

HD74ALVC162834A

18-bit Universal Bus Driver with 3-state Outputs and Inverted Latch Enable

HITACHI

ADE-205-293B (Z)

Rev. 2
Oct. 2001

Description

The HD74ALVC162834A is an 18-bit universal bus driver designed for 2.3 V to 3.6 V V_{cc} operation.

Data flow from A to Y is controlled by the output enable (\overline{OE}). The device operates in the transparent mode when the latch enable (\overline{LE}) is low. When \overline{LE} is low, the A data is latched if the clock (CLK) input is held at a high or low logic level. If the \overline{LE} is high, the A data is stored in the latch/flip flop on the low to high transition of CLK. When \overline{OE} is high, the outputs are in the high impedance state.

To ensure the high impedance state during power up or power down, \overline{OE} should be tied to V_{cc} through a pullup resistor; the minimum value of the resistor is determined by the current sinking capability of the driver.

All outputs, which are designed to sink up to 12 mA, include series dumping resistors to reduce overshoot and undershoot.

Features

- Supports PC133 and meets “PC SDRAM registered DIMM specification, Rev. 1.1”
- $V_{cc} = 2.3\text{ V to }3.6\text{ V}$
- 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 $\pm 12\text{ mA}$ ($@V_{cc} = 3.0\text{ V}$)
- All outputs have series dumping resistors, so no external resistors are required
- t_{pd} (CLK to Y) = 3.5 ns (Max) ($@V_{cc} = 3.3\pm 0.3\text{ V}$, $C_L = 50\text{ pF}$, $T_a = 0\text{ to }85^\circ\text{C}$)
- t_{pd} (CLK to Y) = 2.5 ns (Max) ($@V_{cc} = 3.3\pm 0.3\text{ V}$, $C_L = 30\text{ pF}$, $T_a = 0\text{ to }85^\circ\text{C}$)
- Package type

| Package type | Package code | Package suffix | Taping code |
|--------------|--------------|----------------|--------------------|
| TSSOP-56pin | TTP-56DAV | T | EL(1000pcs / Reel) |
| TVSOP-56pin | TTP-56DBV | N | EL(1000pcs / Reel) |

Function Table**Inputs**

| \overline{OE} | \overline{LE} | CLK | A | Output Y |
|-----------------|-----------------|--------|---|------------|
| H | X | X | X | Z |
| L | L | X | L | L |
| L | L | X | H | H |
| L | H | ↑ | L | L |
| L | H | ↑ | H | H |
| L | H | L or H | X | Y_0^{*1} |

H : High level

L : Low level

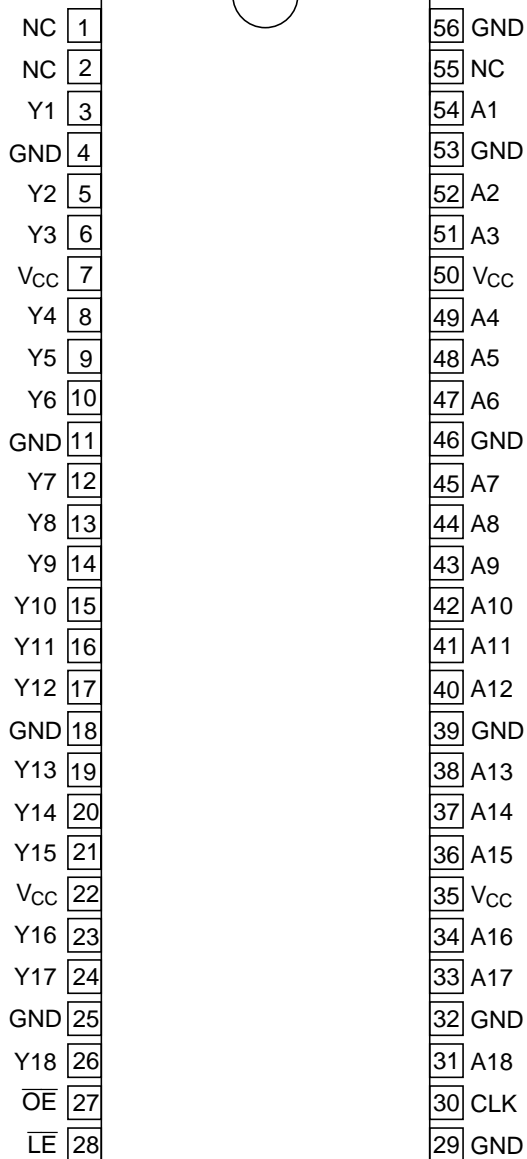
X : Immaterial

Z : High impedance

↑ : Low to high transition

Note: 1. Output level before the indicated steady-state input conditions were established.

