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Evaluating the AD5629R/AD5669R, Octal, 16-/12-Bit, *dense*DAC

FEATURES

- Full featured evaluation boards for the AD5629R/AD5669R
- On-board reference
- Various link options
- PC control in conjunction with the Analog Devices, Inc., EVAL-SDP-CB1Z system demonstration platform (SDP)

EVALUATION KIT CONTENTS

- EVAL-AD5629RSDZ/EVAL-AD5669RSDZ evaluation boards
- CD includes
  - Self installing evaluation software that allows users to control the board and exercise all functions of the device
  - Electronic version of theEVAL-AD5629RSDZ/ EVAL-AD5669RSDZ user guide

ADDITIONAL EQUIPMENT AND SOFTWARE NEEDED

- EVAL-SDP-CB1Z SDP board (includes a USB cable)
- PC running Windows Vista, Windows 7, or Windows 8 with a USB 2.0 port

ONLINE RESOURCES

- Documents needed
  - AD5629R/AD5669R
  - EVAL-AD5629RSDZ/EVAL-AD5669RSDZ user guide
- Required software
  - AD5629R/AD5669R evaluation software (download from the EVAL-AD5629RSDZ/EVAL-AD5669RSDZ product pages)
- Design and integration files
  - Schematics, layout files, bill of materials

GENERAL DESCRIPTION

This user guide details the operation of the evaluation boards for the AD5669R octal channel, 16-bit, voltage output digital-to-analog converter (DAC) and the AD5629R octal channel, 12-bit, voltage output DAC.

The EVAL-AD5629RSDZ/EVAL-AD5669RSDZ evaluation boards help users quickly prototype new AD5629R/AD5669R circuits and reduce design time. The AD5629R/AD5669R operates from a single 2.7 V to 5.5 V supply. The AD5629R/AD5669R has an internal 1.25 V or 2.5 V reference giving an output voltage span of 2.5 V or 5 V. The internal reference is off at power-up, allowing the use of an external reference; the REF195 is provided on-board as a 5 V reference source. The device must be written to after power-up to turn on the internal reference.

The evaluation boards interface to the USB port of a PC via the SDP-B board. Software is supplied with the evaluation boards to allow the user to program the AD5629R/AD5669R.

The evaluation boards are compatible with the EVAL-SDP-CB1Z Blackfin® SDP controller board (SDP-B), available to order on the Analog Devices website at www.analog.com.

Full data on the AD5629R/AD5669R is available in the corresponding data sheets, available from Analog Devices, which should be consulted in conjunction with this user guide when using the evaluation boards.

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REVISION HISTORY

9/15—Revision 0: Initial Version

TYPICAL EVALUATION SETUP

Figure 1. Typical Evaluation Setup of the AD5629R/AD5669R Evaluation Boards

GETTING STARTED

INSTALLING THE SOFTWARE

The evaluation kit for the AD5629R/AD5669R includes self installing software on the CD provided. The software is compatible with Windows® Vista™ (32-bit), Windows 7 (32-bit and 64-bit), and Windows 8.

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

To install the software, complete the following steps:

1. Start the Windows operating system and insert the CD.
2. The installation software opens automatically. If it does not open automatically, run the **setup.exe** file from the CD.
3. After installation is complete, power up the evaluation board as described in the Power Supplies section.
4. Connect the evaluation board to the SDP-B board and connect the SDP-B board to the PC using the USB cable included in the kit.
5. When the software detects the evaluation board, proceed through any dialog boxes that appear to finalize the installation.

EVALUATION BOARD SETUP PROCEDURES

To set up the evaluation board, complete the following steps:

1. Connect the evaluation board to the SDP-B board and connect the USB cable from the SDP-B board to the PC.
2. Power the SDP-B and evaluation board by connecting 5 V dc to the J2 connector (AVDD and AGND).

EVALUATION BOARD HARDWARE

POWER SUPPLIES

To power the AD5629R/AD5669R evaluation boards, supply 5 V between the AVDD and AGND inputs for the analog supply.

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

Table 1. Power Supply Connector

Connector	Voltage
J2	Analog power supply, AVDD. For single-supply operation, supply 5 V.

