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## How To: Upgrade USB block Erupters from 334 to 447 MH/s

Pugano of bitcointalk.org

**Please note, that any work that you do on your own may destroy your device.  
Do so at your own risk and only if you know what you are doing!**

Also note, I am not a professional at soldering. I am learning as I go, as many are, but this did work for me, and at the time of writing this, my USB miners have been running for 1 week with no issues.

Also, I do not take any credit for any research on how to do this modification; all the hard work of learning how to do this was already done. This is just a noob tutorial after I spent day after day reading about other's successful work.

If you wish to donate as a tip for creating this picture tutorial, you may do so at my address below:

BTC: 14Btx73yMPkmcc2e4mM9bjkCkRnQAQYFRg

Also, if you wish to donate to me, please consider donations to the ones who did the research initially.

All credit on how to do this goes to this thread:

<https://bitcointalk.org/index.php?topic=241652.0>

<b>Level of difficulty from 1-10 (1 being easy):</b>	5
<b>Time to Complete:</b>	20 to 30 min per stick
<b>Cost involved:</b>	USB miners + about \$100 to \$150 USD depending on what you buy equipment wise

#### Parts Required:

1. USB block erupter
2. 1.2k ohm 1/8w 1% resistor you can purchase from digikey.com, part number 1276-5275-6-ND
3. Oscillator 16 MHz 3.3v SMD also purchased from digikey.com, part number ctx691ct-nd

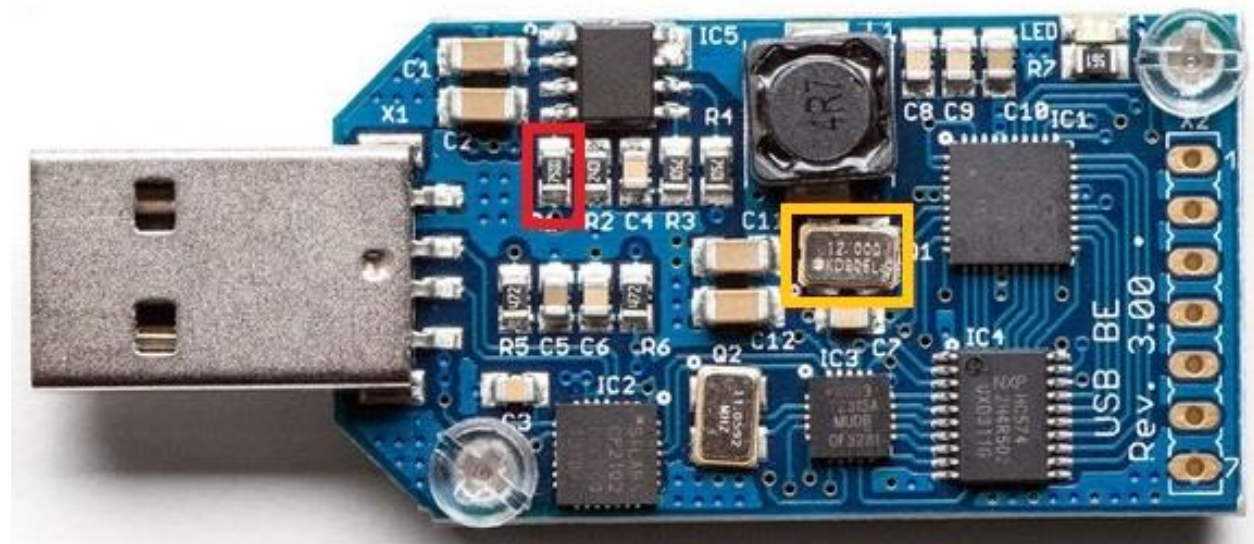
#### Tools Required:

1. Hot air rework station like <http://amzn.com/B009PPRJHS>
2. Syringe of solder paste [Sold here](#)
3. Liquid flux [Sold Here](#)
4. Solder removing gun [Sold Here](#)
5. Precision tweezers [Sold Here](#)

I recommend learning about swapping SMD's (surface mounted devices) using hot air rework on YouTube (YouTube has a lot of great content on this to watch.) I would also practice removing and placing parts on a crap board you may have from an old computer component as I did, in order to make sure you aren't going to destroy your investment. Practice removing and reinstalling SMD's first to get acquainted with the process and equipment.

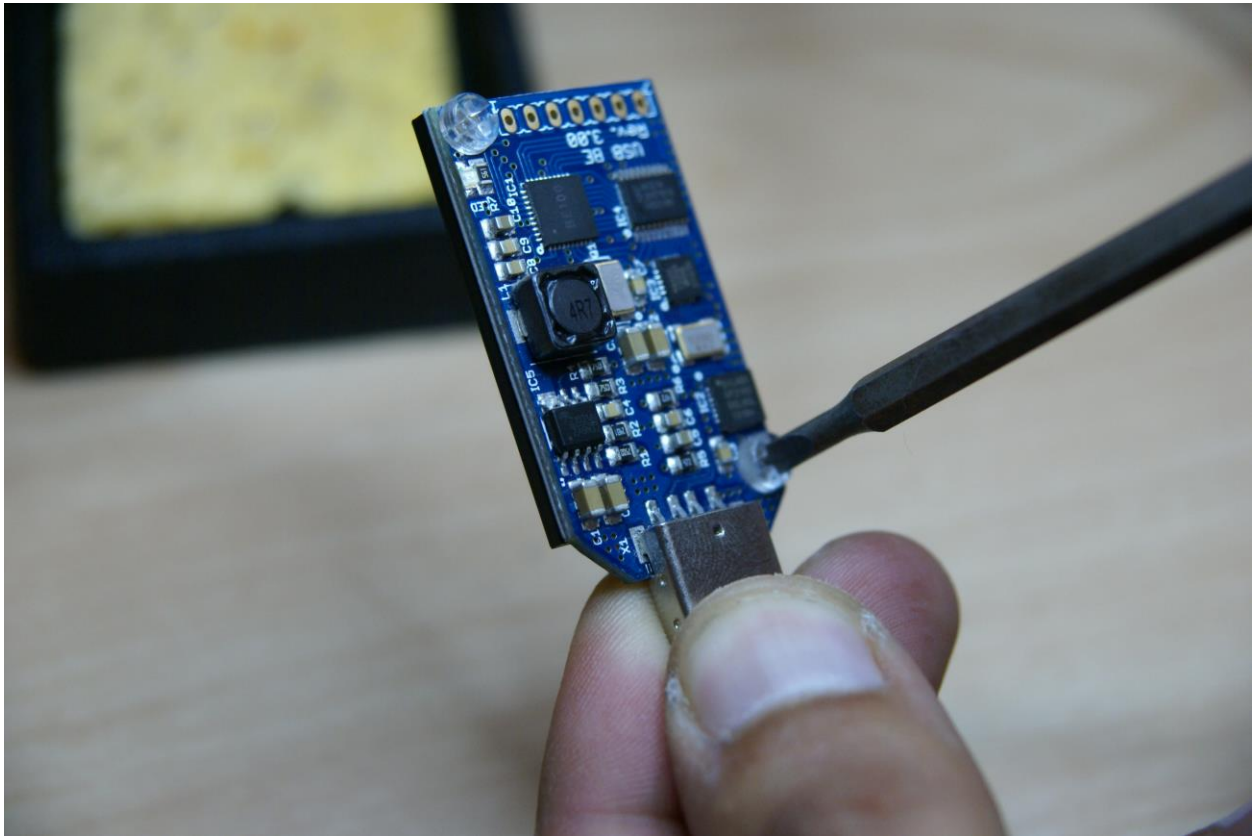
Now first you need to make sure you have some room at your work station. I sadly do not have a lot of room in my work area so bear with the mess.

