

Aleph Mini Clone Build Notes

Thank you for participating the Classic Aleph Group Buy!

The idea for this PCB is to bring back the classic Aleph circuit for DIY builders in a flexible and expandable format. This document focuses on building the Aleph Mini Clone circuit in a stereo / 2 channel chassis.

Project Difficulty: NOVICE **INTERMEDIATE** EXPERT



Questions?

You're probably not alone!

Post your question(s) on the [DIYAudio forums](#).

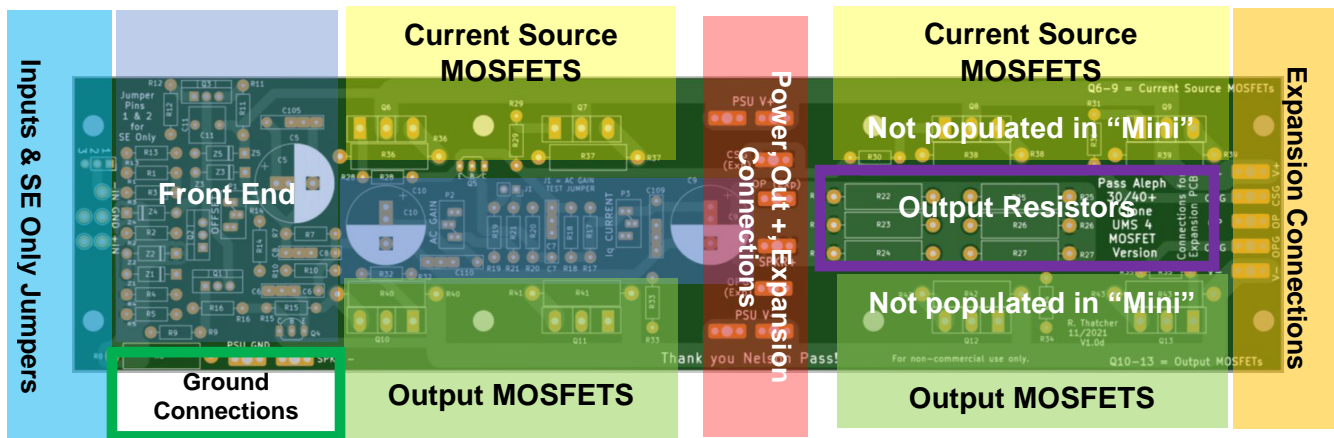


This project uses line/mains voltages and has a power supply with large capacitors. The voltages in this amplifier can kill – even at miniscule current. If you are not competent / confident with working with these voltages, please seek advice from either a qualified electrician, or an audio DIYer who is competent and experienced in this area. Always work safe and work smart!

The original schematic has been updated and a new PCB layout devised. The PCBs for this project are offered without any warranty, guarantee provided, or liability taken.

Version / Date	Revision History
V1.0a 28 Nov 2022	Original Release. "Mini" circuit is adapted to this PCB set from the original BrianGT design. Thank you to DIYAudio user " Mikerodrig27 " for encouragement, input, and review of this document!
V1.0b 12 Apr 2023	<ul style="list-style-type: none">Added pinout diagrams for ZTX450 & 2N4401Updated PSU BOM based on current stock levels

Getting to know the Amp PCB



PCB Revisions

PCB	Version / Date	Revision History
Main Aleph PCB	V1.0d – 11/2021	Group Buy #1 Version <ul style="list-style-type: none"> Q4 & Q5 CBE / EBC markings are backwards on PCB.
Main Aleph PCB	V1.0f – 3/2022	Group Buy #2 Version <ul style="list-style-type: none"> Q4 & Q5 corrected CBE / EBC markings on PCB Added C20 & C21

Resistors

Resistors are either 1/4W or 3W rated.

- For 1/4W resistors use your favorite brand metal film resistors. Yaego, etc.
 - Higher wattage is OK. Less is not OK
 - Hole spacing on PCB is 10mm for 1/4 W resistors.
- For 3W MOSFET Source Resistors and Output resistors use 3W metal oxide, and avoid wire wounds unless non-inductive.
- Solder all 3W resistors on amp PCBs and Power supply PCBs so they are elevated from the PCB. Put a spacer underneath them (like a piece of cardboard) to create an air gap of a few mm, and remove it after soldering them in place.
- For Ground / Hum Breaker resistor (R0), any brand 3W Metal Oxide resistor will work. Value is not critical, 2R7 to 4R will be fine.

Trimpots & Adjustments

Trimpot positions are included for adjusting output DC Offset, AC Gain, and bias current. In the original circuit these were fixed resistors. It is recommended to install the trimpots to make easy adjustments to your build. The values below are chosen so that midrange of the trimpot value (factory default) + associated resistor equals approximately the original Aleph Mini resistor value. This allows for range for adjustment.

BUILD NOTE: Set trimpot prior to installation

Parameter	Original Fixed Resistor Value	This PCB Values: Trimpot + Resistor	Initial Trimpot value Set before Installing
DC Offset	R14 = 392R	P1 @ 242R + R14 @ 150R = 392R	P1 = 242R
AC Gain	R21 = 750R	P2 @ 500R + R21 @ 250R = 750R	P2 = 500R
Iq Current	R19 = 47k5	P3 @ 17k5 + R19 @ 30k = 47k5	P3 = 17k5

Bias Current Measurement

Option 1 – Measure voltage of each source resistor (R36 & R40), divide by source resistor values.
Example: R36: $550\text{mV} / 0R47 = 1.17\text{A}$

Option 2 – use a clamp ammeter on positive and negative voltage rail wires from power supply.

Initial target value is 1.0 – 1.4 A. See table in power supply / Transformer section for more information.

AC Gain Setting Procedure

See Posts 2 & 3 here for guidance

<https://www.diyaudio.com/forums/pass-labs/38033-proper-current-source-adjustment.html>

Post 3 - From Nelson:

If you set the amplifier driving a sine wave into a load (let's say 10 Vrms into 8 ohms at 100 Hz), you can measure the current variation of the gain N channel Mosfets (whose Sources attach through power resistors to the - supply rail) with a cheap AC voltmeter placed across one of these Source resistors.

With R21 taken out of the circuit, you will get one AC value across the Source resistor (say 470 mV, for example). As you put a value for R21 in the circuit, this will decline, and when it measures ½ the value without R21, you have reached 50%.

If it measures 1/4 the value, the current gain of the Aleph source is 75%, and this figure is too high for a standard Aleph. Most listeners like the Alephs at 50% or lower, so I recommend between 50% and 100% of the AC voltage value compared with no R21.

NOTE: The PCB has an AC Gain Setting jumper that allows for pulling R21 out of circuit temporarily by removing the jumper.

