

## Evaluation Board for the **AD5570** 16-Bit $\pm 12\text{ V}/\pm 15\text{ V}$ Serial Input Voltage Output DAC

### FEATURES

Full-featured evaluation board for the **AD5570**

Link options

PC control in conjunction with the Analog Devices, Inc.,  
system demonstration platform

PC software for control

### DEVICE DESCRIPTION

The **AD5570** is a single 16-bit serial input, voltage output DAC that operates from supply voltages of  $\pm 11.4\text{ V}$  up to  $\pm 16.5\text{ V}$ . INL and DNL are accurate to 1 LSB (maximum).

Complete specifications for the **AD5570** are provided in the **AD5570** data sheet, available from Analog Devices, and should be consulted in conjunction with this user guide when using the evaluation board.

### EVALUATION BOARD DESCRIPTION

The **EVAL-AD5570SDZ** is a full-featured evaluation board that is designed to allow the user to easily evaluate all features of the **AD5570** voltage output, 16-bit digital-to-analog converter (DAC).

Components on the **AD5570** evaluation board include SMB connectors for interfacing to other equipment, a 5 V voltage reference, and a ground force sense. Testpoints are provided on all of the digital interface signal lines for ease of monitoring. The user has the option of inserting both a resistive and capacitive load on the output of the **AD5570** at C1 and R1.

The board can be controlled by the system demonstration platform (SDP) connector (J1). The SDP board allows the evaluation board to be controlled through the USB port of a Windows® XP (SP2 or later) or more recent 32-bit or 64-bit (Vista, Windows 7) PC using the **AD5570** evaluation software.

### FUNCTIONAL BLOCK DIAGRAM

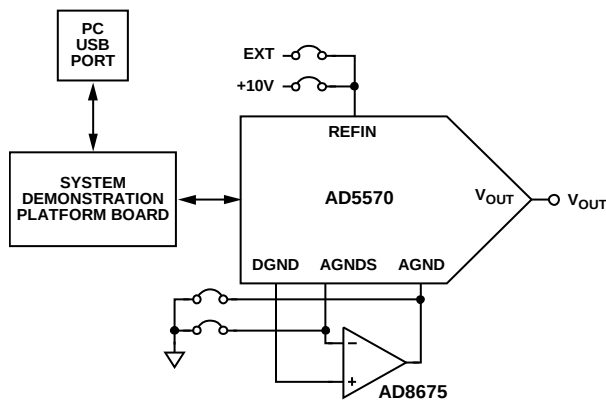


Figure 1.

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REVISION HISTORY

3/12—Revision 0: Initial Version

## EVALUATION BOARD HARDWARE

### POWER SUPPLIES

The following external supplies must be provided:

- +11.4 V to +16.5 V between the  $V_{DD}$  and AGND inputs for the positive analog supply of the [AD5570](#).
- -11.4 V to -16.5 V between the  $V_{SS}$  and AGND inputs for the negative analog supply of the [AD5570](#).

The analog and digital planes are connected at one location, close to the [AD5570](#). To avoid ground loop problems, it is recommended AGND and DGND not be connected elsewhere in the system.

Each supply is decoupled to the relevant ground plane with 10  $\mu$ F and 0.1  $\mu$ F capacitors. Each device supply pin is also decoupled with a 10  $\mu$ F and 0.1  $\mu$ F capacitor pair to the relevant ground plane.

### LINK OPTIONS

The link options on the evaluation board should be set for the required operating setup before using the board. The functions of the link options are described in Table 3.

### Default Link Option Setup

The default link options are listed in Table 1.

**Table 1. Default Link Options**

| Link Number | Option   |
|-------------|----------|
| LK1         | Inserted |
| LK2         | Inserted |
| LK3         | Inserted |

### ON-BOARD CONNECTORS

There are four connectors on the [AD5570](#) evaluation board PCB as outlined in Table 2.

