EVAL-AD5325DBZ User Guide
UG-976

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Evaluation Board for the AD5325 12-Bit, Quad Channel, Voltage Output Digital-to-Analog Converter (DAC)

FEATURES

- **Full featured evaluation board in conjunction with *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-AD5325DBZ evaluation board**
- **EVAL-MBnanoDAC-SDZ motherboard**

SOFTWARE REQUIRED

- **EVAL-AD5325DBZ evaluation software**

HARDWARE REQUIRED

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

GENERAL DESCRIPTION

This user guide details the operation of the evaluation board for the AD5325 quad channel, voltage output DAC.

The evaluation board is designed to help users quickly prototype new AD5325 circuits and reduce design time. The AD5325 operates from a single 2.5 V to 5.5 V supply.

Full details are available in the AD5325 data sheet, which must be consulted 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 (EVAL-SDP-CB1Z). Software is supplied with the evaluation board to allow the user to program the AD5325.

This evaluation board requires the SDP-B board (EVAL-SDP-CB1Z) board, which is available for order on the Analog Devices website at www.analog.com.

EVAL-AD5325DBZ, EVAL-MBnanoDAC-SDZ, AND SDP-B BOARDS

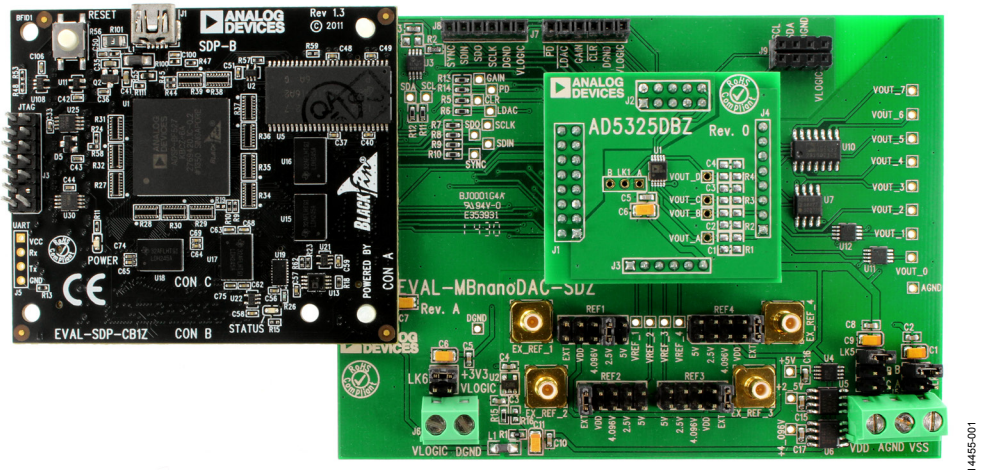

Figure 1.

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REVISION HISTORY

10/2017—Rev. 0 to Rev. A

Change to Table 6 13

3/2017—Revision 0: Initial Version

EVALUATION BOARD HARDWARE

POWER SUPPLIES

The *nano*DAC® EVAL-MBnanoDAC-SDZ motherboard supports single and dual power supplies.

The EVAL-AD5325DBZ evaluation board can be powered either from the SDP-B port or externally by the J5 and J6 connectors, as described in Table 1.

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.

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
J6, Pin 1 (J6-1)	VLOGIC	Digital supply from 1.8 V to V_{DD}
J6, Pin 2 (J6-2)	DGND	Digital ground

MOTHERBOARD LINK OPTIONS

Various 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 11).

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

Link Number	Position
REF1	2.5V
REF2	EXT
REF3	EXT
REF4	EXT
LK5	C
LK6	+3.3V
LK7	B

DAUGHTER BOARD LINK OPTIONS

The EVAL-AD5325DBZ daughter board has one link option. This link sets the least significant bit (LSB) of the I^2C address of the DAC. Table 3 describes the function of the link. Set LK1 to Position B for proper device operation.

Table 3. Link Options for Daughter Board

Link Number	Label	Position
LK1	A0	A (high) B (low, default)

Table 4. Link Functions

Link Number	Function
REF1, REF2, REF3, REF4	These links select the reference source. Position EXT selects an off board voltage reference via the appropriate EXT_REF 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. Position B selects the internal voltage source, 3.3 V from the ADP121 on the motherboard. Position C selects an external supply voltage, V_{DD}.
LK6	This link selects the V_{LOGIC} 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 AD5325 evaluation software is compatible with Windows® Vista (64-bit/32-bit) and Windows 7 (64-bit/32-bit).

