

# BOM

## BOM of Gain Board by ChocoHolic, +/-40V Version, 2014 Nov. 21st

Component	Value	Min requirements	Footprint	Comment
C101, C102	4.7u	Film/Foil, 50V	7x8RM5	
C103, C104, C105, C106, C109	100u	Ecap, 16V	D7RM2.5	
C107, C108	100n	X7R, 25V	SM0805	
C110	4u7	16V Leakage < 0.5uA	D6RM2.5	
D101, D102	Z12V	0.5W	Axial type	1W or 1.3W will also work
D103	1N4148		Axial type	
D104, D105, D106, D107, D108, D110, D111	LL4148		SOD80	
D109	Red_LED	Vf=1.6V...1.7V	PIN_ARRAY_2X1	
P101	CONN_4		PIN_ARRAY_4X1	
Q1	2SC5171		TO-220	
Q2	2SA1930		TO-220	
R100, R101	8k2	+/-10%, 0.25W	Axial type	
R102, R103, R107, R108, R115, R116	470	+/-1%	SM0805	
R104	680k	+/-1%	SM0805	
R105, R106	150k	+/-1%	SM0805	
R109	100	+/-1%	SM0805	
R110, R111	2k2	+/-2%, 0.25W	Axial type	vertical
R112, R113	6R8	+/-10%	SM0805	
R114	1N4148WS		SM0805	Cathode pointing Towards LED
R117, R118, R119, R120	4k7	+/-1%	SM0805	
R121	100k	+/-1%, 0.25W	Axial type	vertical
R122	680	+/-5%	SM0805	
R123	1k	+/-5%		
R124, R130	1Meg	+/-5%	SM0805	
R125	820	+/-5%	SM0805	
R126, R131, R132, R136	100k	+/-1%	SM0805	
R127, R133, R135, R138	5k6	+/-1%	SM0805	
R128	150	+/-1%	SM0805	
R129	22	+/-1%	SM0805	
R134	3k3	+/-1%	SM0805	
Rgain101	2k2	+/-2%	SM0805	
RV101	100k	At least 10 turns	Poti	All pins in one line !
R_trshld101	5k94	+/-1%	SM0805	You can parallel 6k8 & 47k,backpack
U101	NSL-32		Custom	
U102	OPA2134		DIP-8	
U103	TL074		SOIC-14	
Heat Sink	85mmx15mm	Aluminium, 2mm	SOIC-14	U-bend

Note: More Narrow tolerances are always allowed / fortunate.

PCB & yellow marked lines are key components of the KCS group buy.

## Building Hints

### Two PCB are possible:

- 1) Dated: 21.11.2014
- 2) Dated: 17.10.2014

### Dated 17.10.2014 is tested, but has Silk Screen Errors.

Marking of +12V & -12V interchanged. ==> Popular knowledge: Plus is Minus and Red is Blue....

Polarity marking of C110 interchanged. ==> Correction: Minus of real component must point towards LED!

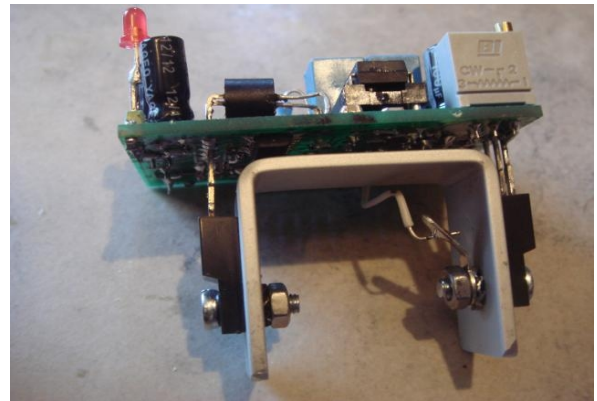
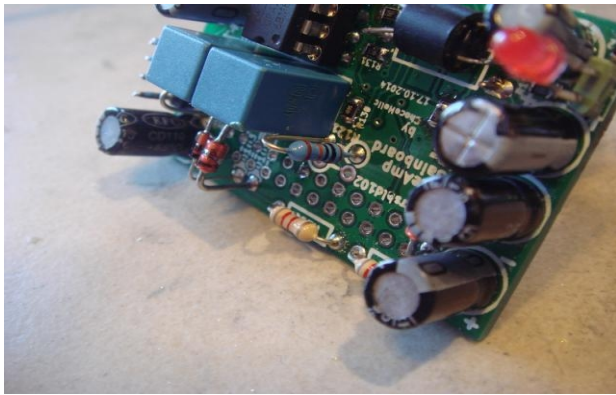
Cathode marking of D104 wrong. ==> Correction: Cathode of real component must point towards Q2 !

### Dated 21.11.2014 has corrected silk screen, but is not tested.

Copper identical in both versions.

### Assembly:

- Do not place R112 and R113. Both will be placed later during Get It Going.
- Do not place R121. It will be placed later during Get It Going.
- Heat sink should be connected to GND.
- D109 can be placed directly at the PCB, or with wires if you wish to place it visible in your front plate.
- Match R119=R120 & R117=R118 as close as possible in order to achieve best CMRR.
- Be aware that R114 is a diode! Cathode must point towards LED.
- D101 and D103 must be placed with long leads. Stand off from PCB approx 10mm.  
(Otherwise you cannot access anymore the solder pads of P103.)



