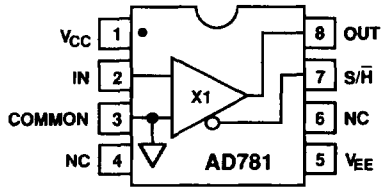
Complete 700 ns Sample-and-Hold Amplifier

AD781*

FEATURES

Acquisition Time to 0.01%: 700 ns Maximum
Low Power Dissipation: 95 mW
Low Droop Rate: 0.01 μV/μs
Fully Specified and Tested Hold Mode Distortion
Total Harmonic Distortion: −80 dB Maximum
Aperture Jitter: 75 ps Maximum
Internal Hold Capacitor
Self-Correcting Architecture
8-Pin Mini Cerdip and Plastic Package
MIL-STD-883 Compliant Versions Available

FUNCTIONAL BLOCK DIAGRAM



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PRODUCT DESCRIPTION

The AD781 is a high speed monolithic sample-and-hold amplifier (SHA). The AD781 guarantees a maximum acquisition time of 700 ns to 0.01% over temperature. The AD781 is specified and tested for hold mode total harmonic distortion and hold mode signal-to-noise and distortion. The AD781 is configured as a unity gain amplifier and uses a self-correcting architecture that minimizes hold mode errors and insures accuracy over temperature. The AD781 is self-contained and requires no external components or adjustments.

The low power dissipation, 8-pin mini-DIP package and completeness make the AD781 ideal for highly compact board layouts. The AD781 will acquire a full-scale input in less than 700 ns and retain the held value with a droop rate of 0.01 μV/μs. Excellent linearity and hold mode dc and dynamic performance make the AD781 ideal for 12- and 14-bit high speed analog-to-digital converters.

The AD781 is manufactured on Analog Devices' BiMOS process which merges high performance, low noise bipolar circuitry with low power CMOS to provide an accurate, high speed, low power SHA.

The AD781 is specified for three temperature ranges. The J grade device is specified for operation from 0°C to 70°C, the A grade from −40°C to +85°C and the S grade from −55°C to +125°C. The J and A grades are available in 8-pin plastic DIP packages. The S grade is available in an 8-pin cerdip package.

*Protected by U.S. Patent No. 4,962,325.

PRODUCT HIGHLIGHTS

1. Fast acquisition time (700 ns), low aperture jitter (75 ps) and fully specified hold mode distortion make the AD781 an ideal SHA for sampling systems.
2. Low droop (0.01 μV/μs) and internally compensated hold mode error results in superior system accuracy.
3. Low power (95 mW typical), complete functionality and small size make the AD781 an ideal choice for a variety of high performance, low power applications.
4. The AD781 requires no external components or adjustments.
5. Excellent choice as a front-end SHA for high speed analog-to-digital converters such as the AD671, AD7586, AD674B, AD774B, AD7572 and AD7672.
6. Fully specified and tested hold mode distortion guarantees the performance of the SHA in sampled data systems.
7. The AD781 is available in versions compliant with MIL-STD-883. Refer to the Analog Devices Military Products Databook or current AD781/883B data sheet for detailed specifications.

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.

AD781—SPECIFICATIONS

DC SPECIFICATIONS (T_{min} to T_{max} with V_{CC} = +12 V ± 10%, V_{EE} = −12 V ± 10%, C_L = 20 pF, unless otherwise specified)

Parameter	AD781J Min	AD781J Typ	AD781J Max	AD781A Min	AD781A Typ	AD781A Max	AD781S Min	AD781S Typ	AD781S Max	Units
SAMPLING CHARACTERISTICS										
Acquisition Time										
10 V Step to 0.01%		600	700		600	700		600	700	ns
10 V Step to 0.1%		500	600		500	600		500	600	ns
Small Signal Bandwidth		4			4			4		MHz
Full Power Bandwidth		1			1			1		MHz
HOLD CHARACTERISTICS										
Effective Aperture Delay (25°C)	−35	−25	−15	−35	−25	−15	−35	−25	−15	ns
Aperture Jitter (25°C)		50	75		50	75		50	75	ps
Hold Settling (to 1 mV, 25°C)		250	500		250	500		250	500	ns
Droop Rate		0.01	1		0.01	1		0.01	1	μV/μs
Feedthrough (25°C)										
(V_{IN} = ±5 V, 100 kHz)		−86			−86			−86		dB
ACCURACY CHARACTERISTICS[1]										
Hold Mode Offset	−4	−1	+3	−4	−1	+3	−4	−1	+3	mV
Hold Mode Offset Drift		10			10			10		μV/°C
Sample Mode Offset		50	200		50	200		50	200	mV
Nonlinearity		±0.002	±0.003		±0.002	±0.003		±0.003	±0.005	% FS
Gain Error		±0.01	±0.025		±0.01	±0.025		±0.01	±0.025	% FS
OUTPUT CHARACTERISTICS										
Output Drive Current	−5		+5	−5		+5	−5		+5	mA
Output Resistance, DC		0.3	0.5		0.3	0.5		0.3	0.5	Ω
Total Output Noise (DC to 5 MHz)		150			150			150		μV rms
Sampled DC Uncertainty		85			85			85		μV rms
Hold Mode Noise (DC to 5 MHz)		125			125			125		μV rms
Short Circuit Current										
Source		20			20			20		mA
Sink		10			10			10		mA
INPUT CHARACTERISTICS										
Input Voltage Range	−5		+5	−5		+5	−5		+5	V
Bias Current		50	250		50	250		50	250	nA
Input Impedance		50			50			50		MΩ
Input Capacitance		2			2			2		pF
DIGITAL CHARACTERISTICS										
Input Voltage Low			0.8			0.8			0.8	V
Input Voltage High	2.0			2.0			2.0			V
Input Current High (V_{IN} = 5 V)		2	10		2	10		2	10	μA
POWER SUPPLY CHARACTERISTICS										
Operating Voltage Range	±10.8	±12	±13.2	±10.8	±12	±13.2	±10.8	±12	±13.2	V
Supply Current		4	6.5		4	6.5		4	7	mA
+PSRR (+12 V ± 10%)	70	80		70	80		70	80		dB
−PSRR (−12 V ± 10%)	65	75		65	75		65	75		dB
Power Consumption		95	175		95	175		95	185	mW
TEMPERATURE RANGE										
Specified Performance	0		+70	−40		+85	−55		+125	°C

