One Technology Way • P.O. Box 9106 • Norwood, MA 02062-9106, U.S.A. • Tel: 781.329.4700 • Fax: 781.461.3113 • www.analog.com

Evaluating the *i*Coupler ADuM1440ARQZ/ADuM1441ARQZ/ ADuM1442ARQZ/ADuM1445ARQZ/ADuM1446ARQZ/ADuM1447ARQZ with the EVAL-ADuM1441EBZ Evaluation System

FEATURES

Access to all 4 data channels
Multiple connection options
Support for Tektronix active probes
Provision for cable terminations
Support for PCB edge-mounted coaxial connectors
Easy configuration
Installed *i*Coupler digital isolator: ADuM1441 in 16-lead QSOP

SUPPORTED *i*Coupler MODELS

ADuM1440ARQZ
ADuM1441ARQZ
ADuM1442ARQZ
ADuM1445ARQZ
ADuM1446ARQZ
ADuM1447ARQZ

GENERAL DESCRIPTION

The EVAL-ADuM1441EBZ supports the ADuM1440ARQZ, ADuM1441ARQZ, ADuM1442ARQZ, ADuM1445ARQZ, ADuM1446ARQZ, and ADuM1447ARQZ, which are ultralow power, 4-channel *i*Coupler® isolators. The evaluation board provides a JEDEC standard 16-lead QSOP pad layout, support for signal distribution, loopback, and loads referenced to VDDx or GNDx, as well as optimal bypass capacitance. Signal sources can be wired onto the board as well as brought onto the board through edge-mounted SubMiniature version A (SMA) connectors (sold separately) or terminal blocks for power connections. The board includes 200 mil (5.08 mm) header positions for compatibility with Tektronix active probes.

The board follows best printed circuit board (PCB) design practices for 4-layer boards, including a full power and ground plane on each side of the isolation barrier. No other electromagnetic interference (EMI) or noise mitigation design features are included on this board. In cases of high speed operation or when ultralow emissions are required, refer to the AN-1109 application note for additional board layout techniques.

PHOTOGRAPH OF THE EVALUATION BOARD

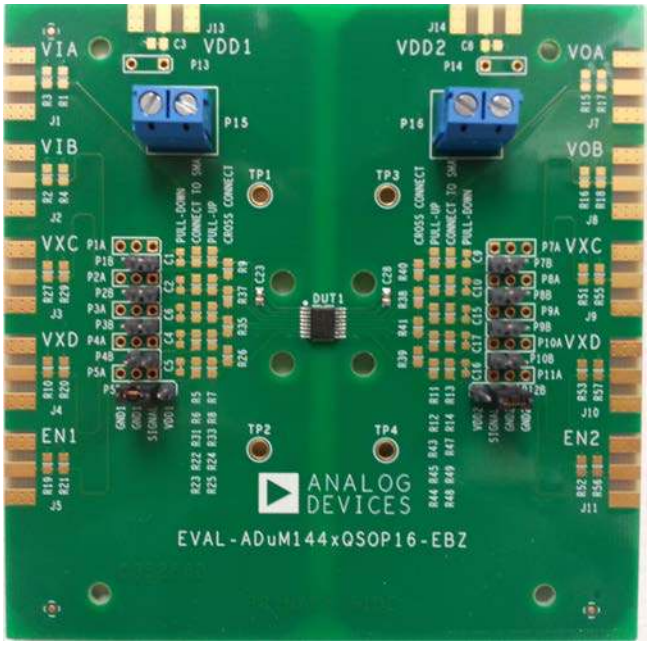

Figure 1. EVAL-ADuM1441EBZ Evaluation Board

TABLE OF CONTENTS

REVISION HISTORY

10/2017—Rev. 0 to Rev. A

Changes to Connectors Section and Power Input Section 3
Changes to Table 1 6

11/2013—Revision 0: Initial Version

EVALUATION BOARD CIRCUITRY

PCB EVALUATION GOALS

The EVAL-ADuM1441EBZ board is intended to achieve the following goals:

- Evaluate the full range of *i*Coupler data transfer functions
- Power each side of the *i*Coupler isolator independently
- Allow high differential voltage to be applied between the two sides of the *i*Coupler isolator
- Allow easy connecting to power and instrumentation

Although the evaluation board comes with the ADuM1441ARQZ *i*Coupler digital isolator installed, the board is also compatible with the ADuM1440ARQZ, ADuM1442ARQZ, ADuM1445ARQZ, ADuM1446ARQZ, and ADuM1447ARQZ, and the user can substitute any of these components in place of the ADuM1441ARQZ.

CONNECTORS

The PCB provides support for three types of interconnections:

- SMA edge-mounted connectors
- Through-hole signal ground pairs
- Terminal blocks for power connections

With these three options, both temporary and permanent connections to the board can easily be made.

