

## Evaluating the AD4858 8-Channel Simultaneous Sampling, 20-Bit 1 MSPS DAS

### FEATURES

- ▶ Full featured evaluation board for the [AD4858](#)
- ▶ 8 input channels available through SMA connectors
- ▶ On-board reference circuit and power supplies
- ▶ Standalone capability through FMC connector and/or test points
- ▶ PC software for control and data analysis of the time and frequency domain
- ▶ ZedBoard-compatible
- ▶ Compatible with other FMC controller boards

### EQUIPMENT NEEDED

- ▶ PC running Windows® 10 operating system or higher
- ▶ Digilent ZedBoard with 12 V wall adapter power supply
- ▶ Precision signal source
- ▶ SMA cables (inputs to evaluation board)
- ▶ USB cable

### SOFTWARE NEEDED

- ▶ [Analysis | Control | Evaluation \(ACE\) Software](#)
- ▶ AD4858 [ACE plugin](#) from plug-in manager

### EVALUATION BOARD KIT CONTENTS

- ▶ EVAL-AD4858FMCZ evaluation board
- ▶ Micro-SD memory card (with adapter) containing system board boot software and Linux OS

### EVALUATION BOARD PHOTOGRAPH

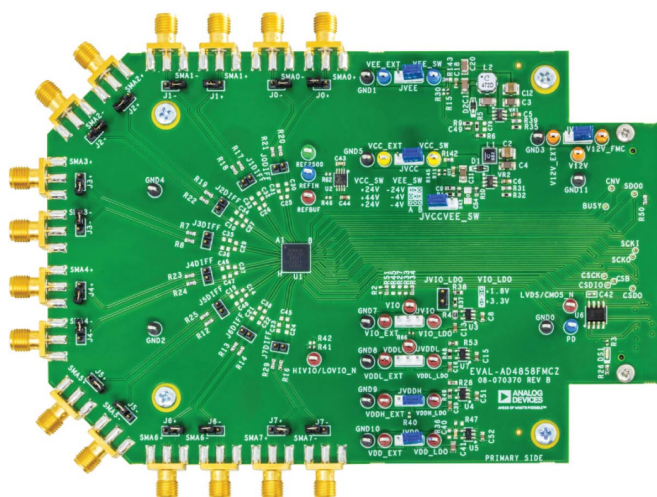


Figure 1. Evaluation Board Photograph

### GENERAL DESCRIPTION

The EVAL-AD4858FMCZ is designed to demonstrate the performance of the AD4858 and to provide access to many included configuration options that are accessed via a simple ACE plug-in graphical user interface (GUI). The AD4858 is a fully buffered, 8-channel simultaneous sampling, 20-bit, 1 MSPS data acquisition system (DAS) with differential, wide common-mode range inputs.

The EVAL-AD4858FMCZ on-board components include the following:

- ▶ The [LTC6655](#) high precision, low drift, 4.096 V voltage reference (not used by default)
- ▶ The [LT1761](#), low noise, 1.8 V, 2.5 V, and 5 V low dropout (LDO) regulators
- ▶ The [LT8330](#) low quiescent current ( $I_Q$ ) boost converter

For full details on the AD4858, see the AD4858 data sheet, which must be consulted in conjunction with this user guide when using the EVAL-AD4858FMCZ evaluation board.

This evaluation board can also be used to evaluate the performance of the [AD4856](#), the [AD4854](#), and the [AD4852](#).

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REVISION HISTORY

12/2024—Rev. A to Rev. B

Changes to General Description Section.....	1
Added Evaluation Board Software Section, Evaluation Software Section, and Host PC Software Section....	3
Changes to Quick Start Guide Section.....	4
Deleted Figure 2 and Figure 3; Renumbered Sequentially.....	4
Changes to Figure 3.....	4

8/2024—Rev. 0 to Rev. A

Changes to General Description Section.....	1
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10/2023—Revision 0: Initial Version

## EVALUATION BOARD SOFTWARE

### EVALUATION SOFTWARE

The ADI ACE application provides a plug and play evaluation experience, enabling users to get up and running quickly with the product evaluation board. ACE can configure the embedded software on supported controller boards and provides a quick and easy way to get setup, configure the board and perform data capture, and analysis and/or waveform generation.

The controller board supported by ACE with this product evaluation board is the ZedBoard.

For ACE installation and documentation instructions, see [www.analog.com/ace](http://www.analog.com/ace). Follow the instructions to install the necessary evaluation board plug-in support.

