

# AD8331 Evaluation Board

## AD8331-EVAL

#### **GENERAL DESCRIPTION**

The AD8331 evaluation board is a platform for testing and evaluating the AD8331 variable gain amplifier (VGA). The board is provided completely assembled and tested; therefore, the user only needs to connect an input signal,  $V_{GAIN}$  sources, and a single 5 V power supply.

#### USER SUPPLIED OPTIONAL COMPONENTS

As shown in the schematic in Figure 2 (fixed), the board has provisions for optional components. The basic components are shown in black, and the optional components, which can be installed at the user's discretion, are shown in grey.

The input impedance of the LNA is configured for 50  $\Omega$  to accommodate most signal generators and network analyzers. Input impedances up to 6 k $\Omega$  can be realized by changing the values of RFB and CSH. Consult the AD8331 data sheet for details on this circuit feature. See Table 1 for typical values of input impedance and corresponding components.

## Table 1. LNA External Component Values for Common Source Impedances

| R <sub>IN</sub> (Ω) | RFB ( $\Omega$ , Nearest 1% Value) | CSH (pF) |
|---------------------|------------------------------------|----------|
| 50                  | 274                                | 22       |
| 75                  | 412                                | 12       |
| 100                 | 562                                | 8        |
| 200                 | 1.13 k                             | 1.2      |
| 500                 | 3.01 k                             | None     |
| 6 k                 | ∞                                  | None     |

The board is designed for 0805 size surface-mount components. Space is provided for various popular configurations of overload diodes at locations D1, D2, or D3.

The LNA can be evaluated on its own. If so used alone, it must be ac-coupled with capacitors at its differential output. Typical values are 0.1  $\mu$ F, and they are installed at Position C1 and Position C2.

Resistors of 0  $\Omega$  are installed at R4 and R8, unless capacitive loads larger than 10 pF are connected to the SMA connectors, LON, and LOP (such as coaxial cables.) In that event, small value resistors (68  $\Omega$  to 100  $\Omega$ ) must be installed at R4 and R8.

A resistor can be inserted at RCLMP if output clamping is desired. Consult the AD8331 data sheet for appropriate values.

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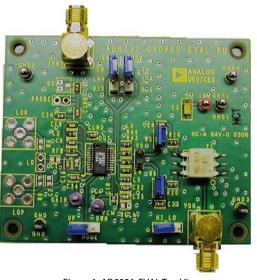


Figure 1. AD8331-EVAL Top View

The preferred signal detection method is a differential probe connected to VO, as shown in Figure 3. Single-ended loads can be connected using the board edge SMA connector, VOH. Be sure to take into account the 25.8 dB attenuation incurred when using the board in this manner.

#### **MEASUREMENT SETUP**

The basic board connection for measuring bandwidth is shown in Figure 3. A 5 V, 100 mA minimum power supply, and a low noise, voltage reference supply for GAIN is required. Table 2 lists jumpers, and Figure 3 shows their function and positions.

#### **Table 2. Jumper Functions**

| No.    | Function   |  |
|--------|--|--|
| ENBL   | Enables the LNA when inserted in the top position  |  |
| ENBV   | Enables the VGA when inserted in the top position  |  |
| W5, W6 | Connects the AD8331's outputs to the SMA connectors  |  |
| Mode   | Bottom, gain increases with $V_{\text{GAIN}}$ ; Top, gain decreases with $V_{\text{GAIN}}$ |  |
| HI_LO  | Top, HI gain; bottom, LO gain (shown in Hi gain position)                                  |  |

#### **BOARD LAYOUT AND PARTS LIST**

The evaluation board circuitry uses four conductor layers. The two inner layers are grounded, and all interconnecting circuitry is located on the outer layers. Figure 5 to Figure 8 illustrate the copper patterns. Table 3 is a part's list. AD8331-EVAL

