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Evaluating the AD7760 and AD7762 Using the EVAL-CED1Z

FEATURES

Full featured evaluation board for the AD7760/AD7762 EVAL-CED1Z-compatible On-board 4.096 V reference Crystal clock oscillator MCLK source Evaluation software for control and data analysis (download from product page) Filter programmability—load custom filter to ADC

EVALUATION KIT CONTENTS

EVAL-AD7760EDZ or EVAL-AD7762EDZ evaluation board EVAL-AD7760EDZ/EVAL-AD7762EDZ software CD (also available for download from product page)

ADDITIONAL EQUIPMENT NEEDED

EVAL-CED1Z (must order separately), includes a USB cable Bench top power supply to Connector J2

GENERAL DESCRIPTION

This user guide describes the evaluation boards for the AD7760/ AD7762 Σ - Δ analog-to-digital converters (ADCs). The AD7760, a 24-bit ADC, combines wide input bandwidth and high speed with the benefits of Σ - Δ conversion with a performance of 100 dB SNR at 2.5 MSPS, making it ideal for high speed data acquisition. The AD7762 derivative is a parallel version with a maximum output data rate of 625 kSPS.

Complete specifications for the AD7760/AD7762 are available in the AD7760 and AD7762 data sheets available from Analog Devices, Inc.; the data sheets should be consulted in conjunction with this user guide when using the evaluation board.

The evaluation software is available to download from the AD7760 and AD7762 product pages.

The AD7760 interfacing signals are created by the EVAL-CED1Z board, which is used in conjunction with the evaluation board to enable data acquisition via the provided software and USB link. The kit requires the controller evaluation and development (CED1) board, the EVAL-CED1Z, which must be purchased separately. The evaluation board includes all routing required for evaluating the ADC.

The combination of the evaluation board and the EVAL-CED1Z board allied with the EVAL-AD7760EDZ/EVAL-AD7762EDZ software allows the user to upload samples taken by the AD7760/AD7762 onto a PC showing the waveform being sampled, as well as allowing the data to be shown in histogram or FFT format. The AD7760/AD7762 can also be used on a standalone basis (without the EVAL-CED1Z); however, in this case, the user must provide the interface and acquisition requirements.

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TYPICAL SETUP

Figure 1. Typical Setup (EVAL-AD7760EDZ/EVAL-AD7762EDZ on Left and EVAL-CED1Z on Right)

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GETTING STARTED

The EVAL-AD7760EDZ/EVAL-AD7762EDZ controls and evaluates the performance of the AD7760/AD7762 when operated with the EVAL-CED1Z board. The software is compatible with Windows^{*} 2000 and Windows XP. If the setup file does not run automatically, run setup.exe from the CD provided.

INSTALLING THE SOFTWARE

When the CD is inserted into the PC, an installation program automatically begins. This program installs the evaluation software. The user interface on the PC is a dedicated program written especially for the AD7760/AD7762 when operated with the EVAL-CED1Z board.

Warning

The software must be installed before the USB cable is connected between the EVAL-CED1Z and the PC, to ensure that the appropriate USB driver files have been properly installed before the EVAL-CED1Z is connected to the PC.

STARTING THE SOFTWARE

When the software is run for the first time with the EVAL-CED1Z board connected to the PC, the PC automatically finds and identifies the new device. Follow the instructions that appear on screen to install the drivers for the CED1 on the PC.

If an error appears when the software is first started, the PC is not recognizing the USB device. To correct this error,

- 1. Access the device manager by selecting **Device Manager** from the **Hardware** tab of the **System Properties** window.
- 2. Examine the devices listed under the **Universal Serial Bus Controller** heading.
- 3. If an unknown device is listed, right-click the unknown device and click **Update Driver**.
- 4. After the New Hardware Wizard runs twice, note that, under the ADI Development Tools, the following is listed: ADI Converter Evaluation and Development Board (WF).
- 5. Restart the PC.

SETTING UP THE SYSTEM

Follow the steps in this section to set up the evaluation board, the EVAL-CED1Z, and the software to begin using the complete system.

1. Insert the CD into the appropriate computer drive. Initial software installation information as shown in Figure 2 appears.



Figure 2. Initial Software Install

 Choose the destination directory. Note that the default directory is shown. If a different location is preferred, click Browse and select the desired location. Then, click Next.

