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Evaluating the AD5543 Current Output/Serial Input DAC

FEATURES

Full-featured evaluation board for the AD5543
Graphic user interface software for board control and data analysis
Connector to EVAL-SDP-CB1Z system development platform board
Various power supply options

APPLICATIONS

Automatic test equipment
Instrumentation
Digitally controlled calibration
Industrial control PLCs

GENERAL DESCRIPTION

The AD5543 is a precision, 16-bit, low power, current output, small form factor, digital-to-analog converter (DAC). It is designed to operate from a single 5 V supply with a ±10 V multiplying reference.

The applied external reference, V_{REF}, determines the full-scale output current. An internal feedback resistor (RFB) facilitates the R-2R and temperature tracking for voltage conversion when combined with an external op amp.

A serial data interface offers high speed, 3-wire, microcontroller-compatible inputs using serial data input (SDI), clock (CLK), and chip select ($\overline{CS}$).

The AD5543 is packaged in ultracompact (3 mm × 4.7 mm) 8-lead MSOP and 8-lead SOIC packages.

The EVAL-AD5543/53SDZ board is used in conjunction with the EVAL-SDP-CB1Z system development platform (SDP) board available from Analog Devices, Inc., which is purchased separately from the evaluation board. The USB-to-SPI communication to the AD5543 is completed using this Blackfin®-based development board. The software offers a waveform generator.

The EVAL-AD5543/53SDZ can also be used for the AD5553 by changing the number of bits written (14 bits) in the input.

FUNCTIONAL BLOCK DIAGRAM

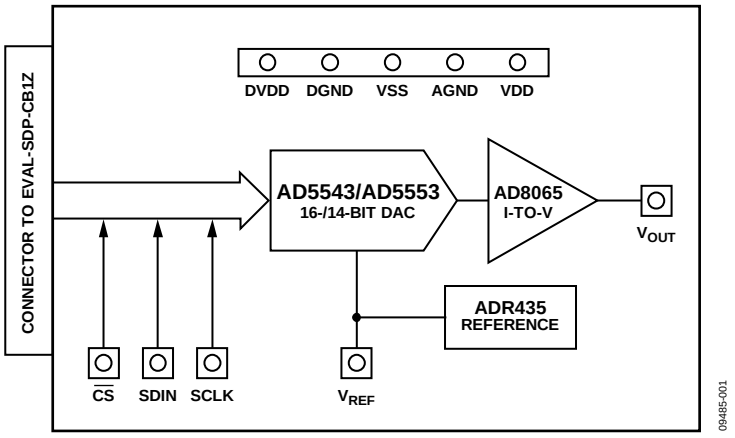

Figure 1.

TABLE OF CONTENTS

REVISION HISTORY

2/12—Rev. 0 to Rev. A

Changes to Level Set Section 4
Replaced Evaluation Board Schematics and Artwork Section ... 7

11/10—Revision 0: Initial Version

EVALUATION BOARD SOFTWARE

QUICK START PROCEDURE

To get started, do the following:

1. Load and install the software CD.
2. Plug in the SDP board. The **Found New Hardware Wizard** dialog box opens, which allows you to install the software automatically.
3. Load the software for the SDP board. Click the **Start** button on the bottom left corner of your screen, then **All Programs,** then **AD5543**, and finally select the **SDP32NET** executable for the SDP board.
4. Connect the SDP board to the AD5543 evaluation board, and plug in the external power supply.
5. Load the AD5543 software. Click **Start**, then **All Programs**, then **Analog Devices**, and finally **AD5543**.

