Evaluation Board for Dual, 16-Bit, I²C® 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®-compatible PC. Software is available with the evaluation board, allowing the user to easily program the AD5667R.
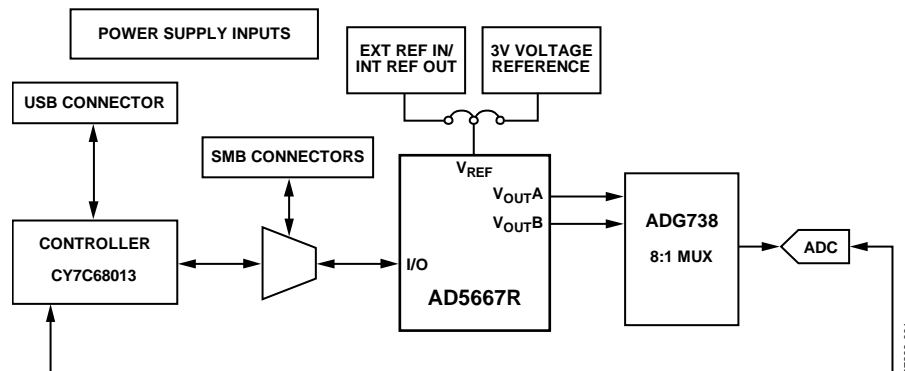
FUNCTIONAL BLOCK DIAGRAM

Figure 1.

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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_{DD} 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 μF and 0.1 μF capacitors. Each device supply pin is also decoupled with a 10 μF and 0.1 μF 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 $V_{OUT}A$ and $V_{OUT}B$ pins of the AD5667R to the input pins of the ADG728 demultiplexer to monitor the DAC output value using the on-board AD7992 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.
	   Position A connects the ADDR pin to AVDD; therefore, two LSBs are 00.
	   Position B connects the ADDR pin to GND; therefore, two LSBs are 11.
	   When there is no connection, the 2 LSBs are 10.

LK4	This link selects the AVDD power supply source for the AD780 reference.
	   Position A selects J6 as the AD780 power supply source.
	   Position B selects the 5 V USB supply voltage as the AD780 power supply source.

LK5	This link selects the AVDD power supply source for the analog circuitry.
	   Position A selects J6 as the AVDD analog circuitry power supply source.
	   Position B selects the 3.3 V power supply source as the AVDD analog circuitry power supply source (see LK6).

LK6	This link selects the 3.3 V power supply source for the digital circuitry.
	   Position A selects J7 as the digital circuitry power supply source.
	   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).
	   Position A selects control by the PC via the USB port.
	   Position B selects control by an external source via SMB connectors (J1 to J4).

LK8	This link sets the $\overline{RESET}$ pin on the ADG728.
	   Position A allows normal operation of the switch.
	   Position B resets the switch.

LK9	Not applicable.
LK10	This link connects a 0.1 μF capacitor to AGND on the V_{REFOUT} pin. It is recommended to connect this when using the internal reference.

| Link No.	Function
LK11	This link selects the reference source.
	Position A selects the internal reference as the reference source. The part must be written to via software to turn on the internal reference.
	Position B selects the on-board AD780 3 V reference as the reference source.
LK12	Not applicable.
LK13	This link selects the DAC voltage source.
	Position A selects the AVDD analog circuitry power supply source.
	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
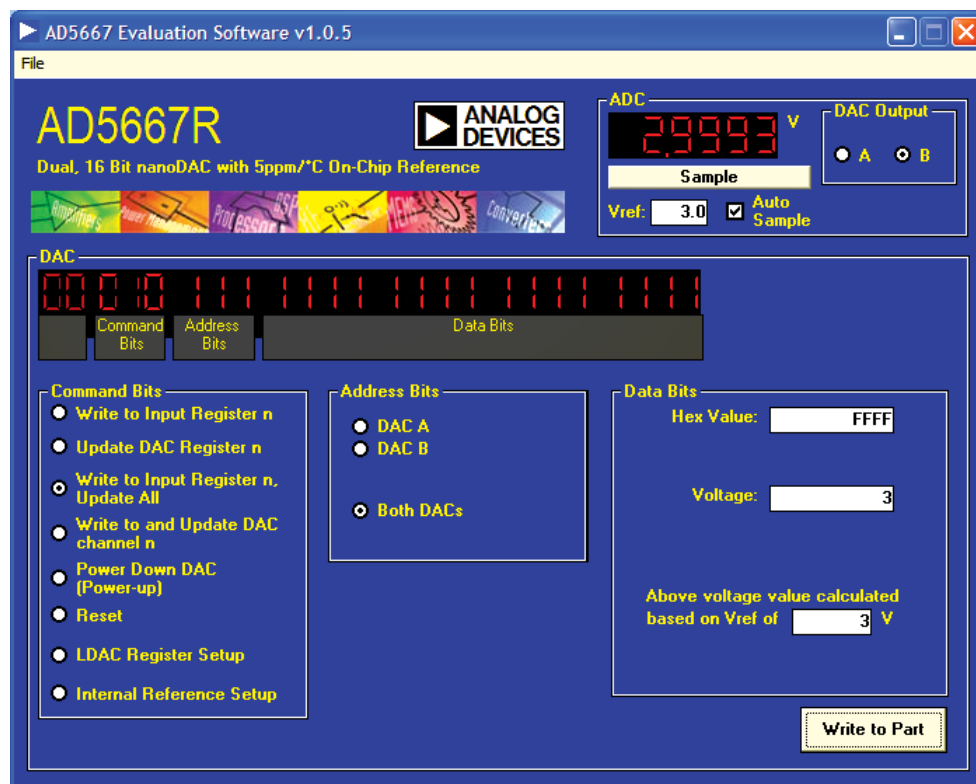
Figure 2. AD5667R Evaluation Software Main Window

