Evaluating the ADL6337, 35 dB Gain, 0.5 GHz to 5.2 GHz Transmitter VGA

FEATURES

- Full featured evaluation board for the ADL6337-EVALZA, ADL6337-EVALZB, ADL6337-EVALZC, and ADL6337-EVALZD
- Single-supply operation
- Easy to use interface with Analysis | Control | Evaluation (ACE) software

EQUIPMENT NEEDED

- 5 V dc power supply
- EVAL-SDP-CS1Z (SDP-S)
- Signal generator
- Spectrum analyzer
- Network analyzer (option)
- Microsoft Windows PC with a USB port

DOCUMENTS NEEDED

- ADL6337 data sheet

SOFTWARE NEEDED

- ACE software
- ACE ADL6337 plugin software

GENERAL DESCRIPTION

The ADL6337-EVALZA, ADL6337-EVALZB, ADL6337-EVALZC, and ADL6337-EVALZD evaluation boards allow the manual control of the ADL6337 through the USB port on a Microsoft® Windows® PC via a SDP-S interface board.

Additional information on the ADL6337 is provided in the ADL6337 data sheet. Consult the data sheet in conjunction with this user guide when using the ADL6337-EVALZA, ADL6337-EVALZB, ADL6337-EVALZC, and ADL6337-EVALZD evaluation boards.

EVALUATION BOARD CONNECTION DIAGRAM

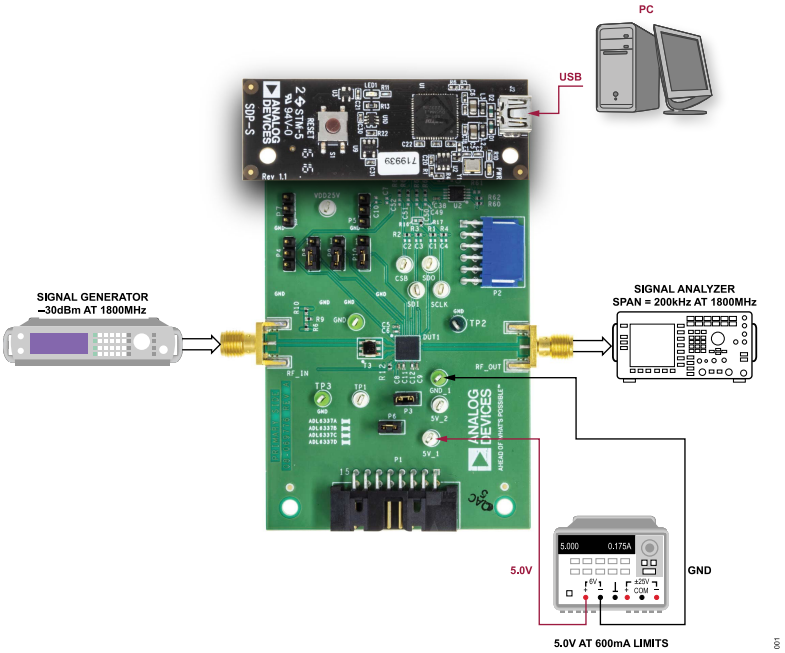

Figure 1. ADL6337-EVALZA/ADL6337-EVALZB/ADL6337-EVALZC/ADL6337-EVALZD Typical Measurement Setup (Option 1)

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REVISION HISTORY

11/2023—Rev. A to Rev. B

Added ADL6337-EVALZD (Universal)..... 1
Added Figure 5; Renumbered Sequentially.....3
Changes to Table 3.....4
Changes to Losses and Signal-to-Noise Ratio (SNR) Degradation Section.....7
Added Table 7; Renumbered Sequentially.....8
Added Figure 15..... 12

10/2023—Rev. 0 to Rev. A

Added ADL6337-EVALZC (Universal)..... 1
Added Figure 4; Renumbered Sequentially.....3
Changes to Single-Tone Demonstration with ACE Section and Table 3.....4
Changes to Table 4 and Table 5..... 7
Added Table 6; Renumbered Sequentially.....7
Added Figure 13.....11

2/2023—Revision 0: Initial Version

EVALUATION BOARD HARDWARE

HARDWARE SETUP

The hardware is connected as shown in Figure 2 and Figure 3. To power up the ADL6337-EVALZA, ADL6337-EVALZB, ADL6337-EVALZC, and ADL6337-EVALZD use a 5 V at 600 mA DC power supply. Connect the SDP-S to the PC through a USB cable.

