Evaluating the AD4857 Buffered, 8-Channel Simultaneous Sampling, 16-Bit 1 MSPS DAS

FEATURES

- Full featured evaluation board for the AD4857
- 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
- AD4857 ACE plugin from plug-in manager

EVALUATION BOARD KIT CONTENTS

- EVAL-AD4857FMCZ evaluation board
- Micro-SD memory card (with adapter) containing system board boot software and Linux OS

EVALUATION BOARD PHOTOGRAPH

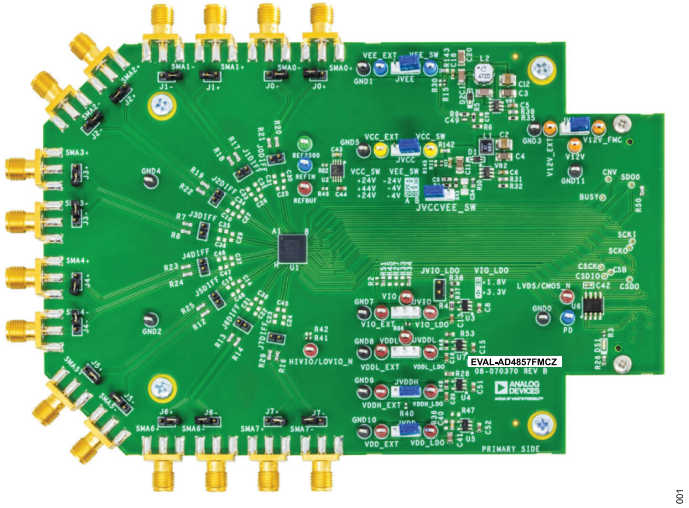

Figure 1. Evaluation Board Photograph

GENERAL DESCRIPTION

The EVAL-AD4857FMCZ is designed to demonstrate the performance of the AD4857 and to provide access to many included configuration options that are accessed via a simple ACE plug-in graphical user interface (GUI). The AD4857 is a fully buffered, 8-channel simultaneous sampling, 16-bit, 1 MSPS data acquisition system (DAS) with differential, wide common-mode range inputs.

The EVAL-AD4857FMCZ 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 AD4857, see the AD4857 data sheet, which must be consulted in conjunction with this user guide when using the EVAL-AD4857FMCZ evaluation board.

This evaluation board can also be used to evaluate the performance of the AD4855, the AD4853, and the AD4851.

TABLE OF CONTENTS

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

8/2024—Rev. 0 to Rev. A

Changes to General Description Section....1

6/2024—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. 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 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 AD4855, AD4853, or AD4851 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-AD4857FMCZ:

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 JVIO is changed as described in Table 1, ensure that the VADJ SELECT jumper is set to the correct voltage for the EVAL-AD4857FMCZ.

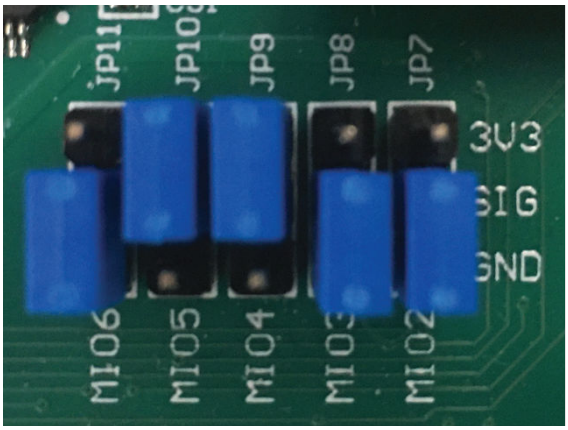

Figure 2. ZedBoard Boot Configuration Jumpers

3. Connect the EVAL-AD4857FMCZ 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-AD4857FMCZ 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-AD4857FMCZ appears in the **ACE Start** in the **Attached Hardware** view, as shown in Figure 3.

   If the EVAL-AD4857FMCZ 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.

