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Evaluation Board for AD5541A/AD5542A, 16-Bit Accurate High Precision DAC in LFCSP with 1µs Settling Time and 5kV ESD Rating

FEATURES

Full-featured evaluation board for the AD5541A/AD5542A
On-board reference
Various link options
PC control in conjunction with Analog Devices
System demonstration platform (SDP)
PC software for control of DACs

PACKAGE CONTENTS

AD5541A/AD5542A evaluation board
AD5541A or AD5542A device
CD that includes
- **Self-installing software that allows users to control the board and exercise all functions of the device**
- **Electronic version of the AD5541A and AD5542A data sheet**
- **Electronic version of AN-XXX**

GENERAL DESCRIPTION

The Analog Devices, Inc., AD5541A and AD5542A evaluation board (EVAL-AD5541A/42AEBZ) is designed to help customers quickly prototype new AD5541A or AD5542A circuits and reduce design time. The AD5541A operates from a single 2.7 V to 5.5 V supply. The on-board reference the REF192 is used on this evaluation board. The part must be written to after power-up to turn on the internal reference. Full data on the AD5541A/AD5542A may be found in the data sheet available from Analog Devices and should be consulted in conjunction with this data sheet when using the evaluation board.

The evaluation board interfaces to the USB port of an IBM compatible PC via the SDP board. Software is available with the evaluation board which allows the user to easily program the AD5541A/AD5542A.

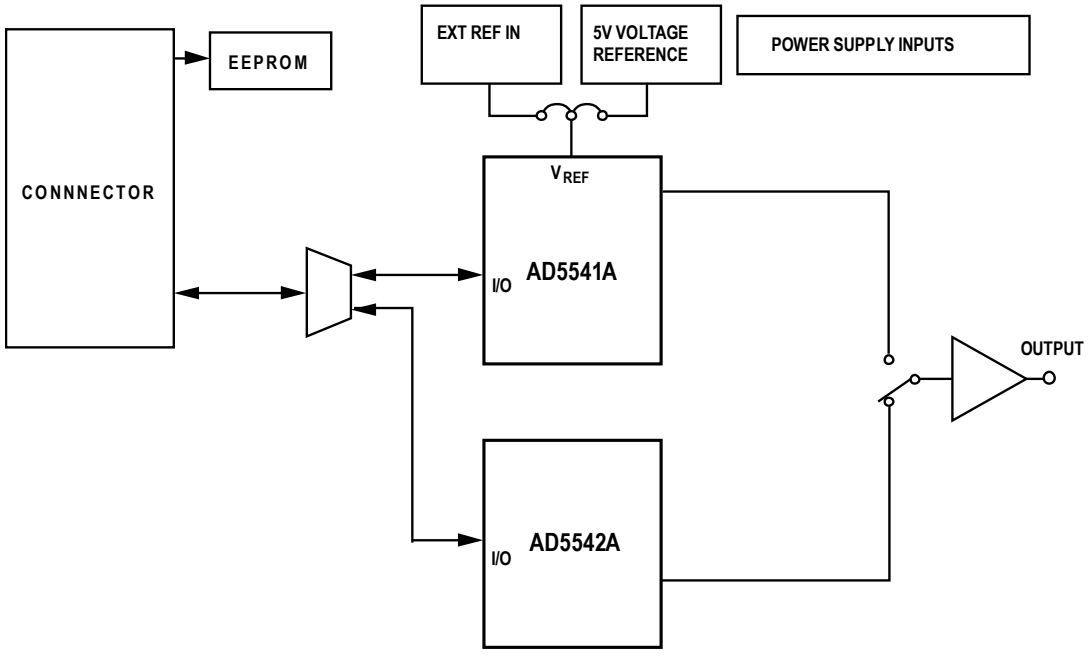

Figure 1. Universal Evaluation Board

EVALUATION BOARD HARDWARE

POWER SUPPLIES

To power the AD5542A evaluation board supply 5V between the +5V and AGND inputs for the analog supply and -5V between -5V and AGND inputs for the negative analog supply of the evaluation board. An AGND input is provided on the board also.

To power the AD5541A board connect the board to the SDP board that is powered by the PC's USB interface.

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

Table 1. Power Supply Connectors

Connector No.	Voltage
J1	Analog positive supply, analog negative supply and ground, +5V, -5V and AGND. For single-supply operation, supply +5 V and -5V.

