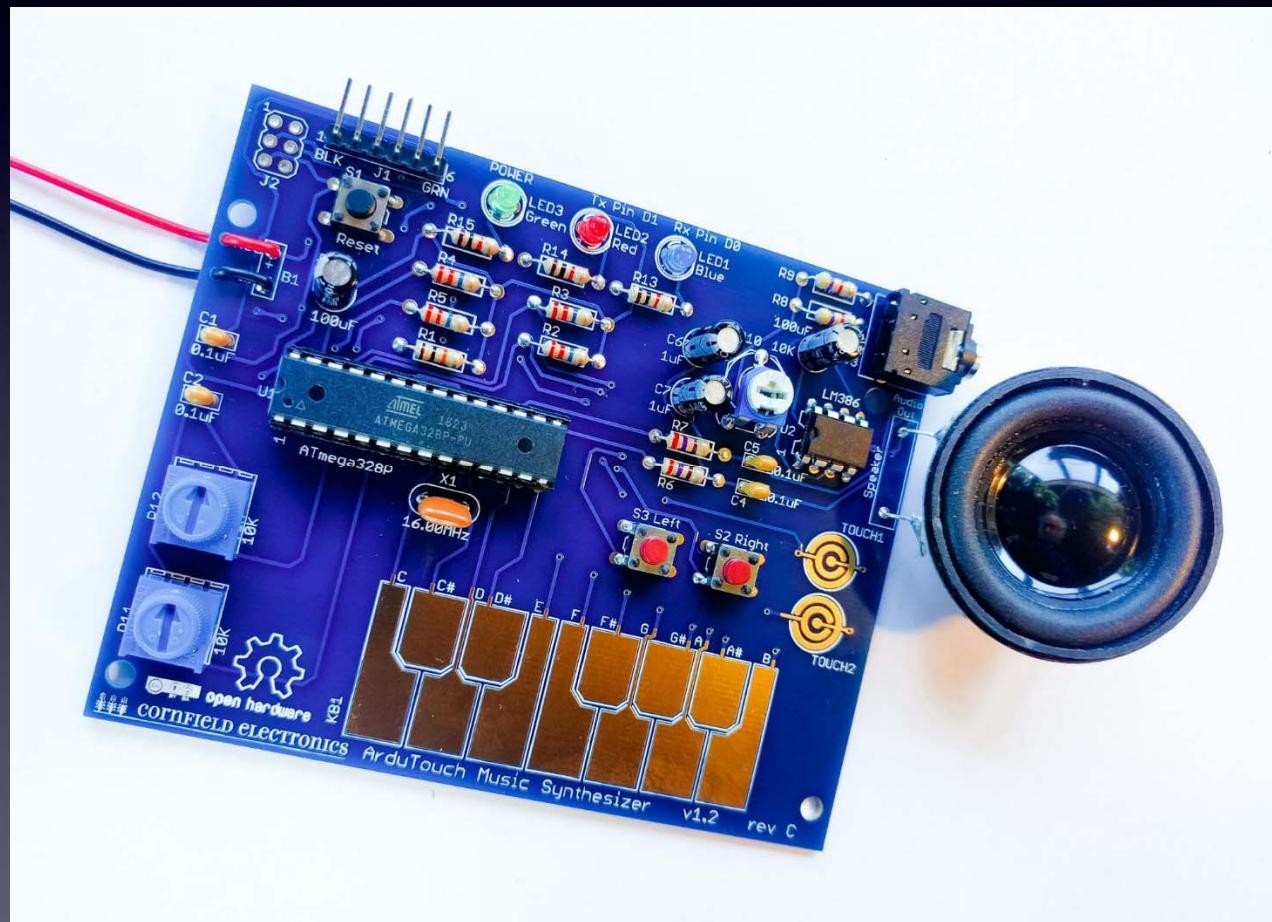


# *ArduTouch Music Synthesizer*

## Assembly Instructions



rev C

# Learn To Solder



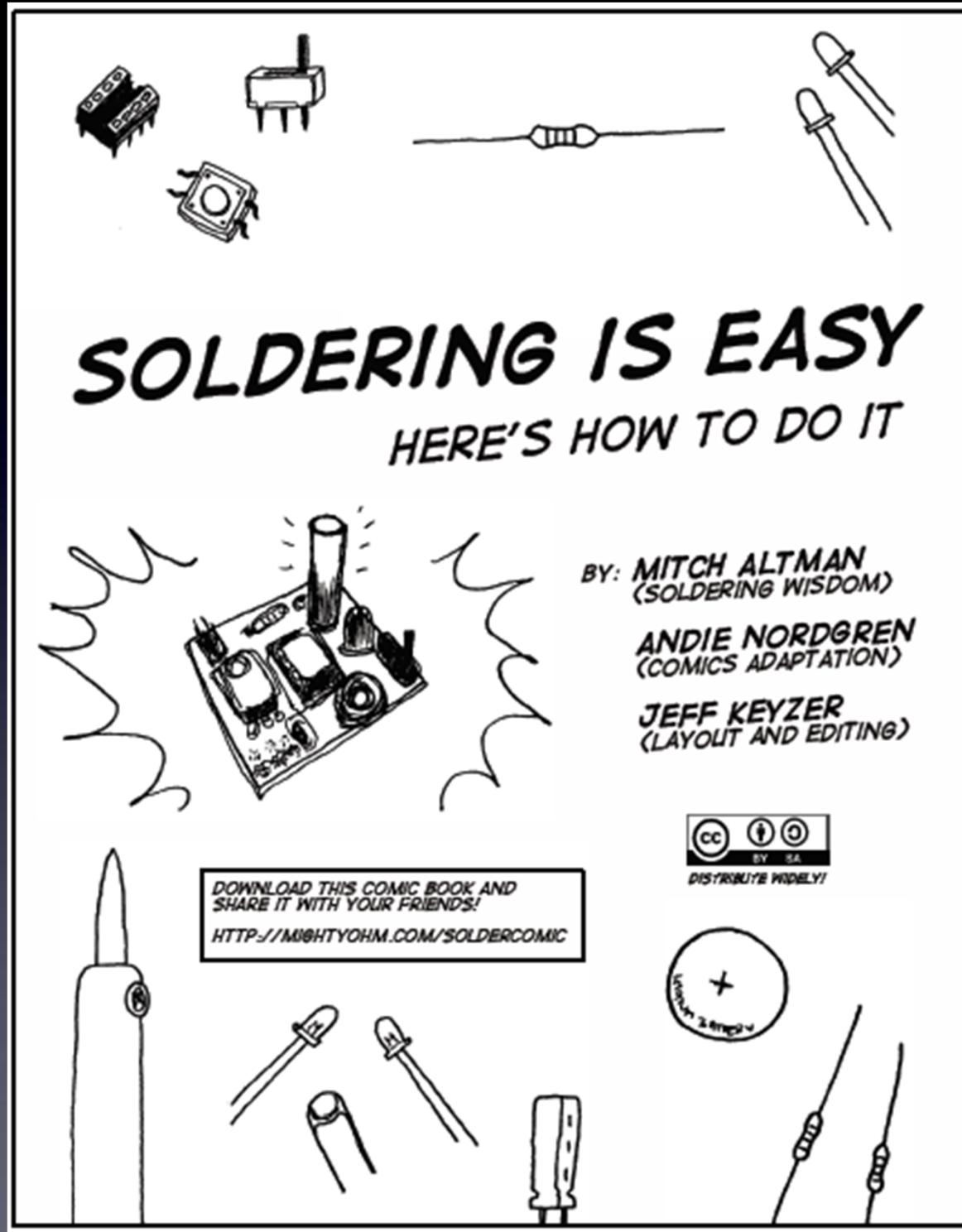
The following photos will show you how to solder.

But feel free to download  
the “Soldering Is Easy” comic book  
for free!

download for free at:

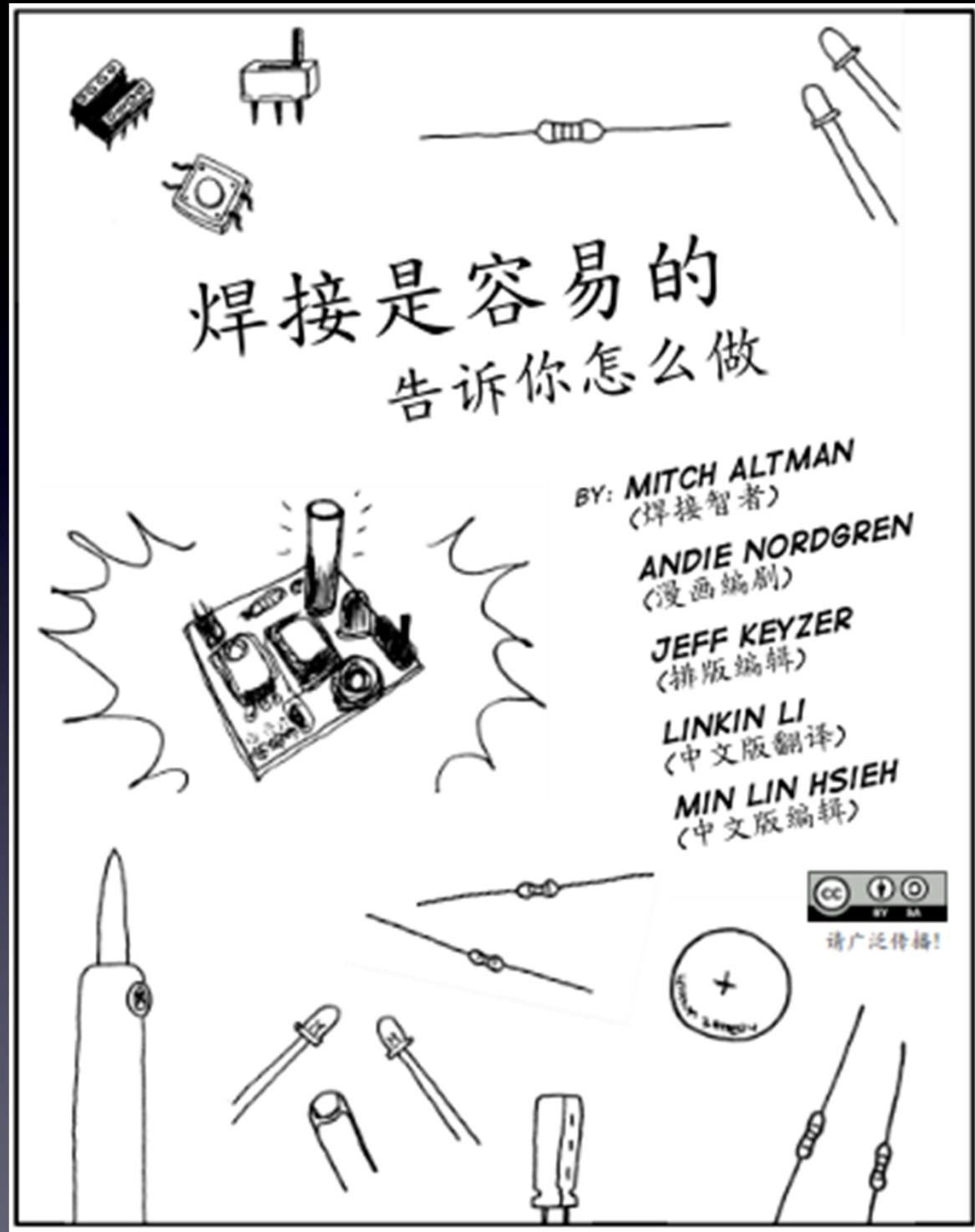
<http://mightyohm.com/soldercomic>

# Learn To Solder



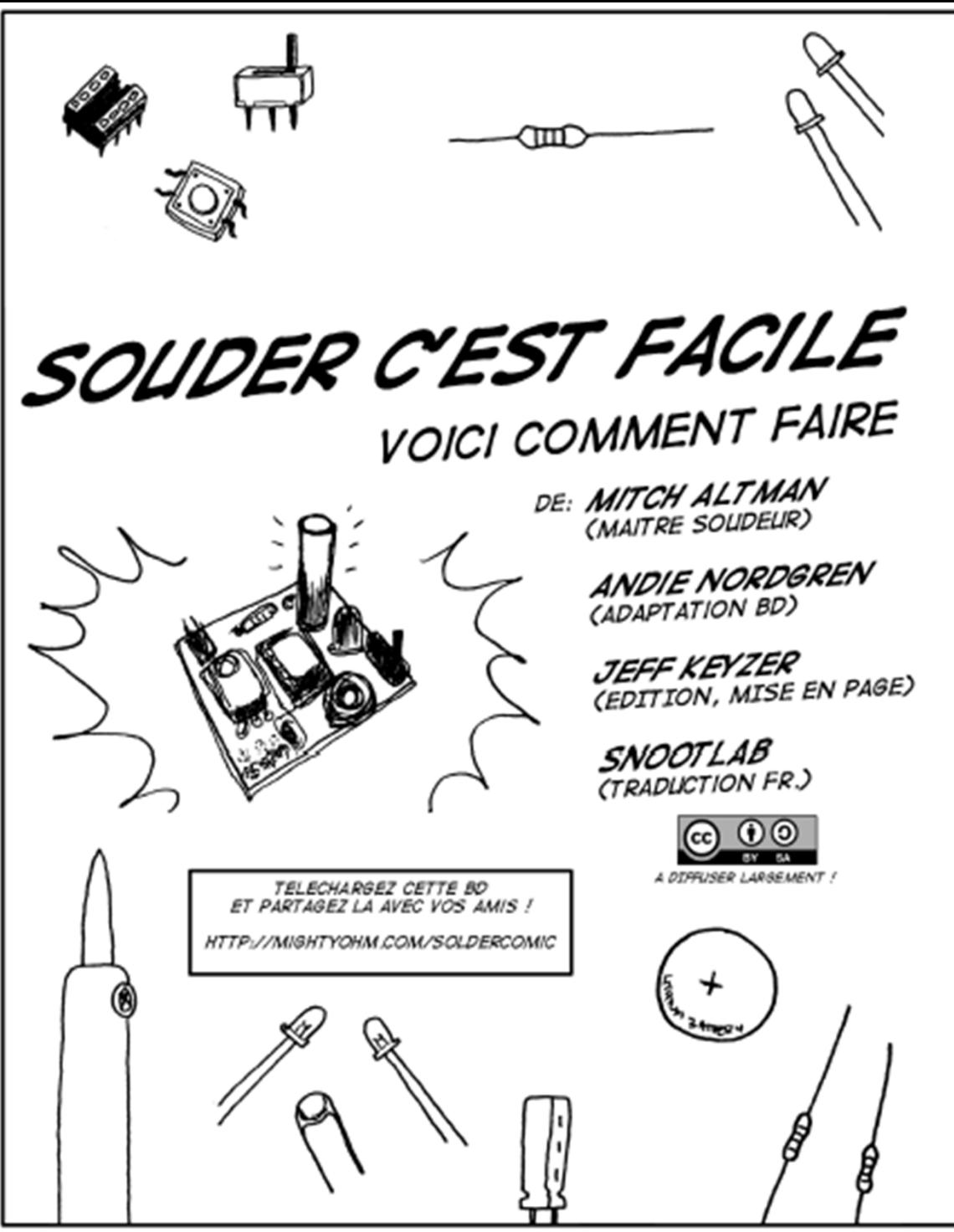
download for free at:  
<http://mightyohm.com/soldercomic>

# 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

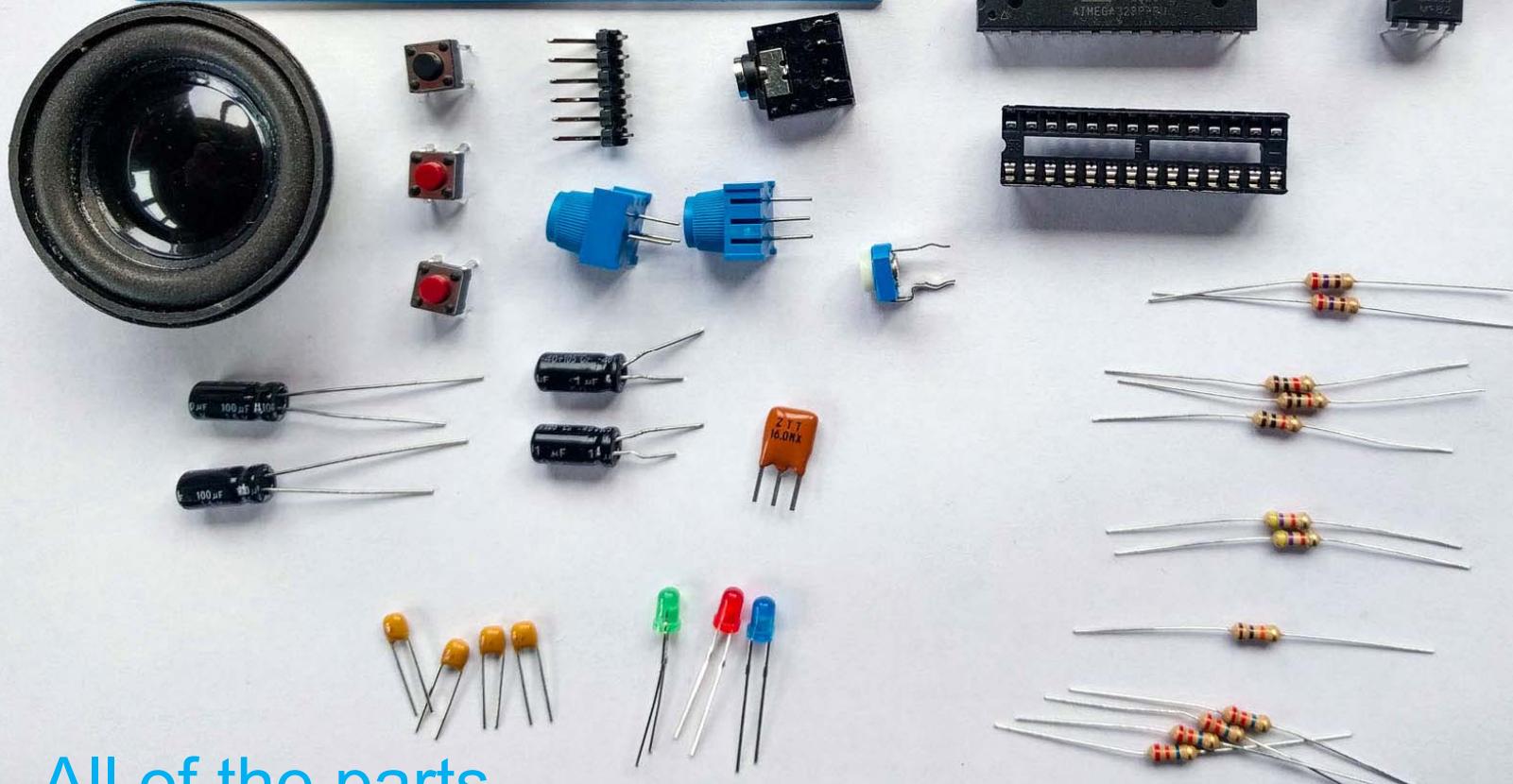
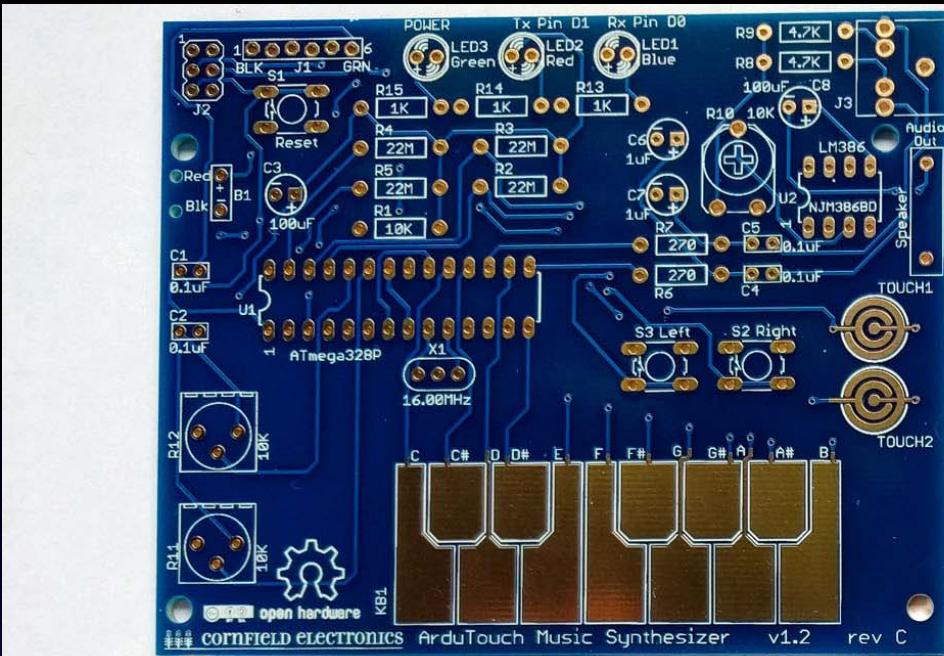


Download in the language of your choice for free at:  
<http://mightyohm.com/soldercomic>

# Learn To Solder

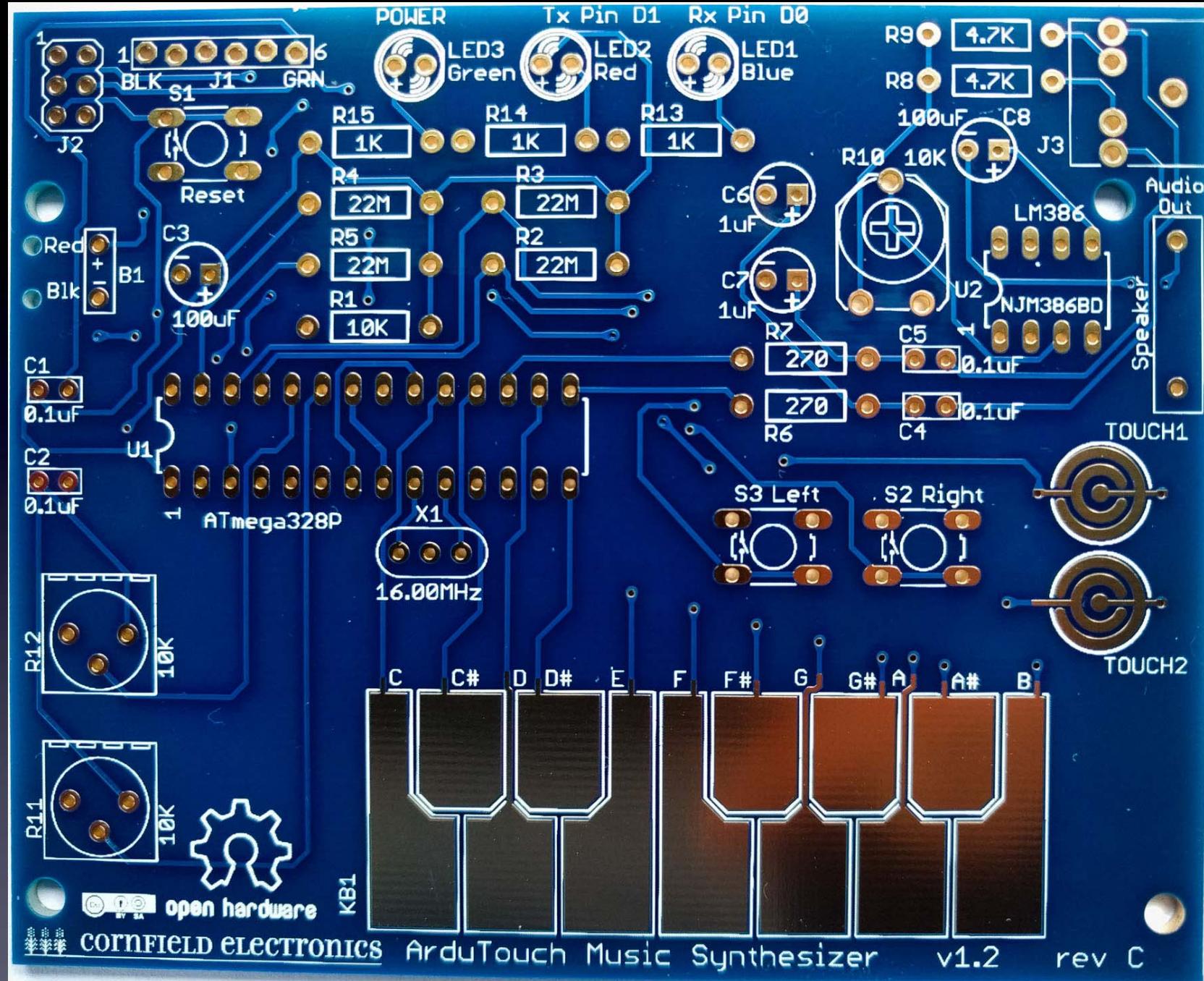


Download in the language of your choice for free at:  
<http://mightyohm.com/soldercomic>

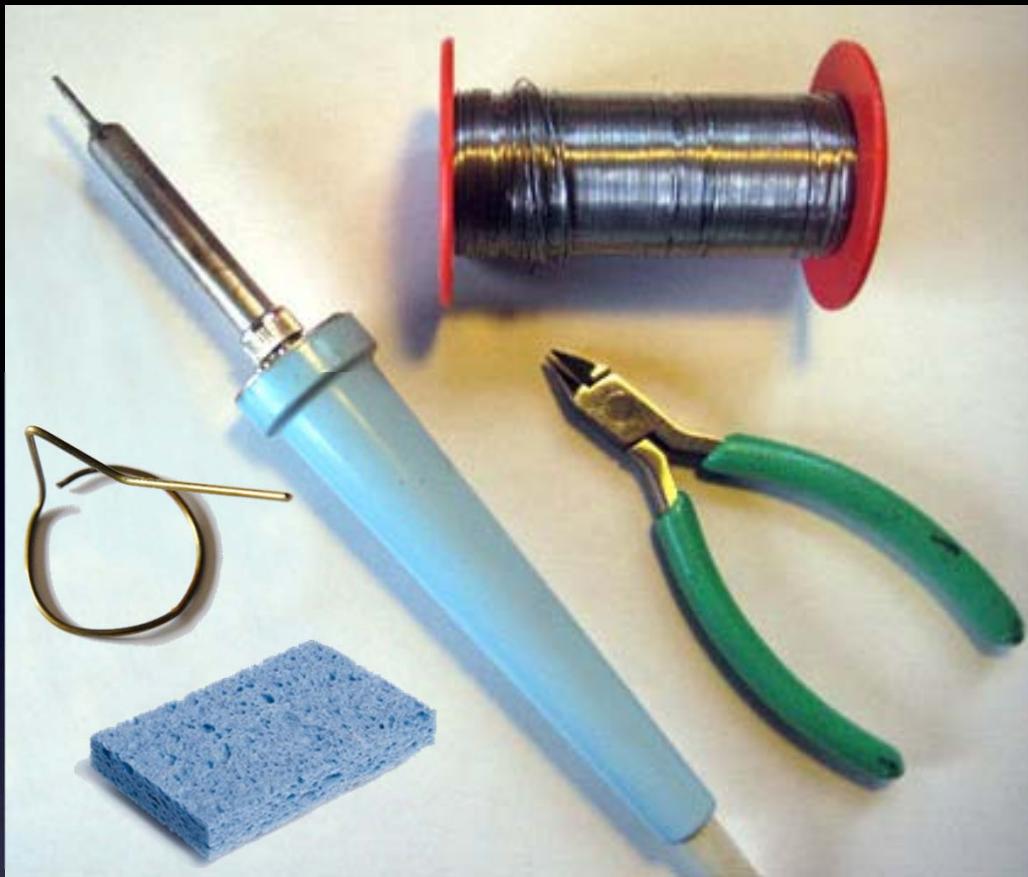


All of the parts





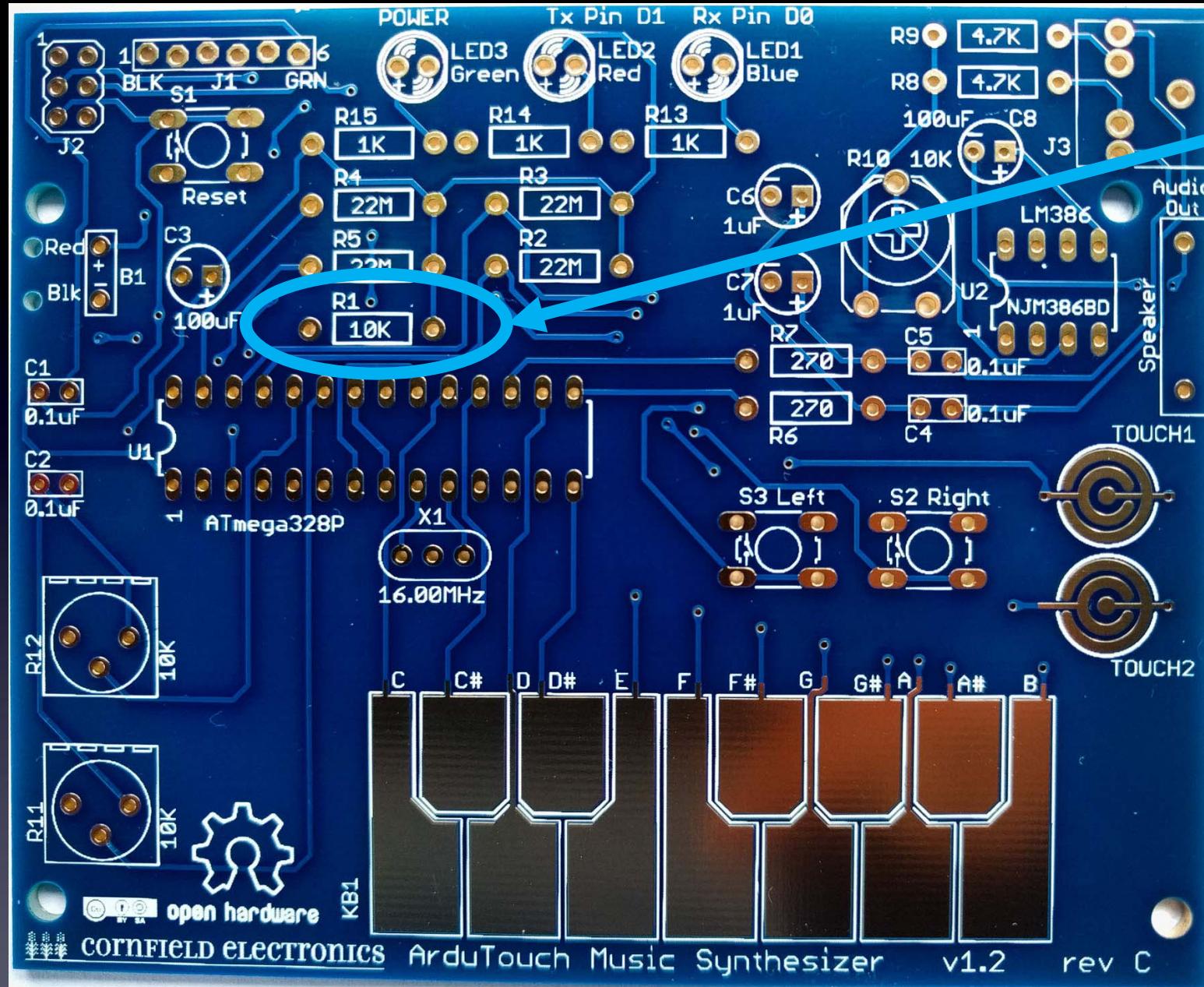
The board we'll solder the parts to



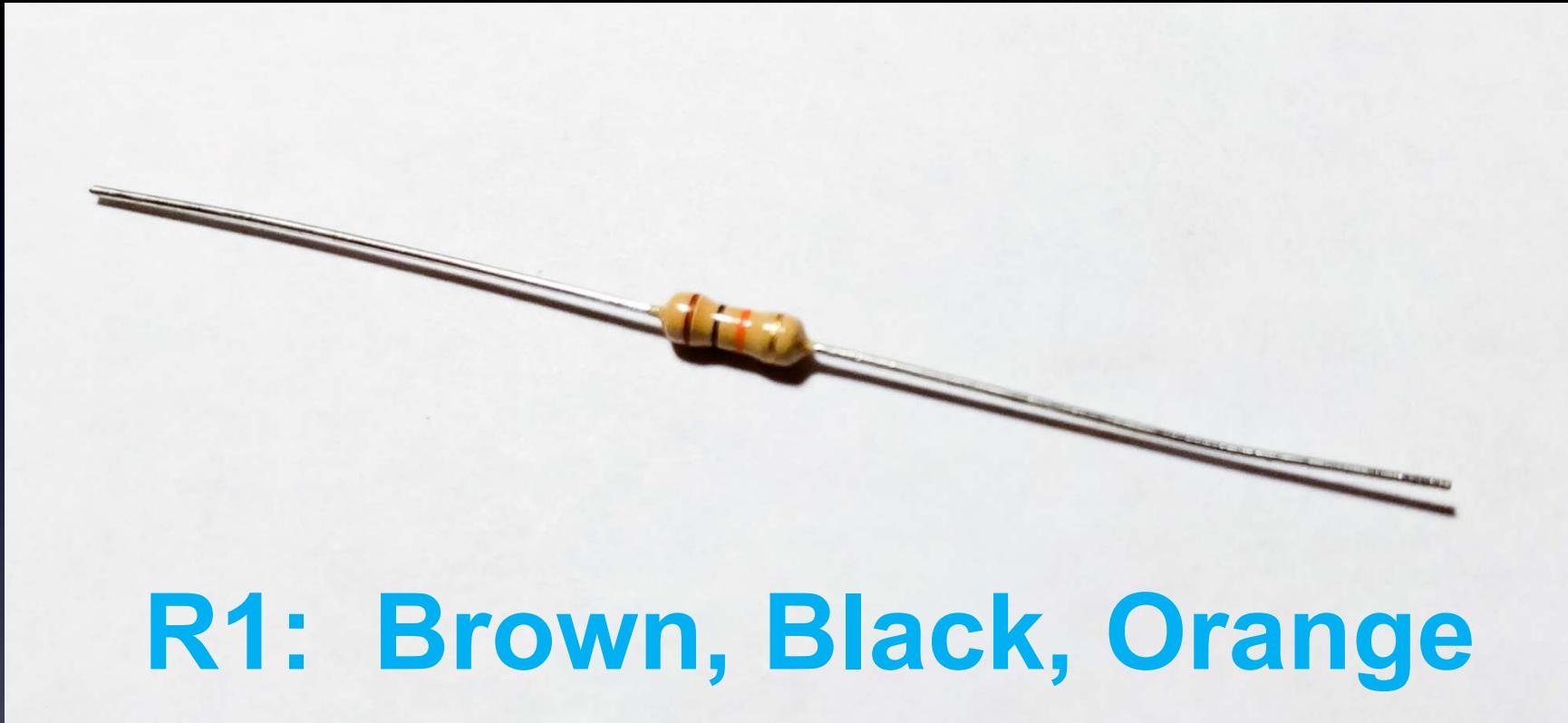
**Important:**  
**Use solder **WITH** lead (Pb) !!**  
**Unleaded solder**  
**has very poisonous fumes!**

