

**FEATURES**

**Full-featured evaluation board for the AD5590**  
**USB interface**  
**PC software for register programming**  
**Various reference voltages available**  
**Standalone operation**

**GENERAL DESCRIPTION**

This data sheet describes the operation and functionality of the evaluation board for the AD5590. This data sheet should be used in conjunction with the AD5590 data sheet. The evaluation board allows the functionality and performance of the AD5590 to be easily evaluated. The evaluation board can be used as a standalone board with control coming from an external DSP or microcontroller, or it can be connected to a PC via the USB port. Software is provided, which can be used to program the registers of the AD5590, read data from the ADC channels, and write data to the DAC channels.

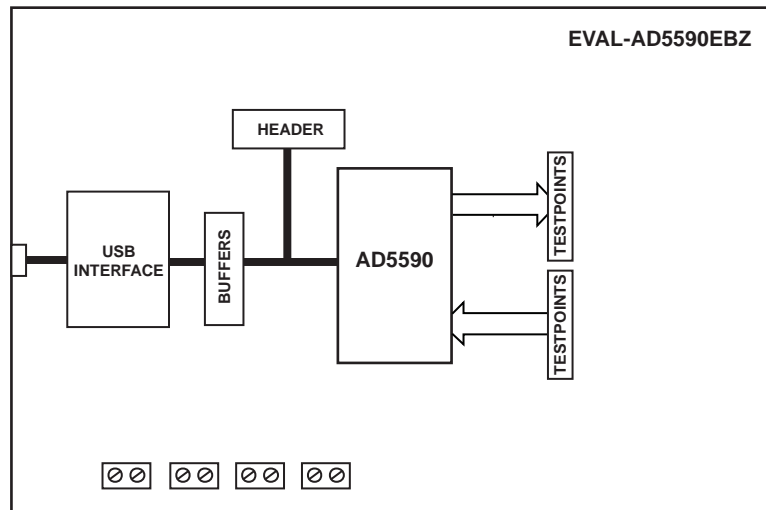
**FUNCTIONAL BLOCK DIAGRAM**

Figure 1.

**Rev. 0**

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## REVISION HISTORY

1/09—Revision 0: Initial Version

## EVALUATION BOARD HARDWARE

### OVERVIEW

The evaluation board for the AD5590 is designed to allow the user to evaluate all the functions and performance of the AD5590 prior to designing it into a system. The evaluation board can be used in a standalone mode with the control signals provided through the 20-pin header, J1, 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 AD5590 with ease. The software operation is described in the Evaluation Board Software section.

### POWER SUPPLIES

The evaluation board requires a number of supplies depending on how it is configured. Table 1 describes the function of each of the connectors.

**Table 1. Power Supply Connectors**

Connector	Description
J3	5 V supply connection for AD5590 Op Amp AMP0 to Op Amp AMP3
J4	5 V supply connection for AD5590 Op Amp AMP4 to Op Amp AMP7
J5	5 V supply connection for AD5590 ADC and DACs
J6	Supply connection for AD5590 $V_{DRIVE}$ pin

To provide maximum flexibility, the AD5590 evaluation board has various links that can be used to group power supply pins together to reduce the number of power supplies required. Details of the link positions are given in Table 2.

**Table 2. Power Supply Links**

Link	Description
LK33	LK33 connects the V1+ supply to the V2+ supply.
LK34	LK34 connects the V1– supply to the V2– supply.
LK35	This link performs two functions. When the link is in Position A, the VDD supply is also connected to the V2+ supply for AMP4 to AMP7 (and, depending on the position of LK33, to the V1+ supply for AMP0 to AMP3). When the link is in Position B, the USB interface is used as the power supply for VDD. LK35 can have links in both Position A and Position B. This allows the evaluation board to be run completely from the USB interface; that is, no external power supplies are needed.
LK36	This link connects V2– to AGND. This link should be in place if the op amps are used with a single supply.
LK37	This link selects the power supply source for the $V_{DRIVE}$ pin. In Position A, the $V_{DRIVE}$ pin is connected to the AVDD supply. In Position B, the $V_{DRIVE}$ pin is connected to the EXT VDRIVE connector (J6).