**Table 2. On-Board Connectors**

| Connector | Function                                   |
|-----------|--------------------------------------------|
| J1        | SDP board connector                        |
| J5        | Analog power supply connector              |
| VOUT      | DAC output connector                       |
| VREF      | External reference voltage input connector |

**Table 3. Link Options**

| Link No. | Description                                                                                                                                                                                                                                                                              |
|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| LK1      | LK1 is used in conjunction with LK2 to select whether the on-board ground force sense buffer is used.                                                                                                                                                                                    |
| LK2      | When LK1 and LK2 are inserted, the ground force sense buffer is not used, the ground pins are connected directly to 0 V, and the buffer is removed from the ground loop.<br>When LK1 and LK2 are removed, the ground force sense buffer is used.                                         |
| LK3      | This link is used to select the internal or the external reference.<br>When LK3 is inserted, the on-board reference is selected as the voltage reference source for the <a href="#">AD5570</a> .<br>When LK3 is removed, an external voltage reference can be applied to Connector VREF. |

## EVALUATION BOARD SOFTWARE

### SOFTWARE INSTALLATION

The **AD5570** evaluation kit includes self-installing software on a CD. The software is compatible with Windows XP (SP2), Vista, and Windows 7 (32-bit or 64-bit). If the setup file does not run automatically, you can run the **setup.exe** file 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.

After installation from the CD is complete,

1. Power up the **AD5570** evaluation board as described in the Power Supplies section. Connect the SDP board (via either Connector A or Connector B) to the **AD5570** 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. This completes the installation.

### SOFTWARE OPERATION

To launch the software, complete the following steps:

1. From the **Start** menu, select **Analog Devices > AD5570 > AD5570 Evaluation Software**. The main window of the software opens (see Figure 3).
2. If the evaluation system is not connected to the USB port when the software is launched, a connectivity error is displayed (see Figure 2). Connect the evaluation board to the USB port of the PC, wait a few seconds, click **Rescan**, and follow the instructions.

