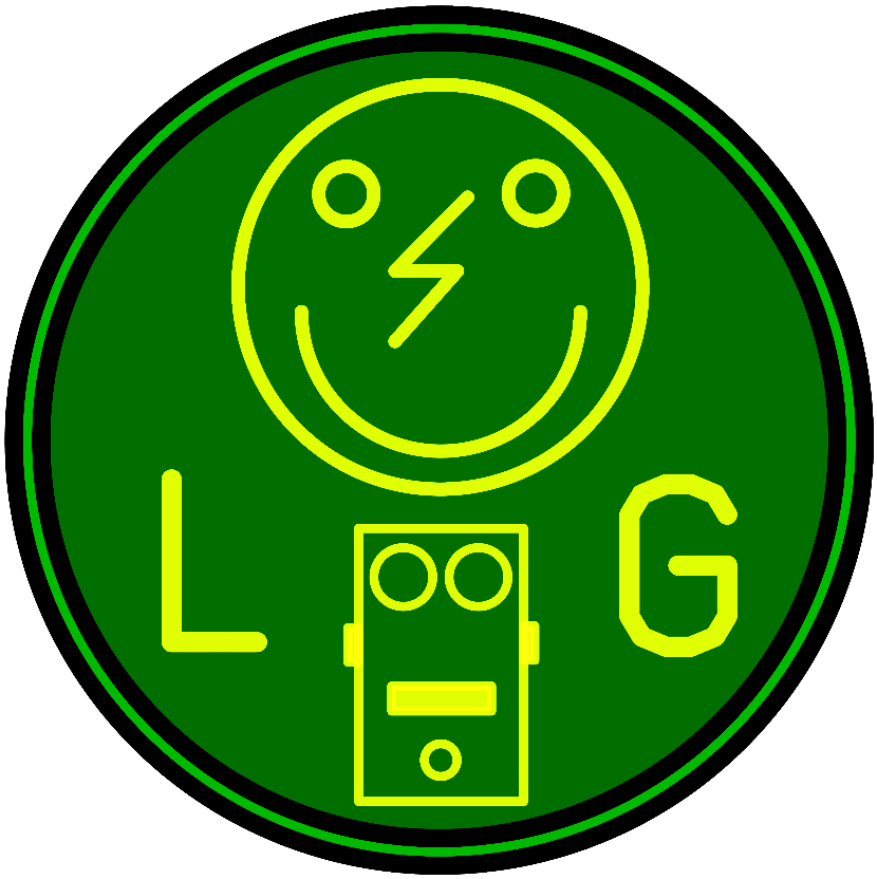
Chop Lo Kai Trem

Building instructions

v1.0



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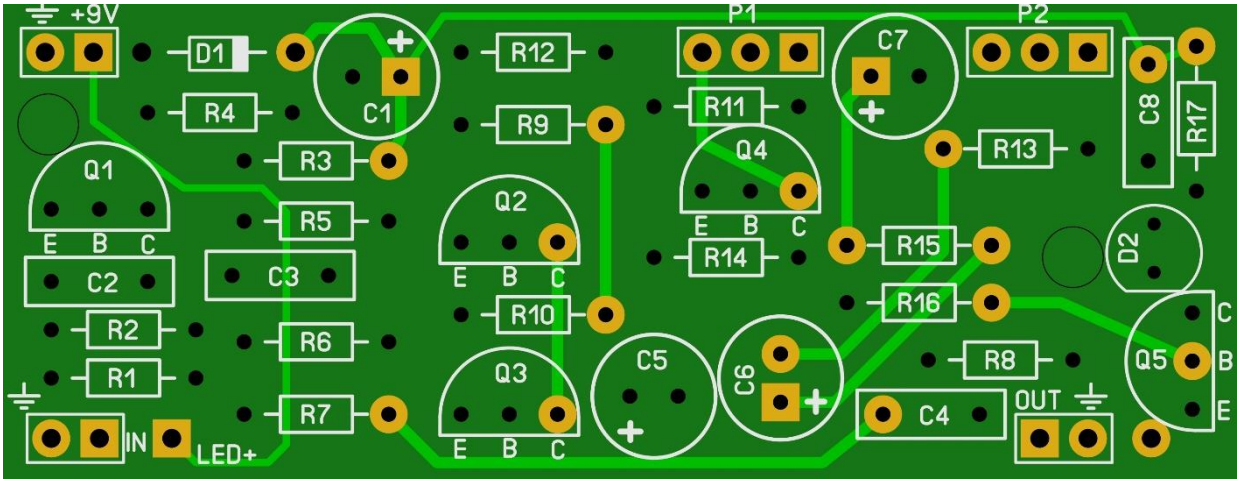
Read this entire manual thoroughly before you start building the effect! There are some available options and you should choose which one you want to incorporate before starting your build.

