# Evaluation Board for the 10-Bit, Serial Input, High Voltage Digital Potentiometer

# EVAL-AD5292EBZ

## FEATURES

Full-featured evaluation board for the AD5292
Wiper buffer
4-wire ohm measurement capability
Various link options
Direct hookup to USB port of PC
PC software for control of digipot
20-times programmable
1% resistance precision

## PACKAGE CONTENTS

AD5292 evaluation board
AD5292 device
3 V voltage regulator (ADP3303)
Buffer (AD8510)
CD, including
    Self-installing software that allows control of the digipot
        and exercise of all functions of the device
    Electronic version of the device data sheet
    Electronic version of the EVAL-AD5292EBZ data sheet

## GENERAL DESCRIPTION

This data sheet describes the evaluation board for evaluating the AD5292 digital potentiometer. This device is a single-channel, 1024-position digital potentiometer with less than ±1% end-to-end resistor tolerance error and 20-times programmable (20 TP) memory. The AD5292 is capable of operating at high voltages, supporting both dual supply ±10.5 V to ±15 V and single supply 21 V to 30 V operation.

The AD5292 part uses a versatile 3-wire serial interface that operates at clock rates of up to 50 MHz and is compatible with standard SPI, QSPI™, MICROWIRE™, and DSP interface standards.

The AD5292 evaluation board incorporates, for the logic voltage levels, an internal power supply from the USB and allows an external power supply. The logic voltage levels operate from single 2.7 V to 5.5 V supplies. The board can operate in single and dual supply modes and incorporates an output buffer.

Complete specifications for the AD5292 part can be found in the AD5292 data sheet available from Analog Devices, Inc., and should be consulted in conjunction with this data sheet when using the evaluation board
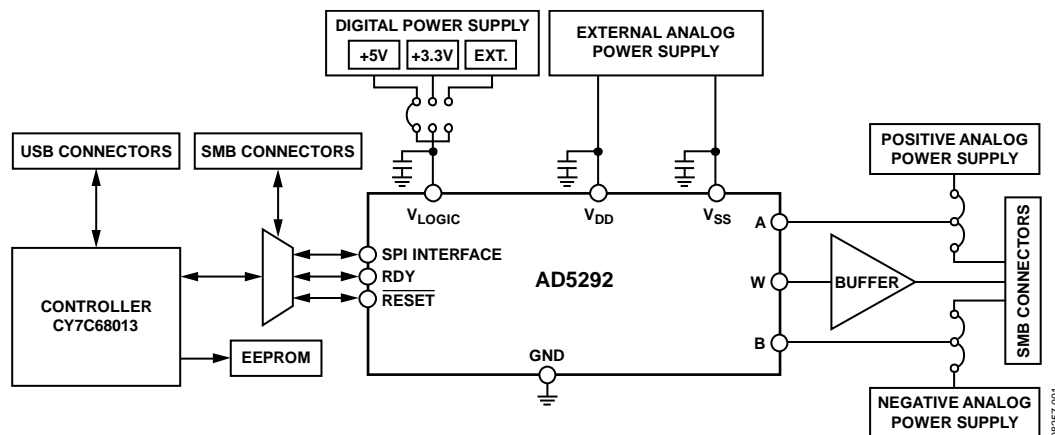
## FUNCTIONAL BLOCK DIAGRAM



*Figure 1.*

# EVAL-AD5292EBZ

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## REVISION HISTORY

**06/09—Revision 0: Initial Version**

# EVALUATION BOARD HARDWARE

## POWER SUPPLIES

The EVAL-AD5292EBZ needs one digital supply and up to two analog supplies to operate. The digital supply is provided on the board, or it is possible to use an external supply by placing Link 8 in Position B and connecting a power supply in J4 (see Table 3). The analog supplies must be provided by the user through connectors J1, J2 and J3, which are $V_{DD}$, GND, and $V_{SS}$, respectively, as shown in Table 1.

All supplies are decoupled to ground with 10 μF tantalum and 0.1 μF ceramic capacitors.

