EVAL-ADuM1241EBZ User Guide
UG-663

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 ADuM1240ARSZ/ADuM1241ARSZ/ ADuM1245ARSZ/ADuM1246ARSZ with the EVAL-ADuM1241EBZ Evaluation System

FEATURES

Access to both 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: ADuM1241 in the 20-lead SSOP package

SUPPORTED *i*Coupler MODELS

ADuM1240ARSZ
ADuM1241ARSZ
ADuM1245ARSZ
ADuM1246ARSZ

GENERAL DESCRIPTION

The EVAL-ADuM1241EBZ supports the ADuM1240ARSZ, ADuM1241ARSZ, ADuM1245ARSZ, and ADuM1246ARSZ, which are ultralow power, dual-channel *i*Coupler® isolators. The evaluation board provides a JEDEC standard 20-lead SSOP pad layout, support for signal distribution, loopback, and loads referenced to V_{DDx} or GND_x, as well as optimal bypass capacitance. Signal sources can be wired onto the board as well as brought onto the board through edge-mounted SMA connectors (sold separately) or terminal blocks for power connections. The board includes 200 mil 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 EMI or noise mitigation design features are included on this board. In cases of very 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

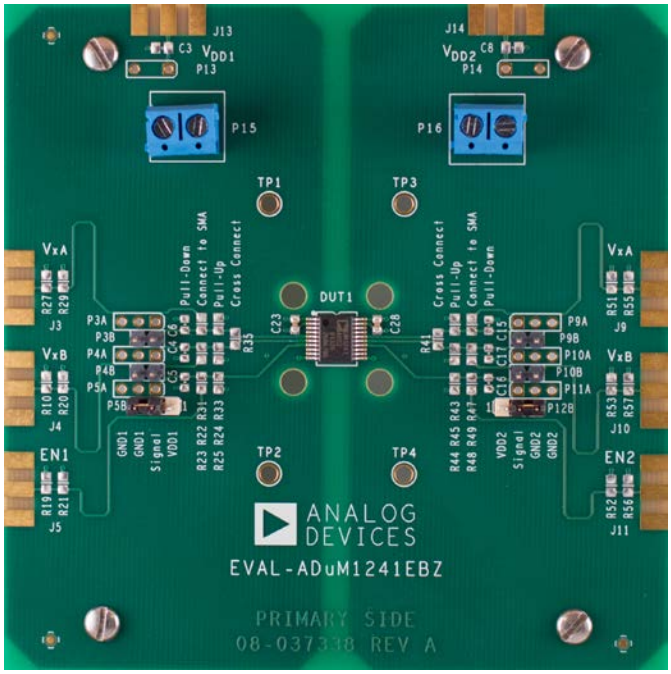

Figure 1. EVAL-ADuM1241EBZ Evaluation Board

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REVISION HISTORY

3/14—Revision 0: Initial Version

EVALUATION BOARD CIRCUITRY

PCB EVALUATION GOALS

The EVAL-ADuM1241EBZ 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 connecting easily to power and instrumentation

Although the evaluation board comes with the ADuM1241ARSZ *i*Coupler digital isolator installed, the board is also compatible with the ADuM1240ARSZ, ADuM1245ARSZ, and ADuM1246ARSZ, and the user can substitute any of these components in place of the ADuM1241ARSZ.

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 the V_{DD1} and V_{DD2} 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 were 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.

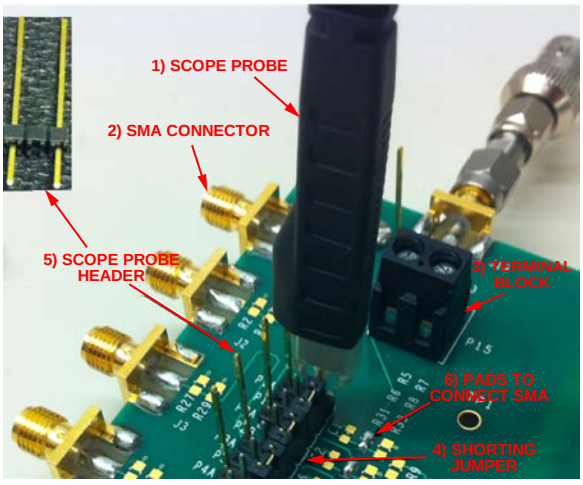

Figure 2. Optional Components

Power can be connected through the P1 and P2 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 between centers. This matches the pin spacing required for Tektronix active scope probes. If a scope probe connection is desired, 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.

POWER INPUT

Each side of the ADuM1240ARSZ/ADuM1241ARSZ/ADuM1245ARSZ/ADuM1246ARSZ *i*Coupler isolator requires an off-board power source. Each power source must be independent if common-mode voltages are to be applied across the isolation barrier. Sharing a single supply for both sides of the part across the isolation barrier does not harm the isolator, and it is useful for functional testing of the ADuM1240ARSZ/ADuM1241ARSZ/ADuM1245ARSZ/ADuM1246ARSZ *i*Coupler isolators when common-mode voltages are not present. If common-mode voltages are to be applied across the isolation barrier, independent power supplies must be provided for each side of the isolator.

