SPLUNKER

FX TYPE: Delay

Enclosure Size: 1590B

"Softie" compatibility: None

Overview

There was a time where mbp offered many different PT2399 delays from 1590A mini sized all the way up to overly-packed full feature delays. They dropped off the radar one by one in favor of more analog, BBD driven delay circuits. 2022 seems like a good time to bring a couple new PT2399 designs back into the fold.

Several years ago, Mad Professor released the Golden Cello which was a fuzz combined with a short delay circuit in a 1590B. Taking inspiration from that, I worked up the SparkleHorn project which was designed around a similar concept except it utilized the Timmy as the base overdrive circuit. The delay had all the usual controls as well, instead of a single control like the Golden Cello. That project ran its course over time and was discontinued. But, I always meant to go back to that idea later on.

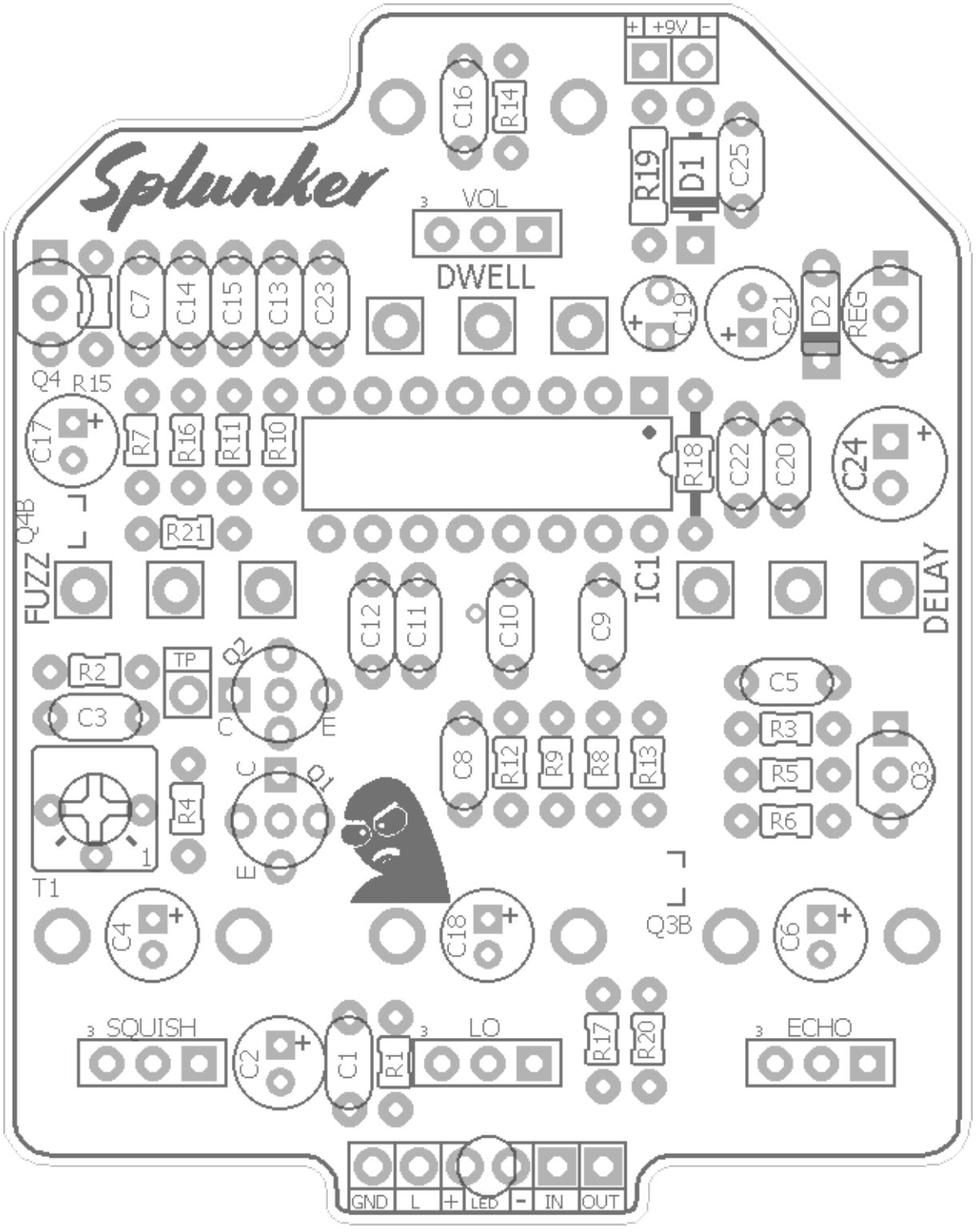
The Splunker is probably somewhat closer to the Golden Cello in that is a fuzz combined with delay. But, it is not a clone (or, at least not intentionally since I have no idea what is in the GC). Rather, it's a straight-forward silicon style fuzz with a PT2399 style delay tacked on. The challenge I set for the design was "as many useful controls as possible" and "fits in a 1590B". You have a full set of delay controls on hand as well as a couple very useful ones for tone shaping on the fuzz side.

