ANALOG DEVICES

Evaluation Board User Guide
UG-059

Evaluation Board for AD5501/AD5504

FEATURES

Full-featured evaluation board for the AD5501/AD5504
USB interface
PC software for register programming
Standalone operation

GENERAL DESCRIPTION

This user guide describes the operation and functionality of the AD5501/AD5504 evaluation board. Use this user guide in conjunction with the AD5501 or AD5504 data sheet (as appropriate) to evaluate board the functionality and performance of the AD5501/AD5504. The evaluation board can be used as a standalone board, with control coming from an external DSP or microcontroller, or it can be connected to a PC. Software is provided that can be used to program the registers of the AD5501/AD5504. Control of the AD5501/AD5504 is via a USB interface.
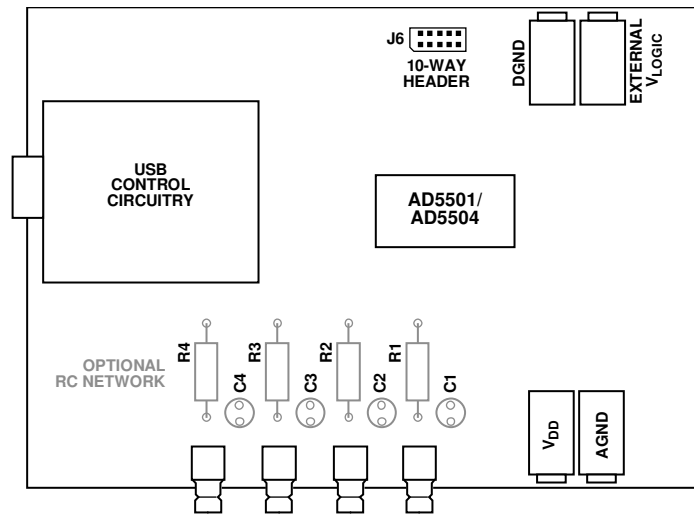
FUNCTIONAL BLOCK DIAGRAM

Figure 1.

TABLE OF CONTENTS

REVISION HISTORY

11/09—Revision 0: Initial Version

FUNCTIONALITY OVERVIEW

The evaluation board for the AD5501/AD5504 allows the user to fully evaluate all the functions and performance of the AD5501/AD5504 prior to designing it into a system. The evaluation board can be used in a standalone mode with the control signals provided through the 10-pin header, J6, or it can be connected to a PC using the USB cable supplied with the evaluation board kit. Software is provided that allows the user to program the various registers of the AD5501/AD5504 with ease. The operation of the software is described in the Using the USB Software section.

SAFETY REQUIREMENTS

Because the AD5501/AD5504 are capable of producing voltages up to 60 V, the evaluation board is shipped with a perspex cover on the top and bottom. This cover should remain in place to prevent accidental contact with any high voltage components or tracks.

POWER SUPPLIES

To supply V_{LOGIC}, the evaluation board requires a 2.7 V to 5 V supply. The V_{DD} supply can be any value within the power supply limit as specified in the AD5501/AD5504 data sheets. Power supply connections are made to the banana sockets of J2 to J5. The USB interface, if used, gets its power supply from the USB port of the PC. This power supply is not used by the AD5501/AD5504 or any of its associated circuitry. When connecting the power supply leads, it is recommended that the supplies be turned off and that the ground leads be connected first.

DAC OUTPUTS

The DAC output for the AD5501 is available on the SMB connector, T1. The DAC outputs V_{OUTA} to V_{OUTD} for the AD5504 are available on the SMB connectors, T1 to T4.

USB INTERFACE

The software provided with the evaluation board kit allows the user to program the registers of the AD5501/AD5504 via the USB interface. It is important that the software supplied is installed on the PC before the board is connected. The USB circuitry gets its power from the USB port of the PC and generates the required interface signals: $\overline{CLR}$, $\overline{SYNC}$, and SCLK to control the AD5501/AD5504. To use the interface Link LK1 should be inserted.

STANDALONE OPERATION

The evaluation board can be used as a standalone device if required. The advantage to this is that it lets the user connect the interface pins of the AD5501/AD5504 to their own DSP or microcontroller, thus allowing them to write code to operate the AD5501/AD5504 as their application requires. To use the board in standalone mode, the connection to the USB interface must be removed. This is achieved by removing LK1, which three-states the connections to $\overline{CLR}$, $\overline{LDAC}$, $\overline{SYNC}$, SCLK and SDI. LK10 should be in Position B or Position C so that the $\overline{R\_SEL}$ pin is connected to DGND or V_{LOGIC} as required. The interface signals required to control the AD5501/AD5504 can then be provided through the 10-pin header, J6. The pinout of J6 is shown in Table 1.

