Do-It-Yourself

USB Blinky - do it yourself

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My projects typically involve many LEDs and microcontrollers. However sometimes I just love the simplest of things with LEDs.

One of the very basic LED circuits is a blinky using astable multivibrator. This is the circuit that I've made - with hand drawn and etched PCB and with incandescent lamps - when I was in high school for a PCB making contest and won. I guess it still has sentimental value for me.

Now with LEDs instead of incandescent lamps, and USB power instead of batteries, here's the USB Blinkly.

I integrated the USB plug into the PCB, so it's simpler as well as economical. You can plug USB Blinky into any USB receptacles - computers, chargers, everywhere.
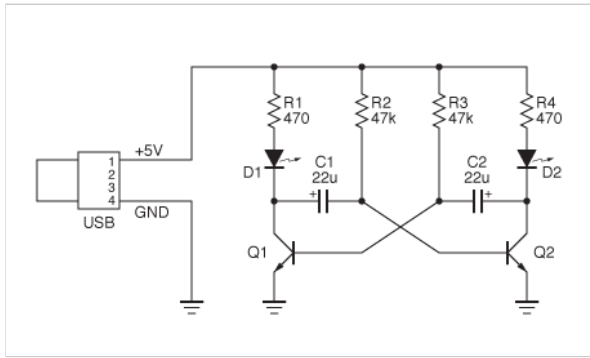
Step 1: Circuit

The circuit is an ubiquitous astable multivibrator. I used NPN type transistors and used the super-bright LESs. As the values shown in the schematics, the blinking rate is about 2 times/second. You can adjust the R2,3 and C1,2 to achieve different speed. Larger the values, the slower the speed. I recommend keeping the values of R2 and R3 between 1k and 47k ohm. At larger resistance transistors do not get enough bias current to fully turn on the LEDs. At smaller resistance than 1k ohm, too much bias current flow into the transistors. Capacitors can be as small as 1uF (very fast blink, more like flicker), or as large as 1000uF (super slow).

Current draw from the USB port is slightly under 5mA.

Step 2: PCB
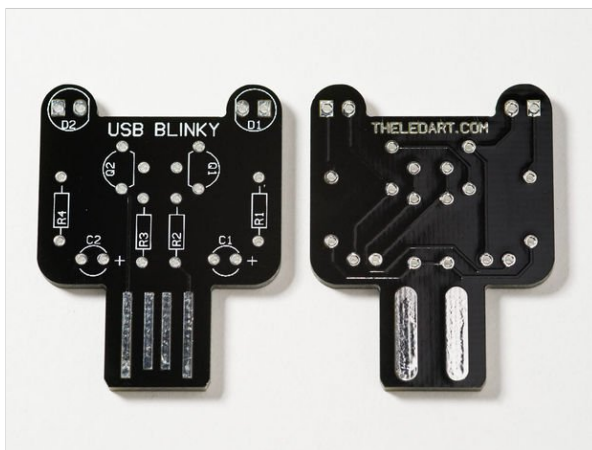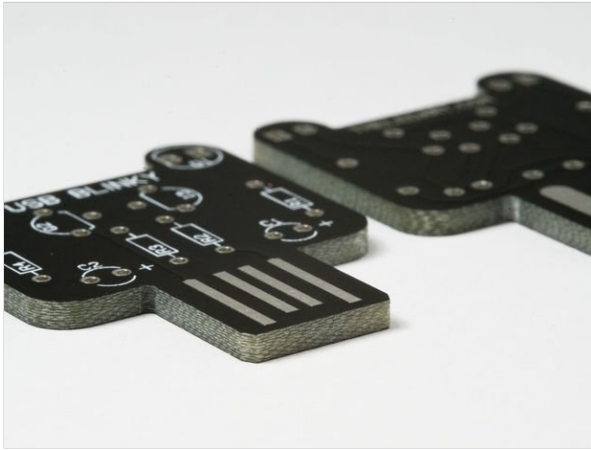
I made "built-in" USB plug right on the PCB. In order to fit nicely into USB ports, I used thicker (2mm) material for the PCB. This seems to work quite well, snug enough to give good electric connection, but not too tight. However if you find your USB Blinky to be too lose in the connector, you can put some solder on the backside of the USB plug - there are two strips of pad that you can coat with solder. By putting a good amount of solder there you can adjust the fit of the USB plug.

