Nordic VLSI ASA

8-Bit 200 MSPS Analog-to-Digital Converter

nAD8200

FEATURES

- Sample rate: 200 MSPS
- 1 V_{pp} Analog Input Range
- Internal THA
- Low Power: 550 mW
- +5 V Single Supply Operation
- TTL Output Interface
- Single or Demultiplexed Output Ports

GENERAL DESCRIPTION

The nAD8200 is an 8-bit monolithic analog-to-digital converter, implemented in a 0.5µ BiCMOS process. It has a folding and interpolation architecture – enabling high conversion rate at low power and small die area. The converter includes Track and Hold amplifier and voltage reference.

The nAD8200 digital input interfaces directly to TTL, CMOS or positive-ECL logic. The user may select dual-channel or single-channel digital outputs. The dual mode interleaves ADC data through two 8-bit channels at one-half the clock rate. This reduces the speed and cost of external digital interfaces. In single-channel mode, all data is piped at the full clock rate to the Channel A outputs. The pipeline delay is only 1.5 clock cycles.

QUICK REFERENCE DATA

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
VDD	Supply voltage			5		V
IDD	Supply current			110	155	mA
PD	Power dissipation			550	800	mW
DNL	Differential nonlinearity			±0.9	+2.0/-1.0	LSB
INL	Integral nonlinearity			±0.6	±2.0	LSB
f_S	Conversion rate		25		200	MSPS
Res	Resolution	f_{IN} = 19.7 MHz	6.3	6.8		Bits
C_{IN}	Input capacitance			4		pF

