TEXAS INSTRUMENTS

ADS7823-28 EVM

User's Guide

June 2004 *Data Acquisition Products*

SLAU124

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EVM WARNINGS AND RESTRICTIONS

It is important to operate this EVM within the input voltage range of 0-5 V and the output voltage range of 0-5 V

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 23°C. The EVM is designed to operate properly with certain components above 23°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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Preface

Read This First

About This Manual

This user's guide describes the characteristics, operation, and use of the ADS7823-28 EVM. The ADS7823-28 is an evaluation module for use with the 12-bit single/octal channel, inter-integrated circuit (I^2C) serial interface analog-to-digital converters ADS7823 and ADS7828. Both devices are located on a single printed wiring board. A complete circuit description as well as a schematic diagram and bill of materials are included.

How to Use This Manual

This document contains the following chapters:

Section 1 – EVM Overview

Section 2 – Analog Interface

Section 3 – Digital Interface

Section 4 – Power Supply Requirements

Section 5 – Board Setup and Operation

Section 6 – EVM BOM and Schematic

FCC Warning

This equipment is intended for use in a laboratory test environment only. It generates, uses, and can radiate radio frequency energy and has not been tested for compliance with the limits of computing devices pursuant to subpart J of 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.

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The I^2C protocol is a form of synchronous, 2-wire serial communication developed by Phillips Semiconductors.

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Data Sheets:	**Literature Number:**
ADS7823	SBAS180
ADS7828	SLAS181
5-6K Interface Board	SLAU104
DAP Signal Conditioning Boards	SLAU105

Third Party Tools:	**Vendor's Website:**
HPA449 Development Board	www.SoftBaugh.com

Contents

Tables

Chapter 1

EVM Overview

The ADS7823 and ADS7828 are single-supply, low-power, 12-bit data acquisition devices that feature a serial I^2C interface. The ADS7828 also features an 8-channel multiplexer. The analog-to-digital (A/D) converter contains a sample-and-hold amplifier and an internal asynchronous clock. The combination of an I^2C serial, 2-wire interface and micropower consumption makes the ADS7823 and ADS7828 ideal for applications requiring the A/D converter to be close to the input source in remote locations and for applications requiring isolation. The EVM features one of each device (the ADS7823 and ADS7828) installed directly on the board.

Topic **Page**

1.1 Features

Full-featured evaluation board for the ADS7823 and ADS7828, single/octal channel analog-to-digital converters with I^2C interface

Up to eight single-ended or four differential analog inputs

Built in reference with buffered output

I^2C interface

Modular EVM form factor for use with a variety of Texas Instruments processors and interface boards

Chapter 2

Analog Interface

For maximum flexibility, the ADS7823-28 EVM 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 www.samtec.com or call 1-800-SAMTEC-9 for a variety of mating connector options.

Pin Number	Signal	Description
J1.2	CH0	MUX input line 0 to ADS7828, AIN to ADS7823 via W4
J1.4	CH 1	MUX input line 1
J1.6	CH 2	MUX input line 2
J1.8	CH 3	MUX input line 3
J1.10	CH 4	MUX input line 4
J1.12	CH 5	MUX input line 5
J1.14	CH 6	MUX input line 6
J1.16	CH 7	MUX input line 7
J1.18	Unused	Pin is unused and should be left open for use with future amplifier and sensor input modules.
J1.20	REFIN	External reference source input (0 to V_{DD} MAX)
J1.1- J1.19 (odd)	AGND	Analog ground connections (except J1.15)
J1.15	VCOM Out	BufOut voltage available on this pin by appropriately setting W1

Chapter 3

Digital Interface

The ADS7823-28 EVM 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 ADS7823 and ADS7828. Consult Samtec at www.samtec.com or 1-800-SAMTEC-9 for a variety of mating connector options.

Pin Number	Signal	Description
J2.1 – J2.19, J2.2, 6, 8, 12, 14	NC	No connections are associated with these pins. May be used in conjunction with GPIO source to control address settings of the ADS7823 and ADS7828 devices.
J2.16	SCL	Serial clock input to the ADC
J2.18	SDA	Serial data to/from the ADC
J2.4, 10, 18	DGND	Digital ground connections

Chapter 4

Power Supplies

The ADS7823-28 EVM board requires +2.7 Vdc to 5.5 Vdc (3.3 V Nom) to power 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 and 3.3-V power is applied to J3 located on the bottom side of the printed circuit board when used in combination with the 5-6K interface or HPA449 development boards. Jumper W3 allows the user to choose 3.3-V operation (default) when a shunt is placed across pins 1-2. Moving the shunt to pins 2-3 allows 5-V operation.

If a variable digital supply voltage is desired, please completely remove the shunt jumper from W3. Apply a 100-mA current limited dc voltage of not more than 5.5 V to the test point TP5, referenced to GND (TP3).

