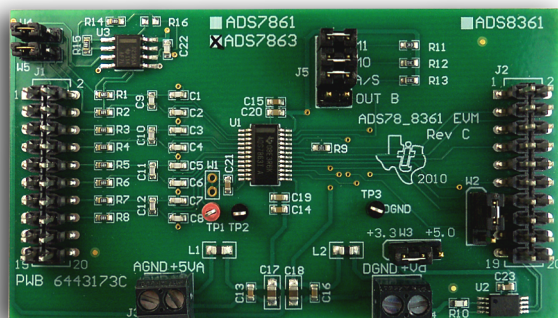


ADS7861/8361/7863EVM



ADS7861/8361/7863EVM

This user's guide describes the characteristics, operation, and use of the ADS7861/8361/7863EVM. This evaluation model (EVM) is an evaluation board for the [ADS7861](#), [ADS7863](#), and [ADS8361](#), a family of 12-/16-bit, dual, 500-kSPS, 2+2 channel, serial analog-to-digital converters (ADCs). The EVM allows evaluation of all aspects of the ADS7861/7863/8361 devices. Complete circuit descriptions, a schematic diagram, and a bill of materials are included in this document.

The following related documents are available for download through the Texas Instruments web site at <http://www.ti.com>.

Related Documentation

Document	Literature Number
ADS7861 Product Data Sheet	SBAS110
ADS7863 Product Data Sheet	SBAS383E
ADS8361 Product Data Sheet	SBAS230
Op Amps for Everyone Design Guide	SLOD006B

Contents

1	EVM Overview	2
2	Analog Interface	2
3	Digital Interface	3
4	Power Supplies	4
5	EVM Operation	4
6	Schematic, Bill of Materials, and Layout	5

1 EVM Overview

1.1 Features

ADS7861/8361/7863EVM:

- Full-featured evaluation board for the ADS7861, ADS8361, and ADS7863, dual, 500-kSPS, 12-bit/16-bit, serial output, 2+2 analog input, simultaneous sampling analog-to-digital converters
- Analog inputs can be configured as single-ended or differential
- Built-in reference
- High-speed serial interface

This manual covers the operation of the ADS7861EVM, ADS8361EVM, and the ADS7863EVM, collectively identified as *ADS7861/8361/7863EVM*. Throughout this document, the abbreviation *EVM* and the term *evaluation module* are synonymous with the ADS7861/8361/7863EVM. Unless otherwise indicated, all references to device operation apply to all three devices.

1.2 Introduction

The ADS7861 operates from 5 V for AV_{DD} and DV_{DD} while the ADS8361 operates from 2.7 V to 3.6 V for AV_{DD} and DV_{DD} . The ADS7863 operates from 2.7 V to 5.5 V for AV_{DD} and DV_{DD} . Each device is a high-speed, low-power, 12-bit or 16-bit A/D converter (ADC).

The four fully-differential analog inputs are divided into two pairs (A and B). Each ADC accepts an analog input voltage in the range of $-V_{REF}$ to $+V_{REF}$ (5 V_{PP}), centered on the internal 2.5-V reference. The device also accepts bipolar input ranges when a level shift circuit is used in the analog frontend circuitry. Refer to Section 12 of the Design Guide, *Op Amps for Everyone* (literature number [SLOD006B](#)) for information on various circuit applications.

2 Analog Interface

For maximum flexibility, the ADS7861/8361/7863EVM is designed for easy interfacing to multiple analog sources. Samtec part numbers SSW-110-22-F-D-VS-K and TSM-110-01-T-DV-P provide a convenient, 10-pin, dual row header/socket combination at J1. This header/socket provides access to the analog input pins of the ADC. Consult Samtec at <http://www.samtec.com> or call 1-800-SAMTEC-9 for a variety of mating connector options. [Table 1](#) summarizes the pinouts for analog interfaces J1.