Install the software before connecting the SDP-B board to the USB port of the PC to ensure that the SDP-B board is recognized when it connects to the PC.

To install the AD5325 evaluation software, take the following steps:

1. Start the Windows operating system.
2. Download the installation software from the EVAL-AD5325DBZ evaluation board page.
3. Run the **setup.exe** file from the installer folder if it does not open automatically.
4. After the installation is complete, power up the evaluation board as described in the Power Supplies section.
5. Connect the EVAL-AD5325DBZ evaluation board to the SDP-B controller board and connect the SDP-B board to the PC using the USB cable included in the evaluation kit.
6. When the software detects the EVAL-AD5325DBZ, proceed 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 Power Supplies section.
3. From the **Start** menu, click **All Programs**, **Analog Devices**, **AD5325 Evaluation Software**.

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 AD5325 evaluation software then opens, as shown in Figure 4.

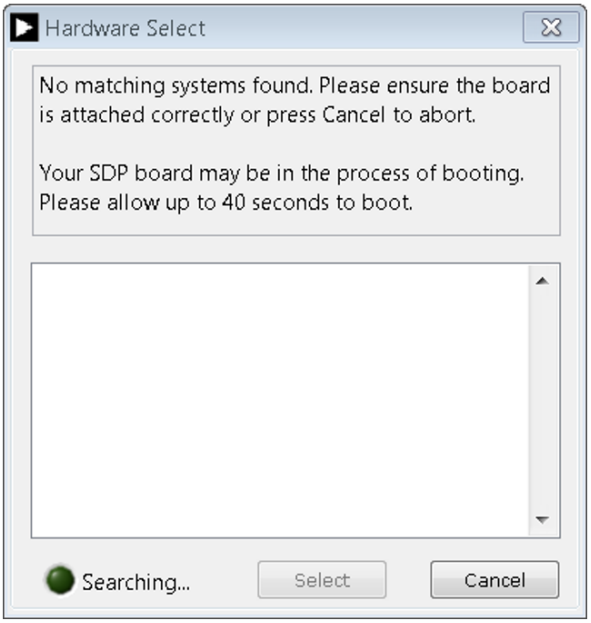

Figure 2. Connectivity Error

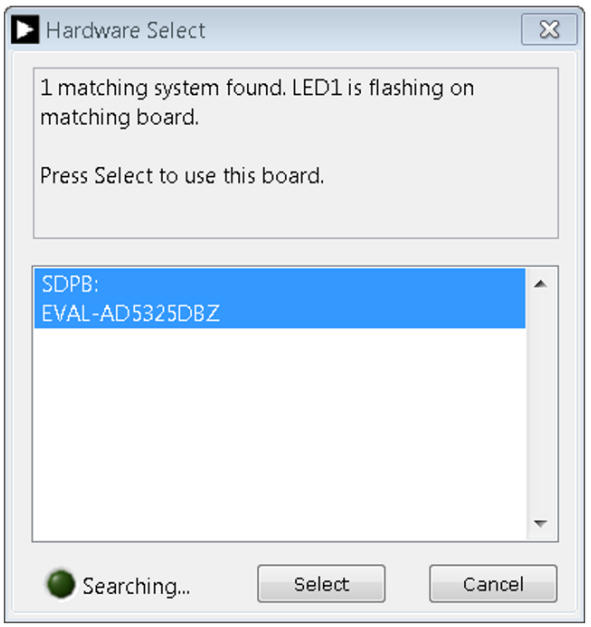

Figure 3. Hardware Select

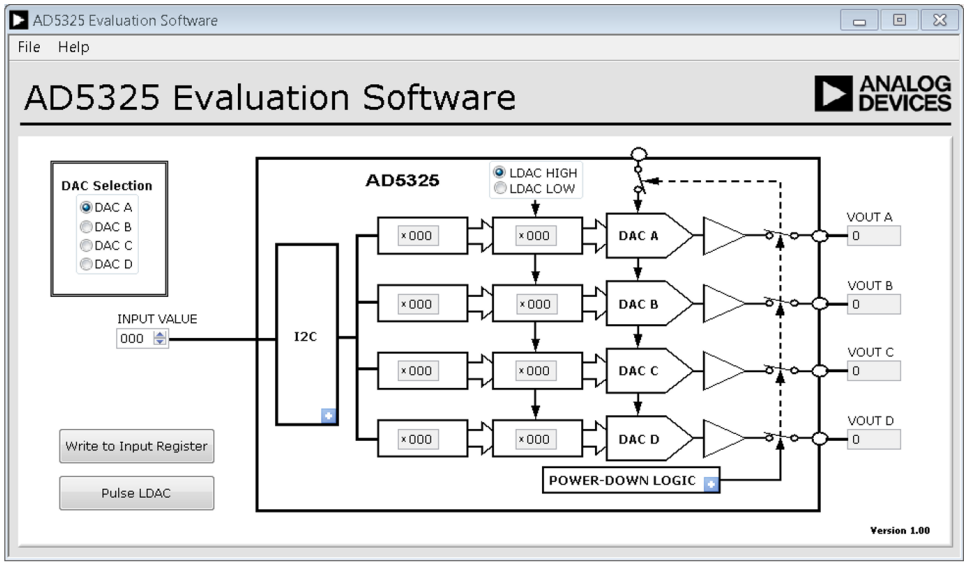

Figure 4. AD5325 Evaluation Board Software Main Window

SOFTWARE OPERATION

The software for the AD5325 allows the user to program values to the input and DAC registers of each DAC individually.

