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Evaluation Board for the AD5668 Octal, 16-Bit, Serial Voltage Output DAC

FEATURES

Full-featured evaluation board for the AD5668
On-board reference
Various link options
PC control in conjunction with Analog Devices, Inc.
System development platform (SDP)
PC software for control of DACs
On-board ADC for voltage readback

EVALUATION KIT CONTENTS

EVAL-AD5668SDCZ/EVAL-AD5668SDRZ evaluation board
AD5668 device
CD including
- **Self-installing software that allows users to control the board and exercise all functions of the device**
- **Electronic version of the AD5668 data sheet**
- **Electronic version of the UG-155 user guide**

ADDITIONAL EQUIPMENT NEEDED

USB cable available in the SDP-B kit or the SDP-S kit

GENERAL DESCRIPTION

The Analog Devices AD5668 evaluation boards, the EVAL-AD5668SDCZ and EVAL-AD5668SDRZ, are designed to help customers quickly prototype new AD5668 circuits and reduce design time. The AD5668 operates from a single 2.7 V to 5.5 V supply. The device incorporates an internal 1.25 V or 2.5 V on-board reference to give an output voltage span of 2.5 V or 5 V, respectively. The on-board reference is off at power-up allowing the use of an external reference; the REF195 is used on this evaluation board. The device must be written to after power-up to turn on the internal reference.

Consult the AD5668 data sheet, available from Analog Devices, in conjunction with this user guide when using the evaluation board.

The evaluation board interfaces to the USB port of a PC via the SDP. Software is available with the evaluation board, which allows the user to easily program the AD5668.

FUNCTIONAL BLOCK DIAGRAM

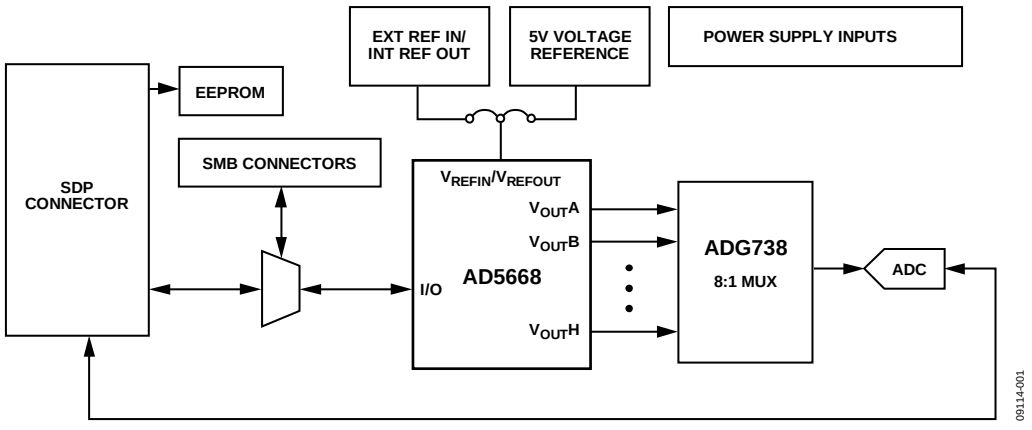

Figure 1.

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REVISION HISTORY

6/2016—Rev. 0 to Rev. A

Changed EVAL-AD5668EBRZ to EVAL-AD5668SDCZ and EVAL-AD5668EBCZ to EVAL-AD5668SDRZ ..... Throughout
Changes to Evaluation Kit Contents Section 1
Added Additional Equipment Needed Section 1
Changes to Table 3 3
Changes to Installing the Software Section and Running the Software Section 4
Changes to Figure 4 and Software Operation Section 5
Changes to Figure 5 6
Changes to Figure 6 7
Changes to Figure 7 and Figure 8 8
Changes to Figure 9 9
Changes to Table 4 10

6/2010—Revision 0: Initial Version

EVALUATION BOARD HARDWARE

POWER SUPPLIES

To power the AD5668 evaluation board, supply 5.5 V between the AVDD and AGND inputs for the analog supply, and supply 5 V between DVDD and DGND inputs for the digital supply. Refer to Table 1 for information on the power supply connectors.