**Table 1. Maximum and Minimum Voltages Connectors**

| Connector No. | Voltage |
|---|---|
| J1 | Analog positive power supply, $V_{DD}$, as follows: |
| | 21 V to 30 V single-supply operation |
| | 10.5 V to15 V dual-supply operation |
| J2 | Analog GND |
| J3 | Analog negative power supply, $V_{SS}$, as follows: |
| | 0 V single-supply operation |
| | −10.5 V to −15 V dual-supply operation |
| J4 | Digital power supply from 2.7 V to 5 V |

## LINK OPTIONS

A number of link and switch options are incorporated into the evaluation board and should be set to the required operating setup before using the board. The functions of these link options are described in detail in Table 3. Table 2 describes the positions of the links to control the evaluation board by the PC via the USB port using the AD5292 in single-supply mode with the wiper buffer connected.

**Table 2. Link Options Setup for PC Control (Default)**

| Link No. | Options |
|---|---|
| LK2 | Inserted |
| LK4 | Inserted |
| LK5 | Inserted |
| LK6 | Inserted |
| LK7 | Inserted |
| LK8 | A |
| LK9 | B |

**Table 3. Link Functions**

| Link No. | Option |
|---|---|
| LK1 | Connects Terminal A of the digipot to $V_{DD}$. |
| LK2 | Connects Terminal W of the digipot to the buffer. |
| LK3 | Connects Terminal B of the digipot as follows: |
| | LK3 A—$V_{SS}$ |
| | LK3 B—GND |
| LK4 [1] | Connects the negative power supply of the buffer to GND. |
| LK5 | Connects the positive power supply of the buffer to $V_{DD}$. |
| LK6 | Allows feedback in the buffer. |
| LK7 [1] | Connects the negative power supply of the buffer to $V_{SS}$. |
| LK8 | Selects the digital power supply as follows: |
| | LK8 A—5 V (from USB) |
| | LK8 B—3.3 V (from ADP3303) |
| | LK8 C—external supply from J4 connector |
| LK9 | Selects whether the AD5292 evaluation board is controlled by the PC via the USB port or by an external source via the SMB connectors, as follows: |
| | LK9 A—SMB connectors |
| | LK 9 B—USB port |

[1] In single supply-power operation, it is recommended to connect LK4 and LK7.

# EVALUATION BOARD SOFTWARE

## INSTALLING THE SOFTWARE

The AD5292 evaluation kit includes self-installing software on a CD-ROM. The software is compatible with Microsoft® Windows® 2000 and Windows XP.

The software should be installed before the evaluation board is connected to the USB port of the PC. This ensures that the board is correctly recognized when connected to the PC.

1. Start the Windows operating system and insert the CD-ROM
2. The installation software must open automatically. If it does not, run the **setup.exe** file from the CD.
3. After installation is completed, power up the evaluation board as described in the Power Supplies section. Plug the AD5292 evaluation board into the PC using the USB cable that is included in the box.
4. After the software detects the evaluation board, proceed through any dialog boxes that appear to finalize the installation.

## RUNNING THE SOFTWARE

1. To run the program, click **Start**, **All Programs**, **ADI**, **AD5292 Eval Board**, **AD5292 Evaluation Board**.
2. If the PC is not connected to the board via the USB port, a message box advises you, as shown in Figure 1. Check the cable between the PC and the board, and click **Retry**. If the cable is connected, exit the program and try to reinstall it.
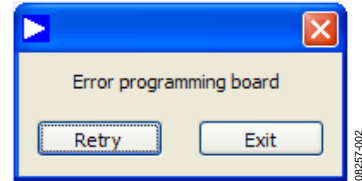