So let us look at the board:



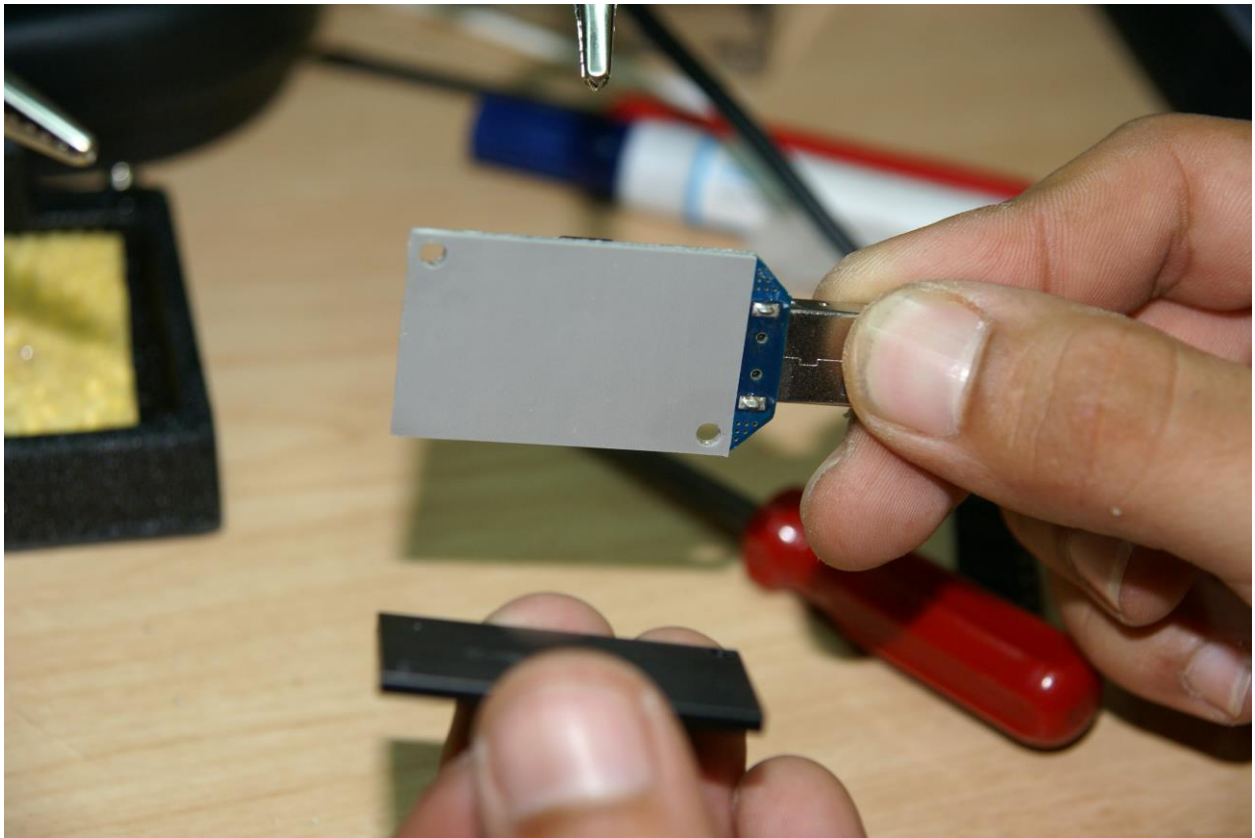
So we are only modifying the R1 resistor highlighted in red, and the 12 MHz OSC highlighted in yellow.

First step to this upgrade is to remove the heat spreader on the back of the miner. You do this by removing the 2 plastic screws holding it to the board:

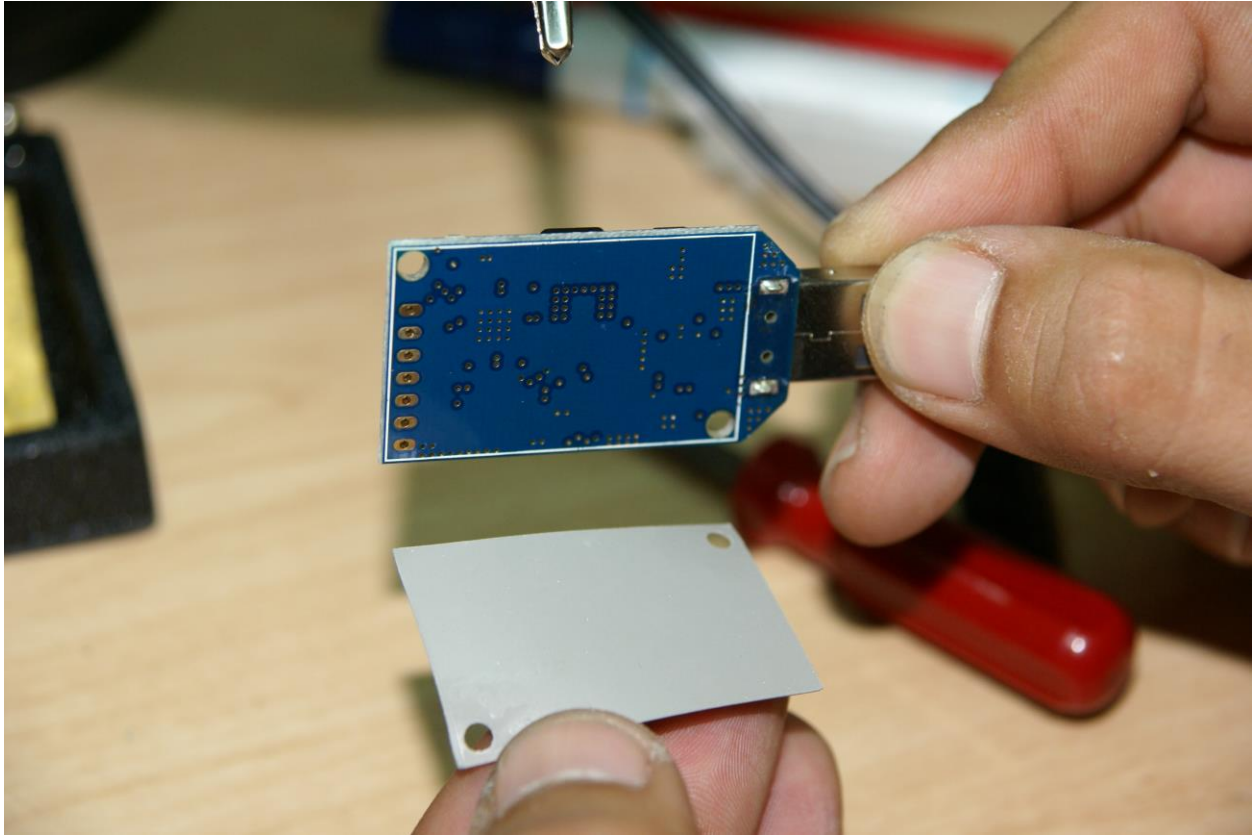


Removing this component is important due to you are working with heat. You want to concentrate your hot air gun on the SMD's that you are removing, and by leaving the thermal pad and the heat spreader on, it will make it harder to localize the heat transfer.

