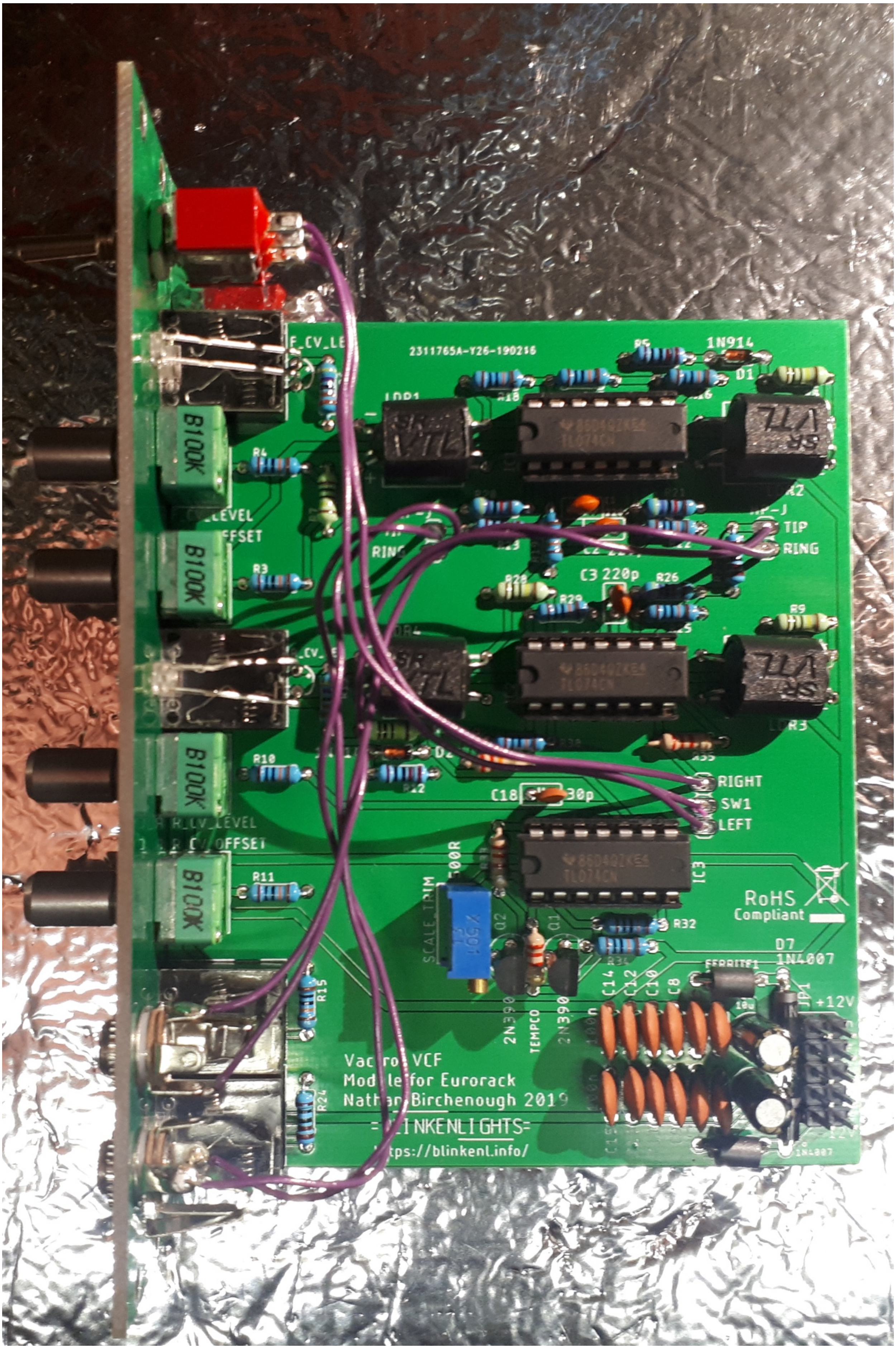
BLINKENLIGHTS VCF - Vactrol



STATS

POWER	+12V 29mA, -12V 27mA
WIDTH	6HP
HEIGHT	3U
DEPTH	82mm

TOOLS

Soldering iron
Wire clippers
Wire stripper
LFO (suggested, for testing)
Patch cables (suggested, for testing)

ASSEMBLY

The PCB silkscreen shows the names and values of all the components. When I solder, I usually solder all the resistors, followed by all the diodes, then capacitors, IC sockets, pin headers, jacks and the right-angled panel potentiometers. Finally, solder the LEDs when you test fit the front panel.