LINK OPTIONS

A number of link and switch options are incorporated in the evaluation board and should be set for the required operating setup before using the board. The functions of these link options are described in detail in Table 4. Table 2 and 3 describes the positions of the different links to control the evaluation board by PC, via the USB port.

Table 2. Link Options Setup for SDP Control of the AD5541A (Default)

Link No.	Options
LK1	A
LK2	A
LK3	A
LK4	A
LK5	NOT INSERTED
LK6	NOT INSERTED
LK7	B
LK8	A
LK9	B

Table 3. Link Options Setup for SDP Control of the AD5542A (Default)

Link No.	Options
LK1	B
LK2	A
LK3	B
LK4	B
LK5	B
LK6	INSERTED
LK7	A
LK8	B
LK9	A

Table 4. Link Functions

Link No.	Option
LK1	This link selects the output configuration of the OP97/ AD8628: • Position A selects connection to the non-inverting input of the OP97/ AD8628. • Position B selects connection to the output of the OP97/ AD8628 and LK5.
LK2	This link selects the reference source: • Position A selects the on-board 2.5 V reference as the reference source. • Position B selects J2 as the reference source.
LK3	This link selects which DAC the reference source connects to: • Position A connects the reference source to the AD5541A. • Position B connects the reference source to the AD5542A.

LK4	This link selects which DAC connects to the non-inverting input of the OP97/ AD8628: • Position A connects the non-inverting input of the buffer to the AD5541A. • Position B connects the non-inverting input of the buffer to the AD5542A.
LK5	This link selects which connection connects to the output(feedback path) of the OP97/ AD8628: • Position A connects the inverting input of the OP97/ AD8628 to the output of the OP97/ AD8628. • Position B connects the RFB pin of the AD5542A to the output of the OP97/ AD8628.
LK6	Connects the INV pin of the AD5542A to the inverting terminal of the OP97/ AD8628.
LK7	This link determines which DAC is being addressed via the serial interface by switching the $\overline{CS}$ line between both DACs: • Position A connects the digital circuitry to the AD5542A. • Position B connects the digital circuitry to the AD5541A.
LK8	This link selects the positive voltage supply for the board: • Position A connects the positive board supply from the ADP121. The ADP121is powered from the PCs USB interface via the ADP121. **(AD5541A board only)** •Position B connects the positive board supply voltage to J1_+5V power connector.
LK9	This link selects the negative voltage supply for the board: •Position A connects the negative voltage supply to J1_-5V power connector.(AD5542A board) •Position B connects the negative voltage supply to GND. (AD5541A board)

EVALUATION BOARD SOFTWARE

INSTALLING THE SOFTWARE

The EVAL-AD5541A/42AEBZ evaluation kit includes self-installing software on CD. The software is compatible with Windows® XP, Windows Vista (32-bits) and Windows 7 (32-bits). When users need drivers for 64-bit operating systems, contact Linear.Apps@analog.com.

Install the software before connecting the SDP board to the USB port of the PC. This ensures that the SDP board is recognized when it connects to the PC.

1. Start the Windows® operating system and insert CD.
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
4. Plug the EVAL-AD5541A/42AEBZ into the SDP board and the SDP board into the PC using the USB cable included in the box.
5. When the software detects the evaluation board, proceed through any dialog boxes that appear to finalize the installation.

RUNNING THE SOFTWARE

To run the program, do the following:

1. Click **Start** > **All Programs** > **Analog Devices** > **AD5541A_42A**> **AD5541A_42A Evaluation Software**. To uninstall the program, click **Start** > **Control Panel** > **Add or Remove Programs** > **AD5541A_42A Evaluation Software**.

2. If the SDP board is not connected to the USB port when the software is launched, a connectivity error is displayed (see Figure 2). Simply connect the evaluation board to the USB port of the PC, wait a few seconds, click **Rescan**, and follow the instructions.

