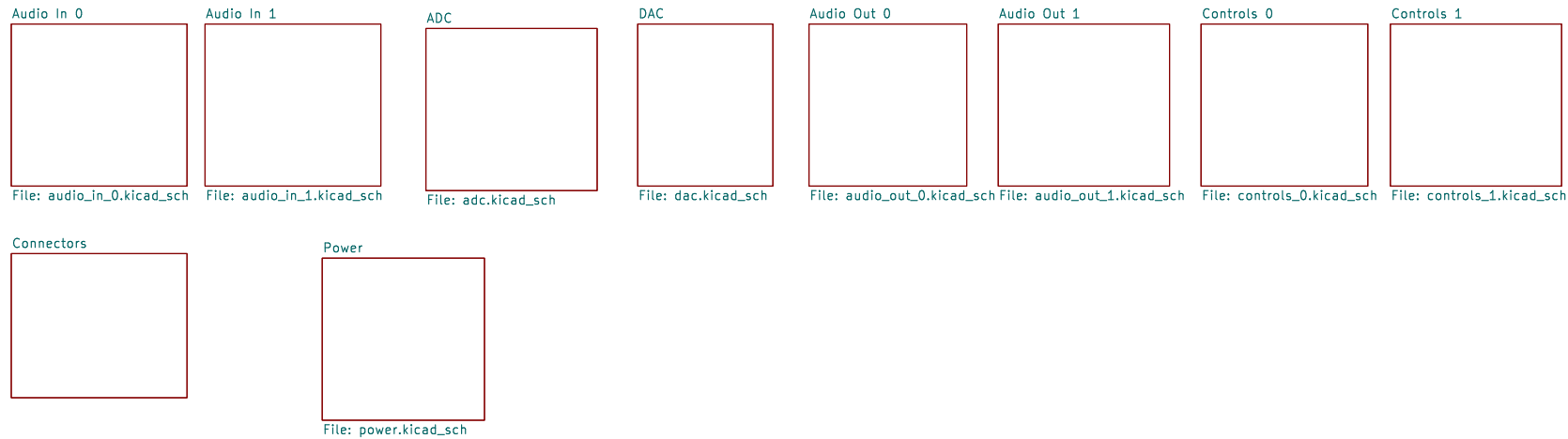


# Digital Repeater Controller V2 – Radio Interface Board

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- NOTES:
- \* This is an analog board that interfaces with two radios. A separate digital board based on the RP2040 is also required. A ribbon cable connects the two boards.
  - \* The goal of this design is to do as little as possible in hardware.
  - \* Many things that usually happen in hardware (or FPGA) will happen in software:
    - Audio routing between the two radios will happen in software.
    - Audio pre-emphasis/de-emphasis (if needed) will happen using DSP using digital filters.
    - CTCSS decoding (if needed) will happen in DSP.
    - CTCSS encoding (if needed) will happen in DSP.
    - DTMF decoding will happen in DSP.
    - CWID and other tone prompts will happen in DSP/software.
    - Voice IDs will happen in DSP/software.
    - Other digital audio interfaces like EchoLink (or DMR/D-Star in the future) will be directly integrated.

