ANALOG DEVICES

10-Bit High-Speed Multiplying D/A Converter (Universal Digital Logic Interface)

ANALOG DEVICES INC

DAC-10

1.0 SCOPE

This specification covers the detail requirements for a 10-bit monolithic digital-to-analog converter which provides full-scale accuracy and high speed performance.

It is highly recommended that this data sheet be used as a baseline for new military or aerospace spec control drawings.

1.2 Part Number. The complete part numbers per Table I of this specification follow:

Device	Part Number	Package
B	DAC-10BX/883	X

1.2.3 Case Outline.

Letter	Case Outline (Lead finish per MIL-M-38510)
X	18-lead ceramic dual-in-line package (CERDIP)

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

Operating Temperature Range ..... -55°C to +125°C
DICE Junction Temperature Range (T_J) ..... -65°C to +150°C
Storage Temperature Range ..... -65°C to +150°C
Power Dissipation 500mW
Derate Above 100°C ..... 10mW/°C
Lead Temperature (Soldering, 60 sec) ..... +300°C
V+ Supply to V- Supply 36V
Logic Inputs ..... V- to (V- + 36V)
V_{LC} ..... V- to V+
Analog Current Outputs ..... +18V to -18V
Reference Inputs (V_{16} to V_{17}) ..... V- to V+
Reference Input Differential Voltage (V_{16} to V_{17}) ..... ±18V
Reference Input Current (I_{16}) 2.5mA

1.5 Thermal Characteristics:

Thermal Resistance, CERDIP (X) package:
Junction-to-Case (Θ_{JC}) = 35°C/W MAX
Junction-to-Ambient (Θ_{JA}) = 120°C/W MAX

TABLE 1

V_S = ±15V; I_{REF} = 2mA; -55°C ≤ T_A ≤ +125°C unless otherwise specified.
Output characteristics refer to both I_{OUT} and $\overline{I_{OUT}}$.

Characteristics	Symbol	Special Conditions	DAC-10/883 LIMITS B Min	Max	Units
Power Supply	I+	V_S = ±15V	–	4	mA
		V_S = +5V, -7.5V; I_{REF} = 1mA	–	4	mA
	I-	V_S = ±15V	–	-15	mA
		V_S = +5V, -7.5V; I_{REF} = 1mA	–	-9	mA
Full-Scale Current	I_{FR}	V_{REF} = 10.000V R_{16}, R_{17} = 5.000kΩ	3.960	4.032	mA
		V_{REF} = 10.000V R_{16}, R_{17} = 5.000kΩ T_A = +25°C	3.978	4.014	mA
Output Voltage Compliance	V_{OC}	Full-Scale Current Change < 1 LSB, T_A = +25°C	-5	10	V
Power Supply Sensitivity	$PSSI_{FS}$+	V+ = +4.5 to +18V; V- = -18V	–	±0.01	$\frac{\%\Delta I_{FS}}{\%\Delta V+}$
	$PSSI_{FS}$-	V- = -10 to -18V; V+ = +18V	–	±0.01	$\frac{\%\Delta I_{FS}}{\%\Delta V-}$
Logic Input Levels	V_{IL}	Logic "0", V_{LC} = 0V	–	0.8	V
	V_{IH}	Logic "1", V_{LC} = 0V	2.0	–	V
Logic Input Current (Each Bit)	I_{IL}	V_{IN} = -5V, V_{LC} = 0V	–	-10	µA
	I_{IH}	V_{IN} = 18V, V_{LC} = 0V	–	10	µA
Zero-Scale Current	I_{ZS}		–	±0.5	µA
Full-Scale Symmetry	I_{FSS}	$\lvert I_{FR} - \overline{I_{FR}} \rvert$	–	4.0	µA
Monotonicity			10	–	Bits

TABLE 1 (Continued)

V_S = ±15V; I_{REF} = 2mA; -55°C ≤ T_A ≤ +125°C unless otherwise specified.
Output characteristics refer to both I_{OUT} and I_{OUT}.

Characteristics	Symbol	Special Conditions	DAC-10/883 LIMITS B Min	Max	Units
Nonlinearity	NL		–	±1/2	LSB
Settling Time	t_s	All Bits Switched On or Off, Settle to 0.05% of FS T_A = +25°C	–	165	ns
Differential Nonlinearity	DNL		–	±1	LSB
Power Dissipation (Note 1)	P_d	V_S = ±15V	–	285	mW
		V_S = +5V, -7.5V; I_{REF} = 1mA	–	88	mW
Reference Bias Current	I_B		–	-3.0	µA

NOTES:
1. Power dissipation (P_d) limits are guaranteed by supply current testing.

