

# M62342HP

## 8-Bit, 2-Channel D/A Converter (Buffered)

REJ03F0271-0100  
Rev.1.00  
Mar 25, 2008

### Description

The M62342HP is a CMOS-structure semiconductor integrated circuit incorporating two 8-bit D/A converter channels with output buffer op-amps.

Serial data transfer type input can easily be used through a combination of three lines: DI, CLK, and LD.

Outputs incorporate buffer op-amps that have a drive capacity of 1 mA or above for both sink and source, and can operate over the entire voltage range from almost ground to  $V_{CC}$  (0 to 5 V), making peripheral elements unnecessary and enabling configuration of a system with few component parts.

This product is currently under development, and specifications and other details may be modified at a future date.

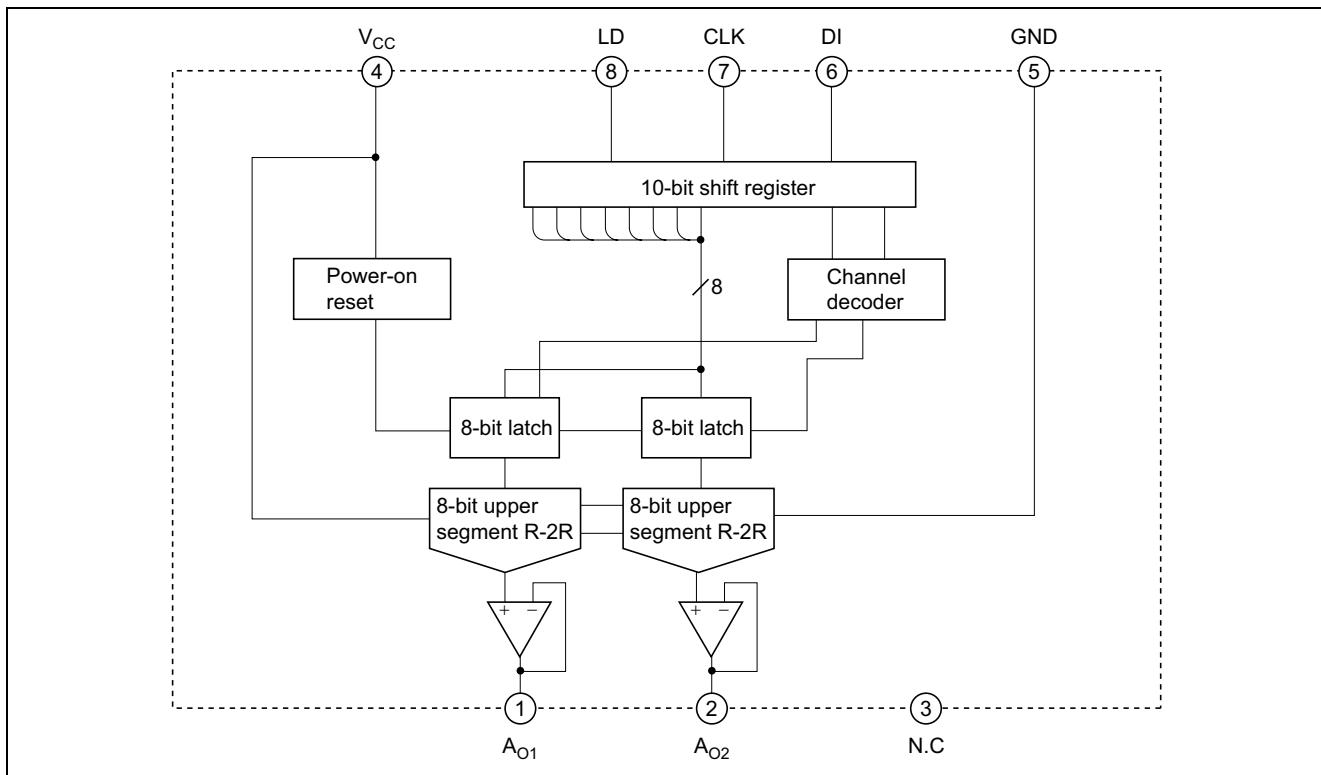
### Features

- Data transfer format  
10-bit serial data input type
- Output buffer op-amps  
Operable over entire voltage range from almost ground to  $V_{CC}$  (0 to 5 V)
- High output current capacity  
±1 mA or higher

