Step 4: Creating The Schematic

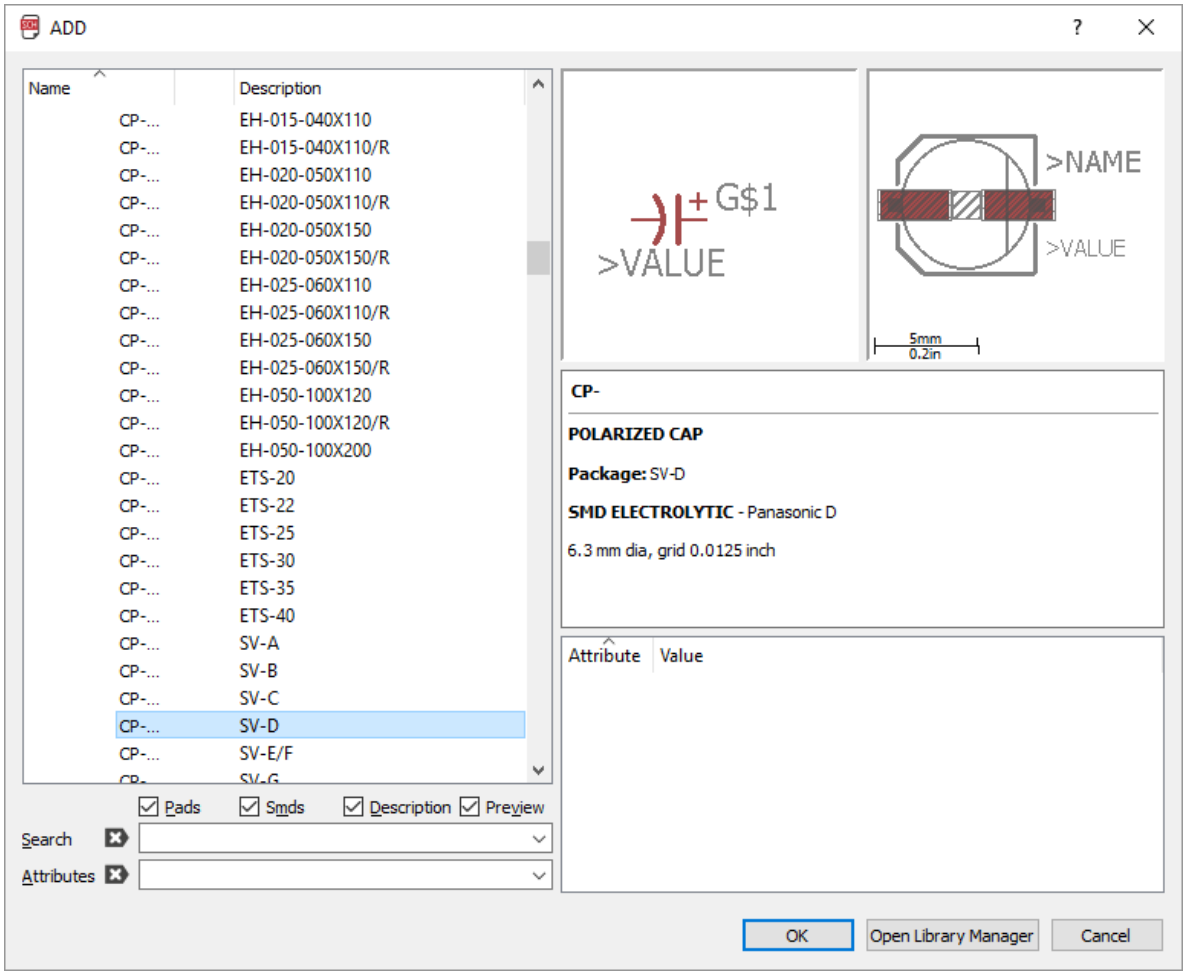
1. Download the following libraries
   https://github.com/sparkfun/SparkFun-Eagle-Libraries/archive/master.zip
   https://github.com/chiengineer/Eagle-Libraries/archive/master.zip
   https://github.com/zumbik/Eagle-Libraries/raw/master/_mod_diode.lbr

