



**FEATURES**

- Fast acquisition time:  
10ns to  $\pm 0.1\%$   
25ns to  $\pm 0.012\%$   
35ns to  $\pm 0.003\%$

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- $\pm 0.0012\%$  Nonlinearity

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- 65 $\mu$ V rms output noise

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- 60MHz full power bandwidth

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- -80dB feedthrough

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- 1ps Aperture jitter

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- Low cost & power (275mW power dissipation)

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- Packaged in a hermetic ceramic LCC package (0.420 X 0.420 inches)

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- Both full 883 and LM/QL versions available

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- RoHS compliant version available

**GENERAL DESCRIPTION**

The SHM-14 is an extremely high-speed and accurate sample-and-hold amplifier designed for fast data acquisition applications. The SHM-14 is accurate ( $\pm 0.5$  LSB to 14-bit over the full military temperature range) and is very fast (25ns and 35ns acquisition times to accuracies of 12 and 14 bits respectively). With this high performance and a full power bandwidth of 60MHz, the SHM-14 is an ideal device for high resolution data acquisition systems.

Careful design optimizes the device for accuracy and speed over the full military temperature range. Operating from  $\pm 5$ V supplies, the SHM-14 consumes only 275mW of power and has high drive capability. The SHM-14 is available with solder dipped leads in both military and commercial temperature ranges. RoHS compliant versions are also available if required. The device is packaged in a 16-pin hermetically sealed ceramic LCC package.

**INPUT/OUTPUT CONNECTIONS**

PIN	FUNCTION	PIN	FUNCTION
1	-5V SUPPLY	16	SAMPLE/HOLD
2	GROUND	15	SAMPLE/HOLD
3	ANALOG INPUT	14	+5V SUPPLY
4	GROUND	13	NC
5	-5V SUPPLY	12	GROUND
6	GROUND	11	+5V SUPPLY
7	GROUND	10	+5V SUPPLY
8	-5V SUPPLY	9	ANALOG OUTPUT

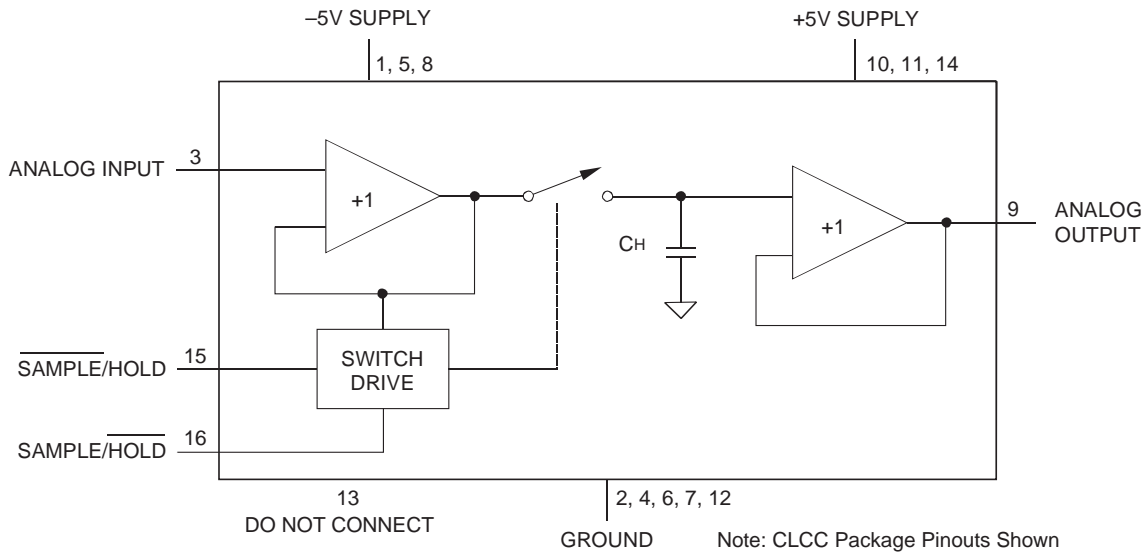


Figure 1. SHM-14 Functional Block Diagram

### ABSOLUTE MAXIMUM RATINGS

PARAMETERS	LIMITS	UNITS
+5V Supply	0 to +6	Volts
-5V Supply	0 to -6	Volts
Analog Input	+5V Supply -1 -5V Supply +1	Volts
Continuous Output Current	±50	mA
Digital Inputs	<Supply Voltages	Volts
Junction Temperature	+175	°C
Lead Temperature (10 seconds)	+300	°C

Output shorted to any supply will cause permanent damage.

