

# 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



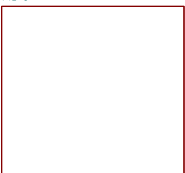
File: audio\_in\_0.kicad\_sch

Audio In 1



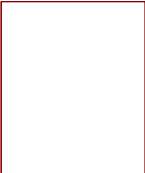
File: audio\_in\_1.kicad\_sch

ADC



File: adc.kicad\_sch

DAC



File: dac.kicad\_sch

Audio Out 0



File: audio\_out\_0.kicad\_sch

Audio Out 1



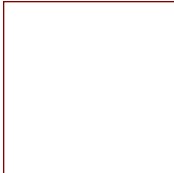
File: audio\_out\_1.kicad\_sch

Controls



File: controls.kicad\_sch

Power



File: power.kicad\_sch

Connectors



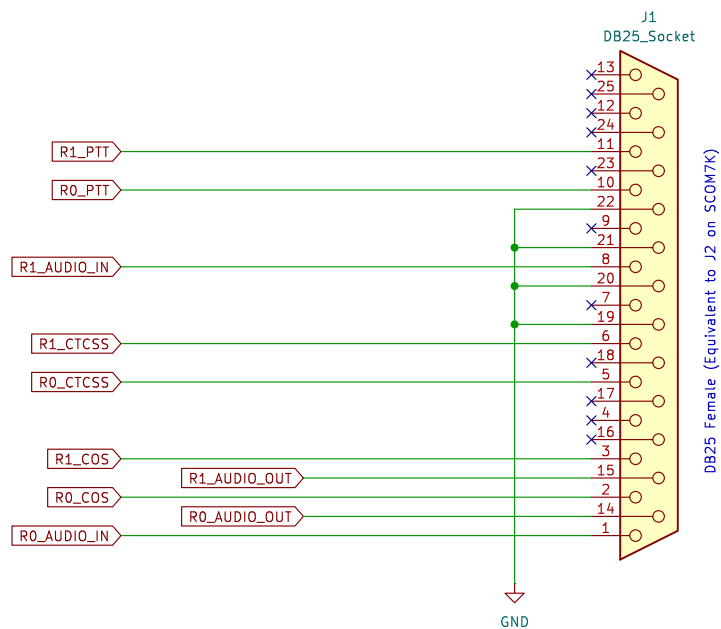
- H1 MountingHole
- H2 MountingHole
- H3 MountingHole
- H4 MountingHole

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

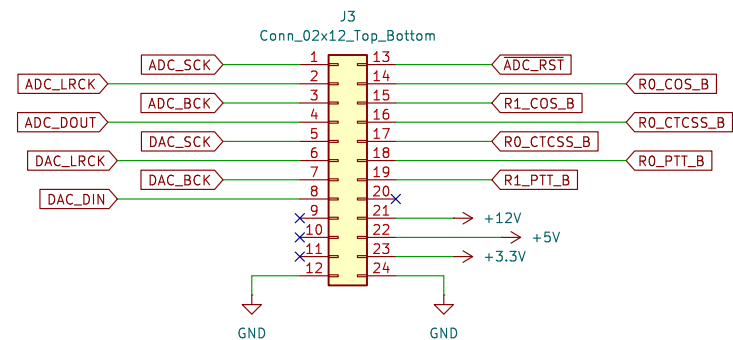
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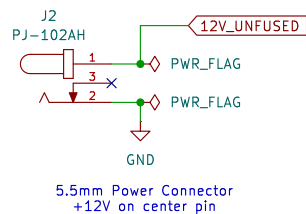
**Rev: 2**  
Id: 1/10



DB25 To Radios



Ribbon Cable to Digital Board



5.5mm Power Connector  
+12V on center pin

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# **Title: Connectors**

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(Will Be Copy of R0 Audio Input)

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**Title: Audio Input Processing (Radio 1)**

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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.

