



## HEX BUFFER/DRIVER WITH OPEN-DRAIN OUTPUTS

### FEATURES

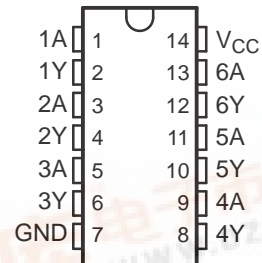
- Operates From 1.65 V to 5 V
- Inputs and Open-Drain Outputs Accept Voltages up to 5.5 V
- Max  $t_{pd}$  of 3.6 ns at 5 V
- Latch-Up Performance Exceeds 250 mA Per JESD 17

### SUPPORTS DEFENSE, AEROSPACE, AND MEDICAL APPLICATIONS

- Controlled Baseline
- One Assembly/Test Site
- One Fabrication Site
- Available in Military (–55°C/125°C), Industrial (–40°C/85°C) Temperature Ranges<sup>(1)</sup>
- Extended Product Life Cycle
- Extended Product-Change Notification
- Product Traceability

(1) Custom Temperature Ranges Available

PW PACKAGE  
(TOP VIEW)



### DESCRIPTION/ORDERING INFORMATION

This hex buffer/driver is designed for 1.65-V to 5.5-V  $V_{CC}$  operation.

The outputs of the SN74LVC07A device are open drain and can be connected to other open-drain outputs to implement active-low wired-OR or active-high wired-AND functions. The maximum sink current is 24 mA.

Inputs can be driven from 1.8-V, 2.5-V, 3.3-V (LVTTTL), or 5-V (CMOS) devices. This feature allows the use of this device as a translator in a mixed-system environment.

### ORDERING INFORMATION

| $T_A$          | PACKAGE <sup>(1)</sup> |              | ORDERABLE PART NUMBER | TOP-SIDE MARKING |
|----------------|------------------------|--------------|-----------------------|------------------|
| –40°C to 85°C  | TSSOP – PW             | Reel of 2000 | SN74LVC07AIPWREP      | C07AEP           |
| –55°C to 125°C | TSSOP – PW             | Reel of 2000 | SN74LVC07AMPWREP      | C07AMEP          |

(1) Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at [www.ti.com/sc/package](http://www.ti.com/sc/package).

### FUNCTION TABLE (each buffer/driver)

| INPUT<br>A | OUTPUT<br>Y |
|------------|-------------|
| H          | H           |
| L          | L           |

**LOGIC DIAGRAM, EACH BUFFER/DRIVER (POSITIVE LOGIC)****Absolute Maximum Ratings<sup>(1)</sup>**

over operating free-air temperature range (unless otherwise noted)

|               |   | MIN       | MAX  | UNIT   |
|---------------|---|-----------|------|--------|
| $V_{CC}$      | Supply voltage range                            | −0.5      | 6.5  | V      |
| $V_I$         | Input voltage range <sup>(2)</sup>              | −0.5      | 6.5  | V      |
| $V_O$         | Output voltage range                            | −0.5      | 6.5  | V      |
| $I_{IK}$      | Input clamp current                             | $V_I < 0$ |      | −50 mA |
| $I_{OK}$      | Output clamp current                            | $V_O < 0$ |      | −50 mA |
| $I_O$         | Continuous output current                       |           | ±50  | mA     |
|               | Continuous current through each $V_{CC}$ or GND |           | ±100 | mA     |
| $\theta_{JA}$ | Package thermal impedance <sup>(3)</sup>        |           | 113  | °C/W   |
| $T_{stg}$     | Storage temperature range                       | −65       | 150  | °C     |

- (1) Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
- (2) The input and output negative-voltage ratings may be exceeded if the input and output current ratings are observed.
- (3) The package thermal impedance is calculated in accordance with JESD 51-7.

