

ADC-HX, ADC-HZ Series

12-Bit, 8 and 20µsec Analog-to-Digital Converters

ABSOLUTE MAXIMUM RATINGS

PARAMETERS	LIMITS	UNITS
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+15V Supply, Pin 28	+18	Volts
–15V Supply, Pin 31	–18	Volts
+5V Supply, Pin 16	+7	Volts
Digital Inputs, Pins 14, 21	±5.5	Volts
Analog Inputs, Pins 24, 25	±25	Volts
Buffer Input, Pin 30	±15	Volts
Lead Temperature (10 seconds)	300	°C

Functional Specifications

(Typical at +25°C and ±15V and +5V supplies unless otherwise noted)

INPUTS	ADC-HX12B	ADC-HZ12B
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Analog Input Ranges

Unipolar 0 to +5V, 0 to +10V

Bipolar ±2.5V, ±5V, ±10V

Input Impedance 2.5k (0 to +5V, ±2.5V)

10k (±10V)

Input Bias Current of Buffer 50 megohms

125nA typical, 250nA max.

+2V min. to +5.5V max; positive pulse with duration of 100ns min. Rise and fall times <30ns.

Logic "1" to "0" transition resets converter and initiates next conversion. Loading: 2 TTL loads.

PERFORMANCE

Resolution	12 bits
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Nonlinearity

±1/2LSB max.

Differential Nonlinearity

±0.2%

Accuracy Error ①

Gain (before adjustment)

Zero, Unipolar (before adj.)

Offset, Bipolar (before adj.)

Temperature Coefficient

Gain

Zero, Unipolar

Offset, Bipolar

Diff. Nonlinearity Tempco

No Missing Codes

Conversion Time ③

12 Bits

10 Bits ④

8 Bits ④

Buffer Settling Time (10V step)

Power Supply Rejection ±0.004%/±0.01% supply max.

Parallel Output Data

command.

V_{OUT} ("0") ≤ +0.4V

V_{OUT} ("1") ≥ +2.4V

Unipolar Coding

Bipolar Coding

Complementary two's complement

Serial Output Data

Compl. binary or compl. offset binary coding.

End of Conversion (Status)

Conversion status signal. Output is logic "1" during reset and conversion and logic "0" when conversion complete.

Clock Output

for ADC-HX and 1.5MHz for ADC-HZ (pin 17 grounded).

Internal Reference

Reference Tempco

External Reference Current

+6.3V

±20ppm/°C max.

2.5mA max.

Train of positive going +5V 100ns pulses. 600kHz

OUTPUTS ⑤

Power Supply Rejection	±0.004%/±0.01% supply max.
Buffer Settling Time (10V step)	3µs to ±0.01%
8 Bits ④	10µs max.
10 Bits ④	15µs max.
12 Bits	20µs max.
Conversion Time ③	20µs max.
No Missing Codes	8µs max.
Diff. Nonlinearity Tempco	6µs max.
Offset, Bipolar	4µs max.
Zero, Unipolar	4µs max.
Gain	4µs max.
Temperature Coefficient	4µs max.
Offset, Bipolar (before adj.)	4µs max.
Zero, Unipolar (before adj.)	4µs max.
Gain (before adjustment)	4µs max.
Accuracy Error ①	4µs max.
Differential Nonlinearity	4µs max.
Nonlinearity	4µs max.
Resolution	4µs max.

