

### FEATURES

- Full-featured evaluation board for the AD7992
- PC software for control and measurement of the AD7992
- USB interface (cable provided)
- Various linking options

### GENERAL DESCRIPTION

This data sheet describes the evaluation board for testing the AD7992 device. This device is a 12-bit, low power, successive approximation analog-to-digital converter (ADC) with an I<sup>2</sup>C-compatible interface. The part operates from a single 2.7 V to 5.5 V power supply and features a 2  $\mu$ s conversion time.

The AD7992 contains a 2-channel multiplexer and track-and-hold amplifier that can handle input frequencies of up to 11 MHz.

Full details on this device are provided in the AD7992 data sheet available from Analog Devices, Inc., which should be consulted in conjunction with this data sheet.

On-board components for the EVAL-AD7992 include two AD8691 operational amplifiers, two AD5245 digital potentiometers, one AD780, which is, which is a pin programmable 2.5 V or 3 V ultra-high precision band gap reference, and one TMP37 precision temperature sensor.

Link options are provided in Table 1 and Table 2.

### FUNCTIONAL BLOCK DIAGRAM

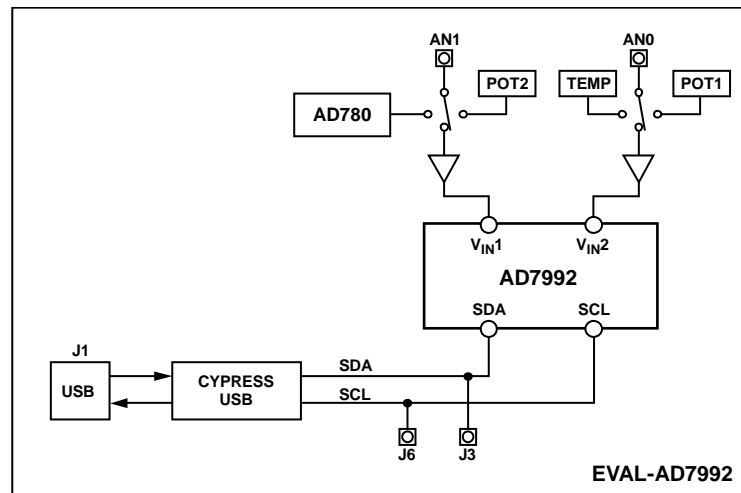


Figure 1.

### Rev. A

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## REVISION HISTORY

### 7/08—Rev. 0 to Rev. A

Changes to Features Section, General Description Section, and Figure 1 .....	1
Changes to Evaluation Board Hardware Section .....	3
Added Evaluation Board Software Section .....	5
Changes to Evaluation Board Schematics and Artwork Section.....	7
Added Bill of Materials Section .....	12
Changes to Ordering Guide .....	13

### 9/07—Revision 0: Initial Version

## EVALUATION BOARD HARDWARE

### POWER SUPPLIES

The EVAL-AD7992 is powered via the 5 V supply from the USB connector, J1. The 5 V supply can be used to power the [AD7992](#) directly through the EMC\_FILTER. A regulated voltage from the on-board [ADP3303](#), a high precision, low power, 3.3 V output voltage regulator, can also be used.

To select the power supply for the AD7992, choose LK7.

### INITIAL SETUP CONDITIONS

Care should be taken before applying power and signals to the evaluation board to ensure that all link positions are set as required by the operating mode.

Table 1 shows the positions in which all the links are set when the evaluation board is shipped.

**Table 1. Initial Link Positions**

Link No.	Position	Function
LK1	A	$V_{IN1}$ is connected to digital Potentiometer 1.
LK2	A	The operational amplifier is supplied from J1 (Channel 1).
LK3	A	The operational amplifier is used on Channel 1.
LK4	A	$V_{IN2}$ is connected to digital Potentiometer 2.
LK5	A	The operational amplifier is supplied from J1 (Channel 2).
LK6	A	The operational amplifier is used on Channel 2.
LK7	A	The power source of the AD7992 is set to 5 V (J1 connector).
LK8	Insert	External reference voltage has a value of 3 V.

