



ANALOG DEVICES INC

# 12-Bit, 10 MSPS A/D Converter

AD9005A

## 1.1 Scope.

This specification covers the requirements for a 12-bit, high speed analog-to-digital converter (ADC). The AD9005A is a complete 12-bit ADC which includes on-board track-and-hold amplifier, voltage reference, and timing circuits.

## 1.2 Part Number.

The complete part number is as follows:

| Device | Part Number    |
|--------|----------------|
| -1     | AD9005ATM/883B |

## 1.2.3 Case Outline.

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

| (X) | Package | Description               |
|-----|---------|---------------------------|
| M   | M-46    | 46-Pin Hermetic Metal DIP |

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

|                                       |                                            |
|---------------------------------------|--------------------------------------------|
| Power Supply Voltages ( $\pm V_S$ )   | $\pm 6\text{ V}$                           |
| Positive Supply Voltage ( $+V_{CC}$ ) | $+18\text{ V}$                             |
| Negative Supply Voltage ( $-V_{EE}$ ) | $-18\text{ V}$                             |
| Power Dissipation (Typical)           | $260\text{ mW}$                            |
| Analog Input Voltage (Pin 45)         | $\pm 3.0\text{ V dc}$                      |
| Digital Input Voltage                 | $-0.5\text{ V to } +V_S$                   |
| Digital Output Current                | $4\text{ mA}$                              |
| Junction Temperature                  | $+175^\circ\text{C}$                       |
| Operating Temperature Range (Case)    | $-55^\circ\text{C to } +125^\circ\text{C}$ |
| Storage Temperature Range (Case)      | $-65^\circ\text{C to } +150^\circ\text{C}$ |
| Lead Temperature (Soldering 10 sec)   | $+300^\circ\text{C}$                       |

## 1.5 Thermal Characteristics.

Maximum junction temperature should not be allowed to exceed  $+175^\circ\text{C}$ . Hybrid thermal model:

$$T_{\text{JUNCTION}} = T_{\text{AMBIENT}} + P_{\text{DISSIPATION}} \times (\theta_{\text{CA}}) + (T_{\text{S}} - T_{\text{C}})_{\text{max}}$$

where  $(T_{\text{S}} - T_{\text{C}})_{\text{max}} = 10^\circ\text{C}$ .  $\theta_{\text{CA}} = 14^\circ\text{C/W}$  in still air;  $\theta_{\text{CA}} = 6^\circ\text{C/W}$  with 500 LFPM air flow.

# AD9005A—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 | Test Condition <sup>2</sup>        | Units    |
|-------------------------------------------|-------------------|--------|----------------------------|-------------|----------------|-------------|----------------|------------------------------------|----------|
| Differential Nonlinearity                 | DNL               | -1     |                            |             |                | ±0.75       | -1.0<br>+1.5   |                                    | LSB      |
| Integral Nonlinearity <sup>3</sup>        | INL               | -1     | ±2.25                      |             |                |             |                |                                    | LSB      |
| Gain Error                                |                   | -1     |                            |             |                | ±1.0        | ±2.0           |                                    | % FS     |
| Offset Error                              | V <sub>OS</sub>   | -1     |                            |             |                | ±15         | ±40            |                                    | mV       |
| Input Resistance                          | R <sub>I</sub>    | -1     |                            | 950         | 950            |             |                |                                    | Ω min    |
|                                           |                   |        |                            | 1050        | 1050           |             |                |                                    | Ω max    |
| Maximum Conversion Rate                   |                   | -1     |                            |             |                | 10.1        | 10.1           |                                    | MSPS min |
| Aperture Uncertainty (Jitter)             | t <sub>j</sub>    | -1     | 20                         |             |                |             |                | @ +25°C                            | ps rms   |
| Transient Response                        | t <sub>TR</sub>   | -1     | 120                        |             |                |             |                | FS Step Input to ±1 LSB<br>@ +25°C | ns       |
| Overvoltage Recovery Time                 | t <sub>OR</sub>   | -1     | 250                        |             |                |             |                | 200% Input to ±1 LSB<br>@ +25°C    | ns       |
| Harmonic Distortion <sup>4</sup>          | HD                | -1     |                            |             |                |             | -63            | f <sub>IN</sub> = 4.3 MHz          | dBc min  |
| Signal-to-Noise Ratio <sup>5</sup>        | SNR               | -1     |                            |             |                |             | 60             | f <sub>IN</sub> = 4.3 MHz          | dB min   |
| Encode Pulse Voltage (HIGH)               | V <sub>E(H)</sub> | -1     | 2.0                        |             |                |             |                |                                    | V min    |
| Encode Pulse Voltage (LOW)                | V <sub>E(L)</sub> | -1     | 0.8                        |             |                |             |                |                                    | V max    |
| Encode Pulse Current (HIGH)               | I <sub>E(H)</sub> | -1     |                            | 150         | 150            |             |                |                                    | μA max   |
| Encode Pulse Current (LOW)                | I <sub>E(L)</sub> | -1     |                            | 150         | 150            |             |                |                                    | μA max   |
| Encode Pulse Width (HIGH)                 | t <sub>E(H)</sub> | -1     | 25                         |             |                |             |                | @ +25°C                            | ns min   |
| High Level Output Voltage                 | V <sub>OH</sub>   | -1     |                            | 2.4         | 2.4            |             |                | 2 mA source                        | V min    |
| Low Level Output Voltage                  | V <sub>OL</sub>   | -1     |                            | 0.4         | 0.4            |             |                | 4 mA sink                          | V max    |
| Positive Analog Supply Current (+5.0 V)   | +I <sub>AS</sub>  | -1     |                            | 210         | 210            |             |                |                                    | mA max   |
| Negative Analog Supply Current (-5.2 V)   | -I <sub>AS</sub>  | -1     |                            | 250         | 250            |             |                |                                    | mA max   |
| Positive Digital Supply Current (-5.2 V)  | +I <sub>DS</sub>  | -1     |                            | 60          | 60             |             |                |                                    | mA max   |
| Negative Digital Supply Current (-5.2 V)  | -I <sub>DS</sub>  | -1     |                            | 100         | 100            |             |                |                                    | mA max   |
| Positive Supply Current (+15.0 V)         | +I <sub>CC</sub>  | -1     |                            | 25          | 25             |             |                |                                    | mA max   |
| Negative Supply Current (-15.0 V)         | -I <sub>EE</sub>  | -1     |                            | 55          | 55             |             |                |                                    | mA max   |
| Power Supply Rejection Ratio <sup>6</sup> | PSRR              | -1     |                            |             |                | 0.02        |                |                                    | %/ % max |
| Power Dissipation                         | P <sub>DISS</sub> | -1     |                            | 4.1         |                |             |                |                                    | W max    |