TEMPCO The PCB is arranged so that the log section can be temperature compensated, but this is not necessary and a 2k2 resistor will work fine in place of the tempco.

PJ-324MH Jacks The holes in the PCB for these jacks are very tight. This is deliberate, to make sure that the jacks are mounted precisely to fit the holes in the front panel. You will have to push carefully to fit these in, and please make sure that they're completely flush with the PCB.

Right Angled Alpha Pots These must be fitted with the bottom face of the pot completely flat against the PCB. Please clamp or hold the pots in place as you solder. I hold the pot firmly against the PCB as I solder the middle leg, then that joint holds it in place as I solder the other two legs.

Log / Lin Toggle Switch Solder an ~80mm wire to each leg of the toggle switch. Solder the wire from the middle leg of the switch to the middle pad of SW1. Solder the other wires to the other pads of SW1. Mount the switches in the panel so that the leg connected to pad RIGHT faces right, and the leg connected to pad LEFT faces left.

'LP' and 'HP' Jacks The Low Pass and High Pass jacks are panel mounted. Solder a ~60mm wire to the Tip and Ring tabs on the panel jacks. Solder those wires to the TIP and RING pads marked LP-J and HP-J on the PCB.

LEDs Before soldering the LEDs, test fit the front panel. You will need to bend the legs of each LED so that it fits through its hole in the front panel, whilst its legs fit into the holes in the PCB. Test fit the LEDs in their holes and gauge where you will need to bend their legs. Pay attention to the polarity of the legs.

TESTING

Turn both sets of Amplitude and Offset knobs all the way right.

Both LEDs should light up.

Patch the BP (Band Pass) output to your speaker or mixer. You should hear the filter harshly resonating at a high frequency.

Turn the Frequency Bias down a little until the frequency is lower and a little louder. Frequency Bias is the knob you can use to set the initial frequency, the frequency that sounds when no control voltage is applied / the control voltage is at 0V.

Turn the Resonance Bias down a little. The resonance should become less harsh and more like a sine wave. If you watch the signal on an oscilloscope, it should look like a sine wave.

The scale trim can be used to get the 'best sounding' response from the Frequency CV when you choose Log mode using the switch on the front panel. With a Vactrol based filter, it'll be difficult to make the Log section perfectly V/Oct which is why I describe the input as Frequency CV not as V/Oct. To set the scale trim correctly, set up the filter to self-oscillate as described above, and set the Frequency CV Amplitude to maximum (all the way to the right). Then feed in a slow ramp wave from an LFO, of the same amplitude of the control voltages you use in your system (for example 0-5V, 0-10V, -5 - 5V). Adjust the scale trim so the frequency stays within the audible range during the whole ramp.

You can *attempt* to set the scale trim so that the filter follows V/Oct, but the Vactrol response is not perfectly linear so it will be difficult to achieve good tracking. If you want to try, you'll need a voltage source you can vary manually, ideally a calibrator like this one from Music From Outer Space:
http://musicfromouterspace.com/index.php?MAINTAB=SYNTHDIY&VPW=1430&VPH=625 You could also follow the calibration guide on that page.

