Evaluation Board for the ADuM5401-ADuM5404 Quad Isolators with *iso*Power

EVAL-ADuM5401-ADuM5404

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 *iso*Power
Project area that supports surface-mount and through hole devices

GENERAL DESCRIPTION

The ADuM540x evaluation board can be used with *i*Coupler® isolation products in the wide body SOP16 package. The evaluation board supports the common pad positions for power, ground, and I/O pins found in nearly all of the *i*Coupler products and is a configurable board that can be adapted to many *i*Coupler products.

SUPPORTED *i*Coupler MODELS

ADuM130x
ADuM131x
ADuM140x
ADuM141x
ADuM240x
ADuM330x
ADuM340x
ADuM540x
ADuM520x
ADuM5000

EVALUATION BOARD

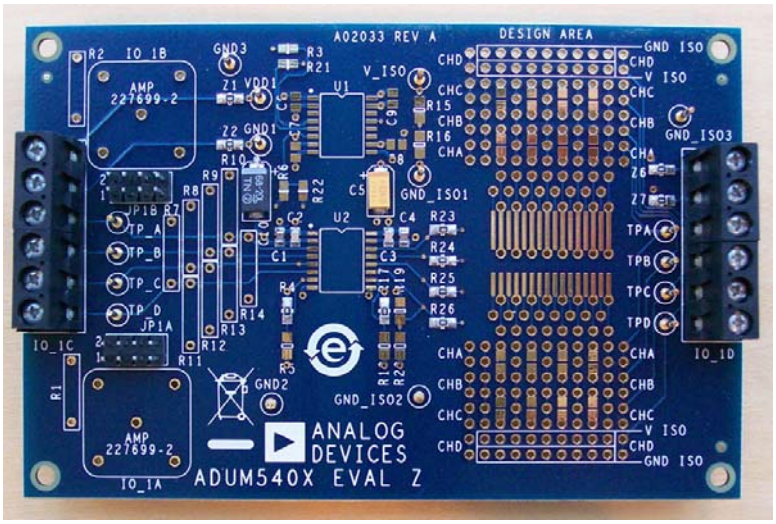

Figure 1.

Rev. 0

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

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REVISION HISTORY

7/08—Revision 0: Initial Version

EVALUATION BOARD HARDWARE

PAD LAYOUT FOR THE DUT

The evaluation board has a pad layout in U2 that accommodates SOP16 wide body devices as shown in Figure 2. Power and ground connections connect to capacitor pads for Side 1 and Side 2.

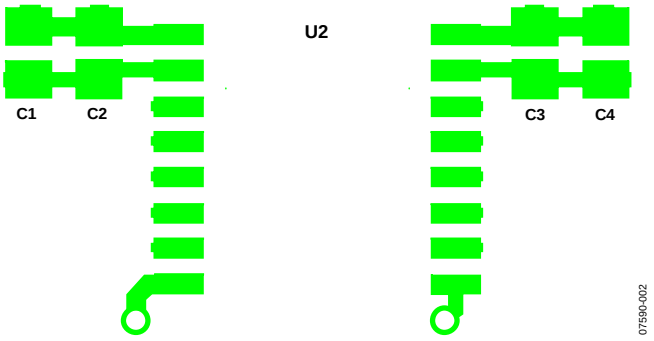

Figure 2. DUT Pad Layout Component U2

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.

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 *iso*Power™ 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-*iso*Power devices.

Many of the *i*Coupler 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 and SM Pad R17 have been provided to pull these pins high. If desired, these pull-up resistors can be removed and pull-down resistors can be installed on R5 and R18.

In addition to the U2 DUT space, an additional pad layout is provided at U1, specifically to accommodate another *iso*Power device, as shown in Figure 3. This is a power supply only device that can be used to provide secondary power for any *i*Coupler, in standalone mode or as a slave, to boost power to the ADuM540x or ADuM520x devices. The surface-mount resistor pads to control these functions are not populated.

Pad layout for the ADuM5000 is provided in U1, but this part is not populated. As can be seen in Figure 3, the power and ground connections for this device are different from the rest of the *i*Coupler components. Bypass capacitor Pad C6 through Pad C9 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.

