

Aleph 60 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 expandible format. This document focuses on building the Aleph 60 Clone circuit as a pair of monoblock amplifiers.

NOTE: The Aleph 30 stereo amplifier is covered in a separate document.

Project Difficulty: **NOVICE** **INTERMEDIATE** **EXPERT**



Questions?

You're probably not alone!

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

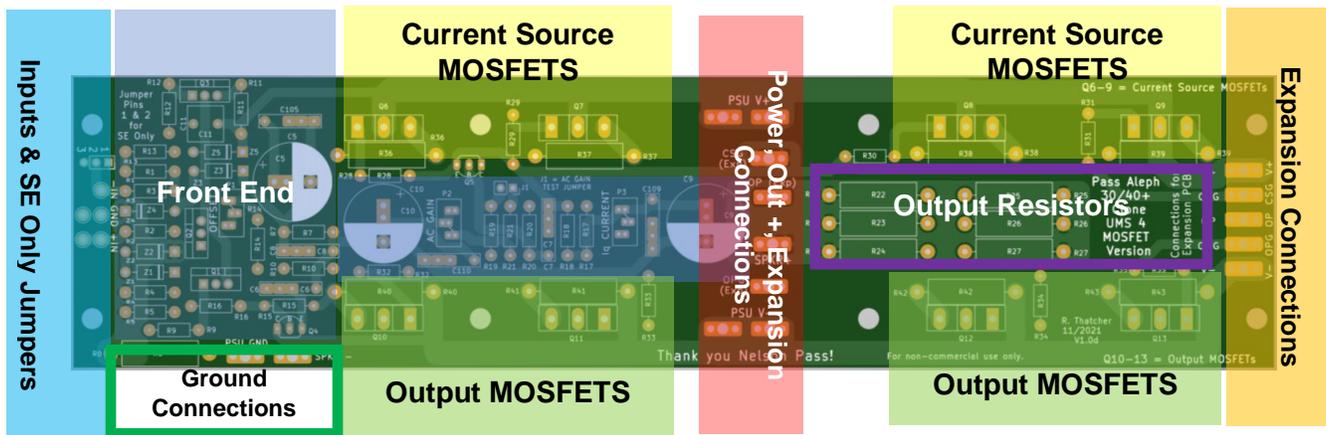


This project uses line/mains voltages and has a power supply with large capacitors. The voltages in this amplifier can kill – even at miniscule current. If you are not competent / confident with working with these voltages, please seek advice from either a qualified electrician, or an audio DIYer who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

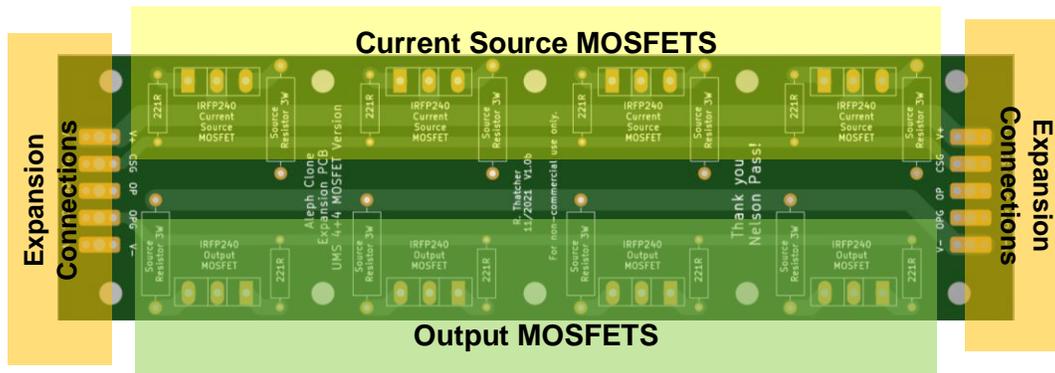
The original schematic has been updated and a new PCB layout devised. The PCBs for this project are offered without any warranty, guarantee provided, or liability taken.

Version / Date	Revision History
V1.0a 10 Dec 2021	Original Release

Getting to know the Main Amp PCB



Getting to know the Expansion PCB



Resistors

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

- For 1/4W resistors use your favorite brand metal film resistors. Yaeko, 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.

Trim pots & Adjustments

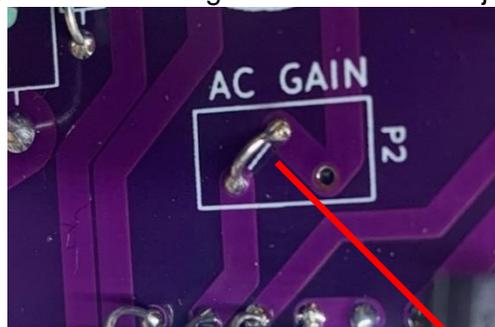
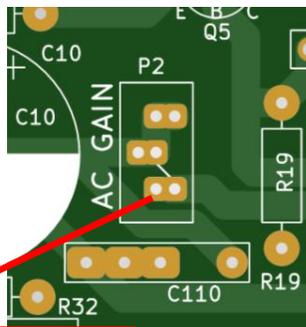
Trimpot positions are included for adjusting output DC Offset, AC Gain, and bias current. In the original circuit these were fixed resistors. It is recommended to install the trim pots to make easy adjustments to your build. The values below are chosen so that midrange of the trimpot value (factory default) + associated resistor equals approximately the original Aleph 60 resistor value. This allows for range for adjustment.