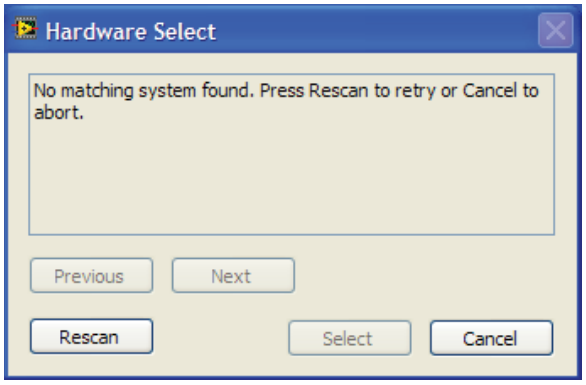

Figure 2. Pop-Up Window Error

3. If the SDP board is not connected to the evaluation boards a message box appears as shown in Figure 3. Check the connection between the SDP and EVAL-AD5541A/42AEBZ boards and run the program again.

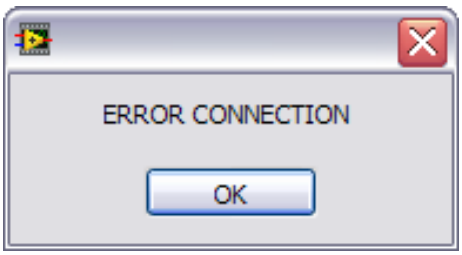

Figure 3. Error Message

4. If the SDP board is connect the System Development Platform will connect for a brief period.

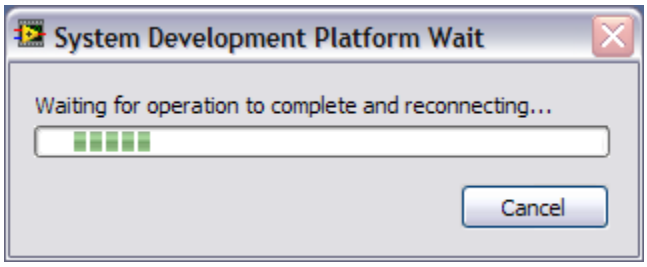

Figure 4.System Develop Platform Wait Window

5. The device selection window opens, as shown in Figure 6 allowing the user to select the AD5541A or the AD5542A .

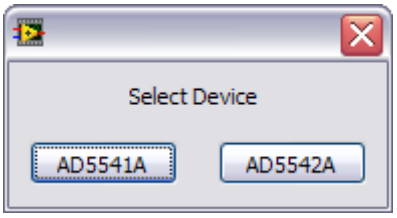

Figure 5. Device Selection Window

6. The main evaluation software window opens, as shown in Figure 6.

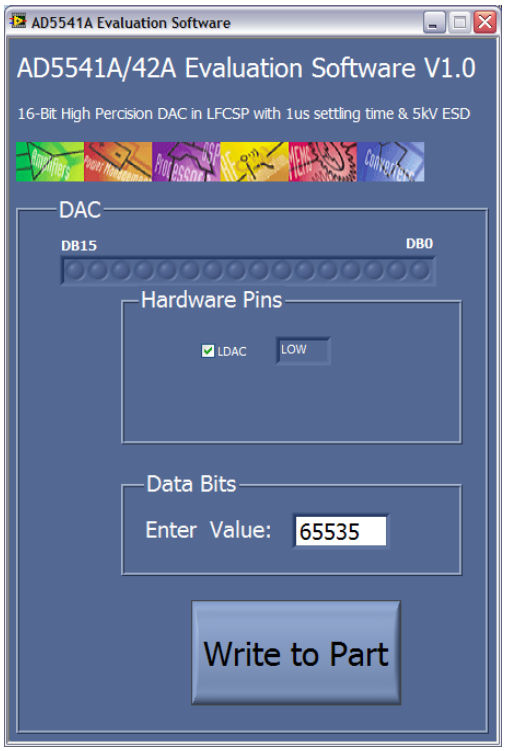

Figure 6. AD5541A/42A Evaluation Board Software Main Window

SOFTWARE OPERATION

From the **Analog Devices** menu, click **Start > All Programs > Analog Devices >AD5541A_42A >AD5541A_42A SDP Evaluation Software**.

For older PCs, click **Start > Programs > Analog Devices > AD5541A_42A >AD5541A_42A SDP Evaluation Software**.

The AD5541A_42A main window opens, as shown in Figure 6. The data programmed into the 32 bit input shift register is displayed. You can select the command bits, the address bits and the data bits by clicking the appropriate button under each area.

