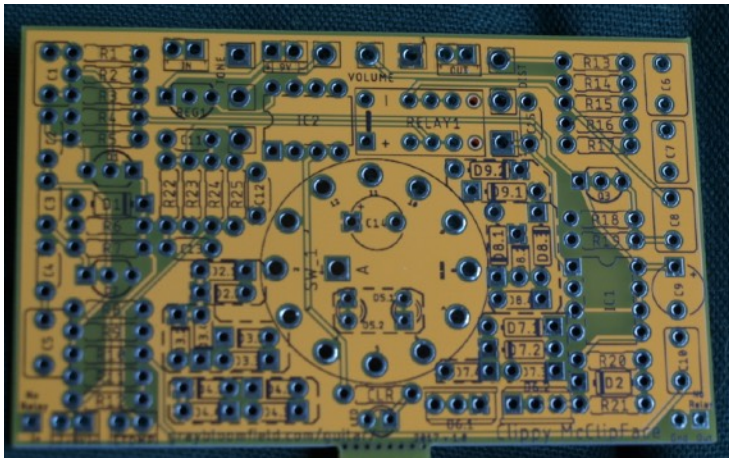
Clippy McClipFace Build Document

January 2018 v1.0

www.graybloomfield.com/guitar/docs/clippy1.0.pdf

SUMMARY



What is it?

The Clippy McClipFace started out as a BOSS DS-1 schematic, which I've modified to have a few different component values here and there, as well as including relay bypass options on the board, and nine different clipping options. If you've ever found that eight clipping options is just not enough, then this board is for you.

Build options

There are many different component values that you can use on this board. The BOM shows the values that I used when I built my copy, but I have also included a list of 'original' components, and point out where you can customise the components and why. You can also search online for DS-1 mods and find other things to try.

Switching and clipping options

If you want to include nine different clipping options, then you will need a rotary switch. A 12 pole rotary switch can be used - it has a little lug that can restrict it's movement to 9 (or other numbers) positions.

Note that you don't have to use all nine clipping options! You might choose not to populate any of the diodes and rotary switch, and use just the op-amp for distortion. That's fine. Or you can use a toggle switch for just two options. Or restrict the rotary to a lesser number for less options. Clippy McClipFace is happy with whatever clipping options you go with.

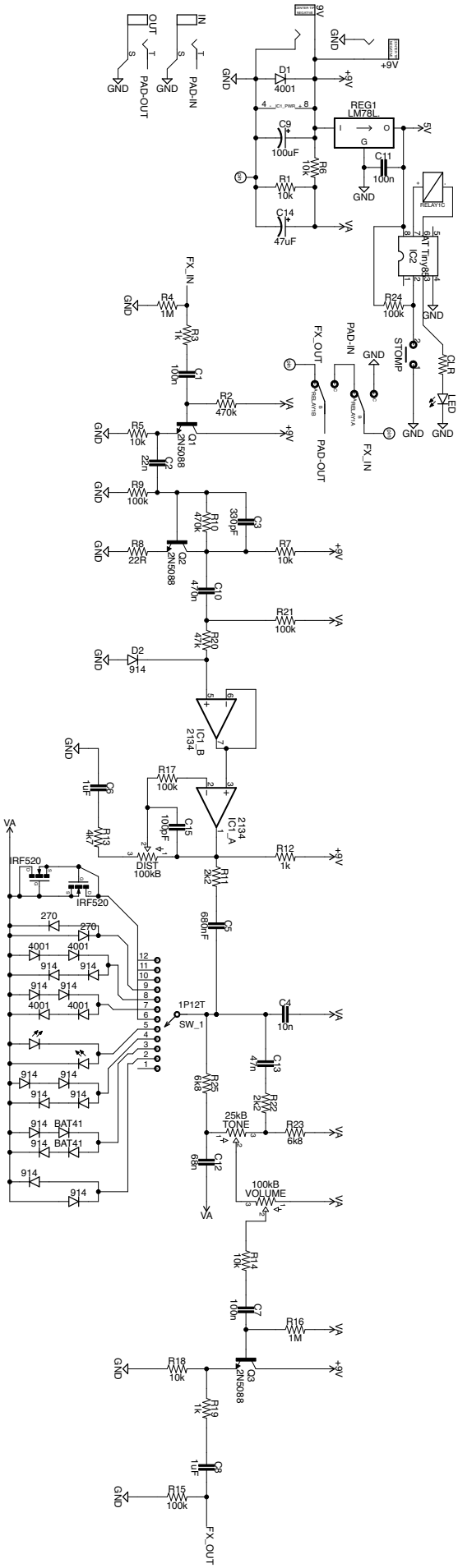
See later in the build doc for how to choose your clipping options, and what to solder where.

