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Evaluating the **AD5675/AD5675R** Octal, 16-Bit *nanoDAC*+

FEATURES

Full featured evaluation board for the **AD5675/AD5675R**
Various link options
PC control in conjunction with the Analog Devices, Inc.,
EVAL-SDP-CB1Z system demonstration platform (SDP)

EVALUATION KIT CONTENTS

AD5675/AD5675R 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-AD5675SDZ/EVAL-AD5675RSDZ** 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

- AD5675/AD5675R** data sheet
- EVAL-AD5675SDZ/EVAL-AD5675RSDZ** user guide

Required Software

- AD5675(R)** evaluation software (download from the **EVAL-AD5675SDZ/EVAL-AD5675RSDZ** 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 **AD5675/AD5675R** octal channel, voltage output digital-to-analog converters (DACs).

The **EVAL-AD5675SDZ/EVAL-AD5675RSDZ** evaluation boards help customers to quickly prototype new **AD5675/AD5675R** circuits and reduce design time. The **AD5675/AD5675R** operate from a single 2.7 V to 5.5 V supply. The **AD5675R** has an internal 2.5 V reference giving a maximum output voltage of 2.5 V or 5 V. The **AD5675** 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 **AD5675/AD5675R** 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 **AD5675/AD5675R**.

The evaluation boards are compatible 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

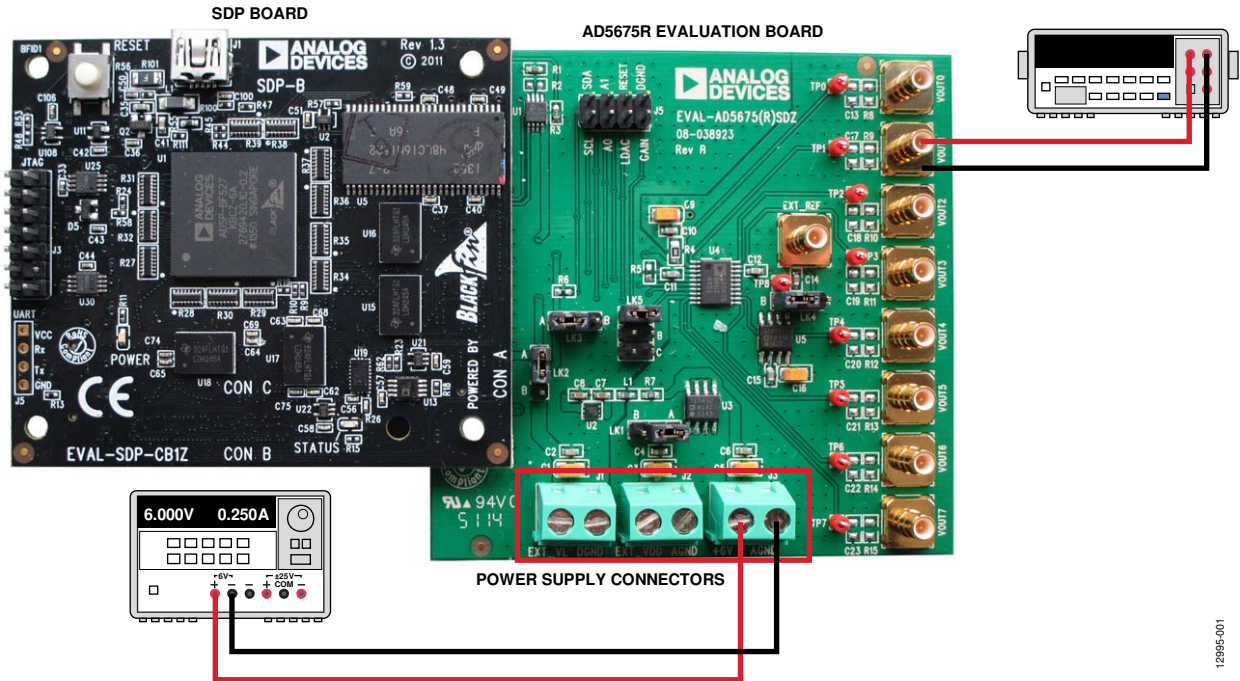


Figure 1.

12995-001

GETTING STARTED

INSTALLING THE SOFTWARE

The evaluation kit for the [AD5675/AD5675R](#) 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 completed, 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 into 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 board 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 which 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 AD5675/AD5675R. 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 μ F tantalum and 0.1 μ F 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 is used to control 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.

