



# Evaluation Board for Dual, 16-Bit, I<sup>2</sup>C<sup>®</sup> Interface, Voltage-Output DAC

## EVAL-AD5667R

### FEATURES

- Full-featured evaluation board for the AD5667R and the AD5667 part
- On-board reference
- On-board ADC for voltage readback
- Various link options
- Direct hookup to the USB port of a PC
- PC software for control of DACs

### GENERAL DESCRIPTION

This data sheet describes the evaluation board for the AD5667R dual 16-bit DAC. The AD5667R operates from a single 2.7 V to 5.5 V supply. The part incorporates an internal 1.25 V or 2.5 V on-chip reference to give an output voltage span of 2.5 V or 5 V, respectively. The on-chip reference is off at power-up allowing

for the use of an external reference (the AD780 on this evaluation board). The part must be written to after power-up to turn on the internal reference.

Complete specifications for the AD5667R can be found in the data sheet available from Analog Devices, Inc., and should be consulted in conjunction with this data sheet when using the evaluation board.

This board can also be used to evaluate the AD5667 part. Full data on the AD5667 can be found in the data sheet available from Analog Devices.

The evaluation board interfaces to the USB port of an IBM<sup>®</sup>-compatible PC. Software is available with the evaluation board, allowing the user to easily program the AD5667R.

### FUNCTIONAL BLOCK DIAGRAM

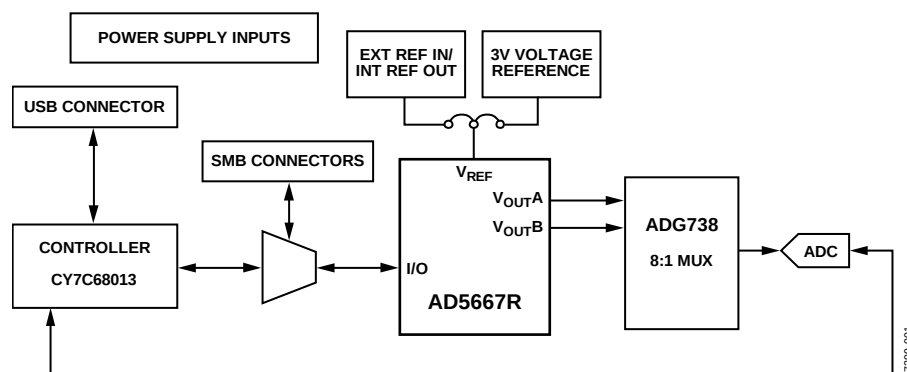


Figure 1.

#### Rev. 0

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REVISION HISTORY

2/08—Revision 0: Initial Version

## EVALUATION BOARD HARDWARE

### POWER SUPPLIES

To power the EVAL-AD5667R, apply 2.7 V to 5.5 V between the AV<sub>DD</sub> and AGND inputs for the analog supply of the [AD5667R](#) (J6). Alternatively, placing Link 6 in Position B powers the analog circuitry from the USB port (default setting). This powers all devices with a 3.3 V supply.

Both AGND and DGND inputs are provided on the board. The AGND and DGND planes are connected at one location close to the AD5667R. To avoid ground loop problems, it is recommended not to connect AGND and DGND 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

A number of link and switch options on the evaluation board should be set for the required operating setup before using the board. The functions of these link options are described in detail in Table 2. The default setup is for control by the PC via the USB port and for evaluating the part in standard/fast mode with an external 3 V reference, the [AD780](#). The default link options are listed in Table 1.