# EVAL-AD7992

## LINK OPTIONS

Eight link options can be set to change the configuration of the circuits. The functions of these link options are summarized in Table 2. The positions of the links can be changed when the evaluation board is connected to the power supply.

Table 2.

Link No.	Function
LK1	LK1 connects the input of $V_{IN1}$ to the AN0 input socket, to a digital potentiometer, or to a temperature sensor. In Position A, $V_{IN1}$ is connected to the digital potentiometer. In Position B, $V_{IN1}$ is connected to the AN0 input socket. In Position C, $V_{IN1}$ is connected to the temperature sensor.
LK2, LK5	LK2 and LK5 connect the power supply pins of the operational amplifiers to 3.6 V regulated output from the on-board ADP3330 voltage regulators, or to 5 V supply from J1. In Position A, an operational amplifier is supplied from J1. In Position B, an operational amplifier is supplied from ADP3330.
LK3, LK6	LK3 and LK6 tie the operational amplifiers to the analog inputs of the AD7992. In Position A, the operational amplifier is used. In Position B, the operational amplifier is not used.
LK4	LK4 connects the input of $V_{IN2}$ to the AN1 input socket, to a digital potentiometer or to a high precision reference voltage. In Position A, $V_{IN2}$ is connected to a digital potentiometer. In Position B, $V_{IN2}$ is connected to the AN1 input socket. In Position C, Channel 2 is used as external reference input for the AD7992.
LK7	LK7 selects the power source for $V_{DD}$ on the AD7992. In Position A, LK7 selects the 5 V supply from the USB connector. In Position B, LK7 selects the 3.3 V regulated output from the on-board ADP3303 voltage regulator.
LK8	LK8 changes the value of the external reference voltage. If a link is inserted, the reference voltage is 3 V. If a link is not inserted, the reference voltage is 2.5 V.

## SOCKETS

There are four input sockets relevant to the operation of the [AD7992](#) on this evaluation board. The functions of these sockets are outlined in Table 3.

Table 3. Socket Functions

Socket	Function
AN0	Subminiature BNC (SMB) Connector. The analog input signal for the $V_{IN1}$ of the AD7992 is applied to this socket.
AN1	Subminiature BNC (SMB) Connector. The analog input signal for the $V_{IN2}$ of the AD7992 is applied to this socket.
J2	Subminiature BNC (SMB) Connector. This socket is connected to the SDA track on the evaluation board.
J3	Subminiature BNC (SMB) Connector. This socket is connected to the SCL track on the evaluation board.

## USB CONNECTOR

A standard USB connector, J1, is used to connect the evaluation board to the USB port of a PC. A standard USB connector cable is included with the AD7992 evaluation board kit. Because the USB connector powers the board, there is no need for an external power supply.

Communication between the AD7992 evaluation board and the PC is over the USB interface. The on-board USB controller controls this communication.

## EVALUATION BOARD SOFTWARE

### INSTALLING THE SOFTWARE

Included in the EVAL-AD7992 kit is a CD that contains software for controlling and evaluating the functionality of the AD7992.

When the CD is inserted into the PC, an installation program automatically begins. This program installs the evaluation software as well as electronic versions of the evaluation board data sheet and the AD7992 device data sheet. All literature on the CD is in the Adobe® Systems, Inc., portable documentation format (PDF) and requires Acrobat Reader® to be viewed or

printed. The user interface on the PC is a dedicated program written especially for the AD7992.

Connect the evaluation board to the PC when the installation process is finished.

### USING THE MAIN WINDOW

The software that controls the AD7992 consists of one window shown in Figure 2. This window, which appears when the software is run, allows you to display and read samples from the evaluation board.

