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# HD74ALVCHS162830

1-bit to 2-bit Address Driver with 3-state Outputs

## HITACHI

ADE-205-221 (Z)

Preliminary

1st. Edition

July 1998

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### Description

This 1-bit to 2-bit address driver is designed for 2.3 V to 3.6 V  $V_{CC}$  operation. 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. Active bus hold circuitry is provided to hold unused or floating inputs at a valid logic level. All outputs, which are designed to sink up to 12 mA, include equivalent 26  $\Omega$  resistors to reduce overshoot and undershoot.

Diodes to  $V_{CC}$  have been added on the inputs to clamp overshoot.

### Features

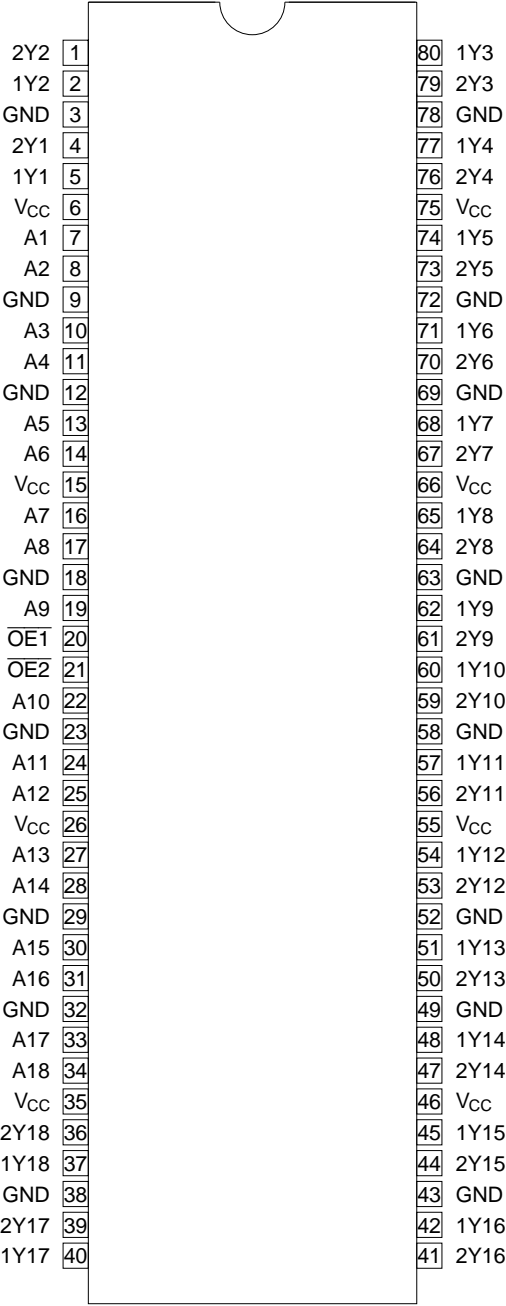
- $V_{CC} = 2.3 \text{ V to } 3.6 \text{ V}$
- Typical  $V_{OL}$  ground bounce  $< 0.8 \text{ V}$  ( $@V_{CC} = 3.3 \text{ V}$ ,  $T_a = 25^\circ\text{C}$ )
- Typical  $V_{OH}$  undershoot  $> 2.0 \text{ V}$  ( $@V_{CC} = 3.3 \text{ V}$ ,  $T_a = 25^\circ\text{C}$ )
- High output current  $\pm 12 \text{ mA}$  ( $@V_{CC} = 3.0 \text{ V}$ )
- Bus hold on data inputs eliminates the need for external pullup / pulldown resistors
- All outputs have equivalent 26  $\Omega$  series resistors, so no external resistors are required
- Diode on inputs clamp overshoot

Function Table

Inputs			Outputs	
OE1	OE2	A	1Yn	2Yn
L	H	H	H	Z
L	H	L	L	Z
H	L	H	Z	H
H	L	L	Z	L
L	L	H	H	H
L	L	L	L	L
H	H	X	Z	Z

H : High level  
L : Low level  
X : Immaterial  
Z : High impedance

Pin Arrangement



(Top view)

Absolute Maximum Ratings

Item	Symbol	Ratings	Unit	Conditions
Supply voltage	$V_{CC}$	−0.5 to 4.6	V	
Input voltage <sup>*1</sup>	$V_I$	−0.5 to 4.6	V	
Output voltage <sup>*1,2</sup>	$V_O$	−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) <sup>*3</sup>	$P_T$	1	W	TVSOP
Storage temperature	$T_{stg}$	−65 to 150	$^{\circ}\text{C}$	

