Evaluating the ADL6331, 0.38 GHz to 12 GHz Transmitter VGA

FEATURES

- Full featured evaluation board for the ADL6331-EVALZA
- Single-supply operation
- Easy to use interface with Analysis | Control | Evaluation (ACE) software

EQUIPMENT NEEDED

- 3.3 V DC power supply
- EVAL-SDP-CS1Z (SDP-S)
- Signal generator
- Spectrum analyzer
- Network analyzer (optional)
- Microsoft Windows PC with a USB port

DOCUMENTS NEEDED

- ADL6331 data sheet

SOFTWARE NEEDED

- ACE software
- ACE ADL6331 plugin software

EVALUATION BOARD CONNECTION DIAGRAM

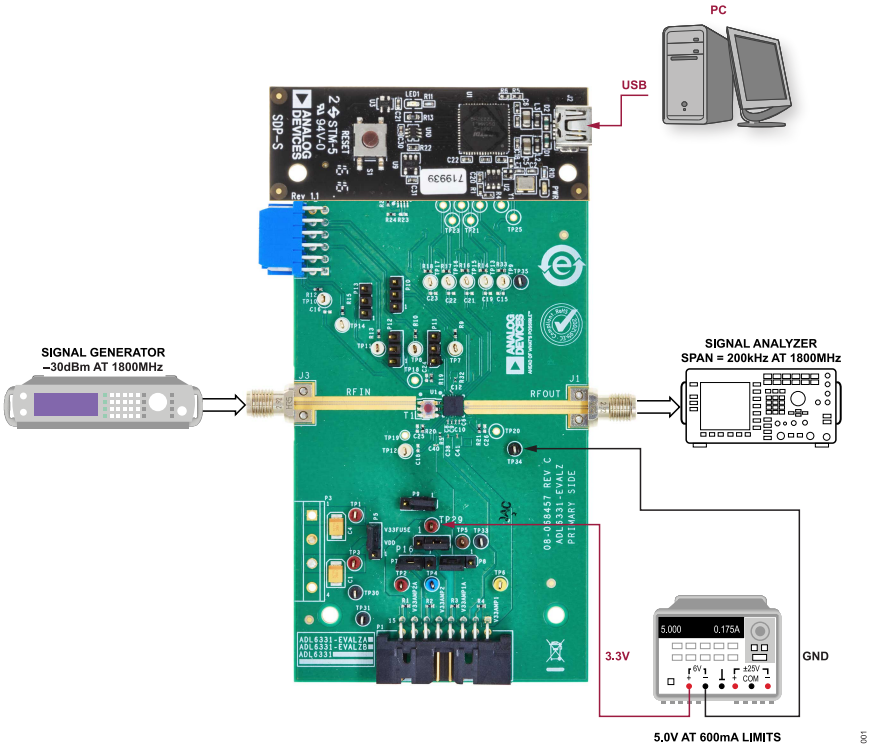

Figure 1. ADL6331-EVALZA Typical Measurement Setup (Option 1)

GENERAL DESCRIPTION

The ADL6331-EVALZA evaluation board allows the manual control of the ADL6331 through the USB port on a Microsoft® Windows® PC via an SDP-S interface board.

Additional information on the ADL6331 is provided in the ADL6331 data sheet. Consult the data sheet in conjunction with this user guide when using the ADL6331-EVALZA evaluation board.

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REVISION HISTORY

2/2024—Revision 0: Initial Version

EVALUATION BOARD HARDWARE

HARDWARE SETUP

The hardware is connected as shown in Figure 2. To power up the ADL6331-EVALZA, use a 5 V at 600 mA DC power supply. Connect the SDP-S to the PC through a USB cable.

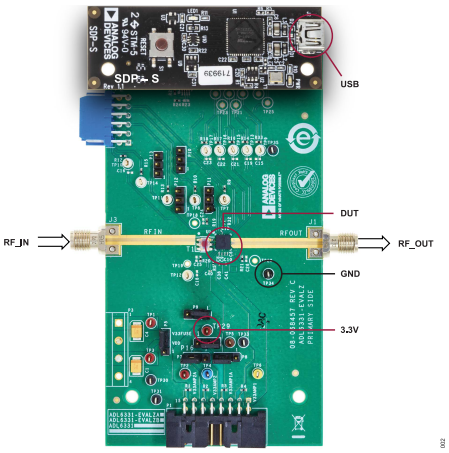

Figure 2. ADL6331-EVALZA and SDP-S Connections

See Table 1 to connect the equipment needed to evaluate the ADL6331-EVALZA.