**Recommended Operating Conditions<sup>(1)</sup>**

|          |                                | MIN  | MAX                  | UNIT |
|----------|--------------------------------|--|----------------------|------|
| $V_{CC}$ | Supply voltage                 | 1.65   | 5.5                  | V    |
| $V_{IH}$ | High-level input voltage       | $V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$ | $0.65 \times V_{CC}$ | V    |
|          |                                | $V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$   | 1.7                  |      |
|          |                                | $V_{CC} = 2.7 \text{ V to } 3.6 \text{ V}$   | 2                    |      |
|          |                                | $V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$   | $0.7 \times V_{CC}$  |      |
| $V_{IL}$ | Low-level input voltage        | $V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$ | $0.35 \times V_{CC}$ | V    |
|          |                                | $V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$   | 0.7                  |      |
|          |                                | $V_{CC} = 2.7 \text{ V to } 3.6 \text{ V}$   | 0.8                  |      |
|          |                                | $V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$   | $0.3 \times V_{CC}$  |      |
| $V_I$    | Input voltage                  | 0  | 5.5                  | V    |
| $V_O$    | Output voltage                 | 0  | 5.5                  | V    |
| $I_{OL}$ | Low-level output current       | $V_{CC} = 1.65 \text{ V}$                    | 4                    | mA   |
|          |                                | $V_{CC} = 2.3 \text{ V}$                     | 12                   |      |
|          |                                | $V_{CC} = 2.7 \text{ V}$                     | 12                   |      |
|          |                                | $V_{CC} = 3 \text{ V}$                       | 24                   |      |
|          |                                | $V_{CC} = 4.5 \text{ V}$                     | 24                   |      |
| $T_A$    | Operating free-air temperature | SN74LVC07AIPWREP                             | −40                  | °C   |
|          |                                | SN74LVC07AMPWREP                             | −55                  |      |

- (1) All unused inputs of the device must be held at  $V_{CC}$  or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

## Electrical Characteristics

over operating free-air temperature range (unless otherwise noted)

| PARAMETER        | TEST CONDITIONS  | V <sub>CC</sub> | MIN | TYP <sup>(1)</sup> | MAX  | UNIT |
|------------------|--|-----------------|-----|--------------------|------|------|
| V <sub>OL</sub>  | I <sub>OL</sub> = 100 µA   | 1.65 V to 5.5 V |     |                    | 0.2  | V    |
|                  | I <sub>OL</sub> = 4 mA   | 1.65 V          |     |                    | 0.45 |      |
|                  | I <sub>OL</sub> = 12 mA  | 2.3 V           |     |                    | 0.7  |      |
|                  |  | 2.7 V           |     |                    | 0.4  |      |
|                  | I <sub>OL</sub> = 24 mA  | 3 V             |     |                    | 0.55 |      |
| I <sub>I</sub>   | V <sub>I</sub> = 5.5 V or GND  | 3.6 V           |     |                    | ±5   | µA   |
| I <sub>CC</sub>  | V <sub>I</sub> = V <sub>CC</sub> or GND, I <sub>O</sub> = 0                  | 3.6 V           |     |                    | 10   | µA   |
| ΔI <sub>CC</sub> | One input at V <sub>CC</sub> – 0.6 V, Other inputs at V <sub>CC</sub> or GND | 2.7 V to 3.6 V  |     |                    | 500  | µA   |
| C <sub>I</sub>   | V <sub>I</sub> = V <sub>CC</sub> or GND                                      | 3.3 V           |     | 5                  |      | pF   |

(1) All typical values are at V<sub>CC</sub> = 3.3 V, T<sub>A</sub> = 25°C.

## Switching Characteristics

over recommended operating free-air temperature range (unless otherwise noted) (see Figure 1 through 4)

| PARAMETER       | FROM<br>(INPUT) | TO<br>(OUTPUT) | V <sub>CC</sub> = 1.8 V<br>± 0.15 V |     | V <sub>CC</sub> = 2.5 V<br>± 0.2 V |     | V <sub>CC</sub> = 2.7 V |     | V <sub>CC</sub> = 3.3 V<br>± 0.3 V |     | V <sub>CC</sub> = 5 V<br>± 0.5 V |     | UNIT |
|-----------------|-----------------|----------------|-------------------------------------|-----|------------------------------------|-----|-------------------------|-----|------------------------------------|-----|----------------------------------|-----|------|
|                 |                 |                | MIN                                 | MAX | MIN                                | MAX | MIN                     | MAX | MIN                                | MAX | MIN                              | MAX |      |
| t <sub>pd</sub> | A               | Y              | 1                                   | 6.6 | 1                                  | 4.4 |                         | 4.3 | 1                                  | 4.6 | 1                                | 3.6 | ns   |

