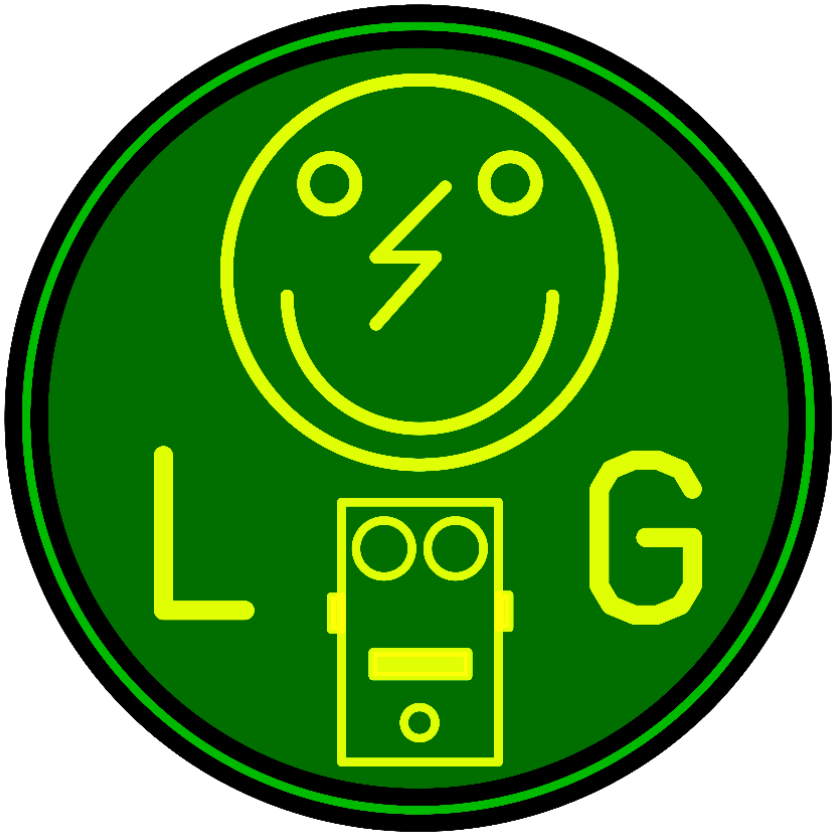
Snail Gear

Building instructions

V1.1



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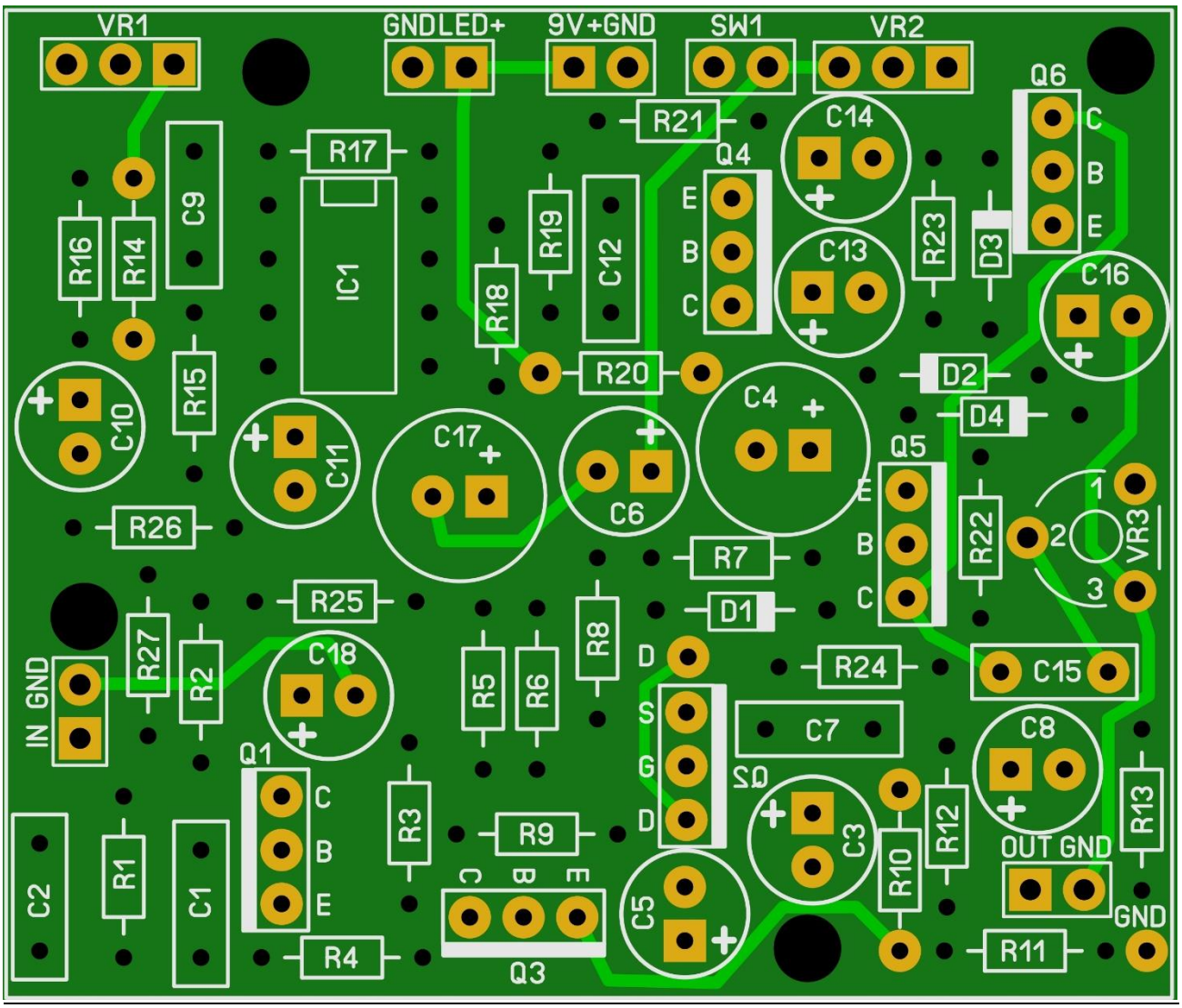
Read this entire manual thoroughly before you start to building the effect! Especially the Modification and Biasing part. Decide before building the effect which mods you want to try so that you do not need to desolder parts later.

Last update: 26-02-2017

Components

Name	Value	Comment	Name	Value	Comment
C1	47n	MKT	**R1**	1k	
C2	22n	MKT	**R2**	470k	
C3	1u	Electrolyte	**R3**	10k	
C4	47u	Electrolyte	**R4**	22k	
C5	1u	Electrolyte	**R5**	3k3	
C6	470n	**Electrolyte!**	**R6**	470k	
C7	33n	MKT	**R7**	47k	
C8	1u	Electrolyte	**R8**	1M	
C9	22n	MKT	**R9**	1M	
C10	1u	Electrolyte	**R10**	1M	
C11	10u	Electrolyte	**R11**	10k	
C12	1n	MKT	**R12**	1k	
C13	1u	Electrolyte	**R13**	100k	
C14	1u	Electrolyte	**R14**	470R	
C15	47n	MKT	**R15**	220k	
C16	10u	Electrolyte	**R16**	390R	
C17	33u	Electrolyte	**R17**	1M	
C18	10u	Electrolyte	**R18**	1k	
D1	Zener 5,6V		**R19**	390k	
D2	1n4148		**R20**	4k7	
D3	1n4148		**R21**	4k7	
D4	1n4148		**R22**	100k	
IC1	TL071		**R23**	100k	
Q1	BC549C		**R24**	10k	
Q2	2SK30A	2N5457 use extra D pad	**R25**	22k	
Q3	BC549C		**R26**	22k	
Q4	BC549C		**R27**	1M	
Q5	BC549C	Match with Q6	**VR1**	A100k	Sensitivity
Q6	BC549C	Match with Q5	**VR2**	B25k	Attack
			VR3	B10k	BIAS Trim pot

