BEARHUG

FX TYPE: Compressor

by Jon Patton

Enclosure Size: 1590B

“Softie” compatibility: Softie2, 3

Overview

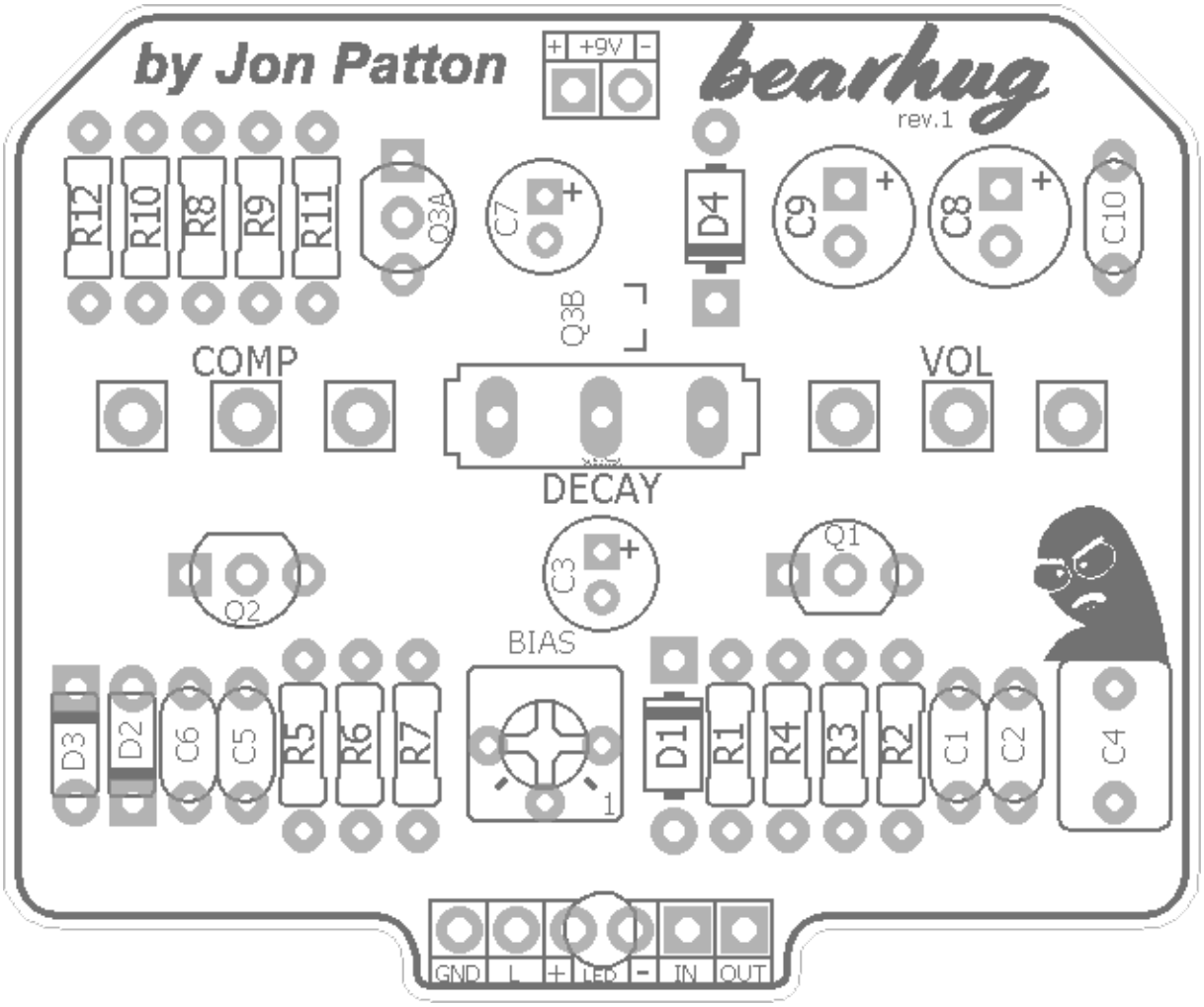
Jon’s circuit description:

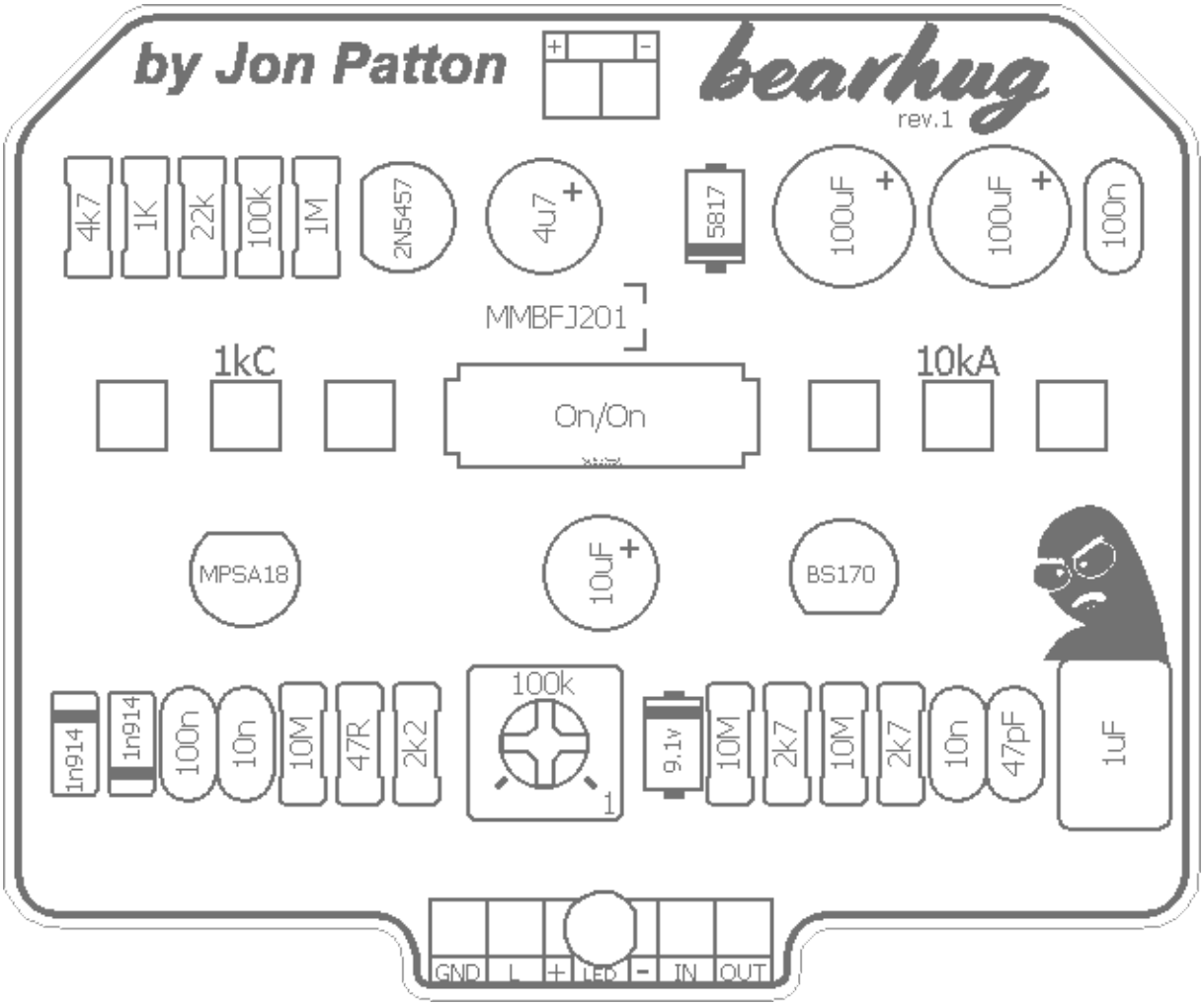
This is a tonally transparent, ultra-quiet, tiny, and easy-to-build compressor. It occupies some middle ground between the ultra-subtle compressors like the Flatline/Afterlife and Orange Squeezer and the super squishy compressors like the Ross. The comp knob ranges from almost no compression to “you can tell it’s working.” The L/H toggle switches between a short decay for subtle peak limiting and a long decay for a mild “duck and swell” sustainer effect, as well as changing the overall amount of compression available. The Bear Hug also makes a good lead boost — it will give you roughly 10-15dB of boost even on higher compression settings.