Step 3: Parts
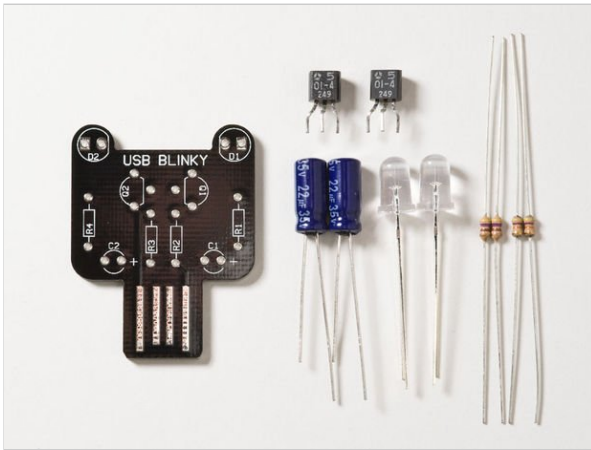
There are only 11 parts total:

- 2x 5mm Super Bright LED
- 2x 470 ohm 1/8 or 1/4W (R1, R4) (yellow-purple-brown-gold)
- 2x 47k ohm 1/8 or 1/4W (R2, R3) (yellow-purple-orange-gold)
- 2x 22uF 10V or higher Electrolytic Capacitor (C1, C2)
- 2x NPN General Purpose Transistor (Q1, Q2)
- 1x Custom PCB

Transistors can be just about any general purpose NPN type, such as 2N2222, 3904, 4400, etc.

If you are using "standard" type LEDs (non "super bright"), you might want to give them more current to get the decent brightness. Use 220 or even 150 ohm for R1 and R4 (up to 20mA with 150 ohm).

Dig into your parts drawers or junk box. You might have all the parts you need (except maybe the PCB). Of course you can purchase the PCB or full kit from my site.

Step 4: Assembly
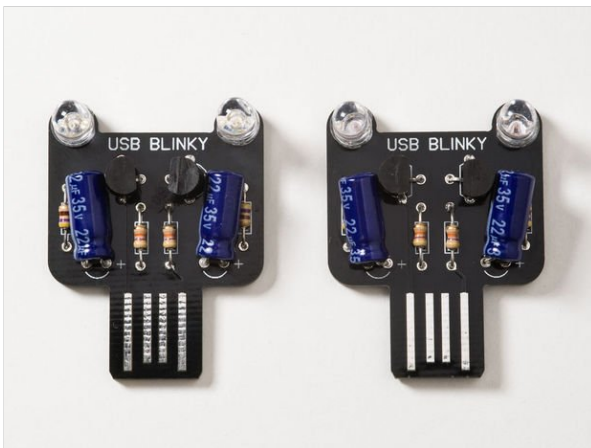
Assembly is very straightforward. I think it's perfect for beginners. However if you are completely new to soldering, you might want to do a bit of practice before assembling USB Blinky.

Start soldering the low profile pars first - try soldering in this order:

- Resistors - Bend the leads, insert them into the holes on the PCB, flip the PCB over, and solder.
- Capacitors - bend the lead at the bottom of the body, watching the polarity. Longer lead is the positive (+).
- Transistors - match the shape of them with the marking on the PCB. Bend the leads to fit the holes. Solder.
- LEDs - watch the polarity again. Longer lead goes into the hole with the square pad. You can also use the shape of LEDs and the marking on the PCB to identify the orientation. (One side of LED is flat)

Now carefully examine the solder joints - under good lighting and use magnifying glass if necessary. Fix if you find shorts or insecure joints.

Step 5: Plug it in!

Take a deep breath, and insert the USB Blinky into an USB port. The LEDs should come on immediately. Make sure that the USB port is powered. If the LEDs don't come on unplug the USB Blinky immediately and examine it for soldering errors.

Pick your favorite color LEDs and make one. Happy blinking!

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