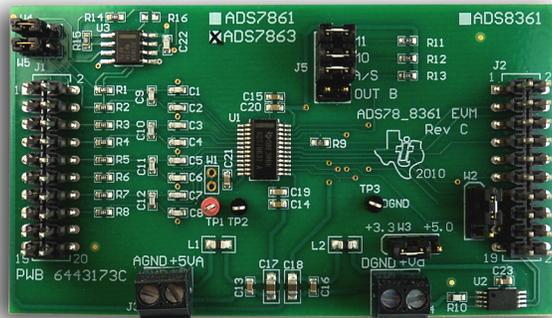


# ADS7861/8361/7863EVM



**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
<a href="#">ADS7861</a> Product Data Sheet	<a href="#">SBAS110</a>
<a href="#">ADS7863</a> Product Data Sheet	<a href="#">SBAS383E</a>
<a href="#">ADS8361</a> Product Data Sheet	<a href="#">SBAS230</a>
Op Amps for Everyone Design Guide	<a href="#">SLOD006B</a>

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## 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<sub>DC</sub> 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<sub>DC</sub> power is applied to J3 and J4 (pin 1 referenced to pin 2). The ADS8361 and ADS7863 each require 5 V<sub>DC</sub> for the analog supply located on J3, and 2.7 V to 5.5 V<sub>DC</sub> 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.

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**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.

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### 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<sub>DC</sub> 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<sub>pp</sub>. The analog input range is from -VREF to VREF (0 V to 5 V<sub>DC</sub>) 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

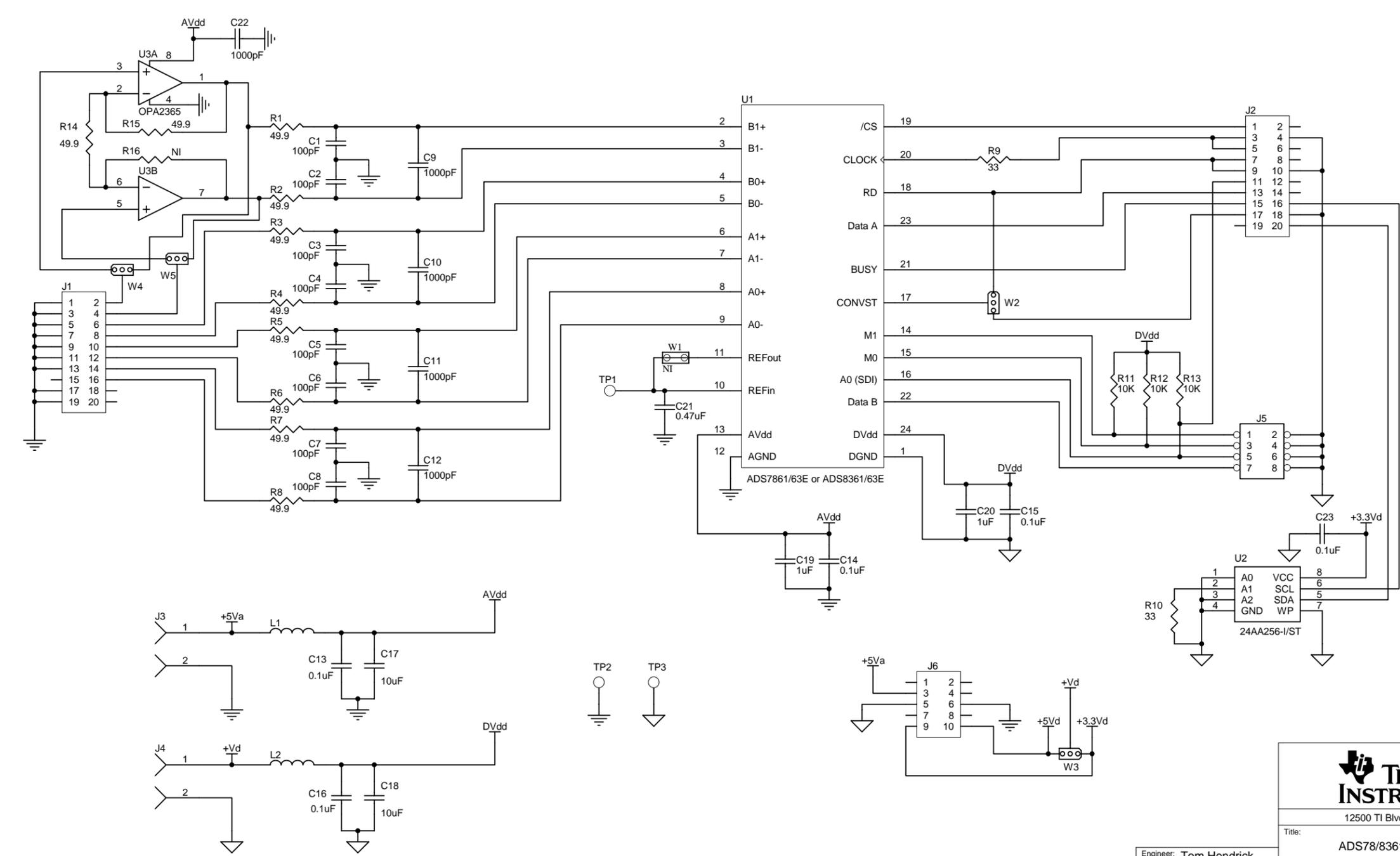
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## Revision History

<b>Changes from Original (October, 2002) to A Revision</b>	<b>Page</b>
• 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.

Revision History		
REV	ECN Number	Approved



12500 TI Blvd. Dallas, Texas 75243

Title: ADS78/8361/7863 EVM Schematic

Engineer: Tom Hendrick	SIZE: B	DATE: 11-May-2011	REV: C
Drawn By: Tom Hendrick	FILE: 6443171_C.DDB		SHEET: 1 OF 1

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## 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.

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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.

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