TABLE 2

DAC-10/883

Electrical Test Requirements
For Class B Devices

MIL-STD-883 Test Requirements	Subgroups (see Table 3)
Interim Electrical Parameters (pre Burn-In)	1
Final Electrical Test Parameters	1*, 2, 3
Group A Test Requirements	1, 2, 3

* PDA applies to Subgroup 1 only.
No other Subgroups are included in PDA.

TABLE 3

Group A Inspection

V_S = ±15V; I_{REF} = 2mA unless otherwise specified.
Output characteristics refer to both I_{OUT} and $\overline{I_{OUT}}$.

Subgroup	Symbol	Special Conditions	DAC-10/883 LIMITS B Min	Max	Units
Subgroup 1	I+	V_S = ±15V	–	4	mA
		V_S = +5V, -7.5V; I_{REF} = 1mA	–	4	mA
T_A = +25°C	I-	V_S = ±15V	–	-15	mA
		V_S = +5V, -7.5V; I_{REF} = 1mA	–	-9	mA
	I_{FR}	V_{REF} = 10.000V R_{16}, R_{17} = 5.000kΩ	3.978	4.014	mA
	V_{OC}	Full-Scale Current Change < 1 LSB	-5	10	V
	I_{ZS}		–	±0.5	µA
	I_{FSS}	$\lvert I_{FR} - \overline{I_{FR}} \rvert$	–	4	µA
	$PSSI_{FS}+$	V+ = 4.5, 18V V- = -18V	–	±0.01	$\frac{\%\Delta I_{FS}}{\%\Delta V+}$
	$PSSI_{FS}-$	V- = -10, -18V V+ = 18V	–	±0.01	$\frac{\%\Delta I_{FS}}{\%\Delta V-}$
	V_{IL}	Logic "0", V_{LC} = 0V	–	0.8	V
	V_{IH}	Logic "1", V_{LC} = 0V	2	–	V
	I_{IL}	V_{IN} = -5V, V_{LC} = 0V	–	-10	µA
	I_{IH}	V_{IN} = +18V, V_{LC} = 0V	–	10	µA
	Monotonicity		10	–	Bits
	NL		–	±1/2	LSB

TABLE 3

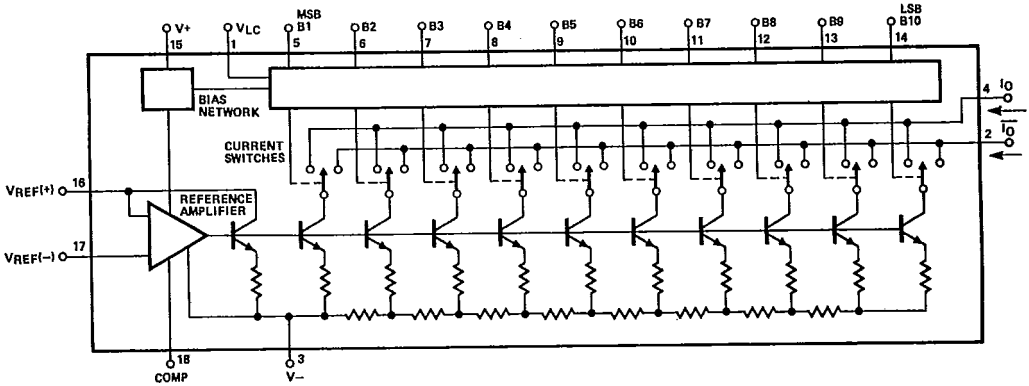
Group A Inspection (Continued)

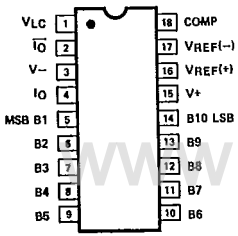
V_S = ±15V; I_{REF} = 2mA unless otherwise specified.
Output characteristics refer to both I_{OUT} and I_{OUT}.

Subgroup	Symbol	Special Conditions	DAC-10/883 LIMITS B Min	Max	Units
Subgroup 1	DNL		–	±1	LSB
T_A = +25°C	I_B		–	-3.0	µA
(Continued)	P_d	V_S = ±15V	–	285	mW
	(Note 1)	V_S = +5V, -7.5V; I_{REF} = 1mA	–	88	mW
Subgroup 2	I_{FR}	V_{REF} = 10.000V R_{16}, R_{17} = 5.000kΩ	3.960	4.032	mA
T_A = +125°C		Remaining Tests, Limits and Conditions are the same as for Subgroup 1 excluding V_{OC}.			
Subgroup 3		All Tests, Limits and Conditions are the same as for Subgroup 2.			
T_A = -55°C					

NOTES:
1. Power dissipation (P_d) limits are guaranteed by supply current testing.

3.2.1 Simplified Schematic and Pin Connections.





18-PIN HERMETIC DIP
(X-Suffix)

3.2.4 Microcircuit Group Assignment.

This microcircuit is covered by microcircuit group 56.

4.2 Life Test/Burn-In Circuit.