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Evaluation Board for the AD5930 Programmable Frequency Sweep and Output Burst Waveform Generator

FEATURES

Full-featured evaluation board for the AD5930
USB cable for PC connection
Can be powered entirely from USB port
Various linking options
PC software for control of the AD5930
On-board patchwork area

EVALUATION BOARD DESCRIPTION

This user guide describes the evaluation board for the AD5930 programmable single-scan waveform generator with programmable frequency sweep and output burst capabilities. The EVAL-AD5930EBZ interfaces to the USB port of a PC. It is possible to power the entire EVAL-AD5930EBZ off the USB port. Software for the EVAL-AD5930EBZ is downloadable from the EVAL-AD5930EBZ product page, which allows users to easily program the AD5930.

The EVAL-AD5930EBZ includes a 50 MHz oscillator that provides the MCLK for the AD5930. The user can remove this oscillator, if required, and drive the AD5930 with a different clock oscillator or an external clock source via a subminiature BNC connector.

AD5930 DEVICE DESCRIPTION

The AD5930 is a waveform generator that allows a user to generate synthesized analog or digital frequency stepped waveforms. Because frequency profiles are preprogrammed, continuous write cycles are eliminated, which frees up valuable DSP/microcontroller resources. Waveforms start from a known phase and increment phase continuously, which allows phase shifts to be easily determined. The AD5930 can be operated with clock frequencies up to 50 MHz.

Complete specifications for the AD5930 are available in the AD5930 data sheet available from Analog Devices, Inc., and should be consulted in conjunction with this user guide when using the evaluation board.

EVALUATION BOARD BLOCK DIAGRAM

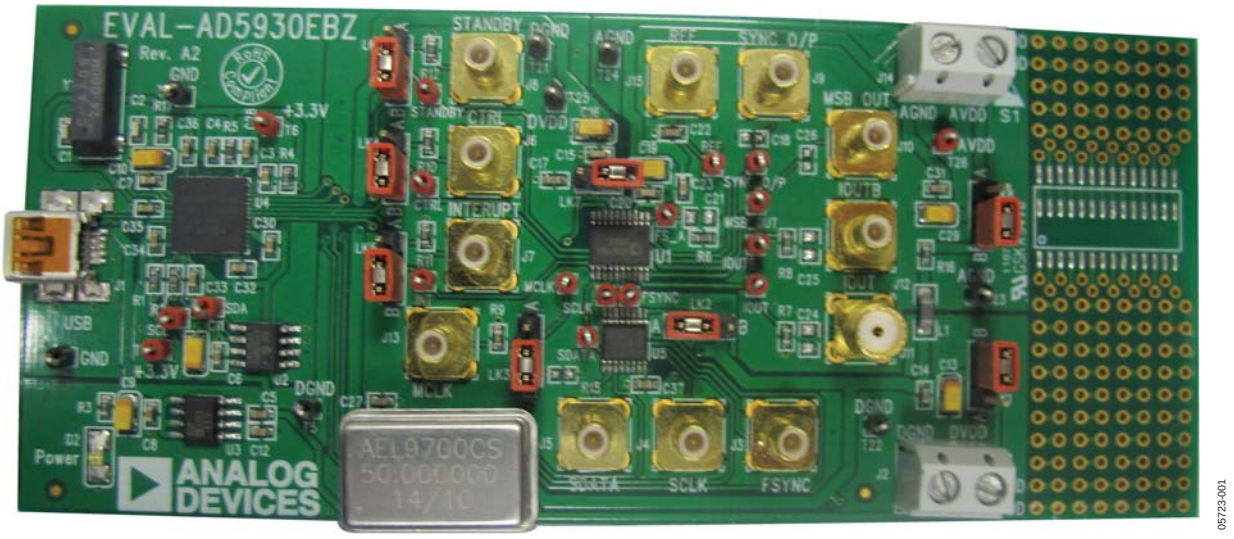

Figure 1.

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REVISION HISTORY

3/15—Rev. 0 to Rev. A

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3/06—Revision 0: Initial Version

HARDWARE DESCRIPTION

POWER SUPPLIES

The AD5930 has two analog power supply inputs: AVDD (analog VDD) and AGND (analog GND). There are also two digital supplies on the device, DVDD (digital VDD) and DGND (digital GND). Both of these supplies are independent of each other and can be powered from 2.3 V to 5.5 V.

