
HD74ALVCH162373

16-bit Transparent D-type Latches with 3-state Outputs

HITACHI

ADE-205-179 (Z)
Preliminary
1st. Edition
December 1996

Description

The HD74ALVCH162373 is particularly suitable for implementing buffer registers, I/O ports, bidirectional bus drivers, and working registers. It can be used as two 8-bit latches or one 16-bit latch. When the latch enable (LE) input is high, the Q outputs follow the data (D) inputs. When LE is taken low, the Q outputs are latched at the levels set up at the D inputs. Active bus hold circuitry is provided to hold unused or floating data inputs at a valid logic level. All outputs, which are designed to sink up to 12 mA, include 26 Ω resistors to reduce overshoot and undershoot.

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 Ω series resistors, so no external resistors are required.

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Function Table

Inputs			Output Q
\overline{OE}	LE	D	
L	H	H	H
L	H	L	L
L	L	X	Q_0^{-1}
H	X	X	Z

H : High level

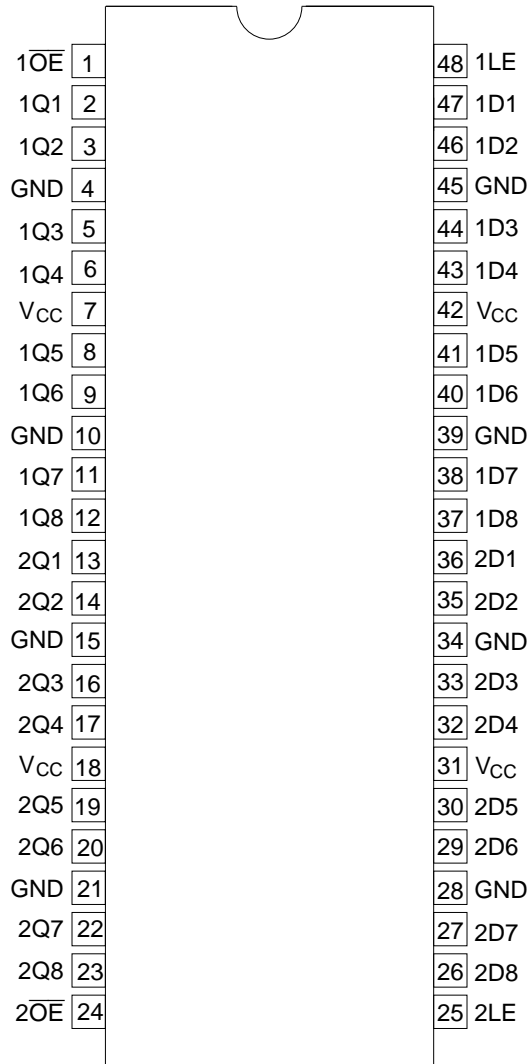
L : Low level

X : Immaterial

Z : High impedance

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	V_{CC}	-0.5 to 4.6	V	
Input voltage ^{*1}	V_I	-0.5 to 4.6	V	
Output voltage ^{*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}
		± 100		
Maximum power dissipation at $T_a = 55^\circ\text{C}$ (in still air) ^{*3}	P_T	0.85	W	TSSOP
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.

