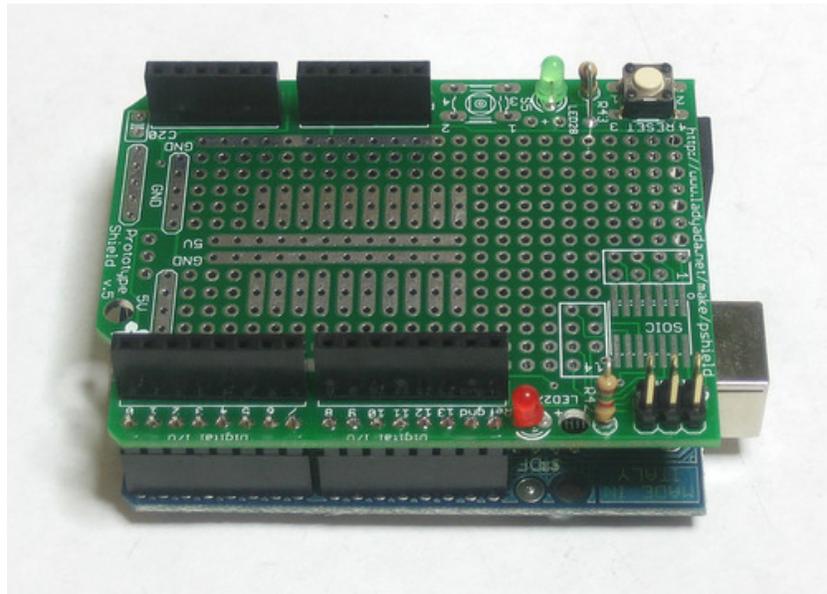




Adafruit Proto Shield for Arduino

Created by lady ada

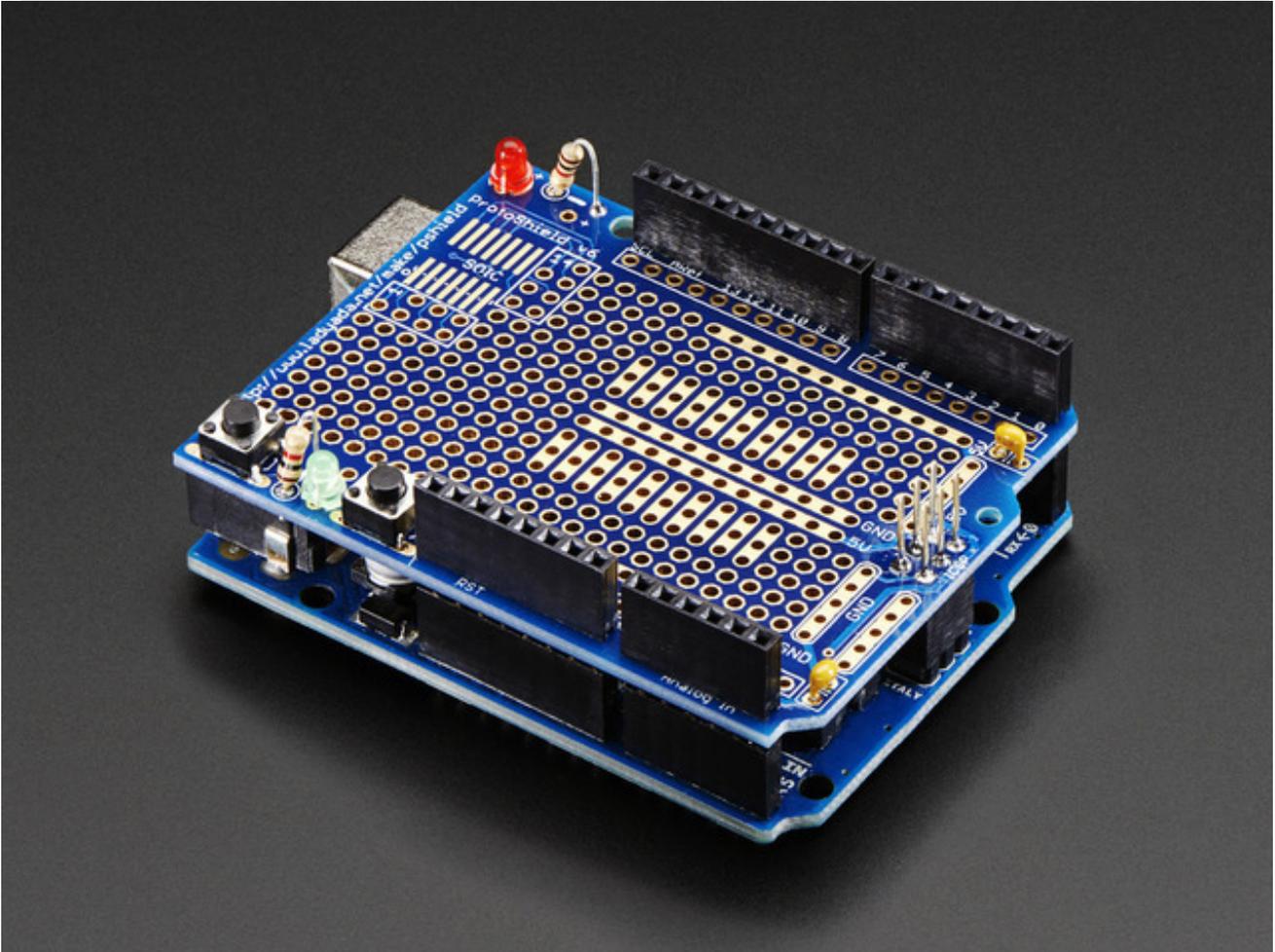


Last updated on 2015-02-11 03:45:58 PM EST

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Overview



This prototyping shield is the best out there (well, we think so, at least), and now is even better with **Version R3** - updated for the most compatibility with just about all the Arduinos!

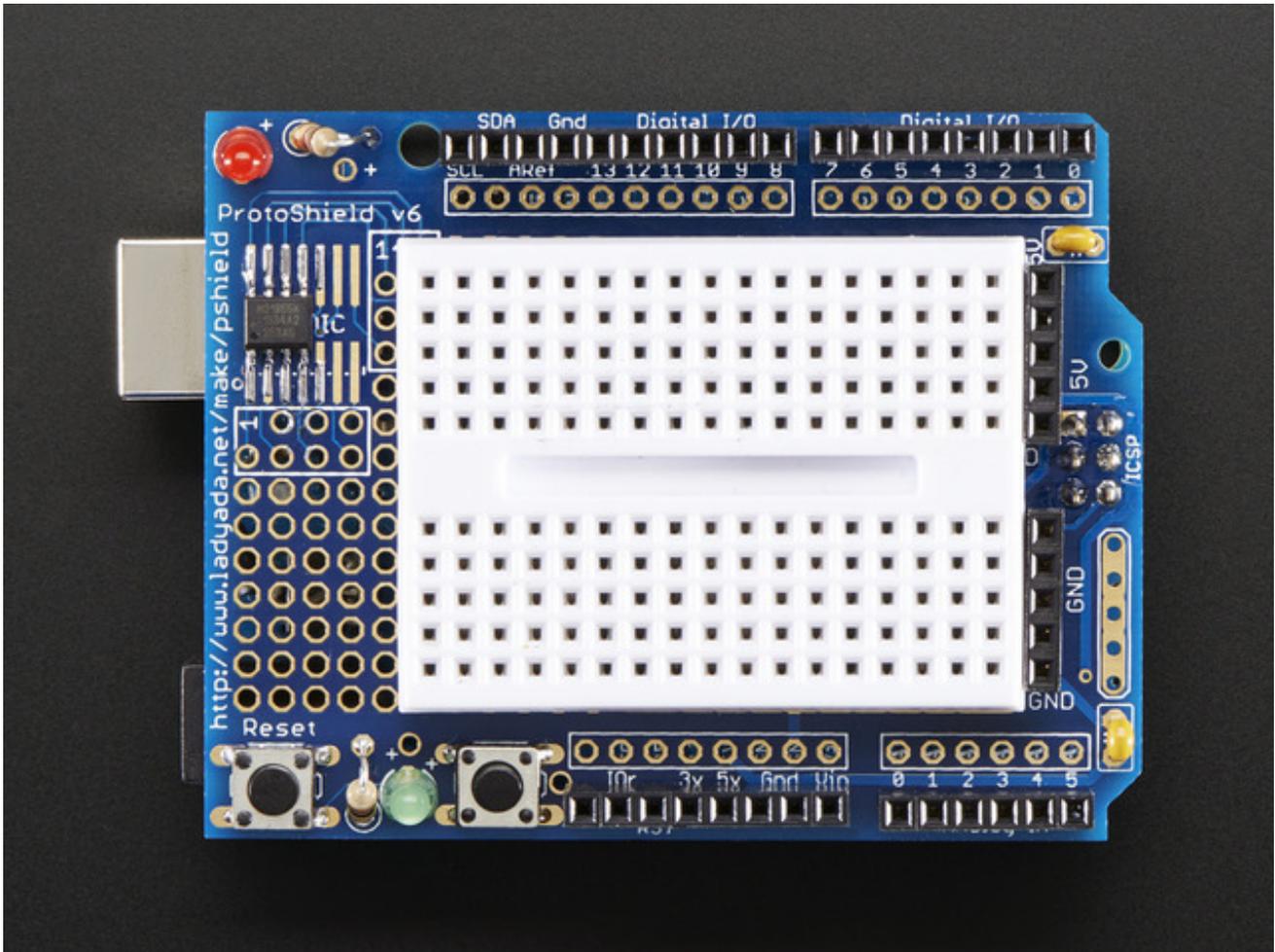
It works with UNO, Mega, Leonardo, NG, Diecimila, Duemilanove, and compatible Arduinos. Yun's and Arduino Ethernets have a chunky Ethernet jack that gets in the way of stacking, you can use the stacking headers included and it will work, just doesn't sit nice and flat.

