HD74ALVC162835A

18-bit Universal Bus Driver with 3-state Outputs

HITACHI

ADE-205-294 (Z)
Preliminary
1st. Edition
May 1999

Description

The HD74ALVC162835A 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) is high. When LE is low, 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 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 registor; the minimum value of the registor 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. 0.9”
- V_{CC} = 2.3 V to 3.6 V
- Typical V_{OL} ground bounce < 0.8 V (@V_{CC} = 3.3 V, Ta = 25°C)
- Typical V_{OH} undershoot > 2.0 V (@V_{CC} = 3.3 V, Ta = 25°C)
- High output current ±12 mA (@V_{CC} = 3.0 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±0.3 V, Ta = 0 to 85°C)

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	L or H	X	Y_0 *1

H : High level

L : Low level

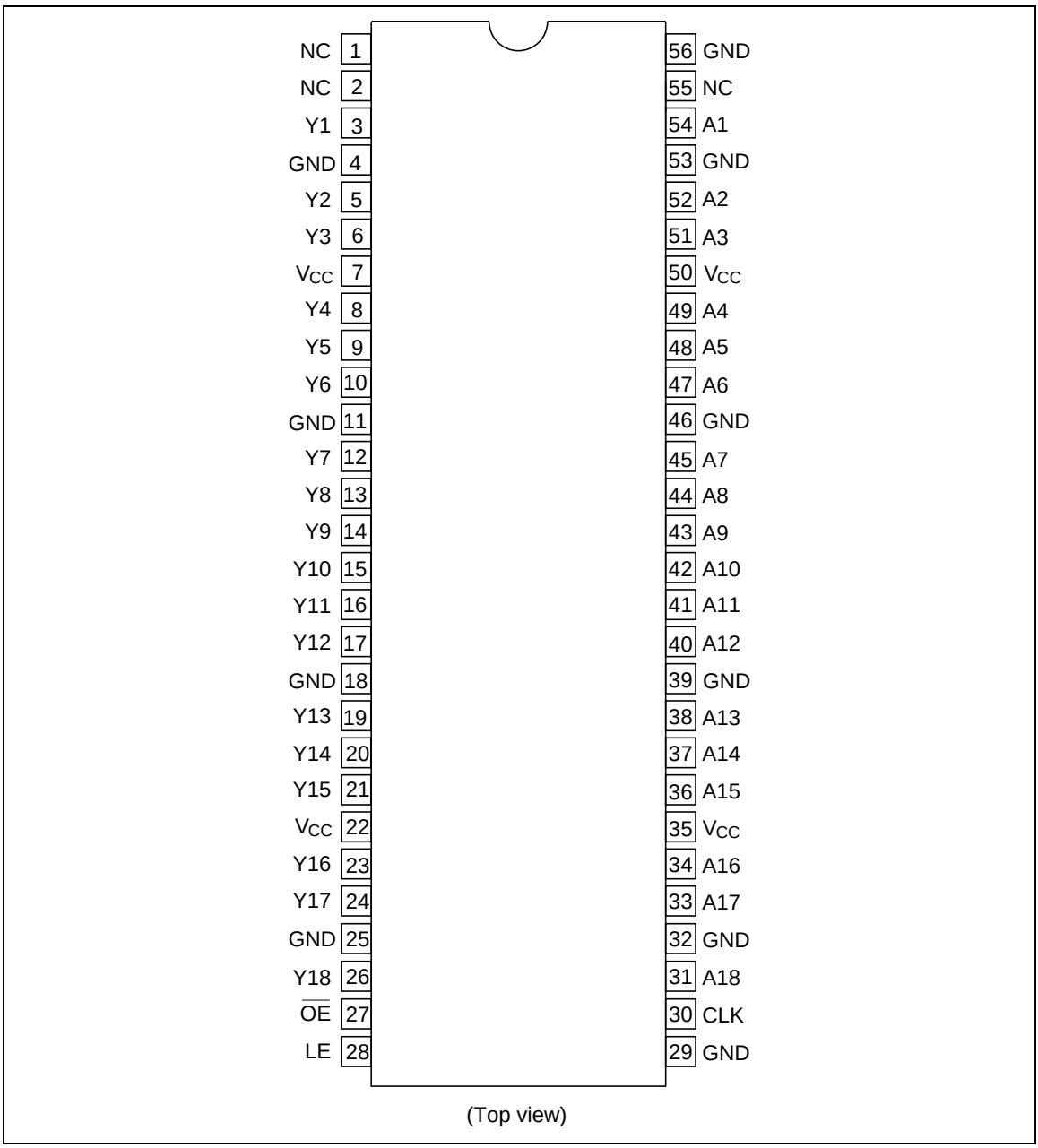
X : Immaterial

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 Ta = 55°C (in still air) [*3]	P_T	1	W	TSSOP
Storage temperature range	Tstg	–65 to 150	°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.

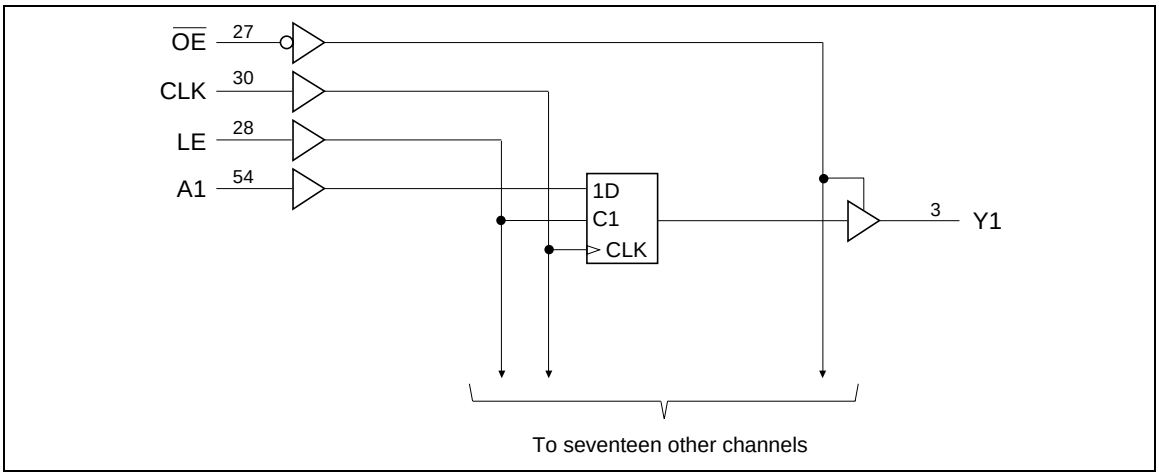
Notes: 1. The input and output negative-voltage ratings may be exceeded if the input and output clamp current ratings are observed.
2. The input and output positive-voltage ratings may be exceeded up to 4.6 V if the input and output clamp-current ratings are observed.
3. The maximum power dissipation is calculated using a junction temperature of 150°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 V
