Dual-Channel Digital Isolator EVM

Contents

List of Figures

List of Tables

1 Introduction

This user's guide details the evaluation module (EVM) operation of the factory installed ISO7421 dual-channel digital isolator; however, the EVM board may be reconfigured by a user for use with ISO7220A, ISO7220B, ISO7220C, ISO7220M, ISO7420, ISO7420M, ISO7420F, or ISO7420FCC same-channel direction isolators and the ISO7221A, ISO7221B, ISO7221C, ISO7221M, ISO7421, ISO7421M or ISO7421F opposing-channel direction isolators.

This guide also explains the user configurable I/O loads for both dual-channel isolator EVM configurations, and presents a typical lab setup with input and output waveforms.

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1.1 Overview

The ISO7220x, ISO7221x, and ISO742X dual digital isolators have a logic input and output buffer separated by a silicon oxide (SiO_2) insulation barrier. Used in conjunction with isolated power supplies, these devices block high voltage, isolate grounds, and prevent noise currents on a data bus or other circuits from entering the local ground and interfering with or damaging sensitive circuitry.

A binary input signal is conditioned, translated to a balanced signal, and then differentiated by the capacitive isolation barrier. Across the isolation barrier, a differential comparator receives the logic transition information, then sets or resets a flip-flop and the output circuit accordingly. A periodic update pulse is sent across the barrier to ensure the proper dc level of the output. If this dc-refresh pulse is not received for more than 4 µs, the input is assumed to be unpowered or not functional, and the failsafe circuit drives the output to a logic-high state. For ISO7420F, ISO7420FCC, and ISO7421F, the failsafe circuit drives the output to a logic-low state.

CAUTION

Note that although these devices provide galvanic isolation of up to 4000 V, this EVM cannot be used for isolation voltage testing. It is designed for the examination of device operating parameters only and will be damaged if high voltage (> 5.5 V) is applied anywhere in the circuit.

1.2 Functional Configuration of the Dual-Channel Digital Isolator

The pin-outs of the dual-channel digital isolators are displayed in Figure 1. The EVM comes with an ISO7421 installed; however, the user may reconfigure the EVM for use with any of the footprints.

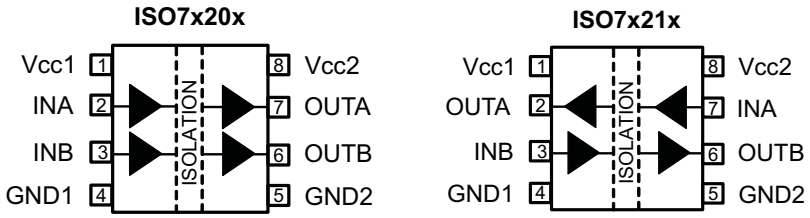

Figure 1. The ISO7x20x and ISO7x21x Pinouts

The ISO7220A, ISO7220B, ISO7220C, ISO7221A, ISO7221B and ISO7221C have TTL input thresholds and an input noise filter that prevents transient pulses of up to 2 ns in duration from being passed to the output of the device.

The ISO7220M and ISO7221M have a CMOS Vcc/2 input threshold, but do not have the noise filter and the additional propagation delay.

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1.3 The EVM Signal Paths of the ISO7220x, ISO7221x, and ISO742x Isolators

This multifunctional EVM is designed with signal paths shown in Figure 1, Figure 2, and Figure 3 for the evaluation of the ISO7220x and ISO7221x dual-channel isolators.

