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# HD74ALVCH16835

18-bit Universal Bus Driver with 3-state Outputs

## HITACHI

ADE-205-126D (Z)

5th. Edition

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### Description

The HD74ALVCH16835 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 (LE) input is high. The A data is latched if the clock (CLK) input is held at a high or low logic level. If the LE is low, the A bus 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, the output enable ( $\overline{OE}$ ) input 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 data inputs at a valid logic level.

### Features

- Supports unregulated battery operation down to 2.7 V
- Bus hold on data inputs eliminates the need for external pullup resistors.
- Distributed  $V_{CC}$  and GND pin configuration minimizes high speed switching noise.

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### Function Table

#### Inputs

$\overline{OE}$	LE	CLK	A	Output Y
H	X	X	X	Z
L	H	X	L	L
L	H	X	H	H
L	L	↑	L	L
L	L	↑	H	H
L	L	H	X	$Y_0^{*1}$
L	L	L	X	$Y_0^{*2}$

H : High level

L : Low level

X : Immaterial

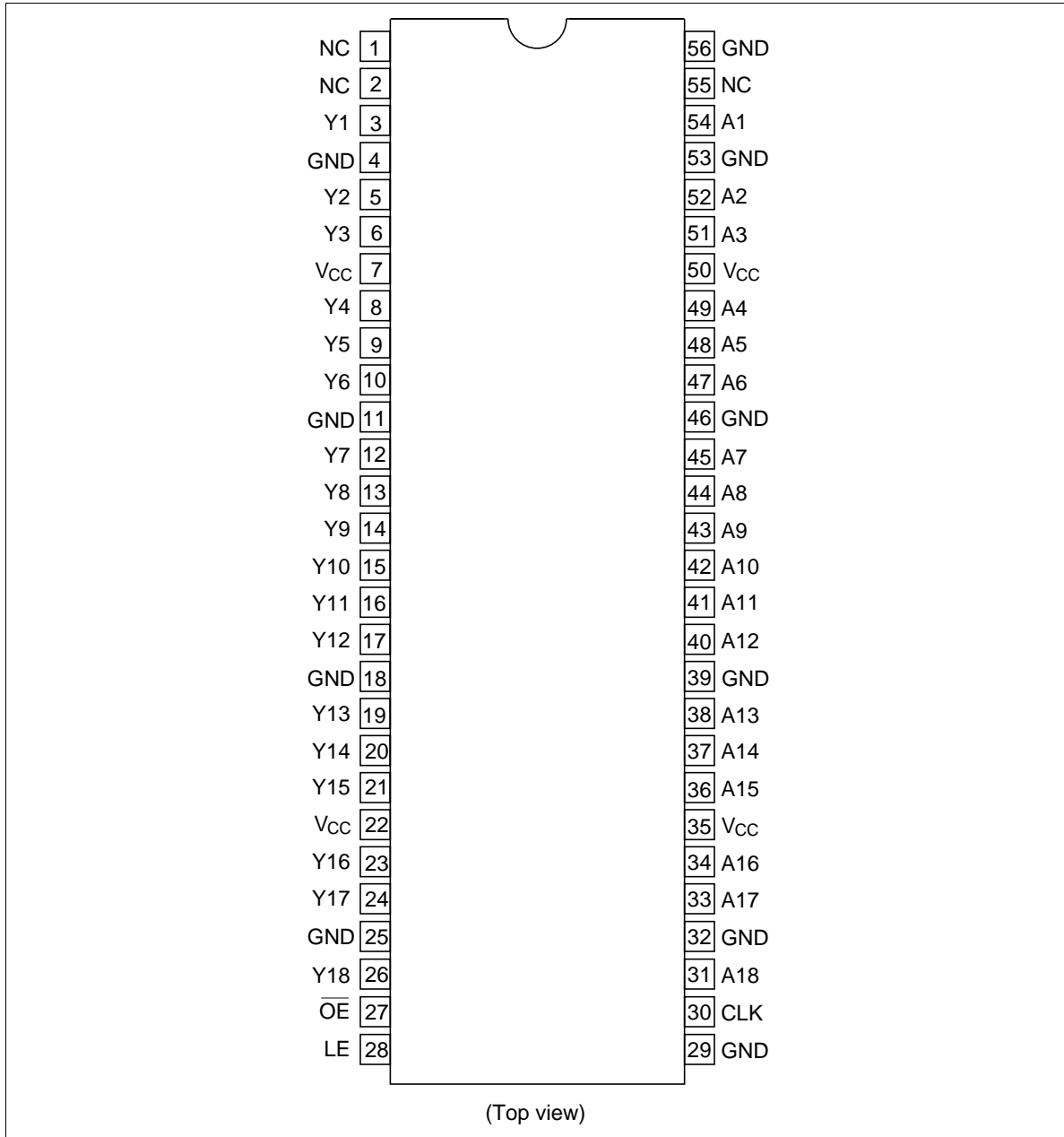
Z : High impedance

↑ : Low to high transition

Notes: 1. Output level before the indicated steady-state input conditions were established, provided that CLK was high before LE went low.

