Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of “Quality Parts,Customers Priority,Honest Operation,and Considerate Service”,our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!

Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832
Email & Skype: info@chipsmall.com Web: www.chipsmall.com
Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China

EVAL-AD5316RDBZ User Guide
UG-969

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

Evaluation Board for the AD5316R 10-Bit, Quad-Channel, Voltage Output DAC

FEATURES

- Full featured evaluation board in conjunction with the *nano*DAC® motherboard (EVAL-MBnanoDAC-SDZ)
- On-board references
- Various link options
- PC control in conjunction with Analog Devices, Inc., system demonstration platform (SDP)

PACKAGE CONTENTS

- EVAL-AD5316RDBZ evaluation board
- EVAL-MBnanoDAC-SDZ motherboard

SOFTWARE NEEDED

- EVAL-AD5316RDBZ evaluation software

HARDWARE NEEDED

- EVAL-SDP-CB1Z (SDP-B board), must be purchased separately

DOCUMENTS NEEDED

- Electronic version of the AD5316R data sheet
- Electronic version of the EVAL-AD5316RDBZ user guide

GENERAL DESCRIPTION

This user guide details the operation of the evaluation board for the AD5316R quad-channel, voltage output, digital-to-analog converter (DAC).

The evaluation board is designed to help users quickly prototype new AD5316R circuits and reduce design time. The AD5316R operates from a single 2.7 V to 5.5 V supply.

For full details, see the AD5316R data sheet, which must be used in conjunction with this user guide when using the evaluation board.

The evaluation board interfaces to the USB port of a PC via the SDP-B board. Software is supplied with the evaluation board to allow the user to program the AD5316R.

EVAL-AD5316RDBZ, EVAL-MBnanoDAC-SDZ, AND SDP-B BOARDS

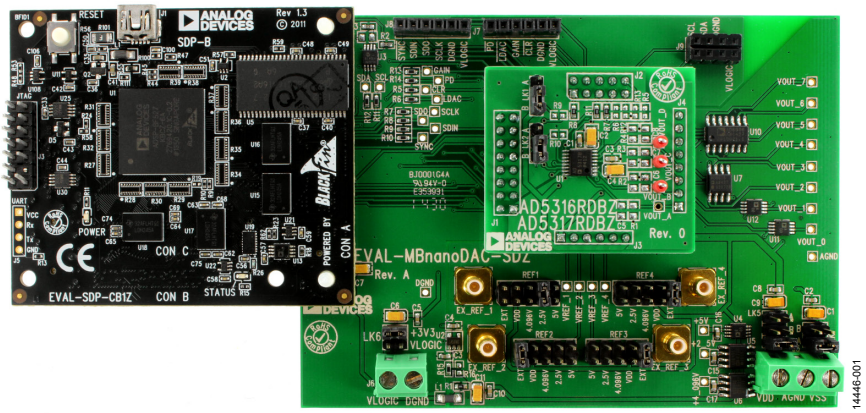

Figure 1.

TABLE OF CONTENTS

Features 1
Package Contents 1
Software Needed 1
Hardware Needed 1
Documents Needed 1
General Description 1
EVAL-AD5316RDBZ, EVAL-MBnanoDAC-SDZ, and SDP-B Boards 1
Revision History 2
Evaluation Board Hardware 3
Motherboard Power Supplies 3
Motherboard Link Options 3
Daughter Board Link Options 3
Evaluation Board Software Quick Start Procedures 4
Installing the Software 4
Running the Software 4
Software Operation 5
Evaluation Board Schematics and Artwork 7
EVAL-MBnanoDAC-SDZ Motherboard 7
EVAL-AD5316RDBZ Daughter Board 11
Ordering Information 13
Bill of Materials 13

REVISION HISTORY

8/2017—Rev. 0 to Rev. A

Change to Table 4 3
Change to Table 6 13

3/2017—Revision 0: Initial Version

EVALUATION BOARD HARDWARE

MOTHERBOARD POWER SUPPLIES

The EVAL-MBnanoDAC-SDZ motherboard supports single and dual power supplies.

The EVAL-AD5316RDBZ evaluation board can be powered either from the SDP-B port, or externally by the J5 and J6 connectors, as described in Table 1.

Table 1. Power Supply Connectors

Connector No.	Label	Voltage
J5, Pin 1 (J5-1)	VDD	Analog positive power supply, V_{DD}. Single and dual supply 5.5 V.
J5, Pin 2 (J5-2)	AGND	Analog ground.
J5, Pin 3 (J5-3)	VSS	Analog negative power supply, V_{SS}. Dual supply −5.5 V. Digital ground.
J6, Pin 1 (J6-1)	VLOGIC	Digital supply from 1.8 V to V_{DD}.
J6, Pin 2 (J6-2)	DGND	Digital ground.

Both AGND and DGND inputs are provided on the board. The AGND and DGND planes are connected at one location on the EVAL-MBnanoDAC-SDZ. It is recommended that AGND and DGND not be connected elsewhere in the system to avoid ground loop problems.

All supplies are decoupled to ground with 10 µF tantalum and 0.1 µF ceramic capacitors.

MOTHERBOARD LINK OPTIONS

A number of link options are incorporated in the EVAL-MBnanoDAC-SDZ and must be set for the required operating conditions before using the board. Table 2 describes the positions of the links to control the evaluation board via the SDP-B board using a PC and external power supplies. The functions of these link options are described in detail in Table 4. The positions listed in Table 2 and Table 4 match the evaluation board imprints (see Figure 12).

Table 2. Link Options Setup for SDP-B Control (Default)

Link No.	Position
REF1	2.5V
REF2	EXT
REF3	EXT
REF4	EXT
LK5	C
LK6	3.3V
LK7	B

DAUGHTER BOARD LINK OPTIONS

The EVAL-AD5316RDBZ daughter board has two link options. These links set the least significant bits (LSBs) of the DAC I^2C address. Table 3 describes the function of these links. For proper device operation, position LK1 and LK2 to A.

