

## Evaluating the ADN4620/ADN4621 3.75 kV RMS, Dual-Channel LVDS 2.5 Gigabit Isolators

### FEATURES

- ▶ Isolated ground planes (logic side and bus side)
- ▶ High speed layout supports 2.5 Gigabit operation and precision jitter measurements (<1 ps rms for random jitter)
- ▶ Convenient connections through SMA terminals
  - ▶ 1.8 V power on Side 1 ( $V_{DD1}$ ) and Side 2 ( $V_{DD2}$ )
  - ▶ 3.3 V power for LVDS receivers on Side 1 ( $V_{IO1}$ ) and Side 2 ( $V_{IO2}$ , used with ADN4621 only)
  - ▶ Ground on Side 1 ( $GND_1$ ) and ground on Side 2 ( $GND_2$ )
  - ▶ Side 1 LVDS signals:  $D_{IN1+}$ ,  $D_{IN1-}$ ,  $D_{IN2+}$  or  $D_{OUT2+}$ ,  $D_{IN2-}$  or  $D_{OUT2-}$
  - ▶ Side 2 LVDS signals:  $D_{OUT1+}$ ,  $D_{OUT1-}$ ,  $D_{OUT2+}$  or  $D_{IN2+}$ ,  $D_{OUT2-}$  or  $D_{IN2-}$
- ▶ Jumper-selectable refresh mode
- ▶ Termination resistors on all LVDS receivers

### EVALUATION KIT CONTENTS

- ▶ EVAL-ADN4620EBZ or EVAL-ADN4621EBZ

### DOCUMENTS NEEDED

- ▶ ADN4620/ADN4621 data sheet

### EQUIPMENT NEEDED

- ▶ Signal generator
- ▶ Oscilloscope
- ▶ Power supply

### GENERAL DESCRIPTION

The EVAL-ADN4620EBZ and EVAL-ADN4621EBZ allow quick and easy evaluation of the ADN4620/ADN4621 low voltage differential signaling (LVDS) isolators without the need for external components. The ADN4620/ADN4621 employ the Analog Devices, Inc., iCoupler® technology to combine a 2-channel isolator with LVDS receivers and drivers into a single, 20-lead SSOP package. The ADN4620/ADN4621 are capable of running at data rates of up to 2.5 Gbps with low jitter.

The EVAL-ADN4620EBZ/EVAL-ADN4621EBZ have separate ground and power planes for each side of the isolator, with individual 1.8 V power supplies required on each side of the ADN4620/ADN4621. This separation enables the evaluation of the ADN4620/ADN4621 with galvanic isolation between both sides of the devices. An additional power supply providing 3.3 V is required on Side 1 (and also Side 2 for the ADN4621).

For full details on the ADN4620/ADN4621, see the ADN4620/ADN4621 data sheet, which must be consulted in conjunction

with this user guide when using the EVAL-ADN4620EBZ or EVAL-ADN4621EBZ.

