

1.0 SCOPE

This specification documents the detail requirements for space qualified die manufactured on Analog Devices, Inc.'s QML certified line per MIL-PRF-38534 class K except as modified herein.

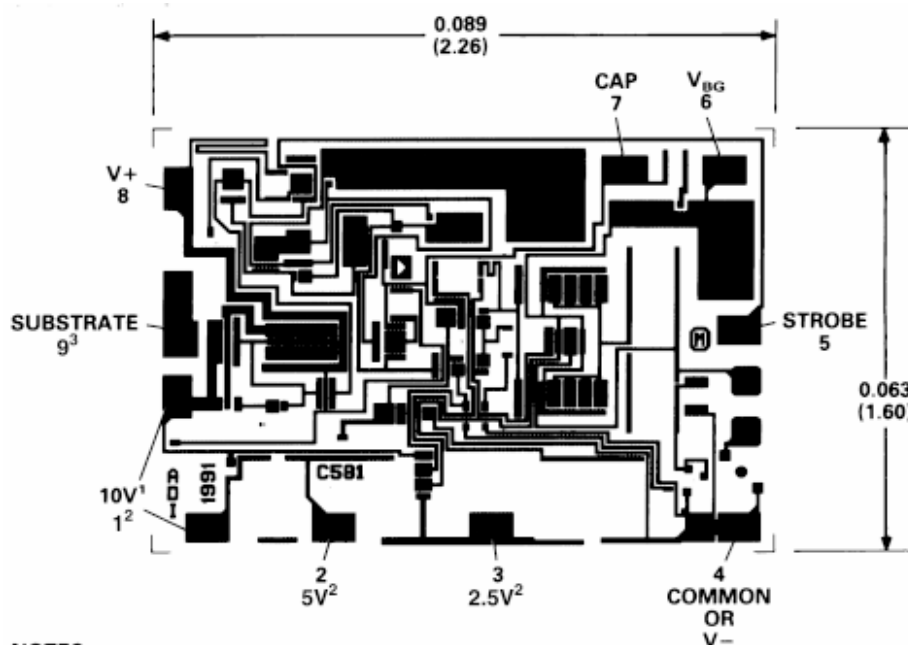
The manufacturing flow described in the STANDARD DIE PRODUCTS PROGRAM brochure at <http://www.analog.com/aerospace> is to be considered a part of this specification.

This data sheet specifically details the space grade version of this product. A more detailed operational description and a complete data sheet for commercial product grades can be found at www.analog.com/AD584

2.0 Part Number. The complete part number(s) of this specification follow:

| <u>Part Number</u> | <u>Description</u> |
|--------------------|---|
| AD584-000C | Pin Programmable Precision Voltage Reference Die |
| AD584R000C | Radiation tested Pin Programmable Precision Voltage Reference Die |

3.0 Die Information



NOTES

- ¹ BOTH 10V PADS MUST BE CONNECTED TO THE OUTPUT.
- ² INTERCONNECTIONS REQUIRED; SEE PIN DESIGNATIONS FOR INFORMATION.
- ³ NOT BROUGHT OUT IN PACKAGE DEVICE.
PAD NUMBERS CORRESPOND TO PIN NUMBERS FOR THE TO-99, 8-PIN METAL PACKAGE.

ASD0016518

Rev. C

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3.1 Absolute Maximum Ratings ^{1/}

| | |
|---|-----------------|
| Supply Voltage (V_{IN}) | 40V |
| Power Dissipation | 600 mW |
| Storage Temperature | -65°C to +175°C |
| Ambient Operating Temperature Range (T_A) | -55°C to +125°C |
| Junction Temperature (T_J)..... | +175°C |
| Absolute Maximum Ratings Notes: | |

^{1/} Stresses above the absolute maximum rating may cause permanent damage to the device. Extended operation at the maximum levels may degrade performance and affect reliability.

4.0 Die Qualification

In accordance with class-K version of MIL-PRF-38534, Appendix C, Table C-II, except as modified herein.

- (a) Qual Sample Size and Qual Acceptance Criteria – 25/2
- (b) Qual Sample Package – DIP
- (c) Pre-screen test post assembly required prior to die qualification, to remove all assembly related rejects.

Table I - Dice Electrical Characteristics

| Parameter | Symbol | Conditions ^{1/} | Limit Min | Limit Max | Units |
|------------------|----------|-----------------------------|--------------|--------------|-------|
| Supply Current | I_{SY} | No Load | 0.1 | 1.07 | mA |
| Output Error | | 10 Volt | | 4.2 | mV |
| | | 7.5 Volt | | 3.6 | mV |
| | | 5 Volt | | 2.7 | mV |
| | | 2.5 Volt | | 2.25 | mV |
| Band Gap Voltage | | | -5 | 5 | mV |

Table I Notes:

1. $V_{IN} = 15V$, $T_A = 25°C$, unless otherwise specified.

