

PRODUCT DATA SHEET

FEATURES

ADC-301

- 8-Bit resolution
- Non-linearity  $\pm \frac{1}{2}$  LSB
- Conversion rate 30 MHz
- 15 MHz bandwidth
- 35 pF input capacitance
- Power dissipation 420 mW

ADC-302

- 8-Bit resolution
- Non-linearity  $\pm \frac{1}{2}$  LSB
- Conversion rate 50 MHz
- 25 MHz bandwidth
- 35 pF input capacitance
- Power dissipation 550 mW

GENERAL DESCRIPTION

These ADC's are video speed 8-bit flashes capable of digitizing analog signals at conversion rates of 30 MHz (ADC-301) and 50 MHz (ADC-302) with a power consumption of 420 mW and 550 mW respectively.

The 256 clocked comparators have the analog voltage applied to one input and a voltage derived from the reference voltage and reference resistors applied to the other comparator input.

The comparator outputs are 'anded' with adjacent outputs and these outputs latched into a 6-bit encoder. These 6-bit codes are further encoded to 8-bit codes and latched. The final ECL output buffer stage requires external pull down resistors, the output being delayed from the sampling point by the time of one clock cycle.

Output polarity of the MSB and LSB's respectively can be controlled on two digital input lines.

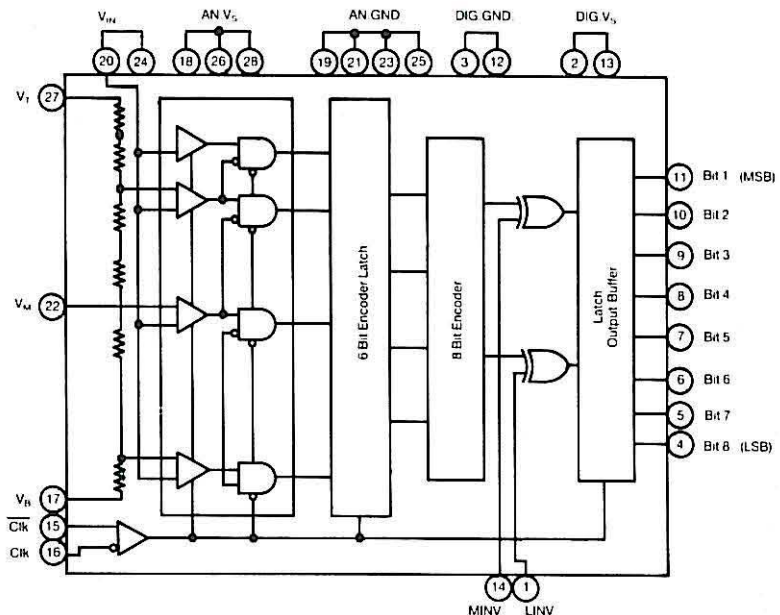
With a reference of -2V the analog input range will be 0 to -2V.

APPLICATIONS

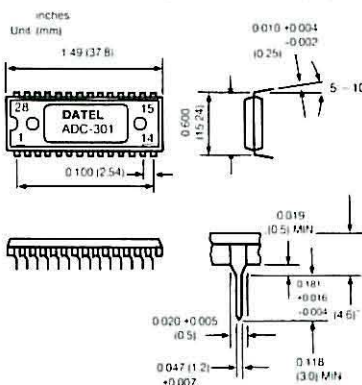
- High speed data acquisition
- Radar pulse analysis
- TV video encoding
- High energy physics
- Transient analysis
- Medical electronics
- Fluid flow analysis
- Sonar systems

