Evaluation Board for Zero-Drift, Digitally Programmable Sensor Signal Amplifier

Data Sheet

AD8556-EVALZ

FEATURES

- Single- or dual-supply operation
- AC and DC signal evaluation
- Built-in, 100 Ω bridge with unbalancing capability
- Provision to create low-pass filter
- Readback feature of programmed values
- External clamp voltage setting
- Interface for PC USB port
- Microsoft® Windows® XP, Windows Vista, Windows 7 compatible software
- SOIC socket for easy part replacement
- Supports AD8555, AD8556 and AD8557 IC's

GENERAL DESCRIPTION

This document describes the evaluation board hardware and software used to evaluate the AD8555, AD8556, and AD8557 in a SOIC package. The evaluation board allows the quick demonstration and evaluation of the AD8555/AD8556/AD8557 zero-drift, digitally programmable sensor signal amplifiers.

The AD8555/AD8556/AD8557 are auto-zero instrumentation amplifiers with programmable gain and output offset adjustment features. The evaluation board enables a PC to communicate with the AD8555/AD8556/AD8557. Users can send commands to the evaluation board and read back the programmed values for the device that is being evaluated.

The information in this document is meant to supplement the information in the AD8555, AD8556, and AD8557 data sheets. To evaluate the device thoroughly, users are encouraged to read this document and the AD8555/AD8556/AD8557 data sheets.

FUNCTIONAL BLOCK DIAGRAM

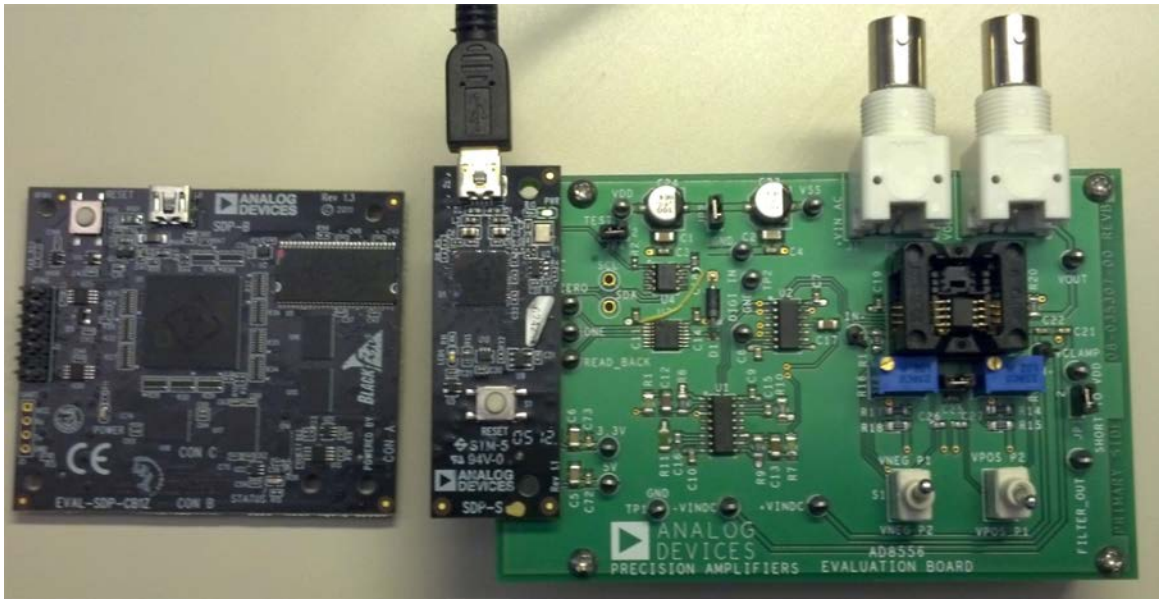

Figure 1.Image of SDP-S board Connected to the AD8556-EVALZ Board (SDP-B Board Is Shown for Reference)

Rev. 0

One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106, U.S.A.
Tel: 781.329.4700 www.analog.com
Fax: 781.461.3113

