VERY SIMPLE QUASI HYBRID AMPLIFIER

Start: 28 April 2014 by Ranchu32 Christian Australia

Inspiration from: Gareth- TGM lineup; Hugh- AKSA-55; Carlos- original DX.....

First backing Ideas comes in by: kasey197; Mooly; Circlotron; richie00boy; Bigun; AKSA; borys and many more, later ilimzn; ivanlukic; vzaichenko; GEirin.....like AnrewT with advice brings it on way to live.

Hugh loves this Child, like his owns and is helping on every corner !

Bimo comes in to do simulation work.

Ranchus first own boards in 28 August 2014 #133 P.14.

In January 2015 #158 P.16 ranchu has worked out the real working schematic.

Borys worked out a CFP- design #183 P.19 end January.

Ranchu shows next step more compact board 31. January #215 P.22; #225,228 P.23

PCB design: done by Prasi-started on 1.Juli 2016 #292 P.30 and ends in first #307 P.31 version.

Amp rev2 #313 P.32 PDF Files very nice compact and quick worked on needed alterations.

Prasi rev 3-#333 P.34 gerber files; rev 4-#561 P.57; rev4.1 #580 P58

Thiagomogi comes out with own pcb and nice psu section too-#324 P.33; #332-gerbers; #380 new; #460 P.46 board with psucap. #482 P.49

The Race came up to run faster now- are any fellows in hurry here?

Still4given and thimios was first successful builder from a singing amp with self etched prasi board.

Thimios on 5. July #346, #347 **First** singing Amp- Change VR1 to 500R and R5 to 51k 0mV offset.

Prasi advice mounting tempco BD139 and spacer #409 P.41

Terry starts with self etched boards #461 P.47 #502 P.51 with first sound impression.

Thimios measuring voltage #483 P.49

Thanks Thimios industrious work in fine tuning Amp works better with changed values.

Ranchu- Thimios new part value: #564 P.57; prasi board rev.4.1 #580

Advice from AndrewT: FB-resistor dissipation- board rev4.2 #590 is done by prasi. #597 gerbers.

Idefixes a combined SMD board #666 P.67- like something from Ettore Bugatti..... Hugh

HolesQ3/5- need board rev4.3 #675 P.68.

First teaching explain post about FB resistors by Hugh

Let's examine the dissipation of the fb resistor.

Assume that the complete output voltage is applied to the emitter of the input transistor, Q1. In fact it's a bit less by the input voltage, but the reduction is only worked out on the gain, and is only 3% (gain of 30, for example), so assume, with 42V rails, that we can produce 37.5x2=75Vpp across the resistor. This is 53Vpp rms.

Dissipation is voltage dropped multiplied by corresponding current.

Here is an interesting fact; the DC current is pretty much constant, but the AC does vary because its AC load is in fact the shunt resistor, 47R in this case. The dissipation is Eexp2/R from Ohms Law.

So for calculating the full dissipation, assume 1.5k + 47R = 1547 ohms.

This is 1.82W, but it's only relevant to continuous sine waye, or square wave on 1:1 mark space ratio.

For music, it really is about 25% of this. So the continuous power dissipation in this 1.5K series fb resistor on MUSIC is around 460mW. And this is at full output, that is, lifting the roof, burning up the speakers, and attracting the neighbours. Even at very high levels, and with your ears bleeding, you would max out at around 300mW on this resistor.

A 1W resistor would be absolutely fine, and in truth I would use a 600mW Beyschlag through hole in this position, even in my bigger amps, which in fact are voltage fb amps, not quite such a high dissipation regards at the higher output in volts.

Cheers, #601 P.61

Second- About a very good sounding Amplifier Idea lost in nirvana- now back on live.

Yes Ranchu I agree. I would add that these purist tests, along with cheap complementary devices and expensive AP1s in the early seventies, the quasi was relegated as irrelevant. No-one ever highlighted the very good sounding quasi amps, particularly the British (Armstrong, Radford and very significantly the JLH 1969 and 1996.)

As quasis go this one is very well designed and even with heavy ringing it would still be stable. As I have stated a couple of times it does not measure well but it sounds very good particularly at voice and lower volumes. This is the SET amp you have without a tube, and BTW a SET measures very, very badly and lots of audiophiles love SETS and they are among the most expensive amps to buy. A friend has just a Chinese 833S SET (125W and 950V on the plate according to their specs but 90W would be more like it) and arguably it was one of the best amps he and I have ever experienced. #623

Third Ranchu about 0,33R resistor

0R22 vs 0R47

The lower R gives slightly more headroom but on the downside it makes thermal stability of the output stage more difficult to achieve.

0R33 is the best compromise for this design, closely followed by 0R47. 0R22 might work OK but you'd need to test carefully. #721 P.73

That is what Hugh wrote to answer Marc-OP- resistor: FET- transconductance-gm

When you set a higher source resistor on a mosfet you reduce the transconductance. Put another way, more voltage at the gate is needed to achieve an increase of current. This is because more current through the source resistor drops more voltage, and a marked increase of gate voltage wrt to the BOTTOM of the resistor is the higher, the voltage dropped across the resistor is more, and a little more voltage is increased also across gate and the source, but the dominant voltage drop is across the resistor.

This is interesting, because these days there are very high transconductance mosfets available with up to 30A/volt (20 Siemens) transconductance and even more. This means that if there were no source resistor, an increase of 1V across the gate from say 4.1V to 5.1V the current through the drain/source would increase from say 0.1A up to 30.1A! But if you put in a 0.47R source resistor, this

sort of additional current would hugely reduce the voltage between gate and source, which cannot happen, so the result is that the overall increase of current is rather less than you would expect based entirely on the Gm of the device. Since Rdson of a mosfet is often less than 0.1R, and down to as low as 10 milliohms, the source resistor starts to dominate the transconductance. In fact the relationship of the transconductance is the reciprocal of the source resistor.

Try this thought experiment. Use a mosfet with say 100S, a huge, almost ridiculous figure but helpful for this explanation. Let us put another voltage on the gate wrt the BOTTOM of the 0.47R source resistor. We set it up to 100mA quiescent at 4.15V. Now, increase the current with a 5.15V from gate to bottom of source resistor. We know that the mosfet might be passing 100A more or more if there were NO source resistor, so most of this 1V must be across this resistor, not across the mosfet. Add 1V across the 0.47R resistor, and we pass another 2.12A. That is, the reciprocal of the source resistor value, 1/0.47. In truth the mosfet will have a much smaller transconductance than 100S, it might be 6S (IRFP240), so some of this voltage will show an increased from Vgs. But in this situation, you can see that the transconductance will be hugely reduced by a larger source resistor, in this example it will be less than 2.12, it might be around 1.8S. With less current flowing through the mosfet when you increase an extra voltage on the gate, it shows that the transconductance is lower and therefore the quiescent current is much easier to set on a real push pull (or SE) amplifier #725

31 July first rev.3 boards are assembled by xrk971 the crazy race begins #748 P.75 and follow.

Not all parts, like last values are placed in and the trouble to set up the offset begins.

Now we could learn any lessons- how works an amp particularly- awesome stuff from Hugh