
HD74LVC541A

Octal Buffers / Line Drivers with 3-state Outputs

HITACHI

ADE-205-115B(Z)
3rd Edition
December 1996

Description

The HD74LVC541A has eight line drivers with three state outputs in a 20 pin package. When $\bar{G}1$ and $\bar{G}2$ is low level, this drivers set up output is enable. Low voltage and high speed operation is suitable at the battery drive product (note type personal computer) and low power consumption extends the life of a battery for long time operation.

Features

- $V_{CC} = 2.0\text{ V to }5.5\text{ V}$
- All inputs $V_{IH}(\text{Max.}) = 5.5\text{ V}$ ($@V_{CC} = 0\text{ V to }5.5\text{ V}$)
- All outputs $V_{OUT}(\text{Max.}) = 5.5\text{ V}$ ($@V_{CC} = 0\text{ V}$ or output off state)
- Typical V_{OL} ground bounce $< 0.8\text{ V}$ ($@V_{CC} = 3.3\text{ V}$, $T_a = 25^\circ\text{C}$)
- Typical V_{OH} undershoot $> 2.0\text{ V}$ ($@V_{CC} = 3.3\text{ V}$, $T_a = 25^\circ\text{C}$)
- High output current $\pm 24\text{ mA}$ ($@V_{CC} = 3.0\text{ V to }5.5\text{ V}$)

Function Table

| Inputs | | | |
|------------|------------|---|----------|
| $\bar{G}1$ | $\bar{G}2$ | A | Output Y |
| L | L | L | L |
| L | L | H | H |
| H | X | X | Z |
| X | H | X | Z |

H: High level

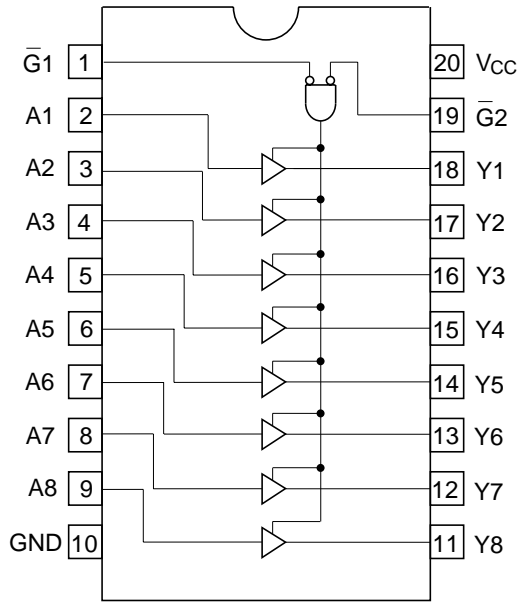
L: Low level

X: Immaterial

Z: High impedance

HD74LVC541A

Pin Arrangement



(Top view)

Absolute Maximum Ratings

| Item | Symbol | Ratings | Unit | Conditions |
|------------------------------|-----------------------|------------------------|------|-----------------------------|
| Supply voltage | V_{CC} | -0.5 to 6.0 | V | |
| Input diode current | I_{IK} | -50 | mA | $V_I = -0.5$ V |
| Input voltage | V_I | -0.5 to 6.0 | V | |
| Output diode current | I_{OK} | -50 | mA | $V_O = -0.5$ V |
| | | 50 | mA | $V_O = V_{CC} + 0.5$ V |
| Output voltage | V_O | -0.5 to $V_{CC} + 0.5$ | V | Output "H" or "L" |
| | | -0.5 to 6.0 | V | Output "Z" or V_{CC} :OFF |
| Output current | I_O | ± 50 | mA | |
| V_{CC} , GND current / pin | I_{CC} or I_{GND} | 100 | mA | |
| Storage temperature | T_{stg} | -65 to +150 | °C | |

Note: The absolute maximum ratings are values which must not individually be exceeded, and furthermore, no two of which may be realized at the same time.

Recommended Operating Conditions

| Item | Symbol | Ratings | Unit | Conditions |
|--------------------------------------|------------|---------------|------|-----------------------------|
| Supply voltage | V_{CC} | 1.5 to 5.5 | V | Data hold |
| | | 2.0 to 5.5 | V | At operation |
| Input / output voltage | V_I | 0 to 5.5 | V | $\bar{G}1, \bar{G}2, A$ |
| | V_O | 0 to V_{CC} | V | Output "H" or "L" |
| | | 0 to 5.5 | V | Output "Z" or V_{CC} :OFF |
| Operating temperature | T_a | -40 to 85 | °C | |
| Output current | I_{OH} | -12 | mA | $V_{CC} = 2.7$ V |
| | | -24^{*2} | mA | $V_{CC} = 3.0$ V to 5.5 V |
| | I_{OL} | 12 | mA | $V_{CC} = 2.7$ V |
| | | 24^{*2} | mA | $V_{CC} = 3.0$ V to 5.5 V |
| Input rise / fall time ^{*1} | t_r, t_f | 10 | ns/V | |

Notes: 1. This item guarantees maximum limit when one input switches.

