

# SHM-5

## Ultra-Fast, 0.01% Sample-Hold



T-73-65

### FEATURES

- 200 Nanoseconds acquisition to 0.1%
- 350 Nanoseconds acquisition to 0.01%
- 5 MHz Bandwidth
- 0.005% Linearity
- 250 Picoseconds aperture uncertainty

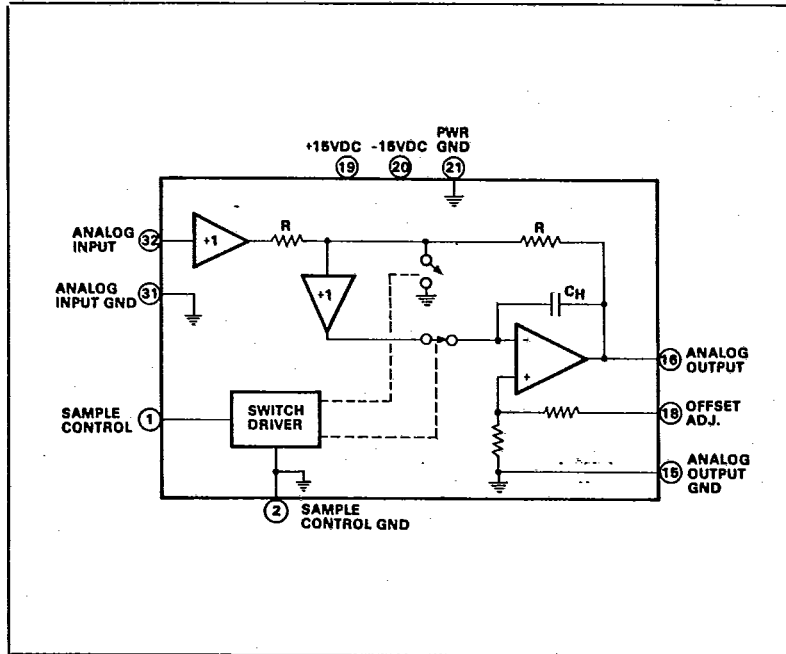
### GENERAL DESCRIPTION

Model SHM-5 is a new, ultra-fast acquisition sample-hold module for use with high speed 10- and 12-bit A/D converters. When used with DATEL's model ADC-EH12B3, a 12-bit, 2 microseconds A/D, the SHM-5 permits sampling and conversion at rates up to 425 kHz. The key circuit element in the SHM-5 is an ultra-fast settling hybrid operational amplifier manufactured in DATEL's thin-film hybrid facility. This amplifier operates in the inverting mode as a hold amplifier. A fast FET sampling switch operates between two virtual ground points in order to keep switching errors small and independent of signal level. A second FET switch operates out-of-phase with the first one to minimize signal feed-through errors.

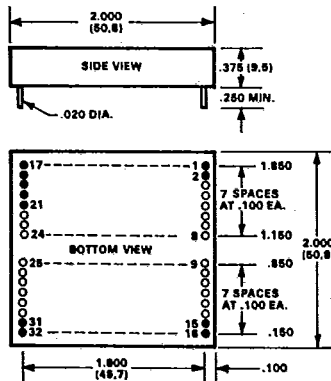
The SHM-5 is designed primarily for fast track & hold and simultaneous sampling applications with A/D converters. From the tracking mode it realizes acquisition times of 200 nanoseconds to 0.1% or 350 microseconds to 0.01% for a 10V change. When the input buffer amplifier must also make a 10V change, as in multiplexer applications, the total acquisition time is 1 microsecond to 0.01%.

The SHM-5 operates in the inverting mode with a gain of -1 and an input impedance of  $10^8$  ohms. Dynamic characteristics include a 5 MHz small signal bandwidth, and 25V/microseconds slew rate in the sampling (tracking) mode. When acquiring a new sample, however, the internal slew rate across the holding capacitor is 200V/microseconds. Aperture delay time is 20 nanoseconds and aperture uncertainty time is 250 picoseconds.

This device is packaged in a 2 x 2 x 0.357 inch epoxy encapsulated module. Operating temperature range is 0°C to +70°C and power requirement is  $\pm 15V$  dc at 75 mA maximum. The SHM-5 is pin compatible with DATEL's model SHM-UH3.



### MECHANICAL DIMENSIONS INCHES (MM)



### INPUT/OUTPUT CONNECTIONS

PIN	FUNCTION
1	SAMPLE CONTROL
2	SAMPLE CONTROL GND
15	ANALOG OUTPUT GND
16	ANALOG OUTPUT
17	NO CONNECTION
18	OFFSET ADJ.
19	+15V POWER
20	-15V POWER
21	POWER GND
31	ANALOG INPUT GND
32	ANALOG INPUT



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**FUNCTIONAL SPECIFICATIONS**

Typical at 25°C, ±15V supply unless otherwise noted.

