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Evaluating the AD5546 Current Output/Serial Input DACs

FEATURES

Full-featured evaluation board for the AD5546
Graphic user interface software for board control and data analysis
Connector to EVAL-SDP-CB1Z system demonstration platform board
Various power supply options

APPLICATIONS

Automatic test equipment
Instrumentation
Digitally controlled calibration
Digital waveform generation

GENERAL DESCRIPTION

The AD5546 is a precision 16-bit, multiplying, low power, current output, parallel input digital-to-analog converter (DAC). It operates from a single 2.7 V to 5.5 V supply with ±10 V multiplying references for four-quadrant outputs. Built-in four-quadrant resistors facilitate the resistance matching and temperature tracking that minimize the number of components needed for multiquadrant applications.

The applied external reference input voltage (V_{REF}) determines the full-scale output current. The feedback resistor (R_{FB}) simplifies the I-to-V conversion with an external buffer.

The AD5546 is packaged in compact 28-lead TSSOP packages with operating temperatures from −40°C to +125°C.

The EVAL-AD5546SDZ is used in conjunction with the EVAL-SDP-CB1Z system demonstration platform (SDP) board available from Analog Devices, Inc., which is purchased separately from the evaluation board. The USB-to-SPI communication to the DAC is completed using this Blackfin®-based demonstration board.

FUNCTIONAL BLOCK DIAGRAM

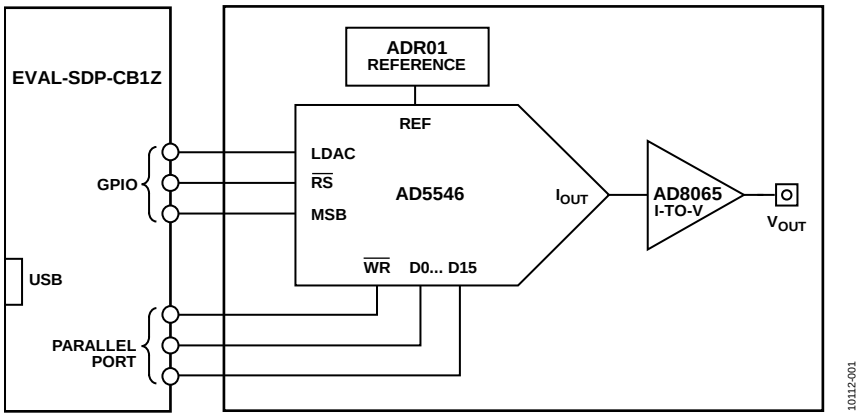

Figure 1.

TABLE OF CONTENTS

REVISION HISTORY

3/12—Rev. 0 to Rev. A

Added New Table 1; Renumbered Sequentially 4
Changes to the Example Section 5
Replaced Evaluation Board Schematics and Artwork Section ... 6

