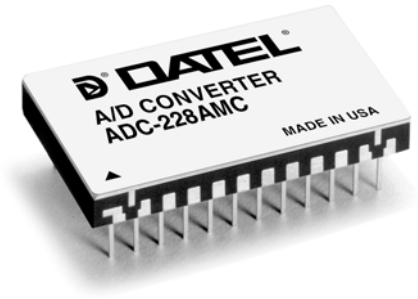
DATEL®
INNOVATION and EXCELLENCE

PRELIMINARY PRODUCT DATA

ADC-228A
8-Bit, 20MHz, Complete Flash A/D Converter

FEATURES

- **8-Bit flash A/D converter**
- **20MHz sampling rate**
- **Complete support circuitry**
- **Low power, 900mW**
- **Sample-hold not required**
- **Three-state outputs**
- **MIL-STD-883 versions**



GENERAL DESCRIPTION

The ADC-228A combines analog front-end circuitry and a flash A/D converter to digitize high-speed analog signals at a rate of 20 million samples per second. The ADC-228A contains an 8-bit, 20MHz, flash A/D, a wideband analog input buffer, a precision voltage reference, temperature compensation circuitry, reference trims, and a three-state output buffer in a 24-pin package.

The ADC-228A offers significant savings by combining all of the circuitry in a single package. Valuable board real estate is saved, and design time and manufacturing costs are reduced.

The ADC-228A is housed in a 24-pin ceramic DDIP package and is available in the commercial, 0 to +70°C, or military, –55 to +125°C, temperature ranges. A MIL-STD-883 version is also available. Operation is from ±15V and +5V power supplies.

INPUT/OUTPUT CONNECTIONS

PIN	FUNCTION	PIN	FUNCTION
1	+5V SUPPLY	24	BIT 8 (LSB)
2	GROUND	23	BIT 7
3	+5V REFERENCE OUT	22	BIT 6
4	GROUND	21	BIT 5
5	ANALOG INPUT	20	NO CONNECTION
6	GROUND	19	+15V SUPPLY
7	GROUND	18	CLOCK INPUT
8	NO CONNECTION	17	BIT 4
9	NO CONNECTION	16	BIT 3
10	–15V SUPPLY	15	BIT 2
11	$\overline{CS1}$	14	BIT 1 (MSB)
12	CS2	13	NO CONNECTION