### EVALUATION BOARD PHOTOGRAPHS

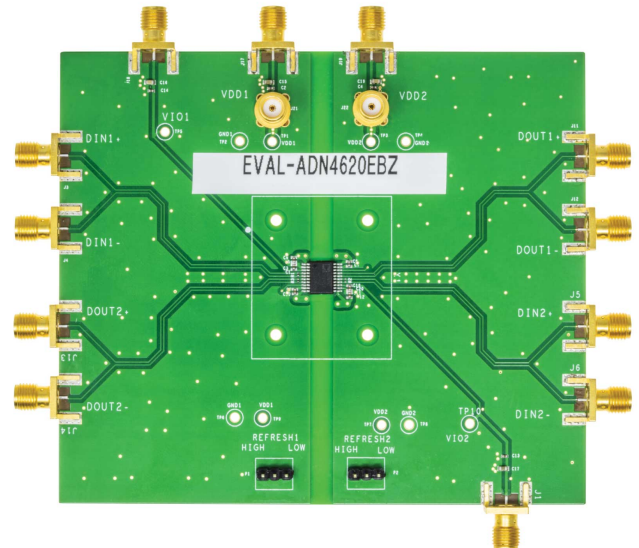


Figure 1. EVAL-ADN4620EBZ Photograph

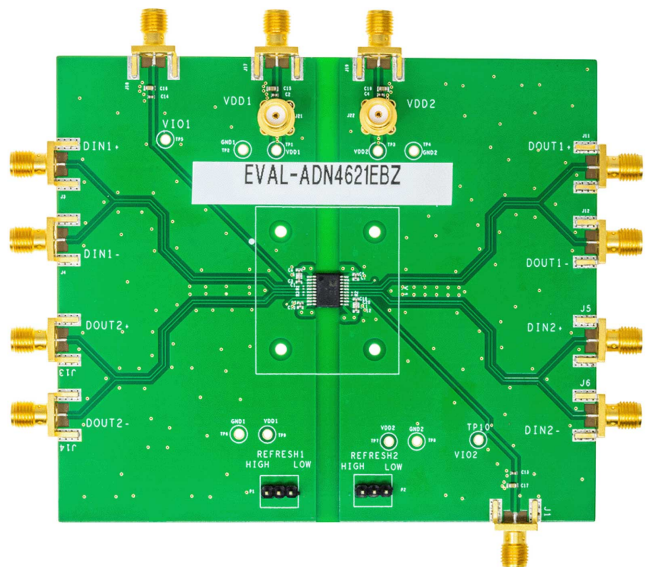


Figure 2. EVAL-ADN4621EBZ Photograph

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REVISION HISTORY

6/2022—Revision 0: Initial Version

## EVALUATION BOARD CONFIGURATION

## SETTING UP THE EVALUATION BOARD

On the EVAL-ADN4620EBZ or EVAL-ADN4621EBZ, connect a 3.3 V power supply to the J18 subminiature Version A (SMA) connector and connect 1.8 V power supplies to the J17 or J21 SMA connectors for Side 1 and the J19 or J22 SMA connectors for Side 2 (see Table 2). For the EVAL-ADN4621EBZ, also connect another 3.3 V power supply to the J1 SMA connector. At 1.25 GHz, with a load resistance of 100  $\Omega$ , the maximum operating current is 80 mA from each 1.8 V power supply, 14 mA from the 3.3 V supply on Side 1, and 7 mA from the 3.3 V supply on Side 2.

$V_{DD1}$  (Pin 1 and Pin 10 on the ADN4620/ADN4621) is bypassed to  $GND_1$  and  $V_{DD2}$  (Pin 11 and Pin 20 on the ADN4620/ADN4621) is bypassed to  $GND_2$ . Similarly,  $V_{IO1}$  (Pin 3 on the ADN4620/ADN4621) is bypassed to  $GND_1$  and  $V_{IO2}$  (Pin 13 on the ADN4621 only) is bypassed to  $GND_2$ . Bypass capacitors of 0.1  $\mu F$  are used in all cases.

The ADN4620/ADN4621 integrates a refresh function to correct, if necessary, the output state in the absence of any input transitions. This function ensures the correct output state at power-up, for example. To reduce internal switching noise and provide even lower jitter, the refresh function can be disabled. This functionality is accessed on the EVAL-ADN4620EBZ or EVAL-ADN4621EBZ by changing the position of the P1 and P2 jumpers for Side 1 and Side 2, respectively, as described in Table 1.

