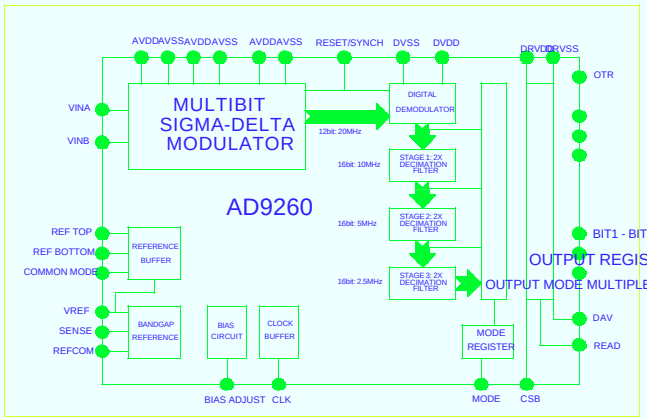
High Speed Oversampling CMOS ADC w/16-Bit Resolution at a 2.5 MHz Output Word Rate

AD9260

FEATURES

Monolithic 16-Bit, Oversampled A/D Converter
8× Oversampling Mode, 20 MSPS Clock
2.5 MHz Output Word Rate
1.01 MHz Signal Passband w/0.004 dB Ripple
Signal-to-Noise Ratio: 89 dB
Total Harmonic Distortion: –98 dB
Spurious Free Dynamic Range: 100 dB
Input Referred Noise: 0.6 LSB
Selectable Oversampling Ratio: 1×, 2×, 4×, 8×
Selectable Power Dissipation: 150 mW to 550 mW
85 dB Stopband Attenuation
0.004 dB Passband Ripple
Linear Phase
Single +5 V Analog Supply, +5 V/+3 V Digital Supply
Synchronize Capability for Parallel ADC Interface
Twos-Complement Output Data
44-Lead MQFP

FUNCTIONAL BLOCK DIAGRAM



The AD9260 operates on a single +5 V supply, typically consuming 550 mW of power. A power scaling circuit is provided allowing the AD9260 to operate at power consumption levels as low as 150 mW at reduced clock and data rates. The AD9260 is available in a 44-lead MQFP package and is specified to operate over the industrial temperature range.

PRODUCT DESCRIPTION

The AD9260 is a 16-bit, high speed oversampled analog-to-digital converter (ADC) that offers exceptional dynamic range over a wide bandwidth. The AD9260 is manufactured on an advanced CMOS process. High dynamic range is achieved with an oversampling ratio of 8× through the use of a proprietary technique which combines the advantages of sigma-delta and pipeline converter technologies.

The AD9260 is a switched-capacitor ADC with a nominal full-scale input range of 4 V. It offers a differential input with 60 dB of common-mode rejection of common-mode signals. The signal range of each differential input is ±1 V centered on a 2.0 V common-mode level.

The on-chip decimation filter is configured for maximum performance and flexibility. A series of three half-band FIR filter stages provide 8× decimation filtering with 85 dB of stopband attenuation and 0.004 dB of passband ripple. An onboard digital multiplexer allows the user to access data from the various stages of the decimation filter.

The on-chip programmable reference and reference buffer amplifier are configured for maximum accuracy and flexibility. An external reference can also be chosen to suit the users specific dc accuracy and drift requirements.

PRODUCT HIGHLIGHTS

The AD9260 is fabricated on a very cost effective CMOS process. High speed, precision mixed-signal analog circuits are combined with high density digital filter circuits.

The AD9260 offers a complete single-chip 16-bit sampling ADC with a 2.5 MHz output data rate in a 44-lead MQFP.

Selectable Internal Decimation Filtering—The AD9260 provides a high performance decimation filter with 0.004 dB passband ripple and 85 dB of stopband attenuation. The filter is configurable with options for 1×, 2×, 4×, and 8× decimation.

Power Scaling—The AD9260 consumes a low 550 mW of power at 16-bit resolution and 2.5 MHz output data rate. Its power can be scaled down to as low as 150 mW at reduced clock rates.

Single Supply— Both of the analog and digital portions of the AD9260 can operate off of a single +5 V supply simplifying system power supply design. The digital logic will also accommodate a single +3 V supply for reduced power.

