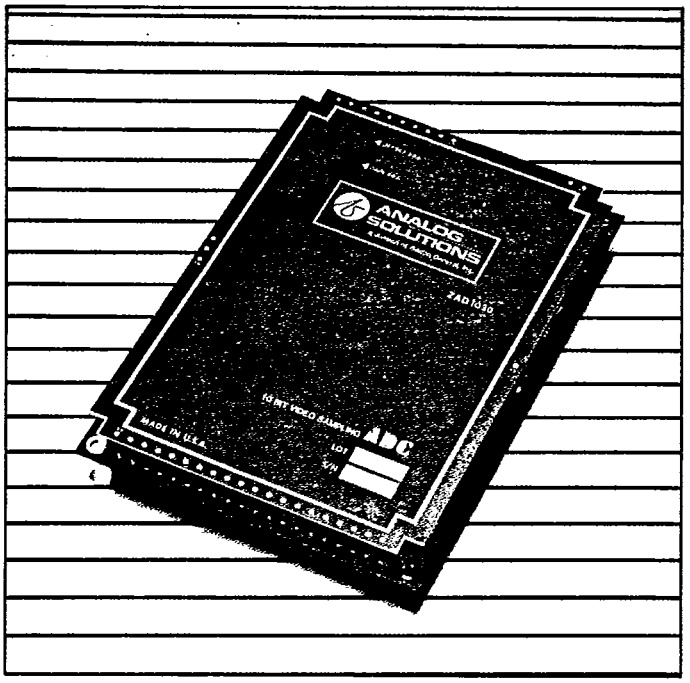
ANALOG SOLUTIONS™
a subsidiary of Silicon General, Inc.

# ZAD1030

**Video Sampling Analog-To-Digital Converter**

T-51-10-10




## Applications

- ☐ Medical Imaging Systems
- ☐ Signature Analysis
- ☐ Spectrum Analysis
- ☐ Radar Digitizing
- ☐ Television Digitizing

## Key Features

- ☐ 10-bit @ 30 MHz Word Rates
- ☐ Fully Variable Conversion Speed
- ☐ Typical Power Consumption 13 Watts
- ☐ Built-in Track and Hold
- ☐ ECL Compatible
- ☐ Pin-Compatible with MOD-1020

# Solutions for Data Conversion

### General Description

The Analog Solutions model ZAD1030 is an ultra-high-speed, Sampling A/D Converter with 10-bit linearity at word rates to 30 MHz and at input signals to 30 MHz. The ZAD1030 utilizes a unique circuit design along with the latest custom semiconductor and Surface Mount Technology (SMT) to provide the high performance necessary in video converters.

The 1030 operates from DC to 30 MHz which eliminates the need to specify unit operation for fixed conversion rates. A maximum differential and integral non-linearity of ±1 LSB is guaranteed. The ZAD1030 has fewer parts and 35% less power dissipation than earlier designs.

The ZAD1030 is constructed on a single 5″×7″ printed circuit board and is pin-compatible with the MOD1020, while offering superior performance. It is a complete converter including integral tract-and-hold, timing circuitry, references and latched digital outputs. The outputs are a balanced parallel digital configuration. The A/D requires only an external encode command input pulse and external power supplies for proper operation. With an input impedance greater than 500 ohms, the unit is easily terminated to match the lower impedance of the system.

The ZAD1030, with superior 10-bit linearity over the full input bandwidth, provides immediate performance improvements when replacing older video converters.

The ZAD1030 is ideally suited for systems requiring the ultimate in conversion speed, accuracy and flexibility. Such applications include variable frame rate television, radar digitizing, digital communications, medical instrumentation and many others.