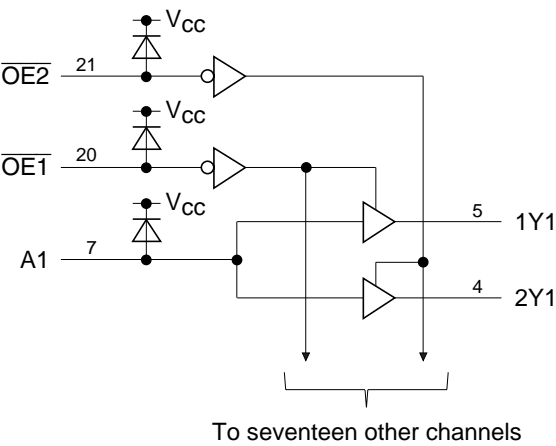
- Notes:
- Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute maximum rated conditions for extended periods may affect device reliability.
1. The input and output negative voltage ratings may be exceeded if the input and output clamp current ratings are observed.
  2. This value is limited to 4.6 V maximum.
  3. The maximum package power dissipation is calculated using a junction temperature of 150°C and a 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	$t / v$	0	10	ns / V	
Operating temperature	$T_a$	−40	85	$^{\circ}\text{C}$	

Note: Unused control inputs must be held high or low to prevent them from floating.

Logic Diagram



Electrical Characteristics (Ta = -40 to 85°C)

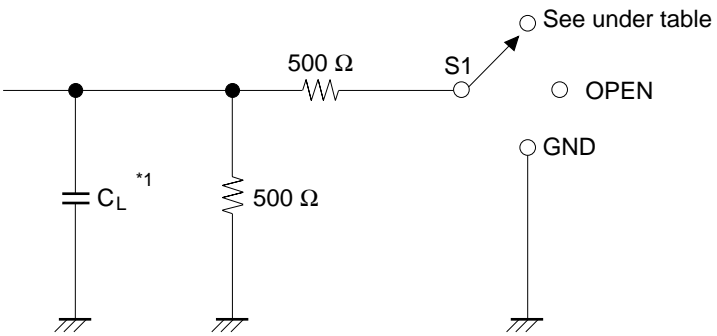
Item	Symbol	V <sub>CC</sub> (V)	Min	Max	Unit	Test Conditions
Input voltage	V <sub>IH</sub>	2.3 to 2.7	1.7	—	V	
		2.7 to 3.6	2.0	—		
	V <sub>IL</sub>	2.3 to 2.7	—	0.7		
		2.7 to 3.6	—	0.8		
Input diode voltage	V <sub>IK</sub>	2.3	—	-1.2	V	I <sub>I</sub> = -18 mA
		2.3	—	V <sub>CC</sub> +1.2		I <sub>I</sub> = 18 mA
Output voltage	V <sub>OH</sub>	2.3 to 3.6	V <sub>CC</sub> -0.2	—	V	I <sub>OH</sub> = -100 μA
		2.3	1.9	—		I <sub>OH</sub> = -4 mA, V <sub>IH</sub> = 1.7 V
		2.3	1.7	—		I <sub>OH</sub> = -6 mA, V <sub>IH</sub> = 1.7 V
		3.0	2.4	—		I <sub>OH</sub> = -6 mA, V <sub>IH</sub> = 2.0 V
		2.7	2.0	—		I <sub>OH</sub> = -8 mA, V <sub>IH</sub> = 2.0 V
		3.0	2.0	—		I <sub>OH</sub> = -12 mA, V <sub>IH</sub> = 2.0 V
	V <sub>OL</sub>	2.3 to 3.6	—	0.2		I <sub>OL</sub> = 100 μA
		2.3	—	0.4		I <sub>OL</sub> = 4 mA, V <sub>IL</sub> = 0.7 V
		2.3	—	0.55		I <sub>OL</sub> = 6 mA, V <sub>IL</sub> = 0.7 V
		3.0	—	0.55		I <sub>OL</sub> = 6 mA, V <sub>IL</sub> = 0.8 V
		2.7	—	0.6		I <sub>OL</sub> = 8 mA, V <sub>IL</sub> = 0.8 V
		3.0	—	0.8		I <sub>OL</sub> = 12 mA, V <sub>IL</sub> = 0.8 V
Input current	I <sub>IN</sub>	3.6	—	±5	μA	V <sub>IN</sub> = V <sub>CC</sub> or GND
	I <sub>IN (hold)</sub>	2.3	45	—		V <sub>IN</sub> = 0.7 V
		2.3	-45	—		V <sub>IN</sub> = 1.7 V
		3.0	75	—		V <sub>IN</sub> = 0.8 V
		3.0	-75	—		V <sub>IN</sub> = 2.0 V
		3.6	—	±500		V <sub>IN</sub> = 0 to 3.6 V *1
Off state output current	I <sub>OZ</sub>	3.6	—	±10	μA	V <sub>OUT</sub> = V <sub>CC</sub> or GND
Quiescent supply current	I <sub>CC</sub>	3.6	—	40	μA	V <sub>IN</sub> = V <sub>CC</sub> or GND
	ΔI <sub>CC</sub>	3.0 to 3.6	—	750	μA	V <sub>IN</sub> = one input at (V <sub>CC</sub> -0.6) V, other inputs at V <sub>CC</sub> or GND

Note: 1. This is the bus hold maximum dynamic current required to switch the input from one state to another.

