ANALOG SOLUTIONS
a division of Telecom Solutions

ZAD-2718

18-Bit, Sampling A/D Converter

T-51-10-90

Applications

- ❑ Precision Audio Digitizing
- ❑ Analytical Instrumentation
- ❑ FT-IR Spectroscopy Instruments
- ❑ Medical Imaging Equipment
- ❑ Automatic Test Equipment

Key Features

- ❑ 18-bit ADC with or without integral S/H amplifier
- ❑ 100-kHz throughput
- ❑ –110 dB total harmonic distortion (THD)
- ❑ –105 dB signal-to-noise ratio (SNR)
- ❑ Noise floor remains low over wide range of fundamental amplitude
- ❑ No "second ops" soldering
- ❑ EMI/RFI shielded
- ❑ Individually tested and certified
- ❑ Low cost

Solutions for Data Conversion

The ZAD-2718 is a true 18-bit, sampling A/D converter that satisfies stringent applications that are compromised by the levels of quantization noise and harmonic distortion produced by most 16-bit ADCs. It is a significant step in the evolution of moderate-cost, precision A/D converters.

As with all Analog Solutions products, the design, packaging and test of this precision converter are carefully controlled to insure top-level performance and reliability in your application. Every unit is individually tested and guaranteed to meet worst-case values for critical parameters so you won't run into unpleasant surprises when your system is in the field.

The ZAD-2718 is available in two forms:

- ZAD-2718-1, with internal sample and hold (S/H)
- ZAD-2718-2, without internal S/H

Figure 1 shows ZAD-2718 FFT spectral performance with 1-kHz and 19-kHz fundamentals, respectively, at an approximate 0 VU level. These plots were obtained using the Audio Precision System One Dual Domain™ analyzer at a 48-kHz sample rate, *non-averaged.*

