EVAL-AD5592R-1SDZ User Guide
UG-754

Evaluating the AD5592R-1 8-Channel, 12-Bit, Configurable ADC/DAC/GPIO with On-Chip Reference

FEATURES

Full featured evaluation board for the AD5592R-1
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-AD5592R-1SDZ 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-AD5592R-1SDZ user guide

ADDITIONAL EQUIPMENT AND SOFTWARE NEEDED

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

ONLINE RESOURCES

Documents Needed
AD5592R-1 data sheet
EVAL-AD5592R-1SDZ user guide
Required Software
AD5592R-1 evaluation software (available for download
from the EVAL-AD5592R-1SDZ product page)

GENERAL DESCRIPTION

This user guide details the operation of the evaluation board for the AD5592R-1 8-channel, 12-bit, configurable ADC/DAC/GPIO with on-chip reference and SPI interface.

The EVAL-AD5592R-1SDZ evaluation board is designed to help customers quickly prototype new AD5592R-1 circuits and reduce design time. The AD5592R-1 operates from a single 2.7 V to 5.5 V supply and incorporates an internal 2.5 V reference to give an output voltage span of 2.5 V or 5 V. An external reference (a 2.5 V reference is provided on the evaluation board) can also be used to give an output from 0 V to V_{REF} or 0 V to $2 \times V_{REF}$.

Full data on the AD5592R-1 can be found in the product data sheet, which should be consulted in conjunction with this user guide when using the evaluation board.

The EVAL-AD5592R-1SDZ evaluation board interfaces to the USB port of a PC via the EVAL-SDP-CB1Z SDP board. Software is supplied with the evaluation board to allow the user to program the AD5592R-1.

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

TYPICAL EVALUATION SETUP

Figure 1.

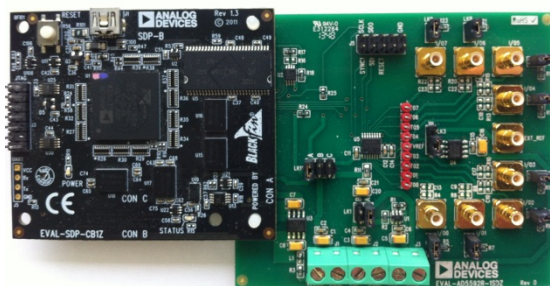# TABLE OF CONTENTS

REVISION HISTORY

10/14—Revision 0: Initial Version

GETTING STARTED

INSTALLING THE SOFTWARE

The evaluation kit for the AD5592R-1 includes self-installing evaluation software on a CD. The evaluation software is compatible with Windows® XP, Windows Vista (32-bit version), and Windows 7 (32-bit and 64-bit versions). The software must be installed before connecting the EVAL-SDP-CB1Z SDP board to the USB port of the PC to ensure that the SDP board is recognized when it is connected to the PC.

To install the evaluation 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 EVAL-AD5592R-1SDZ evaluation board to the EVAL-SDP-CB1Z SDP board, and connect the SDP board to the PC using the USB cable included in the evaluation 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 EVAL-AD5592R-1SDZ evaluation board to the EVAL-SDP-CB1Z SDP board, and connect the USB cable between the SDP board and the PC.
2. Power the SDP board and the evaluation board by connecting 6 V to the J3 connector.

EVALUATION BOARD HARDWARE

POWER SUPPLIES

To use the EVAL-AD5592R-1SDZ evaluation board with the EVAL-SDP-CB1Z SDP board, a 6 V power supply is required, which is connected to Connector J3. The evaluation board can also be used without the SDP board, in which case the J2 is the power supply input for the V_{DD} supply. A separate V_{LOGIC} supply can be connected to J1. LK 11 selects the source for the AD5592R-1 V_{LOGIC} supply.

Both the AGND and DGND inputs are provided on the board. The AGND and DGND planes are connected at one location close to the AD5592R-1. 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_{DD}
J3	6 V board positive power supply

DIGITAL INPUT AND OUTPUT SIGNALS

When the SDP board is used to control the evaluation board, the digital input signals are applied to Connector J4. When the SDP board is not used, digital signals are applied to the 10-way header, J5.