Check out these awesome specifications:

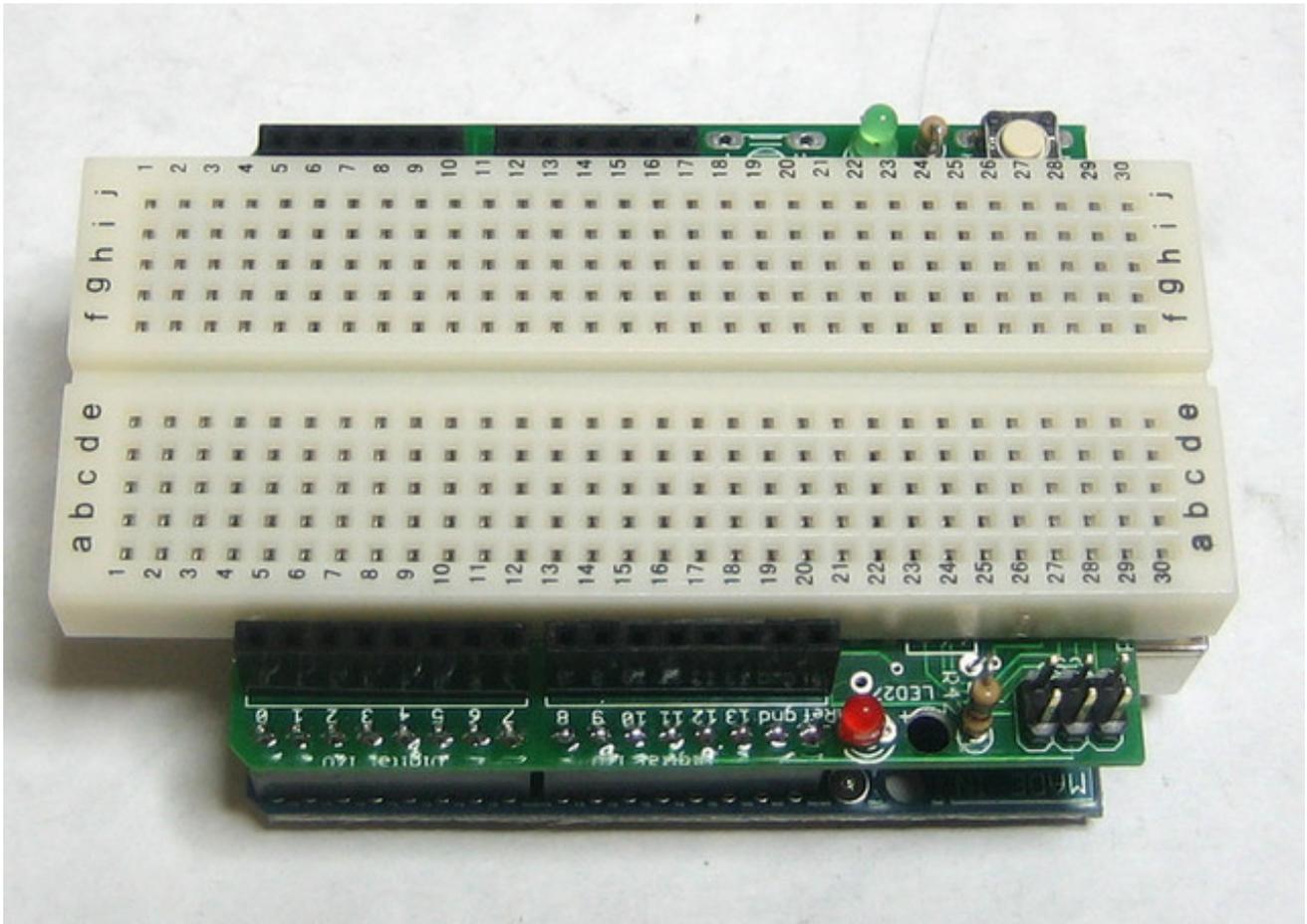
- It has a nice standard 0.1"x0.1" prototyping grid with big pads
- Comes with Stacking headers and plain header, choose whichever you want when soldering together
- A IC pattern for adding DIP ICs up to 20 pins
- Power rails down the middle and sides
- A reset button and an extra general use button
- 2 3mm general use LEDs, red and green, as well as 2 matching resistors
- A pass-thru ICSP stacking header so you can stack any kind of shield on top, and/or use an

AVR programmer

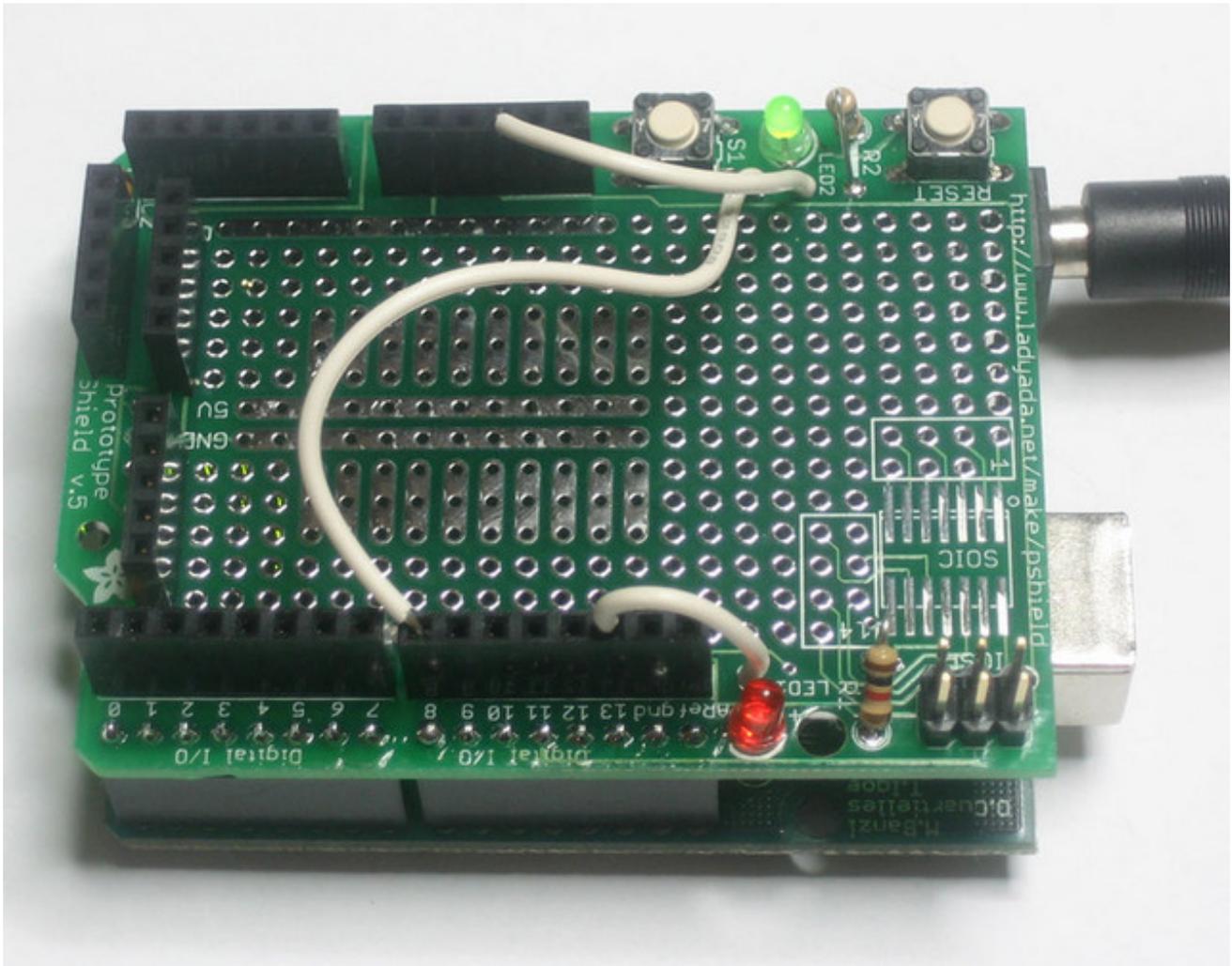
- A surface-mount chip area for up to 14 SOIC size parts
- Compatible with tiny breadboards
- Every pin is brought out!
- Gold plated pads
- 2 x 0.1uF capacitors on either side for extra power stability



Pair with a tiny breadboard for a cute stand-alone prototyping setup!



Larger breadboard for tons of working space!



2 LEDs and one button are available for general purpose use!

Make it!

Lets go!

This is a very easy kit to make, just go through each of these steps to build the kit.

1. [Tools and preparation \(http://adafru.it/cEL\)](http://adafru.it/cEL)
2. [Check the parts list \(http://adafru.it/cEM\)](http://adafru.it/cEM)
3. [Solder it \(http://adafru.it/cEN\)](http://adafru.it/cEN)

Preparation

Prep

Learn how to solder with tons of tutorials! (<http://adafru.it/aTk>)

Don't forget to learn how to use your multimeter too! (<http://adafru.it/aZZ>)

Tools

There are a few tools that are required for assembly. None of these tools are included. If you don't have them, now would be a good time to borrow or purchase them. They are very very handy whenever assembling/fixing/modifying electronic devices! I provide links to buy them, but of course, you should get them wherever is most convenient/inexpensive. Many of these parts are available in a place like Radio Shack or other (higher quality) DIY electronics stores.



Soldering iron

Any entry level 'all-in-one' soldering iron that you might find at your local hardware store should work. As with most things in life, you get what you pay for.

Upgrading to a higher end soldering iron setup, like the [Hakko FX-888](http://adafru.it/180) that we stock in our store (<http://adafru.it/180>), will make soldering fun and easy.

Do not use a "ColdHeat" soldering iron! They are not suitable for delicate electronics work and can damage the kit ([see here \(http://adafru.it/aOo\)](http://adafru.it/aOo)).



[Click here to buy our entry level adjustable 30W 110V soldering iron \(http://adafru.it/180\)](http://adafru.it/180).

[Click here to upgrade to a Genuine Hakko FX-888 adjustable temperature soldering iron. \(http://adafru.it/303\)](http://adafru.it/303)

Solder



You will want rosin core, 60/40 solder. Good solder is a good thing. Bad solder leads to bridging and cold solder joints which can be tough to find.

[Click here to buy a spool of leaded solder \(recommended for beginners\) \(http://adafru.it/145\).](http://adafru.it/145)

[Click here to buy a spool of lead-free solder \(http://adafru.it/734\).](http://adafru.it/734)

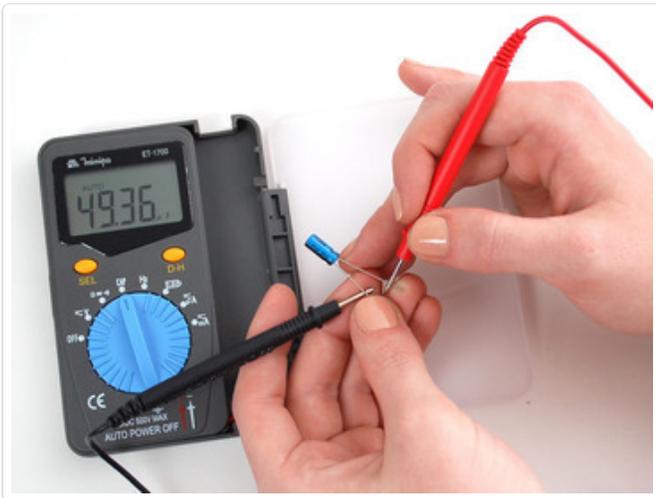
Multimeter

You will need a good quality basic multimeter that can measure voltage and continuity.

[Click here to buy a basic multimeter. \(http://adafru.it/71\)](http://adafru.it/71)

[Click here to buy a top of the line multimeter. \(http://adafru.it/308\)](http://adafru.it/308)

[Click here to buy a pocket multimeter. \(http://adafru.it/850\)](http://adafru.it/850)



Flush Diagonal Cutters



You will need flush diagonal cutters to trim the wires and leads off of components once you have soldered them in place.

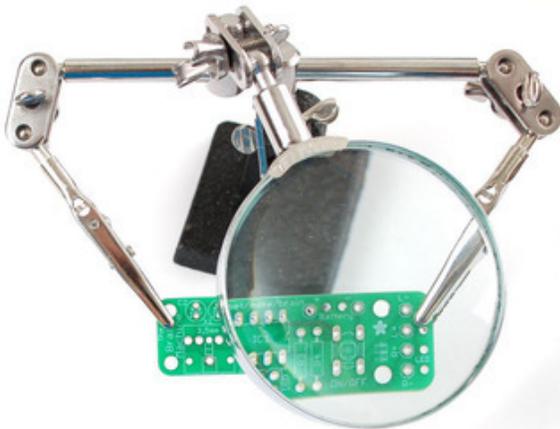
[Click here to buy our favorite cutters \(http://adafru.it/152\).](http://adafru.it/152)



Solder Sucker

Strangely enough, that's the technical term for this desoldering vacuum tool. Useful in cleaning up mistakes, every electrical engineer has one of these on their desk.