11/11—Revision 0: Initial Version

EVALUATION BOARD SOFTWARE

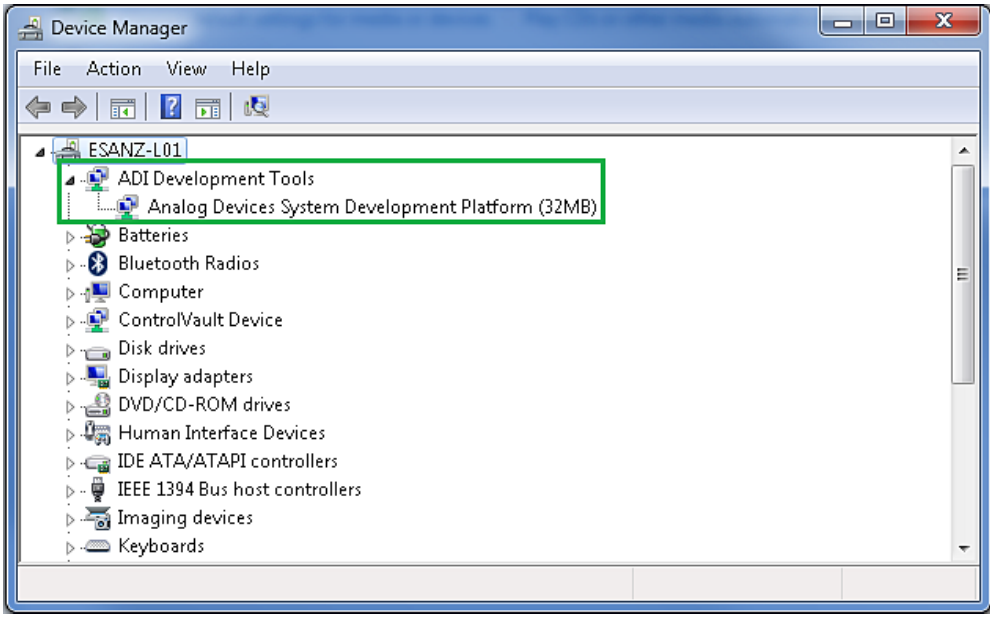

Figure 2. Device Manager Showing the SDP Board Connected

INSTALLING THE SOFTWARE

The EVAL-AD5546SDZ kit includes the software and drivers on a CD. To install the software, follow these steps:

1. Install the software before connecting the SDP board to the USB port of the PC.
2. Start the Windows® operating system and insert the EVAL-AD5546SDZ CD.
3. Download the EVAL-AD5546SDZ LabVIEW™ software. The correct driver for the SDP board, SDPDriversNET, should download automatically after LabVIEW is downloaded, supporting both 32- and 64-bit systems. However, if the drivers do not download automatically, the driver executable file can also be found in the **Program Files/Analog Devices** folder. Follow the on-screen prompts to install it.
4. After installation of the software and drivers is complete, plug the EVAL-AD5546SDZ into the SDP board and the SDP board into the PC using the USB cable included in the kit.
5. When the software detects the evaluation board, proceed through any dialog boxes that appear to finalize the installation (for example, **Found New Hardware Wizard** and **Install the Software Automatically**).

RUNNING THE SOFTWARE

To run the evaluation board program, do the following:

1. Click **Start/All Programs/Analog Devices/EVAL-AD5546SDZ**.
2. If the SDP board is not connected to the USB port when the software is launched, a connectivity error displays (see Figure 3). Simply connect the evaluation board to the USB port of the PC, wait a few seconds, click **Rescan**, and follow the instructions.

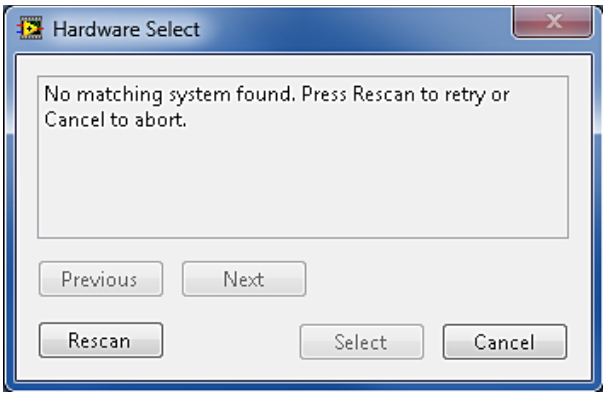

Figure 3. Connectivity Error

APPLICATIONS PROVIDED

The EVAL-AD5546SDZ board provides the possibility of configuring the DAC in two different unipolar two-quadrant multiplying modes. Table 1 show how to select the desired voltage reference. Table 2 shows the connections needed to obtain these unipolar modes.

Table 1. Voltage Reference Selection

Link Connections		
Link No.	**Position**	**Function**
LK1	IN	Internal voltage reference ADR01 connected.
	OUT	External voltage reference connected to VREF (J3 SMB connector).