   and extract them all to C:\EAGLE 8.3.2\lbr

2. Select File -> New -> Project and give it a name. Right click your new project folder and select New -> Schematic.

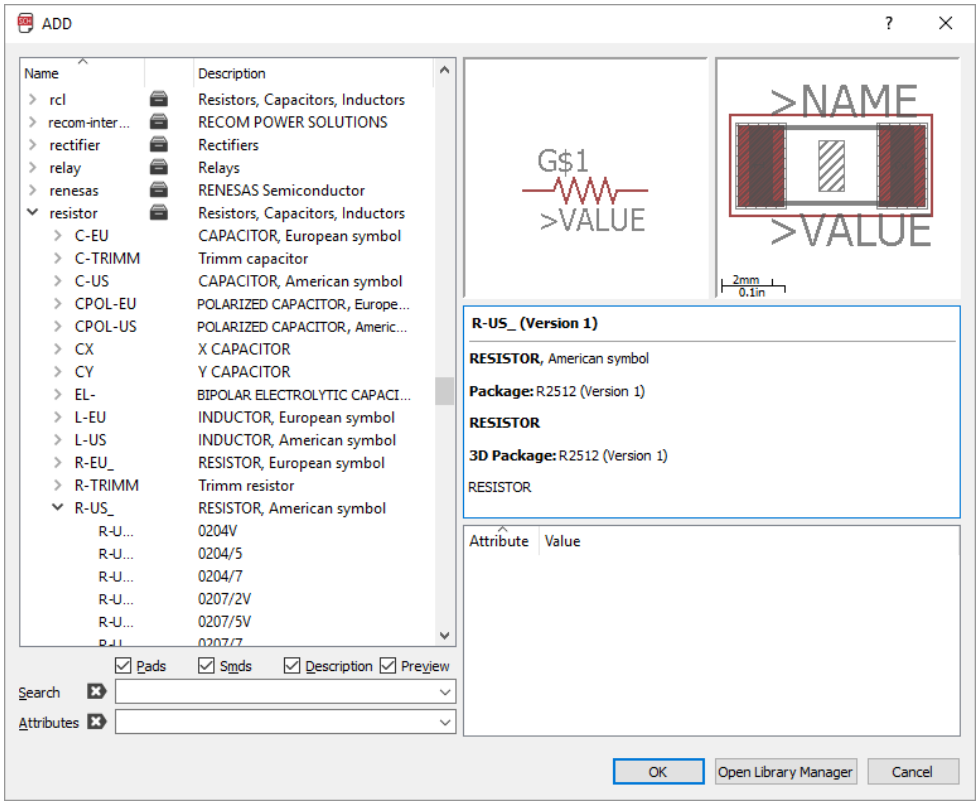
3. Click Add -> Open Library Manager -> Browse and highlight all the Sparkfun libraries just downloaded. Click OK to add the libraries. Repeat for the libraries inside the “Capacitors” folder for the “Eagle-libraries” folder downloaded. Also add the library we created in step 1 for the MX1508 part and the _mod_diode library.

4. Click Add and find the “Panasonic D” capacitors under cap-master -> CP-

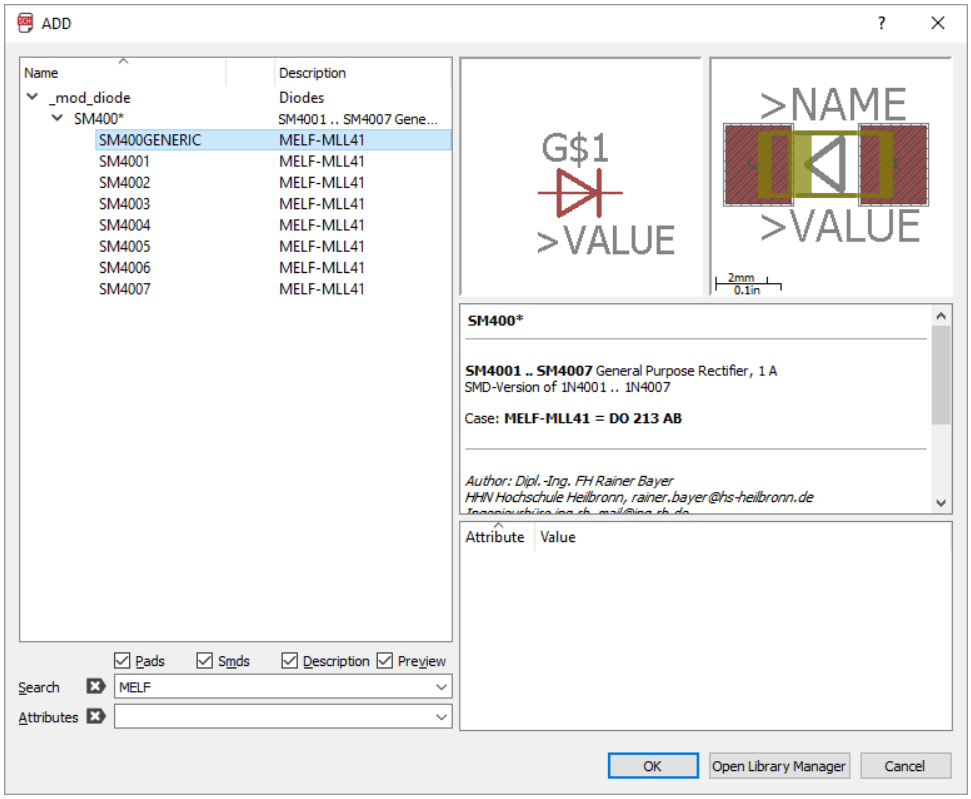


Add two of these.