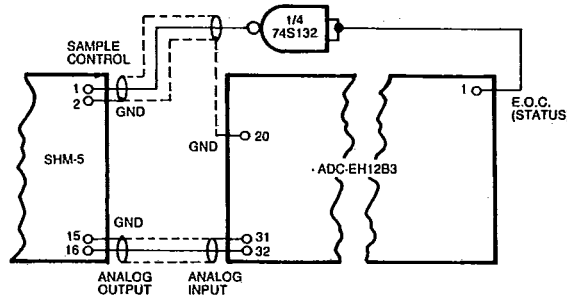
<b>INPUTS</b>	
Input Voltage Range .....	±10V minimum
Input Overvoltage, no damage .....	±15V
Input Impedance .....	10 <sup>8</sup> ohms
Input Bias Current .....	250 nA maximum
Sample Control, sample mode .....	+2.0 to +5.5V
hold mode .....	0V to +0.8V
Sample Control Loading .....	+1 mA
Offset Adjustment Range .....	±300 mV
<b>OUTPUT</b>	
Output Voltage Range, minimum .....	±10V
Output Current, S.C. protected .....	±40 mA
Output Impedance .....	0.1 Ω maximum
<b>PERFORMANCE</b>	
Gain .....	-1.000 ± 0.1%
Gain Temp. Coefficient .....	±15 ppm/°C maximum
Output Offset Voltage, sample mode .....	±50 mV maximum
Output Offset Voltage Drift .....	±30 μV/°C maximum
Sample to Hold Offset Error .....	±5 mV maximum
Tracking Nonlinearity .....	±0.005% maximum
Hold Mode Droop .....	20 μV/μsec. maximum
Hold Mode Feedthrough, DC-500 kHz .....	0.02%
Output Offset vs Supply .....	1 mV/V
<b>DYNAMIC RESPONSE</b>	
Acquisition Time <sup>1</sup> , 10V to 0.1% .....	200 nsec. maximum
Acquisition Time <sup>1</sup> , 10V to 0.01% .....	350 nsec. maximum
Acquisition Time <sup>2</sup> , 10V to 0.01% .....	1.0 μsec. typical
Bandwidth, tracking, -3 dB .....	5 MHz
Slew Rate, tracking .....	25V/μsec.
Aperture Delay Time .....	20 nsec.
Aperture Uncertainty Time .....	250 psec.
<b>POWER REQUIREMENTS</b>	
Power Supply Voltage .....	±15V dc ±0.5V
Quiescent Current .....	75 mA maximum
<b>PHYSICAL/ENVIRONMENTAL</b>	
Operating Temp. Range .....	0°C to +70°C
Storage Temp. Range .....	-55°C to +85°C
Relative Humidity .....	Up to 100% non-condensing
Case Size .....	2.0 x 2.0 x 0.375 in, 50.8 x 50.8 x 9.5 mm
Case Material .....	Black diallyl phthalate per MIL-M-14
Pins .....	0.020" round, gold plated; 0.25" long minimum
Weight .....	2 ounces (57 grams)
<b>FOOTNOTES:</b>	
1. From tracking mode.	
2. From input buffer.	

**TECHNICAL NOTES**

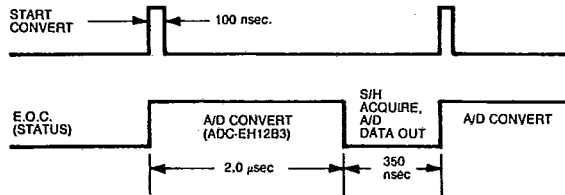
1. The SHM-5 initial gain error of ±0.1% must be adjusted out separately from the sample hold. This is most easily done by using the gain adjust of the A/D converter used with the SHM-5.
2. The maximum sample-to-hold offset error of 5 mV is constant with signal level. This error can be adjusted out in the hold mode by means of the external offset adjustment shown in the diagram. It should be noted that the SHM-5 can be adjusted for zero output offset in either the sample (tracking) mode or the hold mode, but not in both at the same time.
3. The sample control input is compatible with standard TTL levels. It is recommended that this input be driven from its own active pull-up Schottky TTL circuit, such as the 74S132. This will readily supply the +1 mA drive current required by the SHM-5.
4. The analog signal delay from the input of the SHM-5 to the sampling switch is approximately 32 nanoseconds. Aperture delay is 20 nanoseconds.
5. When the SHM-5 is switched into the hold mode, about 50 nanoseconds is required for the switch transient to settle. This time should be allowed for before the first A/D conversion is made.



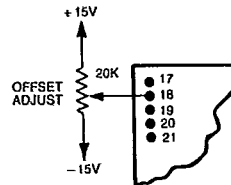
**CONNECTION TO ADC-EH12B3**



**TIMING DIAGRAM**



**OFFSET ADJUSTMENT**



**ORDERING INFORMATION**

SHM-5

**ACCESSORIES**

Part Number	Description
DILS-2	Mating Sockets: (2 per module)
TP20K	Trimming Potentiometer