EVAL-AD5676SDZ/ EVAL-AD5676RSDZ User Guide

UG-814

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Evaluating the AD5676/AD5676R Octal, 16-Bit *nano*DAC+

FEATURES

- Full featured evaluation board for the AD5676/AD5676R
- Various link options
- PC control in conjunction with the Analog Devices, Inc., EVAL-SDP-CB1Z system demonstration platform (SDP)

EVALUATION KIT CONTENTS

- EVAL-AD5676SDZ/EVAL-AD5676RSDZ evaluation board
- CD includes
  - Self-installing evaluation software that allows users to control the board and exercise all functions of the device
  - Electronic version of the EVAL-AD5676SDZ/ EVAL-AD5676RSDZ user guide

ADDITIONAL EQUIPMENT AND SOFTWARE NEEDED

- EVAL-SDP-CB1Z SDP board, includes a USB cable
- PC running Windows XP SP2, Windows Vista, or Windows 7 with USB 2.0 port

ONLINE RESOURCES

- Documents Needed
  - AD5676/AD5676R data sheet
  - EVAL-AD5676SDZ/EVAL-AD5676RSDZ user guide
- Required Software
  - AD5676(R) evaluation software (download from the EVAL-AD5676SDZ/EVAL-AD5676RSDZ 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 AD5676/AD5676R octal channel, voltage output digital-to-analog converter (DAC).

The EVAL-AD5676SDZ/EVAL-AD5676RSDZ evaluation boards help users to quickly prototype new AD5676/AD5676R circuits and reduce design time. The AD5676/AD5676R operate from a single 2.7 V to 5.5 V supply. The AD5676R has an internal 2.5 V reference giving a maximum output voltage of 2.5 V or 5 V. The AD5676 does not have an internal reference; therefore, an ADR431 is provided on-board as a 2.5 V reference source. A different reference voltage can be applied via the EXT_REF SMB connector, if required.

Full data on the AD5676/AD5676R are available in the respective product data sheets, available from Analog Devices, which should be consulted in conjunction with this user guide when using the evaluation boards.

The evaluation boards interface to the USB port of a PC via the SDP board. Software is supplied with the evaluation board to allow the user to program the AD5676/AD5676R.