🐺 AD7760_2	
Destination Directory Select the primary installation directory.	
All software will be installed in the following location(s). To install software into a different location(s), click the Browse button and select another directory.	
Directory for AD 7760_2 C\Program Files Analog Devices\	Browse
Directory for National Instruments products C\Program Files\National Instruments\	Browse
<< Back Next>>	<u>C</u> ancel

Figure 3. Choose the Destination for the Software

3. Accept the license agreement and click **Next** as shown in Figure 4.



Figure 4. Accept License Agreement

4. To start the installation, click **Next** as shown in Figure 5. This window shows the installation actions being taken.

AD7760_2	
Start Installation Review the following summary before continuing.	
Adding or Changing • AD7760_2 Files	
lick the Next button to begin installation. Click the Back button to change the installation settings.	
Save File C Sack Next >>>	Cancel
Figure 5, Install Steps	

 Follow the path chosen during installation to locate the software. If the default location was chosen, the location of the software (for the AD7760) is Start > All Programs > Analog Devices > AD7760_2 > AD7760_2.

煛 EVAL-AD776xEDZ Software	
Dverall Progress	
Currently installing EVAL-AD776xEDZ Software. Part 1 of 1.	
<< Back Next >>	Cancel
<< Back Next>>	Cancel

Figure 6. Default Location of AD7760/AD7762 Software

6. When the installation completes, the window as shown in Figure 7 displays. Restart the PC for the software to take full effect.

🥫 EVAL-AD776xEDZ Software		
Installation Complete		
The installer has finished updating your system.		
	<< Back Next >>	Finish

Figure 7. Install Completed

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ABOUT THE EVALUATION HARDWARE POWER SUPPLIES

The EVAL-AD7760EDZ/EVAL-AD7762EDZ must be powered using an external power supply that applies 7.5 V between the V+ and GND terminals of Connector J2.

This 7.5 V supply is then regulated on board using ADP3334 devices (U9 and U6) to provide the 2.5 V and 5 V signals required by the AD7760/AD7762. The AV_{DD2}, AV_{DD3}, and AV_{DD4} supplies are the 5 V supplies to the AD7760/AD7762. A voltage of 2.5 V supplies the AV_{DD1}, V_{DRIVE}, and DV_{DD} pins of the AD7760/AD7762.

A separately regulated 2.5 V supply powers all the digital functionality on the evaluation board excluding the AD7760/AD7762. An individually regulated 5 V supply also supplies the crystal oscillator and clock buffer devices on the EVAL-AD7760EDZ/EVAL-AD7762EDZ. Setting LK1 to A means that the MCLK buffer is powered by 5 V, enabling the ADC to be operated using an MCLK signal with an amplitude of 5 V.

DIFFERENTIAL INPUT

The differential input to the AD7760/AD7762 is applied through Connector J1, which is an XLR audio standard connector. The differential inputs are routed through the AD7760/AD7762 onboard differential amplifiers using the external circuit components as detailed in the AD7760 and AD7762 data sheets.

STANDALONE OPERATION

The evaluation board can be used in a standalone manner (that is, without using the EVAL-CED1Z). In this case, however, the user must provide all required interface communications and a means to acquire the output data from the board.

DECOUPLING AND LAYOUT RECOMMENDATIONS

The AD7760 and AD7762 data sheets contain specific information about the decoupling and layout recommendations required to achieve optimum specifications.

The EVAL-AD7760EDZ/EVAL-AD7762EDZ adhere to these recommendations completely and are designed as the blueprint for users of the AD7760 and AD7762. The Gerber files for the evaluation board are available for download from the AD7760 and AD7762 product pages.

The EVAL-AD7760EDZ/EVAL-AD7762EDZ are 4-layer boards. One layer is a dedicated ground plane. All supplies to the devices on the EVAL-AD7760EDZ/EVAL-AD7762EDZ are decoupled to this ground plane. In addition to the printed circuit board (PCB) top and bottom layers, there is also a layer for routing power signals. All layers of the boards are detailed in the Evaluation Board Schematics and Artwork section.

In addition, the exposed paddle of an AD7760 or AD7762 is connected by multiple vias to this ground plane. The exposed paddle is not connected to any of the ground pins on the device.

LINK OPTIONS

The link options on the evaluation board are factory set for the required operating setup. The functions of these links are described in Table 1.

