RETROGRADE

FX TYPE: Fuzz Octave

Based on the Tycobrahe® Octavia™

Enclosure Size: 125B

“Softie” compatibility: Softie3

Overview

The **Retrograde** is one of a very few projects I’ve kept going since the beginning of madbeanpedals, and every few years I’ve updated the PCB design to reflect my own evolving standards. The previous version (2019) was fitted for 1590B with the transformer mounted on a breakout board. For the 2022 version I decided a 125B layout would be the more practical choice (my aging eyes and diminished tolerance for cramming as much as possible in the smallest footprint being the prime motivation.)

The Retrograde is a wall of fuzz, with a pronounced octave generated by an inexpensive transformer. It also features the ability to turn the octave off with the flip of a switch. Like many analog up octave circuits, the most pronounced upper octave is achieved by using the guitar’s neck pickup, with the tone rolled all the way off and notes played around the 12th fret. You can also get ring modulator type sounds with chords or with the volume knob on your guitar rolled down. Best of all, you get a great “dive-bomb” effect when doing double-stop bends!

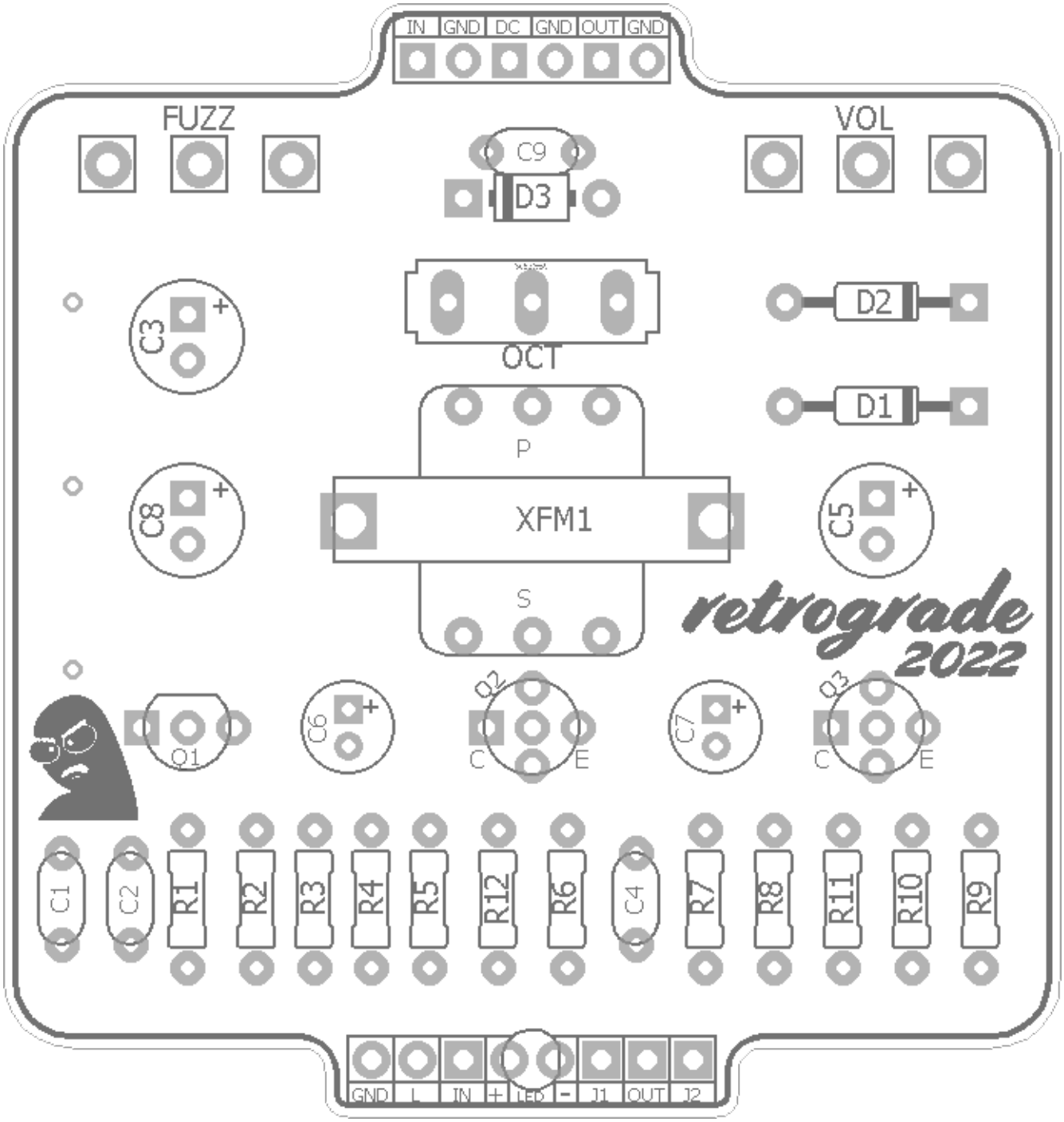
Controls

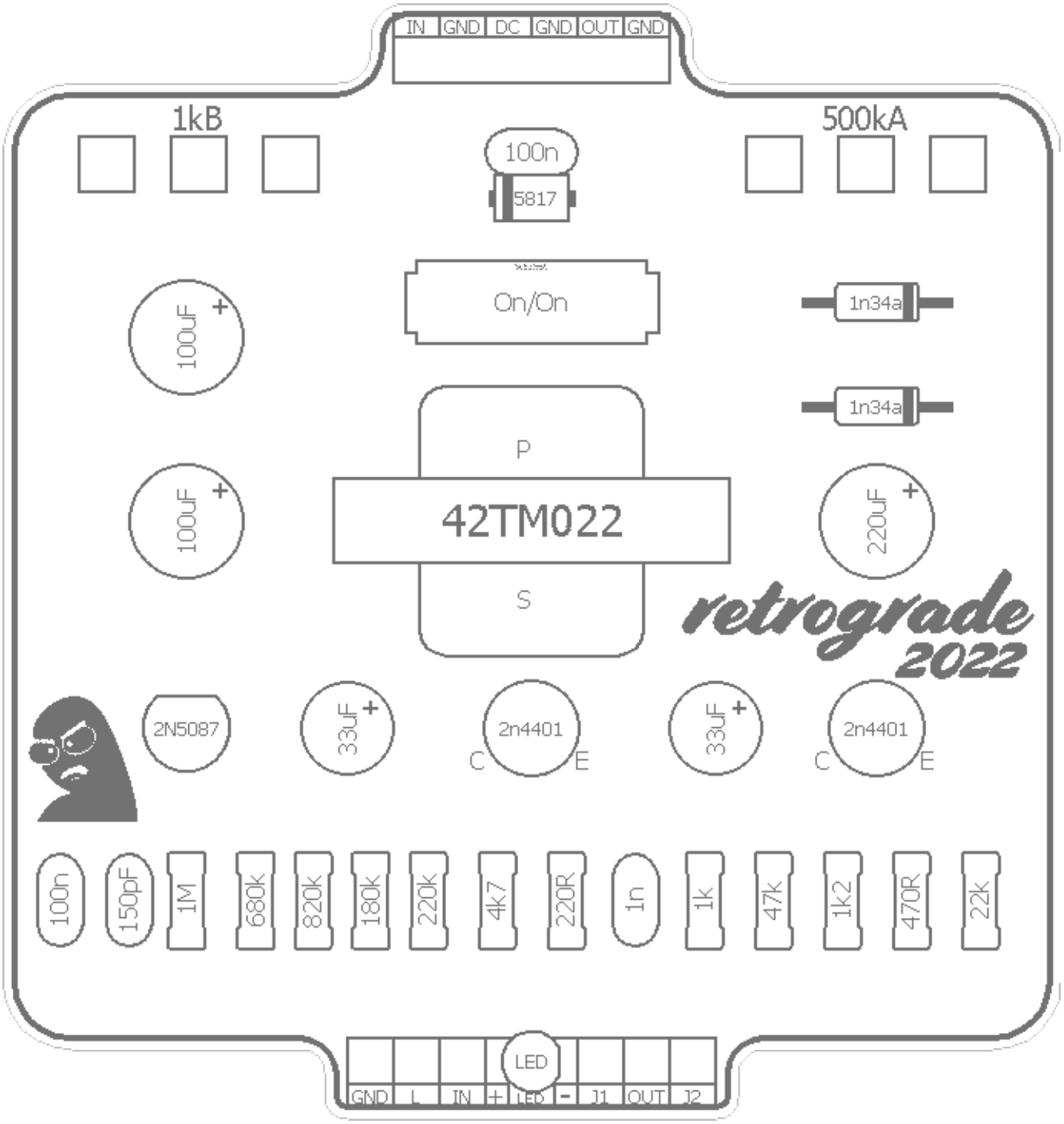
- **VOL -** Output level.
- **FUZZ -** Fuzz amount.
- **OCT -** Octave up (left position) or fuzz only (right position). The fuzz-only position *increases* the volume output.