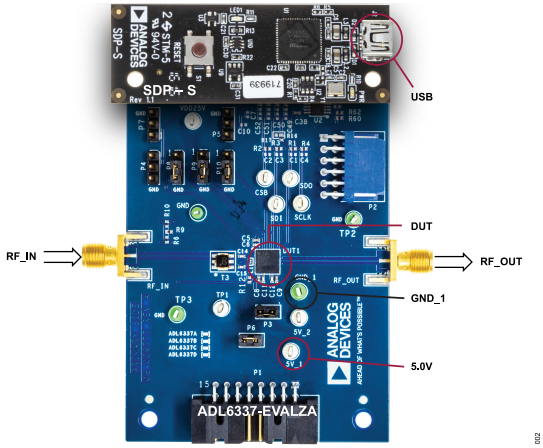

Figure 2. ADL6337-EVALZA and SDP-S Connections

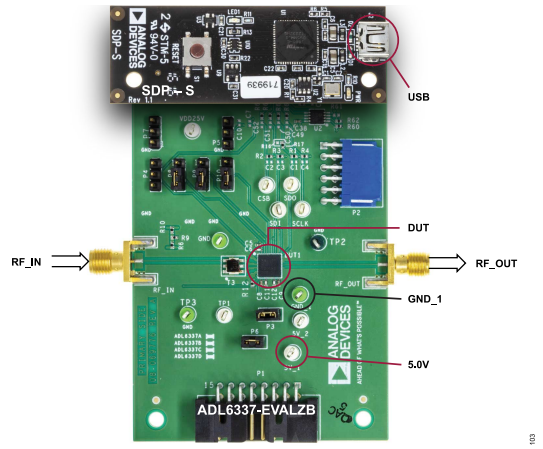

Figure 3. ADL6337-EVALZB and SDP-S Connections

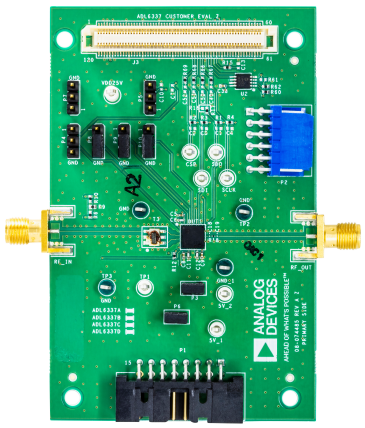

Figure 4. ADL6337-EVALZC and SDP-S Connections

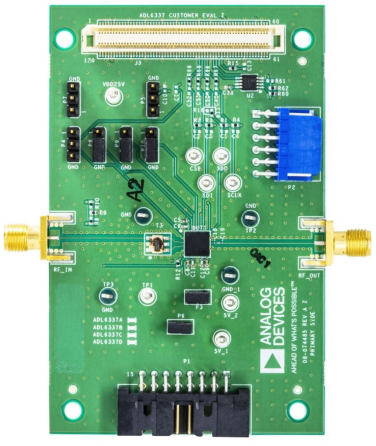

Figure 5. ADL6337-EVALZD and SDP-S Connections

See Table 1 to connect the equipment needed to evaluate the ADL6337-EVALZA, ADL6337-EVALZB, ADL6337-EVALZC, and ADL6337-EVALZD.

Table 1. ADL6337-EVALZA, ADL6337-EVALZB, ADL6337-EVALZC, and ADL6337-EVALZD Equipment Connections

Equipment	Connection
Power Supply	5V_1 (5.0 V) GND_1 (GND)
Signal Source	RF_IN
Network Analyzer	Connect to one port on the network analyzer (see Figure 6)
Signal Generator	Set the source to −30 dBm output signal level. (see Figure 1)
SDP-S	J3
Signal Analyzer	RF_OUT
Spectrum Analyzer	Connect to port (see Figure 1)

Table 2. SDP-S Connections

Equipment	Connection
PC USB Cable	J2

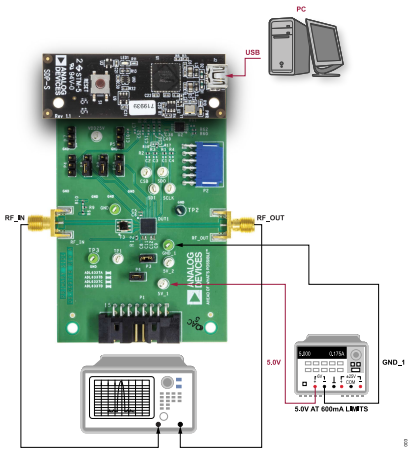

Figure 6. ADL6337-EVALZA/ADL6337-EVALZB/ADL6337-EVALZC/ADL6337-EVALZD Measurement Setup with Network Analyzer (Option 2)

EVALUATION BOARD SOFTWARE QUICK START PROCEDURES

INSTALLING THE ACE SOFTWARE AND ADL6337 PLUGINS

The ADL6337-EVALZA, ADL6337-EVALZB, ADL6337-EVALZC, and ADL6337-EVALZD connect to the SDP-S for quick evaluation of the ADL6337. The ADL6337-EVALZA, ADL6337-EVALZB, ADL6337-EVALZC, and ADL6337-EVALZD are configured over a USB from a panel within the ACE software, which can be downloaded from the ACE website. When the ACE software installations are complete, the user must install the evaluation board ACE plugins that are provided with evaluation package to the hard drive of the PC.

