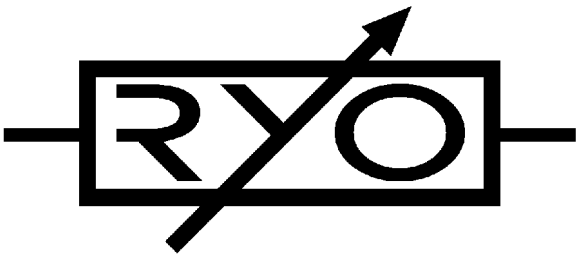
Ljunggren Audio
Roll Your Own
VC Sequencer



Version: VC Sequencer 1.5 TH
For previous version 1.2: http://ljunggrenaudio.com/products/VCSEQ/vcsequencer1.2.pdf
For previous version 1.3: http://ljunggrenaudio.com/products/VCSEQ/vcsequencer1.3.pdf

Bills Of Material

Full BOM

Type	Qty	Value	Parts	Note
Pow er header	1	2x5pin	POWER	boxed
Expand header	2	2x5pin	EXPAND-16STEP, EXPAND-CHANNEL	
Pin strip	2	1x8pin	PCB1-CON1, PCB1-CON2	
Socket strip	2	1x8pin	PCB2-CON1, PCB2-CON2	
Rotary pot	8	100K	POT1, POT2, POT3, POT4, POT5, POT6, POT7, POT8	9mm vertical mount
LED	8	Orange 3mm	L1, L2, L3, L4, L5, L6, L7, L8	
Jack	3	3.5mm	J1, J2, J3	PJ301BM
Toggle sw itch	1	SPDT on-off-on	S1	
Diode	10	1N4148	D4, D5, D6, D7, D8, D9, D10, D11, D12, D13	General purpose.
Diode	2	1N5818	D1, D2	Schottky rectifier. Pow er polarity protection. Alternatives: 1N5817, 1N5819, SB130.
Resistor	1	1K	R65	
Resistor	2	10R	R1, R2	
Resistor	2	4.7K	R3, R21	
Resistor	12	100K	R8, R11, R12, R54, R55, R56, R57, R58, R59, R60, R61, R64	
Resistor	14	1M	R10, R30, R31, R32, R33, R34, R35, R36, R46, R47, R48, R51, R52, R53	
Resistor	16	2.2K	R14, R15, R16, R17, R18, R19, R20, R22, R23, R24, R25, R26, R27, R28, R29, R66	1% Tolerance
Resistor	18	27K	R4, R5, R6, R7, R9, R13, R37, R38, R39, R40, R41, R42, R43, R44, R45, R49, R50, R62	1% Tolerance for R4-R7.
Capacitor	1	15pF	C25	Ceramic 2.5mm
Capacitor	3	1nF	C22, C23, C24	Ceramic 2.5mm
Capacitor	21	100nF	C1, C2, C6, C7, C8, C9, C10, C11, C12, C13, C14, C15, C16, C17, C18, C19, C20, C21, C26, C27, C28	Ceramic X7R 2.5mm
Electrolytic	3	10uF	C3, C4, C5	2mm pin pitch, 5mm dia, max 10mm height. Min 25V.
Volt reference	1	LM4040 5V	D3	
IC Socket	4	DIP8	IC1, IC4, IC8, IC11	**8 pin**
OpAmp	1	LM358	IC1	8 pin
Comparator	1	LM393	IC4	8 pin
OpAmp	2	TL072	IC8, IC11	8 pin
IC Socket	2	DIP14	IC2, IC3	**14 pin**
Comparator	2	LM339	IC2, IC3	14 pin
IC Socket	5	DIP16	IC5, IC6, IC7, IC9, IC10	**16 pin**
CMOS Encoder	1	CD4532	IC5	16 pin
CMOS Counter	1	CD4516	IC6	16 pin
CMOS Sw itch	2	CD4051	IC7, IC9	16 pin
CMOS Buffer	1	CD4050	IC10	16 pin
Faceplate	1		Black 2mm	
PCB1	1		Green 1,6mm	
PCB2	1		Green 1,6mm	
Knob	8		Cream colour	
Spacer	2		M3 11mm	
Nut	2		For spacer M3.	
Screw	2		For spacer M3.	
Pow er cable	1		16pin – 10pin	
Mount screw s	4		Black pozi M3x6	

PCB1 BOM

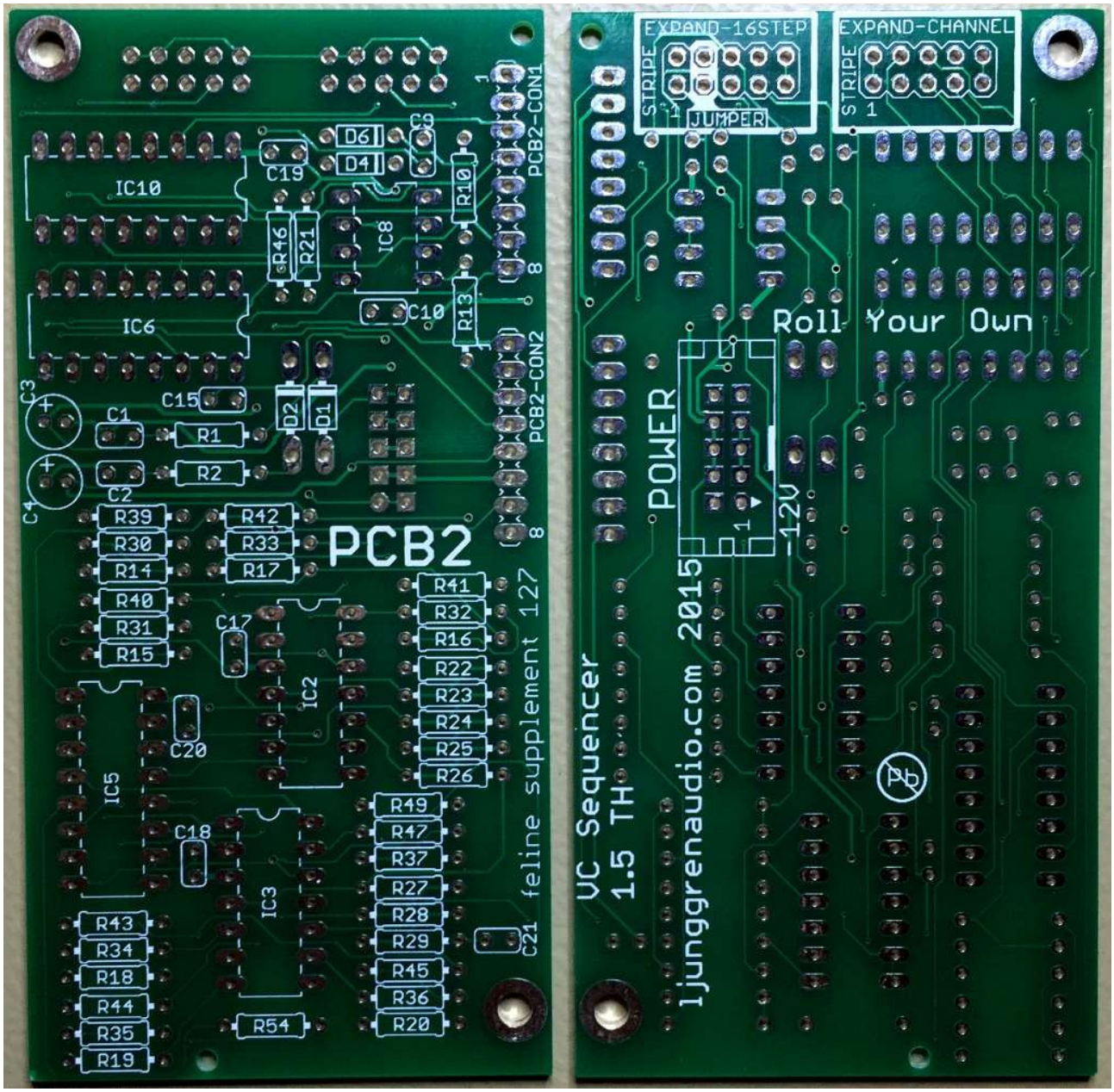
Type	Qty	Value	Parts	Note
Pin strip	2	1x8pin	PCB1-CON1, PCB1-CON2	
Rotary pot	8	100K	POT1, POT2, POT3, POT4, POT5, POT6, POT7, POT8	9mm vertical mount
LED	8	Orange 3mm	L1, L2, L3, L4, L5, L6, L7, L8	
Jack	3	3.5mm	J1, J2, J3	PJ301BM
Toggle switch	1	SPDT on-off-on	S1	
Diode	8	1N4148	D5, D7, D8, D9, D10, D11, D12, D13	General purpose.
Resistor	1	1K	R65	
Resistor	1	4.7K	R3	
Resistor	11	100K	R8, R11, R12, R55, R56, R57, R58, R59, R60, R61, R64	
Resistor	4	1M	R48, R51, R52, R53	
Resistor	1	2.2K	R66	LED resistor
Resistor	8	27K	R4, R5, R6, R7, R9, R38, R50, R62	1% Tolerance for R4-R7.
Capacitor	1	15pF	C25	Ceramic 2.5mm
Capacitor	3	1nF	C22, C23, C24	Ceramic 2.5mm
Capacitor	11	100nF	C6, C7, C8, C11, C12, C13, C14, C16, C26, C27, C28	Ceramic X7R 2.5mm
Electrolytic	1	10uF	C5	2mm pin pitch, 5mm dia, max 10mm height. Min 25V.
Volt reference	1	LM4040 5V	D3	
IC Socket	3	DIP8	IC1, IC4, IC11	**8 pin**
OpAmp	1	LM358	IC1	8 pin
Comparator	1	LM393	IC4	8 pin
OpAmp	1	TL072	IC11	8 pin
IC Socket	2	DIP16	IC7, IC9	**16 pin**
CMOS Switch	2	CD4051	IC7, IC9	16 pin

PCB2 BOM

Type	Qty	Value	Parts	Note
Power header	1	2x5pin	POWER	boxed
Expand header	2	2x5pin	EXPAND-16STEP, EXPAND-CHANNEL	
Socket strip	2	1x8pin	PCB2-CON1, PCB2-CON2	
Diode	2	1N4148	D4, D6	General purpose.
Diode	2	1N5818	D1, D2	Schottky rectifier. Power polarity protection. Alternatives: 1N5817, 1N5819, SB130.
Resistor	2	10R	R1, R2	
Resistor	1	4.7K	R21	
Resistor	1	100K	R54	
Resistor	10	1M	R10, R30, R31, R32, R33, R34, R35, R36, R46, R47	
Resistor	15	2.2K	R14, R15, R16, R17, R18, R19, R20, R22, R23, R24, R25, R26, R27, R28, R29	1% Tolerance
Resistor	10	27K	R13, R37, R39, R40, R41, R42, R43, R44, R45, R49	1% Tolerance for R4-R7.
Capacitor	10	100nF	C1, C2, C9, C10, C15, C17, C18, C19, C20, C21	Ceramic X7R 2.5mm
Electrolytic	2	10uF	C3, C4	2mm pin pitch, 5mm dia, max 10mm height. Min 25V.
Volt reference	1	LM4040 5V	D3	
IC Socket	1	DIP8	IC8	**8 pin**
OpAmp	1	TL072	IC8	8 pin
IC Socket	2	DIP14	IC2, IC3	**14 pin**
Comparator	2	LM339	IC2, IC3	14 pin
IC Socket	3	DIP16	IC5, IC6, IC10	**16 pin**
CMOS Encoder	1	CD4532	IC5	16 pin
CMOS Counter	1	CD4516	IC6	16 pin
CMOS Buffer	1	CD4050	IC10	16 pin

Assembly instructions

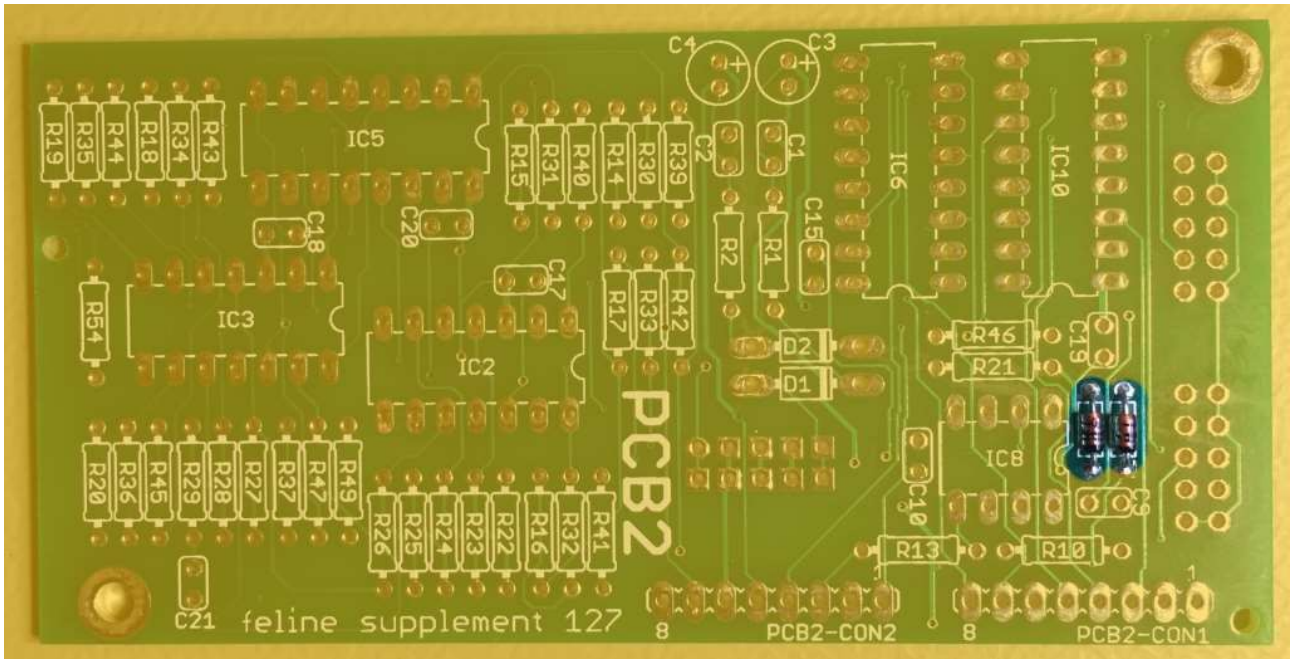
We start with PCB2.