- ▶ If the machine that ACE is installed on has internet access, find/install/update plug-ins directly from the ACE application.
- ▶ For environments without internet access, download these plug-ins from [www.analog.com/ace](http://www.analog.com/ace) to portable storage and install them into ACE.

Note that the product specific documentation for the evaluation software can be found within the ACE plug-in.

### EMBEDDED SOFTWARE

The embedded software used for evaluation is typically built using open-source firmware examples, drivers, and HDL, where available, and can be found in the Software section on the product page.

Note that if the embedded software is not available, the user can submit a request through the [AD4856](#), [AD4854](#), or [AD4852](#) product page.

Evaluation boards using Linux-based controllers come with an SD card in the box. The SD card provides a version of ADI Kuiper Linux for evaluation that can boot the controller board. The ACE evaluation board plug-in provides product specific configuration data and files.

If there is an issue or update available for this SD card, the image can be found in the Software section on the relevant evaluation board page.

### HOST PC SOFTWARE

The embedded firmware and Linux stacks are based on the Industrial I/O (IIO) architecture. This enables tools such as Python, through the `pyadi-iio` package, or MATLAB, with the Precision Toolbox, on a host PC to communicate with the evaluation and controller boards. Where available, links can be found in the Software section on the product page.

There are generic, not product specific, IIO tools, such as IIO Oscilloscope, Scopy, and IIO command line tools, that provide basic, low-level functionality, and work with any IIO platform.

QUICK START GUIDE

Take the following steps to begin to evaluate the EVAL-AD4858FMCZ:

- 1. For getting started with the ACE evaluation software, refer to the [ACE Software Support](#) section.
- 2. Ensure the ZedBoard boot configuration jumpers are set to use the Micro-SD card as shown in [Figure 2](#). To avoid potential damage when JPIO is changed as described in [Table 1](#), ensure that the VADJ SELECT jumper is set to the correct voltage for the EVAL-AD4858FMCZ.

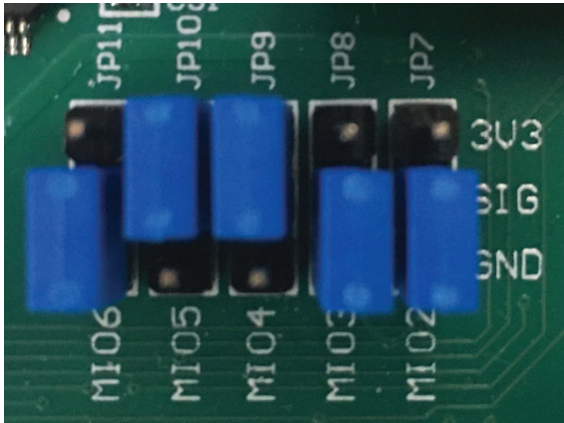


Figure 2. ZedBoard Boot Configuration Jumpers

- 3. Connect the EVAL-AD4858FMCZ to the FMC connector on the ZedBoard.
- 4. Connect the USB cable from the computer to the J13/USB OTG port, and connect the 12 V power supply to J20/DC input.
- 5. Slide the SW8/POWER switch in the ZedBoard to the on position. The green LD13/POWER LED turns on and is followed by the blue LD12/DONE LED (within the ZedBoard). The DS1 LED in the EVAL-AD4858FMCZ also turns on.
- 6. The LED blinks, LD0 and LD1, approximately 20 to 30 seconds later, indicating that the boot process is complete.
- 7. Launch the **ACE Software**. The EVAL-AD4858FMCZ appears in the **ACE Start** in the **Attached Hardware** view, as shown in [Figure 3](#).

If the EVAL-AD4858FMCZ does not appear on the **Attached Hardware** view, the plug-in can still be launched from the **Explore Without Hardware** menu. Click **Proceed To Documentation** to open the plug-in documentation for troubleshooting help as well as descriptions of each window and features within the plug-in.