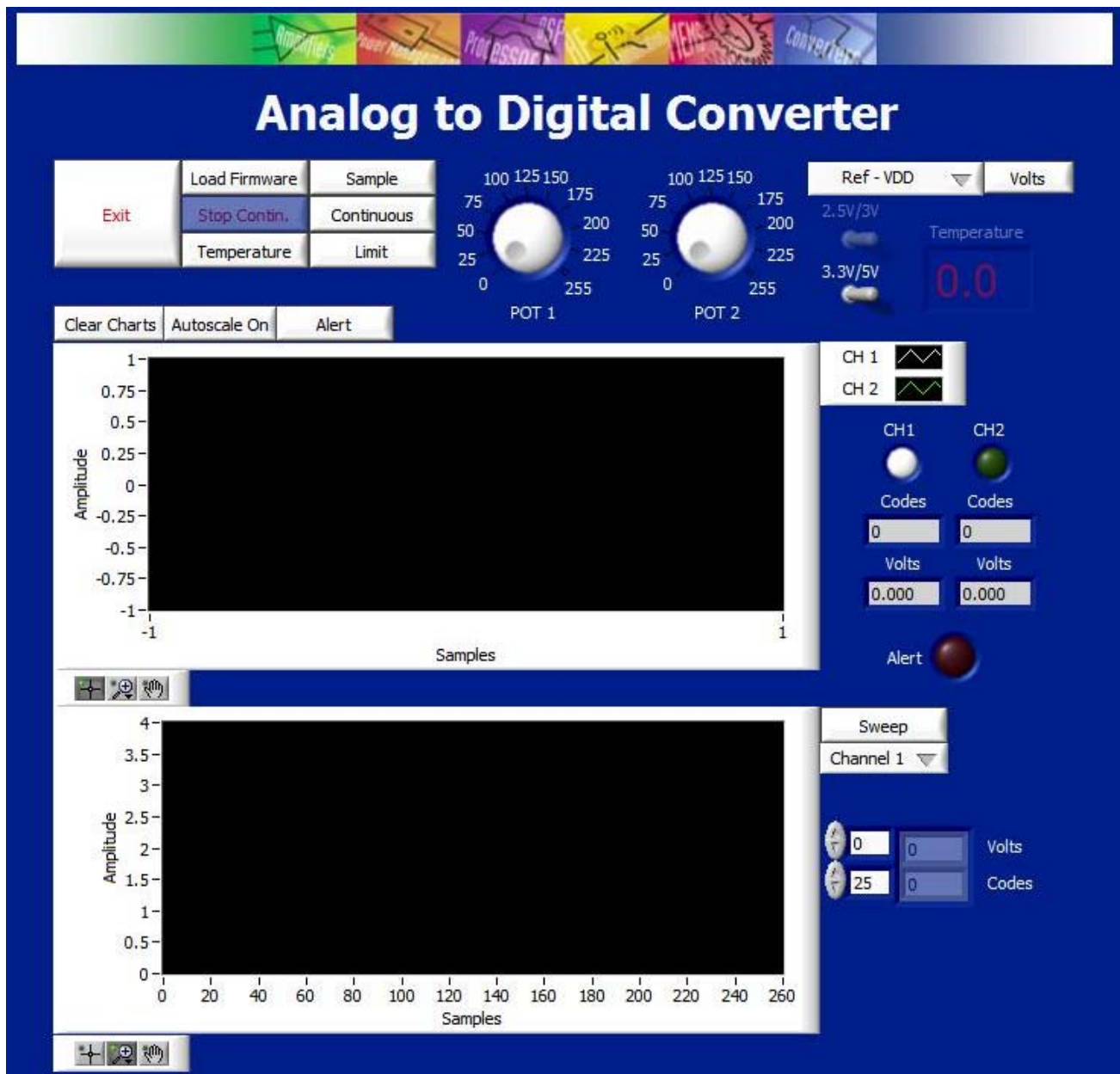


Figure 2. AD7992 Evaluation Board Window

The upper portion of the evaluation board window contains a menu bar and controls. The middle and bottom portions contain digital storage oscilloscopes (DSOs).

## **Menu Bar**

The menu bar (not visible in Figure 2) consists of the **File** and **About** menus.

## **File Menu**

**Exit.** Exits the program.

## **About Menu**

The **About** menu displays information about the current version of the software.

## **Controls**

The controls include control buttons, list boxes, and indicators.

**Exit.** Exits the program.

**Load Firmware.** Loads the firmware to the Cypress USB device.

**Sample.** Samples selected channels.

**Continuous.** Repeats the sampling process.

**Stop Contin.** Stops sampling continuously.

**Temperature.** Enables temperature measurements.

**Limit.** Opens window to configure limit registers (Channel 1 only).

**Potentiometer Value Selector (Pot 1/Pot 2).** Changes the value of the selected digital potentiometer.

**LEDs (CH1, CH2).** Selects the input channel of the [AD7992](#). When more than one channel is selected, the AD7992 works in sequence mode.

