ANALOG DEVICES

Evaluation Board for 10-bit high speed, low power, successive-approximation ADC

EVAL-AD7470CB

FEATURES

Full-Featured Evaluation Board for the AD7470
EVAL-CONTROL BOARD Compatible
HSC-INTERFACE BOARD Compatible
Stand Alone Capability
On-Board Analog Buffering and Reference
Optional On-Board Analog Bias-Up Circuit
Optional On-Board Burst Clock Generator Circuit
Various Linking Options
PC Software for Control and Data Analysis when used with EVAL-CONTROL BOARD

INTRODUCTION

This Technical Note describes the evaluation board for the AD7470 10-bit, high speed, low power, successive approximation A/D converter that operates from a single 2.7 V to 5.25 V supply. Full data on the AD7470 is available in the AD7470 data sheet available from Analog Devices and should be consulted in conjunction with this Technical Note when using the Evaluation Board.

On-board components include an AD780 which is a pin programmable +2.5 V or +3 V ultra high precision bandgap reference, two AD797 op-amps used to buffer the analog input, and an OP07 op-amp used to buffer the DC bias voltage applied to the optional analog input bias-up circuit. There are various link options which are explained in detail on page 2.

Interfacing to this board is through a 96-way connector. This 96-way connector is compatible with the EVAL-CONTROL BOARD which is also available from Analog Devices. External sockets are provided for the $\overline{CONVST}$ input, CLKIN input and the VIN inputs.

OPERATING THE AD7470 EVALUATION BOARD

Power Supplies

When using this evaluation board with the EVAL-CONTROL BOARD all supplies are provided from the EVAL-CONTROL BOARD through the 96 way connector.

When using the board as a stand alone unit or with the HSC-INTERFACE BOARD, external supplies must be provided. This evaluation board has five power supply inputs: V_{DD}, A_{GND}, V_{SS}, V_{DRIVE} and D_{GND}. +5 V must be connected to the V_{DD} input to supply the AV_{DD} and DV_{DD} pins on the AD7470, the AD780 voltage reference, the positive supply pin of all three op-amps and the digital control logic. 0 V is connected to the A_{GND} input. -5 V must be connected to the V_{SS} input to supply the negative supply pins on all three op-amps. The V_{DRIVE} input can be used to provide an external voltage for the output drivers on the AD7470. If an external V_{DRIVE} is supplied, it is referenced to the D_{GND} input which should be tied to 0 V. The supplies are decoupled to the relevant ground plane with 47μF tantalum and 0.1μF multilayer ceramic capacitors at the point where they enter the board. The supply pins of the op-amps and reference are also decoupled to A_{GND} with a 10μF tantalum and a 0.1μF ceramic capacitor. The AD7470 AV_{DD} supply pin is decoupled to A_{GND} with 10uF tantalum and 0.1μF multilayer ceramic capacitors. The AD7470 DV_{DD} and VDRIVE pins are decoupled to A_{GND} with 10uF tantalum capacitors and to D_{GND} with 0.1μF multilayer ceramic capacitors.

Extensive ground planes are used on this board to minimize the effect of high frequency noise interference. There are two ground planes, A_{GND} and D_{GND}. These are connected at one location close to the AD7470.

FUNCTIONAL BLOCK DIAGRAM

Note: For Eval-AD7470CB Rev. B, the maximum throughput rate is 1.5 MHz.
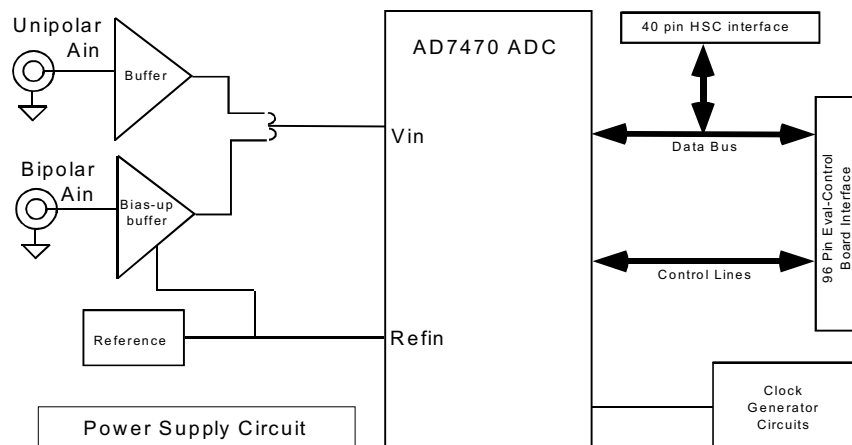
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Analog Input Section

The analog input section of this evaluation board accommodates unipolar and bipolar signals. Unipolar signals within the AD7470 analog input signal range of 0 V - 2.5 V are connected via SK5. They are then buffered by the on-board buffer before being applied to the VIN pin of the AD7470. Bipolar signals are connected via SK3 and are biased up by the on-board bias-up buffer circuit before being applied to the VIN pin of the AD7470. The input impedence of the bias-up circuit is 50Ω which is determined by the value of R7. The input impedence may be modified by removing/changing the value of R7. To obtain optimum performance from this evaluation board the use of an impedance matched, passive filter is recommended before the analog signal is applied to the evaluation board. For example, when using a 100KHz input tone, a 100KHz 50Ω filter from TTE (part number KC5-100K-15K-50/50-720B) is suitable.

R8 Potentiometer (50Kohm)

This variable resistor is used to trim the DC bias voltage applied to the optional analog input bias-up circuit. This bias voltage is factory preset to 1.25 V which biases a bipolar signal to swing around the midpoint of the analog input range (0 - 2.5 V). If any adjustment is required, the user can use the histogram window in the eval-board software to analyze the DC voltage variation while adjusting the trim pot. To view this properly, an analog input signal should not be applied to the board. Under normal operation this pot should not be adjusted as it is preset for optimum performance.

LINK AND SWITCH OPTIONS

There are 11 link options which must be set for the required operating setup before using the evaluation board. The functions of these options are outlined below.