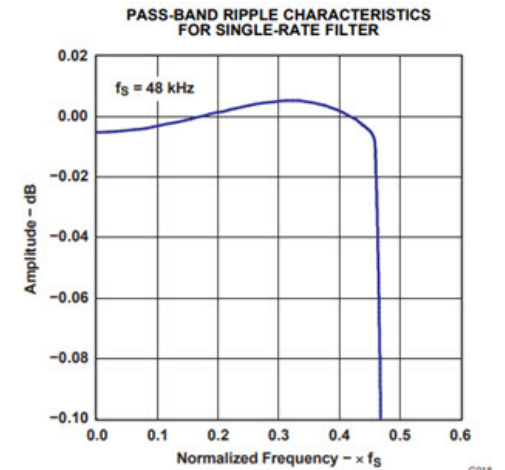
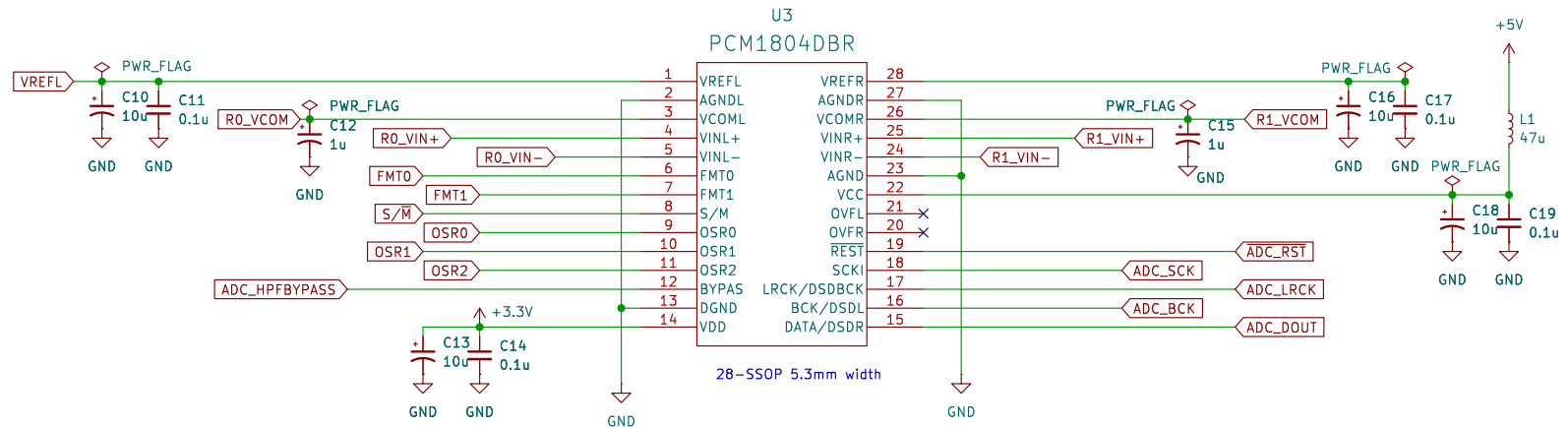


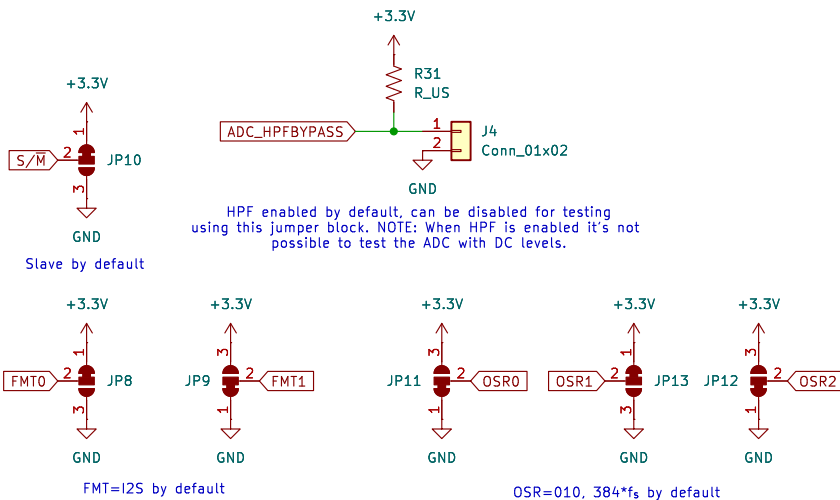
Figure 18.

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File: adc.kicad\_sch

### Title: Analog To Digital Converter

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Slave by default

FMT=I2S by default

OSR=010, 384\* $f_s$  by default

The TI PCM5100 is a 24-bit stereo digital to analog converter designed for audio applications. It contains an integrated low-pass reconstruction 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.