## Switching Characteristics (Ta = -40 to 85°C)

Item	Symbol	V <sub>CC</sub> (V)	Min	Typ	Max	Unit	FROM (Input)	TO (Output)
Propagation delay time	t <sub>PLH</sub>	2.5±0.2	1.2	—	3.8	ns	A	Y
	t <sub>PHL</sub>	2.7	—	—	4.0			
		3.3±0.3	1.7	—	3.5			
Output enable time	t <sub>ZH</sub>	2.5±0.2	1.0	—	5.7	ns	OE	Y
	t <sub>ZL</sub>	2.7	—	—	5.7			
		3.3±0.3	1.0	—	4.8			
Output disable time	t <sub>HZ</sub>	2.5±0.2	1.0	—	4.9	ns	OE	Y
	t <sub>LZ</sub>	2.7	—	—	5.4			
		3.3±0.3	1.7	—	5.2			
Input capacitance	C <sub>IN</sub>	3.3	—	4.5	—	pF	Control inputs	
		3.3	—	5.0	—		Data inputs	
Output capacitance	C <sub>O</sub>	3.3	—	7.5	—	pF		

Test Circuit



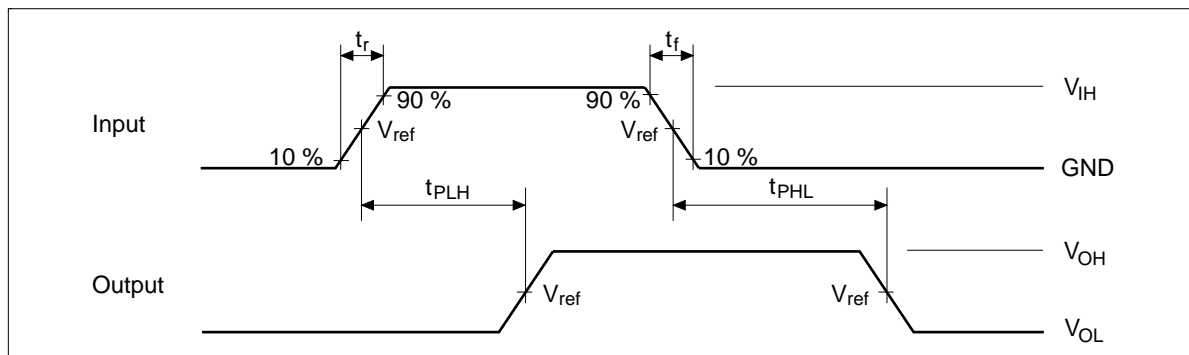
Load Circuit for Outputs

Symbol	Vcc=2.5±0.2V	Vcc=2.7V, 3.3±0.3V
tPLH/ tPHL	OPEN	OPEN
tZH/ tHZ	GND	GND
tZL/ tLZ	2 × VCC	6.0 V
CL	30 pF	50 pF

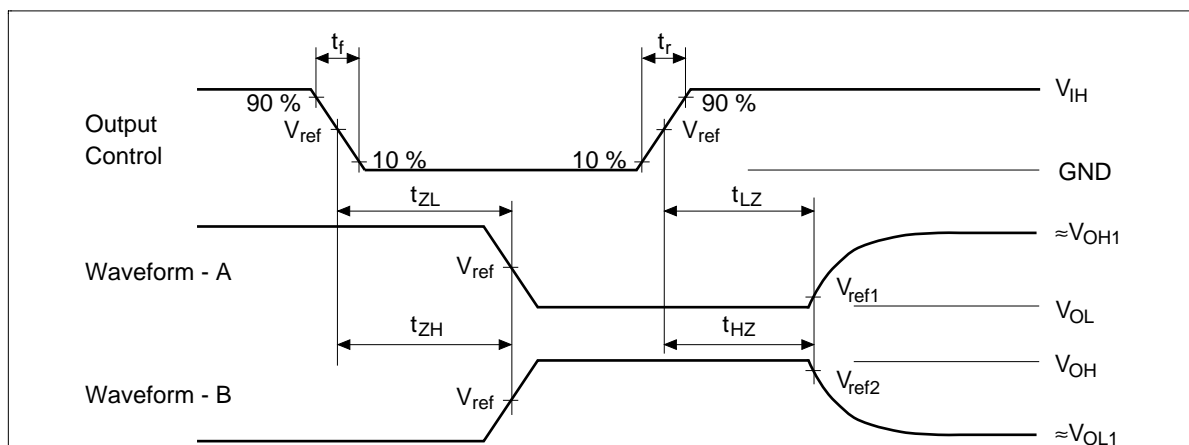
Note: 1. CL includes probe and jig capacitance.