Link No.	Function.
LK1	This link is used to select the DC bias voltage to be applied to the optional Vin bias-up circuit. If the user is using the bias-up circuit, this link must be inserted which will apply the 2.7 V reference voltage to the bias-up circuit. This causes a bipolar signal (applied to the bipolar vin input socket) to be biased up around +1.25 V before it is applied to the AD7470 VIN pin. - see also LK10 (below) If the bias up circuit is not being used this link should be removed.
LK2	This link must be in position "A" if external power supplies are being used. In this position the control logic is being powered by the voltage applied to the VDD input. When power is being supplied from the EVAL-CONTROL BOARD, this link can be moved to position "B" if the user wants to drive the control logic from a separate +5 V which is generated on the EVAL-CONTROL BOARD.
LK3	This link option selects the source of the CLKIN input. When this link is in position "A" the CLKIN input is provided by the EVAL-CONTROL BOARD. When this link is in position "B" the CLKIN input is provided via the on-board 25MHz oscillator. When this link is in position "C", an external CLKIN signal must be provided via SK1. When using the on-board generated burst clock, this link must be in position "D".
LK4	This link option selects the source of the $\overline{\text{CONVST}}$ input. When this link is in position "A" the $\overline{\text{CONVST}}$ input is provided by the EVAL-CONTROL BOARD. When this link is in position "B" the $\overline{\text{CONVST}}$ input is provided via the external socket, SK2.
LK5	This link option selects the source of the $\overline{\text{RD}}$ input. When this link is in position "A" the $\overline{\text{RD}}$ input is provided by the EVAL-CONTROL BOARD. When this link is in position "B" the $\overline{\text{RD}}$ input is tied to GND. This option must be selected while using the High Speed Converter Interface Board.
LK6	This link option selects the source of the $\overline{\text{CS}}$ input. When this link is in position "A" the $\overline{\text{CS}}$ input is provided by the EVAL-CONTROL BOARD. When this link is in position "B" the $\overline{\text{CS}}$ input is tied to GND. This option must be selected while using the High Speed Converter Interface Board.
LK7	This link option sets the voltage applied to the VDRIVE pin on the AD7470. When this link is in position "A", VDRIVE is connected directly to the DVDD pin. When this link is in position "B", an external voltage must be applied to the VDRIVE pin Via J3.
LK8	This link selects the source of the V_{DD} supply. When this link is in position "A" V_{DD} must be supplied from an external source via J2. When this link is in position "B" V_{DD} is supplied from the EVAL-CONTROL BOARD.
LK9	This link selects the source of the V_{SS} supply. When this link is in position "A" V_{SS} must be supplied from an external source via J2. When this link is in position "B" V_{SS} is supplied from the EVAL-CONTROL BOARD.
LK10	This link must be in position "A" if a bipolar AIN signal is being applied to the bipolar Vin socket, SK3. This link must be in position "B" if a unipolar AIN signal is being applied to the unipolar Vin socket, SK5.

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LK11   This link is used to provide a clock signal path to the burst mode circuit generator from either the on-board clock oscillator or from an extermnal clock source via SK1.
In position "A" the master clock signal is provided from the on-board crystal oscillator.
In position "B" the master clock signal must be provided from an external source via SK1.

SET-UP CONDITIONS

Care should be taken before applying power and signals to the evaluation board to ensure that all link positions are as per the required operating mode. Table I shows the position in which all the links are set when the evaluation board is sent out. All links are set for use with the EVAL-CONTROL BOARD.

Table I. Initial Link and Switch Positions

Link No.	Position	Function.
LK1	Inserted	Provides DC bias voltage to the analog bias-up circuit.
LK2	A	The digital logic circuitry is powered from the same voltage as the AD7470.
LK3	A	CLKIN signal is provided by the EVAL-CONTROL BOARD via J1.
LK4	A	$\overline{\text{CONVST}}$ signal is provided by the EVAL-CONTROL BOARD via J1.
LK5	A	$\overline{\text{RD}}$ signal is provided by the EVAL-CONTROL BOARD via J1.
LK6	A	$\overline{\text{CS}}$ signal is provided by the EVAL-CONTROL BOARD via J1.
LK7	A	AD7470 VDRIVE pin is connected to the AD7470 DVDD pin.
LK8	B	V_{DD} is supplied by the EVAL-CONTROL BOARD via J1.
LK9	B	V_{SS} is supplied by the EVAL-CONTROL BOARD via J1.
LK10	A	The AD7470 Vin pin is connected to the output of the bias-up circuit.
LK11	A	Master clock for burst clock generator is provided from the on-board clock oscillator.

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EVAL-CONTROL BOARD INTERFACING

Interfacing to the EVAL-CONTROL BOARD is via a 96-way connector, J1. The pinout for the J1 connector is shown in Figure 2 and its pin designations are given in Table II.
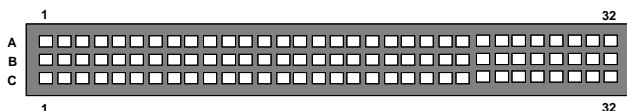

Figure 2. Pin Configuration for the 96-Way Connector, J1

96-Way Connector Pin Description

D0-D11   Data Bit 0 to Data Bit 11. Three-state TTL outputs. D11 is the MSB.

SCLK0   Serial Clock Zero. This continuous clock can be connected to the CLKIN pin of the AD7470 via LK3.

+5VD   Digital +5 V supply. This can be used to provide a separate +5 V supply for the digital logic if required via LK2.

$\overline{RD}$ Read. This is an active low logic input connected to the $\overline{RD}$ pin of the AD7470 via LK5.

$\overline{CS}$ Chip Select. This is an active low logic input connected to the $\overline{CS}$ pin of the AD7470 via LK6.

FL0   Flag zero. This logic input is connected to the $\overline{CONVST}$ input of the AD7470 via LK4.

$\overline{IRQ2}$ Interrupt Request 2. This is a logic output and is connected to the BUSY logic output on the AD7470.

DGND   Digital Ground. These lines are connected to the digital ground plane on the evaluation board. It allows the user to provide the digital supply via the connector along with the other digital signals.

AGND   Analog Ground. These lines are connected to the analog ground plane on the evaluation board.

AV_{SS} Negative Supply Voltage. This provides a negative supply to the on-board op-amps via LK9.

AV_{DD} Positive Supply Voltage. This provides a positive supply to the op-amps, the reference, the AD7470 and the digital logic.

When interfacing directly to the EVAL-CONTROL BOARD, all power supplies and control signals are generated by the EVAL-CONTROL BOARD. However, due to the nature of the DSP interface on the EVAL-CONTROL BOARD, AD7470 sampling rates greater than 400 KHz are not supported when interfacing the EVAL-AD7470CB directly to the EVAL-CONTROL BOARD. To achieve sample rates greater than 400 KHz, the HSC-INTERFACE BOARD must be used. The HSC-INTERFACE BOARD is a board designed to interface between evaluation boards for high speed analog-to-digital converters and the EVAL-CON-TROL BOARD. It can be ordered from Analog Devices through the normal channels using the part number "HSC-INTERFACE BOARD".

Table II. 96-Way Connector Pin Functions.

