

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:



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

| <u>Device type</u> | <u>Generic number</u> | <u>Circuit function</u> |
|--------------------|-----------------------|-------------------------|
| 01 | AD7541AS | 12 bit multiplying DAC |
| 02 | AD7541AT | 12 bit multiplying DAC |
| 03 | PM7541AB | 12 bit multiplying DAC |
| 04 | PM7541AA | 12 bit multiplying DAC |

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

| <u>Outline letter</u> | <u>Case outline</u> |
|-----------------------|---|
| V | D-6 (18-lead, .960" 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.

| | |
|--|-----------------------------|
| Supply voltage (V_{DD}) | +17 V dc |
| Reference input voltage (V_{REF}) | ±25 V dc |
| V_{RFB} to GND | ±25 V dc |
| Digital input voltage (V_{IN}): | |
| devices 01, 02 | -0.3 V dc to V_{DD} |
| devices 03, 04 | GND, V_{DD} |
| Voltage at OUT1, OUT2 pins | -0.3 V dc to V_{DD} |
| Power dissipation | 450 mW 1/ |
| Storage temperature range | -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-M-38510, appendix C |
| Thermal resistance, junction-to-ambient (θ_{JA}): | |
| cases V and 2 | 120 °C/W |

1.4 Recommended operating conditions.

| | |
|---|----------------------|
| Positive supply voltage (V_{DD}) | +15 V dc |
| Ambient operating temperature range (T_A) | -55°C to +125°C |
| Reference input voltage range | -10 V dc to +10 V dc |

1/ Derate 6 mW/°C above $T_A = +75^\circ\text{C}$

| | | |
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| STANDARDIZED MILITARY DRAWING DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444 | SIZE A | 5962-89481 |
| | REVISION LEVEL | SHEET 2 |

DESC FORM 193A
SEP 87

U S GOVERNMENT PRINTING OFFICE 1968-550-547

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).

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.

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|---|------------------|----------------|----------|
| STANDARDIZED MILITARY DRAWING DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444 | SIZE A | 5962-89481 | |
| | | REVISION LEVEL | SHEET 3. |

DESC FORM 193A
SEP 87

U S GOVERNMENT PRINTING OFFICE 1988-550-547

TABLE I. Electrical performance characteristics.

| Test | Symbol | Conditions ^{1/} -55°C ≤ T _A ≤ +125°C unless otherwise specified | Device type | Group A subgroups | Limits | | Unit |
|--|------------------|---|-------------|-------------------|--------|-------|-------|
| | | | | | Min | Max | |
| Relative accuracy | RA | | 01 | 1,2,3 | | ±1 | LSB |
| | | | 02 | 1 | | ±1 | |
| | | | | 2,3,12 | | ±0.5 | |
| | | | 03, 04 | 1,2,3 | | ±0.5 | |
| Differential nonlinearity | DNL | | 01, 03 | 1,2,3 | | ±1 | LSB |
| | | | 02 | 1 | | ±1 | |
| | | | | 2,3,12 | | ±0.5 | |
| | | | 04 | 1,2,3 | | ±0.5 | |
| Gain error ^{2/} | AE | | 01 | 1 | | ±6 | LSB |
| | | | | 2,3 | | ±8 | |
| | | | 02 | 1 | | ±6 | |
| | | | | 2,3 | | ±5 | |
| | | | | 12 | | ±3 | |
| | | | 03 | 1 | | ±2 | |
| | | | | 2,3 | | ±3 | |
| | | | 04 | 1 | | ±1 | |
| 2,3 | | ±2 | | | | | |
| Power supply rejection ratio ^{3/} | PSRR | delta V _{DD} = +5% or -5% | 01,02 | 1 | | ±.01 | %per% |
| | | | | 2,3 | | ±.02 | |
| | | | 03,04 | 1 | | ±.001 | |
| | | | | 2,3 | | ±.002 | |
| Output leakage current ^{4/} | I _{OUT} | I _{OUT1} and I _{OUT2} pins Digital input = 0 V, V _{DD} | 01,02 | 1 | | ±5 | nA |
| | | | | 2,3 | | ±200 | |
| | | | 03,04 | 1 | | ±5 | |
| | | | | 2,3 | | ±100 | |

See footnotes at end of table.

