

### 1.0 SCOPE

This specification covers the detail requirements for an ultra-low-offset voltage operational 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> |
|---------------|--------------------|----------------|
| X             | OP-07J/883         | J              |
| A             | OP-07AJ/883        | J              |
| X             | OP-07Z/883         | Z              |
| A             | OP-07AZ/883        | Z              |
| X             | OP-07RC/883        | RC             |

### 1.2.3 Case Outline.

| <u>Letter</u> | <u>Case Outline (Lead finish per MIL-M-38510)</u> |
|---------------|---------------------------------------------------|
| J             | 8-lead metal can (TO-99)                          |
| Z             | 8-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)

|                                                |                                             |
|------------------------------------------------|---------------------------------------------|
| Supply Voltage.....                            | $\pm 22\text{V}$                            |
| Internal Power Dissipation.....                | 500mW                                       |
| Differential Input Voltage.....                | $\pm 30\text{V}$                            |
| Input Voltage (Note 1).....                    | $\pm 22\text{V}$                            |
| Output Short-Circuit Duration.....             | Indefinite                                  |
| Storage Temperature Range.....                 | $-65^\circ\text{C}$ to $+150^\circ\text{C}$ |
| Lead Temperature (Soldering, 60 sec).....      | $+300^\circ\text{C}$                        |
| Operating Temperature Range.....               | $-55^\circ\text{C}$ to $+125^\circ\text{C}$ |
| DICE Junction Temperature Range ( $T_J$ )..... | $-65^\circ\text{C}$ to $+150^\circ\text{C}$ |

#### NOTES:

1. For supply voltages less than  $\pm 22\text{V}$ , the absolute maximum input voltage is equal to the supply voltages.

## 1.5 Thermal Characteristics:

Thermal Resistance, TO-99 (J) package:

Junction-to-Case ( $\theta_{JC}$ ) = 45°C/W MAX

Junction-to-Ambient ( $\theta_{JA}$ ) = 150°C/W MAX

Thermal Resistance, Cerdip (Z) package:

Junction-to-Case ( $\theta_{JC}$ ) = 26°C/W MAX

Junction-to-Ambient ( $\theta_{JA}$ ) = 119°C/W MAX

Thermal Resistance, LCC (RC) package:

Junction-to-Case ( $\theta_{JC}$ ) = 35°C/W MAX

Junction-to-Ambient ( $\theta_{JA}$ ) = 110°C/W MAX

TABLE 1

$V_S = \pm 15V$ ;  $R_S = 50\Omega$ ;  $T_A = 25^\circ C$  unless otherwise specified.

