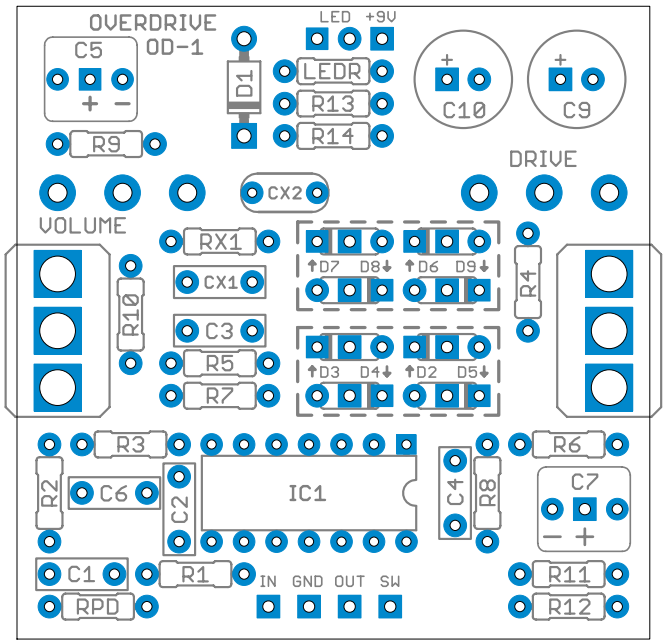
# Corona Overdrive

*BOSS OD-1 OverDrive*

## Overview




The Corona Overdrive project is a clone of the BOSS OD-1 OverDrive, originally released in 1977, which is known for being the first overdrive effect to utilize diodes in a negative-feedback arrangement for clipping purposes. Like the Distortion+, it lacks a tone control, but most who play through it say it doesn't need one.

There have been a couple of different versions of the OD-1, with a major circuit revision in 1981 that dropped the quad op-amp for cost-savings reasons, but most players who have A/B'd the versions say the original is better. This project is for the original quad op-amp circuit.

There are two switches available: one for clipping diodes (with enough pads available for any diode combination you can dream of, as well as "comp cut" or diode lift in the middle), and a second one that changes the EQ of the circuit to have more low-end and fullness.

## Controls & Usage

The OD-1's controls are as simple as they come:

- **Drive** controls the amount of gain in the op amp feedback diode clipping stage.
- **Volume** controls the overall output.

## Modifications & Experimentation

The **Clipping** switch mod allows you to set up a second set of diodes to toggle back and forth from stock. Extra pads have been provided so you can stack two diodes in a row if desired. (The middle two pads are connected in each diode.) If you use a SPDT center-off switch, the middle position becomes a diode lift mode, but you can also use a regular SPDT if you don't care about this. See further down for detailed diagrams on a few different diode configurations.

The **EQ** switch changes the tone stack from stock to modded. The mod gives more bass and fullness and changes the overall gain structure of the effect. Note that this mod doesn't have an "off" mode like a clipping switch or a capacitor mod would, so don't use a center-off switch here. Just use a normal two-position SPDT.

The original uses a **Raytheon RC3403** quad op amp. These can be found on eBay or from Small Bear Electronics for reasonable prices. They have the same pinout as most other quad op-amps such as the TL series, so feel free to experiment with a **TL074** or **NE5514**, though much of the OD-1's character is said to come from the RC3403 and other op amps "don't sound like the originals."

## Parts

### Resistors

| | |
|---|---|
| R1 | 1k |
| R2 | 220k |
| R3 | 10k |
| R4 | 33k |
| R5 | 4k7 |
| R6 | 10k |
| R7 | 10k |
| R8 | 10k |
| R9 | 4k7 |
| R10 | 470k |
| R11 | 470R |
| R12 | 100k |
| R13 | 33k |
| R14 | 33k |
| RX1 | 3k3 [3] |
| RPD | 1M to 2M2 |
| LEDR | 4k7 |

### Capacitors

| | |
|---|---|
| C1 | 100n |
| C2 | 47n |
| C3 | 47n |
| C4 | 18n |
| C5 | 1uF [1] |
| C6 | 100n |
| C7 | 1uF [1, 2] |
| C9 | 100uF 25v |
| C10 | 47uF 25v |
| CX1 | 330n [3] |
| CX2 | 47pF [4] |

### Semiconductors

| | |
|---|---|
| IC1 | RC3403 |
| D1 | 1N4002 |
| D2–D4 | 1N914 |
| D5 | jumper |
| D6–D9 | *see pg. 3* |
| LED | 5MM |

### Potentiometers

| | |
|---|---|
| Drive | 1MA |
| Volume | 10kB |

### Other

| | |
|---|---|
| CLIP | SPDT center off |
| EQ | SPDT on-on [3] |

[1] **Electrolytic or film.** The original uses electrolytics as coupling capacitors, so for “vintage tone” the lower fidelity of electrolytic capacitors may be desired. The layout has room for full-sized film capacitors, but the polarity is marked if you want to use electrolytics.