## NOTES

<sup>1</sup>Indicates specification which is guaranteed but not tested. Value shown is at T<sub>A</sub> = full unless otherwise noted in Test Conditions.

<sup>2</sup>+V<sub>CC</sub> = +15 V; -V<sub>EE</sub> = -15 V; +V<sub>S</sub> = +5 V; -V<sub>S</sub> = -5.2 V, unless otherwise indicated.

<sup>3</sup>Parameter is tested at +25°C; guaranteed but not tested at temperature extremes.

<sup>4</sup>Input at 1 dB below full scale; worst case spurious in-band signal relative to input level.

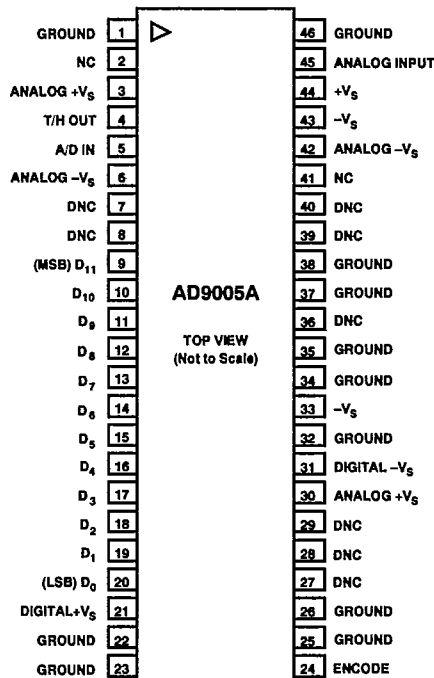
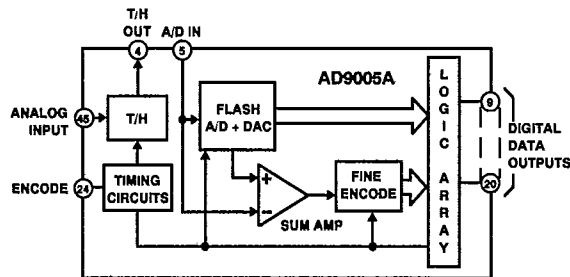
<sup>5</sup>Input at 1 dB below full scale; rms signal to rms noise, including harmonics.

<sup>6</sup>Sensitivity of full-scale gain error with respect to power supply variation with supply min/max limits; PSRR is tested over given voltage range.

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## 3.2.1 Functional Block Diagram and Terminal Assignments.



NC = NO CONNECT  
DNC = DO NOT CONNECT

**3.2.4 Microcircuit Technology Group.**

This microcircuit is covered by technology group (I).

**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).

