

# HD74ALVCH16245

16-bit Bus Transceivers with 3-state Outputs

# HITACHI

ADE-205-134C (Z)

4th. Edition

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## Description

The HD74ALVCH16245 is designed for asynchronous communication between data buses. The control function implementation minimizes external timing requirements. This device can be used as two 8-bit transceivers or one 16-bit transceiver. It allow data transmission from the A bus to the B bus or from the B bus to the A bus depending upon the logic level at the direction control (DIR) input. The output enable ( $\overline{OE}$ ) input can be used to disable the device so that the buses are effectively isolated. Active bus hold circuitry is provided to hold unused or floating data inputs at a valid logic level.

## 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  $> 2.0\text{ V}$  ( $@V_{CC} = 3.3\text{ V}, T_a = 25^\circ\text{C}$ )
- Bus hold on data inputs eliminates the need for external pullup / pulldown resistors

## Function Table

Inputs		Operation
$\overline{OE}$	DIR	
L	L	B data to A bus
L	H	A data to B bus
H	X	Isolation

H : High level

L : Low level

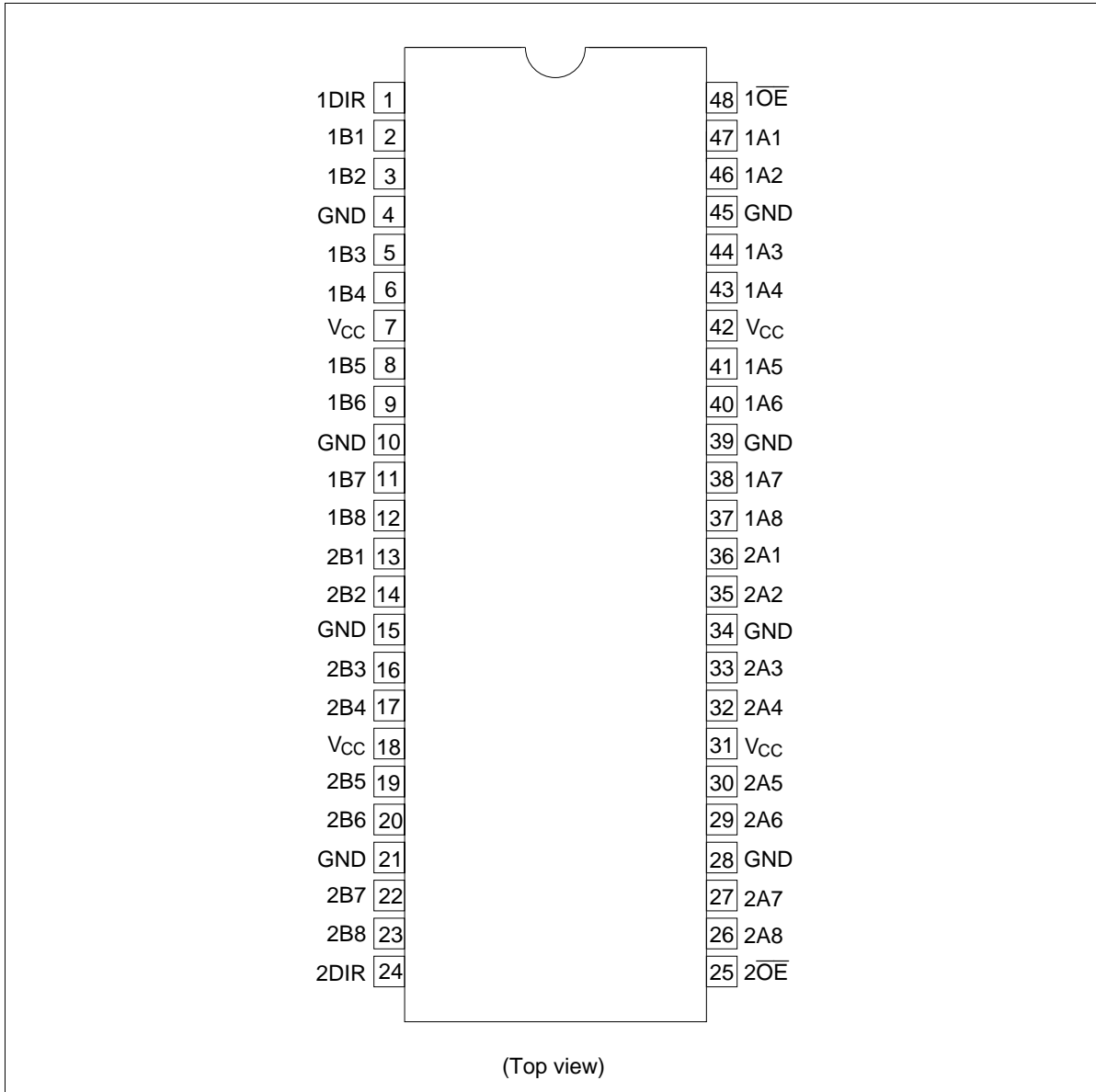