Table 3. Link Options for Daughter Board

Link No.	Pin	Position
LK1	A0	A (low, default)
		B (high)
LK2	A1	A (low, default)
		B (high)

Table 4. Link Functions

Link No.	Function
REF1 to REF4	These links select the reference source. Position EXT selects an off-board voltage reference via the appropriate EXT_REF_x connector. Position VDD selects V_{DD} as the reference source. Position 4.096V selects the on-board 4.096 V reference as the reference source. Position 2.5V selects the on-board 2.5 V reference as the reference source. Position 5V selects the on-board 5 V reference as the reference source.
LK5	This link selects the positive DAC analog voltage source. Position A selects the internal voltage source from the SDP-B board. Only the 2.5 V on-board reference can be used with this configuration. Position B selects the internal voltage source 3.3 V from the ADP121. Position C selects an external supply voltage, V_{DD}.
LK6	This link selects the VLOGIC voltage source. Position 3.3V selects the digital voltage source from the SDP-B board, 3.3 V. Position VLOGIC selects an external digital supply voltage, V_{LOGIC}.
LK7	This link selects the negative DAC analog voltage source. Position A selects V_{SS}. Position B selects AGND.

EVALUATION BOARD SOFTWARE QUICK START PROCEDURES

INSTALLING THE SOFTWARE

The EVAL-AD5316RDBZ evaluation software is compatible with Windows® Vista (64-bit/32-bit), and Windows 7 (64-bit/32-bit).

The software must be installed before connecting the SDP-B board to the PC to ensure that the SDP-B board is recognized when it connects to the PC.

To install the software, take the following steps:

1. Start the Windows operating system. Download the installation software from the EVAL-AD5316RDBZ evaluation board page.
2. Run the setup.exe file from the installer folder if it does not open automatically.
3. After installation is completed, power up the evaluation board as described in the Motherboard Power Supplies section.
4. Connect the evaluation board to the SDP-B board, and connect the SDP-B board into the PC using the USB cable included in the evaluation kit.
5. When the software detects the evaluation board, click through any dialog boxes that appear to finalize the installation.

RUNNING THE SOFTWARE

To run the program, do the following:

1. Connect the evaluation board to the SDP-B board and connect the USB cable between the SDP-B board and the PC.
2. Power up the evaluation board as described in the Motherboard Power Supplies section.
3. From the **Start** menu, click **All Programs, Analog Devices, AD5316R Evaluation Software.**
4. If the SDP-B board is not connected to the USB port when the software is launched, a connectivity error displays (see Figure 2). Connect the evaluation board to the USB port of the PC and wait a few seconds. When the SDP-B board is detected, the display is updated (see Figure 3).

Alternatively, the software can be used without an evaluation board. The software runs in simulation mode displaying expected outputs based on the input data. The main window of the AD5316R evaluation software then opens, as shown in Figure 4.