		—	–8		V_{CC} = 2.7 V
		—	–12		V_{CC} = 3.0 V
Low-level output current	I_{OL}	—	6	mA	V_{CC} = 2.3 V
		—	8		V_{CC} = 2.7 V
		—	12		V_{CC} = 3.0 V
Input transition rise or fall rate	$\Delta t/\Delta v$	0	10	ns/V	
Operating free-air temperature	Ta	–40	85	°C	

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

Logic Diagram



Electrical Characteristics

ItеM	Sym-bol	V_{CC} (V)	Ta = –40 to 85°C 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	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 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}	2.3 to 3.6	—	0.2	V	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	—	±5.0	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)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
	t_{PHL}	2.7	—	—	5.0			
		3.3±0.3	1.0	—	4.2			
		2.5±0.2	1.3	—	5.9		LE	Y
		2.7	—	—	5.8			
		3.3±0.3	1.3	—	5.1			
		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	$\overline{OE}$	Y
	t_{ZL}	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	$\overline{OE}$	Y
	t_{LZ}	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	—	—		
		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_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	1.4	—	—		Data after LE↓
		2.7	1.7	—	—		CLK “H” or “L”
		3.3±0.3	1.4	—	—		

Item	Symbol	V_{CC} (V)	Min	Typ	Max	Unit	From (Input)
Pulse width	t_w	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	—	—		

