Batwing24

FX Type: **FILTER**
Build Level: Intermediate
Based On: Maestro® Filter, Sample & Hold™

Last Updated: November 20, 2024 3:56 PM

The *2024 version* of the **Batwing** has no significant circuit changes and a brand new PCB layout. This version no longer requires 9mm pots.

Overview

The **Sharkfin** was a Maestro FSH project available on madbeanpedals for many years. That project seemed to reach the end of its life cycle after a time and was discontinued. But, several builders had mentioned that they might like a project of just the envelope filter portion. The **Batwing** project was created for just that purpose.

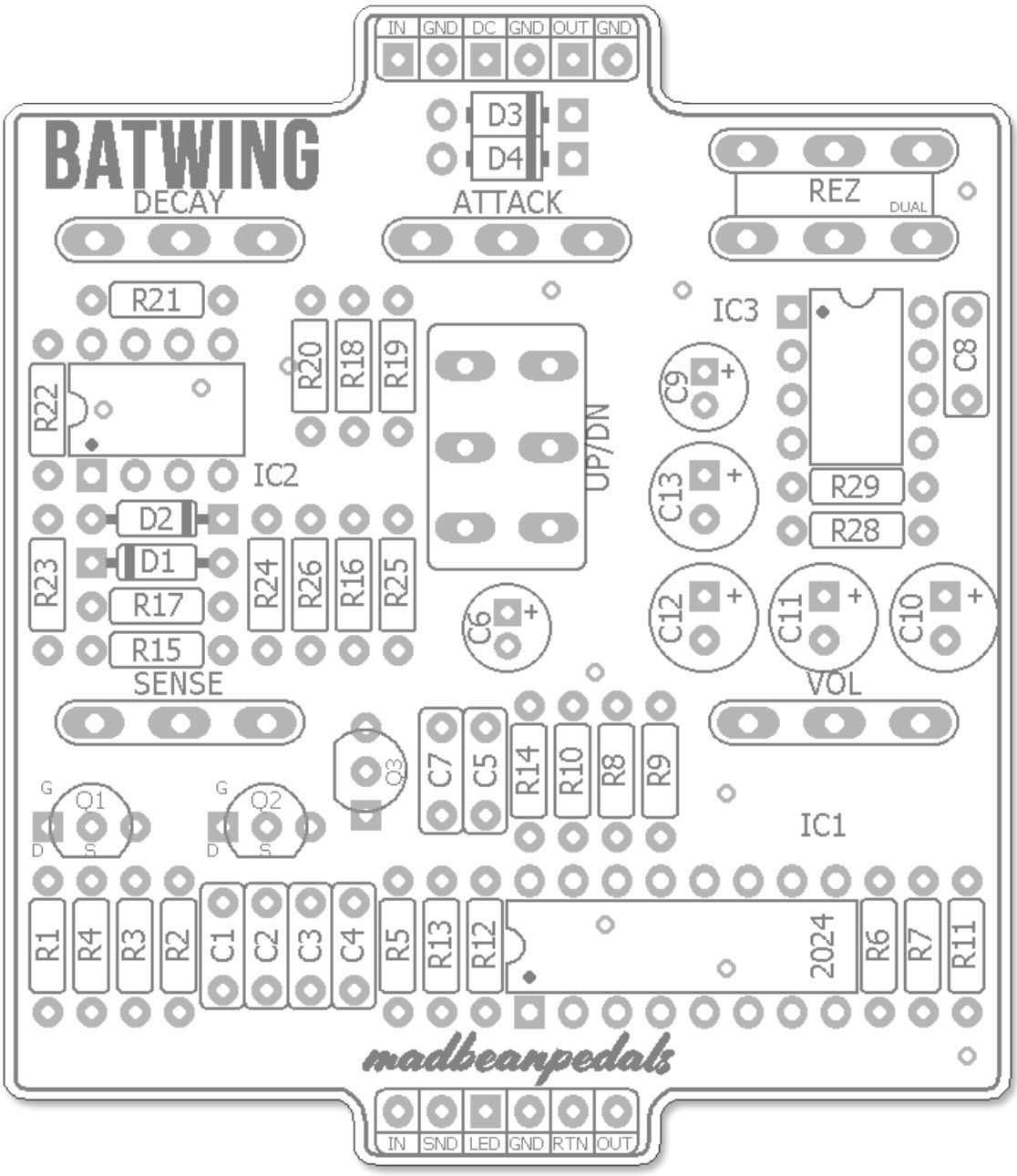
The Batwing retains the entire envelope section of the FSH and borrows the filter direction mod from the older Tonepad project. A few minor tweaks were made to the circuit, as well:

