



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

DAC-08

1.0 SCOPE

This specification covers the detail requirements for an 8-bit monolithic digital-to-analog converter which provides very high-speed performance coupled with low cost and outstanding applications flexibility.

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:

<u>Device</u>	<u>Part Number</u>	<u>Package</u>
A	DAC-08AQ/883	Q
X	DAC-08Q/883	Q
X	DAC-08RC/883	RC

1.2.3 Case Outline.

<u>Letter</u>	<u>Case Outline (Lead finish per MIL-M-38510)</u>
Q	16-lead ceramic dual-in-line package (CERDIP)
RC	20-contact hermetic leadless chip carrier (LCC)

1.3 Absolute Maximum Ratings. ($T_A = 25^\circ\text{C}$, unless otherwise noted)

Operating Temperature Range	-55°C to $+125^\circ\text{C}$
DICE Junction Temperature Range (T_J)	-65°C to $+150^\circ\text{C}$
Storage Temperature Range	-65°C to $+150^\circ\text{C}$
Power Dissipation	500mW
Derate Above 100°C	10mW/ $^\circ\text{C}$
Lead Temperature Range (Soldering, 60 sec)	$+300^\circ\text{C}$
V+ Supply to V- Supply	36V
Logic Inputs	V- to (V- + 36V)
V_{LC}	V- to V+
Analog Current Outputs (at $V_S = 15\text{V}$)	4.25mA
Reference Input Differential Voltage (V_{14} to V_{15})	$\pm 18\text{V}$
Reference Input Current (I_{14})	5.0mA

1.5 Thermal Characteristics:

Thermal Resistance, CERDIP (Q) package:
 Junction-to-Case (θ_{JC}) = 29°C/W MAX
 Junction-to-Ambient (θ_{JA}) = 91°C/W MAX

Thermal Resistance, LCC (RC) package:
 Junction-to-Case (θ_{JC}) = 35°C/W MAX
 Junction-to-Ambient (θ_{JA}) = 110°C/W MAX

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TABLE 1

$V_S = \pm 15V$; $-55^\circ C \leq T_A \leq +125^\circ C$ unless otherwise specified. _____
 $I_{REF} = 2mA$; Output characteristics refer to both I_{OUT} and I_{OUT} .

Characteristics	Symbol	Special Conditions	DAC-08/883				Units
			LIMITS A		LIMITS X		
			Min	Max	Min	Max	
Power Supply	I+	$V_S = \pm 15V$ or $+5V, -15V$	-	3.8	-	3.8	mA
		$V_S = \pm 5V, I_{REF} = 1mA$	-	3.8	-	3.8	mA
	I-	$V_S = \pm 15V$ or $+5V, -15V$	-	-7.8	-	-7.8	mA
		$V_S = \pm 5V, I_{REF} = 1mA$	-	-5.8	-	-5.8	mA
Full Range Current	I_{FR}	$V_{REF} = 10.000V$ $R_{14}, R_{15} = 5.000k\Omega$	1.94	2.04	1.94	2.04	mA
		$V_{REF} = 10.000V$ $R_{14}, R_{15} = 5.000k\Omega$ $T_A = +25^\circ C$	1.984	2.000	1.94	2.04	mA
Output Voltage Compliance	V_{OC}	Full Range Current Change < 1/2 LSB	-10	+18	-10	+18	V
Power Supply Sensitivity	$PSSI_{FS+}$	$V+ = 4.5$ to $18V$; $V- = -18V$ $I_{REF} = 1mA$	-	± 0.01	-	± 0.01	$\frac{\% \Delta I_O}{\% \Delta V+}$
	$PSSI_{FS-}$	$V- = -4.5$ to $-18V$; $V+ = 18V$ $I_{REF} = 1mA$	-	± 0.01	-	± 0.01	$\frac{\% \Delta I_O}{\% \Delta V-}$
Logic Input Swing	V_{IS}	$I_{FR} = 1.94mA$ (min) $I_{FR} = 2.04mA$ (max)	-10	+18	-10	+18	V
Logic Input Levels	V_{IL}	Logic "0", $V_{LC} = 0V$	-	0.8	-	0.8	V
	V_{IH}	Logic "1", $V_{LC} = 0V$	2	-	2	-	V
Logic Input Current (Each Bit)	I_{IL}	$V_{IN} = -10V, V_{LC} = 0V$	-	-10	-	-10	μA
	I_{IH}	$V_{IN} = 18V, V_{LC} = 0V$	-	10	-	10	μA
Zero Scale Current	I_{ZS}		-	1	-	2	μA

TABLE 1 (Continued)

$V_S = \pm 15V$; $-55^\circ C \leq T_A \leq +125^\circ C$ unless otherwise specified. _____
 $I_{REF} = 2mA$; Output characteristics refer to both I_{OUT} and \bar{I}_{OUT} .

