



Evaluation Board for Quad, 16-Bit, I²C Interface, Voltage Output DAC

EVAL-AD5665R

FEATURES

- Full-featured evaluation board for the AD5665R
- 2 DAC footprints to allow evaluation of both package options
 - EVAL-AD5665REBZ1 is populated with the AD5665RBRUZ-2 TSSOP package
 - EVAL-AD5665REBZ2 is populated with the AD5665RBCPZ LFCSP package
- On-board reference
- On-board ADC for voltage readback
- Various link options
- Direct hookup to USB port of PC
- PC software for control of DACs

GENERAL DESCRIPTION

This data sheet describes the evaluation board for the [AD5665R](#) quad, 16-bit DAC. The AD5665R 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 AD5665R can be found in the AD5665R 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 [AD5665](#) part. Full data on the AD5665 can be found in the AD5665 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 AD5665R.

FUNCTIONAL BLOCK DIAGRAM

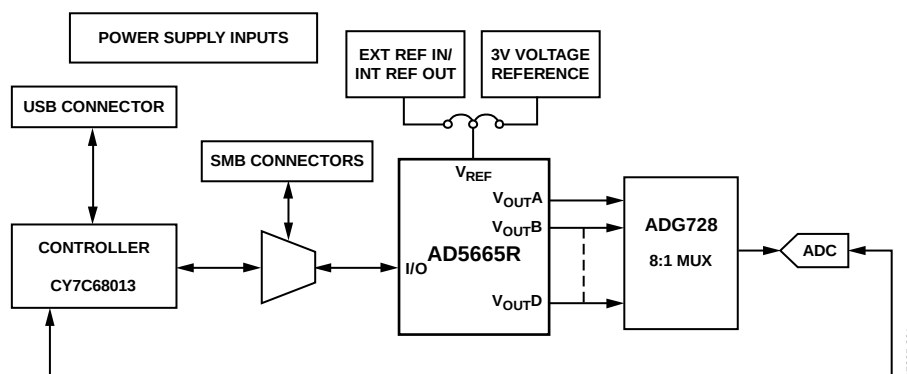


Figure 1.

Rev. 0

Evaluation boards are only intended for device evaluation and not for production purposes. Evaluation boards are supplied "as is" and without warranties of any kind, express, implied, or statutory including, but not limited to, any implied warranty of merchantability or fitness for a particular purpose. No license is granted by implication or otherwise under any patents or other intellectual property by application or use of evaluation boards. Information furnished by Analog Devices is believed to be accurate and reliable. However, no responsibility is assumed by Analog Devices for its use, nor for any infringements of patents or other rights of third parties that may result from its use. Analog Devices reserves the right to change devices or specifications at any time without notice. Trademarks and registered trademarks are the property of their respective owners. Evaluation boards are not authorized to be used in life support devices or systems.

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REVISION HISTORY

1/08—Revision 0: Initial Version

EVALUATION BOARD HARDWARE

POWER SUPPLIES

To power the EVAL-AD5665REBZ, supply the voltage (2.7 V to 5.5 V) between the AVDD and AGND inputs for the analog supply of the [AD5665R](#) (J6). Alternatively, placing Link 6 in Position B powers the analog circuitry from the USB port (default setting). This powers all devices with 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 AD5665R. 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 μ F and 0.1 μ F capacitors. Each device supply pin is also decoupled with a 10 μ F and 0.1 μ 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 to LK4	Inserted
LK5	B
LK6	B
LK7	A
LK8	A
LK9	A
LK10	Removed
LK11	B
LK12	B
LK13	A
LK14	A
LK15	A
LK16	Inserted