Step	Procedure	Measurements	
		Left Channel	Right Channel
1	Remove AC Gain Jumper		
2	Set the amplifier driving a sine wave into a dummy load (let's say 10 Vrms into 8 ohms at 100 Hz).	V = _____ into 8R Freq = _____ Hz	V = _____ into 8R Freq = _____ Hz
3	Measure voltage on source resistor on Amp / V- Side (R40) Set meter to read AC Volts. Confirm it's AC, not DC.	R40 = _____ mV	R40 = _____ mV
4	Calculate 50% of voltages in Step 3	R40 = _____ mV	R40 = _____ mV
5	Install AC Gain Jumper		
6	Set the amplifier driving a sine wave into a load (let's say 10 Vrms into 8 ohms at 100 Hz)	V = _____ into 8R Freq = _____ Hz	V = _____ into 8R Freq = _____ Hz
7	Measure Source resistors on Amp / V- Side. Adjust P2 to match Step 4 values Set meter to read AC Volts. Is it set for AC, not DC?	R40 = _____ mV	R40 = _____ mV

Capacitors

Positions	Value	Size & Notes
C5, C9, C10	220uF 16V or greater	5.0 or 7.5mm Lead Spacing, up to 16mm Diameter Use your favorite brand here
C105, C109, C110	0.1uF Film Cap	OPTIONAL - Bypass for each of the above Electrolytic Caps 5.0, 7.5, or 10.0 mm Lead Spacing
C6, C7	1nF / 1000pf / 0.001uF	5.0, 7.5, or 10.0 mm Lead Spacing
C8	10pF Mica	5.0, 7.5, or 10.0 mm Lead Spacing
C11	1.0uF to 4.7uF will do, value is not critical	5mm LS 7.2x7.2 Film
C20, C21	1,000 uF or greater	5.0 or 7.5mm Lead Spacing, up to 16mm Diameter Use your favorite brand here

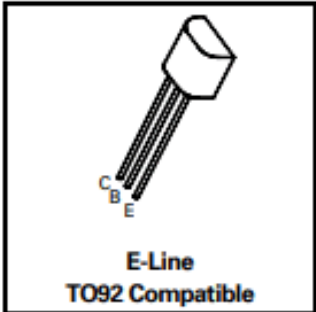
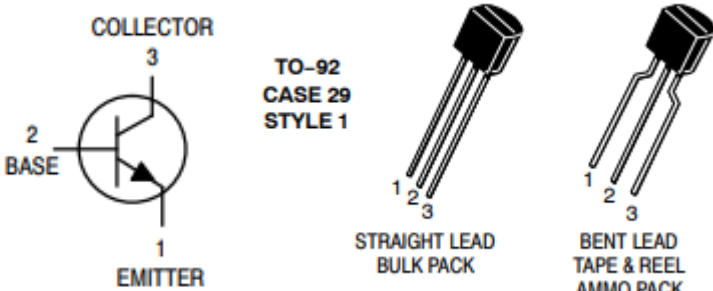
Minimum DC Voltage rating for capacitors should at minimum be rail voltage. Greater is OK, lower is NOT OK.

The exception is C5/105, C9/109, C10/110. For these caps the minimum Voltage rating = $\frac{1}{2}$ rail voltage + 4V. Therefore >15V for Aleph Mini. 16V and 25V are the next larger standard sizes. Greater is OK, lower than 16V rating is NOT OK.

Semiconductors

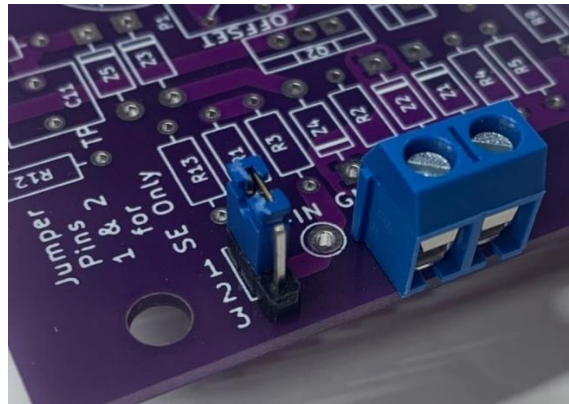
The Aleph Mini clone will use 1 of the 4 MOSFET positions on the top and bottom of the PCB.

Positions	Semiconductors	Matching & Notes
Q1 & Q2	IRF9610 or SFP9610 Alternate: 2SJ313 Alternate: FQP3P20	Must be matched
Q3	IRF9610 or SFP9610	No need to match
Q4 & Q5	ZTX450 Alternate: 2N4401	No need to match NOTE for PCB version 1.0d: Q4 shows "C B E" on PCB rev V1.0d. This is backwards, it should read "E B C". Q5 shows "E B C" on PCB rev V1.0d. This is backwards, it should read "C B E". Markings have been corrected on PCB version 1.0f
Q6	IRFP240	Qty 1. Must populate Q6 position. The remaining MOSFET positions on PCB and associated gate and source resistors will NOT be populated.
Q10	IRFP240	Qty 1. Must populate Q10 position. The remaining MOSFET positions on PCB and associated gate and source resistors will NOT be populated.

ZTX450 Pinout	2N4401 Pinout
 <p>E-Line TO92 Compatible</p>	 <p>COLLECTOR 3 2 BASE 1 EMITTER</p> <p>TO-92 CASE 29 STYLE 1</p> <p>STRAIGHT LEAD BULK PACK</p> <p>BENT LEAD TAPE & REEL AMMO PACK</p>

Connections to PCB

You have several options for wire connections to the board including Quick Disconnect Spades, bare wire, or Euroblock type 5mm / 5.08 mm connectors.



Grounding

Input Signal Ground(s) attach here.

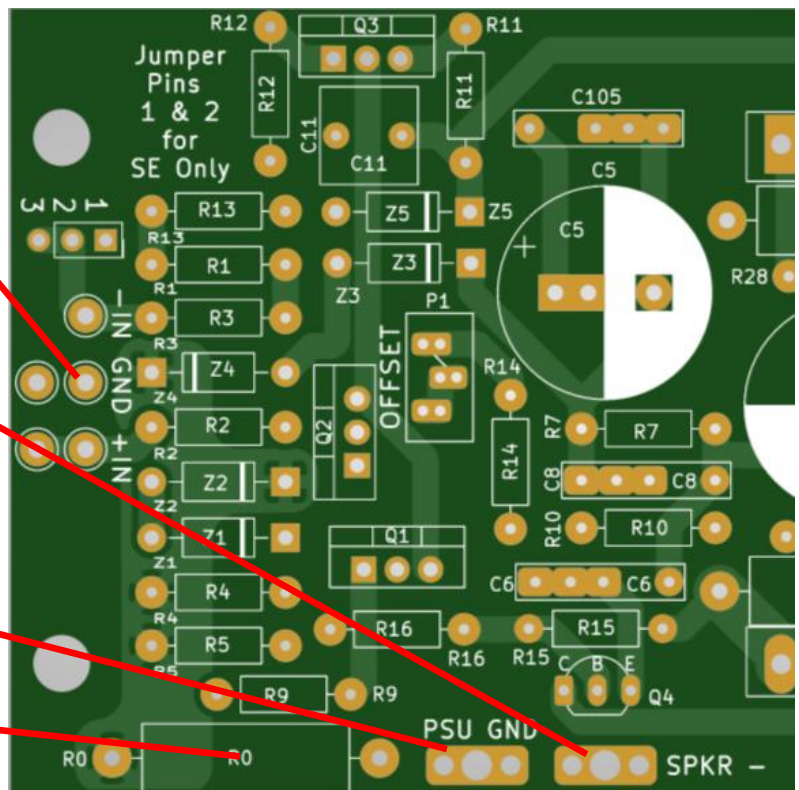
Option 1 – Connect Power supply / star ground to Negative Speaker Terminal.

