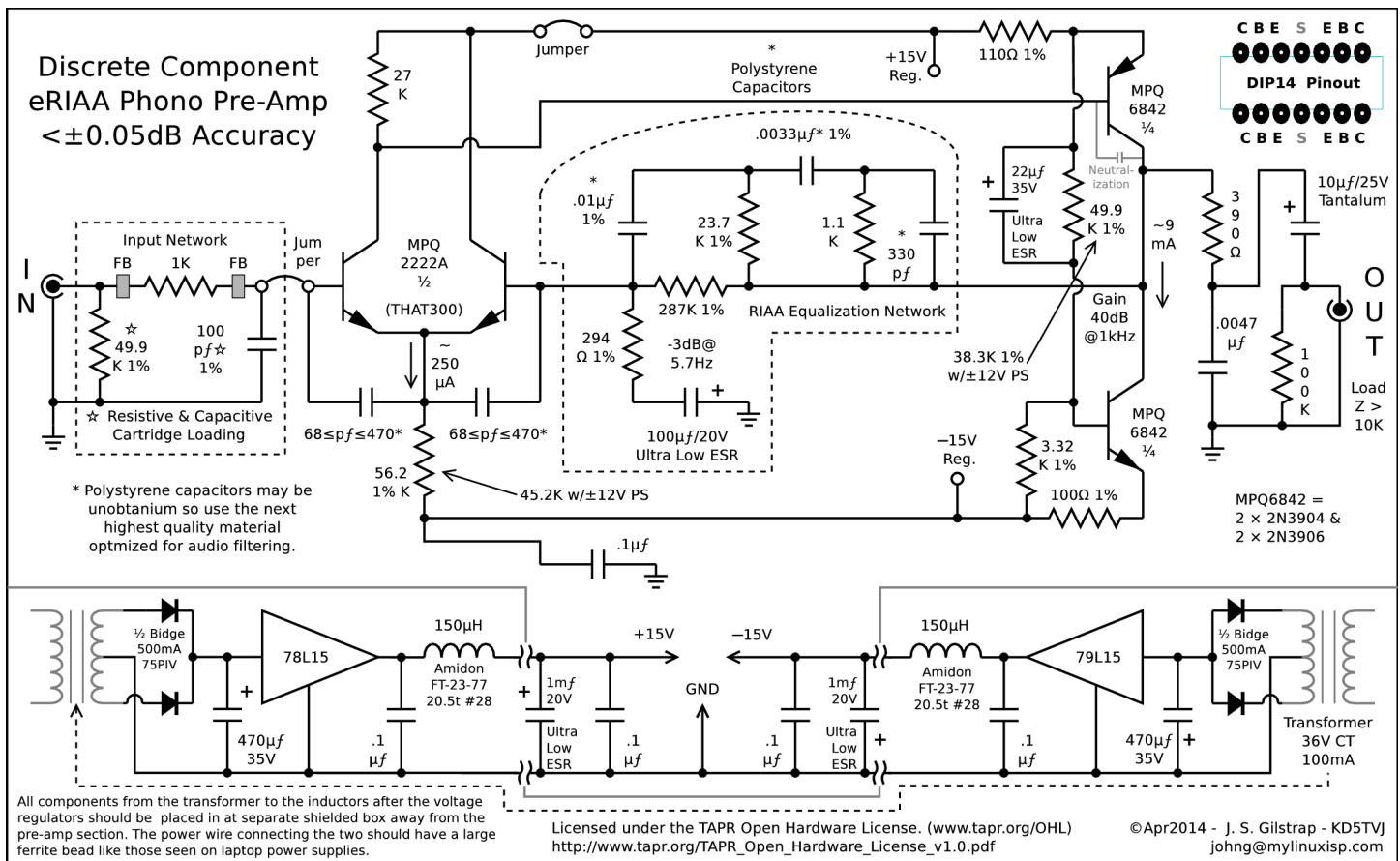


# Discrete Component Phono PreAmp



The input is terminated with a 49.9K resistor and a 100pF capacitor. This sets the resistive and capacitive load of the cartridge and should be adjusted appropriately for the cartridge taking into account the capacitance of the cable also.

