Subject: CCS Failure Possibilities
Posted by Manualblock on Wed, 01 Mar 2006 21:46:37 GMT
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Studying Damir's six part design tutorial for an SE amp I thought I noticed that should a CCS Mos-Fet burn out it would put the entire B+ through your expensive 300b or whatever other tube you are designing around; most likely causing a mini bomb in your amp. Damir confirms that this could in fact occur and should be protected against with a resistive fuse placed between the tube and the CCS. He can explain it better but my concern is that the remaining resister could flame on and start a fire in any CCS loaded tube amp.We need some dialogue regarding this potentially dangerous issue.I just want to state that this is true for any CCS load; not just Damir's design which is designed safely well within the proper guidelines.I would not want to think I had to always stay in the room whenever a CCS amp is on in order to keep watch on it.

Subject: Re: CCS Failure Possibilities
Posted by Damir on Thu, 02 Mar 2006 07:12:22 GMT
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Huh, MB... : "entire B+ through your expensive 300b", "causing a mini bomb in your amp", "remaining resister could flame on and start a fire in any CCS loaded tube amp", "potentially dangerous issue", "I had to always stay in the room whenever a CCS amp is on"...Reading this, someone could think that there`re dangerous terrorists here... Everything can be destroyed and can be dangerous. High voltage can kill you. You can burn your finger on soldering iron. Loud music can damage your hearing.Drain to Source and Drain to Gate max. specifications of DN2540N5 is 400V. We used B+=440V, but voltage drop through the CCS (6C45Pi example) is 440-150=290V. Counting the negative peak of the driver, 290+75 = 365V. Yes, it is safer to lower the B+ to 390V with 6C45Pi.Another "horror" possibility is that somehow driver tube shorts, and that we have the ground on the CCS output. Or for some reason, CCS shorts and we have 440V on its output - then driver tube would "pull" large current, especially if biased with LEDs or Zener "under" cathode.We can use, non-flammable (say metal-film) resistor of, say, 3k3/0,5W between the CCS and the tube. It would limit the current, and in extreme cases burn out (without flames), (hopefully:-) protecting the tube. I`ll try it these days - with 9mA current it dissipates 0,27W, and max. dissipation of 0,5W reaches with 12,3mA through it.300B output tube can`t be damaged in those cases - it is connected to the driver/CCS through the big capacitor, in my case Mundorf Supreme, 4µ7/800V.Adding "back-to-back" Zener G-S protection is another idea.For now, I used DN2540N5 for about a month, few hours a day, with numerous in-out switching and other torturing with no problems and good sound. Yes, I burned one mosfet accidentaly shorting it with unisolated wire. No big deal

Subject: Re: CCS Failure Possibilities
Posted by Manualblock on Thu, 02 Mar 2006 12:18:53 GMT

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Thanks D; but what is the prognosis over the long haul? That seems to be of some concern, that slightly exceeding the safe voltage over many times will cause a transistor failure over time. A couple times and you are safe; but one too many and...

Subject: Re: CCS Failure Possibilities
Posted by Damir on Thu, 02 Mar 2006 13:28:20 GMT
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Huh...if I`d think that way, I`d never leave the house or sit in the car, or tinkering with tubes...hey I measured today 390-0-390 Vrms on the PT secondary - that`s 780V AC between those two red wires on my floor...and 440-460V DC besides...but I stayed cool...(I mean, no fire) On more serious level, I tried 3k3 resistor today, 5-minutes job. It`s about 33V voltage drop "across" it, and less voltage "across" the CCS (440-183 = 257V). For feeling even more better, drop the 440V to 390V through RC filter, 5kOhms/2W - 47µF/500V. Now you have only 207V "through" the CCS, fine.I listened to the added 3k3 "version", and without this resistor, and can`t hear the sound difference - good.

Subject: Re: CCS Failure Possibilities
Posted by Manualblock on Thu, 02 Mar 2006 14:02:42 GMT
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excellent work D; I think you're the only guy addressing this issue. It's a disaster waiting to happen. What else is new with the 300B?

Subject: Re: CCS Failure Possibilities
Posted by Damir on Thu, 02 Mar 2006 14:18:33 GMT
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See "Voltsecond`s" www page, I think that he adressed many dissipation, voltage and safety issues with C4S CCS.But I think that it isn`t that serious - "disaster waiting to happen", :-). I`m not afraid, and I`m gonna use this CCS in my amp permanently. But I can`t get any "guarantee" to anybody. Potential builders must choose for yourself are they cappable of "dealing" with high voltages, mosfets and tubes. I mean, I can provide the schematic and the description, but you are on your own - your work/responsibility. My amp works, and the sound is nice. In the next few days

I`ll post another "report", 6SN7 "family"...

