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ADS788xEVM

This user's guide describes the characteristics, operation, and use of the evaluation module (EVM). A complete circuit description as well as schematic diagrams and bill of materials are included for Revision B of the EVMs.

This user's guide describes the characteristics, operation, and use of the [ADS7883EVM](#), [ADS7884EVM](#), [ADS7885EVM](#), [ADS7886EVM](#), [ADS7887EVM](#), and the [ADS7888EVM](#) (ADS788xEVM). These evaluation modules (EVMs) are evaluation boards for the ADS788x devices, series of 12-bit/10-bit/8-bit, 1-MSPS/1.25-MSPS/3-MSPS, high-speed, serial-interface analog-to-digital converters (ADCs). The EVM allows evaluation of all aspects of the [ADS7883](#), [ADS7884](#), [ADS7885](#), [ADS7886](#), [ADS7887](#), and [ADS7888](#) (collectively referred to as the *ADS788x*) devices. Complete circuit descriptions, schematic diagrams, and bills of material are included in this document.

Throughout this document, the abbreviation *EVM* and the term *evaluation board* are synonymous with the ADS788xEVM. For clarity of reading, the terms *ADS788x* and *ADS788xEVM* refer to all of the devices associated with this document, unless specifically noted.

The following related documents are available through the Texas Instruments web site at _____

EVM-Compatible Device Data Sheets

Device	Literature Number	Device	Literature Number
ADS7883	SLAS594	ADS7886	SLAS492
ADS7884	SLAS567	ADS7887	SLAS468
ADS7885	SLAS567	ADS7888	SLAS468
REF1004C-2.5	SBVS002	THS4031	SLOS224
SN74AHC1G125	SCLS377	OPA227	SBOS110

1 EVM Overview

1.1 Features

- Full-featured evaluation board for the ADS788x 12-bit/10-bit/8-bit, 1-MSPS/1.25-MSPS/3-MSPS, single-channel, high-speed serial interface ADCs
- Onboard signal conditioning
- Onboard reference

2 Introduction

The [ADS7883](#) is a 12-bit, 3-MSPS serial-interface ADC. The [ADS7884](#) is a 10-bit, 3-MSPS serial-interface ADC. The [ADS7885](#) is an 8-bit, 3-MSPS serial-interface ADC. The [ADS7886](#) is a 12-bit, 1-MSPS serial-interface ADC. The [ADS7887](#) is a 10-bit, 1.25-MSPS serial-interface ADC. The [ADS7888](#) is an 8-bit, 1.25-MSPS ADC. These devices include a capacitor-based successive approximation register (SAR) ADC with inherent sample-and-hold stages. The serial interface for each ADC is controlled by two signals: chip select and the serial shift clock. The input signal is sampled with the falling edge of chip select, and the serial shift clock is used as the conversion and the serial data output clock. [Table 1](#) summarizes the devices and the respective features.

Table 1. Device Comparison Summary

Device	No of Bits	MSPS	Package
ADS7883	12	3	SOT23-6
ADS7884	10	3	SOT23-6
ADS7885	8	3	SOT23-6
ADS7886	12	1	SOT23-6, SC70
ADS7887	10	1.25	SOT23-6, SC-70
ADS7888	8	1.25	SOT23-6, SC-70

The devices operate from 2.35 V up to 5.25 V, and are available in a 6-pin SOT23 package. Low power consumption and a small size make these devices ideally suitable for battery-powered, portable applications. The ADS7886, ADS7887, and ADS7888 are also available in a 6-pin SC70 package. All device versions are specified for operation from -40°C to 125°C .

The high level of the digital input to the device is not limited to device VDD. This design means that the digital input can go as high as 5.25 V when the device supply is 2.35 V. This feature is useful when digital signals are coming from another circuit with different supply levels.

3 Analog Interface

The ADS788x ADC has one analog input pin. A signal for the input pin can be applied at connector P1, pin 2 (as shown in Table 2), or applied to the center pin of SMA connector J1. The input range of the converter set by the power-supply voltage applied at pin 1. For example, if $V_{DD} = 2.35\text{ V}$, then V_I can range from 0 V up to 2.35 V or 2.35 V_{PP} .

Table 2. Analog Input Connector

Description	Signal Name	Connector and Pin Number	Signal Name	Description	
Reserved	N/C	P1.1	P1.2	(+)	VIN
Reserved	N/C	P1.3	P1.4	N/C	Reserved
Reserved	N/C	P1.5	P1.6	N/C	Reserved
Reserved	N/C	P1.7	P1.8	N/C	Reserved
Pin tied to Ground	AGND	P1.9	P1.10	N/C	Reserved
Pin tied to Ground	AGND	P1.11	P1.12	N/C	Reserved
Reserved	N/C	P1.13	P1.14	N/C	Reserved
Pin tied to Ground	AGND	P1.15	P1.16	N/C	Reserved
Pin tied to Ground	AGND	P1.17	P1.18	N/C	Reserved
Reserved	N/C	P1.19	P1.20	EXT_REF	External Reference Input

3.1 Signal Conditioning

The VIN input to the ADS788x is driven with a low-impedance source. In many cases, an input driver is not necessary; however, in cases where the source impedance exceeds 200 Ω , using a buffer helps achieve the rated performance of the converter.

The amplifier circuit shown in Figure 1 is the buffer circuit used on the ADS788xEVM. This circuit consists of the THS4031, a high-speed, low-noise, low-distortion amplifier configured as an inverting gain of 1. The circuit shown in Figure 1 is optimized to achieve the ac (that is, SNR, THD, SFDR, etc.) specifications listed in the respective ADS788x product data sheets. Note that the input circuit may require adjustments to achieve best performance for the test system.

