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Using the EL4342 and ISL59446 Triple Video MUX-Amps as A/V Source Selectors

Overview

The increasing number of A/V sources (VCR, DVD, set top box, etc.) in a typical home entertainment system presents the need for a simple way to select the desired source. Add-on mechanical switches available today are bulky, and prone to contact wear resulting in degraded performance over time. Solid state analog switches solve this problem, but passive switching of AC coupling capacitors in audio sources can produce an annoying thump as they are charged and discharged during the make or break action of the switch. This application note describes how to use the Intersil EL4342, fixed gain of 1, and ISL59446, fixed gain of 2 Triple 4:1 MUX amps to design simple audio-video source selection multiplexers that provide excellent performance while greatly reducing the annoying effects due to audio switching transients.

Circuit Description

The basic A/V multiplexer shown in Figure 1 uses the 4:1 Triple Video MUX amp to select any 1 of 4 external audio-video sources consisting of a composite video signal and stereo L-R audio channels. The circuit uses Channel A to select the 1 of 4 composite video sources, and channels B and C to select the stereo left and right audio channels. Channel select logic inputs S0 and S1 are binary coded and perform the input source selection according to the table in Figure 1. The HIZ logic input disables all 3 channels by placing their outputs into a high impedance state which disconnects the audio sources, and places the composite video output at the 0VDC black level. This feature is useful if externally controlled blanking is desired during channel switching. This HIZ disable function can also be used to expand the number of A/V input sources from 4 to higher multiples by enabling additional A/V MUX amps to share the same output channels.

Operating the circuit from dual ±5V supplies enables the video input and output to be DC coupled so that the composite video DC and sync levels are preserved at the output.