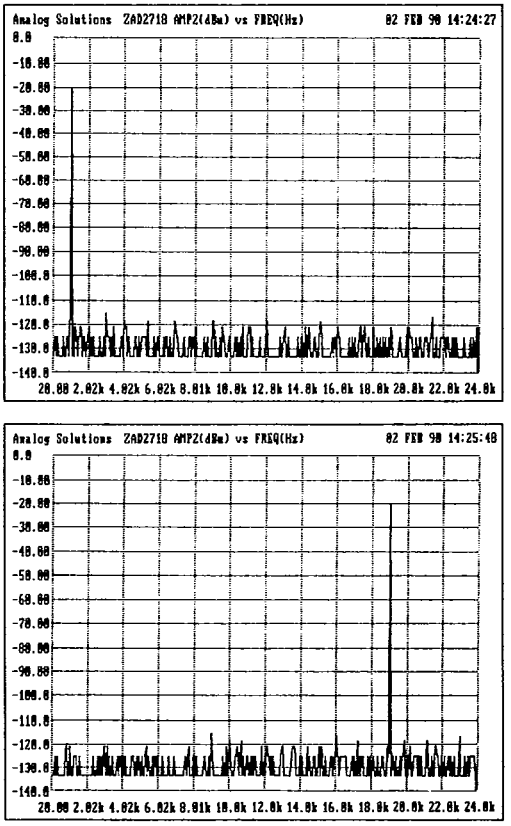


Figure 1. Audio Spectral Performance

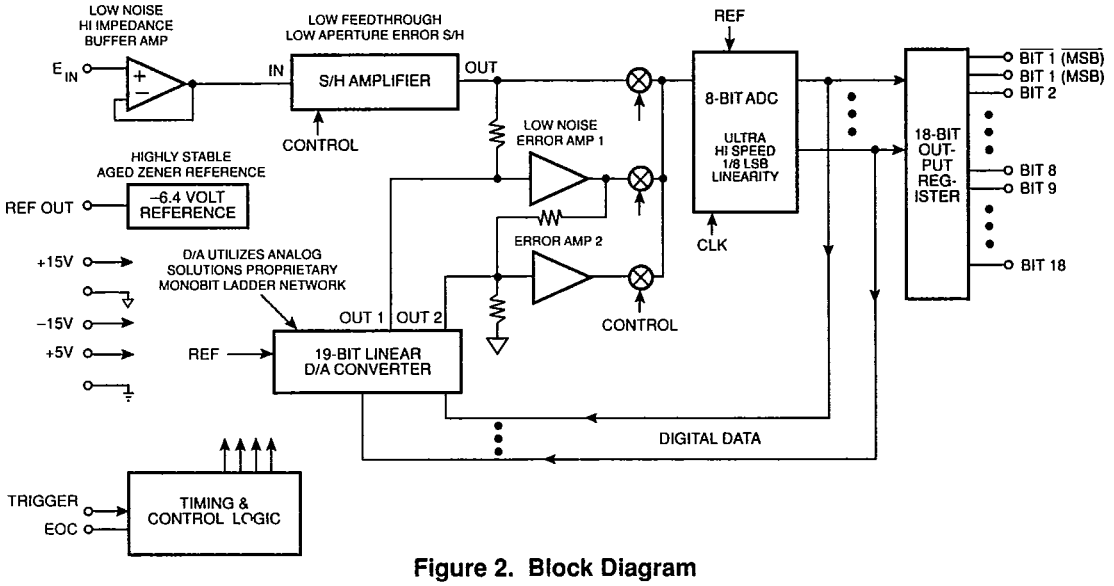


Figure 2. Block Diagram

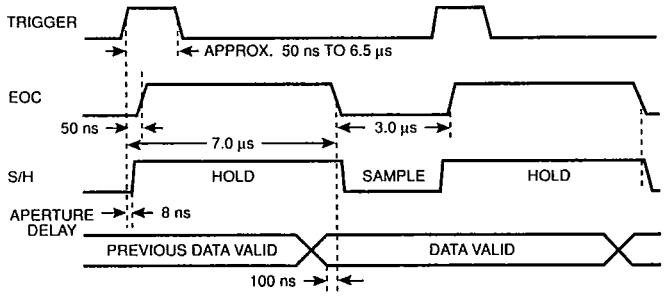
Product Description

The ZAD-2718 uses Analog Solutions' proven three-pass, digitally corrected subranging (DCSR) algorithm that effectively minimizes sensitivity to component drift over time and temperature. The internal 18-bit D/A is trimmed to 19-bit linearity using proprietary Analog Solutions techniques, based on our proven "Monobit" architecture. Premium and matched components are used throughout for better overall performance and uniform tracking over time and temperature. Carefully controlled manufacturing processes and optimum burn-in of the precision resistors ensures that the ZAD-2718 will continue to meet its original specifications for many years.

Most of the internal digital timing and control circuits for the A/D conversion process are contained in a single custom CMOS IC to improve reliability and reduce cost. This chip allows simple user interfacing by providing 19 parallel output data lines (18 data bits plus EOC). The fully electrostatic and electromagnetic shielded case uses a unique connector scheme to eliminate "second ops" soldering in assembly and effectively eliminate contamination and damage during fabrication.

Timing

As shown in Figure 3, conversion starts with the leading edge of the external trigger pulse. While the end of conversion (EOC) signal is at a logic "high", additional trigger pulses are ignored. The falling edge of the EOC signal indicates that the conversion process is complete and data is valid at the ADC output.



NOTES:
1. DATA VALID BEFORE FALLING EDGE OF EOC
2. TRIGGER MUST RETURN LOW PRIOR TO FALLING EDGE OF EOC

Figure 3. Timing Diagram

Performance

Figure 4 demonstrates that no significant harmonic distortion products are present. Unlike converters using the sigma-delta algorithm, the noise floor of the ZAD-2718 remains constant, even at –90 dBc. The ZAD-2718's overall linearity is consistent with 18-bit performance.

To receive a custom plot of how the ZAD-2718 will perform in your application, just call Analog Solutions.

