

| REVISIONS |             |                 |          |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| REV STATUS OF SHEETS | REV SHEET |   |   |   |   |   |   |   |   |   |    |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                      |           | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

|                                                                                                                                                                             |                                          |                                                         |                           |                                                                                  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|---------------------------------------------------------|---------------------------|----------------------------------------------------------------------------------|
| PMIC N/A                                                                                                                                                                    | PREPARED BY<br><i>Charles E. Besore</i>  | DEFENSE ELECTRONICS SUPPLY CENTER<br>DAYTON, OHIO 45444 |                           |                                                                                  |
| <b>STANDARDIZED<br/>MILITARY<br/>DRAWING</b><br><br>THIS DRAWING IS AVAILABLE<br>FOR USE BY ALL DEPARTMENTS<br>AND AGENCIES OF THE<br>DEPARTMENT OF DEFENSE<br><br>AMSC N/A | CHECKED BY<br><i>Charles E. Besore</i>   |                                                         |                           | MICROCIRCUIT, LINEAR, VOLTAGE COMPARATOR,<br>QUAD, PRECISION, MONOLITHIC SILICON |
|                                                                                                                                                                             | APPROVED BY<br><i>[Signature]</i>        |                                                         |                           |                                                                                  |
|                                                                                                                                                                             | DRAWING APPROVAL DATE<br>2 FEBRUARY 1990 | SIZE<br><b>A</b>                                        | CAGE CODE<br><b>67268</b> |                                                                                  |
|                                                                                                                                                                             | REVISION LEVEL                           | SHEET 1                                                 |                           |                                                                                  |

DESC FORM 193  
SEP 87

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DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

## 1. SCOPE

1.1 Scope. This drawing describes device requirements for class B microcircuits in accordance with 1.2.1 of MIL-STD-883, "Provisions for the use of MIL-STD-883 in conjunction with compliant non-JAN devices".

1.2 Part number. The complete part number shall be as shown in the following example:

|                |                        |                         |                                |
|----------------|------------------------|-------------------------|--------------------------------|
| 5962-86860     | 01                     | E                       | X                              |
| Drawing number | Device type<br>(1.2.1) | Case outline<br>(1.2.2) | Lead finish per<br>MIL-M-38510 |

1.2.1 Device type. The device type shall identify the circuit function as follows:

| Device type | Generic number | Circuit function          |
|-------------|----------------|---------------------------|
| 01          | HA-4902        | Precision quad comparator |

1.2.2 Case outlines. The case outlines shall be as designated in appendix C of MIL-M-38510, and as follows:

| Outline letter | Case outline                                                          |
|----------------|-----------------------------------------------------------------------|
| E              | D-2 (16-lead, .840" X .310" X .200"), dual-in-line package            |
| 2              | C-2 (20-terminal, .358" X .358" X .100"), square chip carrier package |

1.3 Absolute maximum ratings.

|                                                             |                             |
|-------------------------------------------------------------|-----------------------------|
| Voltage between +V and -V terminals                         | 33 V dc                     |
| Differential input voltage                                  | ±15 V dc                    |
| Output short-circuit duration                               | Indefinite 1/               |
| Peak output current                                         | ±50 mA                      |
| Storage temperature range                                   | -65°C to +150°C             |
| Maximum power dissipation (P <sub>D</sub> ):                |                             |
| Case E                                                      | 1.33 W 2/                   |
| Case 2                                                      | 1.32 W 3/                   |
| Lead temperature (soldering, 10 seconds)                    | +275°C                      |
| Thermal resistance, junction-to-case (θ <sub>JC</sub> )     | See MIL-M-38510, appendix C |
| Thermal resistance, junction-to-ambient (θ <sub>JA</sub> ): |                             |
| Case E                                                      | 75°C/W                      |
| Case 2                                                      | 76°C/W                      |
| Junction temperature (T <sub>J</sub> )                      | +175°C                      |

1.4 Recommended operating conditions.

|                                             |                 |
|---------------------------------------------|-----------------|
| Positive supply voltage (+V)                | +15 V dc        |
| Negative supply voltage (-V)                | -15 V dc        |
| Logic supply voltage (+V <sub>L</sub> )     | +5.0 V dc       |
| Logic reference voltage (-V <sub>L</sub> )  | 0 V dc          |
| Ambient temperature range (T <sub>A</sub> ) | -55°C to +125°C |

1/ One amplifier shorted to ground.

2/ Derate linearly above T<sub>A</sub> = +75°C at 13.4 mW/°C.