X : Immaterial

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## Pin Arrangement



### Absolute Maximum Ratings

Item	Symbol	Ratings	Unit	Conditions
Supply voltage	$V_{CC}$	-0.5 to 4.6	V	
Input voltage <sup>*1,2</sup>	$V_I$	-0.5 to 4.6	V	Except I/O ports
		-0.5 to $V_{CC} + 0.5$		I/O ports
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	$I_{OK}$	$\pm 50$	mA	$V_O < 0$ or $V_O > V_{CC}$
Continuous output current	$I_O$	$\pm 50$	mA	$V_O = 0$ to $V_{CC}$
$V_{CC}$ , GND current / pin	$I_{CC}$ or $I_{GND}$	$\pm 100$	mA	
Maximum power dissipation at $T_a = 55^\circ\text{C}$ (in still air) <sup>*3</sup>	$P_T$	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 condition" 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  $150^\circ\text{C}$  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	$I_{OH}$	—	-12	mA	$V_{CC} = 2.3\text{ V}$
		—	-12		$V_{CC} = 2.7\text{ V}$
		—	-24		$V_{CC} = 3.0\text{ V}$
Low level output current	$I_{OL}$	—	12	mA	$V_{CC} = 2.3\text{ V}$
		—	12		$V_{CC} = 2.7\text{ V}$
		—	24		$V_{CC} = 3.0\text{ V}$
Input transition rise or fall rate	$\Delta t / \Delta v$	0	10	ns / V	
Operating temperature	$T_a$	-40	85	$^\circ\text{C}$	