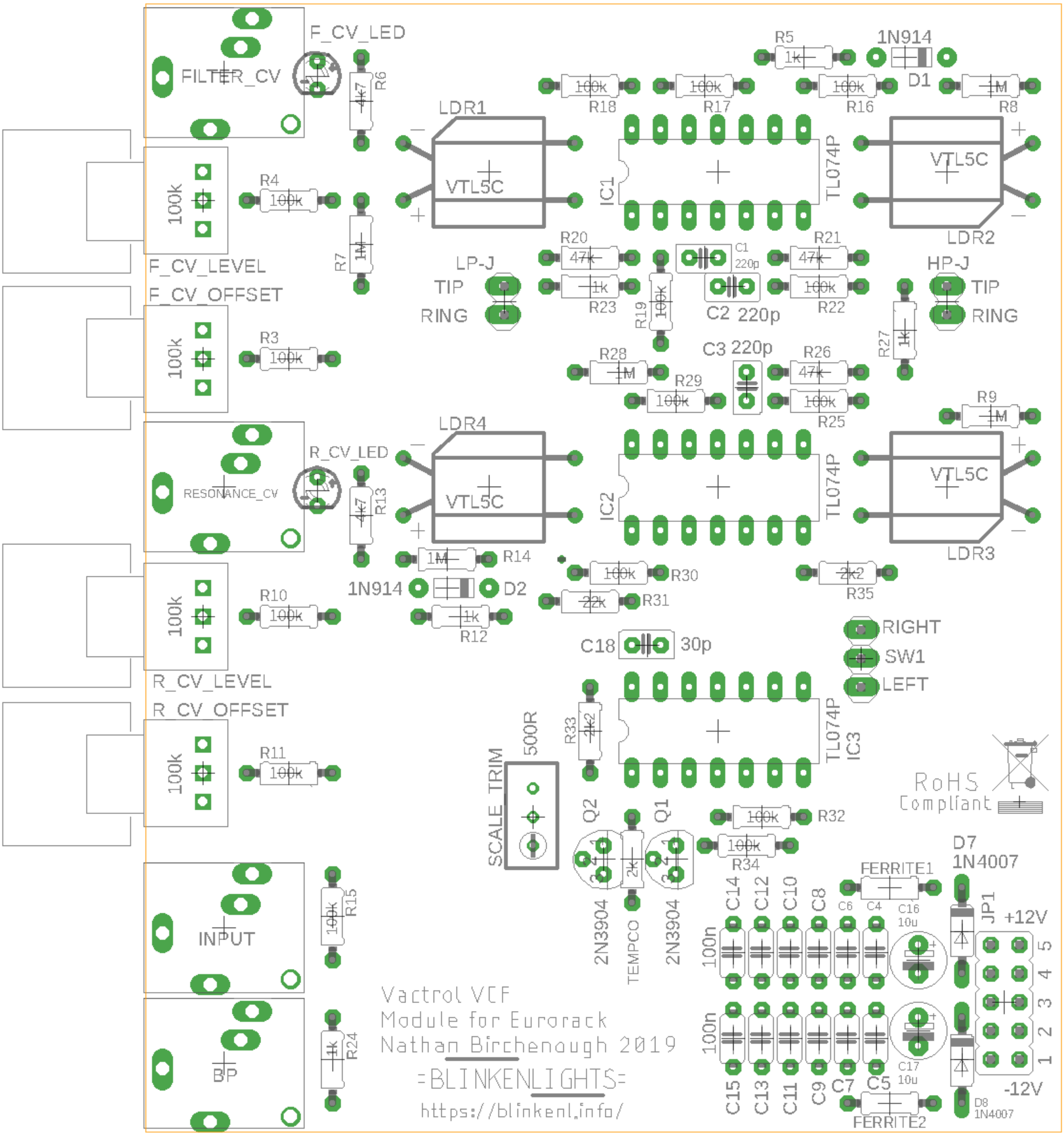
With the Resonance Bias around the centre, the filter should stop self-oscillating and the Resonance LED should not be lit.

Looks like your filter works!

