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Renesas Technology Corp.
Customer Support Dept.
April 1, 2003

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HD74LVCZ16240A

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

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 ($1\overline{G}$ to $4\overline{G}$). 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, Ta = 25°C)
- Typical V_{OH} undershoot > 2.0 V (@V_{CC} = 3.3 V, Ta = 25°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)

Function Table

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

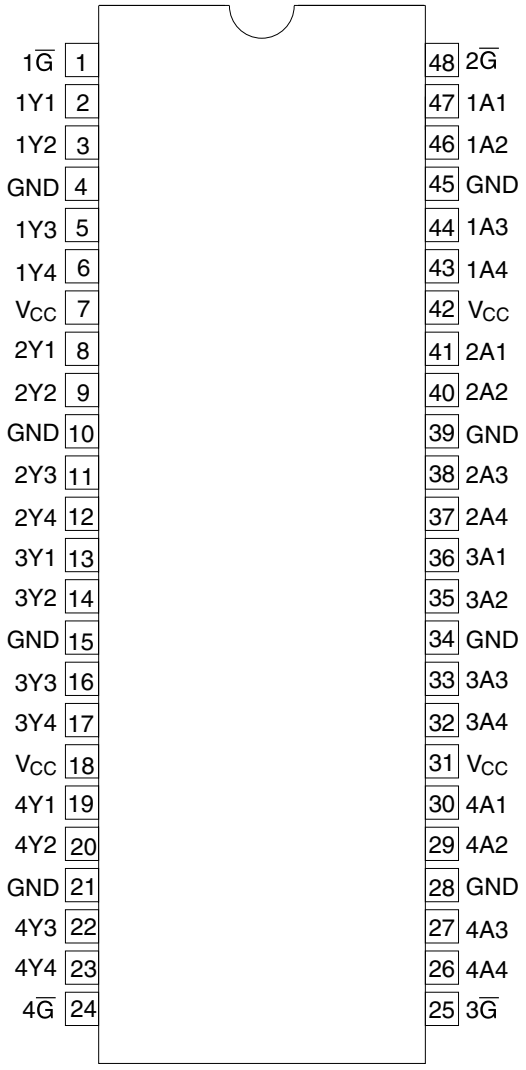
H : High level

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	V	Output "Z" or V_{CC} : OFF
		–0.5 to V_{CC}+0.5		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	

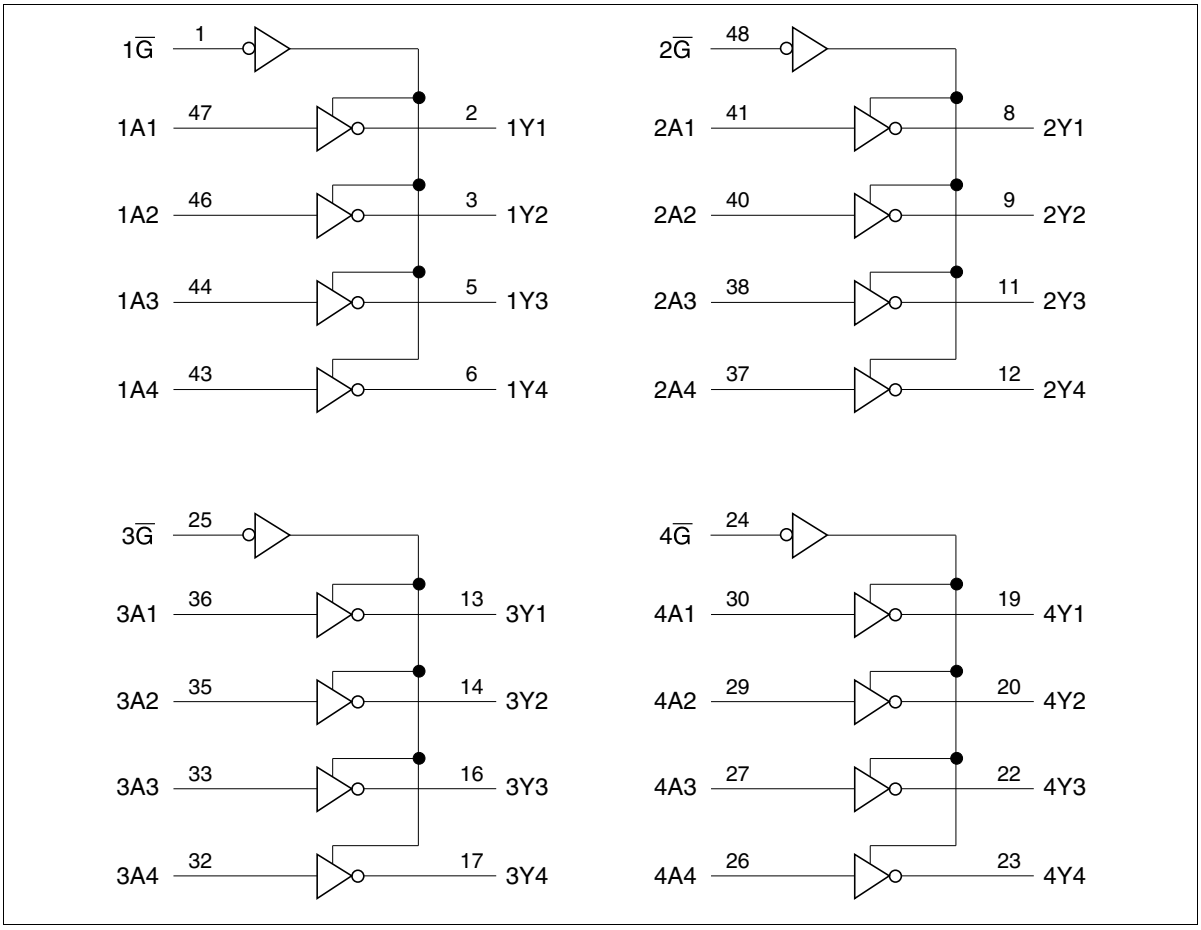
Note: The absolute maximum ratings are values which must not individually be exceeded, and furthermore, no two of which may be realized at the same time.

