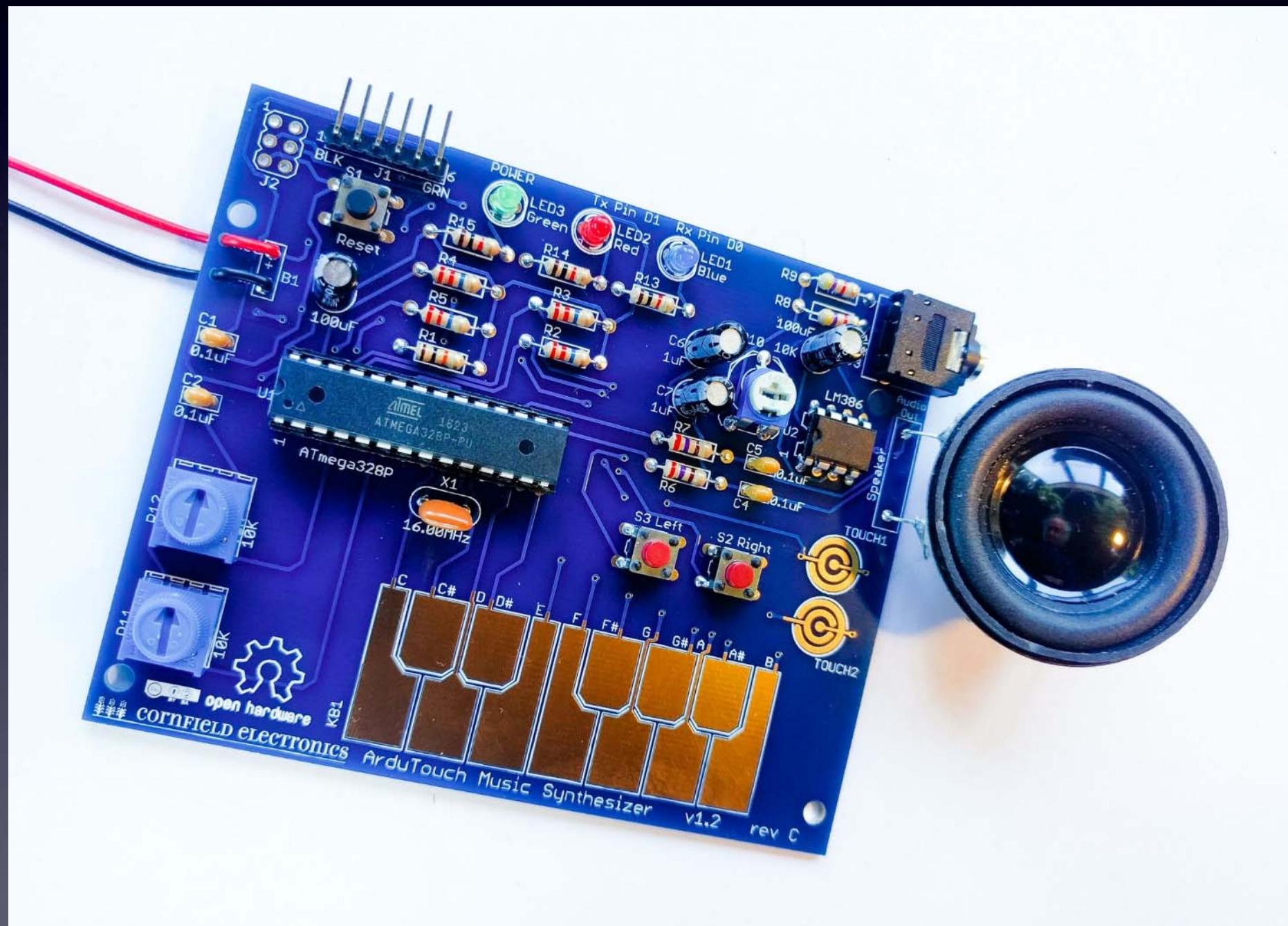


ArduTouch Music Synthesizer

Assembly Instructions



rev C

Learn To Solder

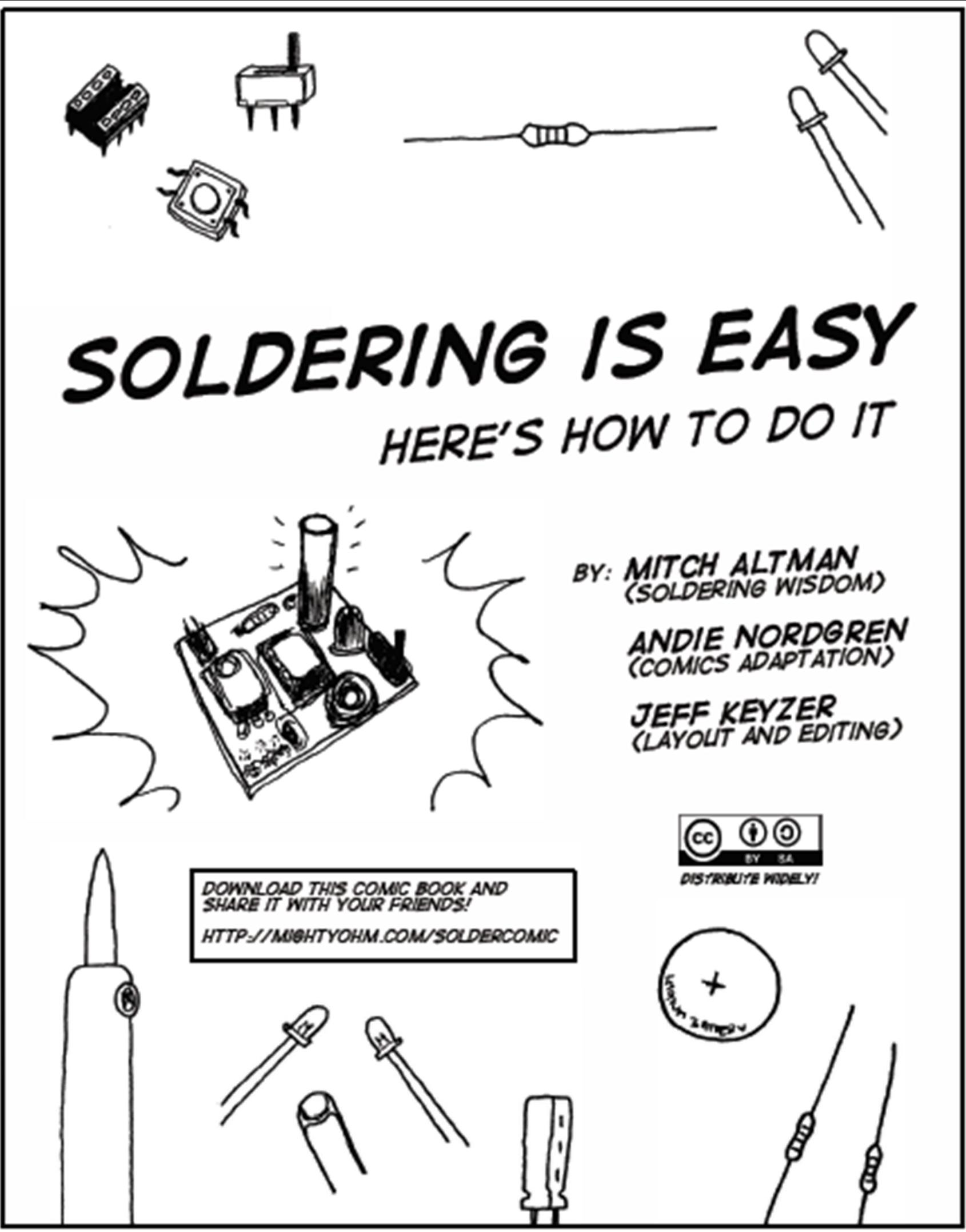


The following photos will show you how to solder.
But feel free to download the “Soldering Is Easy” comic book for free!

download for free at:

<http://mightyohm.com/soldercomic>

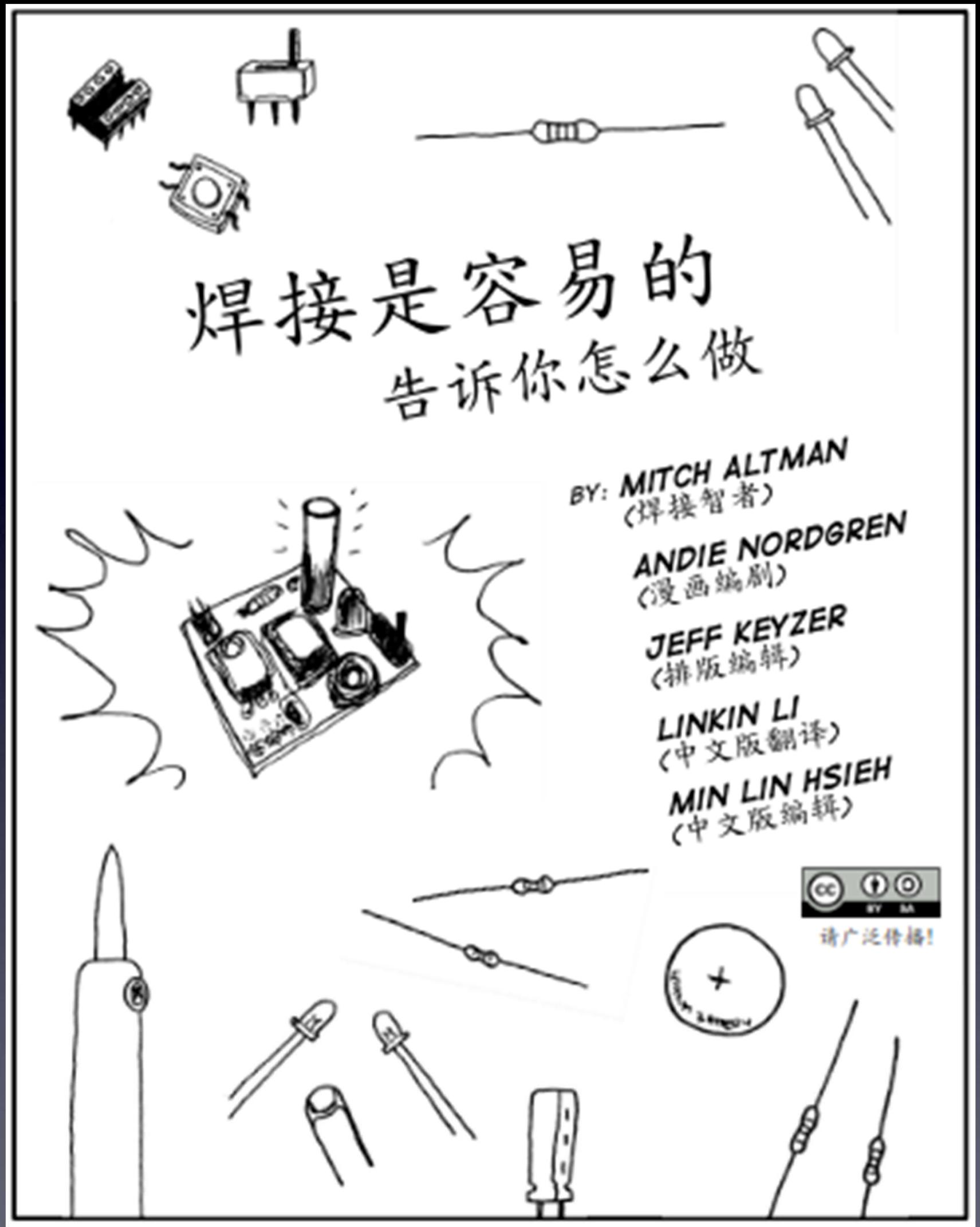
Learn To Solder



download for free at:

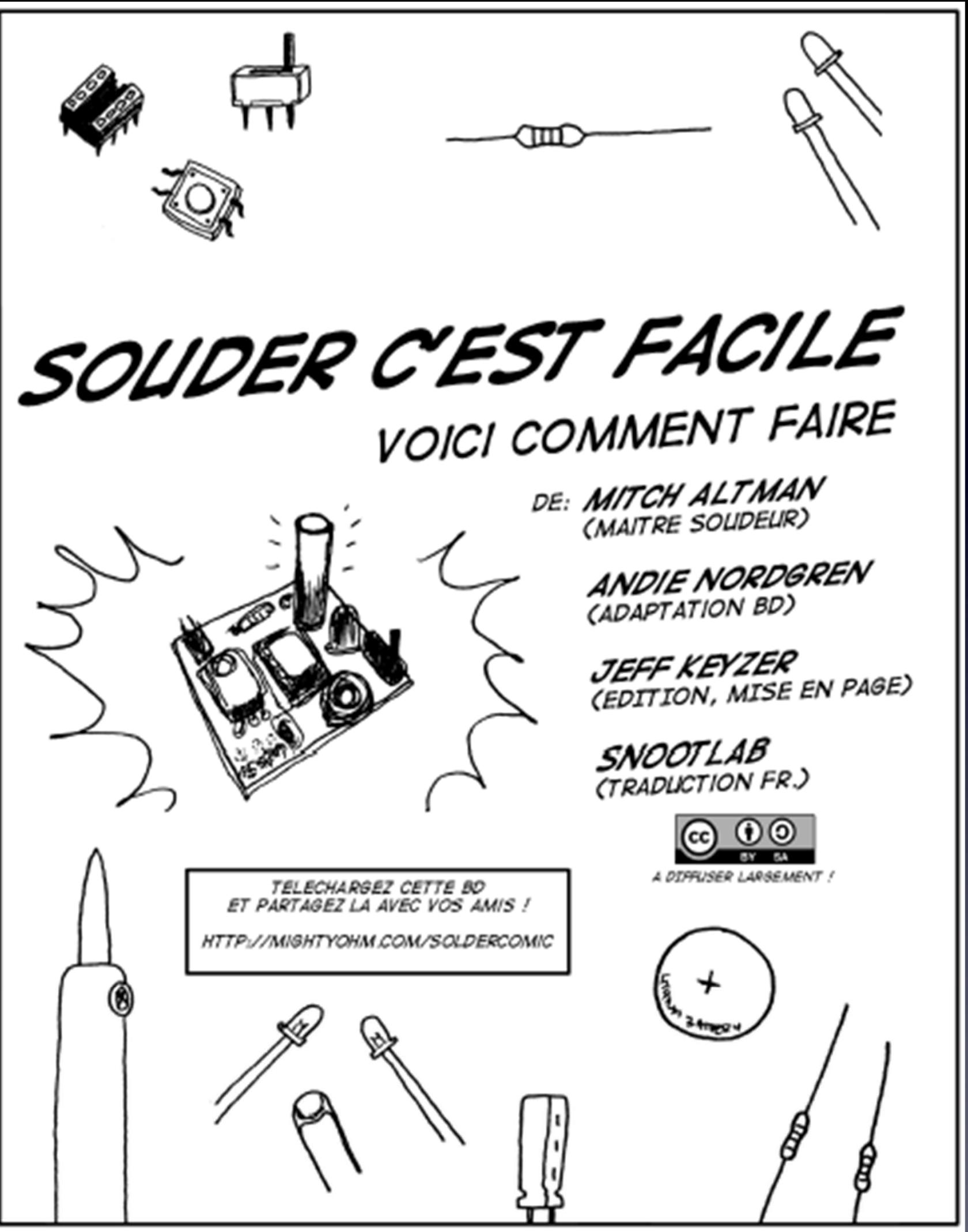
<http://mightyohm.com/soldercomic>

Learn To Solder



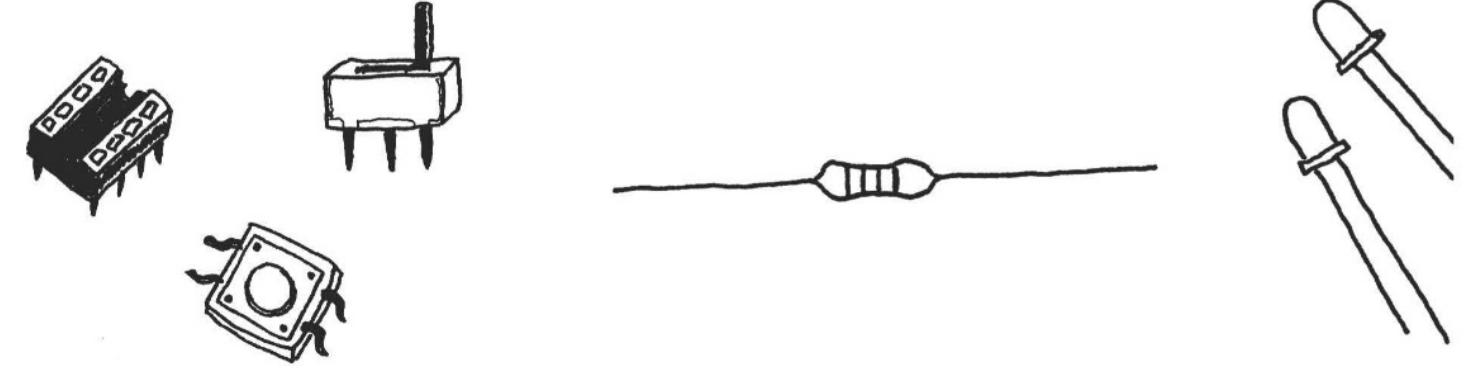
Download in the language of your choice for free at:
<http://mightyohm.com/soldercomic>

Learn To Solder



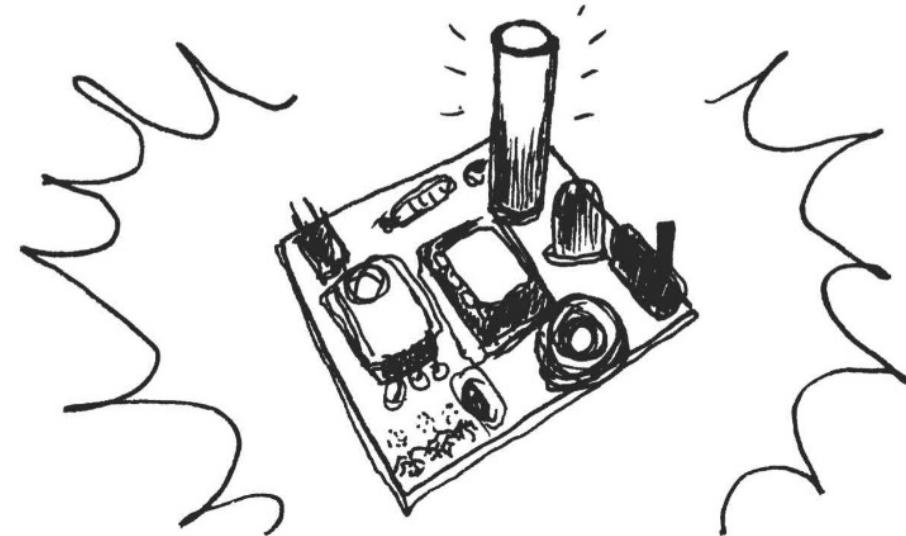
Download in the language of your choice for free at:
<http://mightyohm.com/soldercomic>

Learn To Solder



SOLDAR ES FÁCIL!

APRENDE CÓMO HACERLO



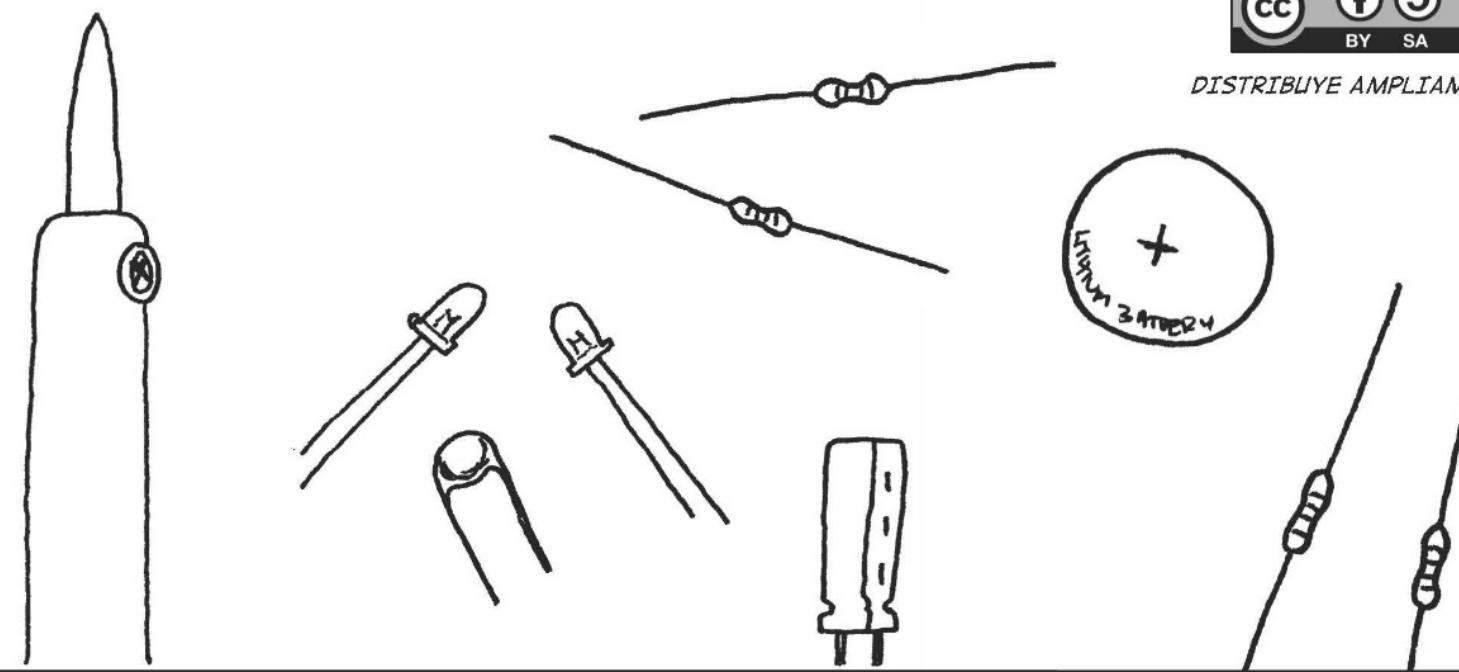
POR: MITCH ALTMAN
(SABIDURÍA EN SOLDADO)

ANDIE NORDGREN
(ADAPTACIÓN A COMIC)

JEFF KEYZER
(DISEÑO Y EDICIÓN)



DISTRIBUYE AMPLIAMENTE!



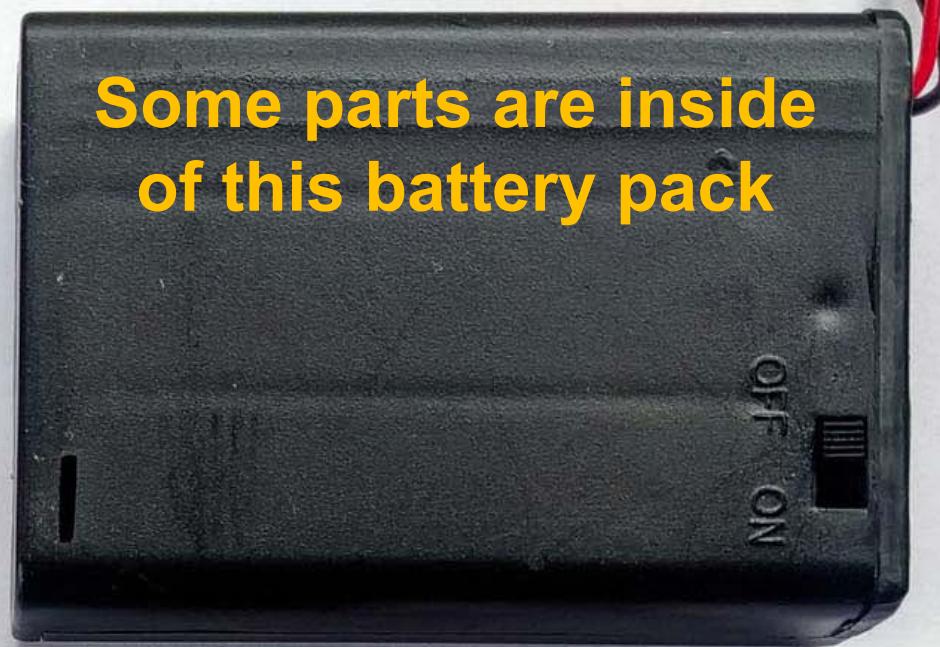
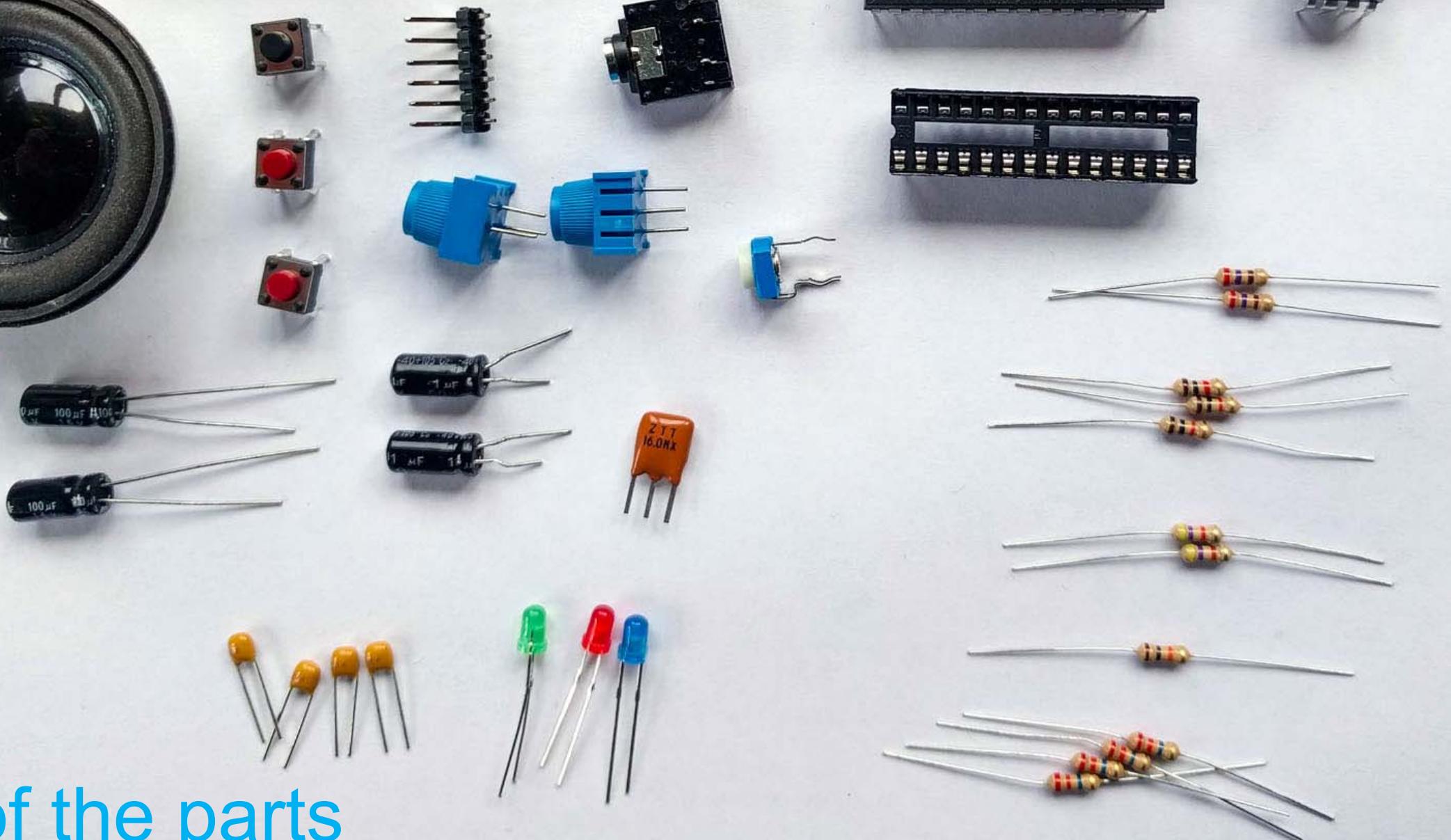
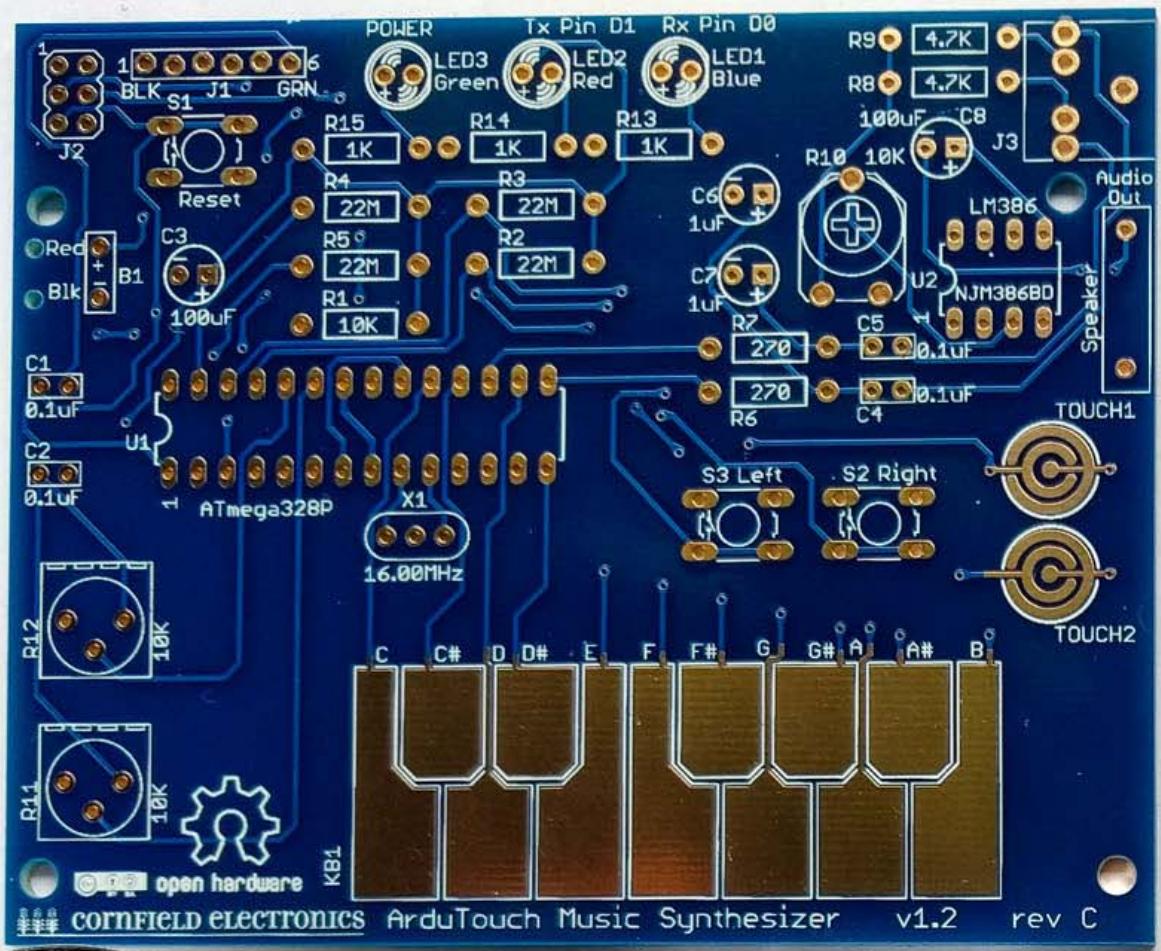
Download in the language of your choice for free at:

<http://mightyohm.com/soldercomic>

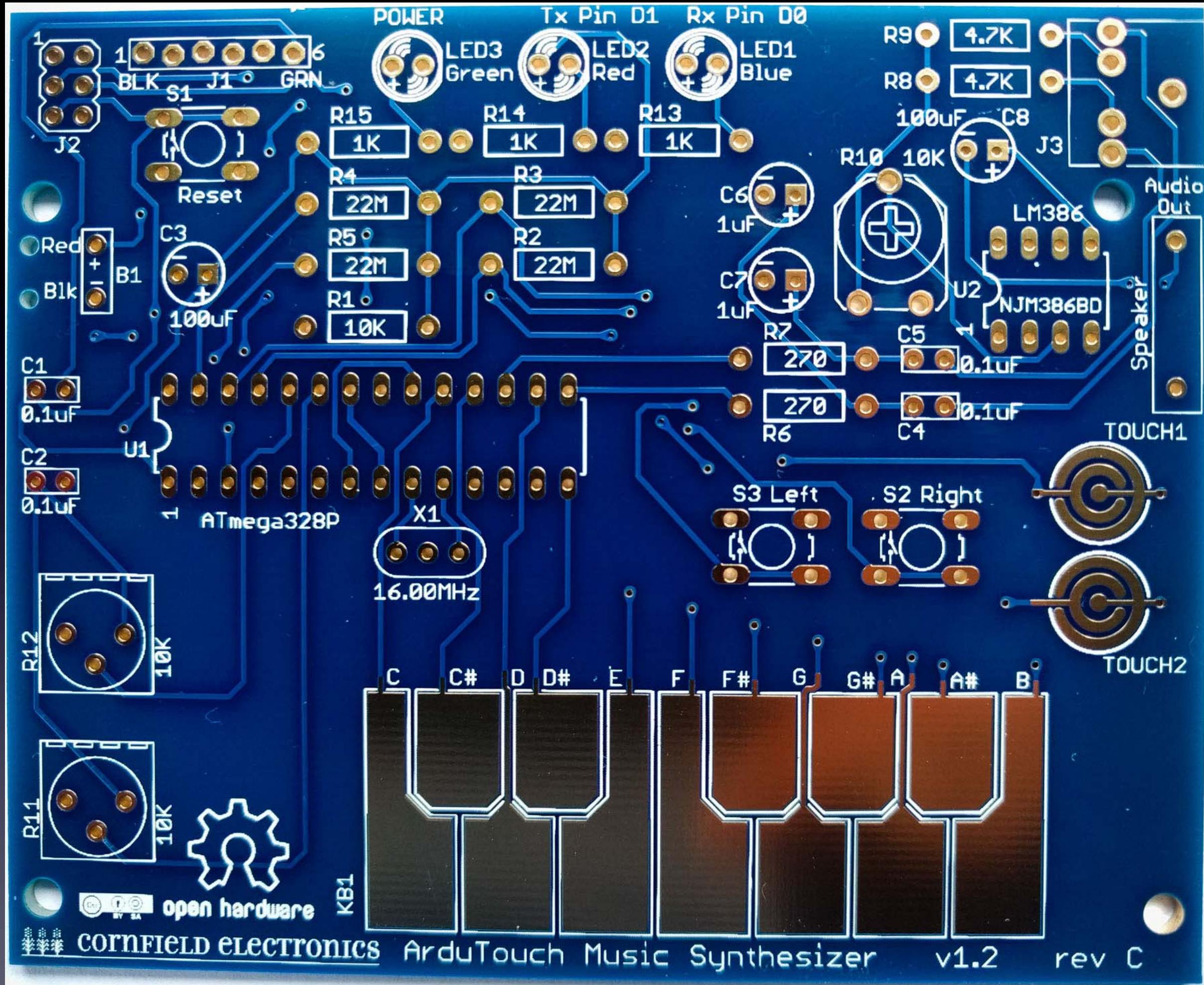
Learn To Solder

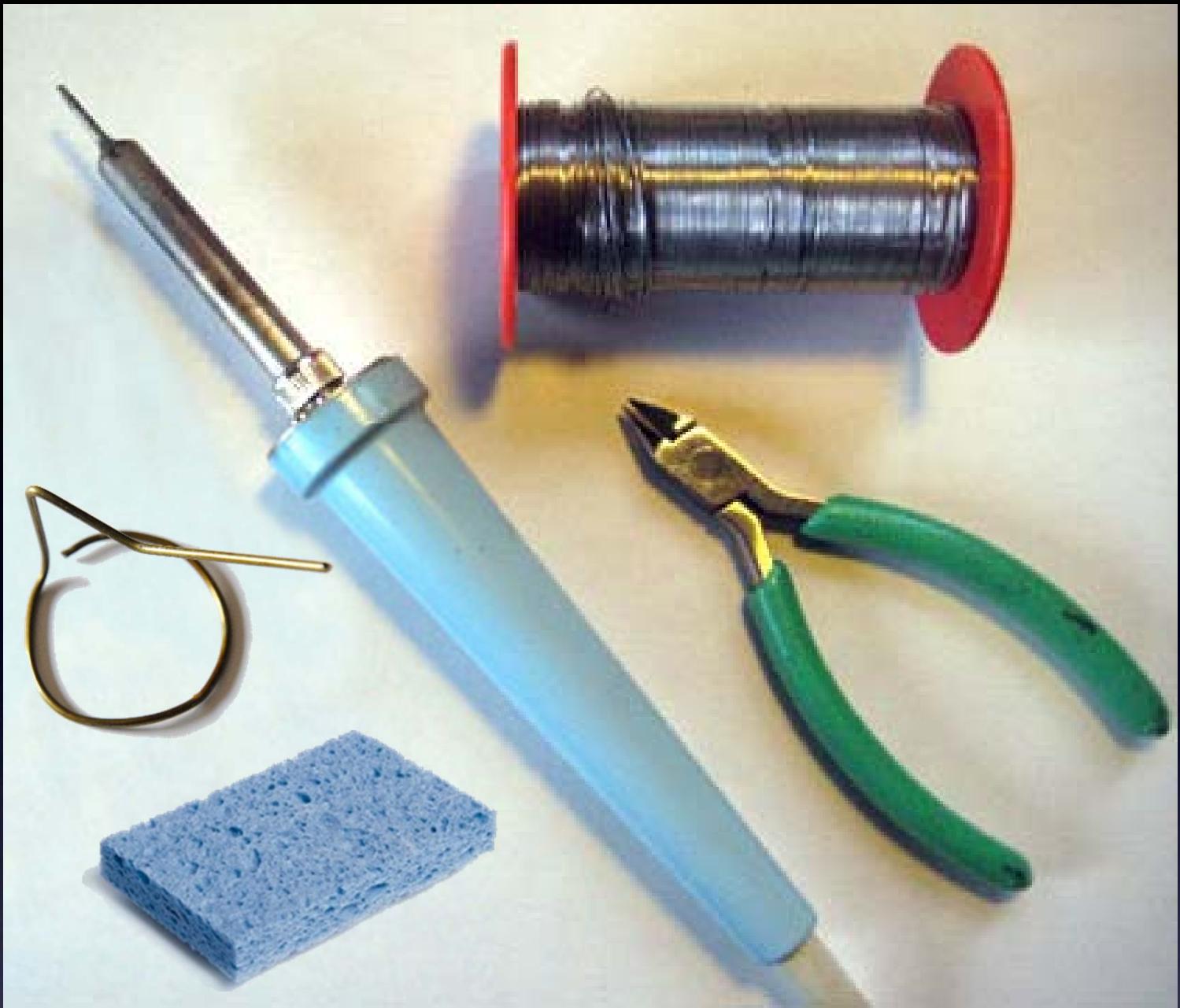


Download in the language of your choice for free at:
<http://mightyohm.com/soldercomic>



All of the parts

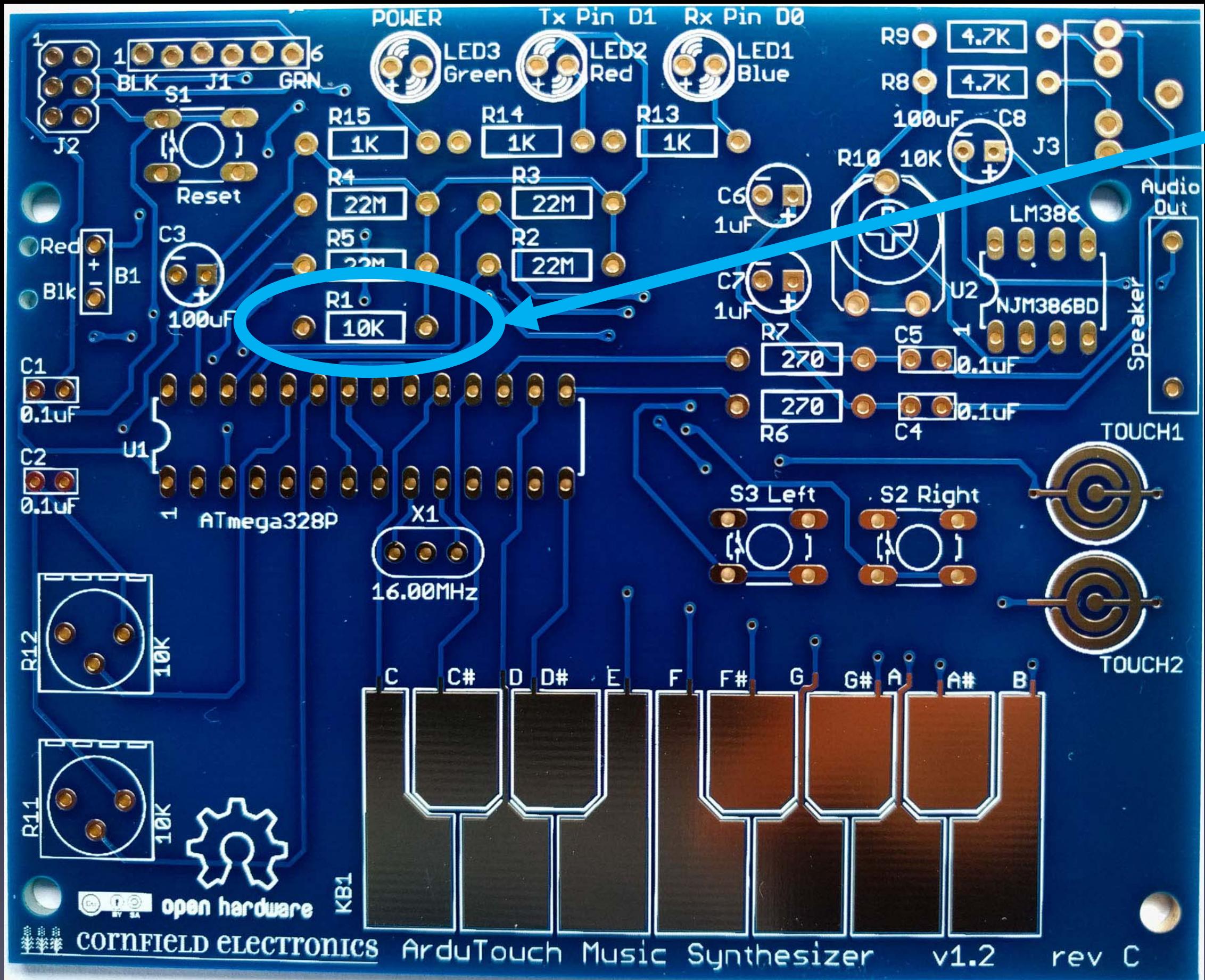




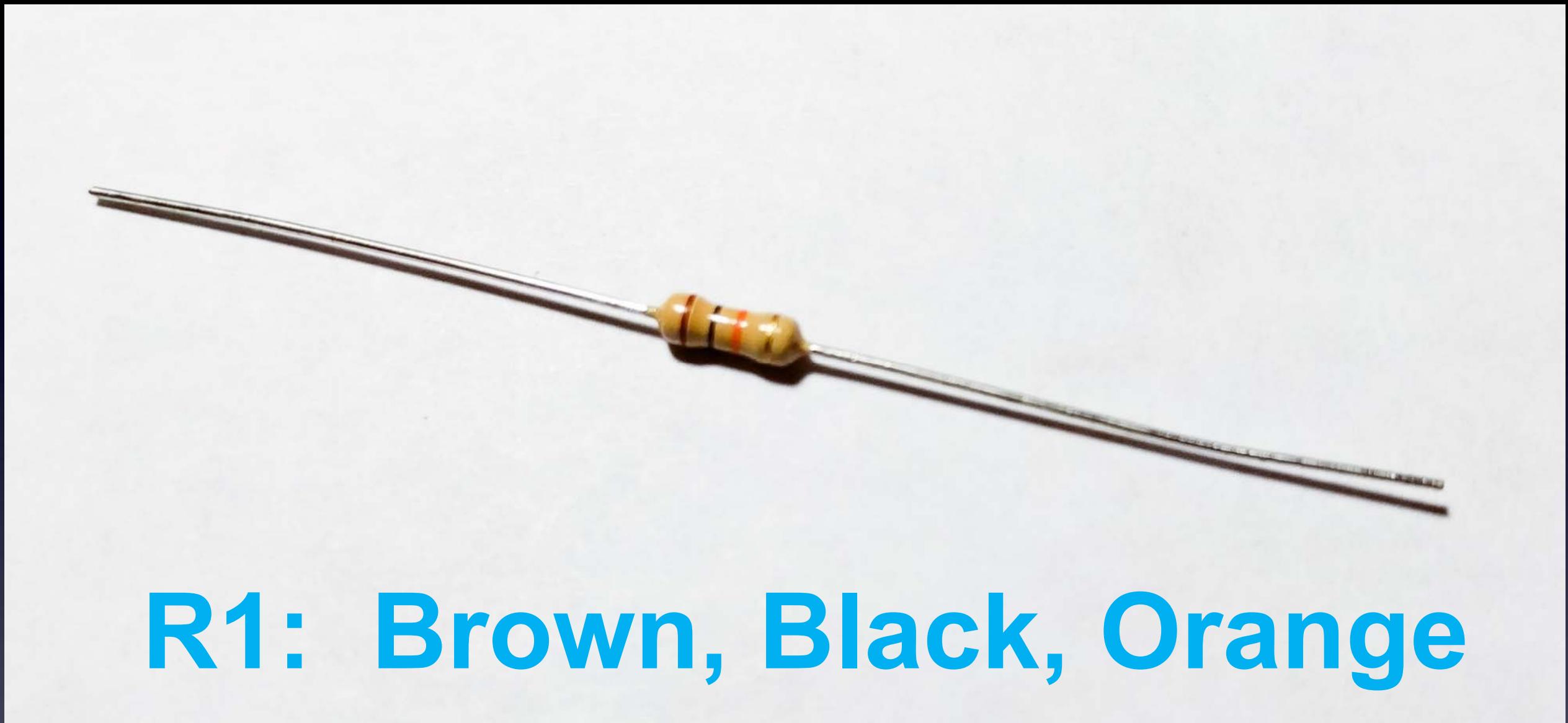
Important:
Use solder WITH lead (Pb) !!
**Unleaded solder
has very poisonous fumes!**