1. The input buffer from the OTA has been replaced with a JFET.
2. A dual-gang 1MB pot is used instead of a single 2MB pot for the REZ control.
3. The Decay range is increased.
4. A volume control has been added.

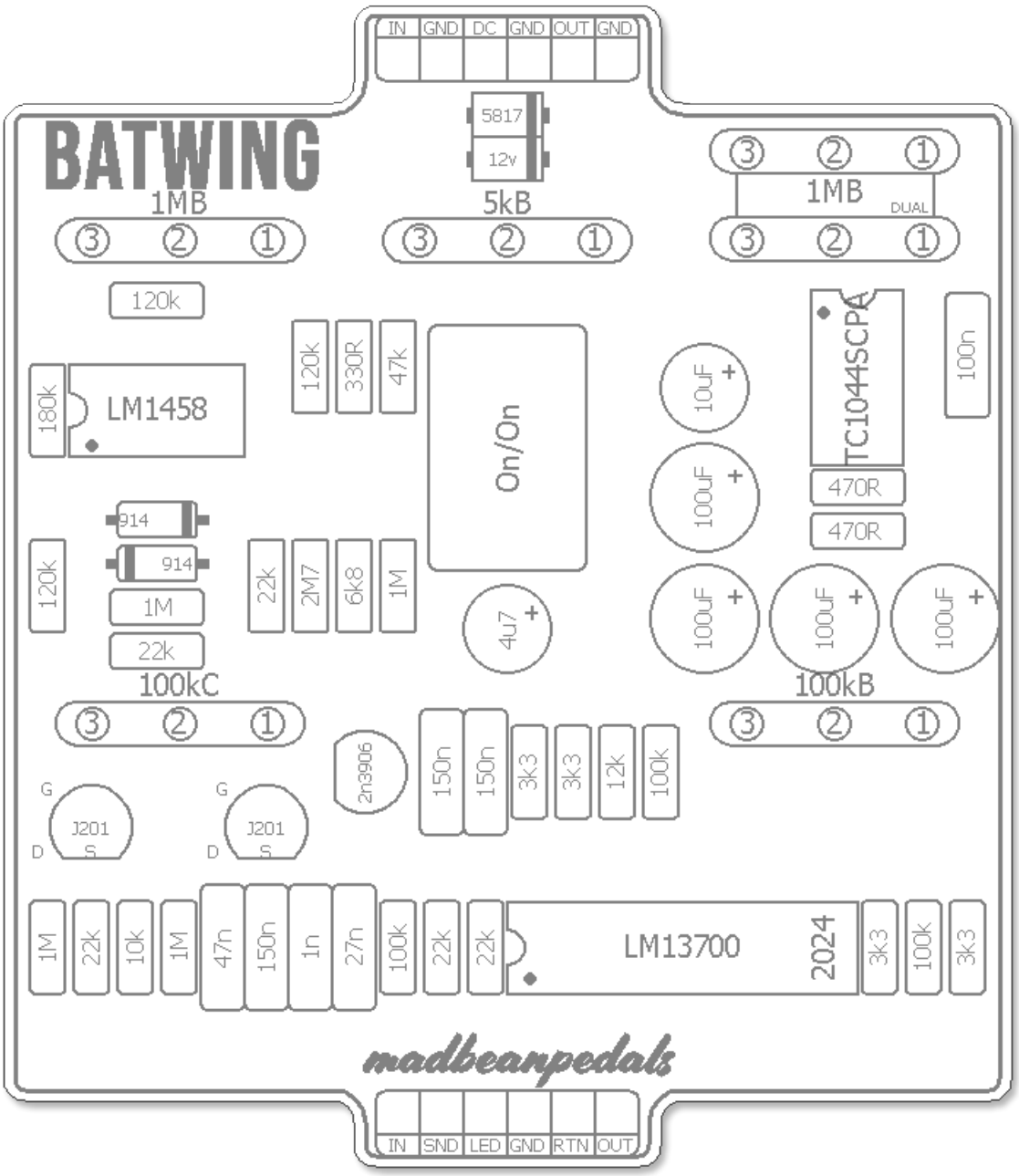
Controls

- **SENSE:** Sets the overall sensitivity of the envelope follower which drives the swept filter.
- **REZ:** Sets the resonance peak of the filter.
- **ATTACK:** CCW: slow envelope attack, CW: fast attack.
- **DECAY:** CCW: very short envelope decay, CW: extremely long decay.
- **VOL:** Effect output level. The nominal output of the Batwing is basically unity. The volume pot was added because some high REZ settings cause a pretty sharp volume spike. So, with those settings you have the option to turn the volume down. Most of the time, you will leave it all the way up.
- **UP/DN:** Sets the direction of the swept envelope in either an upward or downward trajectory.

