Vult Vorg Build Guide

Thank you very much for supporting the Vult project.

Vorg is an analog filter which I designed based on the MS-20 filter. Among all the filters I have built, Vorg is my favourite analog filter. For that reason it is the only filter that I sell in the store (at least for now).

Assembling this module is not complicated. But even if you are an experienced builder, we recommend you to read and follow this guide.

The build is divided in two sections:

- Assembling the main board
- Assembling the control board

This guide is accompanied by an Interactive BOM (vorg.html). This web page will help you locate the positions of all the components in the main board. The traditional BOM includes the list of all necessary components and, when possible, the link to buy them.

Mouser BOM: https://www.mouser.bg/ProjectManager/ProjectDetail.aspx?AccessID=805f3472e4

I hope you enjoy the module, and if you like it, share the Vult love with friends and enemies.

Leonardo Laguna Ruiz

Disclaimer

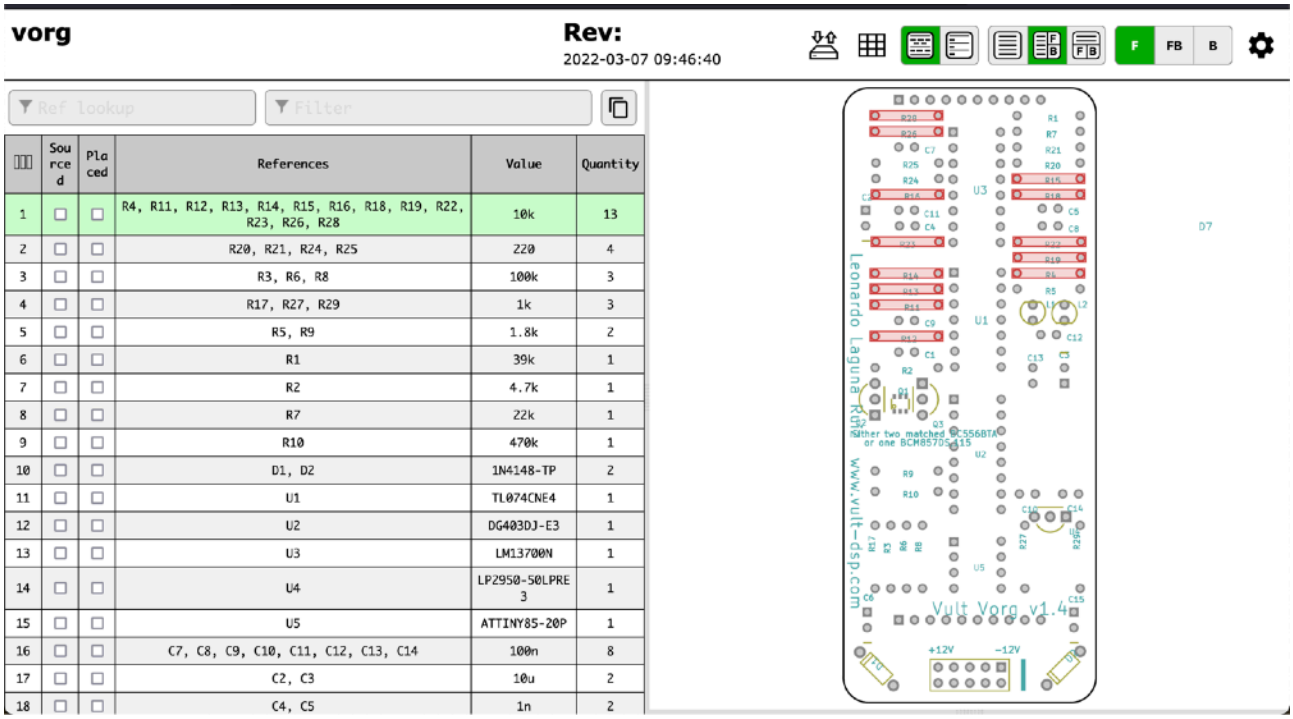
By purchasing a DIY kit or PCBs you are aware that you are responsible for the outcome of your build. Before starting, verify that none of the parts have been damaged during the transport.