The tools you'll need:

- soldering Iron (35W or less)
- solder (60/40 Sn/Pb, rosin core, 0.031" diameter or less)
- soldering iron stand
- cellulose kitchen sponge (*not plastic!*)
- *small* wire cutter



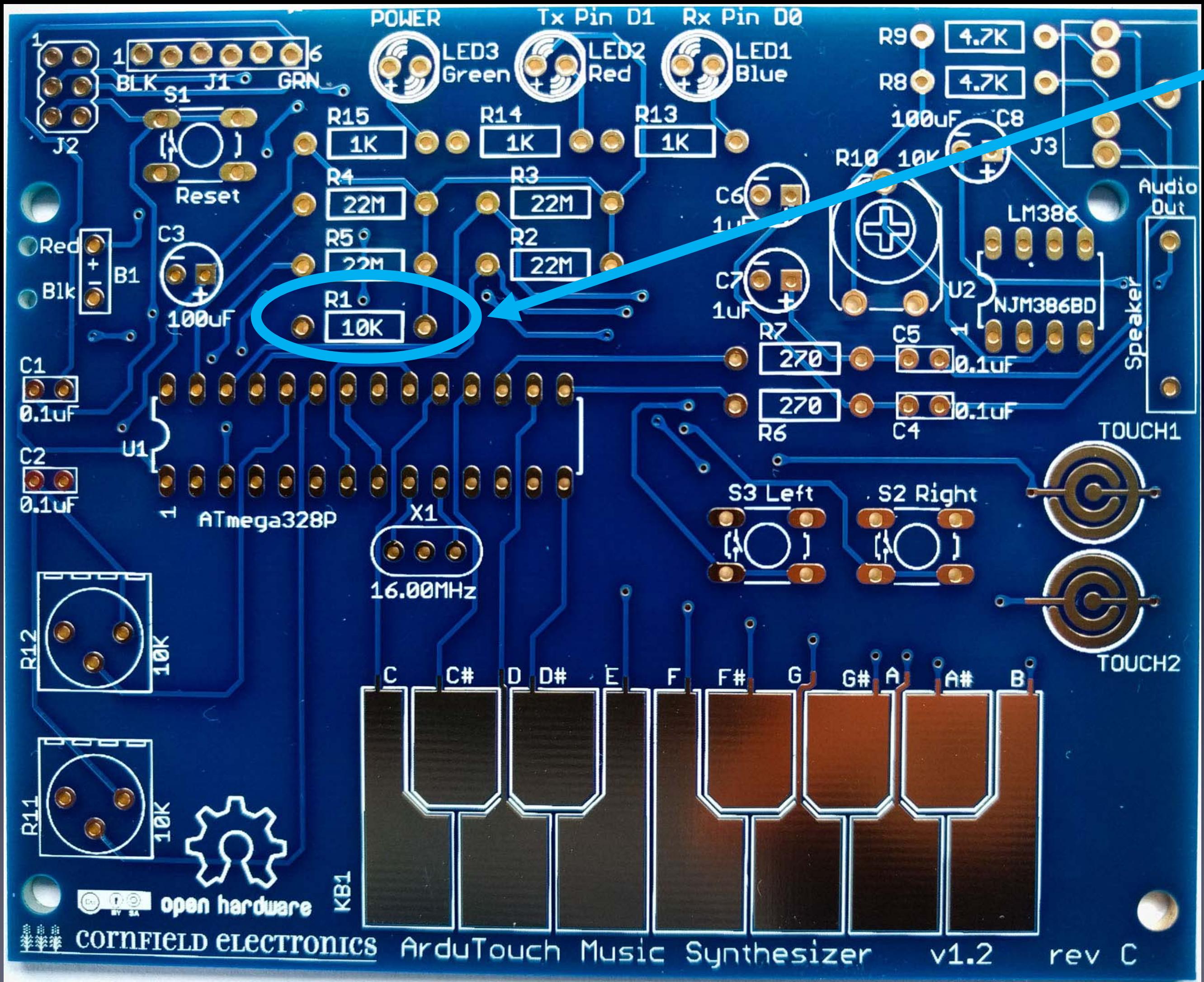
R1 - this is where it goes



R1: Brown, Black, Orange

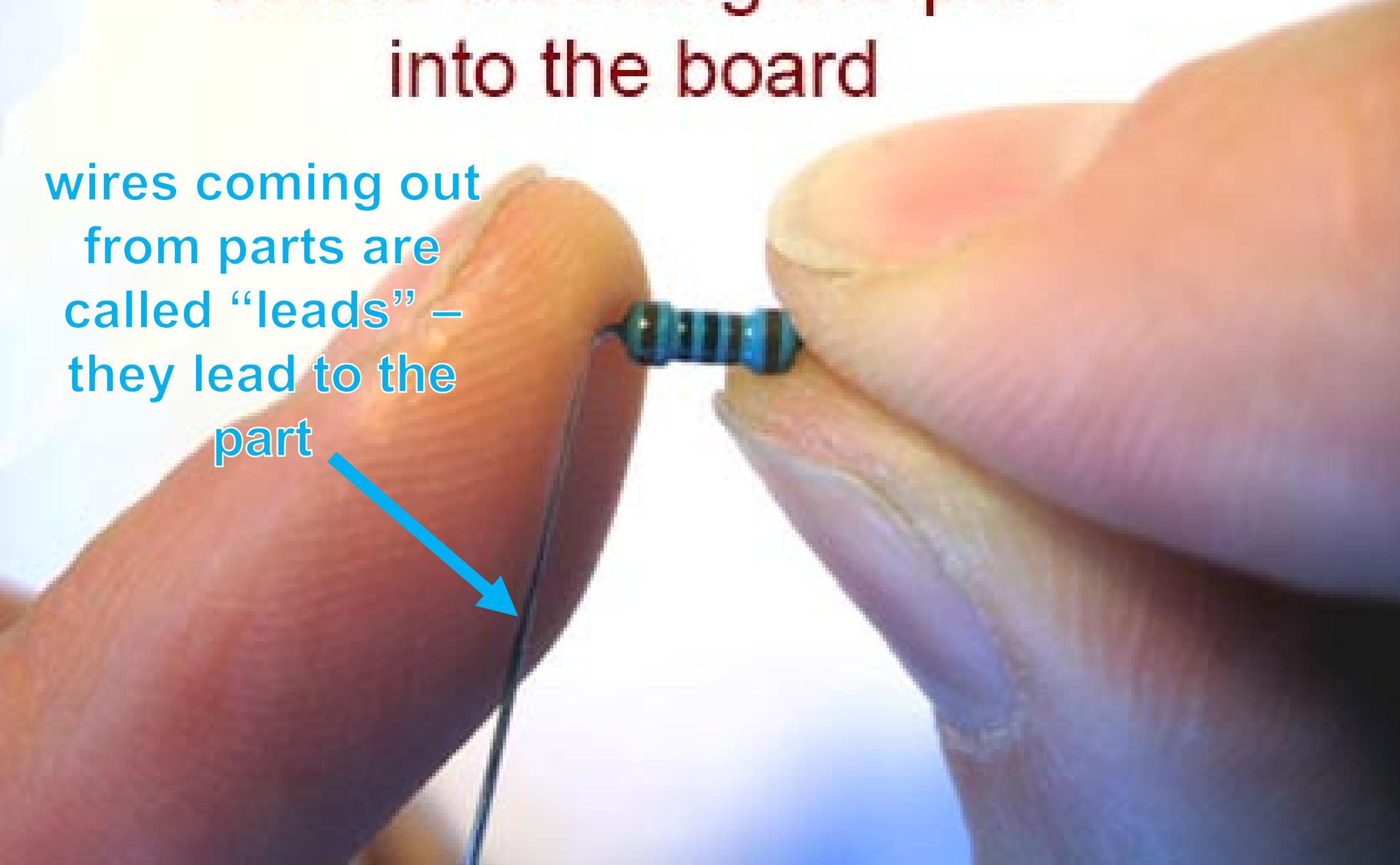
(not Brown, Black, Red)

R1



If necessary, Bend leads
before inserting the part
into the board

wires coming out
from parts are
called “leads” –
they lead to the
part



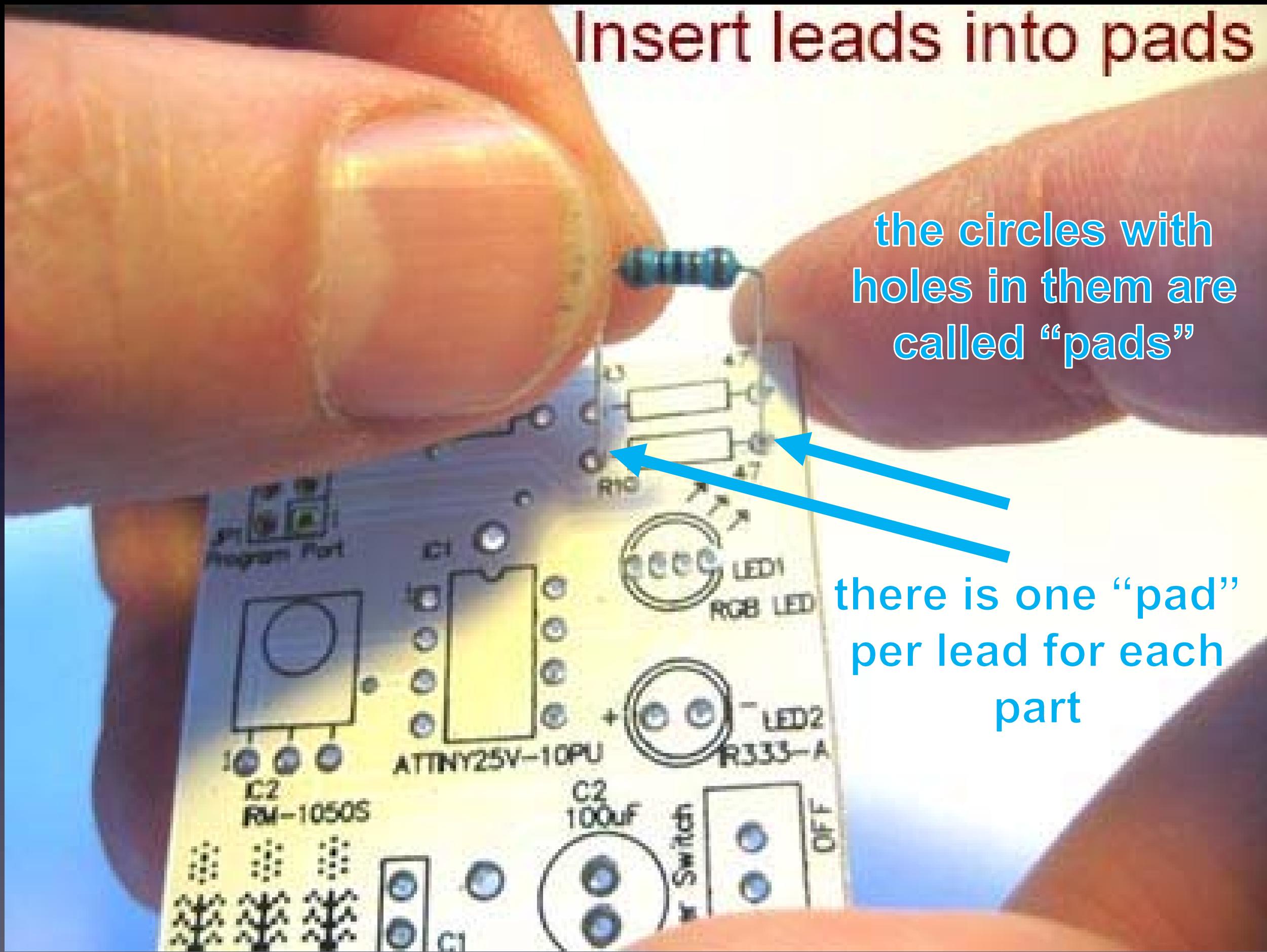


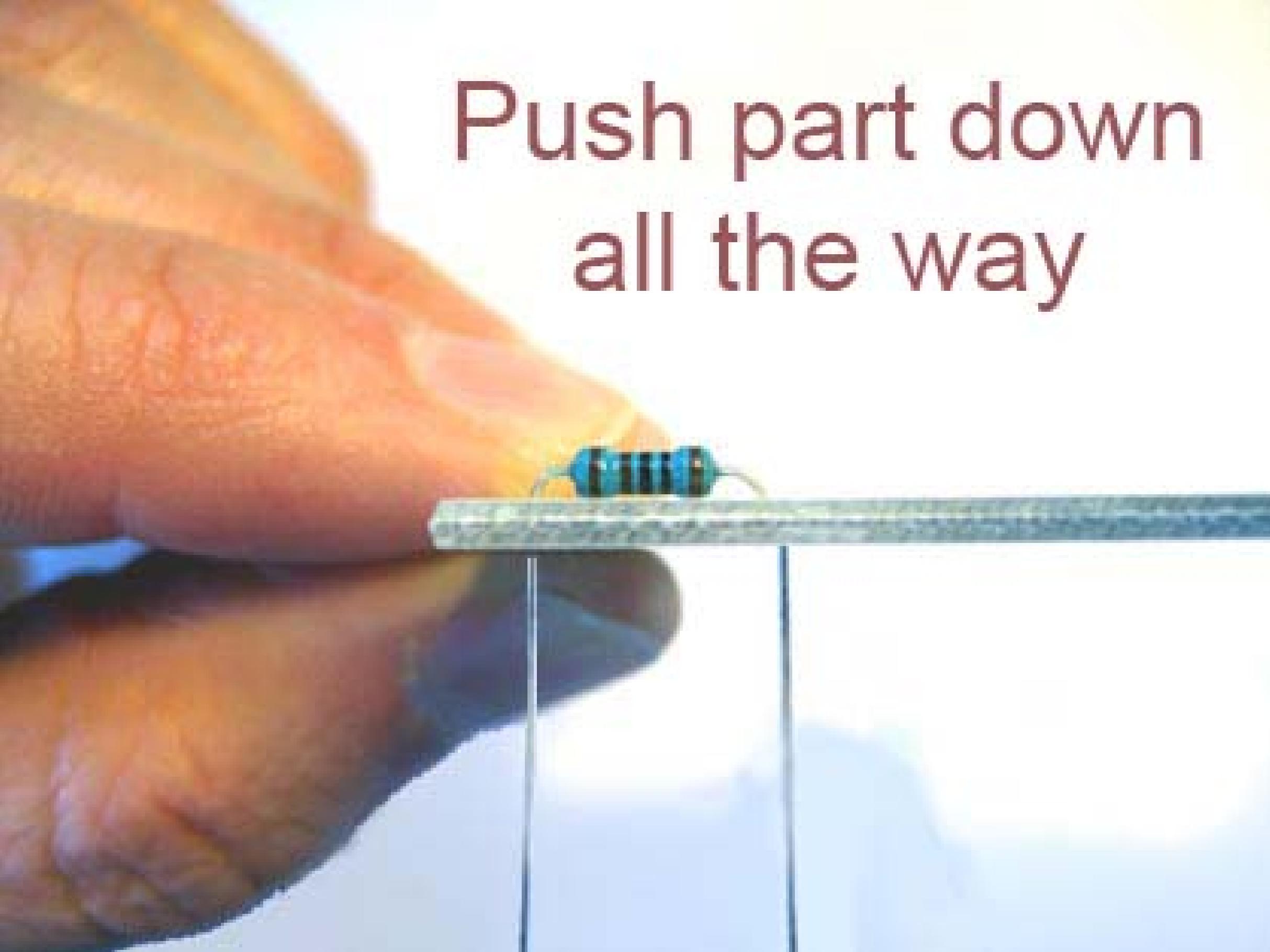
R1 – this is how it will look before inserting it into the board

Insert leads into pads

the circles with
holes in them are
called “pads”

there is one “pad”
per lead for each
part



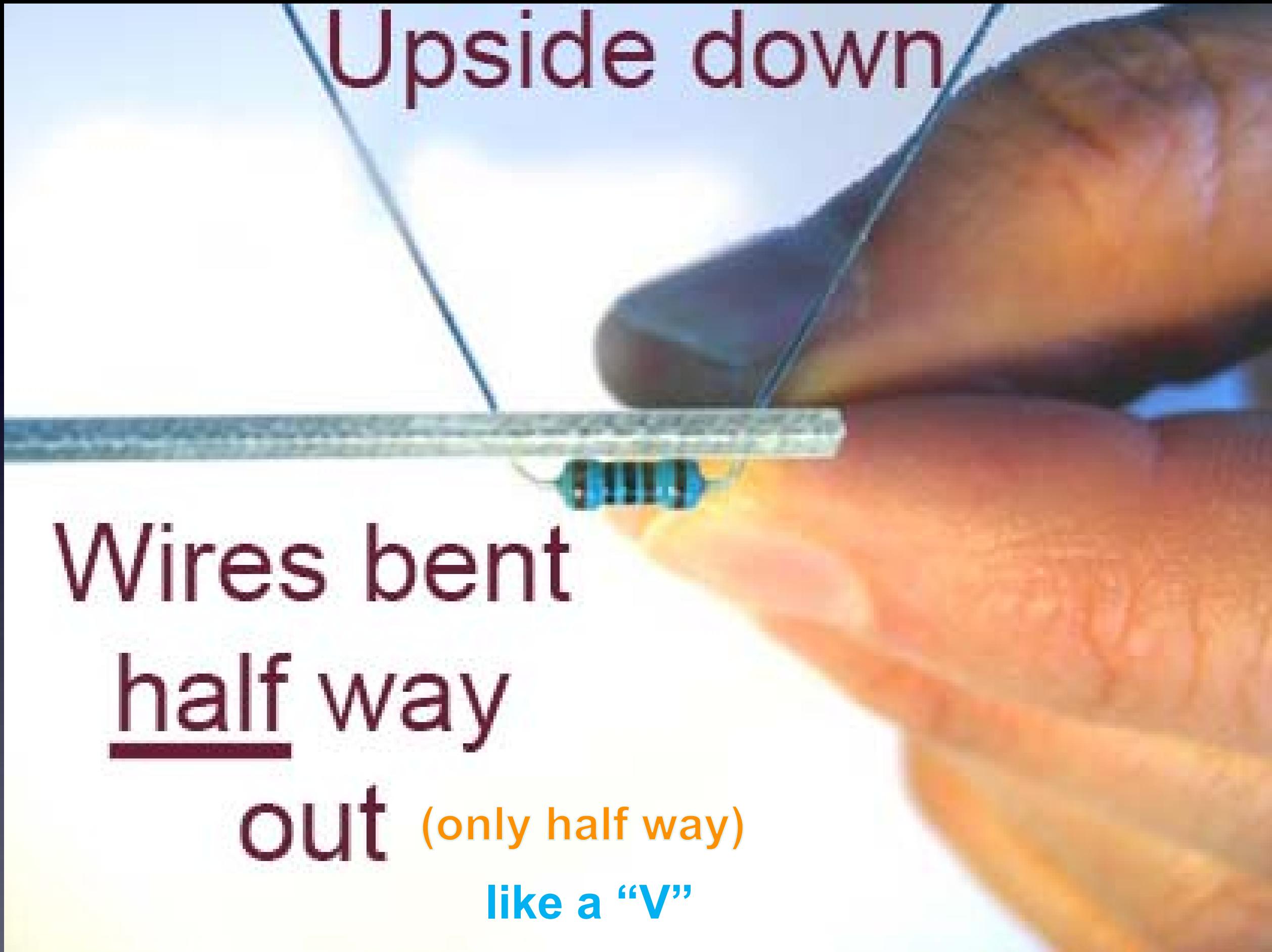


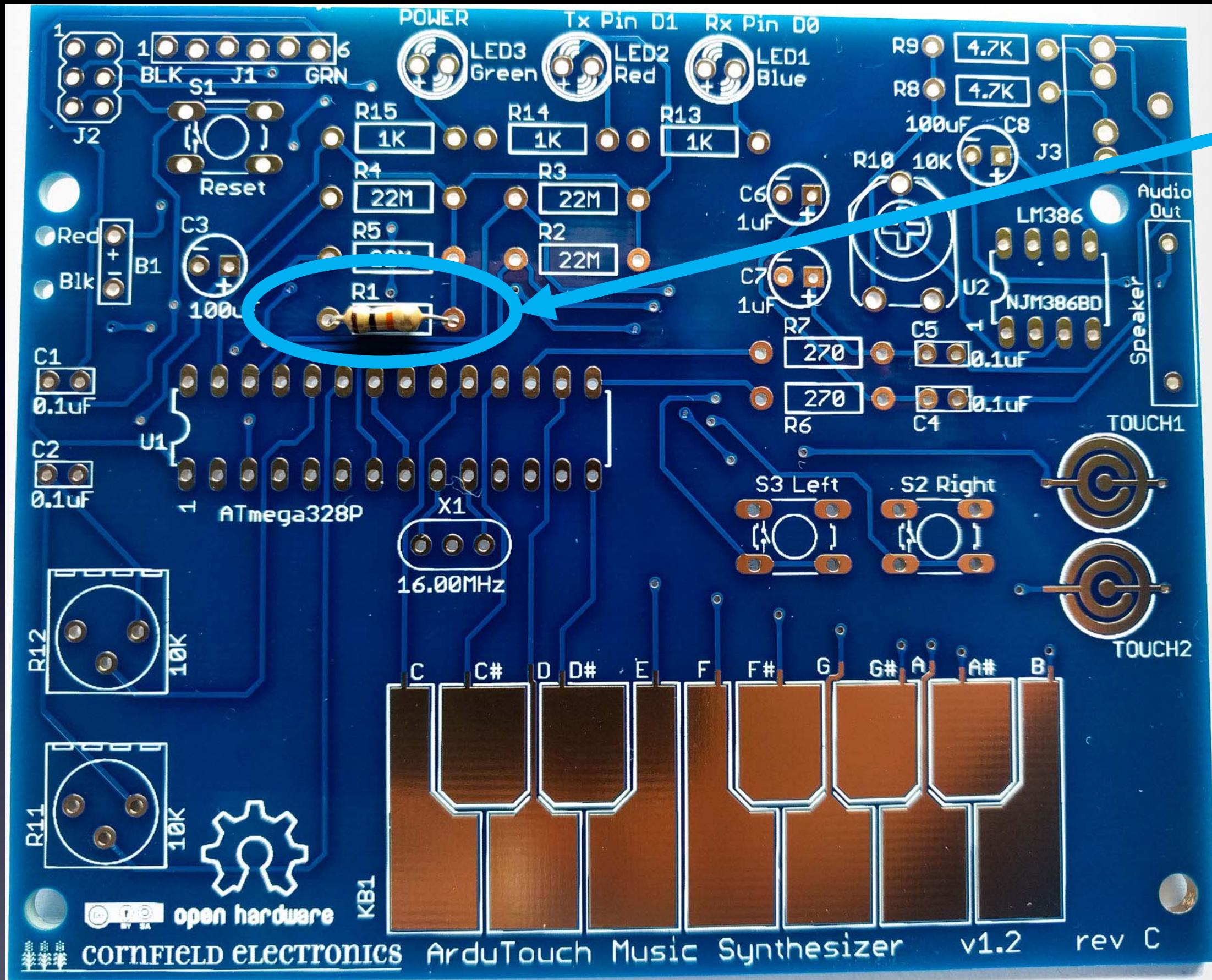
Push part down
all the way

Upside down

Wires bent
half way
out (only half way)
like a “V”

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





R1 - inserted into the board



How to hold a soldering iron

(Like a pencil – held from underneath)

Important

The perfect kind of solder for
electronics:

60/40 rosin core,
0.031" (0.7mm) diameter (or smaller)

(63/37 is also good)

Important:

Use solder **WITH** lead (Pb) !!
lead-free solder
has very poisonous fumes!

3 Safety Tips...

Safety Tip #1:

Hot !!

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

Safety Tip #2:

Lead (Pb) is toxic

But it easily washes 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)

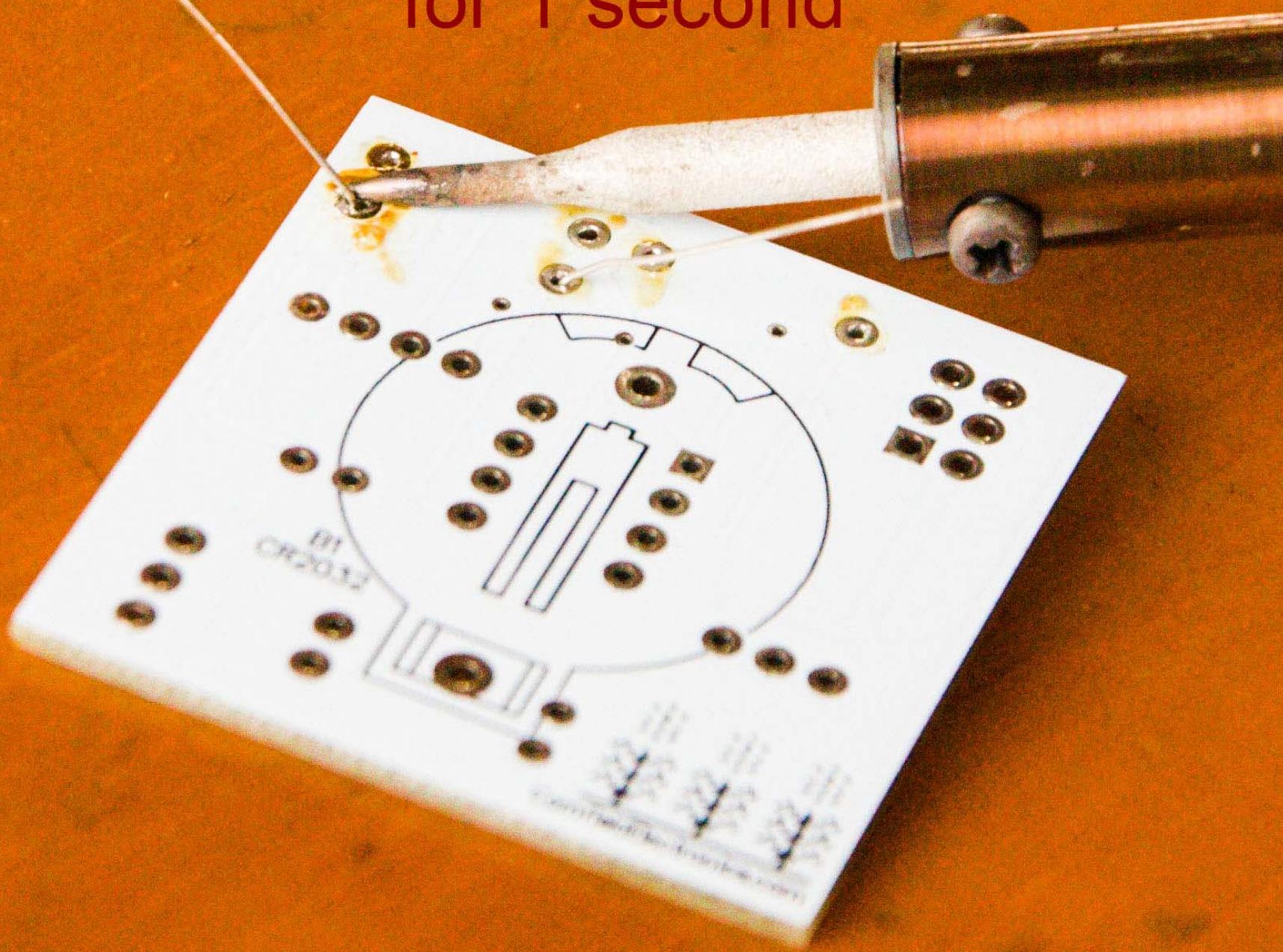
Bang (lightly) 3 times,

Swipe, Rotate, Swipe (on the sponge):

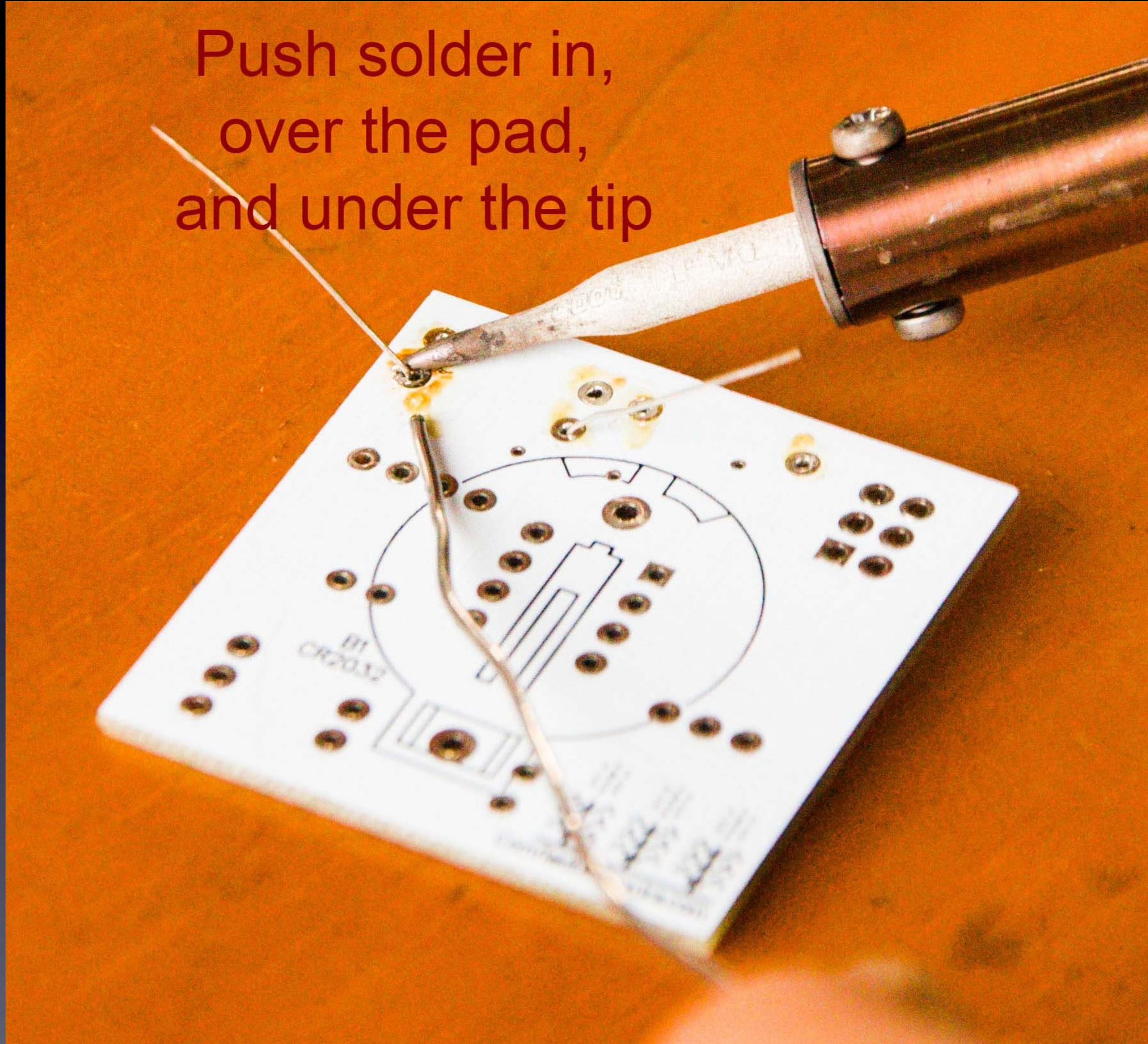
Keep the tip shiny silver!

knock solder off the tip

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

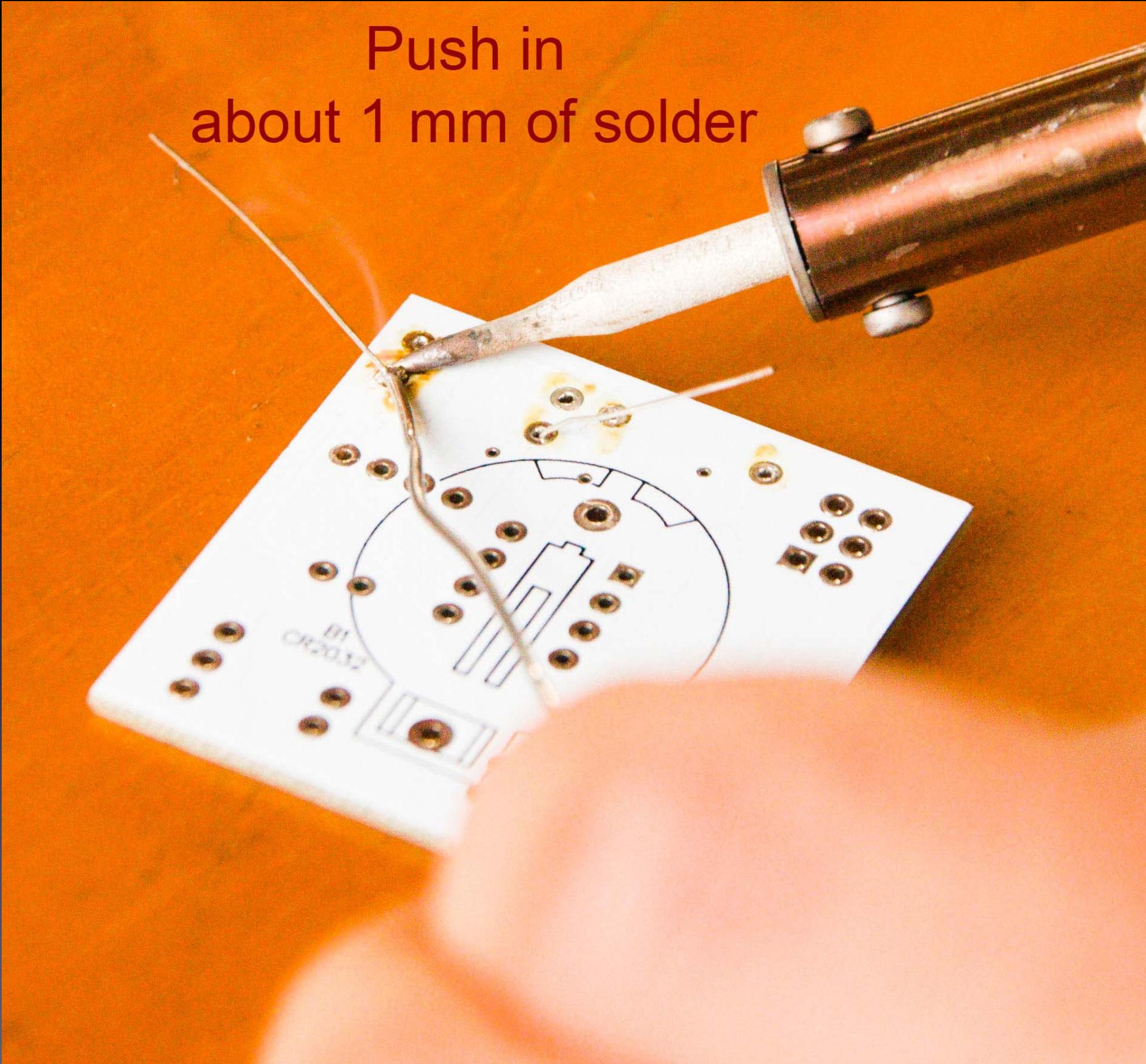


Do this quickly (slowly doesn't work well) – solder in & out in about 1 second

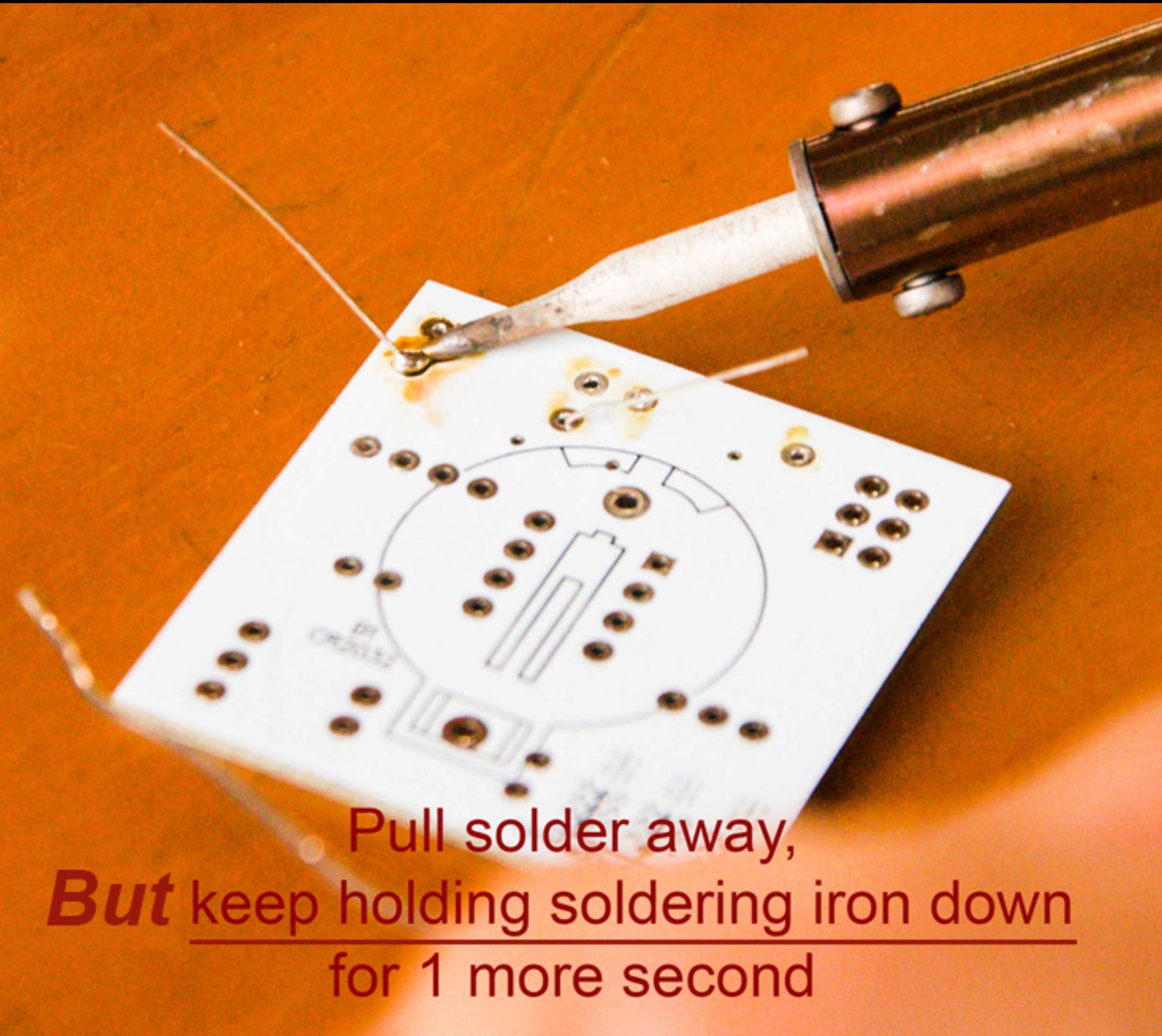


Make sure solder melts on the underside of the soldering iron tip
(not the side or top of the soldering iron tip)!

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



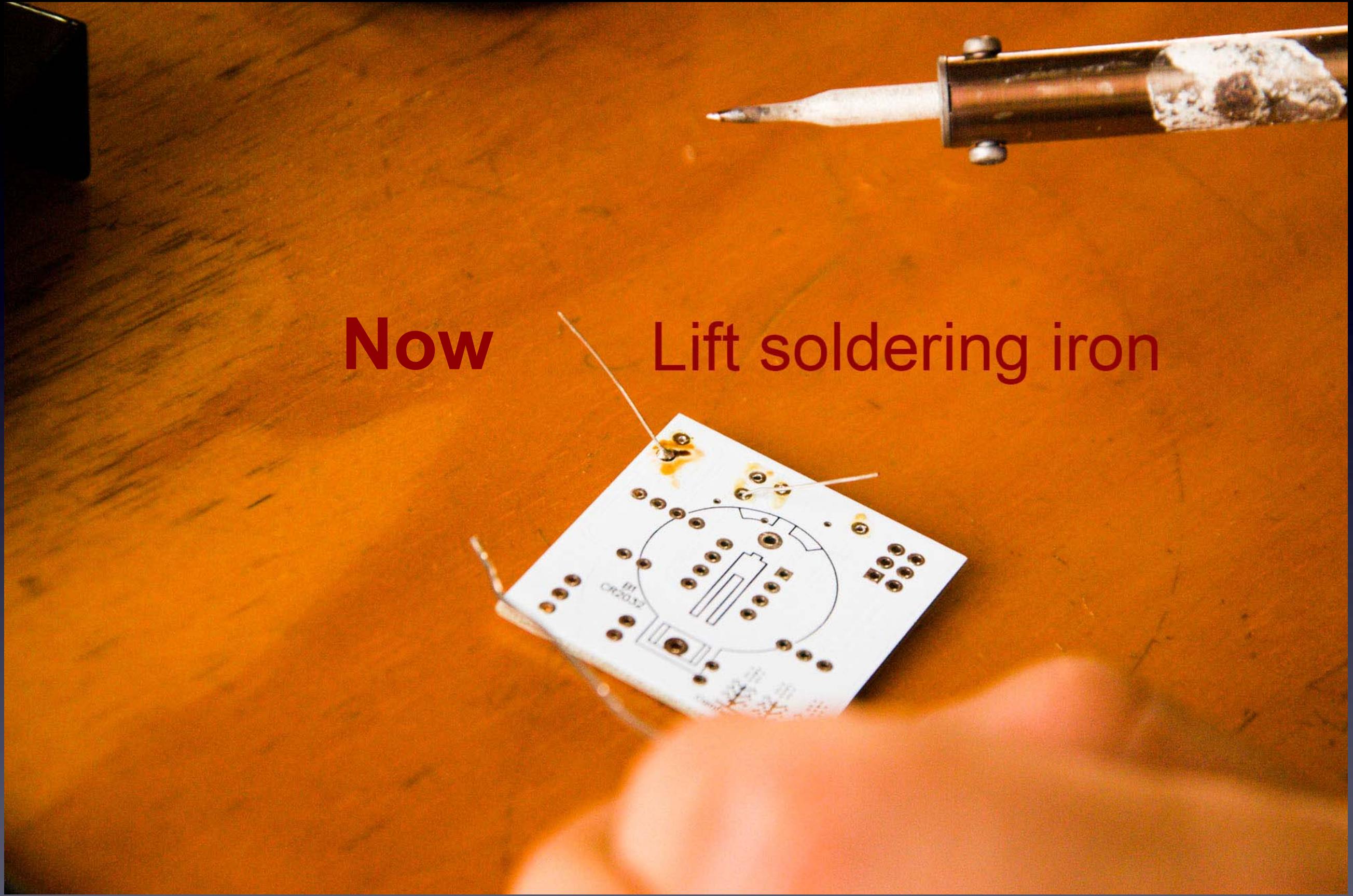
Make sure solder melts on the underside of the soldering iron tip
(not the side or top of the soldering iron tip)!