# PERFORMANCE SPECIFICATIONS ZAD1030 VIDEO SAMPLING ANALOG-TO-DIGITAL CONVERTER

## SPECIFICATIONS*

| | |
|---|---|
| Resolution | 10 bits (0.1% FS) |
| LSB Weight | 1 mV or 2 mV depending upon selected input range |

## ANALOG INPUT

| | |
|---|---|
| Voltage Range | 1 Vp-p or 2 Vp-p depending upon hook-up (see figure on page 4) |
| Impedance | 1000 ohm (2 V Input Range)<br>500 ohm (1 V Input Range) |
| Offset | Preset at factory to Bipolar input range. Adjustable to Unipolar range with on board potentiometer (see table 4) |
| Maximum Input Voltage | 15 V (2 V input range)<br>8 V (1 V input range) |

## ACCURACY

| | |
|---|---|
| No Missing Codes | Guaranteed |
| Monotonicity | Guaranteed |
| Differential Non-Linearity: @ DC to 10MHz | ±½ LSB typ., ±1 LSB max. |
| Integral Non-Linearity: | ±½ LSB typ., ±1 LSB max. |
| Gain Error | Adjustable to zero with on-board potentiometer |
| Gain Versus Temp. | ±0.015% of FSR/°C |
| Offset Error | Adjustable to zero with on-board potentiometer |
| Offset vs Temperature: | ±0.025% FSR/°C |

## ENCODE COMMAND INPUT

Balanced input; ENCODE and $\overline{\text{ENCODE}}$
Start conversion on rising edge of ENCODE.

| | |
|---|---|
| Logic Compatibility | Balanced ECL:<br>0 = −1.7V, 1 = −0.9V |
| Impedance | 100 ohm line-to-line |
| Rise and Fall Time | 5 ns max. |
| Duration (Min/Max) | 10 ns/70% of duty cycle |
| Frequency | DC to 30 MHz, fully variable |

## DATA READY OUTPUT

| | |
|---|---|
| Logic Level, | |
| ECL Compatible | 0 = −1.7 V |
| (Balanced Output) | 1 = −0.9V |
| Rise and Fall Times | 5 ns max. |
| Duration | 20 ns ±3 ns |

## TEMPERATURE RANGE

| | |
|---|---|
| Operating | 0 to 70°C |
| Storage | −55 to +85°C |

Cooling requirement-forced airflow of 500 lfpm required at ambient temperatures above 35°C.

## DYNAMIC CHARACTERISTICS

| AC Linearity | Spurious Signals | S/N Ratio |
|---|---|---|
| DC to 0.5 MHz | −64 dB max.<br>−68 dB typ. | 55 dB min.<br>58 dB typ. |
| 0.5 MHz to .99 MHz | −62 dB max.<br>−67 dB typ. | 53 dB min.<br>56 dB typ. |
| 1 to 4.99 MHz | −59 dB max.<br>−64 dB typ. | 50 dB min.<br>53 dB typ. |
| 5 to 8.99 MHz | −56 dB max.<br>−60 dB typ. | 46 dB min.<br>50 dB typ. |
| 9 to 12.49 MHz | −51 dB max.<br>−55 dB typ. | 44 dB min.<br>47 dB typ. |
| 12.5 to 15 MHz | −48 dB max<br>−50 dB typ. | 42 dB min.<br>45 dB typ. |

| | |
|---|---|
| Conversion Rate | DC to 30 MHz fully variable |
| Aperture Time Delay | 5 ns max. |
| Aperture Hitter | 10 ps rms max. |
| Power Supply Sensitivity | Output Change <0.1%/V change on any supply |
| Input Bandwidth<br>Flat within ±0.2 dB<br>Flat within ±0.6 dB | <br>DC to 12.5 MHz<br>DC to 25 MHz |
| Transient Response[2] | 50 ns |
| Overvoltage Recovery[3] | 50 ns |
| Conversion Time | 46 ns + 2 clock periods. Output data valid after third convert command (2 pipeline delays). Use of the data-ready output is recommended for strobing output data into external registers. |

## DIGITAL OUTPUT DATA

| | |
|---|---|
| Format | 10 parallel bits, NRZ |
| Logic Levels, | |
| ECL Compatible | "0" = −1.7 V |
| (Balanced Output) | "1" = −0.9 V |
| Drive | 75 ohm to 100 ohm Line-to-Line |
| Time Skew | 5 ns max. |
| Coding | Binary, Offset binary, 2's Complement |

