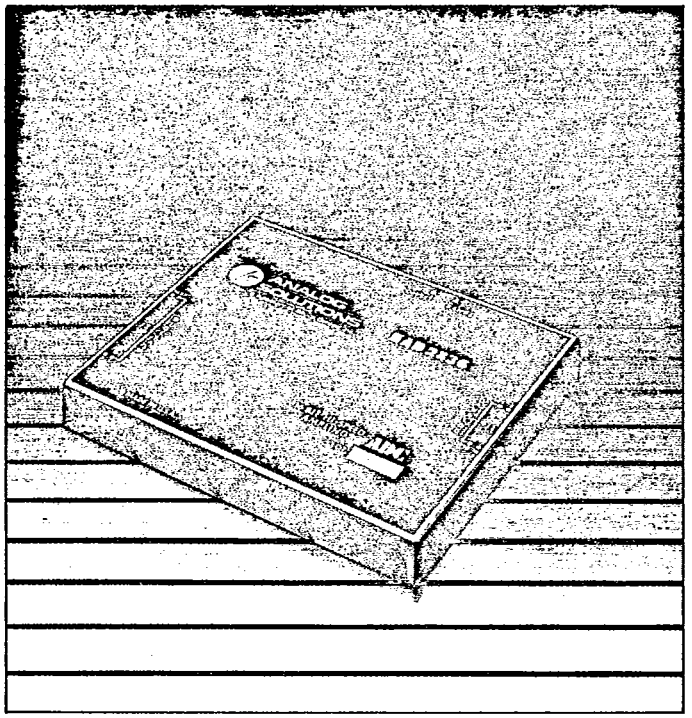
ANALOG SOLUTIONS™
a subsidiary of Silicon General, Inc.

ZAD2836

16-Bit High-Speed Sampling A/D Converter



Applications

- ☐ Medical Imaging Data Acquisition
- ☐ High-Speed Automatic Test
- ☐ Wide Dynamic Range Scientific Instrumentation
- ☐ Professional Audio
- ☐ Multiplexed Data Acquisition

Key Features

- ☐ 3.5 μs A/D Conversion Time
- ☐ 200 kHz Total Throughput
- ☐ Superior Linearity Throughout Signal Range
- ☐ Built-In Ultra-Linear Sample/Hold
- ☐ Sample/Hold Dielectric Absorption < 0.001%
- ☐ Aperture Uncertainty < 50 ps.
- ☐ Dynamic Gain and Offset Correction Capabilities
- ☐ Tri-State Output Latches

Solutions for Data Conversion

Offering a five microsecond total throughput time and improved linearity and drift, the ZAD2836 sets the performance standard for 16-bit sampling A/D converters. Utilizing the latest IC technology and advanced Analog Solutions' proprietary circuit designs, the ZAD2836 provides significantly enhanced performance at a cost less than many older, slower designs.

The ZAD2836 is the solution to your high-speed 16-bit conversion needs.

General Description

The ZAD2836 is a high-performance, five microsecond, 16-bit sampling ADC which includes an ultra-linear Sample/Hold and high-speed A/D converter in one compact, fully tested module. The ZAD2836 has been optimized for performance in critical CT and MRI systems, where the dynamic range, accuracy around zero and repeatability are all critical.

Utilizing an advanced Digitally Corrected Sub-Ranging (DCSR) A/D converter approach and a novel Sample/Hold circuit, the ZAD2836 assures 16-bit total performance.

The ZAD2836's excellent long-term drift and temperature stability are accomplished by using specially selected and tested resistor networks in a proprietary DCSR circuit design that reduces the converter's sensitivity to individual component drift.

Description of Converter

The ZAD2836 utilizes a unique three-pass Digitally Corrected Sub-Ranging (DCSR) technique in conjunction with our proven "monobit" D/A converter architecture to provide premium converter performance.

The unit consists of an ultra-linear Sample/Hold, a 6-bit flash to ensure long-term accuracy, and our monobit DAC for reduced sensitivity to resistor drift.

