Advanced Analog

a division of Intech

T-51-10-12

ADC5200/5600 SERIES

HIGH SPEED 12-BIT A/D CONVERTERS

DESCRIPTION

The ADC5200/5600 Series devices are successive approximation 12-bit A/D converters with 13μsec or 50μsec conversion time. These devices are laser trimmed for ultra accuracy and reliability and require no external adjustment.

These devices are available in four input voltage ranges: ±5V, ±10V, 0 to +10V and -10V to 0. Models are available complete with a highly accurate and stable internal reference, or for use with an even higher quality external reference. All devices in this series have ±1/2 LSB linearity guaranteed over the full operating temperature range.

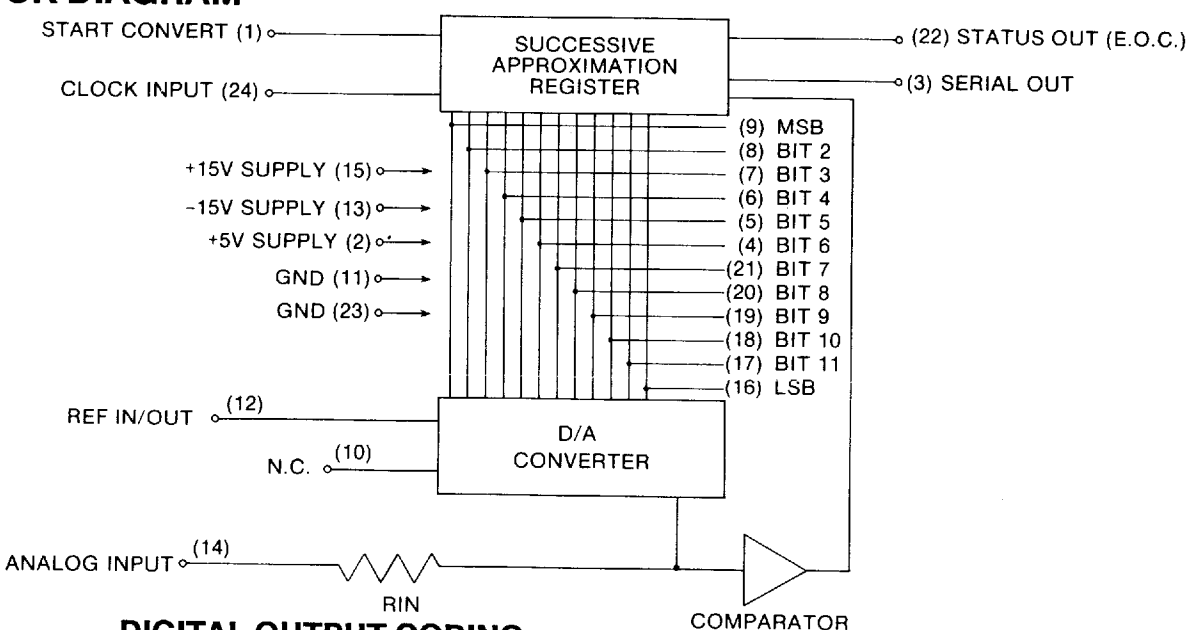
The ADC5200/5600 Series feature low power consumption — 590 mW maximum, serial or parallel output data and TTL compatibility.

All models are available in military, industrial or commercial temperature ranges. Devices with military screening are also available.

FEATURES

- 13μsec or 50μsec conversion time
- Low power consumption — 590 mW max.
- Small, 24-pin hermetic DIP or leadless ceramic package
- Adjustment free operation
- Laser trimmed for accuracy and stability
- TTL/CMOS compatible
- Full military operation