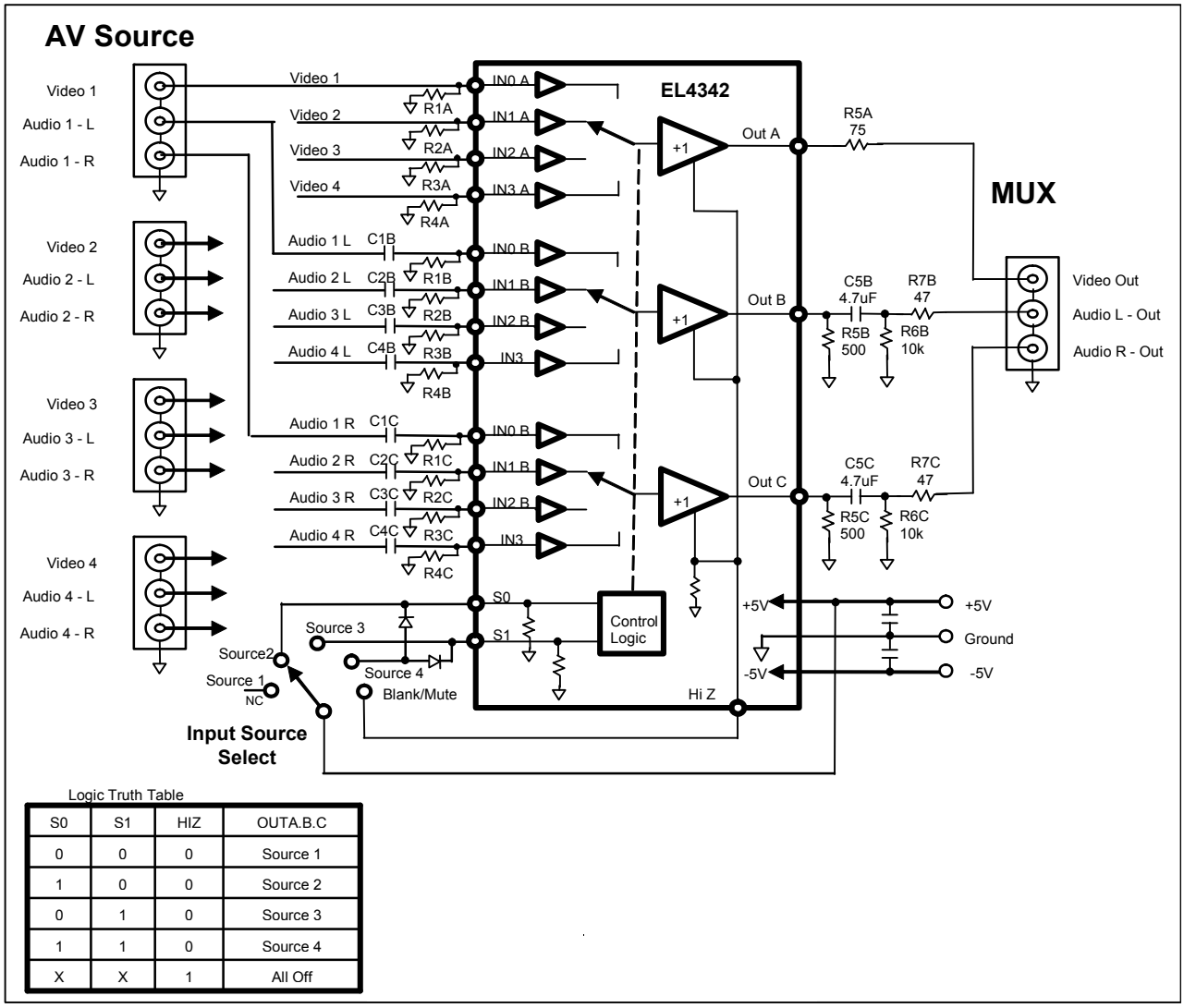
Choosing MUX Amp Gain

The EL4342 and ISL59446 are pin to pin replacement parts. The only difference is in their internal gain settings. The EL4342 has an internally set gain of 1, and the ISL59446 has an internally set gain of 2. The choice of gain depends on the video channel input and output requirements. If the composite video inputs and output display are in close proximity to the MUX amp, input terminating resistors R1A through R4A can be large so that the overall video channel gain is preserved at 0dB. In this case, the EL4342 with a gain of 1 would be a suitable choice. If the application requires 75Ω back-terminated cable driving at the output, or the input, the ISL59446 with it's internal gain of 2 may be the better choice. In the latter case, the higher gain of 2 would also appear in the audio channels, which might require a simple voltage divider at the audio outputs to maintain the correct audio levels.

Adding capacitive coupling (C1b, c through C4b, c) to the audio input isolates the amplifier from unwanted DC that may be present in the audio source. Resistors R1b, c through R4b, c set the desired input impedance and form the input high pass filter. A 4.7µF capacitor and a 10k resistor produce a 20Hz, -3dB cutoff frequency.

The usual approach of using AC coupling in this way has the drawback that low impedance mechanical or solid state switches produce an audible thump, as they charge and discharge the AC coupling capacitors during channel to channel switching. The high impedance input buffers in the MUX amp solve this problem by maintaining a constant impedance on the coupling capacitance during switching.

Video performance is exceptional owing to the 500MHz -3dB bandwidth and 60MHz 0.1dB gain-flatness of the MUX amps. The high video performance also benefits audio performance resulting in a very flat (<±0.02dB) frequency response from DC to well beyond 80kHz. The audio frequency response is tailored by the input and output R-C filters. THD+N vs. amplitude measured on an Audio Precision series 2500 over the 20Hz to 20kHz frequency range is less than 0.015% from 1Vrms down to 100mVrms, increasing to 0.1% down to 4mVrms.



Logic Truth Table

S0	S1	HIZ	OUTA.B.C
0	0	0	Source 1
1	0	0	Source 2
0	1	0	Source 3
1	1	0	Source 4
X	X	1	All Off

FIGURE 1. BASIC A/V MUX

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