Pin Arrangement



(Top view)

Absolute Maximum Ratings

| Item | Symbol | Ratings | Unit | Conditions |
|---|-----------------------|----------------------|------------------|-----------------------------|
| Supply voltage range | V_{CC} | -0.5 to 4.6 | V | |
| Input voltage range ¹ | V_I | -0.5 to 4.6 | V | |
| Output voltage range ^{1, 2} | V_O | -0.5 to $V_{CC}+0.5$ | V | |
| Input clamp current | I_{IK} | -50 | mA | $V_I < 0$ |
| Output clamp current | I_{OK} | ± 50 | mA | $V_O < 0$ or $V_O > V_{CC}$ |
| Continuous output current | I_O | ± 50 | mA | $V_O = 0$ to V_{CC} |
| V_{CC} , GND current / pin | I_{CC} or I_{GND} | ± 100 | mA | |
| Maximum power dissipation at $T_a = 55^\circ\text{C}$ (in still air) ³ | P_T | 1 | W | TSSOP TVSOP |
| Storage temperature range | T_{stg} | -65 to 150 | $^\circ\text{C}$ | |

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 condition" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

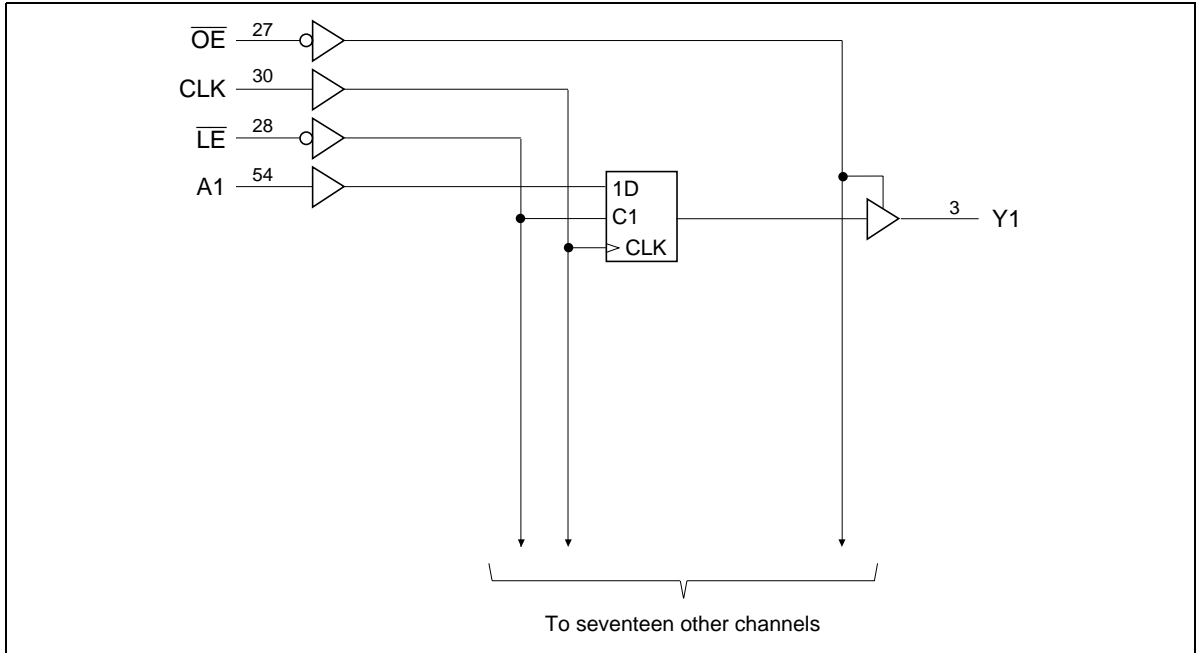
- Notes:
1. The input and output negative-voltage ratings may be exceeded if the input and output clamp current ratings are observed.
 2. The input and output positive-voltage ratings may be exceeded up to 4.6 V if the input and output clamp-current ratings are observed.
 3. The maximum power dissipation is calculated using a junction temperature of 150 $^\circ\text{C}$ and board trace length of 750 mils.

Recommended Operating Conditions

| Item | Symbol | Min | Max | Unit | Conditions |
|------------------------------------|----------------------------------|-----|----------|------------------|-------------------------|
| Supply voltage | V_{CC} | 2.3 | 3.6 | V | |
| Input voltage | V_I | 0 | V_{CC} | V | |
| Output voltage | V_O | 0 | V_{CC} | V | |
| High-level output current | I_{OH} | — | -6 | mA | $V_{CC} = 2.3\text{ V}$ |
| | | — | -8 | | $V_{CC} = 2.7\text{ V}$ |
| | | — | -12 | | $V_{CC} = 3.0\text{ V}$ |
| Low-level output current | I_{OL} | — | 6 | mA | $V_{CC} = 2.3\text{ V}$ |
| | | — | 8 | | $V_{CC} = 2.7\text{ V}$ |
| | | — | 12 | | $V_{CC} = 3.0\text{ V}$ |
| Input transition rise or fall rate | $\bullet t/\blacktriangledown v$ | 0 | 10 | ns/V | |
| Operating free-air temperature | T_a | -40 | 85 | $^\circ\text{C}$ | |

Note: Unused or floating control pins must be held high or low.