[Click here to buy a one \(http://adafru.it/148\).](http://adafru.it/148)



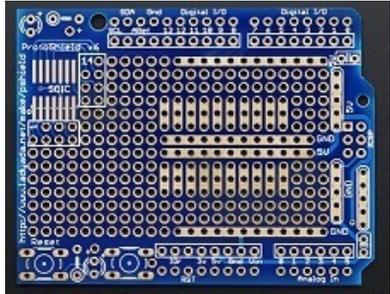
Helping Third Hand With Magnifier

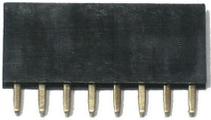
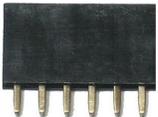
Not absolutely necessary but will make things go much much faster, and it will make soldering much easier.

[Pick one up here \(http://adafru.it/291\).](http://adafru.it/291)

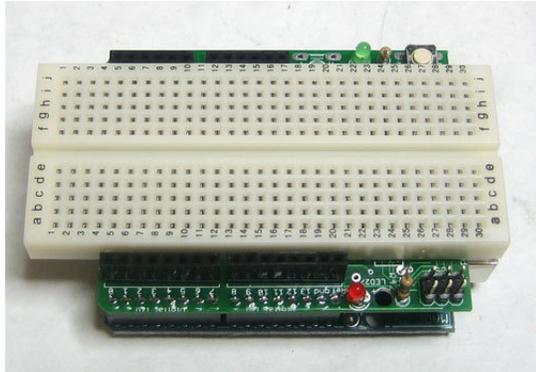
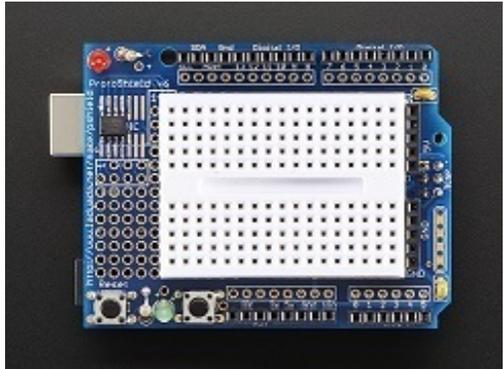
Parts list

Parts List

Image	Name	Description	Information & Distributor	Qty
		Printed circuit board	Adafruit	1
	LED1	3mm Red LED	Generic	1
	LED2	3mm Green LED	Generic	1
	R1 R2	470-1.0K Resistors for LED Carbon 5% 1/4W	Generic	2
	RESET S1	6mm tact switch	Generic	2
		0.1uF 50V ceramic		

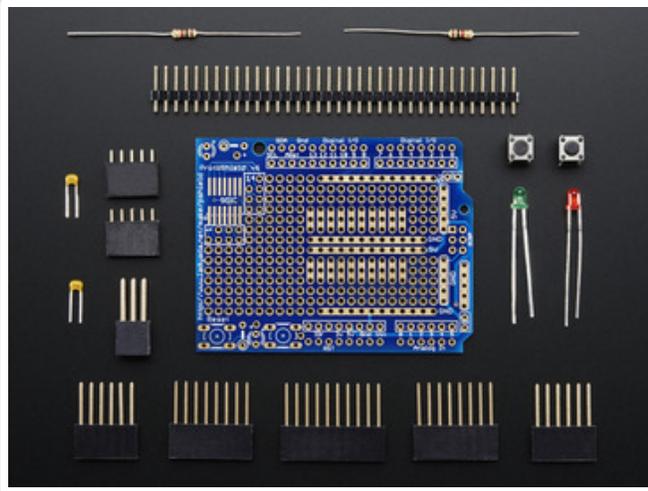
	C1 C2	0.1" 50V ceramic capacitor	Generic	2
		8 pin female 0.1" header (1x8)	Generic	2
		5 pin female 0.1" header (1x6)	Generic	2
		36 pin male 0.1" header (1x36)	Generic	1

Optional parts

Image	Description	Distributor
	<p>Small breadboard (300 tie points).</p> <p>This is a little more practical than the larger 'standard' ones.</p>	<p>Adafruit</p>
	<p>Tiny breadboard (170 tie points).</p> <p>You can use the 5 pin female headers (1x5) a with 'tiny' breadboard as 'end rails.'</p>	<p>Adafruit</p>

Solder it!

Time to solder the kit together! If you've never soldered before, check the [Preparation page for tutorials and more](http://adafru.it/aZW). (<http://adafru.it/aZW>)

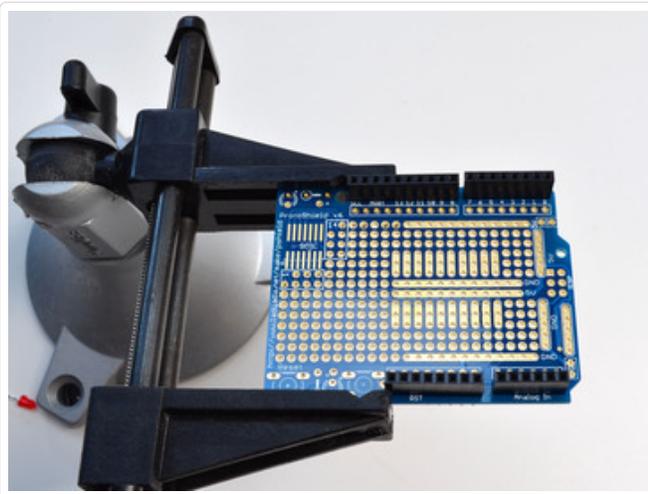


First, check that you have all the parts! Look over the [parts list here](http://adafru.it/aZX) and shown on the left.

Since we released the R3 version we now include stacking headers! The PCB is slightly different to break out all of the Arduino pins, and the 2x3 ICSP header is now part of the stacking kit

Soldering with Stacking Headers

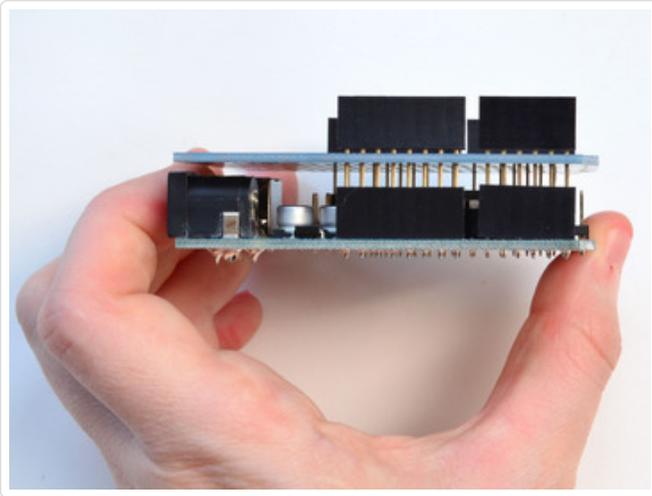
Stacking headers are included with the R3 Proto Shield. They let you stack another shield on top but are not as strong as the non-stacking headers. Also they are taller. If you aren't planning on stacking another Shield on top, we do recommend going with the plain headers as they're smaller and more durable.



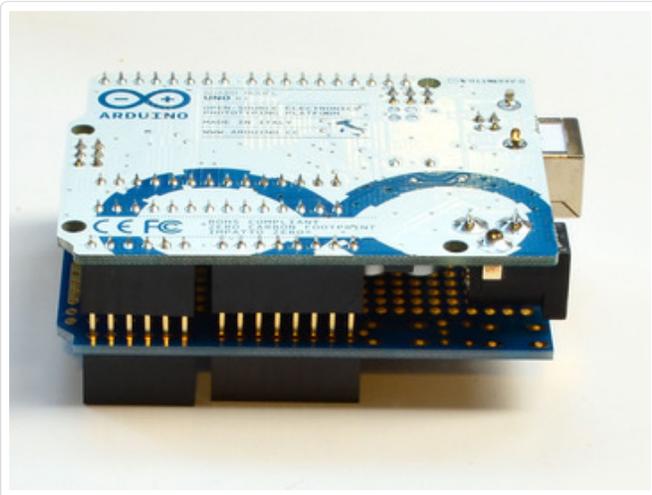
Start by placing the shield in a holder as shown, you shouldn't see the large Adafruit logo (its on the bottom)

Then slide the 6, 8 and 10 pin headers into the outside rows of the shield as shown. You will likely have an extra two stacking parts, just put those aside for now.

Now carefully plug the unsoldered headers into a

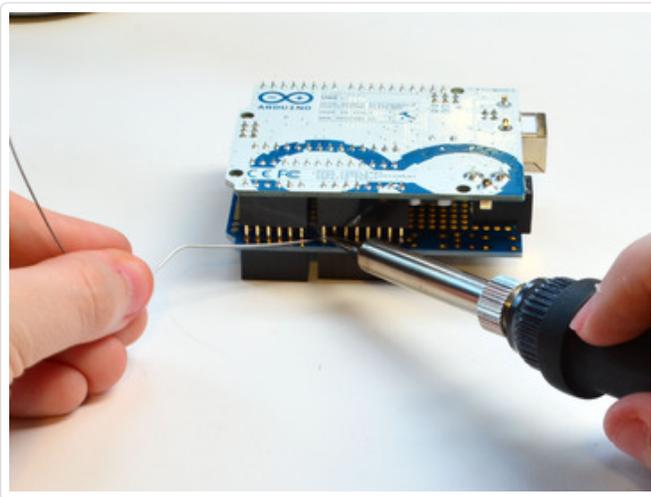
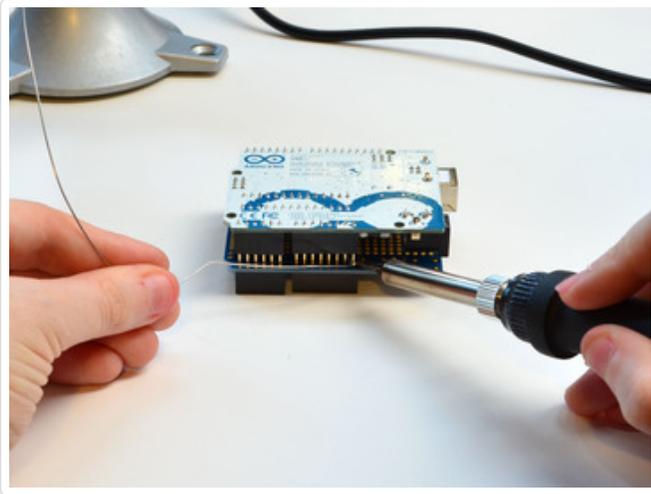


spare Arduino. Make sure all of the long pins plug into the sockets on the side of the Arduino. There will be a gap between the shield and Arduino and the Printed Circuit Board will be loose