NOTE

[1]Specified and tested over an input range of ±5 V.

Specifications subject to change without notice.

Specifications shown in **boldface** are tested on all devices at final electrical test. Results from those tests are used to calculate outgoing quality levels. All min and max specifications are guaranteed although only those shown in **boldface** are tested.

HOLD MODE AC SPECIFICATIONS (T_{min} to T_{max}, V_{CC} = +12 V ±10%, V_{EE} = −12 V ±10%, C_L = 20 pF, unless otherwise specified)[1]

Parameter	AD781J Min	AD781J Typ	AD781J Max	AD781A Min	AD781A Typ	AD781A Max	AD781S Min	AD781S Typ	AD781S Max	Units
TOTAL HARMONIC DISTORTION										
F_{IN} = 10 kHz		−90	**−80**		−90	**−80**		−90	**−80**	dB
F_{IN} = 50 kHz		−73			−73			−73		dB
F_{IN} = 100 kHz		−68			−68			−68		dB
SIGNAL-TO-NOISE AND DISTORTION										
F_{IN} = 10 kHz	72	78		72	78		72	78		dB
F_{IN} = 50 kHz		73			73			73		dB
F_{IN} = 100 kHz		67			67			67		dB
INTERMODULATION DISTORTION										
F_{IN1} = 49 kHz, F_{IN2} = 50 kHz										
2nd Order Products		−77			−77			−77		dB
3rd Order Products		−78			−78			−78		dB

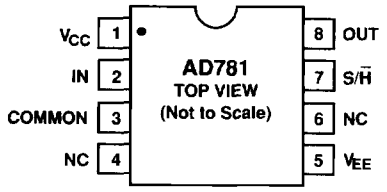
NOTE
[1]F_{IN} amplitude = 0 dB and F_{SAMPLE} = 500 kHz unless otherwise indicated.
Specifications shown in **boldface** are tested on all devices at final electrical test. Results from those tests are used to calculate outgoing quality levels. All min and max specifications are guaranteed although only those shown in **boldface** are tested.

ABSOLUTE MAXIMUM RATINGS*

Spec	With Respect to	Min	Max	Unit
V_{CC}	Common	−0.3	+15	V
V_{EE}	Common	−15	+0.3	V
Control Input	Common	−0.5	+7	V
Analog Input	Common	−12	+12	V
Output Short Circuit to Ground, V_{CC}, or V_{EE}		Indefinite		
Maximum Junction Temperature			+175	°C
Storage		−65	+150	°C
Lead Temperature (10 sec max)			+300	°C
Power Dissipation			195	mW

*Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational section of this specification is not implied.

PIN CONFIGURATION



ORDERING GUIDE

Model[1]	Temperature Range	Description	Package Options[2]
AD781JN	0°C to +70°C	8-Pin Plastic DIP	N-8
AD781AN	−40°C to +85°C	8-Pin Plastic DIP	N-8
AD781SQ	−55°C to +125°C	8-Pin Cerdip	Q-8

NOTES
[1]For details on grade and package offerings screened in accordance with MIL-STD-883, refer to the Analog Devices Military Products Databook or current AD781/883B data sheet.
[2]N = Plastic DIP; Q = Cerdip. For outline information see Package Information section.

CAUTION

ESD (electrostatic discharge) sensitive device. The digital control inputs are diode protected; however, permanent damage may occur on unconnected devices subject to high energy electrostatic fields. Unused devices must be stored in conductive foam or shunts.