

Introduction

The ISL59445/EL4342E1 evaluation board contains all the circuitry needed to characterize critical performance parameters of the ISL59445 and EL4342 triple 4:1 MUX-amplifiers, over a variety of applications.

The ISL59445 (1GHz) and EL4342 (500MHz) each contain 3 separate 4:1 input multiplexers, each followed by a unity gain buffer controlled by common set of logic inputs (Figure 1, Table 1). Control features include a high speed (20ns) HIZ output control for individual selection of MUX amps that share a common video output line. The ENABLE control can be used to save power by powering the device down.

The evaluation board circuit and layout is optimized for either 50Ω or 75Ω terminations, and implements a basic R-G-B video 2 input 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 EL4342 output amplifiers are designed for maximum gain-bandwidth performance when loaded with ~500Ω (R_L) in parallel with ~5pF (C_L) to ground, directly at the output pin (Figure 2A). They are ideally suited for driving high impedance high speed selectable-gain buffers when gain compensation is needed. In these applications, output trace capacitance to 5pF actually optimizes AC performance. For trace capacitance below 5pF, an additional capacitor between the output pin to ground may be added to achieve the 5pF optimum. GBW decreases slightly at the lower output load impedances typical of back-terminated cable driving applications. Additional performance data can be found in the data sheet references.

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 ±1V/μs 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

- ISL59445 Data Sheet, FN7456
- EL4342 Data Sheet, FN7421

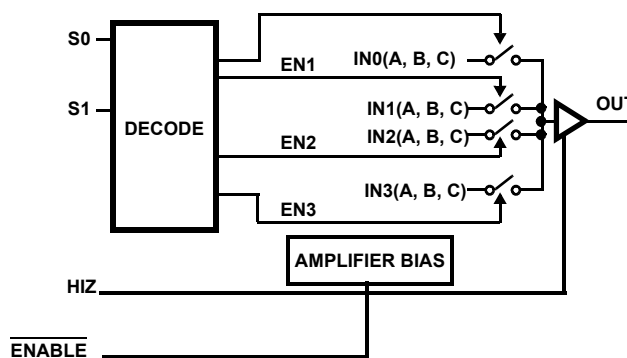
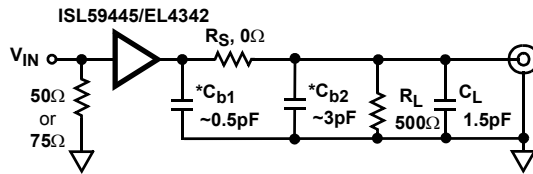


FIGURE 1. EL4342 FUNCTIONAL BLOCK DIAGRAM (1 OF 3 CHANNELS)

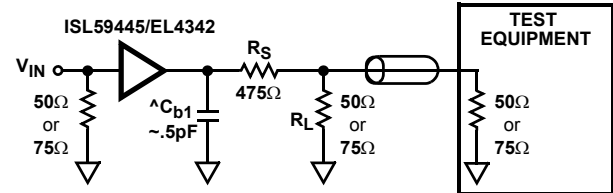
TABLE 1. Logic Table

S0	S1	HIZ	ENABLE	OUTA, B, C
0	0	0	0	IN0A, B, C
1	0	0	0	IN1A, B, C
0	1	0	0	IN2A, B, C
1	1	0	0	IN3A, B, C
-	-	1	0	HIZ
-	-	-	1	Power down



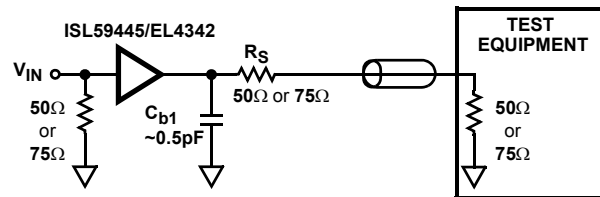
* Cb1, Cb2 are approximate PCB trace capacitances

