| REVISIONS | | | | |
|---|---|---|---|---|
| SYMBOL | PREP BY | DESCRIPTION | DATE | APPROVAL |

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|---|---|---|
| PREPARED BY L.M. Rosenberg L.M. Rosenberg UNISYS | 10/1/90 | TITLE |
| APPROVED G.F. Kiernan UNISYS | 10/1/90 | Screening Procedure for Microcircuit AD7541ATQ CMOS 12 - Bit Monolithic Multiplying Digital to Analog Converter |
| APPROVED T. Mecum GSFC | 7-15-91 | (For XTE use only) |
| APPROVED D. Cleveland GSFC | 7/16/91 | |
| | | |
| | | # S-311-669 |

NASA

National Aeronautics and Space Administration

GSFC

**Goddard Space Flight Center**
Greenbelt, Maryland
20771

I. Screening Requirements - all devices shall be subjected to the screening tests per sequence listed in table I of this specification. DC parameter measurements shall be made on all inputs and outputs.

II. Special Instructions

a. A sample from each lot, not to exceed three devices, shall be submitted to trial initial electrical tests, burn-in, and 25°C final electrical tests before the entire lot is committed to the screening sequence. The burn-in for this trial period shall be limited to 24 +/- 1 hours. If any failures occur during this trial period, the test configuration shall be thoroughly checked before proceeding, and the GSFC Parts Branch shall be notified (see contact point, below).

b. These devices are considered susceptible to Electro-Static Discharge damage (ESD). The testing laboratory must use proper precautions through all phases of testing, handling, and packaging to avoid ESD damage.(Room ambient humidity shall be between 35% and 50% RH.)

c. Burn-in temperature shall be 125° +3/-0°C.

d. The burn-in shall be performed using the test circuit and stress levels shown in figures 2 and 3.

e. Bias shall not be removed from the device after burn-in test until device case temperatures are less than 30°C.

f. Electrical tests shall be performed within 96 hours of reduction of burn-in temperature.

g. Deltas shall be computed for those parameters having Delta limits, if required, in Table II. Deltas shall be computed using the electrical measurements taken immediately prior to the prescribed burn-in as the reference.

h. Devices indicating failure during electrical tests shall be removed from the test socket, reinserted, and retested. If device passes the retest, it shall be considered a passing unit.

i. Devices identified as failures and removed from test shall be stored, handled, and packaged for shipment using the same procedures used for passing units to avoid further damage. Failed units shall be clearly identified and segregated from passing units.

j. The temperature sequence for electrical measurements shall be at +25°C, -55°C and +125°C.

k. Read and record all electrical parameters per Table II.

l. Deliverable data shall be comprised of all "read and record" measurements and a summary of the attribute data.

m. Point of contact - In case the devices exceed prescribed burn-in percent defective allowed (PDA), or for cumulative failures over 5% of the lot size during other phases of the screening sequence, immediately notify:

The Goddard Space Flight Center
Parts Branch, Code 311
Greenbelt, MD 20771
Telephone: (301) 286-6382

TABLE I. Screening and Qualification Requirements for Microcircuits

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| Screen | Per MIL-STD-883C Method 5004 for class B devices | Requirement (Qty.) |
|---|---|---|
| Visual Inspection Serialization 1/ | Method 2009 (3x to 10x) | 100% |
| Temperature Cycling | Method 1010. Test Condition C, $T_{Max}$ = 150°C 2/ | 100% |
| Constant Acceleration | Method 2001, Test Condition E, $Y_1$ Orientation | 100% |
| Particle Impact Noise Detection (PIND) | Method 2020, Condition B | 100% |
| Seal Leak | Fine and Gross Leak, Method 1014, Fine Leak: Condition A or B Gross Leak: Condition C | 100% |
| Initial Electrical Parameters | Per Table II @ 25°C (Read and record) | 100% |
| Static Burn-in | 48 Hrs each per attached schematic (see Figure 2) | 100% |
| Post Static Burn-in 3/ Electrical Parameters | Per Table II @ 25°C (Read, record and compute deltas per Table II) | 100% |
| Dynamic Burn-in | Method 1015, 168 Hrs @ $T_A$ = 125°C All inputs/outputs to be exercised (see Figure 3) | 100% |
| Post Dynamic Burn-in/ Final Electrical Parameters 3/ | To be performed in the following sequence: Per Table II @ 25°C (Read, record and compute deltas per Table II) Per Table II @ -55°C and 125°C (Read and record critical parameters per Table II test conditions) | 100% |
| Final Visual | Method 2009 (3x to 10x) | 100% |

Notes: See page 5.