Bypass options

There are **two bypass options** on the board. Depending on which bypass method you want to use, you will need to wire your **Input** and **Output** jacks to the top or bottom of the board. **If you use the wrong pads, you're not going to get any signal.** That would be sad.

See later in the build doc for details on how to hook up the on board relay, or how to use a 3PDT switch.

SCHEMATIC



Notes

If you are using a 3PDT bypass, you can ignore the parts around the relay, IC2 and regulator.

See the bill of materials for alternate component values.

You don't have to follow the clipping options on this schematic, you can try your own combinations.

BILL OF MATERIALS

Clippy McClipFace main component values

Part	Value
R1	10k
R2	470k
R3	1k
R4	1M
R5	10k
R6	10k
R7	10k
R8	22R
R9	100k
R10	470k
R11	2k2
R12	1k
R13	4k7
R14	10k
R15	100k
R16	1M
R17	100k
R18	10k
R19	1k
R20	47k
R21	100k
R22	2k2
R23	6k8
R25	6k8
D1	1n4001
D2	1n914
C1	100n
C2	22n
C3	330pF
C4	10n
C5	680nF
C6	1uF
C7	100n
C8	1uF
C9	100uF electrolytic
C10	470n
C12	68n
C13	47n
C14	47uF electrolytic
C15	100pF
IC1	OPA2134 (Or TL072, etc)
Q1	2N5088
Q2	2N5088
Q3	2N5088
SW1	1P12T
DIST	100kB
TONE	25kB
VOLUME	100kA
D2.1 - D9.2	See clipping section below
Relay, IC2, R24, C11, REG1, CLR	See relay section below

Relay bypass additional parts

You only need to populate these parts if you want to use the relay bypass:

Part	Value
CLR	Current limiting resistor - for use with 5v
LED	Your choice
IC2	ATTiny85
R24	100k
C11	100n
REG1	LM78L 5v regulator
RELAY1	5v, Latching, DPDT relay. I use this one: https://au.rs-online.com/web/p/latching-relays/0515587/
STOMP	SPST Momentary

Alternate component values

Here are some alternate values that you can try for components. If you search the internet for DS-1 mods, you will likely find more options and opinions.

Part	My value	Modern DS-1 value	Notes
R11	2k2	2k2	3k3 or 4k7 for less highs
R13	4k7	4k7	Drop it to 2k2 if you want more distortion from the op amp
C1	100n	47n	Common mod for the DS-1
C2	22n	47n	22n or 33n will drop out some bass
C3	220pf	250pf	Anything between 220pf to 470pf will do here
C4	10n	10n	22n or 33n for less shrill sound, apparently. I couldn't hear it on my amp.
C5	680n	470n	Higher values let a bit more bass through, up to 1uF is a common mod.
C6	1uF	470n	Take the value back to a vintage DS-1.
C7	100n	47n	Another common mod, to match C1.
C10	470n	68n	Take the value back to a vintage DS-1. 100n is also a common mod.
C12	68n	100n	Changing the tone range. This was just to my taste, I wanted a bit less bass in the tone range.
C13	47n	22n	Common mod for the DS-1 to change the tone.
C15	100pf	100pf	100-250pf is fine here. Whatever you've got.
VOLUME	100kA	100kB	The DS-1 schematics I saw had a linear pot for volume, I prefer log for volume. Either will do.
IC1	OPA2134	A single in-line op-amp that won't fit on this board	Any number of dual op-amps would work here, such as TL072 or 4558. The OPA2134 is meant to be better quality (and has a higher price to match).