Table 1. Quick reference data

BLOCK DIAGRAM

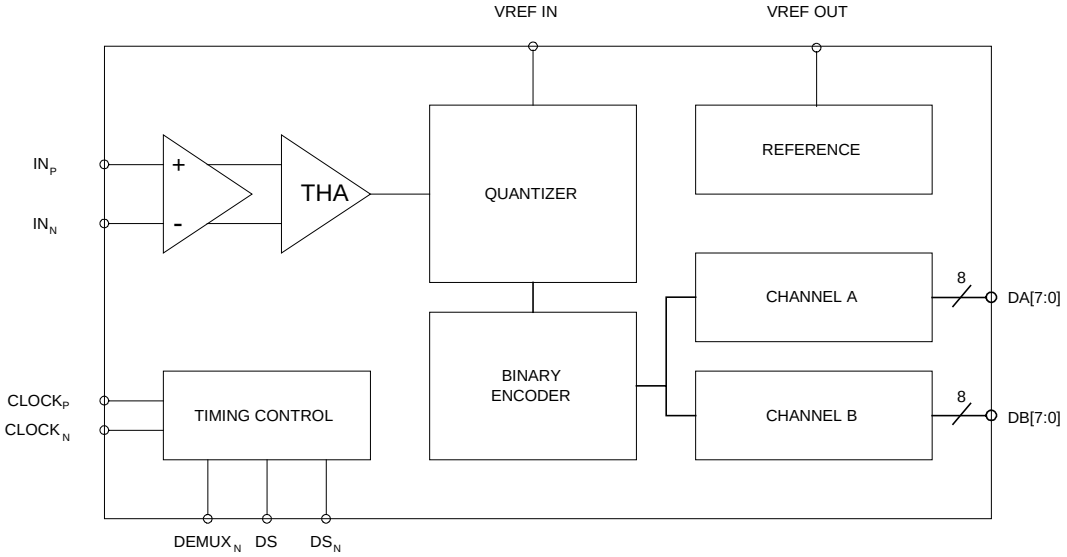

Figure 1. Block diagram

ELECTRICAL SPECIFICATIONS

Symbol	Parameter (condition)	Test Level	Min.	Typ.	Max.	Units
	DC ACCURACY					
DNL	Differential Nonlinearity (+25°C)			±0.9	+1.5/-1.0	LSB
	(-40°C to 85°C)			±1.0	+2.0/-1.0	LSB
INL	Integral Nonlinearity (+25°C)			±0.6	±1.5	LSB
	(-40°C to 85°C)			±0.9	±2.0	LSB
	No Missing Code			Guaranteed		
ε_G	Gain Error (+25°C)			±2	±7	% FS
t_G	Gain Tempco (-40°C to 85°C)			160		ppm/°C
	SWITCHING PERFORMANCE					
	Maximum Conversion Rate (f_S)		200			MSPS
	Minimum Conversion Rate (f_S)				25	MSPS
t_A	Aperture Delay			0.5		ns
Δt_A	Aperture Uncertainty (Jitter)			2.3		ps rms
t_{SDS}	Data Sync Setup Time		0			ns
t_{HDS}	Data Sync Hold Time		0.5			ns
t_{SDS}	Data Sync Setup Time		2.0			ns
t_V	Output Valid Time		2.7	5.1		ns
t_{PD}	Output Propagation Delay			5.9	7.9	ns
	DYNAMIC PERFORMANCE					
SNR	Signal-to-Noise Ratio without harmonics					
	f_{IN} = 19.7 MHz (+25°C)		42	45		dB
	f_{IN} = 19.7 MHz (-40°C to 85°C)			45		dB
	f_{IN} = 49.7 MHz (+25°C)		42	45		dB
	f_{IN} = 49.7 MHz (-40°C to 85°C)			45		dB
	f_{IN} = 70.1 MHz (+25°C)		42	45		dB
	f_{IN} = 70.1 MHz (-40°C to 85°C)			45		dB
SINAD	Signal-to-Noise Ratio with harmonics					
	f_{IN} = 19.7 MHz (+25°C)		40	43		dB
	f_{IN} = 19.7 MHz (-40°C to 85°C)			43		dB
	f_{IN} = 49.7 MHz (+25°C)		40	43		dB
	f_{IN} = 49.7 MHz (-40°C to 85°C)			43		dB
	f_{IN} = 70.1 MHz (+25°C)		39	42		dB
	f_{IN} = 70.1 MHz (-40°C to 85°C)			42		dB
HD_2	2^{nd} Harmonic Distortion					
	f_{IN} = 19.7 MHz (+25°C)		58	63		dBc
	f_{IN} = 49.7 MHz (+25°C)		54	59		dBc
	f_{IN} = 70.1 MHz (+25°C)		52	55		dBc
HD_3	3^{rd} Harmonic Distortion					
	f_{IN} = 19.7 MHz (+25°C)		48	56		dBc
	f_{IN} = 49.7 MHz (+25°C)		48	54		dBc
	f_{IN} = 70.1 MHz (+25°C)		43	50		dBc
IMD	Two-Tone Intermod Distortion					
	f_{IN} = 19.7 MHz (+25°C)			60		dBc
	f_{IN} = 49.7 MHz (+25°C)			55		dBc
	f_{IN} = 70.1 MHz (+25°C)			50		dBc

(table continued on next page)

Symbol	Parameter (condition)	Test Level	Min.	Typ.	Max.	Units
	ANALOG INPUT					
V_{FSR}	Input Voltage Range (Differential)			±0.5		V
	Compliance Range (-40°C to 85°C)		1.8		3.2	V
	Input Offset Voltage (+25°C)			±4	±16	mV
	Input Offset Voltage (-40°C to 85°C)			±8	±19	mV
	Input Resistance (25°C)		36	62		kΩ
	Input Resistance (-40°C to 85°C)		23			kΩ
	Input Capacitance			4		pF
	Input Bias Current (+25°C)			25	50	µA
	Input Bias Current (-40°C to 85°C)				75	µA
	Analog bandwidth, full power			350		MHz
	REFERENCE OUTPUT VOLTAGE					
V_{REF}	Ref. output voltage (-40°C to 85°C)		2.4	2.5	2.6	V
	Temperature Coefficient (-40°C to 85°C)			110		ppm/°C
	DIGITAL INPUTS					
I_{IH}	High level current			500	625	µA
I_{IL}	Low level current			500	625	µA
	Input Capacitance			3		pF
	DIFFERENTIAL INPUTS (-40°C to 85°C)					
V_{ID}	Differential Signal Amplitude		400			mV
V_{IHD}	High Input Voltage		1.5		VDD	V
V_{ILD}	Low Input Voltage		0		VDD-0.4	V
V_{ICM}	Common-Mode Input Voltage		1.5			V
	DEMUX INPUT (-40°C to 85°C)					
V_{IH}	High Input Voltage		2.0		VDD	V
V_{IL}	Low Input Voltage		0		0.8	V
	DIGITAL OUTPUTS					
V_{OH}	High Output Voltage		2.4			V
V_{OL}	Low Output Voltage				0.4	V
	Output Coding			Binary		
	POWER SUPPLY					
I_{DD}	V_{DD} Supply Current (-40°C to 85°C)			110	155	mA
	Power Dissipation (-40°C to 85°C)			550	800	mW
	Power Supply Sensitivity (+25°C)			0.005	0.015	V/V

