

## Introduction

The ISL59420/21EVAL1 evaluation board contains all the circuitry needed to characterize critical performance parameters of the ISL59420, ISL59421 single 2:1 MUX-amplifier, over a variety of applications.

The ISL59420, ISL59421 are single-output, gain-selectable 2:1 MUX-amps. The unity-gain bandwidths are 400MHz for the ISL59420 and 900MHz for the ISL59421. Each contain a common set of logic inputs for channel selection (S) three-state output control (HIZ) and an enable control input that powers down the device ( $\overline{\text{EN}}$ ).

The evaluation board circuit and layout is optimized for either 50Ω or 75Ω terminations, and implements a basic single 2:1 video MUX-amp. The board is supplied with 75Ω input signal terminations and a 75Ω back-termination resistor on each of the 3 outputs, making it suitable for driving video cable. The user has the option of replacing the 75Ω resistors with 50Ω resistors for other applications. The control lines contain 50Ω resistors to match the 50Ω output impedance of high speed pulse generators. Control line termination resistors are recommended for rise and fall times under 10ns to minimize unwanted transients. If DC is used for the control logic, the resistors may be removed; or the applied DC voltage can be reduced to 2.5V to reduce the dissipation in the termination resistor.

The layout contains component options to include an output series resistor ( $R_S$ ) followed by a parallel resistor ( $R_L$ ) capacitor ( $C_L$ ) network to ground. This option allows the user to select several different output configurations. Examples are shown in Figures 2A, 2B, and 2C. The evaluation board is supplied with the 75Ω back termination resistors shown in Figure 2C.

## Amplifier Performance and Output Configurations

The ISL59420, ISL59421 output amplifier is externally gain-selectable with the non-inverting input directly coupled to the 2:1 MUX output. The inverting input is pinned out to the evaluation board. Resistor  $R_F$  is set to the value shown in Figure 2D, and in conjunction with the amplifier internal capacitance, provides optimum frequency response with minimal gain peaking. The output amplifier is ideally suited for driving high impedance high speed selectable-gain buffers when gain compensation is needed. GBW decreases slightly at the lower output load impedances typical of back-terminated cable driving applications. Reference data sheets for additional performance data.

## High Frequency Layout Considerations

At frequencies of 500MHz and higher, circuit board layout may limit performance. The following layout guidelines are implemented on the evaluation board:

- Signal I/O lines are the same lengths and widths to match propagation delay and trace parasitics.
- No series connected vias are used in signal I/O lines, as they can add unwanted inductance.
- Signal trace lengths are minimized to reduce transmission line effects and the need for strip-line tuning of the signal traces.
- High frequency decoupling caps are placed as close to the device power supply pin as possible - without series vias between the capacitor and the device pin.

## Power Sequencing

Proper power supply sequencing is -V first, then +V. In addition, the +V and -V supply pin voltage rate-of-rise must be limited to  $\pm 1V/\mu s$  or less. The evaluation board contains parallel-connected low  $V_{ON}$  Schottky diodes on each supply terminal to minimize the risk of latch up due to incorrect sequencing. In addition, extra 10μF decoupling capacitors are added to each supply to aid in reducing the applied voltage rate-of-rise.

## Reference Documents

- ISL59420 Data Sheet, FN7459
- ISL59421 Data Sheet, FN7458

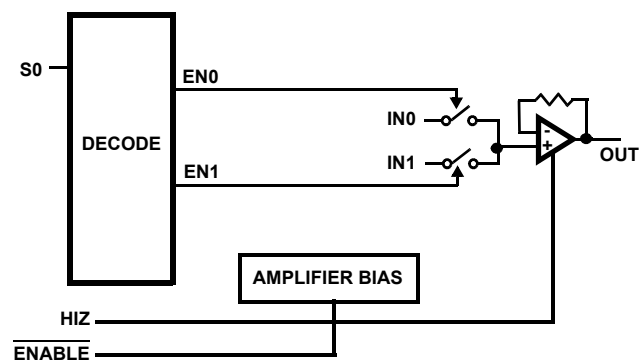
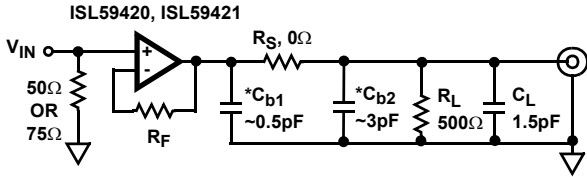