Table 1. J6 Header Pinout

Pin	Signal	Pin	Signal
1	$\overline{CLR}$	6	SDO
2	$\overline{SYNC}$	7	$\overline{R\_SEL}$
3	SCLK	8	$\overline{ALARM}$
4	SDI	9	DGND
5	$\overline{LDAC}$	10	DGND

Table 2. Summary of Link Positions

Link	Description
LK1	This link determines if the USB interface is to be used.
	If this link is inserted, the USB interface generates the signals required to control the AD5501/AD5504.
	If this link is removed, the USB interface is not used, and Header J3 must be used to provide signals to the AD5501/AD5504.
LK2	This link connects the V_{LOGIC} pin of the AD5501/AD5504 to the V_{LOGIC} source. This link can be removed and an ammeter connected across the two pins if it is required to measure the V_{LOGIC} current. The source for V_{LOGIC} is determined by LK9.
LK3	This link connects the V_{DD} pin of the AD5501/AD5504 to the V_{DD} source. This link can be removed and an ammeter connected across the two pins if it is required to measure the V_{DD} current.
LK9	This link selects the voltage source for V_{LOGIC}.
	If this link is in Position A, V_{LOGIC} = 5 V from the USB interface.
	If this link is in Position B, V_{LOGIC} = 3 V from the voltage regulator, U3.
	If this link is in Position C, V_{LOGIC} is connected to the banana sockets, J4 and J5. An external voltage source should be applied to these sockets.
LK10	This link selects the logic level applied to $\overline{R\_SEL}$.
	If this link is in Position A, $\overline{R\_SEL}$ is controlled by software.
	If this link is in Position B, $\overline{R\_SEL}$ is connected to DGND.
	If this link is in Position C, $\overline{R\_SEL}$ is connected to V_{LOGIC}.

USING THE USB SOFTWARE

The evaluation board kit is supplied with a CD containing PC software that allows the user to control the evaluation board via the USB interface. Note that the software must be installed before the evaluation board is connected to the USB port. The software installation program usually runs automatically when the CD is inserted in the drive; however, if this doesn't happen, double-click the **setup.exe** file in the root directory of the CD. The software is installed, and shortcuts are placed on the start menu in a folder called Analog Devices. When the software is installed, the evaluation board can be connected to the USB port.

When the software is started, the user is presented with a selection box. The selection box presents a choice of using the AD5501 or AD5504. Click the appropriate button for the board being used.

The main control panel for the AD5504 software is shown in Figure 2. Use this panel to load values to the DACs and set the status of the $\overline{\text{LDAC}}$ and $\overline{\text{CLR}}$ pins. It should be noted that when power is first applied to the AD5501/AD5504, the DACs are powered down by default. The DACs are powered up by selecting the appropriate options in the control register panel.
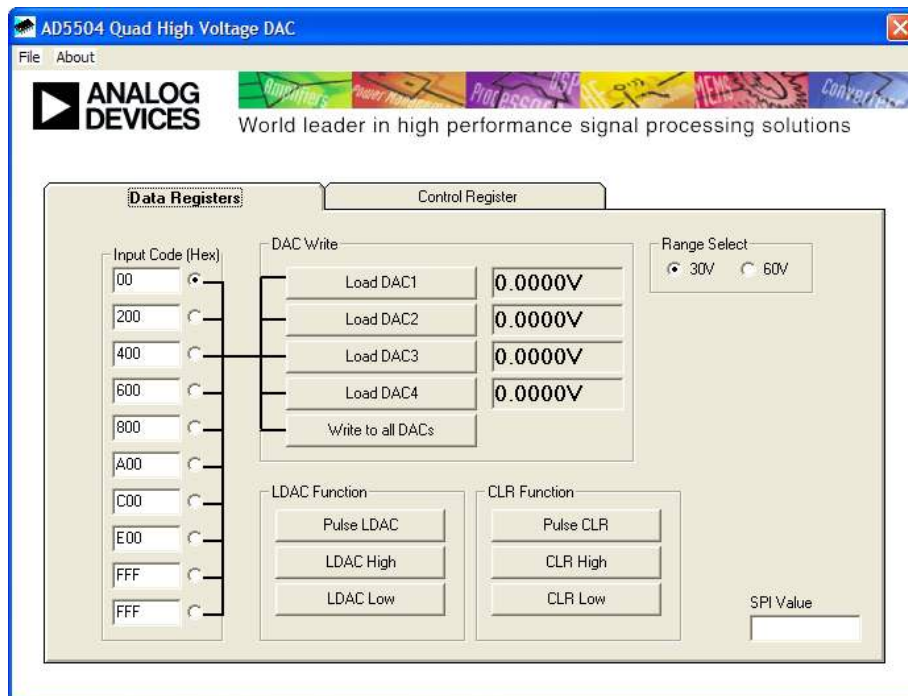