Figure 4 shows an example operation of the EVAL-ADN4621EBZ. The EVAL-ADN4620EBZ is set up similarly with the exception of no connection to J1. The SMA connectors reveal all LVDS inputs and outputs for the EVAL-ADN4620EBZ or EVAL-ADN4621EBZ (see

Table 3). To evaluate Channel 1 on the EVAL-ADN4620EBZ or EVAL-ADN4621EBZ, connect a signal generator to the evaluation board using the J3 connector and J4 connector and set up a 1.25 GHz square wave clock with an amplitude of 200 mV (400 mV peak-to-peak) and an offset of 1.2 V. Connect the oscilloscope to the J11 connector and J12 connector to perform timing measurements, including propagation delay, skew, and jitter. A differential probe with an SMA connector is recommended, terminating each output trace to 50  $\Omega$  connected to 1.24 V (providing 100  $\Omega$  differential termination and matching the ADN4620/ADN4621 driver offset voltage ( $V_{OS}$ )). Refer to Table 3 for the connectors to use to evaluate Channel 2 on the EVAL-ADN4620EBZ or EVAL-ADN4621EBZ.

Figure 3 shows a plot of the oscilloscope connected via the J11 connector and J12 connector. The oscilloscope shows the differential voltage, that is,  $D_{OUT1+} - D_{OUT1-}$ .



Figure 3.  $D_{OUT1-}$  and  $D_{OUT1+}$  with a 1.25 GHz Clock, Differential

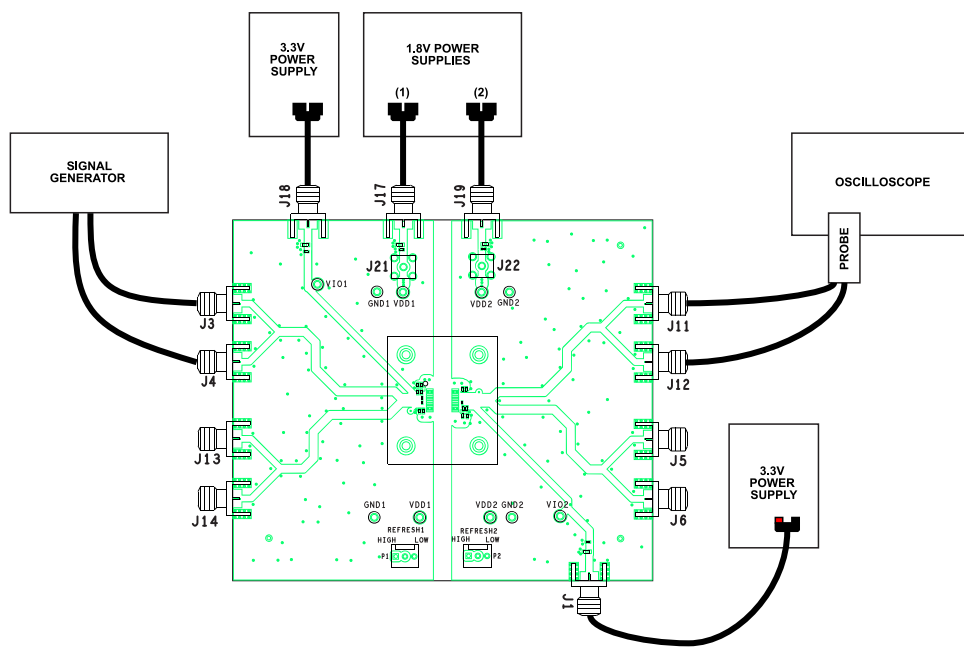


Figure 4. Basic LVDS Isolator Evaluation Board Operation for the EVAL-ADN4621EBZ

## EVALUATION BOARD CONFIGURATION

**Table 1. Jumper Configuration for EVAL-ADN4620EBZ and EVAL-ADN4621EBZ**

| Jumper | Position | Description                                                                                     |
|--------|----------|-------------------------------------------------------------------------------------------------|
| P1     | 1 and 2  | Side 1 refresh disabled (quiet operation): $\overline{\text{REFRESH}}_1$ shorted to $V_{DD1}$ . |
|        | 2 and 3  | Side 1 refresh enabled (normal operation): $\text{REFRESH}_1$ shorted to $\text{GND}_1$ .       |
| P2     | 1 and 2  | Side 2 refresh disabled (quiet operation): $\overline{\text{REFRESH}}_2$ shorted to $V_{DD2}$ . |
|        | 2 and 3  | Side 2 refresh enabled (normal operation): $\text{REFRESH}_2$ shorted to $\text{GND}_2$ .       |