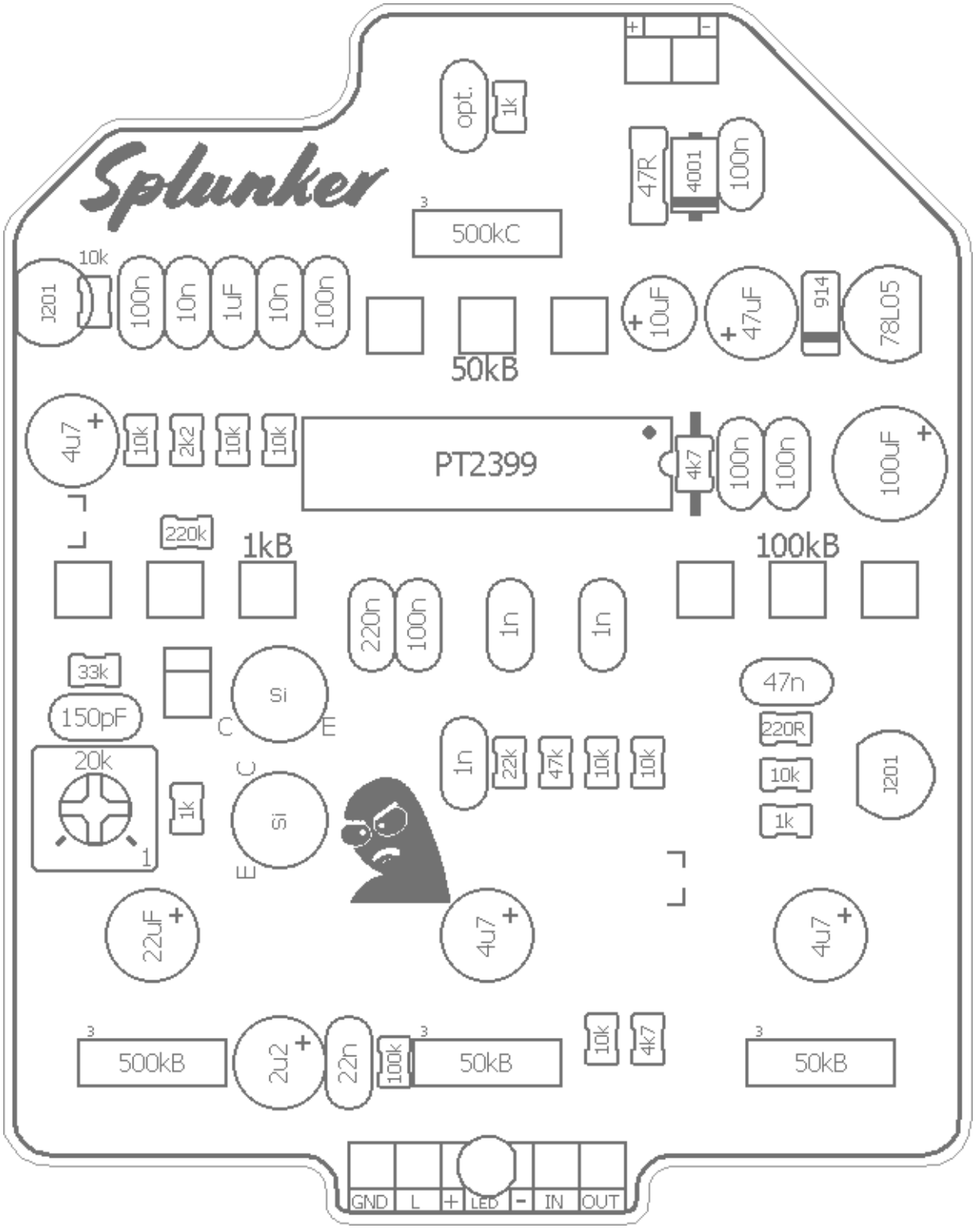
This is not a hi-fi sounding effect. It is way *lo-fi* so if that's not your thing then this project is not for you. That doesn't mean is sounds bad. Rather, it's very limited in its dynamic range due to the fuzz and low parts approach to the PT2399 portion. However, I was able to achieve nearly a full second of delay without the typical noise or puttering you get from a PT2399 with long delay times. So, it's a decent trade-off. The LO and SQUISH controls also allow for some cleaner tones at low Fuzz settings. See Notes for further explanation.