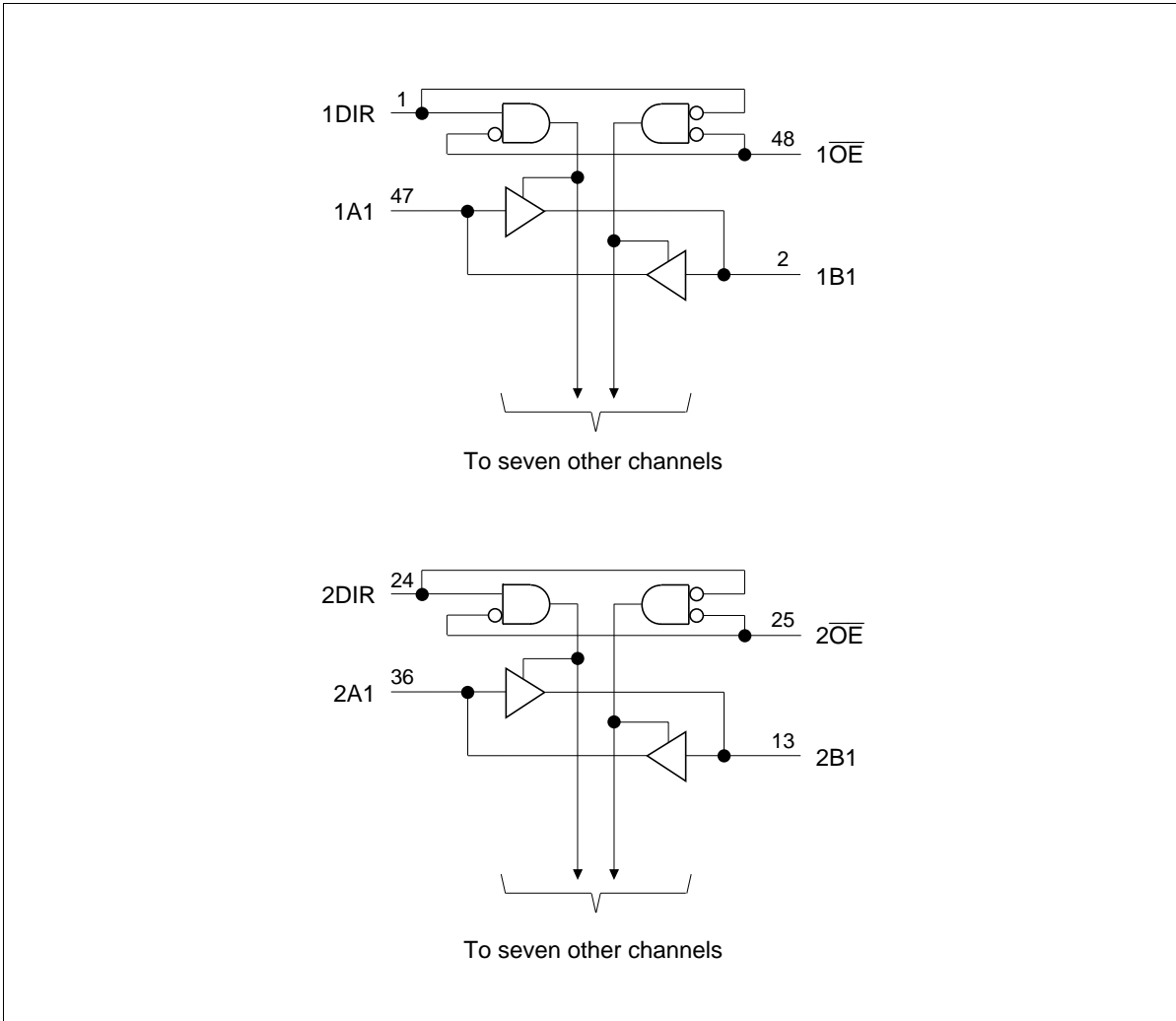
Note: Unused control inputs must be held high or low to prevent them from floating.

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## Logic Diagram



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

Item	Symbol	V <sub>CC</sub> (V) <sup>1</sup>	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			
Output voltage	V <sub>OH</sub>	Min to Max	V <sub>CC</sub> -0.2	—	V	I <sub>OH</sub> = -100 μA	
		2.3	2.0	—		I <sub>OH</sub> = -6 mA, V <sub>IH</sub> = 1.7 V	
		2.3	1.7	—		I <sub>OH</sub> = -12 mA, V <sub>IH</sub> = 1.7 V	
		2.7	2.2	—		I <sub>OH</sub> = -12 mA, V <sub>IH</sub> = 2.0 V	
		3.0	2.4	—		I <sub>OH</sub> = -12 mA, V <sub>IH</sub> = 2.0 V	
		3.0	2.0	—		I <sub>OH</sub> = -24 mA, V <sub>IH</sub> = 2.0 V	
	V <sub>OL</sub>	Min to Max	—	0.2		I <sub>OL</sub> = 100 μA	
		2.3	—	0.4		I <sub>OL</sub> = 6 mA, V <sub>IL</sub> = 0.7 V	
		2.3	—	0.7		I <sub>OL</sub> = 12 mA, V <sub>IL</sub> = 0.7 V	
		2.7	—	0.4		I <sub>OL</sub> = 12 mA, V <sub>IL</sub> = 0.8 V	
		3.0	—	0.55		I <sub>OL</sub> = 24 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
Off state output current <sup>2</sup>	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	

