

# Wideband Video Buffer



## LH4002A / LH4002 / LH4002C

### FEATURES

- DC to 300 MHz Bandwidth with  $V_S = \pm 5V$
- 3000 V/ $\mu s$  Slew Rate into 50 $\Omega$

### APPLICATIONS

- Wideband Amplifier Buffer
- Wideband Line Driver
- Video
- Coaxial Cable Driver

### GENERAL DESCRIPTION

The LH4002 family is a high speed voltage follower designed to drive video signals from DC up to 300MHz. At voltage supplies of  $\pm 5V$ , the LH4002 family will provide up to 80mA into 50 $\Omega$  at slew rates of 2000 V/ $\mu s$ .

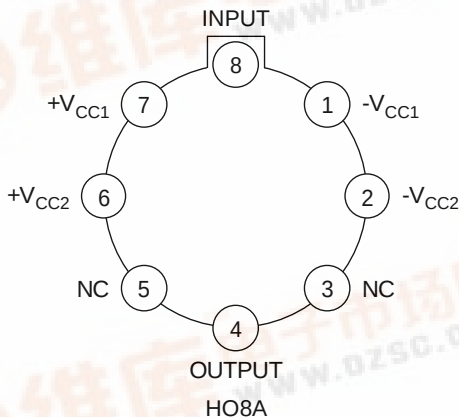
The LH4002 family is intended to fulfill a wide range of high speed applications including video distribution, impedance transformation, and load isolation. It is also suitable for use in current booster applications within an op amp loop. This allows the output current capability of existing op amps to be increased.

### ORDERING INFORMATION

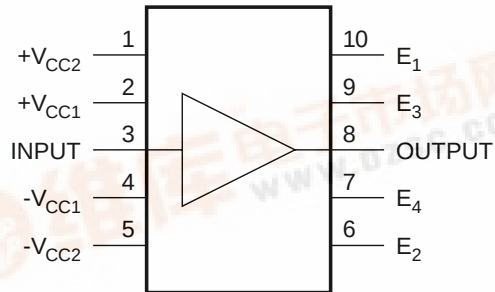
| Part     | Package                    | Temperature Range |
|----------|----------------------------|-------------------|
| LH4002AH | HO8A (TO5-8 Lead)          | -55°C to +125°C   |
| LH4002H  | HO8A (TO5-8 Lead)          | -55°C to +125°C   |
| LH4002CH | HO8A (TO5-8 Lead)          | -40°C to +85°C    |
| LH4002AN | N10A (Plastic Dip-10 Lead) | -40°C to +85°C    |
| LH4002N  | N10A (Plastic Dip-10 Lead) | -40°C to +85°C    |
| LH4002CN | N10A (Plastic Dip-10 Lead) | -40°C to +85°C    |

### CONNECTION DIAGRAMS

#### METAL CAN PACKAGE



#### DUAL-IN-LINE PACKAGE



#### TOP VIEW

N10A

## ABSOLUTE MAXIMUM RATINGS (Note 1)

Supply Voltage.....  $\pm 10$   
 Input Voltage.....  $\pm V_{\text{supply}}$   
 Storage Temperature Range.....  $-65^{\circ}\text{C}$  to  $+150^{\circ}\text{C}$   
 Lead Temperature  
 (Soldering 10 seconds).....  $260^{\circ}\text{C}$   
 Power Dissipation..... (Note 4)

ESD Tolerance (Note 3).....  $\pm 2000\text{V}$   
 Thermal Resistance ( $\theta_{JA}$ ) (Note 6)  
 H Package.....  $125^{\circ}\text{C/W}$   
 N Package.....  $50^{\circ}\text{C/W}$   
 Maximum Junction Temperature.....  $150^{\circ}\text{C}$

## DC ELECTRICAL CHARACTERISTICS

The following specifications apply for Supply Voltage =  $\pm 5\text{V}$ ,  $V_{CM} = 0$ ,  $R_L \geq 100\text{K}\Omega$  and  $R_S = 50\Omega$  unless otherwise noted.