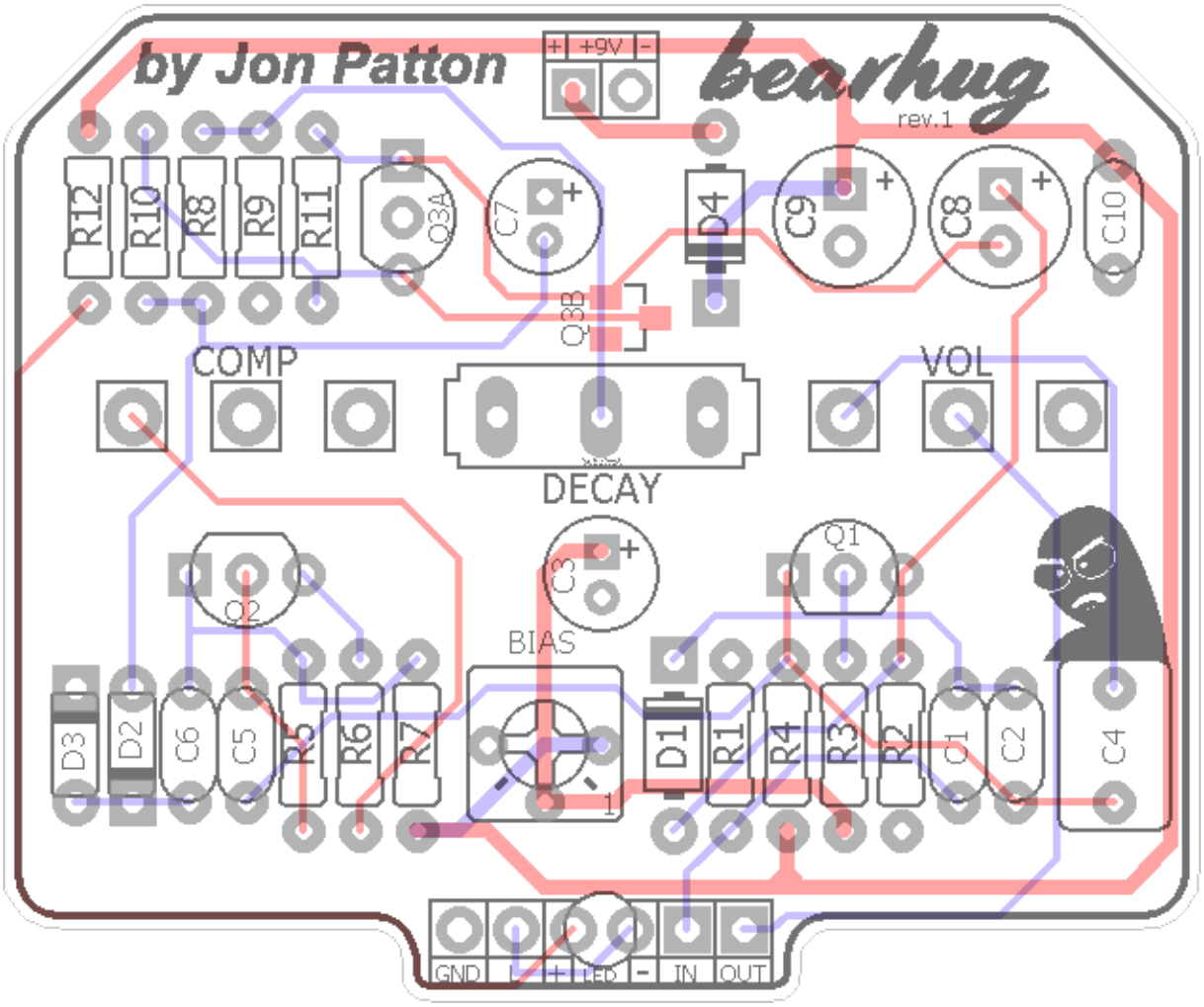
Controls

VOL: Output level.
COMP: Compression amount. Full CCW is little to no compression at which point the circuit can be operated as a boost (like the Jark Orman Mosfet boost).
BIAS: This trimmer is used to set the bias voltage of Q1.

Many thanks to Jon for offering his design as a project on madbeanpedals!


by Jon Patton
+9V
bearhug
rev.1
R12
R10
R8
R9
R11
Q3A
C7
D4
C9
C8
C10
Q3B
COMP
VOL
DECAY
Q2
C3
Q1
BIAS
D3
D2
C6
C5
R5
R6
R7
D1
R1
R4
R3
R2
C1
C2
C4
GND
IN
OUT


by Jon Patton
bearhug
rev.1
4k7
1K
22k
100k
1M
2N5457
4u7
5817
100uF
100uF
100n
MMBFJ201
1kC
On/On
10kA
MPSA18
10uF
BS170
1n914
1n914
100n
10n
10M
47R
2k2
100k
1
9.1v
10M
2k7
10M
2k7
10n
47pF
1uF
GND
IN
OUT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Q2
C3
Q1
BIAS
D3
D2
C6
C5
R5
R6
R7
D1
R1
R4
R3
R2
C1
C2
C4
GND
LED
IN
OUT