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

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REVISION HISTORY

3/15—Revision 0: Initial Version

TYPICAL EVALUATION SETUP

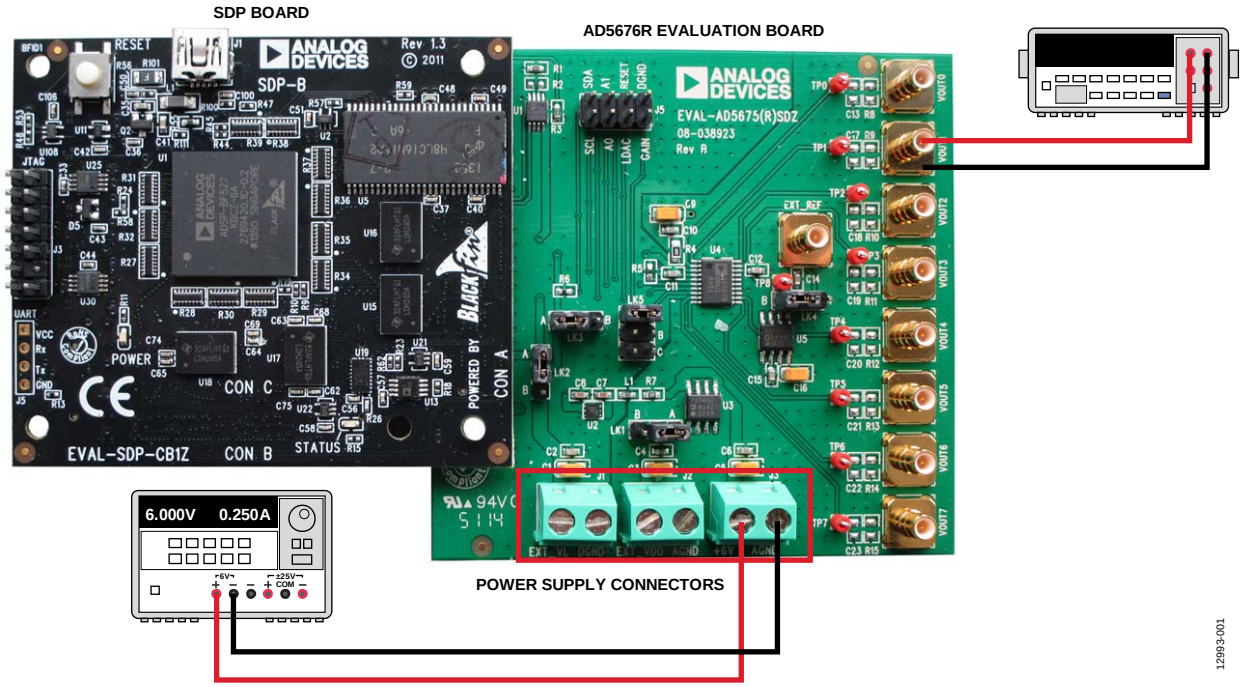

Figure 1.

GETTING STARTED

INSTALLING THE SOFTWARE

The evaluation kit for the AD5676/AD5676R includes self-installing software on the CD. The software is compatible with Windows® XP, Windows Vista (32-bit), and Windows 7 (32-bit and 64-bit).

The software must be installed 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 software, take the following steps:

1. Start the Windows operating system and insert the CD.
2. The installation software should open 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, take the following steps:

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 the SDP-B and evaluation boards by connecting 6 V dc to the J3 connector.

EVALUATION BOARD HARDWARE

POWER SUPPLIES

To use the evaluation board with the SDP-B board, a 6 V dc power supply is required, which is connected to Connector J3. The evaluation board can be used without the SDP-B board. In this case, the J1 and J2 connectors are used as the power supply inputs.

Both AGND and DGND inputs are provided on the board. The AGND and DGND planes are connected at one location close to the AD5676/AD5676R. 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 Number	Voltage
J1	External, V_{LOGIC} supply
J2	Analog power supply, V_{CC}
J3	6 V dc board positive power supply

INPUT SIGNALS

When the SDP-B board controls the evaluation board, the digital input signals are applied to Connector J4. When the SDP-B board is not used, apply the digital signal to Connector J5.

OUTPUT SIGNALS

The DAC output voltages are available on the SMB connectors, VOUT0 to VOUT7.

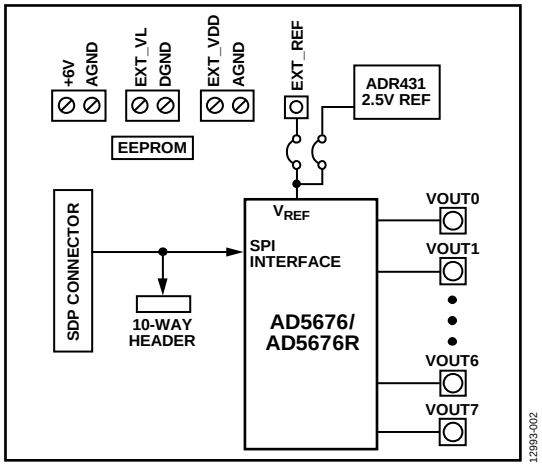

Figure 2. Evaluation Board Block Diagram

LINK CONFIGURATION OPTIONS

Multiple link (LKx) options must be set correctly to select the appropriate operating setup before using the evaluation board. The functions of these options are described in Table 2.

SETUP CONDITIONS

Before applying power and signals to the evaluation board, ensure that all link positions are as required by the operating mode. There are two modes in which to operate the evaluation board. The evaluation boards can be operated in SDP controlled mode to be used with the SDP-B board, or the evaluation board can be used in standalone mode.

The Default Position column of Table 2 shows the default positions in which the links are set 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 DAC analog voltage source. Position A selects the internal voltage source (INT_VCC) from the ADP3331 (U1). Position B selects an external supply voltage (EXT_ VCC).	A
LK2	This link selects the DAC digital voltage source. Position A selects the digital voltage source from the SDP-B board (V_IO). Position B selects an external digital supply voltage (EXT_VLOGIC).	A
LK3	This link selects the reference source. Position A selects the internal reference of the AD5676R as the reference source or an external reference source from the SMB connector EXT_REF. Use only Position A with the EVAL-AD5676RSDZ. Position B selects U6 as the 2.5 V reference source. Do not use Position B with the EVAL-AD5676RSDZ.	A/B[1]
LK4	This link selects the RSTSEL setting of the AD5676/AD5676R. Position A selects DAC power up to zero scale. Position B selects DAC power up to midscale.	A
LK5	This link sets the internal gain setting of the AD5676/AD5676R. Position A selects software control of the gain via the SDP-B board. Position B selects a gain of 0 V to 2 × V_{REF}. Position C selects a gain of 0 V to V_{REF}.	A

[1] Position A is the default for the EVAL-AD5676RSDZ. Position B is the default for the EVAL-AD5676SDZ.