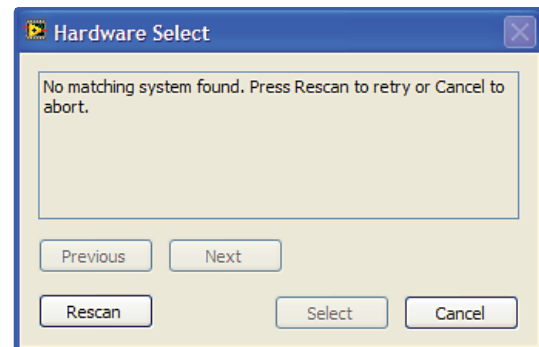


Figure 2. Connectivity Error Alert

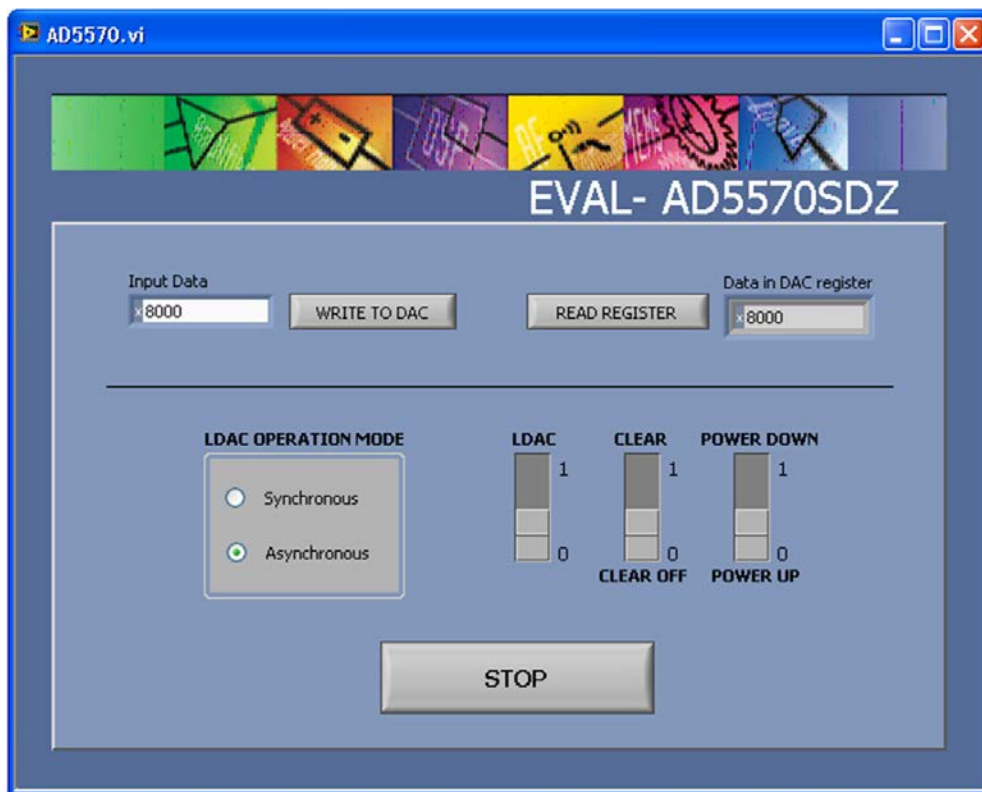


Figure 3. Main Window

## FEATURES OF THE AD5570 EVALUATION BOARD SOFTWARE

The software allows the user to control all the functionality of the [AD5570](#). The main features are as follows:

- Load DAC register with a 16-bit word and update the [AD5570](#) output.
- Data readback of the contents of the input shift register.
- Power down/power up the [AD5570](#).
- Clear the [AD5570](#) output to 0 V.

Each of these features is described in the following sections.

### Load DAC

In the Input Data field, the user types the 16-bit word to be programmed to the [AD5570](#) and clicks the **WRITE TO DAC** button.

In LDAC synchronous loading mode, the **WRITE TO DAC** button writes the required data to the input shift register and toggles the LDAC signal, which then loads the DAC register and updates the output voltage.

In LDAC asynchronous loading mode, the **WRITE TO DAC** button writes the required data to the input shift register, but the user toggles the LDAC signal by clicking the **LDAC** switch to load the DAC register and update the output voltage.

### Data Readback

Clicking the **READ REGISTER** button reads back and displays the current contents of the DAC register.

### Power Down/Power Up

This function allows the user to place the [AD5570](#) in power-down mode and to remove the [AD5570](#) from power-down mode. Clicking the **POWER DOWN** switch places the [AD5570](#) in power-down mode, at the same time the text on the button changes to **POWER UP**, indicating that clicking the button again removes the [AD5570](#) from power-down mode.

### Clear

Clicking the **CLEAR** switch causes the  $\overline{\text{CLR}}$  signal of the [AD5570](#) to be pulsed low, which has the effect of setting the output voltage to 0 V.