Table 2. Applications Provided

Link Connections		
Link No.	**Position**	**Function**
LK2	A	Unipolar two-quadrant multiplying mode, V_{OUT} = 0 V to $-V_{REF}$
LK3	A	
LK4	In	
LK2	B	Unipolar two-quadrant multiplying mode, V_{OUT} = 0 V to + V_{REF}
LK3	B	
LK4	Out	

USING THE EVALUATION BOARD SOFTWARE

When the software is launched, the main window appears (see Figure 4).

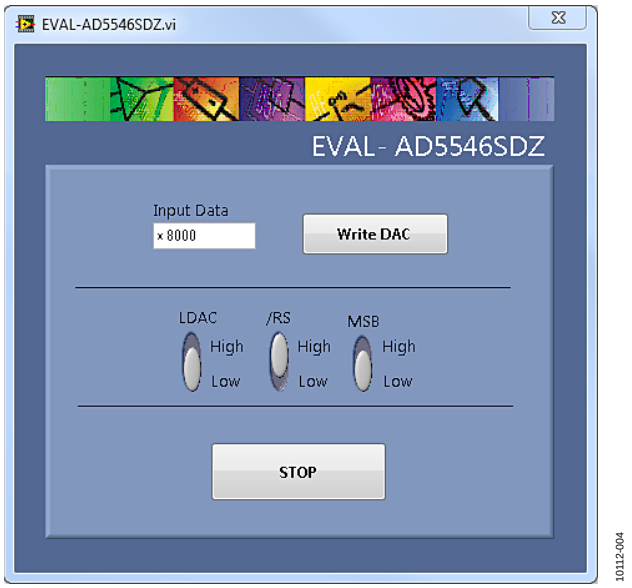

Figure 4. Main Window

The desired data loads and updates the DAC's output when LDAC is brought high.

The reset button, **/RS**, updates all channel outputs to zero scale or midscale when MSB is pulled low or high.

EXAMPLE

Using the internal voltage reference in the unipolar two-quadrant multiplying mode (V_{OUT} = 0 V to $-V_{REF}$), with LDAC, MSB, and $\overline{RS}$ tied high, specify quarter scale (0x4000 or 16,384 decimal) in the **Input Data** box and click **Write DAC**. The expected output obtained is

$$V_{OUT} = -V_{REF} \times \frac{D}{65{,}536} = -10 \times \frac{16{,}384}{65{,}536} = -2.5\ \text{V}$$

If $\overline{RS}$ is tied low, with MSB tied high, a reset takes place in the part, changing the output to half scale (0x8000 or 32,768 decimal).

$$V_{OUT} = -V_{REF} \times \frac{D}{65{,}536} = -10 \times \frac{32{,}768}{65{,}536} = -5\ \text{V}$$