**Table 2. Power Supply Connector Descriptions for EVAL-ADN4620EBZ and EVAL-ADN4621EBZ**

| Connector | Description                                                                       |
|-----------|-----------------------------------------------------------------------------------|
| Side 1    |                                                                                   |
| J17, J21  | Power supply, Side 1, connect 1.8 V to one connector option                       |
| J18       | Input/output power supply, Side 1, connect 3.3 V                                  |
| Side 2    |                                                                                   |
| J19, J22  | Power supply, Side 2, connect 1.8 V to one connector option                       |
| J1        | Input/output power supply, Side 2, connect 3.3 V (leave open for EVAL-ADN4620EBZ) |

**Table 3. Input and Output Connector Descriptions for EVAL-ADN4620EBZ**

| Connector | EVAL-ADN4620EBZ Description                         |
|-----------|-----------------------------------------------------|
| J3        | $D_{IN1+}$ , noninverted LVDS input for Channel 1   |
| J4        | $D_{IN1-}$ , inverted LVDS input for Channel 1      |
| J13       | $D_{IN2+}$ , noninverted LVDS input for Channel 2   |
| J14       | $D_{IN2-}$ , inverted LVDS input for Channel 2      |
| J11       | $D_{OUT1+}$ , noninverted LVDS output for Channel 1 |
| J12       | $D_{OUT1-}$ , inverted LVDS output for Channel 1    |
| J5        | $D_{OUT2+}$ , noninverted LVDS output for Channel 2 |
| J6        | $D_{OUT2-}$ , inverted LVDS output for Channel 2    |

**Table 4. Input and Output Connector Descriptions for EVAL-ADN4621EBZ**

| Connector | EVAL-ADN4621EBZ Description                         |
|-----------|-----------------------------------------------------|
| J3        | $D_{IN1+}$ , noninverted LVDS input for Channel 1   |
| J4        | $D_{IN1-}$ , inverted LVDS input for Channel 1      |
| J13       | $D_{OUT2+}$ , noninverted LVDS output for Channel 2 |
| J14       | $D_{OUT2-}$ , inverted LVDS output for Channel 2    |
| J11       | $D_{OUT1+}$ , noninverted LVDS output for Channel 1 |
| J12       | $D_{OUT1-}$ , inverted LVDS output for Channel 1    |
| J5        | $D_{IN2+}$ , noninverted LVDS input for Channel 2   |
| J6        | $D_{IN2-}$ , inverted LVDS input for Channel 2      |