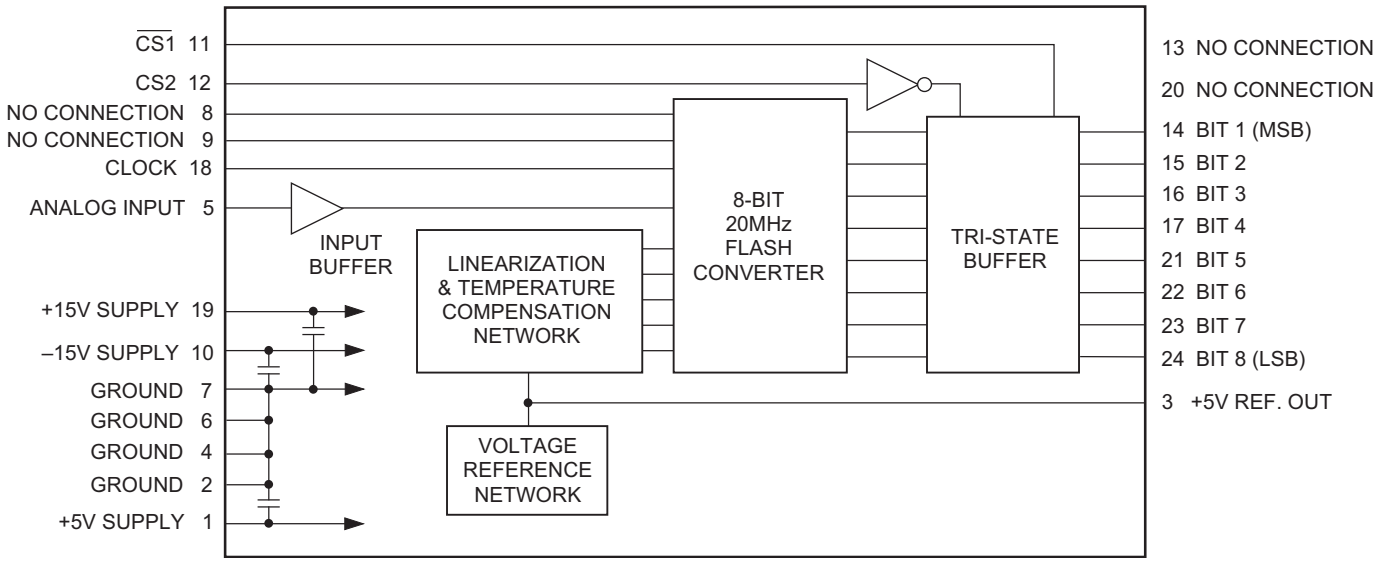


Figure 1. Functional Block Diagram

ABSOLUTE MAXIMUM RATINGS

PARAMETER	LIMITS
Power Supply Voltage, Pin 1	–0.3 to +7V
Pin 19	–0.3 to +18V
Pin 10	+0.3 to –18V
Digital Inputs, Pins 8,9,11,12,18	–0.5 to +5.5V
Analog Input, Pin 5	–3.8 to +6.6V
Digital Outputs	–0.5 to +5.5V (short circuit protected to ground)
Lead Temp. (10 seconds)	+300°C

FUNCTIONAL SPECIFICATIONS

(Apply over the operating temperature range with 20MHz clock and ±15V and +5V power supply voltages, unless otherwise specified.)

ANALOG INPUTS	MIN.	TYP.	MAX.	UNITS
Single-Ended, Non-Isolated				
Input Range, dc-20MHz	0	—	+5.0	Volts
Input Resistance	1.95	2	—	kΩ
Input Capacitance	—	5	10	pF
DIGITAL INPUTS				
Logic Levels				
Logic 1	+2.0	—	—	Volts
Logic 0	—	—	+0.8	Volts
Logic Loading				
Logic 1	—	—	+160	µA
Logic 0	—	—	–0.5	mA
Clock Pulse Widths				
"High"	20	—	—	ns
"Low"	20	—	—	ns
DIGITAL OUTPUTS				
Coding	Straight Binary			
Resolution	8 Bits			
Logic Levels				
Logic 1	+2.4	—	—	Volts
Logic 0	—	—	+0.4	Volts
Logic Loading				
Logic 1	—	—	–1	mA
Logic 0	—	—	+1	mA
Output Data Valid Delay				
From Rising Edge	—	—	40	ns
Output Hold Time	6	—	—	ns
PERFORMANCE				
Sampling Rate ①	20	—	—	MHz
Differential Linearity				
Code Transitions	—	±0.5	±0.75	LSB
Integral Linearity, +25°C				
End-point	—	±0.5	±1	LSB
Best-fit Line	—	±0.35	±0.75	LSB
Over Temperature End-point	—	—	±1.75	LSB
Best-fit Line	—	—	±1	LSB
Zero-Scale Offset				
Code "0" to "1" Transition				
+25°C	—	±0.5	±1	LSB
–55 to +125°C	—	±0.5	±1.5	LSB
Gain error	—	±0.5	±1.5	LSB
Full Scale Absolute Accuracy	—	±0.5	±1.5	LSB
Differential Gain ②	—	2	—	%
Differential Phase ②	—	1	—	deg.
Aperture Delay	—	8	—	ns
Aperture Jitter	—	50	—	ps
No Missing Codes				
Power Supply Rejection	Over the operating temperature range ±0.02% FSR/%V_S maximum			