Table 1. Link Options					
Link No.	Function	Position Descriptions	Default		
LK1	Link option for power mode of the crystal oscillator	Removing this link places the crystal oscillator (Y1) in standby mode.	Inserted		
R23, R12, R31	Sets the MCLK source for AD7760/ AD7762 and EVAL-CED1Z	R23: a 0 Ω link routes the on-board oscillator to two parallel clock buffers in which one goes to MCLK and the other output goes to EVAL-CED1Z board to allow data acquisition using the supplied software. R12, R31: populate R31 to select external MCLK source through Connector J8. R12 may be use for termination of any external MCLK source.	R23		

Table 1. Link Options

CONNECTING THE EVALUATION HARDWARE

Connecting the hardware is a five step process.

- Apply power to the EVAL-CED1Z via the +7 V, 15 W power supply provided with the EVAL-CED1Z board. The green LED (labeled Power) on the EVAL-CED1Z lights up to indicate that the EVAL-CED1Z is receiving power. The USB cable can then be connected between the PC and the EVAL-CED1Z.
- 2. Connect the USB cable between the PC and the EVAL-CED1Z. A green LED positioned beside the USB connector on the EVAL-CED1Z board lights up, indicating that the USB connection has been established.
- 3. Power up the EVAL-AD7760EDZ/EVAL-AD7762EDZ through Connector J2. Connect a wire from the connector labeled V+ to 7.5 V of an external power supply. In addition, ensure that there is a GND connection between the GND of J2 and the power supply GND connection.
- 4. Connect the female connector (J3, marked CED1Z PPI), which is on the underside of the evaluation board, to the PPI header of the EVAL-CED1Z board.
- 5. Start the evaluation software.

The differential input to the AD7760/AD7762 device can be connected to the black XLR connector (J1) marked Differential Input. This differential input is routed to the inputs of the onboard differential amplifier for the device. Because the software powers up the device, do not apply an analog input until the device is fully powered up.

When the hardware is set up, use the software to control the EVAL-CED1Z and the EVAL-AD7760EDZ/EVAL-AD7762EDZ.

Launch the software from the **Analog Devices** menu: from the **AD7760_2** submenu, click the **AD7760_2** icon.

Note that if an error message appears, click **OK** and restart the application after checking the connection between the adapter board and the USB port on the PC. Also check that the USB device is identified by the **Device Manager**, as detailed in the Installing the Software section.

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USING THE EVALUATION SOFTWARE

After the hardware is initially installed, follow the instructions to set up the evaluation software each time the system is used. Note that the hardware must be powered up as described in the About the Evaluation Hardware section.



Figure 8. Front Panel Showing Control and Indicator Information and the Performance with a −0.5 dB, 1 kHz Input Tone in Decimate by 32 Mode when Running with the Default 40 MHz MCLK

OVERVIEW OF THE MAIN WINDOW

Refer to the front panel shown in Figure 8 when following these steps.

- Find the default download location for the evaluation software by clicking Start > All Programs > Analog Devices > AD7760_2 > AD7760_2. For a location other than the default, follow the path entered during setup. The evaluation software GUI appears (see Figure 8).
- 2. Select the correct device: AD7760 or AD7762.
- To power up the device under evaluation, click the Power Mode drop-down menu, and select Low Power or Normal Power. This prompts the EVAL-CED1Z to write to the AD7760/AD7762 registers and power up the device.



Figure 9. Powering Up

- 4. Note that the external voltage supply connected to the EVAL-AD7760EDZ/EVAL-AD7762EDZ shows ~240 mA in Normal Power mode and ~170 mA in Low Power mode. Seeing the current draw levels change when switching between the power modes also verifies that communication between the evaluation board and CED1 board is operational.
- 5. Change the decimation rate setting by clicking the Decimation Rate drop-down menu as shown in Figure 9. Note that the device powers up in a default decimation setting of 32. Changing the rate allows the user to vary the oversampling rate and implement the five on-chip decimation options offering output data rates ranging from 78 kHz to 2.5 MHz output for the AD7760.