Empty PCB2 top & bottom.

Step 1

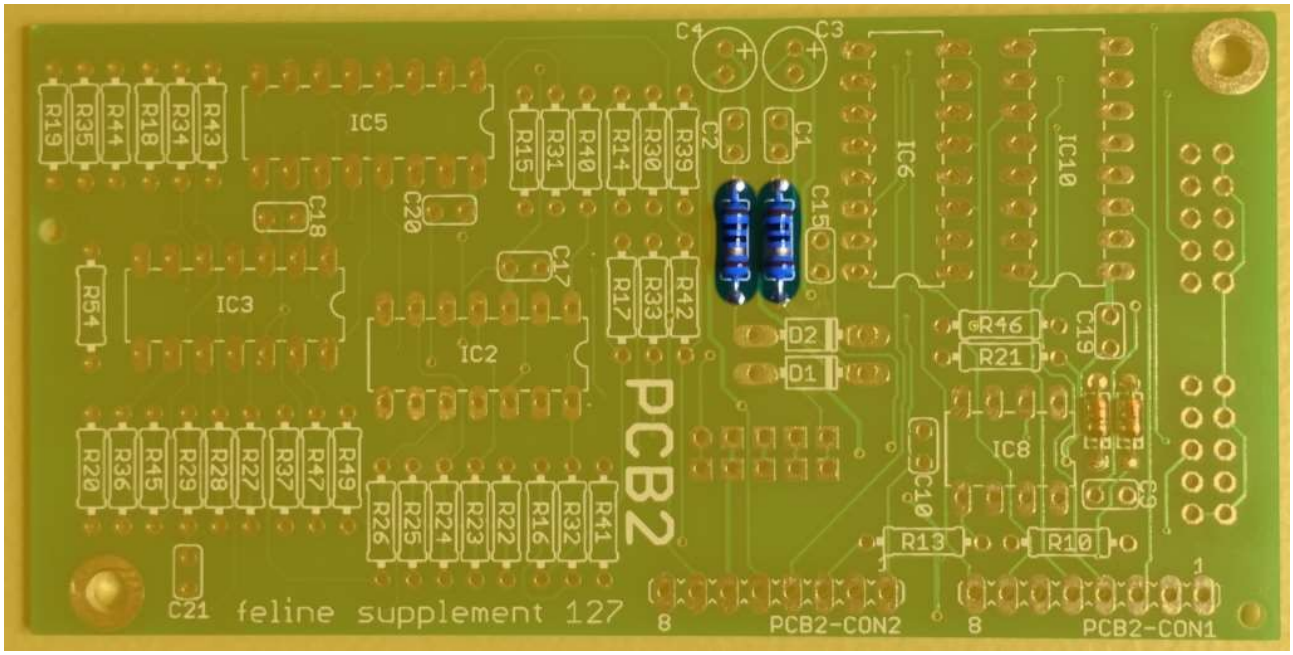
Solder small signal diodes. Diodes are sensitive to mounting direction, make sure the stripe on the diode match the stripe on the silkscreen.



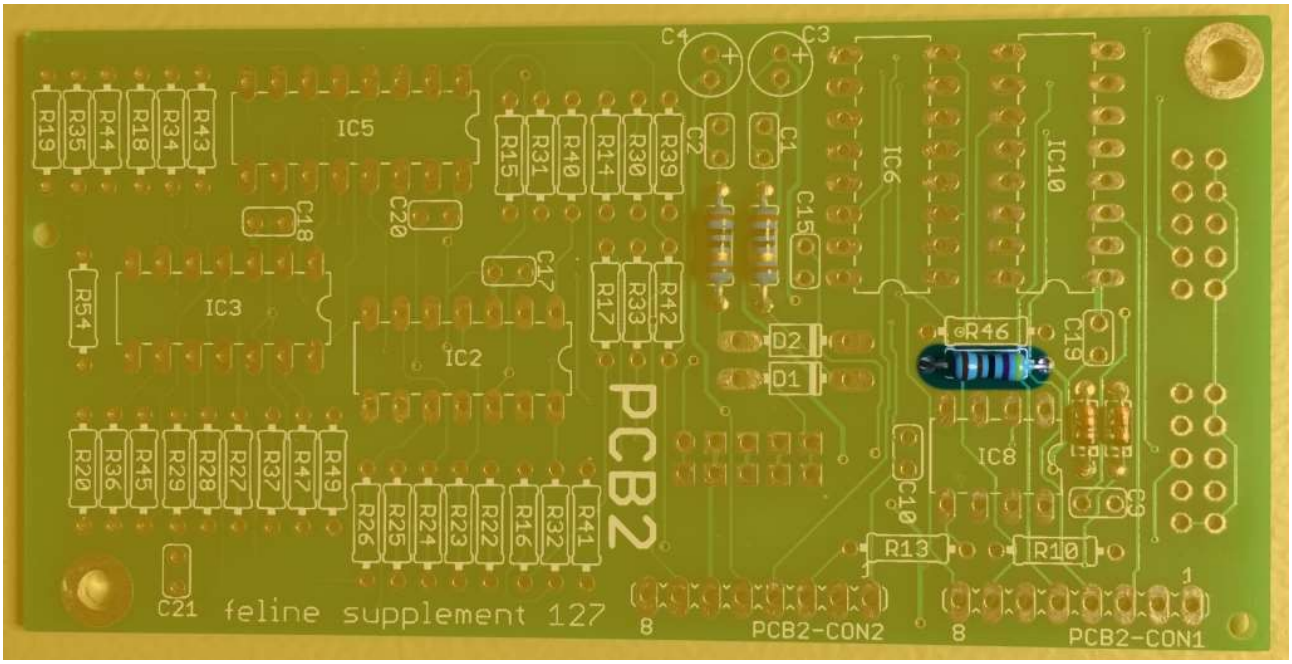
D4, D6 *1N4148*

Step 2

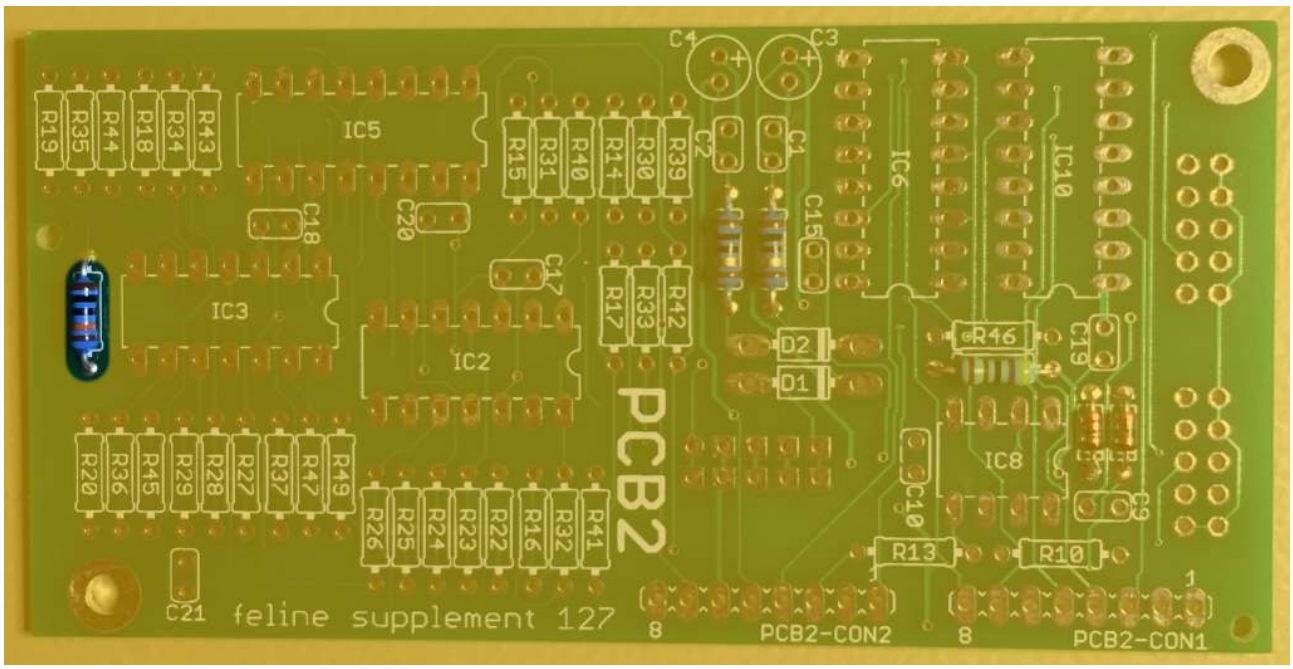
Solder resistors. Resistors are not sensitive to mounting direction.



