Merlin

Building instructions

V1.1

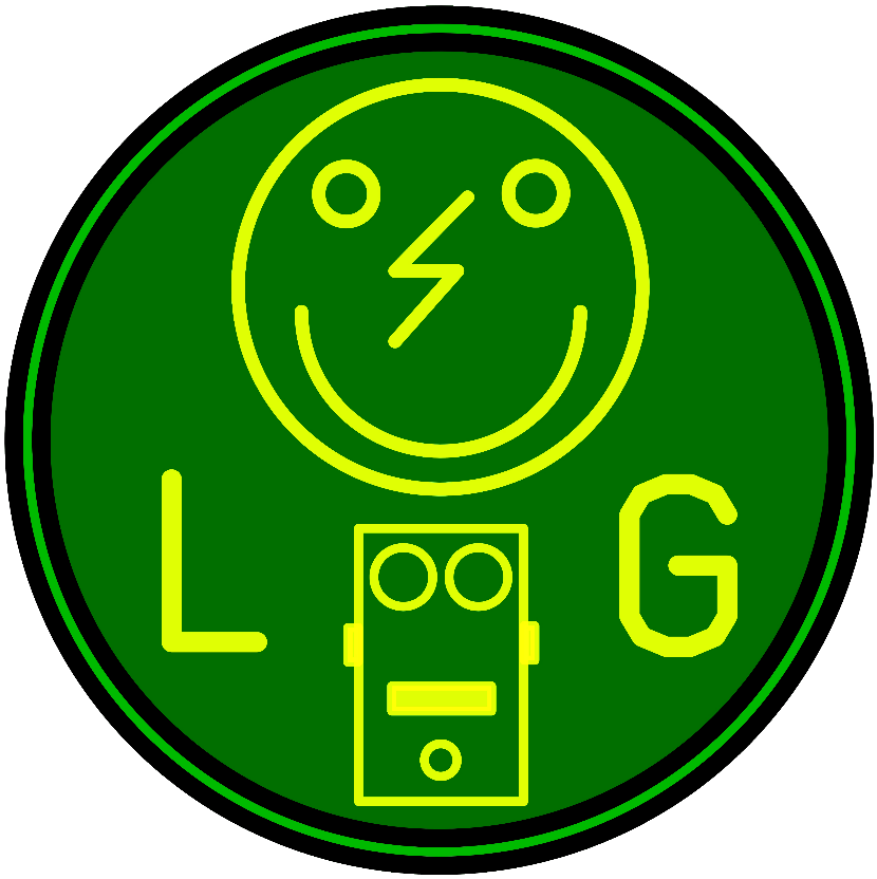


Table of contents

Changelog:
V1.0 : Initial version
V1.1 : Added **J1**, small silkscreen corrections, smaller PCB. Added OD11™ and Zen drive™ configuration

