

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 or Identifying Number (PIN). The complete PIN shall be as shown in the following example:

| | | | |
|----------------|------------------------|-------------------------|--------------------------------|
| 5962-90627 | 01 | G | X |
| Drawing number | Device type (1.2.1) | Case outline (1.2.2) | Lead finish per MIL-M-38510 |

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

| Device type | Generic number | Circuit function |
|-------------|----------------|--------------------|
| 01 | LT1011A | Voltage comparator |
| 02 | LT1011 | Voltage comparator |

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

| Outline letter | Case outline |
|----------------|---|
| G | A-1 (8-lead, .370" x .185"), metal can |
| P | D-4 (8-lead, .405" x .310" x .200"), dual-in-line package |

1.3 Absolute maximum ratings.

| | | |
|---|-----------|-----------------------------|
| Positive supply voltage (V ₊) | - - - - - | +18 V dc |
| Negative supply voltage (V ₋) | - - - - - | -18 V dc |
| Supply voltage (V ₊ to V ₋) | - - - - - | 36 V dc |
| Output to negative supply (OUTPUT to V ₋) | - - - - - | 50 V dc |
| Ground to negative supply (GROUND to V ₋) | - - - - - | 30 V dc |
| Differential input voltage | - - - - - | ±36 V dc |
| Voltage at strobe pin | - - - - - | 5 V dc |
| Power dissipation (P _D) | - - - - - | 200 mW |
| Input voltage | - - - - - | Equal to supplies 1/ |
| Output short circuit duration | - - - - - | 10 seconds |
| Storage temperature range | - - - - - | -65°C to +150°C |
| Lead temperature (soldering, 10 seconds) | - - - - - | +300°C |
| Junction temperature (T _J) | - - - - - | +150°C |
| Thermal resistance, junction-to-case (θ _{JC}) | - - - - - | See MIL-M-38510, appendix C |
| Thermal resistance, junction-to-ambient (θ _{JA}): | | |
| Case G | - - - - - | 150°C/W |
| Case P | - - - - - | 100°C/W |
| Output strobe current (I _{STR}) | - - - - - | 5 mA |
| Output sink current (I _{SINK}) | - - - - - | 50 mA |

1.4 Recommended operating conditions.

| | | |
|---|-----------|-----------------|
| Supply voltage (V _±) | - - - - - | ±15 V dc |
| Ambient operating temperature range (T _A) | - - - - - | -55°C to +125°C |

1/ Inputs may be clamped to supplies with diode so that maximum input voltage actually exceeds supply voltage by one diode drop.

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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 Case outline(s). The case outline(s) shall be in accordance with 1.2.2 herein.

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

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 PIN listed in 1.2 herein. In addition, the manufacturer's PIN may also be marked as listed in MIL-BUL-103 (see 6.6 herein).

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).

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TABLE I. Electrical performance characteristics.

| Test | Symbol | Conditions ^{1/} $-55^{\circ}\text{C} \leq T_A \leq +125^{\circ}\text{C}$ unless otherwise specified | Group A subgroups | Device type | Limits ^{2/} | | Unit |
|-------------------------------|--------------------------|--|----------------------|----------------|----------------------|------|--------------------------------|
| | | | | | Min | Max | |
| Input offset voltage | V_{OS} | <u>3/</u> | 1 | 01 | -0.5 | +0.5 | mV |
| | | | 2,3 | | -1.0 | +1.0 | |
| | | | 1 | 02 | -1.5 | +1.5 | |
| | | | 2,3 | | -3.0 | +3.0 | |
| | | $R_S \leq 50 \text{ k}\Omega$ <u>4/</u> | 1 | 01 | -0.75 | 0.75 | |
| | | | 2,3 | | -1.5 | +1.5 | |
| | | | 1 | 02 | -2.0 | +2.0 | |
| | | | 2,3 | | -3.0 | +3.0 | |
| Input offset current | I_{OS} | <u>4/</u> | 1 | 01 | -3 | +3 | nA |
| | | | 2,3 | | -5 | +5 | |
| | | | 1 | 02 | -4 | +4 | |
| | | | 2,3 | | -6 | +6 | |
| Input bias current | I_B | <u>3/</u> | 1 | 01 | -25 | +25 | nA |
| | | | | 02 | -50 | +50 | |
| | | <u>4/</u> | 1 | 01 | -35 | +35 | |
| | | | 2,3 | | -50 | +50 | |
| | | | 1 | 02 | -65 | +65 | |
| | | | 2,3 | | -80 | +80 | |
| Input offset voltage drift | $\Delta V_{OS}/\Delta T$ | <u>5/ 6/</u> | 2,3 | 01 | -15 | +15 | $\mu\text{V}/^{\circ}\text{C}$ |
| | | | | 02 | -25 | +25 | |

See footnotes at end of table.

