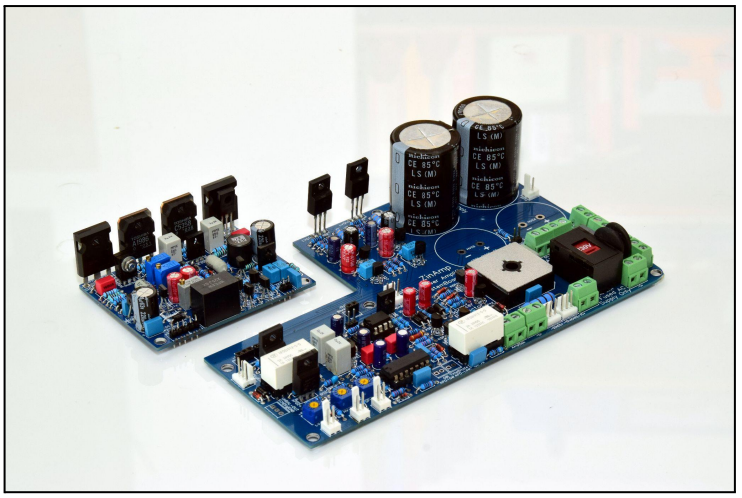
ZinAmp

Beautiful sound, for people who love music

Datasheet & Build Guide Complete Power Amp

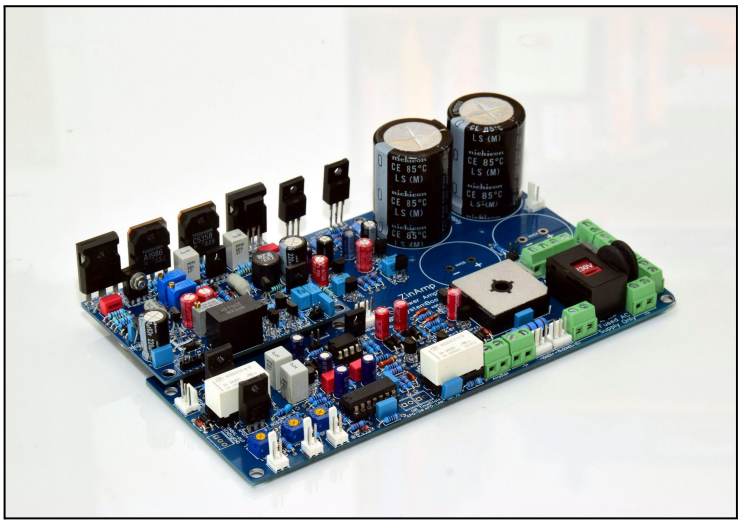
Application & Purpose:



Fully featured Power Amp for installation as a mono-block, loudspeaker plate-amp or stereo enclosure with l & r channels

All analogue with Simultaneous Class A (SCA).

Can accept XLR balanced and RCA unbalanced inputs, with connections for a selector switch and volume control



Power Amps are Simultaneous Class A, arranged in a 'blameless' topology. SCA is ZinAmp's own implementation of feed-forward error correction (aka current-dumping). Power output is approximately 120W.

Other features include:

- Speaker Protection
- -/+14vDC supply for a pre-amp
- Auto Power-Off/On
- XLR and RCA inputs
- Support for 120 or 240v AC

Construction is modular, based around a system board and Power amp. A second 'slave' amp module can be connected allowing a stereo pair (l & r) to be controlled using one system board.

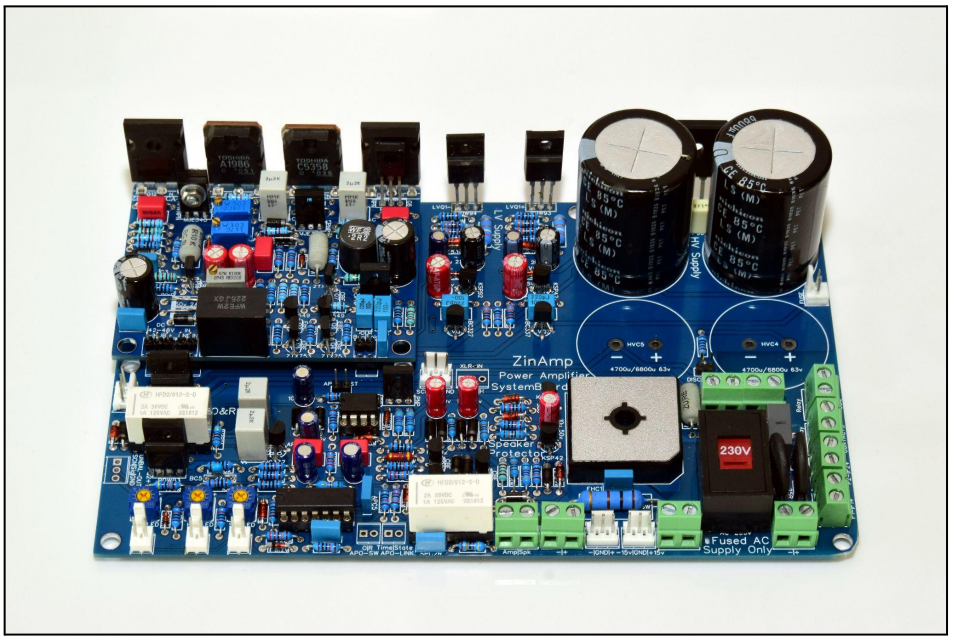
Specification:

Board Dimentions	185mm x 116mm x 1.6mm
Channels	System board can support two power amp channels (L & R)
Power	150W (music power) - 120w RMS continuous
Transformer	Toroidal 2x35vAC 160VA min
Power Amp	Class A/B Lateral Mosfet 'blameless' or Simultaneous Class A (SCA)
Damping Factor	≈ 100
Supply Voltage	240vAC or 120vAC Main board has provision for a selector switch if required
THD	0.009% (mostly lower 2nd order)
Earth Nets	Power and Audio
Speaker Protection	DC Relay controlled
Soft Start	Optional, where using a larger toroidal i.e. > 250VA Soft-start requires a 120v AC relay and two NTC thermistors
Auto Power Off	After approx 15mins. Auto power-on with audio signal

A Fully Functional Power Amp platform

Building a power amp that is reliable and safe for use requires many features and design considerations. A safe and reliable amplifier will switch on and off without speaker "thump", it will not overload your electricity supply at switch on and it will switch itself off when not in use and on again when music is played. ZinAmp's complete power amplifier platform provides all of these features on one board:

- AC Soft-start
- Speaker Protection
- Auto power-off & restart
- XLR balanced and unbalanced inputs
- Support for up to two power amplifiers (stereo L & R)
- A clean -/+15v DC supply for a pre-amp
- A hum-free and noise-optimised ground layout



System board, with Power Amp installed (top-left)

Contents

Build and Construction

Kit options include ready-made boards, or blank PCBs. If you are purchasing ready-made boards, you can skip the steps for constructors of blank PCBs.

