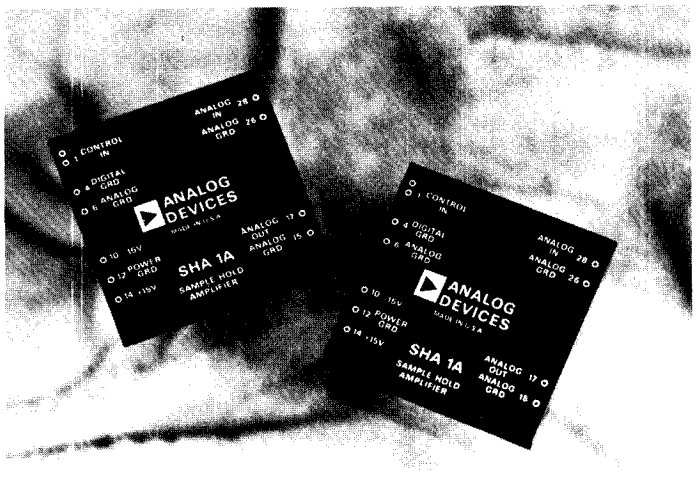
ANALOG DEVICES

Sample and Hold Module

SHA-1A

FEATURES
- 12-Bit System Compatible
- Throughput Nonlinearity 2mV max Over ±10V Input Range
- Acquisition Time 5μs max
- Input Buffer, $10^{12}\Omega$ R_{IN}
- Independent Digital, Analog, and Power Grounds
- Modular 0.4" High Construction
- Standard ±15V dc Power
- No External Adjustments Required

APPLICATIONS
- Data Acquisition Systems
- Data Distribution Systems
- Track and Hold
- Sample and Hold
- Peak Measurement Systems



GENERAL DESCRIPTION

The SHA-1A is a fast sample-and-hold module with low droop rate and overall accuracy compatible with 12-bit A/D conversion systems operating to ½LSB accuracy. When in the "sample" mode, the module appears as a fast amplifier with 5μs settling time of 0.01%, 1nA input current, 25μV/°C drift, and unity gain with ±10V at ±20mA output current capability. When in the "hold" mode, the droop rate is 50μV/ms max, so the SHA-1A will hold an input signal to 0.01% of full scale (20V p-p) for 40ms, sufficient for 12-bit A/D conversion.

SAMPLE TO HOLD CHARACTERISTICS

Of prime importance in selecting Sample-and-Hold amplifiers is the transition characteristics when the module is commanded into hold by the digital control line. A finite delay will occur between initiation of the hold command, and actual disconnection of the hold capacitor from the input buffer amplifier. In the SHA-1A, this delay time is 40ns maximum. The uncertainty, or jitter over which this delay time will vary from cycle to cycle, as the module is repeatedly commanded into hold, is ±5ns. In most systems, the jitter specification is the limiting factor on overall system speed for a given accuracy, since fixed delays can be removed by adjusting the system timing. The 5ns jitter specification means the SHA-1A can track a signal slewing up to 0.2V/μs, and "capture" that signal to within a 1mV accuracy for A/D conversion.

OVERALL ACCURACY

The SHA-1A is guaranteed to have an overall throughput nonlinearity of 2mV max over a ±10V input range, or 1mV max over 0 to +10V inputs. This specification combines the effects of common mode errors, gain nonlinearity and sample to hold offset nonlinearity. It is no longer necessary to guess at the combined effects of individual errors since the SHA-1A specification guarantees that its total nonlinearity errors are sufficiently low to insure ½LSB accuracy in 12-bit systems.

GROUNDING

Many data acquisition systems suffer from digital ground induced noise appearing in the analog system. To counteract this problem, the SHA-1A has three separate ground systems. The digital ground is actually one side of a differential amplifier, with the Sample/Hold digital control input being the other input of this amplifier. This effectively prevents digital ground noise from being impressed into the analog signal channel. The power ground and analog input/output grounds are also separate, so that power supply ground noise is reduced by the rejection coefficients of the amplifiers, normally well over 90dB. Ground connection instructions are given in Figure 1.