PCB layout

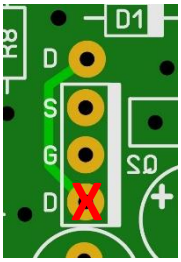

VR1
GNDLED+
9V+GND
SW1
VR2
R21
Q6
C
B
E
C14
Q4
E
B
C
R17
C9
R16
R14
IC1
R19
C12
R18
C13
R23
D3
C16
R15
R20
D2
D4
C10
C11
C17
C6
C4
Q5
E
B
C
R22
1
2
3
VR3
R26
R7
R25
D1
R27
R2
C18
R5
R6
R8
D
S
G
D
R24
C15
IN GND
Q1
C
B
E
C7
SD
C8
R3
R9
C
B
E
C3
R10
R12
R13
C2
R1
C1
C5
OUT GND
GND
R4
Q3
R11

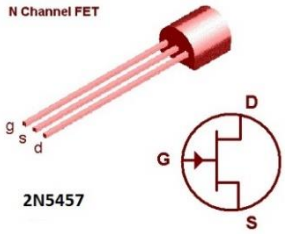
General guideline for components

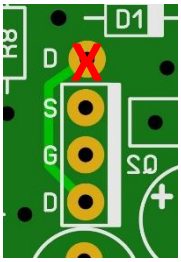
- Capacitors: All values under 1nF should be ceramic disks or silver mica. From 1nF up to 1uF should be SMF (Panasonic stacked metal film) or MKT (Metallized plastic polyester) and values over 1uF use electrolyte caps 16V+ rated and watch out for polarity.
- Resistors: use 1% metal film for the best results.
- Socket the IC's. This way you can easily mod them or replace them if they break.
- Orientation of the transistors: the white stripe on the PCB indicates where the flat side of the transistor should be <u>except</u> for Q2, that one the bold side is facing the white stripe.

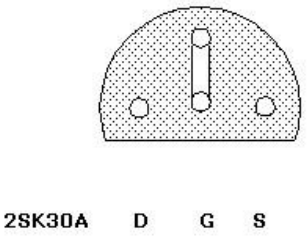
General building tips

Before you start you will need to make sure that you match the Hfe of Q5 and Q6 for the best result. Matching is done by using a Digital Multi Meter (DMM). Get them as close together as possible. You can use any BC549A/B/C or even BC550A/B/C for Q1,Q3,Q4,Q5 and Q6. For Q2 you can <u>only</u> use a 2SK30A or a 2N5457, but the pinout is different so you'll need to use the extra D pad for the 2N5457:

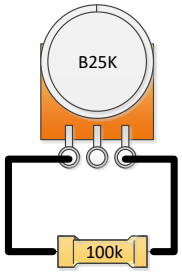








The original Attack pot is B20K. You can easily use the readily available B25K or you can place a 100K resistor between pins 1 and 3 to lower the B25K to B20K.



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. If you want to experiment with other transistors than you could socket them instead of soldering them to the board. You'll need a 20 SIL, break off the sockets and solder them to the board.

Start by soldering D2-D4 and then solder the resistors (but not yet VR3) and then D1.

<u>Note:</u> Diodes are fragile!! Do not expose them to heat for too long or they'll break. Do not blow on your solder in an attempt to cool it down. That will possibly result in a bad join that might corrode!

Next, solder the IC sockets, and transistors or if desired the transistor sockets (only if you want to try different transistors!) then the VR3 and MKT. Lastly solder the electrolyte capacitors.