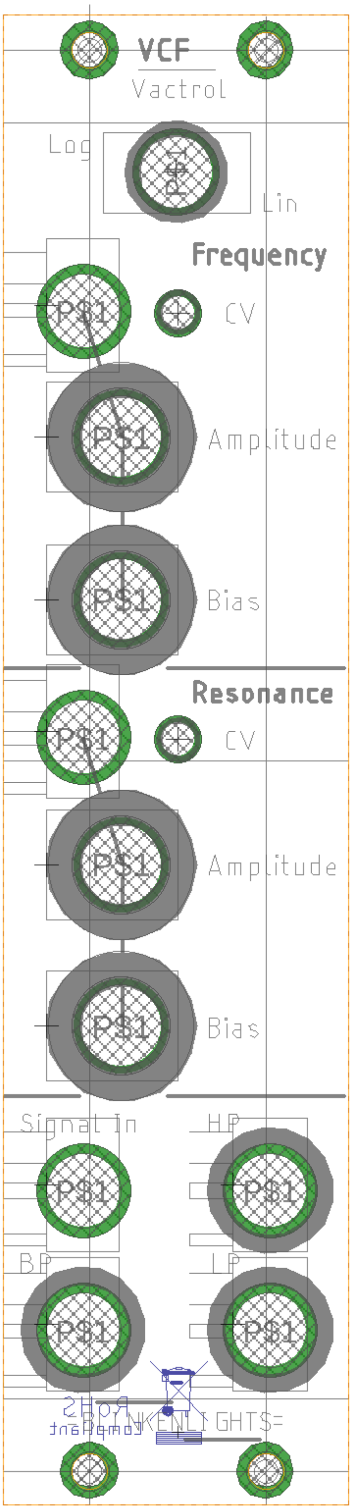
BILL OF MATERIALS

Qty	Value	Parts	Description
2			3.5MM PANEL MOUNTED JACK
4	PJ-324MH	BP, FILTER_CV, INPUT, RESONANCE_CV	3.5MM PCB MOUNTED JACK
1	500R	SCALE_TRIM	3296W Trimm resistor
2	RED	F_CV_LED, R_CV_LED	3MM LED
4	100k	F_CV_LEVEL, F_CV_OFFSET, R_CV_LEVEL, R_CV_OFFSET	9MM ALPHA POT
12	100n	C4, C5, C6, C7, C8, C9, C10, C11, C12, C13, C14, C15	CAPACITOR
3	220p	C1, C2, C3	CAPACITOR
1	30p	C18	CAPACITOR
2	1N4007	D7, D8	DIODE
2	1N914	D1, D2	DIODE
3	14 PIN		IC SOCKET
1		JP1	JUMPER
2	2N3904	Q1, Q2	NPN Transistor
3	TL074P	IC1, IC2, IC3	OP AMP
2	10u	C16, C17	POLARIZED CAPACITOR
2		FERRITE1, FERRITE2	RESISTOR
15	100k	R3, R4, R10, R11, R15, R16, R17, R18, R19, R22, R25, R29, R30, R32, R34	RESISTOR
1	1M	R28	RESISTOR
3	1k	R23, R24, R27	RESISTOR
1	22k	R31	RESISTOR
2	2k2	R33, R35	RESISTOR
3	47k	R20, R21, R26	RESISTOR
1	2k	TEMPCO	RESISTOR (2k2 standard resistor works OK too)
6	560	R6, R7, R8, R9, R13, R14	RESISTOR
2			SPDT TOGGLE SWITCH
4	VTL5C	LDR1, LDR2, LDR3, LDR4	VACTROL

PCB LAYOUT


F_CV_LED
FILTER_CV
R6
4k7
F_CV_LEVEL
F_CV_OFFSET
R4
R3
R7
1M
LDR1
VTL5C
IC1
TL074P
LDR2
R5
1k
1N914
D1
R18
R17
R16
R8
R20
47k
R21
C1
220p
LP-J
TIP
RING
HP-J
R23
R19
C2 220p
R22
R27
C3 220p
R28
R29
R26
R25
R9
LDR4
R_CV_LED
RESONANCE_CV
R13
IC2
LDR3
R14
1N914
D2
R10
R12
R30
R31
R35
2k2
22k
C18
30p
RIGHT
SW1
LEFT
R_CV_LEVEL
R_CV_OFFSET
R11
SCALE_TRIM
500R
R33
IC3
RoHS
Compliant
Q2
Q1
2N3904
TEMPCO
R32
R34
D7
1N4007
FERRITE1
JP1
+12V
C14
C12
C10
C8
C6
C4
C16
10u
100n
INPUT
R15
BP
R24
Vactrol VCF
Module for Eurorack
Nathan Birchenough 2019
=BLINKENLIGHTS=
https://blinkenl.info/
C15
C13
C11
C9
C7
C5
C17
10u
FERRITE2
D8
1N4007
-12V

