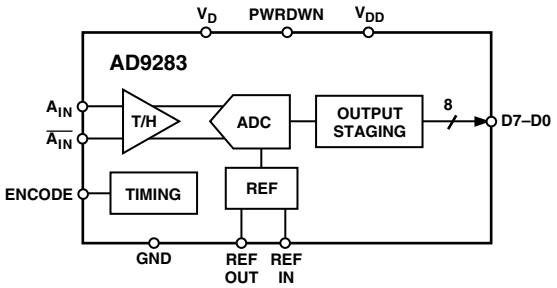
8-Bit, 50 MSPS/80 MSPS/100 MSPS 3 V A/D Converter

AD9283

FEATURES
8-Bit, 50, 80, and 100 MSPS ADC
Low Power: 90 mW at 100 MSPS
On-Chip Reference and Track/Hold
475 MHz Analog Bandwidth
SNR = 46.5 dB @ 41 MHz at 100 MSPS
1 V p-p Analog Input Range
Single 3.0 V Supply Operation (2.7 V–3.6 V)
Power-Down Mode: 4.2 mW

APPLICATIONS
Battery Powered Instruments
Hand-Held Scopemeters
Low Cost Digital Oscilloscopes

FUNCTIONAL BLOCK DIAGRAM



GENERAL DESCRIPTION

The AD9283 is an 8-bit monolithic sampling analog-to-digital converter with an on-chip track-and-hold circuit and is optimized for low cost, low power, small size and ease of use. The product operates at a 100 MSPS conversion rate, with outstanding dynamic performance over its full operating range.

The ADC requires only a single 3.0 V (2.7 V to 3.6 V) power supply and an encode clock for full performance operation. No external reference or driver components are required for many applications. The digital outputs are TTL/CMOS compatible and a separate output power supply pin supports interfacing with 3.3 V or 2.5 V logic.

The encoder input is TTL/CMOS compatible. A power-down function may be exercised to bring total consumption to 4.2 mW. In power-down mode, the digital outputs are driven to a high impedance state.

Fabricated on an advanced CMOS process, the AD9283 is available in a 20-lead surface mount plastic package (SSOP) specified over the industrial temperature range (–40°C to +85°C).

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AD9283–SPECIFICATIONS (V_{DD} = 3.0 V, V_D = 3.0 V; single-ended input; external reference, unless otherwise noted)

Parameter	Temp	Test Level	AD9283BRS-100 Min	AD9283BRS-100 Typ	AD9283BRS-100 Max	AD9283BRS-80 Min	AD9283BRS-80 Typ	AD9283BRS-80 Max	AD9283BRS-50 Min	AD9283BRS-50 Typ	AD9283BRS-50 Max	Unit
RESOLUTION				8			8			8		Bits
DC ACCURACY												
Differential Nonlinearity	25°C	I		±0.5	+1.25		±0.5	+1.25		±0.5	+1.25	LSB
	Full	VI			+1.50			+1.50			+1.50	LSB
Integral Nonlinearity	25°C	I	–1.25	±0.75	+1.25	–1.25	±0.75	+1.25	–1.25	±0.75	+1.25	LSB
	Full	VI			+2.25			+1.50			+1.50	LSB
No Missing Codes	Full	VI	Guaranteed			Guaranteed			Guaranteed			
Gain Error[1]	25°C	I	–6	±2.5	+6	–6	±2.5	+6	–6	±2.5	+6	% FS
	Full	VI	–8		+8	–8		+8	–8		+8	% FS
Gain Tempco[1]	Full	VI		80			80			80		ppm/°C
ANALOG INPUT												
Input Voltage Range (With Respect to A_{IN})	Full	V		±512			±512			±512		mV p-p
Common-Mode Voltage	Full	V		±200			±200			±200		mV
Input Offset Voltage	25°C	I	–35	±10	+35	–35	±10	+35	–35	±10	+35	mV
	Full	VI		±40			±40			±40		mV
Reference Voltage	Full	VI	1.2	1.25	1.3	1.2	1.25	1.3	1.2	1.25	1.3	V
Reference Tempco	Full	VI		±130			±130			±130		ppm/°C
Input Resistance	25°C	I	7	10	13	7	10	13	7	10	13	kΩ
	Full	VI	5		16	5		16	5		16	kΩ
Input Capacitance	25°C	V		2			2			2		pF
	Full	VI										µA
Analog Bandwidth, Full Power	25°C	V		475			475			475		MHz
SWITCHING PERFORMANCE												
Maximum Conversion Rate	Full	VI	100			80			50			MSPS
Minimum Conversion Rate	25°C	IV			1			1			1	MSPS
Encode Pulsewidth High (t_{EH})	25°C	IV	4.3		1000	5.0		1000	8.0		1000	ns
Encode Pulsewidth Low (t_{EL})	25°C	IV	4.3		1000	5.0		1000	8.0		1000	ns
Aperture Delay (t_A)	25°C	V		0			0			0		ns
Aperture Uncertainty (Jitter)	25°C	V		5			5			5		ps rms
Output Valid Time (t_V)[2]	Full	VI	2.0	3.0		2.0	3.0		2.0	3.0		ns
Output Propagation Delay (t_{PD})[2]	Full	VI		4.5	7.0		4.5	7.0		4.5	7.0	ns
DIGITAL INPUTS												
Logic “1” Voltage	Full	VI	2.0			2.0			2.0			V
Logic “0” Voltage	Full	VI			0.8			0.8		0.8		V
Logic “1” Current	Full	VI			±1			±1			±1	µA
Logic “0” Current	Full	VI			±1			±1			±1	µA
Input Capacitance	25°C	V		2.0			2.0			2.0		pF
DIGITAL OUTPUTS												
Logic “1” Voltage	Full	VI	2.95			2.95			2.95			V
Logic “0” Voltage	Full	VI			0.05			0.05			0.05	V
Output Coding			Offset Binary Code			Offset Binary Code			Offset Binary Code			
POWER SUPPLY												
Power Dissipation[3, 4]	Full	VI		90	120		90	115		80	100	mW
Power-Down Dissipation	Full	VI		4.2	7		4.2	7		4.2	7	mW
Power Supply Rejection Ratio (PSRR)	25°C	I			18			18			18	mV/V