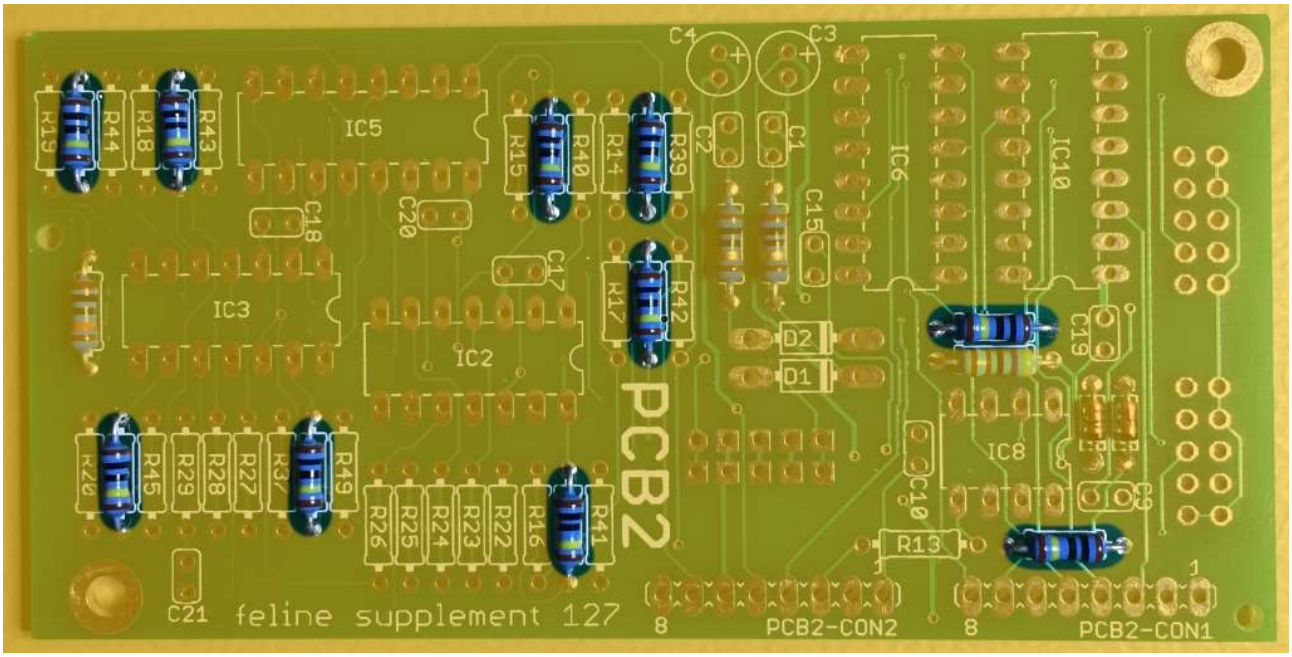
R1, R2 *10R*



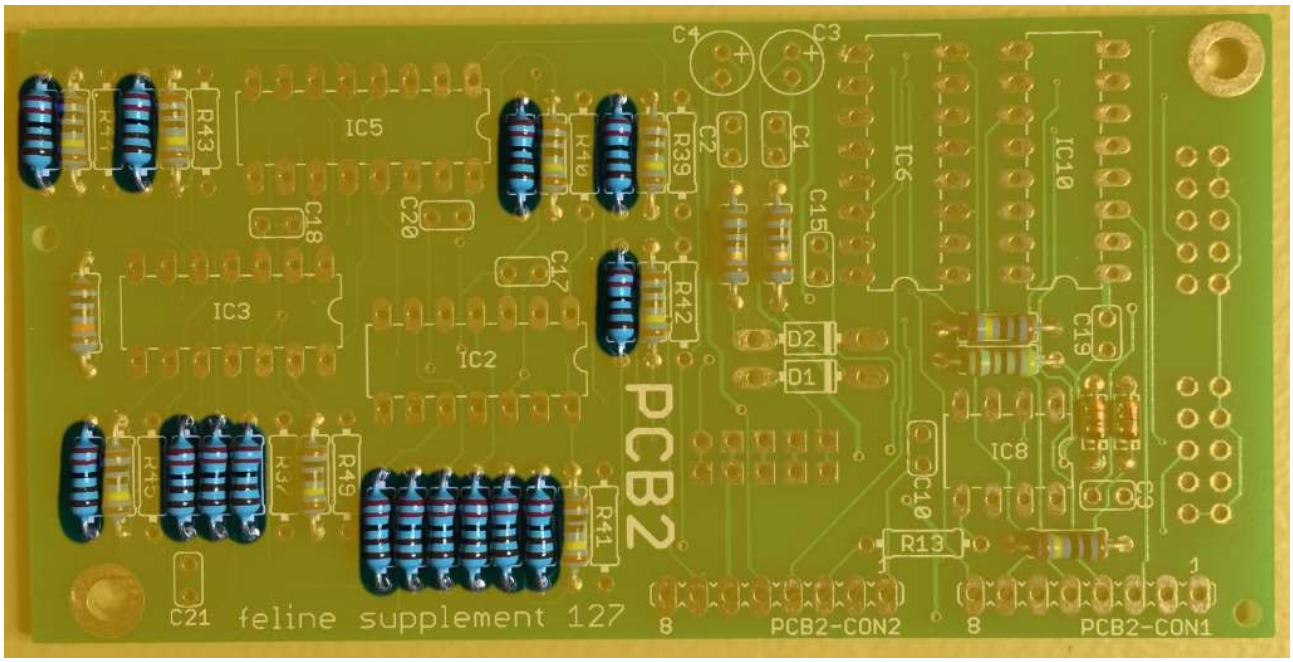
R21 *4.7K*



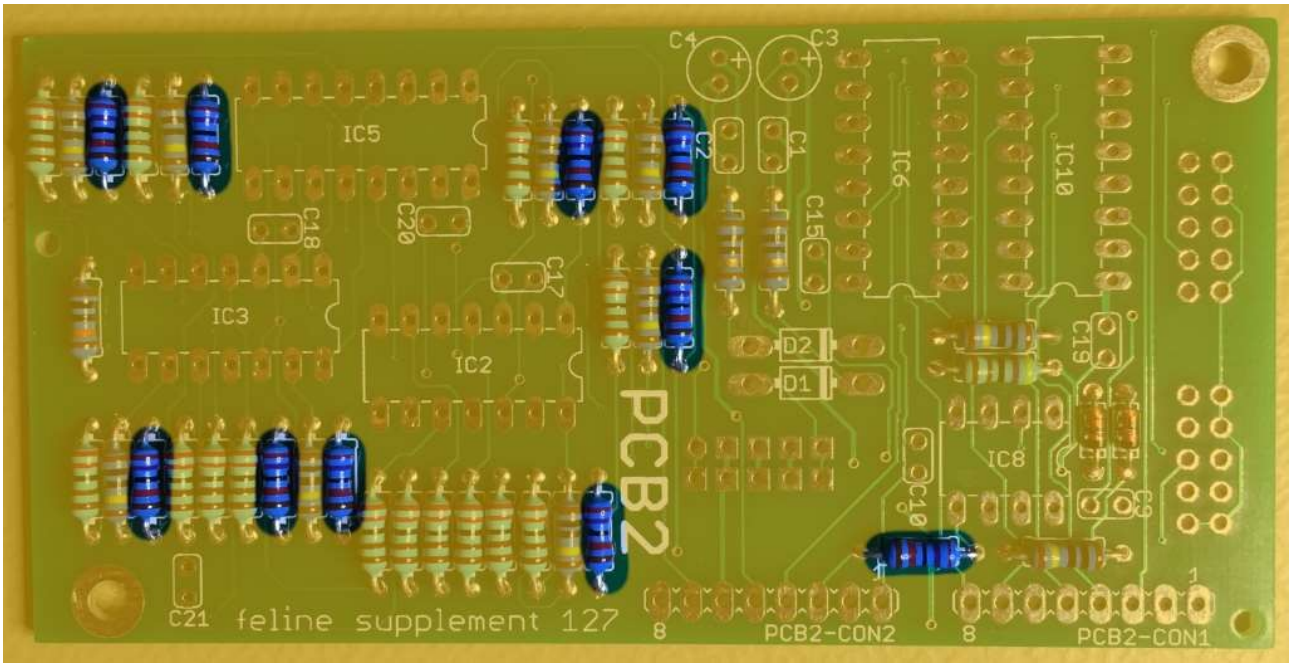
R54 *100K*



R10, R30, R31, R32, R33, R34, R35, R36, R46, R47 *1M*



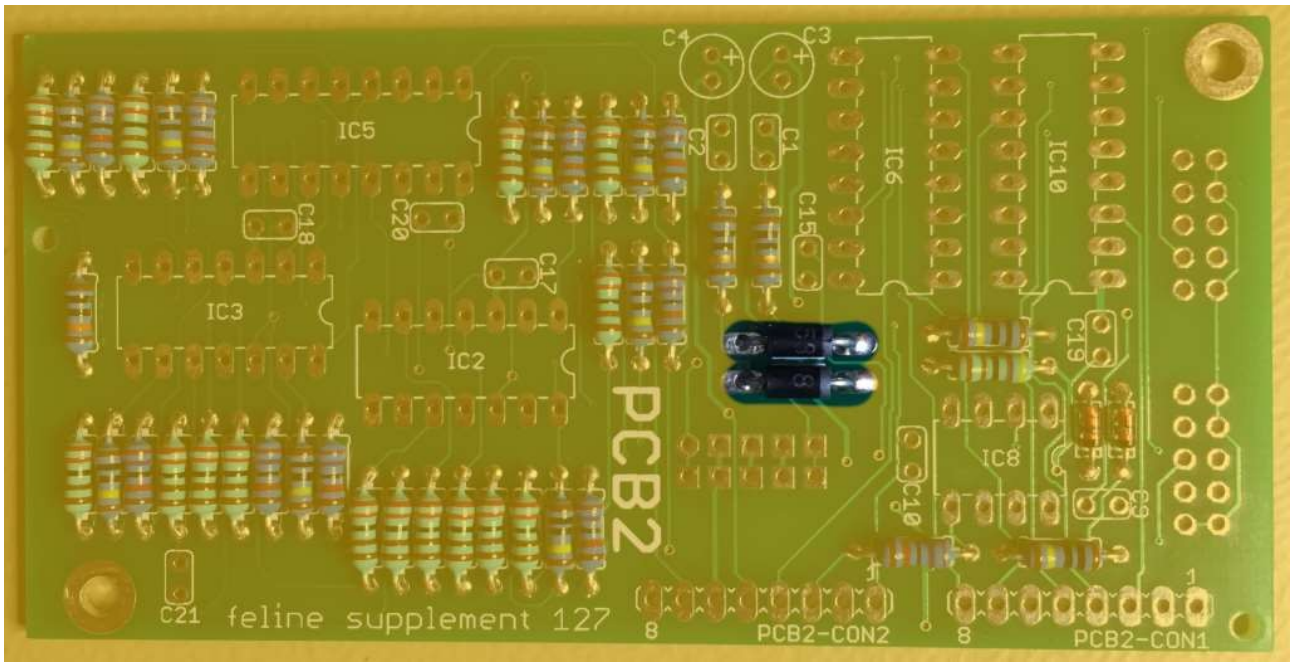
R14, R15, R16, R17, R18, R19, R20, R22, R23, R24, R25, R26, R27, R28, R29 *2.2K*



R13, R37, R39, R40, R41, R42, R43, R44, R45, R49 *27K*

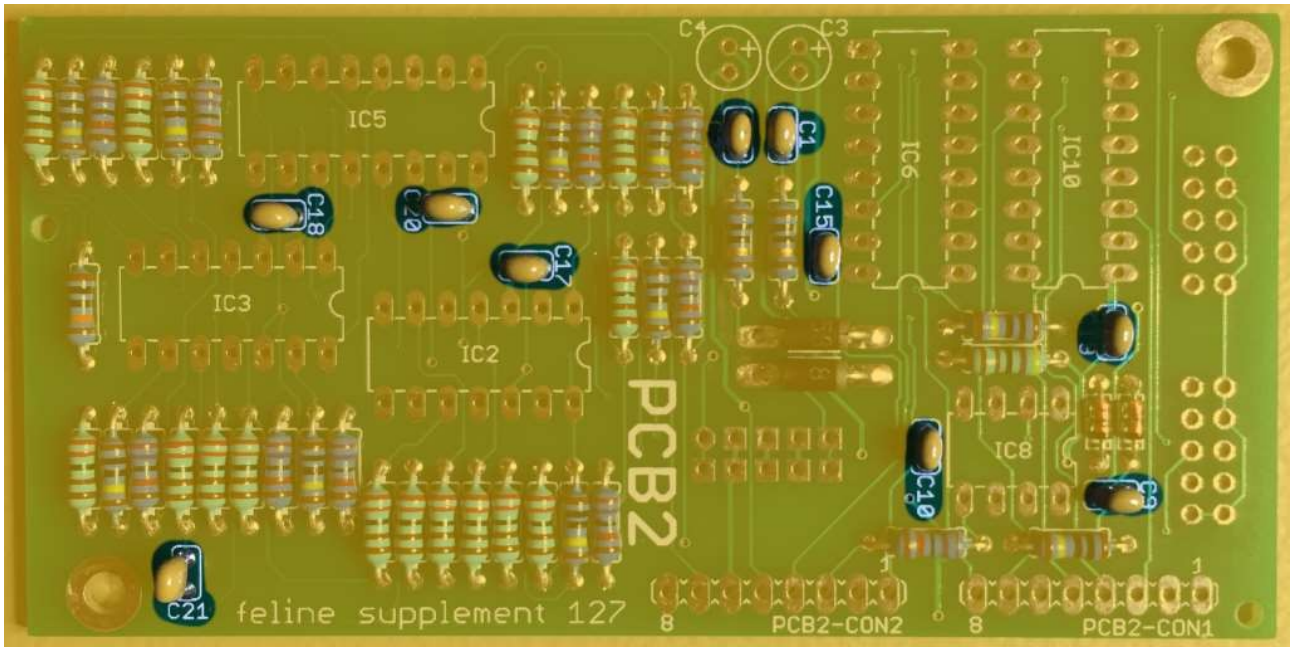
Step 3

Solder power polarity protection diodes. Diodes are sensitive to mounting direction, make sure the stripe on the diode match the stripe on the silkscreen.



D1, D2 *1N5818*

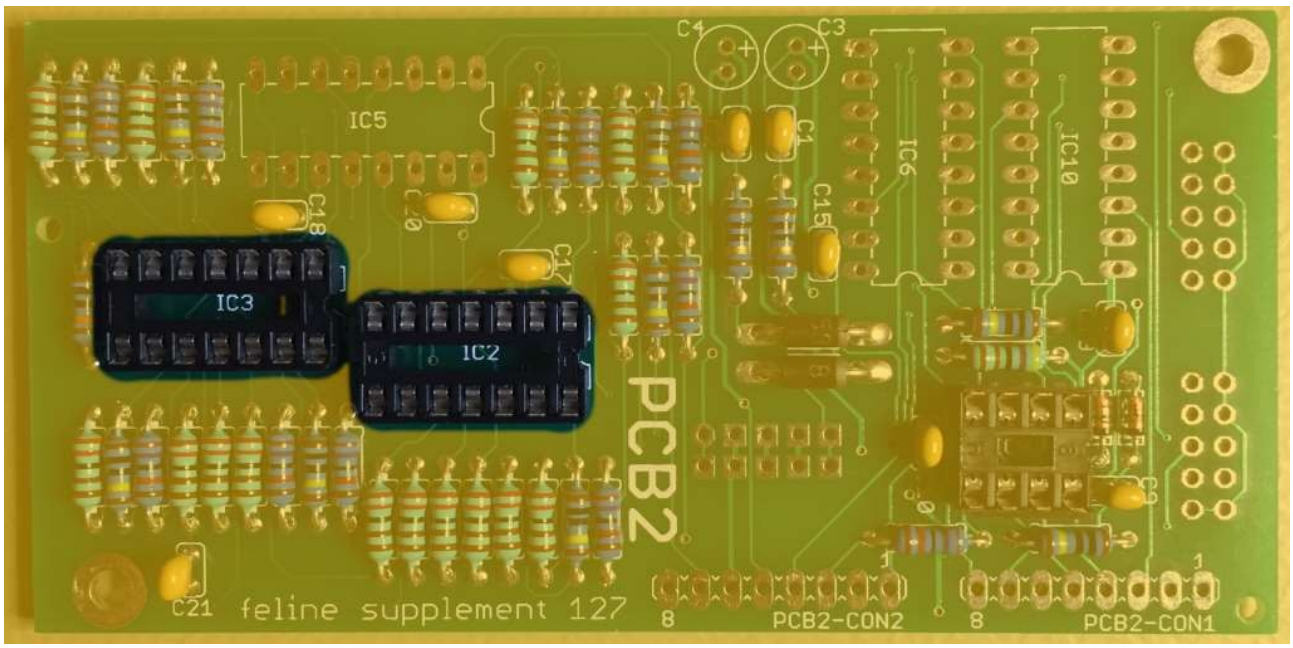
Step 4
Solder ceramic capacitors. Ceramic capacitors are not sensitive to mounting direction.



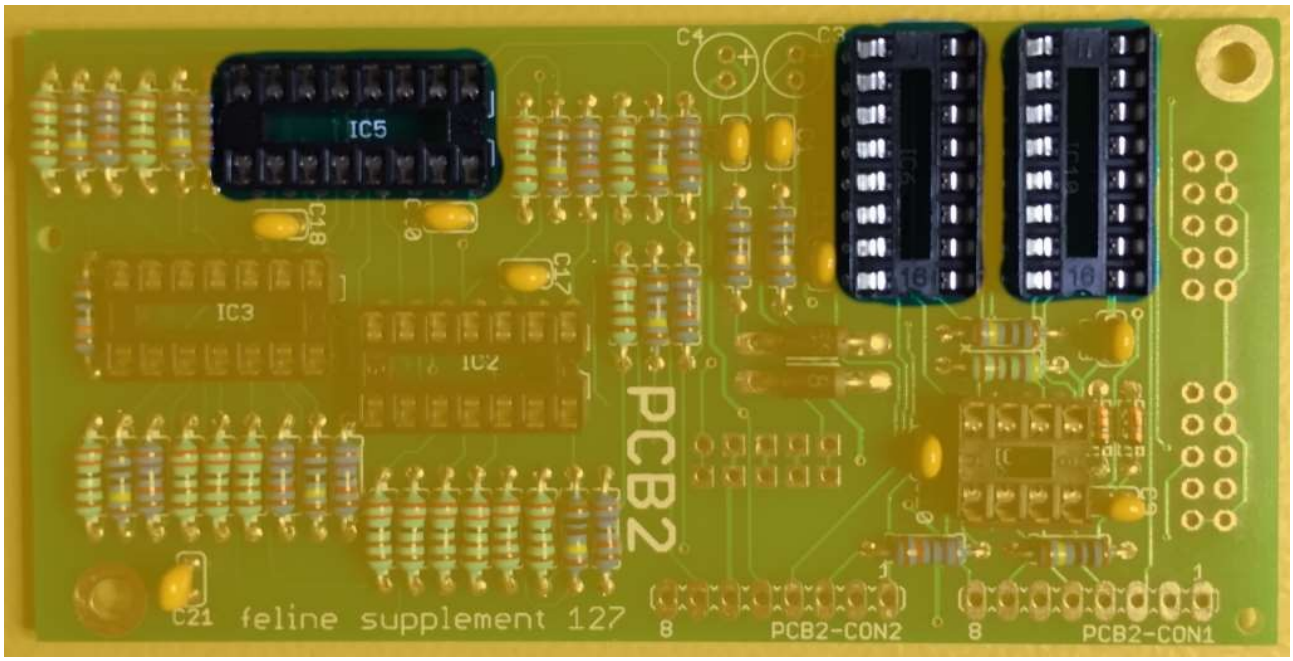
C1, C2, C9, C10, C15, C17, C18, C19, C20, C21 *100nF*

Step 5
Solder IC sockets. Match the IC sockets indent (marking pin 1 side) with the silk screens.