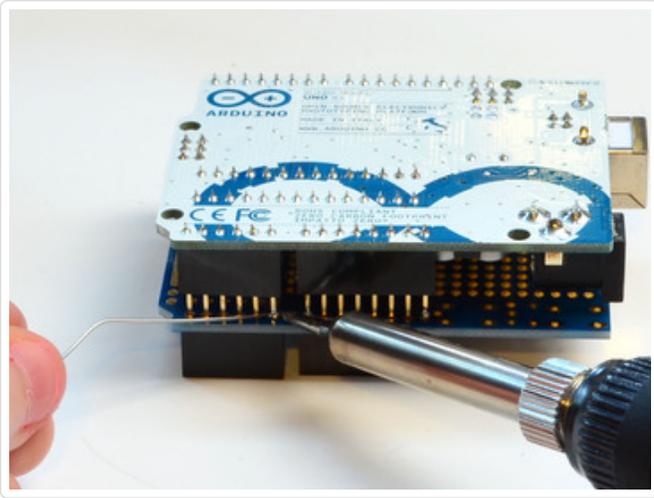


Flip over the Arduino and place it flat on the table so that the PCB sits flat against the stacky headers and the stacky headers are flat against the table

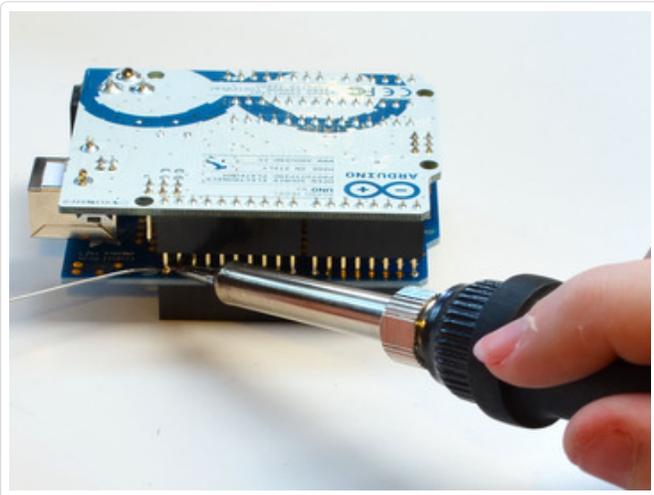
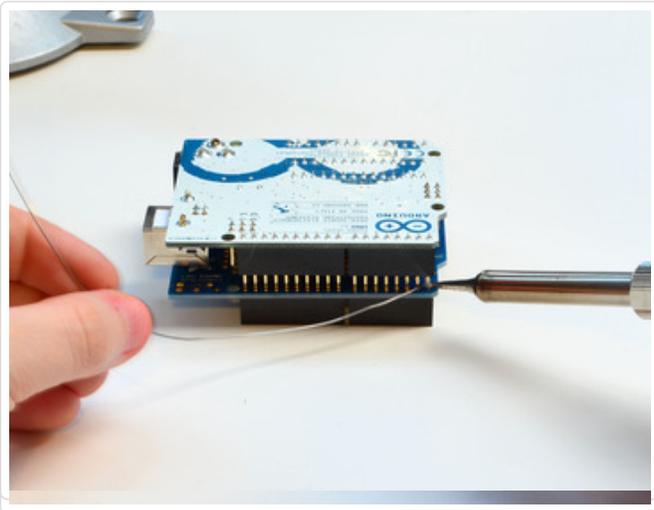
Now from above, solder the two end pins a stacky header to the PCB. You don't have to do a great job soldering, just make sure it's tacked together.

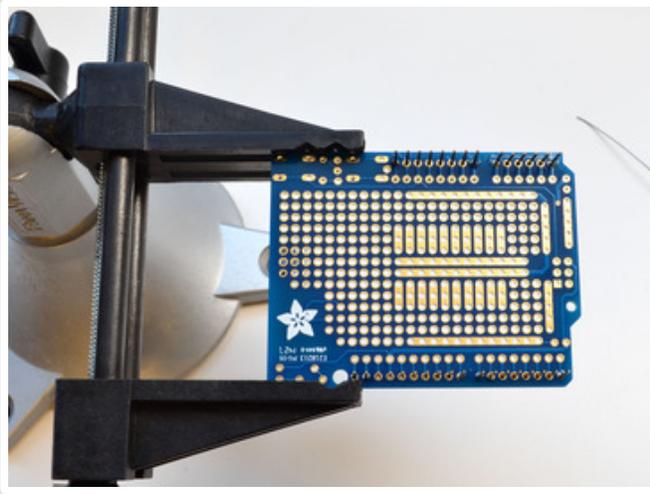


Continue with the other header

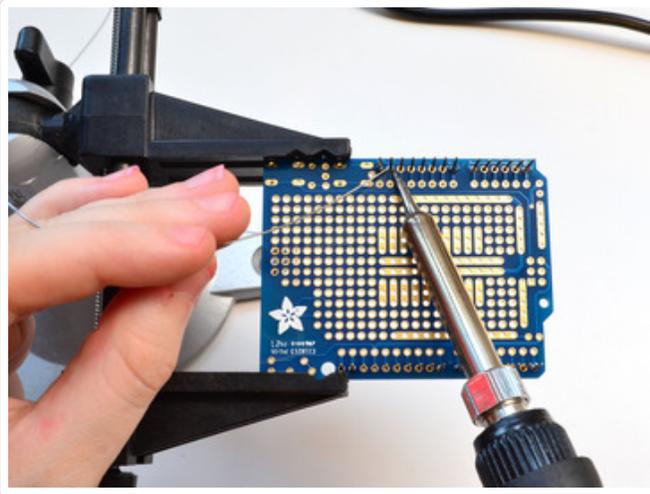


Flip around and do the other two headers



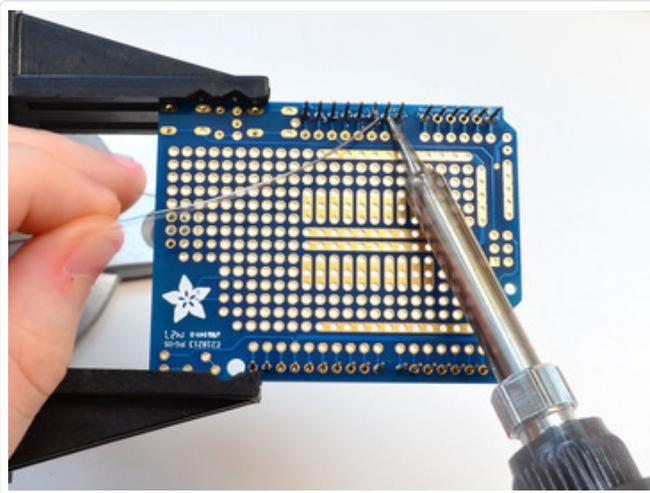


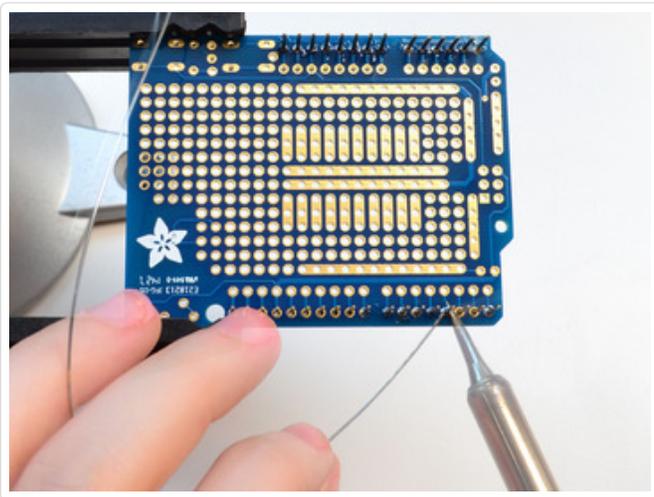
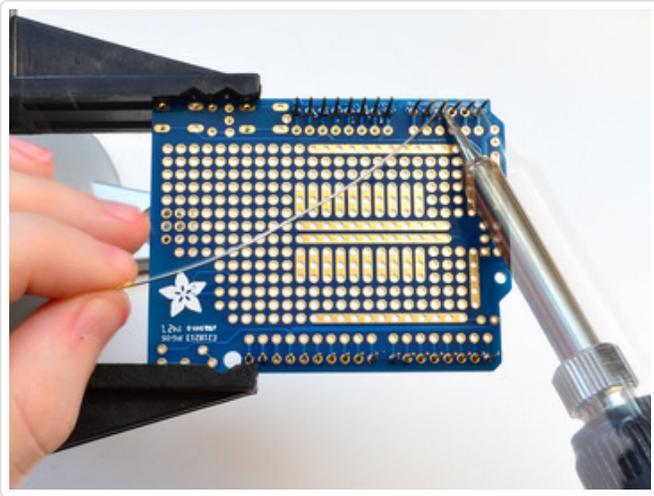
Carefully remove the shield from the Arduino and insert into your vise with the ends of the stacking header pointing up



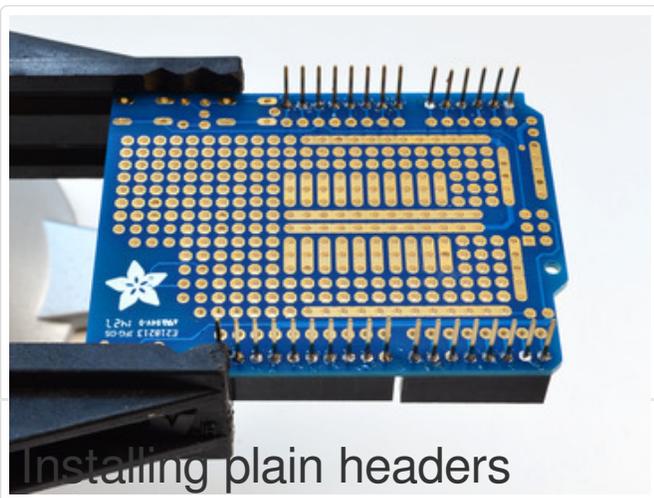
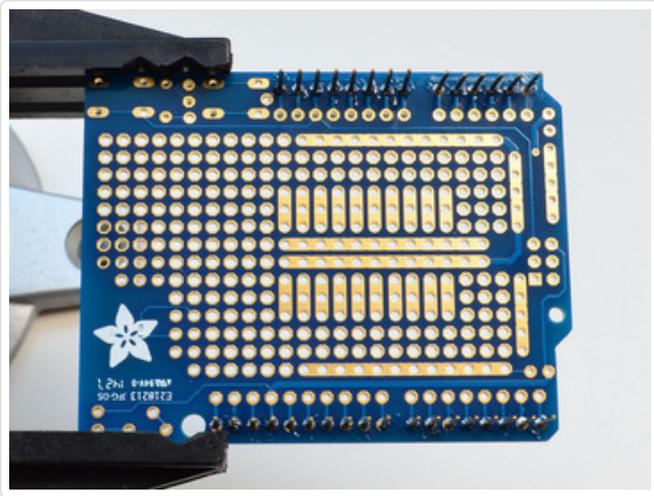
Now that you have aligned the stacky headers using an Arduino it's easy to finish the job

Solder the remaining header pins, including the two end pins just to make sure they are super solidly soldered :)



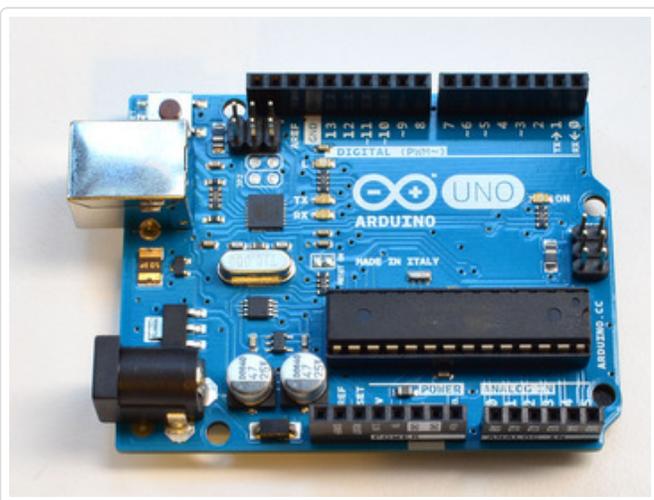


When done, check your work, make sure each pin is soldered with a nice shiny solder connection