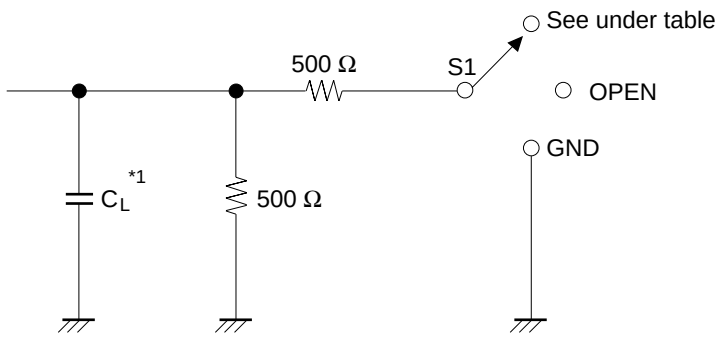
Switching Characteristics (Ta = 0 to 85°C)

Item		Sym-bol	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
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±0.2 V Typ	V_{CC} = 3.3±0.3 V Typ	Unit	Test Conditions
Power dissipation capacitance	Outputs enable	C_{pd}	22.0	24.5	pF	C_L = 0, f = 10 MHz
	Outputs disable		5.0	6.0		

Test Circuit

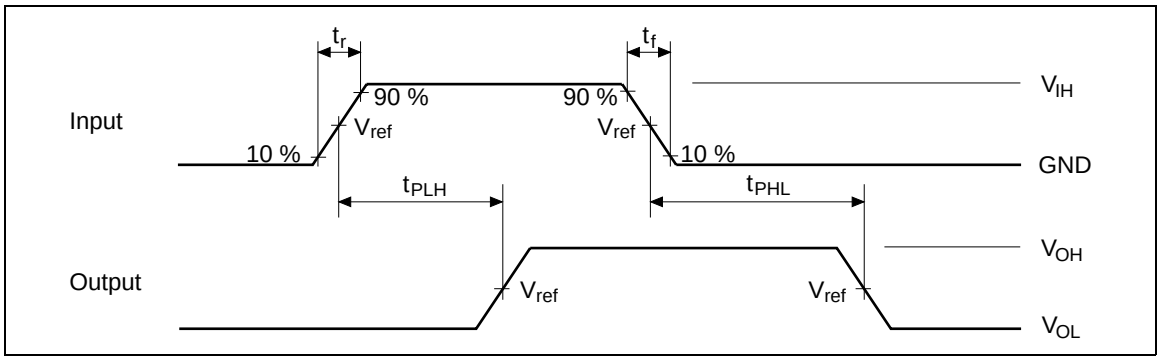


Load Circuit for Outputs

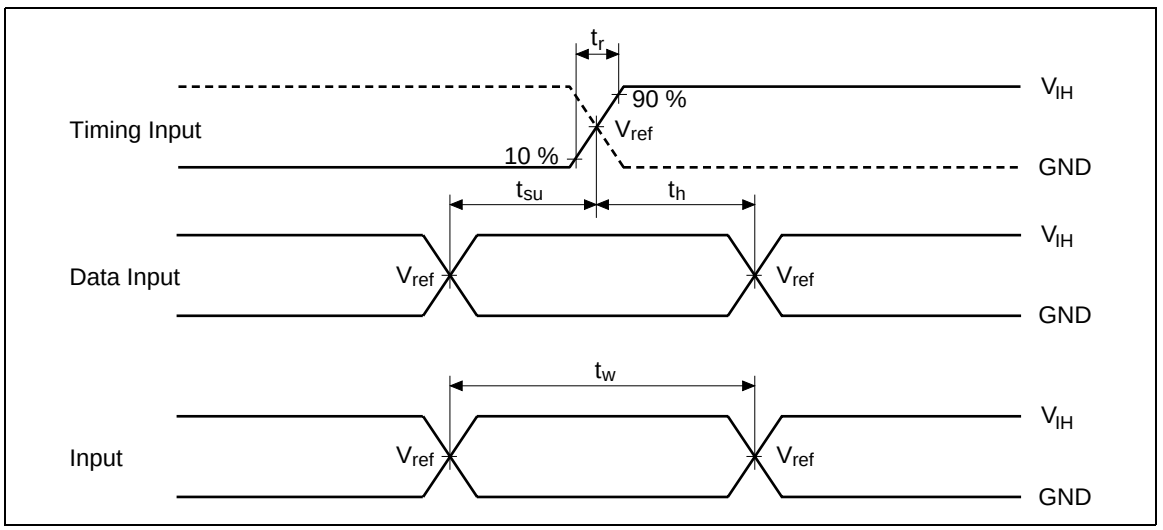
Symbol	Vcc=2.5±0.2V	Vcc=2.7V, 3.3±0.3V
t_{PLH}/ t_{PHL}	OPEN	OPEN
t_{su} / t_h / t_w		
t_{ZH}/ t_{HZ}	GND	GND
t_{ZL} / t_{LZ}	2 × V_{CC}	6.0 V
C_L	30 pF	50 pF

