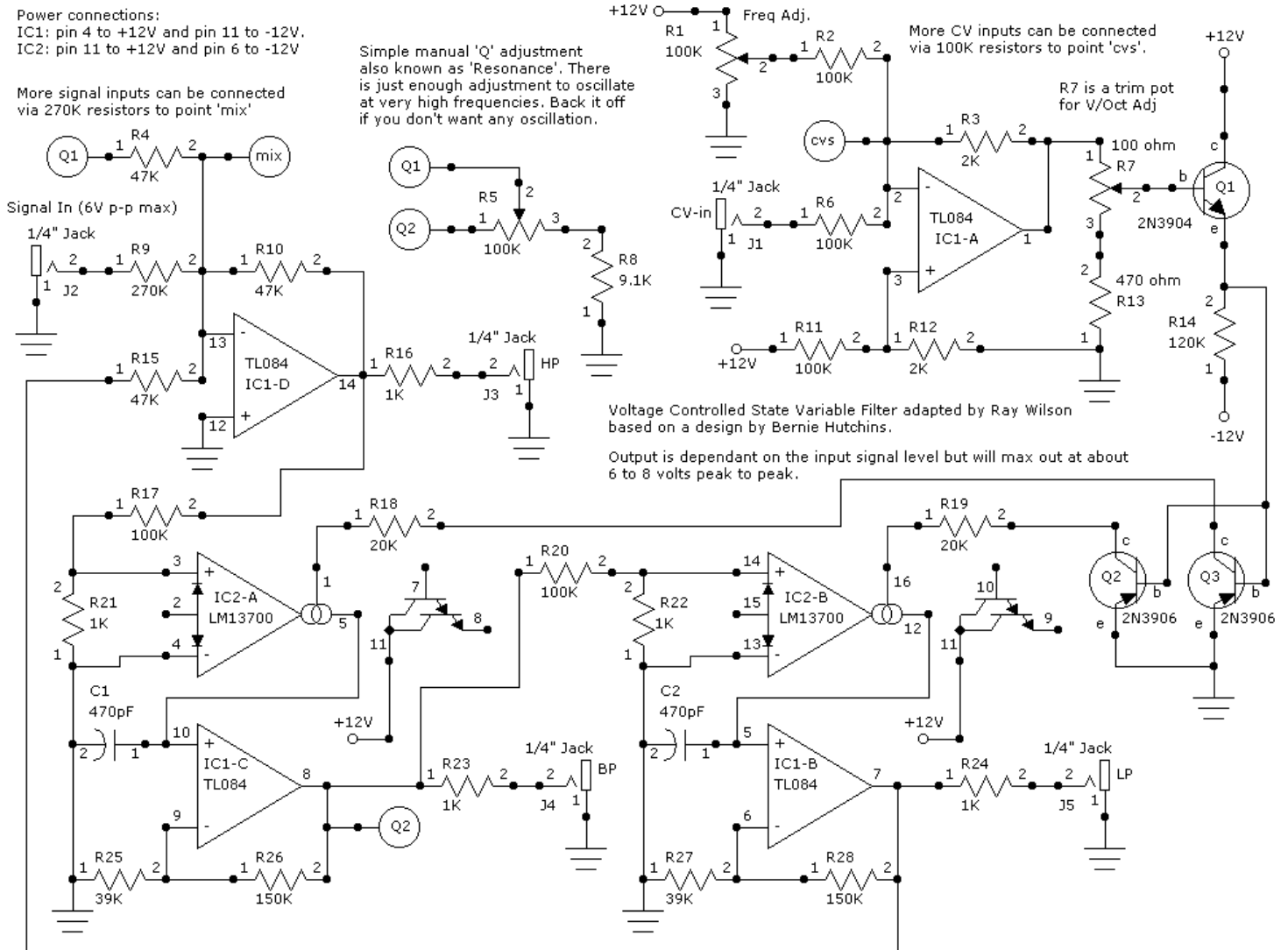


# Controlled State Variable Filter (Two Pole 12db/Octave)

This will add a ton of timbres to your bag of tricks. This filter is also known as a Universal Active Filter. You get simultaneous High Pass, Band Pass, and Low Pass filtering. You can, of course, cascade two of these to obtain higher order filtering. The control voltage portion is just about straight from a Bernie Hutchins design. I love this filter. I built two into a module and am really pleased with the results. Now my synth has two of my low pass filters and two of these... I'm in filter heaven.

