Ljunggren Audio Roll Your Own PATHS
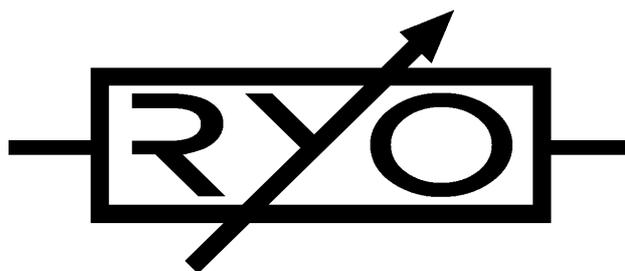
Version: Paths 1.1

Bills Of Material Total

Type	Value	Qty	All parts	Description
Power header	2x5pin	1	POWER	Euro power connector.
Socket strip	1x8pin	3	CON1-PCB1, CON2-PCB1, CON3-PCB1	8 pin female connector. 0.1in/2.54mm
Pin strip	1x8pin	3	CON1-PCB2, CON2-PCB2, CON3-PCB2	8 pin male connector. 0.1in/2.54mm
Socket strip	1x10pin	1	CON4-PCB3	10 pin female connector. 0.1in/2.54mm
Pin strip	1x10pin	1	CON4-PCB2	10 pin male connector. 0.1in/2.54mm
Resistor	249R	5	R3, R4, R5, R6, R32	Ca 3.5mm long body / LED resistors
Resistor	3.3k	7	R29, R30, R31, R37, R38, R39, R40	Ca 3.5mm long body
Resistor	22k	8	R11, R12, R13, R14, R19, R53, R57, R58	Ca 3.5mm long body
Resistor	10k	10	R15, R16, R17, R18, R21, R22, R44, R45, R46, R54	Ca 3.5mm long body
Resistor	100k	19	R7, R8, R9, R10, R20, R23, R24, R25, R26, R27, R28, R41, R42, R43, R47, R52, R55, R56, R59	Ca 3.5mm long body
Resistor	10R	2	R1, R2	Ca 7mm long body. Min 0.25W
Resistor	430R	8	R33, R34, R35, R36, R48, R49, R50, R51	Ca 7mm long body. Min 0.35W. 410-470R
MLCC / disc	15pF	1	C11	2.5-2.54mm pin pitch
MLCC / disc	4.7nF	2	C21, C27	2.5-2.54mm pin pitch
MLCC	100nF	21	C1, C2, C6, C7, C8, C9, C10, C12, C13, C14, C15, C16, C17, C18, C19, C20, C22, C23, C24, C25, C26	X7R 2.5-2.54mm pin pitch
Electrolytic	10uF	2	C3, C4	2.5mm pin pitch, 5mm dia, max 9mm height, min 25V
Electrolytic	100uF	1	C5	2.5mm pin pitch, 6.3mm dia, max 9mm height, min 16V
Diode	1N4148	12	D3, D4, D5, D6, D7, D8, D9, D10, D11, D12, D13, D14	
Diode	1N5818	2	D1, D2	1N5817-1N5819
IC Socket	DIP14	5	IC1, IC2, IC3, IC4, IC8	
CD4xxx	4081N	1	IC1	DIP14
CD4xxx	40106N	2	IC2, IC3	DIP14
OpAmp	TL084	1	IC4	DIP14, alt: TL074
Comparator	LM339	1	IC8	DIP14
IC Socket	DIP16	5	IC5, IC6, IC7, IC9, IC10	
CD4xxx	4516N	1	IC5	DIP16
Switch IC	DG409DJ	2	IC6, IC7	DIP16
CD4xxx	4052N	1	IC9	DIP16
CD4xxx	4043N	1	IC10	DIP16
Jack	3.5mm	12	FWD, HLD, I/O1, I/O2, I/O3, I/O4, O/I1, O/I2, O/I3, O/I4, RES, REV	PJ301M-12 / Thonkiconn / Inline
Transistor	FJN3303R	3	Q1, Q2, Q3	
Volt reg	LM2931 5V	1	RG1	
Toggle Switch	SPDT on/off/on	1	SW2	
Toggle Switch	SPDT on/on	1	SW1	
Tactile Switch	SPST off/(on)	2	SW3, SW6	C&K D6R 00/white
Tactile Switch	SPST off/(on)	2	SW4, SW5	C&K D6R 40/red
LED	green	2	L1, L4	3mm
LED	orange	6	L2, L3, L5, L6, L7, L8	3mm
Power cable	10pin – 16pin IDC	1		
Mounting screws	M3x6 black	2		
PCB		3	PCB1, PCB2, PCB3	
Panel	PCB material 8hp	1		
spacers	11mm	2		
nuts	for spacers	2		
screws	for spacers	2		

Bills Of Material per PCB

Type	Value	PCB1 qty	PCB1 parts	PCB2 qty	PCB2 parts	PCB3 qty	PCB3 parts
Power header	2x5pin			1	POWER		
Socket strip	1x8pin	3	CON1-PCB1, CON2-PCB1, CON3-PCB1				
Pin strip	1x8pin			3	CON1-PCB2, CON2-PCB2, CON3-PCB2		
Socket strip	1x10pin					1	CON4-PCB3
Pin strip	1x10pin			1	CON4-PCB2		
Resistor	249R	5	R3, R4, R5, R6, R32				
Resistor	3.3k					7	R29, R30, R31, R37, R38, R39, R40
Resistor	22k	7	R11, R12, R13, R14, R53, R57, R58			1	R19
Resistor	10k	5	R15, R16, R17, R18, R54	2	R21, R22	3	R44, R45, R46
Resistor	100k	4	R7, R10, R55, R56	4	R23, R24, R25, R26	11	R8, R9, R20, R27, R28, R41, R42, R43, R47, R52, R59
Resistor	10R			2	R1, R2		
Resistor	430R			8	R33, R34, R35, R36, R48, R49, R50, R51		
MLCC / disc	15pF			1	C11		
MLCC / disc	4.7nF					2	C21, C27
MLCC	100nF	6	C7, C8, C9, C10, C22, C25	10	C1, C2, C6, C13, C14, C15, C16, C23, C24, C26	5	C12, C17, C18, C19, C20
Electrolytic	10uF			2	C3, C4		
Electrolytic	100uF			1	C5		
Diode	1N4148	6	D3, D4, D5, D6, D7, D8	2	D9, D10	4	D11, D12, D13, D14
Diode	1N5818			2	D1, D2		
IC Socket	DIP14	2	IC1, IC2	1	IC3	2	IC4, IC8
CD4xxx	4081N	1	IC1				
CD4xxx	40106N	1	IC2	1	IC3		
OpAmp	TL084					1	IC4
Comparator	LM339					1	IC8
IC Socket	DIP16			4	IC5, IC6, IC7, IC9	1	IC10
CD4xxx	4516N			1	IC5		
Switch IC	DG409DJ			2	IC6, IC7		
CD4xxx	4052N			1	IC9		
CD4xxx	4043N					1	IC10
Jack	3.5mm	12	FWD, HLD, I/O1, I/O2, I/O3, I/O4, O/I1, O/I2, O/I3, O/I4, RES, REV				
Transistor	FJN3303R	3	Q1, Q2, Q3				
Volt reg	LM2931 5V			1	RG1		
Toggle Switch	SPDT on/off/on	1	SW2				
Toggle Switch	SPDT on/on	1	SW1				
Tactile Switch	SPST off/(on)	2	SW3, SW6				
Tactile Switch	SPST off/(on)	2	SW4, SW5				
LED	green	2	L1, L4				
LED	orange	6	L2, L3, L5, L6, L7, L8				

Assembly instructions

Start with PCB 3

Step 1
Solder generic small signal diodes. Make sure the stripe on the diode is in the same direction as the stripe on the PCB.
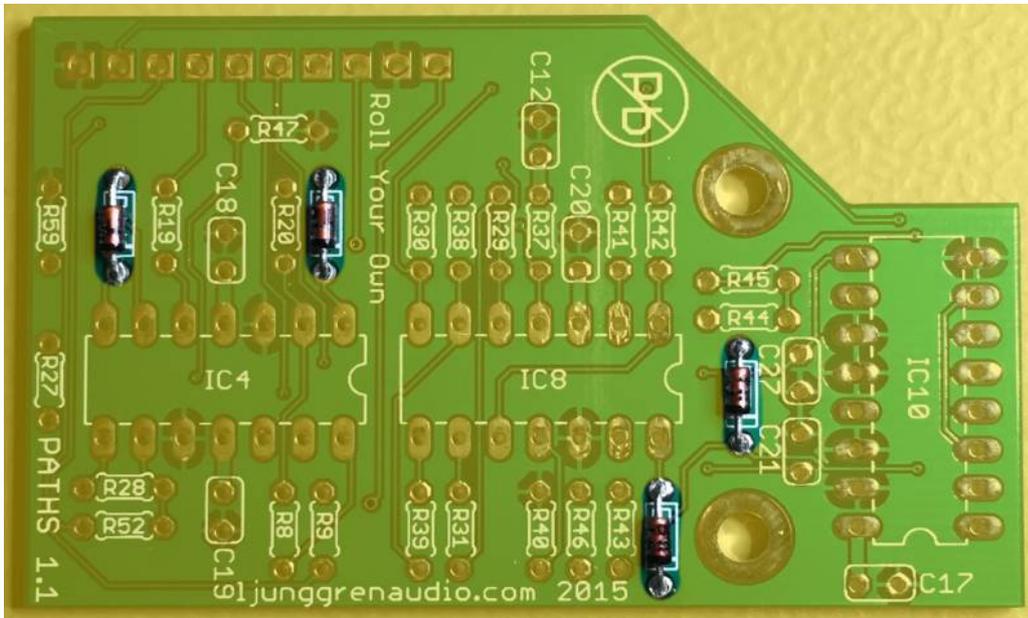
D11, D12, D13, D14 *1N4148 4pcs*

