12-Bit Successive Approximation Integrated Circuit A/D Converter

AD572*

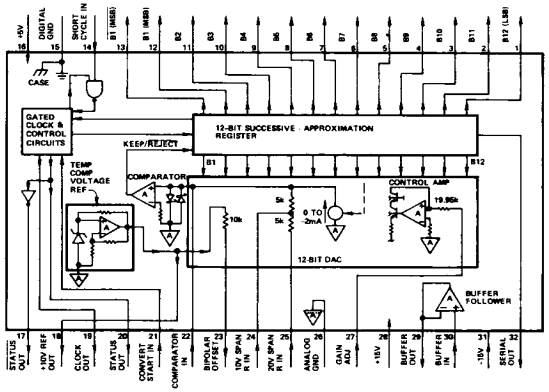
FEATURES

PERFORMANCE
- True 12-Bit Operation: Max Nonlinearity $< \pm 0.012\%$
- Low Gain T.C.: $< \pm 15$ ppm/°C (AD572B)
- Low Power: 900 mW
- Fast Conversion Time: $< 25\ \mu s$
- Monotonic Feedback DAC Guarantees No Missing Codes

VERSATILITY
- Aerospace Temperature Range: −55°C to +125°C (AD572S)
- Positive-True Serial or Parallel Logic Outputs
- Short-Cycle Capability

VALUE
- Precision +10 V Reference for External Application
- Internal Buffer Amplifier
- High Reliability Package

FUNCTIONAL BLOCK DIAGRAM



GENERAL DESCRIPTION

The AD572 is a complete 12-bit successive approximation analog-to-digital converter that includes an internal clock, reference, comparator, and buffer amplifier. Its hybrid IC design utilizes MSI digital and linear monolithic chips and active laser trimming of high-stability thin-film resistors to provide superior performance, flexibility and ease of use, combined with IC size, price, and reliability.

Important performance characteristics of the AD572 include a maximum linearity error at 25°C of ±0.012%, gain T.C. below 15 ppm/°C, typical power dissipation of 900 mW, and conversion time of less than 25 μs. Of considerable significance in aerospace applications is the guaranteed performance from −55°C to +125°C of the AD572S. Monotonic operation of the feedback D/A converter guarantees no missing output codes over temperature ranges of 0°C to +70°C, −25°C to +85°C, and −55°C to +125°C.

The design of the AD572 includes scaling resistors that provide analog input signal ranges of ±2.5, ±5.0, ±10, 0 to +5, or 0 to +10 volts. Adding flexibility and value are the +10 V precision reference, which also can be used for external applications, and the input buffer amplifier. All digital signals are fully TTL compatible, and the data output is positive-true and available in either serial or parallel form.

The AD572 is available in three versions with differing guaranteed performance characteristics and operating temperature ranges; the "A" and "B" are specified from −25°C to +85°C, and the "S" from −55°C to +125°C.

PRODUCT DESCRIPTION

The AD572 functional diagram and pinout are shown above. The device consists of the following monolithic bipolar circuit elements:

1. Twelve-bit successive-approximation register
2. Twelve-bit DAC
3. Low-drift comparator
4. Temperature-compensated precision +10 V reference
5. High-impedance buffer follower
6. Gated clock and digital control circuits

ORDERING GUIDE

Model	Specification Temp Range	Max Gain TC	Max Reference TC	Guaranteed Temp Range No Missing Codes	Package Option*
AD572AD	−25°C to +85°C	±30 ppm/°C	±20 ppm/°C	0°C to +70°C	DH-32C
AD572BD	−25°C to +85°C	±15 ppm/°C	±10 ppm/°C	−25°C to +85°C	DH-32C
AD572SD	−55°C to +125°C	±15 ppm/°C (−25°C to +85°C) ±25 ppm/°C (−55°C to +125°C)	±20 ppm/°C	−55°C to +125°C	DH-32C
AD572SD/883B	Meets all specifications after processing to the requirements of MIL-STD-883, Method 5008, Class B. Refer to Analog Devices Military Databook for details.				

*DH-32C = Size Brazed Ceramic Dip for Hybrid (Medium Cavity). For outline information see Package Information section.

*Protected by U.S. Patent Nos. 3,961,326; 3,803,590; and 3,747,088.