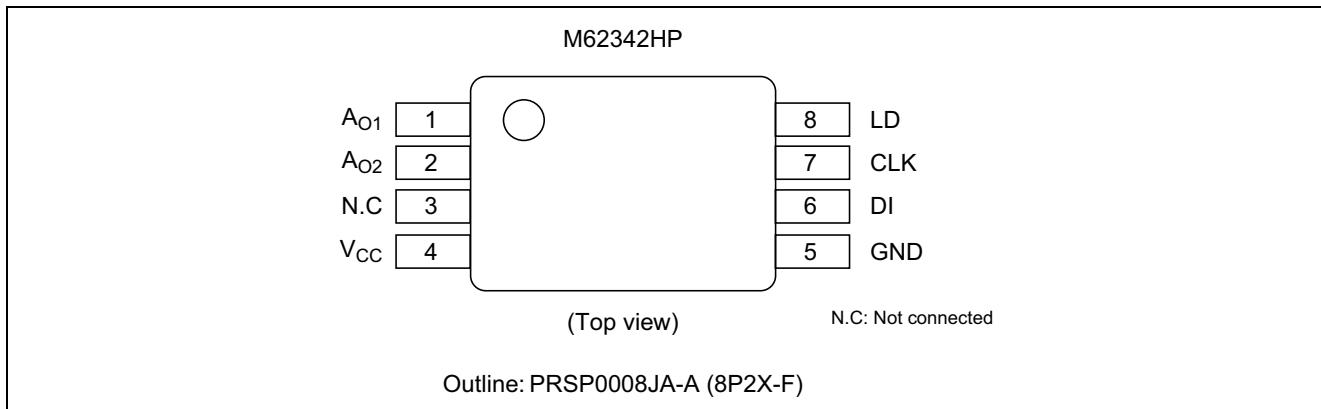
### Application

Signal gain setting and automatic adjustment in DSC, CTV, and display monitors, conversion from digital data to analog data in consumer and industrial products

### Block Diagram



## Pin Arrangement



## Pin Description

| Pin No. | Symbol          | Function  |
|---------|-----------------|---|
| 6       | DI              | Serial data input pin. Inputs serial data with a 10-bit data length.  |
| 7       | CLK             | Serial clock input pin. Input signal from DI pin is input to 10-bit shift register at rise of shift clock.                  |
| 8       | LD              | Load pin. When "H" level is input to LD pin, value in 10-bit shift register is loaded into decoder and D/A output register. |
| 1       | A <sub>01</sub> | 8-bit resolution D/A converter output pins<br>(After power-on, all channels are reset and DAC data 00h is output.)          |
| 2       | A <sub>02</sub> |   |
| 3       | N.C.            | (Not connected)   |
| 4       | V <sub>cc</sub> | Power supply voltage pin  |
| 5       | GND             | GND pin   |

## Absolute Maximum Ratings

| Item                          | Symbol           | Rated Value                        | Unit |
|-------------------------------|------------------|------------------------------------|------|
| Power supply voltage          | V <sub>CC</sub>  | -0.3 to 7.0                        | V    |
| Input voltage                 | V <sub>IN</sub>  | -0.3 to V <sub>CC</sub> +0.3 ≤ 7.0 | V    |
| Output voltage                | V <sub>O</sub>   | -0.3 to V <sub>CC</sub> +0.3 ≤ 7.0 | V    |
| Internal power consumption    | P <sub>D</sub>   | 200                                | mW   |
| Operating ambient temperature | T <sub>OPR</sub> | -20 to +85                         | °C   |
| Storage temperature           | T <sub>STG</sub> | -40 to +125                        | °C   |