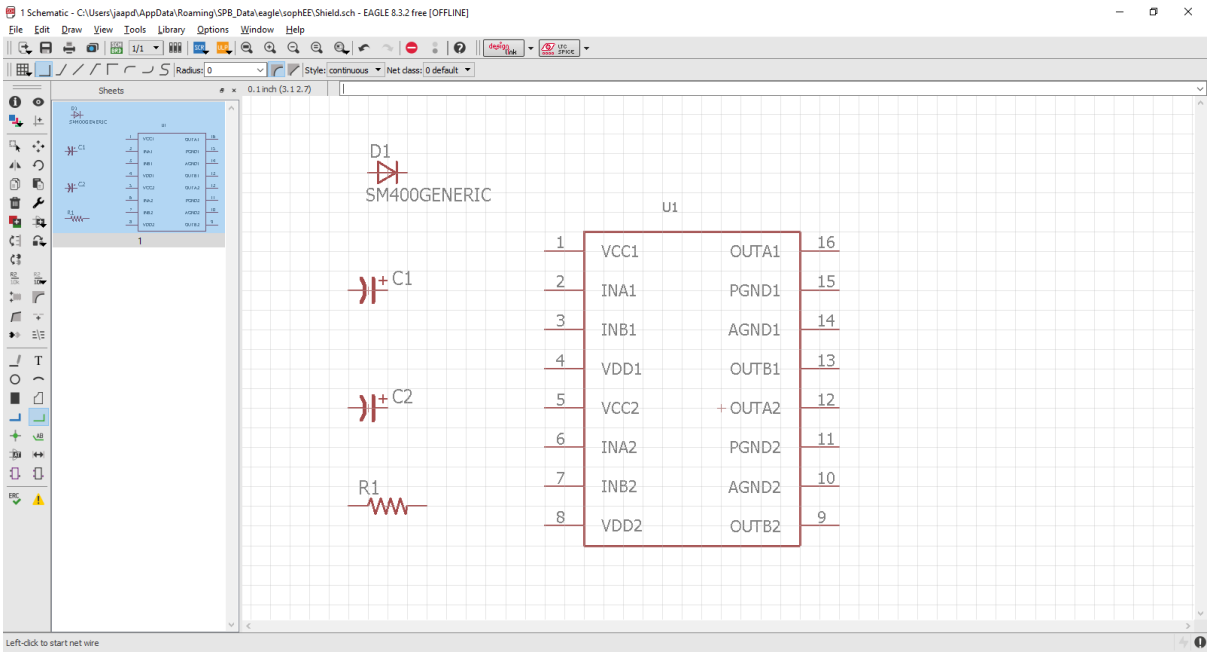
5. Add an R2512 resistor from resistor-> R-US_
   This is the largest type of smd resistor commonly used.