ANALOG INPUT AND OUTPUT SIGNALS

The I/Ox pins of the AD5592R-1 are available on the SMB connectors, I/O0 to I/O7. These connectors are analog inputs or outputs, depending on whether the I/Ox pins are configured as ADCs or DACs, respectively. I/O0 to I/O7 are digital inputs or outputs if the I/Ox pins are configured as GPIOs.
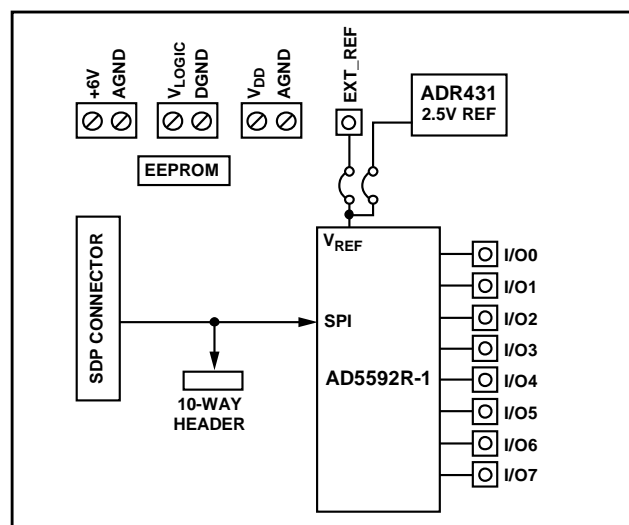

Figure 2. Evaluation Board Block Diagram

LINK CONFIGURATION OPTIONS

A number of link options are incorporated in the EVAL-AD5592R-1SDZ evaluation board and must be set for the required operating conditions before using the board. The functions of these link 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 board, or the evaluation board can be used in standalone mode.

Table 2 shows the default positions in which the links are set when the evaluation board is packaged. When the evaluation board is shipped, it is set up to be operated with the EVAL-SDP-CB1Z board in SDP controlled mode.

Table 2. Link Functions

Link Number	Option	Default Position
LK1	This link selects the V_{DD} source for the AD5592R-1.	A
	Position A selects the internal voltage source (5V_VDD) from the ADP3331.	
	Position B selects an external supply voltage (EXT_VDD).	
LK2, LK4, LK5 to LK9, LK20	These links connect 85 kΩ pull-down resistors from the I/Ox pins to AGND. When the link is removed, the level of the associated pin is determined by the configuration of the AD5592R-1.	IN
LK3	This link selects the reference source for the AD5592R-1.	A
	Position A selects the on-board 2.5 V reference as the reference source.	
	Position B selects an off board voltage reference via the EXT_REF connector. Select this option if the internal reference is to be used.	
LK11	This link selects the source of the V_{LOGIC} supply for the AD5592R-1.	A
	Position A selects the 3.3 V supply from the SDP board.	
	Position B selects the V_{LOGIC} supply from Connector J1.	
	Position C selects the V_{DD} supply determined by LK1.	

EVALUATION BOARD CIRCUITRY

The EVAL-AD5592R-1SDZ evaluation board allows the function and performance of the AD5592R-1 to be easily tested. The evaluation board contains two voltage regulators, which generate the analog and digital power supplies and which also power the SDP board, if it is connected. The two regulators are powered via a 6 V supply attached to Connector J3. Alternatively, a separate supply can be attached via Connector J2. An optional V_{LOGIC} supply can be connected to J1, if required.

The AD5592R-1 is typically controlled by the SDP board, which is attached to Connector J4. The SDP board allows the evaluation

software (provided with the evaluation kit) to configure the AD5592R-1 and to write and read data to and from the AD5592R-1.

When the SDP board is not required, the control signals can be applied to the AD5592R-1 by connecting them to the relevant pins on Connector J5.

In addition to the AD5592R-1 on-chip reference, an external 2.5 V reference is also provided and can be connected to the AD5592R-1 reference input/output pin (V_{REF}) using LK3.