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

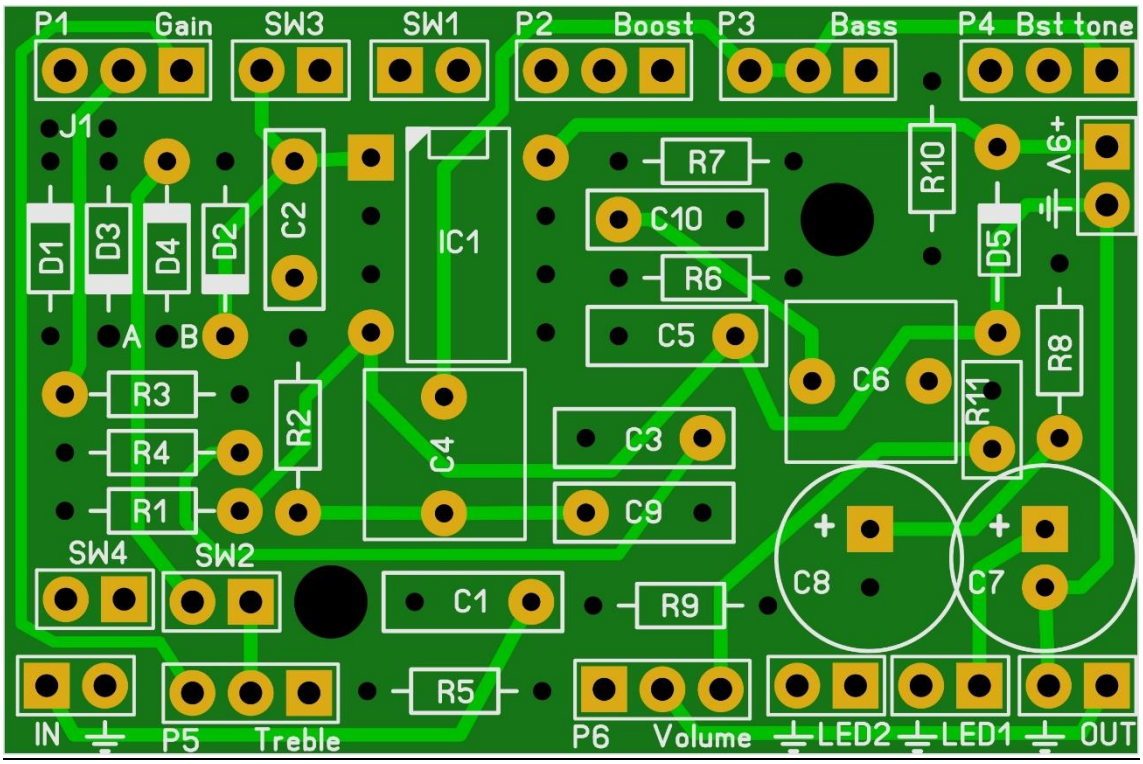
Last update: 20-08-2019

Components

Name	Value	Comment	Name	Value	Comment
C1	47n	MKT/SMF	R1	2M2	1% metalfilm
C2	100p	Silver mica	R2	510k	1% metalfilm
C3	39n	MKT/SMF	R3	3k3	1% metalfilm
C4	1u	MKT/SMF	R4	3k3	1% metalfilm
C5	10n	MKT/SMF	R5	1k5	1% metalfilm
C6	1u	MKT/SMF	R6	3k3	1% metalfilm
C7	47u	Electrolyte 16V+	R7	3k3	1% metalfilm
C8	47u	Electrolyte 16V+	R8	8k2	1% metalfilm
C9	150n	MKT/SMF	R9	10k	1% metalfilm
C10	4n7	MKT/SMF	R10	330R	1% metalfilm
D1	1N4148		R11	Jump	
D2	1N4148		P1	A500k/A1M	Gain
D3	1N4148		P2	A10k	Boost
D4	1N4148		P3	A50k	Bass
D5	1N4001		P4	A10k	Boost Tone
IC1	JRC4559		P5	A50k	Treble
SW1	3PDT	Boost footswitch	P6	A10k	Volume
SW2	SPDT	Soft Clipping			
SW3	DP3T (ON/OFF/ON)	Additional diodes	J1	Jump	Tim/timmy
SW4	DP3T (ON/OFF/ON)	Feedback loop			

A=Log, B=Lin, C=Rev. Log

PCB layout



Bill of Materials

Capacitors			
Value	**Amount**	**Type**	**Rating**
4n7	1	MKT or SMF	16V or higher
10n	1	MKT or SMF	16V or higher
39n	1	MKT or SMF	16V or higher
47n	1	MKT or SMF	16V or higher
150n	1	MKT or SMF	16V or higher
1u	2	MKT or SMF	16V or higher
47u	2	Electrolyte	16V or higher
100p	1	Silver Mica or Ceramic Disc	16V or higher
Diodes			
Value	**Amount**	**Type**	
1N4001	1		
1N4148	4-7	**minimal 4 maximum 7 (see modifications section)**	
LED	1	Red 3mm	
LED	1	Orange 3mm (only for Tim™)	
IC			
Value	**Amount**	**Type**	
JRC4559	1	Socket using a DIP-8 socket	
Resistors			
Value	**Amount**	**Type**	
330R	1	metal film 1%	
1k5	3	2 for LED's metal film 1%	
3k3	6	metal film 1%	
8k2	4	metal film 1%	
10k	2	metal film 1%	
510k	2	metal film 1%	
2M2	2	metal film 1%	
A10K	3	16 mm Alpha pot	
A50K	2	16 mm Alpha pot	
A500K or A1M	1	16 mm Alpha pot A500k for Tim™ A1M for Timmy™	
Switches			
Value	**Amount**	**Type**	
3PDT	2	Footswitch, Timmy™ uses only 1	
DP3T	2	Type ON/OFF/ON **OPTIONAL see modifications section**	
DPDT	2	**OPTIONAL see modifications section**	
SPDT	1	**OPTIONAL see modifications section**	

Building 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. If you want to experiment with other diodes then 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.

This board is primarily inspired by the Paul Cochran Tim™ and Timmy™, but with v1.1 you can also build a Lovepedal Zen Drive™ or OD11™ (which all are themselves based on the tube screamer… yes, nothing is original) using only this single board! If you want to recreate the **Tim**™ then solder all components. **SW3** and **SW4** are optional mods (see modifications section). If you want to recreate the **Timmy**™ then do not solder **SW1, C9, C10, R10, P2 and P4**. For **SW3** you can choose between the standard **SW3** or the original **SW3a** and **SW3b** (see modification section).

