Korg MS50 VCF Board Layout

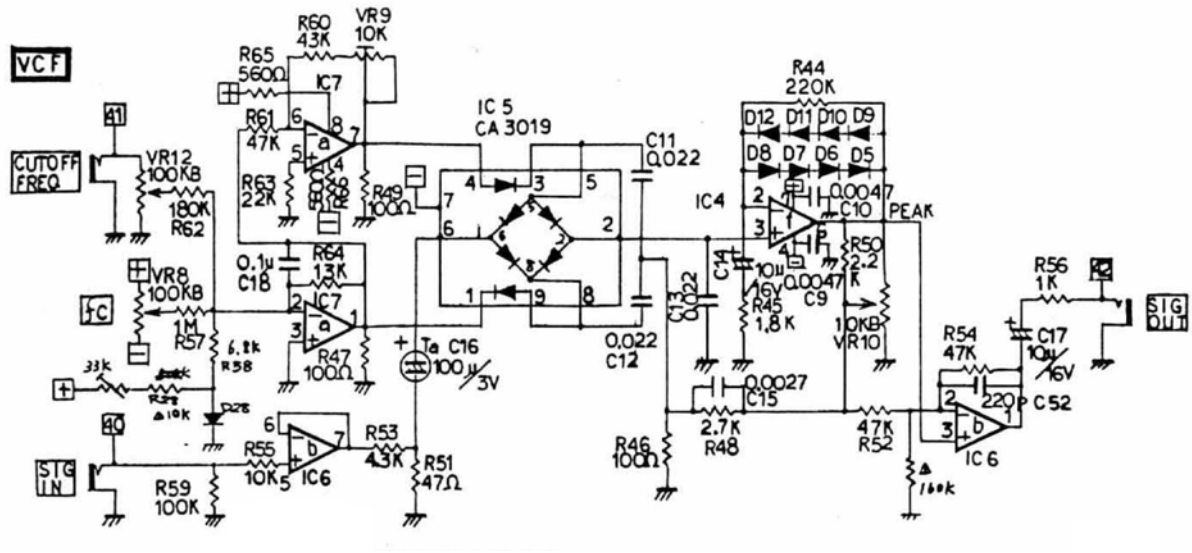

Figure 1 -- original schematic from service manual

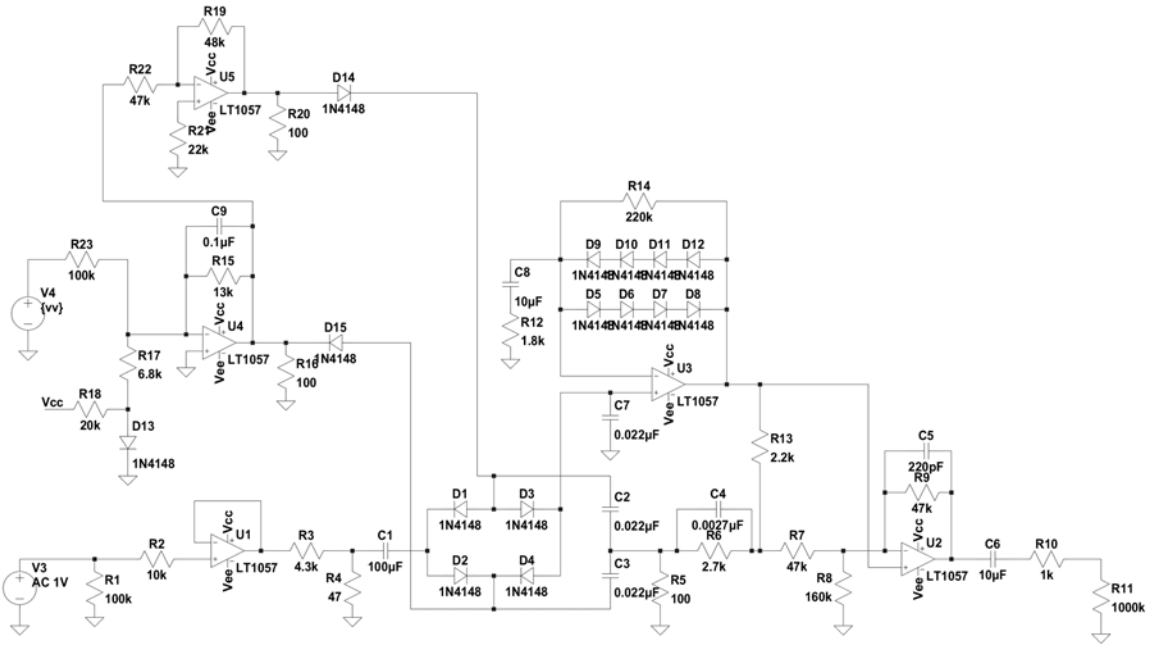

Figure 2 -- simulation schematic

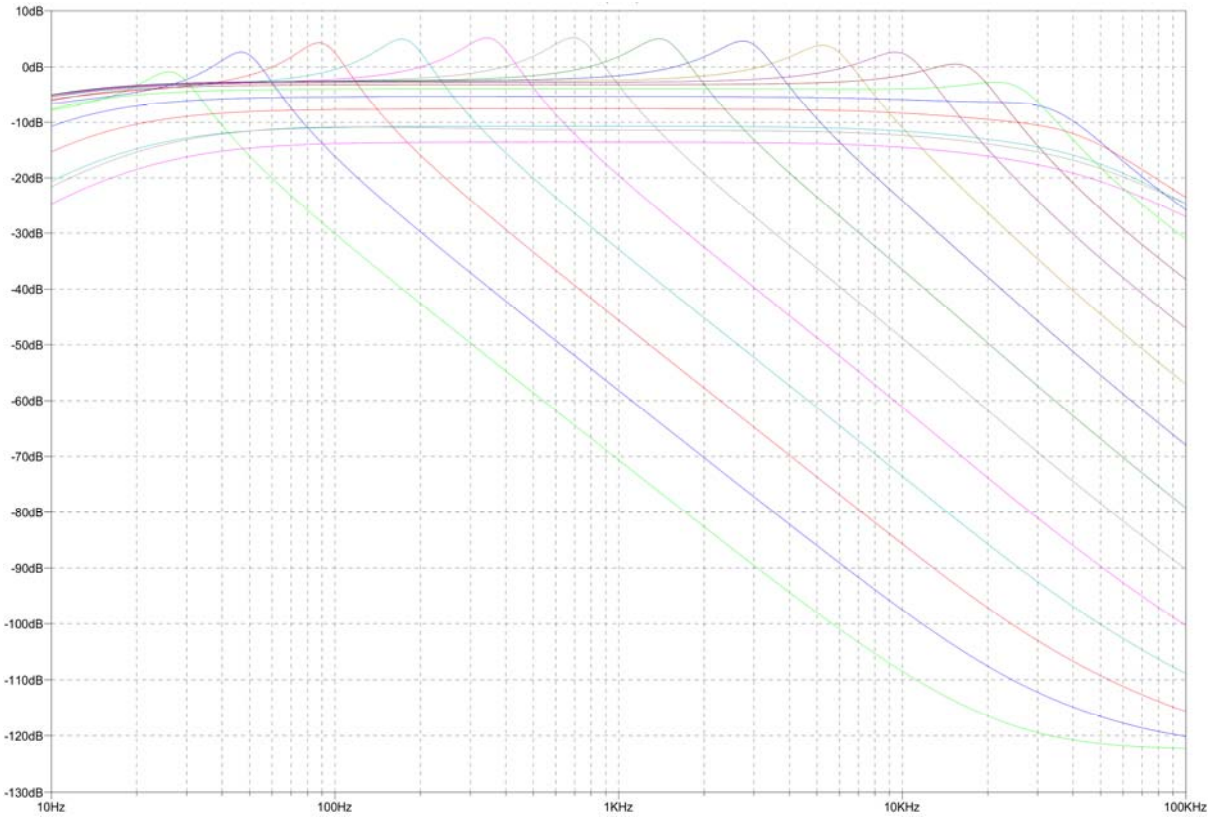

Figure 3 -- simulation output

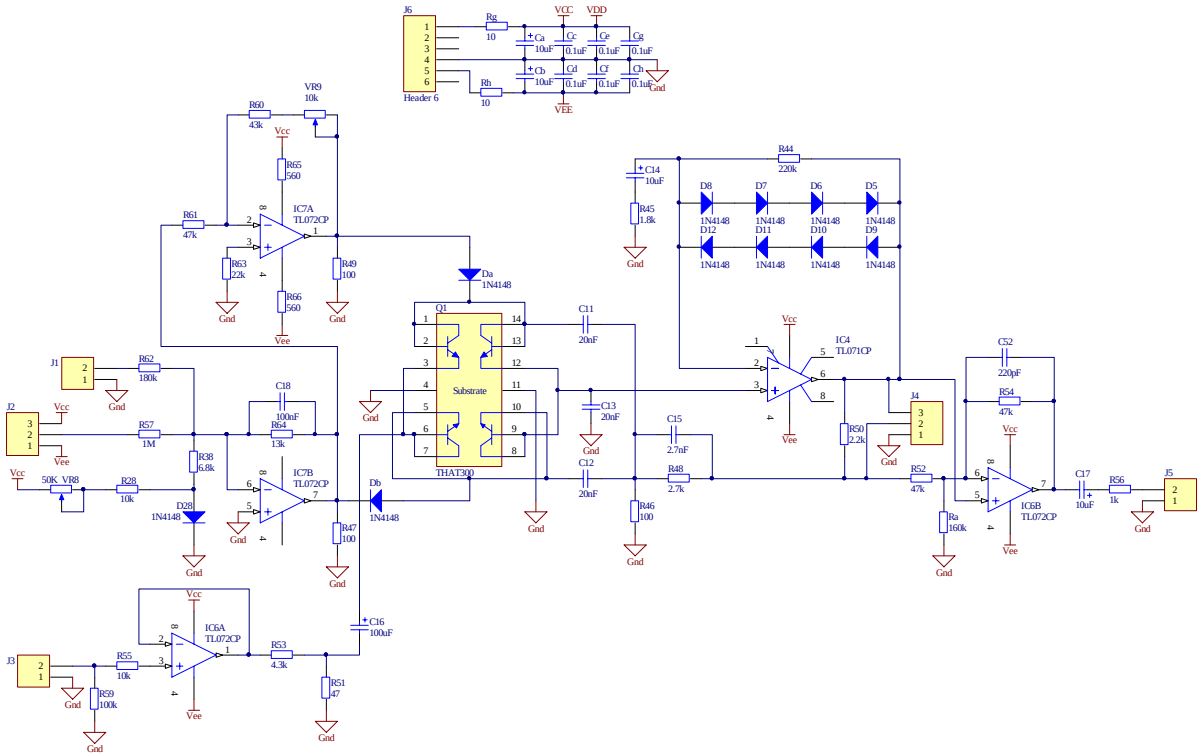

Figure 4 - redrawn schematic with extra decoupling & matched transistor array

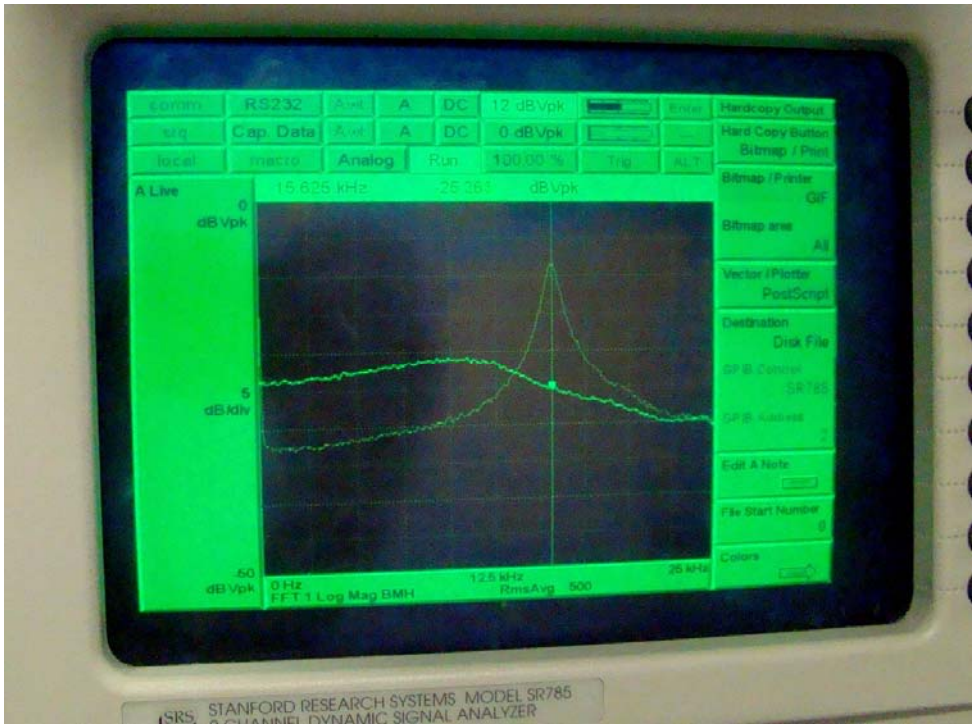

Figure 5 -- Screen capture from Spectrum Analyser

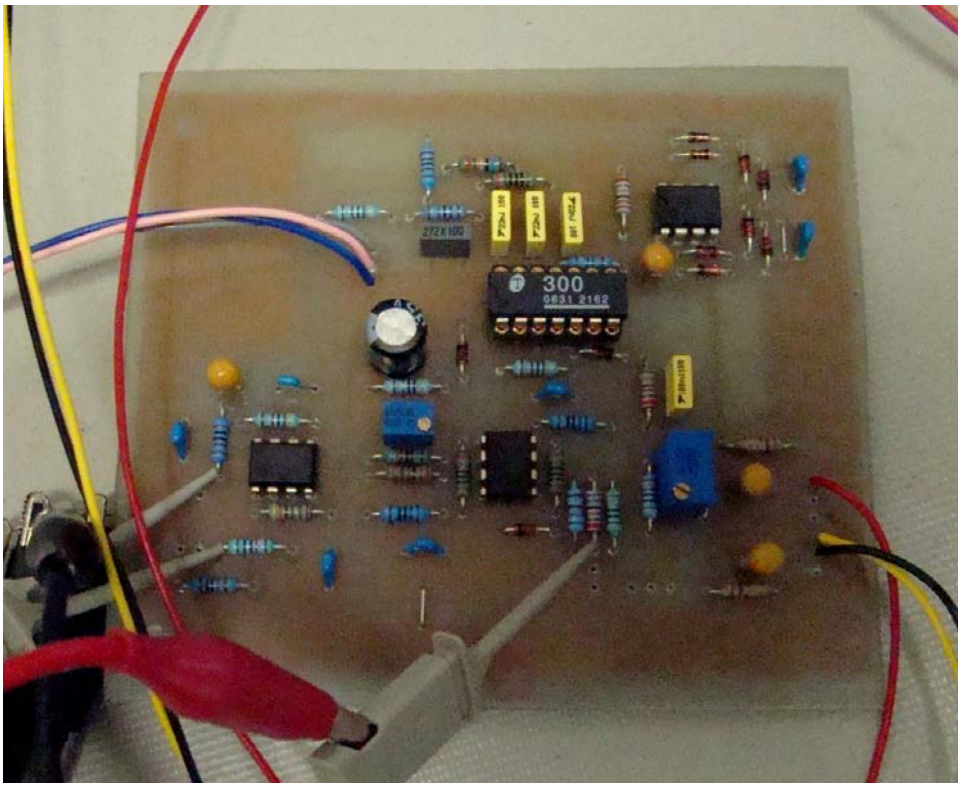