EVALUATION BOARD CIRCUITRY

The EVAL-AD5676SDZ/EVAL-AD5676RSDZ evaluation boards allow the function and performance of the AD5676/AD5676R to be easily tested. Each evaluation board contains two voltage regulators that generate the analog and digital power supplies and that also power the SDP-B board, if it is connected. The two regulators are powered via a 6 V supply attached to Connector J3. Alternatively, a separate analog supply can be attached via Connector J2, and an external V_{LOGIC} supply can be connected to Connector J1.

Control of the AD5676/AD5676R is typically performed by the SDP-B board, which is attached to Connector J4. The SDP-B board allows the software provided with the kit to be used to load register values, set the voltage of the DAC outputs, and write to the control register of the AD5676/AD5676R. When the SDP-B board is not required, the control signals can be applied to the AD5676/AD5676R by connecting them to the relevant pins on Connector J5.

The DAC output voltages are available on the SMB connectors, VOUT0 to VOUT7.

HOW TO USE THE SOFTWARE

STARTING THE SOFTWARE

To run the program, take the following steps:

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 the SDP-B board and the evaluation board by connecting 6 V to Connector J3.
3. Click **Start** > **All Programs** > **Analog Devices** > **AD5676/AD5676R** > **AD5676/AD5676R Evaluation Software**. While the software connects to the evaluation board, the message in Figure 3 displays.

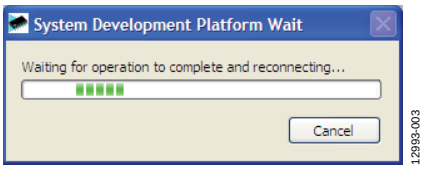

Figure 3. Connection Message

If the SDP-B board is not connected to the USB port when the software is launched, a connectivity error displays (see Figure 4). Connect the evaluation board to the USB port of the PC, wait a few seconds, click **Rescan**, and follow the instructions.

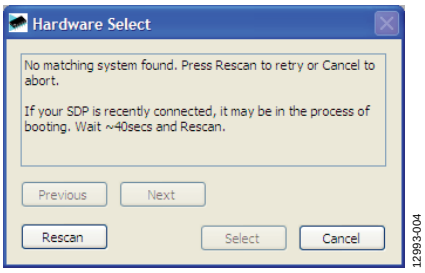

Figure 4. Connectivity Error

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 AD5676/AD5676R evaluation software then opens, as shown in Figure 5.