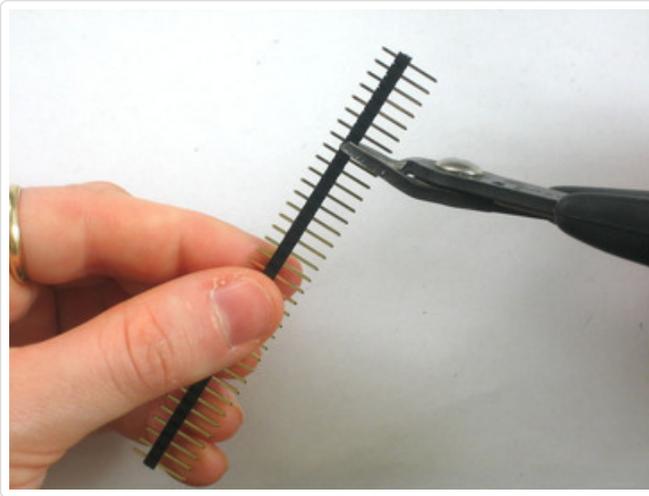
Installing plain headers

If you want to install the plain header rather than stacking headers, follow this part:

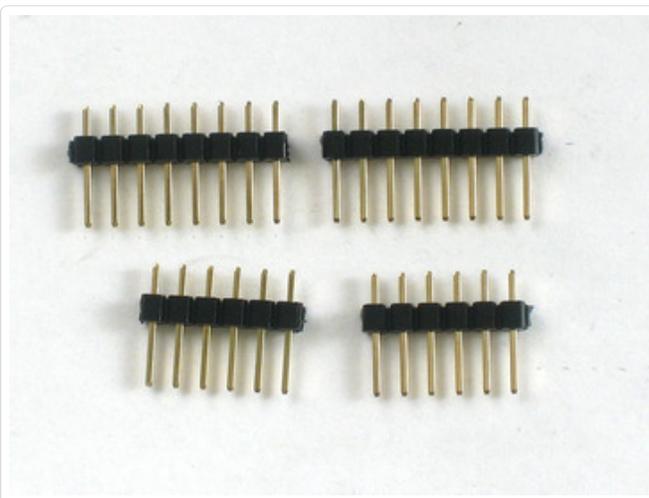


Grab a plain Arduino

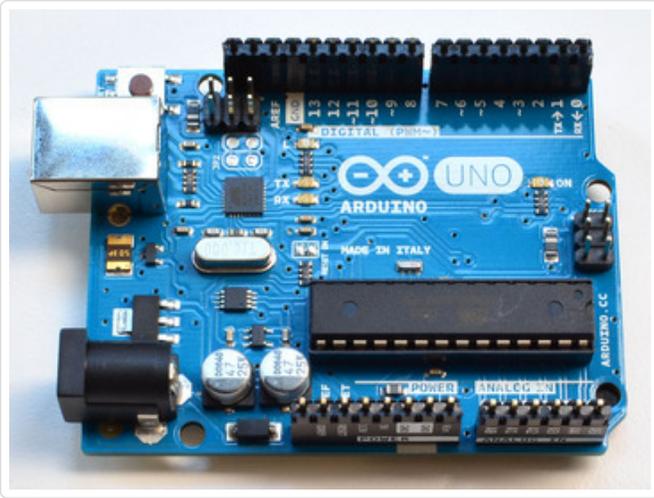
Next its time to make the male headers from the



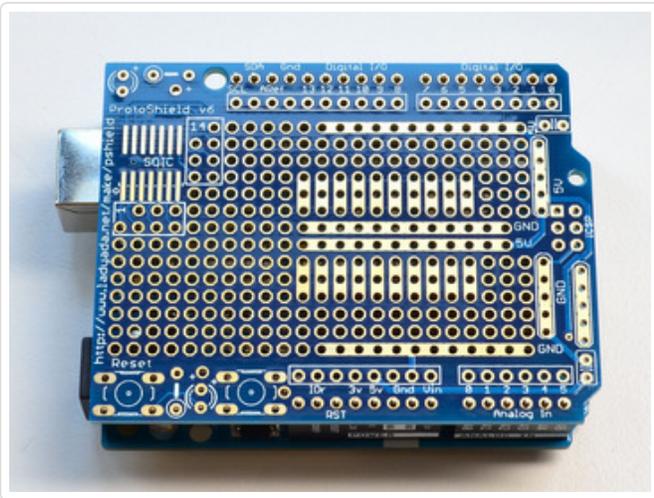
long strip. use diagonal cutters or pliers to clip off 4 parts, one 6-pin, two 8-pin, and one 10-pin



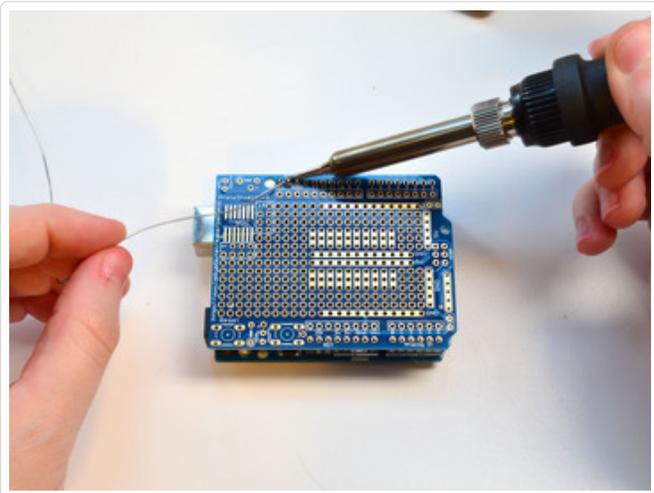
Place the pieces of header into the Arduino so the long pins are in the side sockets and the short pins stick up

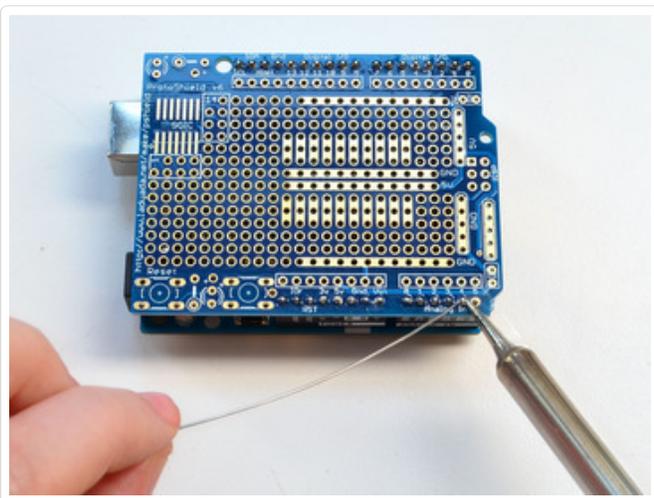
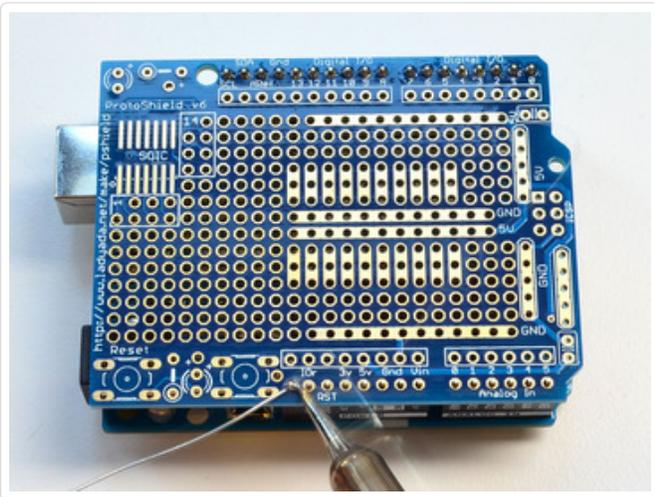
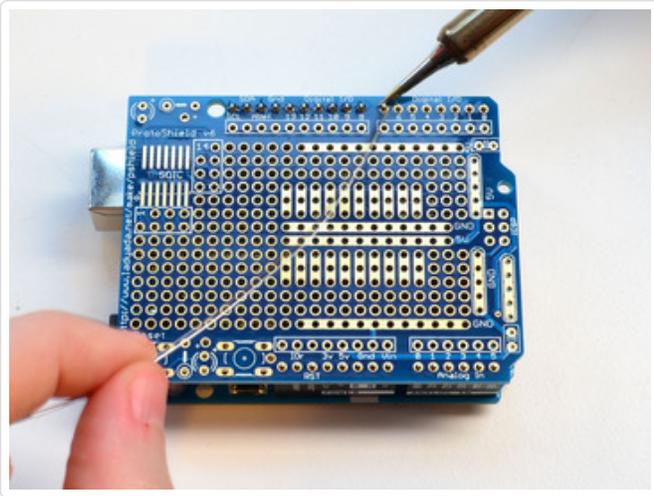


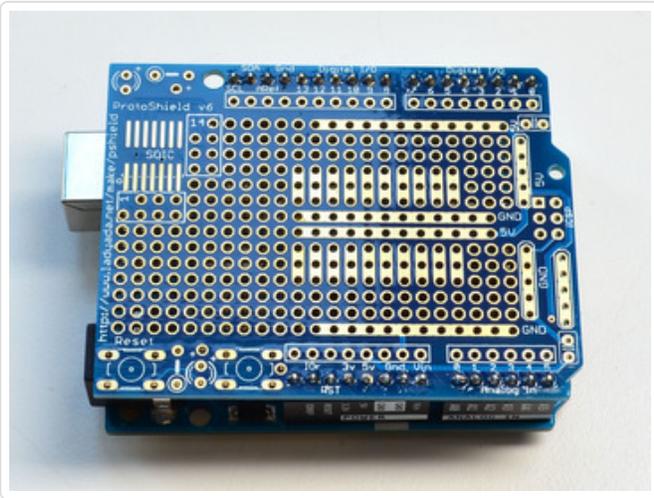
Place the PCB on top of the Arduino so the short pins stick through the rows of pads on either side



Solder all of the pads!