Pull solder away,
But keep holding soldering iron down
for 1 more second

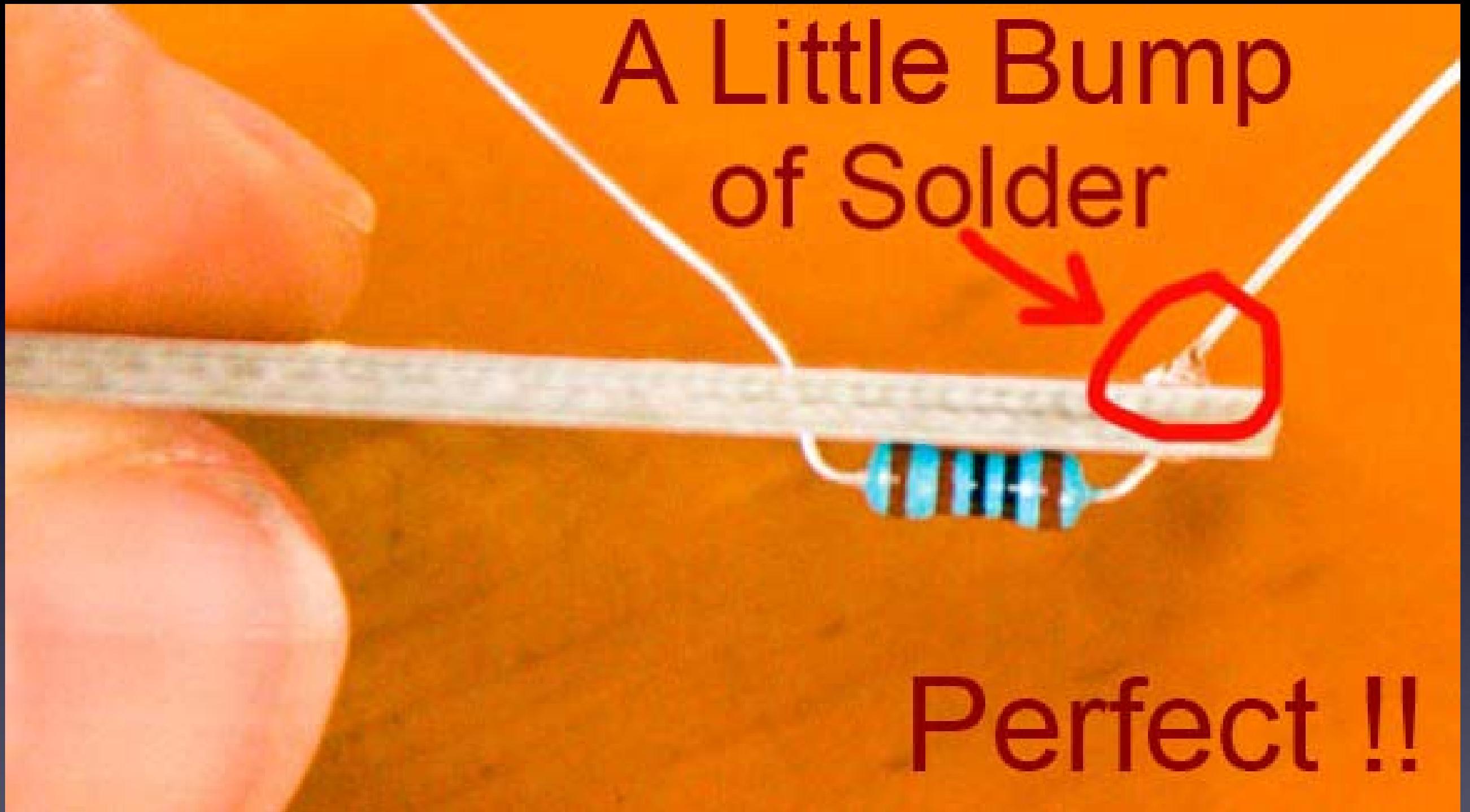
Secret #2:

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



Now

Lift soldering iron

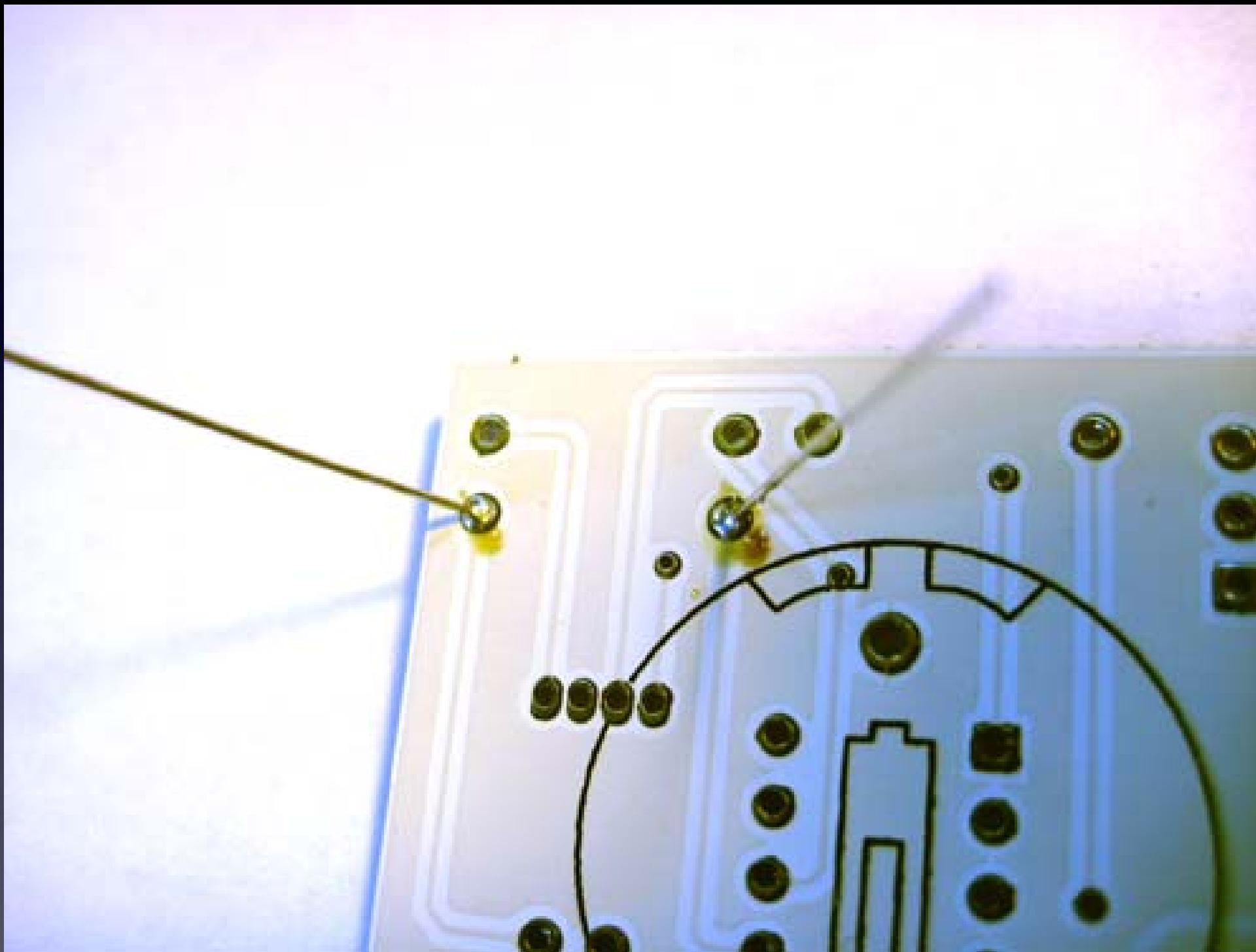


A Little Bump
of Solder

Perfect !!

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.

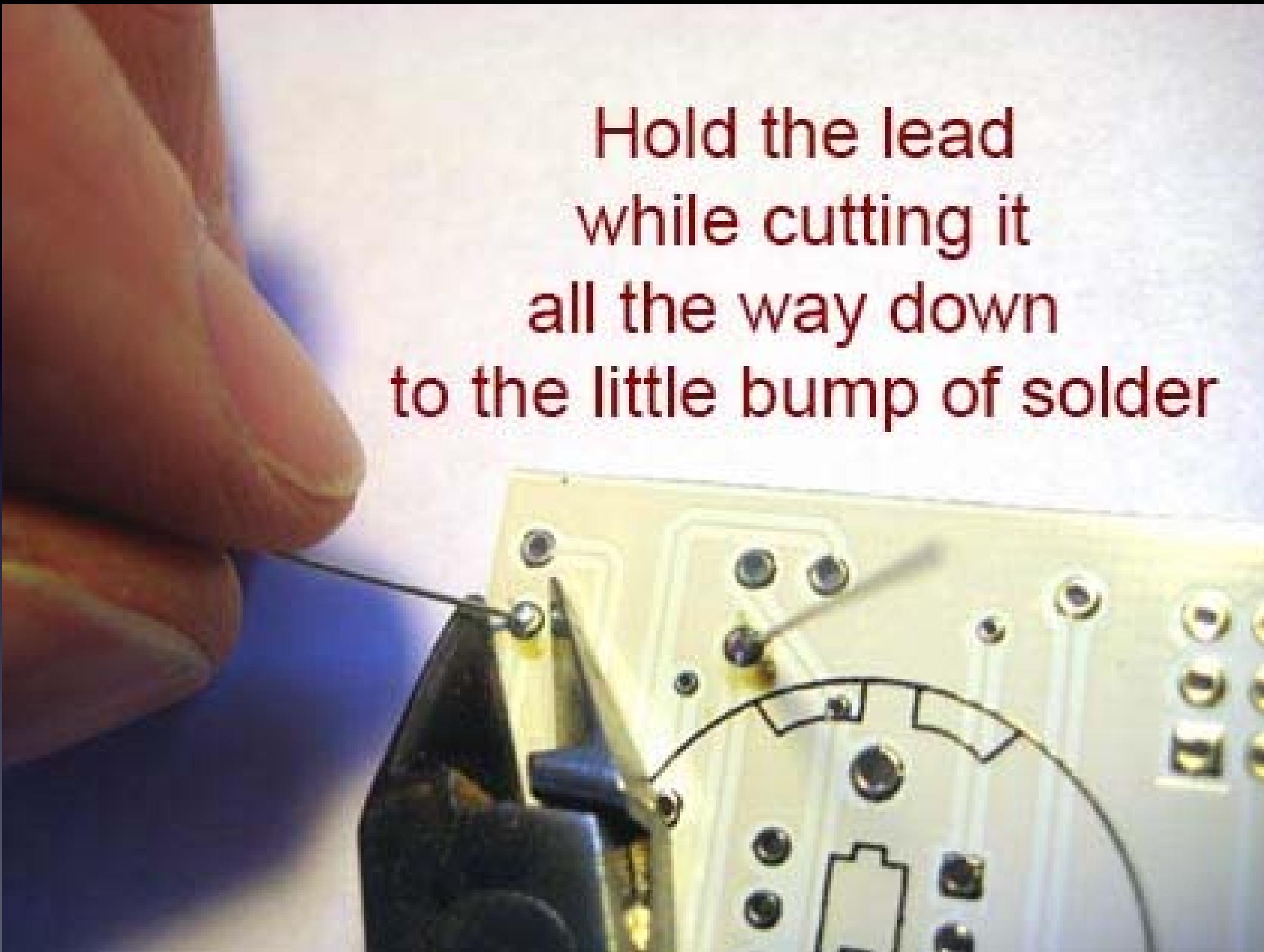
Solder all of the leads of the part to the board



For this part, there are two leads
Here you can see two good solder connections

Now cut the leads short

Hold the lead
while cutting it
all the way down
to the little bump of solder



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!)

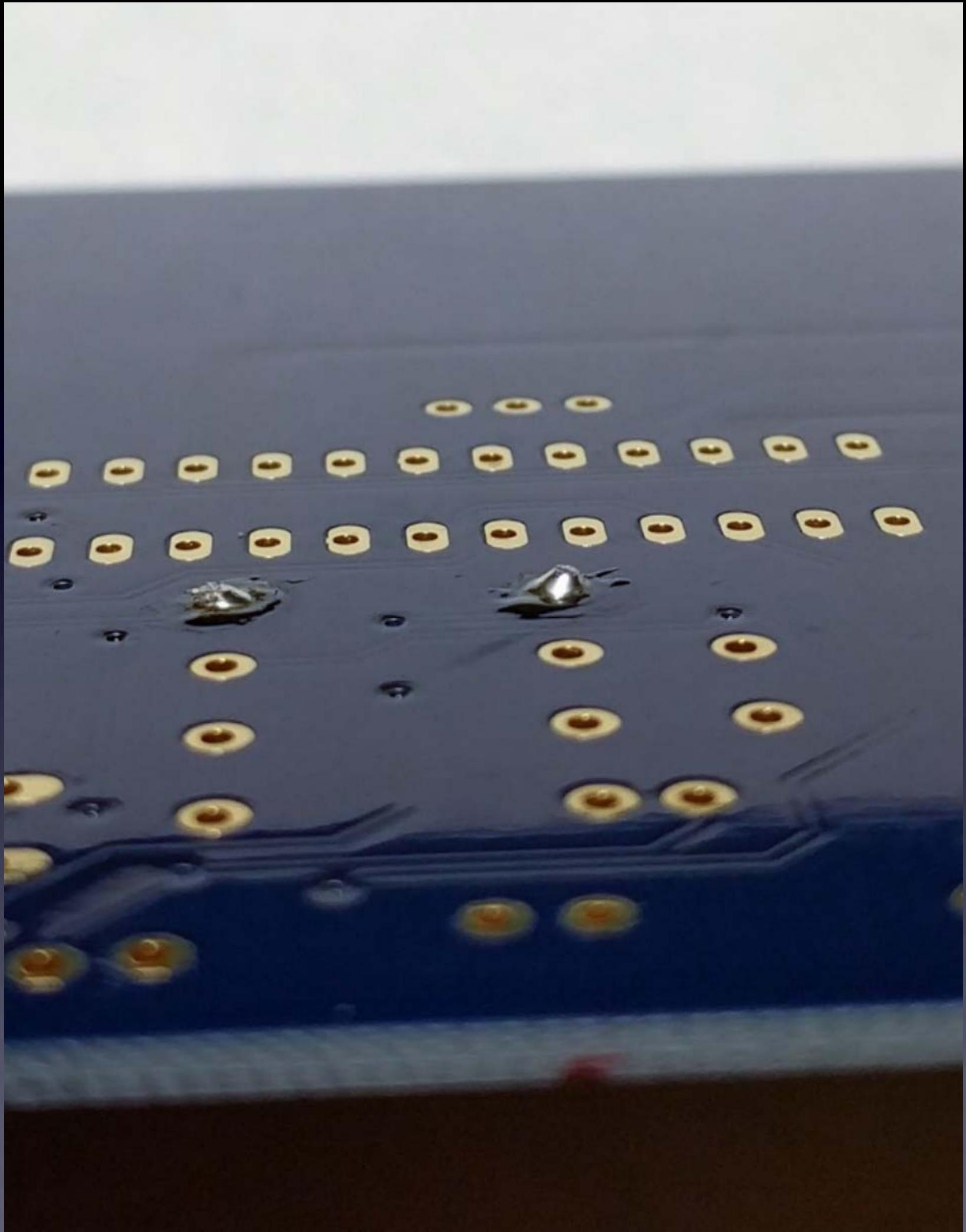
(They like doing that – so please hold or cover the lead when you cut.)



All done !

No wires sticking out

R1 soldered to the board

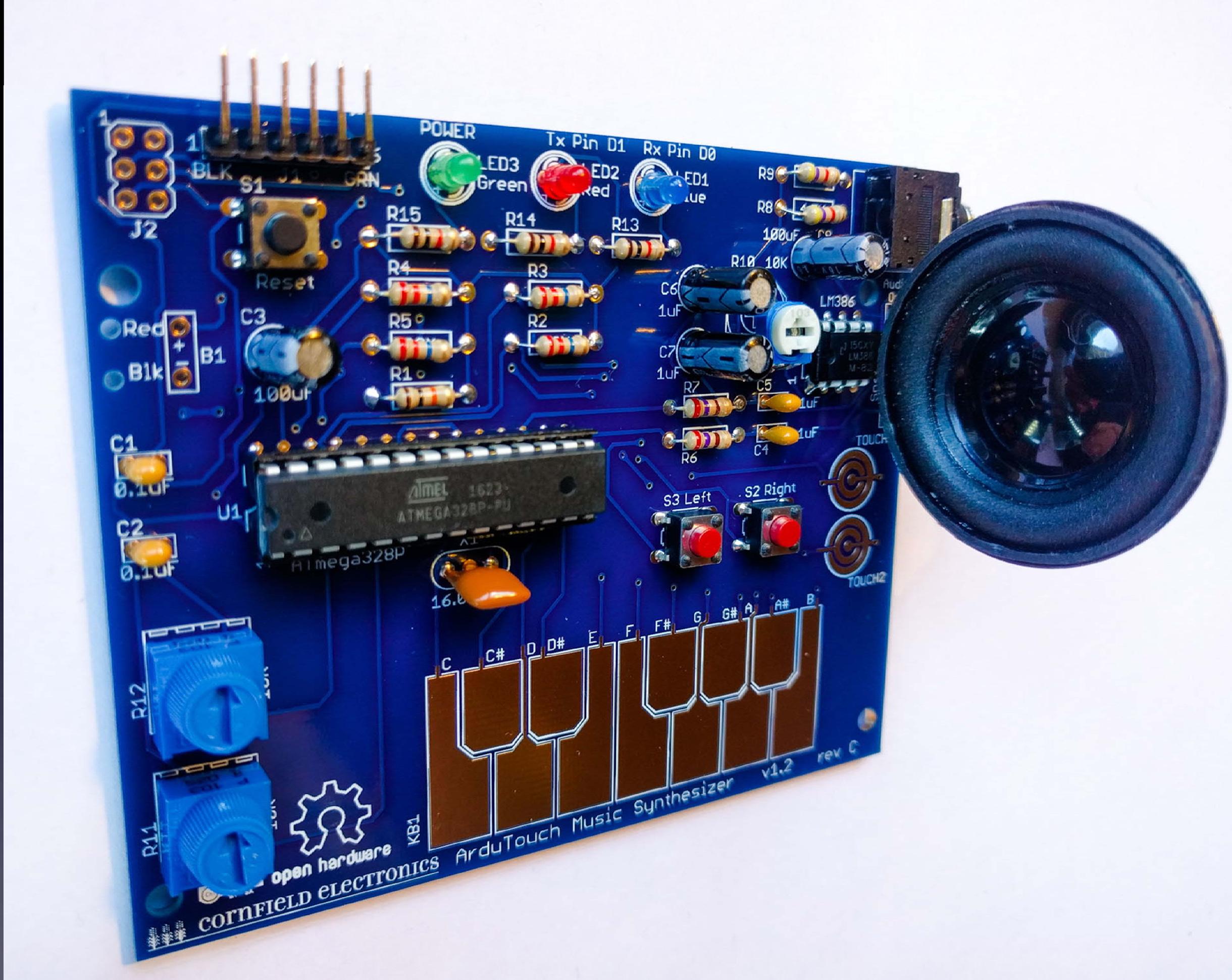


Notice that:

- each connection is a small bump (not flat)
- you cannot see any pad (it's totally covered with solder)
- you cannot see the hole (it's totally covered with solder)

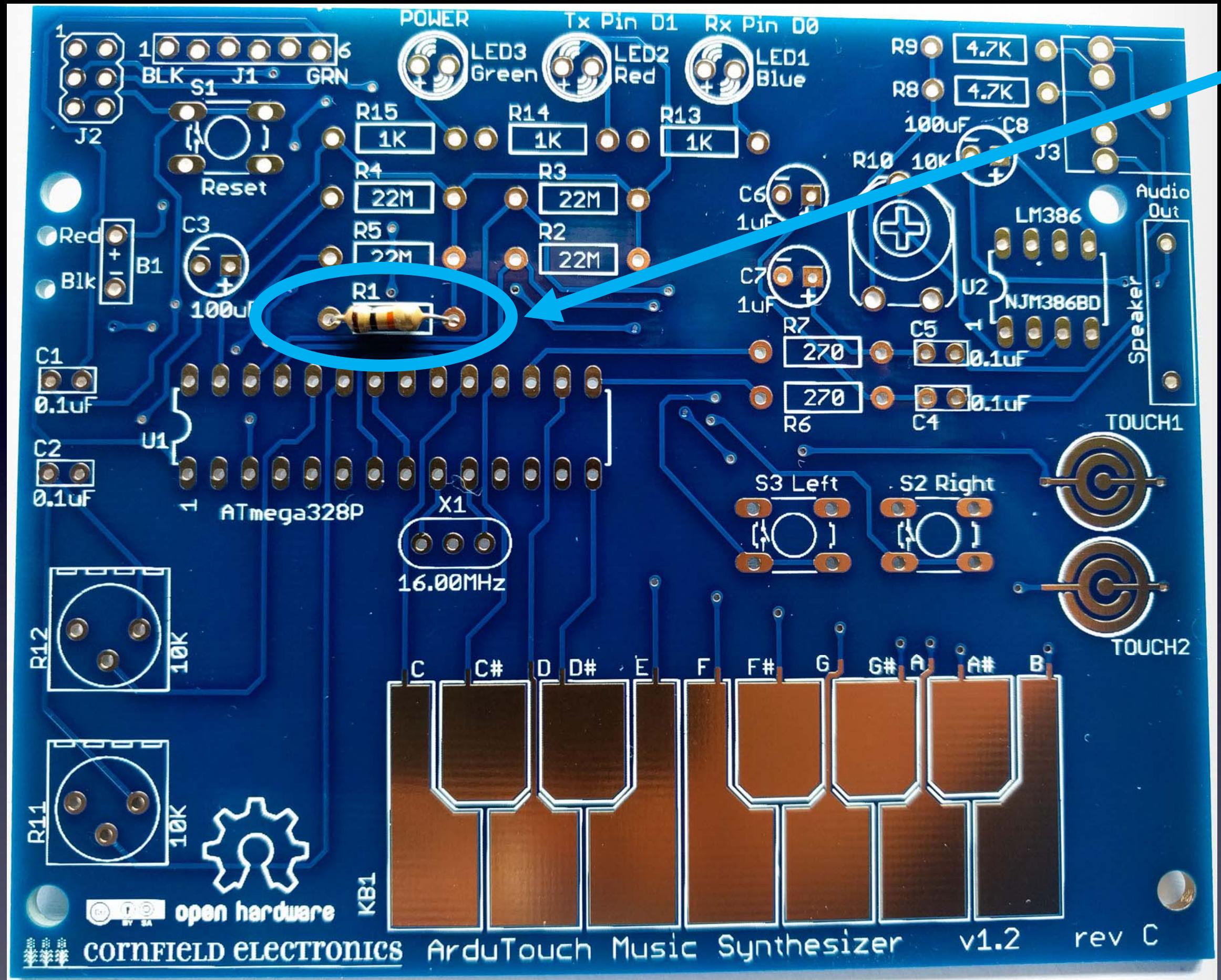
One part at a time

Till all the parts are soldered



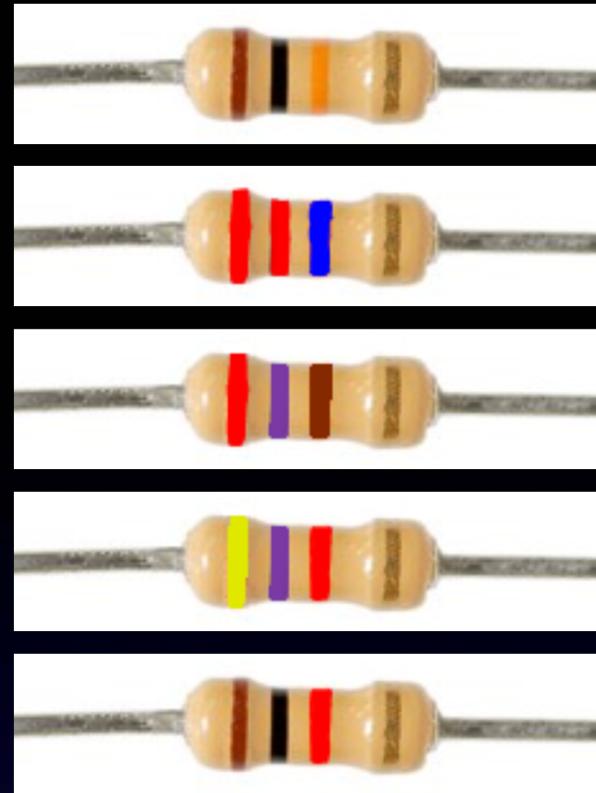
And it will look like this when you're done.

Let's start!

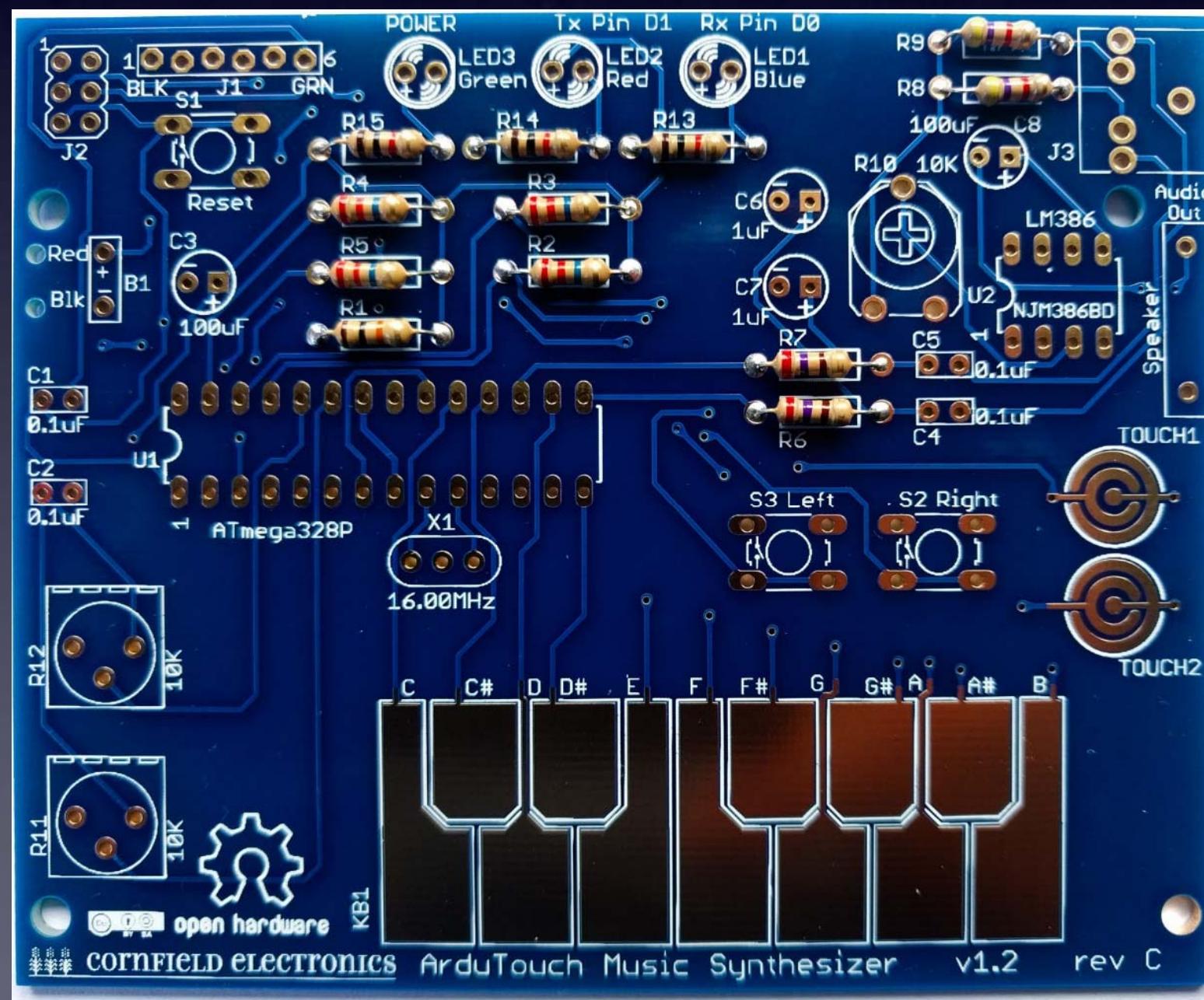


If you haven't done so already, solder R1: brown, black, orange

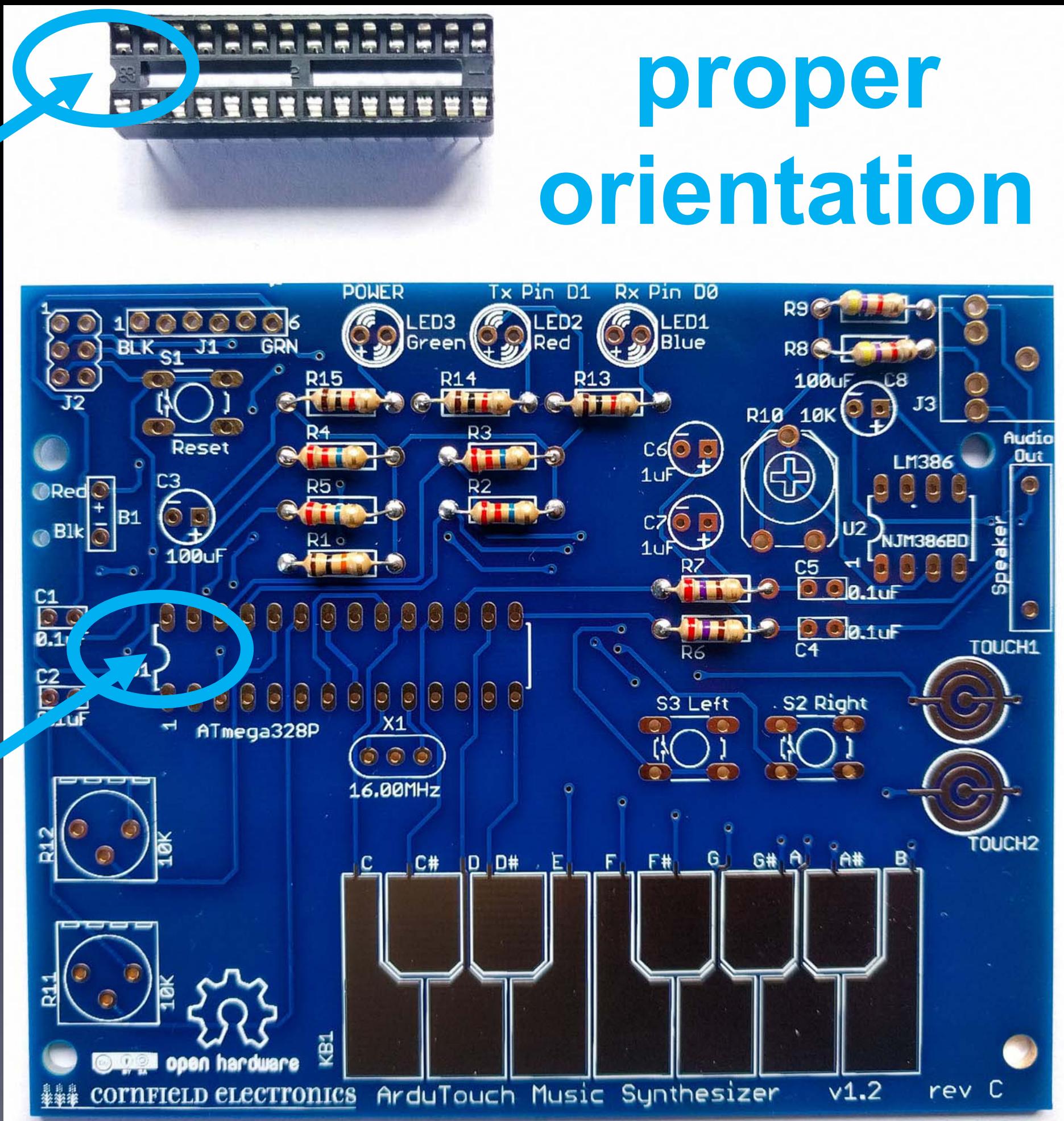
R1:
R2, R3, R4, R5:
R6, R7:
R8, R9:
R13, R14, R15:



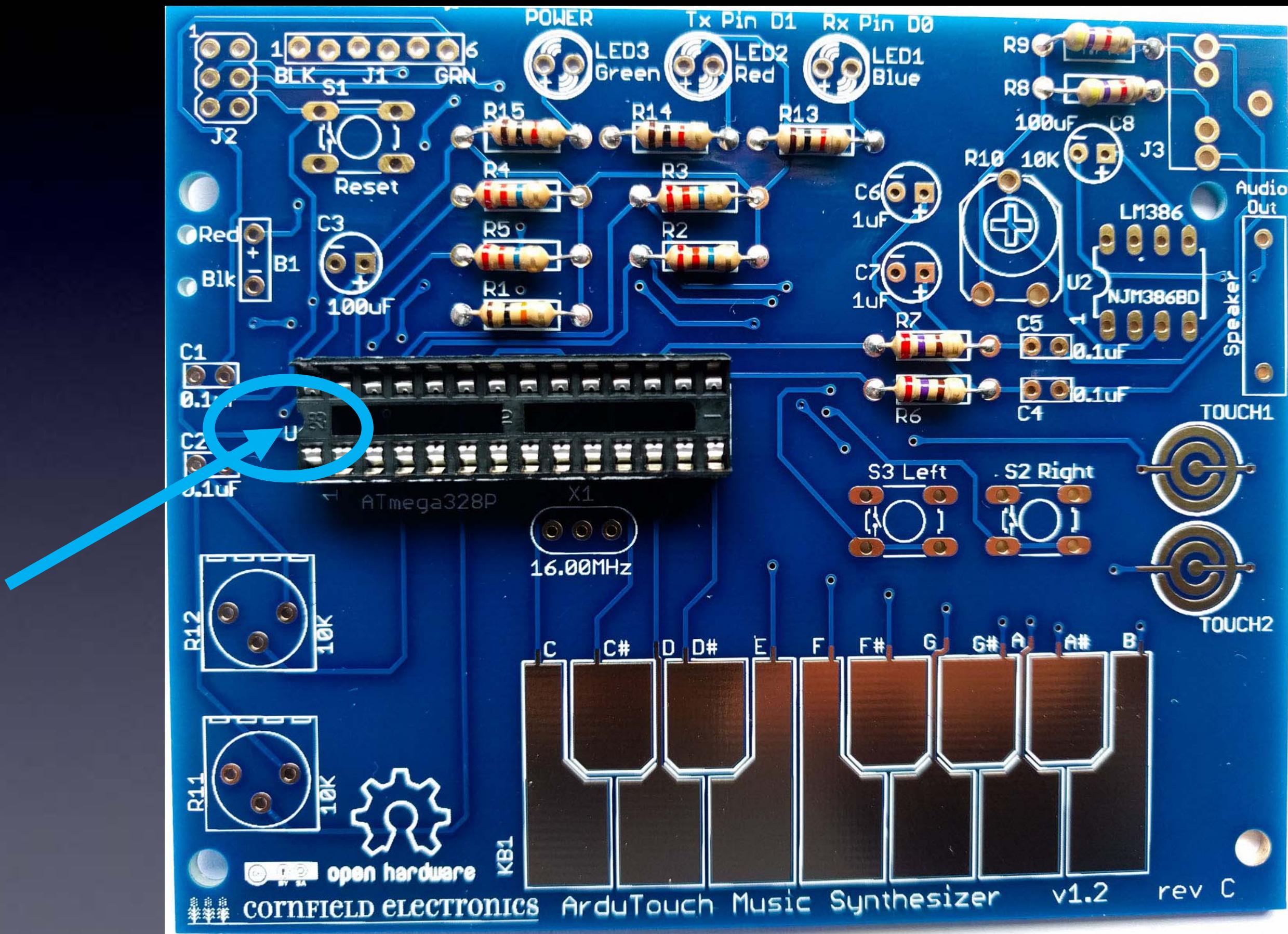
10K: Brown, Black, Orange
22M: Red, Red, Blue
270: Red, Violet, Brown
4.7K: Yellow, Violet, Red
1K: Brown, Black, Red



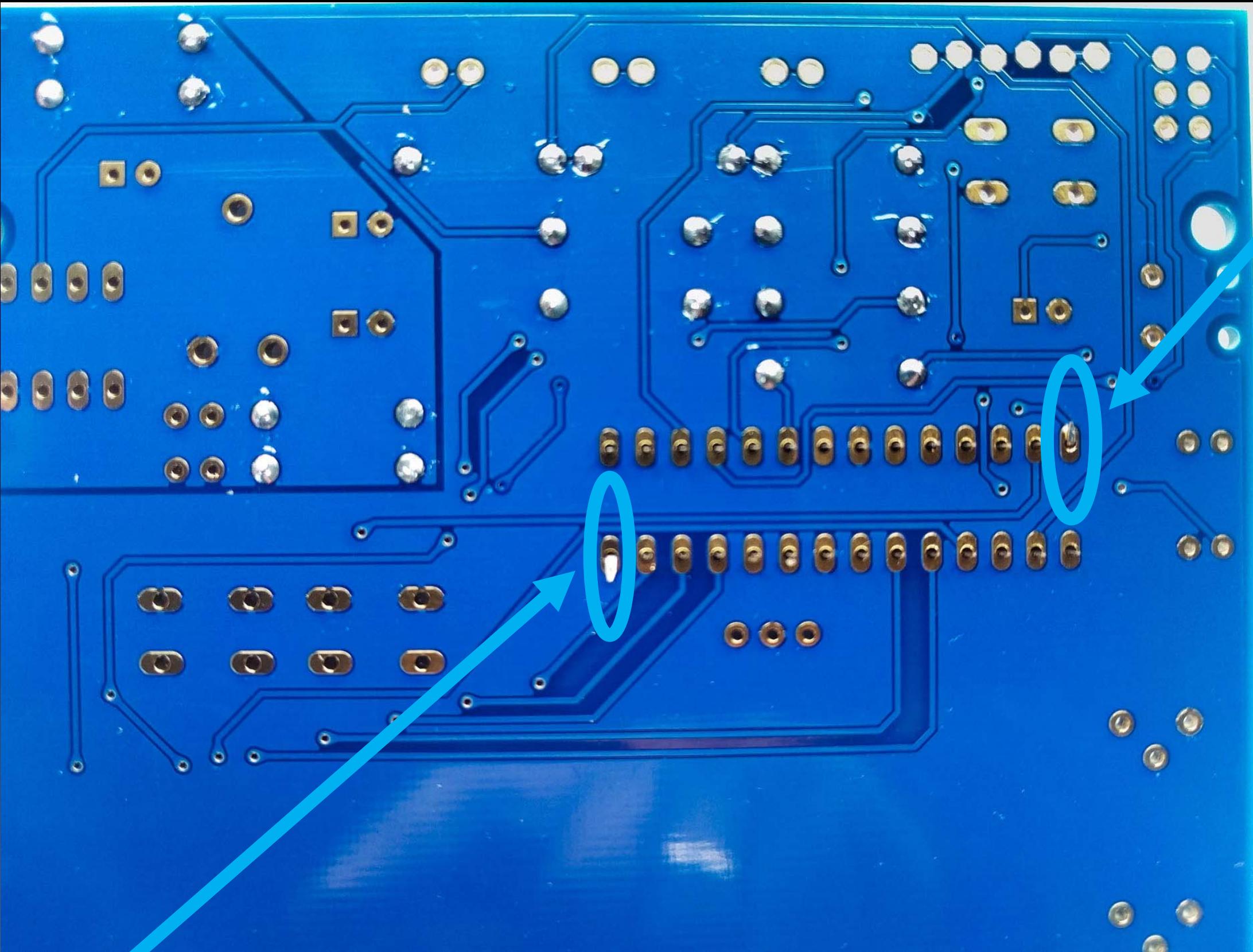
U1: microcontroller socket



U1: microcontroller socket: inserted correctly

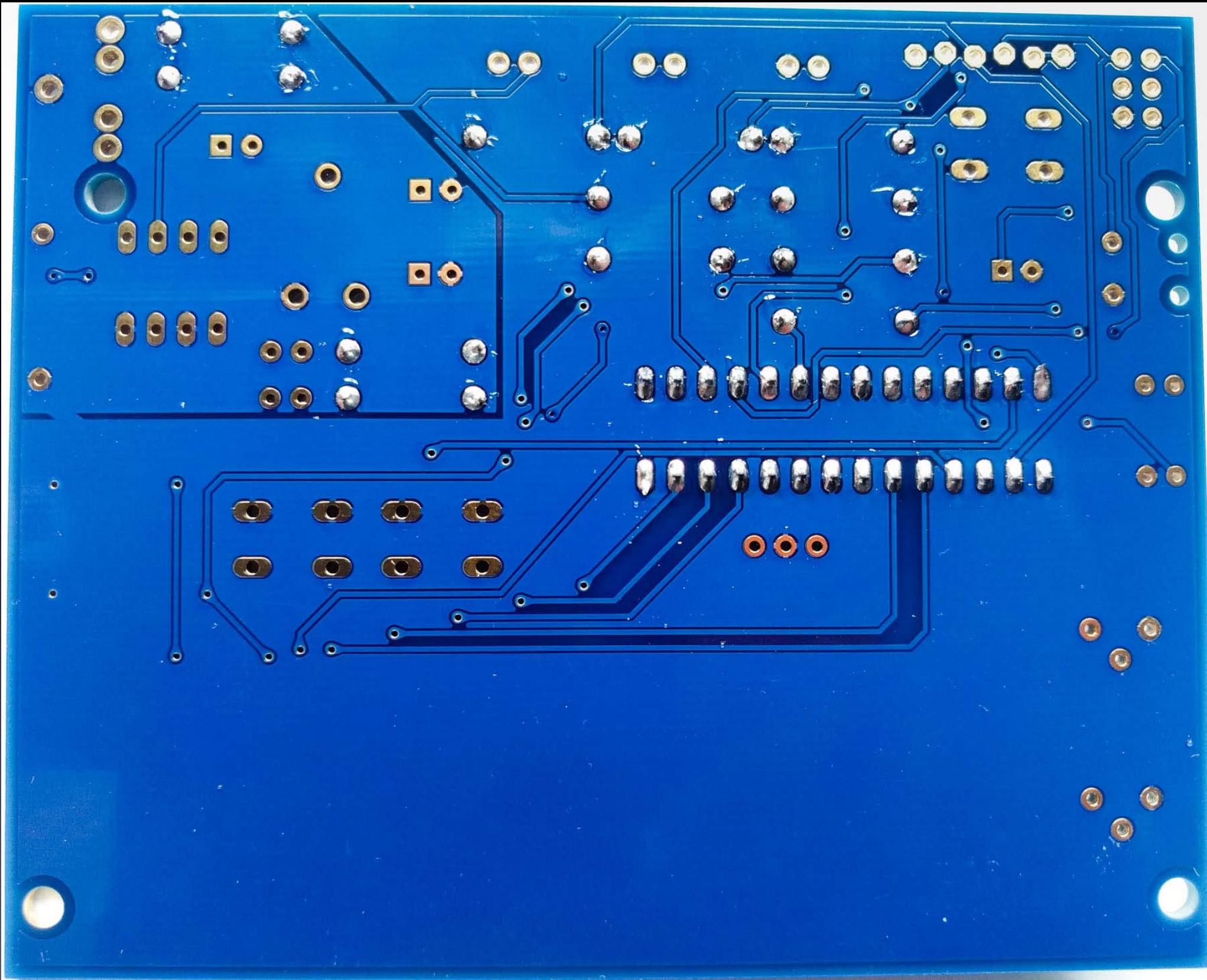


U1: microcontroller socket

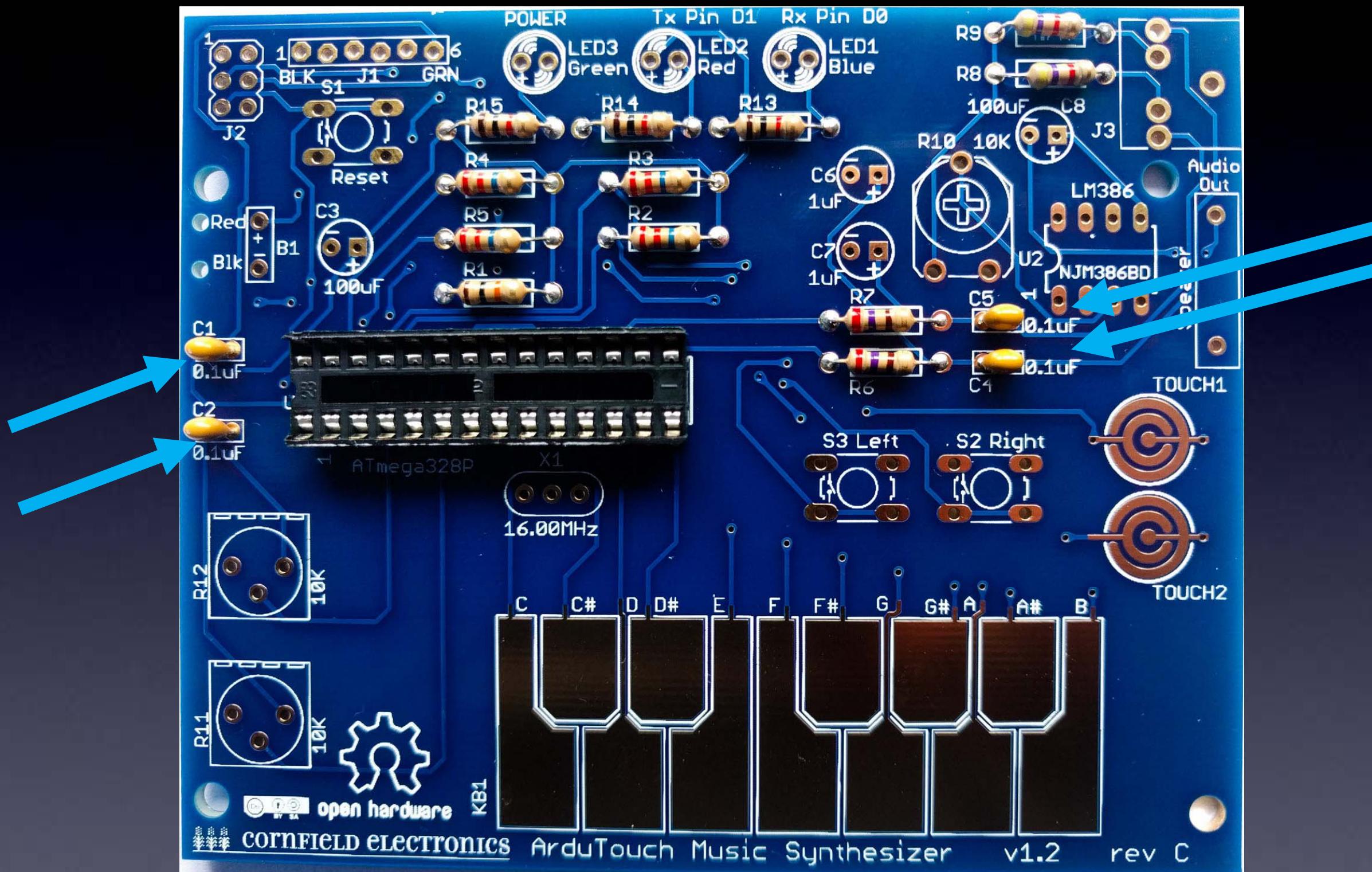


bend pins down on two corners,
and solder all 28 leads to the board

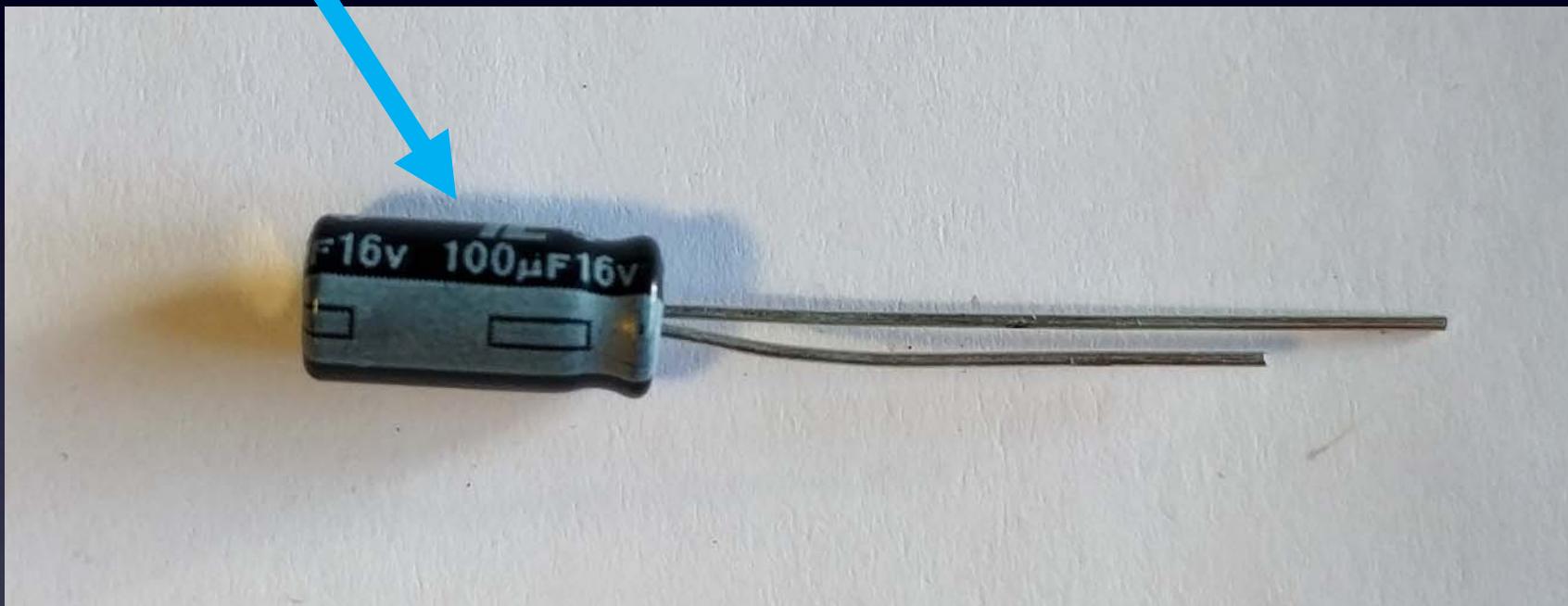
U1: microcontroller socket



All 28 leads soldered to the board:
→ Notice that each has a little bump of solder (not flat). ←