BUILD NOTE: Set trimpot prior to installation

Parameter	Original Aleph 60 Value	Trimpot + Resistor	Initial Trimpot value Set before Installing
DC Offset	R14 = 392R	P1 @ 242R + R14 @ 150R = 392R	P1 = 242R
AC Gain	R21 = 1k5	P2 @ 1,108R + R21 @ 392R = 1k5	P2 = 1,108R / 1k108
Iq Current	R19 = 56k2	P3 @ 26k2 + R19 @ 30k = 47k5	P3 = 26k2

Optional – Build with fixed resistors and no trim pots

You can use the original base Aleph 60 resistor values in R14, R19, and R21. You will need to jumper the trim pots by soldering in a clipped resistor lead from your discard pile as a jumper wire between the trimpot pads on the PCB. You must use the correct base resistor value (R14 = 392R, R21 = 1k5, R19 = 56k2), not the values in the BOM. The PCB is marked with a white line showing where to install the jumper.



Install Jumper here.
See the white mark on the PCB for guidance.

Example hardwired jumper on a prototype build

Bias Current Measurement

Option 1 – Measure voltage of each source resistor (R36-39 + Current Source MOSFET source resistors on Expansion PCB and R40-43 + Output MOSFET source resistors on Expansion PCB), divide by source resistor values. Add them up. Example: R36: 370mV / 1R = 0.37A. Measure the rest and add up the values.

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

Initial target value is 2.1 – 2.2A

Use Option 1 to verify the current is spread evenly on the MOSFETS. Once verified, Option 2 is good for overall bias adjustments.

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 16 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 R0 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	Measurement
1	Remove AC Gain Jumper	
2	Set the amplifier driving a sine wave into a load (let's say 16 Vrms into 8 ohms at 100 Hz)	V = _____ into 8R Freq = _____ Hz
3	Measure voltage on source resistors on Amp / V- Side (R40-43)	R40 = _____ mV R41 = _____ mV R42 = _____ mV R43 = _____ mV
4	Calculate 50% of voltages in Step 3	R40 = _____ mV R41 = _____ mV R42 = _____ mV R43 = _____ mV
5	Install AC Gain Jumper	
6	Set the amplifier driving a sine wave into a load (let's say 16 Vrms into 8 ohms at 100 Hz)	V = _____ into 8R Freq = _____ Hz
7	Measure Source resistors on Amp / V- Side. Adjust P2 to match Step 4 values	R40 = _____ mV R41 = _____ mV R42 = _____ mV R43 = _____ mV

Capacitors

Positions	Value	Size & Notes
C5, C9, C10	220uF 20+V	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
C8	10pF Mica	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
C11	1.0uF to 4.7uF will do, value is not critical	5mm LS 7.2x7.2 Film

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. $34V / 2 + 4V = 21V$. Therefore >21V for Aleph 60. 21V or higher voltage rating is OK. Lower is not OK.

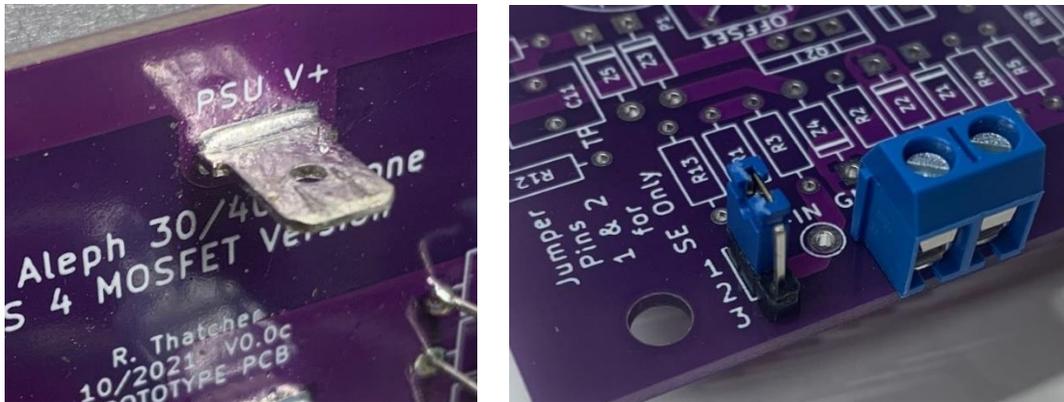
Semiconductors

The Aleph 60 clone will use 3 of the 4 MOSFET positions on the top and bottom of the main PCB and 3 of the 4 MOSFET positions on the top and bottom of the Expansion PCB. There will be a total of 24 IRFP240's in 2 channels of Aleph 60 configuration.