First decide which pedal you want to build. When making the Tim™/Timmy™ you must short **J1** with a spare piece of lead wire. Do not short **J1** for the OD11™ and Zen Drive™. **R11** is only used for the Zen Drive™, short it for the OD11™,Tim™ and Timmy™. Now solder the diodes and then the resistors. Again, If you want to socket the diodes then skip them and instead solder the sockets for the diodes. **Note:** 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!

Solder the IC socket next and then the small SMF/MKT capacitators, then the electrolytes, then the 1uF SMF/MKT and finish with the **C2** silver mica.

Place the IC (and diodes if socketed) and you are almost ready to rock.

Besides the components mentioned in the table on the page 4, 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. If you also want to incorporate the effects loop you'll need an extra mono jack and a switching mono jack (see effectsloop section).
- **2 x 3PDT footswitch** (9 pins) if you are building the Tim™ or only 1 if you are building the Timmy™.
- **2,1mm DC jack** (isolated).
- **9v battery clip** (optional).
- **22 gage stranded hook-up wire.**
- **2 x LED** if you are building the Tim™ or only 1 if you are building the Timmy™, OD11™ or Zen Drive™
- **Hammond 1590BB** case (or similar) in your favorite color for the Timmy and a **Hammond 1590XX** (or **Hammond 1590DD**) for the Tim™.

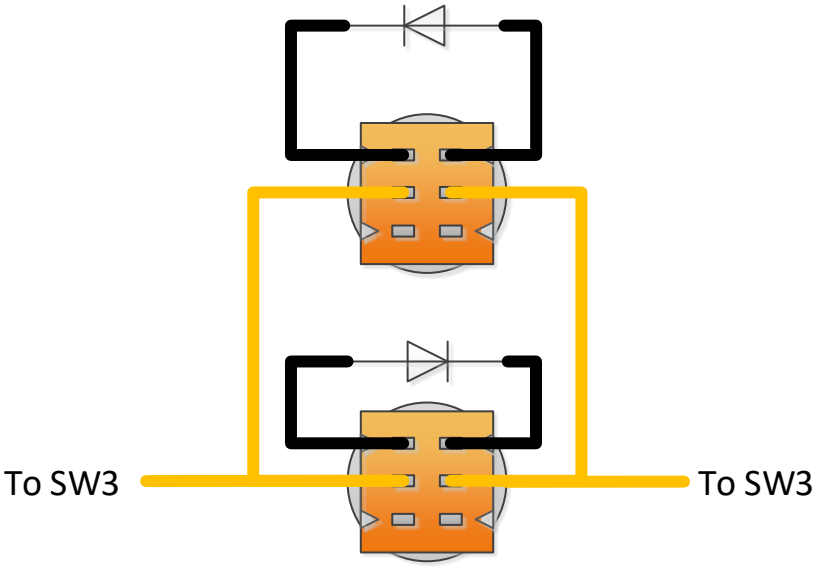
Modifications

Softclipping

SW2 is a clipping mod for all versions. There is no specific order in which you need to solder it to the pads of **SW2**.

Additional diodes

You can have different choices for your diode switching. **SW3** is used standard only for the Timmy™ but can also be added to the Tim™ as a mod. Here is the diagram for the original wiring for the Timmy™ using 2 DPDT switches. There is no specific order in which you need to solder it to the pads of **SW3**.

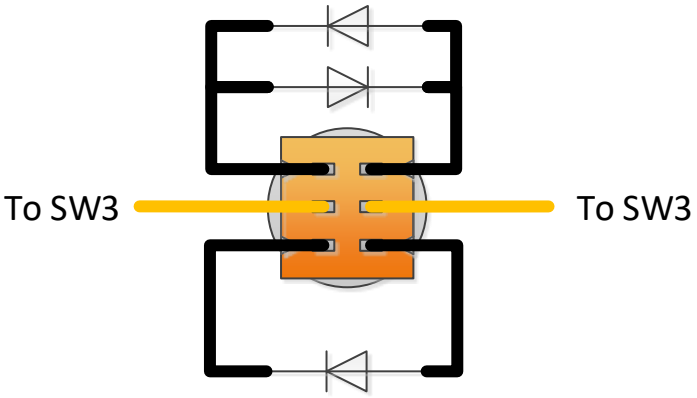


Diodes and Op amp

You can use other diodes than the mentioned 1N4148. Try LED's, MA858/859 (very nice!!) or even 1N4001's.