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.

LDAC Control

Click **Pulse LDAC** to bring the $\overline{\text{LDAC}}$ pin low and then back high. Doing this copies the data from the input registers to the DAC registers, and the outputs update accordingly.

The $\overline{\text{LDAC}}$ pin can also be set high or low by clicking **LDAC HIGH** or **LDAC LOW**, respectively.

Power-Down Control

All of the DACs can be powered down simultaneously. The DACs have a selection box that allows the device to operate in normal mode or in three different power-down modes. Click the blue progressive disclosure button on the **POWER-DOWN LOGIC** block to access the **Powerdown** configuration window, which allows the device to operate in normal mode or power-down mode, as shown in Figure 5. Click **OK** to write the appropriate values to the AD5325 when the power-down setting is selected.

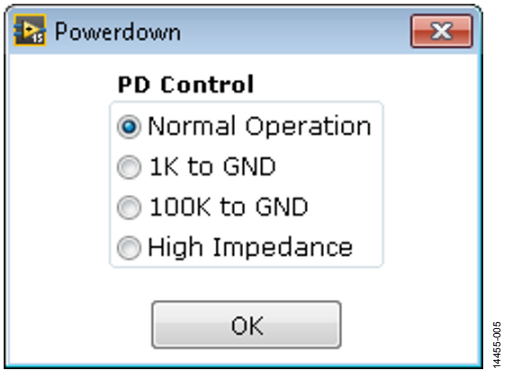

*Figure 5. **Powerdown** Configuration Window*

$\overline{\text{CLR}}$ Control

The $\overline{\text{CLR}}$ bit can also be set high or low by clicking the blue progressive disclosure button on the **I2C** block and selecting the appropriate radio button, as shown in Figure 6. Click **OK** to write the appropriate values to the AD5325 when the $\overline{\text{CLR}}$ settings for the DAC are selected.