Option 2 – Connect from here to Negative Speaker Terminal.

See which option sounds better in your setup

Power Supply Ground attaches here.

R0 = hum breaker resistor



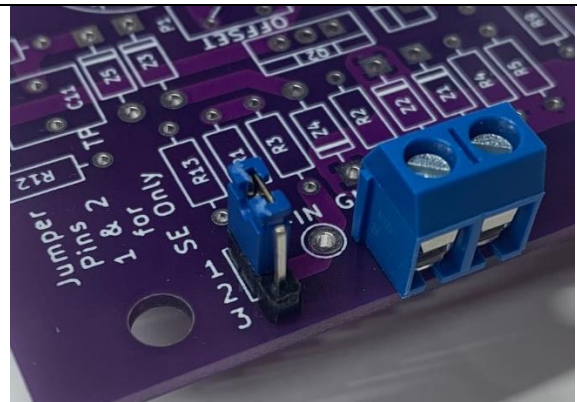
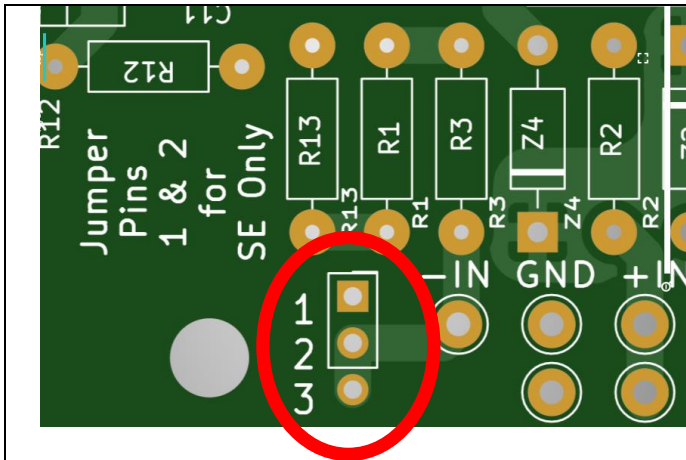
Single Ended vs. Balanced & SE Only Jumper

The Aleph 30 can be operated in balanced or single ended mode. When operating in Singled ended mode, XLR- must be connected to ground.

Option 1: Install a shorting plug/wire in the XLR jack that connects XLR Pin 1 (Ground) to XLR Pin 3 (negative)

Option 2: install a jumper header pins and use a jumper on the PCB between Pins 1 & 2 as marked on the PCB. You can store the jumper on Pins 2 & 3 when operating in Balanced mode.

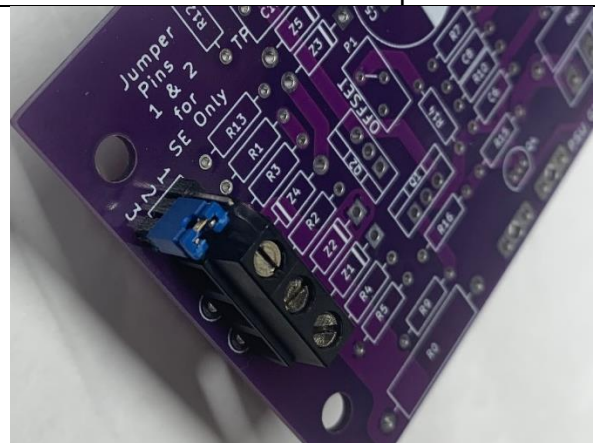
Option 3: SE only mode ONLY - Solder in a clipped resistor lead from your discard pile as a jumper wire between the point 1 & 2.



