

Digital Repeater Controller V2

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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.

Audio In 0



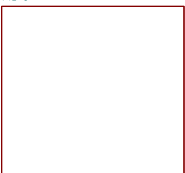
File: audio_in_0.kicad_sch

Audio In 1



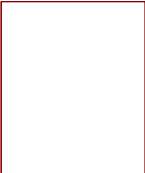
File: audio_in_1.kicad_sch

ADC



File: adc.kicad_sch

DAC



File: dac.kicad_sch

Audio Out 0



File: audio_out_0.kicad_sch

Audio Out 1



File: audio_out_1.kicad_sch

Controls 0



File: controls_0.kicad_sch

Controls 1

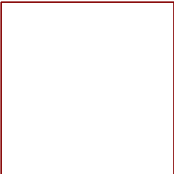


File: controls_1.kicad_sch

Connectors



Power



File: power.kicad_sch

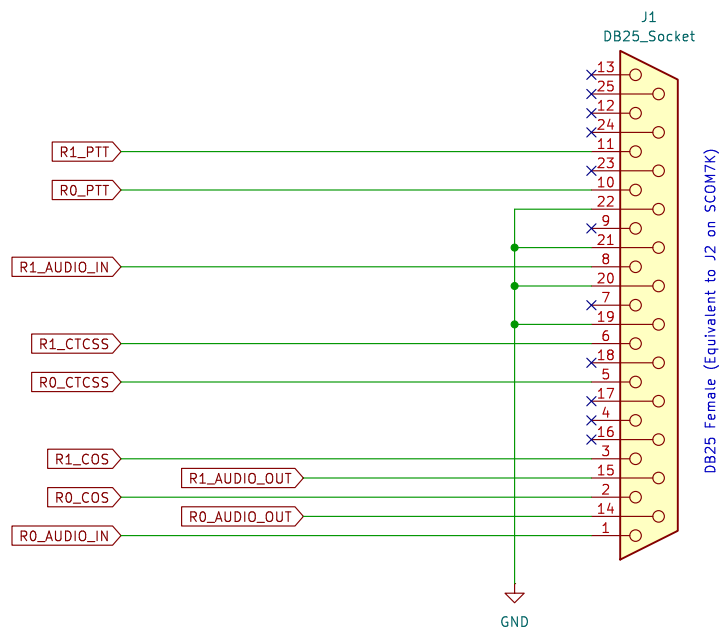
- H1 MountingHole
- H2 MountingHole
- H3 MountingHole
- H4 MountingHole

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Sheet: /
File: if-2.kicad_sch