TABLE OF CONTENTS

Features 1
General Description 1
Functional Block Diagram 1
Revision History 2
Hardware Description 3
System Requirements 3
Communicating with the Evaluation Board 3
Hardware Requirements 3
Adjusting for 0 V Differential Input 3
Quick Initial Hardware Setup and Output Verification 4
Software 5
Installation 5
Removing the Evaluation Software 5
Running the Software 5
Typical AC Setup and Response 6
Output Clamp Feature 7
Evaluation Board Schematic 8
Ordering Guide 8

REVISION HISTORY

10/13—Revision 0: Initial Version

HARDWARE DESCRIPTION

The AD8556-EVALZ evaluation board is designed for maximum configuration flexibility. An ac signal can be applied to $+V_{IN}$ ac, and the output can be monitored from V_{OUT} ac. DC signals can be differentially applied between $+V_{IN}$ dc and $-V_{IN}$ dc, and the results can be monitored using a voltmeter at V_{OUT}. Users can view the filter output signal at the FILT/DIGOUT pin. The board also allows swapping of the polarity of the inputs using switches V_{NEG} P1 and V_{POS} P1.

Four resistors (R1A, R1B, R2A, R2B) simulate a 100 Ω bridge configuration. The bridge can be unbalanced using the provided trim potentiometers (P1 and P2). The top and bottom of the bridge are connected to VDD and VSS, respectively.

Pulse shaping is performed on this board before applying the data to the AD8556-EVALZ data input pin. The pulse widths are set for 5 µs, representing the low level (0 V); and 80 µs, representing the high level (>2.4 V). This adjustment is made using Resistor RT0 and Resistor RT1. The trim potentiometers are glued to their fixed positions.

Supply current can be monitored by using a resistor in place of R7. Clamp voltage can be applied externally to a level or can be set easily to V_{DD} by placing a jumper from VCLAMP to VDD. The SOIC socket is soldered for easy programming and removal of the part. Pin 1 is the pin located in the upper left-hand corner of the socket close to R7. Please make sure that the part is placed in the socket properly. See Figure 11 for the evaluation board schematic.

SYSTEM REQUIREMENTS

- The evaluation kit has the following system requirements:
- ADI SDP-B or SDP-S board. Available for purchase separately.
  http://www.analog.com/sdp
- PC with available USB 2.0 port.
- Microsoft® Windows® operating system with administrator access.

COMMUNICATING WITH THE EVALUATION BOARD

The evaluation board connects to the ADI SDP-B or SDP-S board, which connects to the USB port of a PC.

Ensure that the evaluation software provided on the CD installed before connecting SDP board and evaluation board.

HARDWARE REQUIREMENTS

- Power supplies
- Voltage source
- Voltmeter
- BNCs and power cables
- SDP board with USB mini-B cable

ADJUSTING FOR 0 V DIFFERENTIAL INPUT

Prior to initial hardware setup and output verification, complete the following to adjust for differential input offset:

1. Connect +input (high) of a voltmeter to $-V_{IN}$ dc.
2. Connect −input (low) of the voltmeter to GND of the power supply.
3. Monitor the output (V_{OUT} dc) voltmeter.
4. Adjust trim Potentiometer P1 to get close to 0 V (−0.1 mV).
5. Connect +input (high) of a voltmeter to $+V_{IN}$ dc.
6. Connect −input (low) of the voltmeter to GND of the power supply.
7. Monitor the output (V_{OUT} dc) voltmeter.
8. Adjust trim Potentiometer P2 to get close to 0 V (0.1 mV).

QUICK INITIAL HARDWARE SETUP AND OUTPUT VERIFICATION

For an initial hardware setup and output verification, follow these steps:

1. Connect the AD8556-EVALZ evaluation board to the SDP board, which is connected to the USB port of your PC system using USB mini-B cable.
2. Position manual switches to V_{POS} P2 and V_{NEG} P1.
3. Jumper the VCLAMP connector pin to the VDD connector pin.
4. Apply 1 mV dc signal between the $+V_{IN}$ dc and $-V_{IN}$ dc connectors, and monitor the V_{OUT} dc output using a voltmeter.
5. Place an AD8556-EVALZ part in the SOIC socket, connect the VCLAMP pin to the VDD pin, and apply dc power to the board using an external power supply (±2.5 V).