Table 2. Link Functions

Link No.	Function
LK1 to LK4	These links connect the V _{OUTA} to V _{OUTD} pins of the AD5665R to the input pins of ADG728 demultiplexer to monitor the DAC output value using the on-board AD7992 ADC.
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 DVDD supply source for the digital circuitry. Position A selects J7 as the digital circuitry power supply source. Position B selects the 3.3 V USB as the digital circuitry power supply source.
LK7	This link selects whether the AD5665R evaluation board is controlled by the PC via the USB port or by an external source via the SMB connectors J1 to J12. Position A selects control by the PC via the USB port. Position B selects control by an external source via the SMB connectors J1 to J4.
LK8	This link sets the RESET pin on the ADG728. Position A allows normal operation of the switch. Position B resets the switch.
LK9	This link selects the AVDD power supply source for the AD780 reference. Position A selects J6-3 as the AD780 power supply source. Position B selects the 5 V USB supply voltage as the AD780 power supply source.
LK10	This link connects a 0.1 μ F capacitor to AGND on the V _{REFOUT} pin. It is recommended to connect this when using the internal reference.
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	This link selects whether the part power-on resets to zero-scale or midscale. Position A ensures that the part power-on resets to midscale. Position B ensures that the part power-on resets to zero-scale.

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Link No.	Function
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.
LK14	This link allows the user to hardwire the ADDR1 pin to set the two LSBs (A1, A0) of the 7-bit address. 00011A1A0 (10-lead LFCSP); 001A3A2A1A0 (14-lead TSSOP). Position A connects the pin to AVDD; therefore, two LSBs are 00. Position B connects the pin to GND; therefore, two LSBs are 11. No connection; therefore, two LSBs are 10.
LK15	This link allows the user to hardwire the ADDR2 pin to set the bits (A3, A2) of the 7-bit address. 001A3A2A1A0 (14-lead TSSOP only). Position A connects the pin to AVDD; therefore, two bits are 00. Position B connects the pin to GND; therefore, two bits are 11. No connection; therefore, two bits are 10.
LK16	This link connects the OP_SEL pin of the AD780 reference to ground, selecting a 3 V output. Leaving no connect gives a 2.5 V output.

EVALUATION BOARD SOFTWARE

INSTALLING THE SOFTWARE

The AD5665R evaluation kit includes self-installing software on CD-ROM. The software is compatible with Microsoft® Windows® 2000 and Windows XP.

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

1. Start the Windows operating system and insert the CD-ROM.
2. The installation software should launch automatically. If it does not, run the **setup.exe** file directly from the CD.
3. After installation from the CD-ROM is complete, power up the AD5665R evaluation board as described in the Power Supplies section. Connect the board to the PC's USB port using the supplied cable.
4. Once the software detects the evaluation board, proceed through any dialog boxes that appear to finalize the installation.

SOFTWARE OPERATION

1. From the **Analog Devices** menu, click **Start > All Programs > Analog Devices > AD5665R > AD5665R Evaluation Software**.

For older PCs, click **Start > Programs > Analog Devices > AD5665R > AD5665R Evaluation Software**.

2. The device selection window opens, as shown in Figure 2.

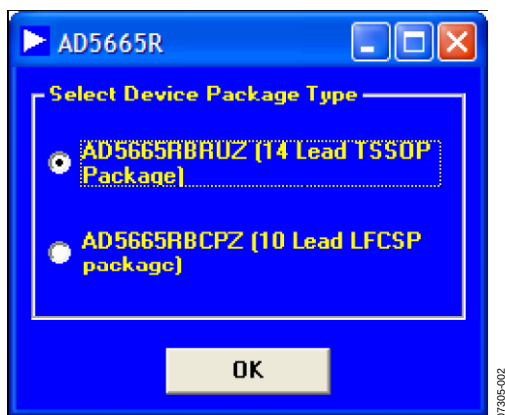


Figure 2. Device Selection Window

3. Select the part number of the device on the evaluation board and click **OK**.
4. The main window of AD5665R evaluation software opens, as shown in Figure 3. The data programmed into the 24-bit input shift register is displayed. You can select the command bits, the address bits, and the data bits by clicking 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. Next, click **All DACs** in the **Address Bits** section.
3. Then, in the **Data Bits** section, enter the 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.