Figure 2. Error Message

3. To uninstall the program, click **Start**, **Control Panel**, **Add or Remove Programs**, **AD5292**.

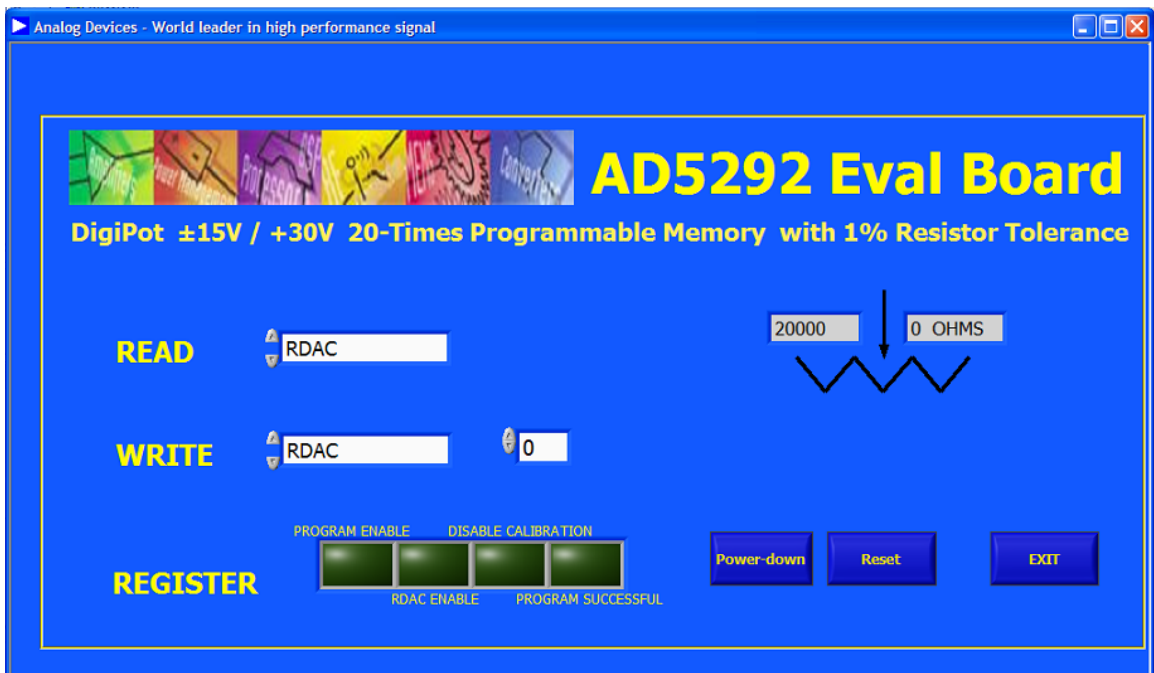The main window of the AD5292 evaluation board software opens, as shown in Figure 3.



Figure 3. AD5292 Evaluation Board Main Window

## SOFTWARE OPERATION

The main window is divided in three sections, as follows:

- **READ s**hows the actual value of the RDAC or the value of the selected 20-TP memory location. These values are displayed in the resistor, as shown in Figure 4, and are updated when you read from or write to the part.
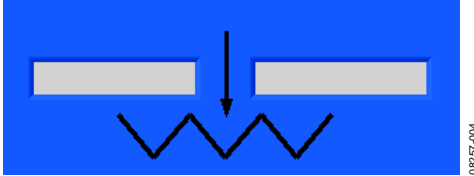


*Figure 4. Resistor Figure: Left Position, Resistance from A to W; Right Position, Resistance from W to B*

- **WRITE** has the following options:
  - **RDAC**—changes the RDAC register contents. The value is in hex format.
  - **Control Register**—updates the control register contents.
  - **Save Value To 20-TP**—saves into the 20-TP memory the value that is shown in the display (see Figure 5). It is necessary to click **Write To Part** to write to the part.
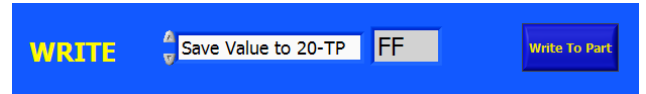


*Figure 5. Save Value to 20-TP Option (the Display Is in Hex Format)*

  Note that, if the enable program is disabled or the display value is different from the RDAC register, **Write To Part** does not appear (to prevent errors).
  - **Reset (software)**—sends a reset by software. It is necessary to click **Write To Part** to send the command.
- **REGISTER s**hows the value of the control register.

There are also three buttons that allow the following functions:

- **Power-down/Power-up**—powers the part down and up. When the button is clicked, the power-up/-down bit toggles automatically.
- **Reset**—sends a reset by hardware.
- **EXIT**—closes the program (it does not reset the part).