3/ Derate linearly above T<sub>A</sub> = +75°C at 13.1 mW/°C.

|                                                                                                     |                  |            |            |
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## 2. APPLICABLE DOCUMENTS

2.1 Government specification, standard, and bulletin. Unless otherwise specified, the following specification, standard, and bulletin of the issue listed in that issue of the Department of Defense Index of Specifications and Standards specified in the solicitation, form a part of this drawing to the extent specified herein.

### SPECIFICATION

#### MILITARY

MIL-M-38510 - Microcircuits, General Specification for.

### STANDARD

#### MILITARY

MIL-STD-883 - Test Methods and Procedures for Microelectronics.

### BULLETIN

#### MILITARY

MIL-BUL-103 - List of Standardized Military Drawings (SMD's).

(Copies of the specification, standard, and bulletin required by manufacturers in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting activity.)

2.2 Order of precedence. In the event of a conflict between the text of this drawing and the references cited herein, the text of this drawing shall take precedence.

## 3. REQUIREMENTS

3.1 Item requirements. The individual item requirements shall be in accordance with 1.2.1 of MIL-STD-883, "Provisions for the use of MIL-STD-883 in conjunction with compliant non-JAN devices" and as specified herein.

3.2 Design, construction, and physical dimensions. The design, construction, and physical dimensions shall be as specified in MIL-M-38510 and herein.

3.2.1 Terminal connections. The terminal connections shall be as specified on figure 1.

3.2.2 Case outlines. The case outlines shall be in accordance with 1.2.2 herein.

3.3 Electrical performance characteristics. Unless otherwise specified herein, the electrical performance characteristics are as specified in table I and shall apply over the full ambient operating temperature range.

3.4 Electrical test requirements. The electrical test requirements shall be the subgroups specified in table II. The electrical tests for each subgroup are described in table I.

3.5 Marking. Marking shall be in accordance with MIL-STD-883 (see 3.1 herein). The part shall be marked with the part number listed in 1.2 herein. In addition, the manufacturer's part number may also be marked as listed in MIL-BUL-103 (see 6.6 herein).

|                                                                                                     |                  |                |            |
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TABLE I. Electrical performance characteristics.

| Test                  | Symbol              | Conditions 1/<br>-55°C < T <sub>A</sub> < +125°C<br>unless otherwise specified | Group A<br>subgroups | Limits |      | Unit |
|-----------------------|---------------------|--------------------------------------------------------------------------------|----------------------|--------|------|------|
|                       |                     |                                                                                |                      | Min    | Max  |      |
| Input offset voltage  | V <sub>IO</sub>     | V <sub>CM</sub> = 0 V, V <sub>OUT</sub> = 1.4 V 2/                             | 1                    |        | ±5.0 | mV   |
|                       |                     |                                                                                | 2, 3                 |        | ±8.0 |      |
| Input bias current    | +I <sub>B</sub>     | V <sub>CM</sub> = 0 V                                                          | 1                    |        | ±150 | nA   |
|                       |                     |                                                                                | 2, 3                 |        | ±200 |      |
|                       | -I <sub>B</sub>     | V <sub>CM</sub> = 0 V                                                          | 1                    |        | ±150 | nA   |
|                       |                     |                                                                                | 2, 3                 |        | ±200 |      |
| Input offset current  | I <sub>IO</sub>     | V <sub>CM</sub> = 0 V                                                          | 1                    |        | ±35  | nA   |
|                       |                     |                                                                                | 2, 3                 |        | ±45  |      |
| Input sensitivity     | I <sub>SEN</sub>    |                                                                                | 1                    |        | ±0.5 | mV   |
|                       |                     |                                                                                | 2, 3                 |        | ±0.6 |      |
| Output low voltage    | V <sub>OL</sub>     | I <sub>SINK</sub> = 3.0 mA                                                     | 1, 2, 3              |        | 0.4  | V    |
| Output high voltage   | V <sub>OH</sub>     | I <sub>SOURCE</sub> = 3.0 mA                                                   | 1, 2, 3              | 3.5    |      | V    |
| Output sink current   | I <sub>SINK</sub>   | V <sub>OUT</sub> ≤ 0.4 V                                                       | 1, 2, 3              | 3.0    |      | mA   |
| Output source current | I <sub>SOURCE</sub> | V <sub>OUT</sub> ≥ 0.4 V                                                       | 1, 2, 3              | -3.0   |      | mA   |
| Supply current        | +I <sub>CC</sub>    | V <sub>OUT</sub> = V <sub>OL</sub> and V <sub>OH</sub>                         | 1, 2, 3              |        | 20   | mA   |
|                       | -I <sub>CC</sub>    | V <sub>OUT</sub> = V <sub>OL</sub> and V <sub>OH</sub>                         | 1                    |        | 8.0  |      |
|                       |                     |                                                                                | 2, 3                 |        | 10   |      |