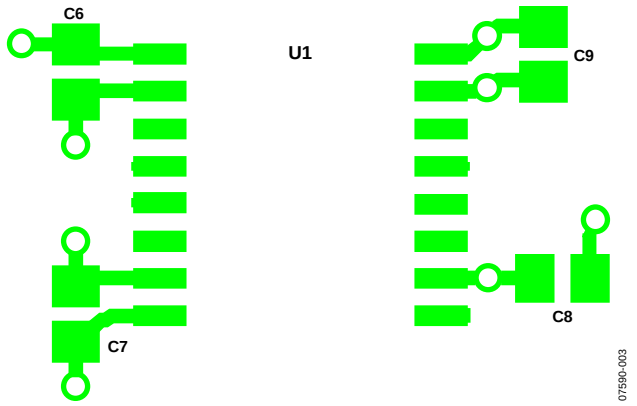

Figure 3. ADuM5000 Pad Layout Component U1

Grounding Scheme

The board consists of two separate ground and power systems. Each side of the DUT can be operated from an independent power and ground reference. This allows simulation of conditions similar to the target application. The 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.

EMI and EMC Measurements

The signal path has been made as simple as possible while still providing flexibility. The 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 board results will be indicative of the final system performance in these areas.

TERMINALS

Side 1 Power Supply Inputs

Power is supplied to the board via a set of terminal block connectors labeled IO_1C, as shown in Figure 4. Power is connected to the top terminal Pin 1, and ground is connected to the top terminal Pin 2. Provisions for adding in line inductors for noise isolation have been 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 board. If isolation inductors are required, these components should be removed and replaced at your discretion.

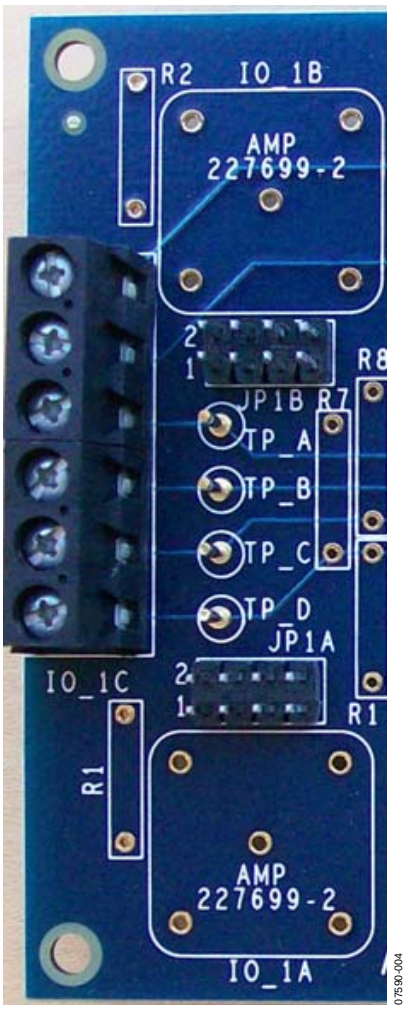

Figure 4. Side 1 Terminal Block Connector

The power and ground from the screw terminal block 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.

Side 2 Power Supply Connections

The Side 2 connections are different from those on Side 1. With standard *i*Coupler devices, these connections are power supply inputs for Side 2. However, with *iso*Power 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.