To select a command with which to program the part, select the Appropriate option from the drop down menu under **Command Menu**. For example, to program all DAC outputs with fullscale click "Write to and Update DAC channel n". Click "All DACs" under **Address Bits**.

Under **Data Bits**, type the data in decimal format. To execute click **Write to Part**.

The AD5541A/42A evaluation board lets you set up the $\overline{\text{LDAC}}$ pin, the $\overline{\text{CLR}}$ pin (AD5542A only). Consult the AD5541A/42A datasheet for details.

Set $\overline{\text{LDAC}}$ pin or the $\overline{\text{CLR}}$ pin to high or low by clicking the corresponding checkbox under **Hardware Pins**. This command is executed immediately so there is no need to click **Write to Part.**

AD5541A: We suggest connecting a voltmeter to Link 4 and measuring the output voltage at this point

EVALUATION BOARD SCHEMATICS AND ARTWORK

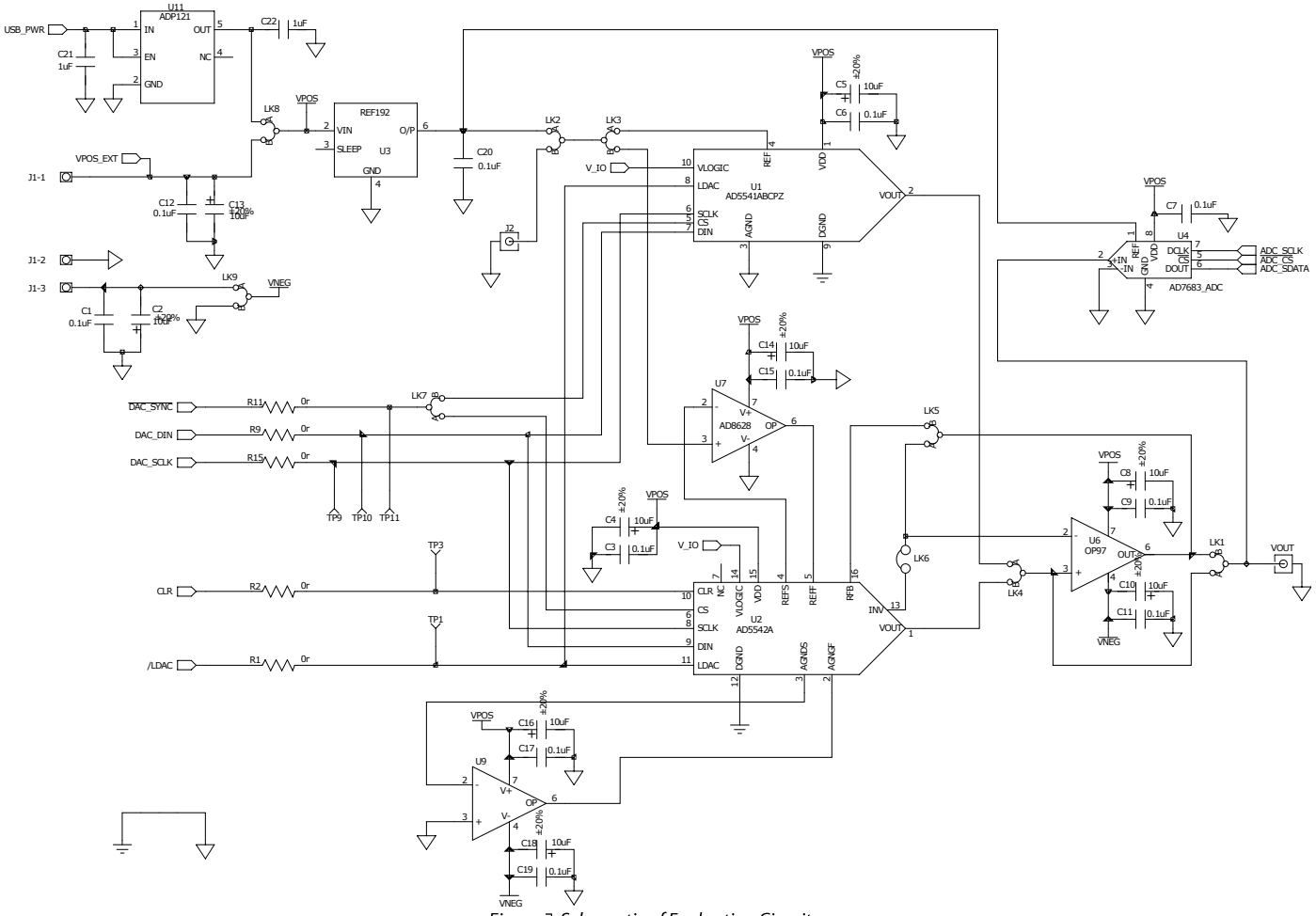

