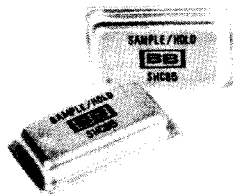




SHC85 SHC85ET



Fast IC SAMPLE/HOLD AMPLIFIERS

FEATURES

- 14-PIN DIP PACKAGE
- 5 μ sec ACQUISITION TIME
- COMPLETE WITH HOLDING CAPACITOR
- $\pm 0.01\%$ ACCURACY
- -55°C TO $+125^{\circ}\text{C}$ TEMPERATURE RANGE (SHC85ET)

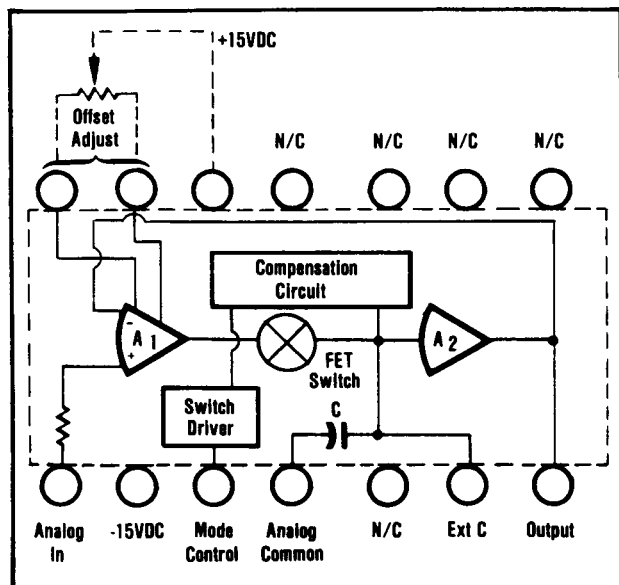
DESCRIPTION

The SHC85 is designed to acquire and hold up to $\pm 10\text{VDC}$ analog signals to an accuracy of $\pm 0.01\%$ of full scale range in 5 μ sec for a 20-volt step or 4.5 μ sec for a 10VDC step. Featuring internally compensated circuits normally found only in more expensive and larger sample/holds, the SHC85 offers ultra-linear performance and fast acquisition speeds for the most demanding data acquisition and control applications.

Two models are available: the SHC85 is specified for 0°C to 70°C operation, and the SHC85ET is specified for -55°C to $+125^{\circ}\text{C}$ operation.

The SHC85/SHC85ET are well suited for use in:

- Data Acquisition Systems
- Data Distribution Systems
- Analog Delay Circuits
- Pulse Amplitude Modulation Circuits
- Waveform Amplitude Measurement



SPECIFICATIONS

Typical at 25°C with rated supply and a 1000pF internal capacitor unless otherwise noted.

ELECTRICAL			
MODELS	SHC85	SCH85ET	UNITS
INPUT			
ANALOG INPUT			
Voltage Range	±10	±10	V
Maximum Safe Input Signal	±15	±15	V
Resistance	10 ⁸	10 ⁸	Ω
Bias Current	50	50	nA
DIGITAL INPUT (TTL Compatible)			
Mode Control	Voltage	Current	
"Sample" - Logic "1"	+2.0V < e < +8V	50nA	
"Hold" - Logic "0"	0V < e < +0.8V	-50μA	
TRANSFER CHARACTERISTICS			
ACCURACY (25°C)			
Dynamic Nonlinearity, max	±0.01	±0.01	% of 20V
At min. "Hold" Time	1000	1000	μsec
Gain	+1.0	+1.0	V/V
Gain Error	±0.01	±0.01	% of 20V
Throughput Offset, max (adjust to zero)	2	2	mV
Droop Rate, max	0.5	0.5	mV/msec
Droop Rate, typical	0.125	0.125	mV/msec
Throughput Nonlinearity	±0.005	±0.005	% of 20V
Noise, rms (10Hz to 100kHz)	100	100	μV
Supply Rejection (0 to 50kHz)	100	100	μV/V
ACCURACY DRIFT			
Gain Drift	±2	±2	ppm of 20V/°C
Offset Drift	±25	±25	μV/°C
Droop Rate			
At 70°C, max	10	10	mV/msec
At +125°C, max	--	200	mV/msec
DYNAMIC CHARACTERISTICS			
Bandwidth (Full Power)(1)	200	200	kHz
Output Slew Rate	20	20	V/μsec
Aperture Time	30	30	nsec
Acquisition Time (to ±0.01%)			
10V Step, max	4.5	4.5	μsec
20V Step, max	5.0	5.0	μsec
Feedthrough in Hold Mode	±0.005	±0.005	% of step change
Charge Offset, max, at 0V Input	±2	±2	mV
Sample-to-Hold Transient			
Peak Amplitude	50	50	mV
Settling to 1mV	0.5	0.5	μsec
OUTPUT			
ANALOG OUTPUT			
Voltage Range	±10	±10	V
Current Range	±10	±10	mA
Impedance	0.1	0.1	Ω
TEMPERATURE			
Specification	0 to +70	-55 to +125	°C
Storage	-55 to +125	-55 to +125	°C
POWER SUPPLY			
Rated Voltage	±15	±15	VDC
Range	±14.5 to ±15.5	±14.5 to ±15.5	VDC
Current	±13	±13	mA
PRICES			
1-9	71.00	97.00	\$
100 up	53.00	70.00	\$