**Table 3. Link Positions for Standalone Operation**

Link	Position
LK33	Inserted
LK34	Inserted
LK35	A and B
LK36	Inserted
LK37	A

### REFERENCE SELECTION

The AD5590 contains two internal 2.5 V references. Either of these references can be used to connect to  $V_{REFA}$  to provide a reference for the ADC block. LK16 selects which reference is used. Table 4 shows the link functions.

**Table 4.  $V_{REFA}$  Selection Using LK16**

LK16 Position	Description
A	Selects an external reference on the VREF SMB connector
B	$V_{REFIN1}/V_{REFOUT1}$ is connected to $V_{REFA}$
C	$V_{REFIN2}/V_{REFOUT2}$ is connected to $V_{REFA}$

### USING THE USB INTERFACE

The software provided with the evaluation board kit allows the user to program the registers of the AD5590 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 receives its power from the USB port of the PC and generates the required interface signals to control the AD5590. To use the interface, LK38 should be in place.

### STANDALONE OPERATION

The evaluation board can be used as a standalone device if required. The advantage is that it allows the user to connect the interface pins of the AD5590 to their own DSP or microcontroller, thus allowing them to write code to operate the AD5590 as the application requires. To use the board in standalone mode, the connection to the USB interface must be removed. This is achieved by removing LK38, which three-states the connections to the AD5590 interface pins. The interface signals required to control the AD5590 can then be provided through the 20-pin header, J1. The pinout of J1 is shown in Table 5.

# EVAL-AD5590

Table 5. J1 Header Pinout

Pin	Signal	Pin	Signal
1	DSYNC1	2	DGND
3	DSYNC2	4	DGND
5	DSCLK	6	DGND
7	DDIN	8	DGND
9	LDAC	10	DGND
11	CLR	12	DGND
13	ASCLK	14	DGND
15	ASYNC	16	DGND
17	ADIN	18	DGND
19	ADOUT	20	DGND

## ANALOG INPUTS

The analog inputs to the AD5590 can be accessed by connecting the input signals to Test Point VIN0 to Test Point VIN15. Each input has a link in series with the test point, allowing the input to be grounded if necessary. Ground any inputs that are not used.

## ANALOG OUTPUTS

The AD5590 DAC analog outputs are available on Test Point VOUT0 to Test Point VOUT15.

## EVALUATION BOARD SOFTWARE

### USING THE USB SOFTWARE

The evaluation board kit comes supplied with a CD containing PC software that allows you to control the evaluation board via the USB interface.

1. The software must be installed before the evaluation board is connected to the USB port.
2. The software installation program runs automatically when the CD is inserted in the drive. If this does not happen, double-click **SETUP.EXE** in the root directory of the CD to install the software and to add shortcuts on the **Start** menu under **Analog Devices**.
3. When the software is installed, connect the evaluation board to the USB port.

When you start the software, it checks for the presence of an evaluation board. If a board is not found, a dialog box appears indicating this. The software can be used without the evaluation board. This can be useful for a system designer because the software shows the values that need to be written to the DAC or ADC interface to carry out the required function. Figure 2 shows the main window of the software.

The software has a tabbed section at the bottom of the window. This is divided into four tabs: **DAC0 to DAC7**, **DAC8 to DAC15**, **ADC**, and **Misc**. The DAC tabs are used to select the internal or external references, clear codes, power modes, and software LDAC selections for both blocks of DACs. Because both DAC blocks have an internal reference, either one can be used as the system reference for the other DAC block and the ADC. Take care that both references are not on at the same time if they are connected together via LK16.

The ADC tab is used to select the weak/three-state condition of the ADOUT line (see the [AD5590](#) data sheet for details about this functionality) and the ADC input range.

