

ISL71610SLHMEV1Z

The ISL71610SLHMEV1Z evaluation board (shown in [Figure 3](#)) features the [ISL71610SLHM](#) Giant Magnetoresistive (GMR) digital isolator part. This IC is a radiation hardened digital isolators designed for isolated power supply designs and isolated serial communications interfaces, such as CAN, SPI, RS-422, and RS-485 applications.

The ISL71610SLHM is a passive input, active output GMR digital isolator that requires a 3V to 5.5V supply to power its CMOS output.

This GMR isolator can replace some of the available optocouplers currently used in space applications. Whereas optocoupler lines are susceptible to Total Ionizing Dose (TID) radiation that causes the optics to become cloudy and therefore compromising the signal, the GMR inductive structure used in the ISL71610SLHM is inherently immune to radiation effects.

The ISL71610SLHMEV1Z evaluation board and this accompanying user guide provides a quick and easy method to evaluate the ISL71610SLHM part, see the ISL71610SLHM datasheet for information about the operation, function, and performance of the device.

Features

- Easy to use design
- Convenient test points and connections for test equipment
- 3V to 5.5V signal operation
- 500V_{DC} rated barrier isolation

Specifications

The ISL71610SLHMEV1Z evaluation board is designed for ease of evaluation with a minimum of components and connections. The electrical ratings of the ISL71610SLHMEV1Z evaluation board are shown in [Table 1](#).

Table 1. Electrical Ratings

Parameter	ISL71610SLHM Rating
Data Throughput	100Mbps
DC Output Supply Voltage	3V to 5.5V
Coil Current	±8mA to ±20mA
Output Current	±4mA
Temperature	-55°C to +125°C

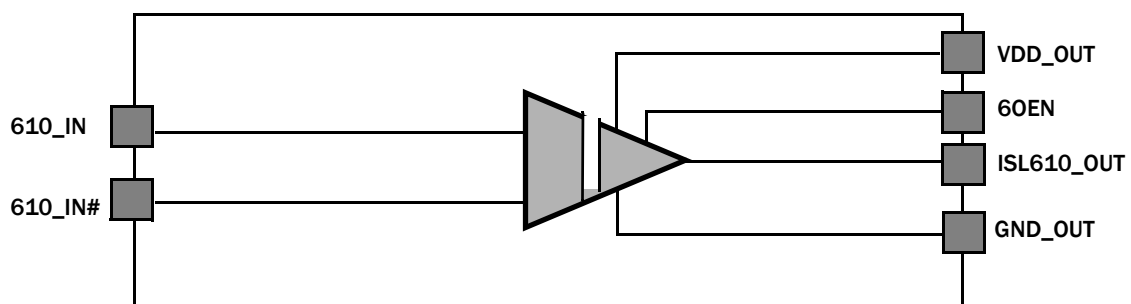


Figure 1. ISL71610SLHMEV1Z Evaluation Board Block Diagram

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1. Functional Description

The ISL71610SLHMEV1Z evaluation board contains the ISL71610SLHM digital signal isolator IC. The ISL71610SLHM is a passive input digital signal isolator with a CMOS output that requires a single supply in the range of 3V to 5.5V to power its CMOS output.

Figure 1 shows the ISL71610SLHMEV1Z evaluation board block diagram. A photograph of the ISL71610SLHMEV1Z is shown in Figure 3.

The ISL71610SLHMEV1Z evaluation board provides a simple platform to demonstrate the features and evaluate the performance of the ISL71610SLHM digital isolators. It provides easy access to the pins of each device and convenient connectors/test points for connecting test equipment. For more information, see the schematic (Figure 4), top layer silkscreen (Figure 7), and Bill of Materials. Performance data taken using the ISL71610SLHMEV1Z and basic lab equipment is shown in Figure 8 through Figure 13.

1.1 Basic Layout

The ISL71610SLHM digital isolator IC is located in the upper center of the board and is labeled ISL71610.

