

Evaluating the **AD5761R** 16-Bit Serial Input, Voltage Output DAC

FEATURES

Full featured evaluation board for the **AD5761R**

Link options

PC control in conjunction with the Analog Devices, Inc.,
EVAL-SDP-CB1Z system demonstration platform (SDP)

PC software for control

EVALUATION BOARD DESCRIPTION

The **EVAL-AD5761RSDZ** is a full featured evaluation board that allows the user to easily evaluate all the features of the **AD5761R** 16-bit, voltage output digital-to-analog converter (DAC). The **AD5761R** pins are accessible at on-board connectors for external connection. The evaluation board can be controlled by two means: via the on-board connector (J3), or via the SDP connector (J4). The **EVAL-SDP-CB1Z** SDP board allows the evaluation board to be controlled through the USB port of a Windows® XP (SP2 or later) or Windows Vista (32-bit) based PC using the **AD5761R** evaluation software.

DEVICE DESCRIPTION

The **AD5761R** is a single channel, 16-bit serial input, voltage output DAC. The device is specified to operate from single supply voltages from 4.75 V up to 30 V, or dual supply voltages from -16.5 V to 0 V (V_{SS}) and +4.75 V to +16.5 V (V_{DD}). The nominal full-scale output range is software or hardware selectable. The integrated output amplifiers, reference buffers, and power-up/power-down control circuitry provide an easy to use, universal solution.

Complete specifications for the **AD5761R** are available in the **AD5761R** data sheet, which should be consulted in conjunction with this user guide when using this evaluation board.

FUNCTIONAL BLOCK DIAGRAM

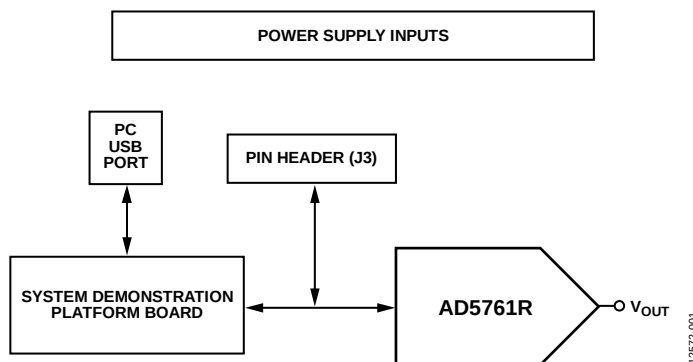


Figure 1.

TABLE OF CONTENTS

Features	1	On-Board Connectors	3
Evaluation Board Description.....	1	Evaluation Board Software.....	4
Device Description	1	Software Installation	4
Functional Block Diagram	1	Software Operation	4
Revision History	2	Main Window	5
Evaluation Board Hardware	3	Evaluation Board Schematics and Artwork.....	7
Power Supplies	3	Ordering Information.....	11
Link Options	3	Bill of Materials.....	11

REVISION HISTORY

11/14—Revision 0: Initial Version

EVALUATION BOARD HARDWARE

POWER SUPPLIES

The following external supplies must be provided:

- 3.3 V between the VCC and DGND inputs for the digital supply of the [AD5761R](#). Alternatively, place Link LK1 in Position A to power the digital circuitry from the USB port (default).
- 4.75 V to 28 V between the VDD and AGND inputs for the positive analog supply of the [AD5761R](#).
- -4.5 V to -16.5 V between the VSS and AGND inputs for the negative analog supply of the [AD5761R](#).

The analog and digital planes are connected at one location close to the [AD5761R](#). To avoid ground loop problems, do not connect AGND and DGND elsewhere in the system.

Each supply is decoupled to the relevant ground plane with 10 μ F and 0.1 μ F capacitors. Each device supply pin is again decoupled with a 10 μ F and 0.1 μ F capacitor pair to the relevant ground plane.

LINK OPTIONS

Set the link options on the evaluation board for the required operating setup before using the board. The functions of the link options are described in Table 5.

Default Link Option Setup

The default link options are listed in Table 1.

Table 1. Default Link Options

Link No.	Default Option
LK1	A
LK2	B
LK3	B
LK4	B

Connector J3 Pin Configuration and Descriptions

Table 2. Connector J3 Pin Configuration

9	7	5	3	1
10	8	6	4	2

Table 3. Connector J3 Pin Descriptions

Pin No.	Description
1	SDO
2	RESET
3	DGND
4	CLR
5	DGND
6	LDAC
7	SDIN
8	DGND
9	SCLK
10	SYNC

ON-BOARD CONNECTORS

There are seven connectors on the [EVAL-AD5761RSDZ](#) printed circuit board (PCB), as shown in Table 4.