PERFORMANCE	12 bits
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Logic "

ADC-HX, ADC-HZ Series

12-Bit, 8 and 20µsec Analog-to-Digital Converters

CODING TABLES

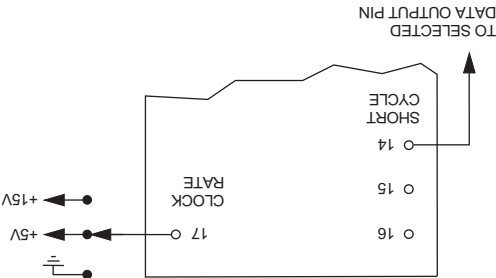
UNIPOLAR OPERATION		
INPUT RANGE		COMP. BINARY CODING
0 TO +10V	0 TO +5V	MSB
		LSB
+9.9976V	+4.9988V	0000 0000 0000
+8.7500	+4.3750	0001 1111 1111
+7.5000	+3.7500	0011 1111 1111
+5.0000	+2.5000	0111 1111 1111
+2.5000	+1.2500	1011 1111 1111
+1.2500	+0.6250	1101 1111 1111
+0.0024	+0.0012	1111 1111 1110
0.0000	0.0000	1111 1111 1111

BIPOLAR OPERATION					
INPUT VOLTAGE RANGE			COMP. OFFSET BINARY		
+10V	+5V	+2.5V	MSB	LSB	COMP. TWO'S COMPLEMENT
+9.9951V	+4.9976V	+2.4988V	0000 0000 0000	0000 0000 0000	1000 0000 0000
+7.5000	+3.7500	+1.8750	0001 1111 1111	0001 1111 1111	1001 1111 1111
+5.0000	+2.5000	+1.2500	0011 1111 1111	0011 1111 1111	1011 1111 1111
0.0000	0.0000	0.0000	0111 1111 1111	0111 1111 1111	1111 1111 1111
-5.0000	-2.5000	-1.2500	1011 1111 1111	1011 1111 1111	0011 1111 1111
-7.5000	-3.7500	-1.8750	1101 1111 1111	1101 1111 1111	0101 1111 1111
-9.9951	-4.9976	-2.4988	1111 1111 1110	1111 1111 1110	0111 1111 1110
-10.0000	-5.0000	-2.5000	1111 1111 1111	1111 1111 1111	0111 1111 1111

Refer to Technical Note 4 for methods of reducing the ADC-HX or ADC-HZ conversion times.

SHORT CYCLE OPERATION

CONNECTIONS



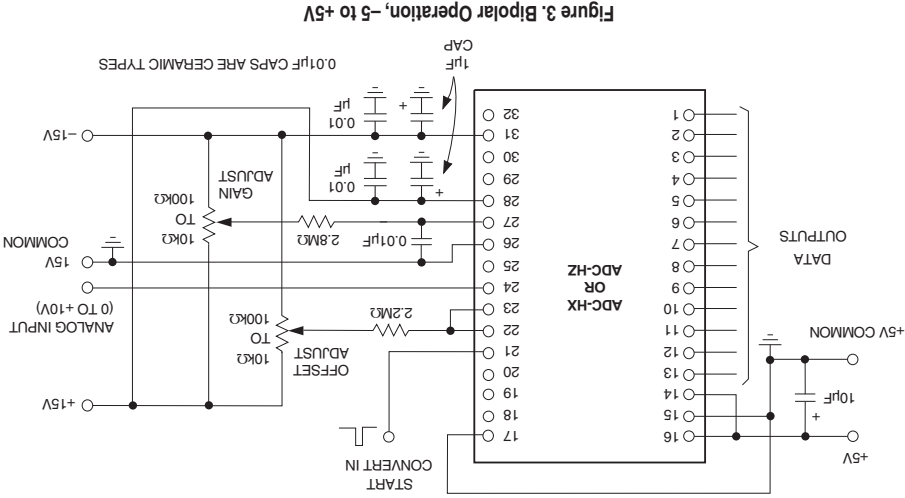
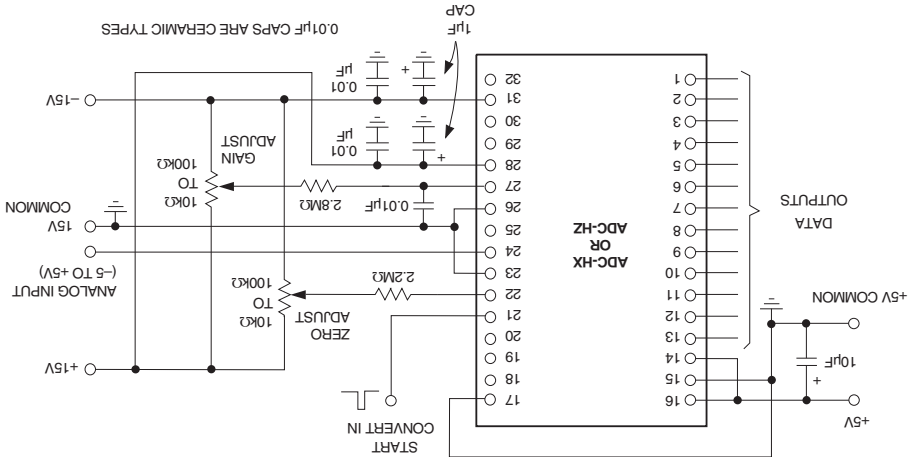
CLOCK RATE VS. VOLTAGE		
PIN 17 VOLTAGE	ADC-HX	ADC-HZ
	CLOCK RATE	
0V	600KHZ	1.5MHZ
+5V	720KHZ	1.8MHZ
+15V	880KHZ	2.2MHZ