BLOCK DIAGRAM



DIGITAL OUTPUT CODING

ADC52x1/52x4 ADC5611/5614 ±5V	ADC52x2/52x5 ADC5612/5615 ±10V	ADC52x0/52x3 ADC5610/5613 0 to -10V	ADC52x6/52x7 ADC5616/5617 0 to +10V	DIGITAL OUTPUT
+4.9976V	+9.9951V	-0.0024V	+9.9976V	0000 0000 0000
+4.9951V	+9.9902V	0.0048V	+9.9951V	0000 0000 0001
+0.0024V	+0.0049V	-4.9976V	+5.0024V	0111 1111 1110
0.0000V	0.0000V	-5.0000V	+5.0000V	0111 1111 1111
-0.0024V	-0.0049V	-5.0024V	+4.9976V	1000 0000 0000
-4.9976V	-9.9951V	9.9976V	+0.0024V	1111 1111 1110
-5.0000V	-10.0000V	-10.0000V	0.0000V	1111 1111 1111

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SPECIFICATIONS

ABSOLUTE MAXIMUM RATINGS

Operating Temperature Range:	0°C to +70°C -25°C to +85°C -55°C to +125°C
Storage Temperature Range	-65°C to +150°C
Positive Supply, Pin 15	+18V
Negative Supply, Pin 13	-18V
Logic Supply, Pin 12	-0.5V to +7V
Analog Input, Pin 14	±25V
Digital Inputs, Pin 1, 24	-0.5V to +5.5V
Digital Outputs	Logic Supply
Reference Input	0 to -15V

@ +25°C, ±15V +5V supply voltages, ±5% unless otherwise noted. External reference devices V_{Ref} = -10.000V, unless otherwise noted.

Analog Inputs	P/N (int. ref.)	P/N (ext. ref.)
Input Range (Input Impedance) -5V to +5V (5kΩ)	ADC52x1/ADC5611	ADC52x4/ADC5614
-10V to +10V (10kΩ)	ADC52x2/ADC5612	ADC52x5/ADC5615
0 to -10V (5kΩ)	ADC52x0/ADC5610	ADC52x3/ADC5613
0 to +10V (5kΩ)	ADC52x6/ADC5616	ADC52x7/ADC5617

Parameters	Min	Typ	Max	Min	Typ	Max	Units
TRANSFER CHARACTERISTICS							
Linearity Error[1] +25°C		±1/4	±1/2		±1/4	±1/2	LSB
0°C to +70°C		±1/4	±1/2		±1/4	±1/2	LSB
-55°C to +125°C			±1/2			±1/2	LSB
Differential Linearity Error			±1/2			±1/2	LSB
No Missing Codes			Guaranteed over temperature				
Full Scale Absolute Accuracy Error[2,3] +25°C		±0.025	±0.05		±0.025	±0.05	%FSR
0°C to +70°C		±0.2	±0.4		±0.05	±0.1	%FSR
-55°C to +125°C			±0.4			±0.1	%FSR
Zero Error: +25°C		±0.01	±0.025		±0.01	±0.025	%FSR
0°C to +70°C		±0.025	±0.05		±0.025	±0.05	%FSR
-55°C to +125°C			±0.05			±0.05	%FSR
Gain Error		±0.025			±0.025		%FSR
Gain Drift		±10			±3		ppm/°C
Conversion Time:[4] ADC521x Series			13			13	µsec
ADC520x Series			50			50	µsec
ADC561x Series			13			13	µsec
REFERENCE INPUT/OUTPUT[10]							
Internal Reference - Voltage		-6.3			-6.3		V
Accuracy		±1			±1		%
Tempco of Drift		±5			±5		ppm/°C
External Current			4			4	mA
External Reference - Voltage		-10.000			-10.000		V
Loading			-.5			-.5	mA
POWER SUPPLIES							
Power Supply Range ±15V	±11.4	±15	±16.5	±11.4	±15	±16.5	V
Power Supply Rejection:[5] +15V supply		±0.005	±0.02		±0.005	±0.02	%FSR/%VS
-15V supply		±0.01	±0.05		±0.05	±0.02	%FSR/%VS
Current Drain: +15V supply		13	18		13	18	mA
-15V supply		-15	-19		-15	-19	mA
+5V supply		10	15		10	15	mA
Power Consumption		470	590		470	590	mW
DIGITAL INPUTS (All Models)							
Logic Levels: Logic "1"	2.0			2.0			V
Logic "0"			0.7			0.7	V
Clock Input:[6]							
Pulse Width High	45			45			nsec
Pulse Width Low	45			45			nsec
Loading High (V_{IN}=2.4V)		2	20		2	20	µA
Loading Low (V_{IN}=0.3V)		-0.25	-0.4		-0.25	-0.4	mA
Frequency: ADC520x Series			260			260	kHz
ADC521x Series			1			1	MHz
ADC561x Series			1			1	MHz
Start Convert Input: Loading High (V_{IN}=2.4V)		4	40		4	40	µA
Loading Low (V_{IN}=0.3V)		-0.25	-0.4		-0.25	-0.4	mA
Setup Time Start Low to Clock[7]	10			10			nsec