### 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



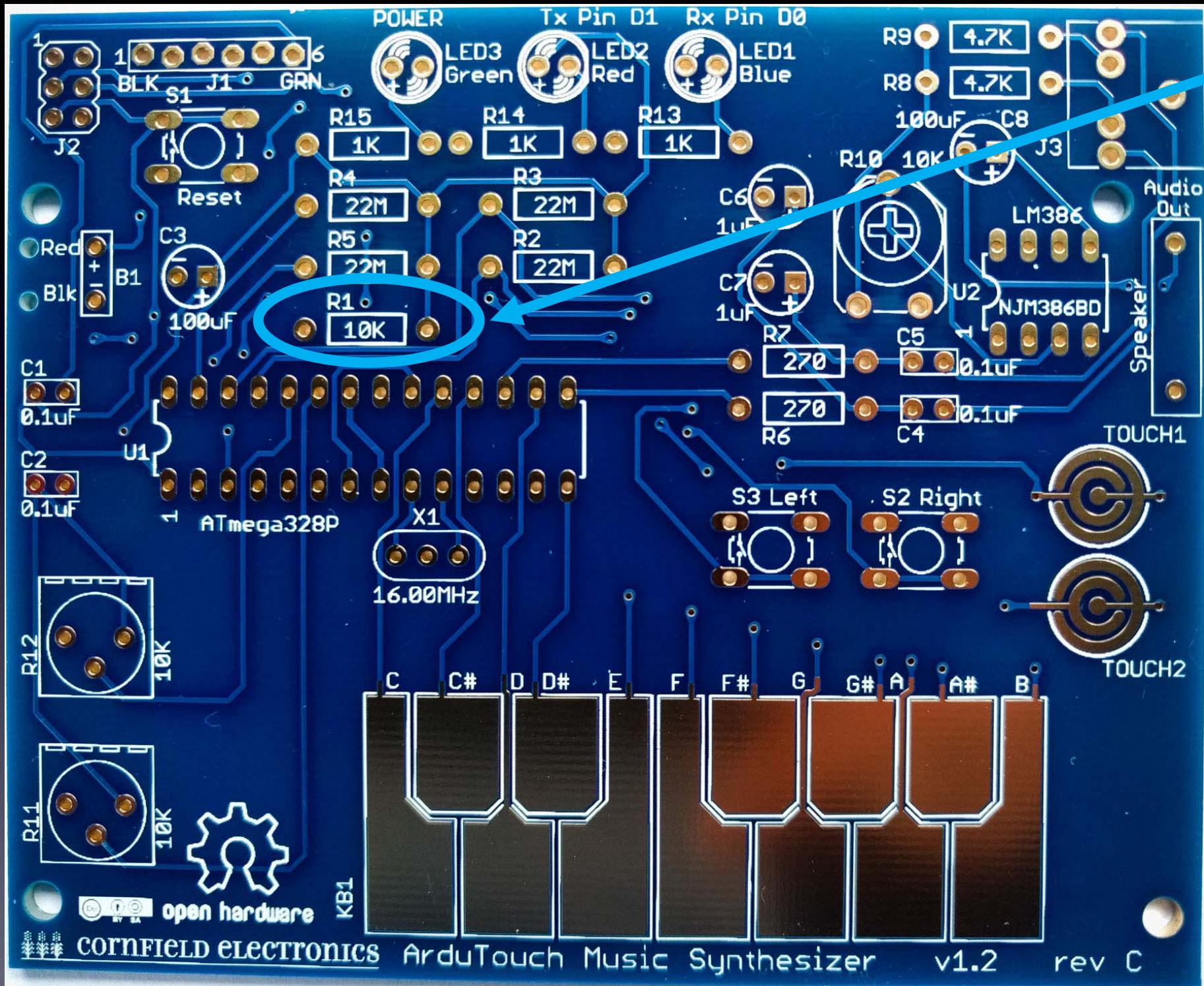
R1 – this is where it goes



R1: Brown, Black, Orange

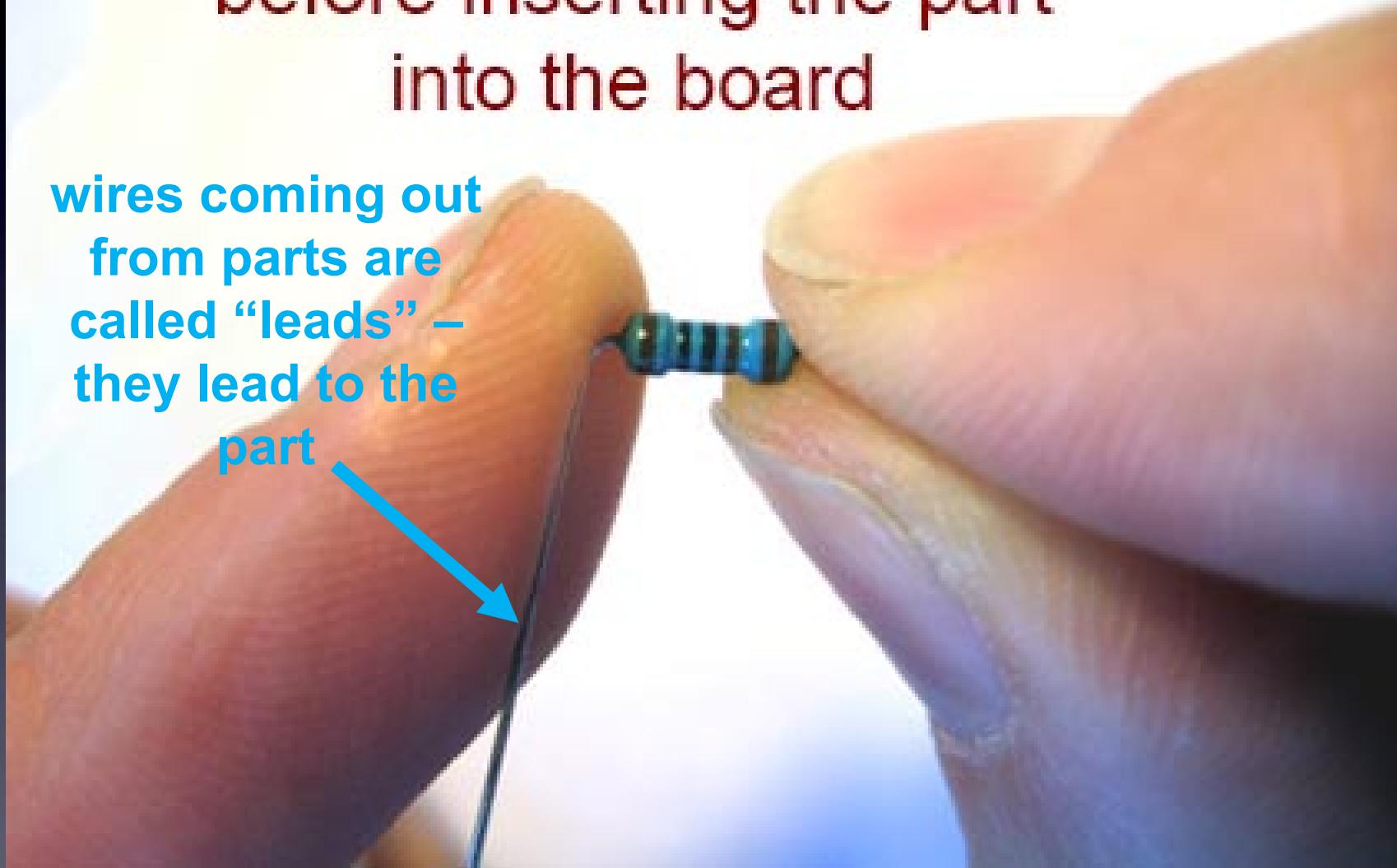
(not Brown, Black, Red)

R1



Bend leads  
before inserting the part  
into the board

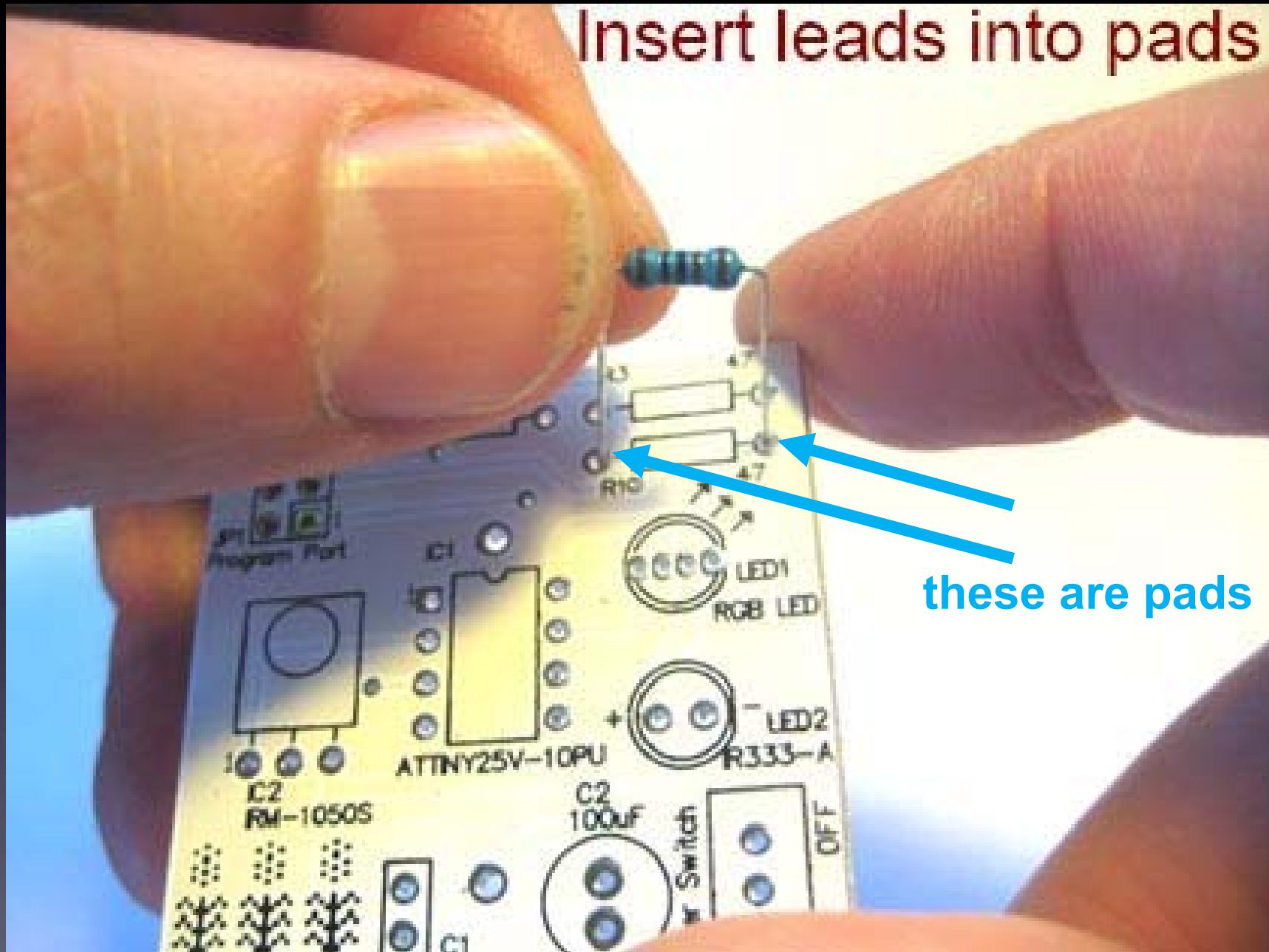
wires coming out  
from parts are  
called “leads” –  
they lead to the  
part

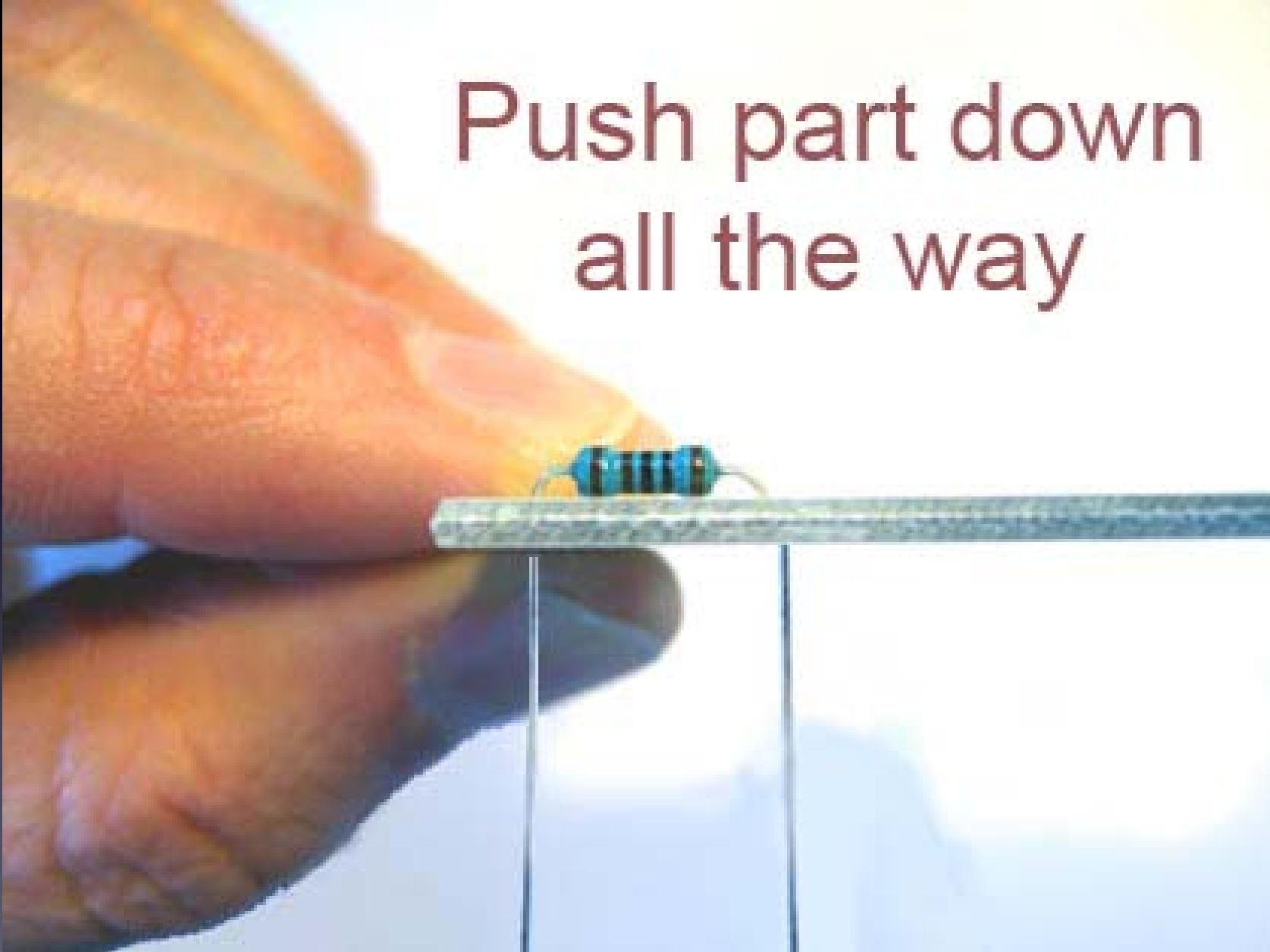




**R1 – this is how it will look before  
inserting it into the board**

Insert leads into pads

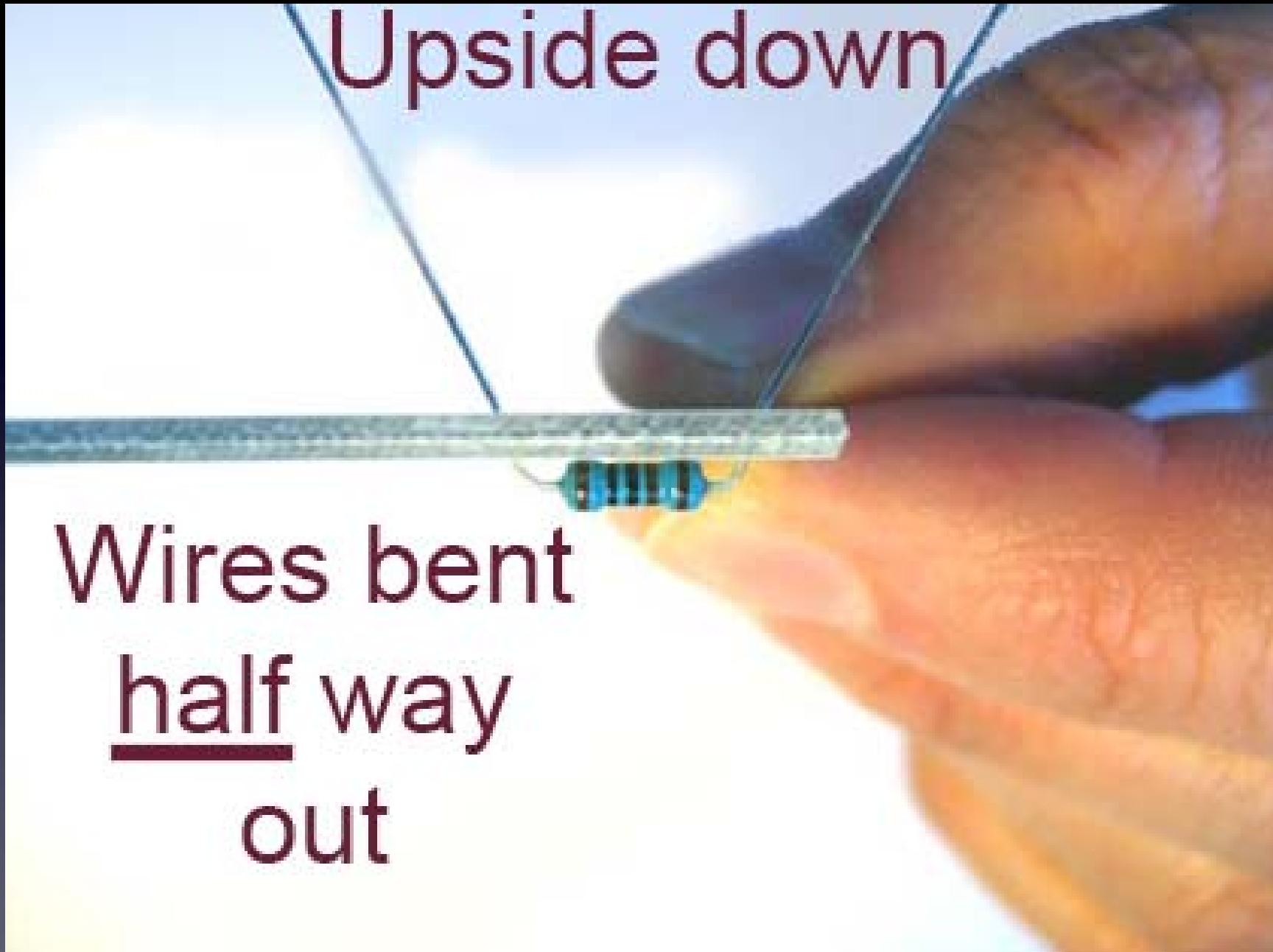


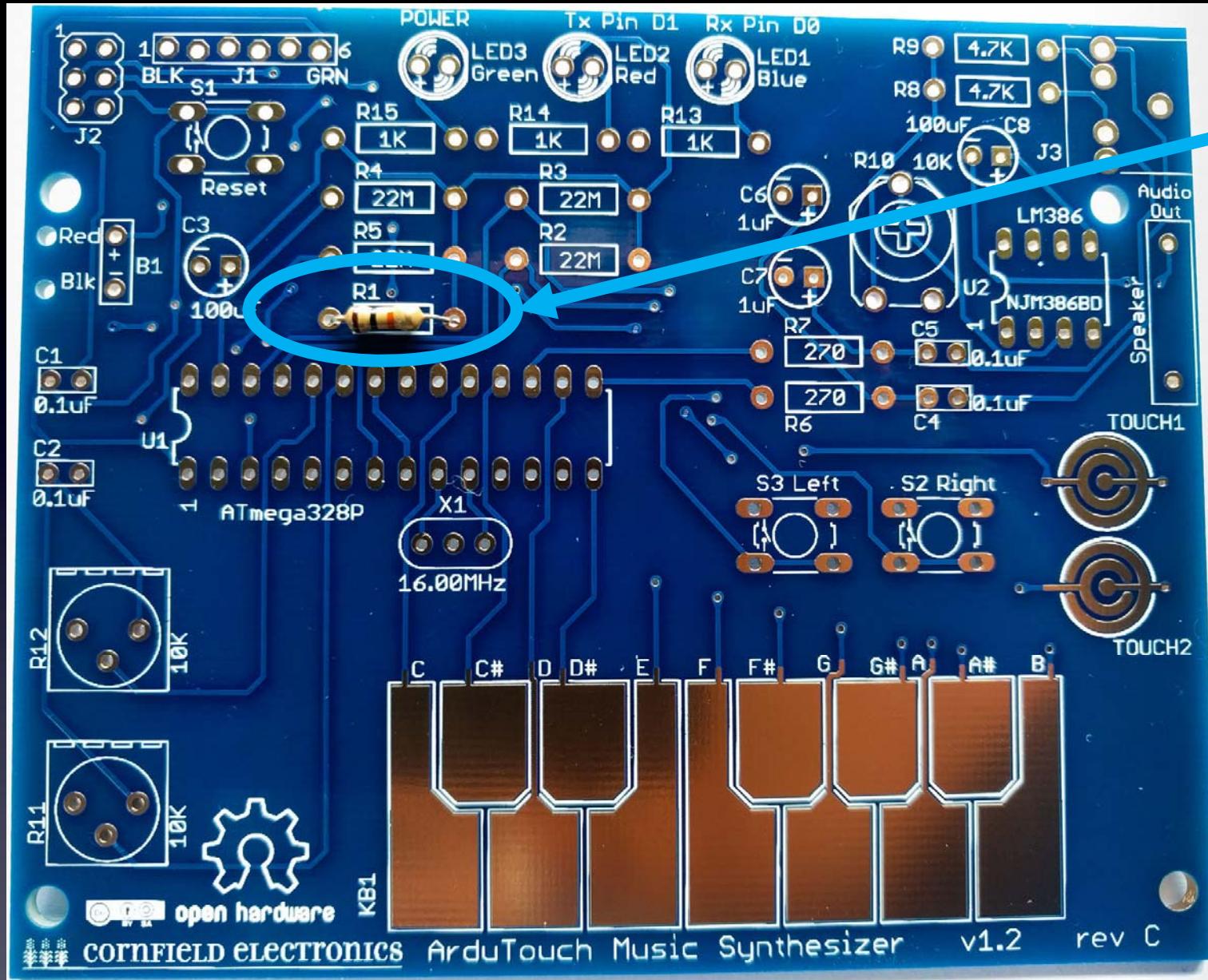


Push part down  
all the way

Upside down

Wires bent  
half way  
out





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" diameter (or smaller)

Important:

Use solder WITH lead (Pb) !!  
Unleaded 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)

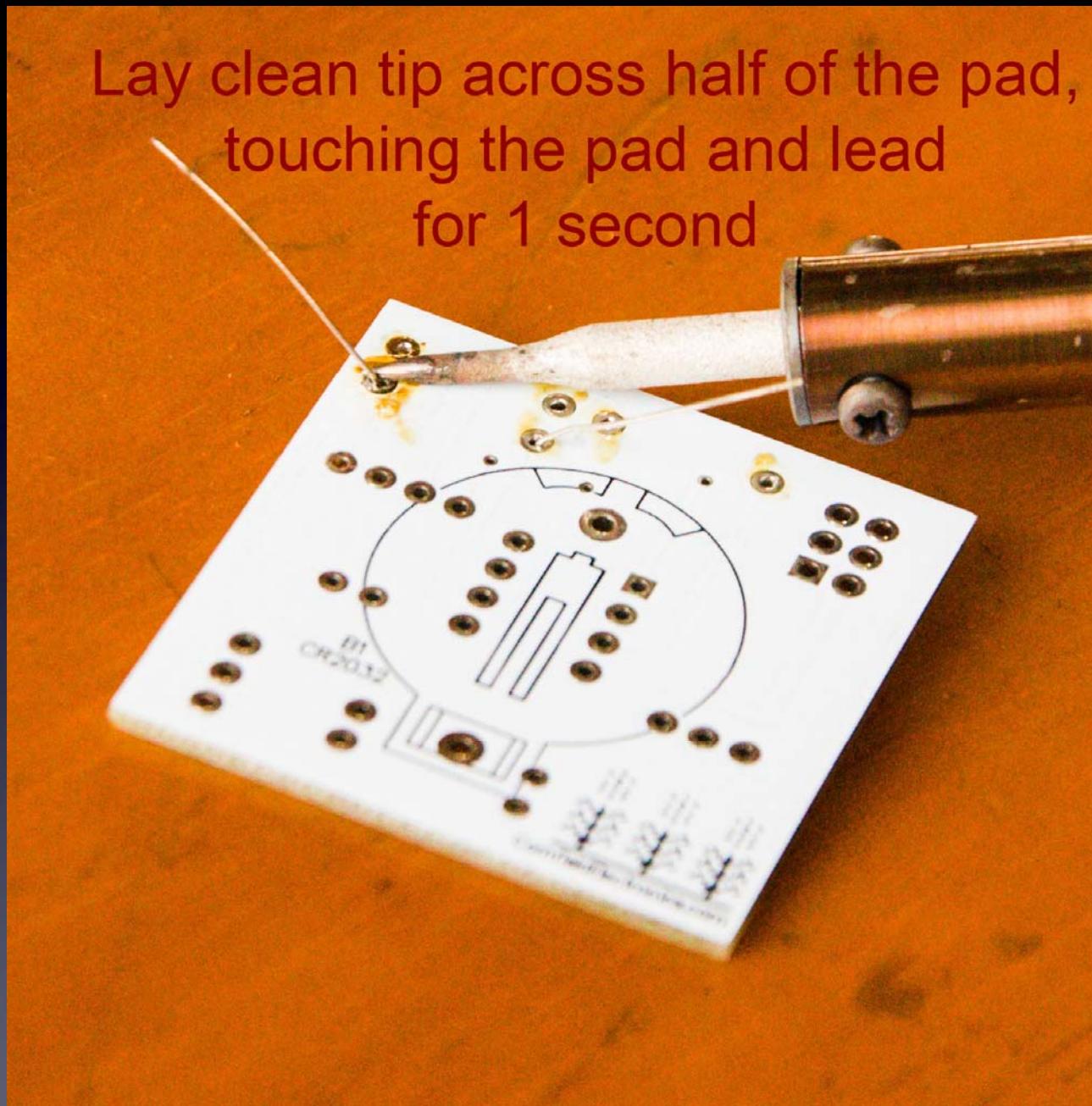
Bang (lightly) 3 times,

Swipe, Rotate, Swipe:

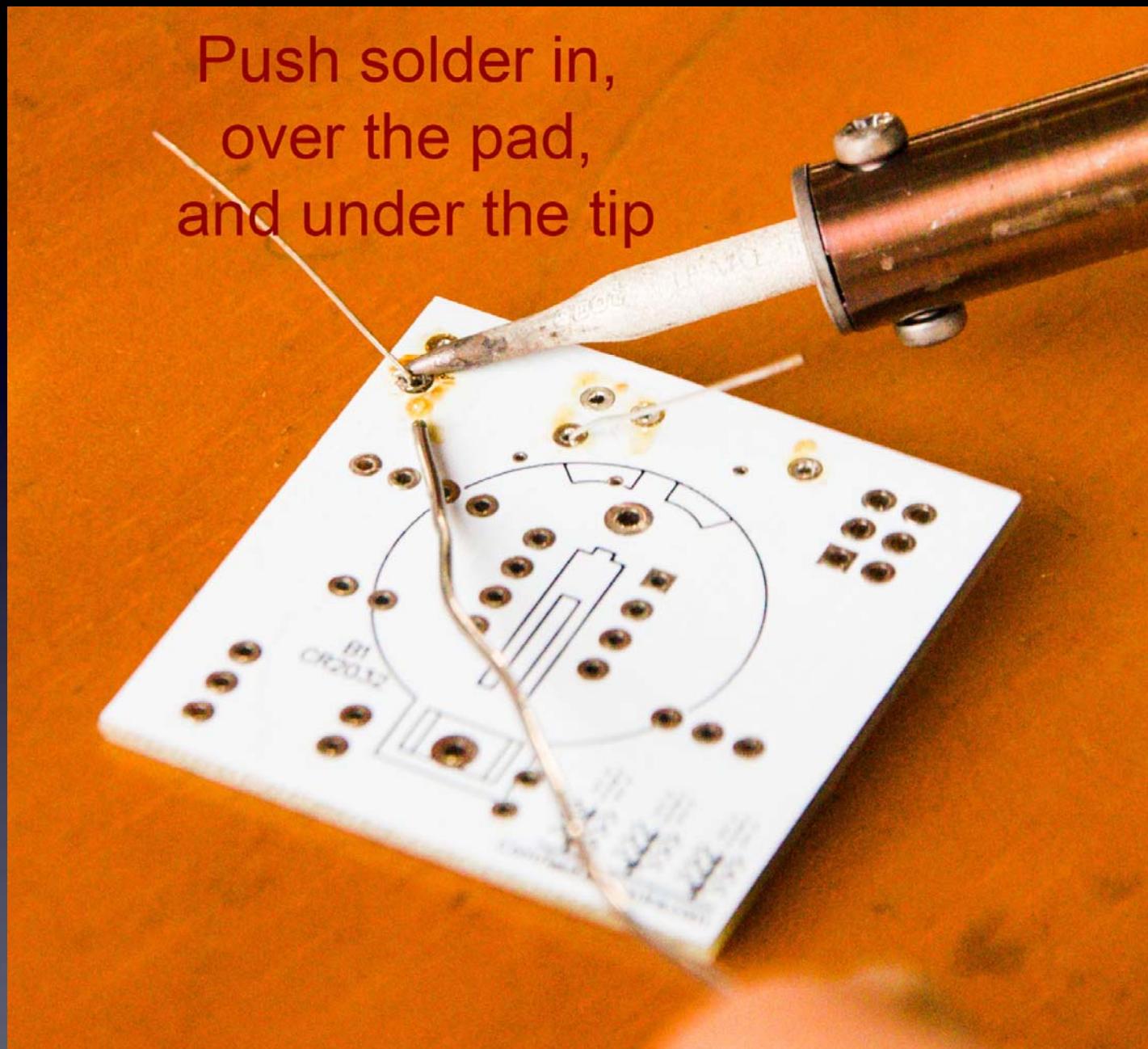
Keep the tip shiny silver!

Knock solder off the tip

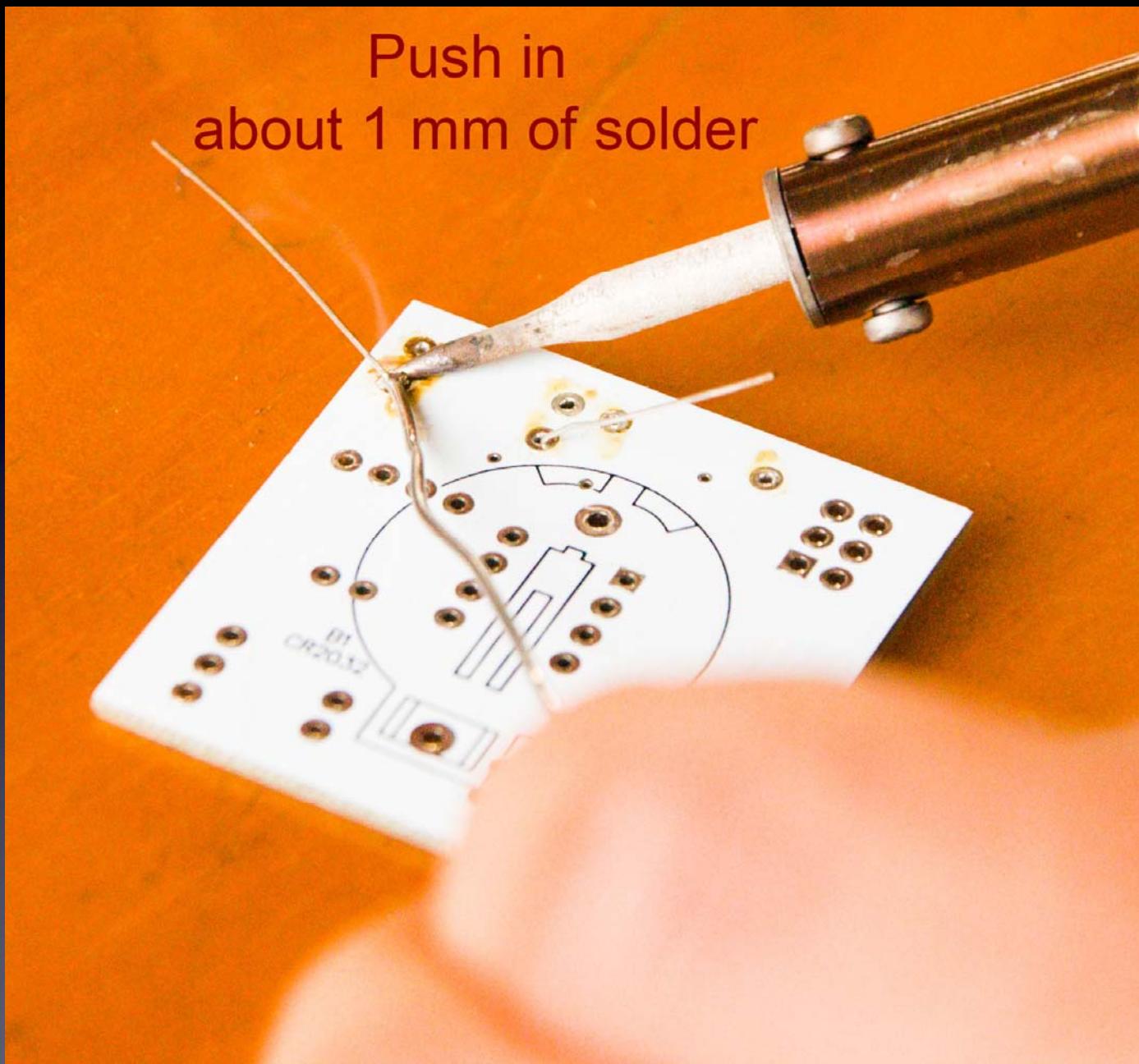
Lay clean tip across half of the pad,  
touching the pad and lead  
for 1 second



Push solder in,  
over the pad,  
and under the tip



Push in  
about 1 mm of solder



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



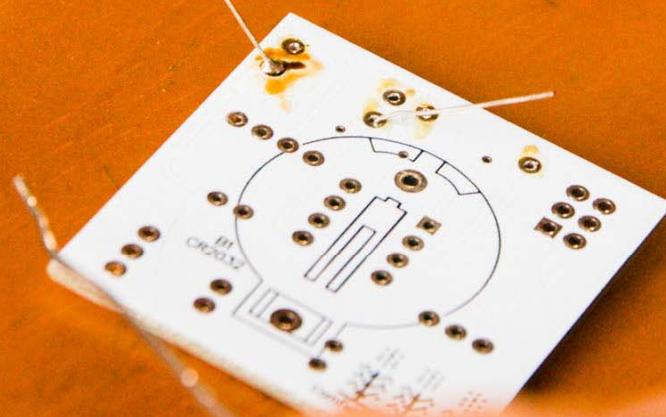
Pull solder away,  
**But keep holding soldering iron down**  
for 1 more second

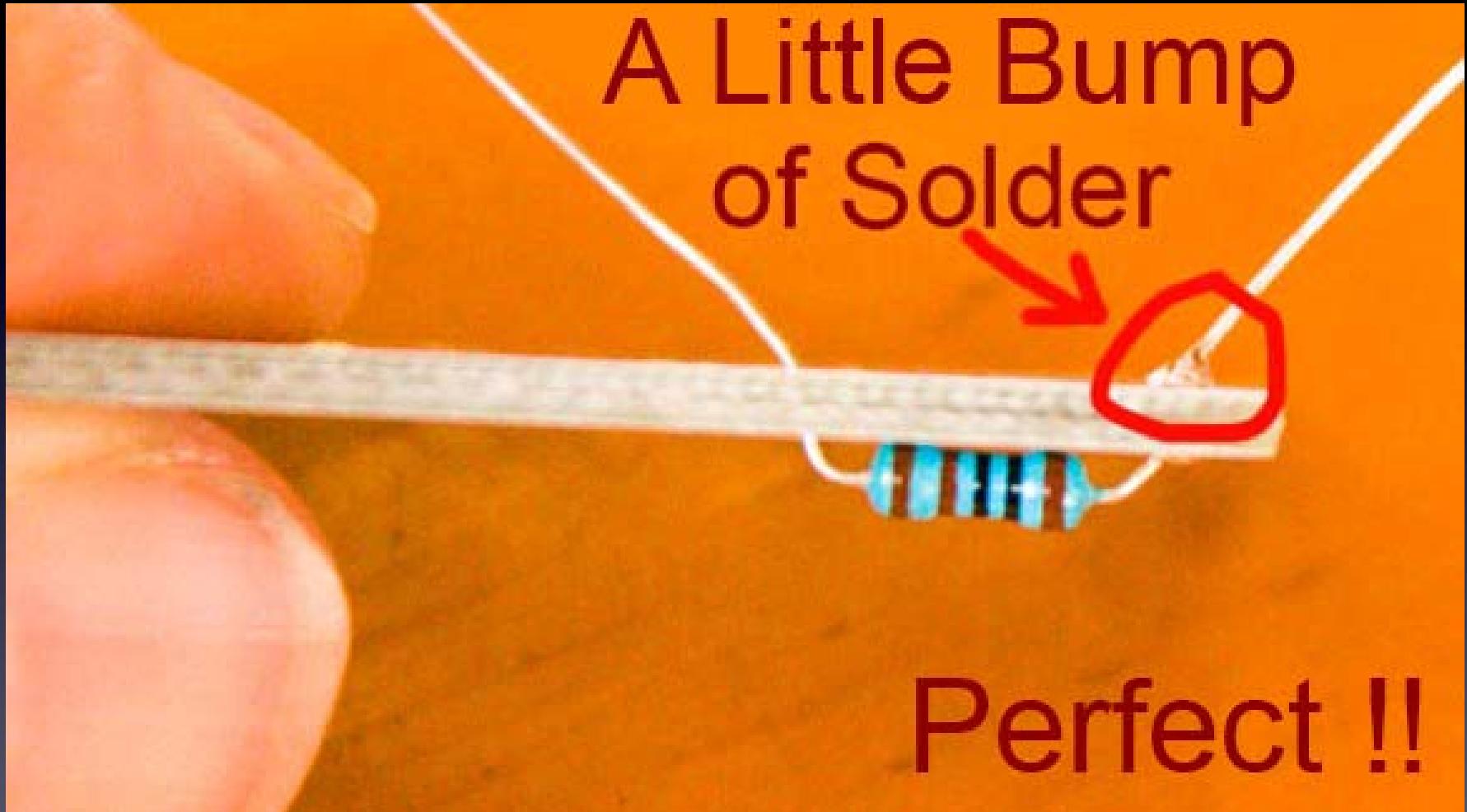
# Secret #2:

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

**Now**

Lift soldering iron



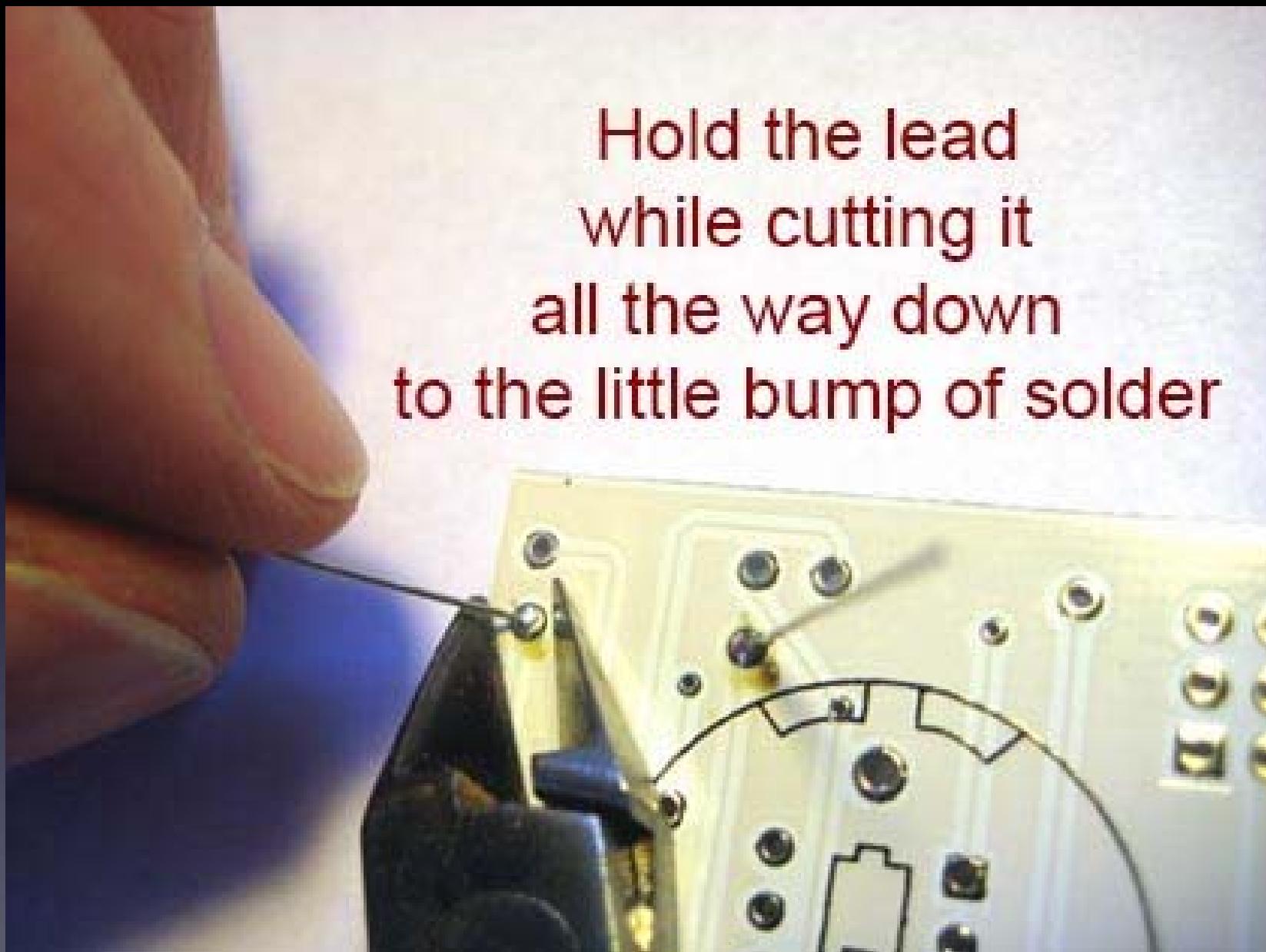


A Little Bump  
of Solder

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.