Both AGND and DGND inputs are provided on the evaluation board. The AGND and DGND planes are connected at one location close to the AD5668. It is recommended not to connect AGND and DGND 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 No.	Voltage
J1	Analog positive supply and ground, AVDD and AGND. For single-supply operation, supply 5.5 V.
J2	Digital positive power supply, DVDD. For single-supply operation, supply 5 V.

LINK OPTIONS

A number of link and switch options are incorporated in the evaluation board and must be set for the required operating setup before using the evaluation board. Table 2 describes the positions of the different links to control the evaluation board by the PC, via the USB port, using the AD5668 in single-supply mode. The functions of these link options are described in detail in Table 3.

Table 2. Link Options Setup for SDP Control (Default)

Link No.	Option
LK1	A
LK2 to LK3	Inserted
LK4	Inserted
LK5	B
LK6	A
LK7	A
LK8	A
LK9 to LK14	Inserted

Table 3. Link Functions

Link No.	Option
LK1	This link selects the AVDD power supply source for the analog circuitry: Position A selects the J1 terminal block as the AVDD analog circuitry power supply source. Position B selects the DVDD source as the AVDD analog circuitry power supply source (see LK6).
LK2	This link connects the $V_{OUT}G$ pin of the AD5668 to the input pin of the ADG738 demultiplexer, so the DAC output value can be monitored using the on-board AD7476 ADC.
LK3	This link connects the $V_{OUT}H$ pin of the AD5668 to the input pin of the ADG738 demultiplexer, so the DAC output value can be monitored using the on-board AD7476 ADC.
LK4	This link connects a 0.1 µF capacitor to AGND on the V_{REFIN}/V_{REFOUT} pin. It is recommended to connect this when using the internal reference.
LK5	This link selects the reference source: Position A selects the internal reference as the reference source. The device must be written to via software to turn on the internal reference. Position B selects the on-board 5 V reference as the reference source.
LK6	This link selects the 5 V power supply source for the digital circuitry: Position A selects V_IO on the evaluation board as the 5 V digital circuitry power supply source. Position B selects the J2 terminal block as the 5 V digital circuitry power supply source.
LK7	This link selects the DAC voltage source: Position A selects the AVDD analog circuitry power supply source. Position B selects the on-board 5 V reference as the power supply source.
LK8	This link sets the $\overline{\text{RESET}}$ pin on the ADG738: Position A allows normal operation of the switch. Position B resets the switch.
LK9 to LK14	This link connects the $V_{OUT}A$ to $V_{OUT}F$ pins of the AD5668 to the input pins of ADG738 demultiplexer, so the DAC output value can be monitored using the on-board AD7476 ADC.

EVALUATION BOARD SOFTWARE

INSTALLING THE SOFTWARE

The AD5668 evaluation kit includes self-installing software on the provided CD. The software is compatible with Windows® XP, Windows Vista (32 bits), and Windows 7 (32 bits).

To obtain drivers for 64-bit operating systems, download them from the AD5668 product page.

Install the software before connecting the SDP to the USB port of the PC. This ensures that the SDP is recognized when it connects to the PC. Follow these steps:

1. Start the Windows operating system and insert the provided CD. The installation software opens automatically. If it does not, run the **setup.exe** file from the CD.
2. After installation is completed, power-up the evaluation board as described in the Power Supplies section.
3. Plug the AD5668 evaluation board into the SDP, and plug the SDP into the PC using the USB cable available in the SDP-B kit or the SDP-S kit.
4. When the software detects the evaluation board, proceed through any dialog boxes that appear to finalize the installation.