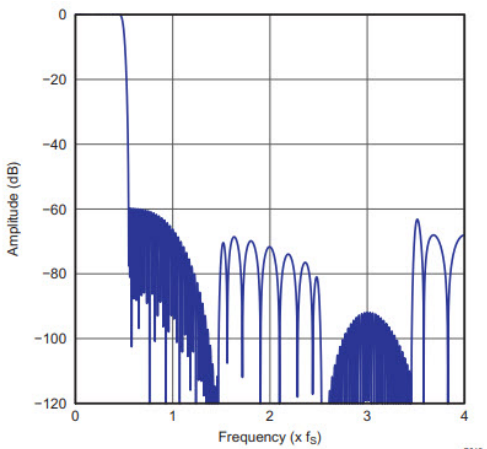
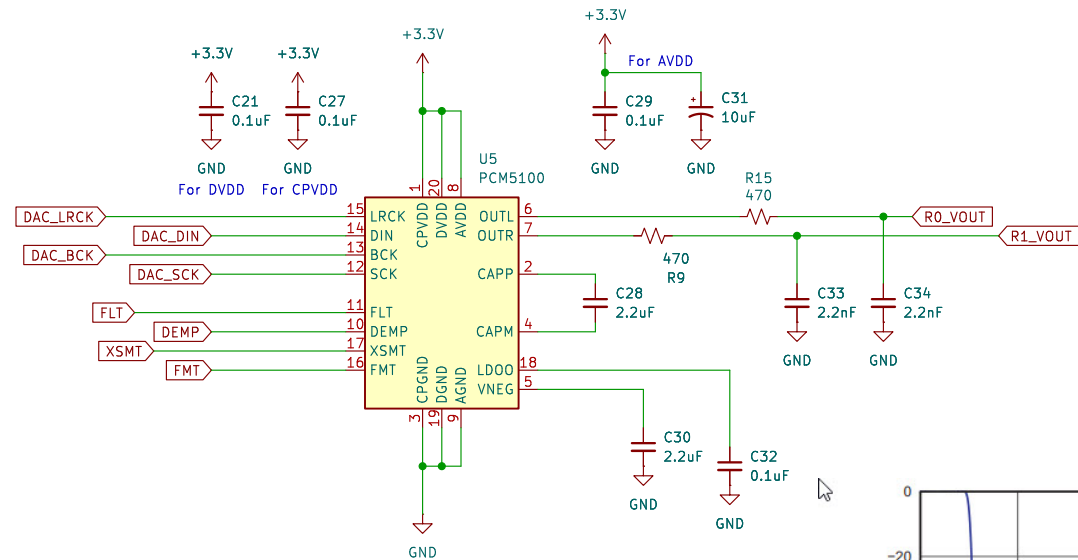
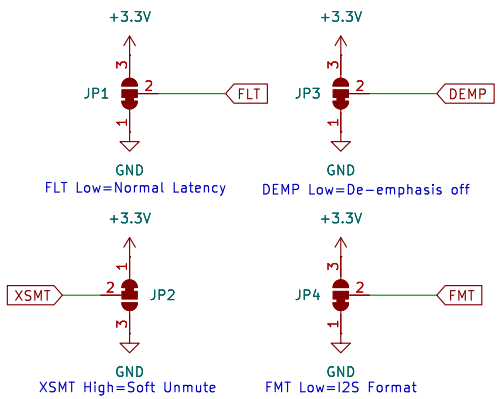


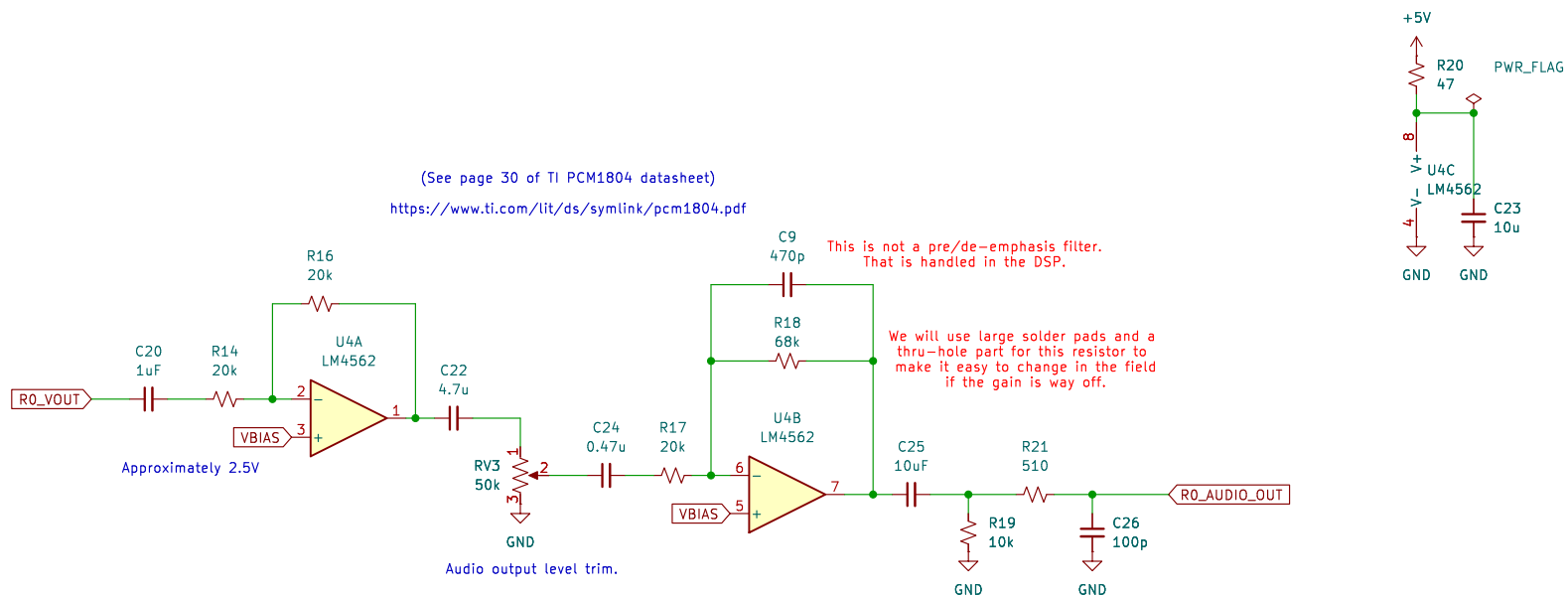
Figure 16. Normal x8 Interpolation Filter Frequency Response