MECHANICAL

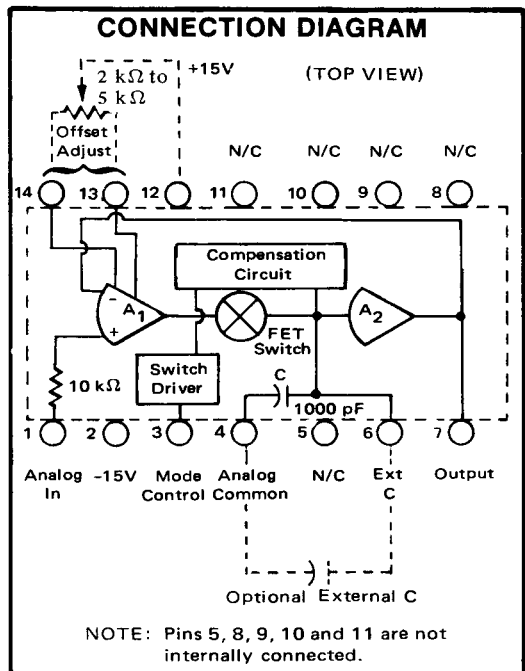
NOTE:
Leads in true position within .010" (.25mm)
R @ MMC at seating plane.

Denotes Pin 1

Pin numbers shown for reference only. Numbers may not be marked on package.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.860	.880	21.84	22.35
B	.490	.510	12.45	12.95
C	.170	.250	4.32	6.35
D	.016	.021	0.41	0.53
G	.100 BASIC		2.54 BASIC	
H	.115	.155	2.92	3.94
K	.150	.300	3.81	7.62
L	.300 BASIC		7.62 BASIC	
R	.080	.120	2.03	3.05

Case: Kovar
Pin material and plating composition conform to method 2003 (solderability) of MIL-STD-883 (except paragraph 3.2). Mating Connector: 0145MC



NOTE:
1. Small signal bandwidth is 3MHz.

The information provided herein is believed to be reliable; however, BURR-BROWN assumes no responsibility for inaccuracies or omissions. BURR-BROWN assumes no responsibility for the use of this information, and all use of such information shall be entirely at the user's own risk. Prices and specifications are subject to change without notice. No patent rights or licenses to any of the circuits described herein are implied or granted to any third party. BURR-BROWN does not authorize or warrant any BURR-BROWN product for use in life support devices and/or systems.

DEFINITION OF SPECIFICATIONS

DYNAMIC NONLINEARITY

This is the total nonadjustable input to output error. This specification includes throughput nonlinearity and errors due to droop, thermal transients and feedthrough, in short, all errors that cannot be adjusted to zero for a 10V input change after a 5μsec acquisition time and a 1msec hold time. Offset errors must be adjusted to zero by the offset control and gain errors must be adjusted to zero by a gain adjustment elsewhere in the system (gain adjust not included in SHC85).

