

## Introduction

The ISL59440/41EVAL1 evaluation board contains all the circuitry needed to characterize critical performance parameters of the ISL59440, ISL59441 single 4:1 MUX-amplifier, over a variety of applications.

The ISL59440, ISL59441 are single-output, gain-selectable 4:1 MUX-amps. The unity-gain bandwidths are 400MHz for the ISL59440 and 900 MHz for the ISL59441. Each contain a common set of logic inputs for channel selection (S0, S1) three-state output control (HIZ) and an enable control input that powers down the device.

The evaluation board circuit and layout is optimized for either 50Ω or 75Ω terminations, and implements a basic single 4:1 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 ISL59440, ISL59441 output amplifier is externally gain-selectable with the non-inverting input directly coupled to the 4:1 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

1. ISL59440 Data Sheet, FN7459
2. ISL59441 Data Sheet, FN7458

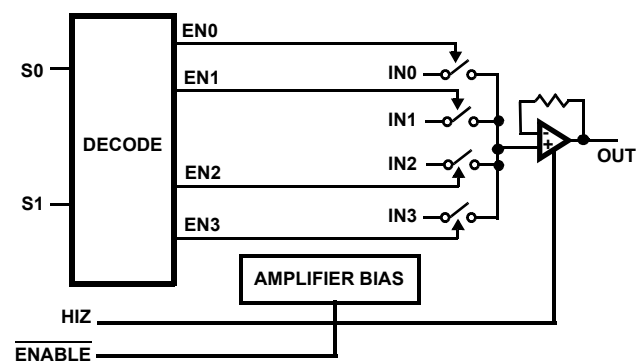
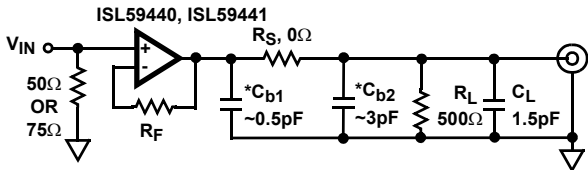


FIGURE 1. ISL59440, ISL59441 FUNCTIONAL BLOCK

# Application Note 1186

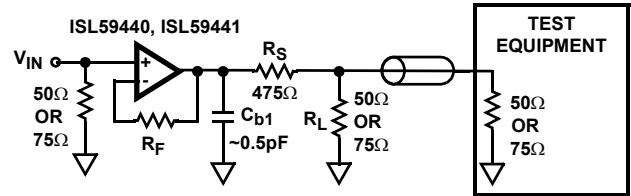
TABLE 1. LOGIC TABLE

S0	S1	HIZ	ENABLE	OUT
0	0	0	0	IN0
1	0	0	0	IN1
0	1	0	0	IN2
1	1	0	0	IN3
-	-	-	1	Power-down
-	-	1	-	High Z



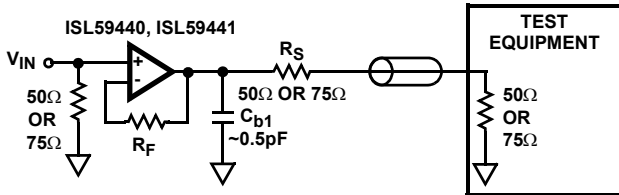
\*  $C_{b1}$ ,  $C_{b2}$  are approximate PCB trace capacitances.

FIGURE 2A. TEST CIRCUIT WITH OPTIMAL OUTPUT LOAD



\*  $C_{b1}$  is approximate PCB trace capacitance.

FIGURE 2B. TEST CIRCUIT FOR 50Ω OR 75Ω TERMINATIONS



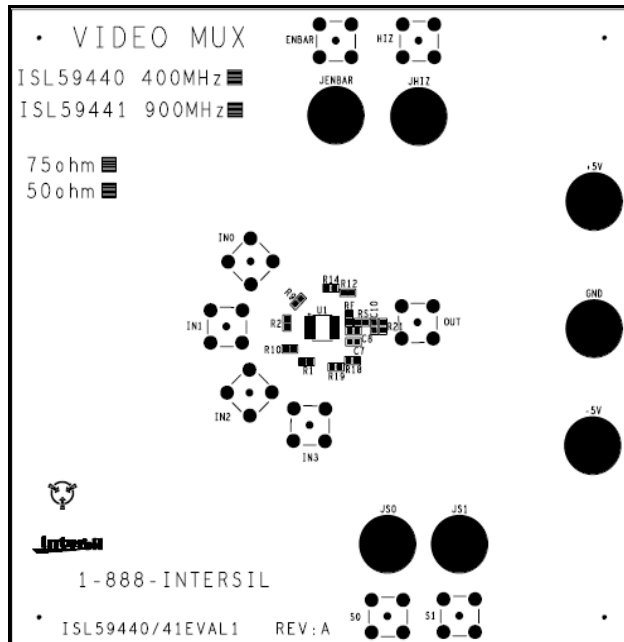
\*  $C_{b1}$  is approximate PCB trace capacitance.