2. Output level before the indicated steady-state input conditions were established.

Pin Arrangement



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### Absolute Maximum Ratings

Item	Symbol	Ratings	Unit	Conditions
Supply voltage range	$V_{CC}$	-0.5 to 4.6	V	
Input voltage range <sup>1</sup>	$V_I$	-0.5 to 4.6	V	
Output voltage range <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>	$P_T$	1	W	TSSOP
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.

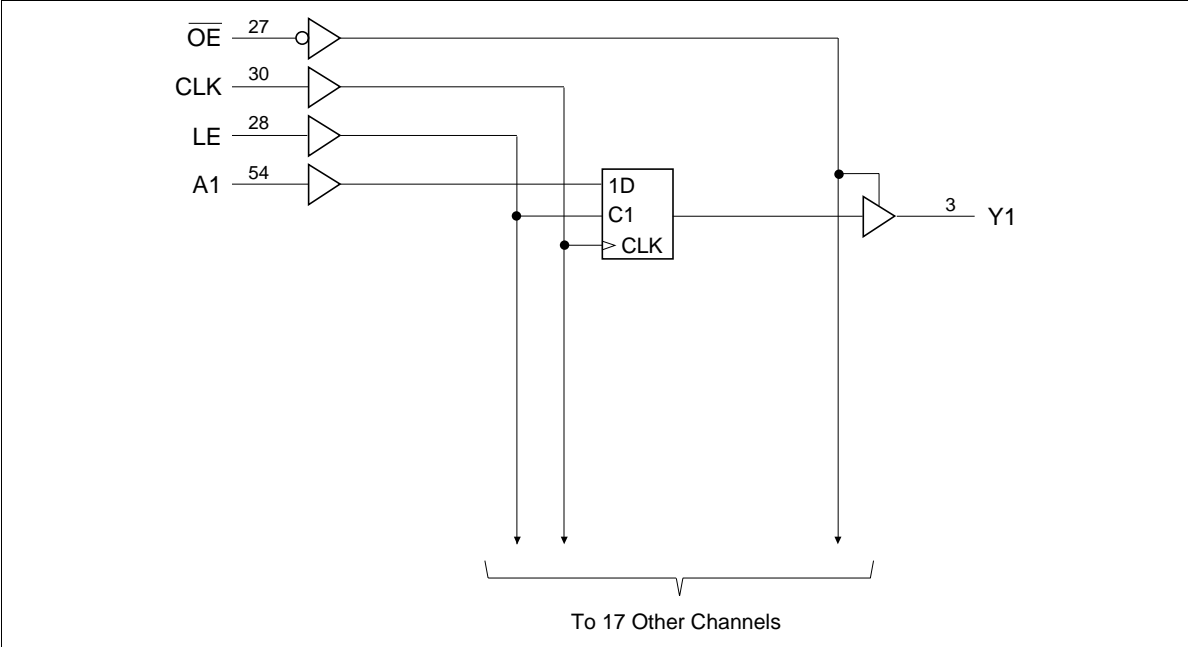
- Notes:
1. The input and output negative-voltage ratings may be exceeded if the input and output clamp current ratings are observed.
  2. The input and output positive-voltage ratings may be exceeded up to 4.6 V if the input and output clamp-current ratings are observed.
  3. The maximum power dissipation 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	$I_{OH}$	—	-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 free-air temperature	$T_a$	-40	85	$^\circ\text{C}$	