Last update: 21-1-2018

PCB layout



Dimensions: **65 mm x 25 mm**
2.56 inch x 0.98 inch

Components

Name	Value	Comment	Name	Value	Comment
C1	100u	Electolytic	**R1**	1M	1% metal film
C2	100n	SMF	**R2**	33k	1% metal film
C3	10n	SMF	**R3**	470k	1% metal film
C4	22n	SMF	**R4**	43k	1% metal film
C5	4u7	Electolytic	**R5**	4k7	1% metal film
C6	4u7	Electolytic	**R6**	100k	1% metal film
C7	10u	Electolytic	**R7**	100k	1% metal film
C8	100n	MKT	**R8**	47k	1% metal film
D1	1N5817		**R9**	33k	1% metal film
D2	LED	Red	**R10**	33k	1% metal film
P1	B100k	Depth	**R11**	470R	1% metal film
P2	B5k	Speed/Rate	**R12**	1k2	1% metal film
Q1	2N3904	Hfe max 250	**R13**	33R	1% metal film
Q2	2N3904	Hfe max 250	**R14**	20k	1% metal film
Q3	2N3904	Hfe max 250	**R15**	20k	1% metal film
Q4	2N3904		**R16**	1M2	1% metal film
Q5	2N3904		**R17**	10k	1% metal film

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! Also take extra care not to short components.

Start by soldering the resistors, D1 and jumpers (if needed). If needed you can create a jumper using a spare piece of lead from a resistor or diode. Next come the diodes (not the LEDs).

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 as well as the socket for the IC. Place the transistors and IC once you are finished with all soldering and off board wiring!

Now continue by soldering the SMF and MKT capacitors. Now finish with soldering the transistors (if not socketed) and the Electrolytics. The rate LED (**D2**) will be discussed later. I suggest you now drill the holes in your enclosure 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:

- **1 mono input jack and 1 stereo input jack**.
- **3PDT footswitch** (9 pins)
- **2,1mm DC jack** (isolated).
- **22 gage stranded hook-up wire.**
- **2 x LED holders.** This enables you to mount the LEDs in the enclosure. You will only need 1 if you are going to let the rate led (**D2**) double as the effects on/off LED.
- **1 x LED (3mm or 5mm depending on your taste).** This is an extra LED for the ON/OFF status.
- **Hammond 1590A** case (or similar) in your favorite color. If you need more room you could consider using a **Hammond 1590B**.

Modifications

The base of this effect is the Kay Tremolo™. The Chop Lo Kai Trem has some added modifications to the original schematic which are all optional! If you take a look at the schematic you'll see that all modifications are indicated as green components. If only the component value is altered, the original value is added in black.

Transistors

The most important thing to remember is that the board originally uses 2SC828 (BCE) transistors with a H_{fe} of about 200. The circuit is altered to use the more common modern CBE pinout transistors like 2N3904, 2N2222A or 2N5551. All can be used as long as you keep the H_{fe} at around 200 and max 250. If you go higher the signal will distort. If you like that, you could also consider to use 2N5088.

If you prefer to use the original 2SC828 then watch out for the different pinout (BCE). You can put some shrink tube (or tape – not preferred!) around the legs to prevent them touching when you cross the legs.

Power stabilization and protection

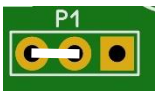
C1, **C8** and **D1** are optional and can be left out. They are added to stabilize and protect the power section and filter out the (high frequency) noise. If you leave them out you will need to jumper **D1** (connect both pads of D1 by soldering a piece of lead wire), else you will have no power on the board.