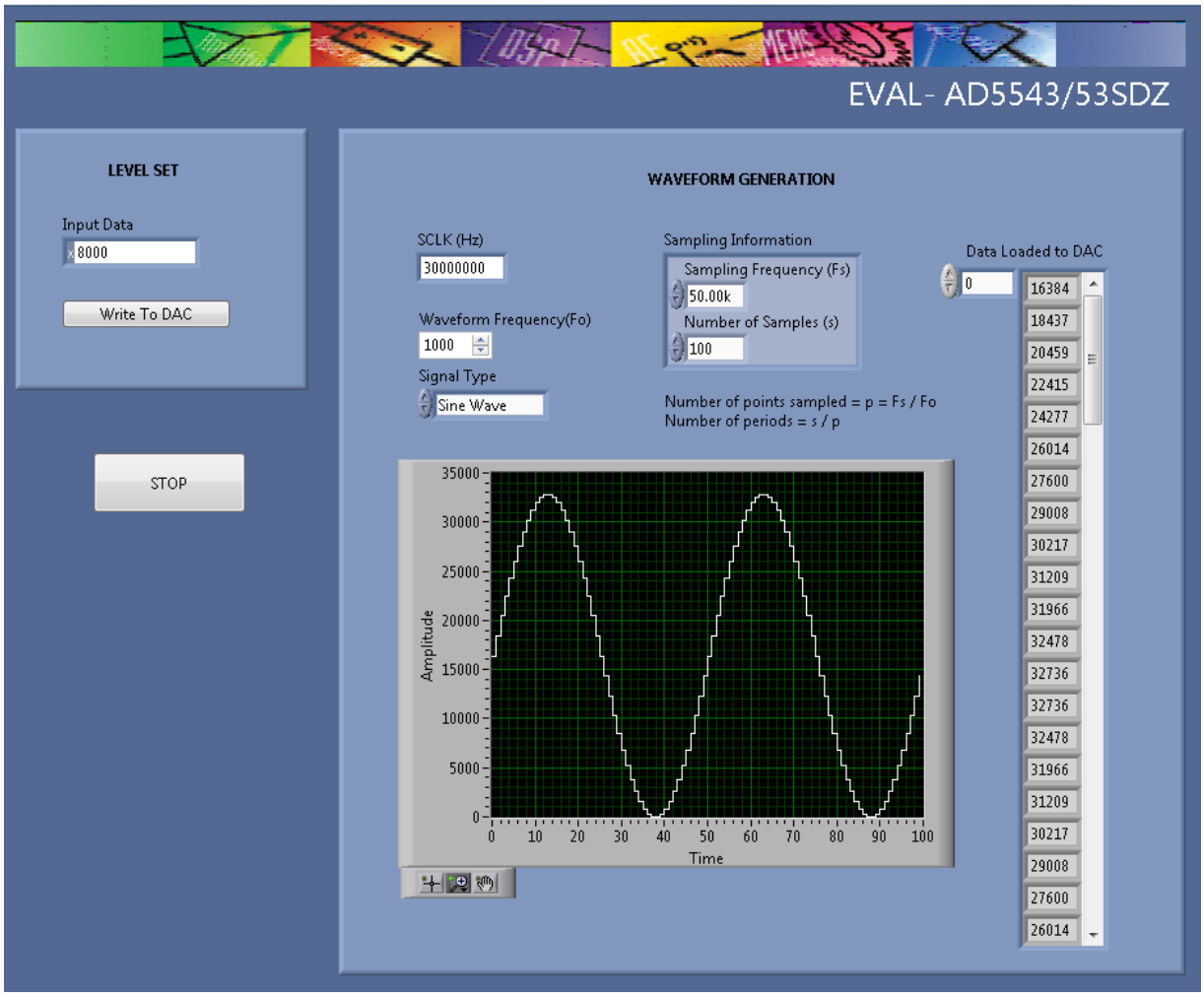

Figure 2. AD5543 Evaluation Software

AD5543 EVALUATION SOFTWARE WINDOW

LEVEL SET

The **LEVEL SET** section in the AD5543 evaluation software allows you to choose the amplitude for the waveform depending on the code entered in the **Input Data** box. Click the **Write To DAC** button to load the code. Being a 16-Bit DAC, the relationship between the code entered and the voltage in the output is as follows:

$$V_{OUT} = (\frac{D}{2^N} - 1) \times V_{REF}$$

where:
N = 16 bits.
V_{REF} = 5 V.
D is the code introduced in decimal (0 to 32,767).