Figure 7. Schematic of Evaluation Circuitry

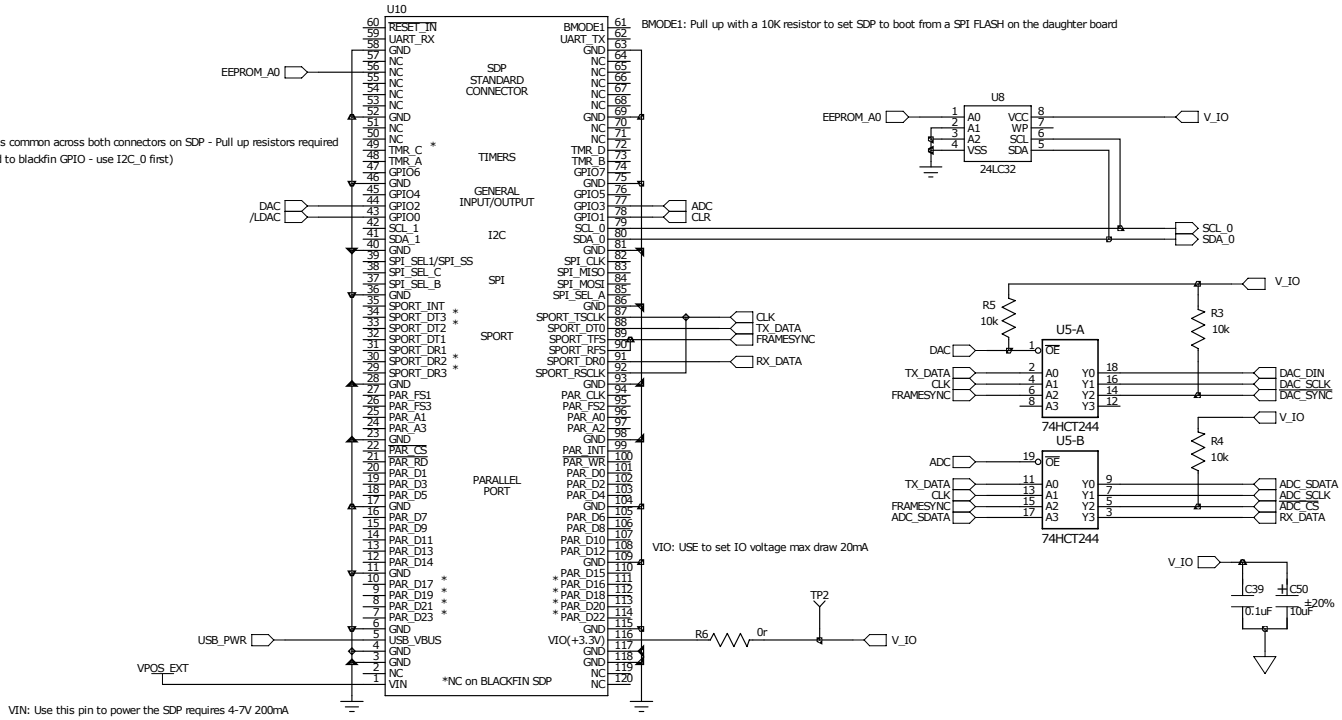

Figure 8. Schematic of SDP Connector

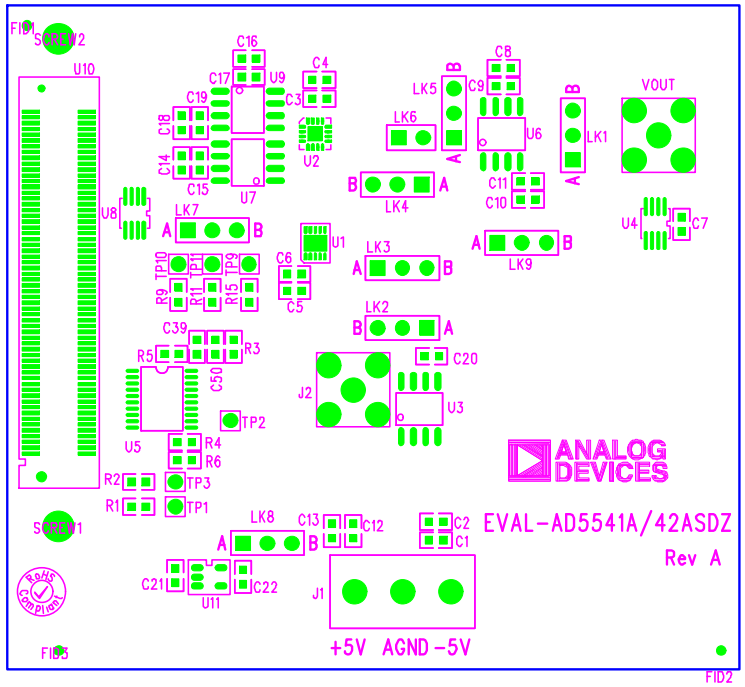

Figure 9. Component Placement Drawing

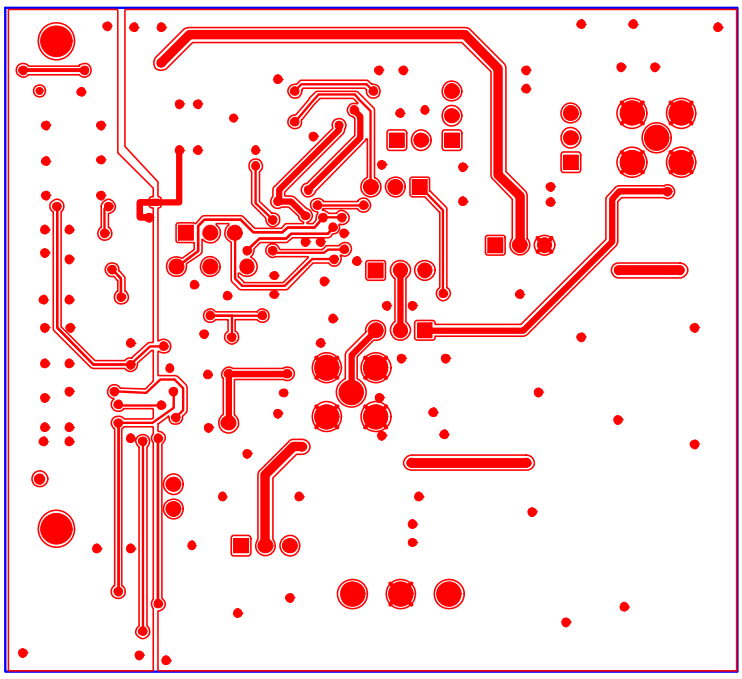

Figure 10. Component Side PCB Drawing

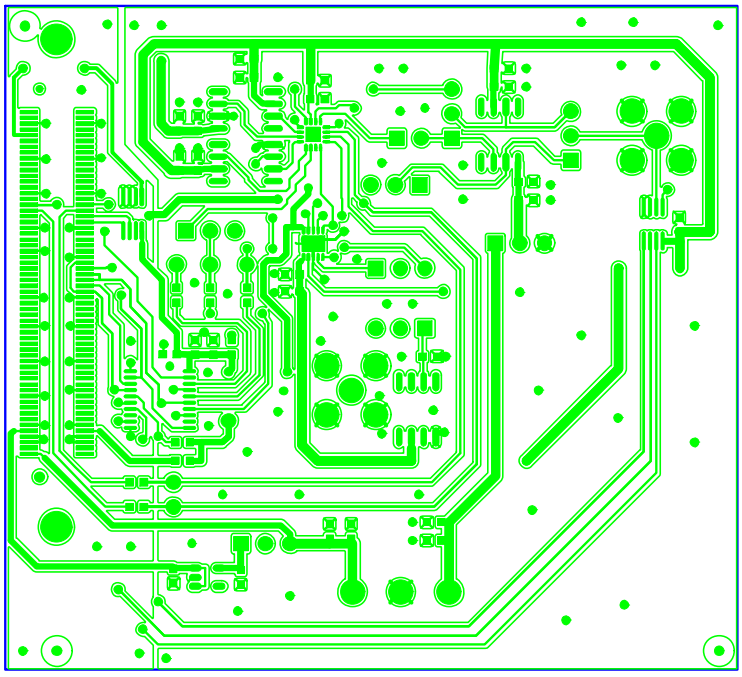

Figure 11. Solder Side PCB Drawing

ORDERING INFORMATION

COMPONENTS LIST

Table 5. AD5541A board

Qty	Reference Designator	Description	Supplier/Part Number
1	U1	Precision 16-bit 1µs setting time DAC	Analog Devices AD5541A
1	U6	Low Power Precision CMOS Amplifier	Analog Devices AD8628
1	U11	3.3V Linear Regulator	Analog Devices ADP121
1	LK6	2 Pin (0.1" Pitch) Header	FEC 1022247
8	LK1, LK2, LK3, LK4, LK5, LK7, LK8, LK9	3 Pin (0.1" Pitch) Header	FEC 1022249
1	J2, VOUT	50R Straight SMB Jack	FEC 1111349
7	C1, C6, C9, C11, C12, C20, C39	0.1uF 16V X7R Ceramic Capacitor	FEC 1216538
1	U10	120-way connector, 0.6mm pitch	FEC 1324660