**Alert LED.** Indicates if an alert occurred (Channel 1 only).

**Ref - VDD.** Selects an external or internal reference voltage.

**2.5V/3V.** Changes the value of the external reference voltage.

**3.3V/5V.** Flip the switch to change the value of the internal reference voltage (power supply voltage).

**Codes/Volts.** Determines whether data is displayed in codes or volts.

**Clear Charts.** Clears the charts displayed.

**Autoscale On/Autoscale Off.** Click this button to turn the autoscale feature on or off.

**Alert.** Shows limits on the upper digital storage oscilloscope.

**Sweep.** Starts the sweep function.

**Channel 1/Channel 2.** Selects the input channel (Channel 1 or Channel 2) of the AD7992 for the sweep function.

## **Digital Storage Oscilloscopes**

The middle portion of the evaluation board window displays a waveform. When samples are uploaded from the evaluation board, they are displayed here. At the bottom left of the upper DSO are zoom options that allow you to zoom in and out while viewing a sample. To the right of this DSO, information about the sample taken and displayed such as measured values in codes and in volts.

The lower portion of the main window displays a waveform of the sweep function. At the bottom left of the lower DSO are zoom options that allow you to zoom in and out while viewing a sample. To the right of the DSO, information about the sample taken and the value of each point of sweep function is displayed.

## **Taking Samples**

During the sweep function, 256 samples are taken directly from the digital potentiometer output. The output of the digital potentiometer is incremented by 1, from 0 to 255, and for each increment, the AD7992 takes a sample. After the measurement, all 256 values are displayed on the digital storage oscilloscope in the lower portion of the main window (see Figure 2).

To instruct the AD7992 to take samples, click either **Sample** or **Continuous**.

- Click **Sample** to perform one conversion. The result is uploaded and displayed.
- Click **Continuous** to start taking samples. When **Continuous** is clicked, all other controls except **Stop Contin.**, **Pot 1/Pot 2**, and **Exit** are disabled. The value of the digital potentiometer can be changed while **Continuous** mode is selected.

