Make your own

TV B GONE® v2 r2

Mitch Altman

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Inventor of **TV-B-Gone** universal remote controls
Co-founder of **3Ware** (successful Silicon Valley startup)
Pioneer of **VR** (in the mid-1980s)
Founding mentor at **HAX** (1st and biggest hardware accelerator)
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Open Hardware Summit 2026

cornfield electronics

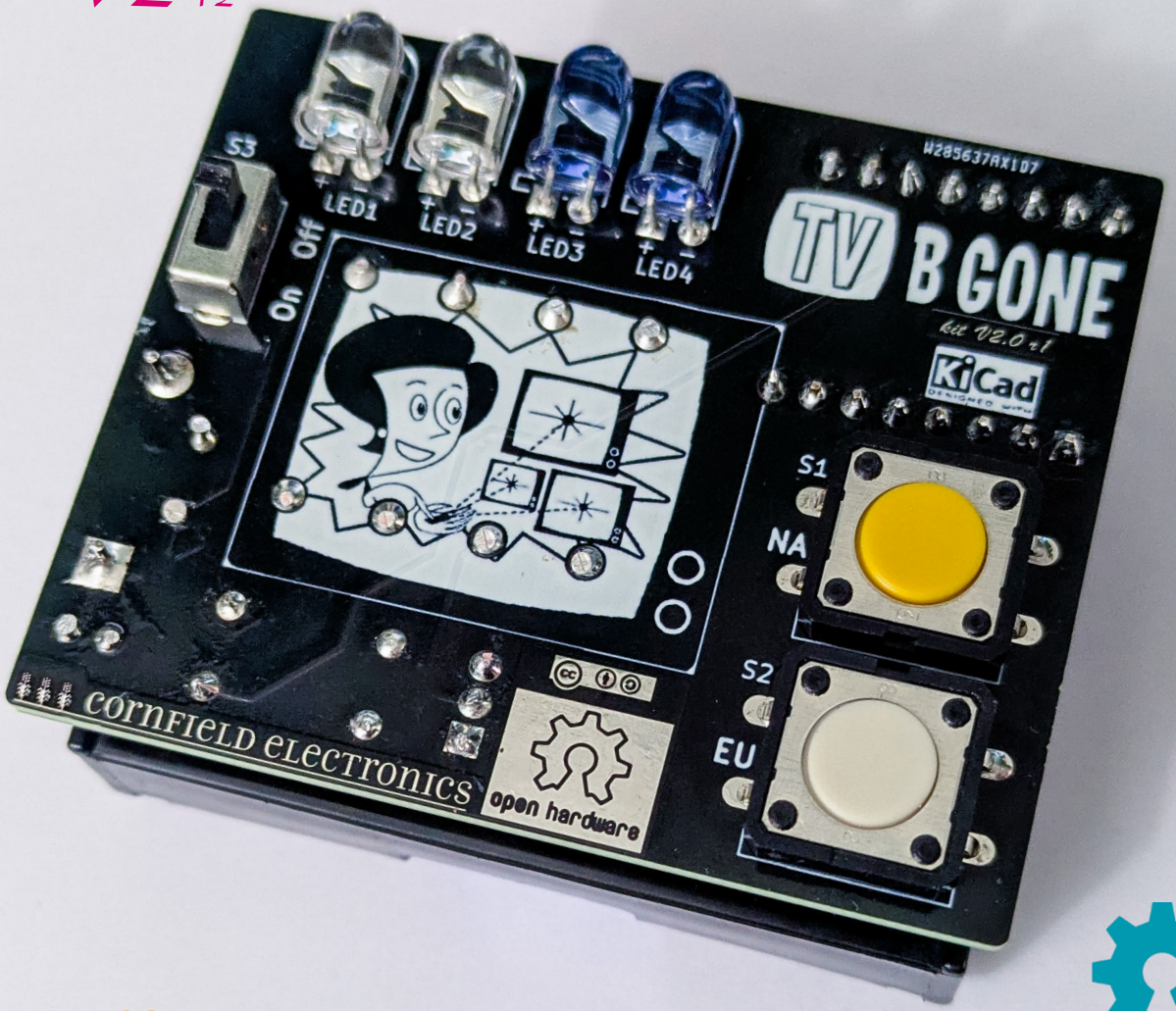
TV B GONE®

TV-B-Gone

Just a remote control, but only one button: OFF !

TV B GONE® Kit

v2 r2

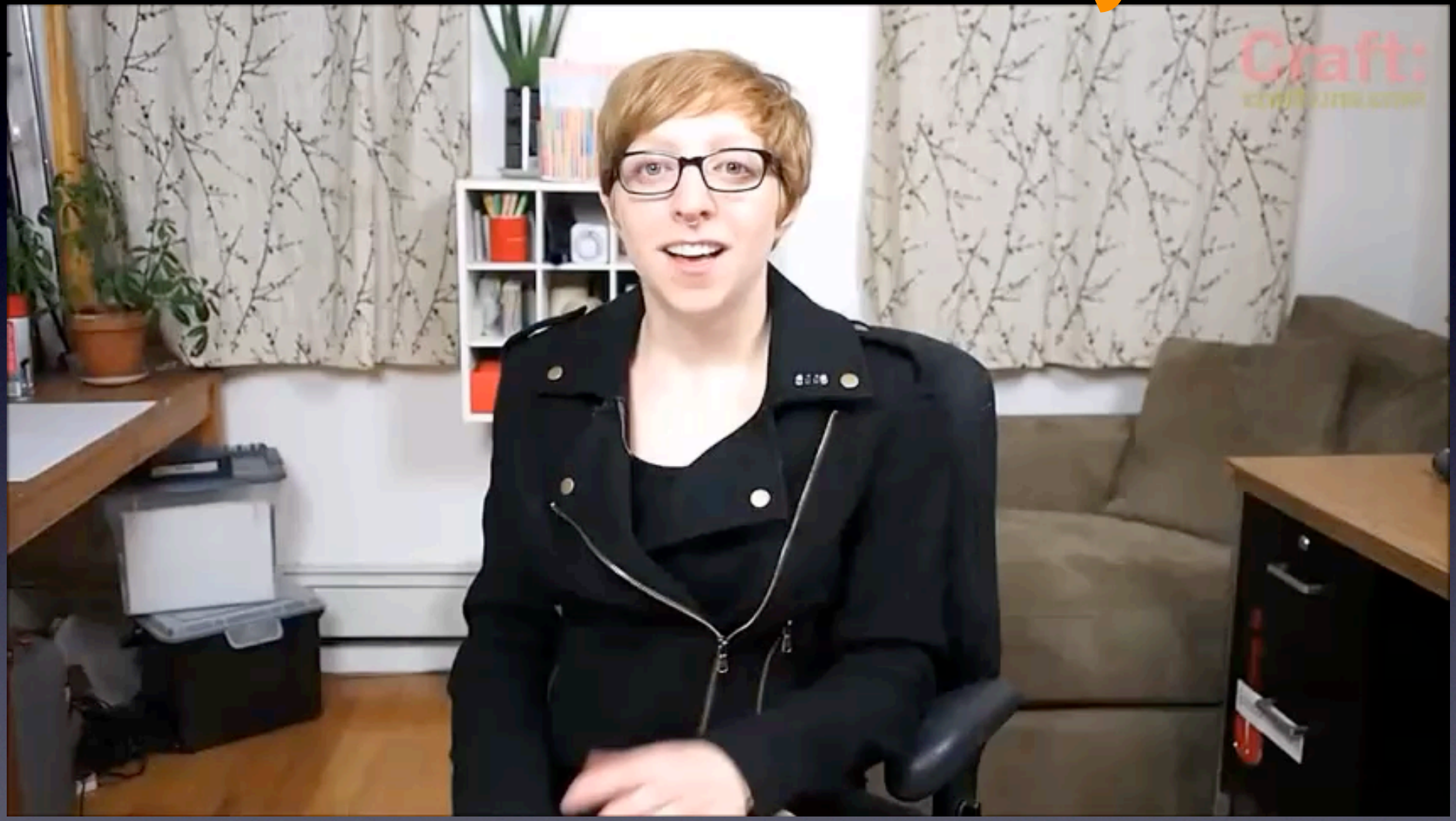


Turn off TVs in public places from 50 meters away!

open source hardware

TV B GONE®

Kit: in a jacket



forbes.com – Turning Off Any TV You Want - Without Getting Caught

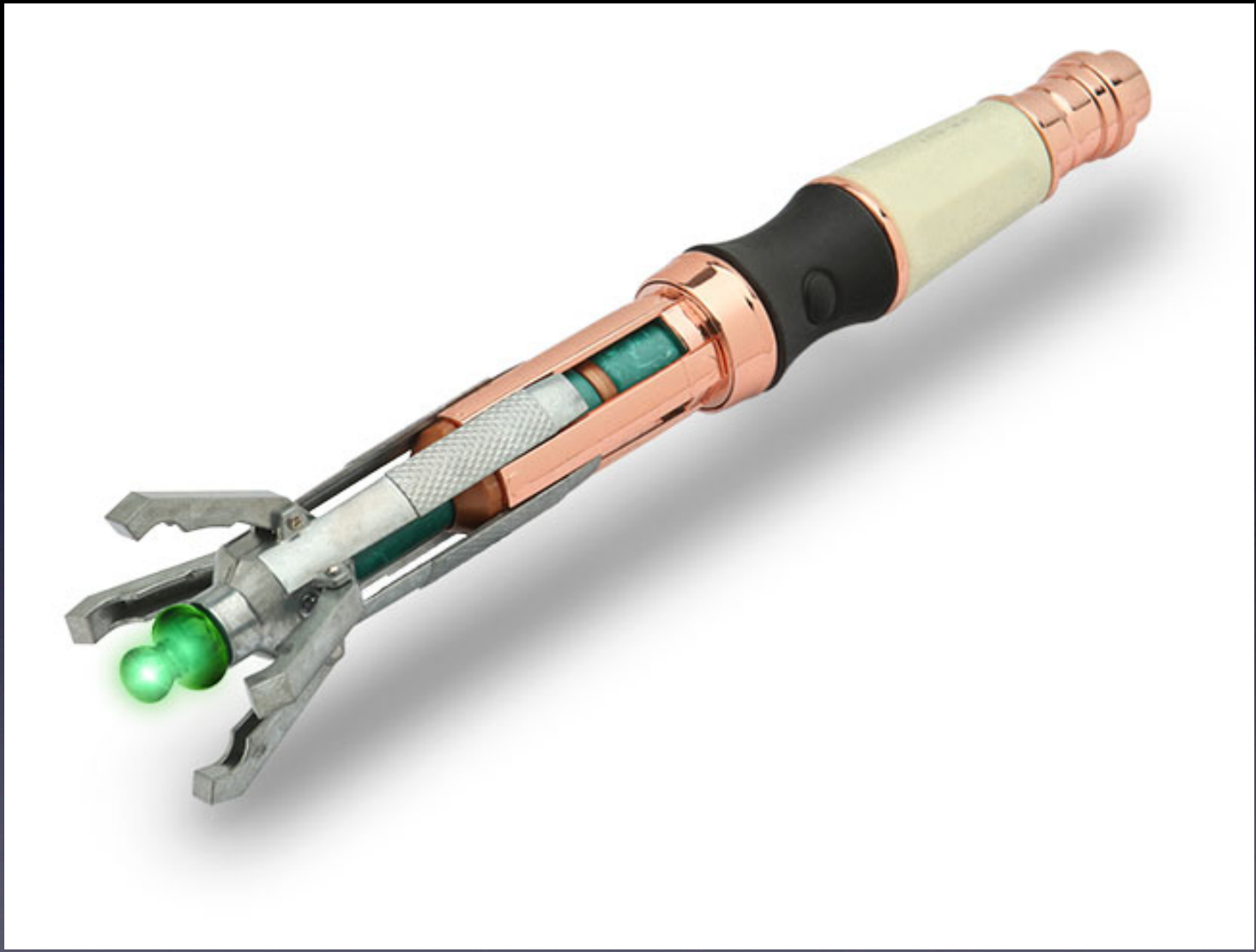
TV B GONE®

Kit: in a hat

makezine.com – TV-B-Gone Hat

TV B GONE®

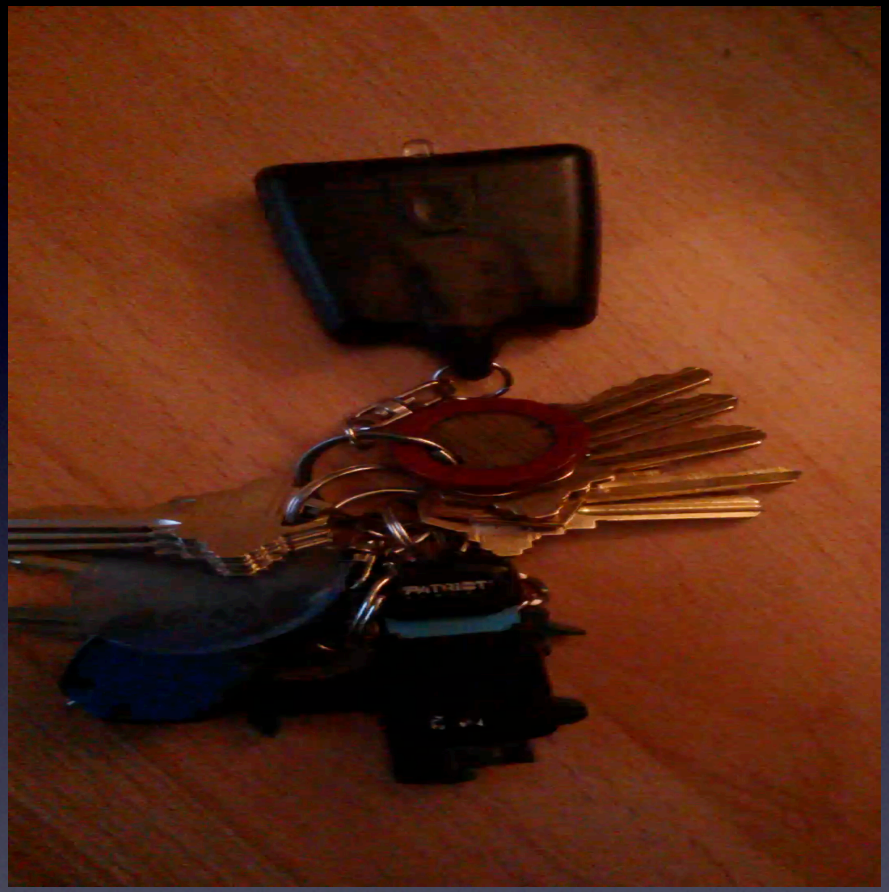
Kit: Sonic Screwdr



hackaday.com – Sonic Screwdriver Meets TV-B-Gone

TV B GONE®

Takes about 60 seconds



About 150 IR "OFF" codes (one per blink)

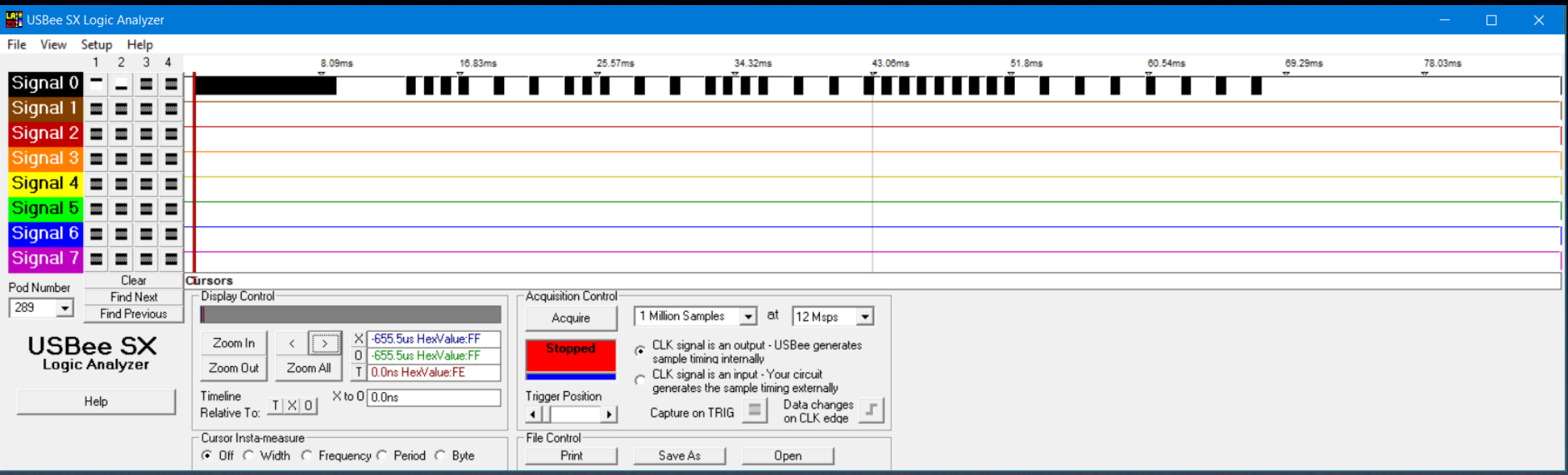
TV-B-Gone universal remote control

IR Remote control codes

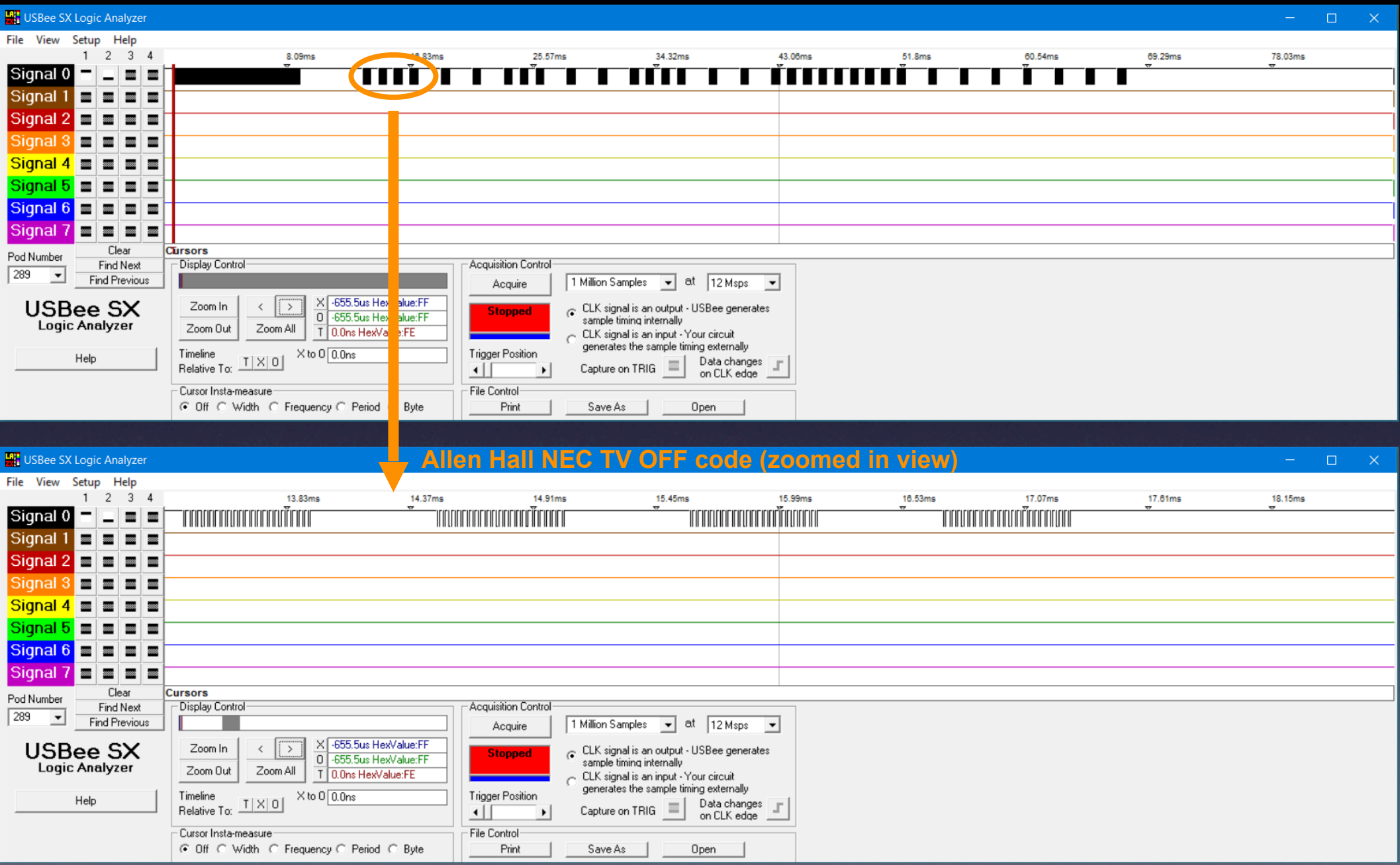
Allen Hall

NEC TV remote control

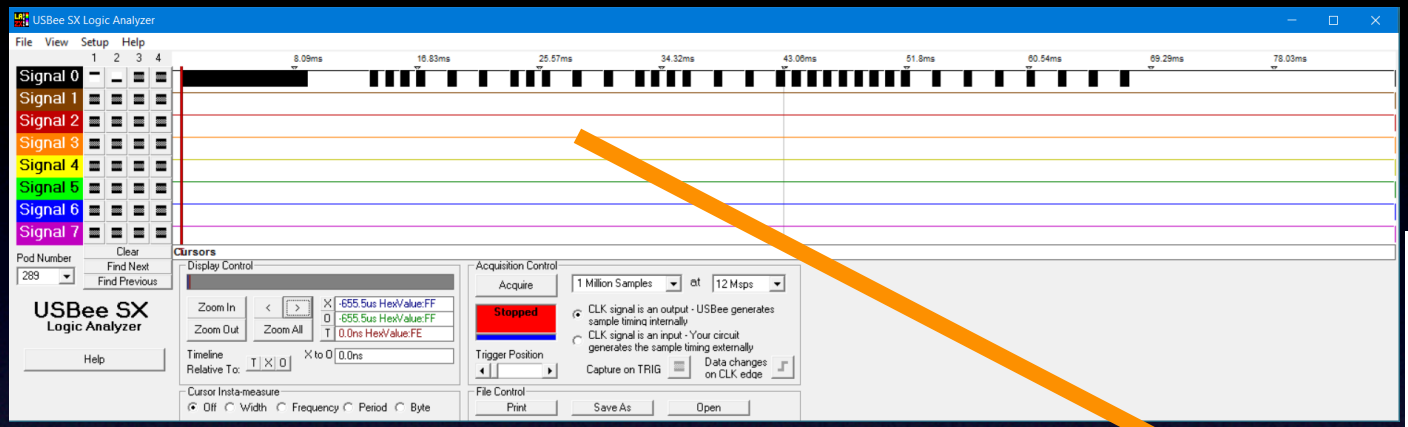
Allen Hall NEC TV OFF code



Allen Hall NEC TV OFF code

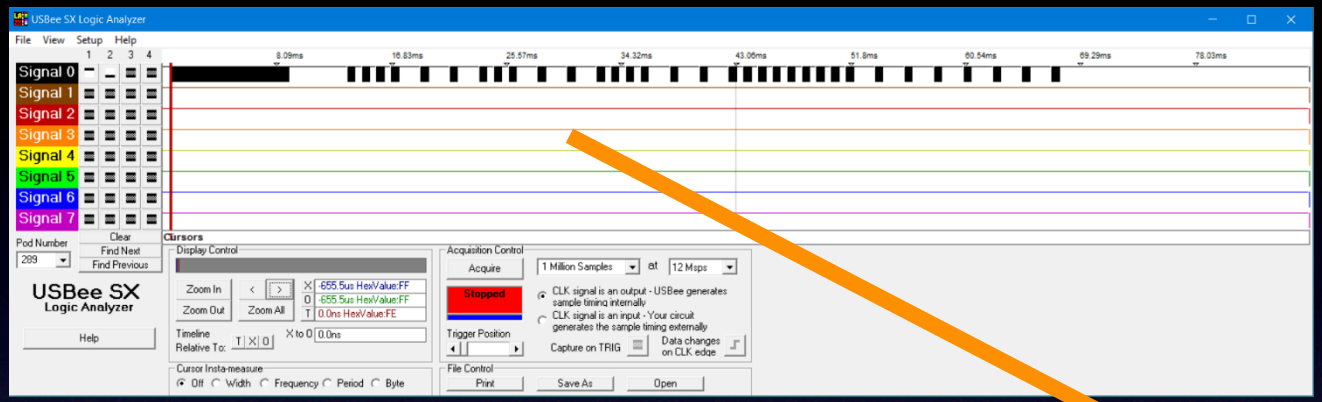


Allen Hall NEC TV OFF code



pair #	on-time	off-time
1	8,920 usec	4,450 usec
2	560 usec	560 usec
3	560 usec	560 usec
4	560 usec	560 usec
5	560 usec	1,680 usec
6	560 usec	1,680 usec
7	560 usec	1,680 usec
8	560 usec	560 usec
9	560 usec	560 usec
10	560 usec	1,680 usec
11	560 usec	1,680 usec
12	560 usec	1,680 usec
13	560 usec	560 usec
14	560 usec	560 usec
15	560 usec	560 usec
16	560 usec	560 usec
17	560 usec	1,680 usec
18	560 usec	1,680 usec
19	560 usec	560 usec
20	560 usec	560 usec
21	560 usec	560 usec
22	560 usec	560 usec
23	560 usec	560 usec
24	560 usec	560 usec
25	560 usec	560 usec
26	560 usec	560 usec
27	560 usec	1,680 usec
28	560 usec	1,680 usec
29	560 usec	1,680 usec
30	560 usec	1,680 usec
31	560 usec	1,680 usec
32	560 usec	1,680 usec
33	560 usec	1,680 usec
34	560 usec	560 usec

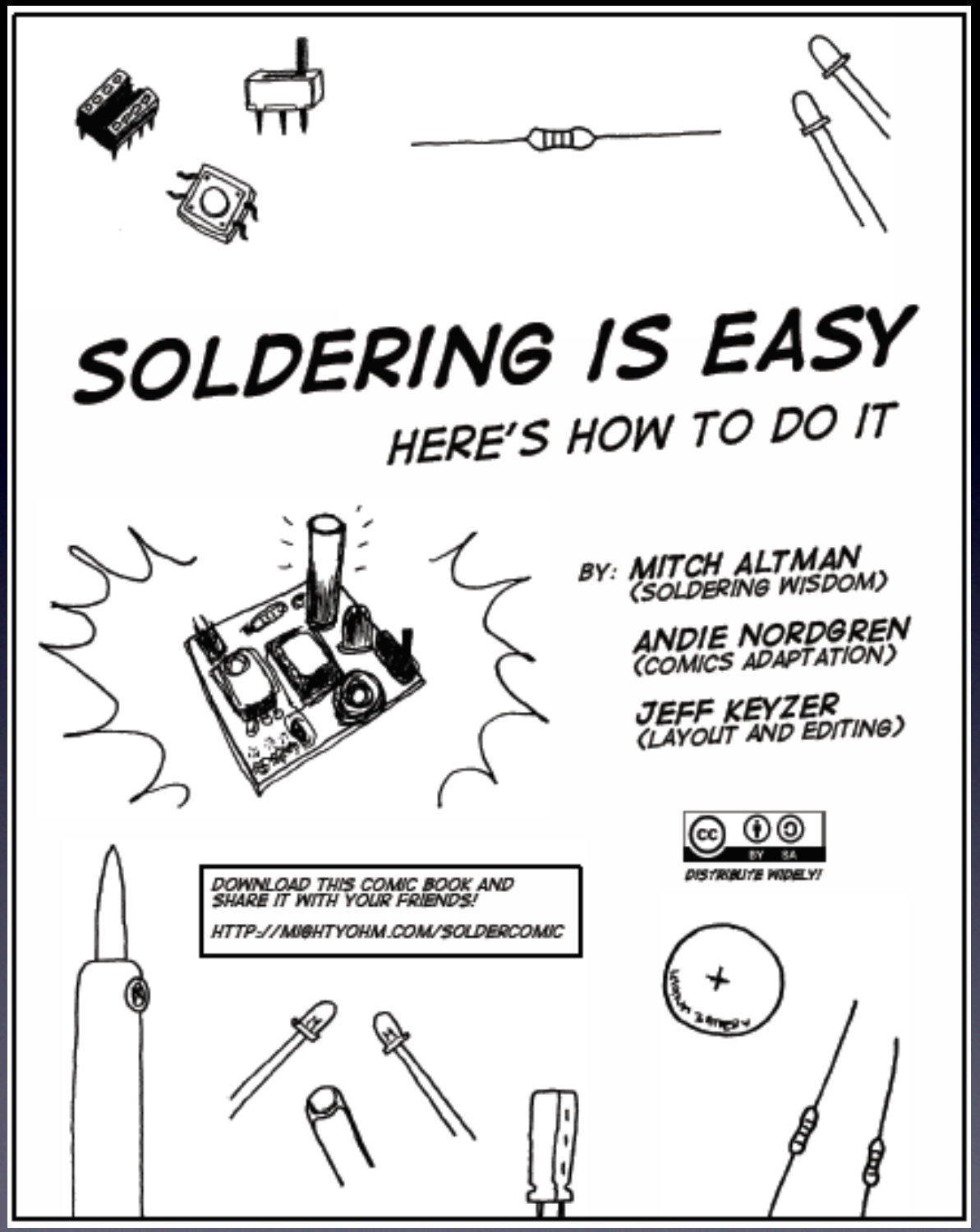
Allen Hall NEC TV OFF code



pair #	on-time	off-time	index
1	8,920 usec	4,450 usec	0
2	560 usec	560 usec	1
3	560 usec	560 usec	1
4	560 usec	560 usec	1
5	560 usec	1,680 usec	2
6	560 usec	1,680 usec	2
7	560 usec	1,680 usec	2
8	560 usec	560 usec	1
9	560 usec	560 usec	1
10	560 usec	1,680 usec	2
11	560 usec	1,680 usec	2
12	560 usec	1,680 usec	2
13	560 usec	560 usec	1
14	560 usec	560 usec	1
15	560 usec	560 usec	1
16	560 usec	560 usec	1
17	560 usec	1,680 usec	2
18	560 usec	1,680 usec	2
19	560 usec	560 usec	1
20	560 usec	560 usec	1
21	560 usec	560 usec	1
22	560 usec	560 usec	1
23	560 usec	560 usec	1
24	560 usec	560 usec	1
25	560 usec	560 usec	1
26	560 usec	560 usec	1
27	560 usec	1,680 usec	2
28	560 usec	1,680 usec	2
29	560 usec	1,680 usec	2
30	560 usec	1,680 usec	2
31	560 usec	1,680 usec	2
32	560 usec	1,680 usec	2
33	560 usec	1,680 usec	2
34	560 usec	560 usec	1

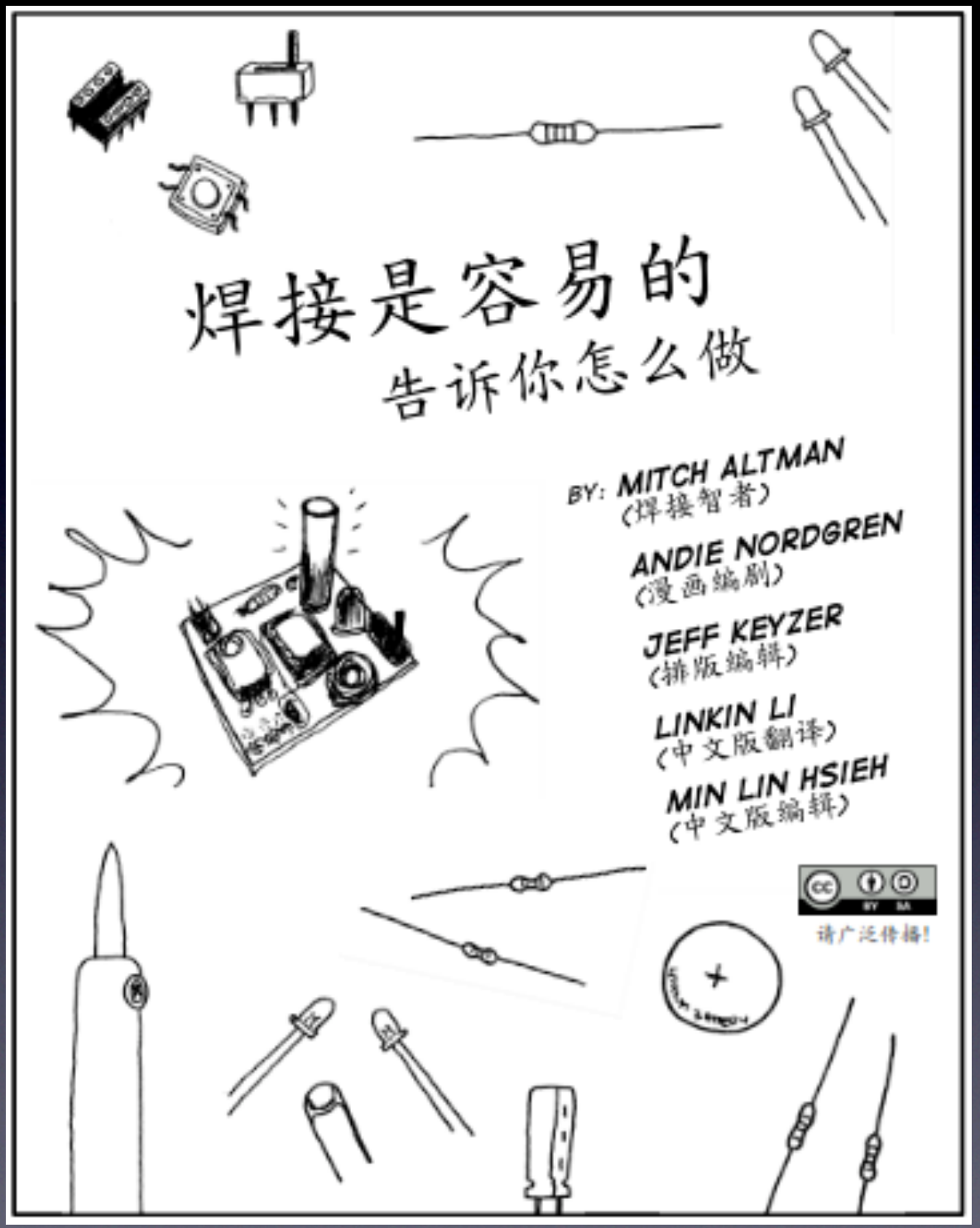
index			
0	1	1	1
2	2	2	1
1	2	2	2
1	1	1	1
2	2	1	1
1	1	1	1
1	1	2	2
2	2	2	2
2	1		

Learn To Solder



download for free at:
http://mightyohm.com/soldercomic
(In many different languages.)

