



ANALOG DEVICES INC

# 8-Bit, 35 MSPS Video A/D Converter

**AD9048****1.1 Scope.**

This specification covers the requirements for an 8-bit, 35 Msp/s analog-to-digital converter (ADC). Refer to the commercial data sheet for applications information.

**1.2 Part Number.**

The complete part number per Table 1 of this specification is as follows:

| Device | Part Number     |
|--------|-----------------|
| -1     | AD9048S(X)/883B |
| -2     | AD9048T(X)/883B |

**1.2.3 Case Outline.**

See Appendix 1 of General Specification ADI-M-1000: package outline:

| (X) | Package | Description        |
|-----|---------|--------------------|
| E   | E-28A   | 28-Contact LCC     |
| Q   | Q-28    | 28-Pin Ceramic DIP |

**1.3 Absolute Maximum Ratings.** ( $T_A = +25^\circ\text{C}$  unless otherwise noted)

|                                                           |       |                    |
|-----------------------------------------------------------|-------|--------------------|
| $V_{CC}$ to DGND                                          | ..... | -0.5 V to +7.0 V   |
| AGND to DGND                                              | ..... | -0.5 V to +7.0 V   |
| $V_{EE}$ to AGND                                          | ..... | +0.5 V to -7.0 V   |
| $V_{IN}$ , $V_{RT}$ or $V_{RB}$ to AGND                   | ..... | +0.5 V to $V_{EE}$ |
| $V_{RT}$ to $V_{RB}$                                      | ..... | -2.2 V to +2.2 V   |
| CONV, NMINV or NLINV to DGND                              | ..... | -0.5 V to +5.5 V   |
| Applied Output Voltage to DGND <sup>1</sup>               | ..... | -0.5 V to +5.5 V   |
| Applied Output Current, Externally Forced <sup>2, 3</sup> | ..... | -1.0 mA to +6.0 mA |
| Output Short Circuit Duration <sup>4</sup>                | ..... | 1.0 sec            |
| Operating Temperature Range (Case)                        | ..... | -55°C to +125°C    |
| Junction Temperature                                      | ..... | +175°C             |
| Storage Temperature Range (Case)                          | ..... | -65°C to +150°C    |
| Lead Soldering Temperature (10 sec)                       | ..... | +300°C             |

**NOTES**

<sup>1</sup>Applied voltage must be current limited to specific range.

<sup>2</sup>Forcing voltage must be limited to specified range.

<sup>3</sup>Current is specified as negative when flowing into the device.

<sup>4</sup>Output HIGH; one pin to ground; one second duration.

**1.5 Thermal Characteristics.**

Maximum junction temperature should not be allowed to exceed +175°C. Typical thermal impedances:

28-Contact LCC:  $\theta_{JA} = 69^\circ\text{C/W}$ ;  $\theta_{JC} = 21^\circ\text{C/W}$ ;

28-pin Ceramic DIP:  $\theta_{JA} = 49^\circ\text{C/W}$ ;  $\theta_{JC} = 15^\circ\text{C/W}$ .

## AD9048—SPECIFICATIONS

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Table 1.