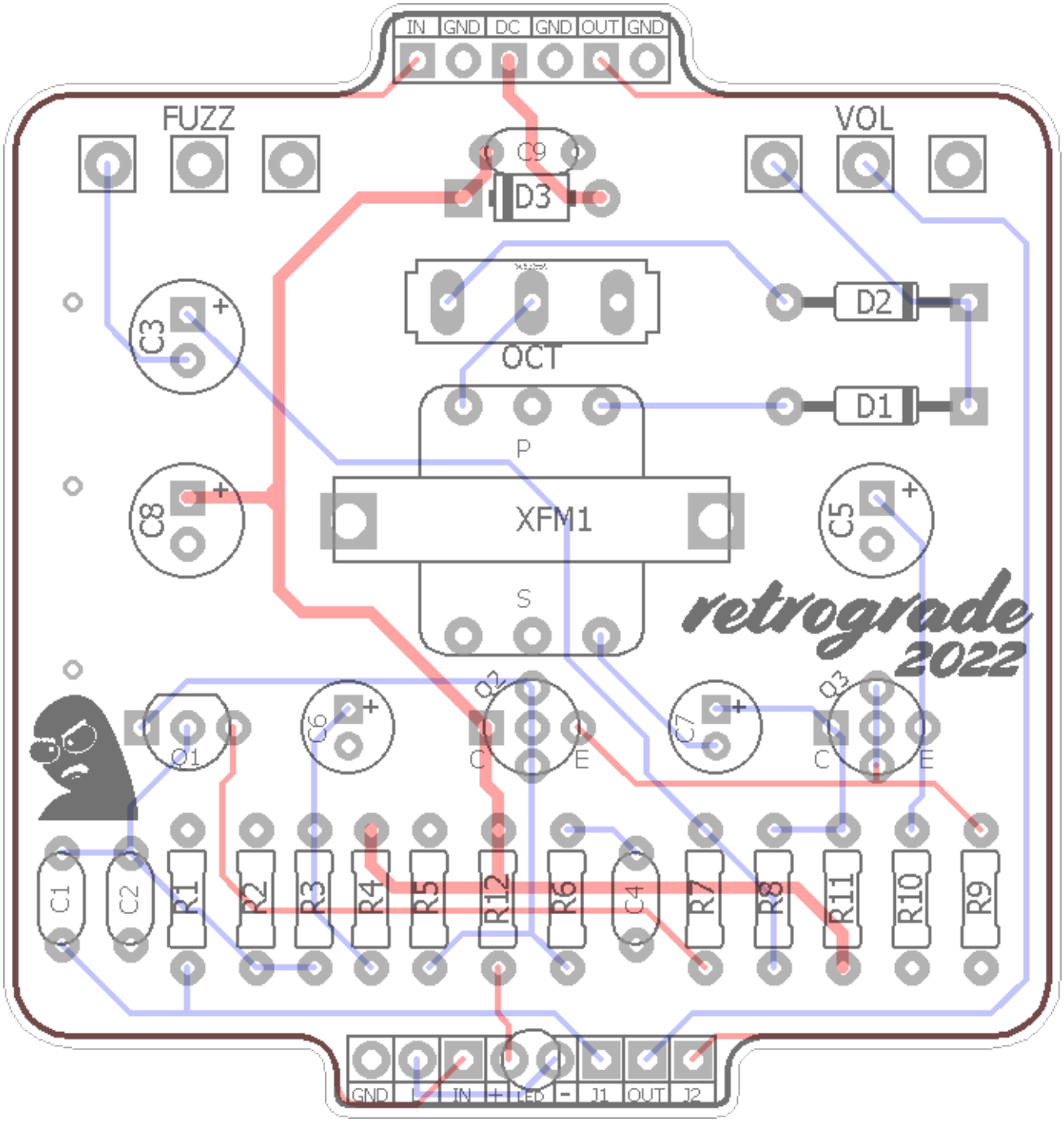
You can read up a little more on the circuit here: http://fuzzcentral.ssguitar.com/octavia.php

NOTE: There is a mistake with the I/O connections on the PCB. The effect input and input jack are transposed on the wiring I/O at the bottom of the PCB. The wiring diagram has been updated to reflect the needed adjustment.

Technical assistance for your build(s) is available via the madbeanpedals forum. Please go there rather than emailing me for assistance on builds. This is because (1) I’m not always available to respond via email in a timely and continuous manner, and (2) posting technical problems and solutions in the forum creates a record from which other members may benefit.


IN
GND
DC
GND
OUT
GND
FUZZ
VOL
C9
D3
C3
OCT
D2
D1
P
XFM1
S
C8
C5
retrograde
2022
Q1
C6
Q2
C
E
C7
Q3
C
E
C1
C2
R1
R2
R3
R4
R5
R12
R6
C4
R7
R8
R11
R10
R9
GND
L
IN
+
LED
-
J1
OUT
J2


IN
GND
DC
GND
OUT
GND
1kB
500kA
100n
5817
On/On
1n34a
1n34a
100uF
100uF
220uF
P
42TM022
S
retrograde
2022
2N5087
33uF
2n4401
C
E
33uF
2n4401
C
E
100n
150pF
1M
680K
820K
180K
220K
4k7
220R
1n
1k
47k
1k2
470R
22k
LED
GND
L
IN
+
LED
-
J1
OUT
J2


IN
GND
DC
GND
OUT
GND
FUZZ
VOL
C9
D3
C3
OCT
D2
D1
P
XFM1
S
C8
C5
retrograde
2022
Q1
C6
Q2
C
E
C7
Q3
C
E
C1
C2
R1
R2
R3
R4
R5
R12
R6
C4
R7
R8
R11
R10
R9
GND
IN
LED
J1
OUT
J2

Resistors		Caps		Diodes	
R1	1M	C1	100n	D1	1n34a
R2	680k	C2	150pF	D2	1n34a
R3	820k	C3	100uF	D3	1n5817
R4	180k	C4	1n	Transistors	
R5	220k	C5	220uF	Q1	2N5087
R6	220R	C6	33uF	Q2	2n4401
R7	1k	C7	33uF	Q3	2n4401
R8	47k	C8	100uF	Transformer	
R9	22k	C9	100n	XFM1	42TM022
R10	470R			Switch	
R11	1k2			OCT	On/On
R12	4k7			Pots	
				FUZZ	1kB
				VOL	500kA