Double click the **Board.ADL6337.1.2022.xxxxx.acezip** file to install the evaluation board plugins.

Ensure that the **Board.ADL6337.1.2022.xxxxx** and **Chip.ADL6337.1.2022.xxxxx** folders are located inside the **C:\ProgramData\Analog Devices\ACE\Plugins** folder.

SINGLE-TONE DEMONSTRATION WITH ACE

Use the following settings to configure the ADL6337-EVALZB as an example to amplify a 1800 MHz sine wave using the ACE software:

1. Configure the hardware according to the Hardware Setup section and shown in Figure 1 or Figure 6.
2. Set the frequency of the signal generator to 1800 MHz and the output level to −30 dBm. Connect the spectrum analyzer to the RF_OUT connector.
3. Launch the ACE application. This action displays the initial ACE start page as shown in Figure 7. The ADL6337-EVALZB is detected automatically and displays under **Attached Hardware**. The current at 5.0 V consumes around 360 mA as soon as the ADL6337 is detected by the ACE software because the ACE software automatically sets TXENP to high. To set the ADL6337 to power-down mode, deselect the TXENP box and click **Apply Changes** for the changes to take effect (see Figure 10). Approximately 18 mA is observed at the 5.0 V supply.
4. Click the **ADL6337-EVALZB** icon shown in Figure 7 to open the evaluation board level view.
5. Click **Initialization** to view the ADL6337 IC level view (see Figure 8 and Figure 9.
6. Set the parameters shown in Table 3 and click **Apply Changes** for the changes to take effect. Note that these IREF and IP3 parameters are subject to change by ADL6337 device variants.

Table 3. IREF and IP3 Values for the ADL6337-EVALZA, ADL6337-EVALZB, ADL6337-EVALZC, and ADL6337-EVALZD

Model	TRM_AMP1_IP3_0	TRM_AMP2_IP3_0	TRM_AMP1_IREF	TRM_AMP2_IREF
ADL6337-EVALZA	2	3	13	11
ADL6337-EVALZB	5	5	12	11
ADL6337-EVALZC	6	6	11	11
ADL6337-EVALZD	1	1	12	12

7. Measure the signal levels with a signal analyzer. The gain of the ADL6337 is derived from the following formula:
   Gain = Signal Level at SA – Input Signal Level + Board Loss (see Table 5) + *Cable Loss*

When TXENP = 0 (the TXENP box is unselected), the ADL6337 is configured to power-down mode (see Figure 10), and it also allows the user to configure the DSA level. The default is set to the maximum attenuation level.