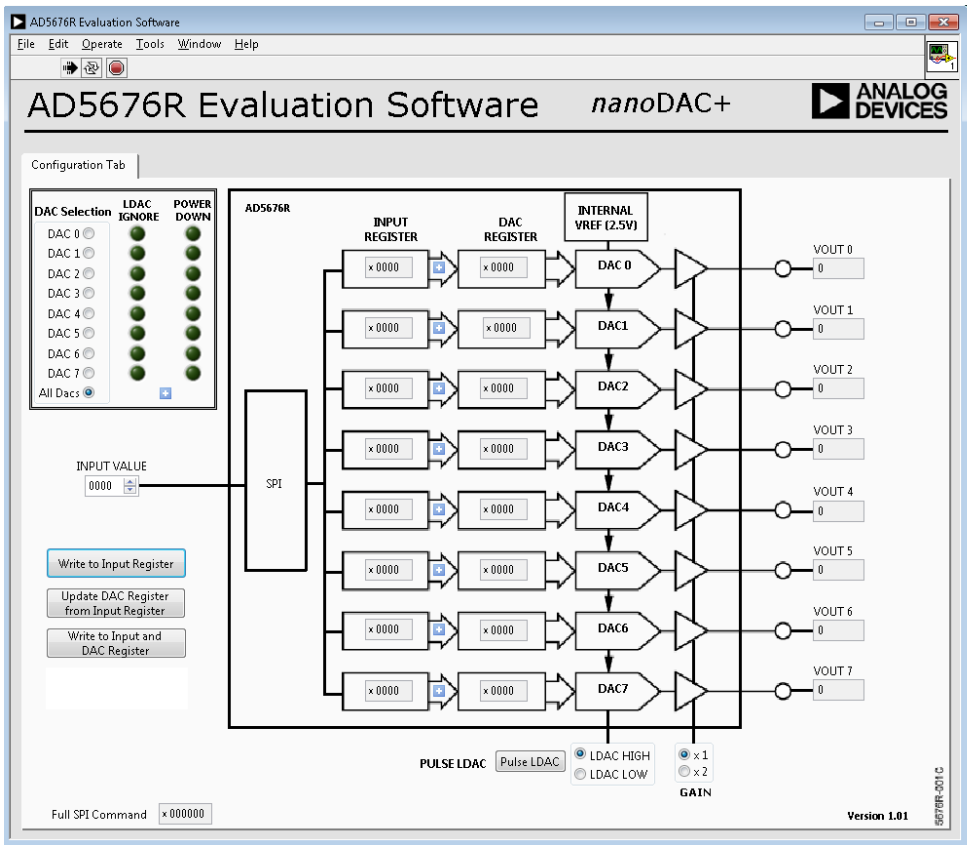

Figure 5. AD5676/AD5676R Evaluation Software Main Window

SOFTWARE OPERATION

The AD5676/AD5676R evaluation software 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 the 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. DAC outputs are automatically updated with the appropriate voltage. LDAC mask settings are ignored.

Write to DAC Register

Select **Write to Input and DAC Register** 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 appropriated voltage. LDAC mask settings are ignored.

Gain Control

Select **GAIN ×1** to give a full-scale output of 2.5 V for the AD5676R or V_{REF} for the AD5676. Select **GAIN ×2** to give a full-scale output of 5 V for the AD5676R or 2 × V_{REF} for the AD5676.

LDAC Control

Click **Pulse LDAC** to bring the 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. Any DAC updates disabled by the LDAC mask settings are ignored.

The LDAC pin can also be set high or low by selecting the appropriate radio button.

Power-Down Control

Each of the DACs can be powered down individually. Each of the DACs has an associated selection box allowing the part to operate in normal mode or power-down mode. Click the blue progressive disclosure buttons to access the selection box. When the power-down setting for each DAC is selected, click **Confirm** to write the appropriate values to the AD5676/AD5676R.

LDAC Mask Register

Each of the DACs has an associated selection box allowing the part to be set to respond or ignore LDAC pulses. Click the blue progressive disclosure buttons to access the selection box. When the LDAC selections are completed, click **Confirm** to write the appropriate values to the AD5676/AD5676R.

SPI Command

The **Full SPI Command** box shows the value that must be written to the AD5676/AD5676R to replicate the function of the evaluation board.