Step 2
Solder resistors. Resistors are not sensitive to mounting direction.
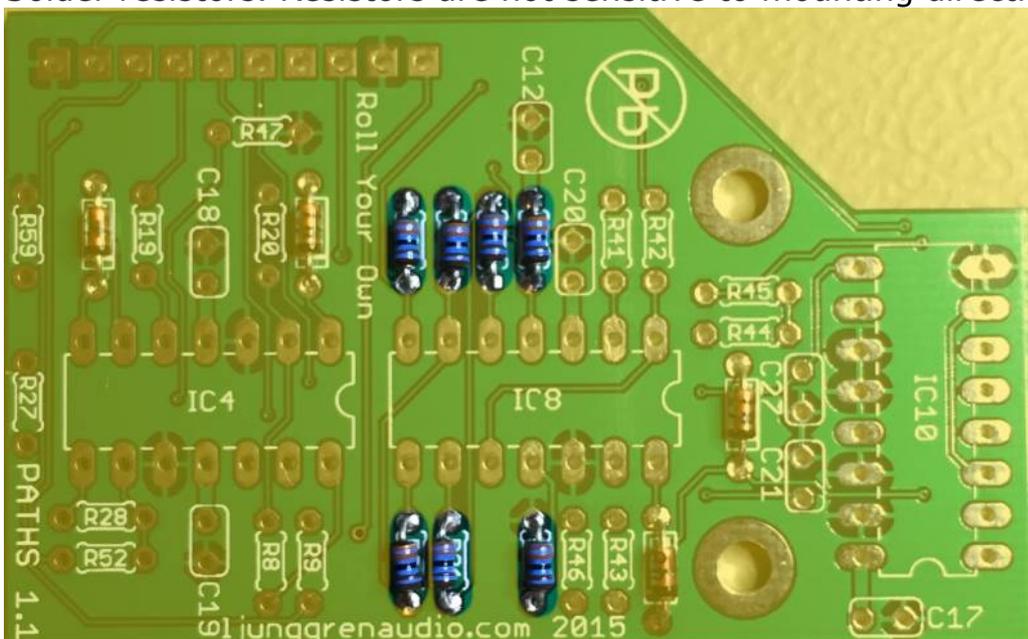
R29, R30, R31, R37, R38, R39, R40 *3.3K 7pcs*
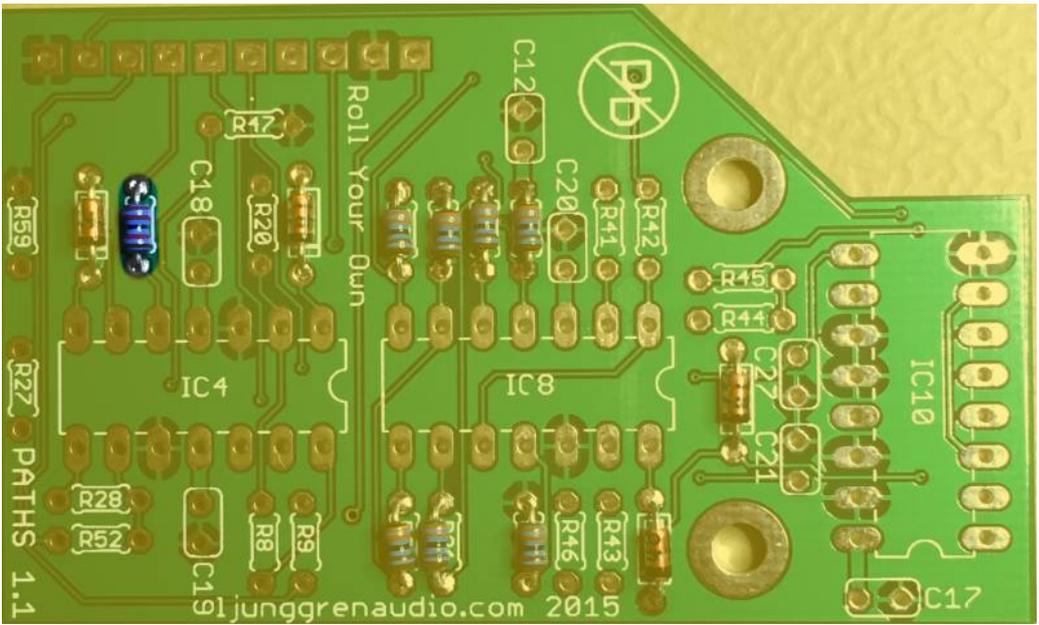
R19 *22K 1pcs*
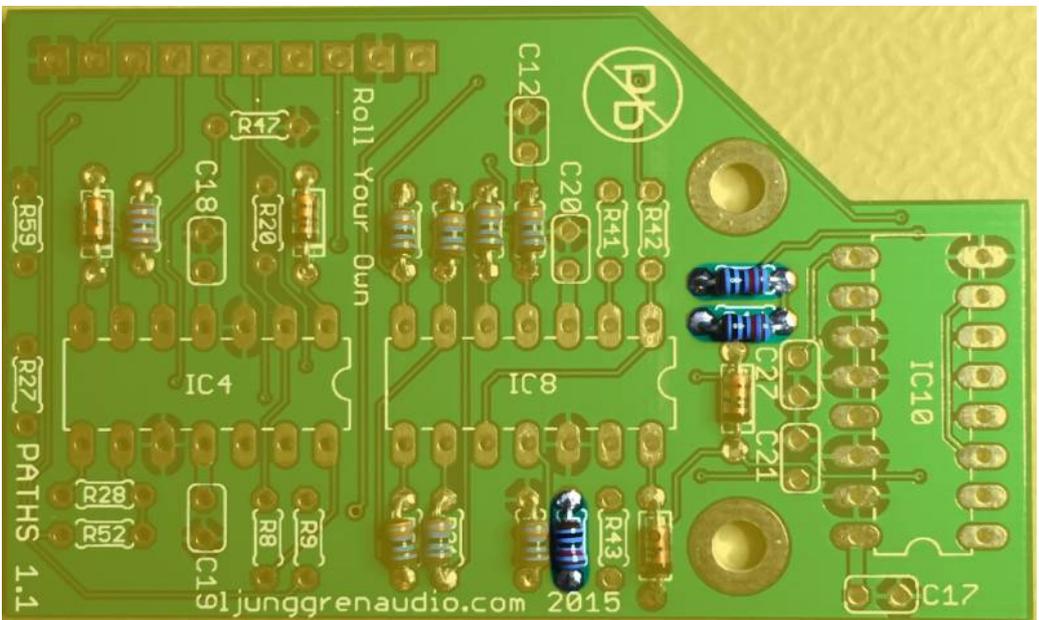
R44, R45, R46 *10K 3pcs*
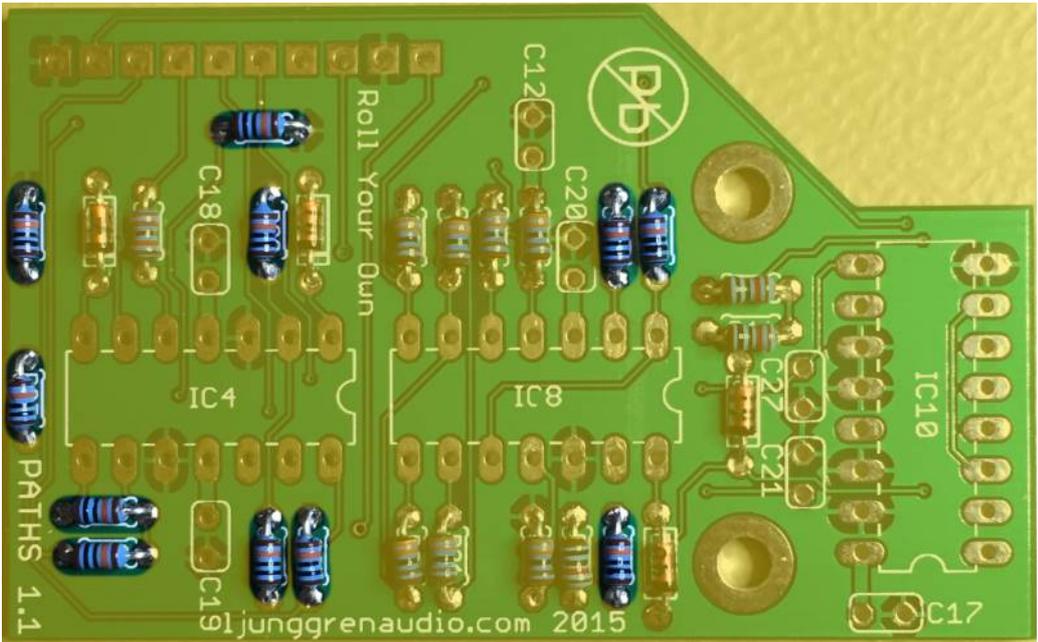
R8, R9, R20, R27, R28, R41, R42, R43, R47, R52, R59 *100K 11pcs*

Step 3

Solder IC sockets. Match the IC sockets indent (indicating pin 1 side) with the silk screens. We will mount the IC's later.
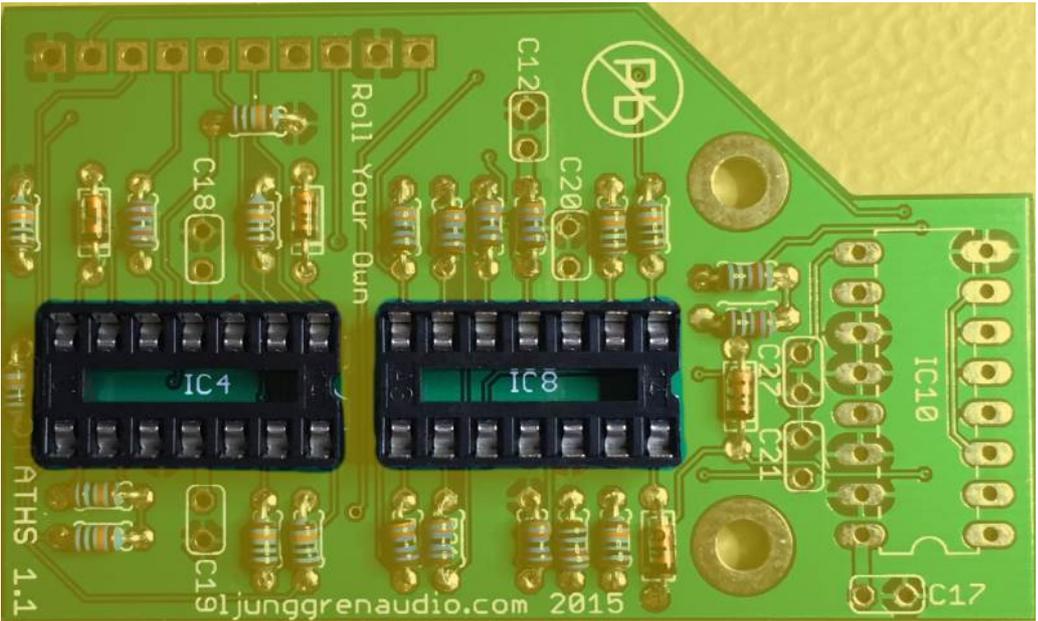
IC4, IC8 14 pin socket 2pcs
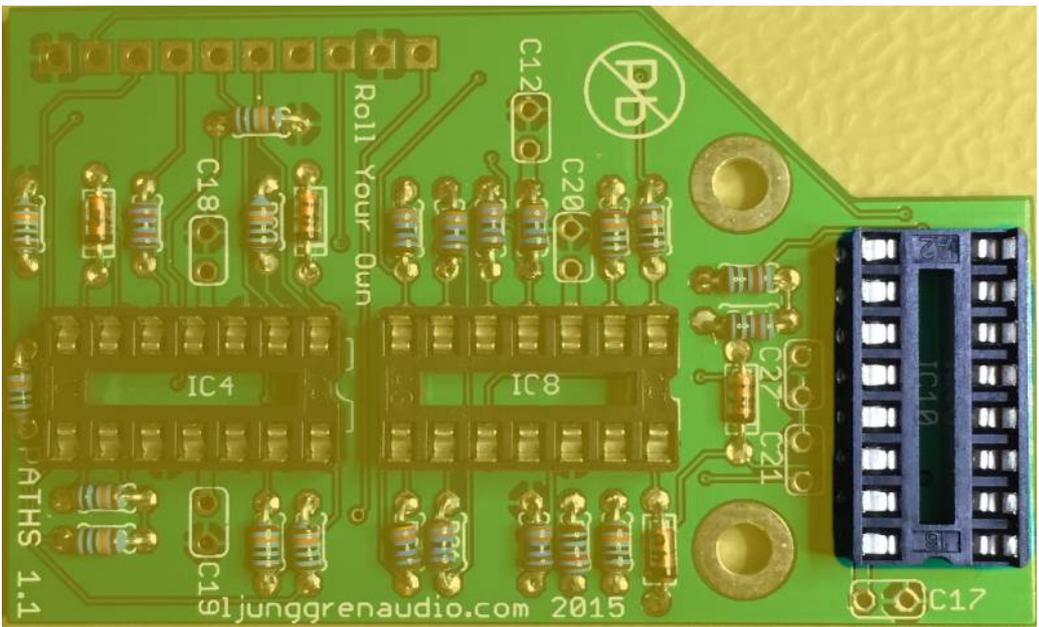
IC10 16 pin socket 1pcs