[2] **Value changed from original.** The original unit uses a **10uF electrolytic** here, which should sound no different than a 1uF capacitor in frequency response, but may degrade signal quality due to the fact that it’s an electrolytic. Since this is the output buffer stage and its purpose is transparency rather than tone-shaping, I elected to use a 1uF film cap here, but polarity is marked if you want to use the original value.

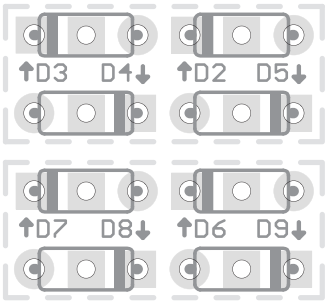
[3] **Important**: If you’re not using the **EQ mod**, you need to **jumper the middle and bottom pads** of the EQ switch for the effect to work properly. If you do use this mod, make sure to use a **regular on-on switch** rather than a center-off switch. The effect would pass only a very weak signal in the center-off position.

[4] **Optional.** The stock OD-1 circuit does not have this feedback capacitor, though every other effect with feedback clipping that came after this one does have it. In theory it should smooth out the highs a little bit.

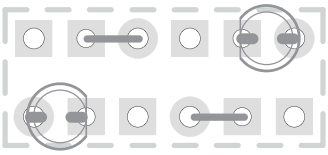
## Additional Part Notes

- Capacitors are shown in nanofarads (n or nF) where appropriate. 1000n = 1uF. Many online suppliers do not use nanofarads, so you’ll often have to look for 0.047uF instead of 47n, 0.0056uF instead of 5n6, etc.
- The PCB layout assumes the use of film capacitors with 5mm lead spacing for all values 1nF through 470nF. I prefer EPCOS box film or Panasonic ECQ-B/V-series.
- Potentiometers are Alpha 16mm right-angle PCB mount.
- Switches are Taiway (Small Bear) or Mountain Switch (Mouser) brand with solder lugs. I prefer the short-toggle variety, but that’s just a matter of aesthetics.
- I recommend using these dust covers / insulators from Small Bear to insulate the back of the pots from the board and prevent shorts. If you don’t use these, use some electrical tape or cardboard to act as insulation. The right-angle pots will make direct contact with the solder pads otherwise.

