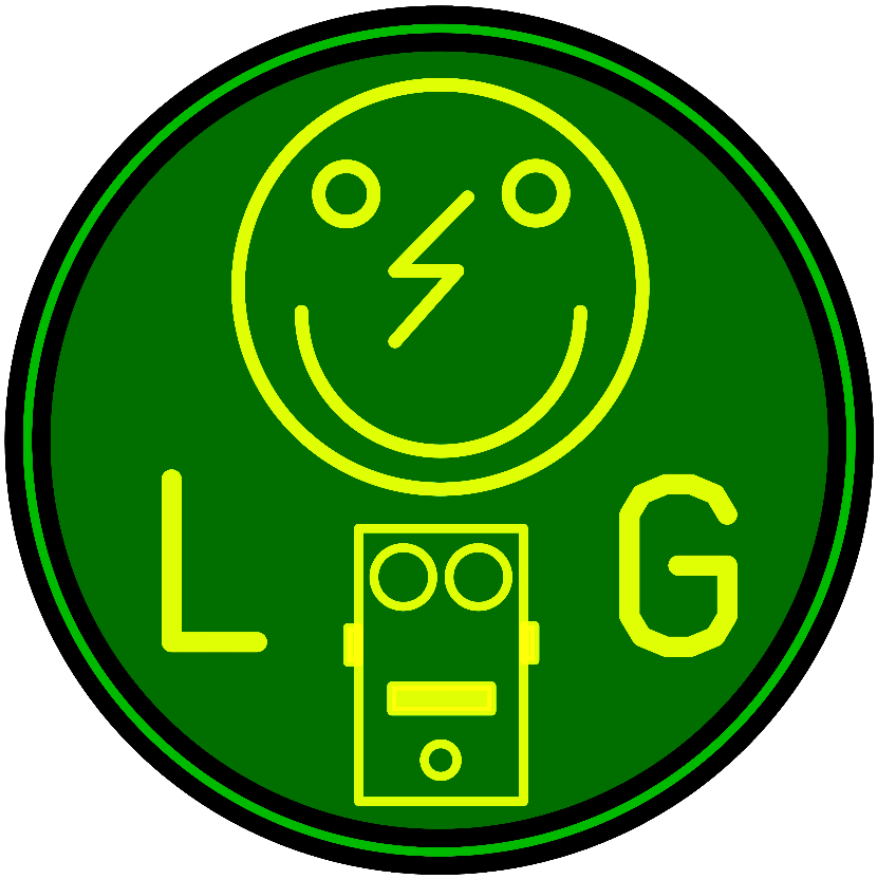
OmniWah

Building instructions

v1.0



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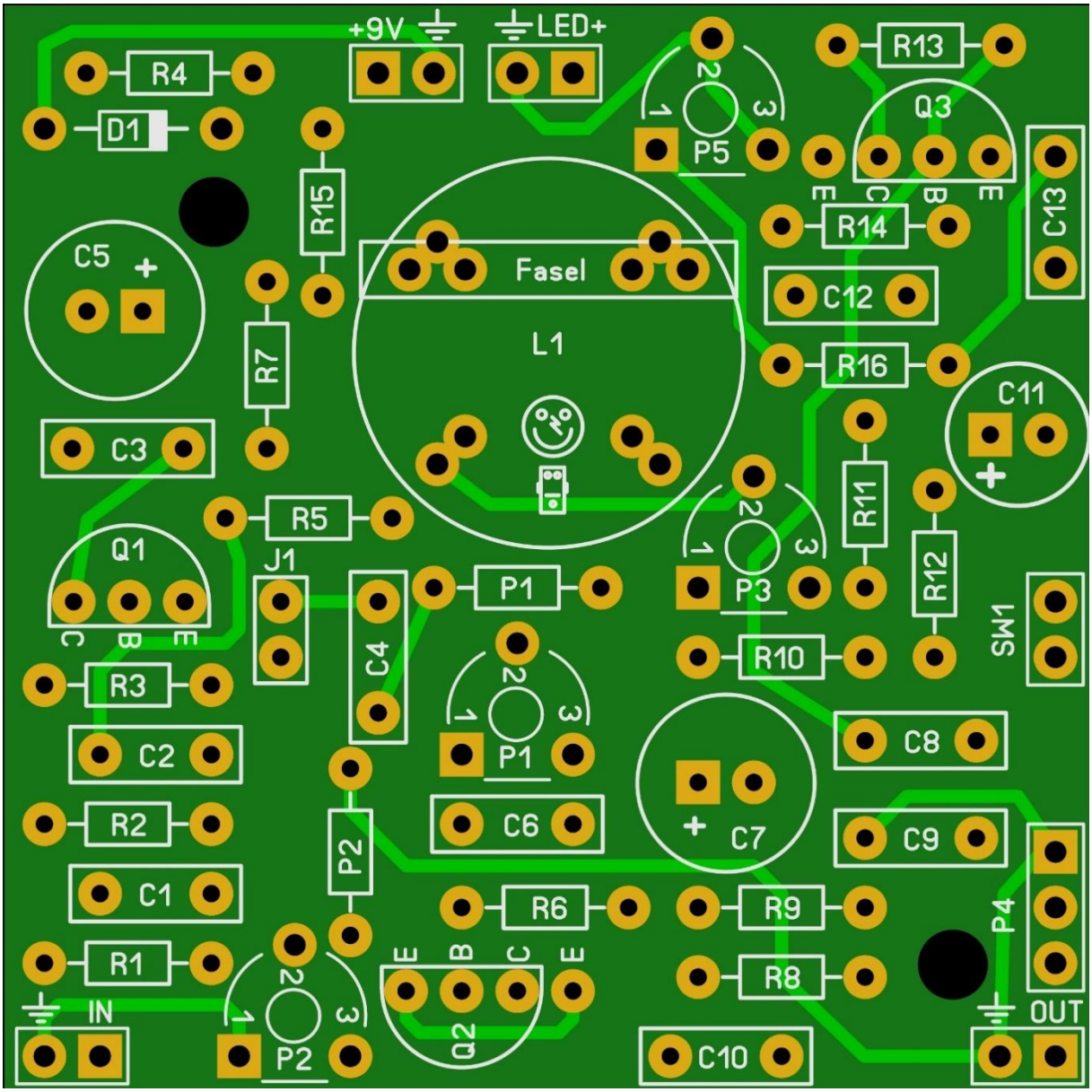
Read this entire manual thoroughly before you start building the effect! There are some available options and mods and you should choose which one you want to incorporate before starting your build.

Last update: 10-12-2017

PCB layout



Dimensions: 50 mm x 50 mm
1.97 inch x 1.97 inch

Build options

This PCB can be used to mimic a wide range of vintage and modern wahs. In the components section the following abbreviations will be used:

Vintage Wahs

- Thomas: Thomas Organ CryBaby
- Grey: Vox Grey Wah
- V847: Vox v847 Wah
- Color: Colorsound Inductor wah
- Shin: Shinei Wah
- BG-1: Maestro Boomerang Wah BG-1

Modern signature Wahs

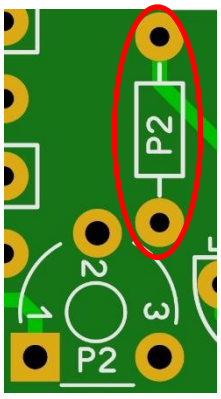