HOW TO USE THE SOFTWARE

STARTING THE SOFTWARE

To run the evaluation software, take the following steps:

1. Connect the EVAL-AD5592R-1SDZ evaluation board to the EVAL-SDP-CB1Z SDP board, and connect the USB cable between the SDP board and the PC.
2. Power the SDP board and the evaluation board by connecting 6 V to the J3 connector.
3. Click **Start** > **All Programs** > **Analog Devices** > **AD5592R-1** > **AD5592R-1 Evaluation Software**. When the software connects to the evaluation board, the message shown in Figure 3 displays.
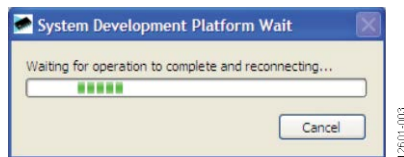

Figure 3. Connection Message

If the SDP 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.
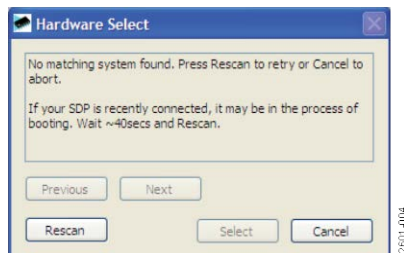

Figure 4. Connectivity Error

Alternatively, the evaluation software can be used without an evaluation board. The software runs in simulation mode, displaying expected outputs based on the input data. When the software runs, the user is first prompted to configure the AD5592R-1 I/Ox pins, as shown in Figure 5. The main window of the AD5592R-1 evaluation software then opens, as shown in Figure 6. The user can click on the block diagram to access the DAC, ADC, and GPIO functions, as well as other options such as enabling the internal reference.
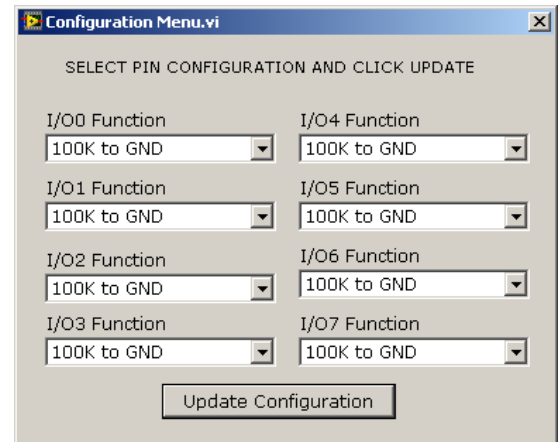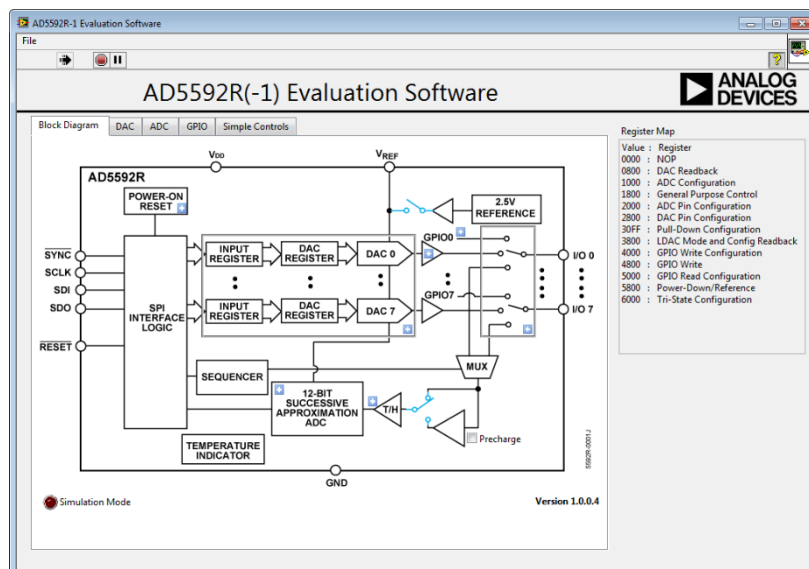

Figure 5. Configuration Menu

*Figure 6. Main Window, **Block Diagram** Tab*

DAC TAB

The **DAC** tab gives the user access to the DAC functions. Each DAC has its own numeric control where a value to be loaded to the appropriate DAC. Clicking **Update DAC Registers** loads the data appropriately as determined by the setting of the **LDAC Mode** control box.

