Keywords: HDTV, reconstuction filter, single supply amplifier

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APPLICATION NOTE 3520

Low-Cost, 30MHz, Triple-Channel HDTV Reconstruction Filter

Abstract: This application note describes how to use the MAX4382 triple amplifier to construct a low-cost, triple-channel, three-pole, lowpass Sallen-Key filter with a dual supply voltage. The circuit provides a Butterworth response with a 30MHz bandwidth, and is ideal for video-reconstruction filtering in HDTV applications. The MAX4382 is also shown as part of a single-supply, input-bias network with the same filter performance as the dual-supply configuration.

In HDTV applications, lowpass filters are used for reconstruction of RGB and component video (Y, Pb, and Pr) signals. They are placed following the video DAC to remove the higher frequency replicas of the signals, as well as before the ADC for anti-aliasing. The MAX4382 high-speed, triple-channel amplifier can be used to build such lowpass filters that are ideal for HDTV applications.

Figure 1 shows a one-channel, dual-supply configuration incorporating the MAX4382. It is a three-pole, Sallen-Key Butterworth lowpass filter, in which the current DAC generates the video signal, and the resistor (RL) sets the amplitude. With the MAX4382, the RL, R1, R2, C1, and C2 form a two-pole, Sallen-Key lowpass filter having a gain of 2. The driving load (75Ω) at the output, plus RT and Cp, sets the real pole. In the Figure 1 circuit, the -3dB bandwidth is about 30MHz (**Figure 2**). The attenuation is approximately 14dB at 44.25MHz, and 28dB at 74.25MHz. The group delay is roughly 6.5ns (**Figure 3**). If the current DAC load is different than 75Ω, just use the following relationship to set the value of R1: R1 + RL = 150Ω. For RL greater than 150Ω, C1, C2, R1, and R2 will need to be adjusted.