If your build fails, we can provide a limited support and repair service.

We want you to succeed. For that reason we tried to make this guide as detailed as possible.

Assembling the main board

For the main board, we provide an Interactive BOM that will help you place all the components. The interactive BOM can be found in the zip file containing all the build information (vorg.html).



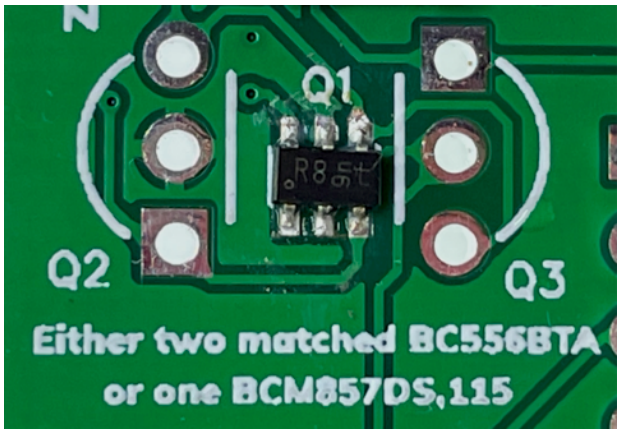
	Sourced	Placed	References	Value	Quantity
1	☐	☐	R4, R11, R12, R13, R14, R15, R16, R18, R19, R22, R23, R26, R28	10k	13
2	☐	☐	R20, R21, R24, R25	220	4
3	☐	☐	R3, R6, R8	100k	3
4	☐	☐	R17, R27, R29	1k	3
5	☐	☐	R5, R9	1.8k	2
6	☐	☐	R1	39k	1
7	☐	☐	R2	4.7k	1
8	☐	☐	R7	22k	1
9	☐	☐	R10	470k	1
10	☐	☐	D1, D2	1N4148-TP	2
11	☐	☐	U1	TL074CNE4	1
12	☐	☐	U2	DG403DJ-E3	1
13	☐	☐	U3	LM13700N	1
14	☐	☐	U4	LP2950-50LPRE3	1
15	☐	☐	U5	ATTINY85-20P	1
16	☐	☐	C7, C8, C9, C10, C11, C12, C13, C14	100n	8
17	☐	☐	C2, C3	10u	2
18	☐	☐	C4, C5	1n	2

The specific steps may vary depending on the option you purchased. Please read the whole build guide and identify the steps that do or do not apply to your case.

TRANSISTOR PAIR

If your board has the transistor pair soldered you can skip this step.

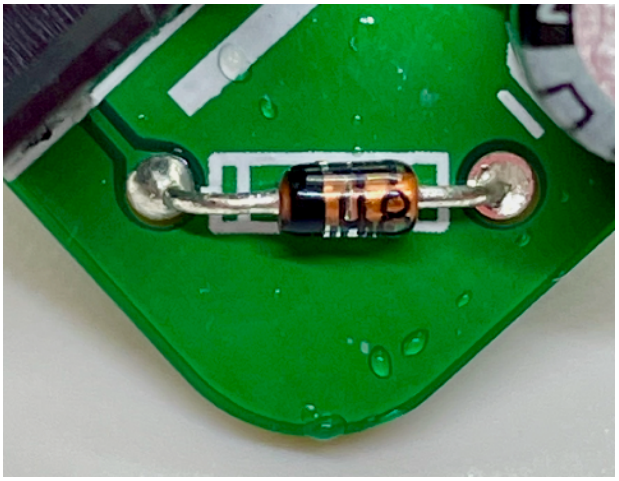
There are two options for the transistor pair. We recommend to use the BCM857DS,115 (surface mount) transistor pair Q1. Notice that the transistor pair has a small dot to designate pin 1. A similar dot is marked in the silkscreen. Make sure they are aligned.