Parameters	Min	Typ	Max	Min	Typ	Max	Units
DIGITAL OUTPUTS (All Models)							
Logic Coding:[8] Unipolar Ranges			Complementary Straight Binary				
Bipolar Ranges			Complementary Offset Binary				
Logic Levels: Logic "1"	+2.4	+3.6		+2.4	+3.6		V
Logic "0"		+0.15	+0.3		+0.15	+0.3	V
Output Drive Capability, All Outputs:[9]							
Logic "1"			8 TTL Loads				
Logic "0"			2 TTL Loads				

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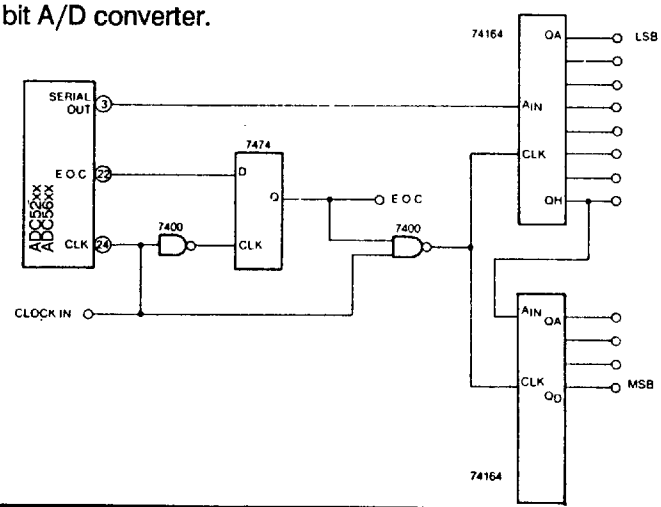
Military screening available.

NOTES:
1. Advanced Analog tests and guarantees maximum linearity error at ambient temperature and at both the high and low extremes of the specified operating temperature range.
2. 1LSB for a 12-bit converter corresponds to 0.024%FSR. See Note 3.
3. FSR stands for Full Scale Range and is equal to the peak to peak voltage of the selected input range. For the ±10V input range, FSR is 20 volts and 1 LSB is equal to 4.88 mV. For the ±5V ranges, FSR is 10 volts and 1 LSB is equal to 2.44 mV.
4. Conversion time is defined as the width of the converter's STATUS (E.O.C.) pulse (see Timing Diagram.) Advanced Analog guarantees ADC521x and ADC561x Series converters will meet all specs with clock frequencies up to 1 MHz. A 1 MHz clock gives a STATUS pulse that is 12μsec wide. The 13μsec spec reflects the fact that unless careful timing precautions are taken, it will usually take 13 clock periods to update digital output data. A 260 kHz clock used with the ADC520x series gives a 50μs status pulse.
5. Advanced Analog tests and guarantees Power Supply Rejection over the ±15V±3% range.
6. The clock may be asymetrical with minimum positive or negative pulse width. See Note 4.
7. In order to reset the converter, START CONVERT must be brought low at least 10 nsec prior to a low to high clock transition. See Timing Diagram.
8. CSB = Complementary Straight Binary. COB = Complementary Offset Binary. Serial and parallel output data have the same coding. Serial data is Non-Return to Zero (NRZ) format. See Output Coding and Timing Diagram.
9. One TTL load is defined as sinking 40μA with a logic "1" applied and sourcing 1.6 mA with a logic "0" applied.
10. ADC52x0, ADC52x1, ADC52x2 and ADC52x6 have an internal -6.3V reference; ADC52x3, ADC52x4, ADC52x5 and ADC52x7 require an external -10.000V reference. ADC5610, ADC5611, ADC5612 and ADC5616 have an internal -6.3V reference; ADC5613, ADC5614, ADC5615 and ADC5617 require an external -10.000V reference.