Waveform Generation

The **WAVEFORM GENERATION** section allows you to control the different frequencies and features in the waveform generation, including

- **SCLK**: clock input frequency (30 MHz default value).
- **Waveform Frequency (Fo).**
- **Signal Type**: dc signal (default), sawtooth, sine, triangle, and square wave options.
- **Sampling Information** includes the two following features:
  - **Sampling Frequency (Fs)**: to avoid the aliasing effect, it is necessary to choose a frequency that is at least twice the value of the waveform frequency. The number of points sampled is calculated as follows:

$$Number\ of\ Points\ Sampled = \frac{Sampling\ Frequency}{Waveform\ Frequency}$$

  - **Number of Samples (s)**: this constant allows you to show in a graph a determined number of periods depending on its value. The maximum number of samples is 32,768.

$$Number\ of\ Periods = \frac{Number\ of\ samples}{Number\ of\ Points\ Sampled}$$

- **Data Loaded to DAC**: the array contains the value of every code where the waveform has been sampled.
- The graph shows each of the points contained in the array.

Example 1

1. Power on the board.
2. Start up the software.
3. Select the default 30 MHz clock frequency.
4. Select a waveform frequency of 500 Hz and **Sine Wave** as the signal type to show (dc signal is the default).
5. Select a sampling frequency of 20 kHz and 80 for the number of samples.

$$Number\ of\ Points\ Sampled = \frac{20{,}000\ \text{Hz}}{500\ \text{Hz}} = 40$$

$$Number\ of\ Periods = \frac{80}{40} = 2$$

6. Write the Code FFFF to show full scale.
7. Click **Write To DAC**.

The waveform obtained from the values entered shows two periods and the 40 samples per period (see Figure 3). The code of each sample is loaded in the array on the right side.

Click the **STOP** button to end the execution of the software.

Example 2

For a sharper waveform, the sampling frequency and the number of samples must be raised according to the frequency. The next example (see Figure 4) shows this relationship, where the sampling frequency value is changed to 1 MHz and the number of samples is 2000.

$$Number\ of\ Points\ Sampled = \frac{1{,}000{,}000\ \text{Hz}}{500\ \text{Hz}} = 2000$$