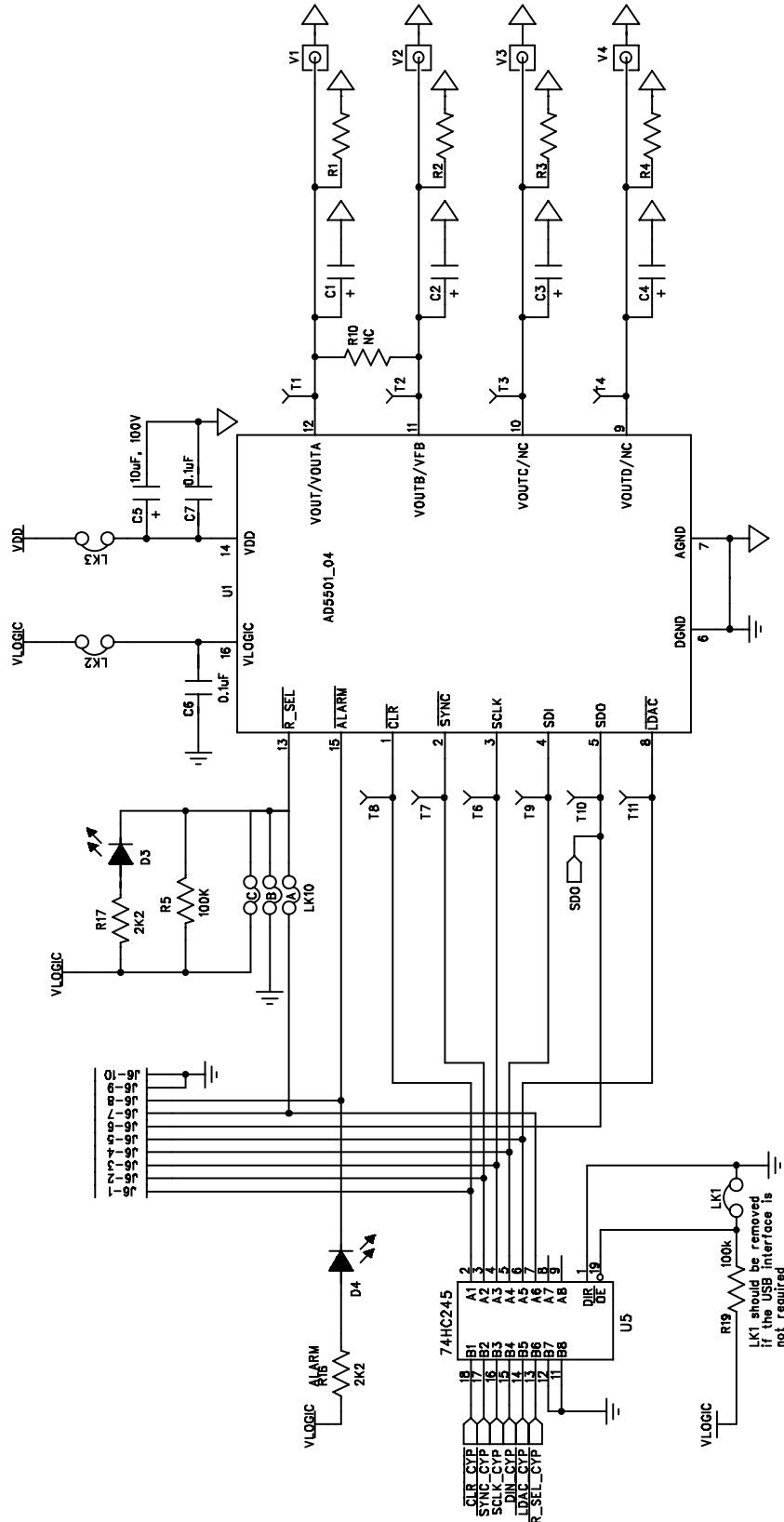*Figure 2. Main Control Panel*

SCHEMATICS AND ARTWORK

Figure 3. Evaluation Board Schematic (1 of 3)