Example: Jumper installed for SE Only Operation
Euroblock for SE inputs

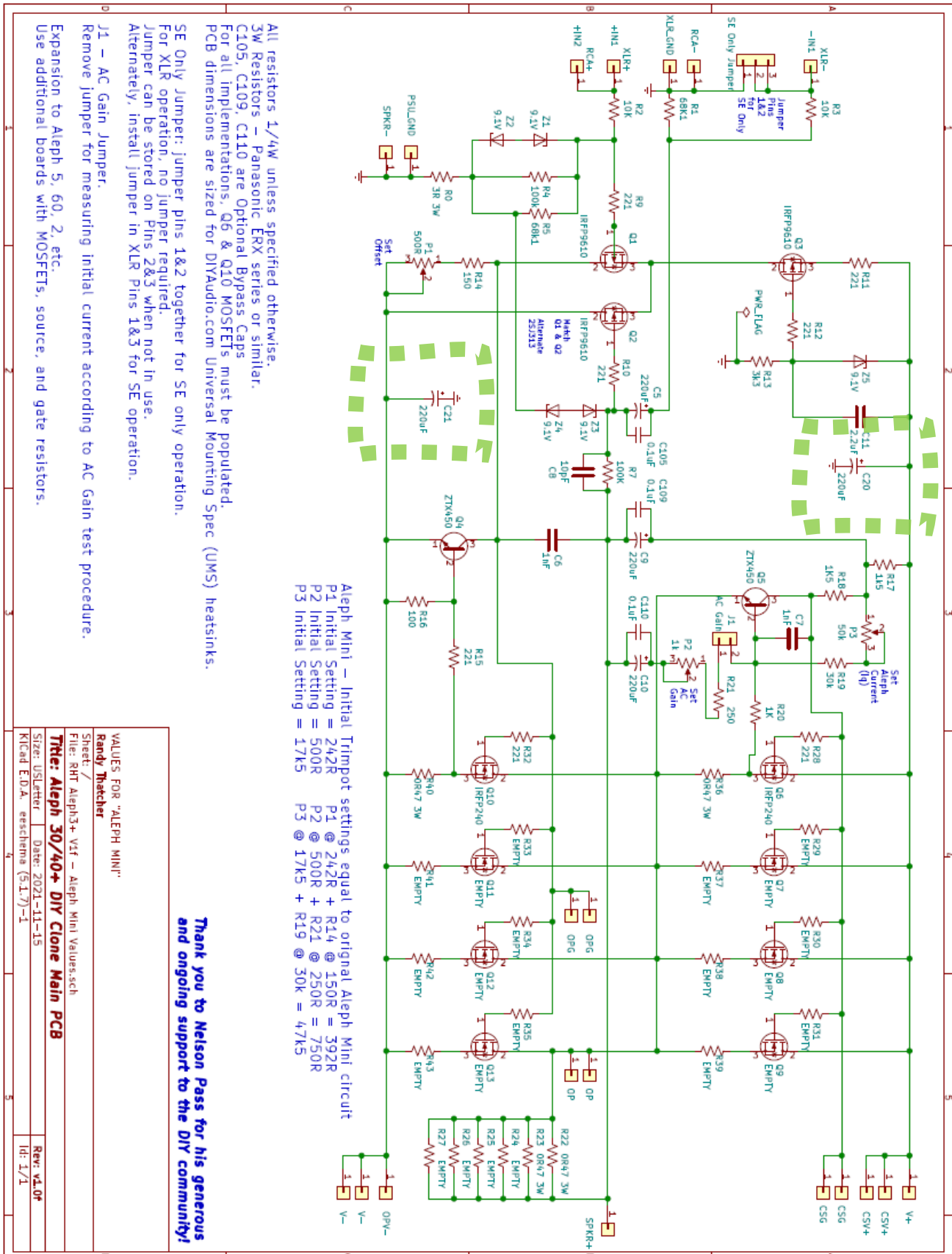


Example: Hardwire jumper installed for SE Only
Hardwired SE Input



Example: Jumper installed for Balanced Operation
Euroblock for Balanced inputs

PCB Schematic – Main PCB – Version 1.0f – Includes Aleph Mini Values



Aleph Mini BOM

BOM for Aleph 30+ Front End PCBs - The quantities below are for 1 MOSFET output (Aleph Mini)

BOM Version: v1.0a

NOTE: Assumes 2 channels in stereo amp chassis configuration

This table contains example part numbers and part recommendations. Any good quality similar parts will work with no detriment to the sound.

Per Chan	2 Chan	Designation	Description	Add'l Detail / Comment	Digikey
1	2	R0	2R7-4R 3W		A131577CT-ND
2	4	R1, R5	68k1 1/4W		68.1KXBK-ND
2	4	R2, R3	10k 1/4W		10.0KXBK-ND
2	4	R4, R7	100k 1/4W		100KXBK-ND
7	14	R9-12, R15, R28-32	221R 1/4W		221XBK-ND
1	2	R13	3k3 1/4W		MFR-25FBF52-3K3-ND
1	2	R14	150R 1/4W		150XBK-ND
1	2	R16	100R 1/4W		100XBK-ND
1	2	R21	250R 1/4W	This part number is 249R. Close Enough	249XBK-ND
2	4	R17, 18	1k5 1/4W		RNF14FTD1K50CT-ND
1	2	R19	30k 1/4W		MFR-25FBF52-30K-ND
1	2	R20	1k 1/4W		1.00KXBK-ND
4	8	R22-23, R36, R40	0R47 3W	Panasonic ERX or similar Metal Oxide	A138094CT-ND
5	10	Z1-5	9.1V Zener		1N5239B-ND
3	6	Q1-3	IRF9610 / SFP9610	Q1&2 Matched	IRF9610PBF-ND
2	4	Q1-2 Alternate Option	2SJ313 or FQP3P20	Q1&2 Matched	
2	4	Q4-5	ZTX450		ZTX450-ND
2	4	Q6, Q10	IRFP240		IRFP240PBF-ND
3	6	C5, C9, C10	220uF 25V	5.0 or 7.5mm Lead Spacing, up to 16mm Diameter	604-1056-ND
3	6	C105, C109, C110 (Optional)	0.1uF Film Cap	5.0, 7.5, or 10.0 mm Lead Spacing	1928-1538-ND
2	4	C6, C7	1nF / 1000pf / 0.001uF	5.0, 7.5, or 10.0 mm Lead Spacing	1928-1384-ND
1	2	C8	10pF Mica	5.0, 7.5, or 10.0 mm Lead Spacing	338-1061-ND
1	2	C11	1.0uF to 4.7uF will do, value is not critical	5mm LS 7.2x7.2 Film	399-12660-ND 495-1127-ND
2	4	C20, C21	1,000uF or more, 25V	5.0 or 7.5mm Lead Spacing, up to 16mm Diameter (PCB V1.0f only)	P10278-ND 1000uF P123950-ND 2000uF 478CKE025MQV-ND 4700uF
1	2	P1	500R Multi-turn pot	Initial Setting = 242R	3296Y-501LF-ND or 3296W-501LF-ND
1	2	P2	1k Multi-turn pot	Initial Setting = 500R	3296Y-102LF-ND or 3296W-102LF-ND
1	2	P3	50k Multi-turn pot	Initial Setting = 17k5	3296Y-503LF-ND or 3296W-503LF-ND
2	4	Jumpers	2.54mm jumper		1849-09200-71-BBGB00-ND
1	1	Jumper Header	2.54mm jumper header pins	Buy a long strip and cut for J1 and SE Only Jumpers	2057-PH1-15-UA-ND
2	4	Heatsink pads	Pads for MOSFETS		Keratherm (DIYAudio Store)
1	2	PCB			Group Buy
		OPTIONAL: QD Connectors	Quick Disconnect Spades		36-1287-ST-ND
		OPTIONAL: QD Connectors	3 Position Terminal Block	Screw disconnect for inputs	A98077-ND

Chassis

The DIY 3U chassis is a perfect candidate for Aleph Mini Stereo Amplifier. You can order UMS heatsinks as an upgrade option. Refer to the DIY Audio store or Modushop for details.

Power Supply – Transformer Options. VA Ratings are based on single transformer for stereo amp.

Rail Voltage	Transformer Secondary Voltage	Bias Current	Per Channel Heatsink Dissipation (Watts)	Transformer Sizing (2x Factor)	Transformer Sizing (3x Factor)	Power Output into 8 Ohms (RMS)
~20V	15V	1.0A	41	160VA	250VA	16
		1.2A	50	200VA	300 VA	19
		1.4A	57	230VA	350 VA	19
~16V	12V	1.0A	33	130VA	200VA	11
		1.2A	40	160VA	230VA	11
		1.4A	46	180VA	275VA	11

The following are some Antek Transformer options. Select a VA rating anywhere between the 2x and 3x factor above based on your desired bias point.

