

Stickuino soldering manual

Interaction technology – Embedded systems and sensors – v4

Lennart Herlaar

Before you start

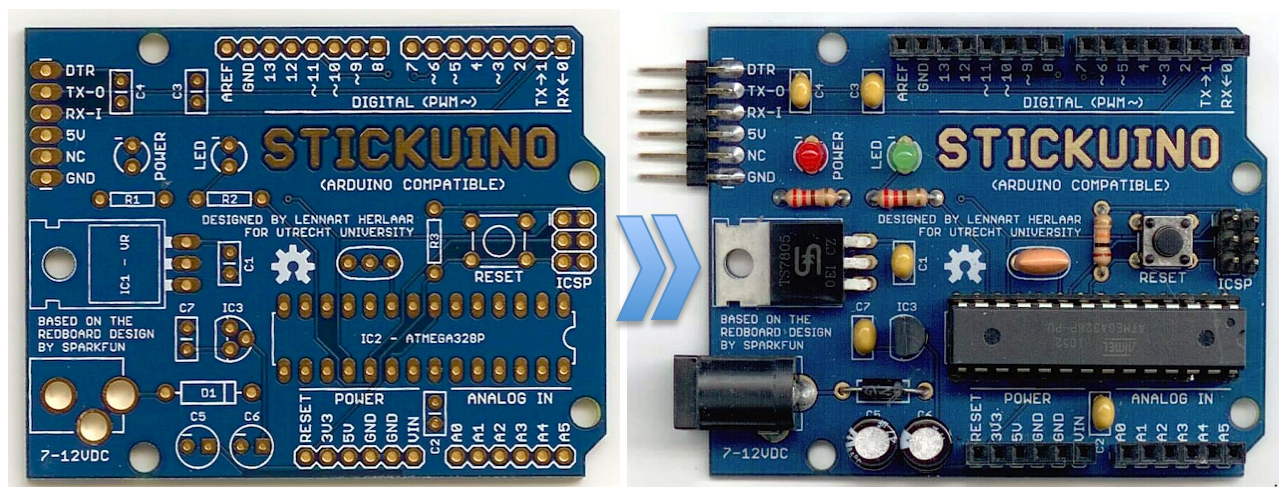
This soldering manual assumes that you've read the embedded systems and sensors website for the Interaction technology course and that you're familiar with the contents of your Stickuino kit.

Please note: soldering irons do get hot. There's one logical way to hold a soldering iron: the least painful one.

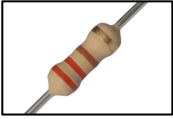


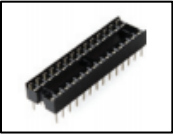
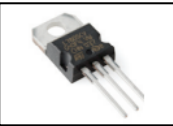
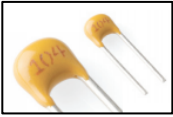


The most convenient way to assemble your Stickuino is in the order suggested below. You'll then be working in the order of component height, from low to high profile. In that case the component you are soldering is always taller than the previously assembled ones and is pressing nicely against the work area. In general each component needs to be mounted as close to / flat against the Stickuino pcb as possible.

Do's and don'ts

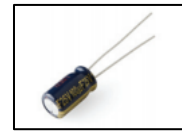
- Use a wooden placemat to protect the surface of your work area while soldering.
- Set the temperature of the soldering iron to 350 degrees Celsius and wait a minute for the soldering iron to heat up.
- Don't forget to clean the tip of your soldering iron frequently, using a wetted sponge.
- After soldering a component, cut off its leads close to the board, just above the solder joint.
- Wash your hands after you're done soldering, as the soldering wire contains lead, which is bad for your health.



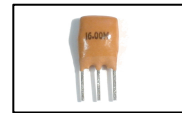
Step by step soldering instructions

1. Solder resistors R1, R2 en R3. R1 and R2 are 220 Ohm. R3 is 10k Ohm. The color code of the 220 Ohm resistors is red-red-brown-gold. For the 10k Ohm resistor, the color code is brown-black-orange-gold. Polarity (distinction between positive and negative sides) is not of importance in case of resistors. Esthetically it's nicer to mount R1 and R2 with the same orientation (e.g. gold colored band on the right hand side). **Please make sure that you mount the components on the top side of your Stickduino pcb!** The side with the golden STICKDUINO text is the top side.
2. Solder diode D1. Here polarity does matter. The white band printed on the Stickduino pcb must match the white band on the diode body.
3. Solder the red and green leds. The red led is the power led. Polarity once again does matter (led = light emitting *diode*). The shorter leg of each led indicates its negative side. On the Stickduino pcb the negative side is marked with a minus sign.
4. Solder the 28 pins IC socket in place of IC2. Note that there are two 28 pins components in the kit. **Don't solder the 28 pins microcontroller (the chip) directly in place of IC2!** Pay attention to the orientation. The notch of the IC socket (a small dent on one of the sides, which may be a bit difficult to spot) should match the image of the socket on the Stickduino pcb. Mounting the socket is most easily achieved by first soldering two legs diagonally opposite from each other and then soldering the remaining legs.
5. Solder the 5V voltage regulator in place of IC1. Note the orientation. The final placement should match the image on the Stickduino pcb. Mounting is most easily achieved by sticking the legs of the voltage regulator through the holes on the pcb, bending it 90 degrees such that it sits flat to the surface, and soldering it in place.
6. Solder ceramic capacitors C1, C2, C3, C4 and C7. Make sure that they are mounted as closely as possible to the pcb. Orientation is not of importance from an electrical point of view, but again, esthetically it would be nice to mount them each in the same way, making sure that the markings on the capacitors can easily be read.
7. Solder the print push button. This is the reset button. The push button can be mounted in two different ways (differing 180 degrees). Either of these two orientations will be fine.
8. Solder the 3V3 voltage regulator in place of IC3. You'll need to bend the middle leg outward a bit. Note the image on the pcb. Try to mount it straight and make sure that it's mounted as closely as possible to the pcb.