When you complete this procedure, the output should be 70 mV, with the board in this configuration consuming roughly 4 mA.

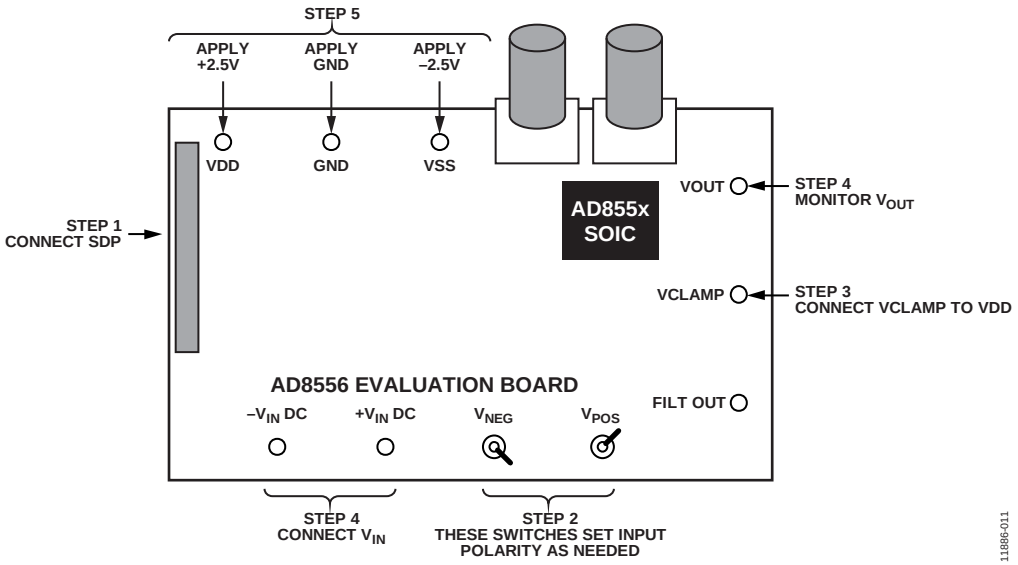

Figure 2.

SOFTWARE

INSTALLATION

To install the evaluation software on the PC

1. Insert the CD-ROM into the CD drive on your computer. After a few moments, a message for the installation appears.
2. Double-click setup.exe. (Right click and select Install as administrator for Windows® 7 onwards)
3. Follow the instructions until the software installation is complete.

The evaluation software is developed in LabVIEW®. The software requires a LabVIEW® runtime engine and USB drivers for the SDP (both included in install). Install the software with administrator access, before plugging in the SDP board. The install will detect if the SDP board has been installed previously.

C:\Program Files (x86)\Analog Devices\AD855x

For future reference or for the most current data sheet, visit www.analog.com/AD8556 or www.analog.com/AD8557.

REMOVING THE EVALUATION SOFTWARE

To remove the AD8556-EVALZ evaluation software modules:

1. Click **Start** > **Settings** > **Control Panel**.
2. Double-click **Add/Remove Program**s and select AD855x Evaluation Software.

RUNNING THE SOFTWARE

To run the AD8556-EVALZ software application:

1. With the SDP board plugged into PC via USB, and into AD8556-EVALZ evaluation board via P1 socket, run the AD8556-EVALZ software by clicking **Start** > **AD855x Eval** > **AD855xEVAL**. The Graphical User Interface (GUI) will load.
2. Select the product for which you have samples and the connector used, and then click **Start** on the left.
3. Set the appropriate gain and offset values, and then click **Simulate**. Monitor the output as the offset is changed to verify communication.
4. Program the gain between 70 and 1280 and the offset between 0 V and 5 V. Click **Simulate** to load these values into the AD8556-EVALZ and monitor the output.