DYNAMIC PERFORMANCE	MIN.	TYP.	MAX.	UNITS
Total Harm. Distortion, –0.5dB				
DC to 2.5 MHz	—	–55	–53	dB
2.5 MHz to 5 MHz	—	–49	–44	dB
5 MHz to 10 MHz	—	–39	–36	dB
Signal-to-Noise Ratio and Distortion, –0.5dB				
DC to 2.5 MHz	44	49	—	dB
2.5 MHz to 5 MHz	41	46	—	dB
5 MHz to 10 MHz	35	38	—	dB
Signal-to-Noise Ratio w/o Distortion, –0.5 dB				
DC to 2.5 MHz	45	48	—	dB
2.5 MHz to 5 MHz	44	49	—	dB
5 MHz to 10 MHz	42	45	—	dB
Effective Bits, –0.5dB				
DC to 2.5 MHz	7.1	7.75	—	Bits
2.5 MHz to 5 MHz	6.8	7.4	—	Bits
5 MHz to 10 MHz	5.6	6.1	—	Bits
Input Bandwidth				
Large Signal (–3dB)	15	—	—	MHz
Small Signal (–20dB)	40	—	—	MHz
POWER SUPPLY				
Power Supply Range				
+15V Supply	+11	+15	+15.75	Volts
–15V Supply	–11	–15	–15.75	Volts
+5V Supply	+4.75	+5	+5.25	Volts
Power Supply Current				
+15V Supply	—	+12	+20	mA
–15V Supply	—	–13	–20	mA
+5V Supply	—	+70	+80	mA
Power Dissipation				
±15V, +5V Nominal	—	0.7	0.9	Watts

PHYSICAL/ENVIRONMENTAL	
Operating Temp. Range, Case	
ADC-228AMC	0 to +70°C
ADC-228AMM, ADC-228A/883	–55 to +125°C
Storage Temp. Range	–65 to +150°C
Package Type	24-pin, ceramic DDIP
Weight	0.3 ounces (8.5 grams)

Footnotes:

① At full power input and chip selects enabled.

② For 10-step, 40 IRE NTSC ramp test.

TECHNICAL NOTES

1. Rated performance requires using good high-frequency techniques. The analog and digital ground pins are connected to each other internally. Avoid ground related problems by connecting the grounds to one point, the ground plane beneath the converter. Due to the inductance and resistance of the power supply return paths, return the analog and digital ground separately to the power supplies.

2. Bypass all the analog and digital supplies and the +5V REFERENCE (pin 3) to ground with a 4.7µF, 25V tantalum electrolytic capacitor in parallel with a 0.1µF ceramic capacitor.

Table 1. ADC-228A Unipolar Output Coding

ANALOG INPUT	CODE	STRAIGHT BIN.
+4.96V	+FS – 1 LSB	1111 1110
+3.75V	+ 3/4 FS	1100 0000
+2.50V	+ 1/2 FS	1000 0000
+1.25V	+ 1/4 FS	0100 0000
+0.02V	+ 1 LSB	0000 0001
0.00V	ZERO	0000 0000

Table 2. Chip Select Truth Table

CS2 Pin 12	$\overline{CS1}$ Pin 11	Bits 1-8
0	0	Three State Mode
0	1	Three State Mode
1	0	Data Outputted
1	1	Three State Mode

