



**FEATURES**

- 200ns Maximum acquisition time
- $\pm 0.01\%$  Accuracy
- 100ns Maximum sample-hold settling time
- 74dB Feedthrough attenuation
- $\pm 50\text{ps}$  Aperture uncertainty
- Industry standard

**PRODUCT OVERVIEW**

DATEL's SHM-4860 is a high-speed, highly accurate sample hold amplifier designed for precision, high-speed analog signal processing applications. Manufactured using modern, high quality hybrid technology, the SHM-4860 features excellent dynamic specifications including a maximum acquisition time of only 200ns for a 10V step to  $\pm 0.01\%$ . Sample-to-hold settling time, to  $\pm 0.01\%$  accuracy, is 100ns maximum with an aperture uncertainty of  $\pm 50\text{ps}$ .

The SHM-4860 is a complete sample-hold circuit, containing a precision MOS hold capacitor and a MOSFET switching configuration which results in faster switching and better feedthrough attenuation. Additionally, a FET-input amplifier design allows faster acquisition and settling times while maintaining a considerably lower droop rate.

**SIMPLIFIED SCHEMATIC**

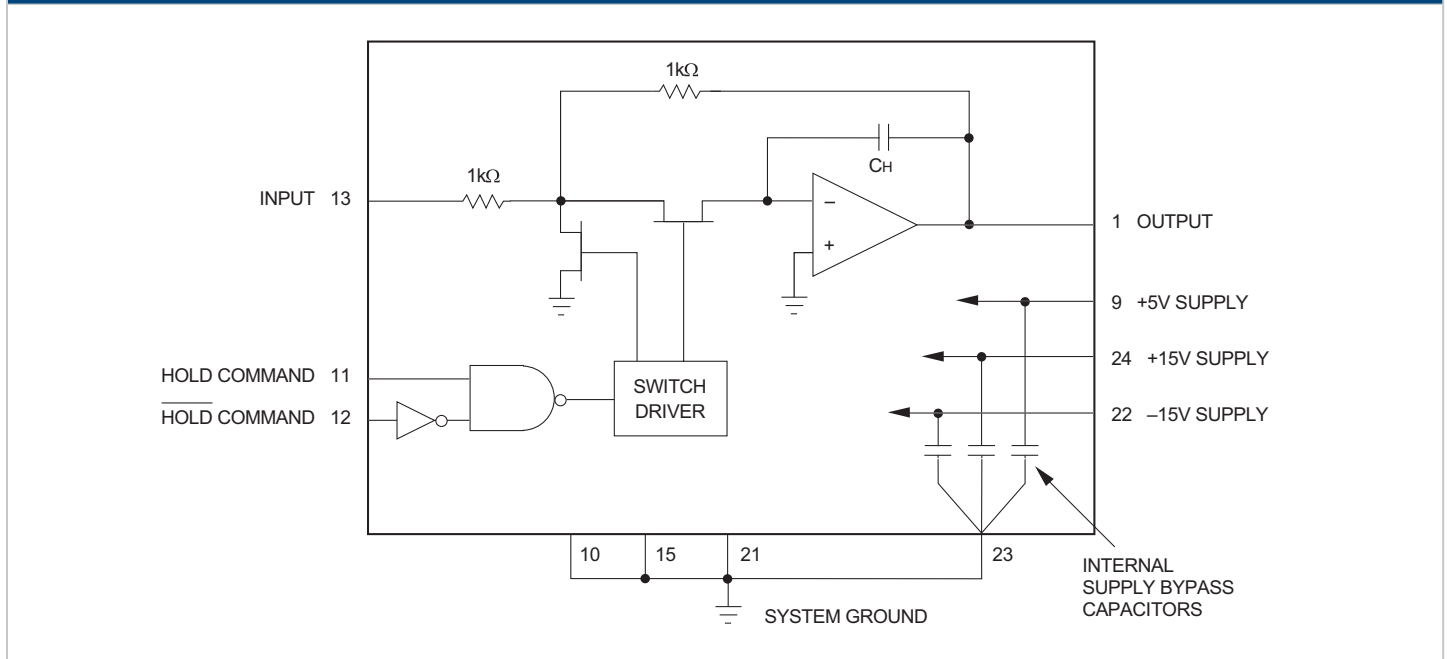


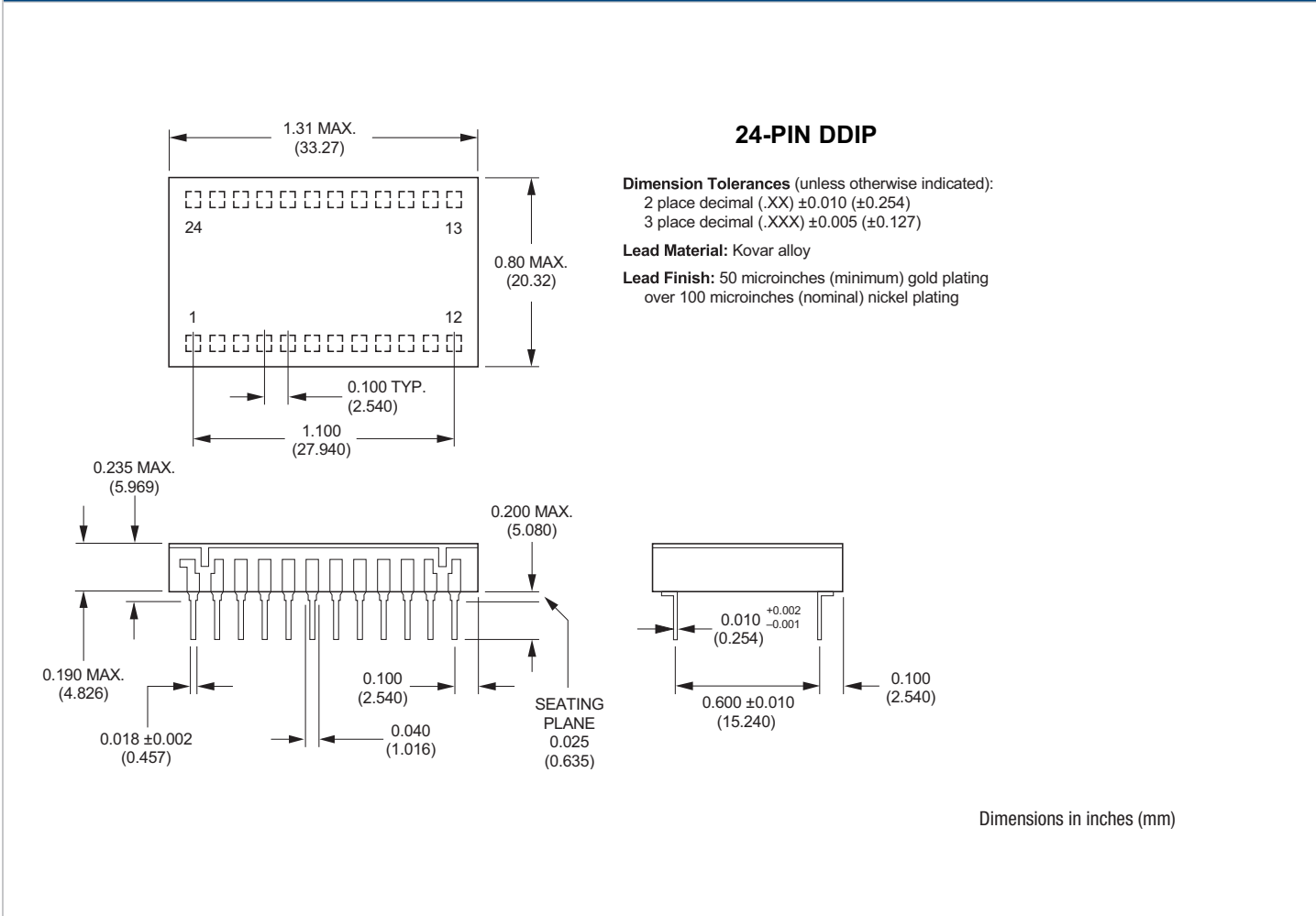
Figure 1. Functional Block Diagram



| ORDERING GUIDE SUMMARY |                             |
|------------------------|-----------------------------|
| Model Number           | Operating Temperature Range |
| SHM-4860MC             | 0 to +70°C                  |
| SHM-4860MM             | -55 to +125°C               |
| SHM-4860/883           | -55 to +125°C               |

| INPUT/OUTPUT CONNECTIONS |              |     |             |
|--------------------------|--------------|-----|-------------|
| PIN                      | FUNCTION     | PIN | FUNCTION    |
| 1                        | OUTPUT       | 24  | +15V SUPPLY |
| 2                        | N.C.         | 23  | GROUND      |
| 3                        | N.C.         | 22  | -15V SUPPLY |
| 4                        | N.C.         | 21  | GROUND      |
| 5                        | N.C.         | 20  | N.C.        |
| 6                        | N.C.         | 19  | N.C.        |
| 7                        | N.C.         | 18  | N.C.        |
| 8                        | N.C.         | 17  | N.C.        |
| 9                        | +5V SUPPLY   | 16  | N.C.        |
| 10                       | GROUND       | 15  | GROUND      |
| 11                       | HOLD COMMAND | 14  | N.C.        |
| 12                       | HOLD COMMAND | 13  | INPUT       |

