

| REVISIONS | | | |
|-----------|--|-----------------|----------------|
| LTR | DESCRIPTION | DATE (YR-MO-DA) | APPROVED |
| A | Changes in accordance with NOR 5962-R213-92. | 92-06-19 | M. A. Frye |
| B | Changes to table I. Editorial changes throughout. - drw | 98-11-04 | Raymond Monnin |
| C | Change to the input bias current test and input resistance test in table I. -rrp | 99-08-13 | Raymond Monnin |

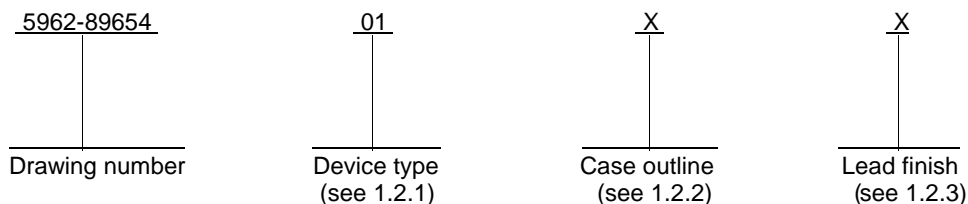
THE ORIGINAL FIRST PAGE OF THIS DRAWING HAS BEEN REPLACED.

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|--|-----------------------|-------------------|---|------------|---|---|---|---|---|---|----|---|--|--|--|--|--|--|--|--|
| REV | | | | | | | | | | | | | | | | | | | | |
| SHEET | | | | | | | | | | | | | | | | | | | | |
| REV | | | | | | | | | | | | | | | | | | | | |
| SHEET | | | | | | | | | | | | | | | | | | | | |
| REV STATUS | REV | C | C | C | C | C | C | C | C | C | C | C | | | | | | | | |
| OF SHEETS | SHEET | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | | | | | | | | | |
| PMIC N/A | PREPARED BY | Joseph A. Kerby | | | | | | | | | | | | | | | | | | |
| STANDARD MICROCIRCUIT DRAWING THIS DRAWING IS AVAILABLE FOR USE BY ALL DEPARTMENTS AND AGENCIES OF THE DEPARTMENT OF DEFENSE AMSC N/A | CHECKED BY | Charles E. Besore | | | | | | | | | | | | | | | | | | |
| | APPROVED BY | Michael A. Frye | | | | | | | | | | | | | | | | | | |
| | DRAWING APPROVAL DATE | 90-02-16 | | | | | | | | | | | | | | | | | | |
| | REVISION LEVEL | C | | | | | | | | | | | | | | | | | | |
| | SIZE | CAGE CODE | | | | | | | | | | | | | | | | | | |
| | A | 67268 | | 5962-89654 | | | | | | | | | | | | | | | | |
| | SHEET | 1 OF 10 | | | | | | | | | | | | | | | | | | |

1. SCOPE

1.1 Scope. This drawing describes device requirements for MIL-STD-883 compliant, non-JAN class level B microcircuits in accordance with MIL-PRF-38535, appendix A.

1.2 Part or Identifying Number (PIN). The complete PIN is as shown in the following example:



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

| <u>Device type</u> | <u>Generic number</u> | <u>Circuit function</u> |
|--------------------|-----------------------|-------------------------|
| 01 | AD9012S | 8 Bit A/D |
| 02 | AD9012T | 8 Bit A/D |

1.2.2 Case outline(s). The case outline(s) are as designated in MIL-STD-1835 and as follows:

| <u>Outline letter</u> | <u>Descriptive designator</u> | <u>Terminals</u> | <u>Package style</u> |
|-----------------------|-------------------------------|------------------|------------------------------|
| X | GDIP1-T28 or CDIP2-T28 | 28 | Dual-in-line |
| 3 | CQCC1-N28 | 28 | Square leadless chip carrier |