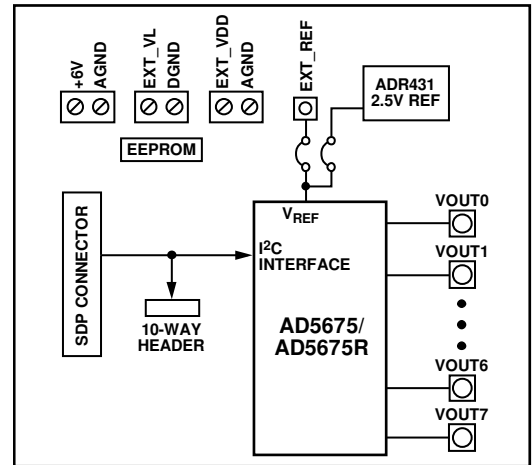


Figure 2. Evaluation Board Block Diagram

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 board 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 boards 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 ADP7104 (U3). 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 power-on voltage for the DAC outputs. Position A selects midscale as the power-on voltage for the DAC outputs Position B selects 0 V as the power-on voltage for the DAC outputs	B
LK4	This link selects the reference source. Position A selects the internal reference of the AD5675R as the reference source or an external reference source from the SMB connector EXT_REF. Use only Position A with the EVAL-AD5675RSDZ . Position B selects U5, the ADR431 , as the 2.5 V reference source. Do not use Position B with the EVAL-AD5675RSDZ .	A/B ¹
LK5	This link selects the gain setting of the AD5675/AD5675R . Position A allows the SDP software to set the state of RSTSEL. Position B selects a DAC output span of 0 V to $2 \times V_{REF}$. Position C selects a DAC output span of 0 V to V_{REF} .	A

¹ Position A is the default for the [EVAL-AD5675RSDZ](#). Position B is the default for the [EVAL-AD5675SDZ](#).

EVALUATION BOARD CIRCUITRY

The [EVAL-AD5675SDZ/EVAL-AD5675RSDZ](#) evaluation boards allow the function and performance of the [AD5675/AD5675R](#) 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 [AD5675/AD5675R](#) 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 [AD5675/AD5675R](#). When the SDP-B board is not required, the control signals can be applied to the [AD5675/AD5675R](#) 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 > AD5675/AD5675R > AD5675/AD5675R 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.

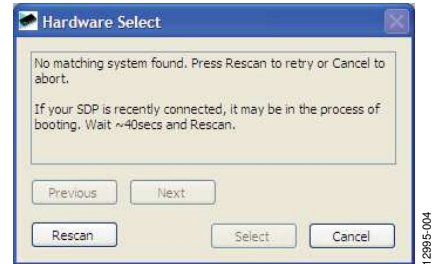


Figure 4. Connectivity Error

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 [AD5675/AD5675R](#) evaluation software then opens, as shown in Figure 5.

