

Learn-to-Solder Exercise: Practice Flasher Circuit

AEM 1905: Spaceflight with Ballooning
and CSE 1012: High-Altitude Ballooning
and AEM 1805: CubeSats (with Ballooning)

James Flaten, MN Space Grant and
AEM Department – University of Minnesota

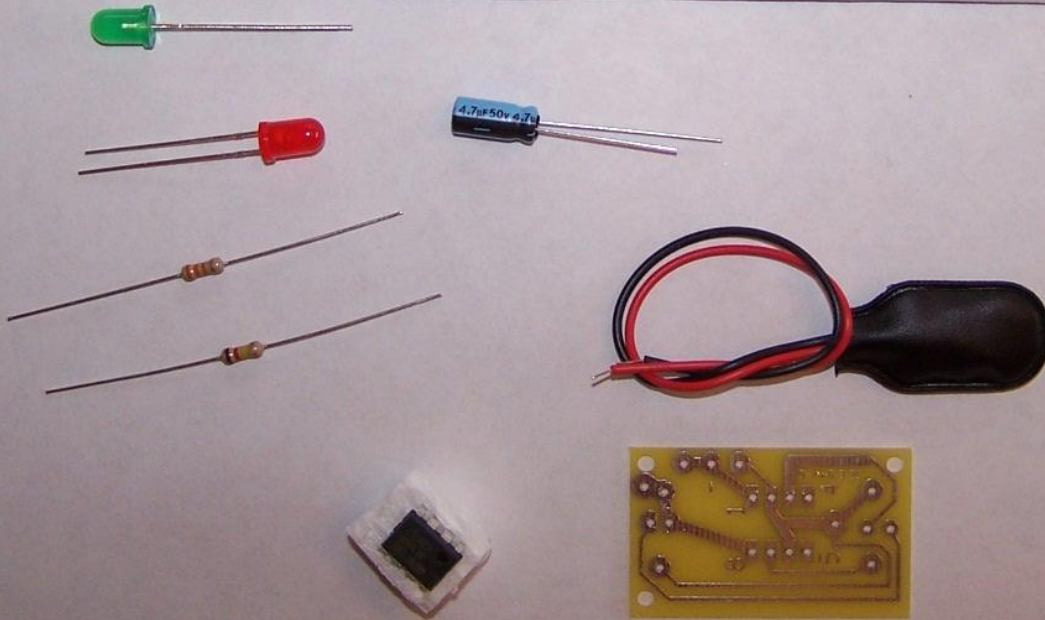
Change 1 – solder in a socket then insert the 555 timer chip – don't solder chip directly
Change 2 – strip wires for battery snap and/or add a disconnect header, if requested

PARTS LIST AND INSTRUCTION FOR LEI

*READ ALL INSTRUCTION BEFORE
STARTING THE PROJECT!*

Your kit should include the following parts:

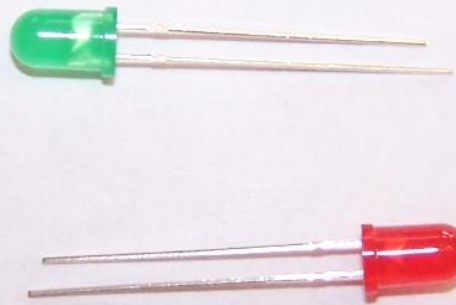
- 1 each - P.C. BOARD
- 1 each - 555 timer I.C.
- 1 each - 33K ohm resistor (orange, orange, orange)
- 1 each - 120K ohm resistor (brown, red, yellow)
- 1 each - 4.7 MFD capacitor with radial (P.C. leads)
- 2 each - L.E.D. (assorted colors)
- 1 each - 9 volt battery snap (battery not included)



Flasher circuit parts



Resistors (polarity doesn't matter)

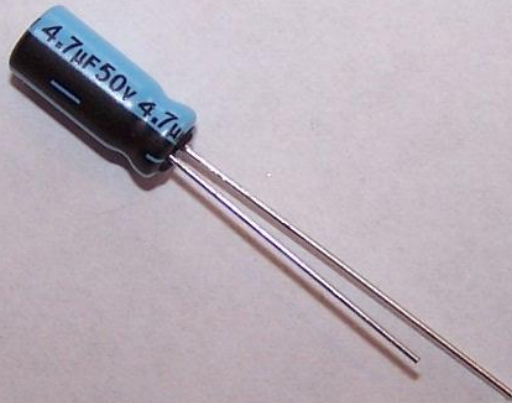


Light emitting diodes (LEDs)

(polarity is important;

the negative cathode looks like a flag

and the negative lead is also shorter)



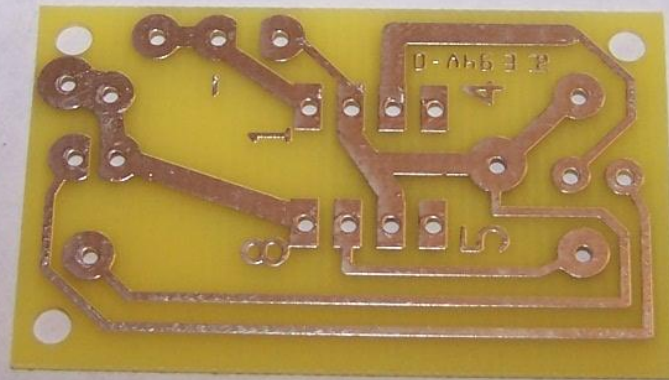
Capacitor (polarity is important;
the negative lead is marked and is also shorter)



555 Timer IC (Integrated Circuit AKA “chip”)
(dot indicates pin 1; orientation/polarity is critical)

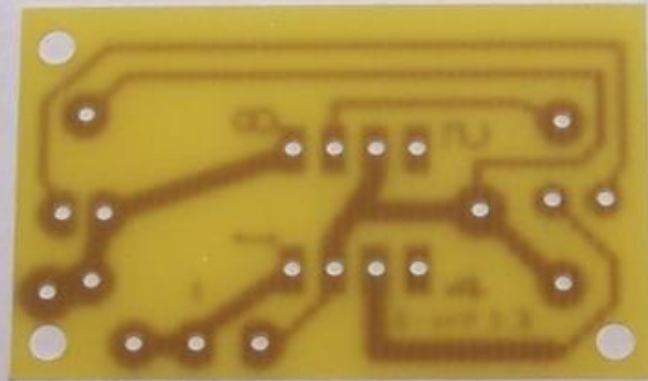


9V battery snap (battery only goes on one way)