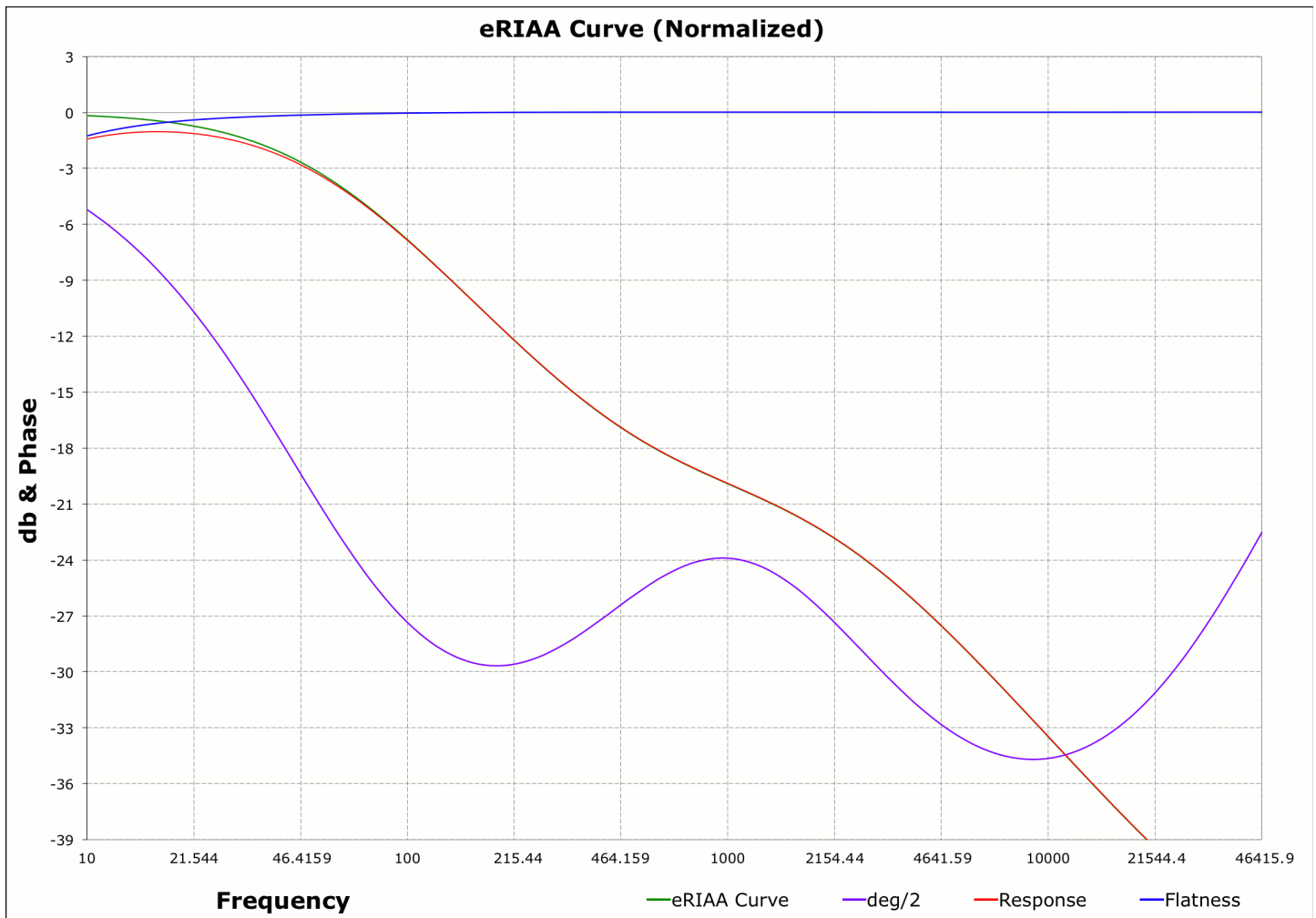
The bias current for the input transistor will create a DC voltage across the input resistor of ~77mV. When the cartridge is directly connected to the input the current will mainly flow through the cartridge. An ~1.25μA current probably will not damage the coil in the cartridge but this will put a magnetic bias on the core and may affect the performance so blocking this is highly recommended. Replacing the 49.9K resistor with a DC blocking high pass  $\pi$  network will eliminate this. The  $\pi$  consists of a 61.9K 1% resistor at the cartridge end, a 1μF low ESR capacitor with the + side towards the cartridge, and a 274K 1% resistor biasing the input transistor.