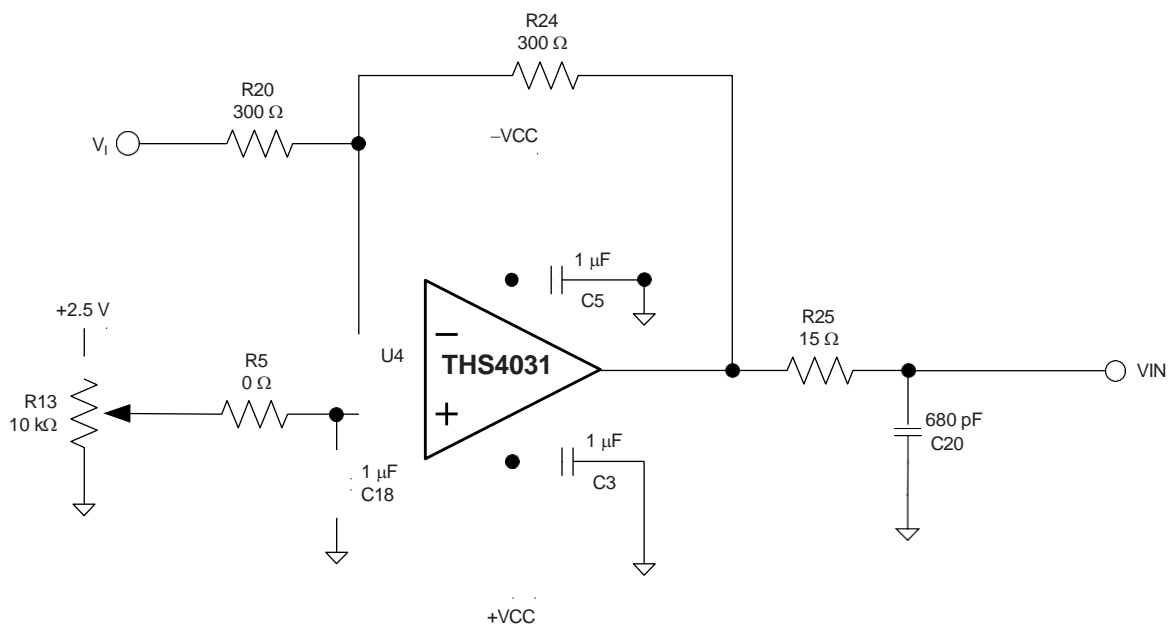


Figure 1. Input Buffer Circuit

The 15-Ω series resistor works with the capacitor, C20, to filter the input signal and isolates the amplifier from the capacitive load. The 680-pF capacitor to ground at the ADC input works with the series resistor to filter the input signal, behaving as a charge reservoir. It provides a short to ground for high-frequency noise and kickback currents when the device switches from hold to sample mode. This external filter capacitor also works with the amplifier to charge the internal sampling capacitor during sampling mode.

The type of input capacitors used in the signal path can make a few decibels of difference in ac performance. TI recommends using either a polypropylene or C0G type capacitor in the input signal path. The polypropylene capacitor causes the least distortion of the input signal and has excellent long-term stability, but is bulky and expensive. The C0G ceramic type is lower cost, comes in smaller packages, and perform well in many applications, but tends to be less stable over time and temperature compared to polypropylene capacitors. The 680-pF capacitors installed on the EVM are low-cost, C0G-type capacitors manufactured by TDK Corporation.

3.2 Reference

The ADS788x reference voltage is derived internally from the supply voltage. Consequently, the supply voltage to these converters must be driven with a low-impedance source and be decoupled to ground at the chip. It is recommended that, at least, a pair of 1-μF and 10-nF decoupling capacitors be placed close to the chip. Use wide, low-impedance traces from these capacitors to the VDD pin.

The converters themselves draw very little current from the supply lines. Therefore, the supply voltage pin for the ADS788x can be connected directly to the system supply, or to a low-noise and low-drift reference chip. The EVM provides users the option to power the ADC from either the analog supply voltage applied at TP4 or from an onboard 2.5-V reference chip.

Table 3. Jumper Setting⁽¹⁾

Reference Designator	Description	Jumper Setting	
		1-2	2-3
SJP1	Set negative supply of U2 to ground.	Installed ⁽²⁾	Not installed
	Select negative supply of U2 to -VCC.	Not installed	Installed
SJP2	Set negative supply of U4 to ground.	Installed	Not installed
	Select negative supply of U4 to -VCC.	Not installed	Installed ⁽²⁾
W1	Apply CS from P2.1 to the ADC chip select pin	Installed	Not installed
	Apply FS from P2.7 to the ADC chip select pin	Not installed	Installed ⁽²⁾
W2	Set BVDD to +5VD	Installed	Not installed
	Set BVDD to +3.3VD	Not installed	Installed ⁽²⁾
W3	Set 2.5 V to W4 (pin 3)	Installed ⁽²⁾	Not installed
	Set user applied voltage to W4 (pin 3)	Not installed	Installed
W4	Set DUT power supply pin to 5 V	Installed ⁽²⁾	Not installed
	Set DUT power supply pin to voltage on W3 (pin 2).	Not installed	Installed

⁽¹⁾ These jumper settings are for revision B of the ADS788xEVM printed circuit board (PCB).

⁽²⁾ Factory-installed.

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