Table 4. On-Board Connectors

Connector	Function
J1	Digital power supply connector
J2	Analog power supply connector
J3	Digital interface pin header connector
J4	SDP board connector
J5	External positive analog supply connector
VOUT	DAC output connector
VREFIN/VREFOUT	Internal reference voltage output and external reference voltage input connector

Table 5. Link Options

Link No.	Description
LK1	This link selects the source of the digital power supply DV _{CC} . Position A selects the source from the SDP board. Position B selects the source from Connector J1.
LK2	This link selects the source of the external reference voltage. Position A selects the source from the voltage applied to the VREFIN/VREFOUT connector. Position B selects the source from the on-board ADR4525 reference.
LK3	This link selects the voltage source for the negative analog supply V _{SS} . Position A connects V _{SS} (Pin 6) to ground. Position B selects an externally applied voltage at V _{SS} of J2.
LK4	This link selects the voltage source for the positive analog supply V _{DD} . Position A connects V _{DD} (Pin 8) to an external voltage applied to Connector J5. Position B selects an externally applied voltage at V _{DD} of J2.

EVALUATION BOARD SOFTWARE

SOFTWARE INSTALLATION

The [AD5761R](#) evaluation kit includes self installing evaluation software on a CD. The evaluation software is compatible with Windows XP (SP2 or later) and Windows Vista (32-bit). If the setup file does not run automatically, run **setup.exe** from the CD.

Install the evaluation software before connecting the evaluation board and SDP board to the USB port of the PC to ensure that the evaluation system is correctly recognized when connected to the PC.

1. After installation from the CD is complete, power up the [EVAL-AD5761RSDZ](#) evaluation board as described in the Power Supplies section. Connect the SDP board (Connector A) to the evaluation board and then to the USB port of your PC using the supplied cable.
2. When the evaluation system is detected, proceed through any dialog boxes that appear to complete the installation.

SOFTWARE OPERATION

To launch the evaluation software, complete the following steps:

1. From the **Start** menu, click **Analog Devices > AD5761R > AD5761R Evaluation Software**. The main window of the software opens (see Figure 5).
2. If the evaluation system 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, wait a few seconds, and click **Rescan**. Follow the instructions that appear.

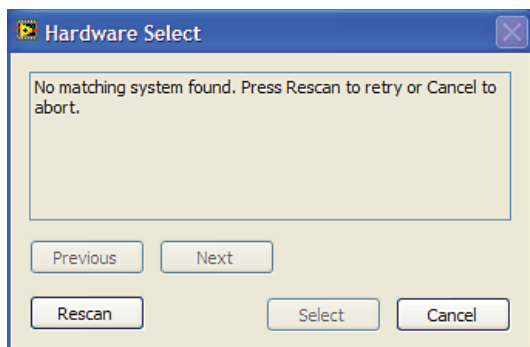


Figure 2. Connectivity Error Alert

MAIN WINDOW

The main window of the evaluation software is divided into two tabs: **Configure** and **DAC**.

Begin by choosing the device to evaluate: the **AD5761R** (16-bit resolution) or the **AD5721R** (12-bit resolution). Note that clicking the **AD5721R** option allows the user to evaluate the **AD5761R** as a 12-bit DAC; there is no separate evaluation setup for the **AD5721R**. A dialog box appears for this selection, as shown in Figure 3.

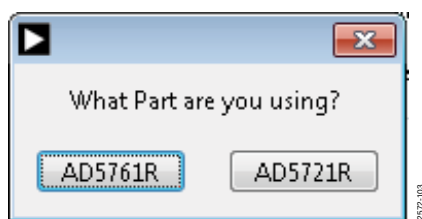


Figure 3. Device Selection

AD5761R Configuration

The **Configure** tab allows access to the control register and the mode of the daisy-chain functionality of the device. Figure 5 shows the **Configure** tab in the main window.

The **AD5761R** requires an initial command to write to the control register to remove the output clamp to ground. A dialog box appears as a reminder to write to the control register (see Figure 4). During the same write, configure the **AD5761R** as necessary to modify the default values for the power-up voltage (**Power Up Voltage**), voltage output range (**Output Range**), clear voltage (**CLEAR Voltage**), overrange (**OVR**), bipolar range coding (**B2C**), thermal shutdown alter (**ETS**), and internal reference mode (**IRO**).