Positions	Semiconductors	Matching & Notes
Q1 & Q2	IRF9610 Alternate: 2SJ313	Must be matched
Q3	IRF9610	No need to match
Q4 & Q5	ZTX450	No need to match
Q6-Q9	IRFP240	Qty 3. Must be matched Must populate Q6 position. Populate 2 of the 3 remaining positions on PCB and populate associated gate and source resistors. All 6 Current Source MOSFETs per channel must be matched. Therefore Current Source MOSFETs on Main PCB must be matched with Current Source MOSFETs Expansion PCB.
Q10-Q13	IRFP240	Qty 3. Must be matched Must populate Q10 position. Populate 2 of the 3 remaining positions on PCB and populate associated gate and source resistors. All 6 Output MOSFETs per channel must be matched. Therefore Output MOSFETs on Main PCB must be matched with Output MOSFETs Expansion PCB.
Expansion PCB – Current Source MOSFETs	IRFP240	Qty 3. Must be matched – see notes above about matching. Populate 3 of the 4 positions on PCB and populate associated gate and source resistors.
Expansion PCB – Output MOSFETs	IRFP240	Qty 3. Must be matched – see notes above about matching. Populate 3 of the 4 positions on PCB and populate associated gate and source resistors.

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.



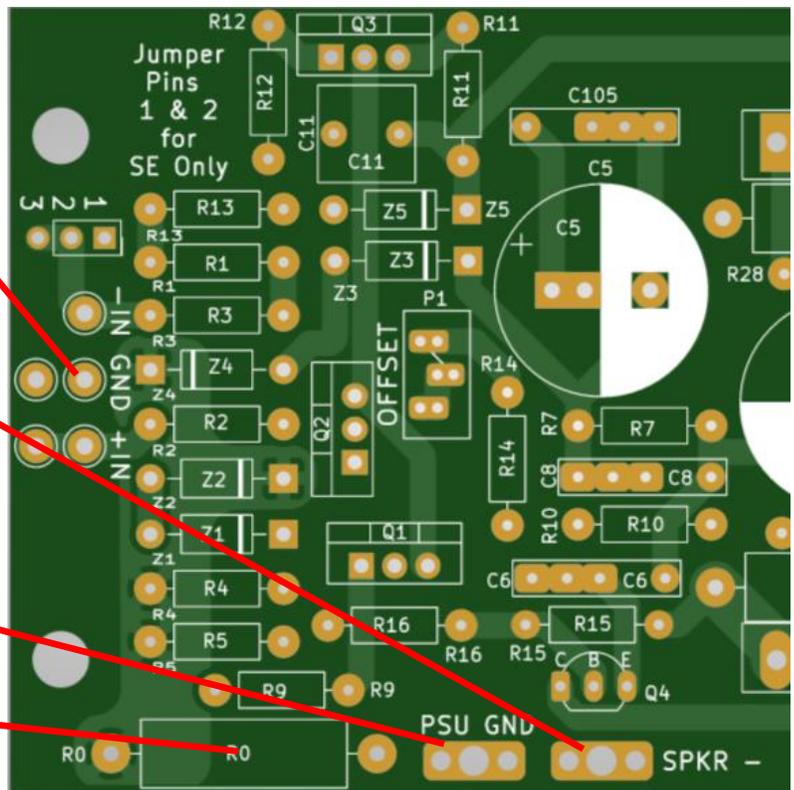
Grounding

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



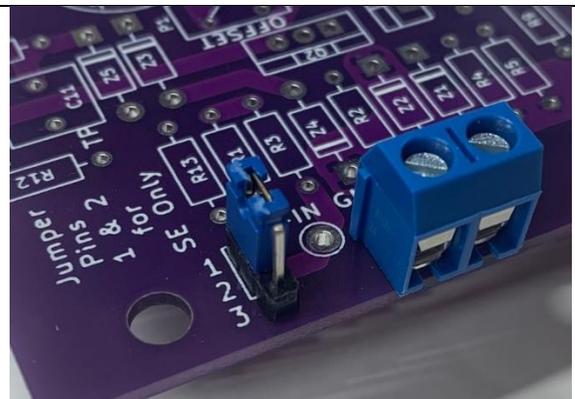
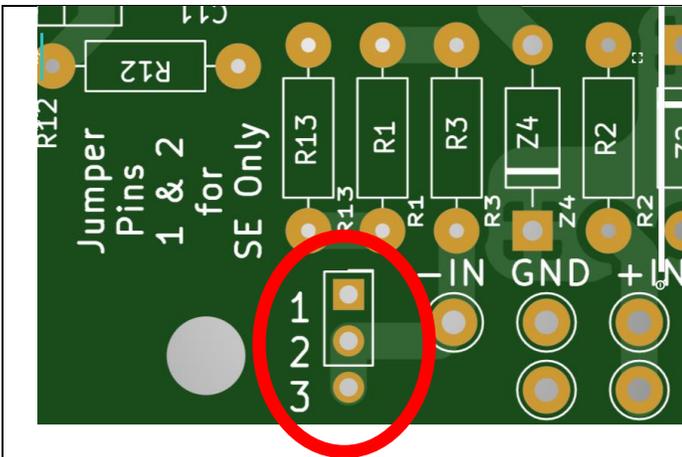
Single Ended vs. Balanced & SE Only Jumper

The Aleph 60 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.