## POWER REQUIREMENTS

| | |
|---|---|
| + 15 V ±5% | 225 mA. |
| − 15 V ±5% | 195 mA. |
| + 5 V ±5% | 160 mA. |
| −5.2 V ±5% | 1.3 A. |
| Power Consumption | 13.9 W |

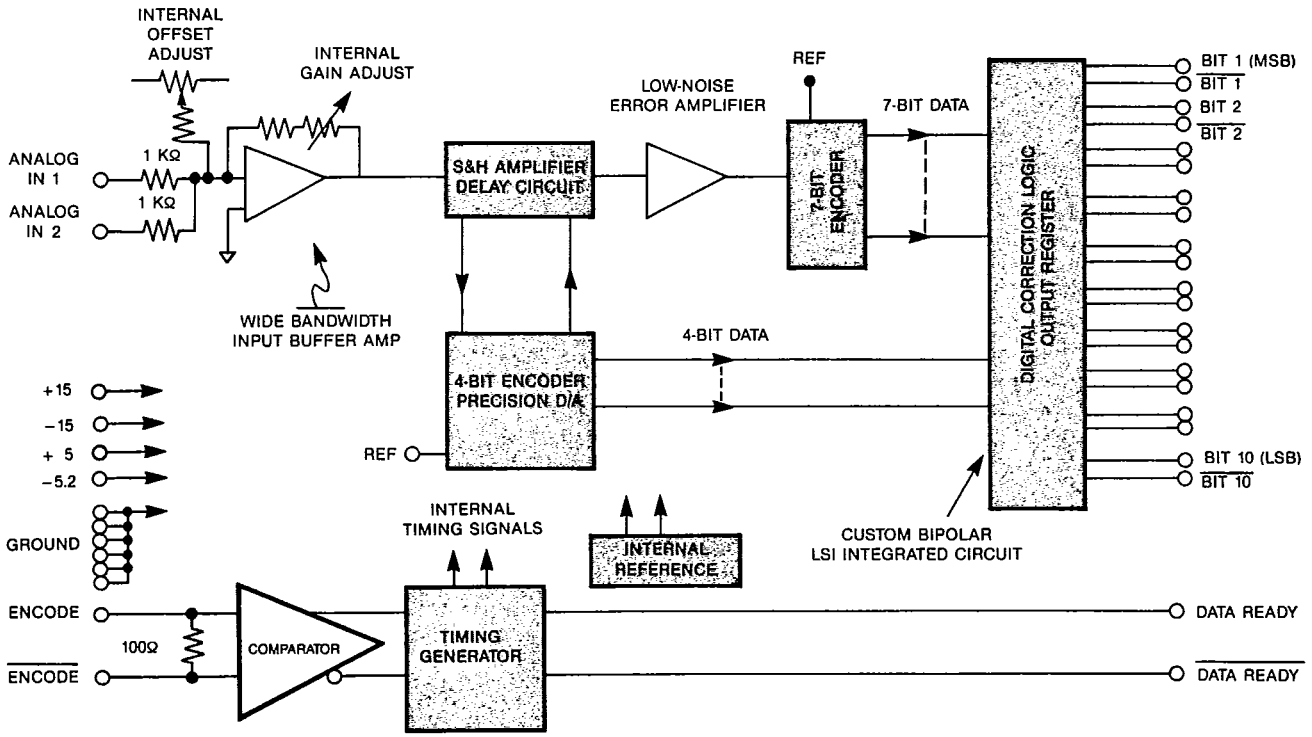
## PHYSICAL CHARACTERISTICS

| | |
|---|---|
| CONSTRUCTION | Single Printed Circuit Card 5″ × 7″ |

Notes:
*Specifications apply at 25°C and nominal supply voltages unless otherwise indicated.

1) RMS signal to RMS noise ratio with 500 kHz analog input.
2) For full-scale step input attains 10-bit accuracy in time specified.
3) Recovers to 10-bit accuracy after 2 X FS input over voltage in specified time.
4) Shaded areas denote enhanced performance.

Specifications subject to change without notice.