Waveform : Refer to test circuit of switching characteristics.

2. duty cycle $\leq 50\%$

Electrical Characteristics

| Item | Symbol | V _{CC} (V) | Ta = -40 to 85°C | | Unit | Test Conditions |
|--------------------------|------------------|---------------------|----------------------|----------------------|------|---|
| | | | Min | Max | | |
| Input voltage | V _{IH} | 2.7 to 3.6 | 2.0 | — | V | |
| | | 4.5 to 5.5 | V _{CC} ×0.7 | — | V | |
| | V _{IL} | 2.7 to 3.6 | — | 0.8 | V | |
| | | 4.5 to 5.5 | — | V _{CC} ×0.3 | V | |
| Output voltage | V _{OH} | 2.7 to 5.5 | V _{CC} -0.2 | — | V | I _{OH} = -100 μA |
| | | 2.7 | 2.2 | — | V | I _{OH} = -12 mA |
| | | 3.0 | 2.4 | — | V | |
| | | 3.0 | 2.2 | — | V | I _{OH} = -24 mA |
| | | 4.5 | 3.8 | — | V | |
| | V _{OL} | 2.7 to 5.5 | — | 0.2 | V | I _{OL} = 100 μA |
| | | 2.7 | — | 0.4 | V | I _{OL} = 12 mA |
| | | 3.0 | — | 0.55 | V | I _{OL} = 24 mA |
| | | 4.5 | — | 0.55 | V | |
| | | | | | | |
| Input current | I _{IN} | 0 to 5.5 | — | ±5.0 | μA | V _{IN} = 5.5 V or GND |
| Off state output current | I _{OZ} | 2.7 to 5.5 | — | ±5.0 | μA | V _{IN} = V _{CC} , GND V _{OUT} = 5.5 V or GND |
| Output leak current | I _{OFF} | 0 | — | 20 | μA | V _{IN} / V _{OUT} = 5.5 V |
| Quiescent supply current | I _{CC} | 2.7 to 3.6 | — | ±10 | μA | V _{IN} / V _{OUT} = 3.6 to 5.5 V |
| | | 2.7 to 5.5 | — | 10 | μA | V _{IN} = V _{CC} or GND |
| | ΔI _{CC} | 3.0 to 3.6 | — | 500 | μA | V _{IN} = one input at (V _{CC} -0.6)V, other inputs at V _{CC} or GND |