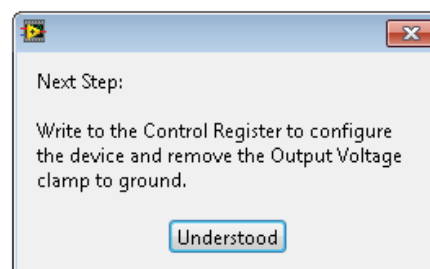


Figure 4. First Write Reminder

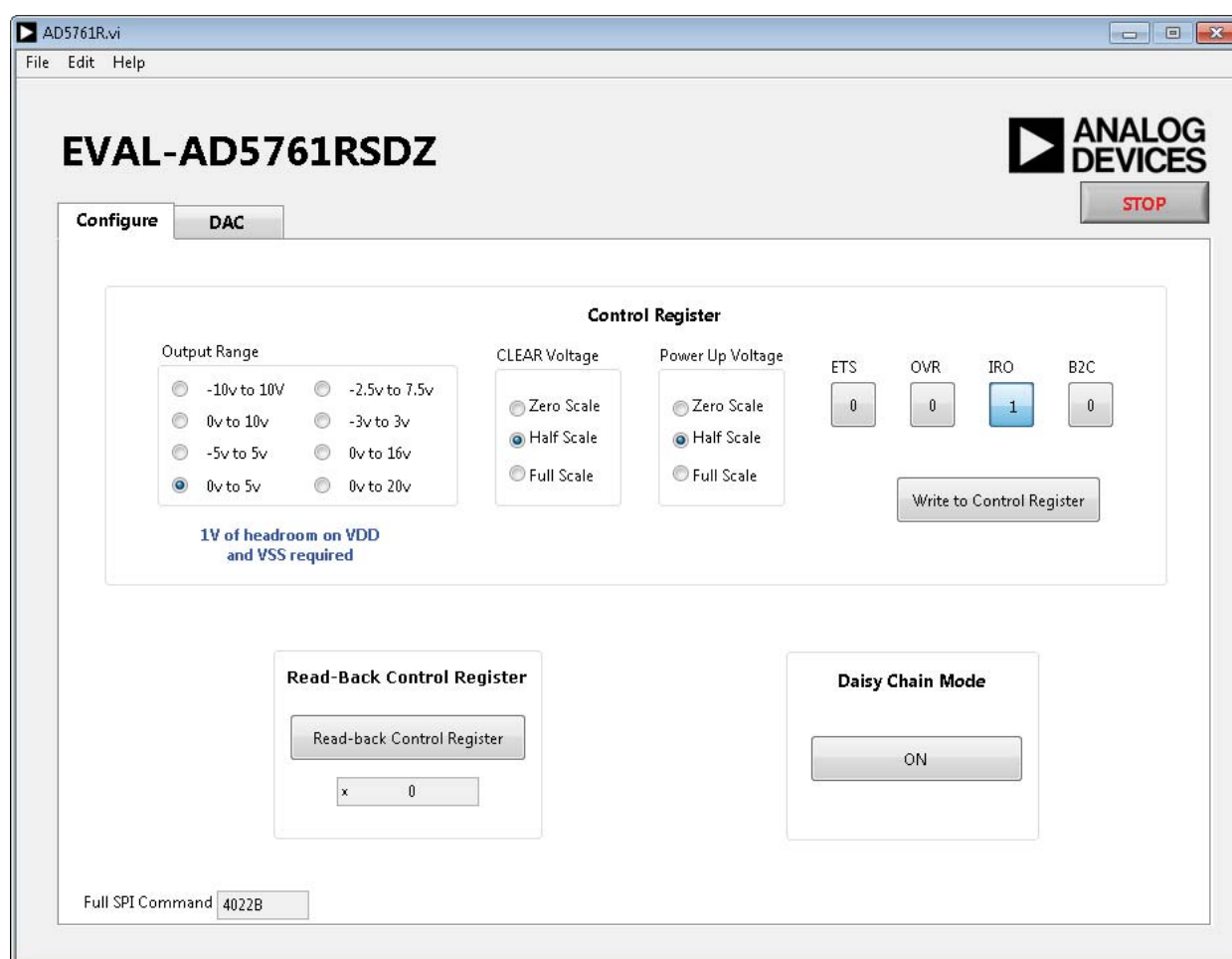


Figure 5. Evaluation Software Main Window, **Configure** Tab

AD5761R DAC

The DAC tab programs the input and DAC registers with a hexadecimal value entered in the **Input Data 16 bit (HEX)** field (see Figure 6). Also available in this tab are the following

options: **Hardware Control** to modify the RESET PIN, CLR PIN, and LDAC PIN values; **Software Reset** options; and **Read-back Input Register** and **Read-back DAC Register** options.