- JH-1: Dunlop JH-1 Hendrix Crybaby
- ZW-45: Dunlop ZW-45 Wylde Crybaby
- DB-1: Dunlop DB-1 Dimebag Crybaby
- JC-95: Dunlop JC-95 Jerry Cantrell Crybaby
- Omni: Modded Dunlop GCB-95 Crybaby

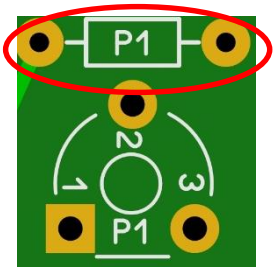
In the components section you will find the components needed for the different configurations. When it says “jump”, there is no component to be place but instead you’ll need to connect both pad of the component with a jumper wire (eg a spare piece of lead wire you get when cutting a resistor to size). When it says “jump 1-2”, then you’ll need to connect pad 1 to pad 2 of the component with a jumper wire. With “jump 2-3” you’ll need to connect pad 2 to pad 3 of the component with a jumper wire.

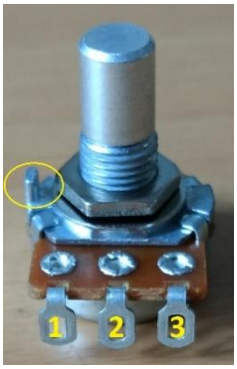
A dash (“-“) means there is no component to be placed at that spot for that type of wah.

