

1.1 Scope.

This specification covers the detail requirements for a monolithic CMOS Quad 8-bit digital-to-analog converter, with output buffer amplifiers and interface logic. Separate on-chip latches are provided for each of the four D/A converters.

1.2 Part Number.

The complete part number per Tables 1 and 2 of this specification is as follows:

Device	Part Number ¹
– 1	AD7226T(X)/883B

NOTE

¹See paragraph 1.2.3 for package identifier.

1.2.3 Case Outline.

See Appendix 1 of General Specification ADI-M-1000: package outline:

(X)	Package	Description
Q	Q-20	20-Pin Cerdip
E	E-20A	20-Contact LCC

1.3 Absolute Maximum Ratings. (T_A = +25°C unless otherwise noted)

V _{DD} to AGND	–0.3V, +17V
V _{DD} to DGND	–0.3V, +17V
V _{SS} to AGND	–7V, V _{DD}
V _{SS} to DGND	–7V, V _{DD}
V _{DD} to V _{SS}	–0.3V, +24V
AGND to DGND	–0.3V, V _{DD}
Digital Input Voltage to DGND	–0.3V, V _{DD}
V _{REF} to AGND	–0.3V, V _{DD}
V _{OUT} to AGND	V _{SS} , V _{DD}
Power Dissipation	
Up to +75°C	500mW
Derates above +75°C	2mW/°C
Operating Temperature Range	–55°C to +125°C
Storage Temperature	–65°C to +150°C
Lead Temperature (Soldering 10sec)	+300°C

1.5 Thermal Characteristics.

Thermal Resistance θ_{JC} = 35°C/W for Q-20 and E-20A

θ_{JA} = 120°C/W for Q-20 and E-20A

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Table 1.

Test	Symbol	Device	Design Limit $T_{min}-T_{max}$	Sub Group 1	Sub Group 2, 3	Test Condition ¹	Units
Resolution	RES	-1	8				Bits
Relative Accuracy	RA	-1	± 1	± 1	± 1	$V_{DD} = +14V$; $V_{SS} = -5V$; $V_{REF} = +10V$	LSB max
Total Unadjusted Error	E_T	-1	± 2	± 2	± 2	$V_{DD} = +14V$; $V_{SS} = -5V$; $V_{REF} = +10V$	LSB max
Differential Nonlinearity	DNL	-1	± 1	± 1	± 1	$V_{DD} = +14V$; $V_{SS} = -5V$; $V_{REF} = +10V$ Guaranteed Monotonic to 8-Bits	LSB max
Full-Scale Error	A_E	-1	$\pm 3/2$	$\pm 3/2$	$\pm 3/2$	$V_{DD} = +14V$; $V_{SS} = -5V$; $V_{REF} = +10V$	LSB max
Zero Code Error	A_{ZCE}	-1	± 30	± 30	± 30	$V_{DD} = 16.5V, 11.4V$ and $14V$; $V_{SS} = -5V$; $V_{REF} = V_{DD} - 4$	mV max
Voltage Output Settling Time ²	t_{SL}	-1	5			Positive Full-Scale Change	μs max
			7			Negative Full-Scale Change	
Voltage Output Slew Rate	t_{SR}	-1	2.5				V/ μs min
Minimum Load Resistance	R_{L-MIN}	-1	2	2	2	$V_{OUT} = +10V$; $V_{DD} = +14V$	k Ω min
Reference Input Resistance	R_I	-1	2	2	2	$V_{DD} = 14V$	k Ω min
Reference Input Capacitance	C_I	-1	65			Occurs when DAC is loaded with all 0's	pF min
			300			Occurs when DAC is loaded with all 1's	pF max
Digital Input High Voltage	V_{IH}	-1	2.4	2.4	2.4	$V_{DD} = 11.4V$; $V_{REF} = V_{DD} - 4$	V min
Digital Input Low Voltage	V_{IL}	-1	0.8	0.8	0.8	$V_{DD} = 11.4V$; $V_{REF} = V_{DD} - 4$	V max
Digital Input Leakage Current	I_{IN}	-1	1	1	1	$V_{IN} = 0V$ or V_{DD} ; $V_{DD} = 16.5V$	$\pm \mu A$ max
Digital Input Capacitance	C_{IN}	-1	8				pF max
Address to Write Setup Time	t_{AS}	-1	0				ns min
Address to Write Hold Time	t_{AH}	-1	10				ns min
Data Valid to Write Setup Time	t_{DS}	-1	100				ns min
Data Valid to Write Hold Time	t_{DH}	-1	10				ns min
Write Pulse Width	t_{WR}	-1	200				ns min
Power Supply Voltage Range	V_{DD}	-1	11.4			For Specified Performance	+ V min
			16.5				+ V max
	V_S	-1	-4.5				- V min
			-5.5				- V max
Power Supply Current	I_{DD}	-1	13	13	13	Outputs Unloaded: $V_{IN} = V_{IL}$ or V_{IH} $V_{DD} = 16.5V$; $V_{SS} = -5.5V$; $V_{REF} = 12.5V$	mA max
	I_{SS}	-1	11	11	11		