GAIN ACCURACY

The difference due to amplifier gain errors between Input and Output voltage when in the "sample" mode.

DROOP RATE

The voltage decay at the output when in the "hold" mode due to storage capacitor, FET switch leakage currents, and output amplifier bias current.

FEEDTHROUGH

The amount of the input voltage change that appears at the output when the amplifier is in the "hold" mode (see Figure 1).

THROUGHPUT - NONLINEARITY

The total charge offset and gain nonlinearity. That is, the inaccuracy due to these two errors that cannot be corrected by gain and offset adjustments. Throughput - nonlinearity is specified over the 20V input range.

THROUGHPUT OFFSET

The sum of sample offset and charge offset.

CHARGE OFFSET

The offset that results from charge transferred from the holding capacitor to the gate capacitance of the switching FET. This charge is partially restored by a special compensation circuit when the unit goes into the "hold" mode.

ACQUISITION TIME

The time required for the output to settle to its final value within a given error band, when the Mode control is switched from "hold" to "sample" (see Figure 2).

APERTURE TIME

The time required to switch from "sample" to "hold". The time is measured from the 50% point of the mode control transition to the time at which the output stops tracking the input.

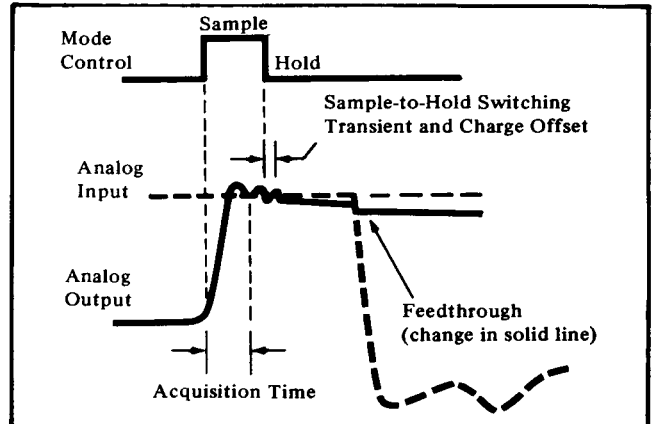


FIGURE 1. Example of Specifications.

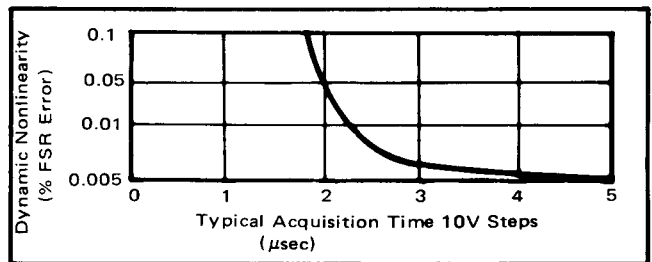


FIGURE 2. Acquisition Time vs Full Scale Range Error.

OPERATING INSTRUCTIONS

OPTIONAL EXTERNAL CAPACITOR SELECTION

The value of the external capacitor determines the droop, charge offset and acquisition time of the sample/hold. Both droop and charge offset will vary linearly with capacitance from the values given in the specification table.

Figure 3 shows the behavior of acquisition time with added external capacitance. The behavior of droop with external C is determined by:

$$\text{Droop} = dv/dt = (0.5 \times 10^{-9}) / (1000\text{pF} + C_{\text{ext}})$$

Capacitors with high insulation resistance and low dielectric absorption, such as teflon or polystyrene should be used as storage elements (polystyrene should not be used above +85°C). Care should be taken in the printed circuit layout to minimize leakage currents from the capacitor; this will minimize droop errors.

OFFSET ADJUSTMENT

Connect a 2kΩ to 5kΩ multiturn potentiometer with a

TCR of 150ppm/°C or less as shown in the Connection Diagram. The offset should be adjusted with the input grounded. During the adjustment, the sample/hold should be switching continuously between the "sample" and the "hold" mode. The error should then be adjusted to zero where the unit is in the "hold" mode. In this way, charge offset as well as amplifier offset will be adjusted.