	ROW A	ROWB	ROWC
1			
2		D0	
3		D1	
4	DGND	DGND	DGND
5		D2	
6		D3	
7	SCLK0	D4	SCLK0
8	+5VD	+5VD	+5VD
9	$\overline{RD}$	D5	
10		D6	$\overline{CS}$
11		D7	
12	DGND	DGND	DGND
13		D8	
14		D9	
15		D10	
16	DGND	DGND	DGND
17	FL0	D11	$\overline{IRQ2}$
18			
19			
20	DGND	DGND	DGND
21	AGND	AGND	AGND
22	AGND	AGND	AGND
23	AGND	AGND	AGND
24	AGND	AGND	AGND
25	AGND	AGND	AGND
26	AGND	AGND	AGND
27		AGND	
28		AGND	
29	AGND	AGND	AGND
30		AGND	
31	AVSS	AVSS	AVSS
32	AVDD	AVDD	AVDD

Note : The unused pins of the 96-way connector are not shown.

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HIGH SPEED CONVERTER (HSC) BOARD INTERFACING

Interfacing to the HSC BOARD is via a 40-way connector, J4. The pinout for the J4 connector is shown in Figure 3 and its pin designations are given in Table III.
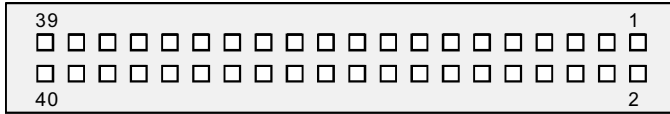

Figure 3. Pin Configuration for the 40-pin HSC Interface Connector, J1

40-Way Connector Pin Description

D0-D11   Data Bit 0 to Data Bit 11. Three-state TTL outputs. D11 is the MSB.

$\overline{BUSY}$ BUSY. This is a logic output and is connected to the BUSY logic output on the AD7470 via an inverting buffer.

GND   Ground. These lines are connected to the digital ground plane on the evaluation board.

When interfacing to the High Speed Converter Interface board, all required power supplies must be supplied from external sources via the power terminal, J2.

The CLKIN signal can be generated on-board (using the crystal oscillator or the burst clock generator circuit) or provided externally via SK1.

The RD and CS inputs to the AD7470 must all be tied low using LK5 and LK6 respectively.

The CONVST signal must be provided externally via SK1.

Due to the 25 MHz on-board crystal (not the maximum of 26 MHz as specified in the datasheet) the throughput rate will not meet the maximum datasheet specification of 1.5 MSPS.

Refer to the documentation included with the HSC-INTER-FACE BOARD for more information. Note, the HSC-INTERFACE BOARD was designed for other high speed ADC devices but it is compatible with the AD7470 evaluation system.

Table III. HSC Interface Connector Pin Functions.

Pin No.	Function	Pin No.	Function
1	D11	2	GND
3	D10	4	GND
5	D9	6	GND
7	D8	8	GND
9	D7	10	GND
11	D6	12	GND
13	D5	14	GND
15	D4	16	GND
17	D3	18	GND
19	D2	20	GND
21	D1	22	GND
23	D0	24	GND
25	N/C	26	GND
27	N/C	28	GND
29	N/C	30	GND
31	N/C	32	GND
33	$\overline{BUSY}$	34	GND
35	N/C	36	GND
37	N/C	38	GND
39	N/C	40	GND

N/C = Not Connected.

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SOCKETS

There are four input sockets relevant to the operation of the AD7470 on this evaluation board. The function of these sockets is outlined in Table IV.

Table IV. Socket Functions

Socket	Function
SK1	Sub-Miniature BNC Socket for external clock input.
SK2	Sub-Miniature BNC Socket for external $\overline{\text{CONVST}}$ input.
SK3	Sub-Miniature BNC Socket for Bipolar analog input The AD7470 can only accept analog inputs in the range 0 V to REFIN. Bipolar analog inputs in the range -1.25 V to +1.25 V applied to this socket are biased up to the acceptable AD7470 input range by the on-board bias-up circuit before being applied to the AD7470 VIN pin.
SK5	Sub-Miniature BNC Socket for unipolar analog input. Analog inputs in the acceptable AD7470 analog input range (0 V to REFIN) are applied to this socket. The signal is then buffered before it is applied to the AD7470 VIN pin.

CONNECTORS

There are four connectors on the AD7470 evaluation board as outlined in Table V.

Table V. Connector Functions

Connector	Function
J1	96-Way Connector for EVAL-CONTROL BOARD interface connections.
J2	External VDD, VSS & AGND power connector.
J3	External VDRIVE & DGND power connector.
J4	40-Way Connector for HIGH SPEED CONVERTER INTERFACE BOARD connections.

OPERATING WITH THE EVAL-CONTROL BOARD

The evaluation board can be operated in a stand-alone mode or operated in conjunction with the EVAL-CONTROL BOARD (with or without the HSC-INTERFACE BOARD). This EVAL-CONTROL BOARD is available from Analog Devices under the order entry "EVAL-CONTROL BOARD". When interfacing directly to this control board, all supplies and control signals to operate the AD7470 are provided by the EVAL-CONTROL BOARD when it is run under control of the AD7470 software which is provided with the AD7470 evaluation board package. This EVAL-CONTROL BOARD will also operate with all Analog Devices evaluation boards which end with the letters CB in their title.

The 96-way connector on the EVAL-AD7470CB plugs directly into the 96-way connector on the EVAL-CONTROL BOARD. No power supplies are required in the system. The EVAL-CONTROL BOARD generates all the required supplies for itself and the EVAL-AD7470CB. The EVAL-CONTROL BOARD is powered from a 12 V AC transformer. This is a standard 12 V AC transformer capable of supplying 1 A current and is available as an accessory from Analog Devices under the following part numbers:

EVAL-110VAC-US: For use in the U.S. or Japan

EVAL-220VAC-UK: For use in the U.K.

EVAL-220VAC-EU: For use in Europe

These transformers are also available for other suppliers including Digikey (U.S.) and Campbell Collins (U.K.).