Resistors		Caps		Diodes	
R1	10M	C1	10n	D1	9.1v Zener
R2	2k7	C2	47pF	D2	1n914
R3	10M	C3	10uF	D3	1n914
R4	2k7	C4	1uF	D4	1n5817
R5	10M	C5	10n	Transistors	
R6	47R	C6	100n	Q1	BS170
R7	2k2	C7	4u7	Q2	MPSA18
R8	22k	C8	100uF	Q3	2N5457
R9	100k	C9	100uF	Switch	
R10	1K	C10	100n	DECAY	On/On
R11	1M			Trimmer	
R12	4k7			BIAS	100k
				Pots	
				COMP	1kC
				VOL	10kA

Values	Qty	Type	Rating
47R	1	Metal / Carbon Film	1/4W
1K	1	Metal / Carbon Film	1/4W
2k2	1	Metal / Carbon Film	1/4W
2k7	2	Metal / Carbon Film	1/4W
4k7	1	Metal / Carbon Film	1/4W
22k	1	Metal / Carbon Film	1/4W
100k	1	Metal / Carbon Film	1/4W
1M	1	Metal / Carbon Film	1/4W
10M	3	Metal / Carbon Film	1/4W
47pF	1	Ceramic / MLCC	16v min.
10n	2	Film	16v min.
100n	2	Film	16v min.
1uF	1	Film	16v min.
4u7	1	Electrolytic	16v min.
10uF	1	Electrolytic	16v min.
100uF	2	Electrolytic	16v min.
Zener	1	9.1v	1W
1n914	2		
1n5817	1		
BS170	1		
MPSA18	1		
2N5457	1	or, MMBFJ201	
SPDT	1	On/On, Solder Lug or Pins	
100k	1	Bourns 3362p	
1kC	1	PCB Right Angle	16mm
10kA	1	PCB Right Angle	16mm

2n5457:
1. https://smallbear-electronics.mybigcommerce.com/transistor-fet-2n5457/
2. https://stompboxparts.com/semiconductors/2n5457-jfet/

SPDT (On/On):
1. https://smallbear-electronics.mybigcommerce.com/spdt-on-on-short-lever/
2. https://stompboxparts.com/switches/spdt-toggle-switch-on-on-solder-lug-short-bat/
3. https://lovemyswitches.com/spdt-on-on-switch-solder-lug-short-shaft/

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

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

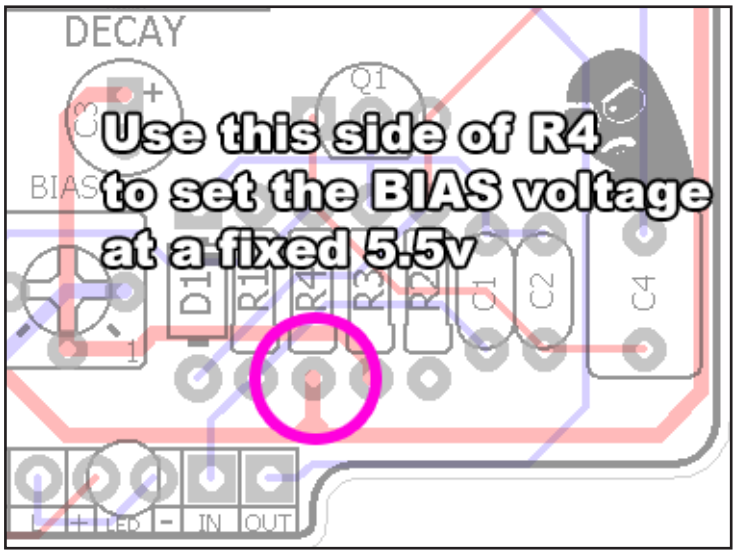
1/4” jacks:
1. https://smallbear-electronics.mybigcommerce.com/1-4-in-mono-nys229/
2. https://smallbear-electronics.mybigcommerce.com/1-4-in-mono-switchcraft-11/
3. https://lovemyswitches.com/1-4-mono-jack-lumberg-klbm-3/
4. https://lovemyswitches.com/1-4-mono-jack-neutrik-rean-nys229/

