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Application Brief 42024

Using the ML6428 as a Clamp and 27MHz Filter

INTRODUCTION

This Application Brief describes circuits which use the ML6428 as an anti-aliasing filter. Although the ML6428 was designed to be used as a reconstruction filter in an S-Video System, it can also be used as a low cost anti-aliasing filter. Separate Y and C outputs of DACs feed the Y and C inputs of the ML6428 when used as a reconstruction filter. Its outputs, Y, C, and CV (created by adding C to Y in the chip), will each drive 2V peak-to-peak into 150Ω or 1V peak-to-peak across a standard 75Ω termination resistor. Two versions of this chip exist: the ML6428-1 requires both its inputs and its outputs to be capacitively coupled; and the ML6428-2 requires its input to be capacitively coupled, but has a DC coupled output. Evaluation kits are available for each of these parts. Because the circuits differ, each part will be treated separately.

ML6428 OVERVIEW

The ML6428 anti-aliasing features include:

- 8th-order filter,
- DC coupled version for use in 5V systems,
- AC coupled version for use with ground-centered ADCs.

The ML6428 also has a sync tip clamp that stabilizes composite video prior to A/D conversion. This ensures that video clipping due to changes in average picture level is eliminated.

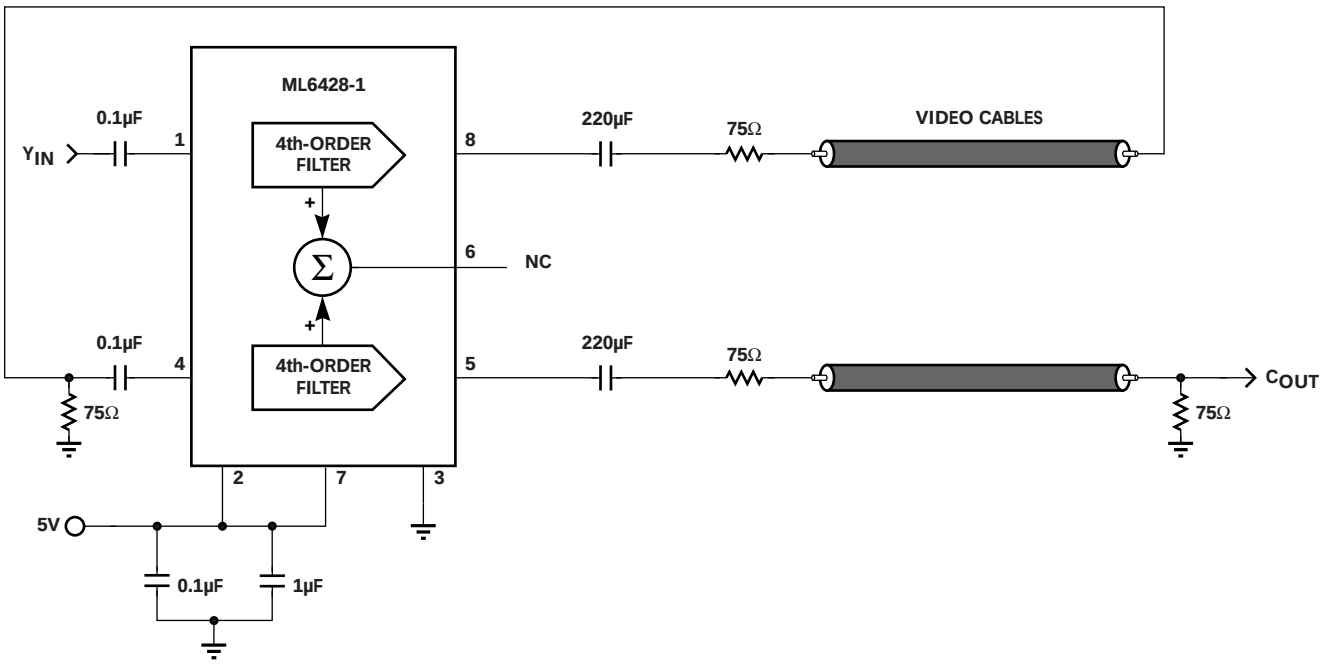

Figure 1. The ML6428-1 as an Anti-aliasing Filter

APPLICATION GUIDELINES

THE ML6428-1 AS AN ANTI-ALIASING FILTER

The ML6428-1 Evaluation Board may be used directly to evaluate the part as an anti-aliasing filter. First, composite video is fed into the Y input. Then, a short co-ax cable connects the Y out to the C in. Finally, filtered composite video is available at the C output connector.