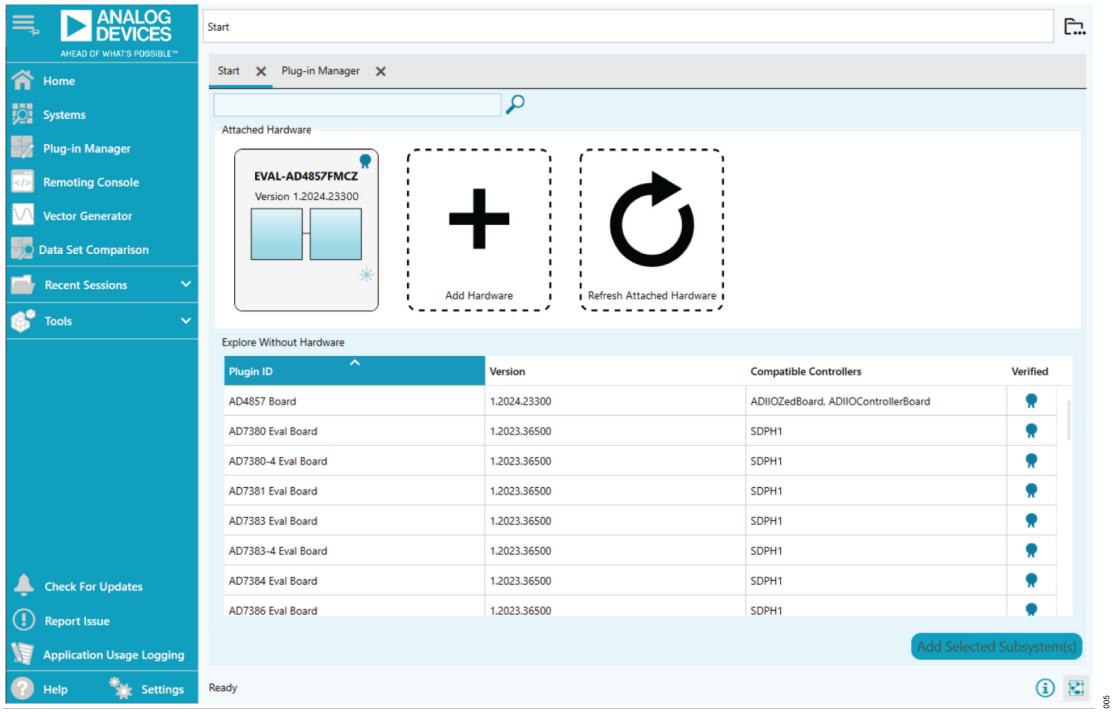

Figure 3. Attached Hardware View

EVALUATION BOARD HARDWARE

The AD4857 is a fully buffered, 8-channel simultaneous sampling, 16-bit 1 MSPS DAS with differential, wide common-mode range inputs. The AD4857 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-AD4857FMCZ can be powered from different sources, as described in the Power Supplies section. By default, the power supply required for the EVAL-AD4857FMCZ 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 AD4857 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-AD4857FMCZ 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 AD4857. 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 LT8330 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 LT8330 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 LT1761 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 LT1761 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 LT1761 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	The JVIO link selects the V_{IO} pin supply source. If not inserted, the V_{IO} pin is taken from the ZedBoard (default). Alternatively, the V_{IO} pin can be supplied from either the on-board LDO regulators or an external supply. In Position A, the V_{IO} 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 Figure 5) is unsoldered. In Position B, the V_{IO} pin is provided though the VIO_EXT connector. The R66 resistor is unsoldered. 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.
JVIO_LDO	Not inserted	The JVIO_LDO link selects the LT1761 LDO regulator output voltage when the JVIO link is in Position B. Inserted, the LT1761 output voltage is 3.3 V. Not inserted, the LT1761 output voltage is 1.8 V.

EVALUATION BOARD HARDWARE

CONNECTORS AND SOCKETS

The connectors and sockets on the EVAL-AD4857FMCZ 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-AD4857FMCZ. The AD4857 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-AD4857FMCZ

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 AD4857 in the EVAL-AD4857FMCZ 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 AD4857 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.

