

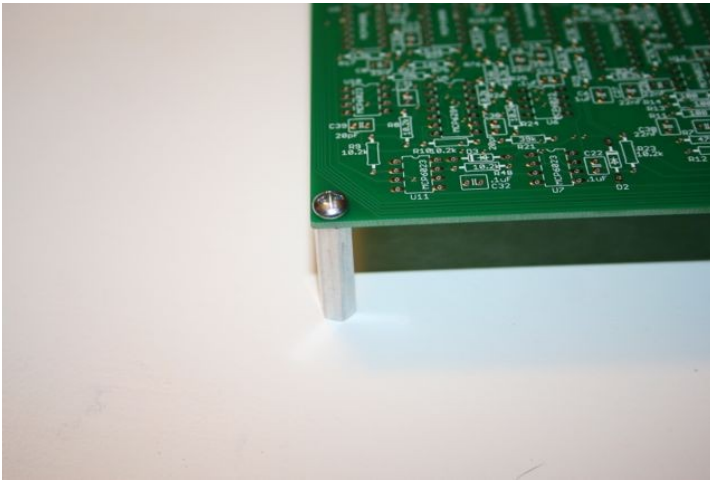
## Rockit Assembly Instructions

Here's my disclaimer:

This may be challenging. You are officially on your own. If you have not soldered much, take your time to do it right. I can't take broken kits back and it's very hard to diagnose electronics problems at a distance. The ICs are static sensitive and can be easily damaged, so please take adequate static electricity prevention measures, such as a ground mat and a wrist strap. Also, be very careful not to create solder bridges, solder connections where they are not wanted. They will often ruin the synth, potentially damaging parts and the PCB. I can attest to both of these failure modes because I've caused them myself. Before powering the board, carefully inspect every solder joint. Make sure all joints are fluid and complete and that there are no solder bridges.

With that out of the way, let's begin!

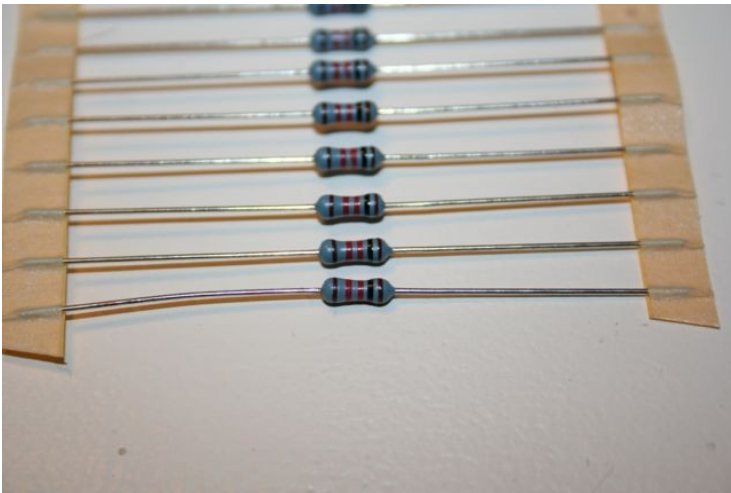
1. Install corner standoffs with screws
1. Installing these standoffs makes life much easier because it provides a flat surface for working and keeps the bottom of the board off the table.



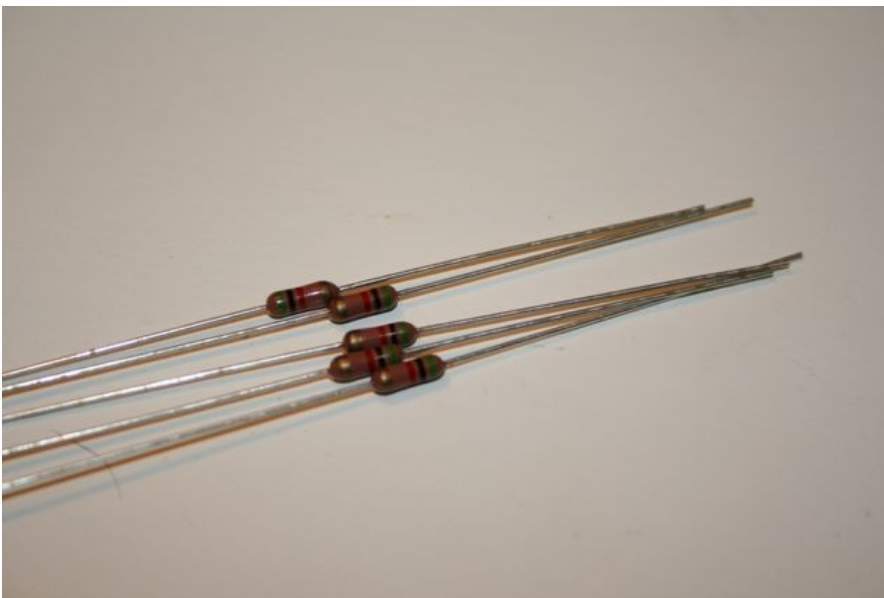
2. If you're a soldering wizard, you can skip this section. For the soldering initiates, a note on soldering. Soldering is a relatively easy thing once you get the hang of it. There are some important points to know though. Here are some pointers:
  1. My six step method:
    1. Iron
      1. Hold the iron tip at the point where the part meets the PCB. There is a solder pad around the hole. The solder pad is on the top and the bottom and the hole is plated so the top and bottom connect. you only have to solder one side, but it's best if you solder all points on the bottom so you can see them all clearly.
    2. Count
      1. Count to 2 or 3 to make sure the lead and the PCB solder pad heat up.
    3. Solder
      1. With your other hand, touch the solder to the same point where the lead and the PCB meet.
    4. Count
      1. Count to 2 or 3 again to make sure the solder flows and fills the hole entirely.
    5. Remove
      1. Pull away the soldering iron.

## 6. Inspect

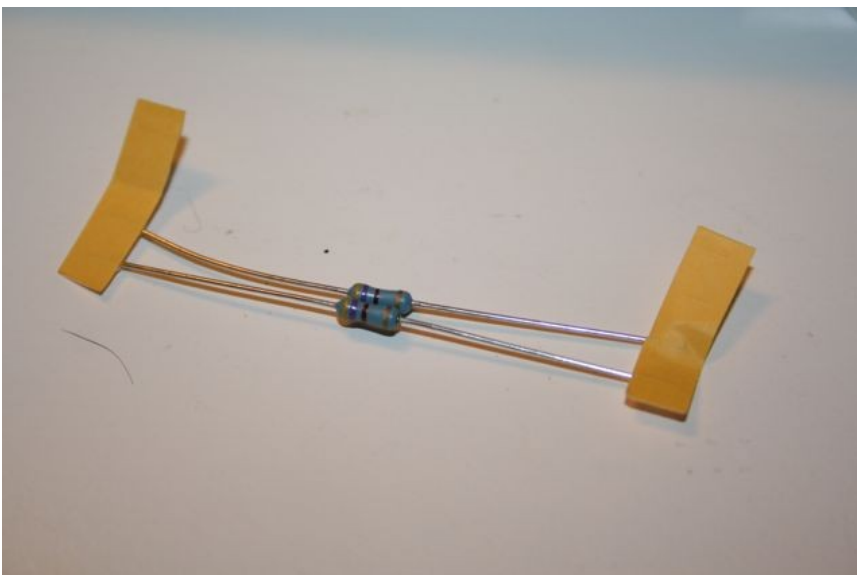
1. Make sure the solder has filled the hole entirely. There should be no gaps in the solder. It should be smooth-looking with a nice fillet. Also, make sure that you have not accidentally created a solder bridge.
2. A few notes:
  7. You have to heat the joint, not just melt the solder. You can easily melt solder by touching it to the iron, but the solder won't adhere to a cold part. If the joint is not hot, it will not bond and you'll end up with a cold solder joint which looks like it works but actually doesn't. These can be difficult to trace.
  8. More solder is not better. You don't have to put mounds of solder on and it may actually make things worse because you'll end up with solder bridges (solder joints where you don't want them). The right amount of solder won't leave big balls of solder, but fills the hole between the part and the pad entirely.
  9. Keep some solder wick at the ready. If you make a mistake by making a solder bridge or putting down too much solder, remove it using solder wick. To use solder wick, hold the wick between the soldering iron and the solder you want to remove. Just don't hold onto the solder wick too close to where you're trying to remove solder because it's made of copper and gets super hot. You'll only make that mistake a few times.
3. To get the knack of solder, let's start by soldering the resistors.
3. Here are some basics on soldering resistors.
  1. Stick the leads through the holes and get the part to sit flush with the board.
  2. Then, bend the leads over on the bottom. You don't have to bend them all the way down. Doing so will make trimming the lead harder.
  3. Solder the joint.
  4. Trim the lead just above the solder. Don't cut into the solder and don't leave too much lead. Both can be problematic.
  5. I like to insert a bunch of resistors at the same time because it saves time not to change tools too often when building. You have to be careful not to cross leads though and solder two parts together unintentionally. Proceed with this method with caution. If you're worried about it, just do one resistor at a time.
4. I would group all the resistors with like kinds. It'll help determine what they are.
  1. Here's a key for the resistor stripes. There are some tolerance colors I have omitted. There are pictures of each below.
    1. 10.2k - Brown, Black, Red, Red
    2. 5.1k - Green, Brown, Red
    3. 47k - Yellow, Purple, Black, Red
    4. 1.5k - Brown, Green, Black, Brown
    5. 39k - Orange, White, Black, Red
    6. 220 - Red, Red, Brown, Red
    7. 100k - Brown, Black, Black, Orange
    8. 1k - Brown, Black, Red
    9. 16k - Brown, Blue, Black, Red
    10. 470 - Yellow, Purple, Brown
    11. 100 - Brown, Black, Black, Black
5. Solder 10.2k resistors. There are 18 of them.