Learn To Solder



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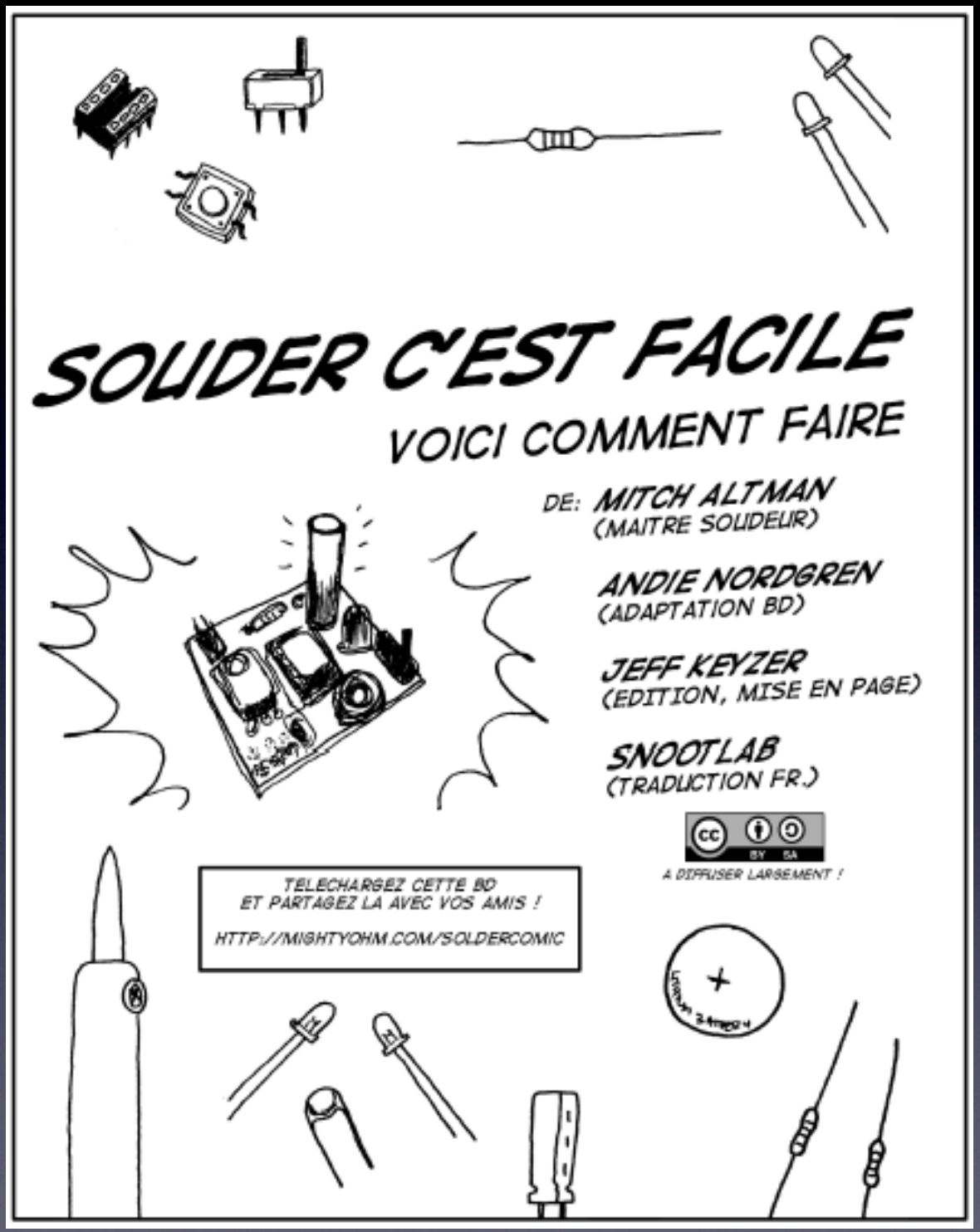
(In many different languages.)

Learn To Solder



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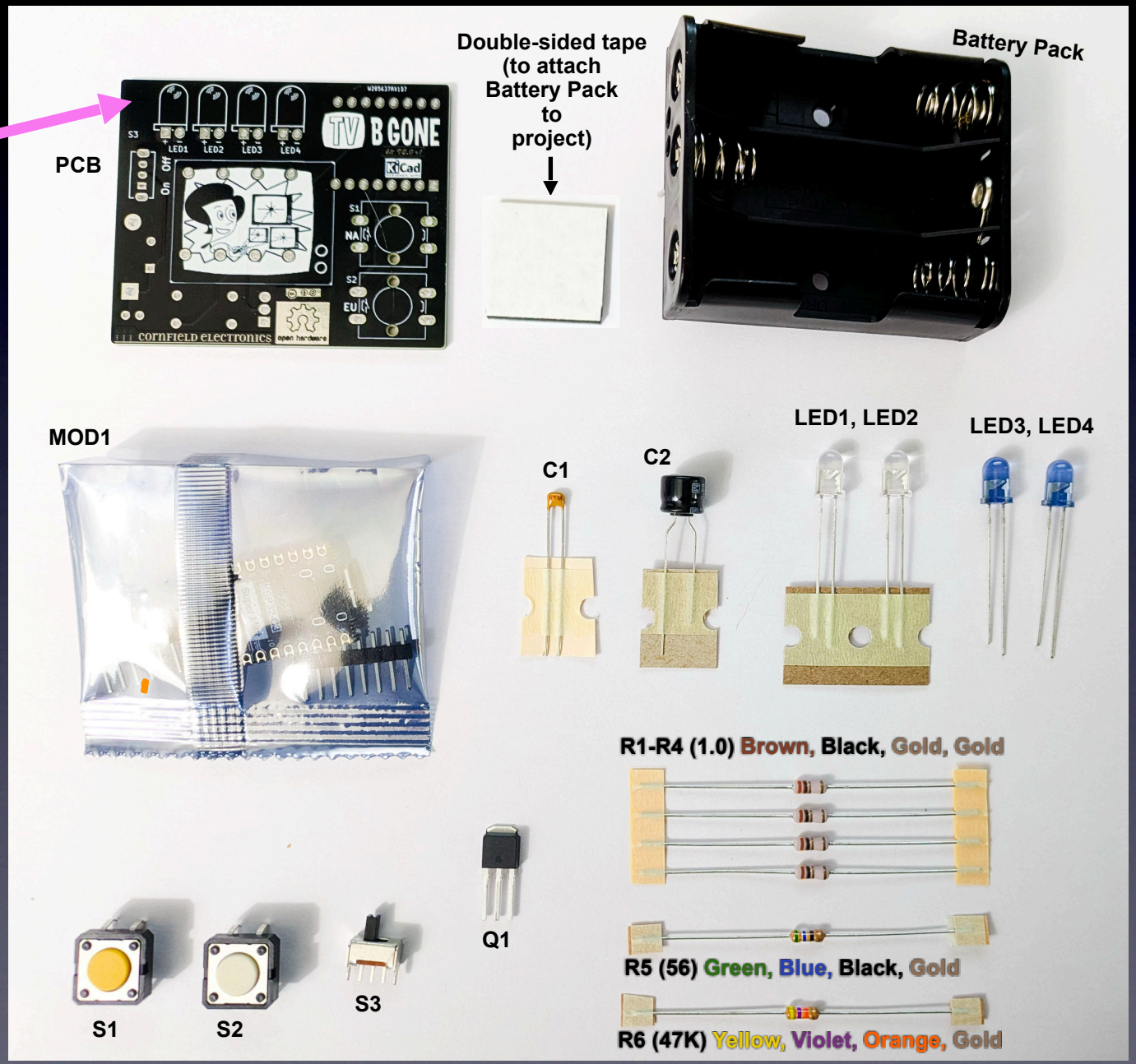
(In many different languages.)

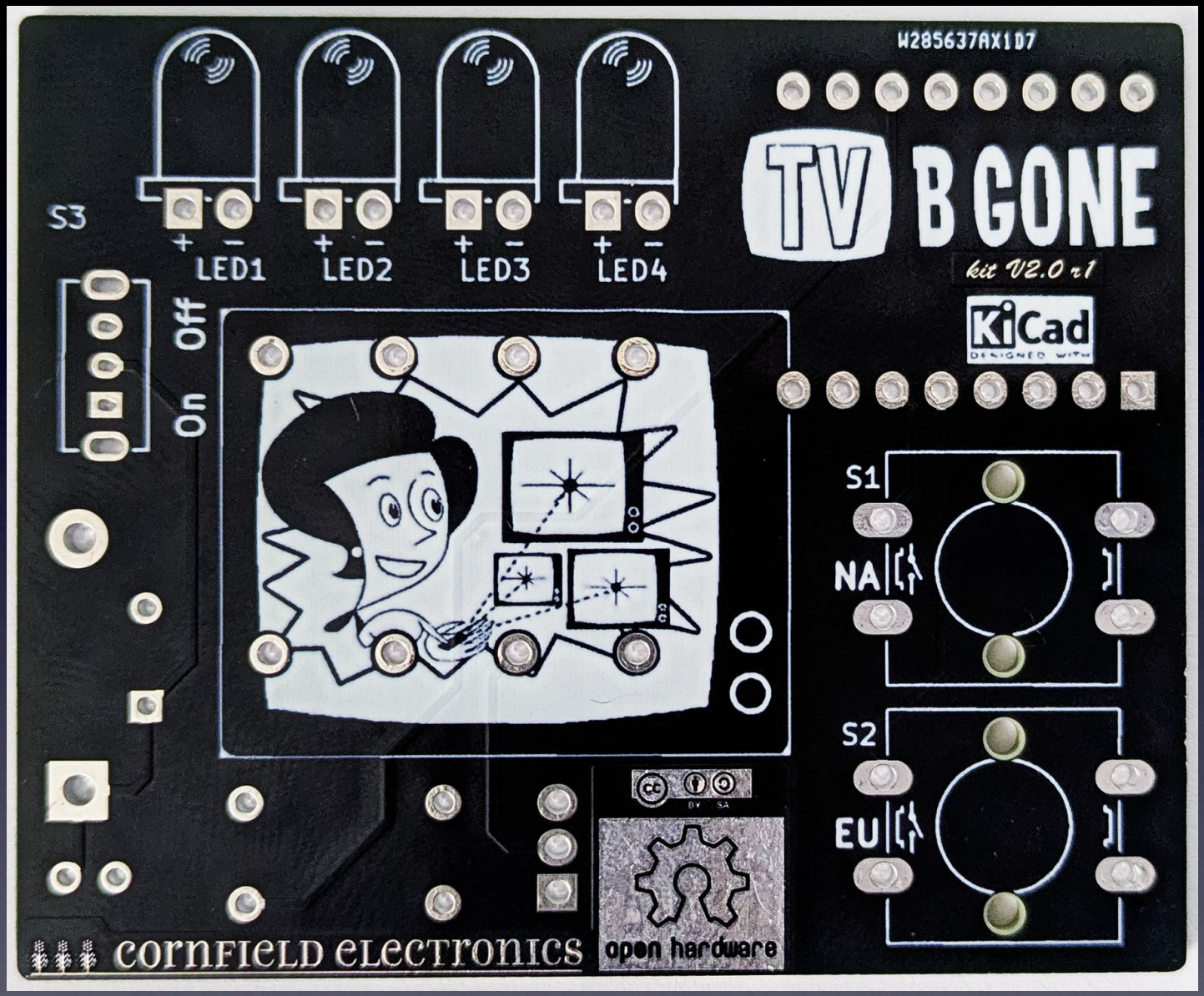
Parts

NOTE:
The board has a place for U1, but it is not included



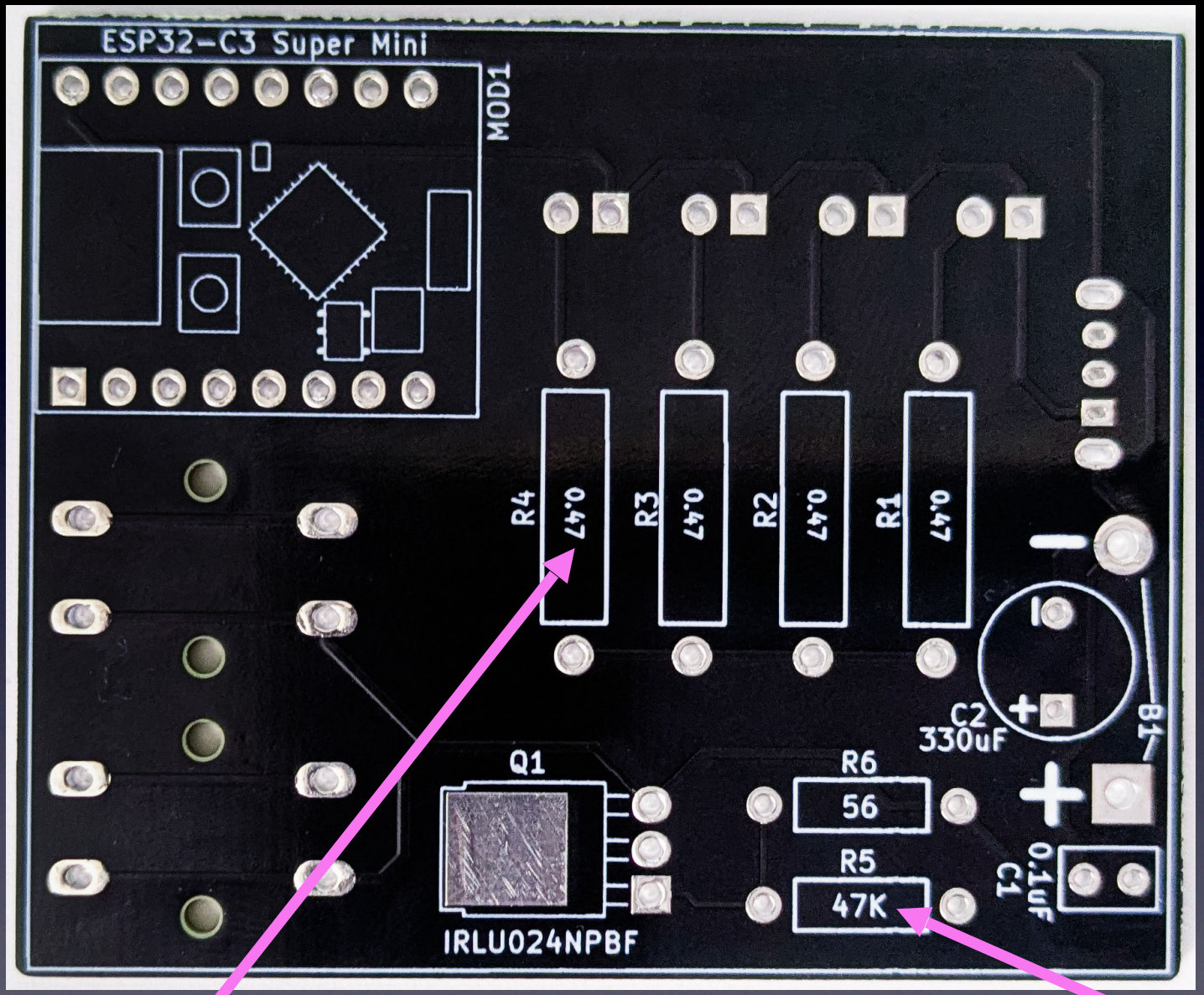
All of the parts

Board (PCB)



The Front

Board (PCB)



NOTE:
R1-R4 now correctly say 1.0

The Back

NOTE — labeling:
R5 now say correctly says 56
R6 now correctly says 47K

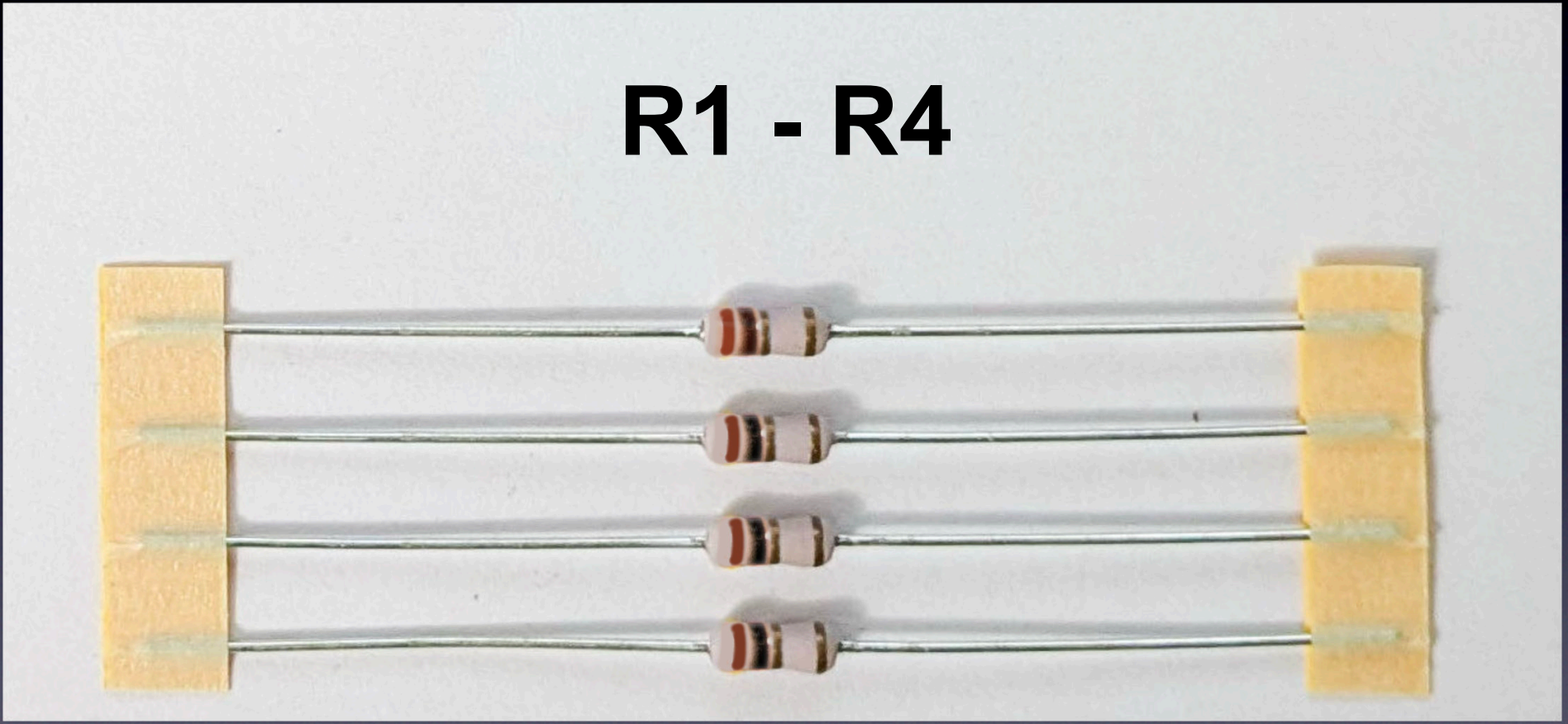
Note:

Since we will use Lead-Free solder it is helpful to also have flux paste in a syringe and Isopropyl Alcohol

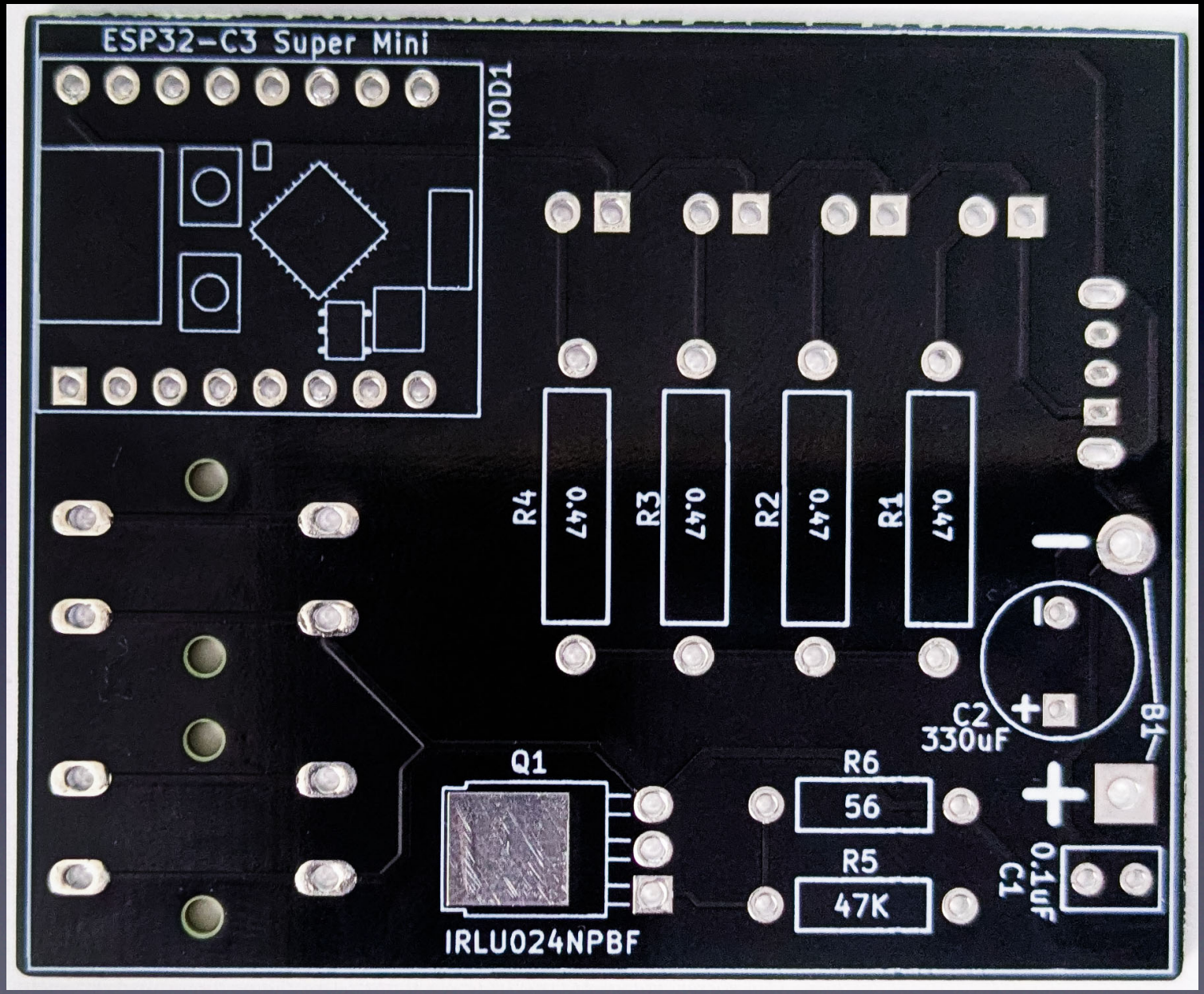
The tools you'll need:

- soldering Iron (35W or less)
- solder (*more details coming*)
- soldering iron stand
- cellulose kitchen sponge *(not plastic!)*
- *small* wire cutter