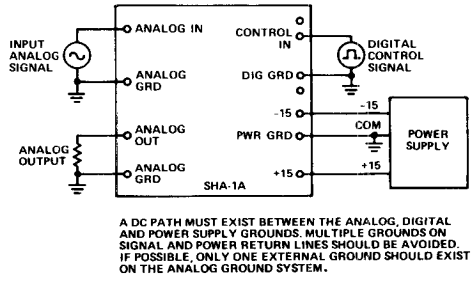


Figure 1. SHA-1A Connections and Grounding

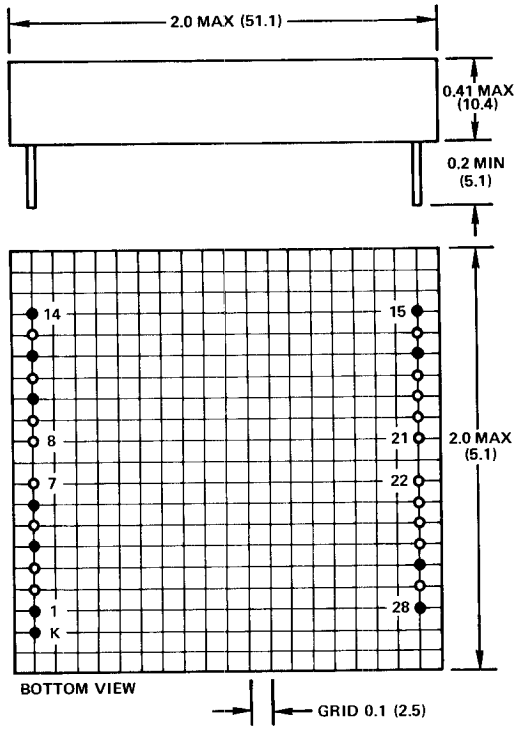
SPECIFICATIONS (typical @ +25°C and nominal supply voltages, unless otherwise noted)

ACCURACY	
Gain	+1
Gain Error	+0.0, -0.05% max
Total Throughput Nonlinearity	2mV max Over ±10V Input Range
(Includes Gain and Sample to Hold Nonlinearities)	1mV max Over 0 to +10V or 0 to -10V Input Range
FREQUENCY RESPONSE IN SAMPLE MODE	
Small Signal -3dB	500kHz min
Slew Rate	4V/μs
Settling Time to 0.01% for 20 Volt Input Step	5μs max
SAMPLE TO HOLD SWITCHING	
Aperture Delay Time	40ns max
Jitter (Cycle to Cycle Variance in Delay)	5ns Peak
Switching Transient Settling Time (to ±1mV)	300ns
HOLDING CHARACTERISTICS	
Droop Rate	50μV/ms max
Droop Rate vs. Temp.	X2/10°C
Feedthrough (10kHz, 20V p-p Input)	0.005% max
HOLD TO SAMPLE SWITCHING	
Acquisition Time to 0.01% of Full Scale	5μs max
INPUT CHARACTERISTICS	
Input Resistance	$10^{12}\Omega$
Input Capacitance	5pF max
Input Bias Current	10nA max, 1nA typ
Initial Input Offset	1mV max
Offset vs. Supply	100μV/%
Offset vs. Temp.	25μV/°C max
Input Voltage, max Safe	±15V
Input Voltage, Normal Operation	±10V
OUTPUT CHARACTERISTICS	
Output Voltage, Current	±10V min at ±20mA min
Maximum Load Capacitance at Output	500pF
DIGITAL CONTROL	
Logic Levels (DTL/TTL Comp)	
("1") Sample	+2V to +5.5V @ 40nA
("0") Hold	-0.5V to +0.8V @ 20μA
POWER REQUIREMENTS	±15V dc @ +10mA, -15mA (±3% Tolerance on Voltage)
TEMPERATURE RANGE	
Rated Accuracy	0 to +70°C
Storage	-55°C to +85°C

Specifications subject to change without notice.

OUTLINE DIMENSIONS AND PIN CONNECTIONS

Dimensions shown in inches and (mm).



Pins: 0.019 ±0.001 (0.48 ±0.03) dia. half-hard brass, gold plated per MIL-G-45204 Class 1, Type 2

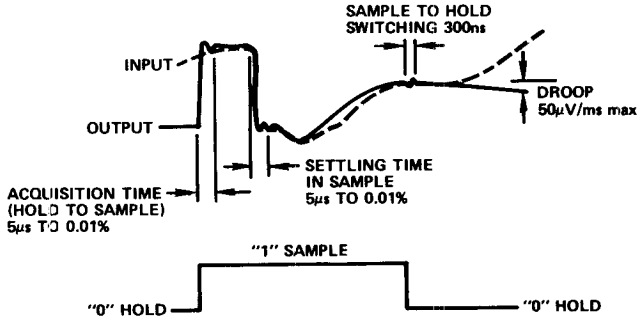


Figure 2. Illustration of Dynamic Specifications (not to scale)

OTHER PRODUCTS

Multiplexer MPX-8A

Available with 8 channels, digital addressing, expandable to 64 channels. Input range ±10V with standard ±15V dc supplies. MOSFET design prevents burn out due to power failure, -80dB cross-talk, 2μs max switching time. Accuracy to 0.01%.

Analog to Digital Converter ADC-QM, ADC1133

The QM is available in 8-, 10-, or 12-bit resolution and accuracy. Extremely low TCs, 3ppm differential linearity.

The new ADC1133 is 12 bits A/D with a conversion time of 25μs. TCs are also a low 3ppm.