Value	QTY	Type	Rating
220R	1	Metal / Carbon Film	1/4W
470R	1	Metal / Carbon Film	1/4W
1k	1	Metal / Carbon Film	1/4W
1k2	1	Metal / Carbon Film	1/4W
4k7	1	Metal / Carbon Film	1/4W
22k	1	Metal / Carbon Film	1/4W
47k	1	Metal / Carbon Film	1/4W
180k	1	Metal / Carbon Film	1/4W
220k	1	Metal / Carbon Film	1/4W
680k	1	Metal / Carbon Film	1/4W
820k	1	Metal / Carbon Film	1/4W
1M	1	Metal / Carbon Film	1/4W
150pF	1	Ceramic / MLCC	16v min.
1n	1	Film	16v min.
100n	2	Film	16v min.
33uF	2	Electrolytic	16v min.
100uF	2	Electrolytic	16v min.
220uF	1	Electrolytic	16v min.
1n34a	2	or, BAT46	
1n5817	1	1k5 Primary, 600R Secondary	
2N5087	1	or, comparable PNP	
2n4401	2	or, comparable NPN	
42TM022	1		
SPDT	1	On/On, Solder Lug or Pins	
1kB	1	PCB Right Angle	16mm
500kA	1	PCB Right Angle	16mm

2N4401 transistors (max 300 Hfe recommended):
https://www.mouser.com/ProductDetail/512-2N4401TFR
http://smallbear-electronics.mybigcommerce.com/transistor-2n4401/

42TM022 transformer:
https://www.mouser.com/ProductDetail/42TM022-RC
https://smallbear-electronics.mybigcommerce.com/transformer-for-tycho-octavia/

SPDT:
https://smallbear-electronics.mybigcommerce.com/spdt-on-on-short-lever/

16mm Right Angle Pots:
http://smallbear-electronics.mybigcommerce.com/alpha-single-gang-16mm-right-angle-pc-mount/

1n34a:
http://smallbear-electronics.mybigcommerce.com/diode-nos-germanium/
https://stompboxparts.com/semiconductors/1n34a-germanium-diode/

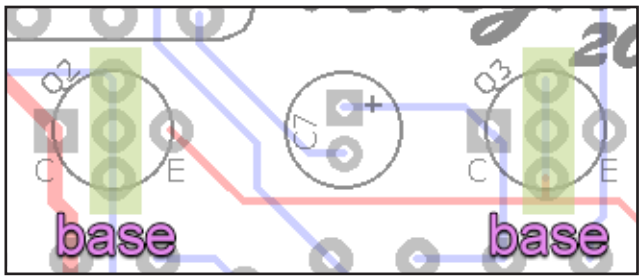
BAT46 (sub for 1n34a):
http://smallbear-electronics.mybigcommerce.com/diode-schottky-bat46/

DC Jacks:
https://smallbear-electronics.mybigcommerce.com/2-1-mm-all-plastic-round/
https://stompboxparts.com/power-connections/dc-power-jack-2-1mm-low-profile/
https://lovemyswitches.com/thinline-lumberg-dc-power-jack-2-1mm/

1/4” jacks:
https://smallbear-electronics.mybigcommerce.com/1-4-in-mono-nys229/
https://smallbear-electronics.mybigcommerce.com/1-4-in-mono-switchcraft-11/
https://lovemyswitches.com/1-4-mono-jack-lumberg-klbm-3/
https://lovemyswitches.com/1-4-mono-jack-neutrik-rean-nys229/

My preferred 3PDT switch:
https://lovemyswitches.com/pro-3pdt-latched-foot-switch-solder-lugs-feather-soft-click/

The transistor footprints are set up to accommodate a variety of pin configurations if you wish to evaluate different types from the spec'd 2n4401. While there's really no benefit in deviating from the Q1 2n5087 at the input gain stage, it might be worth your time to audition different types of transistors in the fuzz circuit (Q2 and Q3) for some tonal variety. The middle row of pads on these transistors are all connected together and correspond to the base pin of each.