CLIPPING OPTIONS

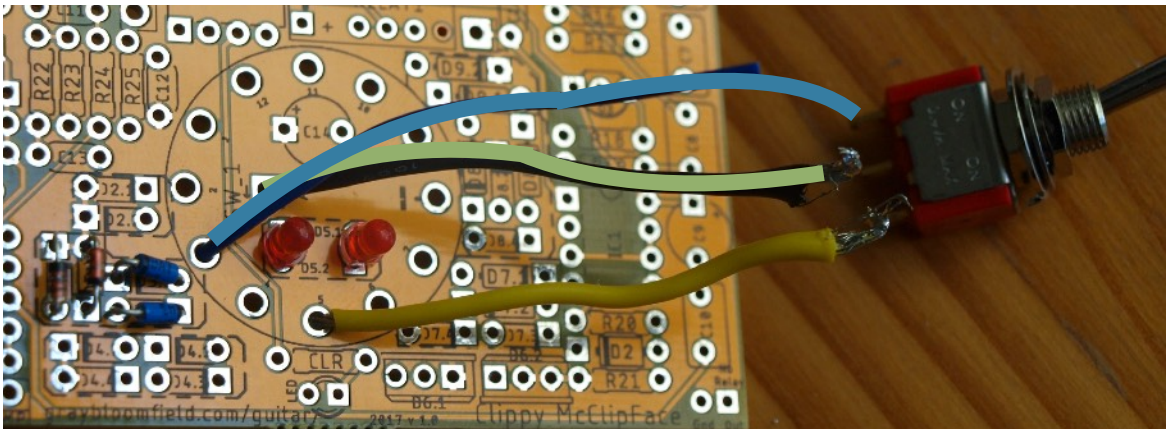
No clipping

If you prefer, you can leave off the clipping diodes D2.1 - D9.2, and just have the op-amp provide distortion. Boring! But still an option.

Two clipping options

You can use a SPDT switch to change between two sets of diodes (or one set of diodes and the 'no clipping' option). Wire the centre of the switch to the 'A' pad in the middle of the board. Wire the outside lugs of the switch to any of the rotary switch pads on the board, labelled '2' through '9'. Populate the corresponding diodes on the board, and you now have a switch between those diode sets.

Example: Some 914 and BAT41 diodes in D3.1-D3.4, using switch pad '3' to one side of the toggle. Some LEDs in D5.1 and 5.2, using switch pad '5' to the other side of the toggle. The switch pad 'A' goes to the middle of the toggle to switch between the diodes and the LEDs:



Three to nine clipping options

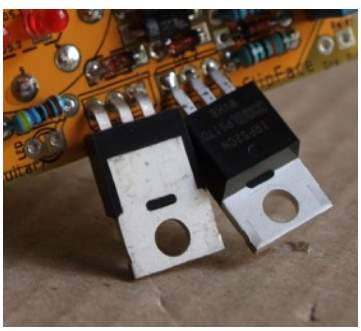
For up to nine clipping options, use a 1P12T rotary switch. Each of the switch positions '2' through '9' correspond to the diode sets with that number. e.g. Switch position 3 will use the diodes D3.1, D3.2, D3.3, D3.4. Switch position 5 will use the diodes D5.1 and D5.2.

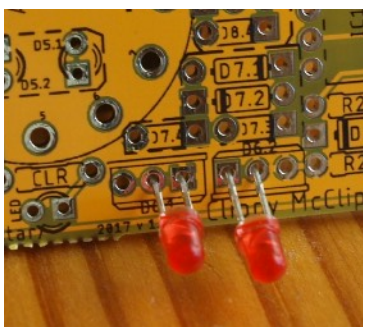
Switch position 1 (and 10,11,12 if you go that far) don't connect to any diodes, so are the 'no clipping' option.

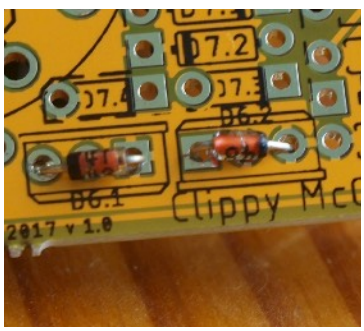
You don't have to use all 9 positions. You can stop at any point, and set the rotary switch to only rotate that far (there's a little lug on the inside of the washer which stops the rotation).

D5.1 and D5.2 are labelled for **LEDs**, but you can use other diodes there if you stand them on their end. The LEDs should be inserted in alternating directions…one will have it's longer leg closer to the bottom of the board, the other will have the shorter leg closer to the bottom of the board.