| OP-07/883                    |                   |                                             |          |      |          |      |       |
|------------------------------|-------------------|---------------------------------------------|----------|------|----------|------|-------|
| Characteristics              | Symbol            | Special Conditions                          | LIMITS A |      | LIMITS X |      | Units |
|                              |                   |                                             | Min      | Max  | Min      | Max  |       |
| Input Offset Voltage         | V <sub>OS</sub>   |                                             | —        | 25   | —        | 75   | μV    |
|                              |                   | -55°C ≤ T <sub>A</sub> ≤ +125°C             | —        | 60   | —        | 200  | μV    |
| Average Offset Voltage Drift | TCV <sub>OS</sub> | -55°C ≤ T <sub>A</sub> ≤ +125°C             | —        | 0.6  | —        | 1.3  | μV/°C |
| Input Offset Current         | I <sub>OS</sub>   |                                             | —        | 2.0  | —        | 2.8  | nA    |
|                              |                   | -55°C ≤ T <sub>A</sub> ≤ +125°C             | —        | 4.0  | —        | 5.6  | nA    |
| Input Bias Current           | I <sub>B</sub>    |                                             | —        | ±2.0 | —        | ±3.0 | nA    |
|                              |                   | -55°C ≤ T <sub>A</sub> ≤ +125°C             | —        | ±4.0 | —        | ±6.0 | nA    |
| Output Voltage Swing         | V <sub>O</sub>    | R <sub>L</sub> ≥ 10kΩ                       | ±12.5    | —    | ±12.5    | —    | V     |
|                              |                   | R <sub>L</sub> ≥ 2kΩ                        | ±12.0    | —    | ±12.0    | —    | V     |
|                              |                   | R <sub>L</sub> ≥ 1kΩ                        | ±10.5    | —    | ±10.5    | —    | V     |
|                              |                   | R <sub>L</sub> ≥ 2kΩ                        | ±12.0    | —    | ±12.0    | —    | V     |
|                              |                   | -55°C ≤ T <sub>A</sub> ≤ +125°C             |          |      |          |      |       |
| Supply Current               | I <sub>SY</sub>   | No Load                                     | —        | 4    | —        | 4    | mA    |
|                              |                   | No Load, V <sub>S</sub> = ±3V               | —        | 1    | —        | 1    | mA    |
| Power Dissipation            | P <sub>d</sub>    | No Load                                     | —        | 120  | —        | 120  | mW    |
|                              |                   | No Load, V <sub>S</sub> = ±3V               | —        | 6    | —        | 6    | mW    |
| Slew Rate                    | SR                | R <sub>L</sub> ≥ 2kΩ, C <sub>L</sub> = 50pF | 0.1      | —    | 0.1      | —    | V/μs  |
| Input Voltage Range (Note 1) | IVR               |                                             | ±13      | —    | ±13      | —    | V     |
|                              |                   | -55°C ≤ T <sub>A</sub> ≤ +125°C             | ±13      | —    | ±13      | —    | V     |
| Common-Mode Rejection        | CMR               | V <sub>CM</sub> = IVR = ±13V                | 110      | —    | 110      | —    | dB    |
|                              |                   | V <sub>CM</sub> = IVR = ±13V                | 106      | —    | 106      | —    | dB    |
|                              |                   | -55°C ≤ T <sub>A</sub> ≤ +125°C             |          |      |          |      |       |

**TABLE 1 (Continued)**

$V_S = \pm 15V$ ;  $R_S = 50\Omega$ ;  $T_A = 25^\circ C$  unless otherwise specified.

| OP-07/883                    |                              |                                                                                                                              |          |      |          |      |            |
|------------------------------|------------------------------|------------------------------------------------------------------------------------------------------------------------------|----------|------|----------|------|------------|
| Characteristics              | Symbol                       | Special Conditions                                                                                                           | LIMITS A |      | LIMITS X |      | Units      |
|                              |                              |                                                                                                                              | Min      | Max  | Min      | Max  |            |
| Power Supply Rejection Ratio | PSRR                         | $V_S = \pm 3V$ to $\pm 18V$<br>$V_S = \pm 3V$ to $\pm 18V$<br>$-55^{\circ}C \leq T_A \leq +125^{\circ}C$                     | --       | 10   | --       | 10   | $\mu V/V$  |
|                              |                              |                                                                                                                              | --       | 20   | --       | 20   | $\mu V/V$  |
| Input Noise Voltage (Note 2) | $e_n$                        | $f_O = 1Hz$ to $100Hz$                                                                                                       | --       | 150  | --       | 150  | $nV_{RMS}$ |
| Input Noise Current (Note 2) | $i_n$                        | $f_O = 1Hz$ to $100Hz$                                                                                                       | --       | 8    | --       | 8    | $pA_{RMS}$ |
| Open-Loop Voltage Gain       | $A_{VO}$                     | $R_L \geq 2k\Omega$ , $V_O = \pm 10V$<br>$R_L \geq 2k\Omega$ , $V_O = \pm 10V$<br>$-55^{\circ}C \leq T_A \leq +125^{\circ}C$ | 300      | --   | 200      | --   | $V/mV$     |
|                              |                              |                                                                                                                              | 200      | --   | 150      | --   | $V/mV$     |
| Small-Signal Bandwidth       | BW                           | $A_{VCL} = +1$                                                                                                               | 0.4      | --   | 0.4      | --   | MHz        |
| Input Offset Adjustment      | $V_{OSadj+}$<br>$V_{OSadj-}$ | $R_p = 20k\Omega$<br>$R_p = 20k\Omega$                                                                                       | 0.5      | --   | 0.5      | --   | mV         |
|                              |                              |                                                                                                                              | --       | -0.5 | --       | -0.5 | mV         |
| Output Short Circuit         | $I_{SC}^{+}$<br>$I_{SC}^{-}$ |                                                                                                                              | --       | 58   | --       | 58   | mA         |
|                              |                              |                                                                                                                              | -50      | --   | -50      | --   | mA         |