$$Number\ of\ Periods = \frac{2000}{2000} = 1$$

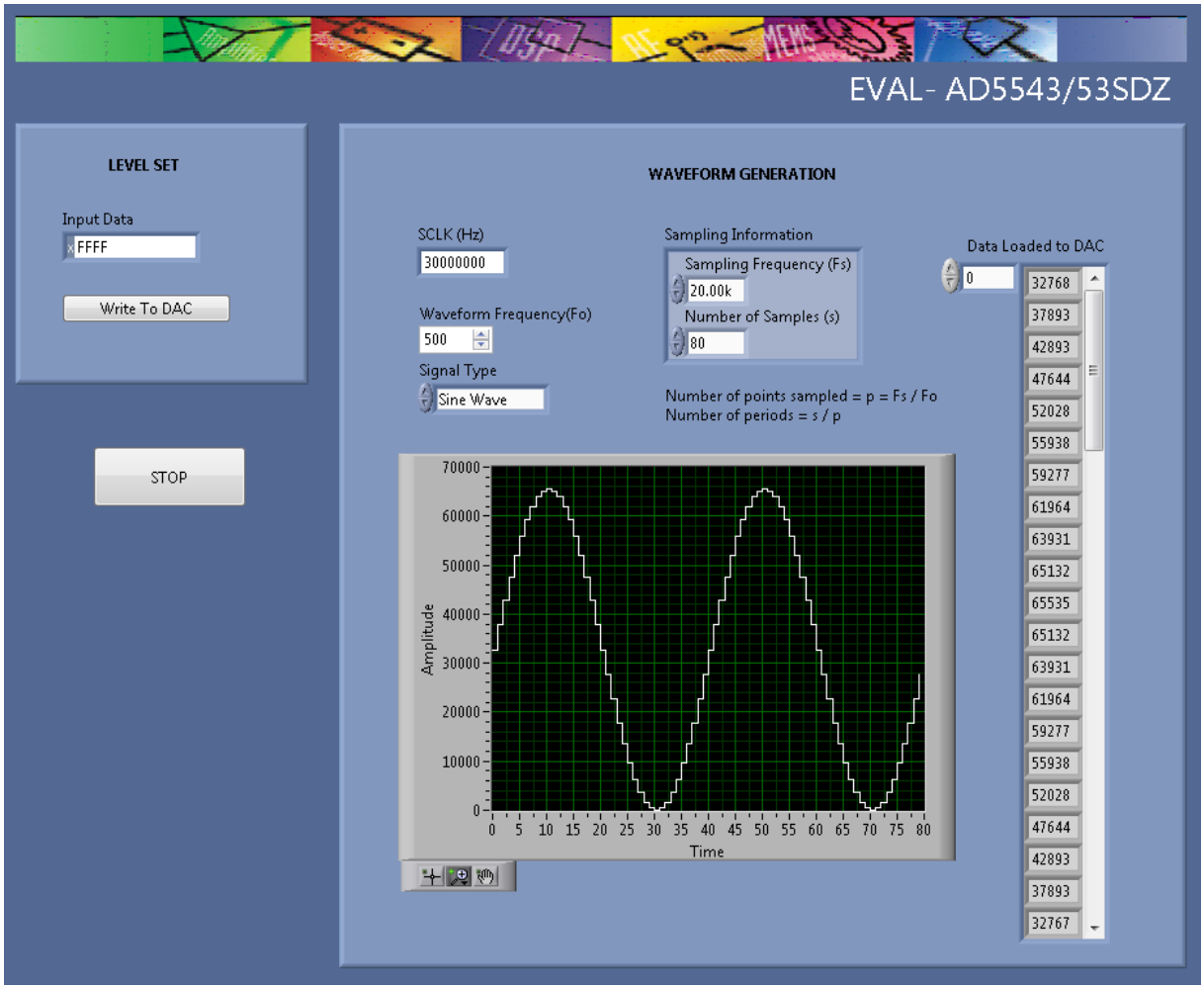

Figure 3. Example 1

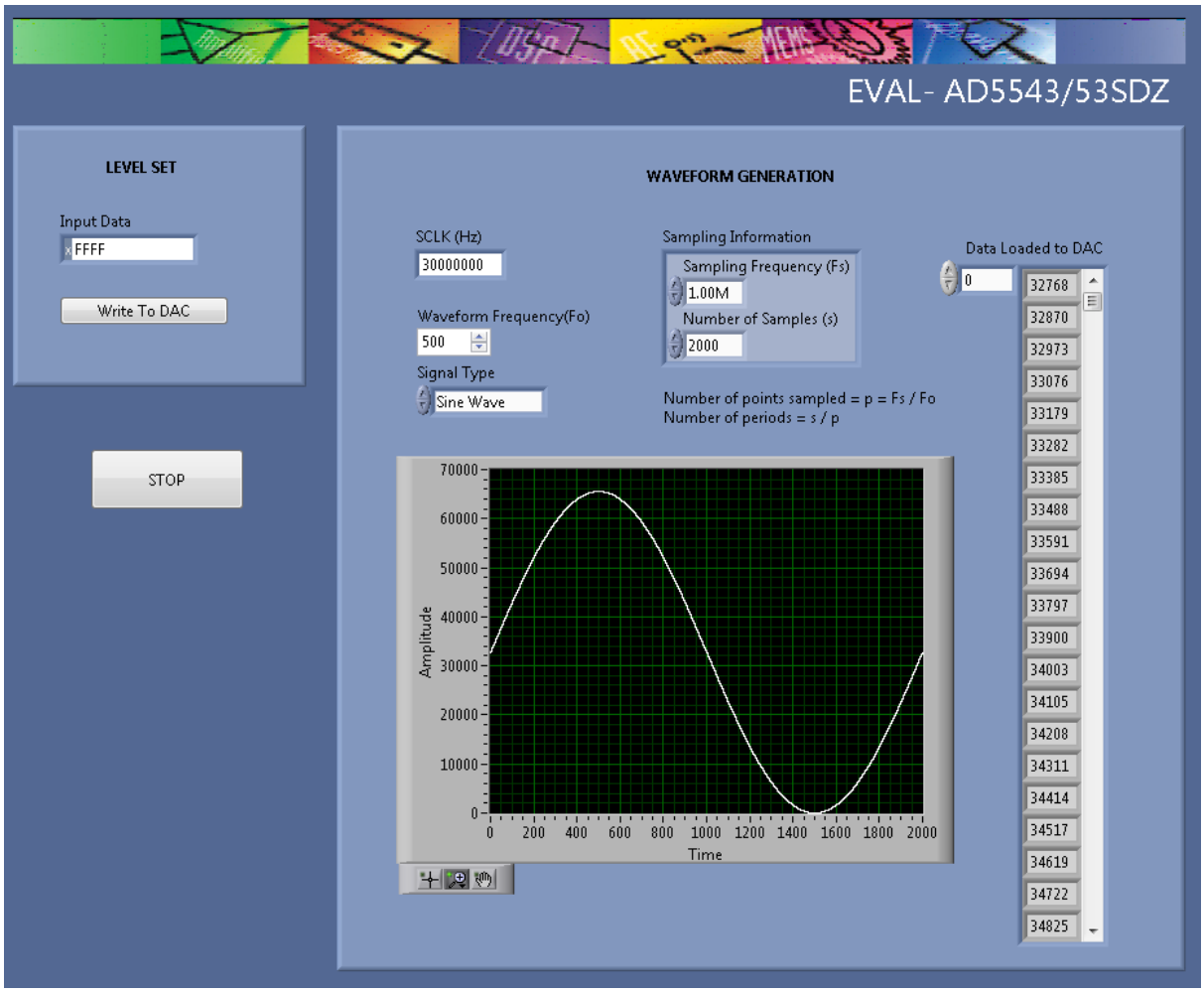

Figure 4. Example 2

EVALUATION BOARD SCHEMATICS AND ARTWORK

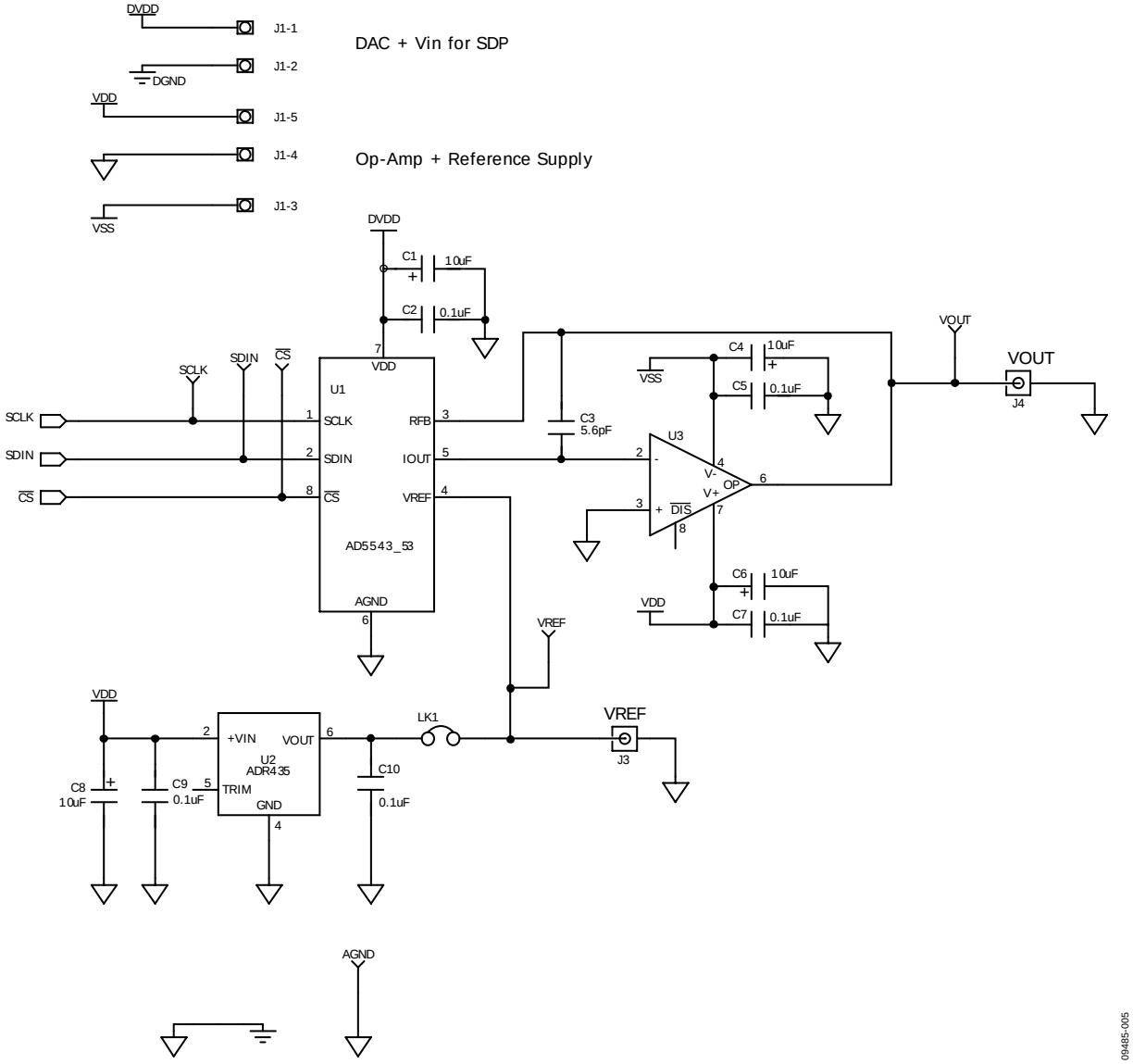