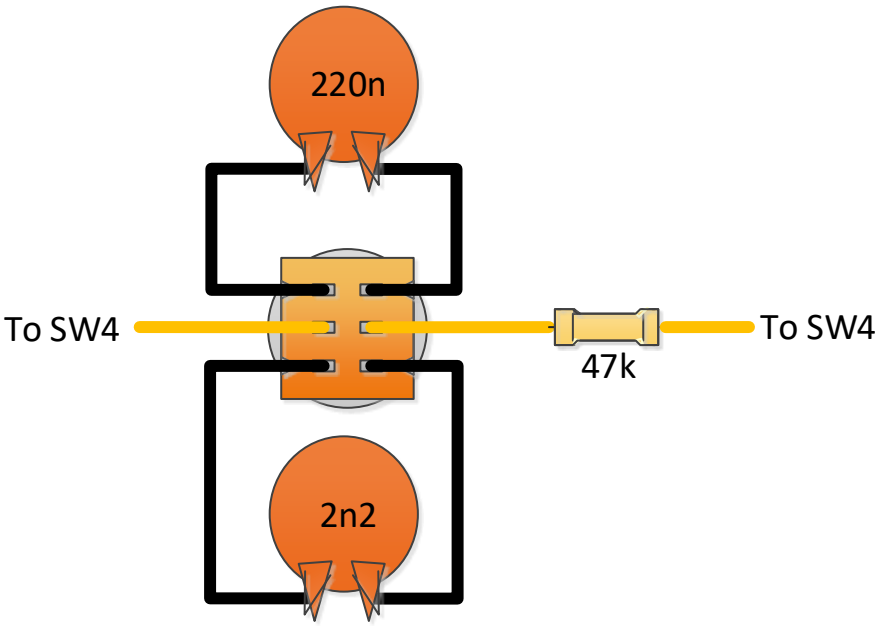
IC1 can be any dual op amp of your liking. Try the RC4558, RC4559, AD712, MC1458, TL072, OPA134, OP275, etc, etc.

As an alternative for using 2 DPDT switches, you can replace them by only one DP3T ON/OFF/ON switch to make use of 2 of the 3 switch options of the standard wiring:



Feedback loop

SW4 is an optional feedback loop mod using a DP3T ON/OFF/ON that can be added to all versions. Although the drawing might suggest to use ceramic disc capacitors, you can use any type you want. Note there is also an added 47k resistor (these components are extra and not mentioned on the bill of materials):



Creating other effect

OD11

Name	Value	Comment	Name	Value	Comment
C1	47n	MKT/SMF	R1	1M	1% metalfilm
C2	100p	Silver mica	R2	1M	1% metalfilm
C3	33n	MKT/SMF	R3	3k3	1% metalfilm
C4	1u	MKT/SMF	R4	3k3	1% metalfilm
C5	47n	MKT/SMF	R5	1k5	1% metalfilm
C6	1u	MKT/SMF	R6	3k3	1% metalfilm
C7	47u	Electrolyte 16V+	R7	3k3	1% metalfilm
C8	47u	Electrolyte 16V+	R8	10k	1% metalfilm
C9	NC		R9	8k2	1% metalfilm
C10	NC		R10	NC	
D1	1N4148		R11	Jump	
D2	1N4148		P1	A500k	Drive
D3	1N4148		P2	NC	
D4	1N4148		P3	A50k	Bass
D5	1N4001		P4	NC	
IC1	JRC4558		P5	A5k	Tone
			P6	A10k	Level
SW1-4	NC		J1	NC	

Zen Drive

Name	Value	Comment	Name	Value	Comment
C1	470n	MKT/SMF	R1	2M	1% metalfilm
C2	100p	Silver mica	R2	470k	1% metalfilm
C3	NC	MKT/SMF	R3	1k	1% metalfilm
C4	100n	MKT/SMF	R4	1k	1% metalfilm
C5	3n3	MKT/SMF	R5	10k	1% metalfilm
C6	470n	MKT/SMF	R6	NC	1% metalfilm
C7	100u	Electrolyte 16V+	R7	Jump	1% metalfilm
C8	47u	Electrolyte 16V+	R8	10k	1% metalfilm
C9	NC		R9	10k	1% metalfilm
C10	NC		R10	NC	
			R11	1k	
D1-5	NC	See Clippingsection	P1	B500k	Gain
			P2	NC	
IC1	AD712		P3	B10k	Voice
			P4	NC	
SW1-4	NC		P5	B50k	Tone
			P6	A100k	Volume
J1	NC				

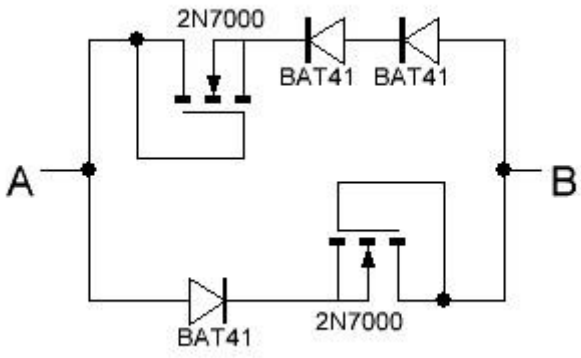
Clipping Diode Configurations

There are really a lot of ways to configure the diodes in the soft clipping section of this effect. For the Tim/Timmy and OD11 you can use the onboard diode section. For the Zen Drive you will have to use a separate diode clipping PCB (sold separately) or build your own using a vero board.