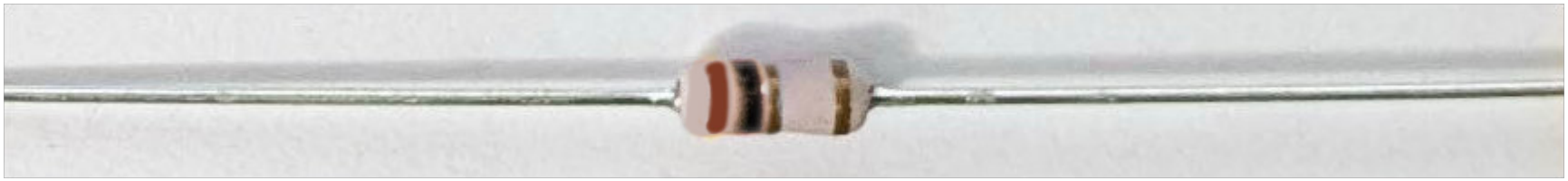
Look at the shape of these parts



See similar shapes on the PCB

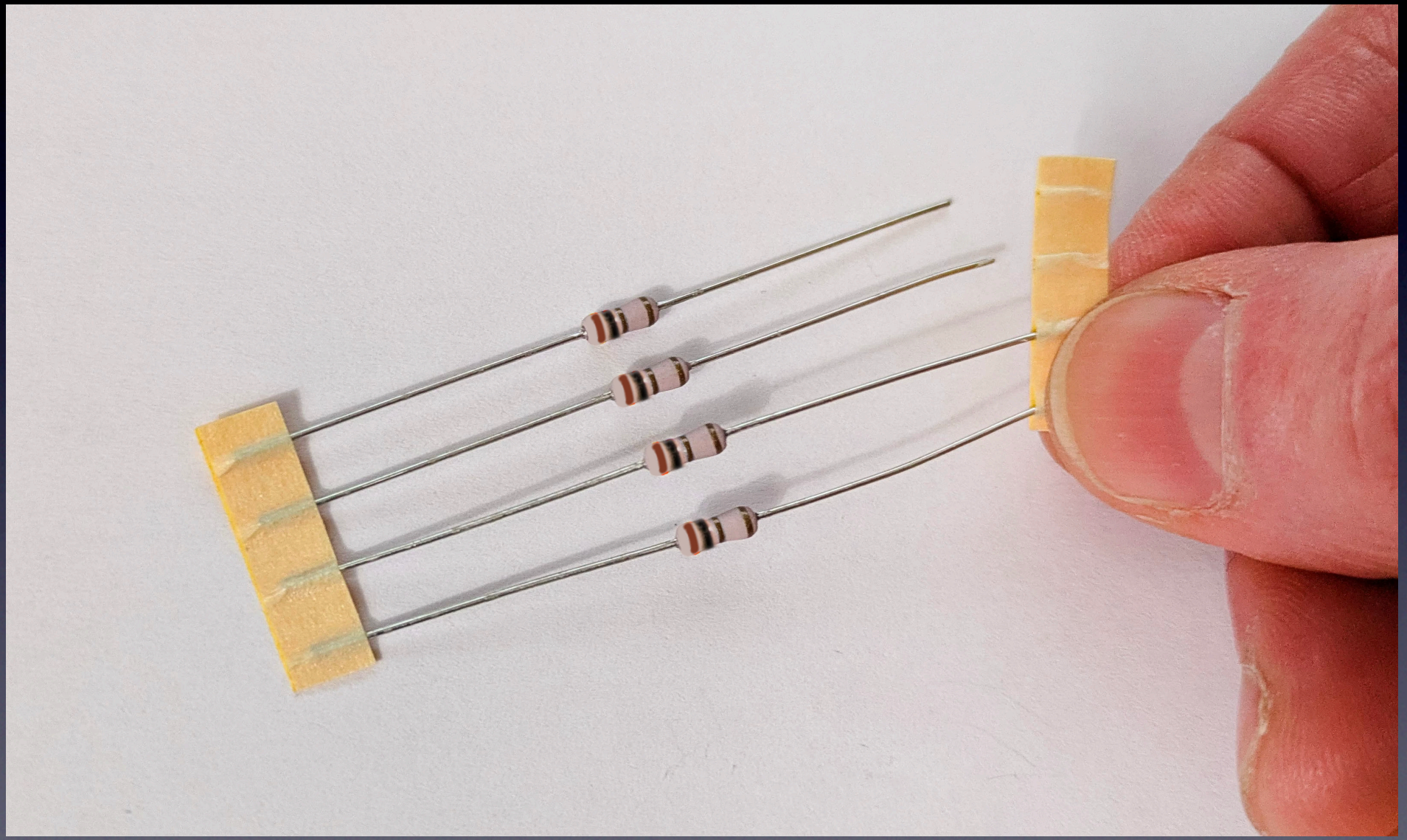


We will start with Resistor R1

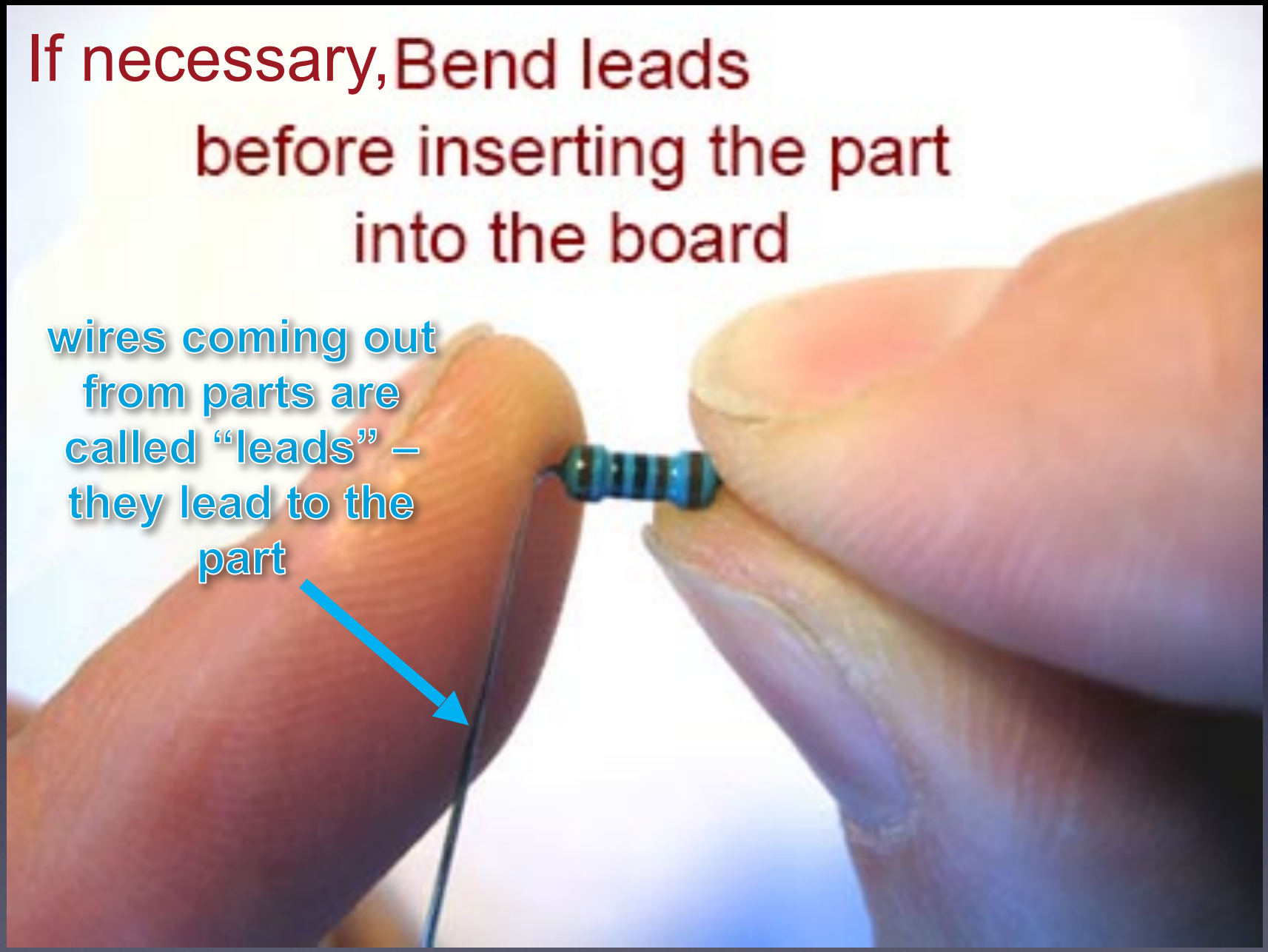


R1-R4 (1.0) Brown, Black, Gold, Gold

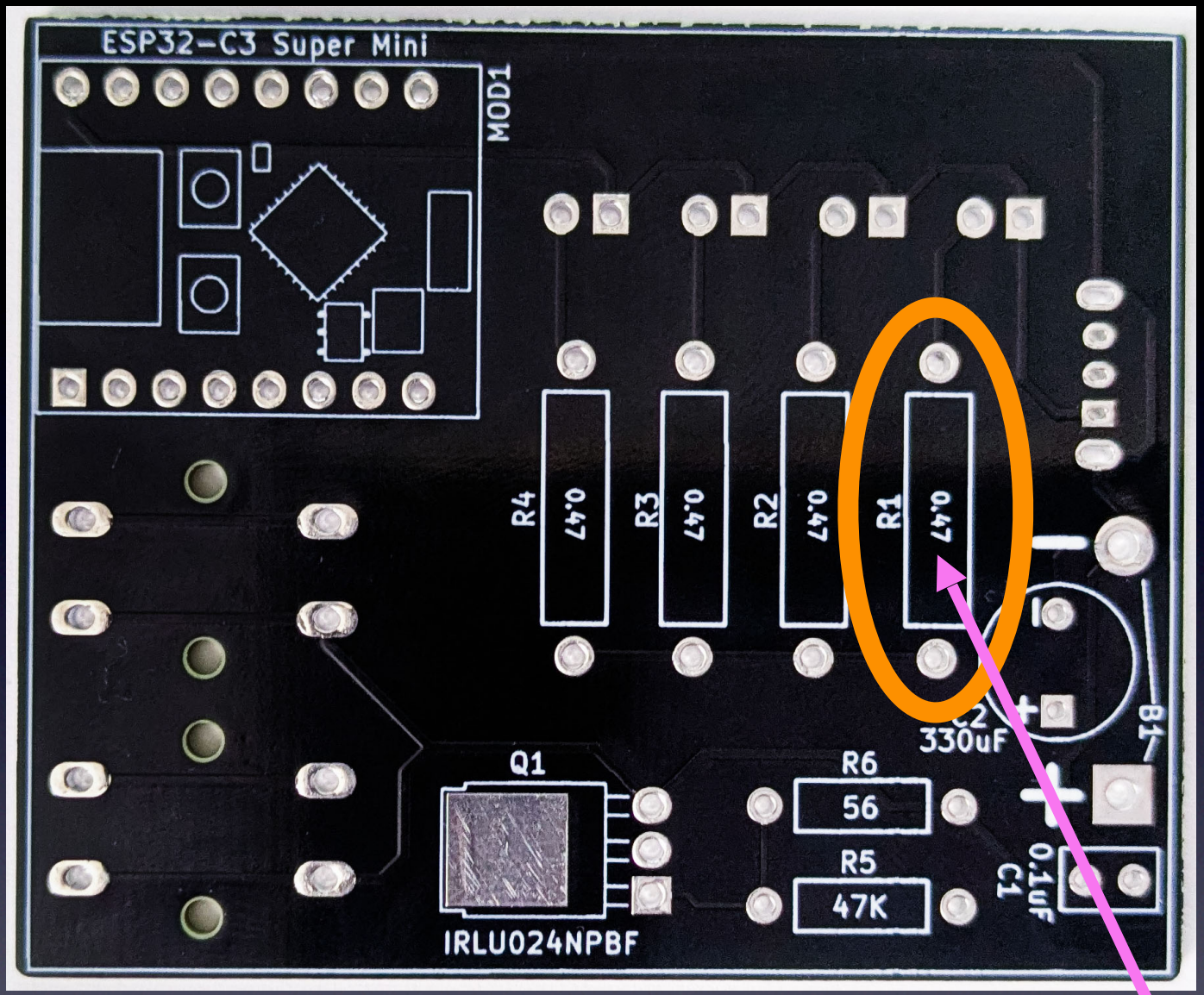
Pull tape off



Some parts, such as resistors, need their leads bent first

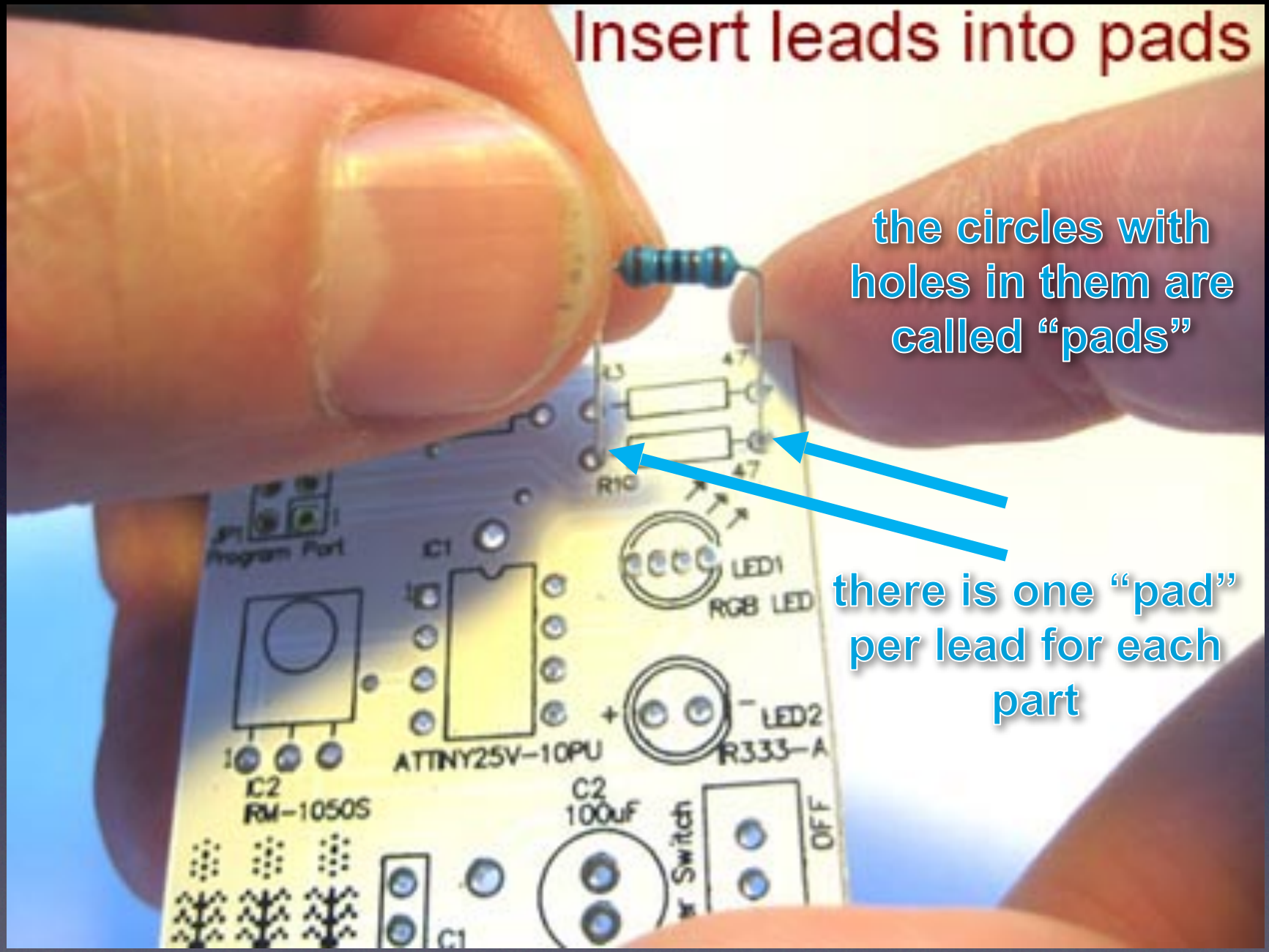


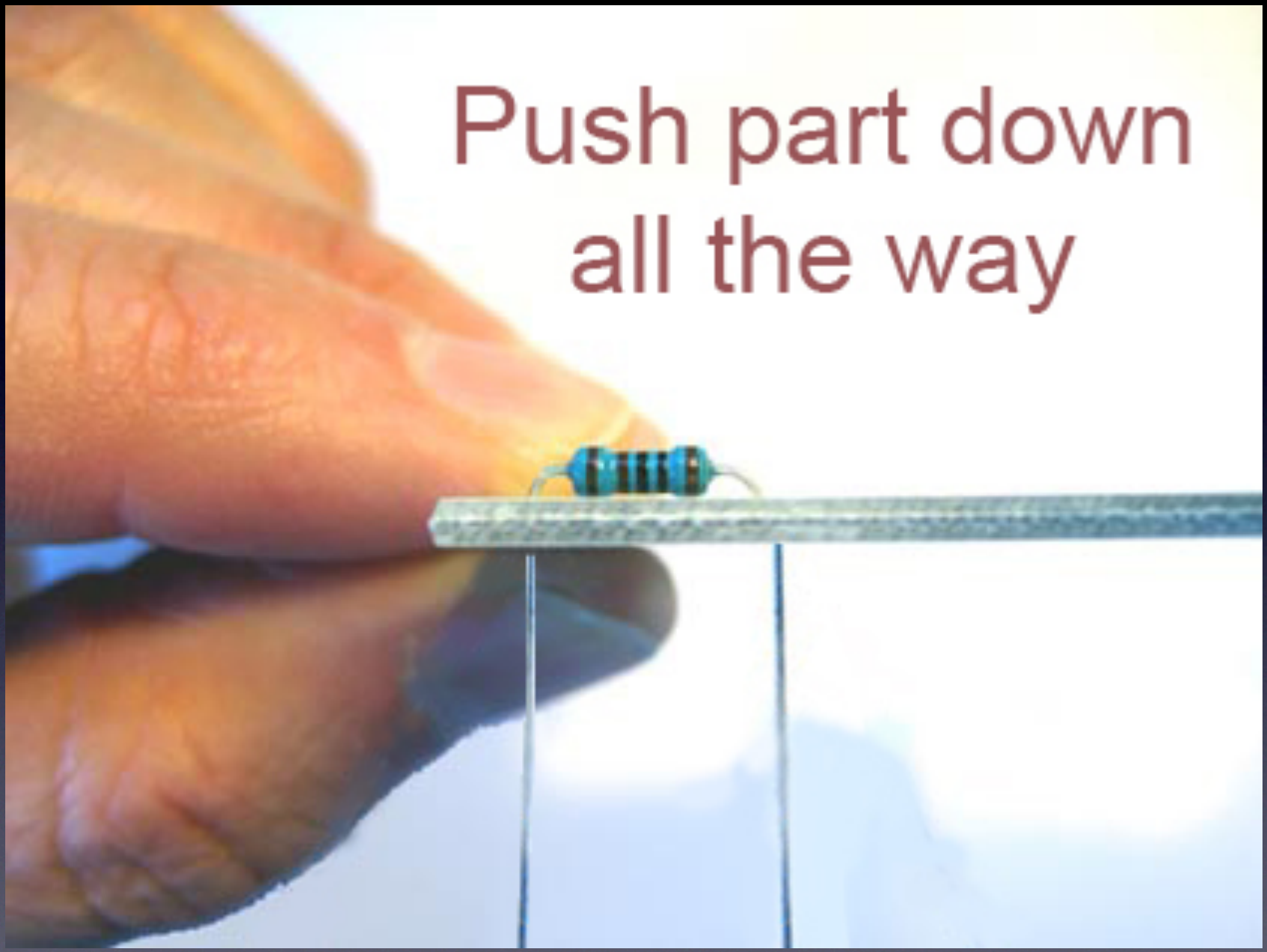
R1 – this is how it will look before inserting it into the board

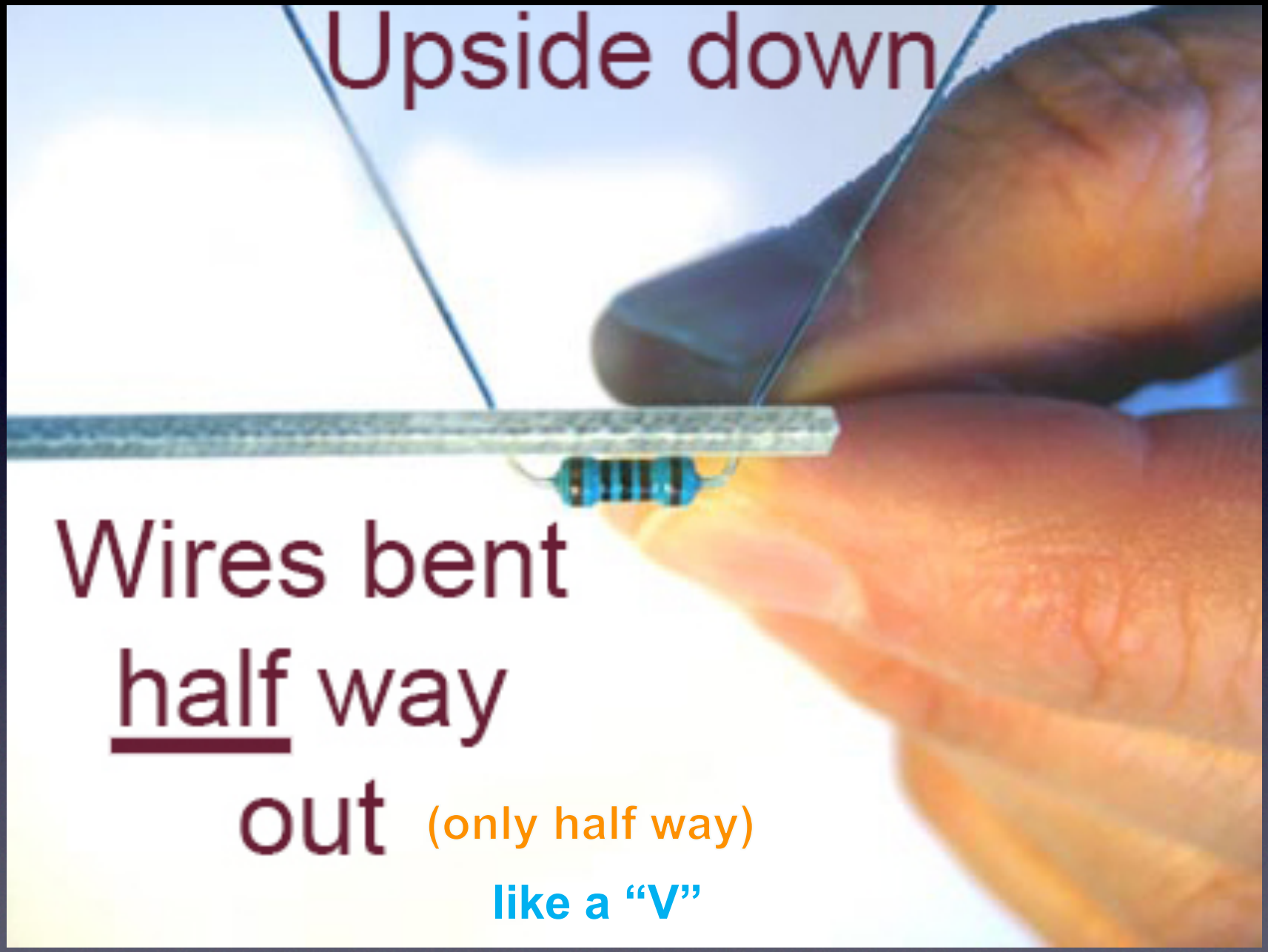


Resistor R1

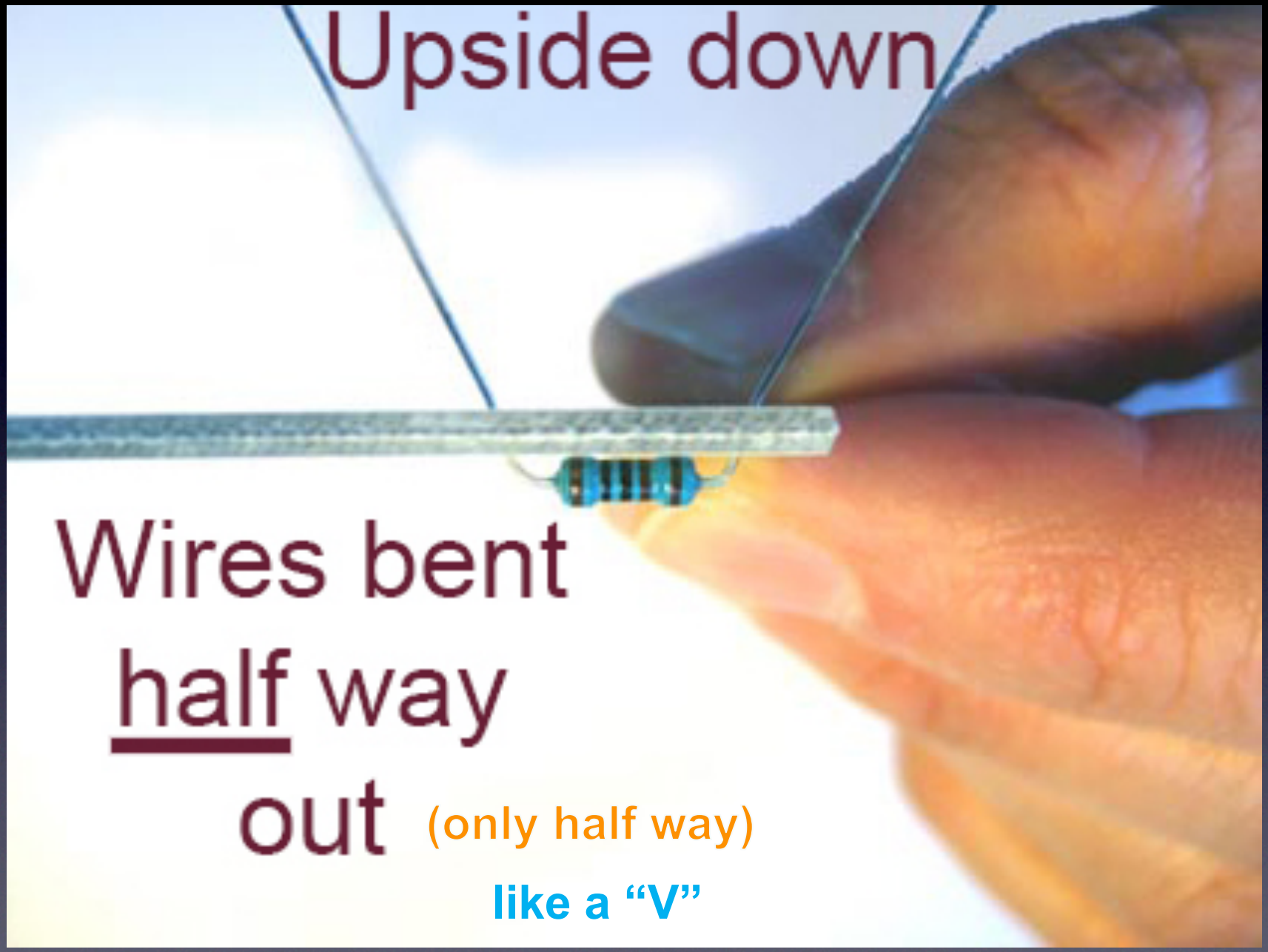
NOTE:
R1-R4 now correctly say 1.0


Insert leads into pads
the circles with holes in them are called “pads”
there is one “pad” per lead for each part
R3
47
R10
47
LED1
RGB LED
IC1
ATTINY25V-10PU
LED2
IR333-A
IC2
RM-1050S
C2
100uF
Switch
OFF
C1

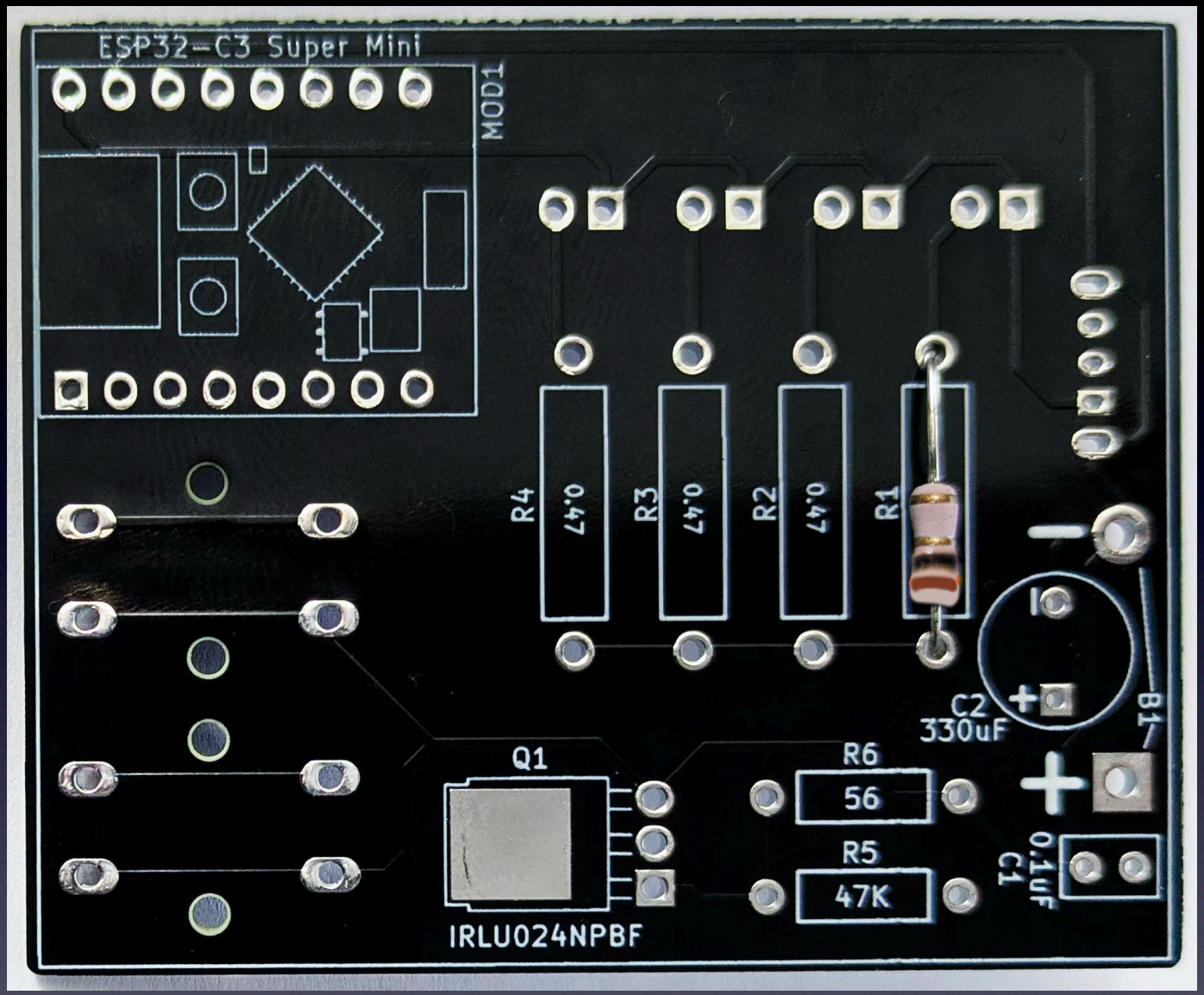

Push part down
all the way



so that the part won’t fall out while soldering it



Ready to Solder !



Resistor R1 inserted

How to hold a soldering iron

(Like a pencil – held from underneath)

Important

The best kind of solder for DIY electronics:

(Sn – Tin / Pb – Lead)

63/37 rosin core,

0.031” (0.8mm) diameter (or smaller)

(60/40 is also good)

Note:

Most
Lead-Free **solder**
has poisonous fumes!

This is what we will use:

A good kind of solder for DIY electronics:

This is the only good Lead-Free ***solder I have found!***

(after years of searching)

Kester
K100LD Rosin
(not "No Clean")
0.031" diameter (0.8mm)

This is what we will use:

A good kind of solder for DIY electronics:

This is the only good Lead-Free solder I have found!

(after years of searching)

Kester **K100LD Rosin** Solder

0.031” diameter (0.8mm)

Note:

Since we will use *Lead-Free* solder
it is *helpful*
to also have
***flux paste* in a syringe**
and Isopropyl Alcohol

Another good kind of solder for DIY electronics:

This is another good Lead-Free solder I have found!

Duratool
D01685 Rosin

0.7mm diameter

(as good as the Kester K100LD Rosin)

Another good kind of solder for DIY electronics:

This is another good Lead-Free solder I have found!

MG Chemicals
4900 Rosin (112g, 227g, 454g)

0.8mm diameter

(as good as the Kester K100LD Rosin)

Another good kind of solder for DIY electronics:

This is another good Lead-Free solder I have found!

iFixit
IF145-077-2 (12g)
1.0mm diameter

(as good as the Kester K100LD Rosin)

3 Safety Tips…

Safety Tip #1:

Hot!!

(When you touch the tip,
you *will* let go quickly every time!)

Safety Tip #2:

Soldering chemicals are toxic

But they easily wash off your hands with soap and water

Safety Tip #3:

(coming soon…)

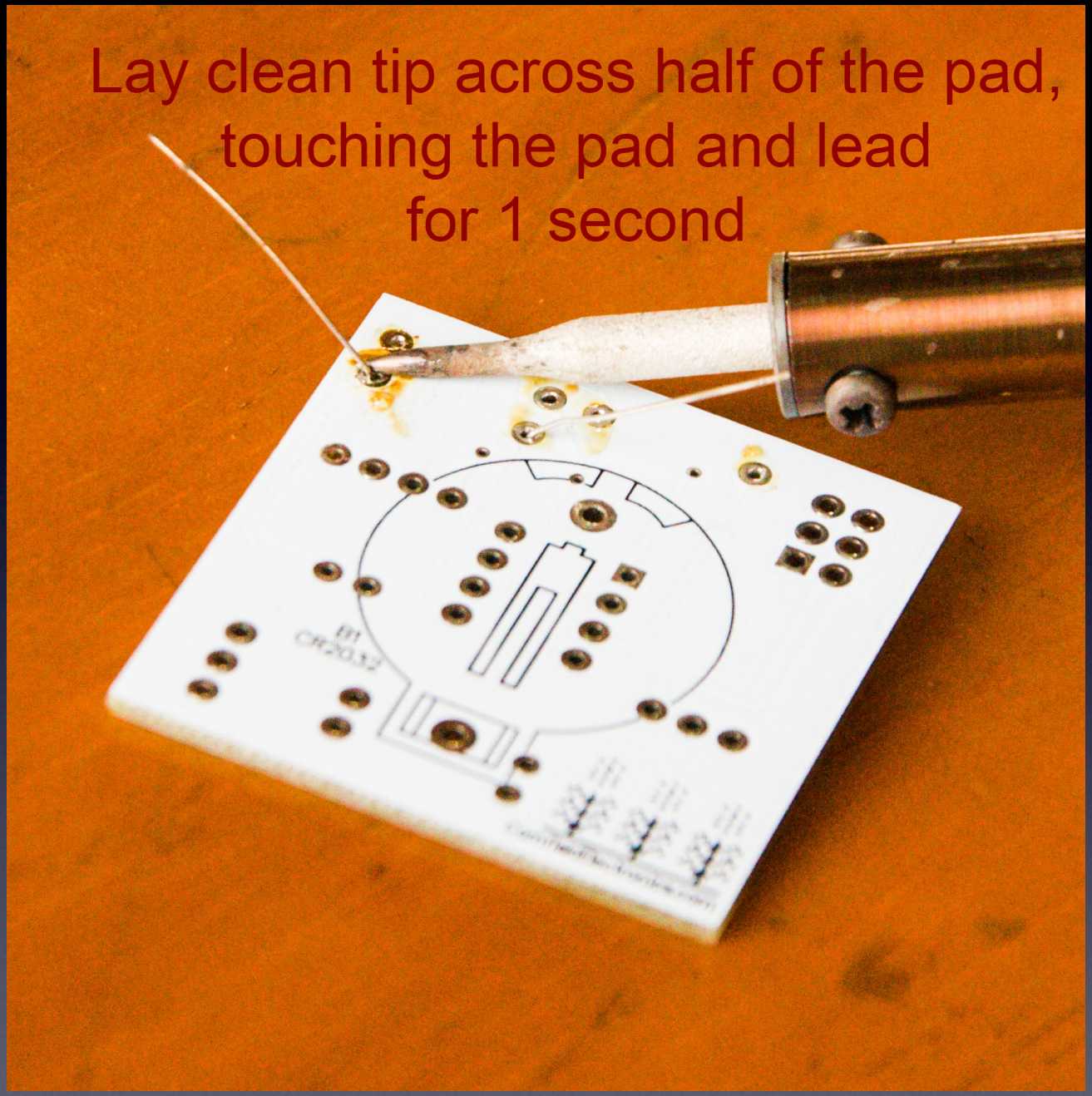
2 secrets
to good soldering…

Secret #1:

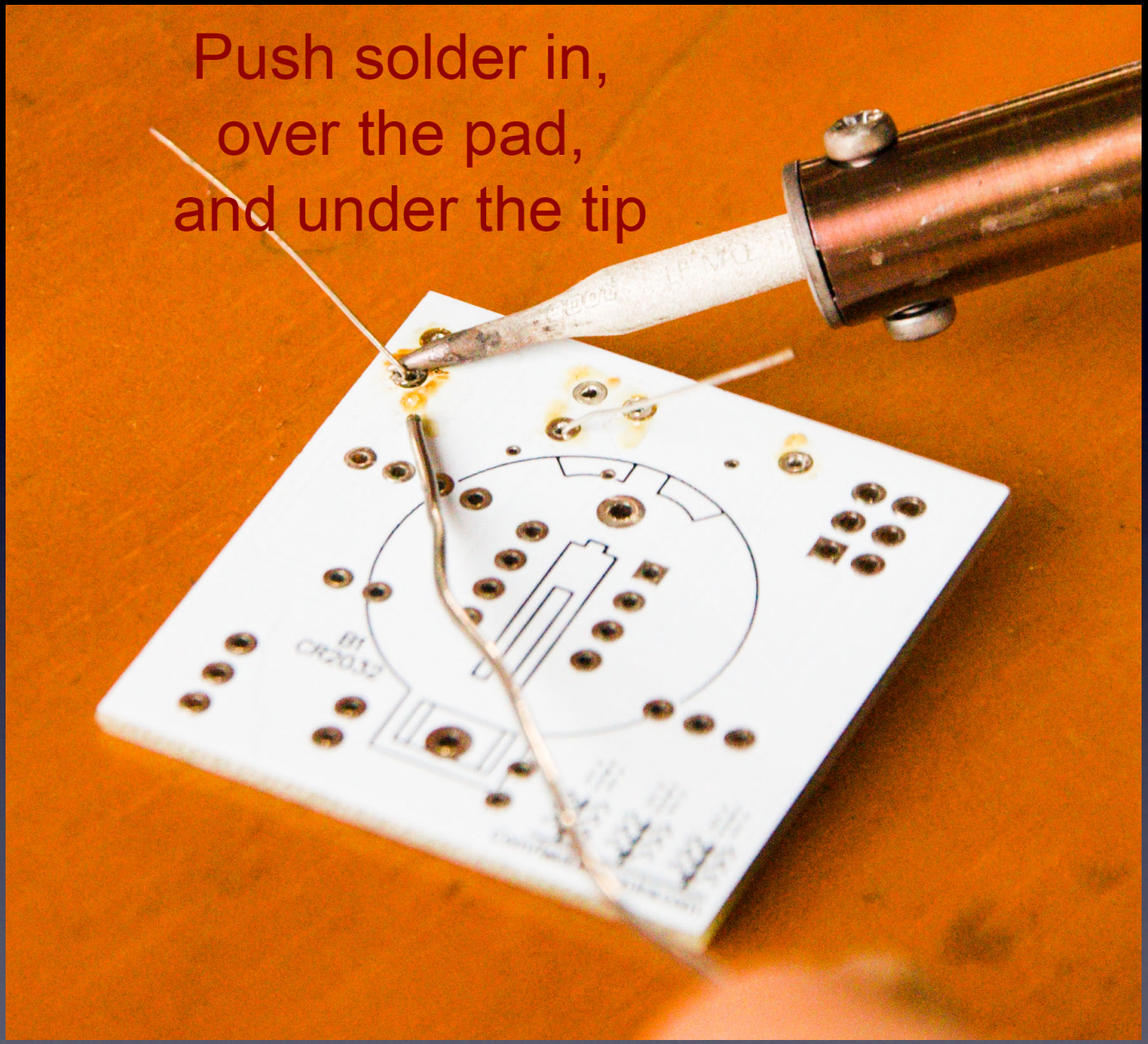
Clean the tip!
(before every solder connection)

Bang (lightly) 3 times,
Swipe, Rotate, Swipe (on the sponge):

Keep the tip shiny silver!

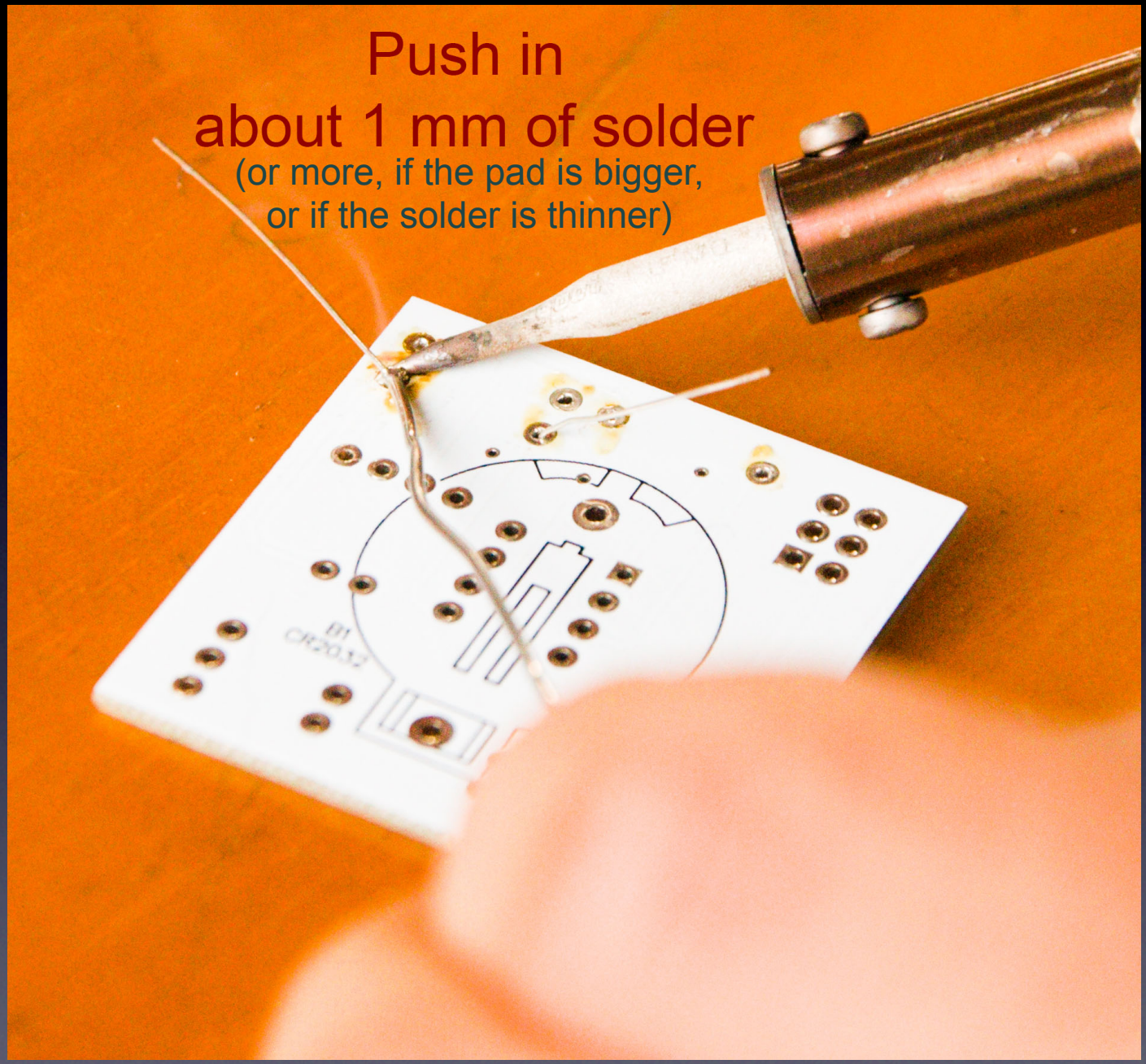

Lay clean tip across half of the pad,
touching the pad and lead
for 1 second

Do this quickly (slowly doesn't work well) – solder in & out in about 1 second



IMPORTANT: Make sure solder melts on the underside of the soldering iron tip (not the side or top of the soldering iron tip)!