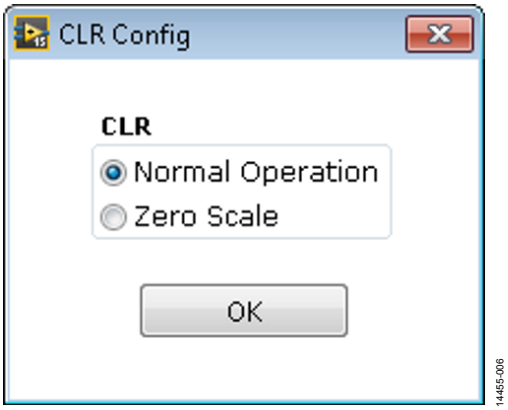

Figure 6. $\overline{\text{CLR}}$ Configuration Window

EVALUATION BOARD SCHEMATICS AND ARTWORK

EVAL-MBnanoDAC-SDZ MOTHERBOARD

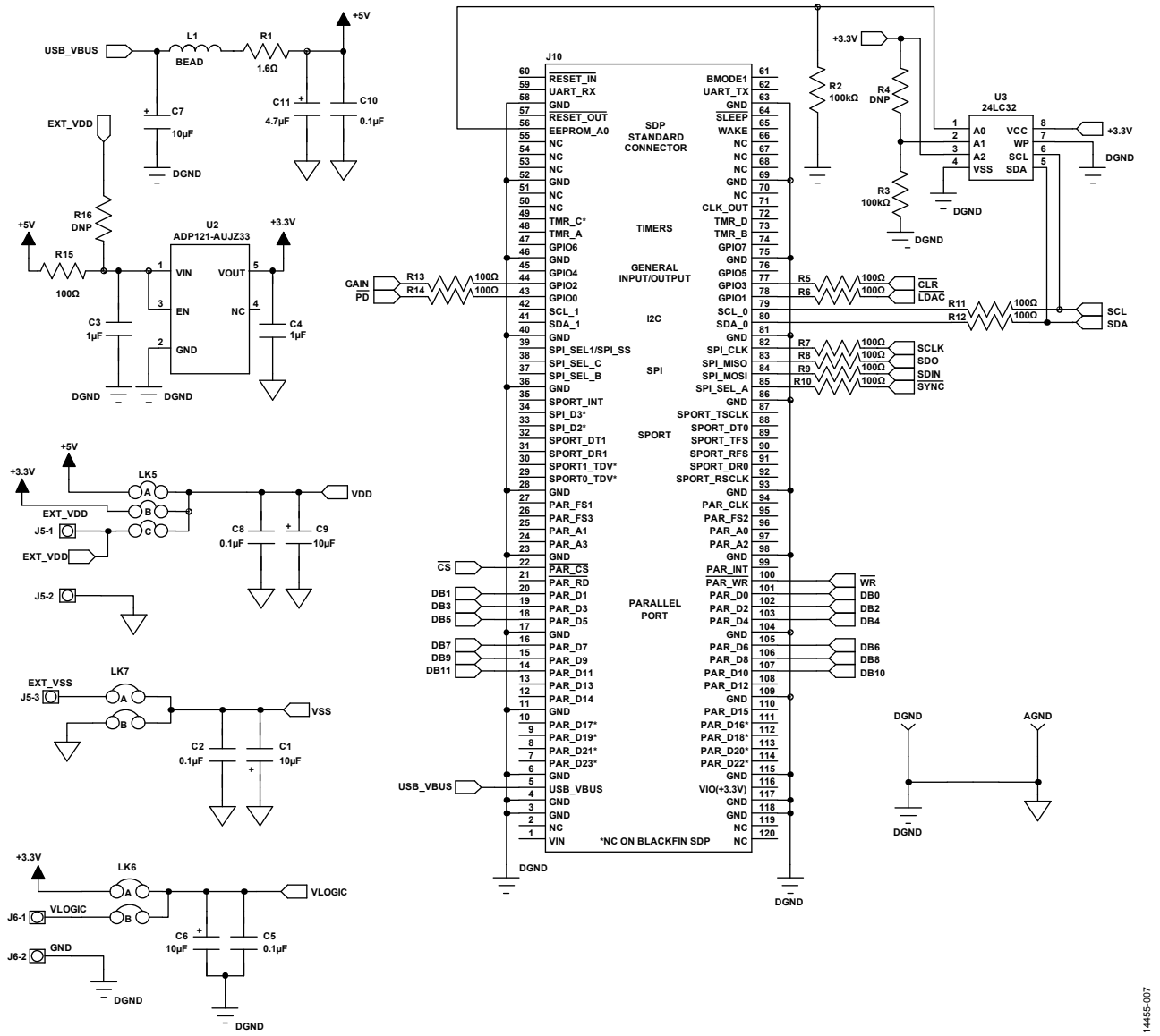

Figure 7. Motherboard SDP-B Connector and Power Supply

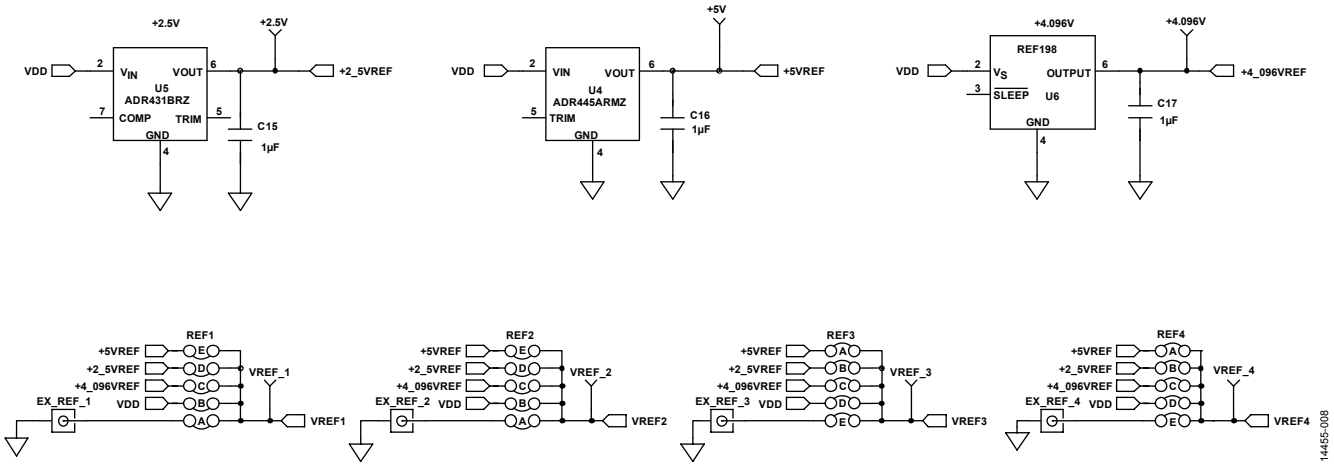

Figure 8. Motherboard Reference Voltage Selector Circuit

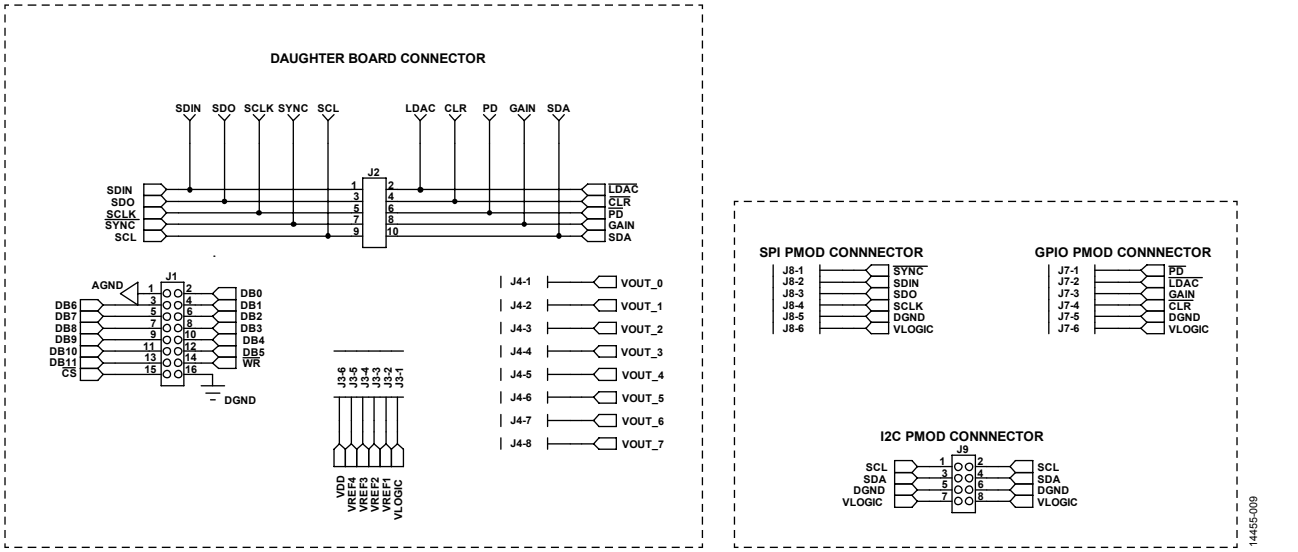

Figure 9. Motherboard Connectors to Daughter Board and Serial Interface

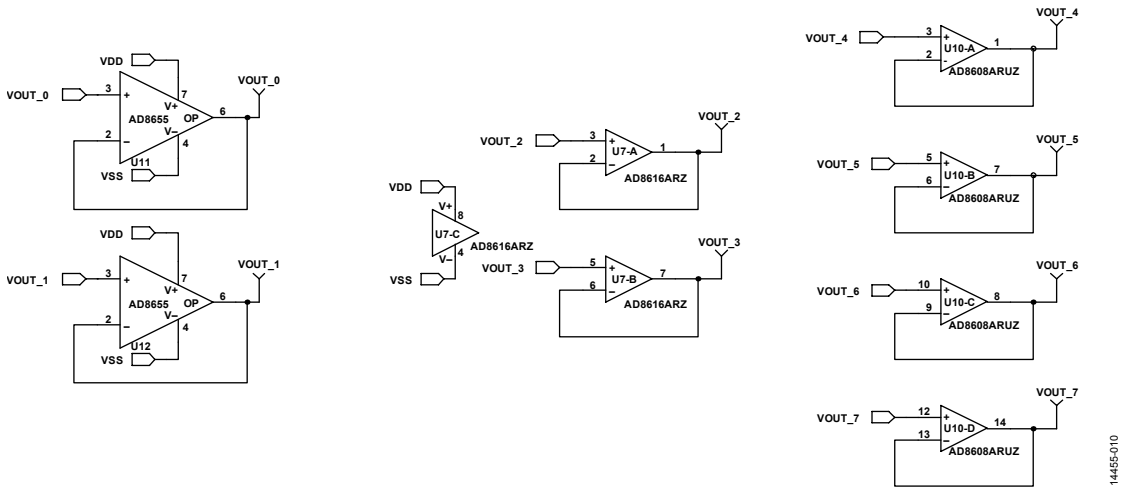

Figure 10. Motherboard Output Amplifier Circuit

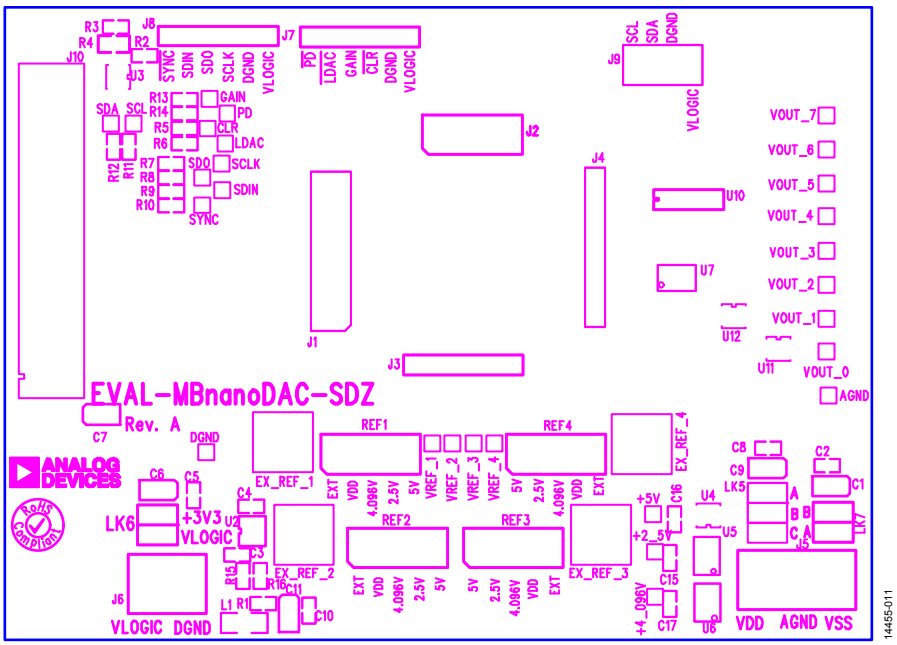

Figure 11. Motherboard Component Placement

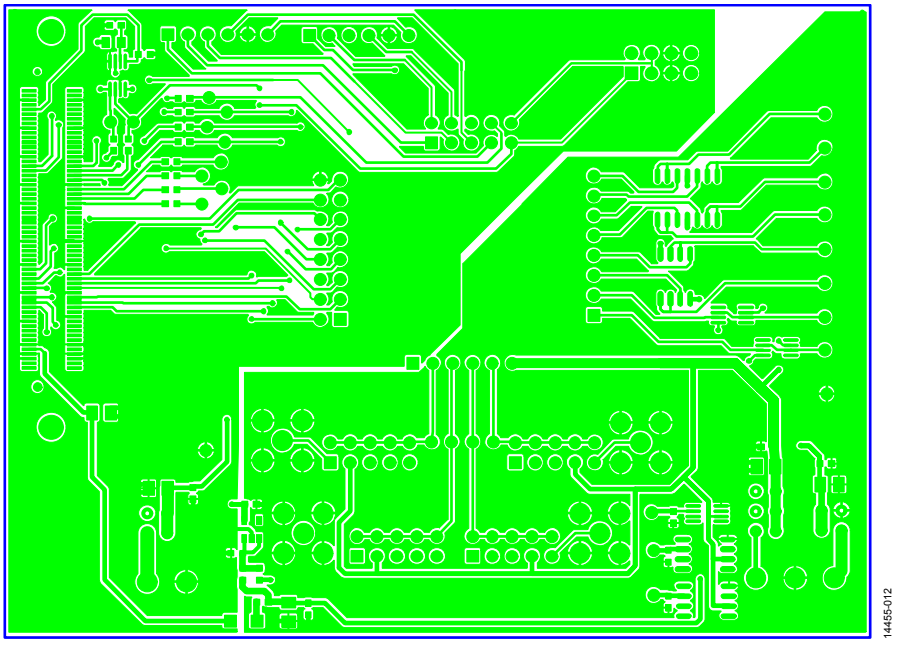