   The output is input × gain and responds to the specified configuration.

5. After the AD8556-EVALZ has been simulated to the final values, click **Program** to permanently blow the internal fuses to the values in the GUI.

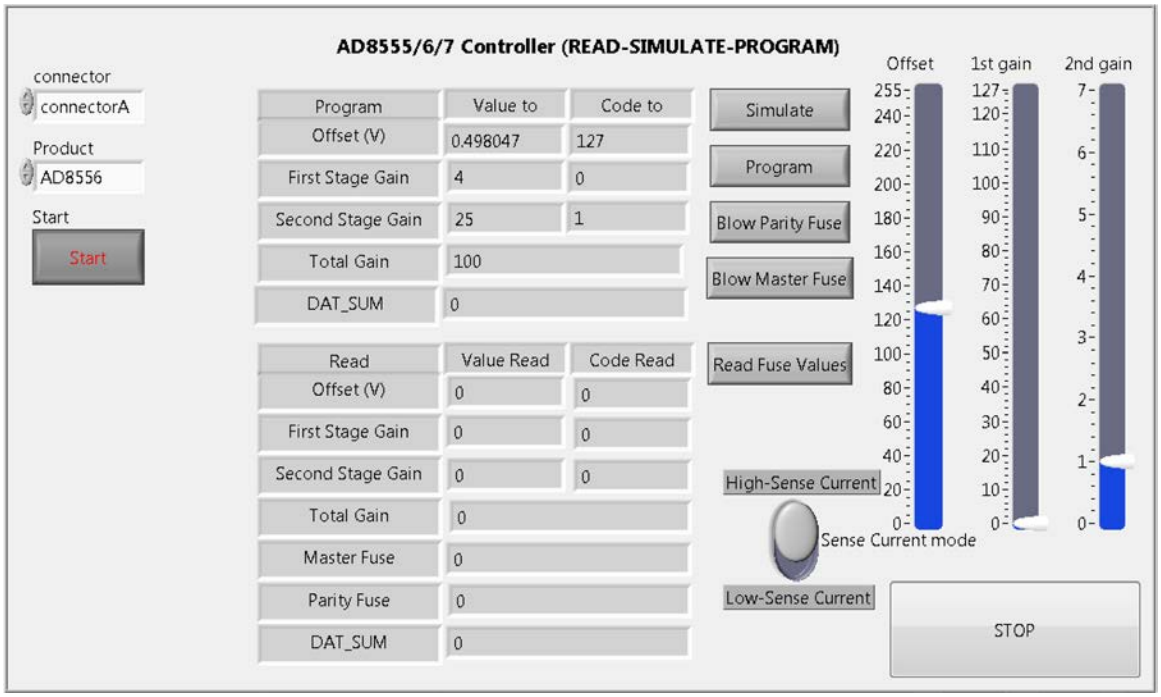

Figure 3. No Programming Dialog Box

Table 1. AD8556-EVALZ Dialog Box Button Functions

Button	Function
Start	Select the connector and the product and then click **Start** to begin evaluation
Connector	Selects the physical connector on the SDP-B board that is used to connect to the AD8556-EVALZ evaluation board. The connectors are labeled on the top silkscreen of the SDP boards.
Product	Selects the IC part number under evaluation.
Simulate	Configures the part according to the specified pattern. This button does not blow any fuses.
Program	Blows fuses according to the specified pattern. Blown fuses cannot be reprogrammed.
Blow Parity Fuse	Blows the parity fuse. The parity fuse keeps track of the state of the blown fuses. If, for any reason, the state of this fuse is changed either intentionally or unintentionally, the parity flag is set and the alarm is set.
Blow Master Fuse	Permanently sets the part to the programmed gain and offset and prevents future programming. Click this button only after selecting and programming the gain and the offset. Prior to blowing the master fuse, make sure that, if prompted, you first blow the parity fuse.
Read Fuse Values	Reads back the state of the programmed fuses after they have been blown. The options are: Low Sense Current option, when dropped across a blown fuse (high impedance), creates a voltage that can trigger an internal comparator and provide the right level in the output. High Sense Current option reads back the fuse states to make sure that the fuses are blown. A code for blown fuses appears in a pop-up box.