P1-**P5** can be either an internal or external potentiometers. When you want to use the controls during play, I suggest you make them external by using an Alpha 16mm pot meter. The pads are marked accordingly to match the pins of the potentiometer. Else us a 6 mm PCB potentiometer.

P1 and **P2** can be either a potentiometer or a single resistor depending on the type of wah you want to build. Only for the Omni version you’ll need to add the potentiometer. For all other versions, you can use the added special extra pads (marked in red below) on the board for the fixed (or jumped) value resistor.







Components

	Thomas	Grey	v847	Color	Shin	BG-1
C1	-	-	-	-	-	-
C2	-	-	-	-	-	-
C3	-	-	-	-	-	-
C4	jump	jump	jump	jump	5n	4n7
C5	-	-	-	-	-	-
C6	10n	10n	10n	10n	jump	jump
C7	3u9	4u7	4u7	10u	10u	6u
C8	220n	220n	220n	220n	200n	1u
C9	-	-	-	-	-	-
C10	220n	220n	220n	220n	200n	1u
C11	-	-	-	-	-	-
C12	-	-	-	-	-	-
C13	10n	10n	10n	10n	30n	10n
D1	-	-	-	-	-	-
J1	jump	jump	jump	jump	jump	jump
L1	500mH	250mH	500mH	550mH	500mH	500mH
P1	68k	68k	68k	100k	30k	47k
P2	470R	470R	510R	jump	470R	120R
P3	Jump 2-3	-	Jump 2-3	Jump 2-3	Jump 2-3	Jump 2-3
P4*	B100k	B100k	B100k	B100k	B50k	B25k
P5	Jump 1-2	Jump 1-2	Jump 1-2	Jump 1-2	Jump 1-2	Jump 1-2
Q1	-	-	-	-	-	-
Q2**	5517	BC150	MPSA18	BC184	2SC828	BC109C
Q3**	2N2925	BC150	MPSA18	BC167B	2SC828	BC109C
R1	-	-	-	-	-	-
R2	-	-	-	-	-	-
R3	-	-	-	-	-	-
R4	jump	jump	jump	jump	jump	jump
R5	-	-	-	-	-	-
R6	1k5	1k5	1k5	1k6	1k2	1k2
R7	22k	22k	22k	22k	22k	10k
R8	470k	470k	470k	470k	470k	-
R9	470k	470k	470k	470k	470k	1M5
R10	82k	82k	100k	-	-	-
R11	33k	-	33k	100k	100k	47k
R12	-	-	-	-	-	-
R13	-	-	-	-	-	620k
R14	-	-	-	-	-	-
R15	1k	1k	1k	jump	1k2	jump
R16	10k	10k	10k	10k	10k	8k2
SW1	-	-	-	-	-	-

	JH-1	ZW-45	DB-1	JC-95	Omni
C1	10n	10n	10n	10n	10n
C2	22p	22p	22p	22p	22p
C3	100n	100n	100n	100n	100n
C4	jump	jump	jump	jump	jump
C5	100u	100u	100u	100u	100u
C6	10n	10n	10n	10n	10n
C7	4u7	4u7	3u9	3u9	3u9
C8	220n	220n	220n	220n	220n
C9	22n	-	-	-	-
C10	220n	220n	220n	220n	220n
C11	-	-	-	-	-
C12	-	-	-	-	-
C13	10n	22n	10n	12n	10n
D1	ZL9M3	-	-	-	ZL9M3
J1	-	-	-	-	-
L1	500mH	500mH	535mH	500mH	500mH
P1	68k	68k	68k	68k	B100k
P2	390R	390R	470R	390R	B1k
P3	Jump 2-3	Jump 2-3	Jump 2-3	Jump 2-3	B100k
P4*	B470k	B100k	B100k	B100k	B100k
P5	Jump 1-2	Jump 1-2	B5k	B5k	B10k
Q1	MPSA13	MPSA13	MPSA13	MPSA13	MPSA13
Q2**	MPSA18	MPSA18	MPSA18	MPSA18	MPSA18
Q3**	MPSA18	MPSA18	MPSA18	MPSA18	MPSA18
R1	-	-	-	-	1M
R2	2M2	2M2	2M2	2M2	2M2
R3	1M8	1M8	1M8	1M8	1M8
R4	1k	1k	1k	1k	1k
R5	10k	10k	10k	10k	10k
R6	1k5	1k5	1k5	1k5	1k5
R7	22k	22k	22k	22k	22k
R8	470k	470k	470k	470k	470k
R9	470k	470k	470k	470k	470k
R10	82k	82k	82k	82k	82k
R11	82k	33k	33k	33k	10k
R12	-	-	-	-	-
R13	-	-	-	-	-
R14	-	-	-	-	-
R15	1k	1k	1k	1k	1k
R16	10k	10k	10k	10k	5k1
SW1	-	-	-	-	-