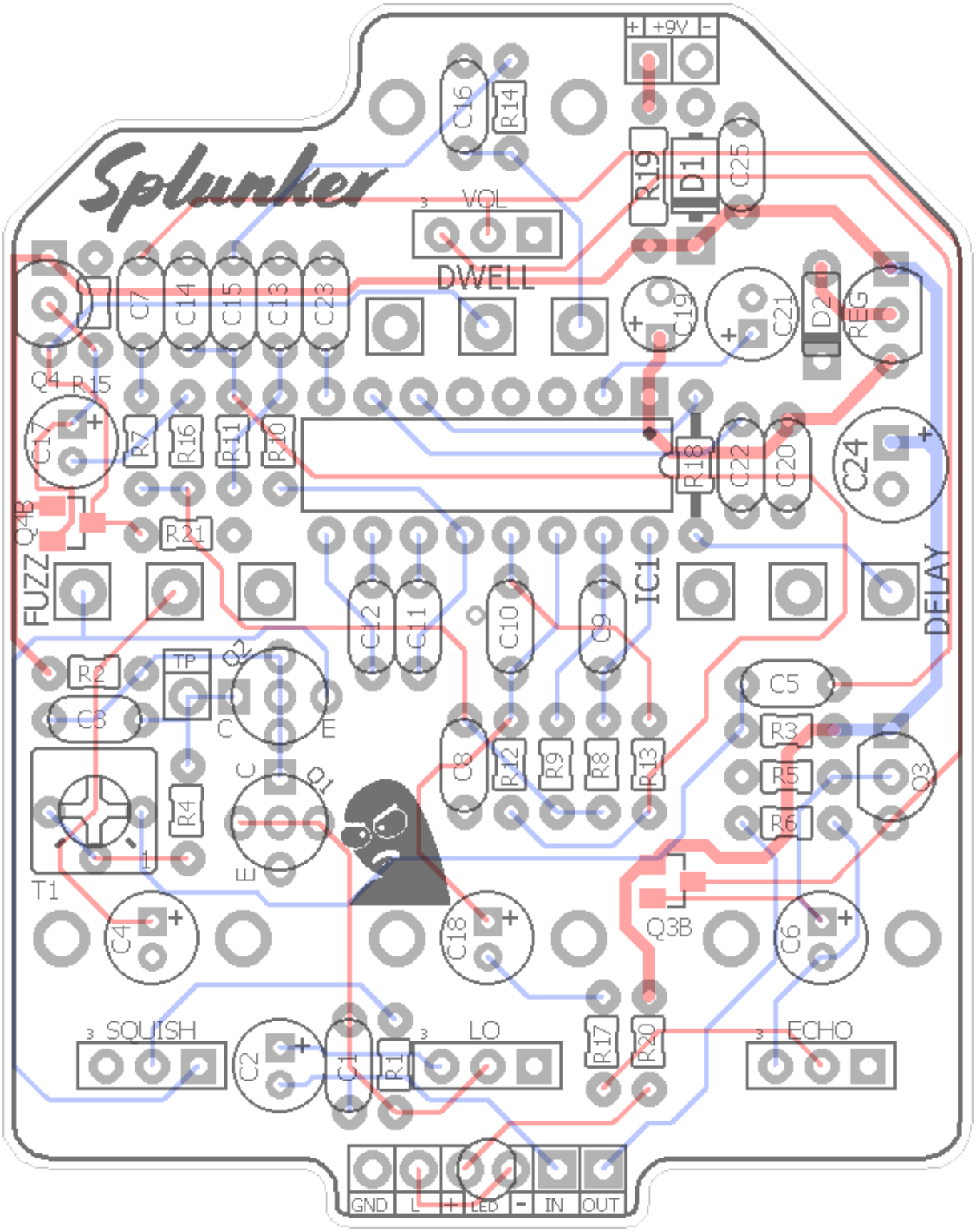
Controls

- **DELAY -** The delay range is around 40ms to ~1sec.
- **ECHO -** Delay signal mix to the fuzz output.
- **DWELL -** Delay repeats, from 1 to many!
- **FUZZ -** From "hairy" to full on fuzz.
- **LO -** Sets the amount of bass into the fuzz circuit, from thin to thicc.
- **SQUISH -** Increases the resistance in the feedback path of Q2/Q1. This creates a squashy bumblebee type effect when turned up. Full CCW is the stock FF setting.
- **VOL -** Fuzz output volume (also doubles as the input volume to the delay circuit).
- **T1** - Used to set the bias point of the Q2 collector (~1/2 supply voltage).

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.


Splunker
+9V
VOL
DWELL
FUZZ
DELAY
IC1
T1
TP
SQUISH
LO
ECHO
GND
LED
IN
OUT
REG


Splunker
opt.
1k
47R
4001
100n
500kC
10k
1201
100n
10n
1uF
10n
100n
50kB
10uF
47uF
914
78L05
4u7
10k
2k2
10k
10k
PT2399
4k7
100n
100n
100uF
220k
1kB
100kB
220n
100n
1n
1n
33k
150pF
Si
C
E
47n
220R
10k
1k
1201
20k
1k
1n
22k
47k
10k
10k
22uF
4u7
4u7
500kB
2u2
22n
100k
50kB
10k
4k7
50kB
GND
L
+
LED
-
IN
OUT


Splunker
+9V
VOL
DWELL
REG
FUZZ
DELAY
IC1
T1
Q1
Q2
Q3
Q3B
Q4
Q4B
SQUISH
LO
ECHO
GND
L
LED
IN
OUT

Resistors		Caps		Diodes	
R1	100k	C1	22n	D1	1n4001
R2	33k	C2	2u2	D2	1n914
R3	220R	C3	150pF	Transistors	
R4	1k	C4	22uF	Q1, Q2	Si
R5	10k	C5	47n	Q3, Q4	J201
R6	1k	C6	4u7	ICs	
R7	10k	C7	100n	IC1	PT2399
R8	10k	C8	1n	Regulators	
R9	47k	C9	1n	REG	78L05
R10	10k	C10	1n	Trimmers	
R11	10k	C11	100n	T1	20k
R12	22k	C12	220n	Pots	
R13	10k	C13	10n	LO	50kB
R14	1k	C14	10n	ECHO	50kB
R15	10k	C15	1uF	SQUISH	500kB
R16	2k2	C16	opt.	VOL	500kC
R17	10k	C17	4u7	FUZZ	1kB
R18	4k7	C18	4u7	DWELL	50kB
R19	47R	C19	10uF	DELAY	100kB
R20	4k7	C20	100n		
R21	220k	C21	47uF		
		C22	100n		
		C23	100n		
		C24	100uF		
		C25	100n		