Please locate and read the following datasheets for your particular selected power amp. There are two options; Simultaneous Class A (SCA) or class A/B LatFET. You will need these modules complete and ready to complete the assembly of your power amp:

Simultaneous Class A Power Amp:
http://www.zinamp.co.uk/datasheets/Datasheet-SCAPowerAmp.pdf

Class A/B LatFET Power Amp:
http://www.zinamp.co.uk/datasheets/Datasheet-LatFET%20AB%20PowerAmp.pdf

Assembly Stages - Overview

Stage 1 - System board - AC Power. Solder-in components for the power supplies and AC transformer connections. Test for correct voltages and discharge safely

Stage 2 - Auto Power-Off/On. Solder-in components for Auto Power-Off/On system, rail fuses, test for correct voltages and and discharge DC power safely

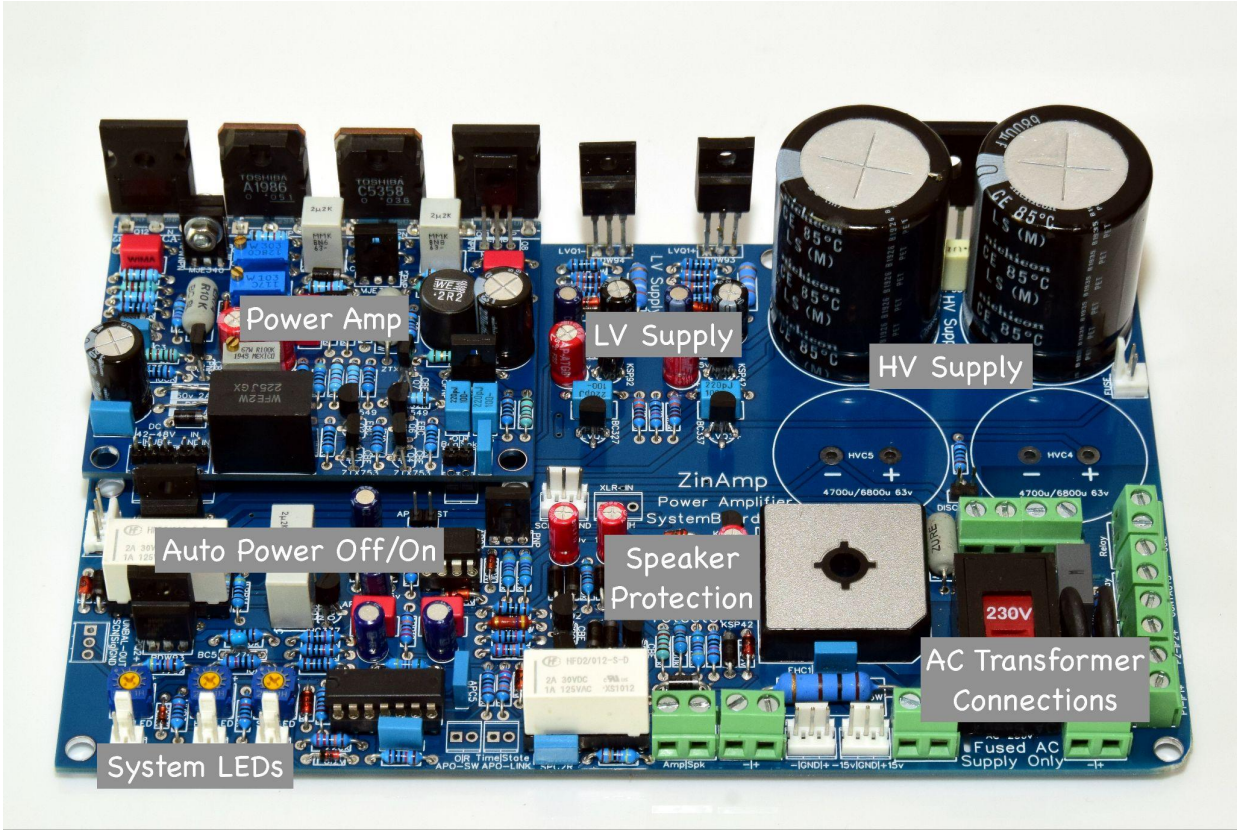
Stage 3 - Speaker Protection. Solder-in components for Speaker Protection, test that relays are closing on start-up and discharge DC power safely

Stage 4 - Power Amp Installation. Test each Power Amp Module and set the DC offset for each to zero.

Stage 5 -Audio Connect. Apply an attenuated line-level signal to the power amplifier and test the output through speakers.

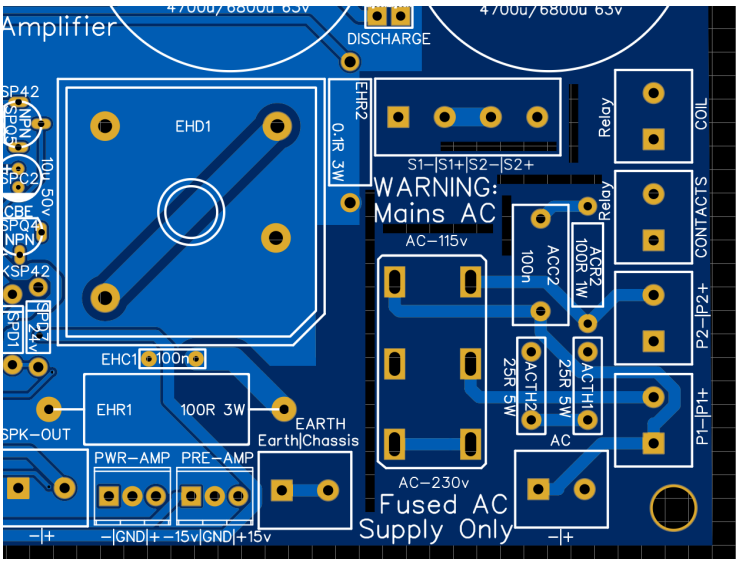
Stage 1 - System board

The system board hosts the power supplies, auto-off/on and speaker protection modules. It also provides connections for the AC transformer. A right-angled cuto-out is provided for the power-amp, minimising the wiring required to complete the construction. The picture below shows where each of these sections are located on the system board:



To complete the first stage, install components for the AC Transformer connections, HV Supply and LV Supply. HV supplies the power amps -/+40-50v and LV supplies the auto-power off system and provides a clean +/-14v DC supply for an optional pre-am.p

DO NOT INSTALL ANY OTHER COMPONENTS AT THIS STAGE. THE POWER SUPPLIES NEED TESTING FIRST!!



AC Connections on PCB

Connecting to AC Power in your installation

AC Connections are clearly marked in the right-edge of the PCB and must be connected as follows:

- AC -ve and +ve. I.e. neutral and live from the Mains AC Switch

- Earth. From the AC Mains Earth

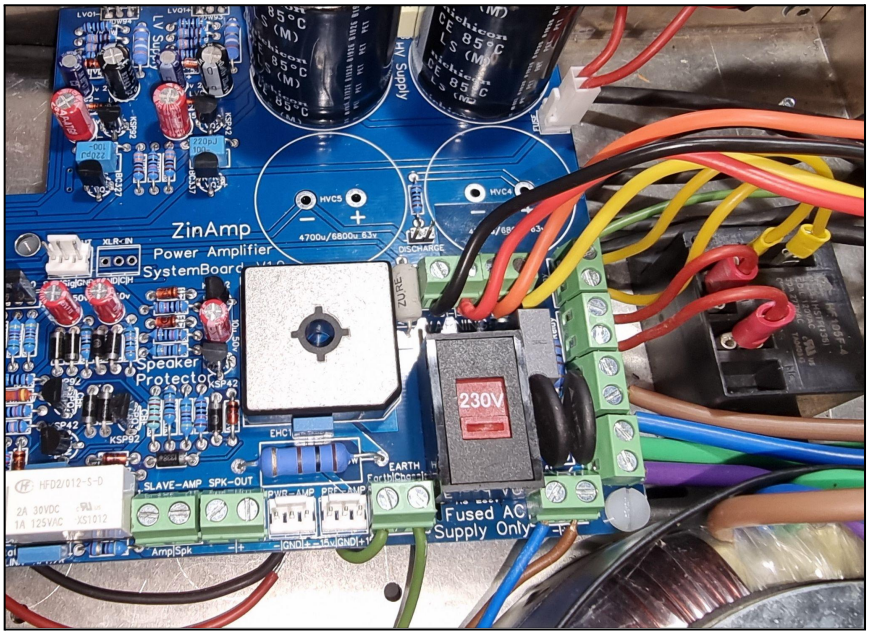
- Chassis. To the metal chassis. This ensures continuity from the mains earth to the metal chassis.