When coaxial connections are desired, SMA connector positions are available for VDD1A, VDD1B, VDD2A, and VDD2B power supplies, as well as all digital inputs and outputs. These SMA connector positions are left unpopulated so that the user can customize the connectors for a given application. Figure 2 shows examples of installed SMA connectors; these connectors are chosen because they are not only low profile and provide excellent mechanical connections to the PCB but also support 50 Ω coaxial cabling. Because most lab equipment is compatible with BNC connectors, adaptors may be required to use some on board connectors.

Power can be connected through the P15 and P16 terminal blocks or can be wired directly to the PCB via the P13 and P14 through-hole connectors. Each through-hole pair provides a power ground pair with the power on the Pin 1 hole. The pin spacing of each through-hole connector is 200 mil (5.08 mm) between centers. This 200 mil (5.08 mm) spacing matches the pin spacing required for Tektronix active scope probes. When a scope probe connection is needed, the header shown in Figure 2 can be soldered into the through-hole positions, and the signal pin can be trimmed to match the height requirements of a Tektronix active scope probe.

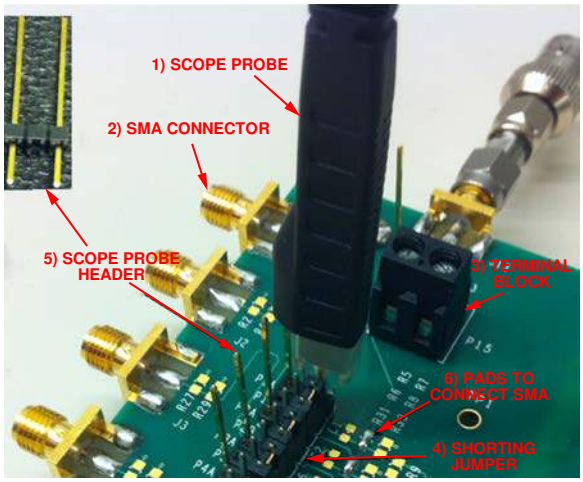

Figure 2. Optional Components

POWER INPUT

Each side of the ADuM1440ARQZ/ADuM1441ARQZ/ADuM1442ARQZ/ADuM1445ARQZ/ADuM1446ARQZ/ADuM1447ARQZ *i*Coupler isolator requires an off board power source. Each power source must be independent if common-mode voltages are applied across the isolation barrier. Sharing a single supply for both sides of the device across the isolation barrier does not harm the isolator, and it is useful for functional testing of the ADuM1440ARQZ/ADuM1441ARQZ/ADuM1442ARQZ/ADuM1445ARQZ/ADuM1446ARQZ/ADuM1447ARQZ *i*Coupler isolator when common-mode voltages are not present. If common-mode voltages are applied across the isolation barrier, provide independent power supplies for each side of the isolator.

The inner layers of the PCB are full power and ground planes on each side of the isolation barrier. Power connects to VDD1A and VDD1B for Side 1 and to VDD2A and VDD2B for Side 2. The A and B power pins on each side cannot be powered separately.

DATA INPUT/OUTPUT (I/O) STRUCTURES

Each data channel has a variety of structures to help configure, load, and monitor both the input and the output. Figure 3 shows one of the datapaths from an external connection to the device under test (DUT) pin. Each channel has similar connections.

Starting at the external connection, the signal path is as follows:

1. A pad layout for a PCB board edge-mounted SMA connector.
2. Two 0805 pads are provided where 100 Ω resistors to ground can be installed. The combined resistance is 50 Ω to provide a termination for a standard coaxial cable.
3. A standard 0805 pad layout that allows the coaxial and termination structures to be connected to the rest of the signal path.
4. A 0603 pad layout between the signal path and VDDxA or VDDxB can be used for installing a pull-up resistor.
5. A populated 2-pin header provides a signal ground pair that can be used for clip leads or for shorting a channel to ground temporarily.
6. There are groupings of three open through holes, consisting of a signal and two ground connections. These holes can be used for hardwiring signal wires into the PCB, installing a header to accept a Tektronix active probe, or installing a 2-pin header to allow adjacent channels to temporarily be shorted together.
7. A 0805 pad layout between the signal and ground where a load capacitor or resistor can be installed.
8. Pads to the adjacent channels are provided to allow permanent connection of adjacent channels. Inputs can be fanned out to several channels, or inputs and outputs can be connected together to allow signals to be looped back.

Figure 2 shows many of the optional components installed, as well as how jumpers can connect channels temporarily. Figure 2 shows a signal connected to the first channel SMA and then fanned out to the top three channels and monitored by an active scope probe.