- 6. Specify the **Power Mode**, **Decimation Rate**, and **Number of Samples** to be acquired (typically 65,536 samples) by using the drop-down menus on the software front panel. The software allows the number of samples specified by the user to be viewed as a waveform, histogram, or FFT.
- 7. Choosing the different decimation rates in the software controls writes to the AD7760/AD7762 Control Register 2 to change the amount of decimation used in the second internal FIR filter of the AD7760. This filter can be completely bypassed to enable decimate ×8 mode, or otherwise set to decimate from ×2 to ×32 to enable an overall decimation rate of 16 to 256 for the AD7760. Note that the AD7762 only operates in decimation rates of 32, 64, 128, and 256.
- 8. Click **Sample** or **Continuous** to show samples output by the evaluation board. **Sample** gives one set of samples, the length of which is determined by the **Number of Samples** selection on the software front panel. Clicking **Continuous** shows continuously updated samples of the analog input to the device.



Figure 10. Showing Samples

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- Check the frequency of the DRDY pulse on an oscilloscope (test point marked DRDY) and ensure that it matches the frequency shown in the **Output Data Rate** text box in the software front panel.
- 10. Observe if the frequencies match. If at any stage these frequencies do not match, reset the EVAL-AD7760EDZ/
 EVAL-AD7762EDZ evaluation board by pressing the RESET push button on the evaluation board. Then, set the Decimation Rate in the software front panel to the correct default value.

WORKING IN MODULATOR MODE

To enter modulator mode,

- 1. Click **Modulator Enable** as shown in Figure 9. When in modulator mode, the green indicator beside the control button appears lit.
- 2. Evaluation of the AD7760 device when using this hardware and software allows the user to look at the direct raw modulator output from the device bypassing all of the internal FIR filtering.
- 3. Running in modulator mode allows the user to see the noise shaping provided by the AD7760 Σ - Δ modulator as shown in Figure 11.
- 4. Click **Modulator Enable** to exit modulator mode; the green indicator light goes off. Reset by clicking **Reset** and then set the **Decimation Rate** as desired to run with the internal default FIR filters.



Figure 11. Modulator Mode Example of Noise Shaping Provided by the AD7760; the High Frequency Content of the Modulator Output Leads to the Coarse Nature of the Waveform Shown

DOWNLOADING A USER DEFINED FILTER

The final stage of the AD7760/AD7762 FIR filters can be programmed to suit the specific requirements of the user. The filter designed must correspond with the requirements listed in the data sheet; it must be a symmetrical filter with an even number of coefficients. The number of coefficients can range from 12 to 96.

Keep the following points in mind:

- Due to the symmetry of the filter, the coefficients repeat. Therefore, only half of the coefficients are required to be sent to the AD7760/AD7762.
- The device software reads the coefficients from a text file and writes each coefficient to the AD7760/AD7762. The filter file must contain the correct checksum, which is also written to the ADC, and the file must be in the correct format.

An example of this format is shown in Figure 12. This example corresponds to the example digital filter in the device data sheet.

Each of the 32-bit words (in this case, there are 12 words for the coefficients and the checksum) are in a hexadecimal format— there must be no spaces between the characters and no text, spaces, or notation before or after any of the hexadecimal words to be written. The software implements a text read from each line of the file and then translates this value to the correct binary 32-bit word to be written to the AD7760/AD7762 as per the description in the data sheet.



Figure 12. Example of Format for Filter Coefficients for Download

To download a filter,

1. Select the number of coefficients for download—this is half the filter length. Therefore, for example, for a 24 tap filter, select 12 from the drop-down selection shown in Figure 13.



Figure 13. Number of Coefficients

 Click the folder icon and browse to the location of the filter text file. The installation placed a copy of the data sheet example at Program files/Analog Device/AD7760_2; this file is called filter_12c.txt.

Open		? 🔀
Look in:	🗀 AD7760_62_EDZ	💌 🔇 🤌 🗁 🛄 -
My Recent Documents Desktop My Documents My Computer	ADC_Labview_Library adc_VIs DLLs 96_Tap_BandPass.txt AD007760.vi AD7760_2.aliases AD7760_2.laiases AD7760_2.lwroj AD7760_e2_63 error handle AD7760_e2_63 queue_enum AD7760_error handler.vi analysis_ac_7760.vi CED1.doc CED1.hexout CED1.CED_CLK.hexout	CED 1_Crystal_osc.hexout CED 1_int_clk.hexout CED 1_int_clk.hexout CED 1_int_clk.hexout CED 1_int_clk.hexout Filter_48c_form.txt Filter_48c_form.txt Filter_48c_form.txt Filter_48c_strict Filter_48c_form.txt
	File name: filter_12c.bt	• ОК
My Network	Files of type: All Files (*.*)	Cancel

Figure 14. Browse to Select the Specific Text File

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- 3. Click **Configure Filter** to download the user defined filter.
- 4. Click **Sample** to acquire a batch of samples from the device.