EVALUATION BOARD SCHEMATICS AND ARTWORK

SCHEMATICS

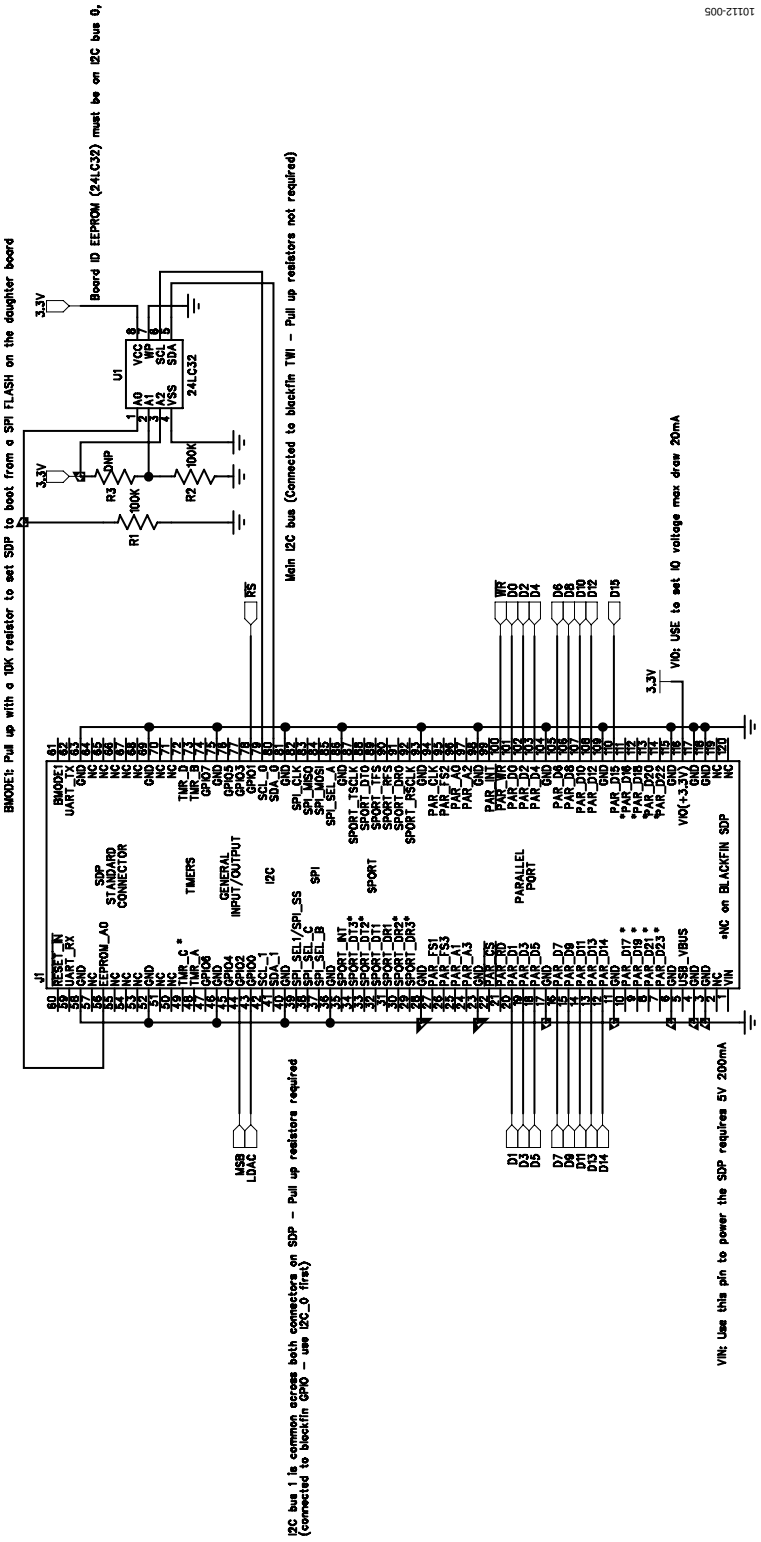

Figure 5. EVAL-AD5546SDZ Schematic, SDP Connector

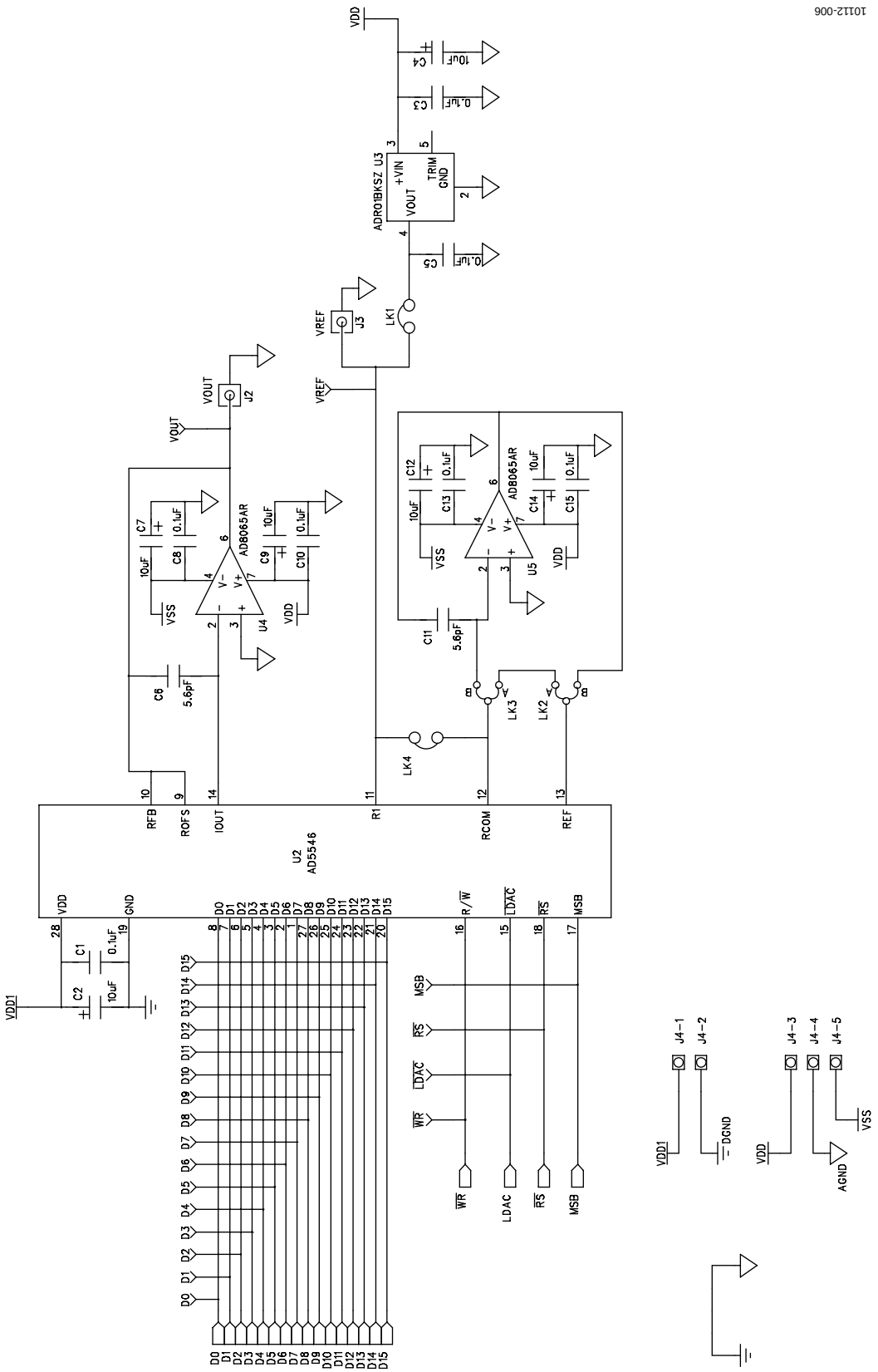

Figure 6. EVAL-AD5546SDZ Schematic, DAC

EVALUATION BOARD LAYOUT

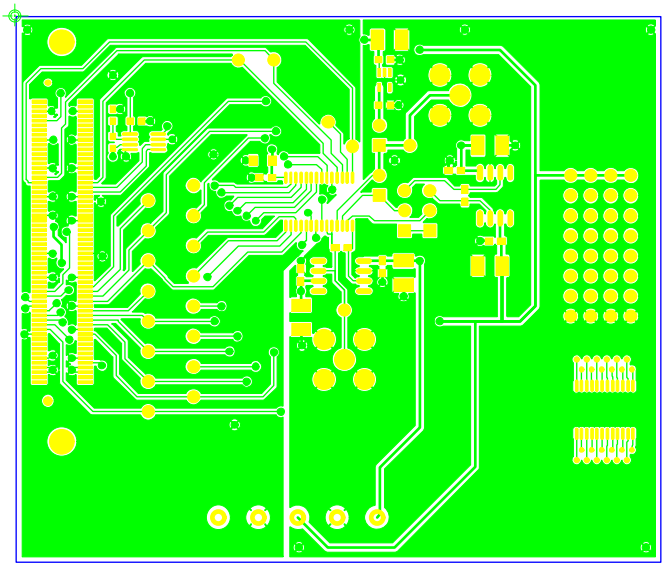

Figure 7. Silkscreen

