
HD74LVCZ16240A

16-bit Buffers / Line Drivers with 3-state Outputs

HITACHI

ADE-205-231 (Z)
1st. Edition
February 1999

Description

The HD74LVCZ16240A has sixteen inverter drivers with three state outputs in a 48 pin package. This device is a inverting buffer and has four active low enables ($\overline{1G}$ to $\overline{4G}$). Each enable independently controls four buffers.

When V_{CC} is between 0 and 1.5 V, the device is in the high impedance state during power up or power down.

Low voltage and high speed operation is suitable at battery drive product (note type personal computer) and low power consumption extends the life of a battery for long time operation.

Features

- $V_{CC} = 2.7$ to 5.5 V
- All inputs V_{IH} (Max) = 5.5 V (@ $V_{CC} = 0$ to 5.5 V)
- All outputs V_O (Max) = 5.5 V (@ $V_{CC} = 0$ V or output off state)
- Typical V_{OL} ground bounce < 0.8 V (@ $V_{CC} = 3.3$ V, $T_a = 25^\circ\text{C}$)
- Typical V_{OH} undershoot > 2.0 V (@ $V_{CC} = 3.3$ V, $T_a = 25^\circ\text{C}$)
- High impedance state during power up and power down
- Power off disables outputs, permitting live insertion
- High output current ± 24 mA (@ $V_{CC} = 3.0$ to 5.5 V)

HD74LVCZ16240A

Function Table

Inputs		Output Y
\overline{G}	A	
H	X	Z
L	H	L
L	L	H

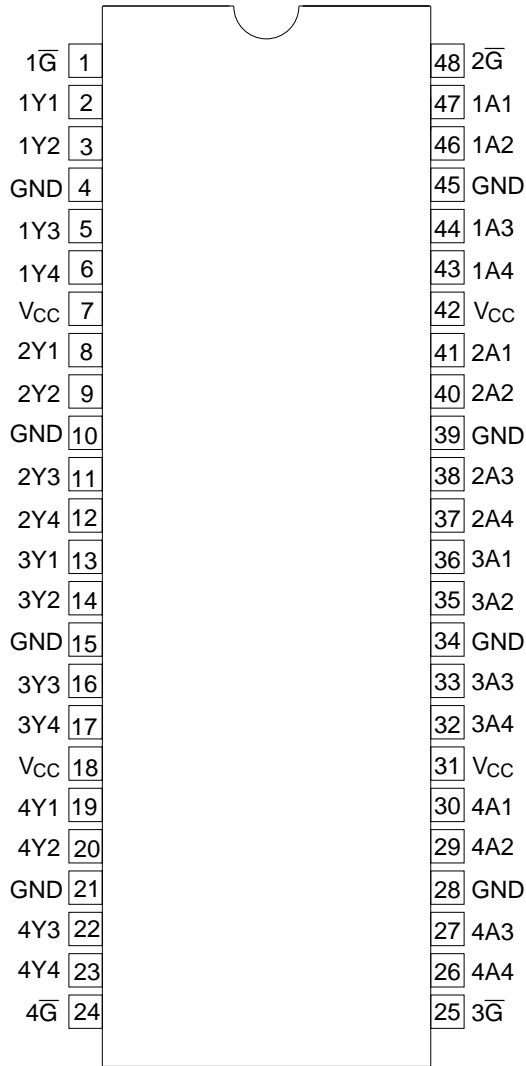
H : High level

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 7.0	V	
Input voltage	V_I	-0.5 to 7.0	V	
Output voltage	V_O	-0.5 to 7.0 -0.5 to $V_{CC}+0.5$	V	Output "Z" or V_{CC} : OFF Output "H" or "L"
Input diode current	I_{IK}	-50	mA	$V_I < 0$
Output diode current	I_{OK}	-50	mA	$V_O < 0$
Output current	I_O	± 50	mA	
V_{CC} , GND current	I_{CC} or I_{GND}	± 100	mA	
Storage temperature	Tstg	-65 to 150	°C	