EVALUATION BOARD SOFTWARE QUICK START PROCEDURES

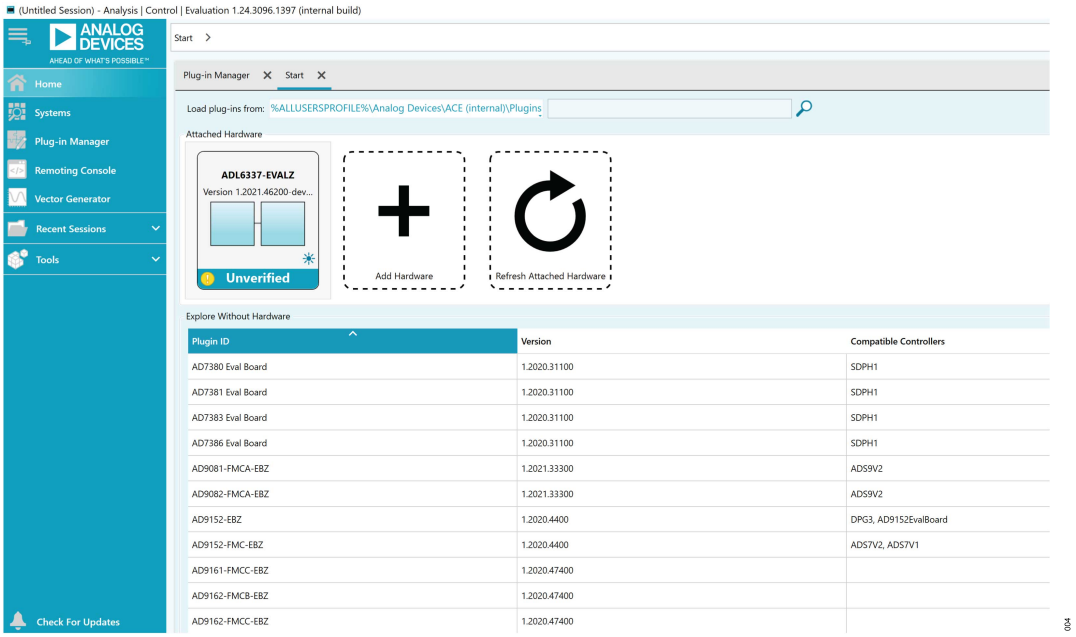

Figure 7. Initial ACE Start Page

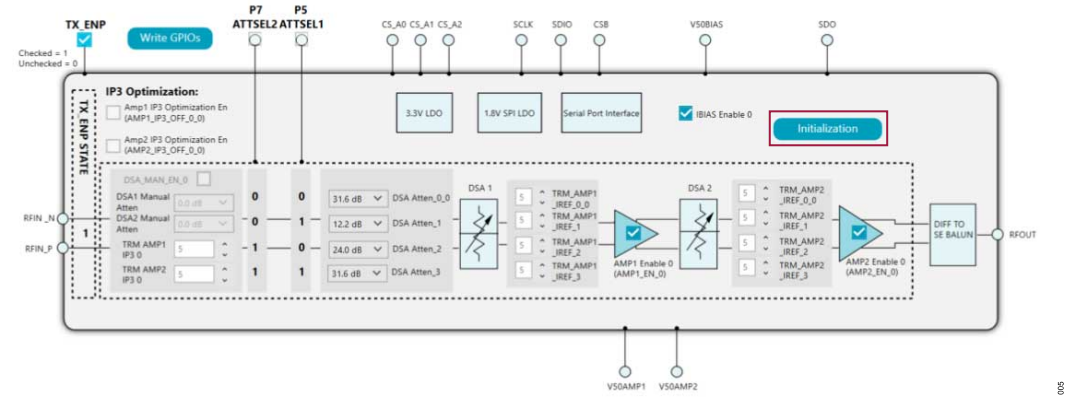

Figure 8. ADL6337-EVALZB Board Level View (After Initialization and TXENP Set to High)

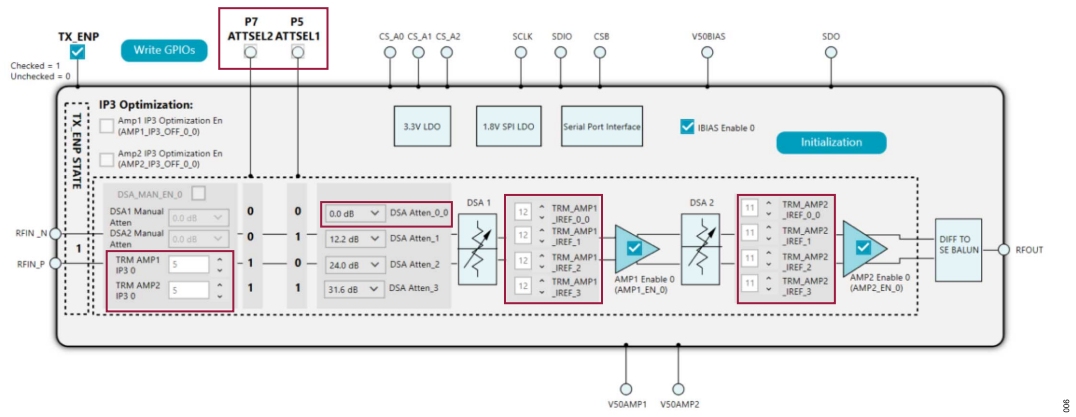

Figure 9. ADL6337 IC Level View (TXENP Set to High)

EVALUATION BOARD SOFTWARE QUICK START PROCEDURES

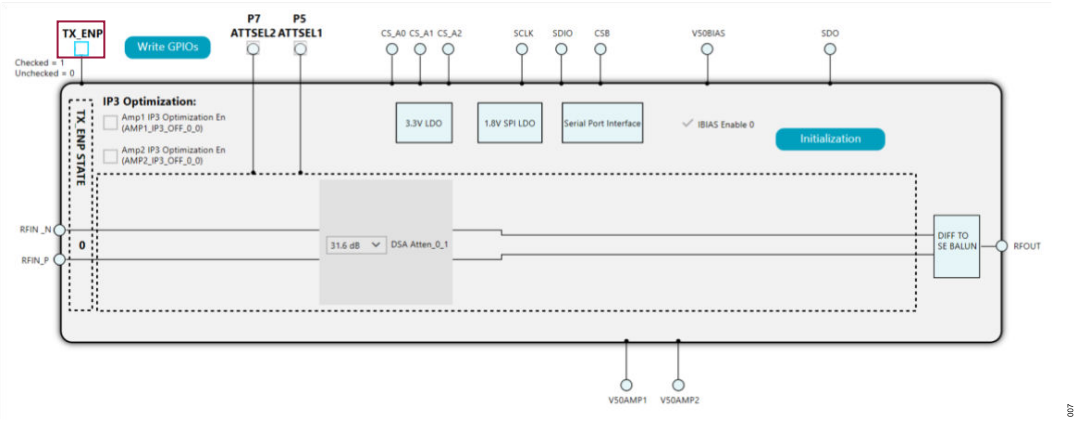

Figure 10. ADL6337 IC Level View (Power-Down Mode with TXENP Set to Low)