Value	QTY	Type	Rating
47R	1	Metal / Carbon Film	1/4W
220R	1	Metal / Carbon Film	1/8W
1k	3	Metal / Carbon Film	1/8W
2k2	1	Metal / Carbon Film	1/8W
4k7	2	Metal / Carbon Film	1/8W
10k	8	Metal / Carbon Film	1/8W
22k	1	Metal / Carbon Film	1/8W
33k	1	Metal / Carbon Film	1/8W
47k	1	Metal / Carbon Film	1/8W
100k	1	Metal / Carbon Film	1/8W
220k	1	Metal / Carbon Film	1/8W
150pF	1	Ceramic/MLCC	16v min.
1n	3	Film	16v min.
10n	2	Film	16v min.
22n	1	Film	16v min.
47n	1	Film	16v min.
100n	6	Film	16v min.
220n	1	Film	16v min.
1uF	1	MLCC	16v min.
2u2	1	Electrolytic	16v min.
4u7	3	Electrolytic	16v min.
10uF	1	Electrolytic	16v min.
22uF	1	Electrolytic	16v min.
47uF	1	Electrolytic	16v min.
100uF	1	Electrolytic	16v min.
1n4001	1		
1n914	1		
Si	2	Fuzz Face appropriate	
J201	2	through-hole or SMD	
PT2399	1		
78L05	1		
20k	1	Bourns 3362p	
50kB	2	PCB Mount, Plastic Shaft	9mm
500kB	1	PCB Mount, Plastic Shaft	9mm
500kC	1	PCB Mount, Plastic Shaft	9mm
1kB	1	PCB Pin Mount	16mm
50kB	1	PCB Right Angle	16mm
100kB	1	PCB Right Angle	16mm

1uF MLCC (X7R):
https://www.mouser.com/ProductDetail/810-FG28X7R1E105KRT6
https://www.taydaelectronics.com/capacitors/monolithic-ceramic-capacitor/1uf-50v-multilayer-ceramic-capacitor.html

PT2399:
https://smallbear-electronics.mybigcommerce.com/ic-pt2399/
https://stompboxparts.com/semiconductors/pt2399-digital-delay-ic/

J201:
https://smallbear-electronics.mybigcommerce.com/transistor-fet-fairchild-j201/
Sub MPF102: https://stompboxparts.com/semiconductors/mpf102-jfet-nos-fairchild/

MMBFJ201:
https://smallbear-electronics.mybigcommerce.com/fairchild-on-semi-jfet-mmbfj201/
https://www.mouser.com/ProductDetail/512-MMBFJ201

Bourns 3362p trimmer 20k:
https://www.taydaelectronics.com/potentiometer-variable-resistors/cermet-potentiometers/3362p/20k-ohm-trimmer-potentiometer-cermet-1-turn-3362p.html
https://www.mouser.com/ProductDetail/652-3362P-1-203LF

9mm Plastic Shaft Pots:
https://smallbear-electronics.mybigcommerce.com/alpha-single-gang-9mm-right-angle-pc-mount-w-knurled-plastic-shaft/

https://www.taydaelectronics.com/potentiometer-variable-resistors/rotary-potentiometer/linear/b50k-ohm-linear-taper-potentiometer-round-knurled-plastic-shaft-pcb-9mm.html
https://www.taydaelectronics.com/potentiometer-variable-resistors/rotary-potentiometer/linear/500k-ohm-linear-taper-potentiometer-round-knurled-plastic-shaft-pcb-9mm.html

16mm Right Angle PCB mount pots:
https://smallbear-electronics.mybigcommerce.com/alpha-single-gang-16mm-right-angle-pc-mount/
https://stompboxparts.com/pots/16mm-potentiometer-short-pcb-leg/
https://lovemyswitches.com/16mm-potentiometers-1-4-smooth-shaft-right-angle-pcb-mount/