Table 3. Electrical specifications

ABSOLUTE MAXIMUM RATINGS

Supply voltages

V_{DD}..... +6 V

Input voltages

Analog Inputs.....0.0 to V_{DD}

Digital Inputs .....0.0 to V_{DD}

V_{REFL}, V_{REFH} .....0.0 to V_{DD}

Temperatures

Operating Temp..... -40°C to +85°C

Storage Temp..... -65°C to +125°C

Note: Stress above one or more of the limiting values may cause permanent damage to the device.

PIN FUNCTIONS

Pin Name	Description
IN_P, IN_N	Differential input pins
$CLOCK_P$, $CLOCK_N$	Differential Clock input
VDD	Power Supply
GND	Ground
DA[7:0]	Digital Outputs, Channel A
DB[7:0]	Digital Outputs, Channel B
VREF_OUT	Reference Output Voltage
VREF_IN	Reference Input Voltage, High
$DEMUX_N$	Format Select: LOW = Dual Channel Mode, HIGH = Single Channel Mode
DS, DS_N	Data Sync, and Data Sync complement – Aligns output channels in Dual Channel Mode

Table 4. Pin functions

PIN ASSIGNMENT

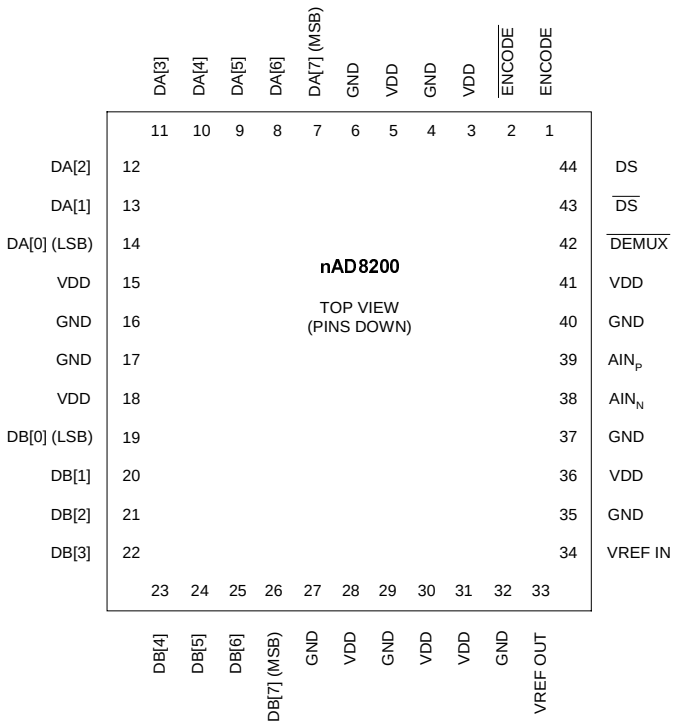

Figure 2. Pin assignment

TIMING DIAGRAM

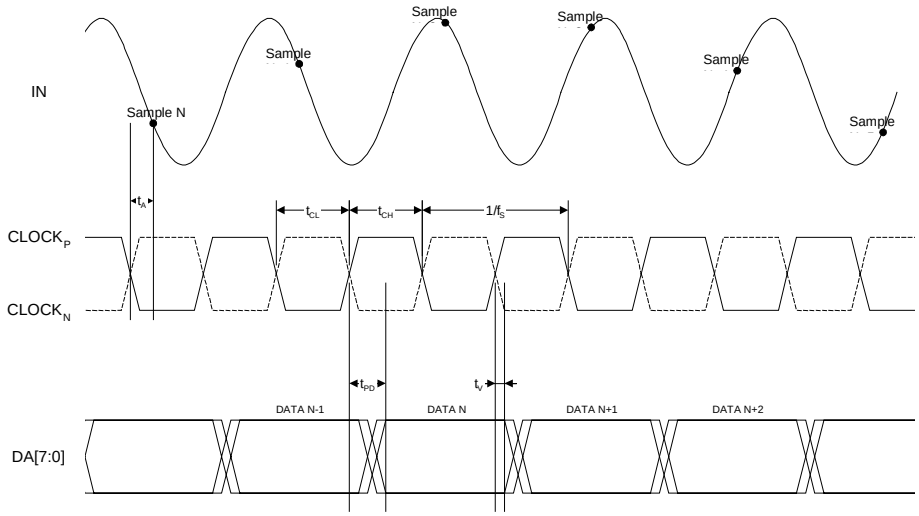

Figure 3. Timing diagram – Single Channel Mode

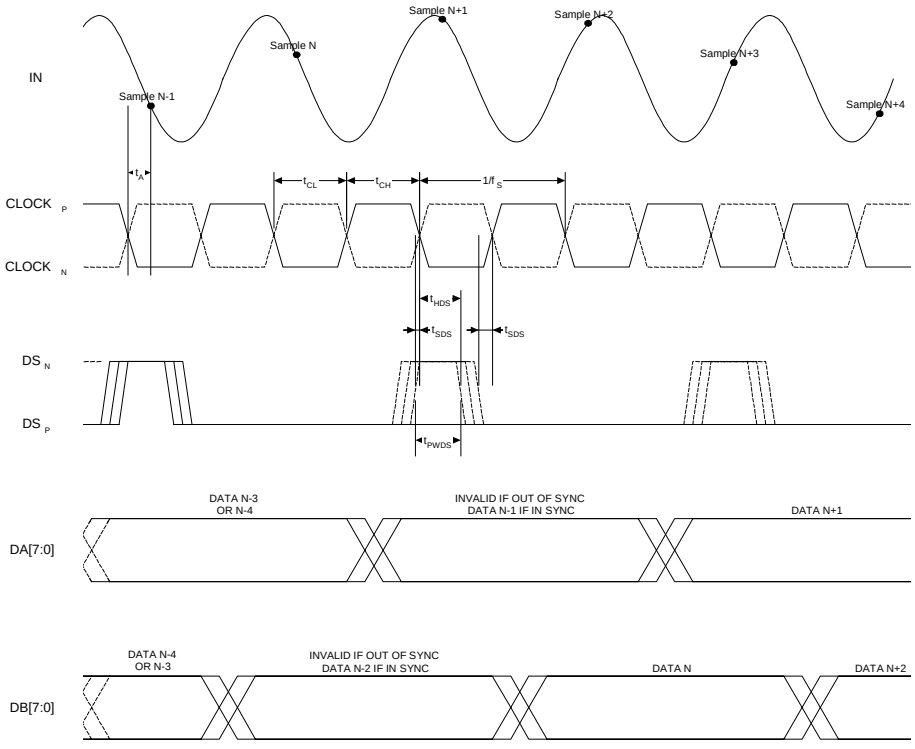

Figure 4. Timing diagram – Dual Channel Mode

PACKAGE OUTLINE

To be added (Drop in compatible with AD9054)

Figure 5. Package outline

DEFINITIONS

Data sheet status	
Objective product specification	This datasheet contains target specifications for product development.
Preliminary product specification	This datasheet contains preliminary data; supplementary data may be published from Nordic VLSI ASA later.
Product specification	This datasheet contains final product specifications.
Limiting values	
Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Specifications sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.	
Application information	
Where application information is given, it is advisory and does not form part of the specification.	

Table 5. Definitions

LIFE SUPPORT APPLICATIONS

These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Nordic VLSI ASA customers using or selling these products for use in such applications do so at their own risk and agree fully indemnify Nordic VLSI ASA for any damages resulting from such improper use or sale.

APPLICATION INFORMATION

To be added

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