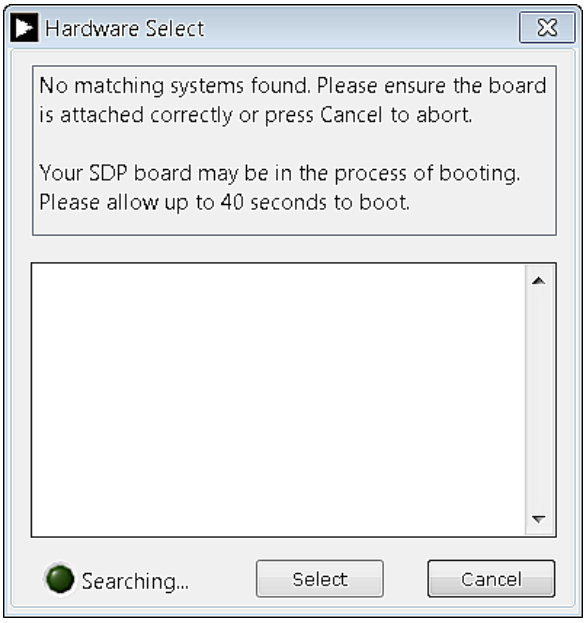

Figure 2. Connectivity Error

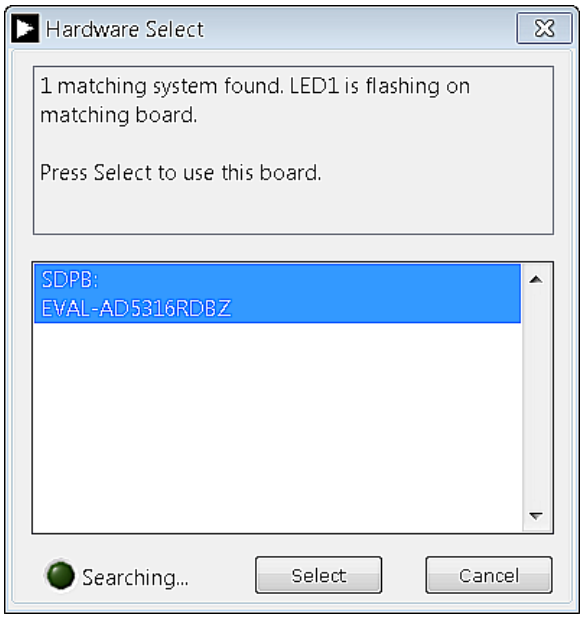

Figure 3. ***Hardware Select***

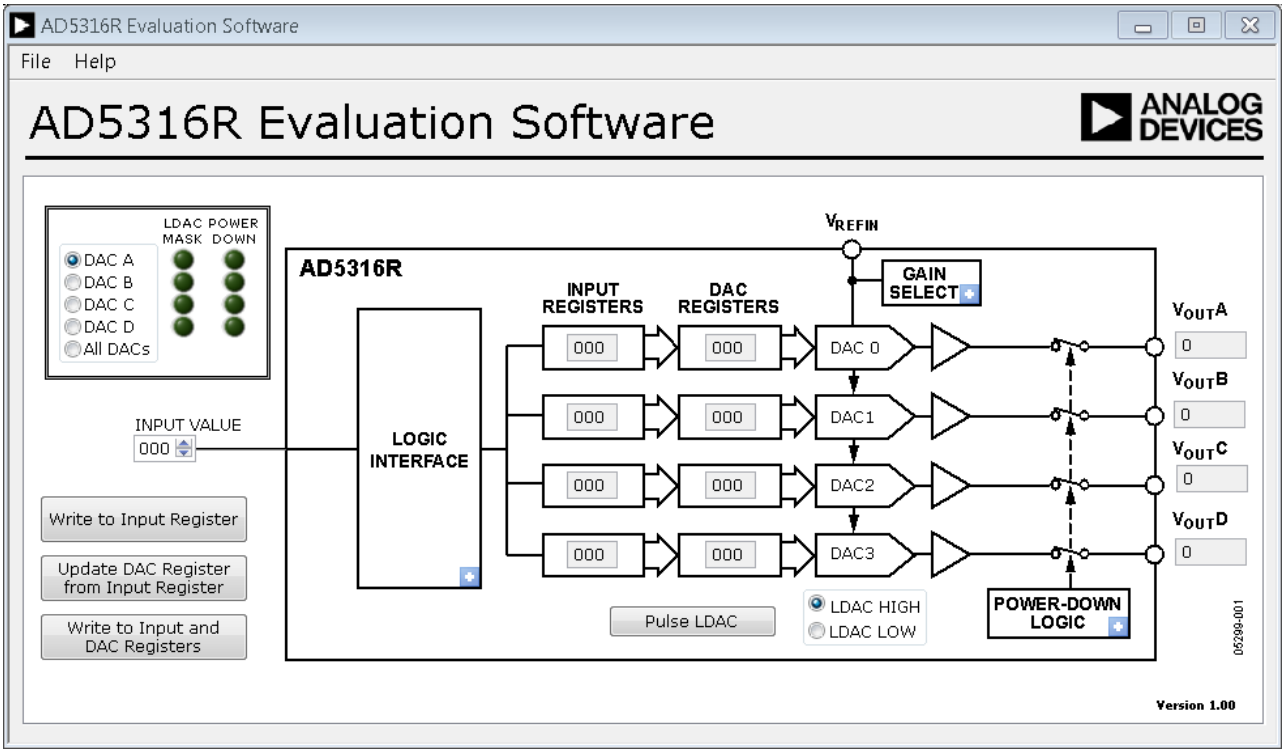

*Figure 4. **AD5316R Evaluation Software** Main Window*

SOFTWARE OPERATION

The software for the AD5316R allows the user to program values to the input and DAC registers of each DAC individually or collectively.

Write to Input Register

Click **Write to Input Register** to load the code of the input data control to the input register of selected DAC in the DAC selection box.

Update DAC Register from Input Register

Click **Update DAC Register from Input Register** to copy the value in the input register to the corresponding DAC register. The DAC outputs are automatically updated with the appropriate voltage. The LDAC mask setting is ignored.

Write to Input and DAC Registers

Click **Write to Input and DAC Registers** to load the code of the input data control to the input register and DAC register of the selected DAC. The DAC outputs are automatically updated with the appropriate voltage. The LDAC mask setting is ignored.

LDAC Control

Click **Pulse LDAC** to bring the LDAC pin low and then back high. This action copies the data from the input registers to the DAC registers, and the outputs update accordingly. Any DAC updates disabled by the LDAC mask settings are ignored.

Alternatively, the LDAC pin high or low by selecting **LDAC HIGH** or **LDAC LOW**.

Power-Down Control

Each DAC can be powered down individually. Each DAC has an associated selection box allowing the selected DAC to operate in normal mode or power-down mode. Click the blue progressive disclosure option on the **POWER-DOWN LOGIC** block to access the **Powerdown Configuration** window, as shown in Figure 5. When the power-down settings for the DAC are selected, click OK to write the appropriate values to the AD5316R. The **POWER DOWN** indicator lights up accordingly when a DAC is powered down.

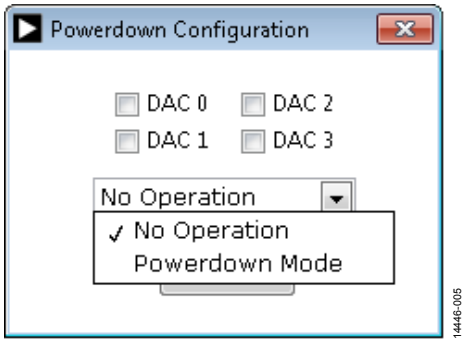

*Figure 5. **Powerdown Configuration** Window*

GAIN Control

To set the GAIN pin high or low, click the blue progressive disclosure option on the **GAIN SELECT** block to access the **Gain Control** window, as shown in Figure 6. In the **GAIN** selection box, select **X1** for a full-scale output of 2.5 V or select **X2** for a full-scale output of 5 V.

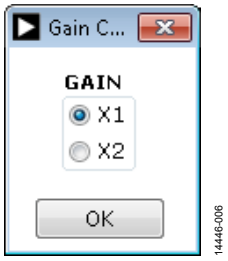

*Figure 6. **Gain Control** Window*

LDAC Mask Register

Each DAC can be configured to respond to or ignore the LDAC pin settings in the **LDAC Configuration** dropdown menu. Click the blue progressive disclosure option on the **LOGIC INTERFACE** block to access the **LDAC Configuration** window, as shown in Figure 7. When the LDAC selections are completed, click **OK** to write the appropriate values to the AD5316R. The **LDAC MASK** indicator lights up accordingly when an LDAC mask of a DAC is enabled.