EVALUATION BOARD SOFTWARE QUICK START PROCEDURES

USING THE ADL6337-EVALZA, ADL6337-EVALZB, ADL6337-EVALZC, AND ADL6337-EVALZD

Losses and Signal-to-Noise Ratio (SNR) Degradation

The ADL6337 provides a nominal 36 dB of power gain between the input and output pins. The on-board balun TCM1-63AX+ (Mini-Circuits) is used to translate from the single-ended board input to the differential inputs of the ADL6337 (see Figure 11). Consider the board losses to derive the accurate RF performance, conversion gain, noise figure, and output third-order intercept (OIP3) of the device. Table 4 to Table 7 detail the board losses including the balun and SMA connectors on the ADL6337-EVALZA, ADL6337-EVALZB, ADL6337-EVALZC, and ADL6337-EVALZD.

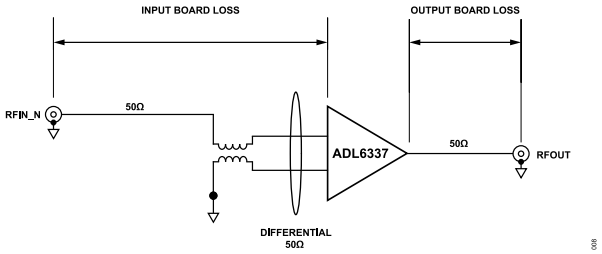

Figure 11. Losses and SNR Degradation

Table 4. Board Loss Table for the ADL6337-EVALZA

	Loss (dB)		
Frequency (MHz)	Input	Output	Total
500	3.05	0.15	3.20
600	2.07	0.17	2.24
700	1.67	0.19	1.86
800	1.52	0.20	1.72
900	1.48	0.22	1.70
1000	1.5	0.23	1.73

Table 5. Board Loss Table for the ADL6337-EVALZB

	Loss (dB)		
Frequency (MHz)	Input	Output	Total
1350	1.46	0.29	1.75
1400	1.47	0.30	1.77
1500	1.50	0.32	1.82
1600	1.54	0.33	1.87
1700	1.58	0.35	1.93
1800	1.63	0.36	1.99
1900	1.67	0.38	2.05
2000	1.71	0.39	2.10
2100	1.76	0.40	2.16
2200	1.80	0.41	2.21
2300	1.84	0.43	2.27
2400	1.89	0.44	2.33
2500	1.92	0.45	2.37
2600	1.95	0.46	2.41
2700	1.98	0.48	2.46
2800	2.01	0.49	2.50

Table 6. Board Loss Table for the ADL6337-EVALZC

	Loss (dB)		
Frequency (MHz)	Input	Output	Total
3100	1.92	0.53	2.45
3200	1.91	0.54	2.45
3300	1.91	0.56	2.47
3400	1.93	0.57	2.50
3500	1.97	0.58	2.55

EVALUATION BOARD SOFTWARE QUICK START PROCEDURES

Table 6. Board Loss Table for the ADL6337-EVALZC (Continued)

	Loss (dB)		
Frequency (MHz)	Input	Output	Total
3600	2.02	0.60	2.62
3700	2.08	0.61	2.68
3800	2.11	0.62	2.73
3900	2.20	0.63	2.83
4000	2.32	0.64	2.96
4100	2.44	0.64	3.08
4200	2.53	0.66	3.19
4300	2.67	0.67	3.34
4400	2.77	0.68	3.45

Table 7. Board Loss Table for the ADL6337-EVALZD

	Loss (dB)		
Frequency (MHz)	Input	Output	Total
4400	2.77	0.68	3.45
4500	2.86	0.68	3.54
4600	3.02	0.69	3.71
4700	3.17	0.70	3.87
4800	3.31	0.71	4.02
4900	3.54	0.72	4.26
5000	3.81	0.74	4.55
5100	4.07	0.75	4.82
5200	4.31	0.76	5.07