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| STANDARDIZED MILITARY DRAWING DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444 | SIZE A | 5962-89481 |
| | REVISION LEVEL | SHEET 4 |

DESC FORM 193A
SEP 87

U.S. GOVERNMENT PRINTING OFFICE: 1968-550-547

TABLE I. Electrical performance characteristics - Continued.

| Test | Symbol | Conditions ^{1/} -55°C ≤ T _A ≤ +125°C unless otherwise specified | Device type | Group A subgroups | Limits | | Unit | |
|--|--|---|----------------|----------------------|--|--|------|--|
| | | | | | Min | Max | | |
| Reference input resistance | R _{IN} | | | 1,2,3 | 7 | 18 | kΩ | |
| | | | | | 03,04 | 7 | | 15 |
| Digital input high voltage | V _{IH} | | All | 1,2,3 | 2.4 | | V | |
| Digital input low voltage | V _{IL} | | All | 1,2,3 | | 0.8 | V | |
| Digital input leakage current | I _{IN} | V _{IN} = 0 V or V _{DD} | All | 1,2,3 | | ±1 | μA | |
| Supply current | I _{DD} | Digital inputs = V _{IH} or V _{IL} | All | 1,2,3 | | 2 | mA | |
| | | | | | 1 | 100 | | μA |
| | | | | | | 2,3 | | |
| Digital input capacitance | C _{IN} | See 4.3.1c, T _A = +25°C | All | 4 | | 8 | pF | |
| Output capacitance I _{OUT1} pin I _{OUT2} pin | C _{OUT1} C _{OUT2} | Digital inputs = V _{IH} See 4.3.1c | All | 4 | | 200 70 | pF | |
| | | | | | I _{OUT1} pin I _{OUT2} pin | C _{OUT1} C _{OUT2} | | Digital inputs = V _{IL} See 4.3.1c |

1/ V_{DD} = +15 V, V_{OUT1} = V_{OUT2} = 0 V, V_{REF} = 10 V unless otherwise specified.

2/ Measured using internal feedback resistor.

3/ Delta V_{DD} = ±5%.

4/ DAC loaded with 0000 0000 0000 for I_{OUT1} and digital inputs = V_{IL}. Digital inputs = V_{IH} for I_{OUT2}.

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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|---|------------------|------------|
| STANDARDIZED MILITARY DRAWING DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444 | SIZE A | 5962-89481 |
| | REVISION LEVEL | SHEET 5 |

DESC FORM 193A
SEP 87

U S GOVERNMENT PRINTING OFFICE 1988-550-547

| | | |
|-----------------|--------------------|-------------------|
| Device types | 01, 02, 03, and 04 | |
| Case outlines | V | 2 |
| Terminal number | Terminal symbol | |
| 1 | I _{OUT1} | NC |
| 2 | I _{OUT2} | I _{OUT1} |
| 3 | GND | I _{OUT2} |
| 4 | BIT 1 (MSB) | GND |
| 5 | BIT 2 | BIT 1 (MSB) |
| 6 | BIT 3 | BIT 2 |
| 7 | BIT 4 | BIT 3 |
| 8 | BIT 5 | BIT 4 |
| 9 | BIT 6 | BIT 5 |
| 10 | BIT 7 | BIT 6 |
| 11 | BIT 8 | NC |
| 12 | BIT 9 | BIT 7 |
| 13 | BIT 10 | BIT 8 |
| 14 | BIT 11 | BIT 9 |
| 15 | BIT 12 (LSB) | BIT 10 |
| 16 | V _{DD} | BIT 11 |
| 17 | V _{REF} | BIT 12 (LSB) |
| 18 | R _{FB-} | V _{DD} |
| 19 | --- | V _{REF} |
| 20 | --- | R _{FB} |