Do this quickly (slowly doesn't work well) – solder in & out in about 1 second



Make sure solder melts on the <u>underside</u> of the soldering iron tip
(not the side or top of the soldering iron tip)!

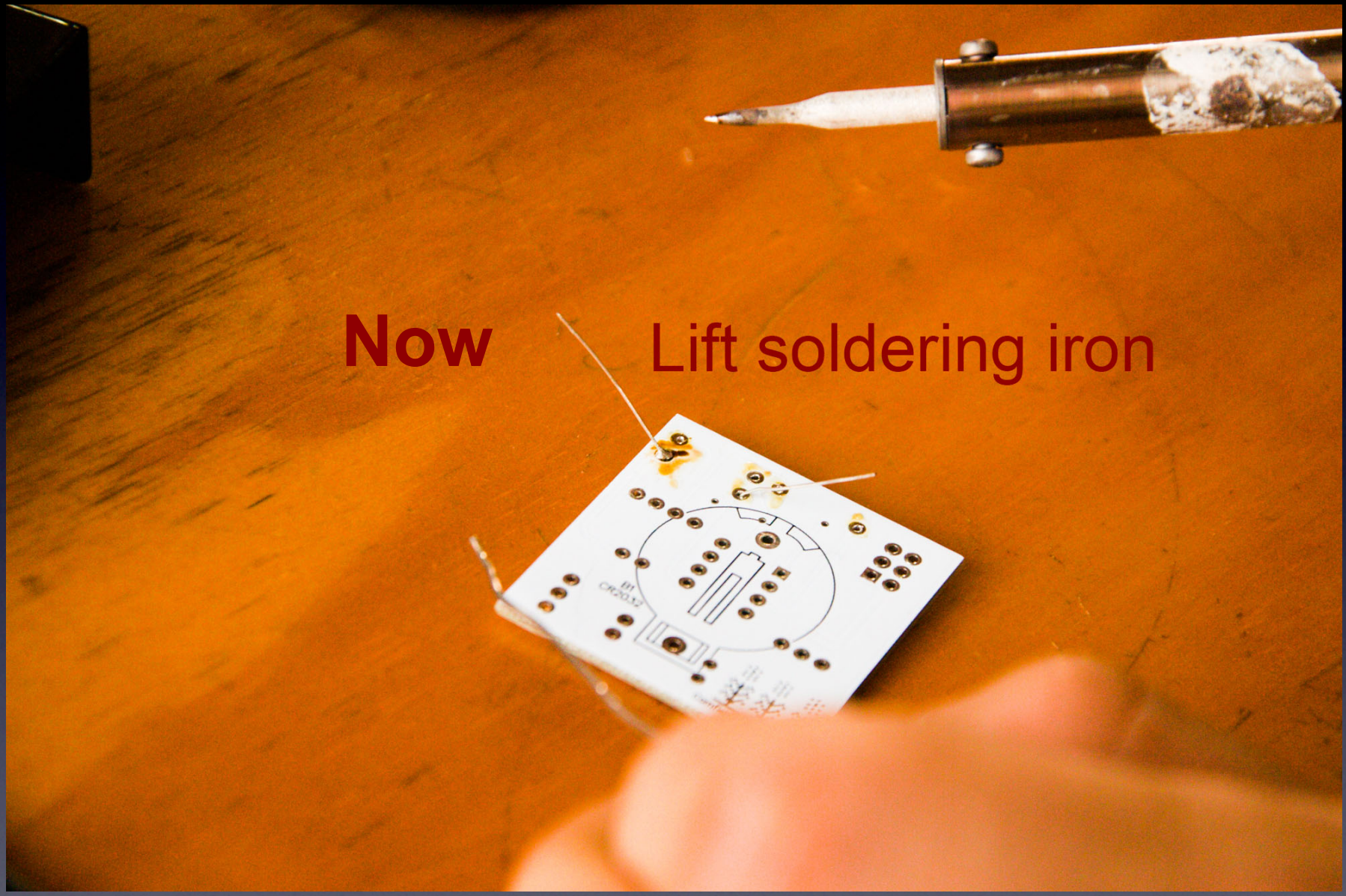
HEY !!!

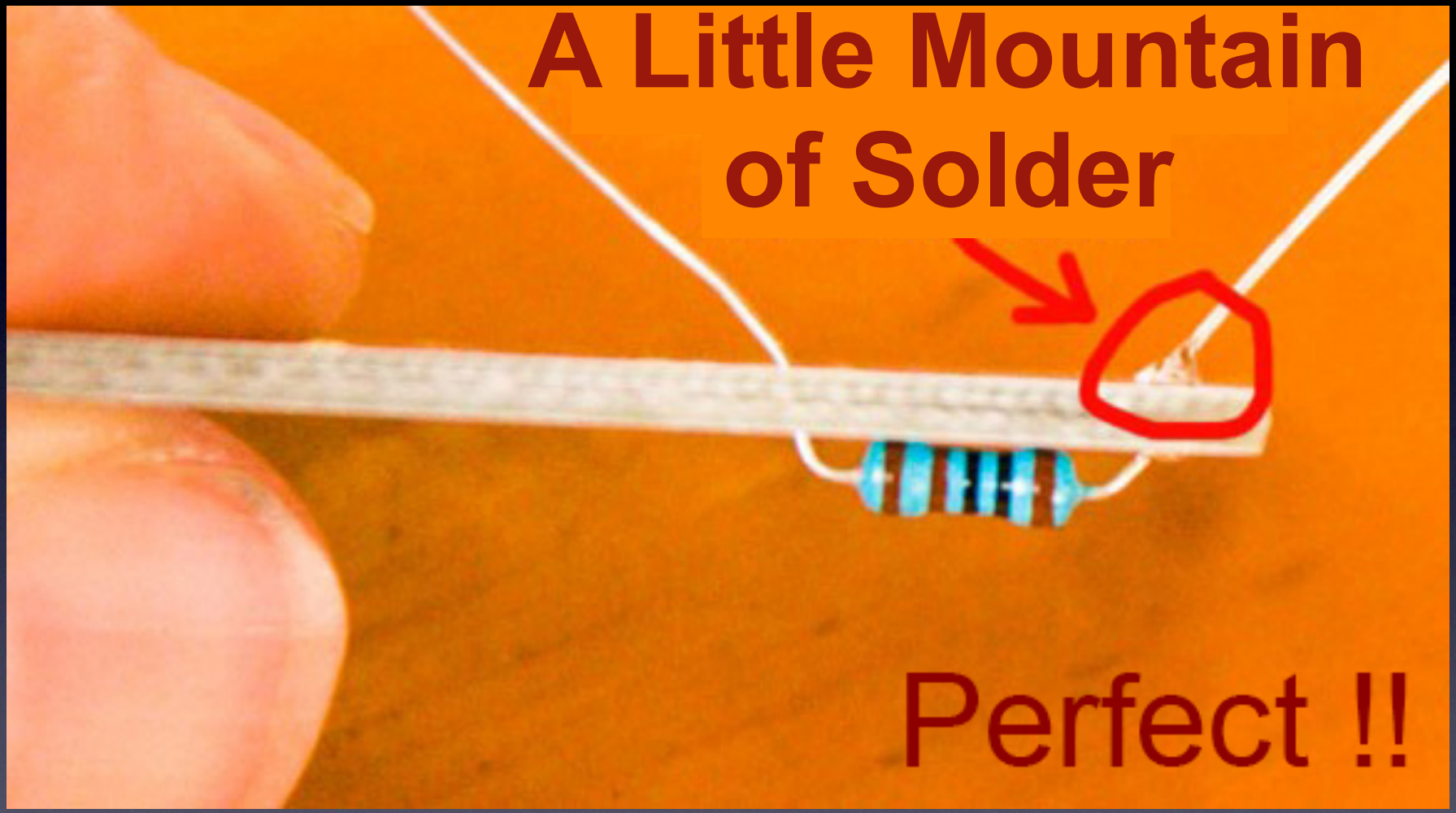
KEEP HOLDING TIP DOWN FOR 1 MORE SECOND !!

WAIT !!
Don’t lift the tip !!

Secret #2:

Keep hot tip down
1 second
For solder to flow !!


Now
Lift soldering iron



If you can see any of the pad, or the hole, you need more solder – so, just do all the steps again to make it perfect.

The Rhythm !

is just as important as the preceding steps!

The Rhythm !

and speed (about 1 second per step)

The Rhythm !

and speed (about 1 second per step)

Clean the tip

The Rhythm !

and speed (about 1 second per step)

Tip Down

The Rhythm !

and speed (about 1 second per step)

Solder In

The Rhythm !

and speed (about 1 second per step)

Solder Out

The Rhythm !

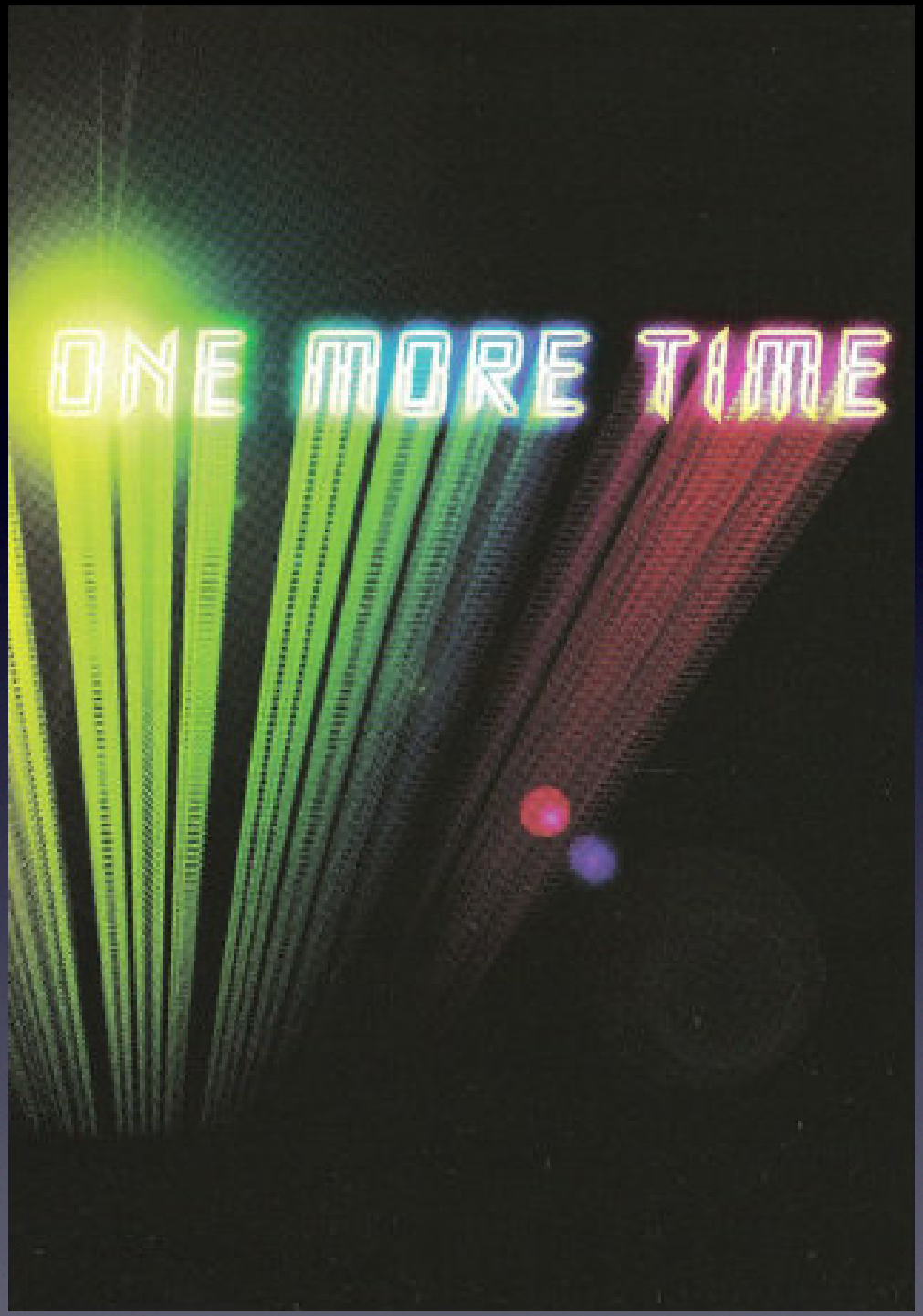
and speed (about 1 second per step)

WAIT !

The Rhythm !

and speed (about 1 second per step)

Lift Tip


ONE MORE TIME

The Rhythm !

and speed (about 1 second per step)

The Rhythm !

and speed (about 1 second per step)

Clean the tip

The Rhythm !

and speed (about 1 second per step)

Tip Down

The Rhythm !

and speed (about 1 second per step)

Solder In

The Rhythm !

and speed (about 1 second per step)

Solder Out

The Rhythm !

and speed (about 1 second per step)

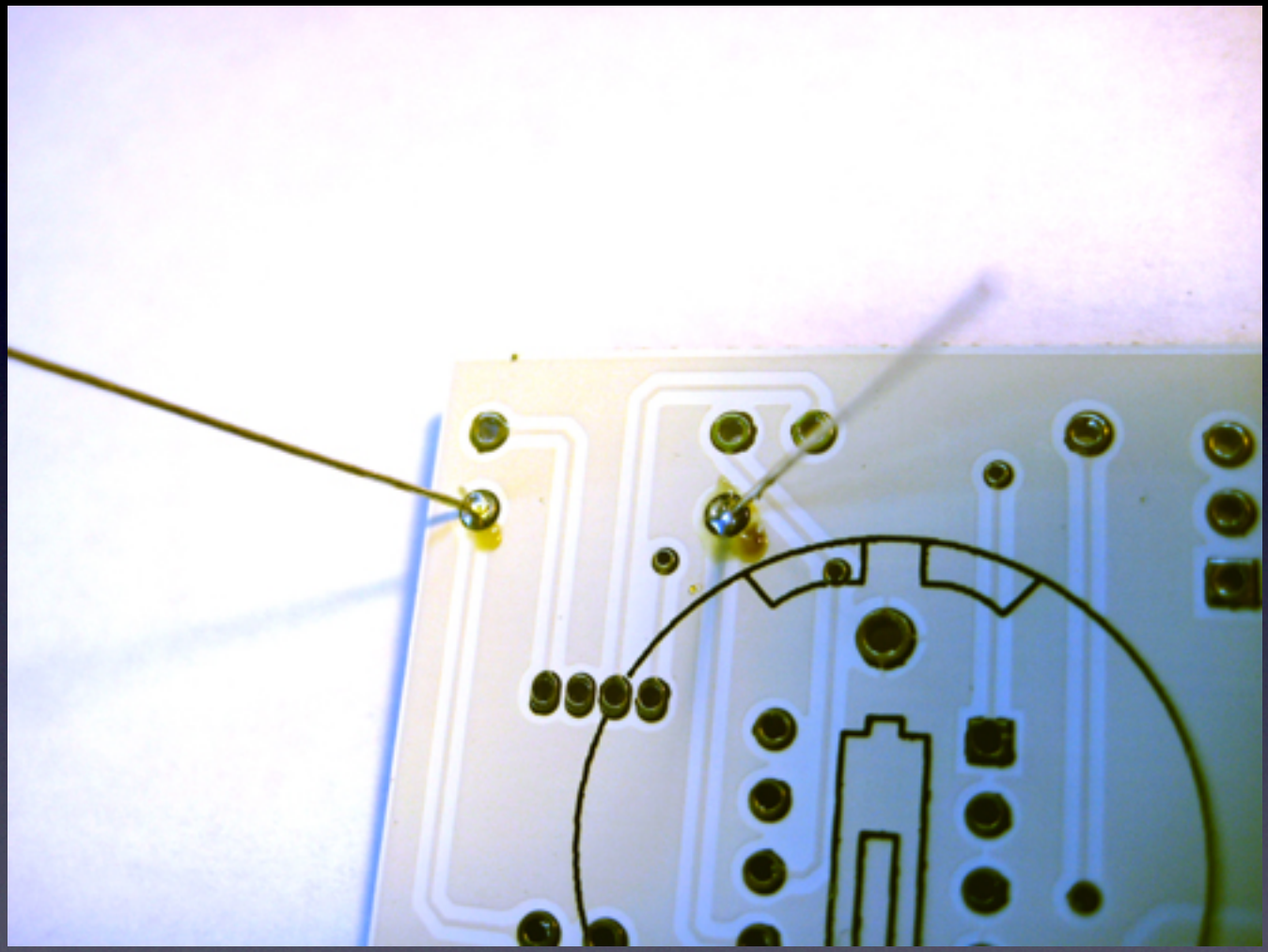
WAIT !

The Rhythm !

and speed (about 1 second per step)

Lift Tip

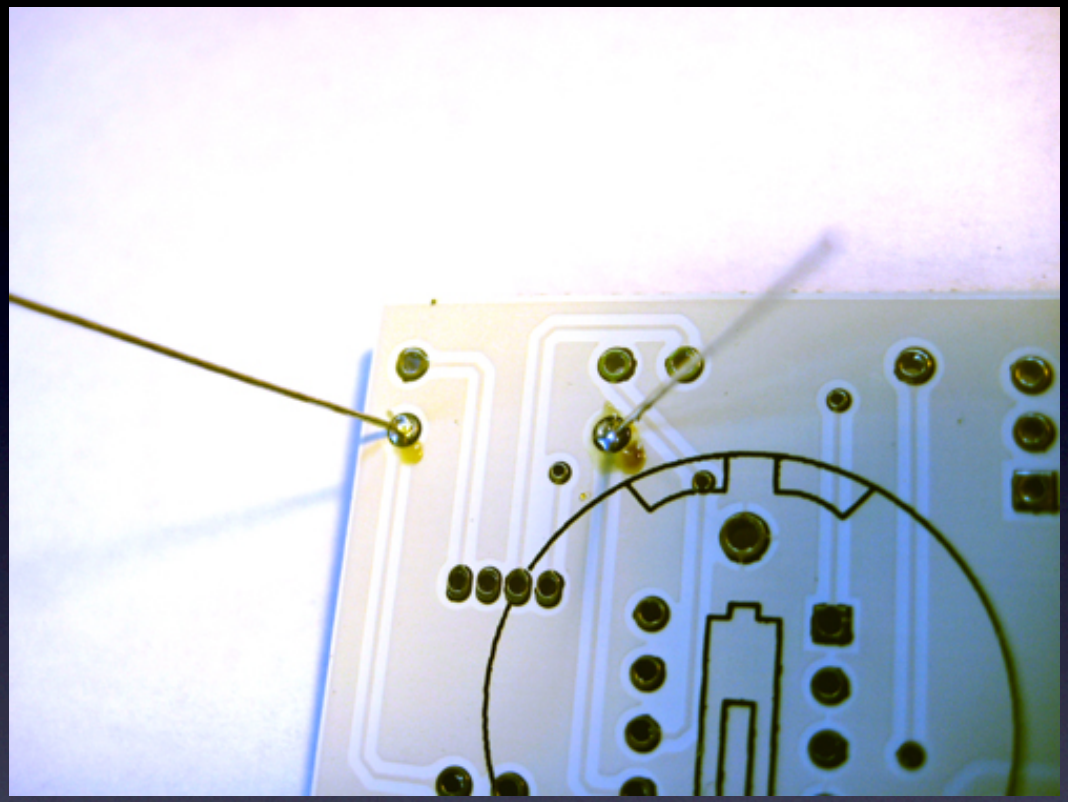
Solder all of the leads of the part to the board



For this part, there are two leads

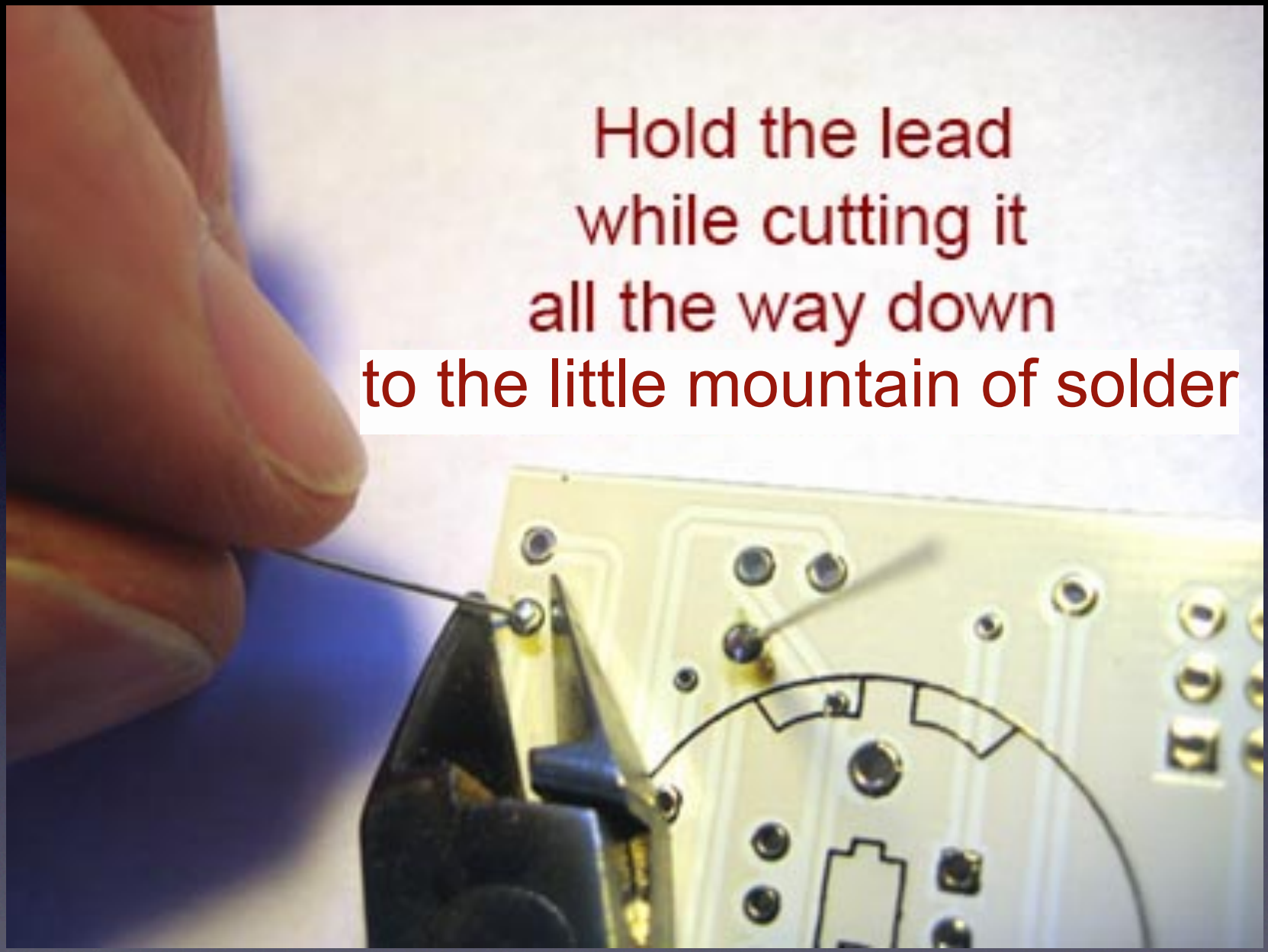
Here you can see two good solder connections

Two good solder connections



- Little mountains (not flat)
- Pads totally covered in solder
- Can’t see the hole
- No connections to other pads

Now cut the leads short



Cutting with the tip of the wire cutter gives you more control

Safety Tip #3:

Hold or cover the lead !

(or it will fly into your eye!)

(They like doing that – so please hold or cover the lead when you cut.)

No wires sticking out

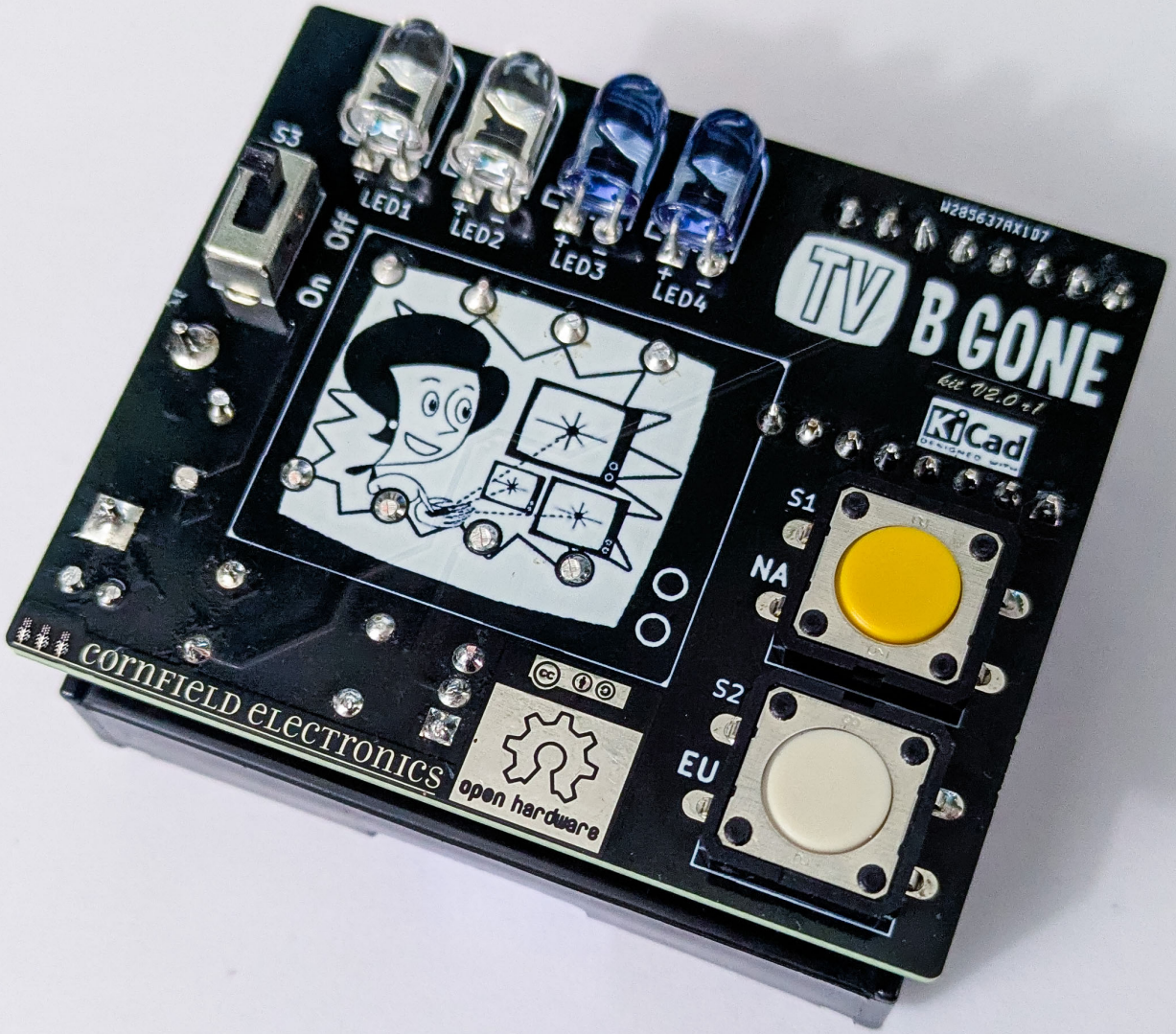
A closer look at good solder connections

Notice that:

- Each connection is a small mountain (not flat)
- You cannot see any pad (they're totally covered with solder)
- You cannot see the holes (they're totally covered with solder)
- No connections to other pads

One part at a time

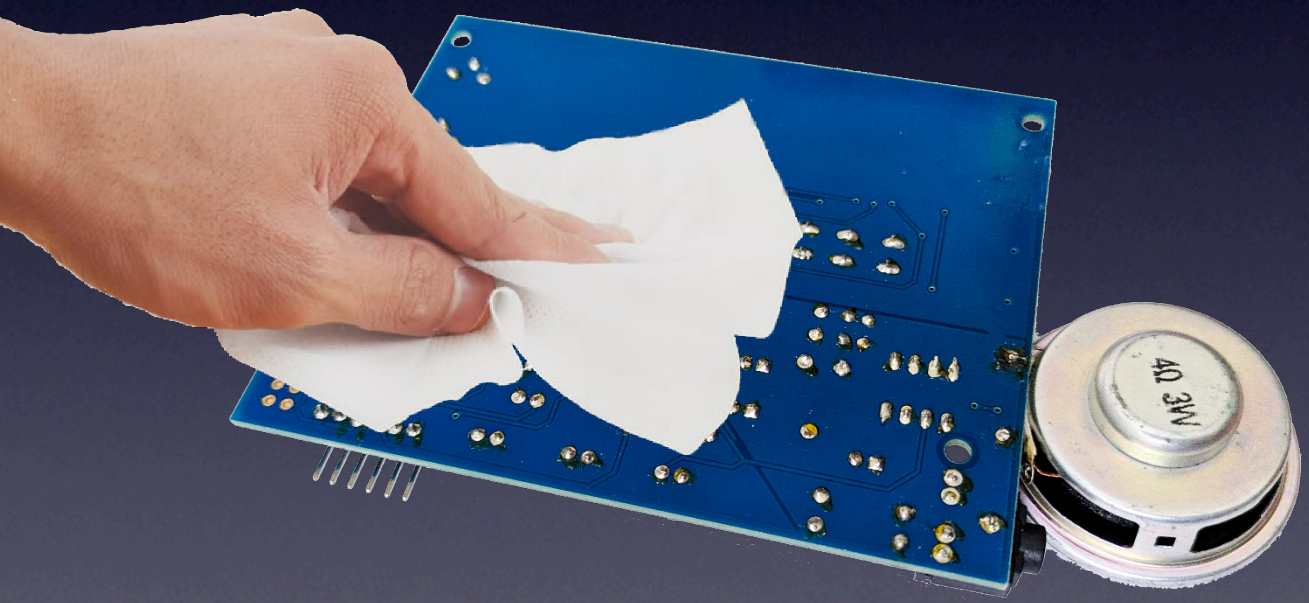
Till all the parts are soldered



And it will look like this when you're done.

If you used any *flux paste for re-working problems*

The bottom of the PCB will be sticky from the flux



You can clean it with a cloth wet with Isopropyl Alcohol

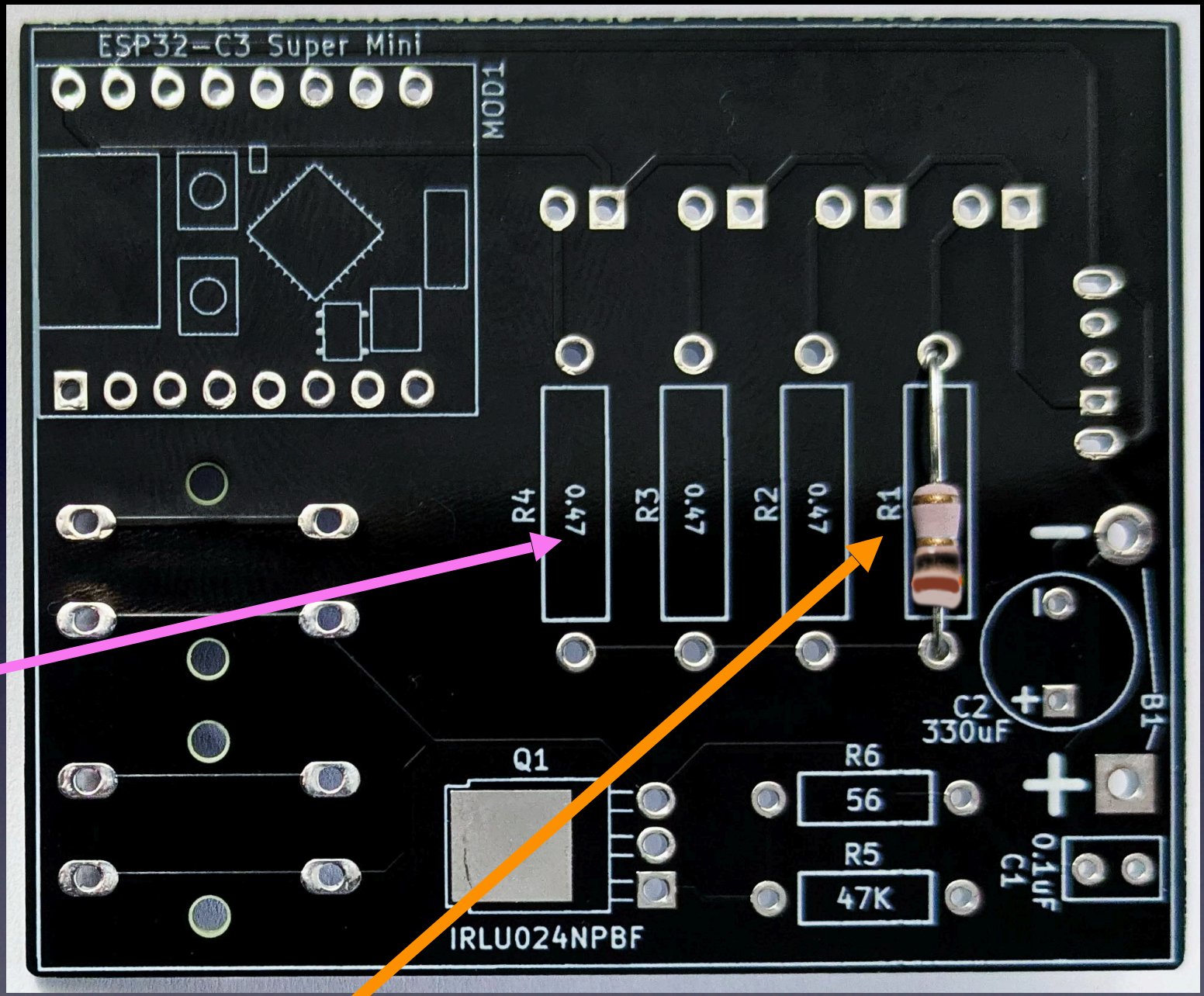
Then test with batteries,

And it works!