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

Logic Diagram



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### 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	$V_{OH}$	Min to Max	$V_{CC}-0.2$	—	V	$I_{OH} = -100 \mu\text{A}$
		2.3	2.0	—		$I_{OH} = -6 \text{ mA}, V_{IH} = 1.7 \text{ V}$
		2.3	1.7	—		$I_{OH} = -12 \text{ mA}, V_{IH} = 1.7 \text{ V}$
		2.7	2.2	—		$I_{OH} = -12 \text{ mA}, V_{IH} = 2.0 \text{ V}$
		3.0	2.4	—		$I_{OH} = -12 \text{ mA}, V_{IH} = 2.0 \text{ V}$
		3.0	2.0	—		$I_{OH} = -24 \text{ mA}, V_{IH} = 2.0 \text{ V}$
	$V_{OL}$	Min to Max	—	0.2	V	$I_{OL} = 100 \mu\text{A}$
		2.3	—	0.4		$I_{OL} = 6 \text{ mA}, V_{IL} = 0.7 \text{ V}$
		2.3	—	0.7		$I_{OL} = 12 \text{ mA}, V_{IL} = 0.7 \text{ V}$
		2.7	—	0.4		$I_{OL} = 12 \text{ mA}, V_{IL} = 0.8 \text{ V}$
		3.0	—	0.55		$I_{OL} = 24 \text{ mA}, V_{IL} = 0.8 \text{ V}$
Input current	$I_{IN}$	3.6	—	$\pm 5.0$	$\mu\text{A}$	$V_{IN} = V_{CC}$ or GND
	$I_{IN(\text{hold})}$	2.3	—	—	$\mu\text{A}$	$V_{IN} = 0.7 \text{ V}$
		2.3	-45	—		$V_{IN} = 1.7 \text{ V}$
		3.0	75	—		$V_{IN} = 0.8 \text{ V}$
		3.0	-75	—		$V_{IN} = 2.0 \text{ V}$
Off state output current	$I_{OZ}$	3.6	—	$\pm 10$	$\mu\text{A}$	$V_{OUT} = V_{CC}$ or GND
Quiescent supply current	$I_{CC}$	3.6	—	40	$\mu\text{A}$	$V_{IN} = V_{CC}$ or GND
	$\Delta I_{CC}$	3.0 to 3.6	—	750	$\mu\text{A}$	One input at $(V_{CC}-0.6)\text{V}$ , other inputs at $V_{CC}$ or GND

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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)
Maximum clock frequency	f <sub>max</sub>	2.5±0.2	150	—	—	MHz		
		2.7	150	—	—			
		3.3±0.3	150	—	—			
Propagation delay time	t <sub>PLH</sub>	2.5±0.2	1.3	—	5.0	ns	A	Y
		2.7	—	—	4.2			
		3.3±0.3	1.0	—	3.6			
	t <sub>PHL</sub>	2.5±0.2	1.8	—	5.8		LE	Y
		2.7	—	—	4.9			
		3.3±0.3	1.3	—	4.2			
	t <sub>PHL</sub>	2.5±0.2	1.9	—	5.5		CLK	Y
		2.7	—	—	5.2			
		3.3±0.3	1.4	—	4.5			
Output enable time	t <sub>ZH</sub>	2.5±0.2	1.5	—	5.5	ns	OE	Y
	t <sub>ZL</sub>	2.7	—	—	5.6			
		3.3±0.3	1.1	—	4.6			
Output disable time	t <sub>HZ</sub>	2.5±0.2	2.1	—	4.5	ns	OE	Y
	t <sub>LZ</sub>	2.7	—	—	4.3			
		3.3±0.3	1.3	—	3.9			
Input capacitance	C <sub>IN</sub>	3.3	—	3.5	—	pF	Control inputs	
		3.3	—	6.0	—		Data inputs	
Output capacitance	C <sub>O</sub>	3.3	—	7.0	—	pF	A or Y ports	