Table 1. ADL6331-EVALZA Equipment Connections

Equipment	Connection
Power Supply	TP29 (3.3 V)
	TP34 (GND)
Signal Source	RF_IN
Network Analyzer	Connect to one port on the network analyzer (see Figure 3)
Signal Generator	Set the source to −20 dBm output signal level (see Figure 1)
SDP-S	P4
Signal Analyzer	RF_OUT
Spectrum Analyzer	Connect to port (see Figure 1)

Table 2. SDP-S Connections

Equipment	Connection
PC USB Cable	J2

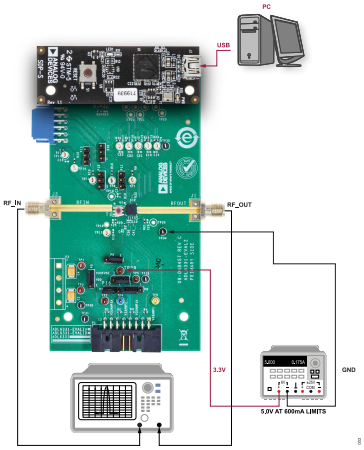

Figure 3. ADL6331-EVALZA Measurement Setup with Network Analyzer (Option 2)

EVALUATION BOARD SOFTWARE QUICK START PROCEDURES

INSTALLING THE ACE SOFTWARE AND ADL6331 PLUGINS

The ADL6331-EVALZA connects to the SDP-S controller board for quick evaluation of the ADL6331. The ADL6331-EVALZA is 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 the evaluation package to the hard drive of the PC.

Double click the **Board.ADL6331.1.2022.xxxxx.acezip** file to install the evaluation board plugins.

Ensure that the **Board.ADL6331.1.2022.xxxxx** and the **Chip.ADL6331.1.2022.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 ADL6331-EVALZA. The following is an example to amplify a 2000 MHz sine wave using the ACE software:

1. Configure the hardware according to the Hardware Setup section and shown in Figure 1 or Figure 3.
2. Set the frequency of the signal generator to 2000 MHz and the output level to −20 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 4. The ADL6331-EVALZA is detected automatically and displays under **Attached Hardware**. As soon as the ADL6331 is detected by the ACE software, the ACE software automatically sets ENP to high. However, since the AMP1, AMP2, and DSA blocks are all disabled by default, the current consumption is very low. Approximately 3 mA is observed at the 3.3 V supply.
4. Click the **ADL6331-EVALZA** icon shown in Figure 4 to open the evaluation board level view (see Figure 5). After opening, click **Reset Chip** before starting configurations.
5. Enable each block of AMP1, AMP2, and DSA. Configure the four RF preconfigurations by selecting the AMP1 and AMP2 bypass modes, as well as setting up the DSA attenuation levels. Use default settings for the bias trim with **Use Fused** boxes checked (see Figure 6).
6. Click **Apply Configuration** for the configurations to take effect.
7. If factory programmed values for the bias trim are needed, click **Read Configuration**. See **Applications Information** of ADL6331 data sheet for more details.
8. Measure the signal levels with a signal analyzer. The gain of the ADL6331 is derived from the following formula:
   Gain = Signal Level at SA – Input Signal Level + Board Loss (see Table 3) + *Cable Loss*