Step 4

Solder ceramic capacitors. Ceramic capacitors are not sensitive to mounting direction. The visual appearence may differ between the kit and the pictures.
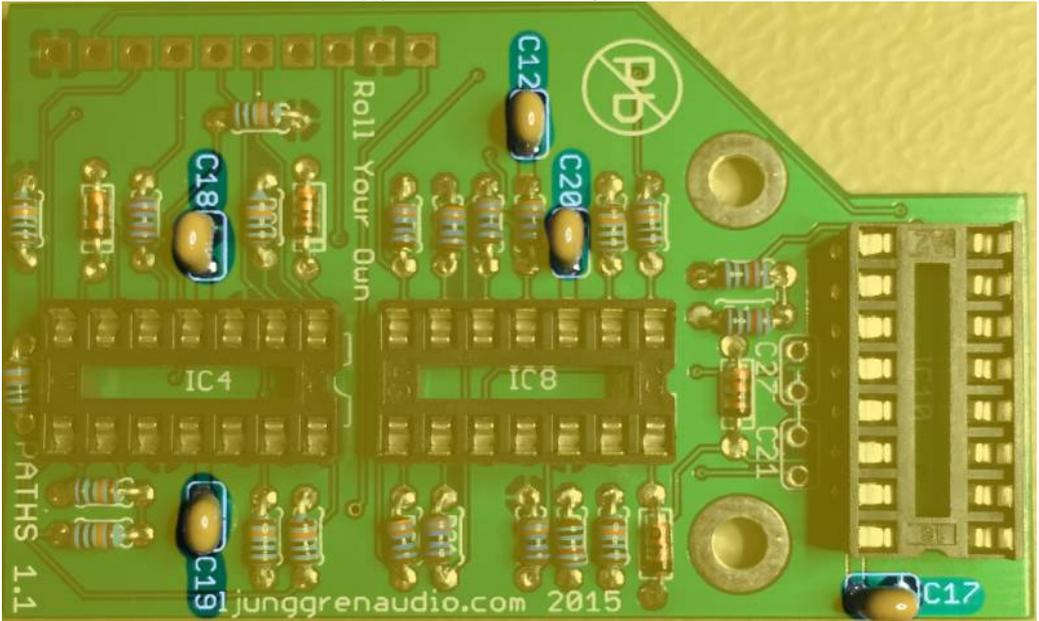
C12, C17, C18, C19, C20 100nF 5pcs
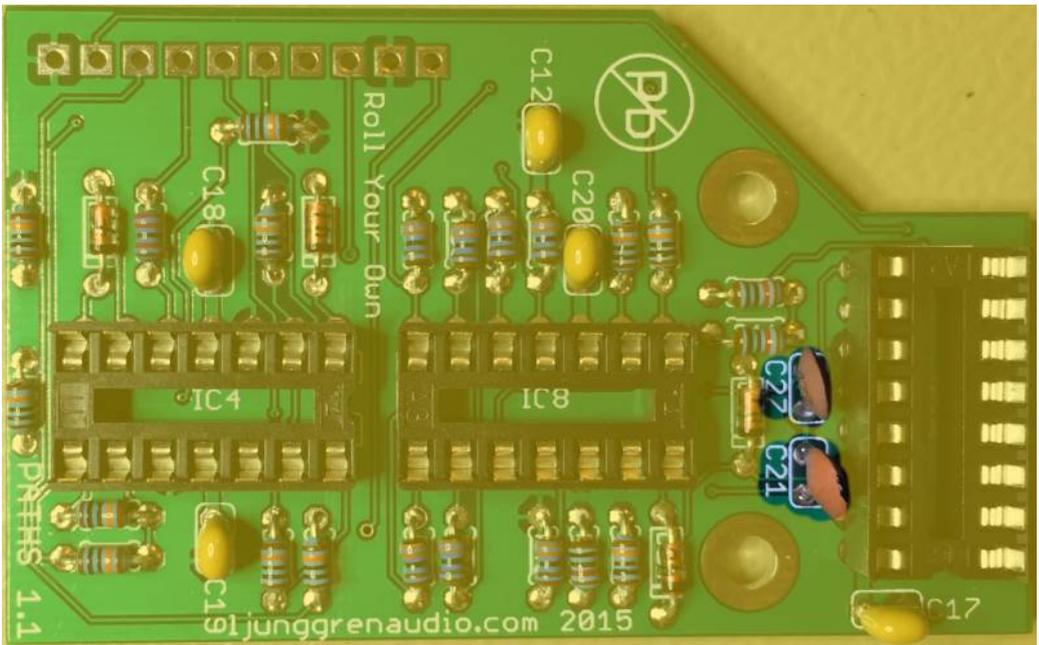
C21, C27 4.7nF 2pcs

Switch to PCB 2

Step 5
Solder generic small signal diodes. Make sure the stripe on the diode is in the same direction as the stripe on the PCB.
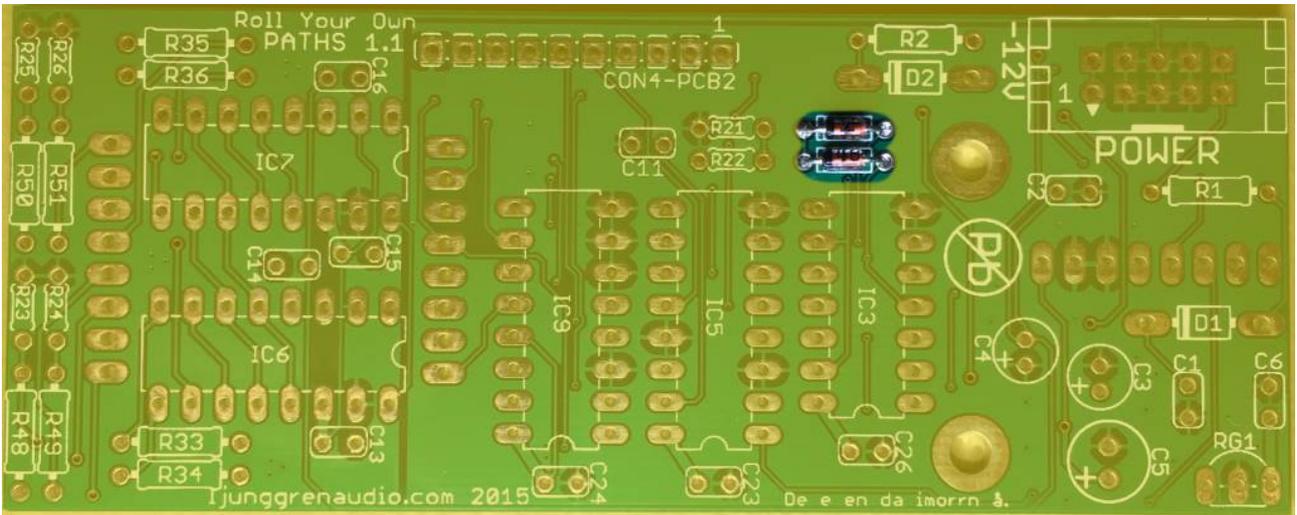
D9, D10 1N4148 2pcs