- Transformer Primaries. For a 240vAC installation, use terminals P1- and P2+ as shown above. If your transformer has dual primaries, solder the two 0v taps together and insulate. For a 120vAC installation, connect both primaries in parallel in terminals P1- and P2+. Only use terminals P2+ and P2- if you have a multi-voltage selector switch.

- Transformer Secondaries. Note the colour order above which is fairly typical of toroidal secondaries i.e. Black, Red, Orange, Yellow. Check your make and model of transformer to be certain, as some manufacturers' schemes vary.

- Relay Coil. Used for a 120V AC relay to provide soft-start. Only necessary with transformers of 300VA and above.

- Relay Contacts. These terminals must be jumpered if not fitting a soft-start Relay.



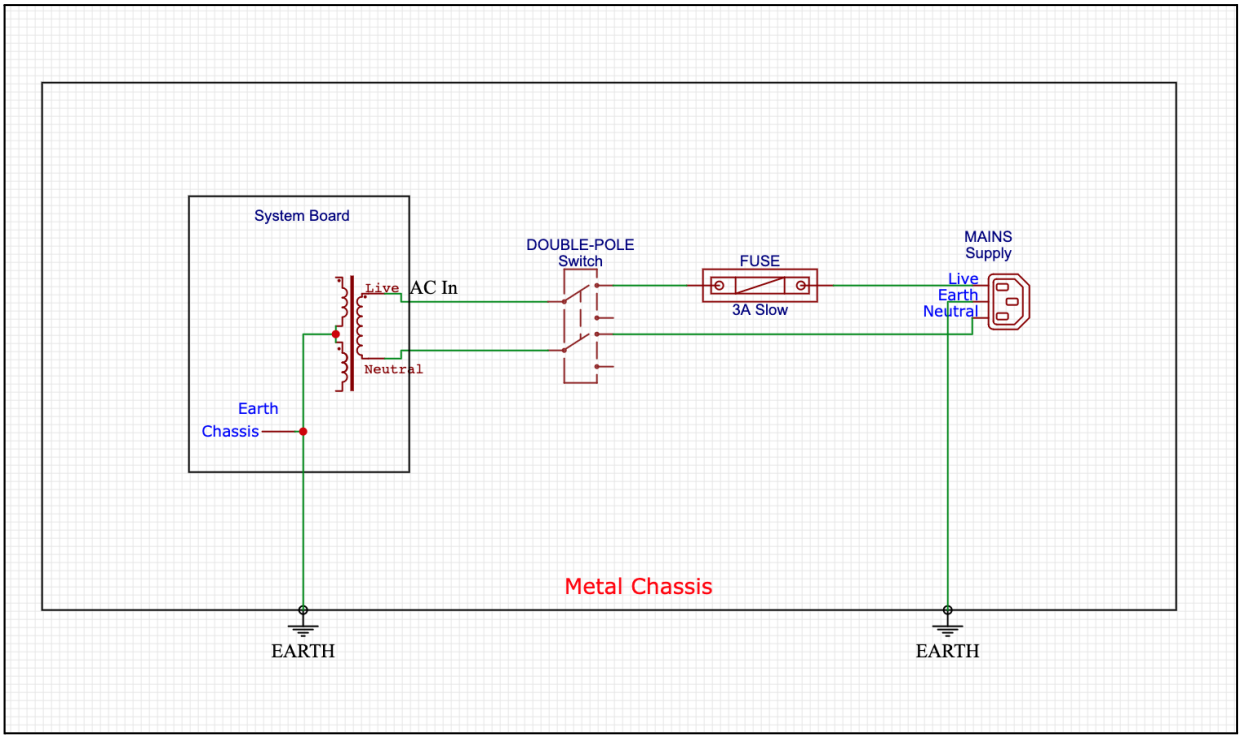
AC Power Installation - soft-start relay is on right

Applying Power for the First Time:

This is best done with a Variac. If you don't have a variac (and if you do), ensure the following checks are made and accept that there may be smoke or damage if any components have been incorrectly installed.

Check that:

- your AC supply is switched with a double-pole switch. One pole for live, one pole for neutral. See diagram below
- your AC supply has a 3A slow blow fuse in series with the live wire. Do not rely on the fuse in your mains plug! A fuse must be fitted between switch and the System board on the 'live' wire
- your chassis has a solid-connection to electrical earth
- the two darlington transistors for the LV supply are on the heatsink
- your multimeter is set to DC voltage, ready to test the voltages on the board

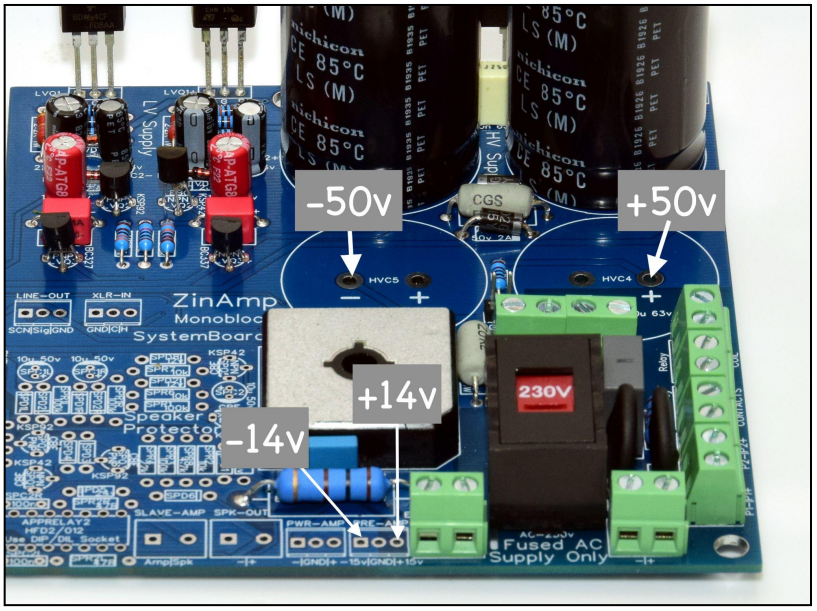


Fused, switched AC Supply

Measuring DC Voltages:

The picture on the next page indicates the DC voltages you should see at each point. Place your black meter terminal on the pad marked 0v. Take a reading with the red terminal at the points marked +45v, -45v, +14v and -14v. These voltages should be within 10% of the values stated.

Note: you are testing the transformer in an unloaded state. You can expect the DC voltage to be between 52 and 56v for a 35-0-35v AC transformer; this is due to the transformer's regulation allowance. With power amps installed, this voltage may well drop to around 48-50vDC. If the HV voltage is lower than 45vDC with a 35vAC transformer, you may have a fault somewhere.