Check your work! Make sure every point is nice and shiny

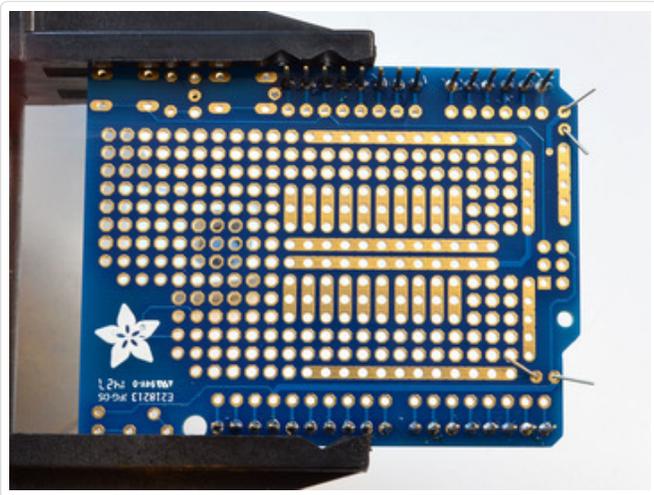
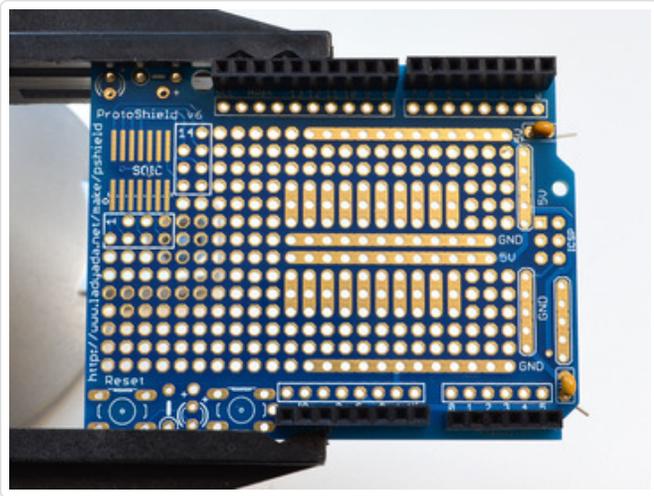
Installing Extras

The Proto Shield comes with some extras like 2 buttons, 2 capacitors and a red/green LED set. These aren't essential but you may want to have them installed! Here's how you go about doing it!

Installing Capacitors

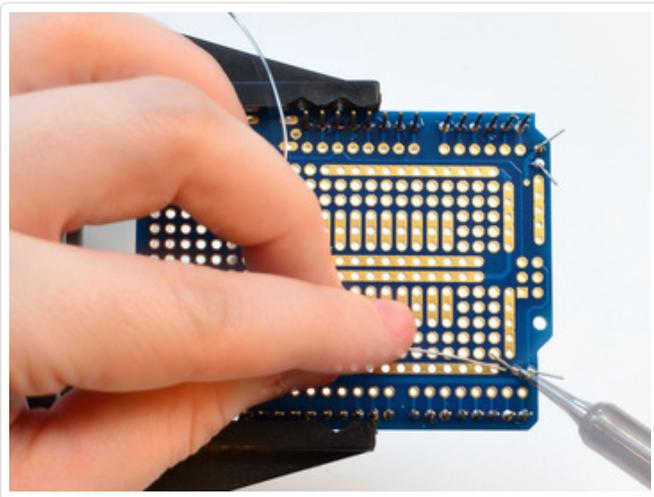
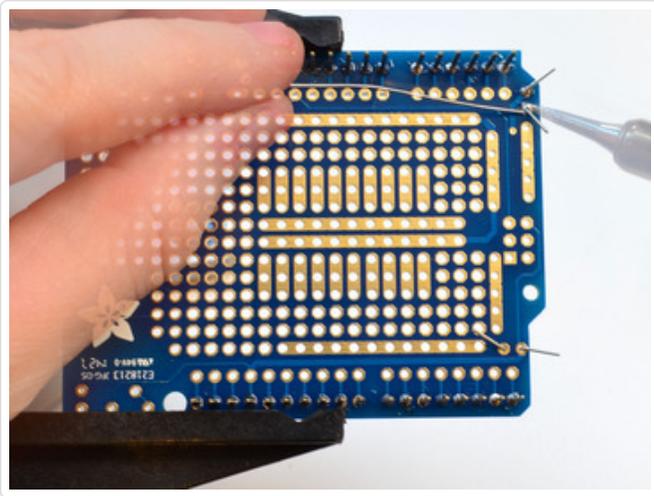
There's two spots for 0.1uF ceramic capacitors. These are nice little additions that help keep your 5V power-supply clean

Place the two ceramic capacitors in the spots shown. They are symmetric so you don't have to worry about putting them in backwards.

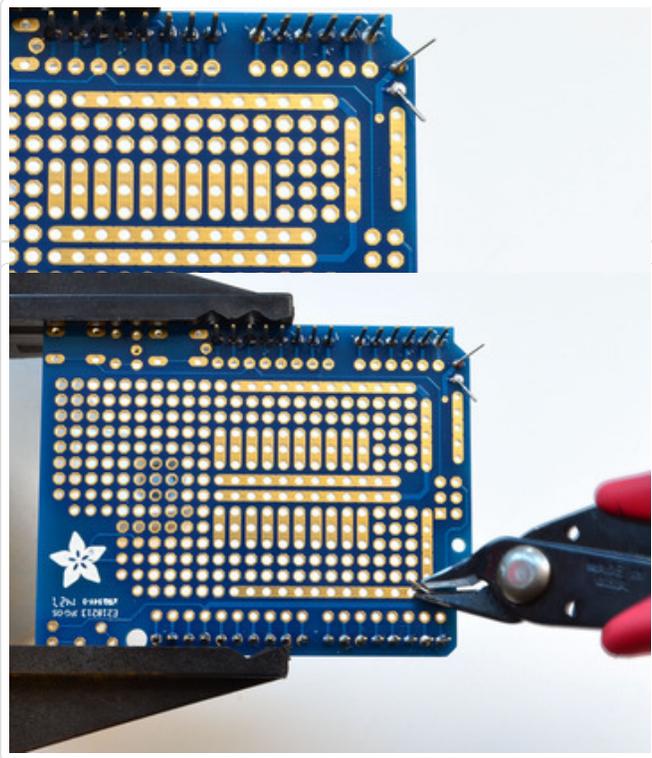


Bend the two little capacitor leads out so that you can flip over the PCB without the caps falling out

Solder each of the 4 leads



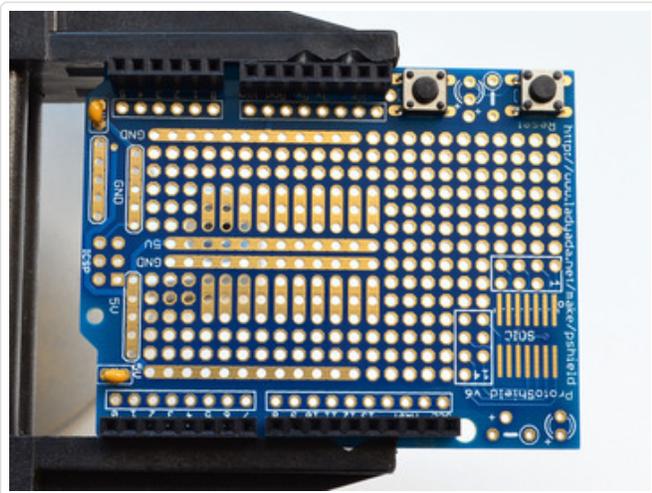
Check your work!



Then clip the leads short using a pair of diagonal cutters

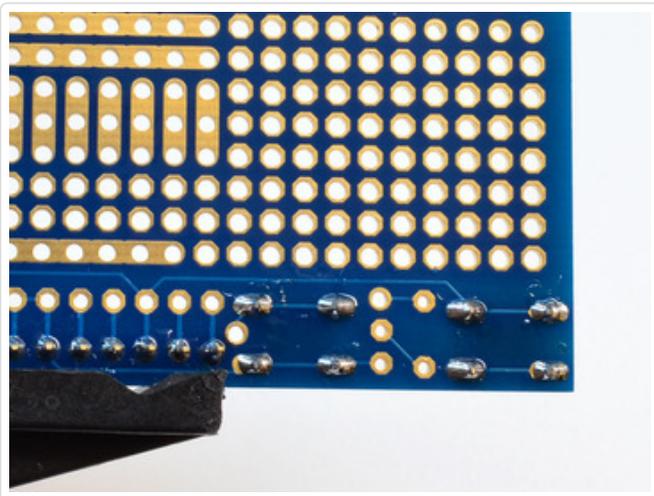
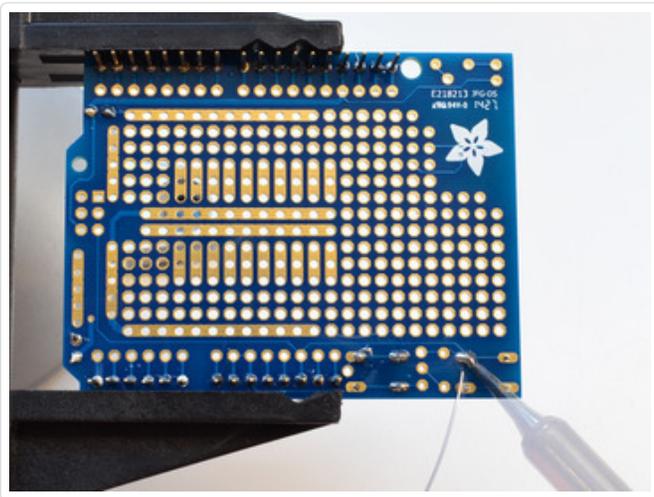
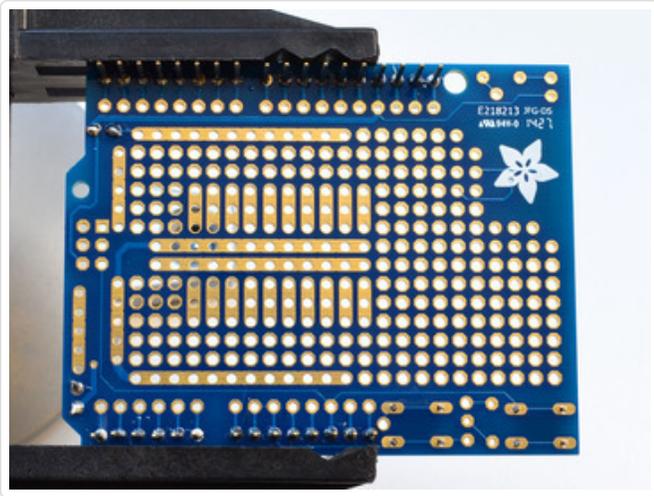
Installing Buttons

There's two optional buttons you can solder into your Proto Shield. One is connected to the Arduino reset pin so you can quickly reset your Arduino. One is not connected to any pin, you can solder a wire from it to any other Arduino pin



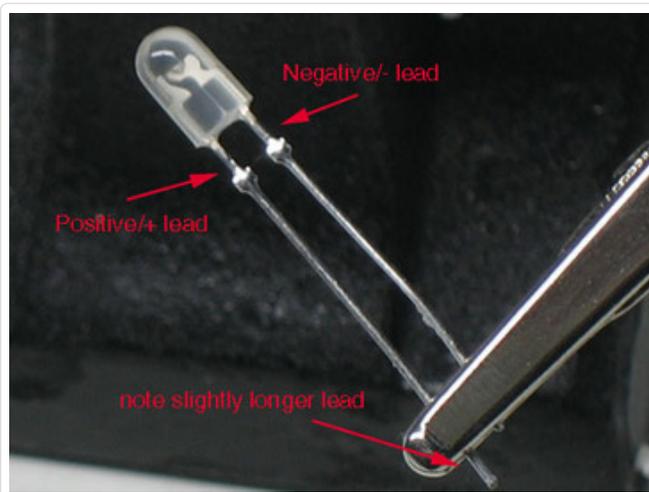
Snap the two buttons into the top corner of the PCB. They will snap into place and sit flat against the PCB. They are symmetric so you can insert them 'either way'

Flip over the board and solder the 4 pads of each button



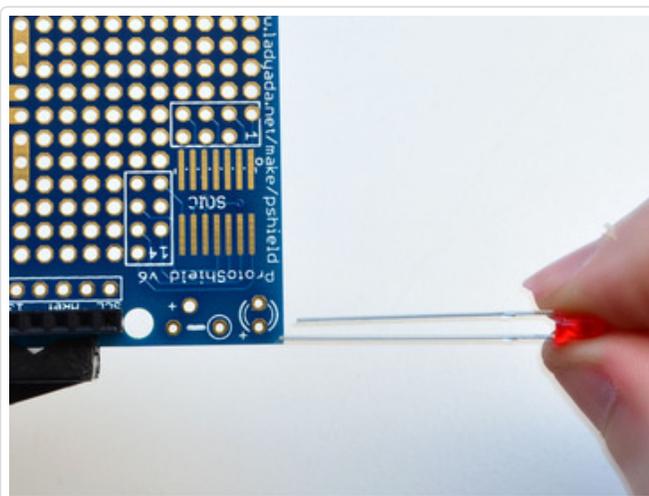
Check your work to make sure the solder points are nice and shiny...you're done!