RUNNING THE SOFTWARE

To run the program, do the following:

1. Click **Start > All Programs > Analog Devices > AD5668 > AD5668 Evaluation Software**. To uninstall the program, click **Start > Control Panel > Add or Remove Programs > AD5668 Evaluation Software**.
2. Determine if the SDP is connected to the USB port. If the SDP is not connected to the USB port when the software is launched, a connectivity error dialog box displays (see Figure 2). Connect the evaluation board to the USB port of the PC, wait a few seconds, click **Rescan**, and follow the instructions shown in the **Hardware Select** dialog box.

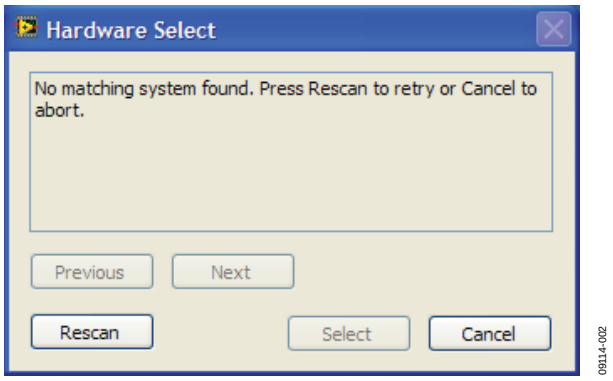

Figure 2. Error Dialog Box

3. Determine if the SDP is connected to the evaluation board in use. If the SDP is not connected to the evaluation board, a dialog box appears, shown in Figure 3. Check the connection between the SDP and AD5668 evaluation boards and run the program again.

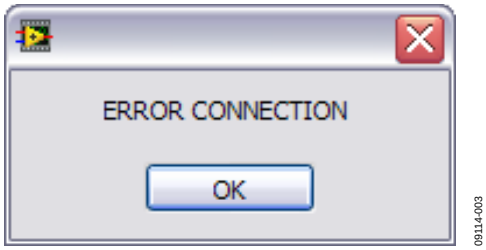

Figure 3. Error Message

4. The main window of the AD5668 evaluation software then displays, as shown in Figure 4.

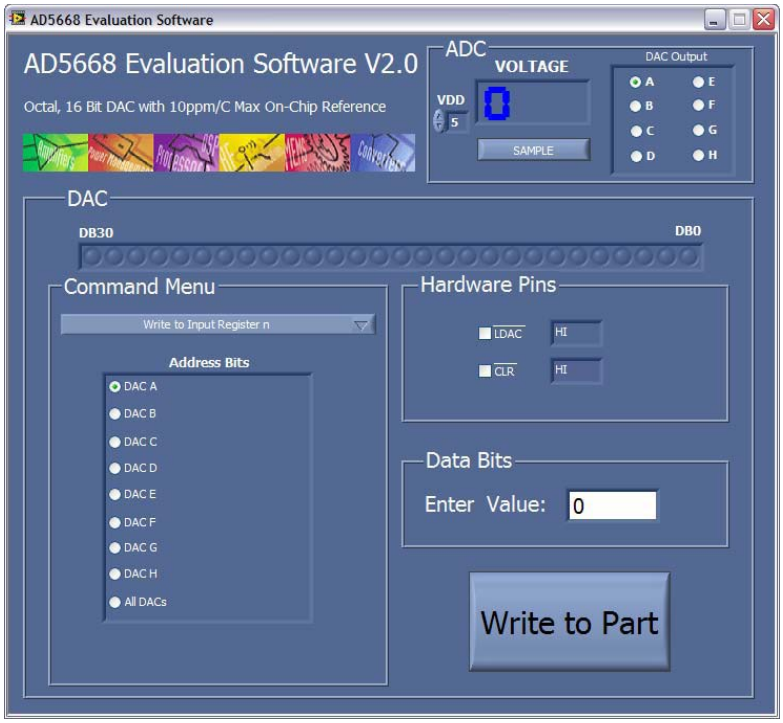

Figure 4. AD5668 Evaluation Board Main Window

SOFTWARE OPERATION

Take the following steps to operate the software:

1. Click **Start > All Programs > Analog Devices > AD5668 > AD5668 SDP Evaluation Software.**

   For PC operating systems running Windows XP or older, click **Start > Programs > Analog Devices > AD5668 > AD5668 SDP Evaluation Software**.