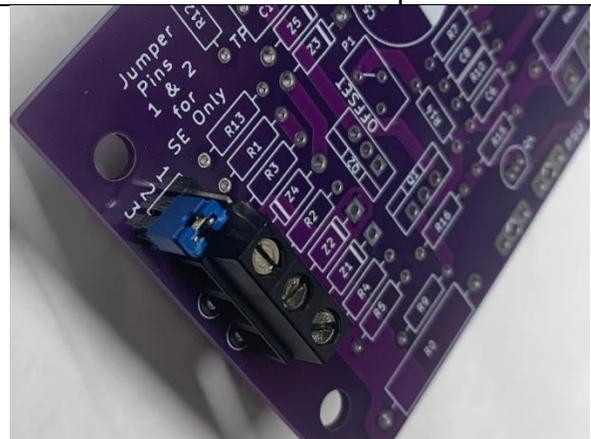
Option 3: SE only mode ONLY - Solder in a clipped resistor lead from your discard pile as a jumper wire between the point 1 & 2.



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

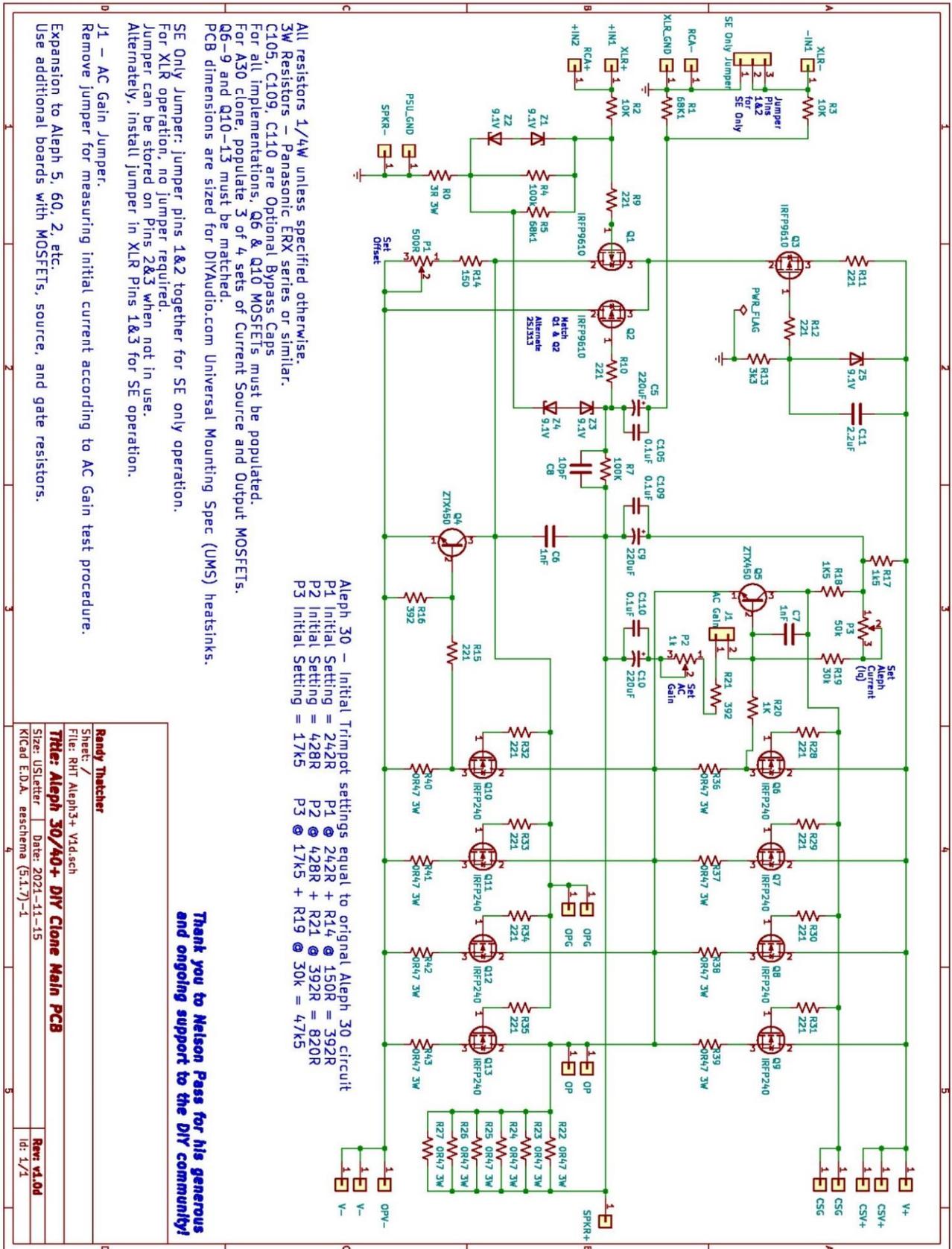


Example: Hardwire jumper installed for SE Only
Hardwired SE Input

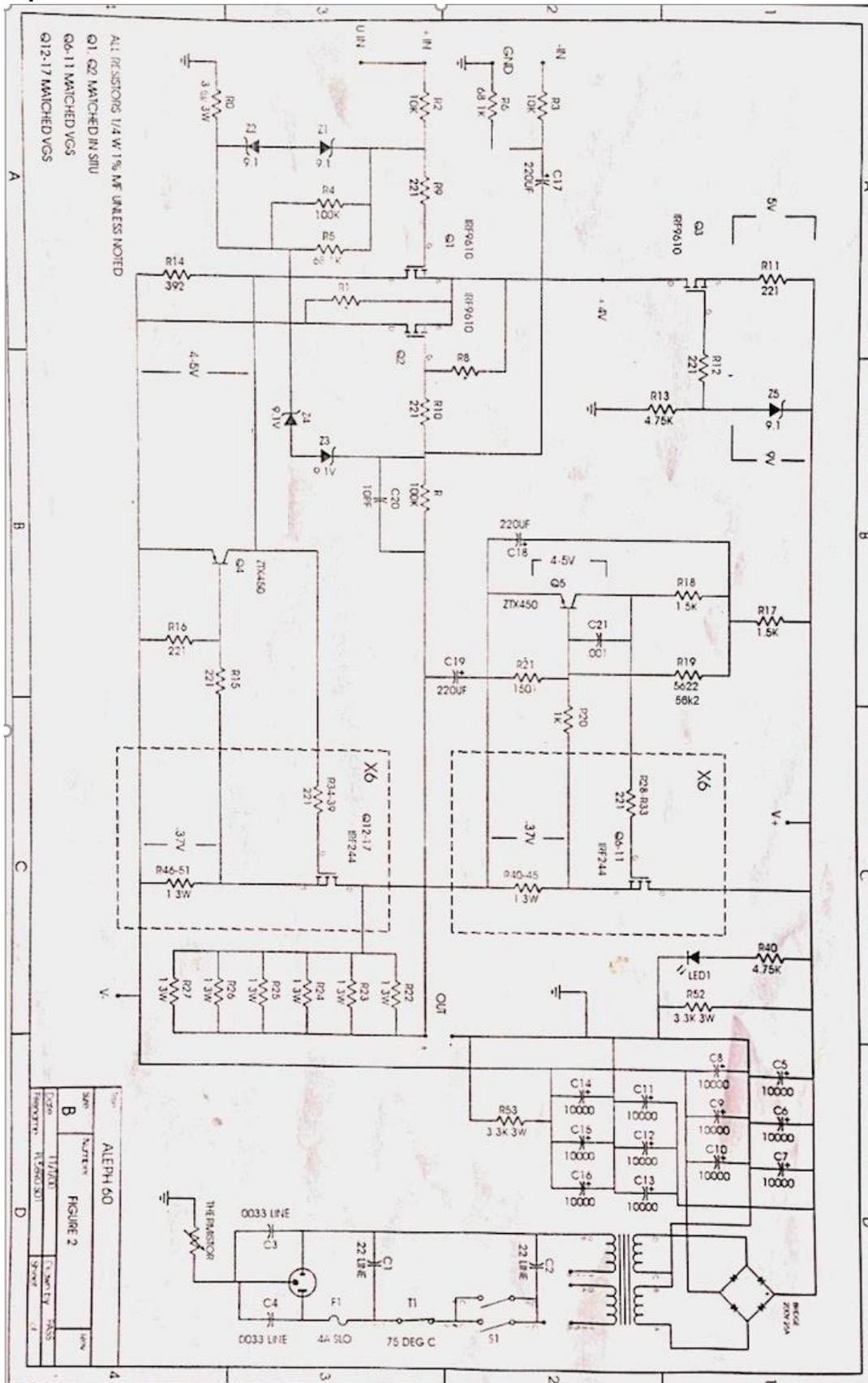


Example: Jumper installed for Balanced Operation
Euroblock for Balanced inputs

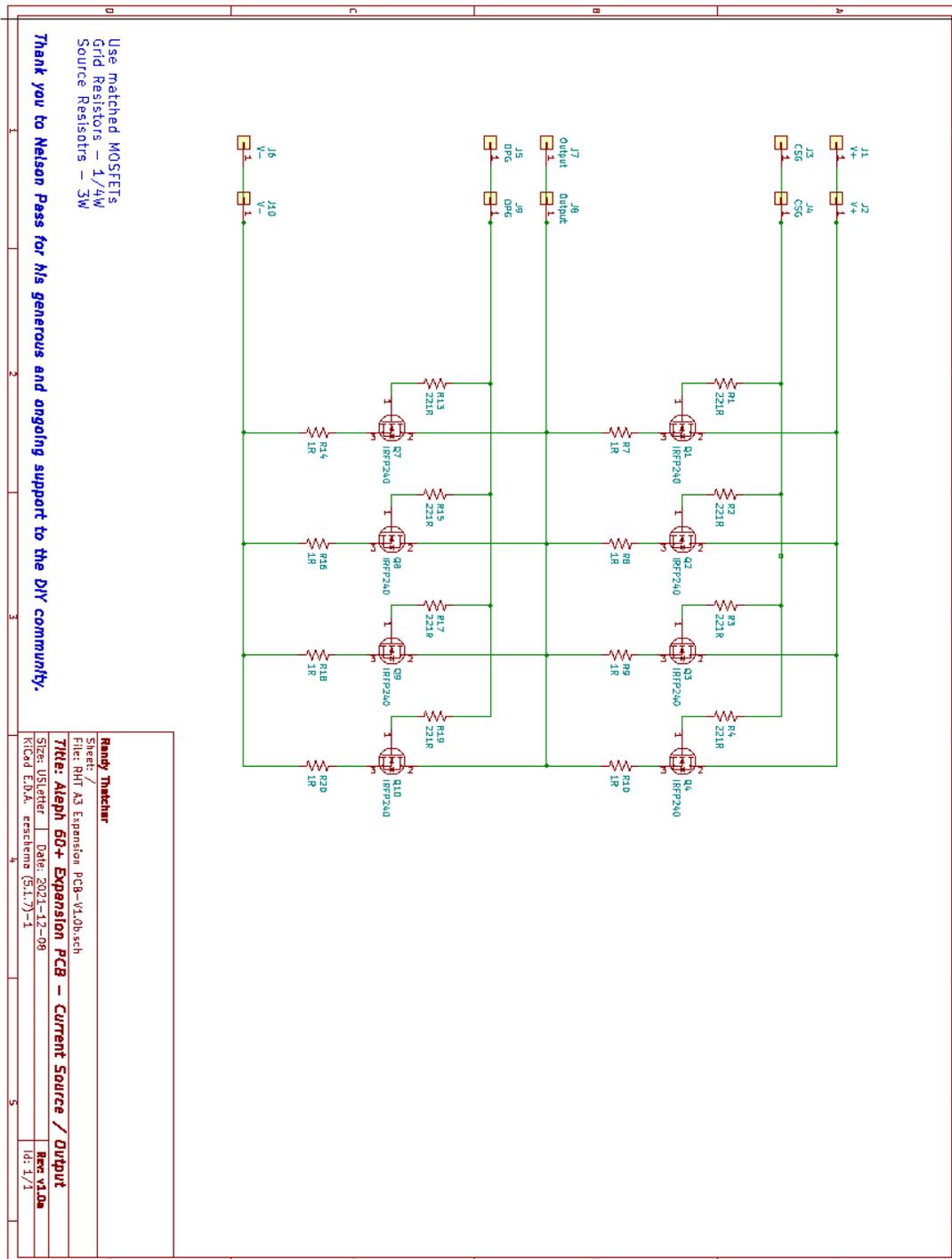
PCB Schematic – Main PCB



Old School Aleph 60 Schematic



Expansion PCB Schematic



Aleph 60 BOM

BOM for Aleph 60 Front End PCBs - The quantities below are for 6 MOSFET output (Aleph 60)

BOM Version: v1.0d

NOTE: This BOM is based on the old school Aleph 60 schematic + Aleph reloaded mods. The PCB schematic above shows Aleph 30 values. Use values from the BOM below for your Aleph 60 build.