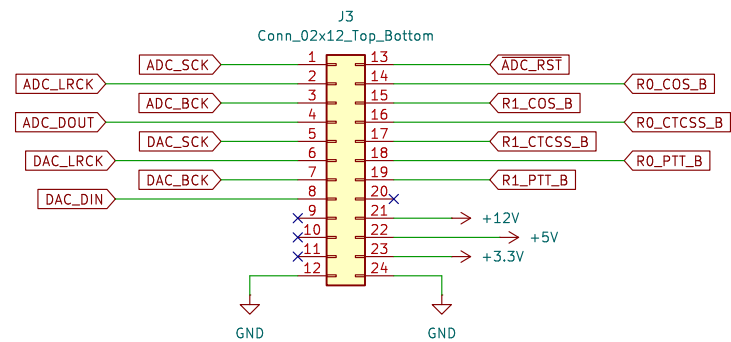
Title: Digital Repeater Controller

Size: USLetter Date: 2025-03-18
KiCad E.D.A. 9.0.0

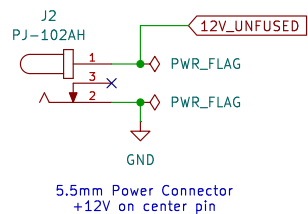
Rev: 2
Id: 1/11



DB25 To Radios



Ribbon Cable to Digital Board



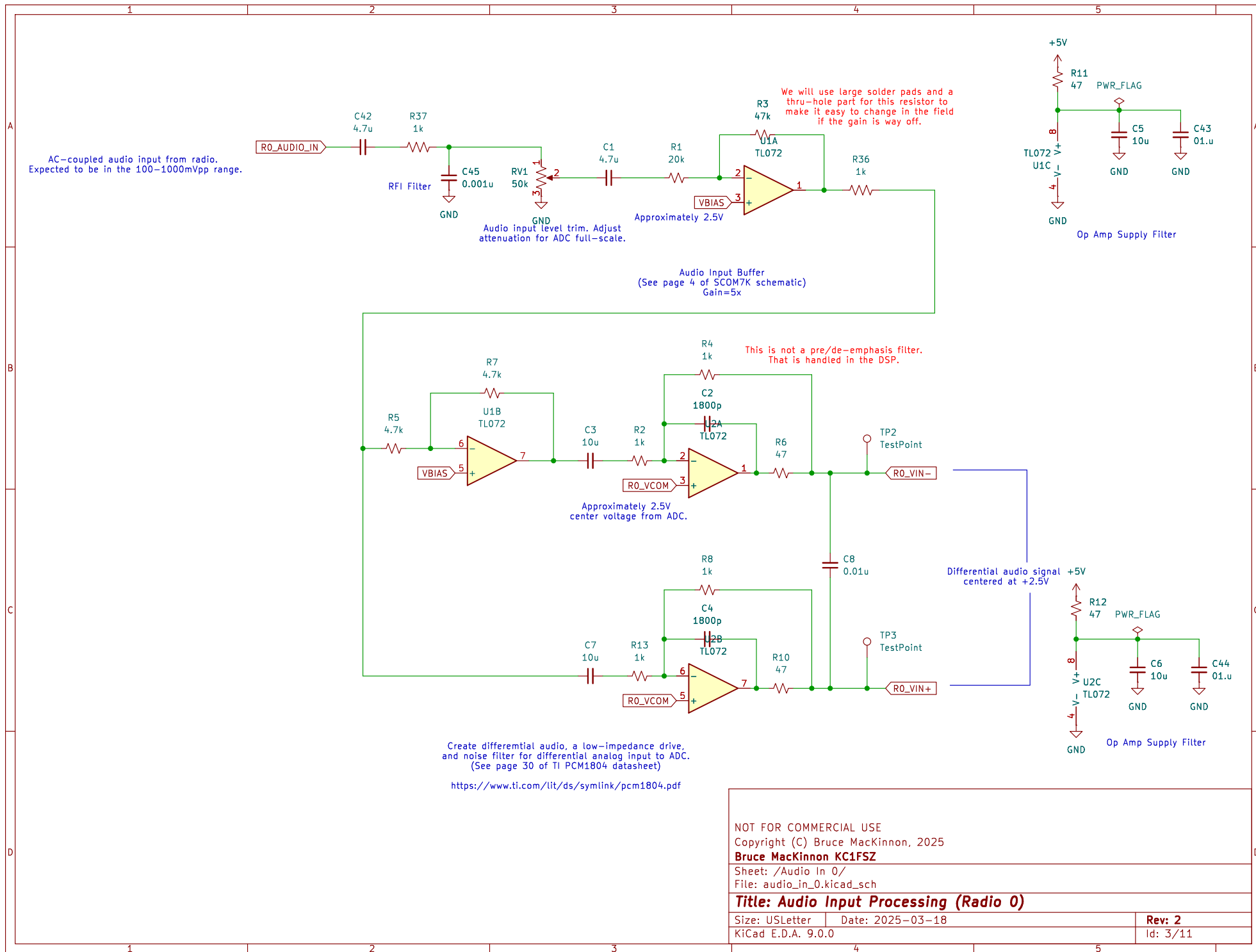
5.5mm Power Connector
+12V on center pin

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Sheet: /Connectors/
File: connectors.kicad_sch

Title: Connectors

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Id: 2/11





(Will Be Copy of R0 Audio Input)