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

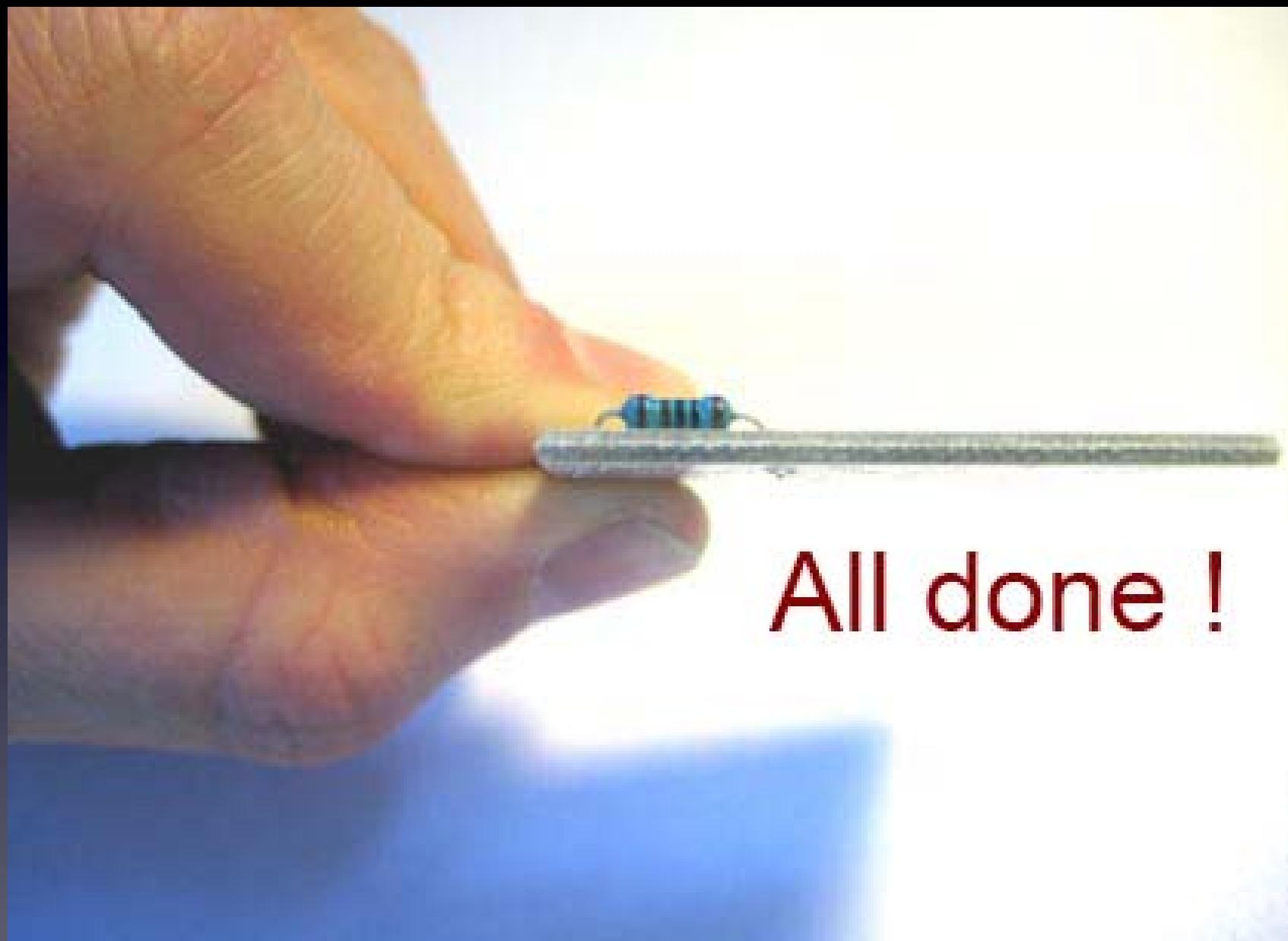


Cutting with the tip of the wire cutter gives you more control

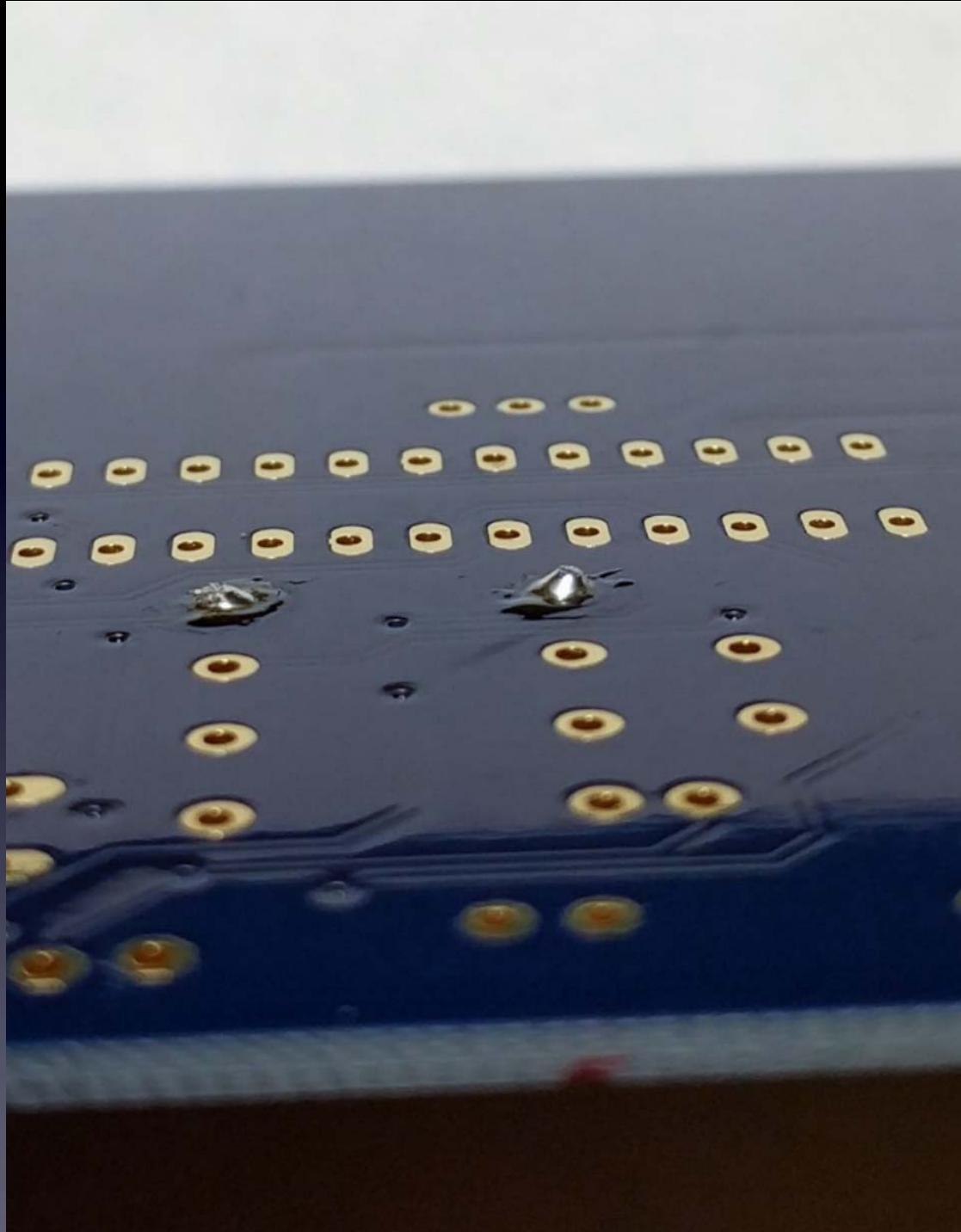
## Safety Tip #3:

Hold or cover the lead !

(or it will fly into your eye!)



No wire sticking out



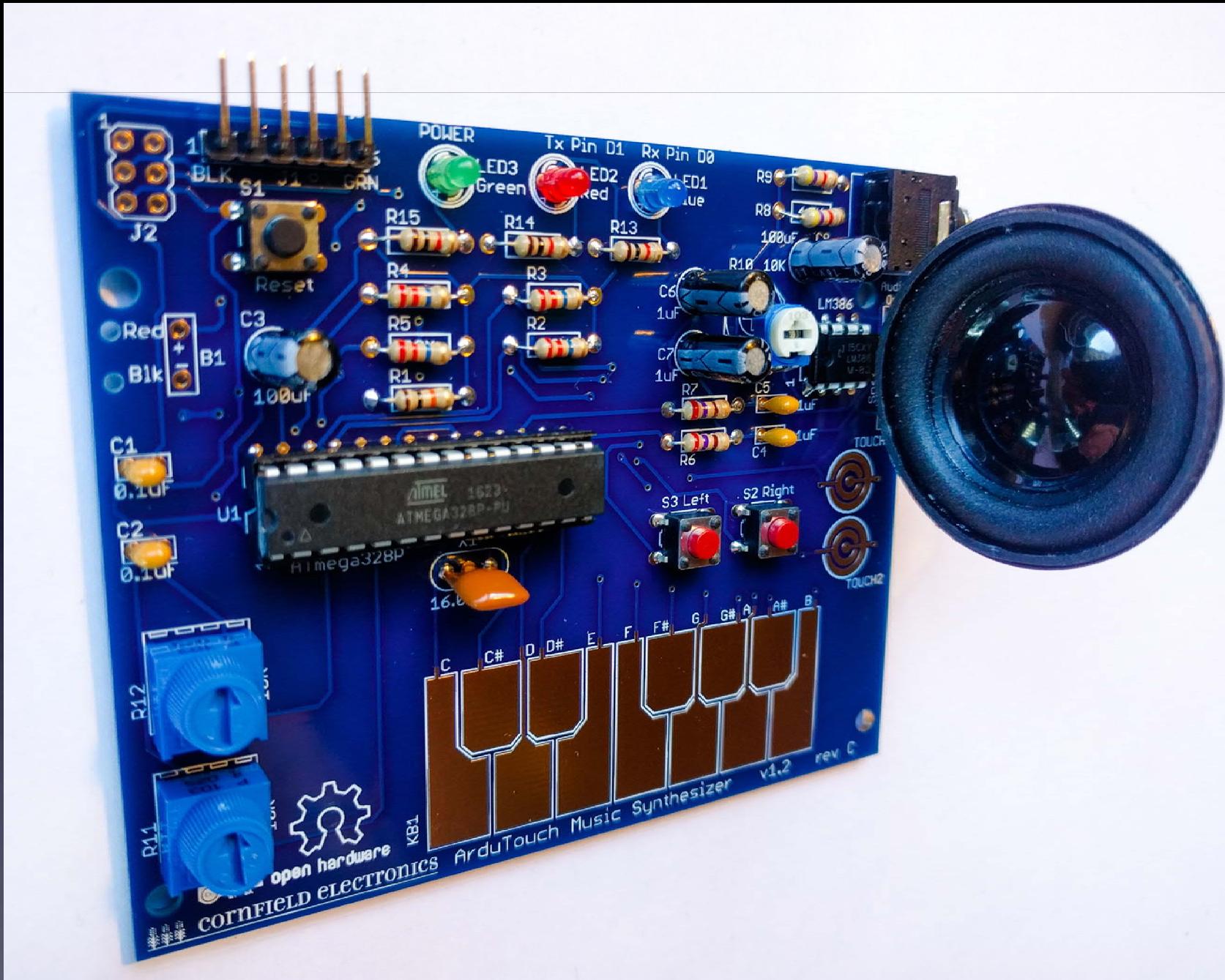
# R1 soldered to the board

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)

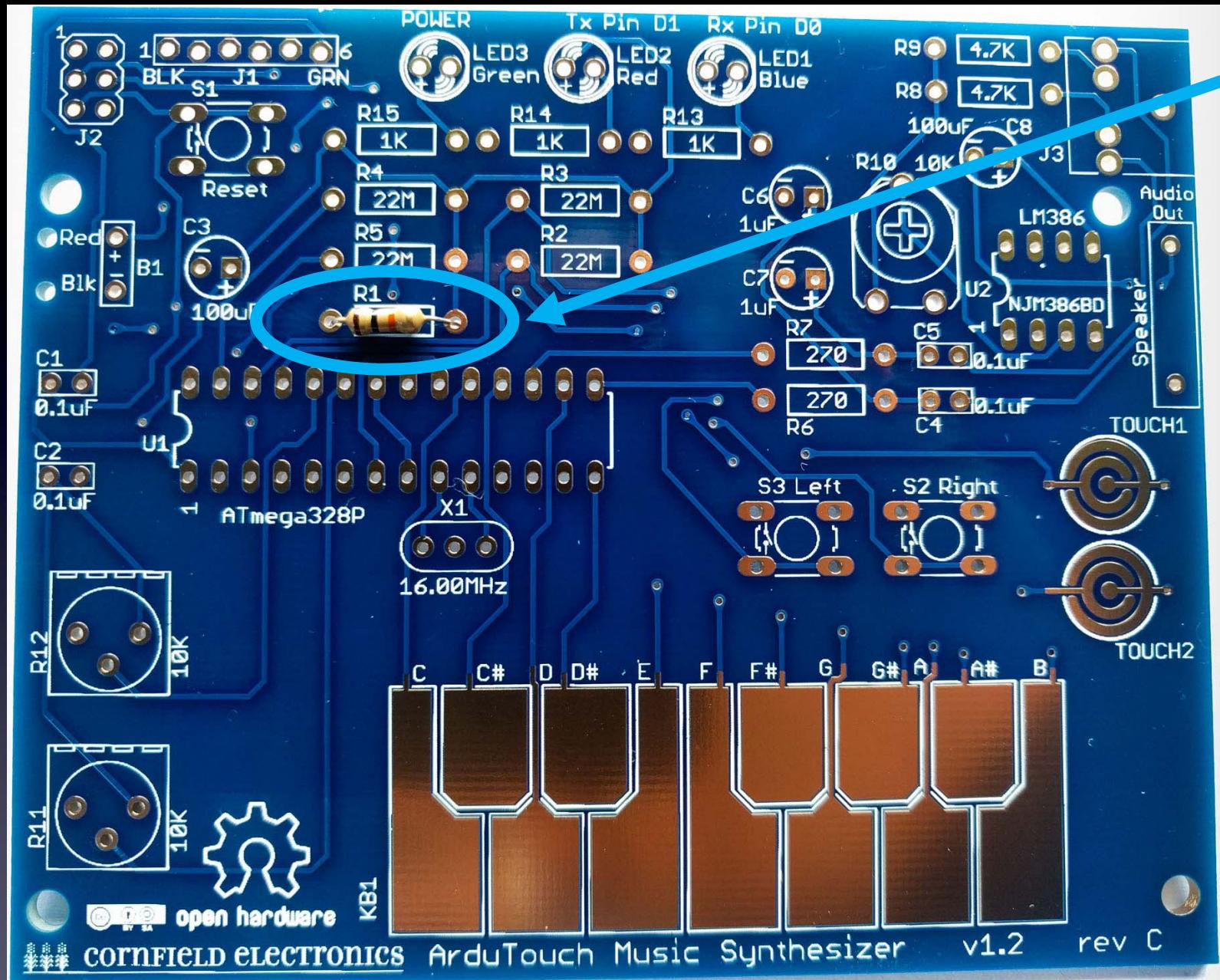
One part at a time

Till all the parts are soldered



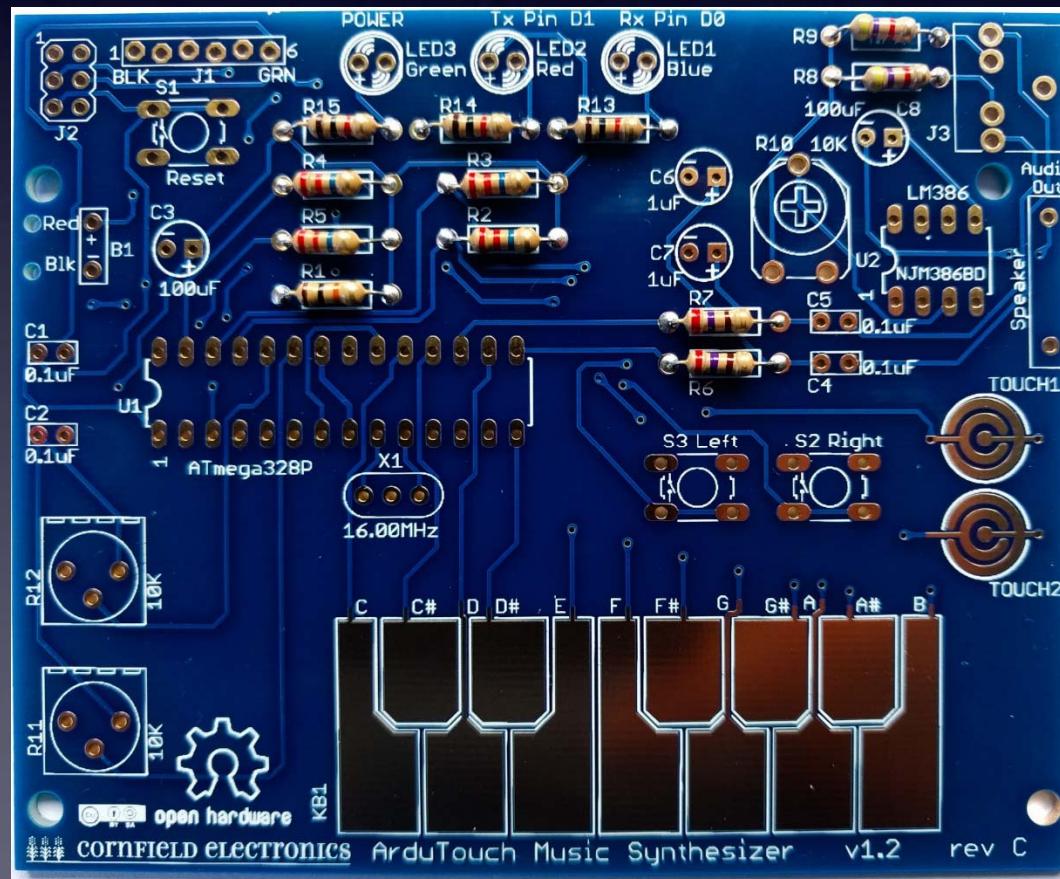
And it will look like this when you're done.

Let's start!

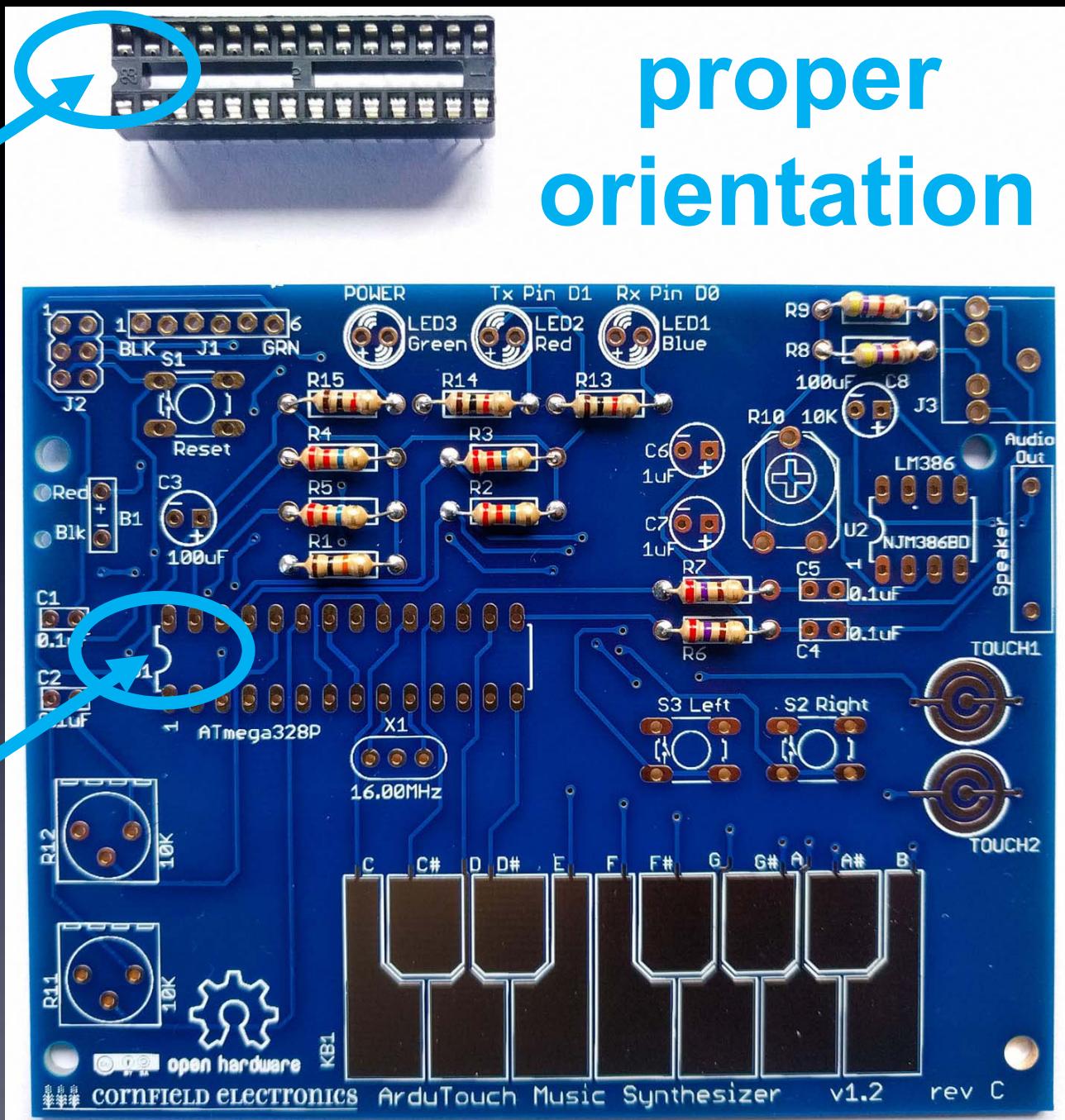


If you haven't done so already, solder R1: brown, black, orange

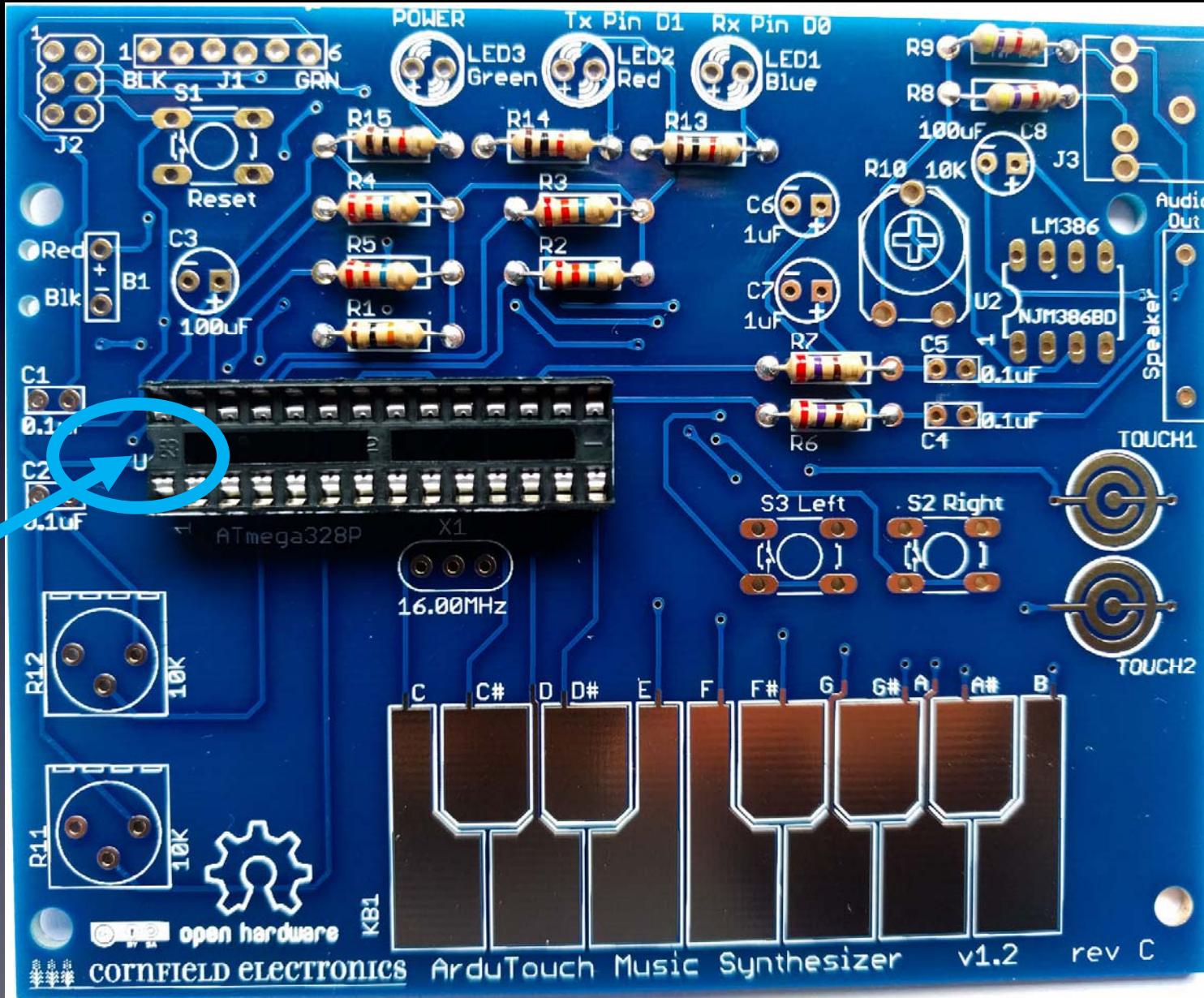
R1:		10K: Brown, Black, Orange
R2, R3, R4, R5:		22M: Red, Red, Blue
R6, R7:		270: Red, Violet, Brown
R8, R9:		4.7K: Yellow, Violet, Red
R13, R14, R15:		1K: Brown, Black, Red



