Component Selection

Op-Amp Selection:

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LF353-N – Dual OpAmp

|  |  |
| --- | --- |
| Slew Rate (typical) | 13 |
| GBWP | 4 |
| Supply voltage (typical) | 15 V |
| Supply voltage (max) | 18 V |
| Supply current |  |
| Output voltage |  |
| Output current |  |
| Input noise voltage |  |
| Total harmonic distortion | 3.6 – 6.5 |
|  |  |

MC33079P –

|  |  |
| --- | --- |
| Slew Rate (typical) | 7 |
| GBWP | 16 MHz |
| Supply voltage (typical) |  |
| Supply voltage (max) | 18V |
| Supply current |  |
| Output voltage |  |
| Output current |  |
| Input noise voltage |  |
| Total harmonic distortion |  |
|  |  |

MCP6292

|  |  |
| --- | --- |
| Slew Rate (typical) |  |
| GBWP | 10 MHz |
| Supply voltage (typical) | 2.4 – 6 V |
| Supply voltage (max) | 7 |
| Supply current | IQ = 1mA |
| Output voltage |  |
| Output current |  |
| Input noise voltage |  |
| Total harmonic distortion |  |
|  |  |

TL082

|  |  |
| --- | --- |
| Slew Rate (typical) | 20 |
| GBWP |  |
| Supply voltage (typical) | 5-15, -5 to -15 |
| Supply voltage (max) |  |
| Supply current |  |
| Output voltage |  |
| Output current |  |
| Input noise voltage |  |
| Total harmonic distortion | 0.003% |
|  |  |

Regarding Ian Edwards radar:

Wouldn’t the bandpass filter for the transmitter circuit be redundant – seeing as though the barrel ultrasonic transmitter can only send signals in the region of 39 kHz – 41 kHz anyway, so signals out of this frequency region would not be transmitted even without a bandpass filter attenuating it.

With regards to the calculation of the bandwidth of the radar system – where the maximum doppler frequency is calculated by using an expected value for the fastest target speed – eg. Max. doppler frequency calculated to be 20kHz, then the bandwidth of the system could be stated as +-20kHz from the critical frequency (40kHz) – my question is why can’t the bandwidth be from 0Hz – 60kHz (the highest frequency of interest) then a lowpass filter could be used in the receiver circuit instead of a bandpass filter that would have been for 20kHz – 60kHz. I know that the GBWP would then be increased, with a larger bandwidth, and so a higher spec OpAmp may be needed than if the bandwidth was 40kHz.

My Ultrasonic radar system

* Transmitter: Lowpass filter to attenuate high frequency components caused by DAC quantisation. Need to test if a low-order high pass filter needs to be implemented, by testing and plotting the spectrum of the transmit signal.
* Measure the received signal and plot the spectrum to reveal how much of attenuation is needed, helping to calculate the order of the high-pass filter – which is needed to attenuate signals from 0Hz – 20kHz which may cause interference. Also, need to look at implementing a filter to attenuate higher frequency signals (lowpass filter) because we cannot allow for signals that are greater than half of the sampling frequency to be passed through, due to Nyquist criterion on avoiding aliasing.

If the maximum Doppler frequency is 20kHz, the frequencies of interest would be between 20kHz – 60kHz (40kHz bandwidth)

* A clamping circuit (adding DC bias) may not be needed in the receiver design because the receiver has two pins that are positive for the signal and ground, therefore the signal level should not be negative and thus there should not be need to add a DC bias
* A clipping circuit is vital in the receiver circuit because the sound card cannot receive signals which are greater than 5V in order to avoid damage to the card.