Topic **Page**

4.1 Reference Voltage

The ADS7823-28 can be configured to use the internal reference of the ADS7828 or an external reference source through jumper W1 (see the schematic for details). If an external reference is desired, the shunt jumper on W1 should cover pins 1-2. The external reference is supplied through J1 pin 20. The EVM is factory configured for use with the internal reference (W1 pin 2-3).

Chapter 5

EVM Operation

Apply power to the EVM. For use in combination with one of the modular EVM interface boards, this is accomplished by simply plugging the ADS7823-28 into one of the serial positions (see the interface board schematics/documents for details). For stand alone use, apply power to TP4 (V_{DD}) referenced to TP3 (GND).

Topic **Page**

5.1 Analog Input

The analog input source can be applied directly to J1 (top or bottom side) or through optional amplifier and signal conditioning modules. The ADS7823 accepts single-ended input in the range of 0-V ref (5.5 V max). The analog input to the ADS7823 is shared with channel 0 of the ADS7828 device through J1 pin 2 and jumper W4.

For the ADS7828, the analog input level should not exceed 5 V_{p-p} (centered at 2.5 V) when configured for differential mode operation. The analog input range is from GND to +VREF (0 V – 5.5 V max) when configured as single ended inputs. Up to eight single-ended inputs can be applied to connector J2, pins 2-16 (even).

A maximum of four differential inputs may be applied to J2, using pins 2-4, 6-8, 10-12, and 14-16 as differential pair inputs. Single-ended and differential modes, as well as differential polarity, can be configured by writing to the ADC Gain/MUX register. Open W4 to remove the analog signal from the input of the ADS7823 when using differential mode signals.

5.2 Digital I/O

The digital control signals can be applied directly to J2 (top or bottom side). The ADS7823-28 EVM can also be connected directly to a DSP or micro controller interface board such as the 5-6K interface board or HPA449 development board. Consult the ADS7823 and ADS7828 product folders for a complete list of DSP interface cards, optional analog interface modules, and available application notes.

5.3 Address Selection

Jumper W2 provides a means to control the I^2C address of the ADS7823 and ADS7828. W2 pins 1-2 and 3-4 control A0 and A1 respectively of the ADS7823. W2 pins 5-6 and 7-8 control A0 and A1 respectively of the ADS7828.

Table 5-1 describes the address selection options for both devices.

Table 5-1. Address Selection Options

W2	Controls	Jumper Functions / I^2C Address Restrictions
1-2	ADS7823 – A0	An open jumper places the address pin voltage at V_{DD} through a 10-kΩ pullup. Closing the jumper places the address pin at ground potential. Four possible address locations are available for each device. For proper operation of both devices simultaneously, each device must have a unique address.
3-4	ADS7823 – A1	
5-6	ADS7828 – A0	
7-8	ADS7828 – A1	

5.4 Jumper Defaults

Table 5-2 describes the factory jumper defaults as well as the functions the jumpers control.

Table 5-2. Factory Jumper Defaults

Jumper	Default Position	Function
W1	Open	Applies internal/common-mode output from/to J1. Default is neither applied.
W2	1-2 and 3-4 closed	Sets ADS7823 to address 00 and ADS7828 to address 11
W3	1-2	Applies 3.3 V or 5 V to V_{DD} when using an appropriate interface board. Default is 3.3 V.
W4	Closed	Applies AIN from J1.1 to ADS7823.

Chapter 6

EVM Bill of Materials and Schematic

This chapter contains the bill of materials table and the schematic diagram.

Topic **Page**

6.1 Bill of Materials

Table 6-1 contains a complete bill of materials for the ADS7823-28 EVM.

