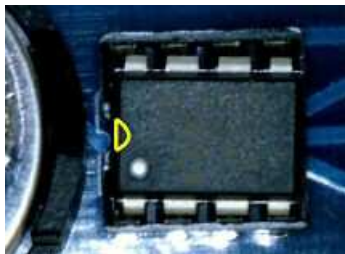
•   The PIC chip is inserted so the dot or notch is facing the battery clips as shown above. The notch on the white silk-screening, the notch on the socket, and the notch on the chip should all face the battery clip. If you soldered in the SOCKET backwards, don't worry, just make the CHIP notch as the above picture shows.

•   Insert the batteries in the battery holder. There will be two batteries stacked together.

•   Insert the first battery with the "+" side up.

- Insert the second battery with the "+" side up on top of the first one, under the clip.

- Turn on the board!

- To change patterns, hold the push button down. The LEDs will count up the pattern number in binary – LEDs representing 1, 2, 4, 8, 16. Release the button to have it run that pattern number.
- It will start back at pattern 1 after the highest pattern number.
- If you hold the button while turning on the blinkie, it will go into a demo mode which runs each pattern for a while, then switches to the next pattern.
- If you are at an event, consider buying and extra battery or two – they are very cheap.

Troubleshooting

If your blinkie doesn't flash, then you'll need to do a little troubleshooting to finish your project. The following steps should isolate most problems.
- Recheck your solder connections. 80% of all problems are related to this. Cold solder joints (where the solder looks dull, not shiny) and broken joints will cause erratic performance or failure. Reheat any questionable solder connections until they flow and look shiny and secure.
- If the switch does not turn off, re-melt the leads while pulling the switch a bit away from the board.
- Check for bits of solder, wire ends, or other foreign matter which may be lodged in the wiring.
- Check that the batteries are correctly inserted. The "+" side of both batteries should face up.
- Check that the PIC chip is inserted with the notch end closest to the batteries – EVEN IF the socket was soldered in backwards.
- A bad part could happen. In the hundreds of boards assembled, we've seen a few power switches fail and had one bad PIC chip.

Soldering Hints

Soldering is not like gluing: both the component lead, and the circuit board pad, must be heated so the solder melts and flows on them, creating both an electrical and a mechanical bond.

Here's how to make a good joint:

Prepare the joint .

- Bend the component lead slightly after it passes through the printed circuit board (this helps hold it in place while soldering).

Prepare the tool .

- The soldering iron should be up to temperature.
- Clean the tip by plunging it into the jar of stainless steel wool several times. Melt a little solder (a 2mm length) onto the tip so it's shiny. This is called "tinning". The solder coating helps conduct heat from the tip to the joint. If it does not melt the iron is not yet up to temperature.
- If it does not tin easily, ask a Blinkie Tech to help: they carry a special tip cleaner compound.
- Place the tip in contact with the component lead and the printed circuit board pad, heating both for 1-2 seconds (slightly longer for bigger wires such as on the battery holder).
- The solder should melt within 2 seconds, and flow around the joint. If it takes longer than that, you're not getting enough heat into the joint.

- Keep the soldering iron in place until the solder flows freely and completely covers the joint. If the heat is removed too soon, the solder will tend to "ball up" and not stick well to the conductors. The solder joint should look "wetted", with a small mound of solder on the pad and going up the wire.
- Let the joint cool for a few seconds without movement.
- If a joint is moved before it cools, it will take on a dull, satin look that is characteristic of a cold solder joint. A cold solder joint is fragile and conducts poorly – reheat the joint until the solder flows freely, and hold it still until it cools.
- Keep the tip of the soldering iron clean. Wipe off flux and excess solder regularly in the jar of stainless steel wool, and re-tin if needed.