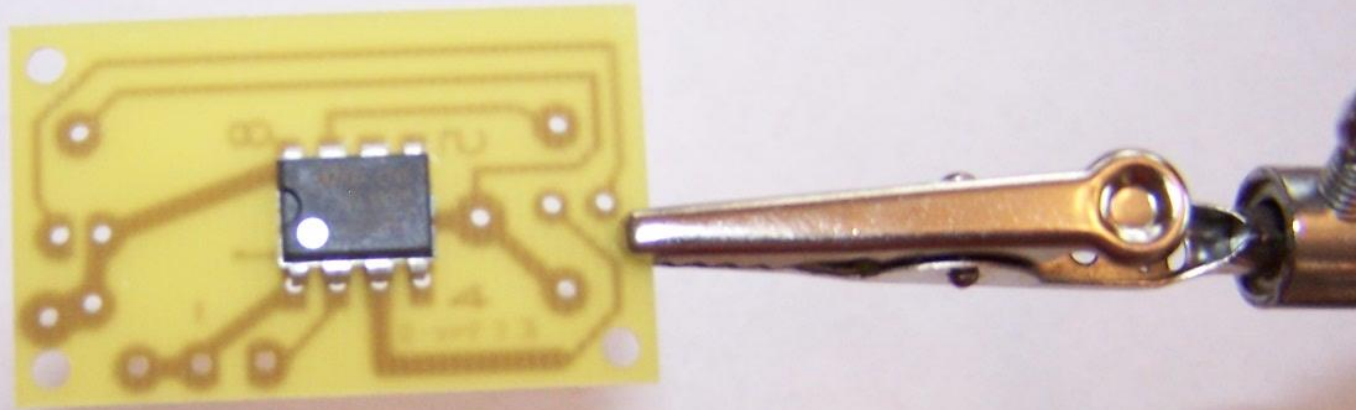


PCB (Printed Circuit Board)

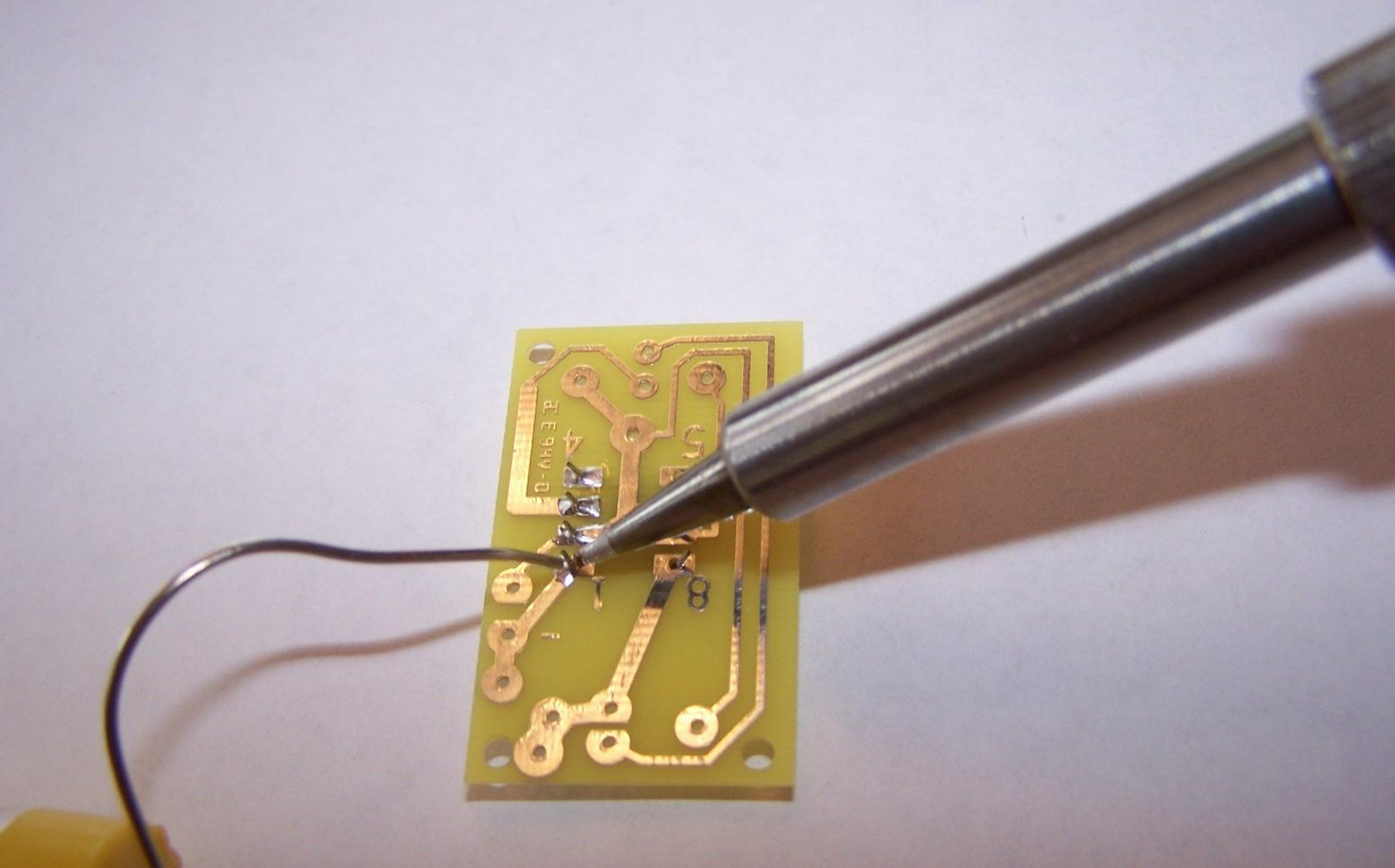
(plastic, with metal “traces” between various holes)



PCB (this side, without exposed metal traces, is where components are mounted)