Table 1. J1: Analog Interface Pinout

Pin Number	Signal	Description
J1.2	B1+	Noninverting input, channel B1
J1.4	B1–	Inverting input, channel B1
J1.6	B0+	Noninverting input, channel B0
J1.8	B0–	Inverting input, channel B0
J1.10	A1+	Noninverting input, channel A1
J1.12	A1–	Inverting input, channel A1
J1.14	A0+	Noninverting input, channel A0
J1.16	A0–	Inverting input, channel A0
J1.18	Unused	Pins are unused and should be left open for use with future amplifier and sensor input modules.
J1.20	REFIN	External reference source input (2.5 V nom, 2.525 V max)
J1.1 to J1.19 (odd)	AGND	Analog ground connections

3 Digital Interface

The ADS7861/8361/7863EVM is designed for easy interfacing to multiple control platforms. Samtec part numbers SSW-110-22-F-D-VS-K and TSM-110-01-T-DV-P provide a convenient, 10-pin dual row header/socket combination at J2. This header/socket provides access to the digital control and serial data pins of the ADS7861/8361. Consult Samtec at <http://www.samtec.com> or call 1-800-SAMTEC-9 for a variety of mating connector options. Table 2 describes the J2 serial interface pins.

Table 2. J2: Serial Interface Pins

Pin Number	Signal	Description
J2.1	$\overline{CS}$	Chip select; active low signal, enables data transfer and device configuration
J2.3	SCLK	Serial clock
J2.5	SCLK(R)	Serial clock return for DSP host
J2.7	FS	Frame sync
J2.9	FS(R)	Frame sync return for DSP host
J2.11	SDI	Serial data input
J2.13	SDO	Serial data output
J2.15	INT	Interrupt output; provides an interrupt source to the host processor
J2.17	CSTART	Conversion start; provides an alternate method of conversion initialization
J2.19	SPARE	

3.1 Additional Control Options

Table 3 shows the pinout of header J5. This dual-row, four-position header provides additional control functionality to the ADS7861/8361/7863EVM. Signals A0, M0, and M1 are configured with pull-up resistors by default. The jumper shunts supplied with the EVM can be used to set these signals to logic low. These signals can also be connected to control signals in the user's system.

Table 3. J5: Header

Pin Number	Signal	Description
J5.1	M0	Selects two-channel or four-channel mode
J5.3	M1	Selects between serial outputs A and B
J5.5	A0	Operates in conjunction with M0. See device data sheet for details.
J5.7	OUT B	B channel secondary output
J5.2 to J5.8 (even)	DGND	Digital ground connections

4 Power Supplies

The ADS7861 EVM board requires 5 V_{DC} for both the analog and digital sections of the ADC. While filters are provided for all power-supply inputs, optimal performance of the EVM requires a clean, well-regulated power source. Positive 5-V_{DC} power is applied to J3 and J4 (pin 1 referenced to pin 2). The ADS8361 and ADS7863 each require 5 V_{DC} for the analog supply located on J3, and 2.7 V to 5.5 V_{DC} for the digital supply located on J4.

An alternate power source can be applied via J6 located on the bottom side of the printed circuit board (PCB). If a variable digital supply voltage is desired, completely remove the shunt jumper from W3. Apply a 100-mA current limited dc voltage of not more than 5.5 V to J4.

NOTE: The shunt jumper at location W3 should be placed across pin 2 and pin 3 for proper operation of the ADS7861. This configuration is the factory default condition for all device versions of the ADS7861/8361/7863EVM.

4.1 Reference Voltage

The ADS7861/8361/7863 can be configured to use its internal reference or external reference source through jumper W1 (see schematic appended to this document for details). If an external reference is desired, the shunt jumper on W1 should cover pins 2 and 3. The external reference is supplied through header/socket J1 pin 20 (J1.20).

5 EVM Operation

Apply a current limited (150 mA max) 5-V_{DC} source to J3 and J4 before connecting the analog input signals and digital control signals.