Speed control

The original uses a B1k pot as Speed/Rate pot (**P2**) combined with 10k's in **R14** and **R15**. I found that the B5k (with 20k's in **R14** and **R15**) had more usable sweep with a lower minimal speed. You could also try a C5k or C1k reverse audio pot if you feel the linear taper is too narrow at the end (highest speed). Also **R14** and **R15** are 20k to lower the minimum speed. If you want a higher minimum speed like in the original, you can bring them back to the original 10k. If you prefer even lower minimum speed, you can increase them to 24k. Feel free to experiment.

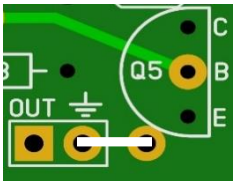
Depth control

As an optional addition to the original, we added a depth control (**P1**). If you want to keep it as stock, you can leave out **P1** and connect pads 2 and 3 by soldering a piece of lead wire. You will also need to increase the value of **R11** back to the original 68k.
NB: Depth at full and Speed at full will kill all sound!



Rate LED

As a bonus there is a multifunctional rate LED (**D2**) added. If you do not want a rate LED then simply leave out **D2**, **R16**, **R17** and **Q5**. You could however consider to make the LED double as the effects on/off indicator. Take a look at the off board wiring section for all the options and how to wire them. Note that if you are going to use a separate LED for the effect status indicator and the rate LED you will need to solder the emitter of **Q5** to ground like this:



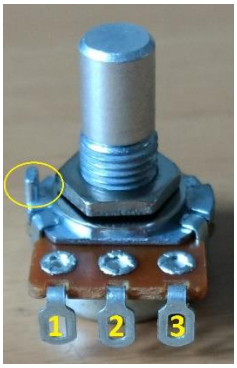
NB change the values of **R16** and **R17** if the LED is to bright or to dim (lower values = brighter LED)

Off board wiring

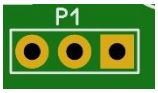
Potentiometers

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 some extra shielding against external noise. The rectangle pad marks the pad for **pin 1**.