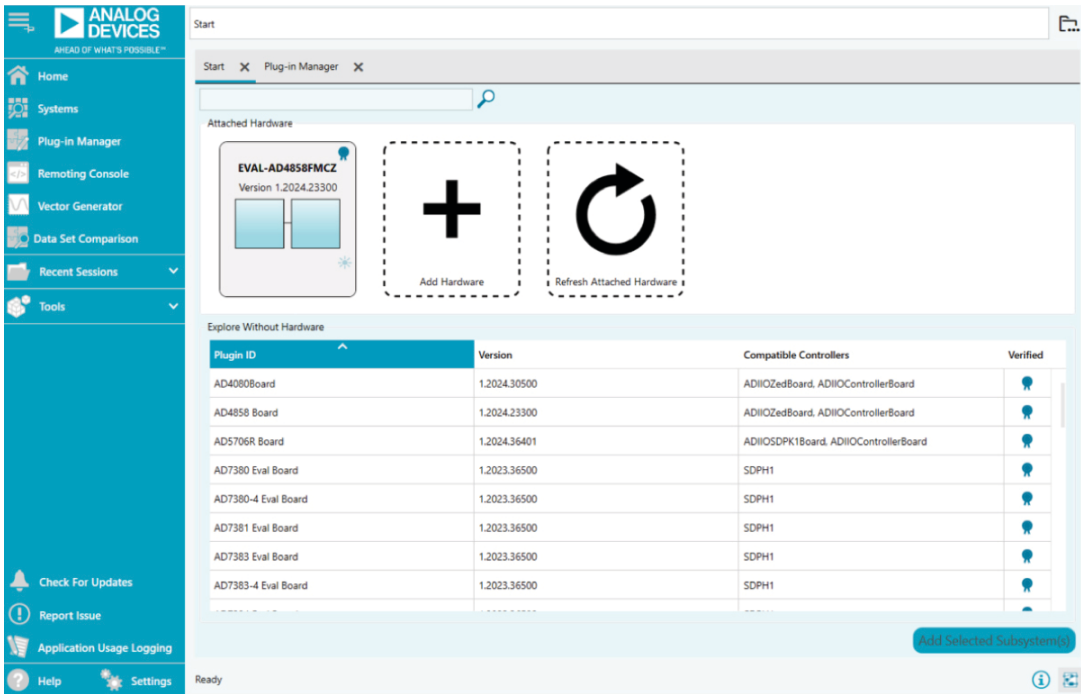


Figure 3. Attached Hardware View

## EVALUATION BOARD HARDWARE

The AD4858 is a fully buffered, 8-channel simultaneous sampling, 20-bit 1 MSPS DAS with differential, wide common-mode range inputs. The AD4858 has an on-chip low drift 4.096 V internal voltage reference; however, it also optionally accepts an external reference applied through the REFIO pin and provided to the on-board [LTC6655](#). The device operates from different power rails, provided through on-board LDO regulators as described in [Power Supplies](#) section. An option to connect external supplies exists and is explained in [Table 1](#).

## HARDWARE LINK OPTIONS

[Table 1](#) details the link option functions and the default power link options. The EVAL-AD4858FMCZ can be powered from different sources, as described in the [Power Supplies](#) section. By default, the power supply required for the EVAL-AD4858FMCZ comes from the ZedBoard controller board. The power supply is regulated by the on-board regulators that generate the required bipolar supplies.

**Table 1. Jumper Details with the Factory Default Settings**

Link	Default Position	Function
JODIFF to J7DIFF	Not inserted	Offset Calibration Jumper. Inserting the JODIFF to J7DIFF jumper link allows short circuiting the corresponding pair of inputs to measure the AD4858 offset and/or to perform an offset calibration.
J0+ to J7+	Not inserted	Analog Input to Ground Connection. Insert the J0+ to J7+ jumper link to connect to the AGND pin, the corresponding positive analog input.
J0- to J7-	Not inserted	Analog Input to Ground Connection. Insert the J0- to J7- jumper link to connect to the AGND pin, the corresponding negative analog input.
JV12V	A	The JV12V link selects the power supply source for the EVAL-AD4858FMCZ evaluation board. In Position A, the unregulated supply to the on-board LDO regulators is taken from the ZedBoard 12 V supply. In Position B, the unregulated external supply to the on-board LDO regulators is taken from the V12V_EXT connector.
JSHIFT	A	The JSHIFT link selects the power supply type for the AD4858. In Position A, the $V_{CC}$ pin = +24 V, and the $V_{EE}$ pin = -24 V. In Position B, the $V_{CC}$ pin = +44 V, and the $V_{EE}$ pin = -4 V. If not inserted, the $V_{CC}$ pin = +24 V, and the $V_{EE}$ pin = -4 V.
JVCC	A	The JVCC link selects the $V_{CC}$ pin supply source. In Position A, the $V_{CC}$ pin is provided by the on board <a href="#">LT8330</a> DC/DC converter. In Position B, the $V_{CC}$ pin is provided though VCC_EXT connector.
JVEE	A	The JVEE link selects the $V_{EE}$ pin supply source. In Position A, the $V_{EE}$ pin is provided by the on-board <a href="#">LT8330</a> DC/DC converter. In Position B, the $V_{EE}$ pin is provided though VEE_EXT connector.
JVDDH	A	The JVDDH link selects the $V_{DDH}$ pin supply source. In Position A, the $V_{DDH}$ pin is provided by the on board <a href="#">LT1761</a> 2.5 V LDO regulator. In Position B, the $V_{DDH}$ pin is provided though VDDH_EXT connector. If not inserted, the $V_{DDH}$ pin can be tied to the AGND pin by inserting an R40 resistor. To disable the internal LDO regulator, tie the $V_{DDH}$ pin to the GND pin. With the regulator is disabled, connect the $V_{DDL}$ pin to an external supply in the range of 1.71 V to 1.89 V through the JVDDL link.
JVDD	A	The JVDD link selects the $V_{DD}$ pin supply source. In Position A, the $V_{DD}$ pin is provided by the on-board <a href="#">LT1761</a> 5 V LDO regulator. In Position B, the $V_{DD}$ pin is provided though VDD_EXT connector.
JVDDL	Not inserted	The JVDDL link selects the $V_{DDL}$ pin supply source. In Position A, the $V_{DDL}$ pin is provided by the on-board <a href="#">LT1761</a> 1.8 V LDO regulator. To use this configuration, tie the $V_{DDH}$ pin to ground through the JVDDH link. In Position B, the $V_{DDL}$ pin is provided though the VDDL_EXT connector. To use this configuration, tie the $V_{DDH}$ pin to ground through the JVDDH link. If not inserted, the internal LDO regulator is used for the JVDDH link to be in Position A or Position B.

