Rochester Electronics

Datasheet

Rochester Electronics Manufactured Components

Rochester branded components are manufactured using either die/wafers purchased from the original suppliers or Rochester wafers recreated from the original IP. All recreations are done with the approval of the OCM.

Parts are tested using original factory test programs or Rochester developed test solutions to guarantee product meets or exceed the OCM data sheet.

Quality Overview

- ISO-9001
- AS9120 certification
- Qualified Manufacturers List (QML) MIL-PRF-35835
    - Class Q Military
    - Class V Space Level
- Qualified Suppliers List of Distributors (QSLD)
    - Rochester is a critical supplier to DLA and meets all industry and DLA standards.

Rochester Electronics, LLC is committed to supplying products that satisfy customer expectations for quality and are equal to those originally supplied by industry manufacturers.

The original manufacturer's datasheet accompanying this document reflects the performance and specifications of the Rochester manufactured version of this device. Rochester Electronics guarantees the performance of its semiconductor products to the original OEM specifications. 'Typical' values are for reference purposes only. Certain minimum or maximum ratings may be based on product characterization, design, simulation, or sample testing.

ANALOG DEVICES

High Speed 6-Bit A/D Converter

AD9000

2

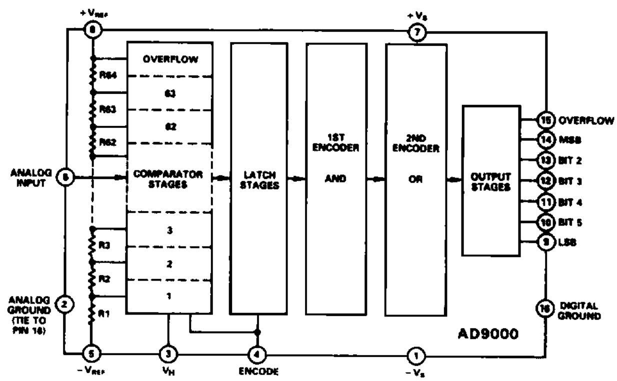
FEATURES

77MSPS Encode Rate
Bipolar Input Range
Low Error Rate
Overflow Bit
MIL-STD-883 Compliant Versions Available

APPLICATIONS

QAM Telecommunications
Electronic Warfare (ECM, ECCM, ESM)
Radar Guidance Digitizers

FUNCTIONAL BLOCK DIAGRAM



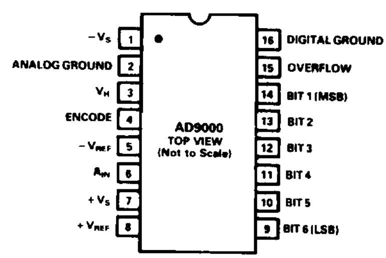
GENERAL DESCRIPTION

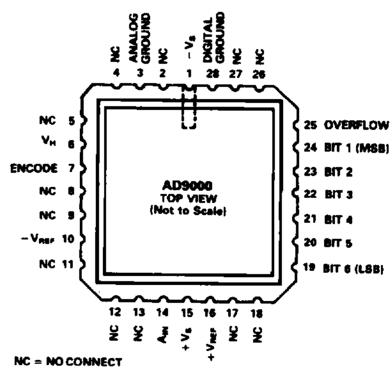
The AD9000 is a 6-bit, high speed, analog-to-digital converter with ECL compatible outputs and a bipolar input stage. The AD9000 is fabricated in a high-performance bipolar process which allows encode rates up to 77MSPS.

The AD9000 employs the standard flash converter architecture based on 64 individual comparators which simultaneously determine the precise analog signal level. The comparators are followed by two stages of decoding logic, allowing the AD9000 to operate with a very low error rate. The low 35pF input capacitance of the AD9000 greatly simplifies the analog driver stage. Also incorporated into the AD9000 design is an overflow output bit as well as a hysteresis control pin to modify comparator sensitivity.

The AD9000 is offered as both an commercial temperature range device 0 to +70°C, and as an extended temperature range device −55°C to +125°C. Both versions are available packaged in a 16-pin ceramic DIP. The extended temperature range device is also available in a 28-pin ceramic LCC package. The extended temperature range versions are offered as fully compliant MIL-STD-883 Class B devices.