DC Voltages - based on a 35-0-35v Transformer

Discharge Safely

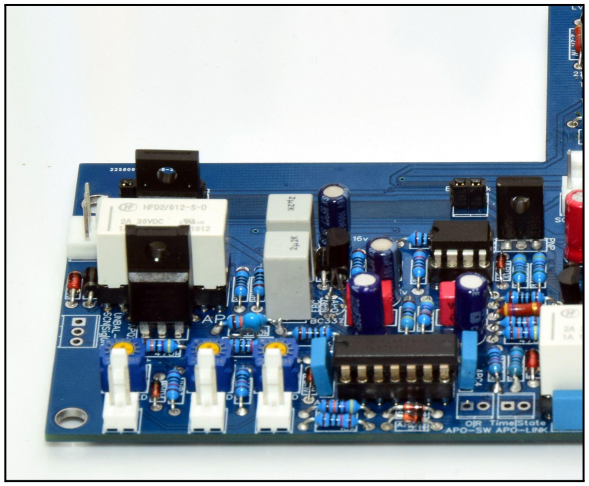
With this first test complete, switch off the AC power, remove the IEC plug from the AC Supply and place a metal screwdriver across the two discharge terminals in the HT power supply - for about 10 seconds. Check the HT voltages are now less than 5v - in which case they should be safe to handle. Never bridge the discharge terminals with the power on!

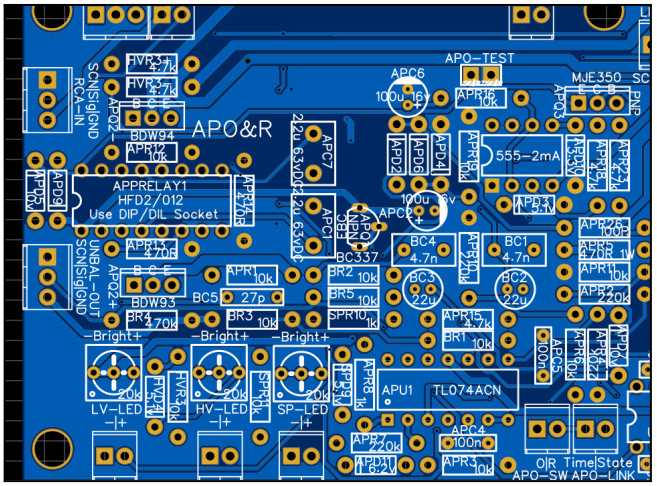
Stage 2 - Auto Power Off/On

Install the components marked with the prefix of 'APO' on the board, as shown below. Testing this module is done in two stages. First, with the DC fuses disconnected and second, with the DC fuses connected. The APO system features two darlington transistors used to switch on/off the HV DC supply to the power amps. Supply is switched on and off by a relay. The relay is connected to the bases of the darlingtons, which minimises the switching current and maximises the life of the relay.

An opamp listens for an input signal and charges a capacitor. When the capacitor discharges, it triggers a 555 timer and opens the relay, switching off the power amps.

We recommend you use an 8-pin DIP/DIL socket for the relay, a 7-pin socket for the opamp and an 8-pin socket for the time. Soldering relays or other multi-legged components into PCBs is asking for problems. These do fail and very occasionally arrive faulty and are notoriously difficult to unsolder. You will want to be able to swap these components out quickly and easily. A DIP/DIL socket is always indicated.





APO Components are prefixed AP and are bottom-left of the board

Applying Power

Again, use a variac if you have one. At this stage, the LV supply is under a small load from the APO module. However, any incorrectly installed components may result in a very large load placed on the LV supply. The supply has current limiting to about 150mA, at which point the voltage will begin to drop.

Test 1 - DC Fuses disconnected: with the DC fuses disconnected, switch on. You should hear the relay click within 0.5 seconds. Check the DC terminals labelled PWR-AMP. These should be at 0vDC.

Check the terminals lablelled PRE-AMP. These should be at -/+ 14v

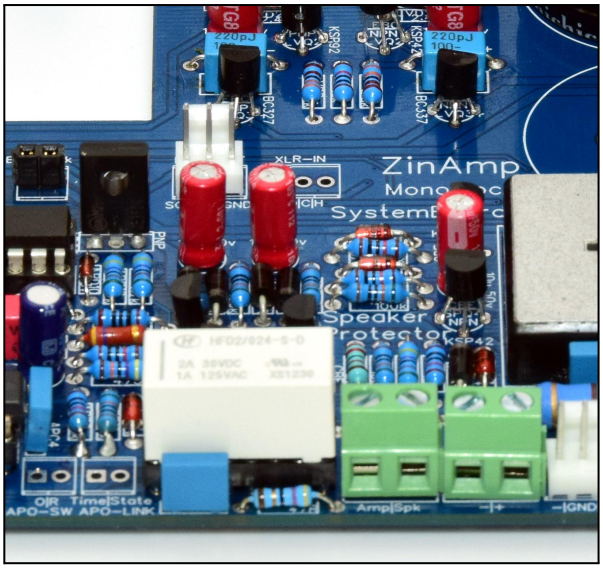
Switch off for about 10 secs and listen to the APO relay click open. If you don't hear this, the relay may not have closed after power-on. Switch on and off again to recheck this. If there is no relay sound, there is likely to be a problem somewhere in the APO module.

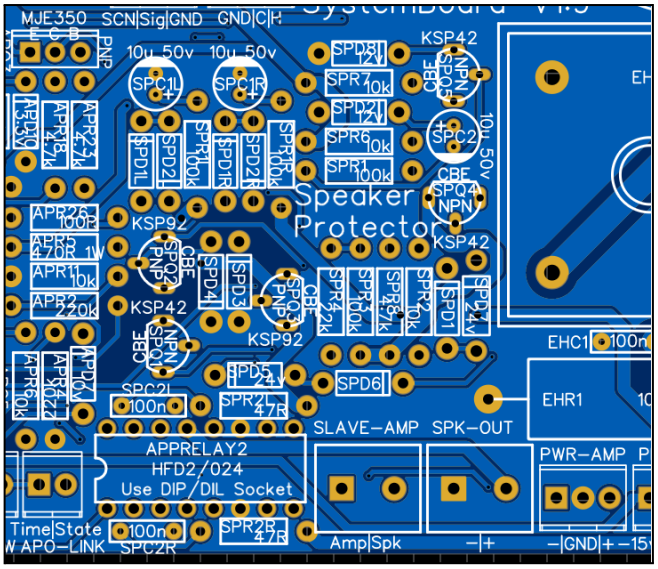
Test 2 - DC Fuses connected: with the DC fuses connected, switch on. You should hear the relay click. Check the DC terminals labelled PWR-AMP. These should be at -/+50vDC or close to it.

Switch off for about 10 secs and check for the APO relay clicking open.

Stage 3 - Speaker Protection

Install the components marked with the prefix of ‘SP’ on the board. The speaker protection module has one double-pole relay and provides speaker protection for the native amp module and a slave module.





Speaker Protection components are prefixed SP - bottom center of board

There is a 2 second delay at startup before the relays are closed. This prevents any start-up thump or snap entering the speakers and protects them from unnecessary cone excursion.

Power On

Using a Variac for this test will delay the closing of the relays, but is still advisable.

Expect a 2 second delay under normal operation. Switching off, the relays will close after 3-4 seconds. When you install the power amps i.e. load up the power supply, this interval will be about 0.5 seconds

Repeat this test 3 or 4 times and ensure you can hear the speaker protection relays closing after power-on and opening again after power-off.