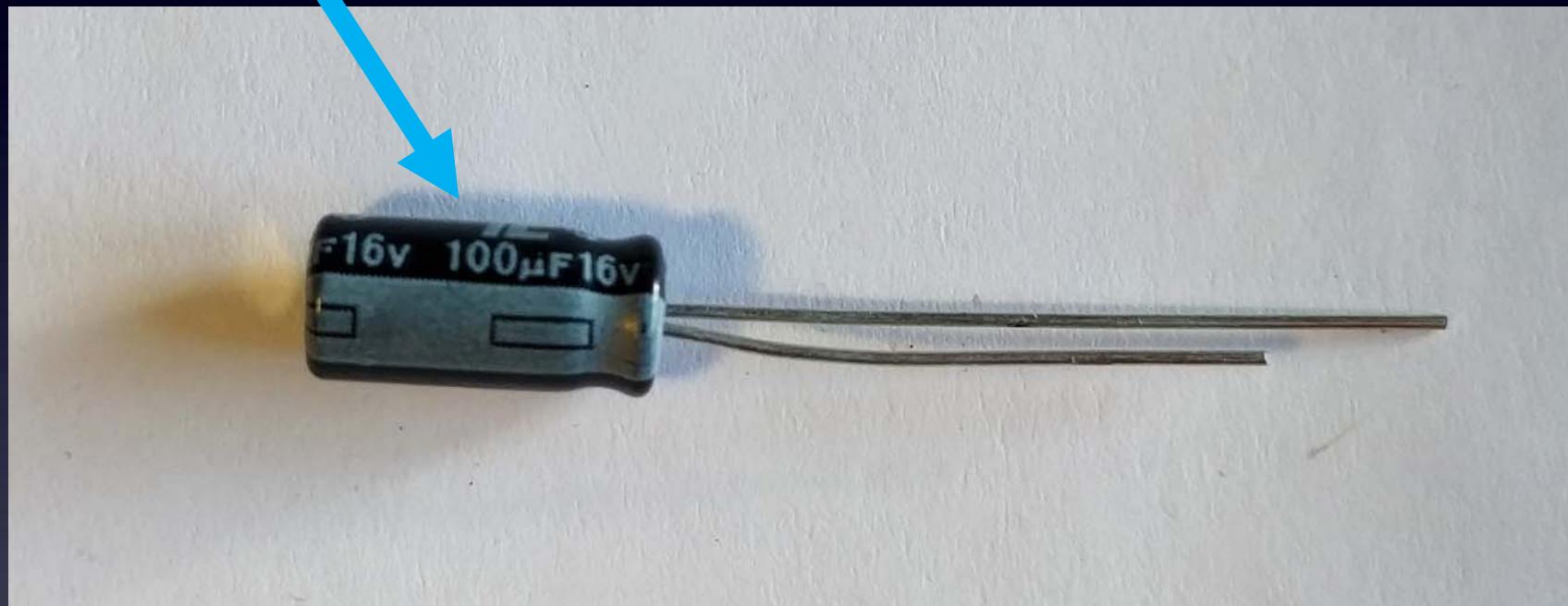
C1, C2, C4, C5



C3, C8: 100uF



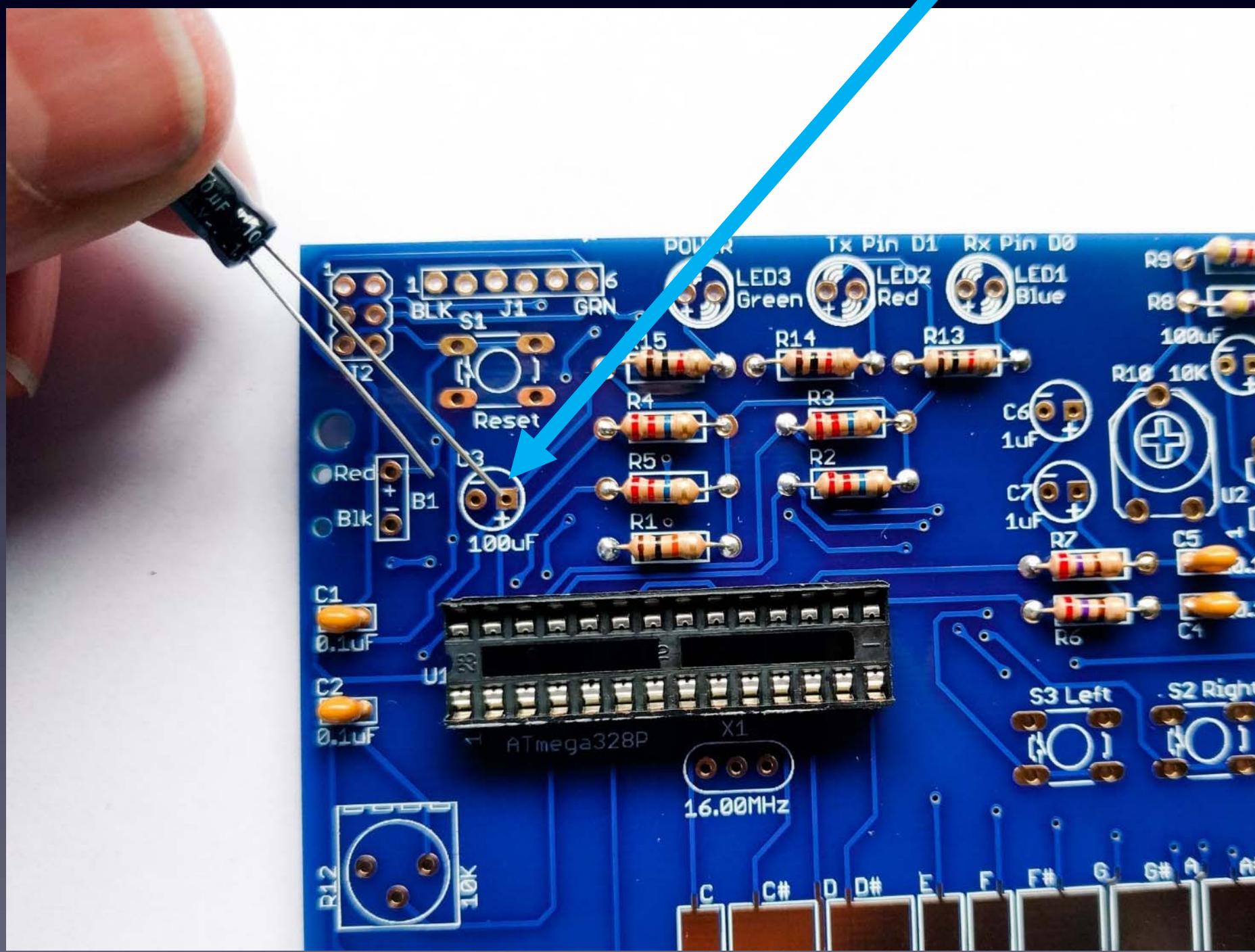
Different than C3, C8 !
C6, C7: 1uF

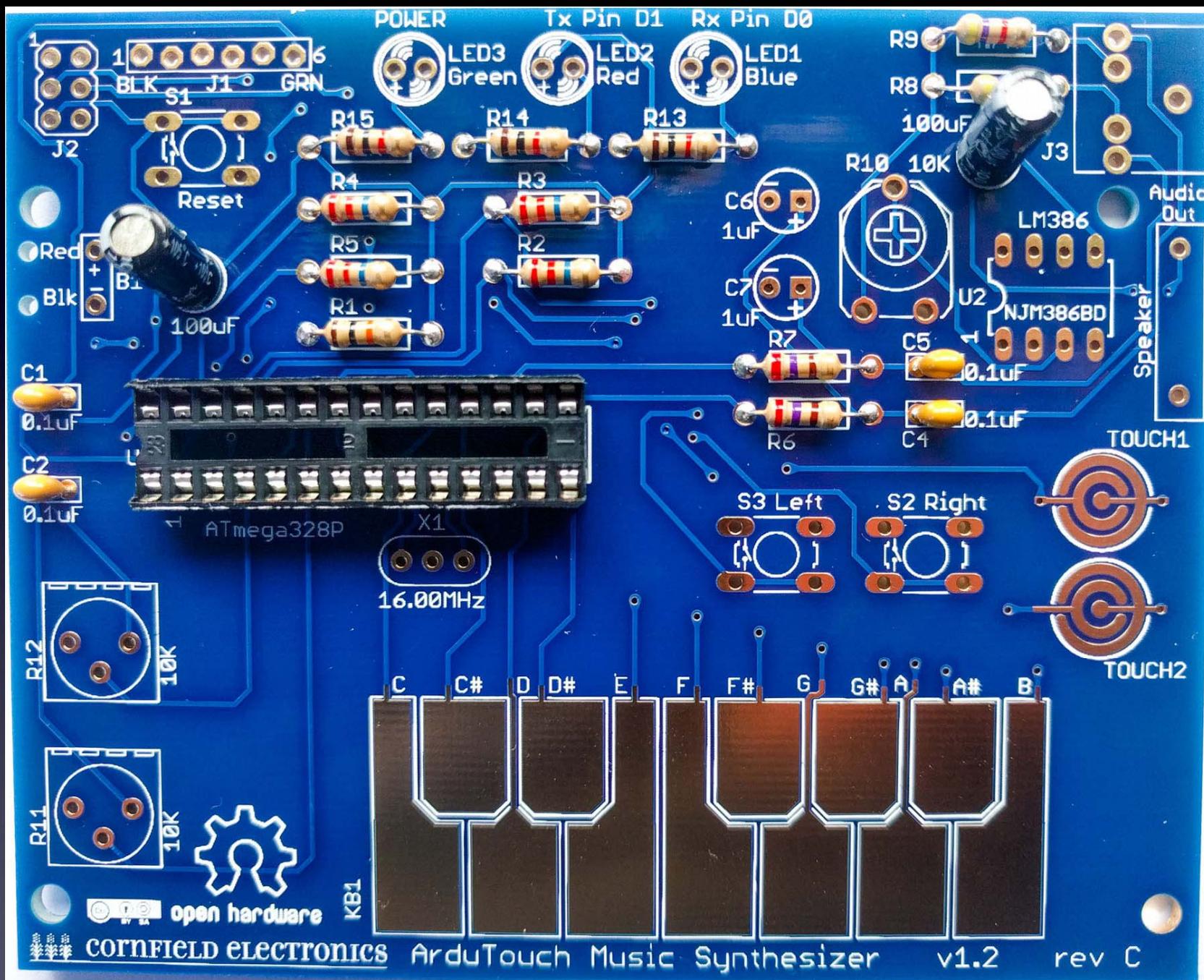


C3, C8: 100uF

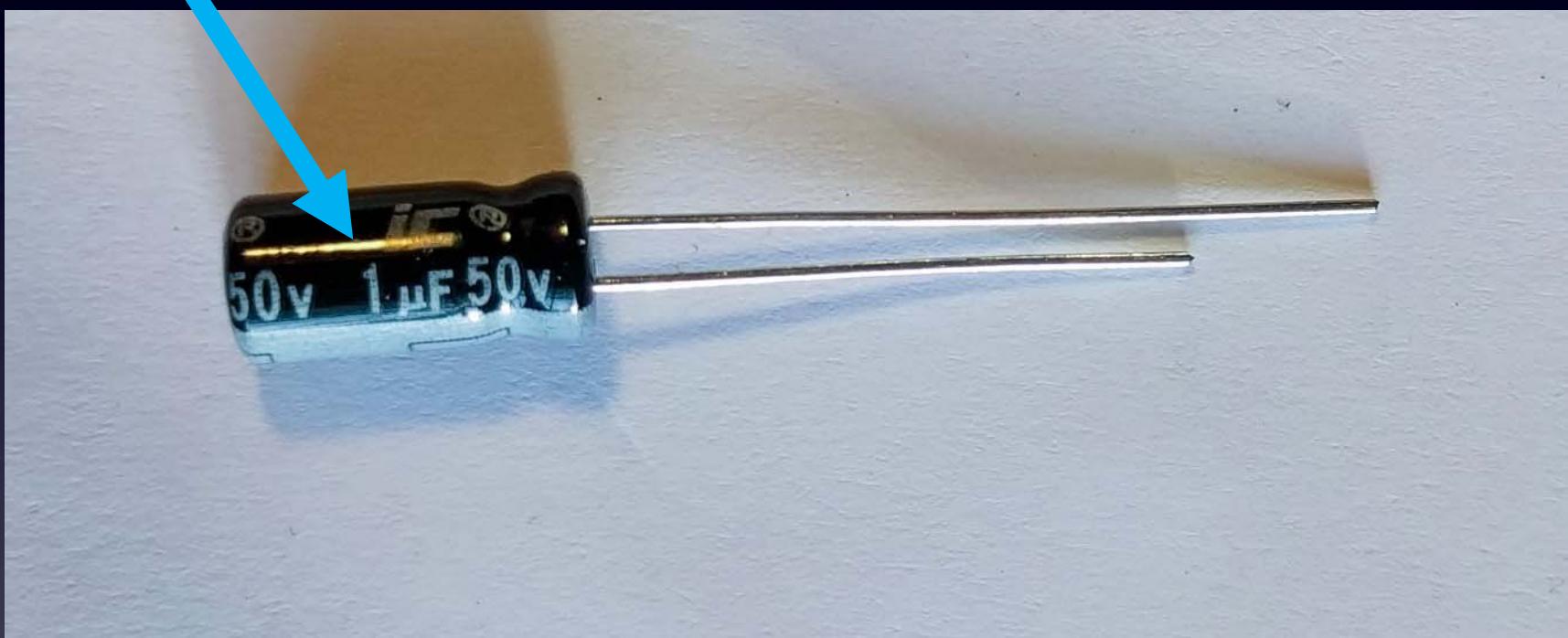
C3, C8:
Long Lead “+”

Use 100uF !!

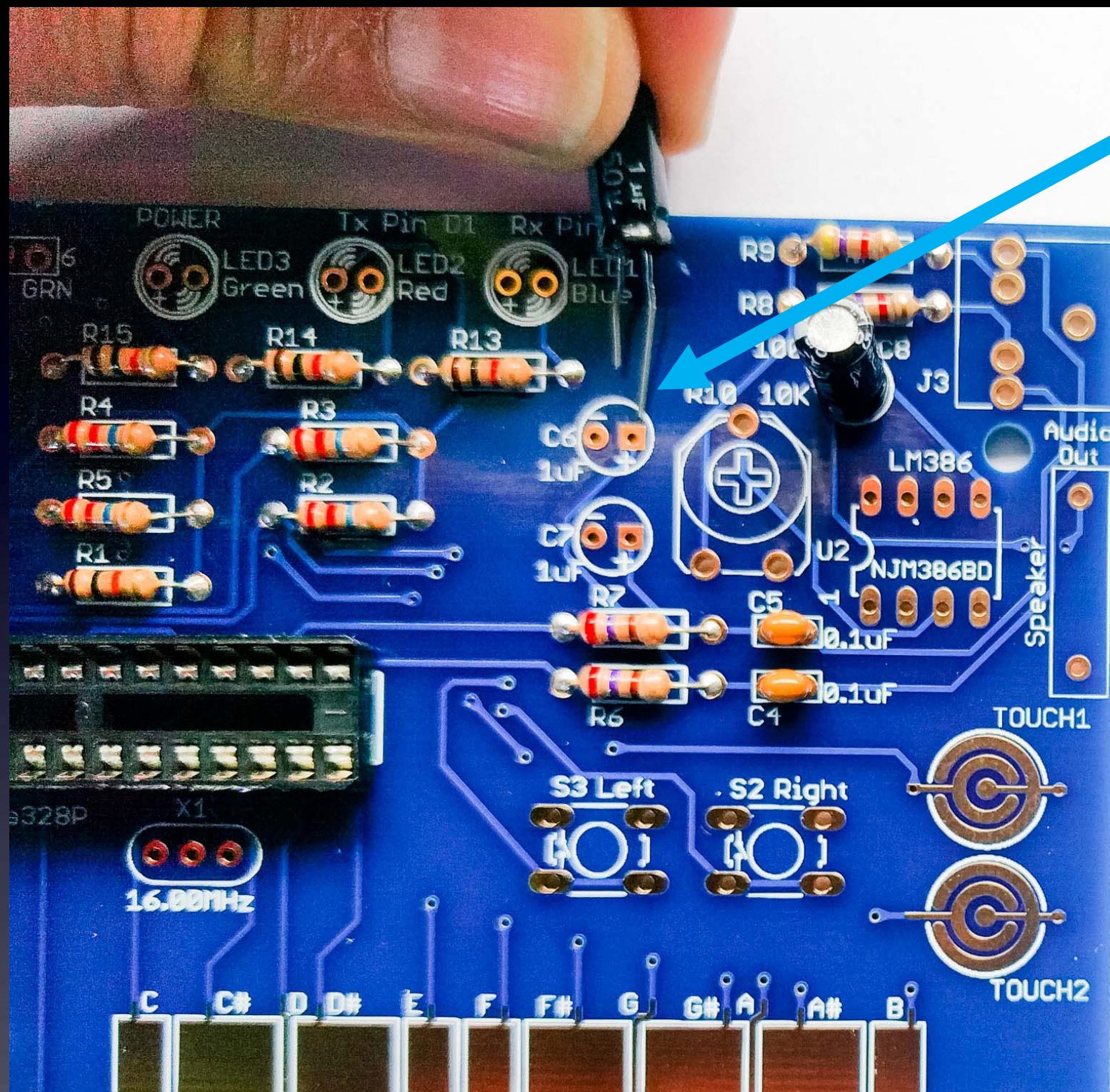




C3, C8: 100uF – soldered to board

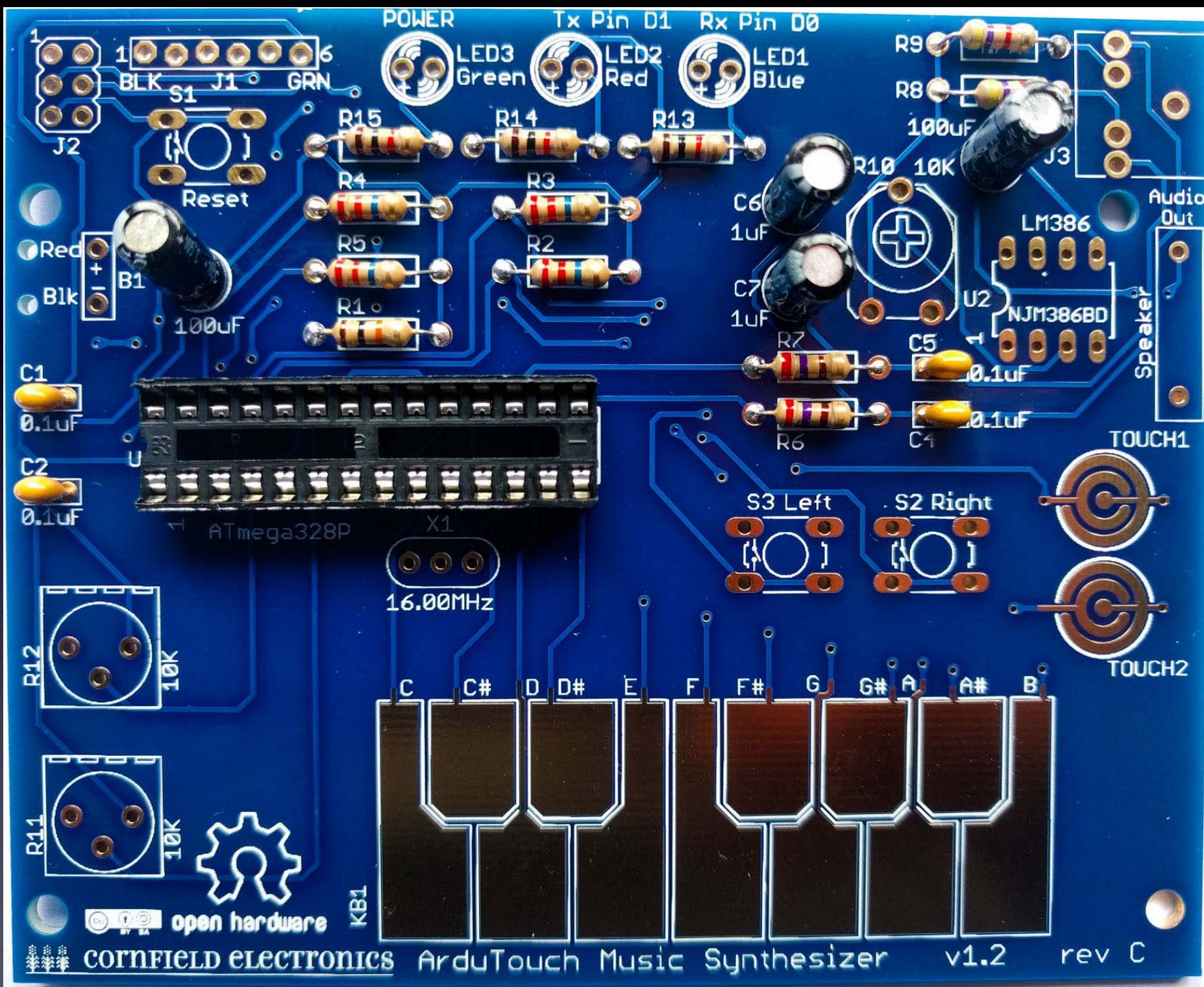


C6, C7: 1uF



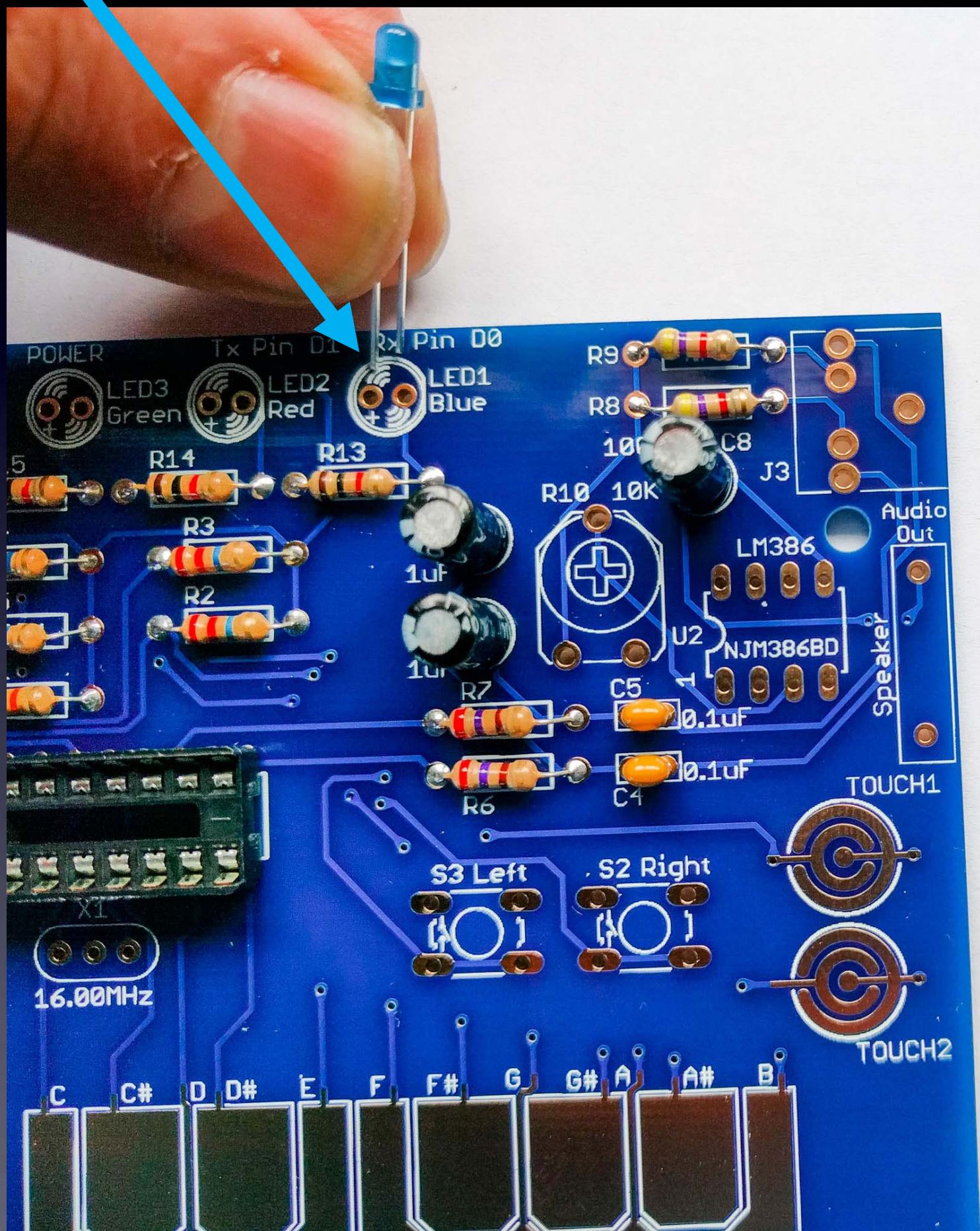
C6, C7:
Long Lead “+”

Use 1uF !!



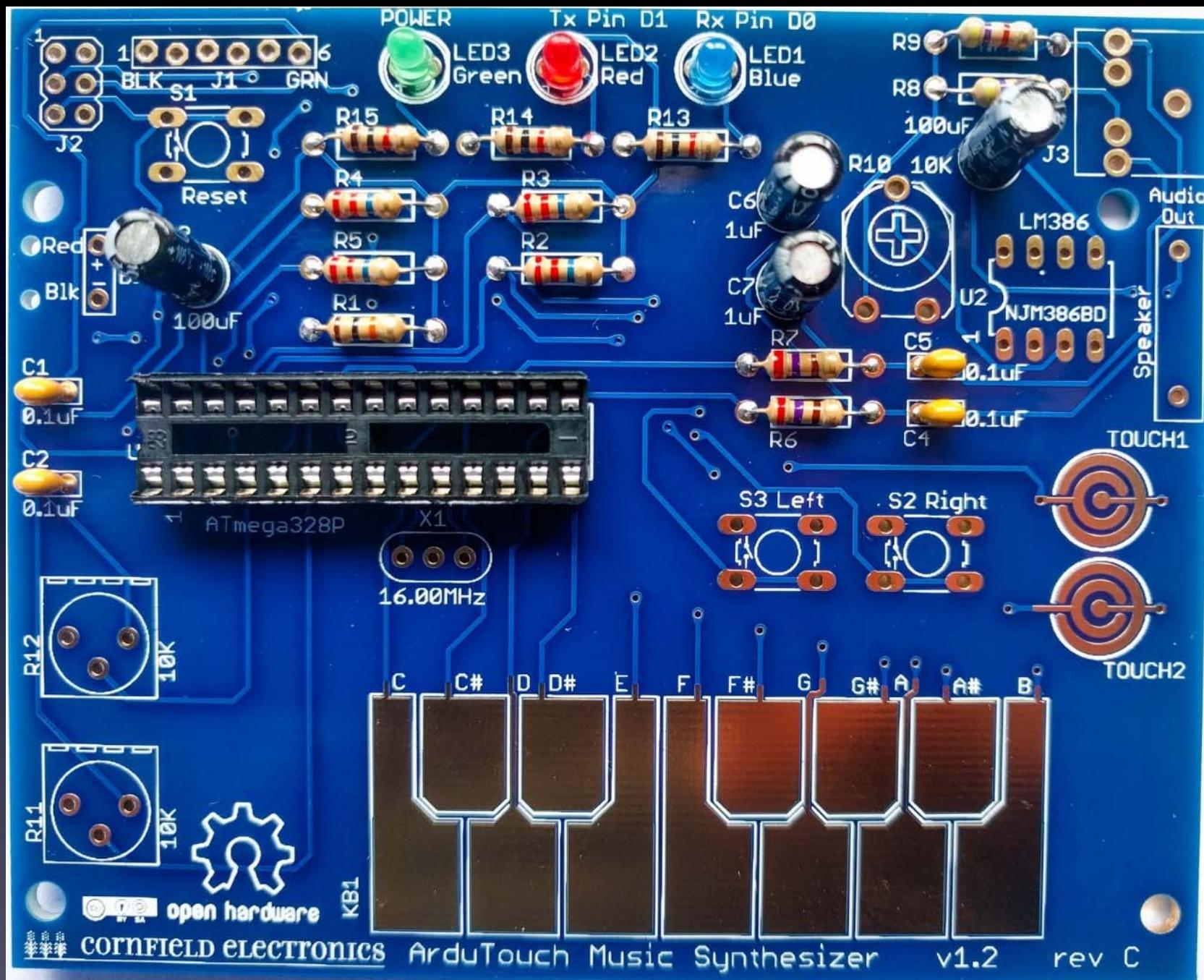
C6, C7: 1uF – soldered to board

LED1, LED2, LED3: Long Lead “+”