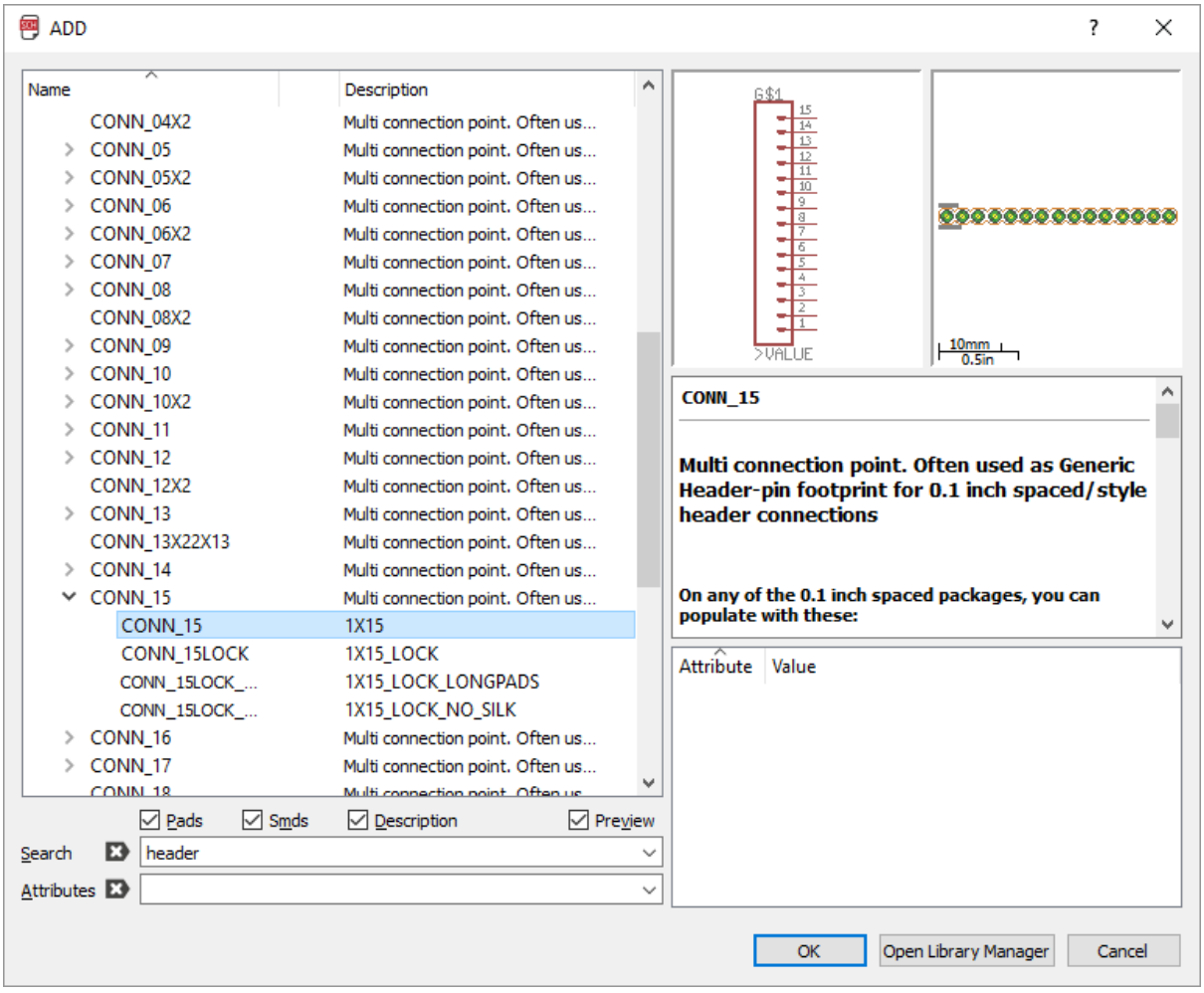
6. Add the SM4000GENERIC diode from _mod_diode -> SM4000