The CV output should be left open. Figure 1 shows the circuit for this application using the evaluation board. Figure 2 illustrates signal rejection at 27MHz, a common sampling frequency. The upper 3dB frequency is shown in Figure 3.

Group delay is shown in Figure 4. Figure 5 documents DC restore performance for the complete filter, showing no difference between the input to the filter and the output from the filter. The 1V peak-to-peak output signal is symmetric about ground if the output is capacitively coupled. Although the evaluation circuit produces a flat frequency response, there are other circuits that will also work. The circuits in Figure 6 and Figure 8 consume less current and use lower cost components. It is necessary to keep stray capacitance to a minimum around the 240Ω resistors to avoid frequency rolloff.

THE ML6428-2 AS AN ANTI-ALIASING FILTER

As with the -1 part, the ML6428-2 Evaluation Board can be used to evaluate the chip as an anti-aliasing filter. Composite video is again fed into Y in, Y out is connected to C in, and the filtered output is present at the C out connector. The circuit is shown in Figure 7. Since the -1 and the -2 are identical except for output coupling capabilities, Figures 2, 3, 4, and 5 apply to both versions of the ML6428.

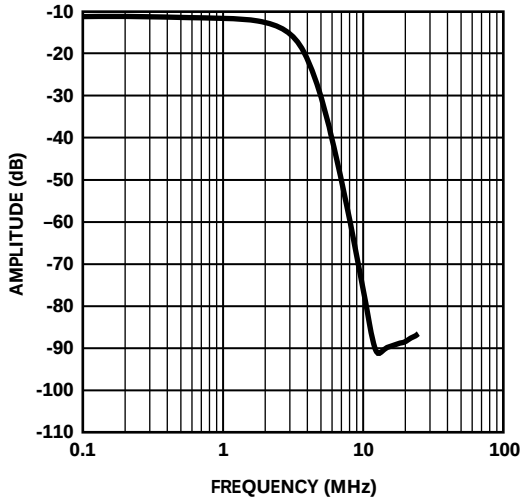

Figure 2. Passband/Stopband Rejection Ratio

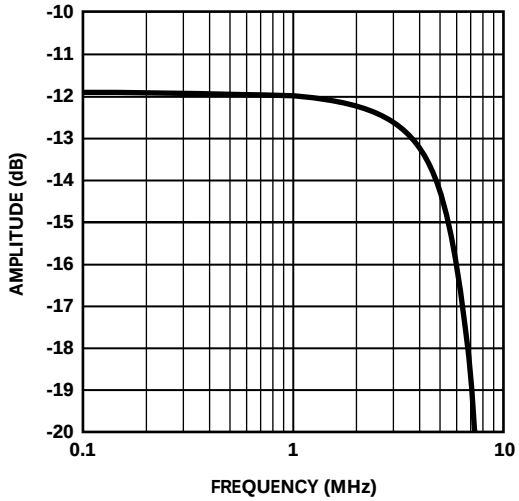

Figure 3. Passband

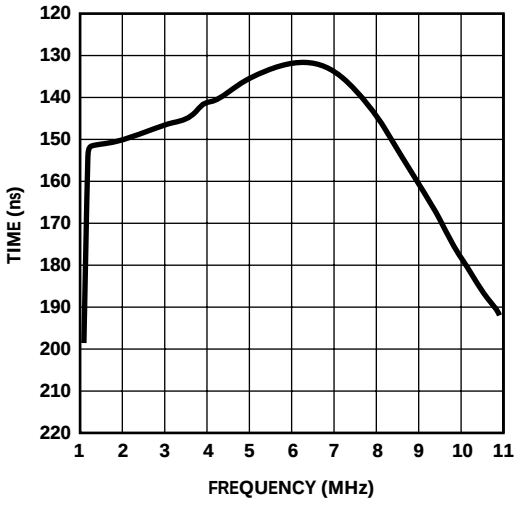

Figure 4. Group Delay

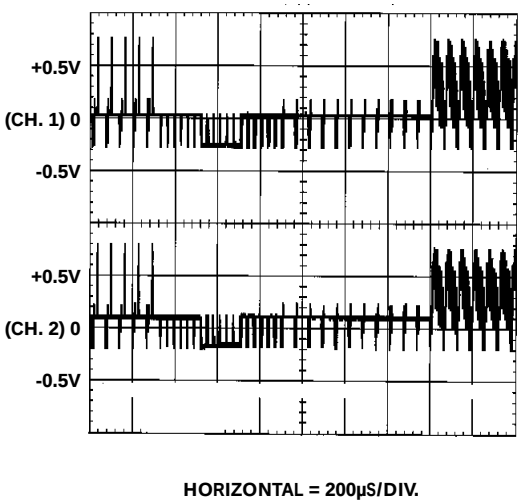

Figure 5. DC Restore Performance

APPLICATION GUIDELINES (Continued)

The direct coupled output of the -2, unlike the -1, places the 1V peak-to-peak signal one volt above ground (*i.e.*, the bottom of the sync tip is one volt above ground). The lower cost, direct coupled counterpart of Figure 7 is Figure 8. System design requirements will determine weather the -1 or the -2 version is appropriate for any anti-aliasing filter.