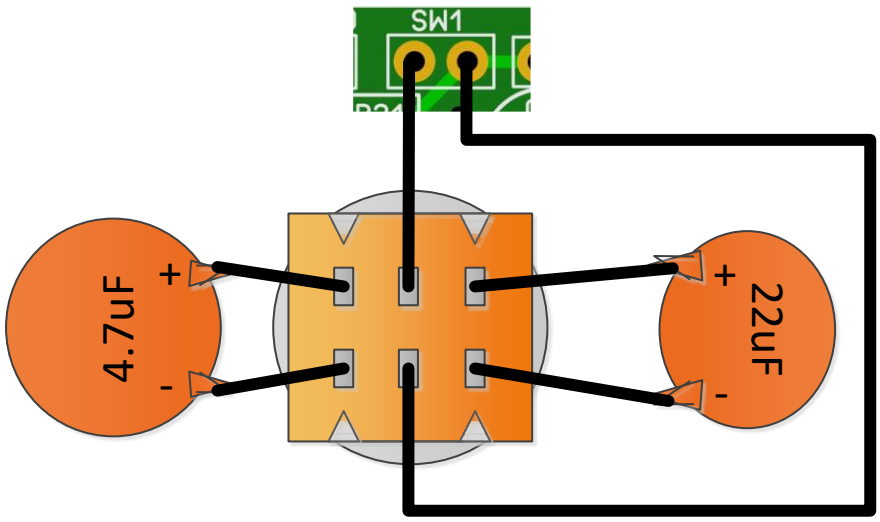
Place the IC (and transistors) and you are almost ready to rock. The flat sides of the transistor are indicated by the thick white line.

Besides the components mentioned in the table on the page 3, 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.
- **1x 3PDT footswitch** (9 pins). I also sell an easy off board circuit for true bypass.
- **2,1mm DC jack** (isolated).
- **9v battery clip** (optional).
- **22 gage stranded hook-up wire.**
- **1 x 3mm LED** (and if needed a LED holder to mount it in the enclosure)
- **Hammond 1590B** case (or similar) in your favorite color. A **Hammond 1590BB** will give you more room to build especially when using the swell mod.

Modifications

- **Swell MOD.** You can extend the swell time by changing C6 to a higher value. Especially for this mod the SW1 is added to the board. If you do not decide to use the mod then leave out the SW1. If you do want to use the mod, I suggest using a DP3T (ON/OFF/ON) switch with the 4.7uF on one side and eg. a 22uF on the other side. Experiment with different values before you decide to do the mod. You could even make a rotary switch with even more values! The lower you set the Attack, the longer the swell takes. In combination with a 22uF (C6) it is about 0,5 seconds.



- The original uses a LM741 instead of a TL071.