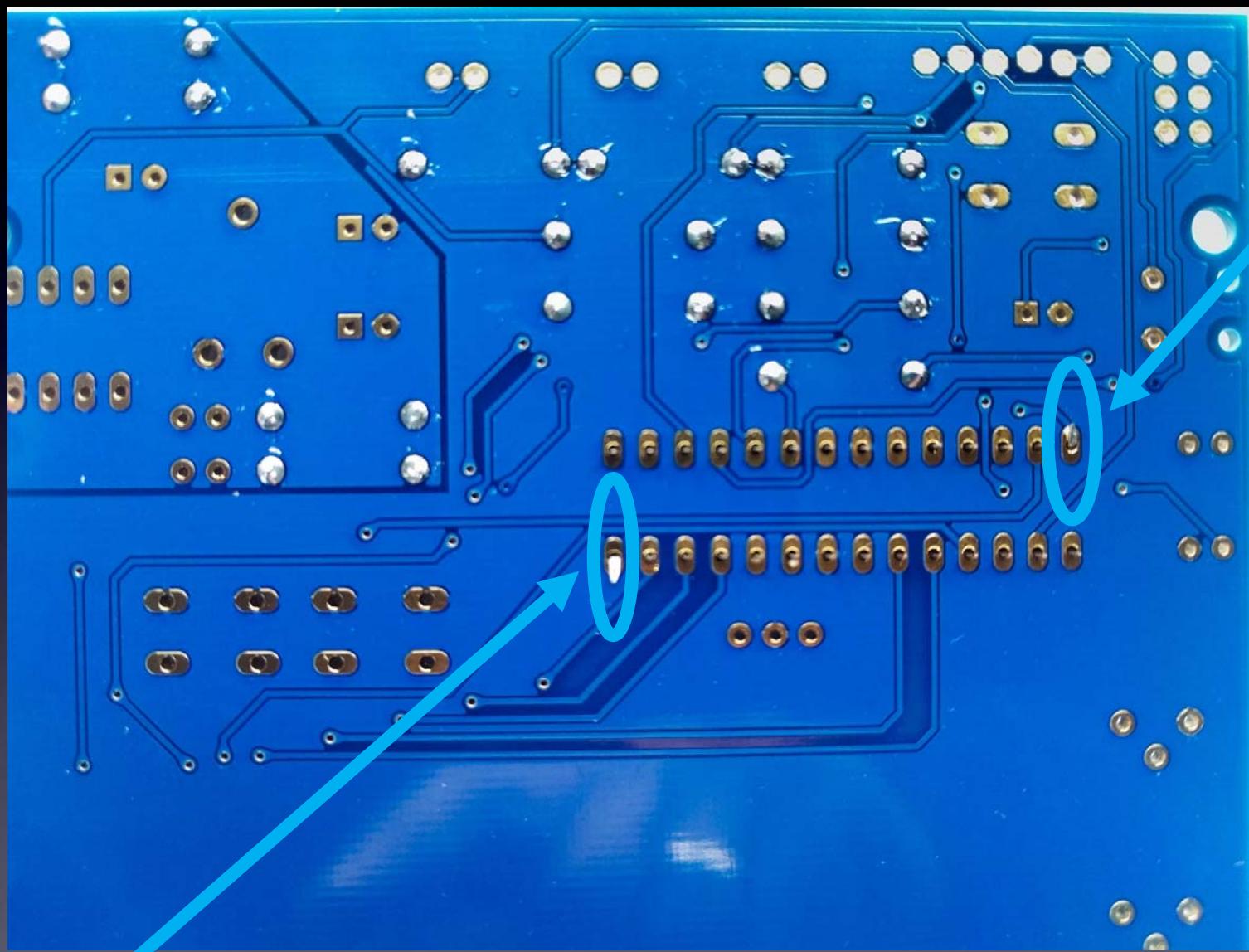
# U1: microcontroller socket



# U1: microcontroller socket: inserted correctly

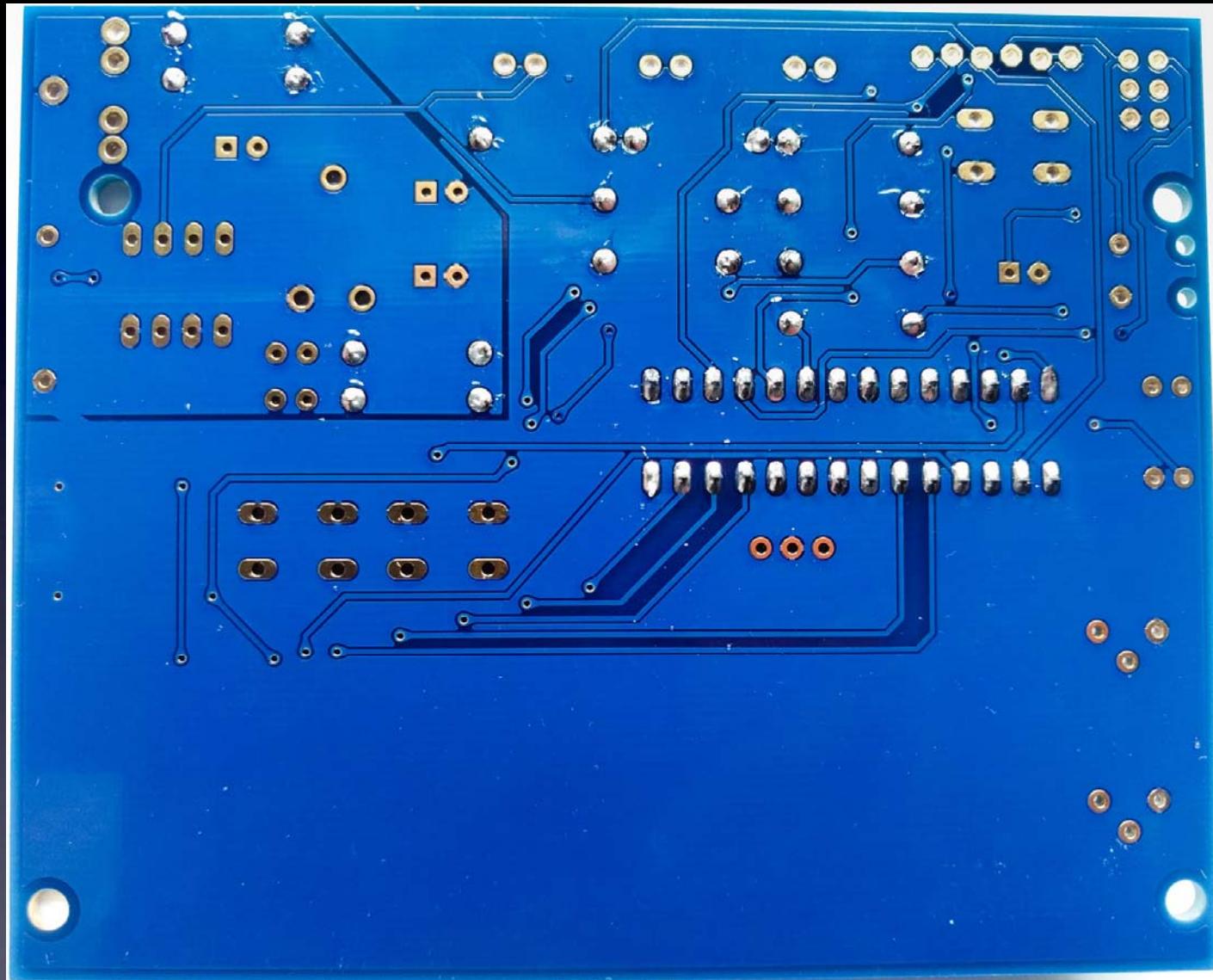


# U1: microcontroller socket

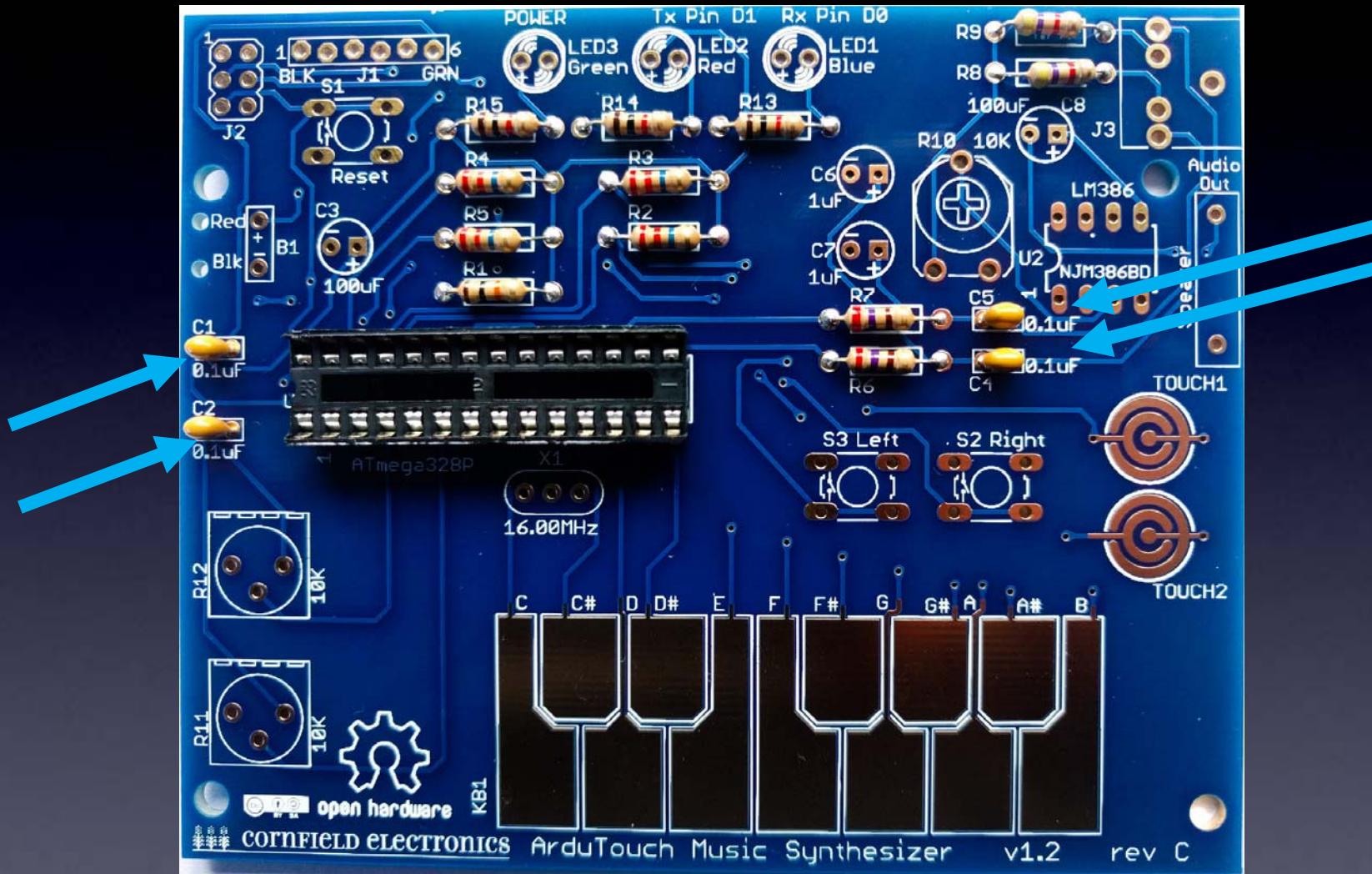


bend pins down on two corners,  
and solder all 28 leads to the board

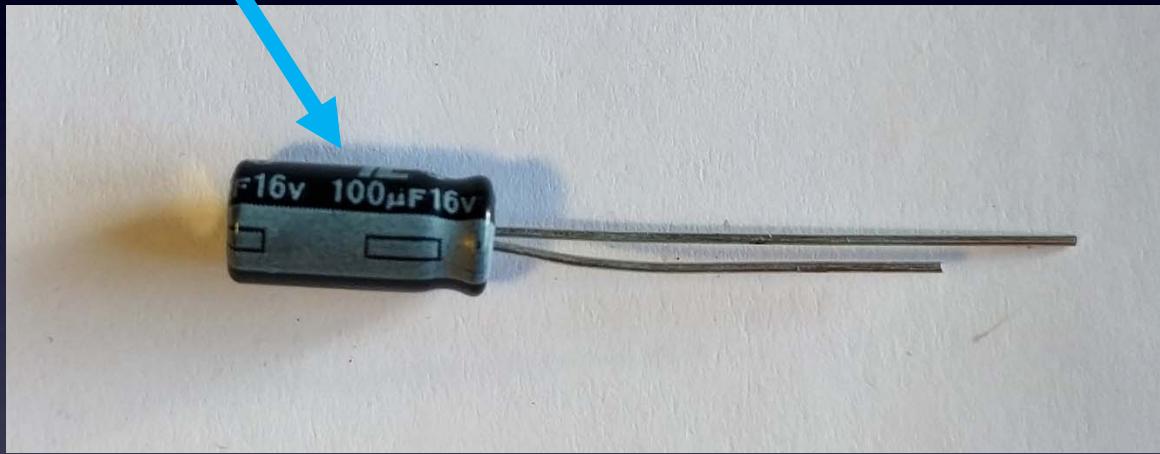
# U1: microcontroller socket



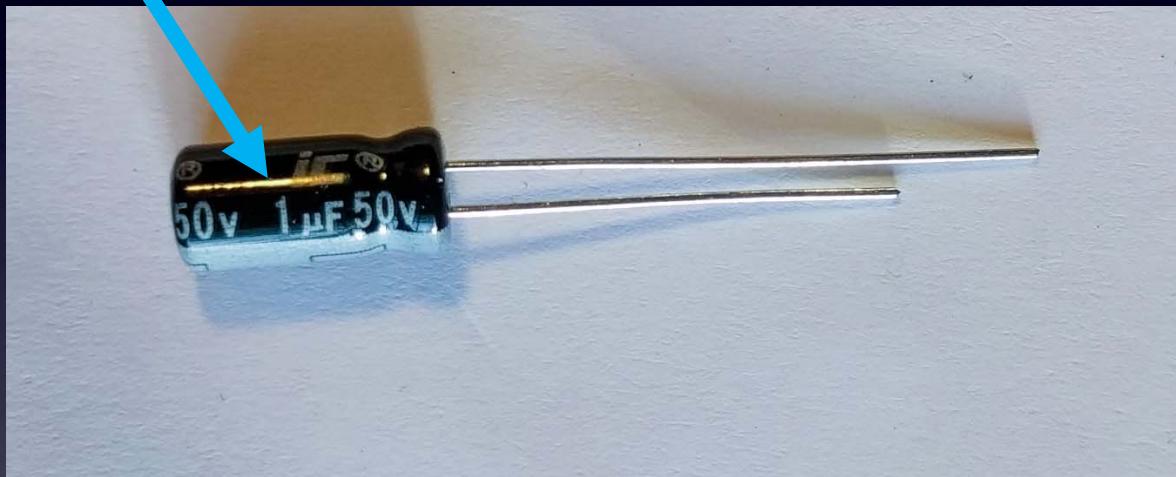
All 28 leads soldered to the board:  
→ Notice that each has a little bump of solder (not flat). ←



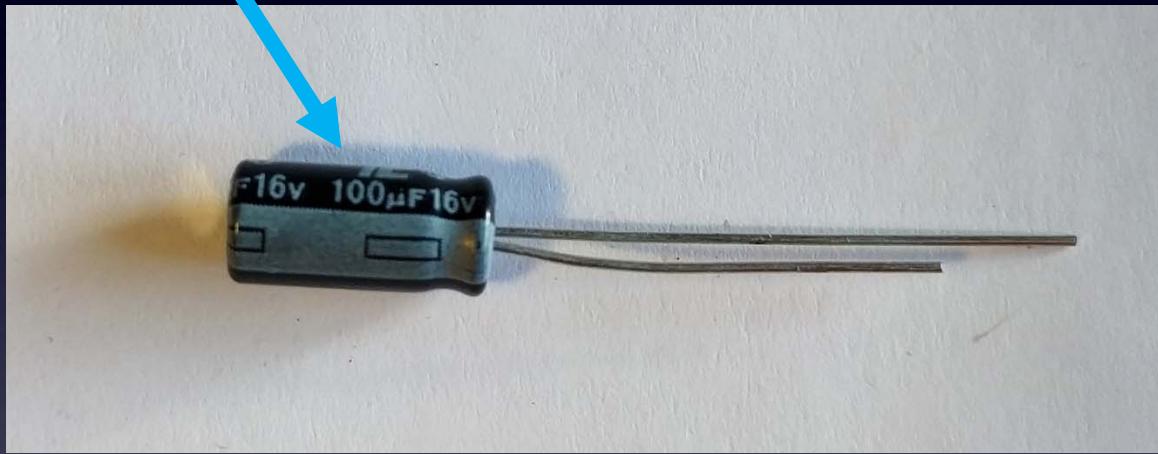
C1, C2, C4, C5



C3, C8: 100uF



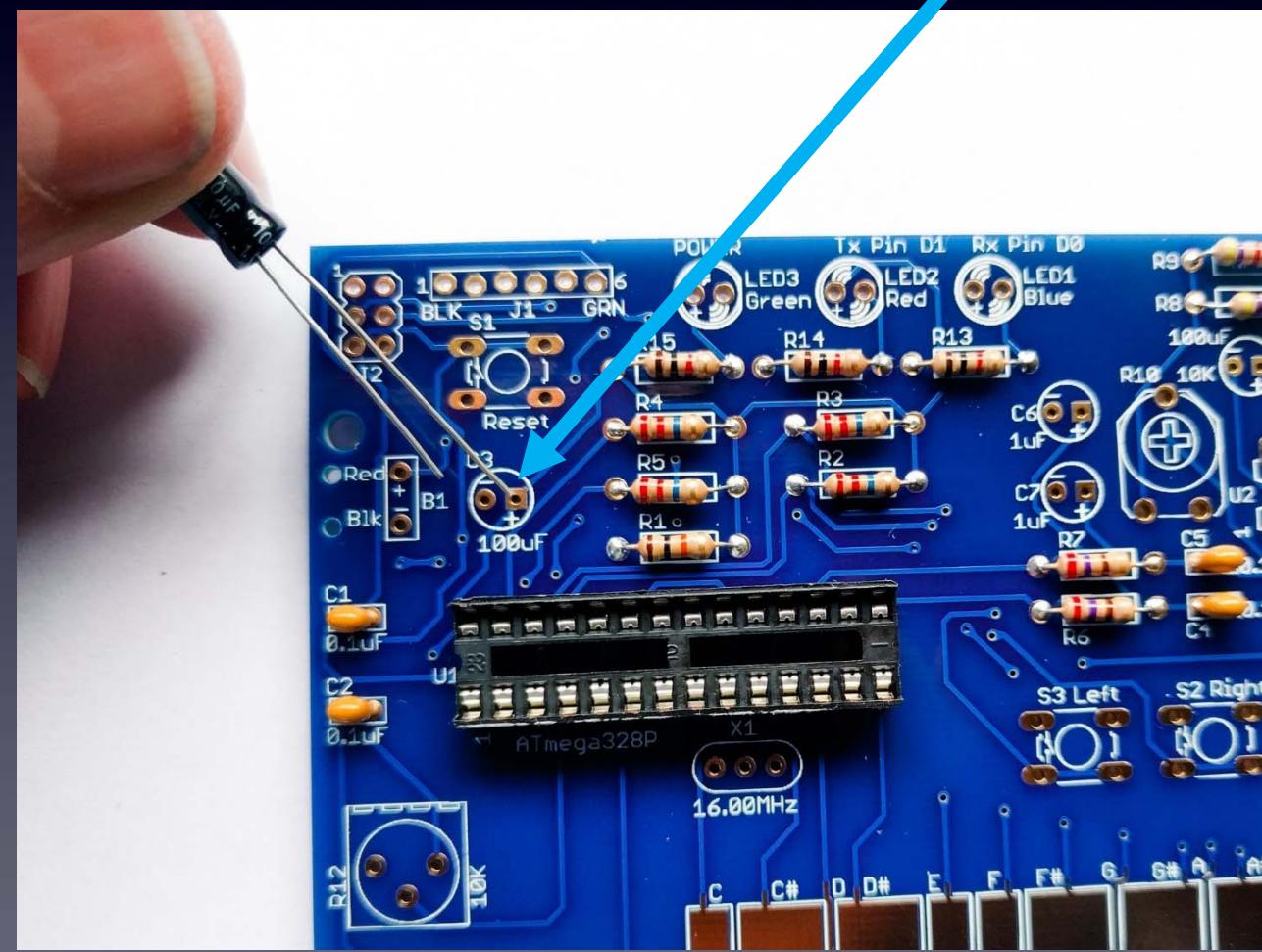
Different than C3, C8 !  
C6, C7: 1uF

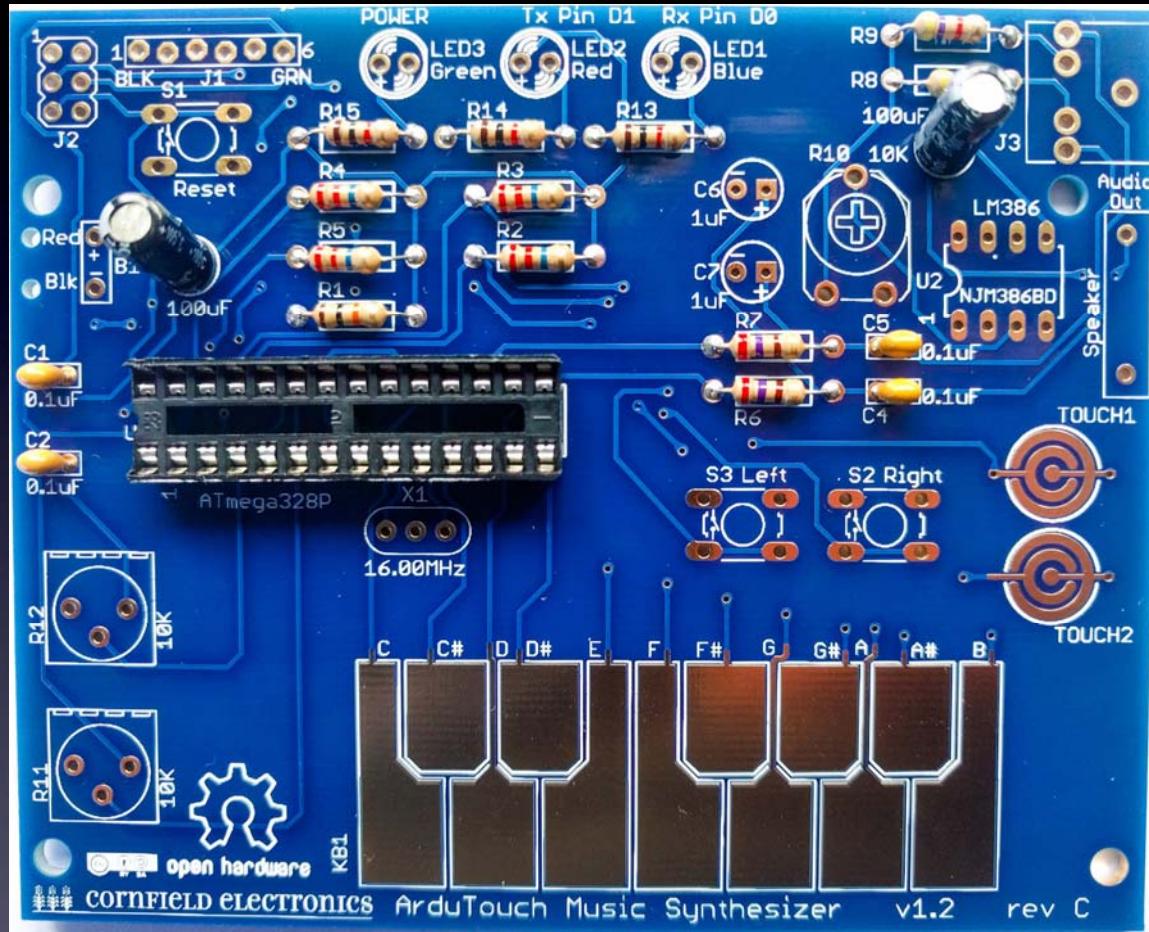


C3, C8: 100uF

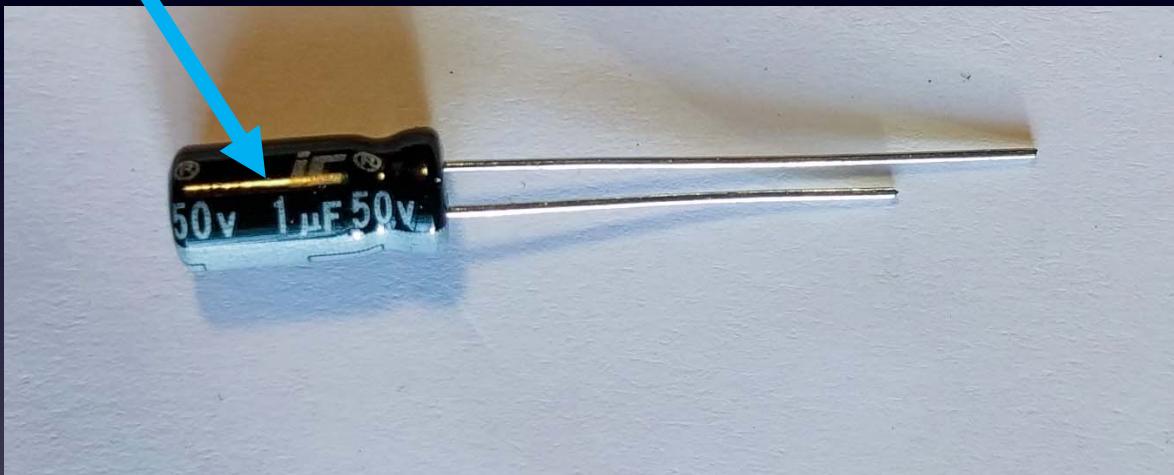
C3, C8:  
Long Lead “+”

Use 100uF !!

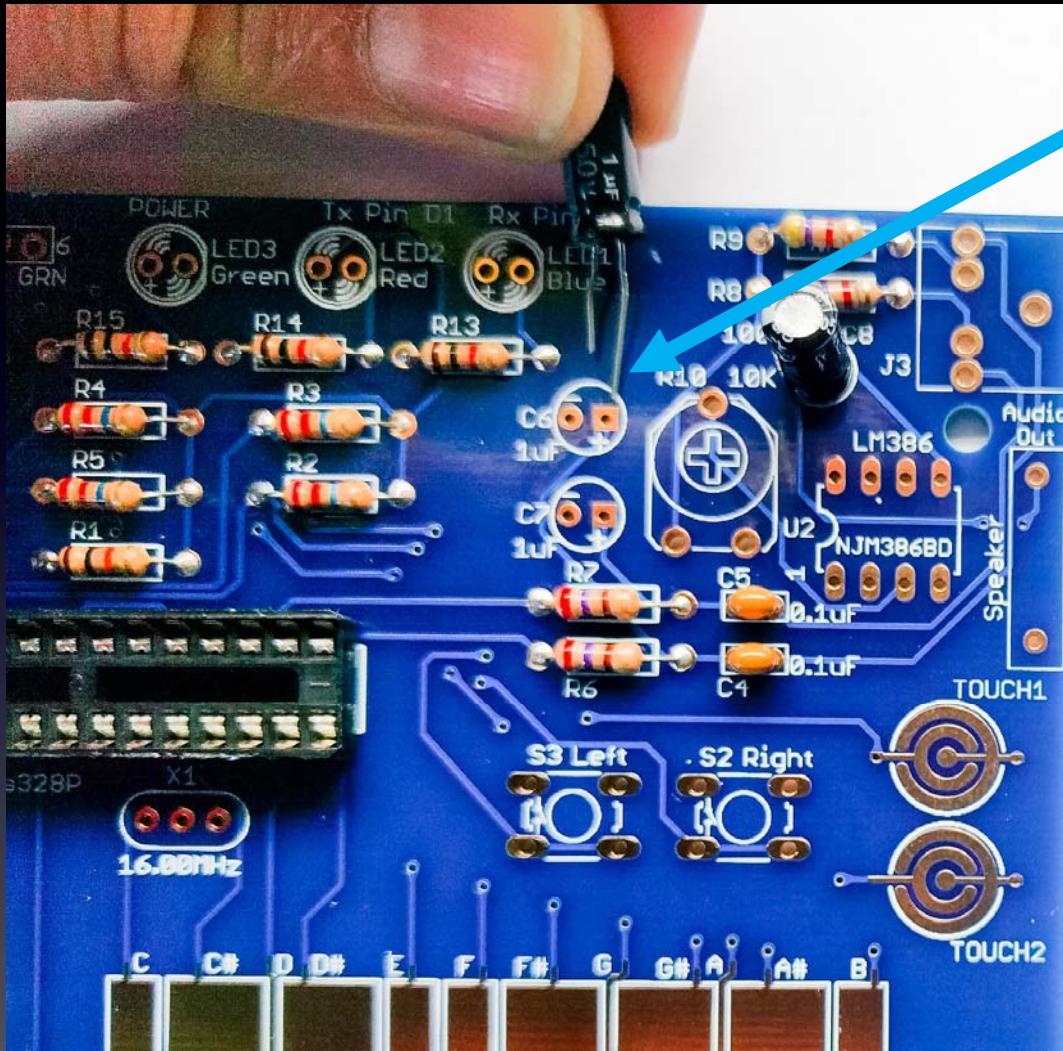




C3, C8: 100uF – soldered to board

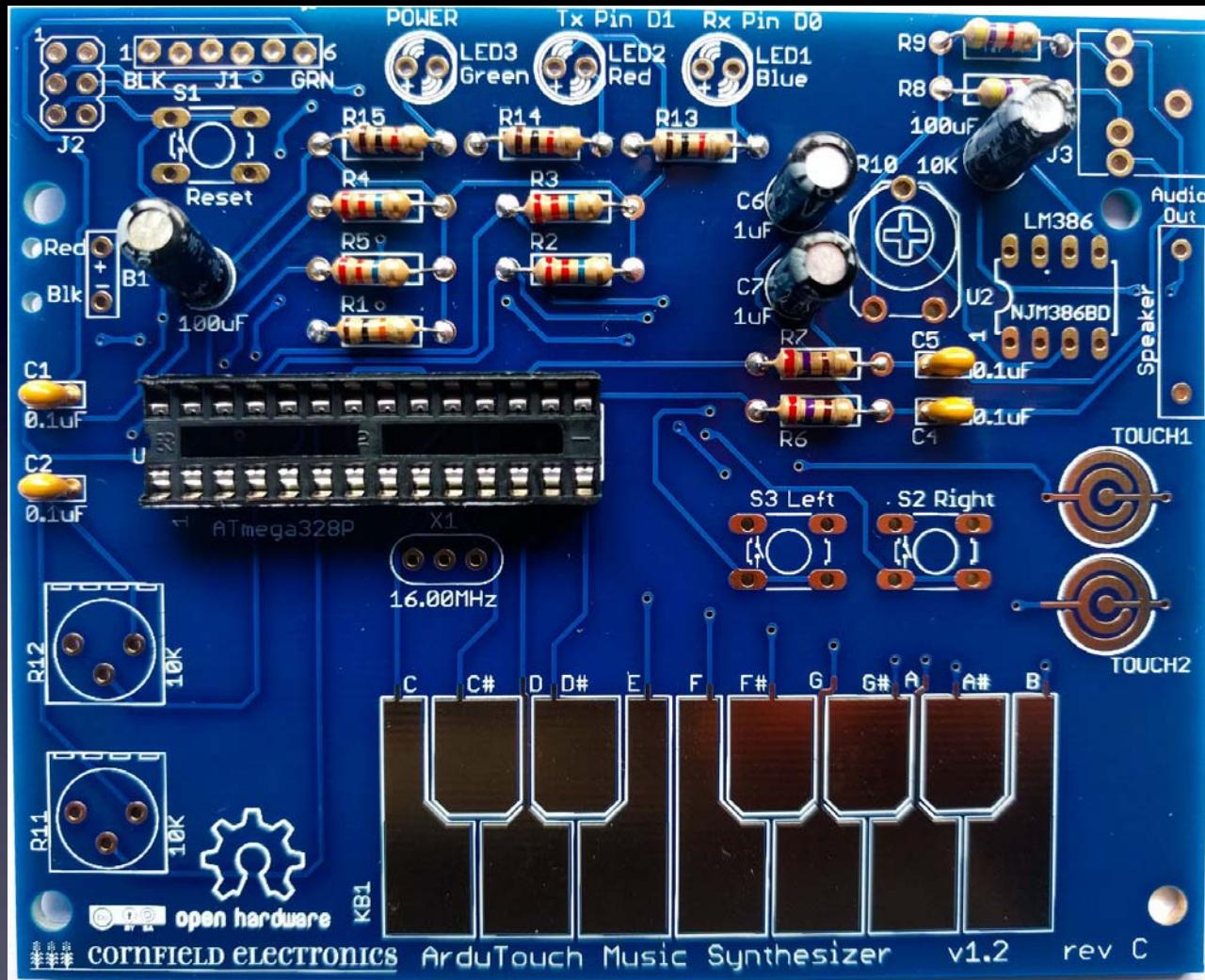


C6, C7: 1uF



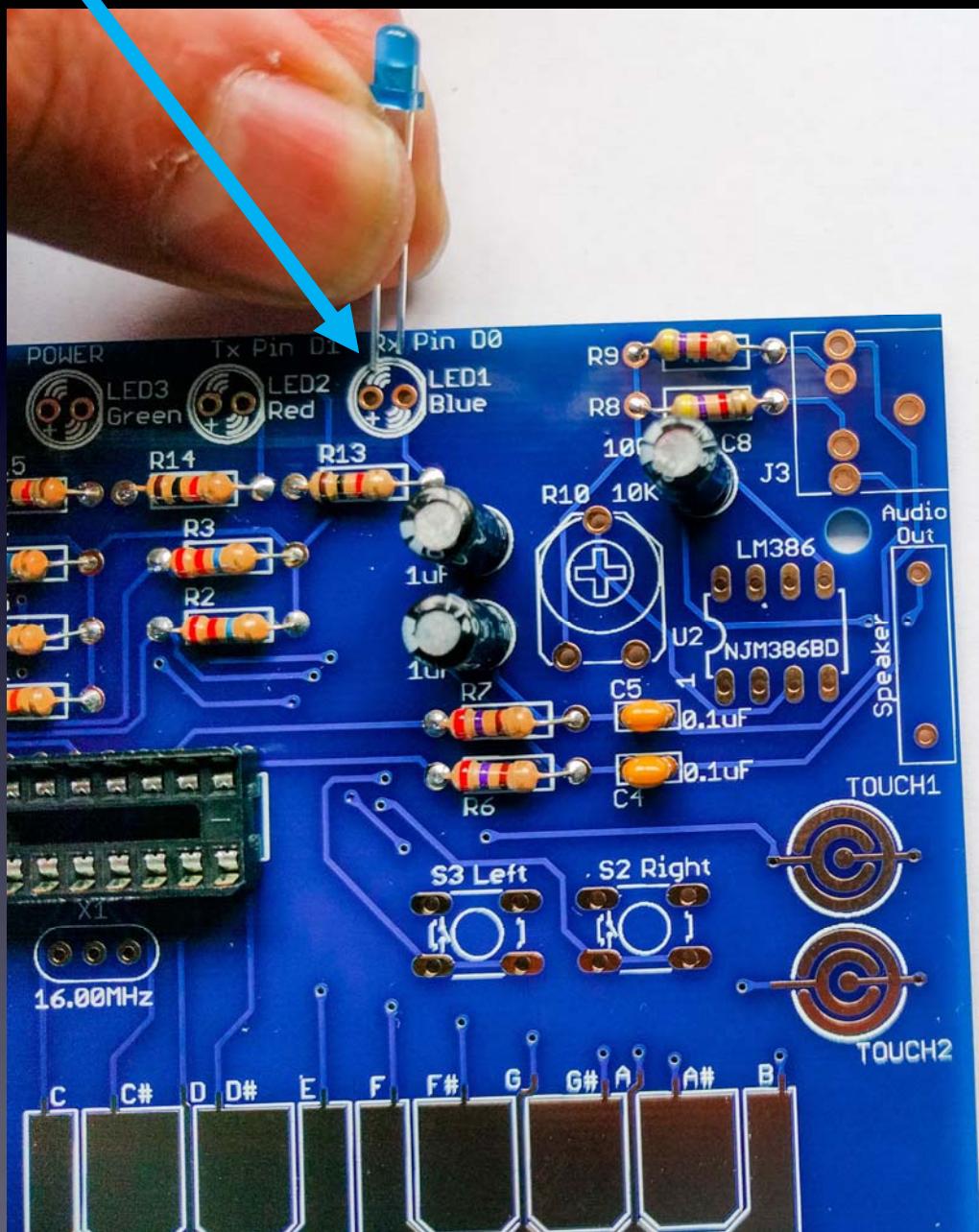
C6, C7:  
Long Lead “+”

Use 1uF !!