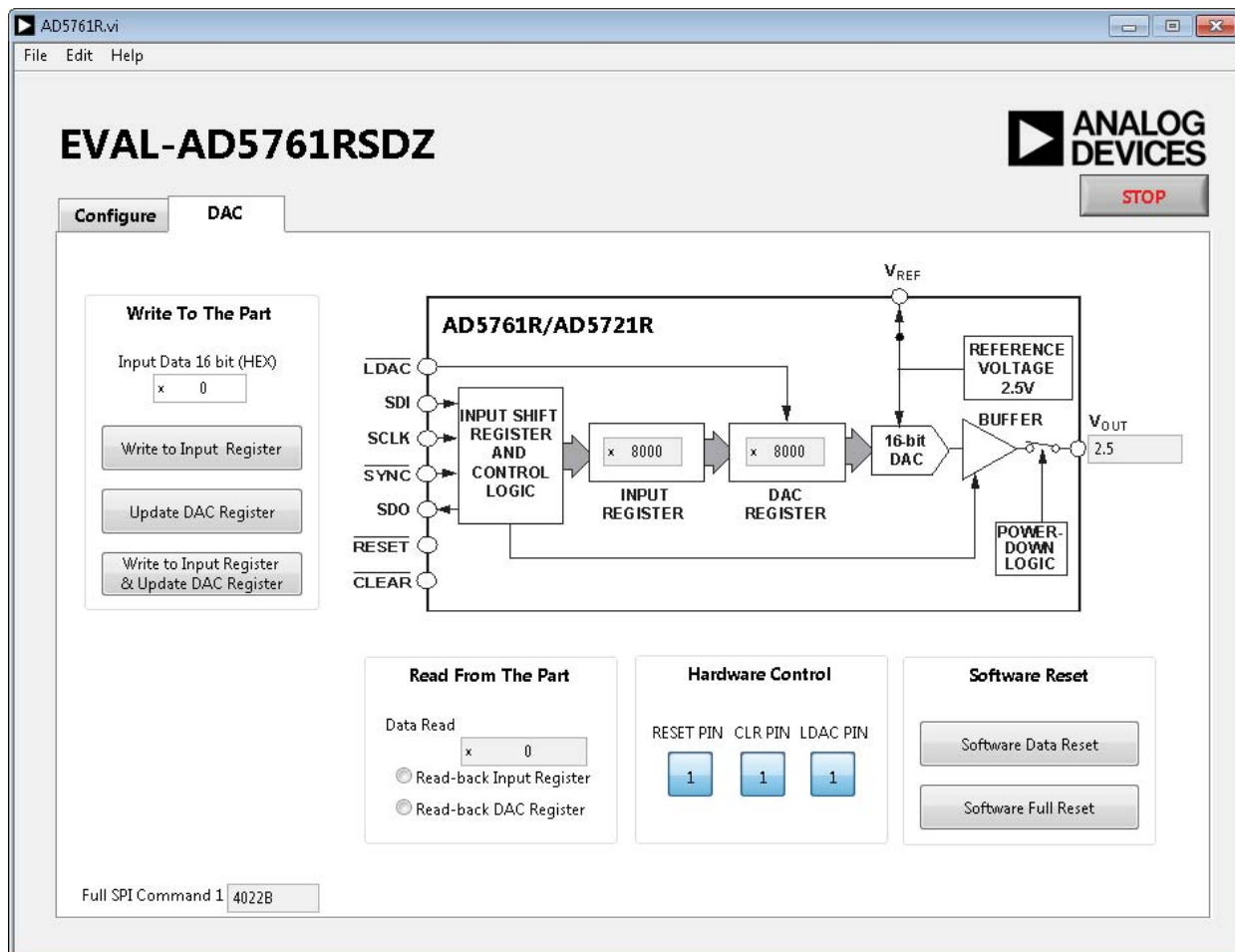


Figure 6. DAC Tab

EVALUATION BOARD SCHEMATICS AND ARTWORK

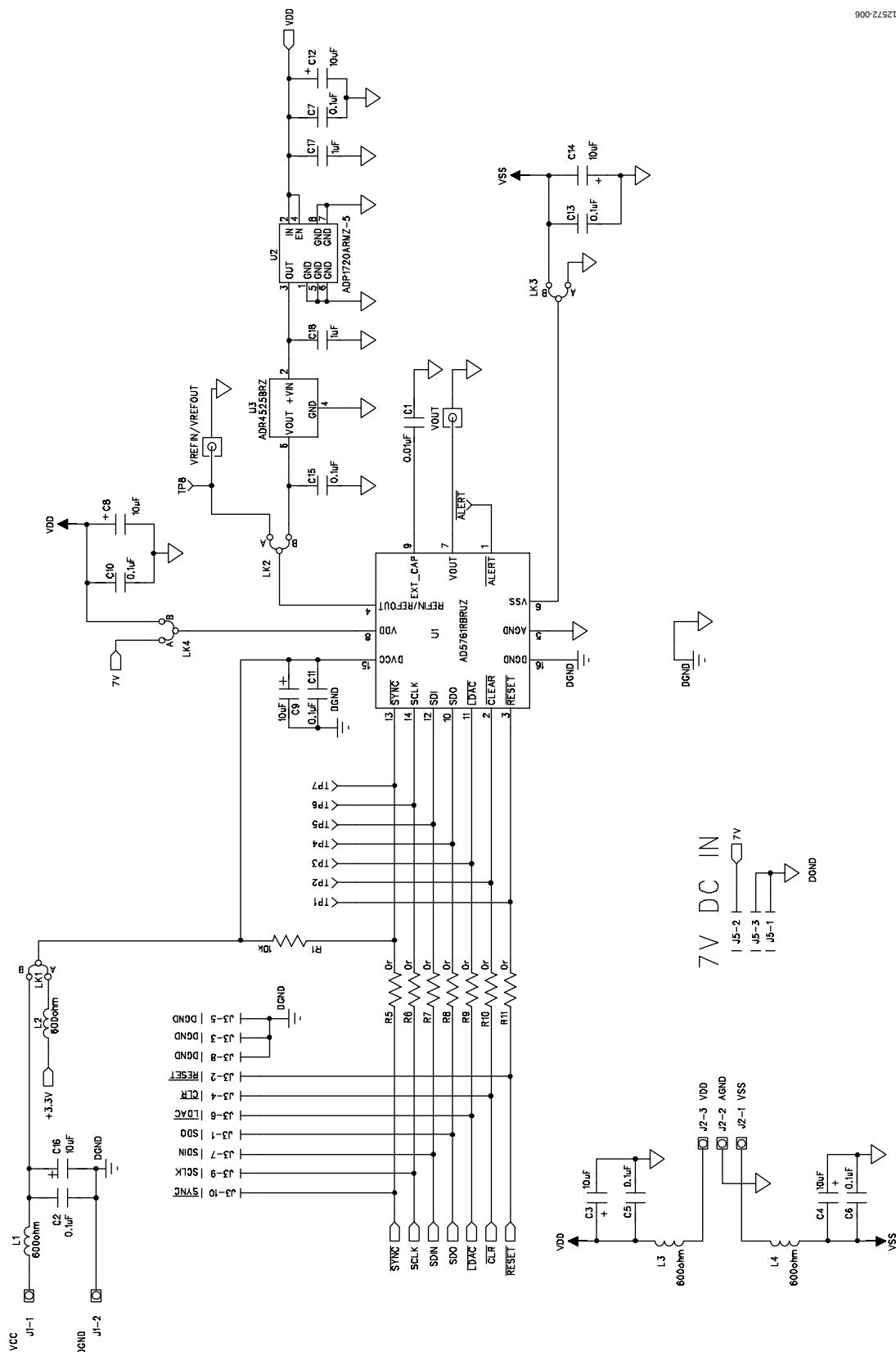


Figure 7. Schematic of the AD5761R Circuitry

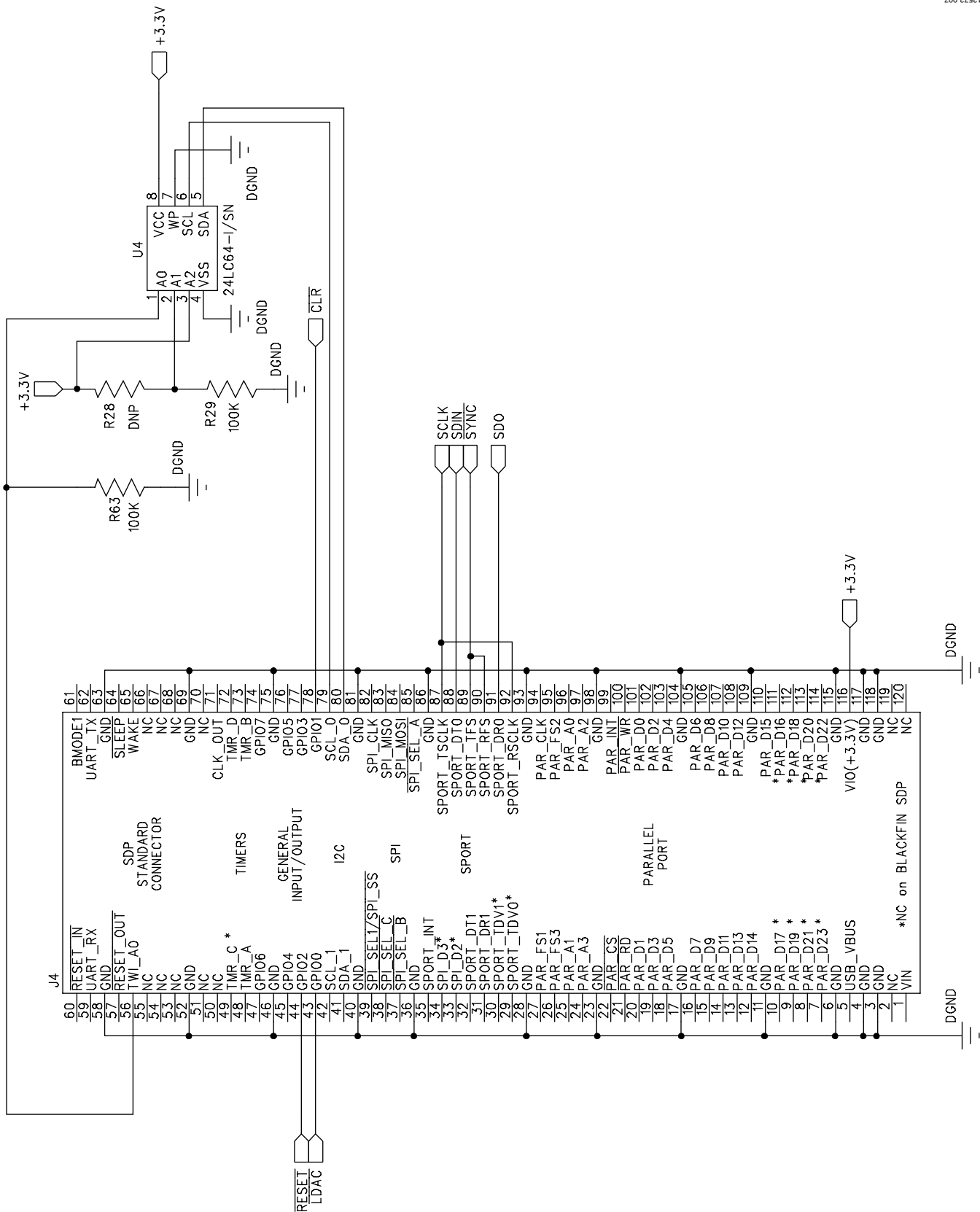


Figure 8. Schematic of the SDP Board Connector

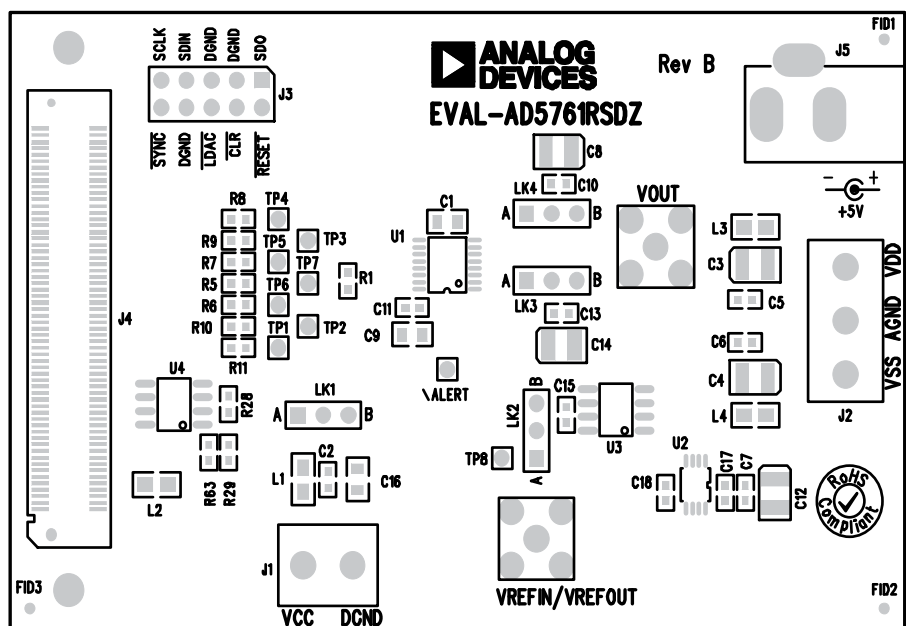


Figure 9. Component Placement Layout

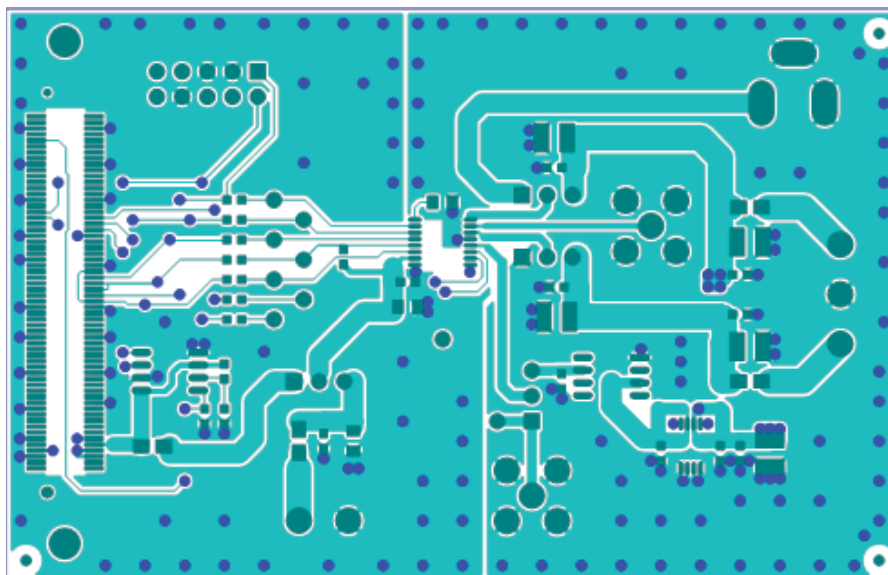


Figure 10. Top PCB Layer Layout

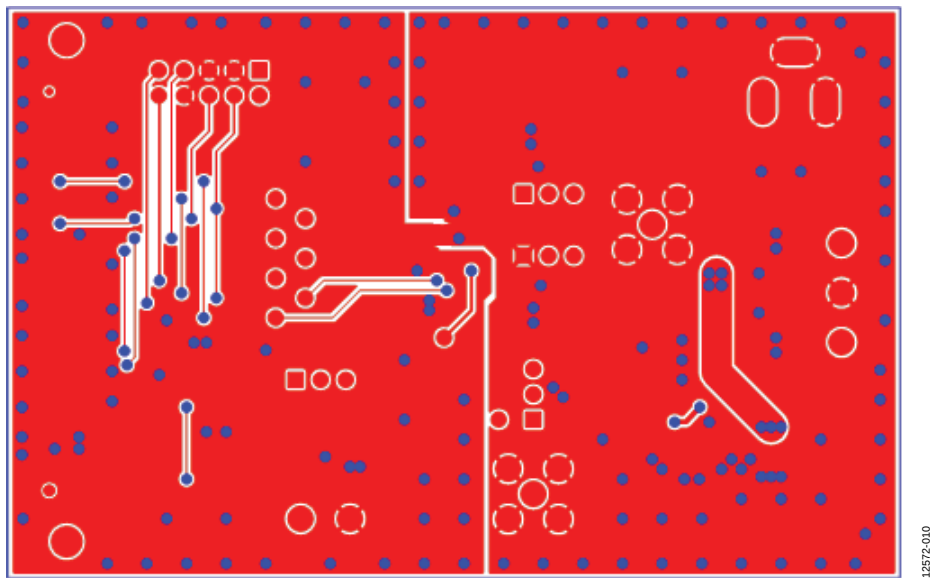


Figure 11. Top Side PCB Layer Layout

12572-010