A ground plane and a power plane are present on Layer 2 and Layer 3 of the PCB on each side of the isolation barrier. Power connects to V_{DD1} for Side 1 and connects to V_{DD2} for Side 2. The A and B power pins on each side cannot be powered separately.

DATA I/O STRUCTURES

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

Starting at the external connection, the signal path is

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 V_{DD1} or V_{DD2} 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 loopback.

Figure 2 shows many of the optional components installed, as well as how jumpers can be used to temporarily connect channels. This figure 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 ADuM1241ARSZ and consist of a 0.1 µF capacitor for V_{DD1} on the top side and bottom side and a 0.1 µF capacitor for V_{DD2} 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. This consists of power and ground planes closely spaced on the inner layers of the PCB. This 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, and the PCB should not be relied on 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.

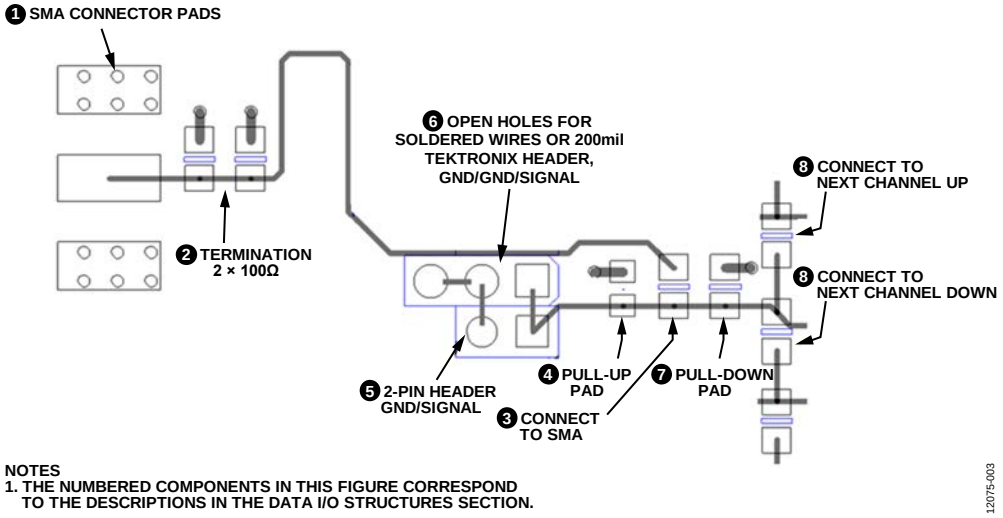

Figure 3. Configuration and Monitoring Structures (Showing a Datapath from an External Connection to the DUT Pin)