CONCLUSION

The ML6428 can be used for both anti-aliasing and reconstruction filter functions in standard TV, HDTV, and VGA video at 27MHz sample rates with minimum additional parts. This greatly simplifies TV and video DSP circuit design.

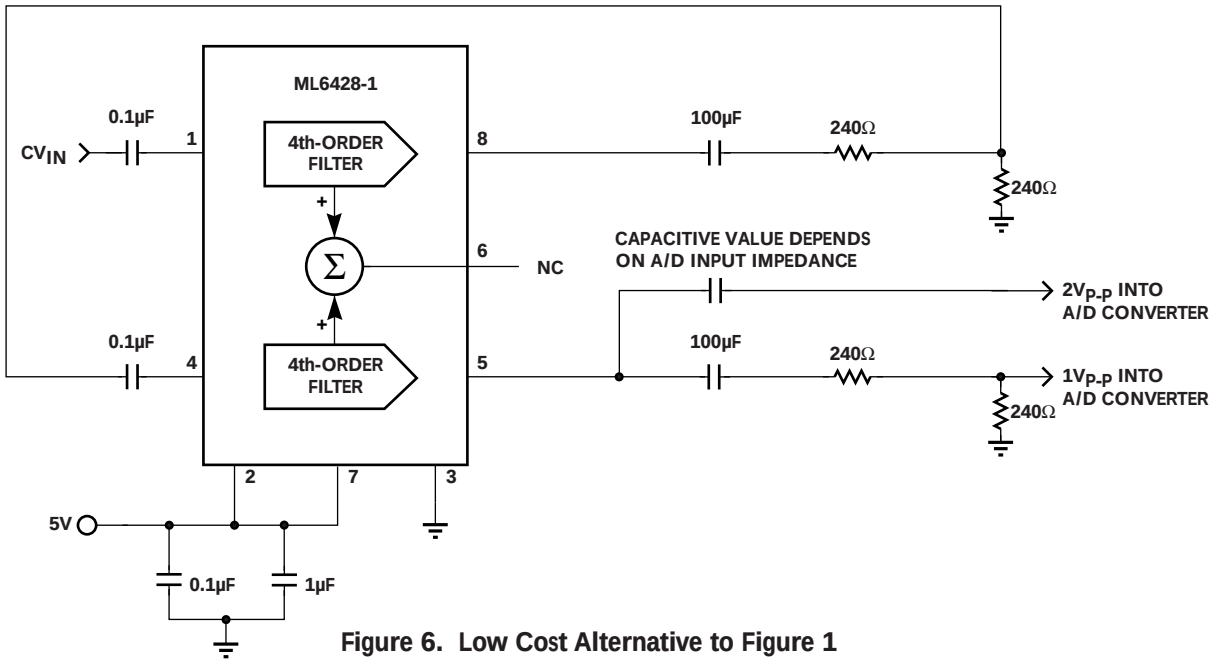

Figure 6. Low Cost Alternative to Figure 1

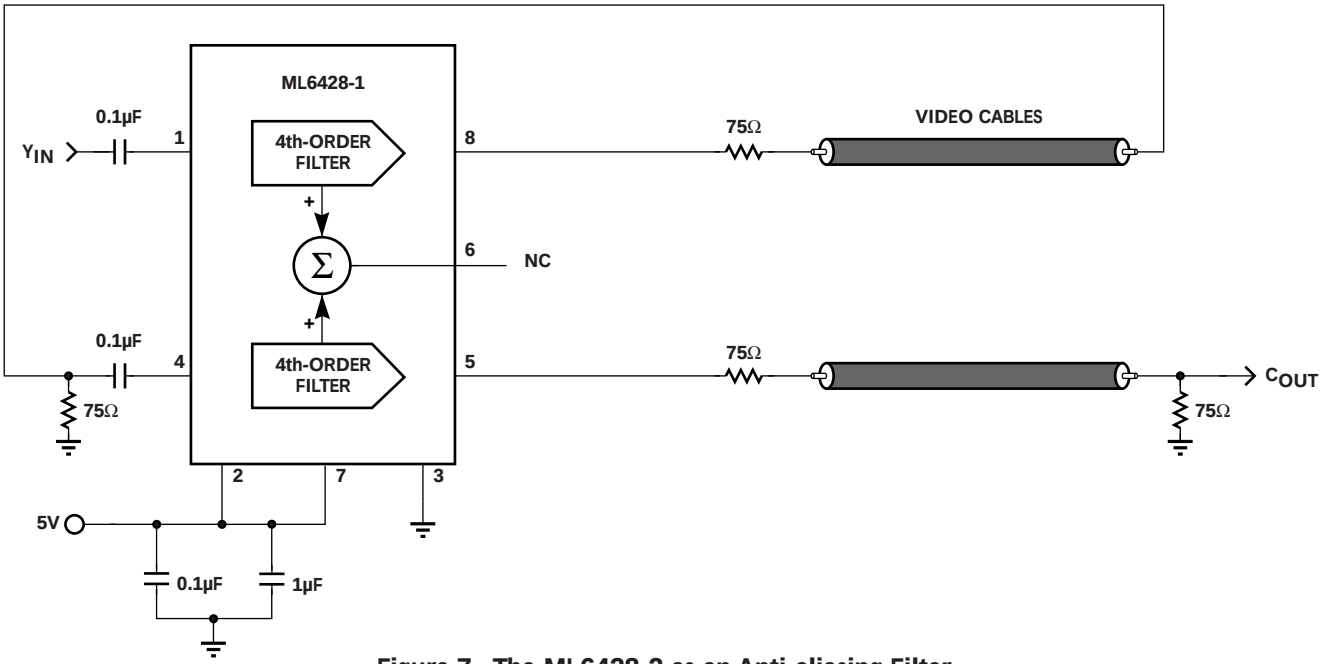

Figure 7. The ML6428-2 as an Anti-aliasing Filter

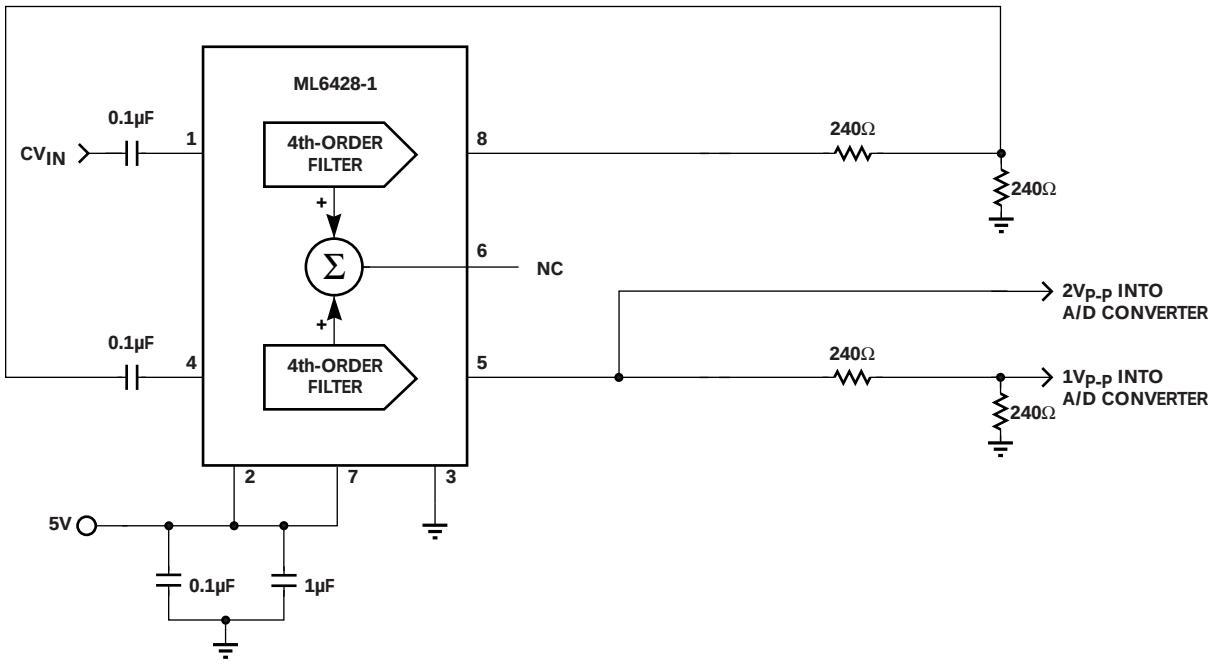

Figure 8. Low Cost Alternative to Figure 7