Refer to the AD8555, AD8556, or AD8557 data sheets for more information on its theory of operation, simulation/programming/read modes, and parity error detection. The AD8555/AD8556/AD8557 data sheets also contain more information on programming procedures for the part.

TYPICAL AC SETUP AND RESPONSE

AC Input Example

Setup requirements are as follows:

- Power supplies
- Function generator
- Scope
- BNCs and cables

Results

When the part is powered with ±2.5 V, and 50 mV of input is applied, the default conditions are

V_{CC} = 2.5 V
V_{SS} = −2.5 V
Gain 1 = 4
Gain 2 = 17.5
Offset = V_{SS}

The overall gain is 70.

When you place the switches in V_{NEG} P1 and V_{POS} P2, there is one set of outputs. When you change to V_{NEG} P2 and V_{POS} P1, you get the exact voltage, but with the opposite polarity.

When both switches are on one side (for example, V_{NEG} P1 and V_{POS} P1), the inputs are shorted together.

RT0 and RT1 are the trim potentiometers used for pulse width shaping. Do not change their settings. RT0 is adjusted to create a 5 µs pulse; RT1 is adjusted to create an 80 µs pulse. Figure 4 shows the output on Channel 2 under these conditions and configuration.

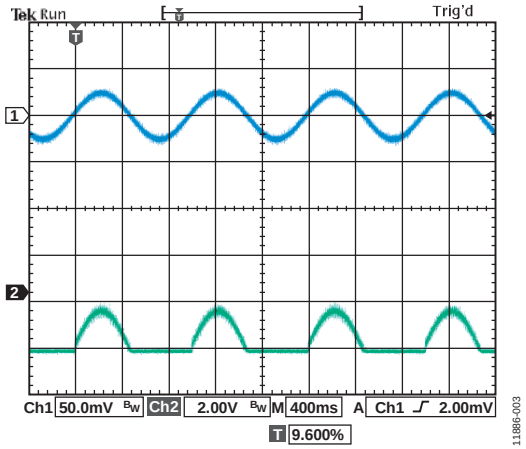

Figure 4.

Figure 5 shows the results of the previous conditions with V_{OFF} = 2.5 V or Code 128.

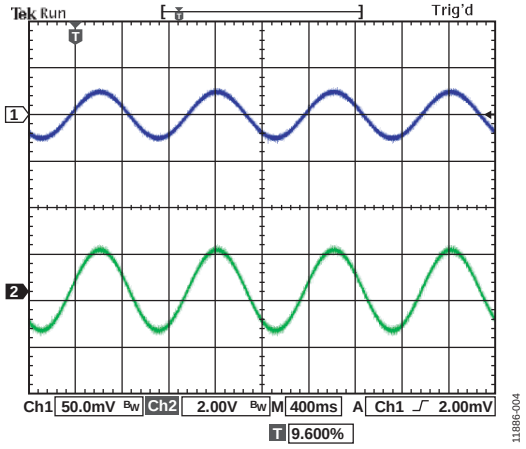

Figure 5.

In Figure 6, overall gain = 100 (G1 = default = 4, G2 = Code 1 = 25, offset = 2.5 V or Code 128).

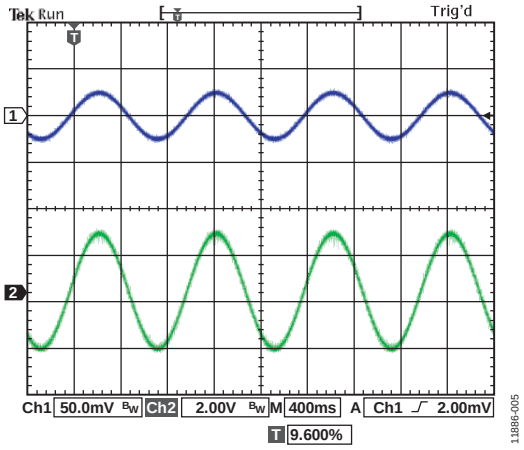

Figure 6.