EVALUATION BOARD SCHEMATICS AND ARTWORK

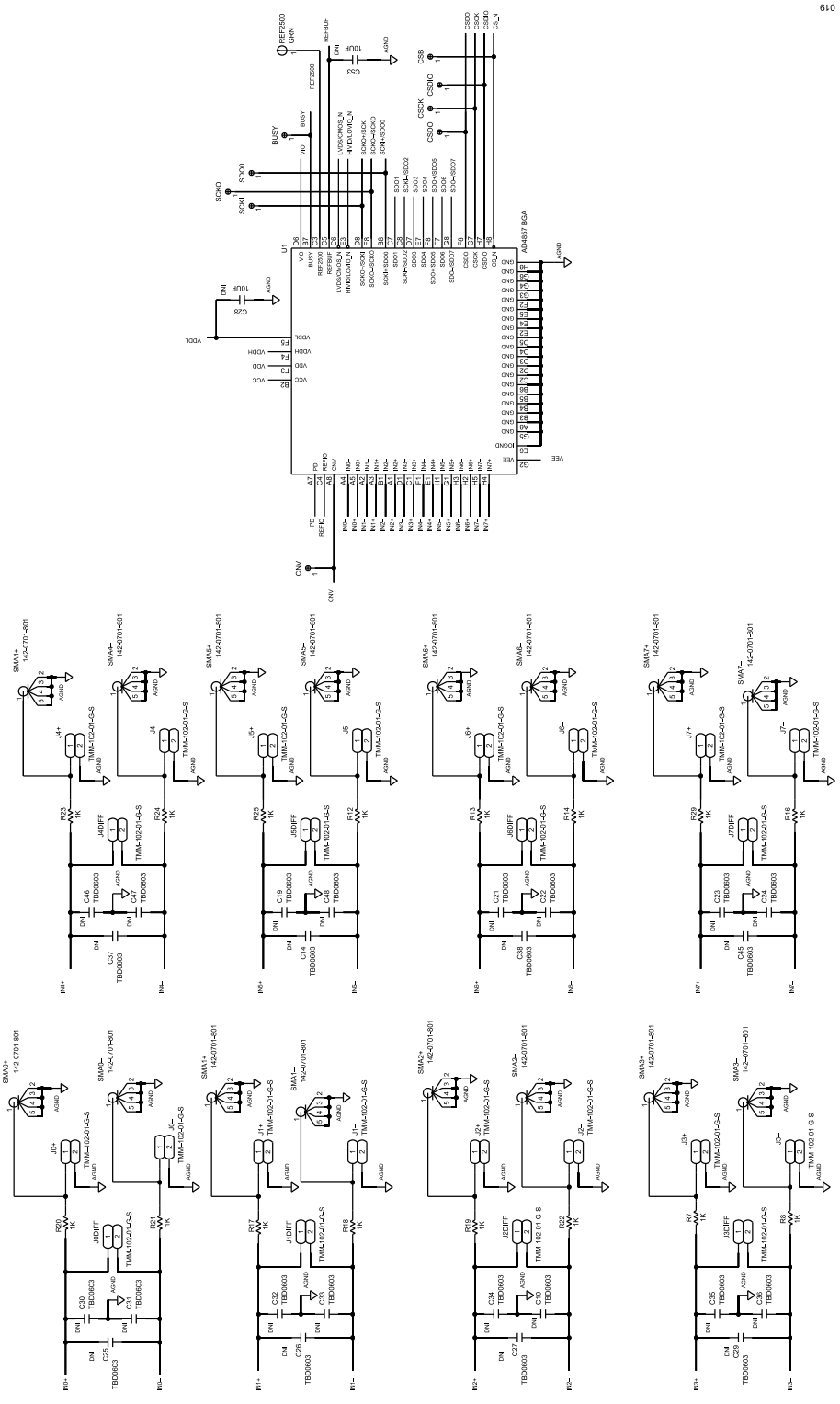

Figure 4. Analog Inputs Schematic