(Or you start debugging.)

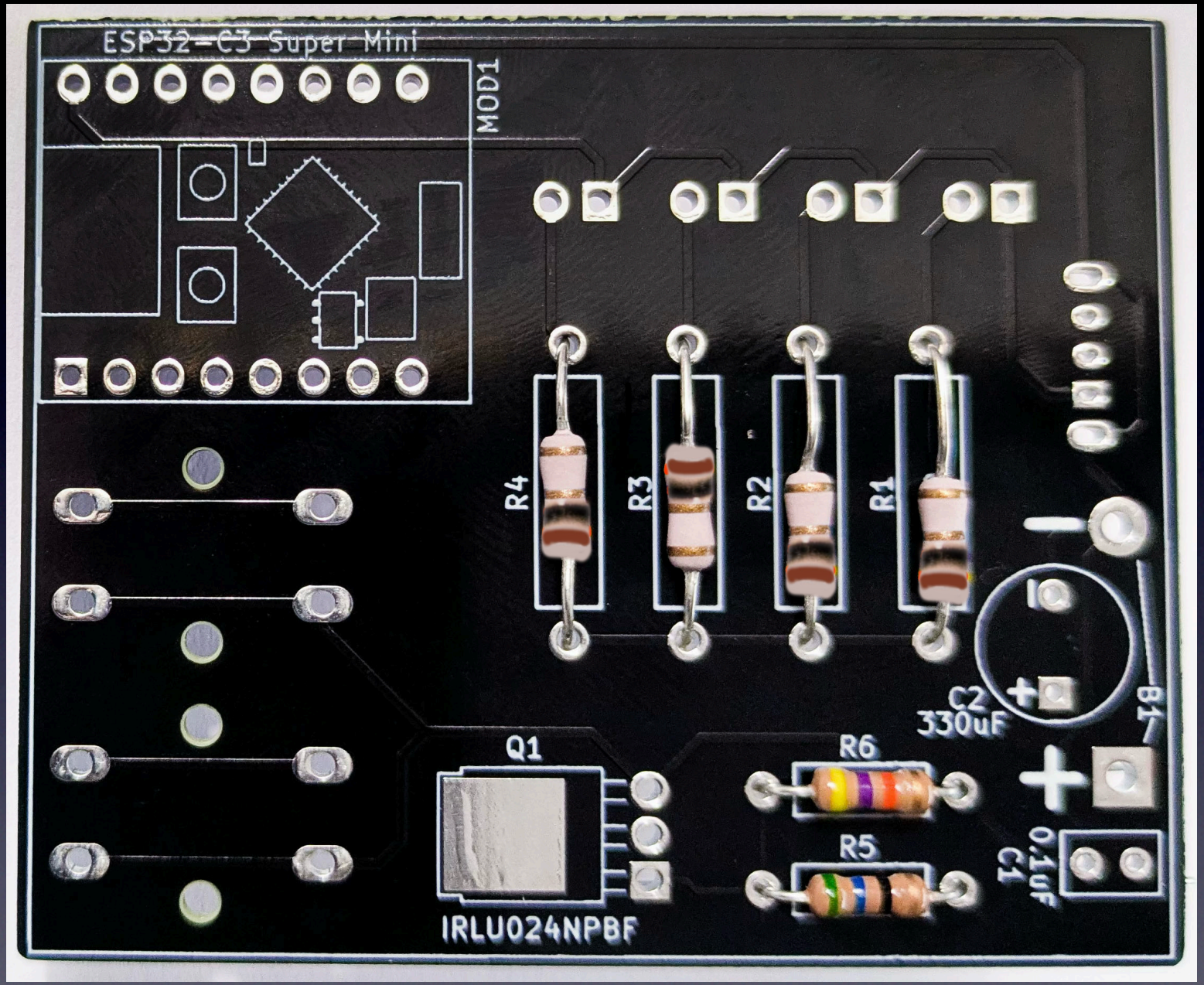
Let’s start!

NOTE:
R1-R4 now correctly say 1.0



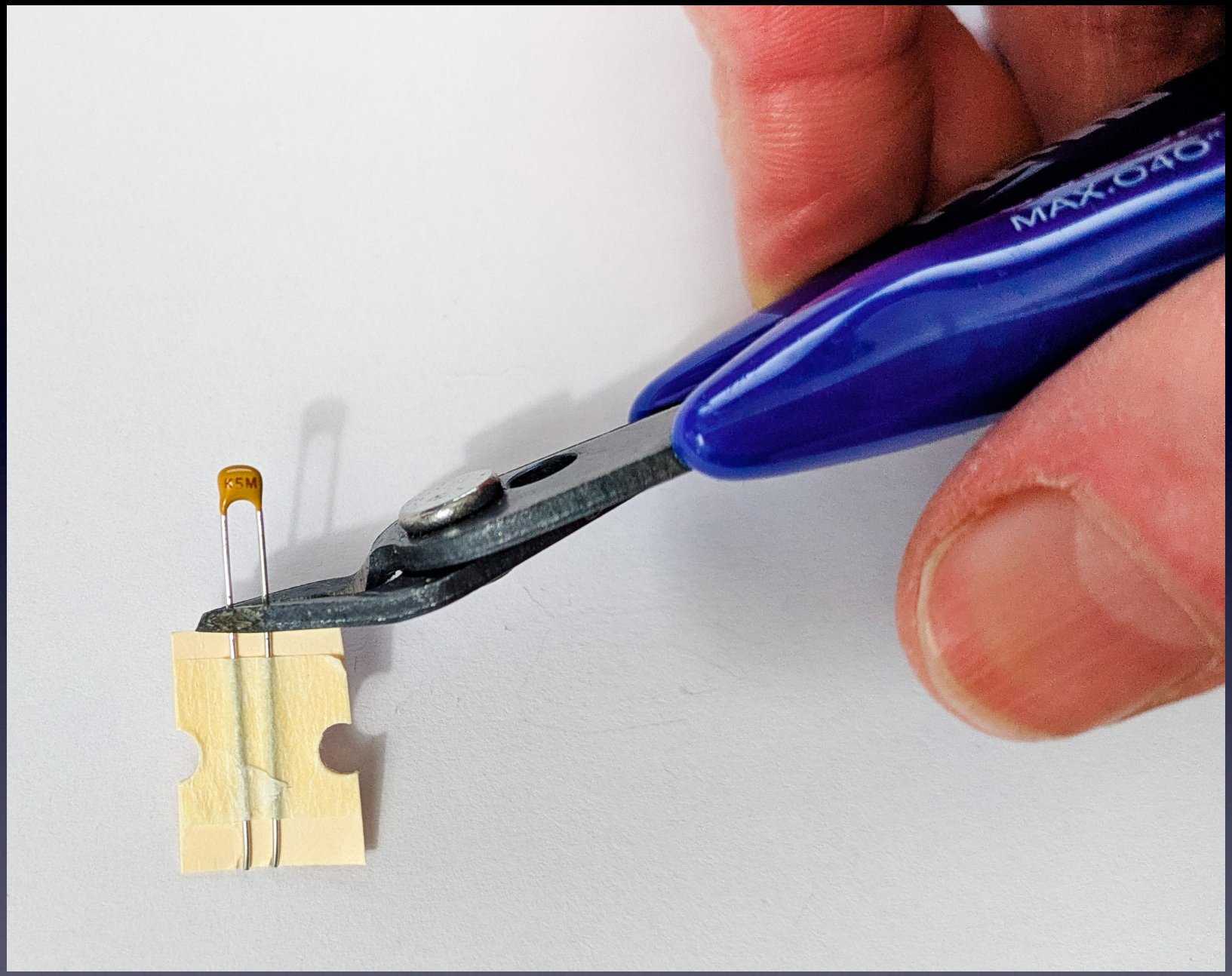
Resistor R1

(Direction does not matter)



All 6 Resistors: R1 - R6

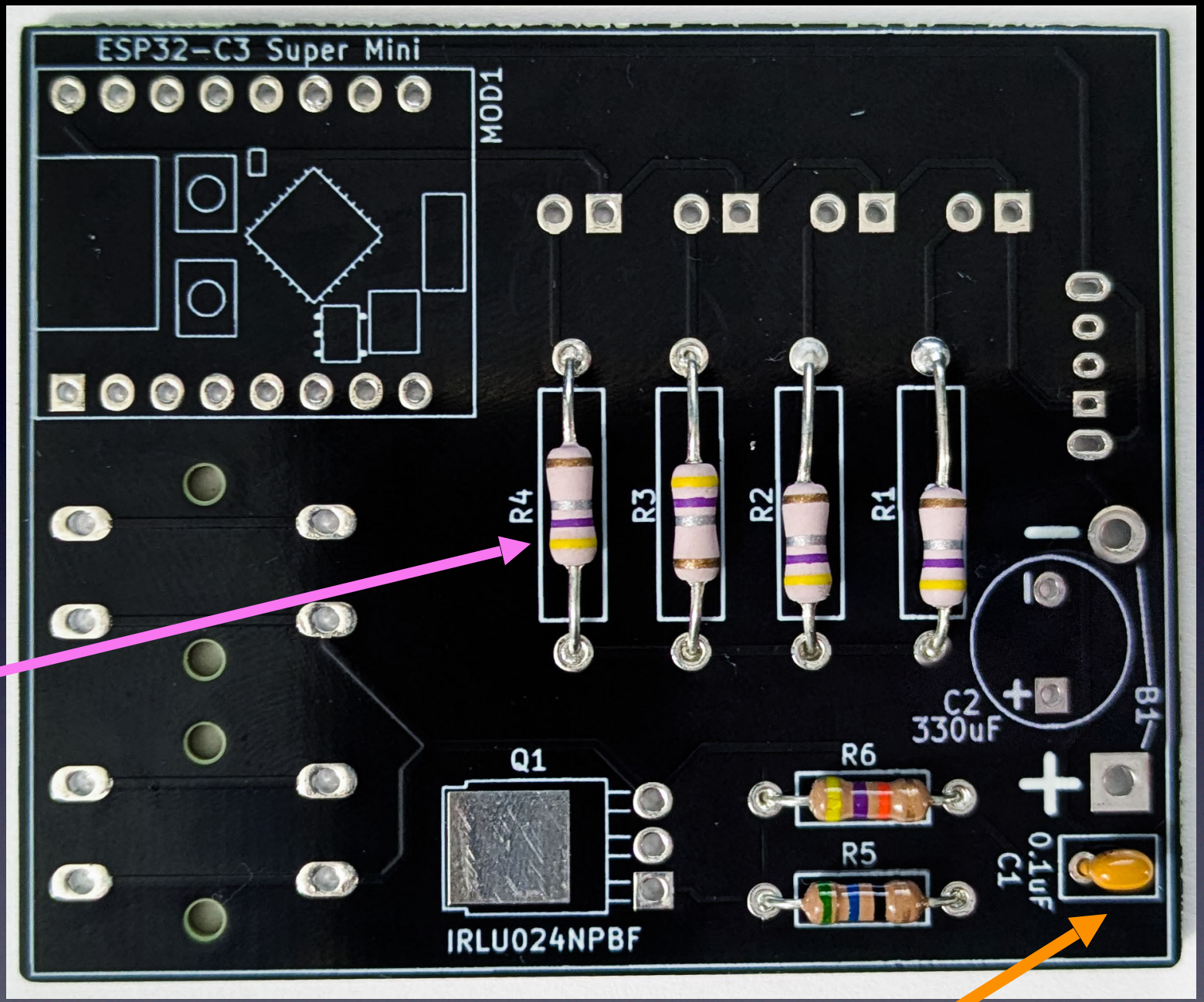
(Direction does not matter)



Capacitor C1 — cut off from tape

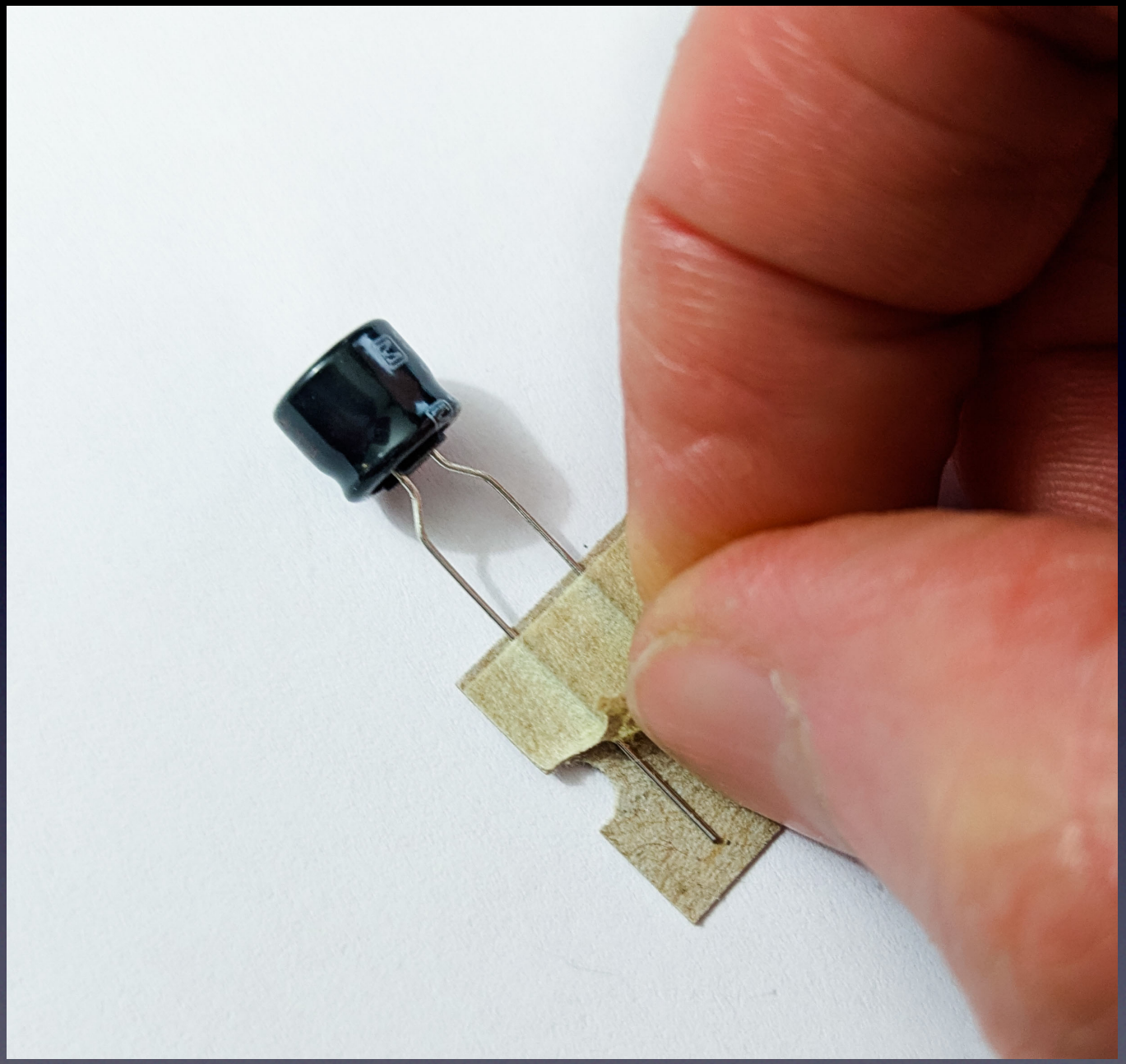
NOTE:

R1-R4 here are 0.47 — but we are using **1.0** .
All following photos show 0.47 resistors.

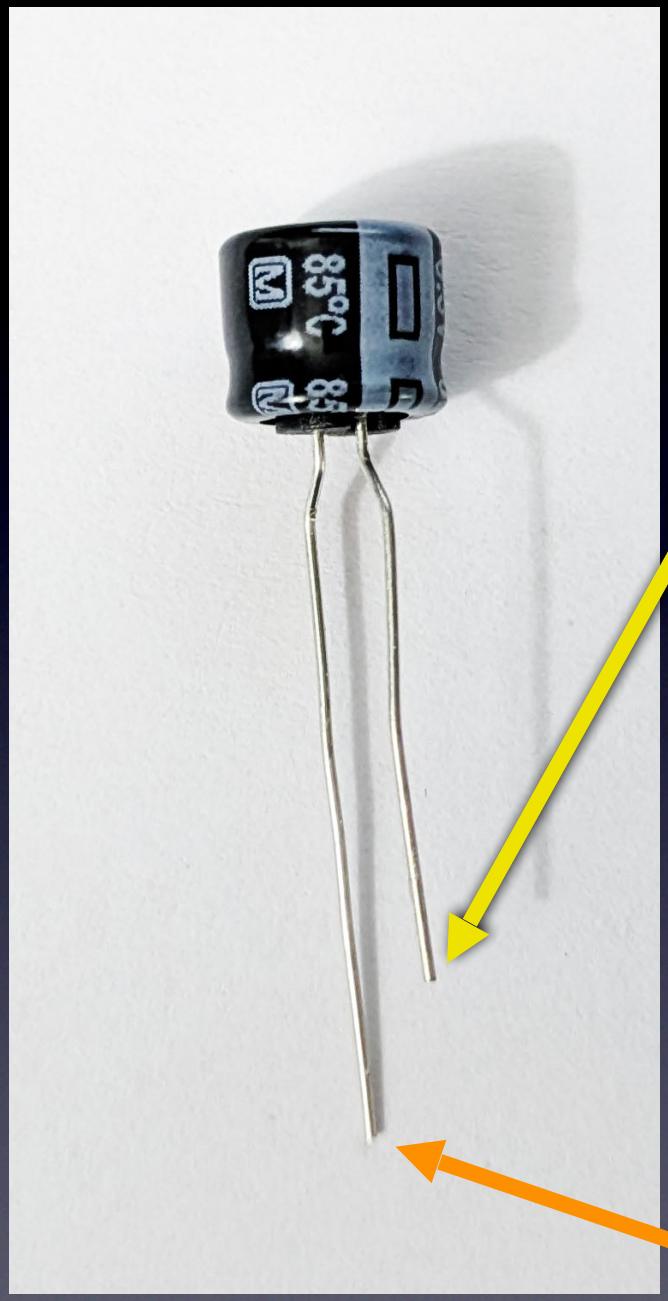


Capacitor C1

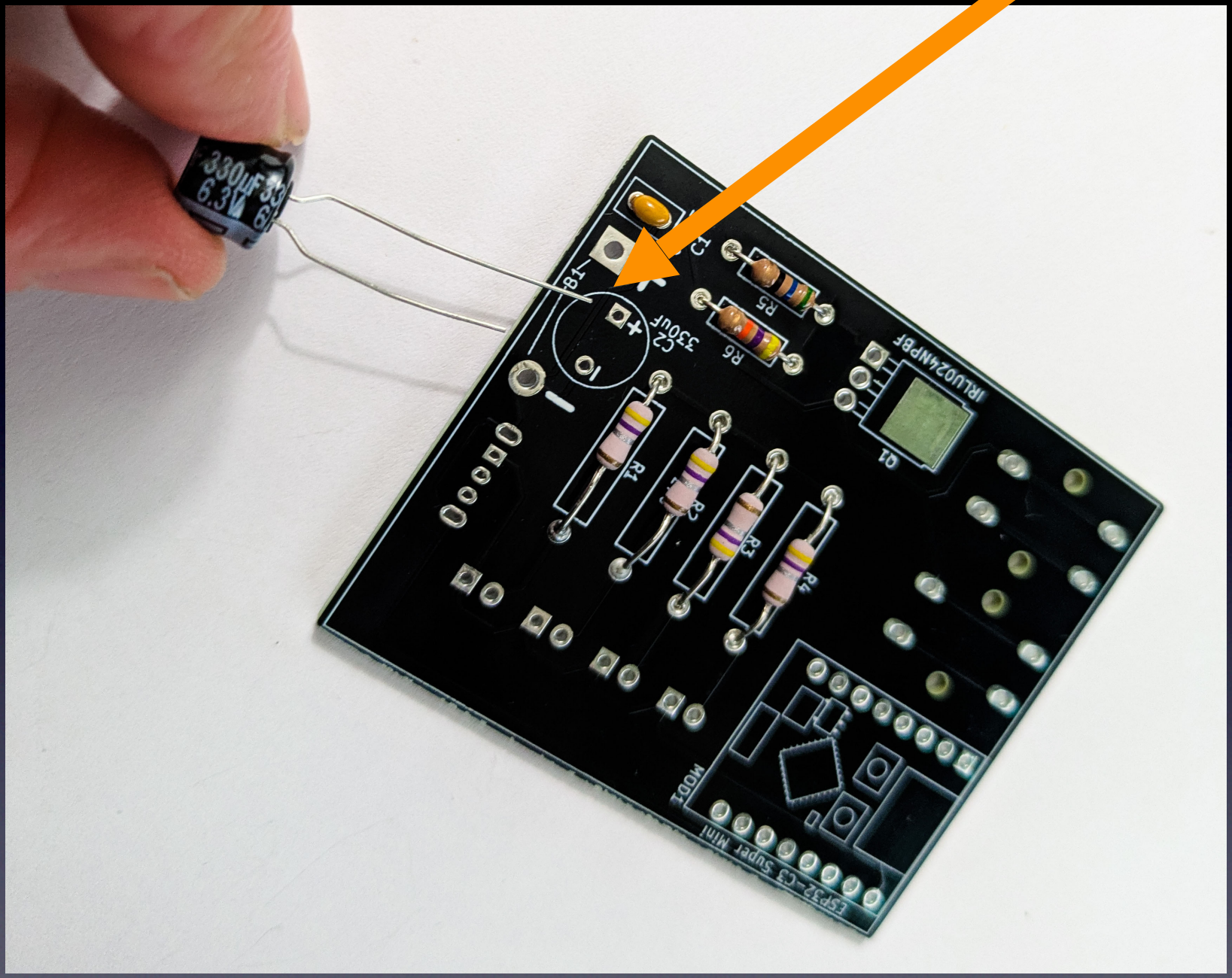
(Direction does not matter)



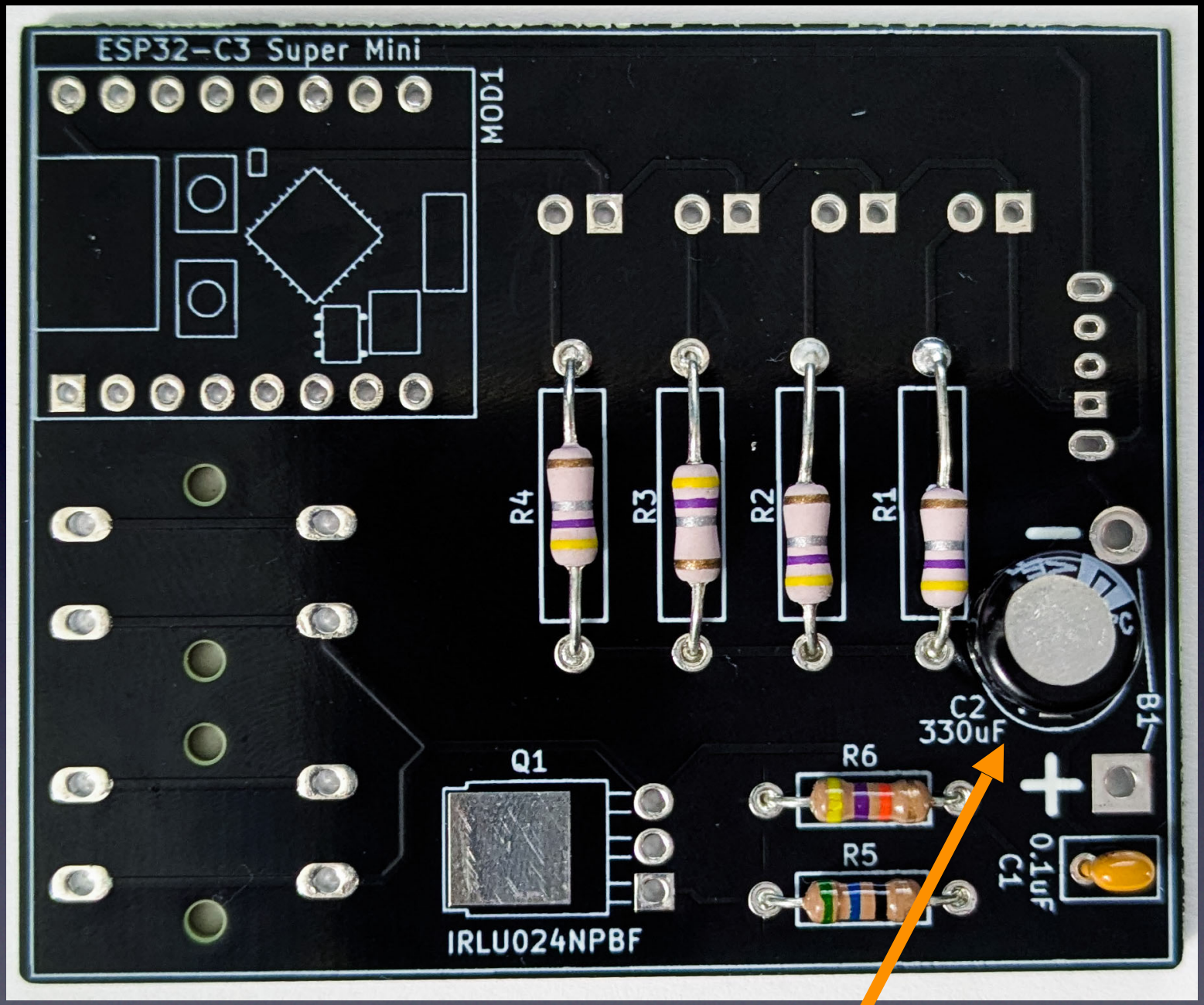
Capacitor C2 — peel off tape



Capacitor C2 — Long Lead is "+"

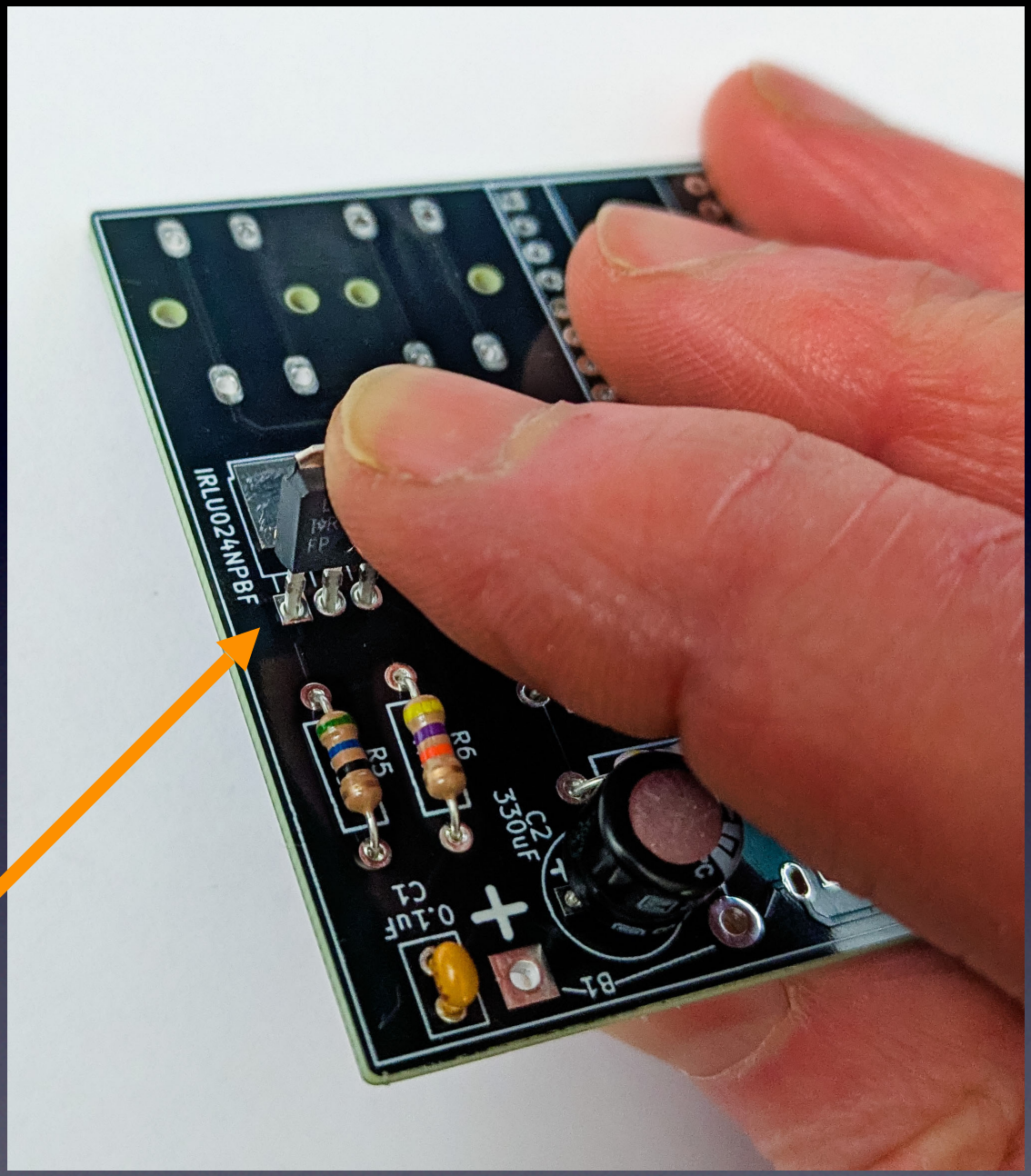


Capacitor C2 — Long Lead is “+”

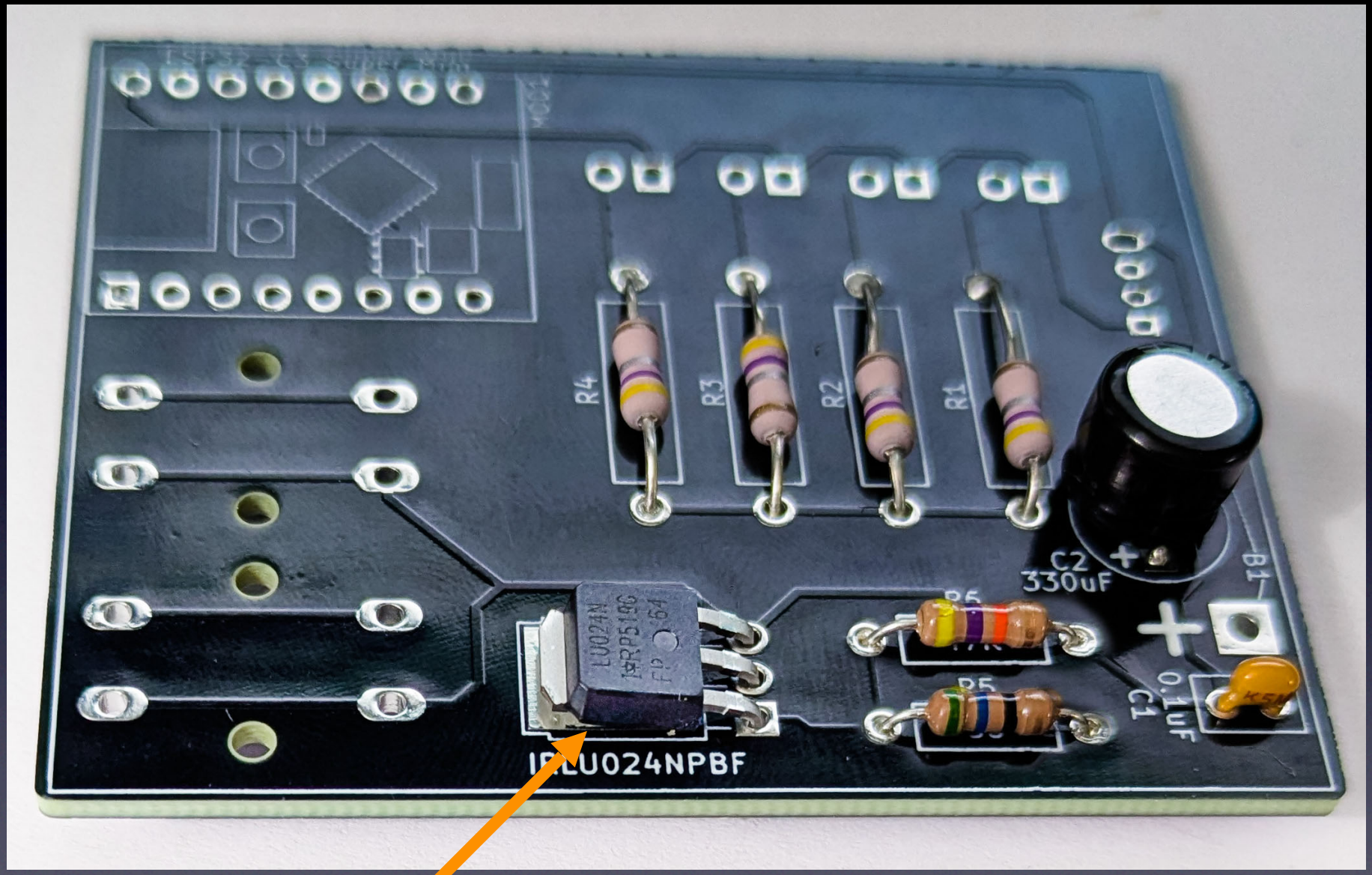


Capacitor C2

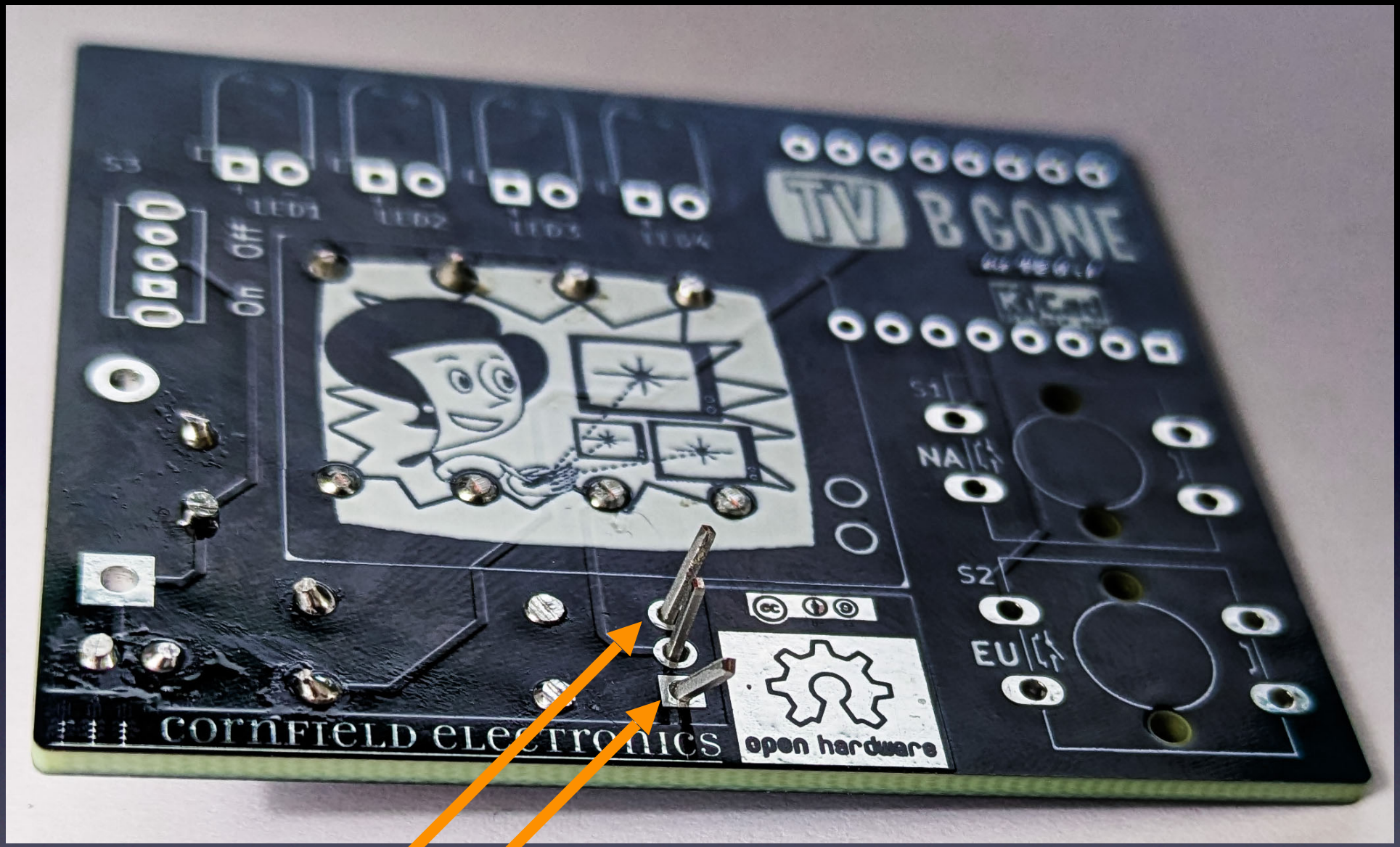
NOTE:
Q1 may also be
DOU90N02 or NCE3080IA