FIGURE 2A. TEST CIRCUIT WITH OPTIMAL OUTPUT LOAD



* Cb1 is approximate PCB trace capacitance

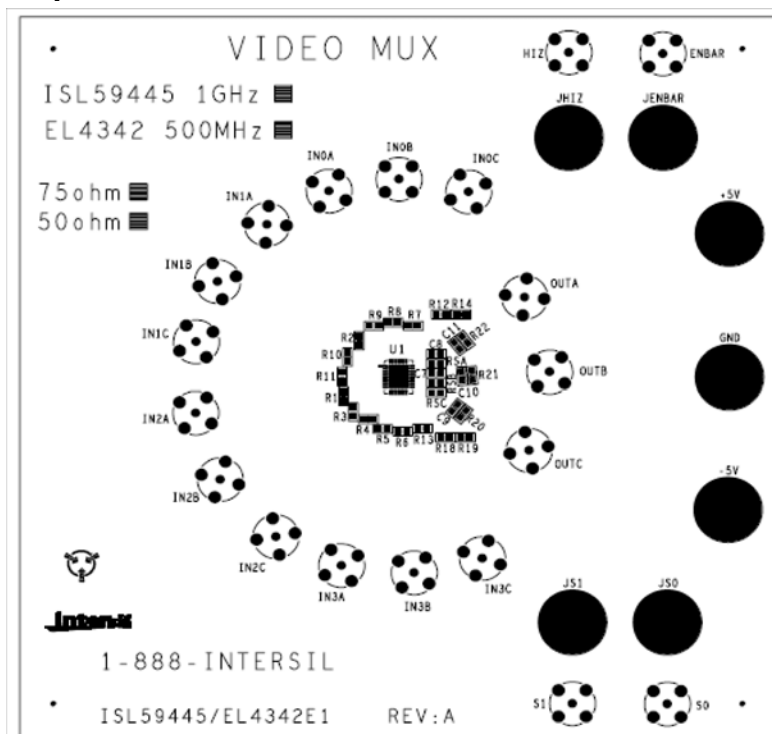
FIGURE 2B. TEST CIRCUIT FOR 50Ω OR 75Ω TERMINATIONS