7. Add the MX1508 part from your own library

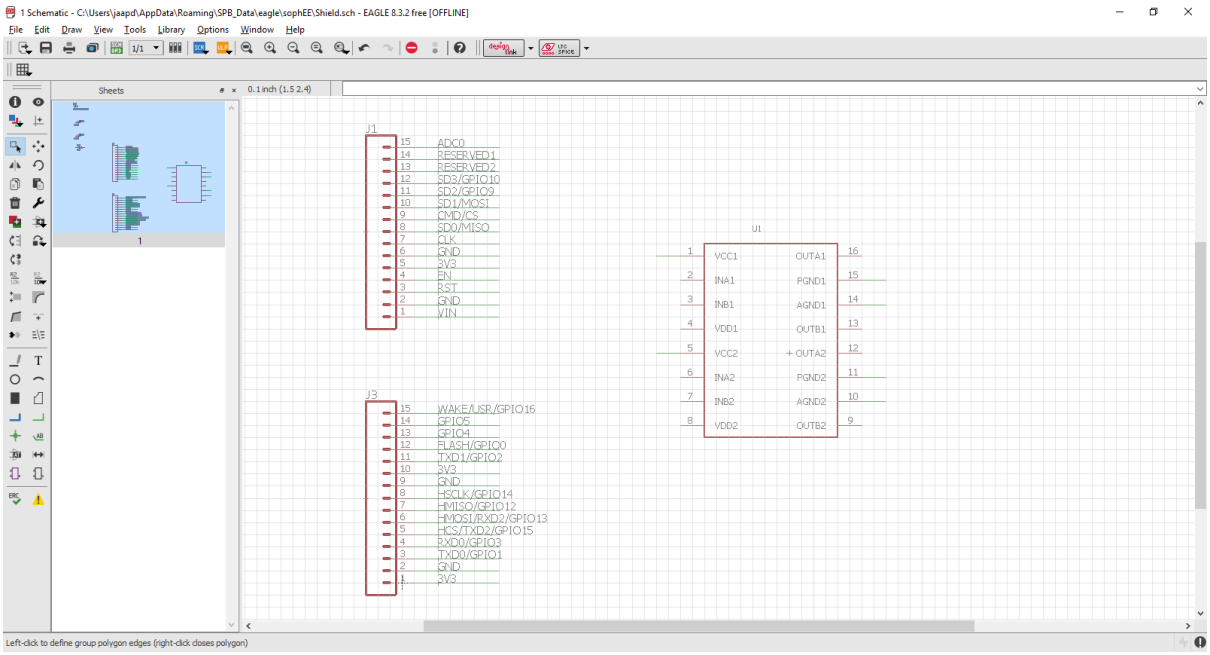


8. Add two 1x15 headers from Sparkfun-connectors -> CONN_15

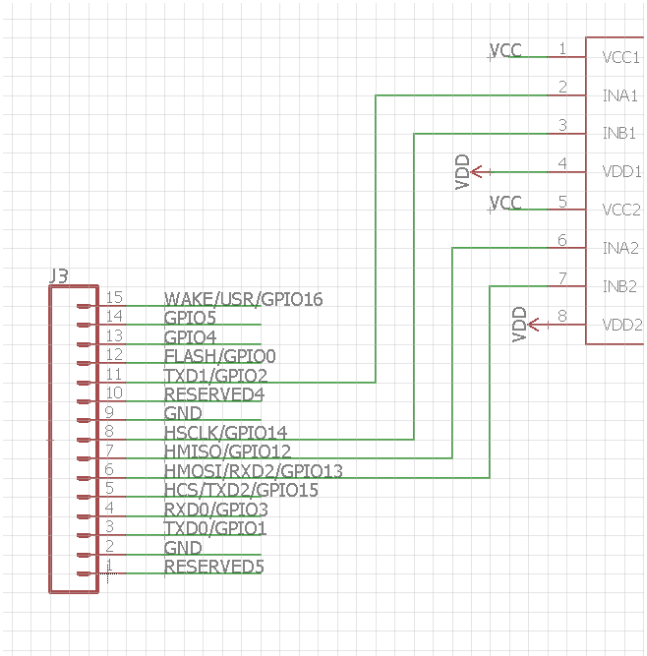


9. (https://www.autodesk.com/products/eagle/blog/schematic-basics-part-2-nets-and-values/ If you find yourself struggling at any point in the following steps the Autodesk schematic guides can be very helpful.)

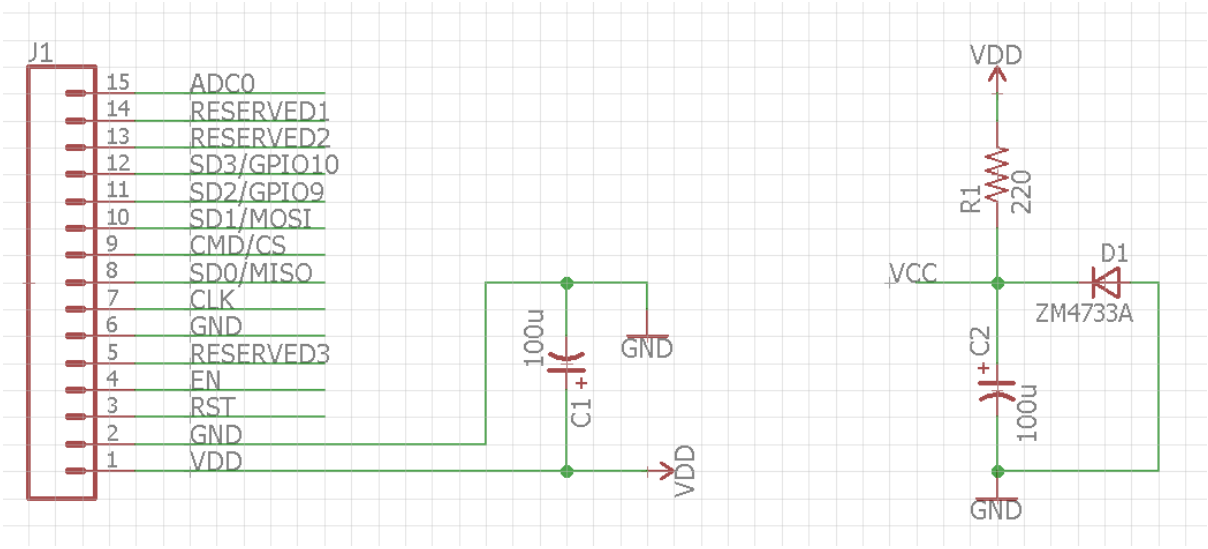
10. Name and label the header pins according to the pinout of our ESP development board or my screenshot below



11. Connect GPIO2, 14, 12 and 13 to INA1, INB1, INA2 and INB2 using  Net, NOT draw lines. Nets are for electrical connections; lines are for everything else.