**Boldface** limits apply for  $T_A = T_J = T_{MIN}$  to  $T_{MAX}$ ; all other limits  $T_A = T_J = 25^{\circ}\text{C}$ .

| SYMBOL    | CHARACTERISTICS    | TYP  | LH4002A             | LH4002              | LH4002C             | UNITS             | CONDITIONS                                                         |
|-----------|--------------------|------|---------------------|---------------------|---------------------|-------------------|--------------------------------------------------------------------|
|           |                    |      | Limit<br>(Note 5)   | Limit<br>(Note 5)   | Limit<br>(Note 5)   |                   |                                                                    |
| $A_{V1}$  | Voltage Gain 1     | 0.99 | 0.96<br><b>0.95</b> | 0.95<br><b>0.95</b> | 0.95<br><b>0.95</b> | V/V Min           | $R_L = 1\text{K}$ , $V_{IN} = \pm 2\text{V}$ , $R_S = 10\text{K}$  |
| $A_{V2}$  | Voltage Gain 2     | 0.92 | 0.89                | 0.88                | 0.87                |                   | $R_L = 50\Omega$ , $V_{IN} = \pm 3\text{V}$                        |
| $A_{V3}$  | Voltage Gain 3     | 0.92 | 0.89                | 0.87                | 0.87                |                   | $R_L = 50\Omega$ , $V_{IN} = \pm 2\text{V}$                        |
| $V_{OS}$  | Offset Voltage     | 10   | 15<br><b>25</b>     | 25<br><b>35</b>     | 30<br><b>40</b>     | mV Max            | $R_L = 50\Omega$ , $R_S = 150\Omega$                               |
| $I_B$     | Input Bias Current | 1    | 10<br><b>20</b>     | 15<br><b>30</b>     | 20<br><b>40</b>     | $\mu\text{A}$ Max | $R_L = 50\Omega$ , $R_S = 1\text{K}\Omega$                         |
| $R_{IN}$  | Input Resistance   | 0.3  |                     |                     |                     | $\text{M}\Omega$  | $R_S = 10\text{K}$ , $R_L = 50\Omega$                              |
| $C_{IN}$  | Input Capacitance  | 3.5  |                     |                     |                     | pF                |                                                                    |
| $R_O$     | Output Resistance  | 3    | 10<br><b>10</b>     | 10<br><b>10</b>     | 10<br><b>10</b>     | $\Omega$ Max      | $R_S = 10\text{K}$ , $R_L = 50\Omega$                              |
| $I_{S1}$  | Supply Current 1   | 20   | 30<br><b>35</b>     | 30<br><b>35</b>     | 35<br><b>35</b>     | mA Max            | $R_S = 10\text{K}$ , $V_{IN} = 0\text{V}$ , $R_L = 1\text{K}$      |
| $V_{O1}$  | Output Swing 1     | 2.4  | 2.2<br><b>2.2</b>   | 2.2<br><b>2.2</b>   | 2.2<br><b>2.2</b>   | $\pm\text{V}$ Min | $R_S = 150\Omega$ , $V_{IN} = \pm 2.5\text{V}$ , $R_L = 50\Omega$  |
| $V_{O2}$  | Output Swing 2     | 2.2  | 2<br><b>2</b>       | 2<br><b>2</b>       | 2<br><b>2</b>       |                   | $R_S = 150\Omega$ , $V_{IN} = \pm 2.5\text{V}$ , $R_L = 1\text{K}$ |
| $V_{O3}$  | Output Swing 3     | 3.6  | 3.0                 | 3.0                 | 3.0                 | $V_{PP}$ Min      | $R_S = 150\Omega$ , $V_{IN} = \pm 4.5\text{V}$ , $R_L = 50\Omega$  |
| $I_{OUT}$ | Output Current     | 80   | 60                  | 60                  | 60                  | mA                | $V_{IN} = 4\text{V}$                                               |

## AC ELECTRICAL CHARACTERISTICS

The following specifications apply for Supply Voltage =  $\pm 5V$ ,  $V_{CM} = 0$ ,  $R_L \geq 100K\Omega$  and  $R_S = 50\Omega$  unless otherwise noted.