Connection between the EVAL-CONTROL BOARD and the serial port of a PC is via a standard RS-232 cable which is provided as part the EVAL-CONTROL BOARD package. Please refer to the manual which accompanies the EVAL-CONTROL BOARD for more details on the EVAL-CONTROL BOARD package.
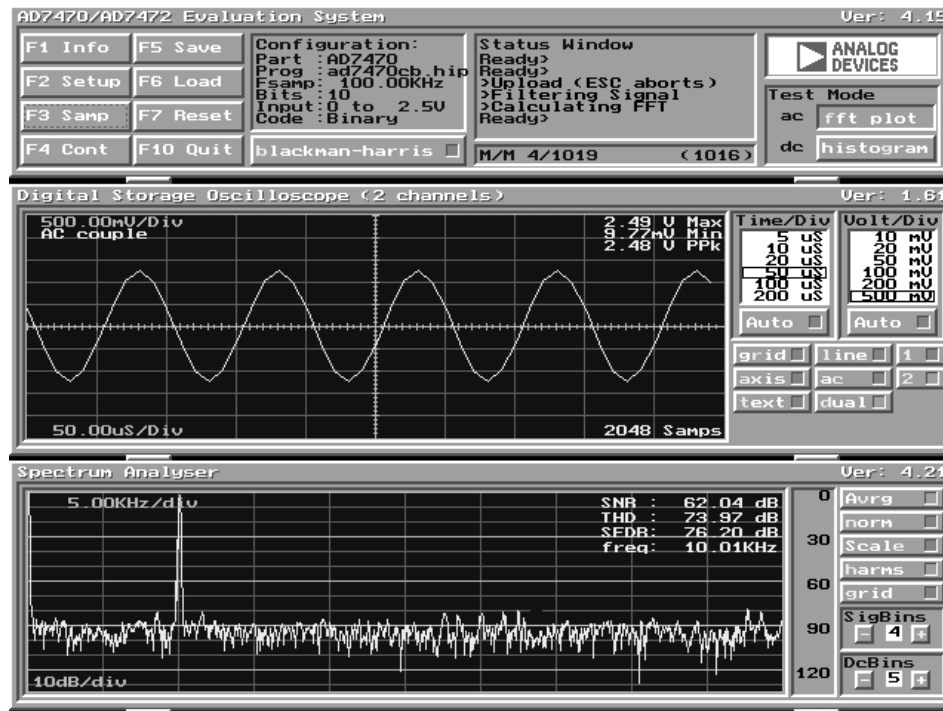
Figure 4. Main Screen

SOFTWARE DESCRIPTION

Included in the EVAL-AD7470CB evaluation board package is a PC-compatible disk. This disk has two sub-directories called EVAL_CTRL and HSC_INT, each containing software for controlling and evaluating the performance of the AD7470 when it is operated with the EVAL-CONTROL BOARD or the HSC-INTERFACE BOARD. The EVAL-AD7470CB Demonstration/Evaluation Software runs under DOS 4.0 or later and requires a minimum of a 386-based machine with 400kB of base RAM and 500kB of free hard disk space. The user interface on the PC is a dedicated program written especially for the AD7470.

The disk which accompanies the EVAL-AD7470CB contains two sub-directories. The user should create a new directory on the main PC drive and label this "AD7470". Then, the sub-directories (and all files contained within them) on the EVAL-AD7470CB disk should be copied into this directory. The Mouse Driver on the PC should be enabled before running the software. If this has not been loaded, the program will not run.

To run the software, simply make the AD7470\EVAL_CTL directory or the AD7470\HSC_INT directory (depending on which setup is being used) the current directory and type "go". When the evaluation program starts, the user sees the screen shown on Figure 3 (without any FFT or scope waveforms). This is the main screen and it is divided into three parts. The top part provides the main control interface for the AD7470 evaluation software. The middle part of the main screen functions as a Digital Storage Oscilloscope and the bottom part of the main screen operates as either a Digital Spectrum Analyzer or a Histogram analyzer.

Each part of the screen has several buttons that can be pressed by using the mouse or the keyboard. To press a button using the mouse, simply use it to move the on-screen pointer to the button to be activated and click. To use the keyboard, simply press the appropriate key as highlighted on the button. Lower case letters must be used. When a button is pressed, it is highlighted on the screen. The next button can be highlighted by using the Tab key or the previous button by holding down the shift key and the Tab key together. The highlighted button can also be pressed by pressing the space bar. Pressing the ESC key halts any operation currently in progress. In this document, if a button can be activated from the keyboard then the key used is shown in bold in the button name. For example, "no **p**rog" has the "p" highlighted in bold, indicating that the button can be activated by pressing the p key.

Some buttons have a red indicator. A red indicator on the button means that the function associated with that button is on. Absence of the red indicator light means that the function associated with the button is off. The on/off status of these buttons is changed simply by selecting the button.

Setting up the EVAL-CONTROL BOARD

When the software is run, the **"F2** Setup" button in the top left of the screen should be selected to pop up the setup menu (see fig. 4). This menu sets up the EVAL-CONTROL BOARD for use with the EVAL-AD7470CB.

Firstly, a configuration file must be chosen. The configuration file contains the default configuration information for the EVAL-CONTROL BOARD, the Digital Spectrum Analyzer and the Digital Storage Oscilloscope. It also tells the AD7470.EXE software which .HIP file to download to the ADSP-2111. The .HIP file contains the DSP code which is executed by the ADSP-2111. Normally, the "no **p**rog" button is off, so when the configuration file is loaded, the .HIP file is automatically downloaded to the ADSP-2111. However, if the "no **p**rog" button is on, then the .HIP file is not downloaded to the ADSP-2111.

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Use the mouse or the keyboard to highlight the configuration file and load it by clicking the **"l**oad" button.

The "Analog in" section shows the analog input range and DC offset voltage.

The user can then select the required number of samples and sampling frequency. Note: While the AD7470 data sheet specifies a maximum clock frequency of 26 MHz, the on-board crystal oscillator outputs a 25MHz clock. Therefore the max. sampling frequency will be less than that specified on the data sheet. An external clock frequency (up to the max specified on the data sheet) can be applied via the external socket, SK1.

Click the OK button to return to the main screen.

MAIN SCREEN

The top left part of the main screen contains eight buttons which are selected using the mouse or by using the function keys from the keyboard. These buttons and the actions they perform are:

F1: Info. This button shows information on the software.

F2: Setup. This button activates the setup menu.

F3: Samp. When this key is pressed, the software causes the AD7470 to perform a number of conversions as determined by the setup menu (see above). The data from these conversions is then analyzed by the AD7470 evaluation software. Another set of samples may be taken by pressing the **F3** key again.

F4: Cont. Pressing this button causes the software to repeatedly perform conversions and analyze them. Once the conversions and analysis has been done for one set of samples, the software automatically repeats the process. It continues to do this until the ESC key is pressed.

Figure 5. Setup Menu Screen

F5: Save. This saves a set of samples to a file for use either at a later date or with other software. The samples can be saved either as "volts", "ints" or "binary". The format of all these files is ASCII text. Note that the AD7470 software can only load files saved in the "ints" format. Files saved in the "volts" and "ints" formats can be used with packages such as Mathcad. Files

saved in the "binary" format are for viewing purposes only.

F6: Load. This allows the user to load data from a file with a .DAT extension. Only data that was saved as ints can be loaded and analyzed. A configuration file must be loaded via the **"F2** Setup" menu before the data file can be analyzed. If there is no EVAL-CONTROL BOARD connected to the PC, then the "no **p**rog" button in the **"F2** Setup" menu must be on. Once a configuration file has been loaded, the data loaded from the .DAT file is analyzed according to the settings in the **"F2** Setup" menu.

F7: Reset. Choosing this option resets the EVAL-CONTROL BOARD.

F10: Quit. This quits the AD7470 evaluation software and returns control to the operating system.