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/

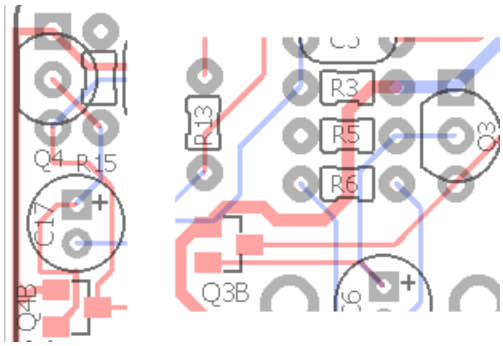
- The quality of fuzz you get from the Splunker is entirely dependent on the transistors you choose for it. Of course, you can just stick in a couple of 2n3904 and call it a day. But, it's not going to sound as good as picking appropriate transistors for an NPN silicon fuzz. Now that smallbear has re-opened I suggest looking at some of the many cool NPN transistors they have. I recommend BC108 and/or BC109, SE1002, SE4002, or any of the many others types they carry. Here are some links to help you:

  https://smallbear-electronics.mybigcommerce.com/to-106-to-109-and-to-110-dots-1/
  https://smallbear-electronics.mybigcommerce.com/bcxxx-bdxxx-1/
  https://smallbear-electronics.mybigcommerce.com/bc10x-1/
  https://stompboxparts.com/semiconductors/bc108-npn-transistor-nos-ti/
  https://stompboxparts.com/semiconductors/bc108c-npn-transistor-nos-itt/

- For my build, I used an SE1002 for Q1 and BC109 for Q2, with an HFE of 216 and 290, resp. This combo works great in the Splunker. YMMV. Make sure you know the pinout of the transistors you choose.

- Due to the way the circuit is designed, you won't be able to turn the delay completely off. Turning the Echo control all the way down does eliminate most of the delay signal. But, if you look closely at the schematic, you'll see a return path from the Dwell control back to the gate of Q3. I could have eliminated that with an additional transistor in the wet path but the layout was already well packed. However, this effect is designed with the intention of using both fuzz and delay simultaneously. So, it's only a small compromise.

- For Q3 and Q4, you have the option to use either through-hole J201 or the SMD equivalent the MMBFJ201 (Q3B and Q4B resp.) Just don't use both for the same transistor! You can sub other JFETs here if you like since they are only acting as signal buffers. An MBF102 or 2N5457 would work just as well. Or, other similar types. Just be mindful of pinouts.

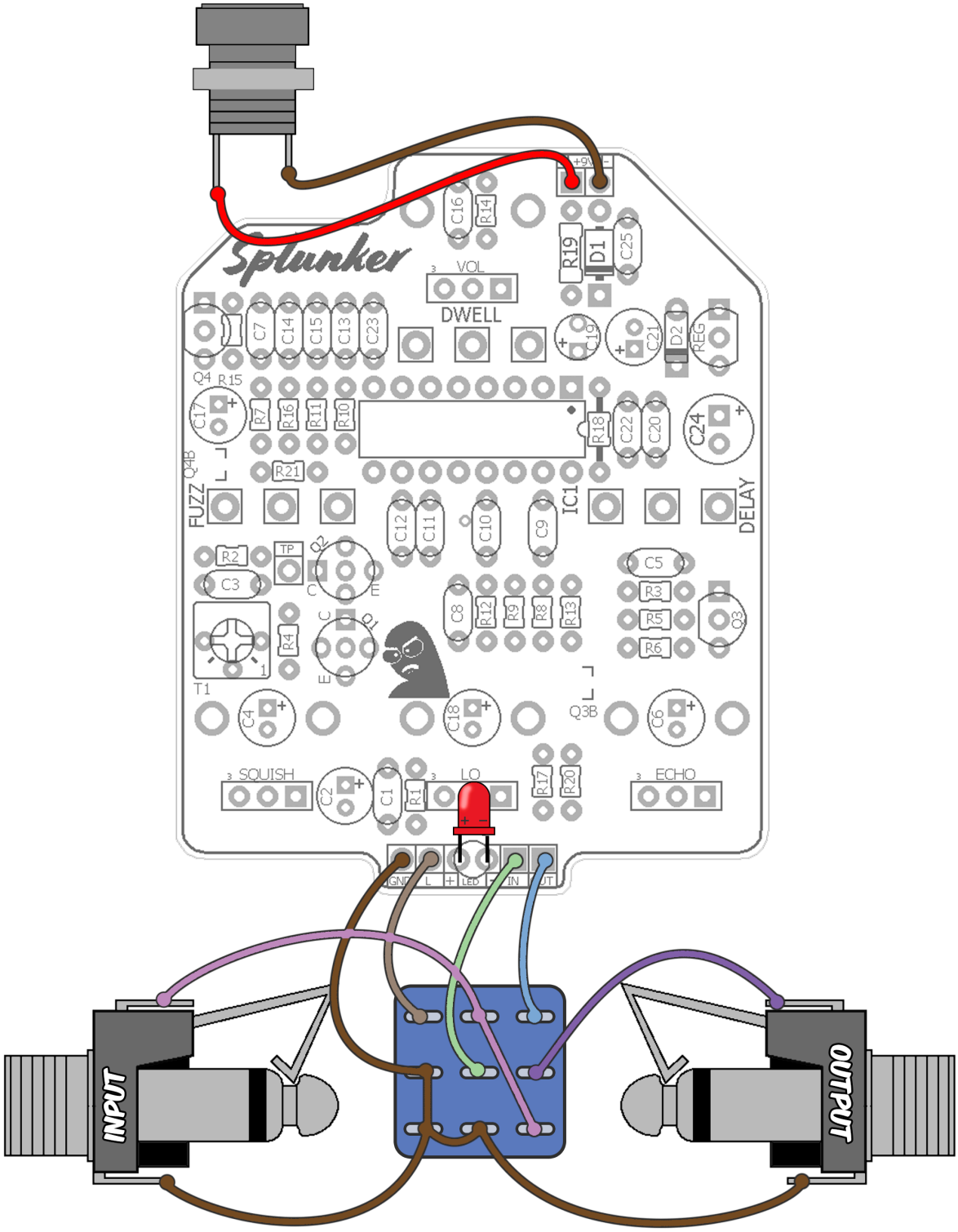


- The Fuzz output is not terribly high and does bunch up some on the Vol control. So, I do recommend using a 500kC for Vol. If you can't get one, 500kB will still work. Also, you can increase the output a bit by changing R3 from 220R to 470R. I would not go further than that.