Figure 5. AD5543 Schematic Part A

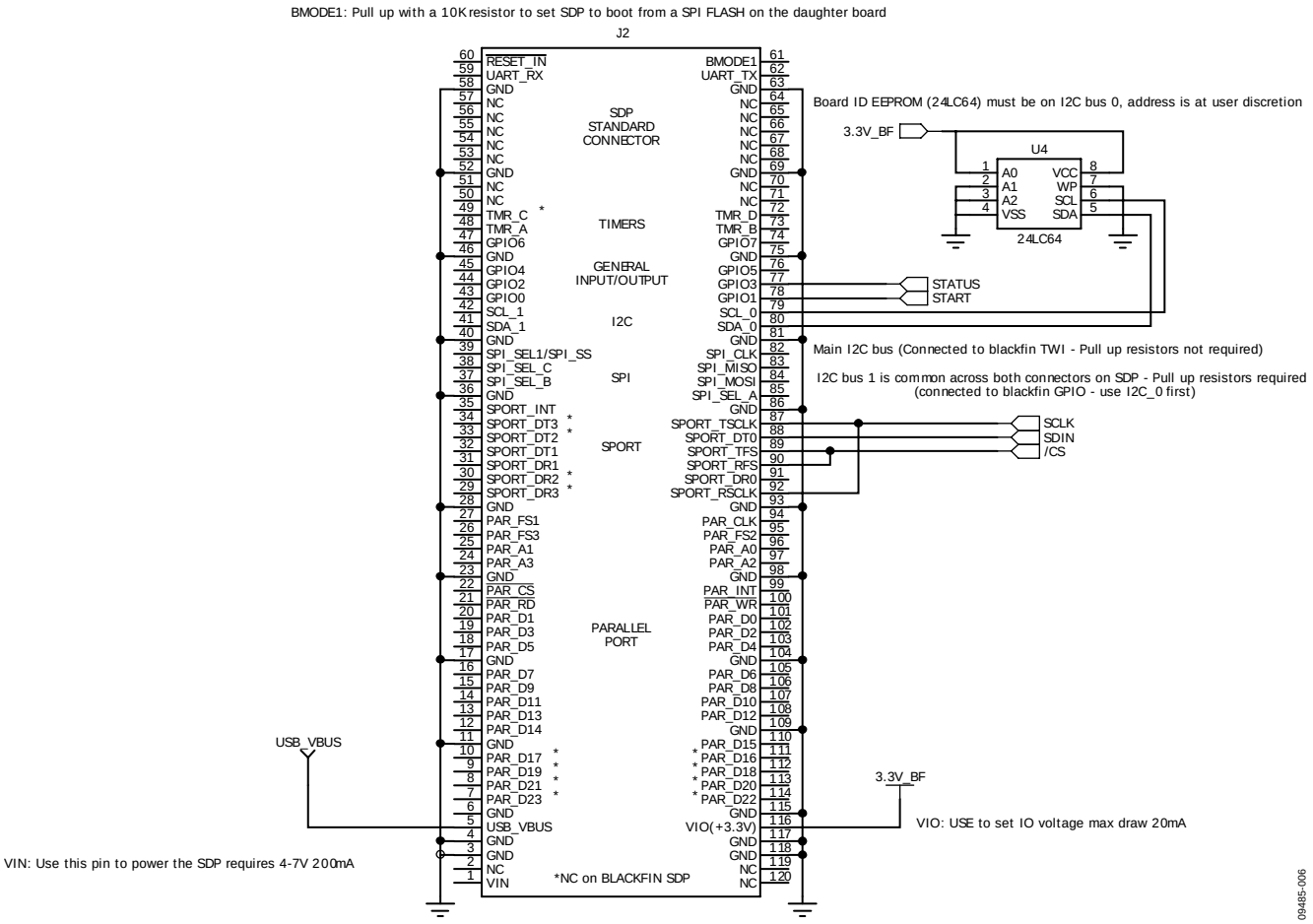

Figure 6. AD5543 Schematic Part B

EVALUATION BOARD LAYOUT

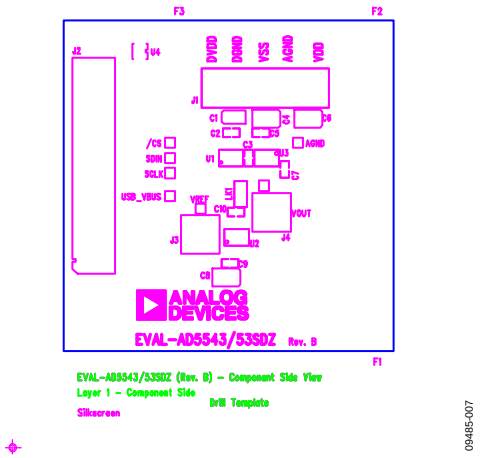

Figure 7. Silkscreen Top

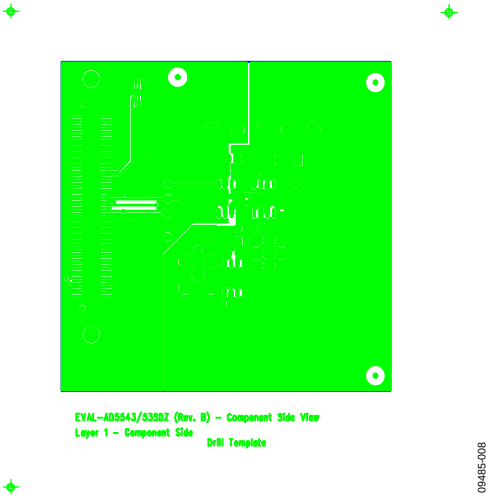

Figure 8. Top Side

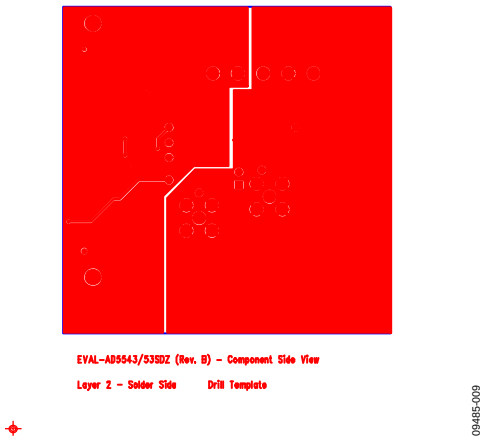

Figure 9. Bottom Side

RELATED LINKS

Resource	Description
AD5543	Product Page, AD5543 16-Bit DAC in µSOIC-8 Package
AD5553	Product Page, AD5553 14-Bit DAC in µSOIC-8 Package
ADR435	Product Page, ADR435 Ultralow Noise XFET® Voltage References with Current Sink and Source Capability
AD8065	Product Page, AD8065 High Performance, 145 MHz *FastFET*™ Op Amp

NOTES

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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