Stage 4 - Power Amp Installation

You will need one ready completed power amplifier module for a mono-block installation. An optional second amplifier module can be added for a stereo installation. Both amplifier modules can be controlled with one system board.

XLR Balanced: Each system board can convert one audio channel from balanced to unbalanced. This means, two system boards are required for a stereo pair of XLR enabled amplifiers.

Refer to the datasheet for the power amp module if you are building these yourself from a blank board. You will need to test them in two stages; once with the main output drivers uninstalled and again with the main drivers soldered in

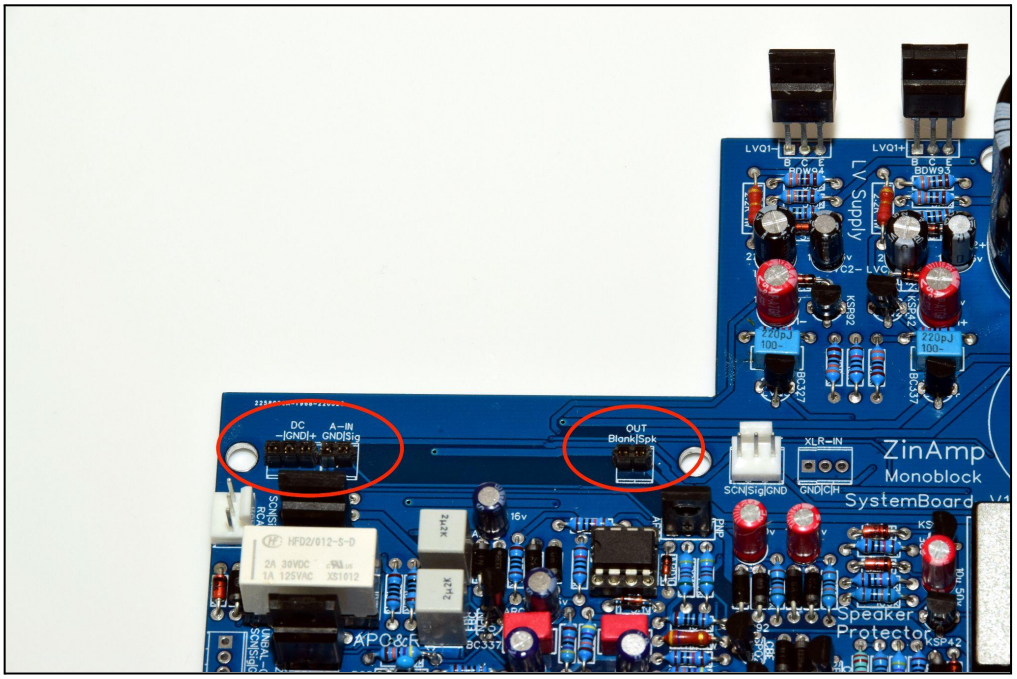
Simultaneous Class A Power Amp:
http://www.zinamp.co.uk/datasheets/Datasheet-SCAPowerAmp.pdf

Class A/B LatFET Power Amp:
http://www.zinamp.co.uk/datasheets/Datasheet-LatFET%20AB%20PowerAmp.pdf

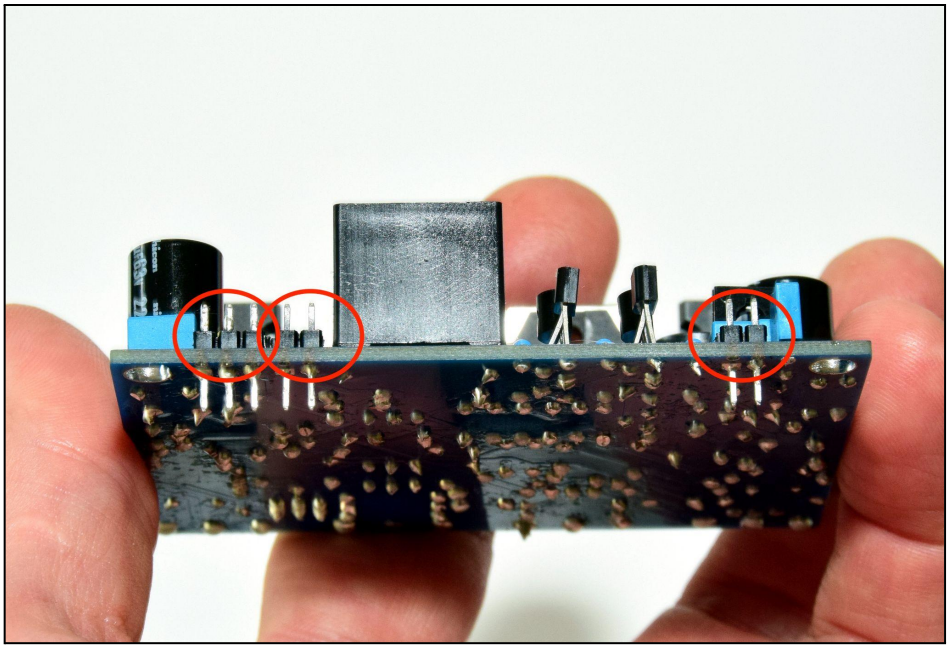
Mounting the Power Amp

The main power amp module - the one that is native to the system board - is mounted using pins and sockets. This means the power amp can be slotted onto the system board without additional wiring. The amplifier module is easy to remove and swap out in the event of any problems. Follow these steps:

1. **Solder in the sockets -** the picture below shows the sockets soldered into the system board.



2. **Solder in the pins** - To ensure pins and sockets line up correctly, insert the pins into the sockets as shown. Place the power amp module over the pins and solder the pins as shown. Take care not to bend the pins nor solder the pins into the board at an angle.



You are now ready to install and test your power amp modules. This is done in two stages

Test 1 - main devices not installed

The first test is to ensure that each module has been built correctly. The test is a simple DC offset test at the speaker output. Turning the trimer pot, it should be possible to centre or zero the speaker terminal to -/+ 25mV. A large DC offset at the speaker output i.e. more than 2V, suggests a problem with the amplifier module.

Seat the module aligning its pins with the sockets on the main board. Switch on and check the voltage at the SPK pin relative to GND. Adjust the trimmer on the board until +/-20mV is seen between the SPK pin and the chassis ground

Test 2 - main devices installed

The power-on test must be done with the devices attached to the heatsink. At idle, they will warm quite quickly and if not bolted onto the heatsink, may overheat within 2 or 3 mins.

Check the DC voltage at the SPK pin is still close to zero. It may have moved slightly now that the devices are installed.

If you have an SCA power amp, consult the data sheet for Biasing steps. If you have a Class A/C LatFET power amp, no biasing is required, however, you must still follow the setup checks in the datasheet to ensure the fixed bias is ‘fixed’ correctly.