The AD5665R evaluation software also allows programming of the power-down DAC bits, the clear code register bits, and the LDAC register bits by clicking 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 [AD5665R](#) 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 (upper right portion of the window).

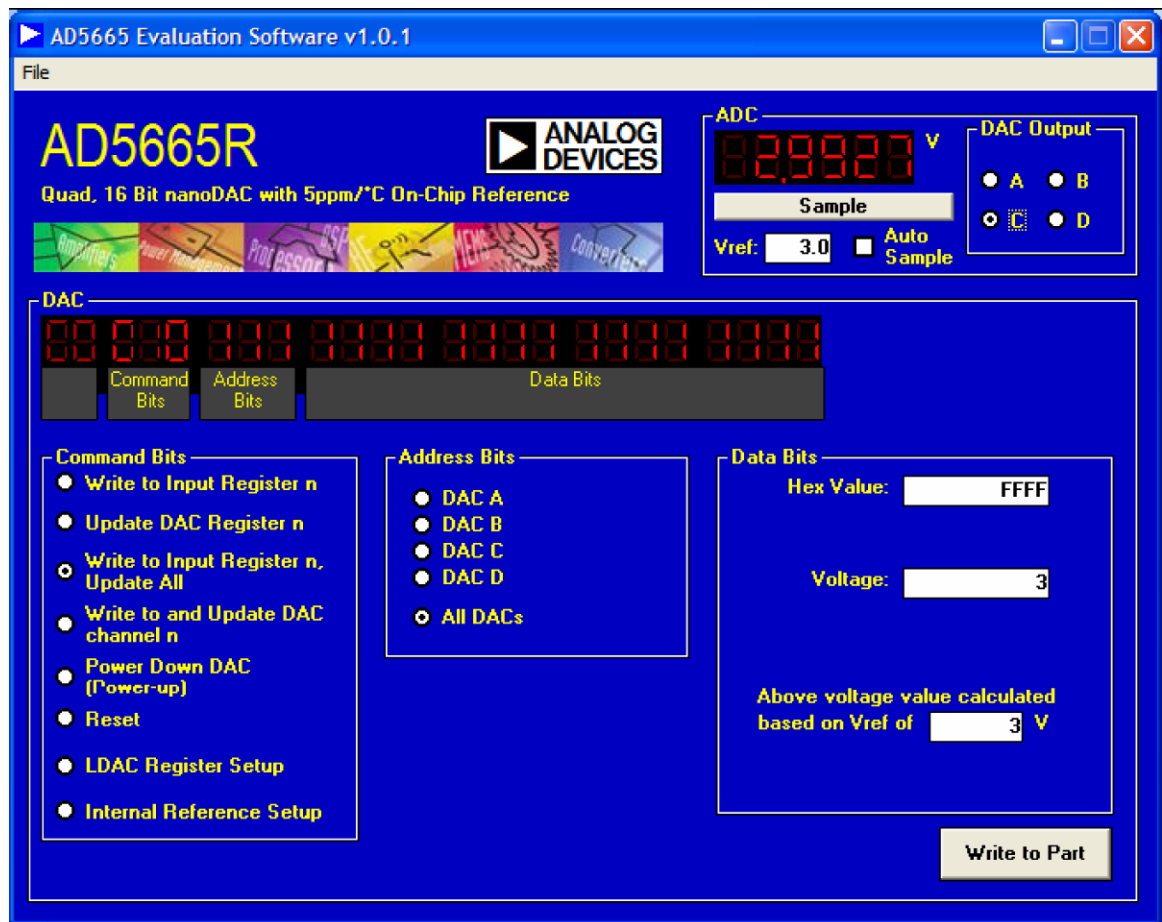


Figure 3. AD5665R Evaluation Software Main Window

Reference Setup

The AD5665R 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. This allows you to program the bit in the reference setup register for the required mode of operation, as shown in Figure 4. Then click **Write to Part**.