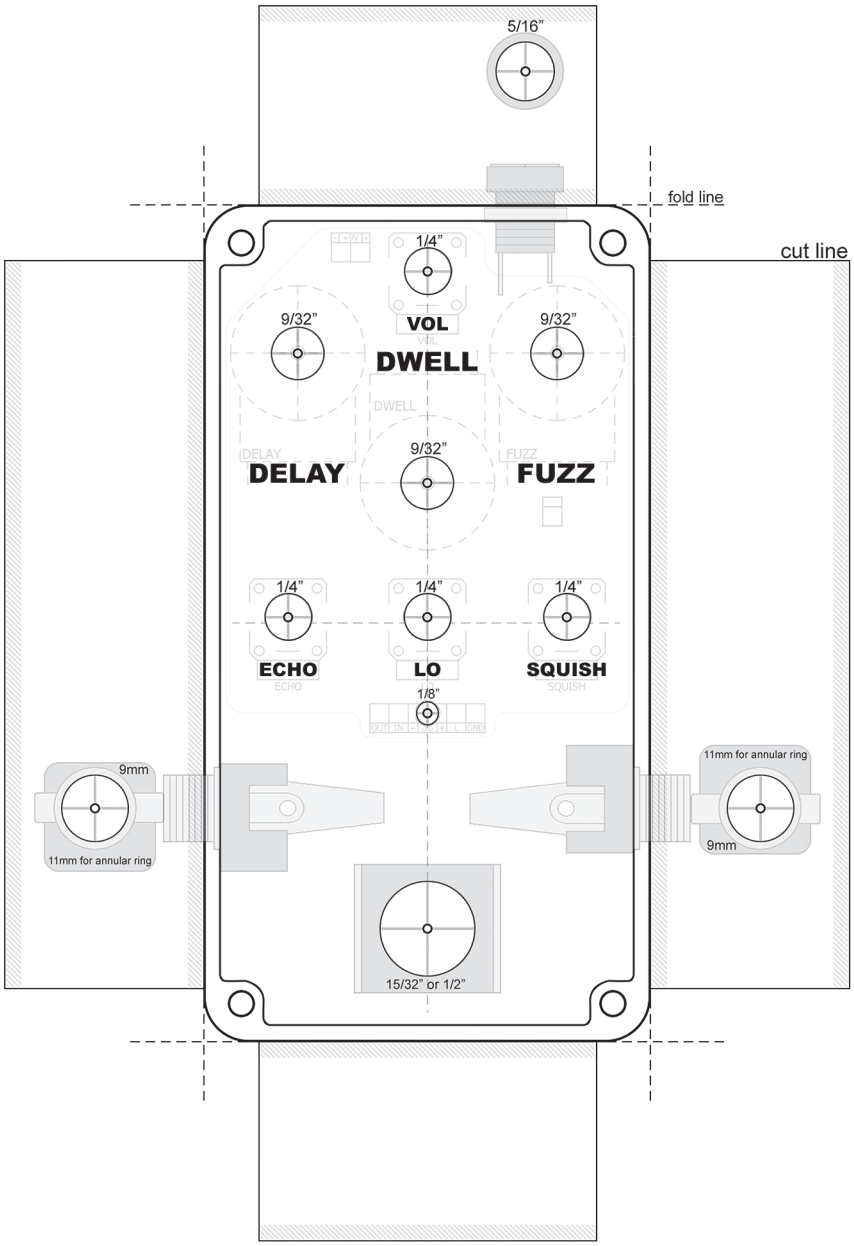
- You can get some decent cleaner tones from the Splunker by rolling the LO and Fuzz control down. This helps avoid the typical mudiness you get from other fuzzes. It also responds very well to rolling down the guitar volume. So, there are lots of tonal possibilities to be had even from such a limited design. You can also use a 1kC in place of 1kB for the fuzz pot for more control.

- C16 is an optional additional low pass filter on the delay path. I suggest socketing that cap. I found it unessary to use but if you want to try for yourself, pick a value from 10n-47n to darken things up.

- To set the bias, power up the Splunker and connect the black lead of your multimeter to ground. Use the red lead to touch the TP (test point) for a DC reading. Adjust the T1 trimmer until you read about 1/2 your supply voltage. My supply voltage read 8.41v so I set mine at around 4.2v.