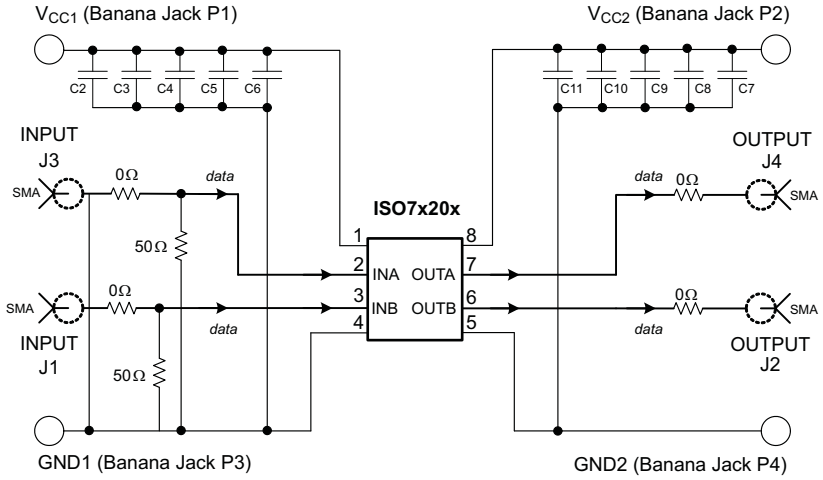

Figure 2. The ISO7x20x Same-Channel Direction Schematic

Table 1. ISO7220x and ISO7420x EVM Connections

Connection	Label	Description
J1		SMA connector to the INB input, pin 3
J2		SMA connector to the OUTB output, pin 6
J3		SMA connector to the INA input, pin 2
J4		SMA connector to the OUTA output, pin 7
P1	V_{CC1}	Input power supply banana jack
P2	V_{CC2}	Output power supply banana jack
P3	GND1	Input power ground connection banana jack
P4	GND2	Output power ground connection banana jack
JMP1		3-pin jumper V_{CC1}, input, GND1
JMP2		3-pin jumper used to monitor OUTB with scope probe
JMP3		3-pin jumper – V_{CC1}, input, GND1
JMP4		3-pin jumper used to monitor OUTA with scope probe

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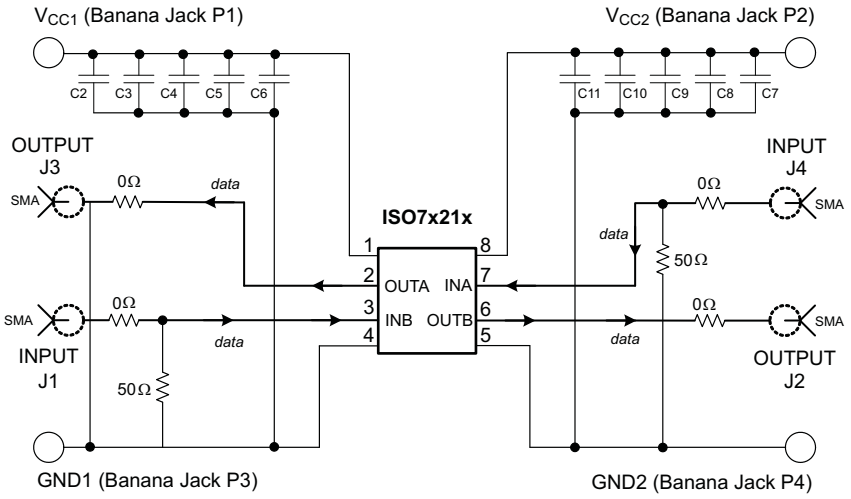

Figure 3. The ISO7x21x Opposing-Channel Direction Schematic

Table 2. ISO7221x and ISO7421x EVM Connections

Connection	Label	Description
J1		SMA connector to the INB input, pin 3
J2		SMA connector to the OUTB output, pin 6
J3		SMA connector to the OUTA output, pin 2
J4		SMA connector to the INA input, pin 7
P1	V_{CC1}	Input power supply banana jack
P2	V_{CC2}	Output power supply banana jack
P3	GND1	Input power ground connection banana jack
P4	GND2	Output power ground connection banana jack
JMP1		3-pin jumper V_{CC1}, input, GND1
JMP2		3-pin jumper used to monitor OUTB with scope probe
JMP3		3-pin jumper used to monitor OUTA with scope probe
JMP4		3-pin jumper V_{CC2}, input, GND2

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1.4 The ISO7220x and ISO7420x EVM Configuration

The ISO7220x EVM configuration has SMA connectors (J1 and J3) set up as the input to the INA (pin 2) and INB (pin 3) of the ISO7220M in Figure 1 and Figure 2. **R2** and **R8** are 0-Ω input series resistors shown in Figure 4, and are located next to the J1 and J3 input connectors. **R1** and **R5** are 50-Ω resistors from each input to ground, and are located on the bottom of the board as shown in Figure 5.

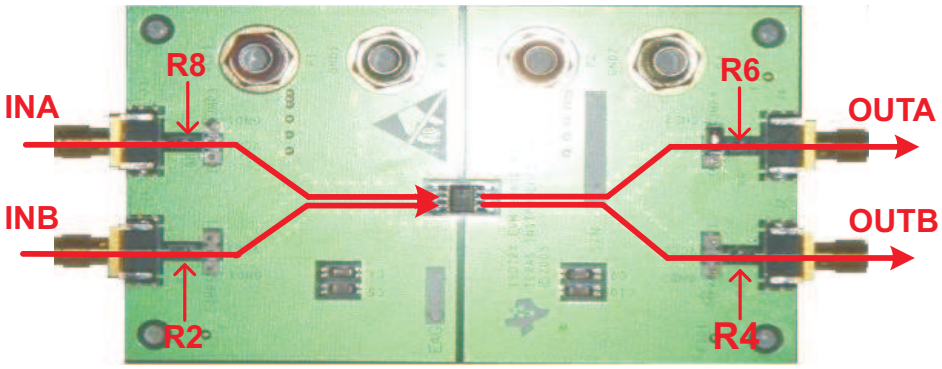

Figure 4. ISO7220x and ISO7420x EVM, Top View

The output channel configuration of the ISO7220x EVM has the OUTA (pin 7) and OUTB (pin 6) of Figure 1 and Figure 2 connected to SMA connector (J2 and J4) through 0-Ω series resistor, **R4** and **R6**.