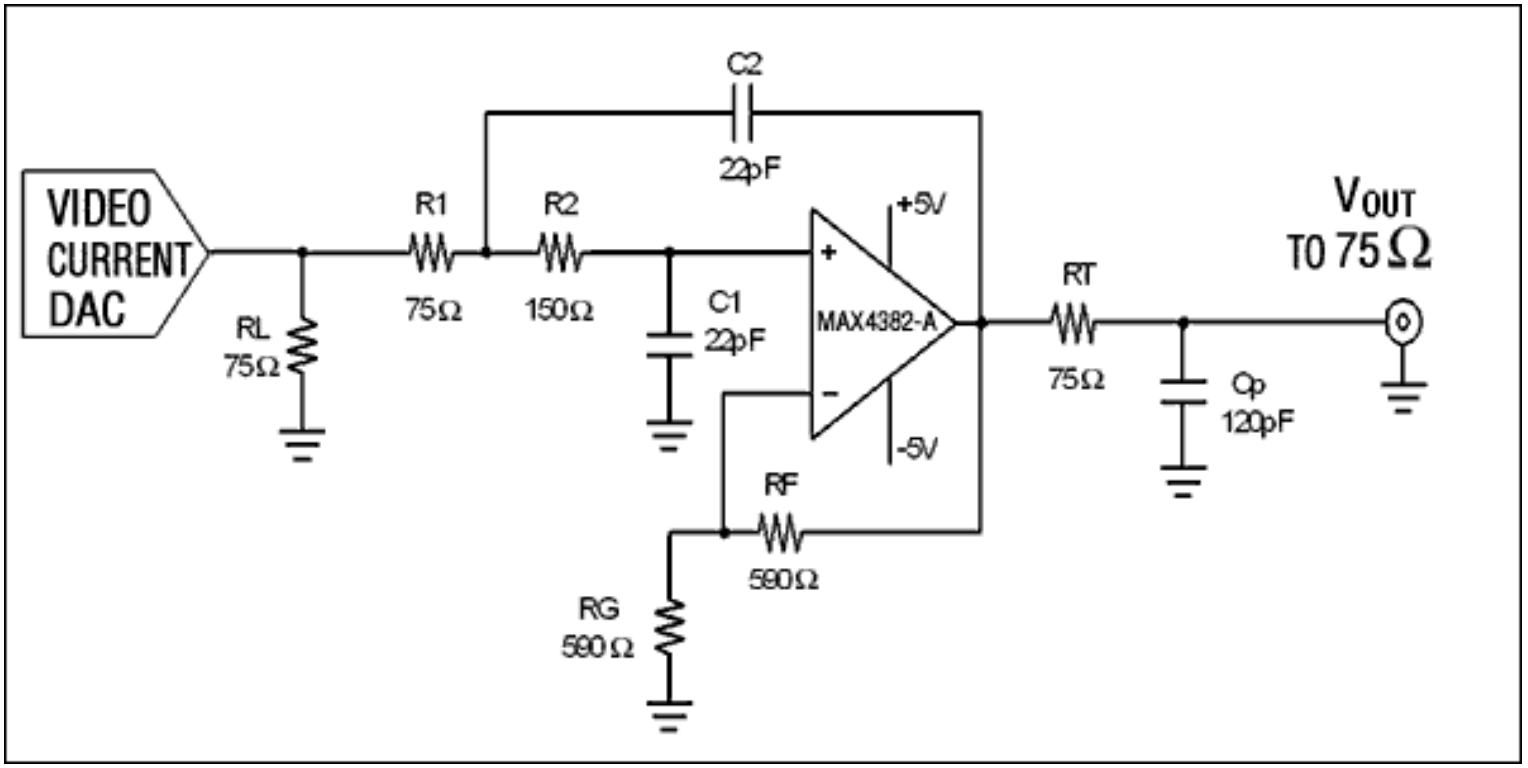

Figure 1. The MAX4382 in a three-pole, sallen-key, butterworth lowpass filter.

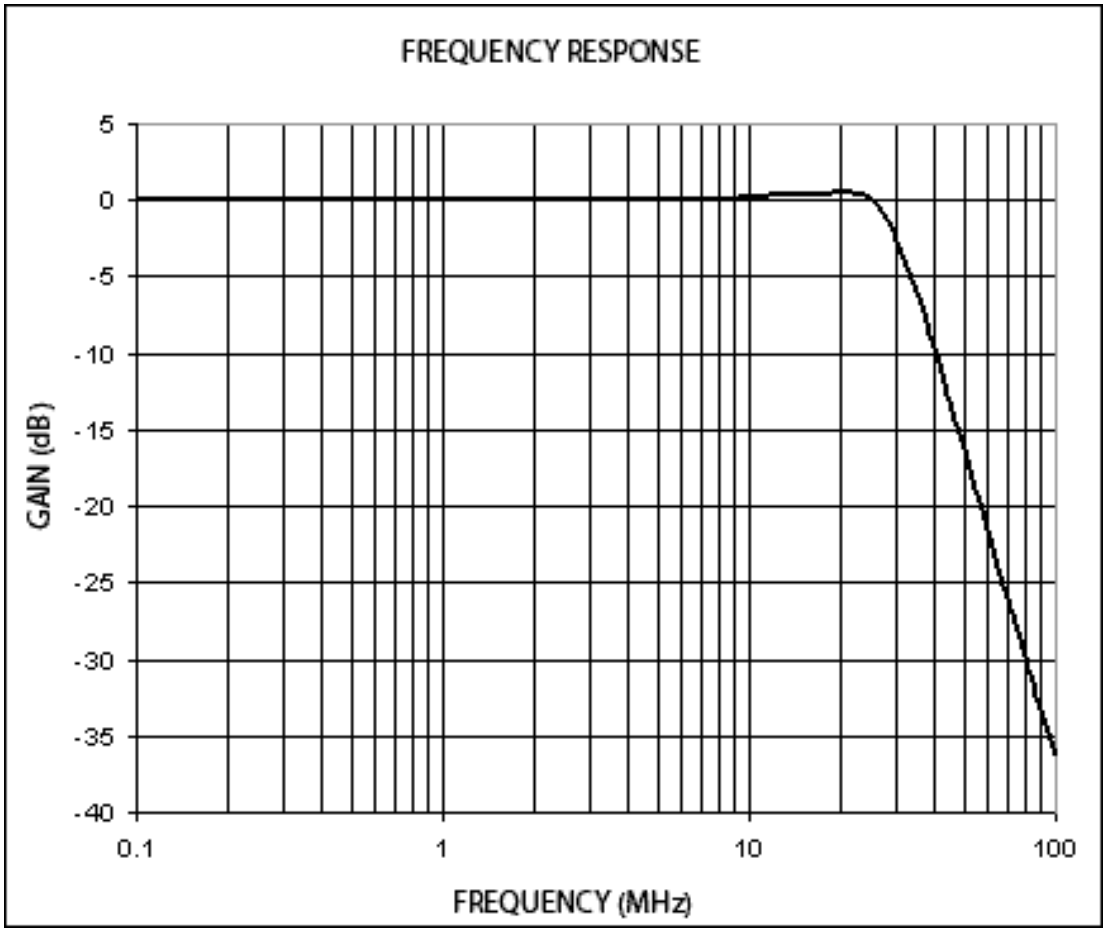

Figure 2. Gain vs. frequency of the circuit.