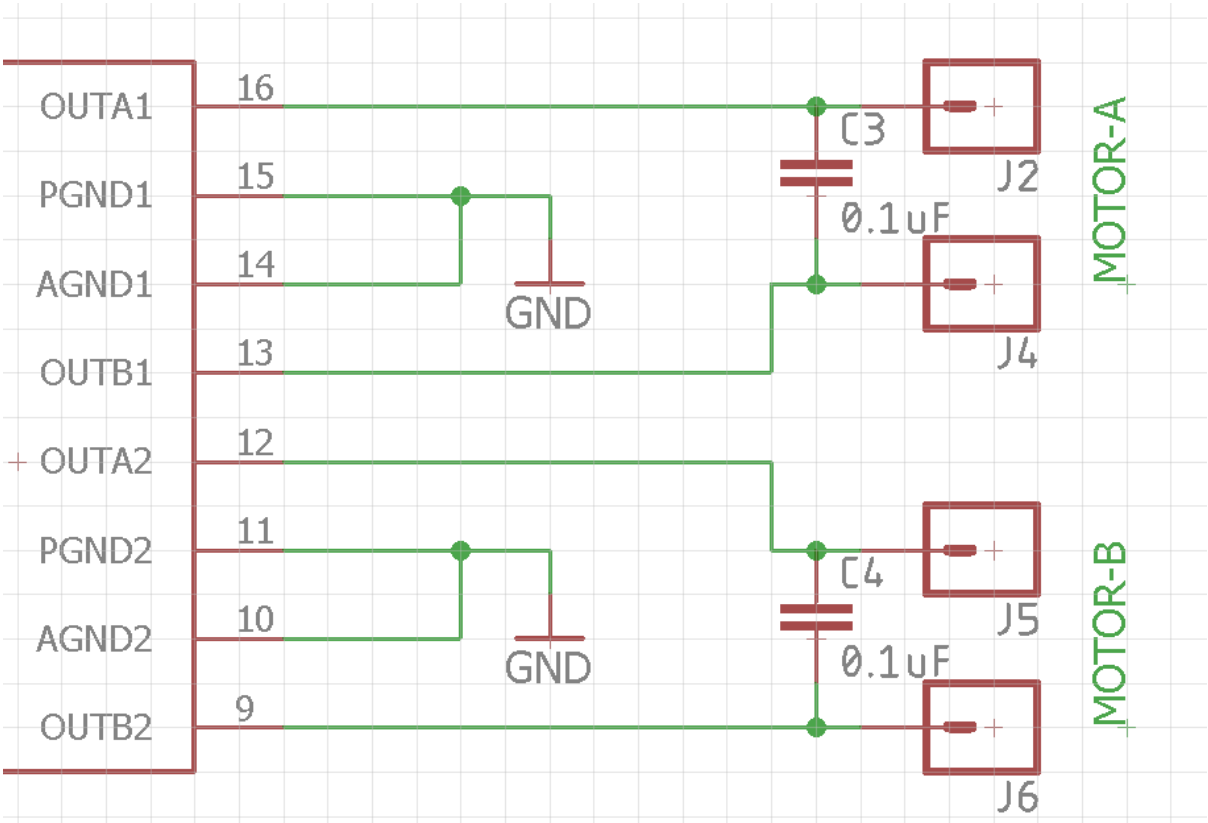


12. Add two “VDD” parts from SparkFun-PowerSymbols and connect them to VDD1 and VDD2 on the MX1508 as shown above.
13. Connect VCC1 and VCC2 to the “VCC” Net by adding a short net and naming it “VCC”
14. On your own, create the following two circuits

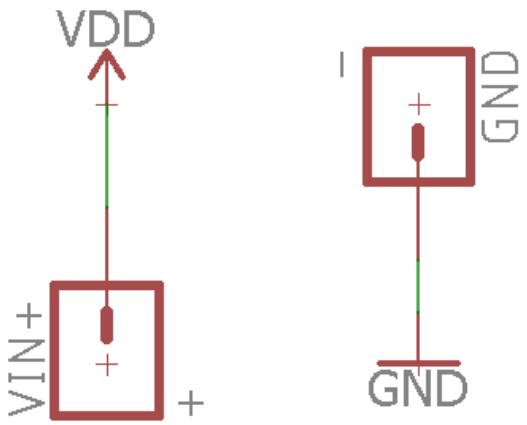


The left simply adds a decoupling capacitor to our power input. This filters noise that could damage our IC. The right circuit uses a 5V Zener diode to supply no more than 5V to the VCC pins of our IC. Note the diode does not have a Zener symbol since I chose to use a different diode with the same package size as there is no existing eagle model for the ZM4733A. This saves us having to create another component manually.