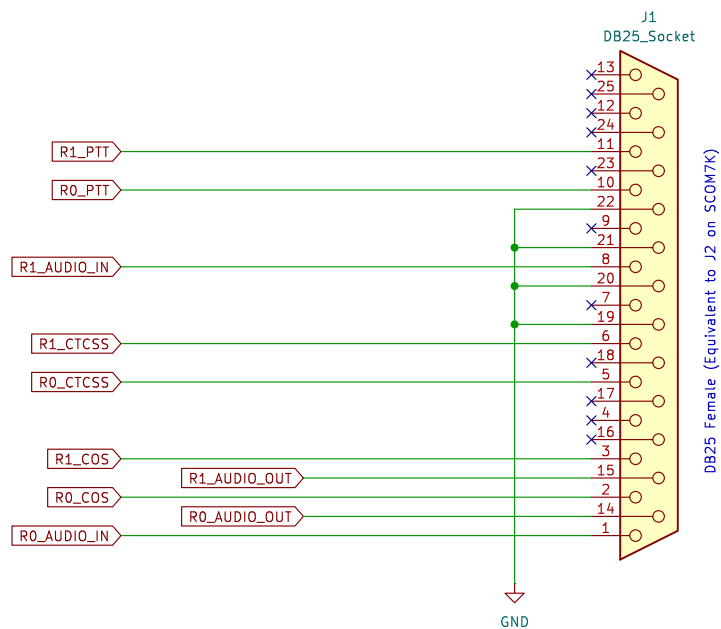


- H1 MountingHole
- H2 MountingHole
- H3 MountingHole
- H4 MountingHole

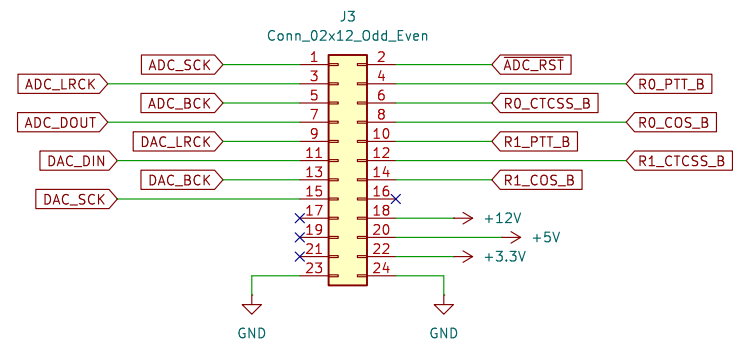
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Sheet: /  
File: if-2.kicad\_sch

**Title: Digital Repeater Controller**

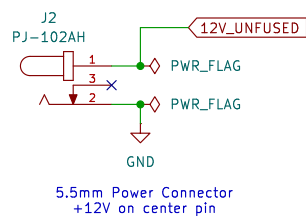
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DB25 To Radios