## Waveforms – 1



## Waveforms – 2

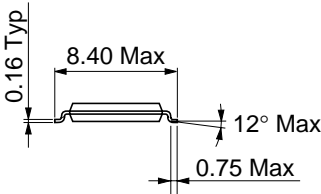
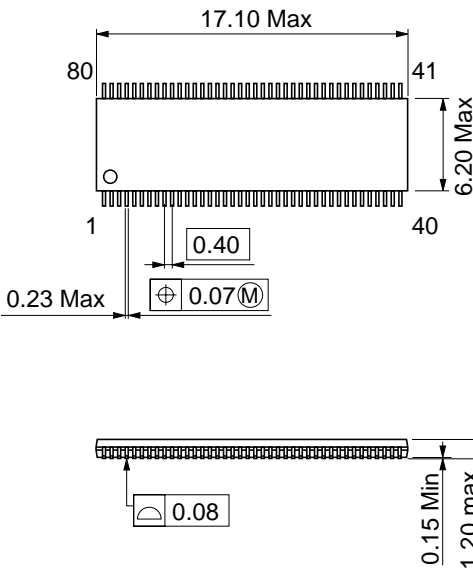


TEST	$V_{CC}=2.5\pm0.2V$	$V_{CC}=2.7V, 3.3\pm0.3V$
$V_{IH}$	$V_{CC}$	2.7 V
$V_{ref}$	$1/2 V_{CC}$	1.5 V
$V_{ref1}$	$V_{OL} + 0.15 V$	$V_{OL} + 0.3 V$
$V_{ref2}$	$V_{OH} - 0.15 V$	$V_{OH} - 0.3 V$
$V_{OH1}$	$V_{CC}$	3.0 V
$V_{OL1}$	GND	GND

- Notes:
1. All input pulses are supplied by generators having the following characteristics :  
 PRR 10 MHz,  $Z_o = 50 \Omega$ ,  $t_r$  2.0 ns,  $t_f$  2.0 ns. ( $V_{CC} = 2.5\pm0.2 V$ )  
 PRR 10 MHz,  $Z_o = 50 \Omega$ ,  $t_r$  2.5 ns,  $t_f$  2.5 ns. ( $V_{CC} = 2.7 V, 3.3\pm0.3 V$ )
  2. Waveform – A is for an output with internal conditions such that the output is low except when disabled by the output control.
  3. Waveform – B is for an output with internal conditions such that the output is high except when disabled by the output control.
  4. The output are measured one at a time with one transition per measurement.

Package Dimensions

Unit : mm



Hitachi code	—
EIAJ code	—
JEDEC code	—

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# HITACHI

## Hitachi, Ltd.

Semiconductor & Integrated Circuits.  
Nippon Bldg., 2-6-2, Ohte-machi, Chiyoda-ku, Tokyo 100-0004, Japan  
Tel: Tokyo (03) 3270-2111 Fax: (03) 3270-5109

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## For further information write to:

Hitachi Semiconductor (America) Inc. 179 East Tasman Drive, San Jose, CA 95134 Tel: <1> (408) 433-1990 Fax: <1> (408) 433-0223	Hitachi Europe GmbH Electronic components Group Dornacher Straße 3 D-85622 Feldkirchen, Munich Germany Tel: <49> (89) 9 9180-0 Fax: <49> (89) 9 29 30 00  Hitachi Europe Ltd. Electronic Components Group. Whitebrook Park Lower Cookham Road Maidenhead Berkshire SL6 8YA, United Kingdom Tel: <44> (1628) 585000 Fax: <44> (1628) 778322
--	---

Hitachi Asia Pte. Ltd.  
16 Collyer Quay #20-00  
Hitachi Tower  
Singapore 049318  
Tel: 535-2100  
Fax: 535-1533

Hitachi Asia Ltd.  
Taipei Branch Office  
3F, Hung Kuo Building, No.167,  
Tun-Hwa North Road, Taipei (105)  
Tel: <886> (2) 2718-3666  
Fax: <886> (2) 2718-8180

Hitachi Asia (Hong Kong) Ltd.  
Group III (Electronic Components)  
7/F., North Tower, World Finance Centre,  
Harbour City, Canton Road, Tsim Sha Tsui,  
Kowloon, Hong Kong  
Tel: <852> (2) 735 9218  
Fax: <852> (2) 730 0281  
Telex: 40815 HITEC HX

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