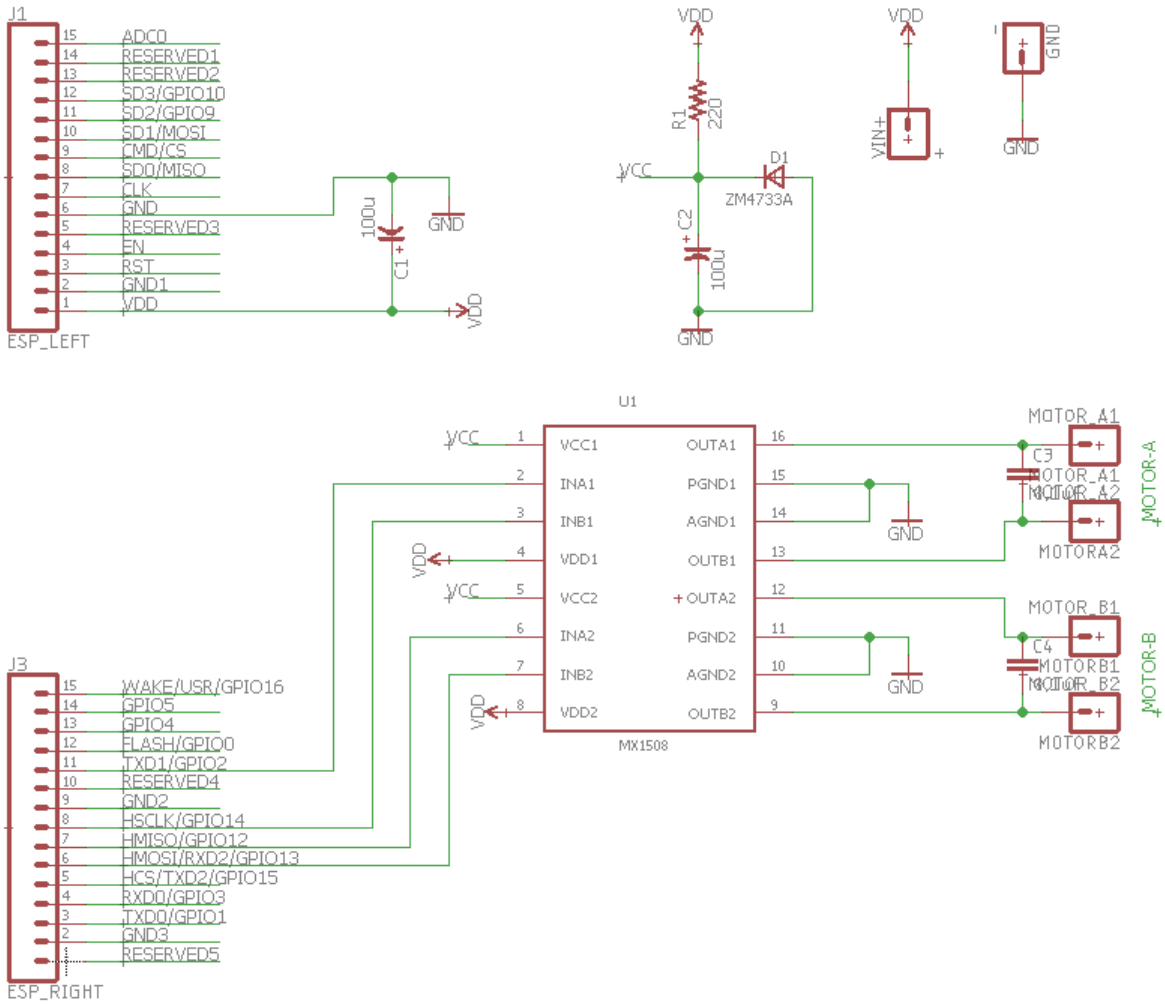
15. Wire all the ground pins of our IC to ground and use the CONN_01 part from SparkFun-Connectors to represent our motor terminal connections. Add the 0.1UF-KIT-EZ-50V-20% part from SparkFun-Capacitors across the motor terminals. This will filter out noise from the motors that could interfere with other parts of our circuit.



16. To make things easier later on, I also suggest you may add two single pin connectors from Sparkfun-connectors to connect VDD and GND. This will give us two ready-made holes we can place when laying out our PCB.