### FUNCTIONAL SPECIFICATIONS

(Apply over the 0°C to +70°C operating temperature range and ±5V nominal supplies, unless specified.)

INPUTS	MIN.	TYP.	MAX.	UNITS
Input Voltage Range	-2	—	+2	Volts
Input Impedance (internal termination)	300	400		Ω
Digital Inputs				
Digital Input Voltage Range	-5	—	+5	Volts
Differential Signal Amplitude	-200	—	—	mV
Input Bias Current	-150	-5	+50	μA
<b>OUTPUTS</b>				
Output Voltage Range	-2	—	+2	Volts
Output Current	±30	—	—	mA
Output Impedance (dc)	—	0.3	1	Ω
<b>PERFORMANCE</b>				
Nonlinearity (±1V)				
+25°C	—	±0.0012	—	%
0°C to +70°C	—	—	±0.002	%
-55 to +125°C	—	—	±0.003	%
Sample Mode Offset				
+25°C	—	±1	—	mV
0°C to +70°C	—	—	±5	mV
-55 to +125°C	—	—	±10	mV
Pedestal				
+25°C	—	±3	—	mV
0°C to +70°C	—	—	±40	mV
-55 to +125°C	—	—	±40	mV
Gain				
Gain Drift (±1V), +25°C				
0°C to +70°C	+0.998	—	+1.002	V/V
-55 to +125°C	+0.996	—	+1.004	V/V
Aperture Delay				
0°C to +70°C	—	2	—	ns
-55 to +125°C	—	2	—	ns
Aperture Jitter				
0°C to +70°C	—	1	—	ps rms
-55 to +125°C	—	1	—	ps rms
Harmonic Distortion (±1V)				
dc to 1MHz				
—	—	-77	—	dB
dc to 10MHz				
+25°C	—	-65	—	dB
0°C to +70°C	—	—	-58	dB
-55 to +125°C	—	—	-55	dB
Acquisition Time (±0.012%, ±2V)				
0°C to +70°C	—	25	—	ns
-55 to +125°C	—	35	—	ns
Acquisition Time (±0.024%, ±2V)				
0°C to +70°C	—	20	35	ns

