Evaluation Board for AD5360/AD5361/AD5362/AD5363

Preliminary Technical Data

EVAL-AD5360/1/2/3EBZ

FEATURES

Full-Featured Evaluation Board for the AD5360/AD5361/AD5362/AD5363
USB Interface
PC Software for Register Programming
Various Reference Voltages Available
Stand-Alone Operation

INTRODUCTION

This Technical Note describes the operation and functionality of the Evaluation Board for the AD5360, AD5361, AD5362 and AD5363. As these 4 parts are pin compatible the same evaluation board is used for all. AD536x will be used throughout this technical note to refer to the actual multi-channel DAC used on the board. This note should be used in conjunction with the data sheet of the appropriate DAC. The evaluation board allows the functionality and performance of the AD536x to be evaluated easily. The evaluation board can be used as a stand alone board with control coming from an external DSP or micro-controller or it can be connected to a PC. Software is provided which can be used to program the registers of the AD536x. Control of the AD536x is achieved via a USB interface

FUNCTIONAL BLOCK DIAGRAM

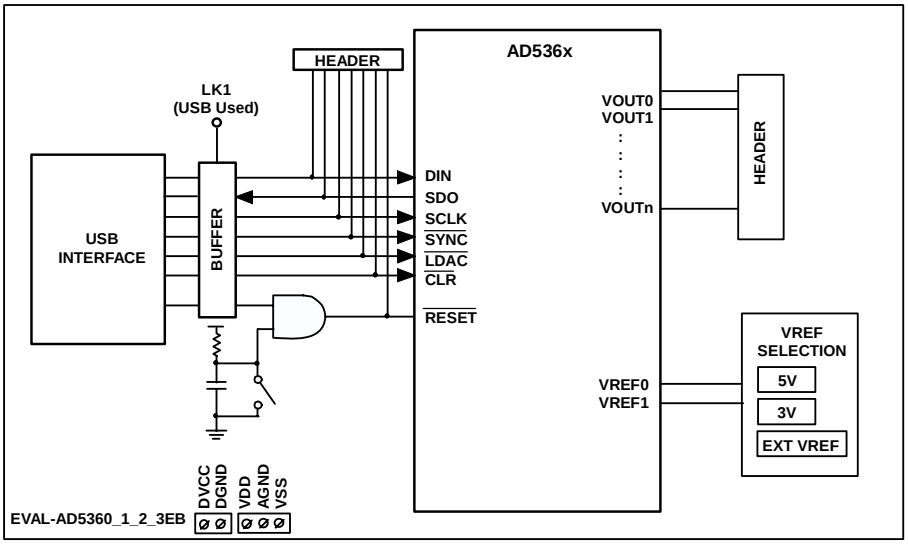

Figure 1. Functional Block Diagram

Rev. PrC
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REVISION HISTORY

GENERAL DESCRIPTION

FUNCTIONALITY OVERVIEW

The evaluation board for the AD536x is designed to allow the user to fully evaluate all the functions and performance of the AD536x prior to designing it into a system. The evaluation board can be used in a stand-alone mode with the control signals being provided through the 20 pin header J3 or it can be connected to a PC using the USB cable supplied with the evaluation board kit. Software is provided which allows the user to program the various registers of the AD536x with ease. The software operation is described later in this document.

POWER SUPPLIES

The evaluation board requires a +5V supply for DV_{CC}. The V_{DD} and V_{SS} supplies can be any value within the power supply limits as specified in the AD536x data sheet. Power supply connections are made to the screw terminals of J2. The USB interface, if used, gets its power supply from the USB port of the PC. This power supply is not used by the AD536x or any of its associated circuitry. When connecting the power supply leads it is recommended that the supplies are turned off and that the ground leads are connected first.

REFERENCE SELECTION

The evaluation board includes two voltage references ICs, the ADR435 and ADR423 which are 5V and 3V references respectively. An SMB connector is provided to allow an external voltage to be connected for use as a reference. Link LK4 is used to select which reference source is used by the AD536x as shown in Table 1.

Table 1. Reference Selection using LK4

LK4 Position	Description
A	The reference voltage is 3V
B	The reference voltage is 5V (default)
C	The voltage on the SMB connector, EXT_REF, is used as the reference voltage

By default the voltage reference pins of the AD536x, VREF0 and VREF1, both use the same reference, i.e. that selected by LK4. If it is required that the reference pins should use different voltage references this can be achieved by removing the 0Ω resistor associated with each VREF pin. The required reference can then be connected to the testpoint associated with the VREF pin. Table 2 shows the 0Ω resistor and testpoint associated with each VREF pin.