Power for the active output of the IC is located at the upper right side of the board through the compact clip-on connector labeled VDD_OUT and the compact clip-on connector labeled GND_OUT. A DC voltage source in the range of 3V to 5.5V must be connected from the positive terminal to the VDD_OUT connector and from the negative terminal to the GND_OUT connector. **Note:** Connectors VDD_OUT and GND_OUT also power the active output of the ISL71710M part.

The ISL71610SLHM can be configured as either a non-inverting isolator or an inverting isolator with a pair of jumpers installed on the appropriately labeled sides of the J1 and J2 jumpers. The waveforms for each are shown in Figure 10 (non-inverting) and Figure 11 (inverting).

The current through the coil can be monitored with a current probe and adjusted by the +V and -V amplitude of the signal generator attached using the COIL_A and COIL_B connectors on the evaluation board. R_1 is the coil current limiting resistor. Although there is no maximum voltage that can be applied to the coil, the current must be between ± 8 to ± 20 mA for both a robust and reliable output in an ion environment and over the operating life.

Access to the \overline{OE} pin of the IC is through the compact clip-on connector labeled OE on the evaluation board. When \overline{OE} is low (< 0.8 V), the output of the IC is active and the signal at the input is passed to the output of the IC. When the output pin is driven high (> 2.4 V), the output is disabled, the input is not passed to the output, and the output is put in a high impedance state. The \overline{OE} pin has an internal pull-down of 100k Ω and can be left floating if an application does not require the output disable function.

1.1.1 Power Supply

The ISL71610SLHM only requires a current through the coil to stimulate it for an output state. The input IC potential is not limited as the current is limited by an external resistor. However, the current limiting resistor on the ISL71610SLHMEV1Z is 300 Ω ; therefore, limiting the input differential to 8V to maintain the coil current to less than the 25mA absolute maximum. If a higher differential voltage is evaluated, increase the current limiting resistor R_1 to protect the input coil. The ISL71610SLHM requires a single DC power supply in the range of 3.0V to 5.5V to power the active output of the part. The power supply is connected at VDD_OUT and GND_OUT and should be capable of delivering 100mA of current.

1.2 Setup and Configuration

1.2.1 Required Equipment

The following equipment is recommended for testing:

- 5V power supply
- Square wave signal generator
- Digital Multimeter (DMM)
- Current probe to observe coil current
- 100MHz quad-trace oscilloscope

1.2.2 Using the Board

1. Configure the board as shown in [Figure 2](#).
2. Use the signal generator to drive a +2V to -2V signal into the coil using the 610_IN and 610_IN# inputs. Observe the coil current with the oscilloscope and adjust the +V and -V levels of the generator to adjust the coil current level. Look at the voltage across the IN to IN# test points to make timing measurements as the current probe display may lag in time.
3. Connect and turn on a 3V to 5.5V power supply to the output.
4. Observe the coil voltage input to the voltage output relationship, moving the pair of jumpers from the inverting (INV) to non-inverting (NINV) set of connectors allows you to see the inverting or non-inverting input to output waveform relationships.
5. There is one pair of jumpers in series with the inputs, configure both of these either (1-2) or (2-3). In position (1-2), the output responds with a current flow from COIL_A to COIL_B. If connected in position (2-3), the output responds with a current flow from COIL_B to COIL_A. With a bidirectional current, the output responds in either connection.