In Figure 7, V_{IN} = 2 mV p-p and G1 = 6.4, G2 = 35, offset = 2.5 V or Code 128.

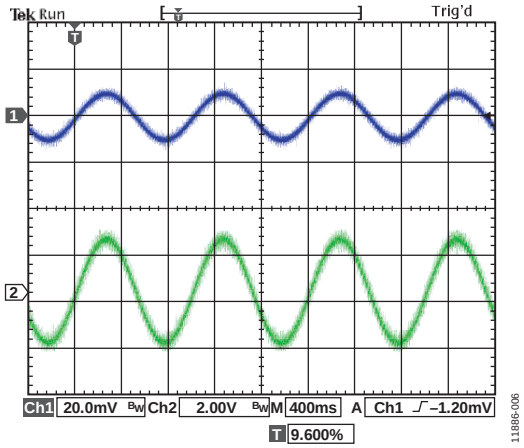

Figure 7.

OUTPUT CLAMP FEATURE

The output of the part can be clamped to the desired level. The output clamp feature is provided to protect the circuitry that follows the AD8556-EVALZ, in case the input to AD8556-EVALZ is accidentally larger than anticipated.

In normal situations ($V_{SUPPLIES}$ = ±2.5 V, Gain = 70, V_{OFFSET} = 2.5 V, Input = 40 mV p-p), the response to an input is as shown in Figure 8.

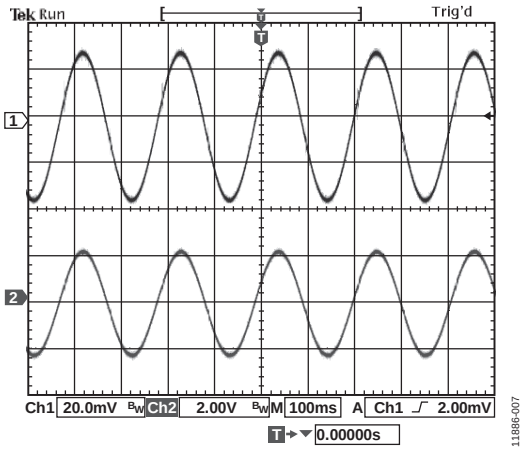

Figure 8. Normal Response

Figure 9 shows the output after V_{CLAMP} is set to 0.8 V.

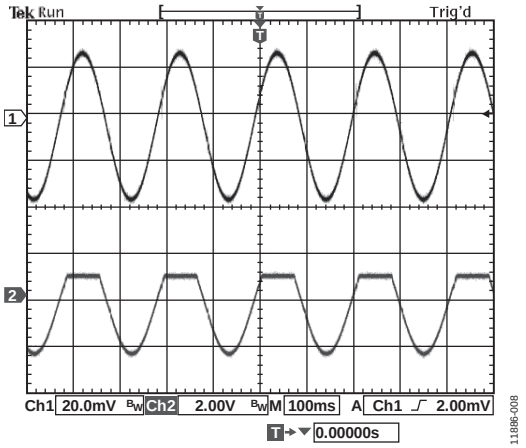

Figure 9. Response with V_{CLAMP} Set

Applying a large gain to an input yields saturation, as shown in Figure 10. The conditions are V_{IN} = 20 mV p-p, G1 = 6.4, G2 = 200, Offset = 2.5 V.