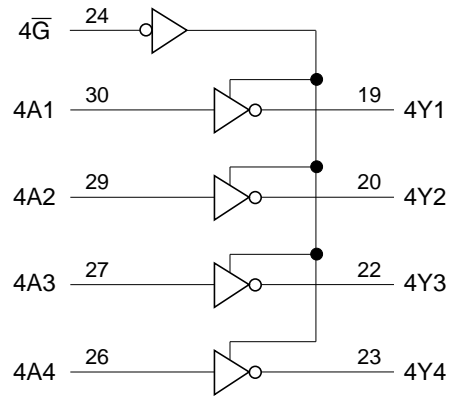
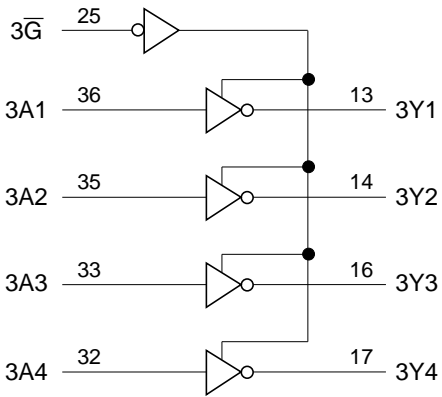
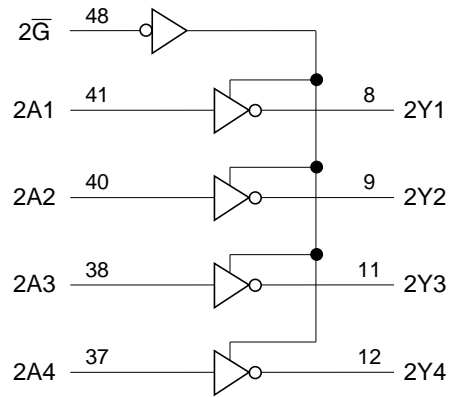
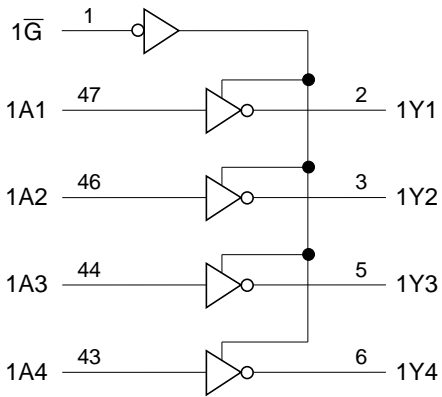
Note: The absolute maximum ratings are values which must not individually be exceeded, and furthermore, no two of which may be realized at the same time.

Recommended Operating Conditions

Item	Symbol	Ratings	Unit	Conditions
Supply voltage	V_{CC}	2.7 to 5.5	V	At operation
Input voltage	V_I	0 to 5.5	V	
Output voltage	V_O	0 to 5.5 0 to V_{CC}	V	Output "Z" or V_{CC} : OFF Output "H" or "L"
Output current	I_{OH}	-12 -24 ^{*1}	mA	$V_{CC} = 2.7$ V $V_{CC} = 3.0$ to 5.5 V
	I_{OL}	12 24 ^{*1}		$V_{CC} = 2.7$ V $V_{CC} = 3.0$ to 5.5 V
Input rise / fall time	t_r, t_f	0 to 6	ns / V	
Operating temperature	Ta	-40 to +85	°C	

Note: 1. Duty cycle \leq 50%

Logic Diagram



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

Item	Symbol	V _{CC} (V)	Min	Typ	Max	Unit	Test Conditions
Input voltage	V _{IH}	2.7 to 3.6	2.0	—	—	V	
		4.5 to 5.5	V _{CC} ×0.7	—	—		
	V _{IL}	2.7 to 3.6	—	—	0.8		
		4.5 to 5.5	—	—	V _{CC} ×0.3		
Output voltage	V _{OH}	2.7 to 5.5	V _{CC} -0.2	—	—	V	I _{OH} = -100 μA
		2.7	2.2	—	—		I _{OH} = -12 mA
		3.0	2.4	—	—		
		3.0	2.2	—	—		I _{OH} = -24 mA
		4.5	3.8	—	—		
	V _{OL}	2.7 to 5.5	—	—	0.2	I _{OL} = 100 μA	
		2.7	—	—	0.4	I _{OL} = 12 mA	
		3.0	—	—	0.55	I _{OL} = 24 mA	
		4.5	—	—	0.55		
Input current	I _{IN}	0 to 5.5	—	—	±5	μA	V _{IN} = 0 to 5.5 V
Off state output current	I _{OZ}	2.7 to 5.5	—	—	±5	μA	V _{OUT} = 0 to 5.5 V
	I _{OZPU}	0 to 1.5	—	—	±5		V _{OUT} = 0.5 to 5.5 V,
	I _{OZPD}	1.5 to 0	—	—	±5		Output enable = don't care
Output leak current	I _{OFF}	0	—	—	±5	μA	V _{IN} or V _O = 5.5 V
Quiescent supply current	I _{CC}	2.7 to 3.6	—	—	225	μA	V _{IN} = 3.6 to 5.5 V ¹⁾ , I _O = 0
		2.7 to 5.5	—	—	350		V _{IN} = V _{CC} or GND
	ΔI _{CC}	2.7 to 3.6	—	—	500		V _{IN} = one input at (V _{CC} -0.6) V, other inputs at V _{CC} or GND
Input capacitance	C _{IN}	3.3	—	4.1	—	pF	V _{IN} = V _{CC} or GND
Output capacitance	C _O	3.3	—	8.1	—	pF	V _{OUT} = V _{CC} or GND