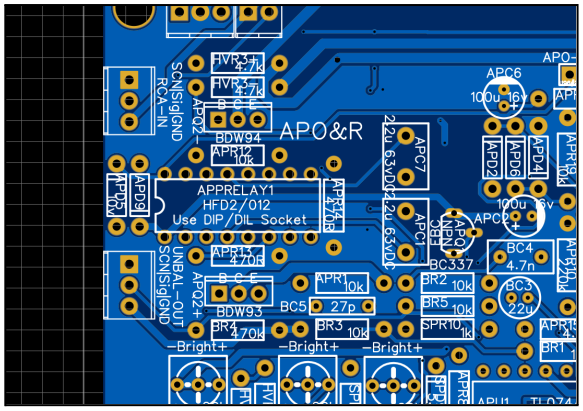
Final Fitting

Use nylon screws and non-metallic standoffs to retain the power amps against the main board. The power amp will sit 5-6mm above the main board on their pins and sockets

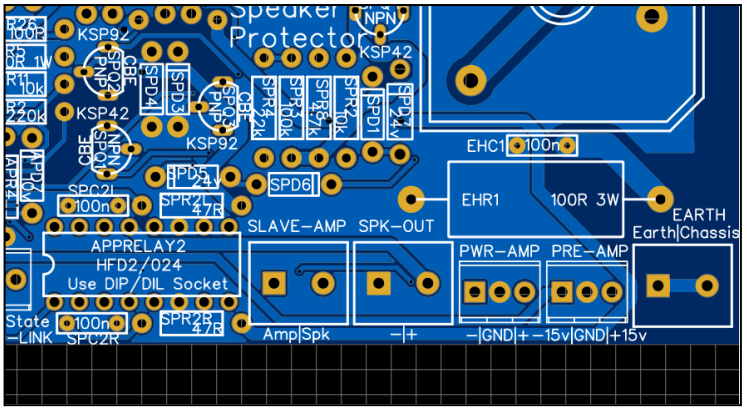
Stage 5 - Audio Connect

Audio testing must be done with an attenuated source. This means the source must be volume controlled. Do no connect a source like a DC player directly to the amplifier input. You will invoke clipping and will damage any speakers connected to the output.

The images below show the RCA-in on the left and Speaker-Out on the right.



RCA-In (top-left)



Speaker Out (bottom-center)

RCA-IN - has three pins - SCN|Sig|GND. SCN is cable screen. We recommend connecting your RCA input with a piece of 2-core screened cable. The screen in connected at one end i.e. at the input on the system board. Sig is the +ve signal pin and GND is Audio ground.

Note: You can use a piece of single core screened cable and use the screen as the Audio Ground, but your cable maybe more prone to transformer noise.

SPK-OUT - has two pins -|+. The - pin is the main ground on the board which can be thought of as a ‘star’ ground. The + pin is the audio output signal i.e. to the loudspeaker.

Note: do not connect the speaker ground to the chassis. Use the - pin, otherwise hum may result.

Slave Amp

You can connect a second power amp module to the system board to provise a second channel, making a stereo amplifier.

In the image above right, the SLAVE-AMP and PWR-AMP terminals are marked

SLAVE-AMP - has two pins Amp|Spk. Connect the output of the slave power amplifier module to Amp. Connect the speaker to SPK. The negative /black/ground wire of the second speaker connects to the - pin on SPK-OUT. Connecting the slave amp to the system board will provide speaker protection for the slave amp channel.

PWR-AMP - this is the DC power supply for the slave power amp. It is controlled by the auto-power off/on circuit and is fused via the same rail fuses as the native power amp. Simply connect the slave amp’s three DC-Power-In pins to these three corresponding pins on the system board (-|GND|+)

Installation Options

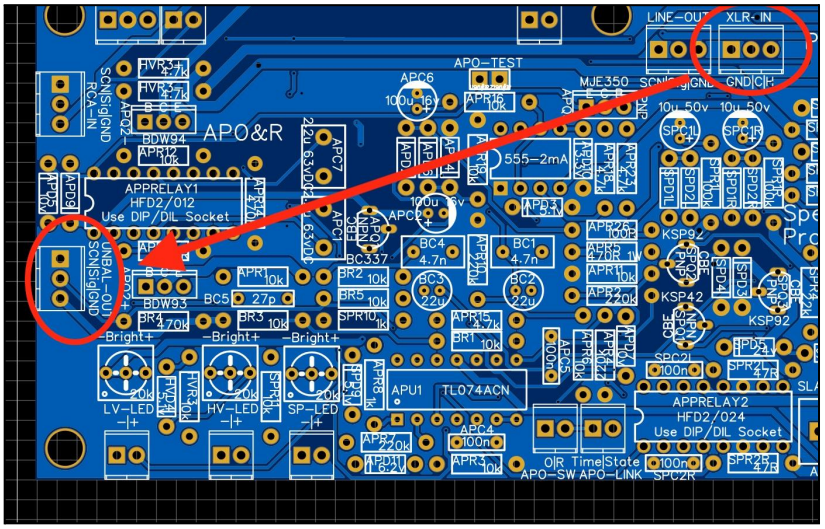
If you are building a custom installation, you may or may not choose to include a selector switch, a volume control, a headphone socket and you may aslo choose to include XLR Balanced Inputs. The following sections explain how each of these are added to your installation.

XLR Balanced Operation - and linking a second System-board

The system board has one XLR input. For a monoblock, this is fine, but for a stereo pair in one enclosure, you will need two system-boards. System boards can be liked together to share a single transformer and soft-start relay.

The XLR Input takes the balanced signal, unbalances it and sends it to the UnBal-Out terminals. For there, the signal can be connected to a selector switch or directly to the RCA-In terminals - although a selector switch is more practical and flexible.

The image below shows the XLR input and the unbalanced output.

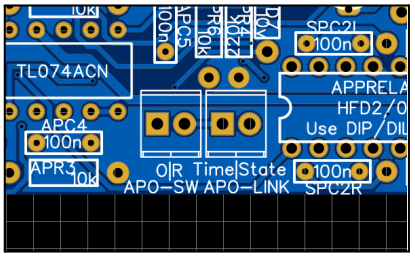


XLR-IN - Three pins GND|C|H i.e. Ground, COld and Hot

UNBAL-OUT - Three pins SCN|Sig|GND. These are the same as the RCA in terminals in that SCN is cable screen, Sig is the +ve audio signal and GND is audio-ground.

Synching Auto Power Off & On

Two system-boards can also be synched so that the auto-power off on one will trigger the auto-power off on the other. The image below show the APO-Link Pins. Connect these to the corresponding pins on the second board and remove the 555 timer from the second board also.



APO-Link Pins

Selector Switch

ZinAmp make a power-amp selector switch that has three positions. These can be used in any way the constructor chooses, but in our own power amplifiers, provide the following

- Pos 1 - RCA Line - line level signal from RCA, direct to amplifier
- Pos 2 - RCA Volume - line level signal from RCA, via volume control
- Pos 3 - XLR Line - line level signal from XLR, direct to amplifier

Volume Control

ZinAmp make a volume control that is simple to install and connect to a selector switch and / or your ZinAmp power amplifier.

Adding a volume control to a power amplifier is a practical proposition for sources with signals above line-level. E.g. CD players typically have an output signal if 2.2v peak, compared with conventional line-level which is about 1 - 1.5v peak. For a CD player, a pre-amp is usually not necessary - unless EQ control is required.

Headphone Adaptor

ZinAmp make a headphone adaptor that provides a 6.5mm jack socket. With a jack-plucg inserted, it cuts audio to the speakers and re-routes this to the jack-socket using a relay; therefore power is required from the power-amp rails to operate the relay. This is fairly simple to wire.

The headphone adaptor circuit is a simple resistive bridge that attenuates the power amp output signal to an amplitude suitable for headphones. It works very well for a wide variety of headphone impedences and is largely superior to most dedicated headphone amps. The adaptor sits between the power amp output and the speaker terminals.

Optional Pre-Amp

ZinAmp make a Solid State Stereo Pre-Amp that is connected upstream of the power amp. This requires a volume control and we recommend a selector switch also. Power for the pre-amp comes from the system-board terminals marked PRE-AMP.