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TABLE 1. Electrical performance characteristics - Continued.

| Test | Symbol | Conditions <u>1/</u> -55°C ≤ T _A ≤ +125°C unless otherwise specified | Group A subgroups | Device type | Limits <u>2/</u> | | Unit |
|--------------------------------|------------------|--|----------------------|----------------|------------------|-----|------|
| | | | | | Min | Max | |
| Common mode rejection ratio | CMRR | V _{CM} = -14.5 V and 13 V | 1 | 01 | 94 | | dB |
| | | | 2,3 | | 88 | | |
| | | | 1 | 02 | 90 | | |
| | | | 2,3 | | 84 | | |
| Input voltage range | IVR | <u>6/</u> | 1,2,3 | ALL | -14.5 | 13 | V |
| | | V ₊ = +5 V, V ₋ = 0 V <u>6/</u> | | | 0.5 | 3.0 | |
| Output saturation voltage | V _{OL} | V ₊ = +5 V, V _{IN} = 5 mV, I _{SINK} = 8 mA, GROUND pin = 0 V | 1,2,3 | ALL | | 0.4 | V |
| | | GROUND pin = 0 V, I _{SINK} = 50 mA | | | | 1.5 | |
| Output leakage current | I _{LKG} | V _{IN} = 5 mV, V _{OUT} = 35 V, GROUND pin = -15 V | 1 | ALL | | 10 | nA |
| | | | 2,3 | | | 500 | |
| Positive supply current | I ₊ | <u>7/</u> | 1 | ALL | | 4.0 | mA |
| | | | 2,3 | | | 9.0 | |
| Negative supply current | I ₋ | <u>7/</u> | 1 | ALL | -2.5 | | mA |
| | | | 2,3 | | -6.5 | | |
| Strobe current | I _{STR} | Minimum to ensure output transistor is turned off, T _A = +25°C <u>6/ 7/ 8/</u> | 1 | ALL | 500 | | μA |
| Large signal voltage gain | A _{VOL} | R _L = 1 kΩ to +15 V, -10 V ≤ V _{OUT} ≤ 14.5 V, T _A = +25°C | 4 | ALL | 200 | | V/mV |
| | | R _L = 500Ω to +5 V, 0.5 V ≤ V _{OUT} ≤ 4.5 V, T _A = +25°C | | | 50 | | |
| Response time | T _R | T _A = +25°C <u>6/ 9/</u> | 9 | ALL | | 250 | ns |

See footnotes at end of table.

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TABLE I. Electrical performance characteristics - Continued.

- 1/ Unless otherwise specified, $V_{\pm} = \pm 15 \text{ V}$, $V_{CM} = 0 \text{ V}$, and $R_S = 50\Omega$.
- 2/ The algebraic convention, whereby the most negative value is a minimum and the most positive is a maximum, is used in this table.
- 3/ Output is sinking 1.5 mA with $V_{OUT} = 0 \text{ V}$.
- 4/ These specifications apply for all supply voltages from a single +5 V to $\pm 15 \text{ V}$, the entire input voltage range, and for both high and low output states. The high state is $I_{SINK} \geq 100 \mu\text{A}$, $V_{OUT} \geq (V_+ - 1 \text{ V})$ and the low state is $I_{SINK} \leq 8 \text{ mA}$, $V_{OUT} \leq 0.8 \text{ V}$. Therefore, this specification defines a worst case error band that includes effects due to common mode signals, voltage gain, and output load.
- 5/ Drift is calculated by dividing the offset voltage difference measured at minimum and maximum temperatures by the temperature difference.
- 6/ Guaranteed by design, characterization, or correlation to other tested parameters.
- 7/ These specifications apply for all supply voltages from a single +5 V to $\pm 15 \text{ V}$.
- 8/ Do not short the strobe pin to ground. It should be current driven at 3 mA to 5 mA for the shortest strobe time. Currents as low as $500 \mu\text{A}$ will strobe the device if speed is not important. External leakage on the strobe pin in excess of $0.2 \mu\text{A}$ when the strobe is "off" can cause offset voltage shifts.
- 9/ Response time is measured with a 100 mV step and 5 mV overdrive. The output load is a 500Ω resistor tied to +5 V. Time measurement is taken when the output crosses 1.4 V.

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.

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 C 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.

4.3.1 Group A inspection.

- a. Tests shall be as specified in table II herein.
- b. Subgroups 5, 6, 7, 8, 10, and 11 in table I, method 5005 of MIL-STD-883 shall be omitted.

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| Device types | 01 and 02 |
| Case outlines | G and P |
| Terminal number | Terminal symbol |
| 1 | GROUND |
| 2 | INPUT+ |
| 3 | INPUT- |
| 4 | V- |
| 5 | BALANCE |
| 6 | BALANCE/STROBE |
| 7 | OUTPUT |
| 8 | V+ |

FIGURE 1. Terminal connections.

| | | | |
|---|-------------------|----------------|-------------------|
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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 C 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.

TABLE II. Electrical test requirements.

| MIL-STD-883 test requirements | Subgroups (per method 5005, table 1) |
|--|--|
| Interim electrical parameters (method 5004) | --- |
| Final electrical test parameters (method 5004) | 1*, 2, 3, 4 |
| Group A test requirements (method 5005) | 1, 2, 3, 4, 9 |
| Groups C and D end-point electrical parameters (method 5005) | 1 |

* PDA applies to subgroup 1.

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 sources of supply. Approved sources of supply are listed in MIL-BUL-103. The vendors listed in MIL-BUL-103 have agreed to this drawing and a certificate of compliance (see 3.6 herein) has been submitted to and accepted by DESC-ECS.

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