8, 10 & 12-BIT CONVERSION TIMES			
RESOLUTION		PIN 14 TO	
12 BITS	20µs	12 BITS	8 BITS
10 BITS	15µs	10 BITS	8 BITS
8 BITS	10µs	8 BITS	8 BITS
ADC-HX Conversion Time		Connect These Pins Together	
8µs		14 & 16	14 & 2
6µs		17 & 15	17 & 16
4µs		17 & 28	14 & 4

PIN 14 CONNECTION			
RES. (BITS)	PIN 14 TO	RES. (BITS)	PIN 14 TO
1	PIN 11	7	PIN 5
2	PIN 10	8	PIN 4
3	PIN 9	9	PIN 3
4	PIN 8	10	PIN 2
5	PIN 7	11	PIN 1
6	PIN 6	12	PIN 16

ADC-HX, ADC-HZ Series

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CONNECTIONS AND CALIBRATION

INPUT CONNECTIONS

WITHOUT BUFFER				WITH BUFFER			
INPUT VOLTAGE RANGE	INPUT PIN	CONNECT THESE PINS TOGETHER		INPUT PIN	CONNECT THESE PINS TOGETHER		
0 to +5V	24	22 & 25	23 & 26	30	22 & 25	23 & 26	29 & 24
0 to +10V	24	—	23 & 26	30	—	23 & 26	29 & 24
±2.5V	24	22 & 25	23 & 22	30	22 & 25	23 & 22	29 & 24
±5V	24	—	23 & 22	30	—	23 & 22	29 & 24
±10V	25	—	23 & 22	30	—	23 & 22	29 & 25