5.1 Analog Input

The analog input source can be applied directly to header/socket J1 (top or bottom side) or through optional amplifier and signal conditioning modules. The analog input level should not exceed 5 V_{pp}. The analog input range is from –VREF to VREF (0 V to 5 V_{DC}) centered at 2.5 V.

5.2 Digital Control

The digital control signals can be applied directly to header/socket J2 (top or bottom side). The ADS7861/8361/7863EVM can also be connected directly to a DSP interface board. Consult the respective device product folder for a complete list of DSP interface cards and optional analog interface modules.

5.3 Default Jumper and Header Settings

Jumper W2 is provided to allow separation of the convert start (CONVST) and read (RD) signals. The factory default condition for the EVM is to place a shunt jumper between pin 1 and pin 2 of W2. This configuration combines signals RD and CONVST, which are applied to the ADC via pin J2.7. When W2 is moved to pin 2 and pin 3, the RD signal is applied via pin J2.7 while CONVST is applied to pin J2.17.

Header J5 provides a way to access the M0, M1, and A1 control lines as well as the OUTB serial data. Shunt jumpers are placed on pins 1 and 2, 3 and 4, and 5 and 6 of J5, which defaults M0, M1, and A0 to logic low levels. Removing the jumpers allows these lines to go to logic high levels through the associated pull-up resistors R12, R13, and R14. In the factory default configuration, the ADC converts the A0 and B0 inputs, and places AOUT serial data on pin J2.13, and BOUT serial data on pin J5.7.

6 Schematic, Bill of Materials, and Layout

A schematic for the ADS7861/8361/7863EVM is appended to this user's guide. The bill of materials is provided in [Table 4](#).

6.1 Bill of Materials

NOTE: All components should be compliant with the European Union Restriction on Use of Hazardous Substances (RoHS) Directive. Some part numbers may be either leaded or RoHS. Verify that purchased components are RoHS-compliant. (For more information about TI's position on RoHS compliance, see the [Quality and Eco-Info information on the TI web site](#).)

Table 4. Bill of Materials

Item No.	Qty			Ref Des	Description	Vendor	Part Number
	ADS7861	ADS8361	ADS7863				
1	1	1	1	N/A	Printed Wiring Board	—	—
2	8	8	8	C1 to C8	100pF, 0603, Ceramic, C0G, 50V, 5%	Murata	GRM1885C1H101JA01D
3	5	5	5	C9, C10, C11, C12, C22	1000pF, 0603, Ceramic, C0G, 50V, 5%	Murata	GRM1885C1H102JA01D
4	5	5	5	C13, C14, C15, C16, C23	0.1µF, 0603, Ceramic, X7R, 50V, 10%	Murata	GRM188R71H103KA01D
5	2	2	2	C17, C18	10µF, 0805, Ceramic, X5R, 10V, 10%	Murata	GRM219R61A106KE44D
6	2	2	2	C19, C20	1.0µF, 0603, Ceramic, X5R, 16V, 10%	Murata	GRM185R61C105KE44D
7	1	1	1	C21	0.47µF, 0603, Ceramic, X7R, 16V, 10%	Murata	GRM188R71C474KA88D
8	2	2	2	L1, L2	Ferrite Chip 600Ω 500MA 0805	TDK	MMZ2012R601A
9	2	2	2	J1, J2 (top side)	10-Pin, Dual Row, SMT Header (20 Pos.)	Samtec	TSM-110-01-T-DV-P
10	2	2	2	J1B, J2B (bottom side)	10-Pin, Dual Row, SMT Socket (20 Pos.)	Samtec	SSW-110-22-F-D-VS-K
11	2	2	2	J3, J4	2 Terminal Screw Connector	OST	ED555/2DS
12	1	1	1	J5	4-Pin, Dual Row, TH Header (8 Pos.)	Samtec	TSW-104-07-L-D
13	1	1	1	J6 (bottom side)	5-Pin, Dual Row, SMT Socket (10 Pos.)	Samtec	SSW-105-22-F-D-VS-K
14	0	0	0	W1	Not installed		
15	2	2	2	W2, W3	3-Pin header	Samtec	TSW-103-07-L-S
16	2	2	2	W4, W5	3-Pin , 2mm header	Samtec	TMM-103-01-T-S
17	10	10	10	R1 to R8, R14, R15	49.9Ω, 0603, 1%, 1/10W	Yageo	RC0603FR-0749R9L
18	2	2	2	R9 R10	33Ω, 0603, 1%, 1/10W	Yageo	RC0603FR-0733RL
19	3	3	3	R11 R12 R13	10Ω, 0603, 1% 1/10W	Yageo	RC0603FR-0710KL
20	0	0	0	R16	Not installed	—	—
21	1	1	1	TP1	Red Test Point Loop	Keystone	5000
22	2	2	2	TP2 TP3	Black Test Point Loop	Keystone	5001
23	1	0	0	U1	IC, ADC Dual 16-Bit 500kSPS 24QSOP	TI	ADS7861E
	0	1	0		IC, ADC Dual 16-Bit 500kSPS 24QSOP	TI	ADS8361IDBQ
	0	0	1		IC, ADC 12-Bit SER 2M 24QSOP	TI	ADS7863IDBQ
24	1	1	1	U2	IC EEPROM 256kBIT 400KHz 8TSSOP	Microchip	24AA256-I/ST
25	1	1	1	U3	IC OPAMP GP R-R 50MHz DUAL 8SOIC	TI	OPA2365AID