## EVALUATION BOARD HARDWARE

**Table 1. Jumper Details with the Factory Default Settings (Continued)**

Link	Default Position	Function
JVIO	Not inserted	<p>The JVIO link selects the <math>V_{IO}</math> pin supply source. If not inserted, the <math>V_{IO}</math> pin is taken from the ZedBoard (default). Alternatively, the <math>V_{IO}</math> pin can be supplied from either the on-board LDO regulators or an external supply.</p> <p>In Position A, the <math>V_{IO}</math> pin is provided by the on-board LT1761 LDO regulator with an output voltage dependent on the JVIO_LDO link. The R66 resistor (shown in <a href="#">Figure 5</a>) is unsoldered.</p> <p>In Position B, the <math>V_{IO}</math> pin is provided through the VIO_EXT connector. The R66 resistor is unsoldered.</p> <p>Note the field programmable gate array (FPGA) image provided works at a 2.5 V digital level; therefore, use caution when changing the default position of the JVIO link jumper.</p>
JVIO_LDO	Not inserted	<p>The JVIO_LDO link selects the LT1761 LDO regulator output voltage when the JVIO link is in Position B.</p> <p>Inserted, the LT1761 output voltage is 3.3 V.</p> <p>Not inserted, the LT1761 output voltage is 1.8 V.</p>

## EVALUATION BOARD HARDWARE

## CONNECTORS AND SOCKETS

The connectors and sockets on the EVAL-AD4858FMCZ are outlined in [Table 2](#).

**Table 2. On-Board Connectors**

Connector	Function
SMA0+ to SMA7+	Positive analog input Subminiature Version A (SMA) to Channel 0 through Channel 7
SMA0- to SMA7-	Negative analog input SMA to Channel 0 through Channel 7
P1	FPGA mezzanine card (FMC) connector

## POWER SUPPLIES

The ZedBoard supplies 12 V to power the rails for the different components on the EVAL-AD4858FMCZ. The AD4858 uses the following five power supply pins:

- ▶ Positive high voltage power supply (the  $V_{CC}$  pin)
- ▶ Negative high voltage power supply (the  $V_{EE}$  pin)
- ▶ Low voltage power supply (the  $V_{DD}$  pin)
- ▶ 1.8 V power supply (the  $V_{DDL}$  pin)
- ▶ Digital power supply (the  $V_{IO}$  pin)

A combination of the [LT8330](#) DC/DC converter and the [LT1761](#) LDO regulator generate all the needed supply rails on the board.