D6.1 and D6.2 have room for some **power MOSFETs** - insert them alternating directions, as shown on the board markings. If you use them, they are quite big so you may need to bend the legs so they fit inside the enclosure. You can also use these positions for other diodes, as shown in the images below:

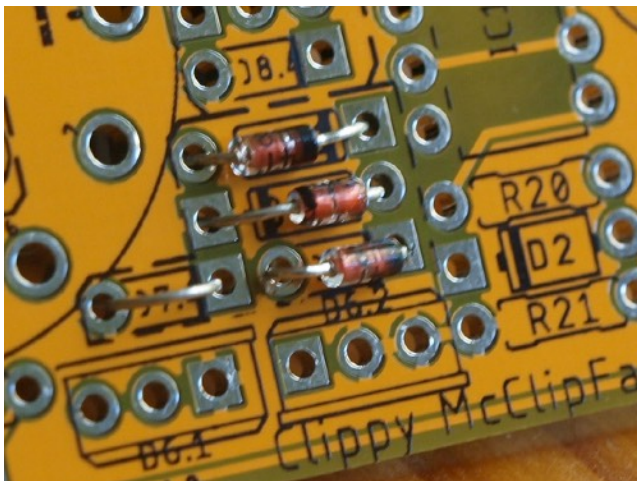






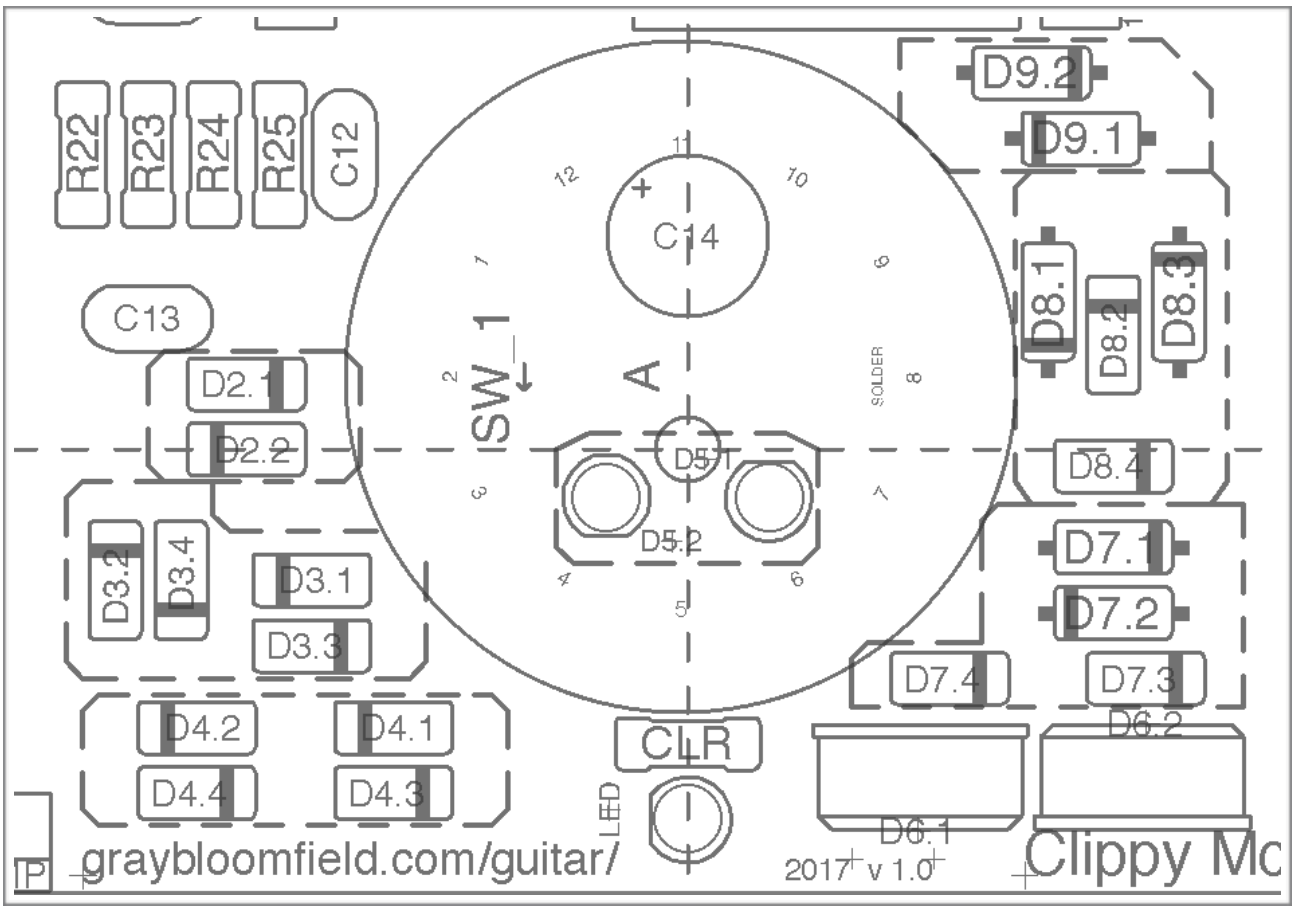
For an '**authentic vintage**' DS-1 sound, something that clips at around 1 to 1.2v is needed. Combining 1n194 and BAT41 diodes should do that. You can fit them in one of the sets of four diodes. e.g. 1n914 in D3.2 and D3.4, BAT41 in D3.1 and D3.3. Or if you can find another type of diode that clips at around 1 volt, try that for sound.