Note: 1. This applies in the disabled state only.

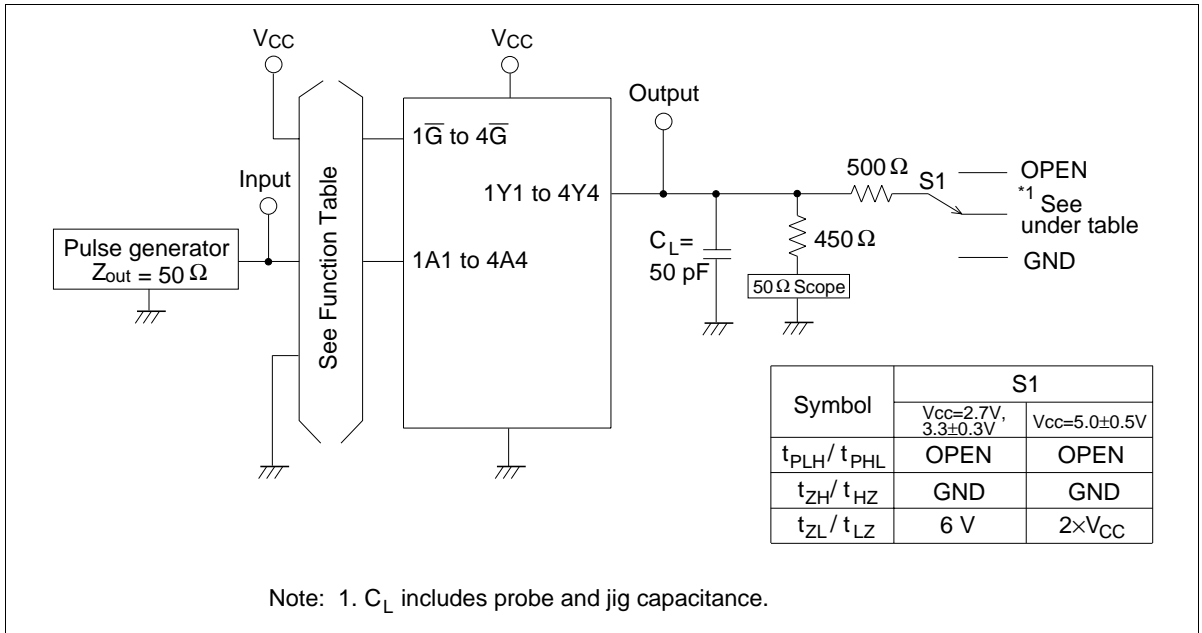
Switching Characteristics (Ta = -40 to 85°C)

Item	Symbol	V _{CC} (V)	Min	Typ	Max	Unit	FROM (Input)	TO (Output)
Propagation delay time	t _{PLH}	2.7	—	—	5.3	ns	A	Y
	t _{PHL}	3.3±0.3	1.1	—	4.7			
		5.0±0.5	—	—	4.2			
Output enable time	t _{ZH}	2.7	—	—	6.2	ns	\overline{G}	Y
	t _{ZL}	3.3±0.3	1.0	—	5.0			
		5.0±0.5	—	—	4.5			
Output disable time	t _{HZ}	2.7	—	—	7.4	ns	\overline{G}	Y
	t _{LZ}	3.3±0.3	1.8	—	6.3			
		5.0±0.5	—	—	4.7			
Between output pin skew ^{*1}	t _{OSLH}	2.7	—	—	—	ns		
	t _{OSHL}	3.3±0.3	—	—	1.0			
		5.0±0.5	—	—	1.0			

