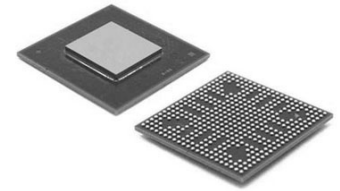


AFE Electrochemical Measurement 1 ADC 16bit 3.3V 48-Pin LFCSP EP Tray



Images are for reference only

[Inquiry](#)

Manufacturer: [Analog Devices, Inc](#)

Package/Case: LFCSP-48

Product Type: Data Conversion ICs

RoHS: RoHS Compliant/Lead free 

Lifecycle: Active

General Description

The AD5941 is a high precision, low power Analog Front End (AFE) designed for portable applications requiring high precision electrochemical based measurement techniques such as amperometric, voltametric or impedance measurements. The AD5941 is designed for skin impedance and body impedance measurements and is also designed to work with the AD8233 AFE in a complete bio-electric/bio-potential measurement system.

The AD5941 consists of two high precision excitation loops and one common measurement channel, which enables a wide capability of measurements of the sensor under test. The first excitation loop consists of an ultra-low power dual output string DAC and low power, low noise Potentiostat amplifier. One output of the DAC controls the non-inverting input of the Potentiostat amplifier and the other output controls the noninverting input of the TIA amplifier. This low power excitation loop is capable of generating DC to 200 Hz signals.

The second excitation loop consists of a 12-bit DAC, often referred to as the high speed DAC, is capable of generating high frequencies excitation signals up to 200 kHz.

The AD5941 measurement channel features a 16-bit, 800 kSPS multi-channel successive approximation register (SAR) ADC with input buffers, built-in anti-alias filter and Programmable gain amplifier (PGA). It has an input voltage range of ± 1.35 V. An input MUX before the ADC allows the user to select an input channel for measurement. These input channels include multiple external current inputs, multiple external voltage inputs and internal channels. The internal channels allow diagnostic measurements of the internal supply voltages, die temperature and reference voltages.

The current inputs include two Trans-impedance amplifiers (TIA) with programmable gain and load resistors for measuring different sensor types. The first TIA, referred to as LPTIA is designed for measuring low bandwidth signals. The second TIA, referred to as the high speed TIA is designed for measuring high bandwidth signals up to 200 kHz.

An ultra-low leakage programmable Switch Matrix is used for connecting the sensor to the internal analog excitation and measurement blocks. It provides an interface for connecting external TIA gain resistors and calibration resistors. It can also be employed for multiplexing multiple electronic measurement devices to the same wearable electrodes.

A precision 1.8V and 2.5 V on-chip reference source is available. The internal ADC and DAC circuits use this on-chip reference source to ensure low drift performance for these peripherals.

The AD5941 measurement blocks can be controlled via direct register writes via the SPI interface or alternatively using a pre-programmable sequencer, which provides autonomous control the AFE chip. 6 Kbyte of SRAM is partitioned for a deep Data FIFO and command FIFO. Measurement commands are stored in the command FIFO and measurement results are stored in the Data FIFO. A number of FIFO related interrupts are available to indicate when FIFO is full etc. A number of GPIO's are available which can be controlled using the AFE Sequencer. This allows for cycle accurate control of multiple external sensor devices via the sequencer.

The AD5941 operates from 2.7 V to 3.6 V supply and is specified over a temperature range of -40°C to $+85^{\circ}\text{C}$. The AD5941 is packaged in a 48-lead 7×7 mm LFCSP package.

Application

Electrochemical measurements

[Electrochemical gas sensors](#)

Potentiostat/amperometric/voltammetry/cyclic
voltammetry
Bioimpedance applications
Skin impedance
Body impedance
Continuous glucose monitoring
Battery impedance

Key Features

16-bit, 800 kSPS ADC

Voltage, current, and impedance measurement capability

Internal and external current and voltage channels

Ultralow leakage switch matrix and input mux

Input buffers and programmable gain amplifier

Voltage DACs

Dual output voltage DAC with an output range of 0.2 V to 2.4 V

12-bit VBIAS0 output to bias potentiostat

6-bit VZERO0 output to bias TIA

Ultra low power: 1 μ A

1 high speed, 12-bit DAC

Output range to sensor: ± 607 mV

Programmable gain amplifier on output with gain settings of 2 and 0.05

Amplifiers, accelerators, and references

1 low power, low noise potentiostat amplifier suitable for potentiostat bias in electrochemical sensing

1 low noise, low power TIA, suitable for measuring sensor current output

50 pA to 3 mA range

Programmable load and gain resistors for sensor output

Analog hardware accelerators

Digital waveform generator

Receive filters

Complex impedance measurement (DFT) engine

1 high speed TIA to handle wide bandwidth input signals from 0.015 Hz up to 200 kHz

Digital waveform generator for generation of sinusoid and trapezoid waveforms

2.5 V and 1.82 V internal reference voltage sources

System level power savings

Fast power-up and power-down analog blocks for duty cycling

Programmable AFE sequencer to minimize workload of host controller

Application

Electrochemical measurements

Electrochemical gas sensors

Potentiostat/amperometric/voltammetry/cyclic
voltammetry

Bioimpedance applications

Skin impedance

Body impedance

Continuous glucose monitoring

Battery impedance

Skin impedance

Body impedance

6 kB SRAM to preprogram AFE sequences

Ultra low power potentiostat channel: 6.5 μ A of current consumption when powered on and all other blocks in hibernate mode

Smart sensor synchronization and data collection

Cycle accurate control of sensor measurement

Sequencer controlled GPIOs

On-chip peripherals

SPI serial input/output

Wake-up timer

Interrupt controller

Power

2.8 V to 3.6 V supply

1.82 V input/output compliant

Power-on reset

Hibernate mode with low power DAC and potentiostat amplifier powered up to maintain sensor bias

Package and temperature range

7 mm \times 7 mm, 48-lead LFCSP

Fully specified for operating temperature range of -40°C to $+85^{\circ}\text{C}$

Recommended For You

AD7305BRZ

Analog Devices, Inc

SOP20

AD9910BSVZ

Analog Devices, Inc

TQFP100

AD9831ASTZ

Analog Devices, Inc

QFP

AD5447YRUZ

Analog Devices, Inc

TSSOP

AD5302BRMZ

Analog Devices, Inc

MSOP10

AD5531BRUZ

Analog Devices, Inc

TSSOP16

AD537JH

Analog Devices, Inc

CAN10

AD652AQ

Analog Devices, Inc

DIP

AD654JN

Analog Devices, Inc

DIP8

AD7740YRMZ

Analog Devices, Inc

MSOP8

AD9914BCPZ

Analog Devices, Inc

LFCSP

AD73311ARSZ

Analog Devices, Inc

SSOP20

AD7291BCPZ

Analog Devices, Inc

LFCSP20

AD9954YSVZ

Analog Devices, Inc

QFP

AD2S1205YSTZ

Analog Devices, Inc

LQFP44