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.

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.
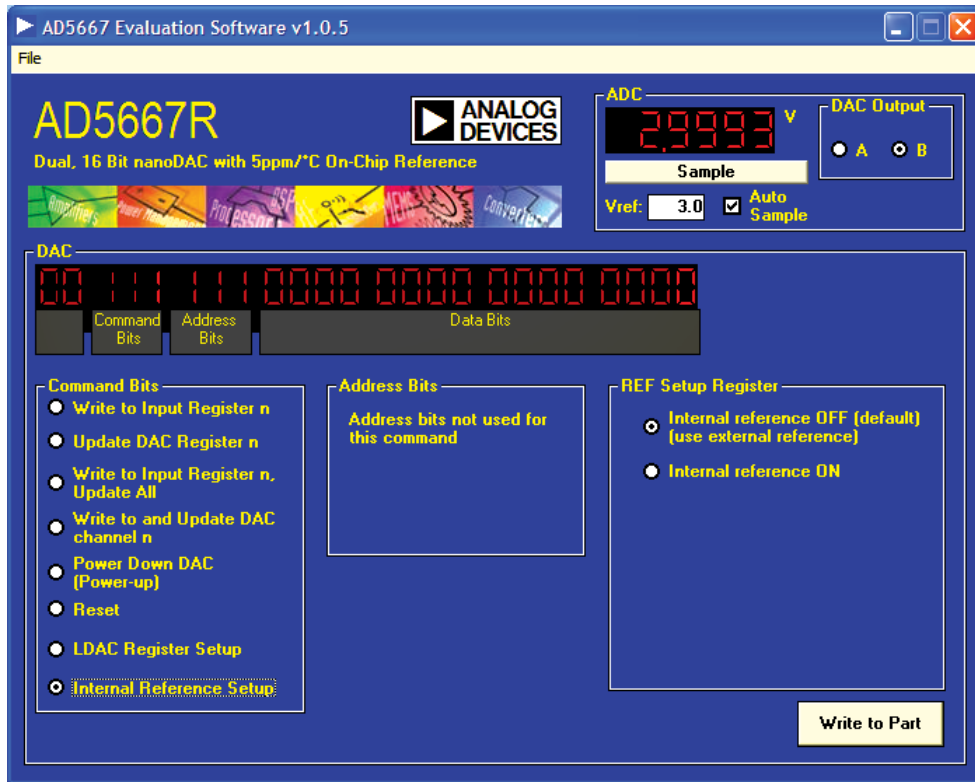