INFORMATION WINDOWS

There are three information windows at the top of the main screen. The left-hand window is the configuration window and gives details about part being evaluated. It shows the name of the program that has been downloaded to the EVAL-CONTROL BOARD, the sampling frequency, the number of bits, the analog input range of the part and the output code format of the part. The right-hand large window is the Status window. This window provides feedback to the user as to what operations are currently being performed by the software and also displays error messages.

Test Mode

At the top right of the main screen are the Test Mode buttons. These buttons determine what sort of testing is done on the samples captured by the software. Both an ac analysis and dc analysis can be performed. The function of these buttons are:

fft plot: Choosing this button causes the Digital Spectrum Analyzer to appear at the bottom of the screen.

Histo**g**ram: Choosing this button causes the Histogram Analyzer to be displayed at the bottom of the screen.

There is one other button near the top of the screen, beside the **"F10** Quit" button. This is:

blackman-harris: When performing a Fourier transform of the sampled data, this button determines whether or not the data is windowed by a blackman-harris window before the transform. When this button is on, the data is windowed. When this button is off, the data isn't windowed. See the Digital Spectrum Analyzer section for more details.

DIGITAL STORAGE OSCILLOSCOPE.

When samples of data are captured, they are displayed on the Digital Storage Oscilloscope. If the **b**lackman-harris button is turned on then the windowed data is also displayed on the oscilloscope. The 'scope has been designed to act in a similar way as a conventional oscilloscope. To the right of the oscilloscope are several buttons that control the manner in which data is displayed on the 'scope. The timebase for the oscilloscope is automatically chosen by the software if the Time/Div "Auto" button is on. The user can also select the timebase by clicking in the Time/Div window and scrolling up and down through the possible timebases. Similarly, the vertical scale of the oscilloscope is chosen automatically if the Volt/Div "Auto" button is on. The user also has the option of selecting the desired vertical scale in a similar manner to selecting the timebase.

The other buttons associated with the oscilloscope are:

grid — This button toggles the grid display of the oscilloscope on and off.

axis — This button toggles the axis display of the oscilloscope on and off

text — This button toggles the text displayed on the oscilloscope screen on and off.

line — When the line button is on, the displayed samples are joined together by lines. When this button is off, the samples are displayed as points.

ac — When this button is on, the dc component of the sampled signal is removed and the signal is displayed. This has the effect of centering the signal vertically on the oscilloscope screen. When this button is off, the dc component is not removed and the signal is displayed with its horizontal axis corresponding to a code of 0. The a**c** display option is useful for zooming in on a low-level signal that has a large dc offset.

dual — When the **"d**ual" button is on, the oscilloscope screen is divided into two parts with the sampled data display centered on one horizontal axis and the windowed data display centered on another. When the **"d**ual" button is off, both traces are centered on the same horizontal axis.

1 — This button toggles the sampled data trace on and off.

2 — This button toggles the windowed data trace on and off.

HISTOGRAM ANALYZER

The histogram analyzer counts the number of occurrences of each code in the captured samples and displays a histogram of these counts. The most frequently occurring code is displayed in the center of the histogram. The analyzer is normally used with a dc input signal and calculates the mean and the standard deviation of the sampled data. The mean and standard deviation are displayed in both volts and in units of the lsb size of the converter. The histogram gives a good indication of the dc noise performance of the ADC. The standard deviation shows directly the noise introduced in the conversion process.
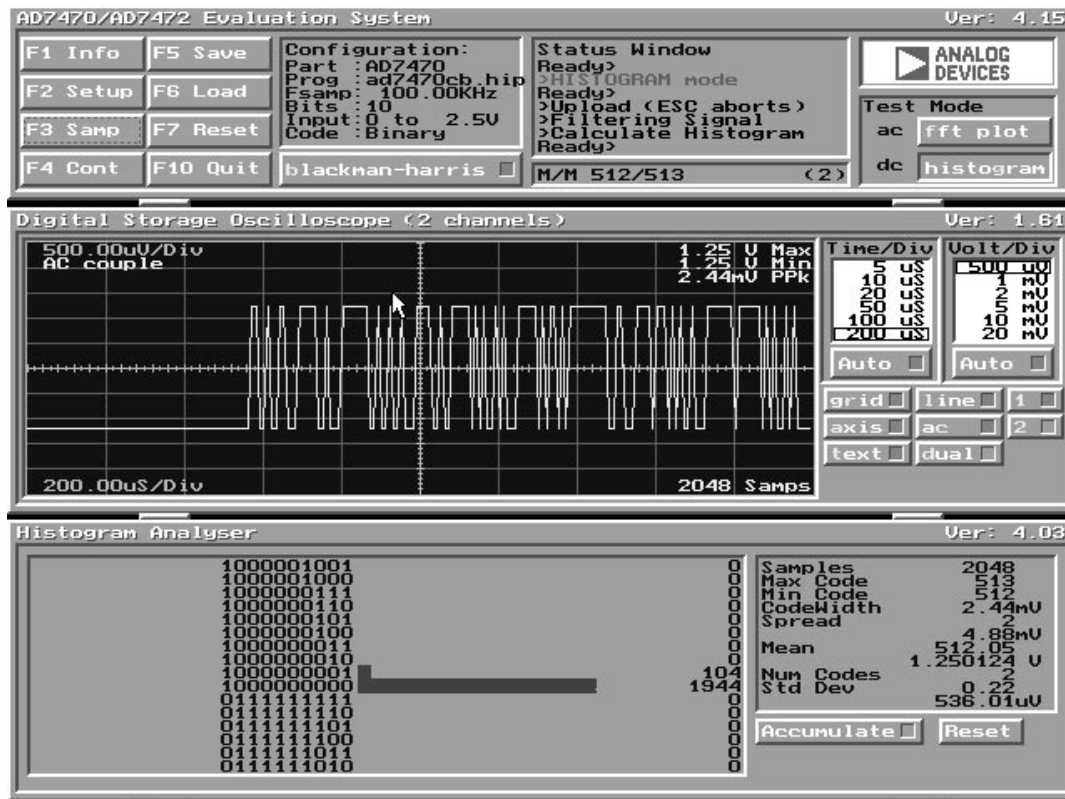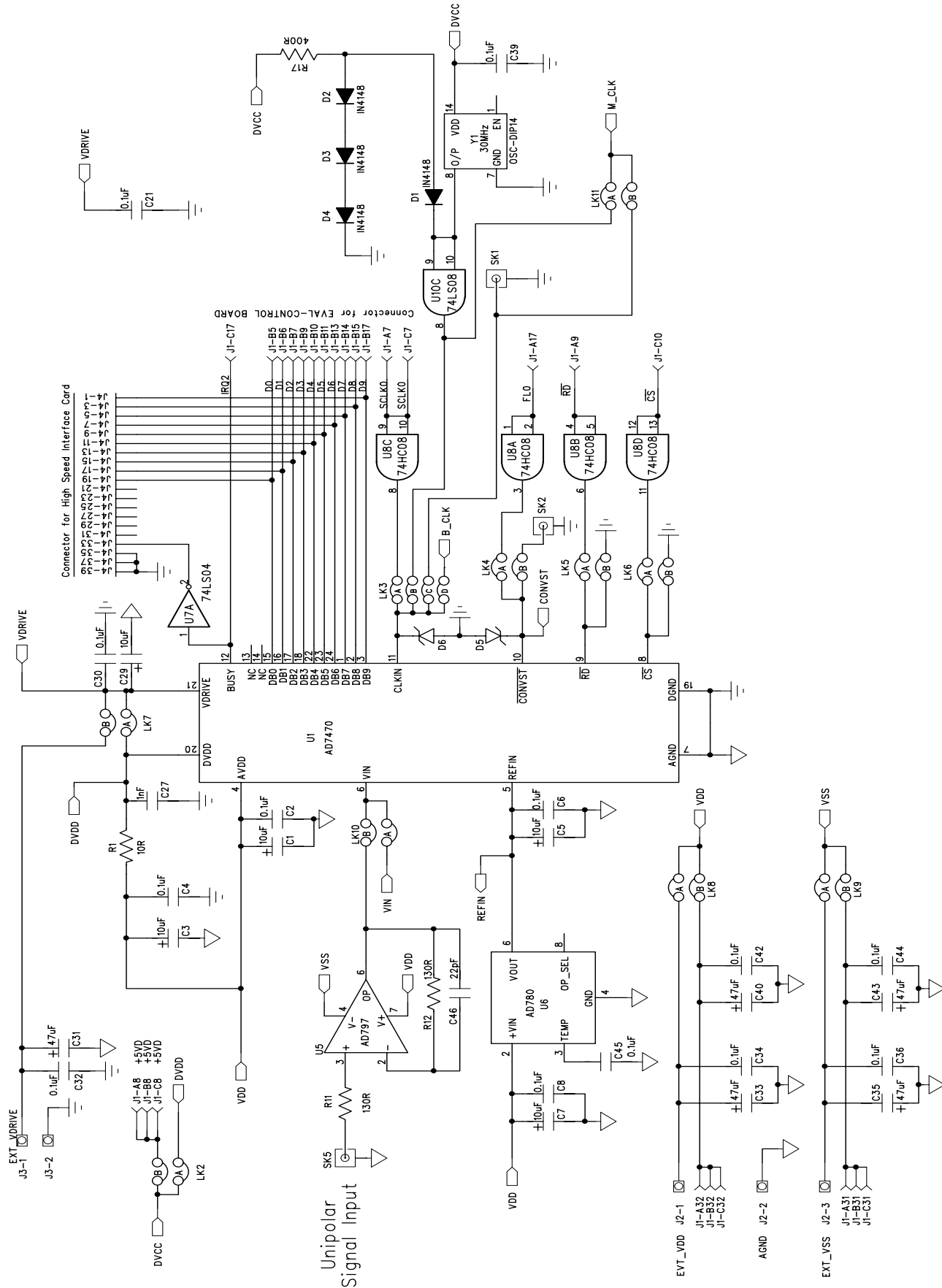