SERIAL TO PARALLEL CONVERSION

Data may be sent in serial format and converted to parallel as shown. This process can reduce the number of transmission lines from 14 to 3 for a 12-bit A/D converter.



DATA OUTPUT

The ADC5200/5600 Series provides the user with both serial and parallel outputs. Serial and parallel output data have the same coding. Serial data is in Non-return to Zero format.

SAMPLE AND HOLD

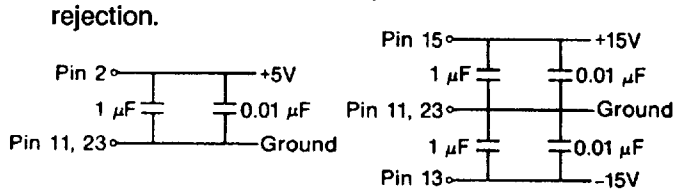
For those applications that require a sample and hold amplifier, the SH346/347 is an ideal device. It is a high speed, adjustment free sample/hold amplifier that features 1.0μsec acquisition time, 0.01% accuracy and a low glitch and droop rate.

HANDLING OF GROUNDS

Layout and decoupling techniques: Ground pins 11 and 23 are not internally connected and should be connected externally as directly or close to the package as possible. They must be connected to the system analog ground, preferably through a large groundplane under the package.

To run the grounds separately, connect a 1μF bypass capacitor between pins 11 and 23.

Power supplies should be decoupled by using tantalum and electrolytic capacitors as close to the pins as possible for peak performance and noise rejection.



Power Supply Decoupling

PIN DESIGNATIONS

Pin 1 Start Convert	Pin 24 Clock Input
Pin 2 +5V Supply	Pin 23 Ground
Pin 3 Serial Output	Pin 22 Status (EOC)
Pin 4 Bit 6	Pin 21 Bit 7
Pin 5 Bit 5	Pin 20 Bit 8
Pin 6 Bit 4	Pin 19 Bit 9
Pin 7 Bit 3	Pin 18 Bit 10
Pin 8 Bit 2	Pin 17 Bit 11
Pin 9 Bit 1 (MSB)	Pin 16 Bit 12 (LSB)
Pin 10 N/C[1]	Pin 15 +15V Supply
Pin 11 Ground	Pin 14 Analog Input
Pin 12 Ref In/Out (-6.3V)	Pin 13 -15V Supply

1. Pin 10 has no internal connection.

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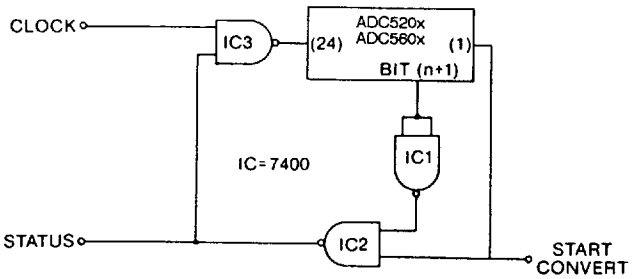
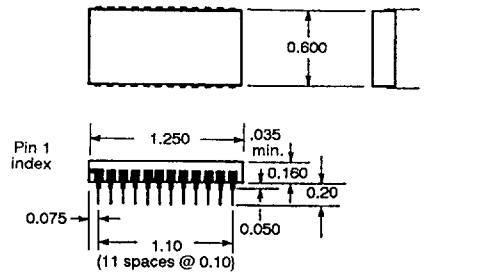
SHORT CYCLE OPERATION

The ADC5200/5600 Series can be short cyled to less than 12 bits resolution, which gives a faster conversion time.