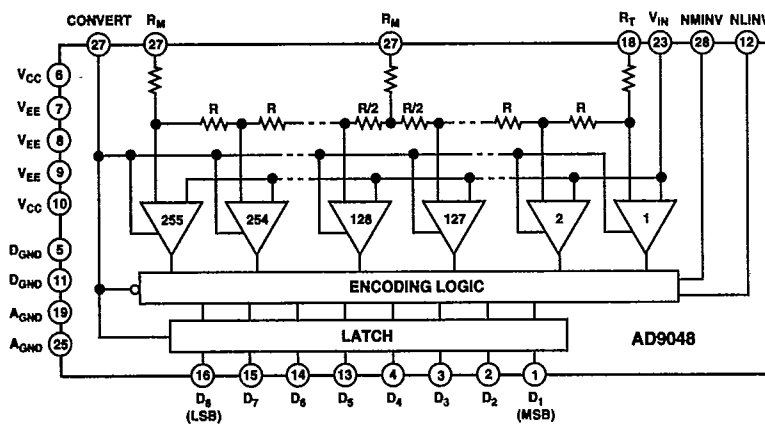
| Test                                | Symbol     | Device | Design Limits <sup>1</sup> | Sub Group 1 | Sub Group 2, 3 | Sub Group 4 | Sub Group 5, 6 | Sub Group 7, 8 | Sub Group 9 | Test Conditions <sup>2</sup>                                                    | Units          |
|-------------------------------------|------------|--------|----------------------------|-------------|----------------|-------------|----------------|----------------|-------------|---------------------------------------------------------------------------------|----------------|
| Input Bias Current                  | $I_B$      | All    |                            | 60          | 100            |             |                |                |             | Measured with $V_{IN} = 0$ V; CONVERT low; $V_{CC} = +5.5$ V; $V_{EE} = -5.5$ V | $\mu$ A max    |
| Input Resistance                    | $R_I$      | All    |                            | 200         |                |             |                |                |             |                                                                                 | k $\Omega$ min |
| Differential Nonlinearity           | DNL        | -1     |                            |             |                | 0.75        | 1.0            |                |             |                                                                                 | LSB            |
|                                     |            | -2     |                            |             |                | 0.5         | 0.75           |                |             |                                                                                 |                |
| Integral Nonlinearity               | INL        | -1     |                            |             |                | 0.75        | 1.0            |                |             |                                                                                 | LSB            |
|                                     |            | -2     |                            |             |                | 0.5         | 0.75           |                |             |                                                                                 |                |
| No Missing Codes                    |            | All    |                            |             |                | Guaranteed  |                |                |             |                                                                                 |                |
| Reference Ladder Resistance         | $R_{RL}$   | All    |                            | 50          |                |             |                |                |             |                                                                                 | $\Omega$ min   |
|                                     |            |        |                            | 125         |                |             |                |                |             |                                                                                 | $\Omega$ max   |
| Reference Ladder Current            | $I_{RL}$   | All    |                            | 40          |                |             |                |                |             | $V_{EE} = -4.9$ V                                                               | mA max         |
| Reference Ladder Offset (Top)       | $O_{RLT}$  | All    |                            | 12          | 12             |             |                |                |             | $+V_{REF} \geq -V_{REF}$<br>All Circumstances.                                  | mV max         |
| Reference Ladder Offset (Bottom)    | $O_{RLB}$  | All    |                            | 8           | 8              |             |                |                |             | $+V_{REF} \geq -V_{REF}$<br>All Circumstances                                   | mV max         |
| +0.4 V Input Current (NMINV; NLINV) |            | All    |                            | 200         | 200            |             |                |                |             | $V_{CC} = +5.5$ V;<br>$V_{EE} = -4.9$ V                                         | $\mu$ A max    |
| +2.4 V Input Current (NMINV; NLINV) |            | All    |                            | 10          | 10             |             |                |                |             | $V_{CC} = +5.5$ V;<br>$V_{EE} = -4.9$ V                                         | $\mu$ A max    |
| +5.5 V Input Current (NMINV; NLINV) |            | All    |                            | 10          | 10             |             |                |                |             | $V_{CC} = +5.5$ V;<br>$V_{EE} = -4.9$ V                                         | $\mu$ A max    |
| Convert Pulse Voltage (HIGH)        | $V_{C(H)}$ | All    |                            |             |                |             |                | 2.0            |             |                                                                                 | V min          |
| Convert Pulse Voltage (LOW)         | $V_{C(L)}$ | All    |                            |             |                |             |                | 0.8            |             |                                                                                 | V max          |
| Convert Pulse Current (HIGH)        | $I_{C(H)}$ | All    |                            | 15          | 15             |             |                |                |             | $V_{CC} = +5.5$ V;<br>$V_{EE} = -4.9$ V;<br>$V_I = +2.4$ V                      | $\mu$ A max    |
| Convert Pulse Current (HIGH)        | $I_{C(H)}$ | All    |                            | 15          | 15             |             |                |                |             | $V_{CC} = +5.5$ V;<br>$V_{EE} = -4.9$ V;<br>$V_I = +5.5$ V                      | $\mu$ A max    |
| Convert Pulse Current (LOW)         | $I_{C(L)}$ | All    |                            | 500         | 500            |             |                |                |             | $V_{CC} = +5.5$ V;<br>$V_{EE} = -4.9$ V                                         | $\mu$ A max    |
| High Level Output Voltage           | $V_{OH}$   | All    |                            | 2.4         | 2.4            |             |                |                |             | $V_{CC} = +4.5$ V                                                               | V min          |
| Low Level Output Voltage            | $V_{OL}$   | All    |                            | 0.5         | 0.5            |             |                |                |             | $V_{CC} = +4.5$ V<br>$V_{EE} = -5.5$ V                                          | V max          |
| Output Delay                        | $t_{OD}$   | All    |                            |             |                |             |                |                | 15          |                                                                                 | ns max         |
| Output Hold Time                    | $t_{OH}$   | All    |                            |             |                |             |                |                | 5           |                                                                                 | ns min         |
| Rise Time                           | $t_R$      | All    |                            |             |                |             |                |                | 9           |                                                                                 | ns max         |
| Fall Time                           | $t_F$      | All    |                            |             |                |             |                |                | 14          |                                                                                 | ns max         |
| Output Time Skew                    | $t_{OS}$   | All    |                            |             |                |             |                |                | 7           |                                                                                 | ns max         |