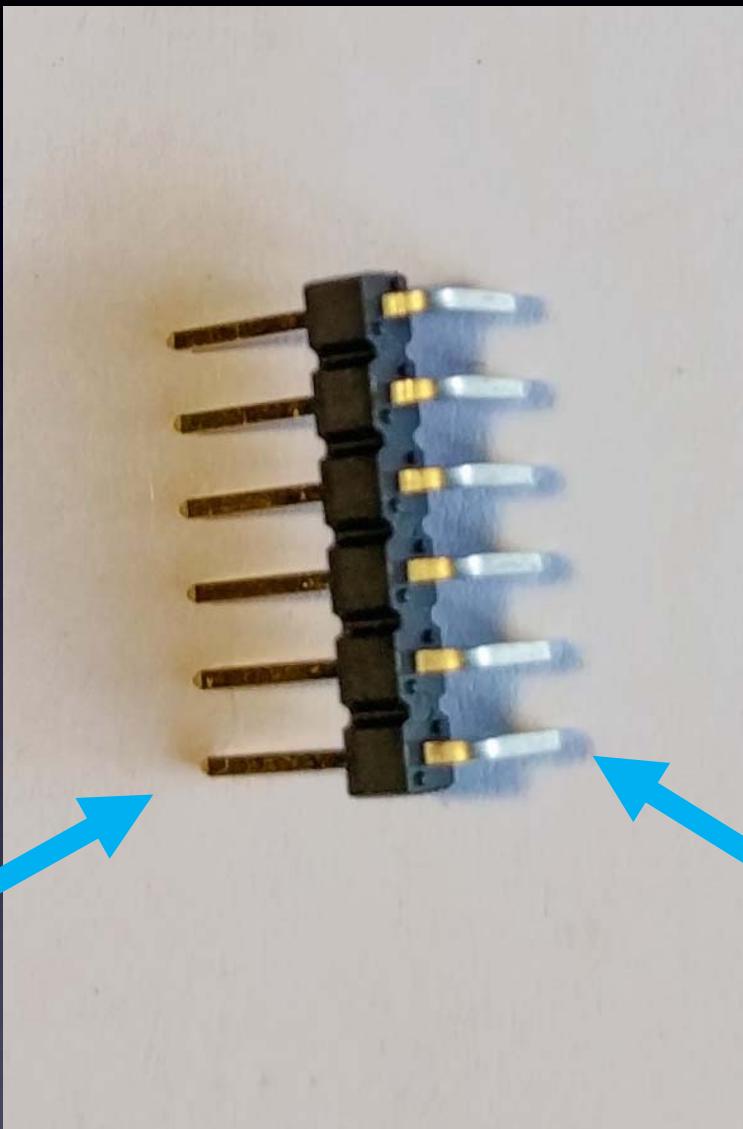
Save
these leads

We'll use them for the speaker



LED1, LED2, LED3

Green, Red, Blue – soldered to board



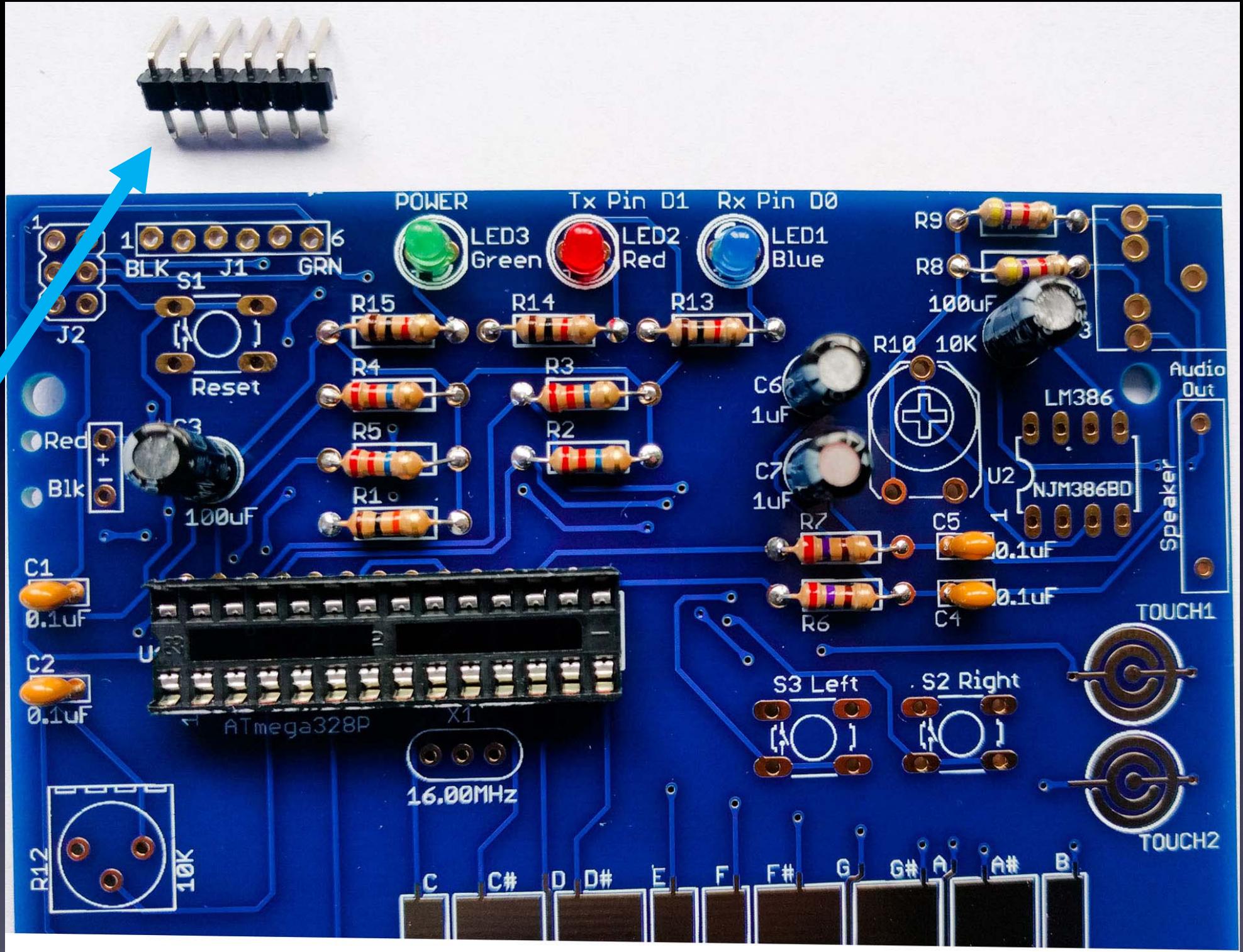
long leads

short leads

J1

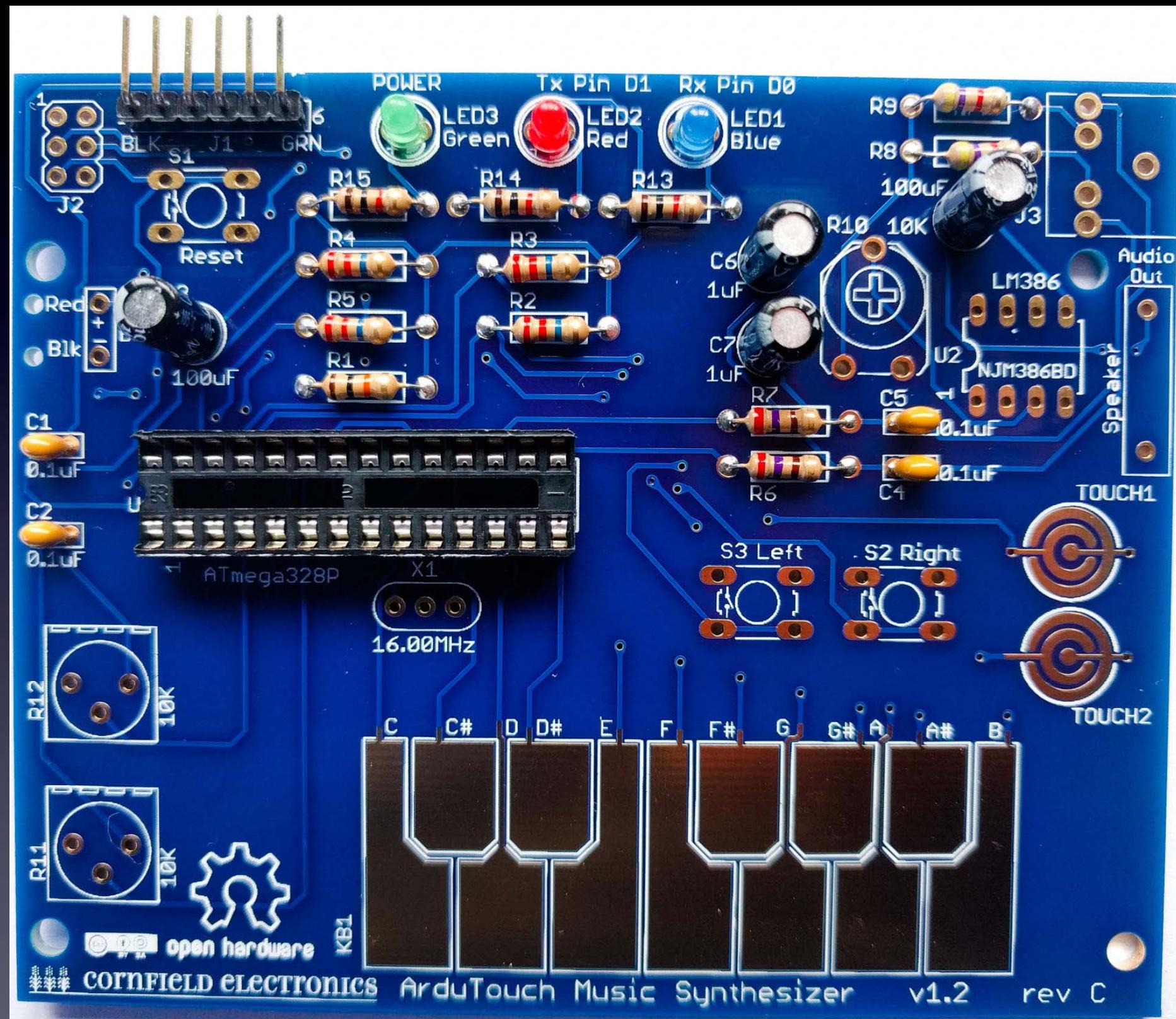
Short leads into board

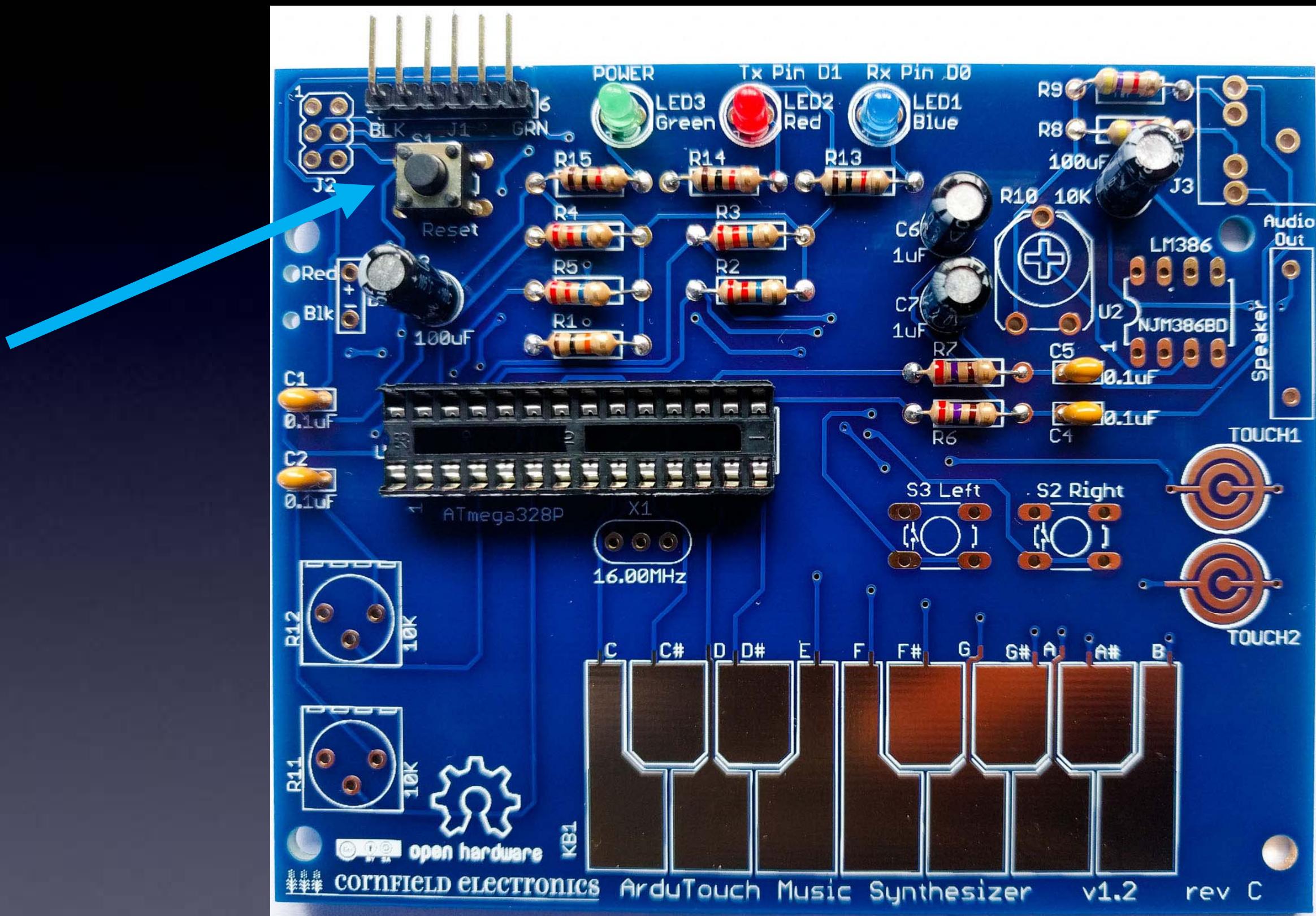
J1
short leads
go into the board



→ long leads sticking out from
board

J1



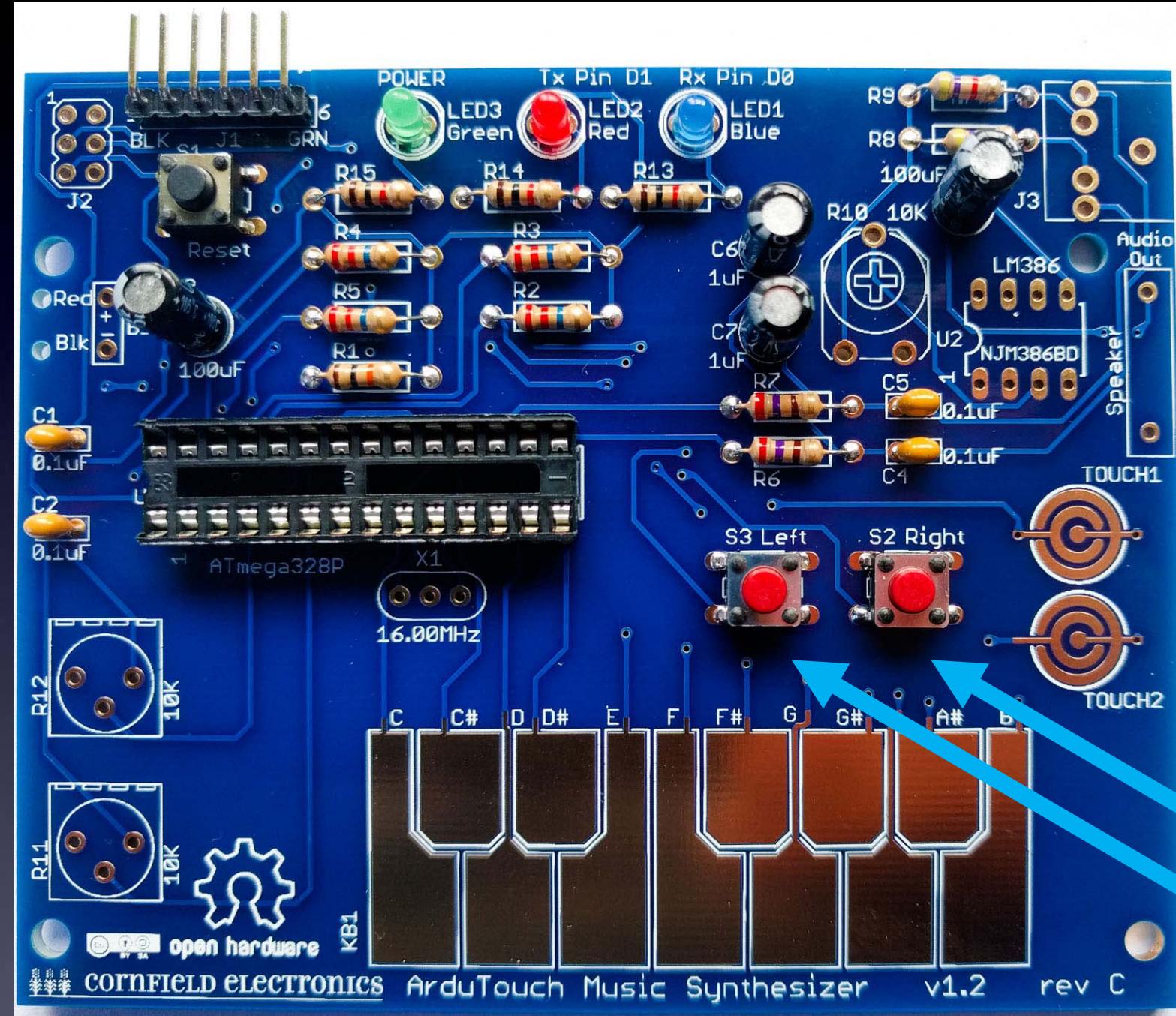


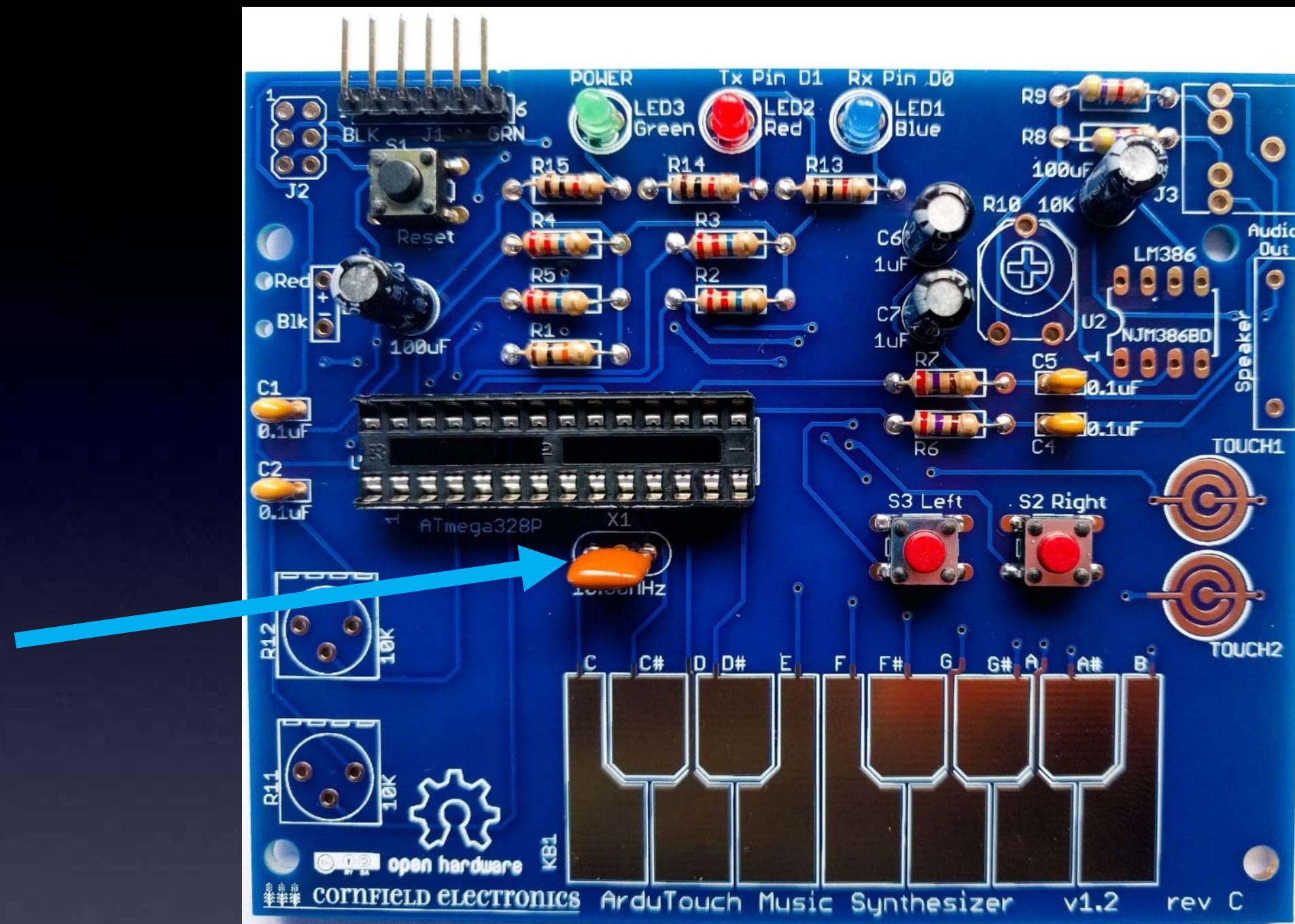
S1: black Reset button

Note: The color of this switch is not important (some kits may have different colors).

S2, S3: Red buttons

Note: The color of these switches is not important (some kits may have different colors).





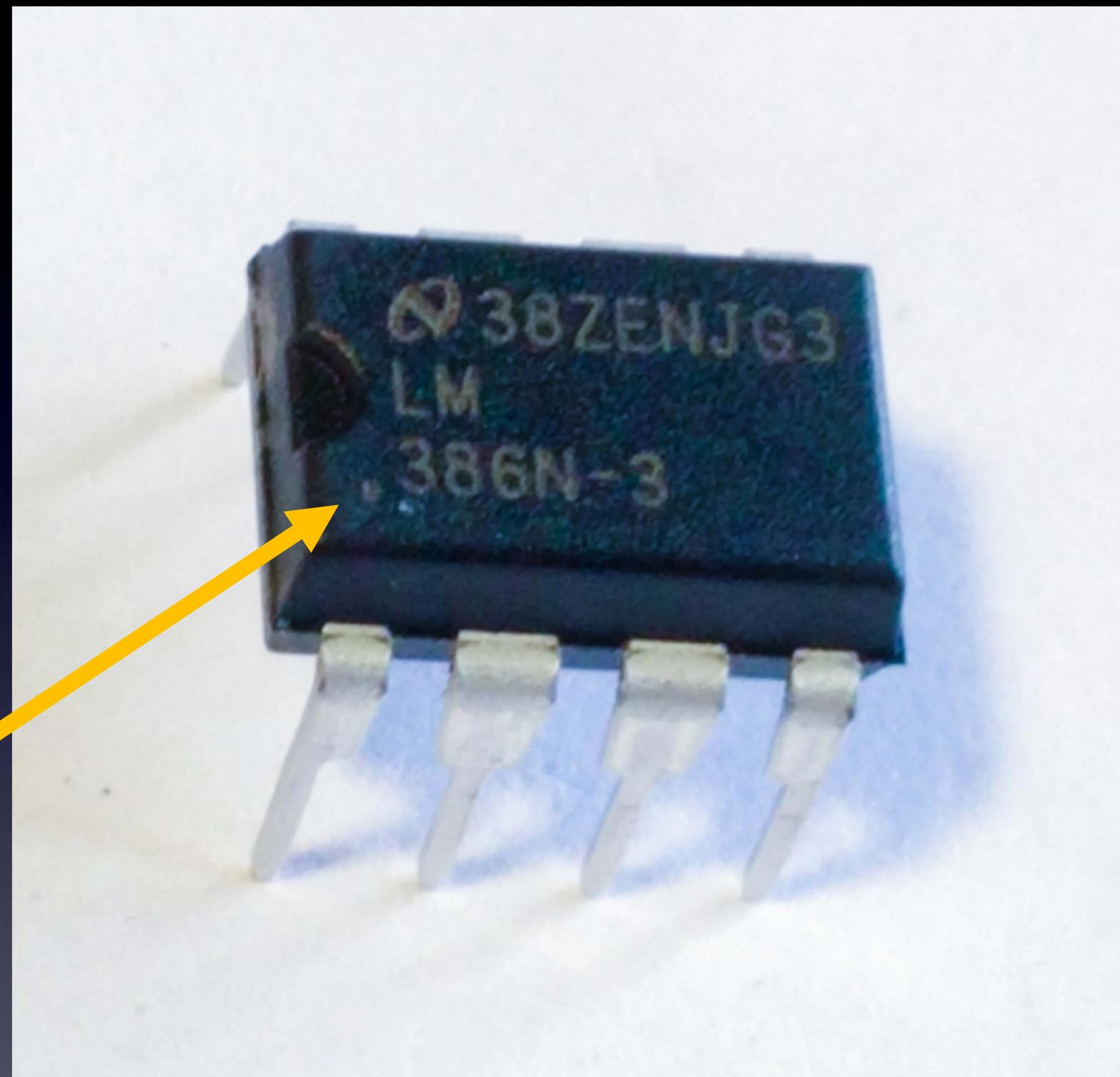
X1

The orientation of X1 does not matter.

Note: X1 may be yellow or blue.

U2

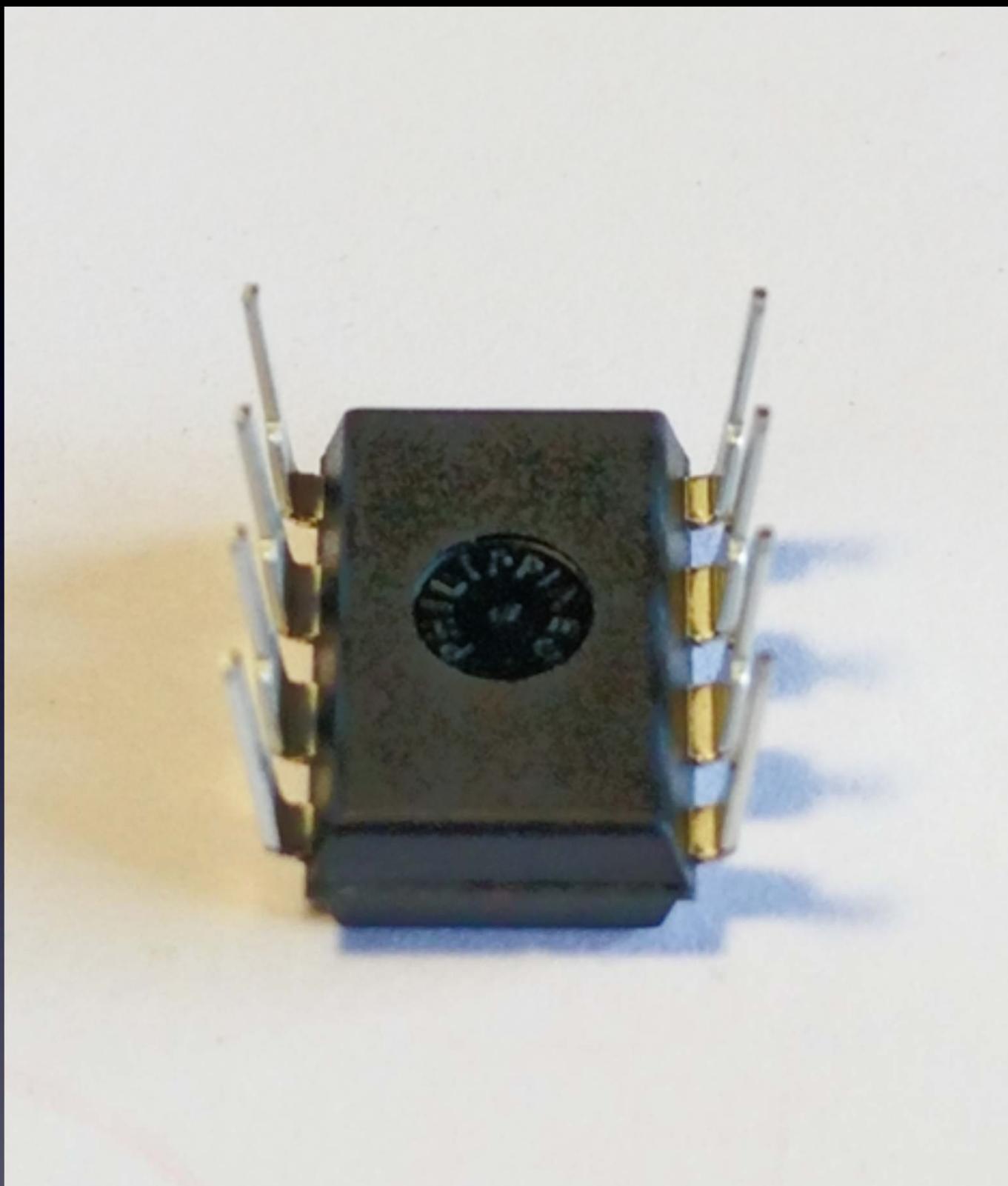
Indented black dot
Pin 1



Note: Your chip may be marked differently, but “386” will be printed on it somewhere.

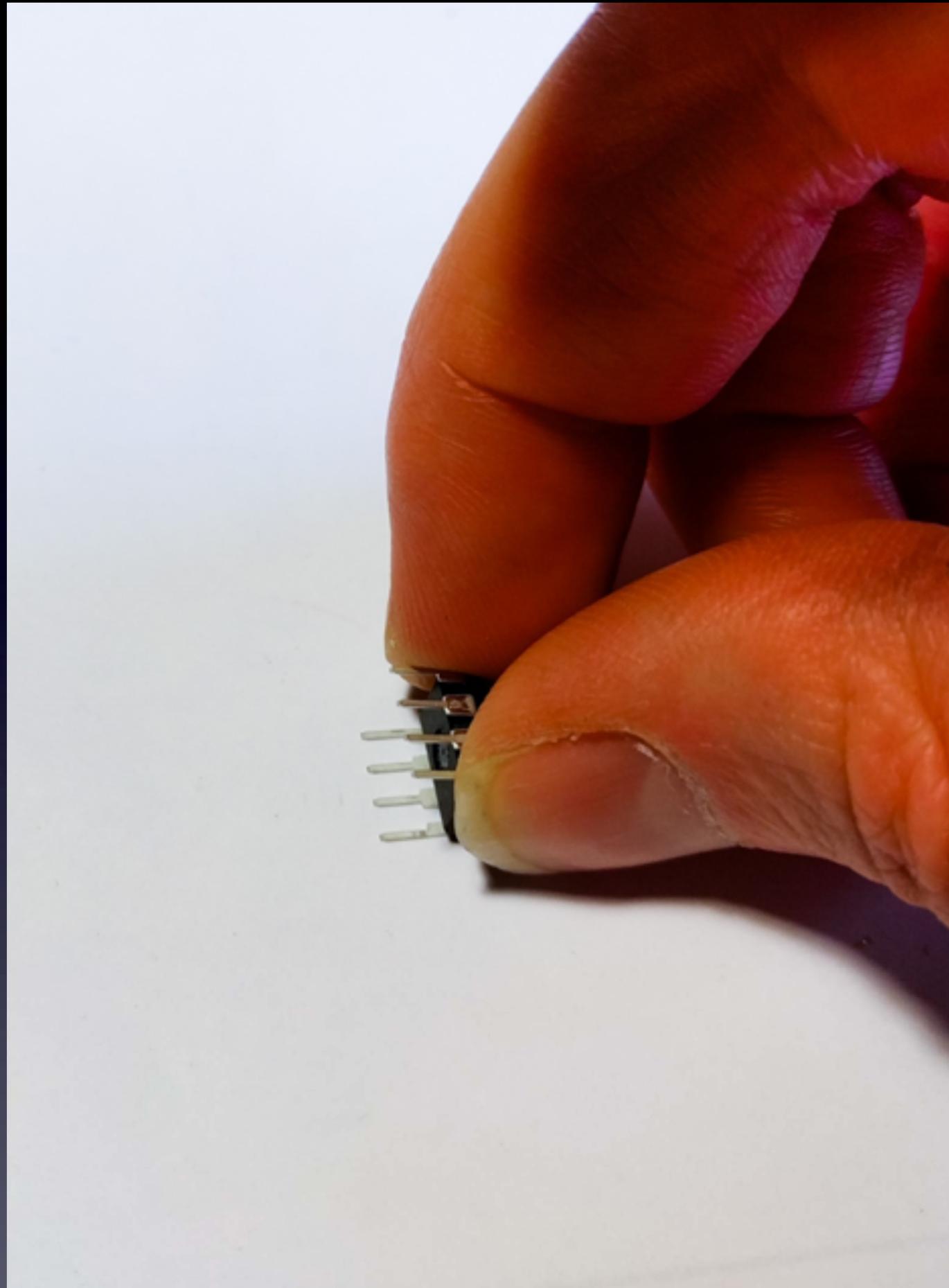
Note: Your chip may or may not have the indented half-moon at the left,
it may have a black indented dot at the lower-left corner showing Pin 1.

U2



When chips are new,
their pins are bent out.

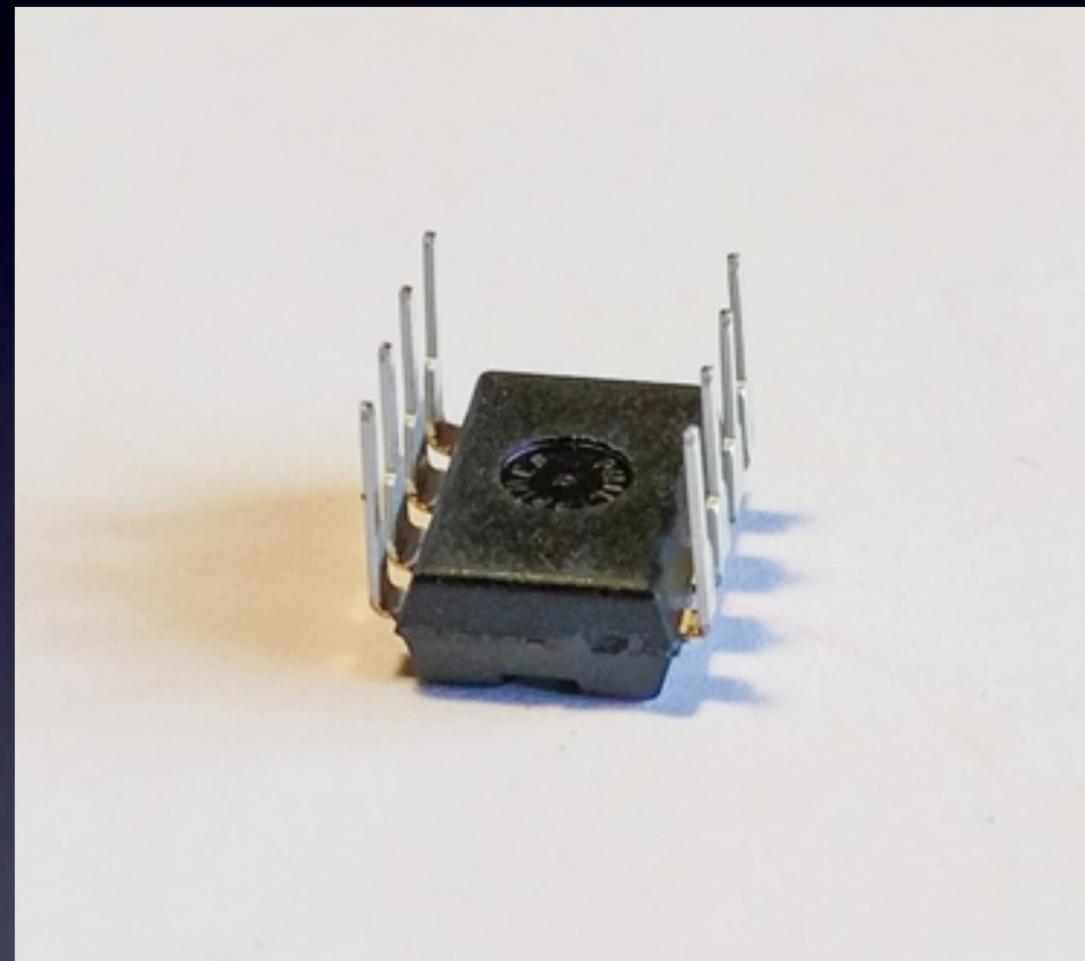
U2

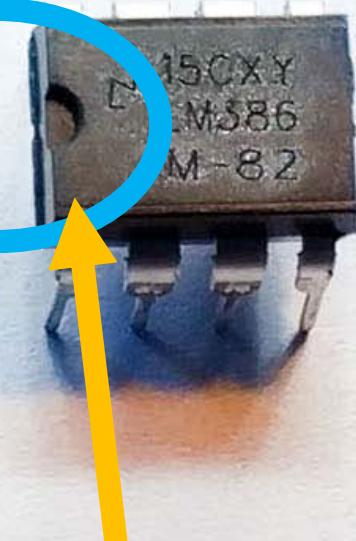
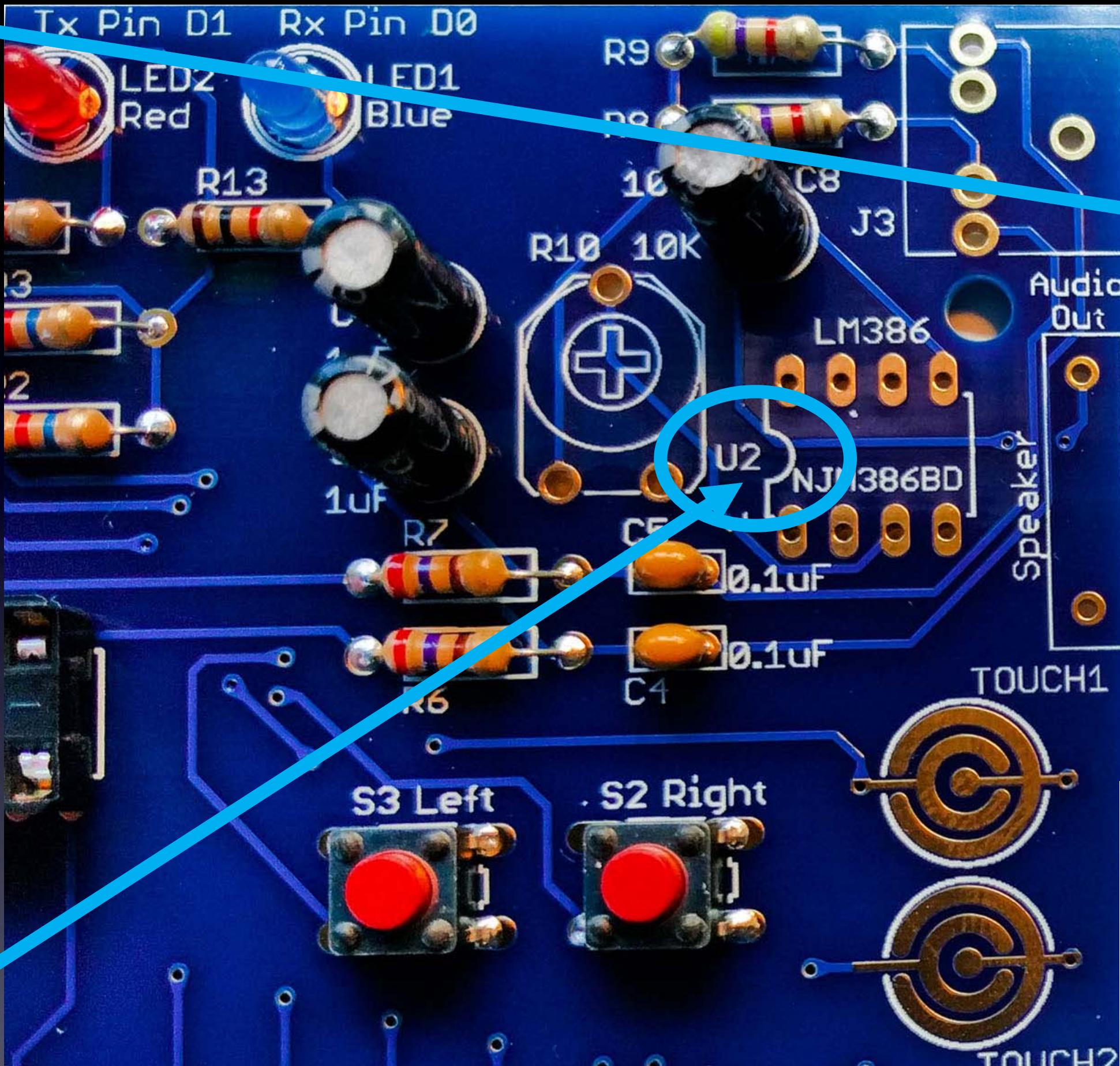


We need the pins bent straight and parallel.
Use your work table to (gently) bend the leads.

U2

Gently
bend leads
so they're straight
and parallel



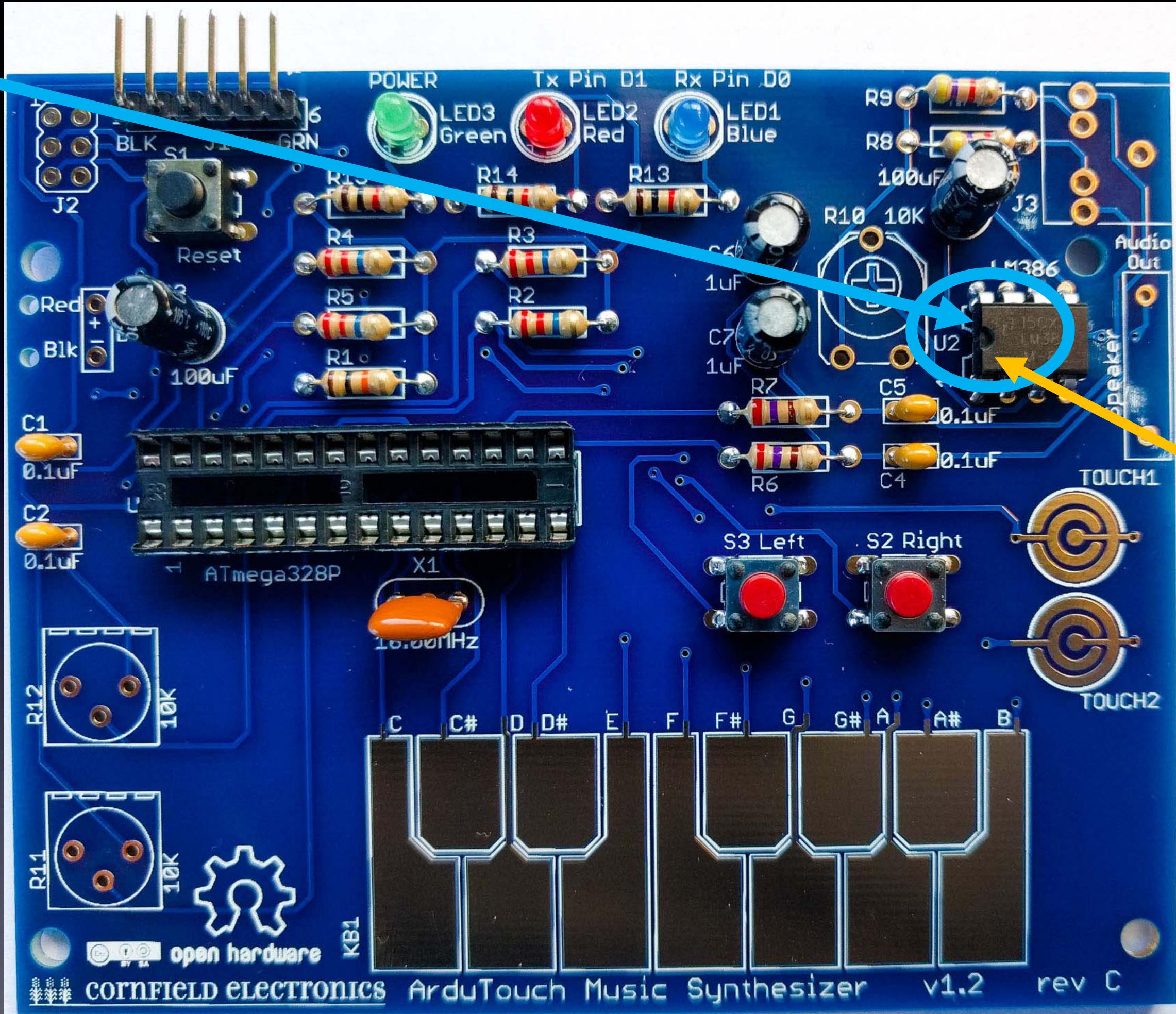


Indented black dot
Pin 1

**proper
orientation**

Note: Your chip may or may not have the indented half-moon at the left, it may have a black indented dot at the lower-left corner showing Pin 1.

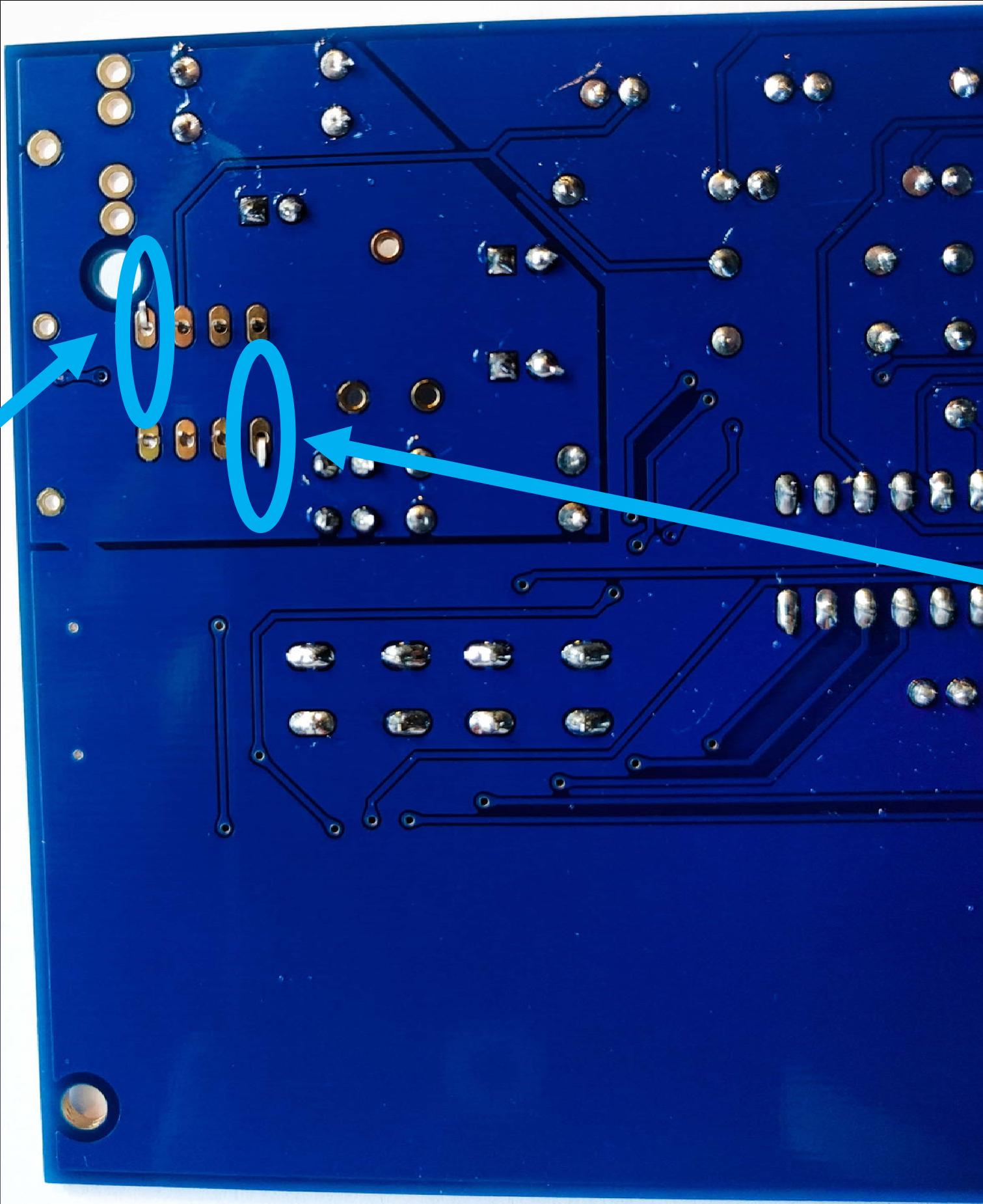
U2: audio amp chip



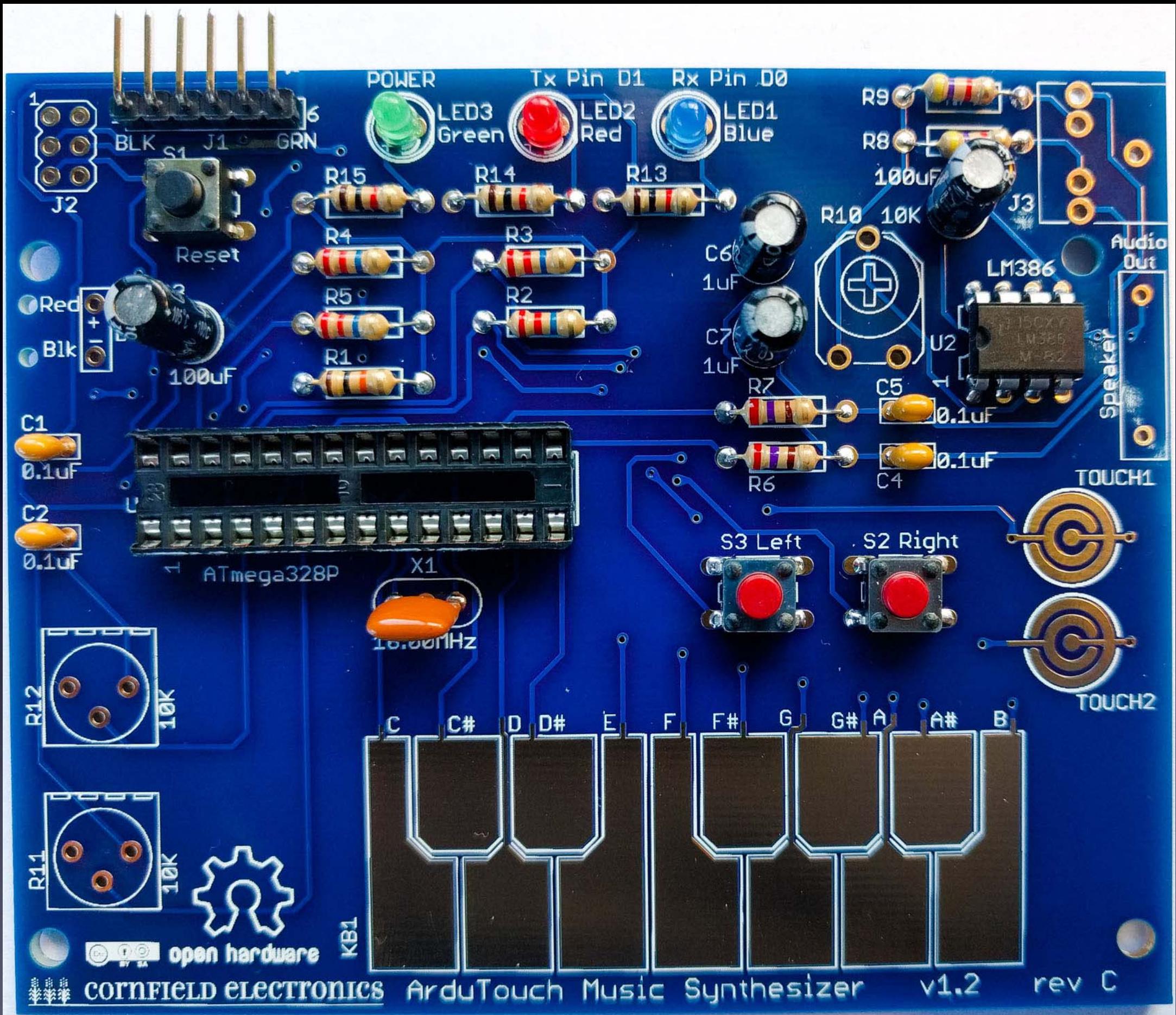
U2: inserted correctly

Indented black dot
Pin 1

U2

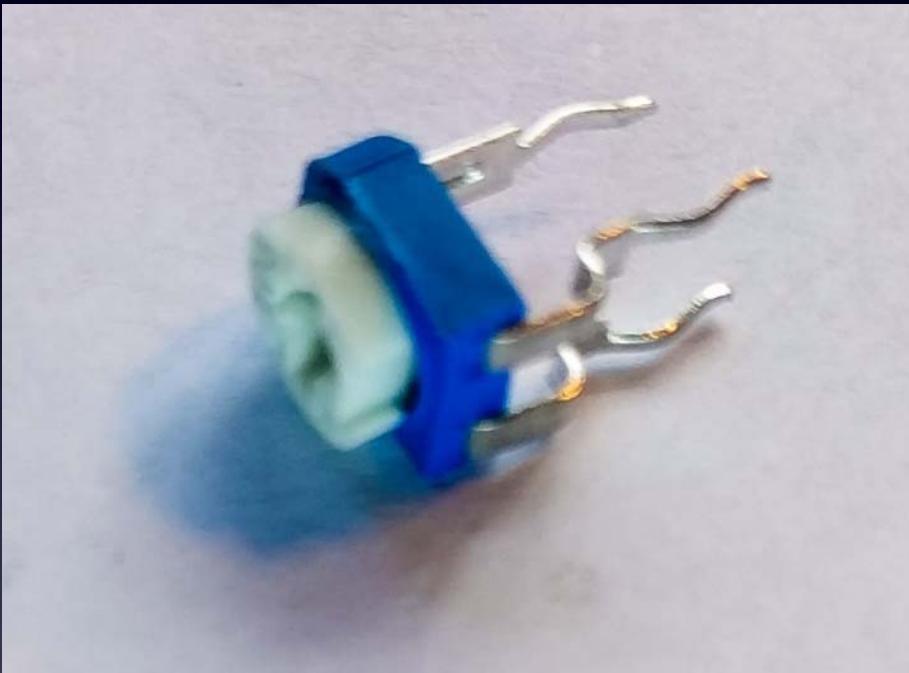


bend pins down on two corners,
and solder all 8 leads to the board



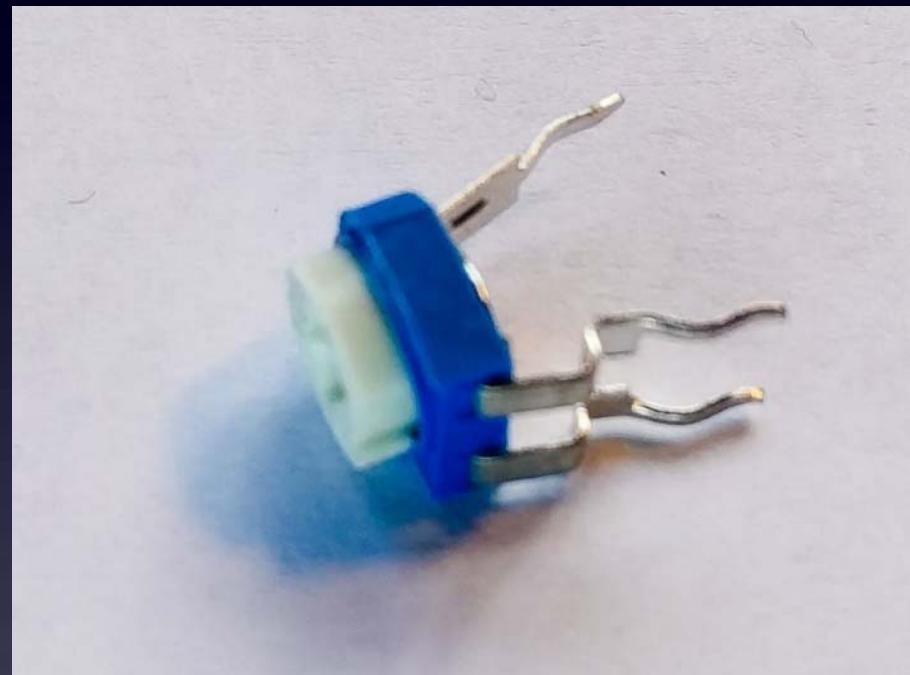
U2 – soldered to board

R10: volume control



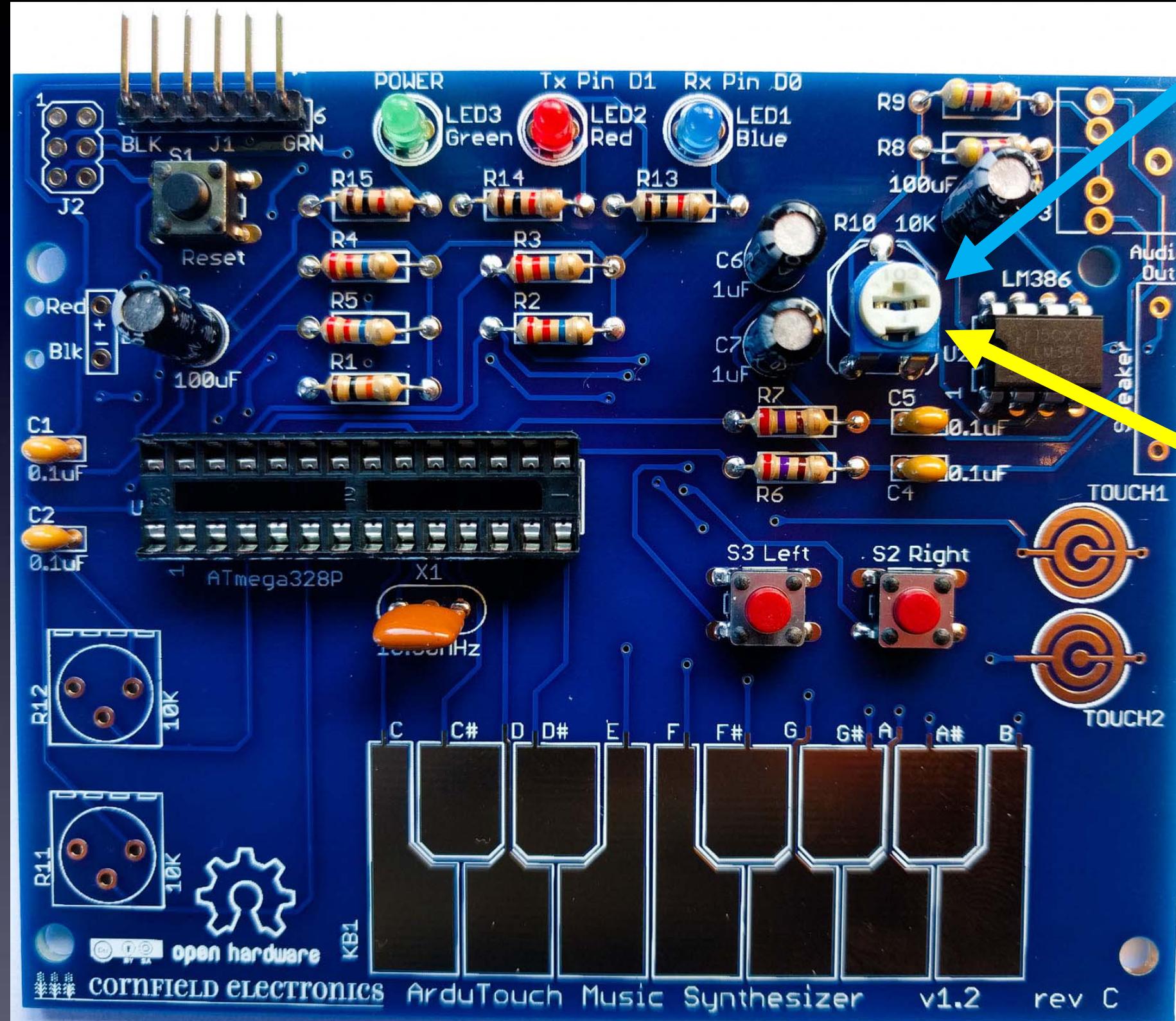
When new, the pins point straight down.