The combination of the three-pass DCSR technique and monobit design DAC provides up to four times more allowance for component variation and drift than older two-pass sub-ranging converters.

This conservative design approach assures that the unit stays within specification over its full temperature range and that long-term drift is minimized.

PERFORMANCE SPECIFICATIONS
ZAD2836 LOW-DISTORTION 16-BIT SAMPLING A/D CONVERTER

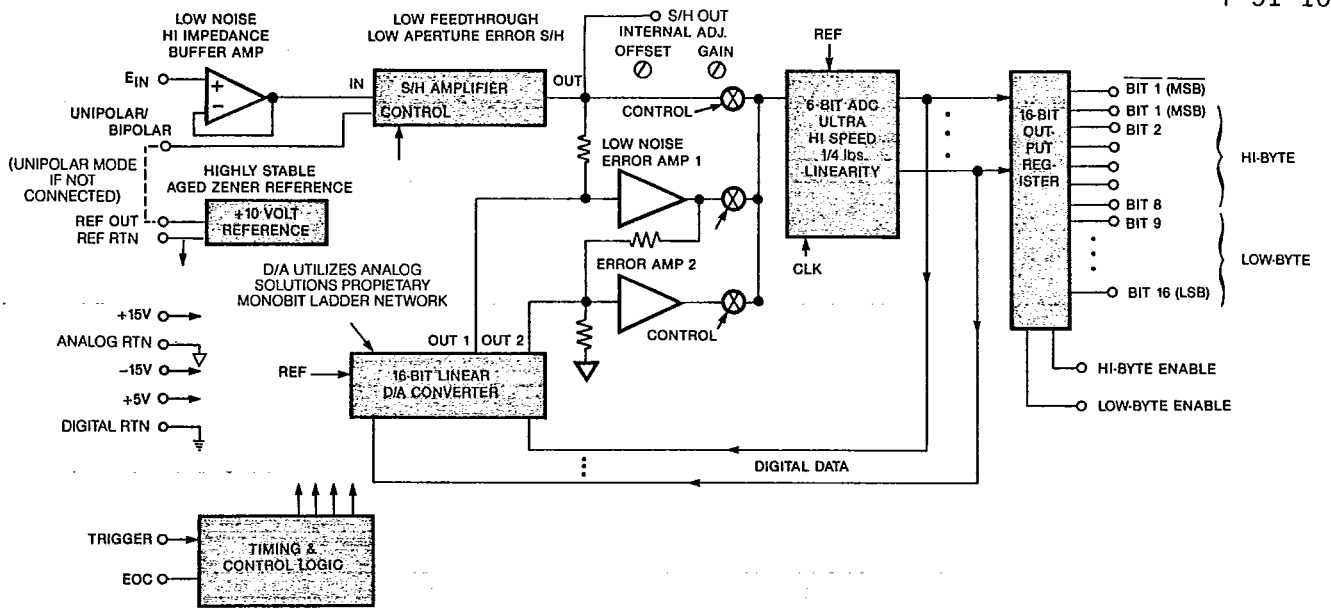
	UNIPOLAR	BIPOLAR
ANALOG INPUT		
Voltage Range	0 to +10 V	±5 V
Input Impedance	100 MΩ//5 pF typical	*
Input Bias Current	±2 nA max (+10°C to +60°C)	*
Initial Offset Voltage	±5mV max[3]	*
Stability of Offset Voltage	±100 µV/72 hrs typical	*
ACCURACY		
Resolution	16 bits	*
Quantization Error	±0.5 LSB	*
Relative Accuracy[1]	±0.003% FSR, max	*
FSR Factory-Calibrated to	±0.01%[3]	*
Absolute Accuracy	±0.003% FSR max[2]	*
Differential Non-Linearity	±0.5 LSB typical, ±0.75 LSB max	
Reference Output	+10.000 V ±20 mV, load = 2 mA max	*[4]
Noise		
Unipolar	40 µV RMS max	*
Bipolar	50 µV RMS max	*
Missing Codes	No missing codes 10° to 50°C	*
Harmonic Distortion (±5 V input, 10 kHz)		−90 dB, typical
STABILITY		
Differential Non-Linearity Temperature Coefficient	±0.5 ppm/°C max	*
Offset Temperature Coefficient	±20 µV/°C typical, ±40 µV/°C max	*
Offset Versus Supply	100 µV/1% change in supply, max	*
Gain Temperature Coefficient	±2 ppm/°C typical ±5 ppm/°C max	*
Warm-up Time	15 minutes to specified accuracy	*
THROUGHPUT		
Throughput Time (ADC and S/H)	5.0 µs max (200 kHz throughput)	*
A/D Conversion Time	3.5 µsec, typical	
SAMPLE-TO-HOLD SWITCHING		
Aperture Delay	15 ns typical	*
Aperture Uncertainty	±50 ps typical ±100 ps max	*