ADC TAB

The **ADC** tab allows the user to select ADC channels on which to perform conversions. Select **REPEAT SEQUENCE** to take multiple samples. The user can select the number of samples per channel and the sample frequency. Clicking **Take Samples** programs the AD5592R-1 for the desired sequence and takes the appropriate number of samples. The data collected from the AD5592R-1 is split into separate channels and displayed on the graph as a voltage. The user has the option to save the data to a comma delimited spreadsheet file.
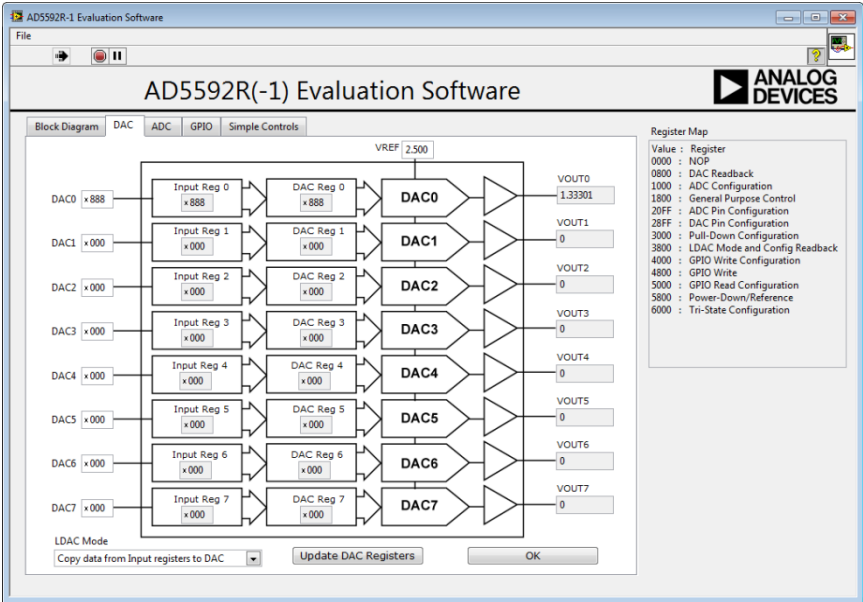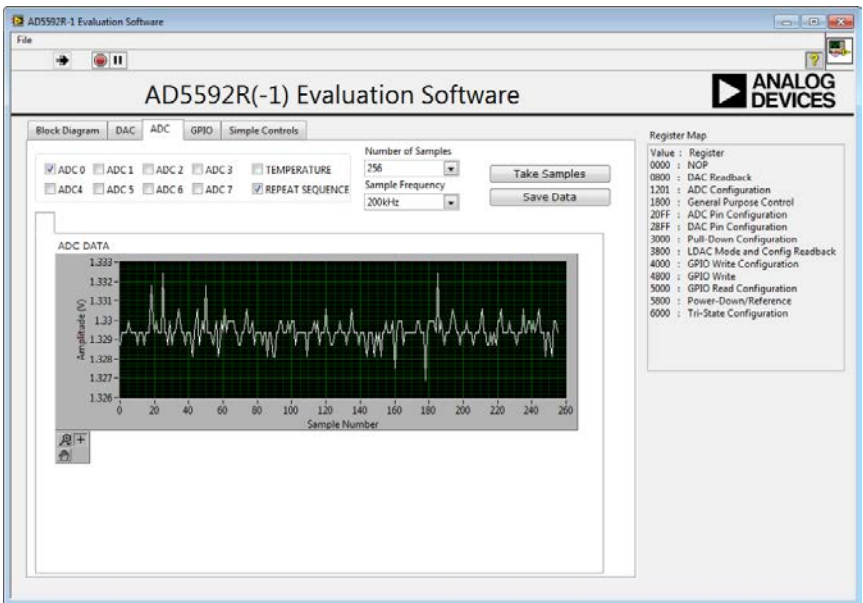

Figure 7. **DAC** Tab

Figure 8. **ADC** Tab

GPIO TAB

The **GPIO** tab allows the user to set the output levels for pins set as general-purpose outputs and to read the levels of pins set as general-purpose inputs as shown in Figure 9.