If the transistor pair is not soldered and you do not feel comfortable soldering this small part, you can use a pair of matched BC556 (Q2 and Q3). You can find a good guide on how to match transistors here.

NOTE: Do not install both options at the same time.

RESISTORS AND DIODES



Placing the resistors is straightforward. Use the interactive BOM to find the locations of each resistor.

Remember that the diodes have polarity. The silkscreen of the board marks the direction of the diodes.

PROGRAMMING THE ATTINY85

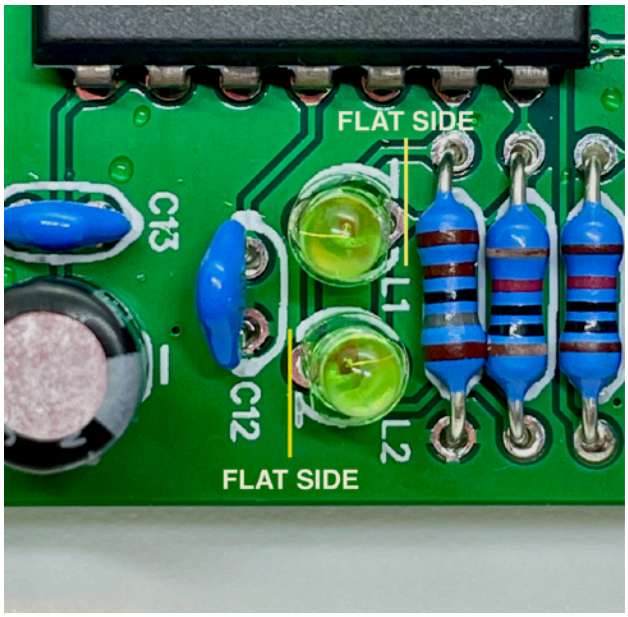
If you received the ATTiny85 from us, you can skip this step because we ship them pre-programmed.

If you sourced the ATTiny by yourself then you need to program it. In order to flash the ATTiny you need a programmer for it. If you don't have one, you can use an Arduino board to flash the program. Check the following link for the instructions: https://create.arduino.cc/projecthub/arjun/programming-attiny85-with-arduino-uno-afb829

You can find the source code here: https://github.com/vult-dsp/VorgToggle

Once you have flashed the program you can solder all the IC sockets.

INTEGRATED CIRCUITS



We recommend you to use sockets for all ICs because it can make the debugging of problems in your build much easier.

The ICs have a notch marking the direction. You can find the corresponding marking in the silkscreen. In this board, all the ICs point up.

Be careful of not bending the IC leads when inserting the into the socket.

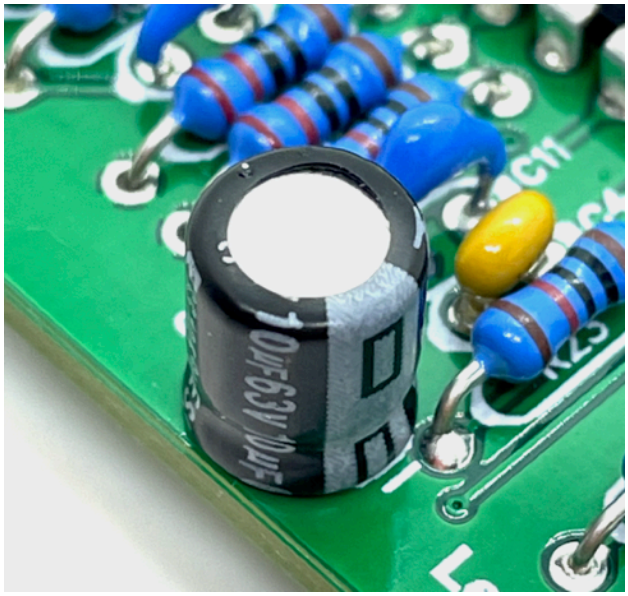
GREEN LEDS

The LEDs have polarity so they must be placed in the correct direction. The LEDs have a flat side which corresponds to the short lead. The silkscreen has a marking that shows where the flat side should be pointing. You can see the markings highlighted in the following picture.