Ribbon Cable to Digital Board

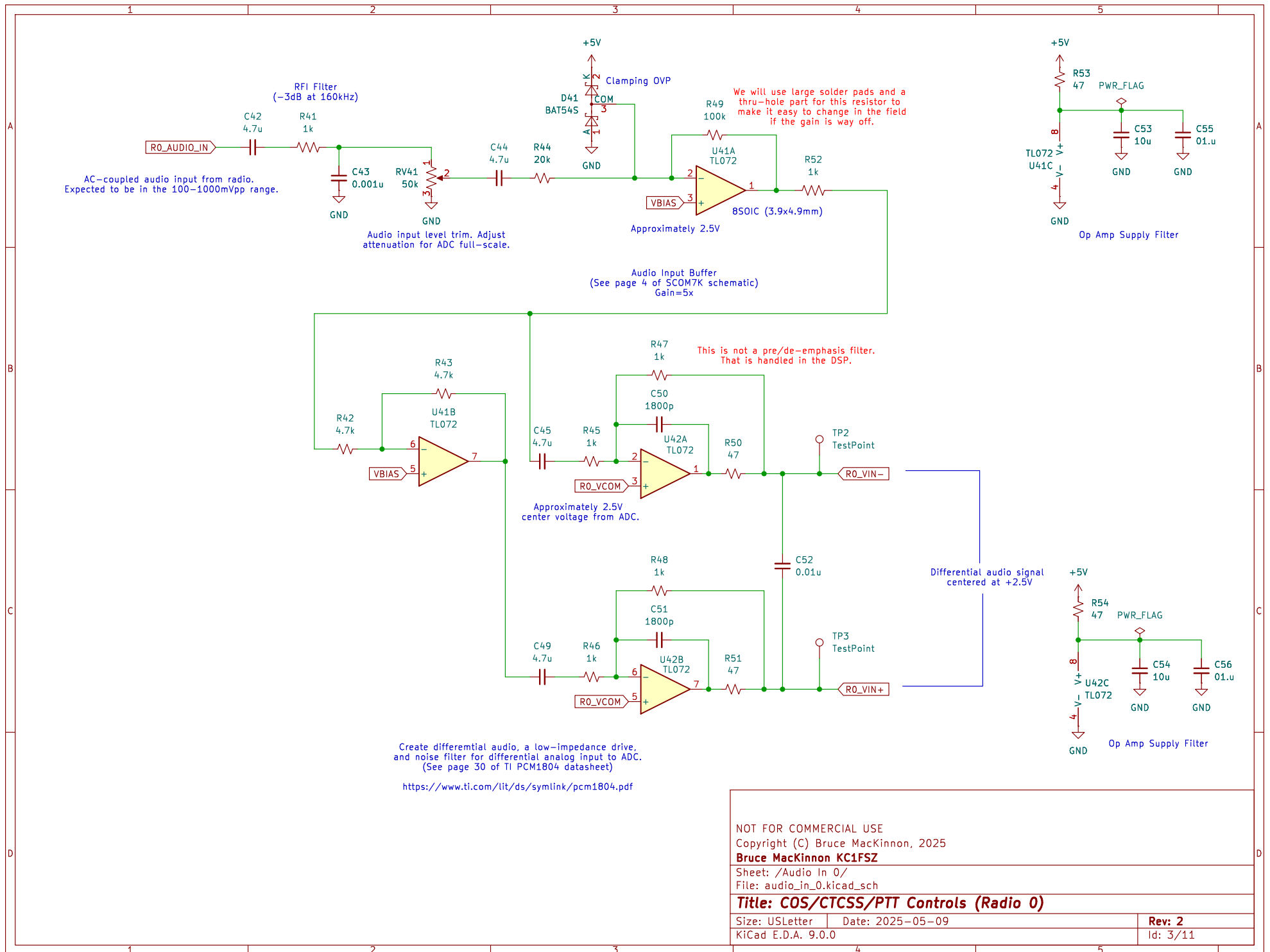


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RFI Filter  
(-3dB at 160kHz)

AC-coupled audio input from radio.  
Expected to be in the 100-1000mVpp range.

Audio input level trim. Adjust  
attenuation for ADC full-scale.

Audio Input Buffer  
(See page 4 of SCOM7K schematic)  
Gain=5x

We will use large solder pads and a  
thru-hole part for this resistor to  
make it easy to change in the field  
if the gain is way off.

Op Amp Supply Filter

Approximately 2.5V  
center voltage from ADC.

This is not a pre/de-emphasis filter.  
That is handled in the DSP.

Differential audio signal  
centered at +2.5V

Create differential audio, a low-impedance drive,  
and noise filter for differential analog input to ADC.  
(See page 30 of TI PCM1804 datasheet)

<https://www.ti.com/lit/ds/symlink/pcm1804.pdf>

(Should be a copy of R0 audio input)