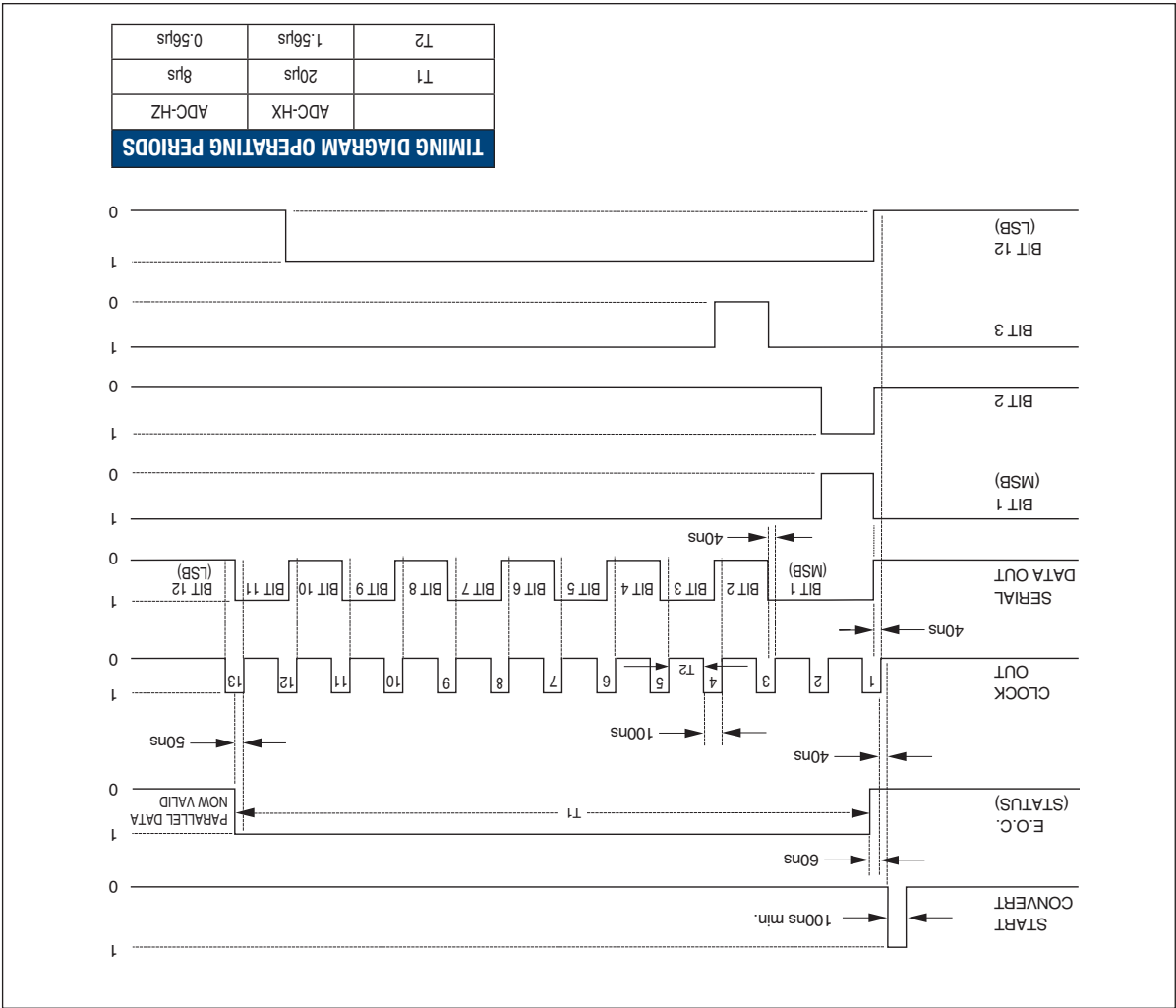
ADC-HX, ADC-HZ Series

12-Bit, 8 and 20µsec Analog-to-Digital Converters

CALIBRATION PROCEDURE

1. Connect the converter for bipolar or unipolar operation.
Use the input connection table for the desired input voltage range and input impedance. Apply START CONVERT pulses of 100 nanoseconds minimum duration to pin 21. The spacing of the pulses should be no less than the maximum conversion time.
2. Zero and Offset Adjustments
Apply a precision voltage reference source between the selected analog input and ground. Adjust the output of the reference source to the value shown in the Calibration Table for the unipolar zero adjustment (zero + 1/2LSB) or the bipolar offset adjustment (–FS + 1/2LSB). Adjust the trimming potentiometer so that the output code flickers equally between 1111 1111 1111 and 1111 1111 1110.
3. Full Scale Adjustment
Change the output of the precision voltage reference source to the value shown in the Calibration Table for the unipolar or bipolar gain adjustment (+FS – 1.5LSB). Adjust the gain trimming potentiometer so that the output code flickers equally between 0000 0000 0000 and 0000 0000 0000.