CAPACITORS

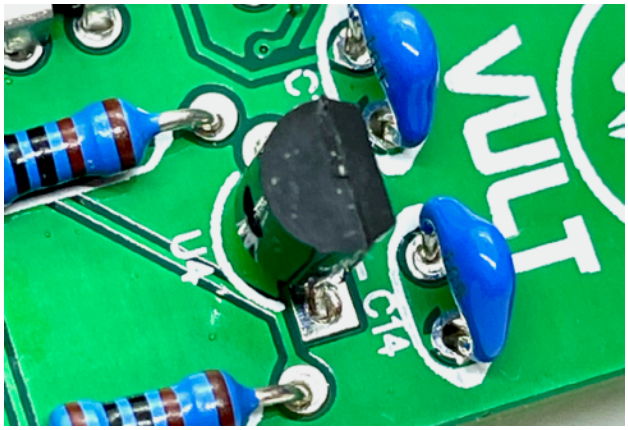
The ceramic capacitors (100nF, 4.7nF and 1nF) are not polarized so you can place them in any direction.

On the other hand, the electrolytic capacitors (47uF and 10uF) have polarity. In the silkscreen you can find the markings for the negative pin. Make sure you are placing them correctly otherwise capacitors could explode.



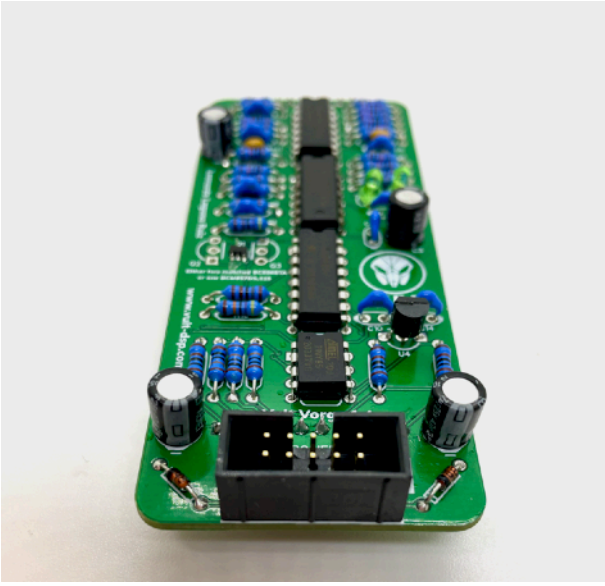
POWER REGULATOR

The direction of the power regulator is marked on the silkscreen. Make sure you have placed it in the correct position.



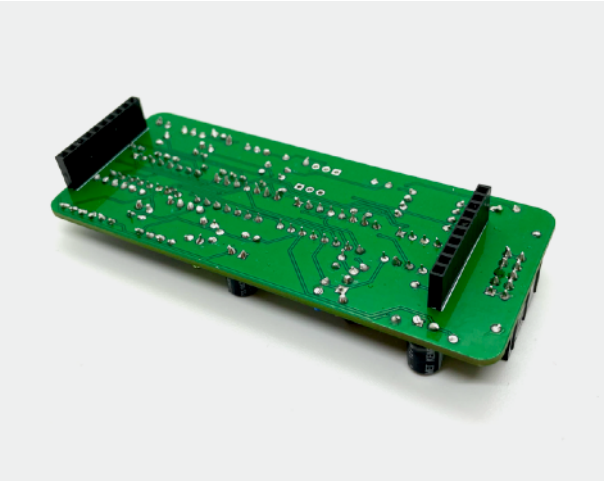
POWER CONNECTOR

The module has reverse polarity protection but we recommend you to use a shrouded connector for the power so you avoid connecting it backwards. The silkscreen marks the direction of the shrouded connector. If you do not use one, the silkscreen marks where the red stripe of your power cable should point to.



