HINTS FOR SETTING THE TOOLE SHUNT REGS.

Steen and myself decided to search for a simple but good shuntreg to be easily set and built, very stable with not too many parts that could be used on most of our lineamps and CDP's projects. Surfing the web was frustrating not a single one there that met our objectives so we went looking, where else, DIYAudio.com and we found a design by our member Colin Toole that seemed to have the right topology for our intent and settled to do some prototypes which confirmed to be the one we were looking for.

This particular regulator has the advantage of using the same PCB for either polarities, positive and negative and can be set to regulate, as far as we have test it, from 15 to 30V. Raw supply should be about 5 VDC over the intended regulated voltage, this means that if we want to have 24V at the output we need a PSU with some 29 / 30VDC.

For our test we have been using a simple CLC PSU as the raw supply, the inductor is a small one with only 22 to 50 uH enough to filter most of the undesirable pikes from the diode bridge. We have done simple inductors winding magnet wire (25Ga.) over a 12mm mandrel by 8 or 9mm long for an outside diameter of 22 mm or less with 70 turns yielding around 50uH. Steen has tested some smaller ones also using sawing machine spools (the small plastic ones which are about 20mm on the outside) those give about 20uH.

The whole supply before the regulator is actually a CLCLC if we add the Ferrite Bead (FB on the layout files) and the decoupling cap found on the regulator board.

Well this is supposed to be hints to set the regulator so lest go to the point.

Most shunt regs, as this one too, are composed by two mayor sections a CCS (constant current source) and the shunt circuit portion.

In the Toole reg the CCS is composed by R6, R5, R3, Q5, Q6 and D1. To set the desired current we want to set R6 according to the table supplied on the schematic file which gives the approximate current it will supply. Haven't taken the parameters for D1 red LED and they vary quite a bit from sample to sample, type and manufacturer, Steen has used what he had on hand I believe and has work with no problems: in the other hand Colin says that we should be looking for some 1.75 of forward dropping voltage with load. The circuit when correctly working will light both LED's.

Please take note of the following error on the layout file: on both polarities where the LED's are shown there is an "A" mark side (stands for anode) indicating the orientation of the LED's…well, on all instances it is reversed so the anodes should be pointing to the other side.

To set the output voltage we will use the value shown on the schematic notes for R4. If an exact voltage is needed you will need to trim the value with a parallel second resistor also marked as R4. The Values for R4 are only

approximate and used as a starting point. With so many components involved you may experience needing somewhat different settings for this resistor for every circuit you make and that's OK.

We have placed a string of three series zeners for trimming purposes if you wish but the real idea behind this was to use three smaller values of zeners which should prove less noisy than using only one. In case you decide to use only one you need to add jumpers on the other two positions to reach ground. In any case the value of the sum of zeners should be 12V in total.

On the shunt side of the circuit we have two elements, one active and one passive, which actually do the shunt function Q2 and R9 which are in parallel; the other components do sink some current also but we will not bother with these.

As an example we will set a regulator to supply 24VDC to one channel of an NS10 circuit (load) that sinks aprox 13mA which is very low compared to other lineamps around.

We will assume you have installed a 8.7K R4 or there abouts for the needed 24V and a 30 Ohms for R6 to set the CCS at around 78mA.

So we have 78mA coming from the CCS and a load of 13mA that leaves an excess of 65mA left to be burned by the shunt elements. If we follow a thumbs rule we will have R9 sink 1/3 of this which is about 22mA. Applying Ohms law we would need 24 / 0.022 = 1091 Ohms so that is a 1K resistor for R9 which will burn about ½ a watt (24*0.022) well within R9 capability of 3W.

The remaining 43mA will be burned by Q2 also well within BD139 12 watts capability.

You may play with all this values experimenting different setting but keep an eye on device dissipation and heatsink temperature on the medium power transistors. For this lower demand example on the regulators you may use smaller heatsinks than what is implied on the layouts figures which is an R-Theta RT3320B02500. Just remember that all heatsinks need air circulation (convection) to function properly.

Caps C1 and C3 are critical values so don't fiddle with them since they may cause oscillations at the MHz range and they will alter the nice and flat output impedance. C1 is a 1nf (1000pf or 0.001uf) and C3 is 10nf (10,000pf or 0.01uf).

If you build this regulators as shown on the documents you most probably end up with one of the best regulators around, your opinion is always welcomed.

Please direct all questions to the thread and we will do our best effort to answer them.

Tony, (apassgear)
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