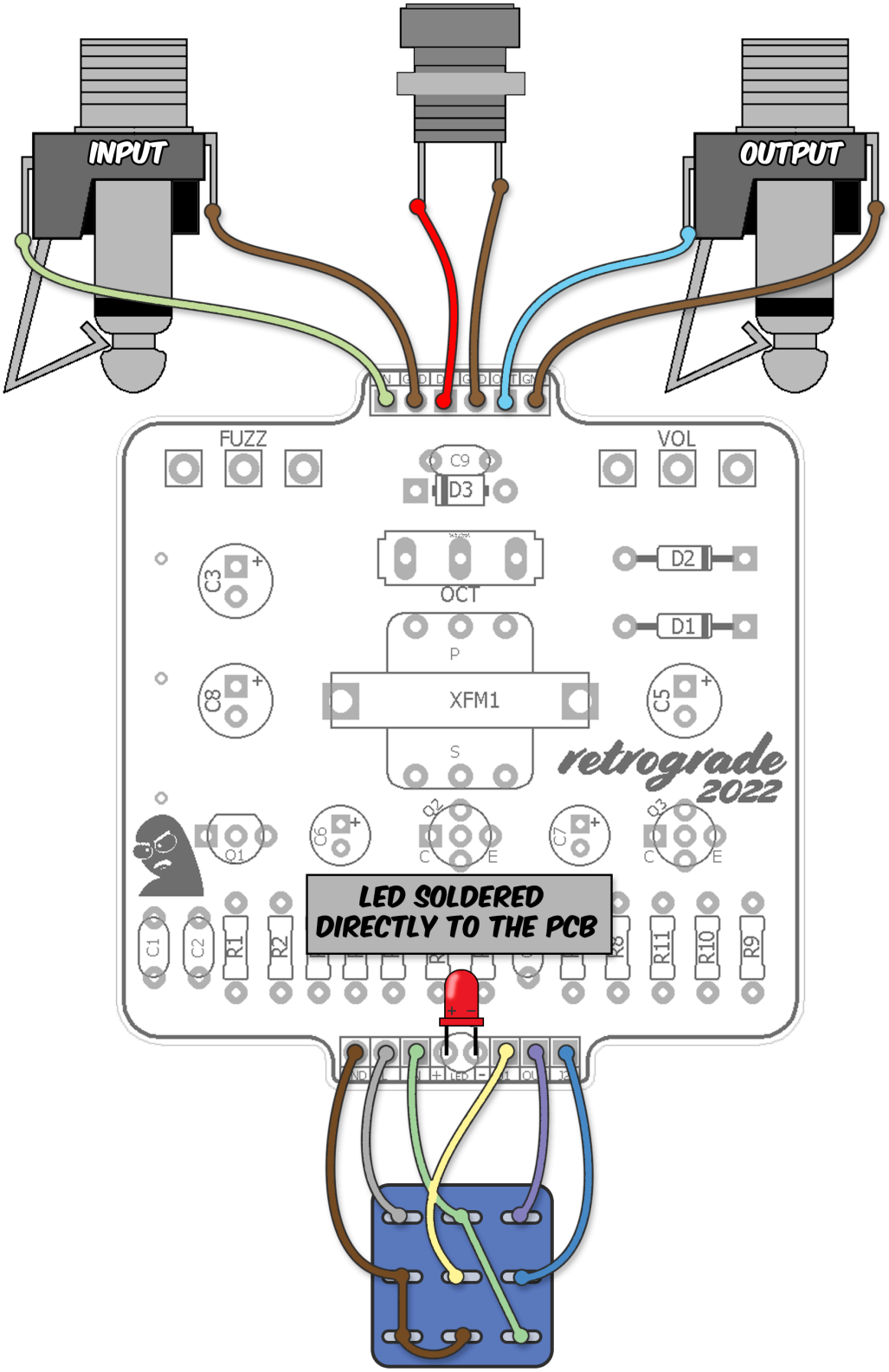
I tested a few different sets of transistors and here's what I found:

2n4401 (stock). Q1 - 169HFE, Q2 - 173HFE
The stock transistors produce a pleasant octave up without being "over the top". The fuzz only setting yields a somewhat "boxy" tone. Like a lower gain Ampeg Scrambler.

BC109: Q1 - 292HFE, Q2 - 459HFE
These are much higher gain than the 2n4401. They also produce a very thick and chewy octave up as well as a somewhat smoother fuzz-only tone. I think I prefer these over the 2n4401 just for the sake of something different. However, at max fuzz these get noisy and start to oscillate a bit so the control has to be backed off about 10%. It is kinda neat, though - turning down the guitar volume actually changes the pitch of the oscillation.