## EVALUATION BOARD SCHEMATICS AND ARTWORK

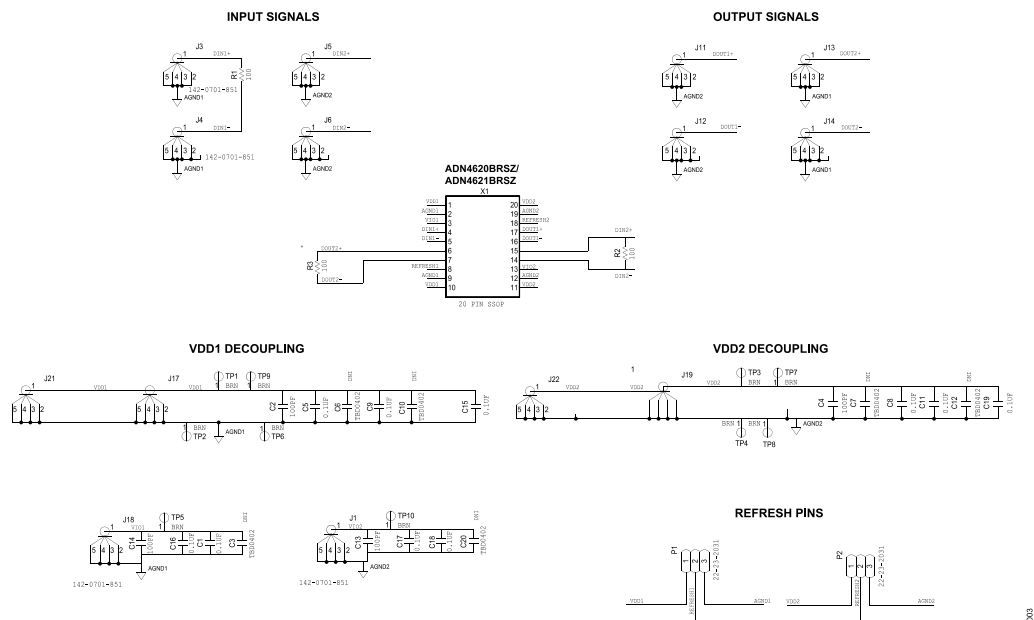


Figure 5. EVAL-ADN4620EBZ and EVAL-ADN4621EBZ Schematic

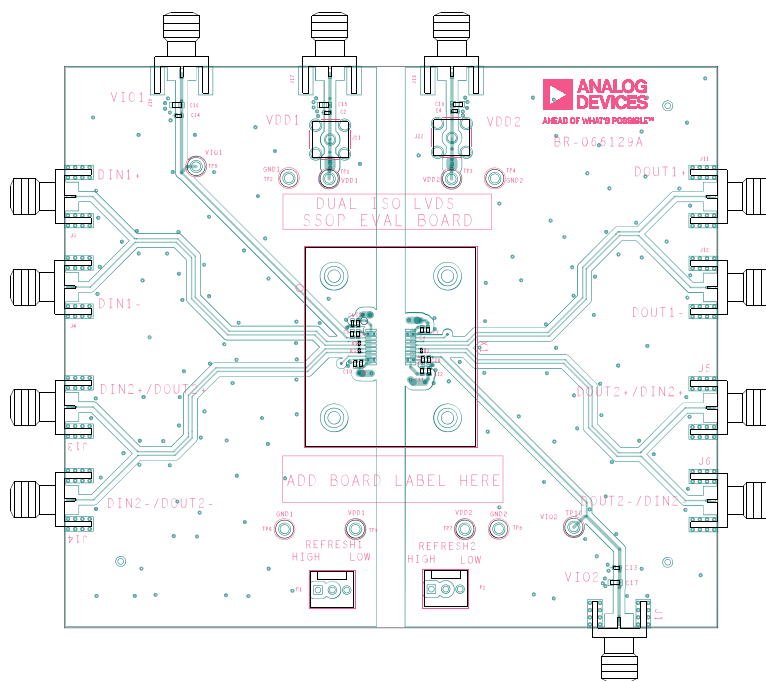


Figure 6. EVAL-ADN4620EBZ or EVAL-ADN4621EBZ Component Side and Silkscreen

## EVALUATION BOARD SCHEMATICS AND ARTWORK

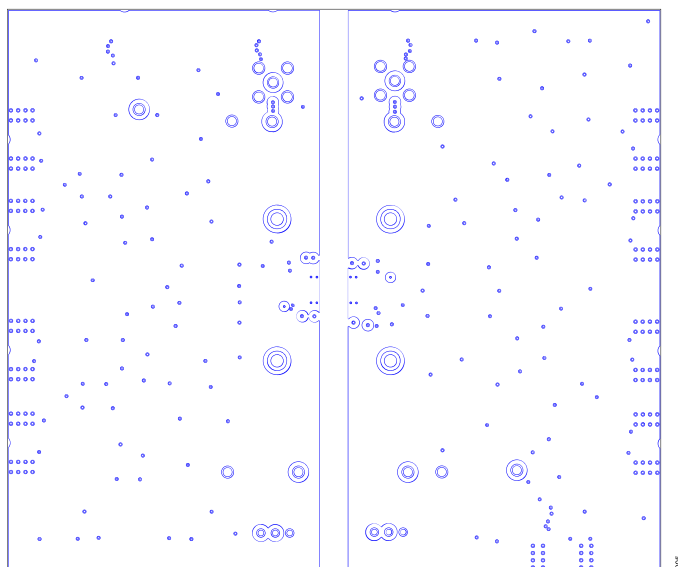


Figure 7. EVAL-ADN4620EBZ or EVAL-ADN4621EBZ Inner Layer 2, Ground

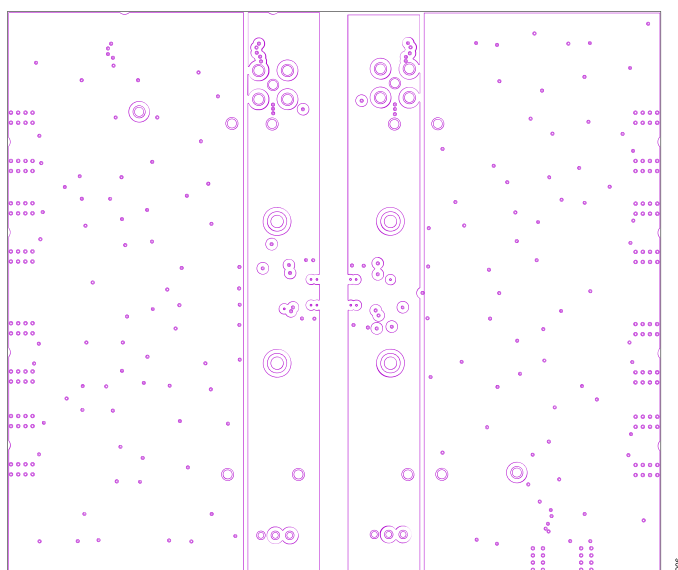


Figure 8. EVAL-ADN4620EBZ or EVAL-ADN4621EBZ Inner Layer 3, Power

## EVALUATION BOARD SCHEMATICS AND ARTWORK

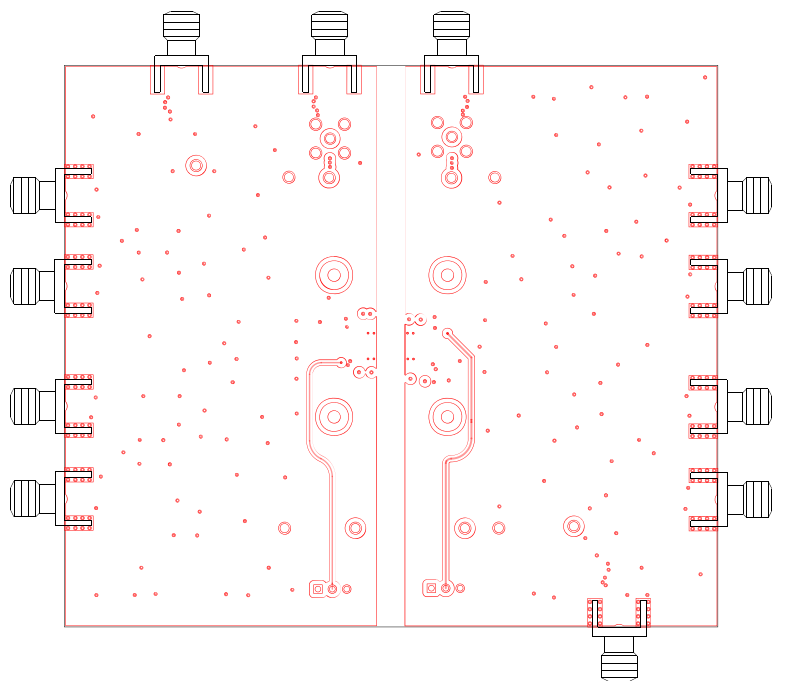


Figure 9. EVAL-ADN4620EBZ or EVAL-ADN4621EBZ Solder Side

## ORDERING INFORMATION

## BILL OF MATERIALS

Table 5. EVAL-ADN4620EBZ Bill of Materials

| Quantity | Reference Designator                | Description                                                                  | Manufacturer           | Part Number                   |
|----------|-------------------------------------|------------------------------------------------------------------------------|------------------------|-------------------------------|
| 5        | C1, C5, C8, C9, C11                 | Capacitors, 0.1 $\mu$ F, 0402                                                | Kemet                  | C0402C104K4RACTU              |
| 3        | C2, C4, C14                         | Capacitors, 100 pF, 0402                                                     | Murata                 | GRM1555C1H101JA01D            |
| 8        | C3, C6, C7, C10, C12, C13, C18, C20 | Capacitors, 0402                                                             | Not fitted             | Not applicable                |
| 3        | C15, C16, C19                       | Capacitors, 0.1 $\mu$ F, 0603                                                | AVX                    | 06035C104KAT2A                |
| 1        | C17                                 | Capacitor, 0603                                                              | Not fitted             | Not applicable                |