**Table 1. Link Options Setup for PC Control (Default)**

| Link No. | Option         |
|----------|----------------|
| LK1, LK2 | Inserted       |
| LK3      | A              |
| LK4      | B              |
| LK5      | B              |
| LK6      | B              |
| LK7      | A              |
| LK8      | A              |
| LK9      | Not applicable |
| LK10     | Removed        |
| LK11     | B              |
| LK12     | Not applicable |
| LK13     | A              |
| LK16     | Inserted       |

**Table 2. Link Functions**

| Link No. | Function                                                                                                                                                                                                                                                                                                                          |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| LK1, LK2 | These links connect the V <sub>OUTA</sub> and V <sub>OUTB</sub> pins of the AD5667R to the input pins of the <a href="#">ADG728</a> demultiplexer to monitor the DAC output value using the on-board <a href="#">AD7992</a> ADC.                                                                                                  |
| LK3      | This link allows the user to hardwire the ADDR pin to set the two LSBs (A1, A0) of the 7-bit address: 00011A1A0.<br>Position A connects the ADDR pin to AV <sub>DD</sub> ; therefore, two LSBs are 00.<br>Position B connects the ADDR pin to GND; therefore, two LSBs are 11.<br>When there is no connection, the 2 LSBs are 10. |
| LK4      | This link selects the AV <sub>DD</sub> power supply source for the AD780 reference.<br>Position A selects J6 as the AD780 power supply source.<br>Position B selects the 5 V USB supply voltage as the AD780 power supply source.                                                                                                 |
| LK5      | This link selects the AV <sub>DD</sub> power supply source for the analog circuitry.<br>Position A selects J6 as the AV <sub>DD</sub> analog circuitry power supply source.<br>Position B selects the 3.3 V power supply source as the AV <sub>DD</sub> analog circuitry power supply source (see LK6).                           |
| LK6      | This link selects the 3.3 V power supply source for the digital circuitry.<br>Position A selects J7 as the digital circuitry power supply source.<br>Position B selects the USB port as the 3.3 V digital circuitry power supply source.                                                                                          |
| LK7      | This link selects whether the AD5667R evaluation board is controlled by the PC via the USB port or by an external source via SMB connectors (J1 to J4).<br>Position A selects control by the PC via the USB port.<br>Position B selects control by an external source via SMB connectors (J1 to J4).                              |
| LK8      | This link sets the <u>RESET</u> pin on the ADG728.<br>Position A allows normal operation of the switch.<br>Position B resets the switch.                                                                                                                                                                                          |
| LK9      | Not applicable.                                                                                                                                                                                                                                                                                                                   |
| LK10     | This link connects a 0.1 $\mu$ F capacitor to AGND on the V <sub>REFOUT</sub> pin. It is recommended to connect this when using the internal reference.                                                                                                                                                                           |

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| Link No. | Function                                                                                                                                                                                                                                                                                  |
|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| LK11     | This link selects the reference source.<br>Position A selects the internal reference as the reference source. The part must be written to via software to turn on the internal reference.<br>Position B selects the on-board <a href="#">AD780</a> 3 V reference as the reference source. |
| LK12     | Not applicable.                                                                                                                                                                                                                                                                           |
| LK13     | This link selects the DAC voltage source.<br>Position A selects the AVDD analog circuitry power supply source.<br>Position B selects the on-board AD780 3 V reference as the power supply source.                                                                                         |
| LK16     | This link connects the O/PSELECT pin of the AD780 reference to ground, selecting a 3 V output. Leaving no connect gives a 2.5 V output.                                                                                                                                                   |