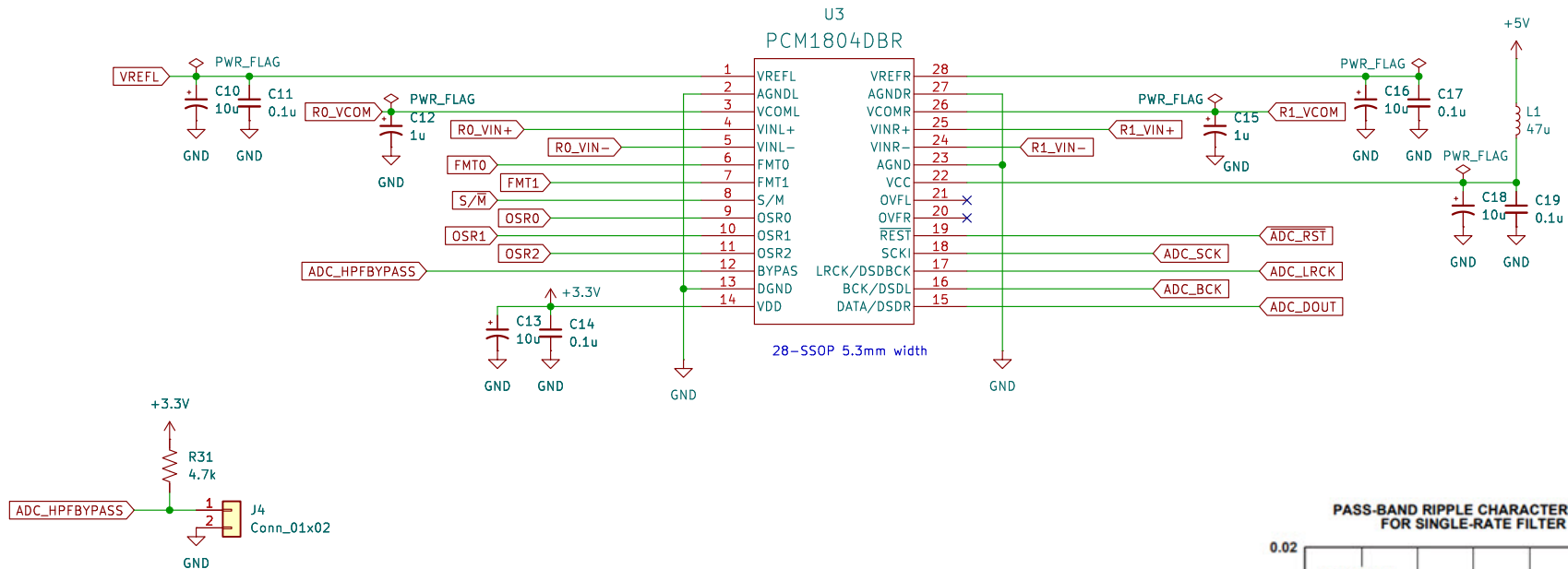
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Sheet: /Audio In 1/
File: audio_in_1.kicad_sch

Title: Audio Input Processing (Radio 1)

Size: USLetter Date: 2025-03-18
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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.

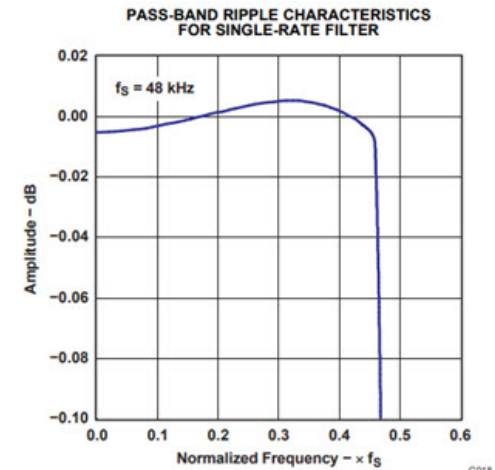
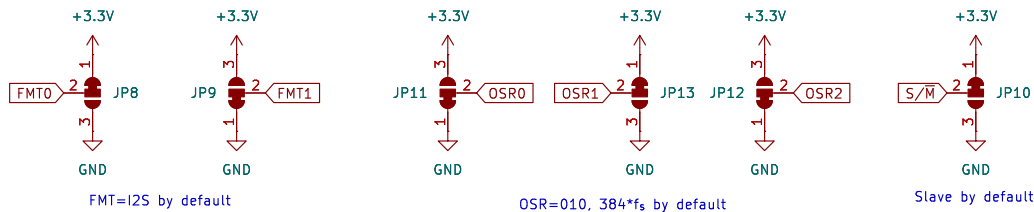


Figure 18.