1	J1	3 Pin Terminal Block (5mm Pitch)	FEC 151-790
2	C21, C22	1uF 16V X7R Ceramic Capacitor	FEC 1658870
6	C2, C5, C8, C10, C13, C50	Capacitor Ceramic, 10uF, 10V, X5R, 0603	FEC 1853538
2	SCREW1, SCREW2	SCREW, CHEESE, NYLON, M3X16, PK100	FEC 7070615
6	TP1, TP2, TP3, TP9, TP10, TP11	Test-point	FEC 8731128
5	R1,R2, R3, R11, R15	0 Ohm Resistor	FEC 9331662
3	R3, R4, R5	10k Ohm Resistor	FEC 933-2413
1	U5	OCTAL BUFFER/LINE DRIVER 3 STATE OUTPUTS	FEC 9591915
1	U8	32K I2C Serial EEPROM	FEC1331330
1	U3	Reference	REF192ESZ

Table 6. AD5542A board

Qty	Reference Designator	Description	Supplier/Part Number
1	U2	Precision 16-bit 1µs setting time DAC	Analog Devices AD5542A
1	U7	Low Power Precision CMOS Amplifier	Analog Devices AD8628
1	U9	Precision CMOS Amplifier	Analog Devices AD8638
1	U11	3.3V Linear Regulator	Analog Devices ADP121
1	LK6	2 Pin (0.1" Pitch) Header	FEC 1022247
1	U6	Operational Amplifier	Analog Devices OP777