NC = No connection

FIGURE 1. Terminal connections.

| | | |
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| STANDARDIZED MILITARY DRAWING DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444 | SIZE A | 5962-89481 |
| | REVISION LEVEL | SHEET 6 |

DESC FORM 193A
SEP 87

U S GOVERNMENT PRINTING OFFICE 1988-550-547

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 B 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.
- c. Subgroup 12 test is used for grading in part selection at $T_A = +25^\circ\text{C}$ and is not included in PDA calculations.

TABLE II. Electrical test requirements.

| MIL-STD-883 test requirements | Subgroups (per method 5005, table I) |
|--|--------------------------------------|
| Interim electrical parameters (method 5004) | --- |
| Final electrical test parameters (method 5004) | 1,* 2, 3, 12 |
| Group A test requirements (method 5005) | 1, 2, 3, 4, 12 |
| Groups C and D end-point electrical parameters (method 5005) | 1 |

*PDA applies to subgroup 1.

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, 9, 10, and 11 in table I, method 5005 of MIL-STD-883 shall be omitted.
- c. Subgroup 4 (C_{IN} and C_{OUT} measurements) shall be measured only for the initial test and after process or design changes which may affect capacitance. Sample size is 15 devices, all input and output terminals tested, and no failures.
- d. Subgroup 12 test is used for grading in part selection at $T_A = +25^\circ\text{C}$.

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|---|------------------|------------|
| STANDARDIZED MILITARY DRAWING DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444 | SIZE A | 5962-89481 |
| | REVISION LEVEL | SHEET 7 |

DESC FORM 193A
SEP 87

U S GOVERNMENT PRINTING OFFICE 1988-550-547

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 B 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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|---|------------------|----------------|------------|
| STANDARDIZED MILITARY DRAWING DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444 | SIZE A | | 5962-89481 |
| | | REVISION LEVEL | SHEET 8 |

DESC FORM 193A
SEP 87

U S GOVERNMENT PRINTING OFFICE 1988-550-547

6.6 Approved sources of supply. Approved sources of supply are listed in MIL-BUL-103. Additional sources will be added to MIL-BUL-103 as they become available. 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. The approved sources of supply listed below are for information purposes only and are current only to the date of the last action of this document.

| Military drawing part number | Vendor CAGE number | Vendor similar part number 1/ |
|------------------------------|--------------------|-------------------------------|
| 5962-8948101VX | 1ES66 | AD7541ASQ/883B |
| | 24355 | AD7541ASQ/883B |
| 5962-89481012X | 1ES66 | AD7541ASE/883B |
| | 24355 | AD7541ASE/883B |
| 5962-8948102VX | 1ES66 | AD7541ATQ/883B |
| | 24355 | AD7541ATQ/883B |
| 5962-89481022X | 1ES66 | AD7541ATE/883B |
| | 24355 | AD7541ATE/883B |
| 5962-8948103VX | 06665 | PM7541ABX/883 |
| 5962-89481032X | 06665 | PM7541ABRC/883 |
| 5962-8948104VX | 06665 | PM7541AAX/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.

| <u>Vendor CAGE number</u> | <u>Vendor name and address</u> |
|---------------------------|---|
| 06665 | Precision Monolithic, Incorporated 1500 Space Park Drive P.O. Box 58020 Santa Clara, CA 95050-8020 |
| 1ES66 | Maxim Integrated Products 120 San Gabriel Drive Sunnyvale, CA 94086 |
| 24355 | Analog Devices Route 1 Industrial Park P.O. Box 9106 Norwood, MA 02062 Point of contact: 181 Ballardvale Street Wilmington, MA 01887 |

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|---|------------------|----------------|
| STANDARDIZED MILITARY DRAWING DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444 | SIZE A | 5962-89481 |
| | | REVISION LEVEL |

DESC FORM 193A
SEP 87

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