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

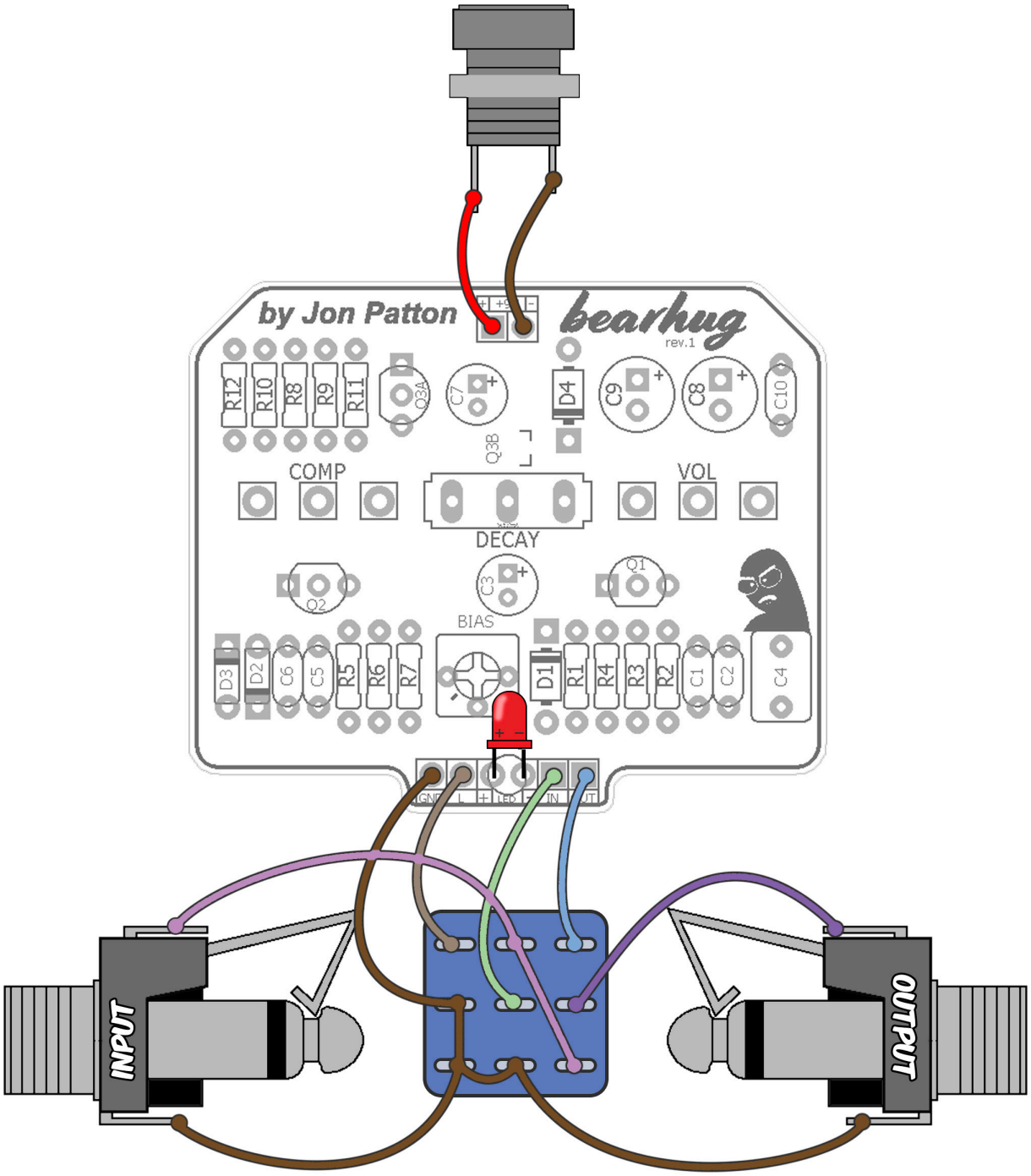
NOTE: I have included a spot for an SMT JFET (Q3B) but I only tested the circuit with a through-hole 2n5457. There are SMT 2n5457, if you can find them. Those are MMBF5457. Possibly other JFETs can be substituted here like the J201 or MMBFJ201.

While the Bearhug has an excellent compression tone and the design is elegant I would categorize it as a “light duty” compressor. Meaning, it has great squash, sustain and character but it doesn’t seem to respond as well to heavy input dynamics as some other circuits. Using a heavy attack will cause at least some low end distortion at the output. As far as I can tell, this is inherent to the design itself. I tried many variations on parts values and tweaks (including different BS170s) on the breadboard to see if the low end distortion could be eliminated but without much success. My guess it is has something to do with the attack envelope response and how it relates to the gain of the mosfet. If you are looking for a good compressor for lead work and big open chords this is a great one to have. But, if you have a real heavy handed approach to guitar I would recommend against the Bearhug.