1.2.3 Lead finish. The lead finish is as specified in MIL-PRF-38535, appendix A.

1.3 Absolute maximum ratings.

| | |
|---|------------------------|
| Positive supply voltage (V_{S+})..... | +6 V dc |
| Negative supply voltage (V_{S-})..... | -6 V dc |
| Analog input voltage..... | -2.1 V dc to +0.5 V dc |
| Power dissipation (P_D) ($T_A = +25^\circ\text{C}$): | |
| Case outline X..... | 2.5 W |
| Case outline 3..... | 1.8 W |
| Storage temperature..... | -65°C to +150°C |
| Lead temperature (soldering, 10 seconds)..... | +300°C |
| Junction temperature (T_J)..... | +175°C |
| Thermal resistance, junction-to-case (θ_{JC})..... | See MIL-STD-1835 |
| Thermal resistance, junction-to-ambient (θ_{JA}): | |
| Case outline X..... | 60°C/W |
| Case outline 3..... | 80°C/W |
| ENCODE input voltage..... | 0 V to +5 V dc |
| OVERFLOW INH input voltage..... | 0 V to -5.2 V dc |
| Reference input voltage ($+V_{REF}$ $-V_{REF}$)..... | -3.5 to +0.1 V dc 1/ |
| Reference midpoint current..... | ±4 mA |
| Digital output current..... | 30 mA |
| Differential reference voltage..... | 2.1 V dc |

1/ $+V_{REF} \geq -V_{REF}$ under all circumstances.

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1.4 Recommended operating conditions.

Ambient operating temperature range (T_A)..... -55°C to +125°C
 Positive supply voltage (V_{S+})..... +5 V dc
 Negative supply voltage (V_{S-})..... -5.2 V dc

2. APPLICABLE DOCUMENTS

2.1 Government specification, standards, and handbooks. The following specification, standards, and handbooks form a part of this drawing to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the solicitation.

SPECIFICATION

DEPARTMENT OF DEFENSE

MIL-PRF-38535 - Integrated Circuits, Manufacturing, General Specification for.

STANDARDS

DEPARTMENT OF DEFENSE

MIL-STD-883 - Test Method Standard Microcircuits.
 MIL-STD-973 - Configuration Management.
 MIL-STD-1835 - Interface Standard For Microcircuit Case Outlines.

HANDBOOKS

DEPARTMENT OF DEFENSE

MIL-HDBK-103 - List of Standard Microcircuit Drawings.
 MIL-HDBK-780 - Standard Microcircuit Drawings.

(Unless otherwise indicated, copies of the specification, standards, and handbooks are available from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

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 takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

| | | | |
|---|------------------|----------------------------|-------------------|
| STANDARD MICROCIRCUIT DRAWING DEFENSE SUPPLY CENTER COLUMBUS COLUMBUS, OHIO 43216-5000 | SIZE A | | 5962-89654 |
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3. REQUIREMENTS

3.1 Item requirements. The individual item requirements shall be in accordance with MIL-PRF-38535, appendix A for non-JAN class level B devices and as specified herein. Product built to this drawing that is produced by a Qualified Manufacturer Listing (QML) certified and qualified manufacturer or a manufacturer who has been granted transitional certification to MIL-PRF-38535 may be processed as QML product in accordance with the manufacturers approved program plan and qualifying activity approval in accordance with MIL-PRF-38535. This QML flow as documented in the Quality Management (QM) plan may make modifications to the requirements herein. These modifications shall not affect form, fit, or function of the device. These modifications shall not affect the PIN as described herein. A "Q" or "QML" certification mark in accordance with MIL-PRF-38535 is required to identify when the QML flow option is used.

3.2 Design, construction, and physical dimensions. The design, construction, and physical dimensions shall be as specified in MIL-PRF-38535, appendix A and herein.

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

3.2.2 System timing diagram and load circuit. The system timing diagram and load circuit shall be as specified on figure 2.

3.2.3 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-PRF-38535, appendix A. 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-HDBK-103 (see 6.6 herein). For packages where marking of the entire SMD PIN number is not feasible due to space limitations, the manufacturer has the option of not marking the "5962-" on the device.

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-HDBK-103 (see 6.6 herein). The certificate of compliance submitted to DSCC-VA prior to listing as an approved source of supply shall affirm that the manufacturer's product meets the requirements of MIL-PRF-38535, appendix A and the requirements herein.