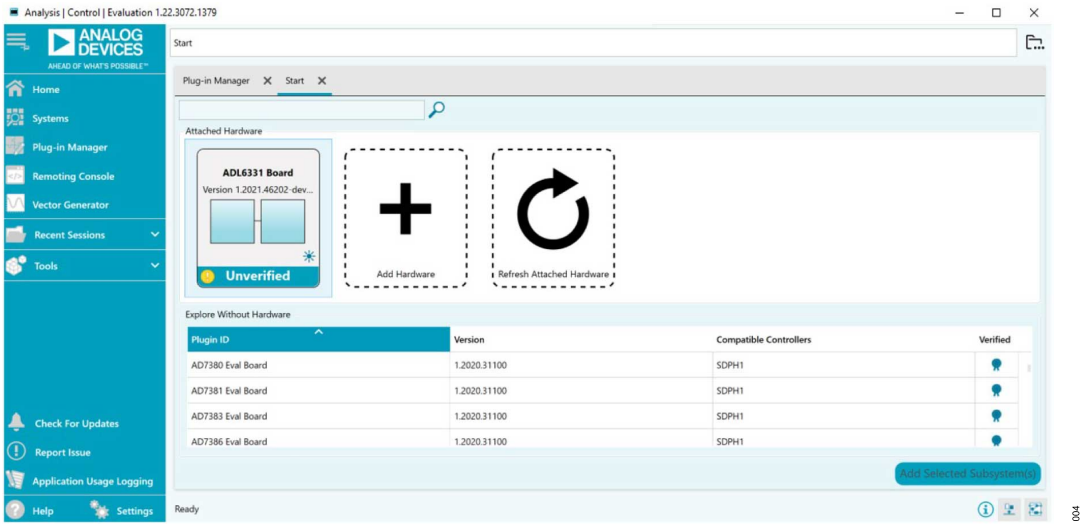

Figure 4. Initial ACE Start Page

EVALUATION BOARD SOFTWARE QUICK START PROCEDURES

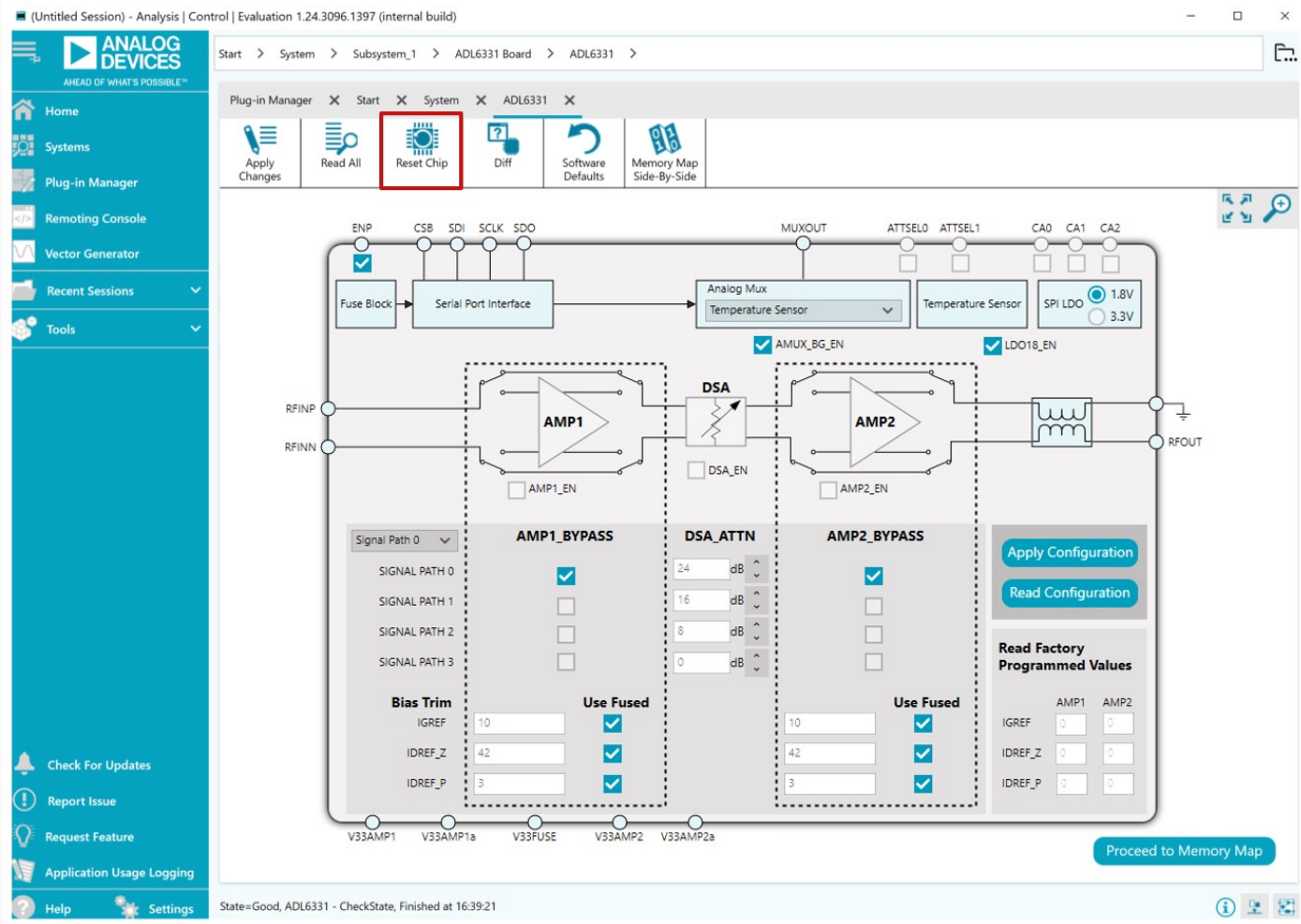

Figure 5. ADL6331-EVALZA Board Level View (After Reset Chip and ENP Set to High)

