Re: Groundplane in poweramplifier PCB design

Source: http://sci.tech−archive.net/Archive/sci.electronics.design/2006−04/msg02697.html

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- *Date*: Wed, 19 Apr 2006 18:36:36 +0200

First, you may want to read this:
http://sound.westhost.com/phpBB2/viewtopic.php?p=6542#6542. I hope you don't mind I posted your message to the forum of the website where that amplifier design comes from. The ESP website has a good community. I was quite surprised to read in your message that the P3a might be a bad amp, so I posted it there for comments, for people who have a great deal of experience with that particular amp to read.

On Tuesday 18 April 2006 20:23, Ban wrote:

> Wiebe, I just had a short look at the webpage. Even if the author says it is
> an excellent amp, it doesn't necessarily need to be so. This construction
> invites any instability and there are a few very weak points.
> To bring good performance, the input pair has to be operated with equal
> currents, which is almost impossible here. There will always be some offset
> voltage at the output. When you trimm it away it will be again there when
> the temperature has changed.

I don't follow this. The trim is not for setting DC offset, it's for setting the quiescent current. DC ofset should be minimal because of C3, which makes sure all DC feedback goes to the inverting input of the long tailed pair.

> This is due to the current source made with Q4.
> which relies only on its Vbe. It is also dependent on the beta of the
> transistor and the forward voltage of the green LED.
> C3 will be always operated with changing polarity, this calls for trouble
> too.

C3 won't see any (significant) DC unless in fault conditions. By your argument, you could say the input cap will also be destroyed, because it also sees changing polaraties of the input signal.

> The worst is when there is an overload on the input and all the current goes
> through Q1 and saturates Q4, especially without a load. The output goes high

> and C5 will be pulled down by R10. Thus the current through Q9 increases, and the voltage drop across it. The moment Q6 starts conducting it turns on Q8 and the current will increase until the fuses blow, but by then it is too late. No current limit. In this kind of topology it is impossible to incorporate a simple current limit, because when you pull down the base in the usual way, the other side starts conducting and shorts the supply rails. So it is not the gnd plane, it is the principle of operation which results in self−destruction, whatever you do.
> There are many more details that can be improved, but IMHO it wouldn't make sense.

I can't really comment on the circuit behaviour you describe here, because it's somewhat beyond me, but I can tell you that this amp is very stable. Not only is it my experience (I have already made one, but now I'm redesigning the PCB), but it has been built by many others. It's predecessor (http://sound.westhost.com/project03.htm) has been built hunderds of times, as you can read in the article, without stability problems. In fact, it's so stable, he was able to run it with 1 meter supply wires and no decoupling.

The lack of a current limiter is intentional BTW. The author hates the reduced (near) clipping performance caused by such a thing. This is an amp for DIY, not mass production, so a short circuit protection is not necessary. And, as you can read in the forum thread I linked to, the overload situation certainly does not happen according to one of the posters.

Also, the ESP website is not just made by a random electronics tinkerer. Rod Elliott really knows what he is doing, and has a lot of experience in audio electronics. There are over a 100 projects on that website he designed. And, they all work as stated in the articles.
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