## EVALUATION BOARD SOFTWARE

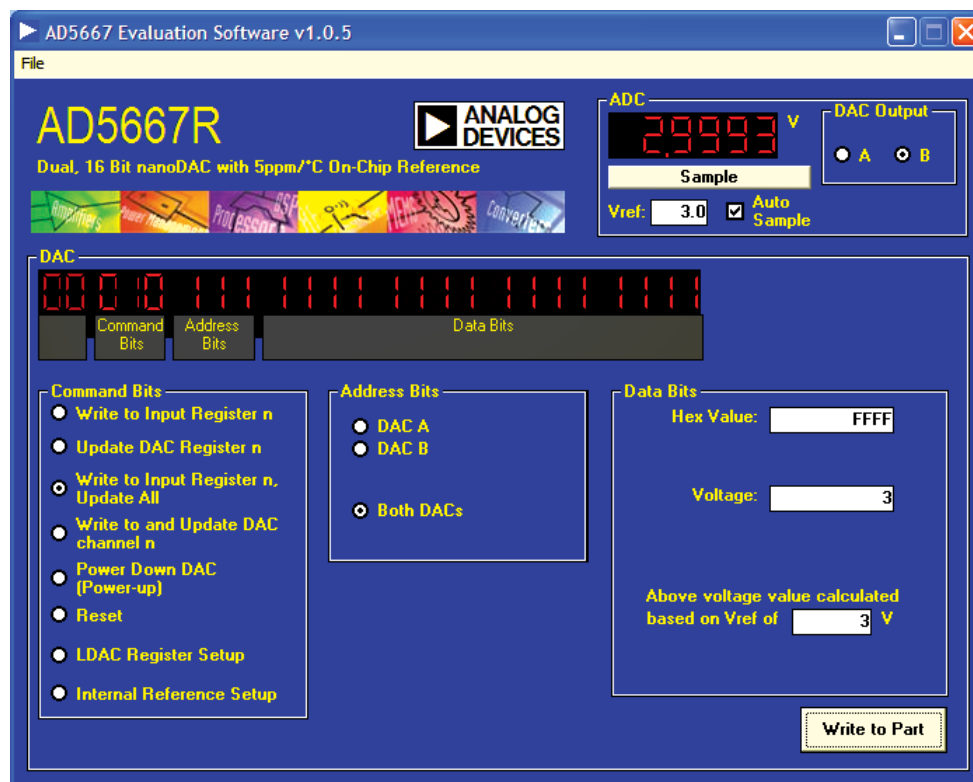


Figure 2. AD5667R Evaluation Software Main Window

### INSTALLING THE SOFTWARE

The AD5667R evaluation kit includes self-installing software on CD. The software is compatible with Microsoft® Windows® 2000 and Windows XP.

The software should be installed before connecting the evaluation board to the USB port of the PC. This ensures that the board is correctly recognized when connected to the PC.

1. Start the Windows operating system and insert the CD.  
The installation software should launch automatically. If it does not, run the **setup.exe** file directly from the CD.
2. After installation from the CD is complete, power up the AD5667R evaluation board as described in the Power Supplies section. Connect the board to the USB port of the PC using the cable supplied.  
Once the software detects the evaluation board, proceed through any additional dialog boxes to finalize the installation.

### SOFTWARE OPERATION

1. From the **Analog Devices** menu, click **Start > All Programs > Analog Devices > AD5667R > AD5667R Evaluation Software**.  
For older PCs, click **Start > Programs > Analog Devices > AD5667R > AD5667R Evaluation Software**.

The main window of AD5667R evaluation software opens, as shown in Figure 2. The data programmed into the 24-bit input shift register is displayed.

2. To select the command bits, the address bits, and the data bits, click the appropriate option button under each section.

#### Command Bits

1. To select a command to program the part, click the appropriate option button under the **Command Bits** section. For example, to program all DAC outputs with full scale, click **Write to and Update DAC channel n**.
2. Select **Both DACs** in the **Address Bits** section.
3. In the **Data Bits** section, enter data in the **Hex Value** or **Voltage** box.
4. To execute, click **Write to Part**. You must click **Write to Part** to execute all writes to the part.
5. Other commands that the AD5667R evaluation software lets you program include powering down DAC bits, resetting bits, and setting up the LDAC register bits. This is done by clicking on the corresponding option button under the **Command Bits** section and then clicking **Write to Part**. You can also set the register bits for the required mode of operation. Consult the [AD5667R](#) data sheet for details.

# EVAL-AD5667R

## ADC

The voltage output on each DAC channel is monitored using the on-board ADC. To read the output voltage, click the **Sample** button in the **ADC** section (see Figure 2).

## Reference Setup

1. The AD5667R internal reference is turned off at power-up by default, allowing the use of an external reference. To turn on (or turn off) the internal reference, click **Internal Reference Setup** in the **Command Bits** section.
2. Click **Write to Part**. This allows you to program the bit in the reference setup register for the required mode of operation, as shown in Figure 3.