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Sheet: /Audio In 1/

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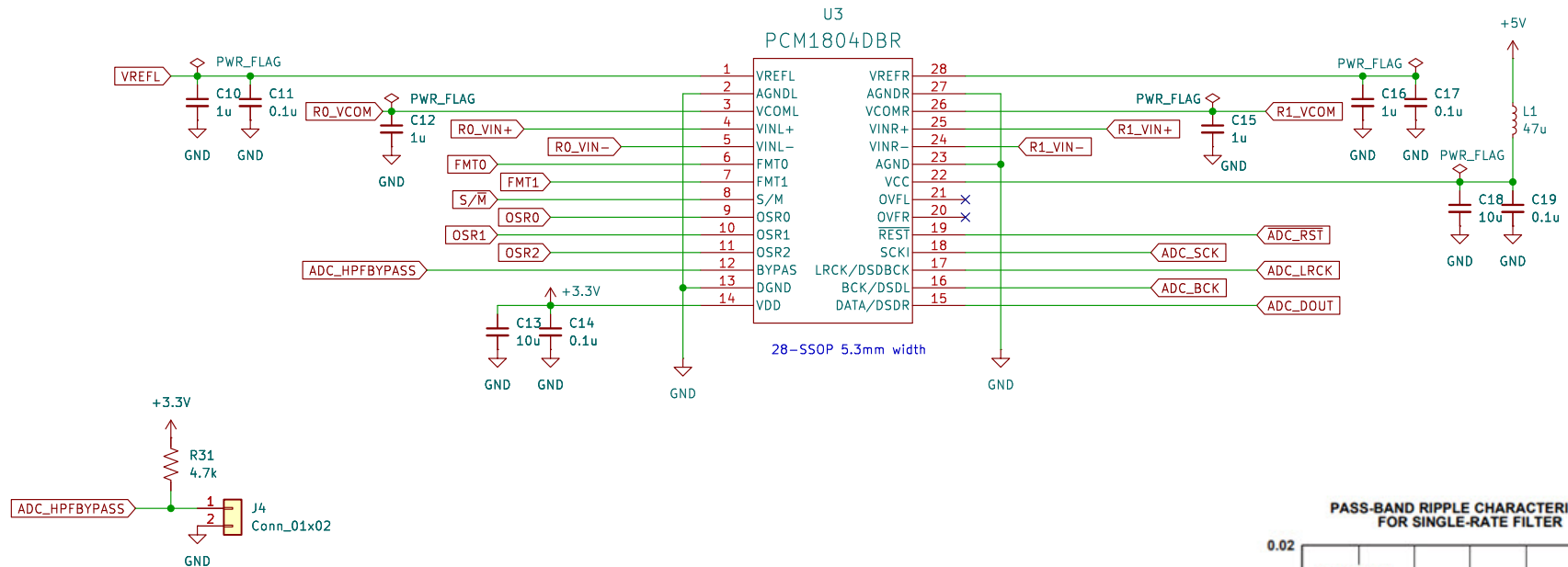
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Rev: 2

Id: 4/11

The TI PCM1804 is a 24-bit stereo analog to digital converter designed for audio applications. It contains an integrated low-pass anti-aliasing filter on the front-end with a cut-off around 20 kHz. Sample rate ( $f_s$ ) will be 48,000 samples/second. Narrower filtering will be achieved in DSP.



HPF enabled by default, can be disabled for testing using this jumper block. NOTE: When HPF is enabled it's not possible to test the ADC with DC levels.

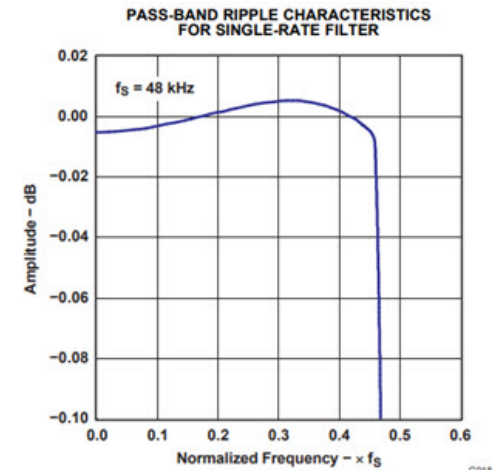
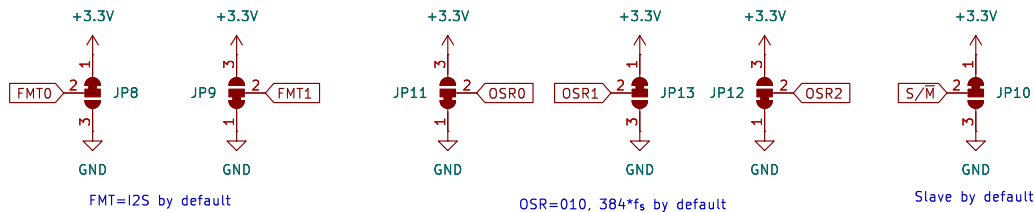


Figure 18.