The filter example used in the device data sheet shows a slower transition band. The FFT of this filter implementation is shown in Figure 15. As highlighted, the status bits output by the ADC show whether the filter file was downloaded correctly.

The indicators for the DL_OK, FILT_OK and UFILT are all asserted to show a successful filter download.



Figure 15. User Defined Filter Example Implemented on Evaluation Board, Note Illuminated Indicators and Custom Filter Transition Band

WRITING TO GAIN, OFFSET, AND OVERRANGE REGISTERS

The evaluation board allows the user to write to the on-board registers for control of gain correction, offset correction, and the setting of the overrange flag.

For example, the default value of the gain correction register, 1.25, can be changed to a value of 1.00 by setting the value in the **WR_GAIN** box to 1.00. Click the white **WR_GAIN** switch on the front panel to write to the gain register.

To check that the value has been written correctly, click the white **RD_GAIN** switch on the front panel. The value of the gain register is shown in the **RD_GAIN** indicator box.



Figure 16. Writing to the On-Board Registers

EVALUATION BOARD SCHEMATICS AND ARTWORK



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Figure 18. EVAL-AD7760EDZ/EVAL-AD7762EDZ Schematic—Power Supply Section

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Figure 19. EVAL-AD7760EDZ/EVAL-AD7762EDZ Schematic—Interface Section



Figure 20. EVAL-AD7760EDZ/EVAL-AD7762EDZ Component Side Top Silkscreen Artwork



Figure 21. EVAL-AD7760EDZ/EVAL-AD7762EDZ Component Side Layer 1 Artwork

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Figure 22. EVAL-AD7760EDZ/EVAL-AD7762EDZ Ground Plane Layer 2 Artwork

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Figure 23. EVAL-AD7760EDZ/EVAL-AD7762EDZ Power Plane Layer 2 Artwork



Figure 24. EVAL-AD7760EDZ/EVAL-AD7762EDZ Solder Side Layer 4 Artwork



Figure 25. EVAL-AD7760EDZ/EVAL-AD7762EDZ Component Side Bottom Silkscreen Artwork

BILL OF MATERIALS

Table 2.