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Sheet: /DAC/  
File: dac.kicad\_sch

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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 R1 Audio Output)

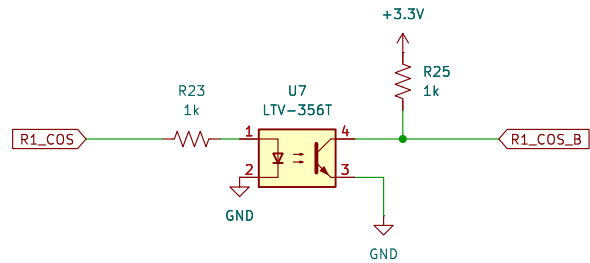
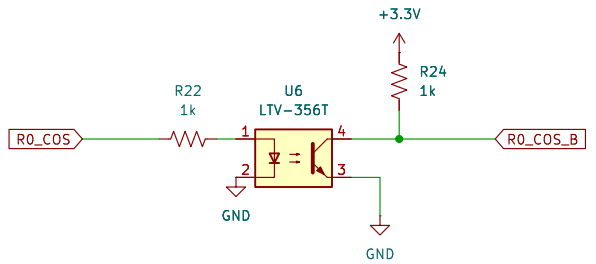
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Sheet: /Audio Out 1/  
File: audio\_out\_1.kicad\_sch

**Title: Audio Output Processing (Radio 0)**

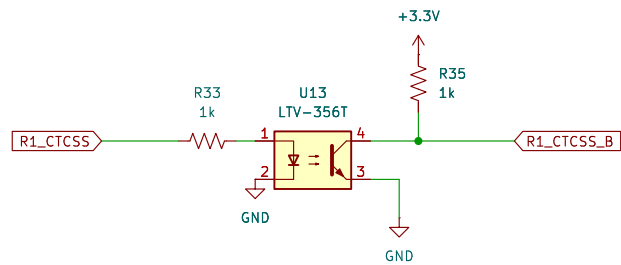
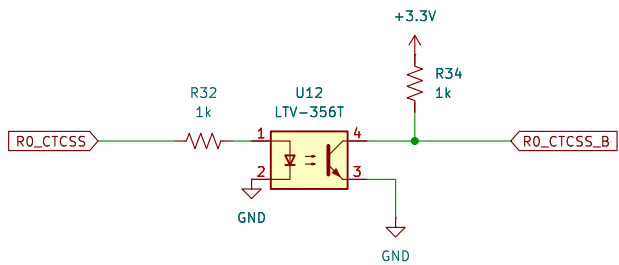
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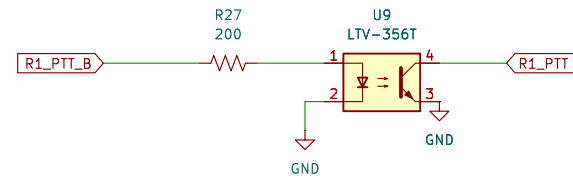
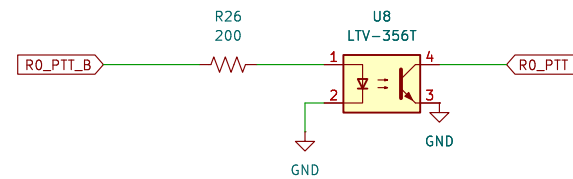




Converts radio COS signals to 3.3V logic.  
 TODO: Validate max current on LTV-353T input.



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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 File: controls.kicad\_sch

### Title: COS/CTCSS/PTT Controls

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