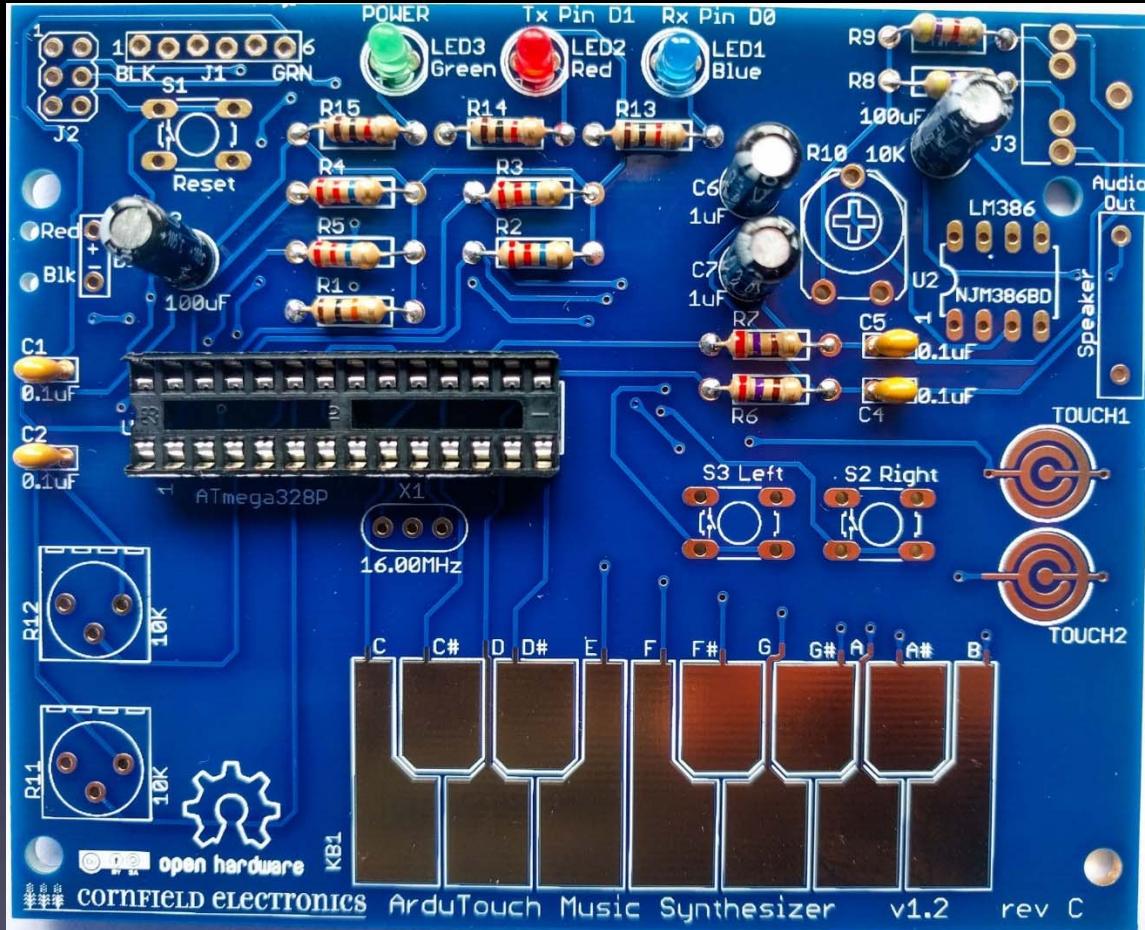
C6, C7: 1uF – soldered to board

# LED1, LED2, LED3: Long Lead “+”



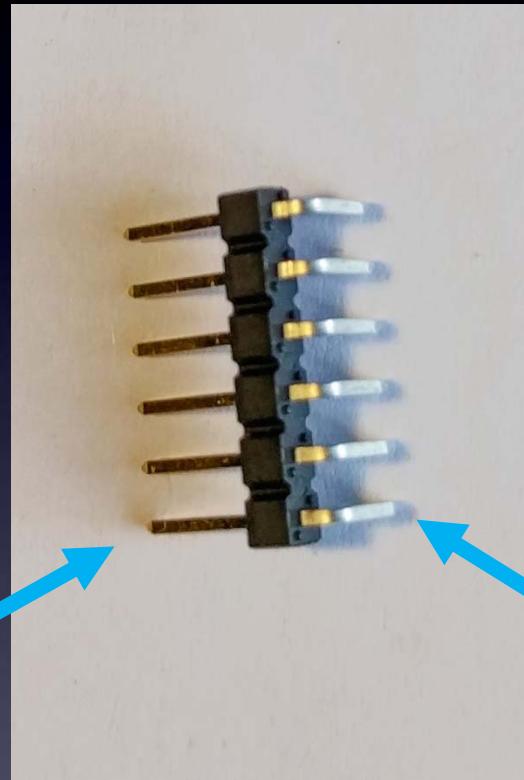
Save  
these leads

We'll use them for the speaker



**LED1, LED2, LED3**

**Green, Red, Blue – soldered to board**



long leads

short leads

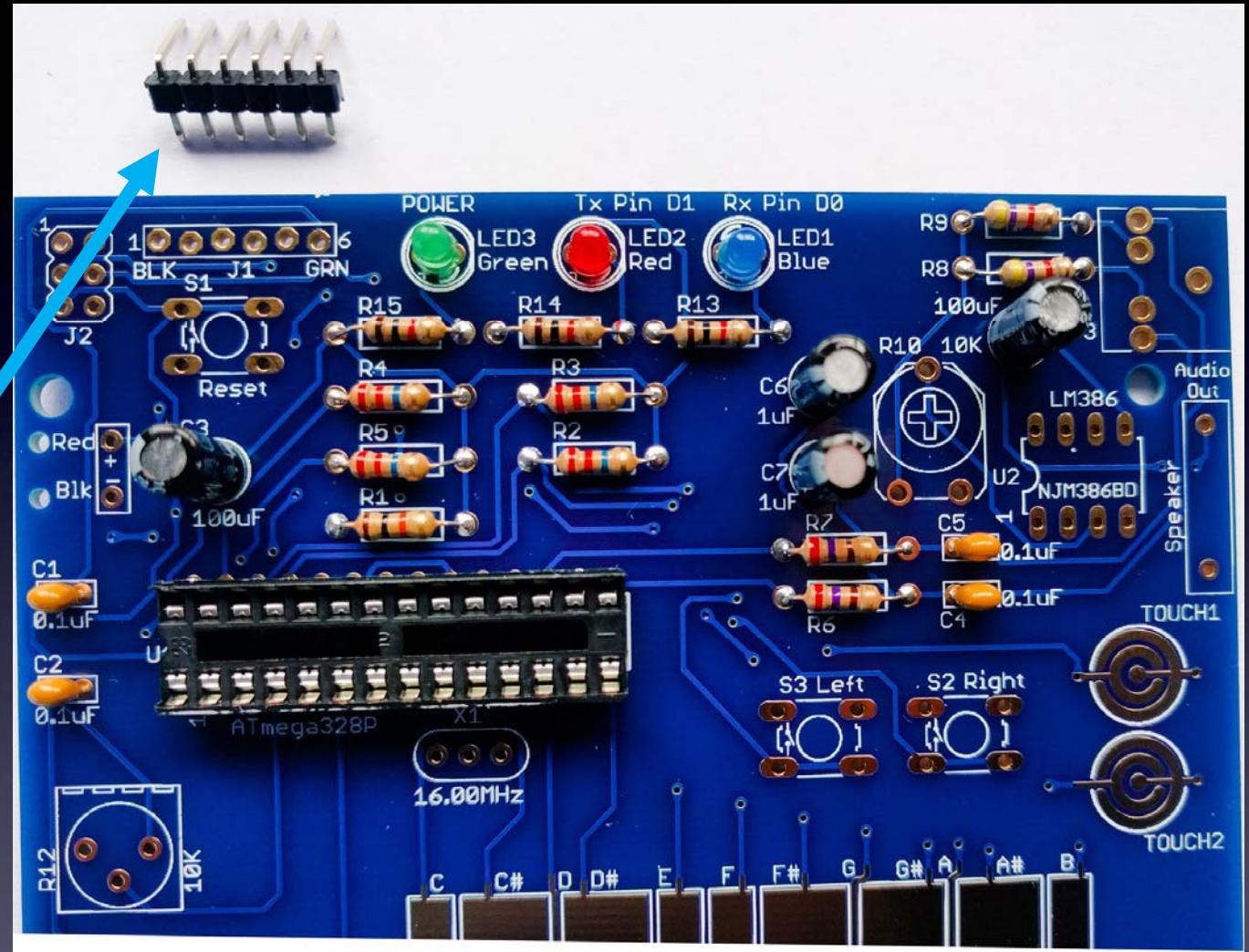
J1

# Short leads into board

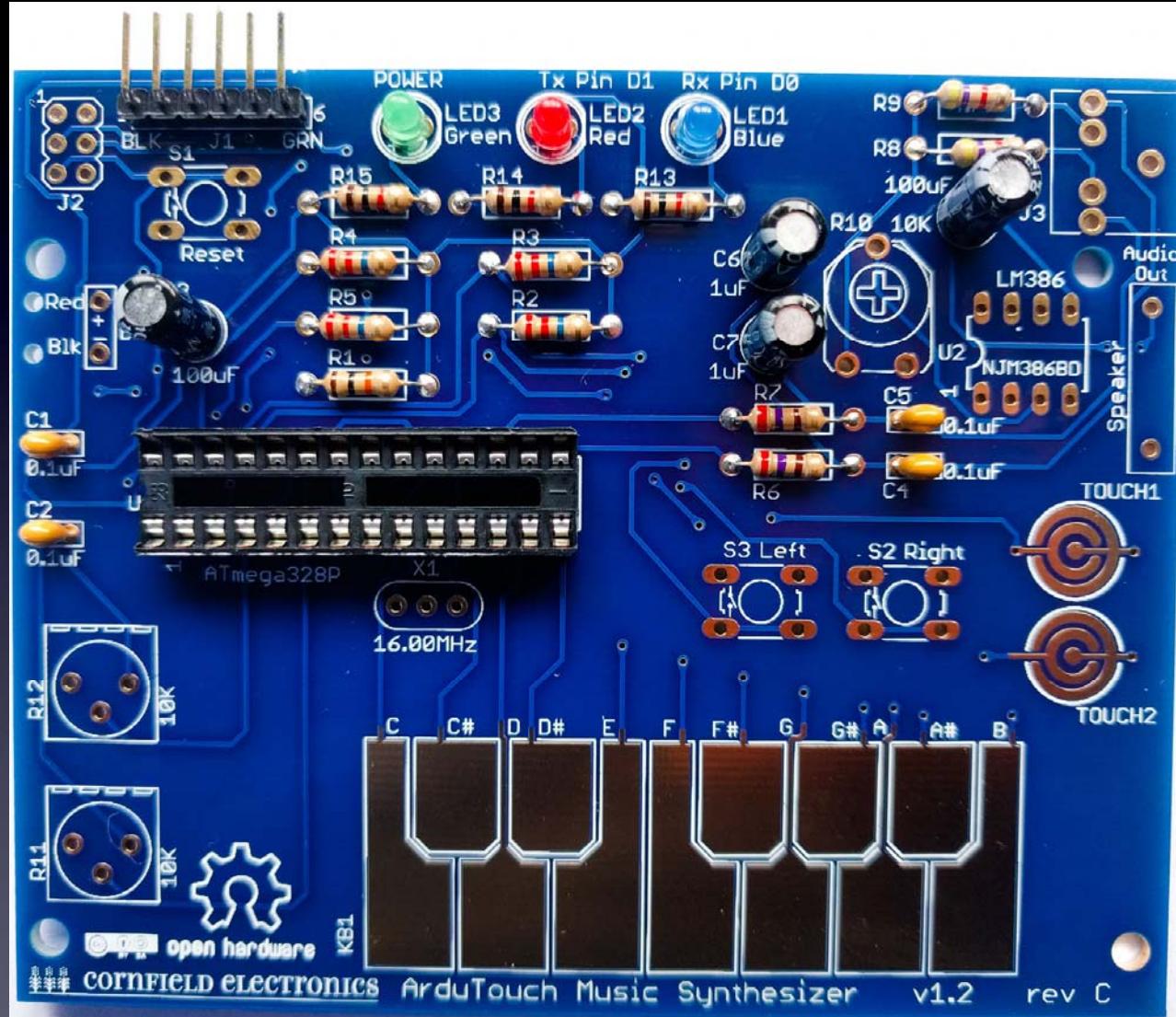
J1

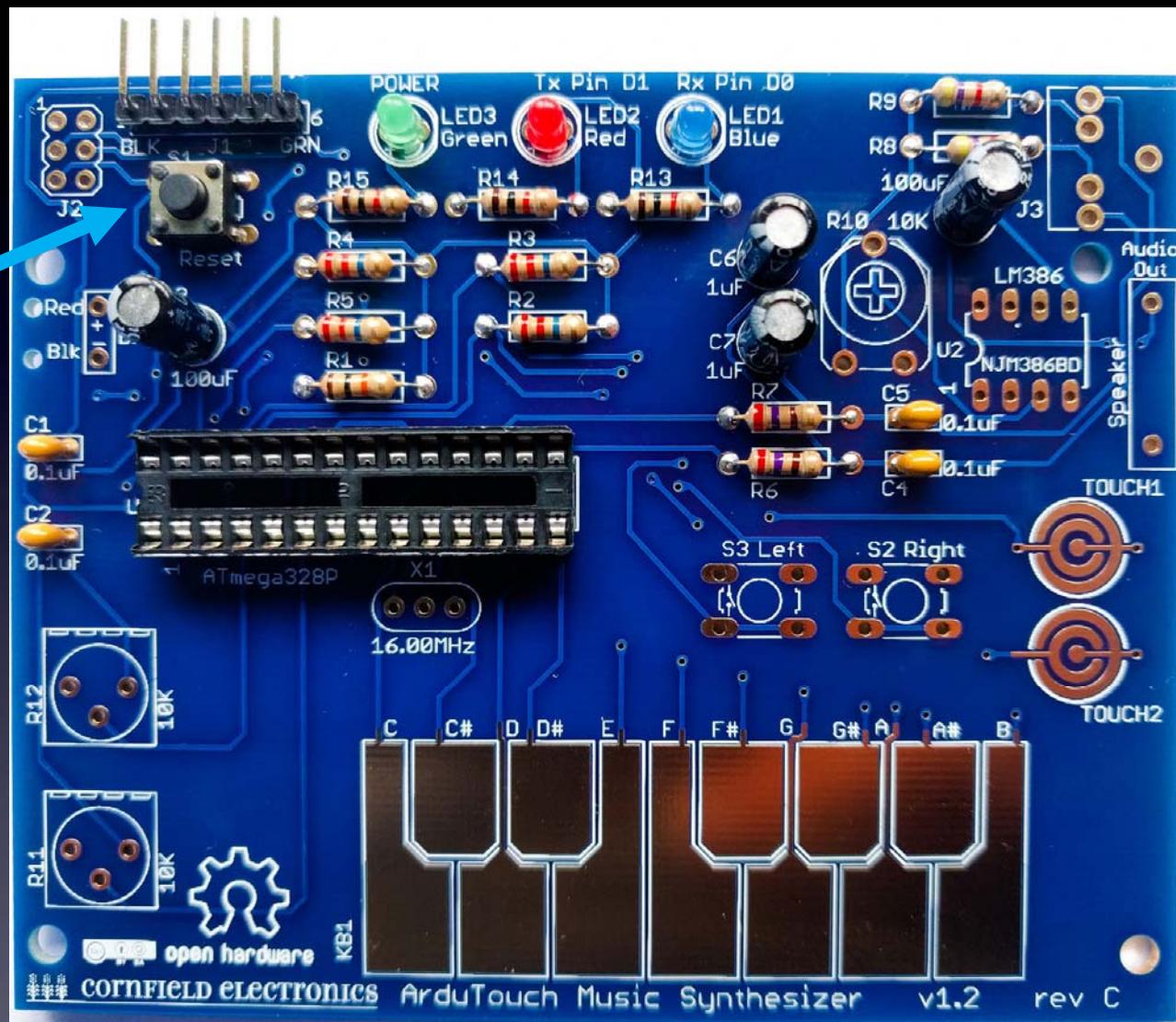
short leads  
go into the board

→ long leads sticking out from  
board



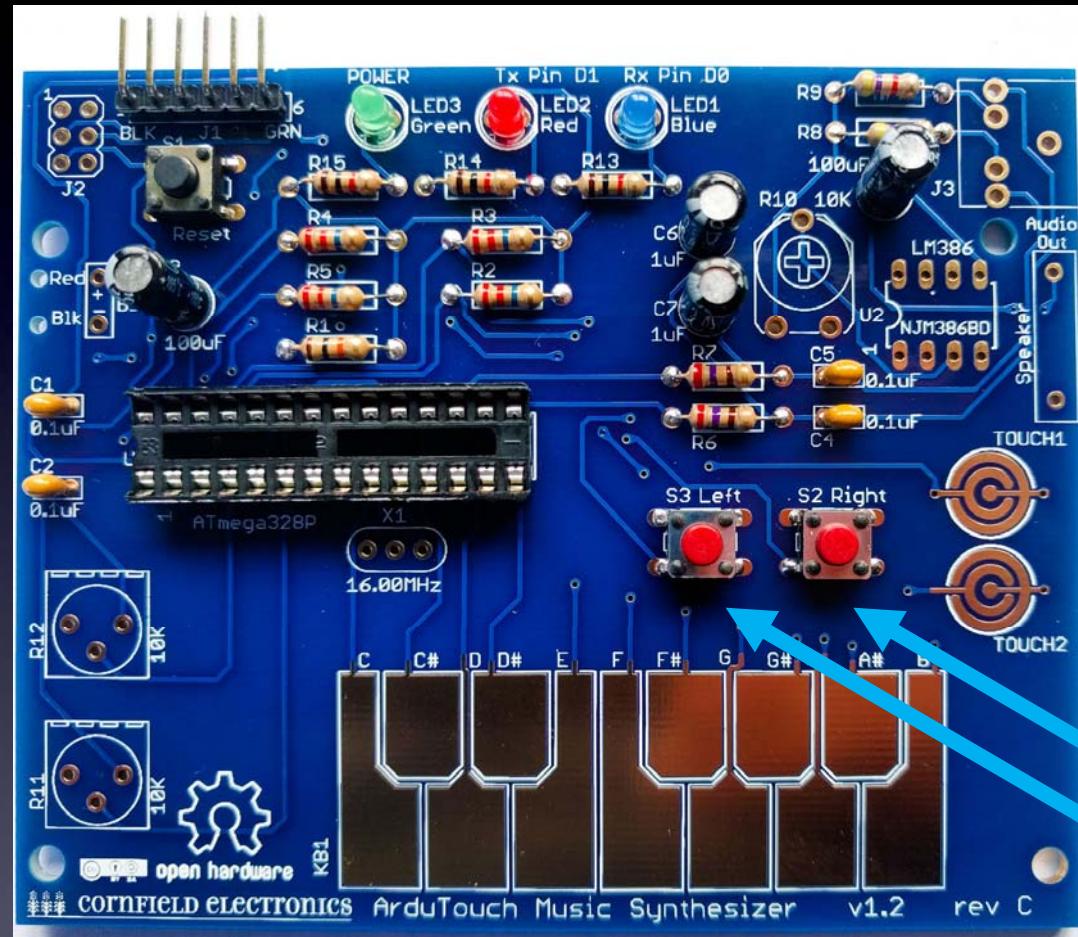
J1

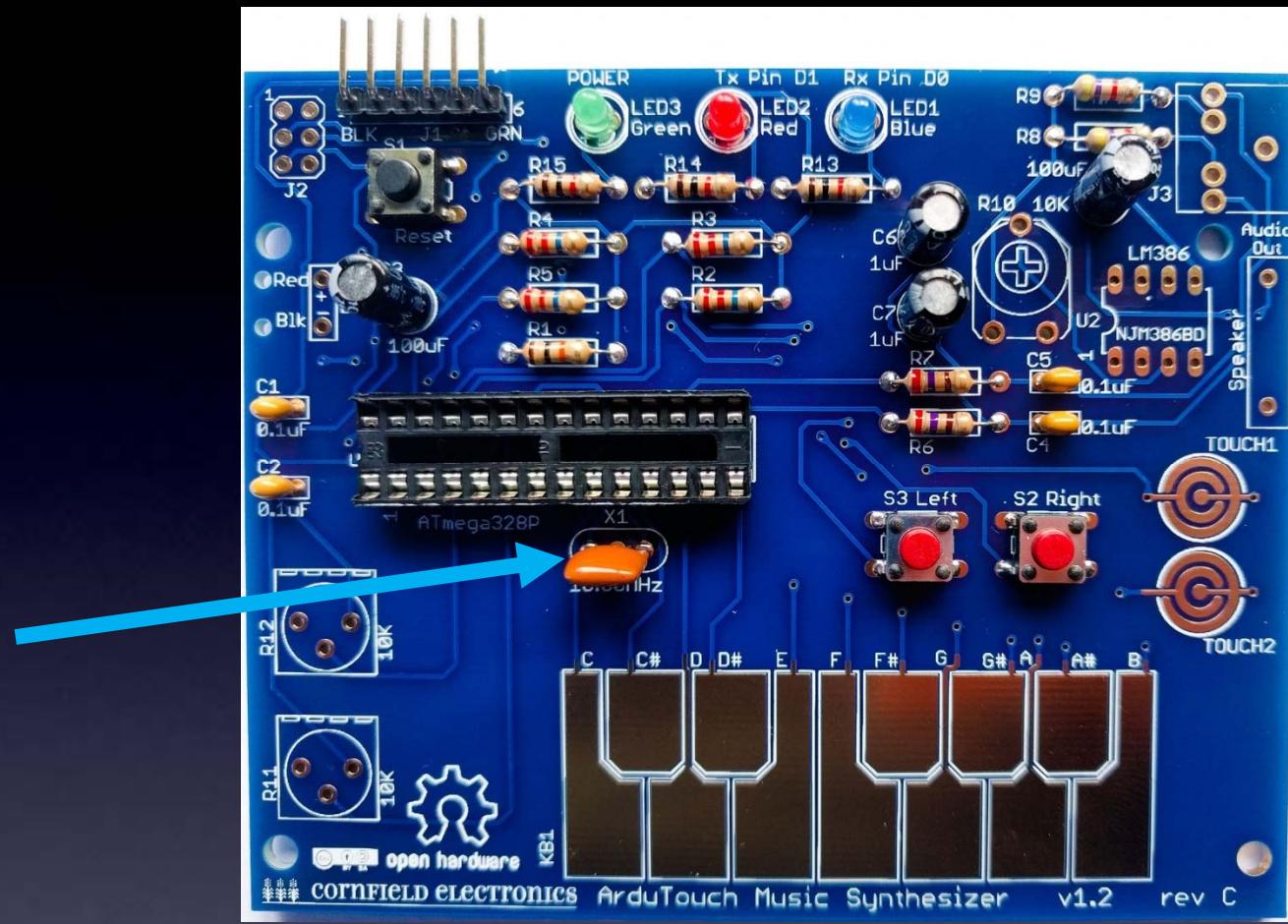




S1: black Reset button

# S2, S3: Red buttons



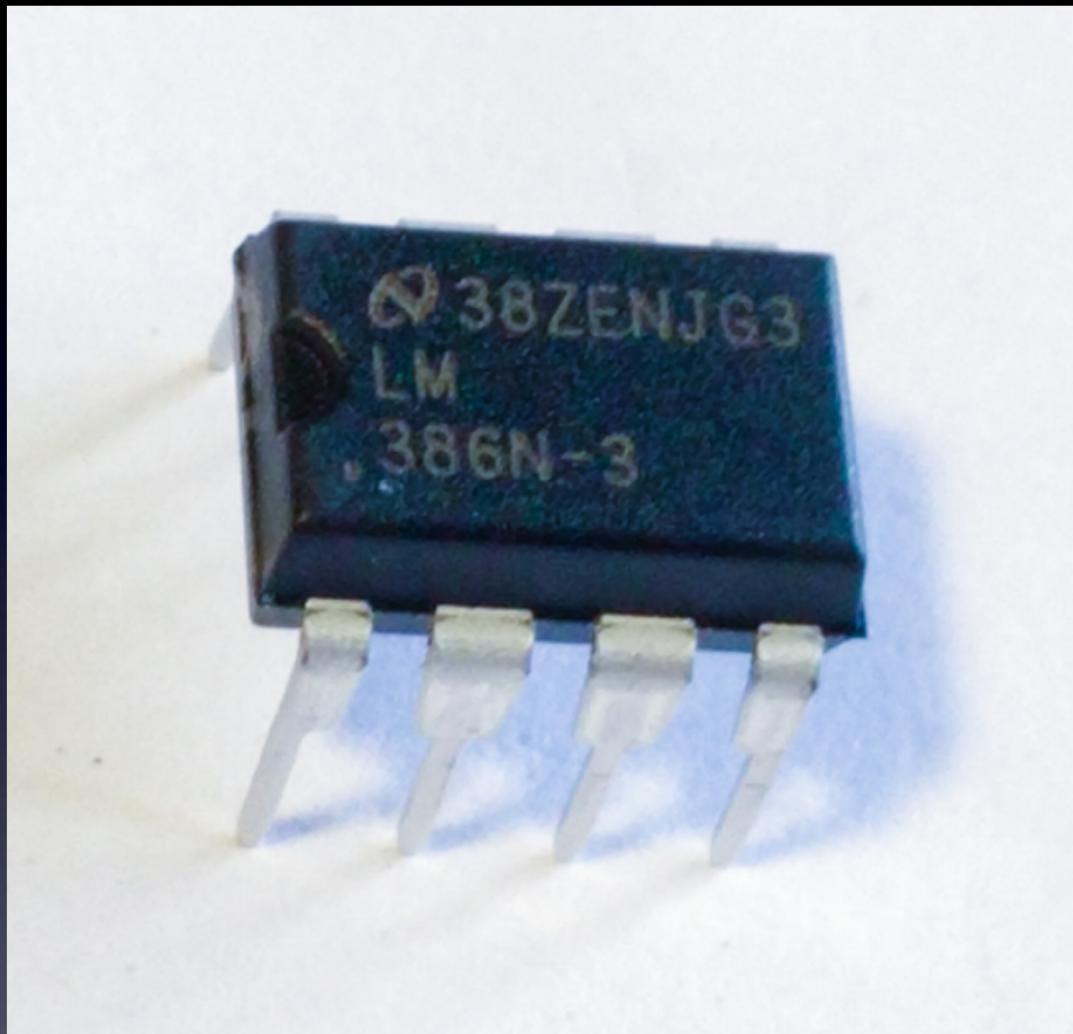


# X1

The orientation of X1 does not matter.

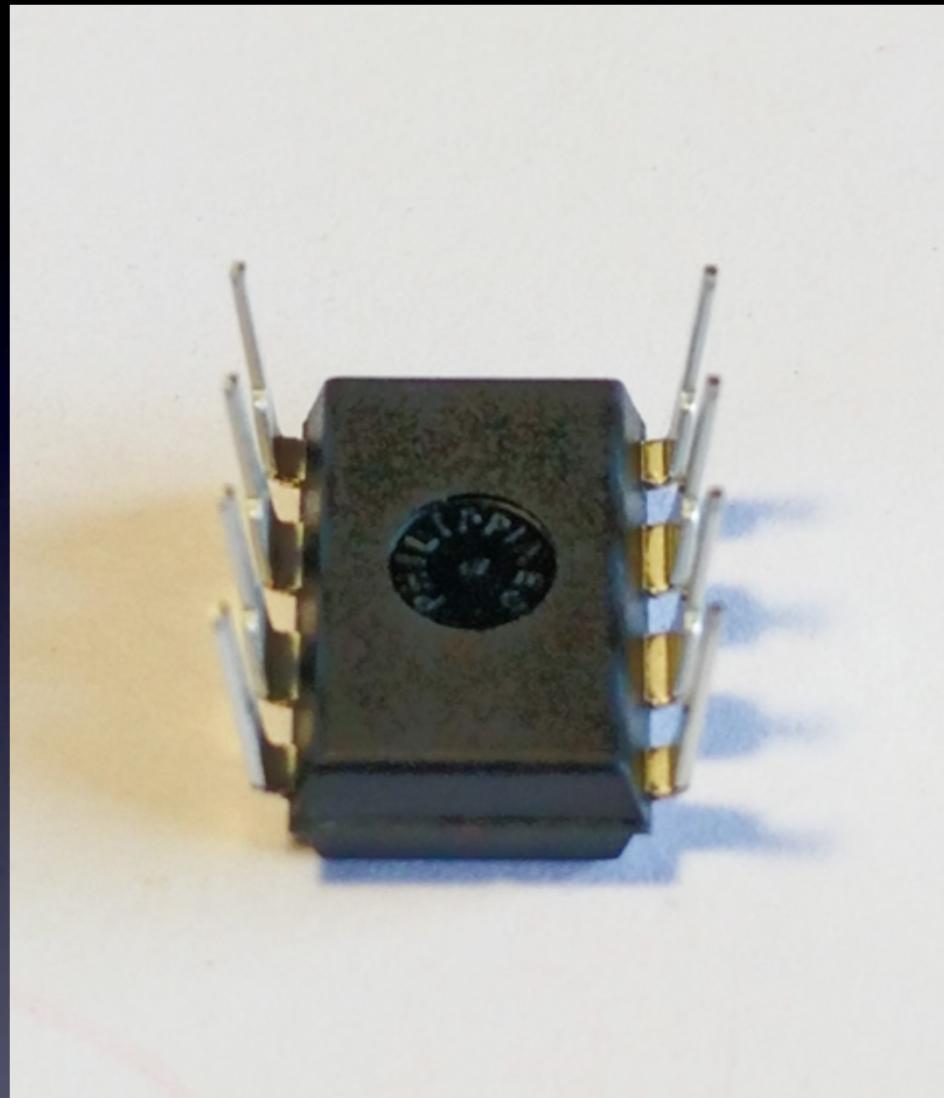
(Note: X1 may be yellow or blue)

**U2**



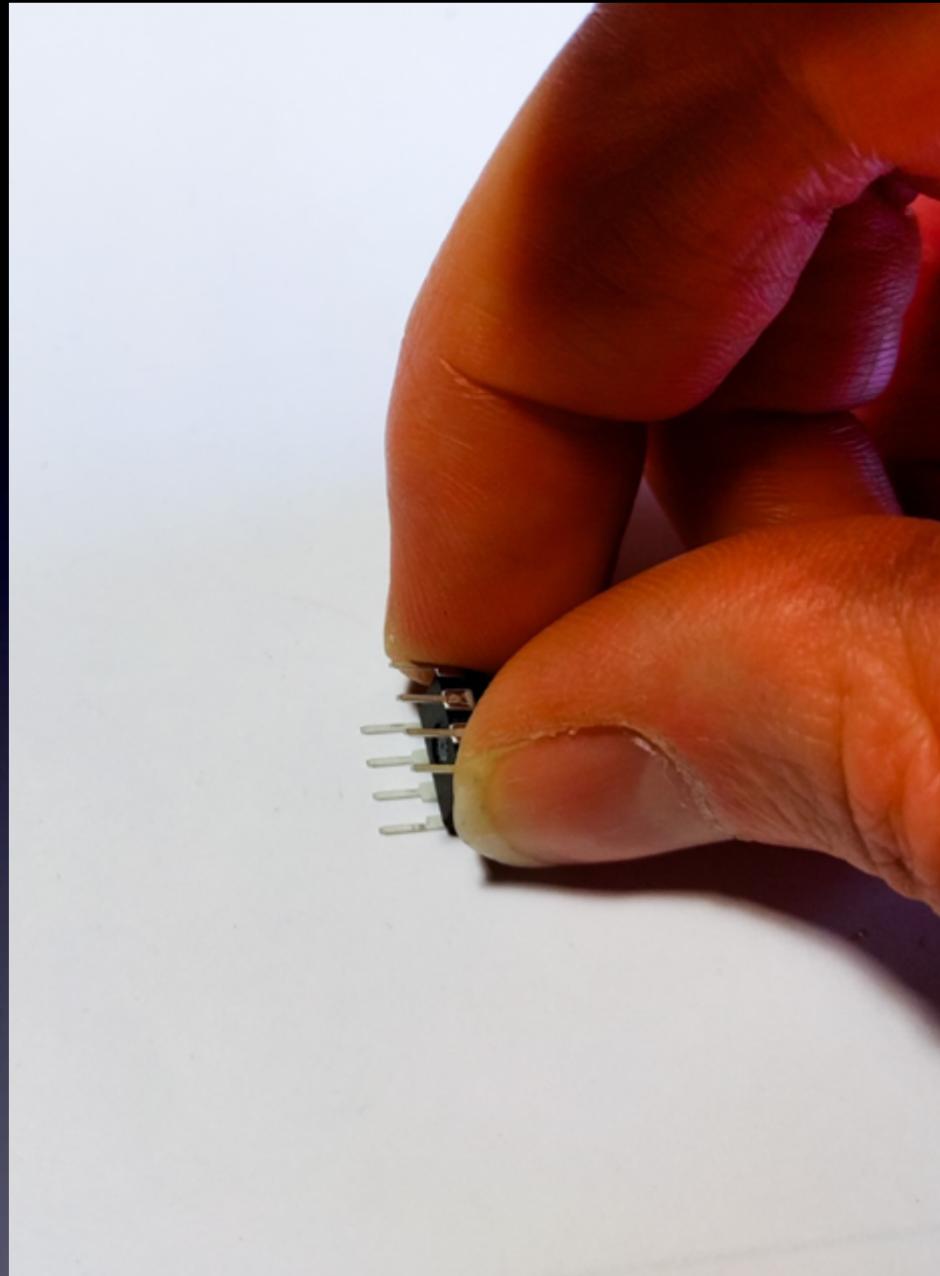
**Note: this chip may be marked differently,  
but “386” will be printed on it somewhere.**

