# Low-Noise Precision Instrumentation Amp

# AMP01

## 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/marketSolutions/militaryAerospace/pdf/Die_Broc.pdf 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/AMP01

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

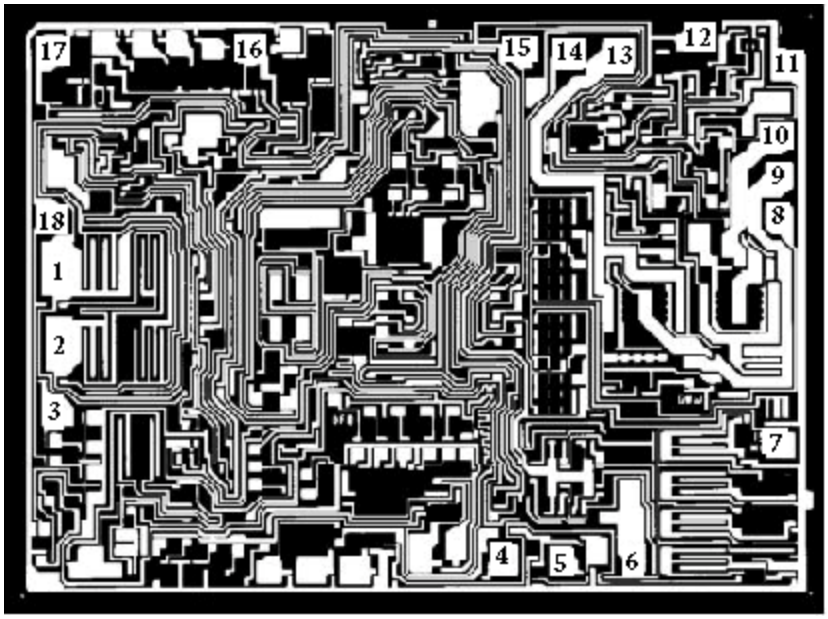
| Part Number | Description |
|---|---|
| AMP01-000C | Low-Noise Precision Instrumentation Amplifier |

## 3.0 Die Information

### 3.1 Die Dimensions

| Die Size | Die Thickness | Bond Pad Metalization |
|---|---|---|
| 111 mil x 149 mil | 19 mil ± 2 mil | Al/Cu |

### 3.1 Die Picture




1. $R_G$
2. $R_G$
3. -INPUT
4. $V_{OS}$ NULL
5. $V_{OS}$ NULL
6. N/C
7. SENSE
8 REFERENCE
9. OUTPUT
10. V- (OUTPUT)
11. V-
12. V+
13. V+ (OUTPUT)
14. $R_S$
15. $R_S$
16. $V_{OS}$ NULL
17. $V_{OS}$ NULL
18. +INPUT

Make no electrical connection to unlabeled pads.

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### 3.3 Absolute Maximum Ratings 1/

| | |
|---|---|
| Supply Voltage ($V_S$) | ±18V dc |
| Common Mode Input Voltage | Supply Voltage |
| Differential Input Voltage: | |
| $R_G \geq 2k\Omega$ | ±20V dc |
| $R_G < 2k\Omega$ | ±10V dc |
| Output Short Circuit Duration | Indefinite |
| Storage Temperature Range | -65°C to +150°C |
| Ambient Operating Temperature Range | -55°C to +125°C |
| Junction Temperature ($T_J$) | +150°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 Samples Size and Qual Acceptance Criteria – 25/2

(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 Bias Current | $I_B$ | | | | ±4 | nA |
| Input Offset Current | $I_{IO}$ | | | | 1 | nA |
| Offset Referred to Input vs. Positive Supply | +PSR | V+ = +5V to +15V, V- = -15V | G = 1000 | 120 | | dB |
| | | | G = 100 | 110 | | |
| | | | G = 10 | 95 | | |
| | | | G = 1 | 75 | | |
| Offset Referred to Input vs. Negative Supply | -PSR | V- = -5V to -15V, V+ = +15V | G = 1000 | 105 | | dB |
| | | | G = 100 | 90 | | |
| | | | G = 10 | 70 | | |
| | | | G = 1 | 50 | | |
| Input Voltage Range | IVR | | | ±10 | | V |
| Common Mode Rejection | CMR | $V_{CM}$ = IVR | G = 1000 | 125 | | dB |
| | | | G = 100 | 120 | | |
| | | | G = 10 | 100 | | |
| | | | G = 1 | 85 | | |
| Gain Equation Accuracy | GE | $G = 20R_S/R_G$ | | | 0.8 | % |
| Output Short Circuit Current | $I_{OS+}$ | | | 60 | 120 | mA |
| | $I_{OS}$ | | | -120 | -60 | |
| Reference Input Resistance | $R_{INREF}$ | | | 35 | 65 | kΩ |
| Quiescent Current | $I_Q$ | +V Linked to $+V_{OP}$<br>-V Linked to $-V_{OP}$ | | | 4.8 | mA |
| Input Offset Voltage | $V_{IOS}$ | | | | 120 | µV |
| Output Offset Voltage | $V_{OOS}$ | | | | 6 | mV |
| Output Voltage Swing | $V_O$ | $R_L$ = 2kΩ | | ±13 | | V |
| | | $R_L$ = 500Ω | | ±13 | | |
| | | $R_L$ = 50Ω | | ±2.5 | | |

Table I Notes:

1/ $V_S$ = ±15V, $R_S$ = 10kΩ, $R_L$= 2kΩ, $T_A$ = 25°C, unless otherwise specified.