Figure 12. Motherboard Top Side Routing

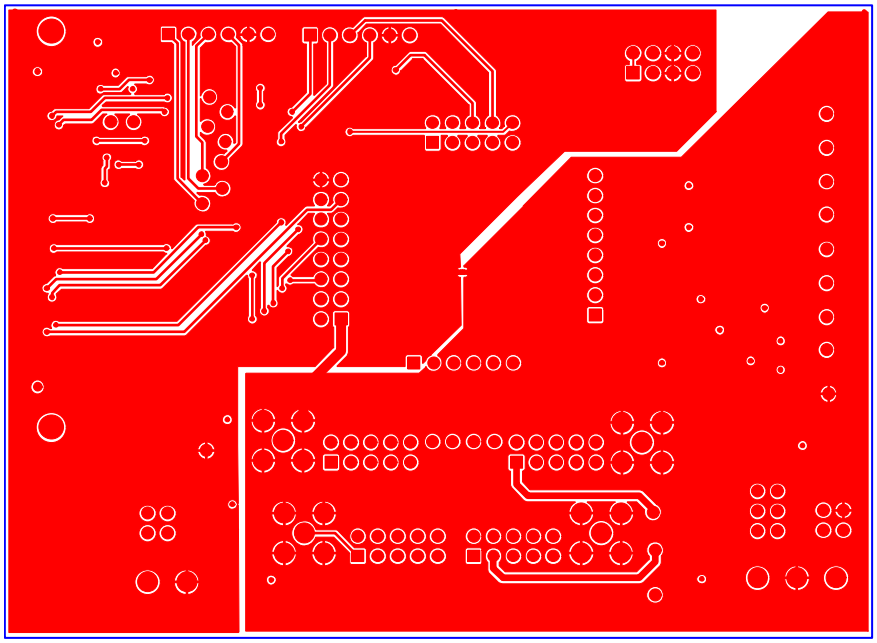

Figure 13. Motherboard Bottom Side Routing

EVAL-AD5325DBZ DAUGHTER BOARD

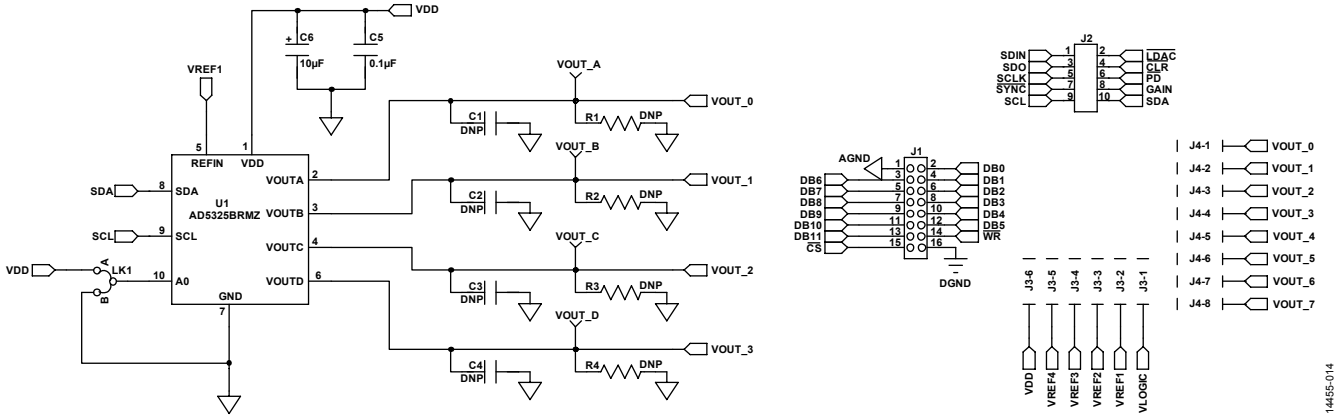

Figure 14. Daughter Board Schematics

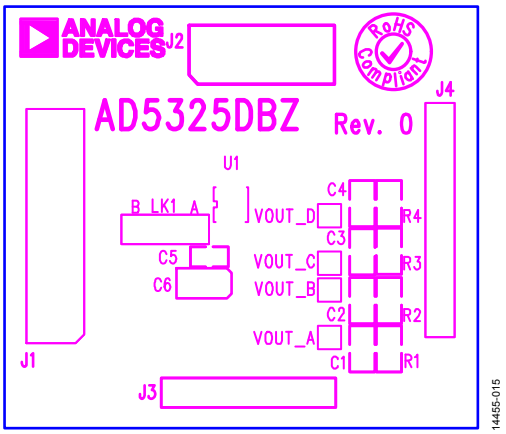

Figure 15. Daughter Board Component Placement

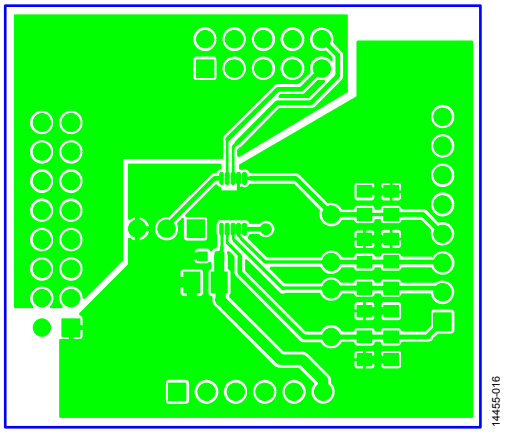

Figure 16. Daughter Board Top Side Routing

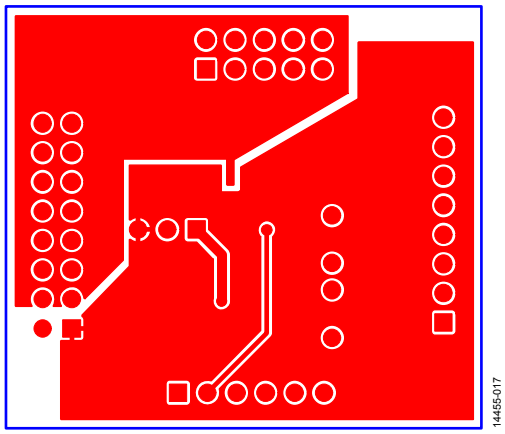

Figure 17. Daughter Board Bottom Side Routing

ORDERING INFORMATION

BILL OF MATERIALS

Table 5. Components List for Motherboard

Qty	Reference Designator	Description	Stock Code/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, EXT_REF_2, EXT_REF_3, EXT_REF_4	Straight 