EVALUATION BOARD SCHEMATICS AND ARTWORK

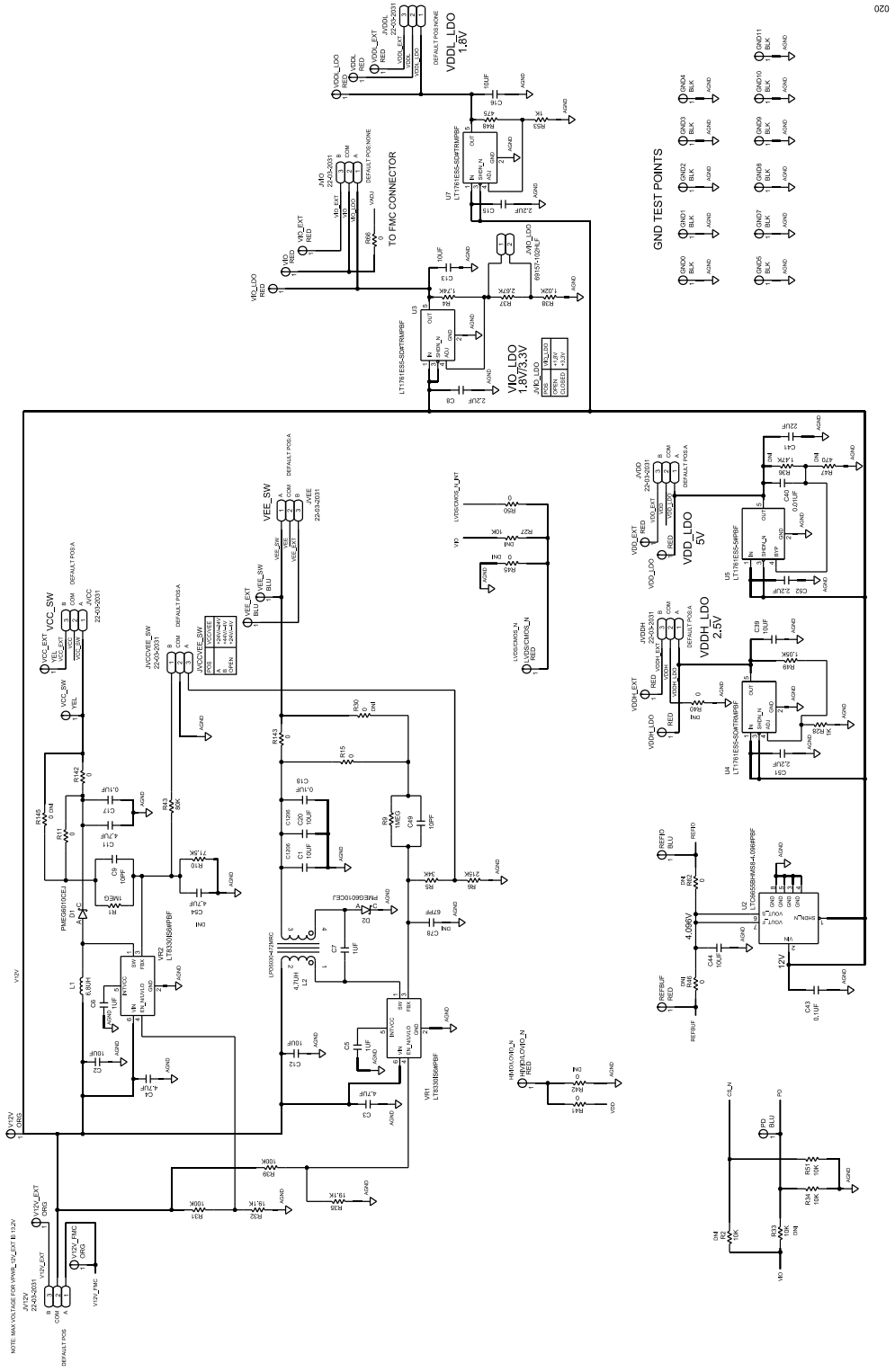

Figure 5. Power Solution Schematic

EVALUATION BOARD SCHEMATICS AND ARTWORK