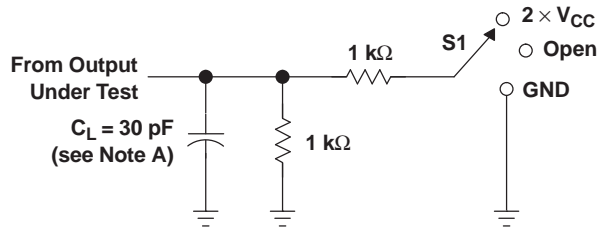
## Operating Characteristics

T<sub>A</sub> = 25°C

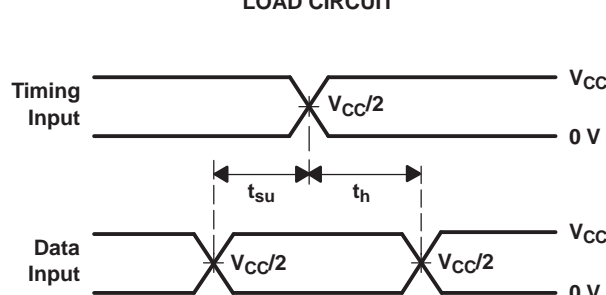
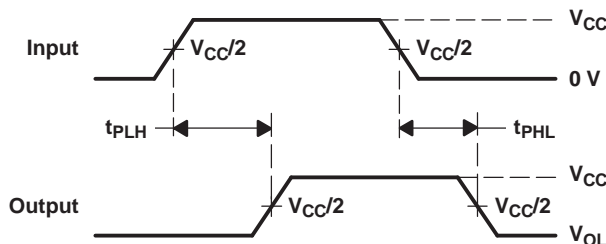
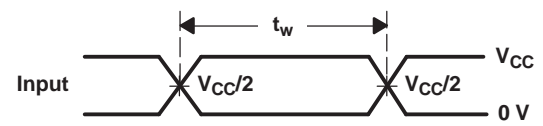
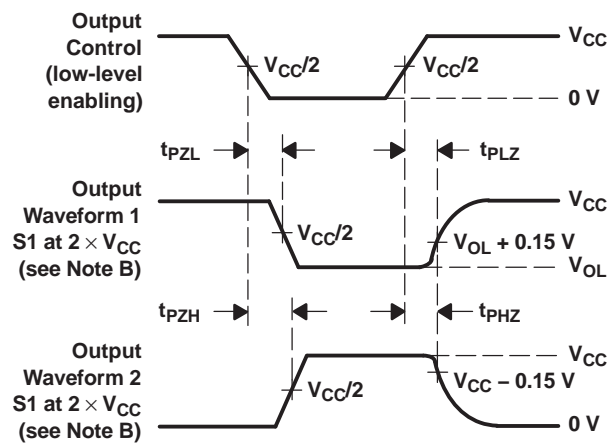
| PARAMETER                                     | TEST<br>CONDITIONS | V <sub>CC</sub> = 1.8 V | V <sub>CC</sub> = 2.5 V | V <sub>CC</sub> = 3.3 V | V <sub>CC</sub> = 5 V | UNIT |
|---|--------------------|-------------------------|-------------------------|-------------------------|-----------------------|------|
|   |                    | TYP                     | TYP                     | TYP                     | TYP                   |      |
| C <sub>pd</sub> Power dissipation capacitance | f = 10 MHz         | 1.8                     | 2                       | 2.5                     | 3.78                  | pF   |

**PARAMETER MEASUREMENT INFORMATION**

$$V_{CC} = 1.8 \text{ V} \pm 0.15 \text{ V}$$

**LOAD CIRCUIT**

| TEST                   | S1                |
|------------------------|-------------------|
| $t_{PZL}$ (see Note F) | 2 $\times V_{CC}$ |
| $t_{PLZ}$ (see Note G) | 2 $\times V_{CC}$ |
| $t_{PHZ}/t_{PHL}$      | 2 $\times V_{CC}$ |

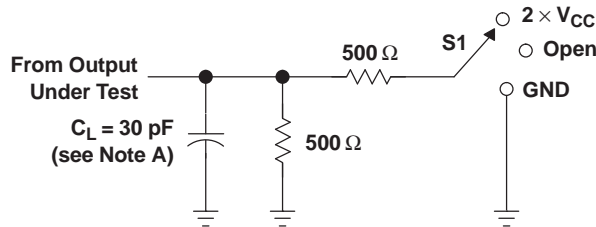
**VOLTAGE WAVEFORMS  
SETUP AND HOLD TIMES****VOLTAGE WAVEFORMS  
PROPAGATION DELAY TIMES****VOLTAGE WAVEFORMS  
PULSE DURATION****VOLTAGE WAVEFORMS  
ENABLE AND DISABLE TIMES**

- NOTES: A.  $C_L$  includes probe and jig capacitance.
- B. Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.
- C. All input pulses are supplied by generators having the following characteristics:  $PRR \leq 10 \text{ MHz}$ ,  $Z_O = 50 \Omega$ ,  $t_r \leq 2 \text{ ns}$ ,  $t_f \leq 2 \text{ ns}$ .
- D. The outputs are measured one at a time, with one transition per measurement.
- E. Since this device has open-drain outputs,  $t_{PLZ}$  and  $t_{PZL}$  are the same as  $t_{pd}$ .
- F.  $t_{PZL}$  is measured at  $V_{CC}/2$ .
- G.  $t_{PLZ}$  is measured at  $V_{OL} + 0.15 \text{ V}$ .
- H. All parameters and waveforms are not applicable to all devices.