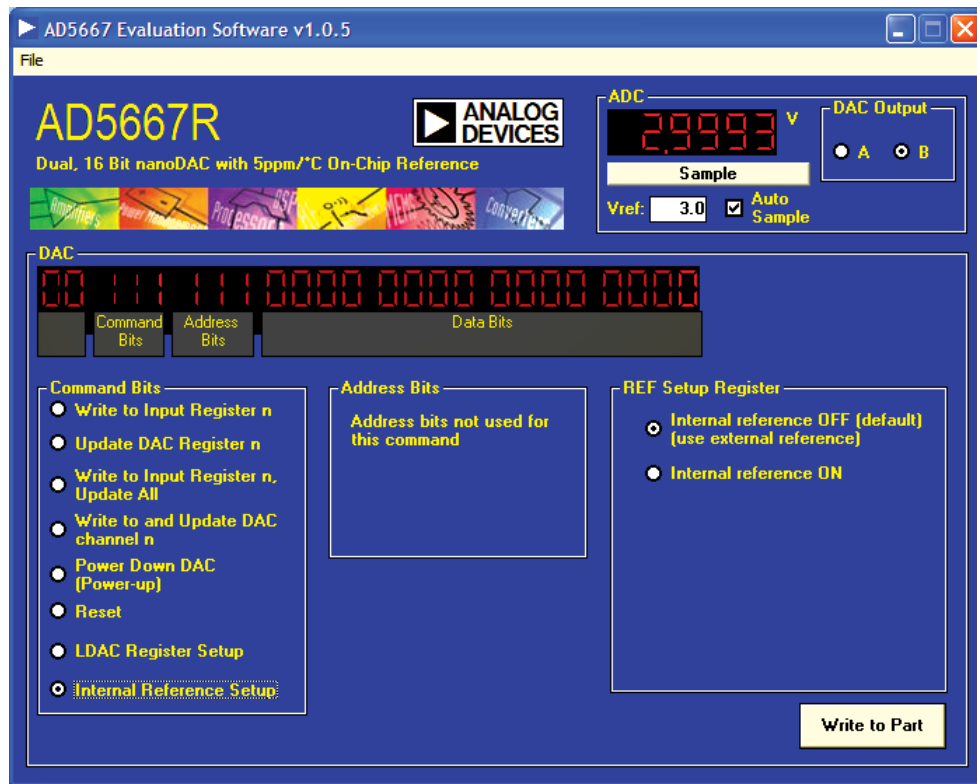
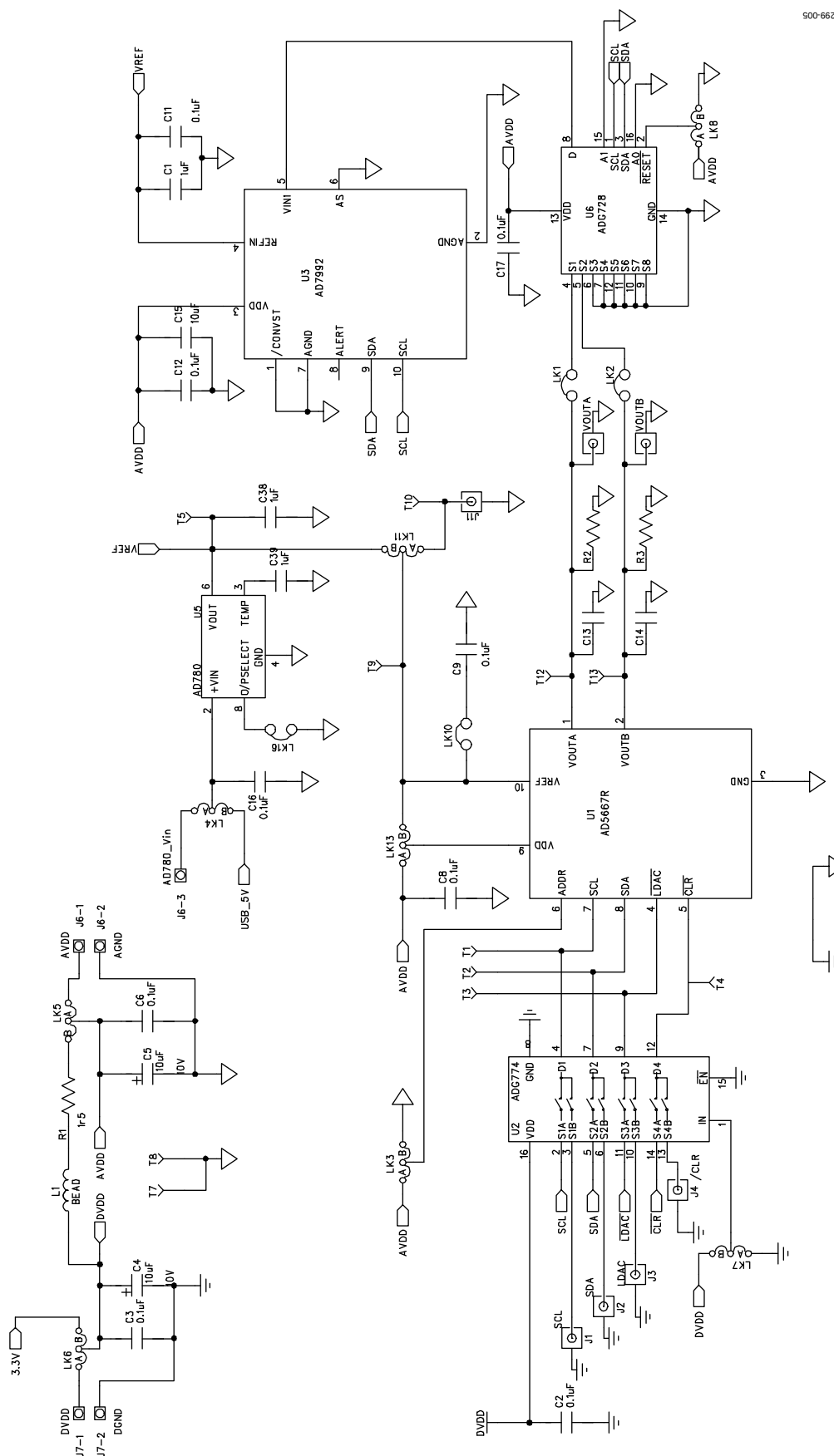