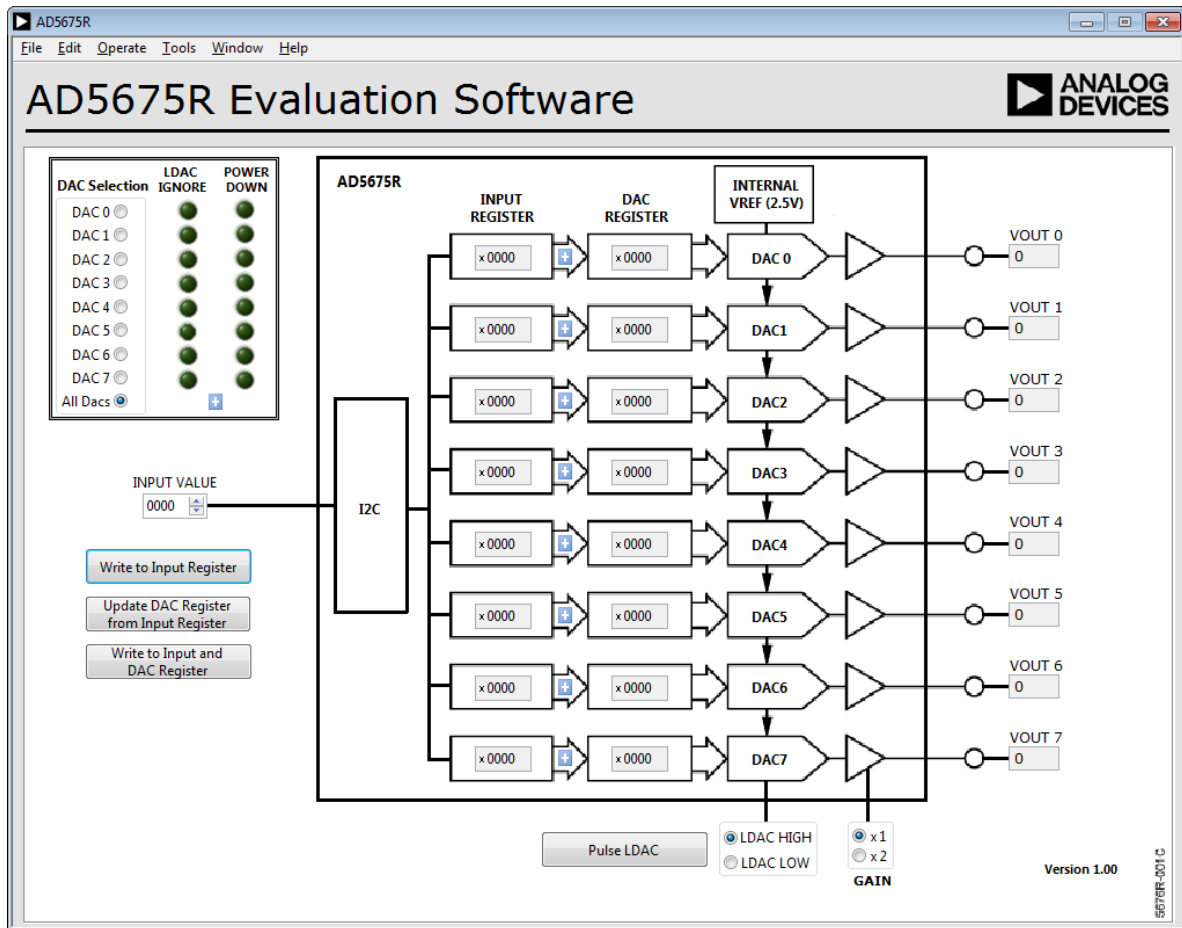


Figure 5. AD5675/AD5675R Evaluation Software Main Window

SOFTWARE OPERATION

The [AD5675/AD5675R](#) 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

Click **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 appropriate voltage. LDAC mask settings are ignored.

GAIN Control

Select **GAIN** $\times 1$ to give a full-scale output of 2.5 V for the [AD5675R](#) or V_{REF} for the [AD5675](#). Select **GAIN** $\times 2$ to give a full-scale output of 5 V for the [AD5675R](#) or $2 \times V_{REF}$ for the [AD5675](#).

LDAC Control

Click **Pulse LDAC** to bring the \overline{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 \overline{LDAC} pin can also be set high or low by clicking the appropriate radio button.