* Cb1 is approximate PCB trace capacitance

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

ISL59445/EL4342E1 Top View



ISL59445/EL4342E1 Schematic Diagram

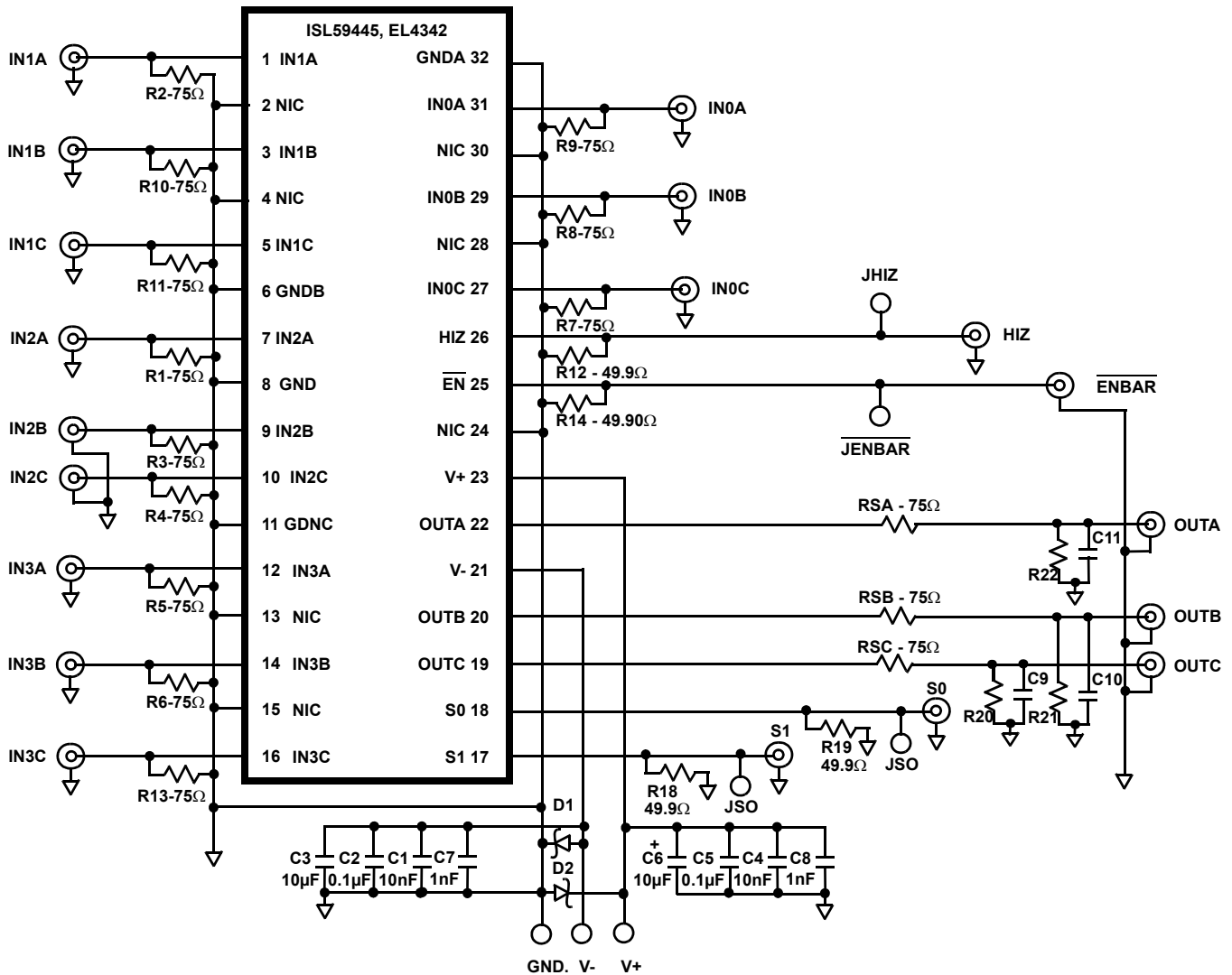


TABLE 1. COMPONENTS PARTS LIST

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
R1-R11, R13, RSA, RSB, RSC	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
C9, C10, C11	Capacitor, SMD, 0603	Optional, not populated
R20, R21, R22	Resistor, SMD, 0603	Optional, not populated
U1	ISL5945IU -1GHz Multiplexing Amplifier, 32P, QFN EL4342IL - 500MHz Multiplexing Amplifier, 32P, QFN	Device Under Test

Notice

1. Descriptions of circuits, software and other related information in this document are provided only to illustrate the operation of semiconductor products and application examples. You are fully responsible for the incorporation or any other use of the circuits, software, and information in the design of your product or system. Renesas Electronics disclaims any and all liability for any losses and damages incurred by you or third parties arising from the use of these circuits, software, or information.
2. Renesas Electronics hereby expressly disclaims any warranties against and liability for infringement or any other claims involving patents, copyrights, or other intellectual property rights of third parties, by or arising from the use of Renesas Electronics products or technical information described in this document, including but not limited to, the product data, drawings, charts, programs, algorithms, and application examples.
3. No license, express, implied or otherwise, is granted hereby under any patents, copyrights or other intellectual property rights of Renesas Electronics or others.
4. You shall not alter, modify, copy, or reverse engineer any Renesas Electronics product, whether in whole or in part. Renesas Electronics disclaims any and all liability for any losses or damages incurred by you or third parties arising from such alteration, modification, copying or reverse engineering.
5. Renesas Electronics products are classified according to the following two quality grades: "Standard" and "High Quality". The intended applications for each Renesas Electronics product depends on the product's quality grade, as indicated below.
"Standard": Computers; office equipment; communications equipment; test and measurement equipment; audio and visual equipment; home electronic appliances; machine tools; personal electronic equipment; industrial robots; etc.
"High Quality": Transportation equipment (automobiles, trains, ships, etc.); traffic control (traffic lights); large-scale communication equipment; key financial terminal systems; safety control equipment; etc.
Unless expressly designated as a high reliability product or a product for harsh environments in a Renesas Electronics data sheet or other Renesas Electronics document, Renesas Electronics products are not intended or authorized for use in products or systems that may pose a direct threat to human life or bodily injury (artificial life support devices or systems; surgical implantations; etc.), or may cause serious property damage (space system; undersea repeaters; nuclear power control systems; aircraft control systems; key plant systems; military equipment; etc.). Renesas Electronics disclaims any and all liability for any damages or losses incurred by you or any third parties arising from the use of any Renesas Electronics product that is inconsistent with any Renesas Electronics data sheet, user's manual or other Renesas Electronics document.
6. When using Renesas Electronics products, refer to the latest product information (data sheets, user's manuals, application notes, "General Notes for Handling and Using Semiconductor Devices" in the reliability handbook, etc.), and ensure that usage conditions are within the ranges specified by Renesas Electronics with respect to maximum ratings, operating power supply voltage range, heat dissipation characteristics, installation, etc. Renesas Electronics disclaims any and all liability for any malfunctions, failure or accident arising out of the use of Renesas Electronics products outside of such specified ranges.
7. Although Renesas Electronics endeavors to improve the quality and reliability of Renesas Electronics products, semiconductor products have specific characteristics, such as the occurrence of failure at a certain rate and malfunctions under certain use conditions. Unless designated as a high reliability product or a product for harsh environments in a Renesas Electronics data sheet or other Renesas Electronics document, Renesas Electronics products are not subject to radiation resistance design. You are responsible for implementing safety measures to guard against the possibility of bodily injury, injury or damage caused by fire, and/or danger to the public in the event of a failure or malfunction of Renesas Electronics products, such as safety design for hardware and software, including but not limited to redundancy, fire control and malfunction prevention, appropriate treatment for aging degradation or any other appropriate measures. Because the evaluation of microcomputer software alone is very difficult and impractical, you are responsible for evaluating the safety of the final products or systems manufactured by you.
8. Please contact a Renesas Electronics sales office for details as to environmental matters such as the environmental compatibility of each Renesas Electronics product. You are responsible for carefully and sufficiently investigating applicable laws and regulations that regulate the inclusion or use of controlled substances, including without limitation, the EU RoHS Directive, and using Renesas Electronics products in compliance with all these applicable laws and regulations. Renesas Electronics disclaims any and all liability for damages or losses occurring as a result of your noncompliance with applicable laws and regulations.
9. Renesas Electronics products and technologies shall not be used for or incorporated into any products or systems whose manufacture, use, or sale is prohibited under any applicable domestic or foreign laws or regulations. You shall comply with any applicable export control laws and regulations promulgated and administered by the governments of any countries asserting jurisdiction over the parties or transactions.
10. It is the responsibility of the buyer or distributor of Renesas Electronics products, or any other party who distributes, disposes of, or otherwise sells or transfers the product to a third party, to notify such third party in advance of the contents and conditions set forth in this document.
11. This document shall not be reprinted, reproduced or duplicated in any form, in whole or in part, without prior written consent of Renesas Electronics.
12. Please contact a Renesas Electronics sales office if you have any questions regarding the information contained in this document or Renesas Electronics products.
(Note 1) "Renesas Electronics" as used in this document means Renesas Electronics Corporation and also includes its directly or indirectly controlled subsidiaries.
(Note 2) "Renesas Electronics product(s)" means any product developed or manufactured by or for Renesas Electronics.