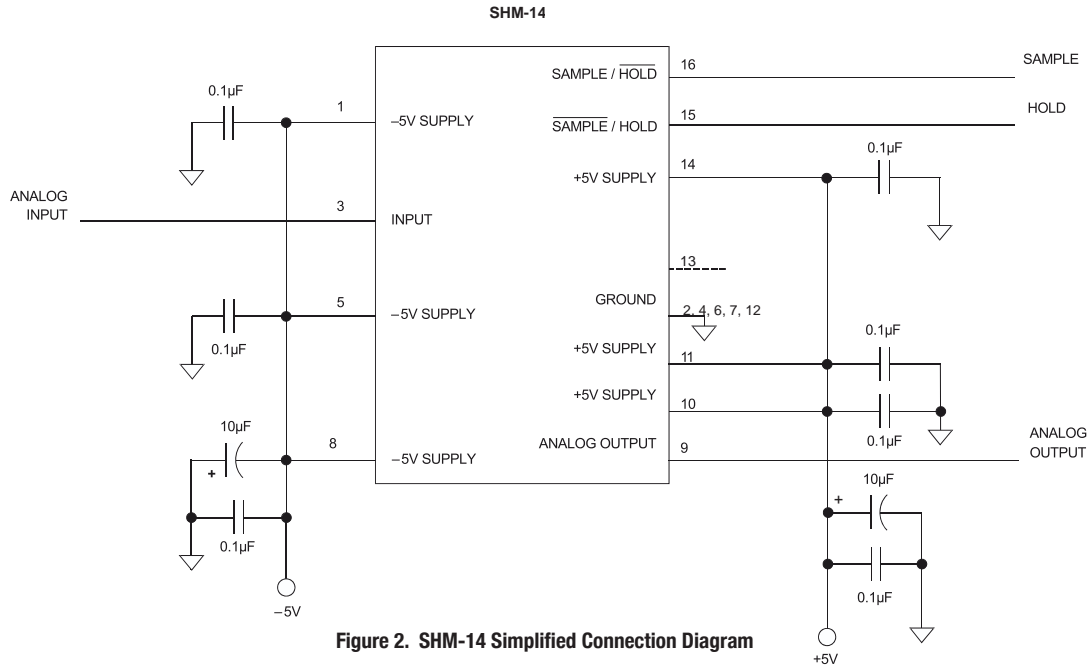
—55 to +125°C	—	25	40	ns
PERFORMANCE (CONT.)	MIN.	TYP.	MAX.	UNITS
Acquisition Time (±0.05%, ±2V)				
0°C to +70°C	—	19	30	ns
-55 to +125°C	—	20	35	ns
Acquisition Time (±0.1%, ±2V)				
0°C to +70°C	—	10	16	ns
-55 to +125°C	—	10	19	ns
Hold Mode Settling (±0.012%)				
0°C to +70°C	—	12	—	ns
-55 to +125°C	—	15	—	ns
Hold Mode Settling (±0.024%)				
0°C to +70°C	—	7	18	ns
-55 to +125°C	—	7	18	ns
Hold Mode Settling (±0.05%)				
0°C to +70°C	—	6	16	ns
-55 to +125°C	—	6	16	ns
Hold Mode Settling (±0.1%)				
0°C to +70°C	—	5	12	ns
-55 to +125°C	—	5	12	ns
Slew Rate	±500	±600	—	V/μs
Full Power Bandwidth (±1V)	45	60	—	MHz
Small Signal Bandwidth	50	65	—	MHz
Output Noise, Hold Mode	—	65	—	μVrms
Feedthrough (2V Step)	—	-80	—	dB
Droop Rate				
+25°C	—	±2	±6	mV/μs
0°C to +70°C	—	±2	±10	mV/μs
-55 to +125°C	—	±2	±15	mV/μs
<b>POWER SUPPLY REQUIREMENTS</b>				
Power Supply Range				
+5V Supply	+4.5	+5	+5.5	Volts
-5V Supply	-5.5	-5	-4.5	Volts
Power Supply Current (no load)				
+5V Supply				
0°C to +70°C	—	+30	+50	mA
-55 to +125°C	—	+30	+55	mA
-5V Supply				
0°C to +70°C	—	-25	-35	mA
-55 to +125°C	—	-25	-40	mA
Power Dissipation				
0°C to +70°C	—	275	425	mW
-55 to +125°C	—	275	475	mW
Power Supply Rejection Ratio	40	60	—	dB
<b>ENVIRONMENTAL</b>				
Operating Temp. Range, case				
SHM-14LC	0	—	+70	°C
SHM-14LM	-55	—	+125	°C
Storage Temperature Range	-65	—	+150	°C
Package Type				
SHM-14LC	CLCC			
SHM-14LM	CLCC			