SIMPLE CONTROLS

The **Simple Controls** tab allows the user to enter 16-bit values directly into the **Write Array** control. These values can then be written to the AD5592R-1 by clicking the **Write and Read** button. Data that appears on the SDO pin of the AD5592R-1 is shown in the **Read Array** control. The data displayed in the **Read Array** control is invalid if it is not part of a read operation from the AD5592R-1. Any commands sent to the AD5592R-1 that change the configuration of the AD5592R-1 are not reflected in the other tabs. The **Simple Controls** tab is shown in Figure 10.
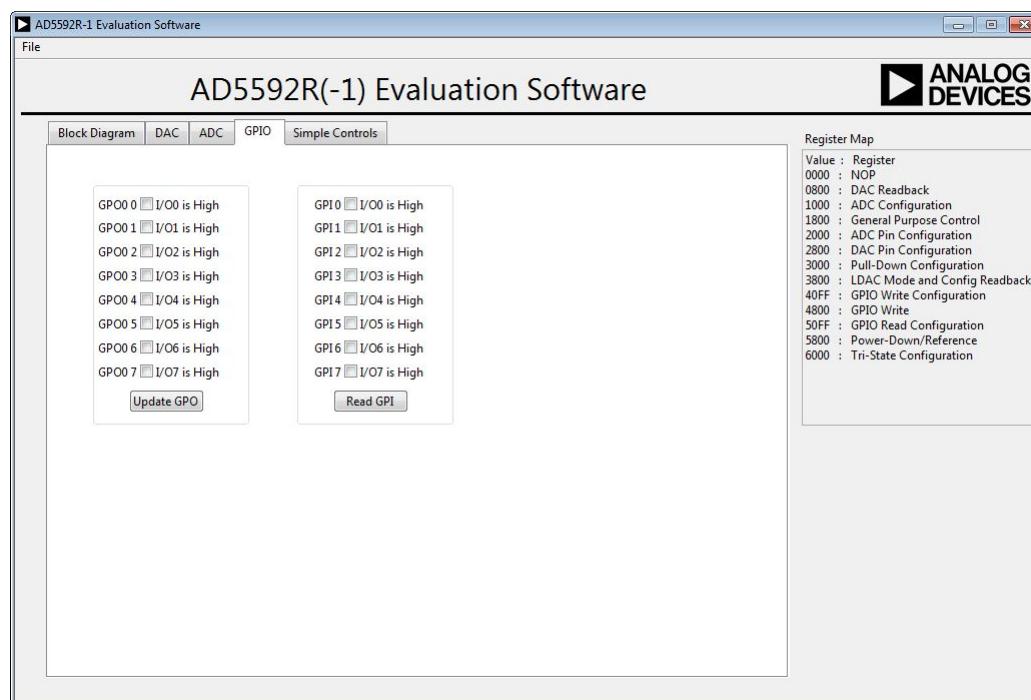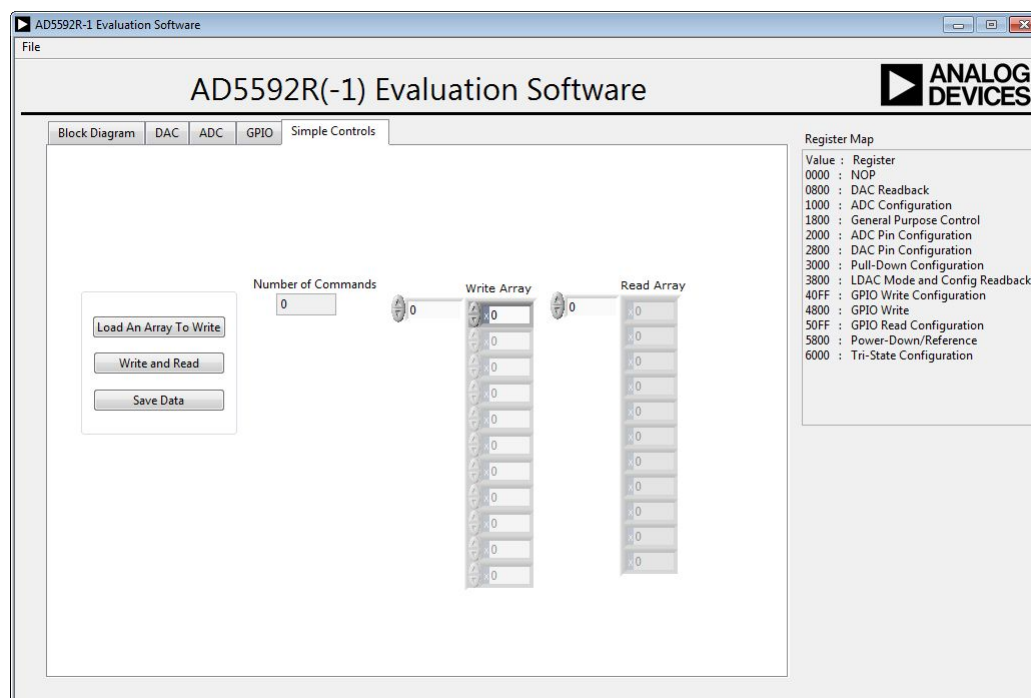