| 1        | J1                                  | Connector, SMA, edge                                                         | Not fitted             | Not applicable                |
| 11       | J3 to J6, J11 to J14, J17 to J19    | Connectors, SMA, edge                                                        | Johnson - Cinch        | 142-0701-851                  |
| 2        | J21, J22                            | Connectors, SMA                                                              | Pasternack Enterprises | PE4117                        |
| 2        | P1, P2                              | 3-pin, header (and jumper)                                                   | Molex (and Sullins)    | 22-23-2031 (and QPC02SXGN-RC) |
| 2        | R1, R3                              | Resistors, 100 $\Omega$ , 0201                                               | Panasonic              | ERJ-1GNF1000C                 |
| 1        | R2                                  | Resistor, 0201                                                               | Not fitted             | Not applicable                |
| 9        | TP1 to TP9                          | Test points                                                                  | Components Corporation | TP104-01-01                   |
| 1        | TP10                                | Test point                                                                   | Not fitted             | Not applicable                |
| 1        | X1                                  | <a href="#">ADN4620</a> 3.75 kV rms, dual-channel LVDS, 2.5 Gigabit isolator | Analog Devices         | <a href="#">ADN4620BRSZ</a>   |

## ORDERING INFORMATION

Table 6. EVAL-ADN4621EBZ Bill of Materials

| Quantity | Reference Designator                 | Description                                              | Manufacturer           | Part Number                   |
|----------|--------------------------------------|----------------------------------------------------------|------------------------|-------------------------------|