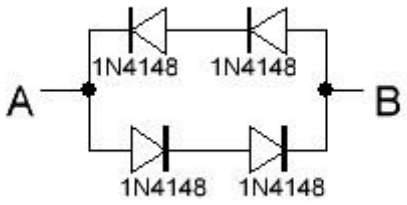
Feel free to experiment with different diodes and configurations. You can use the **SW3** connection to add any clipping configuration either by using a switch or by connecting a separate clipping diode PCB (or vero).

The diode configuration for the Zen Drive™ and OD11™ can be found below. A and B mart the spots on the Merlin PCB where you can connect an external board to is you are not mounting any diodes on the Merlin PCB and/or are not using the **SW3** connection.

Zen Drive™ Clipping Diodes



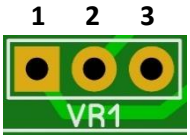
OD 11™ Clipping Diodes



Off board wiring

The biggest challenge of this build is to get all the offboard wiring correct and fit it in a box. Take your time measuring and testing before you start fitting everything in the box.

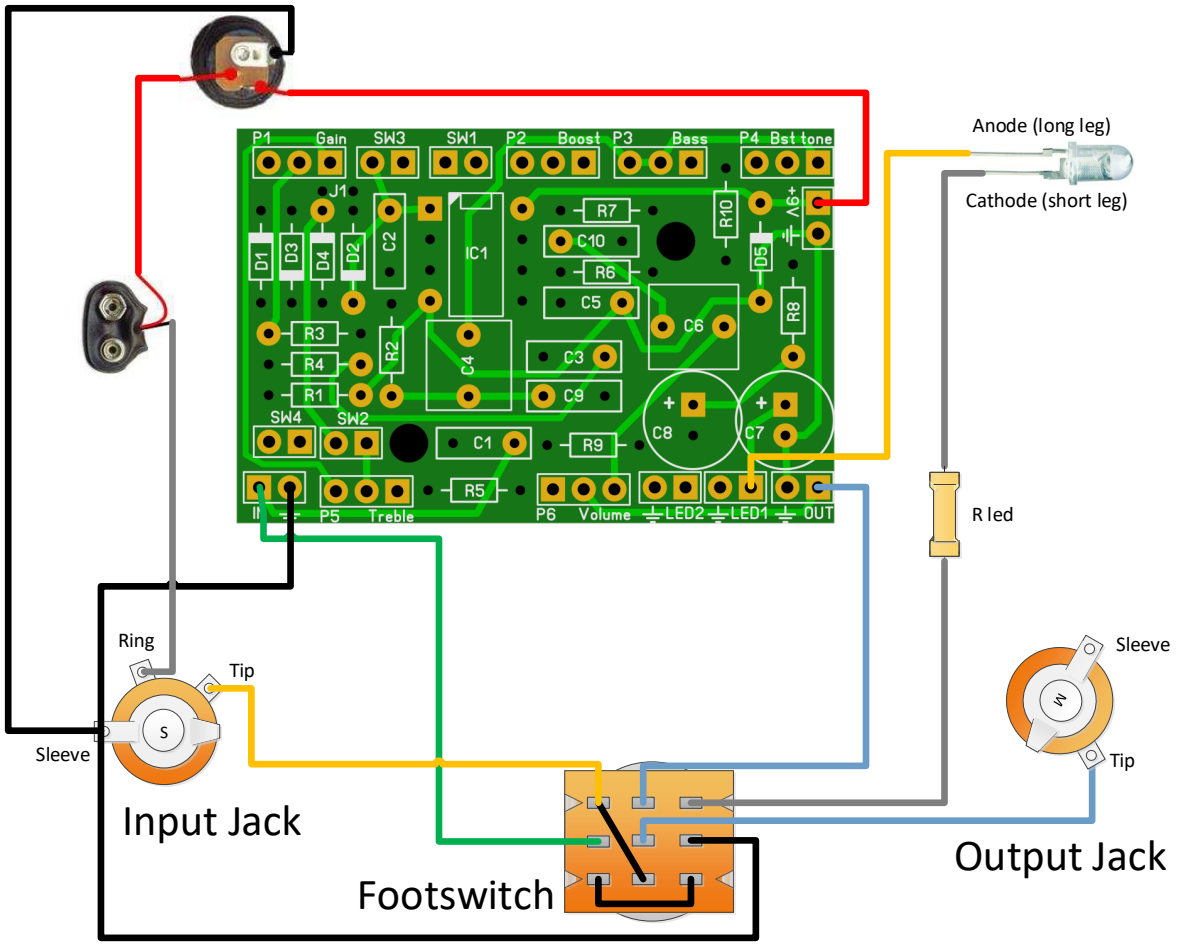
Wiring the pots **P1**-**P6** is very simple. The rectangle pad marks pin 1 of a potentiometer. The images below show how you can recognize which pin is which on a potentiometer. (PS **P3** is wired in reverse, so, for **P3** only, connect pin 3 to the square pad instead of pin 1)