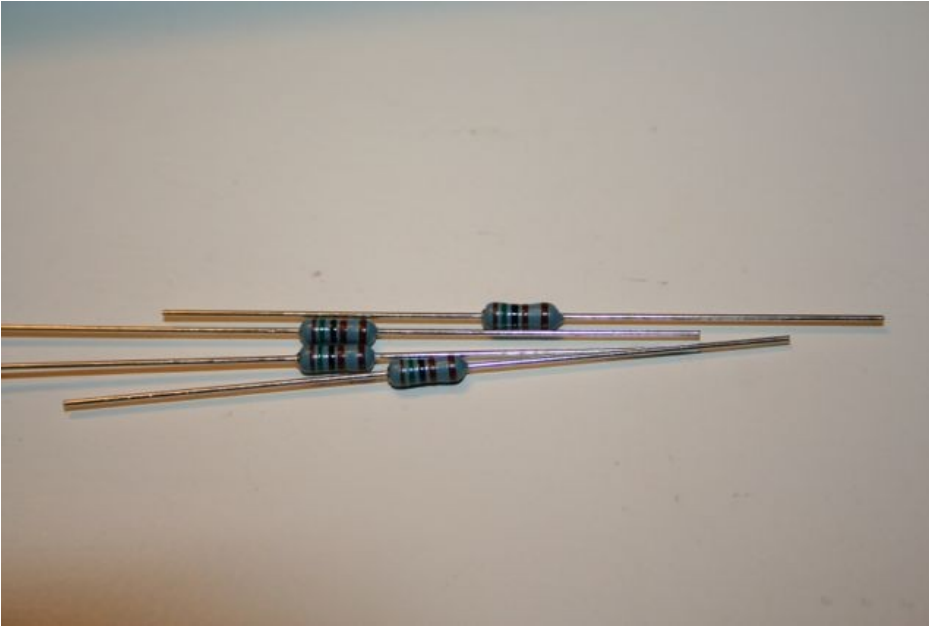
6. Solder 5.1k resistors. There are 5.



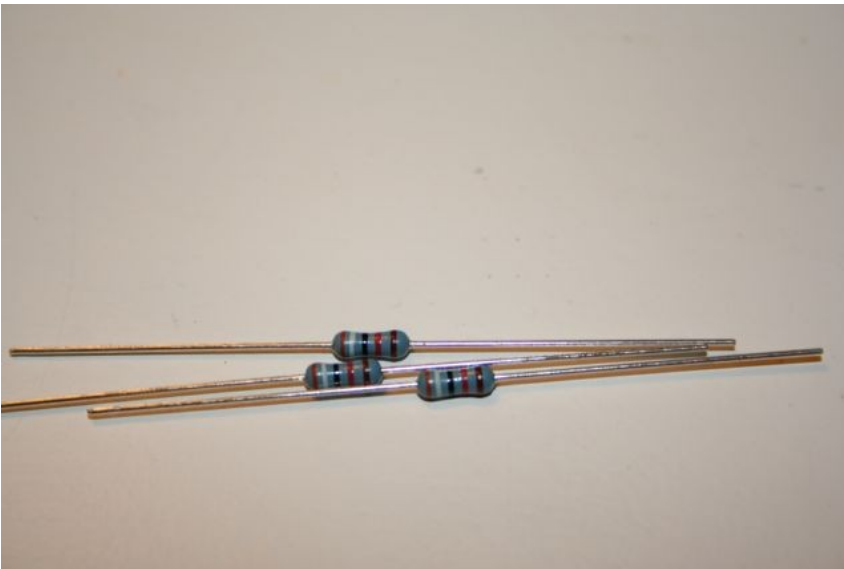
7. Solder 470 Ohm resistors. There are 3. \*NOTE\* Early versions of the kit only had 2 470 Ohm resistors. Resistor R31 changed in value from 220 to 470 to resolve some people's problems with MIDI in. The board may be marked for R31 as 220 if you have an early revision pcb. Make sure to put a 470 Ohm resistor in this position. It is located near the MIDI in jack.



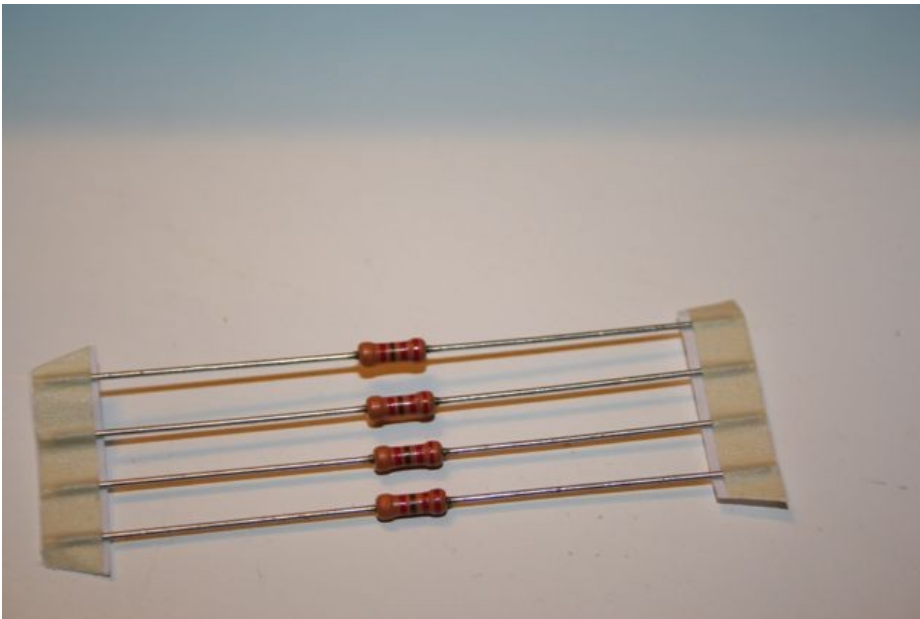
8. Solder 1.5k resistors. There are 4.



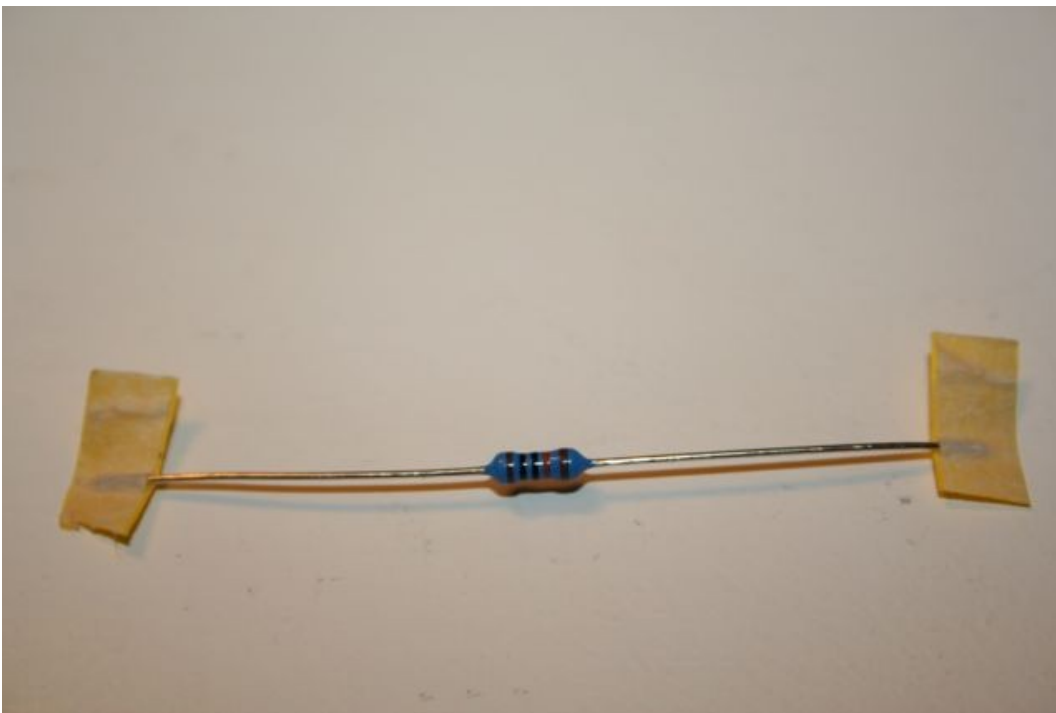
9. Solder 39k resistors. There are 3.



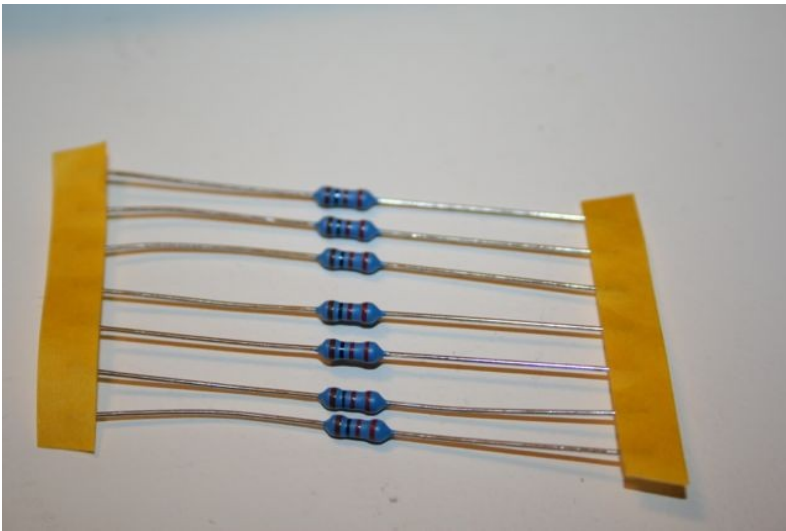
10. Solder 220 Ohm resistors. There are 3. \*NOTE\* Early versions of Rokit shipped with 4 220 Ohm resistors. R31 is no longer a 220 Ohm resistor. Be sure not to put a 220 Ohm resistor in this position. You may encounter MIDI input problems if you do.