Figure 6 Histogram Screen

Figure 7. AD7470 Evaluation Board Circuit Diagram (ADC Section)

Figure 8. AD7470 Evaluation Board Circuit Diagram (Analog Input Bias-Up Section)

Figure 9. AD7470 Evaluation Board Circuit Diagram (Burst Clock Generator Section).

EVAL-AD7470CB

Table VI. Eval-AD7470CB Bill Of Materials

| Qty	PartType	RefDes	Order Number	Supplier/Manuf
11	10uF, 10V (TAJ-B Series)	C1 C3 C5 C9 C11 C13 C15 C17 C19 C21 C29	FEC 498-660	AVX
1	10uF, 10V (TAJ-B Series)	C7	FEC 498-660	AVX
3	0.1uF 16V X7R (0603 size)	C2 C4 C6	FEC 499-675	AVX
11	0.1uF 50V X7R (0805 size)	C8 C10 C12 C14 C16 C18 C20 C21 C42 C44 C45	FEC 499-687	AVX
11	0.1uF 50V X7R (0805 size)	C22 C23 C24 C26 C28 C30 C32 C34 C36 C37 C39	FEC 499-687	AVX
1	27pF 25V X7R (0805 size)	C25		AVX
1	1nF 50V NPO (0805 size)	C27	FEC 317-457	AVX
5	47uF 16V (TAJ-D Series)	C31 C33 C35 C40 C43	FEC 498-762	AVX
1	1uF 25V Y5V (0805 size)	C38	FEC 317-640	AVX
2	22pF 100V NPO (0805 size)	C46 C49	FEC-317-500	AVX
1	4.7uF 16V (TAJ-B Series)	C41	FEC 498-725	AVX
1	10Ω ±1% (0603 Size)	R1	FEC 910-995	Multicomp
2	1KΩ ±1% (0805 Size)	R2 R3	FEC 911-239	Multicomp
2	100Ω ±1% (0805 Size)	R4 R14	FEC 911-732	Multicomp
1	100KΩ ±1% (0805 Size)	R5	FEC 911-471	Multicomp
3	20KΩ ±1% (0805 Size)	R6 R15 R16	FEC 771-491	Multicomp
1	75Ω ±1% (0805 Size)	R7	FEC 771-200	Multicomp
1	130Ω ±1% (0805 Size)	R11	FEC 771-235	Multicomp
1	130Ω ±1% (0805 Size)	R12	FEC 771-235	Multicomp
1	390Ω ±1% (0805 Size)	R17	FEC 911-185	Multicomp
1	50KΩ Multi-turn trimmer pot	R8	FEC 348-144	Bourns
1	220uH Inductor (8RHB Series)	L1	FEC 598-215	TOKO
1	AD7470ARU	U1	AD7470BR	ADI
1	DM74LS14M	U2	FEC 527-361	Fairchild
2	AD797BN	U3 U5	AD797BN	ADI
1	OP07DP	U4	OP07DP	ADI
1	AD780AN	U6	AD780AN	ADI
1	MM74HC04M	U7	FEC 379-220	Motorola
1	MM74HC08M	U8	FEC 379-224	Motorola
1	MM74HC161M	U9	FEC 379-414	Motorola
1	DM74LS08M	U10	FEC 527-336	Fairchild
1	DM74ALS112M	U11	RS 857-430	Fairchild
1	25MHz TTL Output crystal	Y1	FEC 177-414	IQD
4	1N4148 Signal Diode	D1 D2 D3 D4	FEC 368-118	Fairchild
2	SD103C Schottky Diode	D5 D6		
1	2 pin header	LK1	FEC 511-705	Harwin
9	4 (2+2) pin header	LK2 LK4 LK5 LK6 LK7 LK8 LK9 LK10 LK11	FEC 511-791	Harwin
1	8 (4+4) pin header	LK3	FEC 511-780	Harwin
11	Shorting Link	LK1 - LK11	FEC 528-456	Berg
36	Ultra Low Profile Sockets	U3 U4 U5 U6 Y1	FEC 519-959	Harwin
1	96 Pin 90º DIN41612 Plug	J1	FEC 269-931	Siemens
1	3 Pin Terminal Block	J2	FEC 151-786	Lumberg
1	2 Pin Terminal Block	J3	FEC 151-785	Lumberg
1	40 Pin 90º IDC Ribbon Connector	J4	FEC 727-714	3M
4	Gold 50W SMB Jack	SK1 SK2 SK3 SK5	FEC 310-682	M/ACOM
1	PCB	EVAL-AD7470CB Rev. A	n/a	n/a n/a