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
18	36	R9-12, R15-16, R28-39 + Exp. PCB gate Rs	221R 1/4W		221XBK-ND
1	2	R13	3k3 1/4W		MFR-25FBF52-3K3-ND
1	2	R14	150R 1/4W		150XBK-ND
2	4	R16, 21	392R 1/4W		392XBK-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
18	36	R22-27, R36-43 + Exp. PCB source Rs	1R 3W	Panasonic ERX or similar Metal Oxide	P1.0W-3BK-ND
5	10	Z1-5	9.1V Zener		1N5239B-ND
3	6	Q1-3	IRF9610	Q1&2 Matched	IRF9610PBF-ND
2	4	Q1-2 Alternate Option	2SJ313	Q1&2 Matched	
2	4	Q4-5	ZTX450		ZTX450-ND
12	24	Q6-13 + Exp PCB MOSFETs	IRFP240	6 x Current Source MOSFETs matched – per channel 6 x Output MOSFETs matched – per channel Total of 4 matched sextets per 2 channel amp	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
1	2	C8	10pF Mica	5.0, 7.5, or 10.0 mm Lead Spacing	338-1061-ND
2	4	C6, C7	1nF / 1000pf / 0.001uF	5.0, 7.5, or 10.0 mm Lead Spacing	1928-1384-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
1	2	P1	500R Multi-turn pot	Initial Setting = 242R	3296Y-501LF-ND or 3296W-501LF-ND
1	2	P2	2k Multi-turn pot	Initial Setting = 1,108	490-2880-ND or 3296W-1-202RLF
1	2	P3	50k Multi-turn pot	Initial Setting = 26k2	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
12	24	Heatsink pads	Pads for MOSFETS		Keratherm (DIYAudio Store)
1	2	Main PCB			Group Buy
1	2	Expansion 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
		OPTIONAL: QD Connectors	5 Position Terminal Block	Screw disconnect for Expansion connectors For use in Aleph 60 Builds	23-0395443005-ND

Chassis

The DIY Audio 4U Deluxe Chassis is a perfect candidate for the Aleph 60 Mono Amplifier. A 500mm deep chassis is a good candidate for 2 channels in one chassis.