**TIMING DIAGRAM FOR
ADC-HX, ADC-HZ OUTPUT: 101010101010**

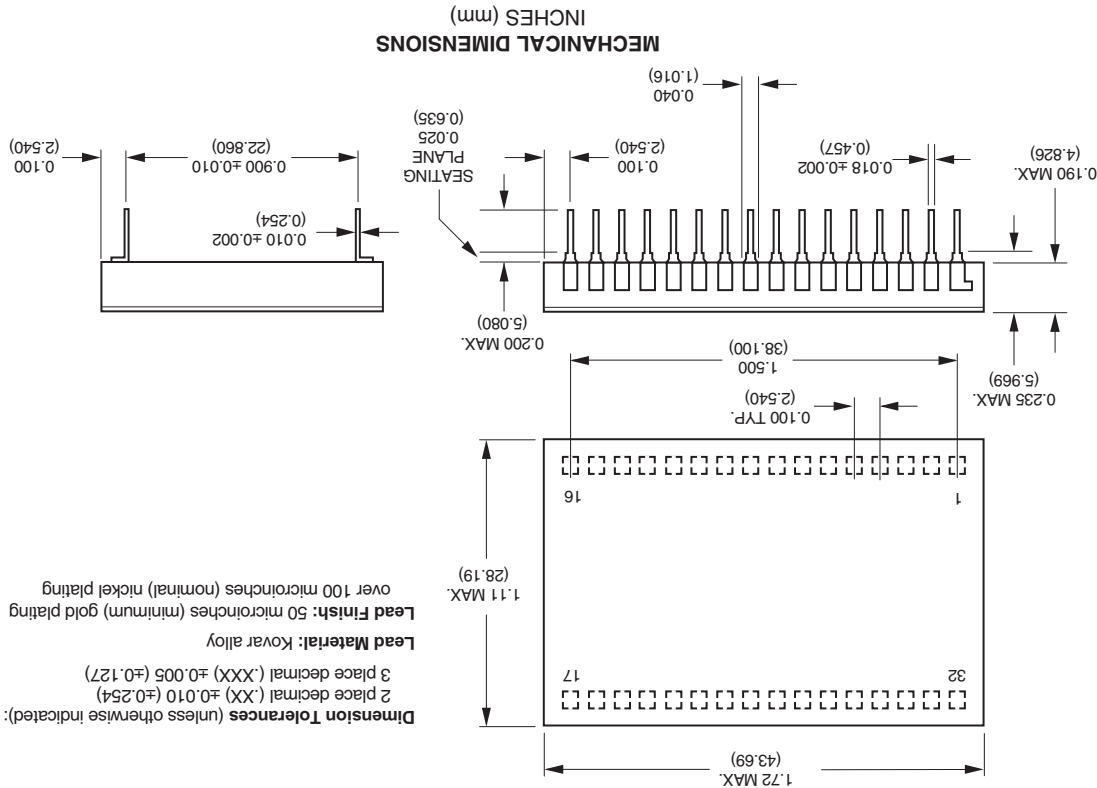


CALIBRATION TABLE

UNIPOLAR RANGE		
ADJUST.	GAIN	INPUT VOLTAGE
0 to + 5V	ZERO	+ 0.6 mV
0 to + 10V	ZERO	+ 1.2 mV
BIPOLAR RANGE		
± 2.5V	OFFSET	-2.494V
± 5V	OFFSET	-4.998V
± 10V	OFFSET	-9.9976V
± 10V	GAIN	+ 9.9927V

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ORDERING GUIDE SUMMARY

MODEL	TEMP. RANGE
ADC-HX12BGC	0 to +70°C
ADC-HX12BMC	0 to +70°C
ADC-HX12BMM	-55 to +125°C
ADC-HX12BMM-QL	-55 to +125°C
ADC-HX/883	-55 to +125°C
ADC-HZ12BGC	0 to +70°C
ADC-HZ12BMC	0 to +70°C
ADC-HZ12BMM	-55 to +125°C
ADC-HZ12BMM-QL	-55 to +125°C
ADC-HZ/883	-55 to +125°C

MIL-STD-883B units are available under DESC Drawing Number 5962-88508. Contact DATel for 883 product specification.

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