PIN DESIGNATIONS





NC = NO CONNECT

ORDERING GUIDE

Model[1]	Temperature Range	Description	Package Option[2]
AD9000JD	0 to +70°C	16-Pin DIP, Industrial	D-16
AD9000SD	−55°C to +125°C	16-Pin DIP	D-16
AD9000SE	−55°C to +125°C	28-Pin LCC	E-28A

NOTES
[1]MIL-STD-883 versions available, contact factory.
[2]D = Ceramic DIP; E = Leadless Ceramic Chip Carrier. For outline information see Package Information section.

This is an abridged data sheet. To obtain the most recent version or complete data sheet, call our fax retrieval system at 1-800-446-6212.

AD9000—SPECIFICATIONS

ELECTRICAL CHARACTERISTICS (Supply Voltages = −5.2V and +5.0V; Differential Reference Voltage = 2.0V unless otherwise stated)

Parameter	Temp	Commercial 0 to +70°C AD9000JD Min	Typ	Max	Military −55°C to +125°C AD9000SD/SE Min	Typ	Max	Units
RESOLUTION		6			6			Bits
DC ACCURACY								
Differential Linearity	+25°C		0.25	0.5		0.25	0.5	LSB
	Full			1.0			1.0	LSB
Integral Linearity	+25°C		0.25	0.5		0.25	0.5	LSB
	Full			1.0			1.0	LSB
No Missing Codes	Full		GUARANTEED			GUARANTEED		
INITIAL OFFSET ERROR								
Top of Reference Ladder	+25°C		0.3	7/8		0.3	7/8	LSB
	Full			1.5			1.5	LSB
Bottom of Reference Ladder	+25°C		0.25	7/8		0.25	7/8	LSB
	Full			1.5			1.5	LSB
Offset Drift Coefficient	Full		145			145		μV/°C
ANALOG INPUT								
Input Voltage Range	Full		±2.0V			±2.0V		V
Input Bias Current (Sampling)[5]	Full			800			800	μA
Input Bias Current (Latched)[5]	Full			20			20	μA
Input Resistance	+25°C		3.0			3.0		kΩ
Input Capacitance	+25°C		35	50		35	50	pF
Full Power Bandwidth[6]	+25°C		20			20		MHz
REFERENCE INPUT[2, 3]								
Reference Ladder Resistance	+25°C	80		200	80		200	Ω
Ladder Temperature Coefficient			0.275			0.275		Ω/°C
Reference Input Bandwidth	+25°C		20			20		MHz
DYNAMIC PERFORMANCE[7]								
Conversion Rate	+25°C	50	70		75	77		MHz
Conversion Time (+1 Clock)	+25°C			20			13.3	ns
Aperture Delay (t_D)	+25°C		2			2		ns
Aperture Uncertainty (Jitter)	+25°C		25			25		ps
Output Propagation Delay (t_{PD})[8]	+25°C	8		12	8		12	ns
Output Hold Time (t_{OH})[9]	+25°C	8		14	8		14	ns
Transient Response[10]	+25°C		13			13		ns
Overvoltage Recovery Time[11]	+25°C		11			11		ns
Output Rise Time[12]	+25°C			5.0			4.5	ns
Output Fall Time[12]	+25°C			5.0			4.5	ns
Output Time Skew	+25°C		0.4			0.4		ns
ENCODE INPUT								
Logic "1" Voltage	Full	−1.1			−1.1			V
Logic "0" Voltage	Full			−1.5			−1.5	V
Logic "1" Current	Full			100			100	μA
Logic "0" Current	Full			100			100	μA
Input Capacitance	+25°C		2.5	5.0		2.5	5.0	pF
ENCODE Pulse Width High (t_{PWH})	+25°C	6.6			6.6			ns
ENCODE Pulse Width Low (t_{PWL})	+25°C	6.6			6.6			ns

ELECTRICAL CHARACTERISTICS (Continued)