	UNIPOLAR	BIPOLAR
HOLD MODE		
Droop Rate	5 µV/µs max (typically doubles every 10°C)	*
Dielectric Absorption	±0.001% of input signal voltage change, typical	*[4]
S/H Feedthrough	−96 dB typical, −90 dB max	*
SAMPLE MODE		
Slew Rate	20 V/µs min	*
Bandwidth	5 MHz typical, 2 MHz min	*
Acquisition Time	1.5 µs typical	*
DIGITAL INPUTS/OUTPUTS		
Logic Levels	LSTTL/CMOS compatible	*
Data Outputs	16 bits data; Tri-state latch, 10 LS loads	*
Trigger Input	Negative edge; 1 µs pulse width min., 3 µs max. (see timing diagram)	*
Trigger Load	1 LSTTL load[5]	*
Tri-State Control	Logic 1 on HI BYTE EN or LO BYTE EN generates HI impedance state	*
End of Conversion (EOC)	Data valid on EOC high to low transition	*
POWER REQUIREMENTS		
+15 V ±0.25 V	65 mA typical	*
−15 V ±0.25 V	85 mA typical	*
+ 5 V ±0.25 V	100 mA typical	*
ENVIRONMENTAL & MECHANICAL		
Operating Temperature Range	+10°C to +60°C	*
Storage Temperature Range	−10°C to +75°C	*
Relative Humidity	0 to 85%, non-condensing up to 40°C	*
Shielding	RFI 6 sides, EMI 5 sides	*
MATING CONNECTOR		
	J1: Amp 103183-7 or equiv. (analog, 16 pin)	*
	J2: Amp 1-103183-2 or equiv. (digital, 28 pin)	*
PACKAGE SIZE[6]		
	3.8 in. (96.5mm) × 4.5 in. (114.3mm) × 0.562 in. (14.3mm) max. pkg. height	*

(Specifications apply @ 25°C unless otherwise noted)
* Same as Unipolar

NOTE:
1. Worst case summation of S/H and A/D non-linearity errors. Best fit straight-line.
2. After OFFSET/GAIN adjustment.
3. Internal (or external customer installed) pots allow field calibration.
4. Shaded areas denotes enhanced performance.
5. External 10 kΩ pull-up required.
6. Consult factory for mounting dimensions.
7. ZAD2846 is recommended for ultra low distortion applications.

2



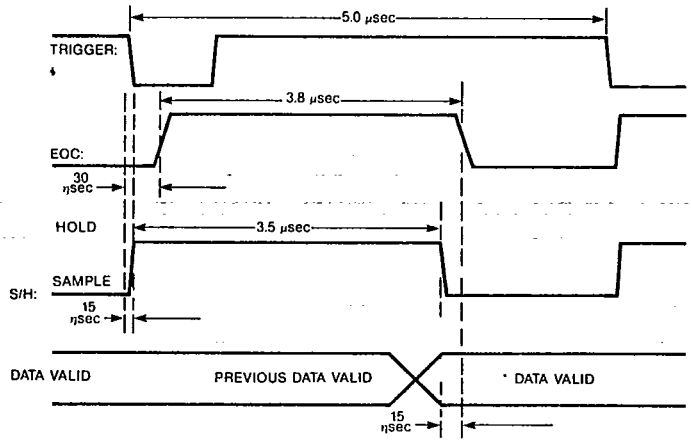
ZAD2836 Three-Pass Digitally Corrected Sub-Ranging (DCSR) Architecture

Sample/Hold Characteristics:

The Sample/Hold is one of the most critical and difficult portions of any data acquisition system.