## Electrical Characteristics

(Unless specified otherwise, V<sub>CC</sub> = +5 V ±10%, GND = 0 V, Ta = -20°C to 85°C)

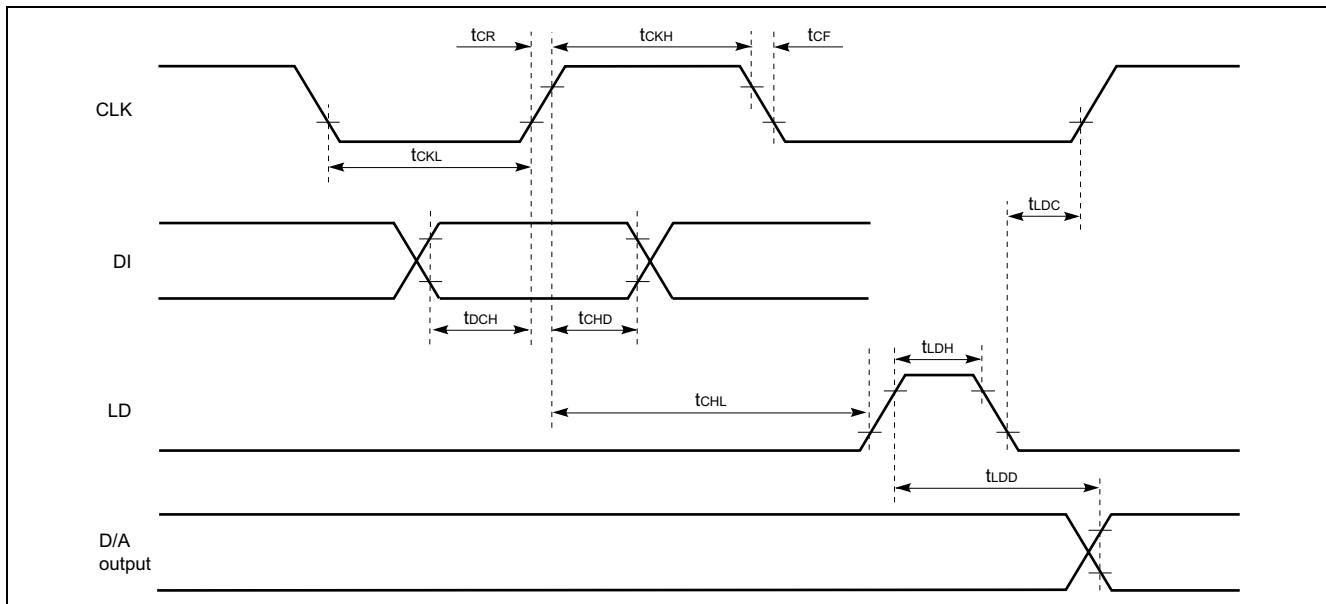
| Item                                 | Symbol            | Specification Values |     |                      | Unit | Test Conditions   |
|--------------------------------------|-------------------|----------------------|-----|----------------------|------|---|
|                                      |                   | Min                  | Typ | Max                  |      |   |
| Power supply voltage                 | V <sub>CC</sub>   | 2.7                  | 5.0 | 5.5                  | V    |   |
| Power supply current                 | I <sub>CC</sub>   | —                    | 0.7 | 2.5                  | mA   | At CLK = 1 MHz operation, I <sub>AO</sub> = 0 μA<br>D/A data: 6 Ah (at maximum current) |
|                                      |                   | —                    | 0.5 | 1.6                  |      | DI = CLK = LD = GND, I <sub>AO</sub> = 0 μA   |
| Input leakage current                | I <sub>ILK</sub>  | -10                  | —   | 10                   | μA   | V <sub>IN</sub> = 0 to V <sub>CC</sub>  |
| Input voltage "L"                    | V <sub>IL</sub>   | 0                    | —   | 0.2V <sub>CC</sub>   | V    |   |
| Input voltage "H"                    | V <sub>IH</sub>   | 0.5V <sub>CC</sub>   | —   | V <sub>CC</sub>      | V    |   |
| Buffer amp output voltage range      | V <sub>AO</sub>   | 0.1                  | —   | V <sub>CC</sub> -0.1 | V    | I <sub>AO</sub> = ±100 μA   |
|                                      |                   | 0.1                  | —   | V <sub>CC</sub> -0.2 |      | I <sub>AO</sub> = ±500 μA   |
| Buffer amp output drive range        | I <sub>AO</sub>   | -1.0                 | —   | 1.0                  | mA   | Upper saturation voltage = 0.3 V<br>Lower saturation voltage = 0.2 V                    |
| Differential nonlinearity error      | S <sub>DL</sub>   | -1.0                 | —   | 1.0                  | LSB  | V <sub>CC</sub> = 5.12 V (20 mV/LSB)<br>No load (I <sub>AO</sub> = 0)                   |
| Nonlinearity error                   | S <sub>L</sub>    | -1.5                 | —   | 1.5                  | LSB  |   |
| Zero point error                     | S <sub>ZERO</sub> | -2.0                 | —   | 2.0                  | LSB  |   |
| Full-scale error                     | S <sub>FULL</sub> | -2.0                 | —   | 2.0                  | LSB  |   |
| Oscillation limit output capacitance | C <sub>O</sub>    | —                    | —   | 0.1                  | μF   |   |
| Buffer amp output impedance          | R <sub>O</sub>    | —                    | 5.0 | —                    | Ω    |   |