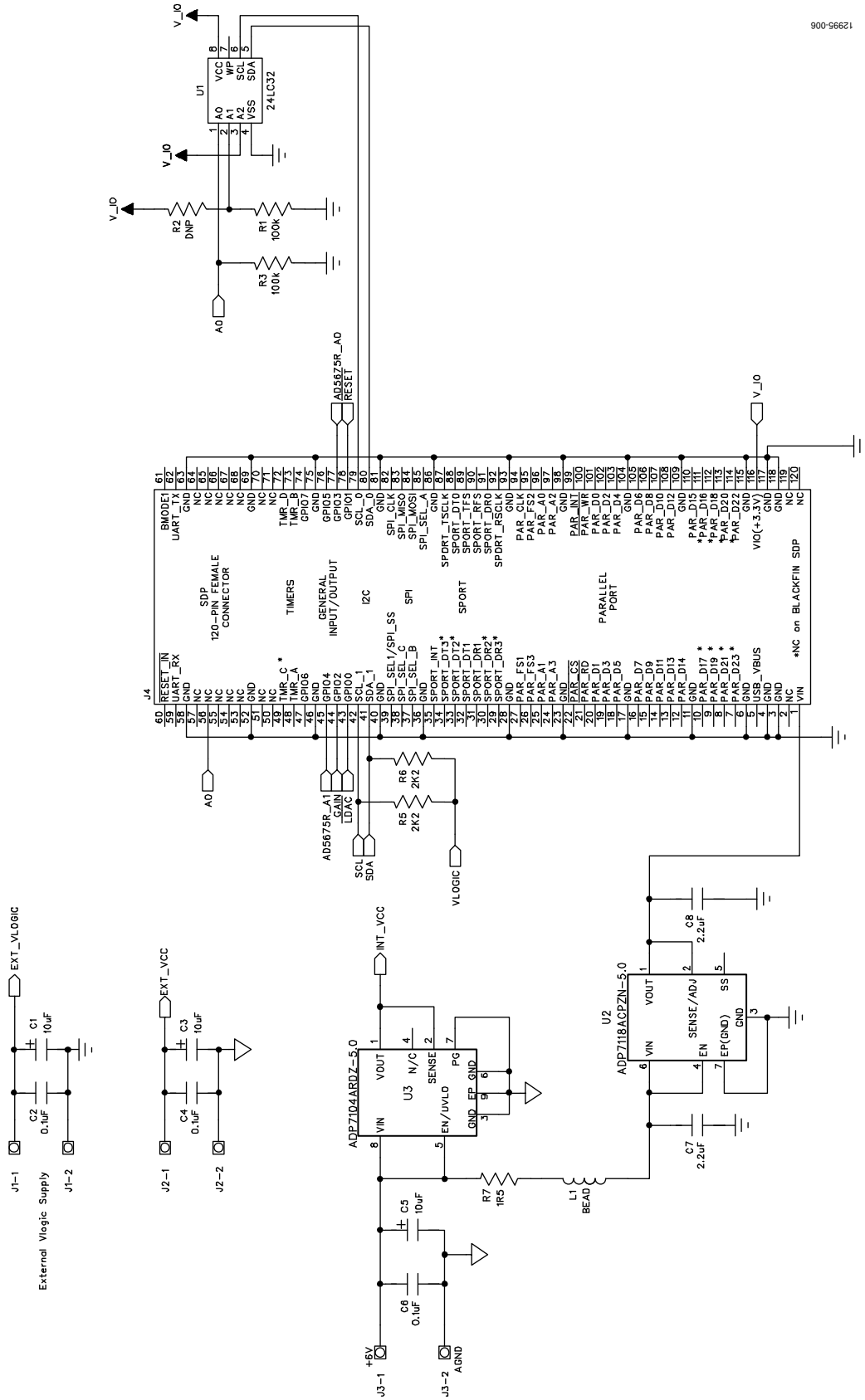
Power-Down Control

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 [AD5675/AD5675R](#).

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 [AD5675/AD5675R](#).

EVALUATION BOARD SCHEMATICS



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Figure 6. EVAL-AD5675SDZ/EVAL-AD5675RSDZ Schematic, Page 1 of 2