Capacitors with values < 1nF are MLCC, values of 1nF – 1uF are SMF and all values > 1uF are Electrolyte. “B” means linear for potentiometers.

NB Wah pot tapers (**P4**) are not always linear!!

Modifications

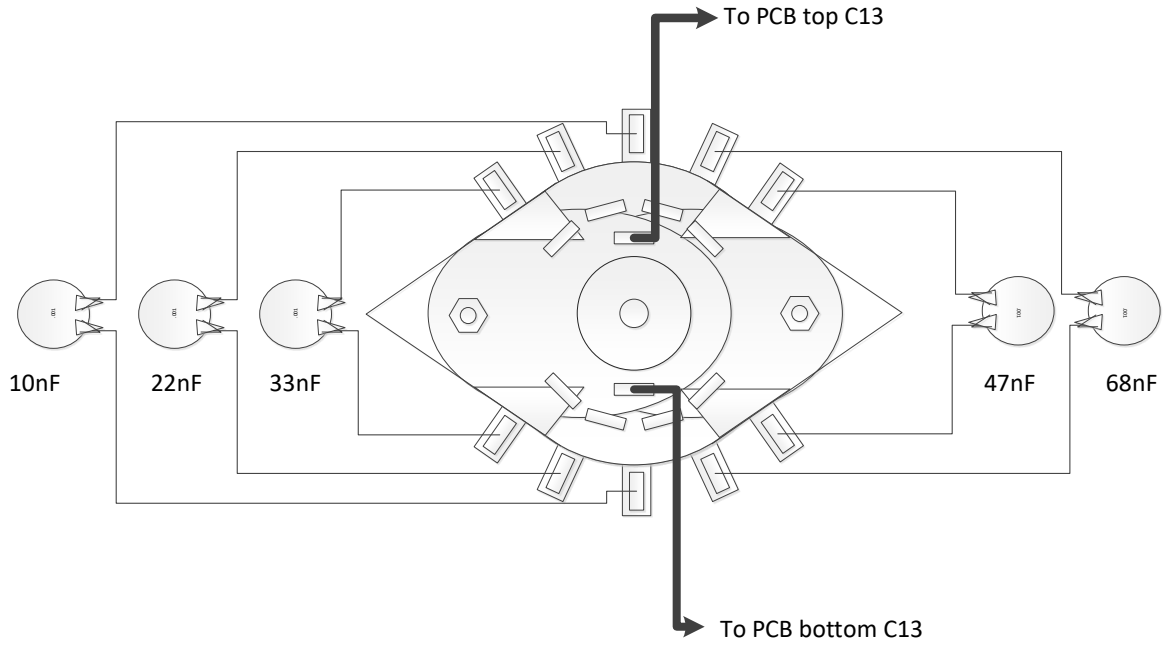
Mix and match

You could mix a few options of different versions to get your own custom effect. I think it would be a good idea to add **R1** (pull down resistor) and **P2** (Gain) to all types. This way you can reduce the pop when switching on the effect and add a gain control that influence the tone of the wah.

Also consider to experiment with different types of transistors. The described transistors can be replaced with any **300-400 Hfe NPN transistor**.

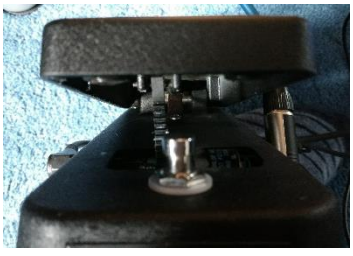
Sweep board

A nice added feature can be to add a sweep board to replace **C13**. You can use a rotary switch for the for example a 2P5T so you can switch between 5 different values. The example below is just for reference. You can always use different values then mentioned in the picture.