To avoid signal-clipping we recommend connecting the pre-amp in the following arrangement:

SOURCE -> SELECTOR SWITCH -> VOLUME CONTROL -> PRE-AMP -> POWER AMP

The other way to do this is to swap Volume Control and Pre Amp so that the Pre-amp is first. Whist this maybe more traditional, it presents the risk of any clipping in the pre-amp being conveyed directly to the power amp, which may cause damage, even with the volume low. Placing the volume control ahead of the pre-amp ensures the pre-amp and power-amp cannot clip unless the volume is turned right up - and this is a very good thing!

Parts Lists

Parts for the System-board are listed below

Parts for the SCA Power Amplifier are listed here:
http://www.zinamp.co.uk/datasheets/Datasheet-SCAPowerAmp.pdf

Parts for the Class A/B LatFET Power Amplifier are listed here:
http://www.zinamp.co.uk/datasheets/Datasheet-LatFET%20AB%20PowerAmp.pdf

System (main) board

Designator	Value/Spec	Qty	Sup	Manuf	Manuf. Part	Sup. Part
EHD1	GBPC3508	1	RS	HY	GBPC3506W	917-8821
APC8,APC3,APC4,SPC4,EHC1,SPC1,SPC3	100n	7	RS	Epcos	B32529C1104K000	896-1332
APR8,HVR4,LVR3+,LVR3-,SPR10	1k	5	RS	TE Connectivity	LR1F1K0	125-1159
APR9,APR2,APR7,APR10	220k	4	RS	TE Connectivity	LR1F220K	125-1159
APD11	6.2v	1	RS	Nexperia	BZX85C6V2	759-8891
APR4,APR12	470R	2	RS	TE Connectivity	LR1F470R	149-060
LVR5+,LVR5-	47R 1W	2	RS	Vishay	PR01000104709JA100	683-5515
APQ3	MJE350	1	RS	OnSemi	MJE350G	125-1158
APR3,APR5,APR6,APR11,APR13,APR14,APR16,APR19,SPR2,SPR6,SPR7	10k	11	RS	TE Connectivity	LR1F10K	125-1164
SPD2,APD5,APD7	10v	3	RS	Nexperia	BZX79-C10,113	544-4461
LVR6+,LVR6-	3.9R 1W	2	RS	TE Connectivity	ROX1SJ3R9	214-0813
SPD8,SPD7	24v	2	RS	OnSemi	1N4749A	186-9155
X/O-DC	+|GND|-	1	RS	Samtec	SLW-103-01-G-S	180-0848
PSD1	GBU2510	1	RS	HY	GBU2510	923-5472
HVC1	100n 63v	1	RS	Epcos	B32529C1104K000	896-1332
WFR_AMP,MID_AMP,TWT_AMP	GND|IN|SPK	3	RS	Samtec	SLW-103-01-G-S	180-0848
MID_XO,TWT_XO,WFR_XO	GND|Sig	3	RS	Samtec	SLW-102-01-T-S	923-5472
MID,TWT,WFR	-|GND|+	3	RS	Samtec	SLW-103-01-G-S	180-0848
DISCHARGE	Jumper	1	RS			

APSWITCH-TRIGGER	555	1	RS	Renesas	ICM7555IPAZ	921-5374
HV+DC,HV-DC	FUSE	2	RS			
HVC2,HVC3,HVC4,HVC5	4700u/6800u 63v	4	RS	Yaego	LH063M4700BPF-3030	440-6755
ACR2,HVR1	100R 1W	2	RS	TE Connectivity	ROX1SJ100R	125-1174
APR18,APR15,APR23,HVR3+,HVR3-	4.7k	5	RS	Vishay	MRS25000C4701FCT00	683-3799
LVR1+,LVR1-,LVR2+,LVR2-,LVR8+,LVR8-,HVR3,LVR2,SPR11	3.3k	9	RS	TE Connectivity	LR1F3K3	125-1162
APQ2+,LVQ1+	BDW93	2	RS	ST	BDW93CFP	793-1318
APQ2-,LVQ1-	BDW94	2	RS	OnSemi	BDW94CFTU	807-5178
APPRELAY1	HFD2/012	1	RS	Hongfa	HFD2/012-S-D	176-2938
BASS-OUT,MID-OUT,TWT-OUT,AC	-|+	4	RS	RS Pro	146-8347	146-8347
COIL,CONTACTS	Relay	2	RS	RS Pro	146-8347	146-8347
EARTH	Earth|Chassis	1	RS	RS Pro	146-8347	146-8347
PRIM_1	P1-|P1+	1	RS	RS Pro	146-8347	146-8347
PRIM_2	P2-|P2+	1	RS	RS Pro	146-8347	146-8347
SEC	S1-|S1+|S2-|S2+	1	RS	RS Pro	146-8347	146-8347
TC10	220u	1	RS	Panasonic	ECEA1EN221U	176-3786
LVQ3+,LVQ2+,SPQ1,SPQ5,SPQ4	KSP42	5	RS	OnSemi	KSP42TA	739-0505
LVQ3-,LVQ2-,SPQ2,SPQ3	KSP92	4	RS	OnSemi	KSP92TA	
APC1,APC7	2.2u 63vDC	2	RS	Kemet	MMK5225K63J06L4BULK	191-985
APO-SW	O|R	1	RS			
LVD1+,LVD1-,SPD9,HVD4,APD3	5.1v	5	RS	Nexperia	BZX79-C5V1,113	544-3597
LVC3+,LVC3-	220u 16v	2	RS	Wurth	NRSZ221M10V6.3X11F	839-6438
EHR2	0.1R 3W	1	RS	TE Connectivity	ER74R10KT	158-569
SPC1B,SPC1M,SPC1T,SPC2,LVC2+,LVC2-	10u 50v	6	RS	Nichicon	UPW1H100MDD	715-2819
APD9,SPD1,SPD1B,SPD1M,SPD1T,SPD2B,SPD2M,SPD2T,SPD3,SPD4,SPD6,APD2,APD4,APD6	1A 50v	14	RS	Vishay	UF4001-E3/54	628-9669
SPR1,SPR1B,SPR1M,SPR1T,SPR3	100k	4	RS	TE Connectivity	LR1F100K	125-1168

36982	470R 1W	1	RS	Vishay	PR01000104700JA100	683-5518
TC3	470n	1	RS	Panasonic	ECWFE2W474P1	105-1083
APC2,APC6	100u 16v	2	RS	Rubycon	16PK100MEFC5X11	763-9396
46113	100R	1	RS	TE Connectivity	LR1F100R	125-1155
APD10	3.3v	1	RS	Nexperia	BZX79-C3V3,113	544-3531
APQ1	BC337	1	RS	On	BC33740TA	671-1119
APU1	TL074ACN	1	RS	Texas Instruments	TL074ACN	182-2441
SPR12,SPR5,SPR9	47R	3	RS	TE Connectivity	LR1F47R	148-175
SPRELAY2	32.21.7.024.2000	1	RS	Finder	32.21.7.024.2000	492-6647
MAINSACSELECTOR	115-230	1	RS	C & K	S202031MS02Q	175-9674
ACC2	100n	1	RS	Kemet	R75GF31004030J	171-9186
HVVR1,SPVR1,LVVR1	20k	3	RS	Copal	CT-6EV 20kR	896-7169
HV-LED,LV-LED,SP-LED	-|+	3	RS			
EHR1	100R 3W	1	RS	TE Connectivity	ROX3SJ100R	214-2623
ACTH1,ACTH2	25R 5W	2	RS			
LVC1+,LVC1-	100u 35v	2	RS	Vishay	MAL203850101E3	684-1973
LVR4-,LVR4+	2.2k	2	RS	Vishay	MRS25000C2201FCT00	683-3449
LVC4-,LVC4+	100p	2	RS	Wima	FKP2/100/100/5	484-1978
LVD2-,LVD2+	2.4v	2	RS	Nexperia	BZX79-C2V4,113	544-3503
SPR8	4.7k	1	RS	Vishay	MRS25000C4701FCT00	683-3799
SPD5	24v	1	RS	OnSemi	1N4749A	186-9155
SPRELAY1	HFD2/024	1	RS	Hongfa	HFD2/024-S-D	176-2943
SPR4	22k	1	RS	TE Connectivity	LR1F22K	125-1167