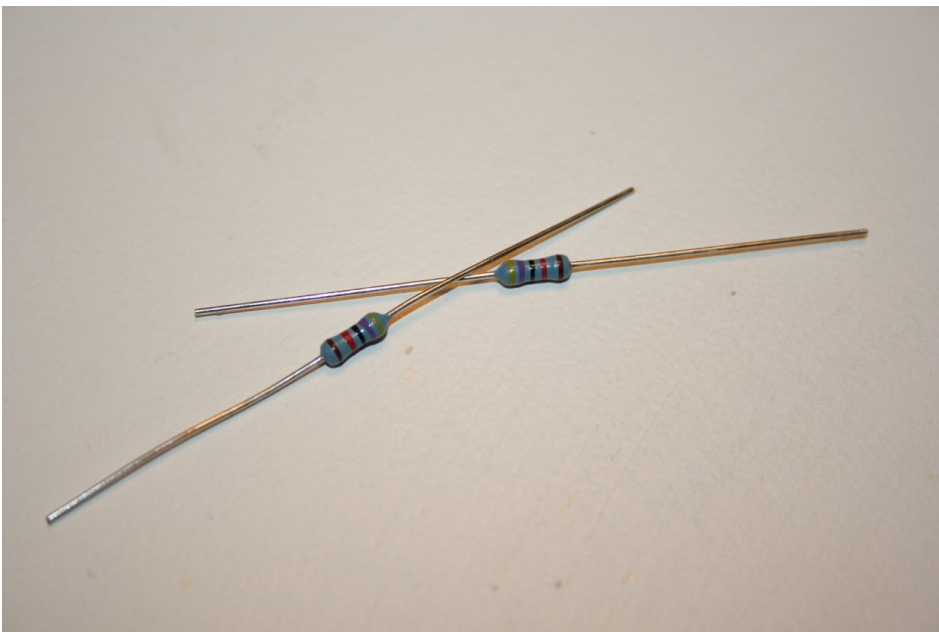
11.Solder 100k resistor. There is only 1. It's to the left of the microcontroller.



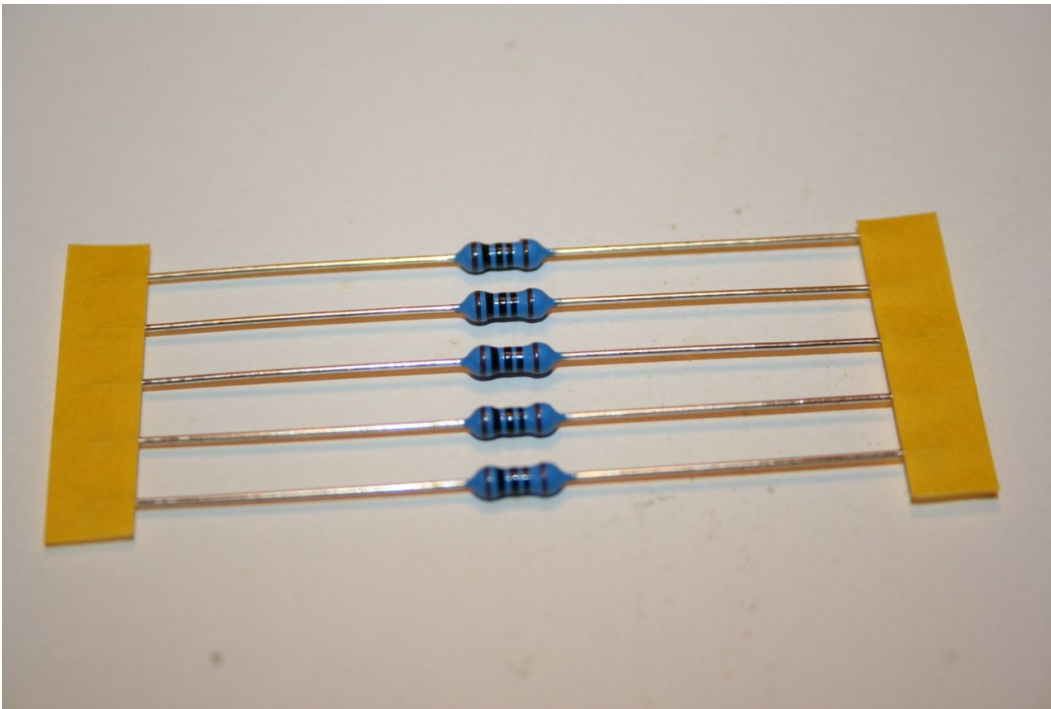
12.Solder 1k resistors. There are 7.



13.Solder the 47k resistors. There are 2.



14.Solder the 100 Ohm resistors. There are 5.



15. Solder 16k resistors. There are 2.



4. Now, that you're a soldering master, let's kick it up a notch and solder the ICs. ALL THE ICs FACE THE SAME DIRECTION. THEY ALL HAVE A NOTCH AT THE TOP THAT INDICATES UP. MAKE SURE THEY FACE THE RIGHT WAY BEFORE YOU SOLDER THEM! ALSO, NEVER SLIDE THESE PARTS ACROSS A SURFACE AND MAKE SURE YOU ARE NOT STATIC CHARGED WHEN HANDLING THEM! THEY ARE EASILY DAMAGED.
1. I have a trick for soldering ICs. They come with their legs bent out a little bit to make it possible for an insertion machine to bend them in to put them in the board. You have to stand in for this machine and get the legs pointing straight down so that they easily go into the board. It should never be difficult to put an IC in the board. If it is, you've got one or more leads not going smoothly into the board and if you force it, the lead will bend awkwardly and you'll need to get out the pliers and risk permanent damage to the IC straightening the lead. Be careful with this lead bending because if you bend them too far you'll regret it. With this procedure, you bend all of the legs at the same time which keeps all the leads in line with each other. Here's how you do it:



2. Place the part on its side with the legs on the table.
3. Hold the part with both hands and rock it forward a little to get the legs to be pretty much perfectly perpendicular to the body of the IC. It's a very light rocking motion. Don't go past 90 degrees.
4. Now, do the other side of the part. If you've done it right, the legs on both sides will be pointing straight down.

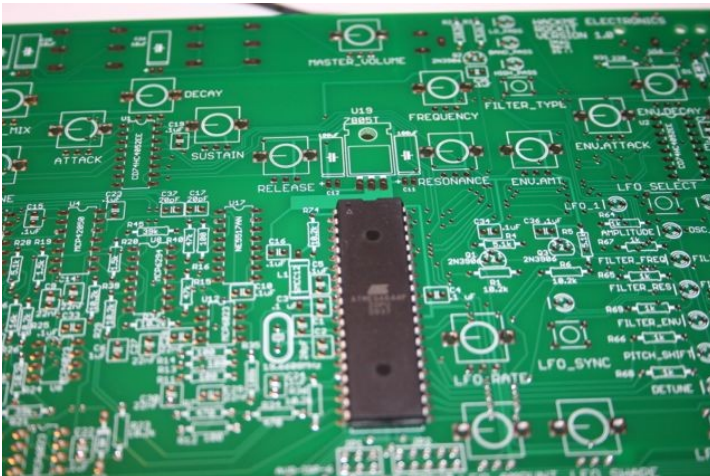


## 2. One more tip for solder ICs.

1. Once it's in the board and flush, solder it in one corner on the top side of the PCB.
2. Then, flip it over and solder the rest of the leads on the bottom.

## 3. Solder Microcontroller

1. The microcontroller has 40 pins and the synth uses all of them. Make sure they all pass through the board and the part is sitting flush before soldering. This is the most expensive part and you can't have any leads unsoldered.

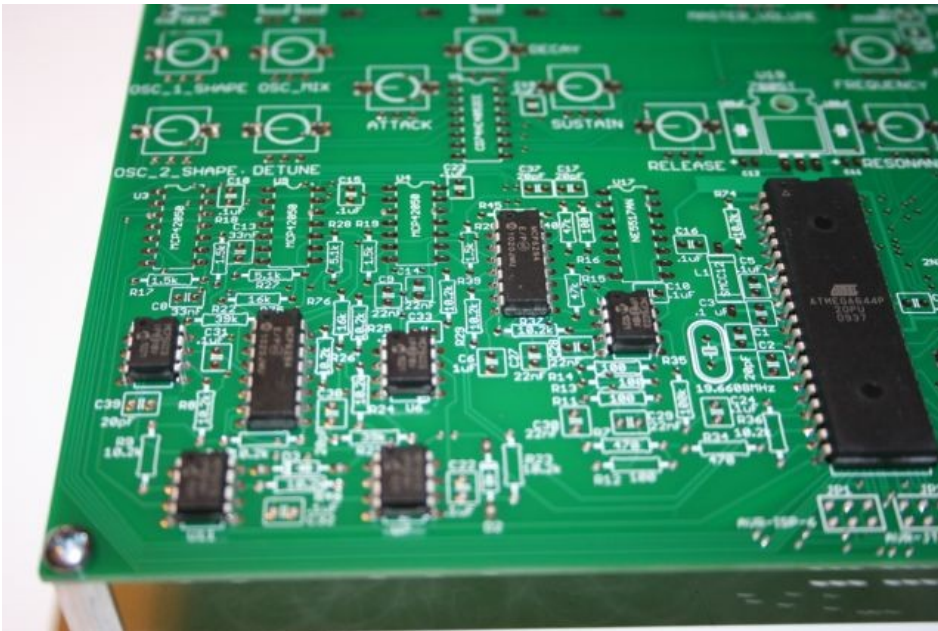


## 4. Solder Op Amps

1. There are two different sizes of op amps. There are 5 little 8-pin op amps and 2 14-pin op amps. The 5-pin parts say MCP6023 on top. The 14-pin parts say MCP6294 on top. The 14-pin op amps can easily be confused with the digital potentiometers or the transconductance amplifier. Please don't make this mistake.