EVALUATION BOARD SCHEMATICS AND ARTWORK

600-99290

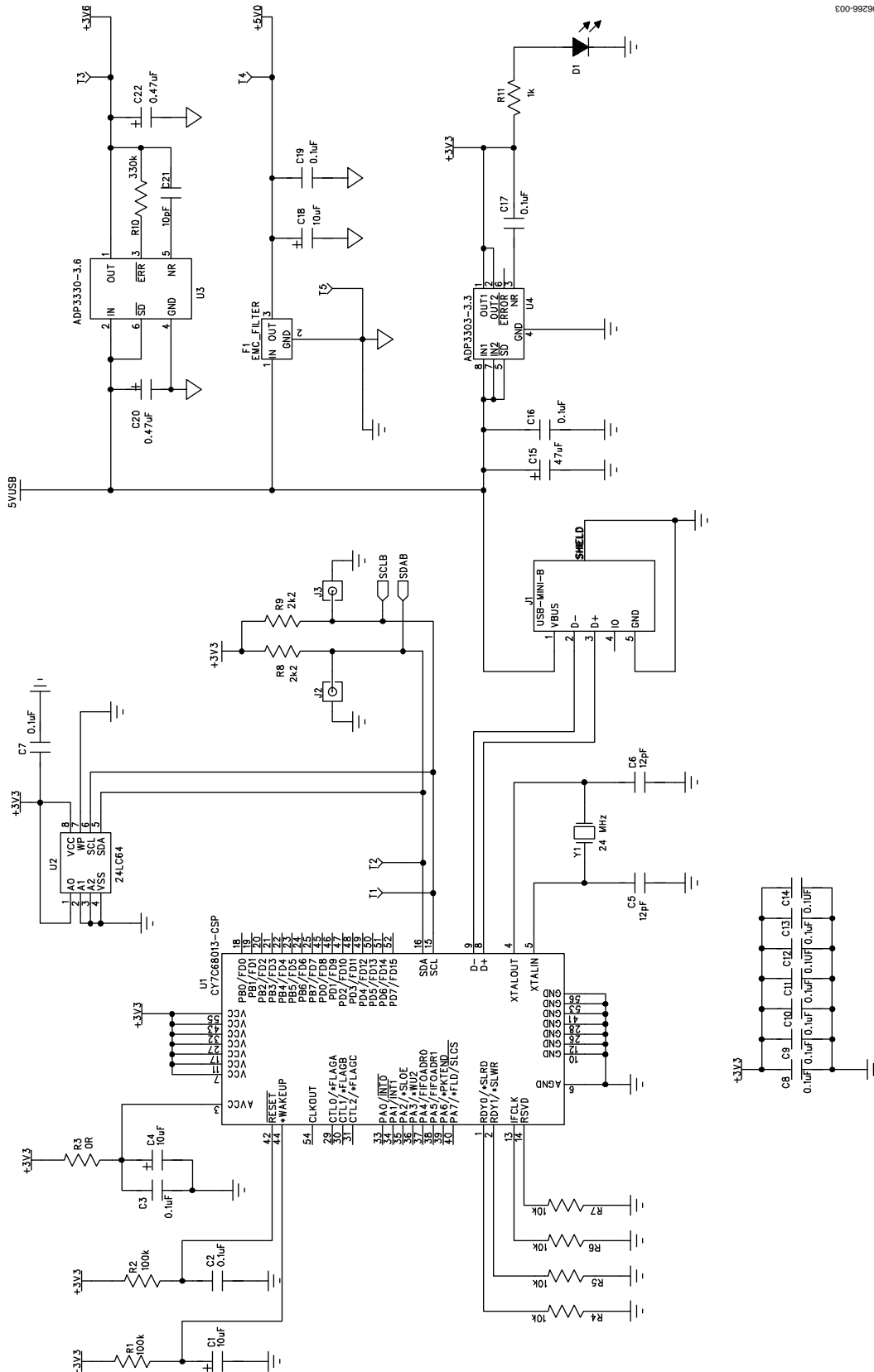
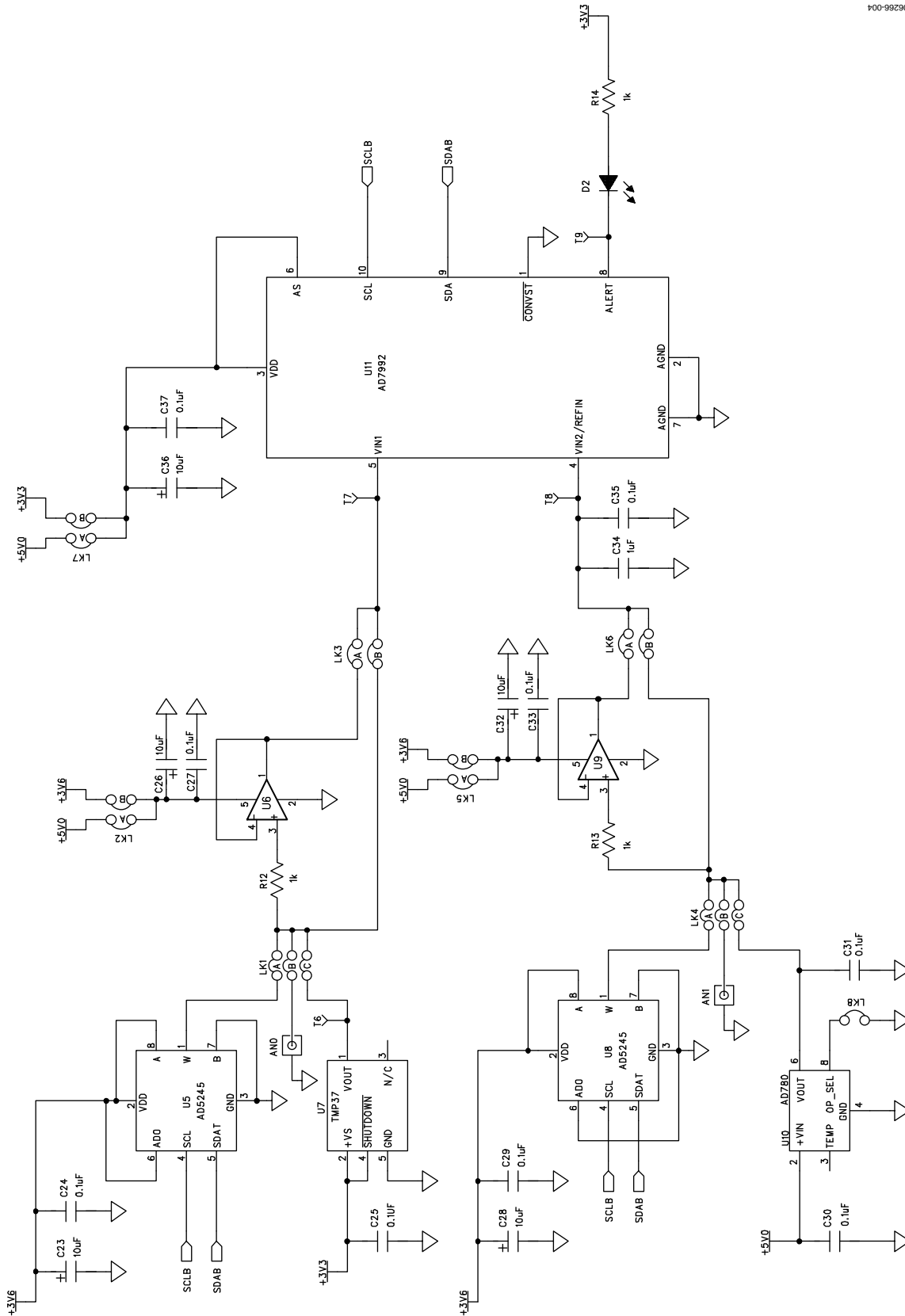