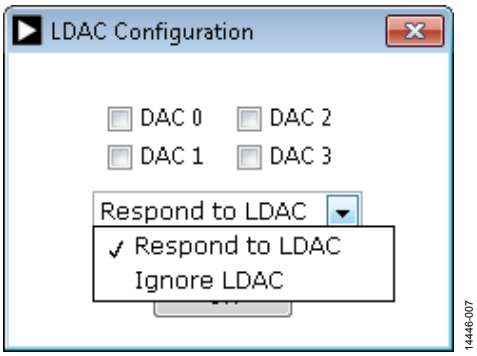

*Figure 7. **LDAC Configuration** Window*

EVALUATION BOARD SCHEMATICS AND ARTWORK

EVAL-MBnanoDAC-SDZ MOTHERBOARD

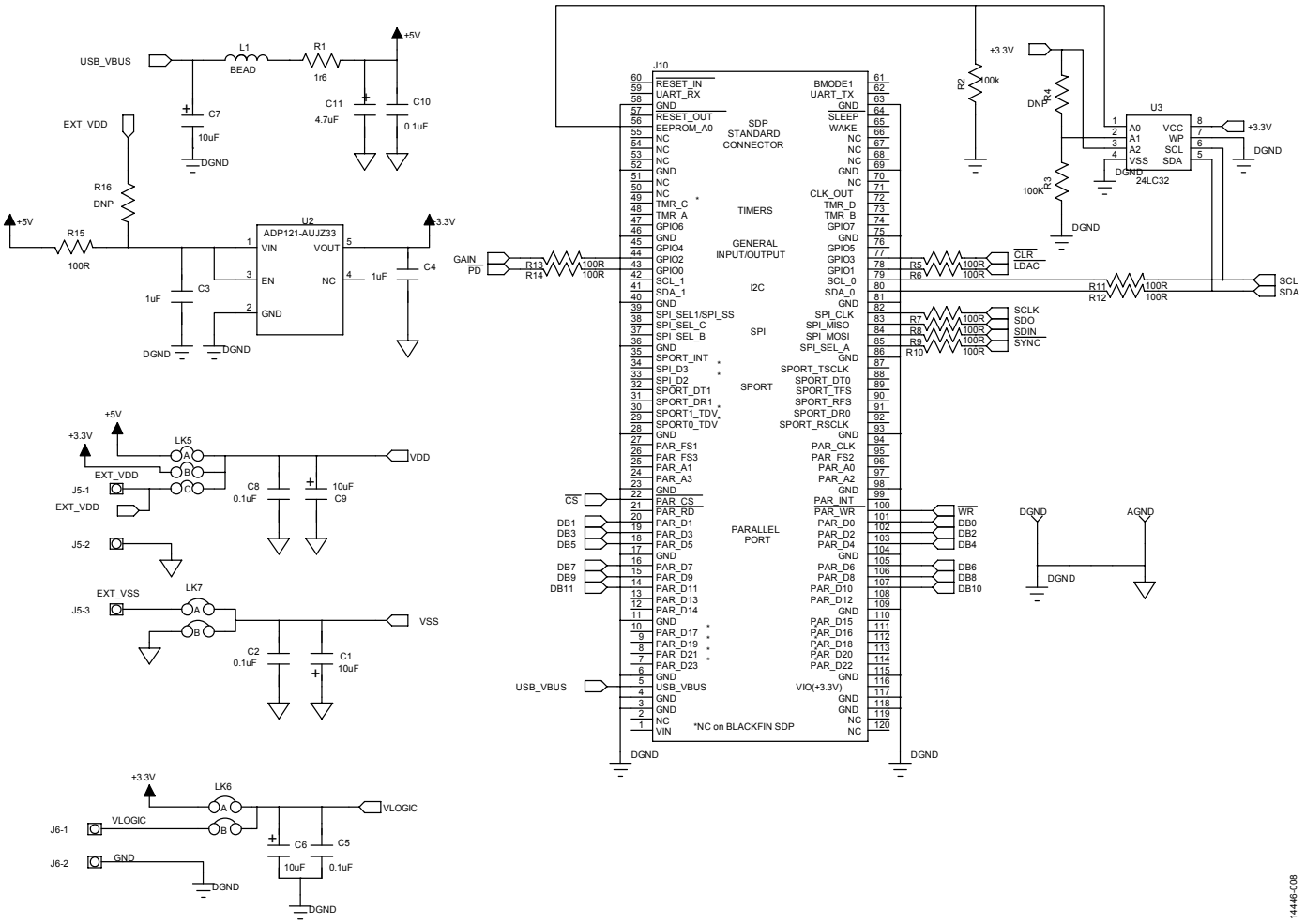

Figure 8. EVAL-MBnanoDAC-SDZ Motherboard SDP-B Connector and Power Supply