**Figure 1. Load Circuit and Voltage Waveforms**

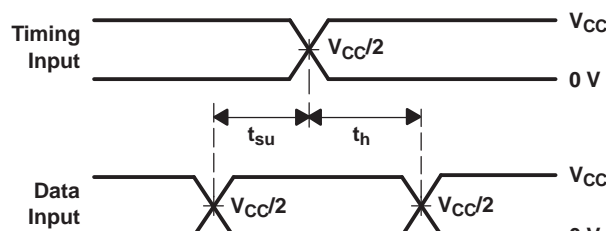
# PARAMETER MEASUREMENT INFORMATION

$$V_{CC} = 2.5 \text{ V} \pm 0.2 \text{ V}$$

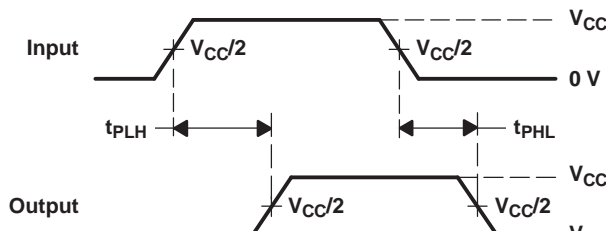


LOAD CIRCUIT

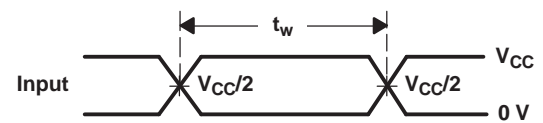
| TEST                   | S1                |
|------------------------|-------------------|
| $t_{PZL}$ (see Note F) | 2 $\times V_{CC}$ |
| $t_{PLZ}$ (see Note G) | 2 $\times V_{CC}$ |
| $t_{PHZ}/t_{PZH}$      | 2 $\times V_{CC}$ |



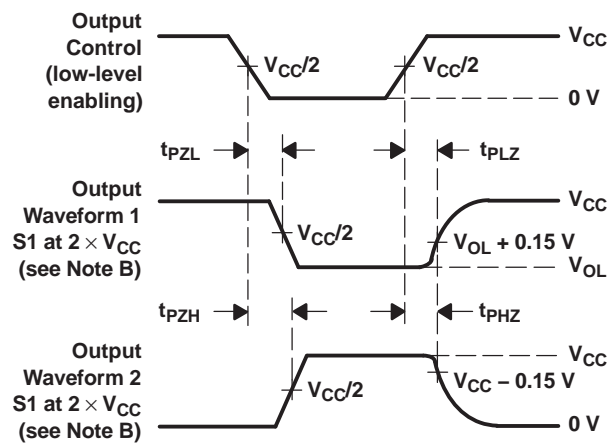
VOLTAGE WAVEFORMS  
SETUP AND HOLD TIMES



VOLTAGE WAVEFORMS  
PROPAGATION DELAY TIMES



VOLTAGE WAVEFORMS  
PULSE DURATION



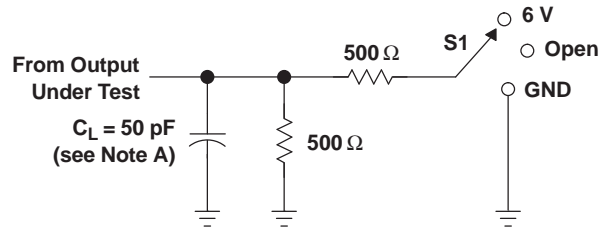
VOLTAGE WAVEFORMS  
ENABLE AND DISABLE TIMES

- NOTES:
- $C_L$  includes probe and jig capacitance.
  - Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.
  - All input pulses are supplied by generators having the following characteristics:  $PRR \leq 10 \text{ MHz}$ ,  $Z_O = 50 \Omega$ ,  $t_r \leq 2 \text{ ns}$ ,  $t_f \leq 2 \text{ ns}$ .
  - The outputs are measured one at a time, with one transition per measurement.
  - Since this device has open-drain outputs,  $t_{PLZ}$  and  $t_{PZL}$  are the same as  $t_{pd}$ .
  - $t_{PZL}$  is measured at  $V_{CC}/2$ .
  - $t_{PLZ}$  is measured at  $V_{OL} + 0.15 \text{ V}$ .
  - All parameters and waveforms are not applicable to all devices.