Installing LEDs

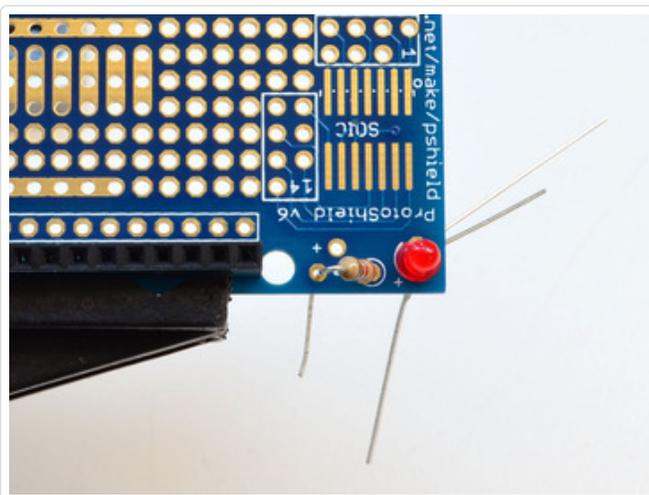


Next it's time to place the two 3mm LEDs. LEDs are directional, and if you put them in backwards they won't work.

LEDs have a positive lead and a negative lead. The positive lead is longer.

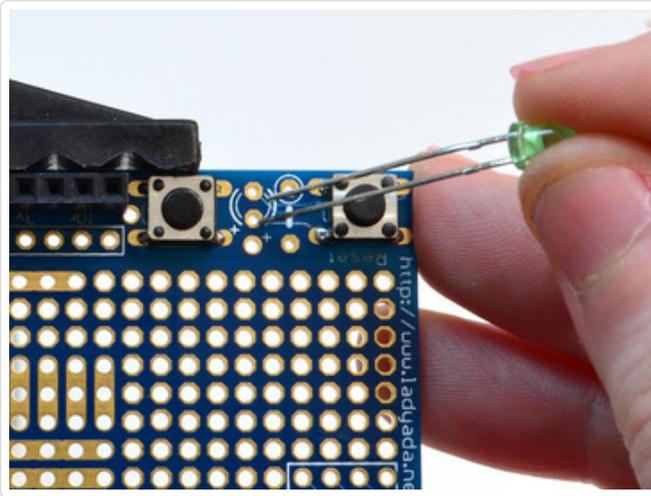


On the Proto Shield PCB, you'll see a circle indicating where the LED goes, and a small + sign. That's the indicator for which pad gets the longer leg of the LED



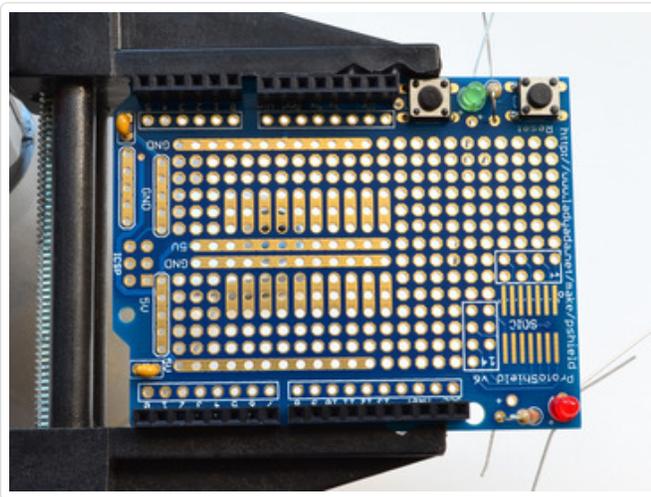
Next to the red LED you can bend one of the 1K ohm resistors over and insert it in the O- shaped silkscreen pads to the left

Resistors do not have a direction, so they can be installed either way.

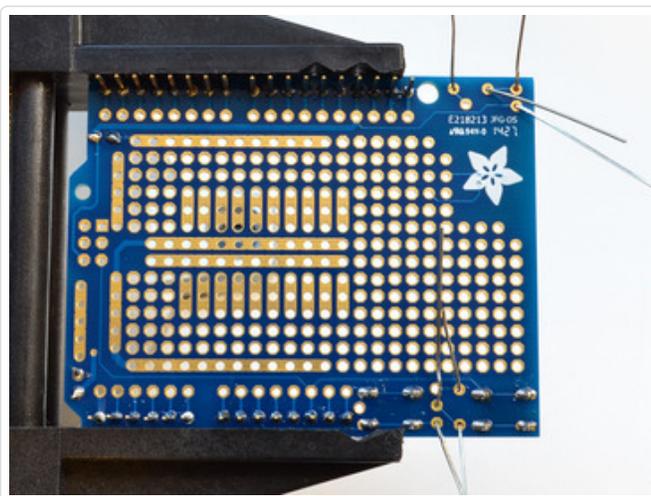


Next insert the small green LED between the two buttons. Like the red LED, check for the tiny + symbol on the PCB, and place the longer leg of the LED into this pad.

Then insert the other 1K resistor into the 0-marked spot right next to it

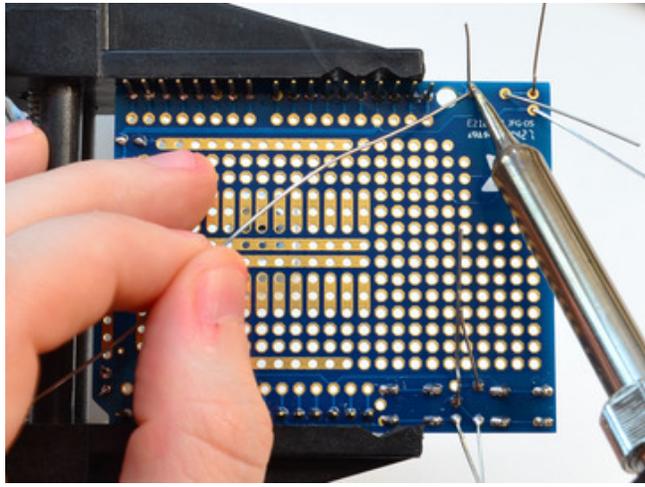


On the Proto Shield PCB, you'll see a circle indicating where the LED goes, and a small + sign. That's the indicator for which pad gets the longer leg of the LED

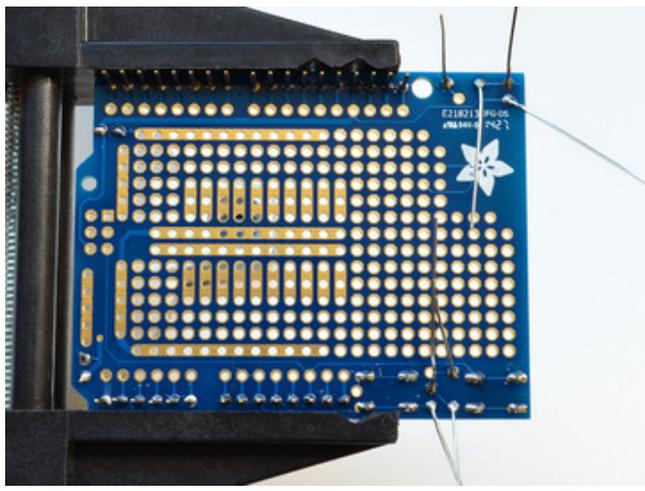


Bend out the leads of the LEDs and resistors so they sit flat against the PCB

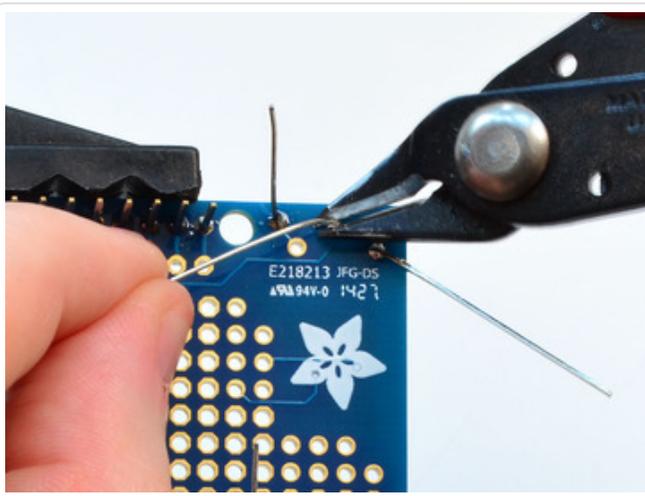
Flip over the PCB in your vise



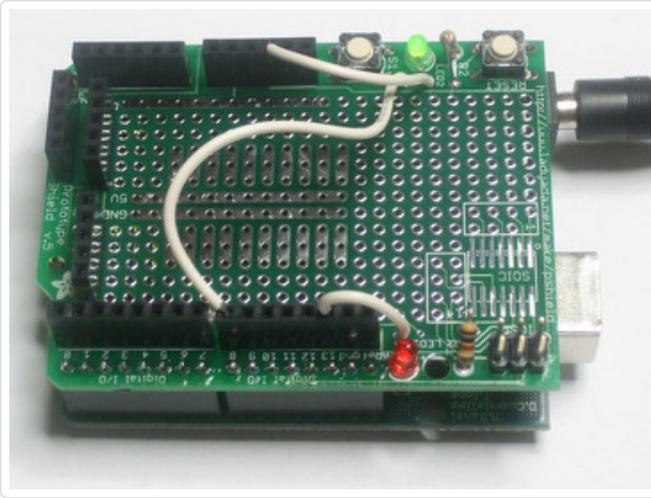
Solder in all the legs of the LEDs and resistors.



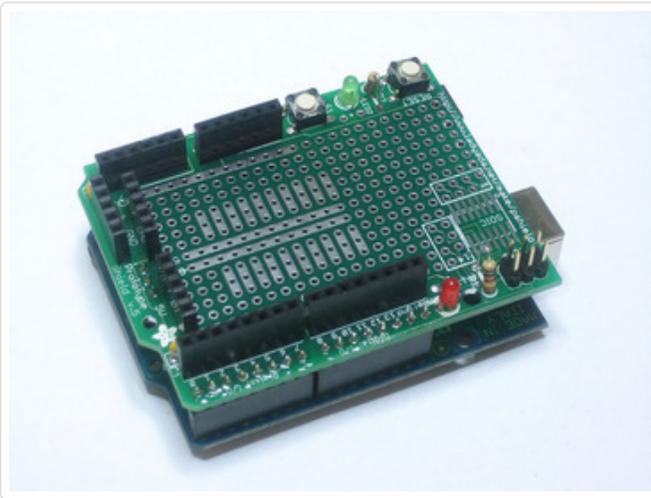
When done, check your work!