Name	Value	Part Number	Part Description	Stock Code ¹
+7V5. /SYNC. 2V5D. 5VD.			Test point, holes must be left free of solder	Do not insert
AVDD1, AVDD2, AVDD3,				
AVDD4, CS, DRDY, DVDD,				
GND, GND1 to GND3,				
$(1 \ (2 \ (14)))$	33 nF	06035A3301AT2A	50 V NPO multilaver ceramic capacitor	FFC 498555
C3	2.2 pF	CC0603CBNPO9BN2B2	50 V. NPO, multilayer ceramic capacitor	FFC 721888
C4 to C6. C9. C56. C58. C62	0.1 µF	B0603R104KCT	16 V. X7R. multilayer ceramic capacitor	FEC 9406140
C7. C48. C50. C52 to C54.	0.1 µF	CC04027RY5V7BB104	16 V. Y5V. multilayer ceramic capacitor	FFC 3019482
C57	от р.			
C10, C13	DNI	Not applicable	Optional capacitor footprint (0805)	Do not insert
C11	100 μF	TAJC107K010RNJ	10 V, tantalum capacitor	FEC 197180
C15, C32 to C34, C39, C61,	10 µF	TAJB106K020RNJ	20 V, tantalum capacitor	FEC 197427
C64, C65, C72, C84				
C16	47 μF	TAJD476K020RNJ	20 V, tantalum capacitor	FEC 197464
C17	22 pF	GRM1555C1H220JZ01D	50 V, C0G, multilayer ceramic capacitor	FEC 8819629
C19, C21, C23, C25, C27,	0.1 μF	U0805R104KCT	50 V, X7R, multilayer ceramic capacitor	FEC 9406387
C29, C43 to C45, C47, C83	1			FFC 0527710
C20, C22		GRM2TBR7TCT05KA0TL	16 V, X/R, multilayer ceramic capacitor	FEC 9527710
C42			PTH capacitor location	Do not insert
	10 nF		16 V, X7R, multilayer ceramic capacitor	FEC 3/8149
	10 IIF 100 pE		25 V, X/R, multilayer ceramic capacitor	FEC 0406115
C00, C90, C93, C94	TOO PF	SOM	2 A rectifier diada	FEC 9400113
DI E1 to E10			2 A, rectifier alode	FEC 9043070
11			YI P fomale audio connector	FEC 724518
		CTR5000/2	2-pin_terminal block (5 mm pitch)	FEC 724310 FEC 151780
13		M20-7832046	40-nin (2 x 20) DII vertical socket	FEC 7992033
16 18 112		R114426000	50.0 SMB jack	FEC 4194512
11 to 18 110 to 114	200 uH	742792661 F	Inductor	
19	10 nH	B82496C31001	Inductor	FFC 3877024
LK1	10111	M20-9990246	2-pin (0.1" pitch) header and shorting shunt	FFC 1022247
			_ p (p)	and 150-411
R1, R2	649 Ω	RN73C1J649RBTG	Precision SMD resistor	FEC 1140503
R3, R4	1 kΩ	RN73C1J1K0BTG	Precision SMD resistor	FEC 1140509
R5, R6	18 Ω	RN73C1J17R8BTG	Precision SMD resistor	FEC 1140429
	(17.8 Ω)			
R7, R8, R35	100 Ω	MC 0.063W 0603 1% 100 Ω	SMD resistor	FEC 9330364
R9	18 Ω	MC 0.063W 0603 5% 18 Ω	SMD resistor	FEC 9331840
R10, R11, R14 to R16, R18,	0Ω	MC 0.063W 0603 0R	SMD resistor	FEC 9331662
R21 to R25, R29, R32, R33, R40 to R44, R46				
R12 R31 R45		Not applicable	SMD resistor	Do not insert
R17	10	BC0603EB-071BI	SMD resistor	FFC 9238123
R19	160 kO	MC 0.063W 0603 1% 160 kO	SMD resistor	FEC 9330682
R20 R26 to R28	10 kO	MC 0.063W 0603 1% 10 kO	SMD resistor	FEC 9330399
R30	100 0	RC0402FR-07100RI	SMD resistor	FEC 9239111
R34	220 kO	MC 0.063W 0603 1% 220 kO	SMD resistor	FEC 9330836
R36	68 kΩ	MC 0.063W 0603 1% 68 kO	SMD resistor	FEC 9331468
R37	110 kΩ	MC 0.063W 0603 1% 110 kΩ	SMD resistor	FEC 9330461
R38	10 Ω	MC 0.063W 0603 1% 10 Ω	SMD resistor	FEC 9330429

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Name	Value	Part Number	Part Description	Stock Code ¹
R39	100 kΩ	MC 0.063W 0603 1% 100 kΩ	SMD resistor	FEC 9330402
S1		B3S-1000	SMD push button switch (sealed 6 mm × 6 mm)	FEC 177-807
U1		AD7760BSVZ/AD7762BSVZ	AD7760/AD7762 analog-to-digital converter	AD7760BSVZ/ AD7762BSVZ
U2, U5		NC7SZ08M5	Single AND gate	FEC 1013807
U3		ADR434ARZ	Ultralow noise XFET voltage references	ADR434ARZ
U4		ADP3330ARTZ-2.5	Low dropout regulator	ADP3330ARTZ-2.5
U6, U9		ADP3334ARMZ	Adjustable LDO regulator	ADP3334ARMZ-REEL7
U11		ADP3330ARTZ-5	Low dropout regulator	ADP3330ARTZ-5
U12		SN74LVC08APWR	Quad, two-input, positive AND gate	FEC 1102978
U14		ADM6711ZAKSZ	Reset generator	ADM6711ZAKSZ
X1 to X4		Not applicable	PCB standoff (0.156" hole)	Do not insert
Y1	40 MHz	MX045HS40M0000	HCMOS/TTL clock oscillator	Digi-Key CTX175-ND
Y1 (alternate)	40 MHz	MS06122	40.0 MHz, GXO-U100H/B, 5 V, half size, ±50 ppm stability, 0 + 70°	Second source P/N for Y1

¹ The FEC stock code notation refers to the stock order code for that component from Farnell Element 14.



