National Semiconductor

April 2005

LMH730277 2:1 Multiplexer Evaluation Board

General Description

The LMH™730277 evaluation board is designed to aid in the characterization of National Semiconductor's High Speed 2:1 Multiplexers.

Use the evaluation board as a guide for high frequency layout and as a tool to aid in device testing and characterization.

The evaluation board schematic is shown in *Figure 1*. Refer to the product data sheets for recommendations for component values.

Basic Operation

By changing the input termination resistors (R_{IN0} and R_{IN1}) and series output resistor (R_{OUT}) different input and output impedances can be matched. The SMA connectors and board traces are optimized for 50 to 75Ω operation. Other impedances can be matched but performance may be noticeably different, especially high frequency response. Even with optimal layout, board parasitics play a large part in high frequency performance and different termination resistors will change the frequency of the dominant parasitic poles/zeros. To accommodate 50Ω high speed pulse generators for driving the select (SEL) or shutdown (SD) pins, use the logic control signal termination resistors (R_{SEL} and R_S) to match the impedance of the signal generator. When driving the logic pins be careful to use compatible signal levels. Devices designed for split supply operation will require special care if used in a single supply configuration. See the device datasheet for more details

Layout Considerations

Printed circuit board layout and supply bypassing play major roles in determining high frequency performance. When designing your own board use the LMH730277 evaluation board as a guide and follow these steps to optimize high frequency performance

1. Use a ground plane.
2. Include large (~6.8 µF) capacitors on both supplies (C_3 & C_4).
3. Near the device use .01 µF ceramic capacitors from both supplies to ground (C_1, C_2).
4. A capacitor between V^+ and V^- is optional (C5) but will help suppress second order harmonic distortion.
5. Remove the ground and power planes from under and around the part, especially near the OUT and FB pins.
6. Minimize all trace lengths.
7. Use terminated transmission lines for long traces.

Sample artwork for the LMH730277 Evaluation board is included on the next page in *Figure 2*.

Measurement Hints

The board is designed for 50Ω input and output connections into coaxial cables. For other impedances the terminating resistors can be modified to help match different impedances.

Do not use normal oscilloscope probes to test these circuits. The capacitive loading will change circuit performance drastically. Instead use low impedance resistive divider probes of 100 to 500Ω. See *Figure 3* for a sample resistive probe. The Low impedance resistor should be 50 - 450Ω. The ground connection should be as short as possible (~1/2"). Even with careful use of these probes, results should be considered preliminary until verified with controlled impedance measurements. Even the best probes will interfere with circuit operation to some degree. Also, tools, power cables, fingers, etc. near the device will change measurement results, often dramatically.

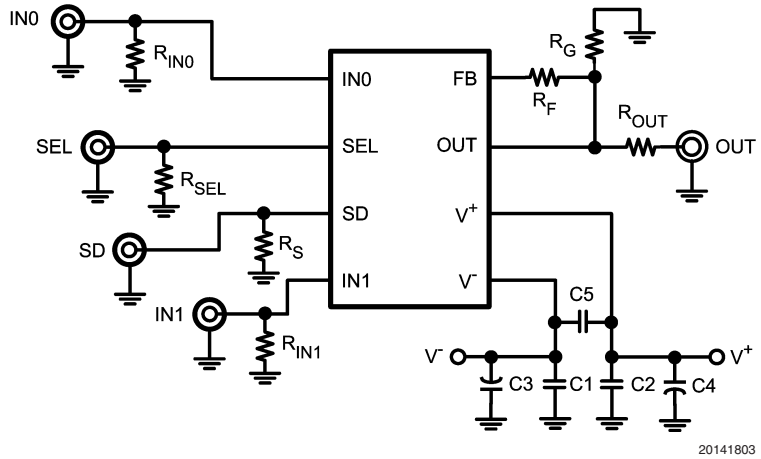

FIGURE 1. Board Schematic

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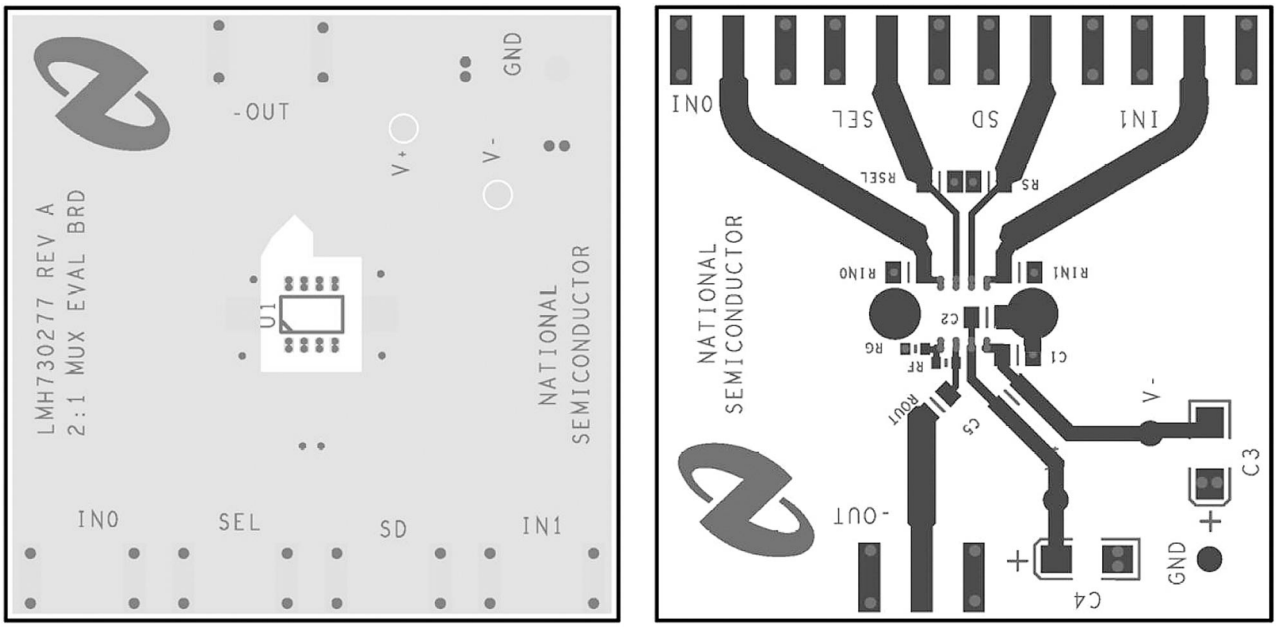

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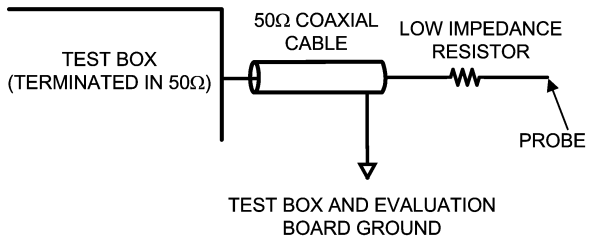
FIGURE 2. Board Layout (Actual Size = 2" x 2")



$$\text{PROBE ATTENUATION} = \frac{50}{R + 50}$$

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FIGURE 3. Probe Schematic

Notes

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