One thing I did find that reduces the low end distortion is changing the bias point a little. Jon recommends adjusting the BIAS trimmer so that the drain of Q1 is between 5-5.5vDC. However, if you look at Jack Orman’s original mosfet boost design, he uses two fixed resistors to supply the bias voltage to the gate of Q1, namely a 62k and 100k voltage divider. At 9v, this creates a fixed 5.5v to the 10M bias resistor on the Q1 gate. This is different than biasing the drain to 5.5v. Meaning, 5.5v at to the gate resistor makes the gate voltage lower and the drain voltage higher. This (IMO) improves the dynamics overall. I’ve listed both sets of voltages later on the doc for comparison. It easy to compare the two approaches yourself and I recommend doing so.

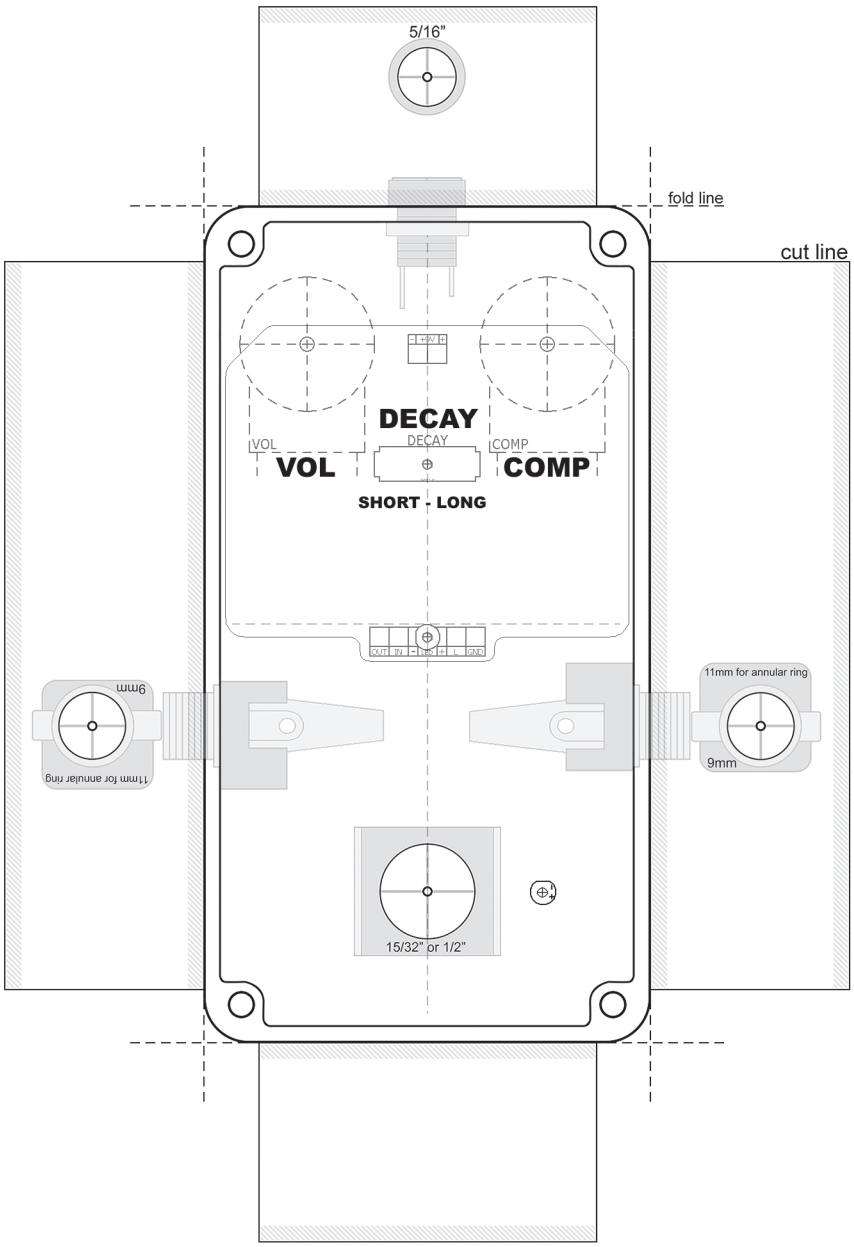


Lastly, Jon recommends replacing R4 with 4k7 instead of 2k7 if you primarily use lower output pickups. I tested this circuit with my SG P90’s and stuck with 2k7.



The bypass LED is soldered directly to the PCB.