NOTES

¹ $V_{DD} = +11.4V$ to $16.5V$; $V_{SS} = -5V \pm 10\%$; AGND = DGND = 0V; $V_{REF} = +2V$ to $(V_{DD} - 4V)$ unless otherwise stated.

² $V_{REF} = +10V$; Settling Time to $\pm 1/2LSB$.

Table 2.

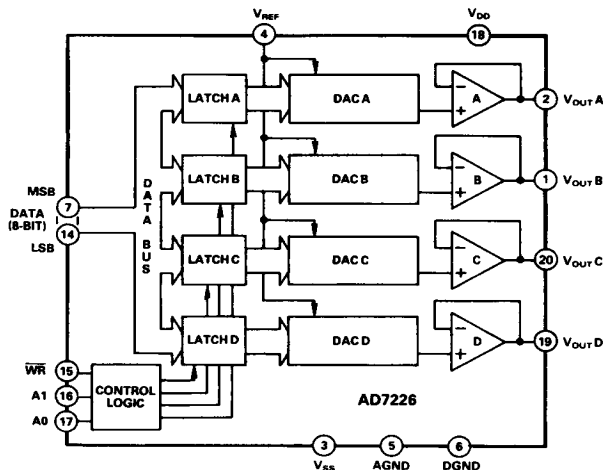
Test	Symbol	Device	Design Limit $T_{min}-T_{max}$	Sub Group 1	Sub Group 2, 3	Test Condition ¹	Units
Resolution	RES	- 1	8				Bits
Total Unadjusted Error	E_T	- 1	2	2	2	$V_{DD} = +14V$	$\pm$ LSB max
Differential Nonlinearity	DNL	- 1	1	1	1	$V_{DD} = +14V$ Guaranteed Monotonic to 8-Bits	$\pm$ LSB max
Voltage Output Settling Time ²	t_{SL}	- 1	5			Positive Full-Scale Change	μs max
			20			Negative Full-Scale Change	
Voltage Output Slew Rate	t_{SR}	- 1	2				V/ μs min
Minimum Load Resistance	RL_{MIN}	- 1	2	2	2	$V_{OUT} = +10V$; $V_{DD} = +15V$	k Ω min
Reference Input Resistance	V_{REF}	- 1	2			$V_{DD} = 14.25V$	k Ω min
Reference Input Capacitance	C_I	- 1	65			Occurs when DAC is loaded with all 0's	pF min
			300			Occurs when DAC is loaded with all 1's	pF max
Digital Input High Voltage	V_{IH}	- 1	2.4	2.4	2.4	$V_{DD} = +14.25V$	V min
Digital Input Low Voltage	V_{IL}	- 1	0.8	0.8	0.8	$V_{DD} = +14.25V$	V max
Digital Input Leakage Current	I_{IN}	- 1	1			$V_{IN} = 0V$ or V_{DD} ; $V_{DD} = +14.25V$	$\pm \mu A$ max
Digital Input Capacitance	C_I	- 1	8				pF max
Address to Write Setup Time	t_{AS}	- 1	0				ns min
Address to Write Hold Time	t_{AH}	- 1	10				ns min
Data Valid to Write Setup Time	t_{DS}	- 1	100				ns min
Data Valid to Write Hold Time	t_{DH}	- 1	10				ns min
Write Pulse Width	t_{WR}	- 1	200				ns min
Power Supply Voltage Range	V_{DD}	- 1	14.25			For Specified Performance	+ V min
			15.75				+ V max
Power Supply Current	I_{DD}	- 1	13			Outputs Unloaded; $V_{IN} = V_{IL}$ or V_{IH} $V_{DD} = 15.75V$	mA max