## EVALUATION BOARD SCHEMATICS AND ARTWORK

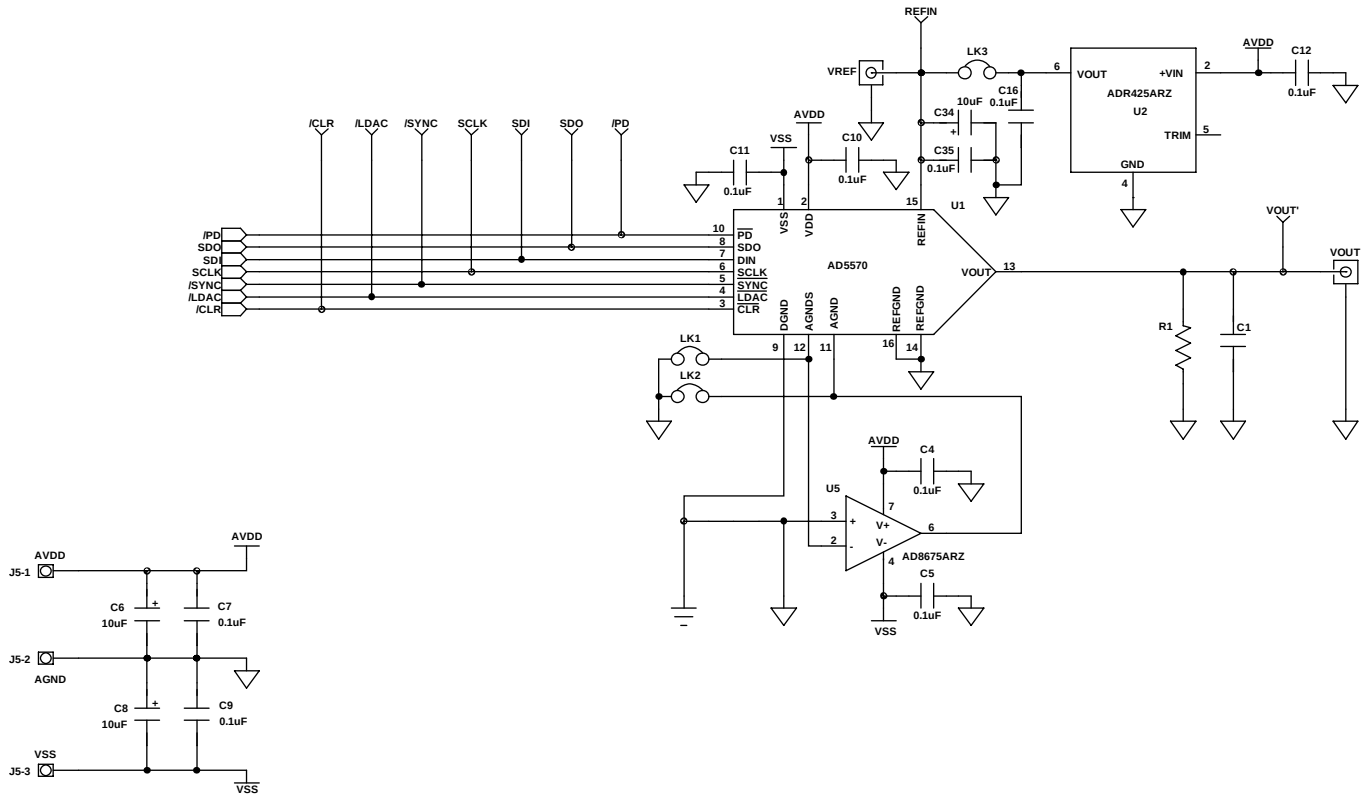


Figure 4. Schematic of the AD5570 Circuitry

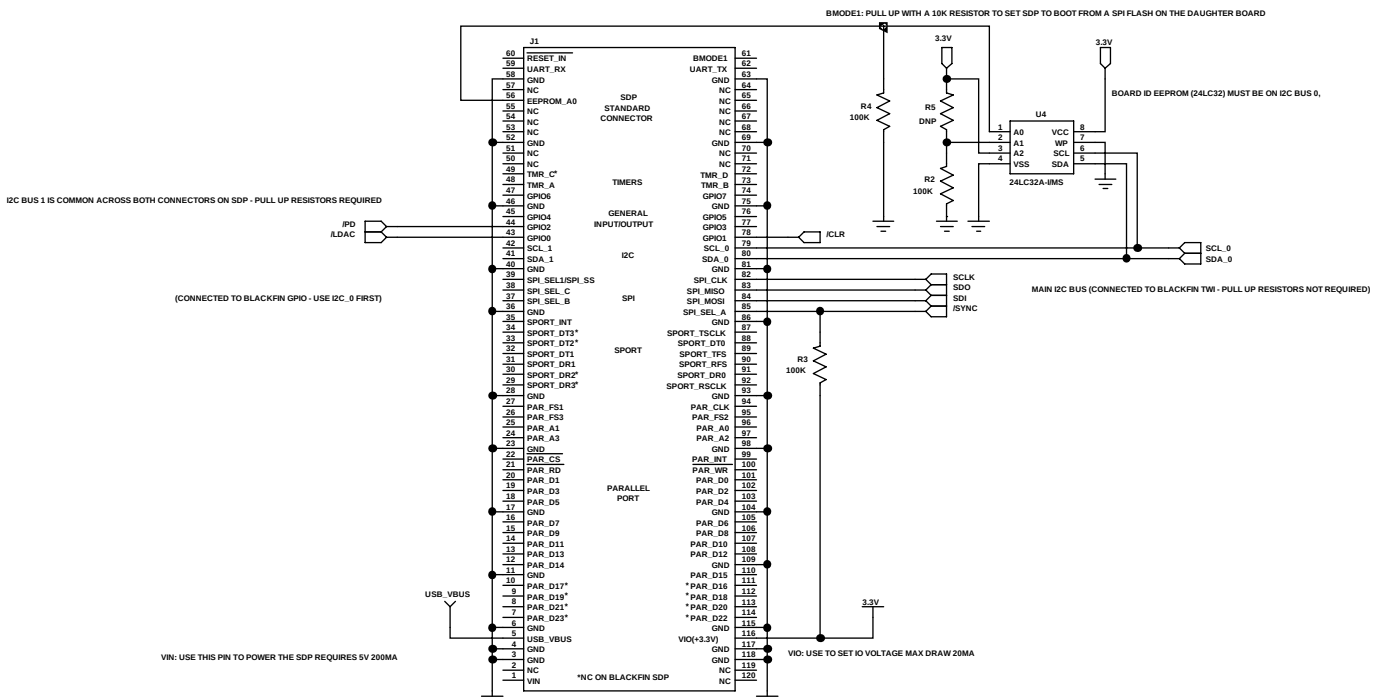