3.7 Certificate of conformance. A certificate of conformance as required in MIL-PRF-38535, appendix A shall be provided with each lot of microcircuits delivered to this drawing.

3.8 Notification of change. Notification of change to DSCC-VA shall be required in accordance with MIL-PRF-38535, appendix A.

3.9 Verification and review. DSCC, DSCC'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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TABLE I. Electrical performance characteristics.

| Test | Symbol | Conditions <u>1/</u> -55°C ≤ T _A ≤ +125°C unless otherwise specified | Group A subgroups | Device type | Limits | | Unit |
|---------------------------------------|------------------|---|----------------------|----------------|--------|------|------|
| | | | | | Min | Max | |
| Input bias current | I _B | Analog input = 0 V | 1, 2, 3 | All | | 200 | μA |
| Input resistance | R _{IN} | | 1 | All | 25 | | kΩ |
| Reference ladder resistance | R | | 1 | All | 40 | 110 | Ω |
| Overflow inhibit 0 V input current | I _{IN} | | 1, 2, 3 | All | | 250 | μA |
| High level output voltage | V _{OH} | <u>2/</u> | 1, 2, 3 | All | 2.4 | | V |
| Low level output voltage | V _{OL} | <u>2/</u> | 1, 2, 3 | All | | 0.4 | V |
| Positive supply current | +I _{CC} | V _{S+} = +5.0 V <u>3/</u> | 1 | All | | 45.0 | mA |
| | | | 2, 3 | | | 48.0 | |
| Negative supply current | -I _{CC} | V _{S-} = -5.2 V <u>3/</u> | 1 | All | | 179 | mA |
| | | | 2, 3 | | | 191 | |
| Conversion rate | F _S | | 4 | All | 75 | | MSPS |
| Encode pulse width (low) | t _{PWL} | <u>4/</u> | 4 | All | 2.5 | | ns |
| Encode pulse width (high) | t _{PWH} | <u>4/</u> | 4 | All | 2.5 | | ns |
| Signal-to-noise ratio | SNR | <u>5/</u> | 4 | All | 46 | | dB |
| Differential linearity | DNL | <u>6/</u> | 4 | 01 | | 0.75 | LSB |
| | | | | 02 | | 0.5 | |
| | | | 5, 6 | 01 | | 1.0 | |
| | | | | 02 | | 0.75 | |
| Integral linearity | INL | <u>6/</u> | 4 | 01 | | 1.0 | LSB |
| | | | | 02 | | 0.5 | |
| | | | 5, 6 | All | | 1.2 | |
| Top of reference ladder | | | 1 | All | | 15 | mV |
| | | | 2, 3 | | | 18 | |
| Bottom of reference ladder | | <u>6/</u> | 4 | All | | 10 | mV |
| | | | 5, 6 | | | 13 | |
| High level input voltage | V _{IH} | <u>6/</u> | 4, 5, 6 | All | 2.0 | | V |
| Low level input voltage | V _{IL} | <u>6/</u> | 4, 5, 6 | All | | 0.8 | V |

See footnotes at end of table.

| | | | |
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TABLE I. 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 | | Unit |
|------------------------------|-----------------|---|----------------------|----------------|--------|------|------|
| | | | | | Min | Max | |
| High level input current | I _{IH} | <u>6/</u> | 4, 5, 6 | All | | 250 | μA |
| Low level input current | I _{IL} | <u>6/</u> | 4, 5, 6 | All | | 400 | μA |
| Power supply rejection ratio | PSRR | <u>3/</u> , <u>7/</u> | 4 | All | | 2.5 | mV/V |
| Input capacitance | C _{IN} | <u>8/</u> | 4 | All | | 18 | pF |
| Output delay | t _{PD} | <u>2/</u> , <u>9/</u> | 9 | All | 4.0 | 11.0 | ns |
| Output rise time | t _r | <u>2/</u> | 9 | All | | 8.0 | ns |
| Output fall time | t _f | <u>2/</u> | 9 | All | | 4.3 | ns |
| In-band harmonics | | Analog input signal = 1.23 MHz <u>10/</u> | 4 | All | 48 | | dB |

1/ V_{S+} = 5.0 V, V_{S-} = -5.2 V, differential reference voltage = 2.0 V.