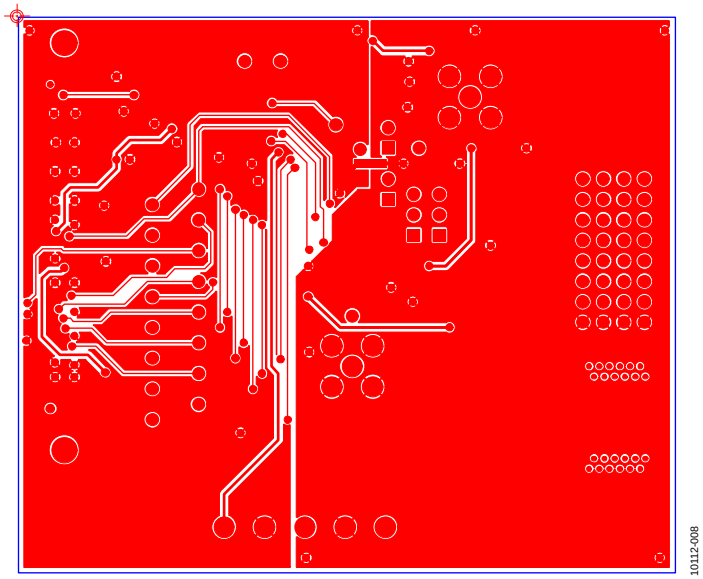

Figure 8. Component Side

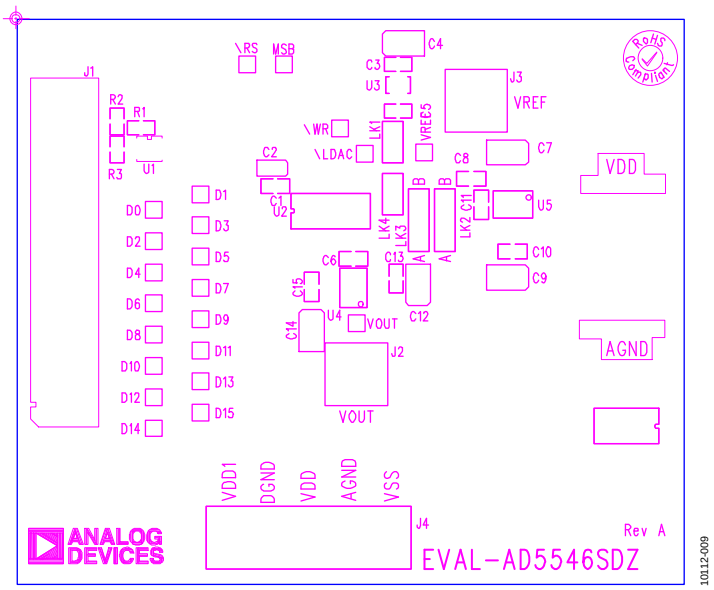

Figure 9. Solder Side

RELATED LINKS

Resource	Description
AD5546	Product Page, AD5546 Current-Output Parallel-Input, 16-Bit Digital-toAnalog-Converter
ADR01	Product Page, ADR01 Ultracompact, Precision 10.0 V Voltage Reference
AD8065	Product Page, AD8065: High Performance, 145 MHz FastFET™ Op Amp
EVAL-SDP-CB1Z	Product Page, SDP-B: System Demonstration Platform—Blackfin

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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.

UG10112-0-3/12(A)

ANALOG DEVICES

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