See footnotes at end of table.

|                                                                                                     |                  |                |            |
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TABLE I. Electrical performance characteristics - Continued.

| Test                                    | Symbol           | Conditions <sup>1/</sup><br>-55°C < T <sub>A</sub> < +125°C<br>unless otherwise specified | Group A<br>subgroups | Limits |      | Unit |
|-----------------------------------------|------------------|-------------------------------------------------------------------------------------------|----------------------|--------|------|------|
|                                         |                  |                                                                                           |                      | Min    | Max  |      |
| Logic current                           | I <sub>L</sub>   | V <sub>OUT</sub> = V <sub>OL</sub> and V <sub>OH</sub>                                    | 1                    |        | 6.0  | mA   |
|                                         |                  |                                                                                           | 2, 3                 |        | 8.0  |      |
| Response time <sup>3/</sup>             | t <sub>PDO</sub> | 100 mV input step, <sup>4/</sup><br>10 mV overdrive,<br>T <sub>A</sub> = +25°C            | 9                    |        | 200  | ns   |
|                                         | t <sub>PD1</sub> | -100 mV input step, <sup>4/</sup><br>-10 mV overdrive,<br>T <sub>A</sub> = +25°C          | 9                    |        | 200  |      |
| Common mode voltage range <sup>3/</sup> | +V <sub>CM</sub> | T <sub>A</sub> = +25°C                                                                    | 1                    | -15    | 12.4 | V    |
|                                         | -V <sub>CM</sub> | T <sub>A</sub> = +25°C                                                                    | 1                    | -15    | 12.4 | V    |

<sup>1/</sup> +V = 15 V, -V = -15 V, and V<sub>L</sub> = 0 V unless otherwise specified.

<sup>2/</sup> Offset voltage is measured when V<sub>OUT</sub> = 1.4 V. Sensitivity is measured on the transition edge at 0.4 V and 3.5 V. Sensitivity is the change in differential input voltage required to change the output state. Sensitivity includes the effects of offset voltage, offset current, common mode rejection and voltage gain. See figure 2.

<sup>3/</sup> If not tested, shall be guaranteed to the limits specified in table I.

<sup>4/</sup> Duty cycle = 50%, f = 100 Hz, inverting input is driven, and all unused inverting inputs are tied to +5.0 V. See figure 3.

3.6 Certificate of compliance. A certificate of compliance shall be required from a manufacturer in order to be listed as an approved source of supply in MIL-BUL-103 (see 6.6 herein). The certificate of compliance submitted to DESC-ECS prior to listing as an approved source of supply shall affirm that the manufacturer's product meets the requirements of MIL-STD-883 (see 3.1 herein) and the requirements herein.

3.7 Certificate of conformance. A certificate of conformance as required in MIL-STD-883 (see 3.1 herein) shall be provided with each lot of microcircuits delivered to this drawing.

3.8 Notification of change. Notification of change to DESC-ECS shall be required in accordance with MIL-STD-883 (see 3.1 herein).

3.9 Verification and review. DESC, DESC's agent, and the acquiring activity retain the option to review the manufacturer's facility and applicable required documentation. Offshore documentation shall be made available onshore at the option of the reviewer.

|                                                                                                     |                  |                |            |
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|                 |                 |                 |
|-----------------|-----------------|-----------------|
| Device type     | 01              | 01              |
| Case outline    | E               | 2               |
| Terminal number | Terminal symbol |                 |
| 1               | +V <sub>L</sub> | NC              |
| 2               | OUT 1           | +V <sub>L</sub> |
| 3               | -IN 1           | OUT 1           |
| 4               | +IN 1           | -IN 1           |
| 5               | -V              | +IN 1           |
| 6               | +IN2            | NC              |
| 7               | -IN2            | -V              |
| 8               | OUT 2           | +IN 2           |
| 9               | -V <sub>L</sub> | -IN 2           |
| 10              | OUT 3           | OUT 2           |
| 11              | -IN 3           | NC              |
| 12              | +IN 3           | -V <sub>L</sub> |
| 13              | +V              | OUT 3           |
| 14              | +IN 4           | -IN 3           |
| 15              | -IN 4           | +IN 3           |
| 16              | OUT 4           | NC              |
| 17              | ---             | +V              |
| 18              | ---             | +IN 4           |
| 19              | ---             | -IN 4           |
| 20              | ---             | OUT 4           |