**OBSOLETE PRODUCT**

Contact Factory for Replacement Model



MECHANICAL DIMENSIONS



INPUT/OUTPUT CONNECTIONS

| PIN | FUNCTION               | PIN | FUNCTION                 |
|-----|------------------------|-----|--------------------------|
| 1   | OUTPUT POLARITY (LINV) | 28  | ANALOG Vs (-5.2V)        |
| 2   | DIGITAL Vs (-5.2V)     | 27  | REFERENCE INPUT Vi (-0V) |
| 3   | DIGITAL GROUND         | 26  | ANALOG Vs (-5.2V)        |
| 4   | BIT 8 (LSB)            | 25  | ANALOG GROUND            |
| 5   | BIT 7                  | 24  | ANALOG INPUT             |
| 6   | BIT 6                  | 23  | ANALOG GROUND            |
| 7   | BIT 5                  | 22  | REFERENCE Vm             |
| 8   | BIT 4                  | 21  | ANALOG GROUND            |
| 9   | BIT 3                  | 20  | ANALOG INPUT             |
| 10  | BIT 2                  | 19  | ANALOG GROUND            |
| 11  | BIT 1 (MSB)            | 18  | ANALOG Vs (-5.2V)        |
| 12  | DIGITAL GROUND         | 17  | REFERENCE INPUT Vb (-2V) |
| 13  | DIGITAL Vs (-5.2V)     | 16  | CLOCK INPUT              |
| 14  | OUTPUT POLARITY (MINV) | 15  | CLOCK INPUT              |

# ABSOLUTE MAXIMUM RATINGS

|                                            |                 |
|--------------------------------------------|-----------------|
| Supply Voltage $V_S$ .....                 | 0 to -7V        |
| Input Voltage ( $V_{IN}$ ) .....           | 0.5V to $V_S$   |
| Reference Voltage<br>$V_I, V_b, V_m$ ..... | 0.5V to $V_S$   |
| Reference Voltage<br>( $V_b - V_I$ ) ..... | -2.5V           |
| Digital Inputs .....                       | 0.5V to -4V     |
| $V_m$ Input Current .....                  | -3 mA to +3 mA  |
| Digital Outputs .....                      | 0 to -10 mA     |
| Operating Temperature .....                | -20°C to +100°C |
| Storage Temperature .....                  | -55°C to +150°C |
| Allowable Power<br>Dissipation .....       | 1.48 W          |

# FUNCTIONAL SPECIFICATIONS

Typical at +25°C,  $V_S = -5.2V$  dc,  $V_B = -2.0V$  unless otherwise stated.

| PERFORMANCE                     | ADC-301  | ADC-302  |
|---------------------------------|----------|----------|
| Resolution .....                | 8 Bits   | 8 Bits   |
| Conversion Rate (Min) .....     | 30 MHz   | 50 MHz   |
| Non-Linearity (Max) .....       | +½ LSB   | +½ LSB   |
| Diff. Non-Linearity (Max) ..... | +½ LSB   | +½ LSB   |
| Diff. Gain (Max) .....          | 1.5%     | 1.5%     |
| Diff. Phase (Max) .....         | 0.5 Deg. | 0.5 Deg. |
| Aperture Jitter (Typ) .....     | 45 psec. | 30 psec. |
| Input Bandwidth (Typ) .....     | 15 MHz   | 25 MHz   |
| Power Dissipation (Typ) .....   | 420 mW   | 550 mW   |

| INPUTS                                           | MIN.  | TYP.  | MAX. | UNITS |
|--------------------------------------------------|-------|-------|------|-------|
| Reference Input<br>Voltage .....                 | -1.8  | -2.0  | -2.2 | V     |
| Reference<br>Resistance .....                    | 70    | 80    | 100  | Ohms  |
| Analog Input<br>Voltage .....                    | 0.1   | —     | -2.2 | V     |
| Analog Input<br>Capacitance .....                | —     | 35    | 40   | pF    |
| Analog Input Bias<br>Current .....               | —     | 60    | 90   | µA    |
| (ADC-301) .....                                  | —     | 75    | 115  | µA    |
| (ADC-302) .....                                  | —     | 9     | 11   | mV    |
| Offset Voltage $V_I$ .....                       | 7     | 9     | 11   | mV    |
| $V_b$ .....                                      | 15    | 17    | 19   | mV    |
| Digital Input Voltage<br>$V_h$ .....             | -0.7  | -0.9  | -1.0 | V     |
| $V_l$ .....                                      | -1.6  | -1.75 | -1.9 | V     |
| Digital Input Current<br>( $V_h = -0.9V$ ) ..... | 0     | —     | 0.4  | mA    |
| ( $V_l = -1.75V$ ) .....                         | -0.05 | —     | 0.35 | mA    |

