ANALOG SOLUTIONS™
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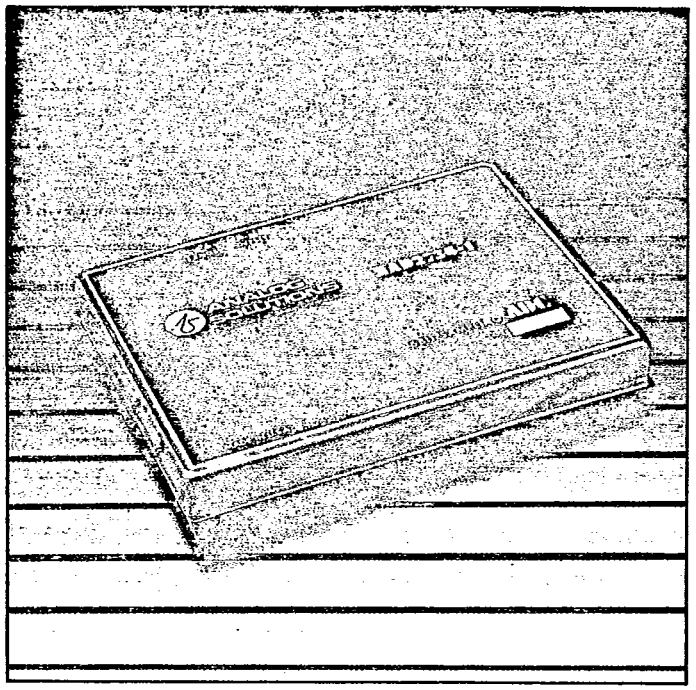
ZAD2736

Low Distortion 16-Bit Sampling A/D Converter



Applications

- ☐ Upgrades ZAD2735/MP2735 Systems
- ☐ Medical Imaging Data Acquisition
- ☐ Satellite Communications
- ☐ Telecommunications Test Equipment
- ☐ High Speed Automatic Test
- ☐ Professional Audio
- ☐ Scientific Instrumentation

Key Features

- ☐ Low Cost
- ☐ Built-In Sample/Hold
- ☐ Optional Offset Binary Coding
- ☐ High-Speed: 125 kHz Throughput
- ☐ External Gain and Offset Adjust for Computer Calibration and Control
- ☐ Superior Linearity Throughout Signal Range
- ☐ Tri-State Outputs

Solutions for Data Conversion

Offering enhanced performance and improved reliability, the Analog Solutions ZAD2736 Series sets a new standard for 16-bit sampling A/D converters. Utilizing the latest IC technology and Analog Solutions' advanced circuit designs, the ZAD2736 contains up to 25 percent fewer parts than earlier designs, which results in greater reliability and higher performance.

The ZAD2736 Series is the solution to your A/D conversion needs.

General Description

The ZAD2736 is a high-performance, high-speed, 16-bit sampling A/D converter designed for audio, MRI and ATE applications. With zero crossover linearity and a mid-range differential linearity of only 0.25 LSB, the ZAD2736 faithfully digitizes complex waveforms. The 0.25 LSB differential linearity is superior to most 16-bit converters in the same price range.

Good digitization of audio and MRI signals requires exceptional linearity and long-term stability around zero. This critical high performance is provided through proprietary circuit design that reduces the converter's sensitivity to individual component drift, and through the use of carefully selected and tested resistor networks.

The ZAD2736 is available with or without the built-in sample/hold and with binary coding, offset binary coding, or complementary offset coding. See the ordering guide on the back for details.

Tri-State Outputs

The ZAD2736 outputs can be addressed in byte-wide increments by utilizing the tri-state control capabilities. The units are easily interfaced to byte-wide microcomputer buses when the high-byte and low-byte outputs are paralleled and addressed via the tri-state control lines.

PERFORMANCE SPECIFICATIONS

ZAD2736 LOW DISTORTION 16-BIT SAMPLING A/D CONVERTERS

ANALOG INPUT

Full-Scale Range (FSR)[3]	±5 V, or 0 to +10 V[5]
Input Impedance	100 MΩ//10 pf
Reference Input Voltage	−6.4 V
Reference Input Impedance	2.7 kΩ

ACCURACY

Resolution	16 bits
Quantization Error	±0.5 LSB
Relative Accuracy incl. internal S/H	±0.003% FSR max
FSR Factory-Calibrated to	±0.01%[1,4]
Offset Factory-Adjusted to	±1 mV[1,4]
Differential Linearity	±0.25 LSB typical, ±1 LSB max
Monotonicity	Guaranteed
Noise (10 Hz to 100 kHz)	25 μV rms
Zero Code (0° to 60°C)	Continuous and monotonic through zero