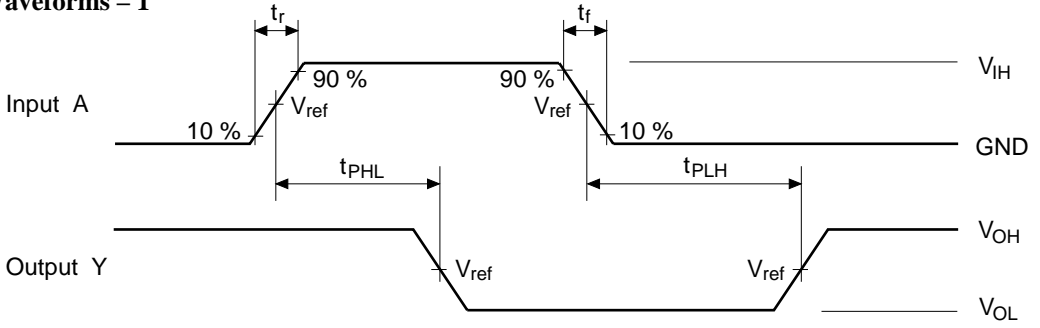
Note : 1. This parameter is characterized but not tested.

$$t_{OSLH} = |t_{PLHm} - t_{PLHn}|, t_{OSHL} = |t_{PHLm} - t_{PHLn}|$$

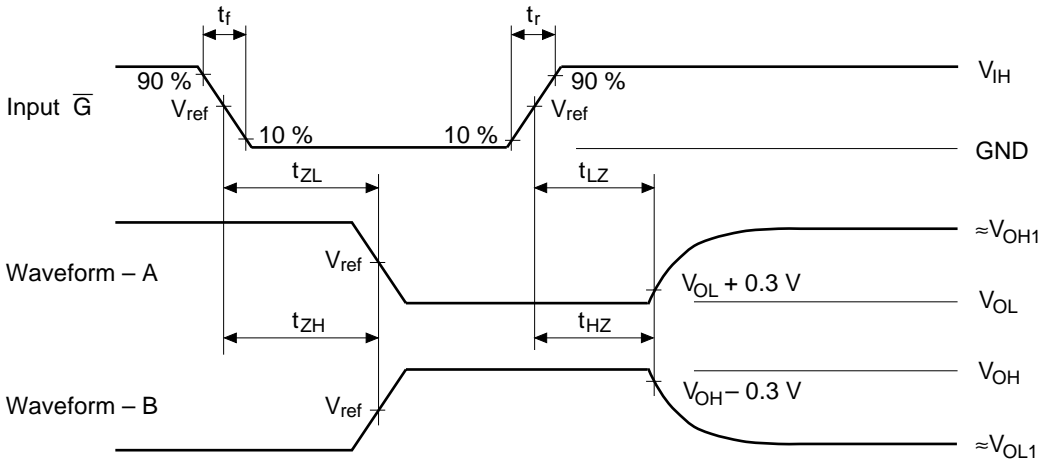
Test Circuit



• Waveforms – 1



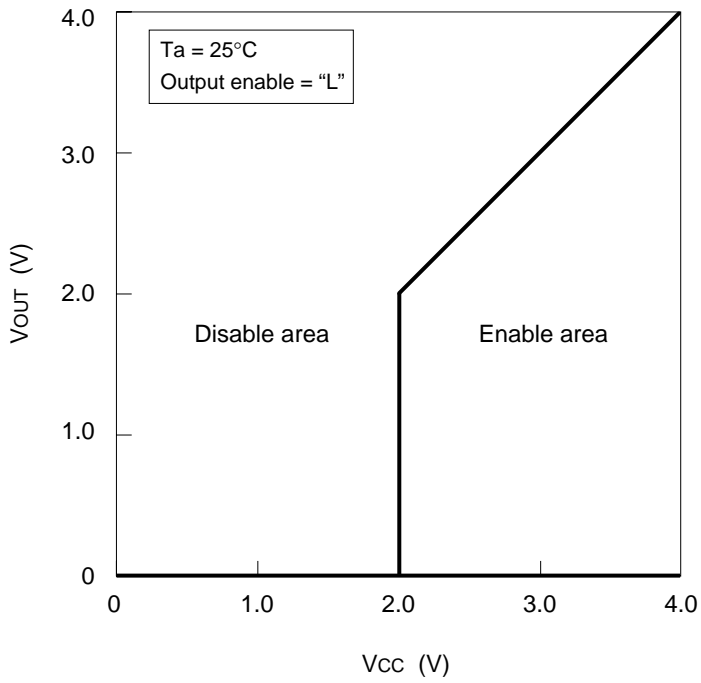
• Waveforms – 2



TEST	$V_{CC}=2.7V,$ $3.3\pm 0.3V$	$V_{CC}=5.0\pm 0.5V$
V_{IH}	2.7 V	V_{CC}
V_{ref}	1.5 V	$50\%V_{CC}$
V_{OH1}	3 V	V_{CC}
V_{OL1}	GND	GND

- Notes:
1. Input waveform : PRR = 10 MHz, duty cycle 50%, $t_r = 2.5$ ns, $t_f = 2.5$ ns
 2. Waveform – A shows input conditions such that the output is "L" level when enabled by the output control.
 3. Waveform – B shows input conditions such that the output is "H" level when enabled by the output control.

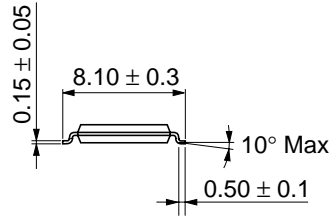
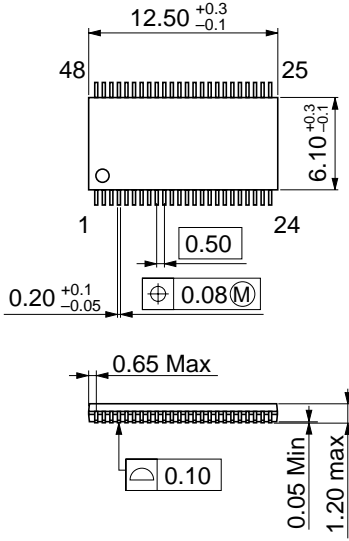
Power up / down Characteristics



HD74LVCZ16240A

Package Dimensions

Unit : mm



Hitachi code	TTP-48DC
EIAJ code	—
JEDEC code	—

Cautions

1. Hitachi neither warrants nor grants licenses of any rights of Hitachi's or any third party's patent, copyright, trademark, or other intellectual property rights for information contained in this document. Hitachi bears no responsibility for problems that may arise with third party's rights, including intellectual property rights, in connection with use of the information contained in this document.
2. Products and product specifications may be subject to change without notice. Confirm that you have received the latest product standards or specifications before final design, purchase or use.