EVALUATION BOARD SCHEMATICS

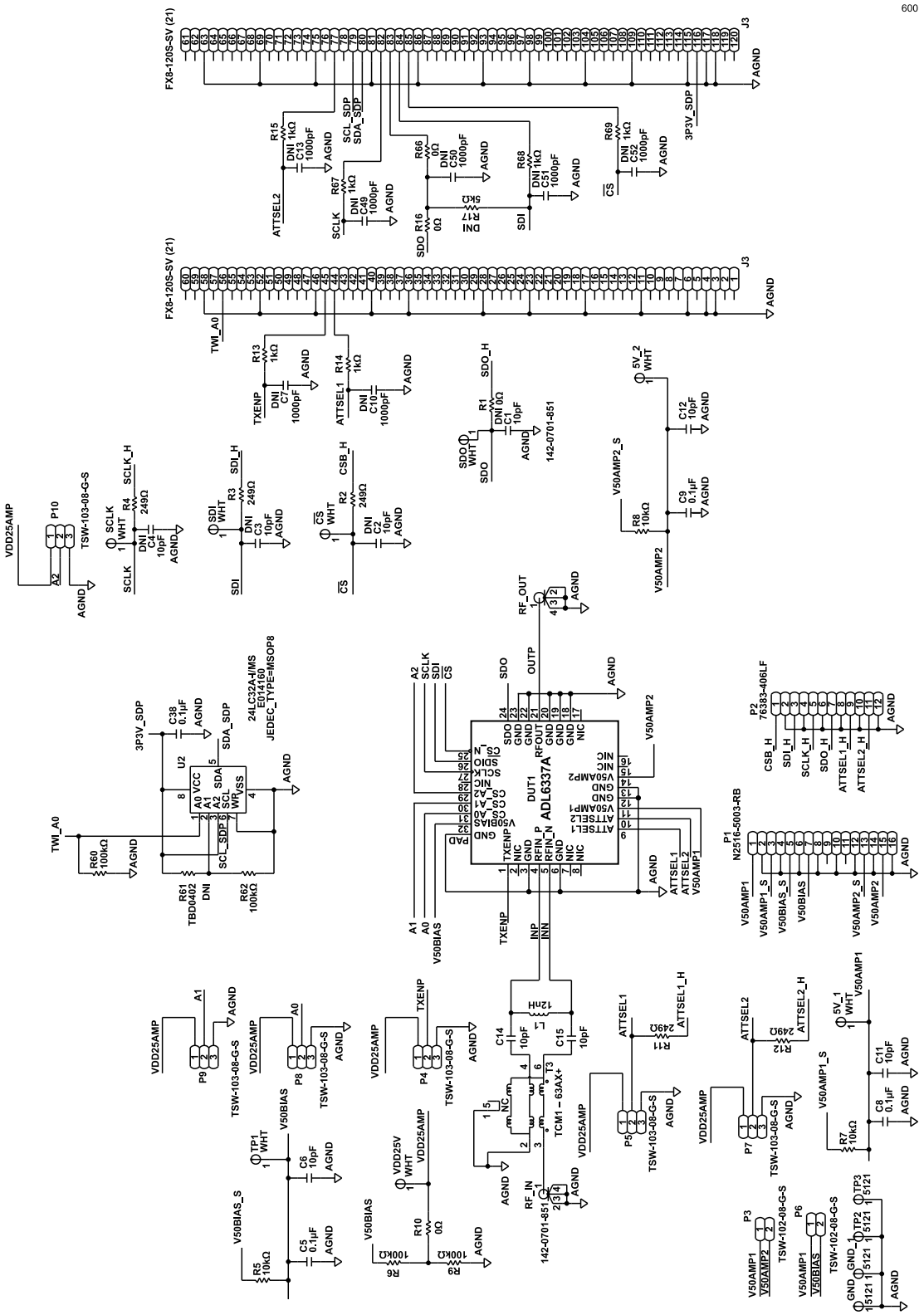

Figure 12. ADL6337-EVALZA Schematic

EVALUATION BOARD SCHEMATICS

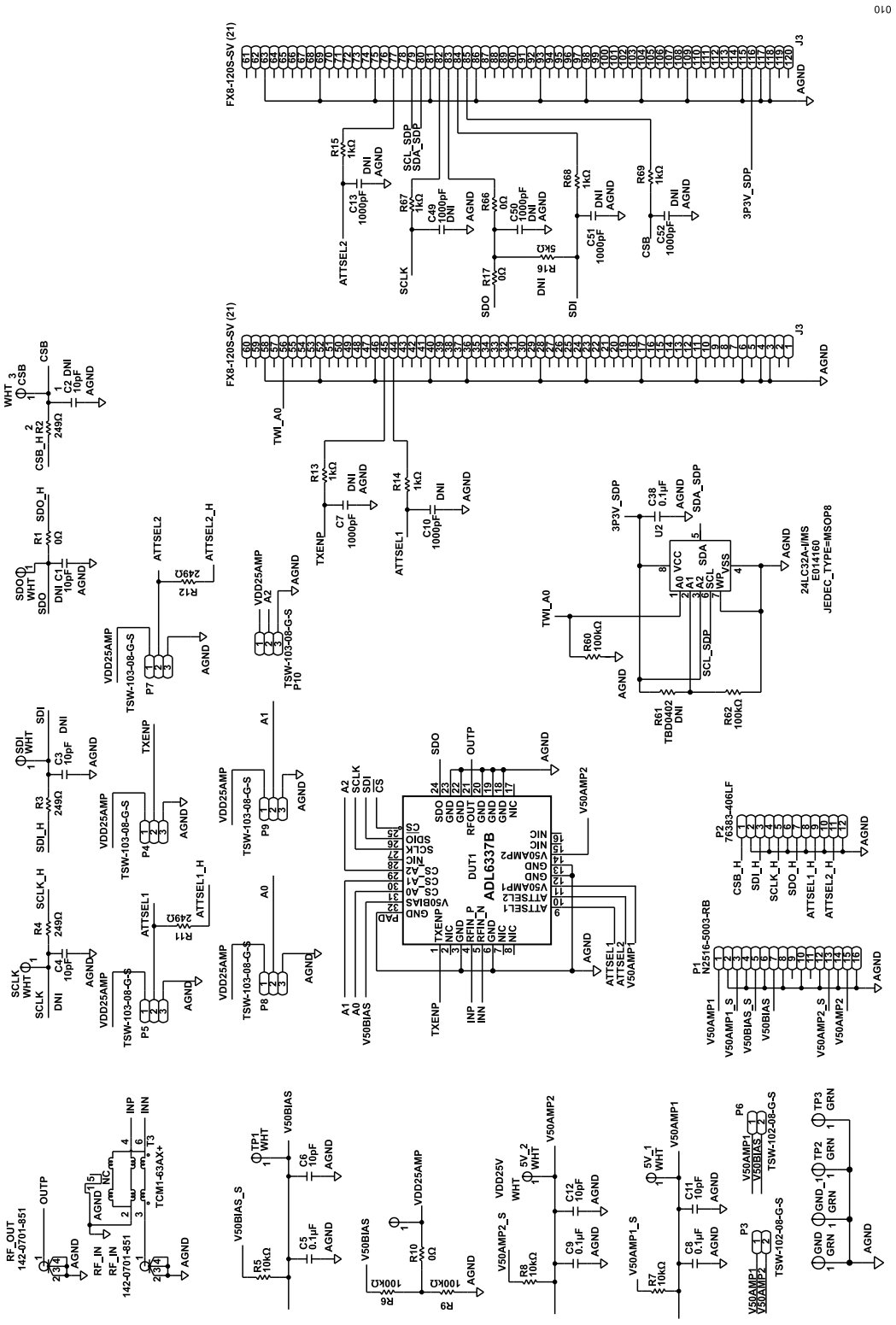

