



Low-Noise Precision Instrumentation Amplifier

ANALOG DEVICES INC AMP-01

1.0 SCOPE

This specification covers the detail requirements for a low-noise precision instrumentation amplifier.

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	AMP-01AX/883	X
B	AMP-01BX/883	X
B	AMP-01BTC/883	TC

1.2.3 Case Outline.

<u>Letter</u>	<u>Case Outline (Lead finish per MIL-M-38510)</u>
X	18-lead ceramic dual-in-line package (CERDIP)
TC	28-contact hermetic leadless chip carrier (LCC)

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

Supply Voltage.....	$\pm 18\text{V}$
Power Dissipation.....	500mW
Common-Mode Input Voltage.....	Supply Voltage
Differential Input Voltage	
$R_G \geq 2\text{k}\Omega$	$\pm 20\text{V}$
$R_G < 2\text{k}\Omega$	$\pm 10\text{V}$
Output Short-Circuit Duration.....	Indefinite
Storage Temperature Range.....	-65°C to $+150^\circ\text{C}$
Operating Temperature Range.....	-55°C to $+125^\circ\text{C}$
Lead Temperature (Soldering, 60 sec).....	$+300^\circ\text{C}$

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

Thermal Resistance, LCC (TC) package:
 Junction-to-Case (θ_{JC}) = 35°C/W MAX
 Junction-to-Ambient (θ_{JA}) = 104°C/W MAX

10 INSTRUMENTATION AMPLIFIERS

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TABLE 1

 $V_S = \pm 15V$; $R_S = 100\Omega$; $R_L = 2k\Omega$; $T_A = 25^\circ C$ unless otherwise specified.

Characteristics	Symbol	Special Conditions	AMP-01/883				Units
			LIMITS A		LIMITS B		
			Min	Max	Min	Max	
Input Offset Voltage	V_{IOS}		--	50	--	100	μV
		$-55^\circ C \leq T_A \leq +125^\circ C$	--	80	--	150	μV
Average Input Offset Drift	TCV_{IOS}	$-55^\circ C \leq T_A \leq +125^\circ C$	--	0.3	--	1.0	$\mu V/^\circ C$
Output Offset Voltage	V_{OOS}		--	3	--	6	mV
		$-55^\circ C \leq T_A \leq +125^\circ C$	--	6	--	10	mV
Output Offset Voltage Drift	TCV_{OOS}	$R_G = \infty$ $-55^\circ C \leq T_A \leq +125^\circ C$	--	50	--	120	$\mu V/^\circ C$
Offset Referred to Input vs. Positive Supply	+PSR	$V_+ = +5V$ to $+15V$; $V_- = -15V$ $-55^\circ C \leq T_A \leq +125^\circ C$					
		$G = 1000$	120	--	110	--	dB
		$G = 100$	110	--	100	--	dB
		$G = 10$	95	--	90	--	dB
		$G = 1$	75	--	70	--	dB
Offset Referred to Input vs. Negative Supply	-PSR	$V_- = -5V$ to $-15V$; $V_+ = +15V$ $-55^\circ C \leq T_A \leq +125^\circ C$					
		$G = 1000$	105	--	105	--	dB
		$G = 100$	90	--	90	--	dB
		$G = 10$	70	--	70	--	dB
		$G = 1$	50	--	50	--	dB
Output Short-Circuit Current	I_{SC}^+		60	120	60	120	mA
	I_{SC}^-		-120	-60	-120	-60	mA
Input Bias Current	I_B		--	± 4	--	± 6	nA
		$-55^\circ C \leq T_A \leq +125^\circ C$	--	± 10	--	± 15	nA
Input Offset Current	I_{OS}		--	1	--	2	nA
		$-55^\circ C \leq T_A \leq +125^\circ C$	--	3	--	6	nA

TABLE 1 (Continued)

 $V_S = \pm 15V$; $R_S = 100\Omega$; $R_L = 2k\Omega$; $T_A = 25^\circ C$ unless otherwise specified.