Once that is done the heat spreader will separate like this:

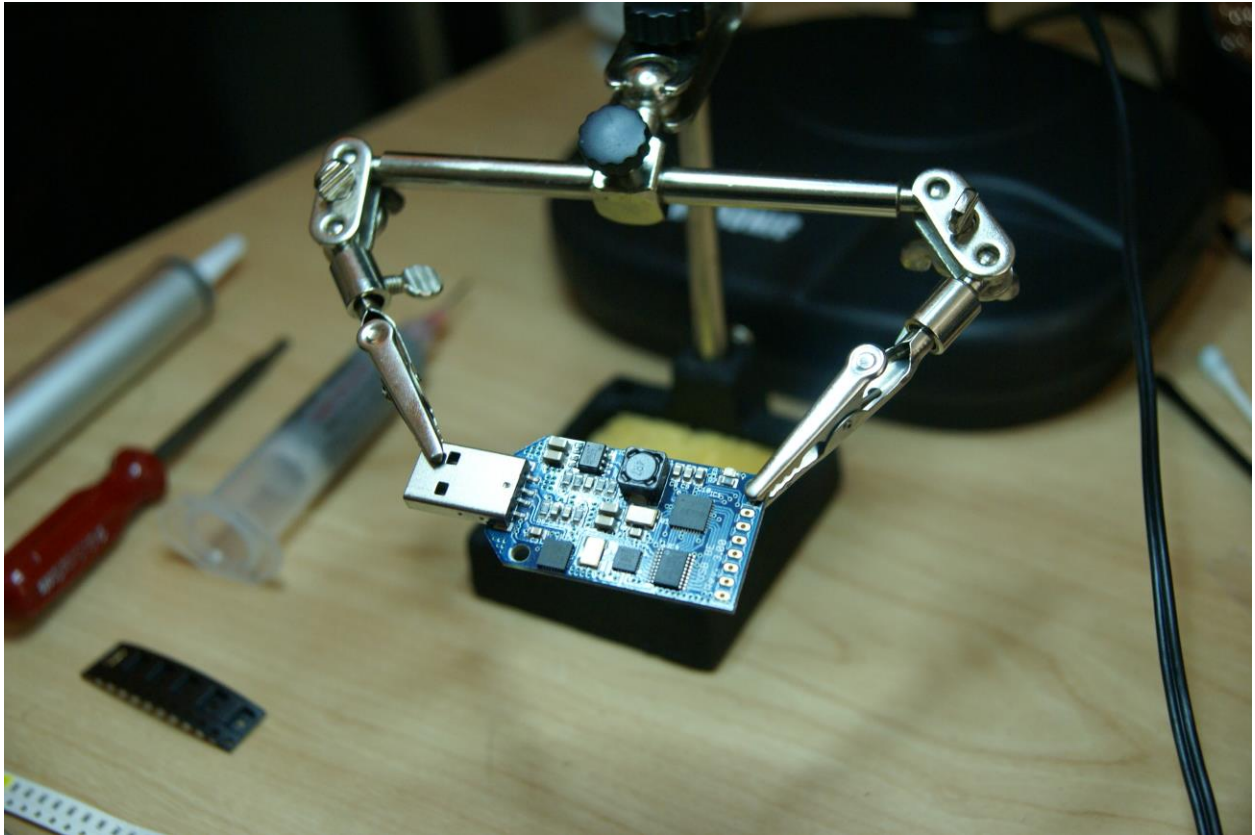


Next, you have to remove the thermal pad - just be cautious that you don't tear it when peeling it off:



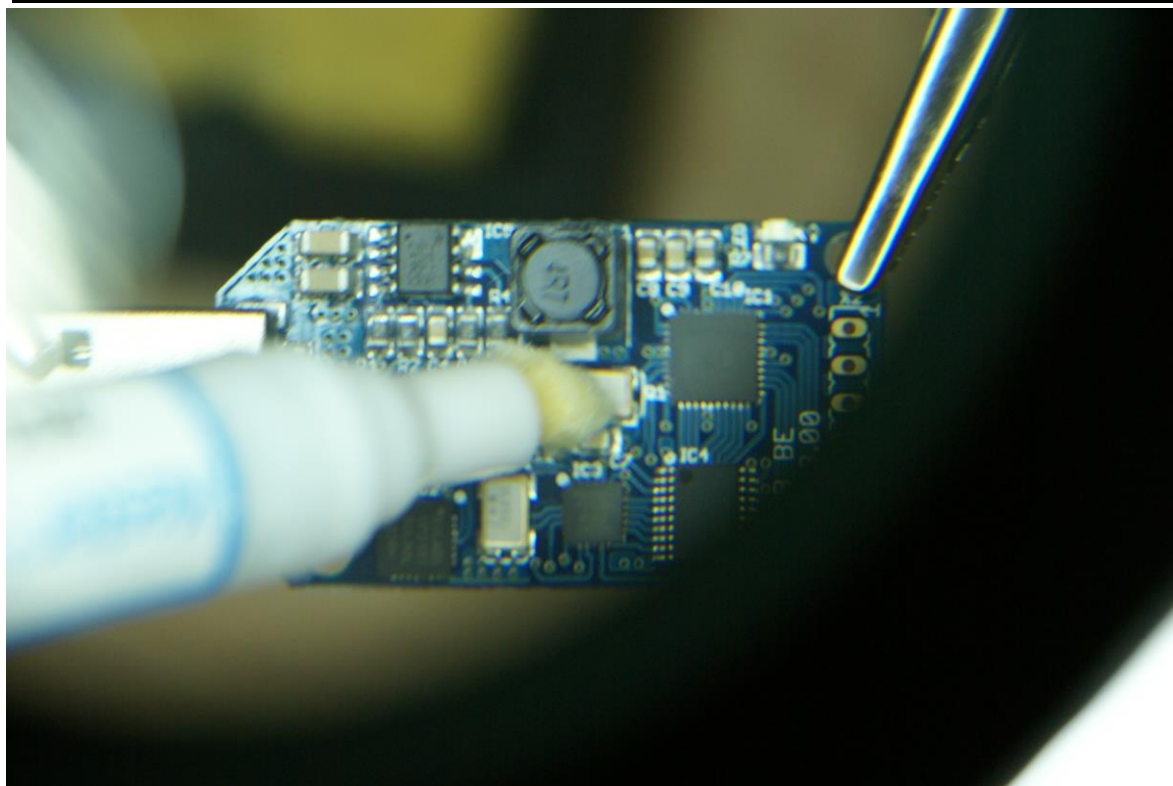
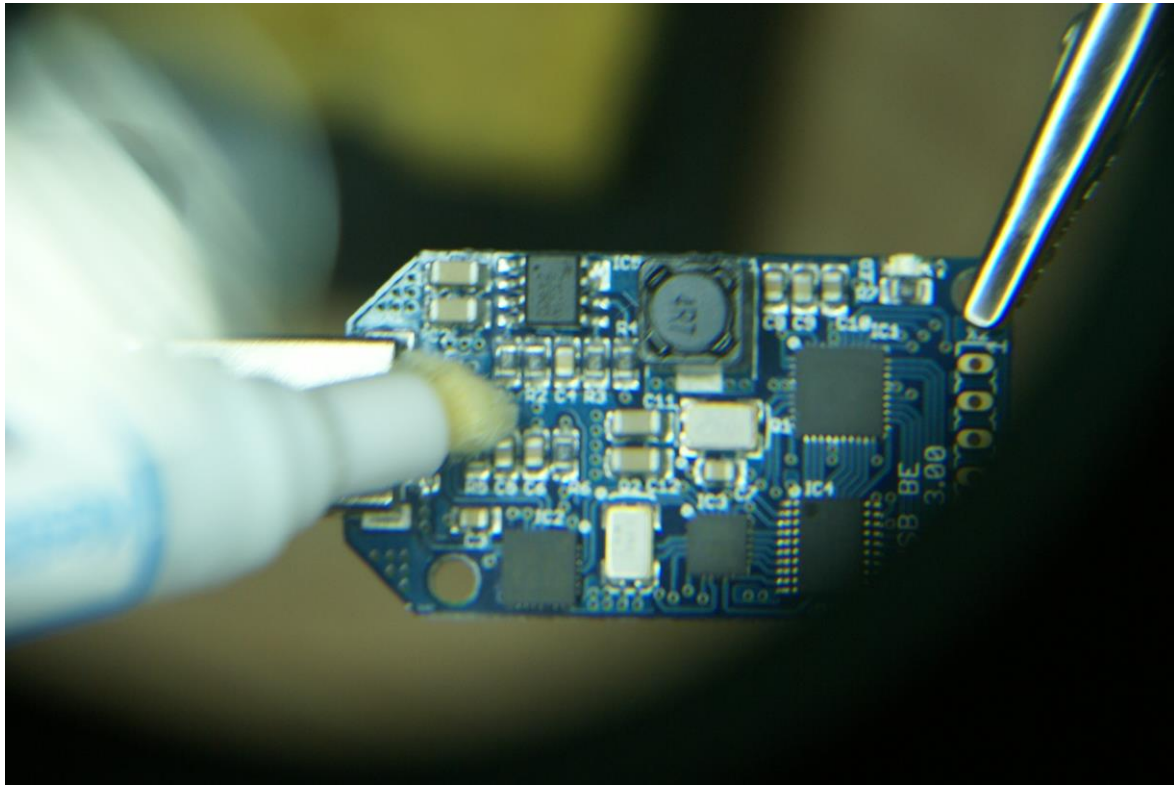