REV. 0
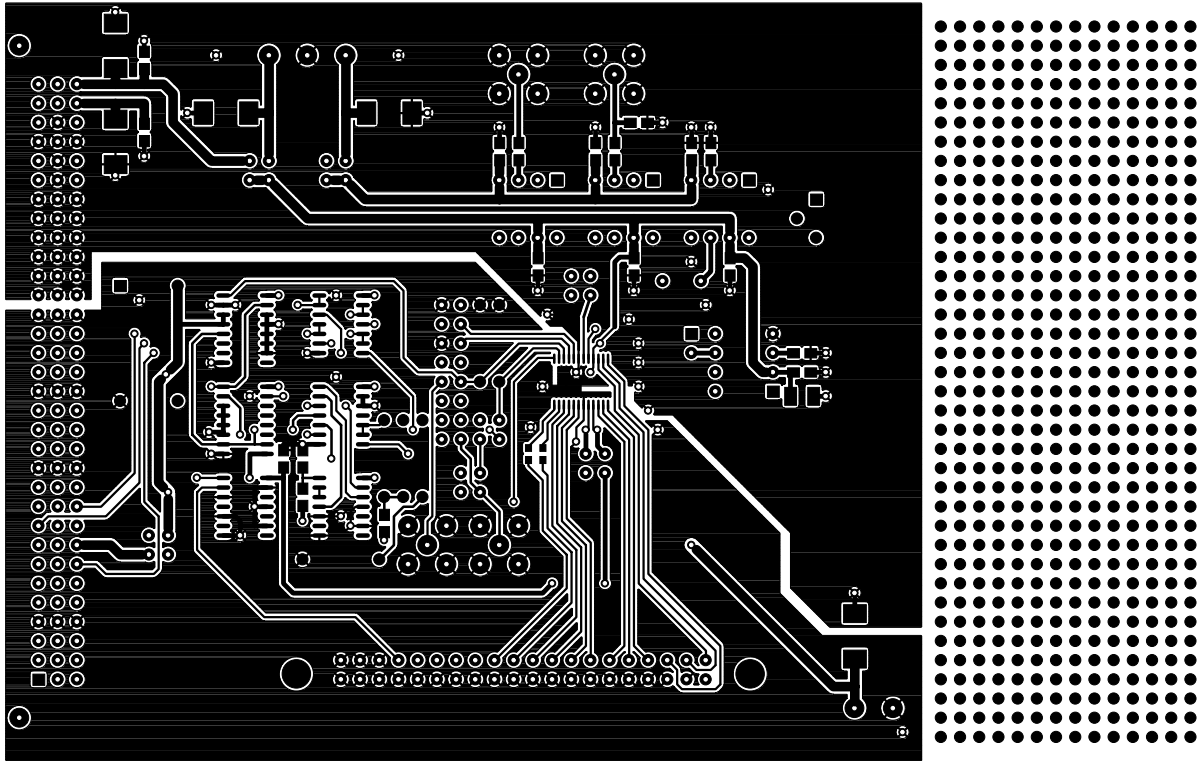
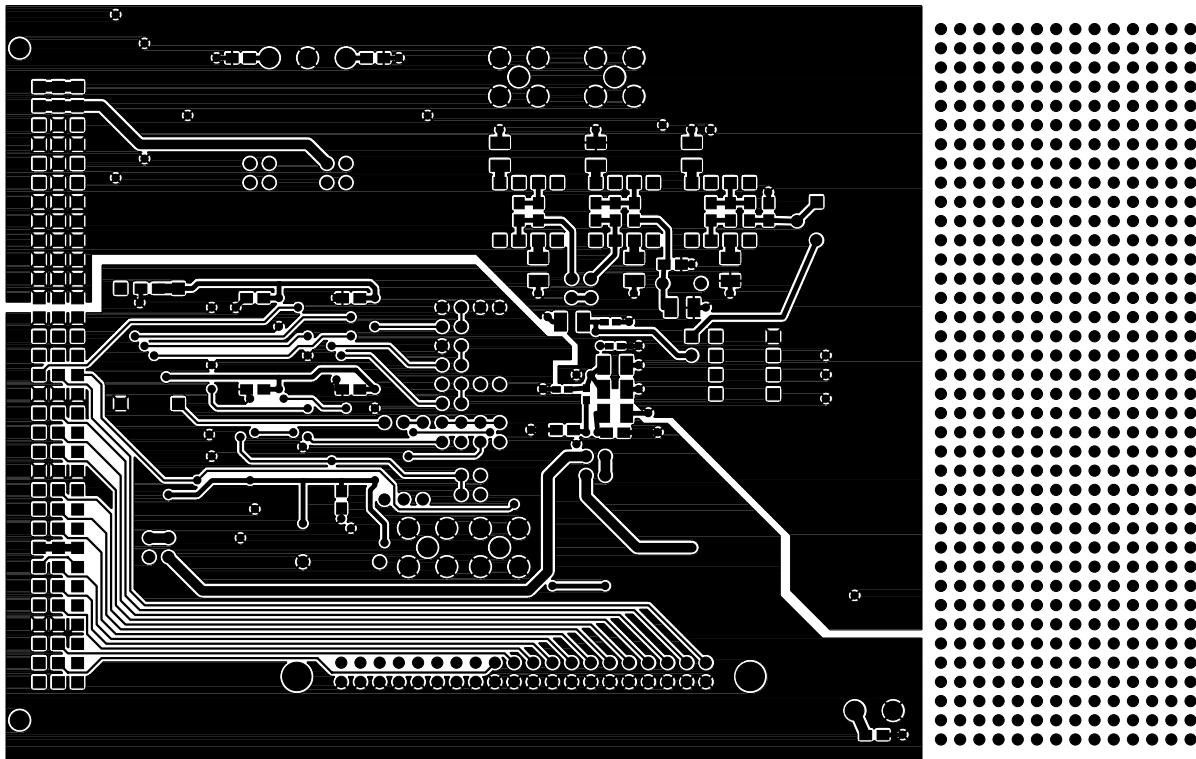Figure 10. Component Side Artwork