08561-004
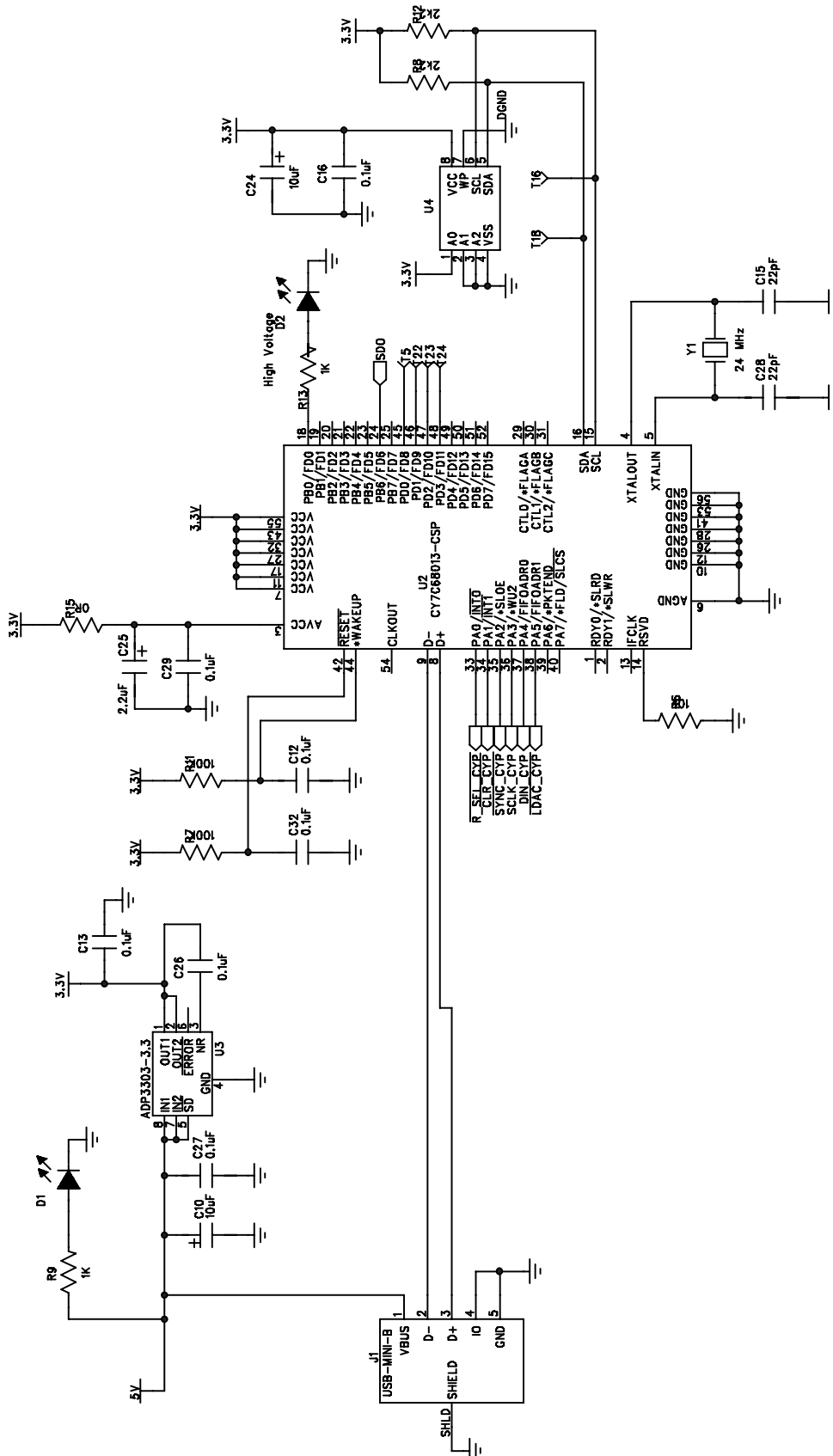
Figure 4. Evaluation Board Schematic (2 of 3)