Configuration Solder Bridges



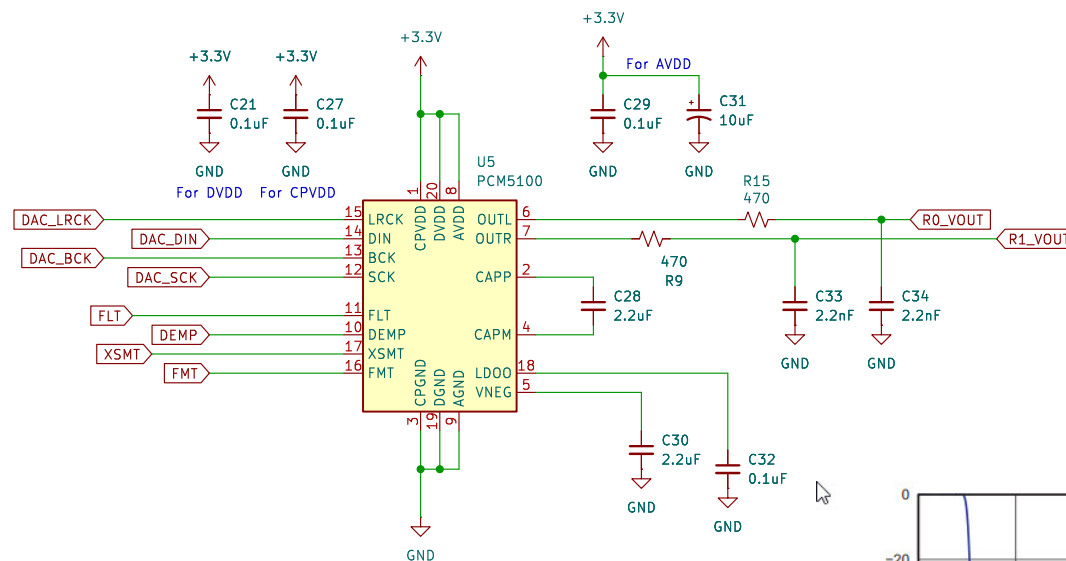
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Copyright (C) Bruce MacKinnon, 2025
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Sheet: /ADC/
File: adc.kicad_sch

Title: Analog To Digital Converter

Size: USLetter Date: 2025-03-18
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Rev: 2
Id: 5/11

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

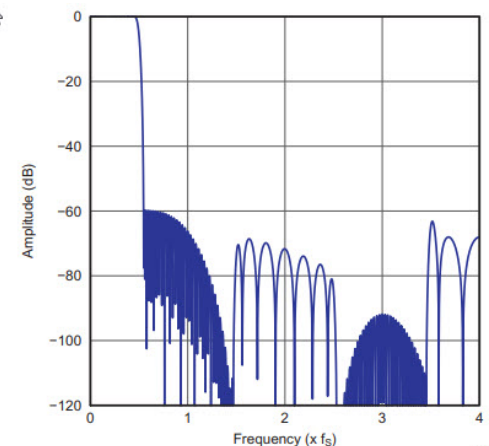
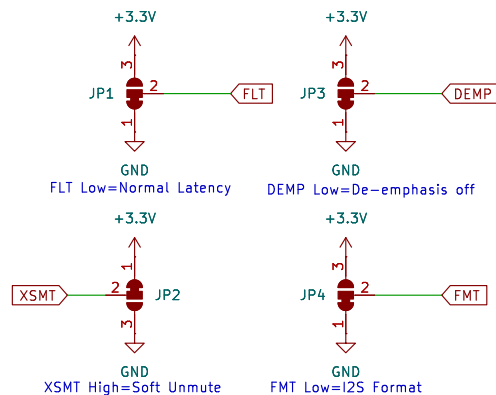