# EVALUTION BOARD SCHEMATICS AND ARTWORK

USB Interface

08257-006
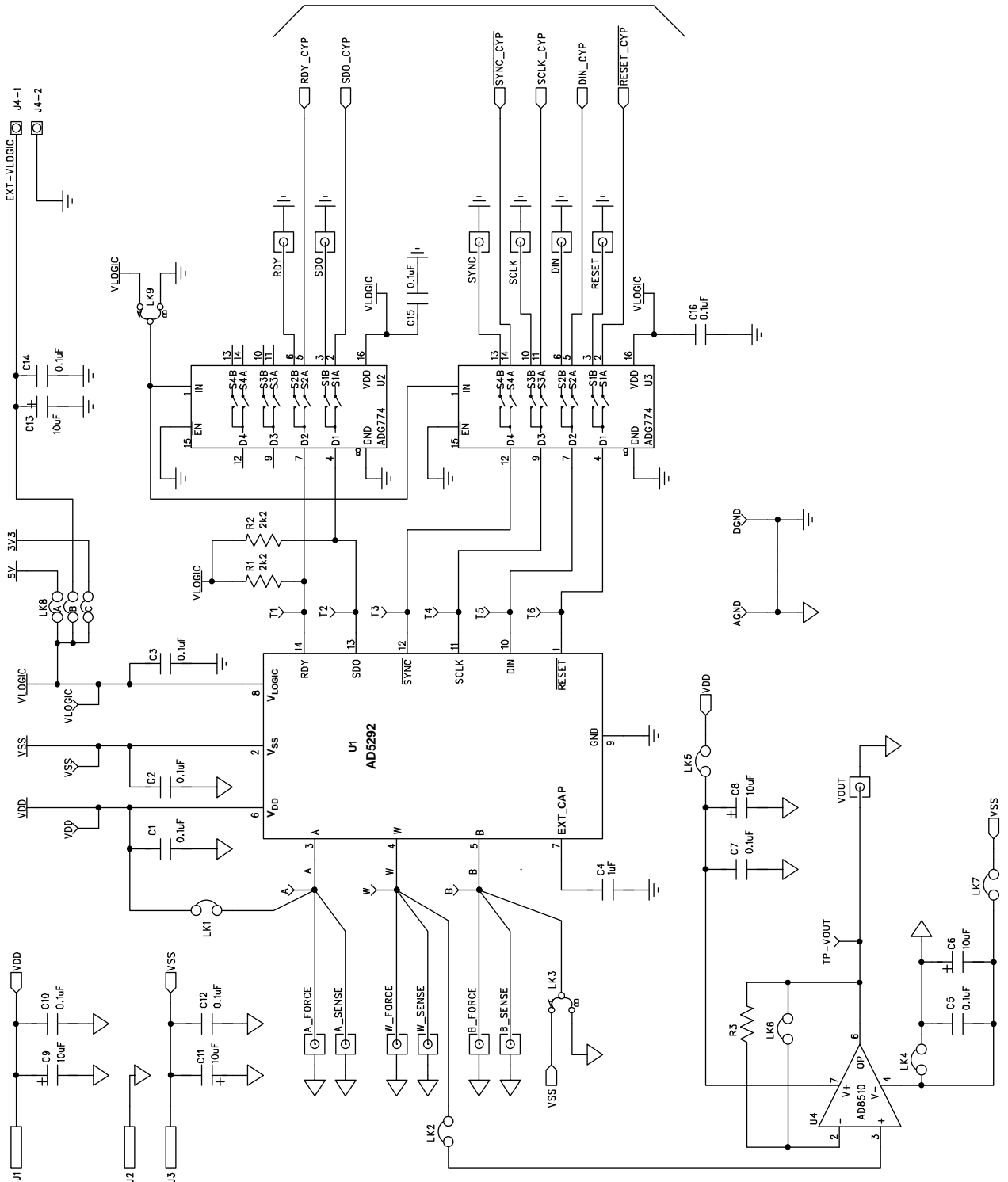


Figure 6. Schematic of the AD5292 Circuitry

08257-007