12V Secondaries

Antek AS-2212 - 200VA 12V Transformer

Antek AS-3212 - 300VA 12V Transformer

15V Secondaries

Antek AS-2215 - 200VA 15V Transformer

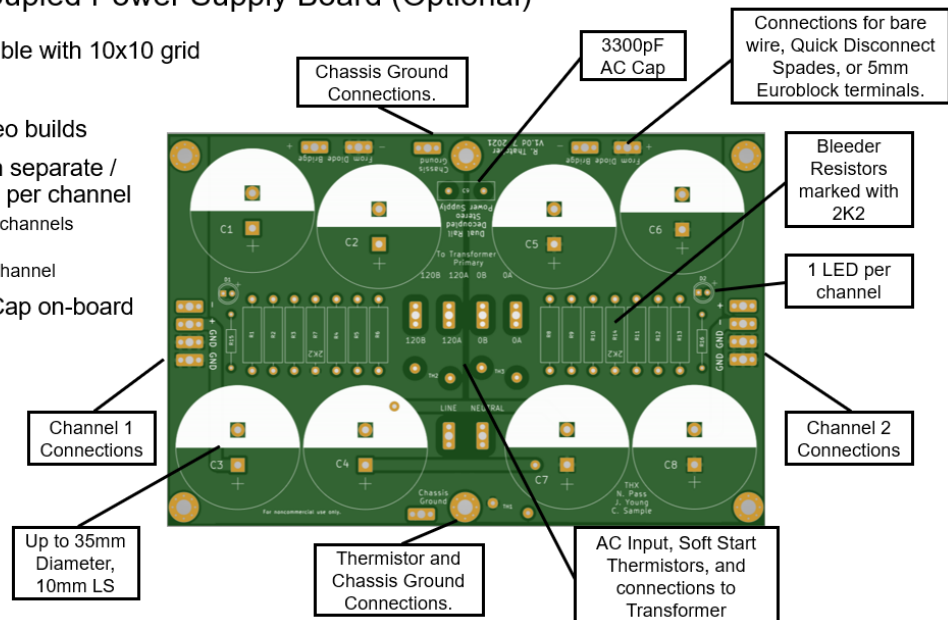
Antek AS-3215 - 300VA 15V Transformer

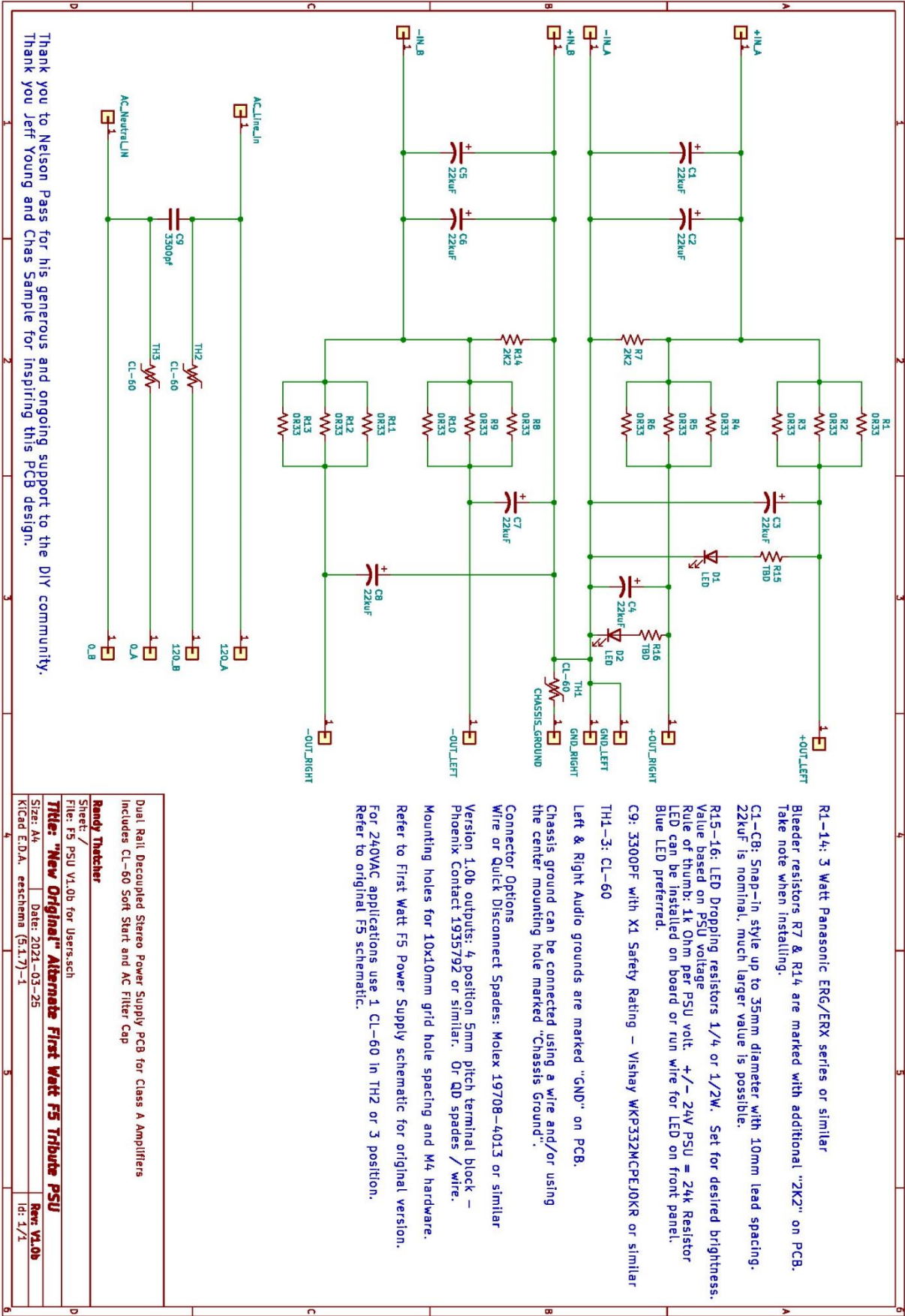
“New Original” F5 Power Supply – Recommended for Stereo builds

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Dual Rail Decoupled Power Supply Board (Optional)

- Mounting holes compatible with 10x10 grid
- 112 x 170mm
- Recommended for stereo builds
- CRC Power Supply with separate / decoupled 2nd cap bank per channel
 - 1st bank of caps for both channels
 - Last bank of caps: 1 cap per rail for each channel
- CL-60 Soft Start & AC Cap on-board