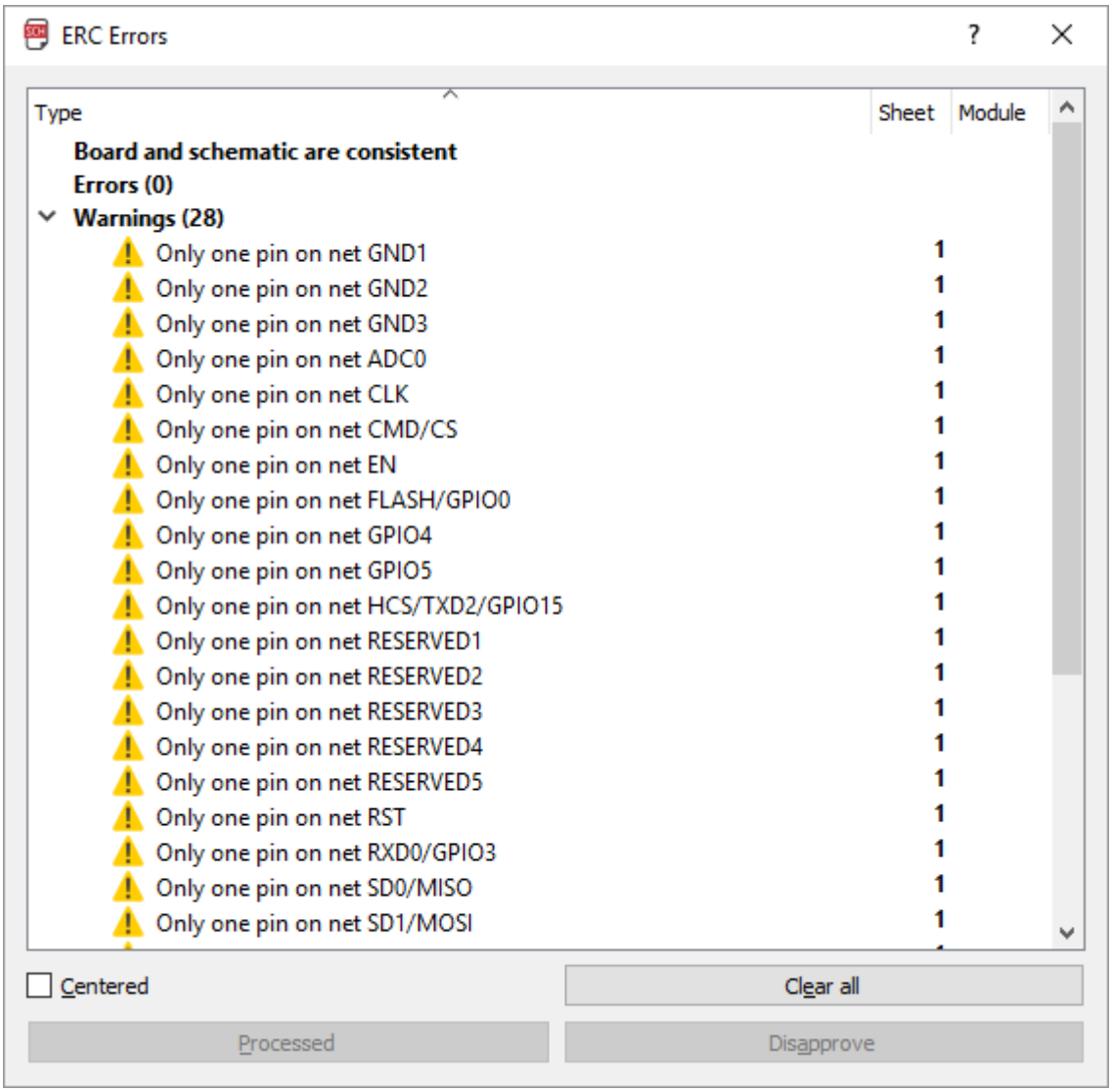
17. This is our finished schematic



We still have a lot of pins available on the ESP as well as available space on the PCB, so if you have any creative ideas for things to add let me know!

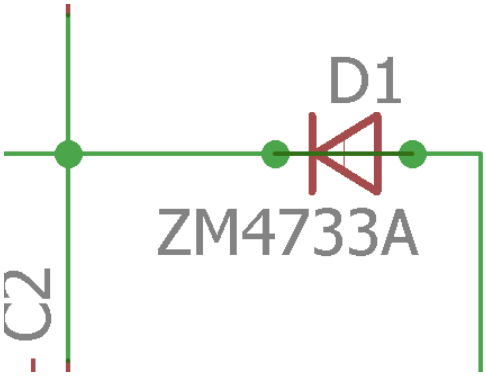
18. Checking for Errors

Click the  ERC button. You should see a window like this:



If you did everything right so far there should be no errors. If there are, fix them!

The warnings you see in my screenshot can be approved as they are intended in the design, although be aware that a warning could be an issue that breaks your design. A common issue I've see is something like this:



This may look okay from a distance but if you look closely, you can see there is a wire behind the diode, shorting its terminals and thus making it useless. This will simply give a warning, so be sure to check and approve warnings one by one

References/Further reading

http://web.csulb.edu/~hill/ee400d/Technical%20Training%20Series/11%20PCB%20Layout%20with%20Eagle%20CAD.pdf

https://www.autodesk.com/products/eagle/blog/schematic-basics-part-1/

https://www.autodesk.com/products/eagle/blog/schematic-basics-part-2-nets-and-values/

https://www.autodesk.com/products/eagle/blog/schematic-basics-part-3-erc/