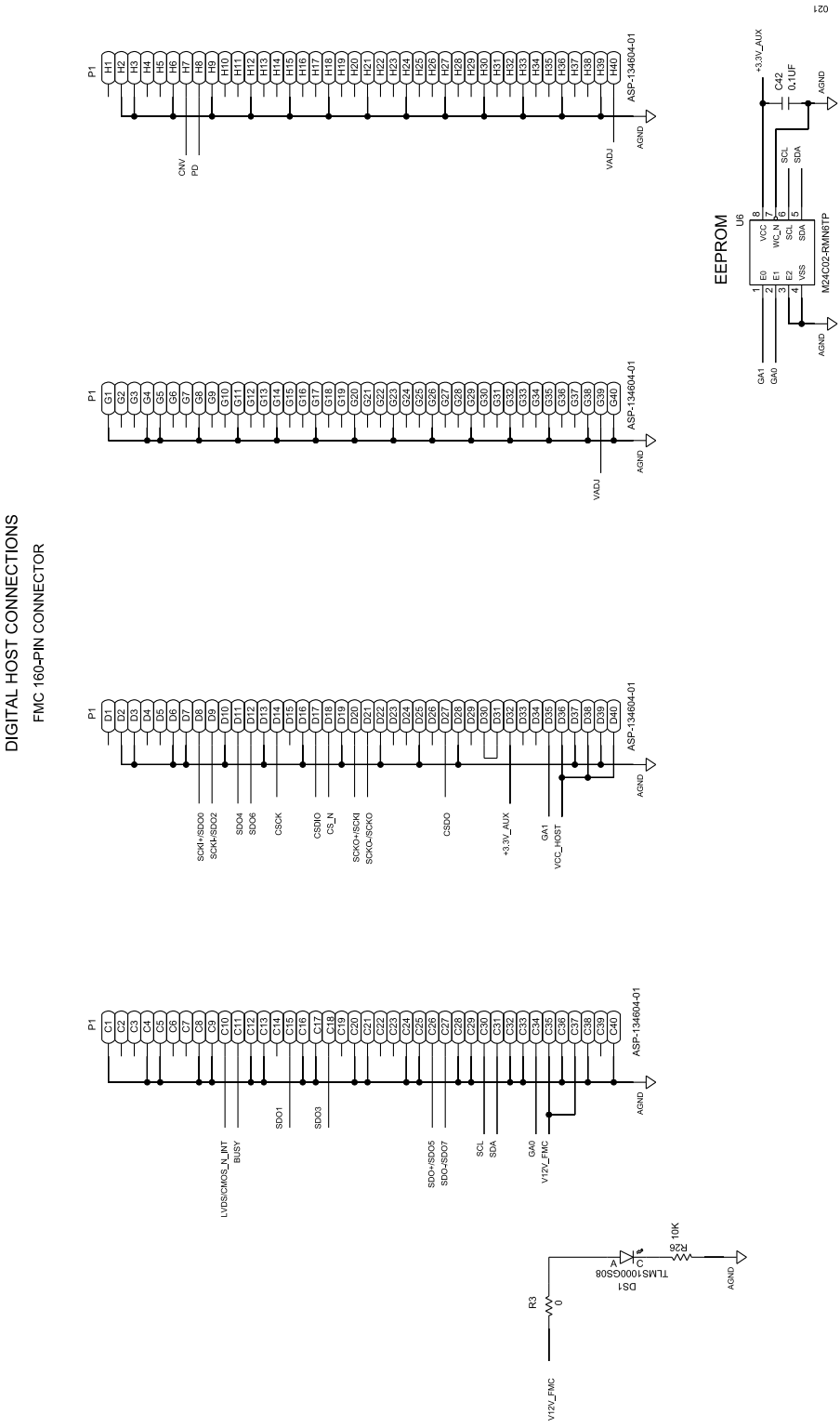

Figure 6. FMC Connection Schematic

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.