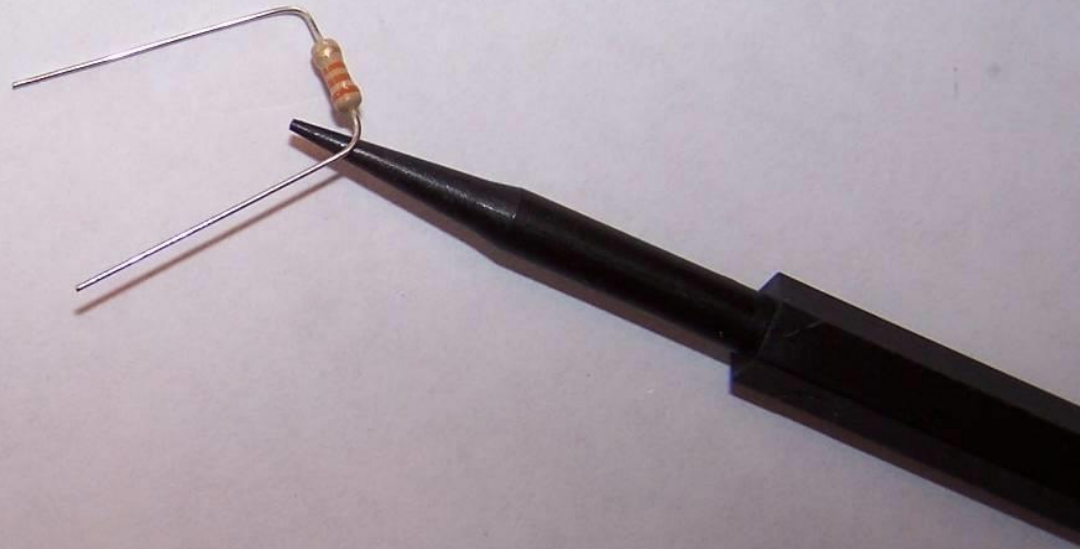
Place the 555 chip on the side of the PCB opposite the metal traces. Be very careful to get orientation correct.



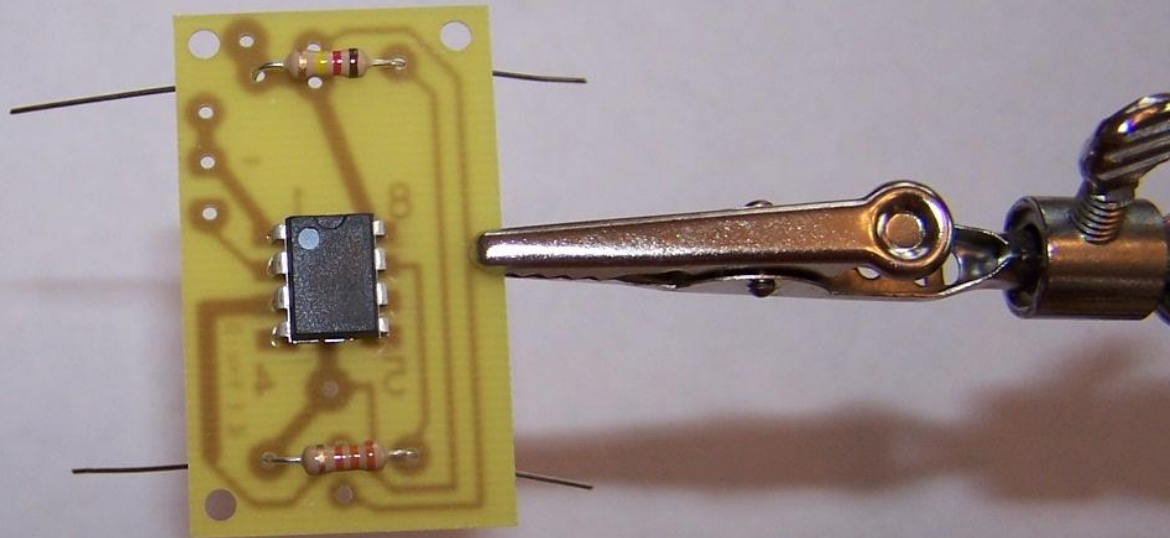
Turn PCB over and solder all pins of chip to metal traces. Avoid overheating chip.



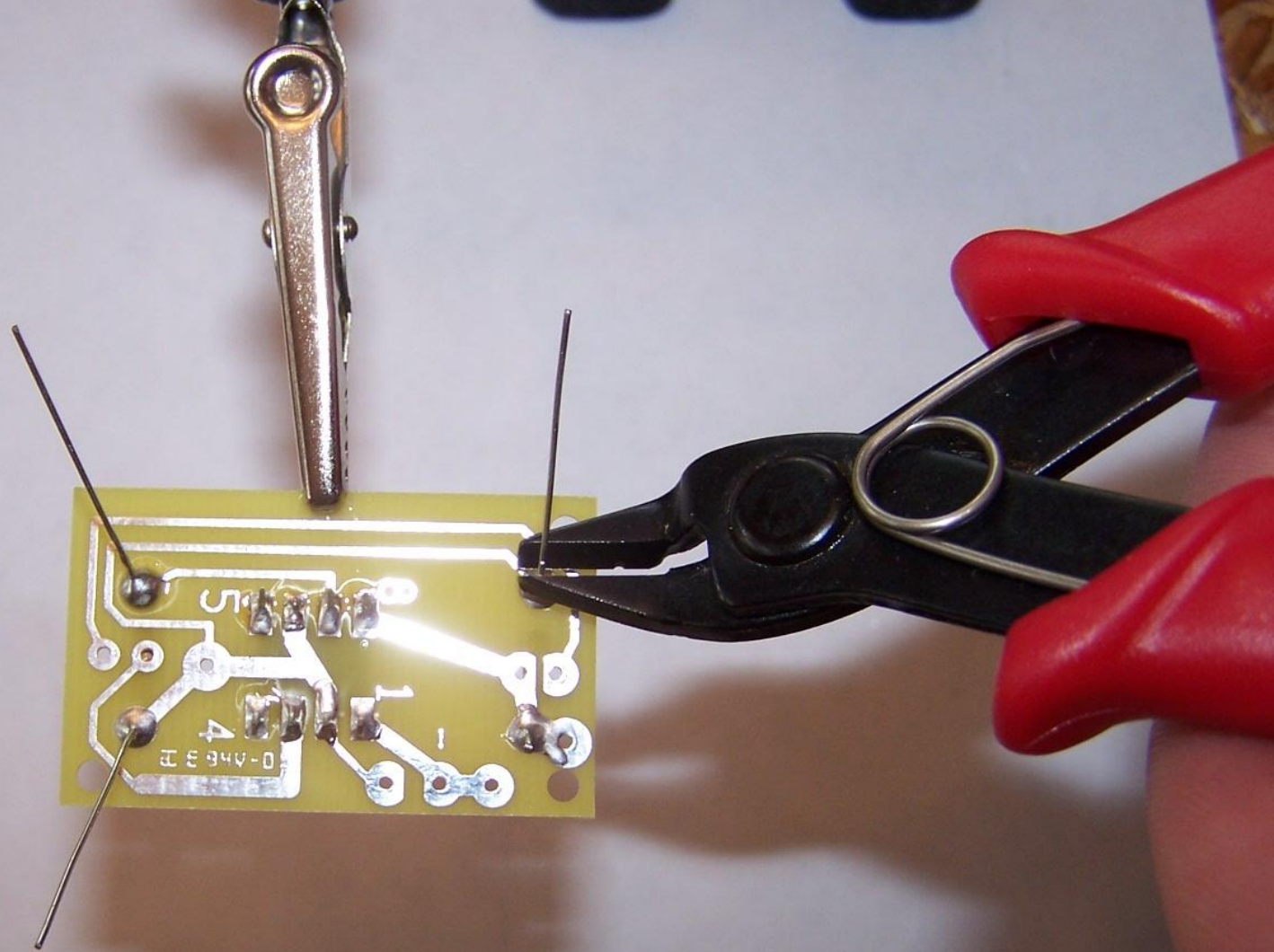
After every step examine the soldering;
good connections, no solder bridges.