IC8 *8 pin DIP sockets. IC's will be mounted later.*



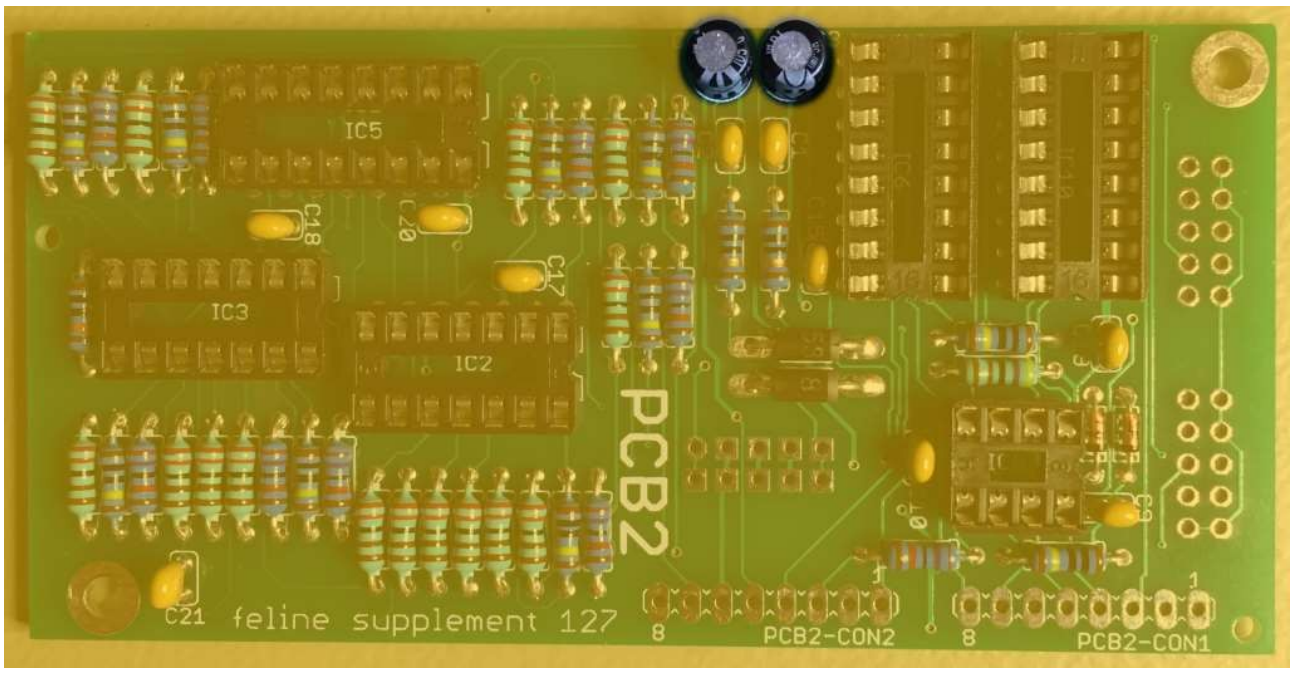
IC2, IC3 *14 pin DIP socket. IC will be mounted later.*



IC5, IC6, IC10 *16 pin DIP socket. IC will be mounted later.*

Step 6

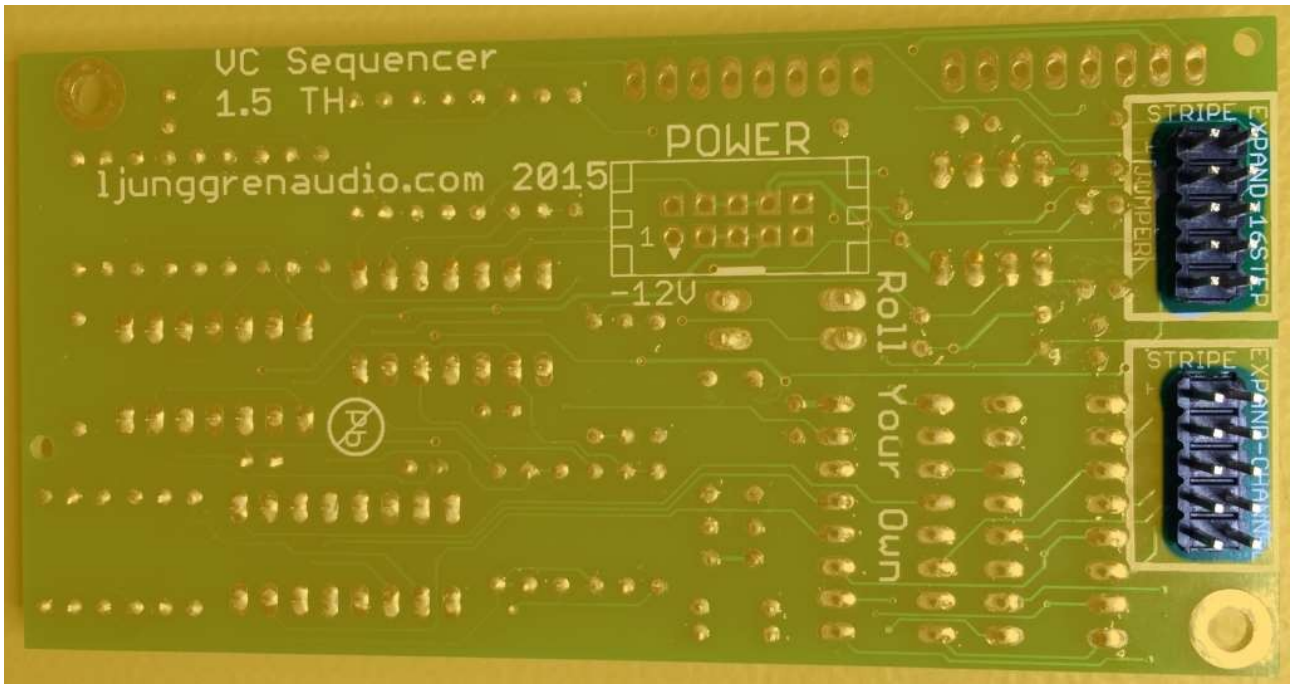
Solder electrolytic capacitors. Electrolytic capacitors are sensitive to mounting direction. Put the long pin in the hole marked with a + (anode) on the silkscreen. The opposite side is marked with – (cathode) on the electrolytic capacitor.



C3, C4 *10µF*

Step 7

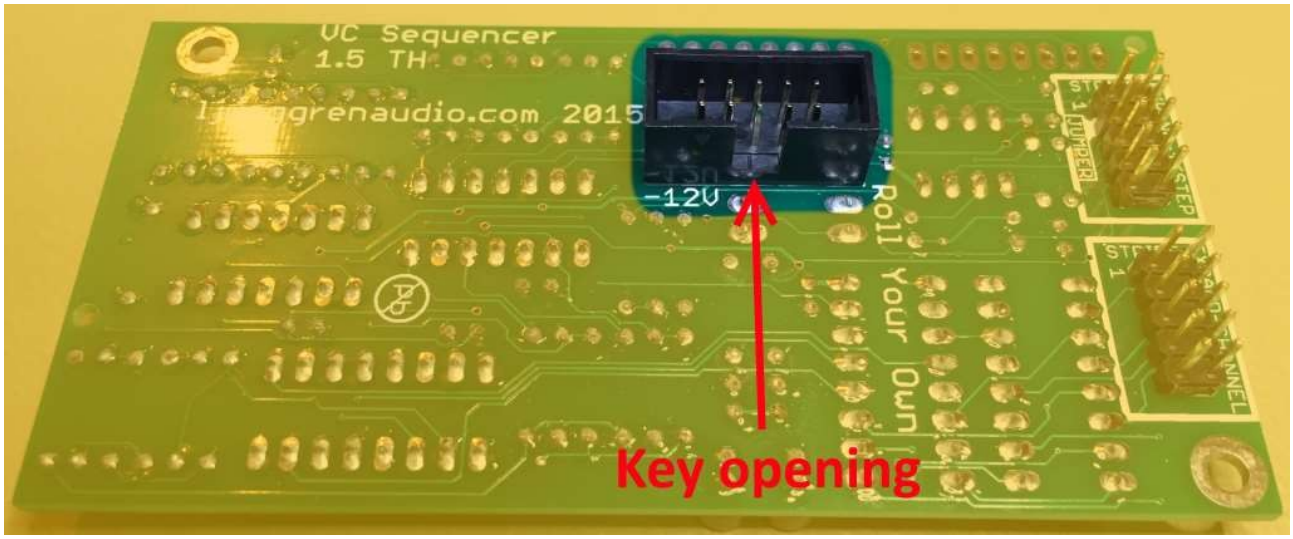
Turn PCB2 over to the back and solder the expander headers. It's easier to avoid bent pins if you attach the power cable in the header you are currently soldering.



EXPAND-16STEP, EXPAND-CHANNEL *2x5pin*

Step 8

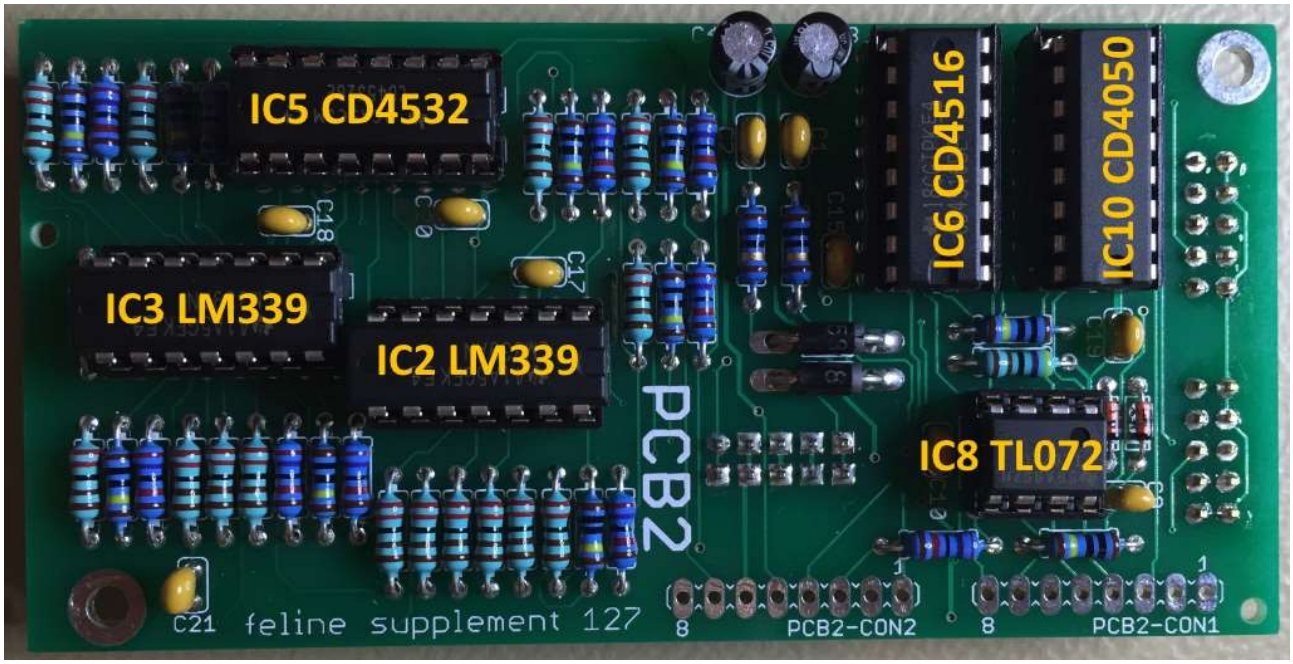
Solder the power header. Make sure the key opening is oriented in the same way as in the picture below. It's easier to avoid bent pins if you attach the power cable in the header while you are soldering.



POWER *2x5pin*

Step 9

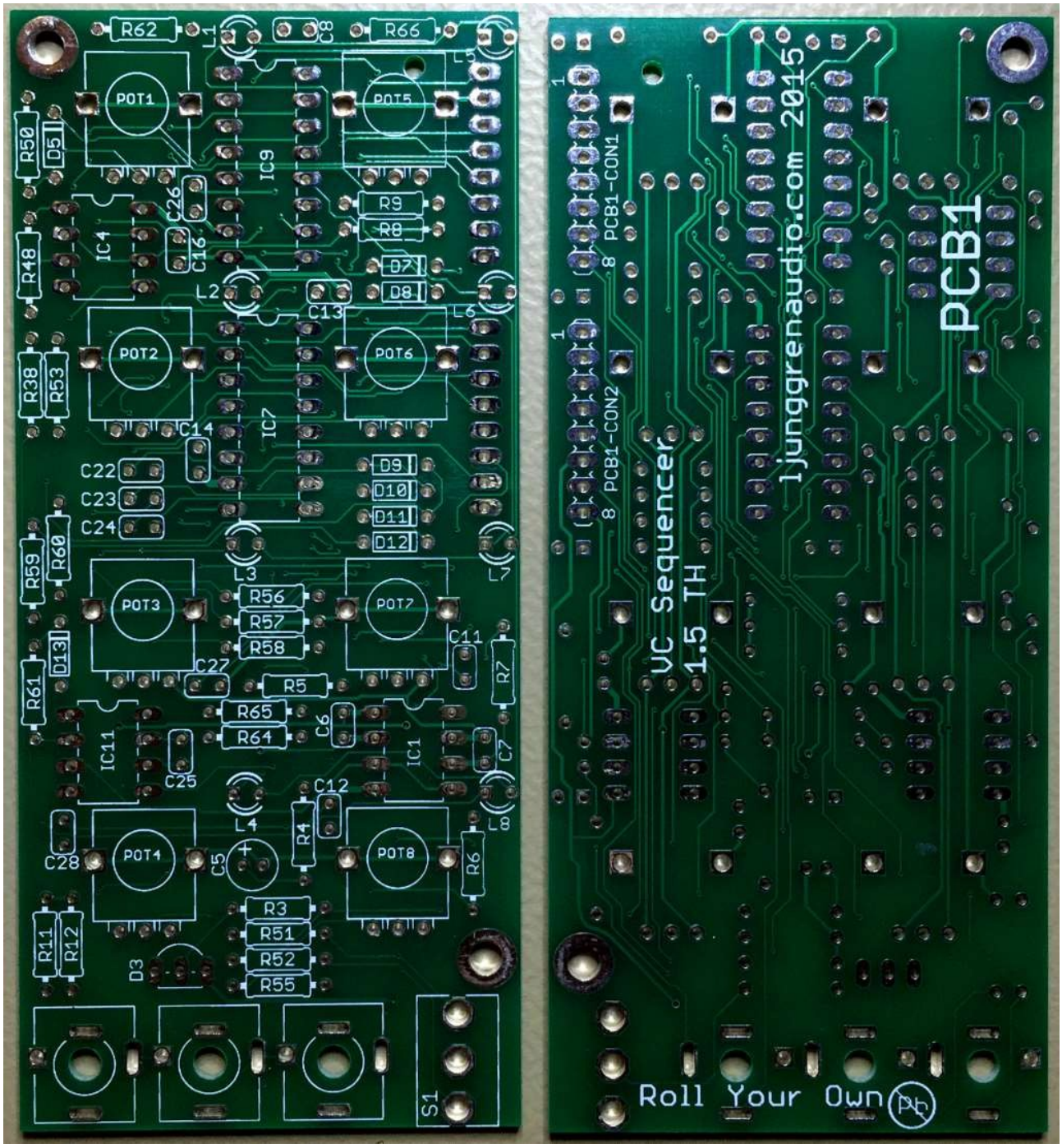
Turn PCB2 back to the front side again and insert the ICs in the sockets.