Table 2. 0Ω Resistor and Testpoints for VREF pins

VREF	Resistor	Testpoint
VREF0	R16	T25
VREF1	R17	T26

DAC OUTPUTS

The DAC outputs are available on the 50 pin header J4. The first 16 pins are the 16 VOUT pins for the AD5360 and AD5361 devices. When the AD5362 or AD5363 is used the outputs are available on the pins indicated in Table 3.

Table 3. DAC Output Pins for AD5362 and AD5363

VOUT	Pin	Pin	VOUT
VOUT0	1	2	VOUT1
VOUT2	3	4	VOUT3
VOUT4	9	10	VOUT5
VOUT6	11	12	VOUT7

USING THE USB INTERFACE

The software provided with the evaluation board kit allows the user to program the registers of the AD536x via the USB interface. It is important that the software supplied is installed on the PC before the board is connected. See the Using the USB Software section for more information. The USB circuitry gets its power from the USB port of the PC and will generate the required interface signals, $\overline{\text{RESET}}$, $\overline{\text{CLR}}$, $\overline{\text{SYNC}}$, SCLK etc. to control the AD536x. To use the interface LK1, LK3 and LK8 should be in place. The function of these links is described in Table 5. LK2 should be in position A to select the binary numeric format which is required for USB operation.

STAND-ALONE OPERATION

The evaluation board can be used as a stand-alone device if required. This has the advantage that it lets the user to connect the interface pins of the AD536x to their own DSP or micro-controller thus allowing them to write code to operate the AD536x as their application requires. To use the board in stand-alone mode the connection to the USB interface must be removed. This is achieved by removing LK1, which will three-state the connections to $\overline{\text{CLR}}$, $\overline{\text{LDAC}}$, $\overline{\text{SYNC}}$, SCLK and DIN. LK3 should be removed to isolate the $\overline{\text{RESET}}$ pin from the USB interface and the push-button. The interface signals required to control the AD536x can then be provided through the 20 pin header J3. The pinout of J3 is shown in Table 4

Table 4. J3 Header Pinout

Pin	Signal	Pin	Signal
1	DIN	8	$\overline{\text{LDAC}}$
2	NC	10	$\overline{\text{CLR}}$
3	SCLK	12	$\overline{\text{BUSY}}$
4	NC	14	$\overline{\text{RESET}}$
5	NC	16	NC
6	$\overline{\text{SYNC}}$	18	NC
7,9,11,13, 15,17,19,20	DGND		

Table 5. Summary of Link Positions

Link	Description
LK1	Determines if the USB interface is to be used If this link is inserted the USB interface will generate the signals required to control the AD536x If this link is removed the USB interface is not used and header J3 must be used to provde signals to the AD536x
LK2	Selects the numberic format for the DAC codes If this link is in position A then Binary Format is used. This option should be selected if the PC software is used If this link is in position B then 2s Complement Format is used
LK3	Selects Source of the $\overline{\text{RESET}}$ signal If this link is inserted the $\overline{\text{RESET}}$signal comes from either the $\overline{\text{RESET}}$ push-button being pressed or a $\overline{\text{RESET}}$ signal being issued by the USB interface If this link is removed the $\overline{\text{RESET}}$ signal must come for the header J3
LK4	Selects the Reference Source If this link is in position A the 3V reference is selected If this link is in position B the 5V reference is selected If this link is in position C the voltage on SMB connector EXT_REF is selected
LK8	Selects the Source of the $\overline{\text{CLR}}$ signal If this link is inserted the $\overline{\text{CLR}}$ signal comes from the USB interface If this link is removed the $\overline{\text{CLR}}$ signal must come for the header J3

USING THE USB SOFTWARE

The evaluation board kit comes supplied with a CD containing PC software allowing the user to control the evaluation board via the USB interface. The software **must** be installed before the evaluation board is connected to the USB port. The software installation program usually runs automatically when the CD is inserted in the drive but if this doesn't happen the user should double-click on the SETUP.EXE file in the root directory of the CD. The software will be installed and shortcuts will be placed on the Start Menu in a folder called Analog Devices. When the software has been installed the evaluation board can be connected to the USB port.

When the software is started the user is presented with a selection box. The selection box presents a choice of all the high channel count DACs in the AD536x and AD537x family. The user should click the button appropriate to the board being used.

The first tab in the main operating window, shown in Figure 6, allows the user to send data to the registers of any of the DACs. All the available channels are shown in the DAC selection section. When one of the radio buttons is selected the lower portion of the screen will show the values currently assigned to that DAC channel. The X1A, X1B, M or C registers can be updated simply by entering the desired code and clicking the X, M or C button. Note that when the X button is pressed the X1A or X1B register is updated according to the selection of the A/B radio button.
To update the DAC output the user should click the LDAC button.

The Input Code block allows the user to store several commonly used values and select between them as required.