This is an abridged version of the data sheet. To obtain a complete data sheet, contact your nearest sales office.

AD572—SPECIFICATIONS (typical @ +25°C, ±15 V and +5 V unless otherwise noted)

Model	AD572AD	AD572BD	AD572SD
RESOLUTION	12 Bits	*	*
ANALOG INPUTS			
Voltage Ranges			
Bipolar	±2.5, ±5.0, ±10.0 V	*	*
Unipolar	0 to +5, 0 to +10 V	*	*
Impedance (Direct Input)			
0 to +5 V, ±2.5 V	2.5 kΩ	*	*
0 to +10 V, ±5 V	5.0 kΩ	*	*
±10 V	10 kΩ	*	*
Buffer Amplifier			
Impedance (min)	100 MΩ	*	*
Bias Current	50 nA	*	*
Settling Time			
to 0.01% of FSR for 20 V Step	2 µs	*	*
DIGITAL INPUTS			
Convert Command	Note 1	*	*
Logic Loading	1 TTL Load	*	*
TRANSFER CHARACTERISTICS			
Gain Error (Note 2)	±0.05% FSR (Adj to Zero)	*	*
Unipolar Offset Error	±0.05% FSR (Adj to Zero)	*	*
Bipolar Offset Error	±0.1% FSR (Adj to Zero)	*	*
Linearity Error (max)	±0.012% FSR	*	*
Inherent Quantization Error	±1/2 LSB	*	*
Differential Linearity Error	±1/2 LSB	*	*
No Missing Codes	Guaranteed: 0°C to +70°C	Guaranteed: −25°C to +85°C	Guaranteed: −55°C to +125°C
Power Supply Sensitivity			
±15 V	±0.002% FSR/%ΔV_S	*	*
±5 V	±0.001% FSR/%ΔV_S	*	*
TEMPERATURE COEFFICIENTS			
Gain (max)	±30 ppm/°C (−25°C to +85°C)	±15 ppm/°C (−25°C to +85°C)	±15 ppm/°C (−25°C to +85°C) ±25 ppm/°C (−55°C to +125°C)
Unipolar Offset	±3 ppm FSR/°C	±5 ppm FSR/°C (max)	**
Bipolar Offset (max)	±15 ppm FSR/°C	±7 ppm FSR/°C	**
Linearity	±3 ppm FSR/°C	±2 ppm FSR/°C	**
CONVERSION TIME (max)	25 µs	*	*
DIGITAL OUTPUTS (All Codes Positive-True)			
Parallel Data			
Unipolar Code	Binary	*	*
Bipolar Code	Offset Binary/Twos Complement	*	*
Output Drive	2 TTL Loads	*	*
Serial Data (NRZ format)			
Unipolar Code	Binary	*	*
Bipolar Code	Offset Binary	*	*
Output Drive	2 TTL Loads	*	*
Status	Logic "1" during Conversion	*	*
Status	Logic "0" during Conversion	*	*
Output Drive	2 TTL Loads	*	*
Internal Clock			
Output Drive	2 TTL Loads	*	*
Frequency	500 kHz	*	*
INTERNAL REFERENCE VOLTAGE	+10.00 V, ±10 mV typ	*	*
Max External Current	±1 mA	*	*
Voltage Temperature Coefficient (max)	±20 ppm/°C	±10 ppm/°C	*
POWER REQUIREMENTS			
Supply Voltages/Currents	+15 V, ±5% @ +25 mA (40 max)	*	*
	−15 V, ±5% @ −20 mA (35 max)	*	*
	+5 V, ±5% @ +80 mA (150 max)	*	*
Total Power Dissipation	925 mW	*	*
TEMPERATURE RANGE			
Specification	−25°C to +85°C	*	−55°C to +125°C
Operating	−55°C to +125°C	*	*
Storage	−55°C to +150°C	*	*

NOTES
*Same specification as AD572AD.
**Same specifications as AD572BD.
Note 1 Positive pulse 200 ns wide (min). Leading edge ("0" to "1") resets registers. Trailing edge ("1" to "0") initiates conversion.
Note 2 With 50 Ω. 1% fixed resistor in place of Gain Adjust pot.
Specifications subject to change without notice.