IC2, IC3 *LM339*
IC5 *CD4532*
IC6 *CD4516*
IC8 *TL072*
IC10 *CD4050*

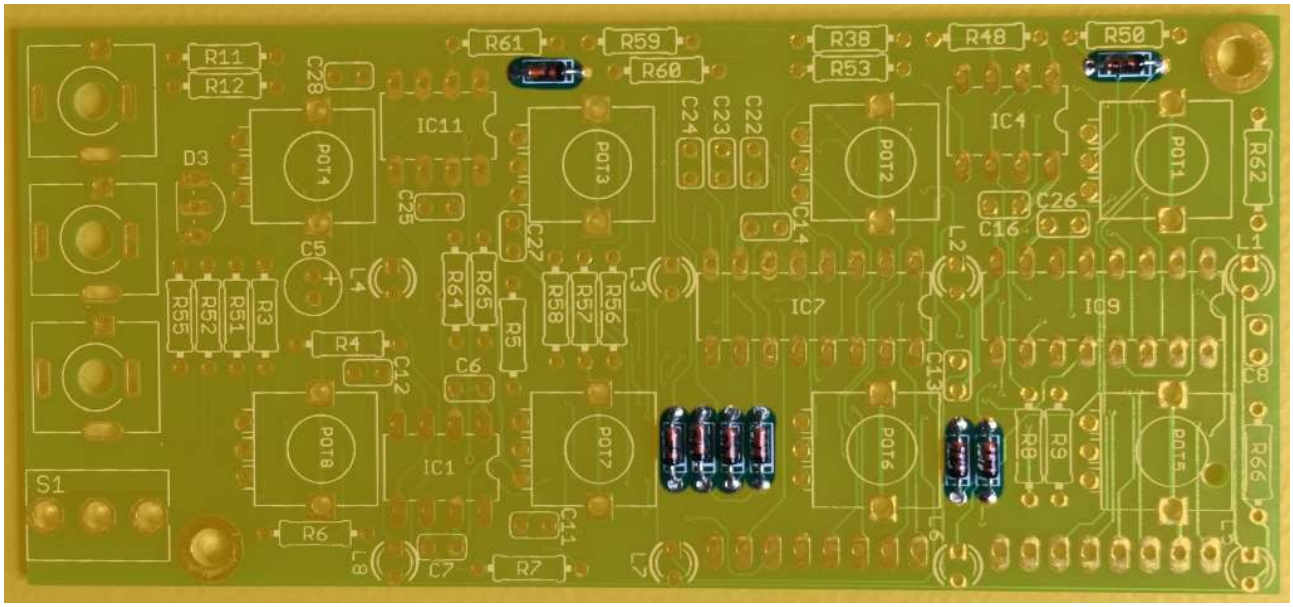
Step 10

Leave PCB2 on the side with PCB2-CON1 and PCB2-CON2 not soldered.
Now it's time for PCB1.



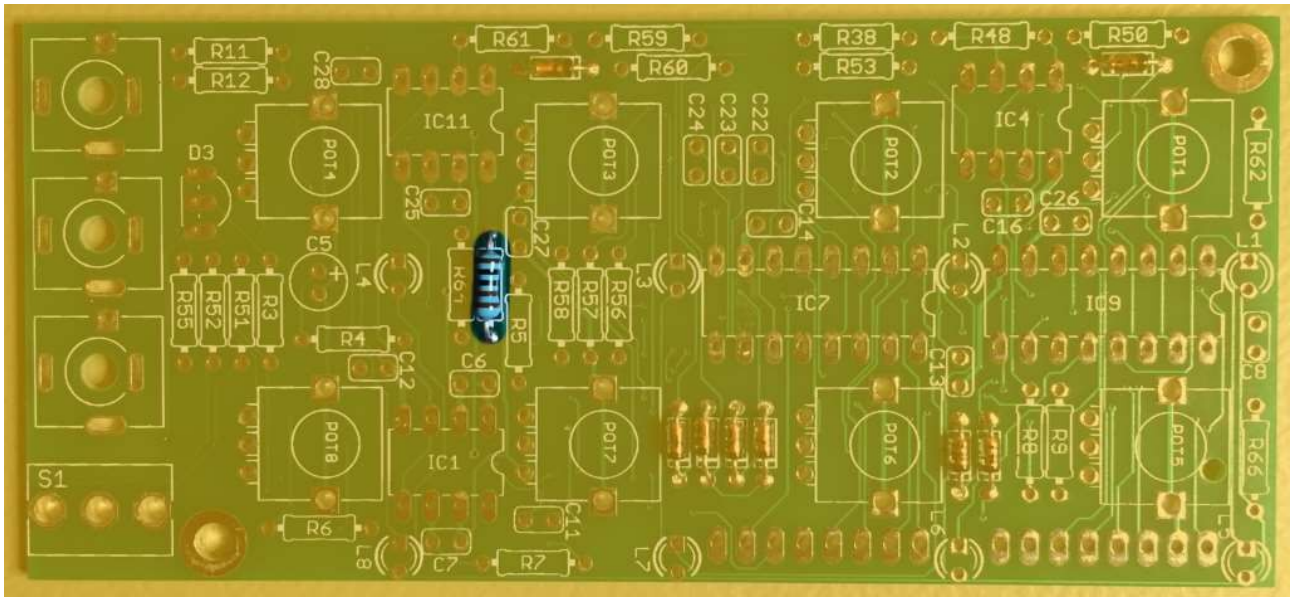
Empty PCB1 top & bottom.

Step 11
Solder small signal diodes. Diodes are sensitive to mounting direction, make sure the stripe on the diode match the stripe on the silkscreen.

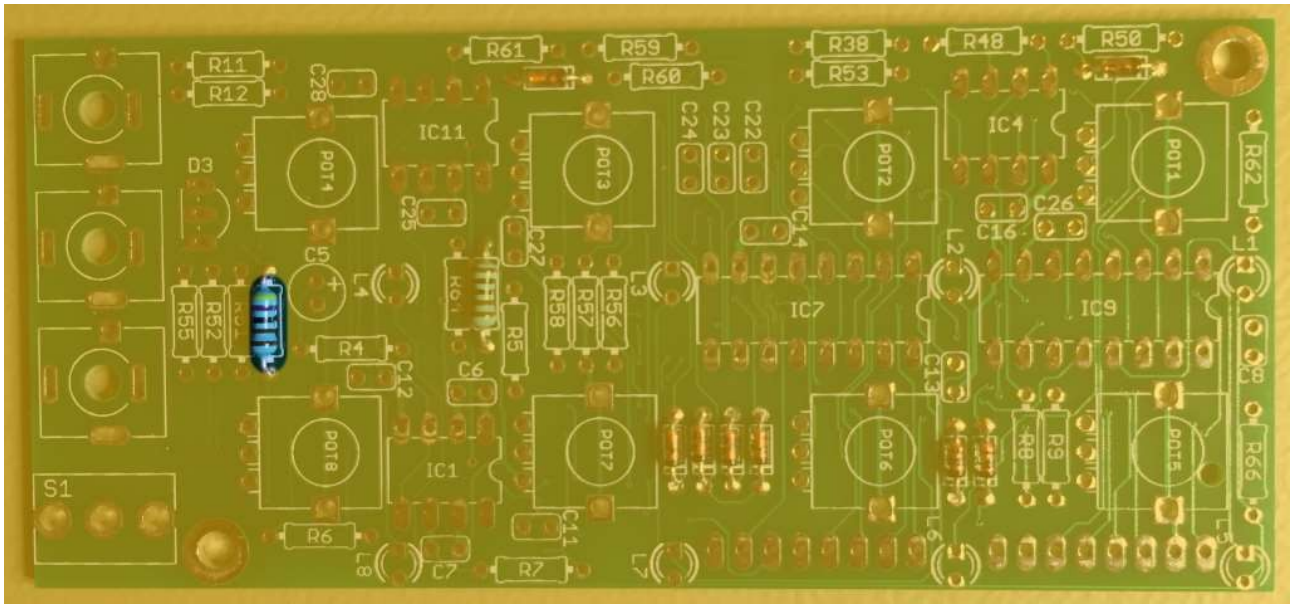


D5, D7, D8, D9, D10, D11, D12, D13 *1N4148*

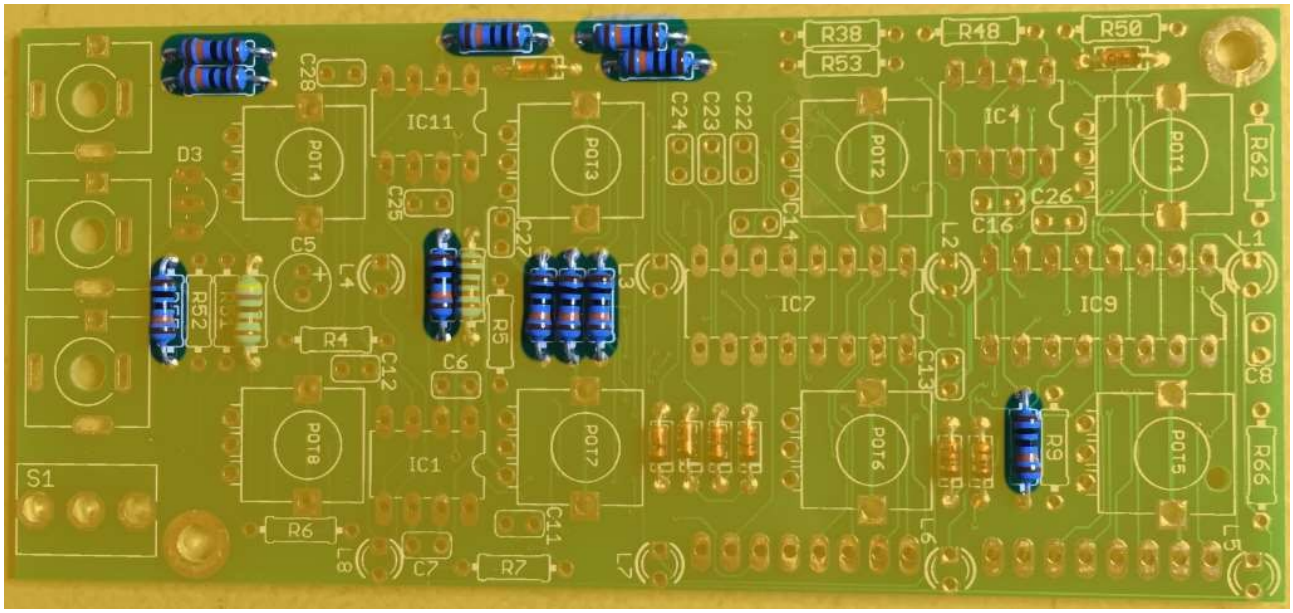
Step 12
Solder resistors. Resistors are not sensitive to mounting direction.