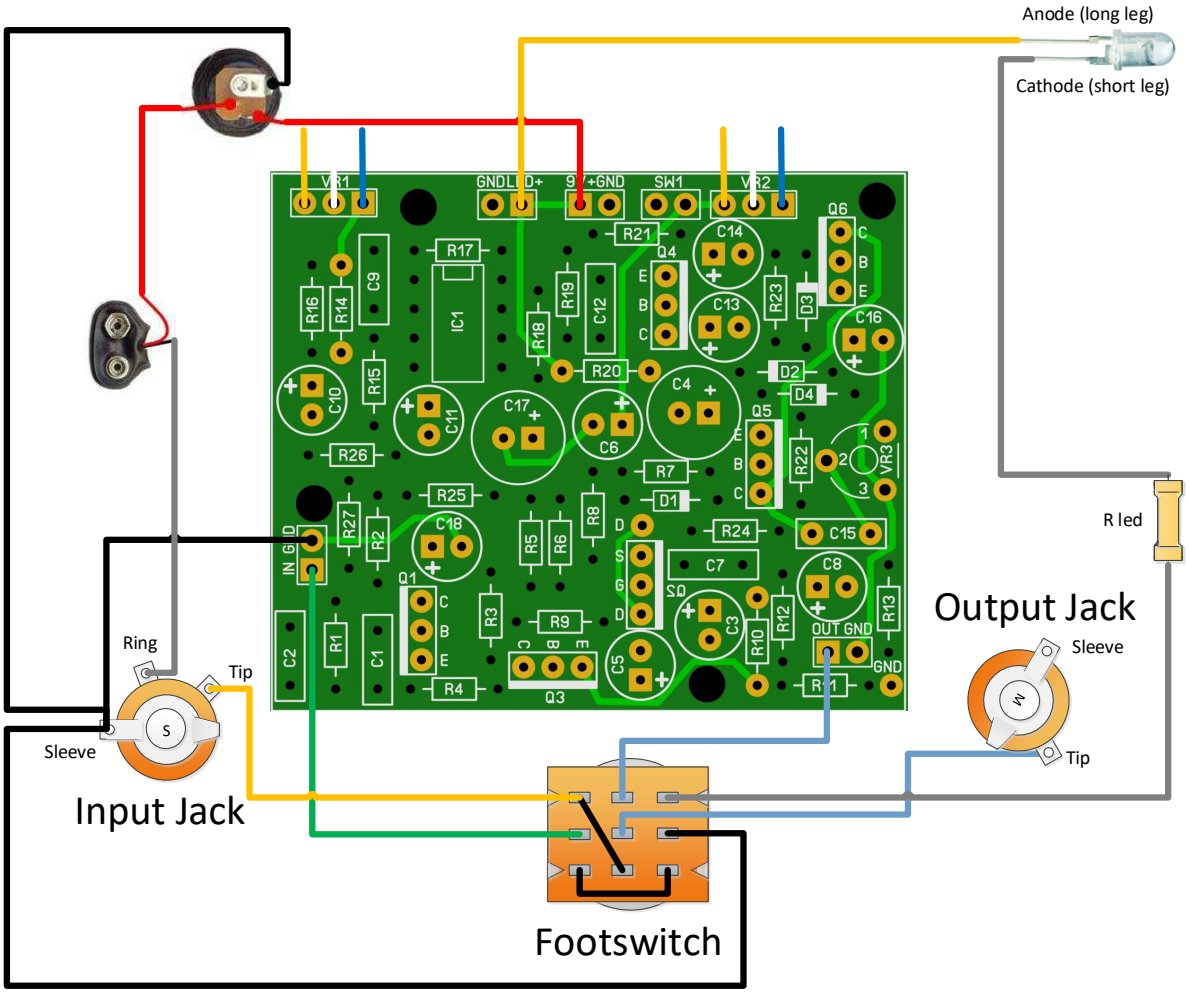
Biasing

The most important part of this build is the biasing. If your effect is inaudible at low attack settings then it is not biased correctly. Biasing can be done by ear, but can be difficult, so take your time.

1. Turn **Attack** to 0 (=fully counterclockwise) and **Sensitivity** to 5 (=halfway/12 o'clock) and VR3 to 10 (=fully clockwise)
2. Turn the VR3 until you hear the effect swell correct and without volume loss.

NB the Sensitivity pot is used to adapt the effect to the amount of input the effect gets (like an input boost). If you use a booster/fuzz in front of the effect, you will need to lower the Sensitivity to get the optimal result.

Off board wiring



Blue = pin 1
White = pin 2
Yellow = pin 3

The LEDs requires a resistor (R led in the diagram) depending on the type of LED you are using. To be safe use a 3k3 or 4k7 resistor. If you want to be more exact then go here:
http://www.muzique.com/schem/led.htm