Parameter	Temp	Test Level	AD9283BRS-100 Min	AD9283BRS-100 Typ	AD9283BRS-100 Max	AD9283BRS-80 Min	AD9283BRS-80 Typ	AD9283BRS-80 Max	AD9283BRS-50 Min	AD9283BRS-50 Typ	AD9283BRS-50 Max	Unit
DYNAMIC PERFORMANCE[5]												
Transient Response	25°C	V		2			2			2		ns
Overvoltage Recovery Time	25°C	V		2			2			2		ns
Signal-to-Noise Ratio (SNR) (Without Harmonics)												
f_{IN} = 10.3 MHz	25°C	I		46.5			47		44	47		dB
f_{IN} = 27 MHz	25°C	I		46.5		44	47			47		dB
f_{IN} = 41 MHz	25°C	I	43.5	46.5			47					dB
f_{IN} = 76 MHz	25°C	V		46.0								dB
Signal-to-Noise Ratio (SINAD) (With Harmonics)												
f_{IN} = 10.3 MHz	25°C	I		45			47		43.5	46.5		dB
f_{IN} = 27 MHz	25°C	I		45.5		43.5	46.5			46		dB
f_{IN} = 41 MHz	25°C	I	42.5	45			42					dB
f_{IN} = 76 MHz	25°C	V		42.5								dB
Effective Number of Bits												
f_{IN} = 10.3 MHz	25°C	I		7.3			7.5			7.6		Bits
f_{IN} = 27 MHz	25°C	I		7.4			7.5			7.5		Bits
f_{IN} = 41 MHz	25°C	I		7.3			7.5					Bits
f_{IN} = 76 MHz	25°C	V		6.9								Bits
2nd Harmonic Distortion												
f_{IN} = 10.3 MHz	25°C	I		57			60		55	60		dBc
f_{IN} = 27 MHz	25°C	I		60		55	60			56		dBc
f_{IN} = 41 MHz	25°C	I	50	58			55					dBc
f_{IN} = 76 MHz	25°C	V		46								dBc
3rd Harmonic Distortion												
f_{IN} = 10.3 MHz	25°C	I		54.5			70		55	70		dBc
f_{IN} = 27 MHz	25°C	I		55		55	62.5			60		dBc
f_{IN} = 41 MHz	25°C	I	47	52.5			60					dBc
f_{IN} = 76 MHz	25°C	V		53								dBc
Two-Tone Intermod Distortion (IMD)												
f_{IN} = 10.3 MHz	25°C	V		52			52			52		dBc

NOTES
[1]Gain error and gain temperature coefficient are based on the ADC only (with a fixed 1.25 V external reference).
[2]t_V and t_{PD} are measured from the 1.5 V level of the ENCODE input to the 50%/50% levels of the digital outputs swing. The digital output load during test is not to exceed an ac load of 10 pF or a dc current of ±40 µA.
[3]Power dissipation measured with encode at rated speed and a dc analog input.
[4]Typical thermal impedance for the RS style (SSOP) 20-lead package: θ_{JC} = 46°C/W, θ_{CA} = 80°C/W, θ_{JA} = 126°C/W.
[5]SNR/harmonics based on an analog input voltage of –0.7 dBFS referenced to a 1.024 V full-scale input range.

Specifications subject to change without notice.

ABSOLUTE MAXIMUM RATINGS*

V_D, V_{DD} . . . . . 4 V
Analog Inputs . . . . . –0.5 V to V_D + 0.5 V
Digital Inputs . . . . . –0.5 V to V_{DD} + 0.5 V
VREF IN . . . . . –0.5 V to V_D + 0.5 V
Digital Output Current . . . . . 20 mA
Operating Temperature . . . . . –55°C to +125°C
Storage Temperature . . . . . –65°C to +150°C
Maximum Junction Temperature . . . . . 150°C
Maximum Case Temperature . . . . . 150°C

*Stresses above those listed under Absolute Maximum Ratings may cause permanent damage to the device. This is a stress rating only; functional operation of the device at these or any other conditions outside of those indicated in the operation sections of this specification is not implied. Exposure to absolute maximum ratings for extended periods may affect device reliability.

ORDERING GUIDE

Model	Temperature Ranges	Package Descriptions	Package Options
AD9283BRS -50, -80, -100	–40°C to +85°C	20-Lead SSOP	RS-20
AD9283/PCB	25°C	Evaluation Board	

CAUTION

ESD (electrostatic discharge) sensitive device. Electrostatic charges as high as 4000 V readily accumulate on the human body and test equipment and can discharge without detection. Although the AD9283 features proprietary ESD protection circuitry, permanent damage may occur on devices subjected to high-energy electrostatic discharges. Therefore, proper ESD precautions are recommended to avoid performance degradation or loss of functionality.