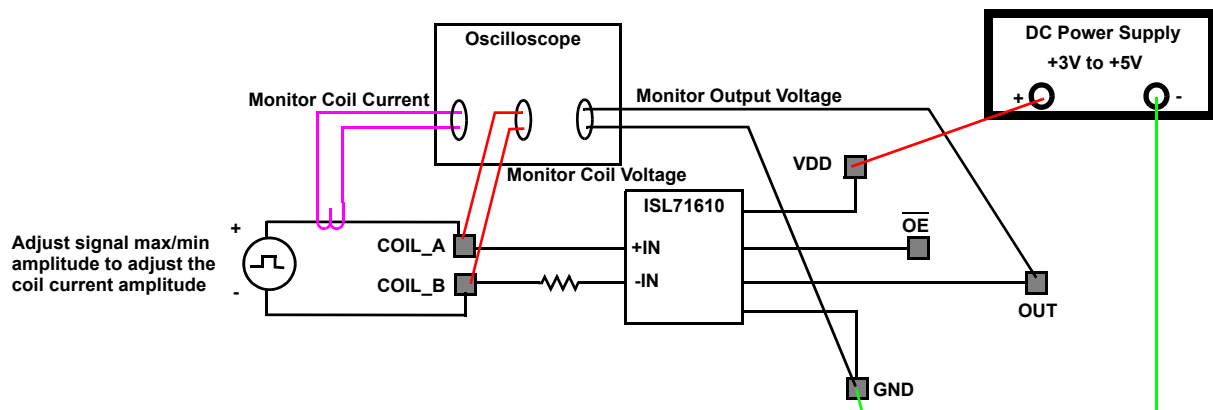


Figure 2. ISL71610SLHM Basic Evaluation Test Setup Block Diagram

2. Board Design

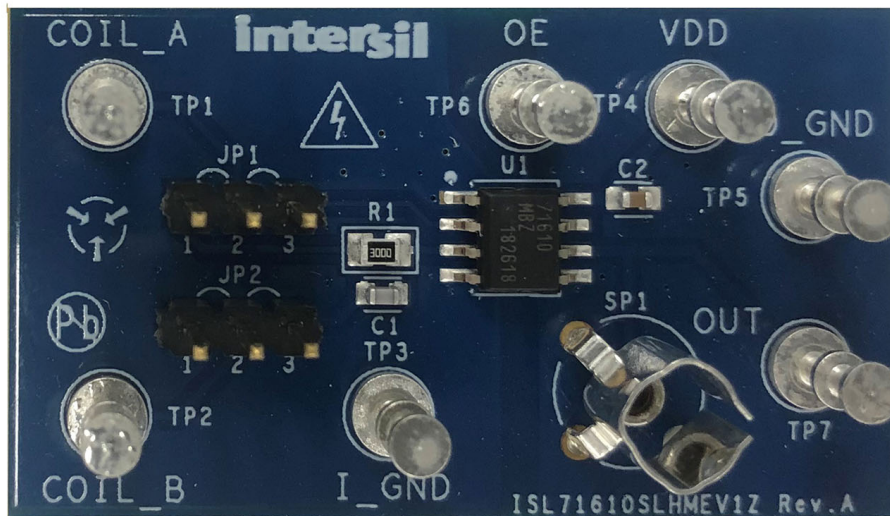


Figure 3. ISL71610SLHMEV1Z Evaluation Board Top Side

2.1 Layout Guidelines

PCB design is critical to preserve the 500V_{DC} isolation rating of the input to the output. A minimum gap spacing across the device (Pins 1, 2, 3, 4 to Pins 5, 6, 7, 8) of 2.54mm should be observed. Place the components close to the IC to minimize stray parasitic influences.