**Table 3. Default Power Supplies Available in the EVAL-AD4858FMCZ**

Power Supply (V)	Function	Component
+24	$V_{CC}$	LT8330
-24	$V_{EE}$	LT8330
+2.5	$V_{DDH}$	LT1761
+5	$V_{DD}$	LT1761
+1.8	$V_{IO}$	LT1761

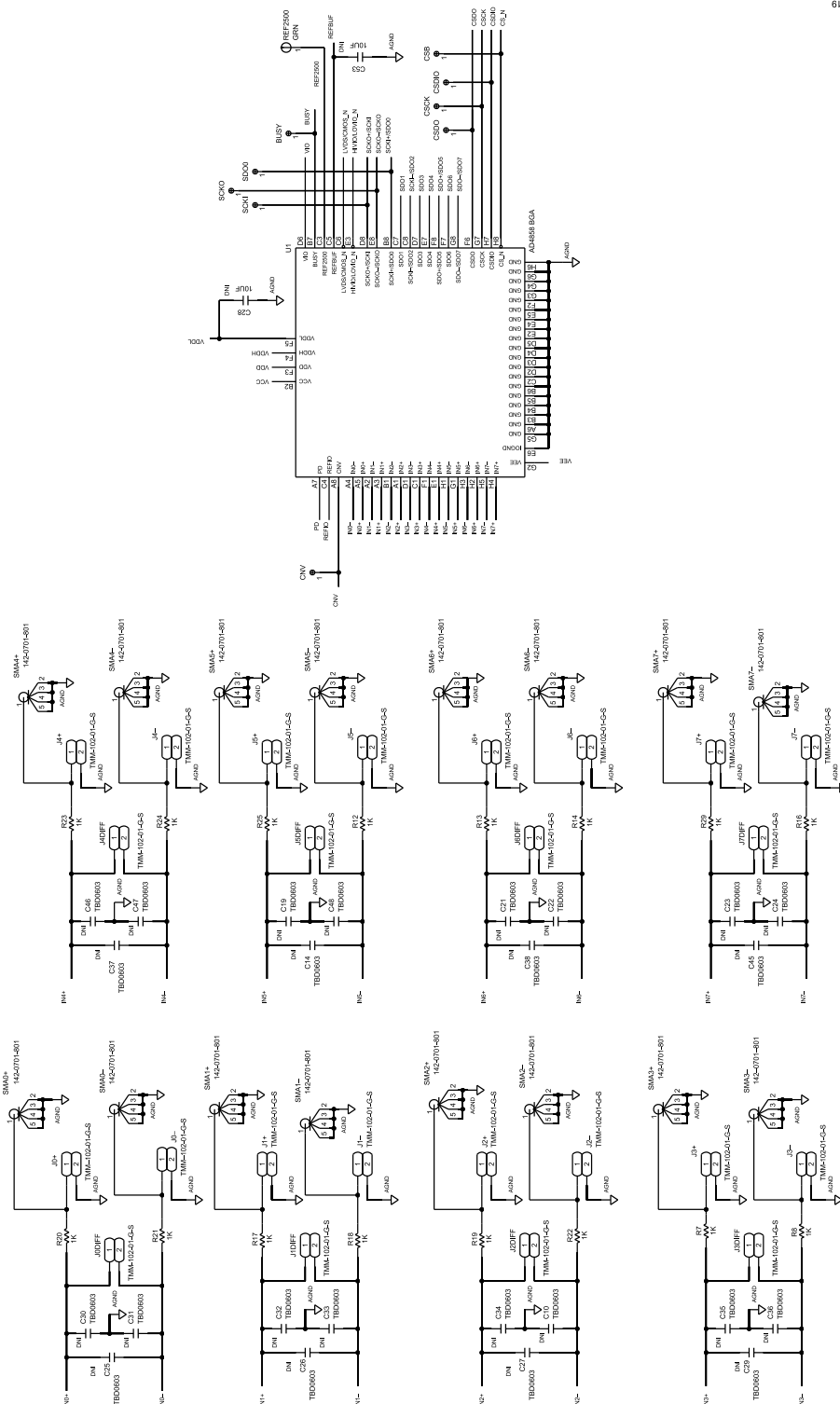
## REFERENCE CIRCUIT

By default, the AD4858 in the EVAL-AD4858FMCZ uses the internal low noise, low drift (10 ppm/°C maximum), temperature compensated band-gap reference that is factory trimmed to 4.096 V and the internal reference buffer.

As an optional alternative, an [LTC6655](#) high precision, low drift (2 ppm/°C maximum), 4.096 V voltage reference is also provided. This external reference can be used in two different configurations, as explained in the AD4858 data sheet and as follows:

- ▶ External reference with internal buffer. For this configuration, connect the external reference to the REFIO pin and populate the R62 resistor shown in [Figure 5](#).
- ▶ External reference with disabled internal buffer. For this configuration, connect the external reference to the REFBUF pin and populate the R46 resistor shown in [Figure 5](#) and also connect the REFIO test point to ground.

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**Figure 4. Analog Inputs Schematic**



## 020



## DIGITAL HOST CONNECTIONS



## 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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