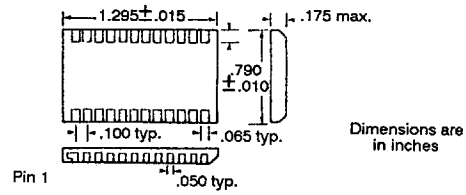
When a conversion is in process, bit (n+1) will go low as bit n is being set. The Start Convert signal is high at this point and Status (IC2 output) will go low gating off the clock at IC3, thus ending the conversion.



MECHANICAL OUTLINE



ADC5200



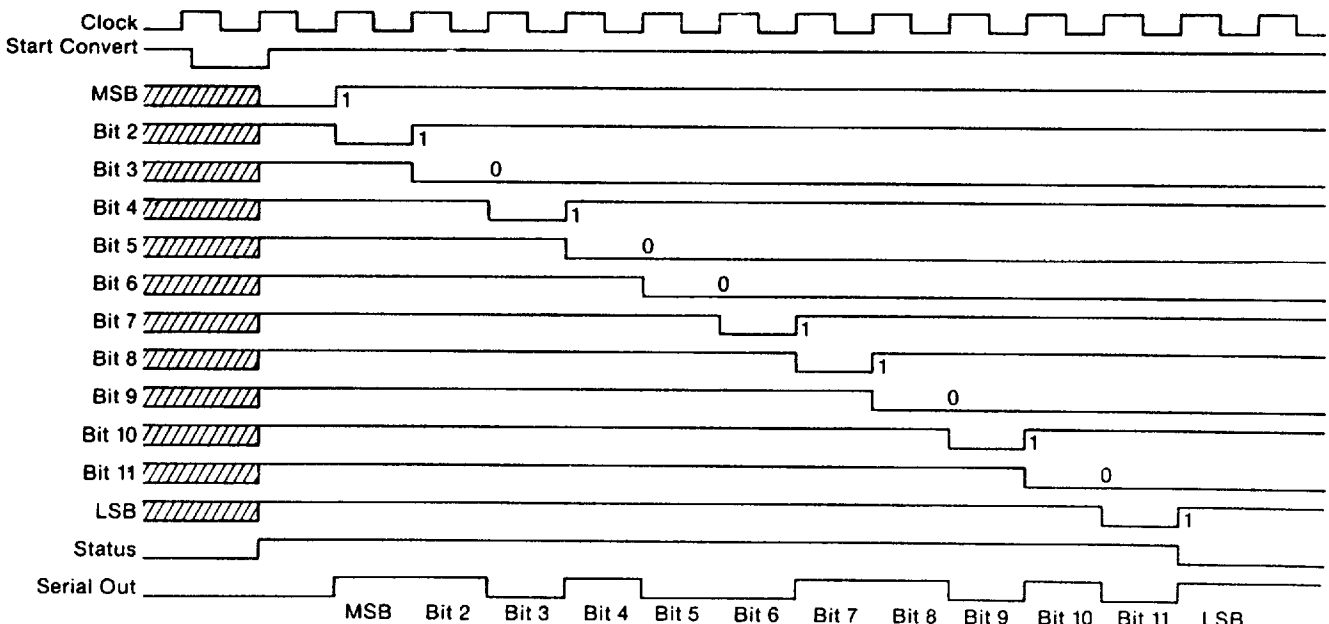
ADC5600

PART NUMBER

ADC5 x x x x /B

- Model
  - 2 - DIP
  - 6 - LCC
- Conversion Time
  - 0 - 50µsec. max.
  - 1 - 13µsec. max.
- Analog Inputs
  - 0 - 0 to -10V(5kΩ)int.ref.
  - 1 - -5V to +5V(5kΩ)int.ref.
  - 2 - -10V to +10V(10kΩ)int.ref.
  - 3 - 0 to -10V(5kΩ)ext.ref.
  - 4 - -5V to +5V(5kΩ)ext.ref.
  - 5 - -10V to +10V(10kΩ)ext.ref.
  - 6 - 0 to +10V(5kΩ)int.ref.
  - 7 - 0 to +10V(5kΩ)ext.ref.
- Temperature Range
  - H - -55°C to +125°C
  - E - -25°C to +85°C
  - Omit for standard 0°C to +70°C
- Military screening.
  - Omit for comm'l or industrial.

TIMING DIAGRAM



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