| 6        | C1, C5, C8, C9, C11, C18             | Capacitors, 0.1 $\mu$ F, 0402                            | Kemet                  | C0402C104K4RACTU              |
| 4        | C2, C4, C13, C14                     | Capacitors, 100 $\mu$ F, 0402                            | Murata                 | GRM1555C1H101JA01D            |
| 6        | C3, C6, C7, C10, C12, C20            | Capacitors, 0402                                         | Not fitted             | Not applicable                |
| 4        | C15, C16, C17, C19                   | Capacitors, 0.1 $\mu$ F, 0603                            | AVX                    | 06035C104KAT2A                |
| 12       | J1, J3 to J6, J11 to J14, J17 to J19 | Connectors, SMA, edge                                    | Johnson - Cinch        | 142-0701-851                  |
| 2        | J21, J22                             | Connectors, SMA                                          | Pasternack Enterprises | PE4117                        |
| 2        | P1, P2                               | 3-pin, header (and jumper)                               | Molex (and Sullins)    | 22-23-2031 (and QPC02SXGN-RC) |
| 2        | R1, R2                               | Resistors, 100 $\Omega$ , 0201                           | Panasonic              | ERJ-1GNF1000C                 |
| 1        | R3                                   | Resistor, 0201                                           | Not fitted             | Not applicable                |
| 10       | TP1 to TP10                          | Test points                                              | Components Corporation | TP104-01-01                   |
| 1        | X1                                   | ADN4621 3.75 kV rms, dual-channel LVDS 2.5 Gb/s isolator | Analog Devices         | ADN4621BRSZ                   |

**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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