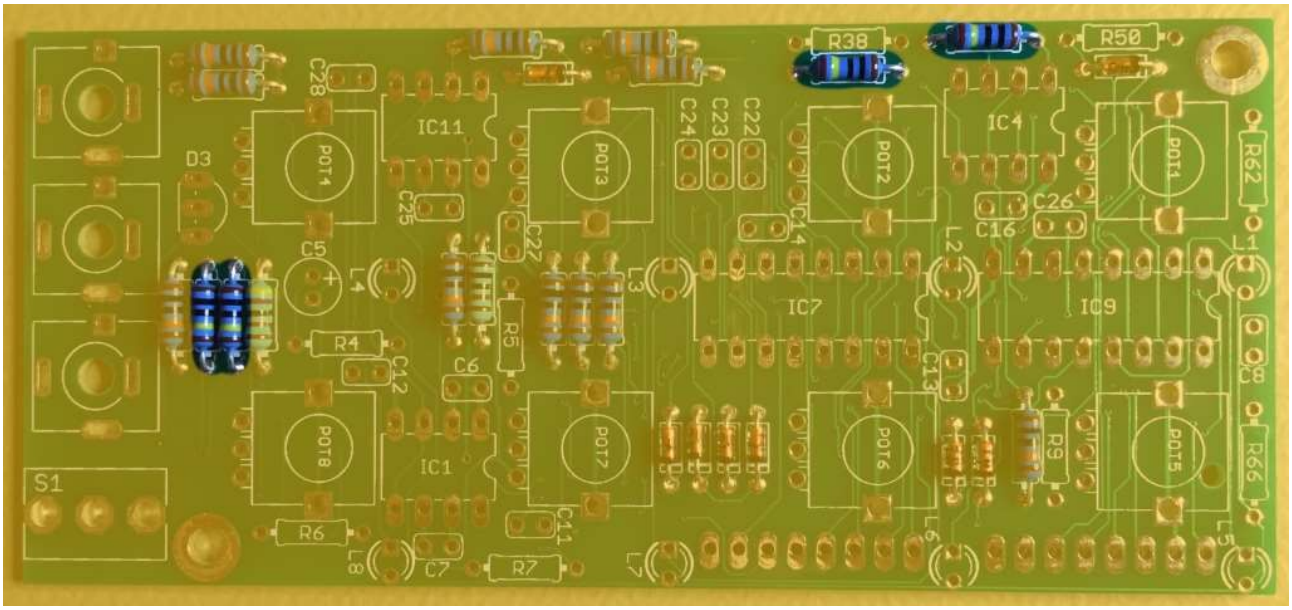
R65 *1K*



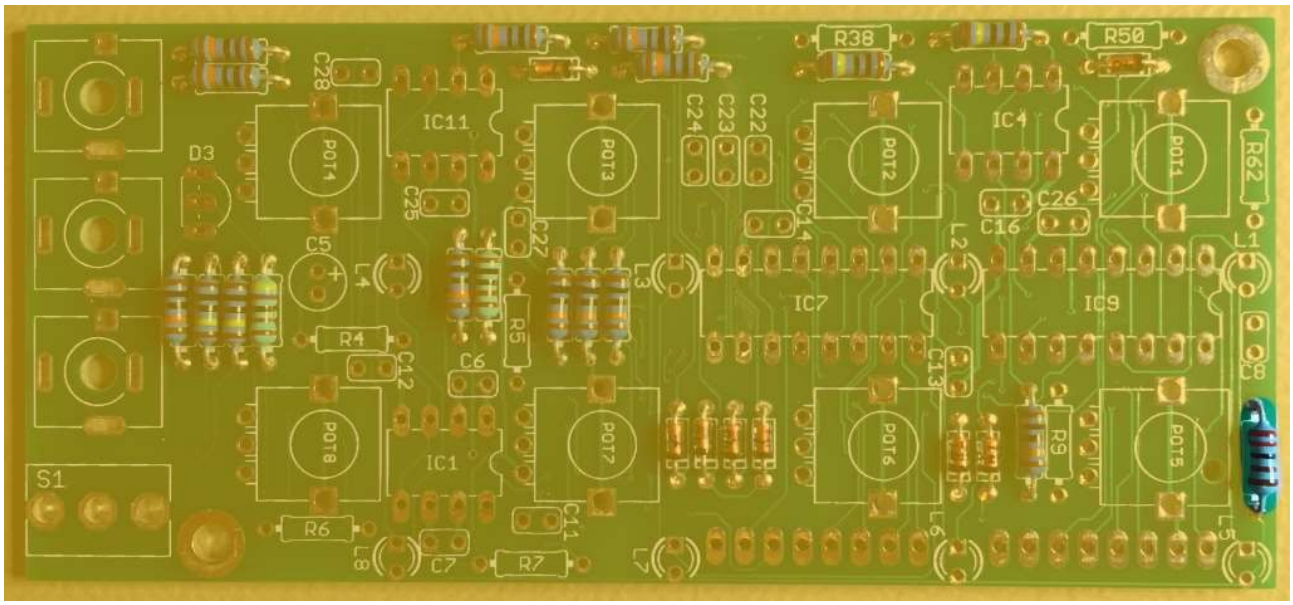
R3 *4.7K*



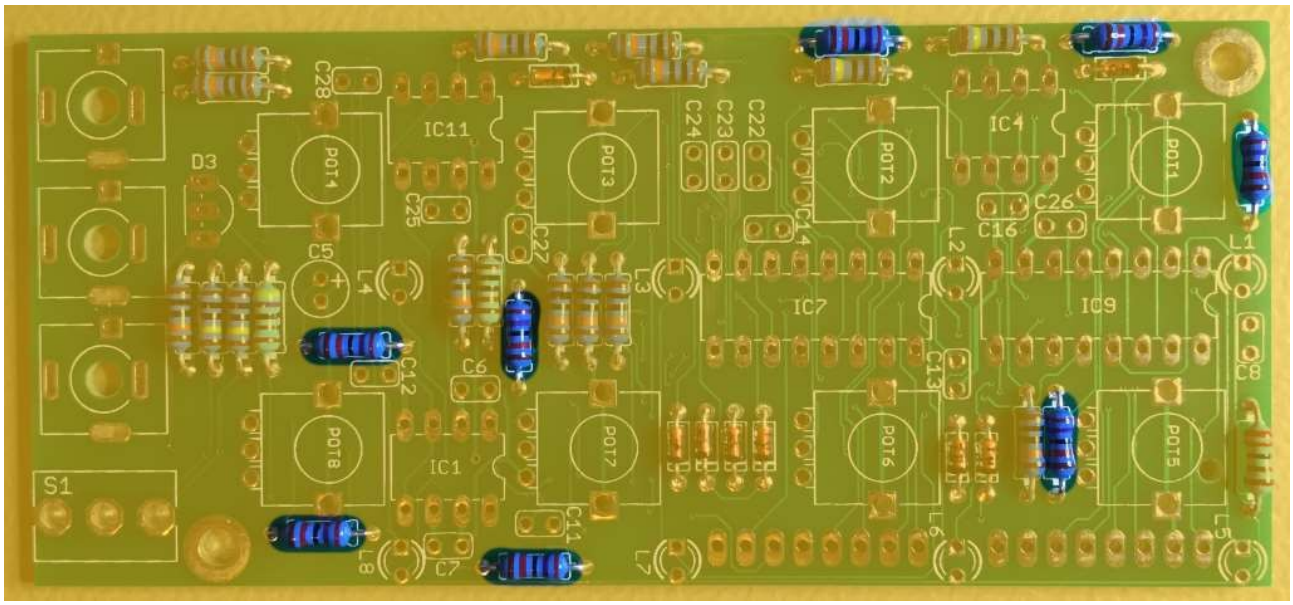
R8, R11, R12, R55, R56, R57, R58, R59, R60, R61, R64 *100K*



R48, R51, R52, R53 *1M*



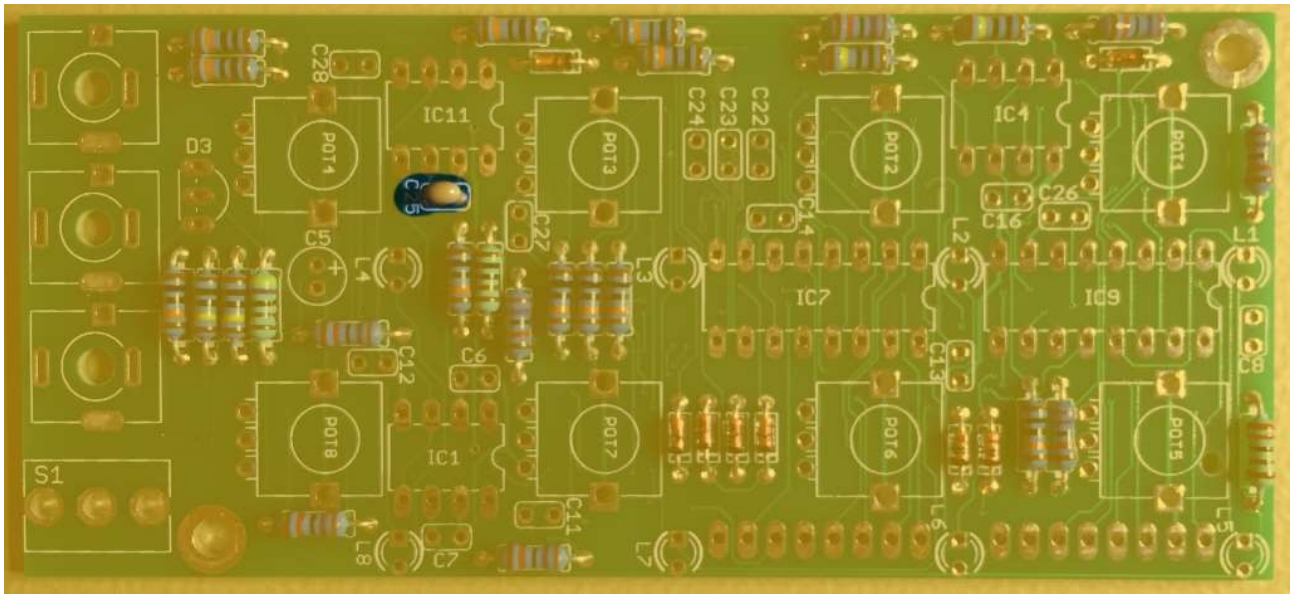
R66 *2.2K LED resistor*



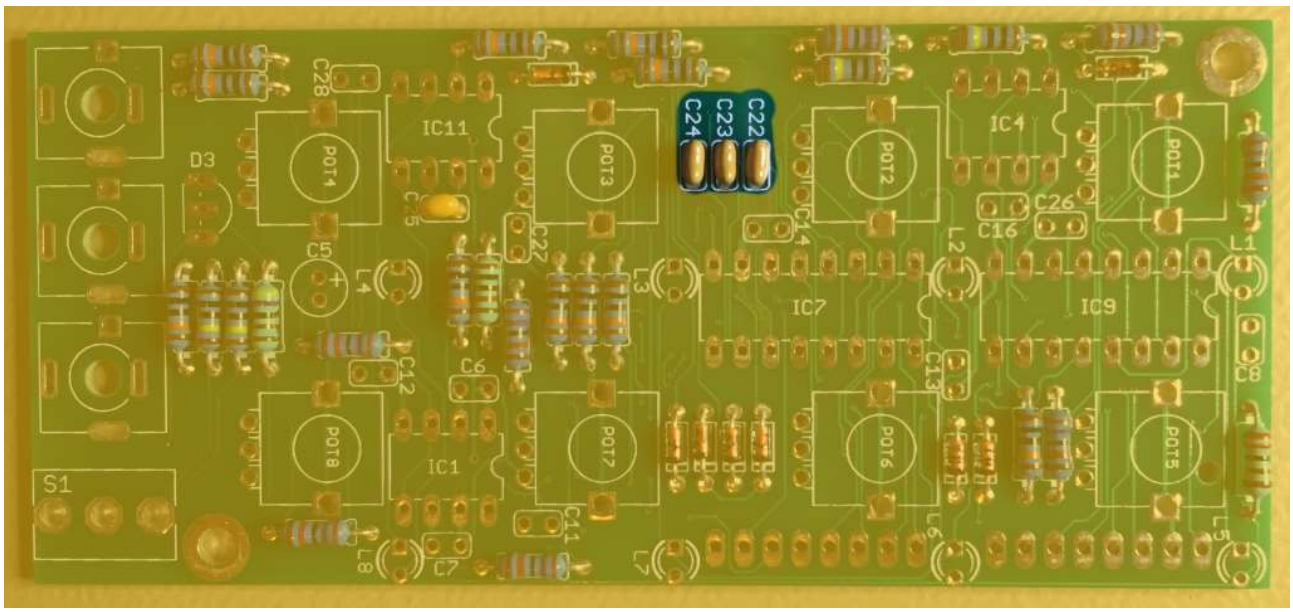
R4, R5, R6, R7, R9, R38, R50, R62 *27K*

Step 13

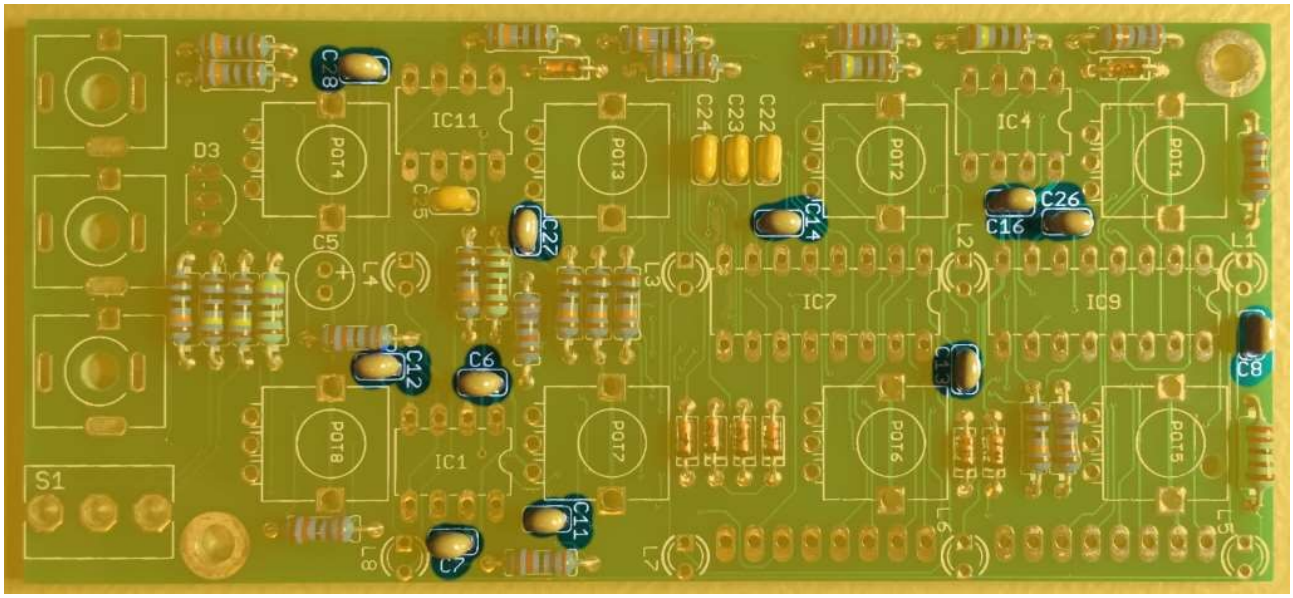
Solder ceramic capacitors. Ceramic capacitors are not sensitive to mounting direction.