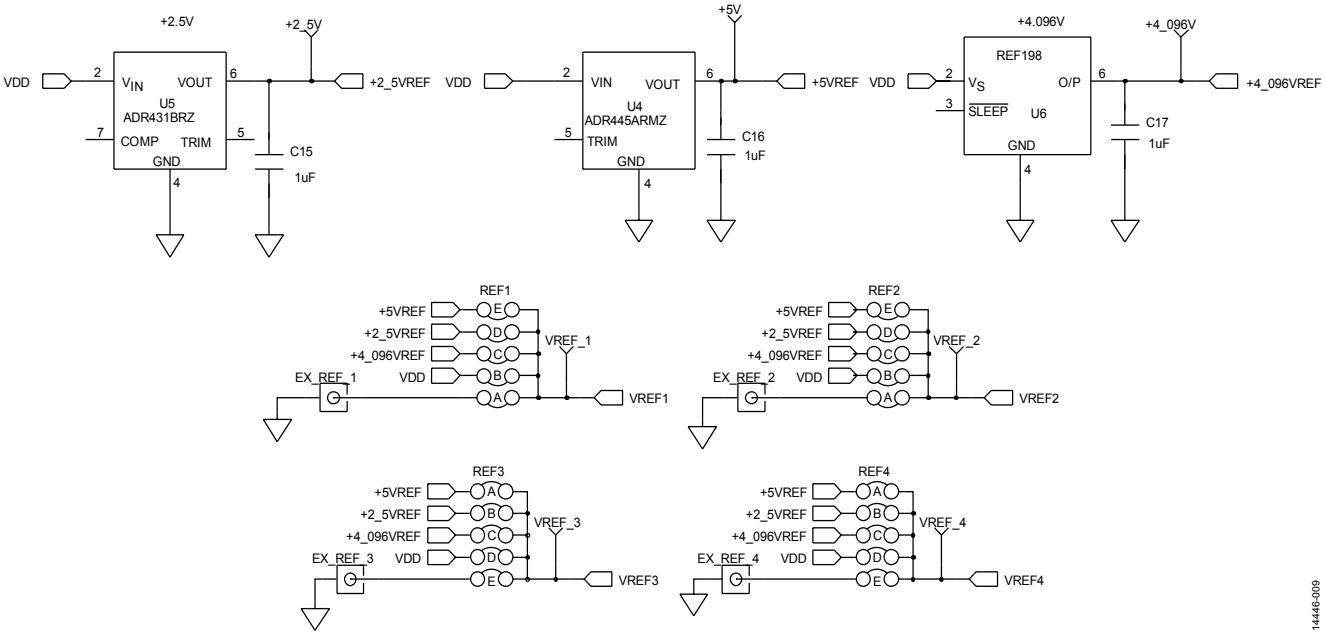

Figure 9. EVAL-MBnanoDAC-SDZ Motherboard Reference Voltage Selector Circuit

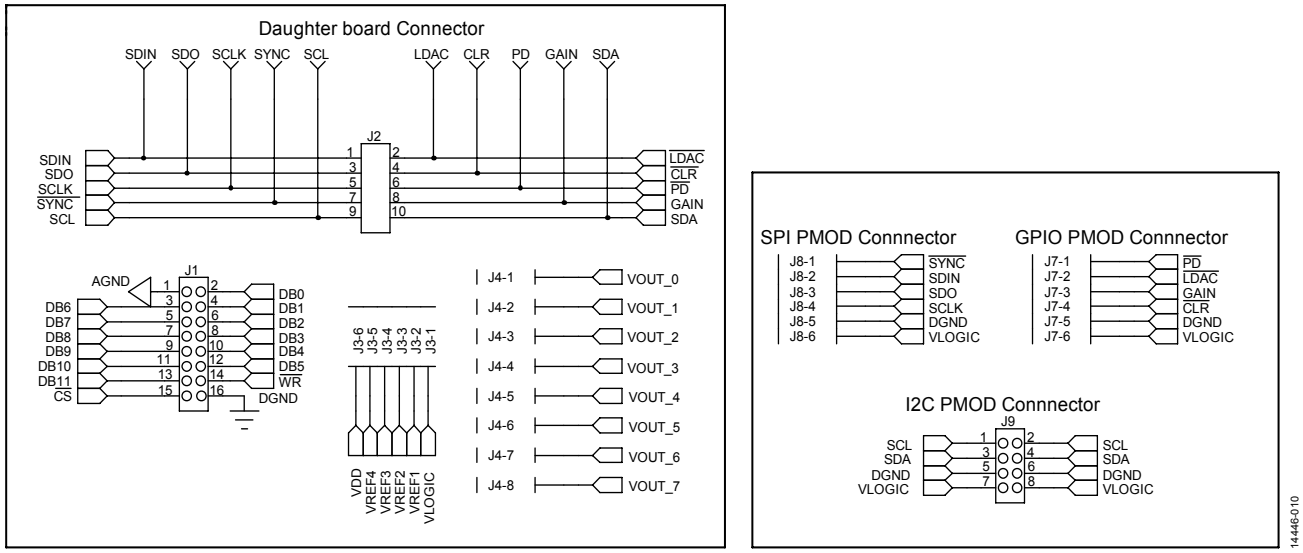

Figure 10. EVAL-MBnanoDAC-SDZ Motherboard Connectors to Daughter Board and Serial Interface