R10: volume control

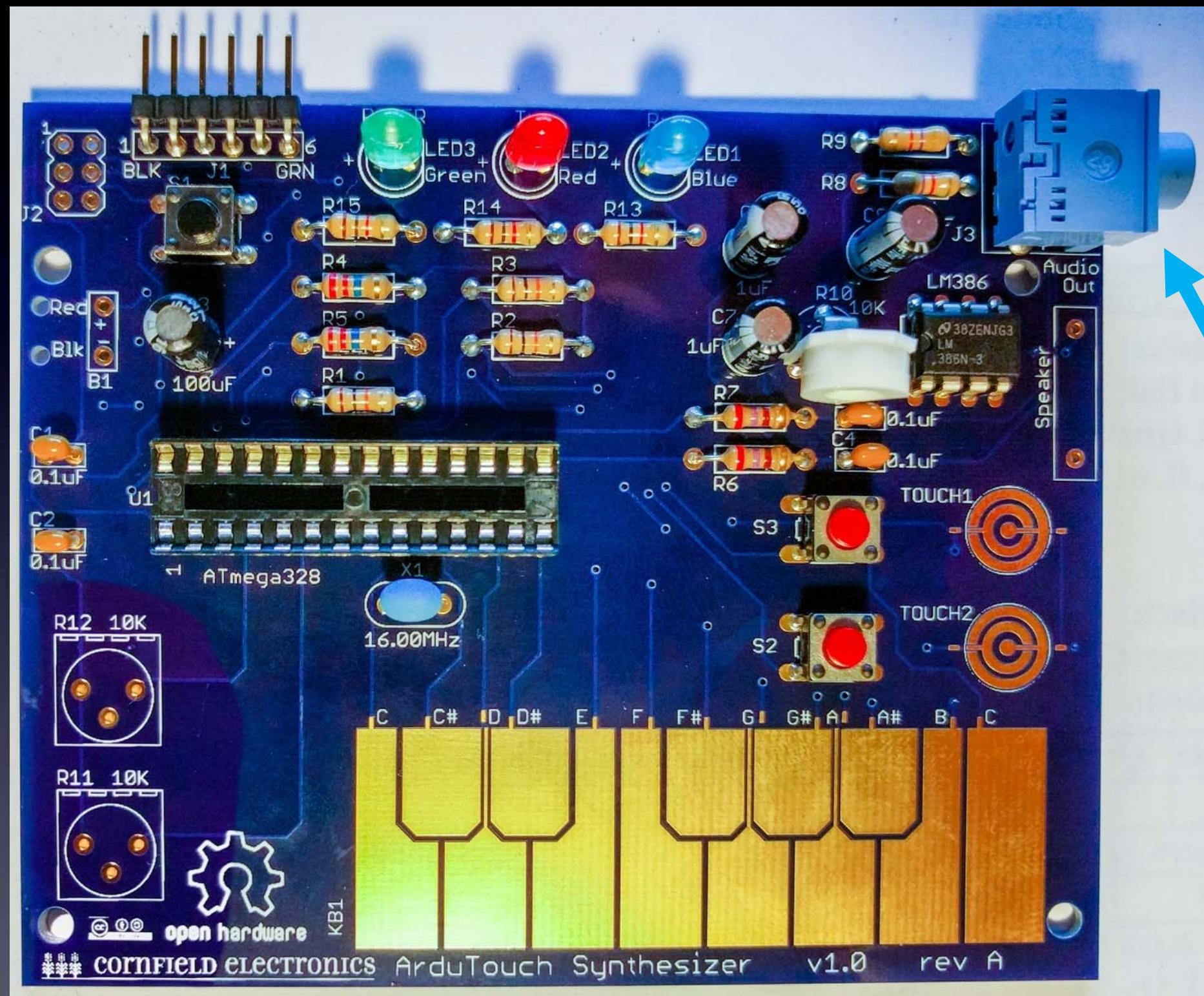


We need to bend them out a little to fit into the board.

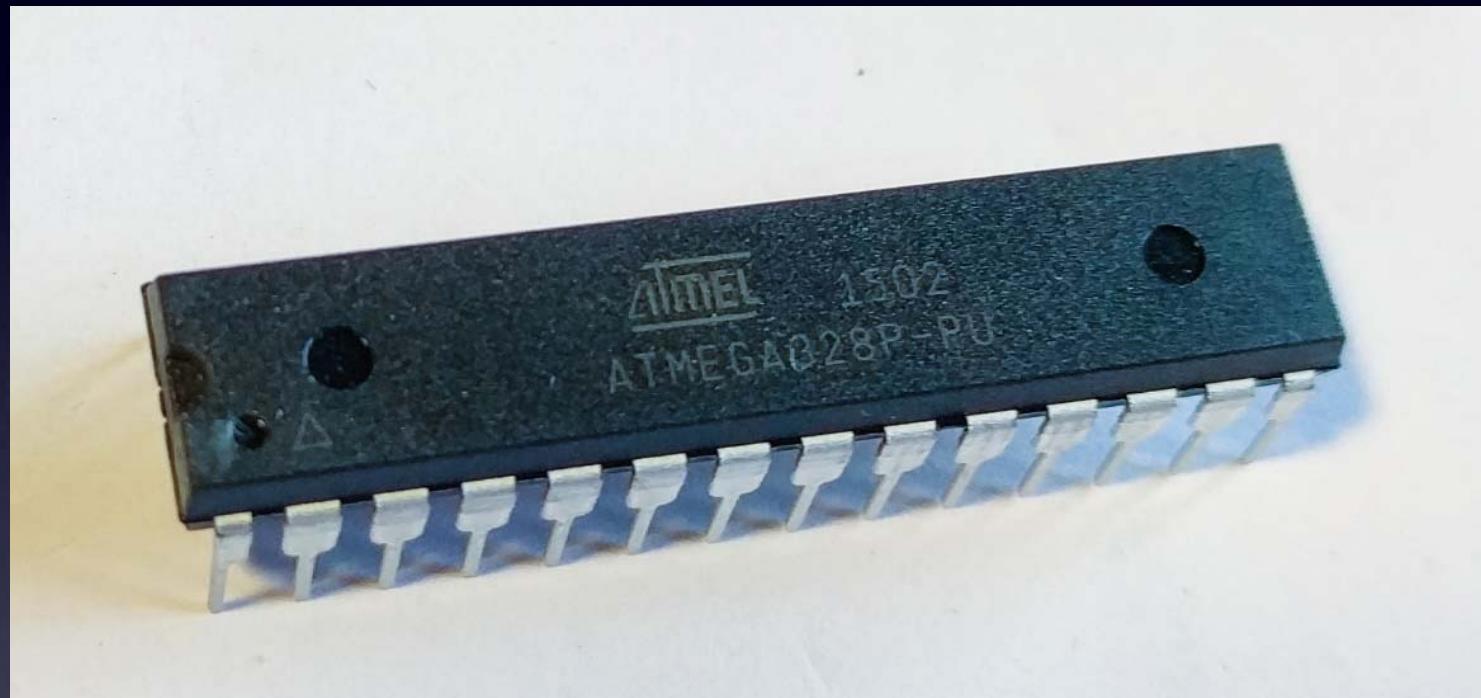
R10: volume control



If necessary,
rotate the white top
so that it looks
like this photo
(rotated half-way)

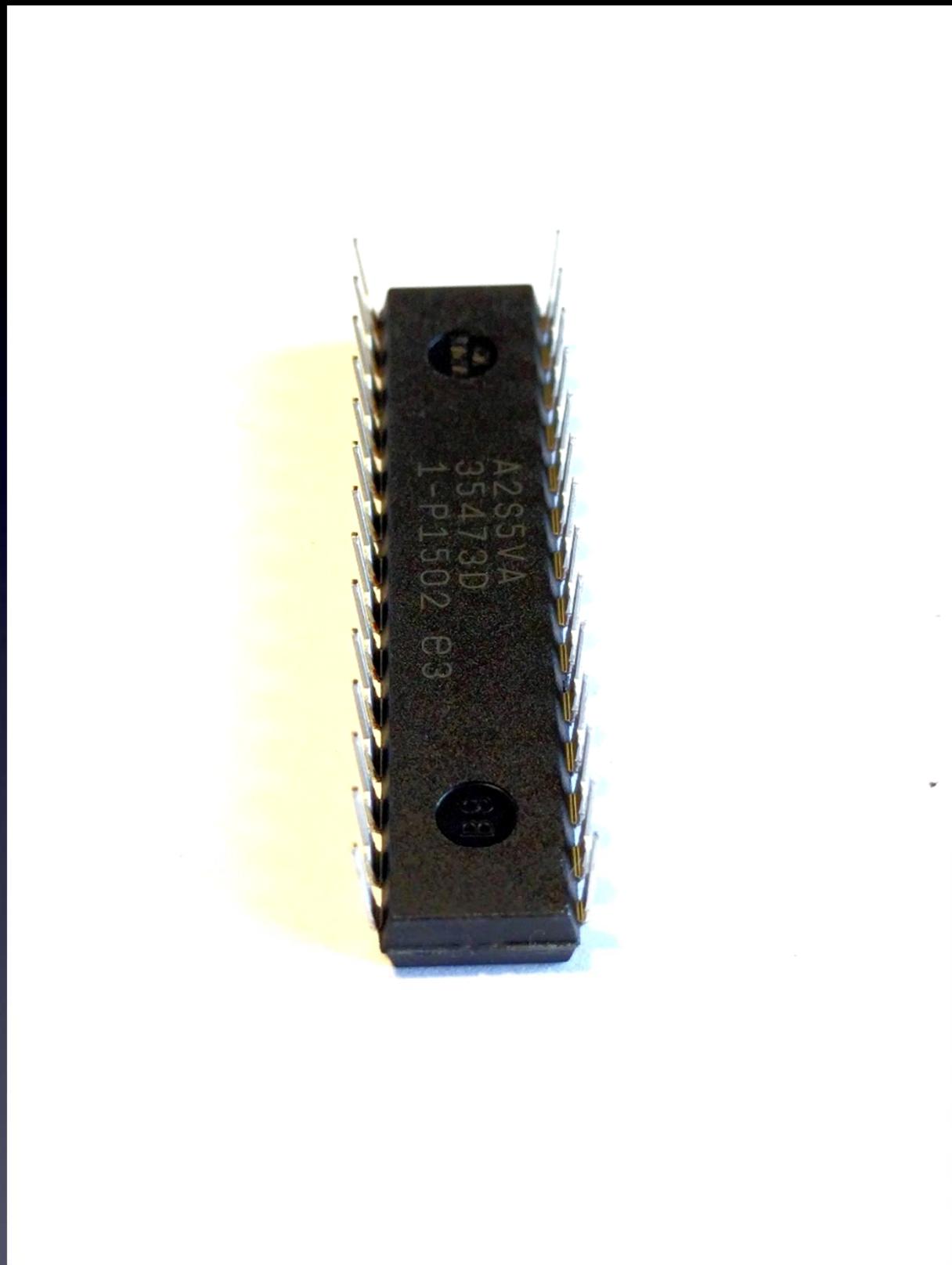


J3: headphone / output jack



U1: microcontroller

U1



**When chips are new,
their pins are bent out.**

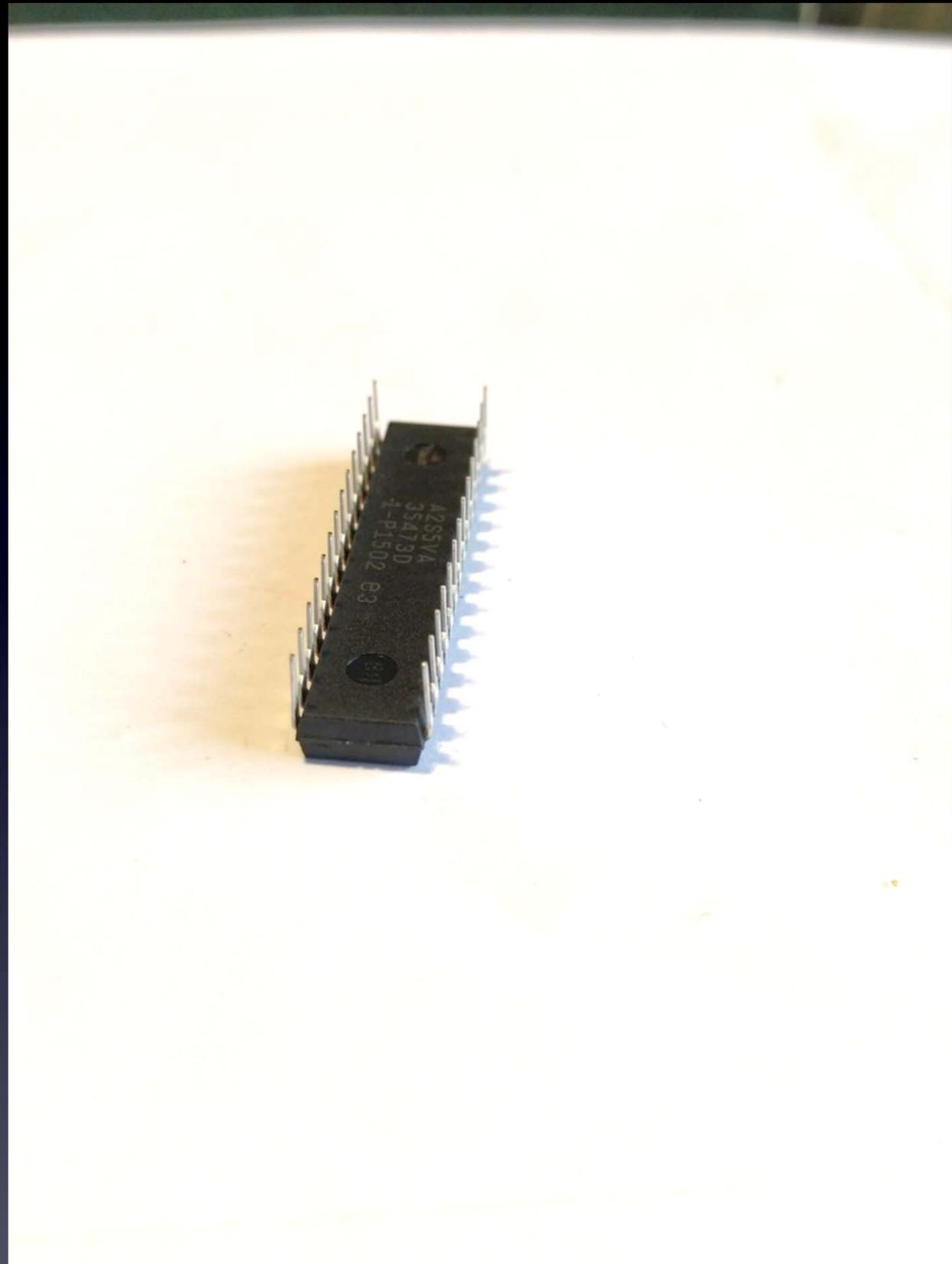
Note: Your kit's U1 chip may or may not have its pins already bent straight and parallel. If not, you need to bend them, as shown in the next picture.

U1

Note: Your kit's U1 chip may or may not have its pins already bent straight and parallel.
If not, you need to bend them, as shown in this picture.



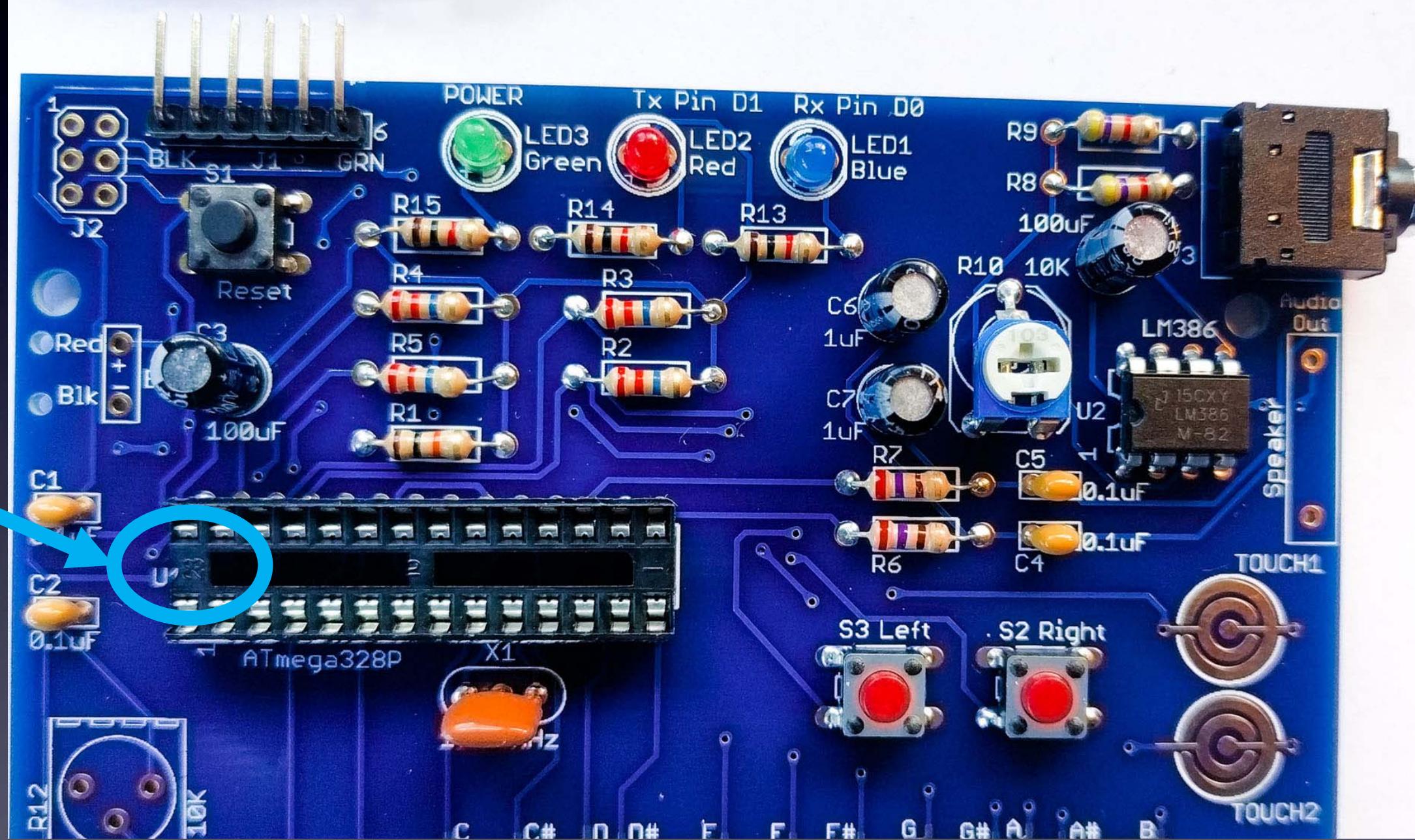
**We need the pins bent straight and parallel.
Use your work table to (gently) bend the leads.**



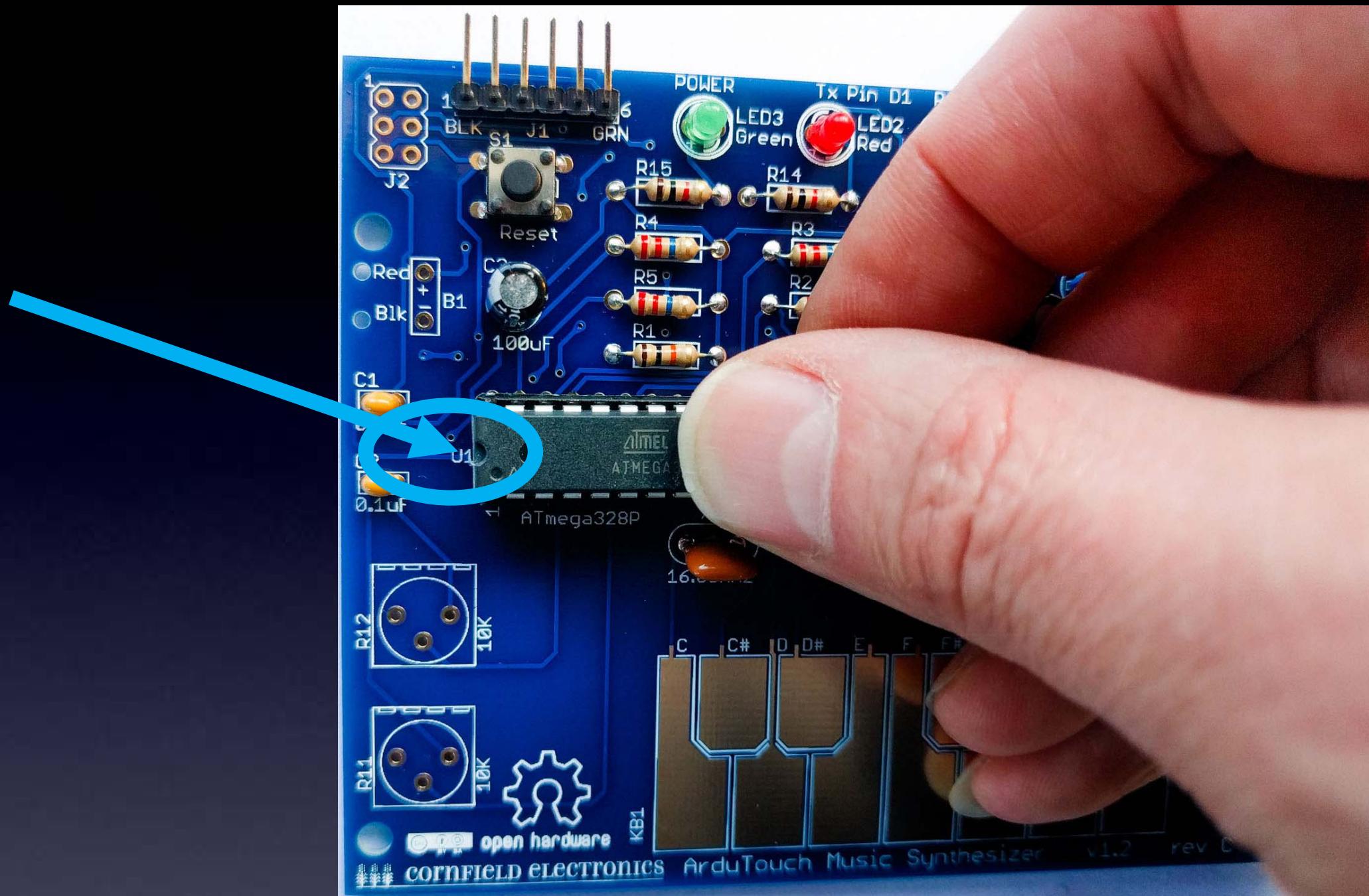
U1: microcontroller

These pins must be straight and parallel

proper
orientation



U1: microcontroller



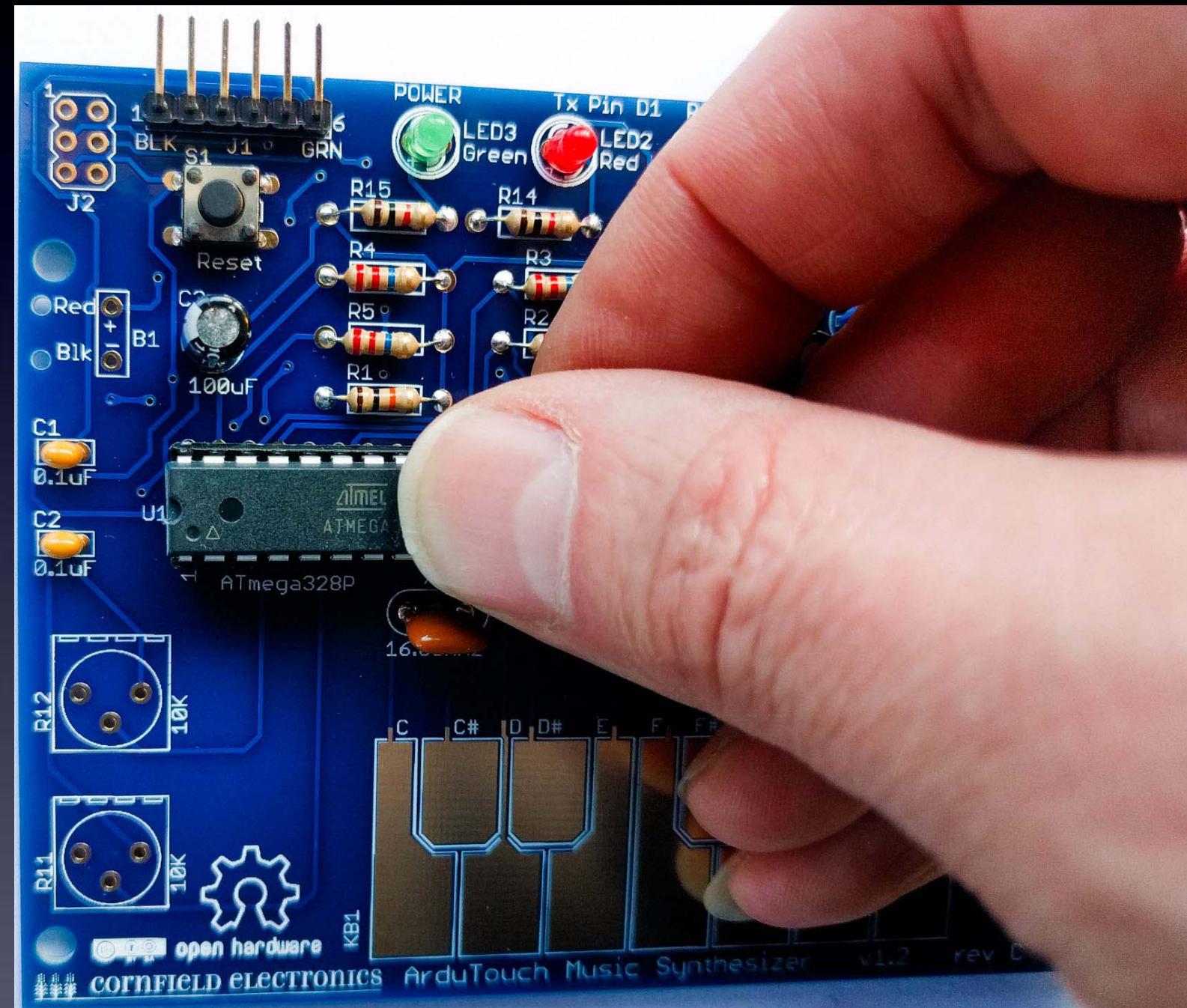
U1: microcontroller

make sure each pins rests in its hole in the socket
→ with the proper orientation

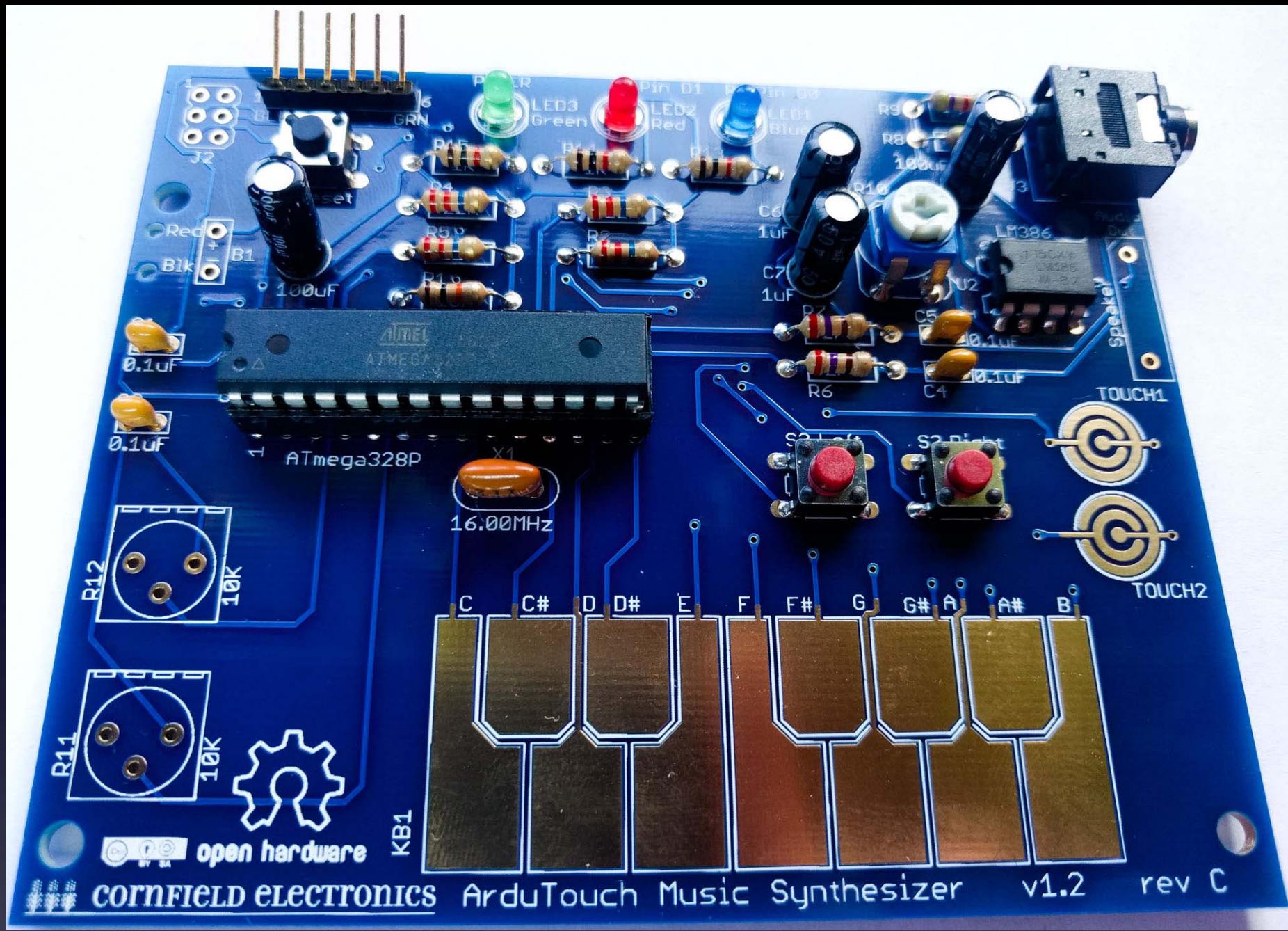
Use two thumbs to push microcontroller into the socket

**Make sure all 28 pins
are in place,
and push it into its socket.**

**(This is actually way easier
with 2 thumbs.)**



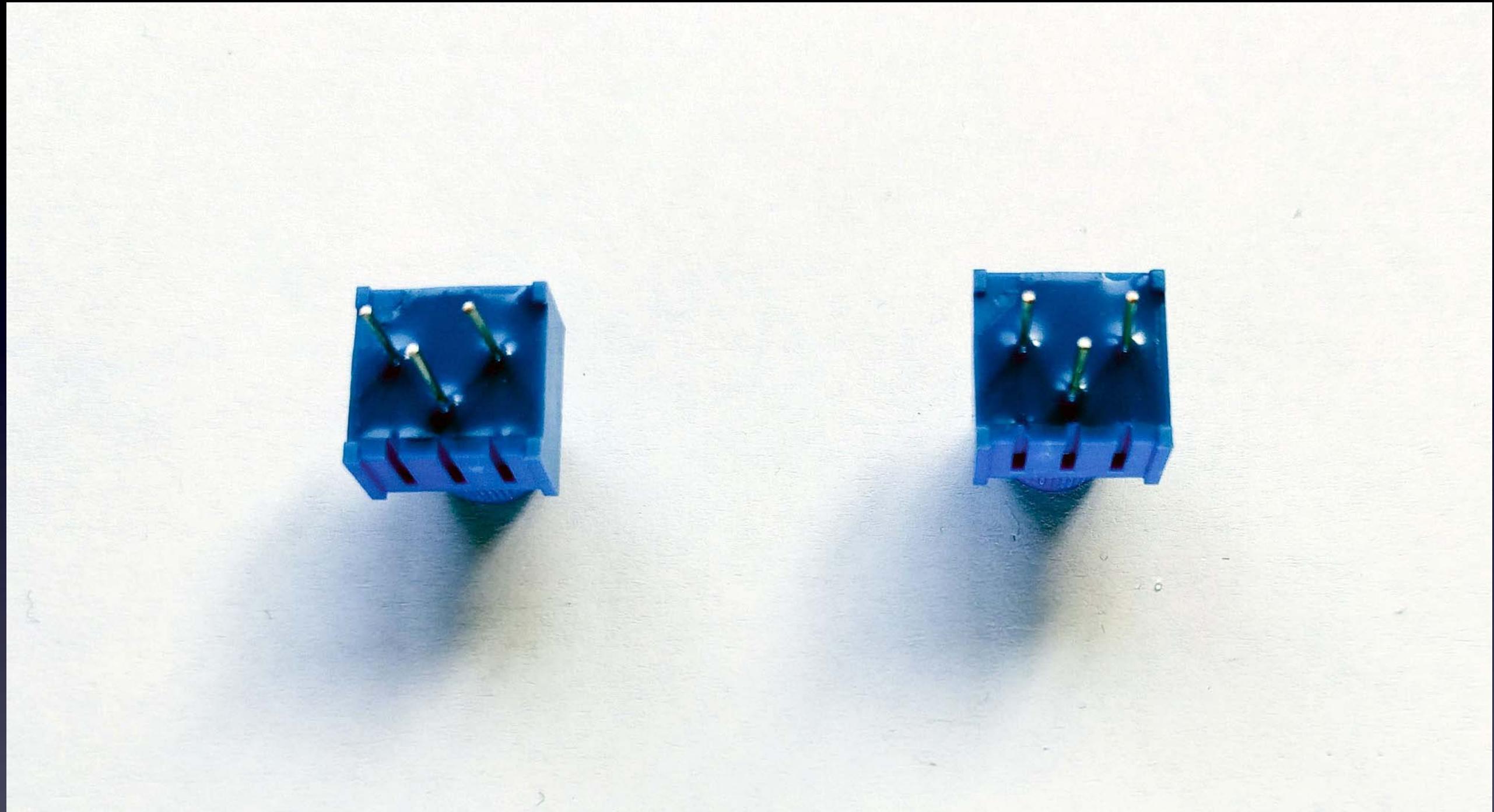
U1: microcontroller



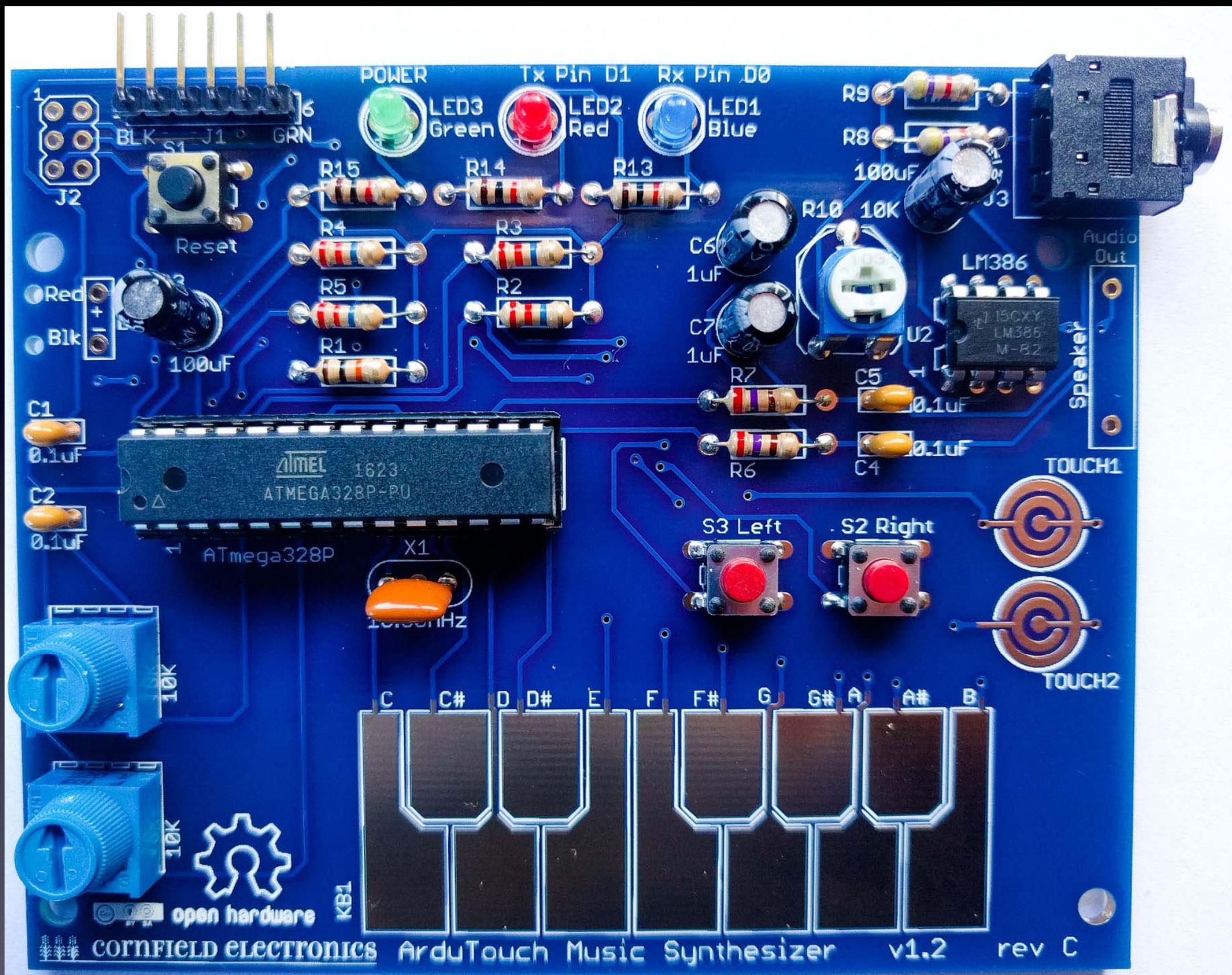
U1: microcontroller

Inspect all pins, and be sure each went into its hole in the socket – not bent.

If any pins are bent, (gently) pry out chip, straighten pins, and insert again.