Note: 1. C_L includes probe and jig capacitance.

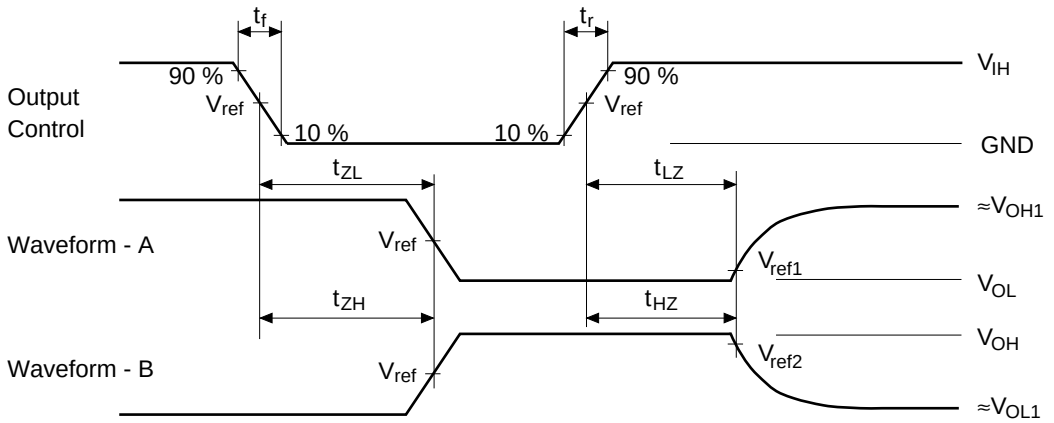
Waveforms – 1



Waveforms – 2



Waveforms – 3



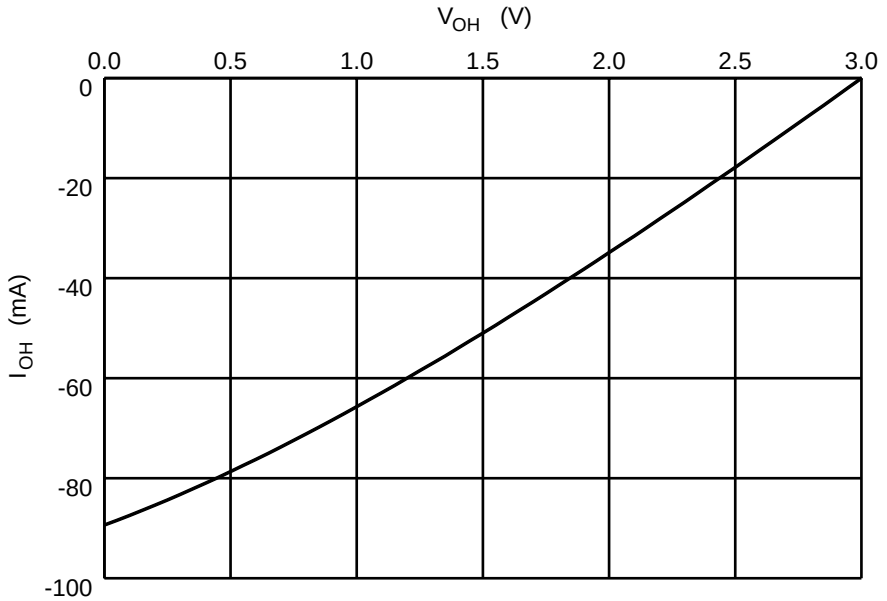
TEST	Vcc=2.5±0.2V	Vcc=2.7V, 3.3±0.3V
V_{IH}	V_{CC}	2.7 V
V_{ref}	1/2 V_{CC}	1.5 V
V_{ref1}	V_{OL} +0.15 V	V_{OL} +0.3 V
V_{ref2}	V_{OH}–0.15 V	V_{OH}–0.3 V
V_{OH1}	V_{CC}	3.0 V
V_{OL1}	GND	GND