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

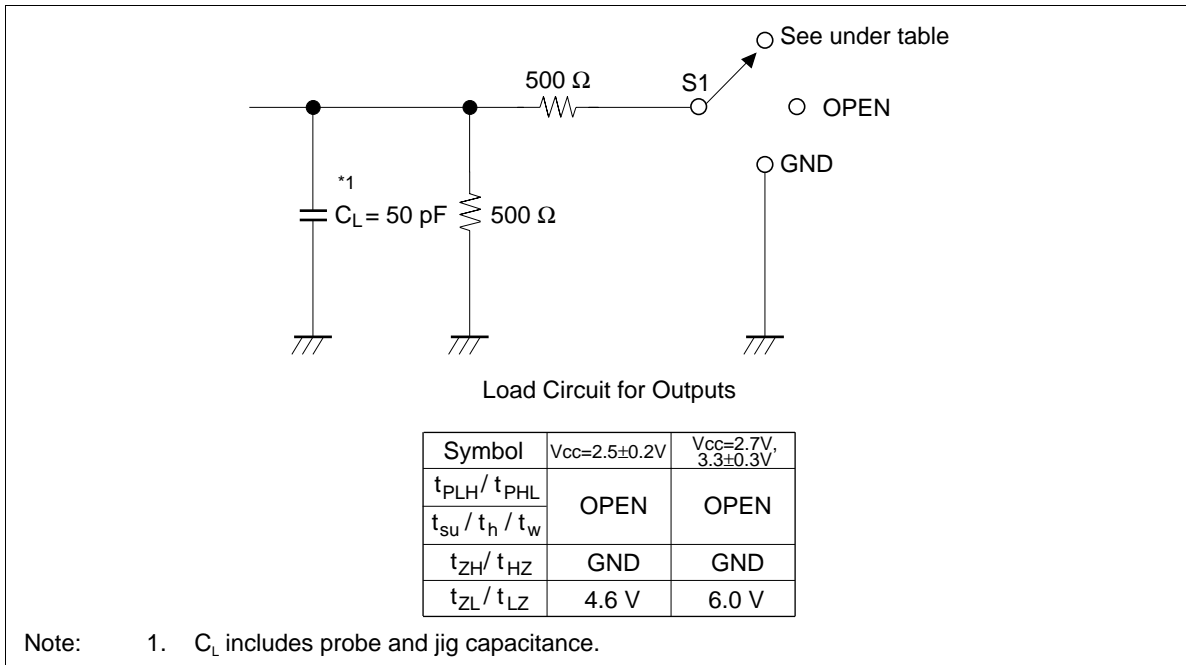
Item	Symbol	V <sub>cc</sub> (V)	Min	Typ	Max	Unit	From (Input)
Setup time	t <sub>su</sub>	2.5±0.2	2.2	—	—	ns	Data before CLK↑
		2.7	2.1	—	—		
		3.3±0.3	1.7	—	—		
		2.5±0.2	1.9	—	—		Data before LE↓
		2.7	1.6	—	—		CLK "H"
		3.3±0.3	1.5	—	—		
		2.5±0.2	1.3	—	—		Data before LE↓
		2.7	1.1	—	—		CLK "L"
		3.3±0.3	1.0	—	—		
Hold time	t <sub>h</sub>	2.5±0.2	0.6	—	—	ns	Data after CLK↑
		2.7	0.6	—	—		
		3.3±0.3	0.7	—	—		
		2.5±0.2	1.4	—	—		Data after LE↓
		2.7	1.7	—	—		CLK "H" or "L"
		3.3±0.3	1.4	—	—		
Pulse width	t <sub>w</sub>	2.5±0.2	3.3	—	—	ns	LE "H"
		2.7	3.3	—	—		
		3.3±0.3	3.3	—	—		
		2.5±0.2	3.3	—	—		CLK "H" or "L"
		2.7	3.3	—	—		
		3.3±0.3	3.3	—	—		

### Switching Characteristics (Ta = 0 to 65°C)

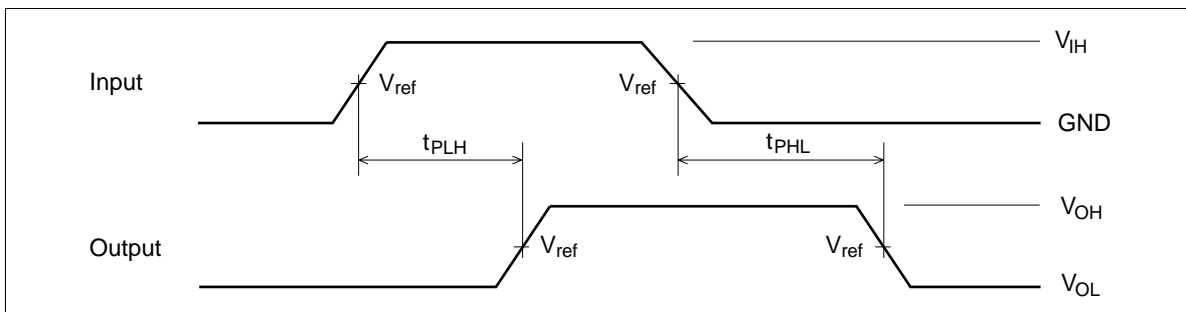
Item	Symbol	V <sub>cc</sub> (V)	Min	Typ	Max	Unit	FROM (Input)	TO (Output)
Propagation delay time	t <sub>PLH</sub> , t <sub>PHL</sub>	3.3±0.15	1.7	—	4.5	ns	CLK	Y