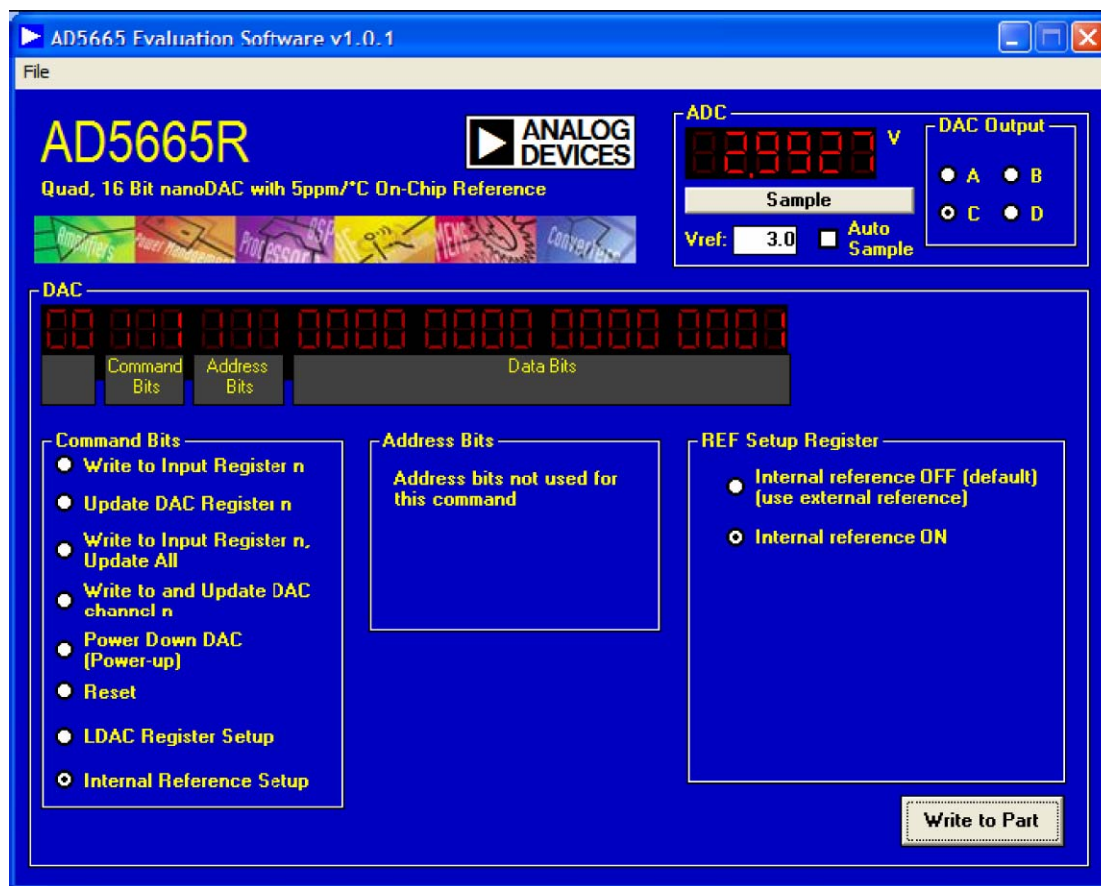


Figure 4. AD5665R Evaluation Software Main Window, Reference Setup