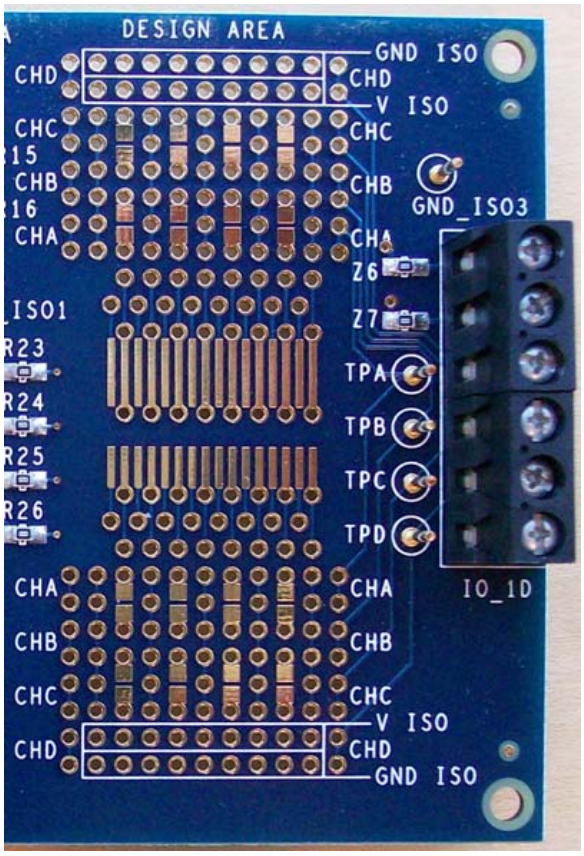

Figure 5. Side 2 Terminal Block Connector

Power is connected to the terminal block connector labeled IO_1D, as shown in Figure 5. Power is connected to the top Pin 1, 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 have been 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 *i*Coupler isolators are installed, the Z6 and Z7 pads should be populated with 0 Ω resistors to connect the power jacks to the power pins of the DUT. Inductors can be installed if noise isolation is required.

When *iso*Power devices are installed on the 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 *iso*Power device to an external device.

With Z6 and Z7 open, IO_1D Pin 1 and Pin 2 become general-purpose connections that can be wired into the project area with the through hole connections provided. Without Z6 and Z7 populated, these pins then become completely isolated from the ground and power connections on the board (see the complete schematic shown in Figure 7).

DATA I/O CONNECTIONS

Side 1 Data I/O

Signals can be provided to the 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 through IO_1C Pins 3 through 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 also correspond to BNC Channel A and Channel B, if you populate them). Each jumper block allows a channel signal from the terminal block IO_1C to be connected to additional data input lines by configuring the jumpers. The jumper blocks can also be used to wrap signals from an *i*Coupler 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 ADuM540x board has a layout position at IO_1A and IO_1B for adding two BNC connectors, but these are not provided with the board. You can purchase the coax cables (AMP #227699-2) and populate these BNC connectors. In addition, to have 50 Ω terminations on the board for the added BNC connectors, a 50 Ω through hole resistor must be added at the R1 and R2 positions. It is possible to route data outputs to this connector as well, but 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.

Also part of the Side 1 I/O structure are the 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 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 *i*Coupler output back to an input.

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

DESIGN AREA

The design area of the evaluation board is provided to allow bread-boarding of application components such as RS485 and CAN transceivers, ADC or 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 be used to complete a wide variety of circuits.

The design area has convenient connection points to the primary data path CHA to CHD of the *i*Coupler, as well as power connections for V_{ISO} and GND_{ISO}. To allow signals from the design area to be routed to the IO_1D terminal block, you should remove the R23 0 Ω through R26 0 Ω resistors. Note that no ground plane is provided in the design area.