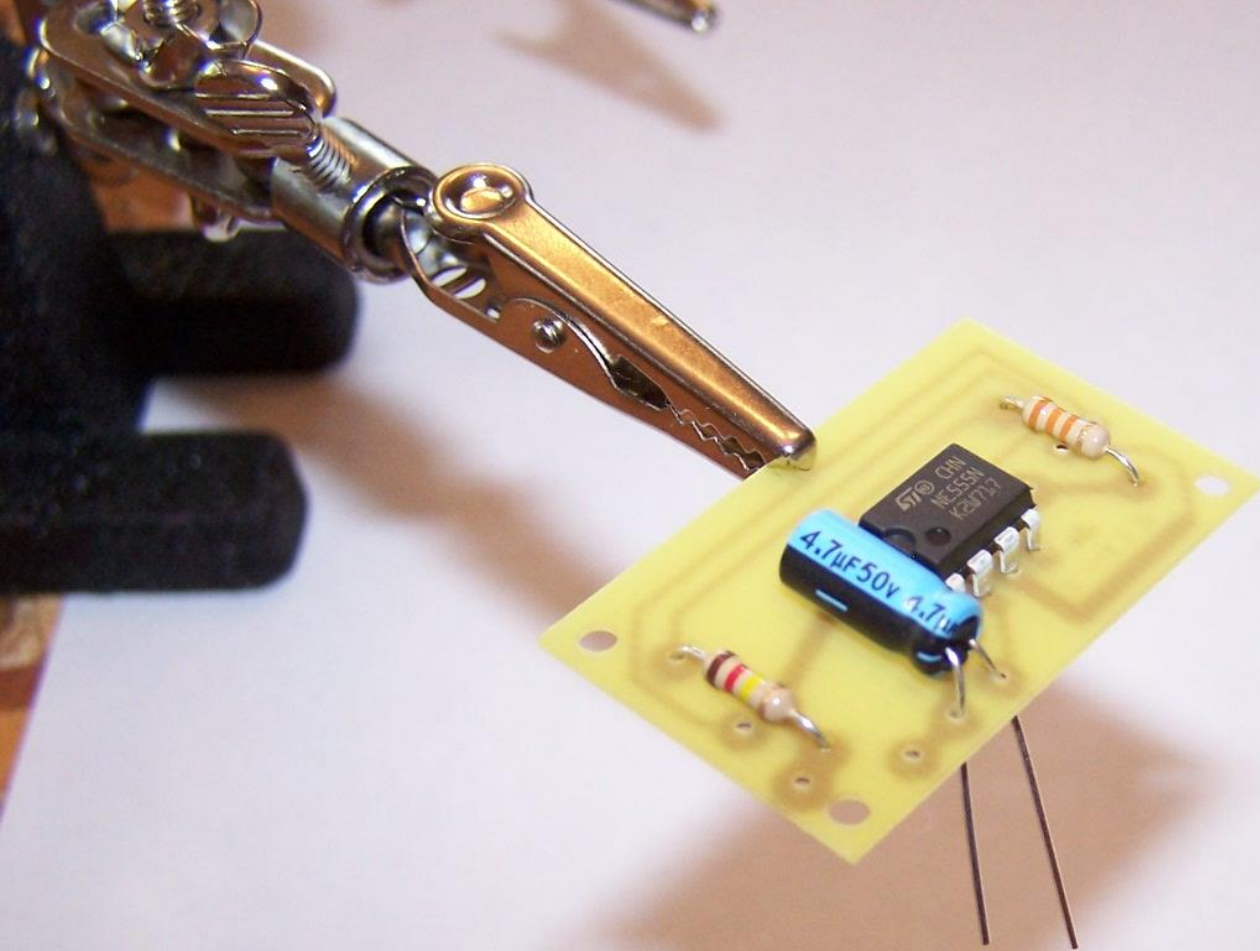
Bend leads of resistors (best to use the forming tool) so they lay flat on the PCB.