Characteristics	Symbol	Special Conditions	DAC-08/883				Units
			LIMITS A		LIMITS X		
			Min	Max	Min	Max	
Reference Bias Current	I_{15}		0	-3	0	-3	μA
Output Current Range	I_{OR1}	$V_{REF} = 15.0V, V_- = -10V$ $R_{14}, R_{15} = 5.000k\Omega$	2.1	-	2.1	-	mA
	I_{OR2}	$V_{REF} = 25.0V, V_- = -12V$ $R_{14}, R_{15} = 5.000k\Omega$	4.2	-	4.2	-	mA
Full Range Symmetry	I_{FRS}	$I_{FR} - \bar{I}_{FR}$	-	± 4	-	± 8	μA
Monotonicity			8	-	8	-	Bits
Nonlinearity	NL		-	± 0.1	-	± 0.19	%FS
Full Scale Tempco	TCI_{FS}		-	± 50	-	± 80	ppm/ $^\circ C$
Settling Time	t_s	To $\pm 1/2$ LSB	-	135	-	150	ns
Propagation Delay All Bits Switched	t_{PLH}	Low to High Transition	-	60	-	60	ns
	t_{PHL}	High to Low Transition	-	60	-	60	ns
Reference Input Slew Rate	di/dt	$R_{EQ} = 200\Omega, C_C = 0pF$ $R_L = 100\Omega$	4	-	4	-	$mA/\mu s$
Power Dissipation (Note 1)	P_d	$V_S = \pm 5V, I_{REF} = 1mA$	-	48	-	48	mW
		$V_S = +5V, -15V; I_{REF} = 2mA$	-	136	-	136	mW
		$V_S = \pm 15V, I_{REF} = 2mA$	-	174	-	174	mW

NOTES:

1. Power dissipation limits are guaranteed by supply current testing.

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TABLE 2**DAC-08/883****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, 8, 9

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

TABLE 3

Group A Inspection

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

Subgroup	Symbol	Special Conditions	DAC-08/883				Units
			LIMITS A		LIMITS X		
			Min	Max	Min	Max	
Subgroup 1 $T_A = +25^\circ C$	I+	$V_S = \pm 15V$ or +5V, -15V	-	3.8	-	3.8	mA
		$V_S = \pm 5V$, $I_{REF} = 1mA$	-	3.8	-	3.8	mA
	I-	$V_S = \pm 15V$ or +5V, -15V	-	-7.8	-	-7.8	mA
		$V_S = \pm 5V$, $I_{REF} = 1mA$	-	-5.8	-	-5.8	mA
	I_{FR}	$V_{REF} = 10.000V$ $R_{14}, R_{15} = 5.000k\Omega$	1.984	2.000	1.94	2.04	mA
	V_{OC}	Full Range Current Change < 1/2 LSB	-10	+18	-10	+18	V
	I_{ZS}		-	1	-	2	μA
	I_{FRS}	$I_{FR} - \overline{I_{FR}}$	-	± 4	-	± 8	μA
	I_{OR_1}	$V_{REF} = 15.0V$, $V_- = -10V$ $R_{14}, R_{15} = 5.000k\Omega$	2.1	-	2.1	-	mA
	I_{OR_2}	$V_{REF} = 25.0V$, $V_- = -12V$ $R_{14}, R_{15} = 5.000k\Omega$	4.2	-	4.2	-	mA
$PSSI_{FS+}$	$V_+ = 4.5$ to 18V; $V_- = -18V$ $I_{REF} = 1mA$	-	± 0.01	-	± 0.01	$\frac{\% \Delta I_O}{\% \Delta V_+}$	
$PSSI_{FS-}$	$V_- = -4.5$ to -18V; $V_+ = 18V$ $I_{REF} = 1mA$	-	± 0.01	-	± 0.01	$\frac{\% \Delta I_O}{\% \Delta V_-}$	
I_{15}		0	-3	0	-3	μA	

TABLE 3

Group A Inspection (Continued)