EVALUATION BOARD SCHEMATICS AND ARTWORK

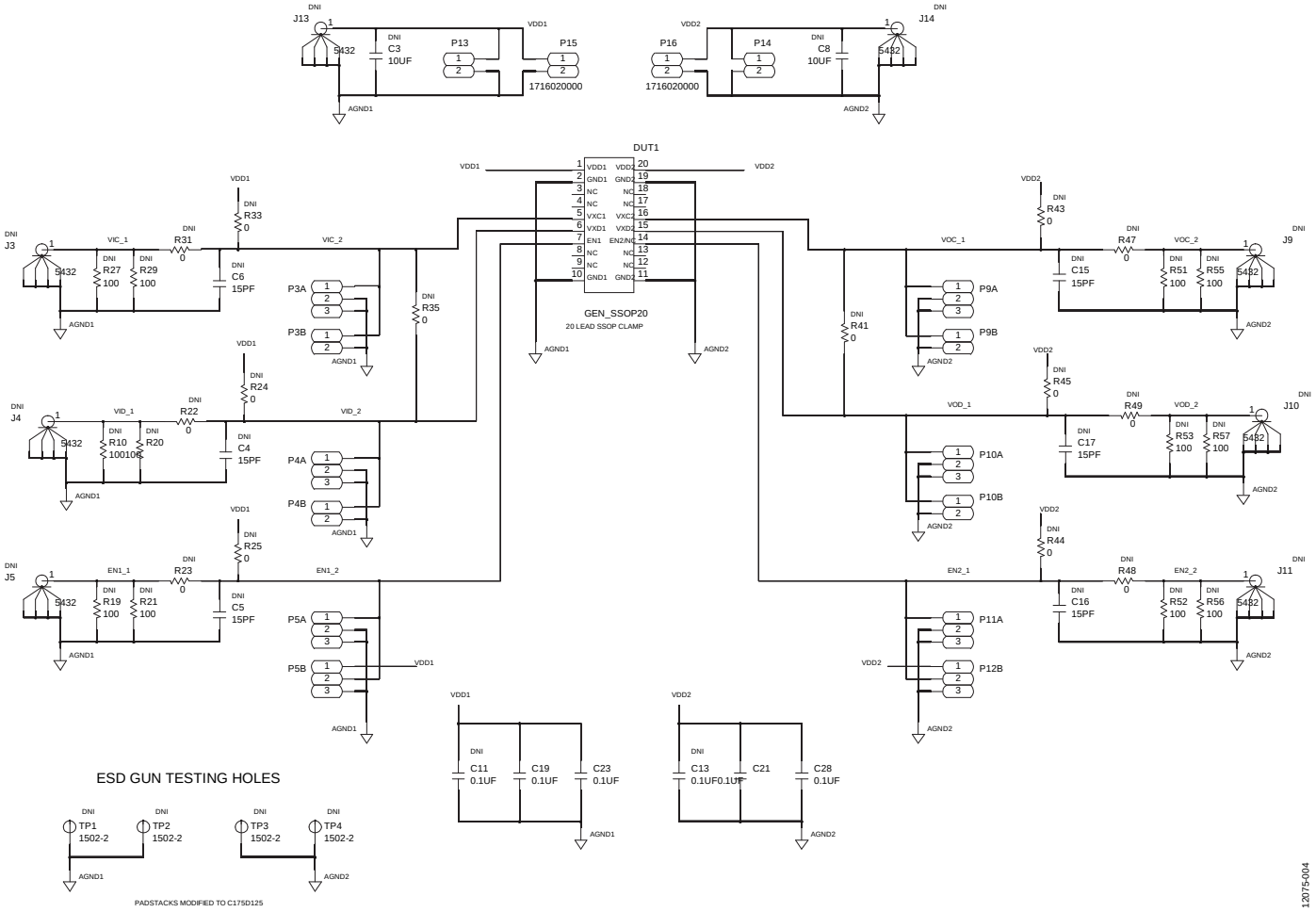

Figure 4. EVAL-ADuM1241EBZ Schematic

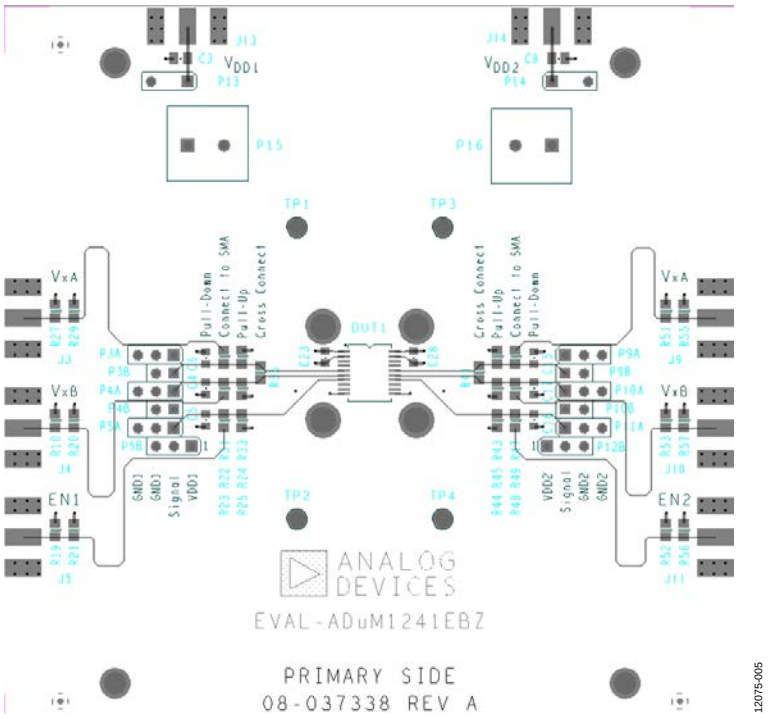

Figure 5. Top Side Layout

BILL OF MATERIALS

Table 1. Bill of Materials

Qty	Reference Designator	Description	Part Number[1]
1	U1	DUT	Analog Devices, Inc., ADuM1241ARSZ
2	C23, C28	0.1 µF, 16 V, 10%, 0603	AVX 0603YC104KAT2A
2	C3, C8	0805 bypass capacitor position	DNI
17	R19 to R21, R22 to R25, R31, R33, R35, R41, R43 to R45, R47 to R49	0805 pad for optional, application-specific connections	DNI
9	C4 to C6, C11, C13, C15, C17, C19, C21	0603 pad for optional, application-specific connections	DNI
2	P15, P16	Terminal block	On-Shore Technology, Inc., OSTTC022162
6	P3A to P5A, P9A to P11A	2-pin header, 200 mil spacing (not installed)	Samtec MTSW-202-12-G-S-730
2	P5B, P12B	3-pin header 100 mil spacing	FCI, 90726-403HLF
7	P3B to P5B, P9B to P12B	2-pin header 100 mil spacing	Samtec HTSW-102-07-T-S
8	J3 to J5, J9 to J11, J13, J14	SMA edge connector (not installed)	Johnson/Emerson Network Power Connectivity Solutions, Inc., 142-0701-851

[1] DNI = do not install.

NOTES

ESD Caution

ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

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Наши контакты:

Телефон: +7 812 627 14 35

Электронная почта: sales@st-electron.ru

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