Logic Diagram



Electrical Characteristics

| Item | Symbol | V_{CC} (V) | $T_a = -40 \text{ to } 85^\circ\text{C}$ | | Unit | Test Conditions | | | |
|--------------------------|-----------------|--------------------------|--|------|---------------|---|-----------|---------------|---------------------------|
| | | | Min | Max | | | | | |
| Input voltage | V_{IH} | 2.3 to 2.7 | 1.7 | — | V | | | | |
| | | 2.7 to 3.6 | 2.0 | — | | | | | |
| | V_{IL} | 2.3 to 2.7 | — | 0.7 | V | | | | |
| | | 2.7 to 3.6 | — | 0.8 | | | | | |
| Output voltage | V_{OH} | 2.3 to 3.6 | $V_{CC}-0.2$ | — | V | $I_{OH} = -100 \mu\text{A}$ | | | |
| | | 2.3 | 1.9 | — | | $I_{OH} = -4 \text{ mA}, V_{IH} = 1.7 \text{ V}$ | | | |
| | | 2.3 | 1.7 | — | | $I_{OH} = -6 \text{ mA}, V_{IH} = 1.7 \text{ V}$ | | | |
| | | 3.0 | 2.4 | — | | $I_{OH} = -6 \text{ mA}, V_{IH} = 2.0 \text{ V}$ | | | |
| | | 2.7 | 2.0 | — | | $I_{OH} = -8 \text{ mA}, V_{IH} = 2.0 \text{ V}$ | | | |
| | | 3.0 | 2.0 | — | | $I_{OH} = -12 \text{ mA}, V_{IH} = 2.0 \text{ V}$ | | | |
| | V_{OL} | 2.3 to 3.6 | — | 0.2 | V | $I_{OL} = 100 \mu\text{A}$ | | | |
| | | 2.3 | — | 0.4 | | $I_{OL} = 4 \text{ mA}, V_{IL} = 0.7 \text{ V}$ | | | |
| | | 2.3 | — | 0.55 | | $I_{OL} = 6 \text{ mA}, V_{IL} = 0.7 \text{ V}$ | | | |
| | | 3.0 | — | 0.55 | | $I_{OL} = 6 \text{ mA}, V_{IL} = 0.8 \text{ V}$ | | | |
| | | 2.7 | — | 0.6 | | $I_{OL} = 8 \text{ mA}, V_{IL} = 0.8 \text{ V}$ | | | |
| | | 3.0 | — | 0.8 | | $I_{OL} = 12 \text{ mA}, V_{IL} = 0.8 \text{ V}$ | | | |
| | | Input current | I_{IN} | 3.6 | | — | ± 5.0 | μA | $V_{IN} = V_{CC}$ or GND |
| | | Off state output current | I_{OZ} | 3.6 | | — | ± 10 | μA | $V_{OUT} = V_{CC}$ or GND |
| Quiescent supply current | I_{CC} | 3.6 | — | 40 | μA | $V_{IN} = V_{CC}$ or GND | | | |
| | ΔI_{CC} | 3.0 to 3.6 | — | 750 | μA | One input at $(V_{CC}-0.6)\text{V}$, other inputs at V_{CC} or GND | | | |

Switching Characteristics

(Ta = -40 to 85°C)

| Item | Symbol | V _{cc} (V) | Min | Typ | Max | Unit | From (Input) | To (Output) | | |
|-------------------------|------------------|---------------------|-----|-----|-----|------|----------------|-------------|-----|---|
| Maximum clock frequency | f _{max} | 2.5±0.2 | 150 | — | — | MHz | | | | |
| | | 2.7 | 150 | — | — | | | | | |
| | | 3.3±0.3 | 150 | — | — | | | | | |
| Propagation delay time | t _{PLH} | 2.5±0.2 | 1.0 | — | 5.0 | ns | A | Y | | |
| | | 2.7 | — | — | 5.0 | | | | | |
| | | 3.3±0.3 | 1.0 | — | 4.2 | | | | | |
| | t _{PHL} | 2.5±0.2 | 1.4 | — | 6.3 | | LE | Y | | |
| | | 2.7 | — | — | 6.1 | | | | | |
| | | 3.3±0.3 | 1.4 | — | 5.4 | | | | | |
| | | 2.5±0.2 | 1.4 | — | 6.3 | | | | CLK | Y |
| | | 2.7 | — | — | 6.1 | | | | | |
| | | 3.3±0.3 | 1.4 | — | 5.4 | | | | | |
| Output enable time | t _{ZH} | 2.5±0.2 | 1.4 | — | 6.3 | ns | OE | Y | | |
| | | 2.7 | — | — | 6.5 | | | | | |
| | | 3.3±0.3 | 1.1 | — | 5.5 | | | | | |
| Output disable time | t _{HZ} | 2.5±0.2 | 1.0 | — | 4.7 | ns | OE | Y | | |
| | | 2.7 | — | — | 4.9 | | | | | |
| | | 3.3±0.3 | 1.3 | — | 4.5 | | | | | |
| Input capacitance | C _{IN} | 3.3 | 3.3 | 4.0 | 4.5 | pF | Control inputs | | | |
| | | 3.3 | 3.0 | 6.0 | 9.0 | | Data inputs | | | |
| Output capacitance | C _O | 3.3 | 3.0 | 7.0 | 9.0 | pF | Y ports | | | |