**U2**



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

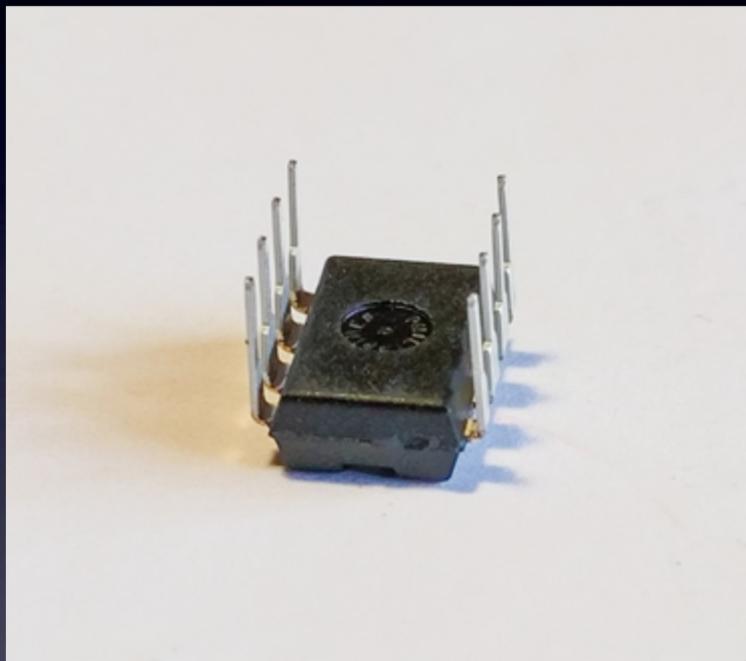
# U2

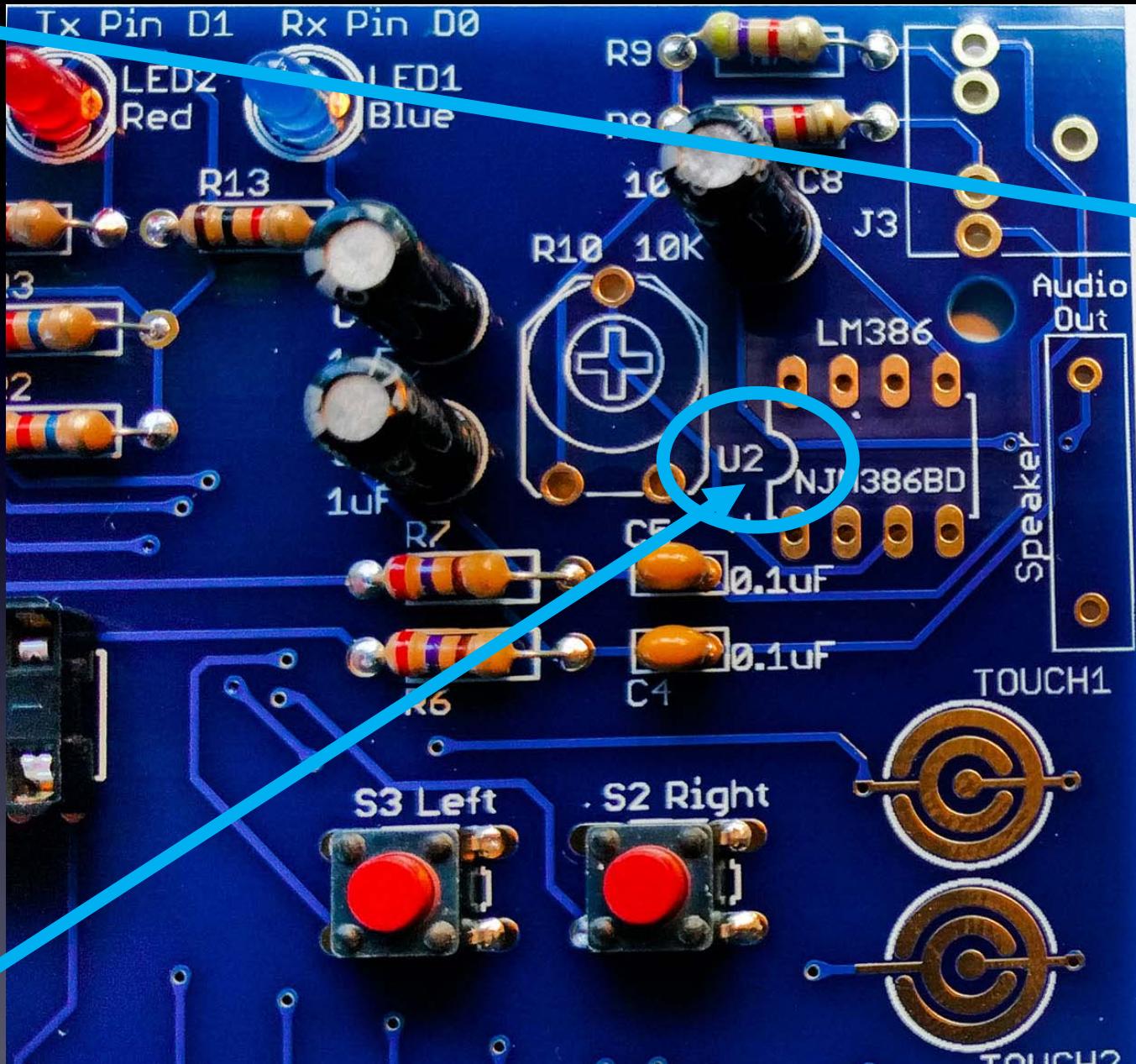


**We need the pins bent straight and parallel.  
Use your work table to (gently) bend the leads.**

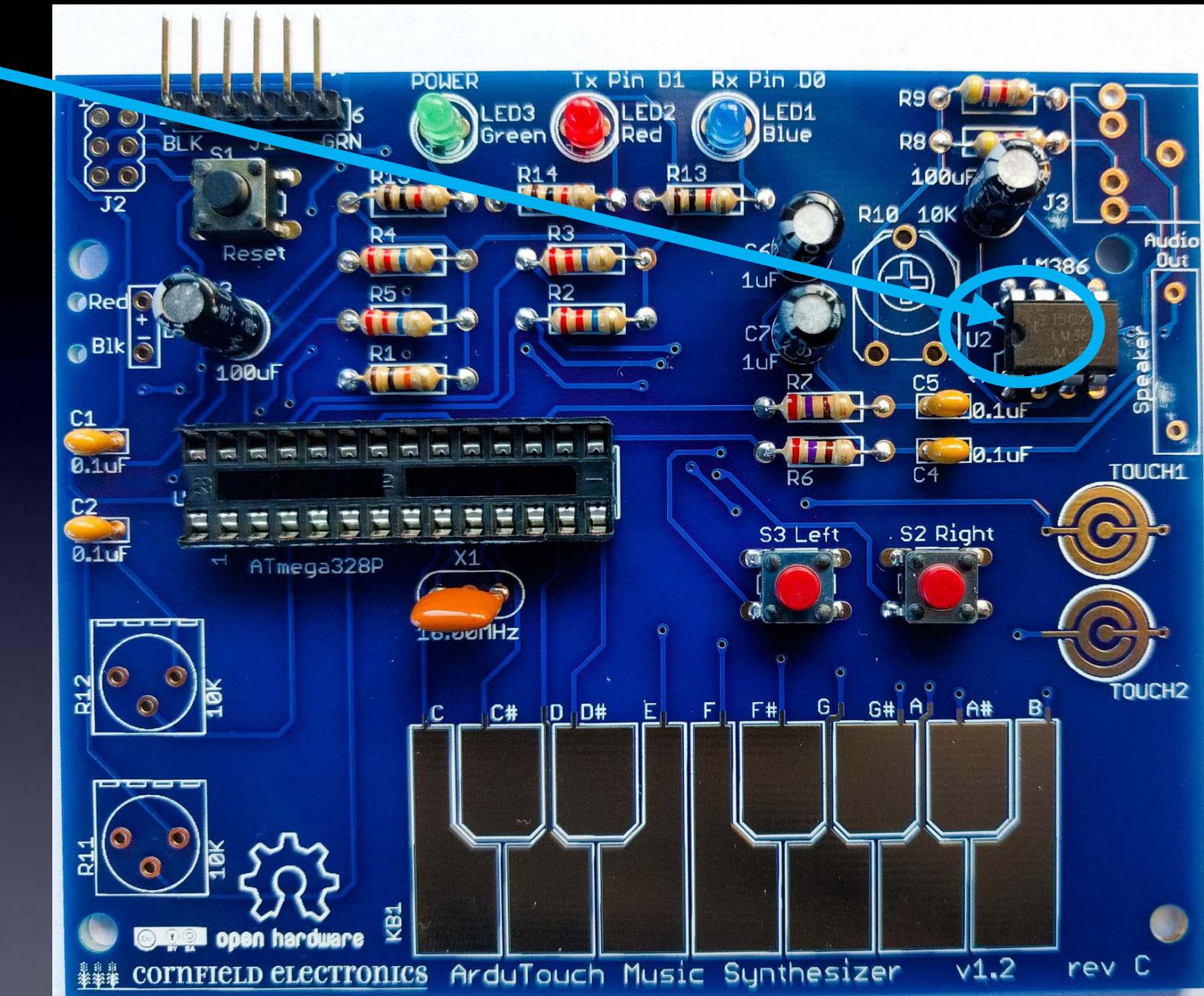
# U2

Gently  
bend leads  
so they're straight  
and parallel



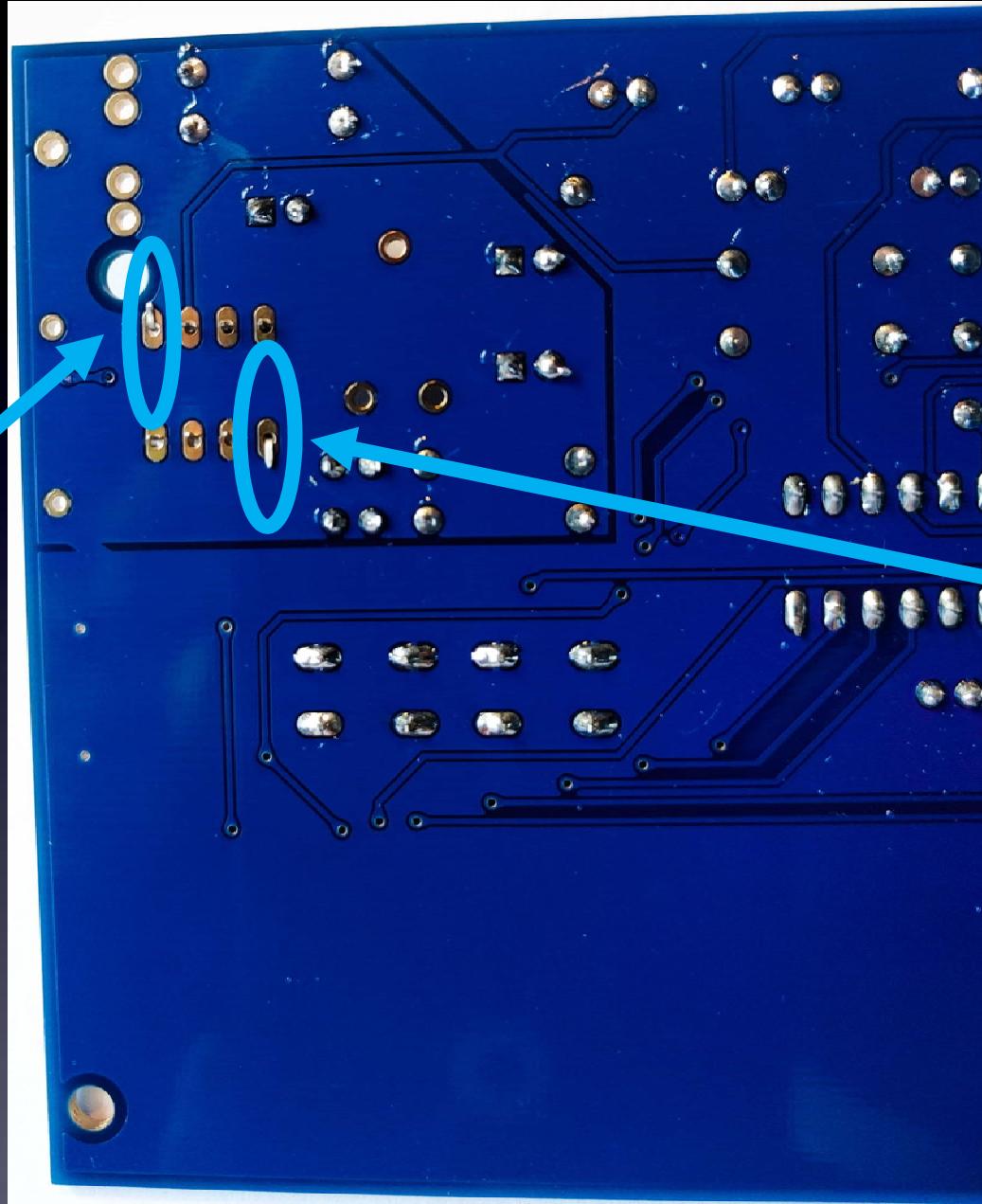


# proper orientation

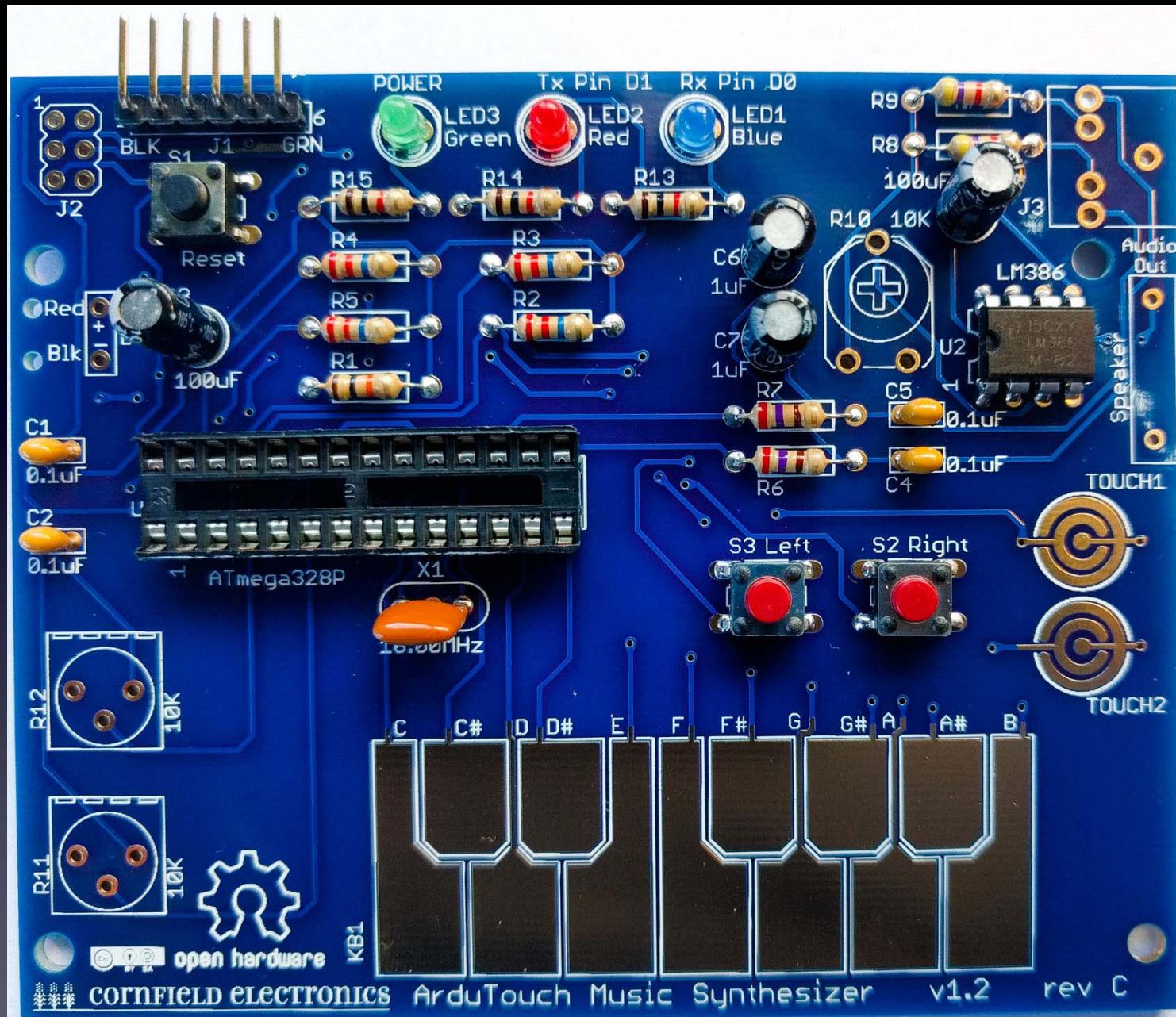


U2: inserted correctly

**U2**

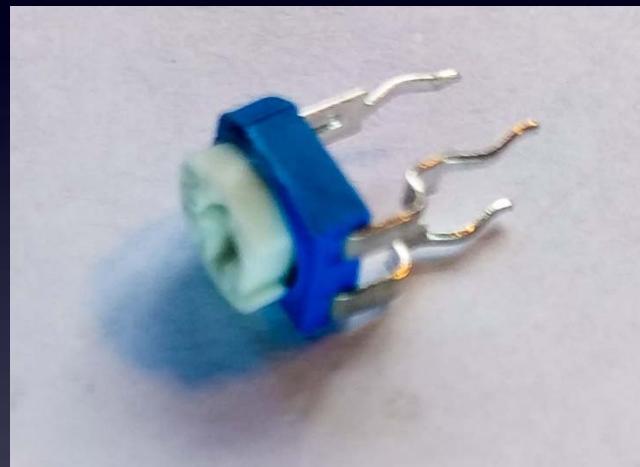


bend pins down on two corners,  
and solder all 8 leads to the board



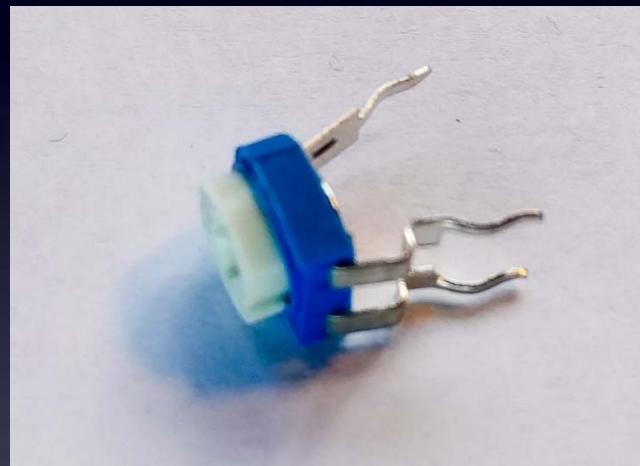
U2 – soldered to board

# R10: volume control



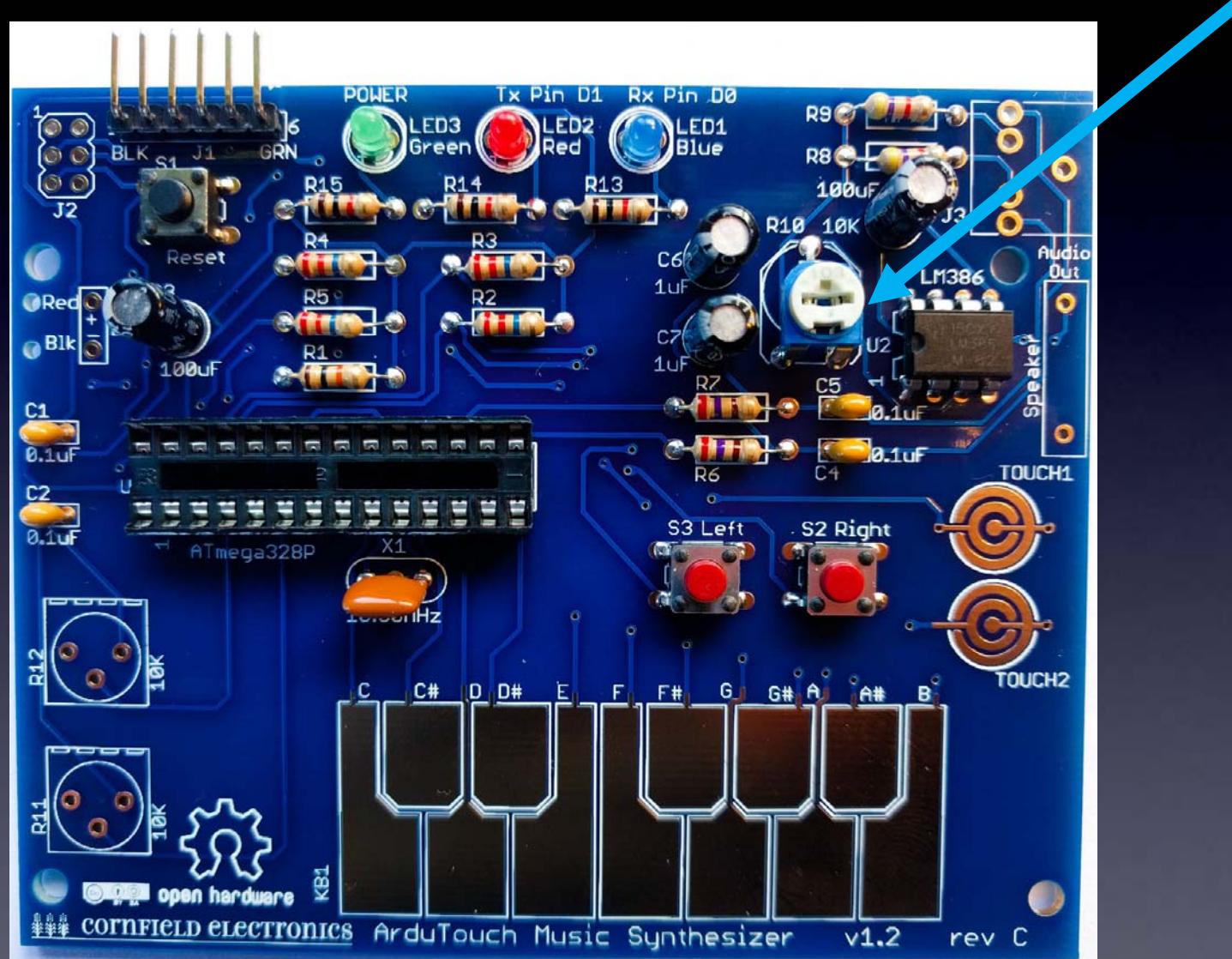
When new, the pins point straight down.

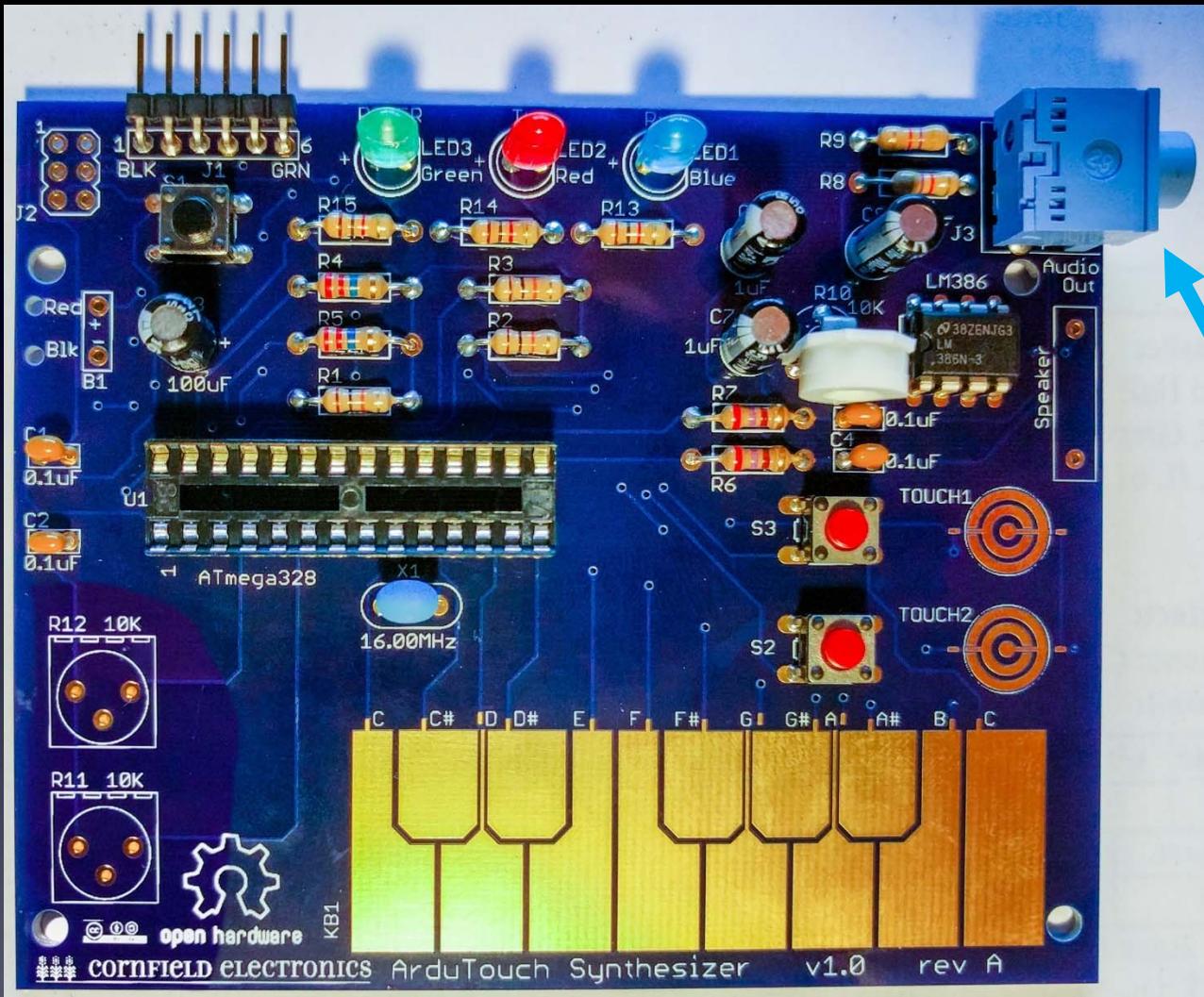
# R10: volume control



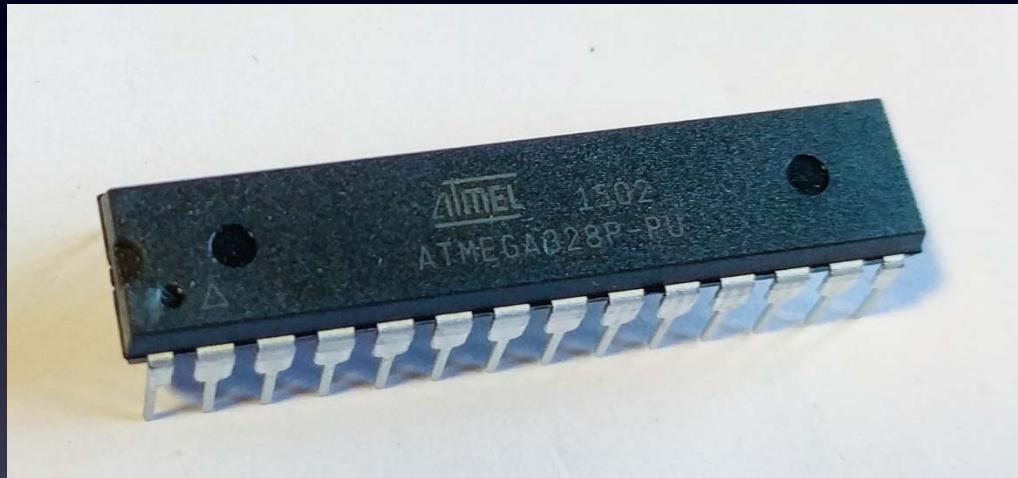
We need to bend them out a little to fit into the board.

# R10: volume control





J3: headphone / output jack



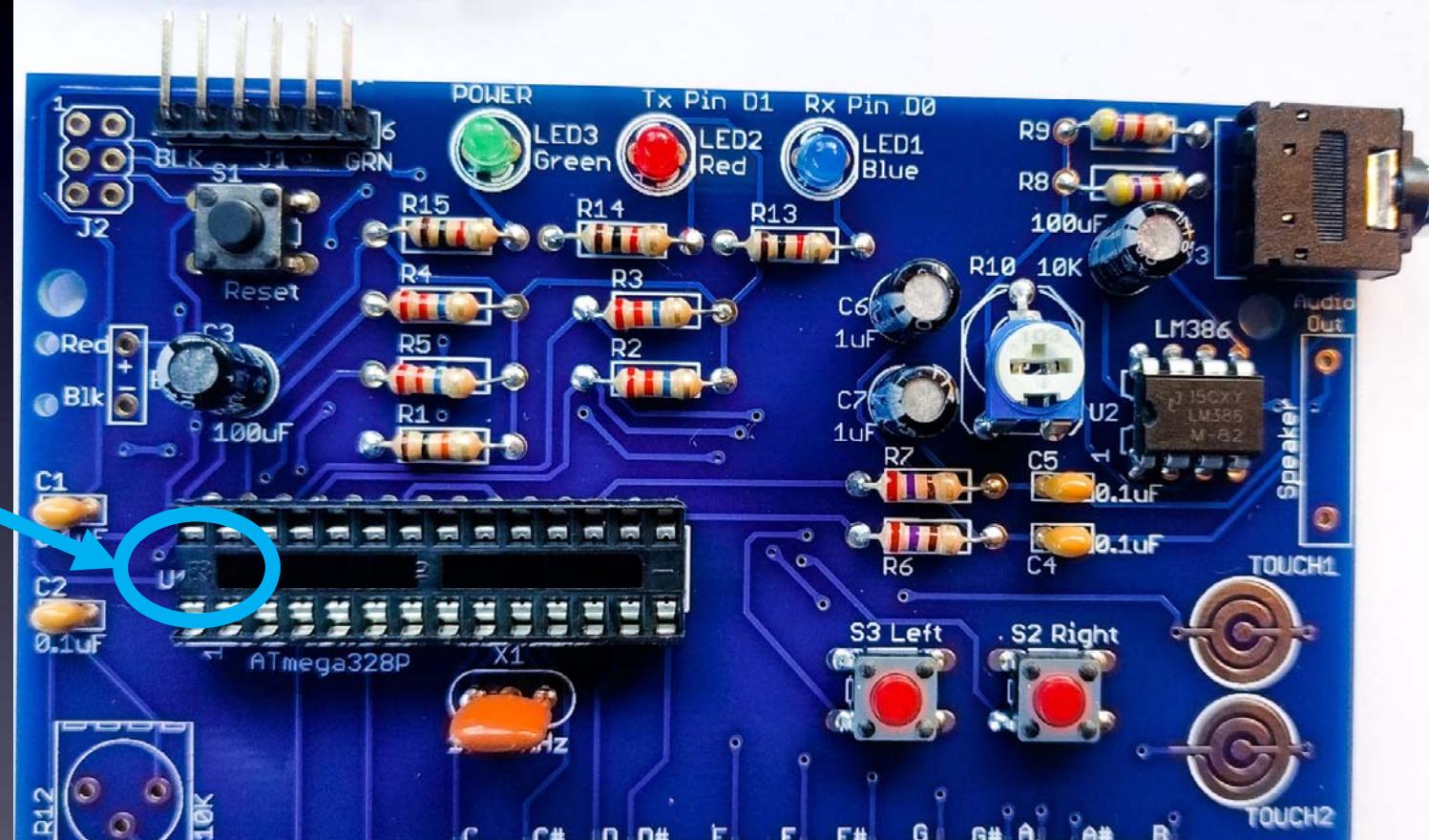
# U1: microcontroller



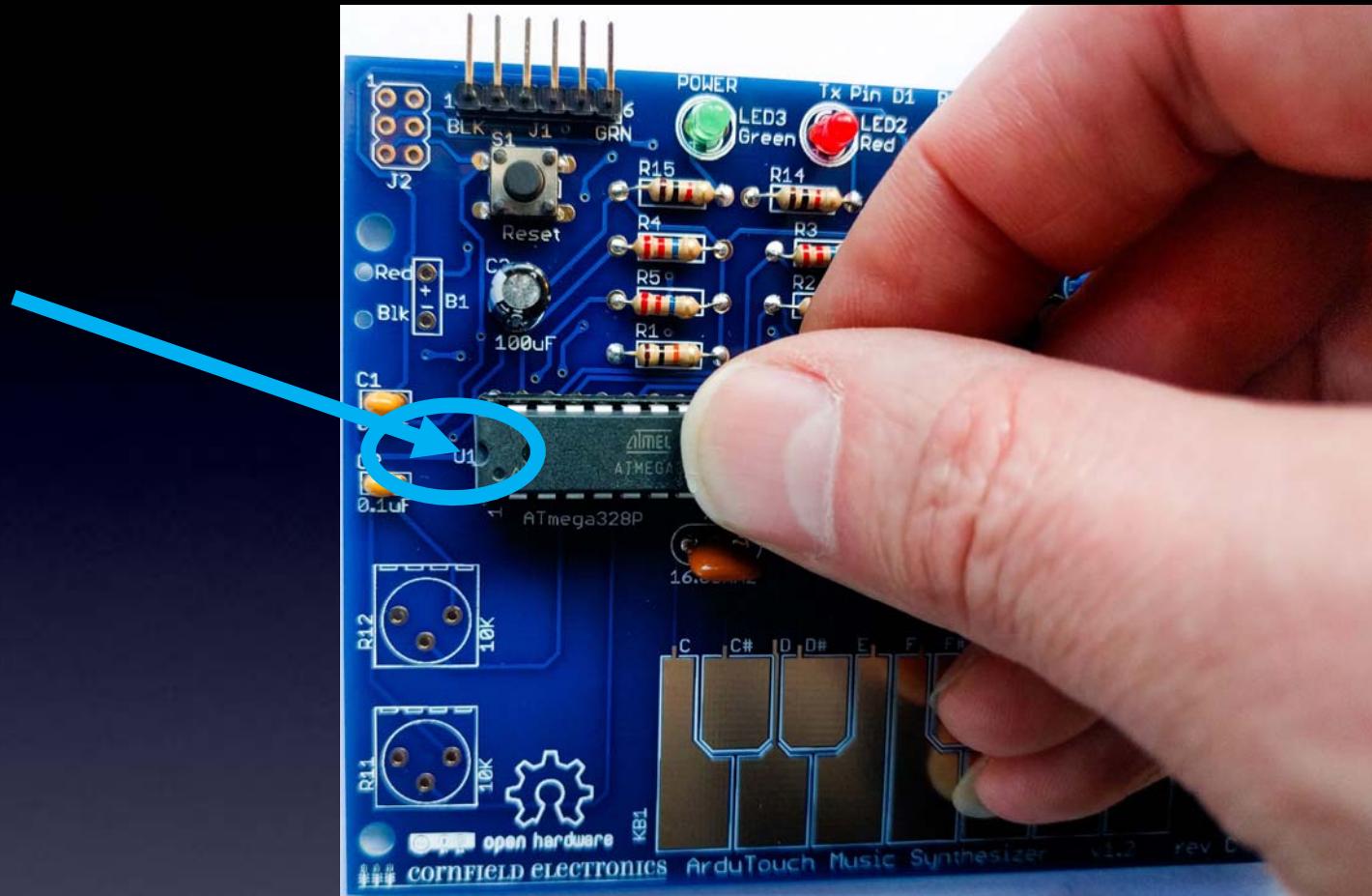
## U1: microcontroller

the kit comes with these pins already bent straight and parallel

proper  
orientation



U1: microcontroller



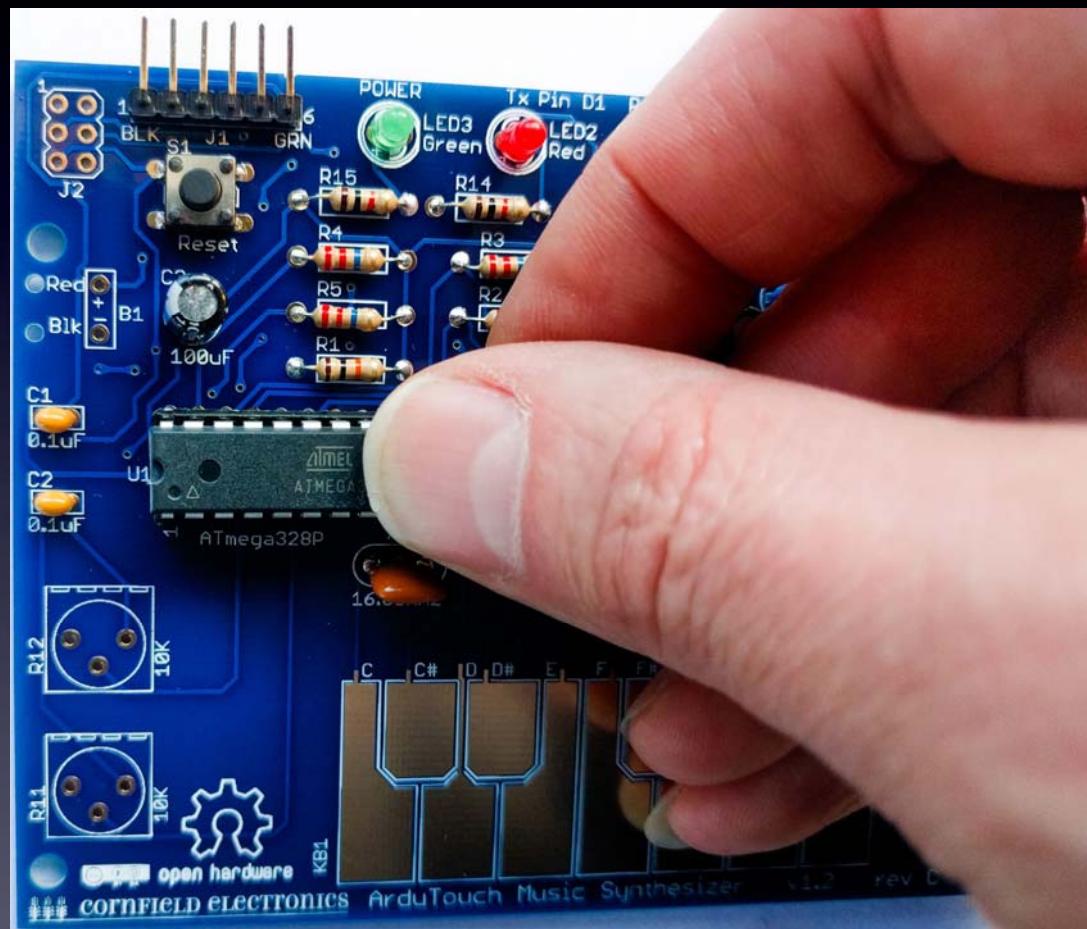
## U1: microcontroller

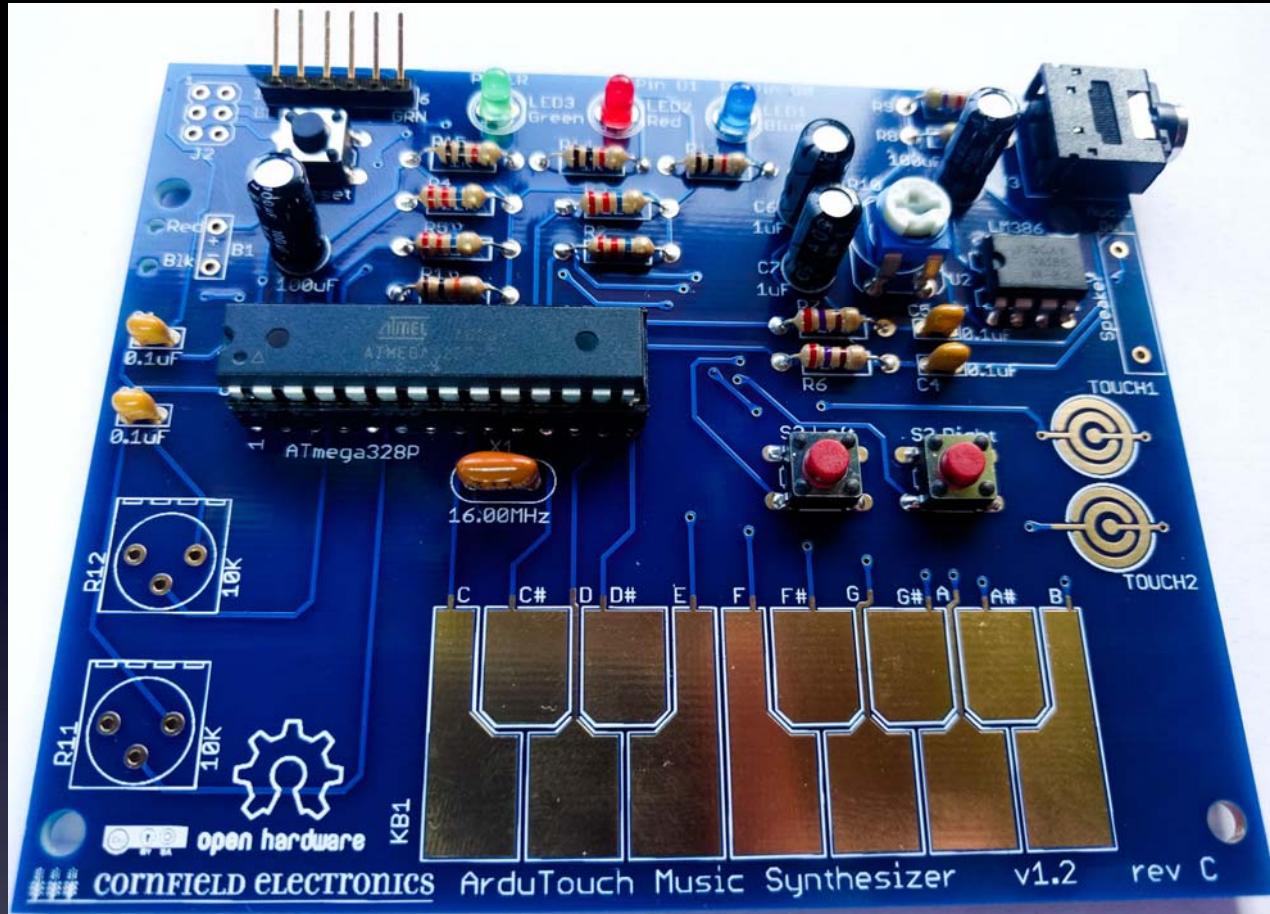
make sure each pins rests in its hole in the socket  
→ with the proper orientation