The second tab of the tabbed dialog box also allows the user to change the contents of the Offset DACs. The values loaded to the Offset DACs will not affect the output voltages until $\overline{\text{LDAC}}$ is pulsed.

The third tab of the tabbed dialog box allows the user to assert or negate the $\overline{\text{RESET}}$ and $\overline{\text{CLR}}$ and $\overline{\text{LDAC}}$. The user can also write 24 bits directly to the part. This can be useful, for example, to write to a group of channels using a single write operation. This function operates independently from the rest of the software so any changes made by a direct write will not be evident in the rest of the software. For example, if the direct write changes the X1 register of all channels to 0xFFFF the first tab in the main operating window will not be updated and will continue to show the previous values that were entered.

The fourth tab shows the expected output voltages based on the values of the X, M and C registers from the main operating window, the reference value and the Offset DAC value. These values are recalculated every time the tab is viewed.

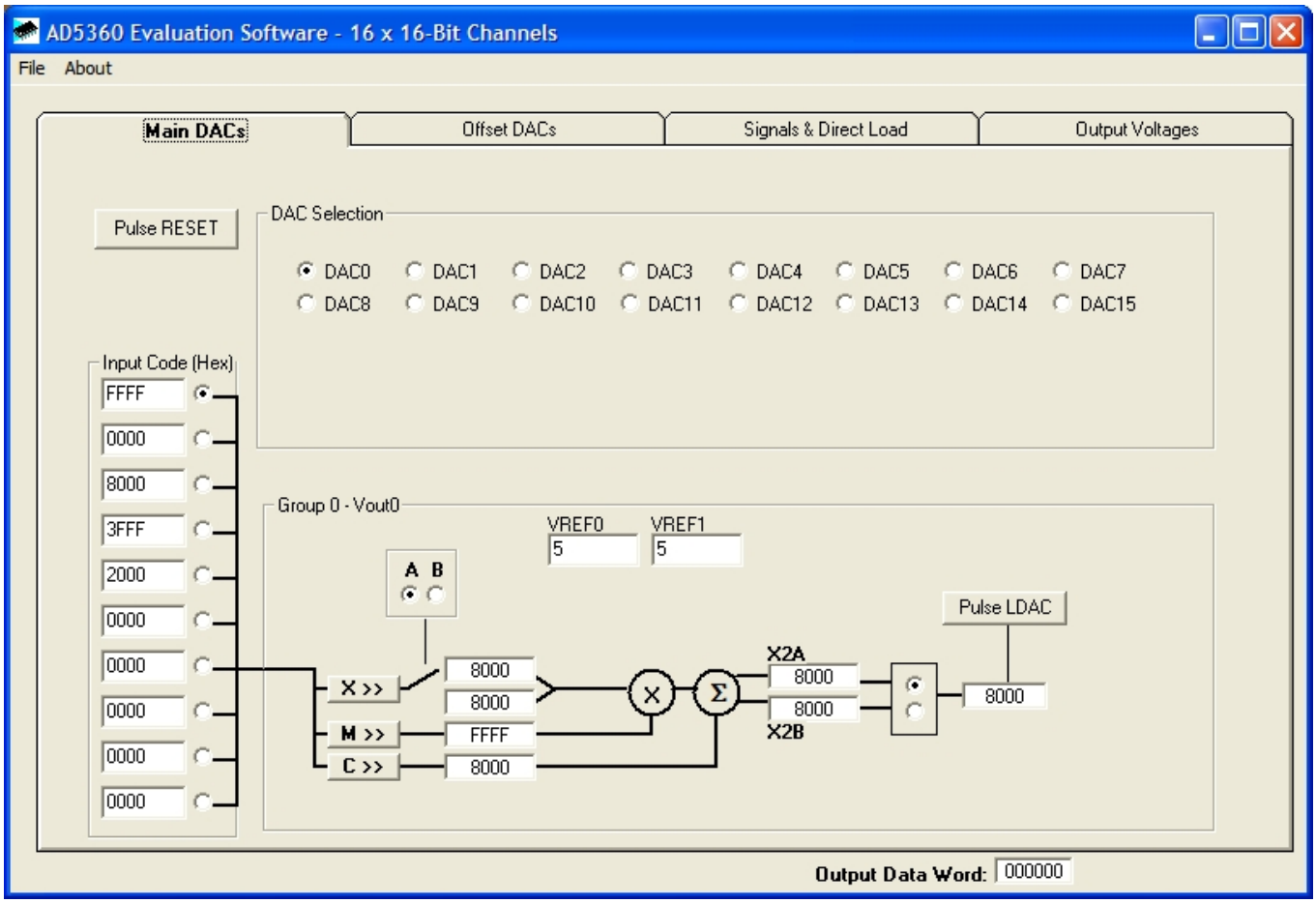

Figure 2. AD536x Tab 1 Software Screenshot

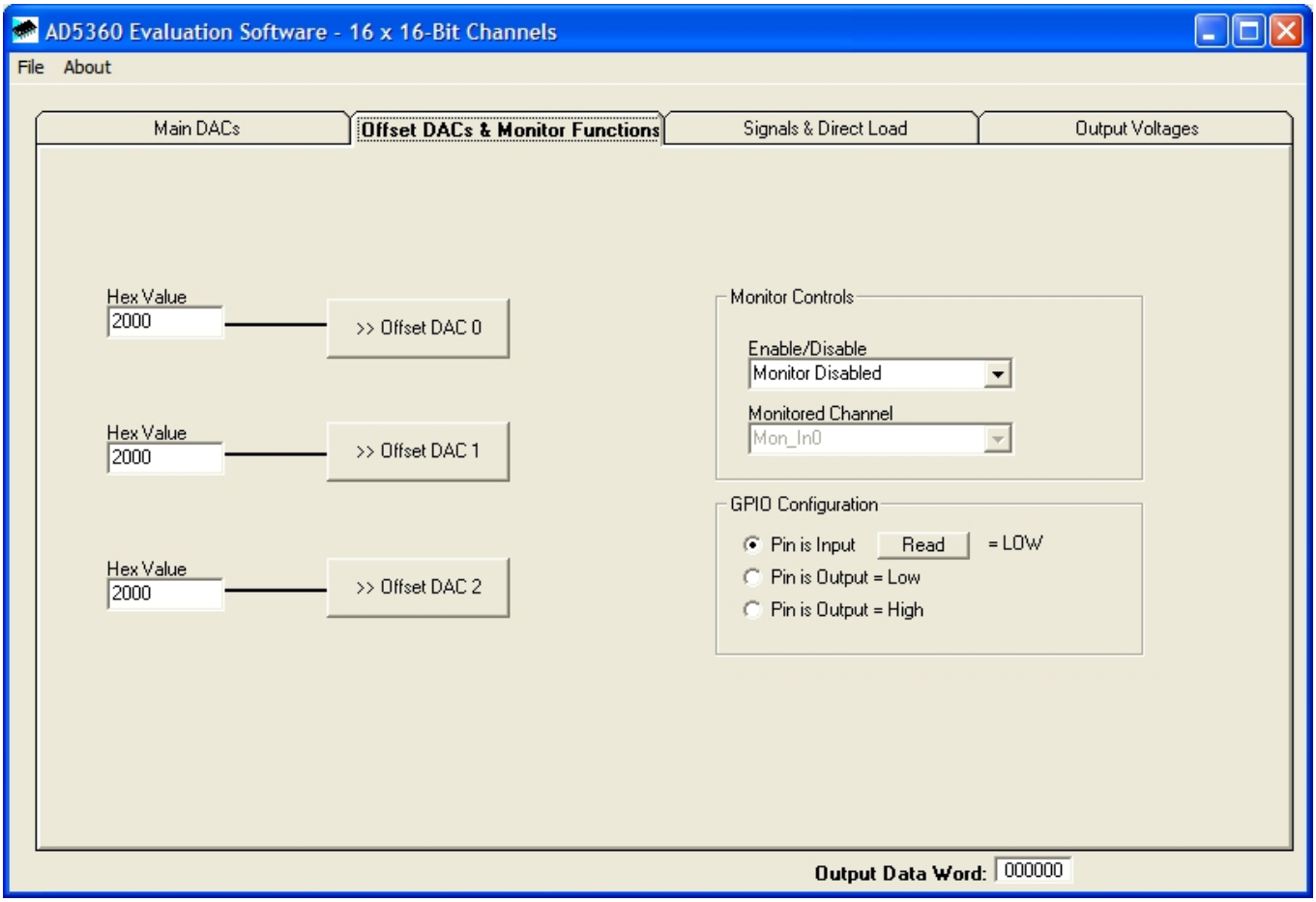

Figure 3. AD536x Tab 2 Software Screenshot