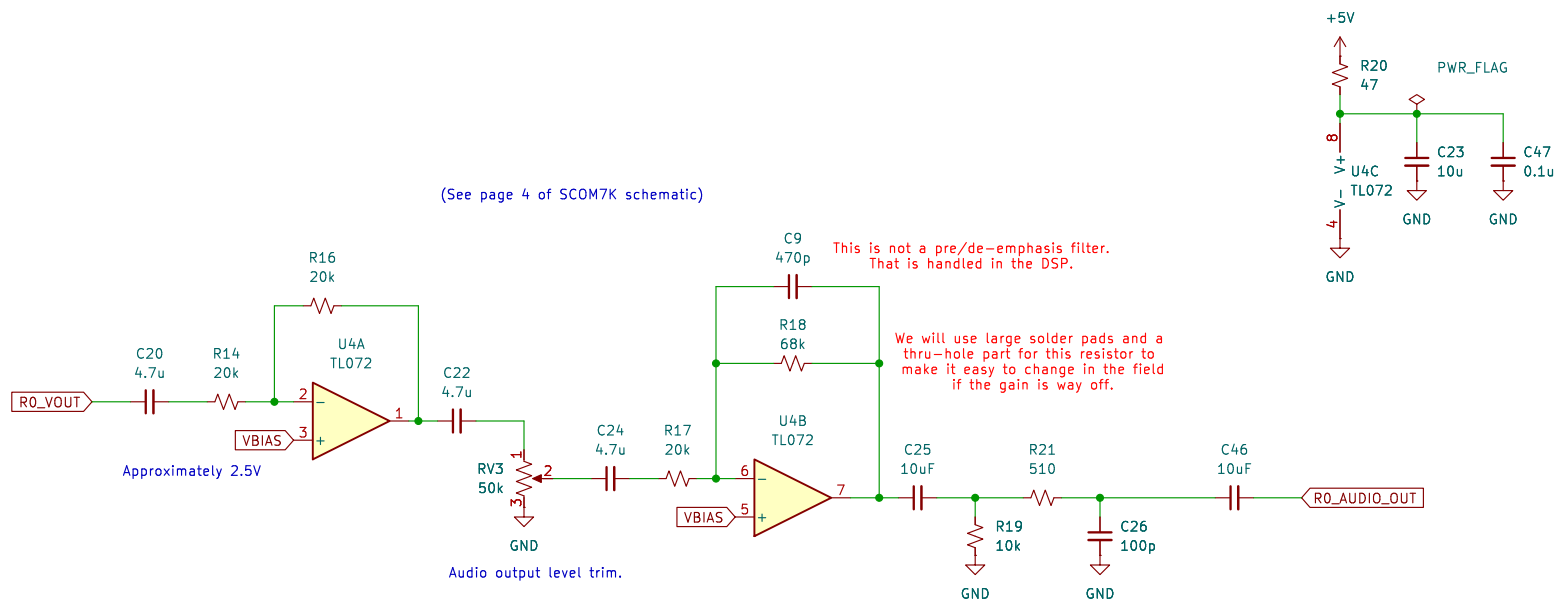
Figure 16. Normal x8 Interpolation Filter Frequency Response

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Sheet: /DAC/
File: dac.kicad_sch

Title: Digital to Analog Converter

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Sheet: /Audio Out 0/
File: audio_out_0.kicad_sch

Title: Audio Output Processing (Radio 0)

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(Will Be Copy of R0 Audio Output)

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Sheet: /Audio Out 1/
File: audio_out_1.kicad_sch

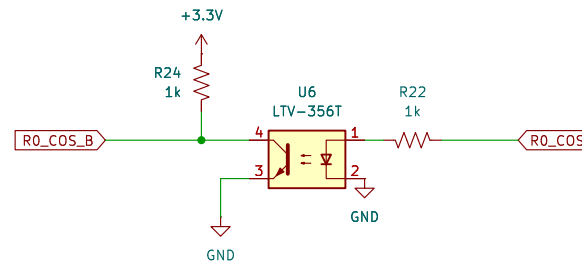
Title: Audio Output Processing (Radio 0)

Size: USLetter Date: 2025-03-18
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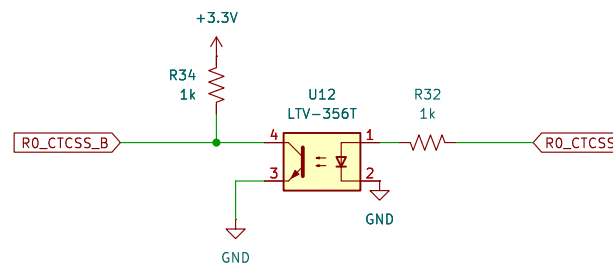
Rev: 2
Id: 8/11

Controller Side

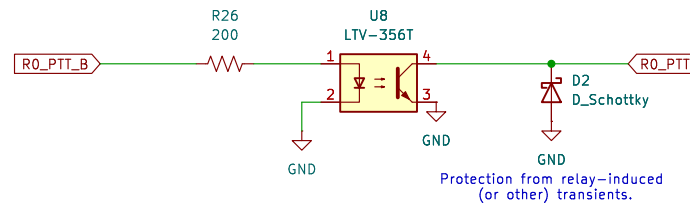
Radio Side



Converts radio COS signals to 3.3V logic.
TODO: Validate max current on LTV-353T input.



Converts radio CTCSS signals to 3.3V logic.
TODO: Validate max current on LTV-353T input.