## Configuration Solder Bridges



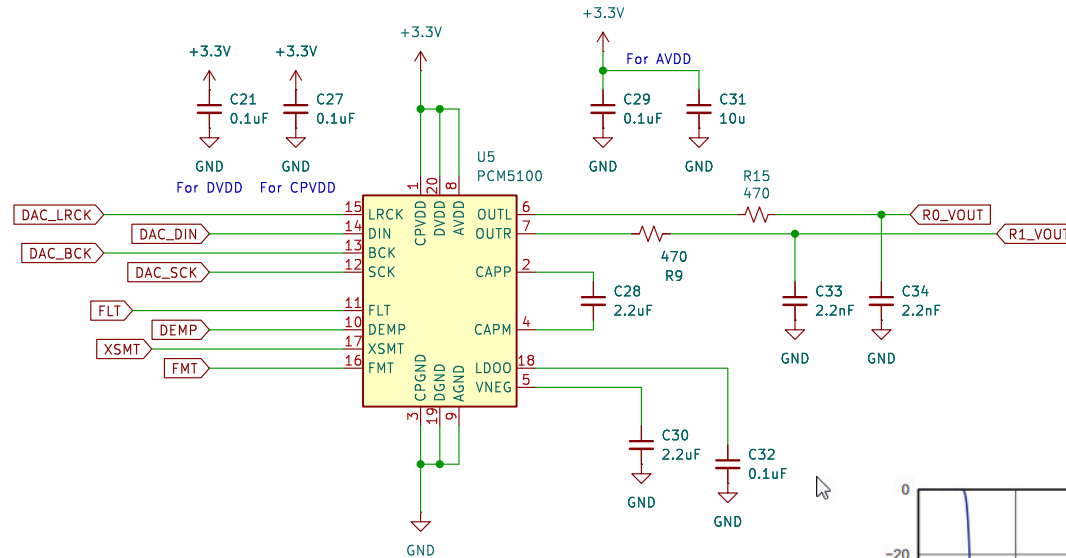
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The TI PCM5100 is a 24-bit stereo digital to analog converter designed for audio applications. It contains an integrated low-pass interpolation filter on the back-end with a cut-off around 20 kHz. Sample rate ( $f_s$ ) will be 48,000 samples/second. Narrower filtering will be achieved in DSP.



## Configuration Solder Bridges

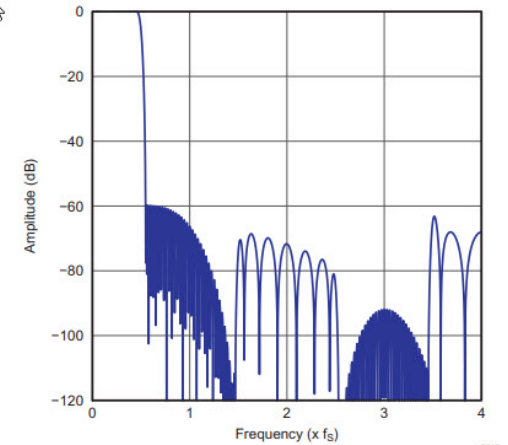
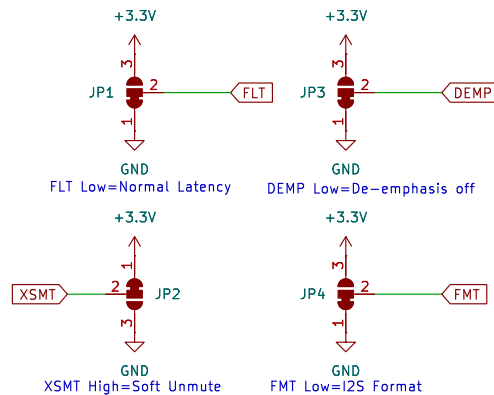