INPUT SIGNALS

When the SDP-B board controls the evaluation board, the digital input signals are applied to Connector J3. When the SDP-B board is not used, apply the digital signals to Connector J6 to Connector J9.

OUTPUT SIGNALS

The DAC output voltages are available on the SMB connectors, labeled A to H.

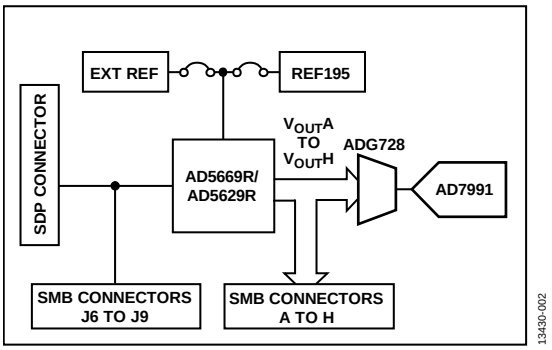

Figure 2. Evaluation Board Block Diagram

LINK CONFIGURATION OPTIONS

Multiple link options must be set correctly to select the appropriate operating setup before using the evaluation board. Table 2 describes the functions of these options.

SETUP CONDITIONS

Before applying power and signals to the evaluation board, ensure that all links are positioned as required by the operating mode.

The evaluation board can operate in SDP controlled mode to be used with the SDP-B board, or the evaluation boards can be used in standalone mode.

Table 2 shows the default positions of the links when the evaluation board is packaged. When the board is shipped, it is set up to operate with the SDP-B board in SDP controlled mode.

Table 2. Link Functions

Link No.	Function	Default Position
LK1	This link selects the source of the A0 pin. Position A selects AVDD. Position B selects GND (default). The software is designed with LK1 in this position.	B
LK2	This link connects the $V_{OUT}A$ to $V_{OUT}F$ pins of the AD5629R/AD5669R to the input pins of the demultiplexer so that the DAC output value can be monitored using the on-board ADC.	Inserted
LK3	This link connects the $V_{OUT}A$ to $V_{OUT}F$ pins of the AD5629R/AD5669R to the input pins of the demultiplexer so the on-board ADC can monitor the DAC output value.	Inserted
LK4	This link connects a 0.1 µF capacitor to AGND on the V_{REF} pin. It is recommended to insert LK4 when using the internal reference.	Inserted
LK5	This link selects the reference source. Position A selects the internal reference as the reference source. The AD5629R/AD5669R must be written to via the software to turn on the internal reference. Position B selects the on-board 5 V reference as the reference source.	B
LK7	This link selects the DAC voltage source. Position A selects the AVDD analog circuitry power supply source. Position B selects the on-board 5 V reference as the power supply source.	B
LK8	This link sets the $\overline{\text{RESET}}$ pin on the ADG728 demultiplexer. Position A allows normal operation of the ADG728. Position B resets the ADG728.	B
LK9 to LK14	This link connects the $V_{OUT}A$ to $V_{OUT}F$ pins of the AD5629R/AD5669R to the input pins of ADG728 demultiplexer so that the on-board ADC can monitor the DAC output value.	Inserted

EVALUATION BOARD CIRCUITRY

The EVAL-AD5629RSDZ/EVAL-AD5669RSDZ evaluation boards easily test the function and performance of the AD5629R/AD5669R.

Control of the AD5629R/AD5669R is typically performed by the SDP-B board, which is attached to Connector J3. The SDP-B board allows the software provided with the kit to load register values, set the voltage of the DAC outputs, and write to the control register of the AD5629R/AD5669R.

When the SDP-B board is not required, the control signals can be applied to the AD5629R/AD5669R by connecting them to the relevant SMB Connector J6 to Connector J9.

The DAC output voltages are available on the SMB Connector A to Connector H.

HOW TO USE THE SOFTWARE

STARTING THE SOFTWARE

To run the EVAL-AD5629RSDZ/EVAL-AD5669RSDZ software, take the following steps:

1. Connect the evaluation board to the SDP-B board and connect the USB cable from the SDP-B board to the PC.
2. Power the SDP-B board and the evaluation board by connecting 5 V to Connector J2.
3. Click **Start** > **All Programs** > **Analog Devices** > **AD5629R/AD5669R** > **AD5629R/AD5669R Evaluation Software**. While the software connects to the evaluation board, the message in Figure 3 displays.