| OUTPUTS                                                      |      |     |      |       |
|--------------------------------------------------------------|------|-----|------|-------|
| Digital Output Voltage<br>$V_h$ ( $R_L = 620 \Omega$ ) ..... | -1.0 | —   | —    | V     |
| $V_l$ ( $R_L = 620 \Omega$ ) .....                           | —    | —   | -1.6 | V     |
| Output Data Delay<br>( $R_L = 620 \Omega$ ) .....            | —    | 4.0 | 5.0  | nsec. |

| POWER                             |      |      |      |    |
|-----------------------------------|------|------|------|----|
| Supply Voltage, $V_S$ .....       | -5.0 | -5.2 | -5.7 | V  |
| Supply Current<br>(ADC-301) ..... | —    | -75  | -100 | mA |
| (ADC-302) .....                   | —    | -95  | -120 | mA |

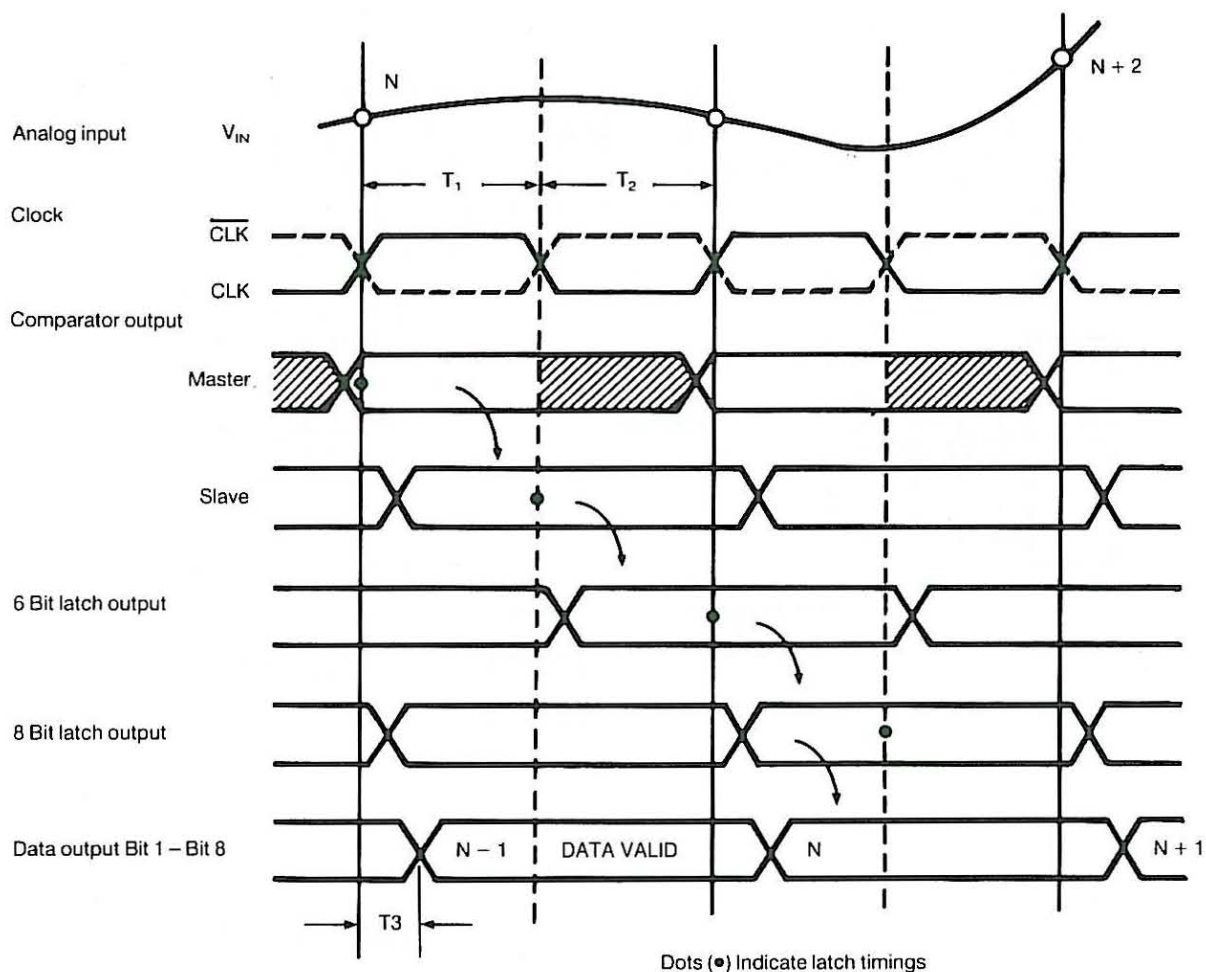
# TECHNICAL NOTES

- Even with the input capacitance down to 35 pF, or less, the converter still requires an input amplifier with good drive capability. The amplifier will require wide bandwidth and a high slew rate (250V/µS typical) to take full advantage of the input bandwidth of the converter.
- The input impedance of the A/D's are capacitive which may result in the input amplifier becoming unstable and cause oscillations. A resistor with a value between 2 and 10 Ohms between the amplifier and the input to the converter will stop any oscillations.
- Clock and Clock (ECL) are usually differentially supplied to pins 16 and 15.