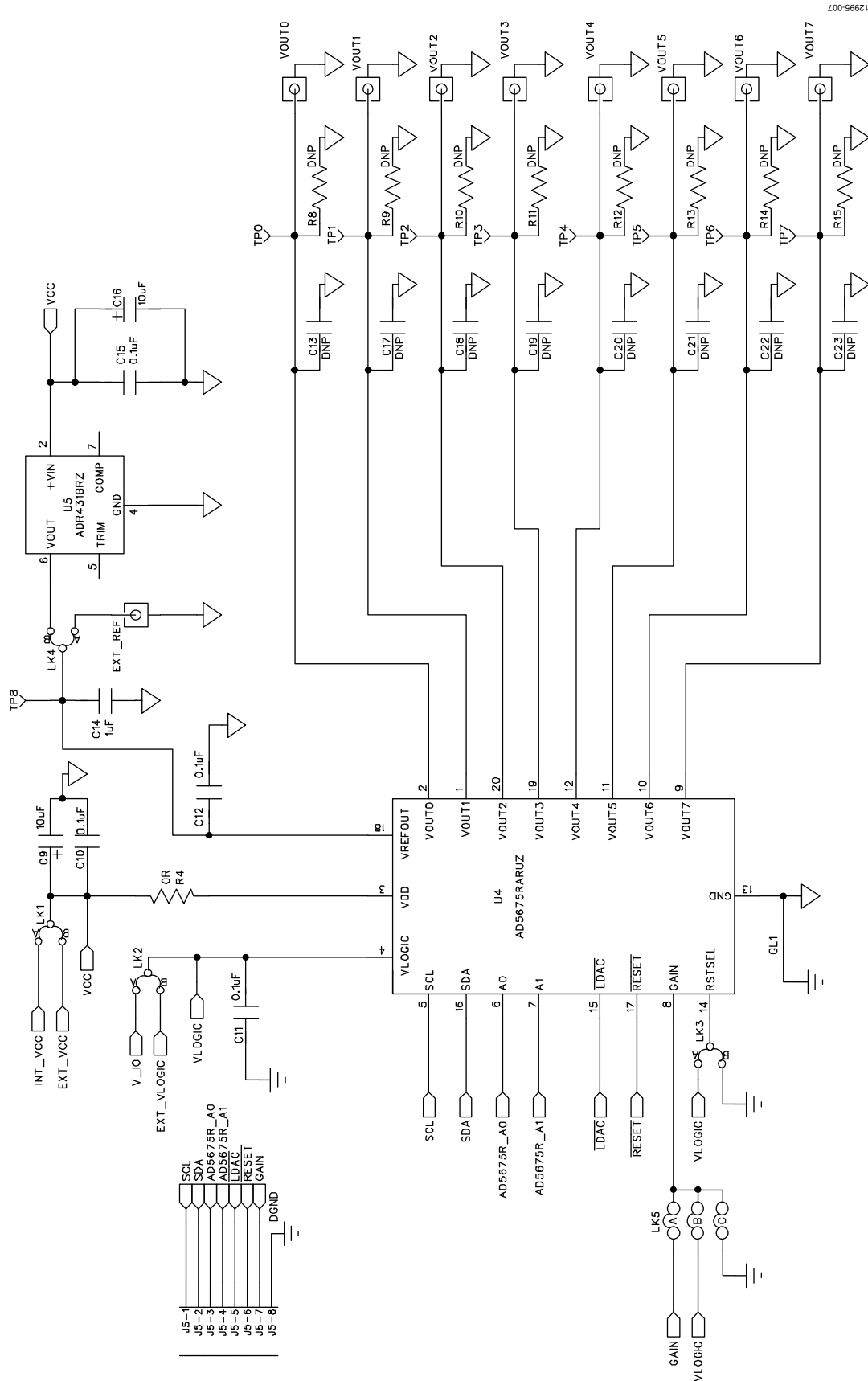


Figure 7. EVAL-AD5675SDZ/EVAL-AD5675RSDZ Schematic, Page 2 of 2

BILL OF MATERIALS

Table 3.

Qty	Reference Designator	Description	Supplier/Part Number ¹
4	C1, C3, C5, C9	Capacitor, Case A, 10 μ F, 10 V	FEC 197-130
1	C16 ²	Capacitor, Case A, 10 μ F, 10 V	FEC 197-130
6	C2, C4, C6, C10 to C12	Capacitor, 100 nF, 50 V, 0603	FEC 8820023
1	C15 ²	Capacitor, 100 nF, 50 V, 0603	FEC 8820023
2	C7-C8	Capacitor, 2.2 μ F, 10 V, 0603	FEC 1797012
7	C13, C17 to C23	Do not insert	Do not insert
1	C14	Capacitor, 0603, 1 μ F, 10 V	FEC 318-8840
9	EXT_REF, VOUT0 to VOUT7	Straight PCB mount SMB jack, 50 Ω	FEC 1206013
3	J1-J3	2-pin terminal block (5 mm pitch)	FEC 151789
1	J4	120-way female connector, 0.6 mm pitch	FEC 1324660 or Digikey H1219-ND
1	J5	8-pin (2x4), 0.1" pitch SMT header	FEC 1022244 (36-pin strip)
1	L1	Ferrite bead	Digikey 490-1024-1-ND
4	LK1-LK4	Jumper block using 3-pin SIP header (insert in Position A)	FEC 1022248 and 150410
4	R1, R3, R5, R6	SMD resistor	FEC 9330402
10	R2, R8-R15	Do not insert	Do not insert
1	R4	Resistor, 0805 0R0	FEC 9333681
1	R7	Resistor, 1R5, 5%, 0.063 W, 0603	FEC 9331832
1	R8	Do not insert	Do not insert
9	TP0-TP8	Red test point	FEC 8731144 (Pack)
1	U1	32k I ² C serial EEPROM	FEC 1331330
1	U2	Linear regulator, 5.0 V, ultralow noise, CMOS	ADP7118ACPZN-5.0-R7
1	U3	Linear regulator, 5 V, 20 V, 500 mA, ultralow noise, CMOS	ADP7104ARDZ-5.0-R7
1	U4	16-bit DAC	AD5675RARUZ ³ or AD5675ARUZ ⁴
1	U5 ²	Ultralow noise XFET voltage references	ADR431BRZ
1	Screw1, Screw2	Screw, cheese, nylon, M3X10, PK100	FEC 7070597
2	Nut1, Nut2	Nut/washer, nylon, M3, PK100	FEC 7061857

¹ FEC is Farnell Electronics Components² Not populated on [EVAL-AD5675RSDZ](#)³ Populated on [EVAL-AD5675RSDZ](#)⁴ Populated on [EVAL-AD5675SDZ](#)

NOTES

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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