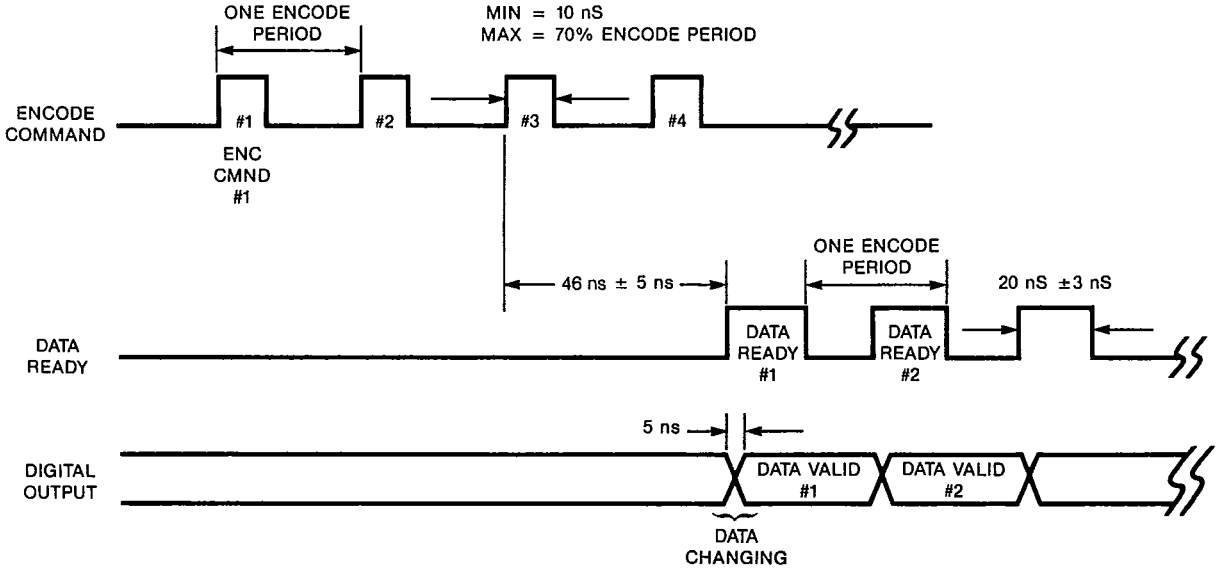

**Block Diagram**

## Description of ZAD1030

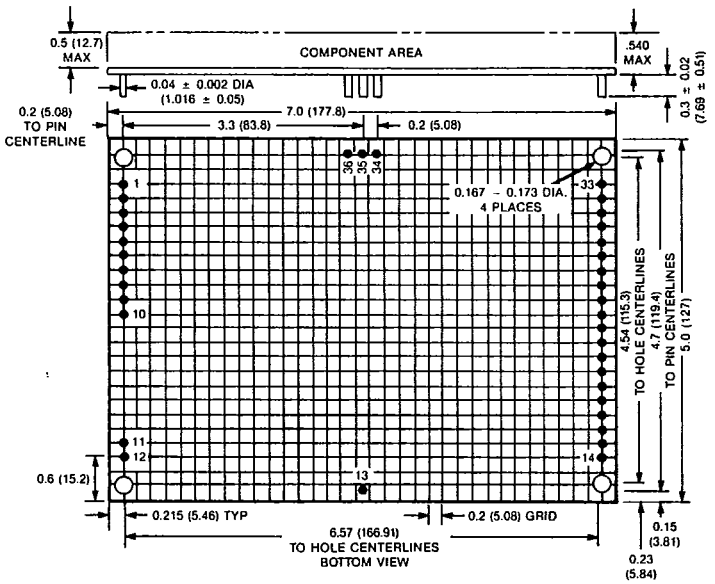
The analog input signal is applied through the input buffer amplifier to a proprietary ultra-high-speed 4-bit flash converter and S/H amplifier. The output of the 4-bit flash is applied to a true 10-bit video speed DAC. This output is subtracted from the input and the output is then digitized by a 7-bit flash converter. The 4-bit initial conversion and 7-bit second conversion are combined with 1 bit of digital correction overlap, to provide the 10-bit output results. This A/D architecture is a Digitally Corrected Sub-Ranging (DCSR) structure and has all of the error correction benefits of this approach.