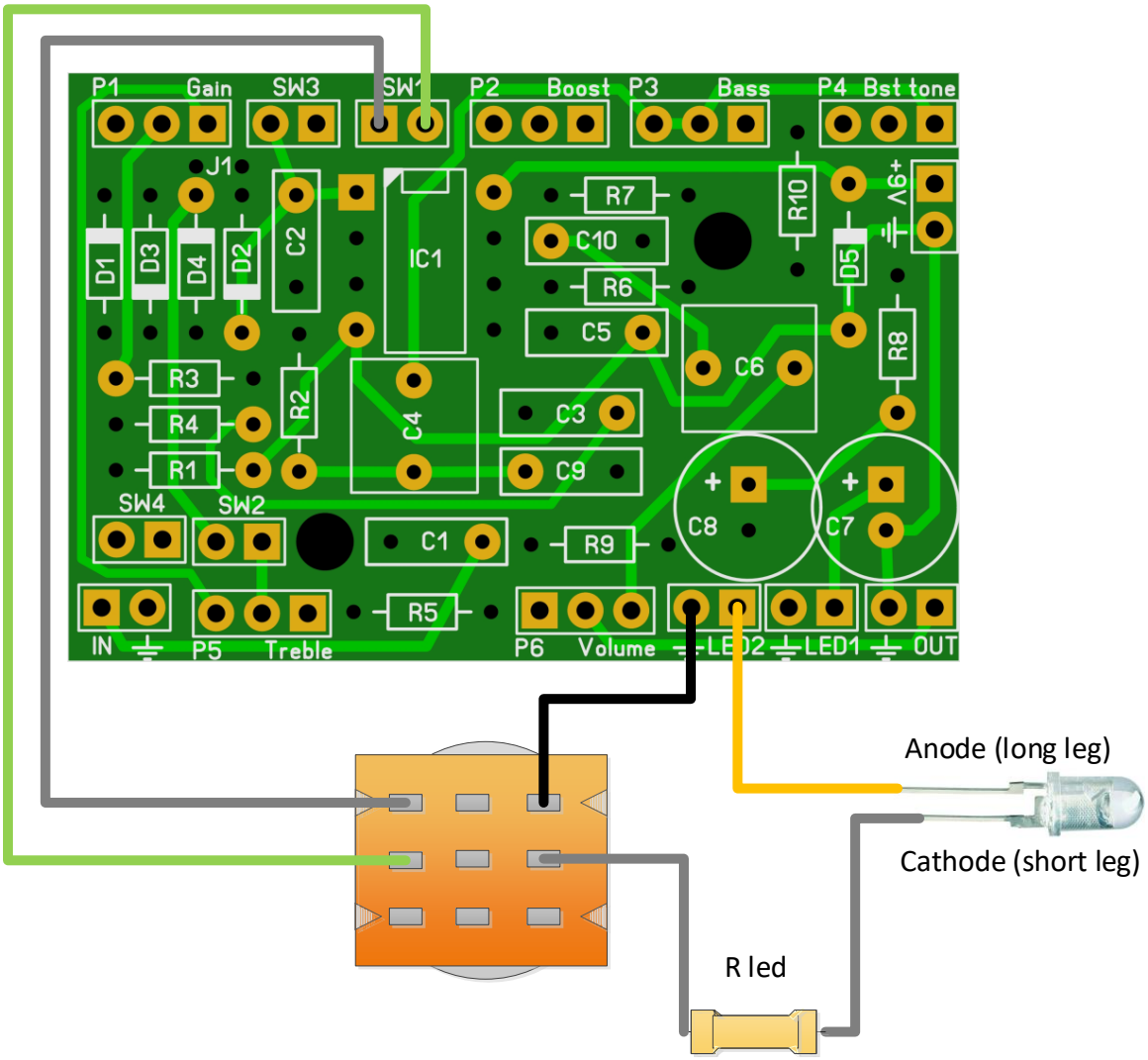
You can break off the pin I marked with the yellow circle with a small pair of pliers.