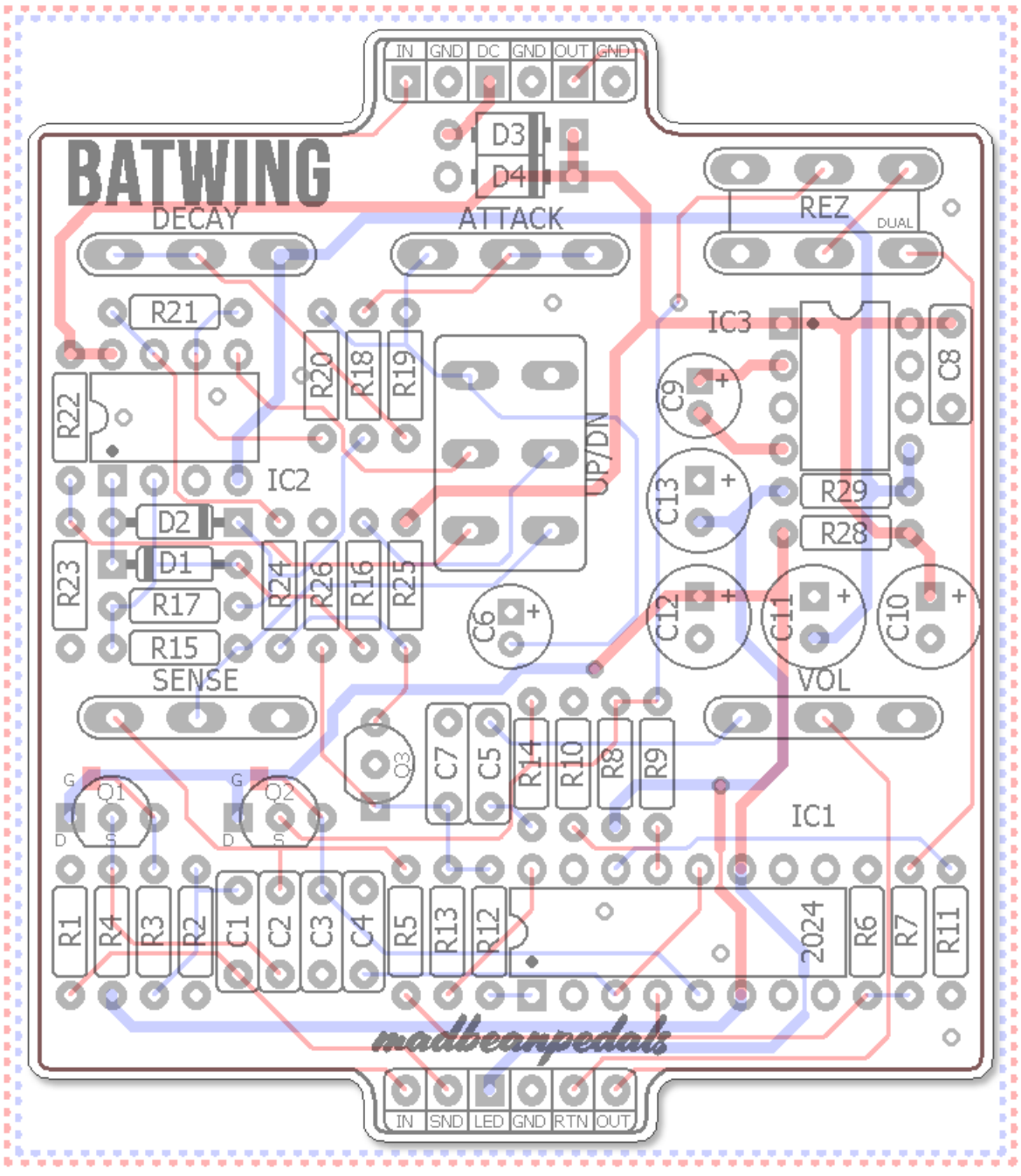
Parts Layout



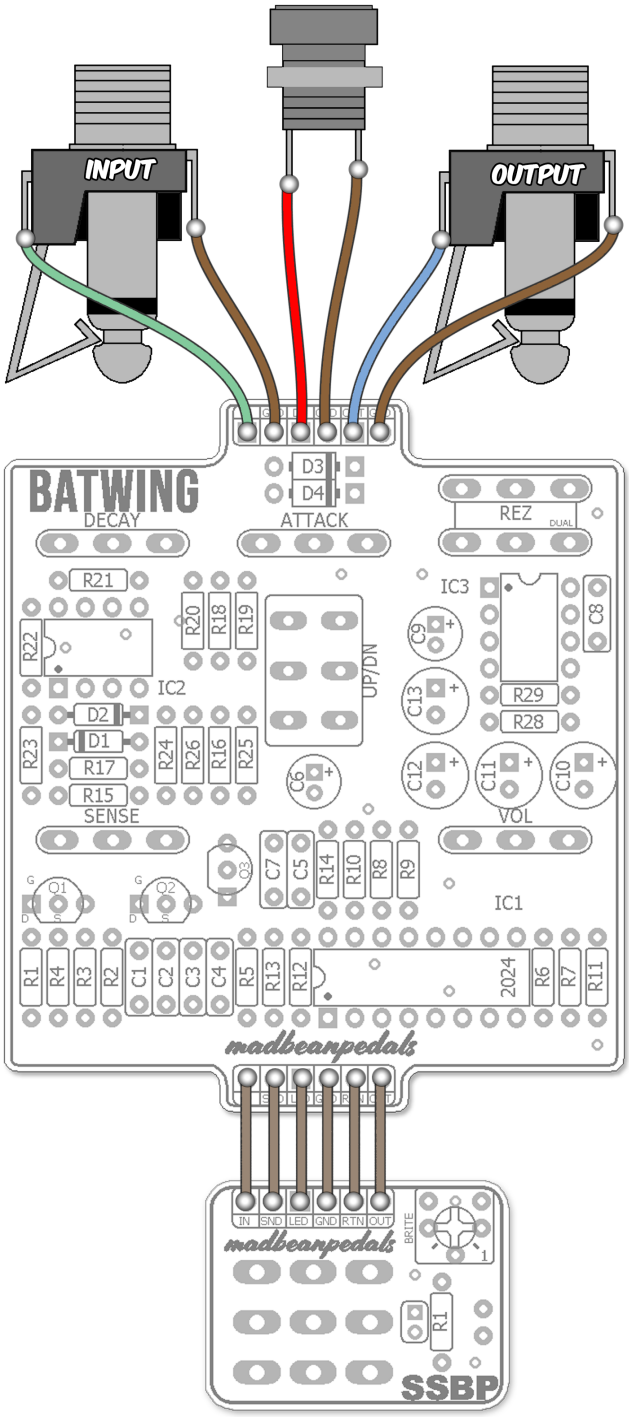
Component Values



Trace Layout



Wiring



The Batwing24 is compatible with both the **SSBP** and **SSABP** bypass boards available at madbeanpedals. The wiring is the same for both.