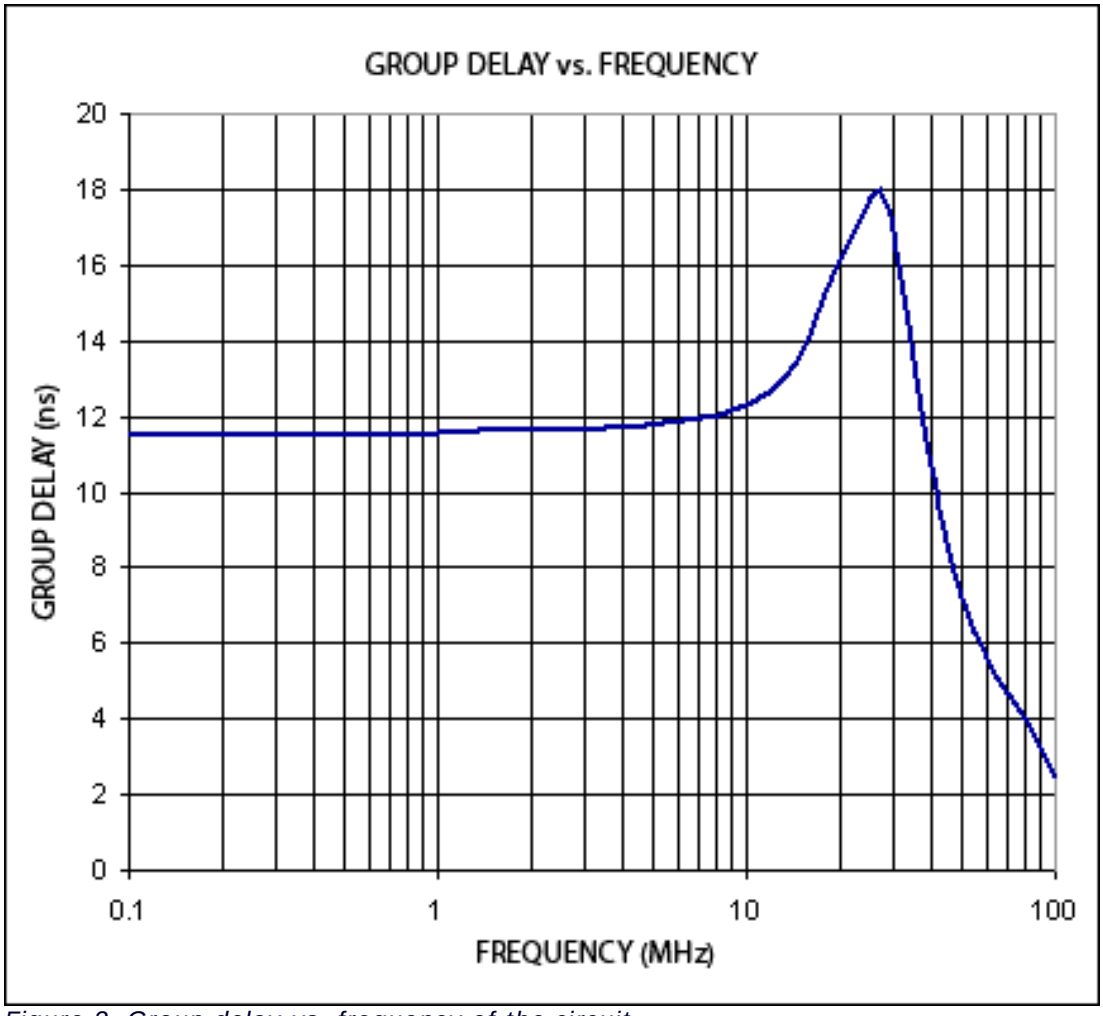

Figure 3. Group delay vs. frequency of the circuit.