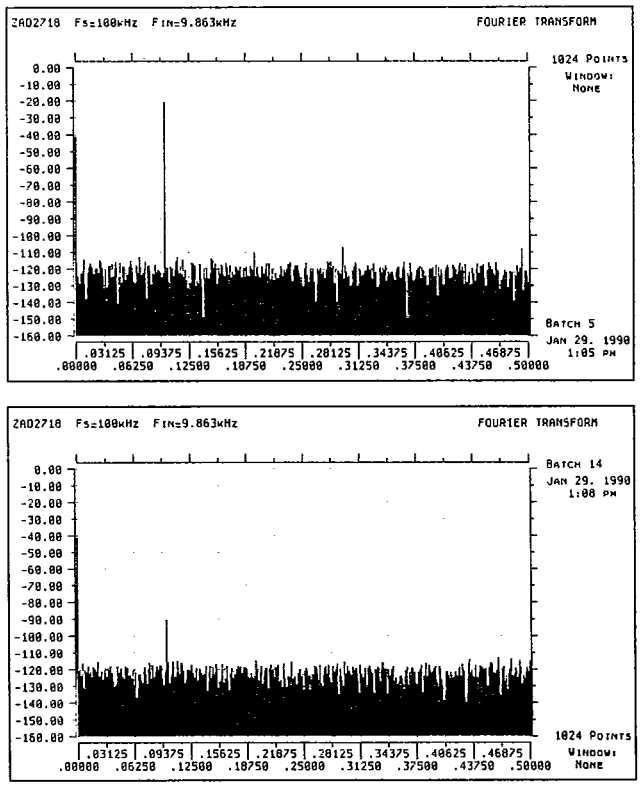


Figure 4. Harmonic Distortion and Spurious Noise Performance

Pinout and Mechanical Data

Pin Assignments

Connector J1 (16-pin)

1.	Offset ADJ[1]	9.	N/C
2.	Gain ADJ[1]	10.	REF OUT
3.	–15V Power	11.	N/C
4.	–15V Power	12.	N/C
5.	Analog RTN[2]	13.	Analog RTN
6.	Analog RTN	14.	Analog RTN
7.	+15V Power	15.	Analog IN
8.	+15V Power	16.	Analog RTN

Connector J2 (28-pin)

1.	Trigger	15.	BIT 11
2.	EOC	16.	BIT 12
3.	BIT 17	17.	BIT 9
4.	BIT 18 LSB	18.	BIT 10
5.	+5V	19.	Under-range[3]
6.	+5V	20.	N/C
7.	Digital RTN	21.	BIT 7
8.	Digital RTN	22.	BIT 8
9.	BIT 1 MSB (inv.)	23.	BIT 5
10.	Digital RTN	24.	BIT 6
11.	BIT 15	25.	BIT 3
12.	BIT 16	26.	BIT 4
13.	BIT 13	27.	BIT 1 MSB
14.	BIT 14	28.	BIT 2

NOTES:
1. Leave open if not used.
2. Digital and analog returns internally connected. Cover is tied to analog ground.
3. Input more negative than –5V causes pin 19 to be in high state.