B.O.M.

Resistors		Caps		Diodes	
R1	1M	C1	47n	D1	1n914
R2	1M	C2	150n	D2	1n914
R3	10k	C3	1n	D3	1n5817
R4	22k	C4	27n	D4	12v Zener
R5	100k	C5	150n	**Transistors**	
R6	3k3	C6	4u7	Q1	J201
R7	100k	C7	150n	Q2	J201
R8	12k	C8	100n	Q3	2n3906
R9	100k	C9	10uF	**ICs**	
R10	3k3	C10	100uF	IC1	LM13700
R11	3k3	C11	100uF	IC2	LM1458
R12	22k	C12	100uF	IC3	TC1044SCPA
R13	22k	C13	100uF	**Switches**	
R14	3k3			UP/DN	On/On
R15	22k			**Pots**	
R16	6k8			ATTACK	5kB
R17	1M			VOL	100kB
R18	330R			SENSE	100kC
R19	47k			DECAY	1MB
R20	120k			REZ	1MB - Dual Gang
R21	120k				
R22	180k				
R23	120k				
R24	22k				
R25	1M				
R26	2M7				
R28	470R				
R29	470R				

Dual-Gang Pot:
https://stompboxparts.com/pots/16mm-dual-gang-pot-short-pcb-leg/

https://www.taydaelectronics.com/potentiometer-variable-resistors/rotary-potentiometer/linear/pb-1m-ohm-linear-dual-taper-potentiometer-pc-mount-round-shaft-l.html

Shopping List

Values	QTY	Type	Rating
330R	1	Metal / Carbon Film	1/4W
470R	2	Metal / Carbon Film	1/4W
3k3	4	Metal / Carbon Film	1/4W
6k8	1	Metal / Carbon Film	1/4W
10k	1	Metal / Carbon Film	1/4W
12k	1	Metal / Carbon Film	1/4W
22k	5	Metal / Carbon Film	1/4W
47k	1	Metal / Carbon Film	1/4W
100k	3	Metal / Carbon Film	1/4W
120k	3	Metal / Carbon Film	1/4W
180k	1	Metal / Carbon Film	1/4W
1M	4	Metal / Carbon Film	1/4W
2M7	1	Metal / Carbon Film	1/4W
1n	1	Film	16v min.
27n	1	Film	16v min.
47n	1	Film	16v min.
100n	1	Film	16v min.
150n	3	Film	16v min.
4u7	1	Electrolytic	16v min.
10uF	1	Electrolytic	16v min.
100uF	4	Electrolytic	16v min.
1n914	2		
1n5817	1		
Zener	1	12v	1W
J201	2	through-hole or surface mount	
2n3906	1		
LM13700	1		
LM1458	1		
TC1044SCPA	1		
DPDT	1	On/On, solder lugs	
5kB	1	PCB Right Angle	16mm
100kB	1	PCB Right Angle	16mm
100kC	1	PCB Right Angle	16mm
1MB	1	PCB Right Angle, Plastic Shaft	16mm
1MB	1	PCB Right Angle, **Dual-Gang**	16mm

Additional Hardware

(1) 125B enclosure
(2) 1/4” mono jacks
(1) Slim 2.1mm DC jack
(1) Standard 3PDT footswitch
(1) 5mm LED

Build Notes

Dialing in the Batwing

Finding settings on the Batwing takes some experimentation. There are certain “sweet spots” that produce excellent envelope response. Because some of the envelope circuit has been made into external controls and the down direction has been added, some control settings may not produce much effect at all. And, the settings that work in the “Up” position tend not to cross over well to the “Down” position.