2/ Outputs terminated with two equivalent LS00 type loads.

3/ Supplies should remain stable within ±5 % for normal operation.

4/ ENCODE signal rise/fall times should be less than 30 ns for normal operation.

5/ RMS signal to RMS noise, including harmonics with 1.23 MHz analog input signal.

6/ Subgroups 5 and 6 if not tested shall be guaranteed to the limits specified.

7/ Measured at -5.2 V ±5 % and +5.0 V ±5 %.

8/ Subgroup 4 (C_{IN} measurement) shall be measured only for the initial test and after process or design changes which may affect input capacitance.

9/ Measured from ENCODE into data out for LSB only.

10/ Measured at 75 MSPS encode rate. Harmonic data based on worst case harmonics.

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| | |
|-----------------|------------------|
| Device types | 01 and 02 |
| Case outlines | X and 3 |
| Terminal number | Terminal symbol |
| 1 | DIGITAL V_{S+} |
| 2 | OVERFLOW INH |
| 3 | HYSTERESIS |
| 4 | $+V_{REF}$ |
| 5 | ANALOG INPUT |
| 6 | ANALOG GROUND |
| 7 | ENCODE |
| 8 | DIGITAL V_{S+} |
| 9 | ANALOG GROUND |
| 10 | ANALOG INPUT |
| 11 | $-V_{REF}$ |
| 12 | REF mid |
| 13 | DIGITAL V_{S+} |
| 14 | DIGITAL V_{S-} |
| 15 | D1 (LSB) |
| 16 | D2 |
| 17 | D3 |
| 18 | D4 |
| 19 | D5 |
| 20 | DIGITAL GROUND |
| 21 | ANALOG V_{S-} |
| 22 | ANALOG V_{S-} |
| 23 | DIGITAL GROUND |
| 24 | D6 |
| 25 | D7 |
| 26 | D8 (MSB) |
| 27 | OVERFLOW |
| 28 | DIGITAL V_{S-} |

FIGURE 1. Terminal connections.

| | | | |
|---|------------------|----------------------------|-------------------|
| STANDARD MICROCIRCUIT DRAWING DEFENSE SUPPLY CENTER COLUMBUS COLUMBUS, OHIO 43216-5000 | SIZE A | | 5962-89654 |
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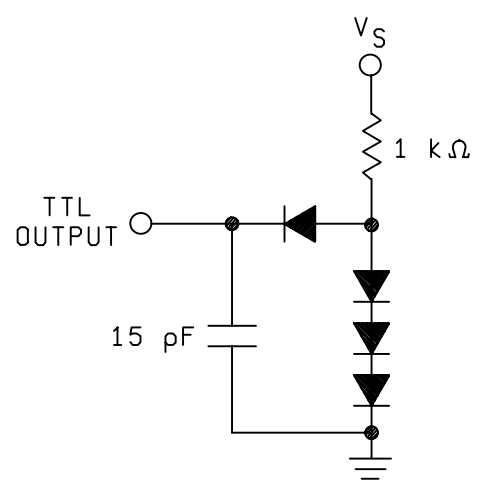
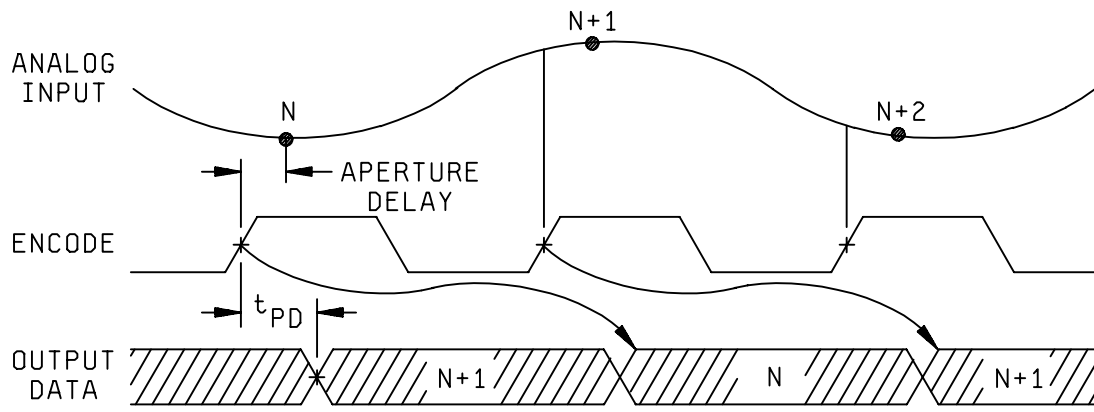