EVALUATION BOARD SOFTWARE QUICK START PROCEDURES

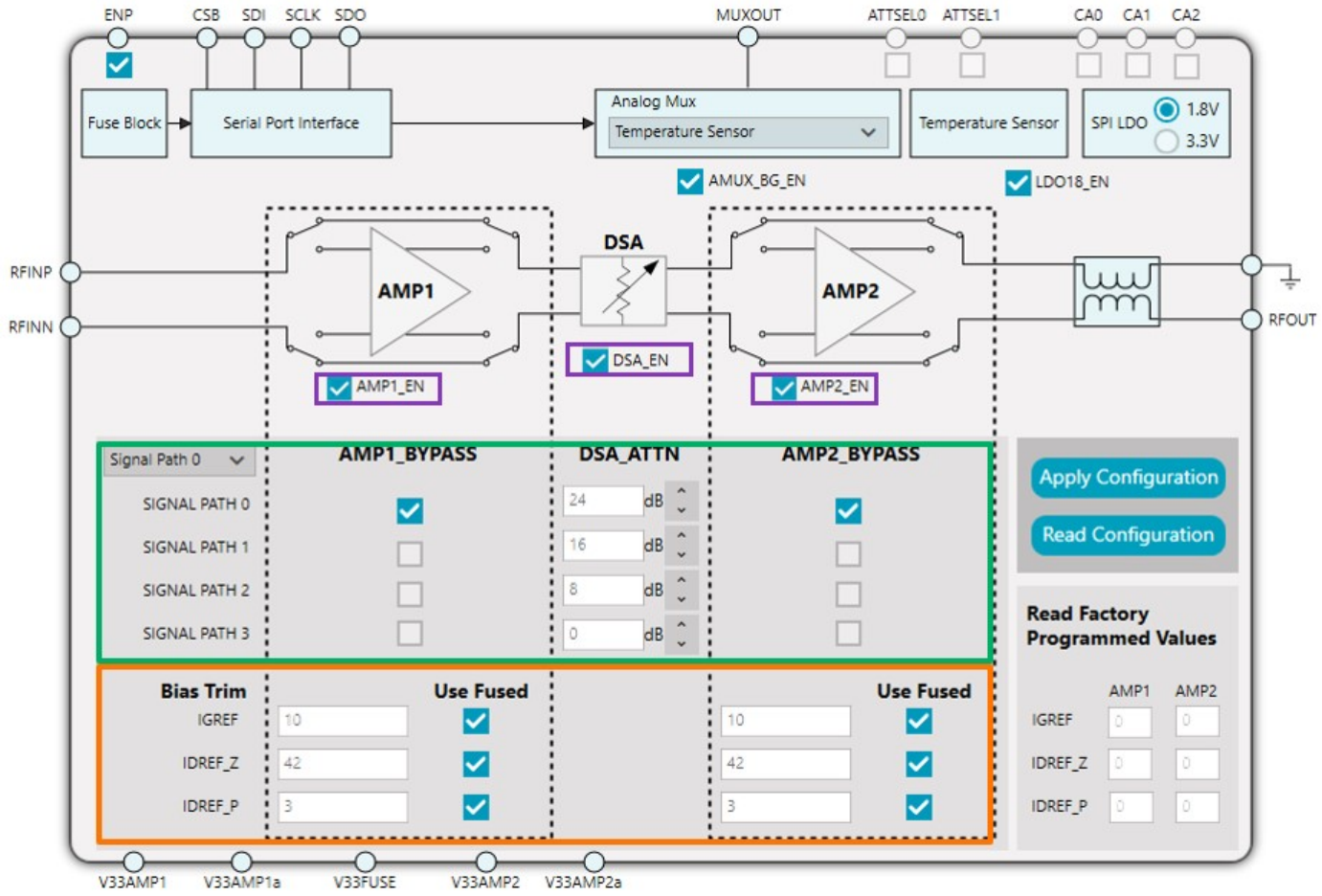

Figure 6. ADL6331 IC Level View (ENP Set to High)

EVALUATION BOARD SOFTWARE QUICK START PROCEDURES

LOSSES AND SIGNAL-TO-NOISE RATIO (SNR) DEGRADATION

The on-board balun MABA-011082 (Macom) is used to transform the single-ended board input to the differential inputs of the ADL6331 (see Figure 7). Consider the board losses to derive the accurate RF performance, conversion gain, noise figure, and output third-order intercept (OIP3) of the device. Table 3 details the board losses including the balun and 2.92 mm connectors on the ADL6331-EVALZA.

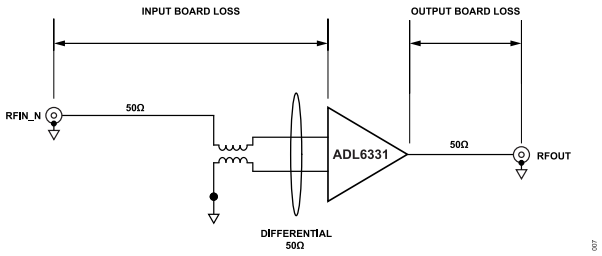

Figure 7. Losses and SNR Degradation

Table 3. Board Loss Table for the ADL6331-EVALZA

	Loss (dB)		
Frequency (MHz)	Input	Output	Total
400	1.63	0.03	1.66
1000	1.58	0.12	1.70
2000	1.54	0.26	1.80
3000	1.69	0.34	2.03
4000	1.69	0.40	2.09
5000	1.68	0.49	2.17
6000	1.79	0.56	2.35
7000	2.31	0.66	2.97
8000	2.80	0.73	3.53