Through careful design, utilizing unique circuitry, the Sample/Hold section of the ZAD2836 provides true 16-bit linearity, dielectric absorption of 0.001% (< 1 LSB) necessary for accurately acquiring wide dynamic range inputs, and 1.5 microseconds total acquisition and settling time.

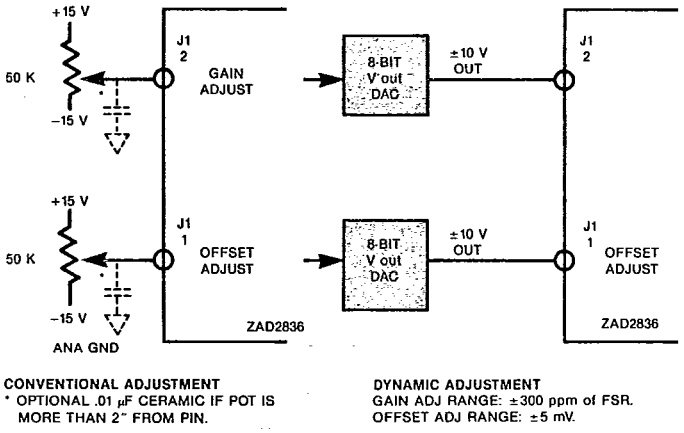
The ZAD2836's Sample/Hold is truly leading the state-of-the-art.



Timing Diagram

Dynamic Adjustment of Gain and Offset:

In addition to internal gain and offset adjustment, provision has been made for the addition of external adjustments. By utilizing these pins and external voltage output D/A's, the gain and offset of the A/D can be dynamically adjusted by the host computer or microcomputer. The available adjustment range for the ZAD2836 has been increased beyond that normally required to enable this dynamic adjustment to handle typical system gain and offset errors.



External Offset and Gain Adjustment

This provides the system designer with the capability to dynamically correct system errors, which results in increased accuracy, system stability and reduced long-term drift.

PC Board Layout

The analog input lead lengths should be as short as possible, preferably surrounded on both sides by an analog ground plane. The module has been carefully laid out internally to separate the analog input from the digital output. This practice should be extended to the PC board as much as possible. All digital control signals should also be kept away from the analog input.

Separate ground planes for analog and digital circuits associated with the ZAD2836 are extremely important. Of equal importance is the use of completely

separate analog and digital ground returns to their respective power supplies. No interconnection of these two returns should occur anywhere in the system except for that which is located within the ZAD2836. In addition, the use of the ANALOG RETURN PIN as an analog ground mecca is recommended. All of these precautions are suggested in order to minimize the effects of ground loops and to eliminate the possibility of digital noise coupling into the analog circuitry.

Power Supplies

In order to take advantage of the full 16-bit accuracy of the ZAD2836, it is recommended that well-regulated linear power supplies be used for the ±15V required by the ZAD2836.

Output Coding

Unipolar Binary	Offset Binary	MSB LSB
+9.99985 V	+4.99985 V	11.....11
+5.00000 V	+0.00000 V	10.....00
+0.00000 V	−5.00000 V	00.....00

Note: For 2's complement coding use the $\overline{\text{MSB}}$ in place of the MSB output.

