

FEATURES

12 Bits @ 5MHz Word Rate
One-27 Sq. In. PC Board
Built-In Track-and-Hold – 25ps Aperture Uncertainty
15MHz Analog Input Bandwidth
TTL Compatible
Low (13-Watt) Power Dissipation
Signal-to-Noise Ratio Greater Than 66dB
Noise Power Ratio Greater Than 56dB
Completely Repairable

APPLICATIONS

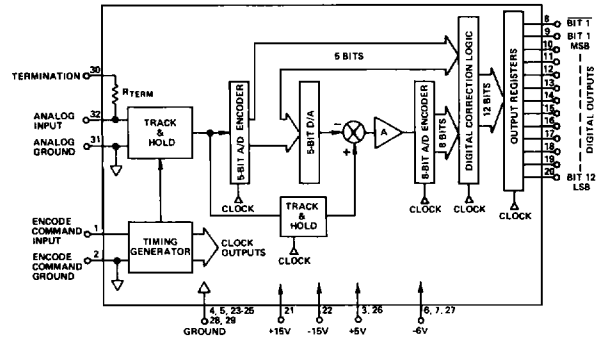
Radar Digitizing
Digital Communications
Real Time Spectrum Analysis
Signature Analysis

GENERAL DESCRIPTION

Analog Devices' model MOD-1205 is a very high-speed A/D converter capable of digitizing video input signals to 12-bit accuracy at random or periodic word rates of dc through 5MHz. The MOD-1205 is truly a breakthrough in high-speed A/D technology. It utilizes the latest state-of-the-art conversion technique called digital correcting subranging (DCS) to effectively eliminate errors normally associated with subranging type ADCs. It is the most cost effective A/D in this speed category, combining small size and low power dissipation with low cost.

The MOD-1205 is constructed on a single printed circuit card which is intended for mounting on a system mother board and occupies only 27 square inches. Within this A/D is the required sample/track-and-hold amplifier, encoder, timing circuits and output latches for a true simultaneous, all-parallel digital output.

MOD-1205 FUNCTIONAL BLOCK DIAGRAM



NOTE: WITH PIN 30 OPEN, ANALOG INPUT IMPEDANCE IS 400Ω; WITH PIN 30 GROUNDED, ANALOG IMPEDANCE IS 50Ω.

The encode command input and digital outputs are TTL compatible. The A/D requires only an external encode command pulse and external power supplies for operation. **NO** external parts are required. Gain and offset potentiometers are provided on the card. The A/D is fully repairable either at the factory or in the field.

The MOD-1205 is ideally suited for systems requiring the ultimate in conversion speed and accuracy. Such applications include radar digitizing, digital communications, spectrum analysis, and many others. Each MOD-1205 is backed by Analog Devices' limited one year warranty.

SPECIFICATIONS (typical @ +25°C with nominal power supplies unless otherwise noted)