Step 6

Solder resistors. Resistors are not sensitive to mounting direction.
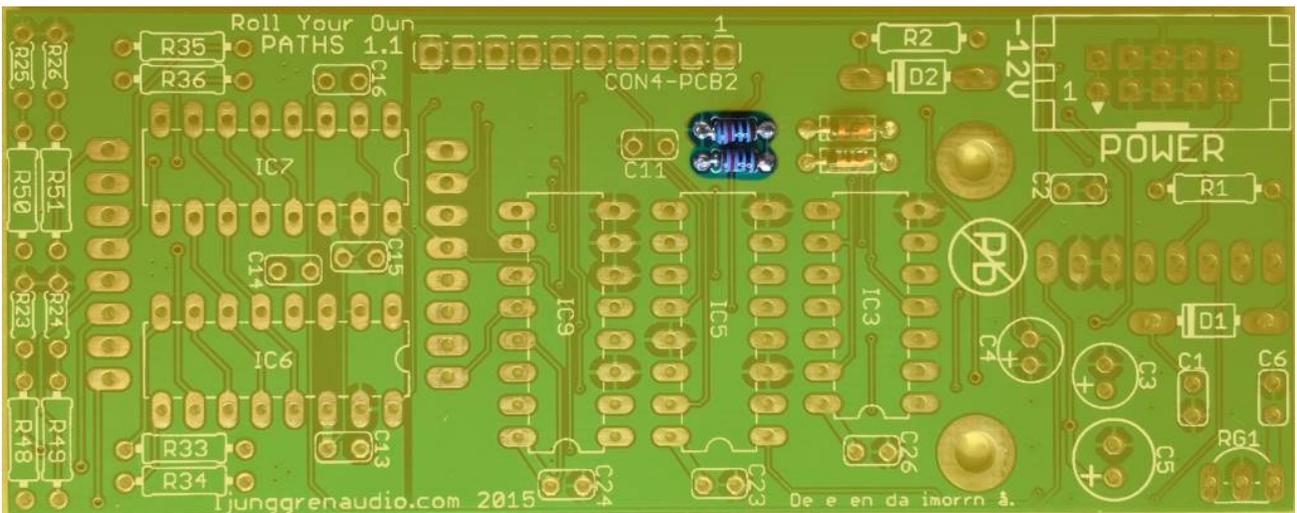
R21, R22 10K 2pcs
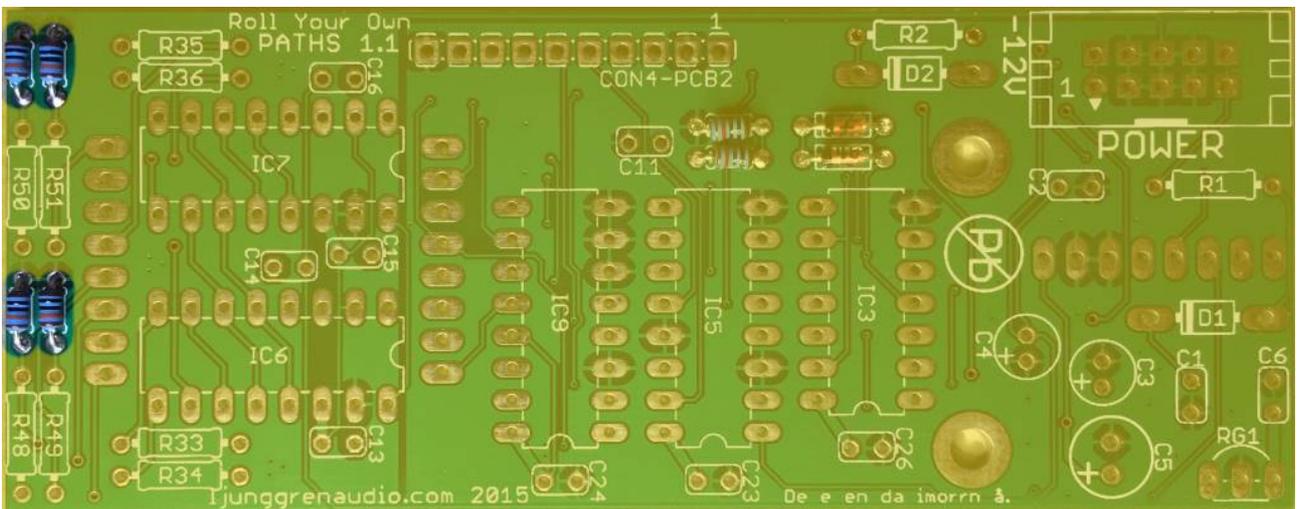
R23, R24, R25, R26 100K 4pcs
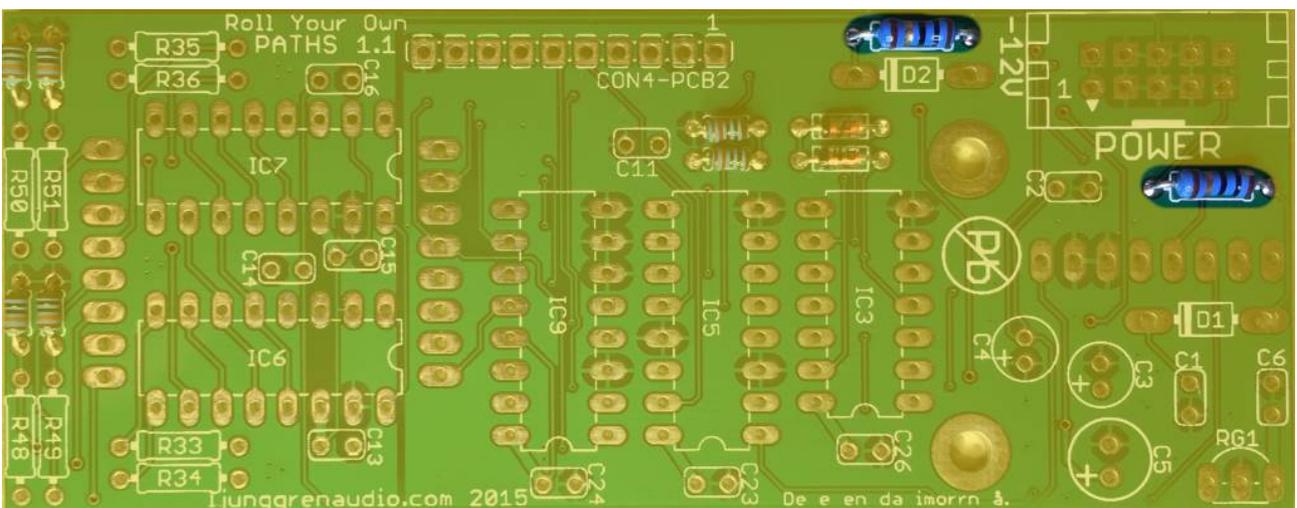
R1, R2 10R 2pcs
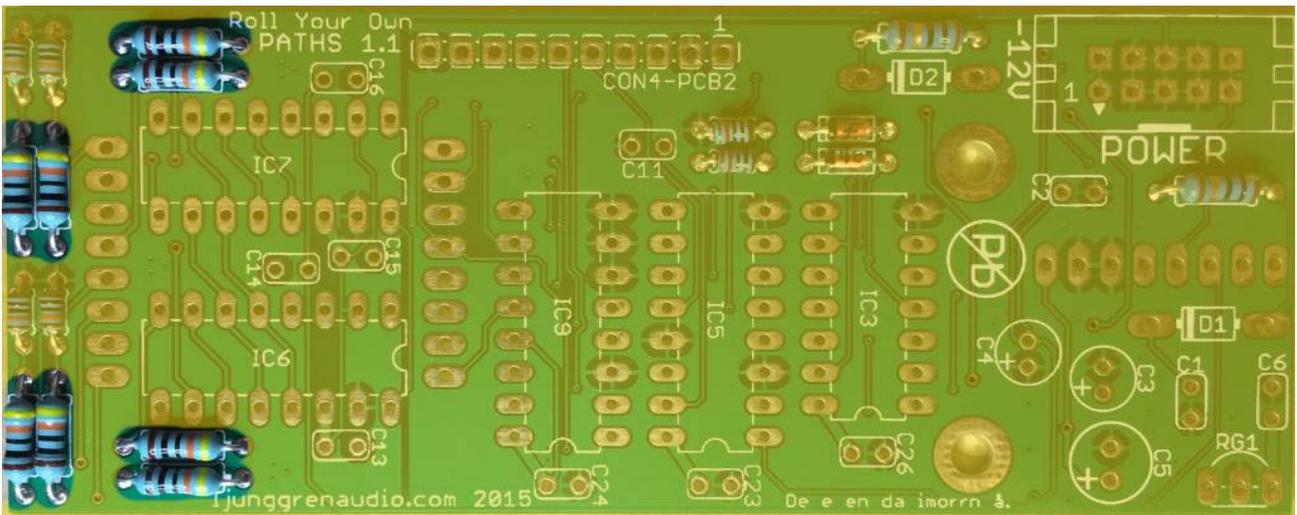
R33, R34, R35, R36, R48, R49, R50, R51 430R 8pcs

Step 7

Solder reverse polarity protection diodes. The stripe on the diodes must be on the same side as indicated in the silk screen.
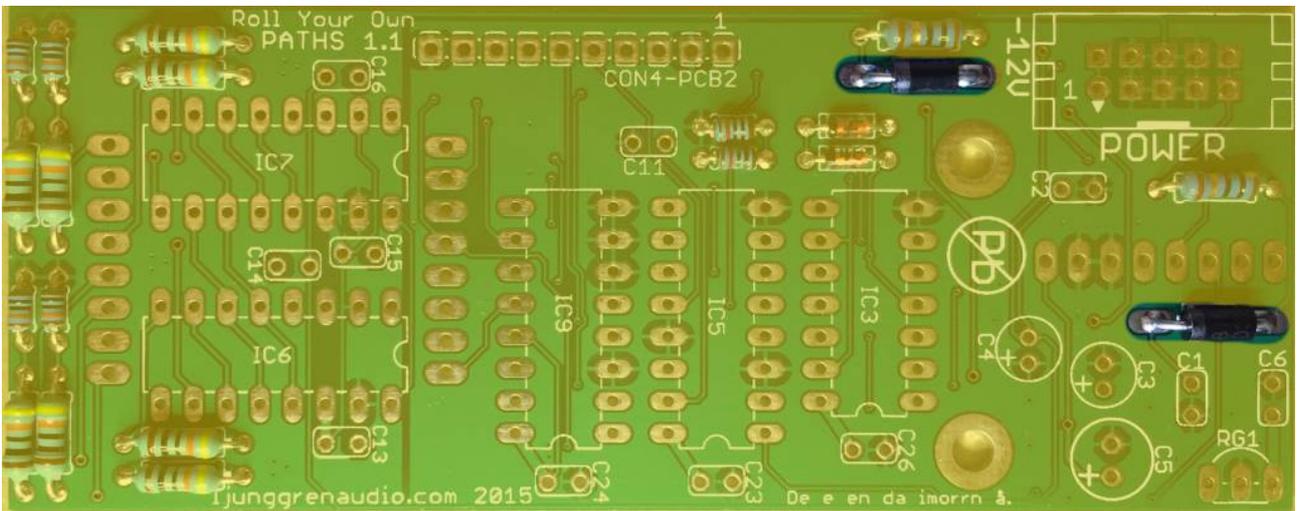
D1, D2 1N5818 2pcs

Step 8

Solder IC sockets. Match the IC sockets indent (indicating pin 1 side) with the silk screens. We will mount the IC's later.

IC3 14 pin socket 1pcs

IC5, IC6, IC7, IC9 16 pin socket 4pcs

Step 9

Solder ceramic capacitors. Ceramic capacitors are not sensitive to mounting direction. The visual appearence may differ between the kit and the pictures.
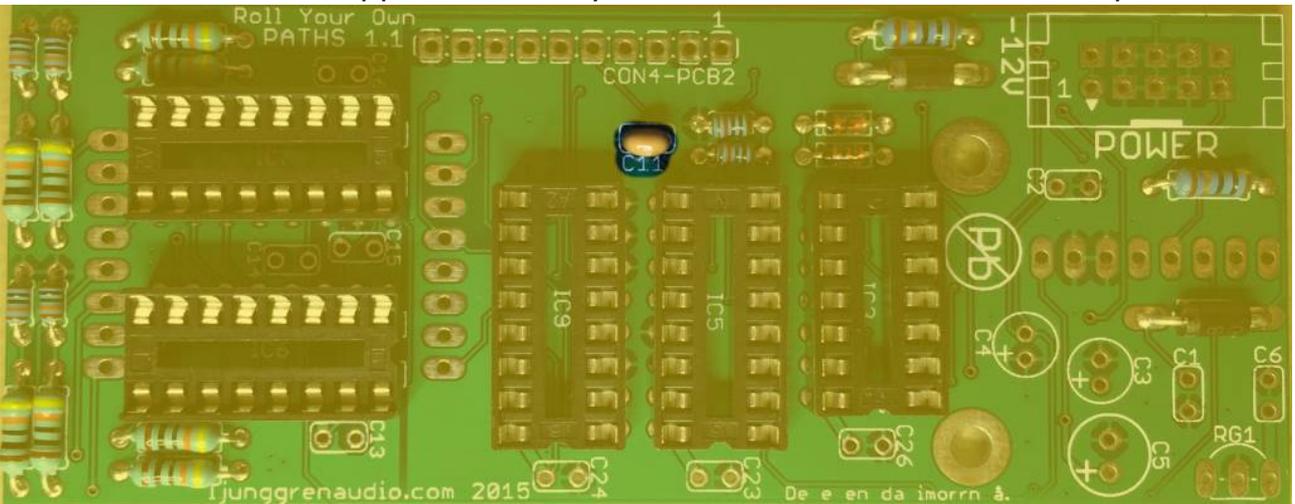
C11 *15pF 1pcs*
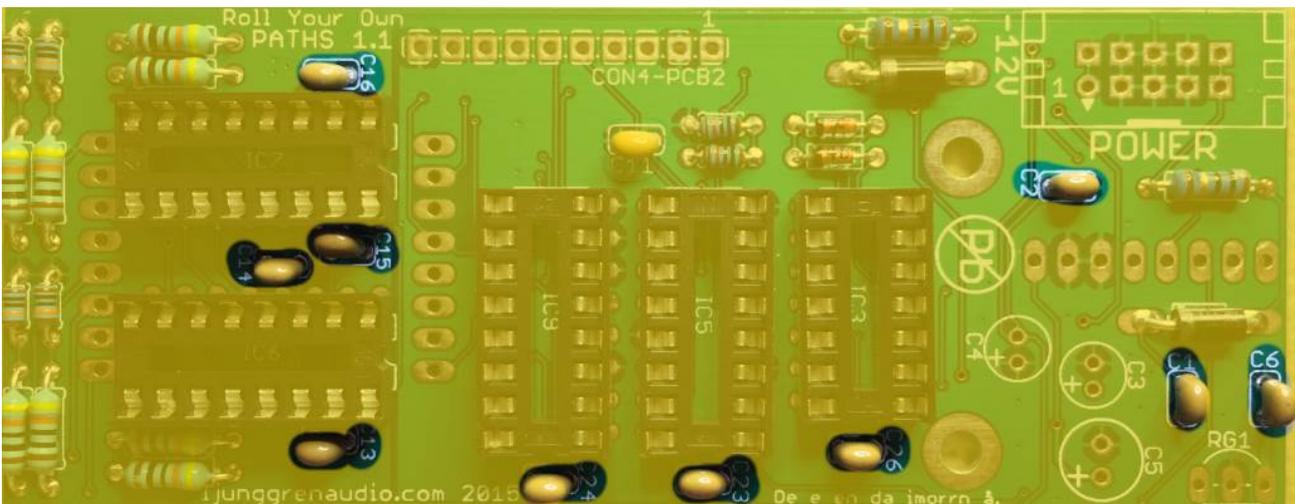
C1, C2, C6, C13, C14, C15, C16, C23, C24, C26 *100nF 10pcs*