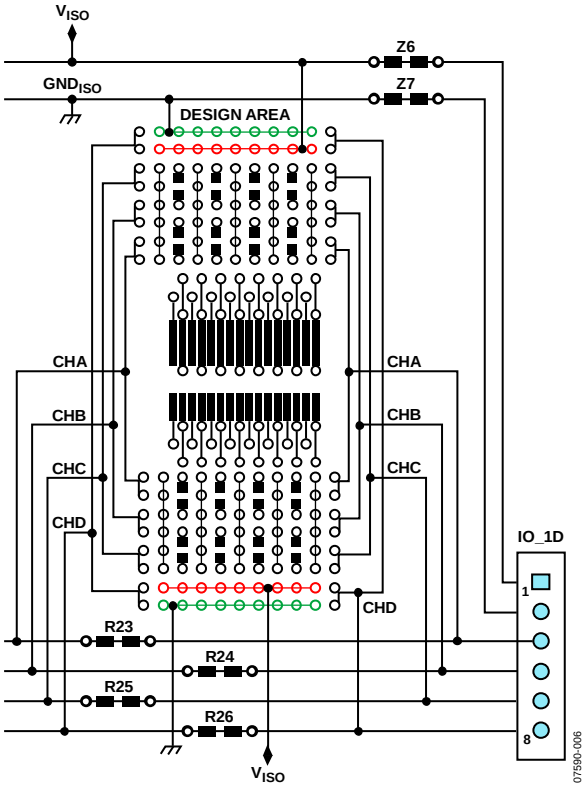

Figure 6. Design Area

EVALUATION BOARD SCHEMATICS AND LAYOUT

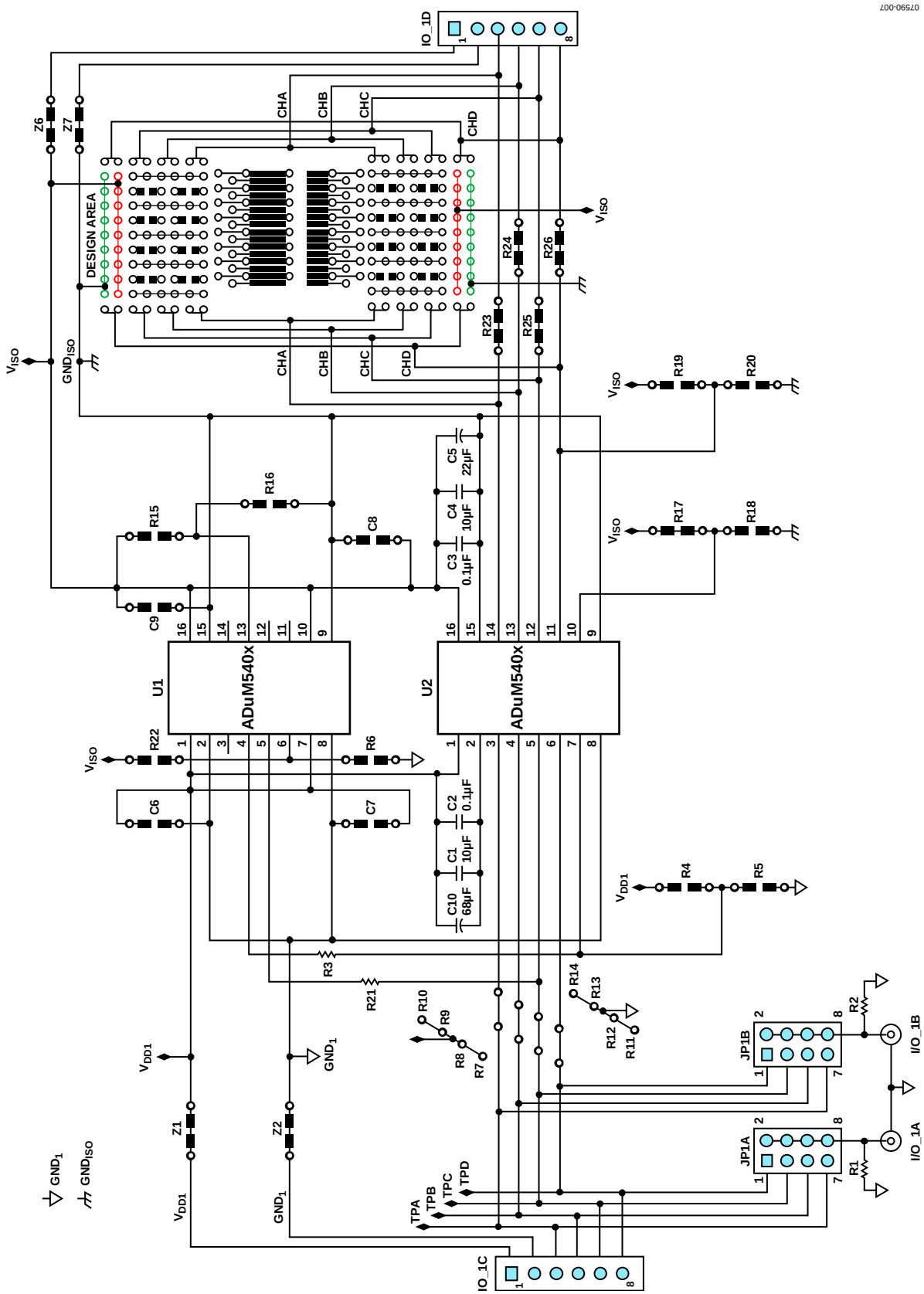

Figure 7. Schematic of ADuM540x Evaluation Board

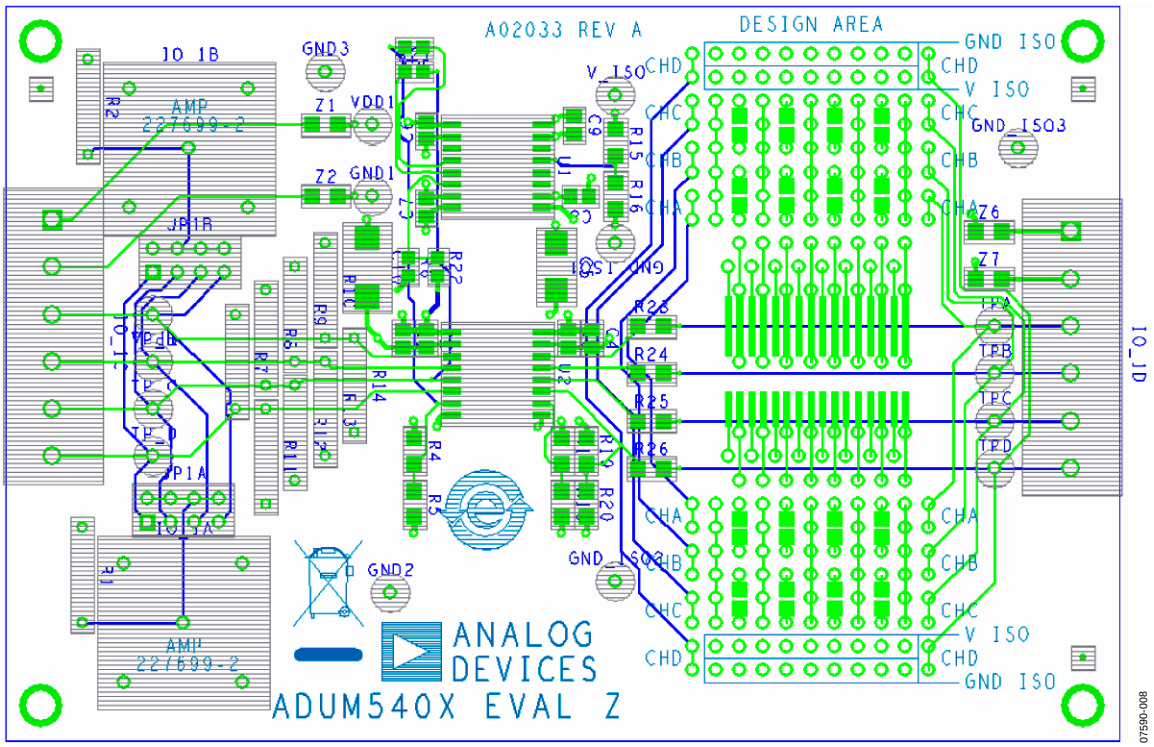

Figure 8. Evaluation Board Layout

ORDERING INFORMATION

BILL OF MATERIALS

Table 1.

Qty	Reference Designator	Description	Supplier/Part Number
2	IO_1C, IO_1D	CONN-PCB terminal	Weidmuller/999394
0	U1	ADuM5000; not populated	
0	U2	Supported *iCoupler* Models SO16WB; not populated	
1	C10	CAP TANT chip 68 µF	KEMET/T495X686K020AS
1	C5	CAP TANT chip 22 µF	AVX/TAJC226K020R
2	C1, C4	CAP CER X5R 10 µF	Panasonic/ECJ-2FB0J106M
2	C2, C3	CAP CER X7R 0.1 µF	Murata/GRM40X7RRR104K0
0	C6, C7, C8, C9	CAP CER SMD 0805; not populated	
0	IO_1A, IO_1B	CONN-PCB coax BNC; not populated	AMP/227699-2
2	JP1A, JP1B	CONN-PCB header, 8-pin double row	SAMTEC/TSW-104-08-T-D
2	P1, P2	Jumper	VECTOR/K24A
0	R3, R6, R21, R22	RES chip SMD 0805; not populated	
6	R4, R17, R23 to R26	RES chip SMD 1206; 0 Ω	Panasonic/ERJ-8GEY0R00V
4	Z1, Z2, Z6, Z7	RES chip SMD 1206; 0 Ω	Panasonic/ERJ-8GEY0R00V
0	R5, R15, R16, R18 to R20	RES chip SMD 1206; not populated	
0	R1, R2, R7 to R14	RES SPACER_400; not populated	

ORDERING GUIDE

Model	Description
EVAL-ADuM540XEBZ[1]	Evaluation Board[2]

[1] Z = RoHS Compliant Part.
[2] Integrated circuit not included; order separately.

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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