**Table II - Electrical Characteristics for Qual Samples**

| Parameter | Symbol | Conditions 1/ | | Sub-groups | Limit Min | Limit Max | Units |
|---|---|---|---|---|---|---|---|
| Input Bias Current | $I_B$ | | | 1 | | ±4 | nA |
| | | | | 2,3 | | ±10 | |
| Input Offset Current | $I_{IO}$ | | | 1 | | 1 | nA |
| | | | | 2,3 | | 3 | |
| Input Voltage Range | IVR | | | 1,2,3 | ±10V | | V |
| Offset Referred to Input vs. Positive Supply | +PSR | V+ = +5V to +15V, V- =-15V | G = 1000 | 1,2,3 | 120 | | dB |
| | | | G = 100 | | 110 | | |
| | | | G = 10 | | 95 | | |
| | | | G = 1 | | 75 | | |
| Offset Referred to Input vs. Negative Supply | -PSR | V- = -5V to 15V, V+ = +15V | G = 1000 | 1,2,3 | 105 | | dB |
| | | | G = 100 | | 90 | | |
| | | | G = 10 | | 70 | | |
| | | | G = 1 | | 50 | | |
| Common Mode Rejection | CMR | $V_{CM}$ = IVR, 1kΩ Source Imbalance | G = 1000 | 1 | 125 | | dB |
| | | | | 2,3 | 120 | | |
| | | | G = 100 | 1 | 120 | | |
| | | | | 2,3 | 115 | | |
| | | | G = 10 | 1 | 100 | | |
| | | | | 2,3 | 95 | | |
| | | | G = 1 | 1 | 85 | | |
| | | | | 2,3 | 80 | | |
| Gain Equation Accuracy | GE | 2/ | | 1 | | 0.8 | % |
| Gain Range | G | | | 1 | 1 | 1000 | V/V |
| Output Short Circuit Current | $I_{OS+}$ | | | 1 | 60 | 120 | mA |
| | $I_{OS}$ | | | | -120 | -60 | |
| Reference Input Resistance | $R_{INREF}$ | | | 1 | 35 | 65 | kΩ |
| Quiescent Current | $I_Q$ | +V Linked to $+V_{OP}$ -V Linked to $-V_{OP}$ | | 1 | | 4.8 | mA |
| Input Offset Voltage | $V_{IOS}$ | | | 4 | | 120 | µV |
| | | | | 5,6 | | 170 | |
| Output Offset Voltage | $V_{OOS}$ | | | 4 | | 6 | mV |
| | | | | 5,6 | | 10 | |
| Output Offset Voltage Drift | $TCV_{OOS}$ | RG = ∞ | | 8 | | 50 | µV/°C |
| Output Voltage Swing | $V_O$ | RL = 500Ω, 2kΩ | | 4 | ±13 | | V |
| | | | | 5,6 | ±12 | | |
| | | RL = 50Ω | | 4 | ±2.5 | | |
| Average Input Offset Voltage Drift | $TCV_{IOS}$ | $T_A$ = -55°C, +125°C | | 8 | 1.0 | | µV/°C |

Table II Notes:

1/ $V_S$ = ±15V, $R_S$ = 100Ω, $R_L$= 2kΩ, unless otherwise specified.

2/ G = $20R_S/R_G$, accuracy measured at G = 1, 10, 100, and 1000.

| Table III -Life Test Endpoint and Delta Parameter (Product is tested in accordance with Table II with the following exceptions) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Parameter** | **Symbol** | **Sub-groups** | **Burn In Limit Min** | **Burn In Limit Max** | **Life Test Limit Min** | **Life Test Limit Max** | **Life Test Delta** | **Units** |
| Input Offset Voltage | $V_{IOS}$ | 4 | | 160 | | 200 | ±40 | µV |
| | | 5, 6 | | | | 250 | | |
| Output Offset Voltage | $V_{OOS}$ | 4 | | 10 | | 16 | ±6 | mV |
| | | 5, 6 | | | | 20 | | |
| Input Bias Current | $I_B$ | 1 | | ±7 | | ±10 | ±3 | nA |
| | | 2, 3 | | | | ±16 | | |

## 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.

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

| Rev | Description of Change | Date |
|---|---|---|
| A | Initiate | 15-NOV-01 |
| B | Update web address | Jan. 25, 2002 |
| C | Update web address | Aug. 5, 2003 |
| D | Correct limits on Output Offset Voltage | 18-JUL-2006 |
| E | Update 1.0 Scope Description | 18-Jul-07 |
| F | Update header/footer and add to 1.0 scope description. | Mar. 3, 2008 |
| G | Add Junction Temperature ($T_J$) ....+150°C to 3.3 Absolute Max. Ratings | April 2, 2008 |
| H | Updated Section 4.0c note to indicate pre-screen temp testing being performed. | 5-JUN-2009 |
| I | Updated fonts and sizes to ADI standards replaced die picture for clarity | 29-Sept-2011 |
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