Switching Characteristics

(Ta = -40 to 85°C) (cont)

| Item | Symbol | V _{cc} (V) | Min | Typ | Max | Unit | From (Input) |
|-------------|-----------------|---------------------|---------|-----|-----|----------------|------------------|
| Setup time | t _{su} | 2.5±0.2 | 2.2 | — | — | ns | Data before CLK↑ |
| | | 2.7 | 2.1 | — | — | | |
| | | 3.3±0.3 | 1.7 | — | — | | |
| | Data before LE↑ | 2.5±0.2 | 1.2 | — | — | ns | Data before LE↑ |
| | | | 2.7 | 1.6 | — | | — |
| | | | 3.3±0.3 | 1.3 | — | | — |
| | | 2.5±0.2 | 1.4 | — | — | ns | Data before LE↑ |
| | | | 2.7 | 1.5 | — | | — |
| | | | 3.3±0.3 | 1.2 | — | | — |
| Hold time | t _h | 2.5±0.2 | 0.6 | — | — | ns | Data after CLK↑ |
| | | 2.7 | 0.6 | — | — | | |
| | | 3.3±0.3 | 0.7 | — | — | | |
| | 2.5±0.2 | 1.2 | — | — | ns | Data after LE↑ | |
| | | 2.7 | 1.1 | — | | — | |
| | | 3.3±0.3 | 1.1 | — | | — | |
| Pulse width | t _w | 2.5±0.2 | 3.3 | — | — | ns | LE "L" |
| | | 2.7 | 3.3 | — | — | | |
| | | 3.3±0.3 | 3.3 | — | — | | |
| | 2.5±0.2 | 3.3 | — | — | ns | CLK "H" or "L" | |
| | | 2.7 | 3.3 | — | | — | |
| | | 3.3±0.3 | 3.3 | — | | — | |

Switching Characteristics

(Ta = 0 to 85°C)

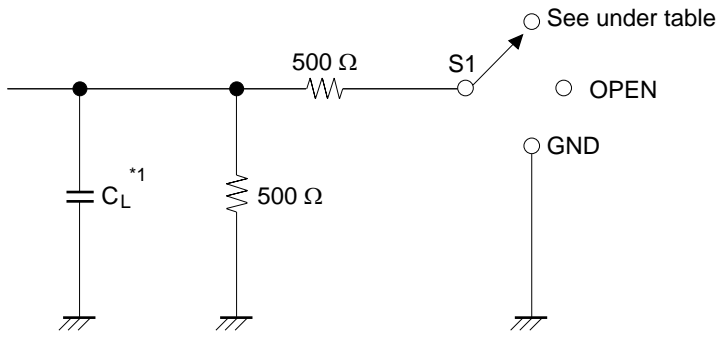
| Item | Symbol | V _{cc} (V) | Min | Typ | Max | Unit | FROM (Input) | TO (Output) | |
|------------------------|----------------------|-------------------------------------|---------|-----|-----|------|------------------|-------------|---|
| Propagation delay time | C _L =50pF | t _{PLH} , t _{PHL} | 3.3±0.3 | 1.4 | — | 3.5 | ns | CLK | Y |
| | | C _L =30pF | 3.3±0.3 | 0.7 | — | 2.5 | | CLK | Y |
| Setup time | t _{su} | 3.3±0.3 | 1.0 | — | — | ns | Data before CLK↑ | | |
| Hold time | t _h | 3.3±0.3 | 0.6 | — | — | ns | Data after CLK↑ | | |

Operating Characteristics

(Ta = 25°C)

| Item | Symbol | $V_{cc} = 2.5 \pm 0.2 \text{ V}$ | $V_{cc} = 3.3 \pm 0.3 \text{ V}$ | Unit | Test Conditions | |
|-------------------------------|-----------------|----------------------------------|----------------------------------|------|-----------------|-------------------------------|
| | | Typ | Typ | | | |
| Power dissipation capacitance | Outputs enable | C_{pd} | 22.0 | 24.5 | pF | $C_L = 0, f = 10 \text{ MHz}$ |
| | Outputs disable | | 5.0 | 6.0 | | |