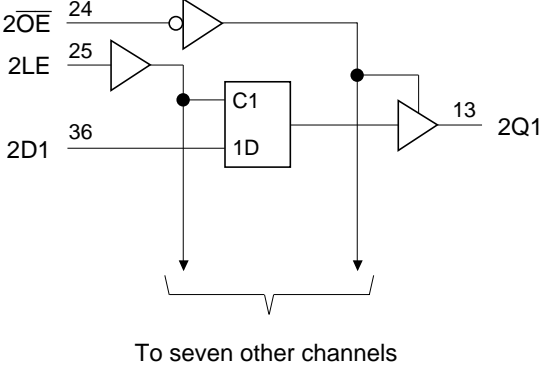
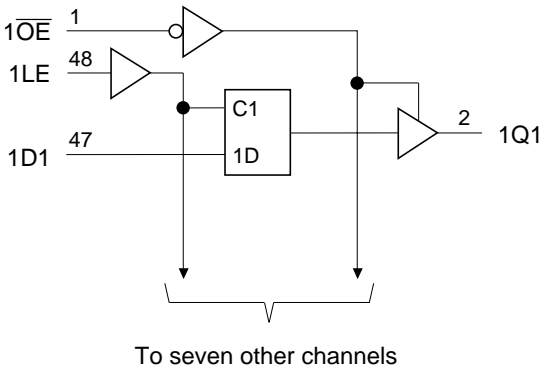
1. The input and output negative voltage ratings may be exceeded if the input and output clamp current ratings are observed.
2. This value is limited to 4.6 V maximum.
3. The maximum package power dissipation is calculated using a junction temperature of 150°C and a board trace length of 750 mils.

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	$\Delta t / \Delta v$	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 _{CC} (V) ^{*1}	Min	Max	Unit	Test Conditions	
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			
		2.7 to 3.6	—	0.8			
Output voltage	V _{OH}	Min to Max	V _{CC} -0.2	—	V	I _{OH} = -100 μA	
		2.3	1.9	—		I _{OH} = -4 mA, V _{IH} = 1.7 V	
		2.3	1.7	—		I _{OH} = -6 mA, V _{IH} = 1.7 V	
		3.0	2.4	—		I _{OH} = -6 mA, V _{IH} = 2.0 V	
		2.7	2.0	—		I _{OH} = -8 mA, V _{IH} = 2.0 V	
		3.0	2.0	—		I _{OH} = -12 mA, V _{IH} = 2.0 V	
	V _{OL}	Min to Max	—	0.2		I _{OL} = 100 μA	
		2.3	—	0.4		I _{OL} = 4 mA, V _{IL} = 0.7 V	
		2.3	—	0.55		I _{OL} = 6 mA, V _{IL} = 0.7 V	
		3.0	—	0.55		I _{OL} = 6 mA, V _{IL} = 0.8 V	
		2.7	—	0.6		I _{OL} = 8 mA, V _{IL} = 0.8 V	
		3.0	—	0.8		I _{OL} = 12 mA, V _{IL} = 0.8 V	
Input current	I _{IN}	3.6	—	±5	μA	V _{IN} = V _{CC} or GND	
		I _{IN (hold)}	2.3	45		—	V _{IN} = 0.7 V
			2.3	-45		—	V _{IN} = 1.7 V
			3.0	75		—	V _{IN} = 0.8 V
			3.0	-75		—	V _{IN} = 2.0 V
			3.6	—		±500	V _{IN} = 0 to 3.6 V
Off state output current ^{*2}	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	V _{IN} = one input at (V _{CC} -0.6) V, other inputs at V _{CC} or GND	

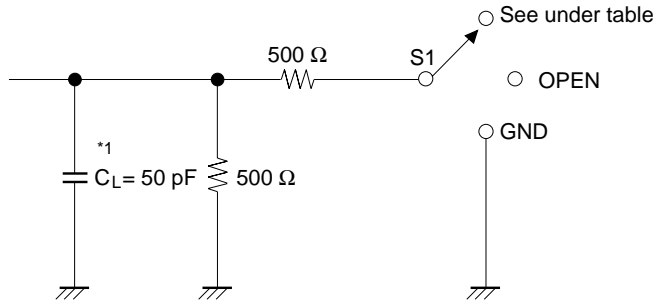
Notes: 1. For conditions shown as Min or Max, use the appropriate values under recommended operating conditions.