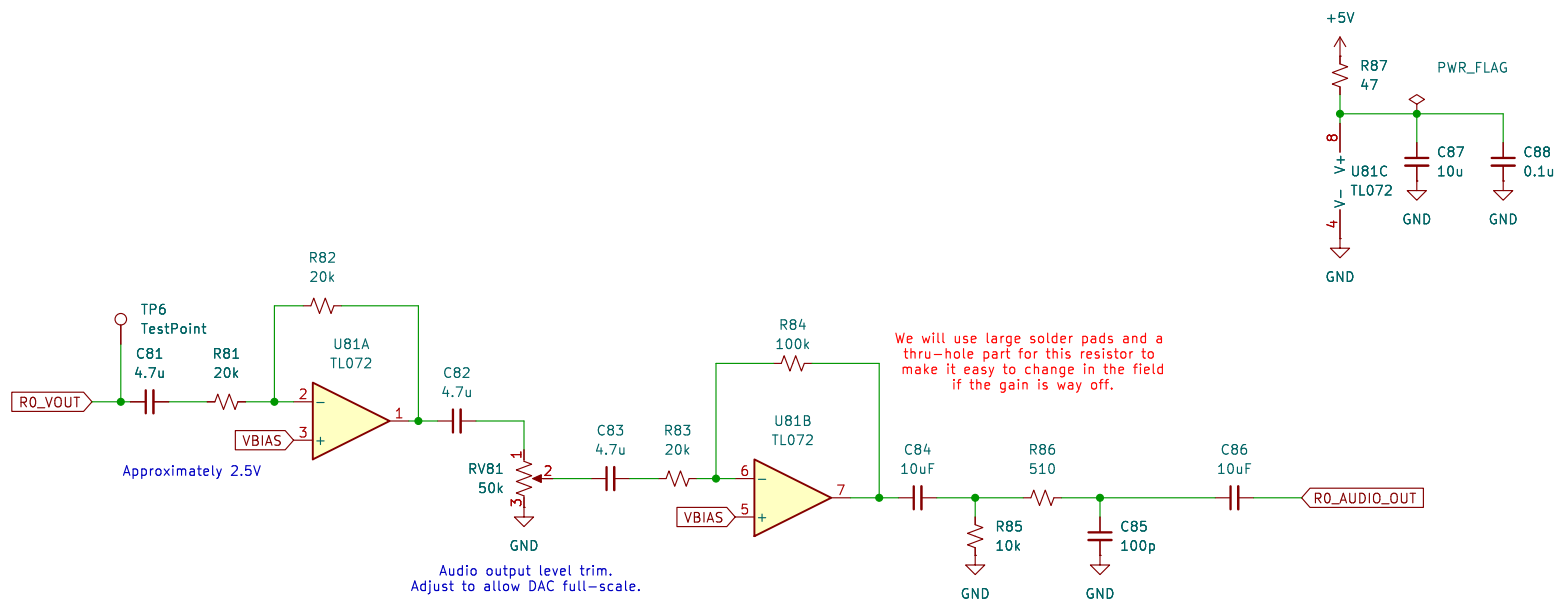
Figure 16. Normal x8 Interpolation Filter Frequency Response

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Sheet: /DAC/  
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Sheet: /Audio Out 0/  
File: audio\_out\_0.kicad\_sch