EVALUATION BOARD SCHEMATICS AND ARTWORK

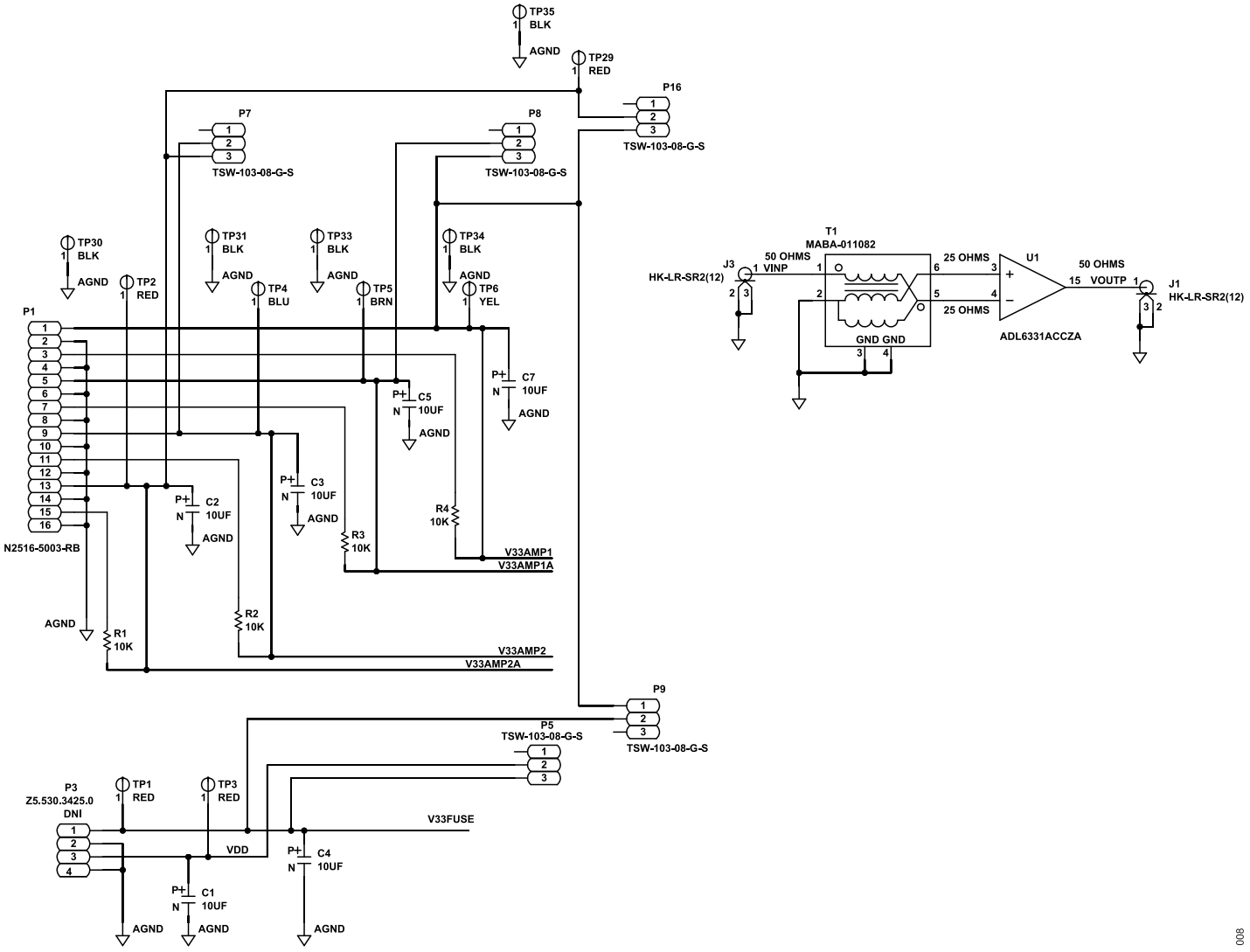

Figure 8. ADL6331-EVALZA Schematic

EVALUATION BOARD SCHEMATICS AND ARTWORK

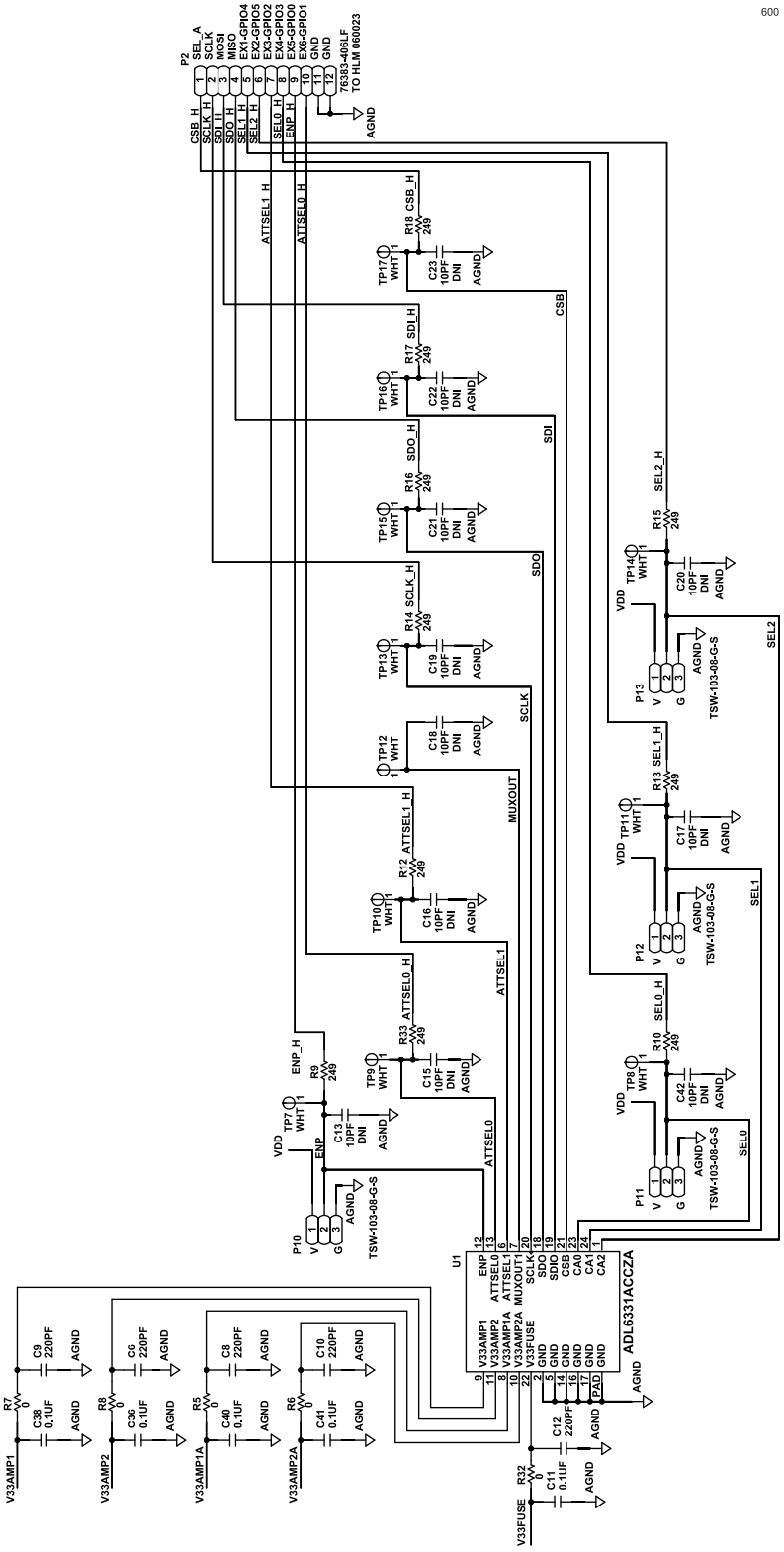

Figure 9. ADL6331-EVALZA Schematic 2

EVALUATION BOARD SCHEMATICS AND ARTWORK

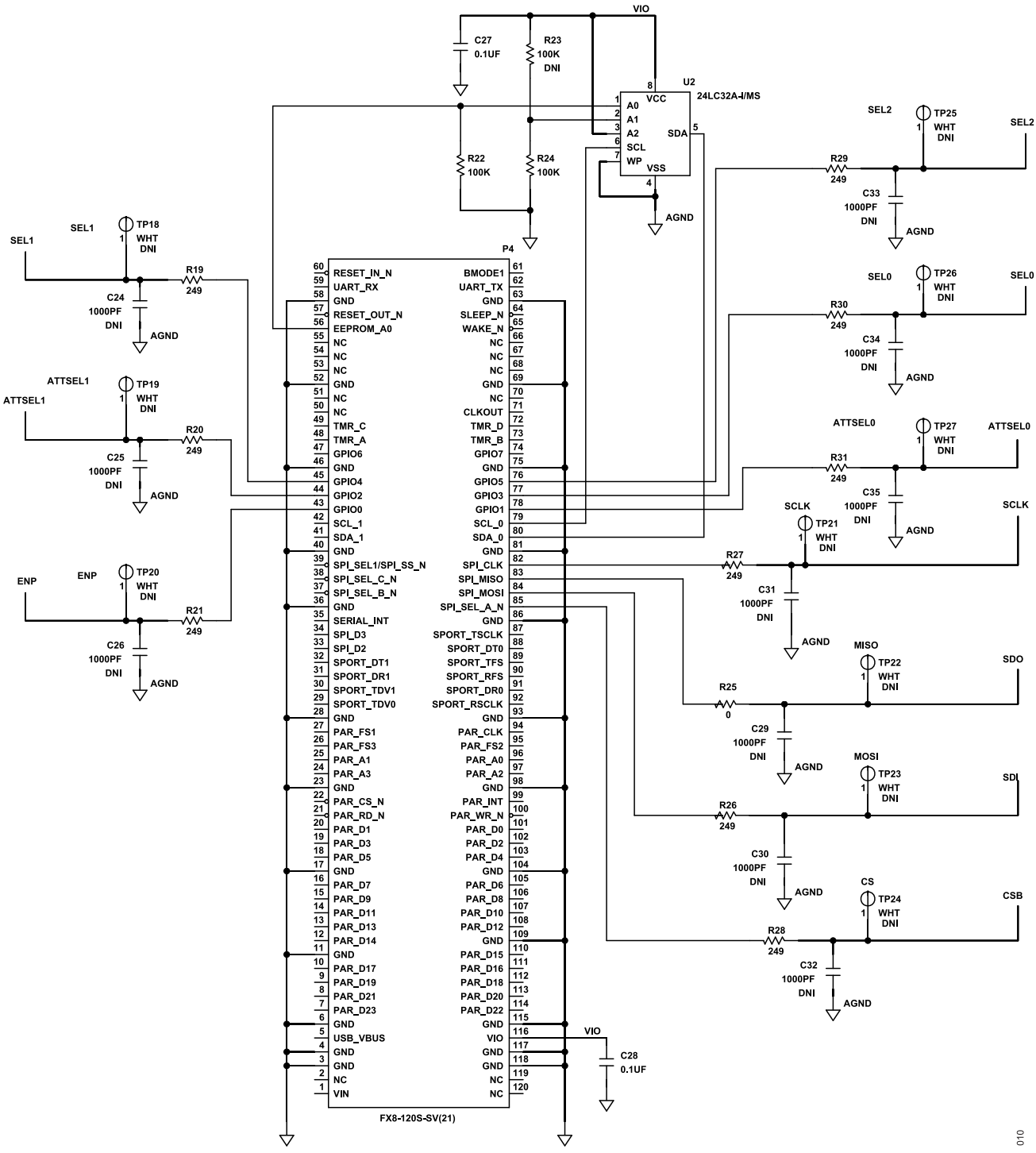

Figure 10. ADL6331-EVALZA Schematic 3

EVALUATION BOARD SCHEMATICS AND ARTWORK

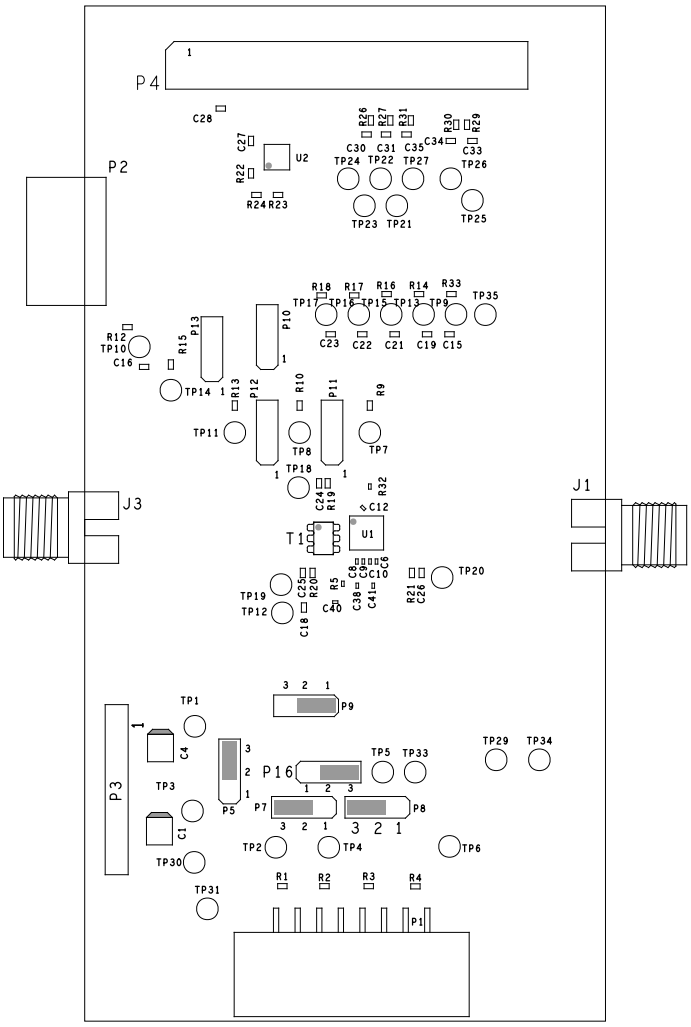

Figure 11. ADL6331-EVALZA Front Side

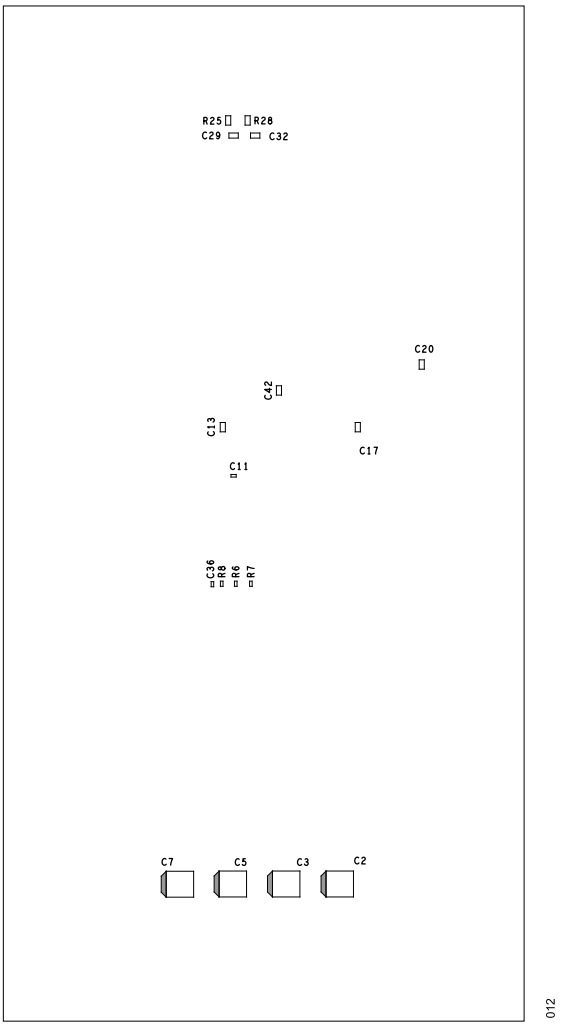

Figure 12. ADL6331-EVALZA Back Side

BILL OF MATERIALS

Table 4. Bill of Materials for ADL6331-EVALZA