C25 *15pF*



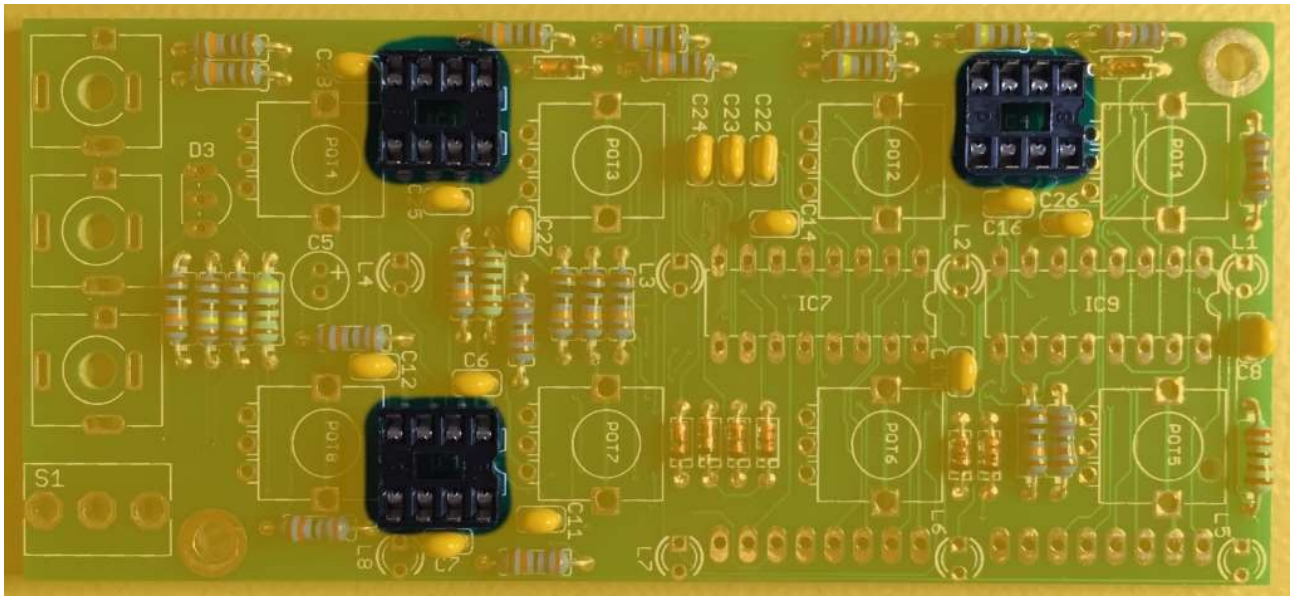
C22, C23, C24 *1nF*



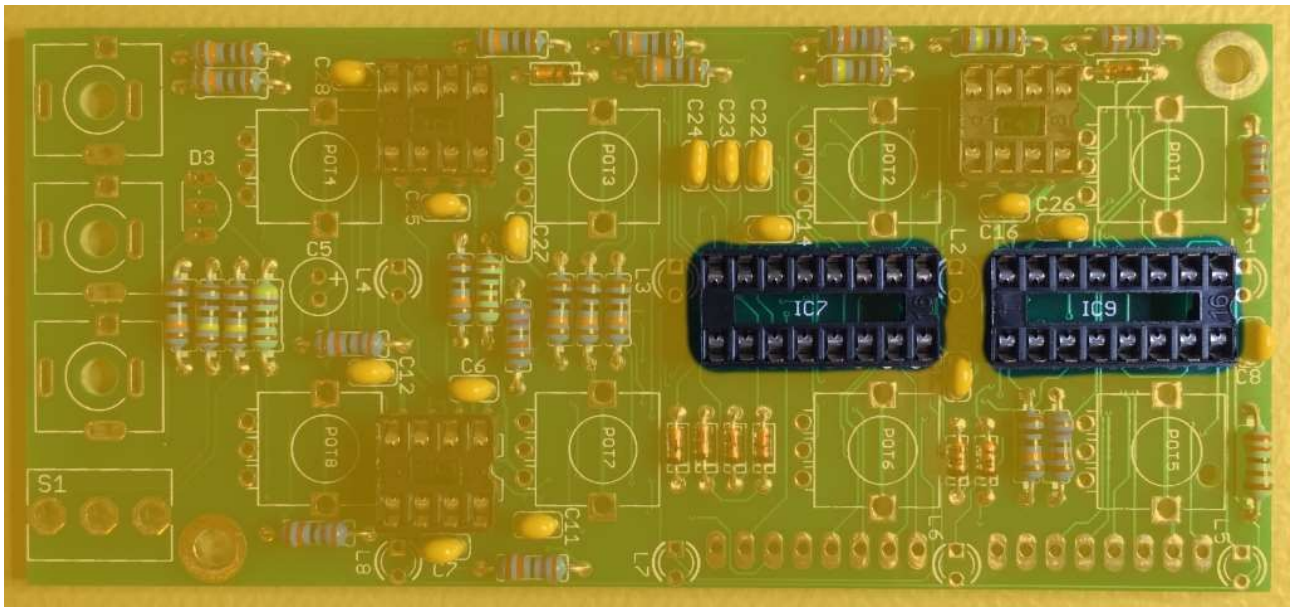
C6, C7, C8, C11, C12, C13, C14, C16, C26, C27, C28 *100nF*

Step 14

Solder IC sockets. Match the IC sockets indent (marking pin 1 side) with the silk screens.



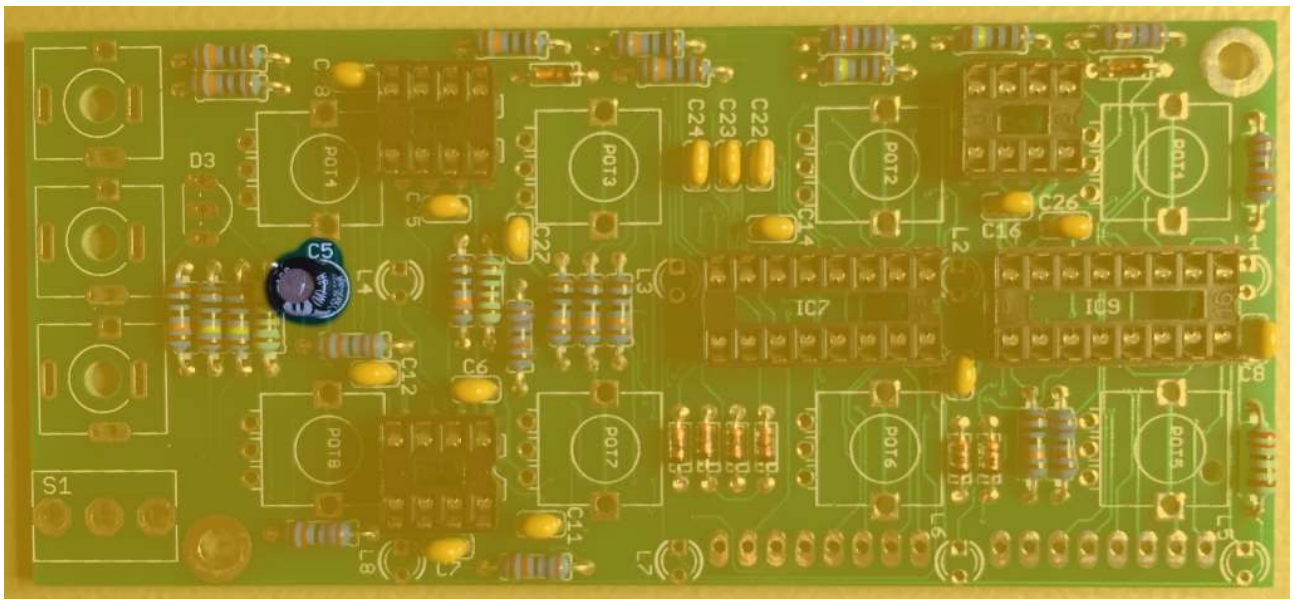
IC1, IC4, IC11 *8 pin DIP sockets. IC's will be mounted later.*



IC7, IC9 *16 pin DIP socket. IC's will be mounted later.*

Step 15

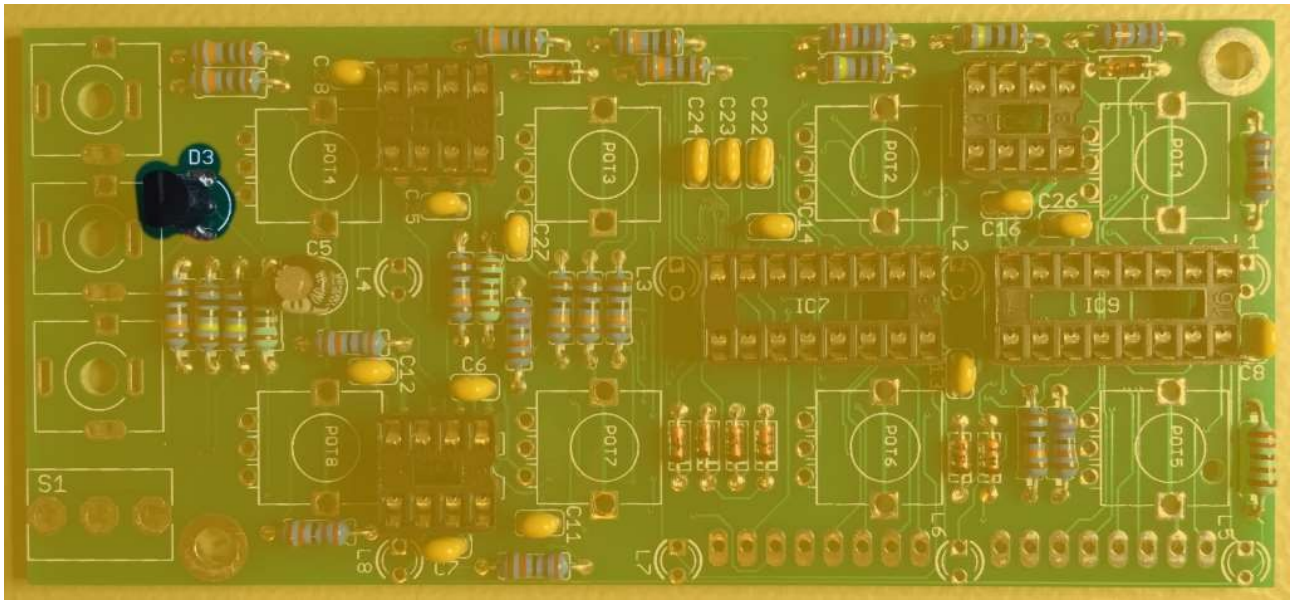
Solder electrolytic capacitors. Electrolytic capacitors are sensitive to mounting direction. Put the long pin in the hole marked with a + (anode) on the silkscreen. The opposite side is marked with – (cathode) on the electrolytic capacitor.



C5 *10µF*

Step 16

Mount the voltage reference. Match the curved side of the voltage reference with the curved side in the silkscreen.



D3 *LM4040 5V*

Step 17

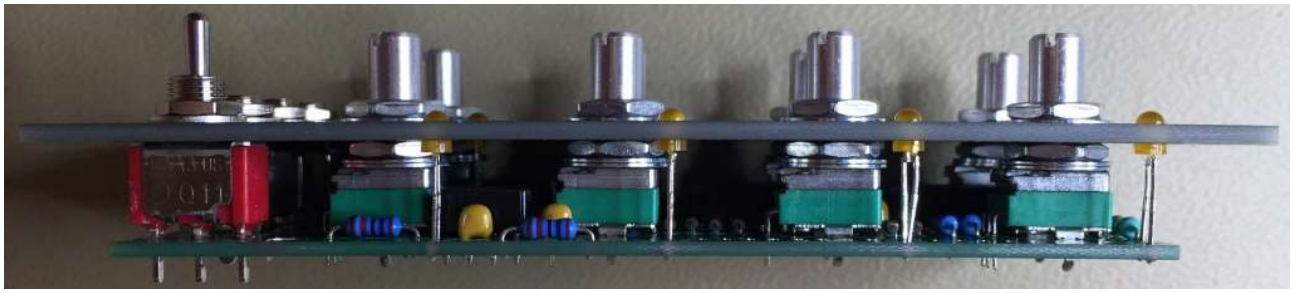
Cut off the small metal tab sticking out on the potentiometers. Use a cheap plier/nipper for this step, save your expensive ones for other tasks. Mount 2 washers and 1 nut on each potentiometer. Make sure the nuts are tight.

Place the potentiometers, jacks, switch and LEDs in their positions but don't solder them yet.
The long pin of the LEDs goes into the hole with a square pad.

Place the front panel on top and add 1 washer and 1 nut to each potentiometer, jack and the switch. Use a socket wrench to avoid scratching of the frontplate.

The switch have bigger pad holes in version 1.5 to allow more different switches to fit but it also means you need to be extra careful to make sure the switch is aligned straight.

Turn it upside down and make sure the LEDs go into their respective panel hole properly.



Now you solder all panel components in place.

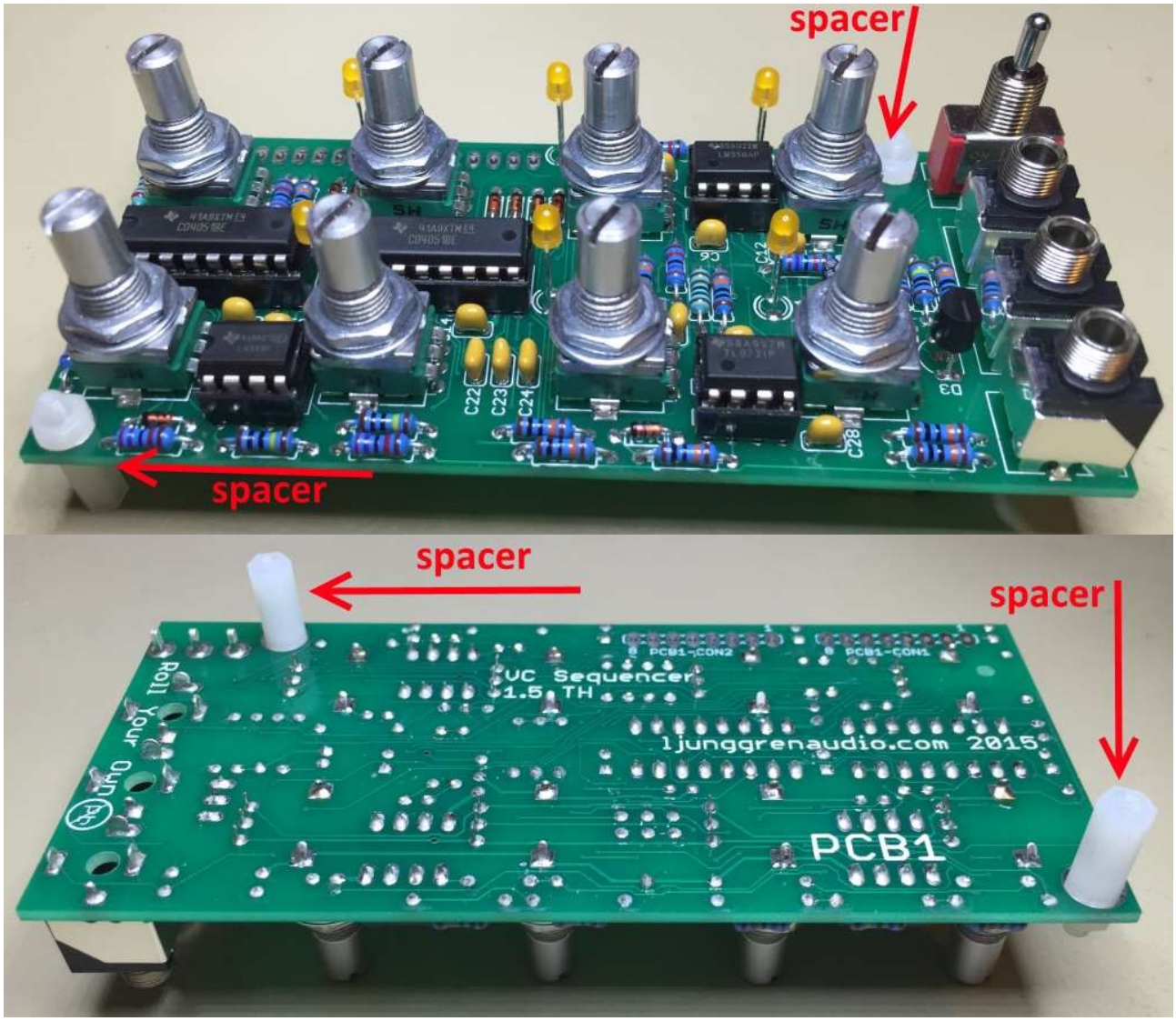
Step 18

Remove the front panel again. Insert the ICs in the sockets.