**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.)**

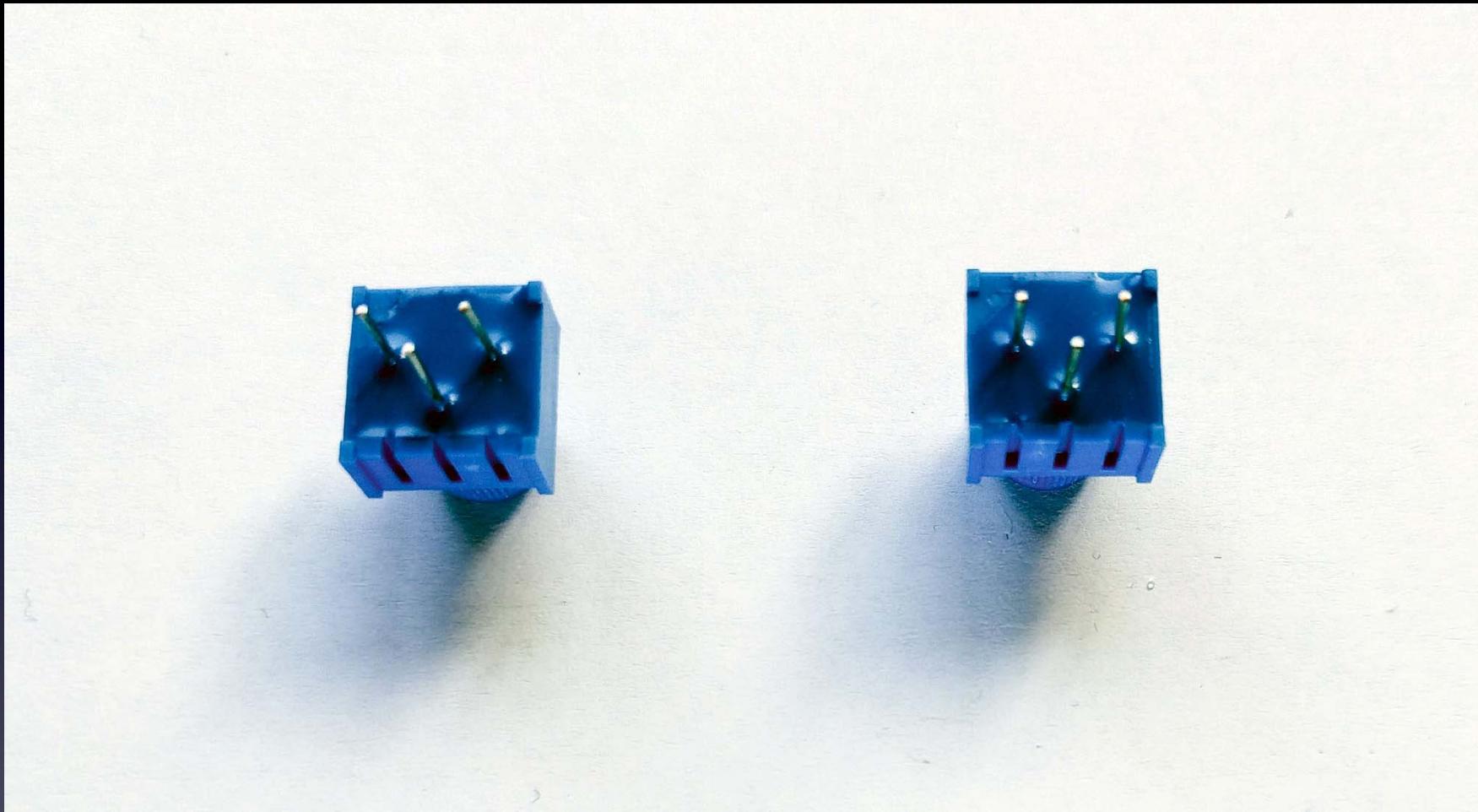




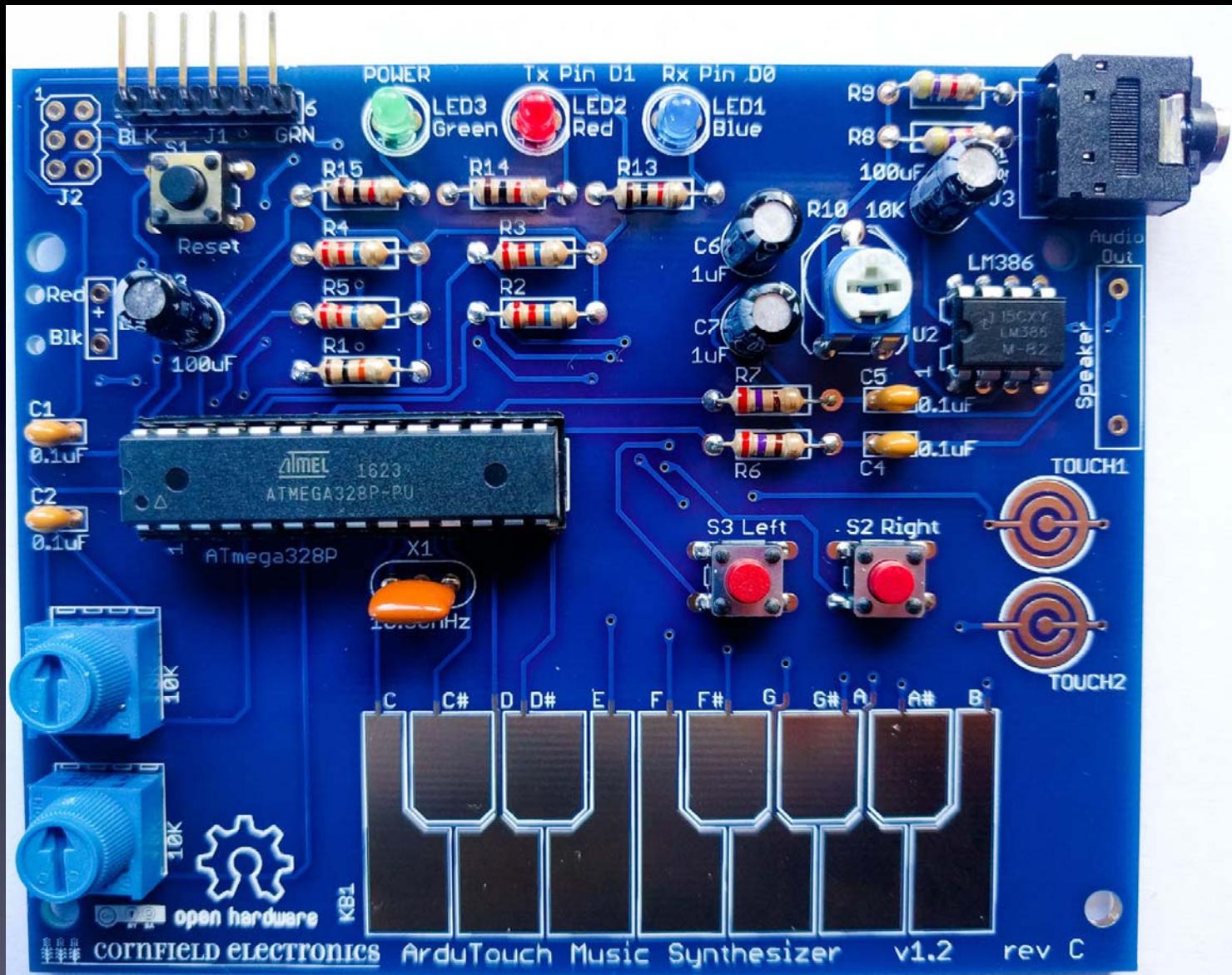
# U1: microcontroller

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



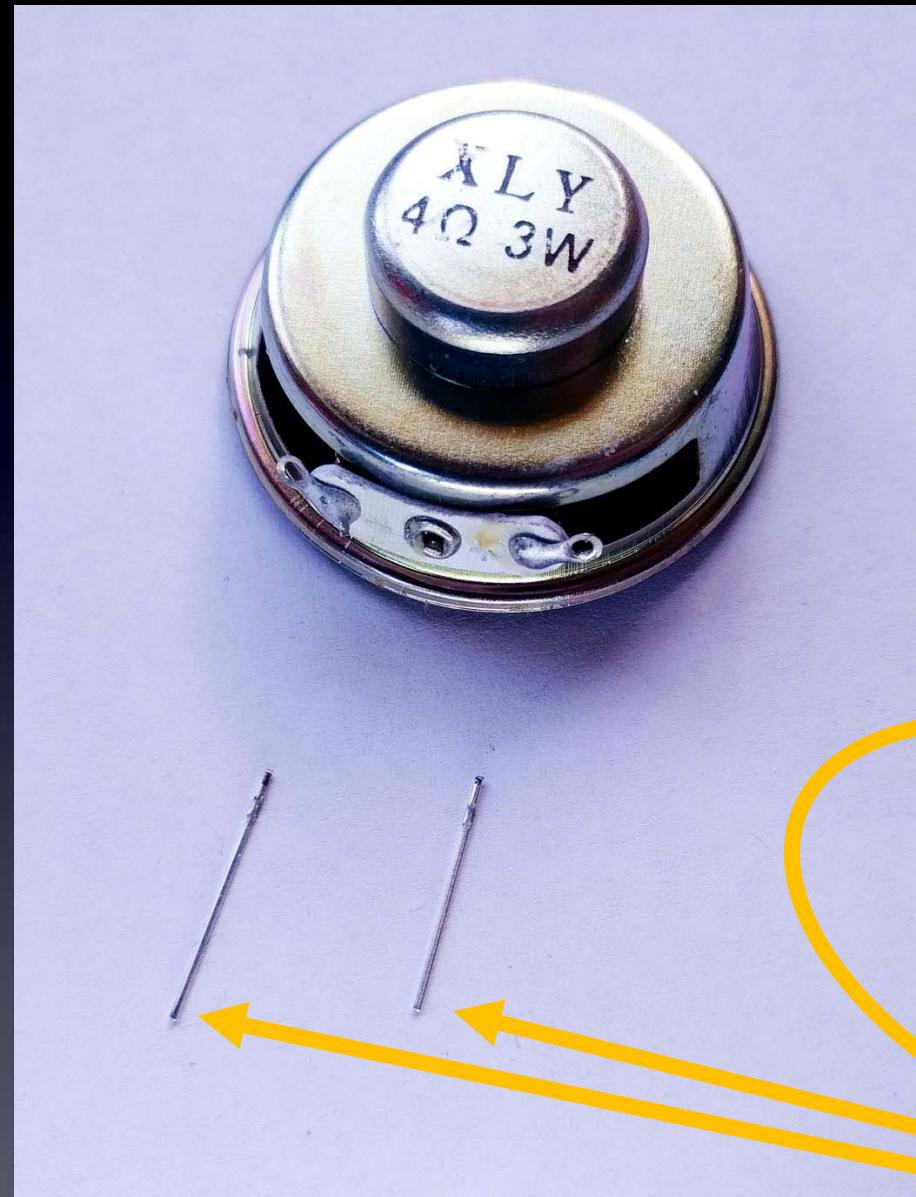
# Speaker

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



**Speaker**

We'll add leads  
to the speaker



Speaker

from the LEDs

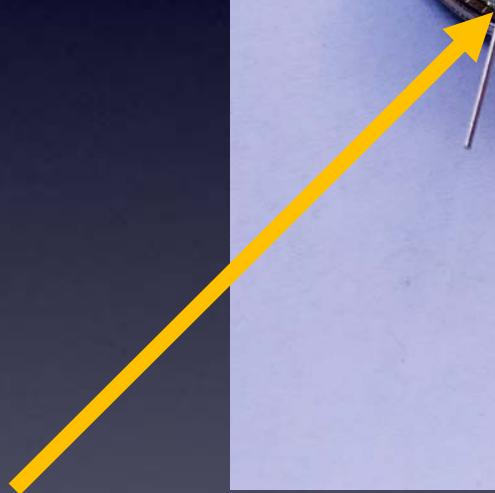
**Tin one side  
of each lead**

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

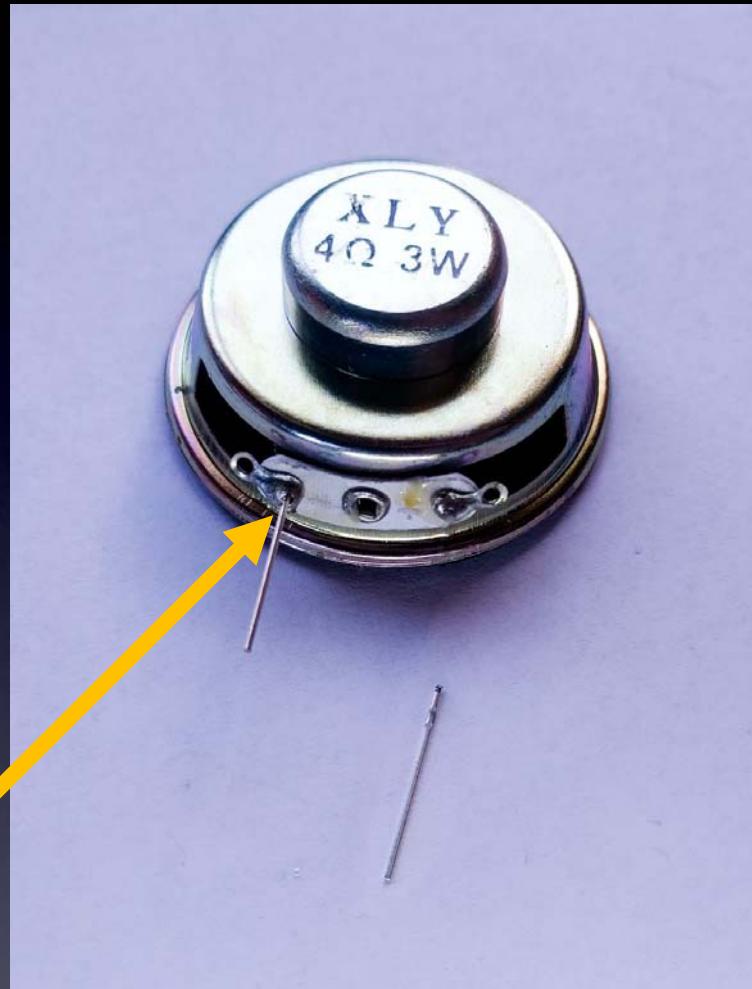


**Speaker**

**Solder one lead  
to speaker**

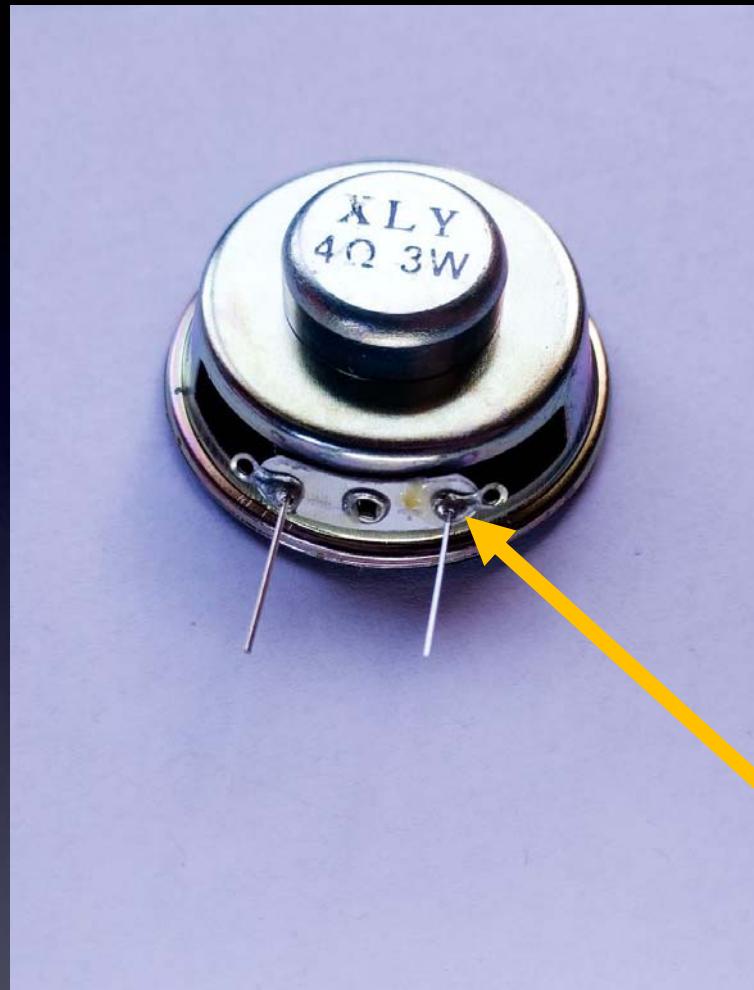


**Notice the  
correct place  
to solder the wire**



**Speaker**

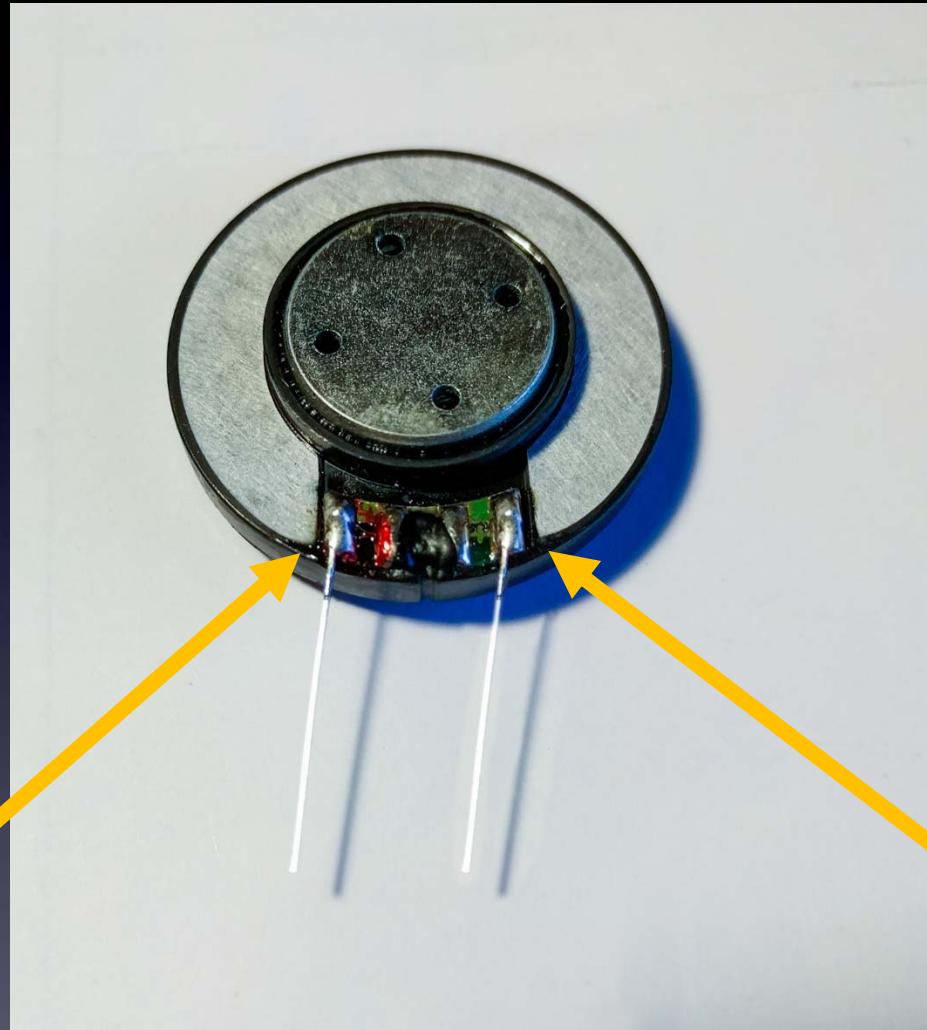
**Solder next lead  
to speaker**



**Speaker**

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

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



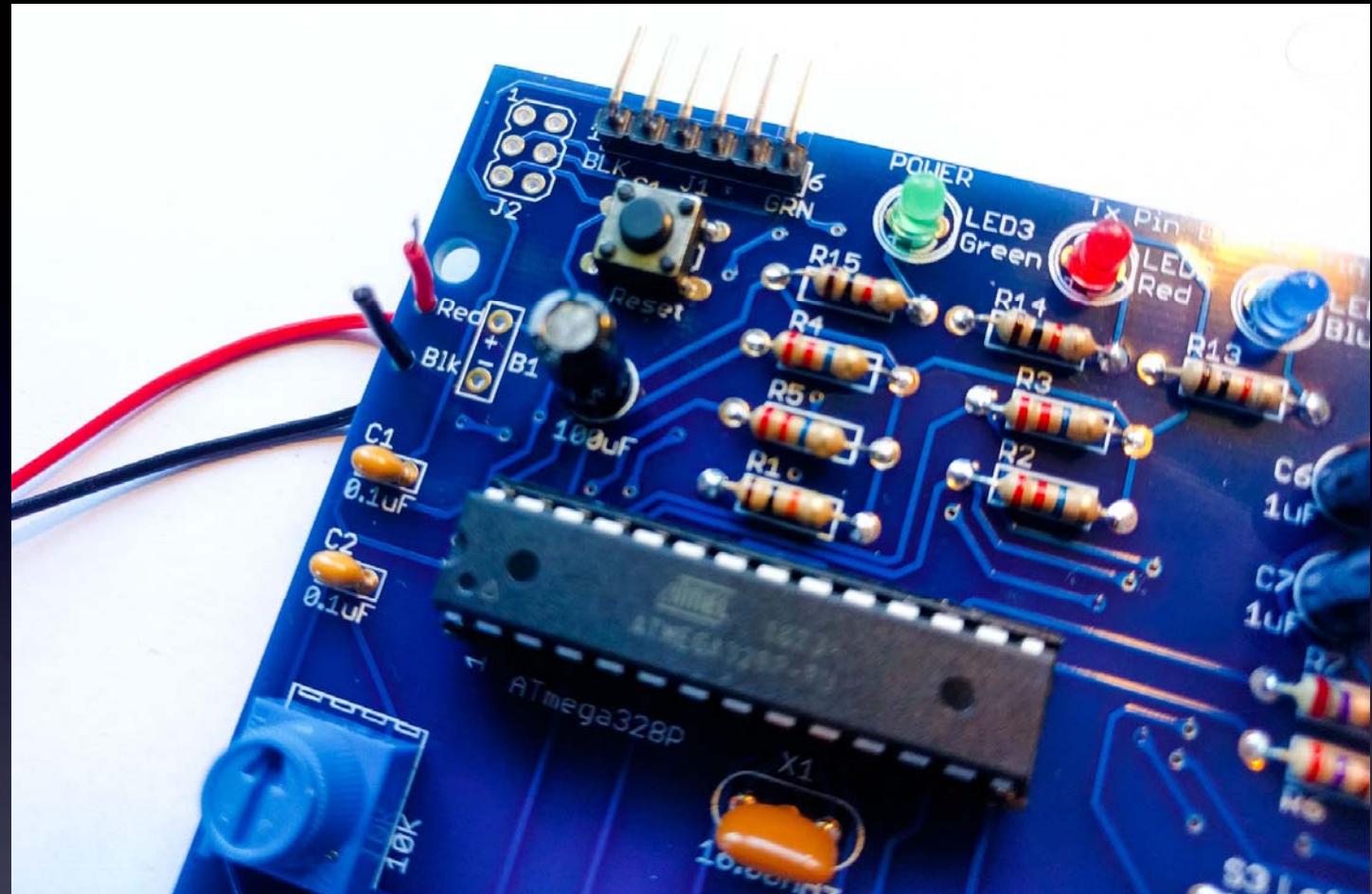
**Notice the  
correct place  
to solder the wires**

# **Speaker**

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



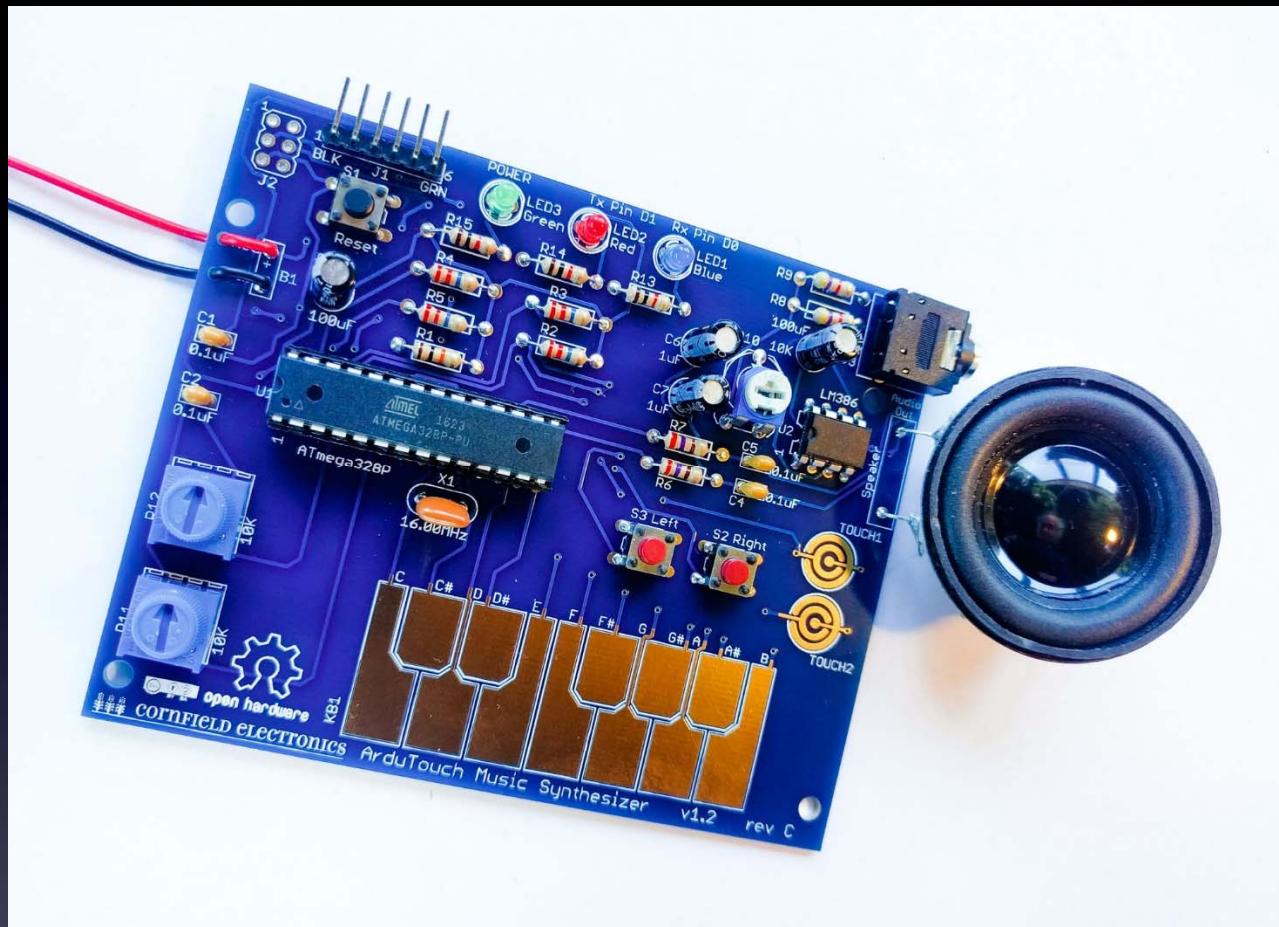
# Speaker



**Push battery pack  
leads through holes.**

**Make sure Red and Black go  
through their correct holes!**

**Battery pack**

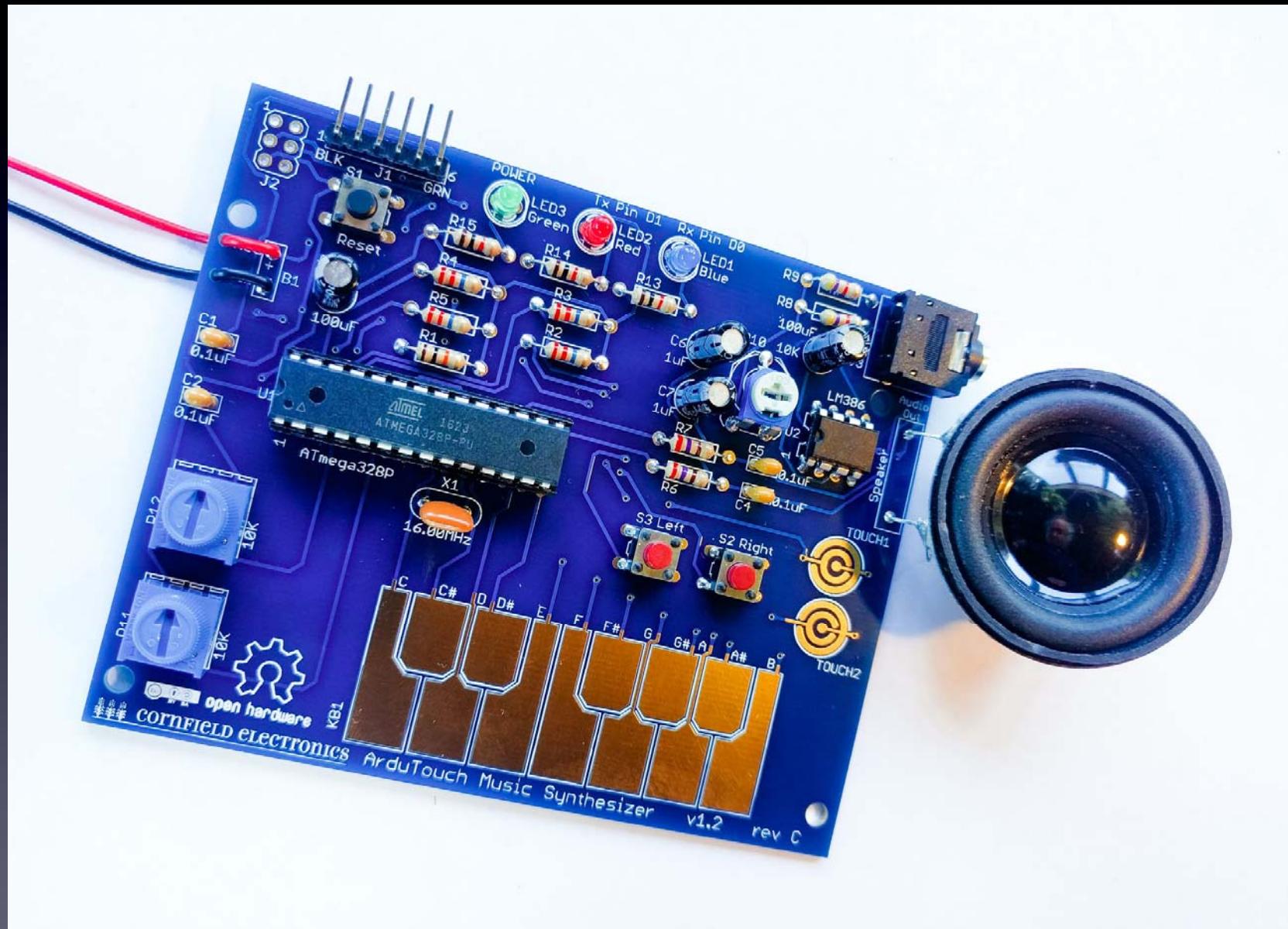


**Loop one lead into its pad,  
and solder.**

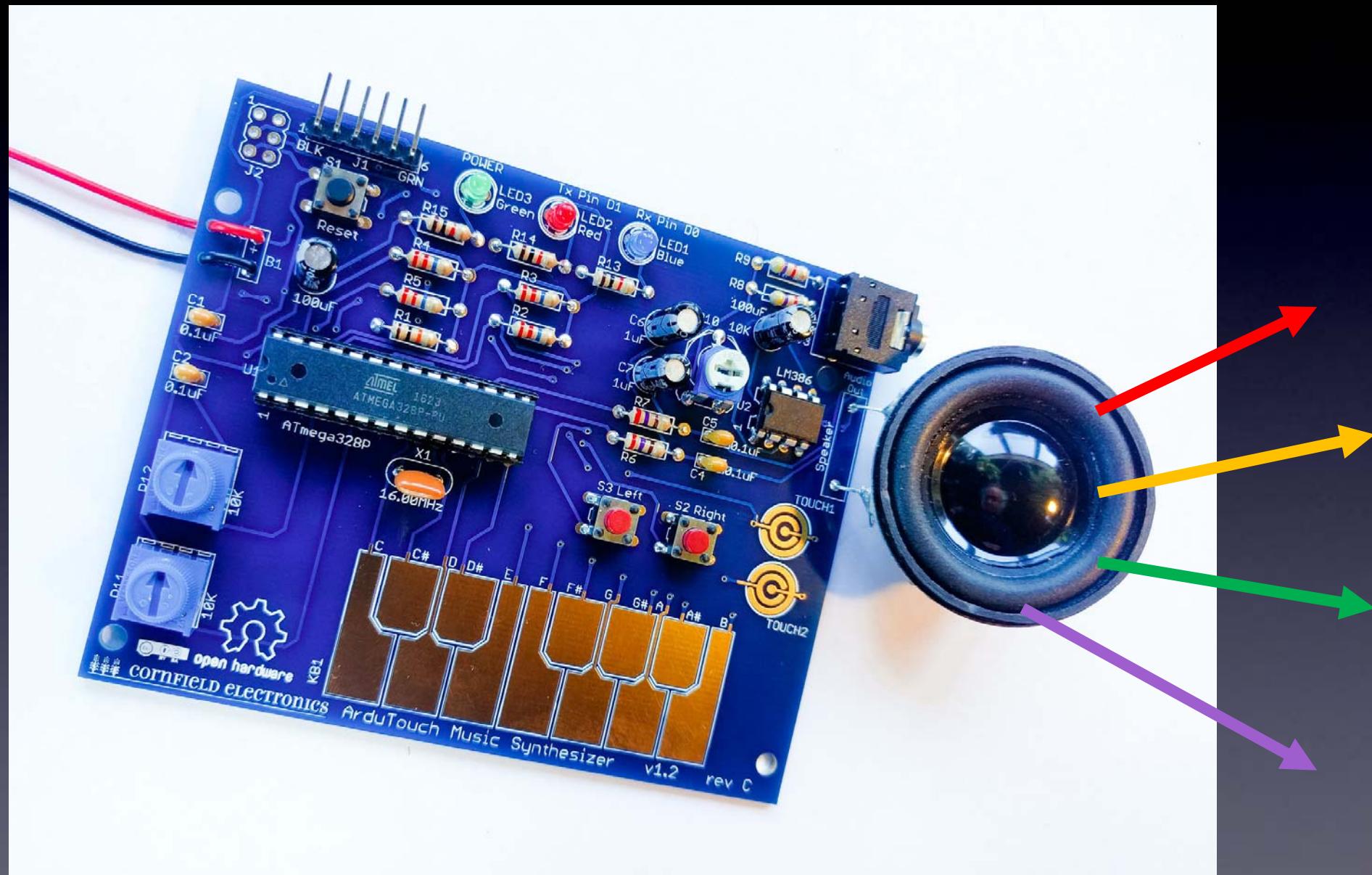
**Then loop the other lead into its pad,  
and solder.**

**Battery pack**

# Done!



# Let's make noise!

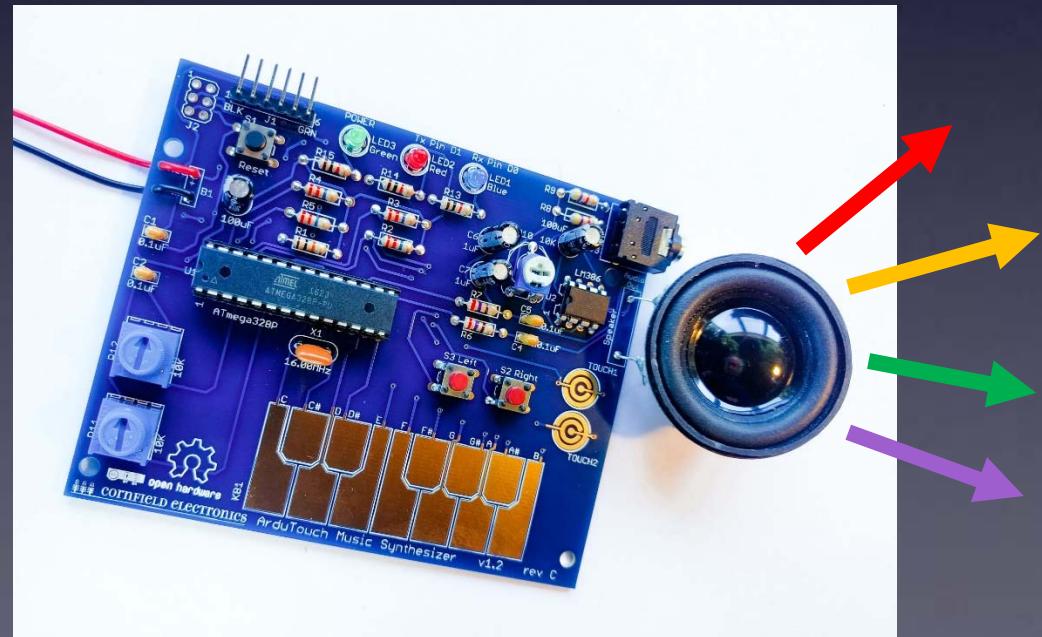


# Let's make noise!

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!

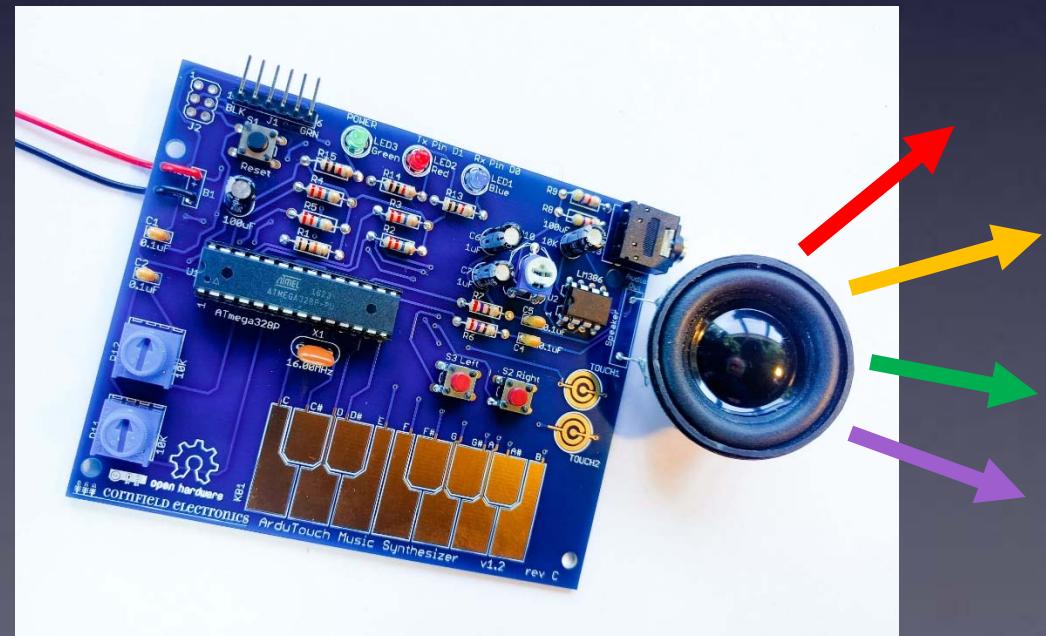


# Let's make noise!

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...