08551-005
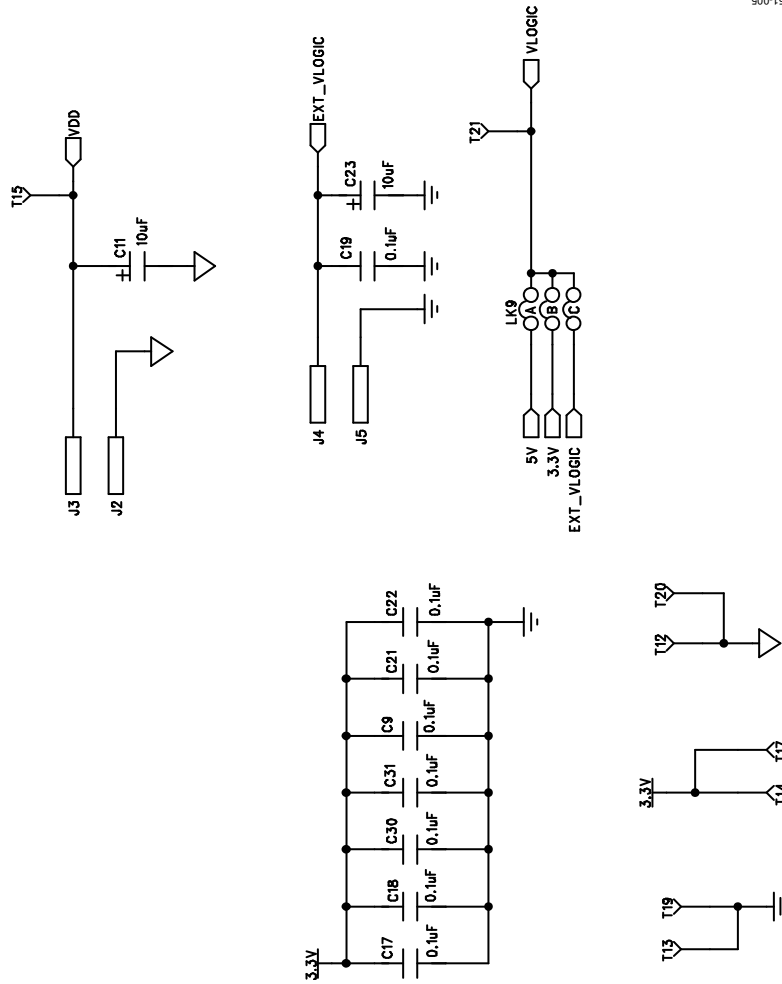
VDD

T15

J3

J2

C11 10uF

EXT_VLOGIC

J4

J5

C23 10uF

C19 0.1uF

VLOGIC

T21

LK9
A
B
C

5V
3.3V
EXT_VLOGIC

C17 0.1uF
C18 0.1uF
C30 0.1uF
C31 0.1uF
C9 0.1uF
C21 0.1uF
C22 0.1uF

3.3V

T20
T12

3.3V
T17
T14

T19
T13

Figure 5. Evaluation Board Schematic (3 of 3)

BILL OF MATERIALS

Table 3. AD5504

Qty	Name	Part Description	Stock Code[1]
4	C1 to C4	Socket pins × 2	FEC 329563 (two required)
2	C5, C11	Capacitor, 10 µF, 100 V	FEC 9693130
17	C6, C7, C9, C12, C13, C16 to C19, C21, C22, C26, C27, C29 to C32	Capacitor, 0603, 100 nF, 50 V	FEC 431989
3	C10, C23, C24	Capacitor, Case A, 10 µF, 10 V	FEC 9751041
2	C15, C28	Capacitor, 0603, 22 pF, 50 V	FEC 9406107
1	C25	Capacitor, Case A, 2.2 µF, 10 V	FEC 9753796
4	D1 to D4	LED, SMD 0805 green	FEC 8529906
1	J1	Socket, USB MINI-AB SMT	FEC 9786490
2	J2, J5	Black 4 mm banana socket	FEC 1101128
2	J3, J4	Red 4 mm banana socket	FEC 1101127
1	J6	10-pin (2 × 5) 0.1" pitch 90° header	FEC 102-2233
3	LK1 to LK3	2-pin 0.1" pitch header and shorting shunt	FEC 102-2247 and FEC 150-411
2	LK9, LK10	6-pin (3 × 2) 0.1" header and shorting shunt	FEC 102-2231 and FEC 150-411
4	R1 to R4	Socket pins × 2	FEC 329563 (two required)
4	R5, R7, R11, R19	Resistor, 0603, 100 kΩ	FEC 9330402
1	R6	Resistor, 0603, 10 kΩ	FEC 9330399
4	R8, R12, R16, R17	Resistor, 0603, 2.2 kΩ	FEC 9330810
2	R9, R13	Resistor, 0603, 1 kΩ	FEC 9330380
1	R10	Not populated	N/A
1	R15	Resistor, 0603, 0 Ω	FEC 9331662
20	T1 to T11, T14 to T19, T22 to T24	Terminal, PCB red	FEC 8731144
4	T12, T13, T20, T21	Terminal, PCB black	FEC 8731128
1	U1	High voltage, quad-channel DAC	AD5504BRUZ
1	U2	USB microcontroller	Digi-Key 428-1669-ND
1	U3	Precision low dropout voltage regulator	ADP3303ARZ-3.3
1	U4	IC serial EEPROM 64K 2.5 V 8-SOIC	FEC 9758070
1	U5	Bus transceiver	Digi-Key 296-8279-1-ND
4	V1 to V4	50 Ω SMB 90° PCB jack	FEC 121-2895
1	Y1	CM309S SMD crystal	FEC 9509658