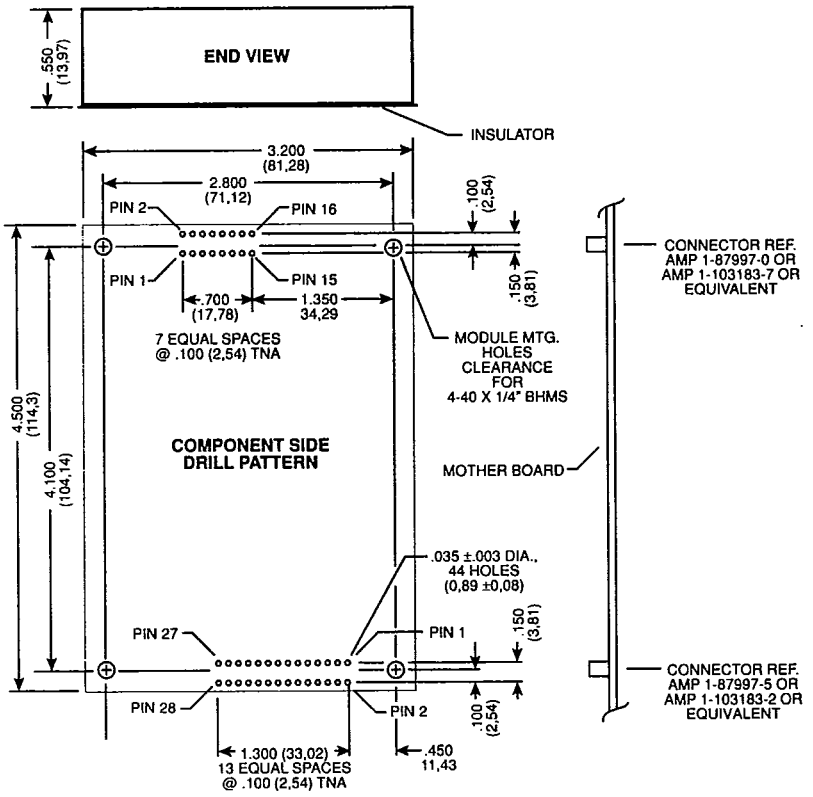


Figure 5. Outline

External Connections

See Figure 6 for specific connection schemes. Isolating the A/D's digital output from the host buss by buffering or optical isolating prevents digital noise injection into the analog signal path. All bypassing or buffering elements should be configured as close to the connectors as possible.

ZAD-2718 power inputs should not be "daisy-chained" on the mother board, but brought in separately from the backplane or power distribution area. For improved noise isolation in systems containing several microprocessors, consider regulating the A/D's +5V from the analog +15V.

Avoid ground loops. Do not connect analog and digital grounds together, except at the power source. They are tied internally to the ZAD-2718 so that noise and transients occurring on the ground paths will be rejected as common-mode signals. Manual offset and gain adjustments can be arranged as shown in the shaded areas.