Power Supply BOM for “New Original” F5 Dual Rail Decoupled Power Supply PCB

NOTE: Assumes 2 channels in stereo amp chassis configuration

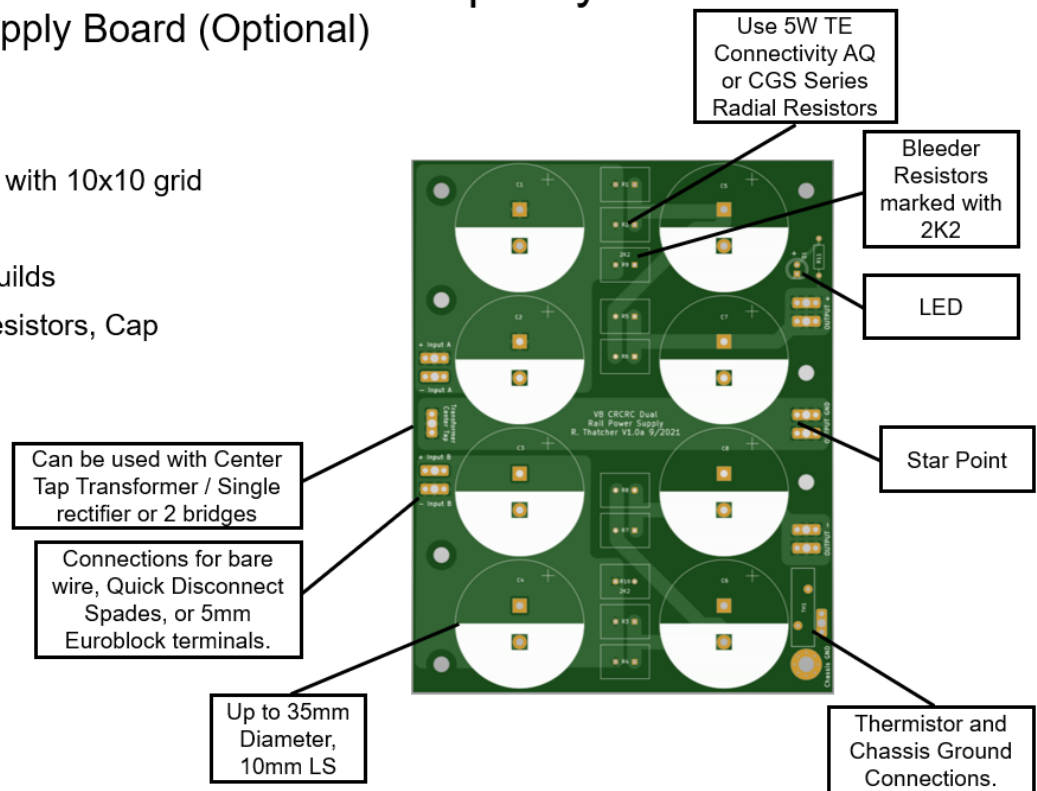
This table contains example part numbers and part recommendations. Any good quality similar parts will work with no detriment to the sound.

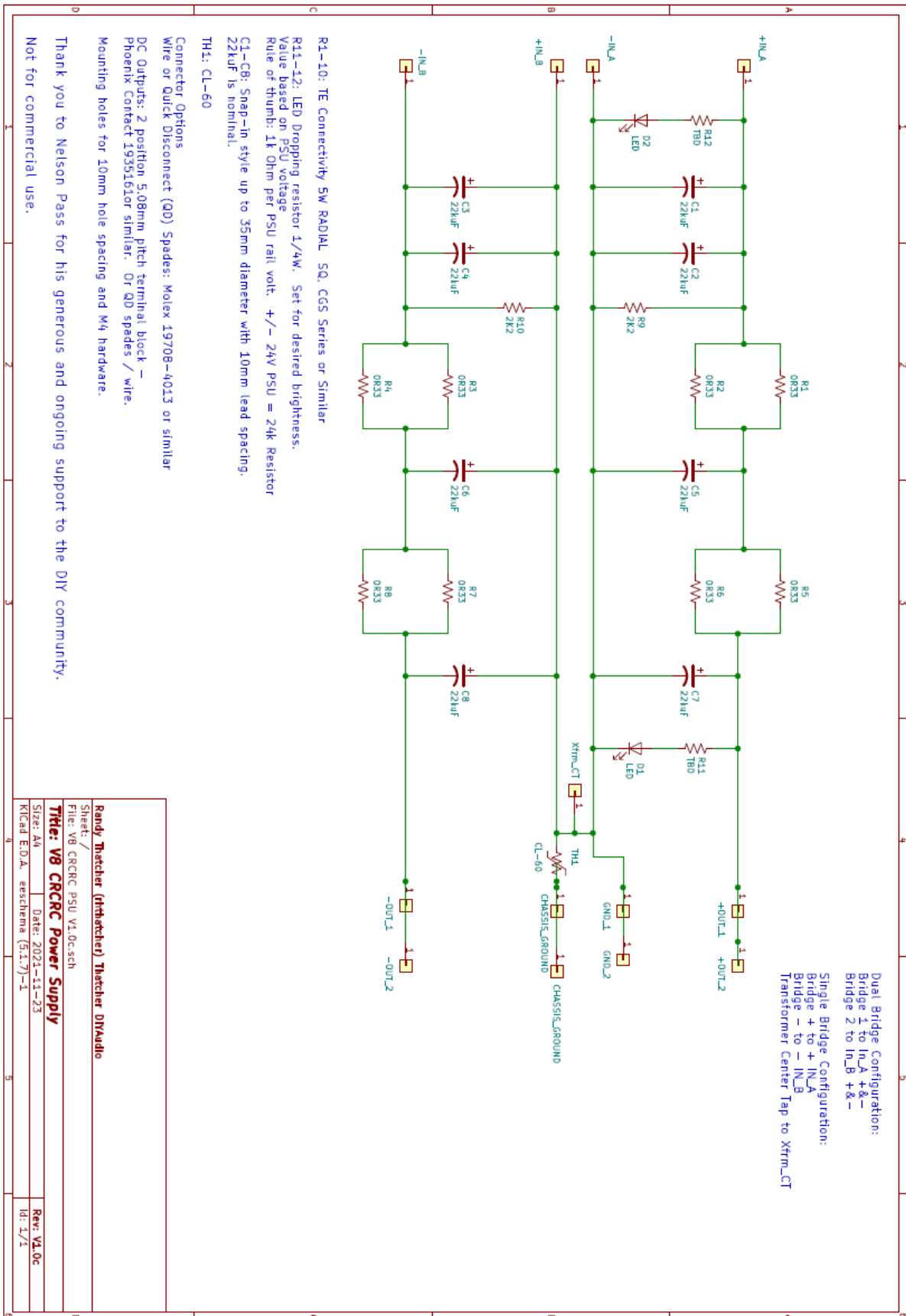
ID	Qty	Value	Digikey Part Number	Comment
Power Supply Board				
R1-6, R8-13	12	0R33 - 1R 3W	P0.47W-3BK-ND WHDR50FETCT-ND 0.33AECT-ND A131659CT-ND	Panasonic EGR/ERX or similar Alternate: use inductive wirewound resistors in this position. Inductive resistors add filtration in powers supply CRC filter.
R7, R14	3	2k2 3W	ERG-3SJ222	Panasonic EGR/ERX or similar
R15-16	2	20k 1/4W	20.0KXBK-ND	"Rule of Thumb" - 1k Ohm per PSU volt Increase R for dimmer LED.
C1-8	8	22k uF or greater, 25V or greater	338-2431-ND	10mm Lead Spacing, up to 35mm Diameter. Voltage rating must be greater than rail voltage!
C1-8 (alternate)		27k uF, 25V	338-2255-ND	
C1-8 (alternate)		33k uF, 25V	338-1613-ND	
C1-8 (alternate)		47k uF, 25V	338-2267-ND	
C9	1	3300pF, X1 Safety Rated	399-9513-1-ND	
TH1-3	3	CL-60	KC006L-ND	
D1,2	2	Blue LED	732-5019-ND	This is a Pass clone – blue is required!
Other	2	Screw Terminal Blocks 4 position	277-1579-ND	OPTIONAL - For connection to amp PCBs
Other	3	Screw Terminal Blocks 2 Position 35 Degree	277-5941-ND	OPTIONAL - for AC Connections (Mains + Transformer)
Other	6-16	Quick Disconnect Blades	WM14275CT-ND 36-1287-ST-ND	OPTIONAL - 6 if AC only, up to 16 total if not using screw terminal blocks
Rectifiers / Snubber PCBs				
Rectifier Bridges	2		GBPC3510-E4/51GI-ND 641-1380-ND	
Snubber C	2	FILM 10000PF / 10nF / .01uF	495-4975-1-ND	
Snubber C	2	FILM 150nF / .15uF	495-77011-1-ND	
Snubber R	2	Metal Film 1/4W - Value TBD		Use Quasimodo test jig to determine value. 22R is a good 'rule of thumb' for Antek Transformers
MISC				
Fuses	TBD	2.0 or 2.5 Amp Slow Blow		Calculate Transformer VA / Mains voltage, then go to next standard size. 200VA / 120V = 1.667A - go with 2A Fuse 300VA / 120V = 2.5A Fuse