Subject: Re: CCS Failure Possibilities
Posted by Manualblock on Thu, 02 Mar 2006 15:29:44 GMT
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Fair Enough. I just feel all the cards should be on the table when safety is an issue. High Voltages are not the problem it is the failure of SS components under stress that is the issue. Tubes as I understand it are pretty rugged and can handle abuse or repeated stress but I'm told that transistors are not that forgiving. I want to add that I only bring this issue up with you because you are willing to discuss it; this in no way is a criticism or knock on your excellent design. Using these CCS in Guinevere and now in a Tube amp results in a total of four CCS loads in use whenever I turn on my system. Thats a lot of solid state loads operating there. If you read John Broskies analysis of the Curry Cascode triode amp with CCS and current mirror loads he says regarding the use of SS components stated at the end of the article;"You must choose either safety or sound."

Subject: Re: CCS Failure Possibilities
Posted by Damir on Thu, 02 Mar 2006 16:07:25 GMT
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"...your excellent design" - Hey, I just put together known "Guinevere" CCS with other tubes (kudos to Doug, G. Pimm and many other people who worked on this before me). I chose this CCS because of simplicity, good performance, and "tradition" - we worked here with DN2540N5 CCS before.It works good. I`m expecting Doug to jump in this "safety" discussion...
http://www.audioroundtable.com/GroupBuild/Projects/Guinevere_Schematic.gif

Subject: Re: CCS Failure Possibilities
Posted by Manualblock on Thu, 02 Mar 2006 18:08:38 GMT
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There is a thread regarding safety in the Guinevere series. It touches on the issue of Mos-Fet overload or failure but there is no in depth discussion of how that would impact an amp; what damage could occur and what exactly would be the conditions under which a transistor might give out. It is my understanding that this is not such an issue with SS amps but with the high voltages used in thube plate circuits it can be much more damaging. I am not afraid to use this circuit; witness the Guienevere I have and use; but at some point this should be addressed.However; I can't find any examples of failures or malfunctions by searching the net; so I guess they are pretty

safe in use. I am sure if there were an event it would be written up somewhere on the net; so if there is I can't find it.Better safe than sorry. Thats the only reason I asked.

Subject: whaaaaaat?
Posted by PakProtector on Thu, 02 Mar 2006 22:52:11 GMT
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this is the circuit you're worried about? Shall we try a thorough FMEA on it? I have some software to assist the process...:)No really...there is not much to go wrong. As Damir pointed out, MOSFET failures do happen, and I have had a few, in several circuits, and I have *NEVER* had to do anything but replace the FET's.cheers,Douglas

Subject: Re: whaaaaaat?
Posted by Manualblock on Fri, 03 Mar 2006 18:28:56 GMT
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It's not so much about being worried; it's more about knowing all potential risk factors ahead of time. So you say if the Mos-Fet fails then it doesn't affect the tube? Because if that is the case then there is nothing to worry about. There was some posts on the net suggesting that there could be a problem should that happen; putting the entire B+ across the tube.

Subject: Re: whaaaaaat?
Posted by PakProtector on Sat, 04 Mar 2006 11:49:49 GMT
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Hey-Hey!!!,I can say I have not encountered that sort of failure. The usual is a gate-source short on the lower MOSFET, and this is prevented by the back-to-back Zener clamps.When I have had a G-S short with a battery circuit, the short will discharge the batteries through the R-set and ~250k filter resistor. One discovers the problem quickly and a 'trace' gets lifted to open the circuit...:)Anyway, I don't see much risk, either to equipment or the wallet, and certainly not the operator(that would be US).cheers,Douglas

Subject: Re: whaaaaaat?
Posted by Manualblock on Sat, 04 Mar 2006 13:18:41 GMT
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Thanks Doug; what is the battry circuit?

Subject: Re: whaaaaaat?
Posted by PakProtector on Sat, 04 Mar 2006 13:40:28 GMT
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Hey-Hey!!!,The battery bias (from output end of R-set to the source) allows a larger R-set value for a given current. The battery voltage plus the bias voltage is used for the V, i is left as the design value, and R is solved for with Lord Ohm's eq'n. One can use up to 4 of the 3,3Volt Li-Ion button cells and not worry about Zener leakage on the G-S clamp.The batteries are then R-C fileted/decoupled from the gate with a 250k resistor and .015 or bigger capacitor. The Russian teflon is a fine piece in this position, but a small poloystyrene/foil should be quite good as well.cheers,Douglas

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