FIGURE 1. Terminal connections.

|                                                                                                     |                  |                |            |
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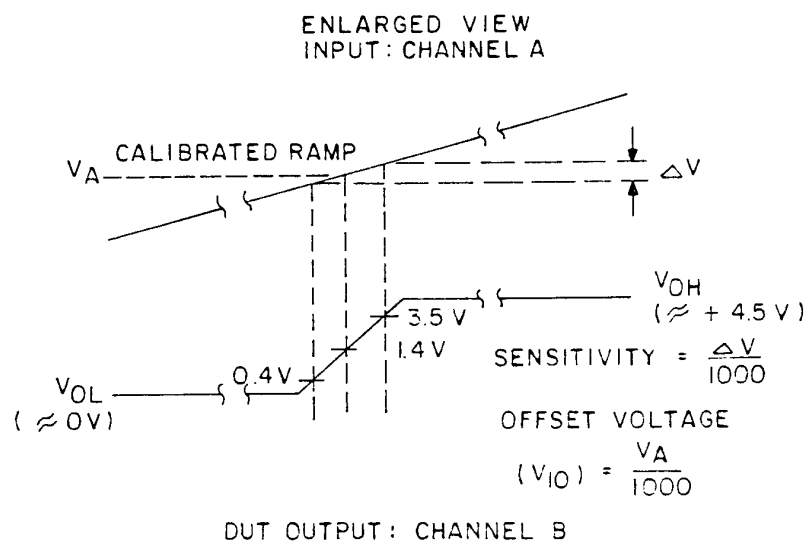
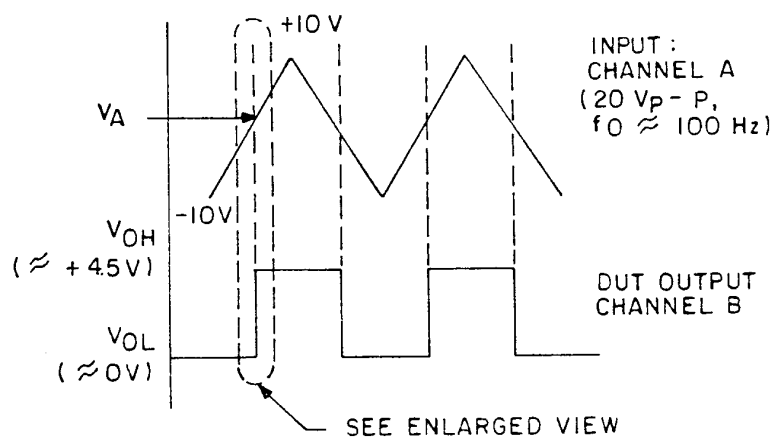
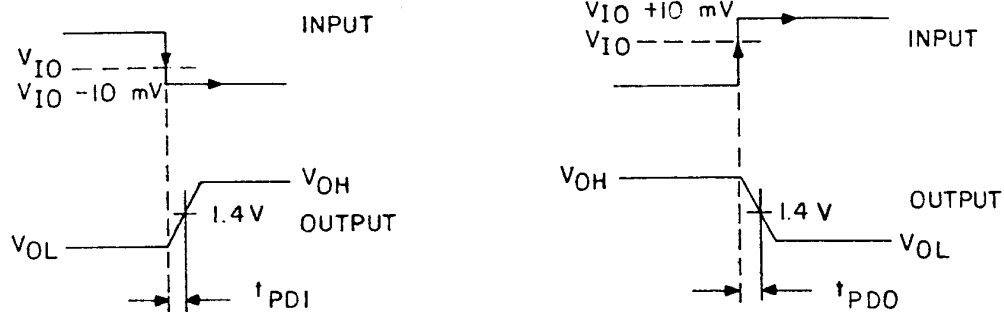


FIGURE 2. Offset voltage and sensitivity waveforms.

|                                                                                                     |                  |                |            |
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NOTE: Response time testing is done after  $V_{I0}$  testing to acquire device offset voltage. Ten millivolts overdrive is then added (or subtracted depending on state) to this measured  $V_{I0}$  value.

FIGURE 3. Response time waveforms.

|                                                                                                     |                  |                |            |
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#### 4. QUALITY ASSURANCE PROVISIONS

4.1 Sampling and inspection. Sampling and inspection procedures shall be in accordance with section 4 of MIL-M-38510 to the extent specified in MIL-STD-883 (see 3.1 herein).