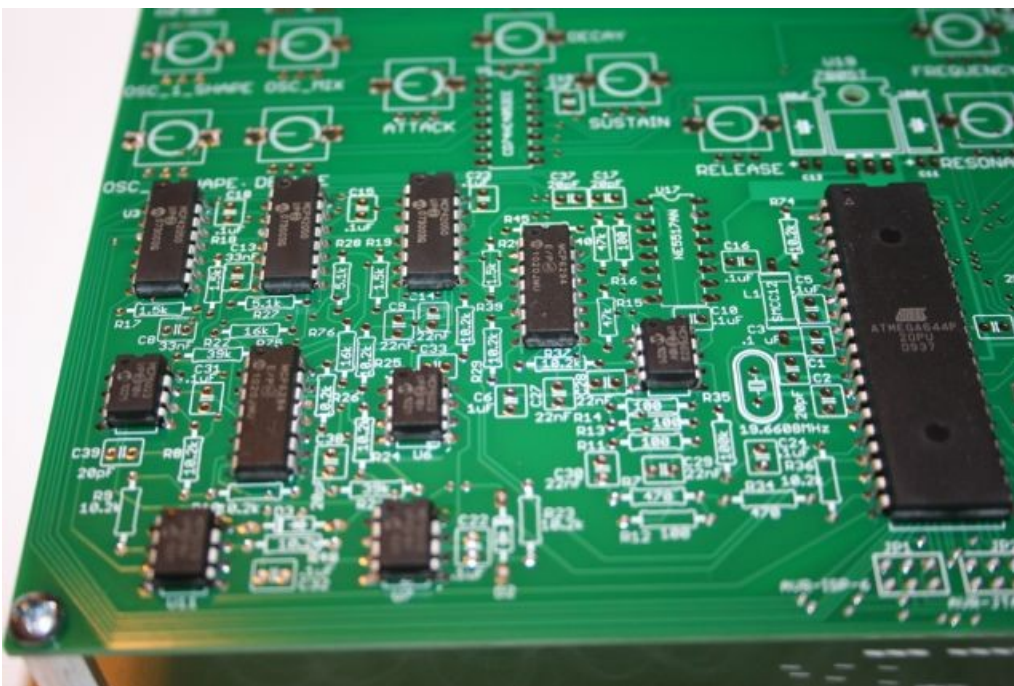






## 5. Solder Digital Potentiometers

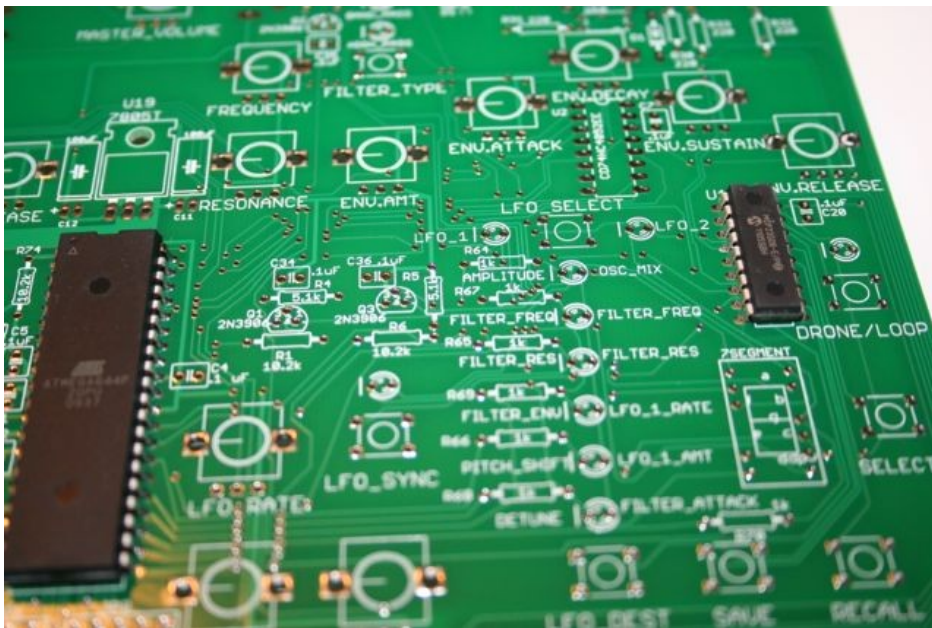
1. There are 3 digital potentiometers. They say MCP42050 on top. They all solder in a row on the left-middle of the board.



## 6. Solder I/O Expander

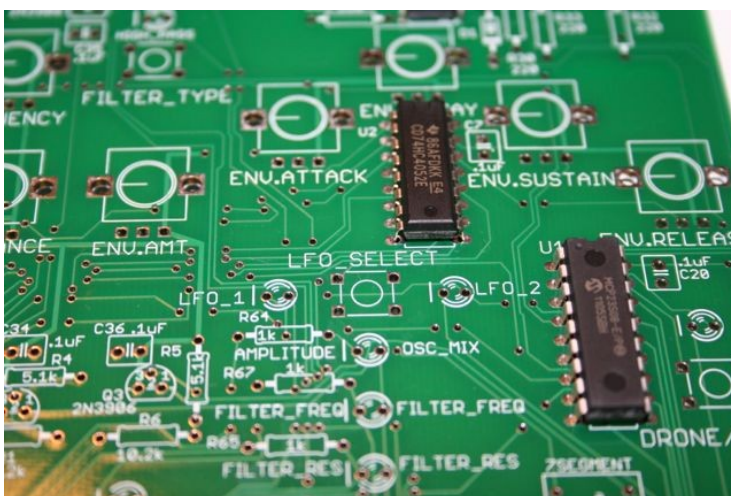
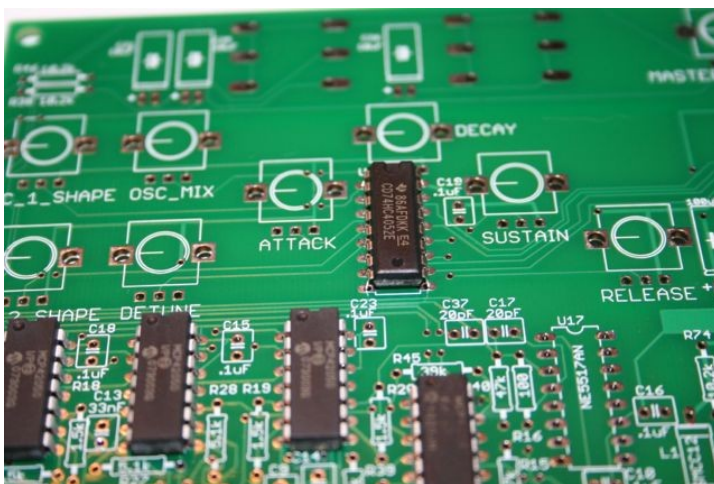
1. There is one I/O expander. It says MCP23S08 on top. It goes over on the right-middle of the board.





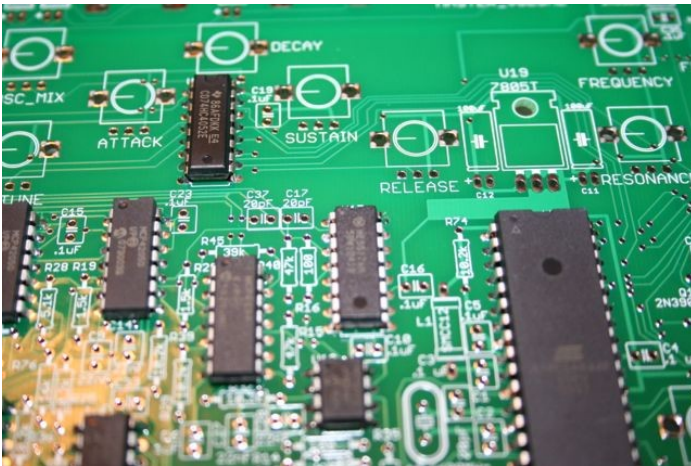
## 7. Solder Multiplexers

1. There are two analog multiplexers on the board. They say CD74HC4052 on top. One goes in the middle of the pots on the left and the other goes in the middle of the pots on the right.