**MECHANICAL SPECIFICATIONS**



| ABSOLUTE MAXIMUM RATINGS               |              |
|--|--------------|
| $\pm 15V$ Supply Voltages, Pins 24, 22 | $\pm 18V$    |
| +5V Supply Voltage, Pin 9              | -0.5V to +7V |
| Analog Input, Pin 13 ①                 | $\pm 18V$    |
| Digital Inputs, Pins 11, 12            | -0.5V to +7V |
| Output Current ②                       | $\pm 65mA$   |

### Functional Specifications

(Typical at +25°C with  $\pm 15V$  and +5V supplies unless otherwise noted.)

| ANALOG INPUT/OUTPUT          |             |             |          |            |
|------------------------------|-------------|-------------|----------|------------|
|                              | MIN.        | TYP.        | MAX.     | UNITS      |
| Input/Output Voltage Range ① | $\pm 10.25$ | $\pm 11.25$ | —        | V          |
| Input Impedance              | —           | 1           | —        | k $\Omega$ |
| Output Current ②             | —           | —           | $\pm 40$ | mA         |
| Output Impedance             | —           | 0.1         | —        | k $\Omega$ |
| Maximum Capacitive Load      | —           | 250         | —        | pF         |

| DIGITAL INPUT     |      |      |      |         |
|-------------------|------|------|------|---------|
|                   | MIN. | TYP. | MAX. | UNITS   |
| Input Logic Level |      |      |      |         |
| Logic "1"         | +2.0 | —    | +5.0 | V       |
| Logic "0"         | 0    | —    | +0.8 | V       |
| Loading           |      |      |      |         |
| Logic "1"         | —    | —    | +40  | $\mu A$ |
| Logic "0"         | —    | —    | -1.6 | mA      |

| TRANSFER CHARACTERISTICS                 |      |             |            |        |
|--|------|-------------|------------|--------|
|  | MIN. | TYP.        | MAX.       | UNITS  |
| Gain                                     | —    | -1          | —          | V/V    |
| Gain Accuracy                            | —    | $\pm 0.05$  | $\pm 0.1$  | %      |
| Gain Linearity Error ③                   | —    | $\pm 0.005$ | $\pm 0.01$ | %FS    |
| Sample-Mode Offset Voltage               | —    | $\pm 0.5$   | $\pm 5$    | mV     |
| Sample-to-Hold Offset Error ④ (Pedestal) | —    | $\pm 2.5$   | $\pm 20$   | mV     |
| Gain Tempco (Drift)                      | —    | $\pm 0.5$   | $\pm 5$    | ppm/°C |
| Sample-Mode Offset Drift                 | —    | $\pm 3$     | $\pm 15$   | ⑤      |
| Sample-to-Hold Offset Drift              | —    | $\pm 4$     | —          | ⑤      |

| DYNAMIC CHARACTERISTICS      |      |      |      |        |
|------------------------------|------|------|------|--------|
| Acquisition Time             |      |      |      |        |
|                              | MIN. | TYP. | MAX. | UNITS  |
| 10V to $\pm 0.01\%$ FS       | —    | 160  | 200  | ns     |
| 10V to $\pm 0.1\%$ FS        | —    | 100  | 170  | ns     |
| 10V to $\pm 1\%$ FS          | —    | 90   | —    | ns     |
| 1V to $\pm 1\%$ FS           | —    | 75   | —    | ns     |
| Sample-to-Hold Settling Time |      |      |      |        |
| 10V to $\pm 0.01\%$ FS       | —    | 60   | 100  | ns     |
| 10V to $\pm 0.1\%$ FS        | —    | 40   | —    | ns     |
| Sample-to-Hold Transient     | —    | 180  | —    | mV p-p |