Figure 13. ADL6337-EVALZB Schematic

EVALUATION BOARD SCHEMATICS

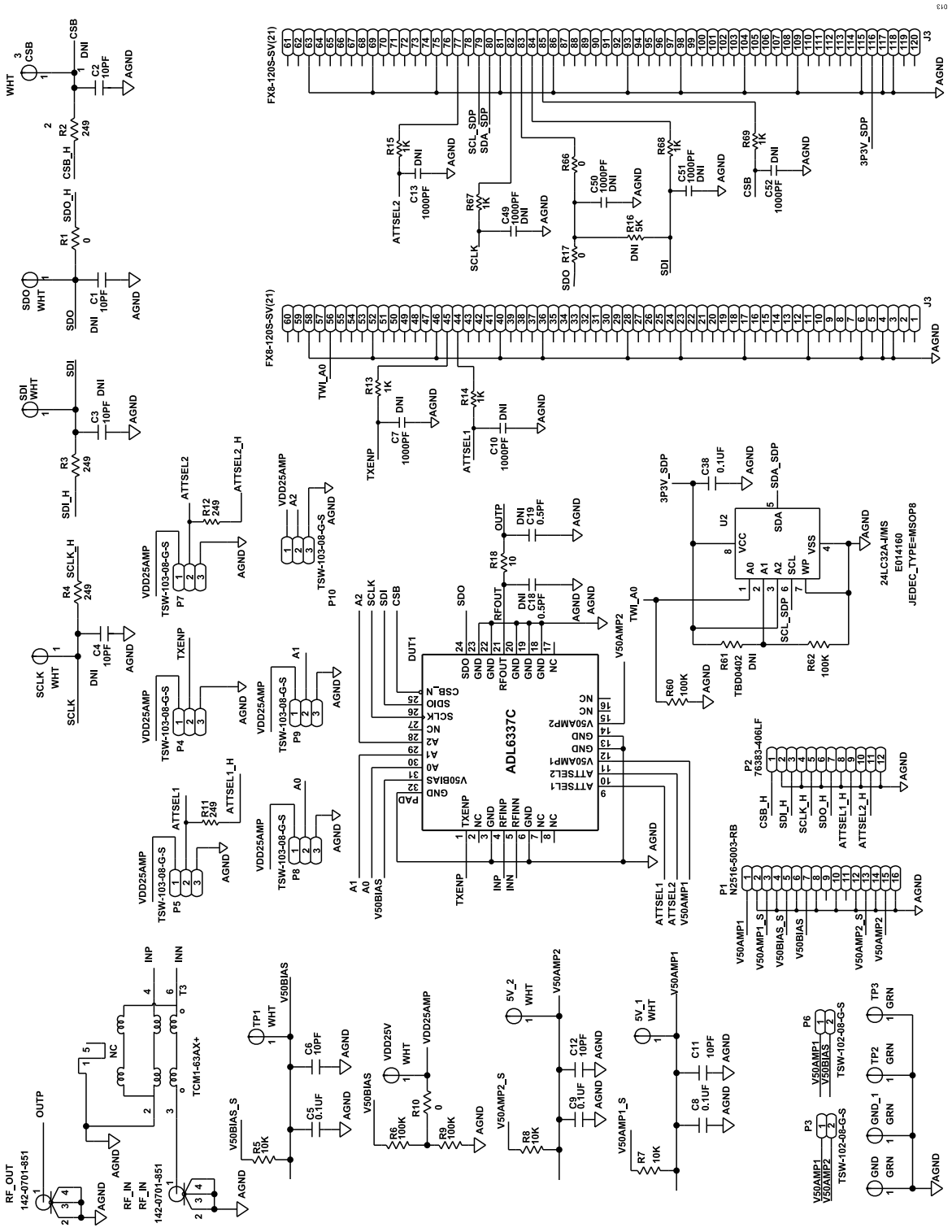

Figure 14. ADL6337-EVALZC Schematic