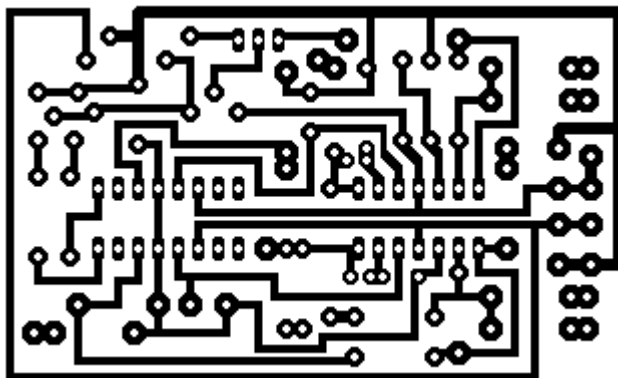
OK, I went back in and got it to work with 8 to 10 volt peak to peak signal amplitudes and made it output 8 to 10 volts peak to peak (note that this is when the Resonance is turned up and the Q ringing adds a couple of volts). If you overdrive the input you get some really funky sounding timbres so give it a try. I'm going to try and build this circuit using the buffers in the LM13700 to replace IC1B and IC1C. If it sounds as good as the current design it will mean that I can build this with one LM13700 and one TL082 (slightly cheaper than the TL084) so we can all save a buck or two.

## Voltage Controlled State Variable Filter Schematic



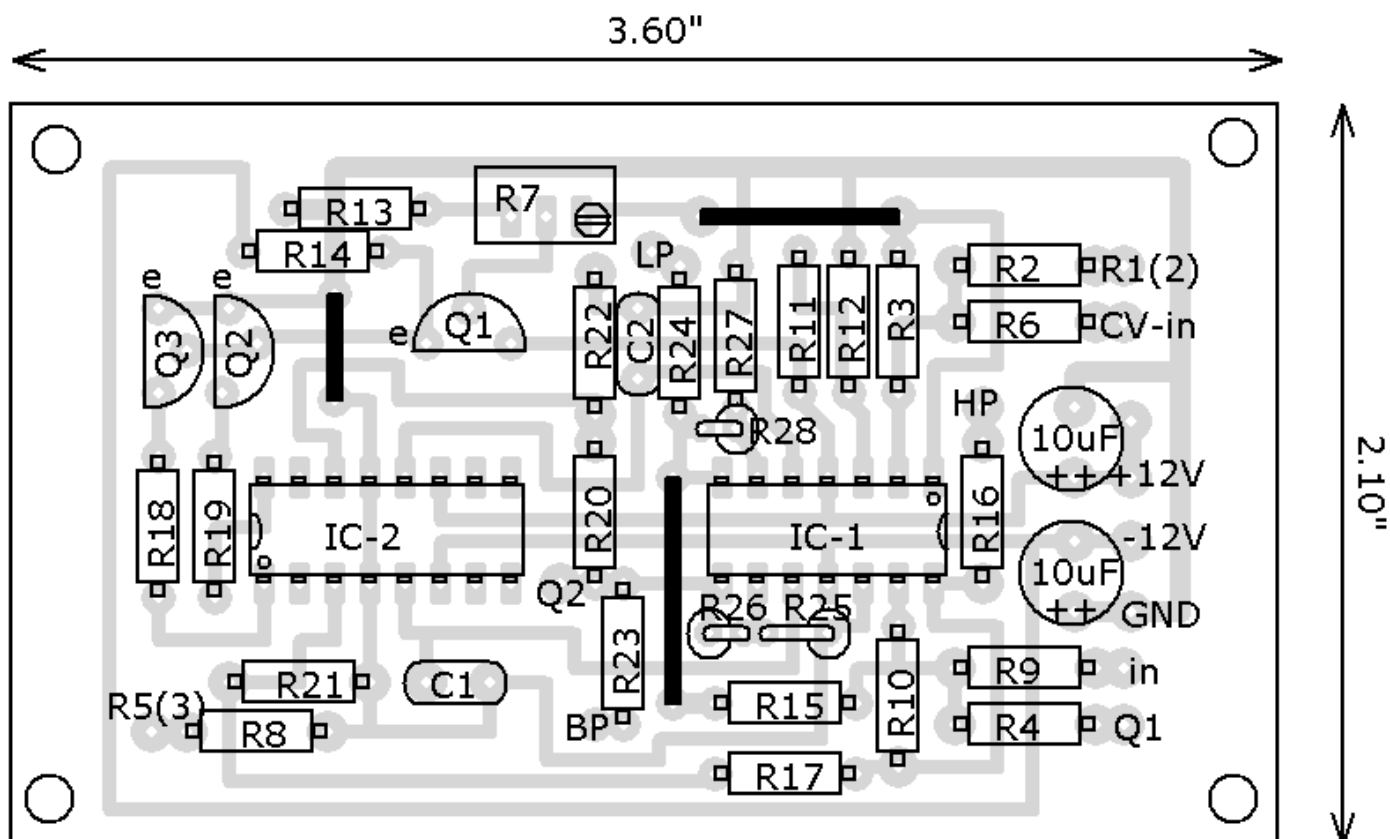
## Voltage Controlled State Variable Filter PCB Layout (Component Side View)