V8 CRCRC Power Supply – Recommended for Mono builds

Classic Aleph for UMS Chassis Group Buy V8 CRCRC Power Supply Board (Optional)

- Mounting holes compatible with 10x10 grid
- 115 x 146mm
- Recommended for mono builds
- 2 Caps, Resistors, Cap, Resistors, Cap





Power Supply BOM for V8 CRCRC Power Supply PCB

NOTE: BOM is for SINGLE CHANNEL. Multiply Quantity x 2 for 2 channels!

This table contains example part numbers and part recommendations. Any good quality similar parts will work with no detriment to the sound.

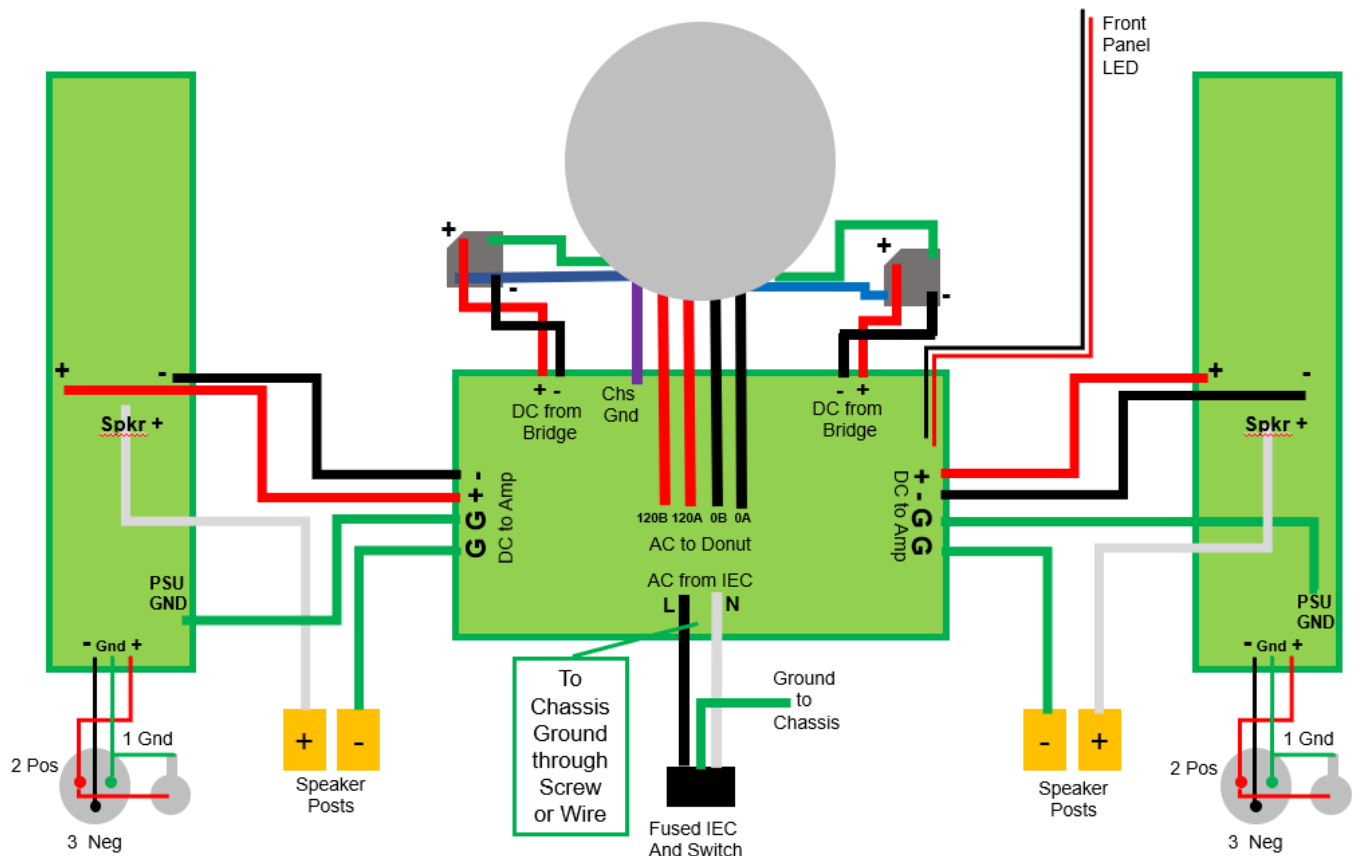
ID	Qty	Value	Digikey Part Number	Comment
Power Supply Board				
R1-8	8	0R22 – 0R33 5W	A103689-ND A137379-ND A102472-ND	Use TE Connectivity 5W Radial Resistors for this PCB 13.00mm x 9.00mm 5mm Lead Spacing
R9-10	2	2k2 5W (3k3 is also OK)	A102461-ND A131251-ND	Use TE Connectivity 5W Radial Resistors for this PCB 13.00mm x 9.00mm 5mm Lead Spacing
R11, 12	2	20k 1/4W	20.0KXBK-ND	"Rule of Thumb" - 1k Ohm per PSU volt Increase R for dimmer LED.
C1-8	8	22k uF or greater, 25V or greater	338-2431-ND	10mm Lead Spacing, up to 35mm Diameter. Voltage rating must be greater than rail voltage!
C1-8 (alternate)		27k uF, 25V	338-2255-ND	
C1-8 (alternate)		33k uF, 25V	338-1613-ND	
C1-8 (alternate)		47k uF, 25V	1189-3900-ND	
TH1	1	CL-60	KC006L-ND	
D1-2	2	Blue LED	732-5019-ND	This is a Pass clone – blue is required! LEDs are both on positive rail. Use one for on-board and another for front panel
Other	5	Screw Terminal Blocks 2 position	277-1667-ND	OPTIONAL - For connection to amp PCB and/or Bridges
Other	10	Quick Disconnect Blades	WM14275CT-ND 36-1287-ST-ND	
CL-60 / AC Cap PCB				
C1	1	3300pF, X1 Safety Rated	399-9513-1-ND	
TH1-2	2	CL-60	KC006L-ND	
Other	3	Screw Terminal Blocks 2 position	277-1667-ND	
Other	6	Quick Disconnect Blades	WM14275CT-ND 36-1287-ST-ND	
Rectifiers / Snubber PCBs				
Rectifier Bridges	2		GBPC3510-E4/51GI-ND 641-1380-ND	
Snubber C	2	FILM 10000PF / 10nF / .01uF	495-4975-1-ND	
Snubber C	2	FILM 150nF / .15uF	495-77011-1-ND	
Snubber R	2	Metal Film 1/4W - Value TBD		Use Quasimodo test jig to determine value