**GROUNDING AND LAYOUT**

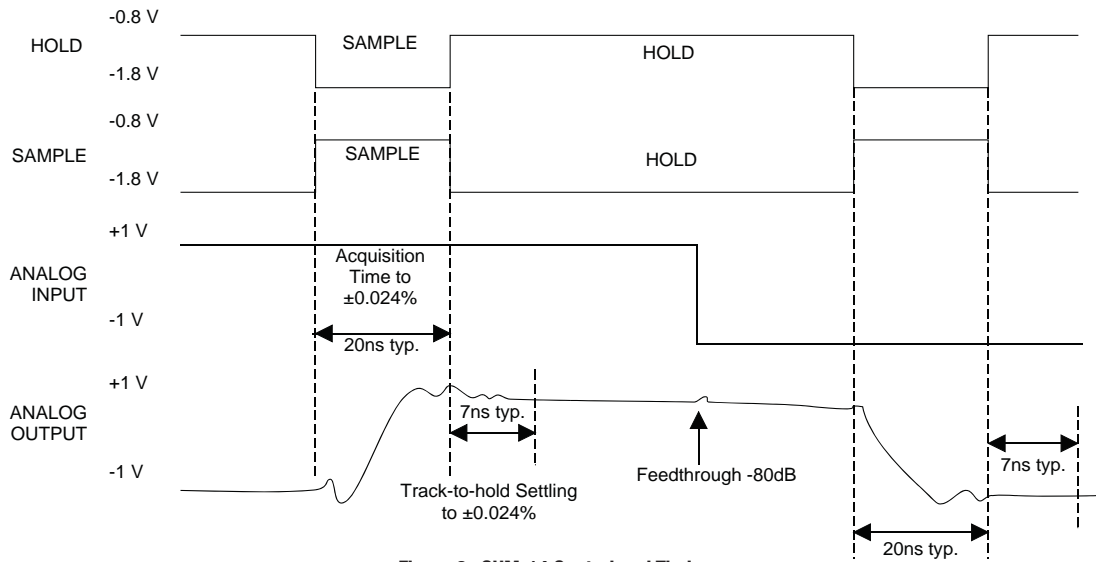
Obtaining fully specified performance from the SHM-14 requires careful attention to pc-board layout and power supply decoupling.

For optimal performance, tie all grounds directly to a large analog ground plane beneath and around the package. Bypass all power supplies to ground with 10µF tantalum capacitors in parallel with 0.1µF ceramic capacitors. Locate the bypass capacitors as close to the unit as possible.

For best performance, controlled impedance transmission line techniques, such as microstrip, should be used. Mount all components as close to the required pins as possible. It is strongly recommended that the SHM-14 not be socket-mounted.