LateralFET Power Amp (mini)

Designator	Value/Spec	Qty	Sup	Manuf	Manuf. Part	Sup. Part
43-48V	-|HUB|+	1	RS	RS-PRO	790-1092	790-1092
OUT, IN	Bdg|Spk,IN	2	RS	RS-PRO	790-1098	790-1098
C2	100p	1	RS	Wima	FKP2/100/100/5	484-1978
C13,C14,C12,C3	100n	4	RS	Epcos	B32529C1104K000	896-1332
C10,C7	220p	2	RS	Wima	FKP2/220/100/5	484-1984
C11	2.2u 40vAC	1	RS	Kemet	MMK5225K63J06L4BULK	191-985
C1	2.2u 40v	1	RS	Kemet	MMK5225K63J06L4BULK	191-985
Q1,Q4,Q3,Q5,Q14	KSP92	5	RS	OnSemi	KSP92TA	806-4627
R5,R10	22R	2	RS	TE Connectivity	LR1F22R	148-095
R7,R2	100R	2	RS	TE Connectivity	LR1F100R	125-1155
R9	22k	1	RS	TE	LR1F22K	125-1167
R6,R11	68R	2	RS	TE Connectivity	LR1F68R	148-219
R4,R41	220R	2	RS	TE Connectivity	LR1F220R	148-348
R1,R12,R27,R8	1k	4	RS	Vishay	MRS25000C1001FCT00	683-3165
R3	47k	1	RS	TE Connectivity	LR1F47K	148-893
R13	22K	1	RS	TE	LR1F22K	125-1167
R26,R20,R37	10R	3	RS	Vishay	MBB02070C1009FCT00	125-1154
R33	330R	1	RS	Vishay	MRS25000C3300FCT00	683-3540

R29,R30	2.7k	2	RS	TE Connectivity	LR1F2K7	125-1161
R14	470R	1	RS	TE Connectivity	LR1F470R	125-1158
R17,R18	0.2R 3W	2	RS	TE	ER74R22KT	151-518
R22	150R	1	RS	Vishay	MRS25000C1500FCT00	683-3058
D5,D12	10V	2	RS	Nexperia	BZX79-C10,113	544-4461
C5,C4	220u 63v	2	RS	Nichicon	UVR1J221MPD1TD	862-3294
C6,C9	100u 35v	2	RS	Vishay	MAL203850101E3	684-1973
VR1	100k	1	RS	Bournes	PV36W104C01B00	769-2160
Q2,Q6	BC550/BC337	2	RS	OnSemi	BC33725TA	671-1116
Q7	KSP42	1	RS	OnSemi	KSP42BU	739-0372
Q12,Q8	N-LatFET	2	Profusion	Exicon	ECX10N20	ECX10N20
Q11,Q9	P-LatFET	2	Profusion	Exicon	ECX10P20	ECX10P20
D7,D8	50v 2A	2	RS	Vishay	SBYV27-50-E3/54	629-6746
D10,D9,D1,D2,D3,D4,D6,D11	50v 1A	8	RS	Vishay	1N4001-E3/54	628-8931
L1	3.9uH	1	RS	Panasonic	ELC11D3R9F	675-5343

3 Way Crossover

Designator	Value/Spec	Qty	Sup	Manuf	Manuf. Part	Sup. Part
C1+,C1-	100u 35v	4	RS	Vishay	MAL203850101E3	684-1973
C1,C2,C3,C4,C5A,C5B,C6,C7A,C7B,C8	4.7n	20	RS	Wima	FKP2/4700/63/5	115-736
C5	220n	2	RS	Panasonic	ECWFE2W224J	105-1074
C7,C13	22u	4	RS	Panasonic	ECEA1EN220X	176-3785
C17,C19	27p	4	RS	Murata	RDE5C2A270J0M1H03A	150-4025
C15,C18	47n	4	RS	Kemet	R79MC2470Z340J	171-9295
C9,C10,C11,C12,C13A,C13B,C14,C15A,C15B,C16,C100	47n	22	RS	Kemet	R79MC2470Z340J	171-9295
C101	33n	2	RS	Vishay	MKP1837333011	166-6459
C102	22n	2	RS	Kemet	R79IC2220Z345J	171-9259
R1,R3,R4,R9,R10,R13,R14,R20,R21,R22,R23	10k	22	RS	TE Connectivity	LR1F10K	125-1164
R2,R11,R12,R17,R18,R19	100R	12	RS	TE Connectivity	LR1F100R	125-1155
R5,R8,R15	4.7k	6	RS	Vishay	MRS25000C4701FCT00	683-3799
R6,R7,R16	470k	6	RS	TE Connectivity	LR1F470K	149-149
U1,U2,U3	TL074ACN	6	RS	Texas Instruments	TL074ACN	182-2441
VR1,VR2,VR9,VR10	50k	8	RS	Bournes	PV36W503C01B00	769-2195
VR3,VR4,VR5,VR6,VR7,VR8,VR11,VR12,VR13,VR14,VR15,VR16	20k	24	RS	Bournes	67YR20KLF	769-2170
VR17,VR18,VR19,VR21	20k	8	RS	Copal	CT-6EV 20kR	896-7169
VR20	10k	2	RS	Copal	CT-6EV 10kR	896-7140
3-pin Connectors	2.54mm pitch	14	RS	RS-PRO	790-1092	790-1092
Baffle Step Selector	2x3-pin 2.54mm pitch	2	RS	Harwin	M20-9980346	745-7046

Input Unbalanced Jumper	2-pin 2.54mm pitch	2	RS	RS-PRO	251-8086	251-8086
Shorting Link		2	RS	RS-PRO	251-8575	251-8575
Phase Shifter.....						
C1,C2,C3,C4,C5,C6,C7,C8	10n	8	RS	Wima	FKP2/0.01/63/5	115-758
CHAN-A-IN,CHAN-B-IN	GND|Sig	2	RS	RS-PRO	790-1098	790-1098
CHAN-A-OUT,CHAN-B-OUT	SCN|Sig|GND, -|GND|+	4	RS	RS-PRO	790-1092	790-1092
R1,R2,R3,R4,R5,R6,R7,R8,R9,R10,R11,R12,R13,R14,R15,R16	1k	16	RS	Vishay	MRS25000C1001FCT00	683-3165
R17,R18	100R	2	RS	TE Connectivity	LR1F100R	125-1155
U1,U2	TL074ACN	2	RS	Texas Instruments	TL074ACN	182-2441
VR1,VR2,VR3,VR4,VR5,VR6,VR7,VR8	20k	8	RS	Copal	CT-6EV 20kR	896-7169