NOTES

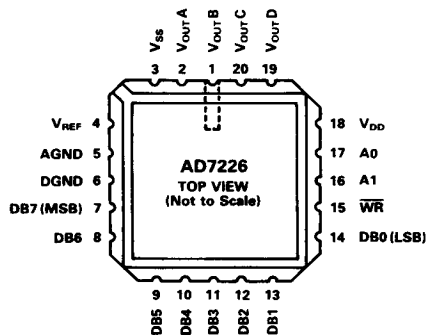
¹ $V_{DD} = +15V \pm 5\%$; $V_{SS} = AGND = DGND = 0V$; $V_{REF} = +10V$ unless otherwise stated.²Settling Time to $\pm 1/2$ LSB.

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3.2.1 Functional Block Diagram and Terminal Assignments.



E Package (LCC)

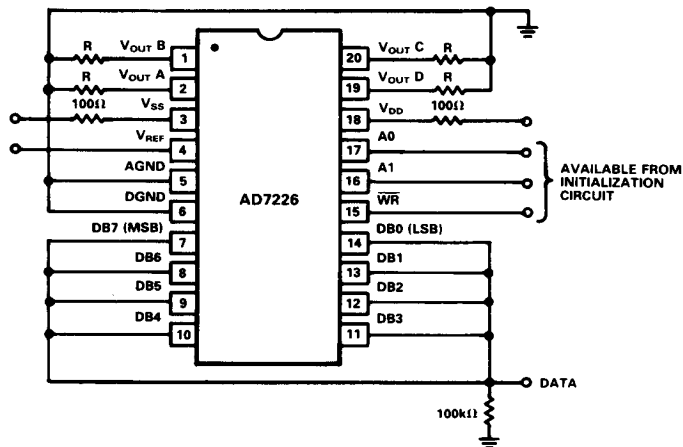


3.2.4 Microcircuit Technology Group.

This microcircuit is covered by technology group (80).

4.2.1 Life Test/Burn-In Circuit.

Steady state life test is per MIL-STD-883, Method 1005. Burn-in is per MIL-STD-883 Method 1015 test condition (B).



V_{DD}	= +15V
V_{SS}	= -5V
V_{REF}	= +5V
DATA	= V_{DD}
R	= 10kΩ
I_{DD}	= 6.5mA
I_{SS}	= -5.0mA
I_{REF}	= 0.5mA

INITIALIZATION PROCEDURE: (SEE SHEET 3)
 V_{DD} IS TURNED ON FIRST, THEN V_{SS} , FOLLOWED BY V_{REF} .
 THE V_{CC} OF THE INITIALIZATION CIRCUIT IS TURNED ON.
 THE START LINE IS TAKEN FROM "LOW" TO "HIGH". WHERE-
 UPON WR GOES LOW FOR 140μs. DURING THIS TIME A0
 AND A1 GO THROUGH THE FOLLOWING STATES:

A1	A0	DAC ADDRESSED
GND	V_{CC}	DAC B
GND	GND	DAC A
V_{CC}	GND	DAC C
V_{CC}	V_{CC}	DAC D

THUS, ALL FOUR DAC'S ARE LOADED WITH ALL 1's.