Amplifier Wiring – Aleph Mini Stereo Configuration with “New Original” F5 Power Supply PCB

- Twist wires!!!
- If using Antek shielded transformer, attach purple wire to Chassis.
 - Option 1: Direct to Chassis
 - Option 2: Connect to “Chassis Ground” termination point on PSU PCB
- Confirm transformer wiring pairs (120A / 0 A, 120B / 0B, secondary pairs)

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Aleph 30 Stereo Wiring using "New Original" PSU PCB – 120VAC Mains

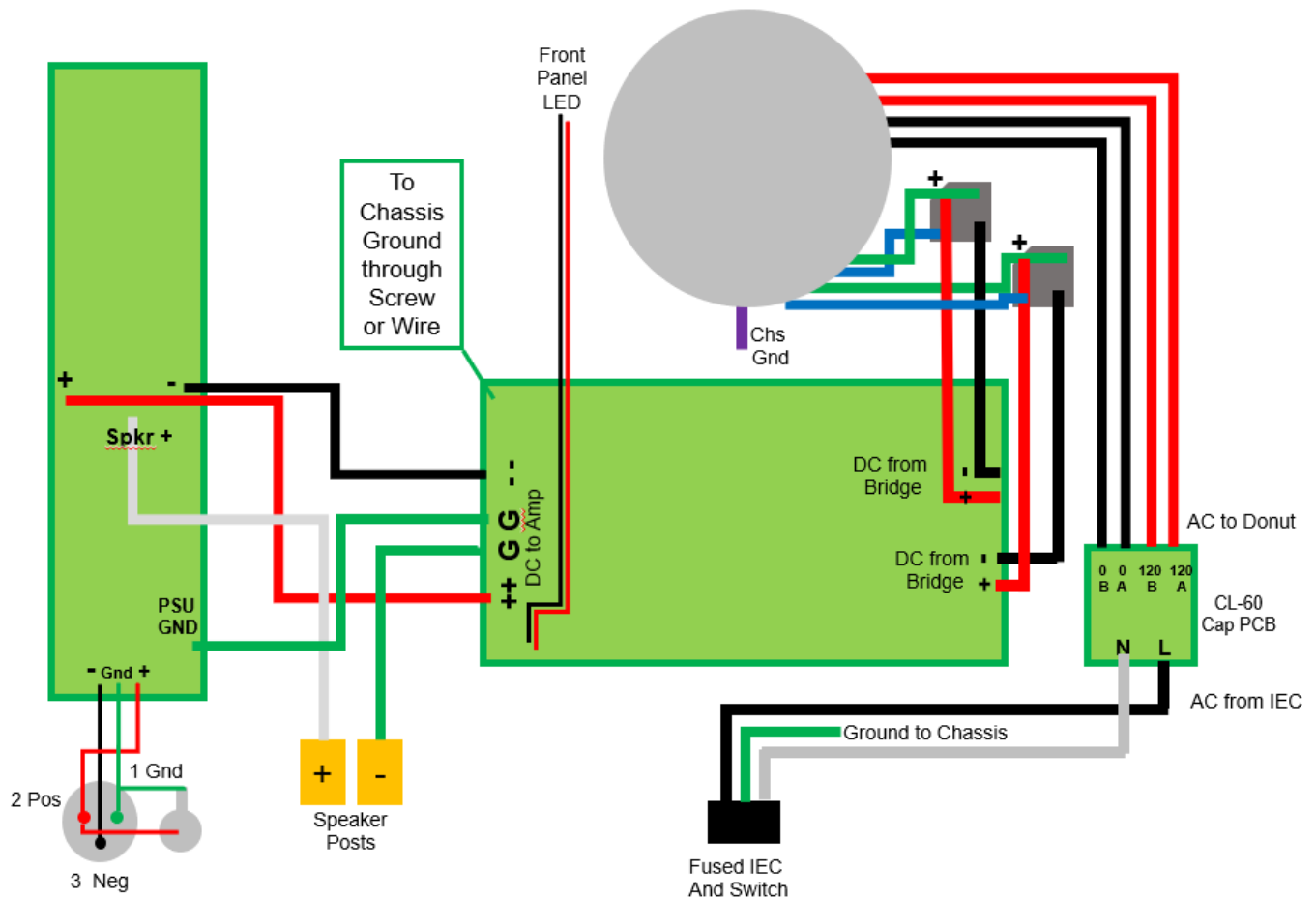


Amplifier Wiring – Aleph Mini Monoblock Configuration with V8 Power Supply PCB

- Twist wires!!!
- If using Antek shielded transformer, attach purple wire to Chassis.
 - Option 1: Direct to Chassis
 - Option 2: Connect to “Chassis Ground” termination point on PSU PCB
- Confirm transformer wiring pairs (120A / 0 A, 120B / 0B, secondary pairs)

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Aleph 30 Monoblock Wiring using V8 CRCRC Power Supply – 120VAC Mains



Final Test / Checkout Sheet

	Unloaded	Loaded
Power Supply V+		
Power Supply V-		

	Initial / Cold		Warm (After ~1 Hour)		After Adjustment	
	Left	Right	Left	Right	Left	Right
DC Offset (mV) Target < 100 mV						
Current Source MOSFET Current (Q6) Target = 1.0 - 1.4A						
Output MOSFET Current (Q10) Target = 1.0 - 1.4A						

See AC Gain setting section for testing / recording AC Gain.