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 inch header and shorting block	FEC 148-535 and 150-411 (36-pin strip)
2	LK6, LK7	4-pin (2 × 2), 0.1 inch header and shorting block	FEC 148-535 and 150-411 (36-pin strip)
4	REF1, REF2, REF3, REF4	10-pin (5 × 2), 0.1 inch 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, R6, R7, R8, R9, R10, R11, R12, R13, R14, R15	SMD resistor, 100 Ω, 1%, 0603	FEC 9330364
1	U2	3.3 V linear regulator	Analog Devices ADP121-AUJZ33R7
1	U3	32 kb I²C serial EEPROM	FEC 1331330
1	U4	5 V reference, 8-lead 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 electronic component distributors.

Table 6. Components List for Daughter Board

Qty	Reference Designator	Description	Stock Code/Part Number[1]
1	C1	Not applicable	Not inserted
1	C2	Not applicable	Not inserted
1	C3	Not applicable	Not inserted
1	C4	Not applicable	Not inserted
1	C5	50 V, X7R, ceramic capacitor, 0.1 µF, ±10%	FEC 1759122
1	C6	6.3 V, tantalum capacitor (Case A), 10 µF, ±20%	FEC 1190107
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
1	LK1	Jumper block, 3-pin SIP header	FEC 1022248 and FEC 150410
1	R1	Not applicable	Not inserted
1	R2	Not applicable	Not inserted
1	R3	Not applicable	Not inserted
1	R4	Not applicable	Not inserted
1	U1	12-bit DAC	Analog Devices AD5325BRMZ
1	VOUT_A	Red test point	Do not insert
1	VOUT_B	Red test point	Do not insert
1	VOUT_C	Red test point	Do not insert
1	VOUT_D	Red test point	Do not insert

[1] FEC refers to Farnell electronic component distributors

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

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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- *Входной контроль качества.*
- *Наличие сертификата ISO.*

В составе нашей компании организован Конструкторский отдел, призванный помогать разработчикам, и инженерам.

Конструкторский отдел помогает осуществить:

- *Регистрацию проекта у производителя компонентов.*
- *Техническую поддержку проекта.*
- *Защиту от снятия компонента с производства.*
- *Оценку стоимости проекта по компонентам.*
- *Изготовление тестовой платы монтаж и пусконаладочные работы.*

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