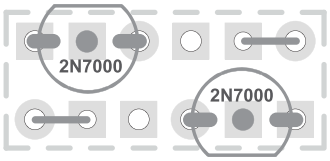
## Diode Clipping Options



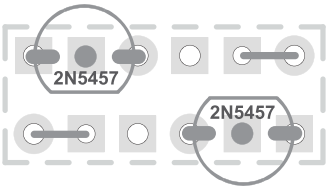

**Close-up of silkscreen. (Square pad pairs are always connected.)**



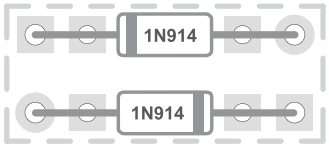
**LED clipping**



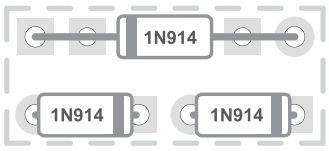

**MOSFET clipping**



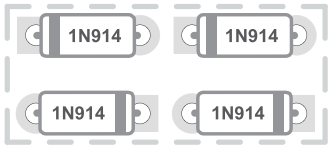

**JFET clipping**



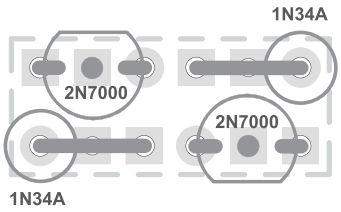

**Stock TS-9 (symmetrical clipping)**



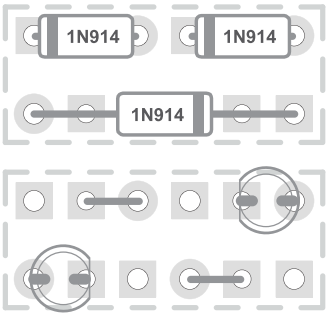

**Boss OD-1, SD-1 (asymmetrical clipping)**



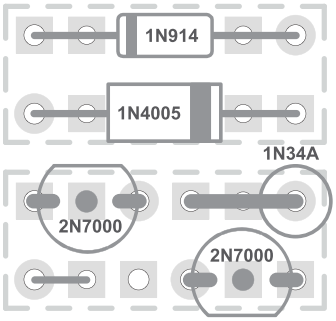

**Lovepedal Eternity, Marshall Bluesbreaker**




**Zendrive**

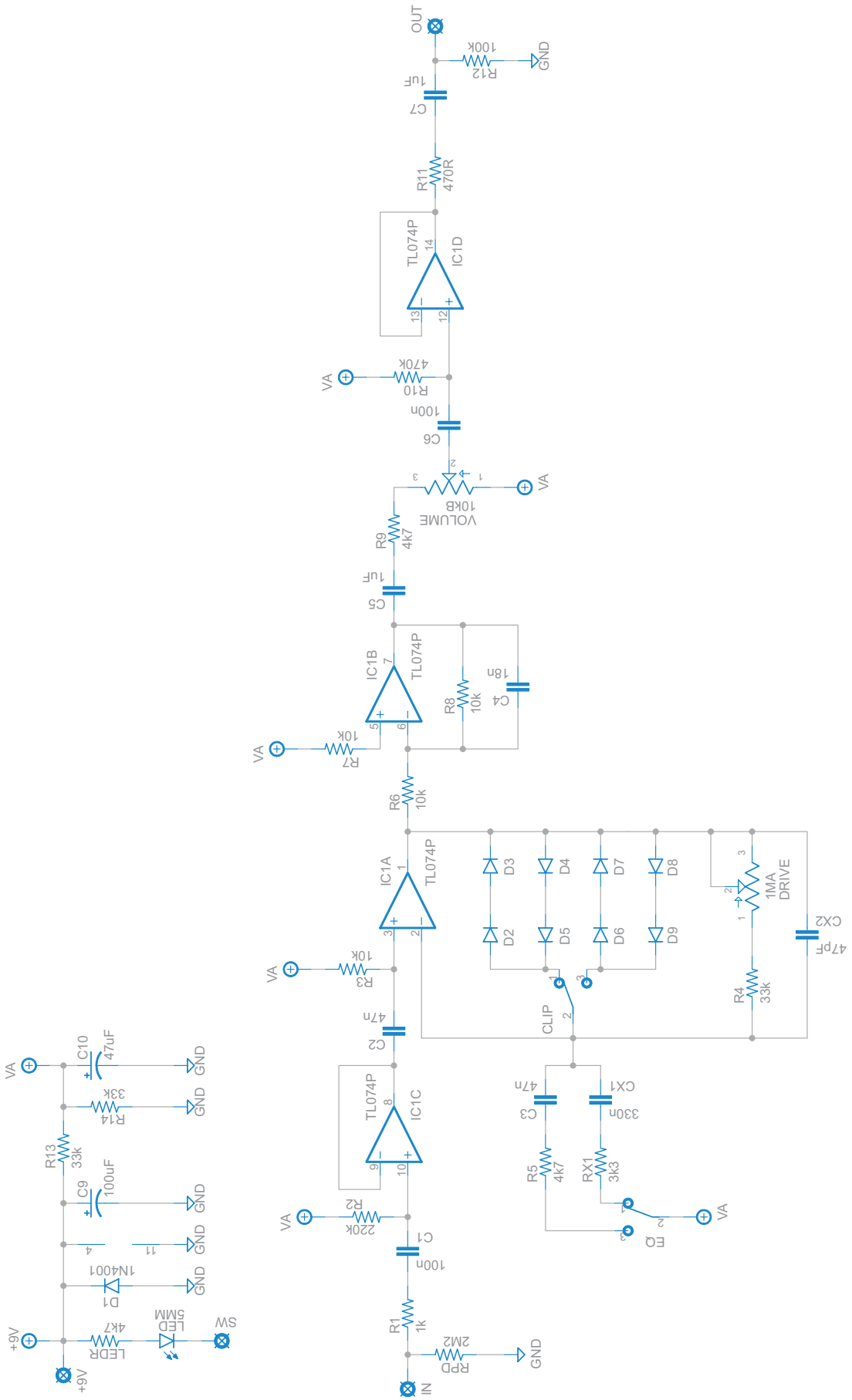



**Landgraff Dynamic Overdrive (asymmetrical silicon on top, LED on bottom)**




**Fulldrive 2 (Silicon top, MOSFET bottom)**

# Schematic


OUT
100K
R12
GND
1uF
C7
R11
470R
TL074P
IC1D
VA
470K
R10
100n
C6
VOLUME
10KB
R9
4k7
1uF
C5
IC1B
TL074P
18n
C4
R8
10k
VA
10K
R7
R6
10k
IC1A
TL074P
D3
D4
D7
D8
D2
D5
D6
D9
1MA
DRIVE
CX2
47pF
VA
10K
R3
R4
33k
CLIP
47n
C2
TL074P
IC1C
47n
C3
CX1
330n
R5
4k7
RX1
3k3
EQ
VA
VA
220K
R2
C1
100n
R1
1k
RPD
2M2
GND
IN
VA
C10
47uF
GND
33K
R14
GND
R13
33k
C9
100uF
GND
GND
1N4001
D1
GND
9V+
LEDR
4K7
LED
5MM
SW
9V+

## General Build Instructions

These are general guidelines and explanations for all Aion Electronics DIY projects, so be aware that not everything described below may apply to this particular project.

### Build Order

When putting together the PCB, it's recommended that you do not yet solder any of the enclosure-mounted control components (pots and switches) to the board. Instead, follow this build order:

1. Attach the **audio jacks**, **DC jack** and **footswitch** to the enclosure.
