Evaluating the 16-Lead SOIC and the 16-Lead QSOP Digital Isolators

FEATURES
Convenient connections for power through screw terminal blocks
Add-on BNC connector for 50 Ω signal sources
On-board signal routing
Support for signal wrap back
Simple signal paths to reduce transmission line effects
Pull-up and pull-down provided for control lines
Support for isoPower
Project area that supports surface-mount and through-hole devices

SUPPORTED iCOUPLER MODELS

ADuM130x
ADuM131x
ADuM140x
ADuM141x
ADuM1510
ADuM240x
ADuM330x
ADuM340x
ADuM344x
ADuM5000
ADuM520x
ADuM540x
ADuM6000
ADuM620x
ADuM640x
ADuM744x
ADuM7510

GENERAL DESCRIPTION
The EVAL-ADuMQSEBZ can be used with most iCoupler isolation products in the 16-lead, wide-body SOIC and QSOP packages. The evaluation board supports the common pad positions for power, ground, and input/output pins found in nearly all of the iCoupler products and is a configurable board that can be adapted to many iCoupler products.

EVALUATION BOARD

Figure 1.
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# REVISION HISTORY

11/2016—Rev. B to Rev. C
   Changes to Supported iCoupler Models Section ....................... 1

10/2015—Rev. A to Rev. B
   Changes to Supported iCoupler Models Section ....................... 1

12/2010—Rev. 0 to Rev. A
   Changes to Supported iCoupler Models Section ....................... 1

1/2010—Revision 0: Initial Version
EVALUATION BOARD HARDWARE

PAD LAYOUT FOR THE DEVICE UNDER TEST (DUT)

The evaluation board has a pad layout in U2A that accommodates 16-lead, wide-body SOIC devices, as well as QSOP miniature packages, as shown in Figure 2. Power and ground connections connect to capacitor pads for Side 1 and Side 2.

Three low inductance, surface-mount bypass capacitors are provided for each side. A 100 nF capacitor is installed on each side in Capacitor C2 and Capacitor C3. Additional bypass capacitors are required for QSOP packages and are below the QSOP pads and within the pad layout of the SOIC package. However, they cannot be installed if the SOIC is in use.

In addition, there are 10 µF ceramic, X7R capacitors, C1 on Side 1 and C4 on Side 2, that provide high frequency bypassing and ripple reduction. For further ripple reduction in isoPower devices like the ADuM540x, tantalum capacitors are added to C10 as a 68 µF value on Side 1 and to C5 as a 22 µF value on Side 2. These large value ceramic and tantalum bypass capacitors are not necessary for non-isoPower devices.

Many of the iCoupler devices have configuration pins that allow outputs to be disabled or default levels to be set. These pins are usually located at Pin 7 and Pin 10 in the wide body package. Pull-up 0 Ω resistors on SM Pad R4 and SM Pad R17 pull these pins high. These pull-up resistors can be removed, and pull-down resistors can be installed on R5 and R18.

In addition to the U2A DUT space, an additional pad layout is provided at U1, specifically to accommodate an ADuM5000 isoPower device, as shown in Figure 3, which is a power supply only device that can provide secondary power for any iCoupler in standalone mode or as a slave to boost power to the ADuM520x or ADuM540x devices. The surface-mount resistor pads that control these functions are not populated.

An ADuM5000 is not installed at Position U1; it is left to the user to obtain and install this device, if required. As shown in Figure 3, the power and ground connections for this device are different from the rest of the iCoupler components. The C6 to C9 pad positions for bypass capacitors are provided but not populated (0.1 µF, X7R, ceramic capacitors are recommended). Pull-up, pull-down, and connecting resistor pads are provided (but not populated) to connect the ADuM5000 in master or slave mode, as well as to set the output voltage. See the ADuM5000 data sheet for descriptions of the pin functions.

Grounding Scheme

The evaluation board consists of two separate ground and power systems. Each side of the DUT can operate from an independent power and ground reference, which allows simulation of conditions similar to the target application. The evaluation board provides for board creepage and clearance typical of most 2.5 kV circuit boards. It is not recommended for use above 2.5 kV rms transient voltages or for isolation voltage testing above 2500 V rms.

Electromagnetic Interference (EMI) and Electromagnetic Compatibility (EMC) Measurements

The signal path was made as simple as possible while still providing flexibility. The evaluation board is not intended for detailed characterization of system noise, EMI, or EMC. It may be useful for initial bench work in these areas, but Analog Devices, Inc., does not guarantee that the evaluation board results will be indicative of the final system performance in these areas. The evaluation board includes some of the structures discussed in the AN-0971 Application Note for radiated EMI mitigation.