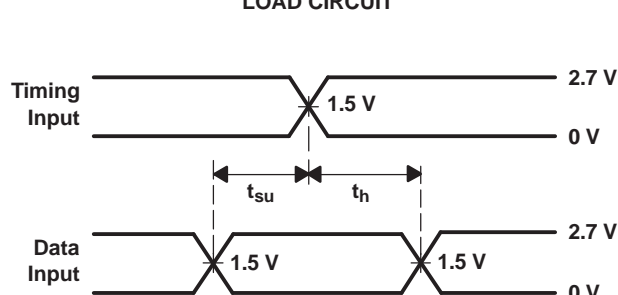
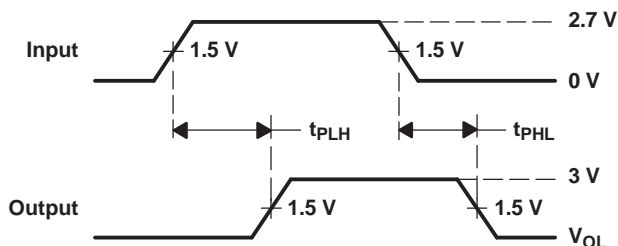
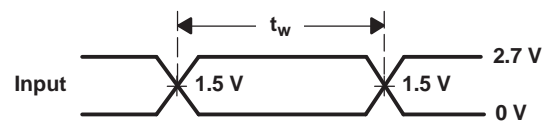
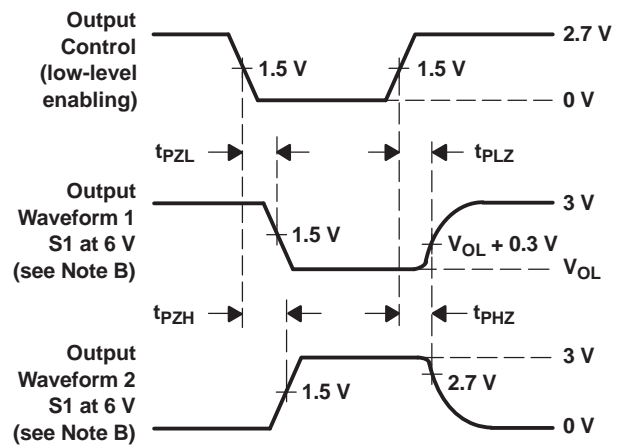
Figure 2. Load Circuit and Voltage Waveforms

**PARAMETER MEASUREMENT INFORMATION**

$$V_{CC} = 2.7 \text{ V AND } 3.3 \text{ V} \pm 0.3 \text{ V}$$

**LOAD CIRCUIT**

| TEST                   | S1  |
|------------------------|-----|
| $t_{pZL}$ (see Note F) | 6 V |
| $t_{pLZ}$ (see Note G) | 6 V |
| $t_{PHZ}/t_{PZH}$      | 6 V |

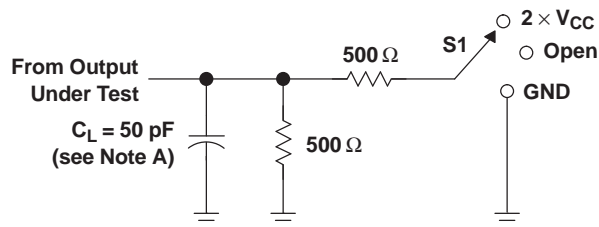
**VOLTAGE WAVEFORMS  
SETUP AND HOLD TIMES****VOLTAGE WAVEFORMS  
PROPAGATION DELAY TIMES****VOLTAGE WAVEFORMS  
PULSE DURATION****VOLTAGE WAVEFORMS  
ENABLE AND DISABLE TIMES**

- NOTES:
- $C_L$  includes probe and jig capacitance.
  - Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.
  - All input pulses are supplied by generators having the following characteristics:  $PRR \leq 10 \text{ MHz}$ ,  $Z_O = 50 \Omega$ ,  $t_r \leq 2.5 \text{ ns}$ ,  $t_f \leq 2.5 \text{ ns}$ .
  - The outputs are measured one at a time, with one transition per measurement.
  - Since this device has open-drain outputs,  $t_{pLZ}$  and  $t_{pZL}$  are the same as  $t_{pd}$ .
  - $t_{pZL}$  is measured at 1.5 V.
  - $t_{pLZ}$  is measured at  $V_{OL} + 0.3 \text{ V}$ .
  - All parameters and waveforms are not applicable to all devices.