STABILITY

Temperature Coefficient of Differential Linearity	±0.5 ppm FSR/°C max
Temperature Coefficient of Gain	±5 ppm/°C ±15 ppm/°C max
Temperature Coefficient of Offset	±10 ppm FSR/°C max
Power Supply Sensitivity:	
Gain	±0.001% per % change in power supply
Offset	±15 ppm of FSR per volt change in power supply
Warm-Up Time	10 minutes

AC CHARACTERISTICS

Conversion Rate:	
ZAD2736-1, ZAD2736-1B	125 kHz[2]
ZAD2736-2, ZAD2736-2B	200 kHz
A/D Conversion Time:	
ZAD2736-1, -1B	5 μs max
ZAD2736-2, -2B	5 μs max
S/H Acquisition Time	3 μs max
S/H Slew Rate	10 V/ μs
S/H Aperture Delay	8 ns typical, 12 ns max
S/H Aperture Uncertainty	±0.2 ns, ±0.4 ns, max
S/H Feedthrough	−96 dB typical, −90 dB max
Harmonic Distortion up to 108 kHz	±0.005%

DIGITAL CONTROLS

Control Compatibility	TTL logic levels
Trigger (positive transition):	
Fan In	1 TTL unit load
Width	50 ns min
Byte Enable Lines	
Output Enabled	Low
Tri-state	High
Propagation Delay	60 nsec
Fan In	1 TTL unit load

DIGITAL OUTPUTS

Parallel Data:	
Fan Out	2 TTL unit loads/line
Coding:	
ZAD2736-1, ZAD2736-2	Complementary Offset Binary
ZAD2736-1B, ZAD2736-2B	Offset Binary, 2's Complement
ZAD2736-1BU, ZAD2736-2BU	Unipolar Binary
End of Conversion (EOC)	High during conversion
Fan Out	2 TTL unit loads

POWER

+15 V ±3%	45 mA
−15 V ±3%	60 mA
+ 5 V ±5%	65 mA
− 5 V ±5%	55 mA

ENVIRONMENTAL

Temperature Range:	
Rated Performance	0°C to 60°C
Storage	−25°C to 85°C
Relative Humidity	0 to 85% non-condensing up to 40°C

MECHANICAL

Packaging:	
Dimensions	3"×4"×0.44"
Shielding	Electromagnetic 5 sides Electrostatic 6 sides
Case Potential	Analog Ground

1 Internal or external pots allow field calibration.
2 Including Internal S/H
3 Range must be specified at time of order.
4 External adjustments available on pins 12 and 31 for computer calibration and control.
5 Available on unit without S/H.

Specifications typical at 25°C and rated supply voltage unless otherwise specified.