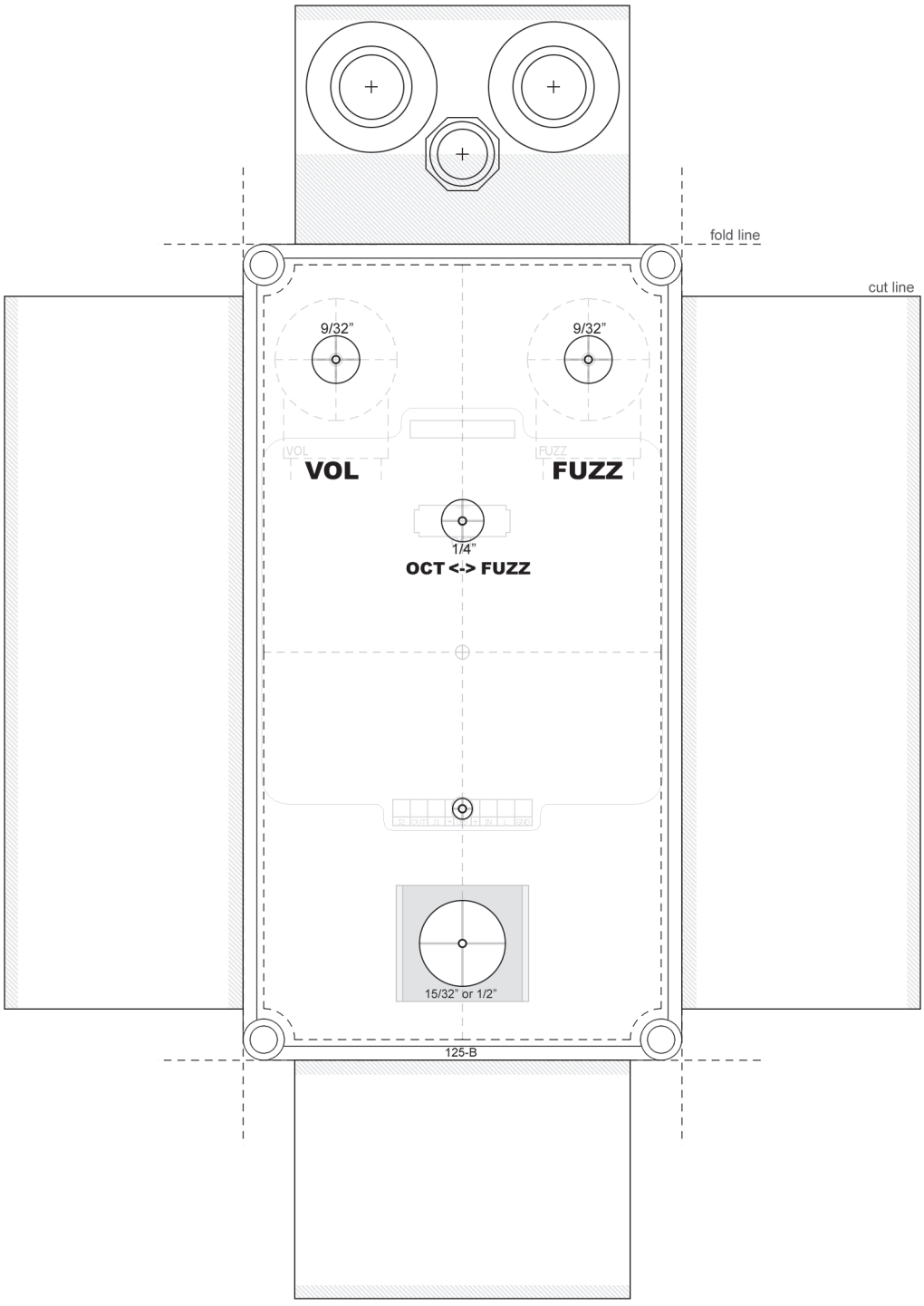
2n3565 (no HFE measurements taken)
These produce a more aggressive oct up than the 2n4401 but are also a bit more "splatty". Cool, but not remarkable.

SE4002 (no HFE measurements taken)
Overall, the SE4002 are kind of in-between the 2n4401 and BC109. The fuzz-only sound is very thick and bassy (in a good way).



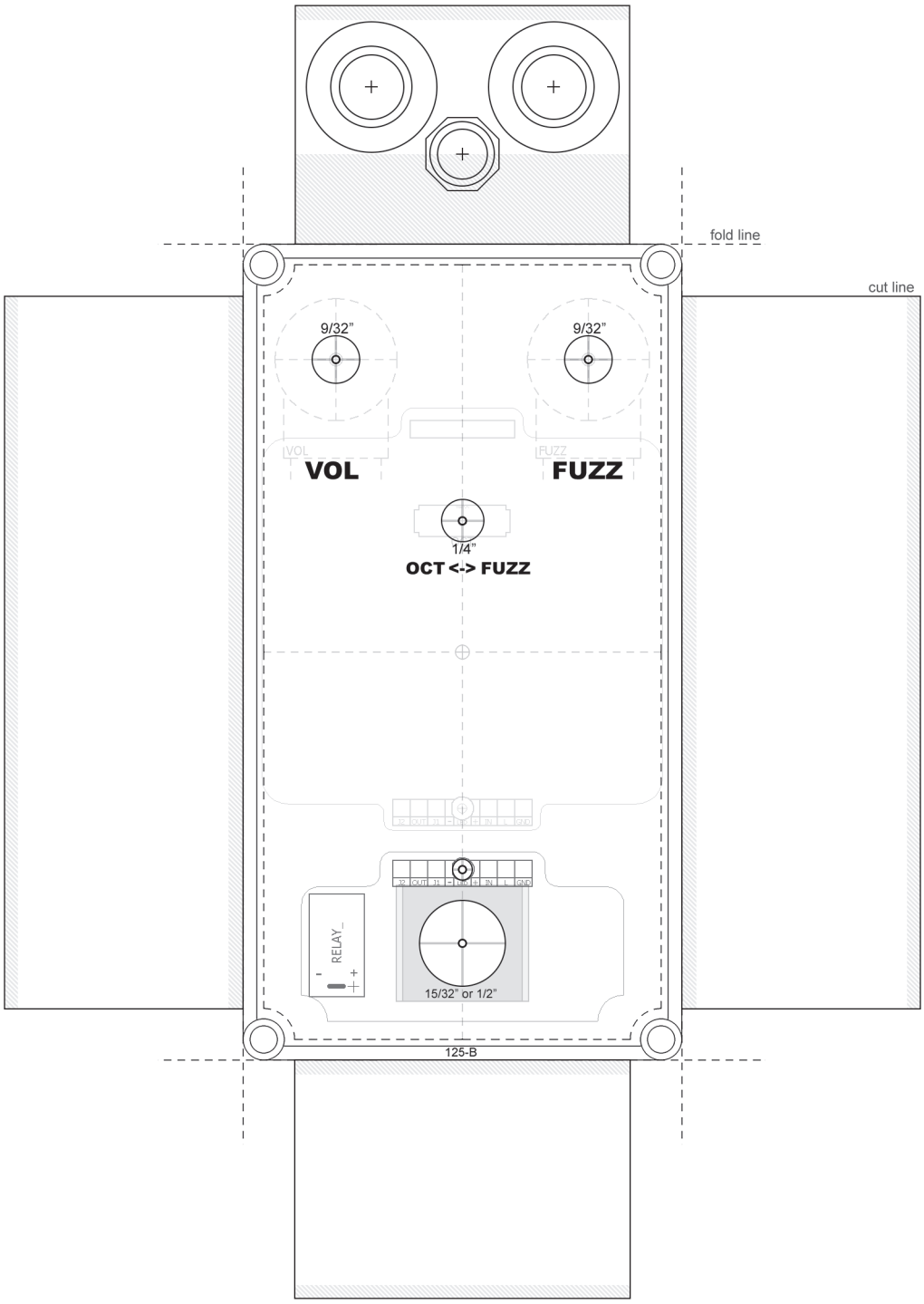
The In and J1 connections were accidentally transposed on the PCB so you will need to follow this diagram for proper bypass.