2. For I/O ports, the parameter I_{OZ} includes the input leakage current.

Switching Characteristics ($T_a = -40$ to 85°C)

Item	Symbol	V_{cc} (V)	Min	Typ	Max	Unit	FROM (Input)	TO (Output)	
Propagation delay time	t_{PLH}	2.5 ± 0.2	1.0	—	5.6	ns	D	Q	
			2.7	—	5.0				
	t_{PHL}	3.3 ± 0.3	1.1	—	4.2				
			2.5 ± 0.2	1.0	—				6.0
				2.7	—	5.3		LE	Q
				3.3 ± 0.3	1.0	—			
Output enable time	t_{ZH}	2.5 ± 0.2	1.0	—	7.0	ns	\overline{OE}	Q	
	t_{ZL}	2.7	—	6.4					
		3.3 ± 0.3	1.0	—	5.3				
Output disable time	t_{HZ}	2.5 ± 0.2	1.9	—	5.8	ns	\overline{OE}	Q	
	t_{LZ}	2.7	—	5.0					
		3.3 ± 0.3	1.4	—	4.6				
Setup time	t_{su}	2.5 ± 0.2	1.0	—	—	ns			
			2.7	1.0	—				—
			3.3 ± 0.3	1.1	—				—
Hold time	t_h	2.5 ± 0.2	1.5	—	—	ns			
			2.7	1.7	—				—
			3.3 ± 0.3	1.4	—				—
Pulse width	t_w	2.5 ± 0.2	3.3	—	—	ns			
			2.7	3.3	—				—
			3.3 ± 0.3	3.3	—				—
Input capacitance	C_{IN}	3.3	—	3.0	—	pF	Control inputs		
			3.3	—	6.0		—	Data inputs	
Output capacitance	C_O	3.3	—	7.0	—	pF			

• Test Circuit

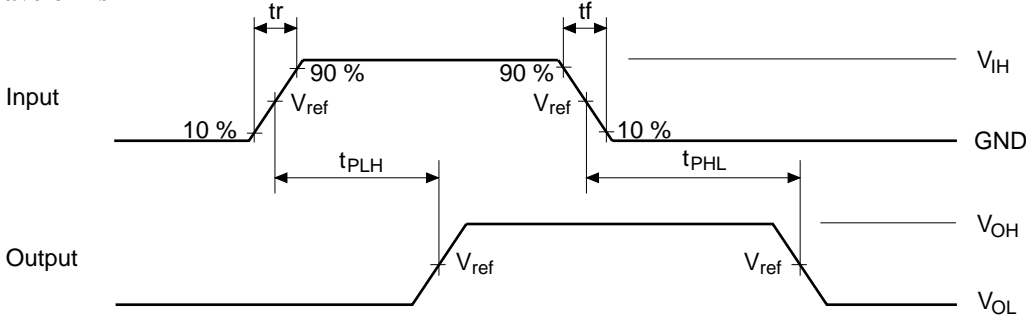


Load Circuit for Outputs

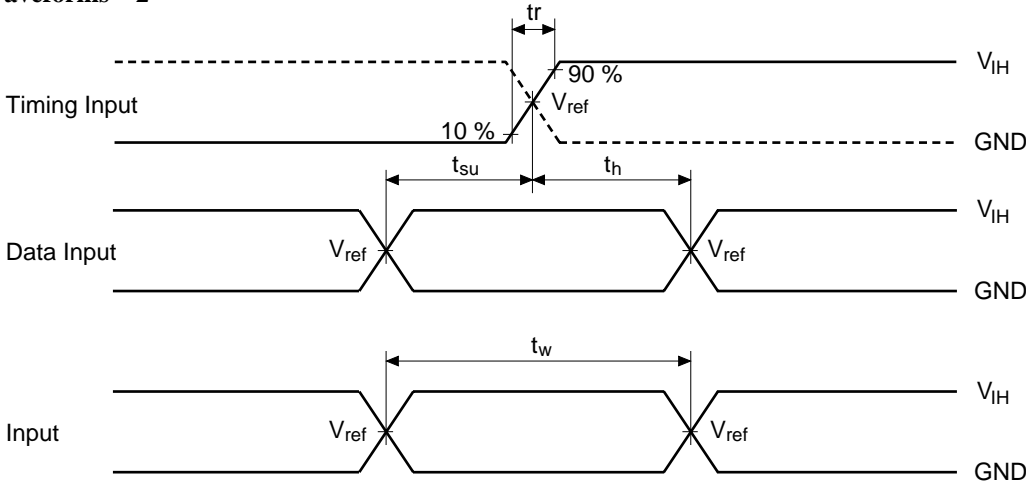
Symbol	$V_{CC}=2.5\pm 0.2V$	$V_{CC}=2.7V,$ $3.3\pm 0.3V$
t_{PLH}/t_{PHL}	OPEN	OPEN
$t_{su}/t_h/t_w$	OPEN	OPEN
t_{ZH}/t_{HZ}	GND	GND
t_{ZL}/t_{LZ}	4.6 V	6.0 V