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.

Legal Terms and Conditions

By using the evaluation board discussed herein (together with any tools, components documentation or support materials, the "Evaluation Board"), you are agreeing to be bound by the terms and conditions set forth below ("Agreement") unless you have purchased the Evaluation Board, in which case the Analog Devices Standard Terms and Conditions of Sale shall govern. Do not use the Evaluation Board until you have read and agreed to the Agreement. Your use of the Evaluation Board shall signify your acceptance of the Agreement. This Agreement is made by and between you ("Customer") and Analog Devices, Inc. ("ADI"), with its principal place of business at One Technology Way, Norwood, MA 02062, USA. Subject to the terms and conditions of the Agreement, ADI hereby grants to Customer a free, limited, personal, temporary, non-exclusive, non-sublicensable, non-transferable license to use the Evaluation Board FOR EVALUATION PURPOSES ONLY. Customer understands and agrees that the Evaluation Board is provided for the sole and exclusive purpose referenced above, and agrees not to use the Evaluation Board for any other purpose. Furthermore, the license granted is expressly made subject to the following additional limitations: Customer shall not (i) rent, lease, display, sell, transfer, assign, sublicense, or distribute the Evaluation Board; and (ii) permit any Third Party to access the Evaluation Board. As used herein, the term "Third Party" includes any entity other than ADI, Customer, their employees, affiliates and in-house consultants. The Evaluation Board is NOT sold to Customer; all rights not expressly granted herein, including ownership of the Evaluation Board, are reserved by ADI. CONFIDENTIALITY. This Agreement and the Evaluation Board shall all be considered the confidential and proprietary information of ADI. Customer may not disclose or transfer any portion of the Evaluation Board to any other party for any reason. Upon discontinuation of use of the Evaluation Board or termination of this Agreement, Customer agrees to promptly return the Evaluation Board to ADI. ADDITIONAL RESTRICTIONS. Customer may not disassemble, decompile or reverse engineer chips on the Evaluation Board. Customer shall inform ADI of any occurred damages or any modifications or alterations it makes to the Evaluation Board, including but not limited to soldering or any other activity that affects the material content of the Evaluation Board. Modifications to the Evaluation Board must comply with applicable law, including but not limited to the RoHS Directive. TERMINATION. ADI may terminate this Agreement at any time upon giving written notice to Customer. Customer agrees to return to ADI the Evaluation Board at that time. LIMITATION OF LIABILITY. THE EVALUATION BOARD PROVIDED HEREUNDER IS PROVIDED "AS IS" AND ADI MAKES NO WARRANTIES OR REPRESENTATIONS OF ANY KIND WITH RESPECT TO IT. ADI SPECIFICALLY DISCLAIMS ANY REPRESENTATIONS. ENDORSEMENTS, GUARANTEES, OR WARRANTIES, EXPRESS OR IMPLIED, RELATED TO THE EVALUATION BOARD INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTY OF MERCHANTABILITY, TITLE, FITNESS FOR A PARTICULAR PURPOSE OR NONINFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS. IN NO EVENT WILL ADI AND ITS LICENSORS BE LIABLE FOR ANY INCIDENTAL, SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES RESULTING FROM CUSTOMER'S POSSESSION OR USE OF THE EVALUATION BOARD, INCLUDING BUT NOT LIMITED TO LOST PROFITS, DELAY COSTS, LABOR COSTS OR LOSS OF GOODWILL. ADI'S TOTAL LIABILITY FROM ANY AND ALL CAUSES SHALL BE LIMITED TO THE AMOUNT OF ONE HUNDRED US DOLLARS (\$100.00), EXPORT. Customer agrees that it will not directly or indirectly export the Evaluation Board to another country, and that it will comply with all applicable United States federal laws and regulations relating to exports. GOVERNING LAW. This Agreement shall be governed by and construed in accordance with the substantive laws of the Commonwealth of Massachusetts (excluding conflict of law rules). Any legal action regarding this Agreement will be heard in the state or federal courts having jurisdiction in Suffolk County, Massachusetts, and Customer hereby submits to the personal jurisdiction and venue of such courts. The United Nations Convention on Contracts for the International Sale of Goods shall not apply to this Agreement and is expressly disclaimed.

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