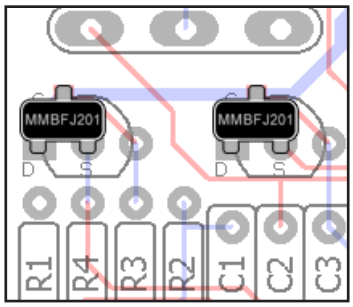
The Up position is the stock direction for the FSH and is the more forgiving of the two. The best settings tend to fall in these ranges: Sense 30-70%, Attack 40-70%, Rez 50-100% and Decay as desired. For the Down position, the range of controls is more limited. I found these to work pretty well: Sense: 70-100%, Attack 50-100%, Rez 50-100% and Decay as desired.

I made one change to the Tonepad “Down” direction mod. In their mod, R16 (my schematic) is 1k2. I found I liked the response better by using something closer to 6k8. This would be the one part I recommend socketing. Try the 1k2 and 6k8 resp. to see if you come to the same conclusion. Or, perhaps in-between or slightly higher. Too high, and the control range with the Sense pot simply gets too narrow and unresponsive.

Once you get it dialed in, the filter is *excellent*. This may be in part due to the bi-polar power which most modern envelopes do not utilize. I think ditching the internal buffers of the OTA and replacing them with JFETs also helped with the very focused tone it produces.

JFETs

The Batwing allows you to use either through-hole or surface mount JFETs for Q1 and Q2.



Circuit Voltages

Q1	J201
D	8.7
S	251mV
G	-13mV

Q2	J201
D	8.7
S	-23mV
G	-18mV

Q3	2n3906
C	-6.3
B	0
E	566mV

IC1	LM13700
1	-7.29
2	~-2.3
3	0
4	0
5	-17mV
6	-8.5
7	ignore
8	ignore
9	ignore
10	ignore
11	8.7
12	0
13	0
14	0
15	-0.62
16	-7.27

IC2	LM1458
1	~380mV
2	0
3	0
4	-9.06
5	~1.5
6	~1.9
7	~1.37
8	9.25

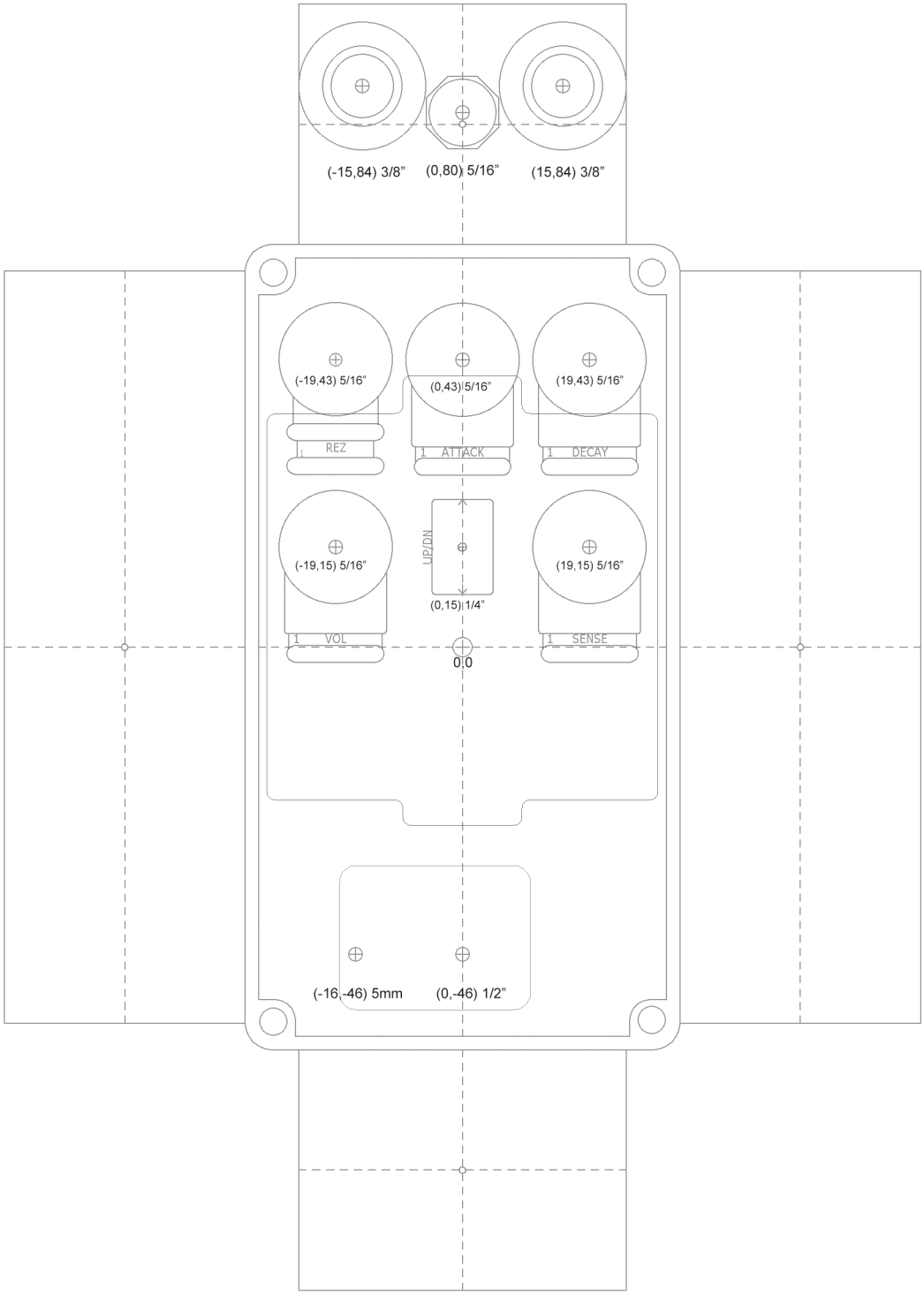
IC3	TC1044
1	9.25
2	5.36
3	0
4	-3.79
5	-9.06
6	4.3
7	5.71
8	9.25