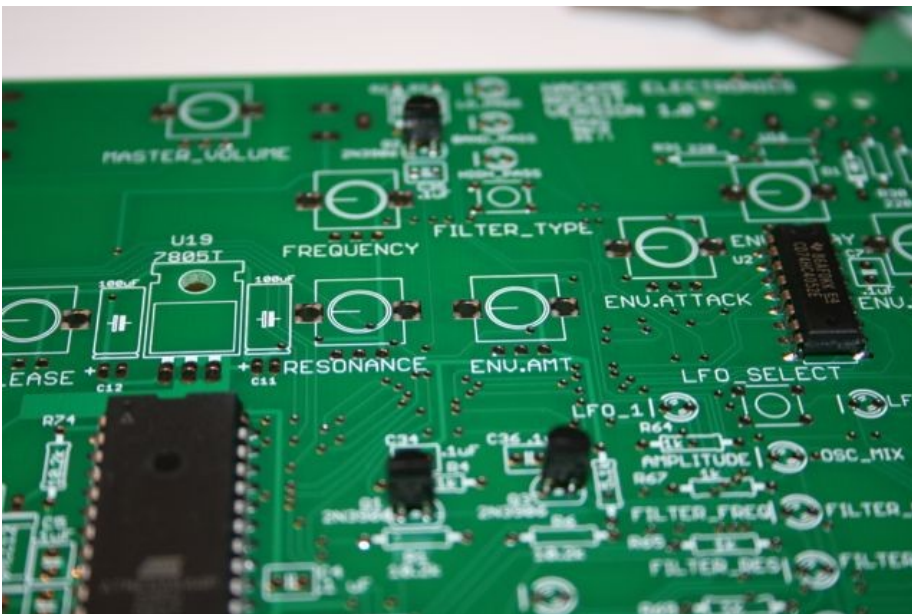
## 8. Solder Transconductance Amplifier

1. There is one transconductance amplifier. It says NE5517 on top. It goes just the the left of the microcontroller.



## 9. Solder BJT's.

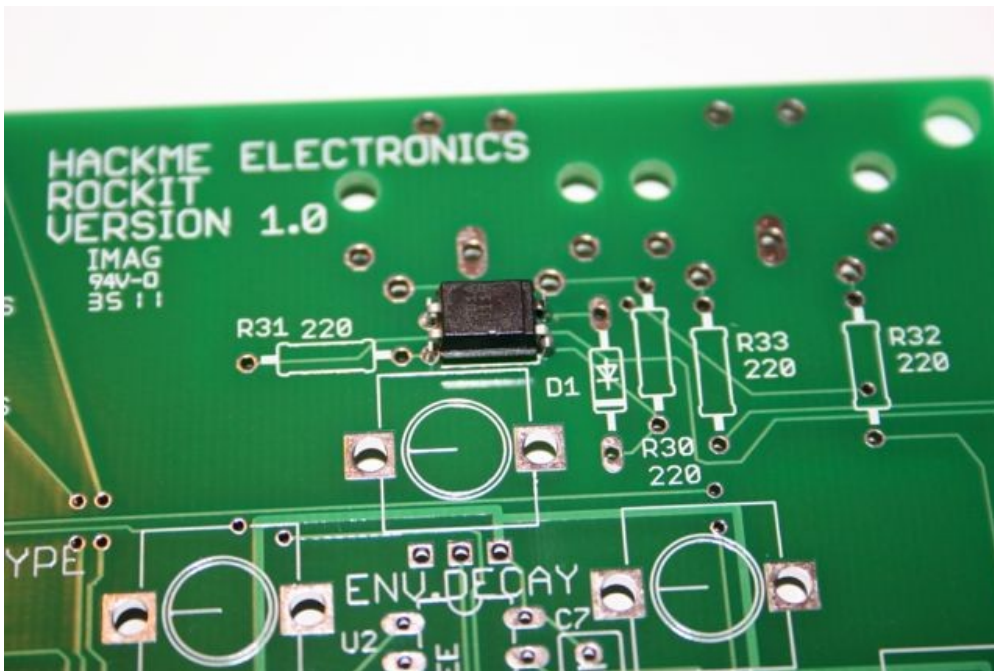
1. There are three 3-legged BJTs on the board. They all go to the right of the microcontroller. The middle leg needs to be bent out to make a tripod. These part should be soldered close to the PCB. Don't leave them standing high off the board.



## 10. Solder the optocoupler.

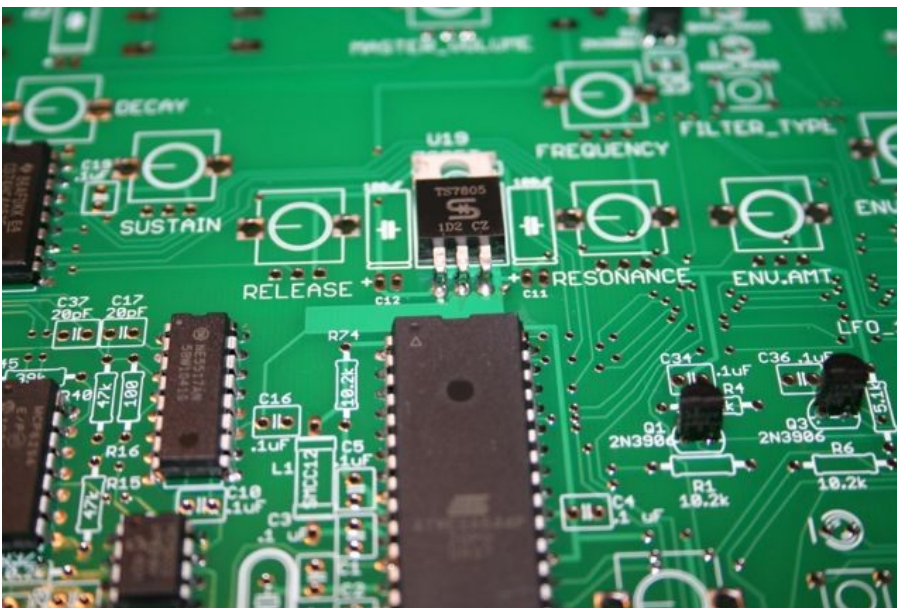
1. The optocoupler goes right bin the upper right corner. It has a line on one side. That line should face toward the right.





11. Solder the linear regulator.

1. The linear regulator goes right in the middle of the PCB. You'll want to make a 90 degree bend just below the point where the lead gets wider. When bent correctly, the part will fit in its outline on the board and lay flat.



5. Solder capacitors

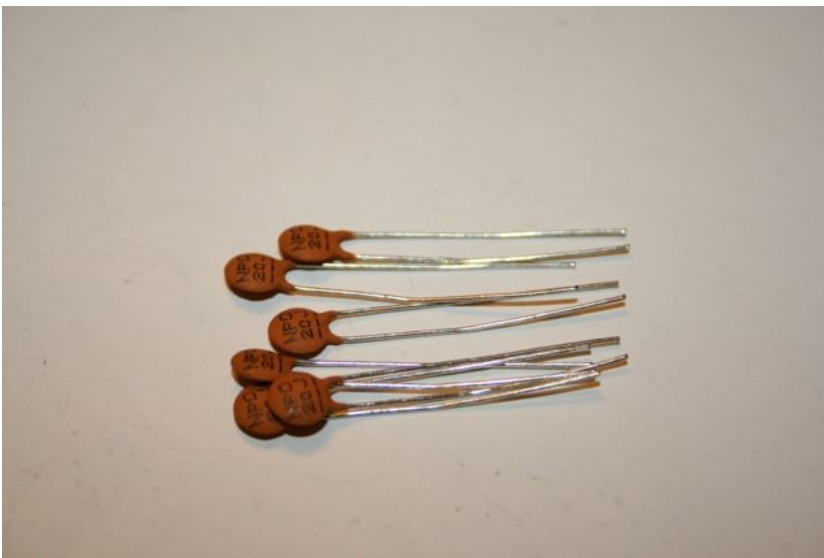
12. I use the same methods for capacitors that I do for resistors. You may have to adjust the leads to get them to go line up with the holes.

13. Solder .1uF capacitors.

1. There are 19 of these. They are all over the board, one for each of the ICs, and several for the microcontroller.



14. Solder 20pF capacitors.



15. Solder 1uF capacitor. This one goes directly below one of the 14-pin op amps, about an inch or two to the left of the middle of the microcontroller.