Revision History

Changes from Original (October, 2002) to A Revision	Page
• Updated entire document to current standards	1
• Added ADS7863EVM to document contents	1
• Added figure of EVM	1

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Evaluation Board/Kit Important Notice

Texas Instruments (TI) provides the enclosed product(s) under the following conditions:

This evaluation board/kit is intended for use for **ENGINEERING DEVELOPMENT, DEMONSTRATION, OR EVALUATION PURPOSES ONLY** and is not considered by TI to be a finished end-product fit for general consumer use. Persons handling the product(s) must have electronics training and observe good engineering practice standards. As such, the goods being provided are not intended to be complete in terms of required design-, marketing-, and/or manufacturing-related protective considerations, including product safety and environmental measures typically found in end products that incorporate such semiconductor components or circuit boards. This evaluation board/kit does not fall within the scope of the European Union directives regarding electromagnetic compatibility, restricted substances (RoHS), recycling (WEEE), FCC, CE or UL, and therefore may not meet the technical requirements of these directives or other related directives.

Should this evaluation board/kit not meet the specifications indicated in the User's Guide, the board/kit may be returned within 30 days from the date of delivery for a full refund. **THE FOREGOING WARRANTY IS THE EXCLUSIVE WARRANTY MADE BY SELLER TO BUYER AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED, OR STATUTORY, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE.**

The user assumes all responsibility and liability for proper and safe handling of the goods. Further, the user indemnifies TI from all claims arising from the handling or use of the goods. Due to the open construction of the product, it is the user's responsibility to take any and all appropriate precautions with regard to electrostatic discharge.

EXCEPT TO THE EXTENT OF THE INDEMNITY SET FORTH ABOVE, NEITHER PARTY SHALL BE LIABLE TO THE OTHER FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES.

TI currently deals with a variety of customers for products, and therefore our arrangement with the user **is not exclusive**.

TI assumes **no liability for applications assistance, customer product design, software performance, or infringement of patents or services described herein.**

Please read the User's Guide and, specifically, the Warnings and Restrictions notice in the User's Guide prior to handling the product. This notice contains important safety information about temperatures and voltages. For additional information on TI's environmental and/or safety programs, please contact the TI application engineer or visit www.ti.com/esh.