A custom digital IC provides the digital correction circuitry and output latches necessary for the ZAD1030's proper operation.

Using custom IC's and the latest analog circuit design, the ZAD1030 has fewer parts and dissipates 35% less power than older designs. This reduction in component count and heat dissipation results in a converter that is more stable and much more reliable.




**Timing Diagram**




**Mechanical Configuration**

## Pin Assignments

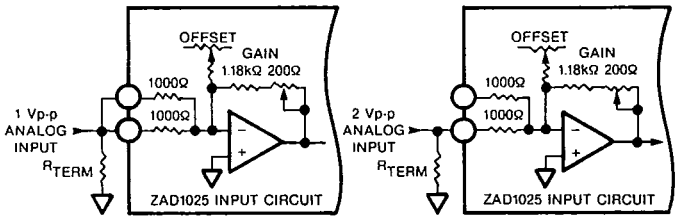
| | | | |
|---|---|---|---|
| 1 | GROUND | 19 | $\overline{\text{BIT 8}}$ |
| 2 | ENCODE COMMAND | 20 | BIT 7 |
| 3 | $\overline{\text{ENCODE COMMAND}}$ | 21 | $\overline{\text{BIT 7}}$ |
| 4 | GROUND | 22 | $\overline{\text{BIT 6}}$ |
| 5 | −5.2 V | 23 | BIT 6 |
| 6 | +15 V | 24 | $\overline{\text{BIT 5}}$ |
| 7 | −15 V | 25 | BIT 5 |
| 8 | GROUND | 26 | $\overline{\text{BIT 4}}$ |
| 9 | ANALOG INPUT #1 | 27 | BIT 4 |
| 10 | ANALOG INPUT #2 | 28 | BIT 3 |
| 11 | +5 V | 29 | $\overline{\text{BIT 3}}$ |
| 12 | GROUND | 30 | BIT 2 |
| 13 | GROUND | 31 | $\overline{\text{BIT 2}}$ |
| 14 | BIT 10 (LSB) | 32 | $\overline{\text{BIT 1}}$ |
| 15 | $\overline{\text{BIT 10}}$ | 33 | BIT 1 (MSB) |
| 16 | BIT 9 | 34 | $\overline{\text{DATA READY}}$ |
| 17 | $\overline{\text{BIT 9}}$ | 35 | GROUND |
| 18 | BIT 8 | 36 | DATA READY |

All ground pins are connected together within the ADC.

## Offset and Gain Adjustment

The offset of the ZAD1030 is adjusted by varying the offset adjustment potentionmeter. Apply an input voltage corresponding to positive full scale to the analog input. Adjust the offset adjustment potentionmeter such that the digital output is changing between 1111111111 and 1111111110.

The gain of the ZAD1030 can be adjusted by varying the gain adjustment potentionmeter. Apply an input voltage to the analog input that corresponds to negative full scale. Adjust the gain adjustment potentionmeter such that the digital output is between 0000000000 and 0000000001. Refer to diagram to determine proper input voltages for the offset and gain adjustments.




**1V Range** **2V Range**

**Figure 4 — Input Connection**

**Table 4 — Input Voltage**

| Offset Adjust Setting | 1V Range | 2V Range |
|---|---|---|
| 1/8 from full CW (Bipolar) | −.4995V, + .4995V | −.999V, + .999V |
| 1/8 from full CW (Unipolar) | 0V, + .999V | 0V, + 1.998V |

### Additional Products from Analog Solutions

Precision Sampling A/D Converters
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High-Speed Industrial Control Interfaces
Precision Strain Gage and Load Cell Measurement Sub-systems

### Custom Products

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

**To Order Simply Specify:**

Since every ZAD1030 operates over the full DC to 30 MHz conversion rate, no special encode rate suffixes are required.

For more information, contact Analog Solutions.

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