Transistor Q1 — put in place, ready to bend

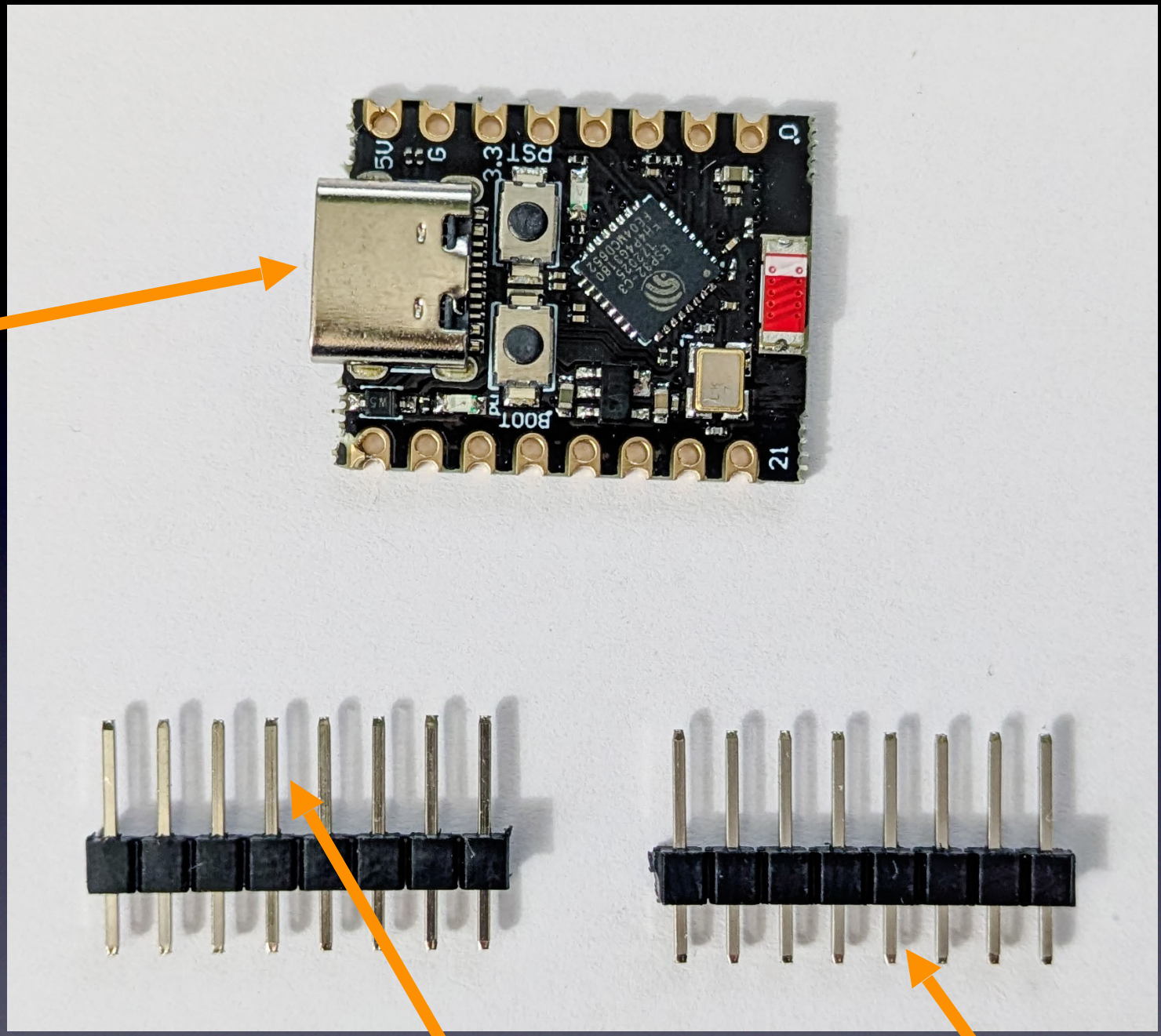


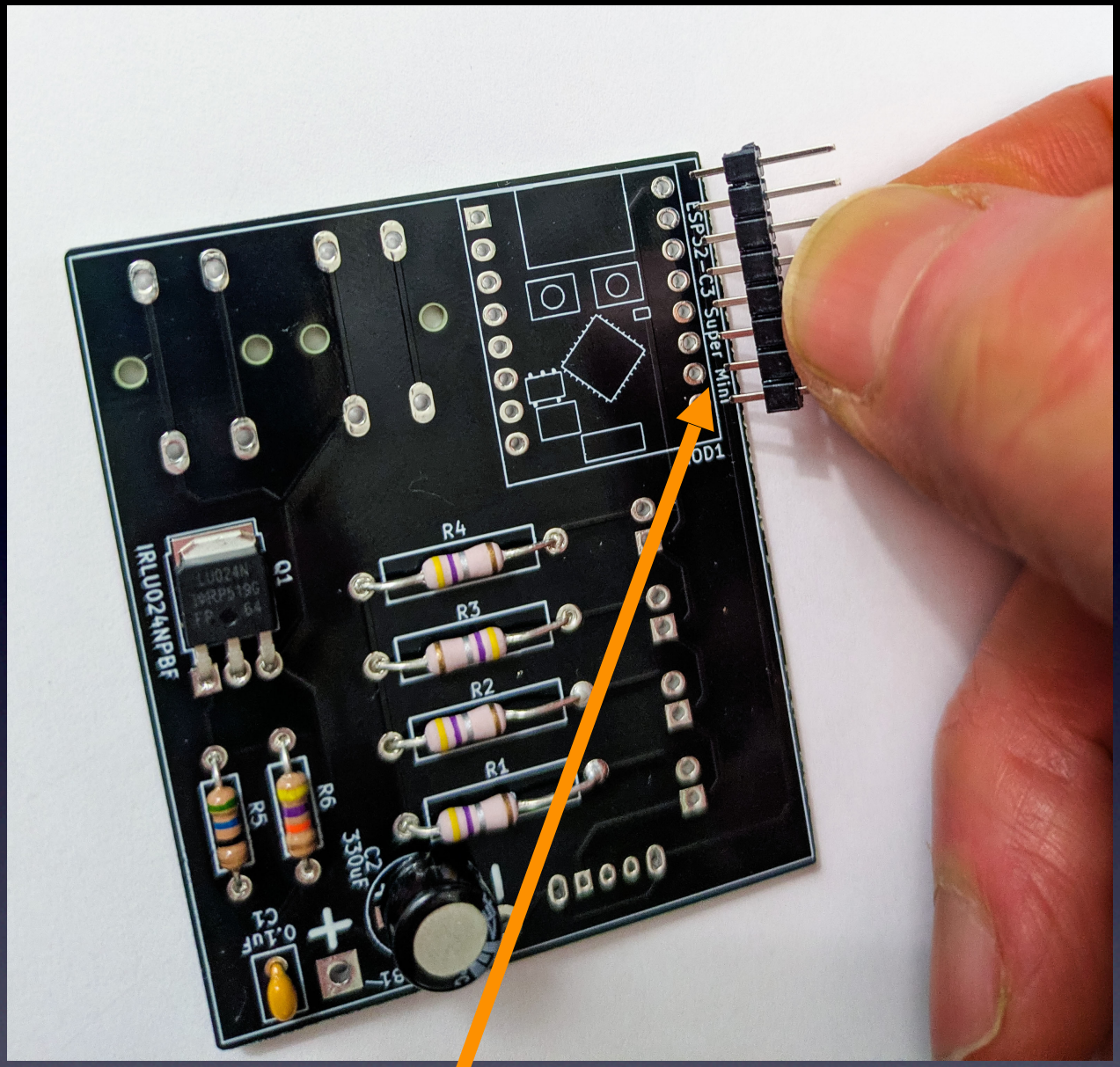
Transistor Q1 — bent down



Transistor Q1 — 2 outside leads bent as a “V”

Ready to solder

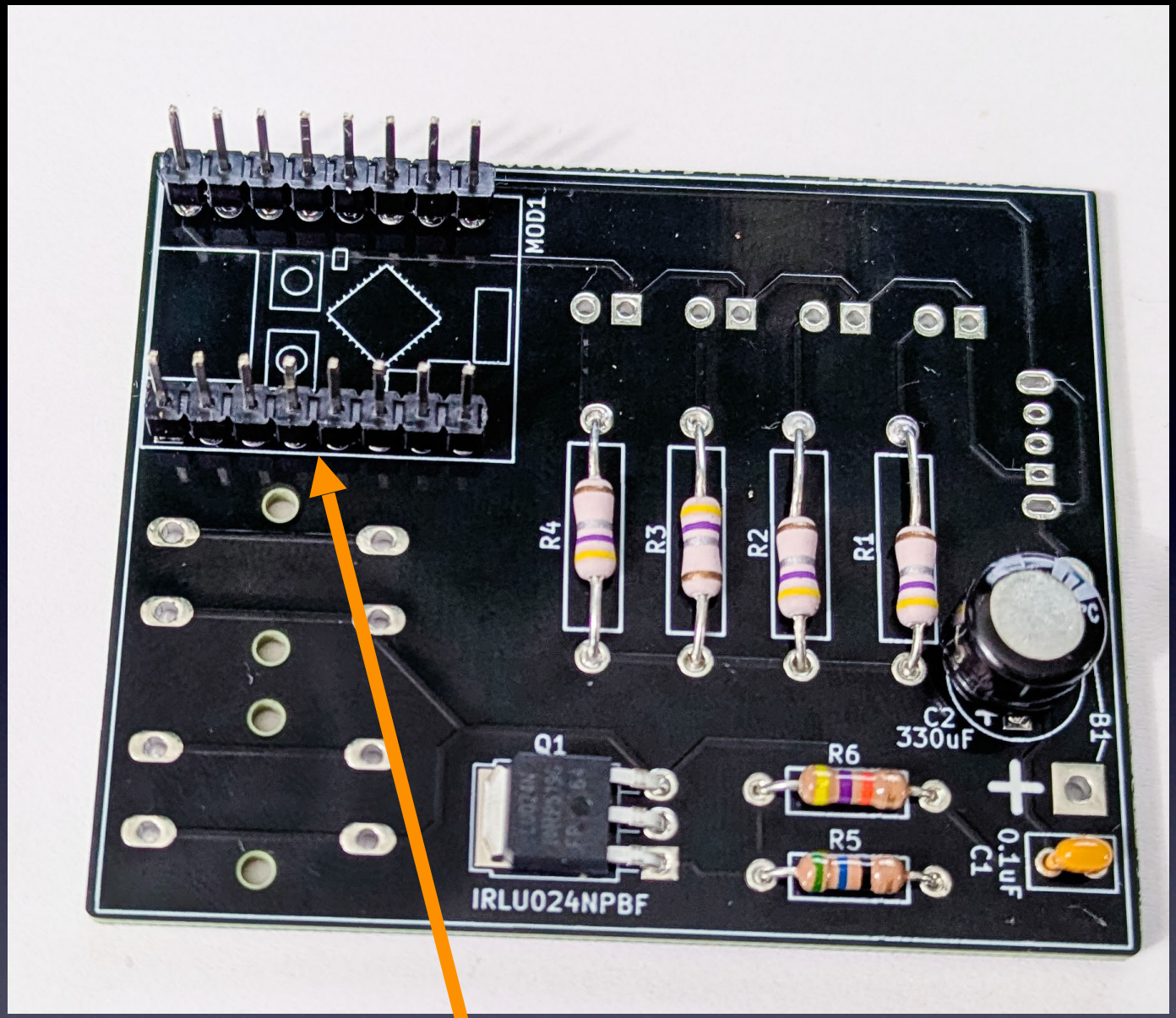

USB
5V
G
3.3
RST
0
BOOT
21
MOD1 — notice long leads and short leads
DO NOT SOLDER YET !



MOD1 — short pins go into PCB

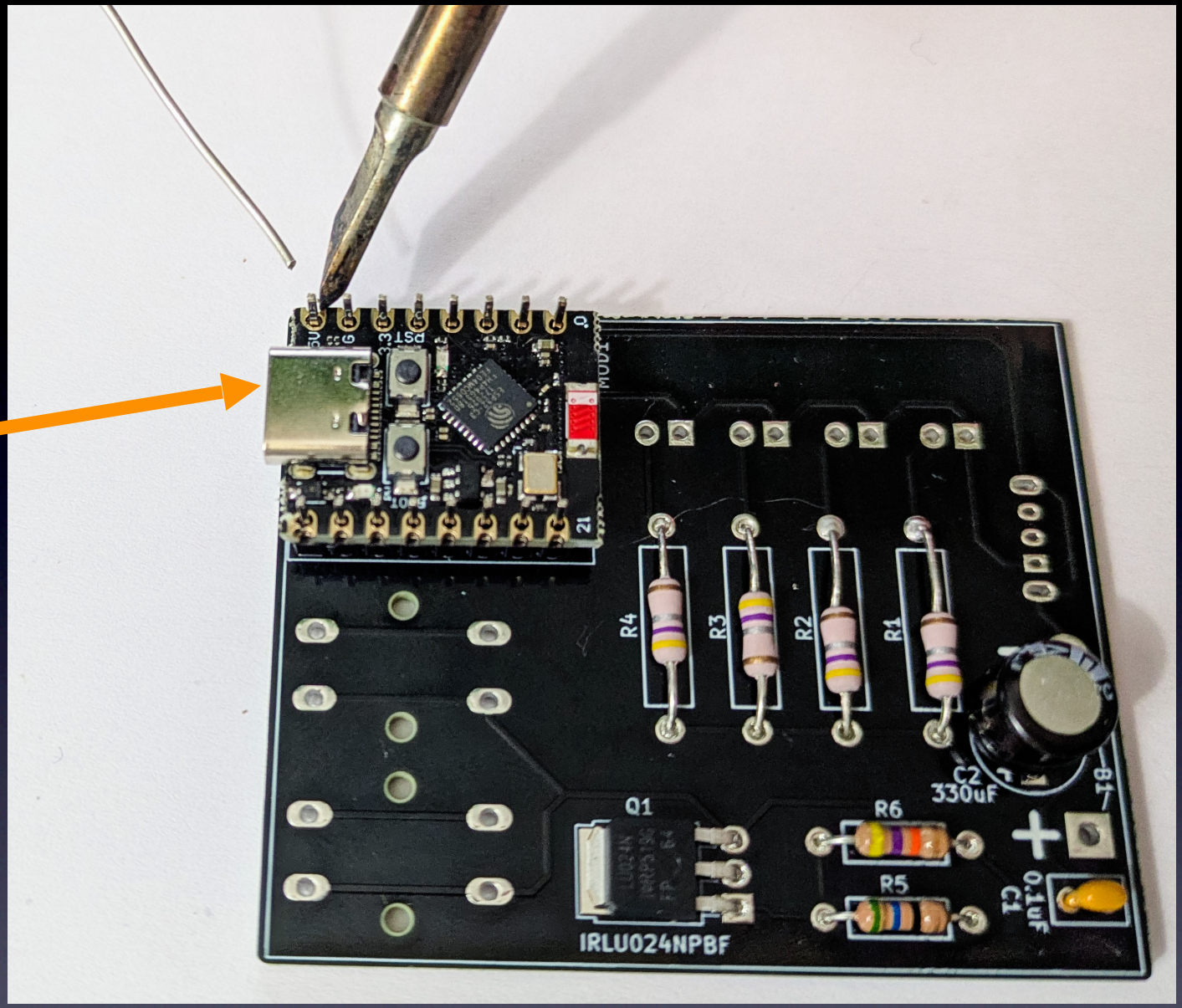
(long leads stick up, away from PCB)

DO NOT SOLDER YET !



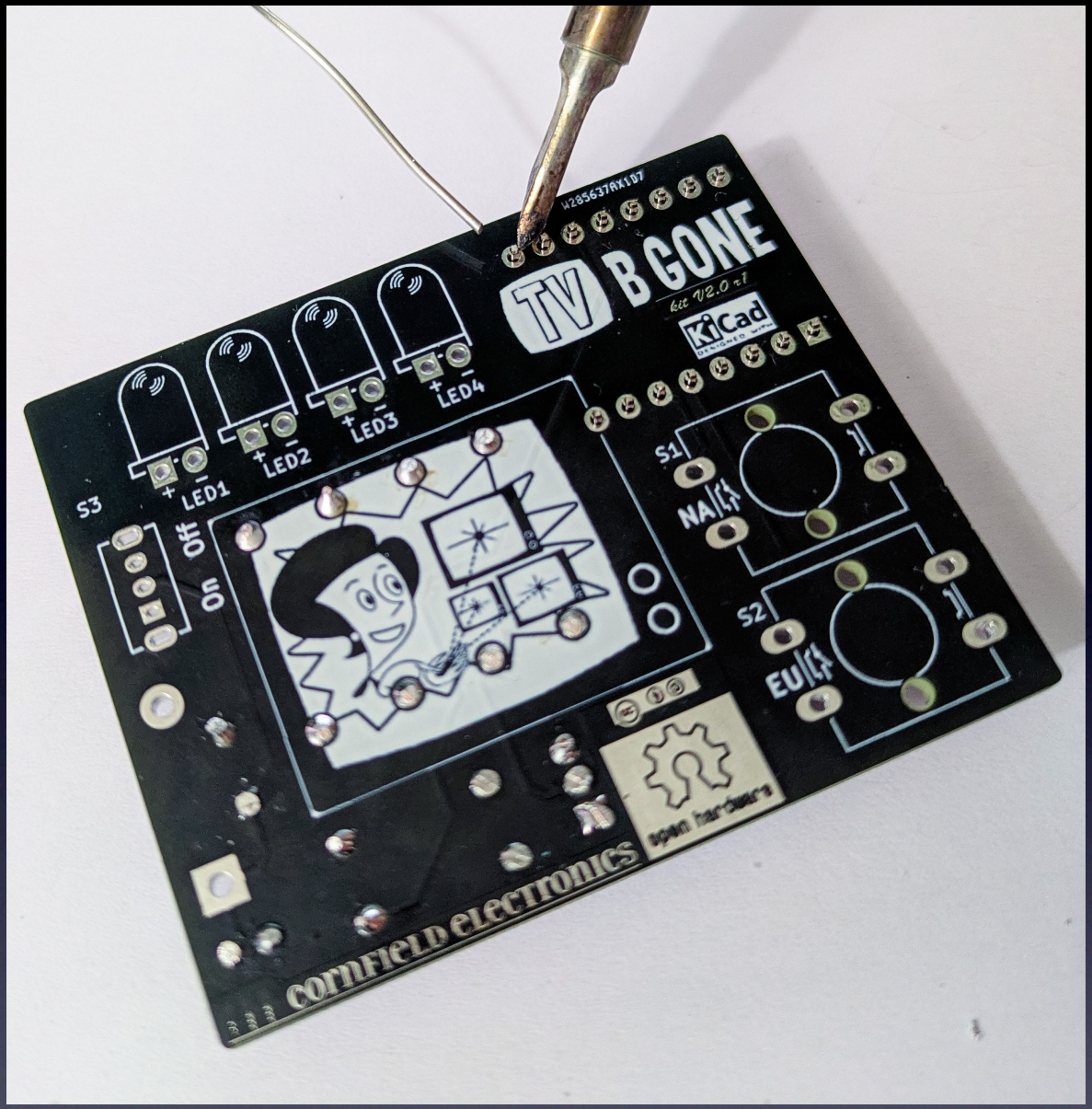
MOD1 — header pins placed

DO NOT SOLDER YET !



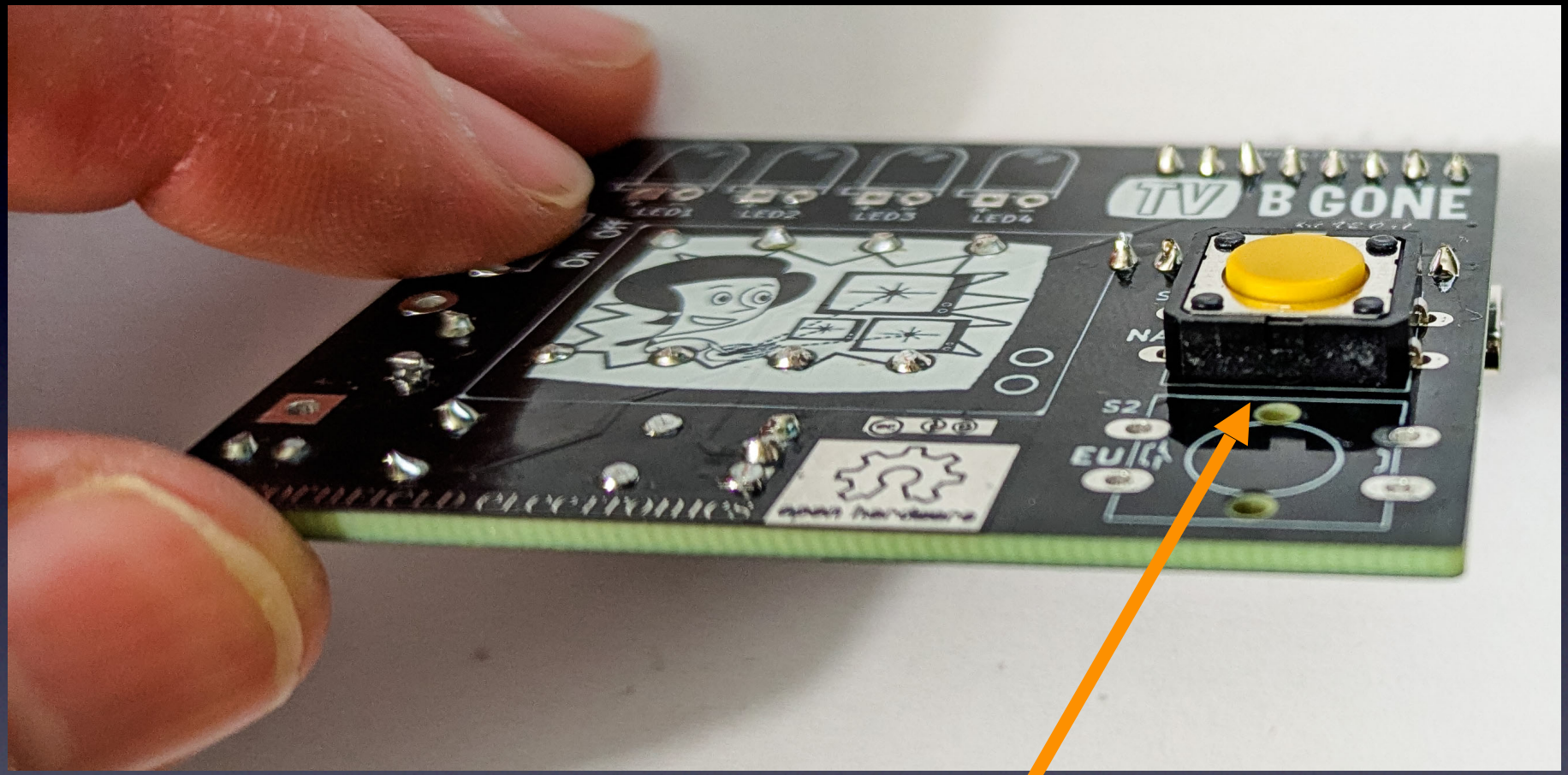
MOD1 — place little board as shown

Solder the pins on the top



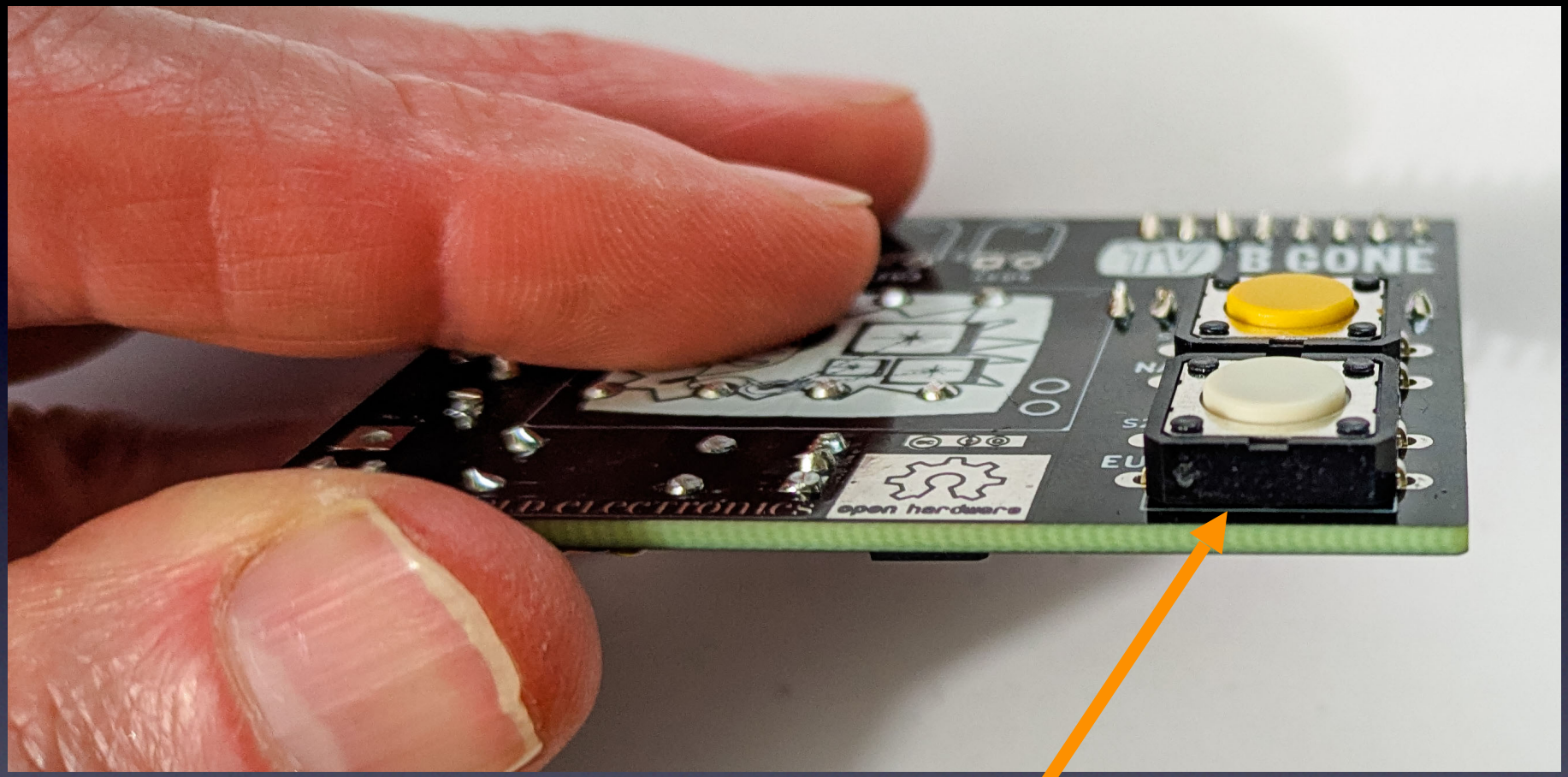
MOD1 — turn board over

Solder the pins on the bottom



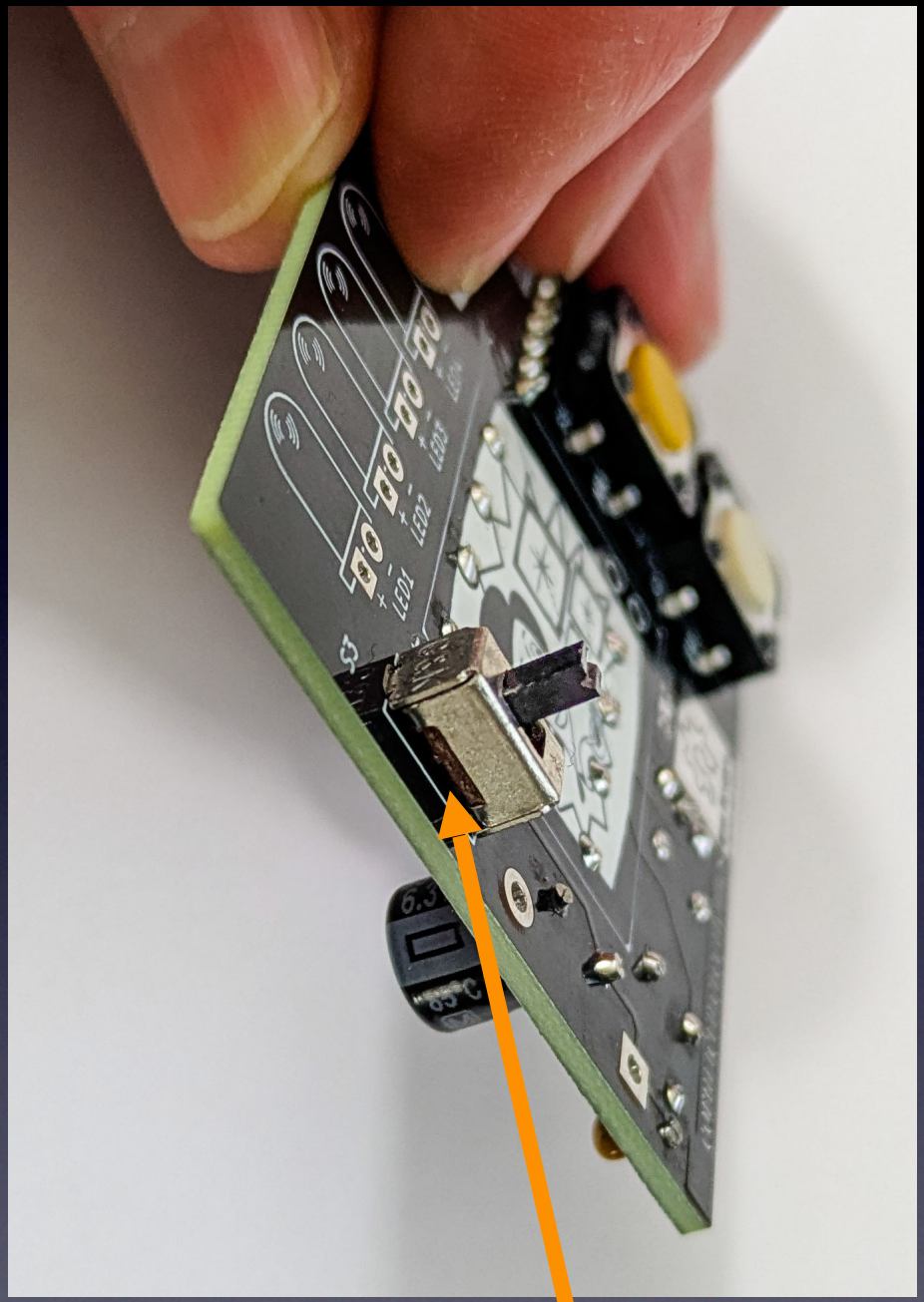
Switch S1

(It will fit in two ways
— either way is fine)