Figure 3. AD7992 Evaluation Board Schematic 1

# EVAL-AD7992



900-98290

Figure 4. AD7992 Evaluation Board Schematic 2



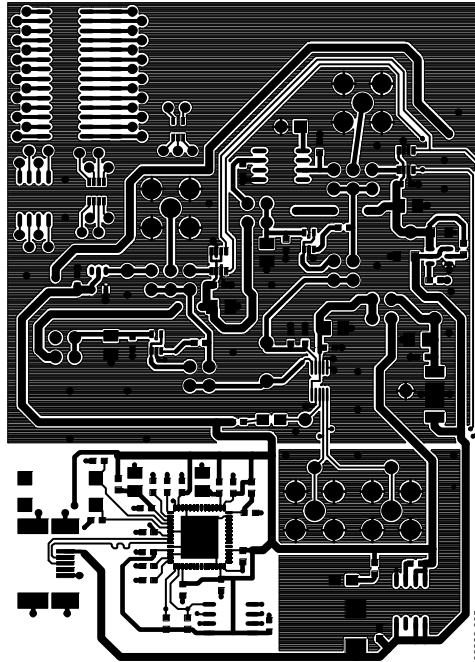


Figure 5. Component Side Artwork

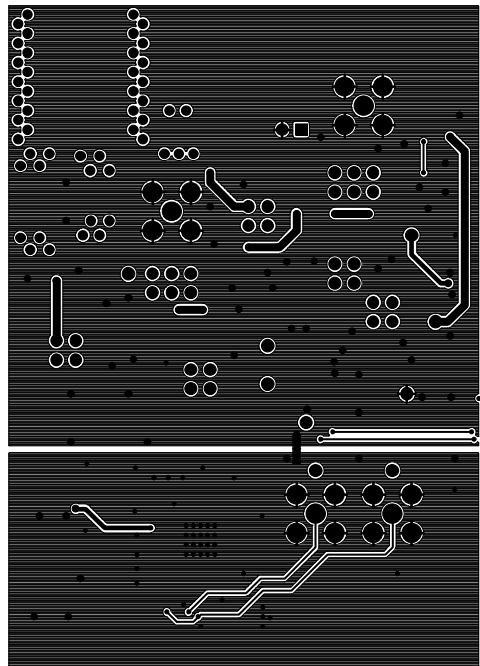


Figure 6. Solder Side Artwork

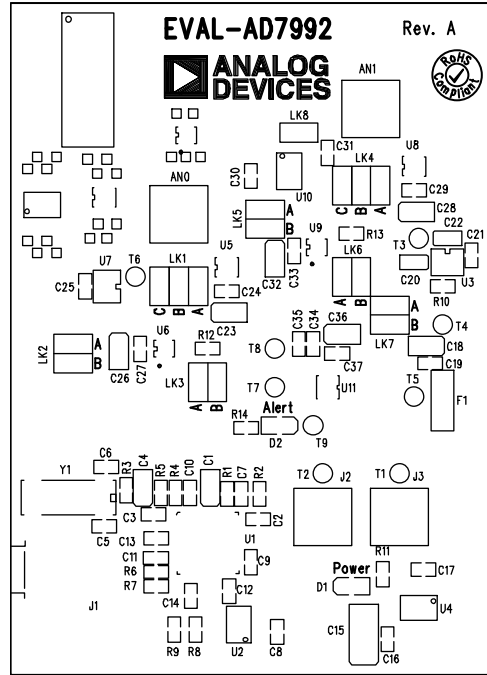


Figure 7. Component Placement Drawing

## ORDERING INFORMATION

### BILL OF MATERIALS

Table 4. Components Listing

Qty.	Reference Designator	Description	Supplier/Number <sup>1</sup>
2	AN0, AN1	Jack, SMB PCB 50 $\Omega$	FEC 1111349
9	C1, C4, C18, C21, C23, C26, C28, C32, C36	Case A, 10 $\mu$ F, 10 V capacitor	FEC 197130
22	C2, C3, C7 to C14, C16, C17, C19, C24, C25, C27, C29, C30, C31, C33, C35, C37	0603, 0.1 $\mu$ F, 16 V capacitor	FEC 9406140
2	C5, C6	0603, 12 pF, 50 V capacitor	FEC 721979
1	C15	Case C, 47 $\mu$ F, 10 V capacitor	FEC 197324
2	C20, C22	Case A, 0.47 $\mu$ F, 25 V capacitor	FEC 498828
1	C34	1 $\mu$ F	FEC 1327680
1	D1	SMD green LED	FEC 5790852
1	D2	SMD red LED	FEC 5790840
1	F1	1.0 nF 3-terminal capacitor	FEC 9528202
1	J1	USB mini-AB SMT socket	FEC 9786490
2	J2, J3	Jack, SMB PCB 50 $\Omega$	FEC 1111349
8	LK1 to LK8	2 row 36 + 36 way header and red jumper socket	FEC 1022244/FEC 150411
2	R1, R2	0603, 100 k $\Omega$ resistor	FEC 9330402
1	R3	0 $\Omega$	FEC 933-1662
4	R4 to R7	0603, 10 k $\Omega$ resistor	FEC 9330399
2	R8, R9	0603, 2.2 k $\Omega$ resistor	FEC 9330810
1	R10	0603, 330 k $\Omega$ resistor	FEC 9331042
4	R11 to R14	0603, 1 k $\Omega$ resistor	FEC 9330380
9	T1 to T9	Testpoint	FEC 8731144
1	U1	Cypress USB microcontroller	Digi-Key 428-1669-ND
1	U2	EEPROM serial 64 k $\Omega$	FEC 9758070
1	U3	High accuracy low dropout regulator	Analog Devices ADP3330ARTZ-3.6-R7
1	U4	High accuracy low dropout regulator	Analog Devices ADP3303AR-3.3
2	U5, U8	Digital potentiometer	Analog Devices AD5245BRJZ10-RL7
2	U6, U9	Operational amplifier	Analog Devices AD8691AKSZ-R2
1	U7	Low voltage temperature sensor	Analog Devices TMP37GRTZ
1	U10	Precision band gap voltage reference	Analog Devices AD780ARZ
1	U11	12-bit ADC, 2-channel with I <sup>2</sup> C-compatible interface	Analog Devices AD7992
1	Y1	24 MHz SMD crystal	FEC 9509658

<sup>1</sup> FEC = Farnell Electronics.

### ORDERING GUIDE

Model	Description
EVAL-AD7992EBZ <sup>1</sup>	AD7992 Evaluation Board

<sup>1</sup> 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**