3. Hitachi makes every attempt to ensure that its products are of high quality and reliability. However, contact Hitachi's sales office before using the product in an application that demands especially high quality and reliability or where its failure or malfunction may directly threaten human life or cause risk of bodily injury, such as aerospace, aeronautics, nuclear power, combustion control, transportation, traffic, safety equipment or medical equipment for life support.
4. Design your application so that the product is used within the ranges guaranteed by Hitachi particularly for maximum rating, operating supply voltage range, heat radiation characteristics, installation conditions and other characteristics. Hitachi bears no responsibility for failure or damage when used beyond the guaranteed ranges. Even within the guaranteed ranges, consider normally foreseeable failure rates or failure modes in semiconductor devices and employ systemic measures such as fail-safes, so that the equipment incorporating Hitachi product does not cause bodily injury, fire or other consequential damage due to operation of the Hitachi product.
5. This product is not designed to be radiation resistant.
6. No one is permitted to reproduce or duplicate, in any form, the whole or part of this document without written approval from Hitachi.
7. Contact Hitachi's sales office for any questions regarding this document or Hitachi semiconductor products.

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

URL North America : <http://semiconductor.hitachi.com/>
 Europe : <http://www.hitachi-eu.com/hel/ecg>
 Asia (Singapore) : <http://www.has.hitachi.com.sg/grp3/sicd/index.htm>
 Asia (Taiwan) : http://www.hitachi.com.tw/E/Product/SICD_Frame.htm
 Asia (HongKong) : <http://www.hitachi.com.hk/eng/bo/grp3/index.htm>
 Japan : <http://www.hitachi.co.jp/Sicd/indx.htm>

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

Copyright ' Hitachi, Ltd., 1999. All rights reserved. Printed in Japan.

HITACHI