TERMINALS

Side 1 Power Supply Inputs

Power is supplied to the evaluation board via a set of terminal block connectors, IO_1C, as shown in Figure 4. Power is connected to the Pin 1 top terminal, and ground is connected to the Pin 2 top terminal. Provisions for adding in-line inductors for noise isolation were made with the inclusion of Z1 and Z2, which are 1206 size, surface-mount components. These positions are populated with 0 Ω resistors to connect power to the evaluation board. If ferrite inductors are required for noise control, remove these components and replace them with appropriate inductors.
The power and ground from the screw terminal block (if installed) are connected to the Side 1 power and ground pads of the DUT and provide power and ground to pull-up and pull-down resistors and terminations.

The ADuM640x devices differ from the rest of the isoPower devices in that they have an additional power supply input on Pin 7 that replaces the R.GOUT pin present on the ADuM5401, ADuM5402, ADuM5403, and ADuM5404. Bypass and connect this pin to VDD1 for proper operation of the ADuM640x. It is recommended that a 0.1 µF capacitor be installed at R5 and a 0 W resistor at R4. The ADuM640x devices are not compatible with power sharing; therefore, do not install an ADuM5000 at U1 when using the ADuM640x.

**Side 2 Power Supply Connections**

The Side 2 connections are different from those on Side 1. With standard iCoupler devices, these connections are power supply inputs for Side 2. However, with isoPower devices such as the ADuM540x, these same connections can be power outputs for off-board circuits. In addition, they can be configured as an independent power supply for the project area.

Power is connected to the terminal block connector (if installed), IO_1D, as shown in Figure 5. Power is connected to IO_1D Pin 1 at the top, and ground is connected to Pin 2. Provisions for adding in-line inductors for noise isolation or for isolating the jacks from the on-board power connections were made with the inclusion of Z6 and Z7. These positions are populated with 0 Ω resistors to connect power from the ADuM540x to the IO_1D terminal block.

When standard iCoupler isolators are installed, populate the Z6 and Z7 pads with 0 Ω resistors to connect the power jacks to the power pins of the DUT. Replace these resistors with inductors if noise isolation is required.

When isoPower devices are installed on the evaluation board, the power configuration required can vary greatly, depending on the demands of the application. With 0 Ω resistors or inductors installed at Z6 and Z7, the power jacks can provide power from the isoPower device to an external device.
DATA INPUT/OUTPUT CONNECTIONS

**Side 1 Data Input/Output**

Signals can be provided to the evaluation board and routed to the required input pins through the IO_1C terminal block connector, as shown in Figure 4. Four channel inputs/outputs can be connected from IO_1C Pin 3 through IO_1C Pin 6 to the respective A, B, C, and D channels of the ADuM540x.

Signals from the IO_1C terminal block connector channels can also be routed to some of the other data lines through the JP1A and JP1B jumper blocks (these jumper blocks correspond to BNC Channel A and Channel B, if you populate them). Each jumper block allows a channel signal from the IO_1C terminal block to be connected to additional data input lines by configuring the jumpers. The jumper blocks can also be used to wrap signals from an iCoupler output back to an input by using the JP1A or JP1B block to cross-connect inputs and outputs.

A common way to provide signals is with a function generator through 50 Ω coax cables. The evaluation board has a layout position at IO_1A and IO_1B for adding two BNC connectors, but these are not provided with the evaluation board. The Tyco AMP 227699-2 coax cables can be purchased to populate these BNC connectors. In addition, to have 50 Ω terminations on the evaluation board for the added BNC connectors, add a 50 Ω through-hole resistor at the R1 and R2 positions. It is possible to route data outputs to this connector as well; however, it is not recommended because proper termination is not possible for logic level signals, and improper termination can cause severe ringing on the output lines.

The Side 1 input/output structure also includes pull-up/pull-down/load positions, R7 through R14. Discrete through-hole resistors and capacitors can be installed at these positions to simulate most loading conditions or to provide pull-ups for open collector outputs.

**Side 2 Data I/O**

Signals can be provided to the evaluation board and routed to the required input pins through the IO_1D terminal block connector, as shown in Figure 5. It consists of terminal block connections that operate like the Side 1 structures. The terminal block connections can also be used to wrap signals from an iCoupler output back to an input.

In addition to the off-board input/output connections, each data channel is provided with through-hole connections to the design area.

DESIGN AREA

The design area of the evaluation board allows breadboarding of application components such as RS-485 and controller area network (CAN) transceiver, analog-to-digital converter (ADC), or digital-to-analog converter (DAC) components with direct interconnects. The design area, as shown in Figure 6, accepts most surface-mount narrow- and wide-body components with 50 mil and 100 mil pitch, as well as narrow- and wide-body 300 mil DIP through-hole devices. These surface-mount discrete components and jumper wires can complete a wide variety of circuits.

The design area has convenient connection points to the primary data path, CHA to CHD, of the iCoupler, as well as power connections for VISO and GNDISO. To allow signals from the design area to be routed to the IO_1D terminal block, remove the 0 Ω resistors for R23 through R26. Note that no ground plane is provided in the design area.
Figure 7. Schematic of ADuM540x Evaluation Board
Figure 8. Evaluation Board Layout
### ORDERING INFORMATION

#### BILL OF MATERIALS

Table 1.

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