Notes: 1. All input pulses are supplied by generators having the following characteristics :
PRR ≤ 10 MHz, Zo = 50 W, t_r ≤ 2.0 ns, t_f ≤ 2.0 ns. (V_{CC} = 2.5±0.2 V)
PRR ≤ 10 MHz, Zo = 50 W, t_r ≤ 2.5 ns, t_f ≤ 2.5 ns. (V_{CC} = 2.7 V, 3.3±0.3 V)

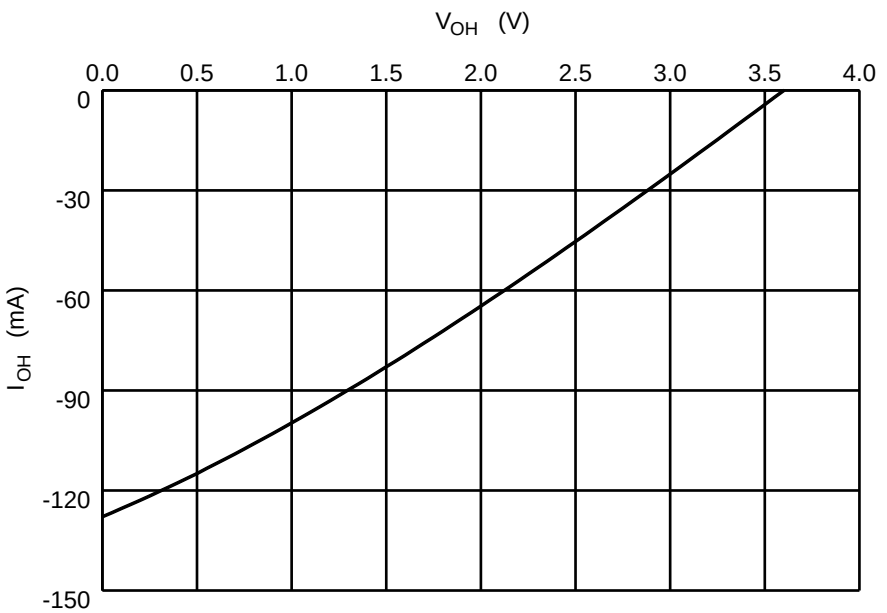
2. Waveform – A is for an output with internal conditions such that the output is low except when disabled by the output control.
3. Waveform – B is for an output with internal conditions such that the output is high except when disabled by the output control.
4. The output are measured one at a time with one transition per measurement.

IV Characteristics for Register Output (Measured value)

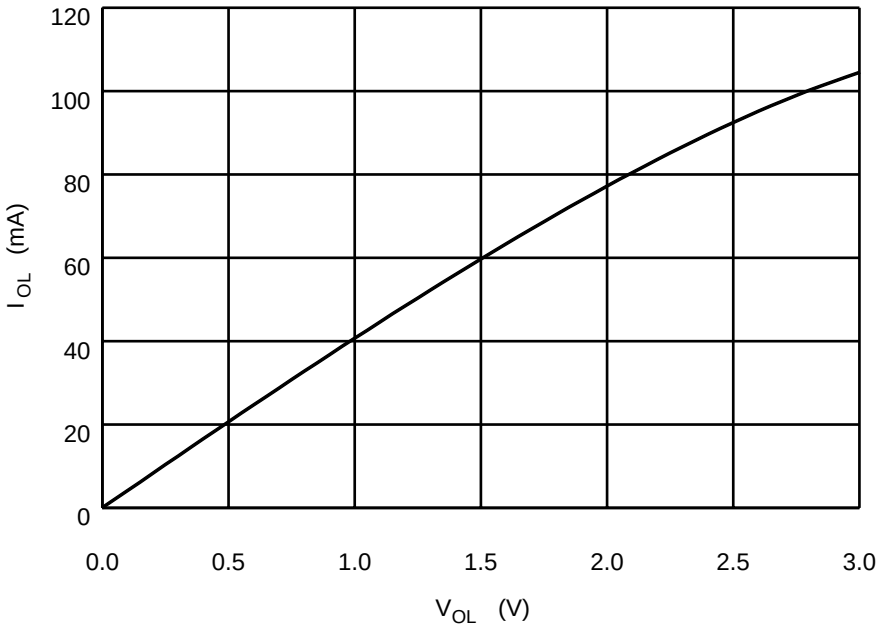
Weak condition HIGH
Vcc = 3.0 V, Ta = 85°C