If you want to do some **asymmetric clipping**, you can mix up the diodes, or put a wire link in some of the positions in place of a diode.



Sorry about the crappy diode labels!

The board markings for the diodes got obscured by the pads, which I didn't realise until the boards arrived. To make it a bit easier to read, I've put a copy of that area of the board here for reference:



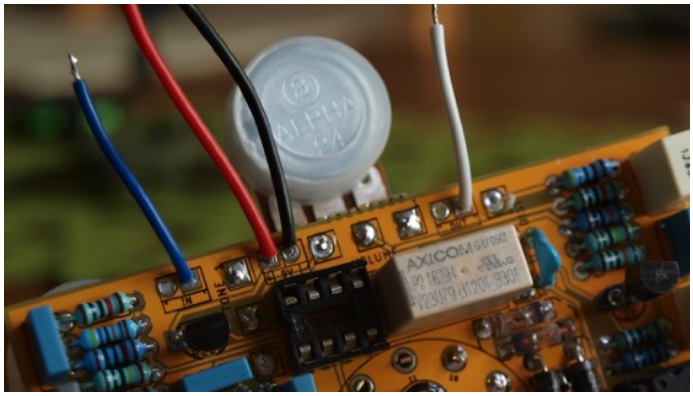
Clipping diode suggestions to get you started

Here are the diodes that I used, with some notes. Feel free to try out your own combinations. There's enough room that even if a few of the options are crap, the pedal will still be useable on the other 7 settings. ;-)

Part	Value	Notes
D2.1	1n914	Quieter than no clipping, but still loud compared to other options. Has more effect than the other diodes at lower distortion settings.
D2.2	1n914	
D3.1	BAT41	For 'authentic vintage' DS-1 sound. Quite nice actually!
D3.2	1n914	
D3.3	BAT41	
D3.4	1n914	
D4.1	1n914	Different tone to the BAT41 combination.
D4.2	1n914	
D4.3	1n914	
D4.4	1n914	
D5.1	Red 3mm LED	More 'crunchy', with a different decay sound to the other diodes. I didn't try other LED colours, it might be interesting to know if the different colours are audibly different!
D5.2	Red 3mm LED	
D6.1	IRF520	More of a compressed sound with my amp. Tends to kick in earlier on lower distortion settings.
D6.2	IRF520	
D7.1	1n4001	Asymmetric clipping.
D7.2	1n4001	
D7.3	1n914	
D7.4	1n914	
D8.1	1n4001	I can't tell the difference between this and the one above. Go figure. Probably should have done something different here.
D8.2	1n914	
D8.3	1n4001	
D8.4	1n914	
D9.1	1n270	Almost into fuzz territory, noisy static, with a volume drop
D9.2	1n270	

BYPASS METHODS

Onboard Relay bypass



The PCB has space for a relay, ATTiny85 chip, CLR, LED, and 5v regulator that are used for relay bypass switching. The **In** and **Out** connectors on the **top** of the board are for use with the relay switching.

Power can be connected to the 9v pads at the top or bottom of the board - either will work.

The SPST momentary stomp switch is connected to the pads marked 'STOMP' at the bottom of the board.

I'm using an ATTiny85 chip to control the relay. This comes down to my experience - I've done Arduino programming in the past, and the ATTiny chip can be programmed using the Arduino IDE and hardware.