**Title: COS/CTCSS/PTT Controls (Radio 0)**

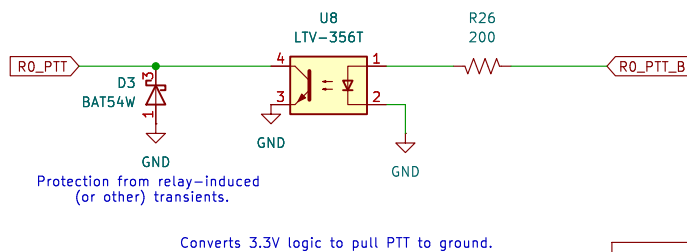
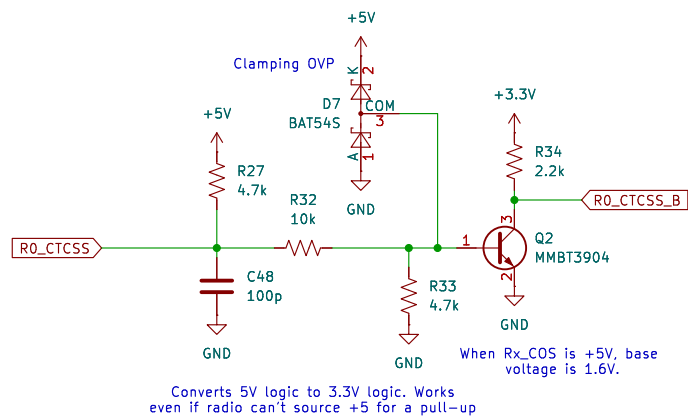
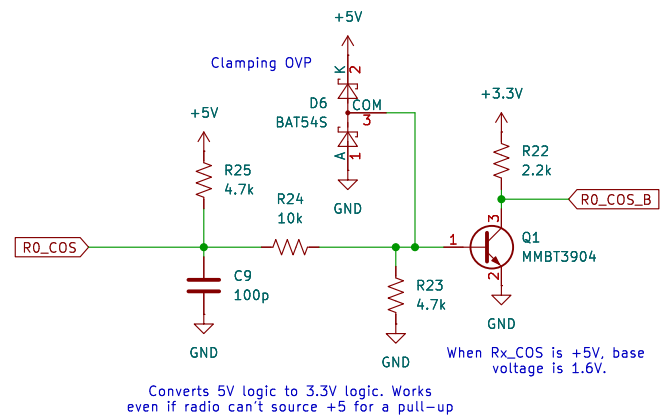
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Radio Side



Controller Side

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Sheet: /Controls 0/  
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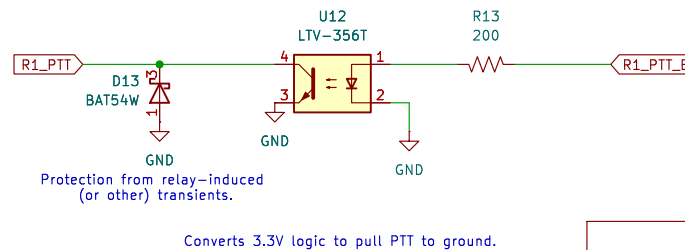
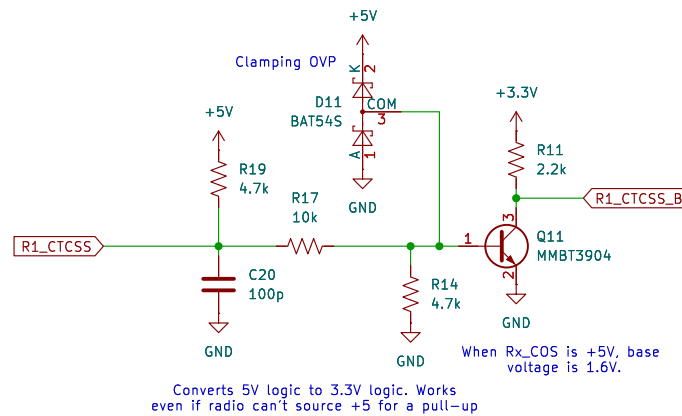
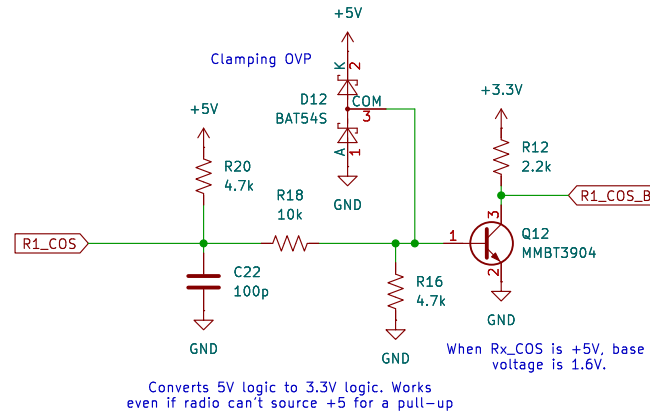
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Radio Side