FIGURE 1. ISL59420, ISL59421 FUNCTIONAL BLOCK

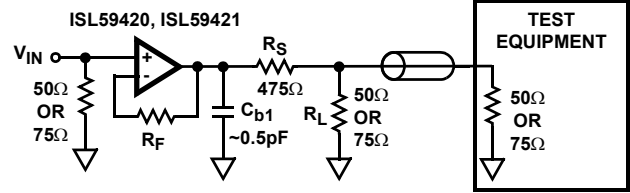
# Application Note 1187

TABLE 1. LOGIC TABLE

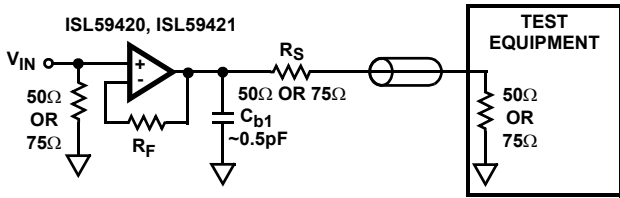
S	HIZ	ENABLE	OUT
0	0	0	IN0
1	0	0	IN1
-	-	1	Power-down
-	1	-	High Z



\* C<sub>b1</sub>, C<sub>b2</sub> are approximate PCB trace capacitances.  
**FIGURE 2A. TEST CIRCUIT WITH OPTIMAL OUTPUT LOAD**



\* C<sub>b1</sub> is approximate PCB trace capacitance.  
**FIGURE 2B. TEST CIRCUIT FOR 50Ω OR 75Ω TERMINATIONS**

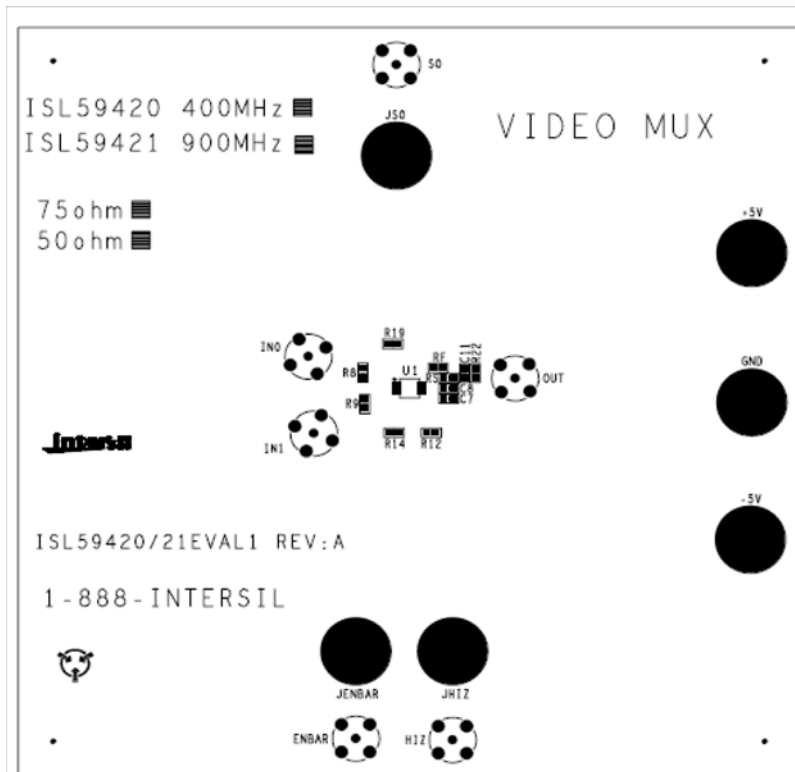


\* C<sub>b1</sub> is approximate PCB trace capacitance.  
**FIGURE 2C. BACK-TERMINATED TEST CIRCUIT FOR CABLE APPLICATION**