Figure 3. AD5667R Evaluation Software Main Window, Reference Setup

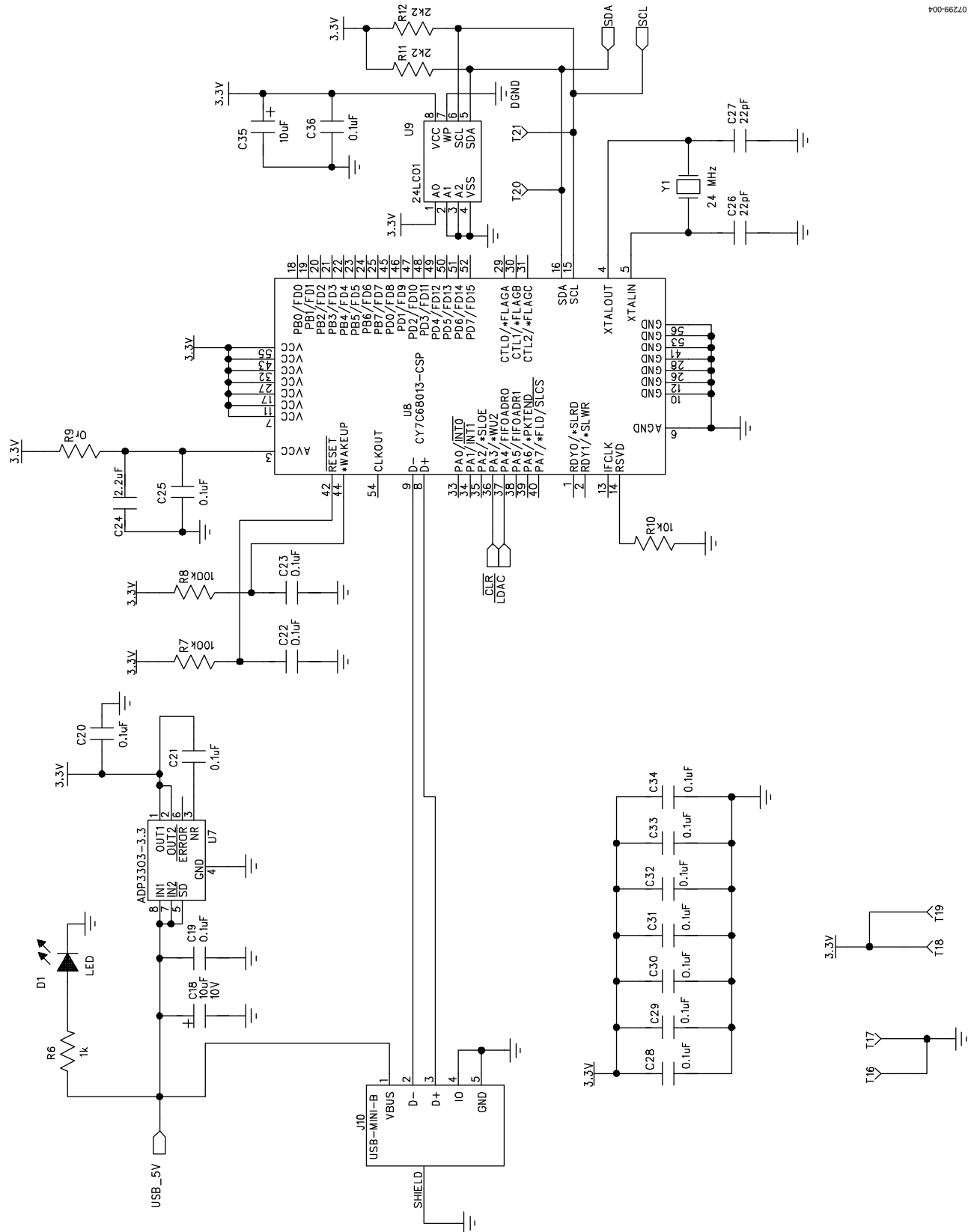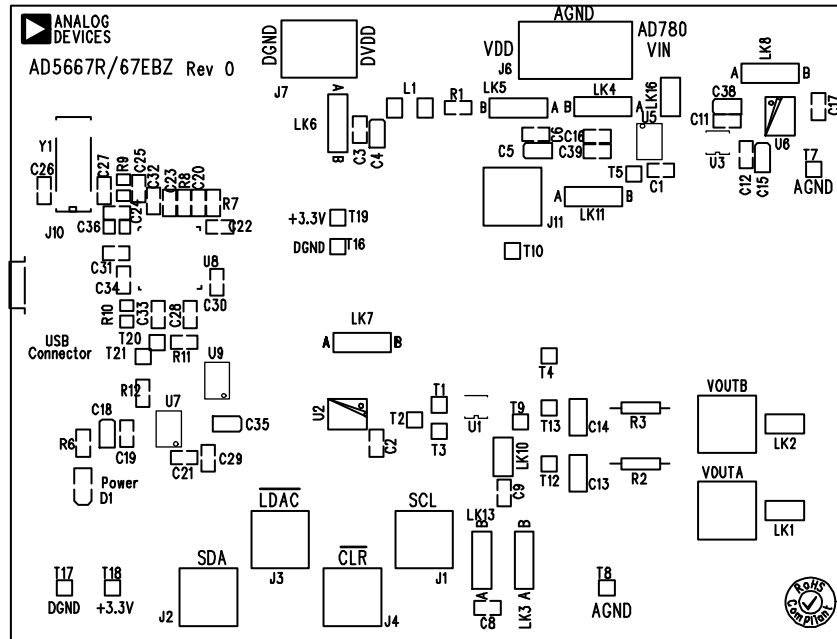# EVALUATION BOARD SCHEMATICS AND ARTWORK