- The polarity of the output data is controlled by two polarity inversion inputs, MINV (pin 14) which controls the MSB alone and LINV (pin 1) which controls Bit 2 to Bit 8 (LSB). The combination of '0's and '1' on these inputs offer the user various code options. Detailed coding is shown in Table 1. Logic level '0' is obtained by leaving inputs open, logic level '1' is obtained by connecting a 3.9K Ohm resistor to digital ground.
- The digital outputs Bits 1 to 8 require pull down resistors, in the range 500 to 1000 Ohms, connected to the negative supply rail to prevent waveform distortions by reflection.
- The reference voltage range (-2.0V to 0V typical) determines the dynamic range of the input voltage.  
Adjustments to this range can be made within the range  $V_B = 2V \pm 0.2V$  and  $V_T = 0V \pm 0.1V$ . The reference input  $V_B$  (pin 17) should be decoupled to analog ground using 1 µF and 0.01 µF capacitors. Improvement in the high frequency stability can be achieved by decoupling terminal  $V_m$  (pin 22) using a 0.01 µF.
- Terminal  $V_m$  is used to achieve less than a  $\pm 1/2$  LSB nonlinearity error. The external circuit to achieve this is shown in the application drawing.
- All pins not being used should be grounded.
- Substantial analog and digital ground planes must be provided. It is recommended that these ground planes are taken to a common point, the power ground line, as close to the converter as possible.
- The power supplies to analog and digital inputs (-5.2V) should be supplied from separate, isolated power supplies. If one of the power supplies fails or is shorted to ground for more than 1 second there is a possibility the device may be destroyed. Both -5.2V lines should be decoupled using 1 µF and 0.01 µF capacitors located as close to the pins as possible.