8	LK1, LK2, LK3, LK4, LK5, LK7, LK8, LK9	3 Pin (0.1" Pitch) Header	FEC 1022249
1	J2, VOUT	50R Straight SMB Jack	FEC 1111349
10	C1, C3, C9, C11, C12, C15, C17, C19, C20, C39	0.1uF 16V X7R Ceramic Capacitor	FEC 1216538
1	U10	120-way connector, 0.6mm pitch	FEC 1324660
1	J1	3 Pin Terminal Block (5mm Pitch)	FEC 151-790
2	C21, C22	1uF 16V X7R Ceramic Capacitor	FEC 1658870
9	C2, C4, C8, C10, C13, C14, C16, C18, C50	Capacitor Ceramic, 10uF, 10V, X5R, 0603	FEC 1853538
2	SCREW1, SCREW2	SCREW, CHEESE, NYLON, M3X16, PK100	FEC 7070615
6	TP1, TP2, TP3, TP9, TP10, TP11	Test-point	FEC 8731128
6	R1,R2, R3, R9, R11, R15	0 Ohm Resistor	FEC 9331662
3	R3, R4, R5	10k Ohm Resistor	FEC 933-2413
1	U5	OCTAL BUFFER/LINE DRIVER 3 STATE OUTPUTS	FEC 9591915
1	U8	32K I2C Serial EEPROM	FEC1331330
1	U3	Reference	REF192ESZ

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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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