FIGURE 2. System timing diagram and load circuit.

| | | | |
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4. QUALITY ASSURANCE PROVISIONS

4.1 Sampling and inspection. Sampling and inspection procedures shall be in accordance with MIL-PRF-38535, appendix A.

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, or C. The test circuit shall be maintained by the manufacturer under document revision level control and shall be made available to the preparing or acquiring activity upon request. The test circuit shall specify the inputs, outputs, biases, and power dissipation, as applicable, in accordance with the intent specified in test method 1015 of MIL-STD-883.

(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.

TABLE II. Electrical test requirements.

| MIL-STD-883 test requirements | Subgroups (in accordance with MIL-STD-883, method 5005, table I) |
|--|---|
| Interim electrical parameters (method 5004) | 1 |
| Final electrical test parameters (method 5004) | 1*, 2, 3, 4 |
| Group A test requirements (method 5005) | 1, 2, 3, 4, 5**, 6**, 9 |
| Groups C and D end-point electrical parameters (method 5005) | 1 |

* PDA applies to subgroup 1.

** Subgroups 5 and 6 if not tested shall be guaranteed to the limits specified in table I.

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 7, 8, 10 and 11 in table I, method 5005 of MIL-STD-883 shall be omitted.

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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 A, B, or C. The test circuit shall be maintained by the manufacturer under document revision level control and shall be made available to the preparing or acquiring activity upon request. The test circuit shall specify the inputs, outputs, biases, and power dissipation, as applicable, in accordance with the intent specified in test method 1005 of MIL-STD-883.
 - (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-PRF-38535, appendix A.

6. NOTES

6.1 Intended use. Microcircuits conforming to this drawing are intended for use for Government microcircuit applications (original equipment), design applications, and logistics purposes.

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-973 using DD Form 1692, Engineering Change Proposal.

6.4 Record of users. Military and industrial users shall inform Defense Supply Center Columbus when a system application requires configuration control and the applicable SMD. DSCC 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 DSCC-VA, telephone (614) 692-0525.

6.5 Comments. Comments on this drawing should be directed to DSCC-VA, Columbus, Ohio 43216-5000, or telephone (614) 692-0674.

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

| | | | |
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STANDARD MICROCIRCUIT DRAWING BULLETIN

DATE: 99-08-13

Approved sources of supply for SMD 5962-89654 are listed below for immediate acquisition information only and shall be added to MIL-HDBK-103 and QML-38535 during the next revision. MIL-HDBK-103 and QML-38535 will be revised to include the addition or deletion of sources. The vendors listed below have agreed to this drawing and a certificate of compliance has been submitted to and accepted by DSCC-VA. This bulletin is superseded by the next dated revision of MIL-HDBK-103 and QML-38535.

| Standard microcircuit drawing PIN <u>1/</u> | Vendor CAGE number | Vendor similar PIN <u>2/</u> |
|---|--------------------|------------------------------|
| 5962-89654013A | 24355 | AD9012SE/883B |
| 5962-8965401XA | 24355 | AD9012SQ/883B |
| 5962-89654023A | 24355 | AD9012TE/883B |
| 5962-8965402XA | 24355 | AD9012TQ/883B |

1/ The lead finish shown for each PIN representing a hermetic package is the most readily available from the manufacturer listed for that part. If the desired lead finish is not listed contact the vendor to determine its availability.

2/ 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

24355

Vendor name and address

Analog Devices
 RT 1 Industrial Park
 P.O. Box 9106
 Norwood, MA 02062
 Point of contact: 7910 Triad Center Drive
 Greensboro, NC 27409-9605

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