



Quad Low-Offset, Low-Power Operational Amplifier

OP400

1.0 SCOPE

This specification documents the detailed requirements for Analog Devices space qualified die including die qualification as described for Class K in MIL-PRF-38534, Appendix C, Table C-II except as modified herein. The manufacturing flow described in the STANDARD DIE PRODUCTS PROGRAM brochure at <http://www.analog.com/aerospace> is to be considered a part of this specification.

This data sheet specifically details the space grade version of this product. A more detailed operational description and a complete data sheet for commercial product grades can be found at www.analog.com/OP400

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

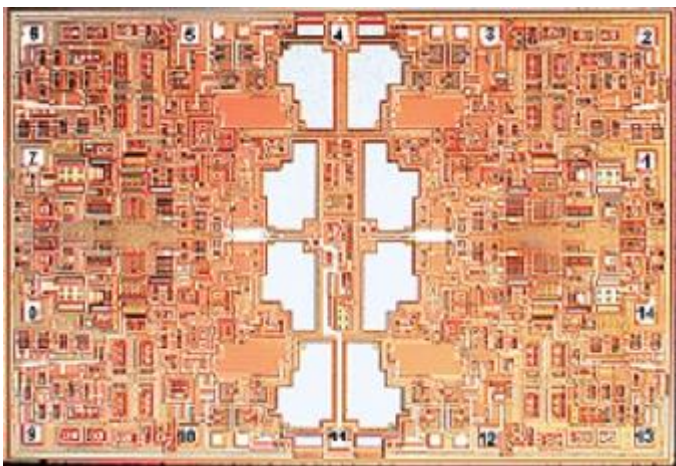
<u>Part Number</u>	<u>Description</u>
OP400-000C	Quad Low-Offset, Low-Power Operational Amplifier

3.0 Die Information

3.1 Die Dimensions

Die Size	Die Thickness	Bond Pad Metalization
181 mil x 123 mil	19 mil \pm 2 mil	Al/Cu

3.2 Die Picture



1. OUT A
2. -IN A
3. +IN A
4. V_{CC+}
5. +IN B
6. -IN B
7. OUT B
8. OUT C
9. -IN C
10. +IN C
11. V_{CC-}
12. +IN D
13. -IN D
14. OUT D

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Rev. H

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OP400

3.3 Absolute Maximum Ratings ^{1/}

Supply Voltage (V_{CC}).....	$\pm 20V$
Differential Input Voltage.....	$\pm 30V$
Input Voltage.....	Supply Voltage
Output Short-Circuit Duration.....	Continuous
Storage Temperature Range	$-65^{\circ}C$ to $+150^{\circ}C$
Junction Temperature (T_J).....	$+150^{\circ}C$
Operating Temperature Range.....	$-55^{\circ}C$ to $+125^{\circ}C$

Absolute Maximum Ratings Notes:

- ^{1/} Stresses above the absolute maximum rating may cause permanent damage to the device.
 Extended operation at the maximum levels may degrade performance and affect reliability.

4.0 Die Qualification

In accordance with class-K version of MIL-PRF-38534, Appendix C, Table C-II, except as modified herein.

- (a) Qual Sample Size and Qual Acceptance Criteria – 10/0
- (b) Qual Sample Package – DIP
- (c) Pre-screen electrical test over temperature performed post-assembly prior to die qualification.

Table I - Dice Electrical Characteristics

Parameter	Symbol	Conditions ^{1/}	Limit Min	Limit Max	Units
Input Offset Voltage	V_{IO}		-150	+150	μV
Input Offset Current	I_{IO}	$V_{CM} = 0V$	-1	+1	nA
Input Bias Current	$\pm I_{IB}$	$V_{CM} = 0V$	-3	+3	nA
Input Voltage Range	IVR		± 12		V
Common Mode Rejection Ratio	CMRR	$V_{CM} = IVR$	120		dB
Power Supply Rejection Ratio	PSRR	$V_S = \pm 3V$ to $\pm 18V$		1.8	$\mu V/V$
Supply Current ^{2/}	I_{SY}	No Load		2.9	mA
Large Signal Voltage Gain	A_{VS}	$V_{OUT} = \pm 10V, R_L = 2k\Omega$	1500		V/mV
Output Voltage Swing	V_{OP}	$R_L = 2k\Omega$	± 11		V

Table I Notes:

^{1/} $V_S = \pm 15V, T_A = 25^{\circ}C$, unless otherwise specified.

^{2/} I_{SY} limit = total all four amplifiers.

Table II - Electrical Characteristics for Qual Samples

Parameter	Symbol	Conditions 1/	Sub-groups	Limit Min	Limit Max	Units
Input Offset Voltage	V _{IO}		1	-150	+150	μV
			2, 3	-270	+270	
Input Offset Current	I _{IO}	V _{CM} = 0V	1	-1	+1	nA
			2, 3	-2.5	+2.5	
Input Bias Current	±I _{IB}	V _{CM} = 0V	1	-3	+3	nA
			2, 3	-5	+5	
Input Voltage Range	IVR		1, 2, 3	±12		V
Common Mode Rejection Ratio	CMRR	V _{CM} = IVR	1	120		dB
			2, 3	115		
Power Supply Rejection Ratio	PSRR	V _S = ±3V to ±18V	1		1.8	μV/V
			2, 3		3.2	
Supply Current 2/	I _{SY}	No Load	1		2.9	mA
			2, 3		3.1	
Large Signal Voltage Gain	A _{VS}	V _{OUT} = ±10V, R _L = 2kΩ	4	1500		V/mV
			5, 6	1000		
Output Voltage Swing	+V _{OP}	R _L = 2kΩ	4, 5, 6	±11		V
Average Input Offset Voltage Drift	TCV _{IO}	-55°C ≤ T _A ≤ +125°C	8		1.2	μV/°C

Table II Notes:

- 1/ V_S = ±15V, unless otherwise specified.
- 2/ I_{SY} limit = total all four amplifiers.

Table III -Life Test Endpoint and Delta Parameter
(Product is tested in accordance with Table II with the following exceptions)

Parameter	Symbol	Sub-groups	Post Burn In Limit Min	Post Burn In Limit Max	Post Life Test Limit Min	Post Life Test Limit Max	Life Test Delta	Units
Input Offset Voltage	V _{IO}	1		±225		±300	±75	μV
		2, 3				±420		
Input Bias Current	±I _{IB}	1		±5		±7	±2	nA
		2, 3				±9		
Input Offset Current	I _{IO}	1		±2		±2.5		nA
		2, 3				±4.5		

5.0 Life Test/Burn-In Information

- 5.1** HTRB is not applicable for this drawing.
- 5.2** Burn-in is per MIL-STD-883 Method 1015 test condition B or C.
- 5.3** Steady state life test is per MIL-STD-883 Method 1005.

Rev	Description of Change	Date
A	Initiate	08-JAN-02
B	Update web address. Table III; add “post” to Burn-in and Life Test title.	17-APR-03
C	Update the 1.0 Scope Description.	9-JUL-07
D	Update header/footer & add to scope description.	13-FEB-08
E	Add Junction Temperature (T _J)...+150°C to 3.3 Absolute Max. Ratings	March 31, 2008
F	Updated Section 4.0c note to indicate pre-screen temp testing being performed.	5-JUN-2009
G	Removed extra markings on die Topographic picture	24-AUG-2011
H	Update link to datasheet	03-SEP-2014