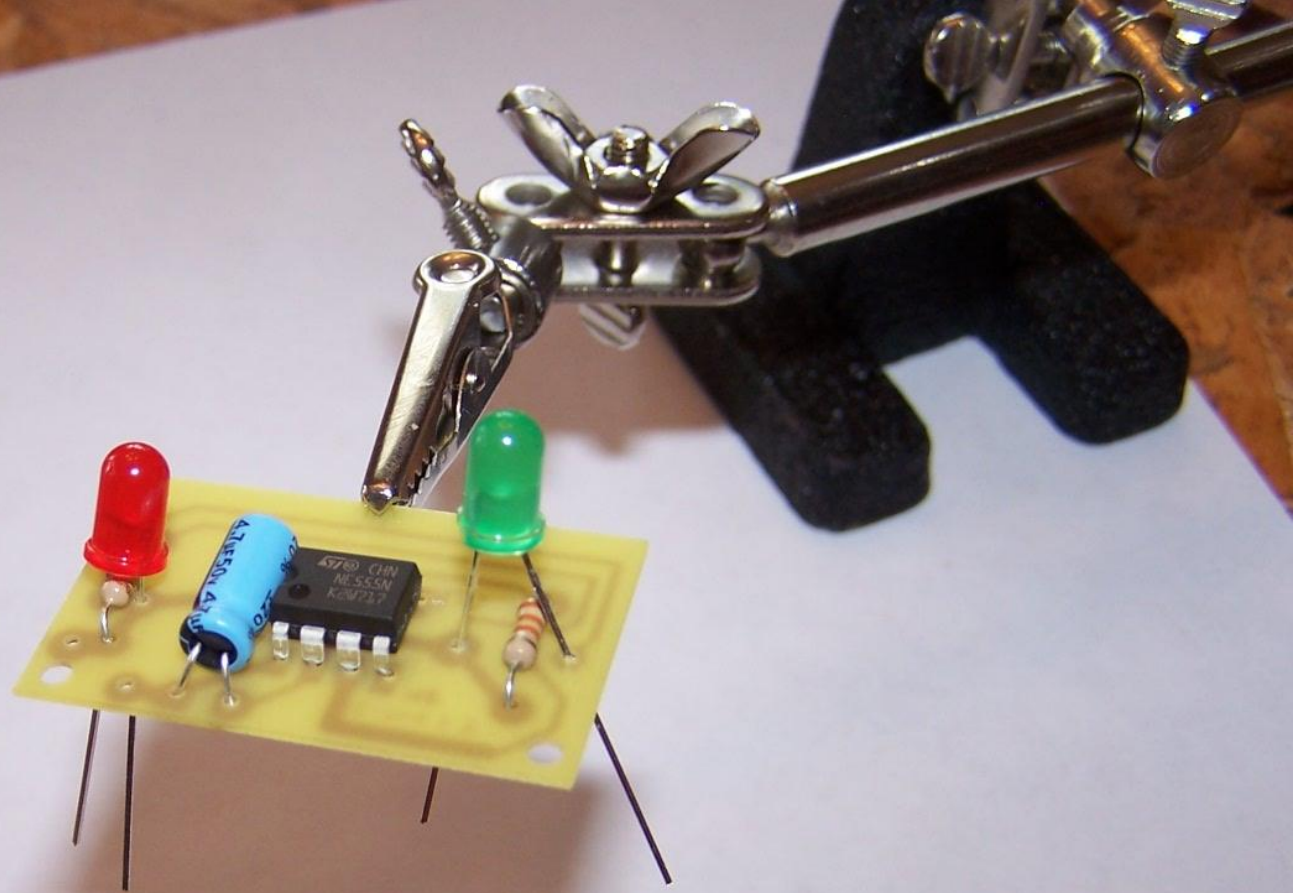
Insert two resistors; splay leads to hold in place. 120 k Ω nearest pin 1 on the chip.



Solder resistors in place; then clip leads.

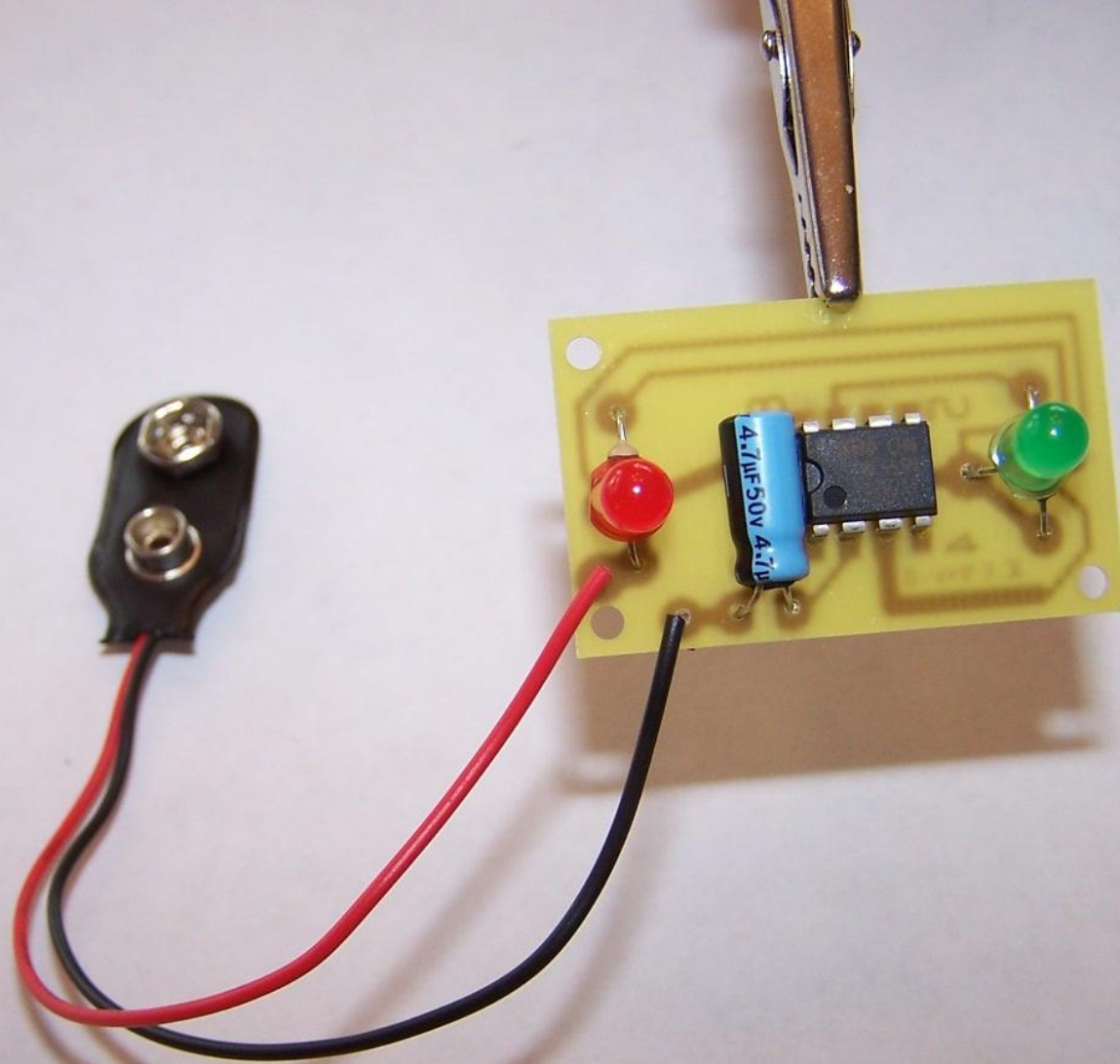


Insert electrolytic capacitor. The negative (shorter) lead is on the side opposite chip.