2.2 Schematic Diagram

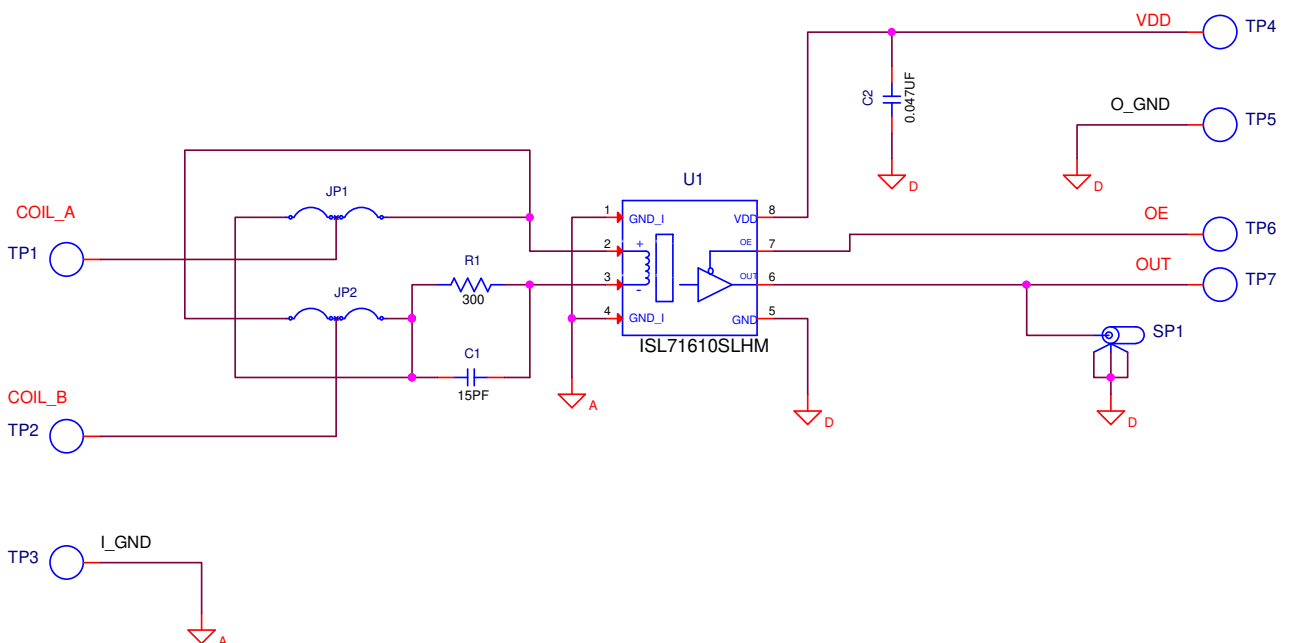


Figure 4. Schematic

2.3 Bill of Materials

Qty	Reference Designator	Description	Manufacturer	Manufacturer Part Number
1	U1	IC-RAD Hardened, DIGITAL ISOLATOR, 8 PiIN 157 MIL BODY SOIC PACKAGE (SOIC8-157)	Renesas	ISL71610SLHMBZ
1	C1	MULTILAYER CAP, 15pF	Generic	Various
1	C2	MULTILAYER CAP, 0.047μF	Generic	Various
1	R1	THICK FILM CHIP RESISTOR, 300Ω	Generic	Various
2	J1, J2	THREE PIN JUMPER	Generic	JUMPER-3-100
1	OUT	PROBE TEST POINT PCB MOUNT	Tektronix	131-4353-00
7	OEN, COIL_A, COIL_B, I_GND VDD, OUT, O_GND	COMPACT SURFACE MOUNT TEST POINT, 0.135 X 0.185 PAD	Keystone	5016