Characteristics	Symbol	Special Conditions	AMP-01/883				Units
			LIMITS A		LIMITS B		
			Min	Max	Min	Max	
Common-Mode Rejection	CMR	$V_{CM} = \pm 10V$, $1k\Omega$ Source Imbalance					
		$G = 1000$	125	--	115	--	dB
		$G = 100$	120	--	110	--	dB
		$G = 10$	100	--	95	--	dB
		$G = 1$	85	--	75	--	dB
Common-Mode Rejection	CMR	$V_{CM} = \pm 10V$, $1k\Omega$ Source Imbalance $-55^\circ C \leq T_A \leq +125^\circ C$					
		$G = 1000$	120	--	110	--	dB
		$G = 100$	115	--	105	--	dB
		$G = 10$	95	--	90	--	dB
		$G = 1$	80	--	75	--	dB
Gain Equation Accuracy	G.E.	$G = \frac{20R_S}{R_G}$ Accuracy Measured from $G = 1$ to 1000	--	0.6	--	0.8	%
Gain Range	G		1.0	1000	1.0	1000	V/V
Output Voltage Swing	V_O	$R_L = 500\Omega$, $2k\Omega$	± 13	--	± 13	--	V
		$R_L \geq 50\Omega$ (Note 1)	± 2.5	--	± 2.5	--	V
		$R_L = 500\Omega$, $2k\Omega$ $-55^\circ C \leq T_A \leq +125^\circ C$	± 12	--	± 12	--	V
Reference Input Resistance	R_{INREF}		35	65	35	65	k Ω

TABLE 1 (Continued)

$V_S = \pm 15V$; $R_S = 100\Omega$; $R_L = 2k\Omega$; $T_A = 25^\circ C$ unless otherwise specified.

Characteristics	Symbol	Special Conditions	AMP-01/883				Units
			LIMITS A		LIMITS B		
			Min	Max	Min	Max	
Quiescent Current	I_Q	+V Linked to $+V_{OP}$ -V Linked to $-V_{OP}$ $-55^\circ C \leq T_A \leq +125^\circ C$	--	4.8	--	4.8	mA
Slew Rate	SR	G = 10	3.5	--	3.0	--	V/ μ s

NOTES:

1. For test conditions, refer to Fig. 5, page 6-19 of the 1988 PMI Analog Products Databook.

TABLE 2

AMP-01/883

**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, 4, 5, 6, 7, 8
Group A Test Requirements	1, 2, 3, 4, 5, 6, 7, 8

* PDA applies to Subgroup 1 only. I_B is excluded from PDA.
No other Subgroups are included in PDA.

TABLE 3

Group A Inspection

$V_S = \pm 15V$; $R_S = 100\Omega$; $R_L = 2k\Omega$; $T_A = T_J$ unless otherwise specified.

Subgroup	Symbol	Special Conditions	AMP-01/883				Units
			LIMITS A		LIMITS B		
			Min	Max	Min	Max	
Subgroup 1	I_B		--	± 4	--	± 6	nA
$T_A = +25^\circ C$	I_{OS}		--	1	--	2	nA
		$V_+ = +5V, +15V; V_- = -15V$					
	+PSR	$G = 1000$	120	--	110	--	dB
		$G = 100$	110	--	100	--	dB
		$G = 10$	95	--	90	--	dB
		$G = 1$	75	--	70	--	dB
	-PSR	$V_- = -5V, -15V; V_+ = +15V$					
		$G = 1000$	105	--	105	--	dB
		$G = 100$	90	--	90	--	dB
		$G = 10$	70	--	70	--	dB
	CMR	$G = 1$	50	--	50	--	dB
		$V_{CM} = \pm 10V, 1k\Omega$ Source Imbalance					
		$G = 1000$	125	--	115	--	dB
		$G = 100$	120	--	110	--	dB
	G.E.	$G = 10$	100	--	95	--	dB
		$G = 1$	85	--	75	--	dB
		$G = \frac{20R_S}{R_G}$	--	0.6	--	0.8	%
		Accuracy Measured at $G = 1, 10, 100, \text{ and } 1000$					
		G	1.0	1000	1.0	1000	V/V
		I_{SC}^+	60	120	60	120	mA
	I_{SC}^-	-120	-60	-120	-60	mA	
	R_{INREF}	35	65	35	65	k Ω	

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TABLE 3

Group A Inspection (Continued)

 $V_S = \pm 15V$; $R_S = 100\Omega$; $R_L = 2k\Omega$; $T_A = T_J$ unless otherwise specified.

Subgroup	Symbol	Special Conditions	AMP-01/883				Units
			LIMITS A		LIMITS B		
			Min	Max	Min	Max	
Subgroup 1 (Continued)	I_Q	+V Linked to +V _{OP} -V Linked to -V _{OP}	-	4.8	-	4.8	mA
Subgroup 2	V_{IOS}		-	80	-	150	μV
$T_A = +125^\circ C$	V_{OOS}		-	6	-	10	mV
	TCV_{OOS}	$R_G = \infty$	-	50	-	120	$\mu V/^\circ C$
	I_B		-	± 10	-	± 15	nA
	I_{OS}		-	3	-	6	nA
	+PSR		V+ = +5V, +15V; V- = -15V				
G = 1000			120	-	110	-	dB
G = 100			110	-	100	-	dB
G = 10			95	-	90	-	dB
-PSR		V- = -5V, -15V; V+ = +15V					
		G = 1000	105	-	105	-	dB
		G = 100	90	-	90	-	dB
		G = 10	70	-	70	-	dB
CMR		$V_{CM} = \pm 10V$; 1k Ω Source Imbalance					
		G = 1000	120	-	110	-	dB
		G = 100	115	-	105	-	dB
		G = 10	95	-	90	-	dB
	I_Q	+V Linked to +V _{OP} -V Linked to -V _{OP}	-	4.8	-	4.8	mA

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TABLE 3

Group A Inspection (Continued)

$V_S = \pm 15V$; $R_S = 100\Omega$; $R_L = 2k\Omega$; $T_A = T_J$ unless otherwise specified.