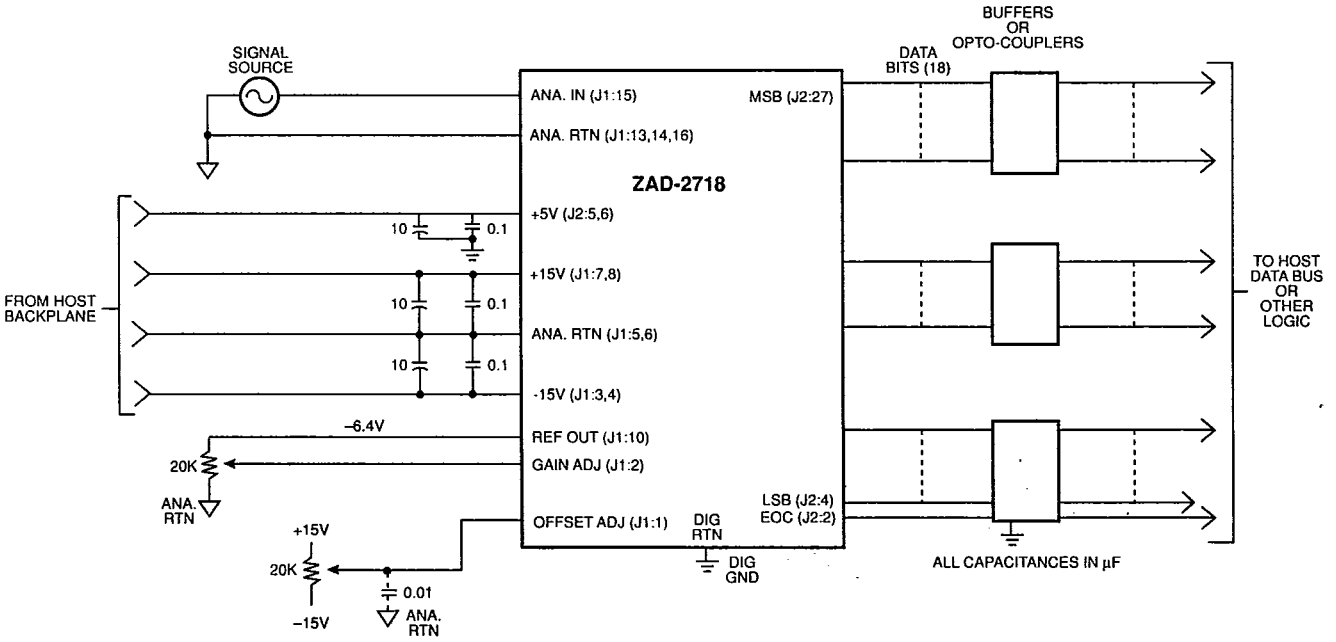


Figure 6. External Connections

Performance Specifications

ANALOG INPUT

Input Range	±5V (±15V max without damage)
Input Bias Current	300 nA max.
Input Capacitance	10 pF
Input Impedance	10^9 Ω

DIGITAL INPUTS

Logic	1 HCMOS Load (Schmitt Trigger)
Trigger Pulse Width	6.5 µsec max.
	30 nsec min. (positive pulse)

DIGITAL OUTPUTS

Fan-Out	HCMOS 10 LSTTL Loads
Output Coding[1]	Offset Binary, 2's Complement
Output Voltage	HCMOS Compatible
EOC	High during conversion

REFERENCE

Internal Reference Output Voltage	–6.4V (will drive external 10 mA load)

DYNAMIC CHARACTERISTICS

Throughput Rate	DC to 100 kHz
A/D Conversion Time	7 µsec max.
Signal-to-Noise Ratio[2]	
1 kHz	105 dB typ., 100 dB min.
20 kHz	105 dB typ., 100 dB min.
Peak Harmonic Distortion[3]	
1 kHz	–110 dB typ., –100 dB max.
20 kHz	–100 dB typ., –96 dB max.
Gain Flatness	–0.1 dB @ 70 kHz
	–0.01 dB @ 25 kHz

SAMPLE HOLD

Acquisition Time	3.0 µsec max.
Aperture Delay	8 nsec typ., 13 nsec max.
Aperture Jitter	40 psec typ., 50 psec. max.
Feedthrough	–100 dB max.

TRANSFER CHARACTERISTICS

Resolution	18 bits
Quantization Error	±0.5 LSB
Integral Non-Linearity	0.0015% max.
Differential Non-Linearity	±0.5 LSB typ., ±0.75 LSB max.
Offset Error	±1 mV max.
Gain Error	0.01% FSR max.
No Missing Codes	18 bits guaranteed

STABILITY (0° TO 60°C)

Differential Non-Linearity	±0.5 ppm FSR/°C max.
Offset Voltage	±50 µV/°C max.
Gain	±10 ppm FSR/°C max.
Warm-up Time	5 minutes max.

SUPPLY REJECTION

Offset	75 µV/1% change of supply, max.
Gain	75 µV/1% change of supply, max.

POWER REQUIREMENTS

Supply Range	
±15V supplies	±15%
+5V supplies	4.75 V min., 5.25 V max.
±15V current draw	50 mA
+5V current draw	160 mA
Power Consumption	2.3 W

ENVIRONMENTAL & MECHANICAL

Temperature	
Rated Performance	0° to 60°C
Storage	–55° to +75°C
Relative Humidity	0 to 90%, non-condensing up to 40°C
Dimensions	3.2" x 4.5" x 0.55"
Shielding	EMI and RFI shielded, 6 sides
Case Potential	Ground

NOTES:

1 Contact factory for other output coding options.

2 Signal to noise (RMS bits) after 2nd through 5th harmonics removed.

3 Absolute measurement of peak harmonics relative to fundamental frequency amplitude.

4 For a custom plot of ZAD-2718 response for your specific application, contact Analog Solutions.

Ordering Guide

To order or obtain more information, simply contact any Analog Solutions office and specify:

- ZAD-2718-1 True 18-Bit Sampling ADC
- ZAD-2718-2 True 18-Bit Sampling ADC without S/H

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