ORDERING INFORMATION

BILL OF MATERIALS

Table 6.

Reference Designator	Description	Part Number	Stock Code
C1	Capacitor, 0805, X7R, 16 V, 0.01 μ F, $\pm 10\%$	0805YC103KAT2A	FEC 4538717
C2, C5 to C7, C10, C11, C13, C15	Capacitor, 0603, X7R, 50 V, 0.1 μ F, $\pm 10\%$	GRM188R71H104KA93D	FEC 8820023
C3, C4, C8, C12, C14	Capacitor, Case B, 25 V, 10 μ F, $\pm 10\%$	293D106X9025B2TE3	FEC 2353056
C9, C16	Capacitor, 0805, X7R, 10 V, 10 μ F, $\pm 10\%$	GRM21BR71A106KE51L	FEC 1828828
C17, C18	Capacitor, 0603, X7R, 50 V, 1 μ F, $\pm 10\%$	GRM21BR71H105KA12L	FEC 1735541
J1	2-pin terminal block, 5 mm pitch	CTB5000/2	FEC 151789
J2	3-pin terminal block, 5 mm pitch	CTB5000/3	FEC 151790
J3	20-pin (2 $\times$ 10) header	Not applicable	FEC 1022244 (36 + 36 pin strip)
J4	120-way connector, 0.6 mm pitch	FX8-120S-SV(21)	FEC 1324660
J5	2.1 mm, dc barrel power connector	DC10A	Optional
L1 to L4	Ferrite bead, 600 Ω	74279204	FEC 1635719
LK1 to LK4	3-pin SIL header and shorting link	M20-9990345, M7567-05	FEC 1022248, 150410
R1	SMD resistor, 10 k Ω	MC 0.063W 0603 10k	FEC 9331700
R5 to R11	SMD resistor, 0 Ω	MC 0.063W 0603 0R	FEC 9331662
R29, R63	SMD resistor, 100 k Ω	MC 0.063W 0603 1% 100K	FEC 9330402
TP1 to TP8, ALERT	Red test point	20-313137	FEC 8731144
U1	16-bit, bipolar DAC with internal reference and programmable output ranges	AD5761RBRUZ	AD5761RBRUZ
U2	50 mA, high voltage, micropower linear regulator (5 V)	ADP1720ARMZ-5	ADP1720ARMZ-5-R7
U3	2.5 V voltage reference	ADR4525BRZ	ADR4525BRZ
U4	64k I ² C serial EEPROM	24LC64-I/SN	FEC 9758070
VOUT, VREFIN/VREFOUT	Straight PCB mount SMB jack, 50 Ω	1-1337482-0	FEC 1206013