BYPASS ON THE PCB

Several positions and structures are provided to allow optimum bypass of the evaluation board. Provision has been made for optional surface-mount bulk capacitors to be installed near the power connectors to compensate for long cables to the power supply. Parallel bypass capacitors are installed near the ADuM1441ARQZ and consist of a 0.1 µF capacitor for each VDDxA on the top side and bottom side and a 0.1 µF capacitor for each VDDxB on the bottom side of the board. It is best to use the top side bypass positions if possible.

The PCB also implements a distributed capacitive bypass on the PCB, which consists of power and ground planes closely spaced on the inner layers of the PCB. This construction minimizes noise and the transmission of EMI without using complex design features.

HIGH VOLTAGE CAPABILITY

This PCB is designed in adherence with 2500 V basic insulation practices. High voltage testing beyond 2500 V is not recommended. Appropriate care must be taken when using this evaluation board at high voltages. Do not rely on the PCB for safety functions because it has not been high potential tested (also known as hipot tested or dielectric withstanding voltage tested) or certified for safety.

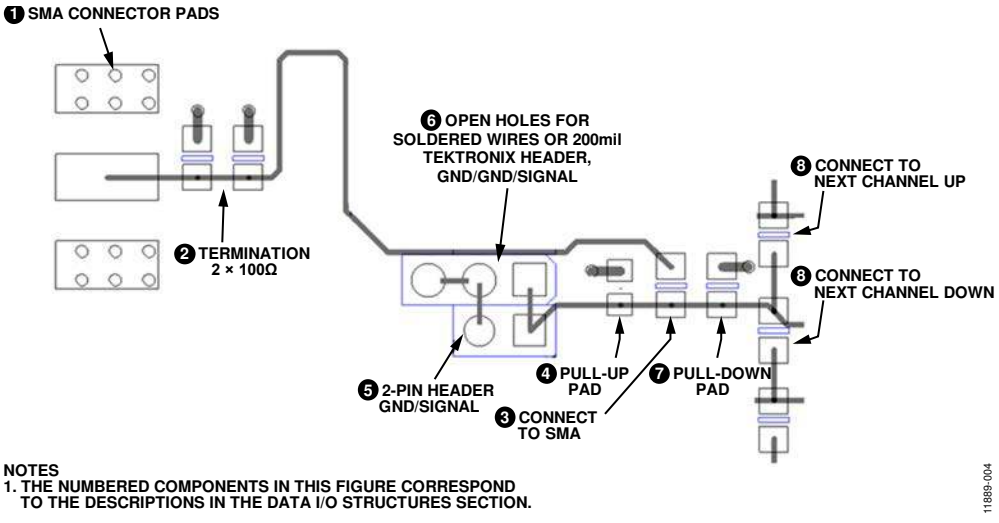

Figure 3. Configuration and Monitoring Structures (Showing a Datapath from an External Connection to the DUT Pin)