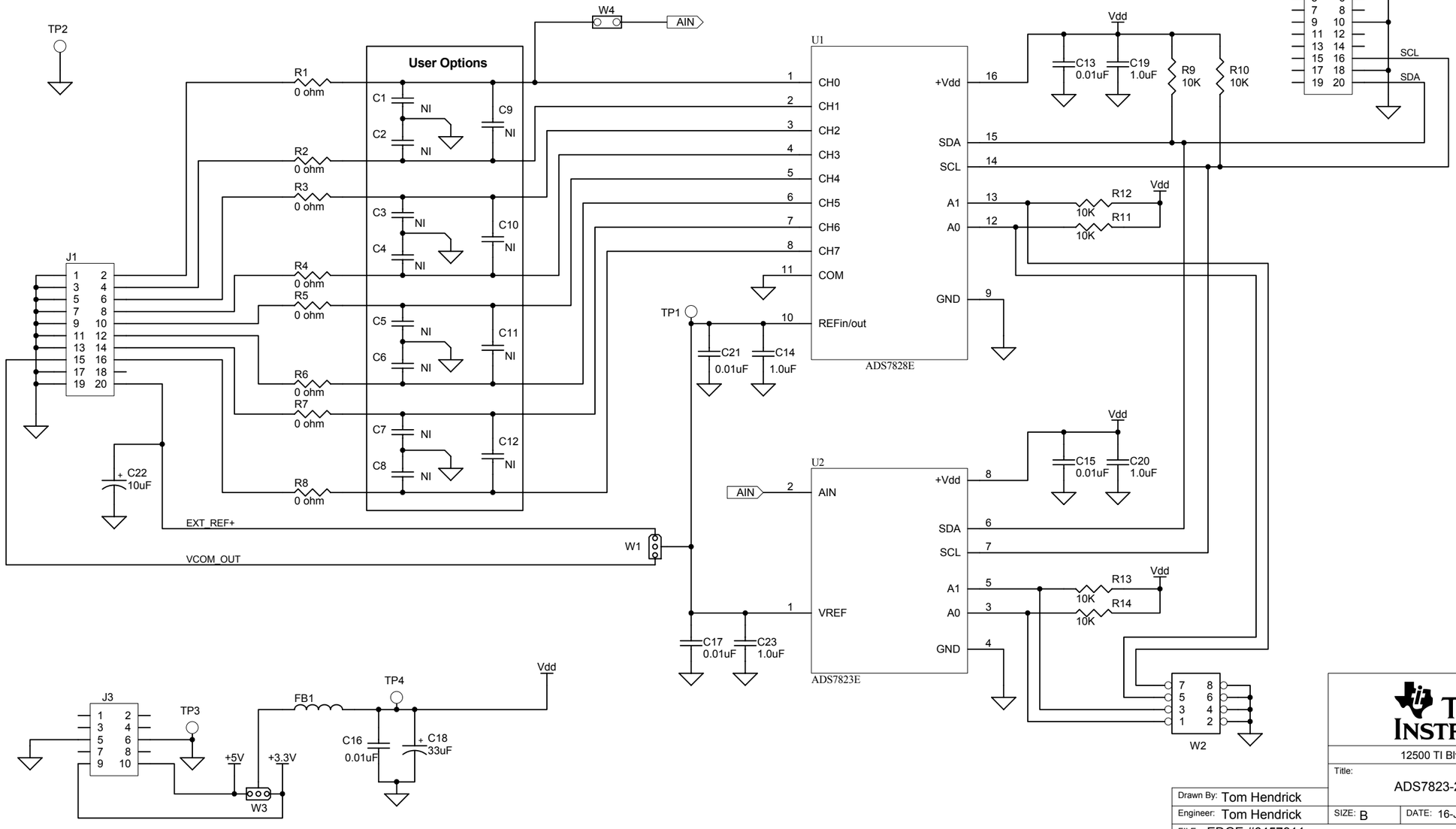
Table 6-1. EVM Bill of Materials

Designators	Description	Manufacturer	Mfg. Part Number
C1, C2, C3, C4, C5, C6, C7, C8, C9, C10, C11, C12	Not installed		
C14, C19, C20, C23	1 μF, 0805, ceramic	Panasonic	ECJ-2YB1H105K
C18	33 μF, 16 V, aluminum, Size C	Cornell Dubilier	AVS106M16B12T
C13, C15, C17, C21	1 nF, 0805, ceramic, NPO, 50 V, 5%	PhyComp	0805CG102J9B200
C22	10-μF tantalum		
FB1	SMT, EMI beads, Z = 47 Ω at 100 MHz	Fair-Rite	2743019447
J1, J2 (top side)	10-pin, dual row, SMT header (20 Pos.)	Samtec	TSM-110-01-T-DV-P
J1B, J2B (bottom side)	10-pin, dual row, SMT socket (20 Pos.)	Samtec	SSW-110-22-F-D-VS-K
J3 (bottom side)	5-pin, dual row, SMT socket (10 Pos.)	Samtec	SSW-105-22-F-D-VS-K
R1, R2, R3, R4, R5, R6, R7, R8	0 Ω, 0805, 0.1-W resistor	Yageo America	9C08052A0R00JLHFT
R10, R11, R12, R13, R14, R15	10 kΩ, 0805, 0.1-W resistor	Yageo America	9C08052A1002JLHFT
TP1, TP4	Red test point loop	Keystone	5000
TP2, TP3	Black test point loop	Keystone	5001
U1	ADS7828	Texas Instruments	ADS7828E
U2	ADS7823	Texas Instruments	ADS7823E
W1, W3	3-pin header	Samtec	TSW-103-07-L-S
W2	4-pin, dual row, TH header (8 Pos.)	Samtec	TSW-104-07-L-D
W4	2-pin header	Samtec	TSW-103-07-L-S

6.2 EVM Schematic

The schematic diagram is also provided for reference.

Revision History		
REV	ECN Number	Approved
A	Initial Release	TH



Drawn By: Tom Hendrick			
Engineer: Tom Hendrick	SIZE: B	DATE: 16-Jun-2004	REV: A
FILE: EDGE #6457911			SHEET: 1 OF: 1

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Title: ADS7823-28 EVM Schematic