Figure 6 -- Board under test

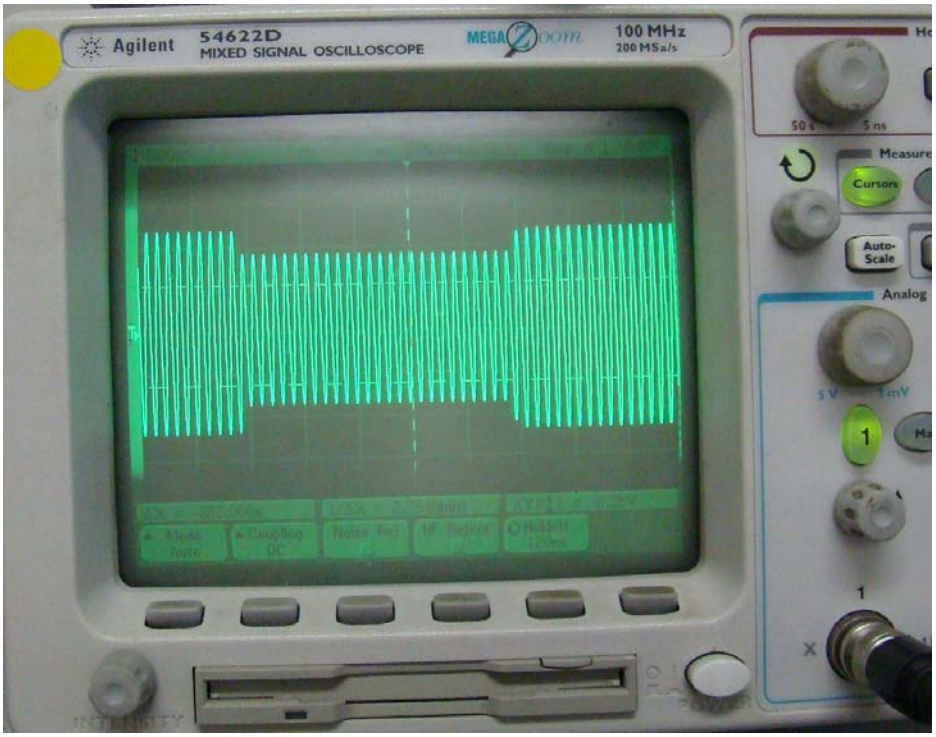

Figure 7 – Calibration

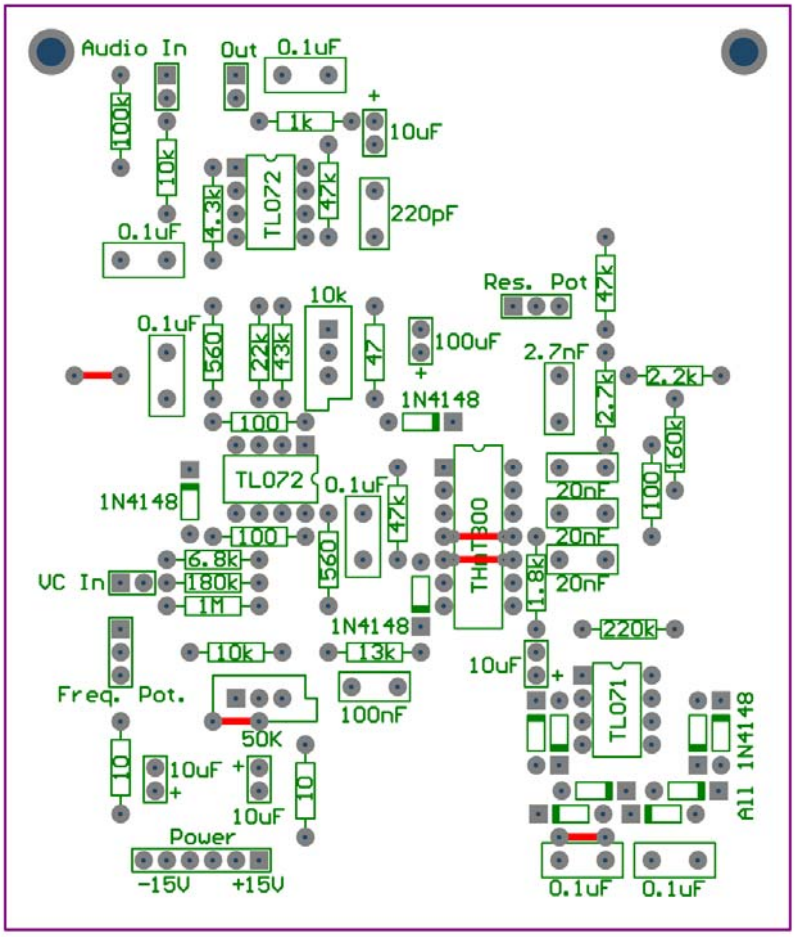

Figure 8 -- Component overlay

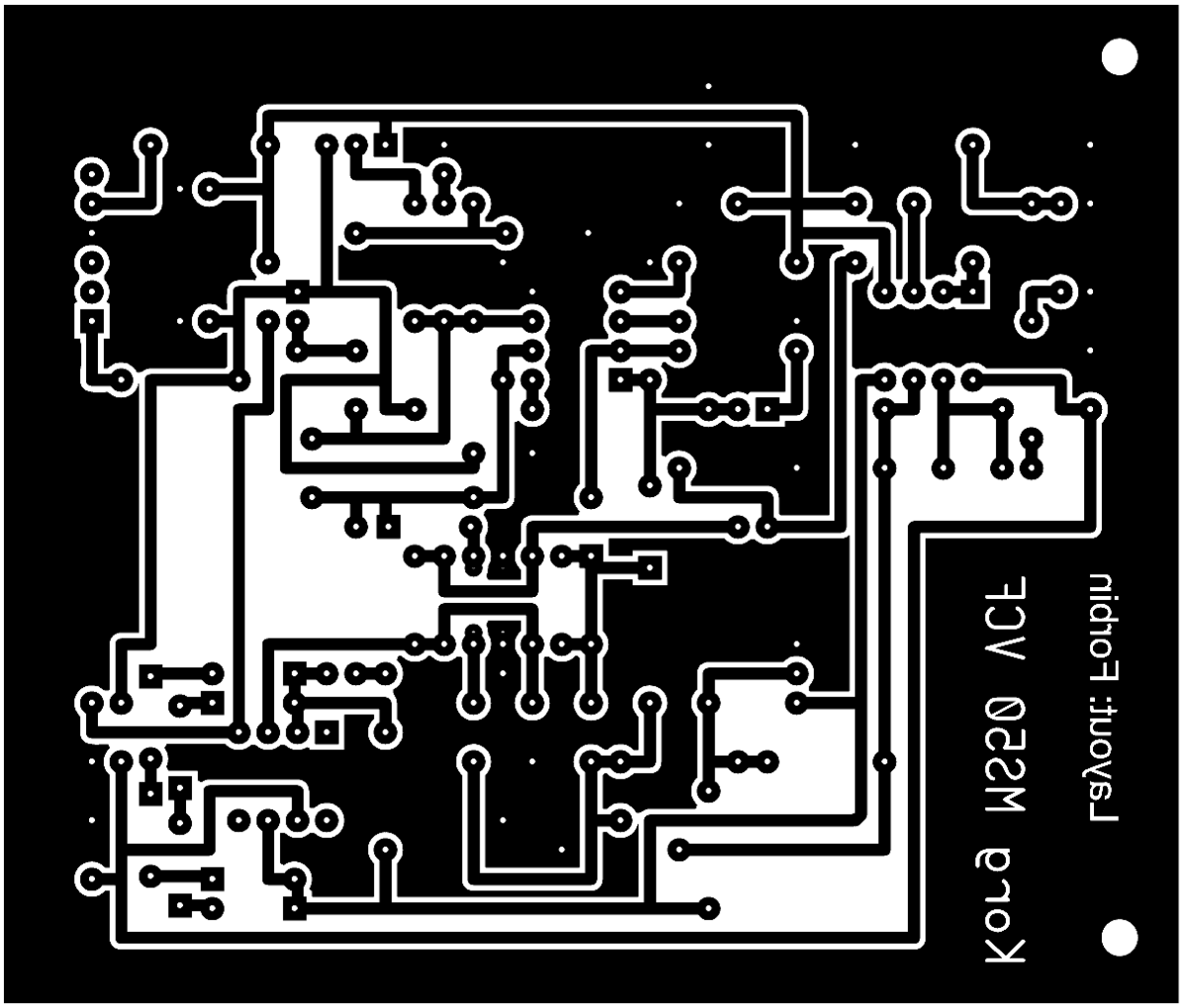

Figure 9 -- PCB Layout

Notes:

The calibration adjustments are relatively simple. VR8 adjusts the Volts per Octave control. To adjust this, remove any audio input and set the Resonance to a maximum to cause the filter to oscillate. Step the voltage and monitor the frequency of the output to try and