| MODEL | MOD-1205 |
|---|--|
| RESOLUTION (FS = FULL SCALE) | 12 Bits (0.024% FS) |
| LSB WEIGHT | 1mV |
| ACCURACY (INCLUDING LINEARITY) @ DC | ±0.0125% Full Scale ±1/2LSB |
| Monotonicity | Guaranteed (0 to +70°C) |
| Nonlinearity vs. Temperature | 0.005% of FS/°C, max |
| Gain vs. Temperature | 0.01% of FS/°C, type; 0.03% of FS/°C, max |
| DYNAMIC CHARACTERISTICS | |
| AC Linearity ¹ (dc to 1MHz) | Spurious Signals >70dB below FS, max |
| (1MHz to 2.5MHz) | Spurious Signals >65dB below FS, max; >68dB, typ |
| Conversion Time | See Text and Timing Diagram |
| Conversion Rate (Word Rate) | 5MHz |
| Aperture Uncertainty (Jitter) | ±25ps max |
| Aperture Time | 30ns (±10ns from unit to unit) |
| Signal to Noise Ratio ² | 66dB min; 68dB, typ |
| Noise Power Ratio ³ | 56dB min, 58dB typ |
| Transient Response ⁴ | 12-Bit (0.0125%) Accuracy within 200ns |
| Overvoltage Recovery Time ⁵ | 200ns |
| Input Bandwidth (small signal, 3dB) | 15MHz min |
| Input Bandwidth (large signal, 3dB) | 10MHz min; flat within ±0.1dB, dc through 5MHz |
| ANALOG INPUT | |
| Voltage Range | ±2.048V FS |
| | ±4V Absolute max |
| Impedance | 400Ω with pin 30 open, 50Ω with pin 30 grounded |
| Offset Voltage | Adjust to 0 with On Board Potentiometer |
| Offset vs. Temperature | 0.02% FS/°C, type; 0.05% of FS/°C, max |
| Bias Current | 1nA max |
| ENCODE COMMAND INPUT | |
| Logic Levels, TTL Compatible | "0" = 0 to +0.4V |
| | "1" = +2.4V to +5V |
| Logic Loading | 2 Standard TTL Gates |
| Rise and Fall Times | 10ns max |
| Duration min/max | 25ns/50% of Duty Cycle |
| Frequency (Random or Periodic) ⁶ | 5MHz |
| DIGITAL DATA OUTPUT | |
| Format | 12 Parallel Bits, NRZ |
| Logic Levels, TTL Compatible | "0" = 0 to +0.4V |
| | "1" = +2.4V to +5V |
| Drive (Not Short Circuit Protected) | Up to 1 Schottky TTL or |
| | 2 Standard TTL Loads |
| Time Skew | 10ns max |
| Coding | Offset Binary (OBN) or 2's complement (2SC) |
| Conversion Time | See Text on the Next Page |
| POWER REQUIREMENTS ⁶ | |
| +15V ±5% | 200mA |
| -15V ±5% | 150mA |
| -6V ±4% | 700mA |
| +5V ±5% | 800mA |
| Power Consumption | 13 Watts |
| TEMPERATURE RANGE | |
| Operating | 0 to +70°C |
| Storage | -55°C to +85°C |
| Cooling Requirements | 500 Linear Feet Per Min (LFPM) @ +70°C |
| PHYSICAL CHARACTERISTICS | |
| Construction | Single Printed Circuit Card |

NOTES:

¹ AC linearity expressed in terms of spurious in-band signals generated at specified encode rates at analog input frequencies ().

² rms signal to rms noise at 500kHz analog input.

³ dc to 2.4MHz white noise bandwidth with slot frequency of 512kHz.

⁴ For full-scale step input, attains 12-bit accuracy in time specified.

⁵ Recovers to 12-bit accuracy after 2 X FS input overvoltage in time specified.

⁶ For operation at word rates below 500kHz, consult factory.

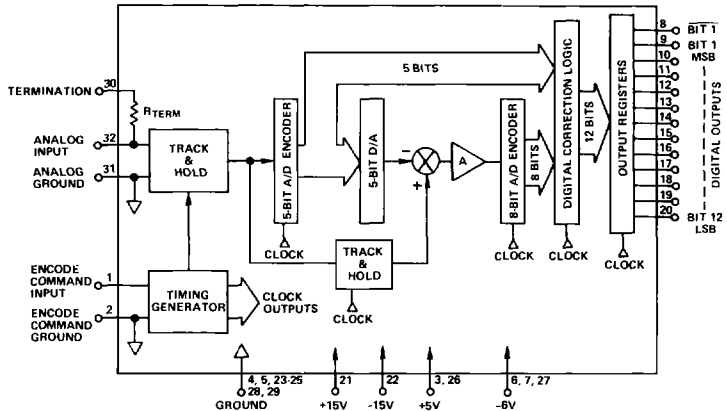
Specifications subject to change without notice.

| PIN | FUNCTION |
|-----|----------------|
| 1 | ENCODE COMMAND |
| 2 | GND* |
| 3 | +5V |
| 4 | GND* |
| 5 | GND* |
| 6 | -6V |
| 7 | -6V |
| 8 | BIT 1 |
| 9 | BIT 1 (MSB) |
| 10 | BIT 2 |
| 11 | BIT 3 |
| 12 | BIT 4 |
| 13 | BIT 5 |
| 14 | BIT 6 |
| 15 | BIT 7 |
| 16 | BIT 8 |

| PIN | FUNCTION |
|-----|--------------|
| 17 | BIT 9 |
| 18 | BIT 10 |
| 19 | BIT 11 |
| 20 | BIT 12 (LSB) |
| 21 | +15V |
| 22 | -15V |
| 23 | GND* |
| 24 | GND* |
| 25 | GND* |
| 26 | +5V |
| 27 | -6V |
| 28 | GND* |
| 29 | GND* |
| 30 | TERMINATION |
| 31 | GND* |
| 32 | ANALOG INPUT |