2. Firmly attach the **pots** and **switches** to the enclosure, taking care that they are aligned and straight.
3. Push the **LED**[1] into the hole in the enclosure with the leads sticking straight up, ensuring that the flat side is oriented according to the silkscreen on the PCB.
4. Fit the **PCB** onto all the control components, including the leads of the LED. If it doesn't fit, or if you need to bend things more than you think you should, double-check the alignment of the pots and switches.
5. Once you feel good about everything, **solder them from the top**[2] as the last step before wiring. This way there is no stress on the solder joints from slight misalignments that do not fit the drilled holes. You can still take it out easily if the build needs to be debugged, but now the PCB is "custom-fit" to that particular enclosure.
6. Wire everything according to the wiring diagram on the last page.

[1] **For the LED**: You can use a bezel if you'd like, but generally it's easier just to drill the proper size of hole and push the LED through so it fits snugly. If you solder it directly to the PCB, it'll stay put even if the hole is slightly too big. Make absolutely sure the LED is oriented correctly (the flat side matches the silk screen) before soldering, as it'll be a pain to fix later! After it's soldered, clip off the excess length of the leads.

[2] **Note on soldering the toggle switch(es):** It will require a good amount of solder to fill the pads. Try to be as quick as possible to avoid melting the lugs, and be prepared to feed a lot of solder as soon as the solder starts to melt. I recommend waiting 20-30 seconds between soldering each lug to give it time to cool down.