   The AD5668 main window opens, as shown in Figure 4. The data programmed into the 32-bit input shift register is displayed. The user can select the command bits, the address bits, and the data bits by clicking the appropriate button under each area.

2. To select a command to program the device, select the appropriate option from the drop-down menu under **Command Menu**. For example, to program all DAC outputs with full scale, select **Write to and Update DAC channel n** and then click **All DACs** under **Address Bits**.

3. Under **Data Bits**, enter the data in decimal format in the **Enter Value** field. To execute, click **Write to Part**. Note that the user must click **Write to Part** to execute all writes to the device.

4. The voltage output on each DAC channel is monitored using the on-board ADC. To read the output voltage, click **SAMPLE**, under **ADC**.

5. To set up the power-down DAC bits, the clear code register bits, and the LDAC register bits, select the appropriate option from the drop-down menu under **Command Menu** and click **Write to Part**. The user can also set the register bits for the required mode of operation. Consult the AD5668 data sheet for details.

6. To set $\overline{\text{LDAC}}$ and $\overline{\text{CLR}}$ pins to high or low, click the corresponding check box under **Hardware Pins**. Because this command is executed immediately, there is no need to click **Write to Part**.

EVALUATION BOARD SCHEMATICS AND ARTWORK

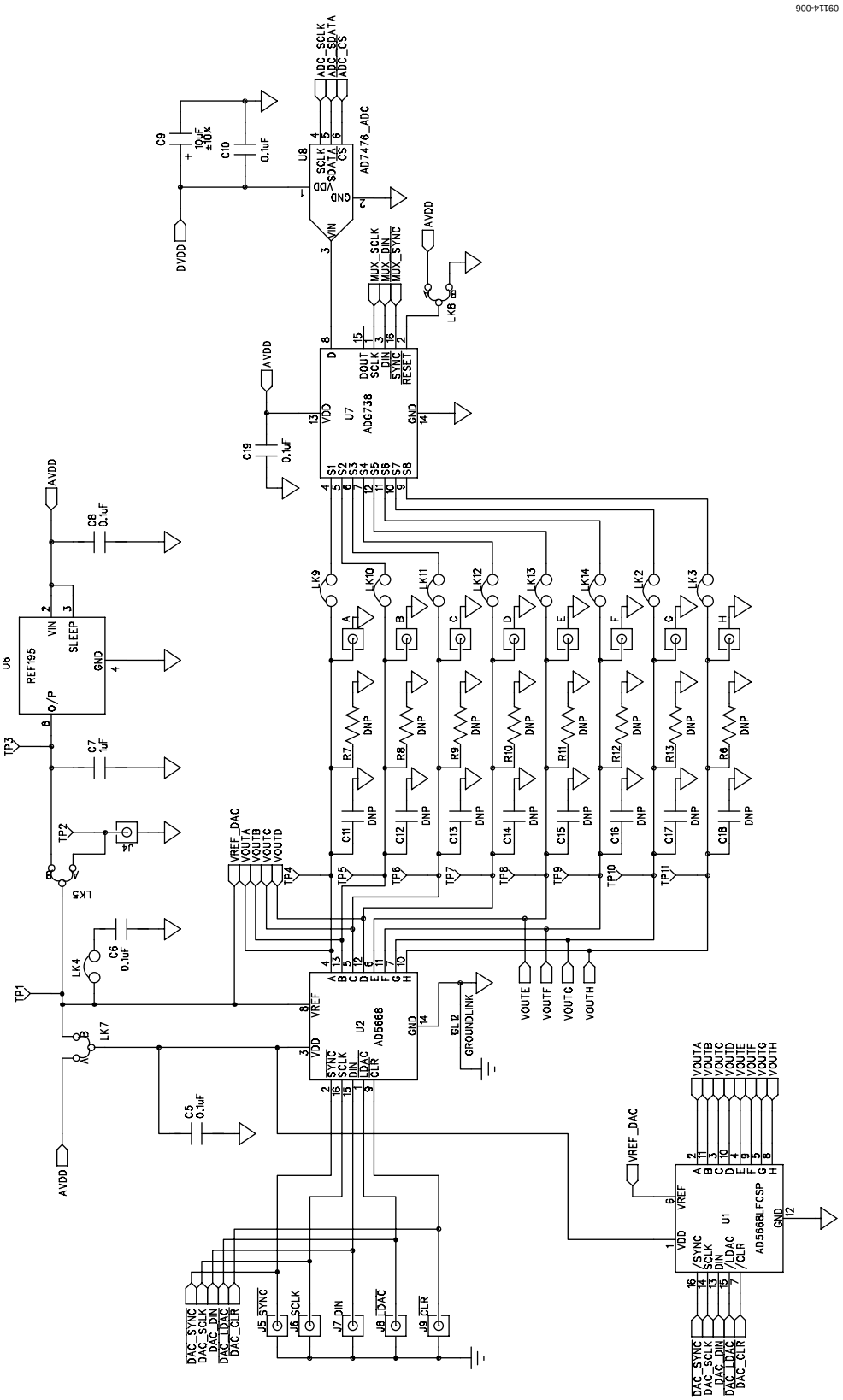

Figure 5. Schematic of AD5668 Evaluation Circuitry

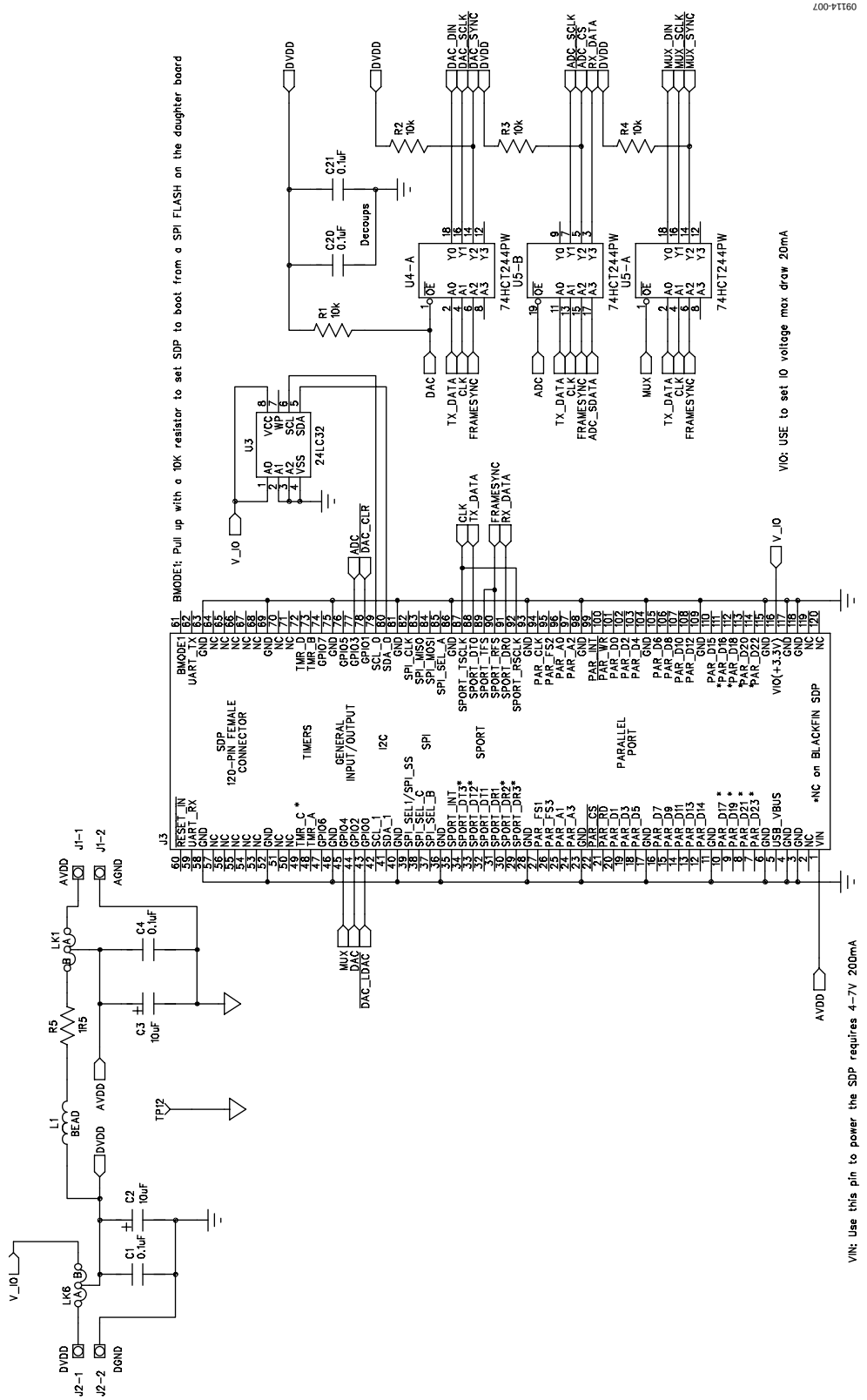

Figure 6. Schematic of SDP Connector

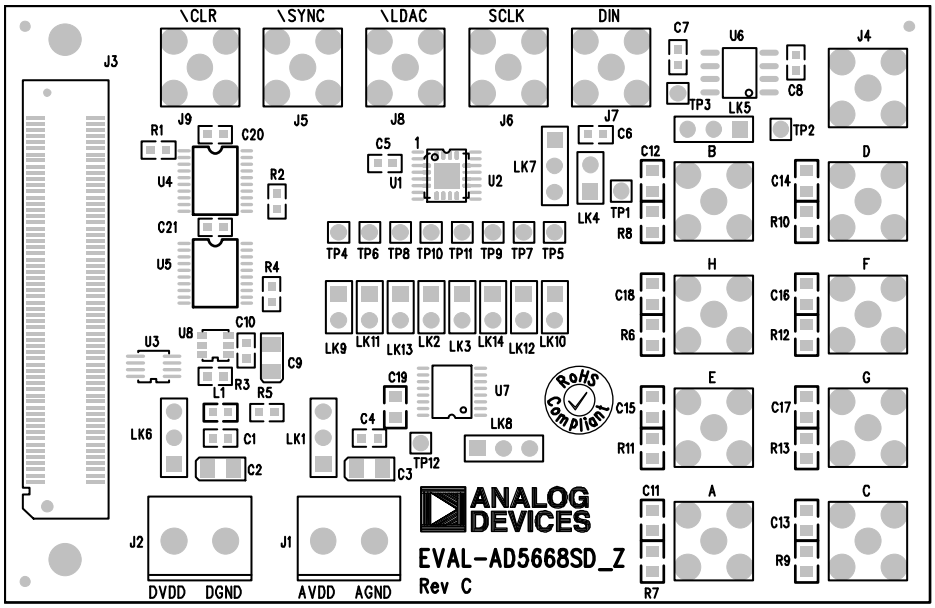

Figure 7. Component Placement Drawing

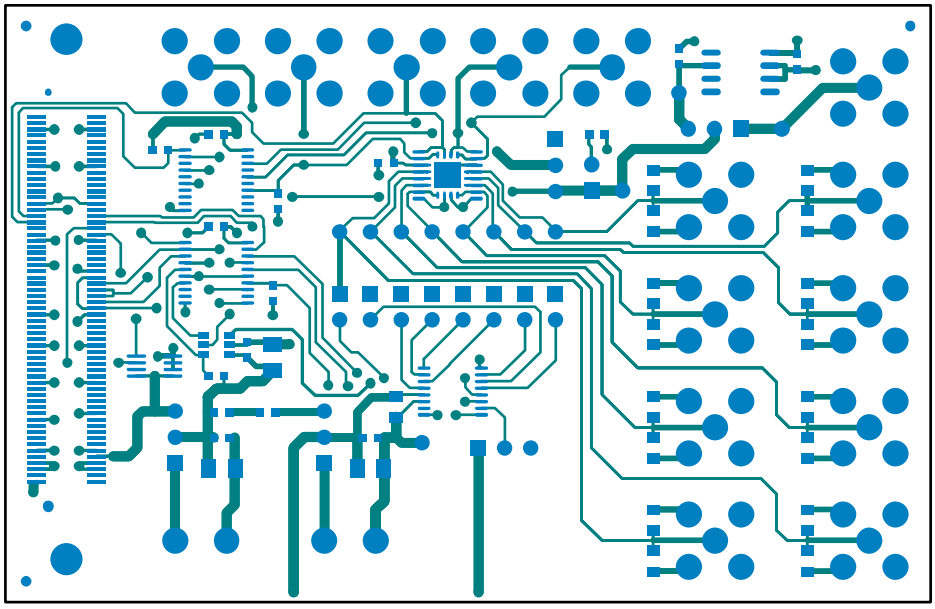

Figure 8. Component Side PCB Drawing

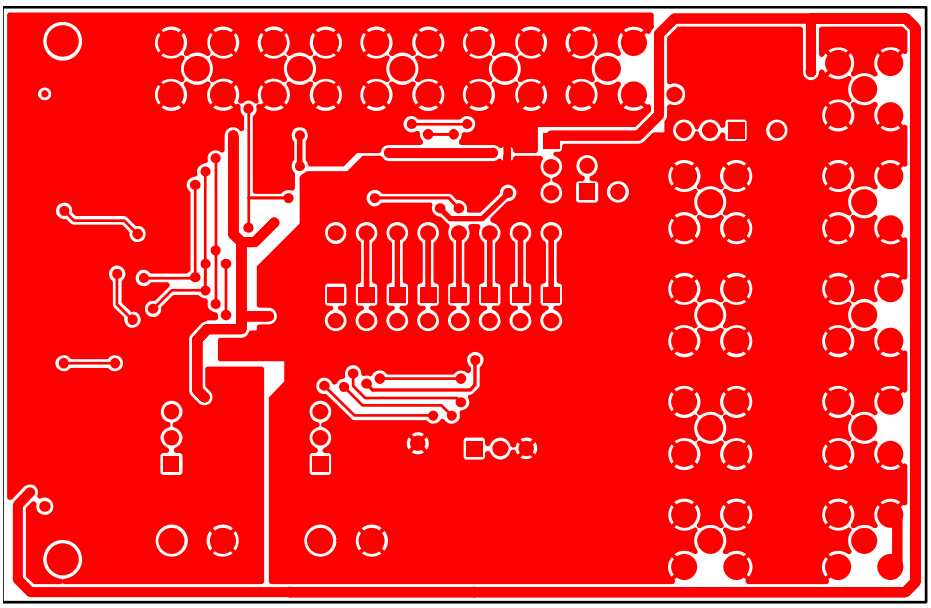

Figure 9. Solder Side PCB Drawing

ORDERING INFORMATION

BILL OF MATERIALS

Table 4.