TABLE I. Screening and Qualification Requirements for Microcircuits (cont.)

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| Screen | Per MIL-STD-883C Method 5004 for class B devices | Requirement (Qty.) |
|---|---|---|
| Life Test | Method 1015, 1000 Hrs @ $T_A$ = 125°C<br>All inputs/outputs to be exercised<br>(see Figure 3) | 22 units |
| Post Life Test/ Electrical Parameters | To be performed in the following sequence:<br>Per Table II @ 25°C (Read, record and compute deltas per Table II)<br>Per Table II @ -55°C and 125°C<br>(Read and record critical parameters per Table II test conditions) | 22 units |
| Destructive Physical Analysis | Per S-311-70 | 4/ |

Notes:

1/ Serialization may be performed at any step prior to initial electricals.

2/ If the leads are not gold plated, the $T_{Max}$ shall be reduced to 125°C.

3/ The total PDA for all burn-in tests shall not exceed 5%.

4/ Sample size as follows:

| Date Code Lot | Sample Size |
|---|---|
| <5 | 1 |
| 5-15 | 2 |
| 6-50 | 3 |
| >50 | 5 |

Table II. Electrical Requirements 1/

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| Parameter | Symbol | Conditions | Limits at temperature 25°C Min. | 25°C Max. | -55°C Min. | -55°C Max. | 125°C Min. | 125°C Max. | Units |
|---|---|---|---|---|---|---|---|---|---|
| Resolution | | | 12 | | 12 | | 12 | | Bits |
| Relative Accuracy | | | | ± 1/2 | | ± 1/2 | | ± 1/2 | LSB 2/ |
| Differential Nonlinearity | | to 12 bits, $T_{MIN}$ to $T_{MAX}$ | | ± 1/2 | | ± 1/2 | | ± 1/2 | LSB |
| Gain Error | | Measure using internal RFB 3/ | | ± 3 | | ± 5 | | ± 5 | LSB |
| Output Leakage Current | OUT1 | $V_{IN}$ Digital = 0.0V | -5.0 | 5.0 | -200.0 | 200.0 | -200.0 | 200.0 | nA |
| | OUT2 | $V_{IN}$ Digital = 15.0V | -5.0 | 5.0 | -200.0 | 200.0 | -200.0 | 200.0 | nA |
| Input Resistance (Reference Input) | | Pin 17 to GND | 7.0 | 18.0 | 7.0 | 18.0 | 7.0 | 18.0 | Kohms |
| Input High Voltage | $V_{IH}$ | | 2.4 | | 2.4 | | 2.4 | | V |
| Input Low Voltage | $V_{IL}$ | | | 0.8 | | 0.8 | | 0.8 | V |
| Input High Current | $I_{IH}$ | $V_{IN}$ = 15.0V | -1.0 | 1.0 | -1.0 | -1.0 | -1.0 | -1.0 | uA |
| Input Low Current | $I_{IL}$ | $V_{IN}$ = 0.0V | -1.0 | 1.0 | -1.0 | 1.0 | -1.0 | 1.0 | uA |
| Power Supply Rejection | | $V_{DD}$ = +/-5% | -0.01 | 0.01 | -0.02 | 0.02 | -0.02 | 0.02 | %per% |
| Supply current | $I_{DD1}$ | $V_{IL}$ = 0.8V | | 2.0 | | 2.0 | | 2.0 | mA |
| | $I_{DD2}$ | $V_{IN}$ = 2.4V | | 2.0 | | 2.0 | | 2.0 | mA |
| | $I_{DD3}$ | $V_{IL}$ = 0.0V | | 100.0 | | 500.0 | | 500.0 | uA |
| | $I_{DD4}$ | $V_{IL}$ = 15.0V | | 100.0 | | 500.0 | | 500.0 | uA |

Notes:

1/ $V_{DD}$ = 15.0V, $V_{REF}$ = +10V; $V_{PIN1}$ = $V_{PIN2}$ = 0V unless otherwise specified