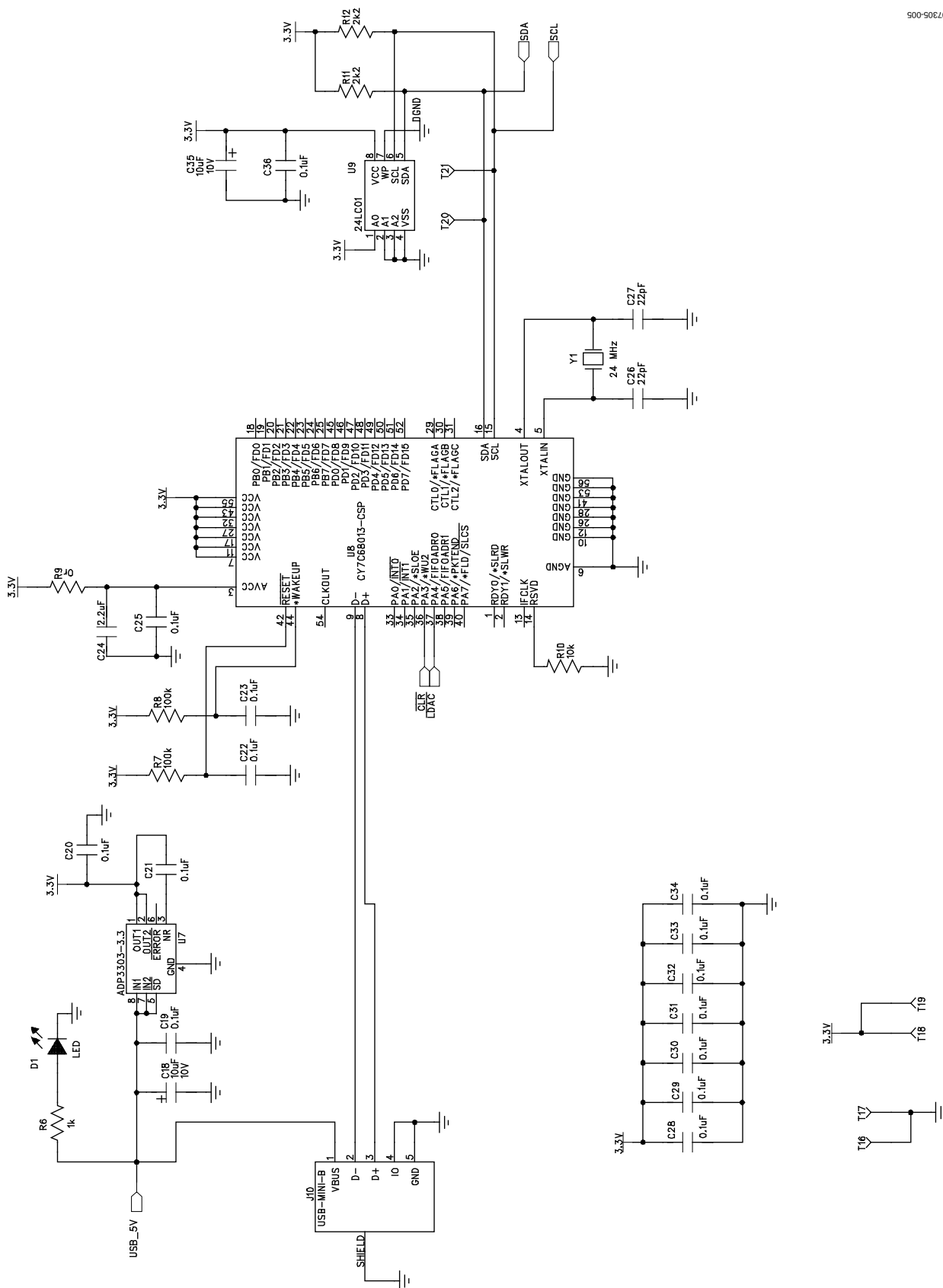
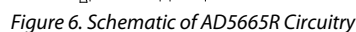