16. Solder 33nF capacitors. They say 333 on them.

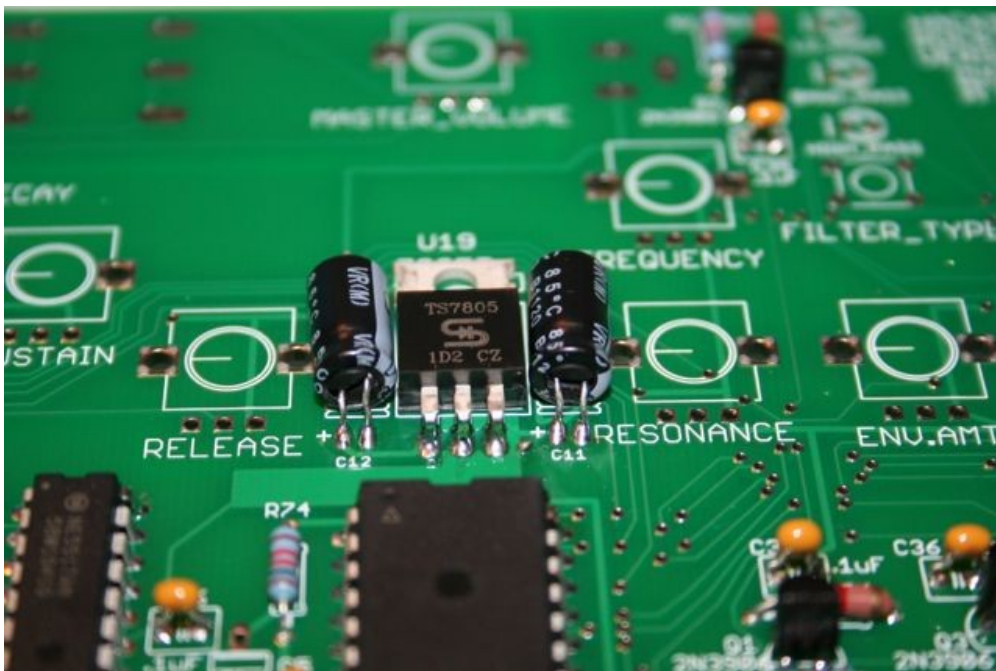




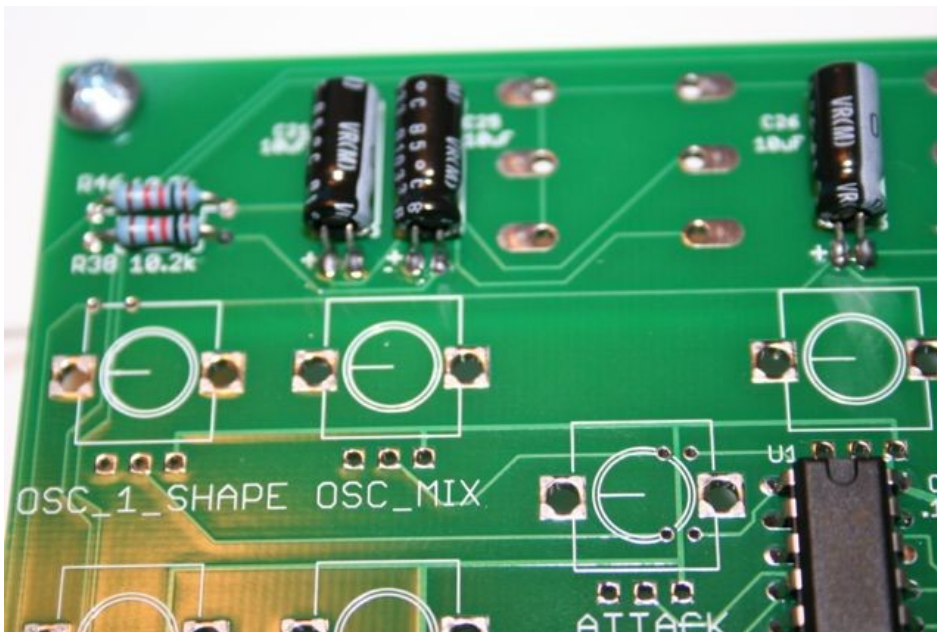
17.Solder 22nF capacitors. They say 223 on them.



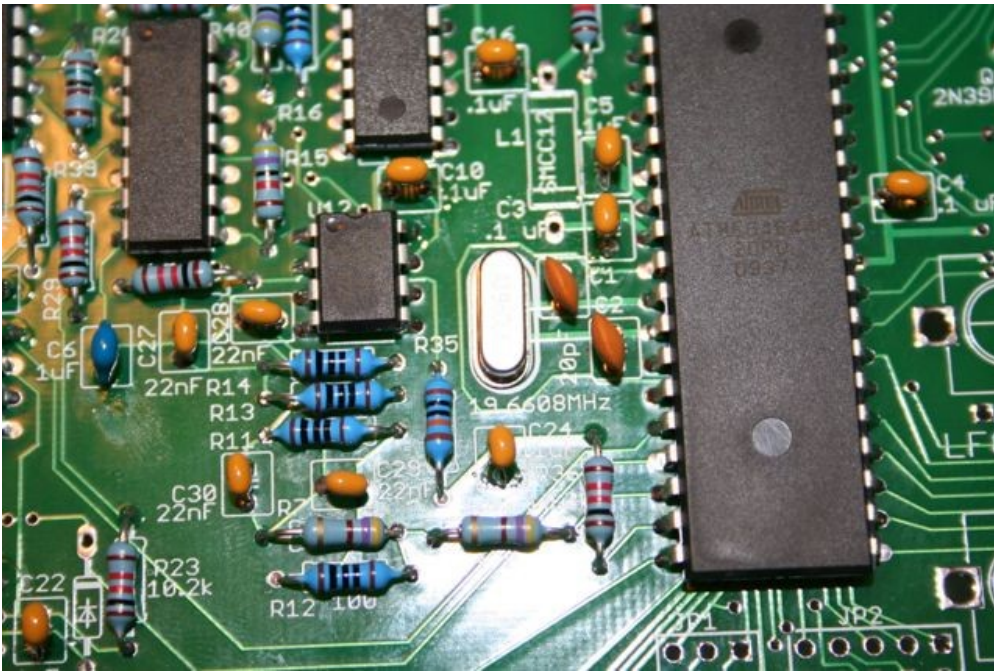
18.Solder 100uF capacitors. There are two and they go next to the linear regulator in the middle of the PCB.