CONNECTORS

To finalise the main board you need to solder the board connectors. These are mounted on the back of the board.



Be careful of not touching the other components with your soldering iron. Some of the pads can be hard to solder because they are attached to a ground plane. With a bit of patience, flux and heat these can be soldered.

CLEANUP AND CHECKING

At this point you can clean the flux residuals on the board (if necessary).

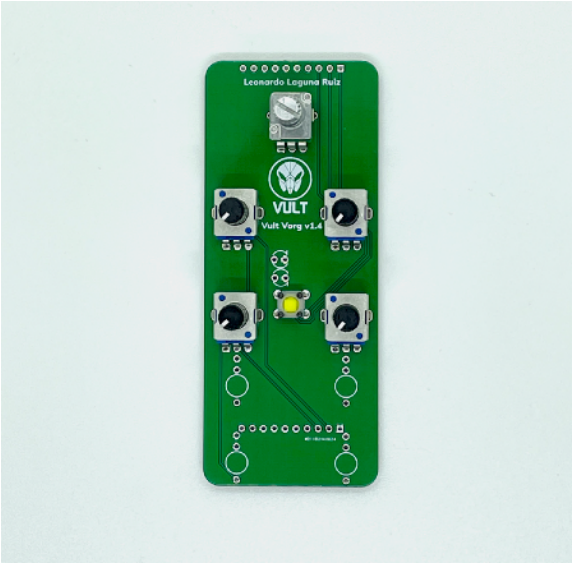
Check if there are any visible solder point that could cause a short circuit. Check as well that there are no solder points needing a bit more tin.

Using a multimeter, check the ±12V points in the connector just to make sure that there are no short-circuits. In my case, when measuring the rails, my multimeter displays a resistance over 1 M ohm.

Assembling the control board

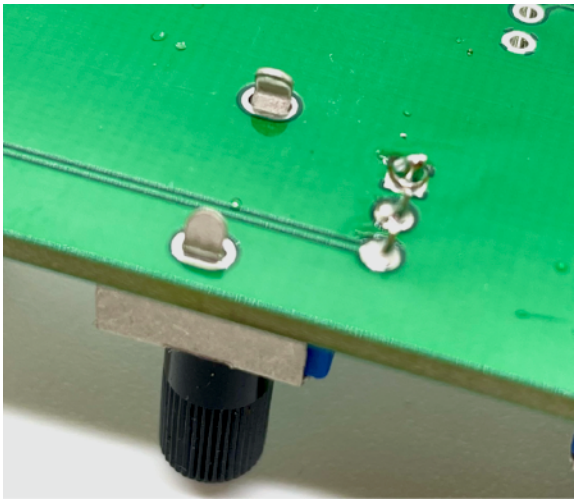
POTENTIOMETERS

Start by placing the potentiometers as shown on the picture. Before soldering them, make sure that they are properly placed. When pressing them, push them from the body, not from the shaft because you could break the plastic knobs.



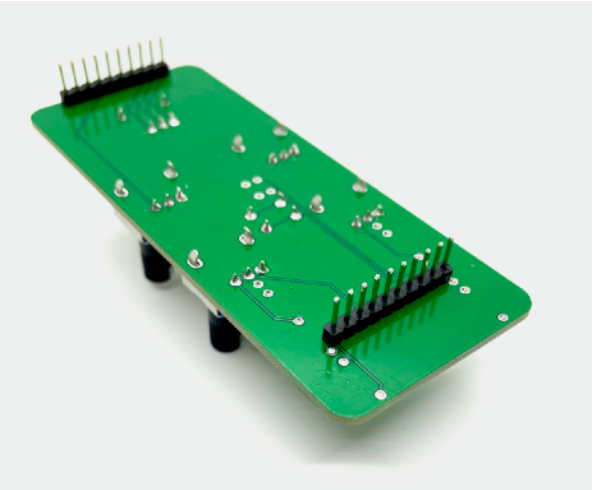
NOTE: do not solder the side terminals of the potentiometers yet. Just solder the main three terminals. This will make easier to fix any mistakes once you mount the panel.