2/ ± 1/2LSB = ± 0.012% of Full Scale

3/ Includes the effect of leakage current and gain T.C.
Gain error can be trimmed to zero.
Gain Temperature Coefficient = 5ppm/°C

TABLE III. Absolute Maximum Ratings 1/,2/

| | |
|---|---|
| $V_{DD}$ (pin 16) to GND | +17V |
| $V_{DD}$ (pin 17) to GND | ±25V |
| $V_{DD}$ (pin 18) to GND | ±25V |
| Digital Input Voltage to GND (pins 4-15) | -0.3V, $V_{DD}$ |
| $V_{PIN1}$, $V_{PIN2}$ to GND | -0.3V, $V_{DD}$ |
| Power Dissipation | |
| To +75°C | 450mW |
| Derates above +75°C | 6mW/°C |
| Operating Temperature Range ($T_A$) | -55 to +125°C |
| Storage Temperature Range | -65 to +150°C |

Notes:

1/ $T_A$ = +25°C unless otherwise noted.

2/ Stresses above those listed may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other condition above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

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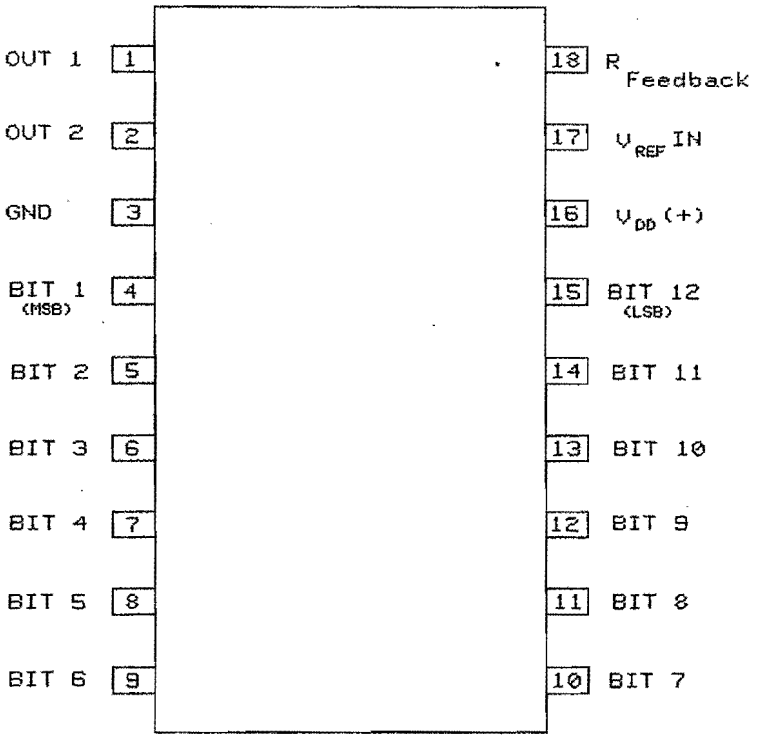