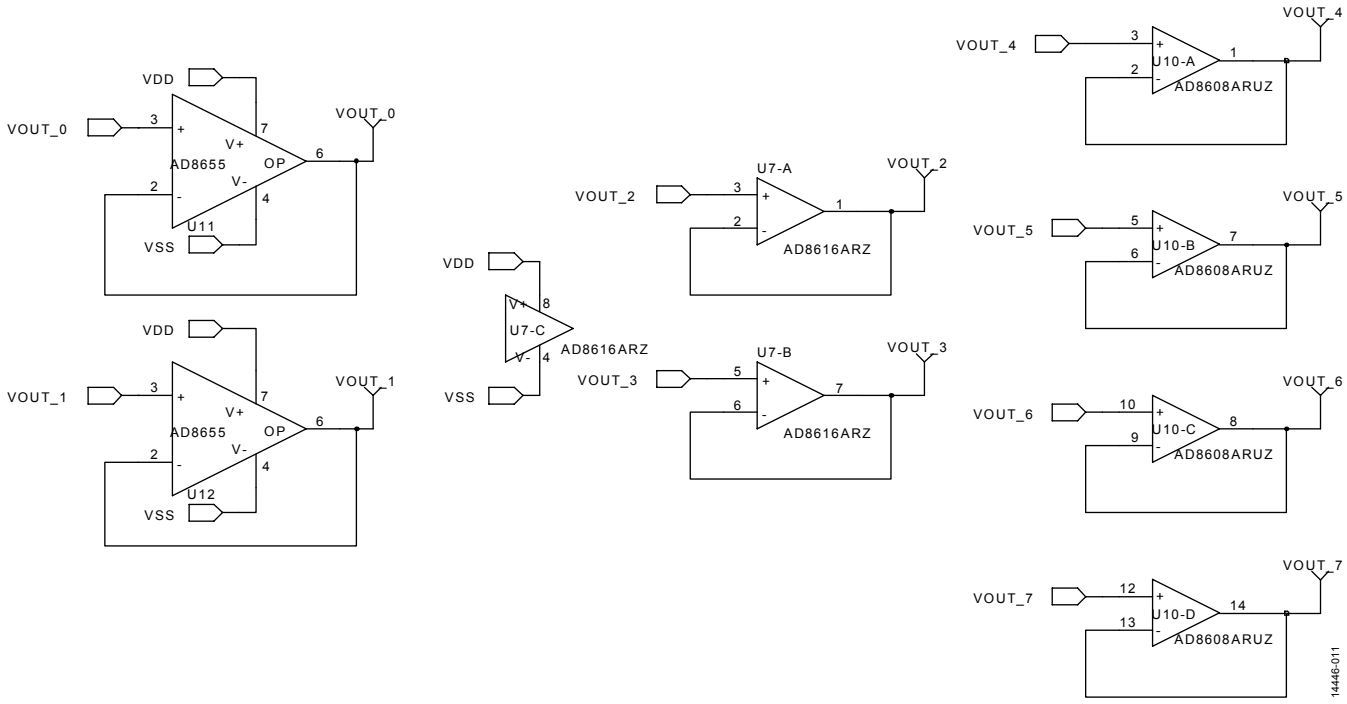

Figure 11. EVAL-MBnanoDAC-SDZ Motherboard Output Amplifier Circuit

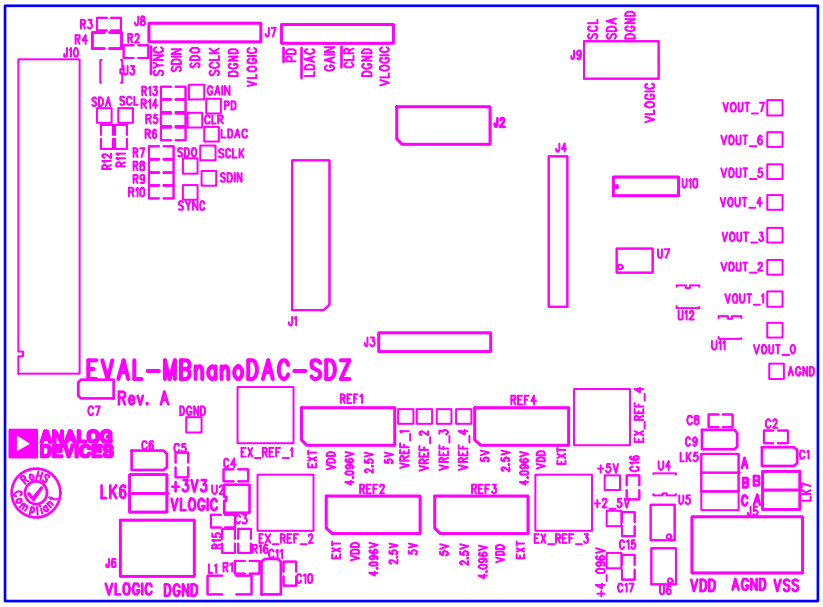

Figure 12. EVAL-MBnanoDAC-SDZ Motherboard Component Placement

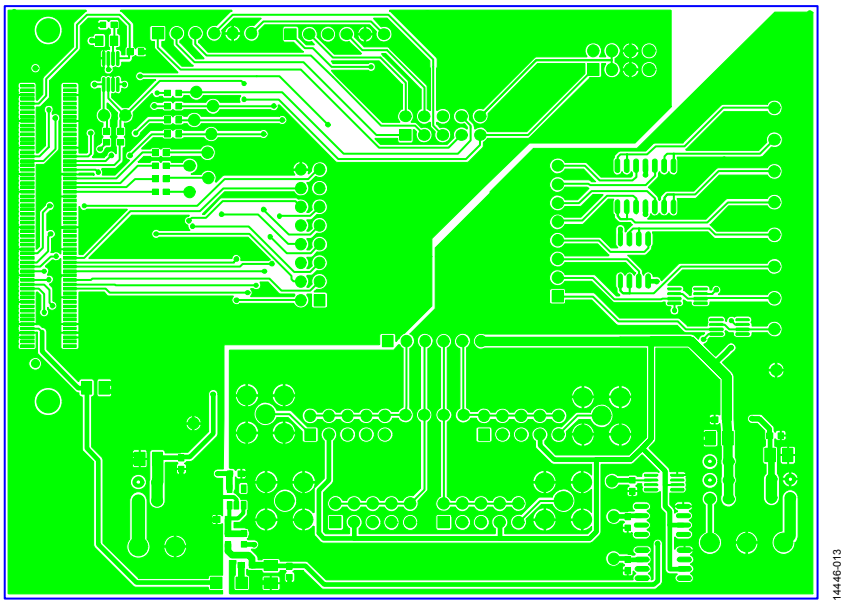

Figure 13. EVAL-MBnanoDAC-SDZ Motherboard Top Side Routing

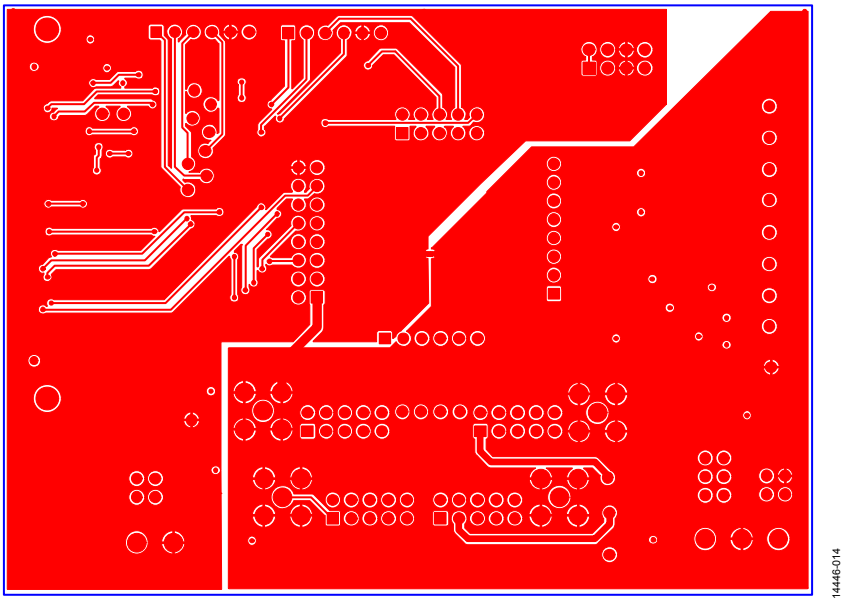

Figure 14. EVAL-MBnanoDAC-SDZ Motherboard Bottom Side Routing

EVAL-AD5316RDBZ DAUGHTER BOARD

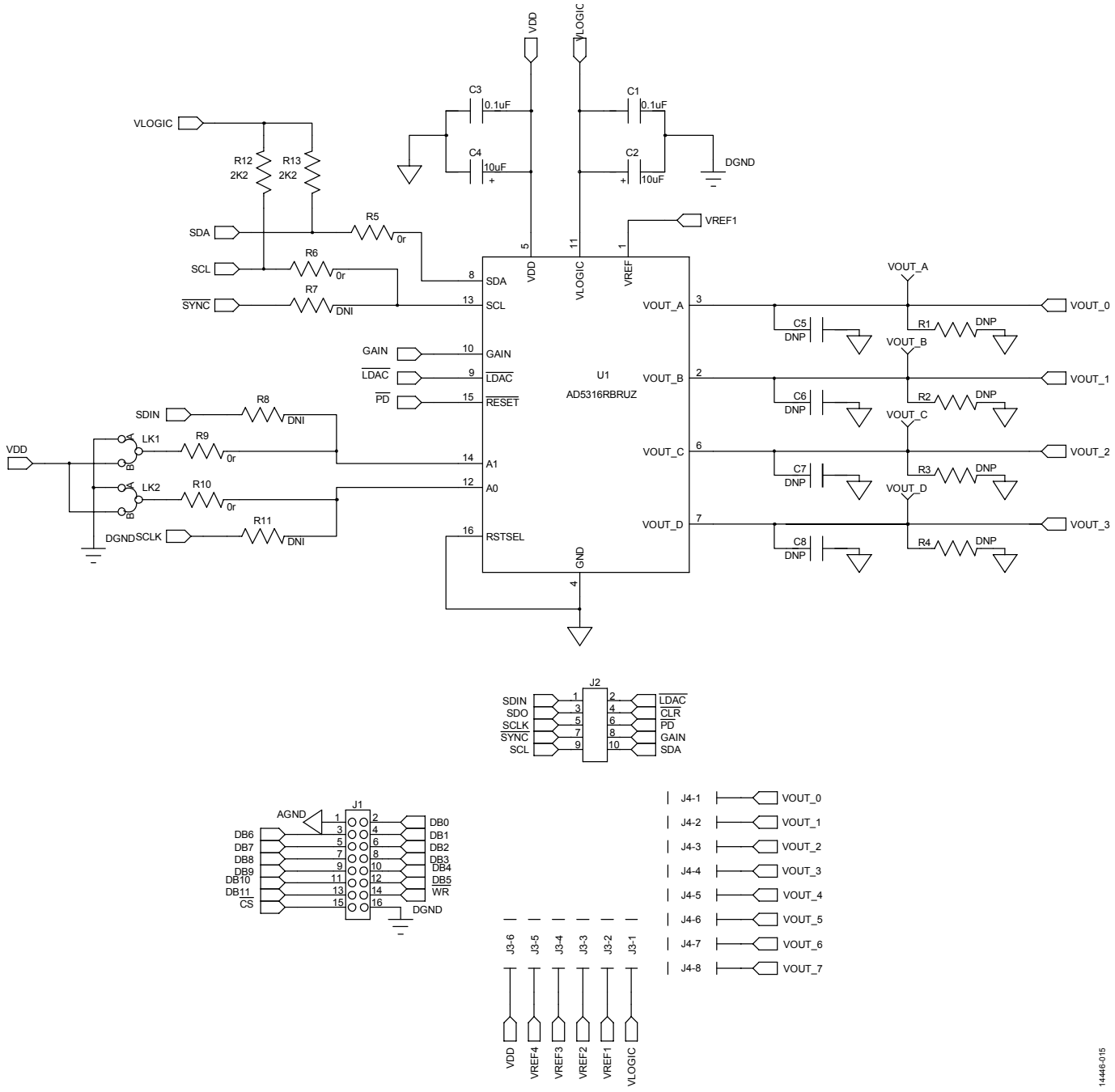

Figure 15. EVAL-AD5316RDBZ Daughter Board Schematics

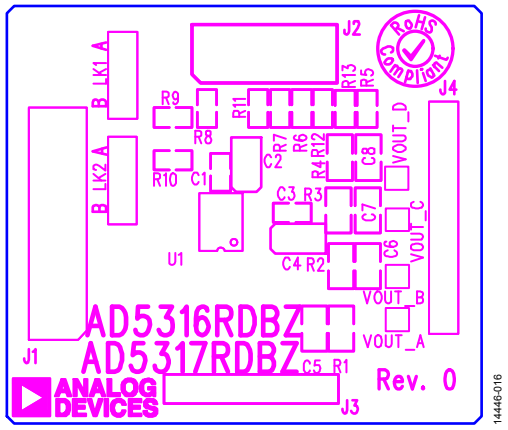

Figure 16. EVAL-AD5316RDBZ Daughter Board Component Placement

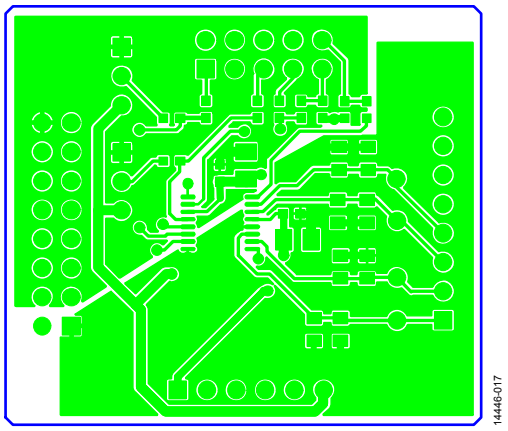

Figure 17. EVAL-AD5316RDBZ Daughter Board Top Side Routing

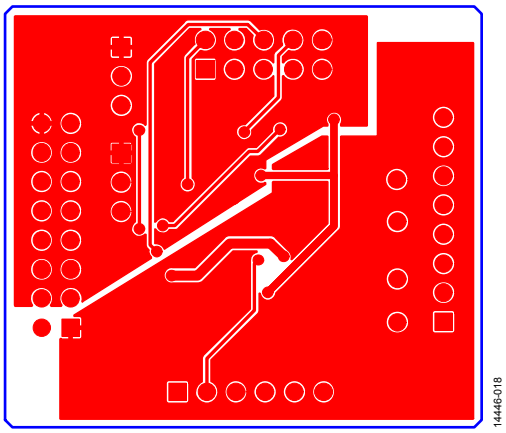

Figure 18. EVAL-AD5316RDBZ Daughter Board Bottom Side Routing

ORDERING INFORMATION

BILL OF MATERIALS

Table 5. EVAL-MBnanoDAC-SDZ Motherboard

Qty	Reference Designator	Description	Supplier/Part Number[1, 2]
4	C1, C6, C7, C9	6.3 V, tantalum capacitor (Case A), 10 µF, ±20%	FEC/1190107
7	C2, C5, C8, C10, C15, C16, C17	50 V, X7R, ceramic capacitor, 0.1 µF, ±10%	FEC/1759122
2	C3, C4	10 V, X5R, ceramic capacitor, 1 µF, ±10%	GRM188R61A105KA61D
1	C11	6.3 V, tantalum capacitor (Case A), 4.7 µF, ±20%	FEC/1432350