**Test Circuit**

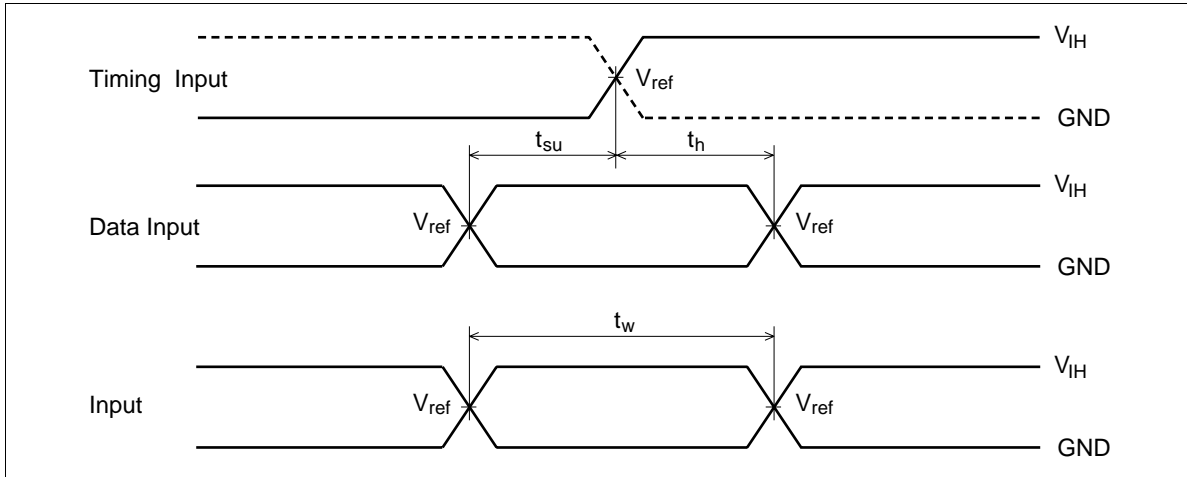


**Waveforms – 1**

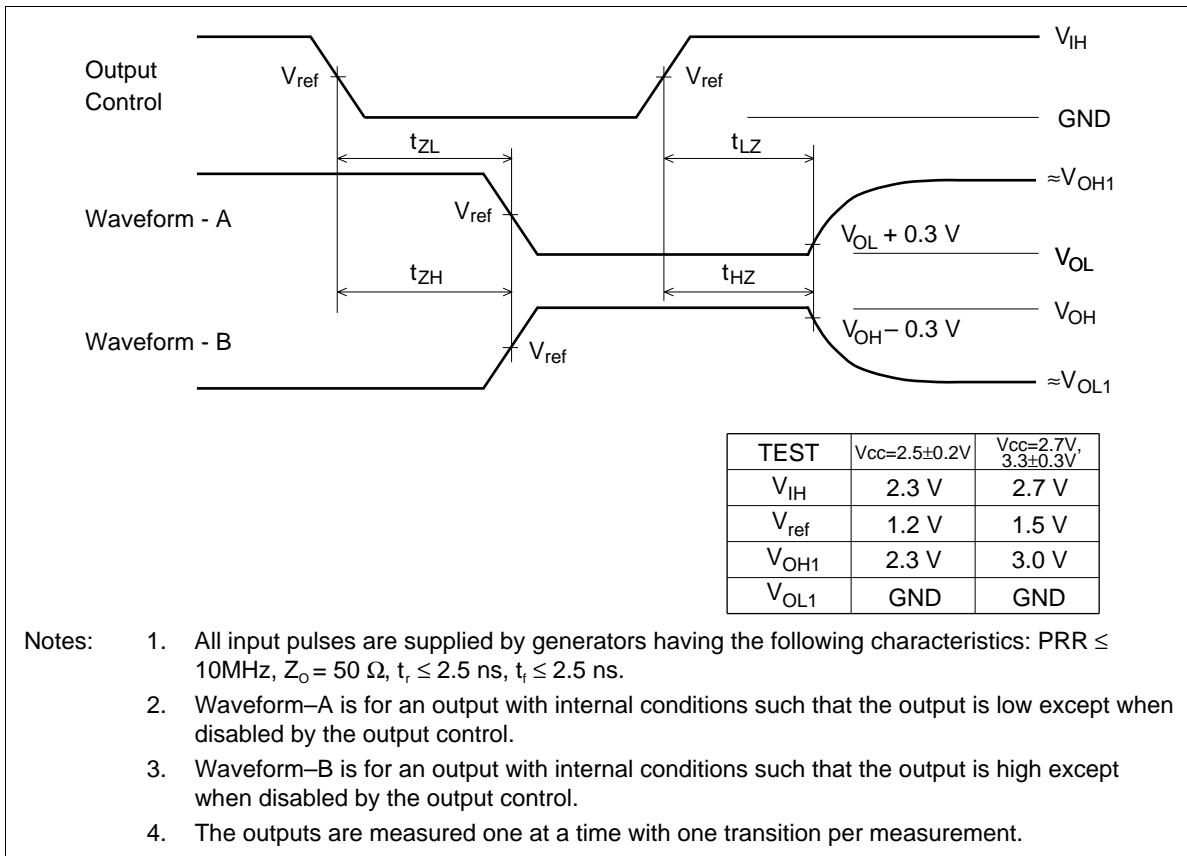


**Waveforms – 2**

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