REV. 0

One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106, U.S.A.
Tel: 617/329-4700 World Wide Web Site: http://www.analog.com
Fax: 617/326-8703

AD9260–SPECIFICATIONS

CLOCK INPUT FREQUENCY RANGE

Parameter	AD9260	AD9260	AD9260	AD9260	Units
DECIMATION FACTOR (N)	8	4	2	1	
CLOCK INPUT (Modulator Sample Rate, f_{CLOCK})	1 20	1 20	1 20	1 20	kHz min MHz max
OUTPUT WORD RATE (FS = f_{CLOCK}/N)	0.125 2.5	0.250 5	0.500 10	1 20	kHz MHz max

Specifications subject to change without notice

DC SPECIFICATIONS

(AV_{DD} = +5 V, DV_{DD} = +3 V, DRV_{DD} = + 3 V, f_{CLOCK} = 20 MSPS, V_{REF} = 2.5 V, T_{MIN} to T_{MAX} unless otherwise noted, R_{BIAS} = 2 kΩ)

Parameter	AD9260	AD9260	AD9260	AD9260	Units
DECIMATION FACTOR (N)	8	4	2	1	
RESOLUTION	16	16	16	12	Bits min
INPUT REFERRED NOISE (TYP) 1.0 V Reference 2.5 V Reference					 µV rms typ µV rms typ
ACCURACY Integral Nonlinearity (INL) Differential Nonlinearity (DNL) INL (V_{REF} = 1 V DNL (VR_{EF} = 1 V) No Missing Codes Zero Error @ +25°C Gain Error @ +25°C Gain Error @ +25°C (Ext. 2.5 V Ref)					 LSB typ LSB typ LSB typ LSB typ Bits Guaranteed % FSR max % FSR max % FSR max
TEMPERATURE DRIFT Zero Error Gain Error Gain Error (Ext. 2.5 V Ref)					 ppm/°C typ ppm/°C typ ppm/°C typ
POWER SUPPLY REJECTION AV_{DD}, DV_{DD}, DRV_{DD} (+5 V ?0.25 V)					
ANALOG INPUT Input Span VREF = 1.0 V VREF = 2.5 V Input (VINA or VINB) Range Input Capacitance	 1.6 4.0 +0.5 +AV_{DD}–0.5	 1.6 4.0 +0.5 +AV_{DD}–0.5	 1.6 4.0 +0.5 +AV_{DD}–0.5	 1.6 4.0 +0.5 +AV_{DD}–0.5	 V p-p Diff. max V p-p Diff. max V min V max pF typ
INTERNAL VOLTAGE REFERENCE Output Voltage (1 V Mode) Output Voltage Error (1 V Mode) Output Voltage (2.5 V Mode) Output Voltage Error (2.5 V Mode) Load Regulation	 1 2.5	 1 2.5	 1 2.5	 1 2.5	 V typ mV max V typ mV max mV max
REFERENCE INPUT RESISTANCE					kΩ

Parameter	AD9260	AD9260	AD9260	AD9260	Units
POWER SUPPLIES					
Supply Voltages					
AV_{DD}	+5	+5	+5	+5	V (±5%)
DV_{DD} and DRV_{DD}	+5.5	+5.5	+5.5	+5.5	V max
	+2.7	+2.7	+2.7	+2.7	V min
Supply Current					
IAV_{DD}					mA typ
					mA max
IDV_{DD}					mA typ
					mA max
$IDRV_{DD}$					mA typ
					mA max
POWER CONSUMPTION					mW typ
					mW max

Specifications subject to change without notice.

AC SPECIFICATIONS

(AV_{DD} = +5 V, DV_{DD} = +3 V, DRV_{DD} = +3 V, f_{CLOCK} = 20 MSPS, V_{REF} = 2.5 V, T_{MIN} to T_{MAX} unless otherwise noted, R_{BIAS} = 2 kΩ)