Figure 5. Schematic of the SDP Board Connector

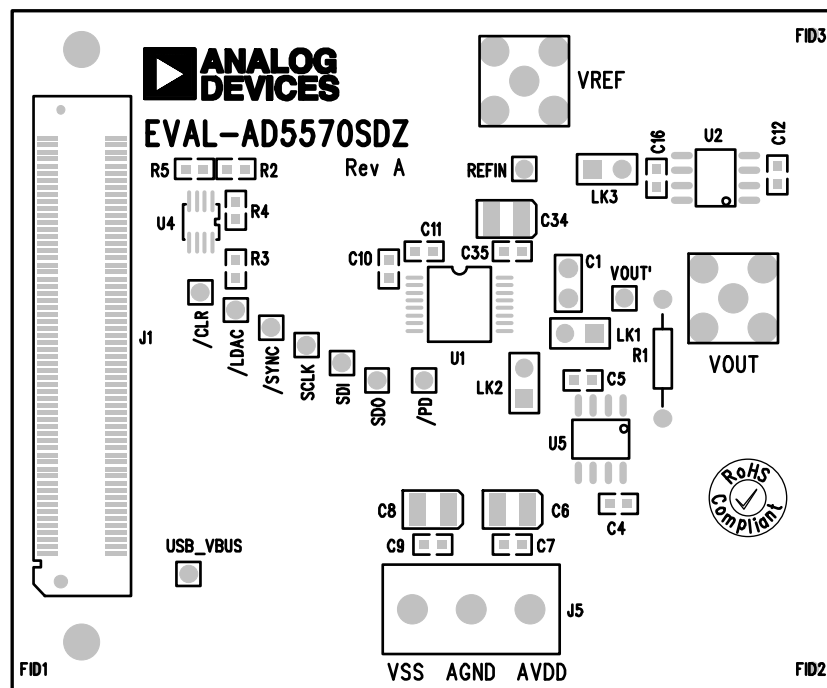


Figure 6. Component Placement Schematic

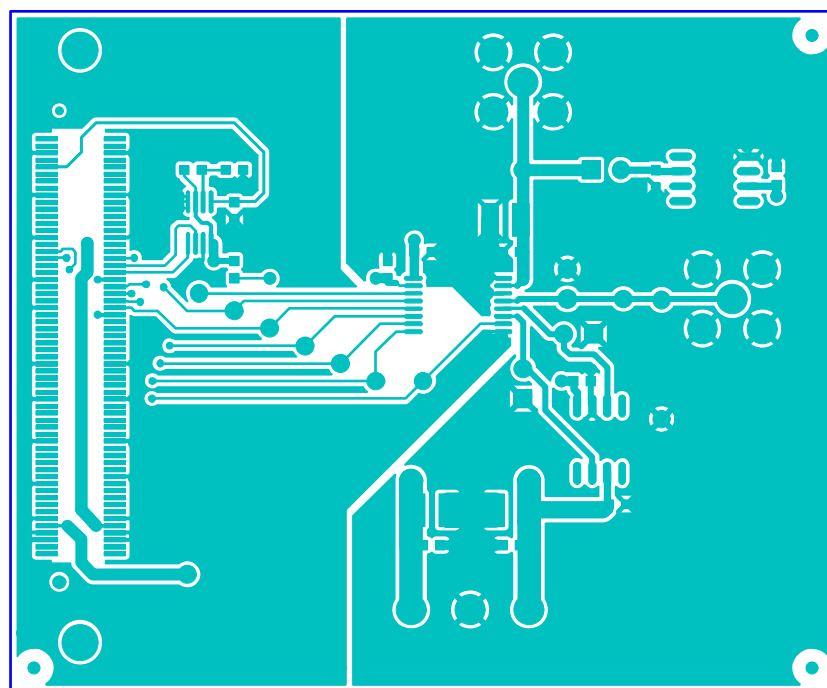


Figure 7. Top Printed Circuit Board (PCB) Layer Schematic