FIGURE 2C. BACK-TERMINATED TEST CIRCUIT FOR CABLE APPLICATION

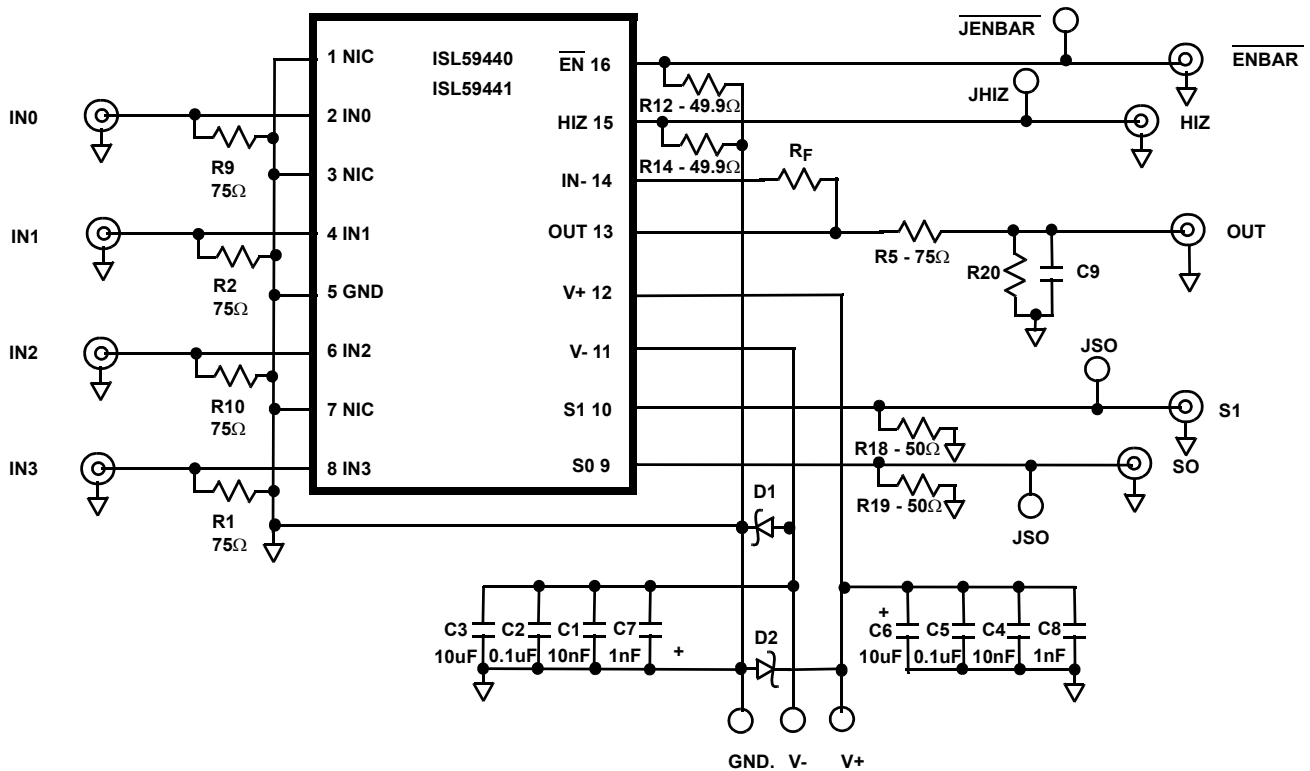
PART #	$R_F$ VALUE
ISL59440	332Ω
ISL59441	301Ω

FIGURE 2D.  $R_F$  TABLE FOR FIGURE 2 CIRCUITS

## ISL59440/41EVAL1 Top View



ISL59440/41EVAL1 Schematic Diagram



ISL59440/41EVAL1 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-Shottky, 2 Pin, 45V, 7.5A	MBR0550T (Motorola) Reverse Polarity Protection
R1, R2, R5, R9, R10	Resistor, SMD, 0603, 75Ω, 1/10W, 1%,	Signal Input/output Termination
R12, R14, R18, R19.	Resistor, SMD, 0603, 49.9Ω, 1/16W, 1%,	Logic Input Termination
R <sub>F</sub> - ISL59440	Resistor, SMD, 0603, 332Ω, 1/10W, 1%	Feedback Resistor
R <sub>F</sub> - ISL59441	Resistor, SMD, 0603, 301Ω, 1/10W, 1%	Feedback Resistor
C9	CAP, SMD, 0603	Optional, not populated
R20	Resistor, SMD, 0603	Optional, not populated
U1	ISL59440/41 - 400/900 MHz MULTIPLEXING AMPLIFIER, 16PIN, 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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