Step 10
Solder Electrolytics. Long leg is + (anode).
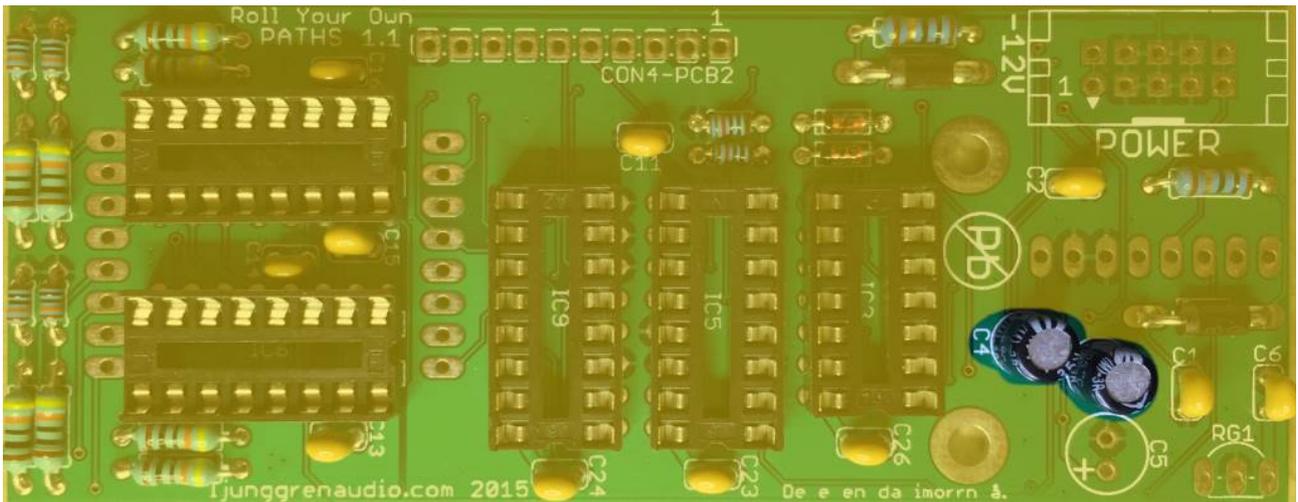
C3, *C4* 10µF 2pcs
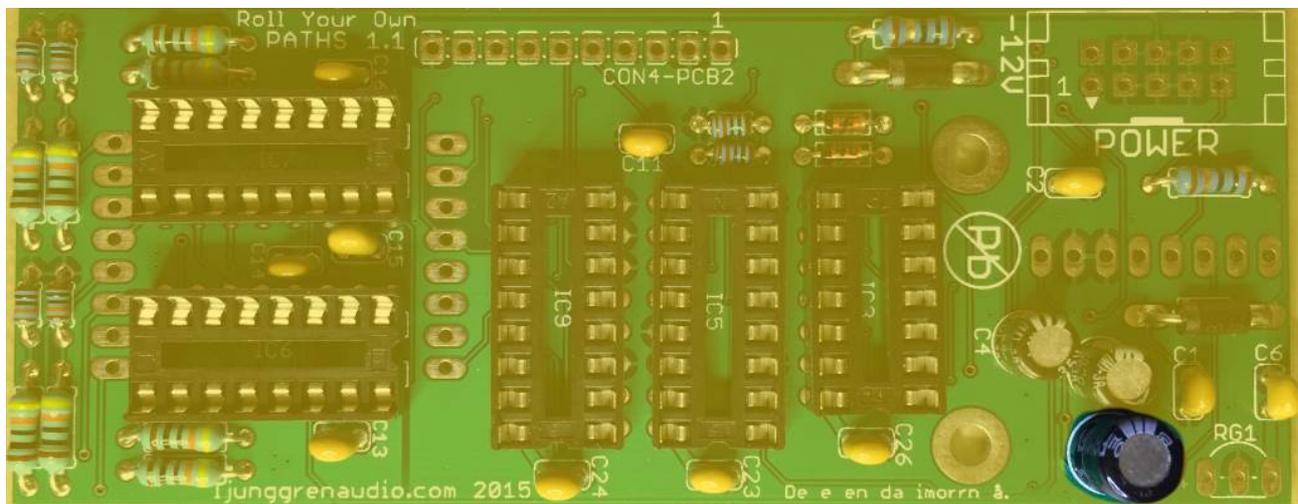
C5 100µF 1pcs

Step 11
Solder voltage regulator. Match the curved side with the silkscreen.

RG1 LM2931 5V 1pcs

Step 12
Solder the keyed boxed power header. Pay extra attention to the direction. The triangle (pin 1) must be at the -12V side. In the picture below you can see the direction of the keyed opening in the boxed header pointed out with an arrow.

POWER

Switch to PCB 1

Step 13
Solder generic small signal diodes. Make sure the stripe on the diode is in the same direction as the stripe on the PCB.
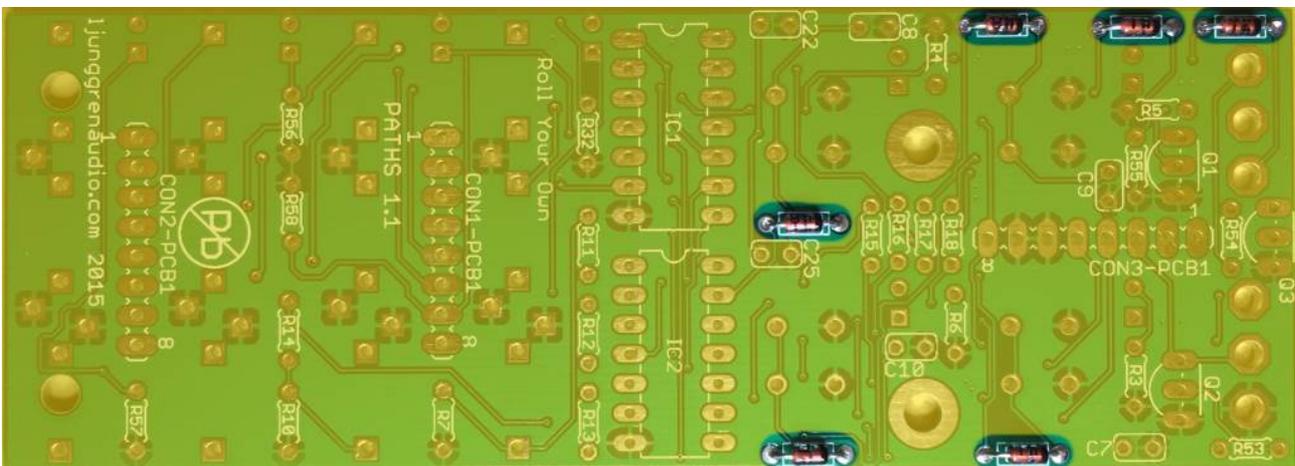
D3, D4, D5, D6, D7, D8 1N4148 6pcs