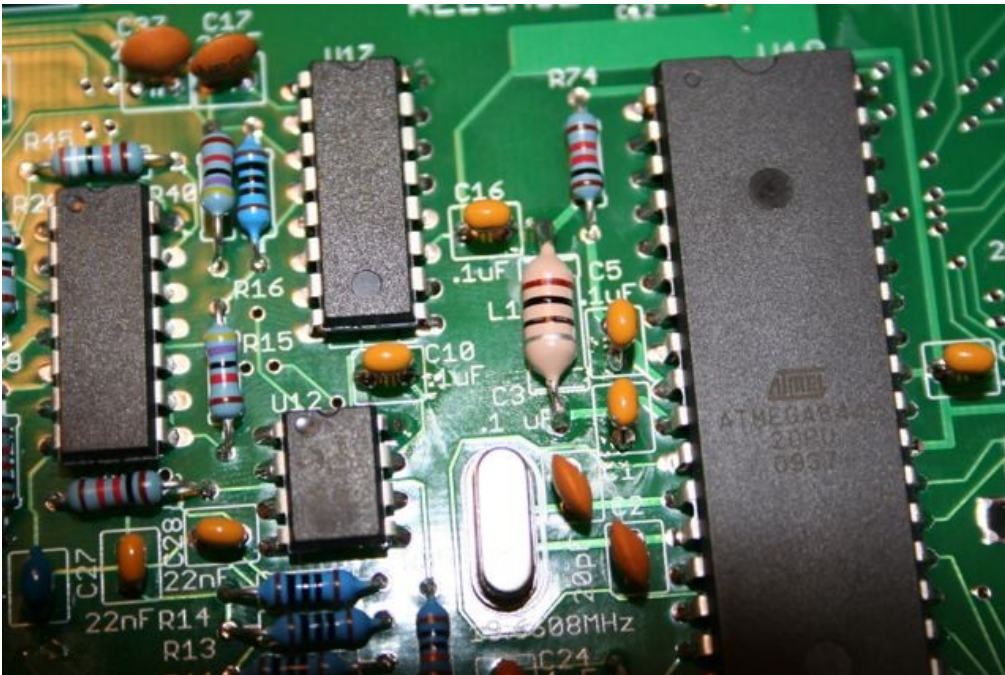
19. Solder 10uF capacitors



6. Solder crystal

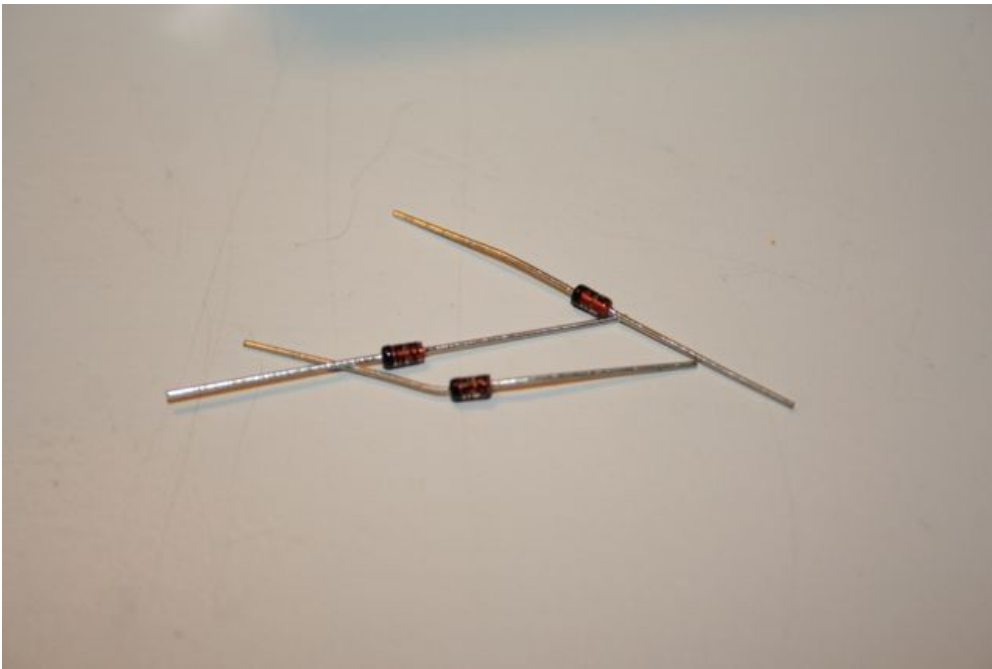


7. Solder inductor



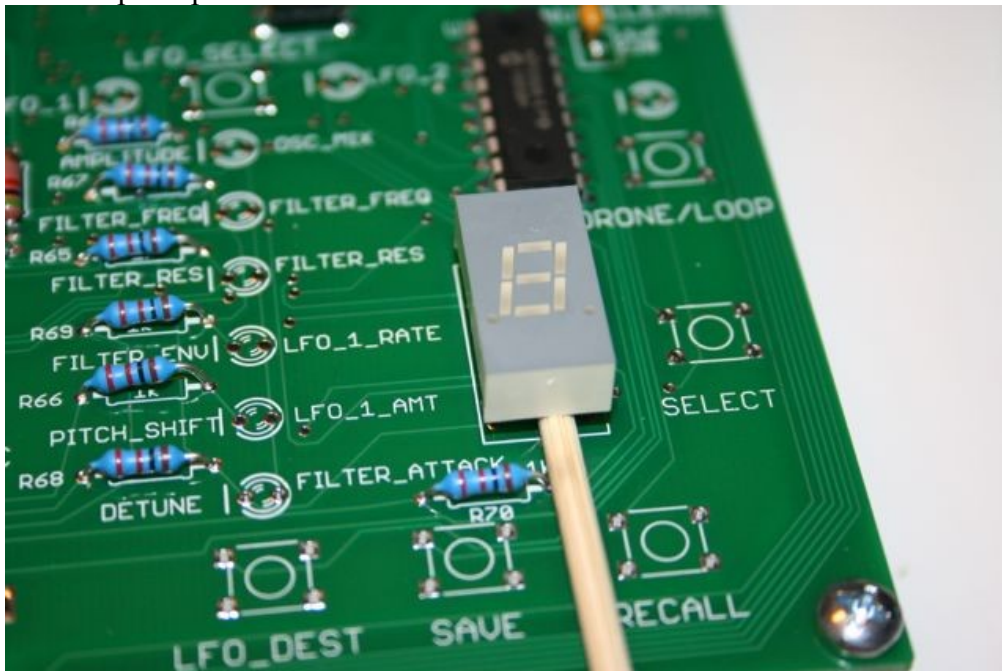
8. Solder diodes. There are 3 diodes. There are two in the lower left and one in the upper right. the black line on the parts should line up with the line in the outline of the part. Don't get these backwards or there will be problems.

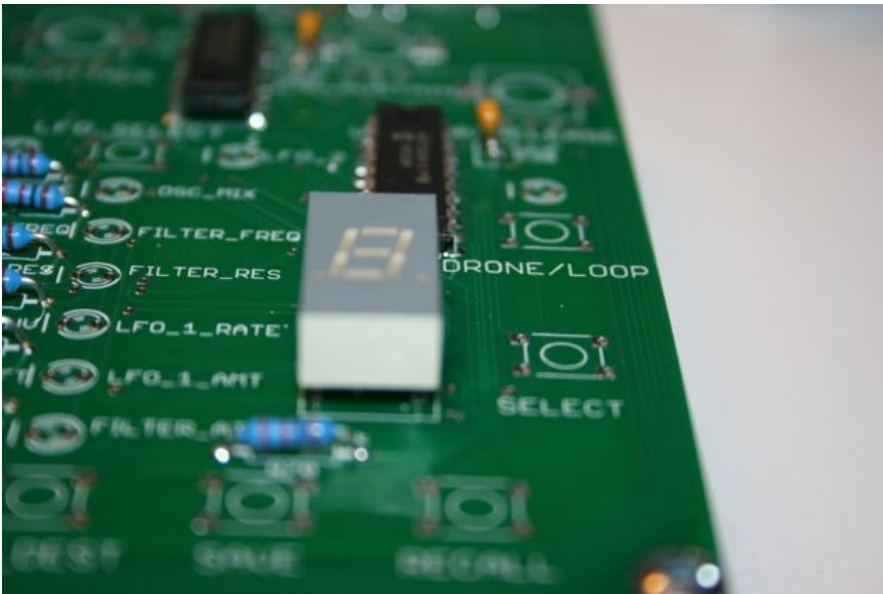




#### 9. Solder display

1. You have two options for soldering the display. If you plan on having a case, you'll probably want to have the display stand up off the PCB so that it'll be visible. Otherwise, you can solder it down flush on the board.
2. To make it stand off the board, I use a chopstick or a wooden skewer and slide it under to hold the part up off the board while I solder it.



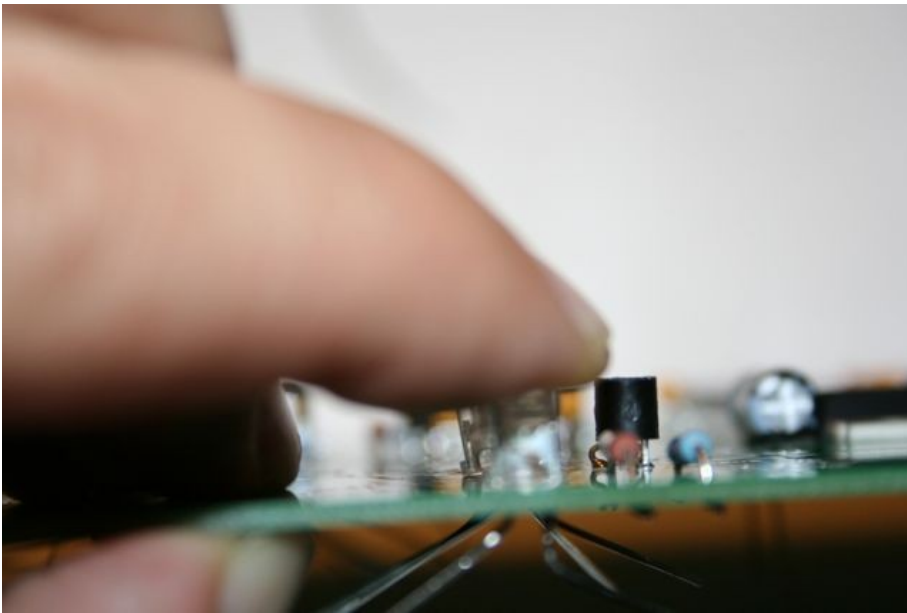


## 10. Solder LEDs

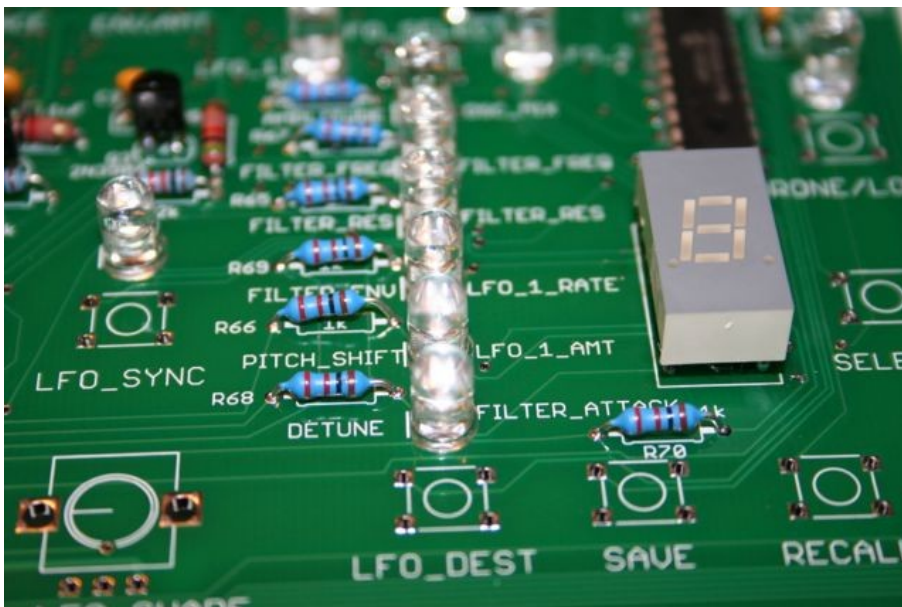
1. The LEDs have a polarity. They have two things which indicate the polarity. They have a flat side and one lead shorter than the other. Both of these indicate that this side is the cathode or negative terminal. The PCB has a line on this side in the LED silkscreen.. So, the flat side with the short lead goes on the line. On this PCB, that means short lead on the left.



2. You'll want the LEDs to sit flush and flat with the PCB. If you don't they'll be all cockeyed and they won't look good.
3. The trick to soldering the LEDs is to get them to sit as flat as you can, bend the leads over, and solder one leg.
4. Then, hold the board and LED with one hand pressing down on the LED to push it flush to the board. Touch the first solder joint again with the soldering iron and make sure that the LED is flat against the board while you have the soldering iron on the joint.



5. Then, solder the other lead.



11. Solder pots

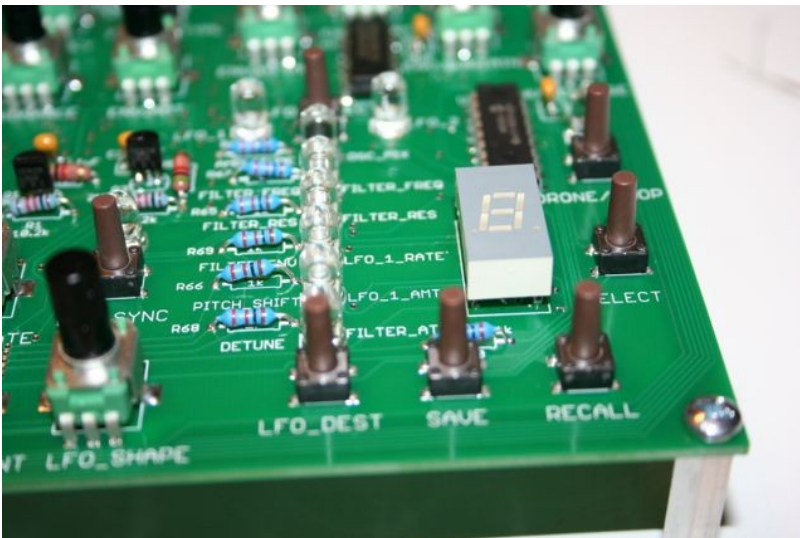
1. The pots snap into the PCB. Make sure they sit flat. Also, make sure to solder not only the electrical leads but the mounting tabs on the left and right also.





