
Subject: The next big thing

Posted by [gofar99](#) on Sun, 22 May 2022 19:19:25 GMT

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Hi Everyone, Now that the 832 amps is finished and working fine...I needed to start something else. Here is a photo of the thing. It is clear that some serious power is involved. A pair of 6AS7s and a pair of 6SL7s is fairly serious. The absence of output trannies is sort of a give away. So what is it? A headphone amp. SRPP input stage and SRPP capacitor coupled output stage. Yes 6AS7s will work as a SRPP. 240 volts B+ at 57 ma. Now if the math works it can deliver +/- 15 volts into 64 ohms. That is serious loudness as many phones only need a handful of milli watts. If it doesn't work as a phone amp, it will be one humongous line stage. More to follow as it gets built.

File Attachments

1) [Phone Amp.jpg](#), downloaded 441 times

Subject: Re: The next big thing

Posted by [Wayne Parham](#) on Mon, 23 May 2022 13:01:44 GMT

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Wow, Bruce, that's a slick one! Too cool!

Subject: Re: The next big thing

Posted by [gofar99](#) on Thu, 09 Jun 2022 19:26:11 GMT

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IT IS A BEAST

Now that I have your attention I want to discuss my latest creation. It is an all tube headphone amplifier. Because of a happy coincidence it has two modes. Low power, about 10 milliwatts into 64 ohms. High power about 750 milliwatts into 64 ohms. Your choice. How you say? It turns out that 6SN7, 6SL7s and 6AS7s share the same pin out. Better yet there is a sweet spot in SRPP use that allows all of them to run in the same amplifier. The driver stage can be either a 6SN7 or 6SL7 with corresponding gain levels. The output SRPP can be either a 6SN7 or 6AS7. The 6SL7 just doesn't have enough current to directly power the headphones. The output is capacitive connected and there is no global negative feed back. Surprisingly, the response is rather similar regardless of the output tubes. With the phones I have (AT ATH-MSR7 and Sennheiser HD260s) the low power level is really quite sufficient. Actually a lot more than they need. The sound is clean and low distortion (see chart). The hum and noise is really low. The scope shows only tube hiss at a consistent wide band level. I grant that this is not a simple project, but I consider it one worth while if you use headphones. The power supply is really important in this build as even small levels of hum will be awful. It uses a toroid transformer available from Antek at modest cost and I used the steel cover for it. That might be unnecessary but it looks cool. The power supply

is full wave with several filter sections. The last one is a FET capacitor multiplier. I used a number of poly type caps at first but had to add an additional electrolytic in one section. You can probably use all electrolytics with poly bypass capacitors and get the same results. The heaters are elevated by about 1/3 of the B+. The B+ with all 6SN7s is about 260 and is about 200 with the 6AS7s outputs. If you use the 6AS7s be aware that they have high current heaters. About 2 amps each. The difference in B+ current is from 5 ma for the 6SN7s to 65 ma for the 6AS7s. I would expect higher power output level with phones that are over 64 ohms.

DATA

6SN7/6SN7 at 64 ohms load 0.5VRMS (about 4 milliwatts)

S/N -80 dbv

20HZ distortion at 100HZ, 1KHZ, 20KHZ below 0.5%

20HZ to 20KHZ +0/-0.6db, -1.3 db at 100KHZ

6SN7/6AS7 at 64 ohms load Max output is 7 volts RMS

S/N -76 dbv

20H to 20KHZ +0/-0.7 dbv

Distortion at 1000HZ at 1 volt (15mw) 0.38%

2 volts (65mw) 0.7%

3 volts (140mw) 1.05%

4 volts (240mw) 1.2%

6 volts (560mw) 2.8%

7 volts (760mw) 3.7%

NOTES

All distortion measurements made on a HP Distortion Analyzer

Source is a Tenma signal generator with a residual distortion level of 0.25%

This combination results in distortion values that are likely higher than indicated

The load in all cases was a non-inductive 64 ohm resistor

Signal to noise levels were obtained from a PC scope in spectral analysis mode

File Attachments

1) [6AS7 Phone Amp June 9 2022.jpg](#), downloaded 403 times

Subject: Re: The next big thing

Posted by [Wayne Parham](#) on Thu, 09 Jun 2022 23:35:29 GMT

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Dude, that's so cool! And it is a "mighty-mouse" - plenty of punch for a headphone amp!