| Test                                       | Symbol | Device | Design Limits <sup>1</sup> | Sub Group 1 | Sub Group 2, 3 | Sub Group 4 | Sub Group 5, 6 | Sub Group 7, 8 | Sub Group 9 | Test Conditions <sup>2</sup>                            | Units   |
|--------------------------------------------|--------|--------|----------------------------|-------------|----------------|-------------|----------------|----------------|-------------|---------------------------------------------------------|---------|
| Signal-to-Noise Ratio @ 1.248 MHz $A_{IN}$ | SNR    | -1     |                            |             |                | 43.5        |                |                |             | RMS to RMS                                              | dB min  |
|                                            |        | -2     |                            |             |                | 45          |                |                |             | Encode = 20 Msps                                        |         |
| Signal-to-Noise Ratio @ 1.248 MHz $A_{IN}$ | SNR    | -1     |                            |             |                | 52.5        |                |                |             | Peak to RMS                                             | dB min  |
|                                            |        | -2     |                            |             |                | 54          |                |                |             | Encode = 20 Msps                                        |         |
| Harmonics @ 1.248 MHz $A_{IN}$             | HD     | -1     |                            |             |                | 48          |                |                |             | Encode = 20 Msps                                        | dBc min |
|                                            |        | -2     |                            |             |                | 50          |                |                |             |                                                         |         |
| Signal-to-Noise Ratio @ 2.438 MHz $A_{IN}$ | SNR    | -1     |                            |             |                | 43          |                |                |             | RMS to RMS                                              | dB min  |
|                                            |        | -2     |                            |             |                | 44          |                |                |             | Encode = 20 Msps                                        |         |
| Signal-to-Noise Ratio @ 2.438 MHz $A_{IN}$ | SNR    | -1     |                            |             |                | 52          |                |                |             | Peak to RMS                                             | dB min  |
|                                            |        | -2     |                            |             |                | 53          |                |                |             | Encode = 20 Msps                                        |         |
| Harmonics @ 2.438 MHz $A_{IN}$             | HD     | -1     |                            |             |                | 47          |                |                |             | Encode = 20 Msps                                        | dBc min |
|                                            |        | -2     |                            |             |                | 49          |                |                |             |                                                         |         |
| Signal-to-Noise Ratio @ 1.238 MHz $A_{IN}$ | SNR    | -1     |                            |             |                | 43.5        |                |                |             | RMS to RMS                                              | dB min  |
|                                            |        | -2     |                            |             |                | 45          |                |                |             | Encode = 35 Msps                                        |         |
| Positive Supply Current                    | $+I_S$ | All    |                            | 46          | 46             |             |                |                |             | $V_{CC} = +5.5 \text{ V};$<br>$V_{EE} = -5.5 \text{ V}$ | mA max  |
| Negative Supply Current                    | $-I_S$ | All    |                            | 110         | 110            |             |                |                |             | $V_{CC} = +5.5 \text{ V};$<br>$V_{EE} = -5.5 \text{ V}$ | mA max  |

## NOTES

<sup>1</sup> Value shown is over full temperature range. Number in this column indicates specification is guaranteed but not tested.<sup>2</sup>  $+V_{CC} = +5 \text{ V}; V_{EE} = -5.2 \text{ V};$  Differential Reference Voltage = 2.0 V, unless otherwise noted.

## 3.2.1 Functional Block Diagram and Terminal Assignments.



**AD9048**

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**3.2.4 Microcircuit Technology Group.**

This microcircuit is covered by technology group (D-57).

**4.2.1 Life Test/Burn-In Circuit.**

Steady state life test is per MIL-STD-883 Method 1005. Burn-in is per MIL-STD-883 Method 1015 test condition (B).