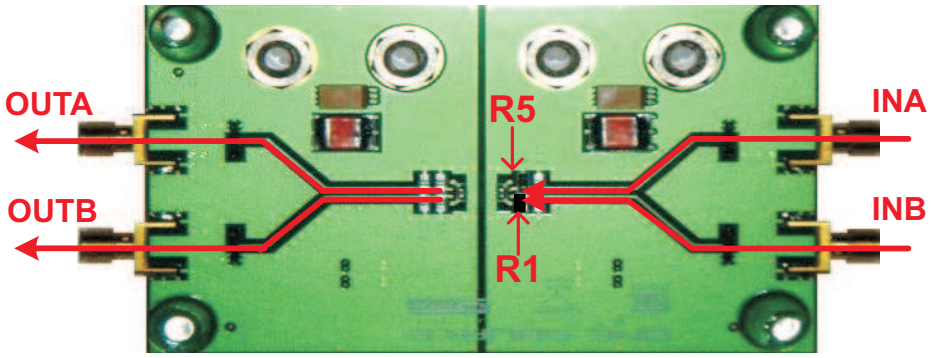

Figure 5. ISO7220x and ISO7420x EVM, Bottom View

The pads for R3, R7, C1, C12, C13 and C14 are available on the bottom of the EVM for varied loading conditions if desired by a user.

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1.5 The ISO7221x and ISO7421x EVM Configuration

The ISO7221x EVM configuration has SMA connectors (J4 and J1) set up as the input to the INA (pin 7) and INB (pin 3) of the ISO7221x in Figure 1 and Figure 3. **R2** and **R6** are 0-Ω input series resistors shown in Figure 6, and are located next to the J1 and J4 input connectors.

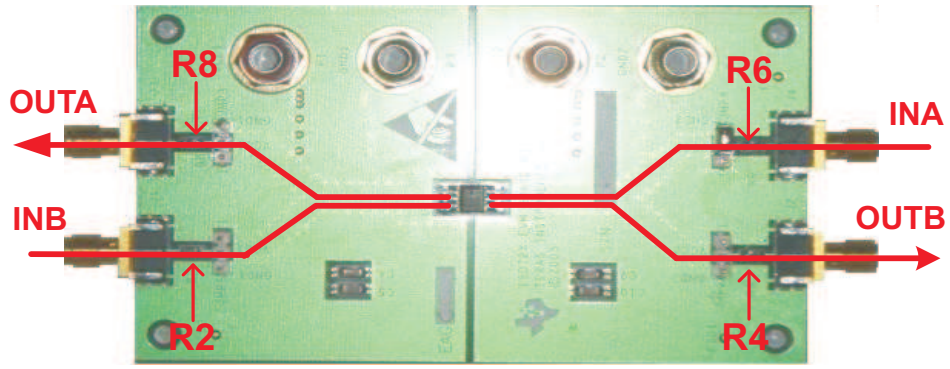

Figure 6. The ISO7221x and ISO7421x EVM Top View

The output channel configuration of the ISO7221x EVM has the OUTA (pin 2) and OUTB (pin 6) of Figure 1 and Figure 3 connected to SMA connector (J3 and J2) through 0-Ω series resistor, **R8** and **R4**.

R1 and **R7** are 50-Ω resistors from each input to ground on the bottom of the board shown in Figure 7.

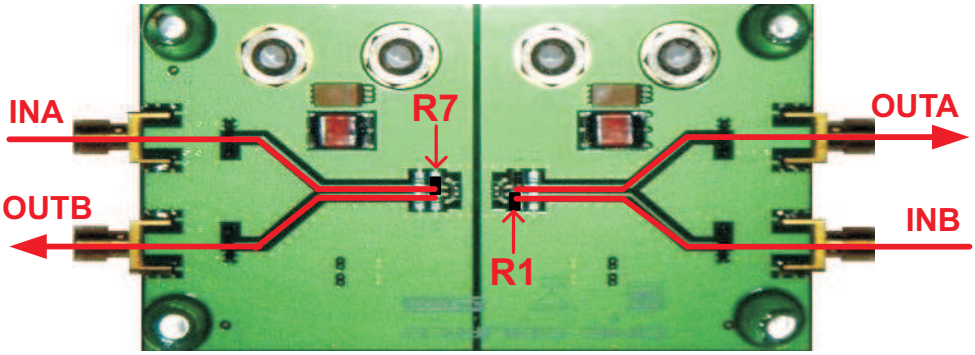

Figure 7. The ISO7221x and ISO7421x EVM Bottom View

The pads for R3, R5, C1, C12, C13 and C14 are available on the bottom of the EVM for varied loading conditions if desired by a user.