Subject: Re: The next big thing
Posted by [positron](#) on Fri, 10 Jun 2022 04:51:58 GMT
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Go, ever thought about all polys, even if solens, or better yet Mundorf EVOs? I have found changing out the last electrolytic with poly made the biggest difference.

Just a thought. Good luck.

pos

Subject: Re: The next big thing
Posted by [gofar99](#) on Sat, 11 Jun 2022 02:27:20 GMT
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Hi, initially it was all polys. I found the hum level rather high though. Tinkering with it (that is high tech terminology for trying stuff) I found that paralleling the second filter with 100uf additional capacitance made it super quiet. Since 100uf 350v polys are both costly and huge I used an electrolytic. So that section has both a 33uf poly and a 100uf electrolytic. All the other caps except for the 330uf outputs and 100uf cathode bypass are poly types. My scope on spectrum analysis mode shows the 60 and 120 HZ from the PS now non-existent and buried in the residual tube noise. The 330uf output caps are NOS Sprague that I discovered in a surplus store a while back. They sound nice. The power supply polys BTW are by Audyn and are audio grade typically used in crossovers. I have used them in a number of builds and they do really well there. The coupling caps are Auricaps. After many years of building stuff I have found components that do the job well. I often use Audyn Copper caps, Jantzen Silver caps, Auricaps (standard and XO), K40-Y9 PIOs, and occasionally FT-4 teflons. My choice for cathode bypass is Silmic IIs. I used to use Black Gates, but they are not easy to get any longer. My choices all go back to the affordable diy nature of the projects I design. I go for great bang for the buck. Premium sound but at a price others can duplicate it. It is possible to "upgrade" any of my projects with high end parts and double or triple the cost. I would suspect strongly that 99% of listeners would not be able to tell which was the upgrade and which was not. I recommend that folks use ones they like (and can afford).

Subject: Re: The next big thing
Posted by [gofar99](#) on Sat, 11 Jun 2022 02:53:00 GMT
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Hi everyone. I get questions about SRPP stages frequently. I hope the following will help make sense of it for you. If not I tried. If anyone was curious about the distortion levels in the 6AS7 mode.... Really it is sort of simple. Two things factor into this. First there is no global negative feedback to reduce it. I am not fond of NFB to fix things so I use as little or none as possible. Generally only for stability. Second is a bit more obscure unless you work with SRPP stages all the time. They were most often found in the deflection circuits of CRT based TVs. This required a huge voltage swing, decent amount of power and linearity was not really all that important. They did fine at that. For audio use the non-linear action manifests itself as distortion. So, most folks

and I am included in this use them only for voltage gain. They are really good at that and can develop very large voltage swings. A drawback is that their gain is restricted to about half the amplification factor of the tubes used. Often called a half mu design. When called upon to deliver current the old problem of non-linear behavior shows up. The "secret" if you want to call it that is to keep the current demand relatively low and carefully chose the load impedance. Too low and it can't deliver the power, ask for too much current and it gets non-linear. So the distortion levels in the amp are directly a function of the current demand. In this case they are rather reasonable up to about 1/2 watt. The thing to remember is that you don't listen to the maximum power level, music is not like that and more often than not the actual average listening level is at most 5-10% of that. So even with low sensitivity phones the 500 milliwatt level will nearly never be needed.
8)

Subject: Re: The next big thing
Posted by [gofar99](#) on Sat, 25 Jun 2022 02:54:16 GMT
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Hi everyone, an update. I built a second version and am listening to it as I type. About 99% the same, but with Auricap XO coupling caps and a revised grounding system. All the specs are the same except that both variants are now about 6 db quieter. They were just fine before. Now the 6AS7 version is at -94db wide band with a single peak at 60HZ of -82. That is IMO really quiet. There is no hum or noise. I redid the response curves. Still -0.7db at 20HZ, but the amps are flat to 100K HZ. The deviations are within the limits of the measuring set up (about 0.05db). The Bode plot is like a ruler straight line. The sound is really nice. I'll post the updated schematic and some photos when I get a chance. This is IMO the cleanest headphone amp I have ever heard. I don't usually like them as they seem to lack the sound qualities I like. This one is different.