This board is printed at the proper size when the distance between adjacent IC pads is exactly  $1/10''$  and the distance across an IC pad layout is exactly  $3/10''$ .



## Voltage Controlled State Variable Filter Parts Placement

NOTE!! that R25, R26, and R28 are vertically mounted. I kludged them in after I went back and worked the gain up a bit. The two 10uF caps are not on the schematic and are present for power supply bypassing. **NOTE THAT THE TWO CHIPS FACE OPPOSITE DIRECTIONS!!** When I was experimenting with this circuit I put the power to a TL084 backwards and the chip got so hot that it melted my breadboard, destroying the chip in the process (no kidding).



## VC State Variable Filter Project Parts List

You can use 5% resistors if you don't have 1% they will work fine.

<b>Qty.</b>	<b>Description</b>	<b>Value</b>	<b>Designators</b>
5	1/4 Watt 1% Resistor(s)	100K	R6, R2, R11, R17, R20
1	1/4 Watt 1% Resistor	120K	R14
2	1/4 Watt 1% Resistor(s)	150K	R26, R28
5	1/4 Watt 1% Resistor(s)	1K	R16, R24, R22, R21, R23
2	1/4 Watt 1% Resistor(s)	20K	R19, R18
1	1/4 Watt 1% Resistor	270K	R9
2	1/4 Watt 1% Resistor(s)	2K	R3, R12
2	1/4 Watt 1% Resistor(s)	39K	R25, R27
1	1/4 Watt 1% Resistor	470 ohm	R13
3	1/4 Watt 1% Resistor(s)	47K	R10, R15, R4
1	1/4 Watt 1% Resistor	9.1K	R8
2	Ceramic Capacitor(s)	470pF	C1, C2
1	LM13700 OP-Amp	LM13700	IC2-B, IC2-A
1	Operational Amplifier	TL084	IC1-D, IC1-C, IC1-A, IC1-B
5	Phone Jack(s)	1/4" Jack	J4, J5, J3, J1, J2
1	Potentiometer	100 ohm	R7
2	Potentiometer(s)	100K	R1, R5
1	Transistor NPN	2N3904	Q1
2	Transistor PNP(s)	2N3906	Q3, Q2