## Get It Going

### Get It Going:

Start up typically triggers the limiter and the LED D109 turns on. It should fade within 20s.

1) Apply GND. Apply +20V....+30V at +V (Collector of Q1) and -20V...-30V at -V (Collector of Q2).  
Connect 3k3 between emitter of Q1 and emitter of Q2.

==> Measure voltages at the emitters of Q1 and Q2 vs GND. Must be within +/-10.8V...+/-12V.

If not OK. Turn off and recheck R100, R101, R102, R103, R107, R108, D101, D102, C103, C104, C105, C106.

If OK. Turn off and place R112 & R113.

2) Apply GND. Apply +20V....+30V at +V (Collector of Q1) and -20V...-30V at -V (Collector of Q2).

==> Measure voltages at the +12V pin and -12V pin of P101. Must be within +/-10.7V..12V.

If not OK. Turn off and recheck orientation of D103, D104, D105, D106, D107, D108, U102, U103.

If OK, step to point 3.

3) Turn off. Connect 'In2' to GND and apply test signal at 'In1'.

Apply GND. Apply +20V....+30V at +V (Collector of Q1) and -20V...-30V at -V (Collector of Q2).

==> Measurement: Signal 'Go' should show the gained signal of 'In1'.

If not OK, turn off and recheck RV101, R104, R105, R109, R110, R111, R106, R115, R116, R117, R118, R119  
R120, Rgain101, C101, C102.

If OK, step to point 4.

4) Turn off. Connect 'In1' to GND and apply test signal at 'In2'.

Apply GND. Apply +20V....+30V at +V (Collector of Q1) and -20V...-30V at -V (Collector of Q2).

==> Measurement: Signal 'Go' should show the gained signal of 'In2'.

If not OK, turn off and recheck RV101, R104, R105, R109, R110, R111, R106, R115, R116, R117, R118, R119  
R120, Rgain101, C101, C102.

If OK, turn off and step to point 5.

5) Connect R121 at one side – the side which has the circle on the PCB.

Put a short wire to the other end of R121.

Connect 'In1' to GND and apply test signal at 'In2'.

Apply GND. Apply +20V....+30V at +V (Collector of Q1) and -20V...-30V at -V (Collector of Q2).

Measure voltage from Anode to Cathode of the NSL-32 and the signal 'Go' and observe the D109

@ 5 test situations:

==> Wire at R121 open: Voltage must be -0.4...-0.7V. Signal 'Go' remains large. D109 remains off.

==> Wire at R121 connected to -12V: Voltage must be -0.4...-0.7V. Signal 'Go' remains large. D109 remains off

==> Wire at R121 connected to +12V: Voltage must be -0.4...-0.7V. Signal 'Go' remains large. D109 remains off

==> Wire at R121 connected to +12V: Voltage must be -0.4...-0.7V. Signal 'Go' remains large. D109 remains off

==> Wire at R121 connected to Collector of Q1: Voltage must be +1.5V..1.7V.

Signal 'Go' gets reduced by factor 10..15. D109 turns on.

==> Wire at R121 connected to Collector of Q2: Voltage must be +1.5V..1.7V.

Signal 'Go' gets reduced by factor 10..15. D109 turns on.

If not OK, turn off and recheck U103, R126, R127, R121, R\_trshld102, R131, R138, R122, R123, R132  
R128, R129, R133, R134, R135, R136, R124, R125, R130, D109, D111, D112, C109, C110.

If OK, turn off. Ready to be combined with the power amp.

In case you cannot get it going, contact ChocoHolic on DIYaudio.com.

### Gain

Gain is set to get 140Wrms into 4R when driven with 0dBm (0.775Vrms).

However many sources like MP3 players deliver much smaller signals.

Gain can be customized by adjusting one single resistor: Rgain101

Voltage gain can be calculated by this formula:  $V_{out}/V_{in} = (9400 \text{ Ohms}/R_{gain101}) + 2$

### Threshold

The limiter is adjusted for the LiteAmp.

If you use an amplifier which has its clipping not at the full rail level but lower, then you need to readjust R\_trshld101.

This typically is the case in class AB amplifiers.

When you increase the value of R\_trshld101, then the limiter will act at lower levels.

Depending on your power amp you will have to adjust it in the range between 5k94...7k Ohms.

### Supply voltages:

The shown values will work for any supply voltage in the range +/-20V..+/-50V.

This serves all needs of the 40V version of the LiteAmp.

When you intend to use it with other amps, you might need to adjust it to higher rails.

Higher rails need an adjustment of R100 and R101. And also a larger heat sink for Q1 and Q2!

$R100=R101=(V_{rail} - 12V) / 2mA$

I.e. When you power amp runs from +/-65V, then chose 27k Ohms and a larger heat sink.

If you manage to handle the heat sinking the board can be used for rails up to +/-100V.

### Using an external +/-12V:

If you do not want to dissipate so much heat, but have an external supply with +/-12V, you can use it as follows.

Skip R100, R101, R102, R103, R107, R108; R112, R113, D101, D102, D103, D104, C103, C104, C105, C106, Q1, Q2.

Use the +/-12V terminals to apply your external supply.

Take care of the polarity (especially, when using the PCB with wrong marking!).

You still have to connect the +V and -V to the rails of you main amp, because the limiter is tracking these rails and judges if clipping is close.

### Further Mods

Theroetically there are tons of further potential mods.

If you are looking for a specific mod to achieve a certain function, feel free to ask in thread.