2.4 Board Layout

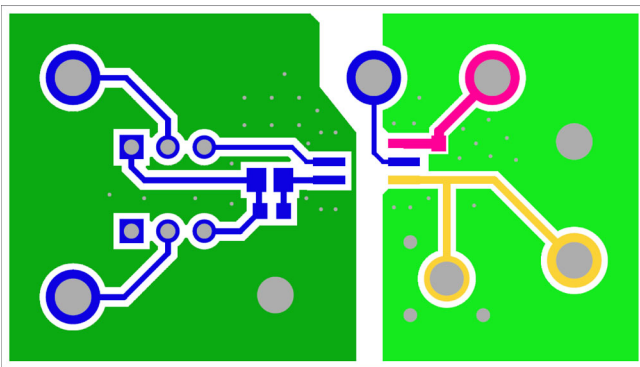


Figure 5. Top Layer

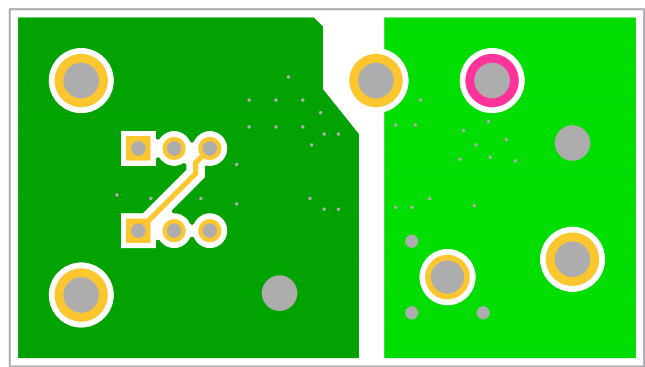


Figure 6. Bottom Layer

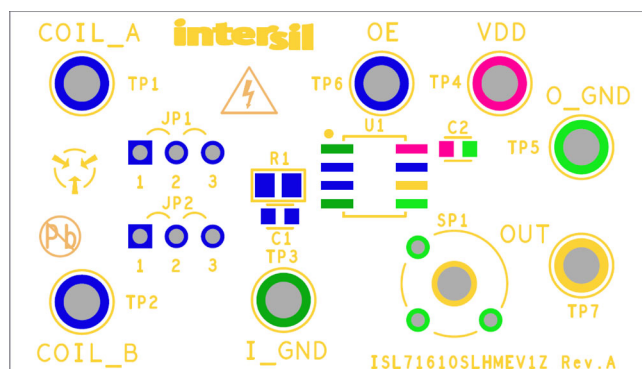
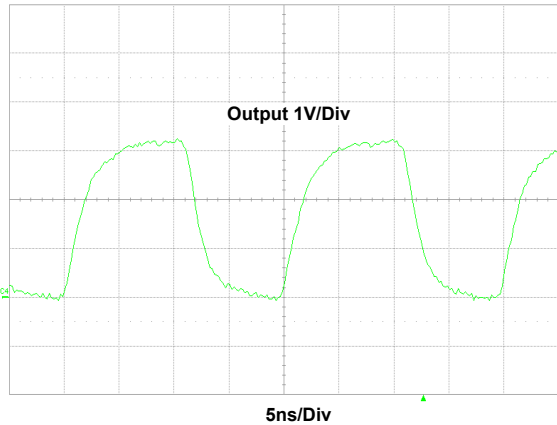