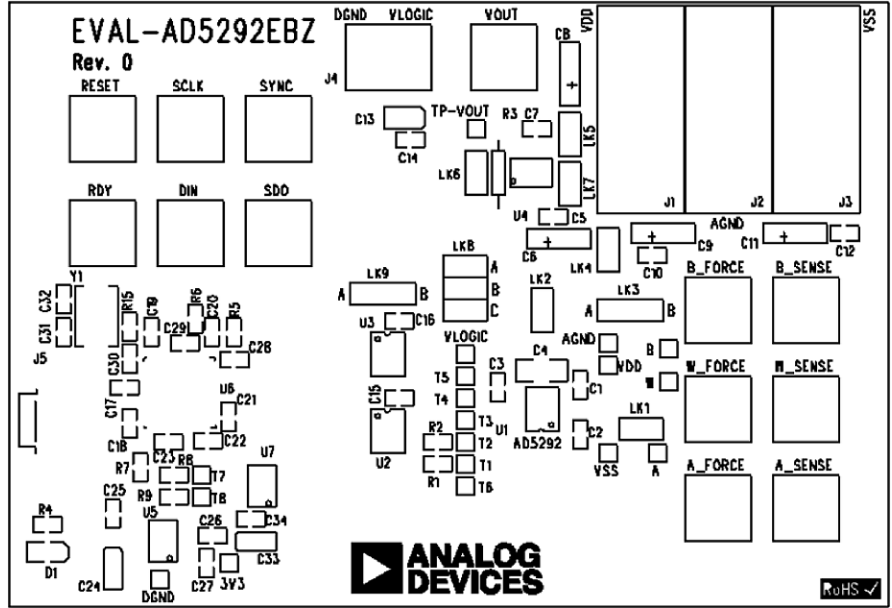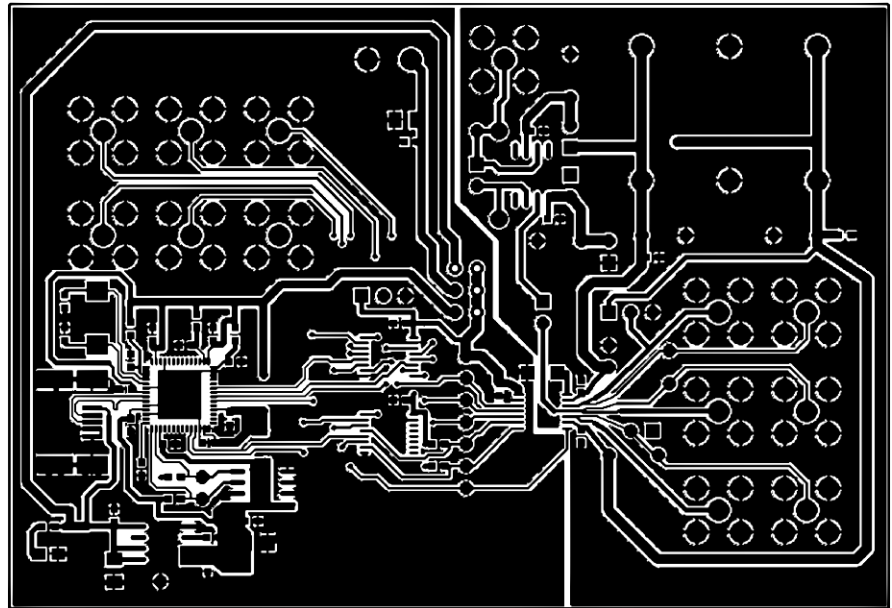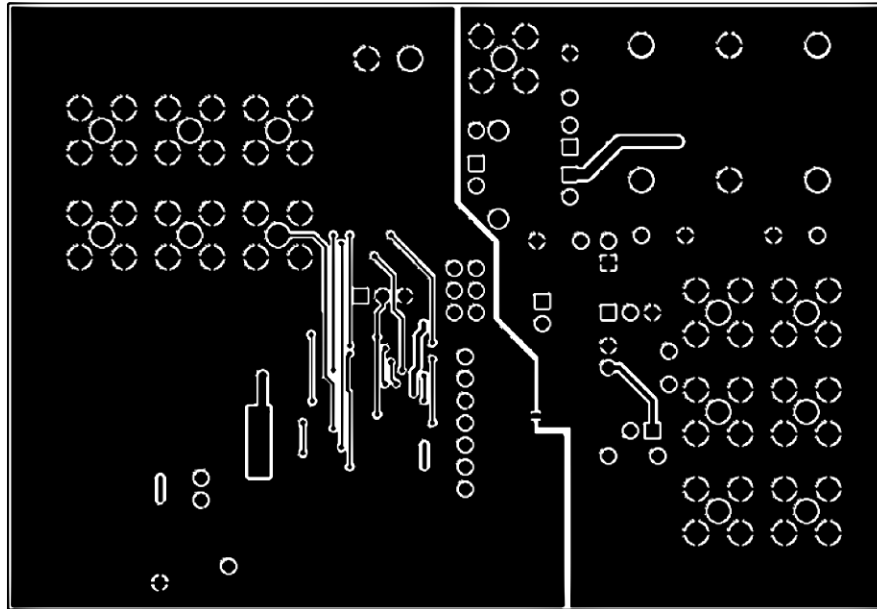Figure 7. Schematic of the Controller Circuitry