P1 is a A500k for Tim™ and a A1M for the Timmy™. If you want to incorporate the effects loop of the Tim then look for the correct wiring in the next chapter before wiring **P6**.

After wiring the potentiometers you will need to wire the footswitches. For both Tim™ as Timmy™ you will need to wire the following :



When building the Tim™ you will need to add the boost switch. In the original the boost potentiometer has a built in switch, but you can also use a footswitch with a LED to see if the boost is engaged or not:

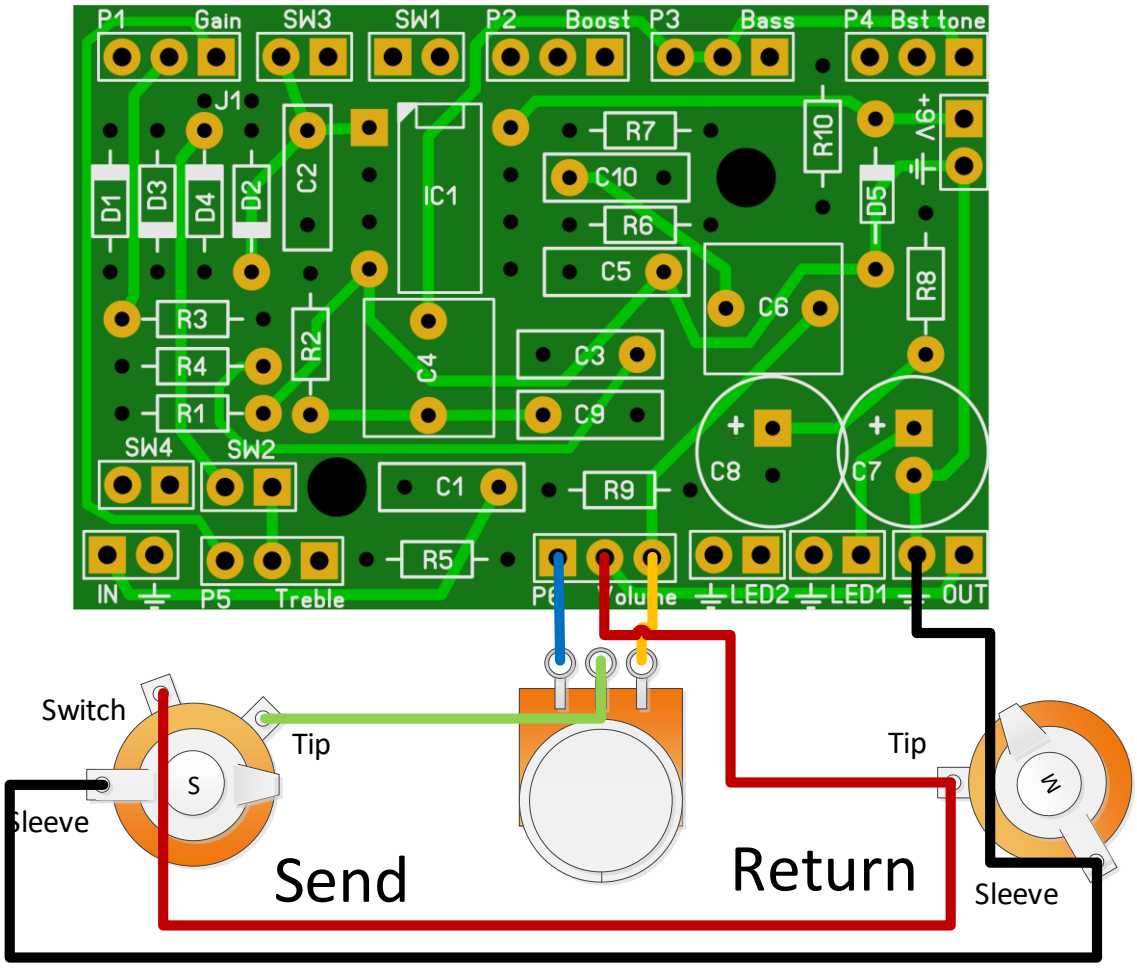


The LEDs requires a resistor (R led in the diagram) depending on the type of LED you are using. An ultra-bright red, green or blue LED requires a 3k3 resistor, diffuse Green requires 680R. If you want to be more exact then go here: http://www.muzique.com/schem/led.htm

Effects loop

The Tim™ also uses an external effects loop consisting of a mono jack and a switching mono jack like this:

The loop is connected as follows:



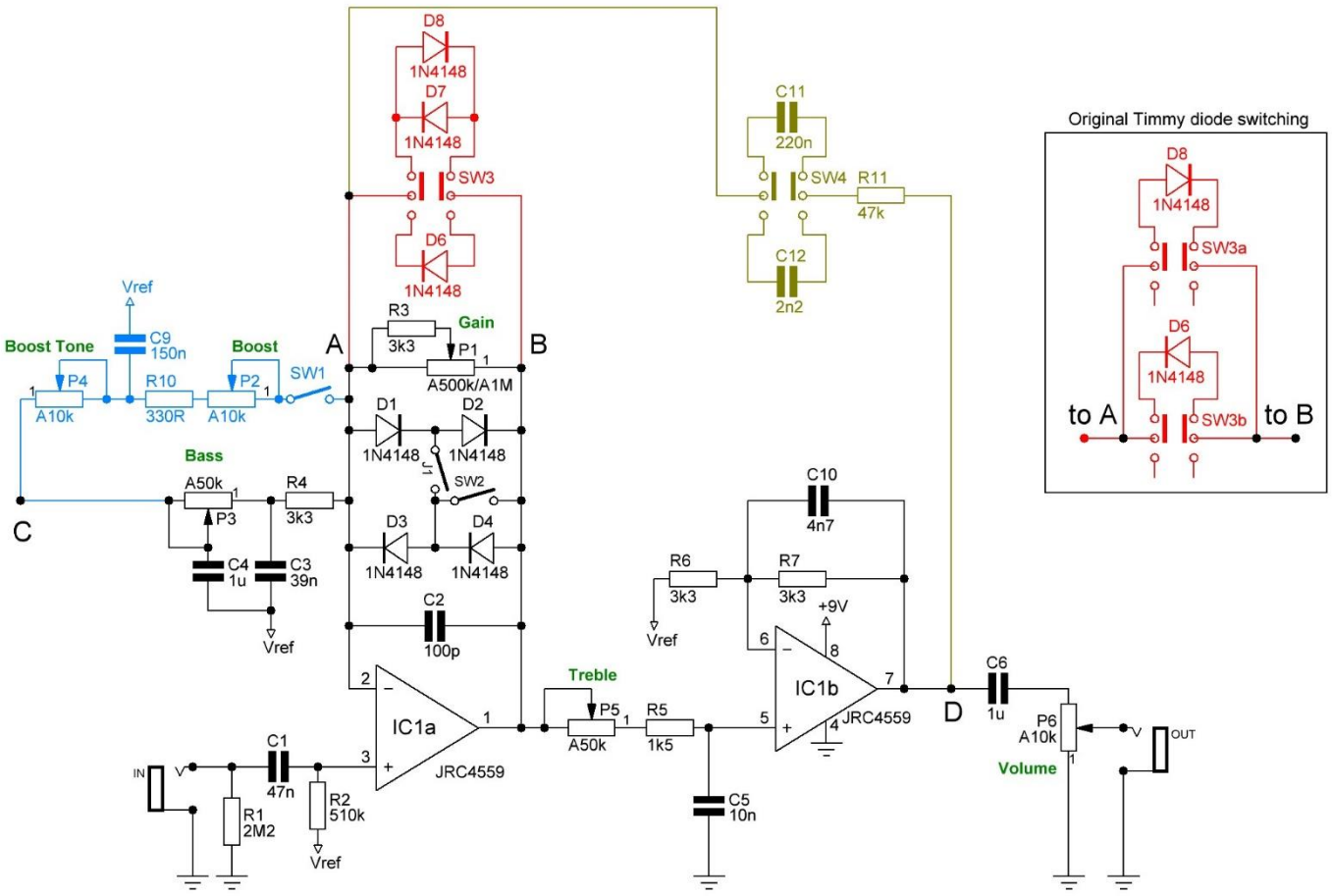
Troubleshooting

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).
- 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.
- 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, it 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, vintage diodes and transistors) so be careful that you source your parts from reliable suppliers.

Schematic



SW1 Boost as in Tim (tm)
SW2 Clipping mod
SW3 Extra Clipping diodes as in Timmy (tm)
SW3a and 3b alternative Extra Clipping diodes as in Timmy (tm
SW4 Feedback loop mod

Timmy(TM):
VR1=A1M, add SW3a and 3b (or the simpeler version SW 3), ommit SW1, C9, C10, R10, VR2 and VR4.
SW 2 and SW4 are optional extra mods

Tim(TM):
VR1=A500k, use all components. SW2, SW3 (or 3a and 3b) and SW4 are optional extra mods.

Drawn by Arnold Dikstaal (2019)