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2 EVM Setup and Operation

This section includes the setup and operation of the EVM for parameter performance evaluation. Typical waveforms are included.

2.1 Overview

The basic setup in Figure 5 has the two power supplies required to evaluate isolator performance with 3.3-V on one side and 3.3-V on the other. If both sides are to be evaluated at the same supply voltage, only one power supply is required and can be used to power both sides of the EVM.

CAUTION

Note that this EVM is for operating parameter performance evaluation only and not designed for isolation voltage testing. Any voltage applied above the 5.5-V maximum recommended operating voltage of the digital isolators will damage the EVM.

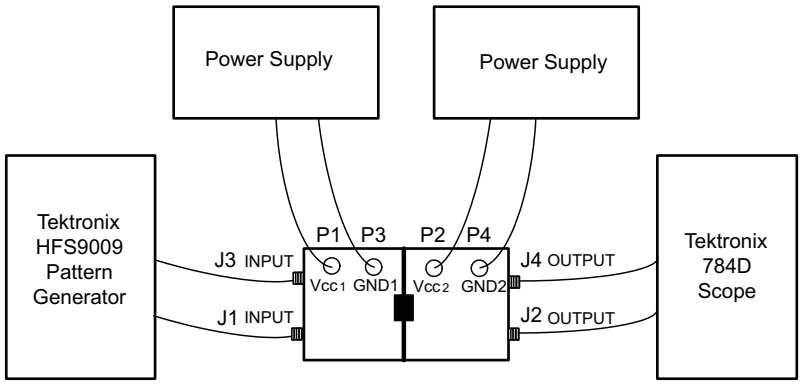

Figure 8. Basic EVM Operation

In Figure 8, the J3 input to the EVM is a 20 MHz pulse displayed on channel 1 in Figure 9. The J4 output of the EVM is channel 2.

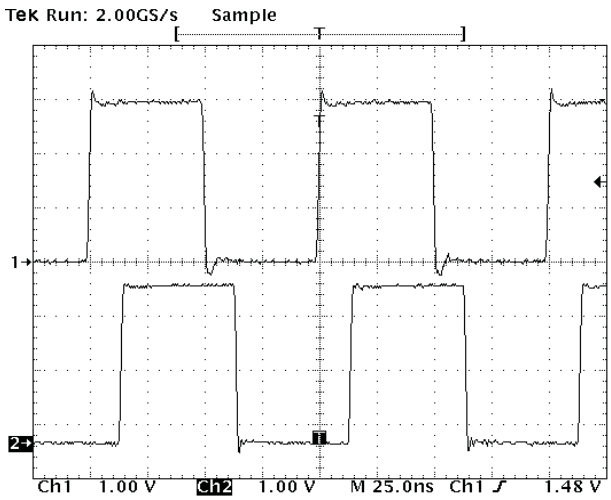

Figure 9. Typical Input and Output Waveforms

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General Statement for EVMs including a radio

User Power/Frequency Use Obligations: This radio is intended for development/professional use only in legally allocated frequency and power limits. Any use of radio frequencies and/or power availability of this EVM and its development application(s) must comply with local laws governing radio spectrum allocation and power limits for this evaluation module. It is the user's sole responsibility to only operate this radio in legally acceptable frequency space and within legally mandated power limitations. Any exceptions to this are strictly prohibited and unauthorized by Texas Instruments unless user has obtained appropriate experimental/development licenses from local regulatory authorities, which is responsibility of user including its acceptable authorization.

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Caution

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

FCC Interference Statement for Class B EVM devices

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

For EVMs annotated as IC – INDUSTRY CANADA Compliant

This Class A or B digital apparatus complies with Canadian ICES-003.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Concerning EVMs including radio transmitters

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Concerning EVMs including detachable antennas

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

This radio transmitter has been approved by Industry Canada to operate with the antenna types listed in the user guide with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Cet appareil numérique de la classe A ou B est conforme à la norme NMB-003 du Canada.

Les changements ou les modifications pas expressément approuvés par la partie responsable de la conformité ont pu vider l'autorité de l'utilisateur pour actionner l'équipement.

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2. Use this product only after you obtained the license of Test Radio Station as provided in Radio Law of Japan with respect to this product, or
3. Use of this product only after you obtained the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to this product. Also, please do not transfer this product, unless you give the same notice above to the transferee. Please note that if you could not follow the instructions above, you will be subject to penalties of Radio Law of Japan.

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