Mechanical Sweeprange mod

If you are using an old crybaby shell, then you might want to remove the rubber underneath the heel of the wah plate. Also you might want to cut about half of the front 2 rubbers off. This way the sweeprange of the wah will increase dramatically. But be careful not to remove too much. Maybe cut in stages and test.



Build sequence

Soldering this board can be very complicated for some people since the solder pads are very close together. Use a magnifying glass to make the job easier. The trick to soldering a PCB is to work from small to big components. My building sequence suggestions in this section are based on the parts I used myself. Sometimes some components are smaller (or bigger) so always use your own common sense and change the order accordingly. Usually capacitors can differ a lot in size depending on their rating and value.

Note: Do not blow on your solder in an attempt to cool it down. That can result in a bad join that might corrode!

Start by soldering the jumpers where needed. Next, solder the resistors and Zener diode.

If you want to experiment with other transistors then you could socket them instead of soldering them to the board. You'll need a some 20 SIL sockets, break off the sockets and solder them to the board. Now is the time to solder these sockets on the PCB. Place the transistors only once you are finished with all soldering and off board wiring!

Note: Orientation of the transistors vary for each different type you use. For this reason I marked the pinout on the board for your convenience. I also added a graphic of the rounded side of the transistor. This is based on the vintage transistors. Eg. a MPSA needs to be rotated 180 degrees! Always consult the datasheet of the transistor and orient accordingly.

Now continue by soldering the small capacitors (MLCC) then the small SMF, trimpots and then the Electrolytes. Finish with soldering the inductor.

I suggest you now drill the holes in your enclosure (maybe a spare old crybaby shell) so you can use it during the off board wiring.

Note: Really take some time to determine where to place the pots, switches, jacks and PCB in the enclosure before you start drilling. Measure twice, drill once.

You are almost ready to rock, well… not really. The difficult part starts now.

Besides the components mentioned in the components table, you will need:

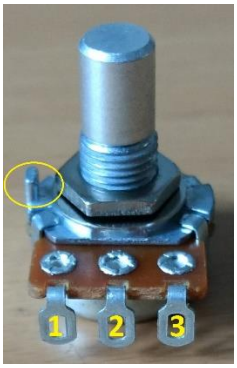
- **2 input jacks**. 2 mono jacks if you are not going to use a battery but only the 9V adapter. 1 mono (for output) and 1 stereo jack (for input) if you will be using both a 9V battery and the 9V adapter.
- **1 x 3PDT footswitch** (9 pins)
- **2,1mm DC jack** (isolated).
- **9v battery clip** (optional).
- **22 gage stranded hook-up wire.**
- **A LED holder.** This enables you to mount the LED in the enclosure.
- **Wah enclosure** (new or used).

Off board wiring

Potentiometers

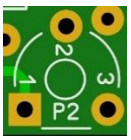
In the pictures below you see the correct pin numbering of the pots (Alpha 16mm style).
Solder the wires accordingly and it is always a good idea to twist the wires together to create a sort of extra shielding against external noise.

You can break off the pin I marked with the yellow circle with a small pair of pliers.