You will also want to securely mount your block erupter somehow; I am using a RadioShack brand “Helping Hands System” [helping hands sold here](#)



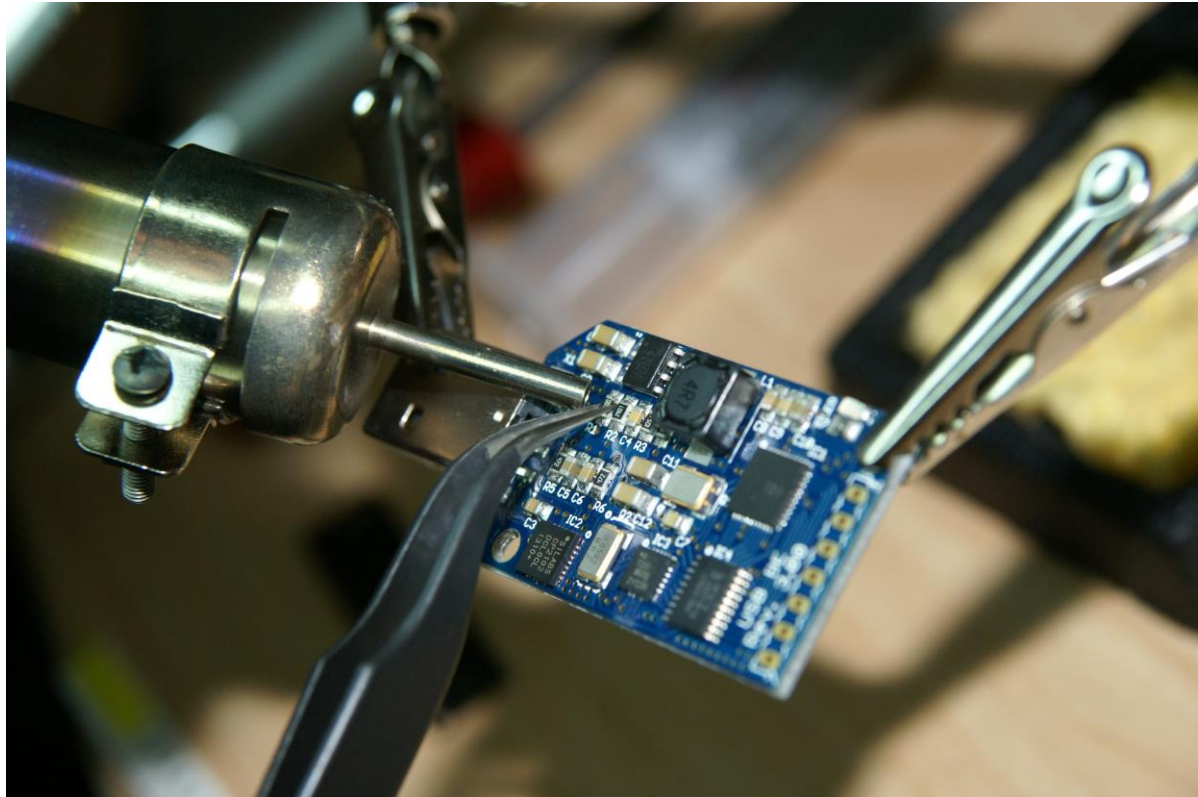
Your next step is to heat up your rework station. Now I have mine set to 380 degrees Celsius. This seems to work great for this process; you may need to adjust the temp based on the quality of your hot air rework station. And for the airflow setting, I am using number 5 for the removal of the components.

Now to remove the 2 chips, you need to coat them in liquid flux in order to clean up any corrosion and to help transfer heat to the solder already on the board; it aids in the removal of both the R1 and the OSC.