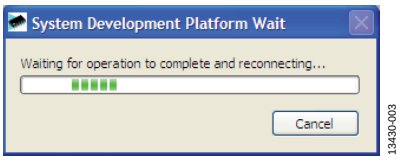

Figure 3. Connection Message

If the SDP-B board is not connected to the USB port when the software launches, a connectivity error displays (see Figure 4).

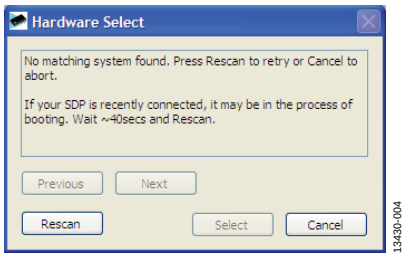

Figure 4. Connectivity Error

Connect the SDP-B board to the USB port of the PC, wait at least 40 sec for the SDP-B board to boot, click **Rescan**, and follow the instructions.

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 AD5629R/AD5669R evaluation software then opens, as shown in Figure 5.

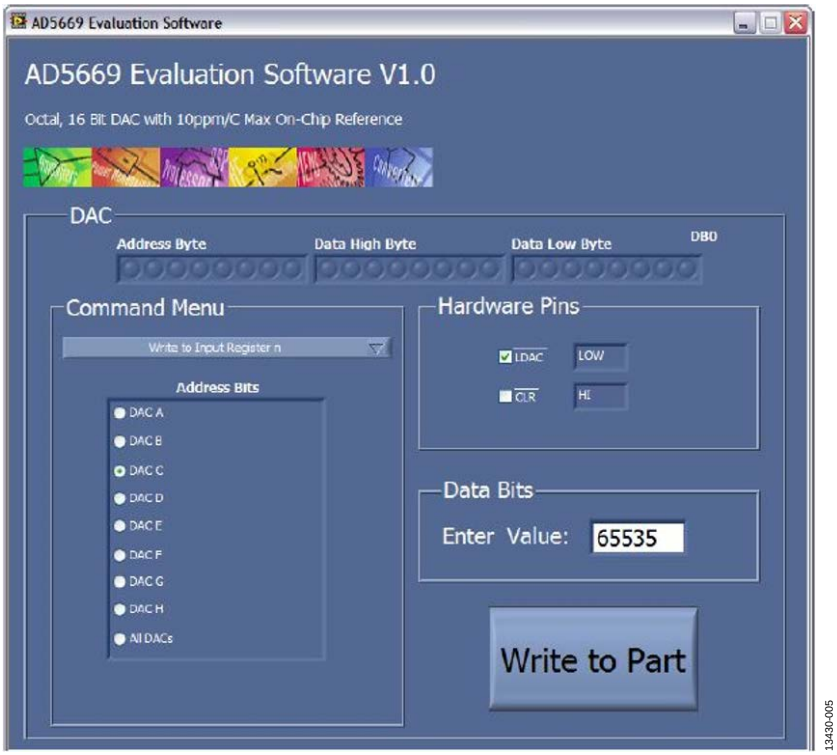

Figure 5. AD5629R/AD5669R Evaluation Software Main Window

SOFTWARE OPERATION

The AD5629R/AD5669R evaluation software allows the user to program values to the input and DAC registers of each DAC individually or collectively.

Command Menu

By selecting the appropriate option in the drop-down menu under **Control Menu**, you can select **Write to Input Register n**, **Write to and Update DAC Channel n**, **Write to Input Register n Update All (Software LDAC)**, **Power Down/Power Up DAC**, **Load Clear Code Register**, and **Load LDAC Register**.

Address Bit

To select which DACs to update, select the appropriate DAC under **Address Bits**.

Hardware Control

Set $\overline{\text{LDAC}}$ and $\overline{\text{CLR}}$ high or low by selecting the corresponding check box under **Hardware Pins**. This command executes immediately.