R11 & R12: potentiometers



R11 & R12: potentiometers



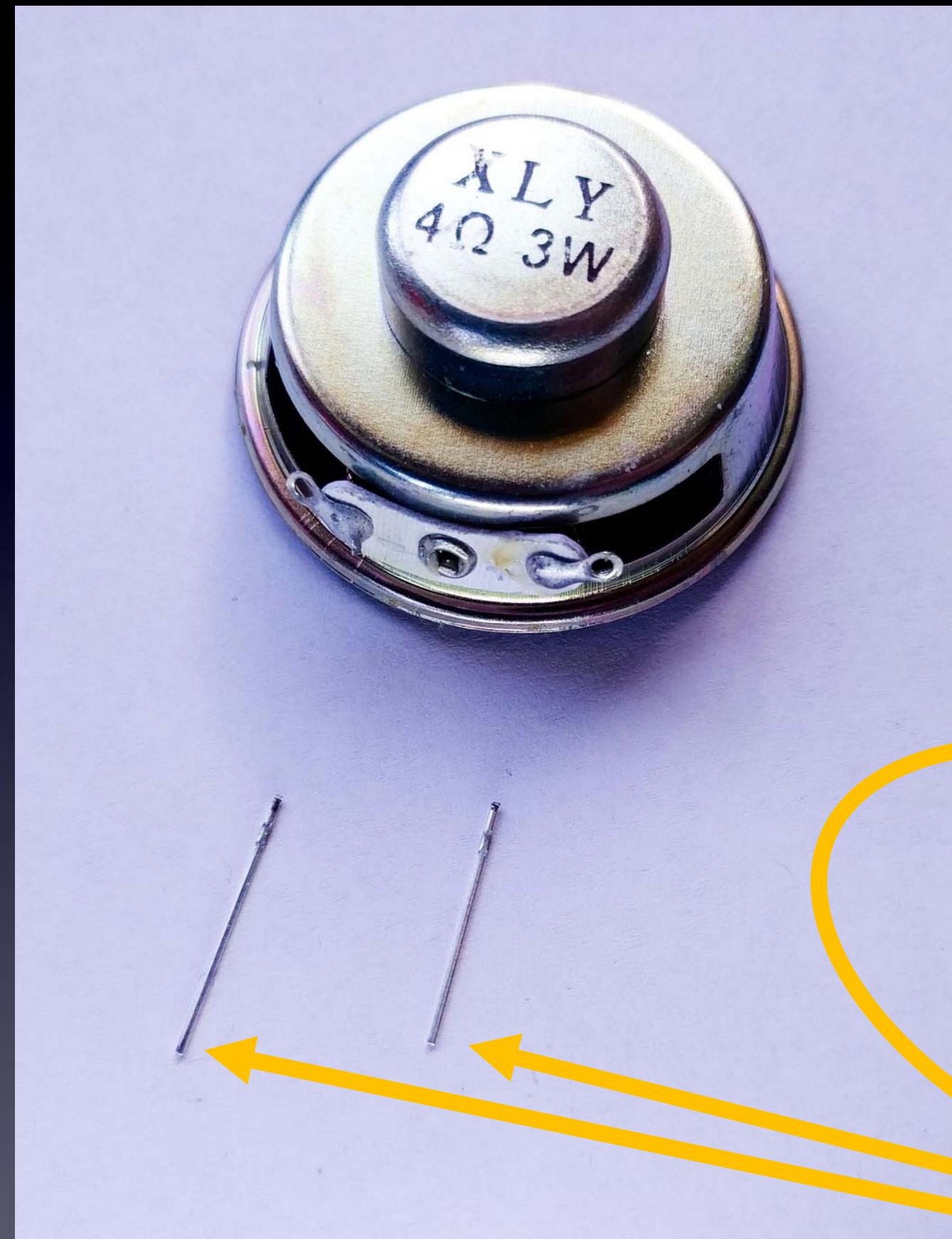
Speaker

**Some kits have a
speaker that looks
like this**



Speaker

We'll add leads
to the speaker



Saved
leads

from the LEDs

Speaker

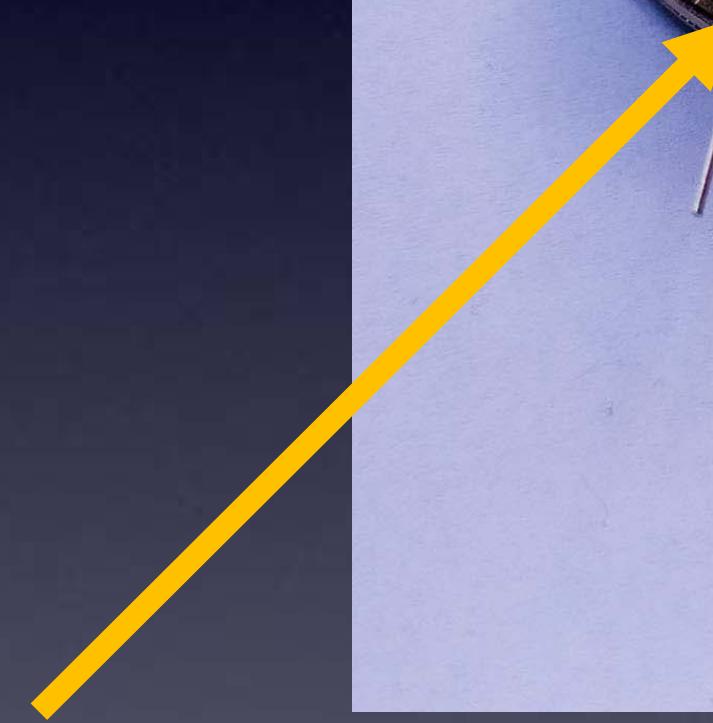
**Tin one side
of each lead**

(i.e., cover with
thin film of melted solder)

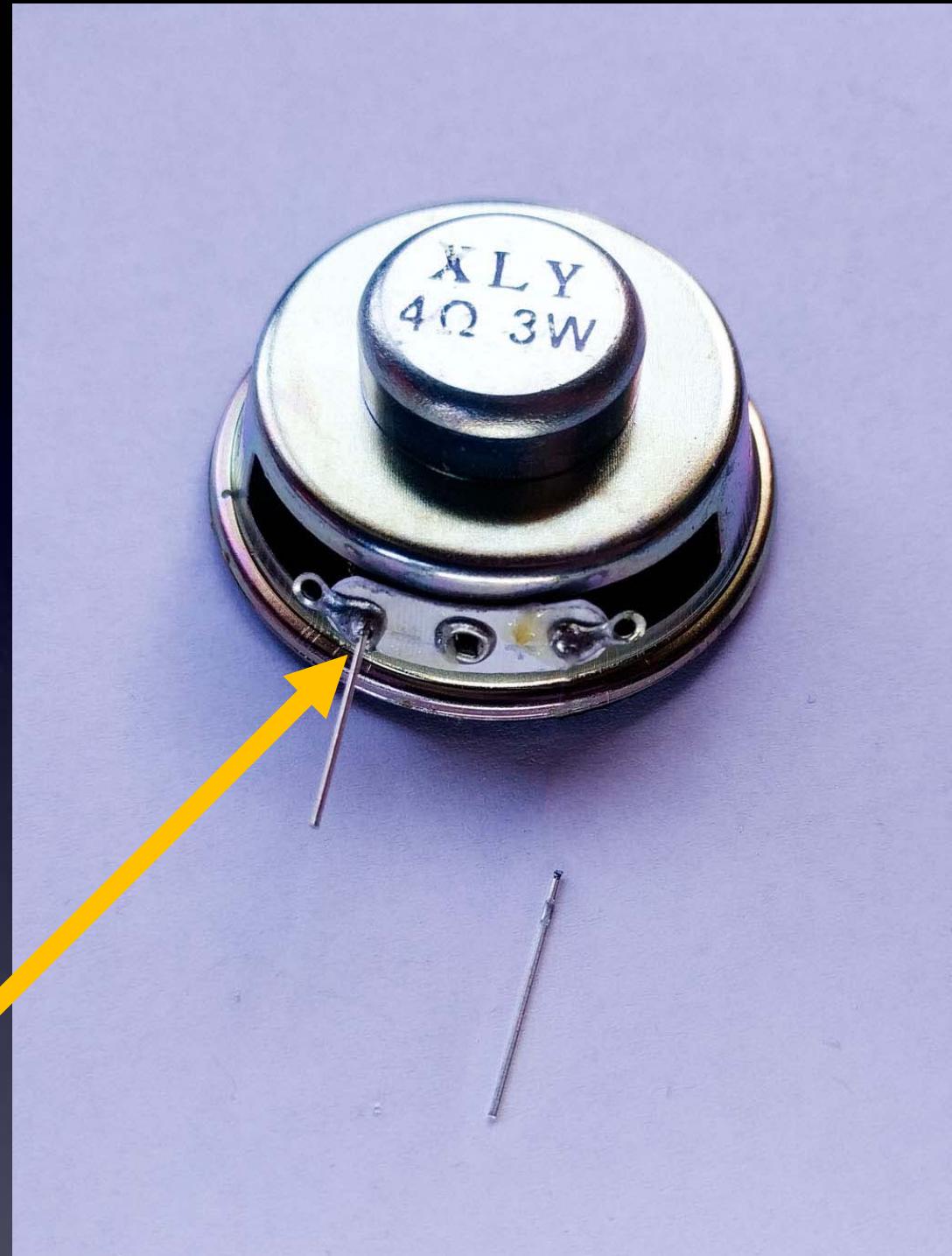


Speaker

**Solder one lead
to speaker**

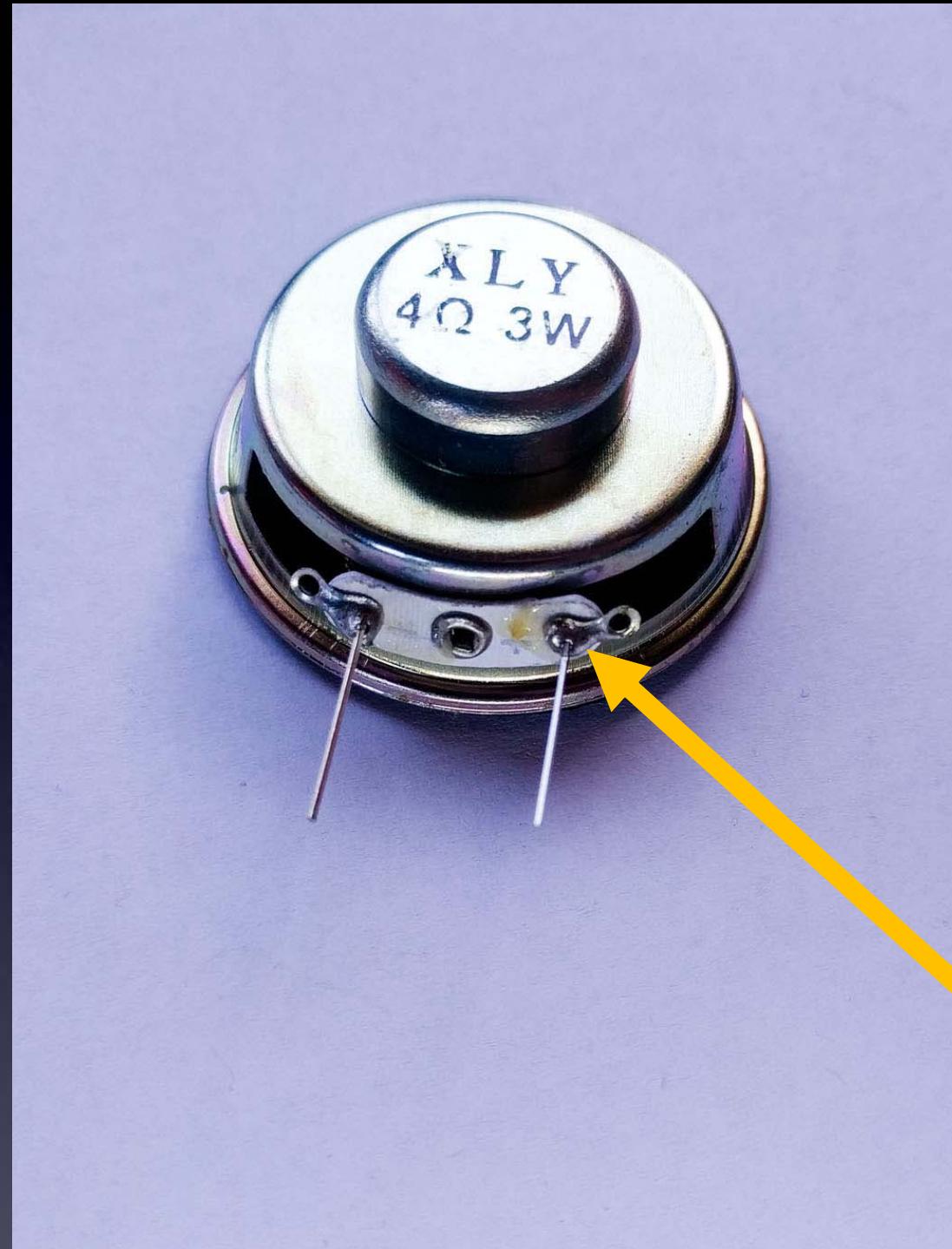


**Notice the
correct place
to solder the wire**



Speaker

**Solder next lead
to speaker**

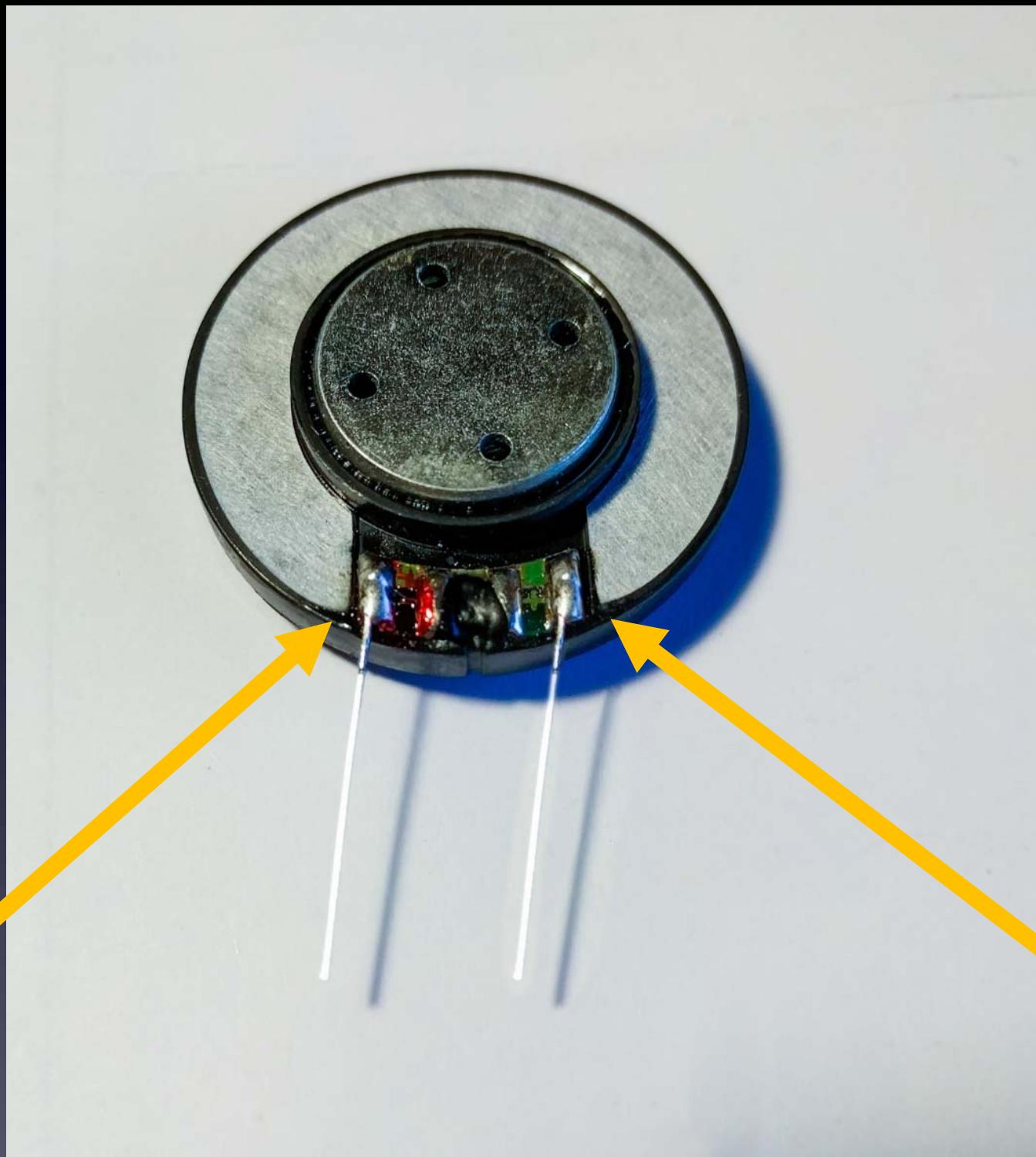


Speaker

**Notice the
correct place
to solder the wire**

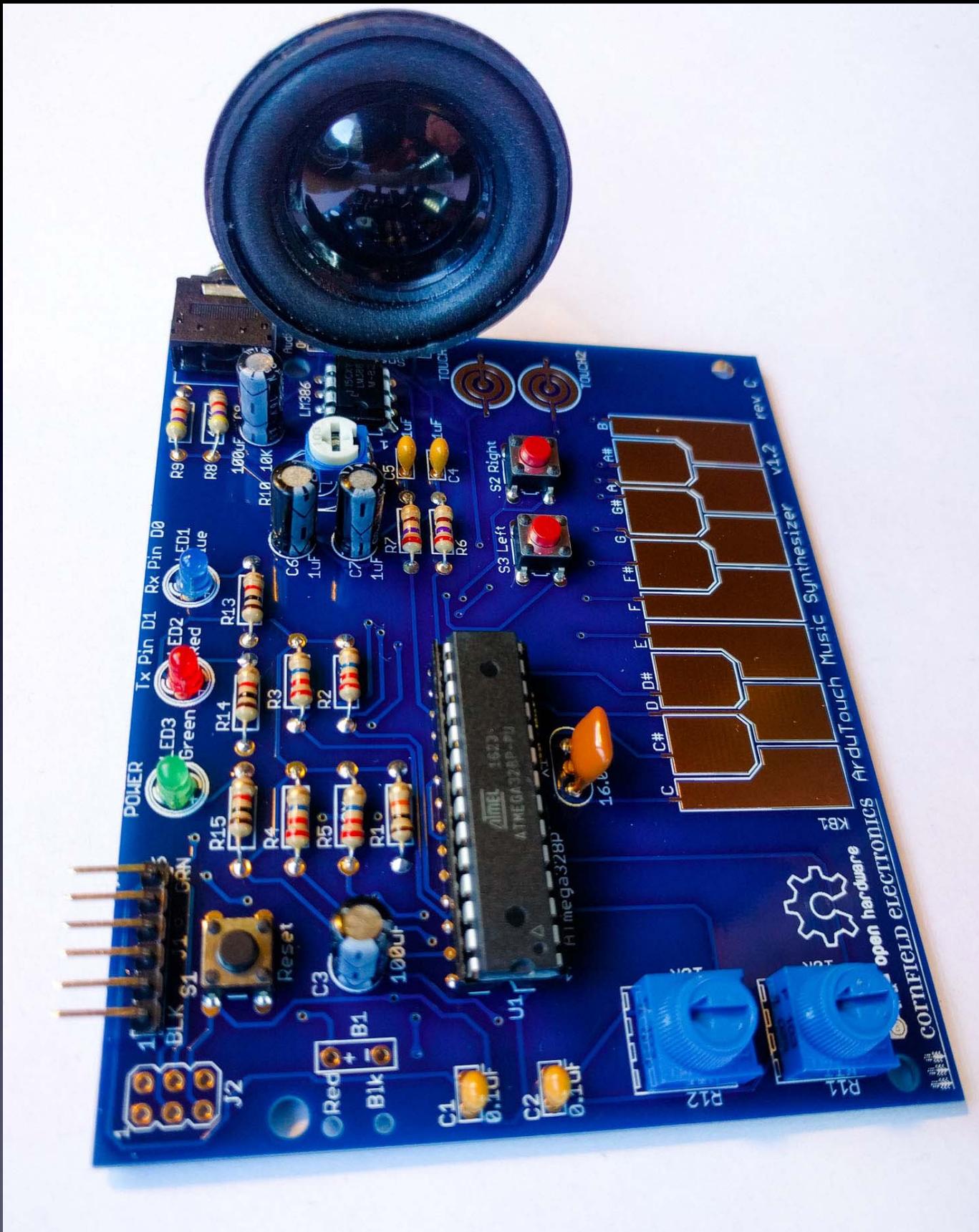
Some kits have a speaker that looks like this

Notice the correct place to solder the wires



Speaker

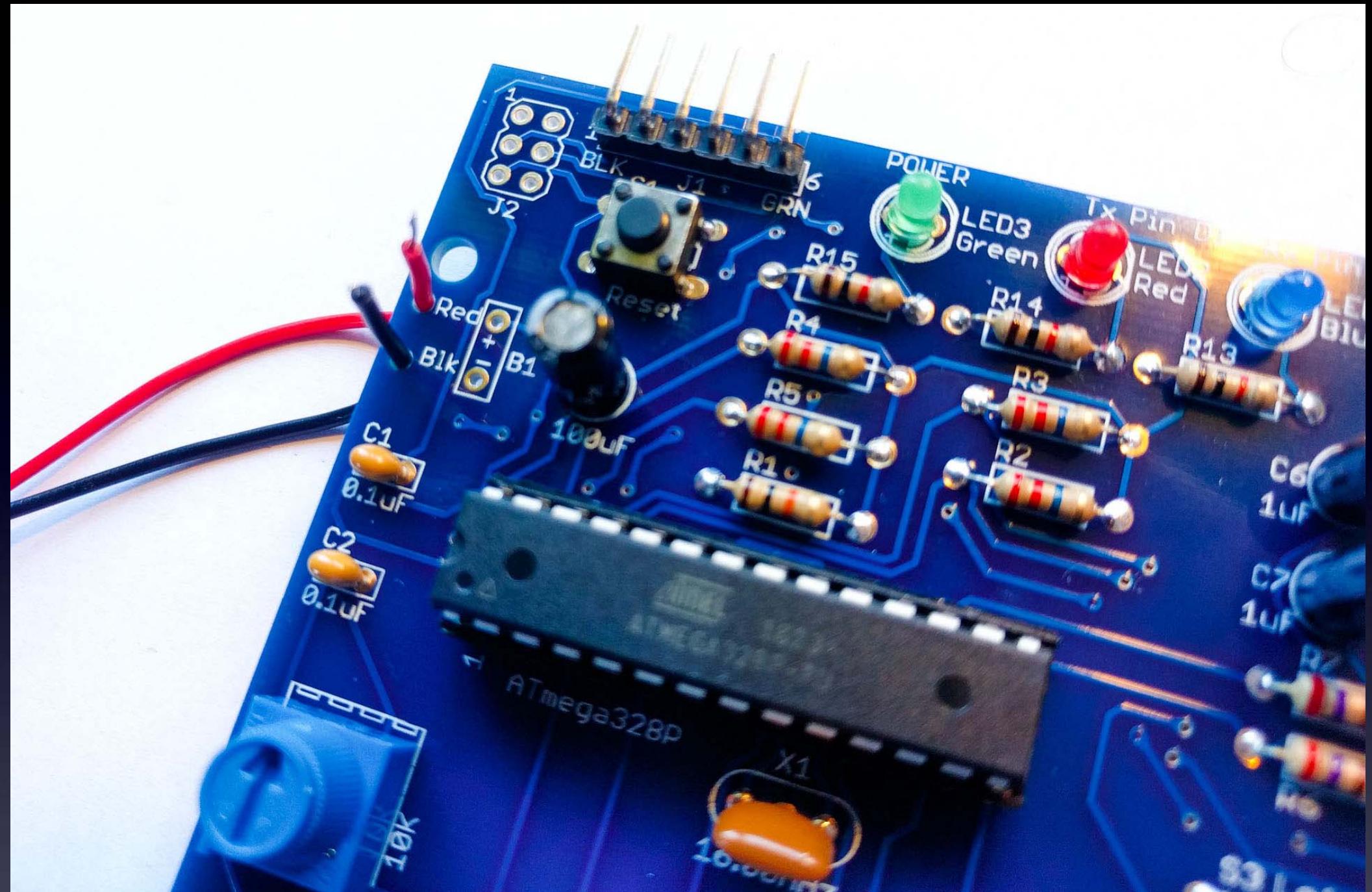
**Insert
speaker into board
and solder
both leads to board.**



Speaker

Note: Some battery pack wires have thicker red and black plastic coatings.

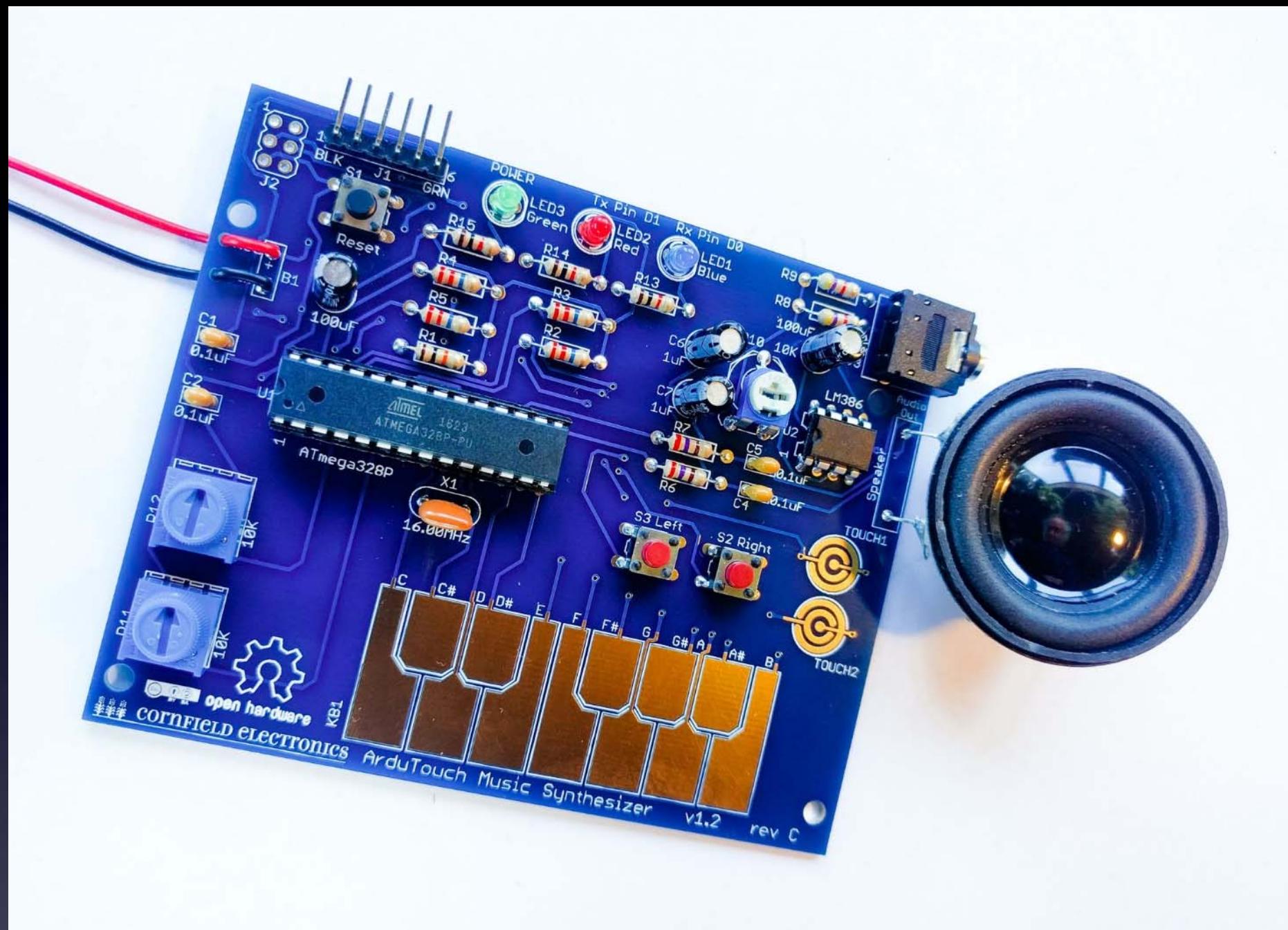
*If so,
you can widen the these
two holes by gently
rotating a scissors or small
knife or small Phillips
screwdriver on the top
and bottom of these two
holes.*



Push battery pack leads through holes.

Make sure Red and Black go through their correct holes!

Battery pack

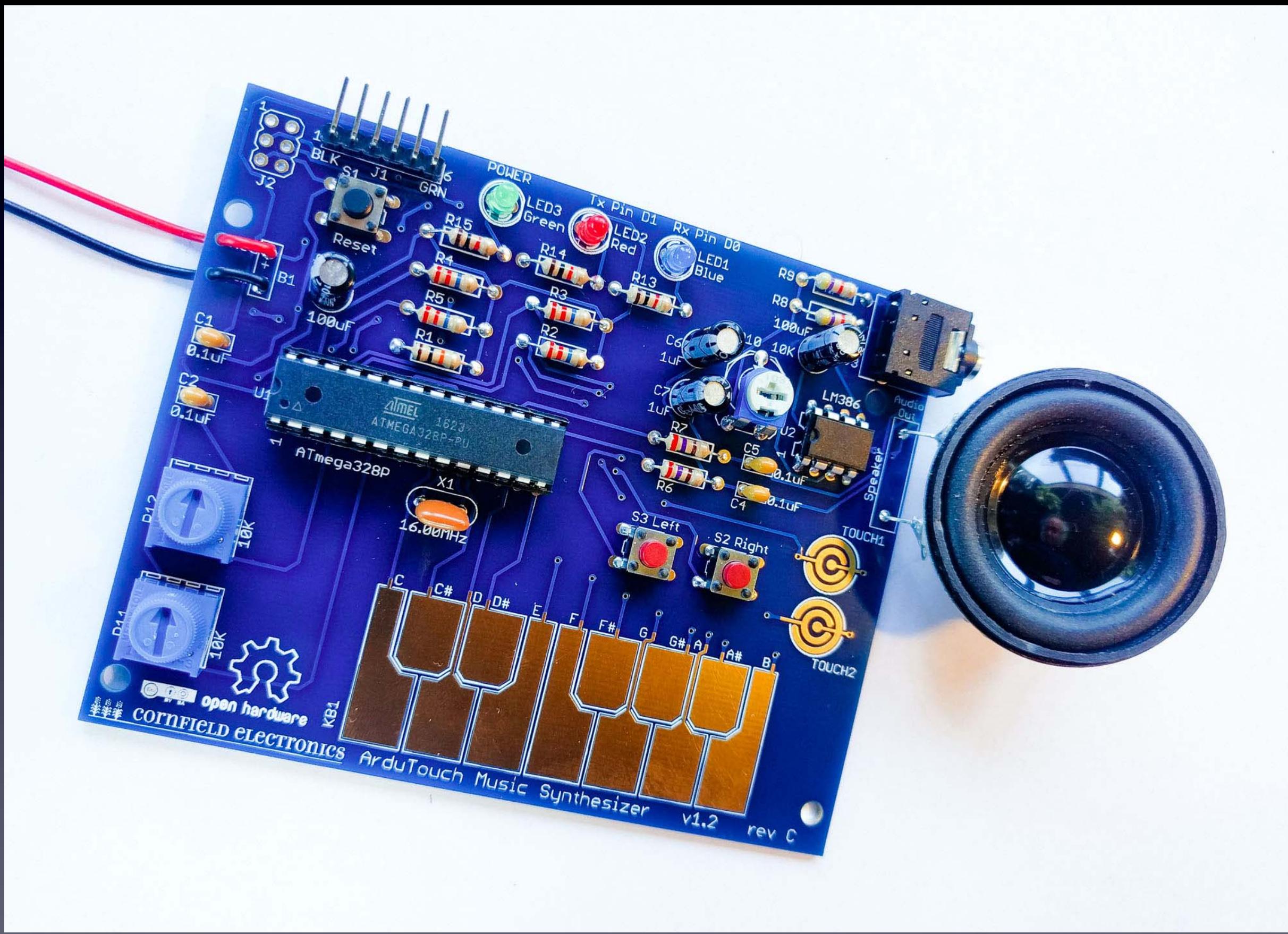


Loop one lead into its pad,
and solder.

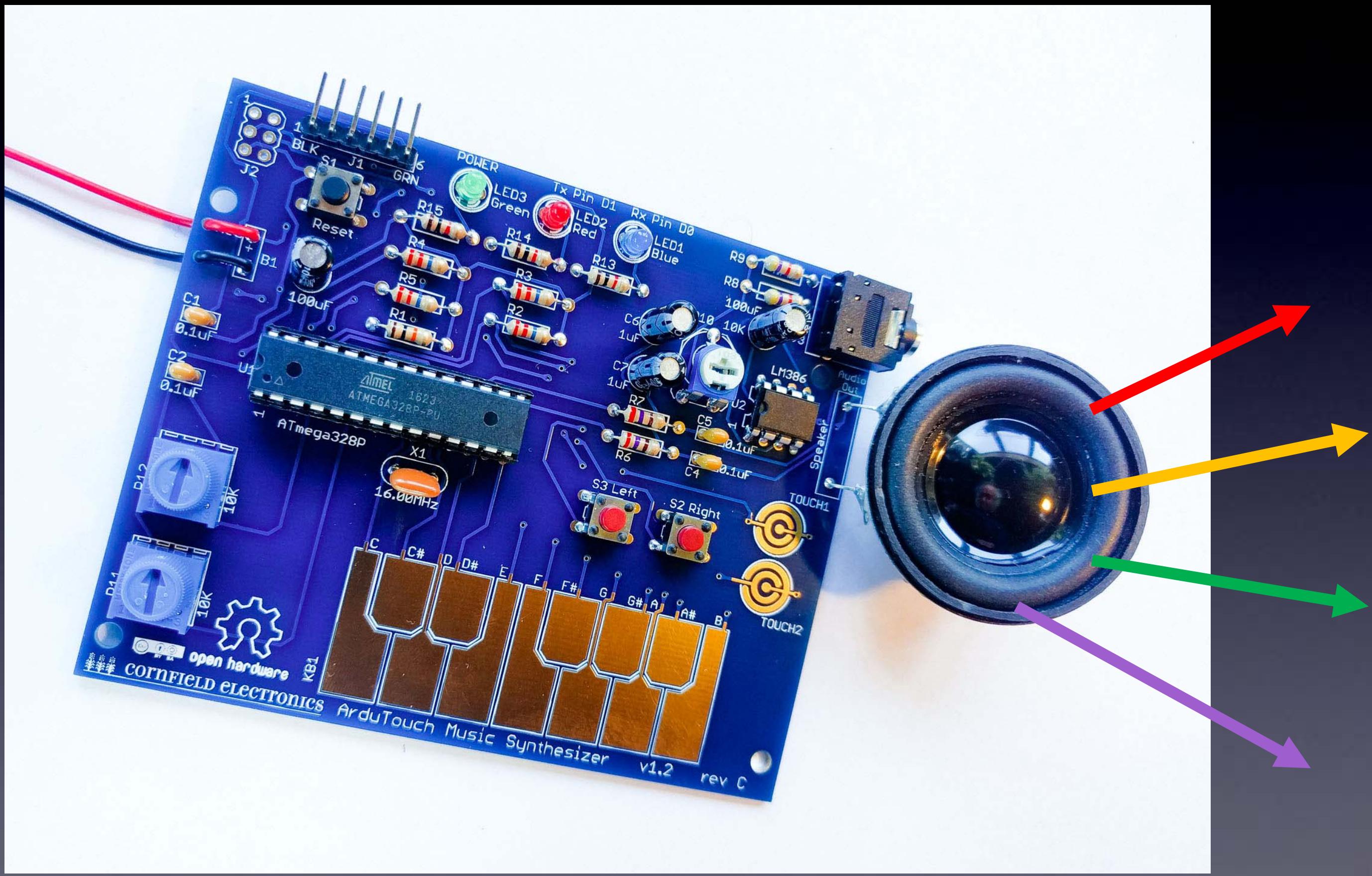
Then loop the other lead into its pad,
and solder.

Battery pack

Done!



Let's make noise!

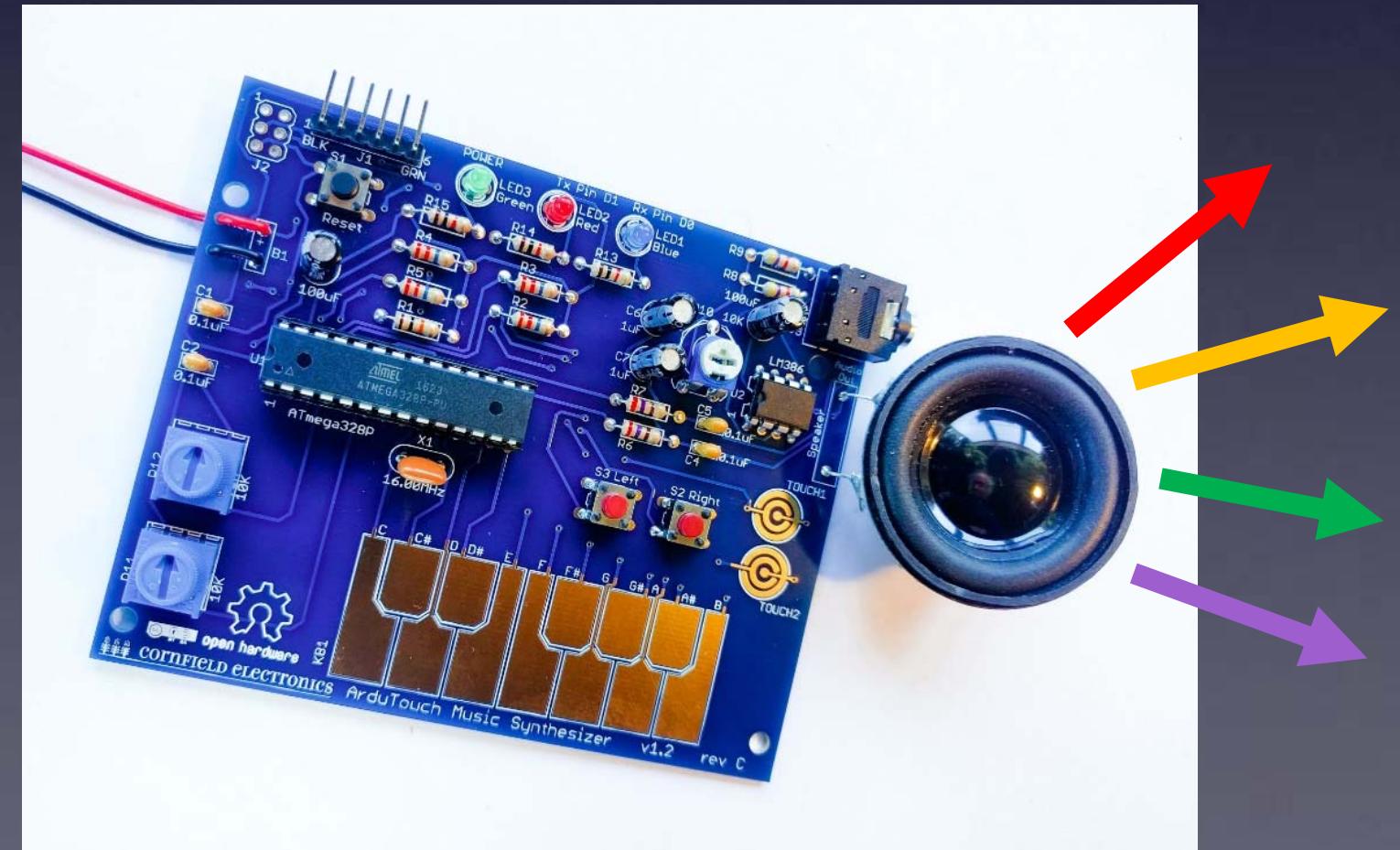


Let's make noise!

Your ArduTouch comes pre-programmed with a really cool synthesizer, called “Thick”.

“Thick” plays 4 sawtooth waves at once.

- the left and right buttons change octaves
- long press the left and right buttons to change sounds
- the Bottom knob controls the glide rate
- the Top knob controls how each of the 4 notes glide separately
- Try playing with these and see!

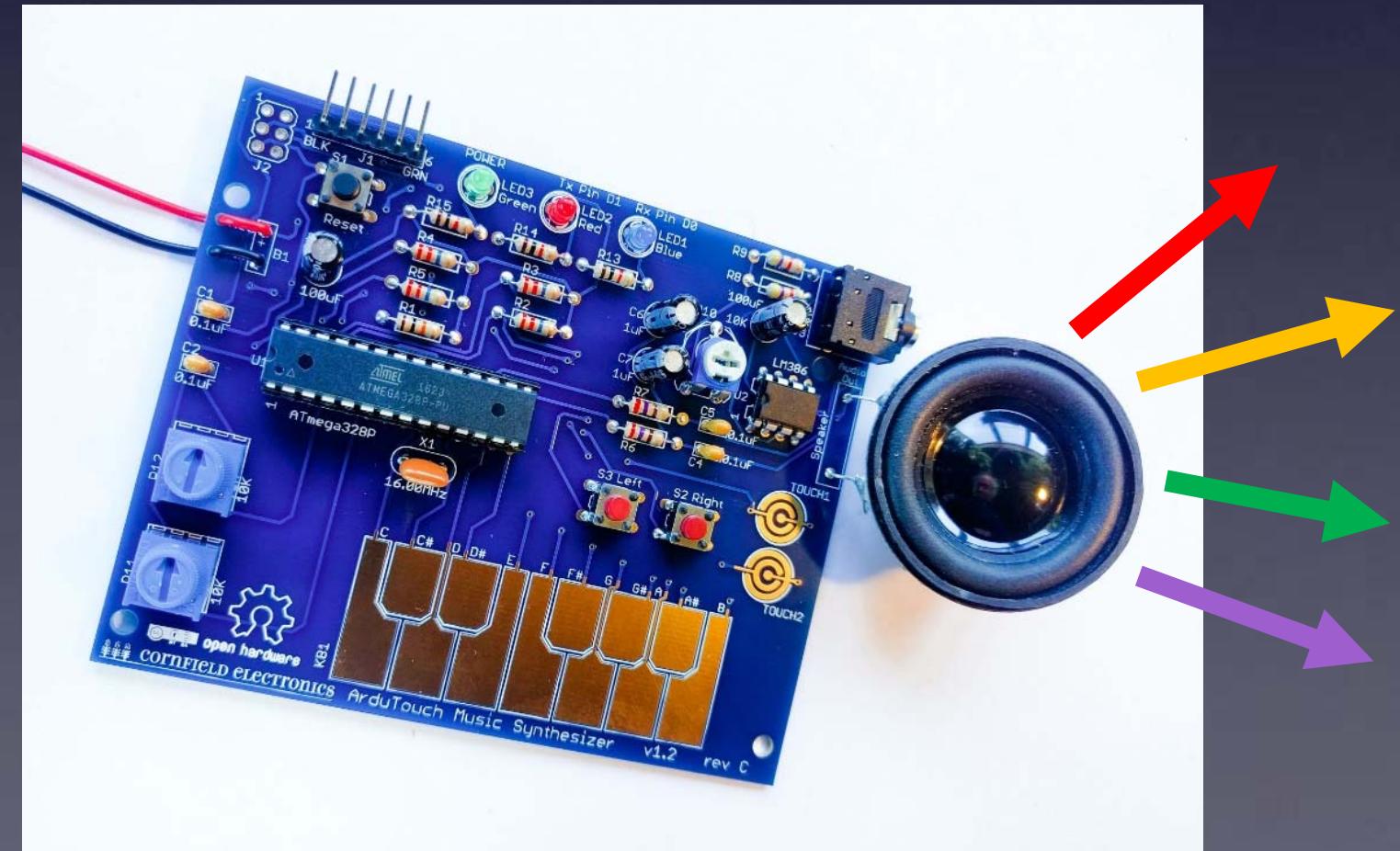


Let's make noise!

Your ArduTouch comes pre-programmed with a really cool synthesizer, called “Thick”.

If you are happy playing with “Thick”
then no need to re-program
your ArduTouch.

But if you want to
program other synths into your
ArduTouch,
the next pages show you how...

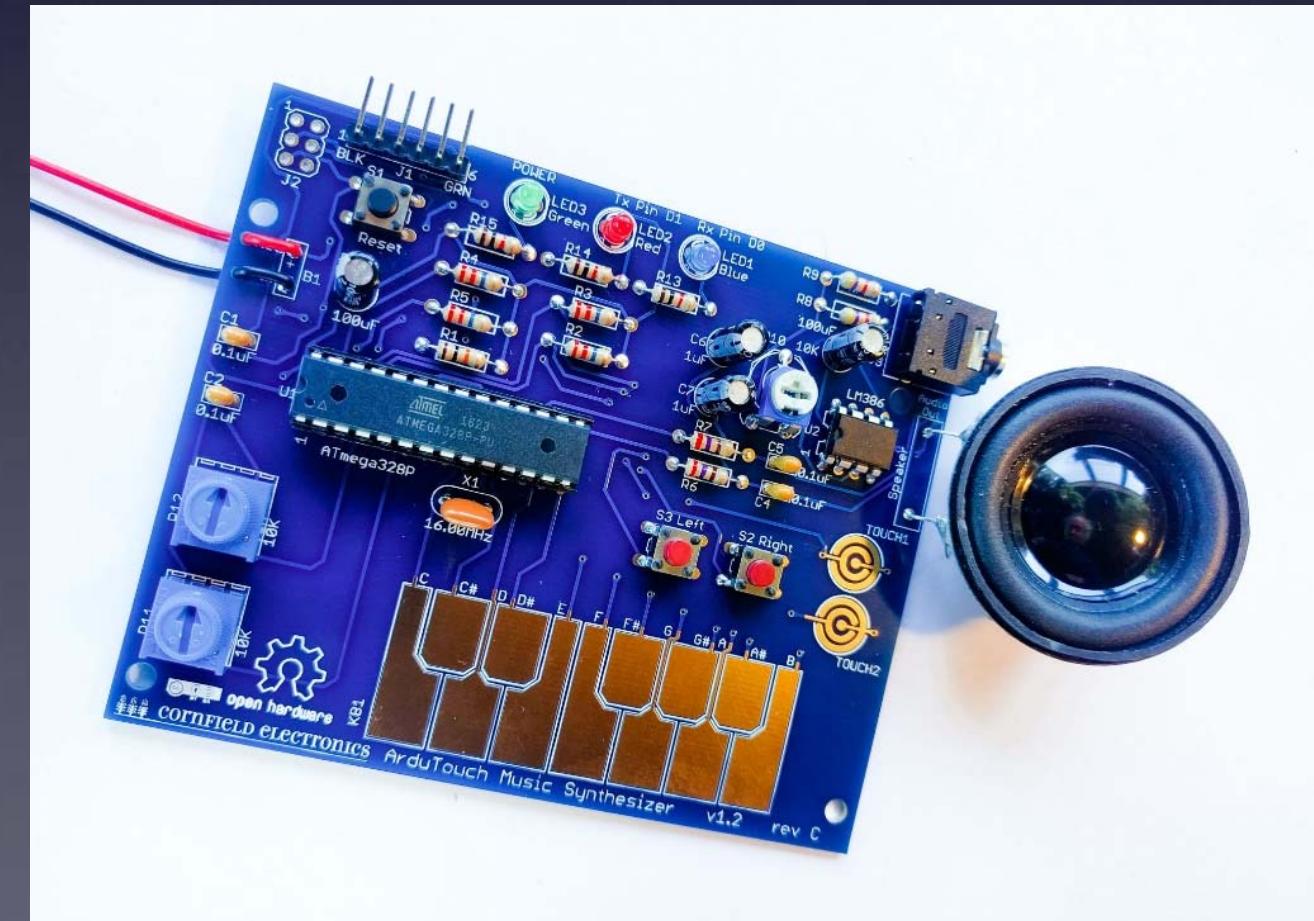


Re-programming the ArduTouch

We have written several way cool synthesizers for ArduTouch!
Each is unique, and each way different than the others.