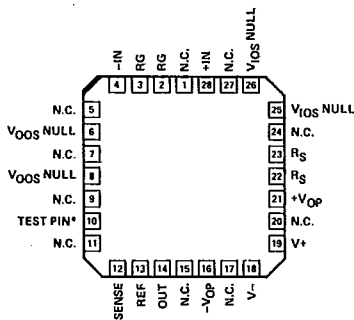
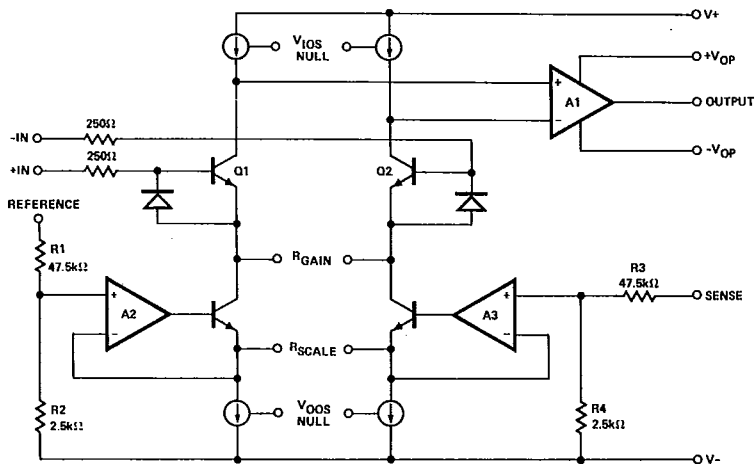
AMP-01/883

Subgroup	Symbol	Special Conditions	LIMITS A		LIMITS B		Units
			Min	Max	Min	Max	
Subgroup 3 $T_A = -55^\circ C$		All Tests, Limits and Conditions are the same as for Subgroup 2.					
Subgroup 4 $T_A = +25^\circ C$	V_{IOs}		-	50	-	100	μV
	V_{OOS}		-	3	-	6	mV
	V_O	$R_L = 500\Omega, 2k\Omega$	± 13	-	± 13	-	V
		$R_L = 50\Omega$ (Note 1)	± 2.5	-	± 2.5	-	V
Subgroup 5 $T_A = +125^\circ C$	V_O	$R_L = 500\Omega, 2k\Omega$	± 12	-	± 12	-	V
Subgroup 6 $T_A = -55^\circ C$		All Tests, Limits and Conditions are the same as for Subgroup 5.					
Subgroup 7 $T_A = +25^\circ C$	SR	$G = 10$	3.5	-	3.0	-	$V/\mu s$
Subgroup 8 $T_A = -55^\circ C, +125^\circ C$	TCV_{IOs}		-	0.3	-	1.0	$\mu V/^\circ C$

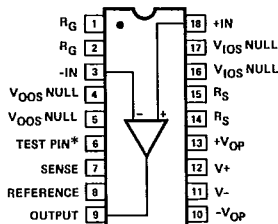
NOTES:

1. For test conditions, refer to Fig. 5, page 6-19 of the 1988 PMI Analog Products Databook.

3.2.1 Simplified Schematic and Pin Connections.



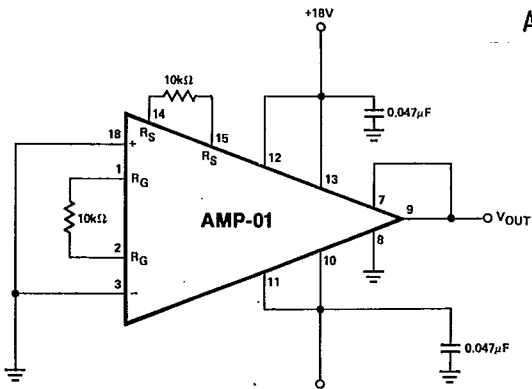
**AMP-01BTC/883
28-LEAD LCC
(TC-Suffix)**



**18-PIN HERMETIC DIP
(X-Suffix)**

3.2.4 Microcircuit Group Assignment. This microcircuit is covered by microcircuit group 49.

4.2 Life Test/Burn-In Circuit.



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