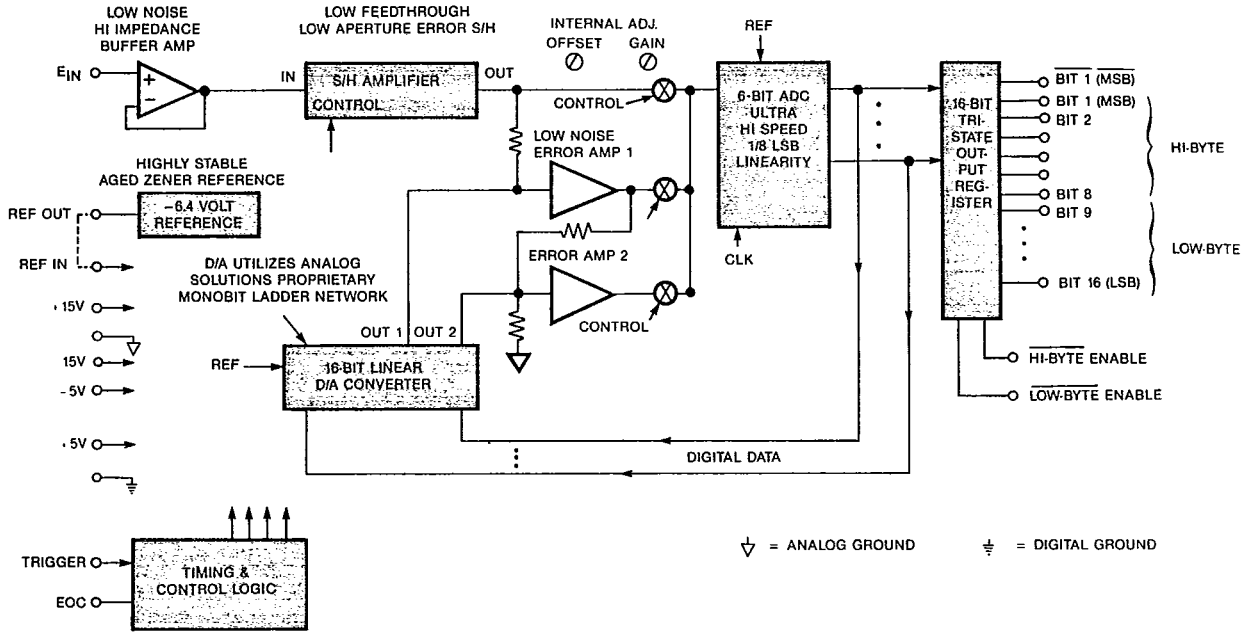


Figure 1 - ZAD2736 Three-Pass Digitally Corrected Sub-Ranging (DCSR) Architecture

Description of Converter

The ZAD2736 Series provides premium converter performance. The Series design is based on a proprietary three-pass Digitally Corrected Sub-Ranging (DCSR) technique which is applied in conjunction with our proven "monobit" D/A converter architecture.

The converter consists of an ultra-linear sample/hold (ZAD2736-1, -1B, 1BU only), an eight-bit flash, and a 16-bit accurate monobit DAC. The flash is utilized only to the six-bit level to ensure long-term accuracy. The monobit DAC reduces the converter's sensitivity to resistor drift.

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

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

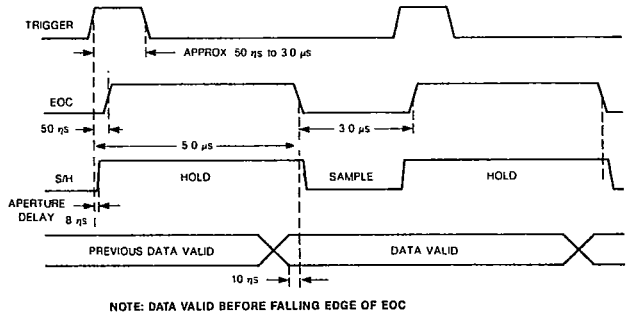


Figure 2 - Timing Diagram

Dynamic Correction of Gain and Offset

As illustrated in figure 3, external control of gain and offset can be accomplished at pins 31 and 12 respectively. By utilizing a 12-bit voltage output DAC for each adjustment, a computer system can readily control the overall calibration. This permits dynamic system calibration while the system is in operation to ensure a continuously-calibrated and accurate system. The need has been eliminated for time-consuming manual re-calibration to maintain precision.

The 12-bit DAC will provide a total adjustment of over ±500 LSB in offset and over ±3000 ppm in gain—well in excess of the requirements of most systems. When less adjustment resolution is acceptable, an 8-bit DAC can be used in place of the 12-bit unit. When dynamic correction is used, the DAC's should be allowed to settle for at least 20 microseconds before the next measurement is taken.

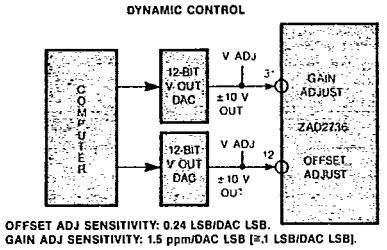


Figure 3 - External Offset and Gain Adjustment

ZAD2735/MP2735 Compatibility

While generally pin-compatible with the ZAD2735 15-bit ADC, the increased flexibility of the ZAD2736 requires the addition of several pins. These include additional analog grounds, tri-state output controls, and external gain and offset controls.

To make the ZAD2736-1 or ZAD2736-2 appear as an upgraded ZAD2735, the pins 58, 59 and 60 should be connected to digital ground. The other additional pins, (12, 13, 31, 55) should be left unconnected. Pin 38 will be the sixteenth bit (LSB).

The unit will now appear as a 16-bit version of the ZAD2735. Timing will be compatible with the ZAD2735.

Coding

The ZAD2736 is available with a variety of output codes including: Complementary Offset Binary for compatibility with the ZAD2735 15-bit converter; Offset Binary and 2's Complement for bipolar versions; and straight Binary for the 0 to 10 V version. (See Ordering Guide for model number description).