- 9.42vDC One Spot
- Current Draw ~ 11mA

Drill Template

Coordinates are denoted in (X,Y), drill size format starting from the center (0,0) location of the enclosure.

Tayda drill template: https://drill.taydakits.com/box-designs/new?public_key=b1E3MlBhNk1vcytFUFVPN3lMMUwyQT09Cg==

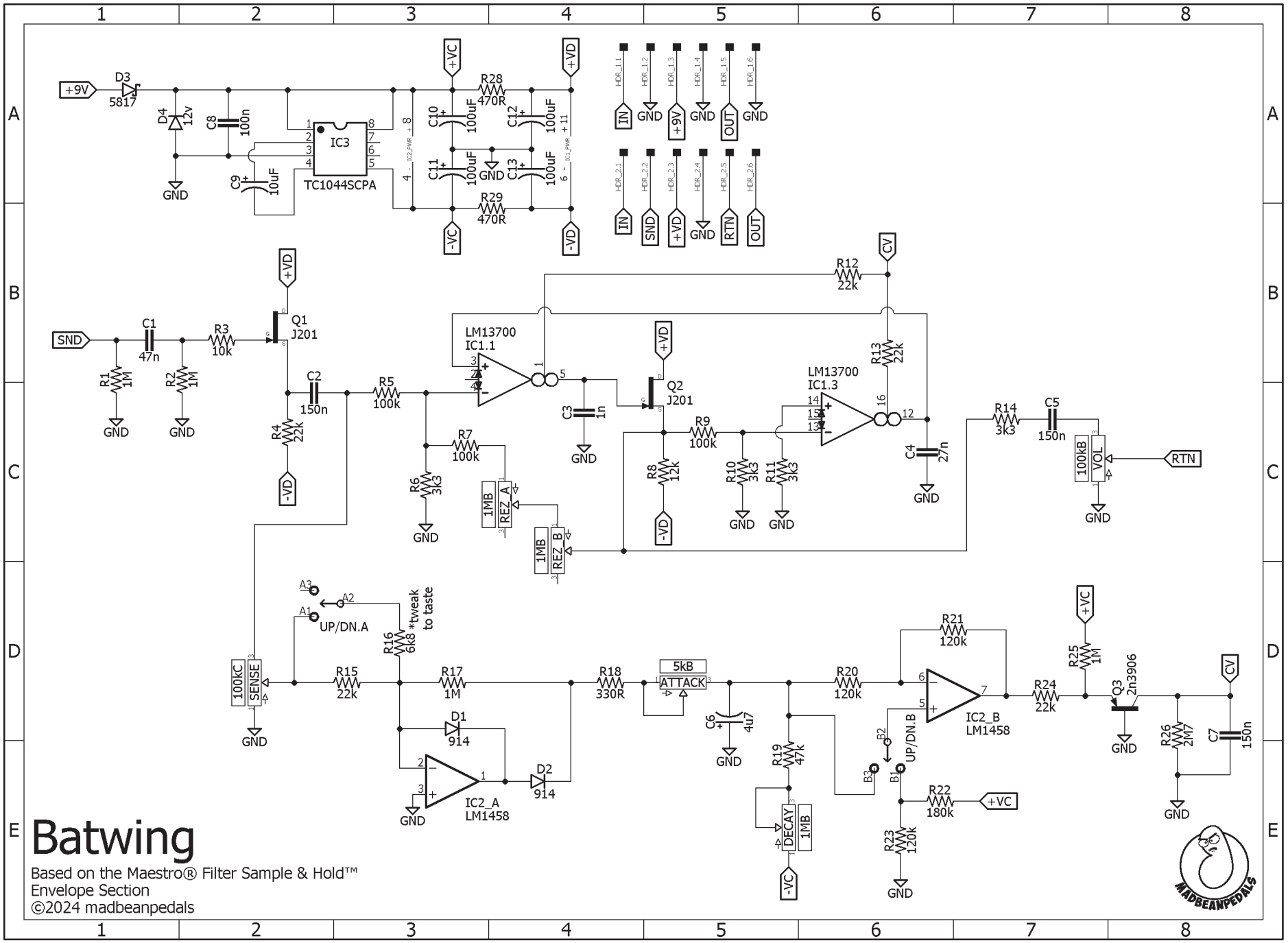


Hardware

125B enclosure
Mono jacks
Slim 2.1mm DC jack
Standard 3PDT footswitch
5mm LED

NOTE: Different 1/4" and DC jack styles may require different sized drill holes.

Schematic


Batwing
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Envelope Section
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+9V
D3
5817
D4
12v
C8
100n
C9
10uF
GND
IC3
TC1044SCPA
+VC
-VC
+VD
-VD
R28
470R