Figure 9. **GPIO** Tab

Figure 10. **Simple Controls** Tab
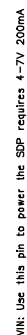
EVALUATION BOARD SCHEMATICS

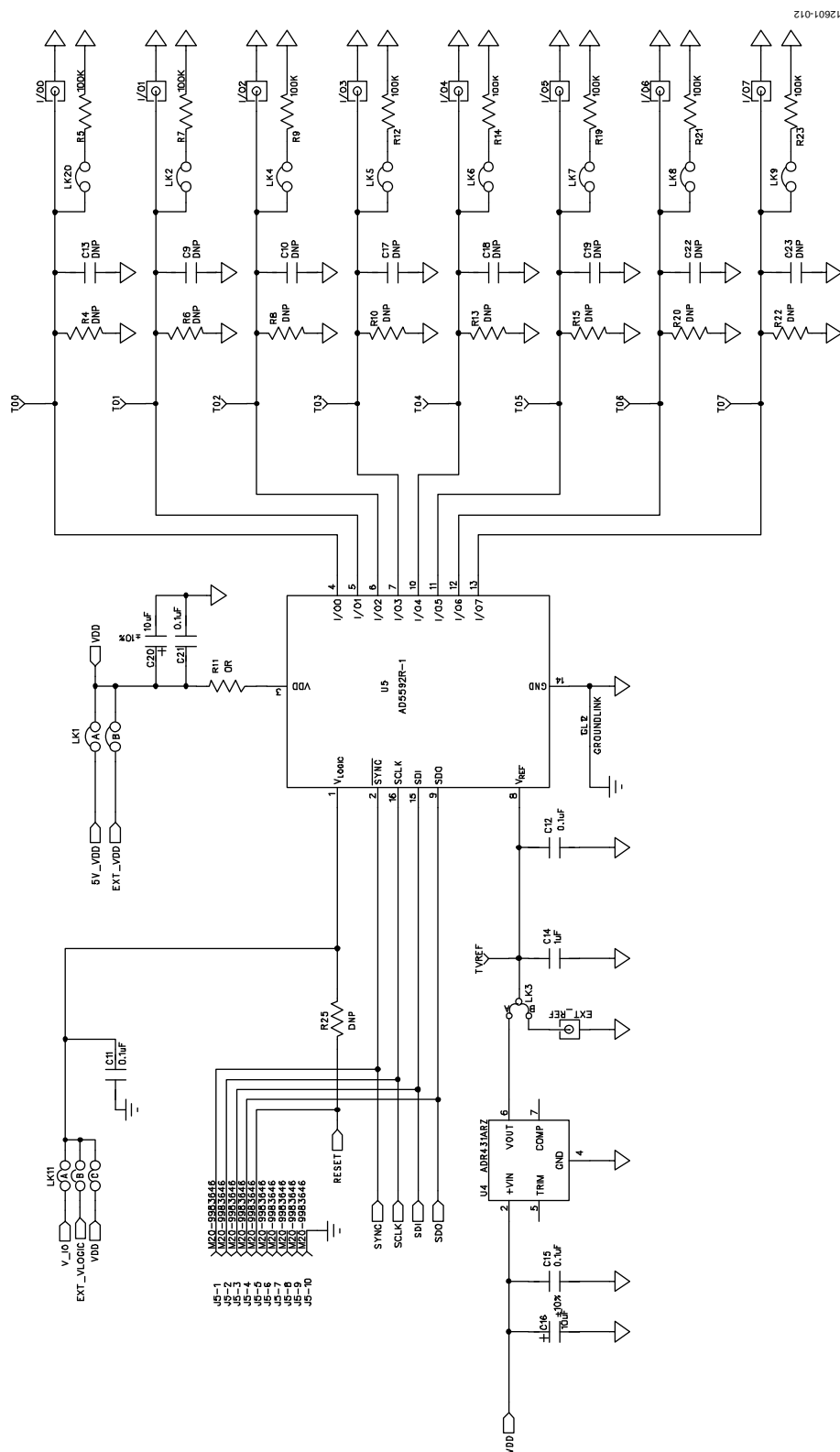Figure 11. *EVAL-AD5592R-1SDZ* Schematic, Page 1 of 2