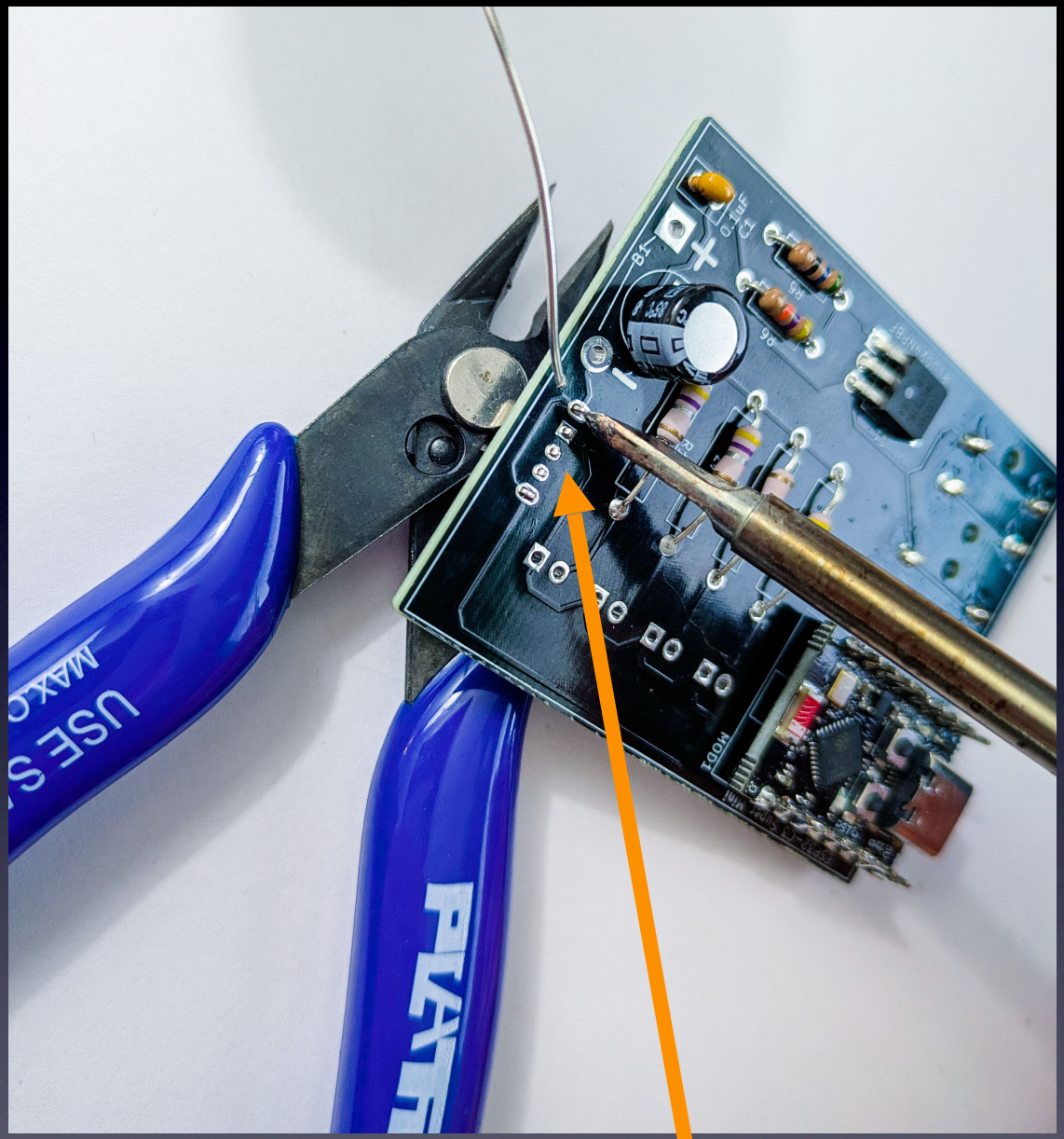
Switch S2

(It will fit in two ways
— either way is fine)

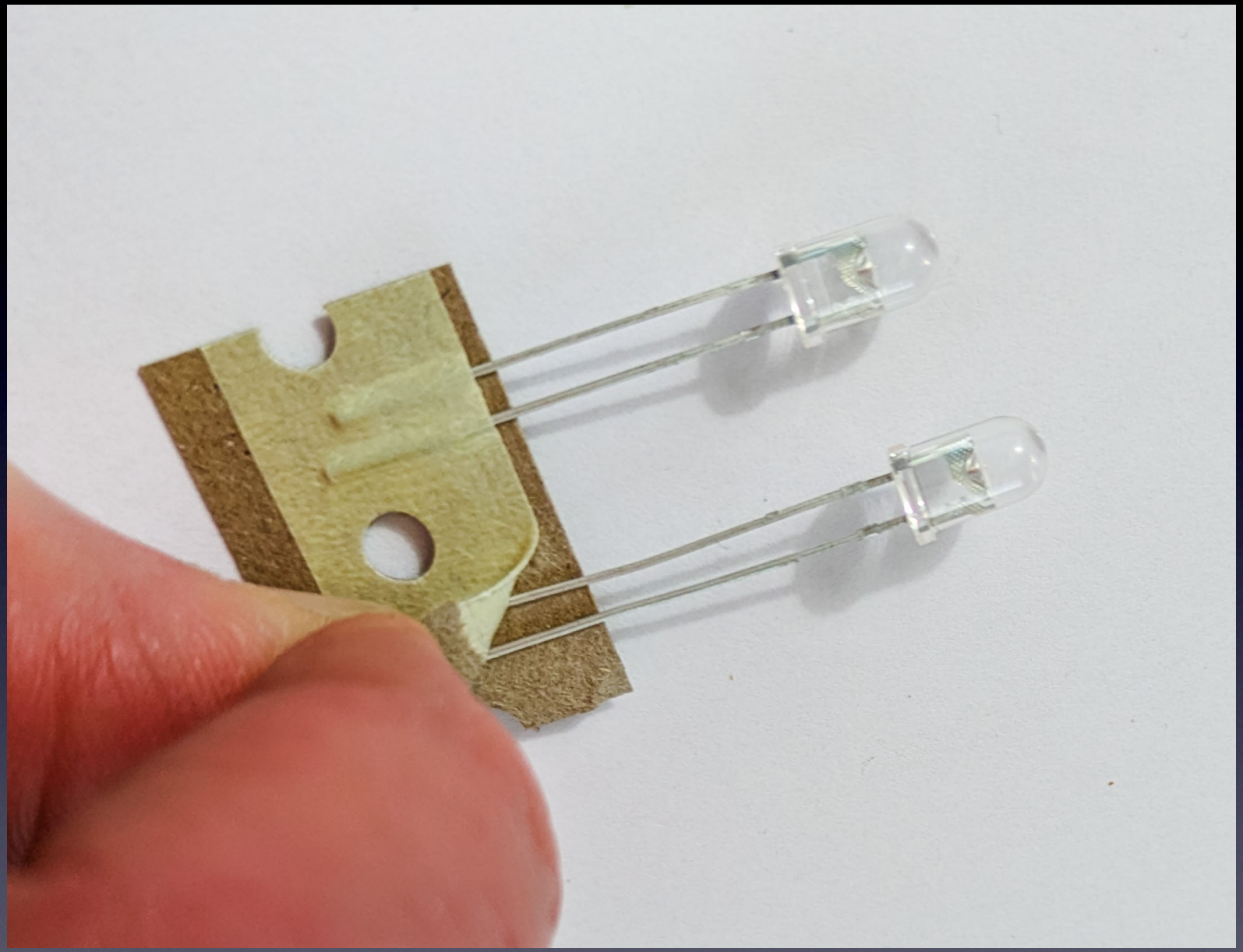


Switch S3

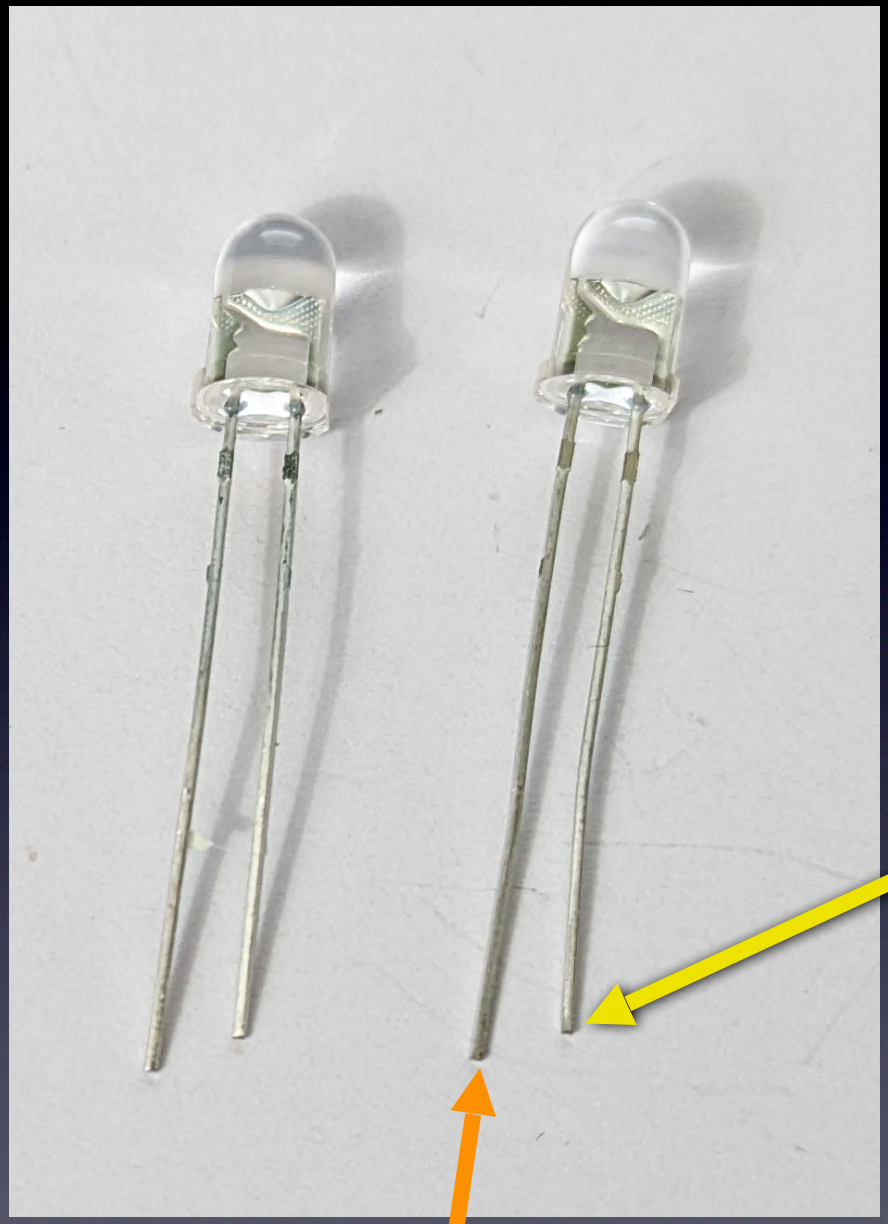
(Direction does not matter)



Switch S3 — resting on wire cutters to solder

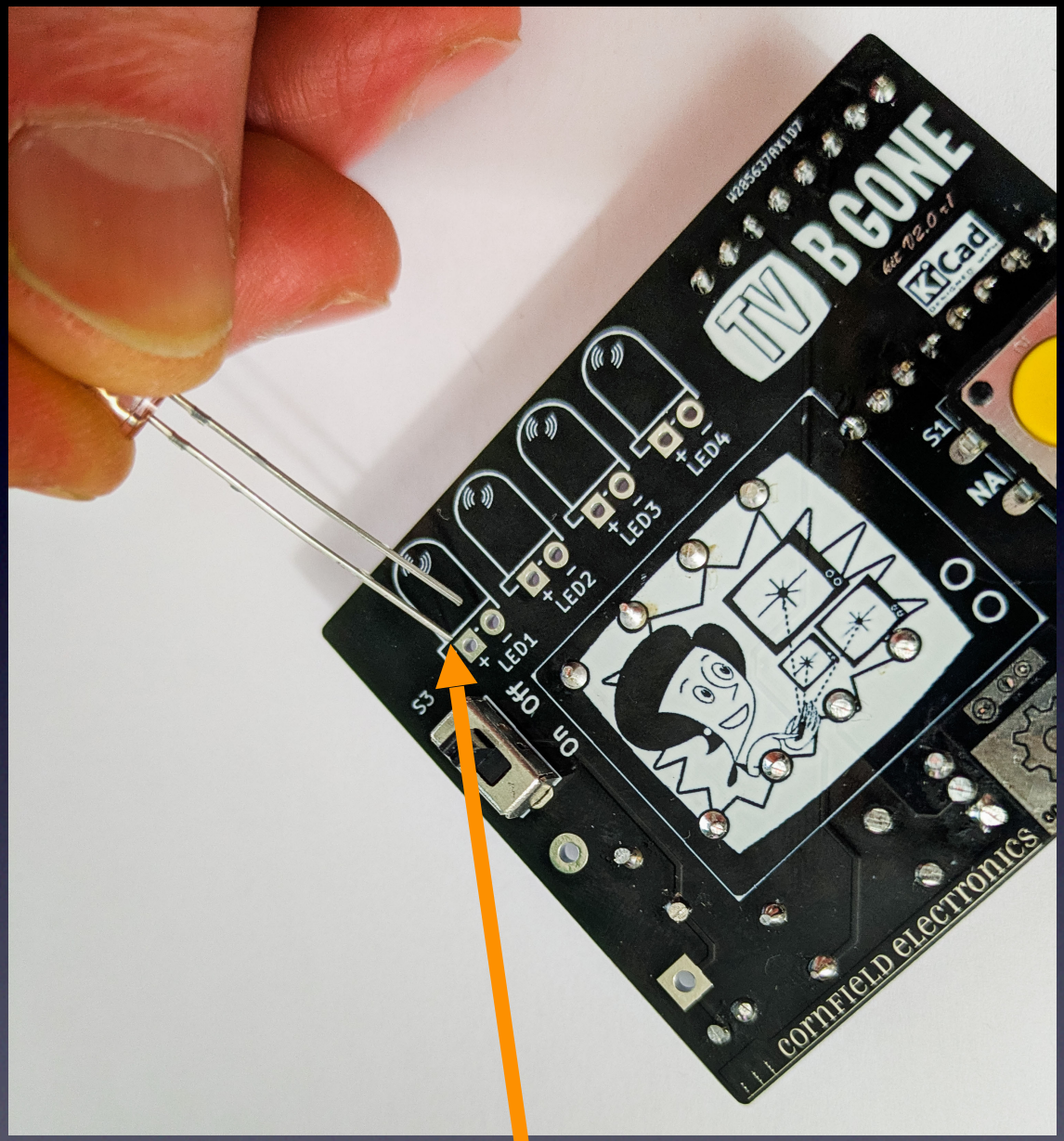


LED1 - LED2 — peel off tape

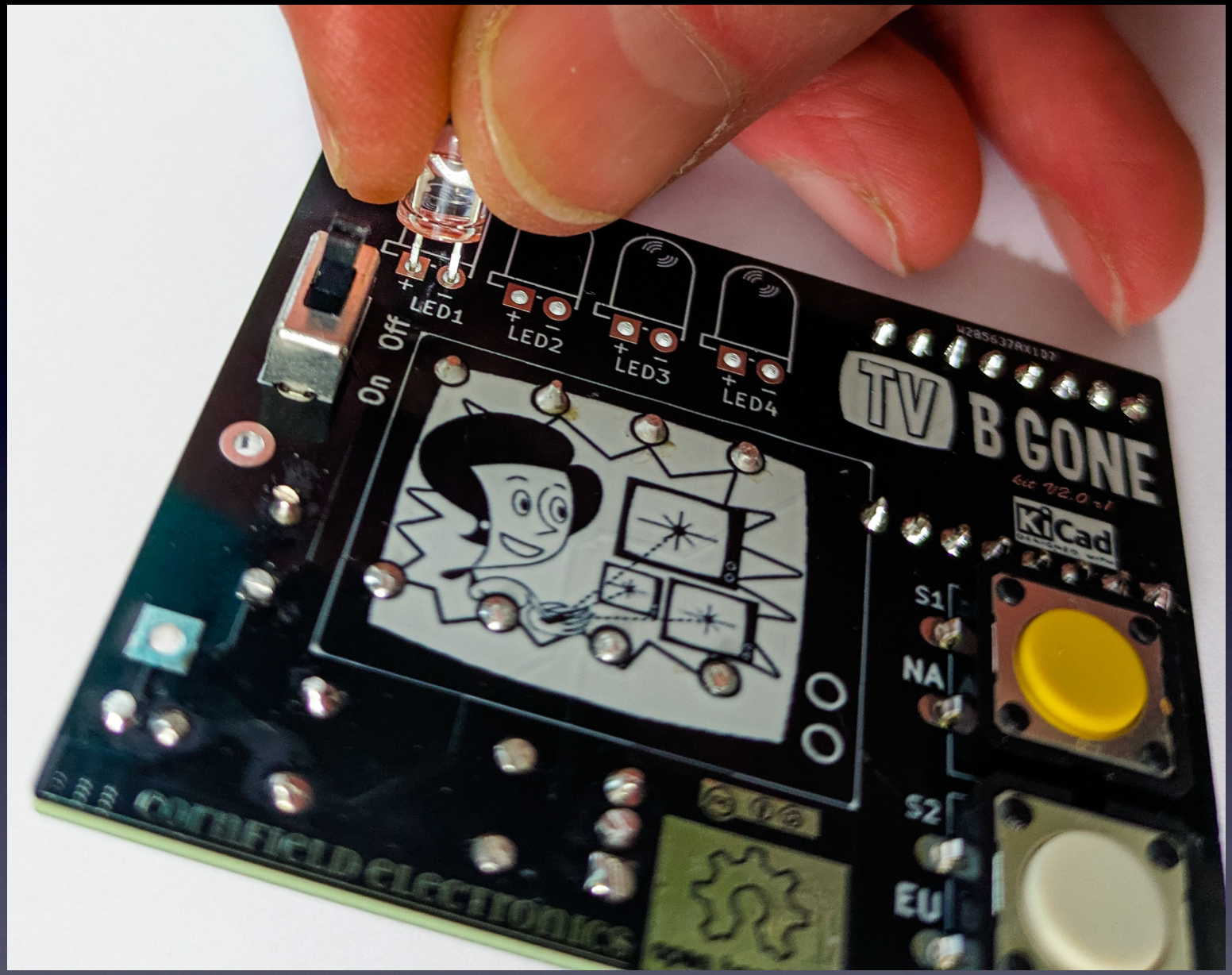


Short Leads are “-”

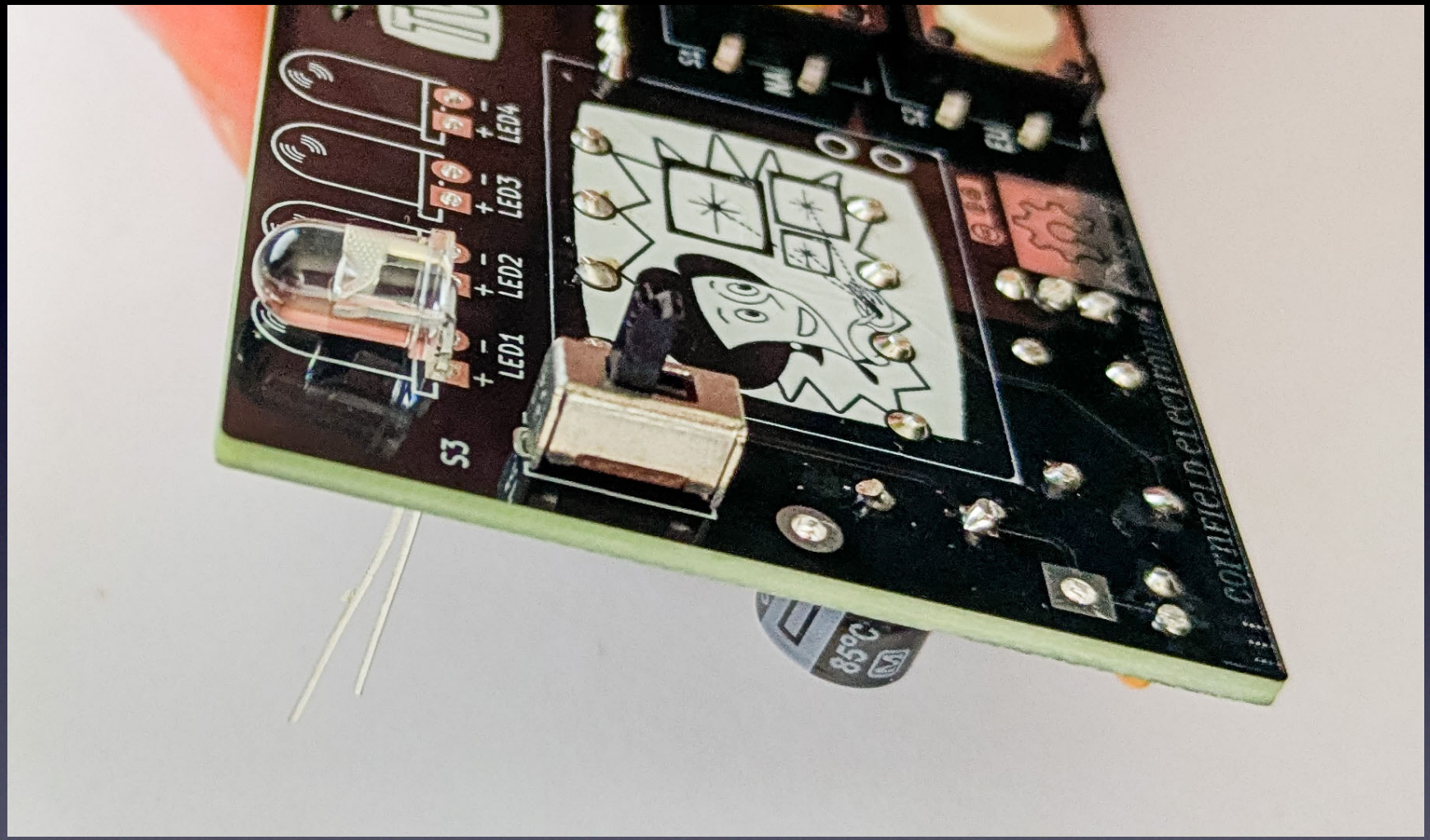
LED1 - LED2 — Long Leads are “+”



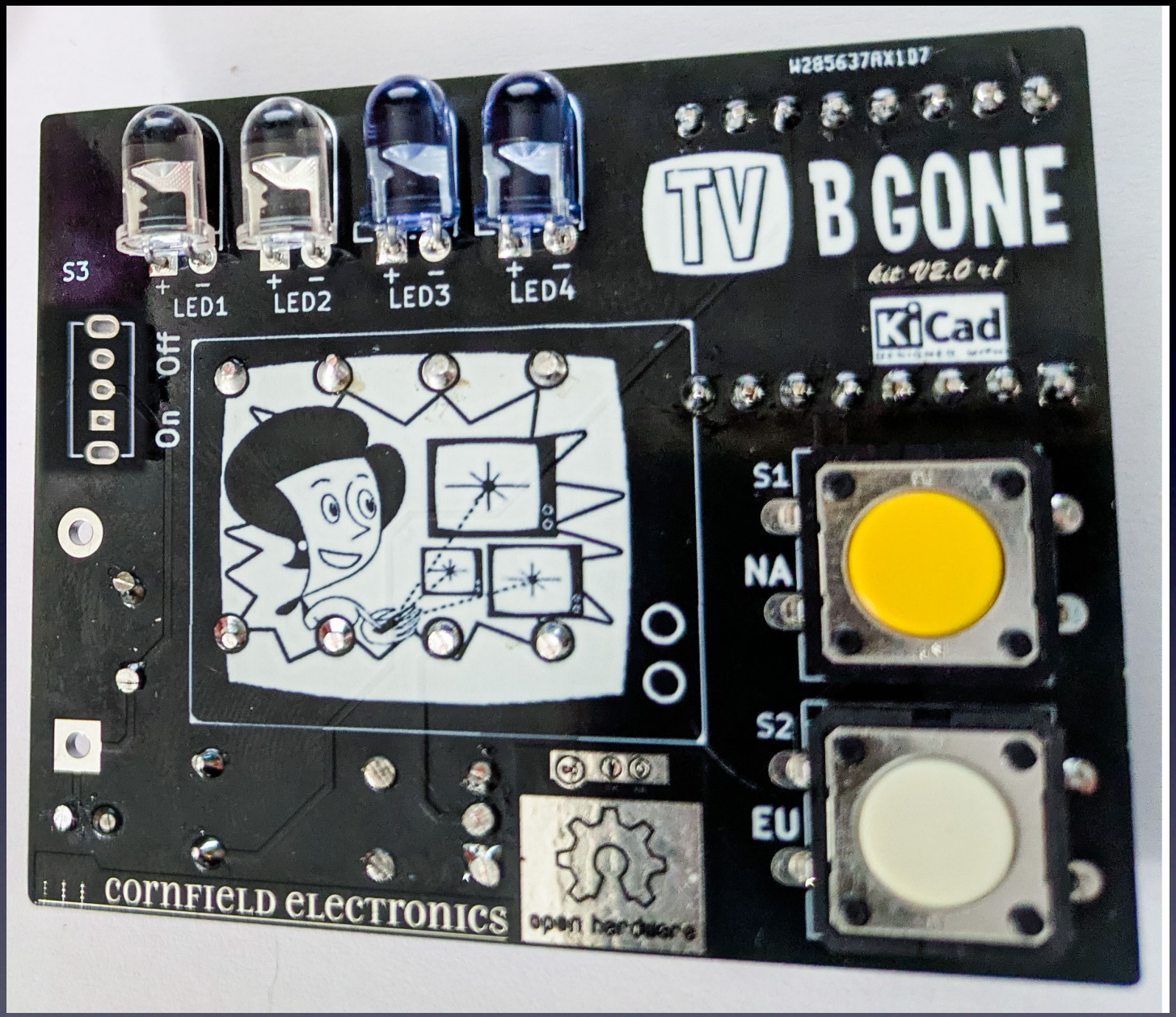
LED1 - LED2 — Long Leads are “+”



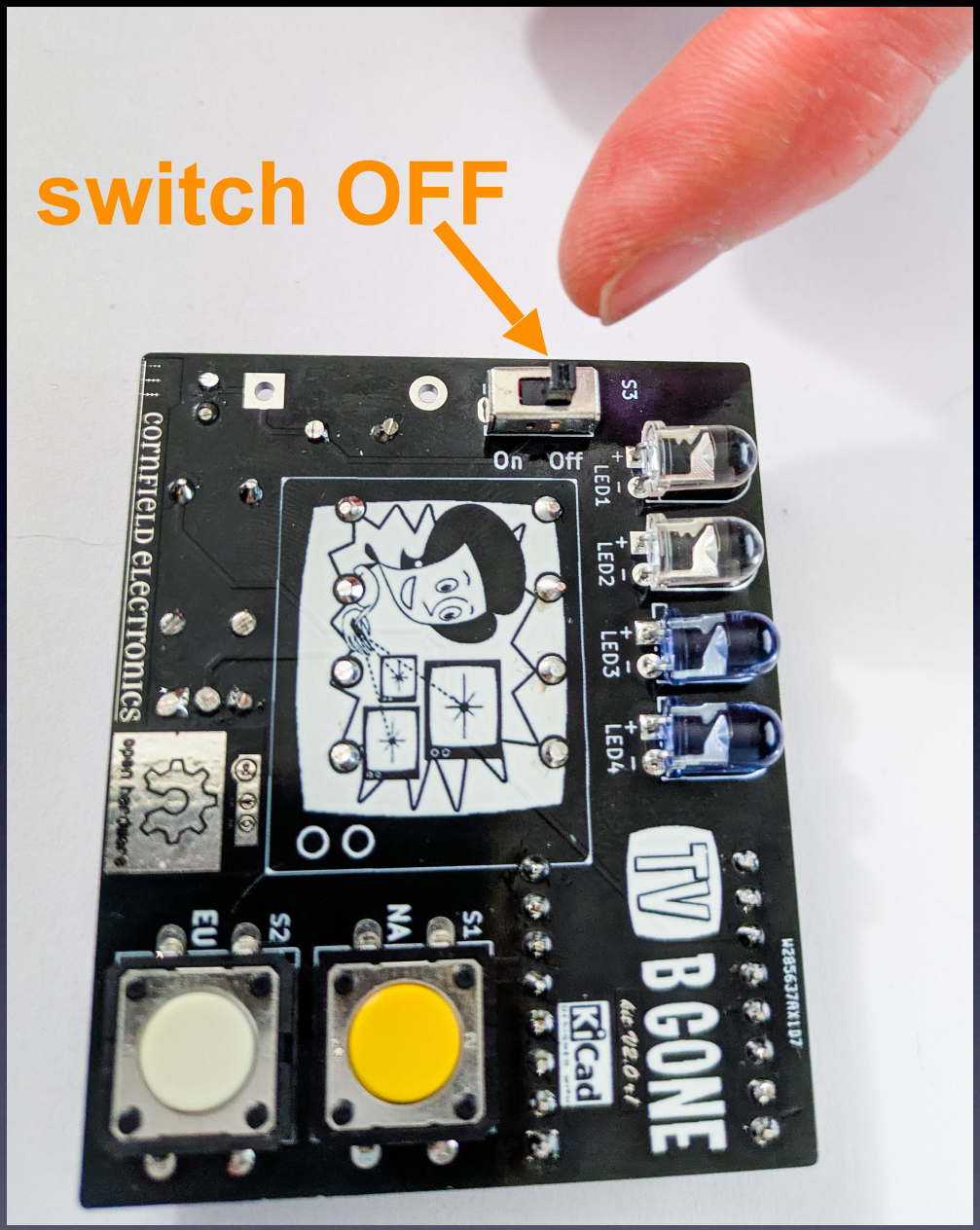
LED1 — put in place, ready to bend



LED1 — bent down



LED1 - LED4 — all soldered in place



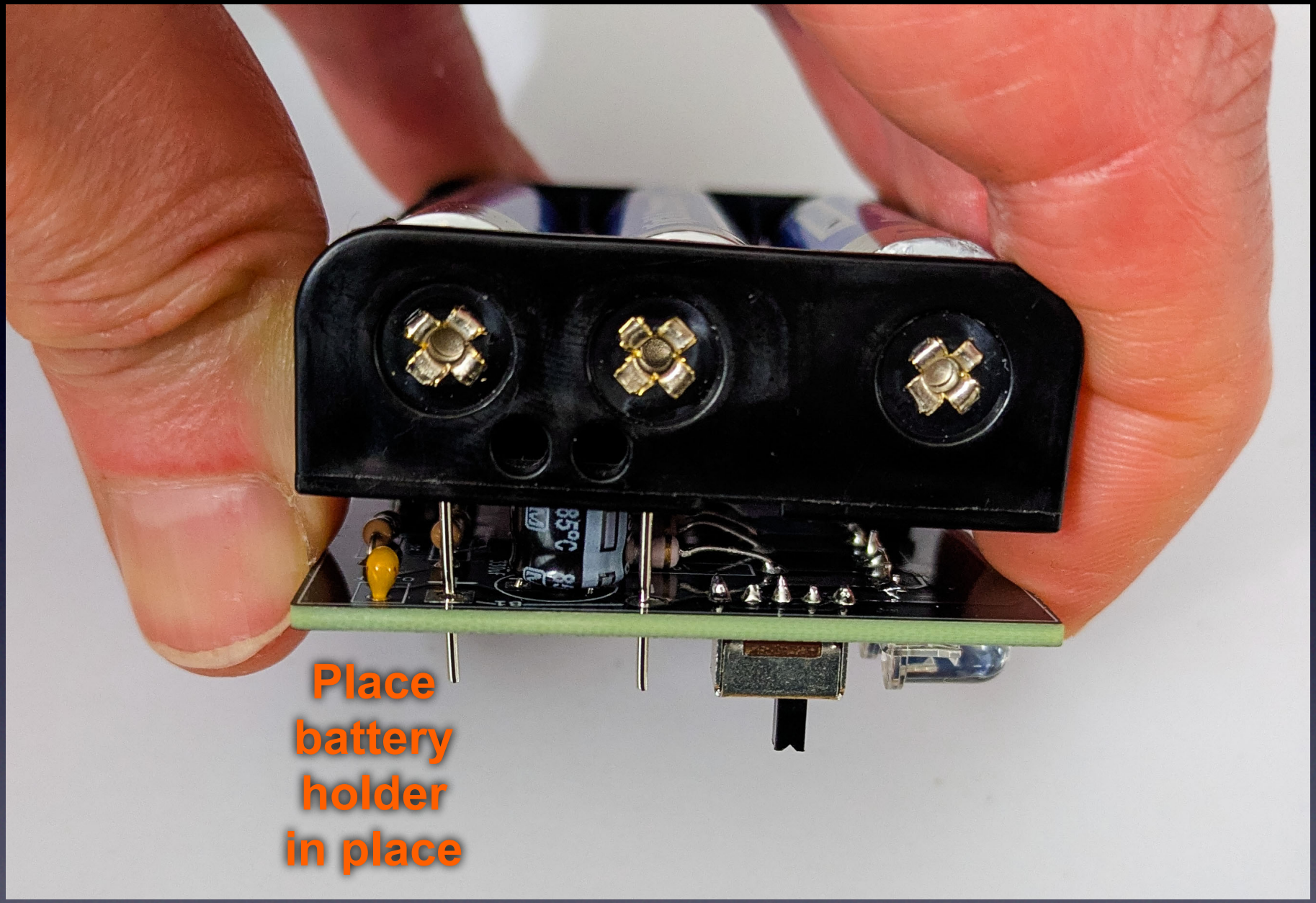
Get ready for testing !