Figure 3. AD5667R Evaluation Software Main Window, Reference Setup

[illegible]

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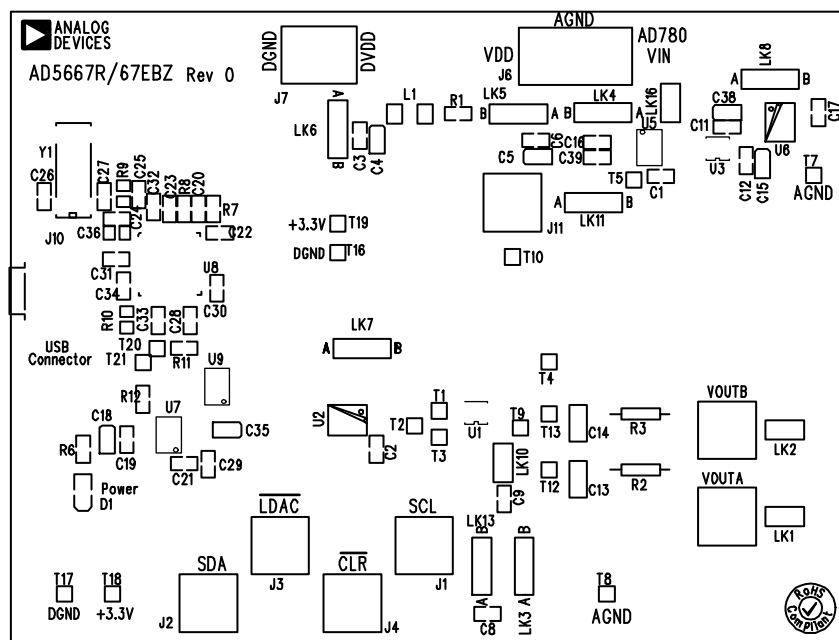