**Boldface** limits apply for  $T_A = T_J = T_{MIN}$  to  $T_{MAX}$ ; all other limits  $T_A = T_J = 25^\circ C$ .

| SYMBOL                          | CHARACTERISTICS        | TYP  | LH4002A        | LH4002         | LH4002C        | UNITS      | CONDITIONS                                               |
|---------------------------------|------------------------|------|----------------|----------------|----------------|------------|----------------------------------------------------------|
|                                 |                        |      | Limit (Note 5) | Limit (Note 5) | Limit (Note 5) |            |                                                          |
| SR <sub>1</sub>                 | Slew Rate 1            | 3000 | 2750           | 2500           | 2500           | V/ $\mu$ S | $V_{IN} = \pm 2V$ , $R_L = 50\Omega$ (Note 2)            |
| SR <sub>2</sub>                 | Slew Rate 2            | 2000 | 1750           | 1600           | 1500           |            | $V_{IN} = \pm 4V$ , $R_L = 50\Omega$ (Note 2)            |
| SS <sub>BW</sub>                | Small Signal Bandwidth | 300  | 250            | 220            | 200            | MHz        | $R_L = 50\Omega$ , $V_{OUT} = 100mV_{P-P}$               |
| LS <sub>BW</sub>                | Large Signal Bandwidth | 140  | 100            | 90             | 80             |            | $R_L = 50\Omega$ , $V_{OUT} = 2V_{P-P}$                  |
| P <sub>BW</sub>                 | Power Bandwidth        | 130  | 100            | 90             | 80             |            | $R_L = 50\Omega$ , $V_{OUT} = 4V_{P-P}$                  |
| t <sub>r</sub> , t <sub>f</sub> | Rise Time<br>Fall Time | 1.2  | 1.5            | 1.7            | 1.8            | ns         | $R_L = 50\Omega$ , $C_L \leq 10pF$<br>$V_O = 100mV_{PP}$ |
| t <sub>pd</sub>                 | Propagation Delay Time | 2.0  |                |                |                | ns         | $R_L = 50\Omega$ , $C_L \leq 10pF$<br>$V_O = 100mV_{PP}$ |
| O <sub>S</sub>                  | Overshoot              | 10   |                |                |                | %          | $R_L = 50\Omega$ , $C_L \leq 10pF$<br>$V_O = 100mV_{PP}$ |

**Note 1:** Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. DC and AC electrical specifications do not apply when operating the device beyond its rated operating conditions.

**Note 2:** Slew rate is measured with  $50\Omega$  source impedance at  $25^\circ C$ . For accurate measurements, the input slew rate should be at least  $5000V/\mu s$ .

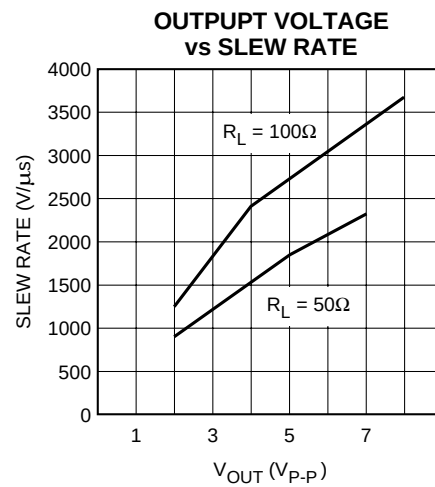
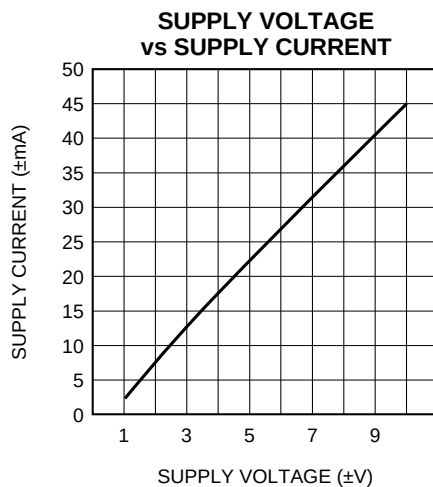
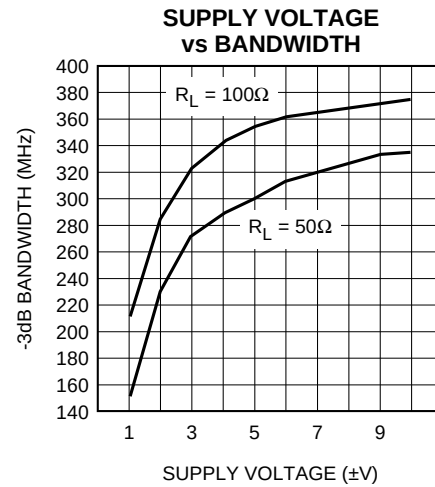
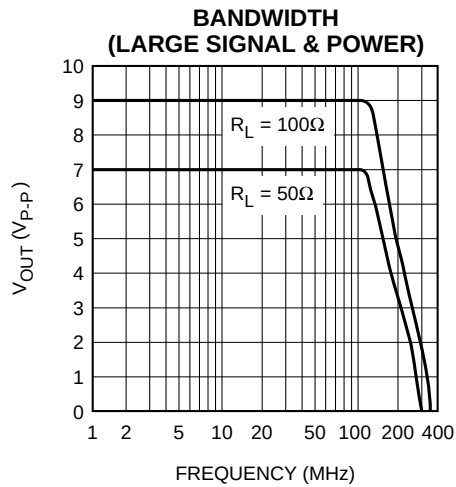
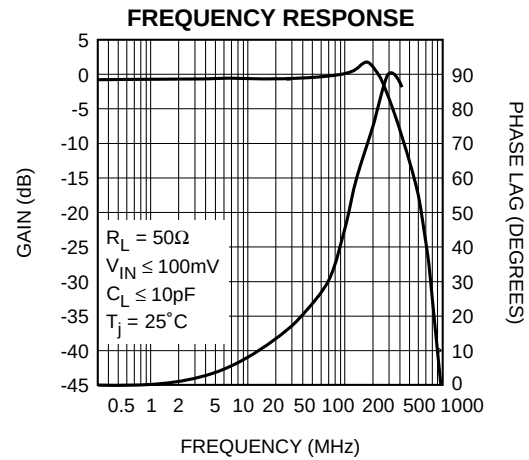
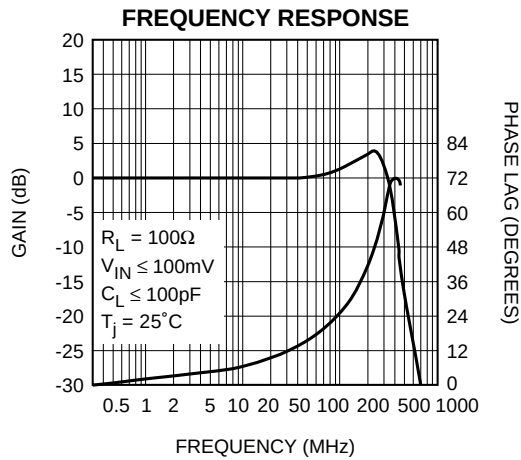
**Note 3:** The test circuit consists of the human body model of  $120pF$  in series with  $1500\Omega$ .