Step 14

Solder resistors. Resistors are not sensitive to mounting direction.
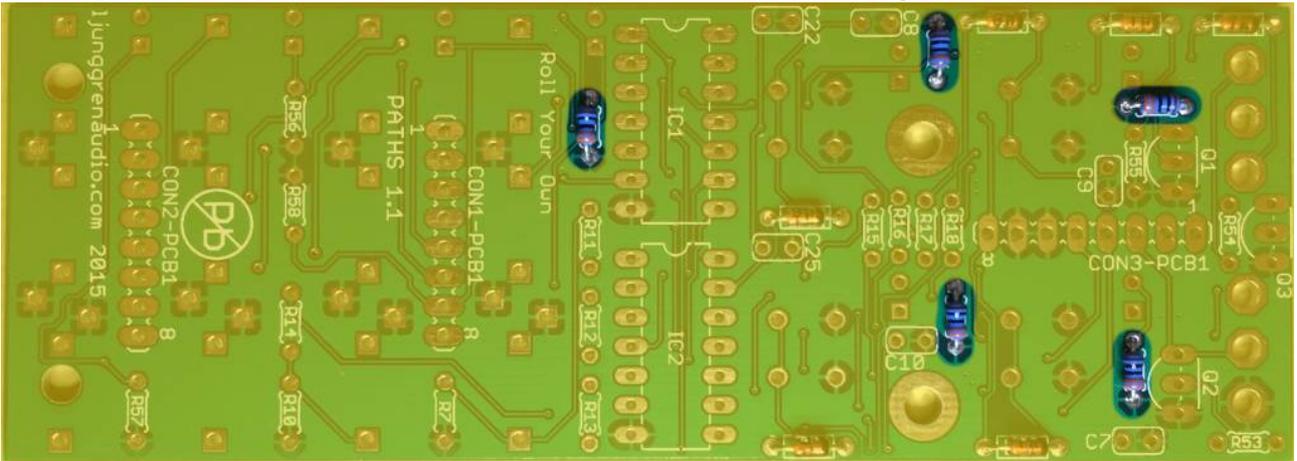
R3, R4, R5, R6, R32 249R 5pcs (LED resistors, lower value = brighter LEDs)
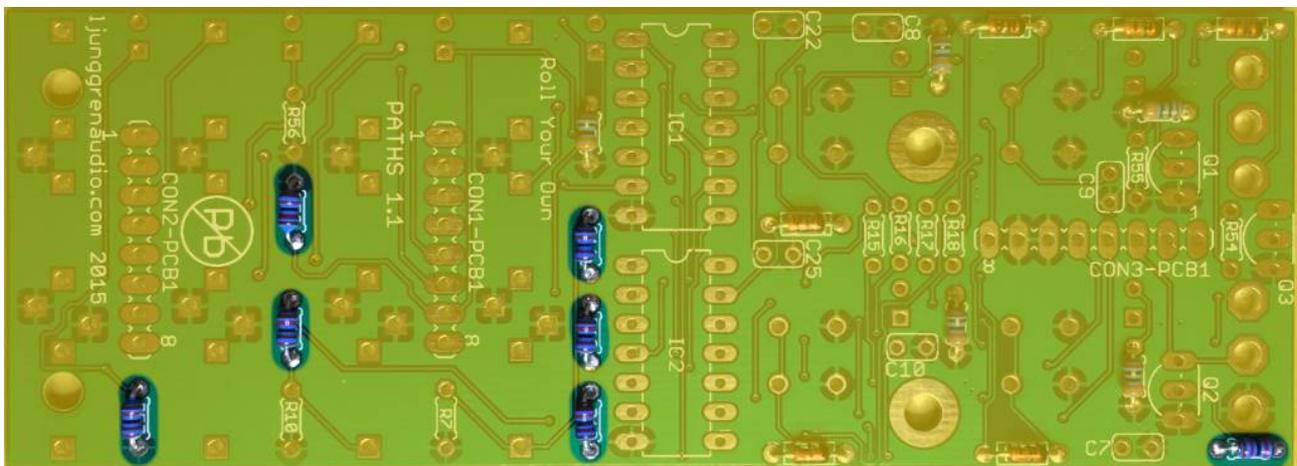
R11, R12, R13, R14, R53, R57, R58 22K 7pcs
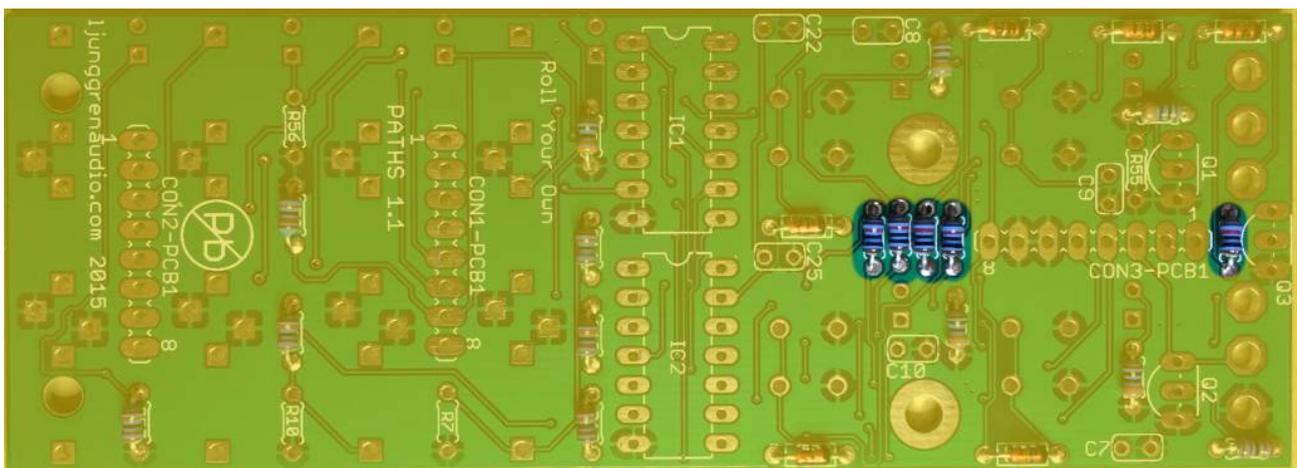
R15, R16, R17, R18, R54 10K 5pcs
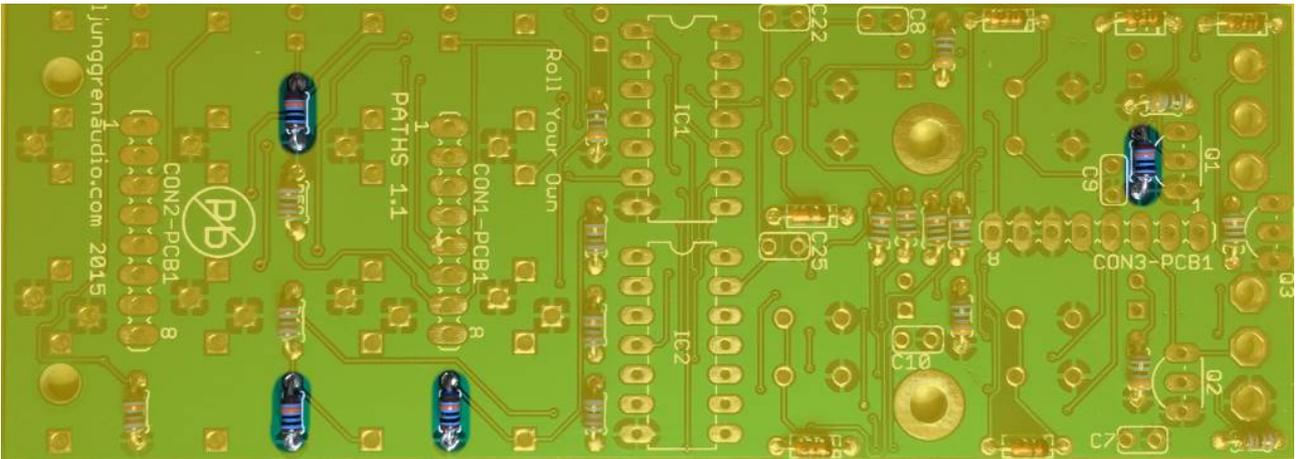
R7, R10, R55, R56 100K 4pcs

Step 15
Solder IC sockets. Match the IC sockets indent (indicating pin 1 side) with the silk screens. We will mount the IC's later.
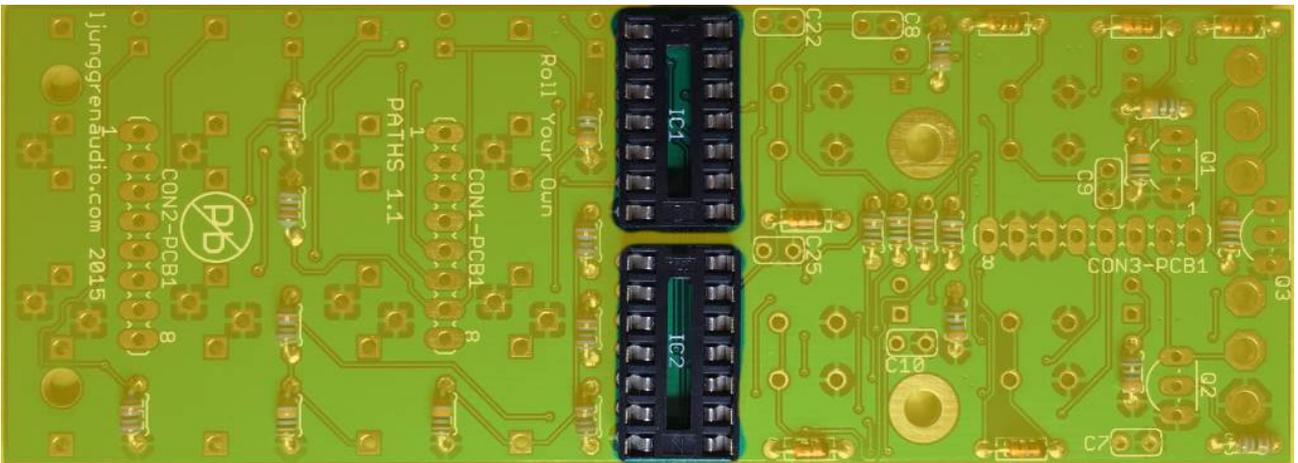
IC1, IC2 14 pin socket 2pcs

Step 16
Solder ceramic capacitors. Ceramic capacitors are not sensitive to mounting direction. The visual appearence may differ between the kit and the pictures
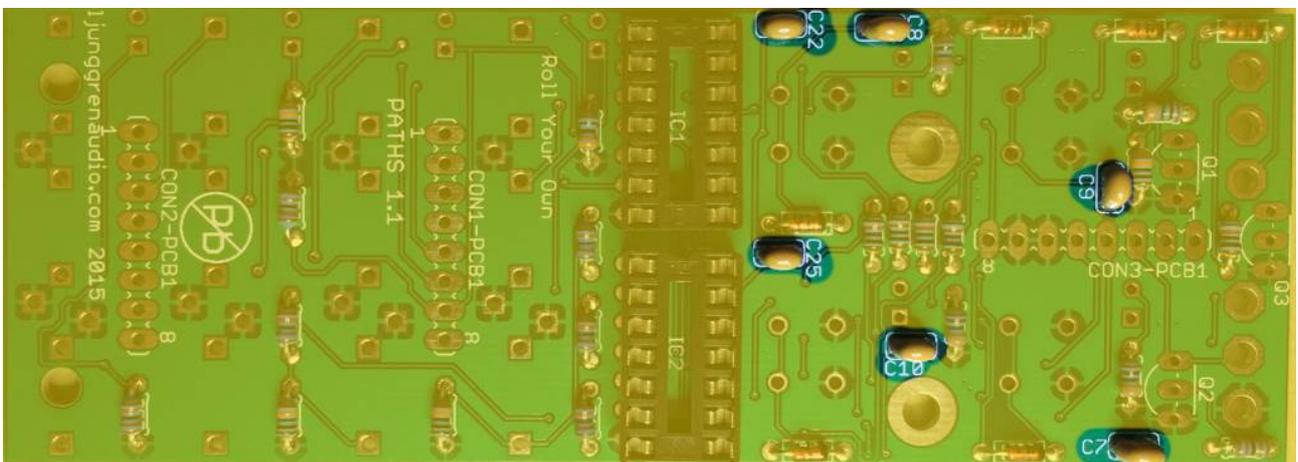
C7, C8, C9, C10, C22, C25 100nF 6pcs

Step 17
Solder transistors. Match the curved side with the silkscreen.
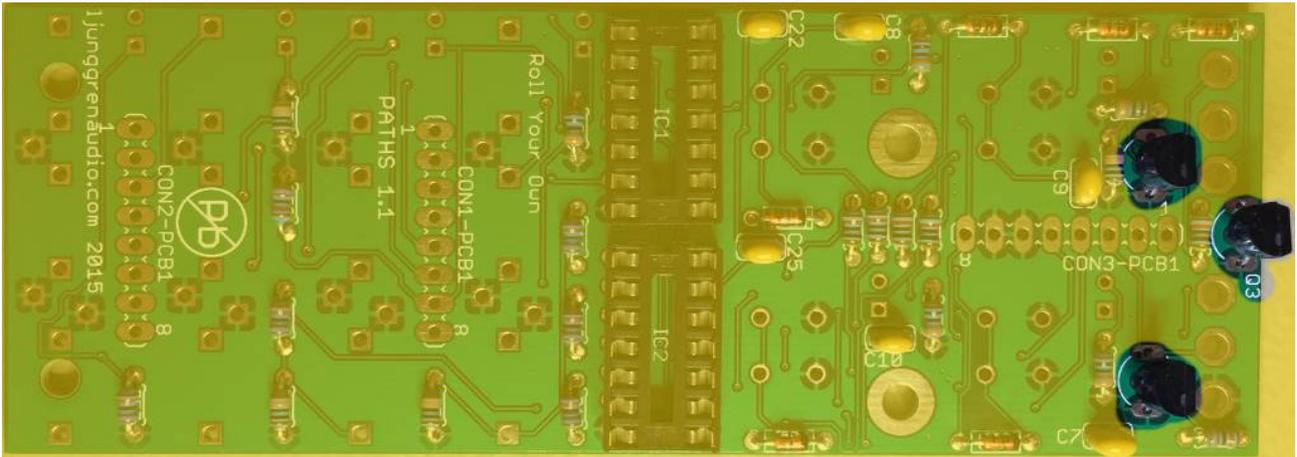
Q1, Q2, Q3 FJN3303R 3pcs

Step 18
Solder connectors between PCB1 and PCB2.