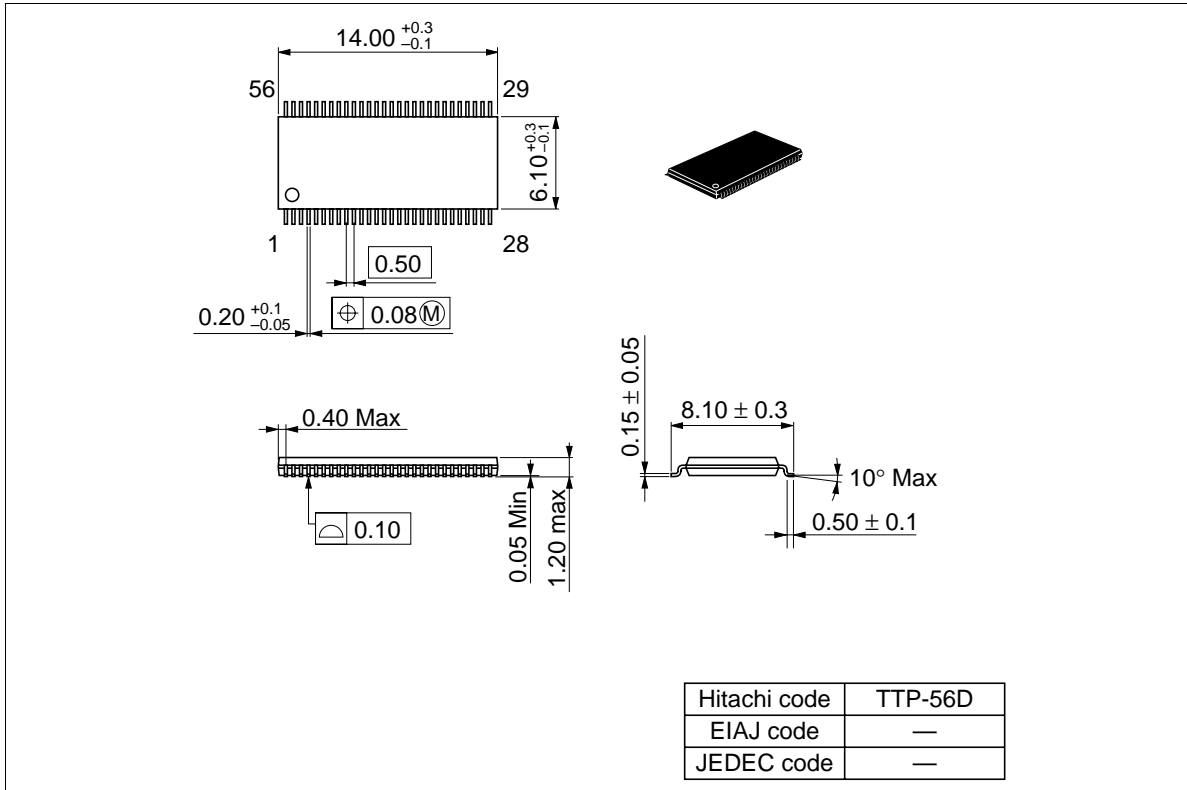
Waveforms – 3



# HD74ALVCH16835

## Package Dimensions

Unit : mm



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