Figure 6. Component Placement Drawing

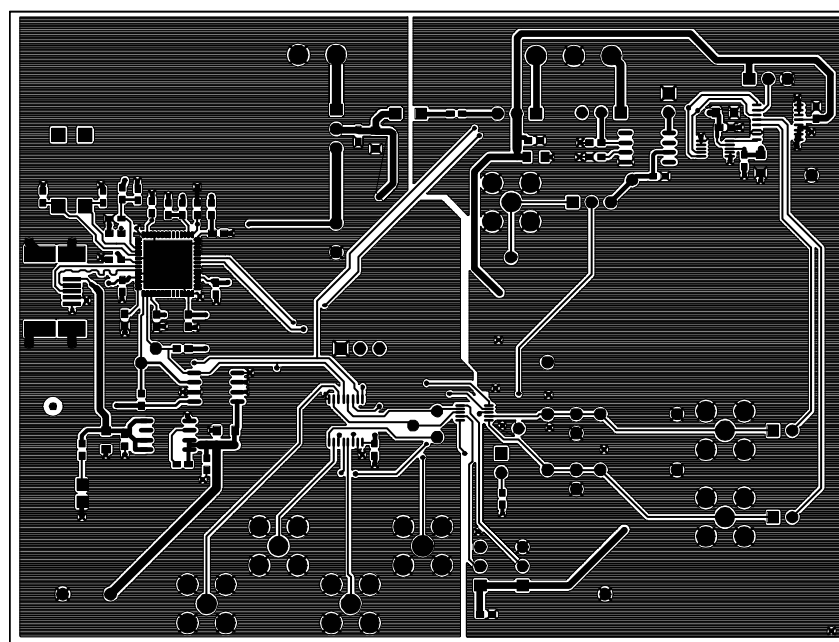


Figure 7. Component Side PCB Drawing

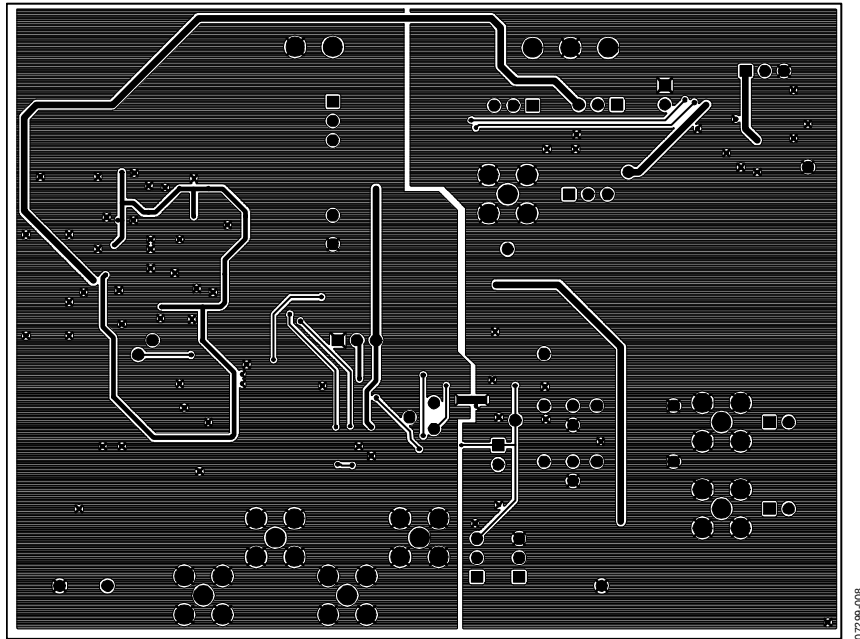


Figure 8. Solder Side PCB Drawing

## ORDERING INFORMATION

### COMPONENT LISTING

Table 3.