There are 68pF capacitors across the emitters and bases of the differential input pair to help attenuate any induced RF and parasitic high frequency oscillations but could be as high as 470pF if necessary. The long tail emitter resistor for the differential pair is set for a ±15V supply but if running it at ±12V another resistor is specified in the schematic.

The 2N2222A type transistors used for the differential input pair are surprisingly low noise for being a general purpose device. Sure there are lower noise devices and they would work well here if you can find them but the 2N2222A in the form of the MPQ2222A quad package offers matched pairs and matched between channels

also. The 2N2222A has a max noise of 4dB and  $0.8\text{nV}/\sqrt{\text{Hz}}$ . The MPQ2222A and its generic form NTE2321 are in DIP while the MMPQ2222A is a SMD device. THAT300 is available in both DIP and SMD but is much more expensive.

The eRIAA equalization network is a typical RC configuration as seen on a many op-amp style pre-amps and can be used for such. It should provide a flat response out past 20kHz and a -3dB@5.7Hz high pass with a 6dB/oct. slope, -0.5dB@~18.4Hz, -0.126dB@50Hz and from 80Hz on should provide  $\leq \pm 0.05\text{dB}$  of accuracy. Polystyrene capacitors should be used for best results and TRW actually sells some so polystyrenes shouldn't be too difficult to find. If not then polypropylenes, or other high quality audio grade capacitors could be used. The resistors should be metalized film 1%. Using all 1% components in this area will ensure an average  $\pm 0.05\text{dB}$  accuracy and a tight balance between channels. For the higher value capacitors like the  $10\mu\text{f}$ ,  $22\mu\text{f}$  and  $100\mu\text{f}$  tantalums should be used for their low ESR high Q features.