Table II - Electrical Characteristics for Die Qual Samples

| Parameter | Symbol | Conditions <u>1/</u> $-55^{\circ}\text{C} \leq T_A \leq +125^{\circ}\text{C}$ | Sub- groups | Limits <u>2/</u> | | Units | |
|---------------------------------|--|--|----------------|------------------|------------|--------|--|
| | | | | Min | Max | | |
| Quiescent Supply Current | I_{CC} | $V_{IN} = 38\text{ V}, V_O = 10\text{ V}$ $T_A = 25^{\circ}\text{C}$ | 1 | 0 | 1 | mA | |
| Output Voltage | Vout 1 | $V_O = 10\text{V}, T_A = 25^{\circ}\text{C}$ M, D, L, R <u>3/</u> | 1 | 9.97 | 10.03 | V | |
| | | | | 9.9 | 10.1 | | |
| | Vout 2 | $V_O = 7.5\text{V}, T_A = 25^{\circ}\text{C}$ M, D, L, R <u>3/</u> | | 7.478 | 7.522 | | |
| | | | | 7.425 | 7.575 | | |
| | Vout 3 | $V_O = 5.0\text{V}, T_A = 25^{\circ}\text{C}$ M, D, L, R <u>3/</u> | | 4.985 | 5.015 | | |
| | | | | 4.95 | 5.05 | | |
| | Vout 4 | $V_O = 2.5\text{V}, T_A = 25^{\circ}\text{C}$ M, D, L, R <u>3/</u> | | 2.493 | 2.508 | | |
| | | | | 2.475 | 2.525 | | |
| Line Regulation <u>4/</u> | VR _{LINE1} | $12.5\text{V} \leq V_{IN} < 15\text{V}, V_O = 10\text{ V}$ | 1 | | ± 0.05 | mA | |
| | | | 2,3 | | ± 0.10 | | |
| | VR _{LINE2} | $15\text{V} \leq V_{IN} \leq 30\text{V}, V_O = 10\text{ V}$ | 1 | | ± 0.02 | mA | |
| | | | 2,3 | | ± 0.05 | | |
| Load Regulation <u>4/</u> | VR _{LOAD1} VR _{LOAD2} VR _{LOAD3} VR _{LOAD4} | $0\text{mA} \leq I_L \leq 5\text{mA}$ $V_O = 10\text{V}$ $V_O = 7.5\text{V}$ $V_O = 5.0\text{V}$ $V_O = 2.5\text{V}$ | 1 | | ± 50 | PPM/mA | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| Load Regulation <u>4/</u> | VR _{LOAD1} VR _{LOAD2} VR _{LOAD3} VR _{LOAD4} | $0\text{mA} \leq I_L \leq 5\text{mA}$ $V_O = 10\text{V}$ $V_O = 7.5\text{V}$ $V_O = 5.0\text{V}$ $V_O = 2.5\text{V}$ | 2,3 | | ± 100 | | |
| | | | | | | | |
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| | | | | | | | |
| | | | | | | | |

| Table II - Electrical Characteristics for Die Qual Samples - Continued | | | | | | |
|--|---------------------|--|----------------|--------------|--------------|-------------------|
| Parameter | Symbol | Conditions <u>1/</u> | Sub- groups | Limit Min | Limit Max | Units |
| Output short circuit current <u>4/</u> | I_{OS} | $V_O = 10\text{ V}$ | 1, 2, 3 | | 55 | mA |
| Output Voltage | $DV_{out\ 1}/DT$ | $V_O = 10\text{V}$ | 2, 3 | | ± 0.3 | %FS |
| | $DV_{out\ 2}/DT$ | $V_O = 7.5\text{V}$ | | | | |
| | $DV_{out\ 3}/DT$ | $V_O = 5.0\text{V}$ | | | | |
| | $DV_{out\ 4}/DT$ | $V_O = 2.5\text{V}$ | | | | |
| Output noise <u>4/</u> | N_o | $V_O = 10\text{ V}, T_A = +25^\circ\text{C}$ $0.1\text{Hz} \leq \text{BW} \leq 10\text{Hz}$ | 4 | | 50 | $\mu\text{Vp-p}$ |
| | | $V_O = 10\text{ V}, T_A = +25^\circ\text{C}$ $10\text{Hz} \leq \text{BW} \leq 100\text{Hz}$ | | | 150 | $\mu\text{V rms}$ |
| Settling time <u>4/</u> 0.1% of final value (power up) | $t_s(p)$ (power) | $V_O = 10\text{ V}, I_L = 0\text{mA}$ $T_A = +25^\circ\text{C}$ | 9 | | 500 | μS |
| | | $V_O = 10\text{ V}, I_L = -5\text{mA}$ $T_A = +25^\circ\text{C}$ | | | 500 | |

Table II Notes:

- 1./ $V_{IN} = 15\text{V}$, $I_L = 0\text{mA}$ unless otherwise specified.
- 2./ The limiting terms “min” (minimum) and “max” (maximum) shall be considered to apply to magnitudes only.
- 3./ These parts may be dose rate sensitive in a space environment and may demonstrate enhanced low dose rate effects. Radiation end point limits for noted parameters are guaranteed only for conditions specified in MIL-STD-883, method 1019, condition A.
- 4./ This parameter is not tested post irradiation.

| Table III - Life Test Endpoint and Delta Parameter (product is tested in accordance with Table II with the following exceptions) | | | |
|---|---------|--------|--------|
| | Limit | | |
| Parameter | Min | Max | Delta |
| VOUT1 (Err) | -30 mV | 30 mV | ±0.2 % |
| VOUT2 (Err) | -20 mV | 20 mV | ±0.2 % |
| VOUT3 (Err) | -15 mV | 15 mV | ±0.2 % |
| VOUT4 (Err) | -7.5 mV | 7.5 mV | ±0.2 % |

5.0 Life Test/Burn-In Information

- 5.1 HTRB is not applicable for this drawing.
- 5.2 Burn-in is per MIL-STD-883 Method 1015 test condition B or C.
- 5.3 Steady state life test is per MIL-STD-883 Method 1005.

AD584

| Rev | Description of Change | Date |
|-----|---|---------------|
| A | Initiate GRN023291 | 10/12/2007 |
| B | Update header/footer and add to 1.0 Scope description. | March 7, 2008 |
| C | Add Junction Temperature...+175°C to Absolute Max Ratings & remove note <u>5/</u> & <u>6/</u> from Table II | April 2, 2008 |
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