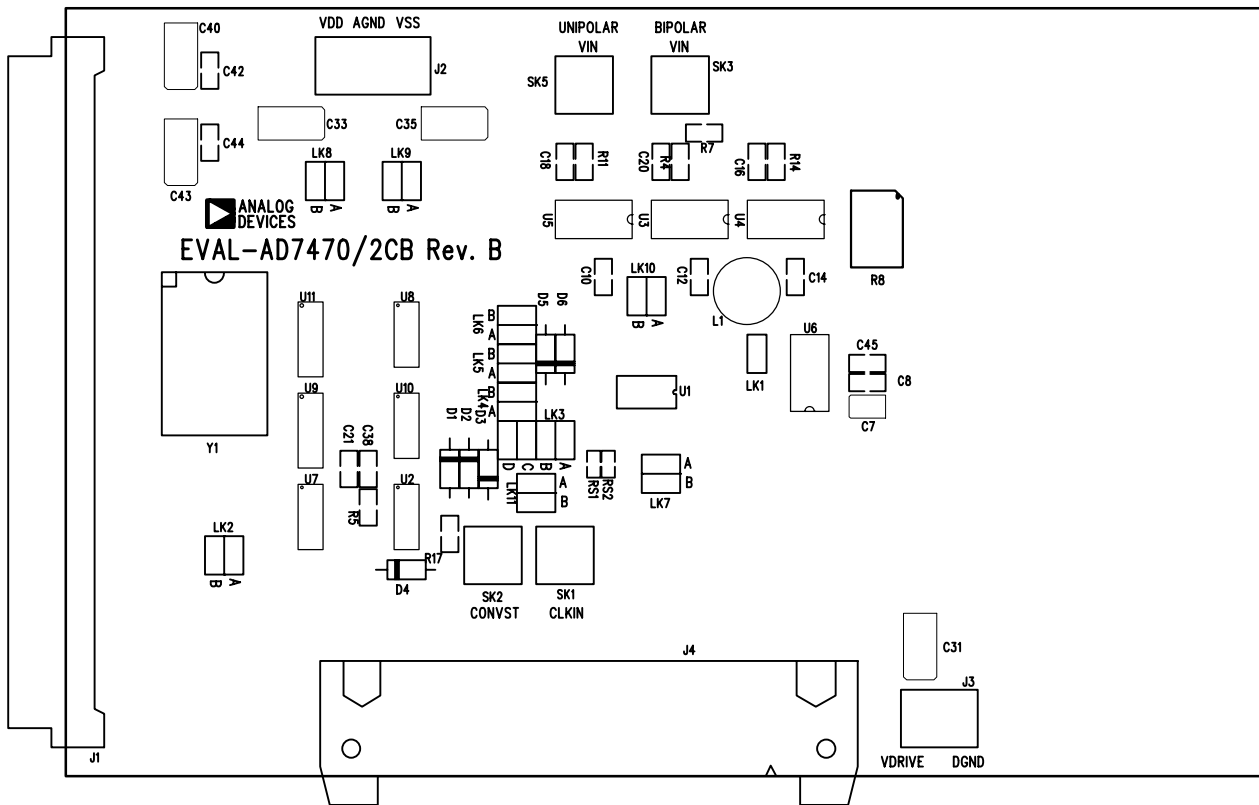
Figure 11. Solder Side Artwork

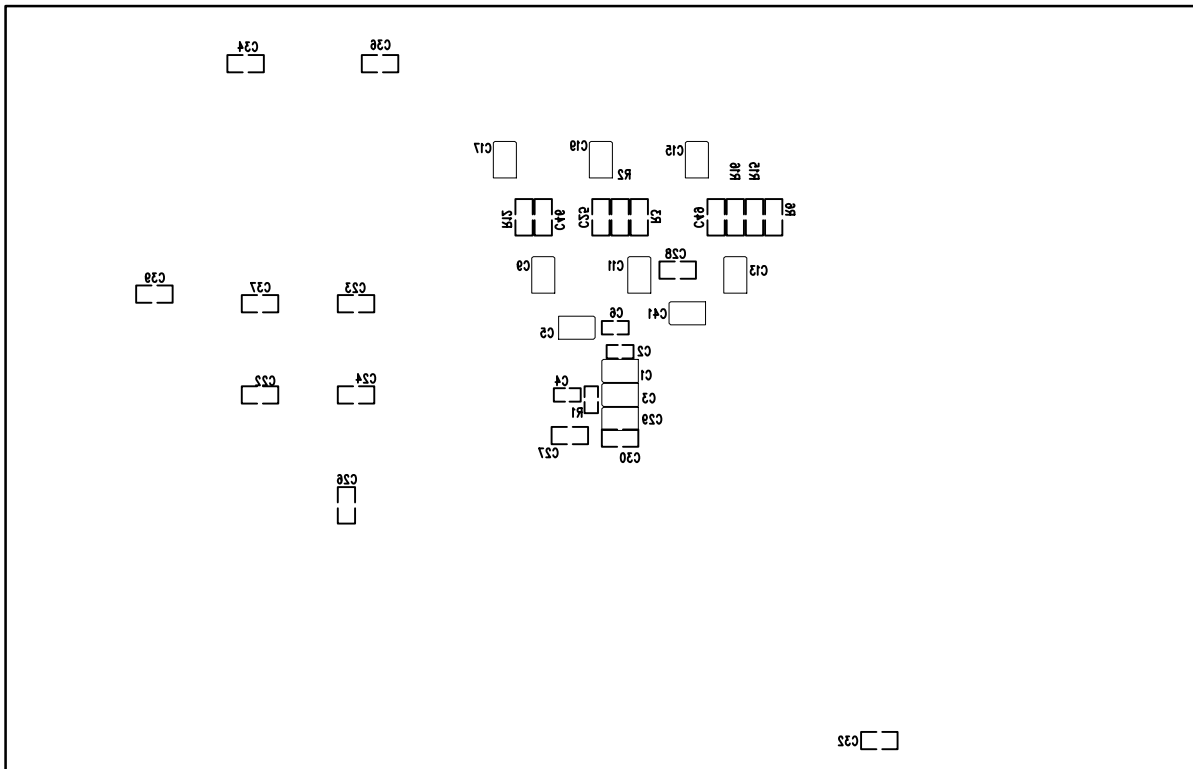Figure 12. AD7470 Evaluation Board Component Placement Drawing (Component Side).

Figure 13. AD7470 Evaluation Board Component Placement Drawing (Solder Side).