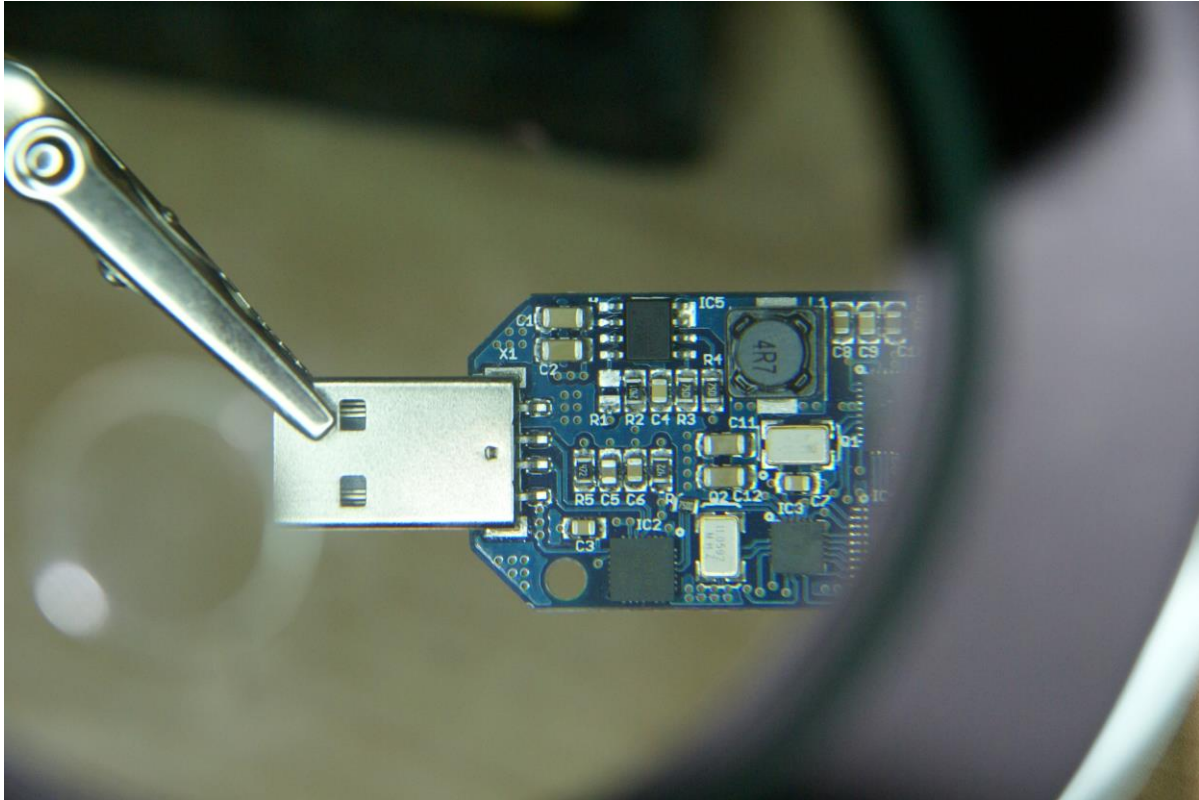




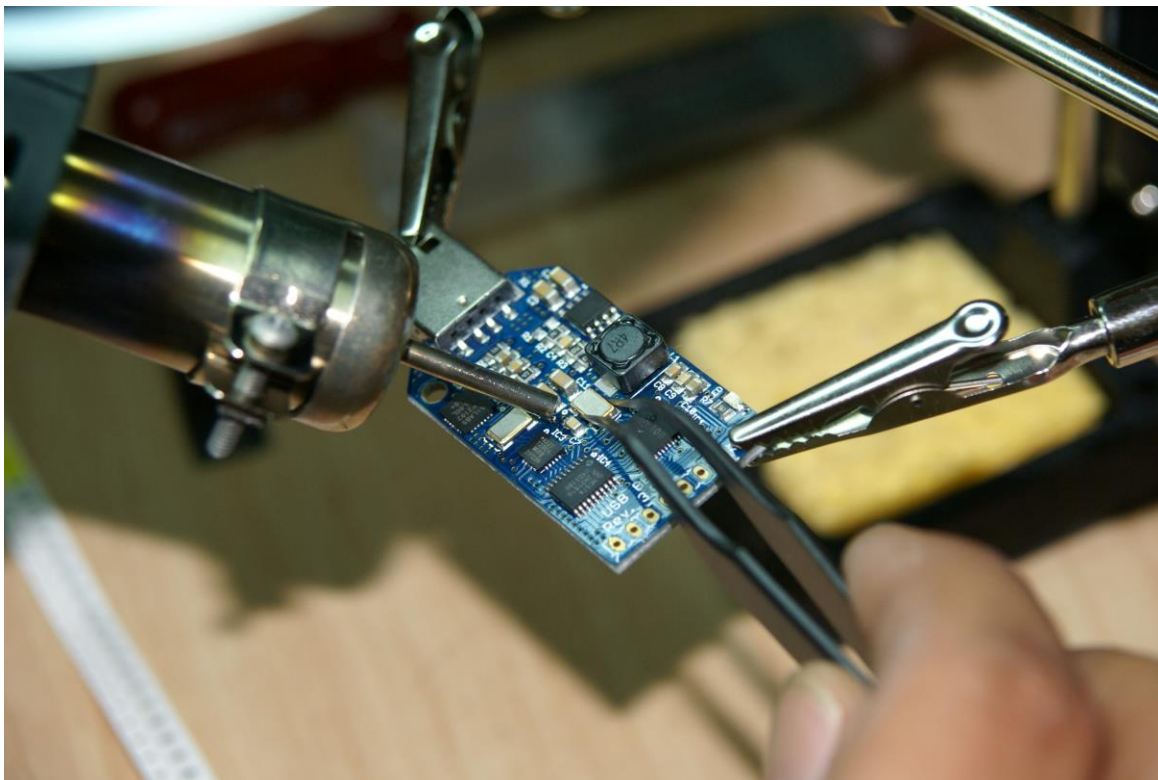
Now time to act on the R1 - use your hot air gun to remove the R1 like so:



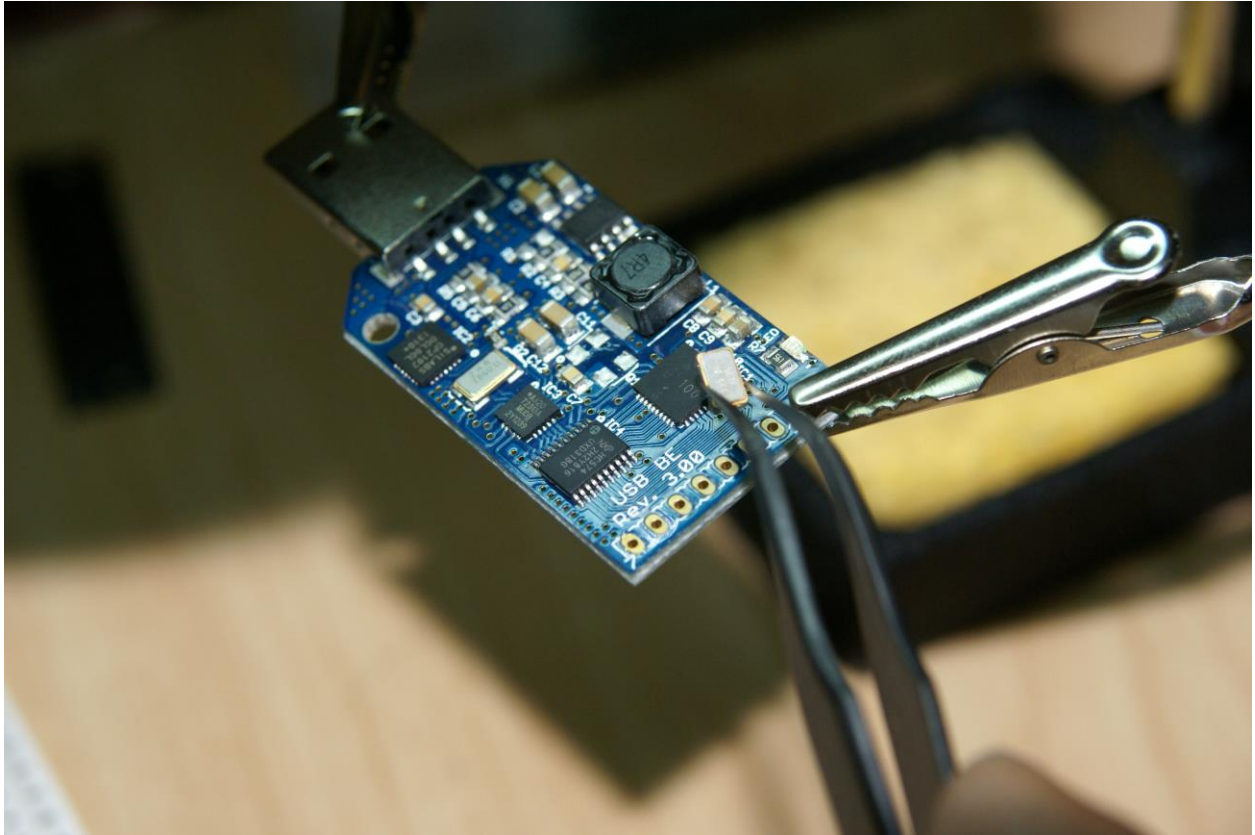
Once it is complete, it will look something like this with no R1:



Next, remove the 12 MHz OSC like so:



Once again a quick after picture:

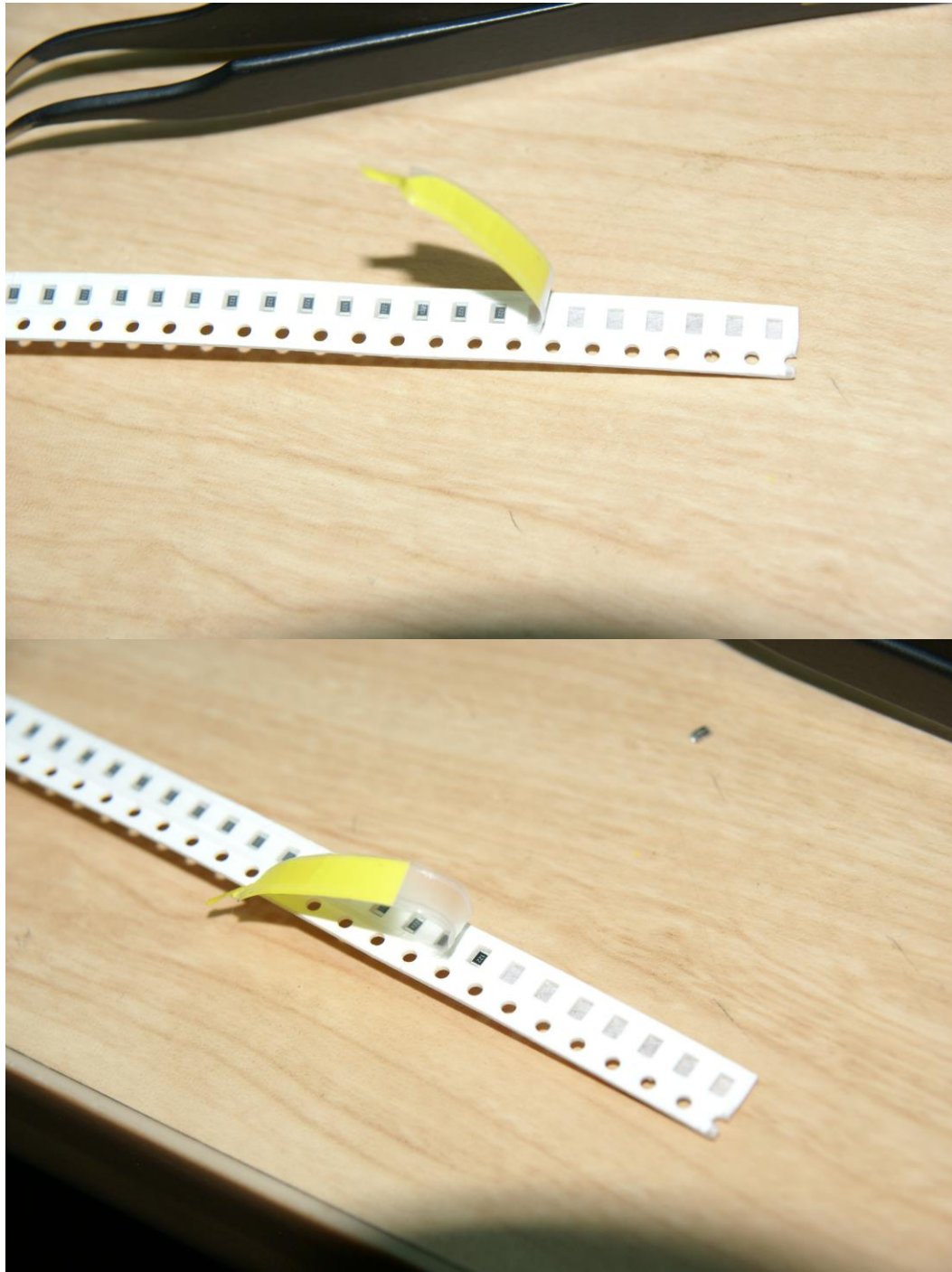


I clean up the pads with the heat gun and solder sucker. Simply heat the pad until the solder becomes liquid and then use the sucker to remove the excess.