Power Supply

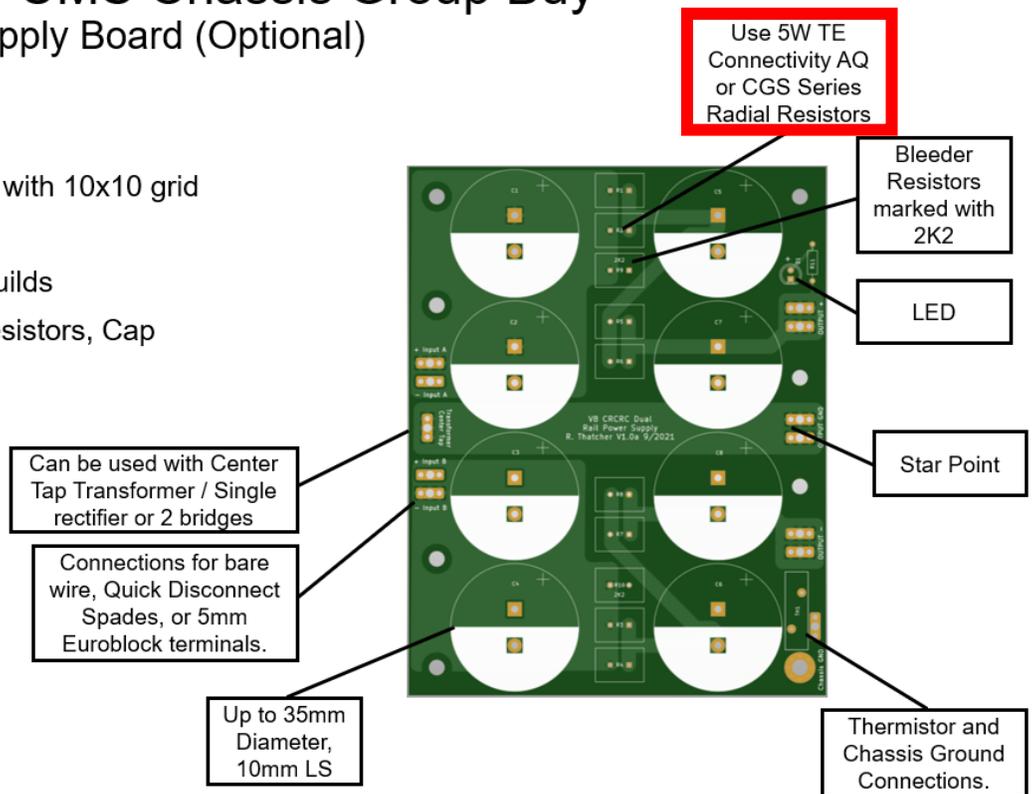
Transformer

Per Monoblock: Recommend 300VA 25+25 Transformer (example: Antek AS-3225)

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.