*ALL GROUND PINS ARE CONNECTED TOGETHER WITHIN THE MOD-1205

Pin Designations



NOTE: WITH PIN 30 OPEN, ANALOG INPUT IMPEDANCE IS 400Ω. WITH PIN 30 GROUNDED, ANALOG IMPEDANCE IS 50Ω.

MOD-1205 Block Diagram

ORDERING INFORMATION

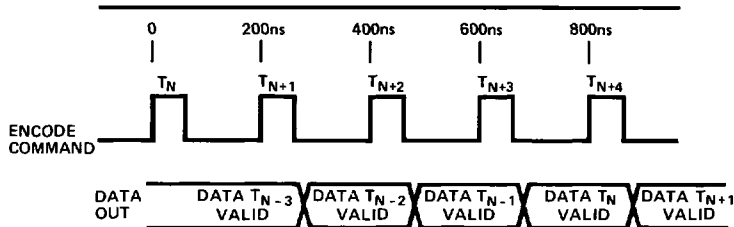
Order model number MOD-1205 A/D converter. Mating pin sockets for the MOD-1205 are model number MSB-2 (32 required per A/D).

CONVERSION TIME

Output data is valid two encode command clock periods plus 275ns ±25ns after application of an initial encode command pulse. Due to the pipeline delay effect of the A/D, a total of

three encode command pulses are required to shift the data to the output of the A/D. For example, with a 5MHz encode rate, data is valid 675ns ±25ns after the application of the first encode command pulse—assuming that two pulses occur after the first.

Use of the trailing edge of the encode command is recommended for strobing output data into external register (see Figure 1).



DATA T_N (THE RESULT OF ENCODE COMMAND T_N) OCCURS TWO CONVERSION PERIODS PLUS 275ns ±25ns AFTER ENCODE COMMAND T_N . FOR A 5MHz WORD RATE AS SHOWN, DATA IS VALID 275ns ±25ns AFTER THE THIRD ENCODE COMMAND PULSE OR $T_N + 675ns ±25ns$. IN ALL CASES, THREE ENCODE COMMAND PULSES ARE REQUIRED FOR TRANSFER OF DATA TO THE OUTPUT, DUE TO THE PIPELINE DELAY EFFECT THROUGH THE A/D. NO DATA READY PULSE IS SUPPLIED.

Figure 1. MOD-1205 Timing Diagram

GROUND CONNECTIONS

It should be noted that the MOD-1205 PC board has 9 ground pins. These are all connected to the ground plane on the board. For best results it is recommended that ALL of these pins be connected to a massive system or "mother board" ground plane.

CALIBRATION PROCEDURE (MOD-1205)

The MOD-1205 A/D is precisely calibrated at the factory before shipments and should need no further calibration. However, if slight readjustments of the A/D are required in the system, the following procedure should be followed. This procedure refers to a binary output.

Offset Adjustment

The offset is adjusted by varying potentiometer R22 with 0 volts applied to the analog input. To obtain the proper output

code, observe that the digital output is changing between 1000000000 and 0111111111 at this adjustment level. When properly adjusted a digital code of 1000000000 will represent an analog input 1/2LSB above zero volts, and a digital code of 0111111111 will represent an analog input of 1/2LSB below zero volts.

Gain Adjustment

The gain is adjusted by varying potentiometer R2. This adjustment is made by applying +2.0465V (FS -1 1/2LSB) to the analog input and while monitoring the digital output, adjust R2 for the output code varying between 1111111110 and 1111111111 (FS). If the user needs to offset the entire range of the A/D, this can be accomplished by a readjusting R22 as required. However, in this procedure, the offset should always be adjusted first.

OUTLINE DIMENSIONS

Dimensions shown in inches and (mm).