EVALUATION BOARD SCHEMATICS

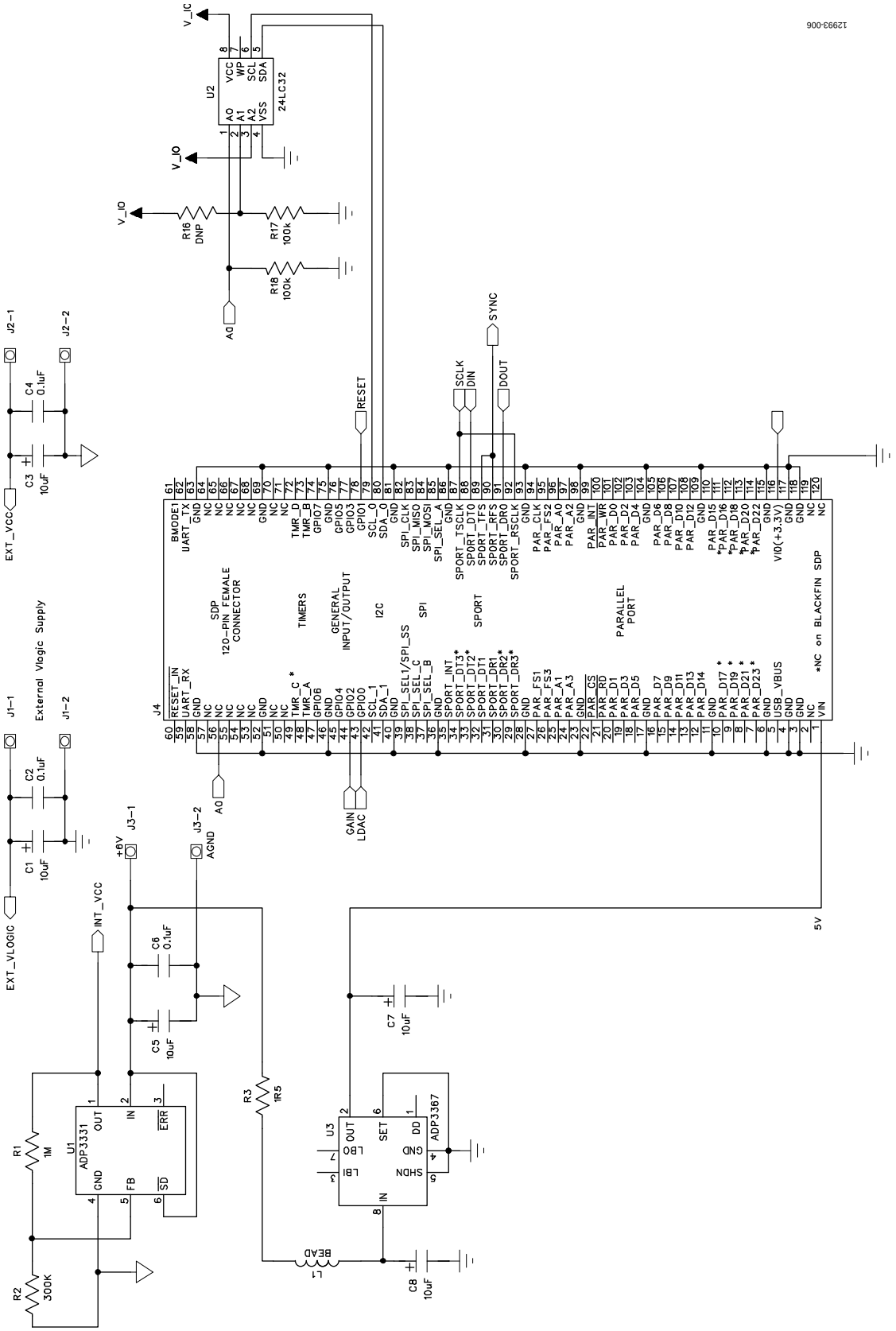

Figure 6. EVAL-AD5676SDZ/EVAL-AD5676RSDZ Schematic, Page 1 of 2

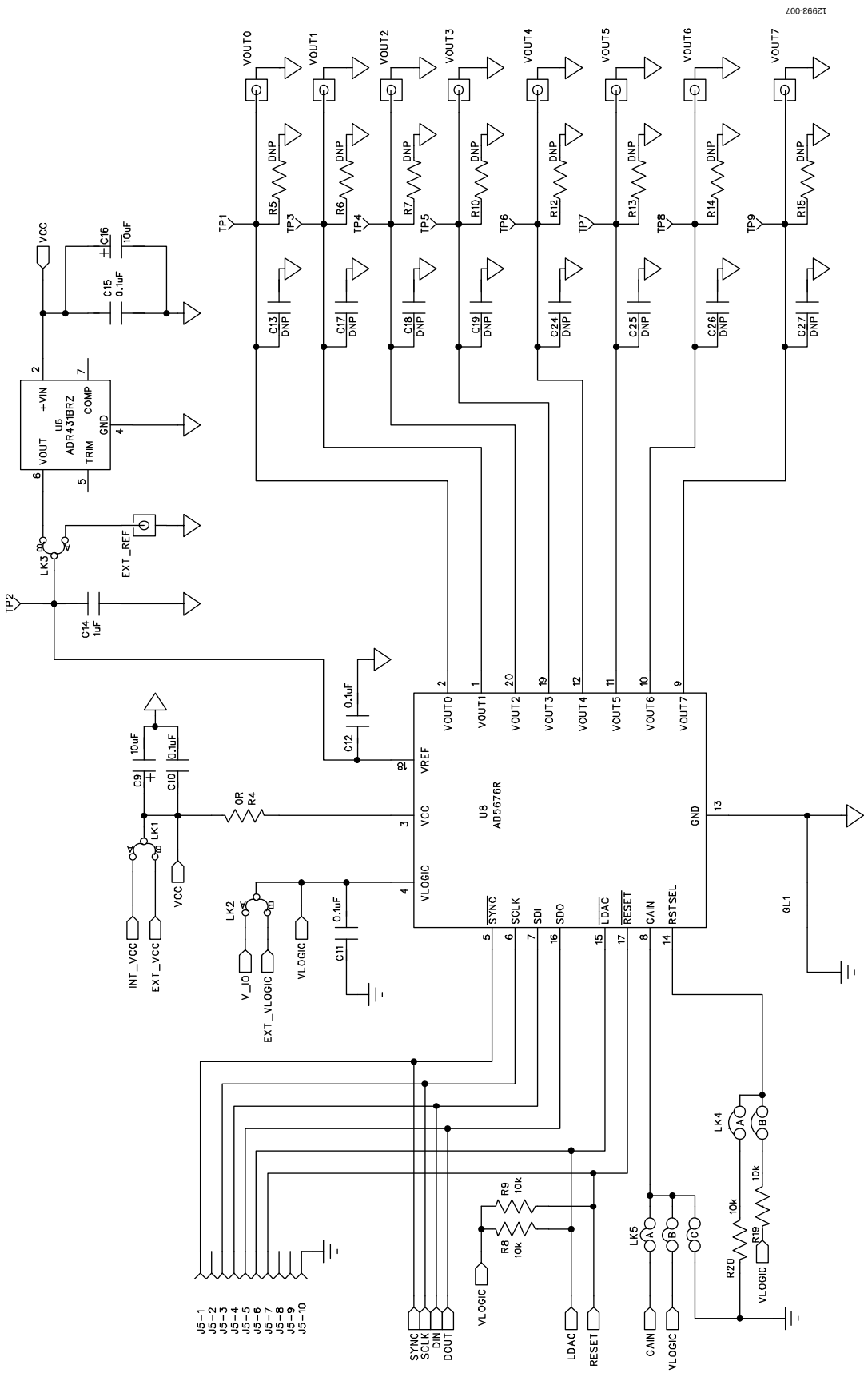

Figure 7. EVAL-AD5676SDZ/EVAL-AD5676RSDZ Schematic, Page 2 of 2

BILL OF MATERIALS

Table 3.

Qty	Reference Designator	Description	Supplier/Part Number[1]
7	C1, C3, C5, C7 to C9, C16	Capacitor, Case A, 10 µF, 10 V	FEC 197-130
7	C2, C4, C6, C10 to C12, C15	Capacitor, 100 nF, 50 V, 0603	FEC 8820023
1	C14	Capacitor, 1 µF, 10 V, 0603	FEC 318-8840
17	C13, C17 to C19, C24 to C27, R5 to R7, R10, R12 to R16	Do not populate	Not inserted
3	J1 to J3	2-pin terminal block	FEC 151789
1	J4	120-way female connector	FEC 1324660 or Digikey H1219-ND
1	J5	10-pin (2x5), 0.1" header	FEC 1022244 (36 Pin Strip)
1	L1	Ferrite bead, 600 Ω at 100 MHz	Digikey 490-1024-1-ND
3	LK1 to LK3	Jumper block using 3-pin SIP header	FEC 1022248 and 150410
1	LK4	2-way link option	FEC 1022244