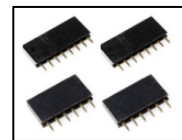
9. Solder the electrolytic capacitors C5 and C6. Polarity does matter in this case. The shorter leg of each capacitor indicates its negative side. On the Stickduino pcb the negative side is marked with a minus sign. The negative side of each capacitor can also be identified by a light colored band containing minus signs.



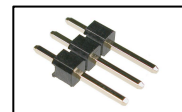
10. Solder the brown 3 pins resonator. Placement should match the oval contours on the Stickduino pcb. From an electrical point of view orientation is not of importance but it would be nice to mount it in such a way that the markings can easily be read. Mounting it straight may require some skill. A third hand could be convenient here (but don't touch the resonator as it gets hot!). You'll notice: we are slowly raising the bar...



11. Solder the 6 pins and 8 pins female headers (4 pieces in total) near the edges of the Stickduino pcb. Orientation does not matter but you do need to pay attention to the number of holes... Again, mounting these straight may turn out to be a challenge. Again, a third hand could make the difference. Fixate a header by soldering only one leg at first. If you're not satisfied with the result, you may heat up and resolder this leg while straightening the header. When you're satisfied, proceed with soldering the remaining legs.



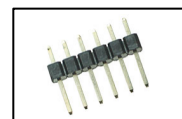
12. Solder both of the 3 pins male headers that together form the ICSP connector. Note that the 3 pins male headers don't exactly match the image on the Stickduino pcb, which suggests 3 times 2 pins headers instead of 2 times 3 pins headers, but multiplication is commutative as you may know. Take one of the headers and place it on the top side of the Stickduino pcb. The short side of the headers should go into the holes. Again, start by soldering only a single leg, while keeping it in place and straight by pushing down on the other legs. A third hand may come in handy here. Proceed with the remaining legs. Solder the second 3 pins male header in the same way.



13. Solder the DC connector. By now, it should be pretty obvious where it goes. Orientation does matter, but in fact there's only one viable option. Soldering once more poses a challenge, as the holes are rather large. It might help to fixate the connector by soldering one of the legs with just a bit of solder. Proceed by soldering the other two legs and finally complete the first leg. Make sure that the three holes are completely filled with solder.

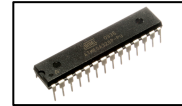


14. Solder the 6 pins male header. Polarity is not of importance. **The intention is to mount the header in the same plane as the Stickduino pcb, on the top side. Do not mount it vertically, standing upright in the holes,** as you can't just bend it! Mount it in the following way: put a bit of solder on the DTR solder pad of the Stickduino pcb, position the 6 pins header flat against the solder pads holding it in place with your thumb, use the soldering iron to melt the solder on the DTR pad, heating the header pin on the DTR pad at the same time. Make sure that your thumb does not touch the pin that you are heating... The solder will now spread and fixate the header with the DTR pin to the Stickduino pcb.



You'll now be able to solder the other header pins at your own pace and finally add some more solder to the DTR pin. If you're in doubt, or don't understand this step, don't hesitate to ask for help.

15. The final step: mount the ATmega328P microcontroller. This component is not soldered onto the Stickduino pcb but inserted into the IC socket in place of IC2. Note the orientation: the notch of the microcontroller should match the notch of the IC socket. The legs of the microcontroller probably won't line up with the IC socket: you'll need to bend the legs inward a bit to be able to insert the microcontroller into the IC socket. This is easily accomplished by placing the microcontroller on its side on a flat surface (e.g. the table) and applying some light pressure. Do this for both sides until the legs of microcontroller line up with the IC socket and the microcontroller can be inserted into it. It's normal for the insertion to take some (but not too much) force.



That's it! If there are no holes left unfilled on your Stickduino pcb and you have no components left, your Stickduino is now finished.



No go? Made a mistake? Not happy?

Don't panic! Just ask for help. Most of what can be soldered can also be desoldered. There are some tools and tricks available to help solve the most frequently occurring mistakes and problems.

After you finish

Once more, wash your hands after you're done soldering, as the soldering wire contains lead, which is bad for your health.

You can now proceed to test and / or clean your Stickduino. See the embedded systems and sensors website for further instructions.