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

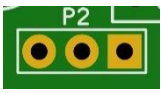


Depth



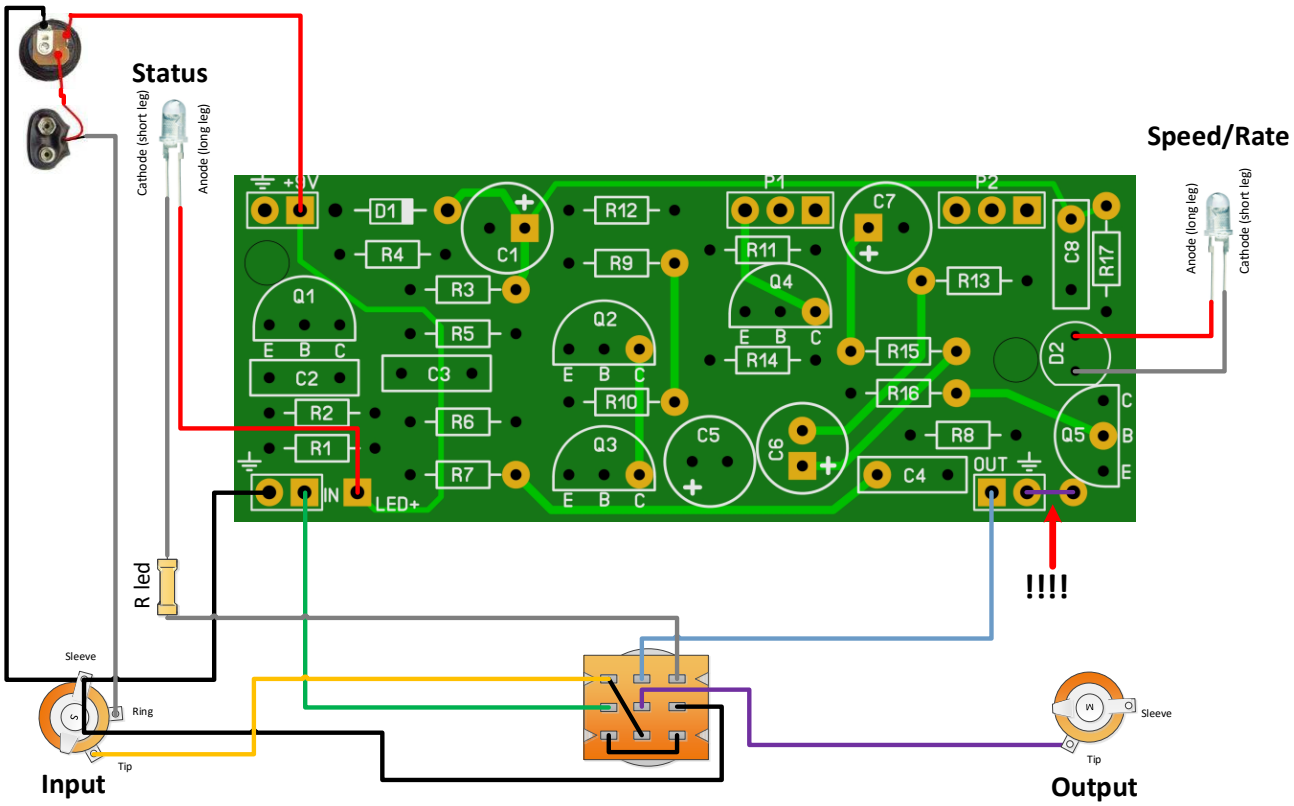
3 2 1

Speed/Rate



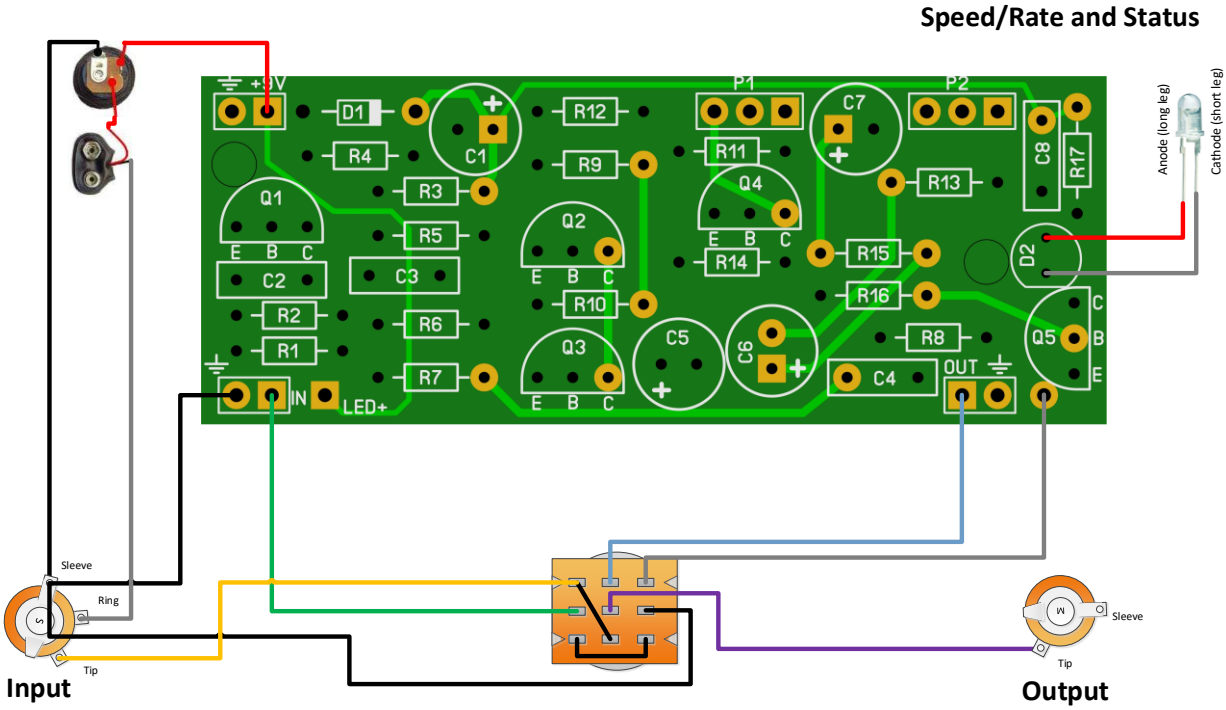
3 2 1

Separate Rate/Speed and Status LED



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

Single LED for both Status and Rate/Speed



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