Data Bits

Type the data to be written to the DAC in decimal format.

Write to Part

You must click **Write to Part** to write the Data Bits value to the device.

EVALUATION BOARD SCHEMATICS AND ARTWORK

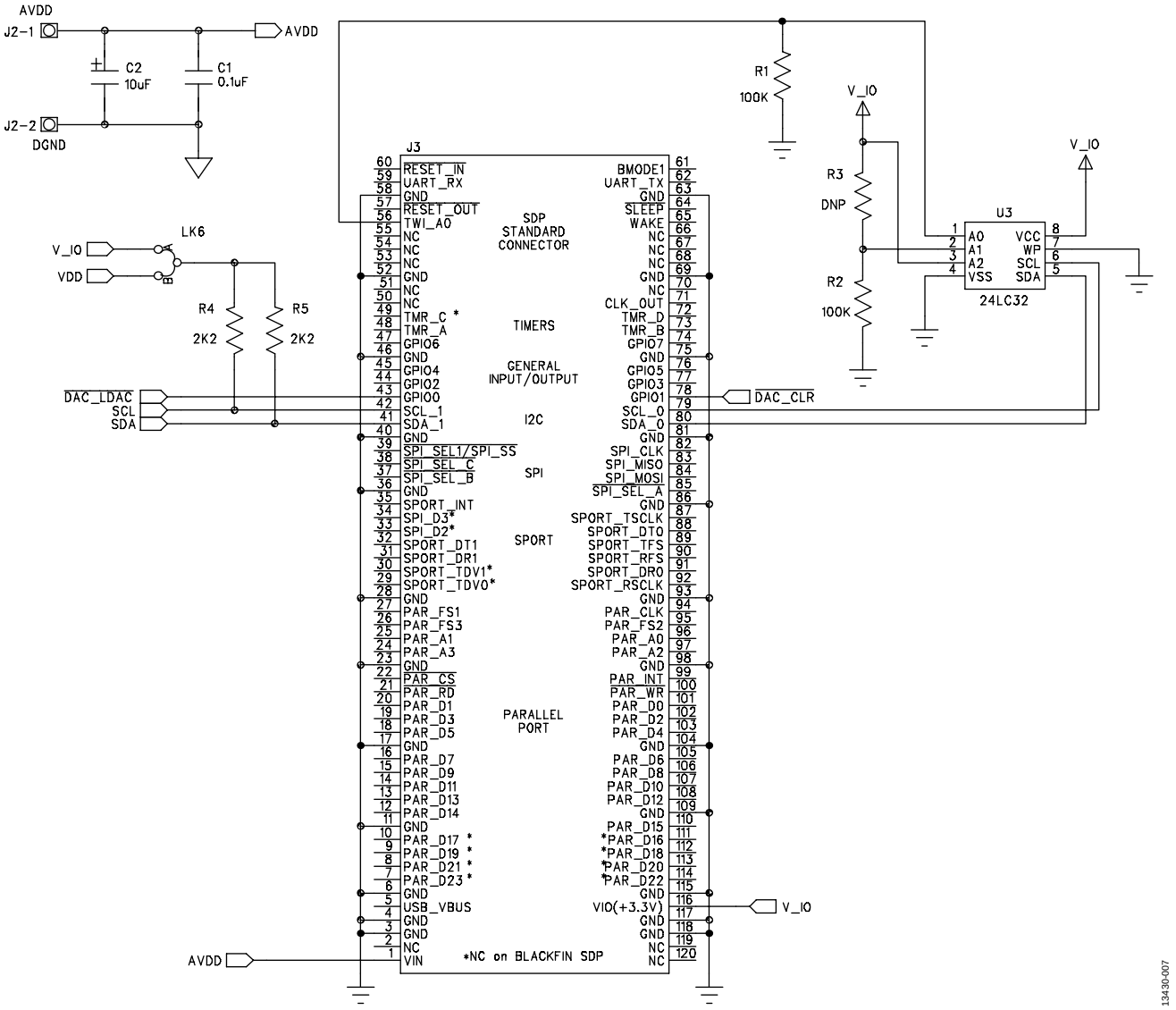

Figure 6. EVAL-AD5629RSDZ/EVAL-AD5669RSDZ Schematic (Page 1)