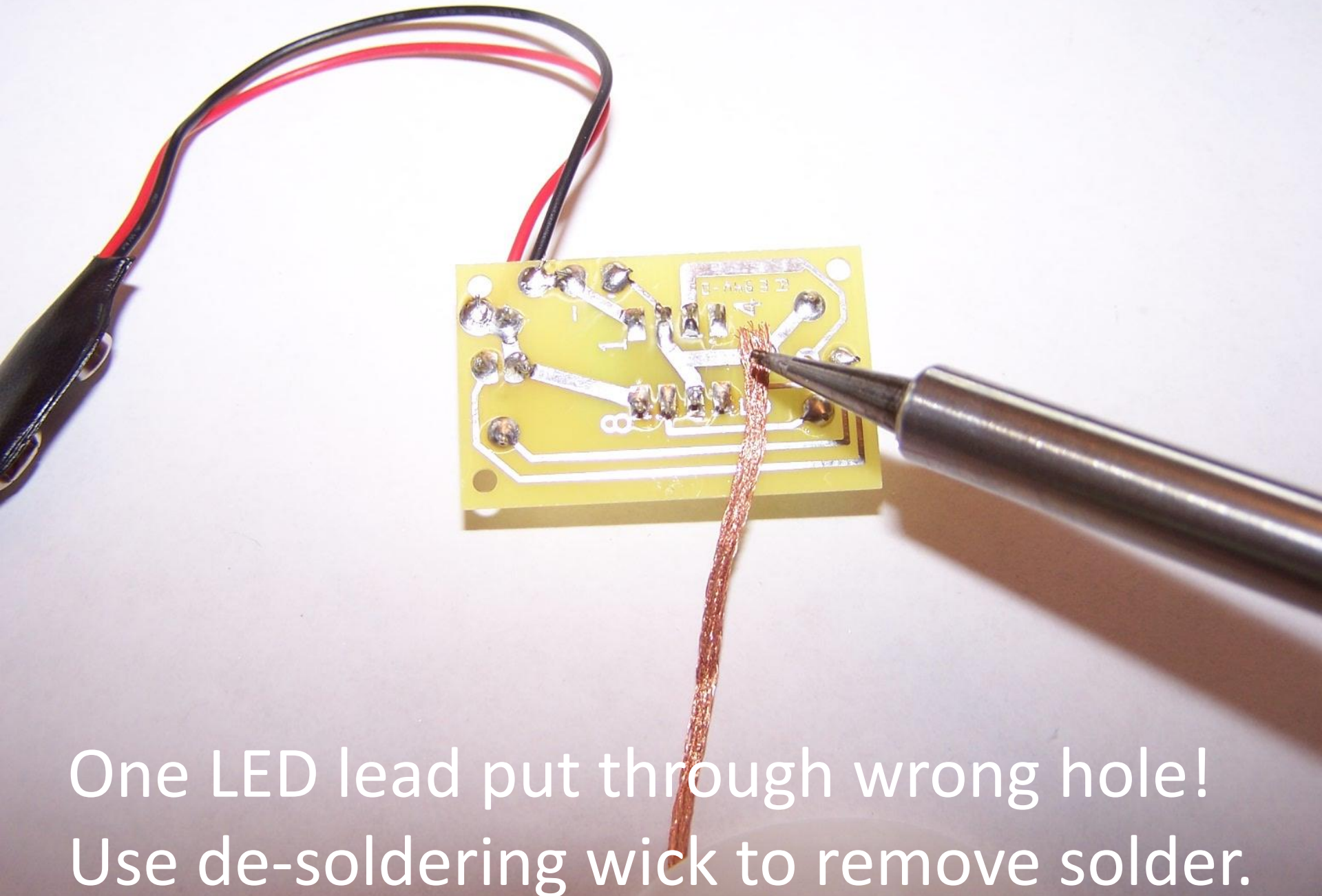


Insert the two LEDs. Negative (shorter) leads both go on the left from this view.

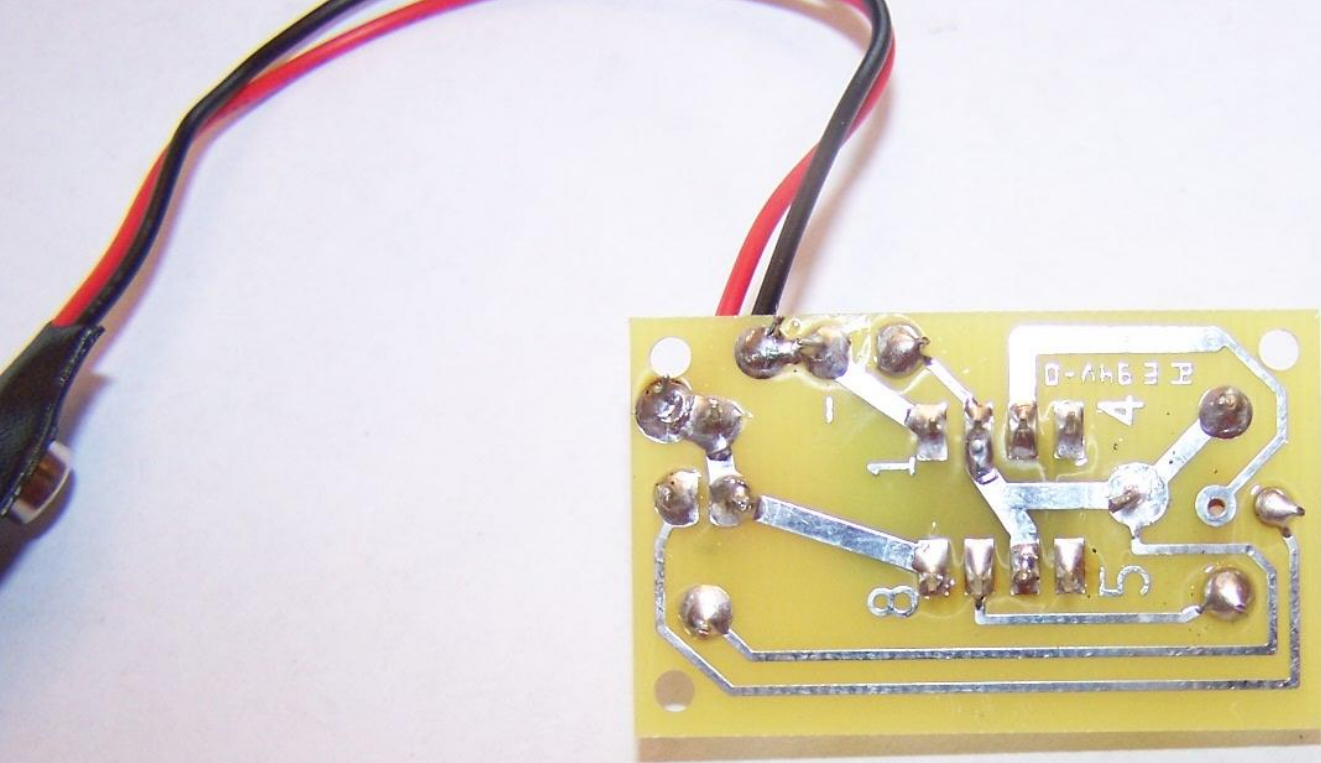
[Beware: there is a build error here – read on before you actually do this step.]