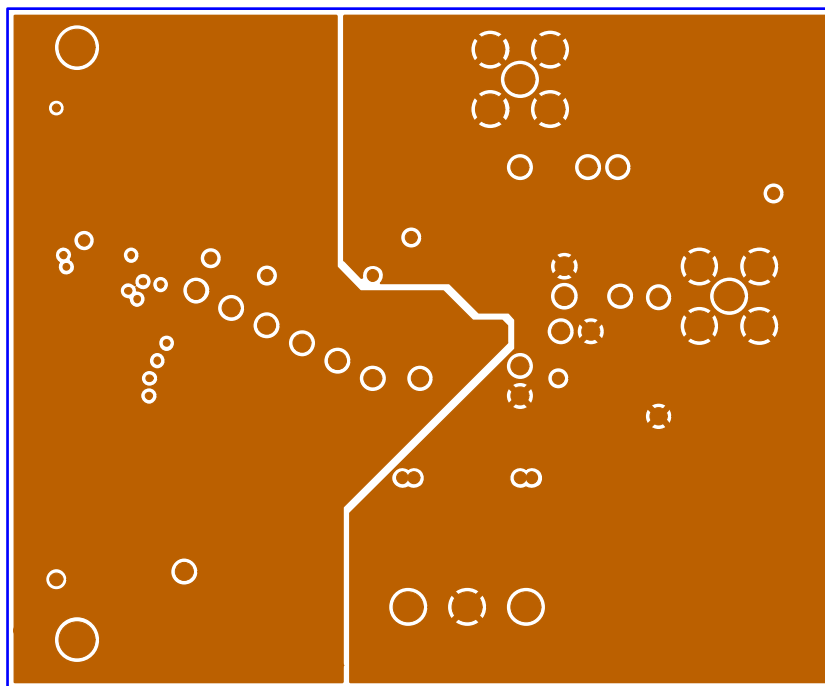


Figure 8. Inner First PCB Layer Schematic

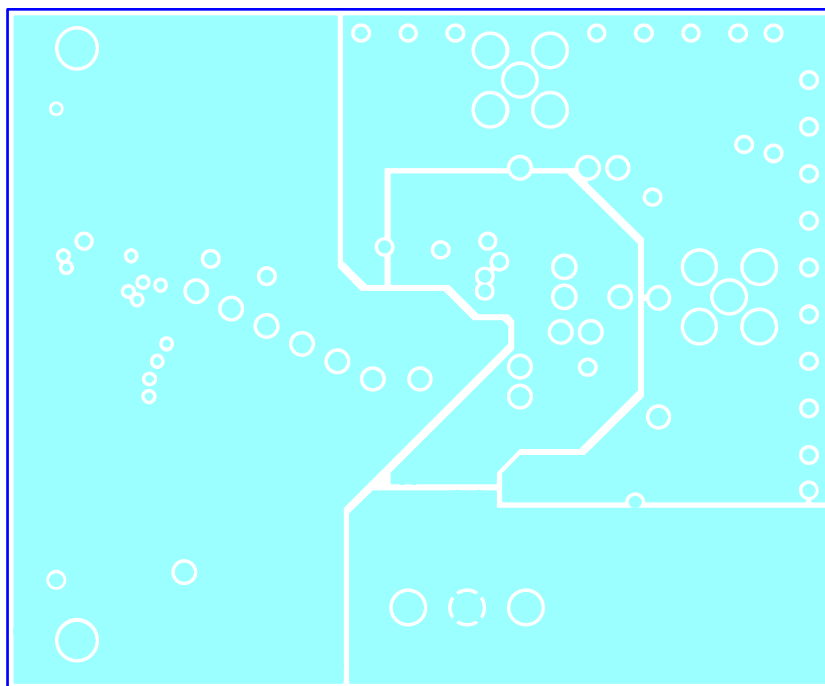
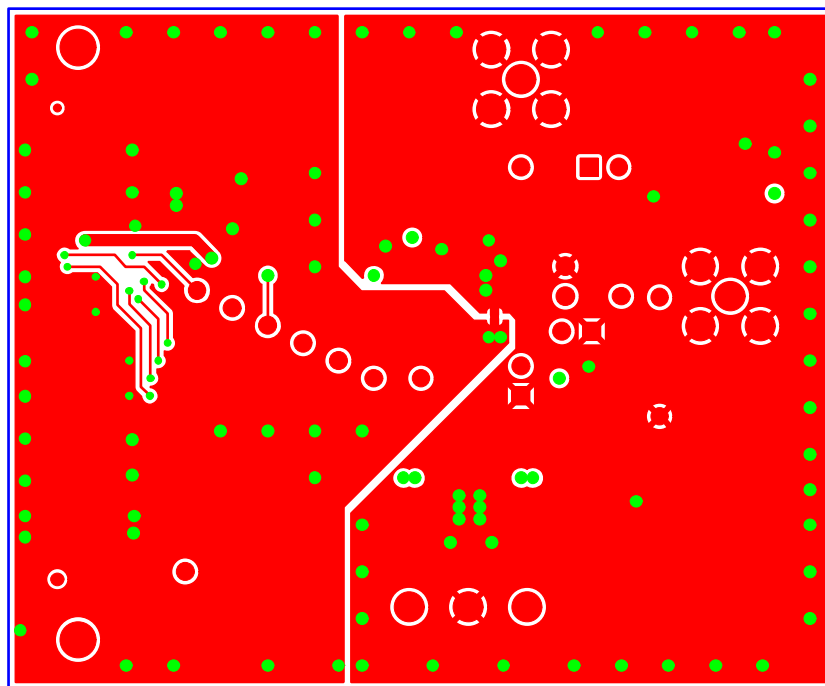