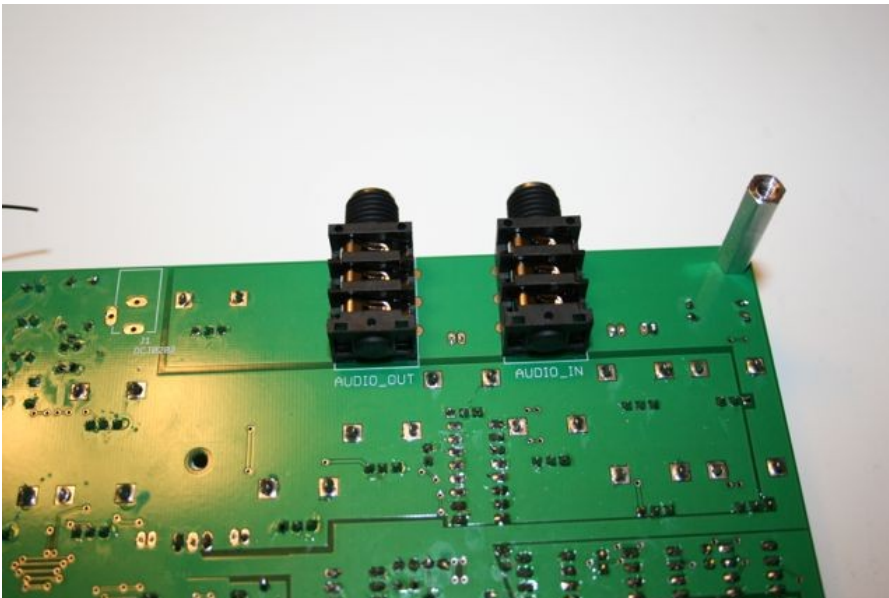
## 12. Solder switches

1. The switches snap into the PCB. They should sit level on the PCB.



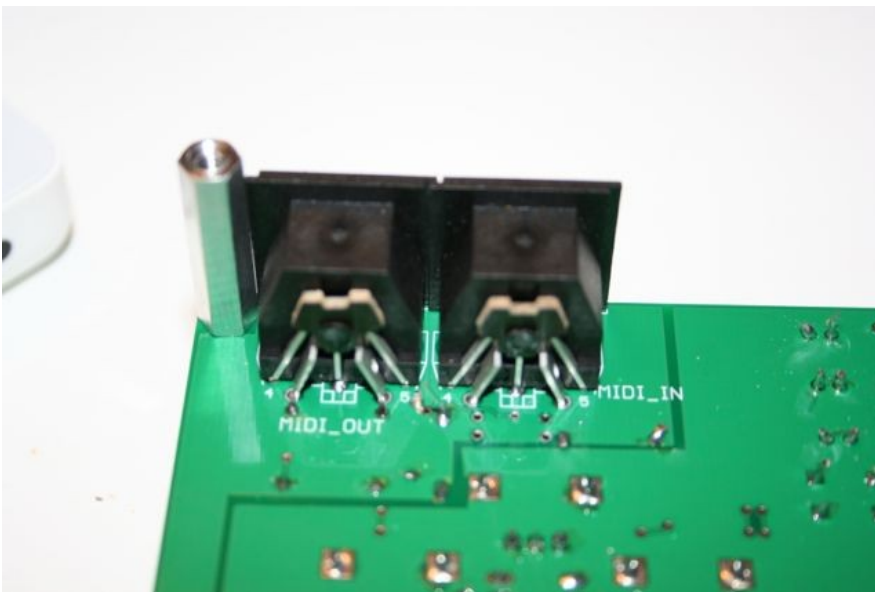
## 13. Solder audio jacks

1. NOTE\* Early Rokit kits shipped with stereo jacks. If you want to be able to use a mono cable, clip the two middle leads off the jack. That's pins 2 and 5, one on each side. If you plug a mono cable into the unmodified stereo jack, you'll get no audio output. So, now is the time to decide. I've found that most people prefer to have mono jacks.
2. The audio jacks go on the bottom off the PCB.
3. The audio jacks also snap into the PCB.



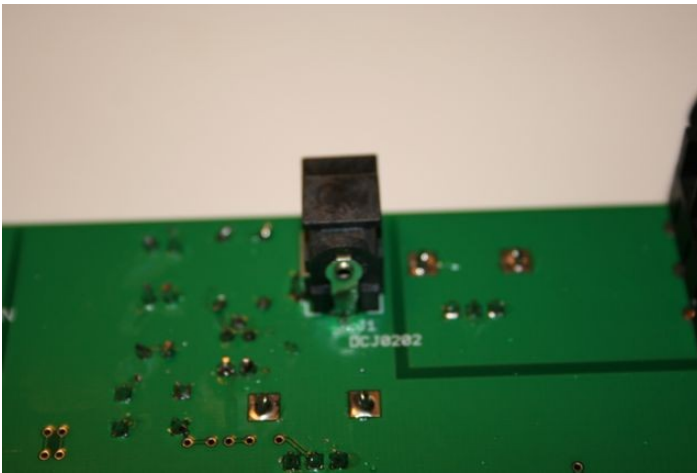
#### 14.Solder MIDI jacks

1. To solder the MIDI jacks, you'll have to hold the PCB and the MIDI jack in the PCB with one hand and solder with the other. Make sure the two jacks line up evenly and are flush with the PCB.



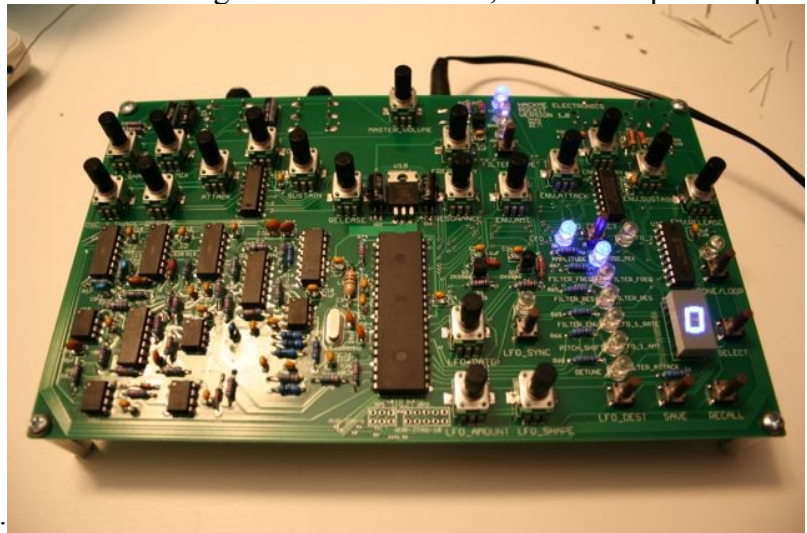
#### 15.Solder power jack

1. Unfortunately, I or the PCB manufacturer made a mistake with the first boards and what should be slots for the power jack ended up as holes. To make it work, i trim off the leads of the power jack nearly flush with the part and then just rest it on the board. This can be a little tough. You'll need a good set of flush cutters or tin snips. Don't cut them totally flush or you won't be able to solder to them. Make sure to solder all three leads. You have to solder the middle one from the top. Also, make sure that there is solder all the way through the hole. This will give it strength. The only alternative is to run wires to the power jack.



That's it! You should have all parts on your board now. It's time to carefully inspect your work. Look at all the solder joints carefully. Use magnification if necessary. There should be all clean solder joints. **NO SOLDER BRIDGES!**

Once you're satisfied that your solder work is nothing short of world class, it's time to power up



that bad boy. It should look like this:

When first powered, the LOW PASS LED, the LFO1 LED, and the AMPLITUDE LED should be lit and the display should say "0". Turning the OSCILLATOR SHAPE knobs should make the display change numbers temporarily. Turning the LFO SHAPE knob should do the same. Pressing the switches should cause LEDs to toggle or advance.

**\*\*Warning - Early Rockits were built with stereo output jacks and require a stereo cable. A mono cable shorts the output and you won't be able to hear anything\*\***

If all that's happy, it's time to make noises. You have two options here. You can just plug in a cable to the audio out, push the drone button and start making noises. Not all the knobs work in the mode, like the envelope knobs and the ADSR knobs control pitch and volume rather than envelope because you're not hitting any notes to envelope. If you do this, the sustain knob acts as a level knob and should be turned up. The attack knob acts as a frequency knob, so it may need to be adjusted. Your other option is to hook up MIDI and play it. If it makes noise, be happy. You've just built a pretty complicated design.

If it doesn't, time to start troubleshooting:

Symptom What to do about it?

No lights. Most likely, the board doesn't have power. Check for voltage on the pads of the DC power jack and check the 100uF capacitors for voltage between their pins. No voltage,

get soldering? The cap on the right should have 5V.

The micro may have problems if you do have voltages on the caps.

No sound. Oh boy. This could be a million things. Check all your solder joints. Look for missing components. Maybe MIDI isn't working. Try drone mode.