1	LK5	3-way link option	FEC 9331662
1	R1	Resistor, 1 MΩ, 0.063 W, 1%, 0603	Digikey RMCF1/161MFRCT-ND
1	R2	Resistor, 300 kΩ, 0.1 W, 1%, 0603	Digikey 541-300KHCT-ND
1	R3	Resistor, 1.5 Ω, 0.063 W, 5%, 0603	FEC 9331832
1	R4	Resistor, 0 Ω, 0805	FEC 9333681
4	R8, R9, R19, R20	10 kΩ, SMD, resistor	FEC 933-0399
2	R17, R18	100 kΩ, SMD, resistor	FEC 9330402
9	TP1 to TP9	Red test point	FEC 8731144 (Pack)
1	U1	Adjustable LDO regulator	Analog Devices ADP3331ARTZ
1	U2	32k I^2C serial EEPROM	FEC 1331330
1	U3	+5 V, fixed, adjustable voltage regulator	Analog Devices ADP3367ARZ
1	U6	Ultralow noise XFET voltage reference	Analog Devices ADR431BRZ
1	U8	Octal,16-bit *nano*DAC+	Analog Devices AD5676RARUZ or AD5676ARUZ
9	VOUT0 to VOUT7, EXT_REF	Straight PCB mount SMB jack, 50 Ω	FEC 1206013

[1] FEC is Farnell Electronics Components.

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.

ANALOG DEVICES

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