**Figure 3. Load Circuit and Voltage Waveforms**

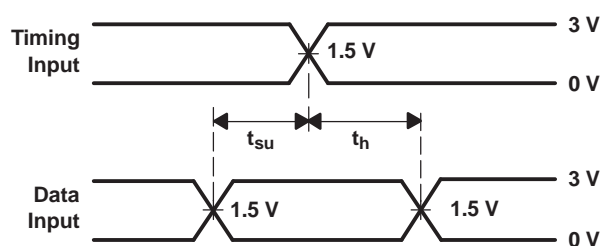
# PARAMETER MEASUREMENT INFORMATION

$$V_{CC} = 5\text{ V} \pm 0.5\text{ V}$$

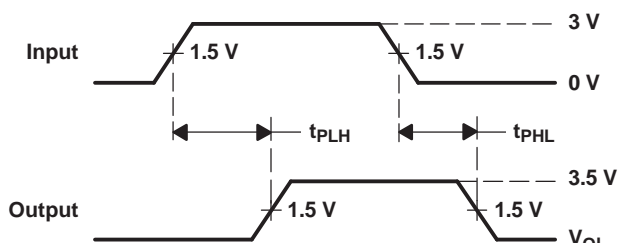


LOAD CIRCUIT

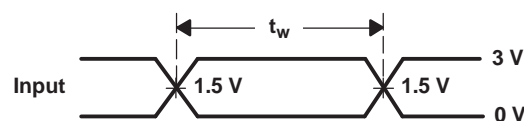
| TEST                   | S1                |
|------------------------|-------------------|
| $t_{PZL}$ (see Note F) | 2 $\times V_{CC}$ |
| $t_{PLZ}$ (see Note G) | 2 $\times V_{CC}$ |
| $t_{PHZ}/t_{PZH}$      | 7 V               |



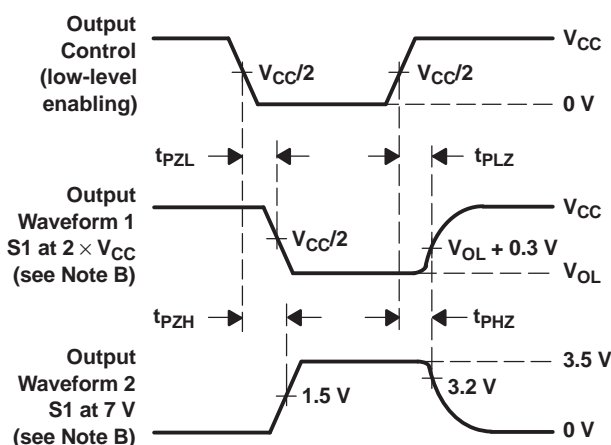
VOLTAGE WAVEFORMS  
SETUP AND HOLD TIMES



VOLTAGE WAVEFORMS  
PROPAGATION DELAY TIMES



VOLTAGE WAVEFORMS  
PULSE DURATION



VOLTAGE WAVEFORMS  
ENABLE AND DISABLE TIMES

- NOTES:
- $C_L$  includes probe and jig capacitance.
  - Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.
  - All input pulses are supplied by generators having the following characteristics:  $PRR \leq 10\text{ MHz}$ ,  $Z_O = 50\text{ }\Omega$ ,  $t_r \leq 2.5\text{ ns}$ ,  $t_f \leq 2.5\text{ ns}$ .
  - The outputs are measured one at a time, with one transition per measurement.
  - Since this device has open-drain outputs,  $t_{PLZ}$  and  $t_{PZL}$  are the same as  $t_{pd}$ .
  - $t_{PZL}$  is measured at  $V_{CC}/2$ .
  - $t_{PLZ}$  is measured at  $V_{OL} + 0.3\text{ V}$ .
  - All parameters and waveforms are not applicable to all devices.