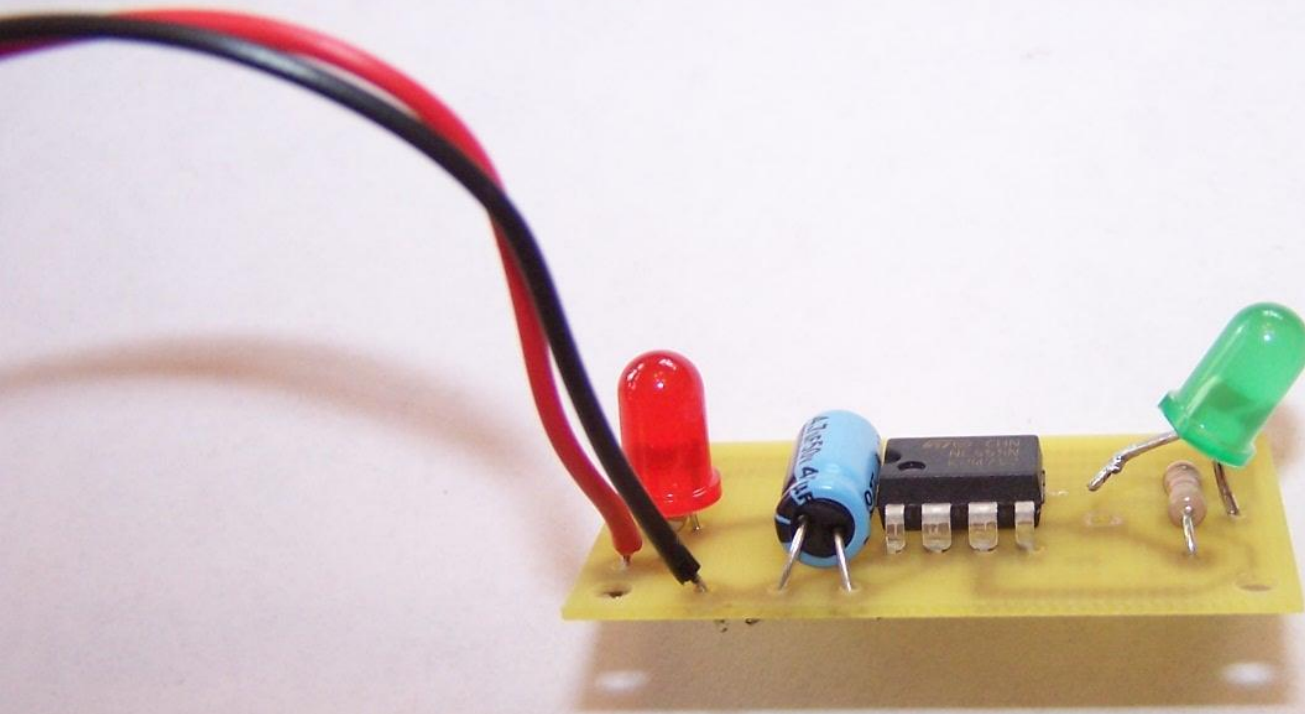
Solder battery snap, watching polarity.



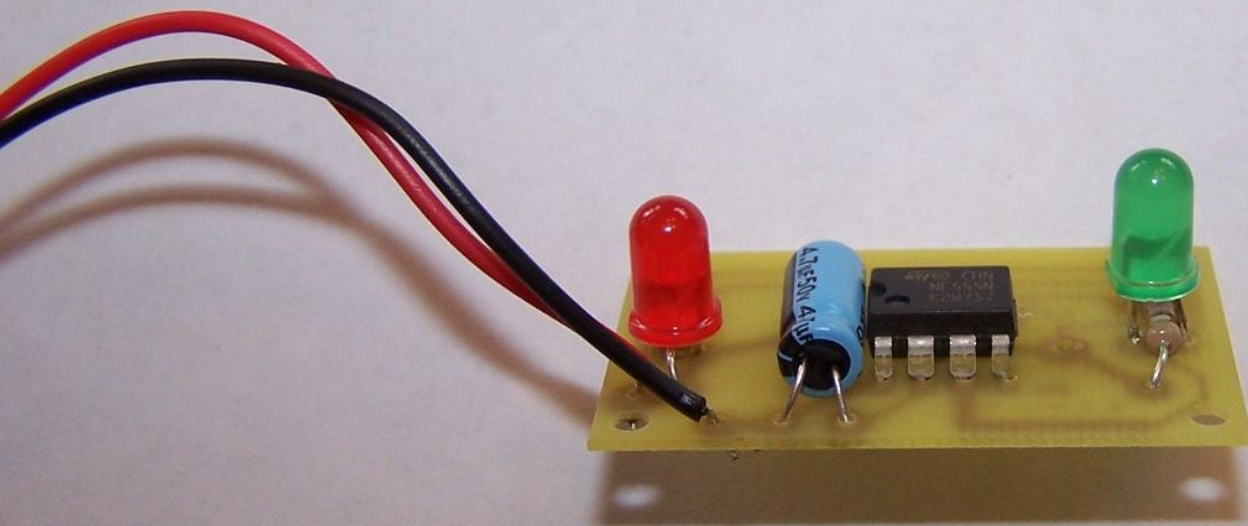
One LED lead put through wrong hole!
Use de-soldering wick to remove solder.