Converts 3.3V logic to pull PTT to ground.

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Sheet: /Controls 0/
File: controls_0.kicad_sch

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

Size: USLetter Date: 2025-03-18
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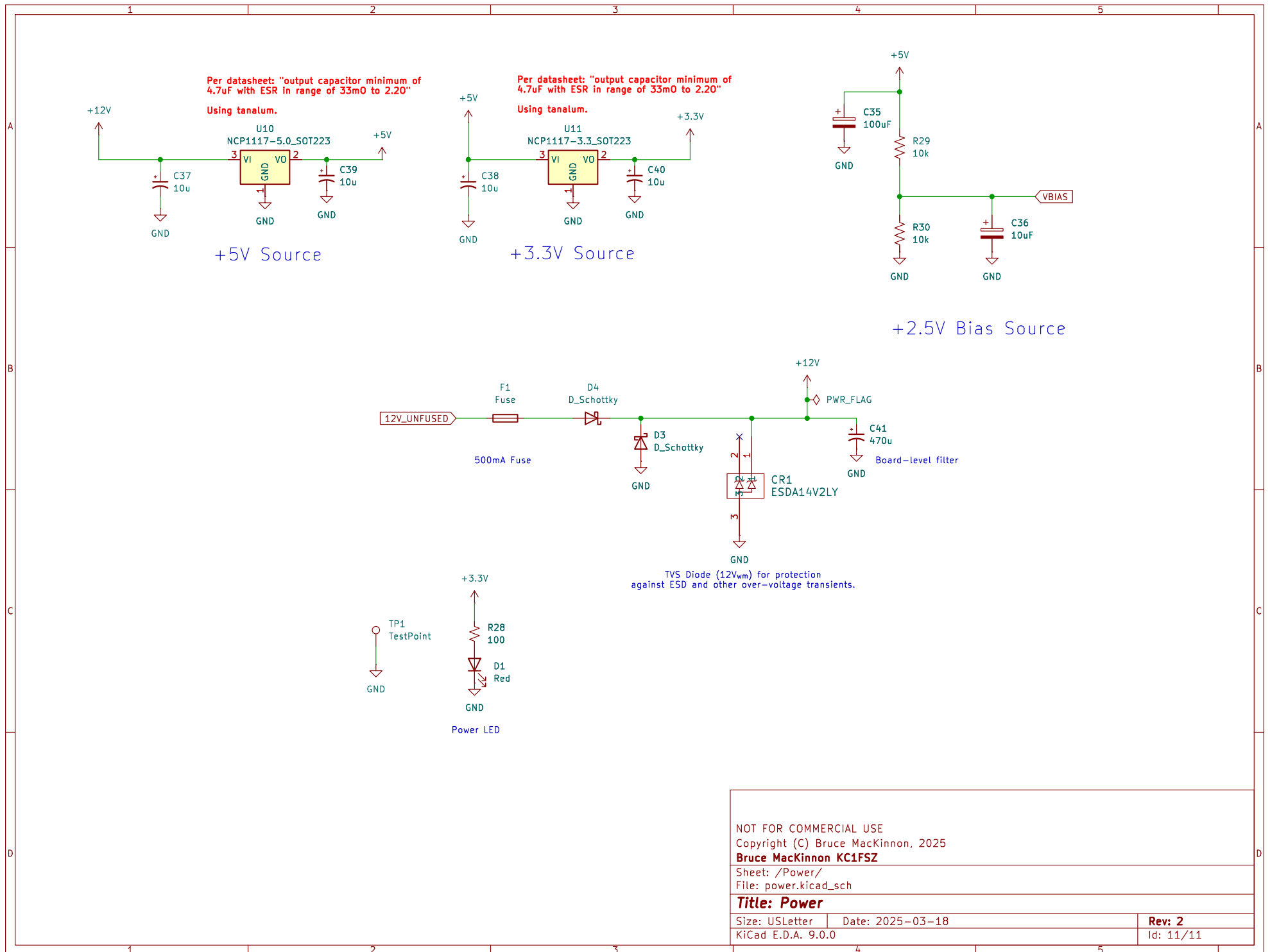
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(Will Be Copy of R0 Controls)

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Sheet: /Controls 1/
File: controls_1.kicad_sch

Title:

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Sheet: /Power/
File: power.kicad_sch

Title: Power

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Rev: 2
Id: 11/11