## AC Characteristics

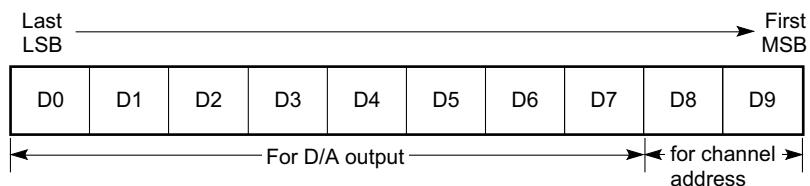
(Unless specified otherwise, V<sub>CC</sub> = +5 V ±10%, GND = 0 V, Ta = -20°C to 85°C)

| Item                     | Symbol           | Specification Values |     |     | Unit | Test Conditions                   |
|--------------------------|------------------|----------------------|-----|-----|------|-----------------------------------|
|                          |                  | Min                  | Typ | Max |      |                                   |
| Clock "L" pulse width    | t <sub>CKL</sub> | 200                  | —   | —   | ns   |                                   |
| Clock "H" pulse width    | t <sub>CKH</sub> | 200                  | —   | —   | ns   |                                   |
| Clock rise time          | t <sub>CR</sub>  | —                    | —   | 200 | ns   |                                   |
| Clock fall time          | t <sub>CF</sub>  | —                    | —   | 200 | ns   |                                   |
| Data setup time          | t <sub>DCH</sub> | 30                   | —   | —   | ns   |                                   |
| Data hold time           | t <sub>CHD</sub> | 60                   | —   | —   | ns   |                                   |
| Load setup time          | t <sub>CHL</sub> | 200                  | —   | —   | ns   |                                   |
| Load hold time           | t <sub>LDC</sub> | 100                  | —   | —   | ns   |                                   |
| Load "H" pulse width     | t <sub>LDH</sub> | 100                  | —   | —   | ns   |                                   |
| D-A output settling time | t <sub>LDD</sub> | —                    | —   | 300 | μs   | Until output reaches last 1/2 LSB |