Parameter	Temp	Commercial 0 to +70°C AD9000JD Min	Typ	Max	Military −55°C to +125°C AD9000SD/SE Min	Typ	Max	Units
AC LINEARITY[11]								
Dynamic Linearity[12]	+25°C		0.5			0.5		LSB
In-Band Harmonics								
(DC to 1MHz)	+25°C		44			44		dBc
(1MHz to 5MHz)	+25°C		42			42		dBc
(5MHz to 8MHz)	+25°C		38			38		dBc
Signal to Noise Ratio[13]	+25°C	31	33		31	33		dB
Signal to Noise Ratio[14]	+25°C	40	42		40	42		dB
Two Tone Intermodulation Rejection[15]	+25°C		46			46		dBc
Noise Power Ratio (NPR)[16]	+25°C		30			30		dBc
DIGITAL OUTPUTS[5]								
Logic "1" Voltage	Full	−1.1			−1.1			V
Logic "0" Voltage	Full			−1.5			−1.5	V
POWER SUPPLY[17]								
Positive Supply Current (+5.0V)	+25°C		60	70		60	70	mA
	Full			75			75	mA
Negative Supply Current (−5.2V)	+25°C		68	80		68	80	mA
	Full			85			85	mA
Nominal Power Dissipation	+25°C		675			675		mW
Reference Ladder Dissipation	+25°C		20			20		mW

NOTES

[1] $A_{IN} = +V_{REF}$.
[2] Determined by 3dB reduction in reconstructed output at 75MSPS.
[3] Under normal operating conditions, the analog input voltages should not exceed nominal ±2V operating range, nor the supply voltages ($+V_S$ and $-V_S$), whichever is smaller.
[4] Under normal operating conditions the differential reference voltage may range from ±0.5V to ±2V; $+V_{REF} \geq -V_{REF}$.
[5] Output terminated with 100Ω resistors to −2.0V.
[6] Measured from the leading edge of ENCODE to data out on Bit 1 (MSB).
[7] Measured from the trailing edge of ENCODE to data out on Bit 1 (MSB).
[8] For full-scale step input, 6-bit accuracy is attained in specified time.
[9] Recovers to 6-bit accuracy in specified time, after 150% full-scale input overvoltage.
[10] Measured on Bit 1 (MSB) only.
[11] Measured at 50MSPS encode rate.
[12] Analog input frequency = 15MHz.
[13] RMS signal to RMS noise, with 540kHz analog input signal.
[14] Peak-to-peak signal to rms noise, with 540kHz analog input signal.
[15] $f_1 = 9.3MHz$; $f_2 = 7.6MHz$; Encode = 42MHz.
[16] DC to 8.2MHz noise bandwidth with 3.886MHz slot.
[17] Supply voltage should remain stable within ±5% for normal operation.

Specifications subject to change without notice.

ABSOLUTE MAXIMUM RATINGS[1]

Positive Supply Voltage . . . . −0.3V to +6V
Negative Supply Voltage . . . . −6.0V to +0.3V
Analog-to-Digital Ground Voltage Differential 0.5
Analog Input Voltages (A_{IN}, $+V_{REF}$, $-V_{REF}$)[2] . . . . . . ±3V
Differential Reference Voltage ($+V_{REF}$ to $-V_{REF}$)[3] 6V
ENCODE Input Voltage . . . . $-V_S$ to 0V
HYSTERESIS Control Voltage . . . . 0V to +3.0V
Digital Output Current 20mA
Power Dissipation (+25°C Free Air)[4] 745mW
Operating Temperature Range
AD9000JD . . . . 0 to +70°C
AD9000SD/SE . . . . −55°C to +125°C
Storage Temperature Range . . . . −65°C to +150°C
Junction Temperature . . . . +175°C
Lead Soldering Temperature (10sec) . . . . +300°C

NOTES

[1] Absolute maximum ratings are limiting values, to be applied individually, and beyond which serviceability of the circuit may be impaired. Functional operability under any of these conditions is not necessarily implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.
[2] Under normal operating conditions, the analog input voltages should not exceed nominal ±2V operating range, nor the supply voltages ($+V_S$ and $-V_S$), whichever is smaller.
[3] Under normal operating conditions the differential reference voltage may range from ±0.5V to ±2V; $+V_{REF} \geq -V_{REF}$.
[4] Typical thermal impedances . . .

16-Pin Ceramic	$\theta_{ja} = 67°C/W$; $\theta_{jc} = 7°C/W$
28-Pin LCC	$\theta_{ja} = 62°C/W$; $\theta_{jc} = 14°C/W$