4	EXT_REF_1 to EXT_REF_4	Straight printed circuit board (PCB) mount SMB jack, 50 Ω	FEC/1206013
1	J1	Header, 2.54 mm, 2 × 8-way	FEC/2308428
1	J2	Header, 2.54 mm, 2 × 5-way	FEC/9689583
3	J3, J7, J8	Header, 2.54 mm, 1 × 6-way	FEC/9689508
1	J4	Header, 2.54 mm, 1 × 8-way	FEC/1766172
1	J5	3-pin terminal block	FEC/1667472
1	J6	2-pin terminal block	FEC/151789
1	J9	Header, 2.54 mm, 2 × 4-way	FEC/1667509
1	J10	120-way connector	FEC/1324660
1	L1	Inductor, SMD,600 Ω	FEC/9526862
1	LK5	6-pin (3 × 2) 0.1", header and shorting block	FEC/148-535 and 150-411 (36-pin strip)
2	LK6, LK7	4-pin (2 × 2) 0.1", header and shorting block	FEC/148-535 and 150-411 (36-pin strip)
4	REF1 to REF4	10-pin (5 × 2) 0.1", header and shorting block	FEC/1022227 and 150-411
1	R1	Resistor, surge, 1.6 Ω, 1%, 0603	FEC/1627674
2	R2, R3	SMD resistor, 100 kΩ, 1%, 0603	FEC/9330402
11	R5 to R15	SMD resistor, 100 Ω, 1%, 0603	FEC/9330364
1	U2	3.3 V linear regulator	Analog Devices/ADP121-AUJZ33R7
1	U3	32 kb I^2C serial EEPROM	FEC/1331330
1	U4	5 V reference MSOP	Analog Devices/ADR445ARMZ
1	U5	Ultralow noise XFET voltage reference	Analog Devices/ADR431BRZ
1	U6	4.096 V reference	Analog Devices/REF198ESZ
1	U7	Dual op amp	Analog Devices/AD8616ARZ
1	U10	Quad op amp	Analog Devices/AD8608ARMZ