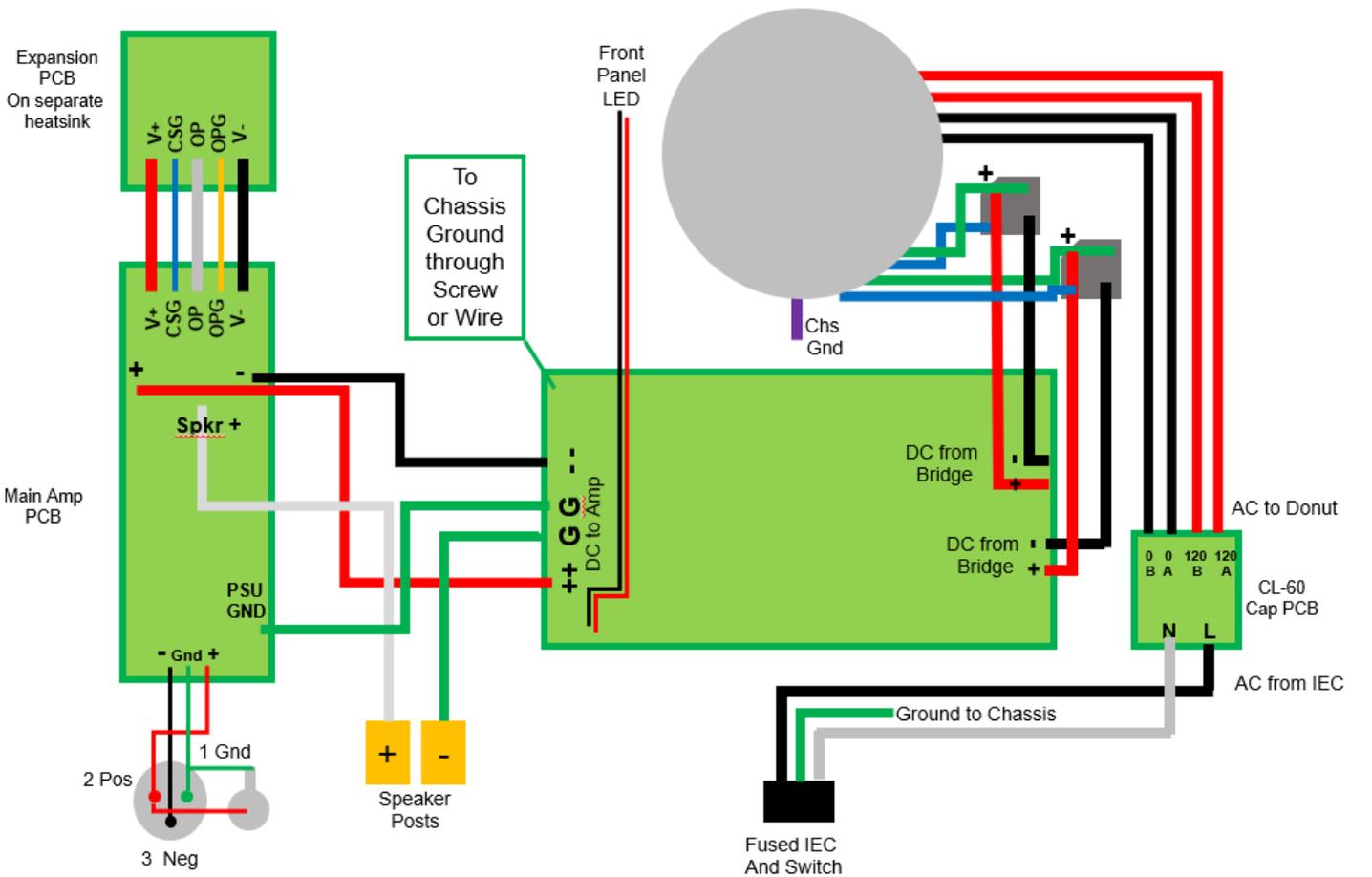
ID	Qty	Value	Digikey Part Number	Comment
Power Supply Board				
R1-8	8	0R27 – 0R47 5W	A137379-ND A102472-ND A137380-ND A102473-ND	Use TE Connectivity 5W Radial Resistors for this PCB 13.00mm x 9.00mm 5mm Lead Spacing
R9-10	2	2k2 5W (3k3 is also OK)	A102461-ND A131251-ND	Use TE Connectivity 5W Radial Resistors for this PCB 13.00mm x 9.00mm 5mm Lead Spacing
R11	1	36k 1/4W	13-MFR-25FTE52-36KCT-ND	"Rule of Thumb" - 1k Ohm per PSU volt Increase R for dimmer LED.
C1-8		22k uF, 35V	338-2305-ND	10mm Lead Spacing, up to 35mm Diameter. Voltage rating must be greater than rail voltage!
C1-8 (alternate)		27k uF, 35V	1189-3914-ND	
C1-8 (alternate)		33k uF, 35V	338-2260-ND	
TH1	1	CL-60	KC006L-ND	
D1	1	Blue LED	732-5019-ND	This is a Pass clone – blue is required!
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	399-9501-1-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		GBPC3502-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 60 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)
- Expansion PCB Wiring
 - There are connections in middle and end of main PCB to Expansion PCB. Choose the wiring that works best in your chassis configuration
 - There are connection on both ends of Expansion PCB

Expansion Board Connection	Wire
V+ (Positive Rail)	Fat Wire
OP (Output)	
V- (Negative Rail)	
CSG (Current Source Gate)	Thin Wire
OPG (Output Gate)	

Classic Aleph for UMS Chassis Group Buy Aleph 60 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 1 current <i>Main PCB</i>						
Current Source MOSFET 2 current <i>Main PCB</i>						
Current Source MOSFET 3 current <i>Main PCB</i>						
Current Source MOSFET 1 current <i>Expansion PCB</i>						
Current Source MOSFET 2 current <i>Expansion PCB</i>						
Current Source MOSFET 3 current <i>Expansion PCB</i>						
Total Current Source Current (Amps) Target = 2.1 - 2.2A						
Output MOSFET 1 current <i>Main PCB</i>						
Output MOSFET 2 current <i>Main PCB</i>						
Output MOSFET 3 current <i>Main PCB</i>						
Output MOSFET 1 current <i>Expansion PCB</i>						
Output MOSFET 2 current <i>Expansion PCB</i>						
Output MOSFET 3 current <i>Expansion PCB</i>						
Total Output Current (Amps) Target = 2.1 - 2.2A						

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