nordic
Nordic VLSI ASA

10-Bit 125MSPS Sampling Digital-to-Analog Converter

nDA10125-18

FEATURES

- 1.8V power supply
- SFDR > 60dB for (f_{in} = 5MHz)
- Low power (63mW@1.8V)
- Update rate: 125MSPS
- Differential output (2 – 15mA)
- Internal voltage reference
- Edge-triggered input latches

APPLICATIONS

- Communications
- Basestations
- Digital Radio Link
- Set top boxes
- Instrumentation
- Digital video systems

GENERAL DESCRIPTION

The nDA10125-18 is a compact, high-speed, low power 10-bit digital-to-analog converter, implemented in a 0.18μm pure digital CMOS process. The power consumption is only 63mW from a 1.8V supply operating at 125MHz update rate. The nDA10125-18 offer good AC and DC performance at update rates up to 125MHz.

The DAC has differential current outputs with a nominal full-scale output current of 15mA. The full-scale output range is adjustable between 2mA and 15mA using the external R_{set} resistor. It operates from a single 1.8V power supply, and despite this low supply voltage the output compliance voltage range is as large as 0.75V.

Functional block diagram
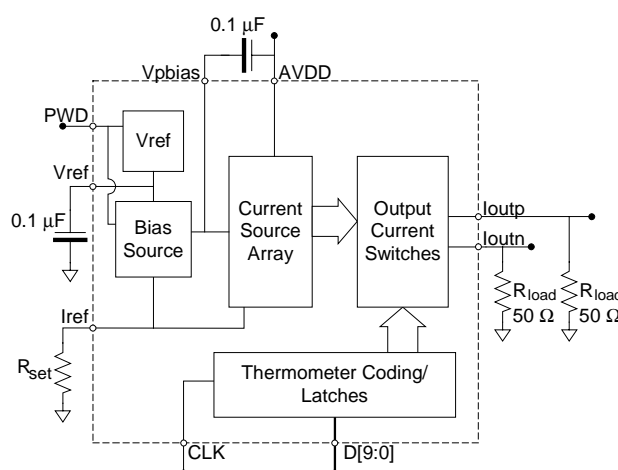
QUICK REFERENCE DATA

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_{DD}	Supply Voltage		1.6	1.8	2.0	V
I_{DD}	Supply Current	125 MSPS			35	mA
P_D	Power Dissipation	125 MSPS, 1.8V			63	mW
DNL	Differential nonlinearity				±0.5	LSB
INL	Integral nonlinearity				±1	LSB
$f_{clk,max}$	Maximum update rate		125			MHz
SFDR	Spurious free dynamic range	125 MSPS, f_{OUT}=5MHz	60			dB
N	Resolution				10	bit

ELECTRICAL SPECIFICATIONS

DC SPECIFICATIONS (T_A = 25°C, V_{DD} = 1.8V, Update Rate = 125MHz, Full scale range = 15mA)

Symbol	Parameter (condition)	Min.	Typ.	Max.	Units
	DC Accuracy				
DNL	Differential Nonlinearity			±0.5	LSB
INL	Integral Nonlinearity			±1.0	LSB
	Monotonicity		Guaranteed		
	Analog Output				
I_{FSR}	Full-scale Output Current (differential)	2		15	mA
V_{FSR}	Output compliance range (differential)	0		±0.75	V
R_{OUT}	Output resistance		TBD		kΩ
C_{OUT}	Output capacitance		TBD		pF
ε_{offset}	Offset error	-0.03		0.03	% FSR
ε_{gain}	Gain error	-10		10	% FSR
	Reference Voltage				
V_{ref}	Reference Voltage	0.92	1.0	1.08	V
	Reference Voltage Drift			100	ppm/°C
	Power Supply				
V_{DD}	Positive supply voltage	1.6	1.8	2.0	V
I_{DD}	Supply current			40	mA
V_{SS}	Negative supply voltage		GND		
P_D	Power dissipation(@1.8V)			72	mW
T	Ambient operating temperature	-40		+85	°C

AC SPECIFICATIONS (T_A = 25°C, V_{DD} = 1.8V, Update Rate = 125MHz, Full scale range = 15mA, R_{load}=50Ω)

Symbol	Parameter (condition)	Min.	Typ.	Max.	Units
	Dynamic Performance				
f_{max}	Maximum output update rate	125			MSPS
t_{ST}	Output Settling time		35		ns
t_{PD}	Output Propagation Delay		TBD		ns
E_{glitch}	Glitch impulse energy		TBD		pV-s
t_{rise}	Output Rise time		2.5		ns
t_{fall}	Output Fall time		2.5		ns
onoise	Output noise(I_{FSR}=15mA)		50		pA/Hz$^{\frac{1}{2}}$
onoise	Output noise(I_{FSR}=2mA)		30		pA/Hz$^{\frac{1}{2}}$
	AC Linearity				
SFDR	Spurious Free Dynamic Range				
	f_{OUT} = 5 MHz	60			dB
	f_{OUT} = 20 MHz	55			dB

ABSOLUTE MAXIMUM RATINGS

Supply voltages

AV_{DD} ....- 0.2V to +2.2V
DV_{DD1} ....- 0.2V to V_{DD} + 0.2V
OV_{DD} ....- 0.2V to V_{DD} + 0.2V

Input voltages

Digital In..............- 0.2V to V_{DD} + 0.2V
CLOCK ....- 0.2V to V_{DD} + 0.2V

Temperatures

Operating Temperature ….-40 to +85°C
Storage Temperature.. ... - 65 to +125°C

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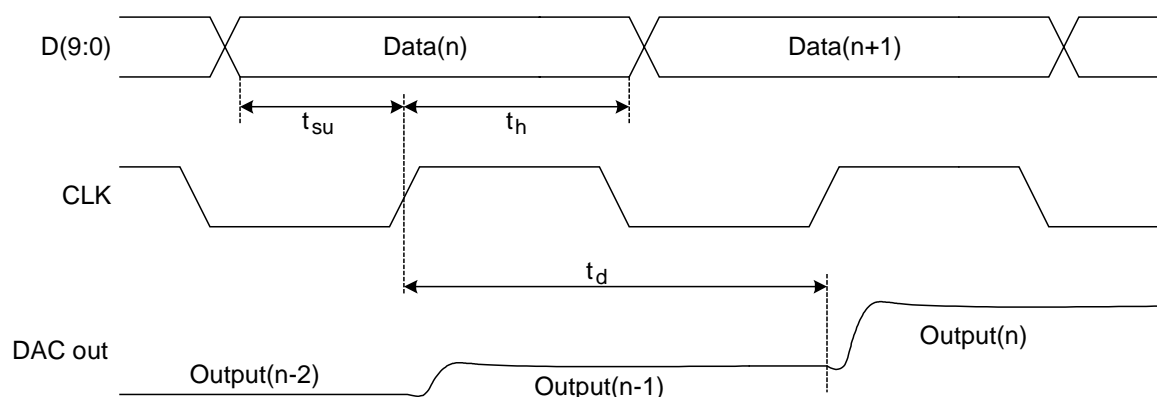
TIMING DIAGRAM

Figure 1: Timing Diagram

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 3. 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.

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ORDERING INFORMATION

Type number	Description	Price	Available
nDA10125-18-IC	nDA10125-18 sample in SSOP28 package (limited availability)	USD 50	February 15th, 2002
nDA10125-18-EVB	nDA10125-18 evaluation board including characterisation report and user guide	USD 300	February 15th, 2002

Table 4. Ordering information

Preliminary Product Specification. Revision Date: September 5th, 2001