Three 8 pin 1 row connectors, place the pin strip part in the socket strip part like in the pictures below. Place the socket strip part towards PCB1 and the pin strip part towards PCB2. This gives uniformity between modules but it doesn't matter if you happen to place them the other way around.
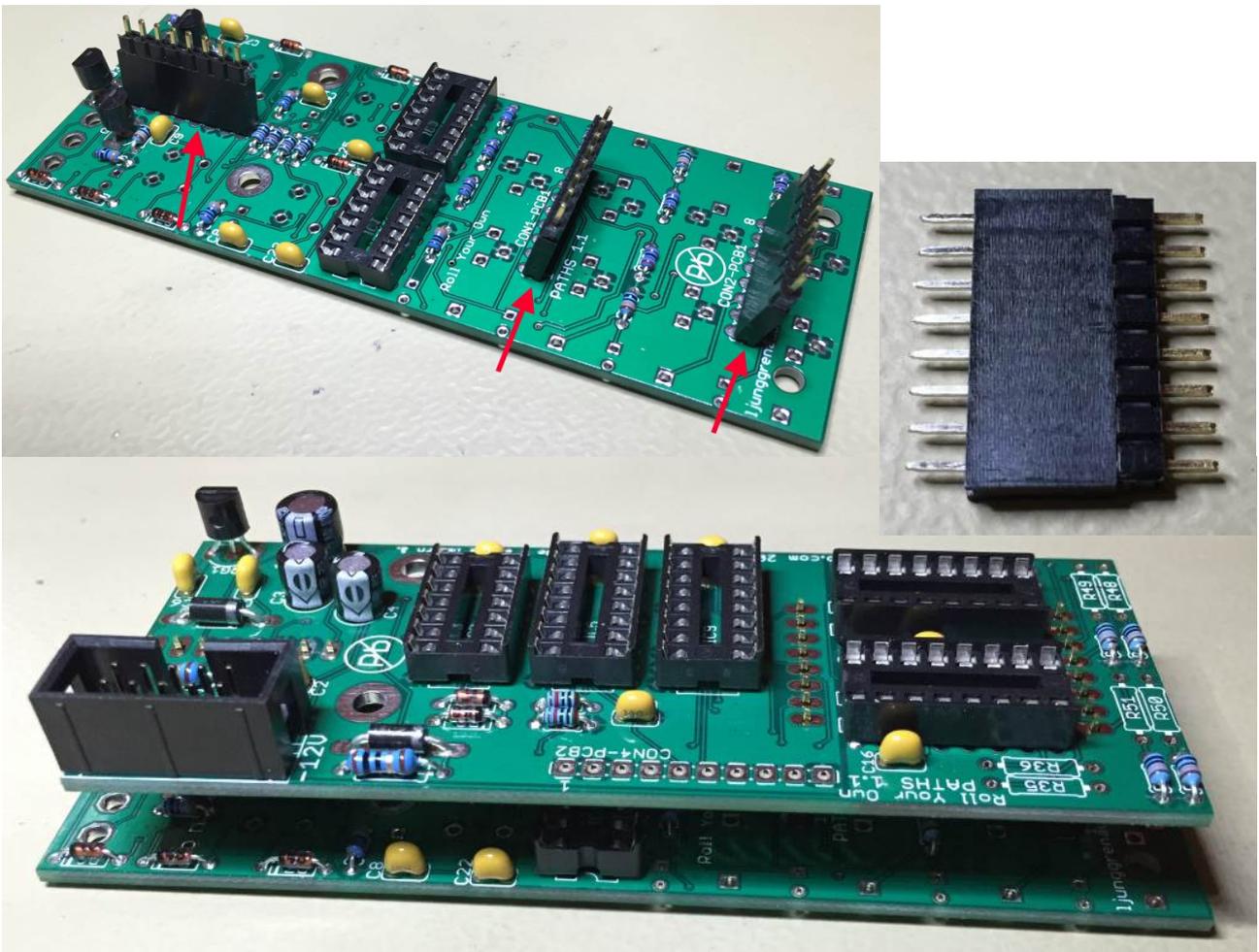
Step 19
Mount the first spacer and nut on PCB2, place it on the same side as the electrolytics. It helps holding the nut with pliers while screwing in the spacer part like in the picture below.
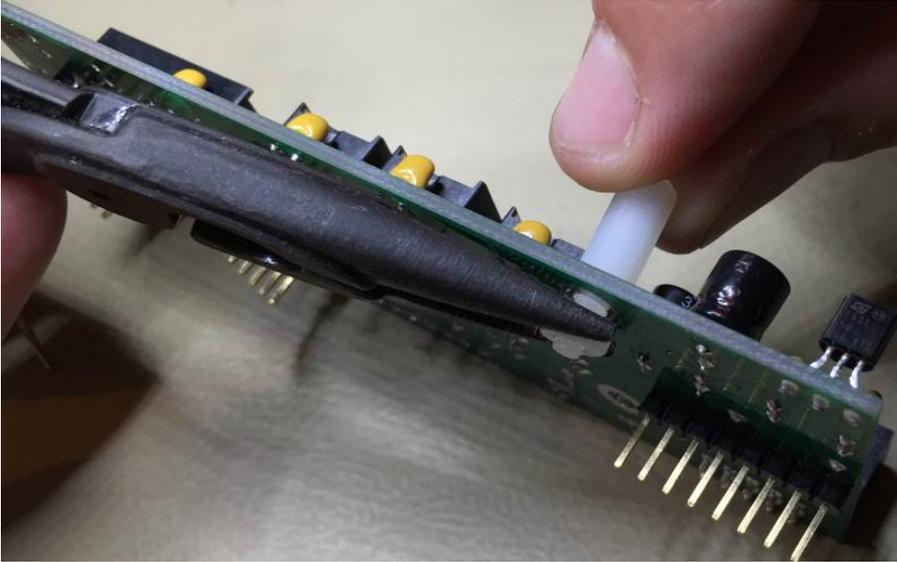
Step 20
Mount the IC's on PCB2. The IC's indent or dot marking pin 1 must match the silk screen direction.
The picture below shows where each IC go as well as the position of the spacer and the 10 pin connector.
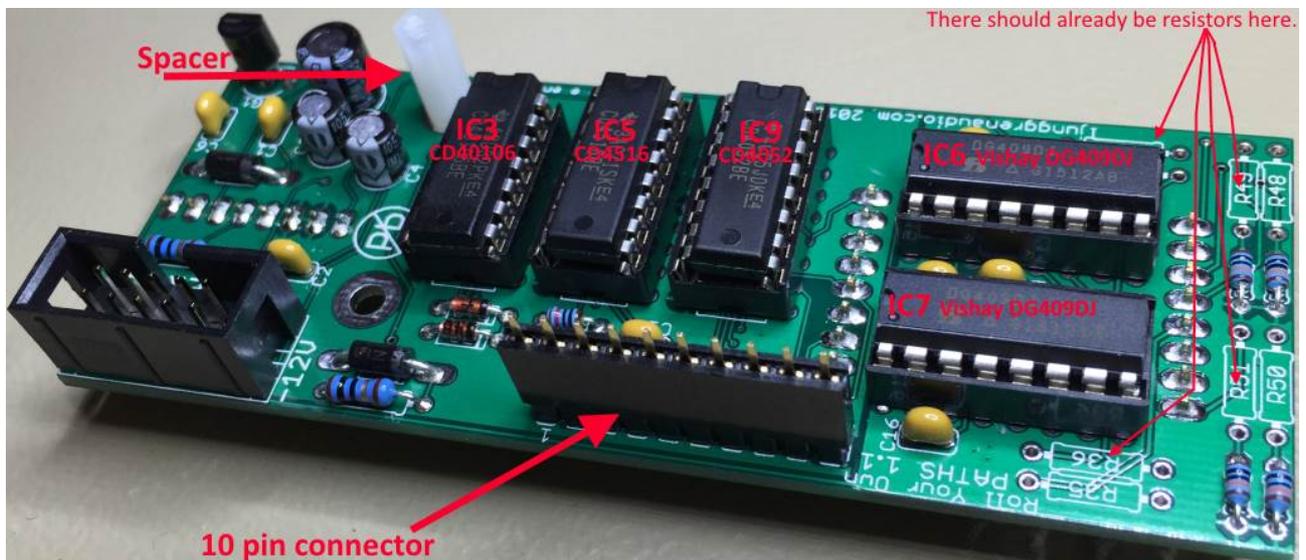
IC3 CD40106 1pcs
IC5 CD4516 1pcs
IC9 CD4052 1pcs
IC6, **IC7** DG409DJ 2pcs

Step 21

Mount the IC's on PCB2. The IC's indent or dot marking pin 1 must match the silk screen direction.

IC4 *TL084 or TL074 1pcs*
IC8 *LM339 1pcs*
IC10 *CD4043 1pcs*

Step 22

Solder the connector between PCB2 and PCB3.

One 10 pin 1 row connector, place the pin strip part in the socket strip part like with the previous connectors. Place the socket strip part towards PCB3 and the pin strip part towards PCB2. This gives uniformity between modules but it doesn't matter if you happen to place it the other way around.

For support while soldering the connector screw the screw into the spacer like shown in the picture below. Hold the spacer firmly with pliers, this step have a bit of friction to it. Unscrew it after you have soldered the connector but let the spacer with nut still be mounted on PCB2.
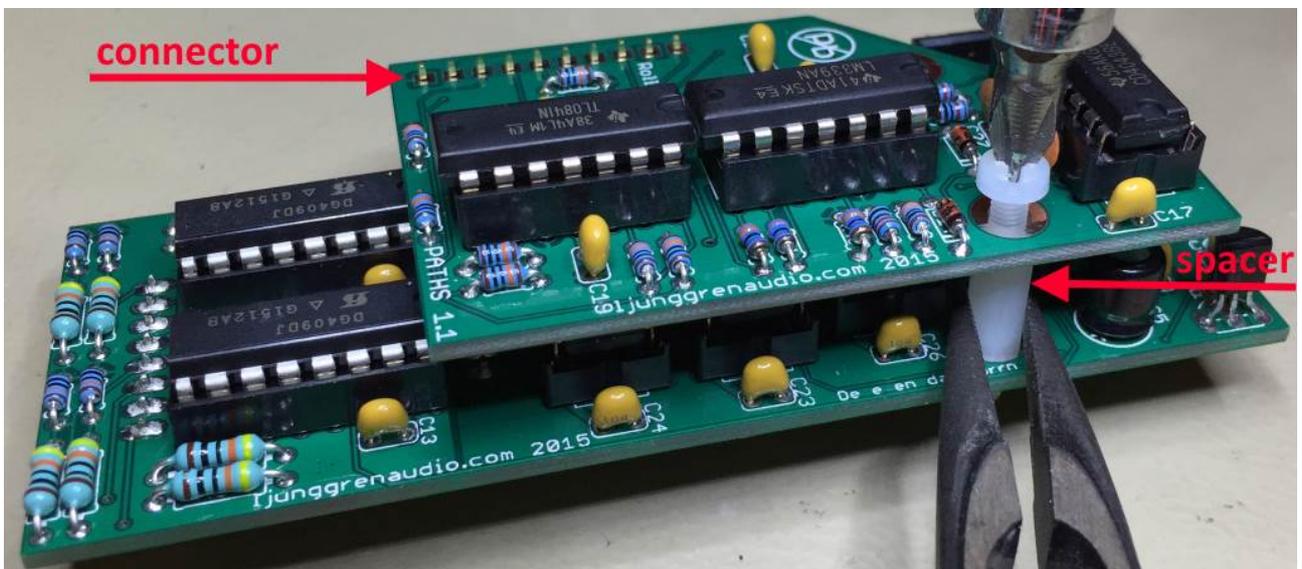
Step 23
Mount the second spacer and nut on PCB1, place it where it's shown in the picture below. It helps holding the nut with pliers while screwing in the spacer part.