As well as supplying the digital supply for the AD5930, DVDD provides the supply for the 50 MHz oscillator and the ADG774 quad 2:1 mux.

The two options available to power the EVAL-AD5930EBZ are

- The USB port of a PC
- A power supply

The default option for powering the EVAL-AD5930EBZ is from the USB port (LK1 and LK8 are in Position B). Alternatively, 2-pin terminal blocks are available to the user for use with an external power supply.

The 5 V supply from the USB port is regulated to a 3.3 V, which provides power for the CY7C68013 USB controller and related USB circuitry. The USB port also provides the GND connections for the EVAL-AD5930EBZ.

When LK1 is in Position B, DVDD is supplied with 3.3 V from the regulator. When LK8 is in Position B, AVDD is powered from DVDD through Ferrite Bead L1 (600 Ω at 100 MHz). When LK1 and LK8 are in Position A, the terminal blocks provide power to the EVAL-AD5930EBZ. Note that when the device must operate at a different supply other than up to 3.3 V, use the terminal blocks. In addition, to abide by the maximum ratings of the AD5930, use the EVAL-AD5930EBZ as a standalone board if operating at a voltage less than 3 V. Therefore, SCLK, SDATA, FSYNC, CTRL, INTERRUPT, and STANDBY must be externally supplied by the user.

DGND and AGND are connected under the AD5930. Therefore, it is recommended not to connect AGND and DGND elsewhere in the system. AVDD and DVDD are decoupled to the relevant ground plane using a 10 µF tantalum capacitor and a 0.1 µF ceramic capacitor at their source, and again at the AD5930.

LINK OPTIONS

Set the link options on the EVAL-AD5930EBZ for the required operating setup before using the EVAL-AD5930EBZ. The functions of these links are described in Table 1.

Table 1. Link Options

Link No.	Function	Position Description	Default
LK1	This link selects the power supply source for the digital circuitry (DVDD).	Position A selects J2 as the digital circuitry power supply source. Position B selects the 3.3 V from the ADP3303 regulator that is powered from the USB port as the digital circuitry power supply source.	Position B
LK2	This link controls whether the serial interface of the AD5930 is driven from a PC or used in standalone mode.	Position A connects FSYNC, SCLK, and SDATA pins to the USB controller (controlled from the software). Position B connects FSYNC, SCLK, and SDATA pins to their respective SMBs (J3, J4, and J5).	Position A
LK3	This link selects the MCLK source.	Position A selects an SMB J13 (MCLK). Position B selects the on-board oscillator (50 MHz provided).	Position B
LK4	This link selects whether the CTRL signal is driven by the software or externally through an SMB.	Position A connects the CTRL pin to an SMB J6 (CTRL). Position B connects the CTRL pin to the USB controller for software control.	Position B
LK5	This link selects whether the INTERRUPT signal is driven by the software or externally through an SMB.	Position A connects the INTERRUPT pin to an SMB J7 (INTERRUPT). Position B connects the INTERRUPT pin to the USB controller for software control.	Position B
LK6	This link selects whether the STANDBY signal is driven by the software or externally through an SMB.	Position A connects the STANDBY pin to the STANDBY SMB J8 (STANDBY). Position B connects the STANDBY pin to the USB controller for software control.	Position B
LK7	Insert this link to connect the CAP/2.5 V pin to DVDD if operating DVDD at < 2.5 V.		Removed
LK8	This link selects the power supply source for the analog circuitry (AVDD).	Position A selects J14 as the analog circuitry supply source. Position B connects AVDD to DVDD through a ferrite bead, L1, (600 Ω at 100 MHz) and a 1.5 Ω resistor (R16).	Position B

EVALUATION BOARD SOFTWARE

The AD5930 evaluation kit and evaluation software are available for download on the EVAL-AD5930EBZ product page under the **Software and Tools** heading. The evaluation software is also included on a CD in the evaluation kit.

Install the evaluation software before you connect the EVAL-AD5930EBZ to the USB port on the PC. Installing the software first ensures that the PC recognizes the EVAL-AD5930EBZ when it is connected to the PC.