Subject: Re: The next big thing
Posted by [Wayne Parham](#) on Sat, 25 Jun 2022 14:16:34 GMT
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Anxious to see the new schematic. I thought the last one was simple, clean and elegant. To have improved upon it - if even only slightly - is an Nth degree thing. Super cool!

What grounding method did you use? Star? Plane? Hybrid?

Subject: Re: The next big thing
Posted by [gofar99](#) on Sat, 25 Jun 2022 18:58:44 GMT
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Hi Everyone. BTW...I changed the name. (harmony one) I attached a schematic with mark ups. Some components are numbered so you can relate to the photos. Red arrows are pointing to changes. The large circle in the middle is the main ground point. Everything goes to it. The "H"

shaped buss only carries signal grounds. Power ones in that area go back to the power supply. The power supply has only one connection to the ground at the central point. This is a bit of deviation from many of my builds as they usually have the central ground at the input jack ground. In this build The shield of the input jacks is only attached at the jack end and a separate wire goes to the main ground. The X2 capacitor goes from the power supply ground to the AC mains ground. It could go to the main ground and I may move it later.

As the photos show I used mostly budget audio grade poly caps for power supply filtering. The single 100uf electrolytic was necessary to get the hum down enough. I tried several other locations and various filter configurations and this worked best. The final stage is a FET capacitor multiplier. It worked best as the last filter. The heaters are raised above ground to protect the tubes.

In retrospect I would use a larger transformer when using the 6AS7s. The one specified is running at near capacity and when inside the steel case gets pretty warm. With 6SN7s it is fine.

File Attachments

- 1) [harmony front.jpg](#), downloaded 265 times
 - 2) [6AS7 Phone Amp June 25 2022 MarkedB.jpg](#), downloaded 330 times
 - 3) [Marked Up B.jpg](#), downloaded 332 times
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Subject: Re: The next big thing
Posted by [Wayne Parham](#) on Sat, 25 Jun 2022 21:09:06 GMT
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Oh, very cool. A star ground, with placement optimized by fit and test.

Extreme excellence, as always, from OddWatt!

Subject: Re: The next big thing
Posted by [gofar99](#) on Sun, 26 Jun 2022 02:18:29 GMT
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Hi Everyone, BTW this thing has a secondary function that might appeal to some folks. It can be used as a line stage preamp that can drive a huge length of cable. Possibly hundreds of feet. The Zout will deliver volts RMS at around 50 ma peak into 64 ohms. Ought to be plenty for any reasonable run to power amps. 8o

Subject: Re: The next big thing

Posted by [gofar99](#) on Fri, 01 Jul 2022 18:21:15 GMT

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Hi Everyone. This morning I paired the amp with a Groove phono preamp. A really exceptional combination. No line stage or anything else. Super quiet, no hum at any level even full gain. Some tube hiss at really high gain levels that comes from the Groove. Not surprising as the gain in it is quite high and all tubes do have some hiss. Even the nearly -90db S/N has some. The amp itself has none. Since LPs have at best a S/N of about 65-70db the hiss is not audible. Probably 20db below the source (LP) noise of even the best records. Really clean sound. Exceptional response. Makes my neck hairs prickle. I used it with my shop turntable. A modified Pro-ject with a Jelco 370H arm, speedbox, and acrylic platter. Cartridge is a Goldring 1042. I used my AT ATF-MSH-7 phones. They are quite linear and smooth sounding. Some Sennheisers (HD280 Pro) I have have a slight tilt toward the low end and sounded really nice as well, just more bottom end. Not excessive and they might be something other folks would find preferable. If you need a phone amp this is the one you should consider. I figure it is one of my best designs. A real over achiever.