The **Misc** tab is used to set the state of  $\overline{\text{LDAC}}$  and  $\overline{\text{CLR}}$ . Additionally, specific data can be sent to the DACs and the ADC to perform functions that are not handled by the software.

### WRITING TO THE DACS

The 12-bit hexadecimal values that are to be loaded to the DACs are entered in the 16 text boxes at the top of the window. Each DAC channel has a check box associated with the input register and another associated with the software update of the DAC register. If the input register check box is selected, the value is loaded to the appropriate input register when the **Load Input Register** button is clicked. If the check box is not selected, the value is ignored. After the input registers have been updated, the  $\overline{\text{LDAC}}$  is pulsed if selected in the **Options** menu. Clicking the **Update DAC Register** button issues an individual software LDAC for any channel selected.

### READING FROM THE ADCS

There are two options when reading from the ADC. Clicking the **Read ADC** button reads all 16 channels and displays the 12-bit results as either hexadecimal or decimal values.

Clicking the **Read & Save ADC** button reads and saves to file 512 conversion results on each channel. These samples are not necessarily equidistant because the timing of the software writes depend on the Windows® operating system.

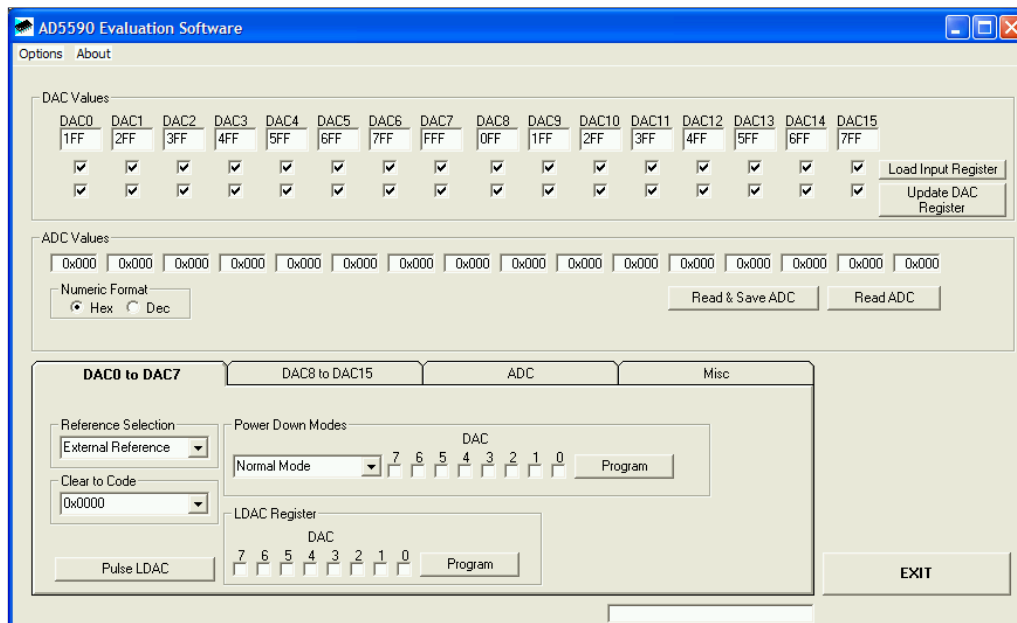


Figure 2. AD5590 Evaluation Software, Main Window

EVALUATION BOARD SCHEMATICS

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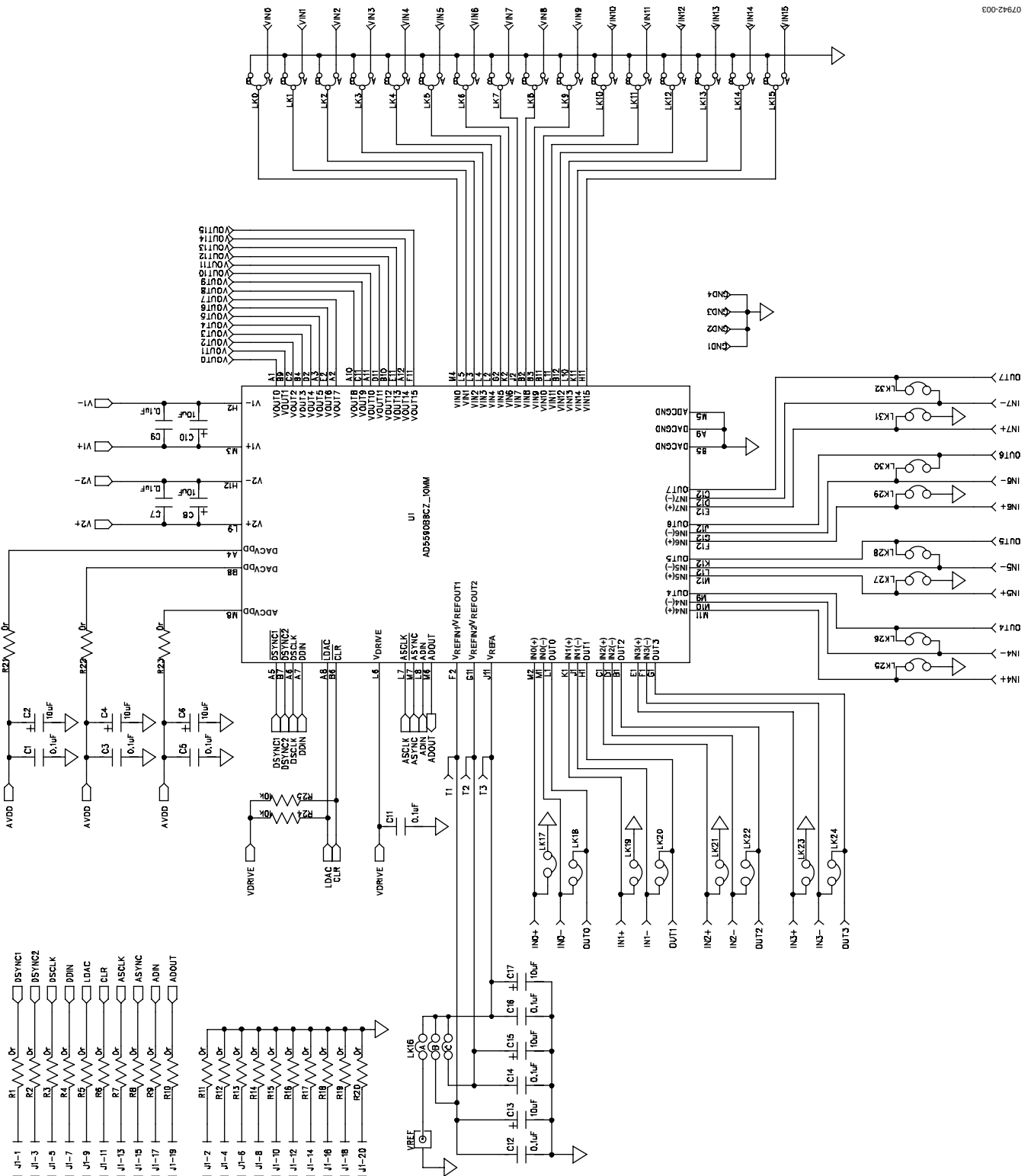


Figure 3. Evaluation Board Schematic (1 of 2)