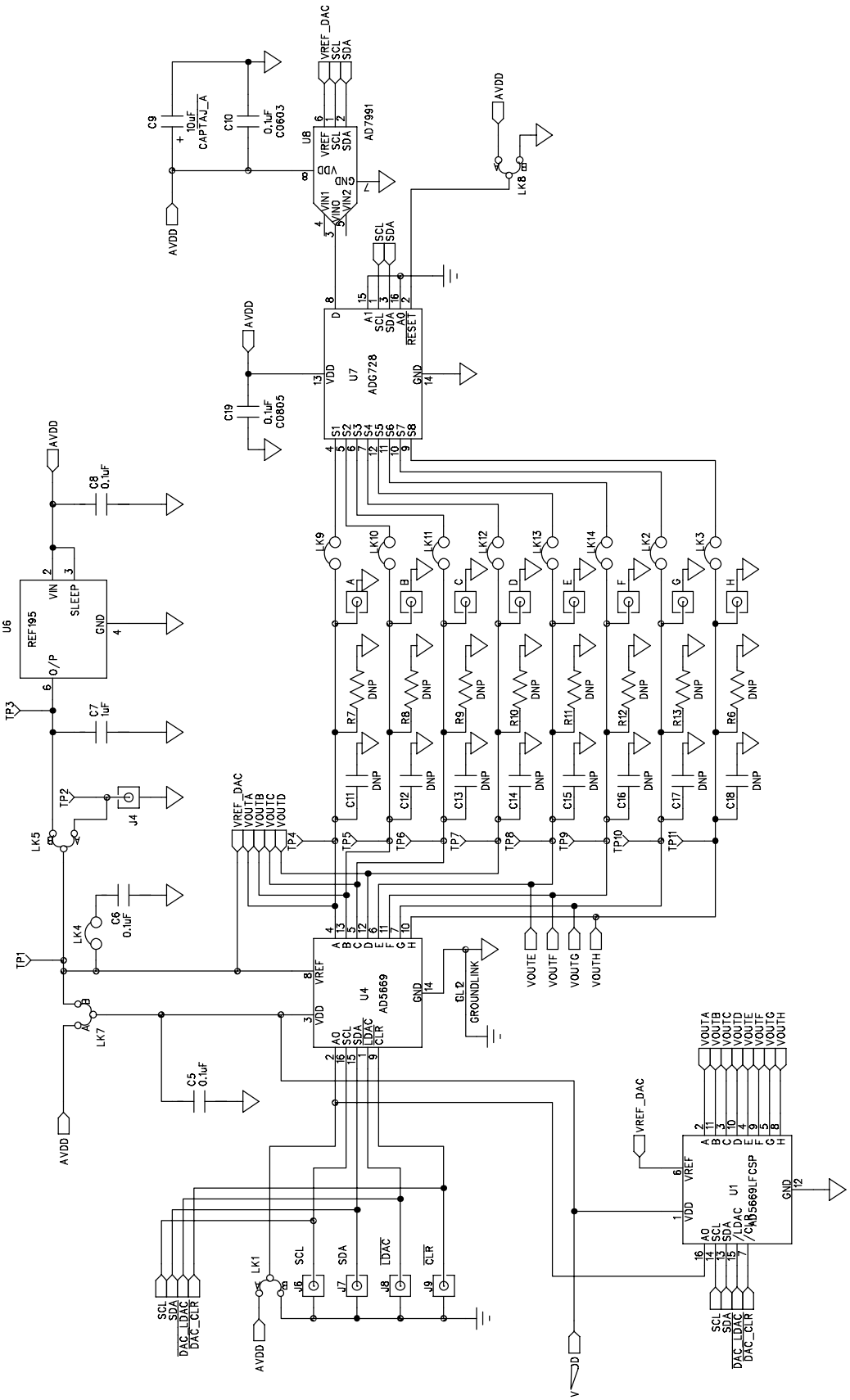

Figure 7. EVAL-AD5629RSDZ/EVAL-AD5669RSDZ Schematic (Page 2)