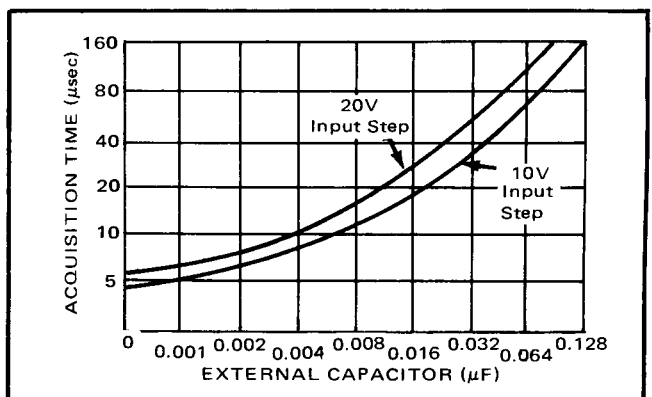
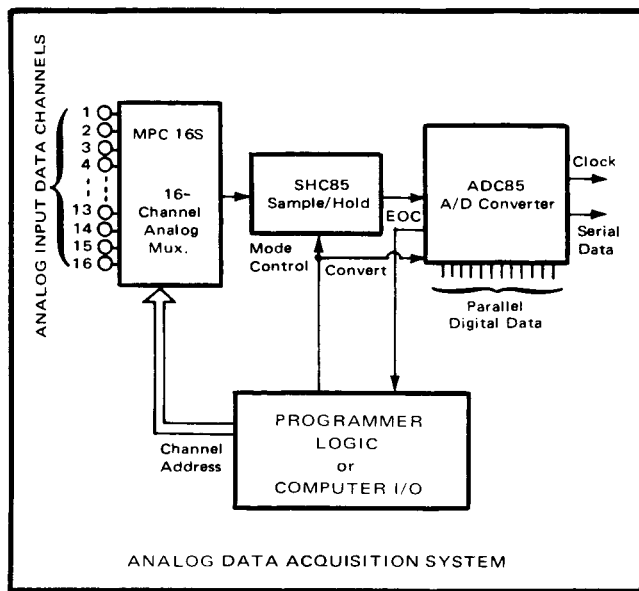


FIGURE 3. Acquisition Time vs External Capacitor.

APPLICATIONS

DATA ACQUISITION SYSTEM

The SHC85 makes an excellent device for reducing aperture time in a data acquisition system. When combined with Burr-Brown's 16-channel MPC-16S Analog Multiplexer and ADC85 10- or 12-bit A/D Converter, you can have a compact 16-channel data acquisition system with 50kHz to 65kHz throughput sampling rates and 0.02 percent (RSS) system accuracy.



SIMULTANEOUS SAMPLE/HOLD

Time correlation of sampled data signals may be implemented by using one sample/hold for each analog signal prior to input to an analog multiplexer. The SHC85 low aperture time of 30nsec practically eliminated channel-to-channel time slew. The throughput sampling rate and the number of data channels will determine the maximum Hold time and hence, the worst-case droop error of the sample/hold in the last channel to be sampled prior to the next "refresh" or sample/hold command. This droop error may be minimized by adding external capacitance to the SHC85 as shown in Figure 3.

The droop error is computed by:

$$\text{MAX DROOP ERROR (CHANNEL N)} = (T \times n) \text{ (Droop rate)}$$

Where $T = 1/\text{System Sampling Rate}$ and $n = \text{number of multiplexer data channels}$.

EXAMPLE:

For a 10-bit, 32-channel system with throughput sample rate of 50kHz, assuming no external capacitance, the droop error of channel N is:

$$\text{Droop Error (E}_D\text{)} = [(1/50\text{k}\Omega) \times 32] [(500 \times 10^{-3})] = 320\mu\text{V}$$

For $\pm 10\text{V}$ input signal range and 10-bit resolution, the resolution of $\pm 1/2\text{LSB}$ is $\pm 9.77\text{mV}$. This droop error is less than 0.016LSB (negligible), and no external C need be added to reduce the droop of the SHC85.