Figure 5. Schematic of Controller Circuitry



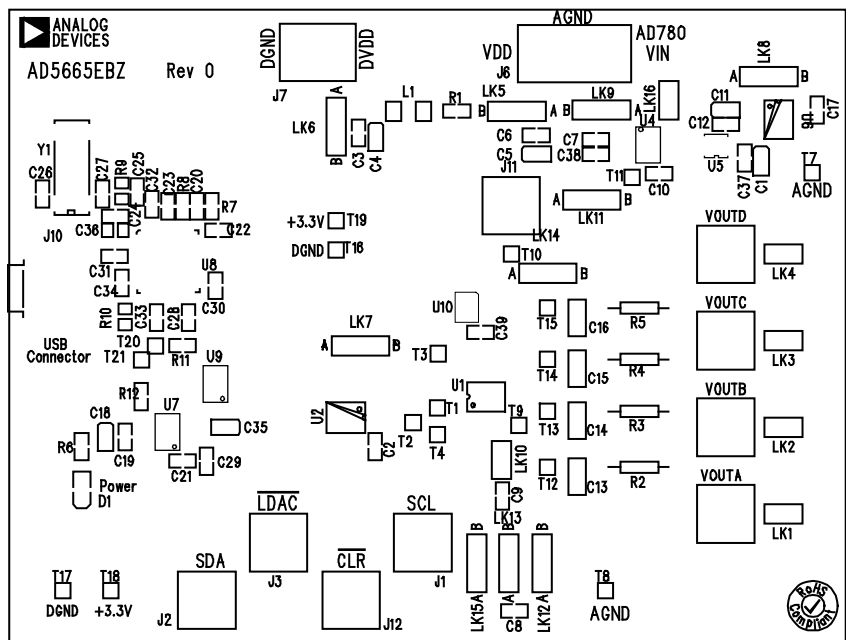


Figure 7. Component Placement Drawing

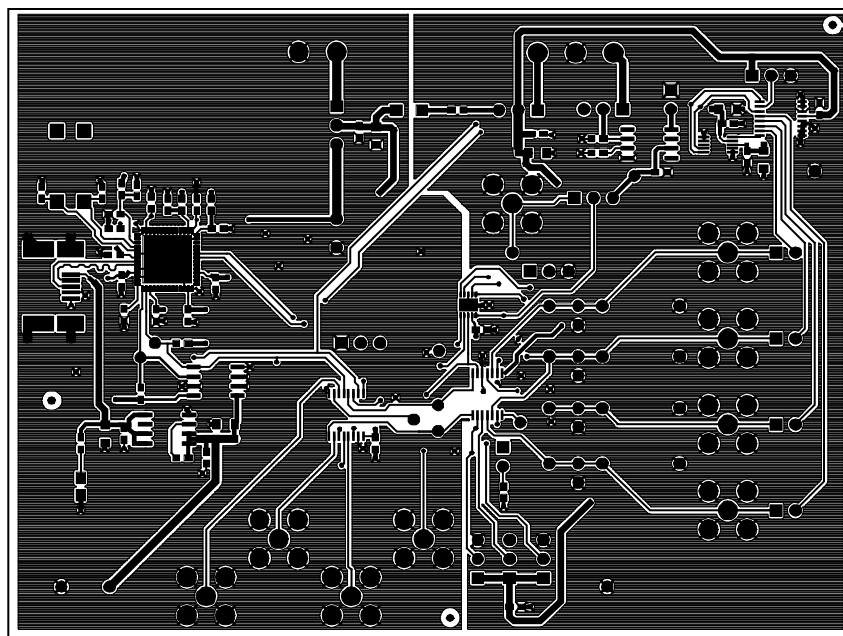


Figure 8. Component Side PCB Drawing

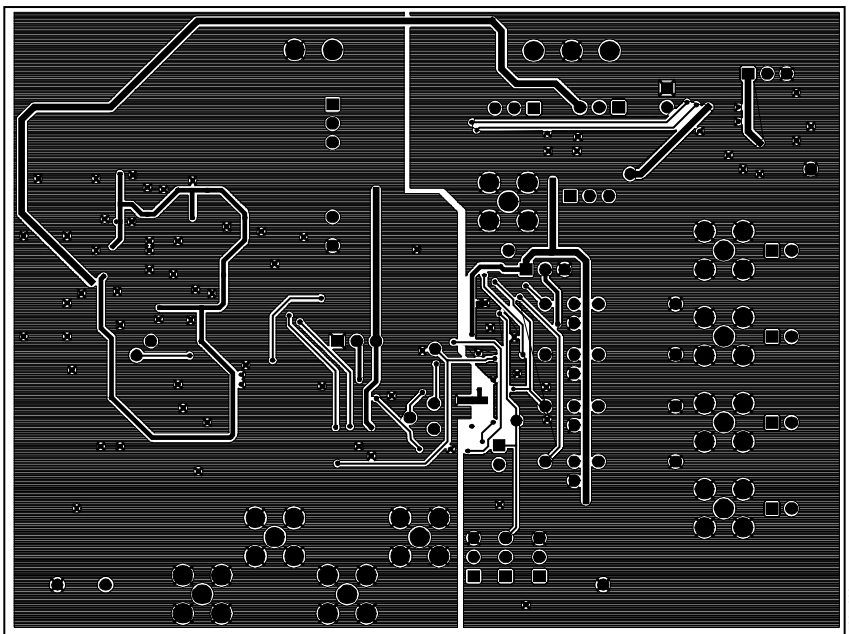


Figure 9. Solder Side PCB Drawing

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ORDERING INFORMATION BILL OF MATERIALS

Table 3.

Qty	Reference Designator	Description	Supplier/Number
1	U1	AD5665RBRUZ-2	Analog Devices
1	U2	ADG774BRQ	Analog Devices
1	U4	AD780ARZ	Analog Devices
1	U5	AD7992BRMZ-1	Analog Devices
1	U6	ADG728BRU	Analog Devices
1	U7	ADP3303AR-3.3	Analog Devices
1	U8	CY7C68013-CSP	Embassy CY7C68013-56LFC
1	U9	24LC01	FEC 975-8070
1	U10	AD5665RBCPZ	Analog Devices
1	Y1	24 MHz crystal	FEC 569-872
9	VOUTA to VOUTD; J1 to J3, J11, J12	Gold 50 Ω SMB jack	FEC 1019324
1	J10	USB Mini B	FEC 476-8309
1	J6	Power connectors	FEC 963-3972
1	J7	Power connectors	FEC 963-2980
1	D1	LED	FEC 515-620
1	L1	Bead	FEC 9526862
5	C1, C4, C5, C18, C35	10 μ F 10 V tantalum capacitor (TAJ-B package)	FEC 197-130