To program in a new synth in your ArduTouch, you will need:

- the Arduino software <<http://arduino.cc>>
- a USB-Serial adapter cable (such as an FTDI, or equivalent)
a nice one is available at
<<https://cornfieldelectronics.com/cfe/products/buy.php?productId=usbcable>>
- a synth sketch and the ArduTouch Arduino library
<<https://cornfieldelectronics.com/cfe/projects.php#ardutouch>>



Arduino

**Arduino is a very powerful tool!
But it is very easy to use.
It was designed for total beginners to use successfully.**

I won't give a complete tutorial here – just some basics.
For more info, there are many good Arduino tutorials online.
A good place to start is:
[<https://www.arduino.cc/en/Tutorial/HomePage>](https://www.arduino.cc/en/Tutorial/HomePage)



Arduino

First:
Download and install the Arduino software
< <http://arduino.cc> >



Re-programming the ArduTouch

Second:

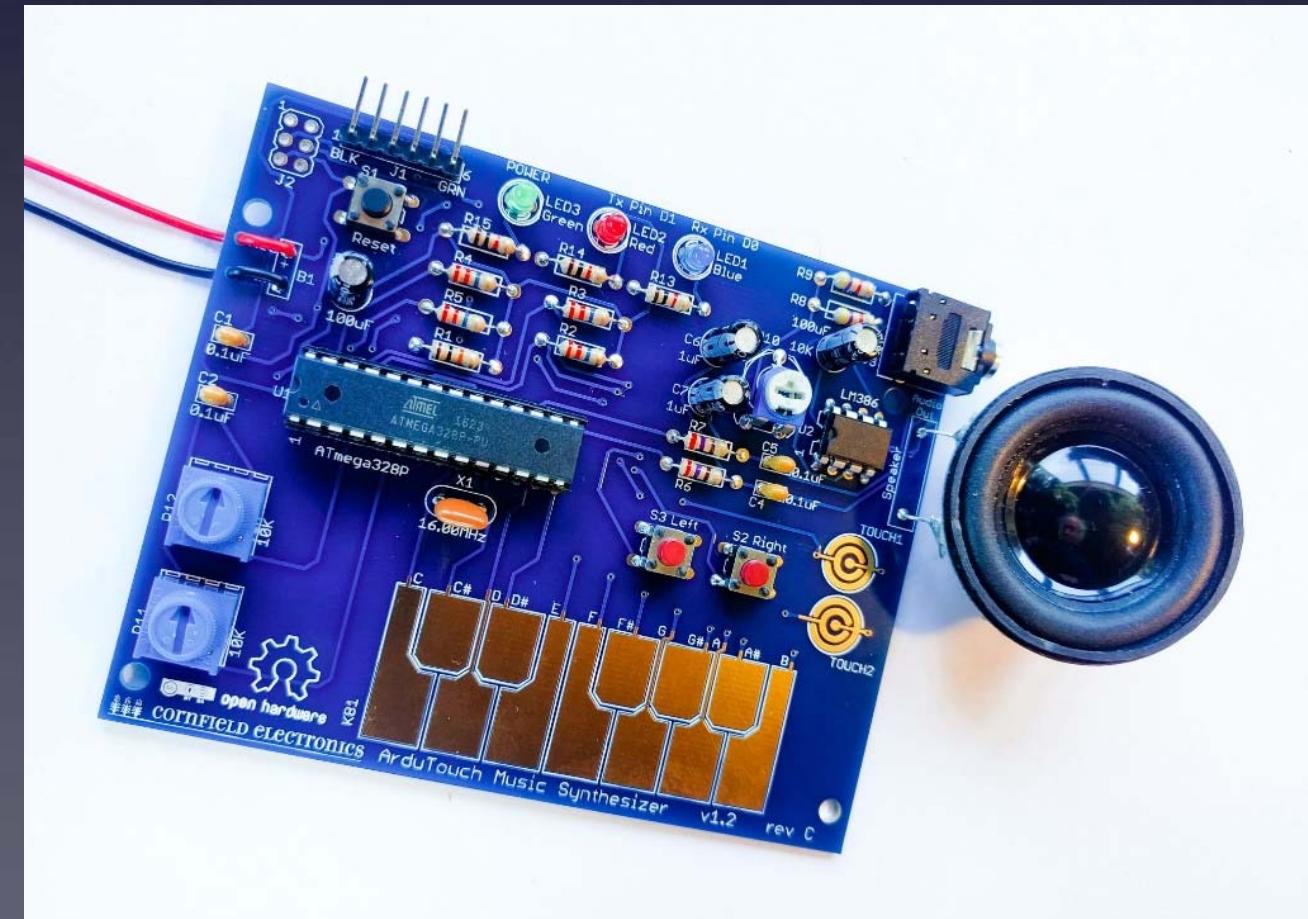
Download and install the ArduTouch Arduino library
[<http://cornfieldelectronics.com/cfe/projects.php#ardutouch>](http://cornfieldelectronics.com/cfe/projects.php#ardutouch)

Instructions for installing a .zip library are at:

< <https://www.arduino.cc/en/Guide/Libraries>>

Scroll down till you see the section:

“Importing a .zip Library”



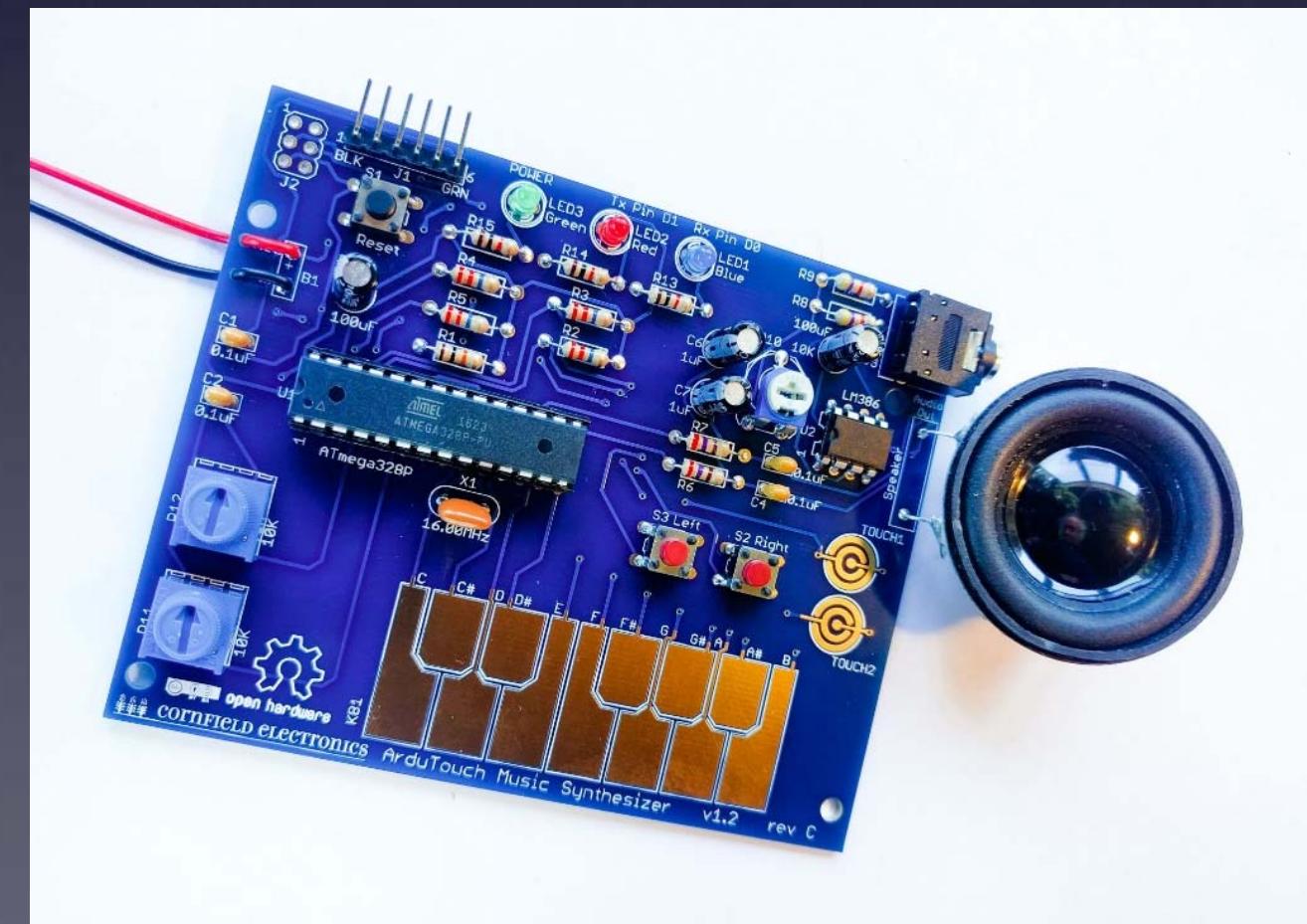
Re-programming the ArduTouch

Third:

Download ArduTouch synth sketches

[<http://cornfieldelectronics.com/cfe/projects.php#ardutouch>](http://cornfieldelectronics.com/cfe/projects.php#ardutouch)

Store them on your computer anywhere you like.

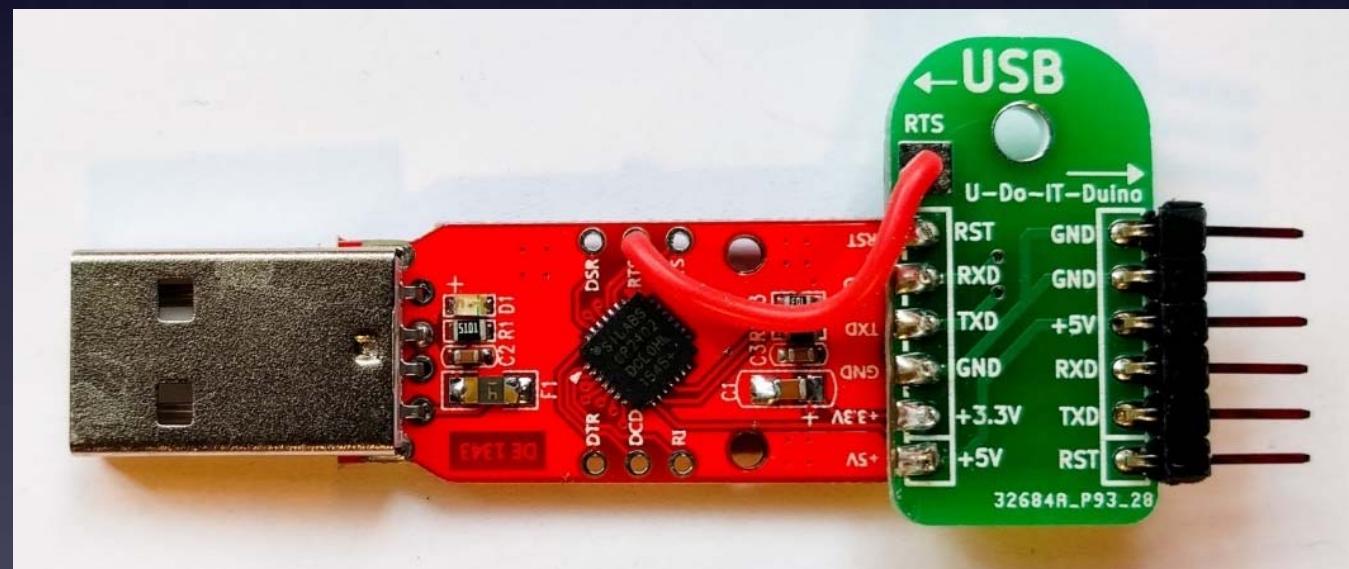


Connecting your ArduTouch to your computer

USB-Serial adapter cable

Ones available from Cornfield Electronics look like this:

<<https://cornfieldelectronics.com/cfe/products/buy.php?productId=usbcable>>

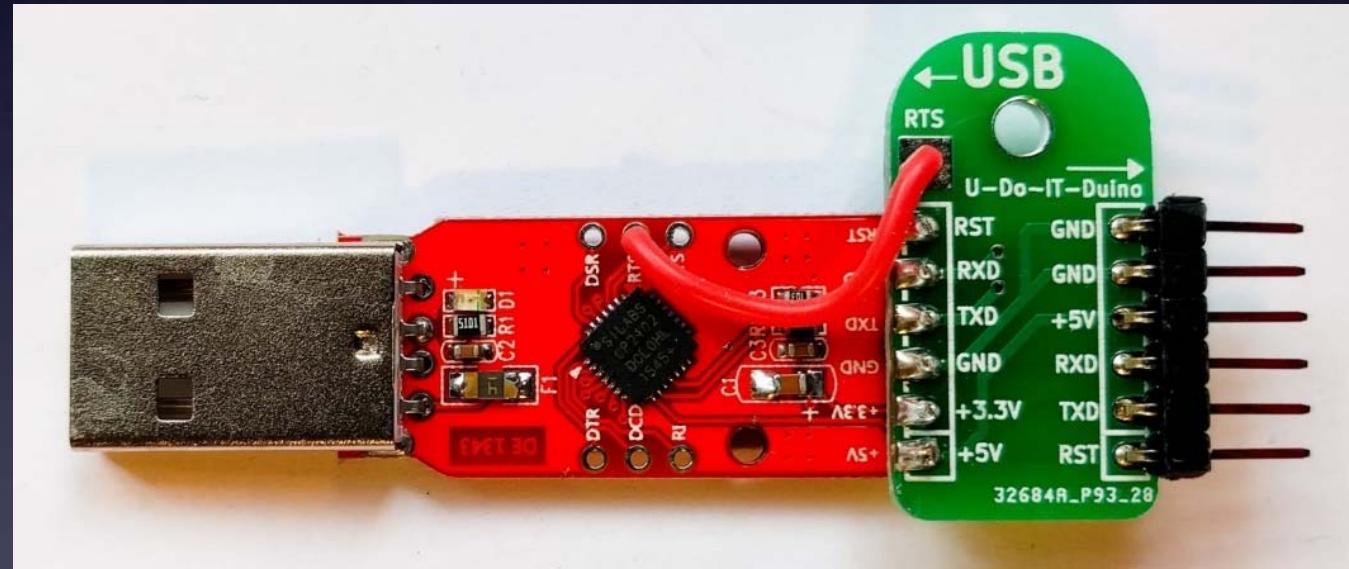


Connecting your ArduTouch to your computer

USB-Serial adapter cable

Ones available from Cornfield Electronics look like this:

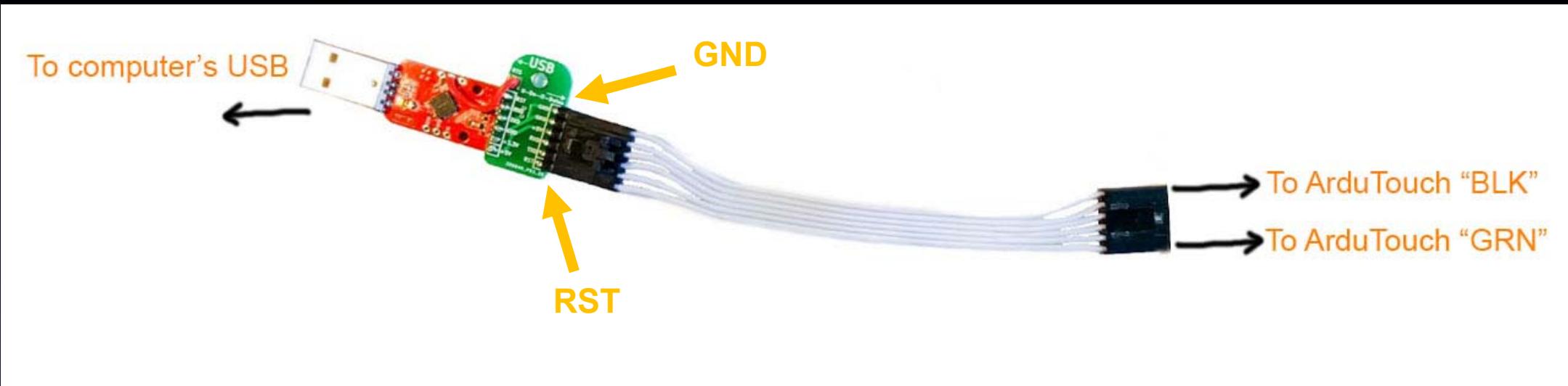
<<https://cornfieldelectronics.com/cfe/products/buy.php?productId=usbcable>>



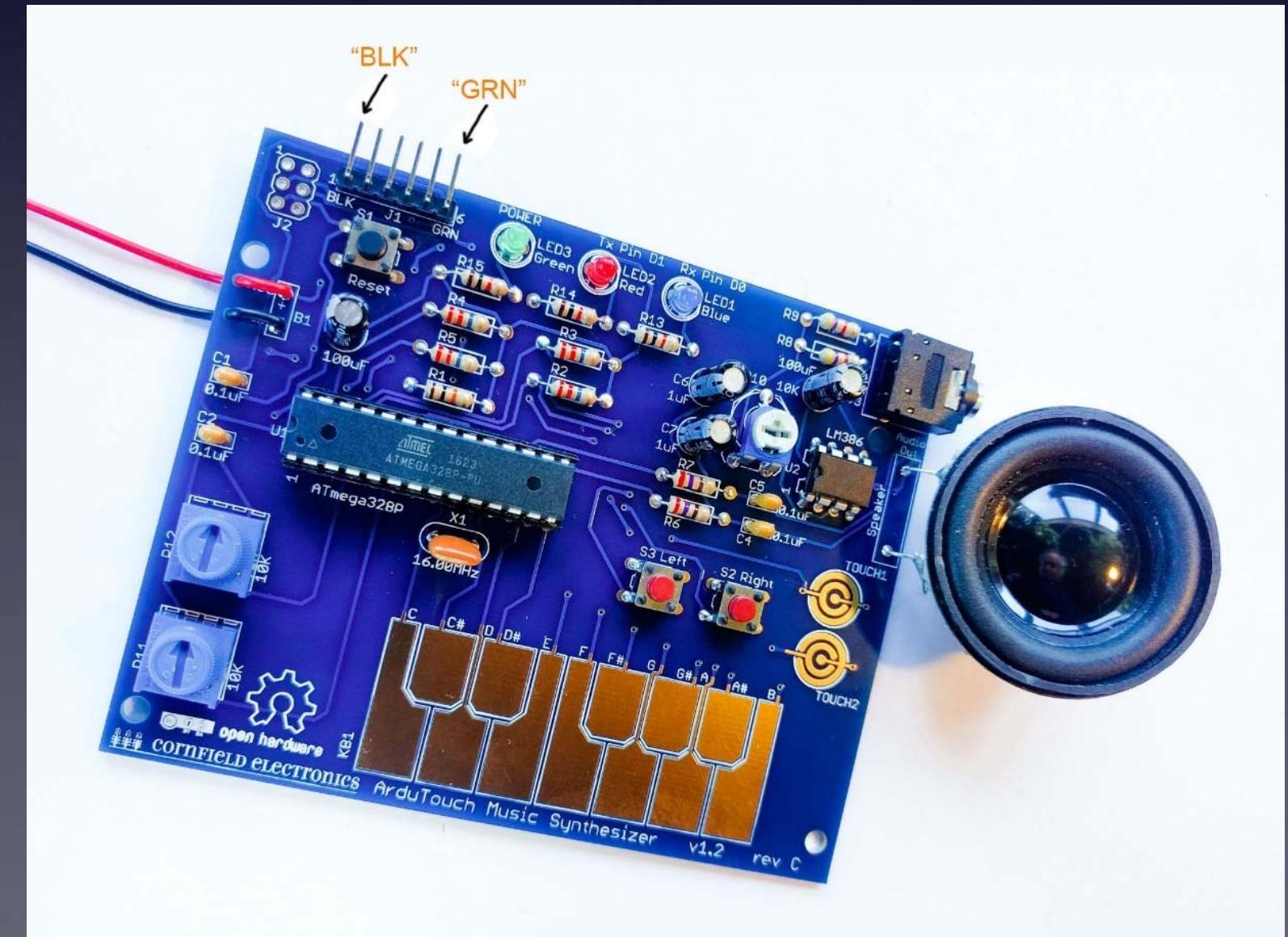
**You will need to download and install a driver
for your Operating System (Windows, MacOS, or Linux):**

<<https://www.silabs.com/products/development-tools/software/usb-to-uart-bridge-vcp-drivers>>

Connecting your ArduTouch to your computer

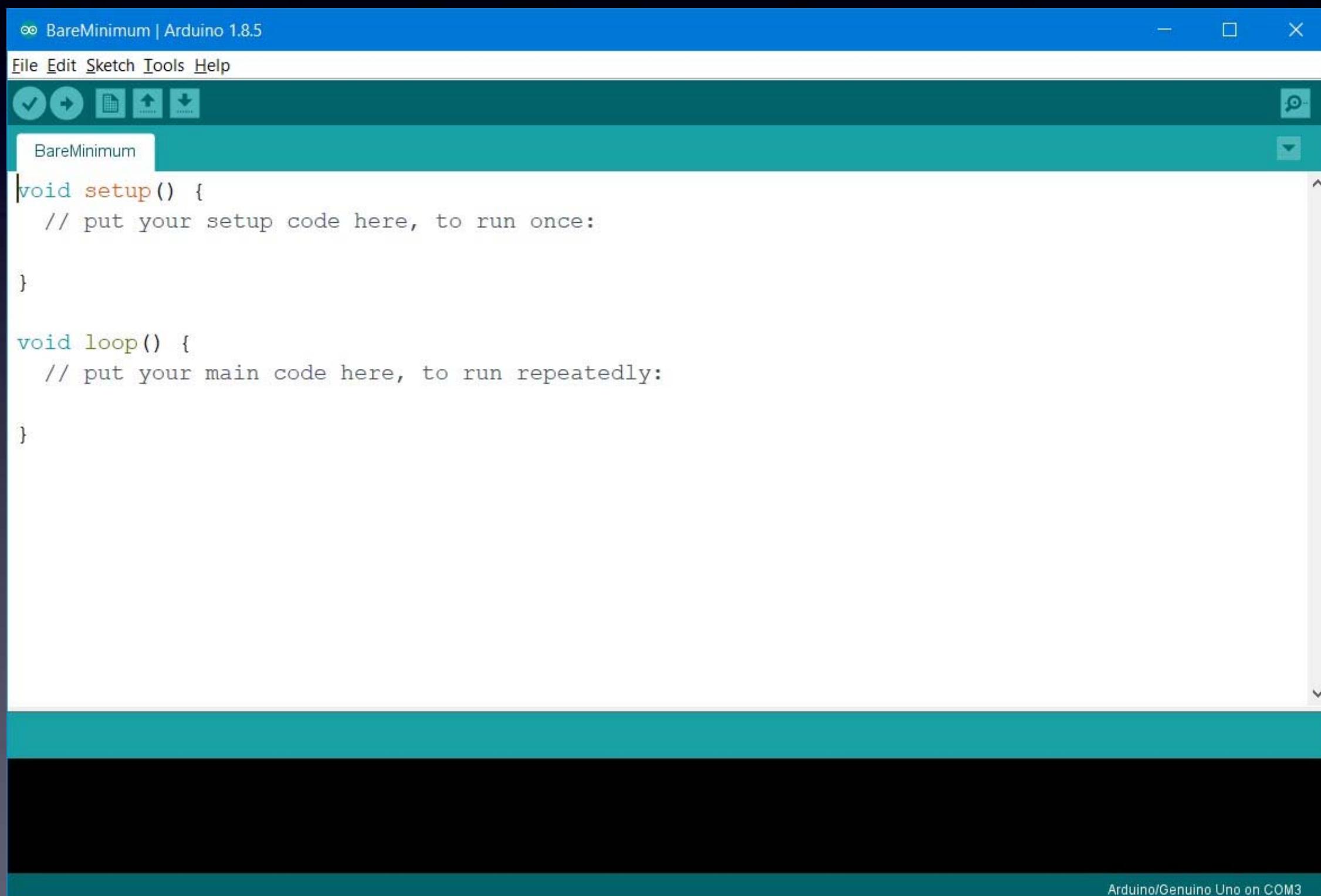


IMPORTANT:
Make sure the
battery pack on your
ArduTouch
is OFF



Arduino

After you download and install the Arduino software start it, and you will see a screen that looks like this:

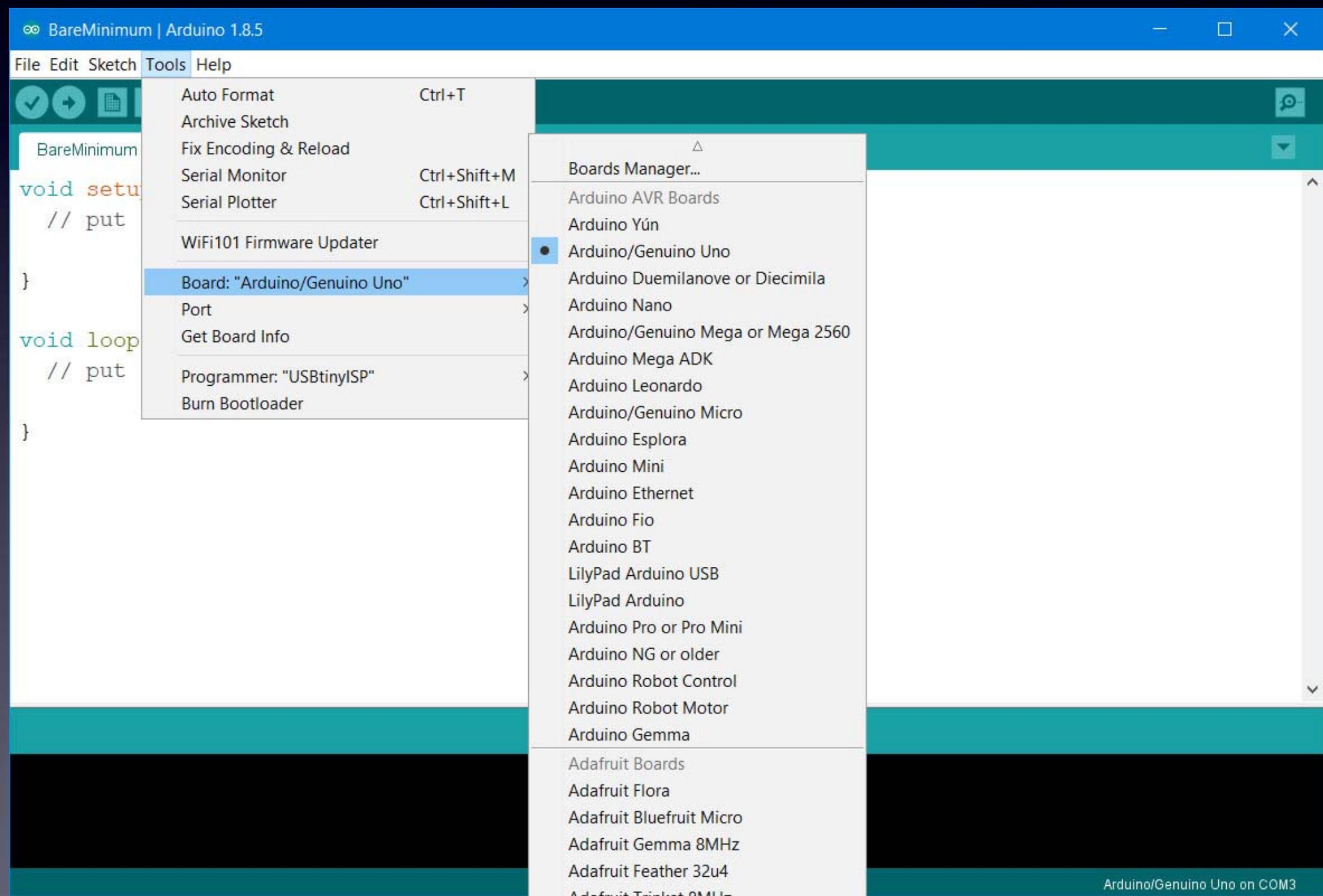


Arduino

The first time you start your Arduino software
you need to do two things to set things up

(1)
**Choose
“Genuino Uno”
as the Board**

(Your
ArduTouch board
acts
just like
an
Arduino Uno board)



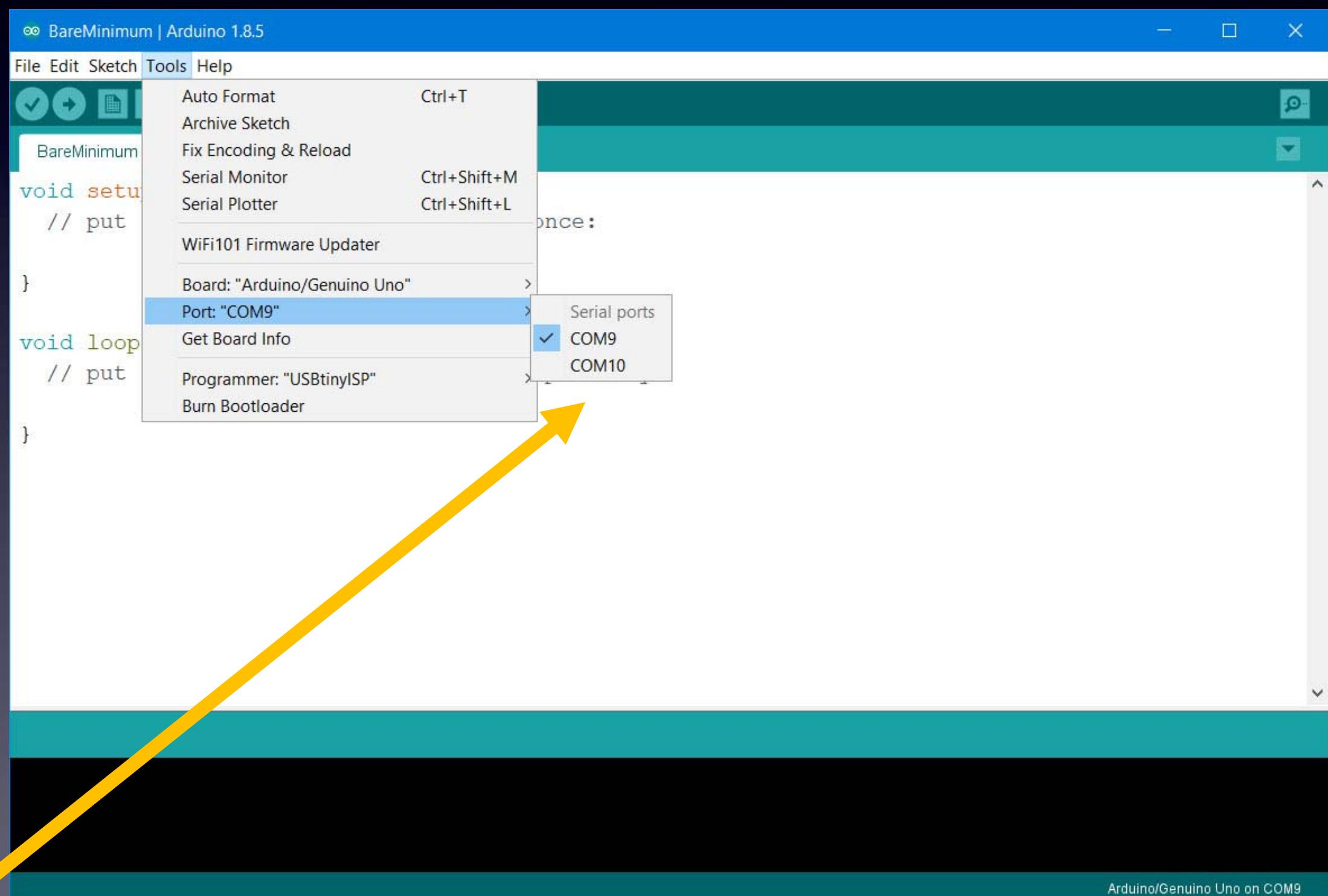
Arduino

The first time you start your Arduino software
you need to do two things to set things up

(2)
**Choose
the Port
(this will be
different
depending on
your Operating
System)**

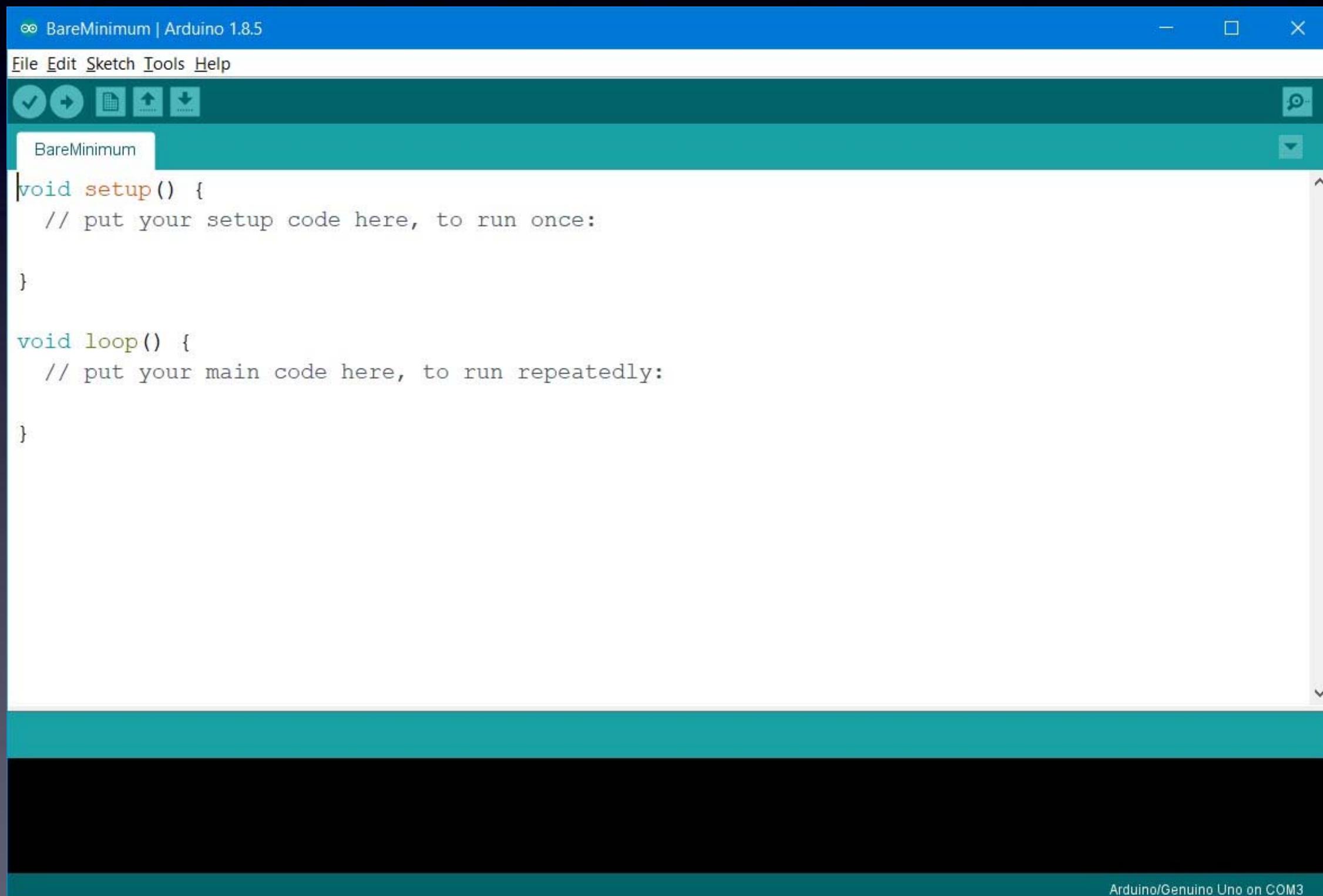
(After installing
the driver
for your USB-Serial
cable,

with your USB-Serial
cable plugged in,
your operating system
will see a serial port
and it appears here.)



Arduino

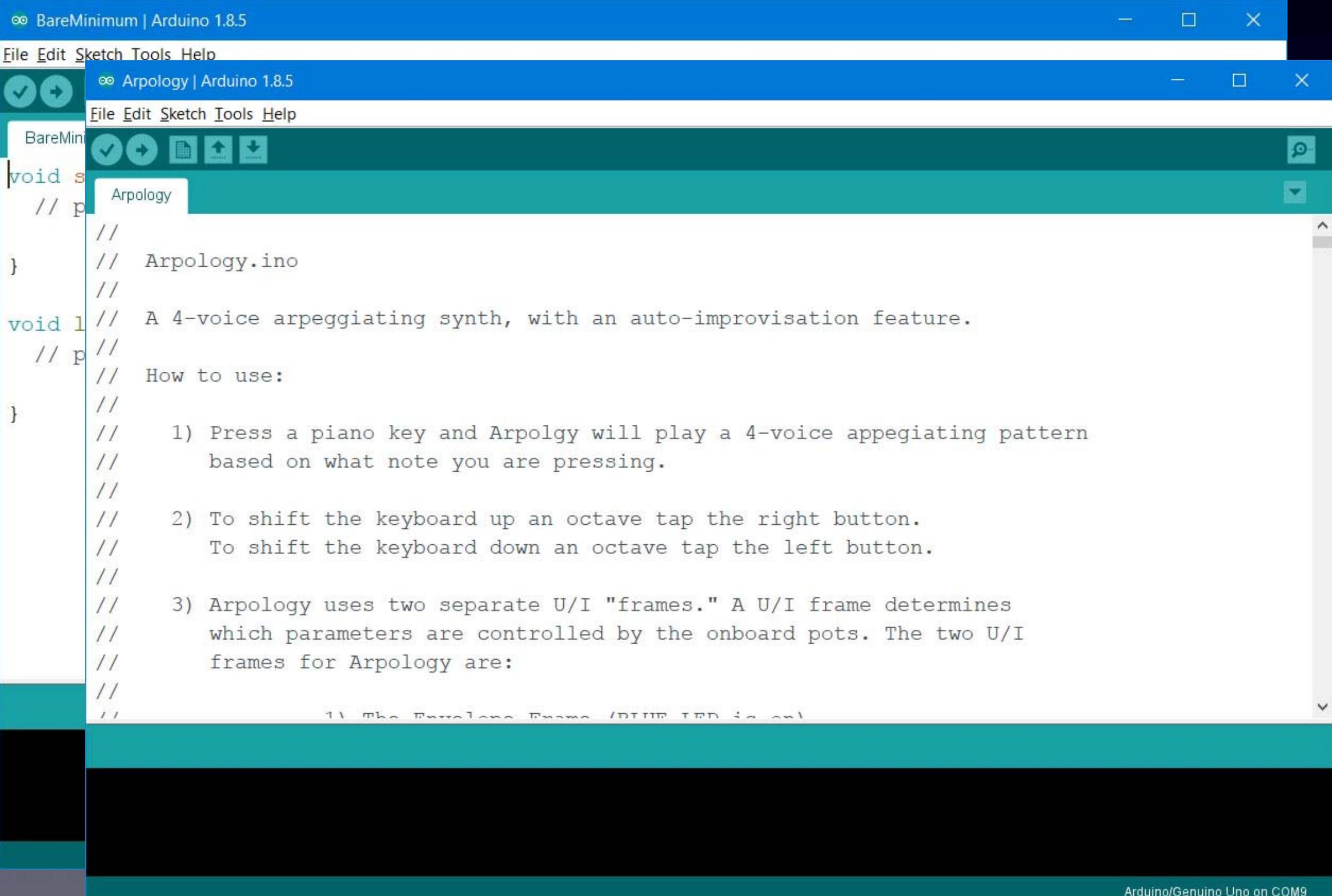
Your Arduino software is now ready to program your ArduTouch!



Arduino

You can open an ArduTouch synth sketch from:
File → Open...

(I opened “Apology here)



```
BareMinimum | Arduino 1.8.5
File Edit Sketch Tools Help
Arpology | Arduino 1.8.5
File Edit Sketch Tools Help
BareMinimum.ino
void setup() {
  // put your setup code here, to run once:
  // Arpology
}
// Arpology.ino
//
void loop() {
  // A 4-voice arpeggiating synth, with an auto-improvisation feature.
  //
  // How to use:
  //
  // 1) Press a piano key and Arpolgy will play a 4-voice appegiating pattern
  //     based on what note you are pressing.
  //
  // 2) To shift the keyboard up an octave tap the right button.
  //     To shift the keyboard down an octave tap the left button.
  //
  // 3) Arpology uses two separate U/I "frames." A U/I frame determines
  //     which parameters are controlled by the onboard pots. The two U/I
  //     frames for Arpology are:
  //
}

  11 mba_Electronics_Piano /DTUEP_TED_100001
```

Arduino

**With the USB-Serial cable connected to your ArduTouch board
press the Upload button**

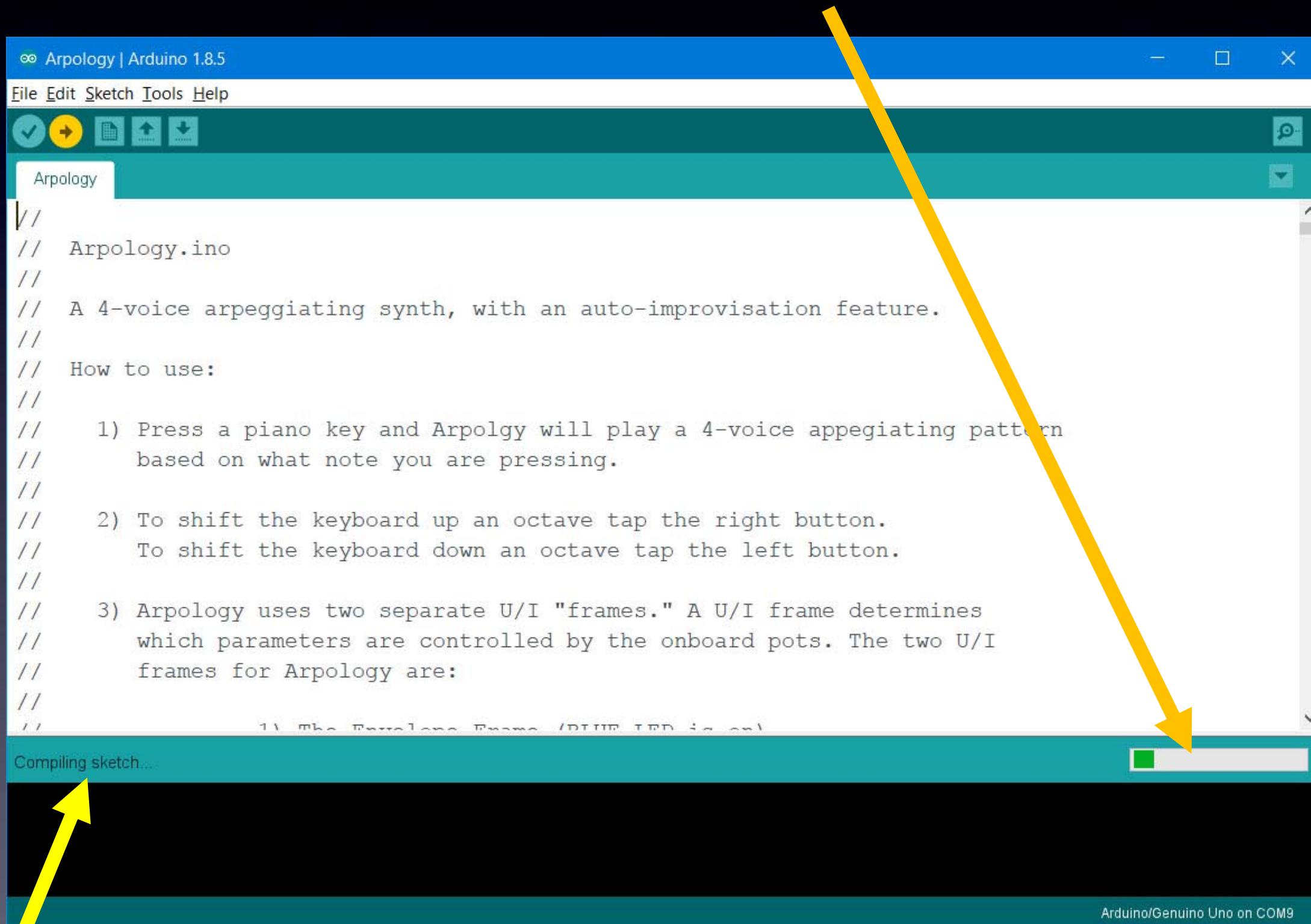


```
// Arpology | Arduino 1.8.5
File Edit Sketch Tools Help
Upload
Arpology
// 
// Arpology.ino
//
// A 4-voice arpeggiating synth, with an auto-improvisation feature.
//
// How to use:
//
// 1) Press a piano key and Arpolgy will play a 4-voice appegiating pattern
//    based on what note you are pressing.
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// 2) To shift the keyboard up an octave tap the right button.
//    To shift the keyboard down an octave tap the left button.
//
// 3) Arpology uses two separate U/I "frames." A U/I frame determines
//    which parameters are controlled by the onboard pots. The two U/I
//    frames for Arpology are:
//
//    11 mba Entwurfene Frames (RTIME TPD 10 ms)
```

Arduino/Genuino Uno on COM9

Arduino

While uploading, you will see a progress bar...



...and when it's completed successfully, it says: “Upload done”

ArduTouch

**Disconnect your ArduTouch board
from the USB-Serial cable,**

turn on your battery pack,

And...

Let's make new noise!