Test Circuit

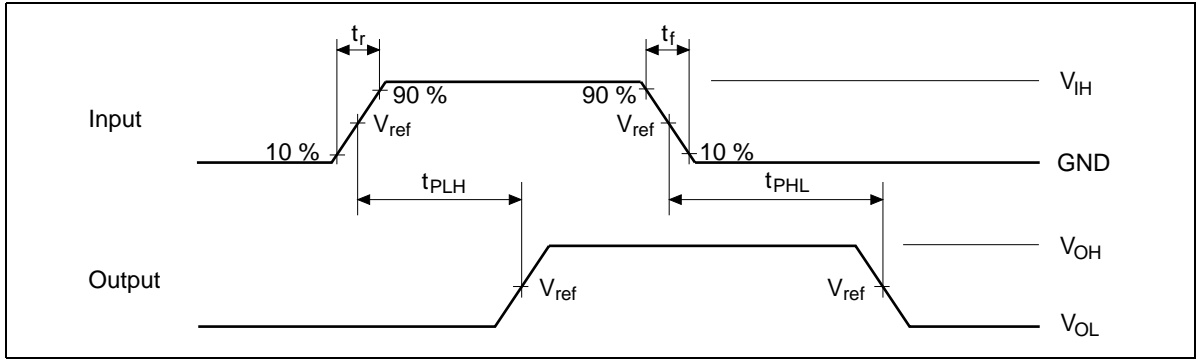


Load Circuit for Outputs

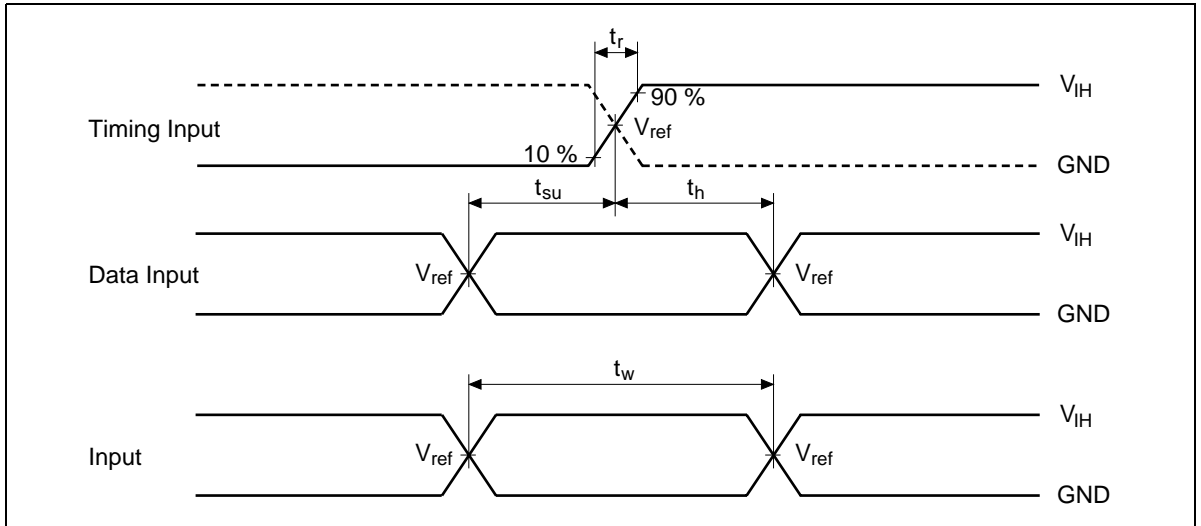
| Symbol | $V_{CC}=2.5\pm 0.2V$ | $V_{CC}=2.7V,$ $3.3\pm 0.3V$ |
|-------------------|----------------------|---------------------------------|
| t_{PLH}/t_{PHL} | OPEN | OPEN |
| $t_{su}/t_h/t_w$ | | |
| t_{ZH}/t_{HZ} | GND | GND |
| t_{ZL}/t_{LZ} | $2 \times V_{CC}$ | 6.0 V |
| C_L | 30 pF | 50 pF |

Note: 1. C_L includes probe and jig capacitance.