Splunker
VOL
DWELL
FUZZ
DELAY
IC1
SQUISH
LO
ECHO
INPUT
OUTPUT

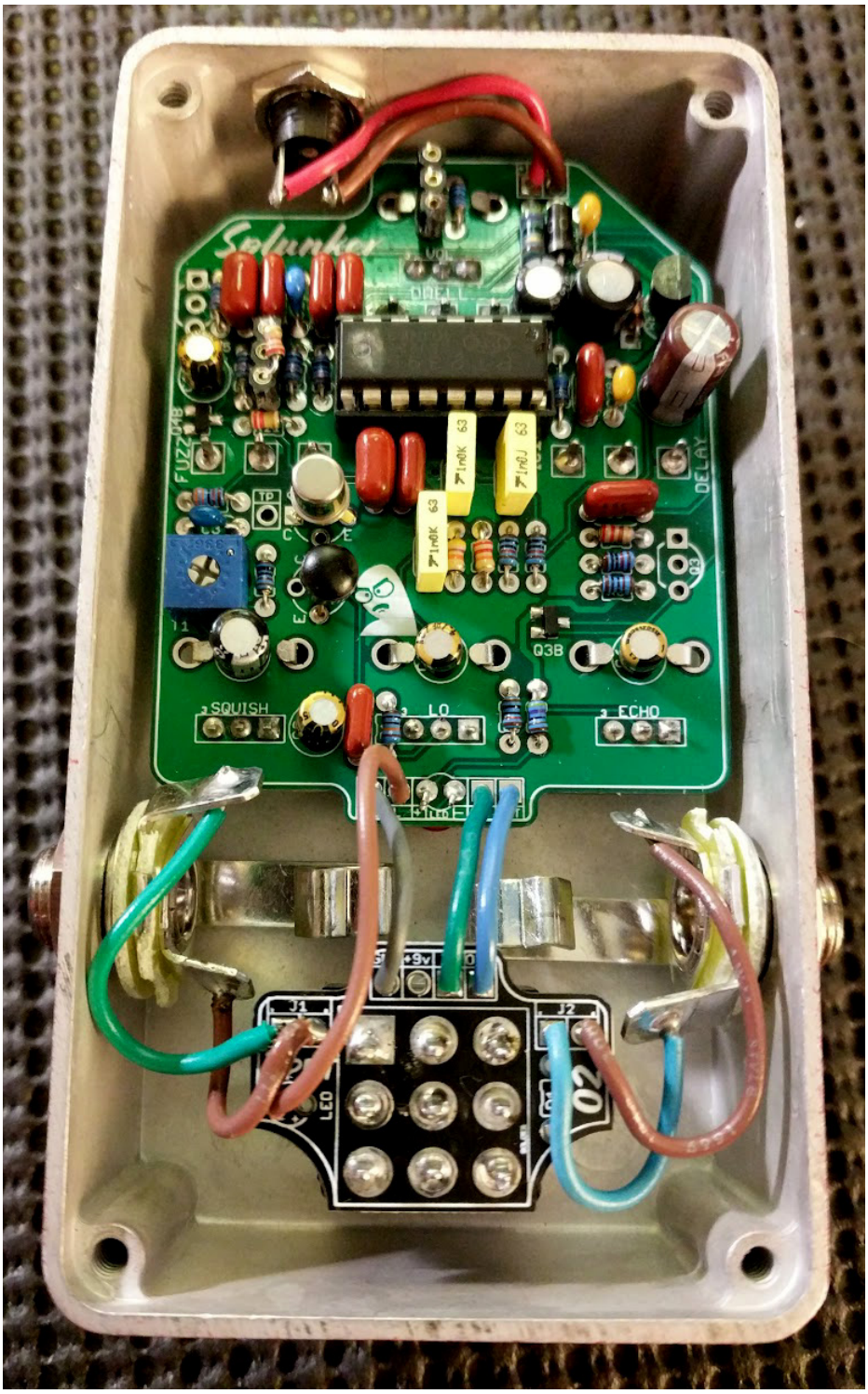
Note: *Drill Guides are approximate and may require tweaking depending on the types of jacks, switches and pots you use.*