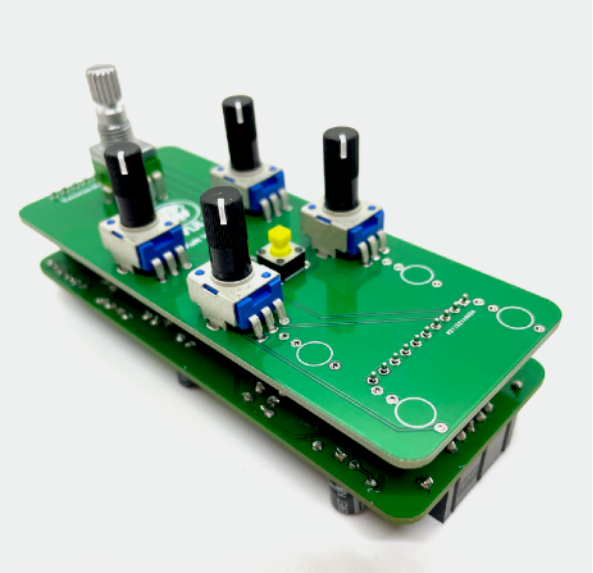
Place the push button and solder it. Just make sure it is mounted correctly.



PIN STRIPS

Before placing the jacks, it is better to solder the pin strips. These are soldered in the bottom of the board. Start soldering one pin and then make sure it is properly aligned, otherwise they will not connect to the headers.





JACKS

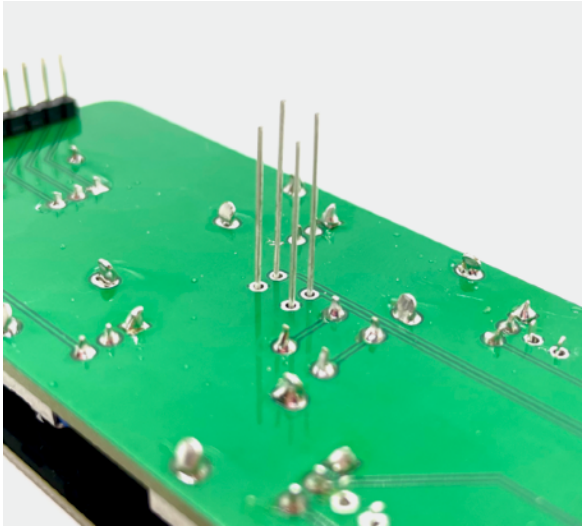
Place the jacks but do not solder them yet. Once the jacks are mounted, put the panel and screw the nut of the potentiometer to keep the panel in place.

Make sure that the jacks are properly mounted and fit nicely in the panel holes.

Remove the panel and place the cap of the push button.

RED LEDS

The red LEDs, similarly to the green one, have a flat side. The flat side is marked in the silkscreen. Once you insert them, they should look like the image.



Place back the panel and put the LEDs through the panel holes. Once they are going through the panel, solder the terminals.

At this point you can solder the potentiometer terminals and clean the board if necessary. Avoid pouring alcohol or other solvents on top of the potentiometers because they may lose the grip.

FINAL ASSEMBLY

You can put back the panel and screw the nuts of the jacks and potentiometers.

Connect the two boards together and put the knob on the potentiometer.

At this point, your module should be ready to use. Take all the necessary precautions when powering your module for the first time.

Enjoy your module and let us know how the build went!