Figure 4. Load Circuit and Voltage Waveforms

## PACKAGING INFORMATION

| Orderable Device | Status <sup>(1)</sup> | Package Type | Package Drawing | Pins | Package Qty | Eco Plan <sup>(2)</sup> | Lead/Ball Finish | MSL Peak Temp <sup>(3)</sup> |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| SN74LVC07AIPWREP | ACTIVE                | TSSOP        | PW              | 14   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LVC07AMPWREP | ACTIVE                | TSSOP        | PW              | 14   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| V62/04654-01XE   | ACTIVE                | TSSOP        | PW              | 14   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| V62/04654-02XE   | ACTIVE                | TSSOP        | PW              | 14   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |

<sup>(1)</sup> The marketing status values are defined as follows:

**ACTIVE:** Product device recommended for new designs.

**LIFEBUY:** TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

**NRND:** Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

**PREVIEW:** Device has been announced but is not in production. Samples may or may not be available.

**OBSOLETE:** TI has discontinued the production of the device.

<sup>(2)</sup> Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

**TBD:** The Pb-Free/Green conversion plan has not been defined.

**Pb-Free (RoHS):** TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

**Pb-Free (RoHS Exempt):** This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

**Green (RoHS & no Sb/Br):** TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

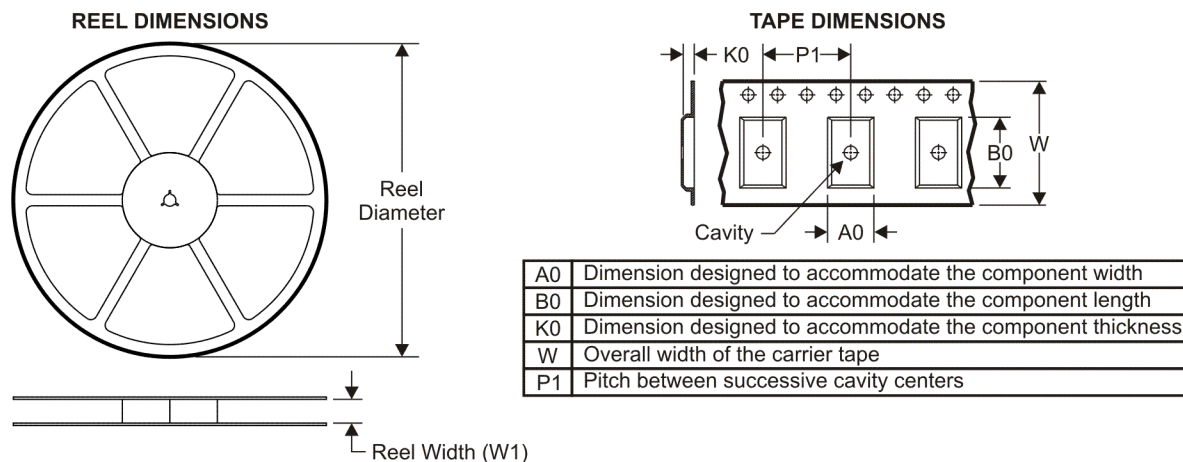
<sup>(3)</sup> MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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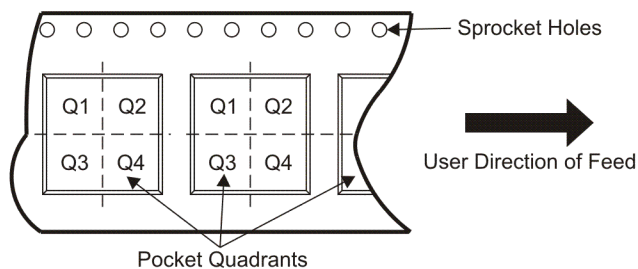
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## TAPE AND REEL INFORMATION



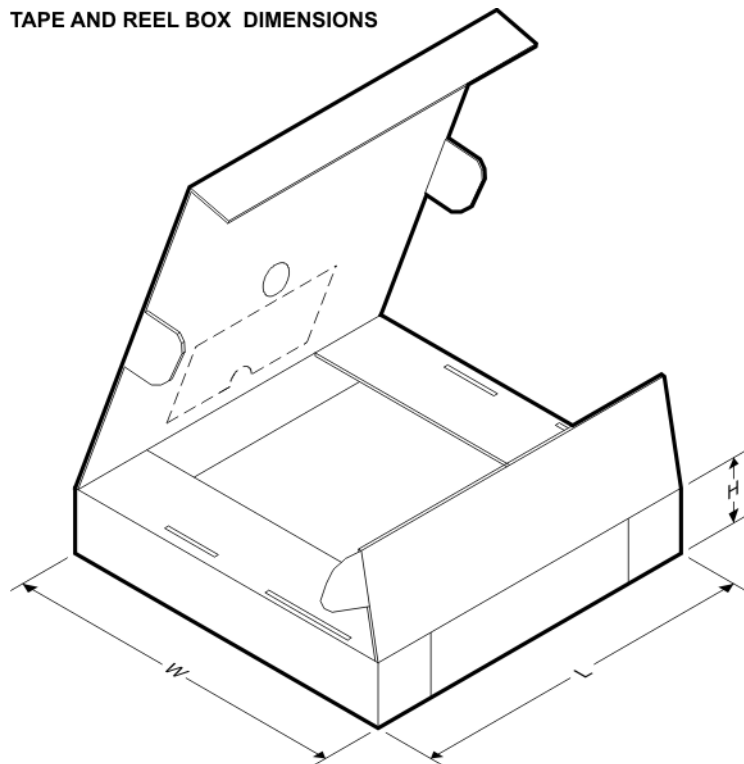
### QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