Step 24
Mount **IC1 CD4081** and **IC2 CD40106** in their sockets like in the picture above.

Step 25
Flip PCB1 over and place the jacks. Bend the ground pin slightly so it reaches the ground-pad like in the picture below. The jacks as well as all other panel components will be soldered after the front panel is in place to reduce stress on the solder joints.
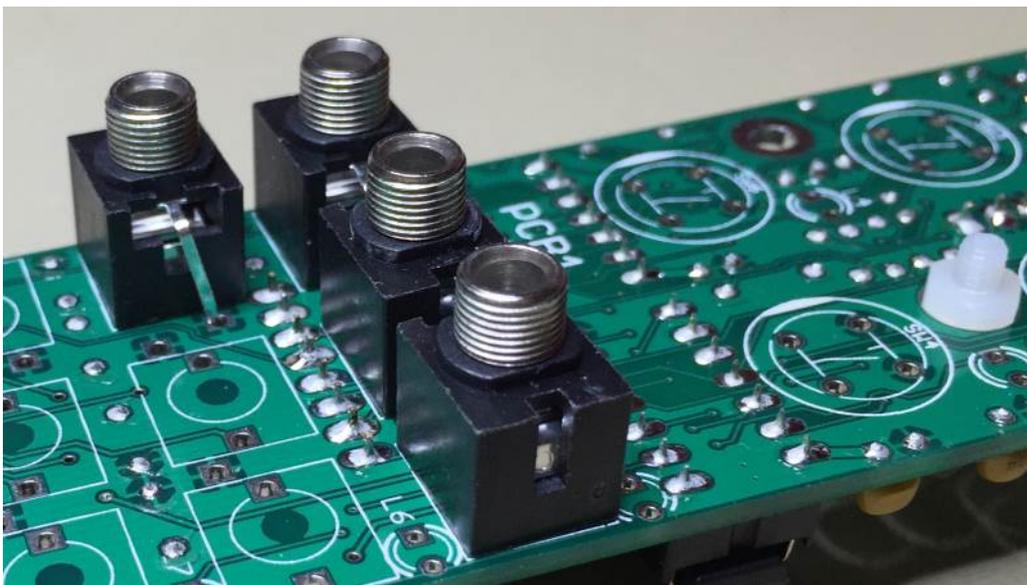
Step 26
Place the rest of the panel components without soldering and mount the panel.

The buttons flat side need to match the white fill-in pointing towards the left of the PCB.

The LEDs long pin (anode, +) need to be placed in the hole with the square pad. Some of the LEDs will have slightly bent pins to reach their panel holes.

Take care to get the correct toggle switch in the correct place, they are not sensitive to mounting direction.

Make sure the panel is equally far away from the PCB on the toggle switch side (top) as on the jacks side (bottom). Mount the nuts with a washer under on all jacks and toggle switches, nothing should be placed between the panel and the jack or switch. The toggle switches have a different nut that comes with it, it's very similar but still different from the jacks nuts so try not to mix them up.
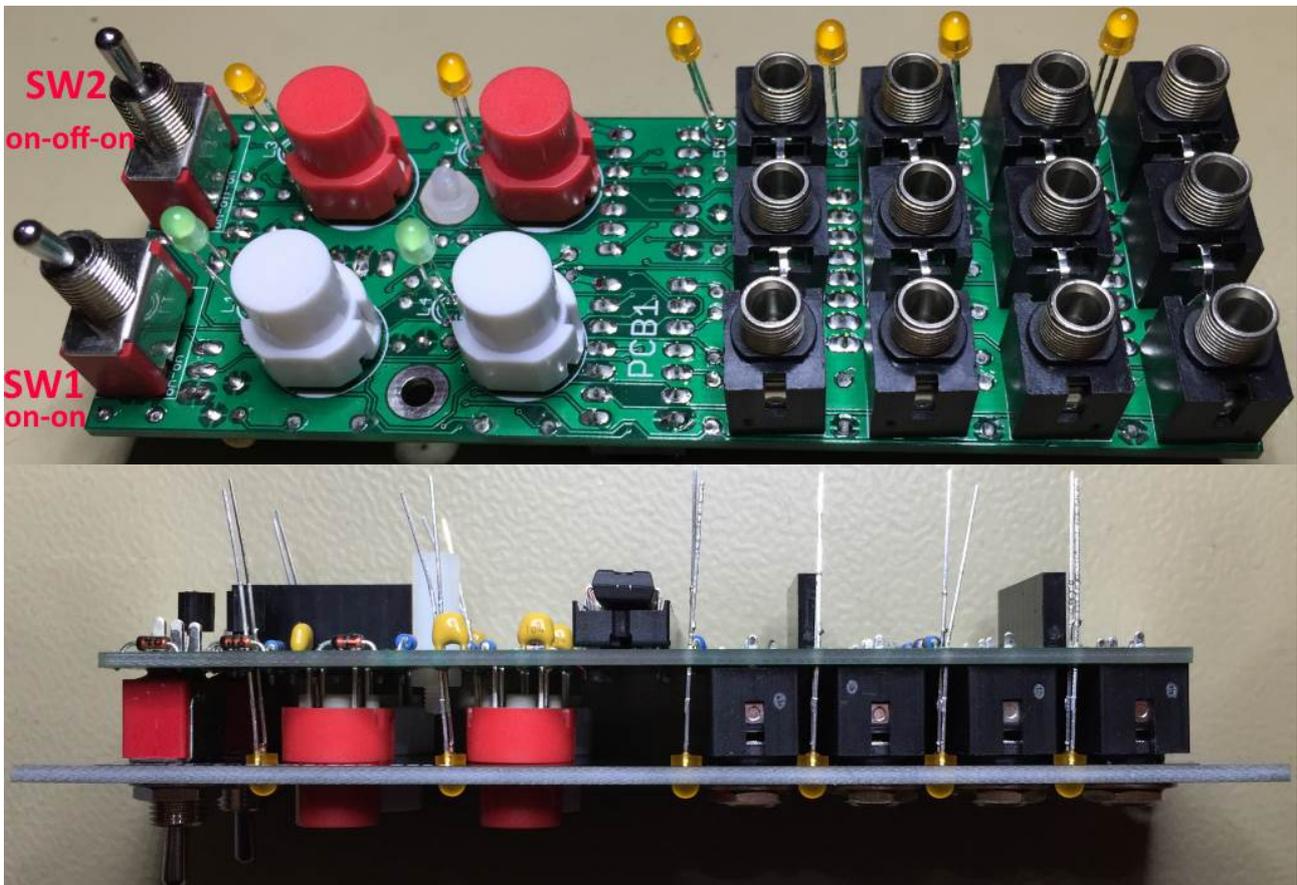
Step 27
Solder all panel components except the buttons after the panel is in place. The buttons will be soldered in the next step.

Step 28

Cut a small piece of cardboard to use as support under the buttons while soldering them. You could use other materials as well. Make sure the support piece only covers the buttons and not the toggle switches or jacks.

Place the module over the edge of the table with the toggle switches sticking out and carefully make sure the buttons are properly in place. Now solder the buttons.
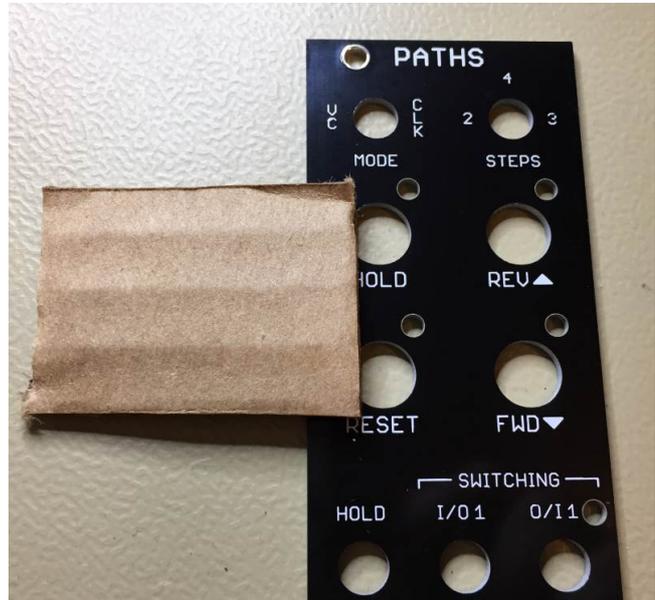
Step 29
After all panel components are soldered you can mount PCB1 and PCB2 together. Screw the screw into the spacer like shown in the picture below. Hold the spacer firmly with pliers, this step have a bit of friction to it.
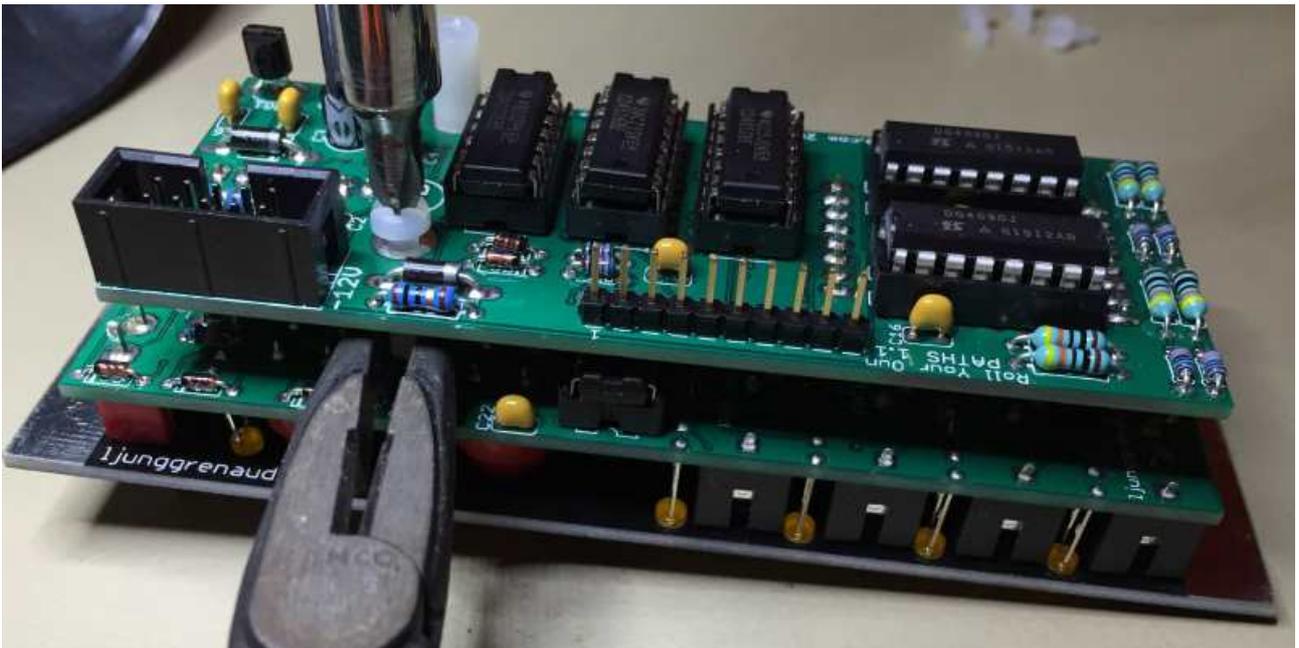
Step 30
Continue with mounting PCB2 and PCB3 together.

Step 31
Mount the power cable. Red stripe at -12V.

Finished module!