Batteries in Holder

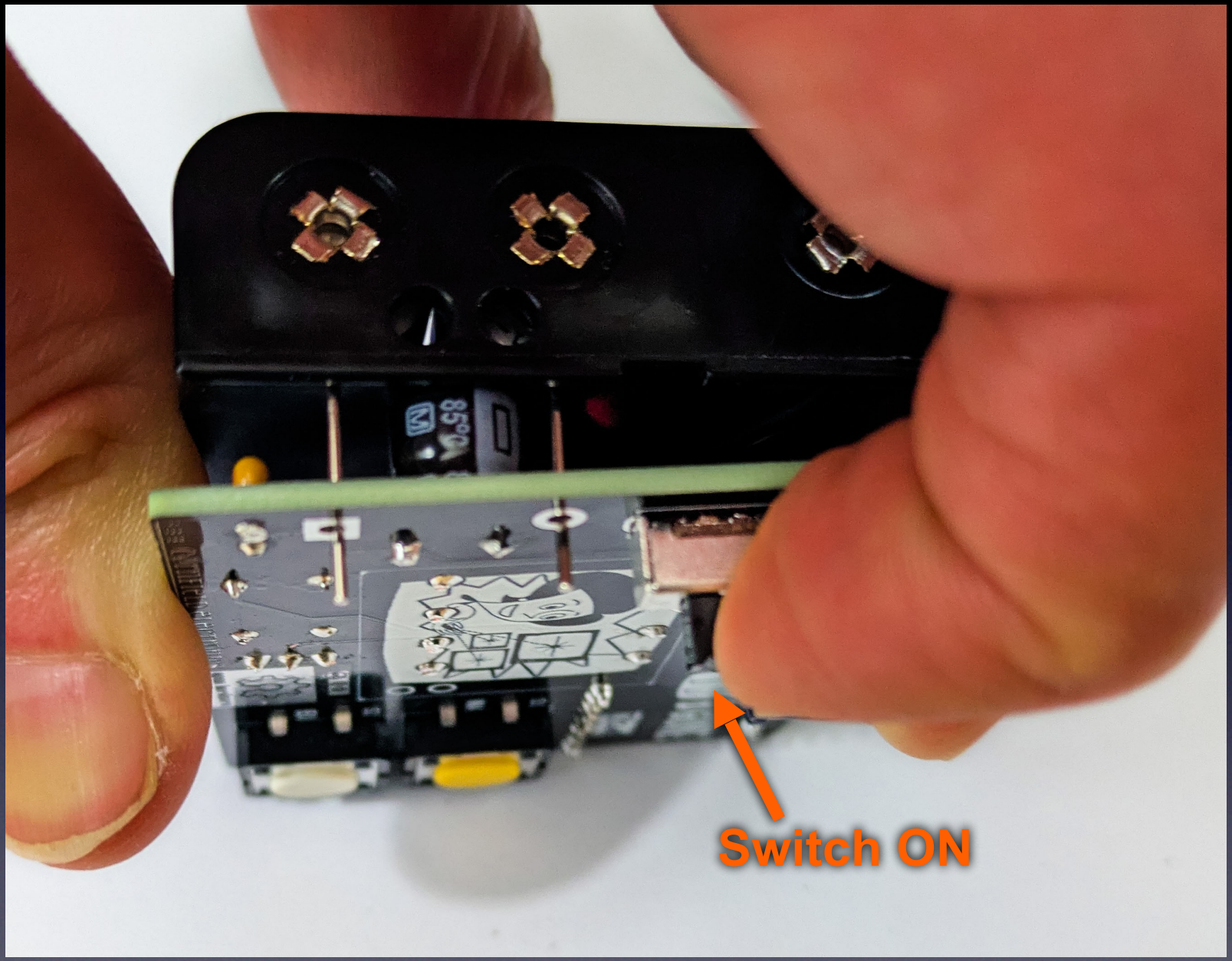
IMPORTANT:
Use Alkaline AA batteries

other kinds of AA batteries will not work

Get ready for testing !

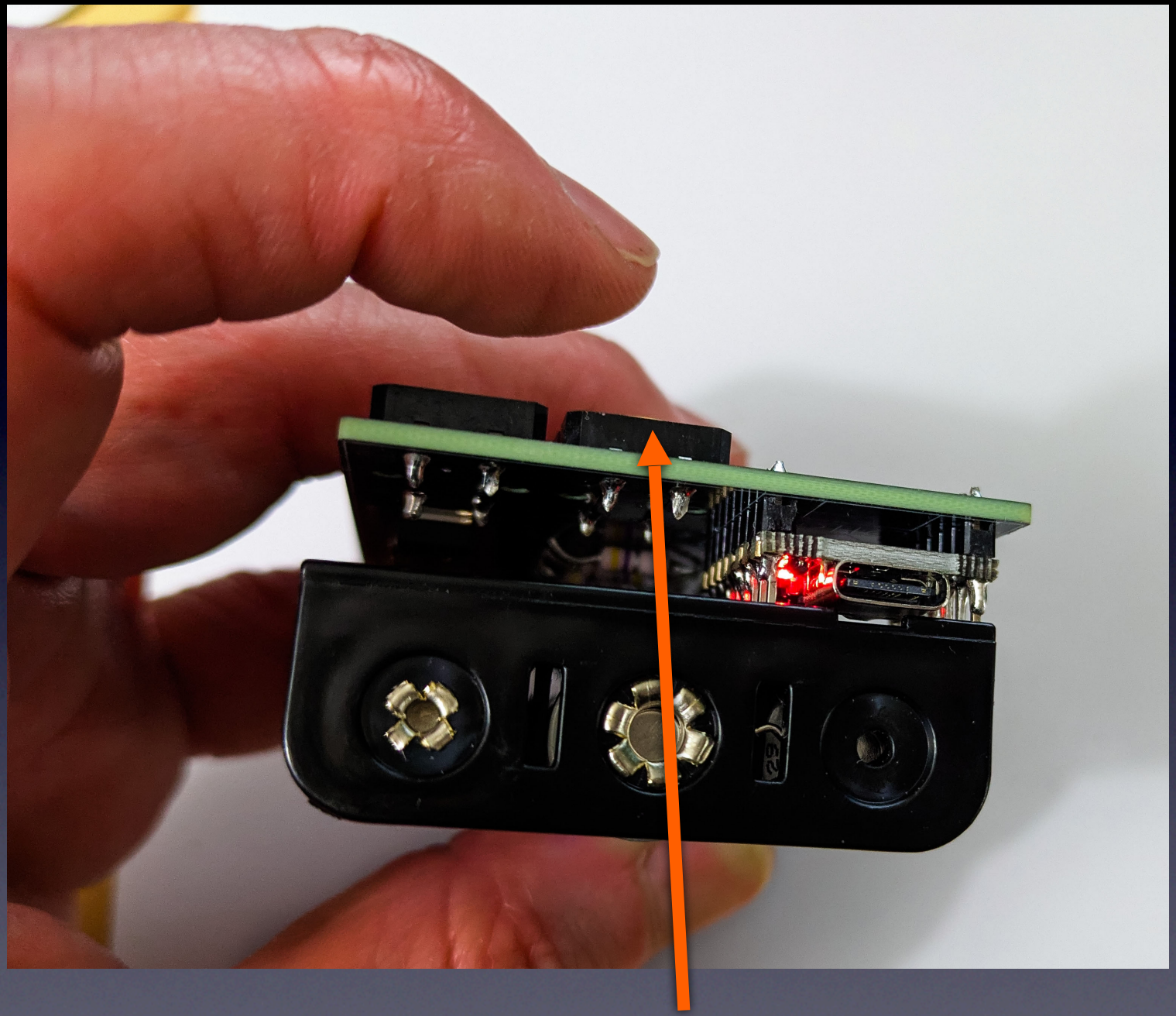


Get ready for testing !

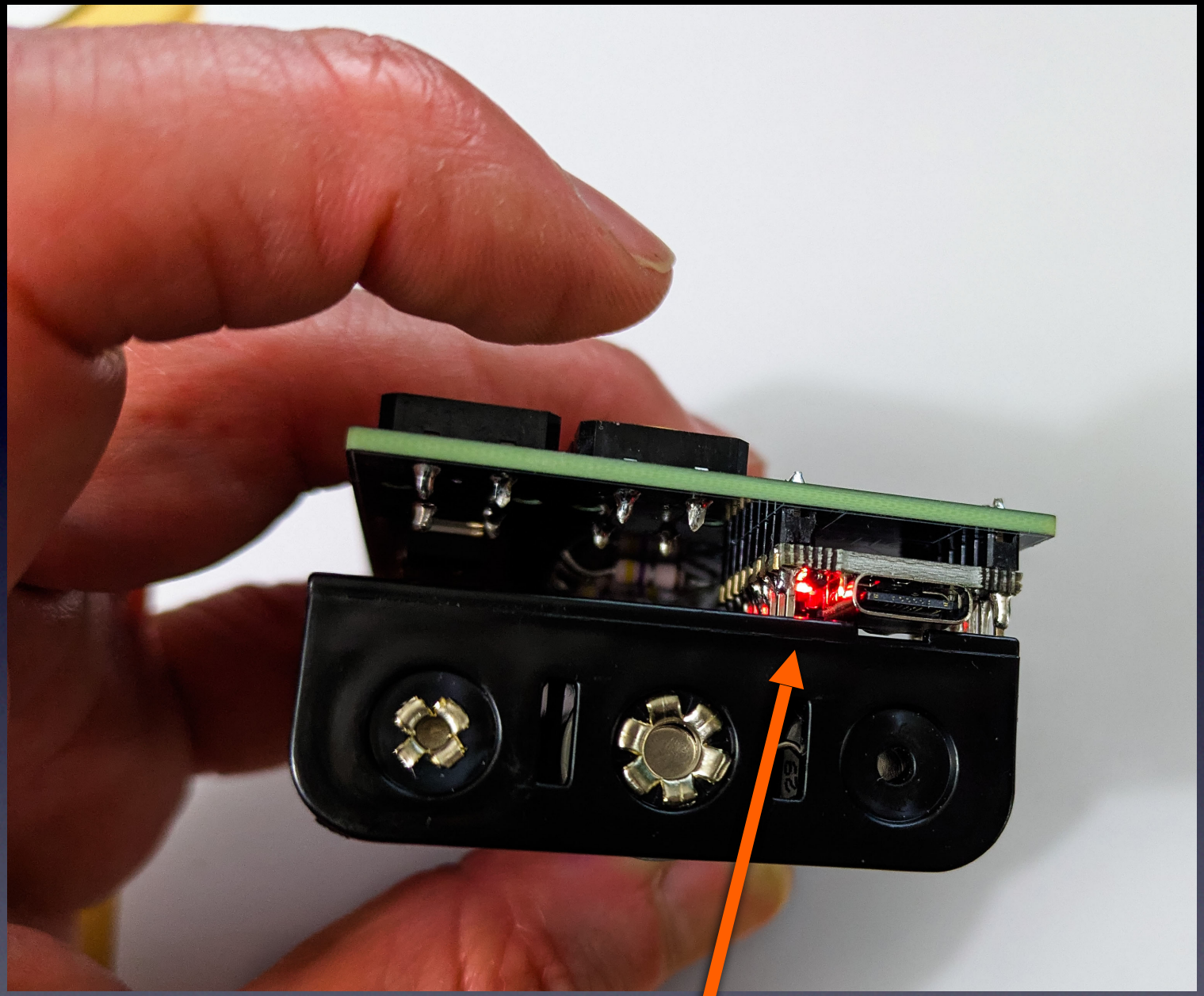


Testing !

First test: Red LED is on



Second test - a): push S1 (or S2) button



Second test - b): Blue LED blinks

Point IR LEDs directly into phone camera lens

IR LEDs flicker (using front-facing phone camera)

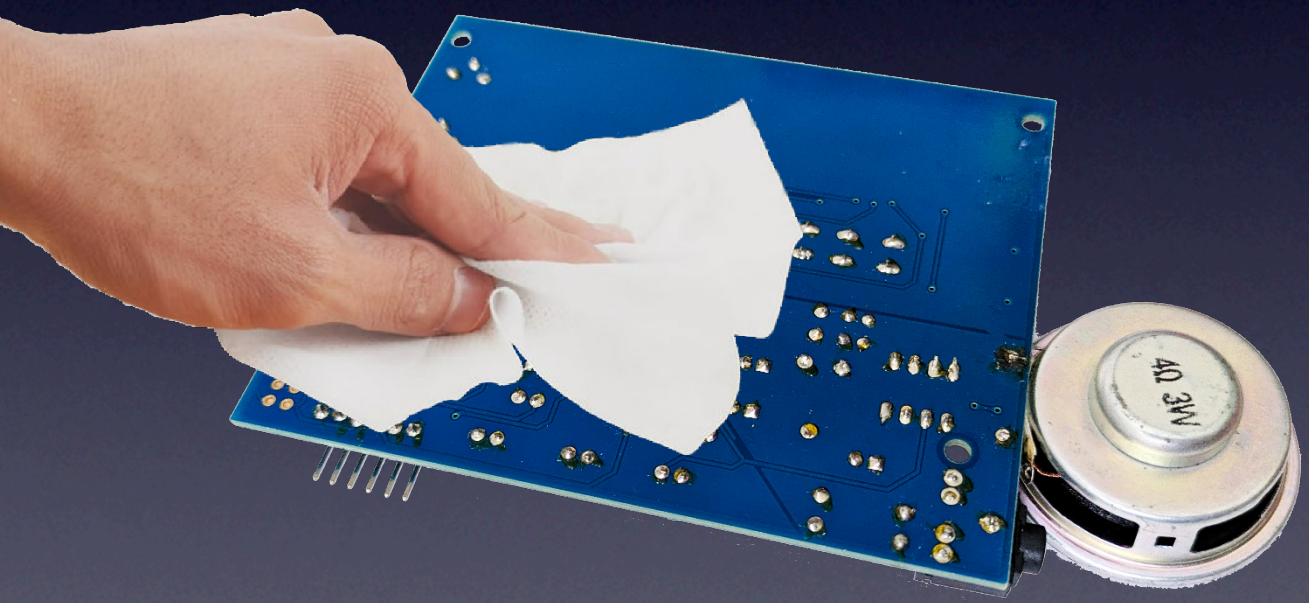
Third test: all 4 IR LEDs flicker

If the three tests are good, it works!

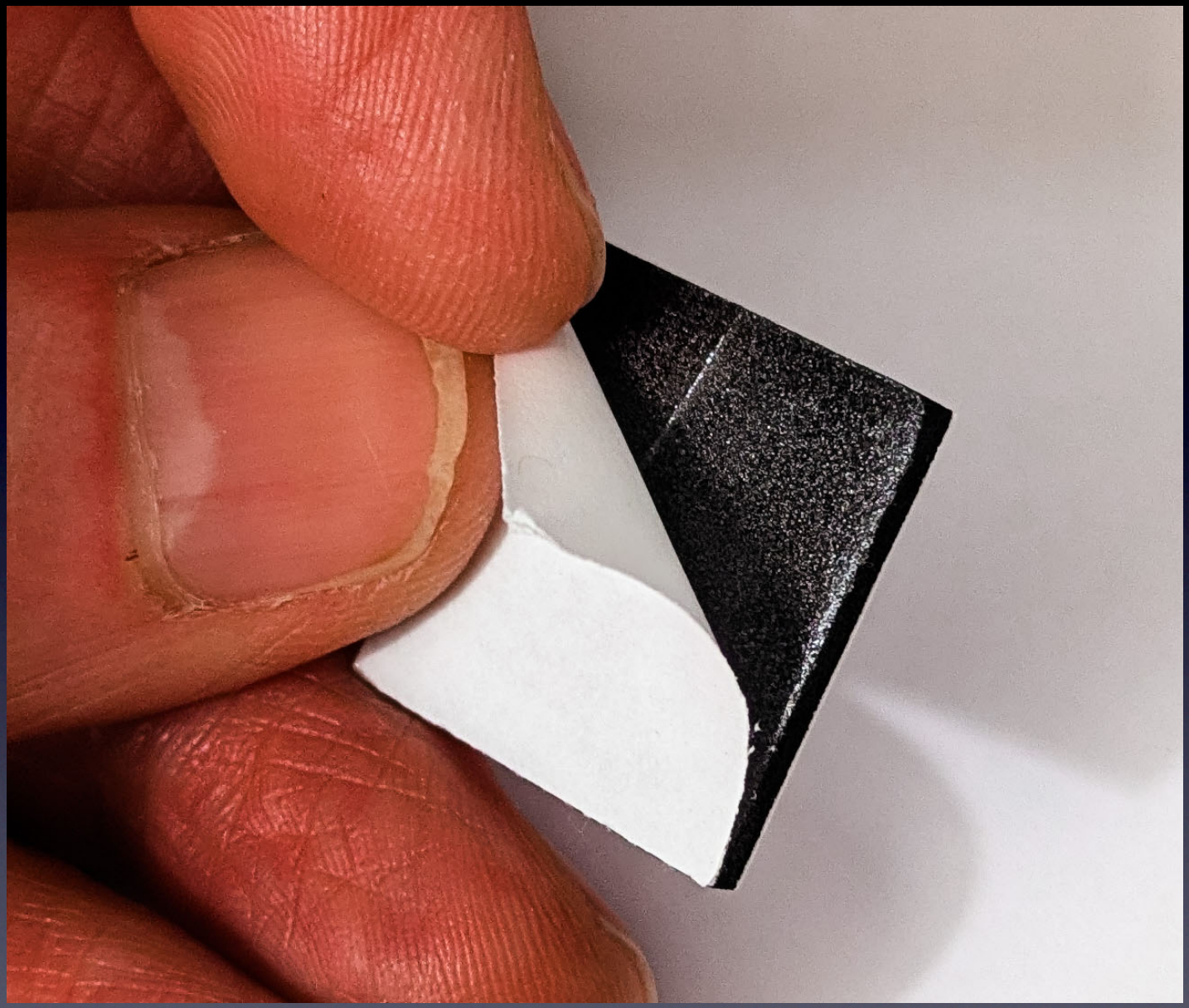
Or you start debugging.

If you used any *flux paste for re-working problems*

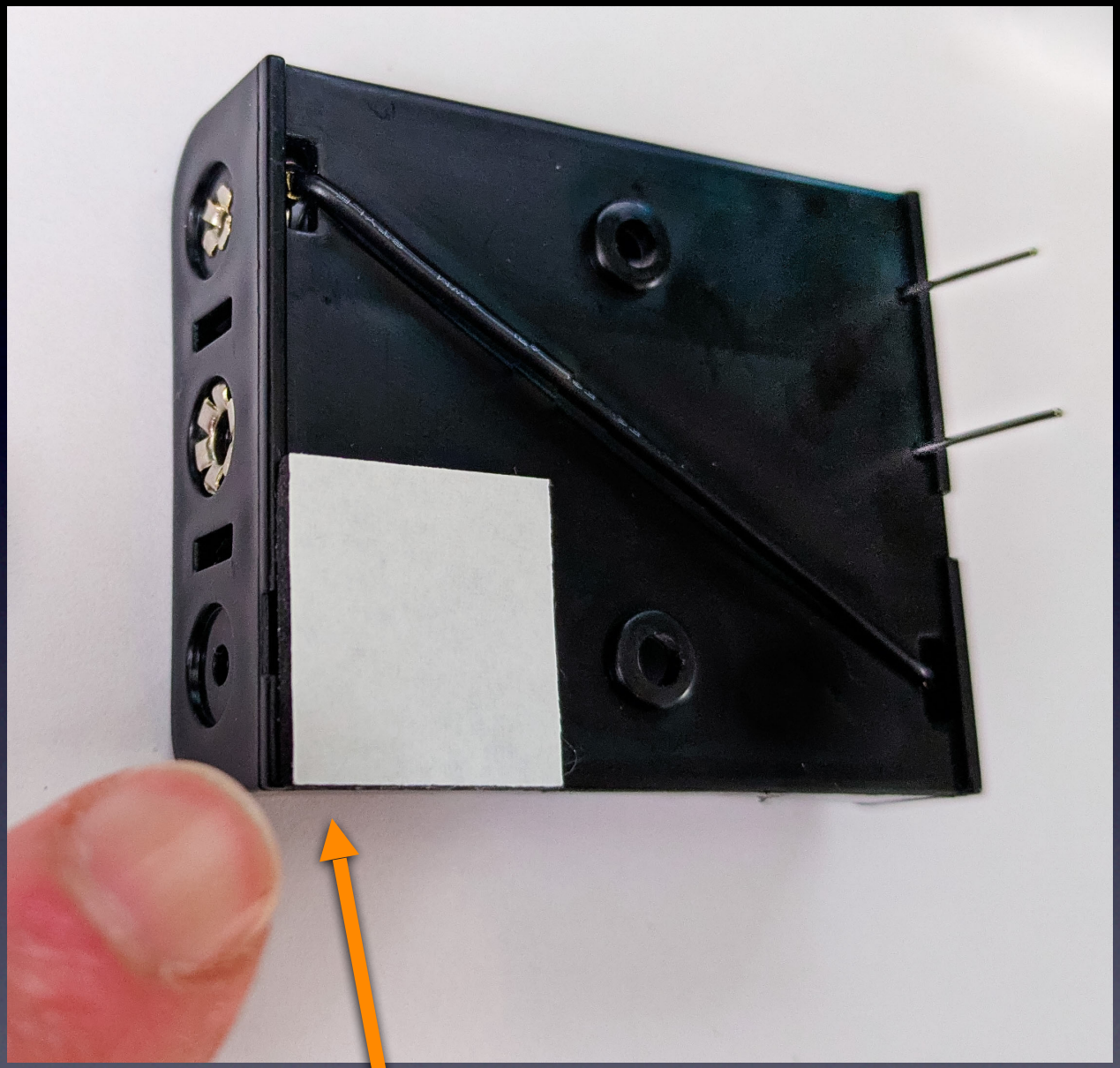
The bottom of the PCB will be sticky from the flux



You can clean it with a cloth wet with Isopropyl Alcohol

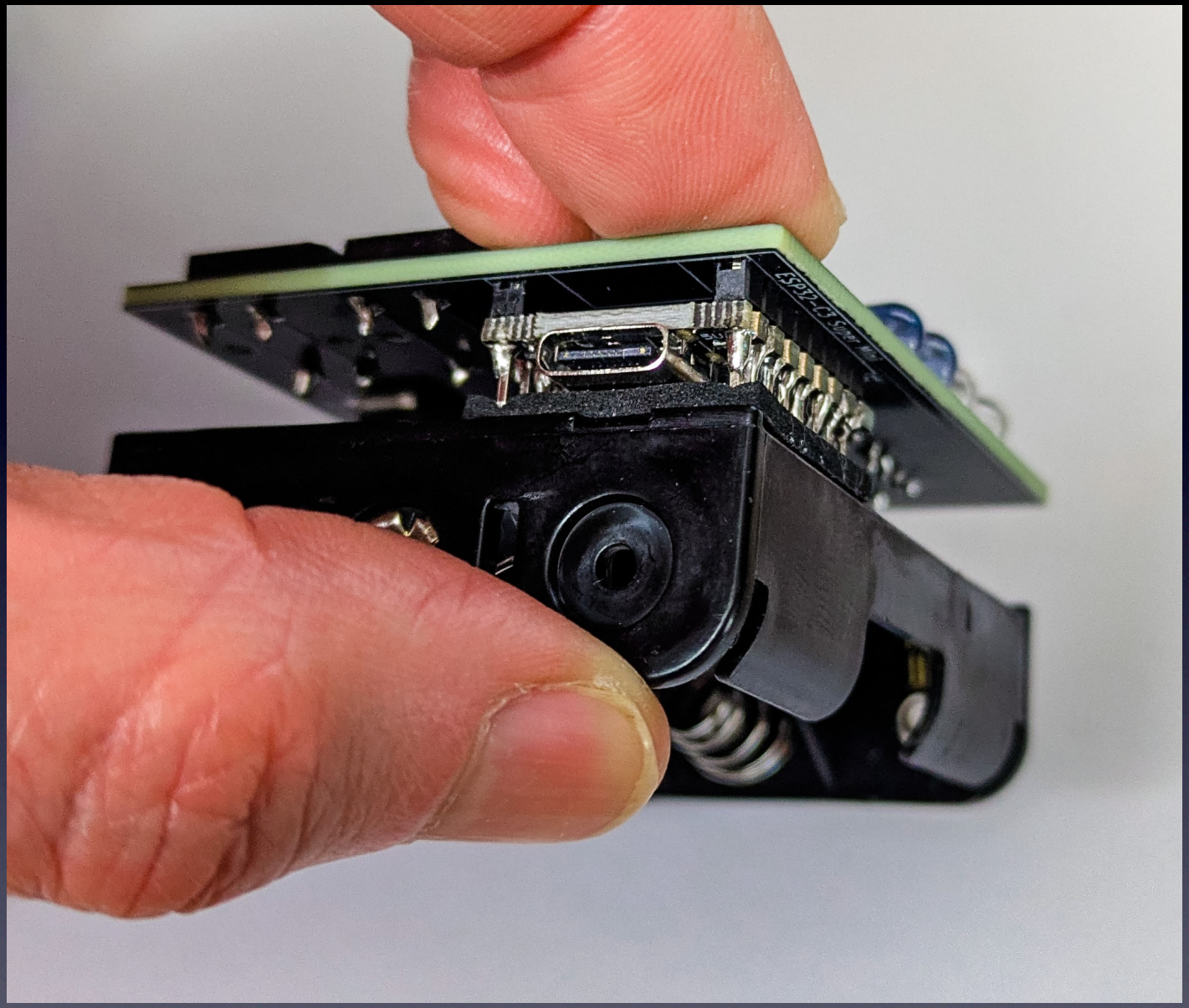


Peel back one side of double-sided foam tape

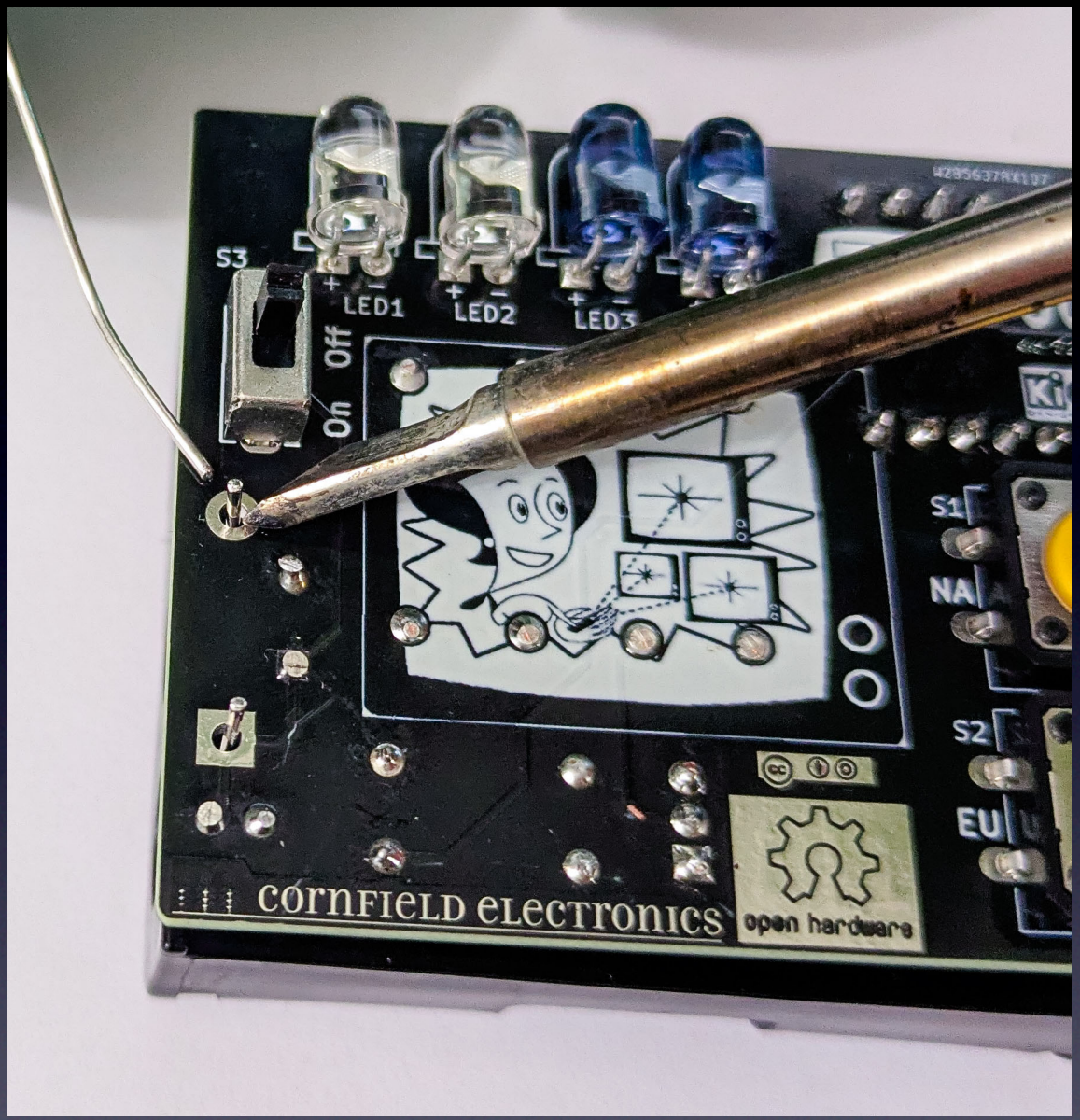


Stick foam in *this* corner of battery pack

Peel back the other side of foam tape



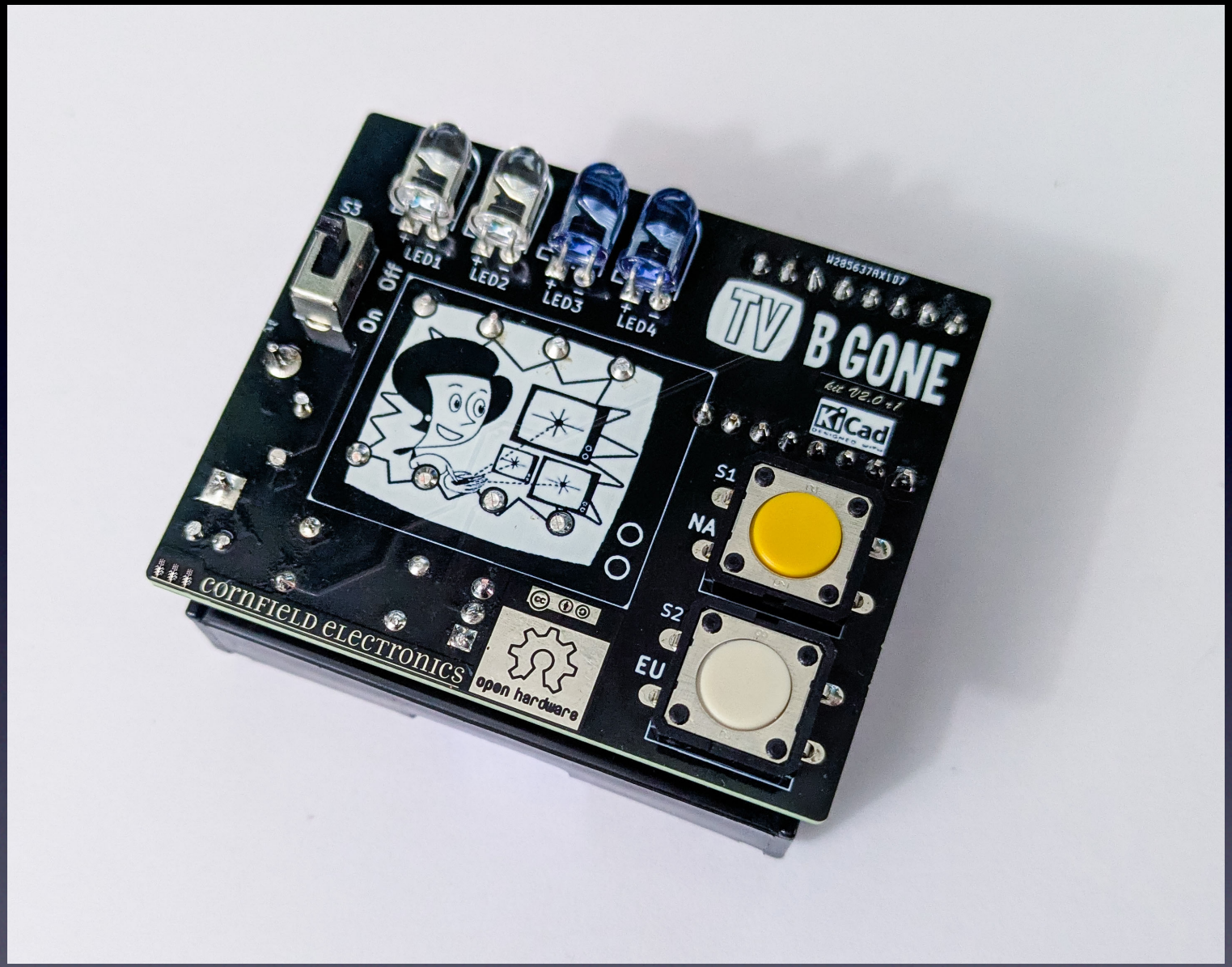
Squeeze foam tape into MOD1



Solder both leads of the battery pack

DO NOT CUT THESE 2 LEADS !

(it will destroy the wire cutters)


S3
On Off
LED1
LED2
LED3
LED4
TV B GONE
kit V2.0+1
KiCad
S1
NA
S2
EU
CORNFIELD ELECTRONICS
open hardware

Done !

Please Remember:

to

Wash your hands

after soldering

TV B GONE®

Turn off TVs!!

Make the world a better place

Make your own

TV B GONE® v2 r2

Mitch Altman

Chief Scientist, **Cornfield Electronics**, San Francisco, CA
Inventor of **TV-B-Gone** universal remote controls
Co-founder of **3Ware** (successful Silicon Valley startup)
Pioneer of **VR** (in the mid-1980s)
Founding mentor at **HAX** (1st and biggest hardware accelerator)
Co-founder of **Noisebridge** (San Francisco hackerspace)
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site: **www.CornfieldElectronics.com**
facebook: **maltman23**
flickr: **maltman23**
WeChat: **mitchaltman**
Fediverse: **@maltman23@mastodon.social**
Patreon: mitchaltman

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