Complementary Offset Code

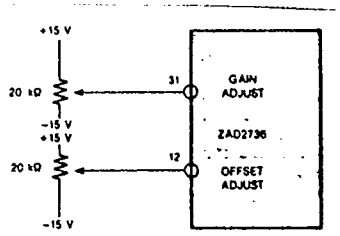
Input Voltage Bipolar	Output Code MSB LSB
+4.999847 V	00.....00
+0.000153 V	01.....10
+0.000000 V	01.....11
−0.000153 V	10.....00
−5.000000 V	11.....11

Binary Code

Input Voltage Bipolar	Unipolar	Output Code* MSB LSB
+4.999847 V	+9.999847 V	11.....11
+0.000153 V	+5.000153 V	10.....01
+0.000000 V	+5.000000 V	10.....00
−0.000153 V	+4.999847 V	01.....11
−5.000000 V	+0.000000 V	00.....00

*A) Code is Offset Binary for bipolar units, Straight Binary for unipolar units

B) For 2's Complement use $\overline{\text{MSB}}$ in place of MSB



NOTE: THE INTERNAL GAIN AND OFFSET CONTROLS SHOULD BE ADJUSTED TO MID-RANGE.

Figure 4 · Manual Offset and Gain Adjustment

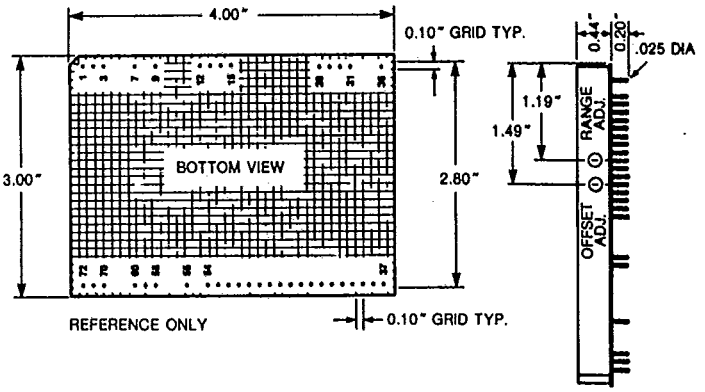


Figure 5 · Mounting Dimensions

Pin Assignments

1.	+15 V	30.	−6.4 V REF. OUT[4]	48.	BIT 7
2.	−15 V	31.	EXT. RANGE ADJ.	49.	BIT 6
3.	ANA. GND.[6]	36.	EOC	50.	BIT 5
7.	TEST POINT[1]	37.	TRIGGER	51.	BIT 4
12.	EXT. OFFSET ADJ.	38.	BIT 16 (LSB)	52.	BIT 3
13.	ANA. GND.[5]	39.	DIG. GND.[3]	53.	BIT 2
14.	ANA. GND.[5]	40.	BIT 15	54.	BIT 1 (MSB)
15.	ANA. INPUT	41.	BIT 14	55.	$\overline{\text{BIT 1}}$ (MSB)
28.	ANA. GND.[5]	42.	BIT 13	58.	$\overline{\text{HIGH BYTE}}$ ENABLE
29.	−6.4 V REF. IN[4]	43.	BIT 12	59.	LOW BYTE ENABLE
		44.	BIT 11	60.	TEST[2]
		45.	BIT 10	70.	DIG. GND.
		46.	BIT 9	71.	−5 V
		47.	BIT 8	72.	+5 V

NOTES:

1. Pin 7 (test point) must be left open. Do not use as tie point.
2. Pin 60 (test point) must be connected to digital ground.
3. Digital and analog grounds are internally connected.
4. Connect pin 29 to pin 30 if external reference is not used.
5. All analog grounds are internally connected.
6. Case connected to pin 3.

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 simply specify:

ZAD2736-1	Complementary Offset coding, includes internal S/H, ±5 V input
ZAD2736-2	Complementary Offset coding without internal S/H, ±5 V input
ZAD2736-1B	Offset Binary and 2's Complement coding. Includes internal S/H, ±5 V input
ZAD2736-1BU	Same as ZAD2736-1B except 0 to +10 V input, Binary Output coding
ZAD2736-2B	Offset Binary and 2's Complement coding without internal S/H, ±5 V input
ZAD2736-2BU	Same as ZAD2736-2B except 0 to +10 V input, Binary Output coding

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

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4.5M 3/87 Data subject to change without notice.