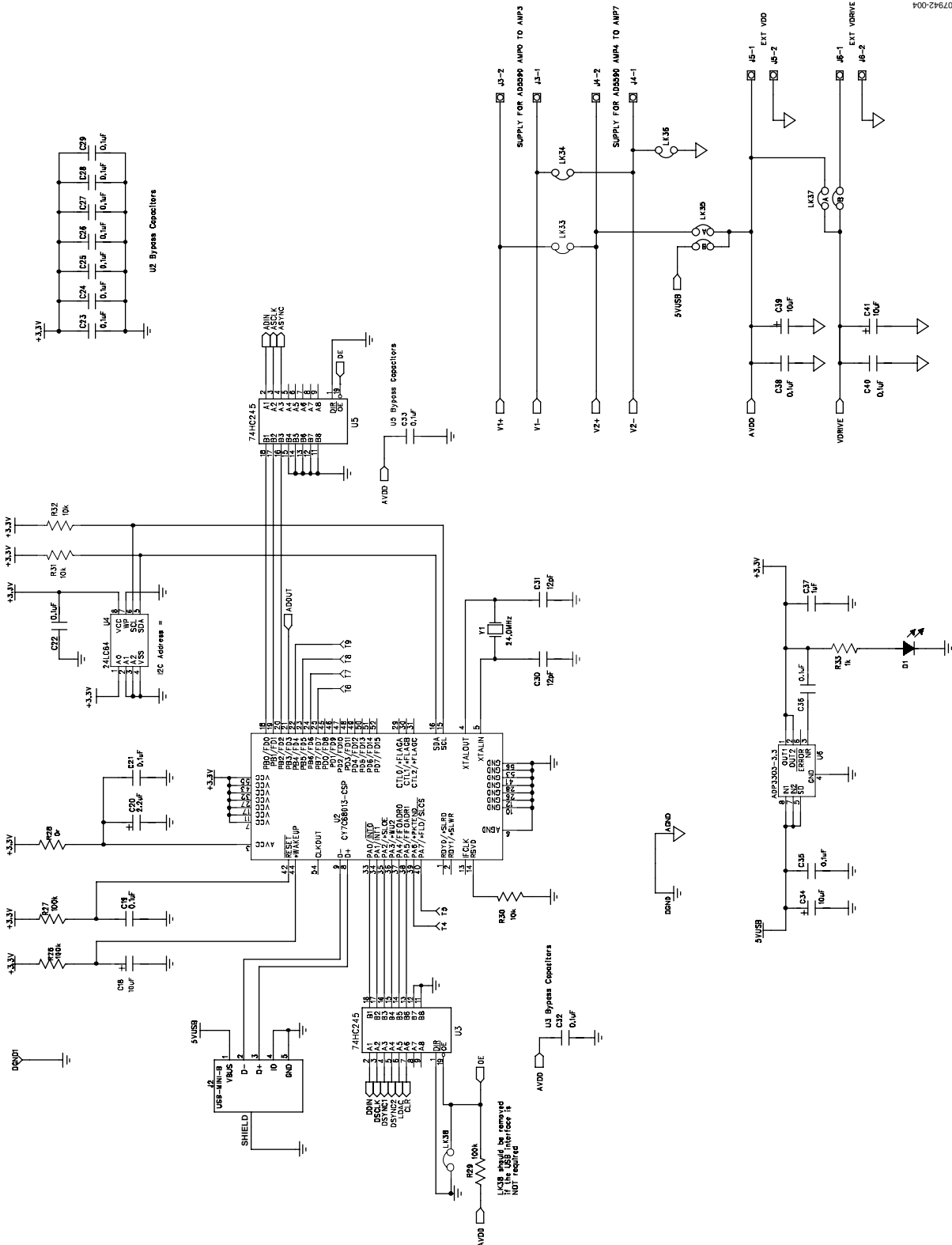


Figure 4. Evaluation Board Schematic (2 of 2)

# EVAL-AD5590

## ORDERING INFORMATION

### BILL OF MATERIALS

Table 6.