| Qty | Reference Designator                                                     | Description                                  | Supplier/Number <sup>1</sup> |
|-----|--------------------------------------------------------------------------|----------------------------------------------|------------------------------|
| 1   | U1                                                                       | AD5667RBRMZ-2                                | Analog Devices               |
| 1   | U2                                                                       | ADG774BRQ                                    | Analog Devices               |
| 1   | U3                                                                       | AD7992BRMZ-1                                 | Analog Devices               |
| 1   | U5                                                                       | AD780ARZ                                     | Analog Devices               |
| 1   | U6                                                                       | ADG728BRU                                    | Analog Devices               |
| 1   | U7                                                                       | ADP3303AR-3.3                                | Analog Devices               |
| 1   | U8                                                                       | CY7C68013-CSP                                | Embassy CY7C68013-56LFC      |
| 1   | U9                                                                       | 24LC64                                       | Digikey 24LC64-I/SN-ND       |
| 1   | Y1                                                                       | 24 MHz crystal                               | FEC 569-872                  |
| 7   | VOUTA, VOUTB, J1 to J4, J11                                              | Gold 50 $\Omega$ SMB jack                    | FEC 1019324                  |
| 1   | J10                                                                      | USB Mini B                                   | FEC 978-6490                 |
| 1   | J6                                                                       | Power connectors                             | FEC 9632980                  |
| 1   | J7                                                                       | Power connectors                             | FEC 9632972                  |
| 1   | D1                                                                       | LED                                          | FEC 1226373                  |
| 5   | C4, C5, C15, C18, C35                                                    | 10 $\mu$ F 10 V tantalum cap (TAJ-B package) | FEC 197-130                  |
| 1   | C38                                                                      | 1 $\mu$ F 10 V tantalum cap (TAJ-B package)  | FEC 1135234                  |
| 2   | C26, C27                                                                 | 22 pF (0603 package)                         | FEC 722-005                  |
| 23  | C2, C3, C6, C8, C9, C11, C12, C16, C17, C19 to C23, C25, C28 to C34, C36 | 0.1 $\mu$ F (0603 package)                   | FEC 9406140                  |
| 1   | C24                                                                      | 2.2 $\mu$ F (0603 package)                   | FEC 1108322                  |
| 2   | C1, C39                                                                  | 1 $\mu$ F (0603 package)                     | FEC 1288256                  |
| 2   | C13, C14                                                                 | 0805 package (not inserted)                  |                              |
| 1   | R1                                                                       | 1.5 $\Omega$                                 | FEC 758-267                  |
| 2   | R2, R3                                                                   | Wire-wrap pin (not inserted)                 |                              |
| 1   | R6                                                                       | 1 k $\Omega$ (0603 package)                  | FEC 911-239                  |
| 2   | R7, R8                                                                   | 100 k $\Omega$ (0603 package)                | FEC 911 471                  |
| 2   | R11, R12                                                                 | 2.2 k $\Omega$ (0603 package)                | FEC 911-276                  |
| 1   | R10                                                                      | 10 k $\Omega$ (0603 package)                 | FEC 911-355                  |
| 1   | R9                                                                       | 0 $\Omega$ (0603 package)                    | FEC 772-227                  |
| 4   | LK1, LK2, LK10, LK16                                                     | Header (2 $\times$ 1 pin)                    | FEC 511-705                  |
| 8   | LK3 to LK8, LK11, LK13                                                   | Header (3 $\times$ 1 pin)                    | FEC 511-717                  |
| 17  | T1 to T5, T7 to T10, T12, T13, T16 to T21                                | Testpoint                                    | FEC 873-1144                 |

<sup>1</sup> FEC = Farnell Electronic Components®.

### ORDERING GUIDE

| Model           | Package Description |
|-----------------|---------------------|
| EVAL-AD5667REBZ | Evaluation Board    |

### 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.

## NOTES