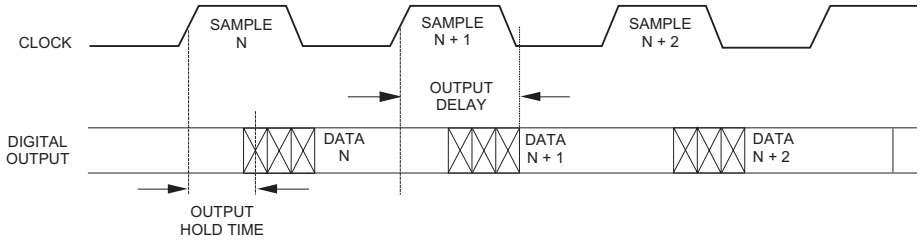


Figure 2. ADC-228A Timing Diagram

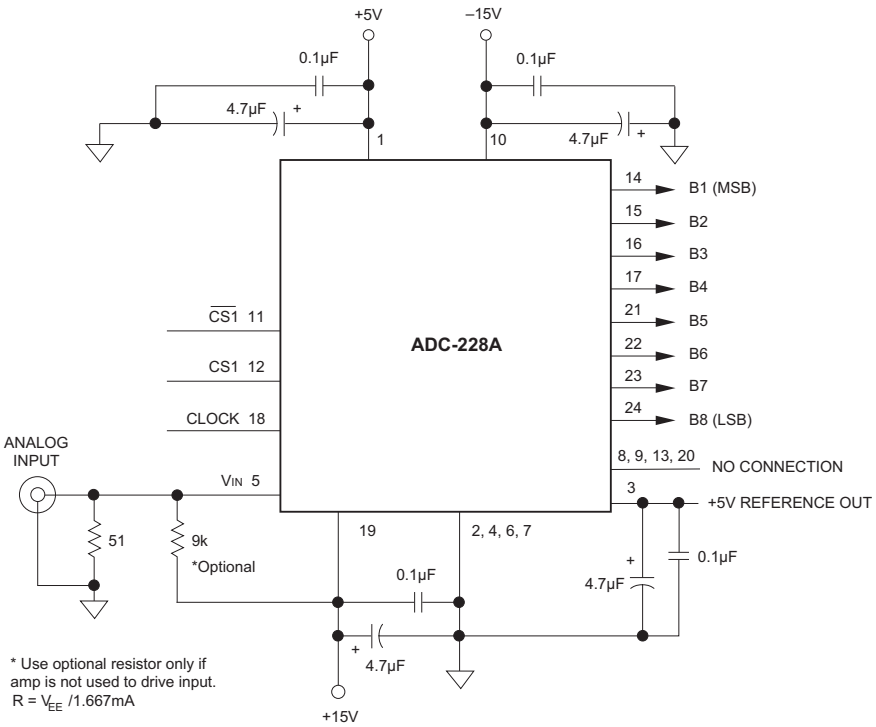
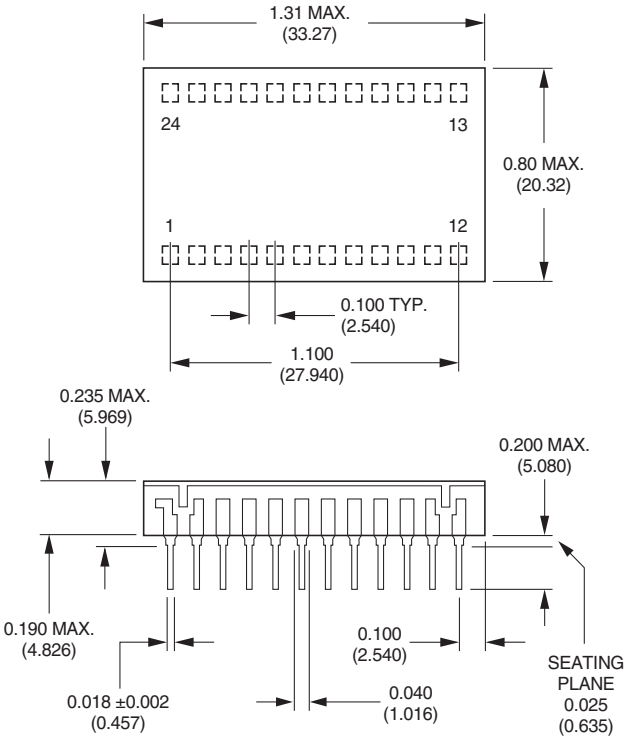


Figure 3. ADC-228A Typical Connections

MECHANICAL DIMENSIONS INCHES (mm)



Dimension Tolerances (unless otherwise indicated):
2 place decimal (.XX) ±0.010 (±0.254)
3 place decimal (.XXX) ±0.005 (±0.127)

Lead Material: Kovar alloy

Lead Finish: 50 microinches (minimum) gold plating over 100 microinches (nominal) nickel plating

ORDERING INFORMATION

MODEL	TEMPERATURE RANGE	SAMPLING RATE
ADC-228AMC	0 to +70°C	20MSPS
ADC-228AMM	–55 to +125°C	20MSPS
ADC-228A/883 *	–55 to +105°C	15MSPS

Receptacle for PC board mounting can be ordered through AMP Inc., part # 3-331272-8 (component lead socket), 24 required. Contact DATEL for 883 product specifications

***** DATEL's initial qualification was done at 15MSPS and as a Mil-STD-883 Class G product per customer request. Mil-STD-883 Class G allows for a reduced temperature range (–55°C to +105°C) that applies to this device. Contact DATEL if a 20MSPS rate or a Mil-STD-883 Class H (–55°C to +125°C) temperature range is desired.

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