

1.0 SCOPE

This specification documents the detail requirements for space qualified product manufactured on Analog Devices, Inc.'s QML certified line per MIL-PRF-38535 Level V except as modified herein.

The manufacturing flow described in the STANDARD SPACE LEVEL PRODUCTS PROGRAM brochure is to be considered a part of this specification.

<http://www.analog.com/aerospace>

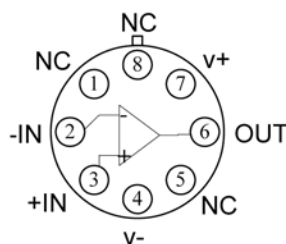
This data sheet specifically details the space grade version of this product. A more detailed operational description and a complete datasheet for commercial product grades can be found at www.analog.com/OP12

2.0 Part Number. The complete part number(s) of this specification follow:

<u>Part Number</u>	<u>Description</u>
OP12-903J	Precision Low-Input Current Operational Amplifier

2.1 Case Outline.

<u>Letter</u>	<u>Descriptive designator</u>	<u>Case Outline (Lead Finish per MIL-PRF-38535)</u>
J	MACY1-X8	8-Lead metal can (TO)



TO-99 (J)

Figure 1 - Terminal connections.

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

Supply Voltage.....	$\pm 20\text{V}$
Power Dissipation	500mW
Differential Input Current (Note 1).....	$\pm 10\text{mA}$
Input Voltage (Note 2).....	$\pm 15\text{V}$
Output Short-Circuit Duration	Indefinite
Operating Temperature Range.....	-55°C to $+125^\circ\text{C}$
Storage Temperature Range.....	-65°C to $+150^\circ\text{C}$
Lead Temperature (Soldering, 60 sec.).....	$+300^\circ\text{C}$
Dice Junction Temperature (T_J).....	-65°C to $+150^\circ\text{C}$
Thermal resistance, junction to case (θ_{JC}).....	see MIL-STD-1835
Thermal resistance, junction to ambient (θ_{JA})	
8-lead metal can (TO)	150°C/W

Precision Low-Input Current Operational Amplifier (Internally Compensated)

NOTES:

1. The inputs are shunted with back-to-back diodes for over voltage protection. Therefore, excessive current will flow if a differential input voltage in excess of 1V is applied between the inputs without some limiting resistance.
2. For supply voltages less than $\pm 15\text{V}$, the absolute maximum input voltage is equal to the supply voltages.

4.0 Electrical Table:

Table I							
Parameter See notes at end of table	Symbol	Conditions $V_S = \pm 15\text{V}$, $R_S = 50\Omega$ Unless otherwise specified		Sub-group	Limit Min	Limit Max	Units
Input Offset Voltage	V_{OS}			1		0.15	mV
				2, 3		0.35	
Input Offset Current	I_{OS}			1		0.20	nA
				2, 3		0.40	
Input Bias Current	I_B			1		± 2.0	
				2, 3		± 3.0	
Input Voltage Range <u>1/</u>	I_{VR}			1, 2, 3	± 13		V
Common-Mode Rejection	CMR	$V_{CM} = \pm 13\text{V}$		1	104		dB
				2, 3	100		
Power Supply Rejection	PSRR	$V_S = \pm 5\text{V}, \pm 15\text{V}$		1		7	$\mu\text{V/V}$
				2, 3		10	
Output Voltage Swing	V_O	$R_L = 10\text{k}\Omega$		4, 5, 6	± 13		V
		$R_L = 5\text{k}\Omega$		4, 5, 6	± 10		
Large-Signal Voltage Gain	A_{VO}	$V_O = \pm 10\text{V}$	$R_L = 10\text{k}\Omega$	4	80		V/mV
			$R_L = 2\text{k}\Omega$	4	50		
			$R_L = 5\text{k}\Omega$	5, 6	40		
Supply Current	I_{SY}	No Load	$V_S = \pm 5\text{V}$	1		0.6	mA
			$V_S = \pm 15\text{V}$	2, 3		0.6	

1/ I_{VR} is defined as the V_{CM} range used for the CMR test.

Precision Low-Input Current Operational Amplifier (Internally Compensated)

4.1 **Electrical Test Requirements:**

Table II	
Test Requirements	Subgroups (in accordance with MIL-PRF-38535, Table III)
Interim Electrical Parameters	1
Final Electrical Parameters	1, 2, 3, 4, 5, 6 <u>1/</u> <u>2/</u>
Group A Test Requirements	1, 2, 3, 4, 5, 6
Group C end-point electrical parameters	1 <u>2/</u>
Group D end-point electrical parameters	1
Group E end-point electrical parameters	1

1/ PDA applies to Subgroup 1. Delta's excluded from PDA.

2/ See Table III for delta parameters. See table I for conditions.

4.2 **Table III. Burn-in test delta limits.**

Table III				
TEST TITLE	BURN-IN LIMIT	LIFETEST LIMIT	DELTA LIMIT	UNITS
VOS	±0.15	±0.225	0.075	mV
±IB	±2.0	±2.5	0.5	nA

5.0 **Life Test/Burn-In Circuit:**

5.1 HTRB is not applicable for this drawing.

5.2 Burn-in is per MIL-STD-883 Method 1015 test condition B.

5.3 Steady state life test is per MIL-STD-883 Method 1005.

Precision Low-Input Current Operational Amplifier (Internally Compensated)

Rev	Description of Change	Date
A	Initiate	Aug. 7, 2000
B	Update web address. Change from $\pm 20\text{V}$ supply voltage to $\pm 15\text{V}$ supply voltage for V_{OS} , I_{OS} , and I_B on Table I and II. Change BI condition from B to A, B, or C.	Mar. 11, 2002
C	Update web address. Delete burn-in circuit & rad bias circuit	June 20, 2003
D	Update package offering.	Oct. 10, 2007