Qty.	Reference Designator	Description	Manufacturer	Part Number	Stock Code
1	U8	AD7476, 1 MSPS, 12-bit ADC in 6-lead SOT-23	Analog Devices, Inc.	AD7476BRTZ	AD7476BRTZ
1	U7	ADG738, CMOS, low voltage, 3-wire, serially-controlled, matrix switch	Analog Devices, Inc.	ADG738BRUZ	ADG738BRUZ
1	L1	Ferrite bead, 600 Ω at 100 MHz, 0603	Murata Electronics	BLM18BD102SN1D	490-1024-1-ND
9	LK2 to LK4, LK9 to LK14	Jumper blocks, 2-way, 2.54 mm pitch spacing, Shoring Block IN	Harwin	M20-9990246	FEC 1022247 and 150-411
2	LK7, LK8	Jumper blocks, 3-way, 2.54 mm pitch spacing, Shoring Block Position A	Harwin	M20-9990345 and M7567-05	FEC 1022248
1	LK5	Jumper blocks, 3-way, 2.54 mm pitch spacing, Shoring Block Position B	Harwin	M20-9990345 and M7567-05	FEC 1022248 and 150410
6	J4 to J9	SMB jacks, 50 Ω	TYCO	1-1337482-0	FEC1206013
1	J3	120-way female connector	Hirose	FX8-120S-SV(21)	FEC 1324660
1	U3	32 kB I²C serial EEPROM	Microchip	24LC32A-I/MS	FEC 1331330
2	J1, J2	Terminal blocks, 2-way, 5 mm pitch	Camden	CTB5000/2	FEC 151789
3	C2, C3, C9	Capacitors, Case A ,10 µF, 10 V, ±10%	AVX	TAJA106K010R	FEC 197-130
1	C7	Capacitor, 0603, 1 µF, 10 V, +80%/−20%	Phycomp	2238 246 19863	FEC 318-8840
2	LK1, LK6	SIL headers, 3-way, Shoring Block Position A	Harwin	M20-9990345 and M7567-05	FEC 512-047 and 150-411
13	TP1 to TP12	Red test points	Vero	20-313137	FEC 8731144 (pack)
9	C1, C4 to C6, C8, C10, C19 to C21	Capacitors, 0603, 100 nF, 0.1 µF, ±10%	Murata	GRM188R71H104KA93D	FEC 8820023
4	R1 to R4	SMD resistors, 10 kΩ, 1%, 0603	Multicomp	MC 0.063W 0603 10K	FEC 933-0399
1	R5	Resistor, 0603, 1.5 Ω, 5%	Multicomp	MC 0.063W 0603 5% 1R5	FEC 9331832
	R6 to R13	Resistor, do not populate, 0805	Not applicable	Not applicable	Do not insert
2	U4, U5	Octal buffer/line drivers	Texas Instruments, Inc.	SN74HCT244PW	FEC 9591915
1	U1	AD5668, octal 16-bit SPI voltage output *dense*DAC with 5 ppm/°C on-chip reference in LFCSP	Analog Devices, Inc.	AD5668BCPZ-1	AD5668BCPZ-1
1	U2	AD5668, octal 16-bit SPI voltage output *dense*DAC with 5 ppm/°C on-chip reference in TSSOP, do not populate	Analog Devices, Inc.	AD5668BRUZ-2	Do not insert
1	U6	REF195, precision micropower, low dropout voltage reference	Analog Devices, Inc.	REF195ESZ	REF195ESZ
3	A to H	SMB connector, do not populate	Not applicable	Not applicable	Do not insert
	C11 to C18	Capacitors, do not populate, 0805	Not applicable	Not applicable	Do not insert
	SCREW1, SCREW2	Screw, cheese, nylon, M3X10, PK100	ALLTHREAD	119030010	FEC 7070597
	NUT1, NUT2	Nut/wascher, nylon, M3, PK100	Duratool	1140030	FEC 7061857

NOTES

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.

UG09114-0-6/16(A)

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