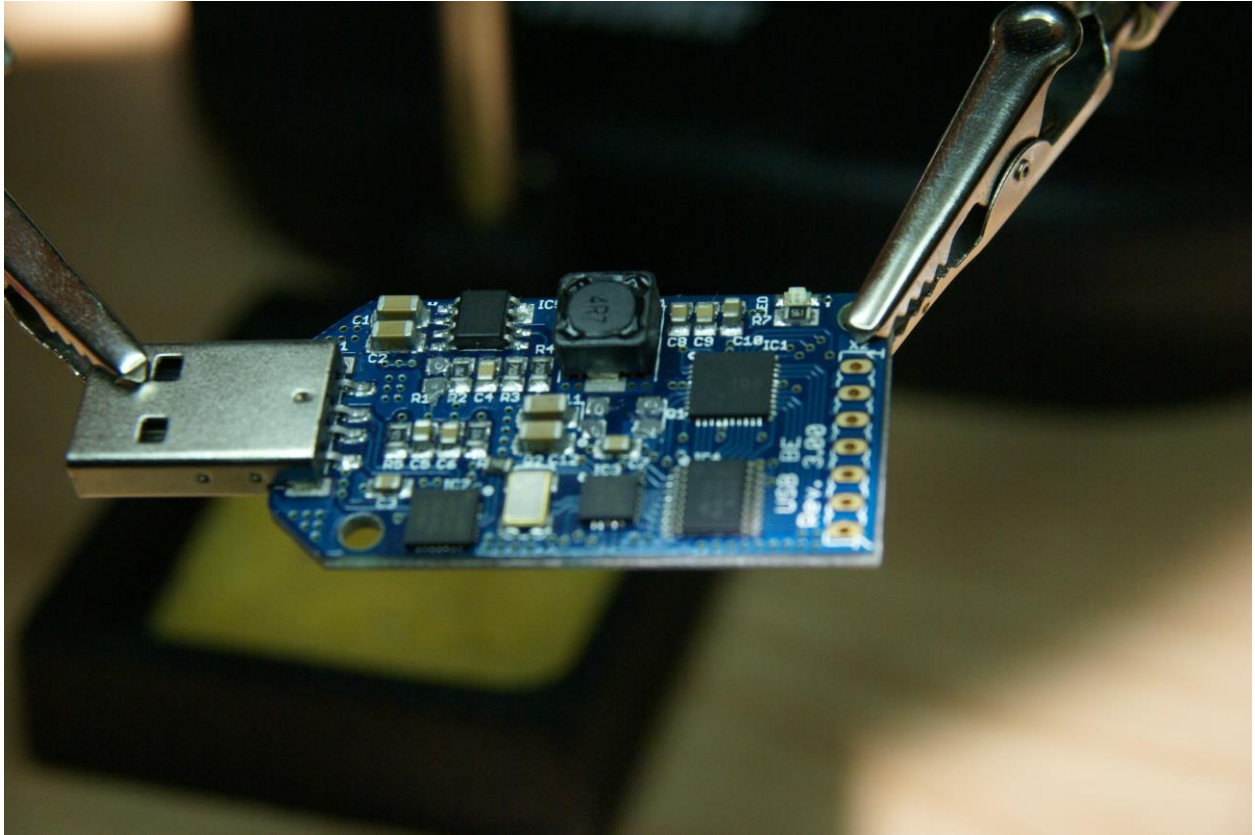


Next, we will be placing a new R1 resistor. Now when you order from digikey.com they come on a reel like so:

(You must peel the tape back and remove one at a time.)

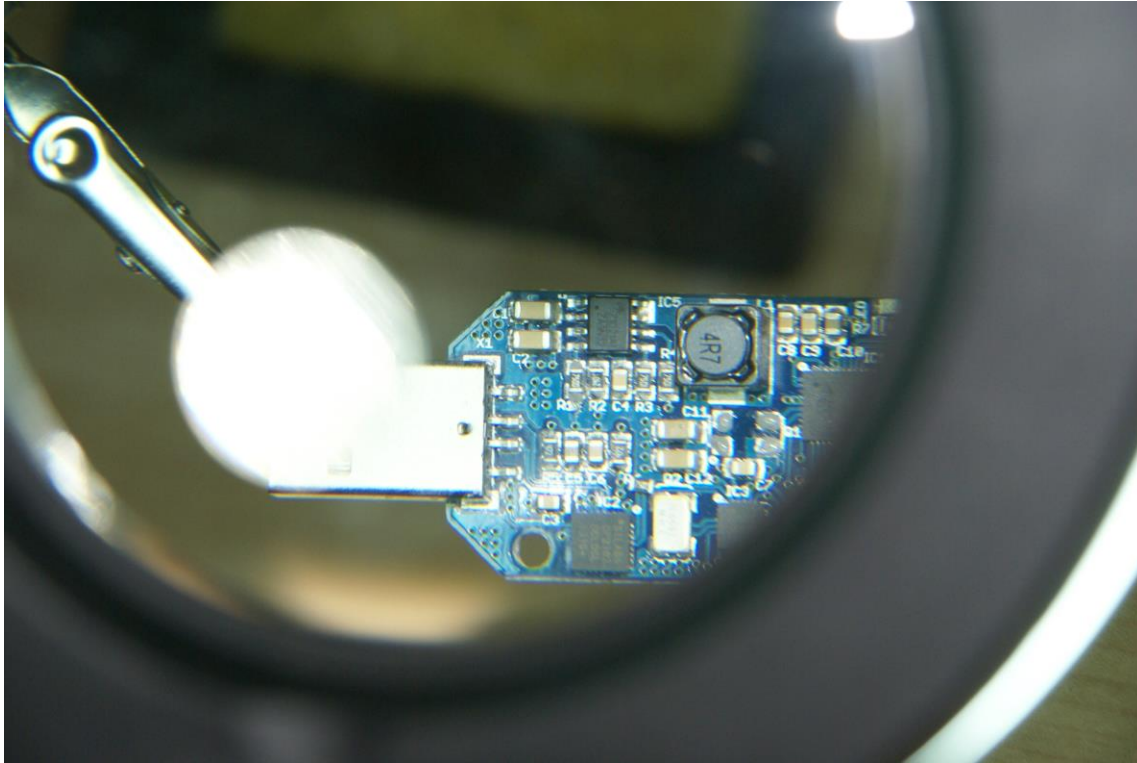


From here, you need to put a very small amount of solder paste on the R1 pads and the OSC pads; it should look something like this when complete. The current view is of the R1 and OSC pads cleaned with fresh solder paste ready for new components.



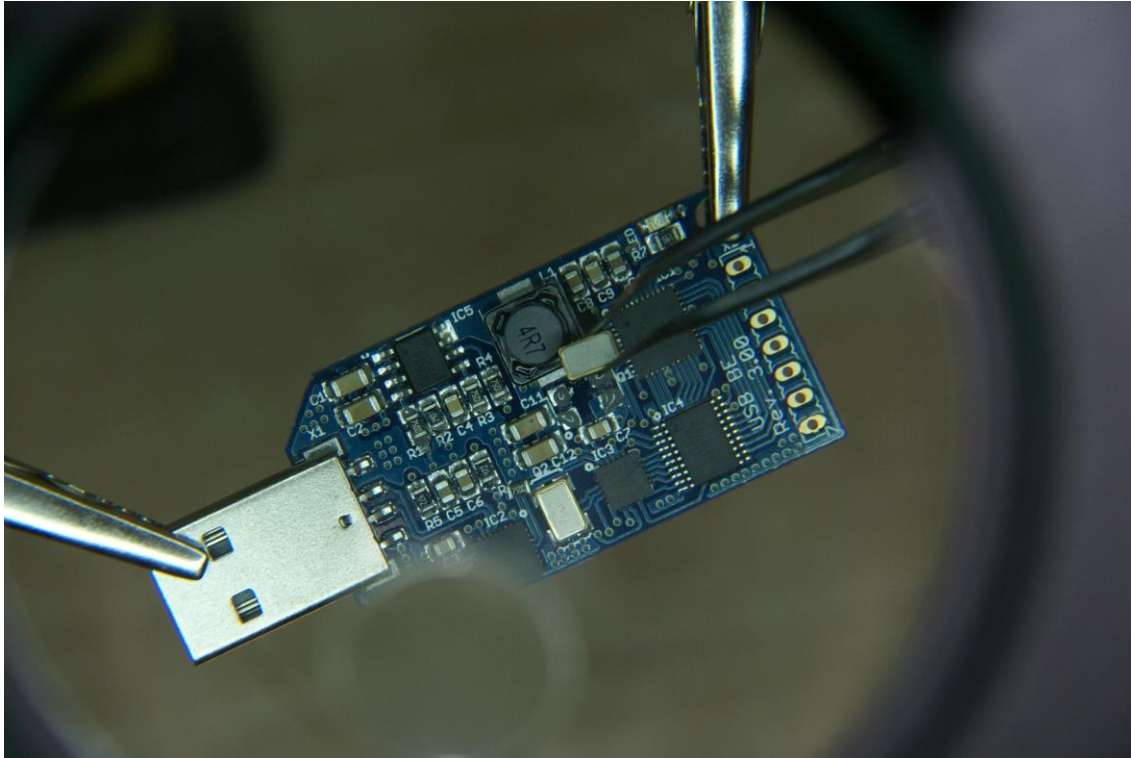


Once this is done, make sure you take your new R1 resistor and place it on the R1 pads. Try to center it as much as possible; it makes life easier; also, to my knowledge, neither SMD has a specific direction to be placed on the pads.