Figure 12. *EVAL-AD5592R-1SDZ* Schematic, Page 2 of 2

ORDERING INFORMATION

BILL OF MATERIALS

Table 3.

Qty	Reference Designator	Description	Supplier/Part Number[1]
1	C1	Noninserted through-hole capacitor location	Do not insert
8	C3 to C6, C22, C24, C27, C29	Capacitor, 100 nF, 50 V, 0603	FEC 8820023
9	C15 to C18, C23, C25, C26, C28, C30	Capacitor, Case A, 10 μF, 10 V	FEC 197-130
1	J1	120-way female connector, 0.6 mm pitch	FEC 1324660 or Digi-Key H1219-ND
1	J2	20-pin (2 × 10) header, 0.1" pitch	FEC 1022242
1	J3	7-pin (1 × 7) header, 0.1" pitch	FEC 1022257
3	J4 to J6	50 Ω straight SMB jack	FEC 1111349
3	J7 to J9	2-pin terminal block (5 mm pitch)	FEC 151789
1	L1	Ferrite bead	Digi-Key 490-1024-1-ND
5	LK1 to LK5	2-pin SIL header, 0.1" pitch, red jumper	FEC 1022247 and FEC 150-411
6	LK6 to LK11	3-pin SIL header, 0.1" pitch, red jumper	FEC 1022248 and FEC 150411
4	R1 to R3, R13	SMD resistor 0603	FEC 933-0399
1	R4	Noninserted through-hole resistor location	Do not insert
1	R5	Resistor, 1.5 Ω, 5%, 0.063 W, 0603	FEC 9331832
1	R6	Resistor, 1 MΩ, 1%, 0.063 W, 0603	Digi-Key RMCF1/161MFRCT-ND
1	R7	SMD resistor 0603	Digi-Key 541-300KHCT-ND
3	R8, R14, R15	SMD resistor 0603	Do not insert
2	R9, R10	SMD resistor	FEC 9330402
2	R11, R12	SMD resistor 0603	FEC 933-1662
1	R25	Not populated	
10	TP1 to TP10	Black test point	FEC 8731128
1	U1	8-channel, 12-bit, configurable ADC/DAC	AD5592RBCPZ-1
1	U2	2.5 V reference	ADR431ARZ
1	U3	Adjustable LDO regulator	ADP3331ARTZ
1	U4	32k I²C serial EEPROM	FEC 1331330
1	U5	5 V fixed, adjustable voltage regulator	ADP3367ARZ
2	Screw1, Screw2	Screw, cheese, nylon, M3X10, PK100	FEC 7070597
2	Nut1, Nut2	Nut/washer, nylon, M3, PK100	FEC 7061857

[1] FEC is Farnell Electronics Components.

NOTES

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