Qty	Reference Designator	Description	Manufacturer/Part No.	Supplier/Part No. <sup>1</sup>
25	C1, C3, C5, C7, C9, C11, C12, C14, C16, C19, C21 to C29, C32, C33, C35, C36, C38, C40	0.1 $\mu$ F, 50 V, ceramic capacitor	GRM188R71H104KA93D	FEC 8820023
12	C2, C4, C6, C8, C10, C13, C15, C17, C18, C34, C39, C41	10 $\mu$ F, 10 V, SMD tantalum capacitor	TAJA106K010R	FEC 197-130
1	C20	2.2 $\mu$ F, 10 V, SMD tantalum capacitor	TAJA225K010R	FEC 498-646
2	C30, C31	12 pF, 50 V, NPO SMD ceramic capacitor	2238 867 15129	FEC 721-979
1	C37	1 $\mu$ F, 10 V, dc Y5V ceramic capacitor	2238 246 19863	FEC 318-8840
1	D1	Green SMD LED	HSMG-C170	FEC 579-0852
5	DGND1, GND1 to GND4	Black test point	20-2137	FEC 8731128 (pack)
16	IN0+, IN0-, IN1+, IN1-, IN2+, IN2-, IN3+, IN3-, IN4+, IN4-, IN5+, IN5-, IN6+, IN6-, IN7+, IN7-	Wire wrap pin	73017015	N/A
1	J1	20-way (2 $\times$ 10) header	M20-9981046	FEC 1022242
1	J2	USB Mini-B connector (USB-OTG)	56579-0576	FEC 9786490
4	J3 to J6	2-pin terminal block (5 mm pitch)	CTB5000/2	FEC 151789
16	LK0 to LK15	3-pin SIL header and shorting link	M20-9990345 and M7567-05	FEC 1022248 & 150410
1	LK16	3-way link option	M20-9983646 and M7567-05	FEC 1022244 & 150-410 (36-pin strip)
20	LK17 to LK34, LK36, LK38	Jumper block, 2 pins, 0.1 inch spacing	M20-9990245 and M7567-05	FEC 1022245 & 150410
2	LK35, LK37	4-pin (2 $\times$ 2), 0.1 inch header and shorting block	M20-9990245 and M7567-05	FEC 1022245 & 150410
8	OUT0 to OUT7	Red test point	20-313137	FEC 8731144 (Pack)
24	R1 to R23, R28	0 $\Omega$ SMD resistor	MC 0.063W 0603 0R	FEC 933-1662
5	R24, R25, R30 to R32	10 k $\Omega$ SMD resistor	MC 0.063W 0603 10K	FEC 933-0399
3	R26, R27, R29	100 k $\Omega$ SMD resistor	MC 0.063W 0603 100K	FEC 933-0402
1	R33	1 k $\Omega$ SMD resistor	MC 0.063W 0603 1K	FEC 933-0380
9	T1 to T9	Red test point	20-313137	FEC 8731144 (pack)
1	U1	Multichannel I/O port	AD5590BBCZ	AD5590BBCZ
1	U2	USB microcontroller, CY7C68013-CSP	CY7C68013A-56LFXC	Digi-Key 428-1669-ND
2	U3, U5	Bus transceiver	SN74HC245PWR	Digi-Key 296-8279-1-ND
1	U4	SMD EEPROM serial 64 K	24LC64-I/SN	FEC 9758070
1	U6	Precision low dropout voltage regulator	ADP3303ARZ-3.3	ADP3303ARZ-3.3
16	VIN0 to VIN15	Wire wrap pin	73017015	N/A
16	VOUT0 to VOUT15	Wire wrap pin	73017015	N/A
1	VREF	Straight PCB mount SMB jack, 50 $\Omega$	1-1337482-0	FEC 1206013
1	Y1	24.0 MHz SMD crystal	ECS-240-12-20A-TR	Digi-Key XC1009CT-ND

<sup>1</sup> FEC refers to Farnell Electronics. Digi-Key refers to Digi-Key Corporation.

### ORDERING GUIDE

Model	Description
EVAL-AD5590EBZ <sup>1</sup>	Evaluation Board

<sup>1</sup> 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.