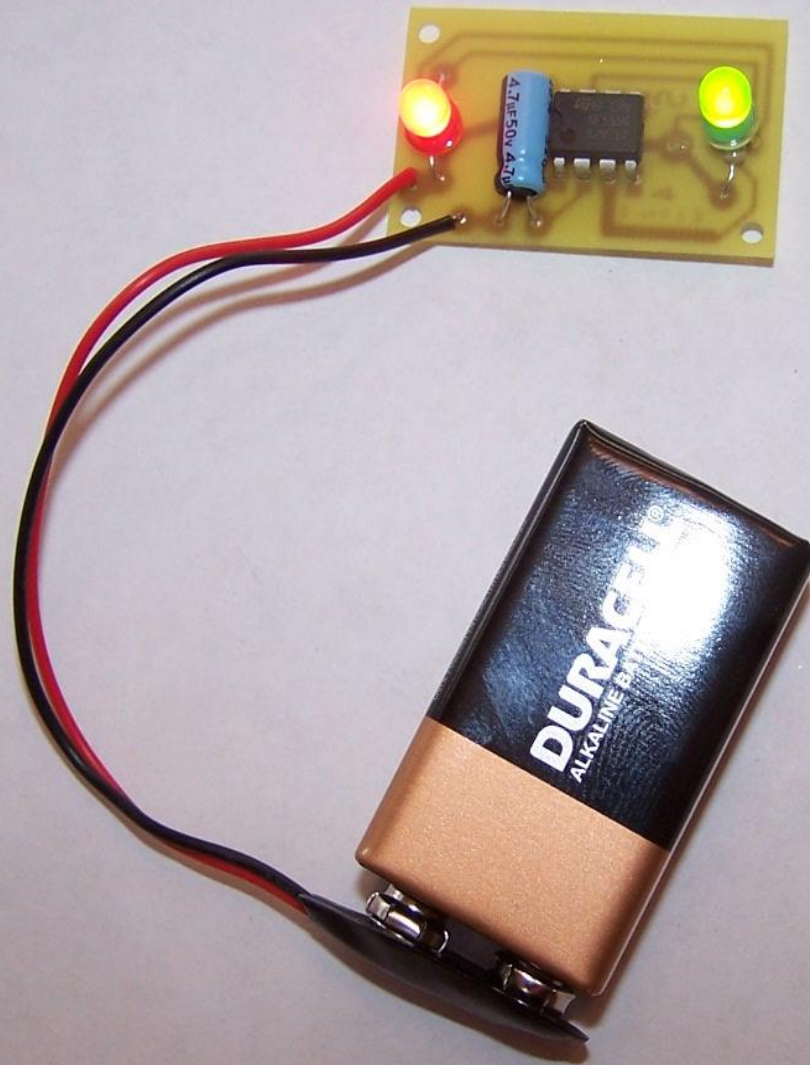
The soldering wick absorbed most of the solder, leaving very little on the PCB.



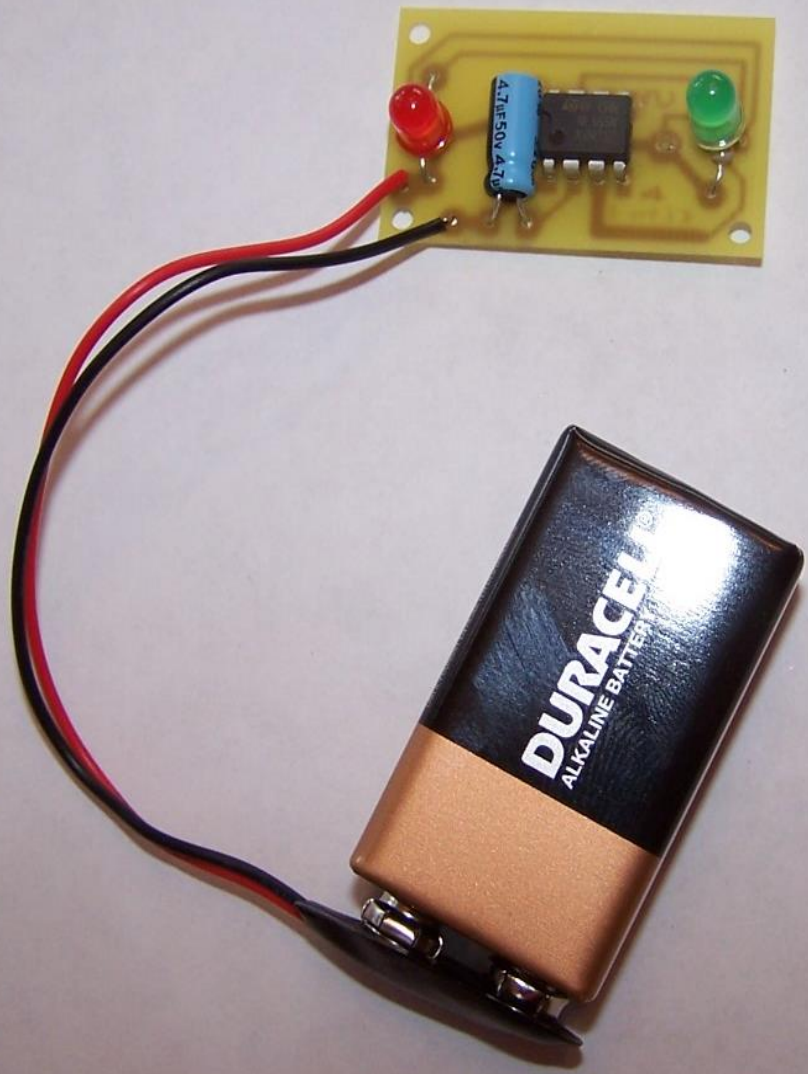
Heat the incorrectly-soldered lead and carefully work it out of the PCB.



Uncover the correct hole (hidden under the resistor) and re-solder the LED lead.



When a 9-volt battery is applied, the LEDs should flash ON together then...



... OFF together. Then the cycle repeats.