Figure 8. Component Placement Drawing



Figure 9. Component Side PCB Drawing

*Figure 10. Solder Side PCB Drawing*

# ORDERING INFORMATION

## BILL OF MATERIALS

Table 4.

| Qty | Reference Designator | Description | Supplier[1]/Number |
|---|---|---|---|
| 25 | C1 to C3, C5, C7, C10, C12, C14 to C23, C25 to C30, C34 | Capacitor, 0.1 μF, 50 V, 0603, SMD | FEC 1288255 |
| 1 | C4 | Capacitor, 1 μF, 16 V, 0805, SMD | FEC 952-7710 |
| 3 | C13, C24, C33 | Capacitor, 10 μF, 10 V, tantalum, SMD | FEC 197-130 |
| 4 | C6, C8, C9, C11 | Capacitor, 10 μF, 35 V, dielectric tantalum | FEC 970-8570 |
| 2 | C31, C32 | Capacitor, 12 pF, 50 V, 0603, SMD | FEC 721-979 |
| 1 | D1 | LED, SMD green | FEC 5790852 |
| 2 | DGND, AGND | Testpoint, black | FEC 8731128 |
| 1 | J1 | Banana-red, socket, 4 mm | FEC 1101127 |
| 1 | J2 | Banana-black, socket, 4 mm | FEC 1101128 |
| 1 | J3 | Banana-red, socket, 4 mm | FEC 1101130 |
| 1 | J4 | Connector\power, 2-way, PCB | FEC 151789 |
| 1 | J5 | USB-MINI-B | FEC 56579-0576 |
| 7 | LK1 to LK7 | Jumper and socket | FEC 1022247 and FEC 150-411 |
| 1 | LK8 | Jumper-3 and socket, 36-pin strip | FEC 148-535 and FEC150-411 |
| 1 | LK9 | Jumper2\SIP3 and socket | FEC 1022248 and FEC 150410 |
| 4 | R1, R2, R8, R9 | Resistor, 2.2 kΩ | FEC 9330810 |
| 1 | R4 | Resistor, 1 kΩ, 0603 | FEC 9330380 |
| 2 | R5, R6 | Resistor, 100 kΩ, 0603 | FEC 9330402 |
| 1 | R7 | Resistor, 10 kΩ. 0603 | FEC 9330399 |
| 1 | R15 | Resistor, 0 Ω, 0603 | FEC 9331662 |
| 16 | T1 to T8, TP-VOUT, VDD, VLOGIC, VSS, W, A, 3V3, B | Testpoint, red, PCB | FEC 8731144 |
| 1 | U1 | AD5292 | Analog Devices |
| 2 | U2, U3 | ADG774 | Analog Devices |
| 1 | U4 | AD8510 | Analog Devices |
| 1 | U5 | ADP3303-3.3 | Analog Devices |
| 1 | U6 | CY7C68013-CSP microcontroller, 15 kB | FEC 1269133 |
| 1 | U7 | 24LC01, EEPROM, 64 k, SOIC8 | FEC 9758070 |
| 1 | Y1 | XTAL1-CSM-8A, crystal, 24.0 MHz, 12 pF, SMD | Digi-Key XC1009CT-ND |

[1] FEC refers to Farnell Electronic Component Distributors; Digi-Key refers to Digi-Key Corporation.

## ORDERING GUIDE

| Model | Package |
|---|---|
| EVAL-AD5292EBZ[1] | Evaluation Board |

[1] Z = RoHS Compliant Part.

## 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.

## NOTES

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