No license is granted under any patent right or other intellectual property right of TI covering or relating to any machine, process, or combination in which such TI products or services might be or are used.

FCC Warning

This evaluation board/kit is intended for use for **ENGINEERING DEVELOPMENT, DEMONSTRATION, OR EVALUATION PURPOSES ONLY** and is not considered by TI to be a finished end-product fit for general consumer use. It generates, uses, and can radiate radio frequency energy and has not been tested for compliance with the limits of computing devices pursuant to part 15 of FCC rules, which are designed to provide reasonable protection against radio frequency interference. Operation of this equipment in other environments may cause interference with radio communications, in which case the user at his own expense will be required to take whatever measures may be required to correct this interference.

EVM Warnings and Restrictions

It is important to operate this EVM within the input voltage range of 3.3 VDC to 5 VDC and the output voltage range of 0 VDC to 5 VDC.

Exceeding the specified input range may cause unexpected operation and/or irreversible damage to the EVM. If there are questions concerning the input range, please contact a TI field representative prior to connecting the input power.

Applying loads outside of the specified output range may result in unintended operation and/or possible permanent damage to the EVM. Please consult the EVM User's Guide prior to connecting any load to the EVM output. If there is uncertainty as to the load specification, please contact a TI field representative.

During normal operation, some circuit components may have case temperatures greater than +30°C. The EVM is designed to operate properly with certain components above +85°C as long as the input and output ranges are maintained. These components include but are not limited to linear regulators, switching transistors, pass transistors, and current sense resistors. These types of devices can be identified using the EVM schematic located in the EVM User's Guide. When placing measurement probes near these devices during operation, please be aware that these devices may be very warm to the touch.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2011, Texas Instruments Incorporated

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

TI products are not authorized for use in safety-critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, unless officers of the parties have executed an agreement specifically governing such use. Buyers represent that they have all necessary expertise in the safety and regulatory ramifications of their applications, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of TI products in such safety-critical applications, notwithstanding any applications-related information or support that may be provided by TI. Further, Buyers must fully indemnify TI and its representatives against any damages arising out of the use of TI products in such safety-critical applications.

TI products are neither designed nor intended for use in military/aerospace applications or environments unless the TI products are specifically designated by TI as military-grade or "enhanced plastic." Only products designated by TI as military-grade meet military specifications. Buyers acknowledge and agree that any such use of TI products which TI has not designated as military-grade is solely at the Buyer's risk, and that they are solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI products are neither designed nor intended for use in automotive applications or environments unless the specific TI products are designated by TI as compliant with ISO/TS 16949 requirements. Buyers acknowledge and agree that, if they use any non-designated products in automotive applications, TI will not be responsible for any failure to meet such requirements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

Products

Audio	www.ti.com/audio
Amplifiers	amplifier.ti.com
Data Converters	dataconverter.ti.com
DLP® Products	www.dlp.com
DSP	dsp.ti.com
Clocks and Timers	www.ti.com/clocks
Interface	interface.ti.com
Logic	logic.ti.com
Power Mgmt	power.ti.com
Microcontrollers	microcontroller.ti.com
RFID	www.ti-rfid.com
RF/IF and ZigBee® Solutions	www.ti.com/lprf

Applications

Communications and Telecom	www.ti.com/communications
Computers and Peripherals	www.ti.com/computers
Consumer Electronics	www.ti.com/consumer-apps
Energy and Lighting	www.ti.com/energy
Industrial	www.ti.com/industrial
Medical	www.ti.com/medical
Security	www.ti.com/security
Space, Avionics and Defense	www.ti.com/space-avionics-defense
Transportation and Automotive	www.ti.com/automotive
Video and Imaging	www.ti.com/video
Wireless	www.ti.com/wireless-apps

TI E2E Community Home Page

e2e.ti.com

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2011, Texas Instruments Incorporated