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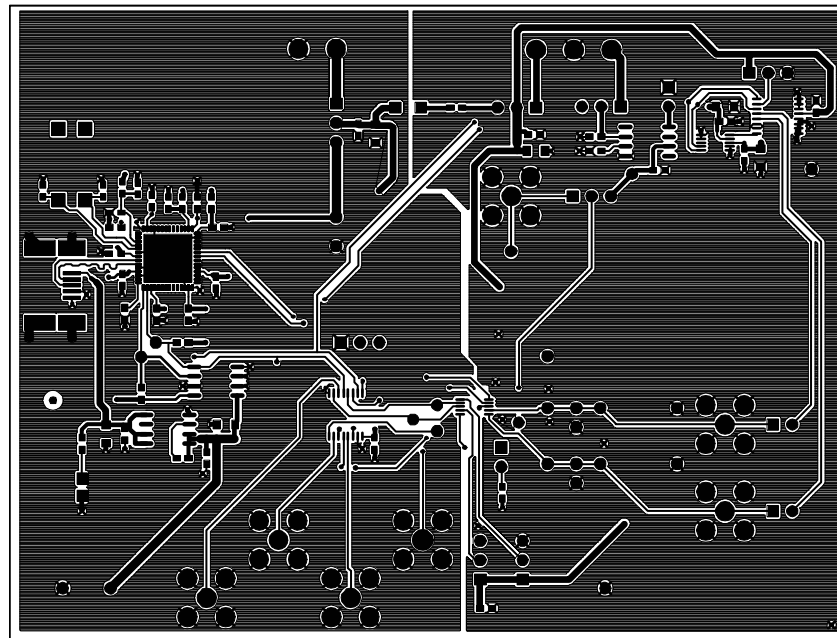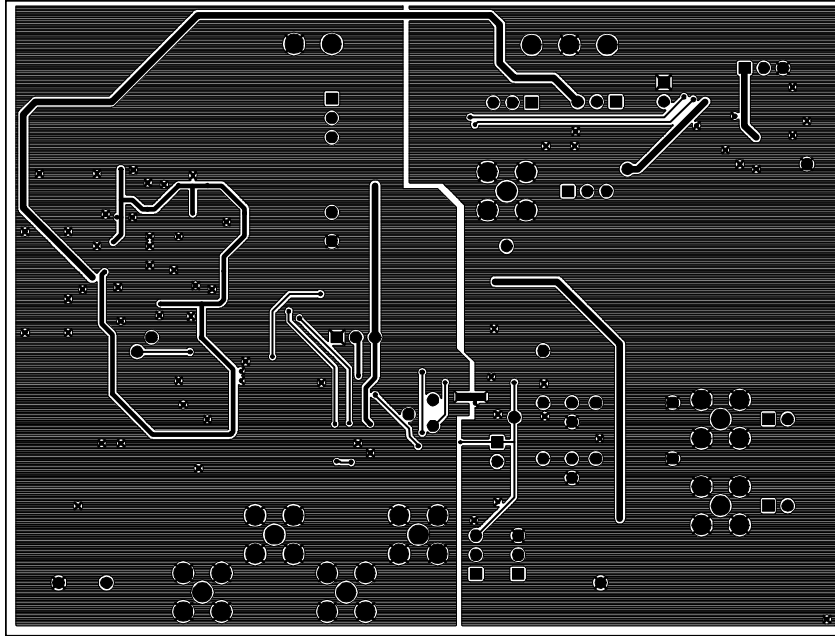Figure 4. Schematic of Controller Circuitry

Figure 5. Schematic of AD5667R Circuitry

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[1]
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 Ω 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 µF 10 V tantalum cap (TAJ-B package)	FEC 197-130
1	C38	1 µF 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 µF (0603 package)	FEC 9406140
1	C24	2.2 µF (0603 package)	FEC 1108322
2	C1, C39	1 µF (0603 package)	FEC 1288256
2	C13, C14	0805 package (not inserted)	
1	R1	1.5 Ω	FEC 758-267
2	R2, R3	Wire-wrap pin (not inserted)	
1	R6	1 kΩ (0603 package)	FEC 911-239
2	R7, R8	100 kΩ (0603 package)	FEC 911 471
2	R11, R12	2.2 kΩ (0603 package)	FEC 911-276
1	R10	10 kΩ (0603 package)	FEC 911-355
1	R9	0 Ω (0603 package)	FEC 772-227
4	LK1, LK2, LK10, LK16	Header (2 × 1 pin)	FEC 511-705
8	LK3 to LK8, LK11, LK13	Header (3 × 1 pin)	FEC 511-717
17	T1 to T5, T7 to T10, T12, T13, T16 to T21	Testpoint	FEC 873-1144

[1] FEC = Farmell 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

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