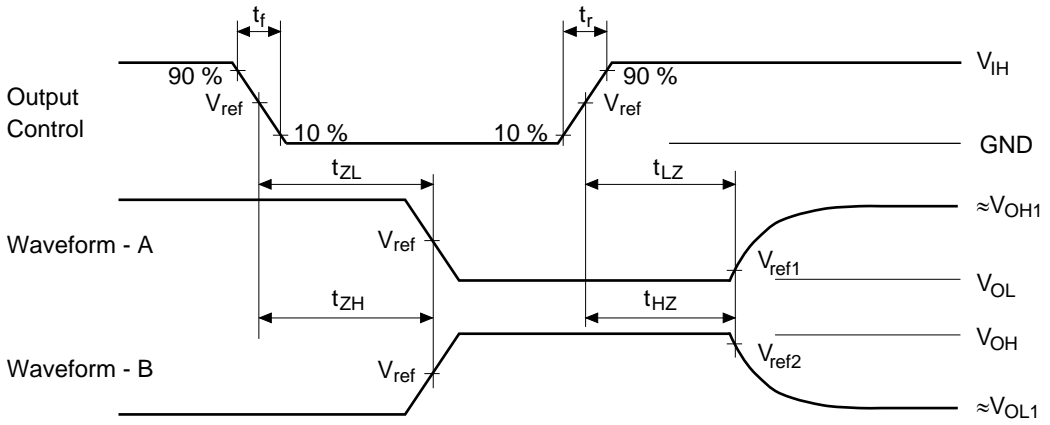
Waveforms – 1



Waveforms – 2



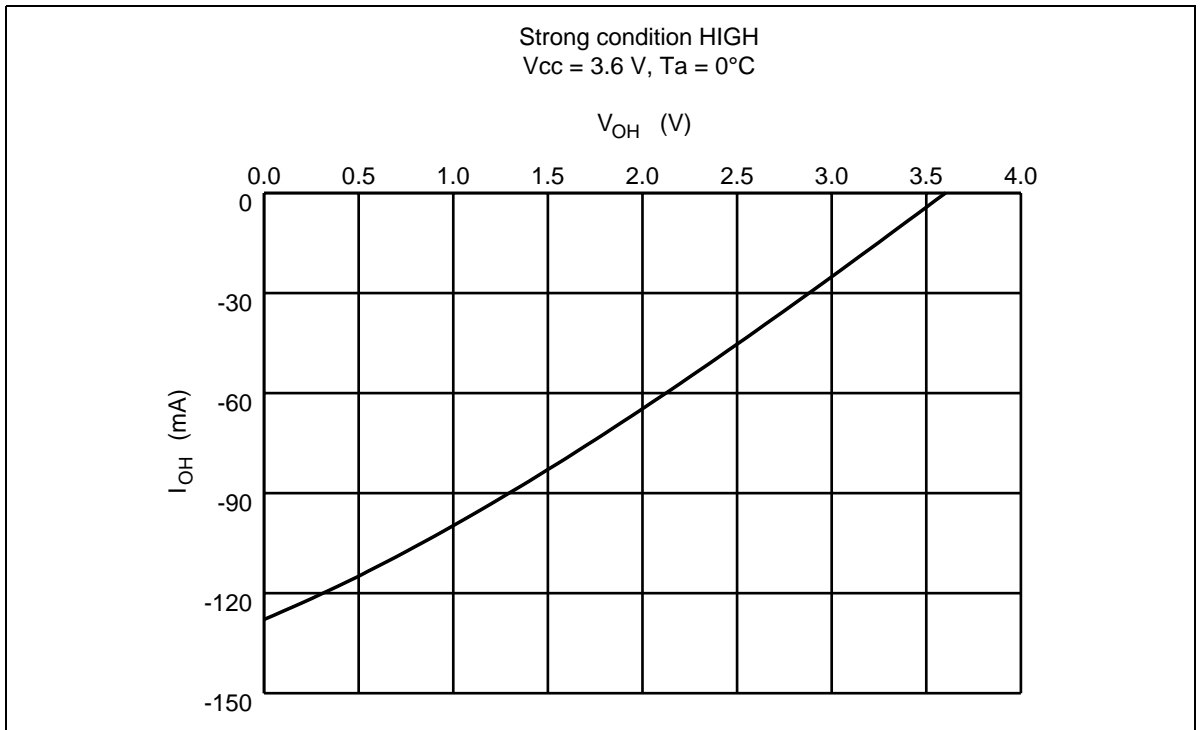
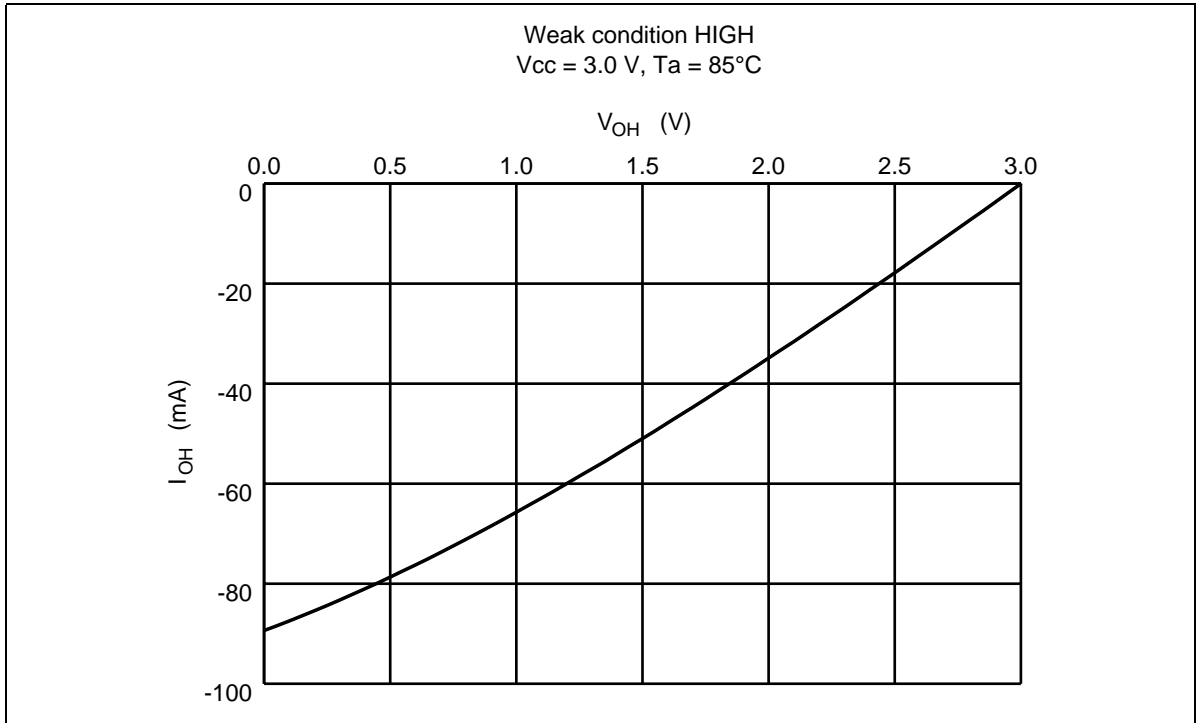
Waveforms – 3