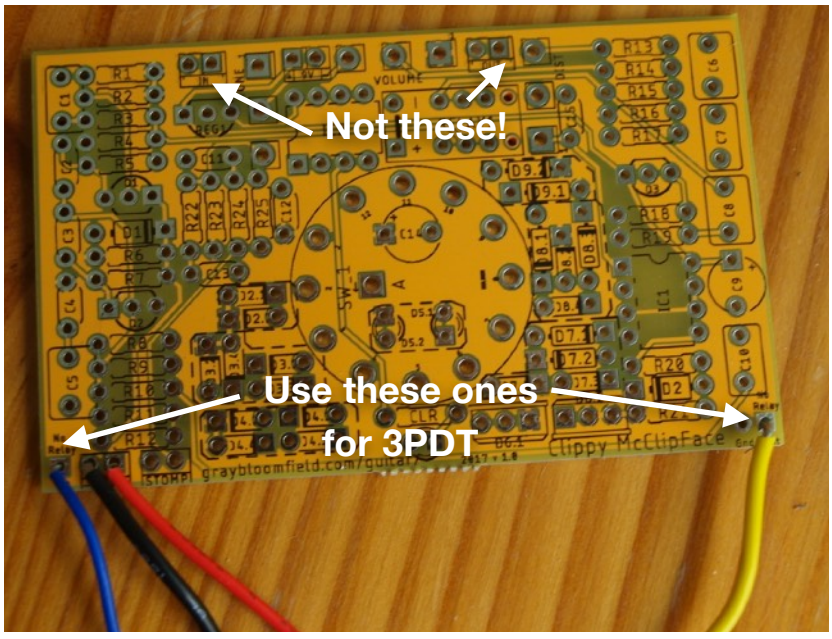
Unfortunately, the ATTiny chips have a different pinout to PIC brand chips. You won't be able to plug in a PIC chip and have it work on this board (it might even fry the PIC chip if you try. I really don't recommend trying it.)

The LED will be running at 5v - keep this in mind when working out which CLR value to use.

The relay switching code that I used is available at www.graybloomfield.com/guitar/docs/clippy-code1.0.zip

Off-board 3PDT bypass (or other off-board switching of your choice)

Alternately, you can use a trusty 3PDT switch instead. You can omit the relay, IC2, C11, R24, regulator, CLR and LED, and wire up your 3PDT as normal off the board. If you use this method, **make sure you use the In and Out connectors at the bottom of the board.** They are labelled 'No Relay', and they connect straight to the effect without going through the relay part of the PCB.



If you use the In and Out connections at the top of the board with a 3PDT switch, nothing will happen. The signal won't get through.

You can use the 9v pads at the top or bottom of the board - either will work.

If you need an extra ground pad, one of the pads marked STOMP is connected to ground. Use a multimeter to work out which one. (I think it's the one on the left…)

Note that the **CLR** and the **LED** on the board are for use with the relay only. If you are going to use a 3PDT switch, then you will have to take care of the LED and CLR off-board too.

BUILD TIPS

It helps to solder things in order of height - resistors first, diodes, IC sockets, transistors (or transistor sockets) capacitors, relay (if using it).

Make sure to do all the components on the front before doing the potentiometers and rotary switch on the back. The pots and switch will cover over some of the component holes, so the pots and switch really do need to be soldered last.

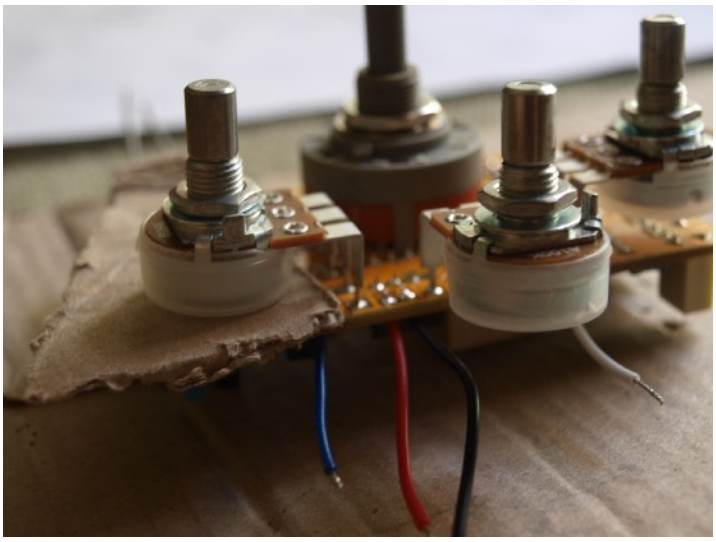
Socket the ICs. This will reduce the chance of frying them, and also let you experiment with different Op-amps. If you are using the relay bypass, socketing IC2 is necessary, as you will need to remove the ATTiny85 if you want to reprogram it.