get a frequency doubling per 1V step.VR9 adjusts the Symmetry of the two sides of the diode bridge. I found the easiest way was to inject a 500Hz sine wave and drive the Control Voltage with 10Hz or so square wave. The output of filter will look something like the signal in Figure 7. By adjusting the trim-pot the balance between the two levels can be made so that they are symmetrical about the centre point.

The parts list doesn't include things like the sockets and potentiometers and knobs.

The part identifiers are kept the same as the original schematic and where extra parts have been added the identifier is a lowercase letter i.e. Ca for a capacitor.

A lot of extra decoupling has been added to the design that wasn't in the original. This is probably more of a digital design consideration and you are at liberty to leave them out if you wish.

This is a relatively simple board to make. Only things to check are the polarity of the capacitors and the wire jumpers, especially the ones under the transistor array! (Shown in RED on the overlay)

The board is reasonably power efficient – my build drew 19mA per supply rail for 15V.

As per the usual disclaimers, don't attempt this if you don't know what you're doing – it could be dangerous and you could kill yourself. This is for Non-Commercial use only. The schematic is the copyright of Korg.

The screen capture in Figure 5 is for the resonance pot at the two ends of travel. The peak of the response does seem to move with varying the Resonance, which in an ideal filter wouldn't be the case…

If you find any mistakes please let me know at the electro-music forum and I will fix it for others.

Parts List for Board

Comment	Quantity	Components	
0.1uF	6	Cc, Cd, Ce, Cf, Cg, Ch	Capacitor
1.8k	1	R45	Resistor
10	2	Rg, Rh	Resistor
100	3	R46, R47, R49	Resistor
100k	1	R59	Resistor
100nF	1	C18	Capacitor
100uF	1	C16	Polarized Capacitor (Axial)
10k	2	R28, R55	Resistor
10k	1	VR9	Potentiometer
10uF	4	C14, C17, Ca, Cb	Polarized Capacitor (Axial)
13k	1	R64	Resistor
160k	1	Ra	Resistor
180k	1	R62	Resistor
1k	1	R56	Resistor
1M	1	R57	Resistor
1N4148	11	D5, D6, D7, D8, D9, D10, D11 D12, D28, Da, Db	Diode
2.2k	1	R50	Resistor
2.7k	1	R48	Resistor
2.7nF	1	C15	Capacitor
20nF	3	C11, C12, C13	Capacitor
220k	1	R44	Resistor
220pF	1	C52	Capacitor
22k	1	R63	Resistor
4.3k	1	R53	Resistor
43k	1	R60	Resistor
47	1	R51	Resistor
47k	3	R52, R54, R61	Resistor
50K	1	VR8	Potentiometer
560	2	R65, R66	Resistor
6.8k	1	R38	Resistor
THAT300	1	Q1	Transistor Array
TL071	1	IC4	Low-Noise JFET-Input Op-Amplifier
TL072	2	IC6, IC7	Low-Noise JFET-Input Op-Amplifier