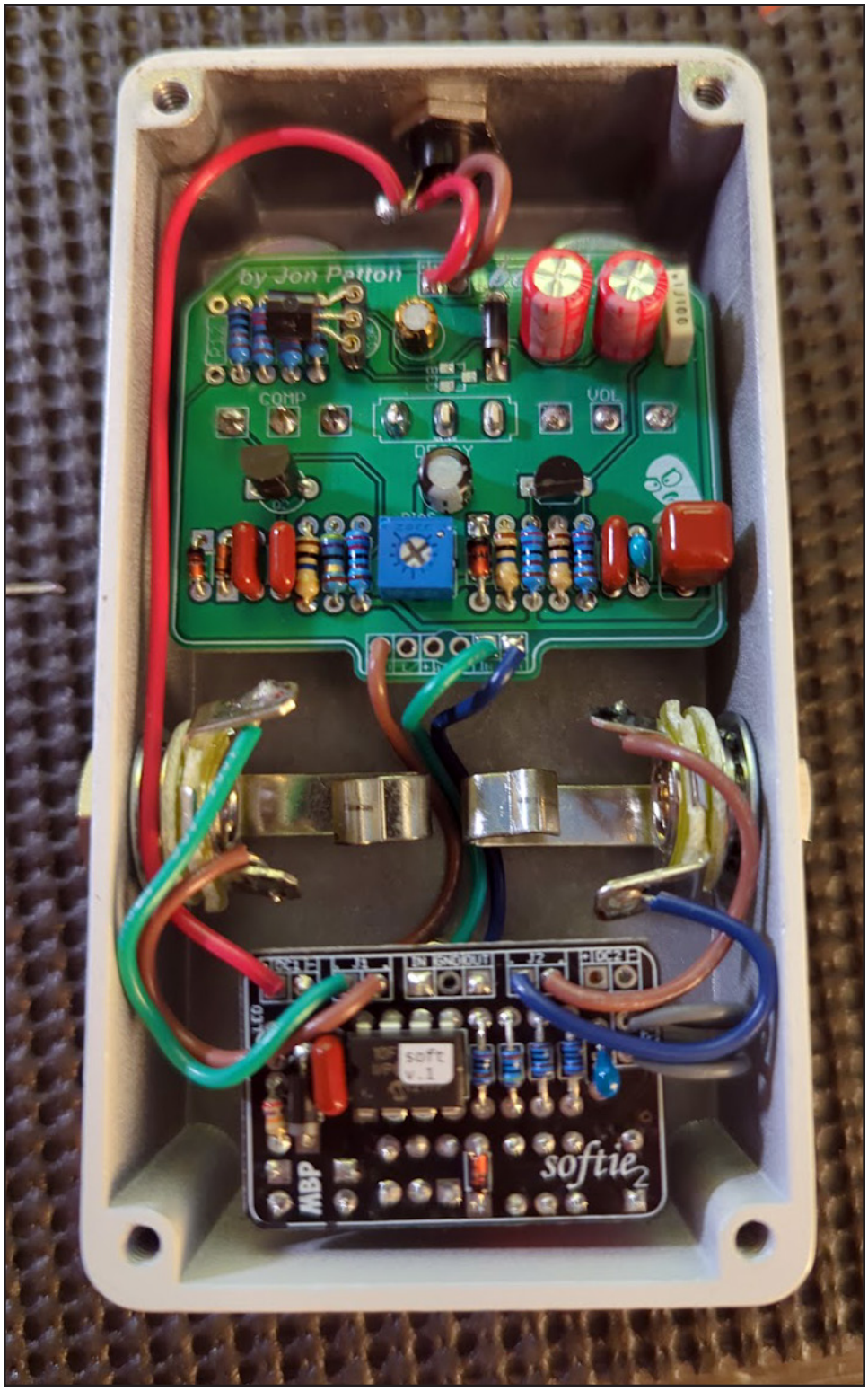
Note: *Drill Guides are approximate and may require tweaking depending on the types of jacks, switches and pots you use.*