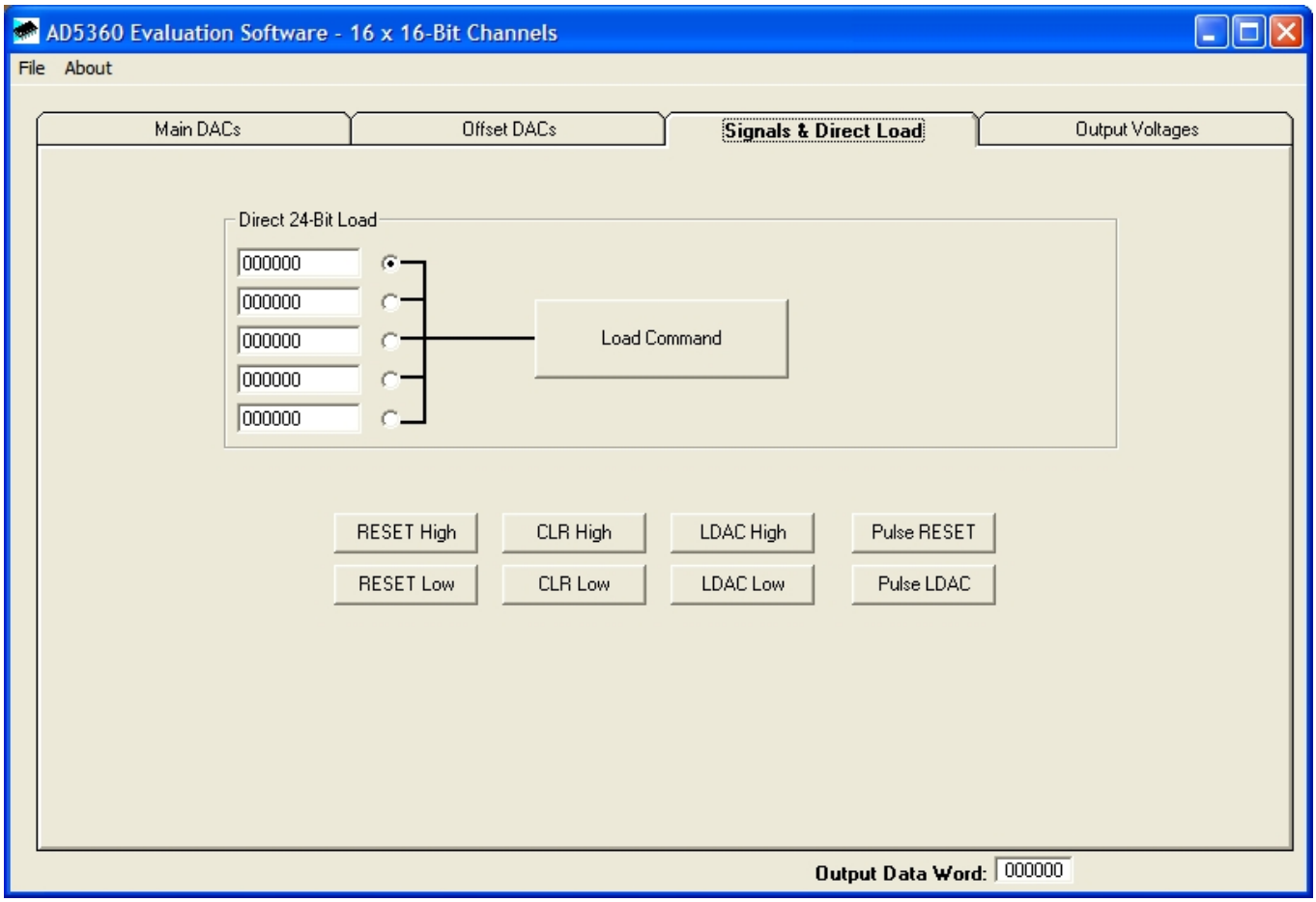

Figure 4. AD536x Tab 3 Software Screenshot

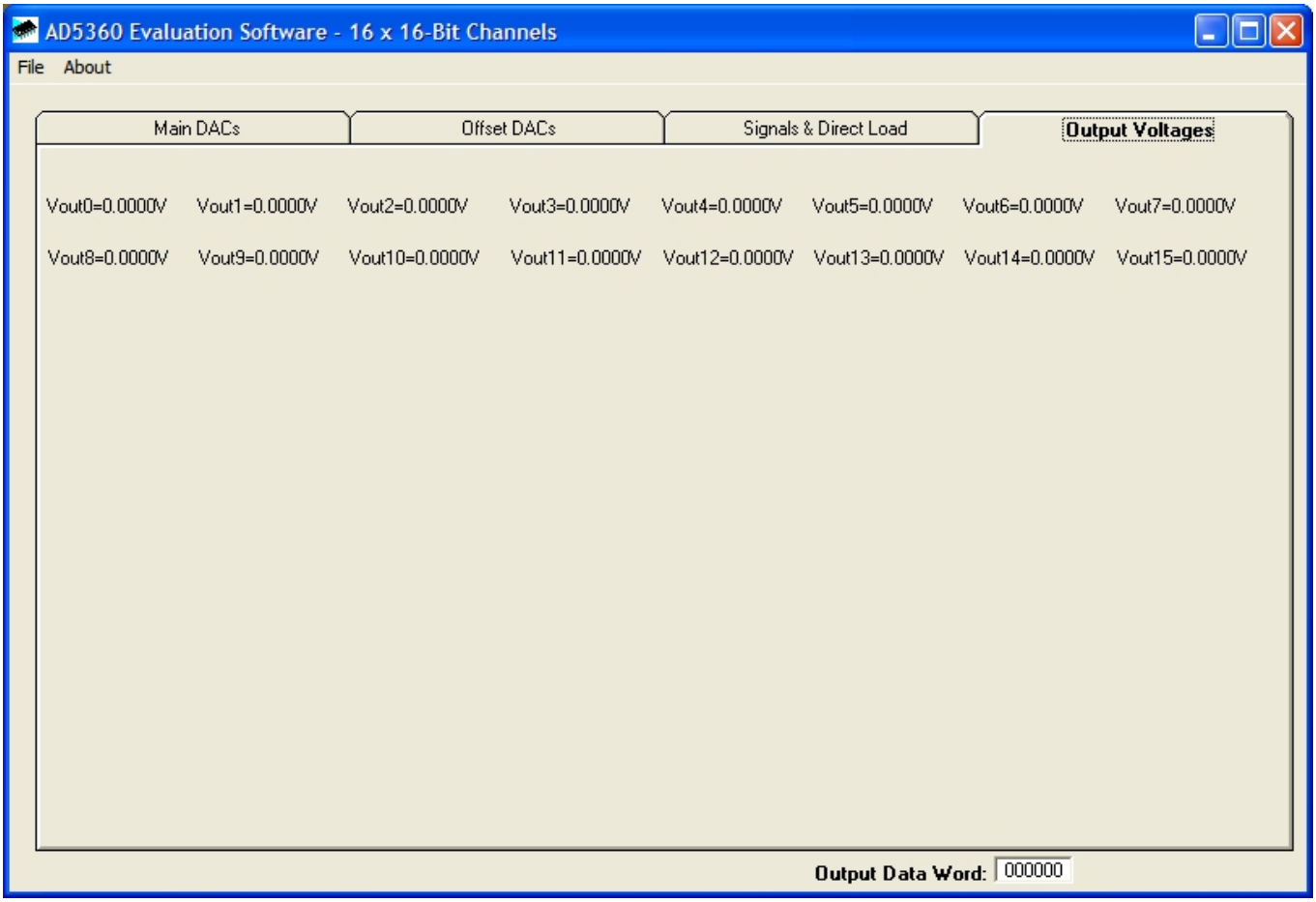

Figure 5. AD536x Tab 4 Software Screenshot

SCHEMATICS

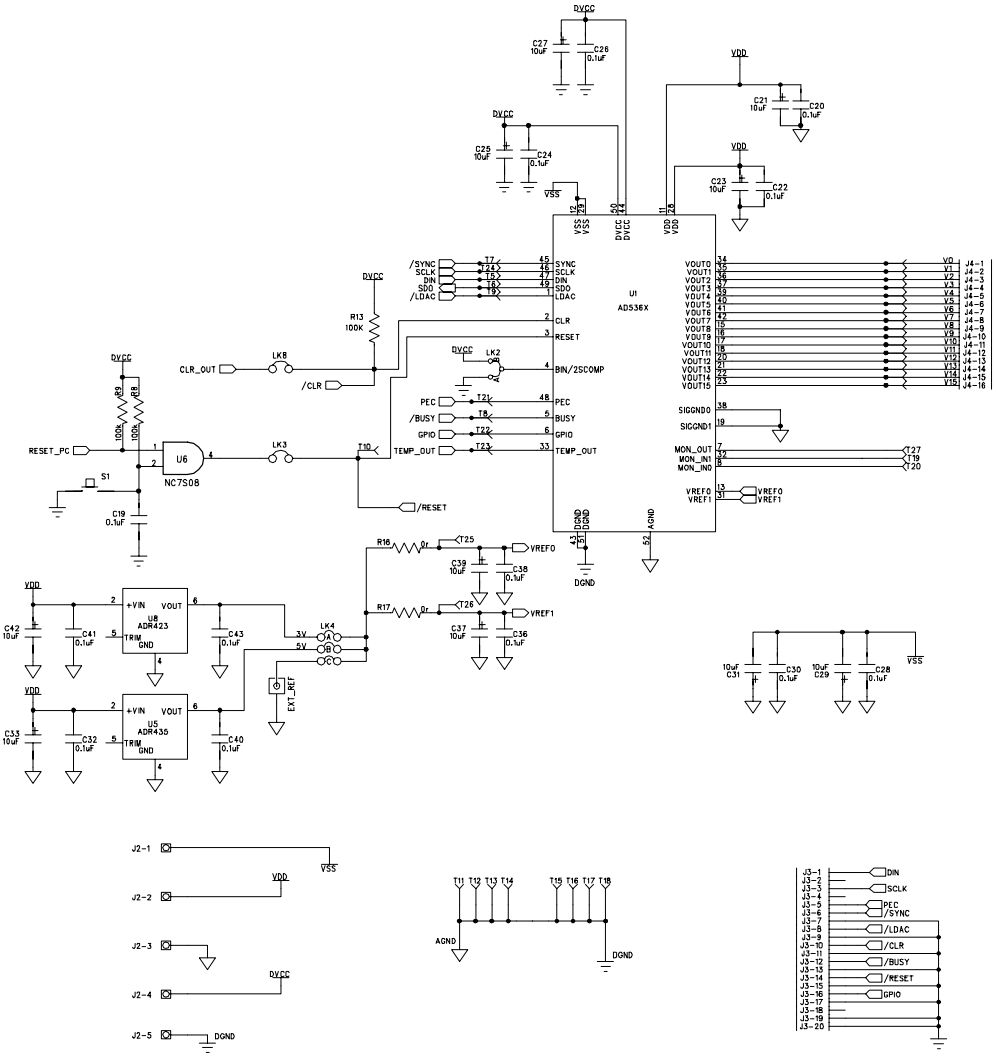

Figure 6. AD536x Schematic (1 of 2)

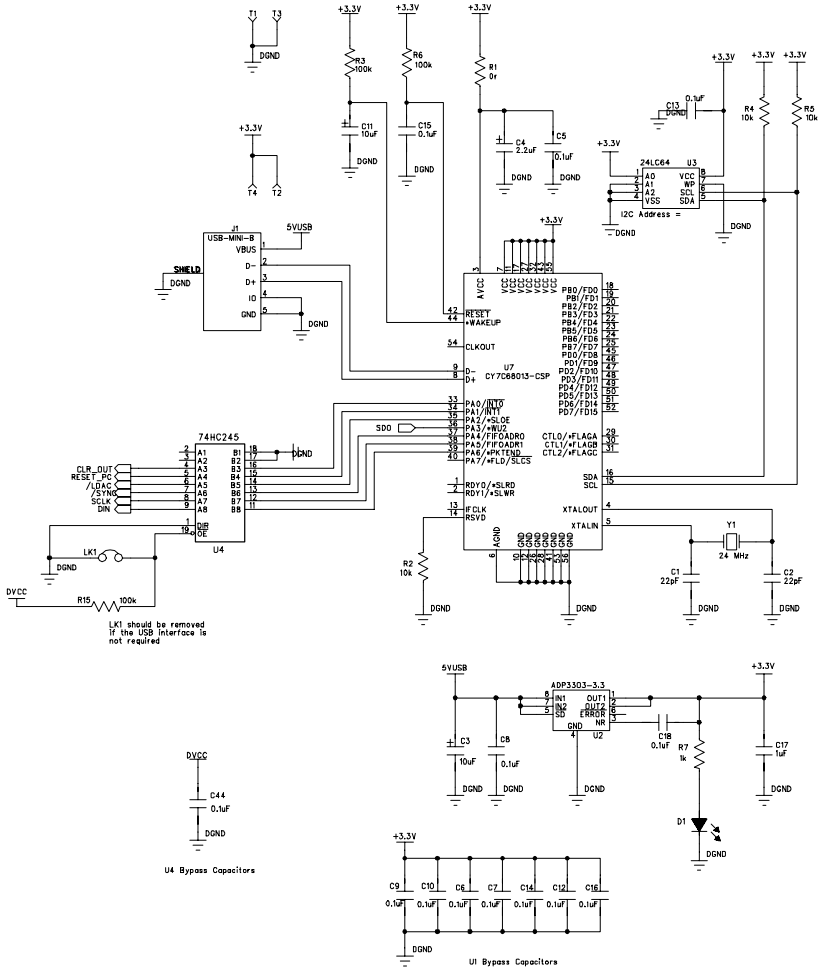

Figure 7. AD536x Schematic (2 of 2)