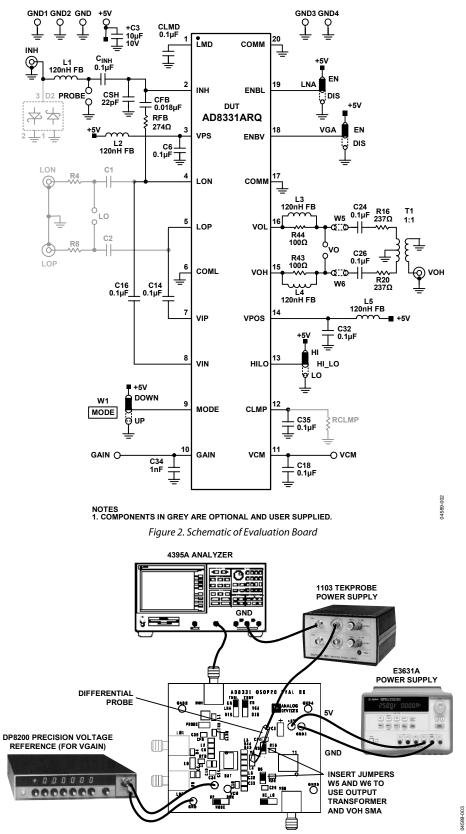


Figure 3. Typical Board Test Connections

## AD8331-EVAL

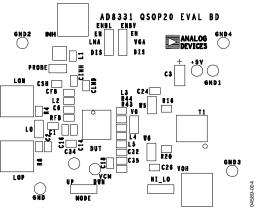


Figure 4. Top Silkscreen

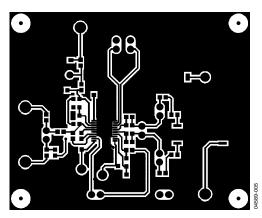


Figure 5. Primary Side Copper

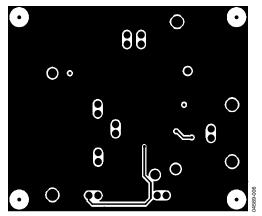


Figure 6. Secondary Side Copper

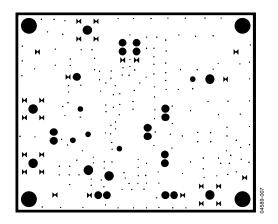


Figure 7. Internal Layer Ground

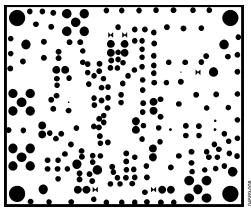


Figure 8. Power Plane

### AD8331-EVAL

#### Table 3. Parts List

| Qty | Name               | Description                 | Reference Designation   | Mfg.                 | Mfg. Part Number |
|-----|--------------------|-----------------------------|---|----------------------|------------------|
| 5   | Inductors          | Ferrite Bead, 120 nH, 0603  | L1, L2, L3, L4, L5  | Murata               | BLM18BA750SN1D   |
| 1   | Resistor           | SM, 274 Ω, 1%, 1/10 W, 0603 | RFB   | Panasonic            | ERJ-3EKF2740V    |
| 2   | Resistors          | SM, 237 Ω, 1%, 1/10 W, 0603 | R16, R20  | Panasonic            | ERJ-3EKF2370V    |
| 2   | Resistors          | SM, 100 Ω, 1%, 1/10 W, 0603 | R43, R44  | Panasonic            | ERJ-3EKF1        |
| 1   | Capacitor          | 0.018 μF, 10%, X7R, 0603    | CFB   | Panasonic            | ECJ-1VB1E183K    |
| 10  | Capacitor          | 0.1 μF, 50 V, 0603          | C6, C14, C16, C18, C24,<br>C26, C32, C35, C <sub>INH</sub> , CLMD | Kemet                | C0603C104K4RAC   |
| 1   | Capacitor          | 1000 pF, 50 V, 0603         | C34   | Panasonic            | ECJ-1VB2A102K    |
| 1   | Capacitor          | 10 μF, 10V Tantalum         | C3  | Nichicon             | F931A106MAA      |
| 6   | Shunt              | Shunt                       | HI_LO (HI), MODE (UP),<br>ENBL (EN), ENBV (EN), W5, W6            | W. M. Berg           | 65474-001        |
| 1   | Capacitor          | 22 pF, 50 V, 0603           | CSH   | Panasonic            | ECJ-1VC1H220J    |
| 1   | Transformer        | RF, 0.015 MHz to 300 MHz    | T1  | Mini-Circuit         | #T1-6T KK81      |
| 4   | Bumper             | Foot                        | Used as feet. Mount to wiring side of board at 4 corners          | 3M                   | SJ-67A11         |
| 1   | Integrated Circuit | Variable Gain Amplifier     | DUT   | Analog Devices, Inc. | AD8331ARQ        |
| 3   | Connector          | 2-Pin Header                | VO, W5, W6  | W. M. Berg           | 69157-102        |
| 4   | Connector          | 3-Pin Header                | ENBL, ENBV, HI_LO, MODE Fixed                                     | Molex                | 22-11-2032       |
| 2   | Connectors         | SMA, Right Angle PC Mount   | INH, VOH  | Amphenol             | 901-143-6RFX     |
| 1   | Test Point         | Red Loop                    | +5V   | Bisco                | TP-104-01-02     |
| 5   | Test Points        | Black Loop                  | GND, GND 1, GND 2, GND 3, GND 4                                   | Bisco                | TP-104-01-00     |
| 1   | Test Points        | Purple Loop                 | VCM Fixed   | Bisco                | TP-104-01-07     |

#### **ESD CAUTION**

ESD (electrostatic discharge) sensitive device. Electrostatic charges as high as 4000 V readily accumulate on the human body and test equipment and can discharge without detection. Although this product features proprietary ESD protection circuitry, permanent damage may occur on devices subjected to high energy electrostatic discharges. Therefore, proper ESD precautions are recommended to avoid performance degradation or loss of functionality.



#### **ORDERING GUIDE**

| UNDERING GUIDE |                                 |  |
|----------------|---------------------------------|--|
| Model          | Description                     |  |
| AD8331-EVAL    | Evaluation Board with AD8331ARQ |  |



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