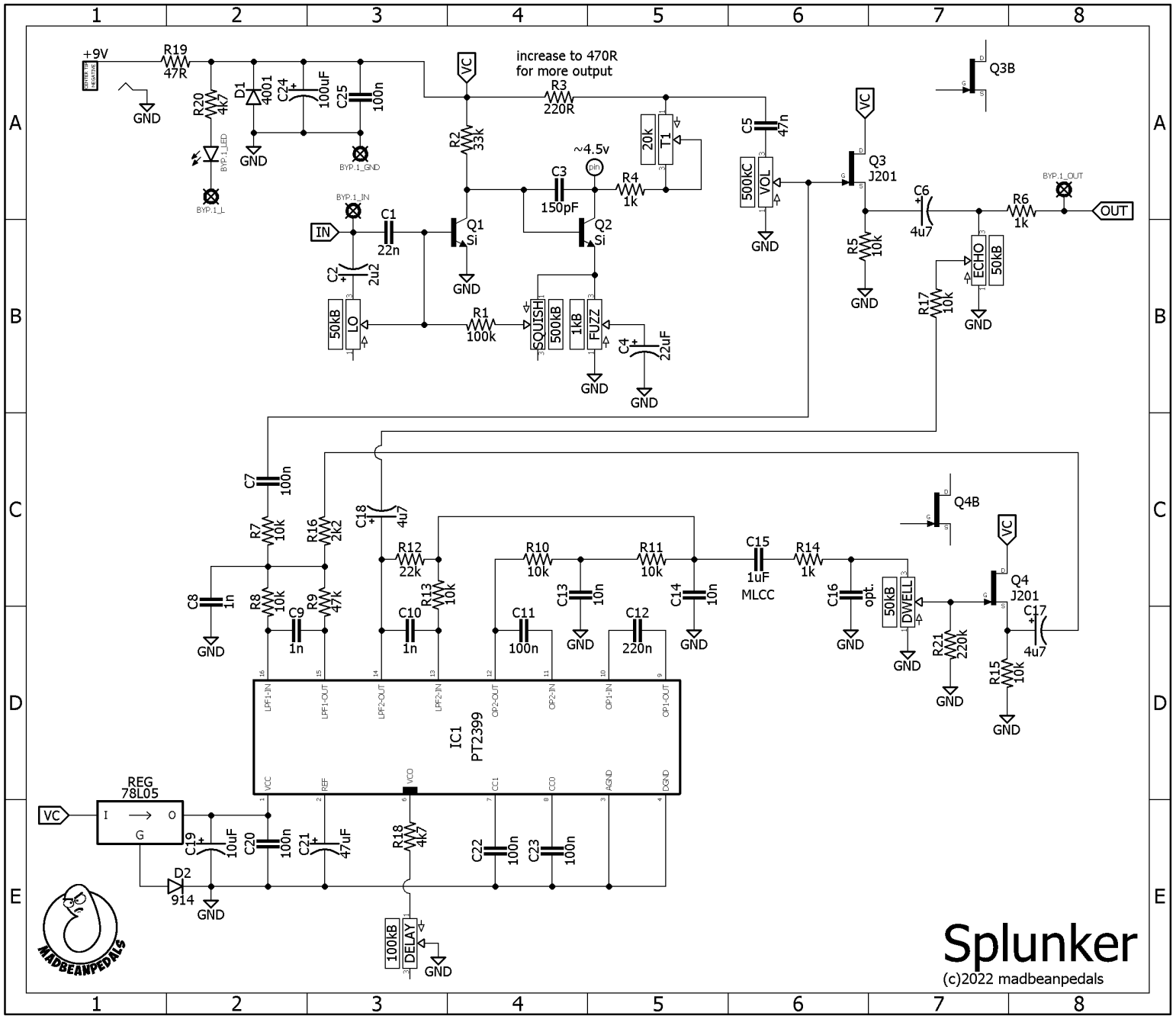


IC1	PT2399
1	5.69
2	2.84
3	0
4	0
5	3.31
6	2.84
7	0.88
8	0.88
9	2.89
10	2.84
11	2.84
12	2.59
13	2.84
14	2.74
15	2.89
16	2.84

REG	78L05
In	8.41
G	0.64
Out	5.68
Q1	**Si**
C	1.38
B	476mV
E	0
Q2	**Si**
C	4.19
B	1.58
E	1.29
Q3	**J201**
D	8.41
S	446mV
G	9.2mV
Q4	**J201**
D	8.41
S	448mV
G	0.5mV

- 9.42vDC One Spot
- Current Draw: 23mA
- Testing Conditions:
- Fuzz @ 2/3rds, Squish @ 0.
- All other knobs about 1/2 up


Splunker
VOL
DRIVE
FUZZ
TONE
DELAY
Q3B
SQUISH
LO
ECHO
9V
J1
J2
LED


+9V
R19
47R
R20
4k7
D1
4001
C24
100uF
C25
100n
GND
BYP.1_LED
BYP.1_L
BYP.1_GND
VC
increase to 470R
for more output
R3
220R
R2
33k
~4.5v
C3
150pF
R4
1k
20k
T1
C5
47n
500kC
VOL
Q3B
Q3
J201
C6
4u7
R6
1k
BYP.1_OUT
OUT
R5
10k
ECHO
50kB
R17
10k
BYP.1_IN
IN
C1
22n
C2
2u2
Q1
Si
Q2
Si
50kB
LO
R1
100k
SQUISH
500kB
1kB
FUZZ
C4
22uF
C7
100n
R7
10k
R16
2k2
C18
4u7
R12
22k
R10
10k
R11
10k
C15
1uF
MLCC
R14
1k
Q4B
C8
1n
R8
10k
R9
47k
C9
1n
C10
1n
R13
10k
C11
100n
C13
10n
C12
220n
C14
10n
C16
opt.
50kB
DWELL
Q4
J201
C17
4u7
R21
220k
R15
10k
IC1
PT2399
LPF1-IN
LPF1-OUT
LPF2-OUT
LPF2-IN
OP2-OUT
OP2-IN
OP1-IN
OP1-OUT
VCC
REF
VCO
CC1
CC0
AGND
DGND
REG
78L05
I
O
G
C19
10uF
C20
100n
C21
47uF
R18
4k7
C22
100n
C23
100n
D2
914
100kB
DELAY
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Splunker
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