| DYNAMIC CHARACTERISTICS, Continued |        |           |           |               |
|------------------------------------|--------|-----------|-----------|---------------|
|                                    | MIN.   | TYP.      | MAX.      | UNITS         |
| Aperture Delay Time                | —      | 6         | —         | ns            |
| Aperture Uncertainty (Jitter)      | —      | $\pm 50$  | —         | ps            |
| Output Slew Rate                   | —      | $\pm 300$ | —         | $\mu V/\mu s$ |
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| Small Signal Bandwidth (-3dB)      | —      | 16        | —         | MHz           |
| Droop: +25°C                       | —      | $\pm 0.5$ | $\pm 5$   | $\mu V/\mu s$ |
|                                    | +70°C  | —         | $\pm 15$  | $\mu V/\mu s$ |
|                                    | +125°C | —         | $\pm 1.2$ | mV/ $\mu s$   |
| Feedthrough Attenuation            | —      | 74        | —         | dB            |

| Overload Recovery Time |      |      |      |       |
|------------------------|------|------|------|-------|
|                        | MIN. | TYP. | MAX. | UNITS |
| Positive               | —    | 200  | —    | ns    |
| Negative               | —    | 700  | —    | ns    |

| POWER REQUIREMENTS                |      |           |      |       |
|-----------------------------------|------|-----------|------|-------|
|                                   | MIN. | TYP.      | MAX. | UNITS |
| Voltage Range: $\pm 15V$ Supplies | —    | $\pm 3$   | —    | %     |
| +5V Supply                        | —    | $\pm 5$   | —    | %     |
| Power Supply Rejection Ratio      | —    | $\pm 0.5$ | —    | mV/V  |

| Quiescent Current Drain |      |      |      |       |
|-------------------------|------|------|------|-------|
|                         | MIN. | TYP. | MAX. | UNITS |
| +15V Supply             | —    | +21  | +25  | mA    |
| -15V Supply             | —    | -22  | -25  | mA    |
| +5V Supply              | —    | +17  | +25  | mA    |
| Power Consumption       | —    | 730  | 875  | mW    |

| PHYSICAL/ENVIRONMENTAL       |                      |
|------------------------------|----------------------|
| Operating Temperature Ranges |                      |
| SHM-4860MC                   | 0 to +70°C (ambient) |
| SHM-4860MM, 883              | -55 to +125°C (case) |
| Storage Temperature Range    | -65 to +150°C        |
| Package Type                 | 24-pin ceramic DDIP  |

#### Footnotes:

- ① Input signal should not exceed the supply voltage.
- ② The SHM-4860's output is current limited at approximately  $\pm 65mA$ . The device can withstand a sustained short to ground. However, shorts from the output to either supply will cause permanent damage. For normal operation, the load current should not exceed  $\pm 40mA$ .
- ③ Full Scale (FS) = 10V. Full Scale Range (FSR) = 20V.
- ④ Sample-to-Hold Offset Error (Pedestal) is constant regardless of input/output level.
- ⑤ Units are ppm of FSR/°C.

#### TECHNICAL NOTES

1. All ground pins (10, 15, 21, 23) should be tied together and connected to system analog ground as close to the package as possible. It is recommended to use a ground plane under the device and solder all four ground pins directly to it. Care must be taken to ensure that no ground potentials can exist between Pin 10 and the other ground pins.
2. Although the power supply pins (9, 22, 24) are internally bypassed to ground with 0.01 $\mu F$  ceramic capacitors, additional external 0.1 $\mu F$  to 1 $\mu F$  tantalum bypass capacitors may be required in critical applications.
3. A logic "0" on the HOLD COMMAND input (Pin 11), or a logic "1" on the HOLD COMMAND input (Pin 12), will put the device in the sample mode. In this mode, the device acts as an inverting unity-gain amplifier, and its output will track its input. A logic "1" on Pin 11 (logic "0" on Pin 12) will put the device in the hold mode, and the output will be held constant at the last input level present when the hold command was given. If the HOLD COMMAND input (Pin 11) is used to control the device, Pin 12 must be tied to digital ground. If HOLD COMMAND input (Pin 12) is used to control the device, Pin 11 must be tied to +5V.
4. The maximum capacitive load to avoid oscillation is typically 250pF. Recommended resistive load is 500 $\Omega$ , although values as low as 250 $\Omega$  may be used. Acquisition and sample-to-hold settling times are relatively unaffected by resistive loads down to 250 $\Omega$  and capacitive loads up to 50pF. However, higher capacitances will affect both acquisition and settling time.