Note: 1. C_L includes probe and jig capacitance.

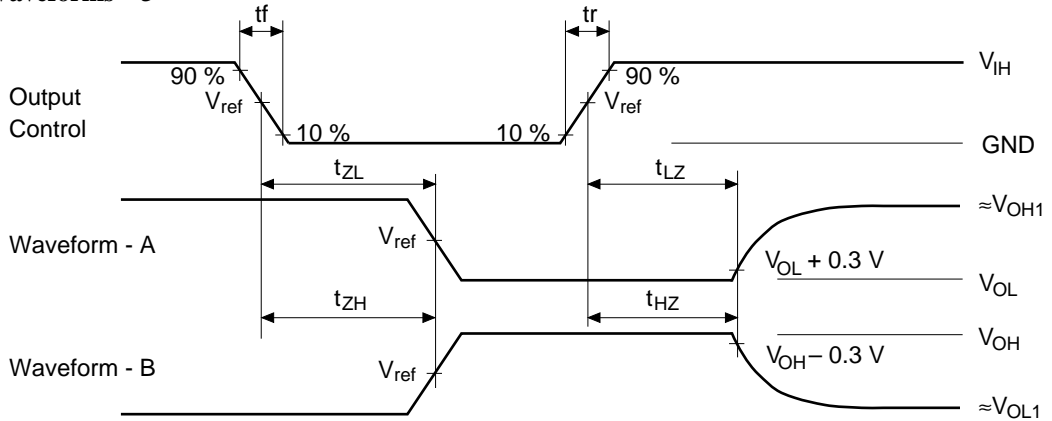
• Waveforms – 1



• Waveforms – 2



• Waveforms – 3

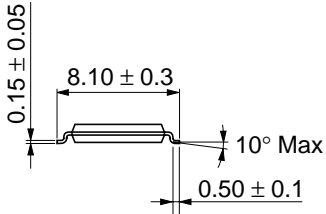
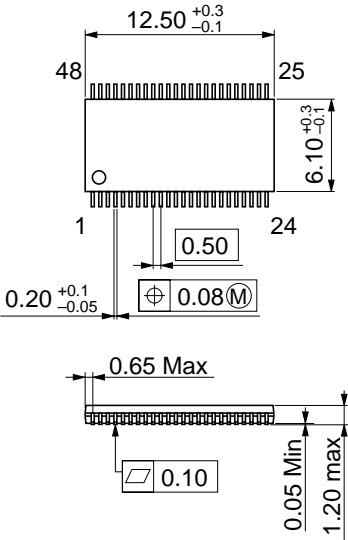


TEST	$V_{CC}=2.5\pm 0.2V$	$V_{CC}=2.7V, 3.3\pm 0.3V$
V_{IH}	2.3 V	2.7 V
V_{ref}	1.2 V	1.5 V
V_{OH1}	2.3 V	3.0 V
V_{OL1}	GND	GND

- Notes:
1. All input pulses are supplied by generators having the following characteristics: $PRR \leq 10$ MHz, $Z_o = 50 \Omega$, $t_r \leq 2.5$ ns, $t_f \leq 2.5$ ns.
 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	TTP-48DC
JEDEC Code	—
EIAJ Code	—

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