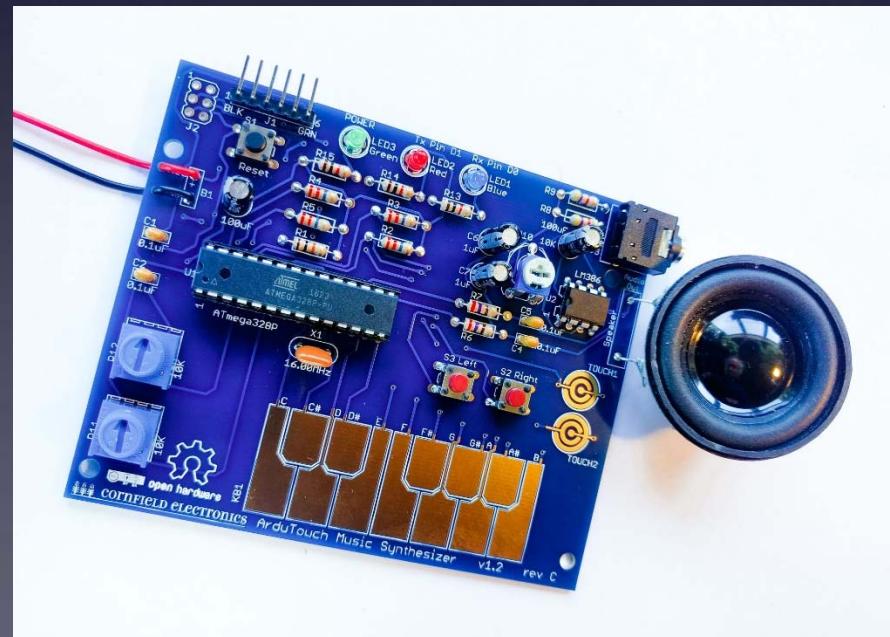


# Re-programming the ArduTouch

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 synth sketch and the ArduTouch Arduino library  
[<http://cornfieldelectronics.com/cfe/projects.php#ardutouch>](http://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>>**



# Arduino

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



# Re-programming the ArduTouch

Second:

Download and install the ArduTouch Arduino library

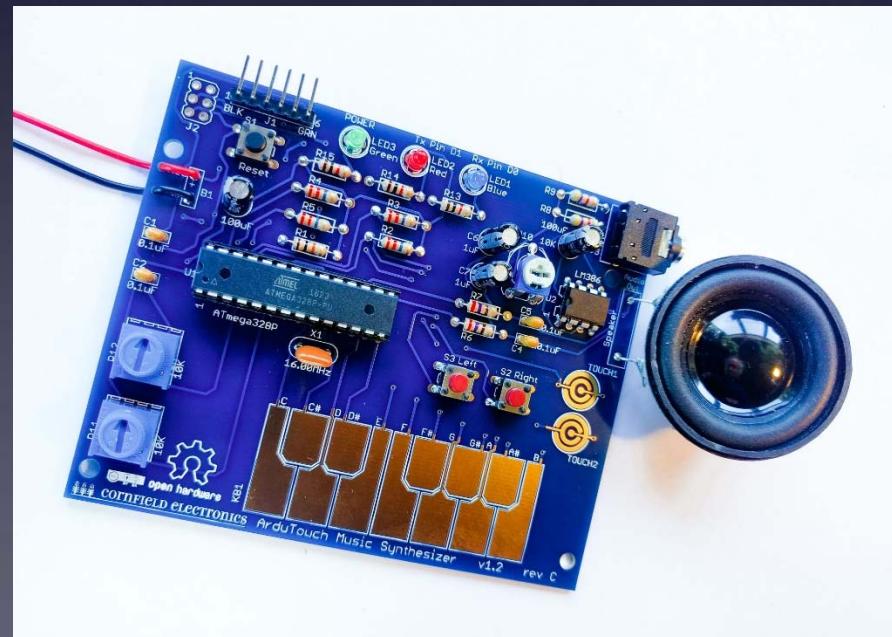
<<http://cornfieldelectronics.com/cfe/projects.php#ardutouch>>

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“



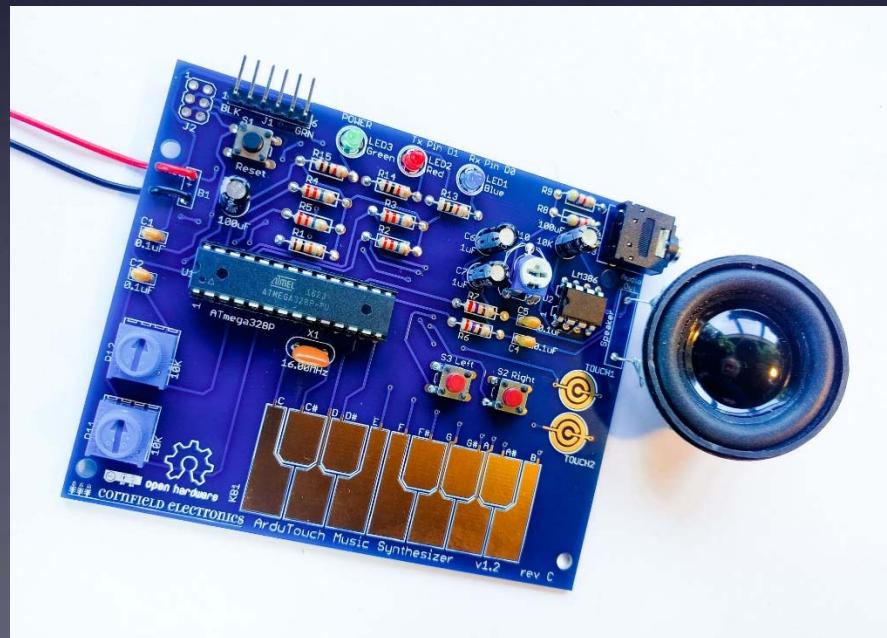
# Re-programming the ArduTouch

Third:

Download ArduTouch synth sketches

<<http://cornfieldelectronics.com/cfe/projects.php#ardutouch>>

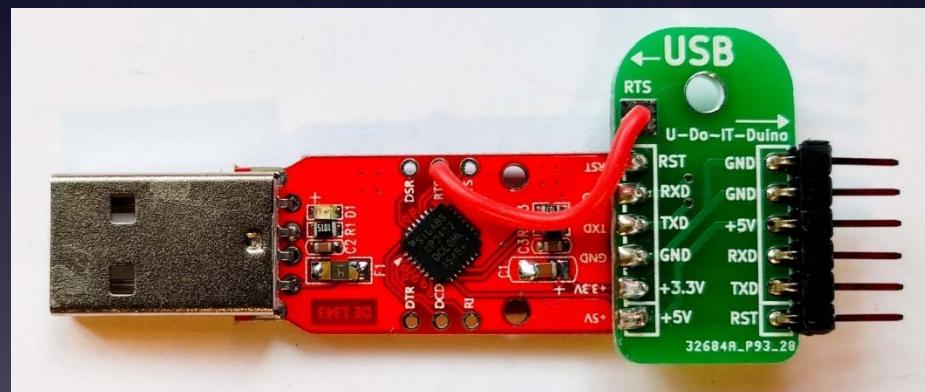
Store them on your computer anywhere you like.



# Connecting your ArduTouch to your computer

USB-Serial adapter cable

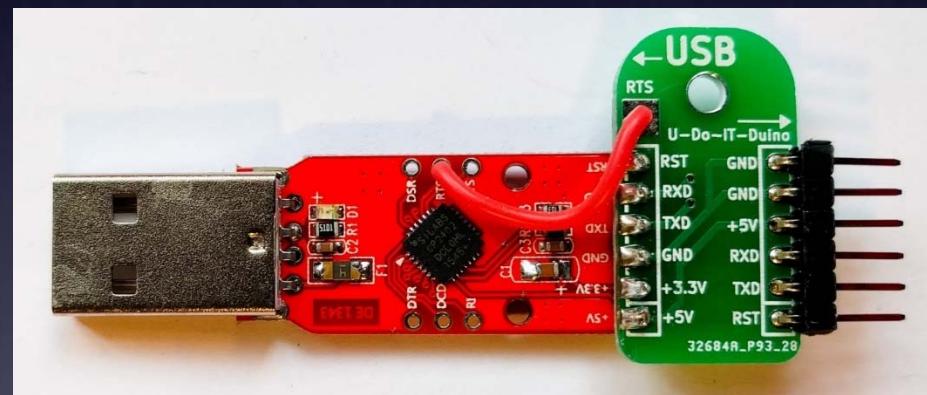
Ones I have available look something like this:



# Connecting your ArduTouch to your computer

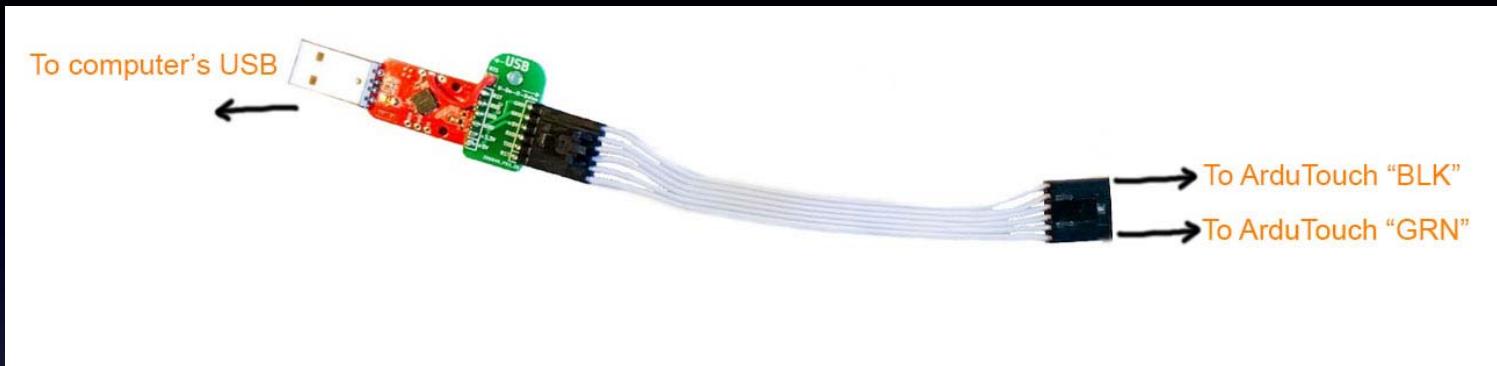
USB-Serial adapter cable

Ones I have available look something like this:

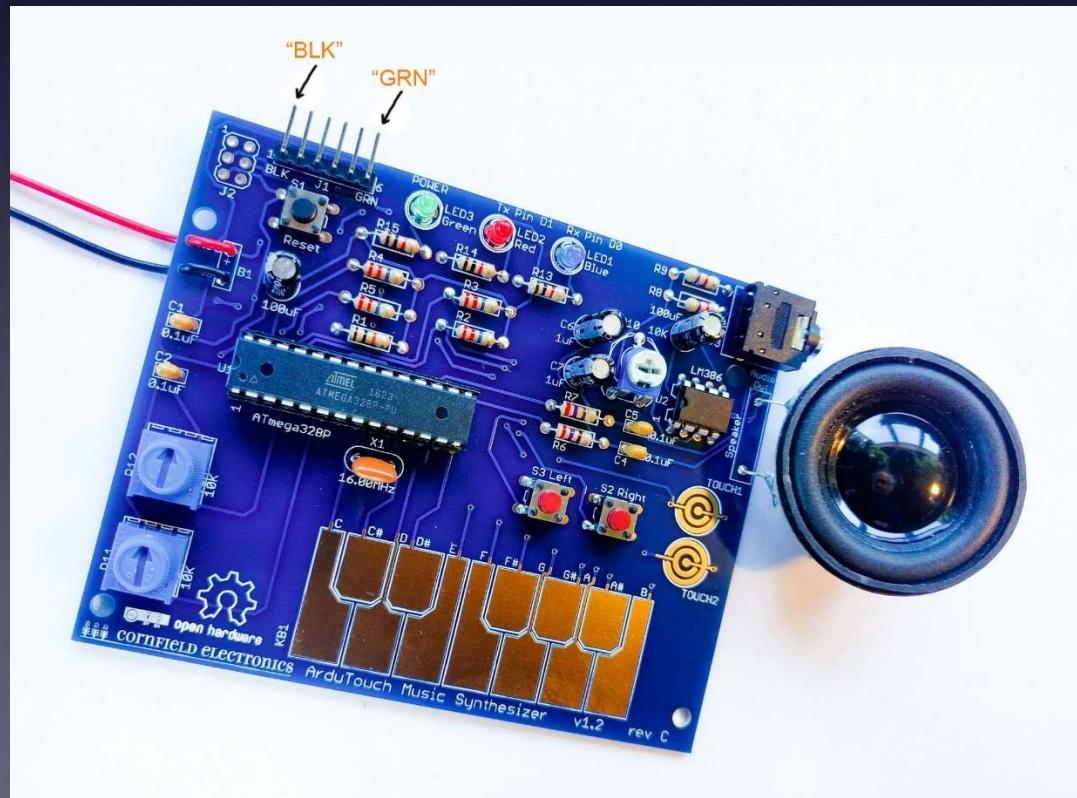


You will need to download and install a driver  
for your Operating System (Windows, MacOS, or Linux):  
[<https://www.silabs.com/products/development-tools/software/usb-to-uart-bridge-vcp-drivers>](https://www.silabs.com/products/development-tools/software/usb-to-uart-bridge-vcp-drivers)

# Connecting your ArduTouch to your computer

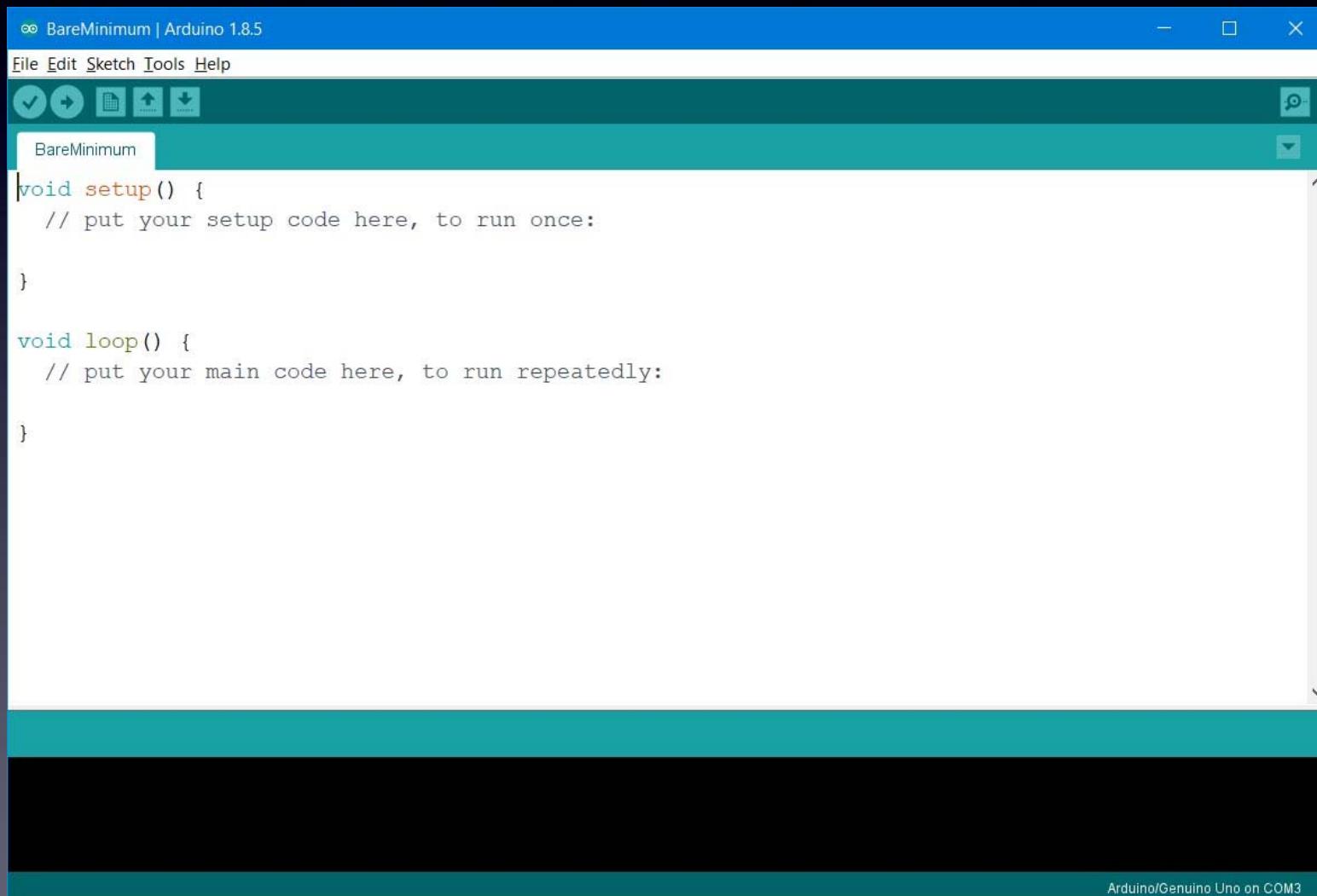


**IMPORTANT:**  
Make sure the  
battery pack on your  
ArduTouch  
is OFF



# Arduino

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

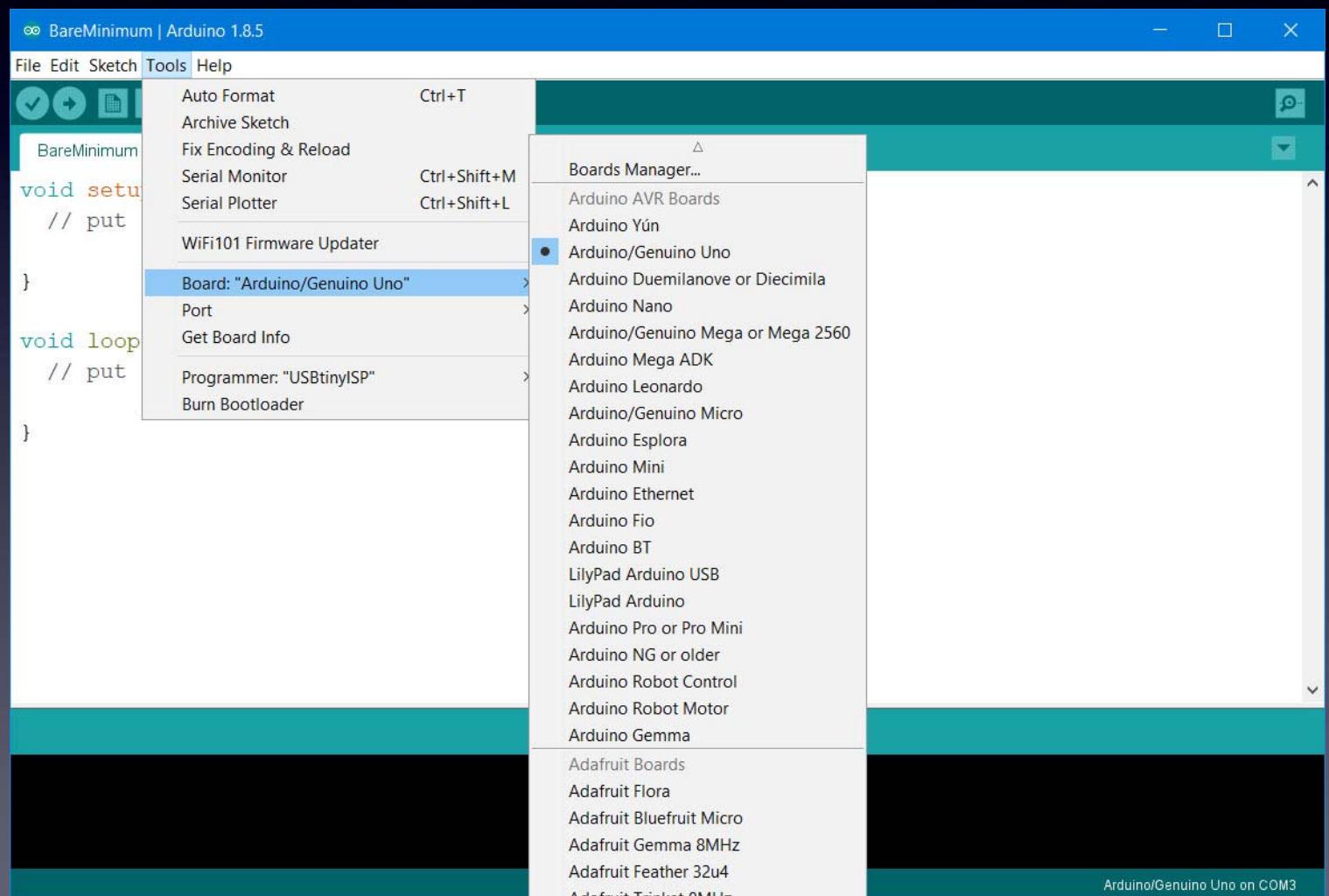


# Arduino

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

(1)  
**Choose “Uno”  
as the Board**

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

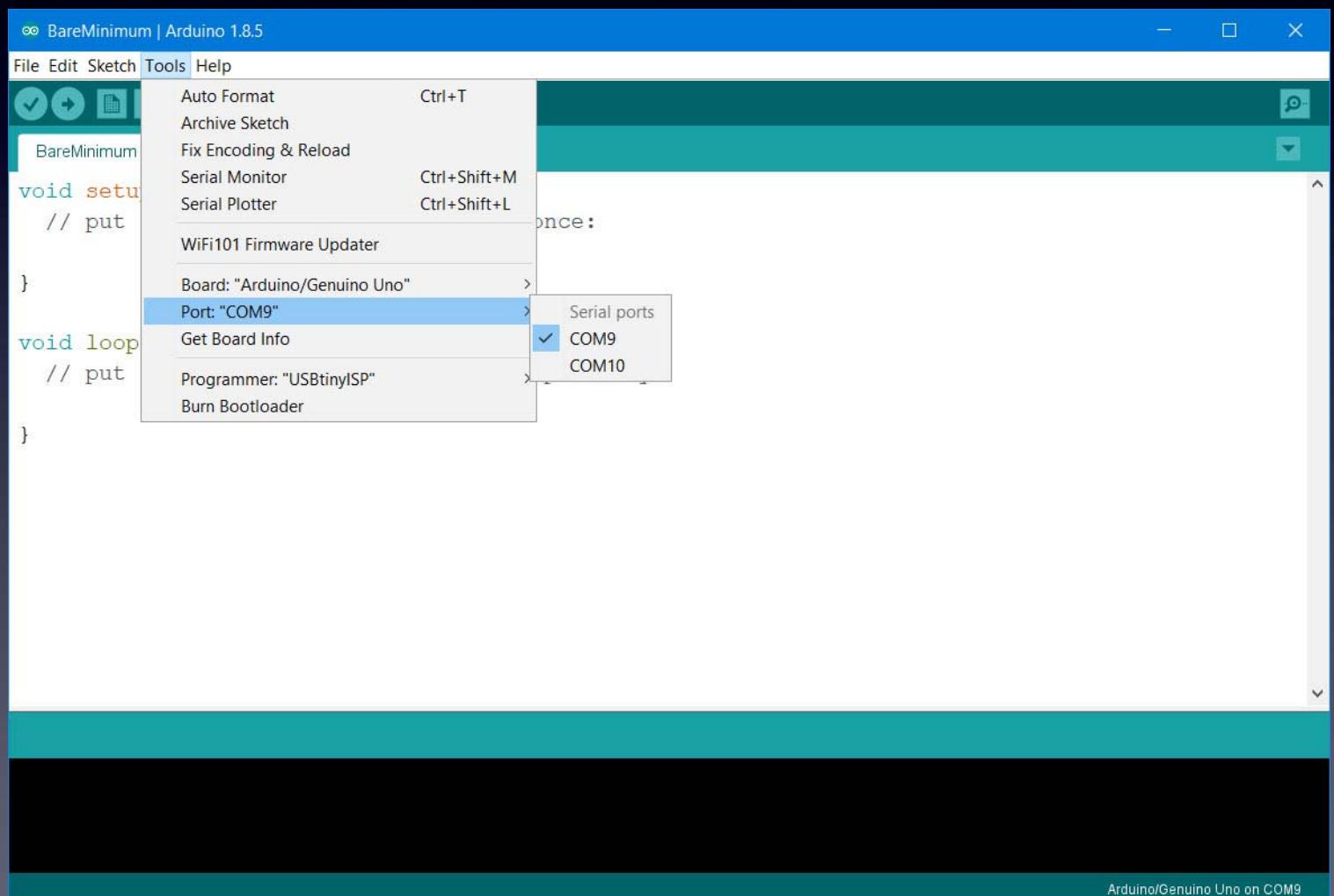


# Arduino

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

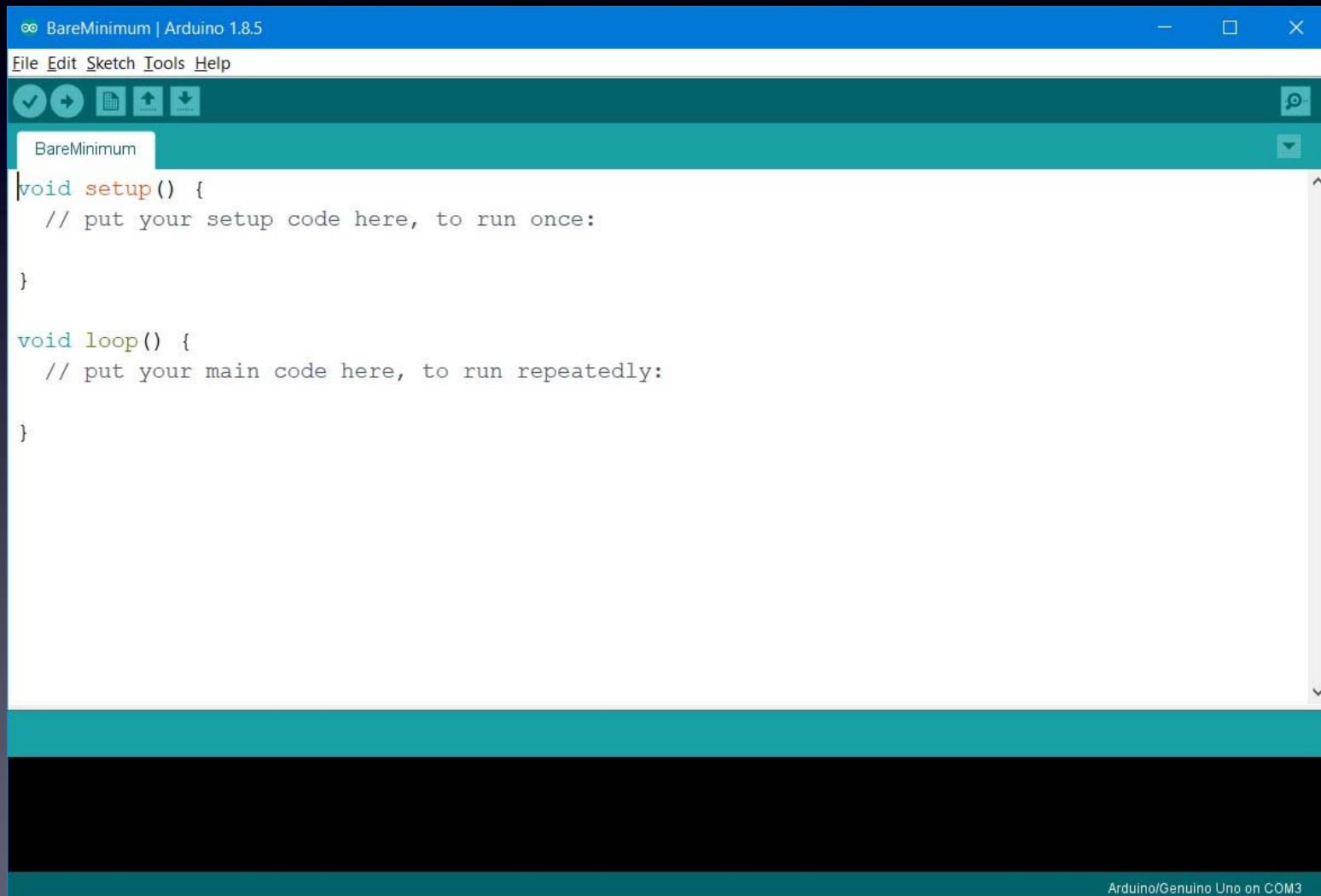
(2)  
**Choose  
the Port  
(this will be  
different  
depending on  
your Operating  
System)**

(After installing  
the driver  
for your USB-Serial  
cable  
your operating system  
will see a serial port  
and it appears here.)



# Arduino

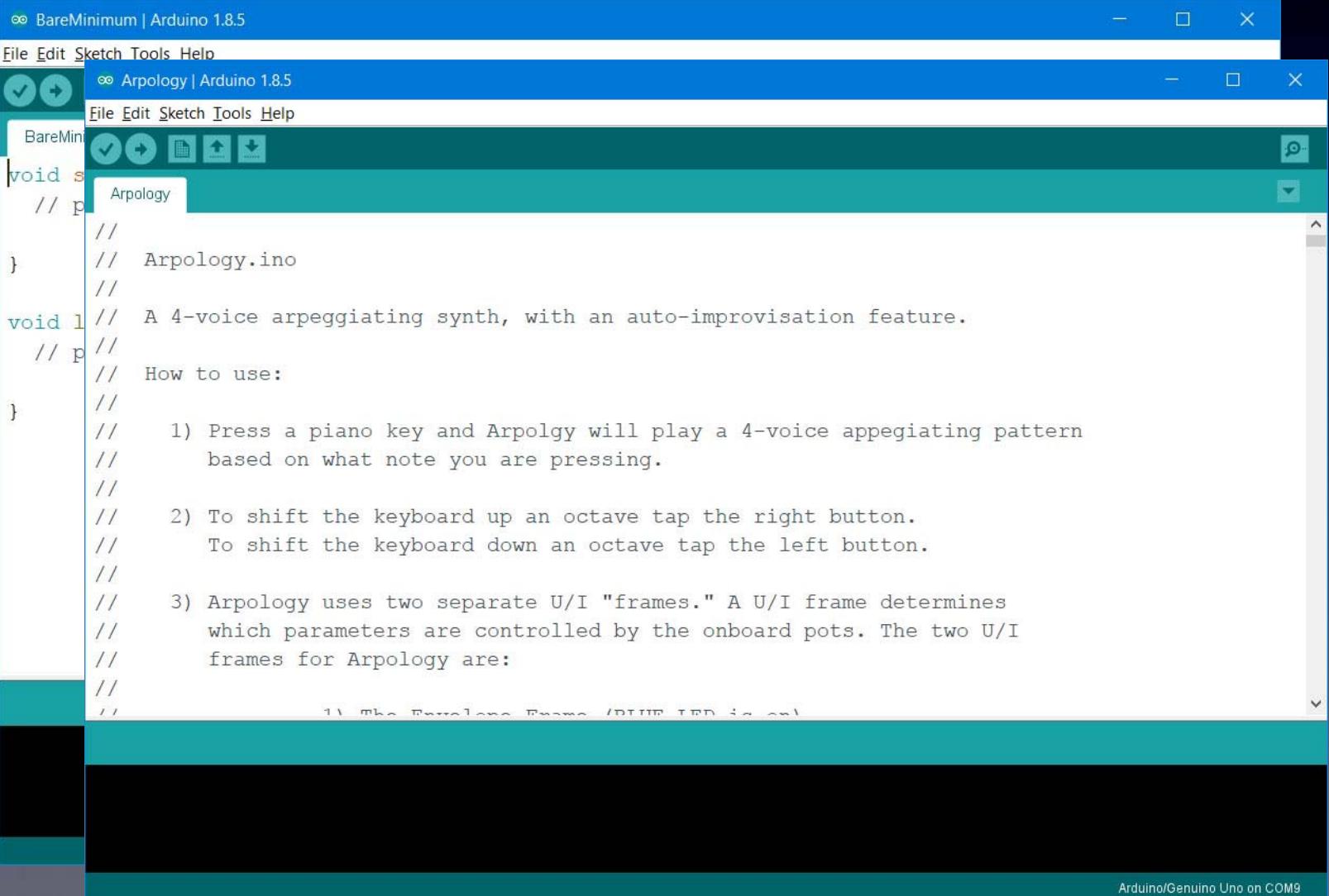
Your Arduino software is now ready to program your ArduTouch!



# 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
BareMinin
void setup() {
    // ...
}

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:
}

// The Arpology Frame (blue LED is on)

```

Arduino/Genuino Uno on COM9

# Arduino

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

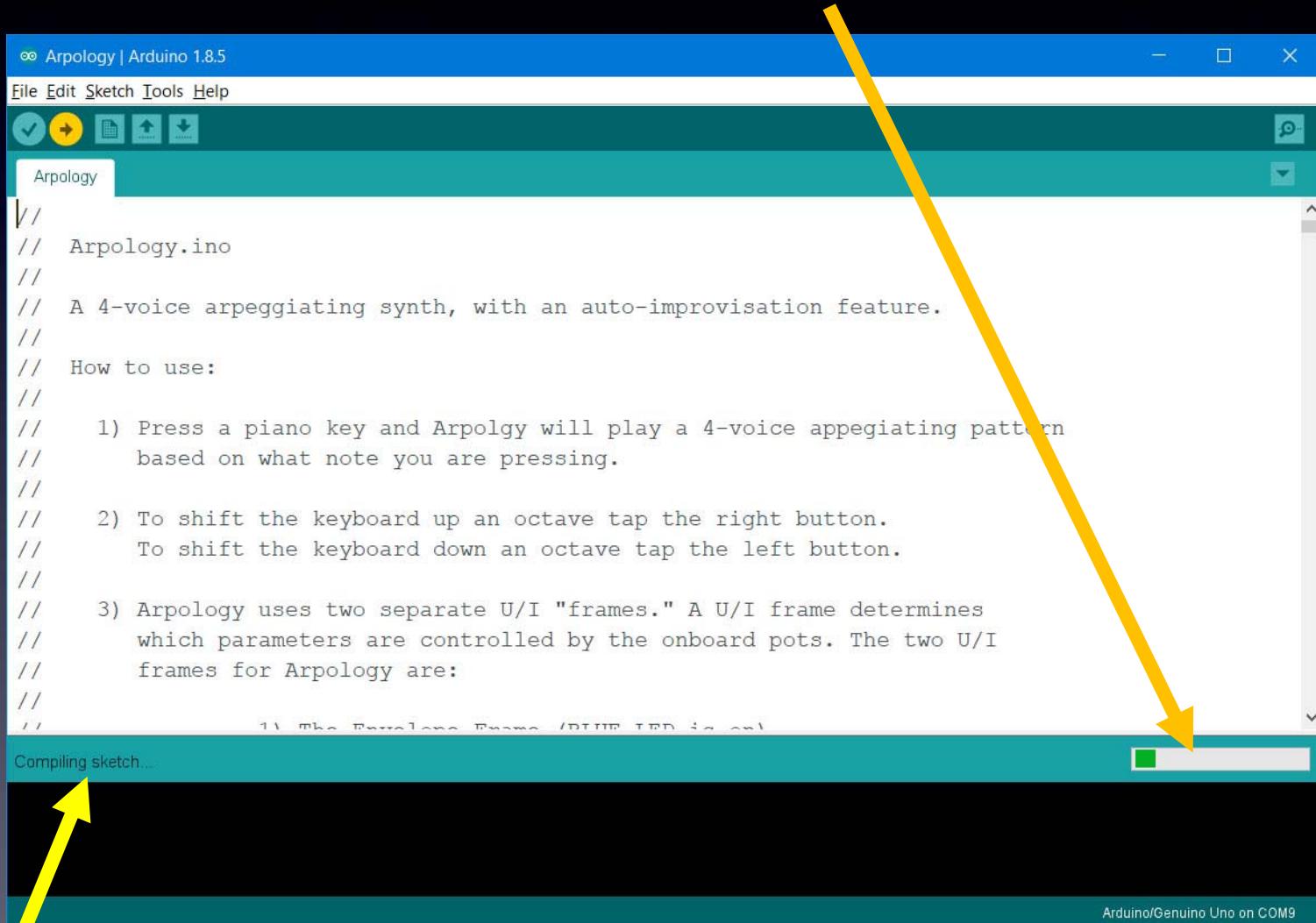


```
Arpology | Arduino 1.8.5
File Edit Sketch Tools Help
Upload
Arpology
// 
// Arpology.ino
//
// A 4-voice arpeggiating synth, with an auto-improvisation feature.
//
// How to use:
//
// 1) Press a piano key and Arpolgy will play a 4-voice appegiating pattern
//    based on what note you are pressing.
//
// 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:
//
//    1) mks_Franchise_Frame (D1/D2 TEP 4c 4m)
```

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!