Note: *Drill Guides are approximate and may require tweaking depending on the types of jacks, switches and pots you use.*



Use this template for regular 3PDT bypass.

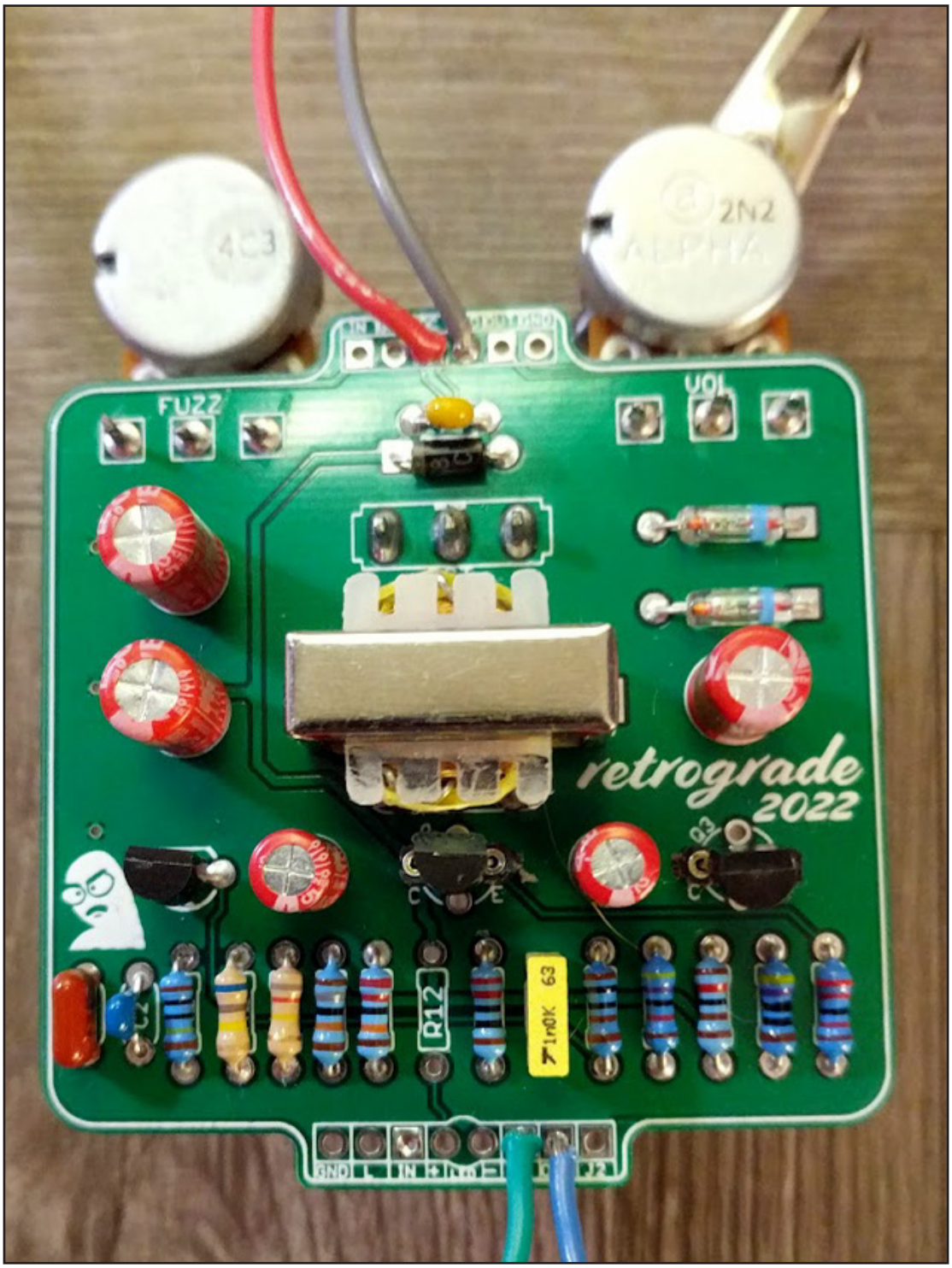
Note: *Drill Guides are approximate and may require tweaking depending on the types of jacks, switches and pots you use.*