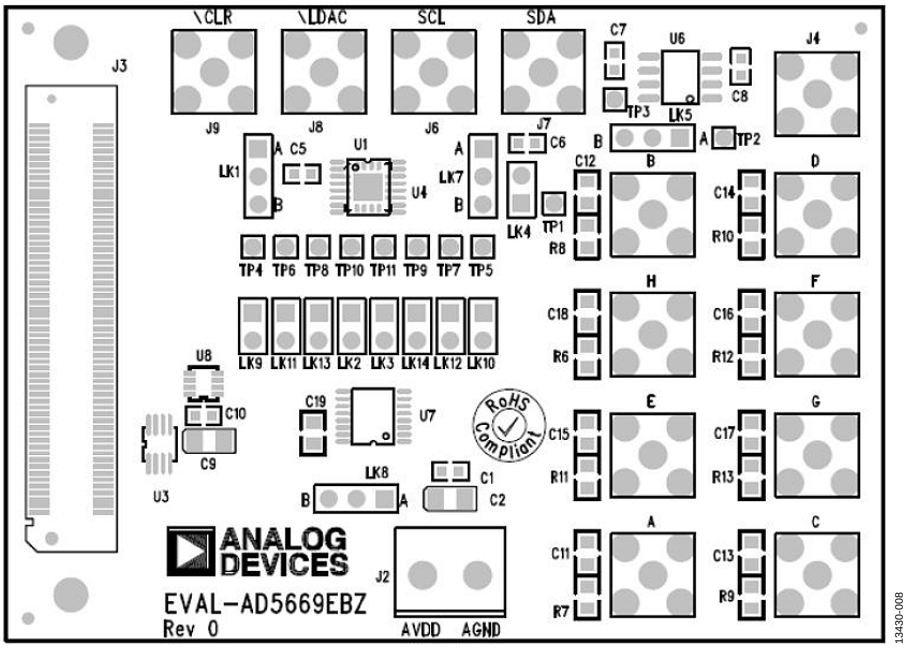

Figure 8. Component Placement Silkscreen

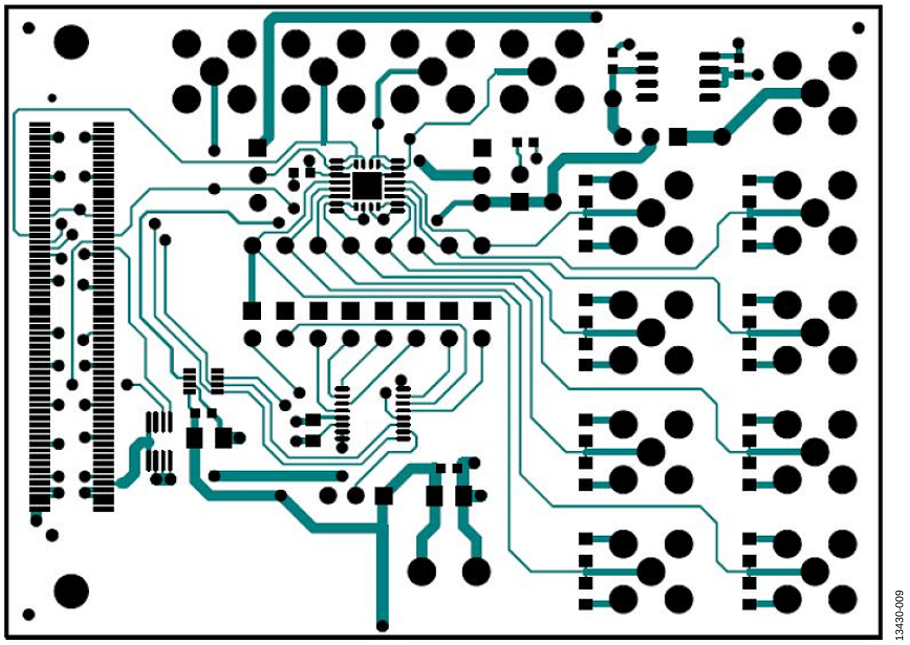

Figure 9. Component Side Printed Circuit Board (PCB) Silkscreen

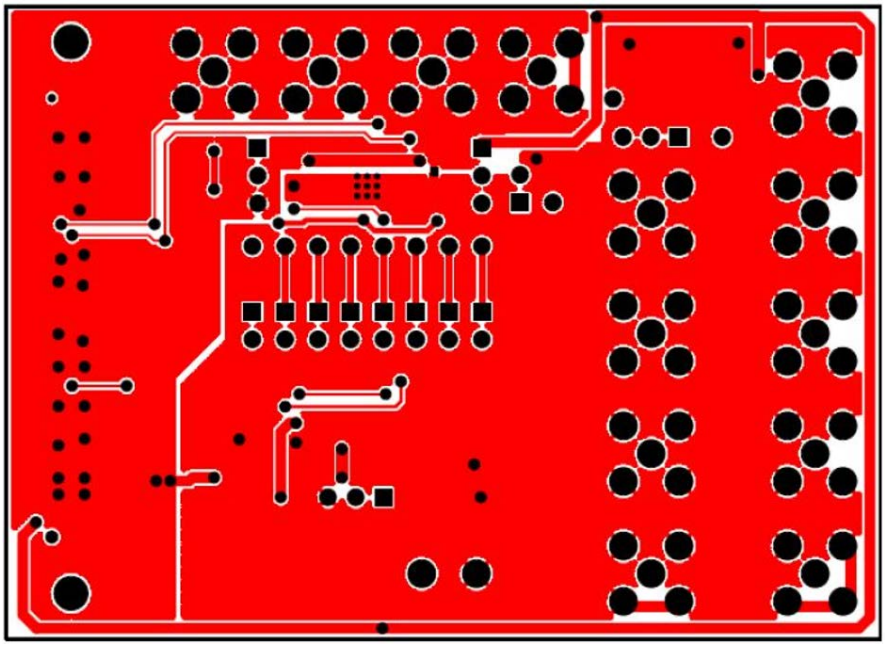

Figure 10. Solder Side PCB Silkscreen

ORDERING INFORMATION

BILL OF MATERIALS

Table 3.

Qty.	Reference Designator	Description	Manufacturer	Part Number[1]
6	C1, C5, C6, C8, C10, C19	Capacitors, 100 nF, 50 V	Murata	FEC 8820023
2	C2, C9	Capacitors, 10 µF, 10 V	AVX	FEC 197130
1	C7	Capacitor, 1 µF, 10 V	Yageo	FEC 3188840
1	J2	2-pin terminal block (5 mm pitch)	Camdenboss	FEC 151789
1	J3	120-way female connector, 0.6 mm pitch	Hirose	FEC 1324660 or Digikey H1219-ND
5	J4, J6 to J9	Straight PCB mount, SMB jacks	TE Connectivity/Greenpar	FEC 1206013
5	LK1, LK5 to LK8	Jumper blocks using 3-pin SIP header	Harwin	FEC 1022248 and 150410
9	LK2 to LK4, LK9 to LK14	2-pin jumper blocks, 0.1" spacing	Harwin	FEC 1022247 and 150411
2	R1, R2	2.2 kΩ SMD resistors	Multicomp	FEC 9330402
2	R4, R5	100 kW, SMD resistors	Panasonic	FEC 1577611
11	TP1 to TP11	Red test points	Vero	FEC 8731144 (Pack)
1	U3	32 kΩ, I²C, serial EEPROM	Microchip	FEC 1331330
1	U4[2]	Octal, 16-bit DAC	Analog Devices	AD5669RBRUZ-2
1	U4[2]	Octal, 12-bit DAC	Analog Devices	AD5629RBRUZ-2
1	U6	Low dropout voltage reference	Analog Devices	REF195ESZ
1	U7	Matrix switch/multiplexer	Analog Devices	ADG728BRUZ
1	U8	4-channel, 12-Bit ADC	Analog Devices	AD7991YRJZ-0

[1] FEC is Farnell Electronics Components.
[2] The AD5669RBRUZ-2 is supplied on the EVAL-AD5669RSDZ evaluation board. The AD5629RBRUZ-2 is supplied on the EVAL-AD5629RSDZ evaluation board.

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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