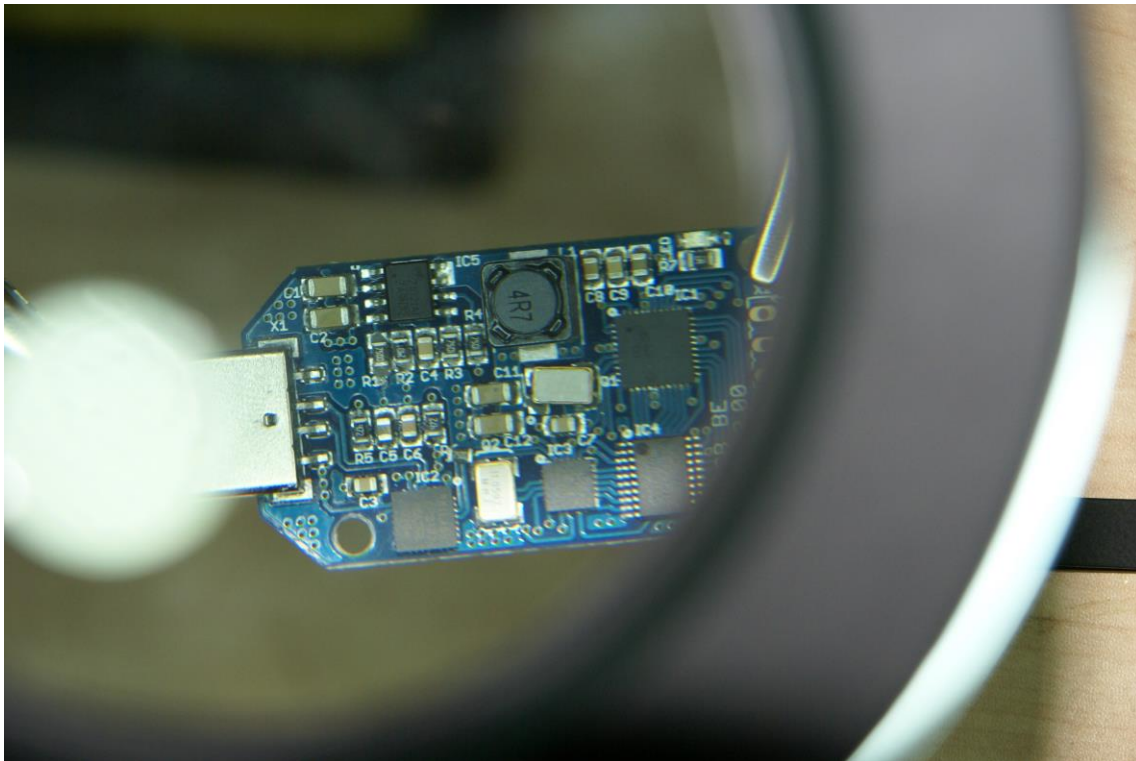


Please note for this picture tutorial, I ran out of the 16 MHz OSC's and I am just reusing the components I removed from the PCB for demonstration purposes only, to show how you go through this process. If you don't like it, then FLAME on, but this is to educate people on how to move through this process.

Next, place your 16 MHz OSC you got from digikey.com on the PCB; here is a during installation shot:



Here is an after shot:



I would align the OSC as best as possible, but it will not kill you if you are just slightly off. Please note, the solder, as it is melting, will align the SMD.

Now, we are almost done. The last steps are to heat up the solder paste until it starts to pull the components to the pads. For this, you will want to turn down the airflow on the rework station to about 2 or 3 due to how small the SMDs are, otherwise, you may blow them off the board. This would result in searching for them, cleaning up what you have done, and just being frustrated because you have to start part of the process over. It's just a huge PITA.

Current shots are of the reinstallation process of soldering the new SMDs to the board:



The solder paste will start to turn into a matte silver color and then become super shiny once it's heated to the proper temperature; once it is at this shiny color, you can remove heat from the SMD.





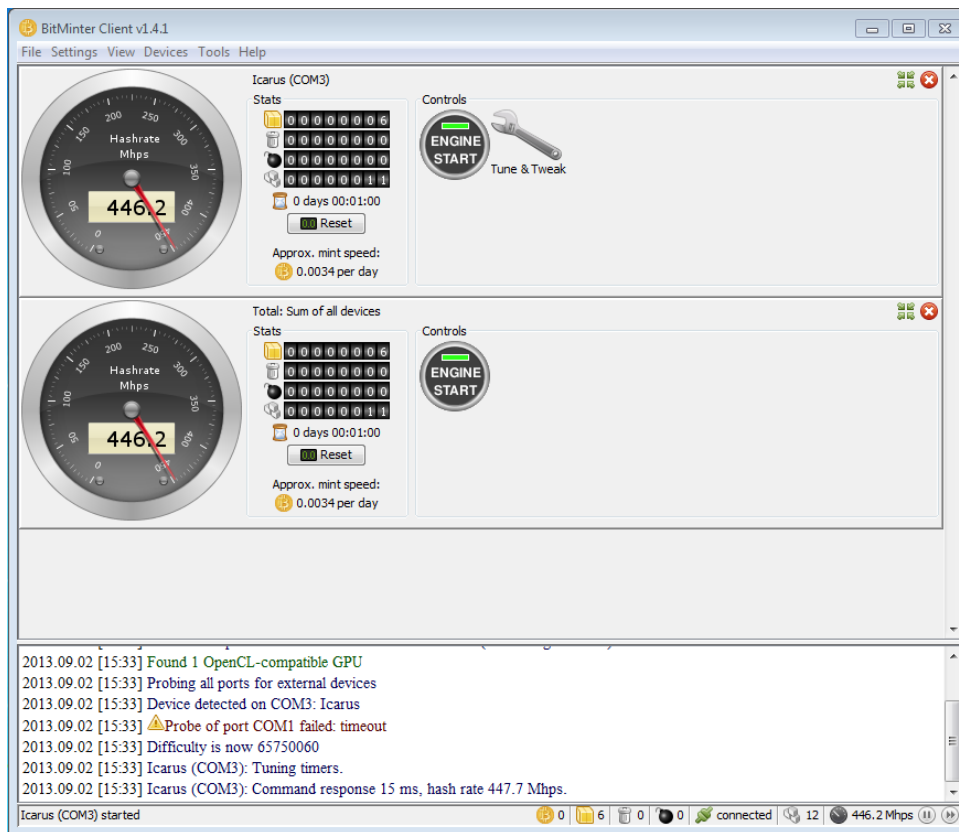
Once you are done soldering your SMD's on the board, inspect to make sure you did your job properly. I will say I cannot get a picture of what this looks like due to I don't have the best camera, but remember to search YouTube to get a better idea of how this works.



One thing to note, upgrading this device will generate more heat; I bought some crappy heat sinks off of eBay and placed them on the ASIC in order to help with this problem. Also I am running a fan over the miner like most people already do, but the finished product should look like this:



Lastly, reinstall the thermal pad and heat spreader back on your board after about 5 min of cooling. Reinstall them simply by reversing the steps that I showed earlier. Plug your eruptor back in and start your favorite mining program; and if all is well, you should see something like this:



I hope this picture tutorial works as well it is intended to; it is my first attempt and thanks for reading.

Now sit back, let your system mine, and grab a beer - bask in your awesomeness.