The evaluation software is compatible with Windows® XP (32-bit), Windows Vista, and Windows 7 (32-bit and 64-bit).

INSTALLING THE SOFTWARE

To install the software, take the following steps:

1. Go to the EVAL-AD5930EBZ product page.
2. Under the **Software and Tools** heading on this page, the AD5930 evaluation software link of the latest revision is available for download. Click this link to save the zipped folder. The evaluation software is also available on the CD that is included I the AD5930 evaluation kit.
3. Open the downloaded folder or the CD folder and double-click the file **setup.exe** to start the installation procedure.
4. When prompted, select the destination directory for the AD5930 program and the National Instruments products. By default, the files are saved to **C:\Program Files\Analog Devices\AD5930**.
    1. Once you have selected the directory, the installation procedure copies the files into the relevant directories on the hard drive. The installation program creates a program group called **Analog Devices** with a subgroup called **AD5930** in the **Start** menu of the taskbar.
5. Double-click the **AD5930** icon to start the program.

USING THE SOFTWARE

To launch the software, click **Start > All Programs > Analog Devices > AD5930 > AD5930 Evaluation Software**. The software for the EVAL-AD5930EBZ is launched as a LabVIEW® front end (see Figure 2).

Figure 2. LabVIEW Front End for AD5930

Figure 2 displays the virtual end panel that appears when the software launches.

After you have completed the control register write section, you must enter the MCLK frequency in Hertz (Hz) in the **MCLK FREQUENCY** window. This value calculates all frequency and time values throughout the evaluation software.

The upper half of the window gives the different options for determining the output and mode of the EVAL-AD5930EBZ. More details on all of these options can be found in the AD5930 data sheet.

The increment frequency determines the duration of the DAC output signal for each individual frequency of the frequency scan. The AD5930 offers the user two choices (see Figure 3):

- The duration is a multiple of cycles of the output frequency (F_{out}).
- The duration is a multiple of MCLK cycles (**MCLK**).

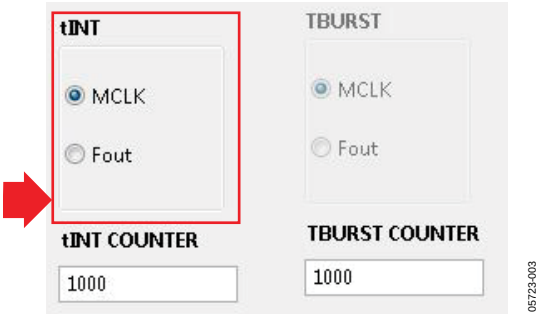

Figure 3. DAC Output Options for Burst Generation

The next step is to enter the values for the numeric registers: the **START FREQUENCY**, **FREQUENCY INCREMENT**, and number of increments (**NUM OF INCREMENT**), as shown in Figure 4.

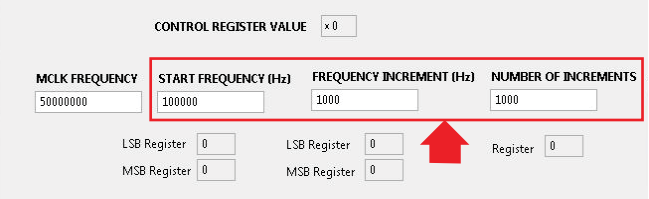

Figure 4. Frequency Output

The values of the **START FREQUENCY** and the **INCREMENT FREQUENCY** are entered in Hertz (Hz).

The SYNCSEL and MSB outputs are also available from the EVAL-AD5930EBZ. It is user-selectable to create a pulse at the end of sweep (**END OF SWEEP**) or at the end of each frequency (**END OF FREQUEN**) increment using the **SYNCSEL FUNCTION**, as shown in Figure 5.

Figure 5. Pin Configuration

Finally, the **PROGRAM** (see Figure 6) command button writes this information to the AD5930 registers. To start the frequency sweep, click the **CONTROL** command button. The **STANDBY** button allows for sections of the AD5930 not in use to be powered down to minimize power consumption. The **INTERRUPT** button allows the user to interrupt during a frequency scan.