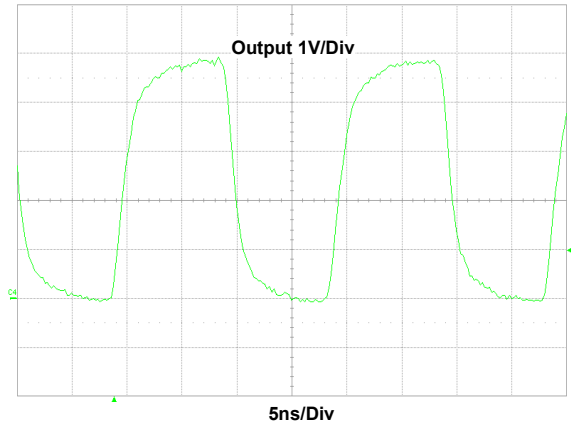
Figure 7. Top Layer Silk Screen

3. Typical Performance Graphs

Unless otherwise noted, +V = 5V; T_A = +25°C



**Figure 8. Output at 100Mbps,
C_{BOOST} = 15pF, C_{OUT} = 15pF, V_{DD} = 3.3V**



**Figure 9. Output at 100Mbps,
C_{BOOST} = 15pF, C_{OUT} = 15pF, V_{DD} = 5V**

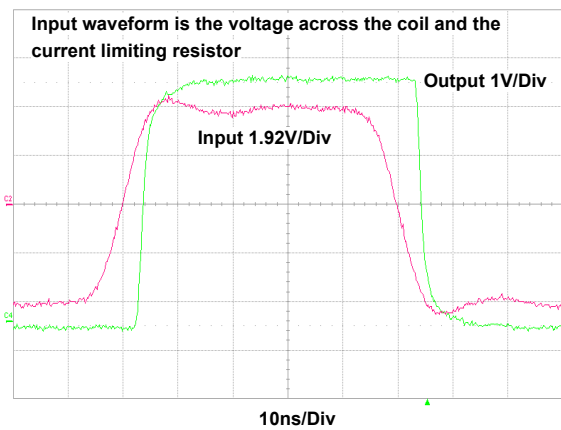


Figure 10. Non-Inverting Switching, Coil Current = ~±10mA, C_{BOOST} = 15pF, C_{OUT} = 15pF, V_{DD} = 5V

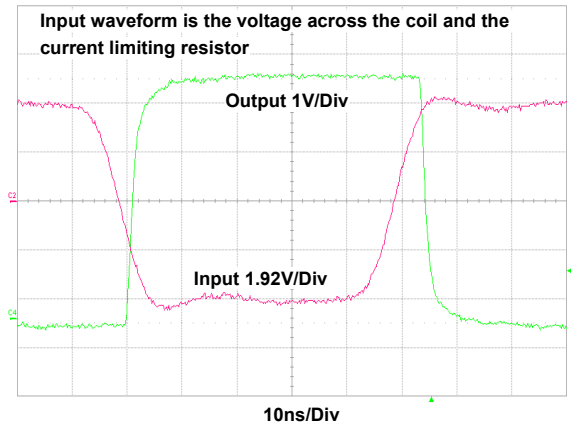


Figure 11. Inverting Switching, Coil Current = ~±10mA, C_{BOOST} = 15pF, C_{OUT} = 15pF, V_{DD} = 5V

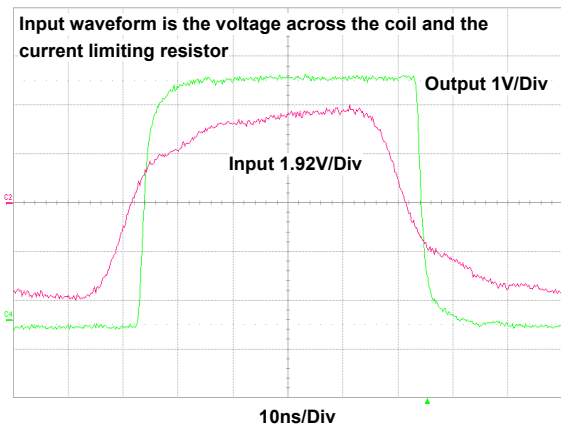


Figure 12. Switching, Coil Current = ~±8mA, C_{BOOST} = 220pF, C_{OUT} = 15pF, V_{DD} = 5V

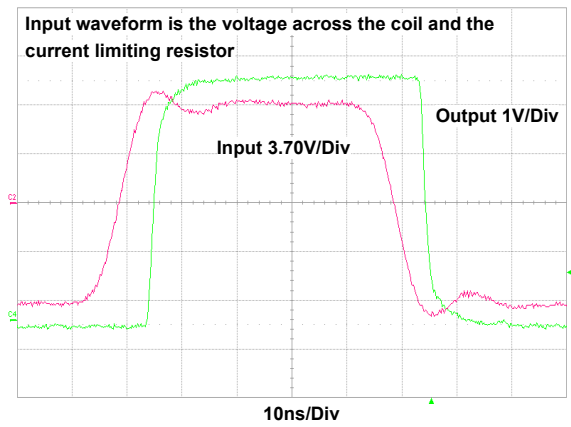


Figure 13. Switching, Coil Current = ~±20mA, C_{BOOST} = open, C_{OUT} = 15pF, V_{DD} = 5V

4. Ordering Information

Part Number	Description
ISL71610SLHMEV1Z	Radiation Hardened ISL71610SLHM digital isolator evaluation board

5. Revision History

Rev.	Date	Description
1.0	Mar 12, 2021	Initial release

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