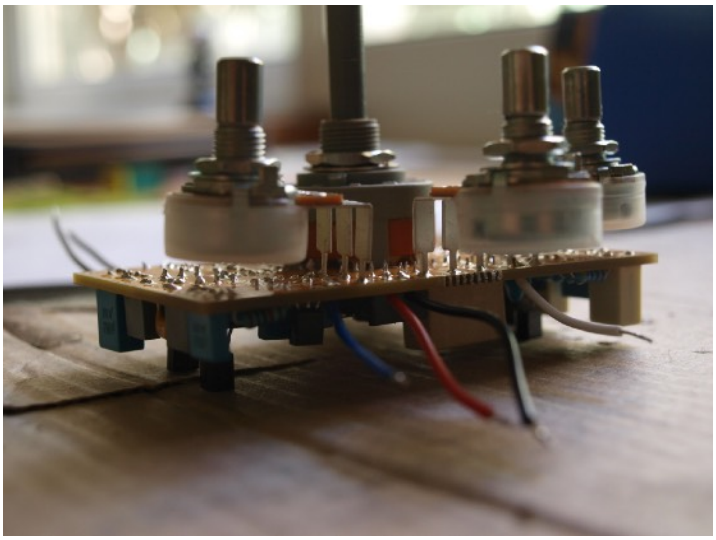
The rotary switch may be a bit higher than your usual potentiometers. **To make things line up with the enclosure surface, you will need to solder the pots quite high.**

I use a bit of thick cardboard under the pots when soldering them, to make them sit up higher. Slide the cardboard out once the solder has set.

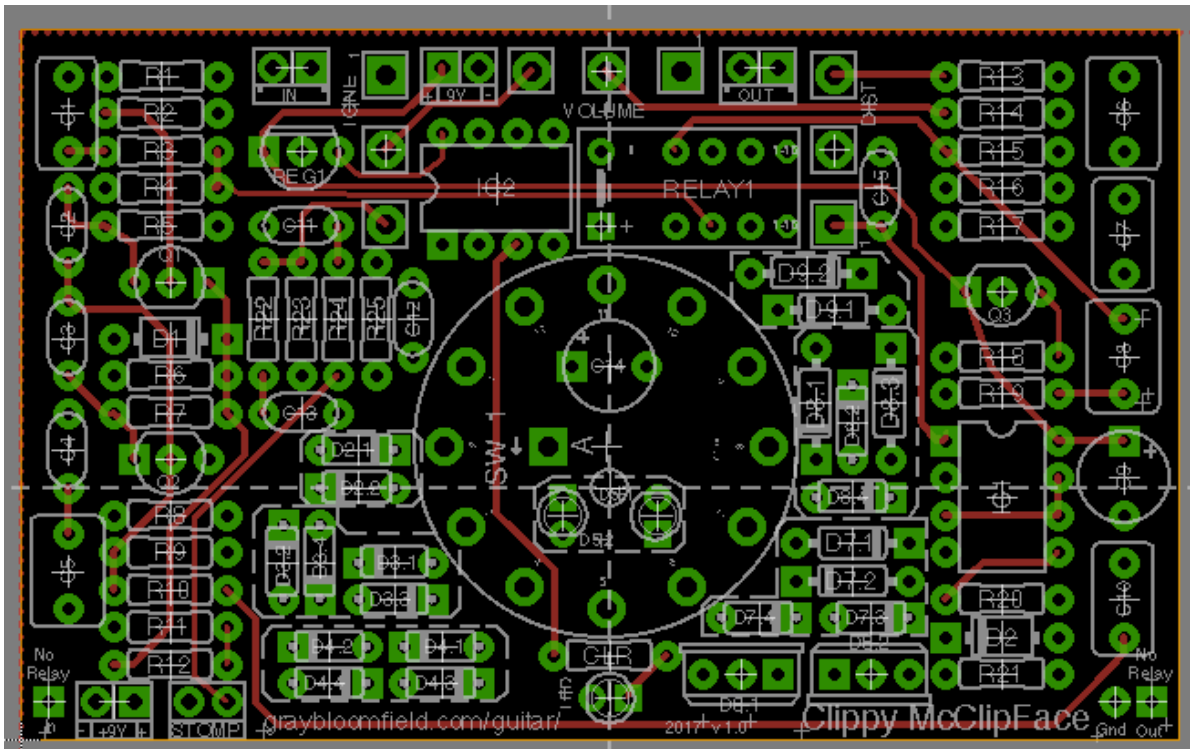
Alternatively, you could drill your holes in the enclosure first, fit the pots and switch in the holes, and then do the soldering to the board.