### "RPD" and "LEDR" resistors

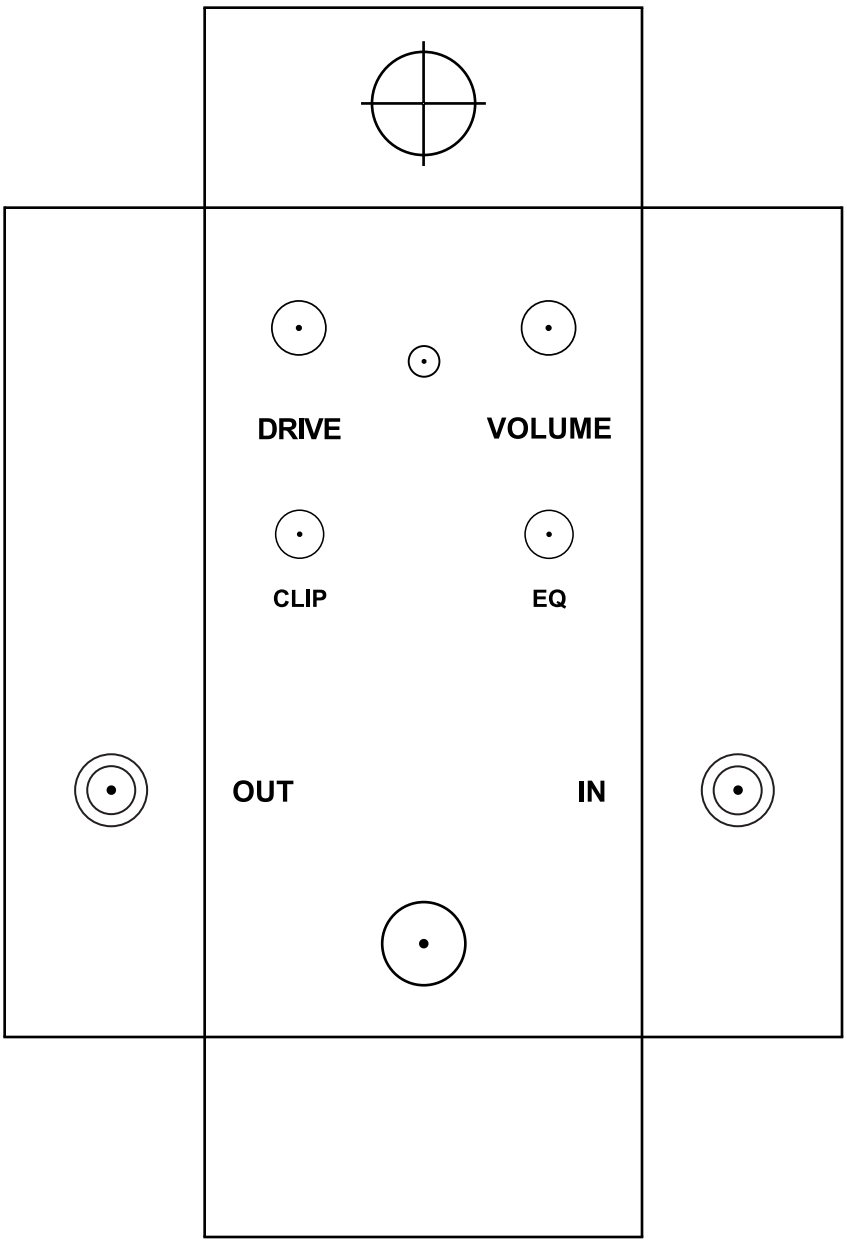
The resistors marked "RPD" and "LEDR" are generally not original to the circuit and can be adjusted to preference. "RPD" is the pulldown resistor to help tame true-bypass popping, while "LEDR" controls the brightness of the LED. I generally use 2.2M for the pulldown resistor and 4.7k for the LED resistor.

### Sockets

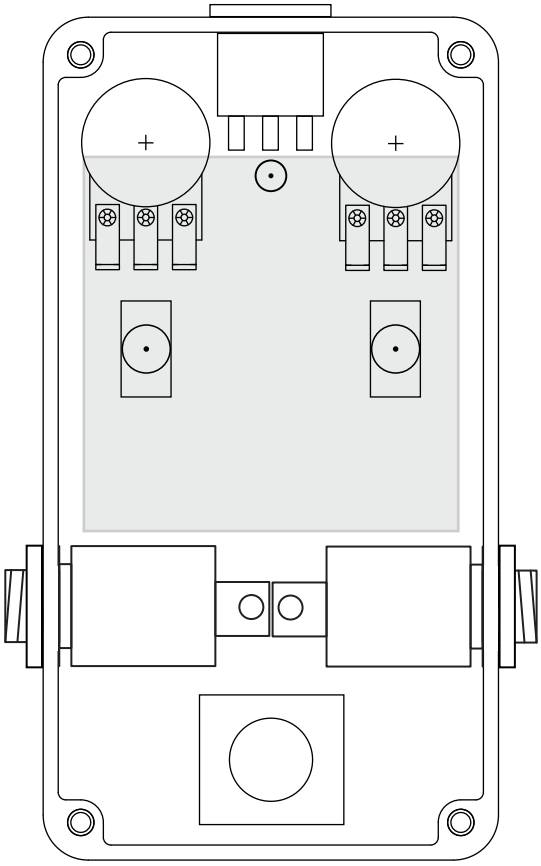
Since double-sided boards can be very frustrating to desolder, especially components with more than 2 leads, it is recommended to use sockets for all transistors and ICs. It may save you a lot of headaches later on.