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

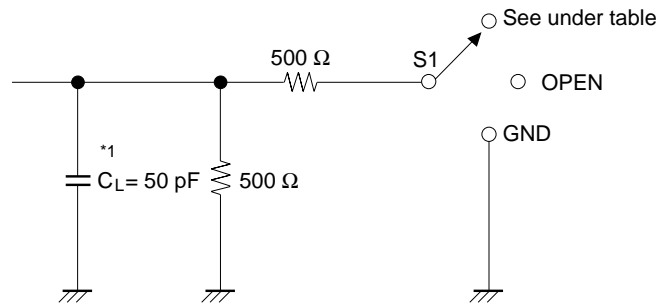
2. For I/O ports, the parameter I<sub>OZ</sub> includes the input leakage current.

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### 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	1.0	—	3.9	ns	A or B	B or A
	t <sub>PHL</sub>	2.7	—	—	3.6			
		3.3±0.3	1.0	—	3.2			
Output enable time	t <sub>ZH</sub>	2.5±0.2	1.0	—	5.7	ns	$\overline{\text{OE}}$	B or A
	t <sub>ZL</sub>	2.7	—	—	5.4			
		3.3±0.3	1.0	—	4.4			
Output disable time	t <sub>HZ</sub>	2.5±0.2	1.0	—	5.2	ns	$\overline{\text{OE}}$	B or A
	t <sub>LZ</sub>	2.7	—	—	4.6			
		3.3±0.3	1.0	—	4.1			
Input capacitance	C <sub>IN</sub>	3.3	—	4.0	—	pF	Control inputs	
Output capacitance	C <sub>O</sub>	3.3	—	9.0	—	pF	A or B ports	

#### • Test Circuit

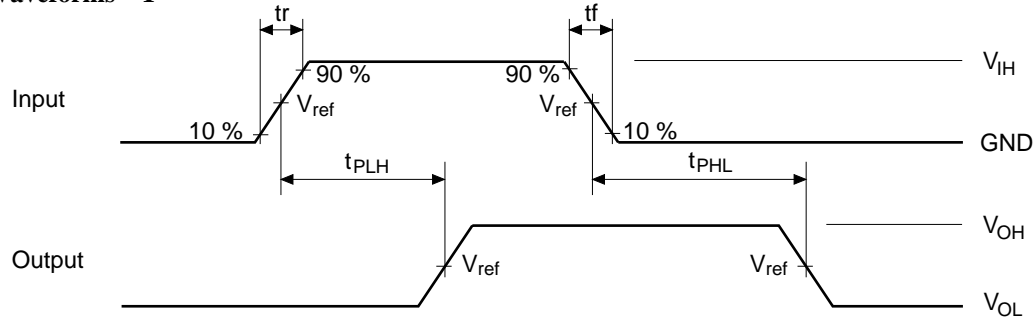


Load Circuit for Outputs

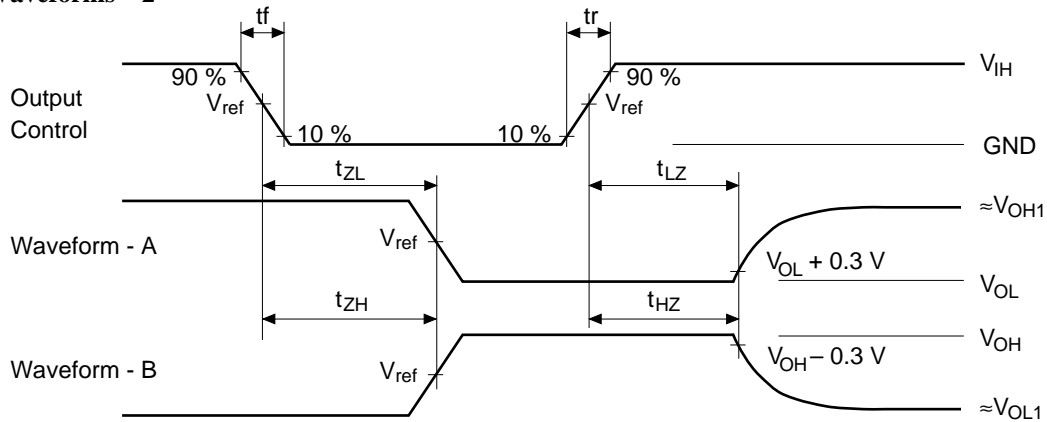
Symbol	V <sub>CC</sub> =2.5±0.2V	V <sub>CC</sub> =2.7V, 3.3±0.3V
t <sub>PLH</sub> /t <sub>PHL</sub>	OPEN	OPEN
t <sub>ZH</sub> /t <sub>HZ</sub>	GND	GND
t <sub>ZL</sub> /t <sub>LZ</sub>	4.6 V	6.0 V