**Note 4:** The maximum power dissipation is a function of  $T_{J(max)}$ ,  $\theta_{JA}$  and  $T_A$ . The maximum allowable power dissipation at any ambient temperature is  $P_D = (T_{J(max)} - T_A)/\theta_{JA}$ .

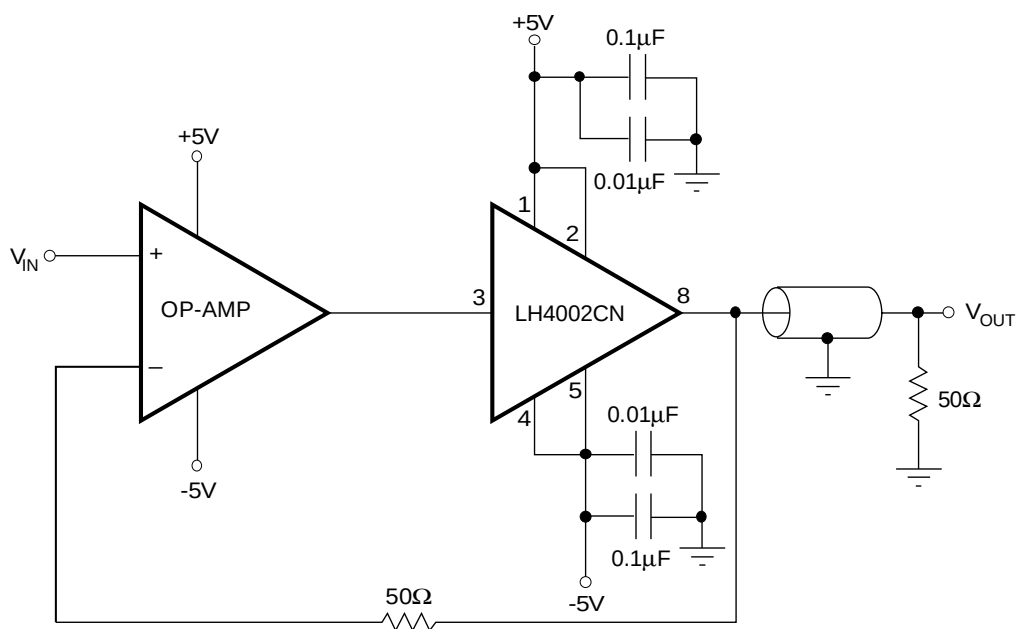
**Note 5:** Limits are guaranteed by testing, correlation or periodic characterization.

**Note 6:** For N package,  $\theta_{JA}$  is measured by soldering the unit directly on a printed circuit board and  $V^-$  pins are connected to 2 square inches of 2 oz copper.

**TYPICAL PERFORMANCE CHARACTERISTICS**



Wideband Unity Gain Amplifier



Short Circuit Protection