\*All dimensions are nominal

| Device           | Package Type | Package Drawing | Pins | SPQ  | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|------------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN74LVC07AIPWREP | TSSOP        | PW              | 14   | 2000 | 330.0              | 12.4               | 7.0     | 5.6     | 1.6     | 8.0     | 12.0   | Q1            |

## TAPE AND REEL BOX DIMENSIONS



\*All dimensions are nominal

| Device           | Package Type | Package Drawing | Pins | SPQ  | Length (mm) | Width (mm) | Height (mm) |
|------------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN74LVC07AIPWREP | TSSOP        | PW              | 14   | 2000 | 346.0       | 346.0      | 29.0        |

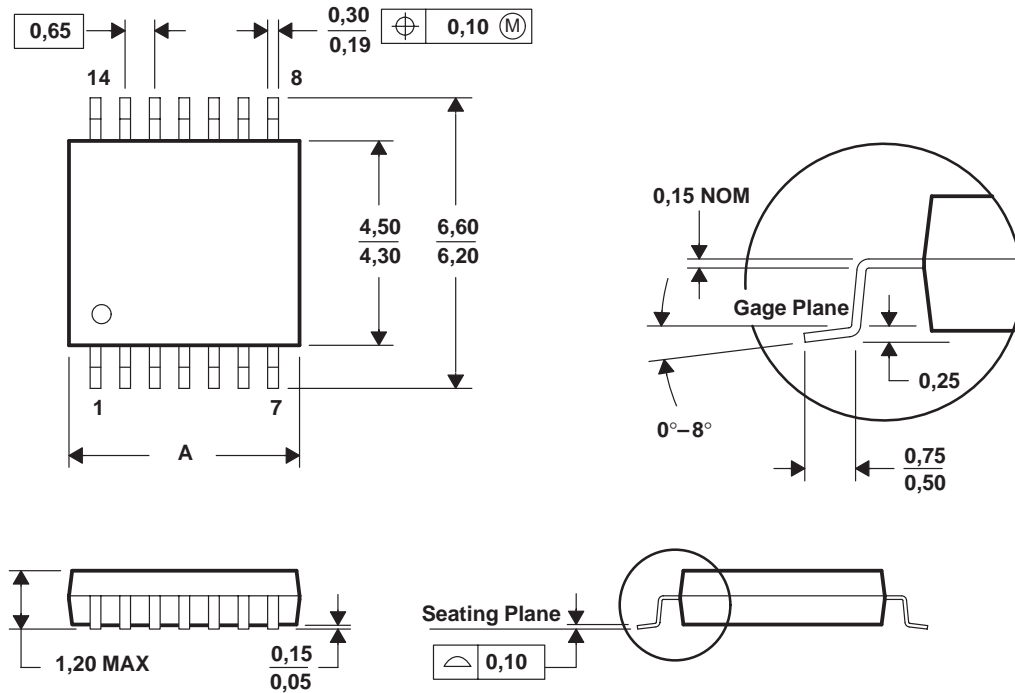
# MECHANICAL DATA

MTSS001C – JANUARY 1995 – REVISED FEBRUARY 1999

PW (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE PACKAGE

14 PINS SHOWN



| PINS **<br>DIM | 8    | 14   | 16   | 20   | 24   | 28   |
|----------------|------|------|------|------|------|------|
| A MAX          | 3,10 | 5,10 | 5,10 | 6,60 | 7,90 | 9,80 |
| A MIN          | 2,90 | 4,90 | 4,90 | 6,40 | 7,70 | 9,60 |

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- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Body dimensions do not include mold flash or protrusion not to exceed 0,15.
  - D. Falls within JEDEC MO-153

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