2	U11, U12	Op amp	Analog Devices/AD8655ARMZ

[1] FEC refers to Farnell Electronic Component Distributors.
[2] GRM refers to Murata Manufacturing Company.

Table 6. EVAL-AD5316RDBZ Daughter Board

Qty	Reference Designator	Description	Supplier/Part Number[1]
2	C1, C3	50 V, X7R, ceramic capacitor	FEC/1759122
1	C2, C4	6.3 V tantalum capacitor (Case A)	FEC/1190107
4	C5 to C8	Not applicable	Not inserted
1	J1	16-pin (2 × 8) header	FEC/2308428 inserted from solder side
1	J2	10-pin (2 × 5) straight header, 2.54 mm pitch	FEC/9689583 inserted from solder side
1	J3	6-pin (1 × 6) straight header, 2.54 mm pitch	FEC/9689508 inserted from solder side
1	J4	Header, 2.54 mm, PCB, 1 × 8-way	FEC/1766172 inserted from solder side
2	LK1, LK2	Jumper block using 3-pin SIP header	FEC/1022248 and 150410
4	R1 to R4	Not applicable	Not inserted
2	R5, R6, R9, R10	Resistor, 0603, 1%, 0 Ω	FEC/9331662
3	R7, R8, R11	Resistor, 0603, 1%, 0 Ω	Do not insert
2	R12, R13	SMD resistor	FEC/9330402
1	U1	10-bit DAC	Analog Devices/AD5316RDBZ
1	VOUT_A	Red test point	Do not insert
3	VOUT_B to VOUT_D	Red test point	FEC/8731144 (Pack)

[1] FEC refers to Farnell Electronic Component Distributors.

NOTES

I²C refers to a communications protocol originally developed by Philips Semiconductors (now NXP Semiconductors).