Controller Side



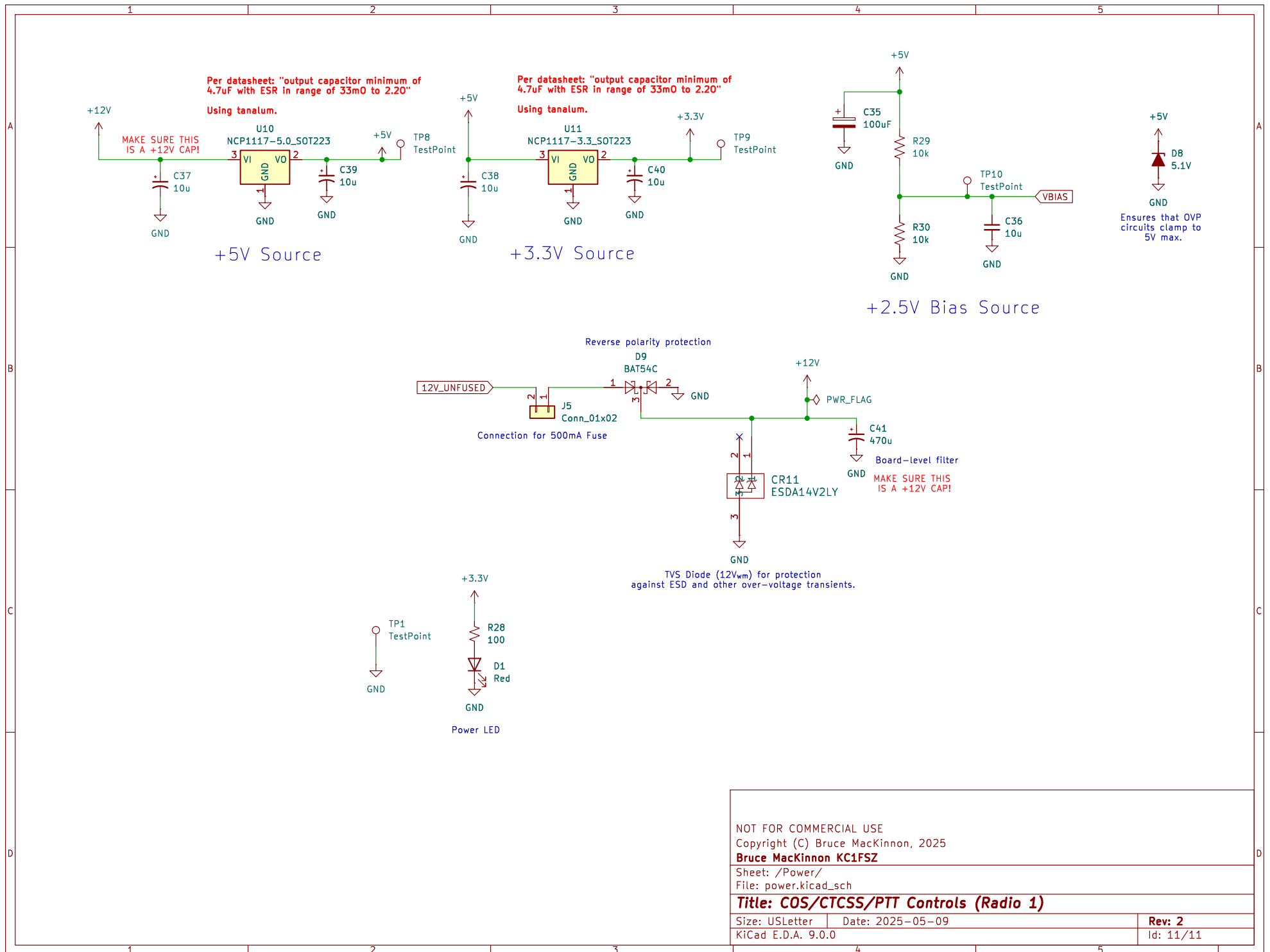
(Should be a copy of R0 controls)

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File: controls\_1.kicad\_sch

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Sheet: /Power/  
File: power.kicad\_sch

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KiCad E.D.A. 9.0.0

Rev: 2  
Id: 11/11