**TABLE 1. DIGITAL OUTPUT CODES**

| MINV<br>LINV         | 0<br>0                 | 0<br>1                 | 1<br>0                 | 1<br>1                 |
|----------------------|------------------------|------------------------|------------------------|------------------------|
| 0.0000V<br>-0.0078V  | 1111 1111<br>1111 1110 | 1000 0000<br>1000 0001 | 0111 1111<br>0111 1110 | 0000 0000<br>0000 0001 |
| -0.9961V<br>-1.0039V | 1000 0000<br>0111 1111 | 1111 1111<br>0000 0000 | 0000 0000<br>1111 1111 | 0111 1111<br>1000 0000 |
| -1.9922V<br>-2.0000V | 0000 0001<br>0000 0000 | 0111 1110<br>0111 1111 | 1000 0001<br>1000 0000 | 1111 1110<br>1111 1111 |

**TIMING DIAGRAM**

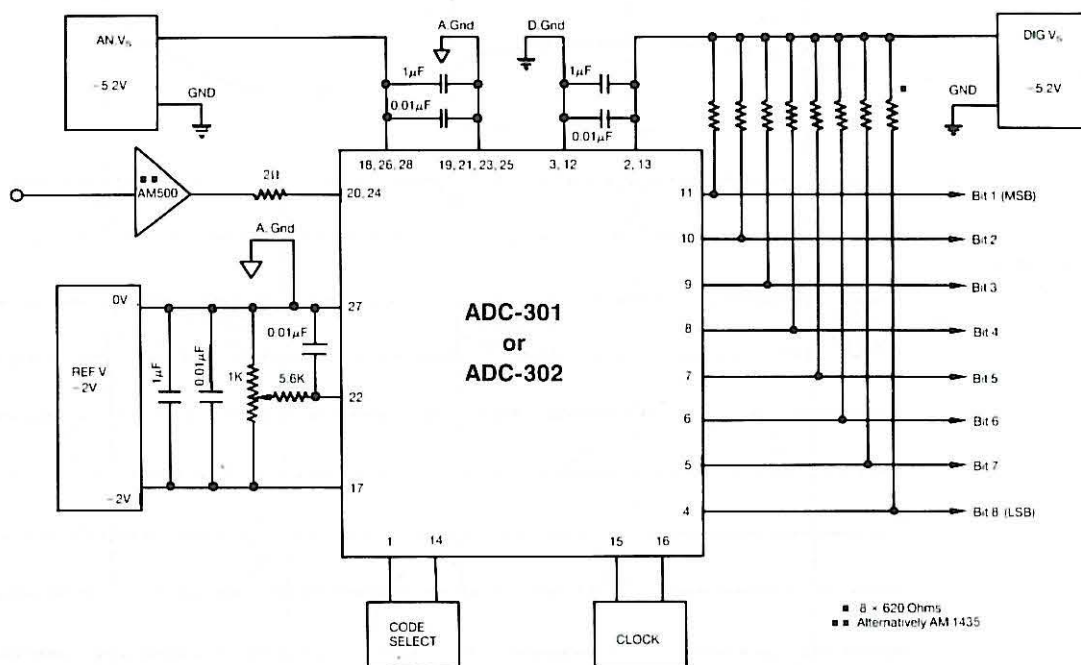


**TIMING NOTES**

- Both Clock and  $\overline{\text{CLK}}$  are required and the input levels are ECL. The timing  $T_1$  and  $T_2$  should be:

|         | $T_1$ (MIN) | $T_2$ (MIN) |
|---------|-------------|-------------|
| ADC-301 | 25 nsec.    | 8 nsec.     |
| ADC-302 | 15 nsec.    | 5 nsec.     |
- The positive transition of the clock latches the comparator outputs into the 'and' gates.
- The negative transition latches the 'anded' outputs into the 6-bit encoder.
- The next positive transition will latch the 6-bit encoder output as well as starting the next conversion cycle.
- The 8-bit encoder output will appear at the output pins 4.0 nsec. (typical)  $T_3$  after 6-bit encoder output has been latched on the next negative transition of the clock.

**CONNECTION AND APPLICATION**



**ORDERING INFORMATION**

**MODEL NO.**

ADC-301  
ADC-302

**OPERATING  
TEMPERATURE  
RANGE**

-20°C to + 100°C  
-20°C to + 100°C

**ACCESSORIES**

**Part Number**

TP 1K

**Description**

Trimming Potentiometer

**Note:** For units with high-reliability processing, contact the factory.