Note: 1. C<sub>L</sub> includes probe and jig capacitance.

• Waveforms – 1



• Waveforms – 2



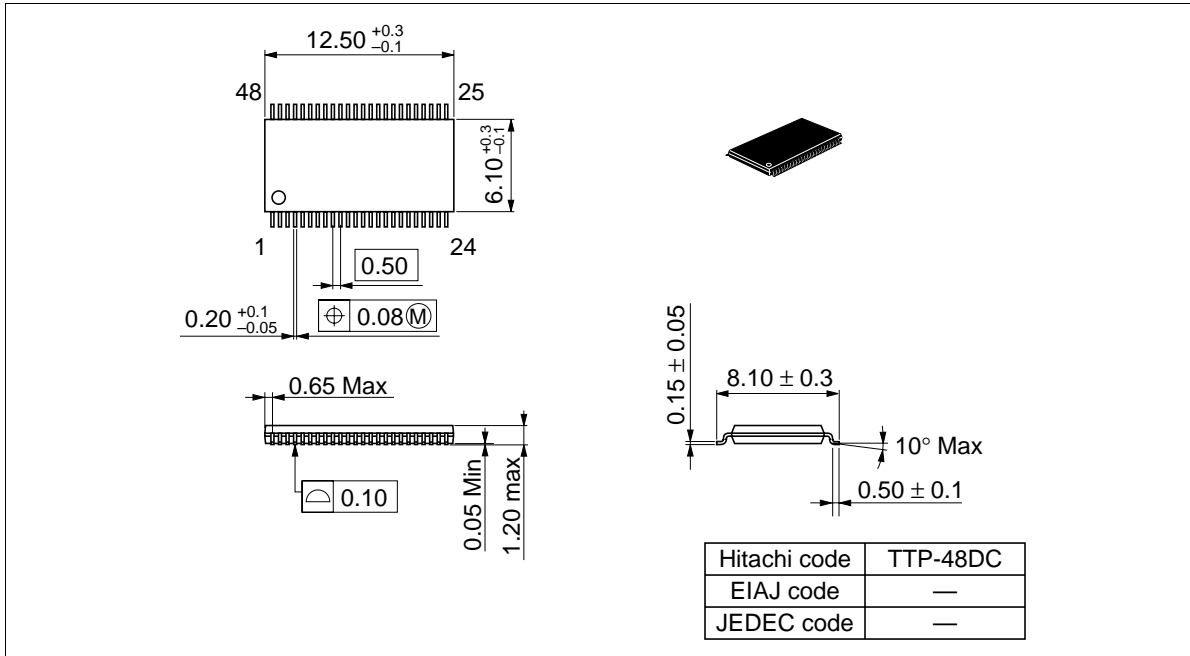
TEST	$V_{CC}=2.5\pm 0.2V$	$V_{CC}=2.7V, 3.3\pm 0.3V$
$V_{IH}$	2.3 V	2.7 V
$V_{ref}$	1.2 V	1.5 V
$V_{OH1}$	2.3 V	3.0 V
$V_{OL1}$	GND	GND

- Notes:
1. All input pulses are supplied by generators having the following characteristics:  $PRR \leq 10 \text{ MHz}$ ,  $Z_o = 50 \Omega$ ,  $t_r \leq 2.5 \text{ ns}$ ,  $t_f \leq 2.5 \text{ ns}$ .
  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.

# HD74ALVCH16245

## Package Dimensions

Unit : mm





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