4.2 Screening. Screening shall be in accordance with method 5004 of MIL-STD-883, and shall be conducted on all devices prior to quality conformance inspection. The following additional criteria shall apply:

a. Burn-in test, method 1015 of MIL-STD-883.

(1) Test condition A, B, C, or D using the circuit submitted with the certificate of compliance (see 3.6 herein).

(2)  $T_A = +125^{\circ}\text{C}$ , minimum.

b. Interim and final electrical test parameters shall be as specified in table II herein, except interim electrical parameter tests prior to burn-in are optional at the discretion of the manufacturer.

4.3 Quality conformance inspection. Quality conformance inspection shall be in accordance with method 5005 of MIL-STD-883 including groups A, B, C, and D inspections. The following additional criteria shall apply.

TABLE II. Electrical test requirements.

| MIL-STD-883 test requirements                                      | Subgroups<br>(per method<br>5005, table I) |
|--------------------------------------------------------------------|--------------------------------------------|
| Interim electrical parameters<br>(method 5004)                     | ---                                        |
| Final electrical test parameters<br>(method 5004)                  | 1*, 2, 3                                   |
| Group A test requirements<br>(method 5005)                         | 1, 2, 3, 9,<br>10**, 11**                  |
| Groups C and D end-point<br>electrical parameters<br>(method 5005) | 1                                          |

\* PDA applies to subgroup 1.

\*\* Subgroups 10 and 11 shall be guaranteed if not tested.

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MILITARY DRAWING**

DEFENSE ELECTRONICS SUPPLY CENTER  
DAYTON, OHIO 45444

SIZE  
**A**

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4.3.1 Group A inspection.

- a. Tests shall be as specified in table II herein.
- b. Subgroups 4, 5, 6, 7, and 8 in table I, method 5005 of MIL-STD-883 shall be omitted.

4.3.2 Groups C and D inspections.

- a. End-point electrical parameters shall be as specified in table II herein.
- b. Steady-state life test conditions, method 1005 of MIL-STD-883:
  - (1) Test condition A, B, C, or D using the circuit submitted with the certificate of compliance (see 3.6 herein).
  - (2)  $T_A = +125^{\circ}\text{C}$ , minimum.
  - (3) Test duration: 1,000 hours, except as permitted by method 1005 of MIL-STD-883.

5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be in accordance with MIL-M-38510.

6. NOTES

6.1 Intended use. Microcircuits conforming to this drawing are intended for use when military specifications do not exist and qualified military devices that will perform the required function are not available for OEM application. When a military specification exists and the product covered by this drawing has been qualified for listing on QPL-38510, the device specified herein will be inactivated and will not be used for new design. The QPL-38510 product shall be the preferred item for all applications.

6.2 Replaceability. Microcircuits covered by this drawing will replace the same generic device covered by a contractor-prepared specification or drawing.

6.3 Configuration control of SMD's. All proposed changes to existing SMD's will be coordinated with the users of record for the individual documents. This coordination will be accomplished in accordance with MIL-STD-481 using DD Form 1693, Engineering Change Proposal (Short Form).

6.4 Record of users. Military and industrial users shall inform Defense Electronics Supply Center when a system application requires configuration control and the applicable SMD. DESC will maintain a record of users and this list will be used for coordination and distribution of changes to the drawings. Users of drawings covering microelectronics devices (FSC 5962) should contact DESC-ECS, telephone (513) 296-6022.

6.5 Comments. Comments on this drawing should be directed to DESC-ECS, Dayton, Ohio 45444, or telephone 513-296-5375.

|                                                                                                     |                  |                |             |
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6.6 Approved source of supply. An approved source of supply is listed in MIL-BUL-103. Additional sources will be added as they become available. The vendor listed in MIL-BUL-103 has agreed to this drawing and a certificate of compliance (see 3.6 herein) has been submitted to and accepted by DESC-ECS. The approved source of supply listed below is for information purposes only and is current only to the date of the last action of this document.

| Military drawing<br>part number | Vendor<br>CAGE<br>number | Vendor<br>similar part<br>number <u>1/</u> |
|---------------------------------|--------------------------|--------------------------------------------|
| 5962-8686001EX                  | 34371                    | HA1-4902/883                               |
| 5962-86860012X                  | 34371                    | HA4-4902/883                               |

1/ Caution. Do not use this number for item acquisition.  
Items acquired to this number may not satisfy the  
performance requirements of this drawing.

Vendor CAGE  
number

34371

Vendor name  
and address

Harris Semiconductor  
P.O. Box 883  
Melbourne, FL 32901

|                                                                                                     |                  |                |             |
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