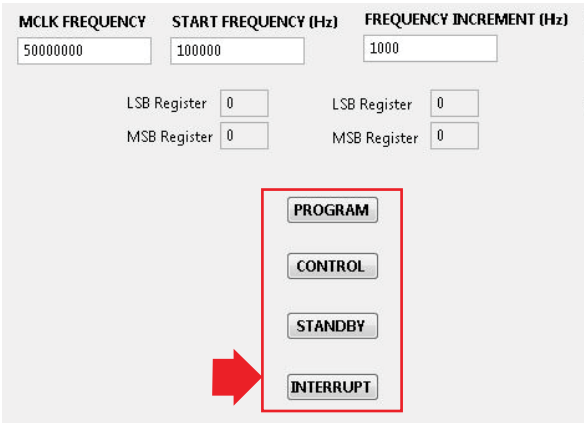

Figure 6. Control Buttons

EVALUATION BOARD SCHEMATIC AND ARTWORK

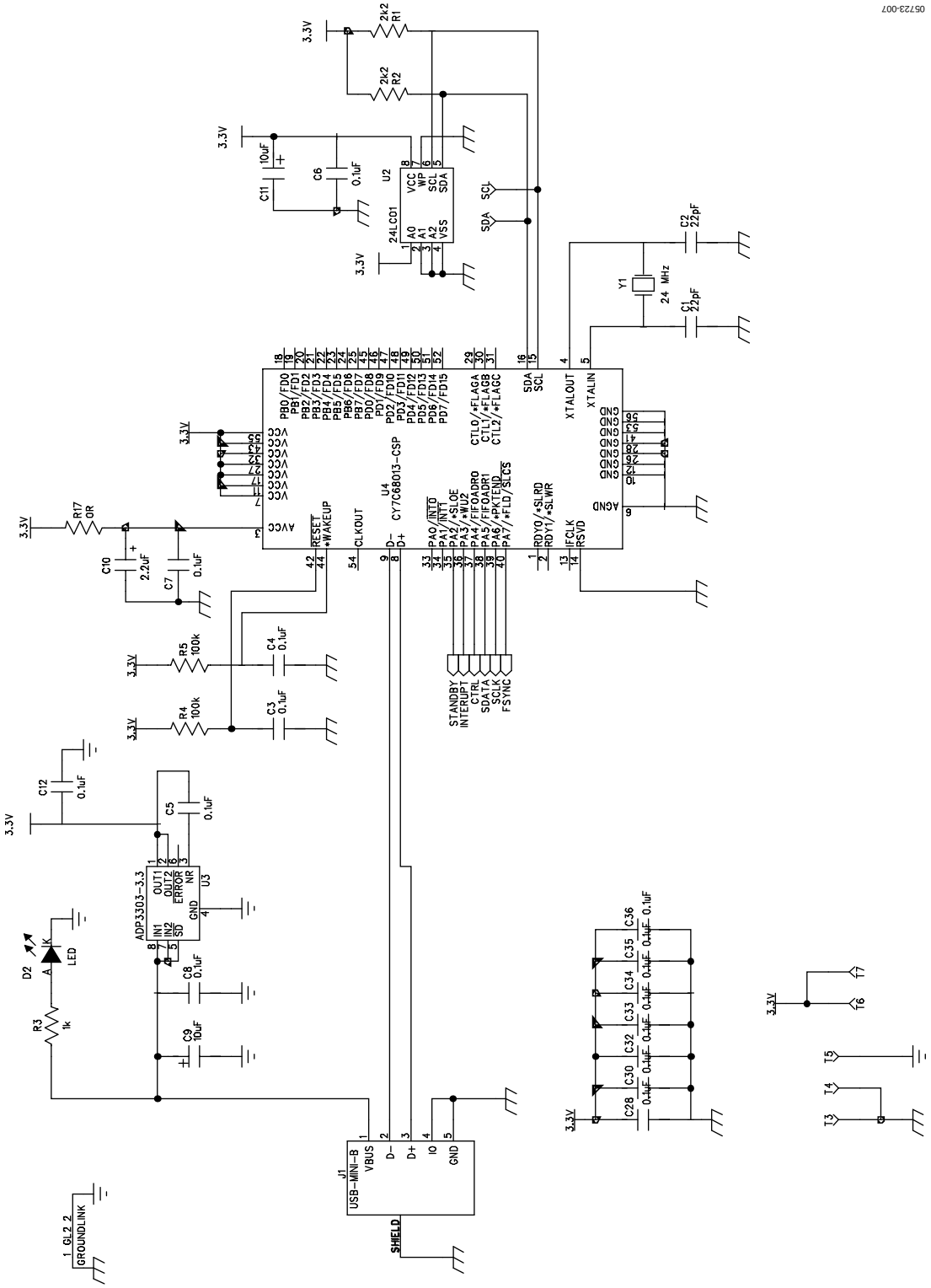

Figure 7. EVAL-AD5930EBZ Schematic, Page 1 of 2

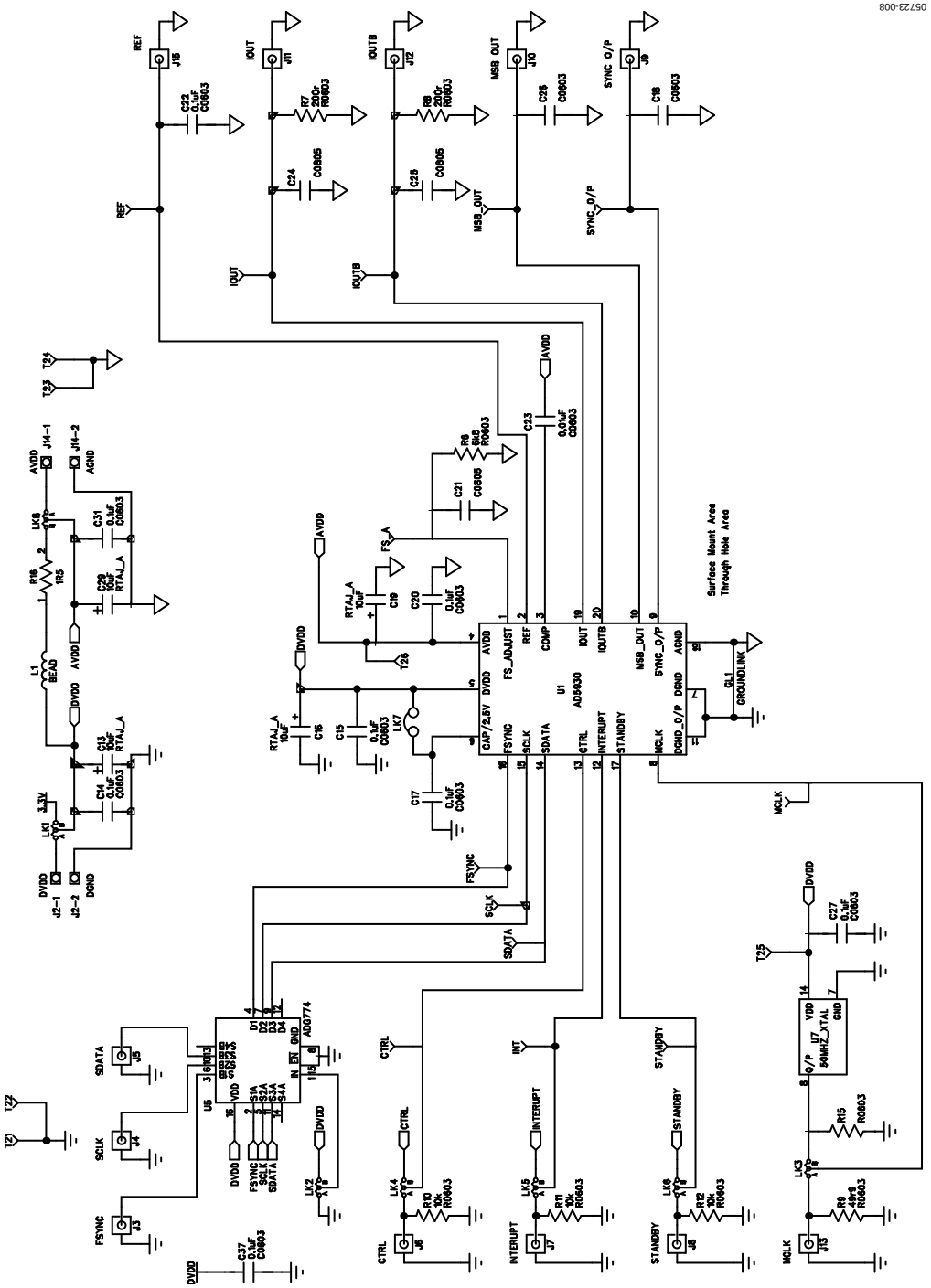

Figure 8. EVAL-AD5930EBZ Schematic, Page 2 of 2

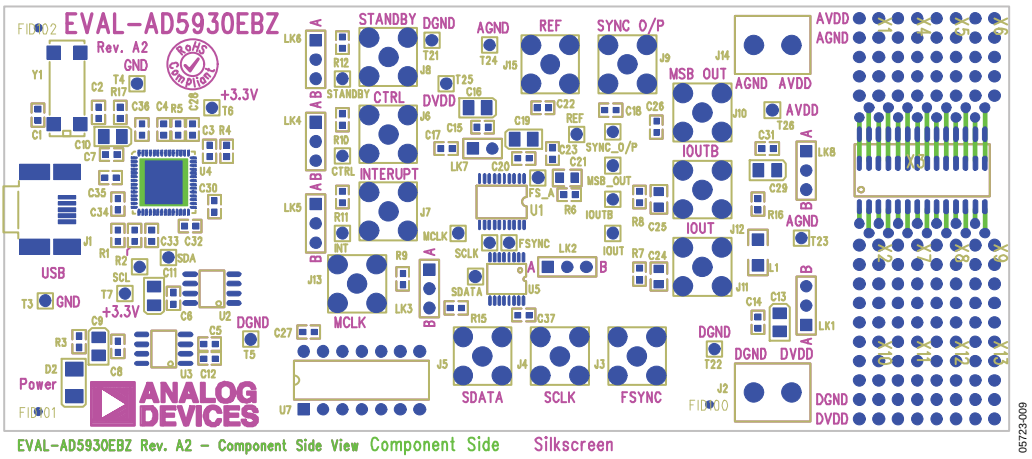

Figure 9. EVAL-AD5930EBZ Silkscreen Artwork

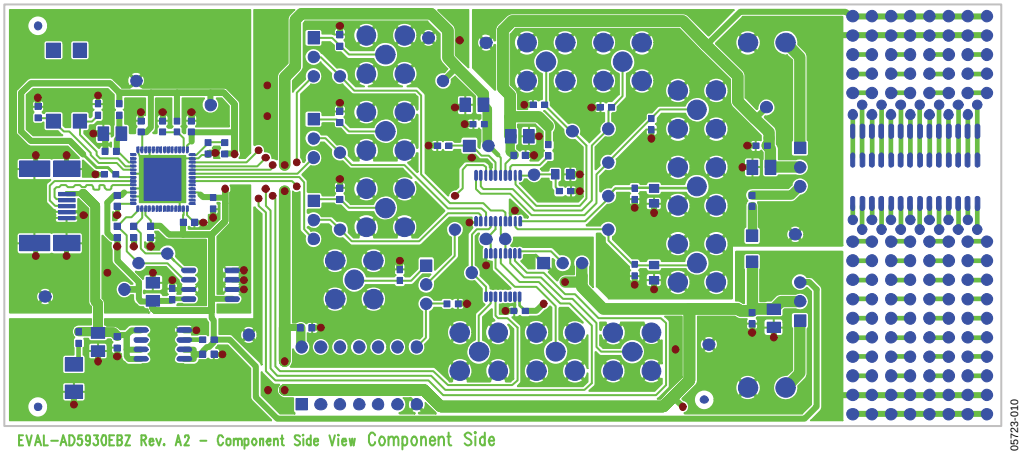

Figure 10. EVAL-AD5930EBZ Component Side Artwork

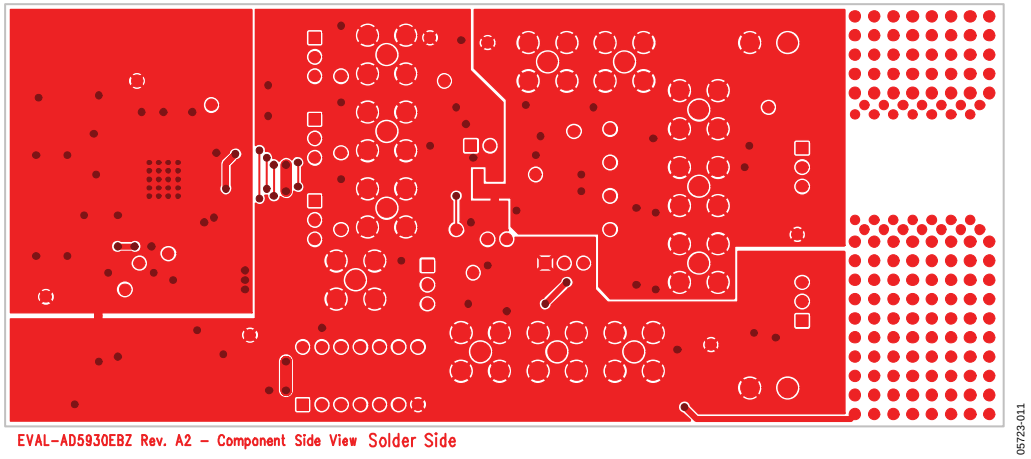

Figure 11. EVAL-AD5930EBZ Solder Side Artwork

ORDERING INFORMATION

BILL OF MATERIALS