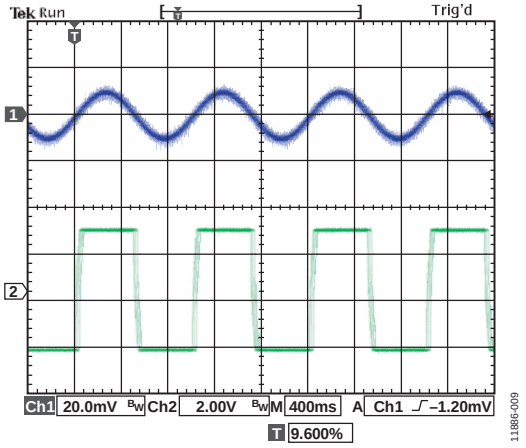

Figure 10. Results with Saturation

Note that Resistor RT1 and Resistor RT2 are used for pulse stretching; do not adjust them. They are factory-adjusted for optimal results.

EVALUATION BOARD SCHEMATIC

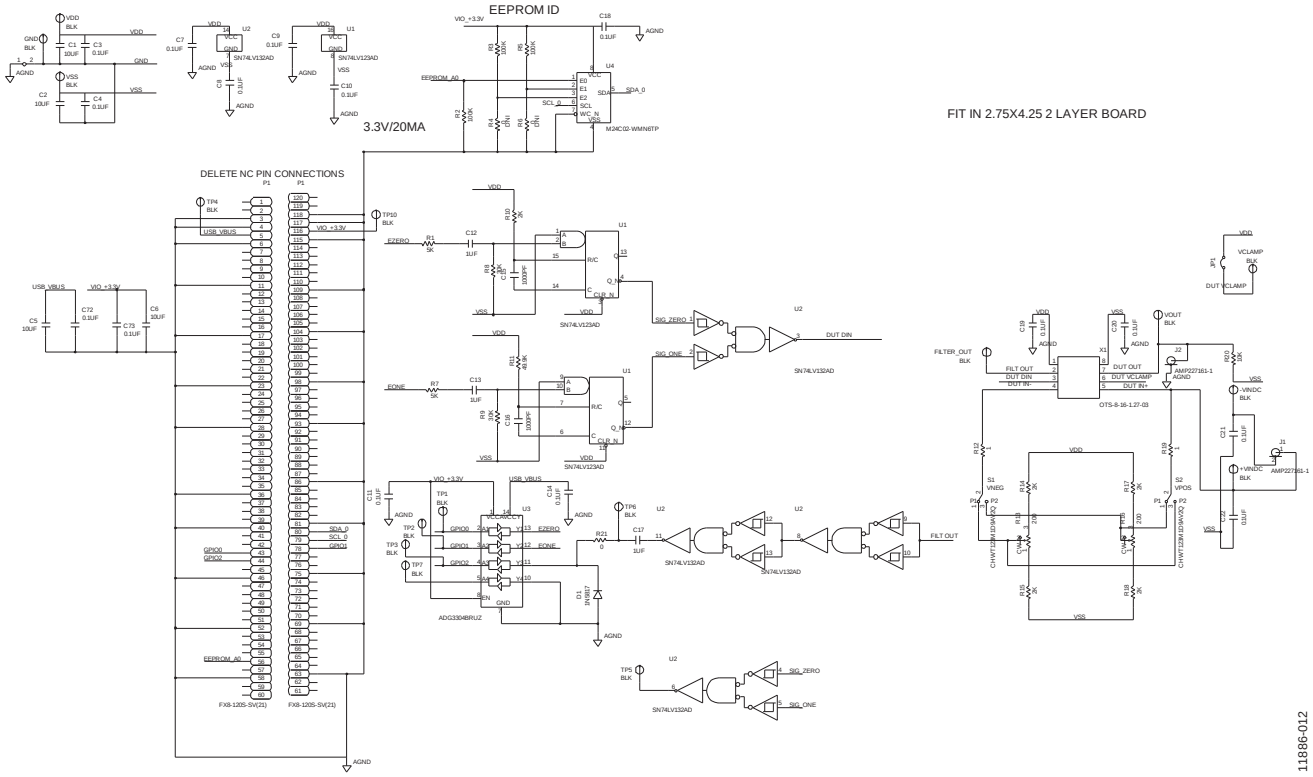

Figure 11. Evaluation Board Schematic

ORDERING GUIDE

Model	Description
AD8556-EVALZ	Evaluation Board