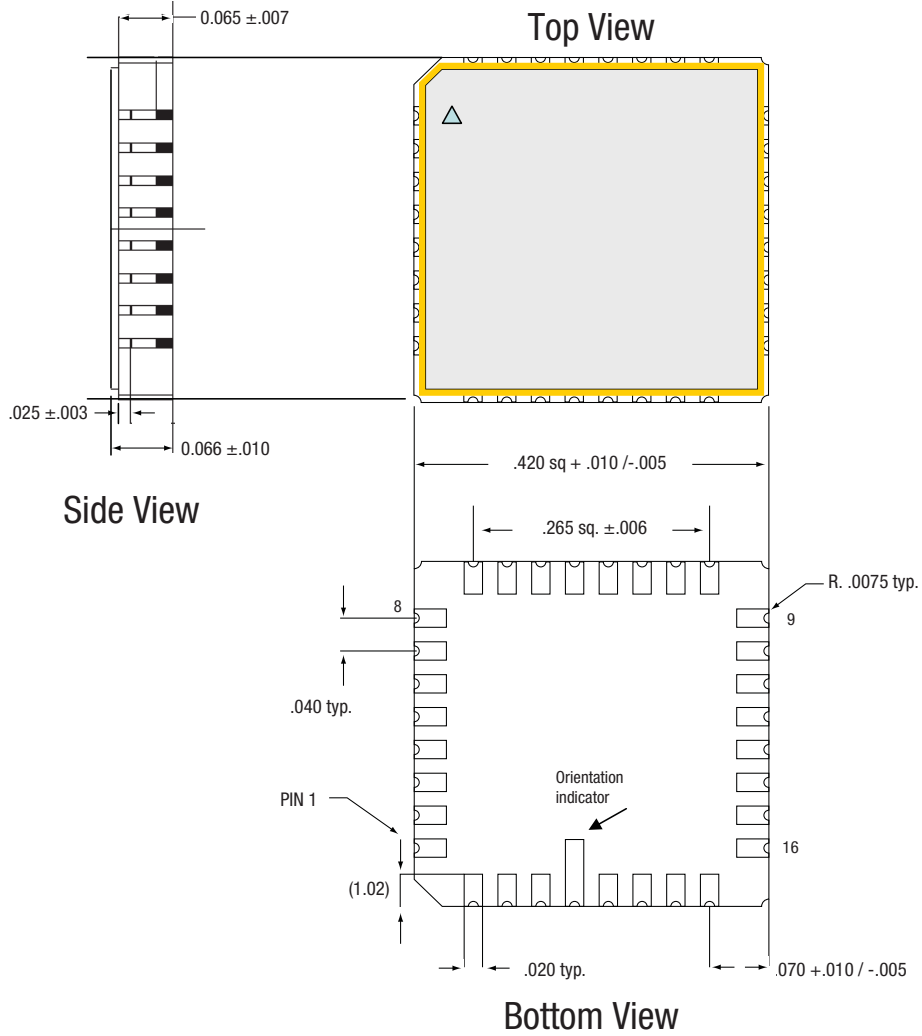


**Figure 2. SHM-14 Simplified Connection Diagram**

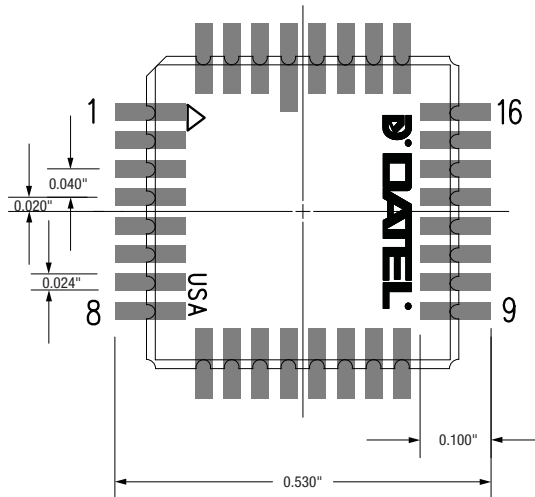


**Figure 3. SHM-14 Control and Timing**

**CLCC Package**



**Recommended LCC Pad Layout**



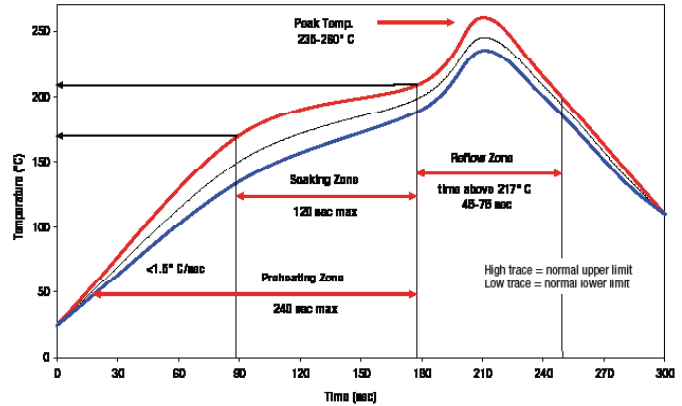
**Recommended Soldering Guidelines**

**SOLDERING GUIDELINES**

DATEL recommends the specifications below when installing these converters. These specifications vary depending on the solder type. Exceeding these specifications may cause damage to the product. Your production environment may differ therefore please thoroughly review these guidelines with your process engineers.

REFLOW SOLDER OPERATIONS FOR SURFACE-MOUNT PRODUCTS (SMT)	
For Sn/Ag/Cu based solders:	
Preheat Temperature	Less than 1 °C. per second
Time over Liquidus	45 to 75 seconds
Maximum Peak Temperature	260 °C.
Cooling Rate	Less than 3 °C. per second
For Sn/Pb based solders:	
Preheat Temperature	Less than 1 °C. per second
Time over Liquidus	60 to 75 seconds
Maximum Peak Temperature	235 °C.
Cooling Rate	Less than 3 °C. per second

**RECOMMENDED LEAD-FREE SOLDER REFLOW PROFILE**



**PRODUCT ORDERING INFORMATION**

MODEL NUMBER	TEMPERATURE RANGE	PACKAGE	ROHS
SHM-14LC	0°C to +70°C	16-PIN LCC	No
SHM-14LM	-55°C to +125°C	16-PIN LCC	No
SHM-14/883	-55°C to +125°C	16-PIN LCC	No
SHM-14LC-C	0°C to +70°C	16-PIN LCC	Yes
SHM-14LM-C	-55°C to +125°C	16-PIN LCC	Yes

Please contact Datel if you require a special or custom solution derived from this product.

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