Table 2.

Item	Quantity	Reference	Description	Supplier/Number
1	3	C1, C2, C6	22 pF, 0603, ceramic capacitors	FEC 722-005
2	1	C10	2.2 µF, 0805, ceramic capacitor	Digi-Key 445-1588-1-ND
3	2	C18, C26	0603, capacitors	Not inserted
4	1	C24	0805, capacitor	Not inserted
5	1	C23	0.01 µF, 0603, ceramic capacitor	FEC 722-066
6	20	C3, C4, C5, C7, C8, C12, C14, C15, C17, C20, C27, C28, C30 to C37	0.1 µF, 0603, ceramic capacitors	FEC 499-675
7	6	C9, C11, C13, C16, C19, C29	10 µF, TAJA tantalum capacitors	FEC 331-3888
8	1	D2	Green LED	FEC 515-620
9	1	J1	USB mini-B connector (USB-OTG)	FEC 476-8309
10	2	J2, J14	2-pin terminal blocks (5 mm pitch)	FEC 151-785
11	10	J3 to J11, J13	Subminiature BNC connectors (SMBs)	FEC 310-682
12	1	L1	Ferrite bead (600 Ω at 100 MHz)	FEC 581-094
13	7	LK1 to LK6, LK8	3-pin SIL headers (with shorting block)	FEC 512-047 and FEC 150-411
14	1	LK7	2-pin SIL header (with shorting block)	FEC 511-705 and FEC 150-411
15	2	R1, R2	2.2 kΩ, 0603, resistors	FEC 911-276
16	3	R10, R11, R12	10 kΩ, 0603, resistors	FEC 911-355
17	1	R15	0603, resistor	Not inserted
18	1	R16	1.5 Ω, 0603, resistor	FEC 758-267
19	1	R17	0 Ω, short resistor	FEC 772-227
20	1	R3	1 kΩ, 0603, resistor	FEC 911-239
21	2	R4, R5	100 kΩ, 0603, resistors	FEC 911-471
22	1	R9	50 Ω, 0603, resistor	FEC 422-1825
23	26	T1 to T26	Test points	FEC 240-333
24	1	U1	AD5930	AD5930
25	1	U2	IC serial EEPROM, 64 K, 2.5 V, 8-SOIC	Digi-Key 24LC64-I/SN-ND
26	1	U3	Precision voltage regulator	ADP3303AR-3.3
27	1	U4	CY7C68013-CSP USB microcontroller	Embassy CY7C68013-56LFC
28	1	U5	Quad SPDT switch/2:1 mux	ADG774BRQ
29	1	U7	50 MHz, CMOS/TTL crystal (and 14-pin DIP)	FEC 788-480/97103
30	1	Y1	24 MHz, CM309S SMD crystal	FEC 569-872

NOTES

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.

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