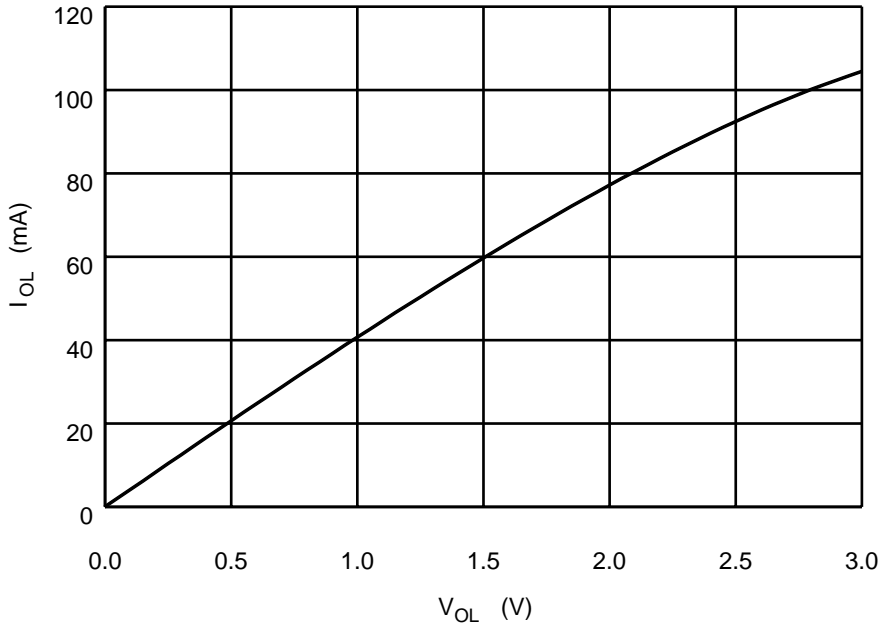
| TEST | V _{CC} =2.5±0.2V | V _{CC} =2.7V, 3.3±0.3V |
|-------------------|---------------------------|------------------------------------|
| V _{IH} | V _{CC} | 2.7 V |
| V _{ref} | 1/2 V _{CC} | 1.5 V |
| V _{ref1} | V _{OL} + 0.15 V | V _{OL} + 0.3 V |
| V _{ref2} | V _{OH} - 0.15 V | V _{OH} - 0.3 V |
| V _{OH1} | V _{CC} | 3.0 V |
| V _{OL1} | GND | GND |

- Notes:
- All input pulses are supplied by generators having the following characteristics :
 PRR • 10 MHz, Z_o = 50 Ω, t_r • 2.0 ns, t_f • 2.0 ns. (V_{CC} = 2.5±0.2 V)
 PRR • 10 MHz, Z_o = 50 Ω, t_r • 2.5 ns, t_f • 2.5 ns. (V_{CC} = 2.7 V, 3.3±0.3 V)
 - Waveform – A is for an output with internal conditions such that the output is low except when disabled by the output control.
 - Waveform – B is for an output with internal conditions such that the output is high except when disabled by the output control.
 - The output are measured one at a time with one transition per measurement.