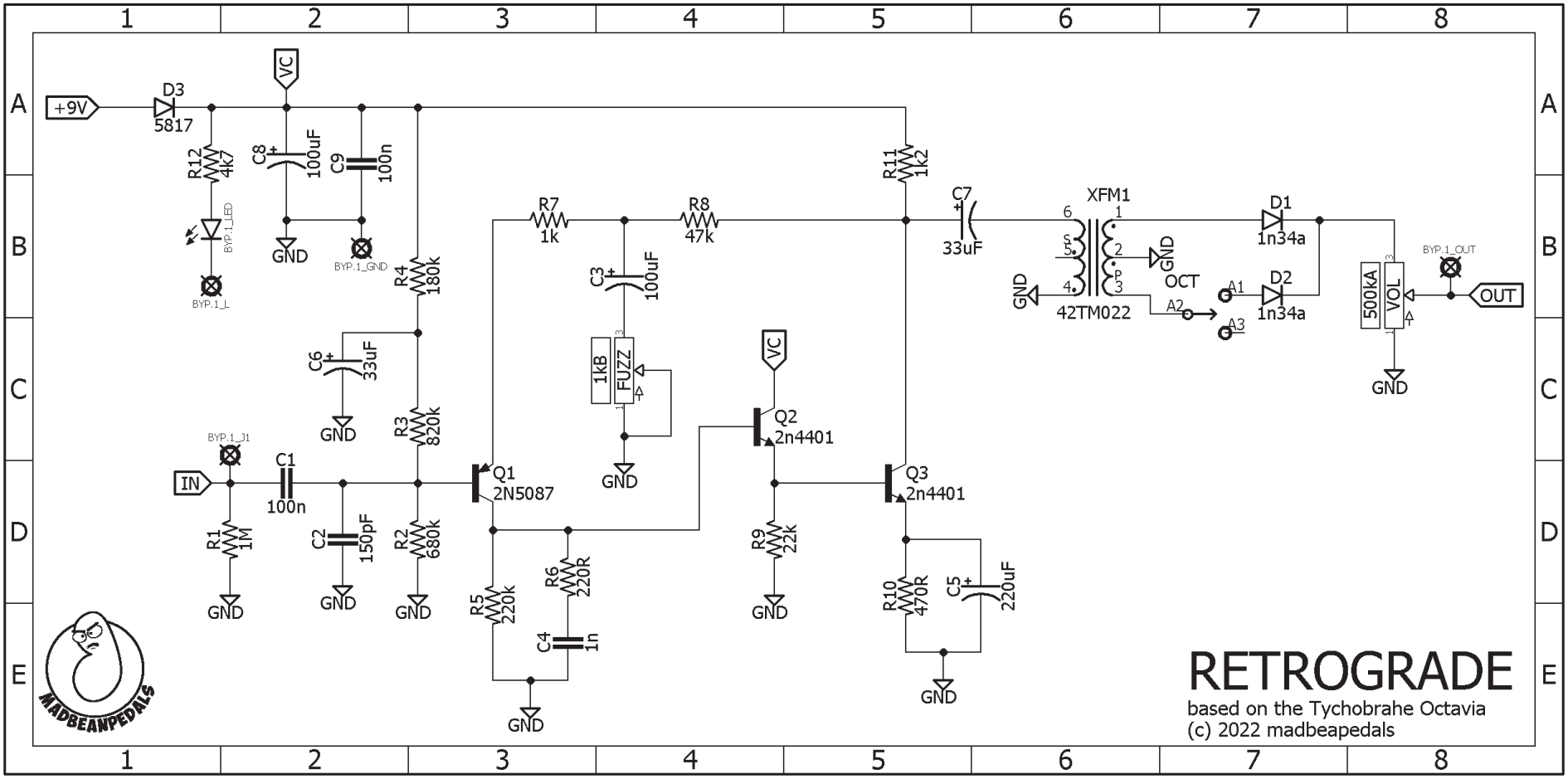


Use this template for “Softie3” relay bypass. Note the different bypass LED location. The drill location for the bypass switch is the same.

Q1	2n5087
C	2.93
B	3.54
E	4.18
Q2	**2n4401**
C	9.26
B	2.93
E	2.38
Q3	**2n4401**
C	4.85
B	3.04
E	1.73

- 9.42vDC One Spot
- Current Draw: ~5mA


FUZZ
VOL
retrograde
2022
R12
GND
IN


+9V
D3
5817
VC
R12
4k7
C8
100uF
C9
100n
GND
BYP.1_LED
BYP.1_L
BYP.1_GND
R4
180k
C6
33uF
R3
820k
BYP.1_J1
IN
C1
100n
R1
1M
C2
150pF
R2
680k
Q1
2N5087
R7
1k
R8
47k
C3
100uF
1kB
FUZZ
R5
220k
R6
220R
C4
1n
Q2
2n4401
R9
22k
Q3
2n4401
R10
470R
C5
220uF
R11
1k2
C7
33uF
XFM1
42TM022
OCT
A1
A2
A3
D1
1n34a
D2
1n34a
500kA
VOL
BYP.1_OUT
OUT
RETROGRADE
based on the Tychobrahe Octavia
(c) 2022 madbeapedals
MADBEANPEDALS