**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.

Legal Terms and Conditions

By using the evaluation board discussed herein (together with any tools, components documentation or support materials, the "Evaluation Board"), you are agreeing to be bound by the terms and conditions set forth below ("Agreement") unless you have purchased the Evaluation Board, in which case the Analog Devices Standard Terms and Conditions of Sale shall govern. Do not use the Evaluation Board until you have read and agreed to the Agreement. Your use of the Evaluation Board shall signify your acceptance of the Agreement. This Agreement is made by and between you ("Customer") and Analog Devices, Inc. ("ADI"), with its principal place of business at One Technology Way, Norwood, MA 02062, USA. Subject to the terms and conditions of the Agreement, ADI hereby grants to Customer a free, limited, personal, temporary, non-exclusive, non-sublicensable, non-transferable license to use the Evaluation Board FOR EVALUATION PURPOSES ONLY. Customer understands and agrees that the Evaluation Board is provided for the sole and exclusive purpose referenced above, and agrees not to use the Evaluation Board for any other purpose. Furthermore, the license granted is expressly made subject to the following additional limitations: Customer shall not (i) rent, lease, display, sell, transfer, assign, sublicense, or distribute the Evaluation Board; and (ii) permit any Third Party to access the Evaluation Board. As used herein, the term "Third Party" includes any entity other than ADI, Customer, their employees, affiliates and in-house consultants. The Evaluation Board is NOT sold to Customer; all rights not expressly granted herein, including ownership of the Evaluation Board, are reserved by ADI. CONFIDENTIALITY. This Agreement and the Evaluation Board shall all be considered the confidential and proprietary information of ADI. Customer may not disclose or transfer any portion of the Evaluation Board to any other party for any reason. Upon discontinuation of use of the Evaluation Board or termination of this Agreement, Customer agrees to promptly return the Evaluation Board to ADI. ADDITIONAL RESTRICTIONS. Customer may not disassemble, decompile or reverse engineer chips on the Evaluation Board. Customer shall inform ADI of any occurred damages or any modifications or alterations it makes to the Evaluation Board, including but not limited to soldering or any other activity that affects the material content of the Evaluation Board. Modifications to the Evaluation Board must comply with applicable law, including but not limited to the RoHS Directive. TERMINATION. ADI may terminate this Agreement at any time upon giving written notice to Customer. Customer agrees to return to ADI the Evaluation Board at that time. LIMITATION OF LIABILITY. THE EVALUATION BOARD PROVIDED HEREUNDER IS PROVIDED "AS IS" AND ADI MAKES NO WARRANTIES OR REPRESENTATIONS OF ANY KIND WITH RESPECT TO IT. ADI SPECIFICALLY DISCLAIMS ANY REPRESENTATIONS, ENDORSEMENTS, GUARANTEES, OR WARRANTIES, EXPRESS OR IMPLIED, RELATED TO THE EVALUATION BOARD INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTY OF MERCHANTABILITY, TITLE, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS. IN NO EVENT WILL ADI AND ITS LICENSORS BE LIABLE FOR ANY INCIDENTAL, SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES RESULTING FROM CUSTOMER'S POSSESSION OR USE OF THE EVALUATION BOARD, INCLUDING BUT NOT LIMITED TO LOST PROFITS, DELAY COSTS, LABOR COSTS OR LOSS OF GOODWILL. ADI'S TOTAL LIABILITY FROM ANY AND ALL CAUSES SHALL BE LIMITED TO THE AMOUNT OF ONE HUNDRED US DOLLARS (\$100.00). EXPORT. Customer agrees that it will not directly or indirectly export the Evaluation Board to another country, and that it will comply with all applicable United States federal laws and regulations relating to exports. GOVERNING LAW. This Agreement shall be governed by and construed in accordance with the substantive laws of the Commonwealth of Massachusetts (excluding conflict of law rules). Any legal action regarding this Agreement will be heard in the state or federal courts having jurisdiction in Suffolk County, Massachusetts, and Customer hereby submits to the personal jurisdiction and venue of such courts. The United Nations Convention on Contracts for the International Sale of Goods shall not apply to this Agreement and is expressly disclaimed.