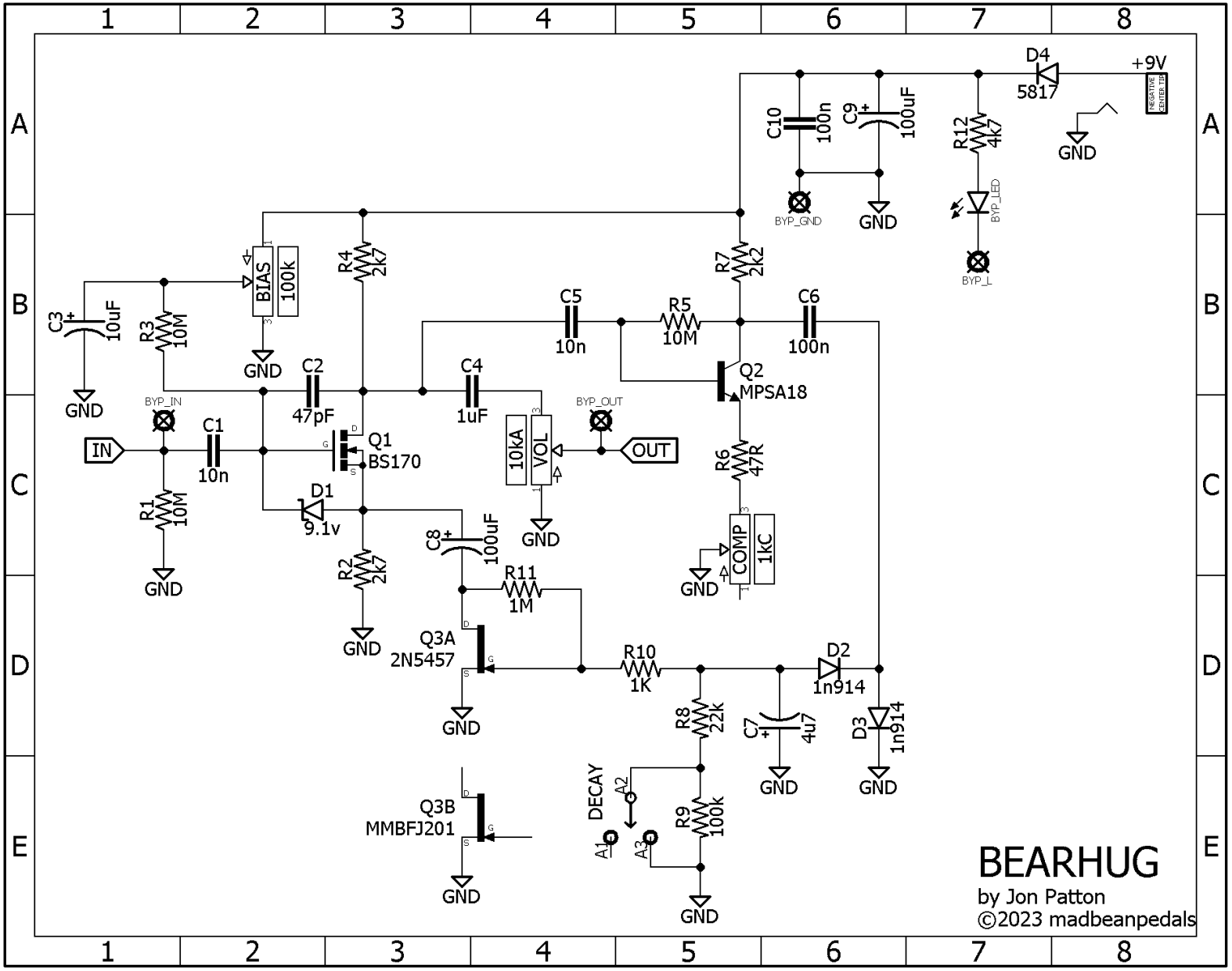


You can use the same drill location for 3PDT bypass or the Softie2 relay bypasss switch. If you are using a 3PDT, drill for the bypass LED location on the Bearhug PCB. If you use a Softie2, use the LED drill location to the right of the bypass switch. Don't drill both!

Q1	BS170	
D	5.51	
S	3.75	BIAS adjusted to 5.5v on Q1 drain
G	3.79	
Q1	BS170	
D	7.3	
S	2.6	BIAS adjusted to fixed 5.5v on R3
G	1.98	
Q2	MPSA18	
C	7.3	
B	0.79	Roughly same for both settings
E	179mV	
Q3	2n5457	
D	2mV	
S	0	Roughly same for both settings
G	0	

9.5v One Spot
Current Draw: ~5mA
Knobs @ noon, switch left


by Jon Patton
COMP
VOL
soft
v.1
softie
MBP


1
2
3
4
5
6
7
8
A
B
C
D
E
D4
5817
+9V
NEGATIVE CENTER TIP
C10
100n
C9
100uF
R12
4k7
GND
BYP_GND
BYP_LED
BYP_L
BIAS
100k
R4
2k7
R7
2k2
C3
10uF
R3
10M
C5
10n
R5
10M
C6
100n
Q2
MPSA18
C2
47pF
C4
1uF
BYP_IN
BYP_OUT
IN
C1
10n
Q1
BS170
10kA
VOL
OUT
R6
47R
D1
9.1v
R1
10M
C8
100uF
COMP
1kC
R2
2k7
R11
1M
Q3A
2N5457
R10
1K
D2
1n914
R8
22k
C7
4u7
D3
1n914
Q3B
MMBFJ201
DECAY
A1
A2
A3
R9
100k
BEARHUG
by Jon Patton
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