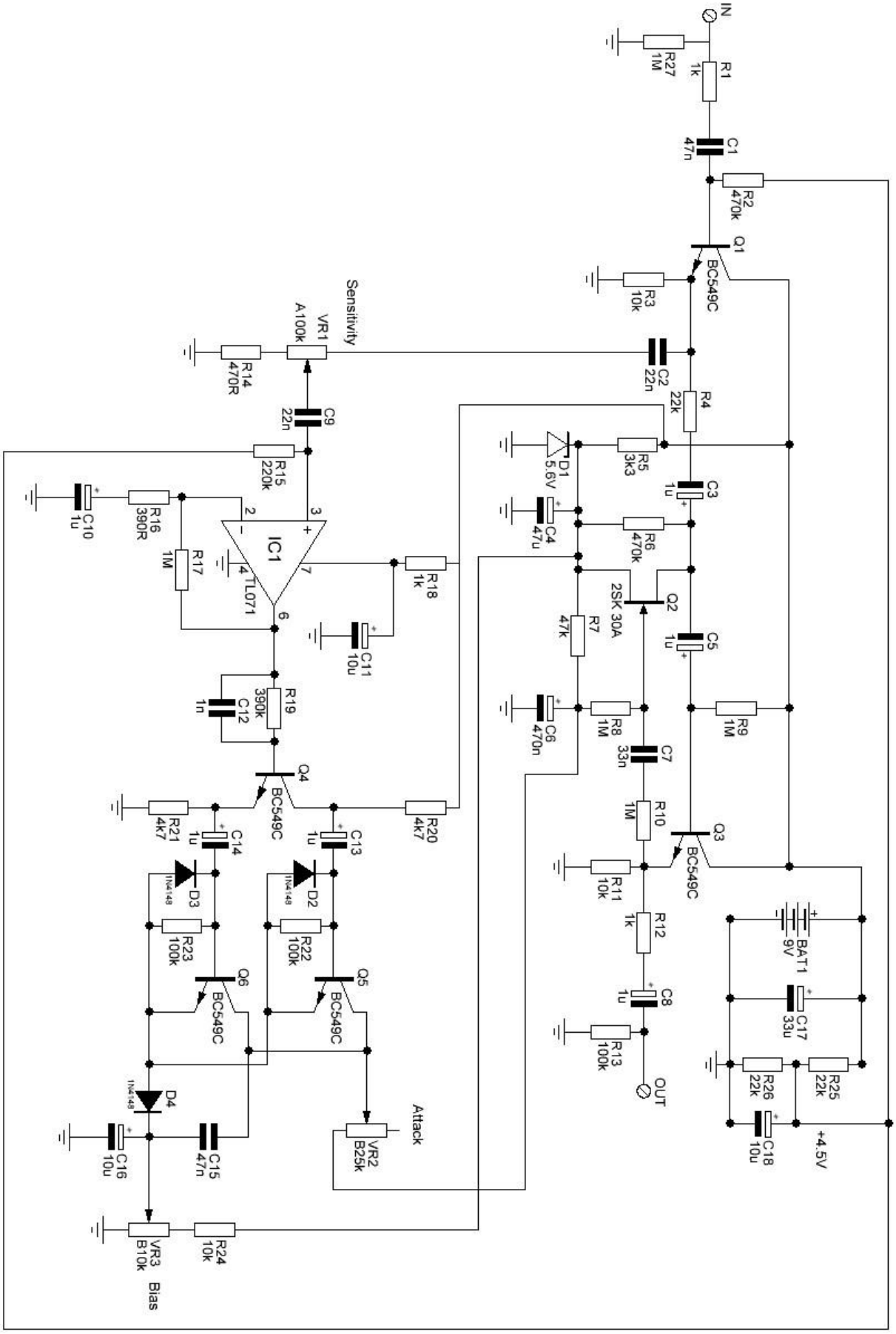
Troubleshooting

All PCB's have been 100% factory e-tested and out of every batch I receive I build a 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).
- Check that you oriented the capacitors, IC's ,transistors and diodes the right way. SMF, MKT capacitors and resistors do not need to be oriented.
- 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's and transistors, one might be defective. Before doing that first unplug the 9V and wait 5 seconds.
- Check that you have good/high grade components. A lot of Chinese sourced parts are fakes (especially high end opamps, vintage diodes and transistors) so be careful that you source your parts from reliable suppliers.

Schematic


IN
R27 1M
R1 1k
C1 47n
R2 470k
Q1 BC549C
R3 10k
C2 22n
R4 22k
Sensitivity
VR1 A100k
R14 470R
C9 22n
R15 220k
D1 5.6V
R5 3k3
C3 1u
C4 47u
R6 470k
C10 1u
R16 390R
R17 1M
IC1 TL071
R18 1k
C11 10u
2SK 30A Q2
R7 47k
C5 1u
C6 470n
R8 1M
R9 1M
C12 1n
R19 390k
C7 33n
R10 1M
Q4 BC549C
R21 4k7
R20 4k7
C14 1u
C13 1u
Q3 BC549C
R11 10k
D3 1N4148
D2 1N4148
R23 100k
R22 100k
R12 1k
BAT1 9V
C17 33u
Q6 BC549C
Q5 BC549C
C8 1u
R13 100k
OUT
R26 22k
R25 22k
D4 1N4148
Attack
VR2 B25k
C16 10u
C15 47n
C18 10u
+4.5V
VR3 B10k
R24 10k
Bias