EVALUATION BOARD SCHEMATICS

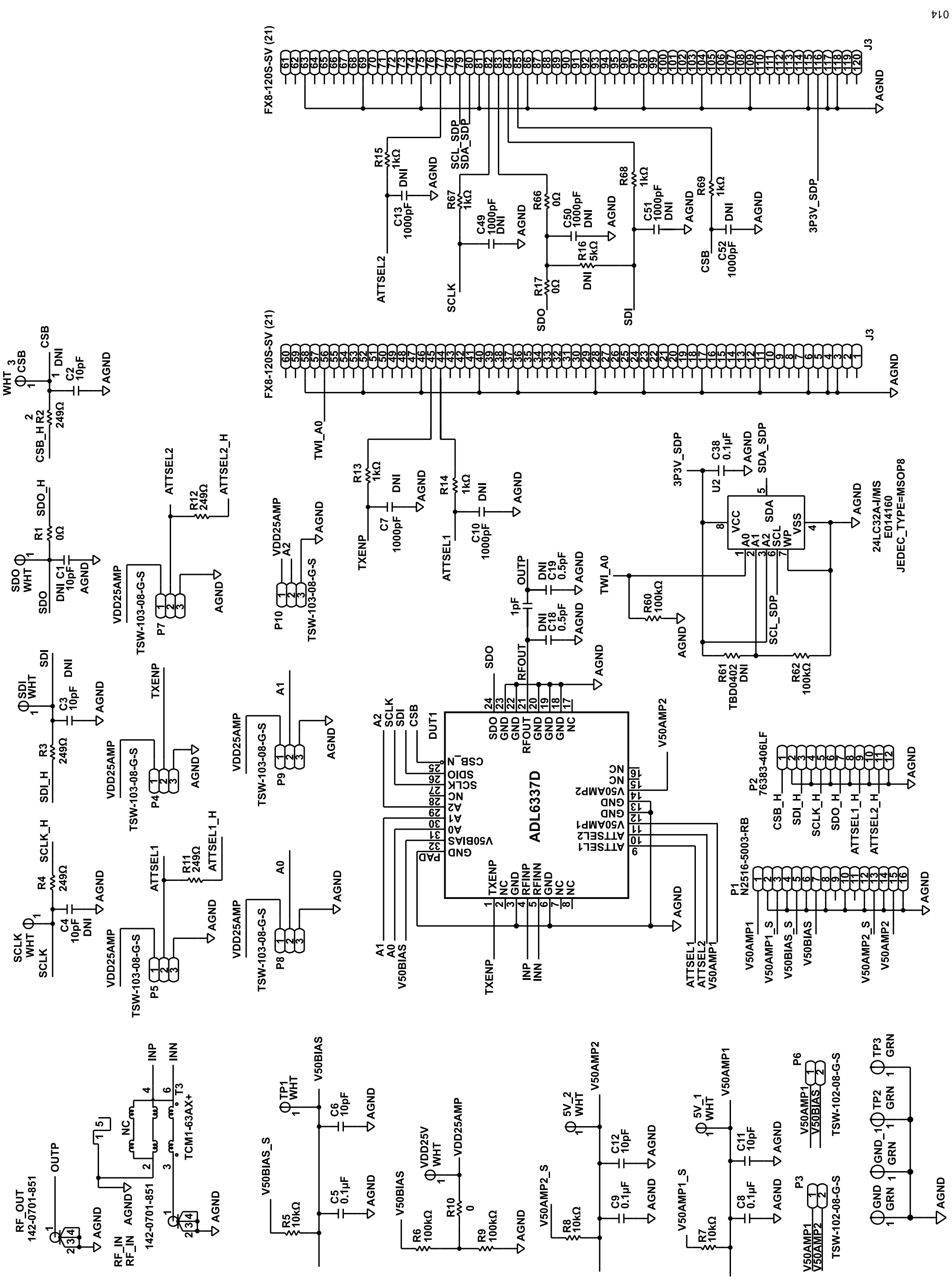

Figure 15. ADL6337-EVALZD Schematic

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.