Quantity	Reference Designator	Description	Manufacturer	Part Number
6	C1, C2, C3, C4, C5, C7	Capacitors, 10 µF, 16 V, C3528 package	AVX	TAJB106K016RNJ
5	C6, C8, C9, C10, C12	Capacitors, 220 pF, 50 V, C0201 package	MURATA	GRM0335C1H221JA01D
5	C11, C36, C38, C40, C41	Capacitors, 0.1 µF, 16 V, C0201 package	MURATA	GRM033Z71C104ME14D
2	C27, C28	Capacitors, 0.1 µF, 16 V, C0402 package	KEMET	C0402C104J4RACTU
2	J1, J3	Edge mount, 2.92 mm connectors	Hirose Electric CO.	HK-LR-SR2(12)
1	P1	Connector header through hole, right angle 16 position	3M	N2516-5003-RB
9	P5, P7, P8, P9, P10, P11, P12, P13, P16	Connector headers through hole, 3 position	SAMTEC	TSW-103-08-G-S
1	P2	Connector header through hole, right angle 12 position	AMPHENOL FCI	76383-406LF
1	P4	120 position connector receptacle, center strip contacts	Hirose Electric CO.	FX8-120S-SV(21)
4	R1, R2, R3, R4	Resistors, 10 kΩ, 0.1 W, 0402 package	Panasonic	ERJ-2RKF1002X
10	R9, R10, R12, R13, R14, R15, R16, R17, R18, R33	Resistors, 249 Ω, 0.063 W, 0402 package	VENKEL	CR0402-16W-2490FT
9	R19, R20, R21, R26, R27, R28, R29, R30, R31	Resistors, 249 Ω, 0.1 W, 0402 package	Panasonic	ERJ-2RKF2490X
2	R22, R24	Resistors, 100 kΩ, 0.1 W, 0402 package	Panasonic	ERJ-2RKF1003X
1	R25	Resistor, 0 Ω, 0.063 W, 0402 package	SAMSUNG	RC1005J000CS
5	R5, R6, R7, R8, R32	Resistors, 0 Ω, 0.05 W, 0201 package	Panasonic	ERJ-1GN0R00C
1	T1	Transformer balun, 1:1 ratio, 5 to 8000 MHz	MACOM	MABA-011082
18	TP1 to TP17, TP29	PCB test point connectors	KEYSTONE ELECTRONICS	5xxx
5	TP30, TP31, TP33, TP34, TP35	PCB Test Point Connector	COMPONENTS CORPORATION	TP-105-01-00
1	U2	32 K bit, serial electrically erasable programmable read-only memory (EEPROM)	MICROCHIP TECHNOLOGY	24LC32A-I/MS
1	U1	0.38 GHz to 8.0 GHz TxVGA	Analog Devices, Inc.	ADL6331ACCZA
1	PCB	Evaluation board	Analog Devices	ADL6331-EVALZA

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.