EVALUATION BOARD SCHEMATIC AND ARTWORK

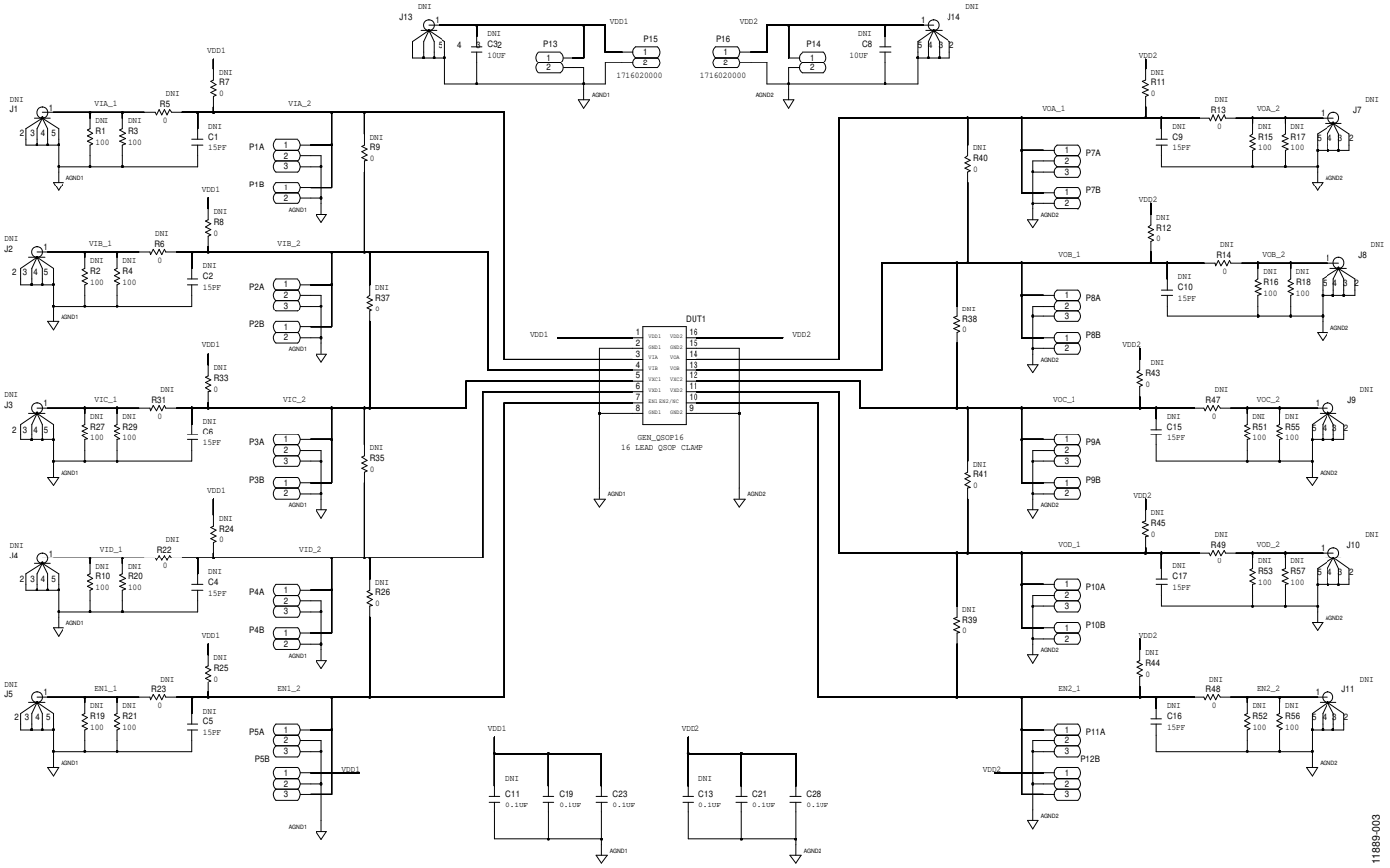

Figure 4. EVAL-ADuM1441EBZ Schematic

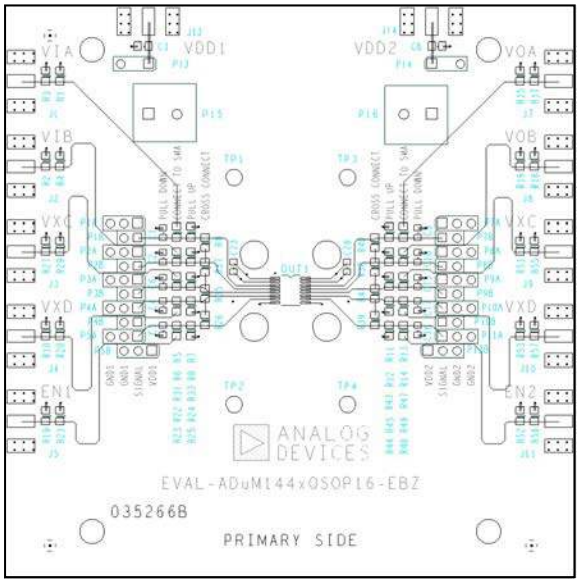

Figure 5. Top Side Layout

BILL OF MATERIALS

Table 1. Bill of Materials

Qty	Reference Designator	Description	Part Number[1]
1	DUT1	DUT	Analog Devices, Inc., ADuM1441ARQZ
2	C23, C28	0.1 µF, 16 V, 10%, 0603	AVX, 0603YC104KAT2A
2	P15, P16	Terminal blocks	On-Shore Technology, Inc., OSTTC022162
2	Not applicable	100 mil (2.54 mm) jumper	65474-001LF
2	P5B, P12B	3-pin headers, 100 mil (2.54 mm) spacing	FCI, 90726-403HLF
8	P1B to P4B, P7B to P10B	2-pin headers, 100 mil (2.54 mm) spacing	Samtec HTSW-102-07-T-S
2	C3, C8	0805 bypass capacitor position	DNI
4	C11, C13, C19, C21	0.1 µF, 16 V, 10%, 0603	DNI
7	C1 to C5, C15, C16	0603 pads for optional, application specific connections	DNI
42	R1 to R27, R29, R31, R33, R43 to R45, R47 to R49, R51 to R53, R55 to R57	0805 pads for optional, application specific connections	DNI
14	P1A to P12A, P13, P14	2-pin headers, 200 mil (5.08 mm) spacing	DNI, Samtec MTSW-202-12-G-S-730
12	J1 to J5, J7 to J11, J13, J14	SMA edge connectors	DNI, Johnson/Emerson Network Power Connectivity Solutions, Inc., 142-0701-851

[1] DNI means do not install.