Switching Characteristics

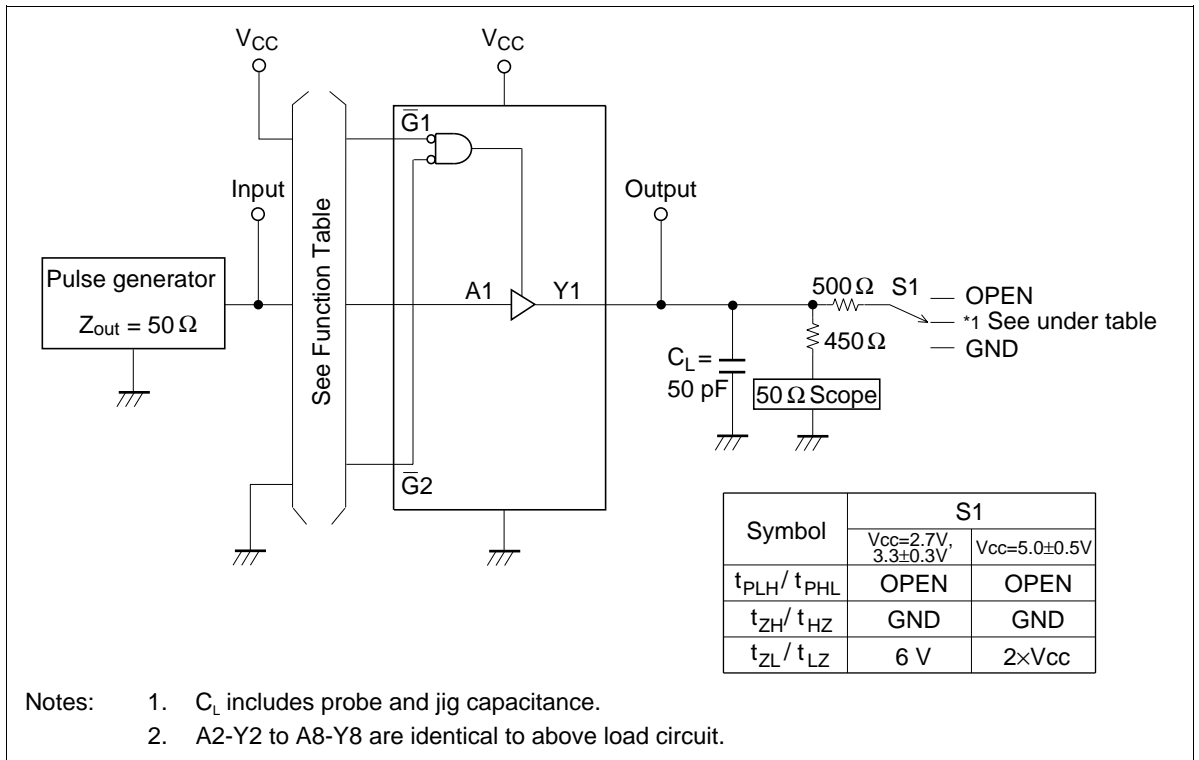
| Item | Symbol | V _{CC} (V) | Ta = -40 to 85°C | | | Unit | From (Input) | To (Output) |
|--|-------------------|---------------------|------------------|------|-----|------|--------------------------|-------------|
| | | | Min | Typ | Max | | | |
| Propagation delay time | t _{PLH} | 2.7 | — | — | 7.5 | ns | A | Y |
| | t _{PHL} | 3.3±0.3 | 1.5 | — | 6.5 | ns | | |
| | | 5.0±0.5 | — | — | 5.0 | ns | | |
| Output enable time | t _{ZH} | 2.7 | — | — | 9.5 | ns | $\bar{G}1$ or $\bar{G}2$ | Y |
| | t _{ZL} | 3.3±0.3 | 1.5 | — | 8.5 | ns | | |
| | | 5.0±0.5 | — | — | 7.0 | ns | | |
| Output disable time | t _{HZ} | 2.7 | — | — | 8.5 | ns | $\bar{G}1$ or $\bar{G}2$ | Y |
| | t _{LZ} | 3.3±0.3 | 1.5 | — | 7.5 | ns | | |
| | | 5.0±0.5 | — | — | 6.5 | ns | | |
| Between output pins skew ^{*1} | t _{OSLH} | 2.7 | — | — | — | ns | | |
| | t _{OSHL} | 3.3±0.3 | — | — | 1.0 | ns | | |
| | | 5.0±0.5 | — | — | 1.0 | ns | | |
| Input capacitance | C _{IN} | 2.7 | — | 3.0 | — | pF | | |
| Output capacitance | C _O | 2.7 | — | 15.0 | — | pF | | |

Note: 1. This parameter is characterized but not tested.

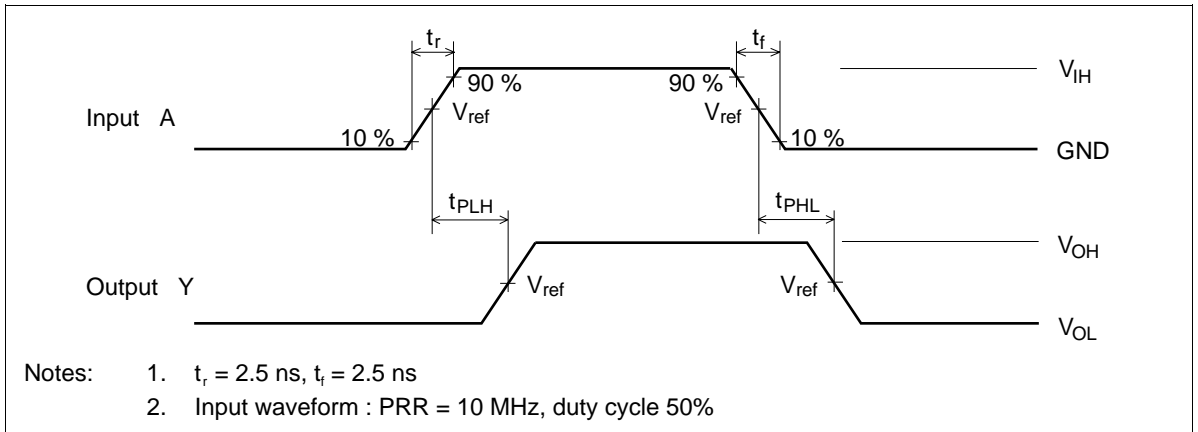
$$tos_{LH} = |t_{PLHm} - t_{PLHn}|, tos_{HL} = |t_{PHLm} - t_{PHLn}|$$