Clip all the leads down so that the long wires are no longer than the solder points



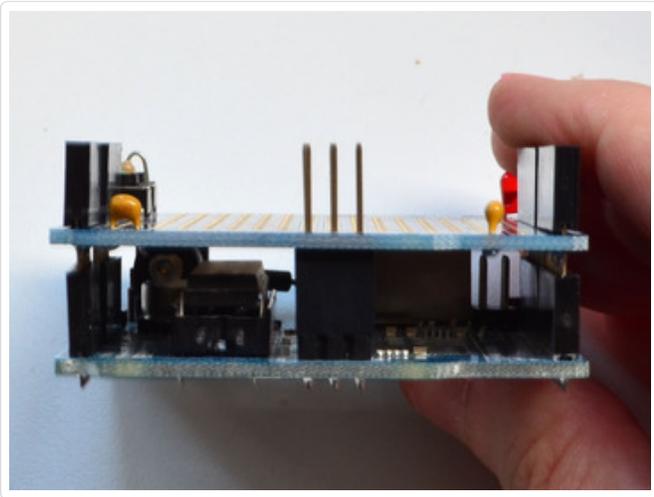
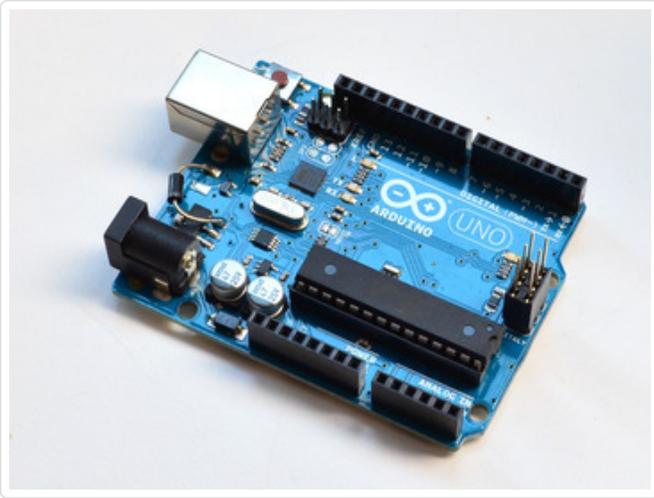
If you want to use the red and green LEDs or the general purpose button, simply solder solid-gauge wire (~22awg is good) into the large solder holes near the device. Then you can plug the other end of the wire like a jumper into any of the female headers. The two LEDs are tied to ground through 1K or 1.5K resistors. The button simply connects the jumper to ground when pressed (use an internal or external pull-up). Check the schematic on the download page for specific details.



SPI/ICSP Connector

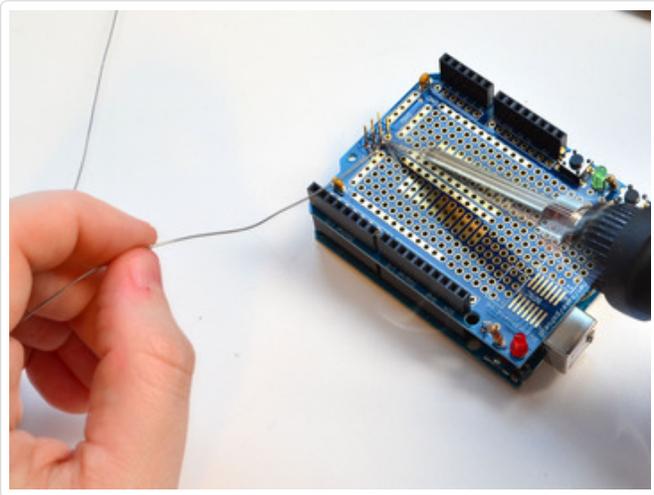
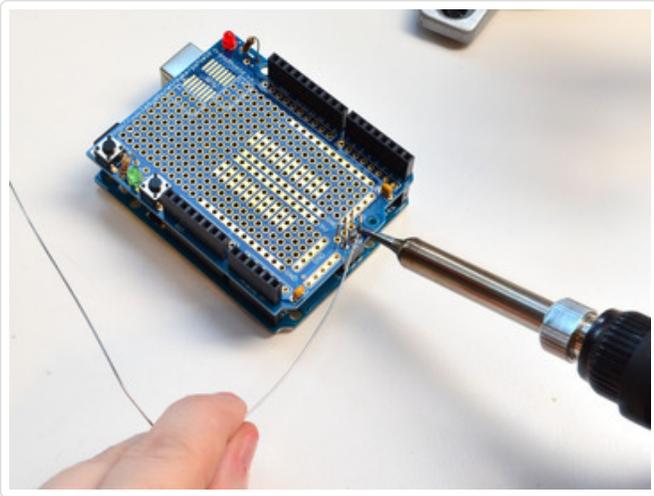
If you need to stack with a board that uses hardware SPI, or maybe you want to reprogram your Arduino with an AVR programmer, you'll want access to the 2x3 pin SPI/ICSP connector.

Grab the 6-pin stacking ICSP header and plug it into the header on your Arduino



Plug the shield on top so that the 6 pins go through the matching holes in the PCB

Solder all 6 pads

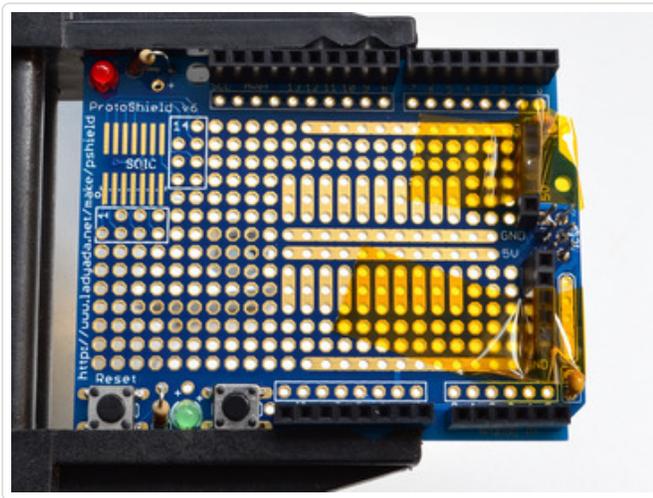


You're done!

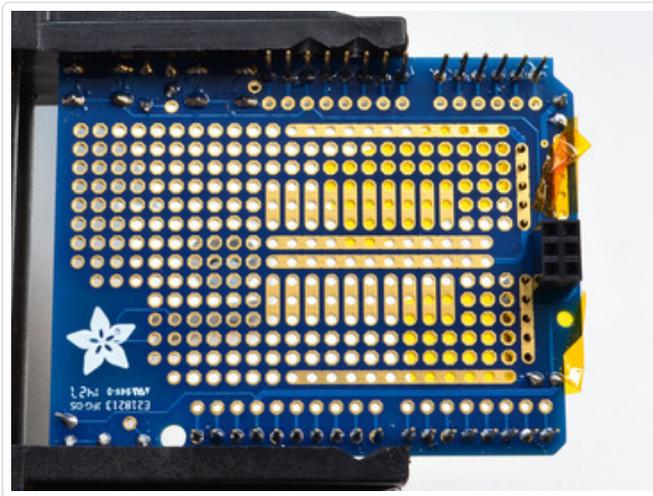


5-Pin power rail connections

If you're using the proto shield with a tiny breadboard you may want to solder in the two 5-pin headers to the 5V and GND rails near the end of the Proto Shield, its pretty easy!

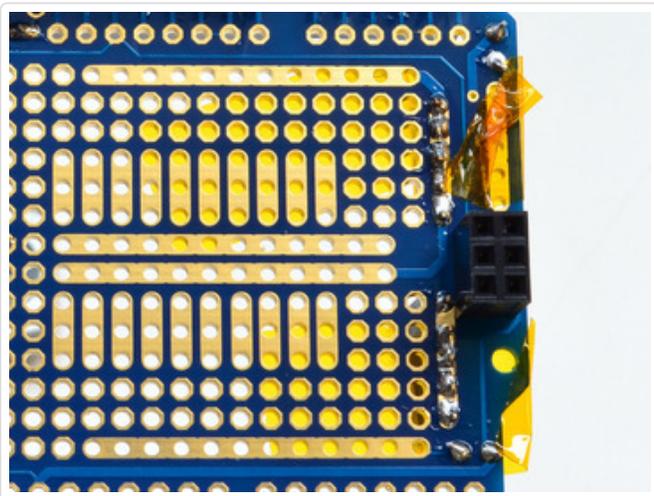
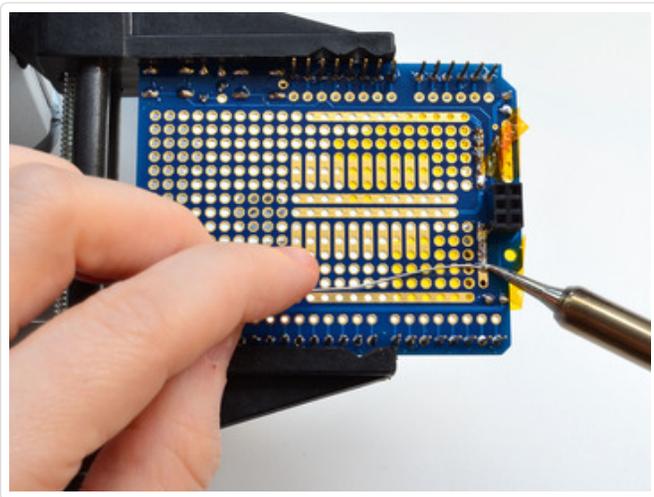
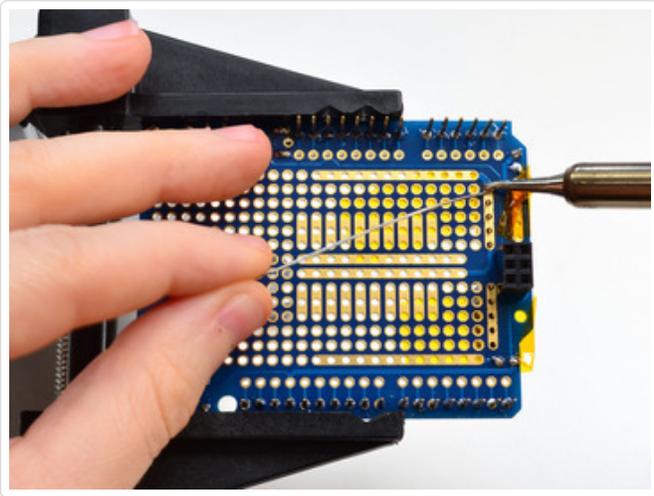


Place the two non-stacking 5-pin headers into the matching slots on the right hand side of the PCB. Use tape to keep them in place



Flip over the board. Use more tape if you need to keep the headers from sliding out

Solder all the pads!



Check your work, make sure all the pins are solidly attached

Download

PCB & Schematic

Here's the latest EagleCAD [sch](http://adafru.it/cmz) (<http://adafru.it/cmz>) and [brd](http://adafru.it/cmy) (<http://adafru.it/cmy>) files.

[And the schematic as an image](http://adafru.it/cmz) (<http://adafru.it/cmz>).

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