Parameter	AD9260	AD9260	AD9260	AD9260	Units
DECIMATION FACTOR (N)	8	4	2	1	
DYNAMIC PERFORMANCE					
Input Test Frequency: 100 kHz					
Signal-to-Noise Ration (SNR)					
Input Amplitude = –0.5 dBFS					dB typ
					dB min
Input Amplitude = –6.0 dBFS					dB typ
					dB min
SNR and Distortion (SINAD					
Input Amplitude = –0.5 dBFS					dB typ
					dB min
Input Amplitude = –6.0 dBFS					dB typ
					dB min
Total Harmonic Distortion (THD)					
Input Amplitude = –0.5 dBFS					dB typ
					dB max
Input Amplitude = –6.0 dBFS					dB typ
					dB max
Spurious Free Dynamic Range (SFDR)					
Input Amplitude = –0.5 BFS					dB typ
					dB max
Input Amplitude = –6.0 dBFS					dB typ
					dB max`
Input Test Frequency: 300 kHz (typ)					
Signal-to-Noise Ration (SNR)					
Input Amplitude = –0.5 dBFS					dB typ
Input Amplitude = –6.0 dBFS					dB typ
SNR and Distortion (SINAD)					
Input Amplitude = –0.5 dBFS					dB typ
Input Amplitude = –6.0 dBFS					dB typ
Total Harmonic Distortion (THD)					
Input Amplitude = –0.5 dBFS					dB typ
Input Amplitude = –6.0 dBFS					dB typ
Spurious Free Dynamic Range (SFDR)					
Input Amplitude = –0.5 dBFS					dB typ
Input Amplitude = –6.0 dBFS					dB typ

AD9260–SPECIFICATIONS

AC SPECIFICATIONS (Continued)

Parameter	AD9260	AD9260	AD9260	AD9260	Units
Input Test Frequency: 1.0 MHz					
Signal-to-Noise Ration (SNR)					
Input Amplitude = –0.5 dBFS					dB typ
					dB min
Input Amplitude = –6.0 dBFS					dB typ
					dB min
SNR and Distortion (SINAD)					
Input Amplitude = –0.5 dBFS					dB typ
					dB min
Input Amplitude = –6.0 dBFS					dB typ
					dB min
Total Harmonic Distortion (THD)					
Input Amplitude = –0.5 dBFS					dB typ
					dB max
Input Amplitude = –6.0 dBFS					dB typ
					dB max
Spurious Free Dynamic Range (SFDR)					
Input Amplitude = –0.5 dBFS					dB typ
					dB max
Input Amplitude = –6.0 dBFS					dB typ
					dB max
Input Test Frequency: 2.0 MHz (typ)					
Signal-to-Noise Ration (SNR)					
Input Amplitude = –0.5 dBFS					dB typ
Input Amplitude = –6.0 dBFS					dB typ
SNR and Distortion (SINAD)					
Input Amplitude = –0.5 dBFS					dB typ
Input Amplitude = –6.0 dBFS					dB typ
Total Harmonic Distortion (THD)					
Input Amplitude = –0.5 dBFS					dB typ
Input Amplitude = –6.0 dBFS					dB typ
Spurious Free Dynamic Range (SFDR)					
Input Amplitude = –0.5 dBFS					dB typ
Input Amplitude = –6.0 dBFS					dB typ
Input Test Frequency: 5.0 MHz (typ)					
Signal-to-Noise Ration (SNR)					
Input Amplitude = –0.5 dBFS					dB typ
Input Amplitude = –6.0 dBFS					dB typ
SNR and Distortion (SINAD)					
Input Amplitude = –0.5 dBFS					dB typ
Input Amplitude = –6.0 dBFS					dB typ
Total Harmonic Distortion (THD)					
Input Amplitude = –0.5 dBFS					dB typ
Input Amplitude = –6.0 dBFS					dB typ
Spurious Free Dynamic Range (SFDR)					
Input Amplitude = –0.5 dBFS					dB typ
Input Amplitude = –6.0 dBFS					dB typ
INTERMODULATION DISTORTION					
$f_{IN}1$ = 475 kHz, $f_{IN}2$ = 525 kHz					dB typ
$f_{IN}1$ = 950 kHz, $f_{IN}2$ = 1.050 MHz					dB typ
FULL POWER BANDWIDTH					
Small Signal Bandwidth	150	150	150	150	MHz typ
Settling time: 1× Decimation	NA	NA	NA		MHz typ
Overvoltage Recovery Time					ns
					ns

Specifications subject to change without notice.