## Timing Chart



## Digital Data Format



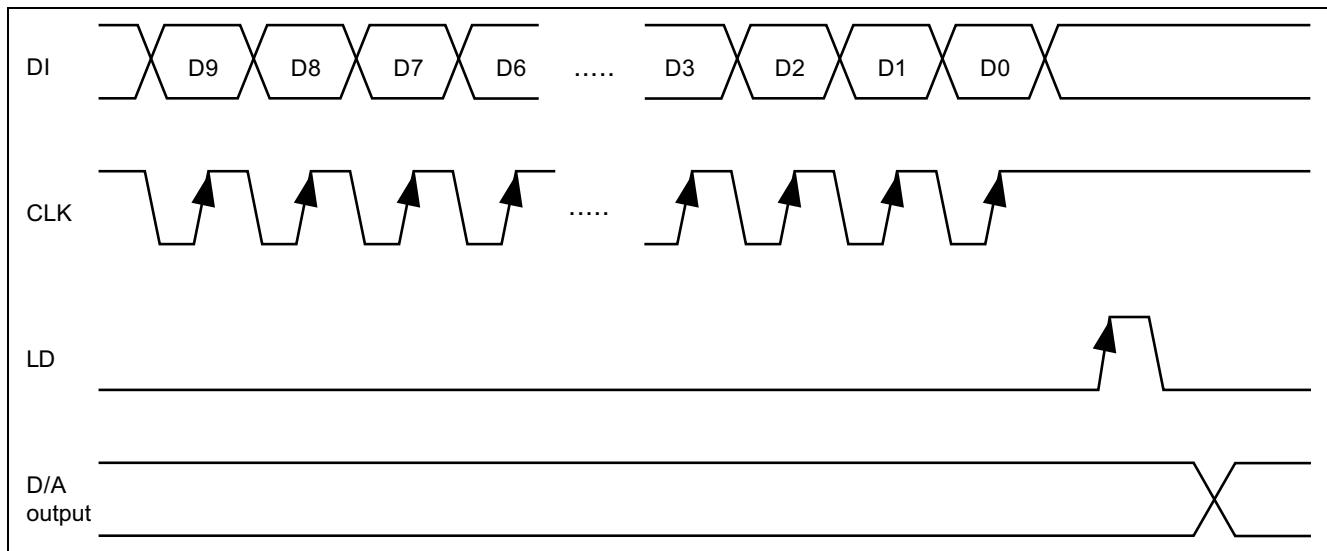
## D/A Data

| D0 | D1 | D2 | D3 | D4 | D5 | D6 | D7 | D-A output              |
|----|----|----|----|----|----|----|----|-------------------------|
| 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | $V_{CC}/256 \times 1$   |
| 1  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | $V_{CC}/256 \times 2$   |
| 0  | 1  | 0  | 0  | 0  | 0  | 0  | 0  | $V_{CC}/256 \times 3$   |
| 1  | 1  | 0  | 0  | 0  | 0  | 0  | 0  | $V_{CC}/256 \times 4$   |
| ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮                       |
| ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮                       |
| 0  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | $V_{CC}/256 \times 255$ |
| 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | $V_{CC}/256 \times 256$ |

## Channel Select Data

| D8 | D9 | Channel Selection |
|----|----|-------------------|
| 0  | 0  | AO1 selected      |
| 1  | 0  | AO2 selected      |
| 0  | 1  | Don't care        |
| 1  | 1  | Don't care        |

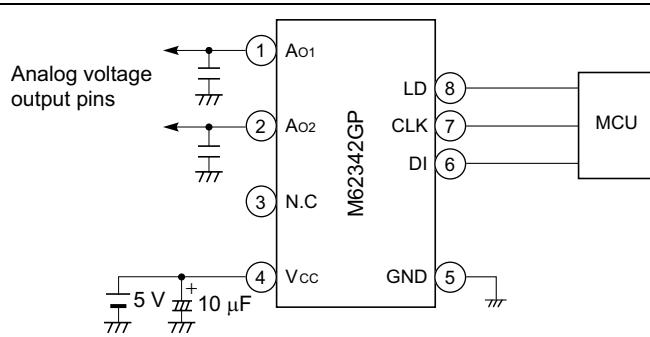
## Data Timing Chart (Model)