R29
470R
C10
100uF
C11
100uF
C12
100uF
C13
100uF
HDR_1.1
IN
HDR_1.2
GND
HDR_1.3
+9V
HDR_1.4
GND
HDR_1.5
OUT
HDR_1.6
GND
HDR_2.1
IN
HDR_2.2
GND
HDR_2.3
+VD
HDR_2.4
GND
HDR_2.5
RTN
HDR_2.6
OUT
SND
C1
47n
R1
1M
R2
1M
R3
10k
Q1
J201
C2
150n
R4
22k
R5
100k
LM13700
IC1.1
C3
1n
Q2
J201
R7
100k
R6
3k3
1MB
REZ_A
1MB
REZ_B
R8
12k
R9
100k
R10
3k3
R11
3k3
LM13700
IC1.3
R12
22k
CV
R13
22k
C4
27n
R14
3k3
C5
150n
100kB
VOL
RTN
A3
A2
A1
UP/DN.A
R16
6k8 *tweak to taste
100kC
SENSE
R15
22k
R17
1M
R18
330R
5kB
ATTACK
C6
4u7
D1
914
D2
914
IC2_A
LM1458
R19
47k
DECAY
1MB
R20
120k
R21
120k
IC2_B
LM1458
B2
B3
B1
UP/DN.B
R22
180k
R23
120k
R24
22k
R25
1M
Q3
2n3906
R26
2M7
C7
150n
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