In a single 5V-supply application, the video signal is normally from 0V to 1V. A DC bias is required at the input of the MAX4382 to prevent video-signal clipping at the amplifier's output. **Figure 4** shows a single-channel, input-bias network. R3, R4, and C3 are added together with RL to generate a 150mV DC bias at the input. The DC level at the amplifier's output is about 300mV, and is enough for the output stage to work linearly. R4 and C3 help to remove the supply noise. The filter performance is the same as in the dual-supply configuration.

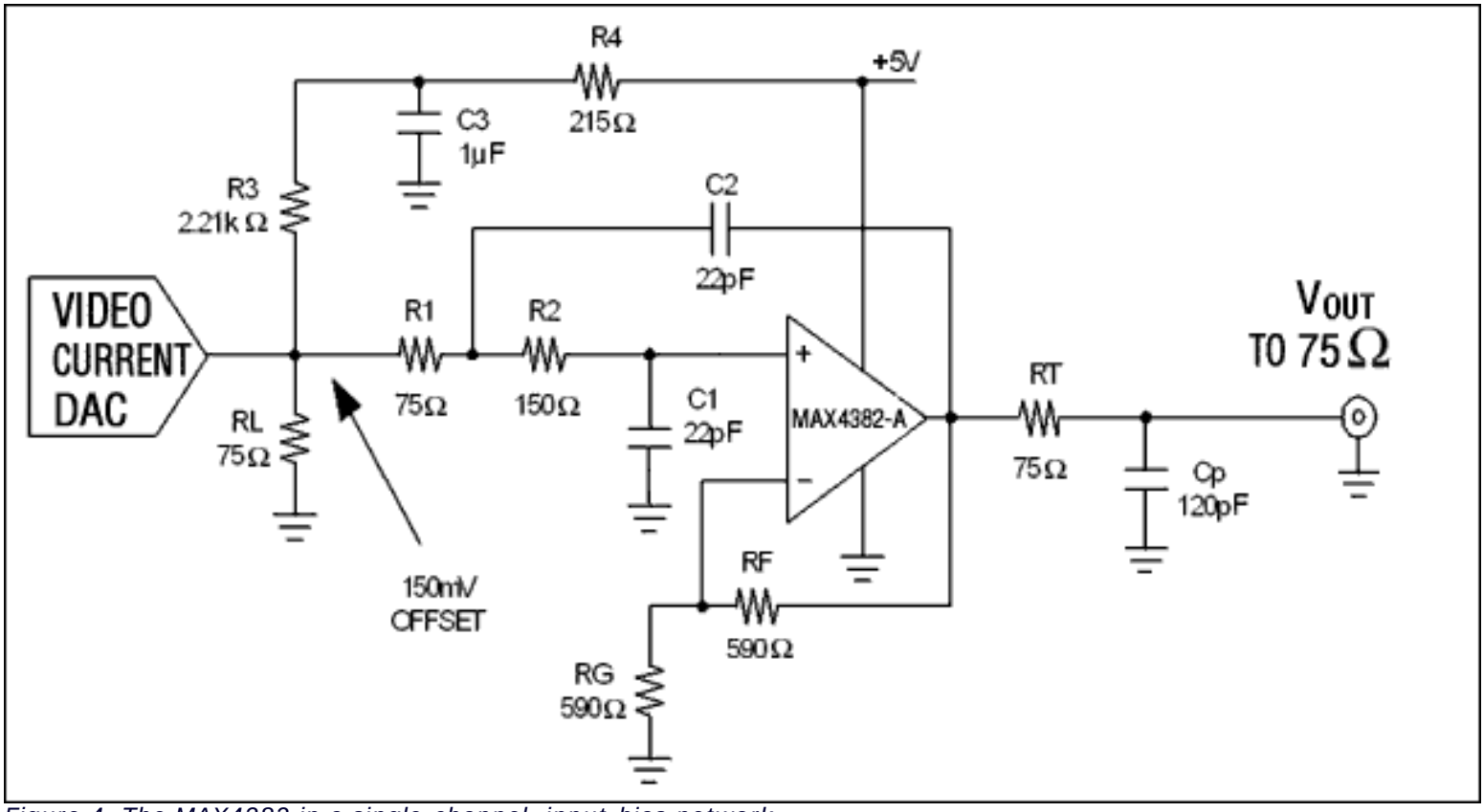

Figure 4. The MAX4382 in a single-channel, input-bias network.

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