IC1 *LM358*
IC4 *LM393*
IC7, IC9 *CD4051*
IC11 *TL072*

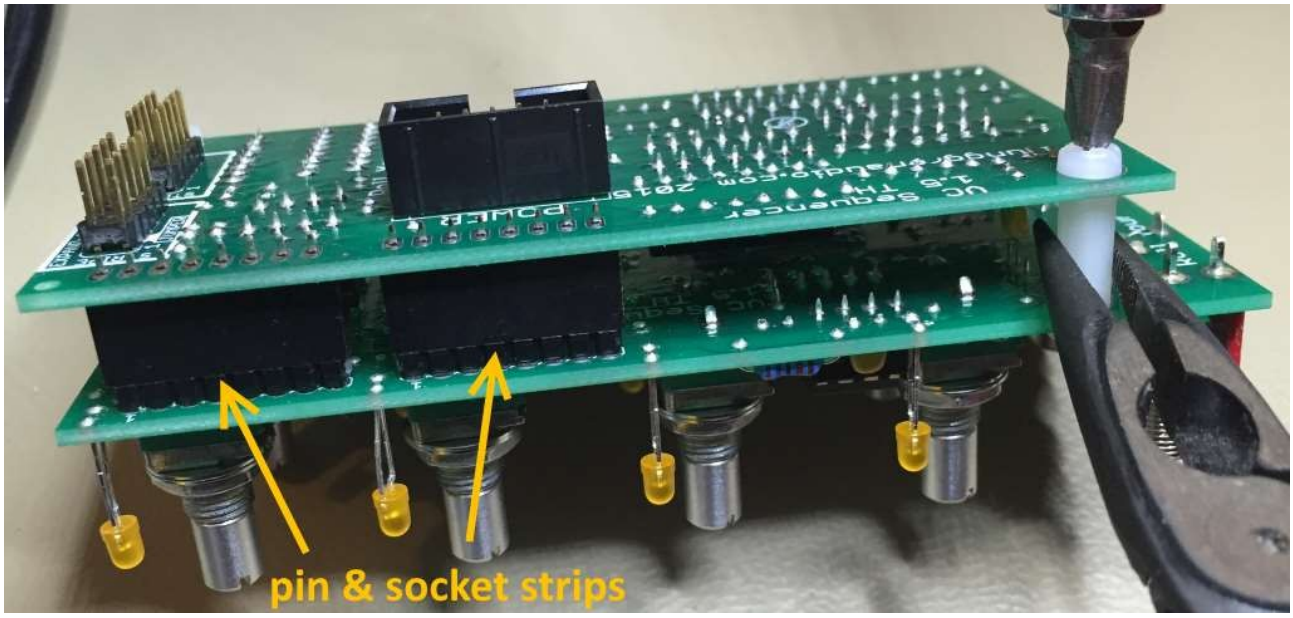
Step 19

Mount the spacers with the nuts on PCB1.



Step 20

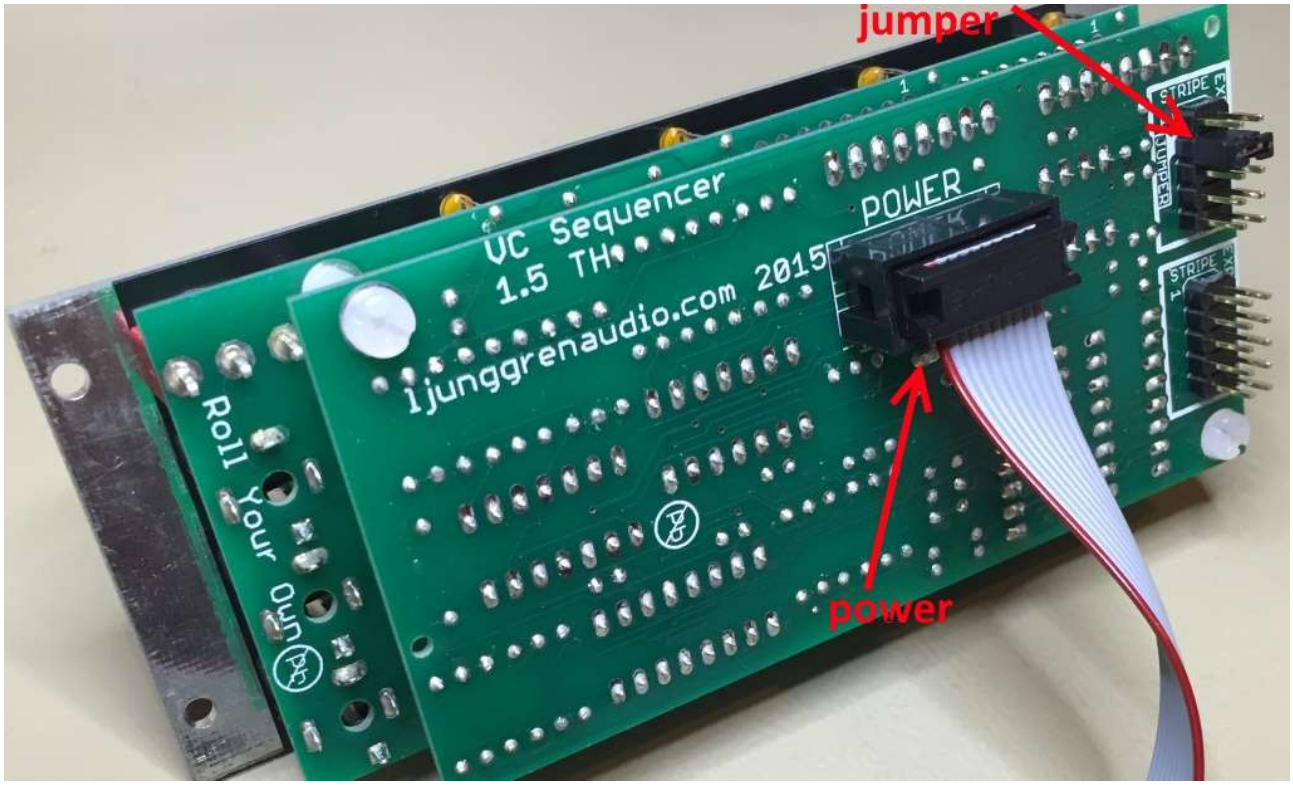
Put the pin & socket strips into each other. Place them between PCB1 and PCB2 like in the picture below. Take a firm grip with a plier around the spacers and screw the screws into place like in the picture below. It's important that the grip is firm as there is a bit of friction in this step and we don't want the nuts to loosen. If the nuts gets loose, tighten them again.



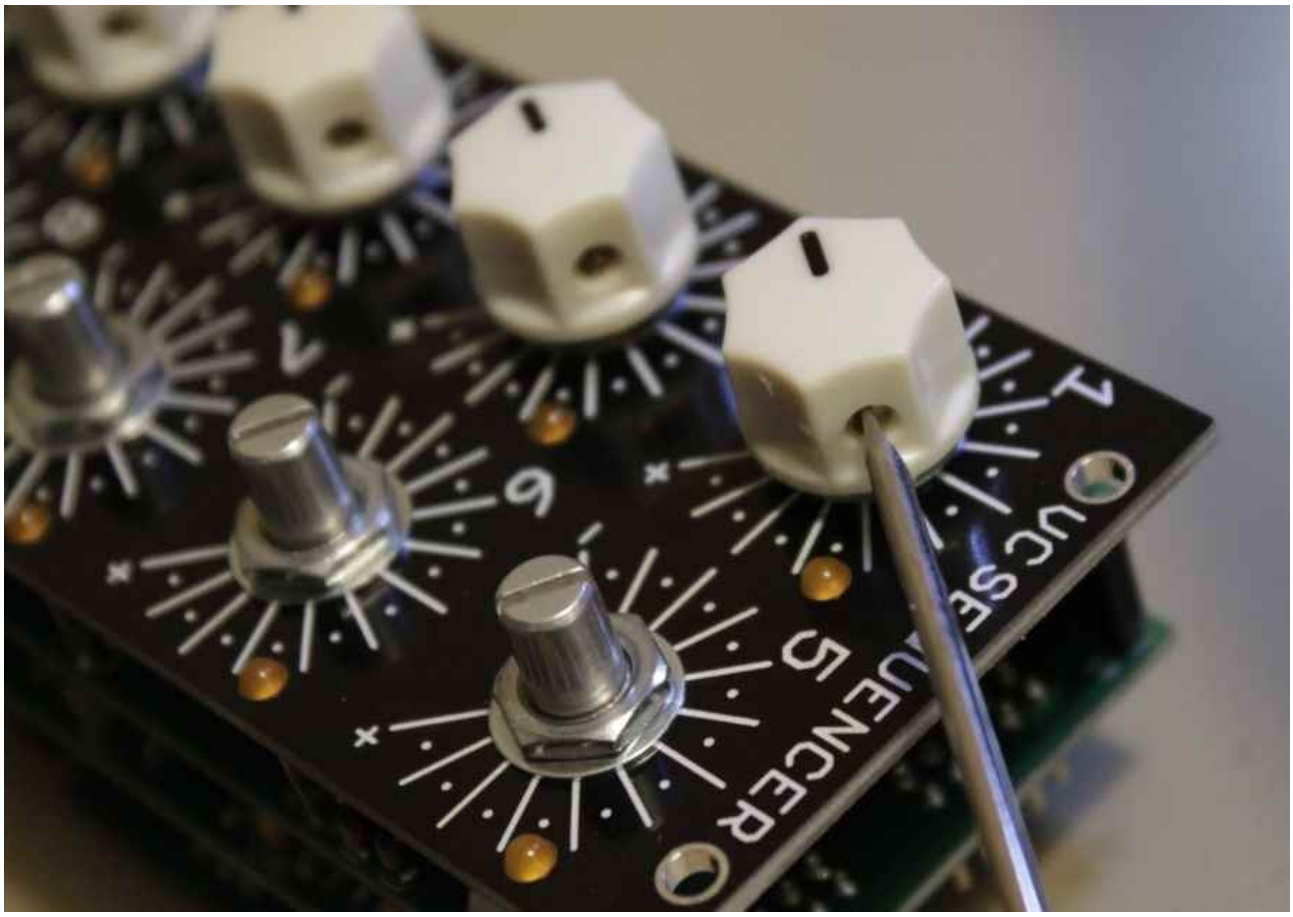
Solder the connectors between PCB1 & 2 in place.

Step 21

Mount the jumper on the EXPAND-16STEP header if you aren't going to attach an expander there. Also mount the power cable on the power header. Make sure the stripe indicating pin 1 is on the same side as -12V.

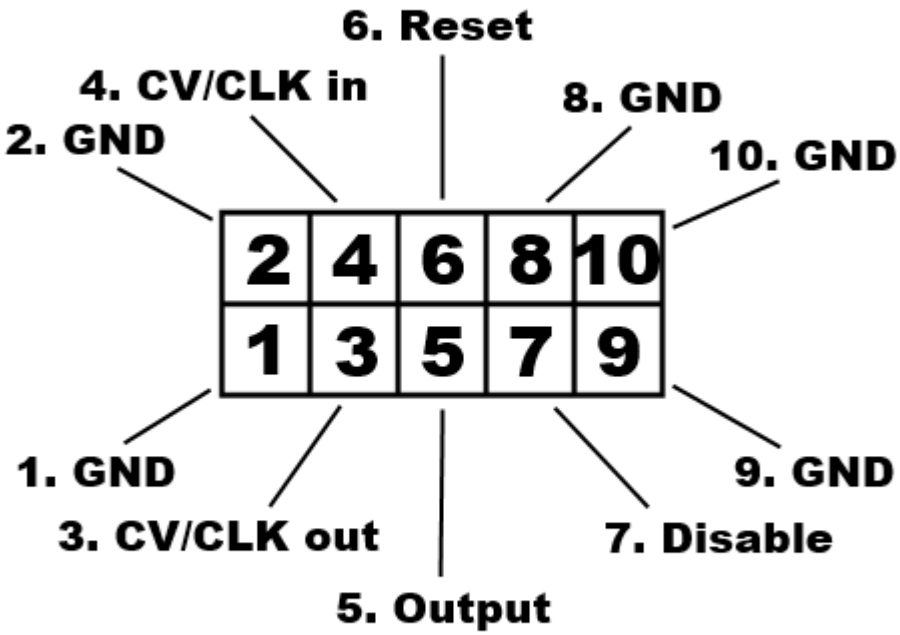


Step 22
Mount the knobs.



Finished module!

EXPAND-16STEP



EXPAND-CHANNEL