**NOTES:**

1. IVR is defined as the  $V_{CM}$  range used for the CMR test.
2. This parameter is 100% tested.

**TABLE 2****OP-07/883**

**Electrical Test Requirements  
For Class B Devices**

| MIL-STD-883<br>Test Requirements               | Subgroups (see Table 3) |
|------------------------------------------------|-------------------------|
| Interim Electrical<br>Parameters (pre Burn-In) | 1                       |
| Final Electrical Test<br>Parameters            | 1*, 2, 3, 4             |
| Group A Test Requirements                      | 1, 2, 3, 4, 7, 8        |

- \* PDA applies to Subgroup 1 only.  
No other Subgroups are included in PDA.  
 $V_{OS}$  is excluded from PDA calculation.

**TABLE 3**

**Group A Inspection**

$V_S = \pm 15V$ ;  $R_S = 50\Omega$ ;  $T_A = T_J$  unless otherwise specified.

| OP-07/883                                  |                              |                                             |          |      |          |      |       |
|--------------------------------------------|------------------------------|---------------------------------------------|----------|------|----------|------|-------|
| Subgroup                                   | Symbol                       | Special Conditions                          | LIMITS A |      | LIMITS X |      | Units |
|                                            |                              |                                             | Min      | Max  | Min      | Max  |       |
| Subgroup 1<br><br>T <sub>A</sub> = +25 °C  | I <sub>OS</sub>              |                                             | –        | 2.0  | –        | 2.8  | nA    |
|                                            | I <sub>B</sub>               |                                             | –        | ±2.0 | –        | ±3.0 | nA    |
|                                            | CMR                          | V <sub>CM</sub> = ±13V                      | 110      | –    | 110      | –    | dB    |
|                                            | PSRR                         | V <sub>S</sub> = ±3V, ±18V                  | –        | 10   | –        | 10   | μV/V  |
|                                            | A <sub>VO</sub>              | R <sub>L</sub> = 2kΩ, V <sub>O</sub> = ±10V | 300      | –    | 200      | –    | V/mV  |
|                                            | V <sub>O</sub>               | R <sub>L</sub> = 10kΩ                       | ±12.5    | –    | ±12.5    | –    | V     |
|                                            |                              | R <sub>L</sub> = 2kΩ                        | ±12.0    | –    | ±12.0    | –    | V     |
|                                            |                              | R <sub>L</sub> = 1kΩ                        | ±10.5    | –    | ±10.5    | –    | V     |
|                                            | P <sub>d</sub>               | No Load                                     | –        | 120  | –        | 120  | mW    |
|                                            |                              | No Load, V <sub>S</sub> = ±3V               | –        | 6    | –        | 6    | mW    |
|                                            | V <sub>OSadj+</sub>          | R <sub>p</sub> = 20kΩ                       | 0.5      | –    | 0.5      | –    | mV    |
|                                            | V <sub>OSadj-</sub>          | R <sub>p</sub> = 20kΩ                       | –        | -0.5 | –        | -0.5 | mV    |
|                                            | I <sub>SC</sub> <sup>+</sup> |                                             | –        | 58   | –        | 58   | mA    |
|                                            | I <sub>SC</sub> <sup>-</sup> |                                             | -50      | –    | -50      | –    | mA    |
| Subgroup 2<br><br>T <sub>A</sub> = +125 °C | I <sub>OS</sub>              |                                             | –        | 4.0  | –        | 5.6  | nA    |
|                                            | I <sub>B</sub>               |                                             | –        | ±4.0 | –        | ±6.0 | nA    |
|                                            | CMR                          | V <sub>CM</sub> = ±13V                      | 106      | –    | 106      | –    | dB    |
|                                            | PSRR                         | V <sub>S</sub> = ±3V, ±18V                  | –        | 20   | –        | 20   | μV/V  |
|                                            | A <sub>VO</sub>              | R <sub>L</sub> = 2kΩ, V <sub>O</sub> = ±10V | 200      | –    | 150      | –    | V/mV  |
|                                            | V <sub>O</sub>               | R <sub>L</sub> = 2kΩ                        | +12      | –    | +12      | –    | V     |