## Usage Notes

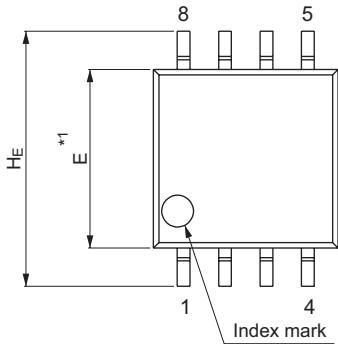
1. With this IC, D/A converter upper reference voltage setting is performed by means of the power supply voltage. If ripples or spikes are imposed on this pin, conversion accuracy may fall. When using this IC, a capacitor must be inserted between the power supply pin and GND in order to ensure stable D/A conversion.
2. The output buffer amps of this IC are highly tolerant of capacitive loads. Therefore, connecting capacitors (0.1  $\mu$ F max.) between the output pins and ground in order to eliminate jitter or noise due to output line wiring presents no problems whatever in terms of operation.

## Sample Standard Application Circuit

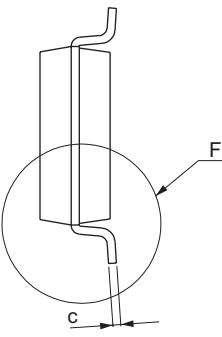


## Package Dimensions

| Package Name | JEITA Package Code    | RENESAS Code | Previous Code | MASS[Typ.] |
|--------------|-----------------------|--------------|---------------|------------|
| SOP-8        | P-SOP8-2.8 x 2.9-0.65 | PRSP008JA-A  | 8P2X-F        | 0.022g     |



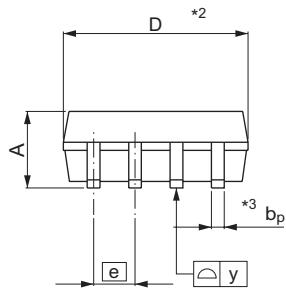
Top view of the SOP-8 package. Lead numbers 1 through 8 are indicated. An index mark is shown at the bottom left. Dimensions  $H_E$  and  $*1$  are indicated on the left side.



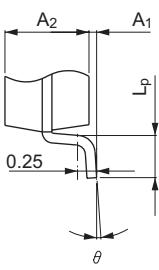
Detail F shows the lead profile. Lead angle  $\theta$  is indicated, and lead thickness is  $c$ . Dimension  $F$  is also shown.

NOTE)

1. DIMENSIONS \*\*1" AND \*\*2" DO NOT INCLUDE MOLD FLASH.
2. DIMENSION \*\*3" DOES NOT INCLUDE TRIM OFFSET.



Side view of the SOP-8 package. Lead thickness is  $b_p$ , lead angle is  $\theta$ , and lead length is  $L_p$ . Dimensions  $A$ ,  $D$ ,  $E$ ,  $A_1$ ,  $A_2$ , and  $*2$  are also indicated.



Detail F shows the lead profile. Lead angle  $\theta$  is indicated, and lead thickness is  $c$ . Dimension  $A_1$  is also shown.

| Reference Symbol | Dimension in Millimeters |       |            |
|------------------|--------------------------|-------|------------|
|                  | Min                      | Nom   | Max        |
| $D$              | 2.8                      | 2.9   | 3.1        |
| $E$              | 2.6                      | 2.8   | 3.0        |
| $A_2$            | —                        | 1.1   | —          |
| $A_1$            | 0.05                     | 0.10  | 0.20       |
| $A$              | —                        | —     | 1.4        |
| $b_p$            | 0.1                      | 0.2   | 0.3        |
| $c$              | 0.077                    | 0.127 | 0.227      |
| $\theta$         | $0^\circ$                | —     | $10^\circ$ |
| $H_E$            | 3.7                      | 4.0   | 4.3        |
| $\square e$      | —                        | 0.65  | —          |
| $y$              | —                        | —     | 0.1        |
| $L_p$            | 0.35                     | 0.55  | 0.75       |

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