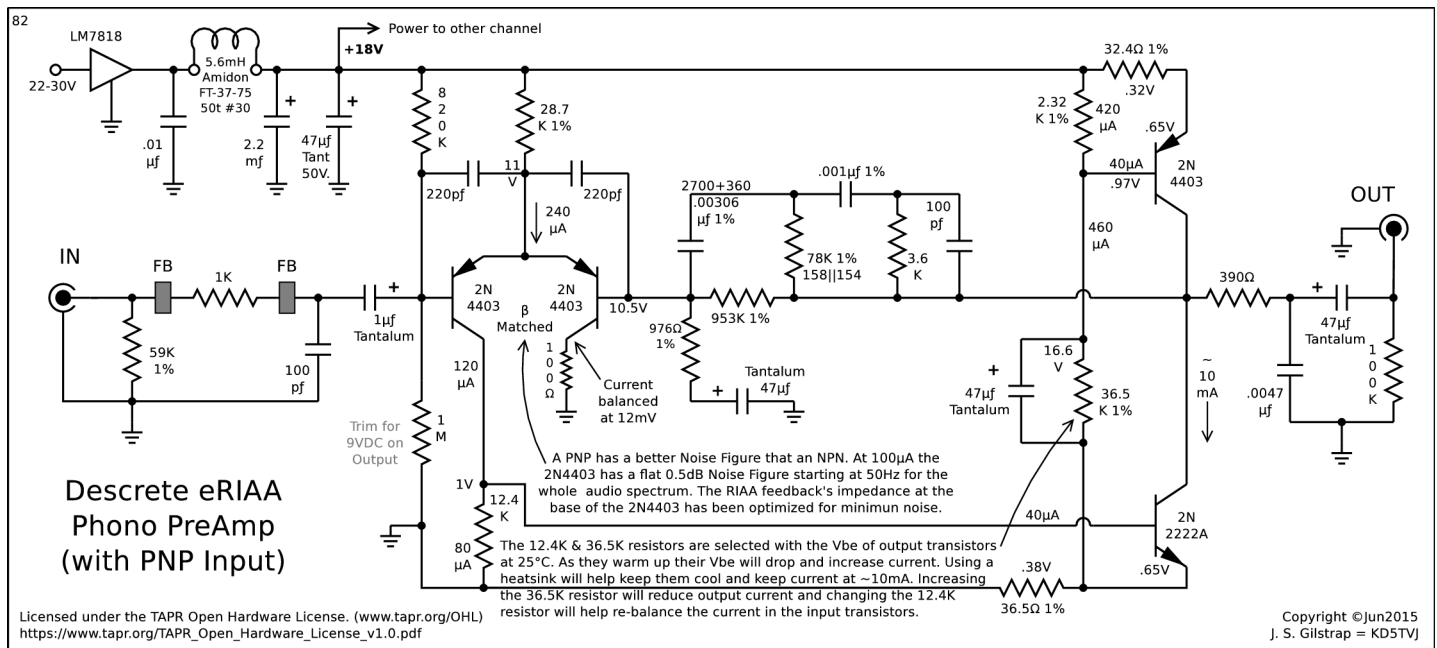


The output is a class A push-pull current mirror and uses the quad complimentary array in the SMD package MMPQ6700 are basically 2 pairs of 2N3904 & 2N3906 or the MPQ6842 and a generic NTE2320 in DIP which are 2 pairs of 2N2222 & 2N2907. Further neutralization can be done with a capacitor from the base to collector on the PNP and for starters a 5pf should be tried if necessary. THAT340 is available in both SMD and DIP but is more more expensive. The array will have 11.4mA of continuous current through it and at 30V will dissipate 350mW which for the SMD version is almost half its rated power so it should have a heat sink on it.

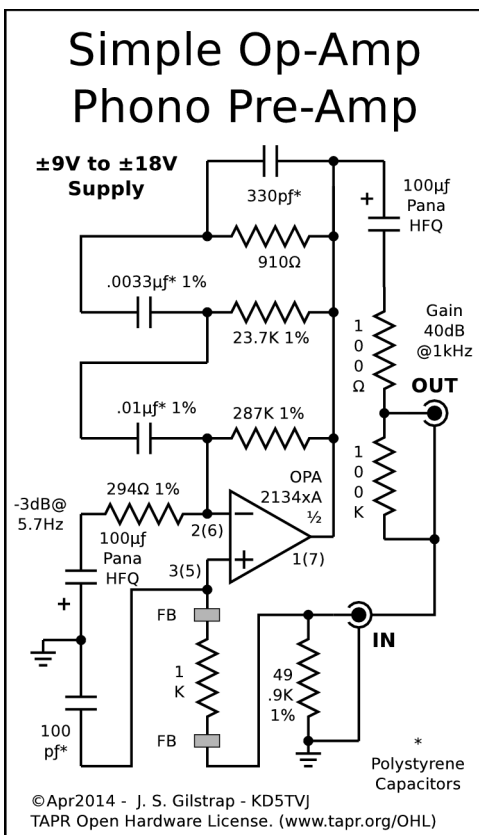
On the board in the center where the ground from the power supply is connected a jumper strip approximately 0.24" (6.1mm) wide, the width of the chip, using brass or copper needs to be placed and connected to ground on



Here is a PNP input version that offers somewhat lower noise factor than the NPN version.



Here is a circuit for an Op-Amp version:



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Moving Coil Amps (2N440x || 2N390x w/ LM4562)  
 Discrete MM (2N3906)