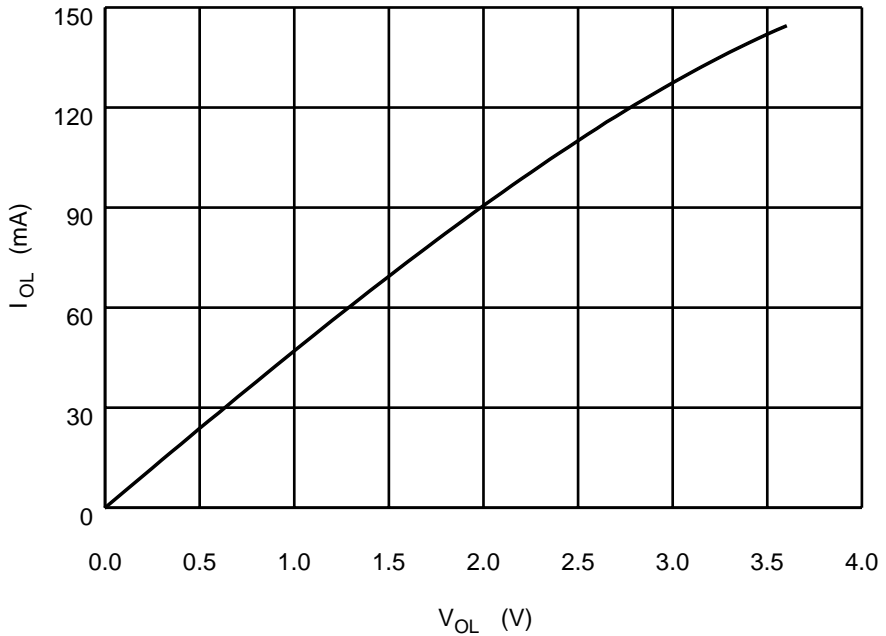
IV Characteristics for Register Output (Measured value)



Weak condition LOW
 $V_{CC} = 3.0\text{ V}$, $T_a = 85^\circ\text{C}$

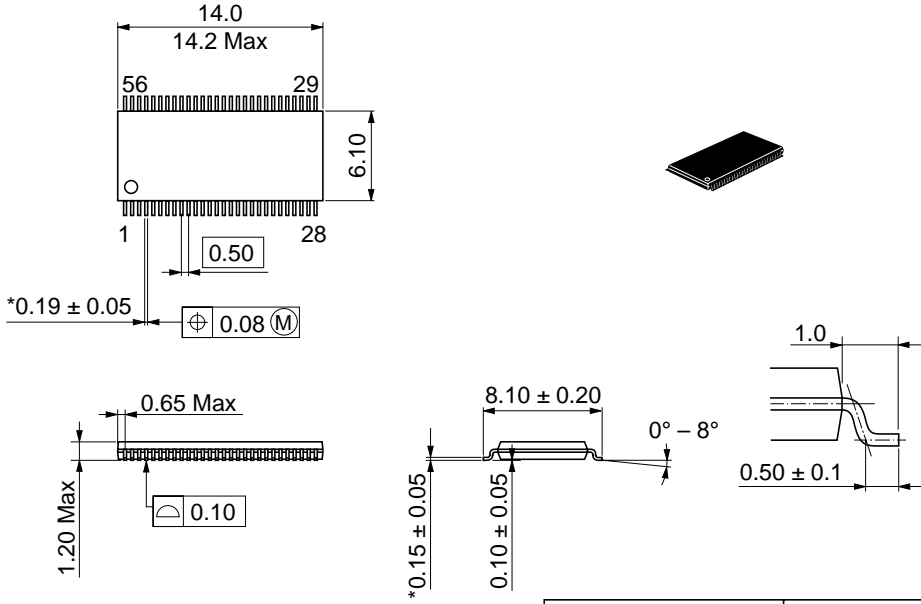


Strong condition LOW
 $V_{CC} = 3.6\text{ V}$, $T_a = 0^\circ\text{C}$



Package Dimensions

As of July, 2001
Unit: mm

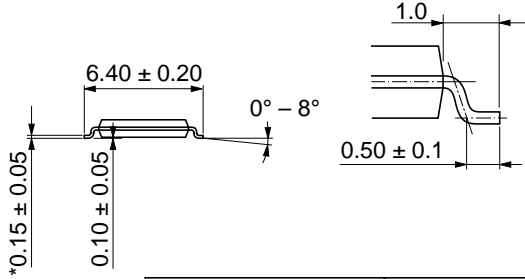
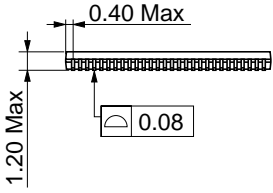
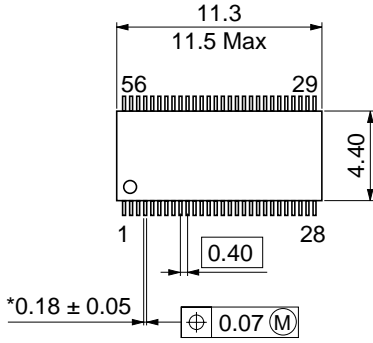


*Pd plating

| | |
|------------------------|-----------|
| Hitachi Code | TTP-56DAV |
| JEDEC | — |
| JEITA | — |
| Mass (reference value) | 0.32 g |

HD74ALVC162834A

As of July, 2001
Unit: mm



*Pd plating

| | |
|------------------------|-----------|
| Hitachi Code | TTP-56DBV |
| JEDEC | — |
| JEITA | — |
| Mass (reference value) | — |

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Hitachi, Ltd.

Semiconductor & Integrated Circuits
Nippon Bldg., 2-6-2, Ohte-machi, Chiyoda-ku, Tokyo 100-0004, Japan
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For further information write to:

| | | | |
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