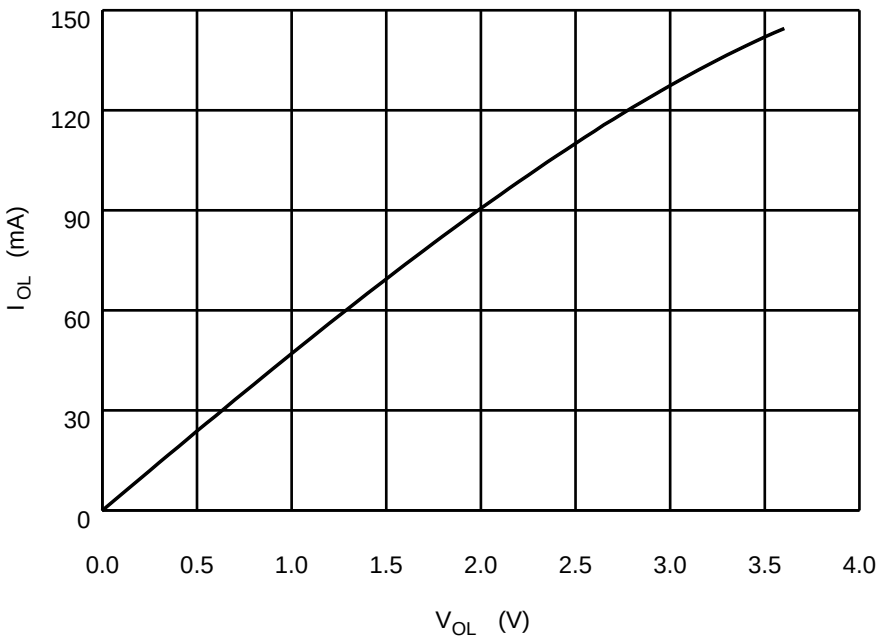
Strong condition HIGH
Vcc = 3.6 V, Ta = 0°C



Weak condition LOW
Vcc = 3.0 V, Ta = 85°C

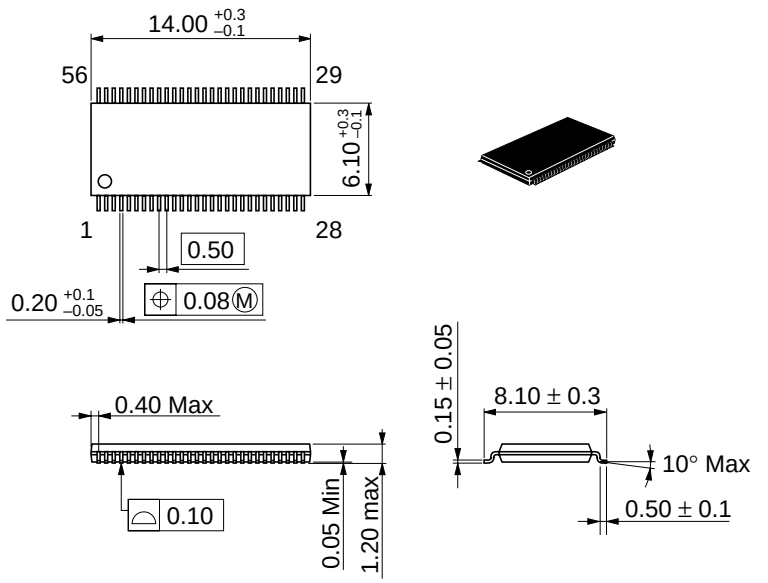


Strong condition LOW
Vcc = 3.6 V, Ta = 0°C



Package Dimensions

Unit : mm



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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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