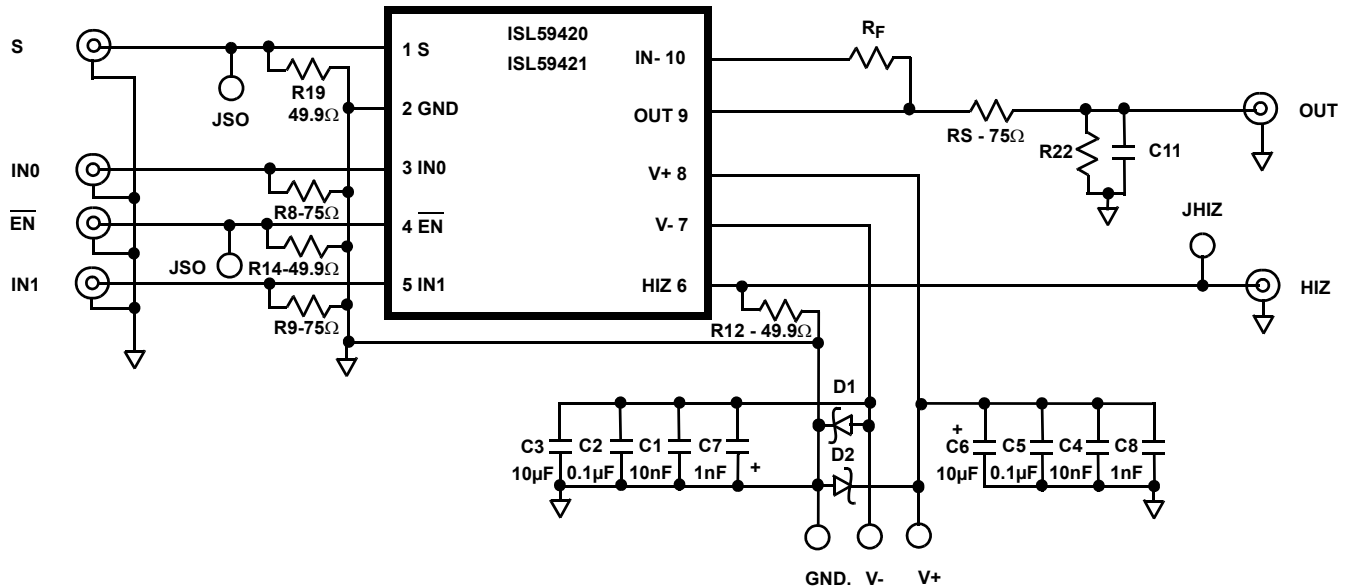
PART #	R <sub>F</sub> VALUE
ISL59420	200Ω
ISL59421	357Ω

**FIGURE 2D. R<sub>F</sub> TABLE FOR FIGURE 2 CIRCUITS**

## ISL59420/21EVAL1 Top View



**ISL59420/21EVAL1 Schematic Diagram**



**ISL59420/21EVAL1 Components Parts List**

DEVICE #	DESCRIPTION	COMMENTS
C7, C8	CAP, SMD, 0603, 1000pF, 25V, 10%, X7R	Power Supply Decoupling
C1, C4	CAP, SMD, 0603, 0.01μF, 25V, 10%, X7R	Power Supply Decoupling
C2, C5	CAP, SMD, 0603, 0.1μF, 25V, 10%, X7R	Power Supply Decoupling
C3, C6	CAP, SMD, 0805, 10μF, 6.3V, 10%, X5R	Power Supply Decoupling
D1, D2	Diode-Schottky, 2 Pin, 45V, 7.5A	MBR0550T (Motorola) Reverse Polarity Protection
R8, R9, RS	Resistor, SMD, 0603, 75Ω, 1/10W, 1%	Signal Input/output Termination
R12, R14, R19	Resistor, SMD, 0603, 49.9Ω, 1/16W, 1%	Logic Input Termination
RF - ISL59420	Resistor, SMD, 0603, 200Ω, 1/10W, 1%	Feedback Resistor
RF - ISL59421	Resistor, SMD, 0603, 357Ω, 1/10W, 1%	Feedback Resistor
C11	CAP, SMD, 0603	Optional, not populated
R22	Resistor, SMD, 0603	Optional, not populated
U1	ISL59420/21 - 400/900 MHz Multiplexing Amplifier, 10PIN, QSOP	Device Under Test

Intersil Corporation reserves the right to make changes in circuit design, software and/or specifications at any time without notice. Accordingly, the reader is cautioned to verify that the Application Note or Technical Brief is current before proceeding.

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