Input range selection:

Range	Connect
0 to +10 Volts	signal input is PIN 15, GND PIN 9
±5 Volts	PIN 10 to PIN 9, signal input is PIN 15

Additional Products from Analog Solutions

Precision A/D and D/A Converters
Precision 16-bit and 18-bit D/A Converters
High-Performance Sample/Hold Amplifiers
Logarithmic, Isolation and Special-Purpose Amplifiers
High-Speed Telecommunications A/D and D/A Systems
Precision Load Cell and Strain-Gage Sub-Systems
High Speed Industrial Control Interfaces

Custom Products

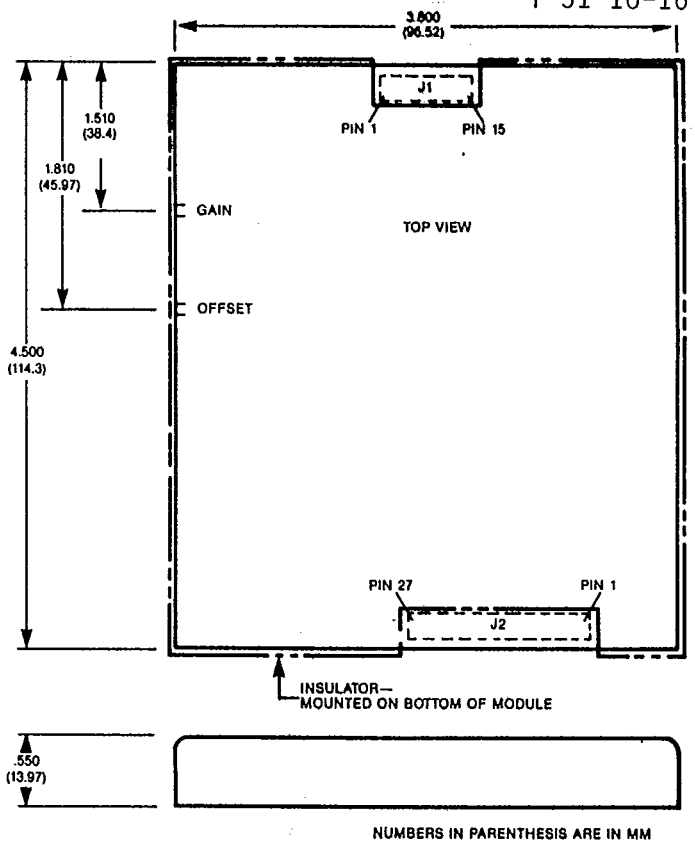
We invite customers to take full advantage of our custom design capability to provide the optimum product solution. Please contact our sales department for further information.

Ordering Guide

To Order Specify:

ZAD2836 16-Bit High-Speed Sampling A/D Converter

To place your order, contact Analog Solutions at (408) 433-1900



NUMBERS IN PARENTHESIS ARE IN MM

Physical Outline

J1 Pin Assignments

1.	OFFSET ADJ	9.	BIPOLAR
2.	GAIN ADJ.	10.	REF. OUT
3.	−15 V	11.	S/H OUT
4.	−15V	12.	REF. RTN
5.	ANALOG RTN	13.	SIG. RTN
6.	ANALOG RTN	14.	SIG. RTN
7.	+15 V	15.	SIG. IN
8.	+15 V	16.	SIG. RTN

J2 Pin Assignments

1.	TRIGGER	19.	LO BYTE ENABLE*
2.	EOC	20.	HI BYTE ENABLE*
3.	N/C	21.	BIT 7
4.	N/C	22.	BIT 8
5.	+5 V	23.	BIT 5
6.	+5 V	24.	BIT 6
7.	DIGITAL RTN	25.	BIT 3
8.	DIGITAL RTN	26.	BIT 4
9.	$\overline{\text{BIT 1}}$	27.	BIT 1 MSB
10.	DIGITAL RTN	28.	BIT 2
11.	BIT 15		
12.	BIT 16 LSB		
13.	BIT 13		
14.	BIT 14		
15.	BIT 11		
16.	BIT 12		
17.	BIT 9		
18.	BIT 10		

N/C: Do Not Connect.

SIG RTN, Analog RTN and Digital RTN Internally Connected

* Open = Enabled

ANALOG SOLUTIONS™
a subsidiary of Silicon General, Inc.

Analog Solutions
85 West Tasman Drive
San Jose, CA 95134-1703
Telephone: 408-433-1900
FAX: 408-433-9308

European Sales Office
London, England
Telephone: 0372-377779
Telex: 897628