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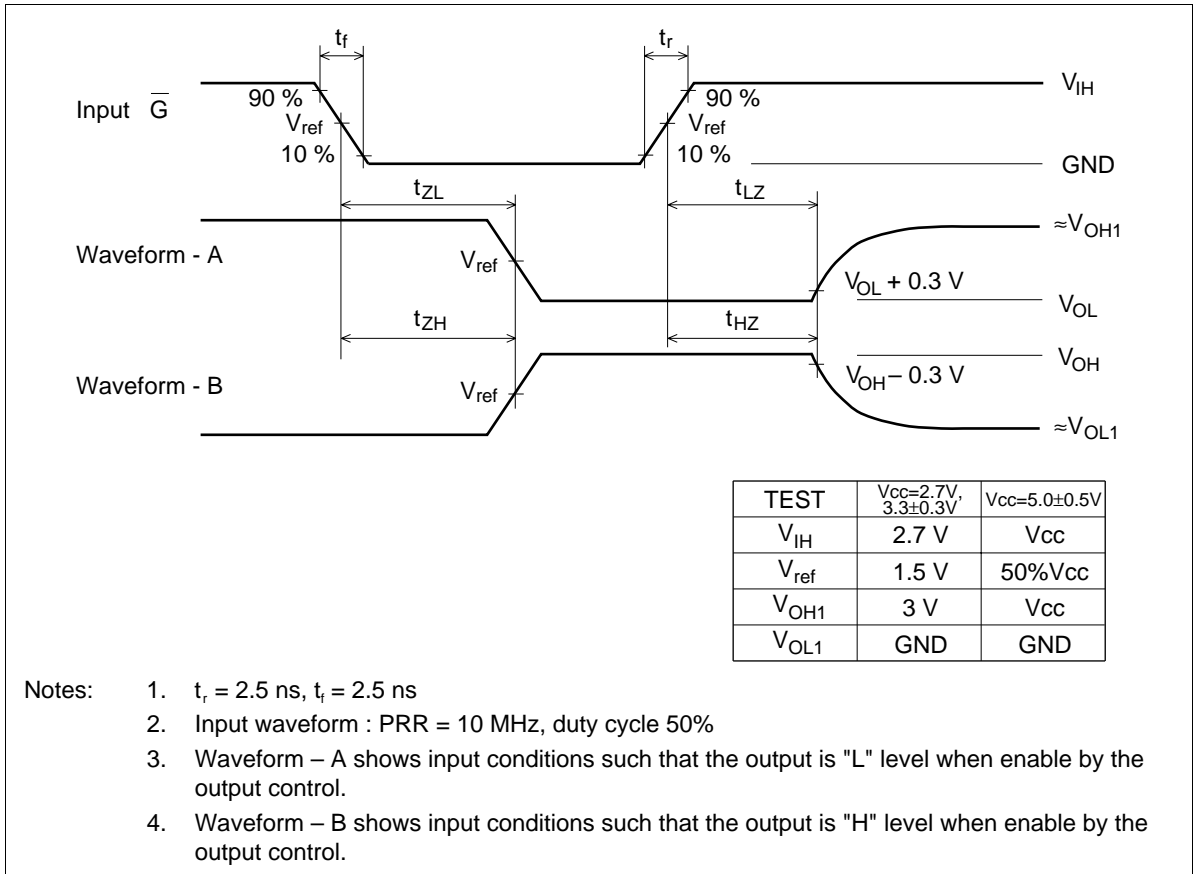
Test Circuit

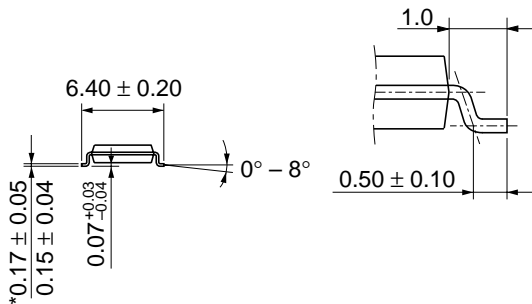
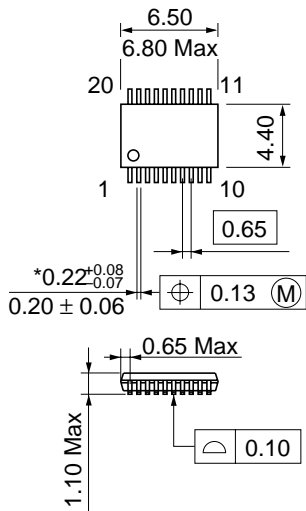


Waveforms – 1



Waveforms – 2





*Dimension including the plating thickness
Base material dimension

| | |
|--------------------------|----------|
| Hitachi Code | TTP-20DA |
| JEDEC | — |
| EIAJ | — |
| Weight (reference value) | 0.07 g |

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