Figure 1. Terminal Diagram

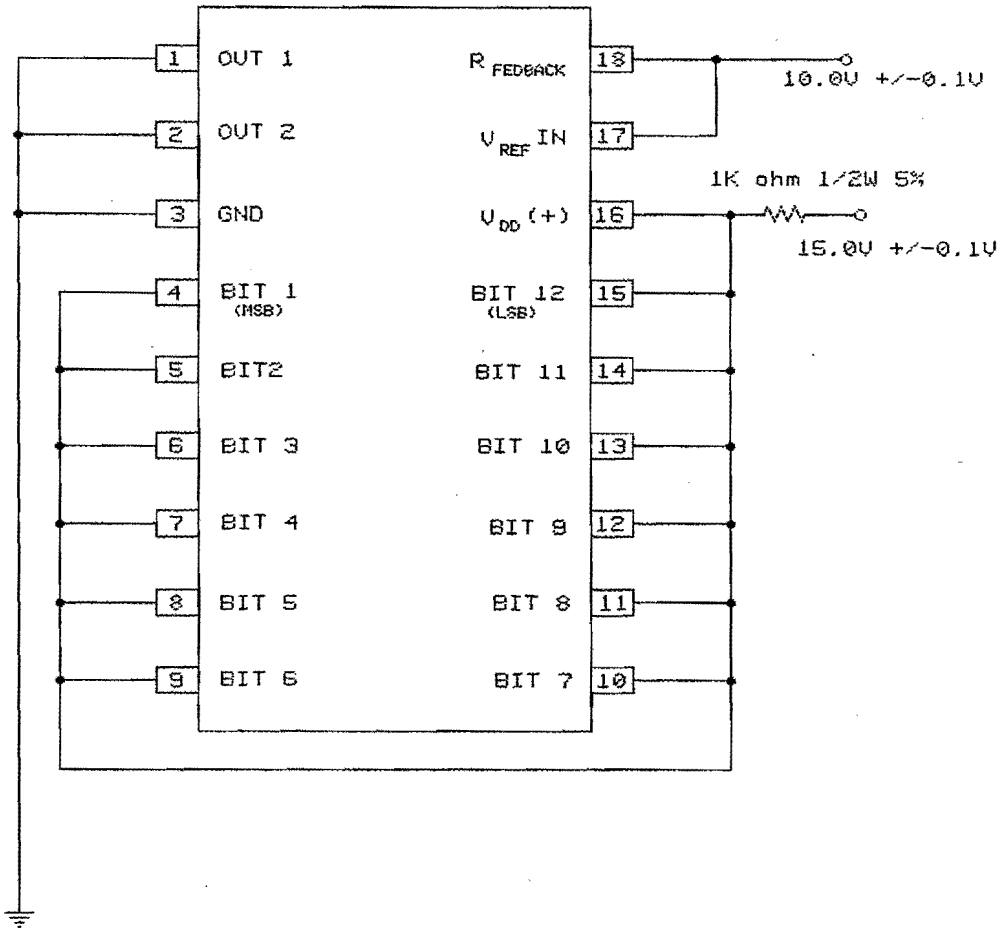


Figure 2. Static Burn-in

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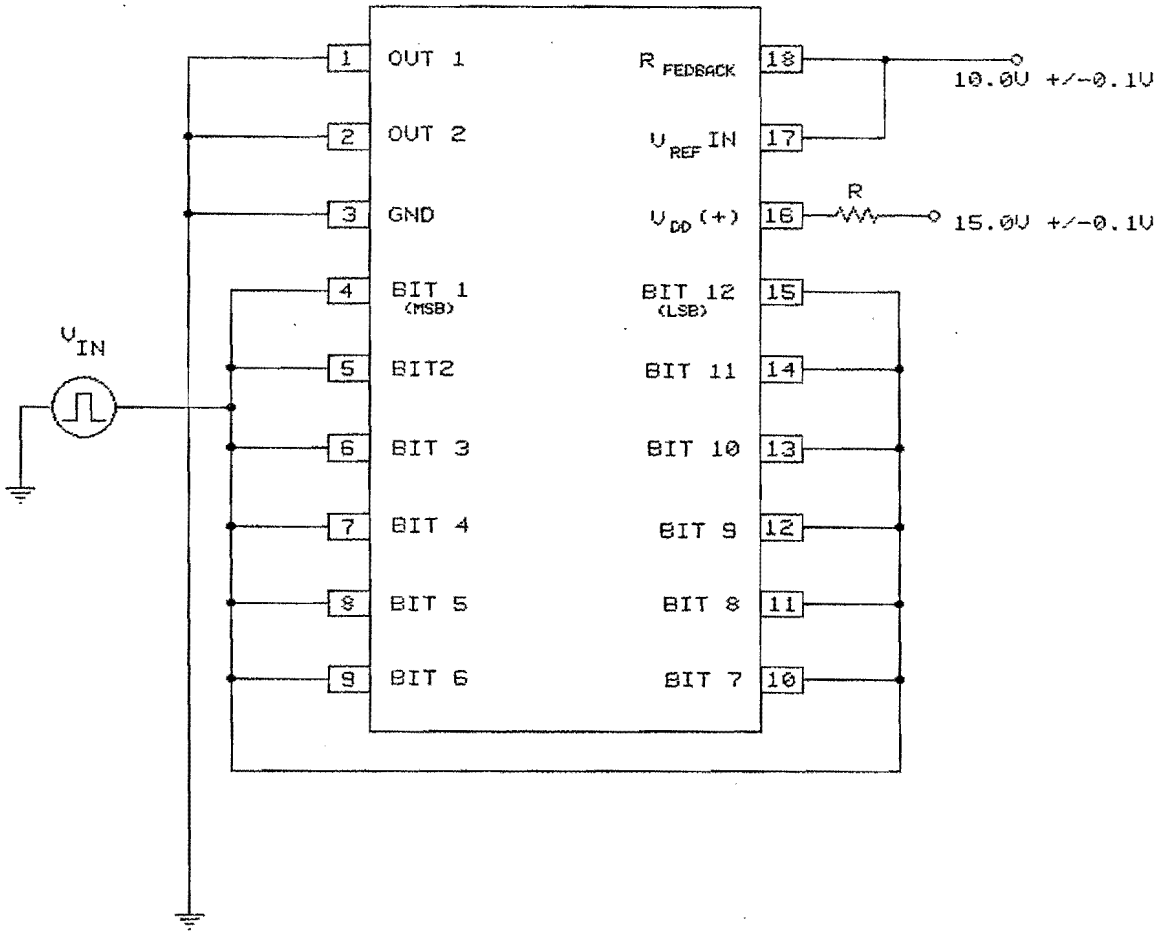