P1 Volume

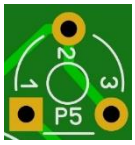
P2 Gain



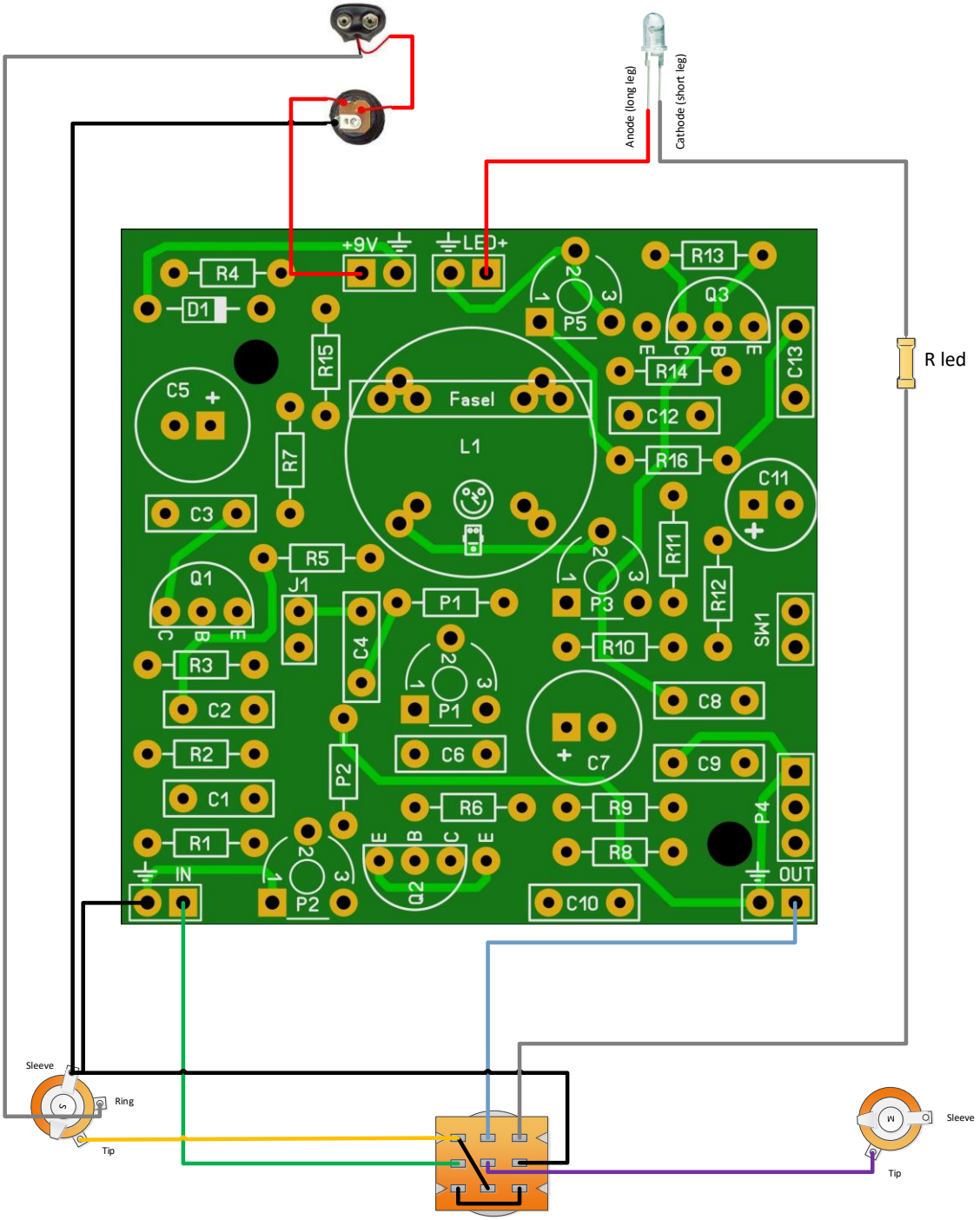
P3 Voice

P4 Wah

P5 Sweep



Footswitches and stargrounding



Note that **R led** is a **4k7** resistors. You can change this value depending on the type of LED you use but 4k7 is safe enough for almost all LEDs @ 9V.

It is now time to place your transistors in the sockets if needed. Connect everything, build it in your enclosure and enjoy your effect!

The sleeve on the output jack is not connected on purpose. Make sure the output jack is in good electronic contact with the enclosure else you can try and connect the sleeves of the input and output together. If you test the unit outside of an enclosure you need to connect the output sleeve to ground!

Troubleshooting

All PCB's have been 100% factory e-tested and out of every batch I receive I build an effect to double check, so there should not be a connection problem on the PCB itself.

The board is not working (at all), what now?

- Check if your 9V is plugged in correctly (and/or soldered correctly on the board). Pay special attention to the polarity.
- Check that you oriented the capacitors, IC's ,transistors and diodes the right way. SMF, MKT and ceramic capacitors as well as resistors do not need to be oriented. A likely sign of incorrect capacitors and/or orientation is when an effect is sputtering, rumbling or "motorboating".
- Check if you used the correct values of the components. For resistors you can look here: http://www.diyaudioandvideo.com/Electronics/Color/
- Double and triple check your soldering! A loose or cold solder can be really bad for your board.
- Replace the IC and/or transistors, one might be defective. Before doing that first unplug the 9V and wait for 5 seconds.
- Check that you have good/high grade components. A lot of Chinese sourced parts are fakes (especially high end opamps, audio capacitors, vintage diodes and transistors) so be careful that you source your parts from reliable suppliers.

Schematic