PANEL LAYOUT



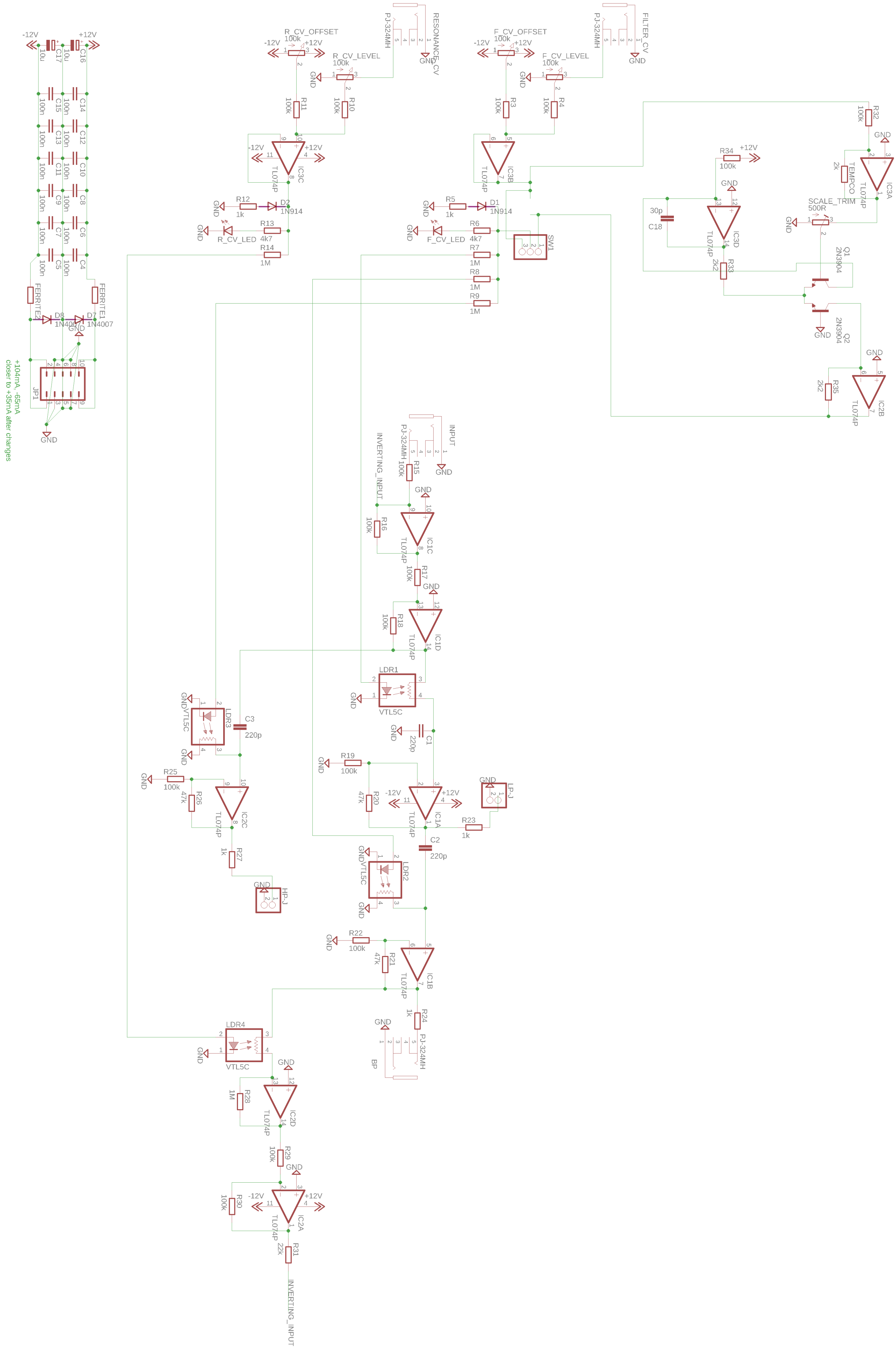
Switch between logarithmic and linear pitch response to the control voltage.

The LED indicates the level of the CV after being attenuated and biased.

The Amplitude and Bias controls allow the CV to be attenuated and biased.

The Resonance CV input can also attenuate and bias the CV

SCHEMATIC



CONTACT

Email: nathan@birchenough.co.uk
Web: blinkenl.info