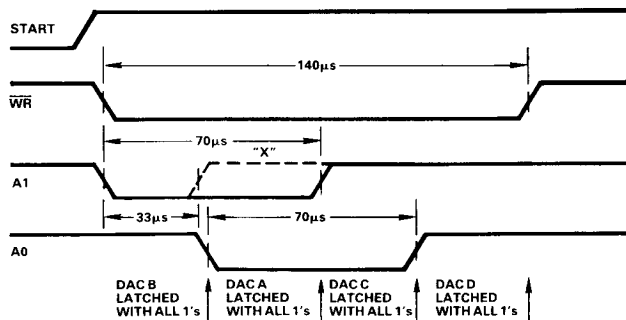


Figure 1. Initialization Timing Diagram

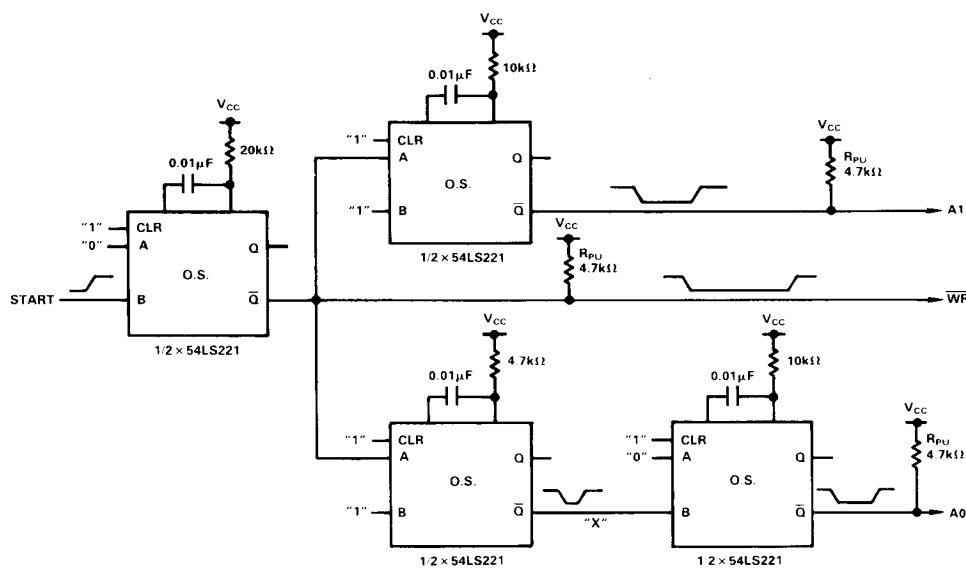


Figure 2. Initialization Circuit

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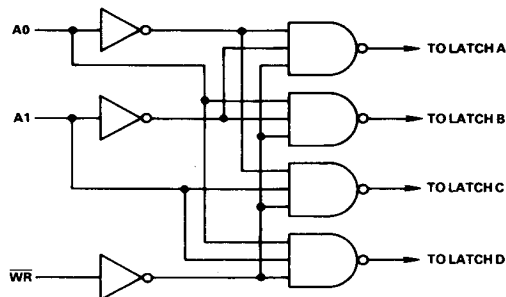
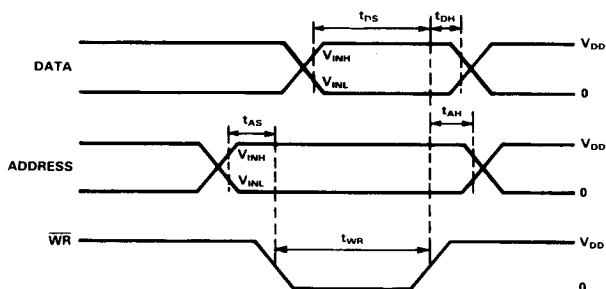


Figure 3. Input Control Logic



NOTES

1. ALL INPUT SIGNAL RISE AND FALL TIMES MEASURED FROM 10% TO 90% OF V_{DD} .
 $t_r = t_f = 20\text{ns}$ OVER V_{DD} RANGE
2. TIMING MEASUREMENT REFERENCE LEVEL IS
 $\frac{V_{INH} + V_{INL}}{2}$
3. SELECTED INPUT LATCH IS TRANSPARENT WHILE $\overline{WR}$ IS LOW, THUS INVALID DATA DURING THIS TIME CAN CAUSE SPURIOUS OUTPUTS.

Figure 4. Write Cycle Timing Diagram

Table 3. AD7226 Truth Table

AD7226 Control Inputs			AD7226 Operation
$\overline{WR}$	A1	A0	
H	X	X	No Operation Device Not Selected
$\overline{L}$	L	L	DAC A Transparent
	L	L	DAC A Latched
$\overline{L}$	L	H	DAC B Transparent
	L	H	DAC B Latched
$\overline{L}$	H	L	DAC C Transparent
	H	L	DAC C Latched
$\overline{L}$	H	H	DAC D Transparent
	H	H	DAC D Latched

L = Low State, H = High State, X = Don't Care