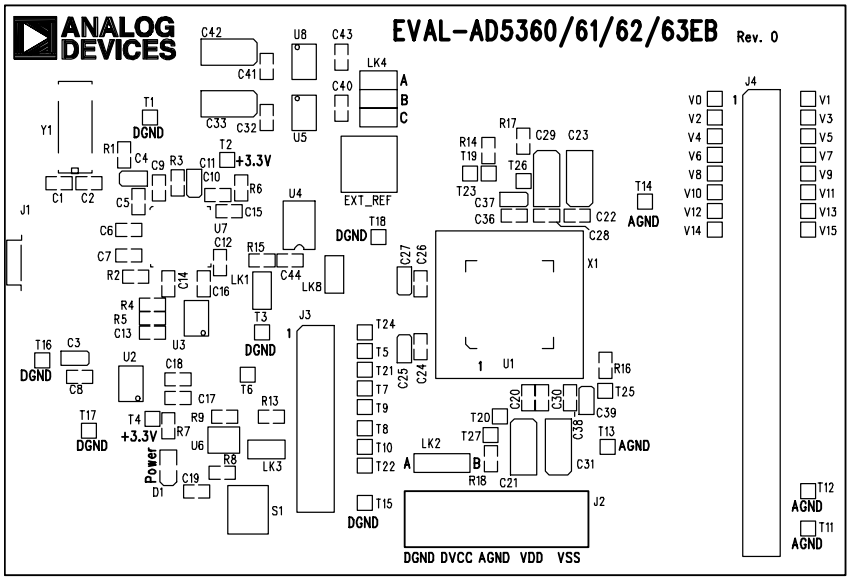

Figure 8. AD536x Component Side Silkscreen

Table 6. Bill Of Materials

Name	Part Type	Value	Part Description	Stock Code[1]
U1	AD536X		8/16-Channel 16/14-Bit DAC	
U2	ADP3303-3.3		Precision Low Dropout Voltage Regulator	ADP3303AR-3.3
U8	ADR423		3V Reference	ADR423AR
U5	ADR435		5V Reference	ADR435AR
U3	24LC64		64K I2C Serial EEPROM	Digikey 24LC64-I/SN-ND
U4	74HC245		Bus Transciever	Digikey 296-8279-1-ND
U7	CY7C68013-CSP		USB Microcontroller	CY7C68013-56LFC
J4	HEADER50		50 Pin (2x25) 0.1" Pitch Header	FEC 148-535
J2	CON\POWER5		5 Pin Termical Block	FEC 151-785 & 151-786
S1	SW-PUSH		Push Button Switch (sealed 6mm x 6mm)	FEC 177-807
C3, C11, C25, C27, C37, C39	CAP+	10µF	10V SMD Tantalum Capacitor	FEC 197-130
C21, C23, C29, C31, C33, C42	CAP+	10µF	25V SMD Tantalum Capacitor	FEC 197-518
C17	CAP	1µF	10V DC Y5V Ceramic Capacitor	FEC 318-8840
D1	LED		Green Light Emitting Diode	FEC 359-9681
EXT_REF	SMB		50r Straight SMB Jack	FEC 365 1228
J1	USB-MINI-B		USB Mini-B Connector (usb-otg)	FEC 476-8309 (Digikey WM2499CT-ND)
C4	CAP+	2.2µF	10V SMD Tantalum Capacitor	FEC 498-646
LK1, LK3, LK8	JUMPER		2 Pin (0.1" Pitch) Header & Shorting Shunt	FEC 511-705 & 150-411
LK2	JUMPER2\SIP3		3 Pin (0.1" Pitch) Header & Shorting Shunt	FEC 511-717 & 150-411
LK4	JUMPER-3		6 Pin (3x2) 0.1" Header & Shorting Block	FEC 511-780 & 150-411
J3	HEADER20		20 Pin (2x10) 0.1" Pitch Header	FEC 511-833
Y1	XTAL-CM309S	24 MHz	Plastic SMD Crystal	FEC 569-872
U6	NC7S08		Tinylogic AND Gate	FEC 685-926
C1, C2	CAP	22pF	50V NPO SMD Ceramic Capacitor	FEC 722-005
R1, R16, R17	RES	0Ω	SMD Resistor	FEC 772-227
T1, T3, T11, T12, T13, T14, T15, T16, T17, T18	TESTPOINT		Black Testpoint	FEC 873-1128
T2, T4, T5, T6, T7, T8, T9, T10, T19, T20, T21, T22, T23, T24, T25, T26, T27	TESTPOINT		Red Testpoint	FEC 873-1144
Name	Part Type	Value	Part Description	Stock Code
V0-V15	TESTPOINT		Red Testpoint	FEC 873-1144

C5, C6, C7, C8, C9, C10, C12, C13, C14, C15, C16, C18, C19, C20, C22, C24, C26, C28, C30, C32, C36, C38, C40, C41, C43, C44	CAP	0.1µF	50V X7R Multilayer Ceramic Capacitor	FEC 882-0023
R7	RES	1kΩ	SMD Resistor	FEC 911-239
R2	RES	10kΩ	SMD Resistor	FEC 911-355
R4	RES	10kΩ	SMD Resistor	FEC 911-355
R5	RES	10kΩ	SMD Resistor	FEC 911-355
R3, R6, R8, R9, R13, R14, R15, R18	RES	100kΩ	SMD Resistor	FEC 911-471

[1] FEC = www.farnell.com, Digikey = www.digikey.com