## Drilling & Placement

Print this page and have an adult cut out the drilling template below for you. Tape it to the enclosure to secure it while drilling. Note that the holes are shown slightly smaller than they need to be, so drill out the holes as shown and then step up until they are the correct size for the components.




**Hammond 1590B**
*(bottom/inside view)*



## Parts Used

- Switchcraft #111A enclosed jacks
- Kobiconn-style DC jack with internal nut

## Standard Wiring Diagram

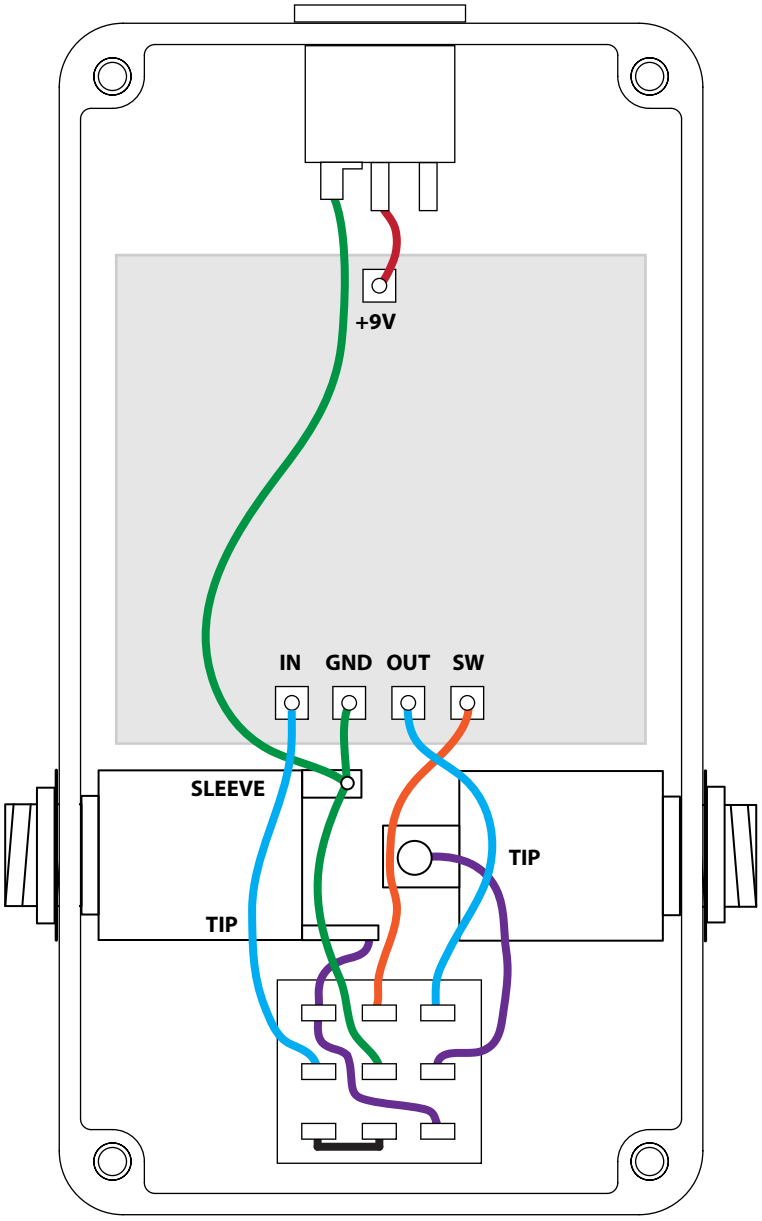
This diagram shows standard true-bypass wiring with a 3PDT switch. When the switch is off, the input of the circuit is grounded and the input jack is connected directly to the output jack.

The **SW** pad is the cathode connection for the LED. This will connect to ground to turn it on when the switch is on. Usage of the on-board LED connection is not required if you have specific placement needs for your enclosure, but's incredibly convenient.

The wiring diagram also makes use of **star grounding** principles where all of the grounds connect to a single ground point (in this case the sleeve of the input jack). This is best practice to avoid added noise caused by improper grounding. The sleeve of the output jack is unconnected.

If using a painted or powdercoated enclosure, **make sure both jacks have solid contact with bare aluminum** for grounding purposes. You may need to sand off some of the paint or powdercoat on the inside in order to make this happen.

*Make sure to double-check the markings of the pads on the PCB for your particular project – they are not always in the order shown here!*

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