1	C11	1 μ F 10 V tantalum capacitor (TAJ-B package)	FEC 1135234
2	C26, C27	22 pF (0603 package)	FEC 722-005
24	C2, C3, C6, C7, C8, C9, C12, C17, C19 to C23, C25, C28 to C34, C36, C37, C39	0.1 μ F (0603 package)	FEC 9632972
1	C24	2.2 μ F (0603 package)	FEC 9632972
2	C10, C38	1 μ F (0603 package)	FEC 9632972
4	C13 to C16	0805 package (not inserted)	
1	R1	1.5 Ω	FEC 758-267
4	R2 to R5	Wire-wrap pin (not inserted)	
1	R6	1 k Ω (0603 package)	FEC 911-239
2	R7, R8	100 k Ω (0603 package)	FEC 911 471
2	R11, R12	2.2 k Ω (0603 package)	FEC 911-276
1	R10	10 k Ω (0603 package)	FEC 911-355
1	R9	0 Ω (0603 package)	FEC 772-227
6	LK1 to LK4, LK10, LK16	Header (2 $\times$ 1 pin)	FEC 511-705
10	LK5 to LK9, LK11 to LK15	Header (3 $\times$ 1 pin)	FEC 511-717
19	T1 to T4, T7 to T21	Test point	FEC 873-1144

ORDERING GUIDE

Model	Description
EVAL-AD5665REBZ1 ¹	TSSOP Evaluation Board, Populated with AD5665RBRUZ-2
EVAL-AD5665REBZ2 ¹	LFCSP Evaluation Board, Populated with AD5665RBCPZ

¹ Z = RoHS Compliant Part.

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.