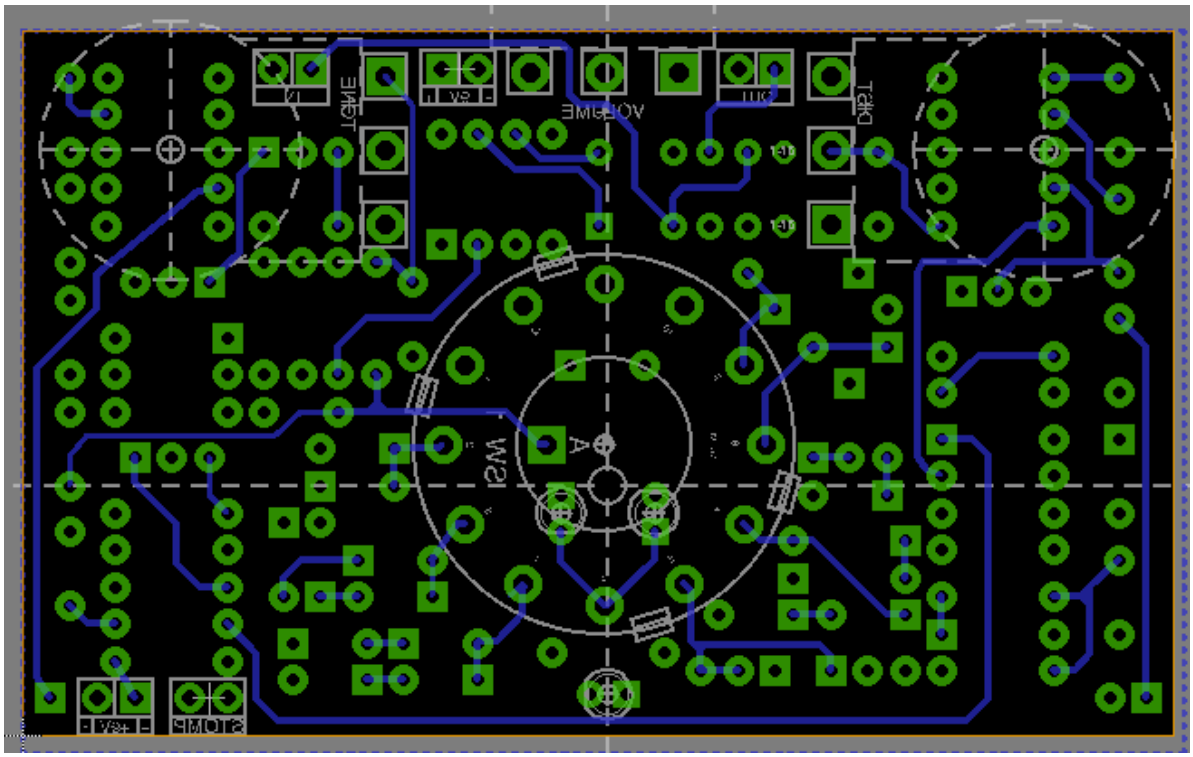
Note that the tone and distortion pots sit over the board, while the volume pot hangs off the top of the board.





BOARD TRACES





DRILLING AND LAYOUT GUIDE

I used a 1590BB enclosure, with top mounted jacks and relay bypass. For a 3PDT setup, side mounted jacks might be easier.

The PCB will fit in a 1590B, but you will have to wire the pots off-board, and it will be a tight fit to get everything in.

Example fit in a 1590BB, with relay bypass:

You will want to double check this guide before drilling. Don't just print and drill!