Figure 9. Inner Second PCB Layer Schematic





10579-010

Figure 10. Bottom PCB Layer Schematic

## ORDERING INFORMATION

### BILL OF MATERIALS

Table 4.

| Reference Designator                                                        | Part Description                                              | Part Number            | Stock Code                     |
|-----------------------------------------------------------------------------|---------------------------------------------------------------|------------------------|--------------------------------|
| /CLR, /LDAC, /PD, /SYNC, REFIN, SCLK, SDI, SDO, USB_VBUS, VOUT <sup>1</sup> | Testpoint                                                     | 20-313137              | FEC 8731144                    |
| C1, C4, C5, C7, C9, C10, C11, C12, C16, C35                                 | Gold plated pin receptacles                                   | 73007015               | Analog Devices 73007015        |
| C6, C8, C34                                                                 | Capacitor +, Case B, 10 $\mu$ F, 20 V                         | TAJB106K020RNJ         | FEC 197427                     |
| J1                                                                          | 120-way connector, 0.6 mm pitch                               | FX8-120S-SV(21)        | FEC 1324660                    |
| J5                                                                          | 3-pin terminal block, 5 mm pitch                              | CTB5000/3              | FEC 151790                     |
| LK1, LK2, LK3                                                               | Jumper block, 2 pins, 0.1" spacing                            | M20-9990246            | FEC 1022247 and<br>FEC 150-411 |
| R1                                                                          | Gold plated pin receptacle, 4.7 k $\Omega$                    | 73007015               | Analog Devices 73007015        |
| R2, R3, R4                                                                  | SMD resistor, 100 k $\Omega$                                  | MC 0.063W 0603 1% 100K | FEC 9330402                    |
| R5                                                                          | SMD resistor                                                  | N/A                    | Not inserted                   |
| U1                                                                          | 16-bit $\pm 12$ V/ $\pm 15$ V serial input voltage output DAC | AD5570BRSZ             | AD5570BRSZ                     |
| U2                                                                          | 5 V reference                                                 | ADR425ARZ              | ADR425ARZ                      |
| U4                                                                          | 32 kB I <sup>2</sup> C Serial EEPROM, MSOP8                   | 24LC32A-I/MS           | FEC 1331330                    |
| U5                                                                          | Single op amp, 8-lead SOIC                                    | AD8675ARZ              | AD8675ARZ                      |
| VOUT, VREF                                                                  | Jack SMB, straight                                            | 1-1337482-0            | FEC 1206013                    |

## NOTES

## NOTES

**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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