[1] FEC refers to Farnell In One; Digi-Key refers to the Digi-Key Corporation.

Table 4. AD5501

Qty	Name	Part Description	Stock Code¹
1	C1	Socket pins × 2	FEC 329563 (two required)
3	C2 to C4	Not populated	FEC 329563 (two required)
2	C5, C11	Capacitor, 10 µF, 100 V	FEC 9693130
17	C6, C7, C9, C12, C13, C16 to C19, C21, C22, C26, C27, C29 to C32	Capacitor, 0603, 100 nF, 50 V	FEC 431989
3	C10, C23, C24	Capacitor, Case A, 10 µF, 10 V	FEC 9751041
2	C15, C28	Capacitor, 0603, 22 pF, 50 V	FEC 9406107
1	C25	Capacitor, Case A, 2.2 µF, 10 V	FEC 9753796
4	D1 to D4	LED, SMD 0805 green	FEC 8529906
1	J1	Socket, USB MINI-AB SMT	FEC 9786490
2	J2, J5	Black 4 mm banana socket	FEC 1101128
2	J3, J4	Red 4 mm banana socket	FEC 1101127
1	J6	10-pin (2 × 5) 0.1" pitch 90° header	FEC 102-2233
3	LK1 to LK3	2-pin 0.1" pitch header and shorting shunt	FEC 102-2247 and FEC 150-411
2	LK9, LK10	6-pin (3 × 2) 0.1" header and shorting shunt	FEC 102-2231 and FEC 150-411
1	R1	Socket pins × 2	FEC 329563 (two required)
3	R2 to R4	Not populated	FEC 329563 (two required)
4	R5, R7, R11, R19	Resistor, 0603, 100 kΩ	FEC 9330402
1	R6	Resistor, 0603, 10 kΩ	FEC 9330399
4	R8, R12, R16, R17	Resistor, 0603, 2.2 kΩ	FEC 9330810
2	R9, R13	Resistor, 0603, 1 kΩ	FEC 9330380
1	R10	Resistor, 1 Ω	FEC 9465561
1	R15	Resistor, 0603, 0 Ω	FEC 9331662
17	T1, T5 to T11, T14 to T19, T22 to T24	Terminal, PCB red	FEC 8731144
3	T2 to T4	Not populated	N/A
4	T12, T13, T20, T21	Terminal, PCB black	FEC 8731128
1	U1	High voltage, 12-bit voltage output DAC	AD5501BRUZ
1	U2	USB microcontroller	Digi-Key 428-1669-ND
1	U3	Precision low dropout voltage regulator	ADP3303ARZ-3.3
1	U4	IC serial EEPROM 64K 2.5 V 8-SOIC	FEC 9758070
1	U5	Bus transceiver	Digi-Key 296-8279-1-ND
1	V1	50 Ω SMB 90° PCB jack	FEC 121-2895
3	V2 toV4	Not populated	N/A
1	Y1	CM309S SMD crystal	FEC 9509658

¹ FEC refers to Farnell In One; Digi-Key refers to the Digi-Key Corporation.

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

NOTES

NOTES

**ANALOG
DEVICES**

www.analog.com