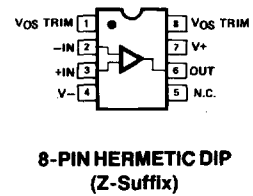
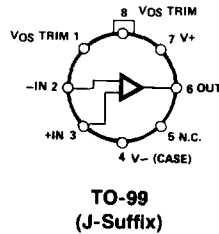
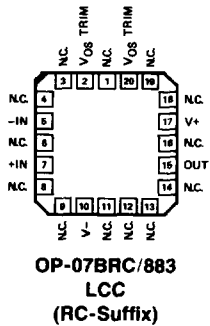
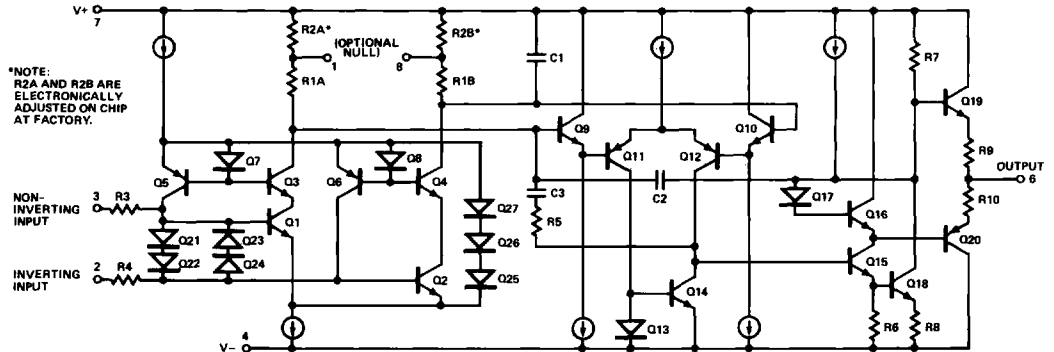
**TABLE 3**

**Group A Inspection (Continued)**

$V_S = \pm 15V$ ;  $R_S = 50\Omega$ ;  $T_A = T_J$  unless otherwise specified.

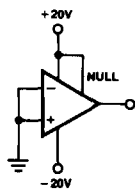
| OP-07/883                                            |                                                                  |                                                      |          |     |          |     |       |
|------------------------------------------------------|------------------------------------------------------------------|------------------------------------------------------|----------|-----|----------|-----|-------|
| Subgroup                                             | Symbol                                                           | Special Conditions                                   | LIMITS A |     | LIMITS X |     | Units |
|                                                      |                                                                  |                                                      | Min      | Max | Min      | Max |       |
| Subgroup 2<br>T <sub>A</sub> = +125°C<br>(Continued) | V <sub>OS</sub>                                                  |                                                      | —        | 60  | —        | 200 | μV    |
| Subgroup 3<br>T <sub>A</sub> = -55°C                 | All Tests, Limits and Conditions are the same as for Subgroup 2. |                                                      |          |     |          |     |       |
| Subgroup 4<br>T <sub>A</sub> = +25°C                 | V <sub>OS</sub>                                                  |                                                      | —        | 25  | —        | 75  | μV    |
| Subgroup 7<br>T <sub>A</sub> = +25°C                 | BW                                                               | A <sub>VCL</sub> = +1                                | 0.4      | —   | 0.4      | —   | MHz   |
|                                                      | SR                                                               | R <sub>L</sub> = 2k $\Omega$ , C <sub>L</sub> = 50pF | 0.1      | —   | 0.1      | —   | V/μs  |
| Subgroup 8<br>-55°C ≤ T <sub>A</sub> ≤ +125°C        | TCV <sub>OS</sub>                                                |                                                      | —        | 0.6 | —        | 1.3 | μV/°C |

## 3.2.1 Simplified Schematic and Pin Connections.



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

## 4.2 Life Test/Burn-In Circuit.



**J AND Z PACKAGES**