(Rev.4.0-1 November 2017)



SALES OFFICES

Renesas Electronics Corporation

<http://www.renesas.com>

Refer to "<http://www.renesas.com/>" for the latest and detailed information.

Renesas Electronics America Inc.
1001 Murphy Ranch Road, Milpitas, CA 95035, U.S.A.
Tel: +1-408-432-8888, Fax: +1-408-434-5351

Renesas Electronics Canada Limited
9251 Yonge Street, Suite 8309 Richmond Hill, Ontario Canada L4C 9T3
Tel: +1-905-237-2004

Renesas Electronics Europe Limited
Dukes Meadow, Millboard Road, Bourne End, Buckinghamshire, SL8 5FH, U.K
Tel: +44-1628-651-700, Fax: +44-1628-651-804

Renesas Electronics Europe GmbH
Arcadiastrasse 10, 40472 Düsseldorf, Germany
Tel: +49-211-6503-0, Fax: +49-211-6503-1327

Renesas Electronics (China) Co., Ltd.
Room 1709 Quantum Plaza, No.27 ZhichunLu, Haidian District, Beijing, 100191 P. R. China
Tel: +86-10-8235-1155, Fax: +86-10-8235-7679

Renesas Electronics (Shanghai) Co., Ltd.
Unit 301, Tower A, Central Towers, 555 Langao Road, Putuo District, Shanghai, 200333 P. R. China
Tel: +86-21-2226-0888, Fax: +86-21-2226-0999

Renesas Electronics Hong Kong Limited
Unit 1601-1611, 16/F., Tower 2, Grand Century Place, 193 Prince Edward Road West, Mongkok, Kowloon, Hong Kong
Tel: +852-2265-6688, Fax: +852-2886-9022

Renesas Electronics Taiwan Co., Ltd.
13F, No. 363, Fu Shing North Road, Taipei 10543, Taiwan
Tel: +886-2-8175-9600, Fax: +886-2-8175-9670

Renesas Electronics Singapore Pte. Ltd.
80 Bendemeer Road, Unit #06-02 Hyflux Innovation Centre, Singapore 339949
Tel: +65-6213-0200, Fax: +65-6213-0300

Renesas Electronics Malaysia Sdn.Bhd.
Unit 1207, Block B, Menara Amcorp, Amcorp Trade Centre, No. 18, Jln Persiaran Barat, 46050 Petaling Jaya, Selangor Darul Ehsan, Malaysia
Tel: +60-3-7955-9390, Fax: +60-3-7955-9510

Renesas Electronics India Pvt. Ltd.
No.777C, 100 Feet Road, HAL 2nd Stage, Indiranagar, Bangalore 560 038, India
Tel: +91-80-67208700, Fax: +91-80-67208777

Renesas Electronics Korea Co., Ltd.
17F, KAMCO Yangjae Tower, 262, Gangnam-daero, Gangnam-gu, Seoul, 06265 Korea
Tel: +82-2-558-3737, Fax: +82-2-558-5338