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

Subgroup	Symbol	Special Conditions	DAC-08/883				Units
			LIMITS A		LIMITS X		
			Min	Max	Min	Max	
Subgroup 1	V_{IL}	Logic "0", $V_{LC} = 0V$	-	0.8	-	0.8	V
$T_A = +25^\circ C$	V_{IH}	Logic "1", $V_{LC} = 0V$	2	-	2	-	V
(Continued)	I_{IL}	$V_{IN} = -10V$, $V_{LC} = 0V$	-	-10	-	-10	μA
	I_{IH}	$V_{IN} = 18V$, $V_{LC} = 0V$	-	10	-	10	μA
	V_{IS}	$I_{FR} = 1.94mA$ (min) $I_{FR} = 2.04mA$ (max)	-10	+18	-10	+18	V
	Monotonicity		8	-	8	-	Bits
	NL		-	± 0.1	-	± 0.19	%FS
Subgroup 2	I_{FR}	$V_{REF} = 10.000V$ $R_{14}, R_{15} = 5.000k\Omega$	1.94	2.04	1.94	2.04	mA
$T_A = +125^\circ C$	Remaining Tests, Limits and Conditions are the same as for Subgroup 1.						
Subgroup 3	All Tests, Limits and Conditions are the same as for Subgroup 2.						
$T_A = -55^\circ C$							
Subgroup 8	TCl_{FS}	Readings taken from $+25^\circ C$ to $+125^\circ C$ and $+25^\circ C$ to $-55^\circ C$	-	± 50	-	± 80	ppm/ $^\circ C$
$-55^\circ C \leq T_A \leq +125^\circ C$							
Subgroup 9	t_{PLH}	Low to High Transition	-	60	-	60	ns
$T_A = +25^\circ C$	t_{PHL}	High to Low Transition	-	60	-	60	ns
	dI/dt	$R_{EQ} = 200\Omega$, $C_C = 0pF$ $R_L = 100\Omega$	4	-	4	-	mA/ μs

TABLE 3

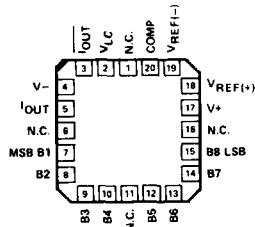
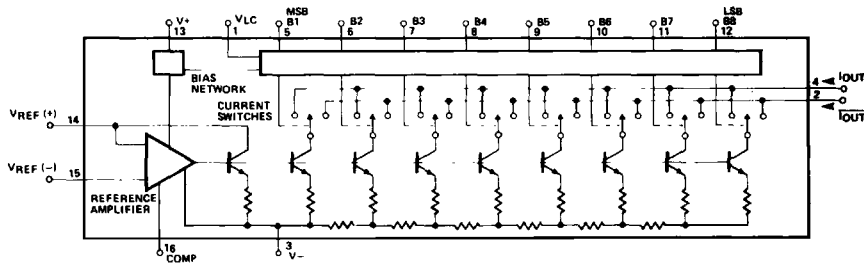
Group A Inspection (Continued)

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

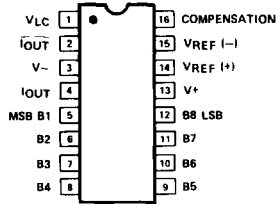
Subgroup	Symbol	Special Conditions	DAC-08/883				Units
			LIMITS A		LIMITS X		
			Min	Max	Min	Max	
Subgroup 9	t_{SLH}	To $\pm 1/2$ LSB Low to High Transition	–	135	–	150	ns
$T_A = +25^\circ C$							
(Continued)	t_{SHL}	To $\pm 1/2$ LSB High to Low Transition	–	135	–	150	ns

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3.2.1 Simplified Schematic and Pin Connections.



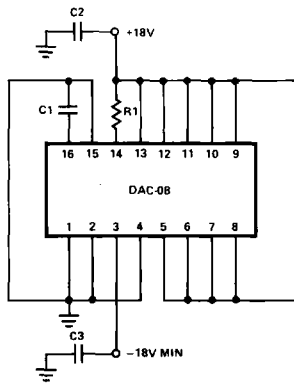
DAC-08RC/883
20-LEAD LCC
(RC-Suffix)



16-PIN DUAL-IN-LINE
PACKAGE
(Q-Suffix)

3.2.4 Microcircuit Group Assignment. This microcircuit is covered by microcircuit group 56.

4.2 Life Test/Burn-In Circuit.



R1 = 9k Ω
 C1 = 0.001 μ F
 C2, C3 = 0.01 μ F