Notes:

1. R = 1K ohm 1/2W 5%
2. VIN = 0 to 3.0V square wave, @ $5 \leq f \leq 10$Hz

Figure 3. Dynamic Burn-in / Life Test

# Power Disscipation Calculation

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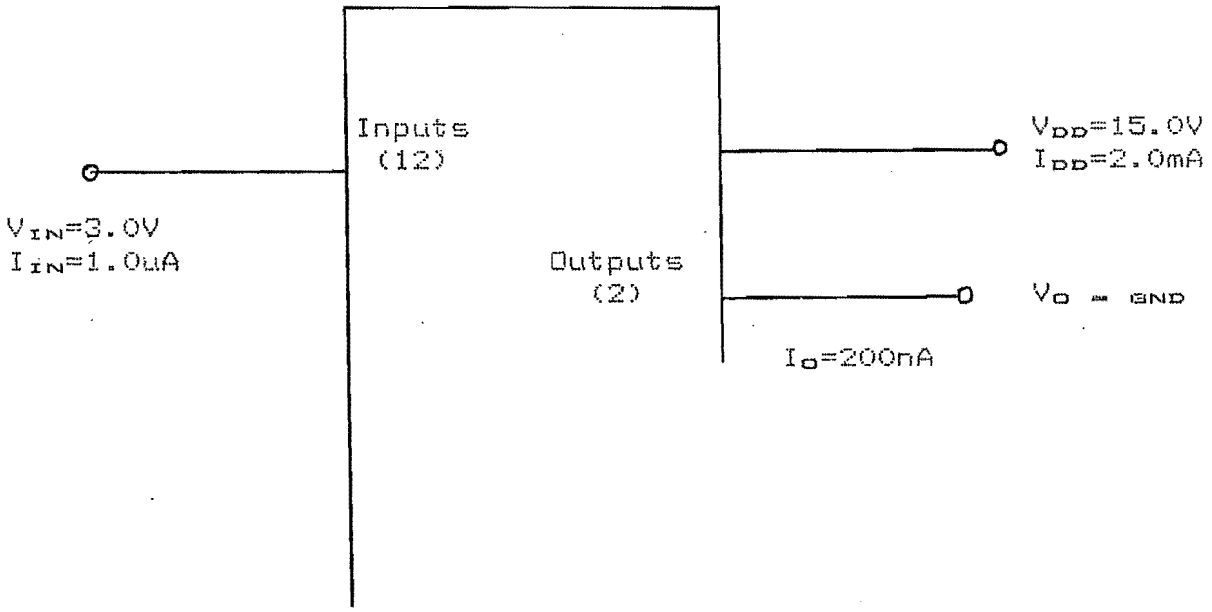
$P_D$ for $T_A$ to = +75°C is 450mW
Derate above +75°C Linearly at 6mW/°C
$P_{D(MAX)}$ = 150mW @ 125°C




$P_T = P_{IN} + P_{VDD} + P_{OUT}$

$= (1uA*3.0*12)+(2.0mA*15.0V)+(200nA*2*0)$

$= 30.0mW$