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	V	Output "Z" or V_{CC} : OFF
		0 to V_{CC}		Output "H" or "L"
Output current	I_{OH}	–12	mA	V_{CC} = 2.7 V
		–24 [*1]		V_{CC} = 3.0 to 5.5 V
	I_{OL}	12		V_{CC} = 2.7 V
		24 [*1]		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 ≤ 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	I_{CC}	2.7 to 3.6	—	—	225	µA	V_{IN} = 3.6 to 5.5 V [*1], I_O = 0
current		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

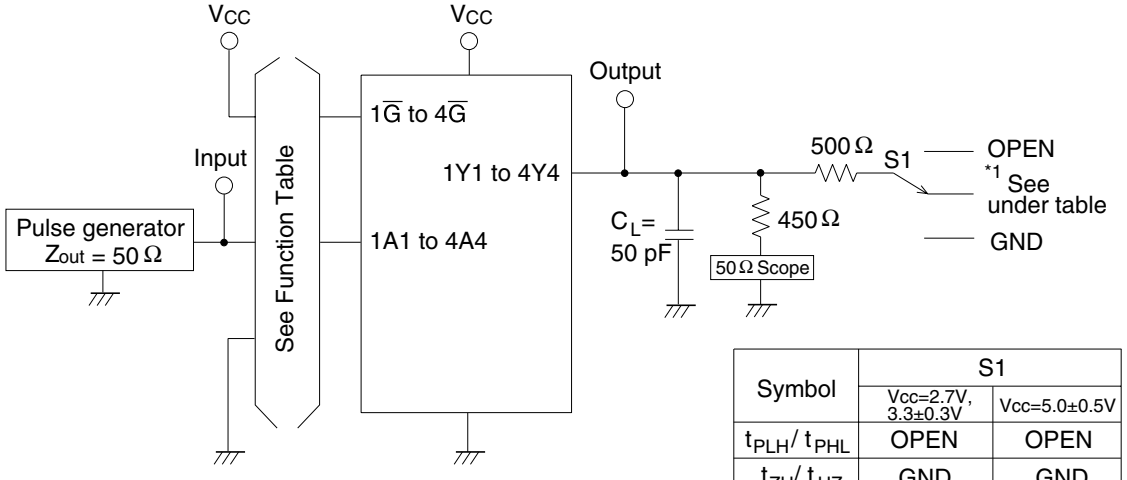
Note: 1. This applies in the disabled state only.

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

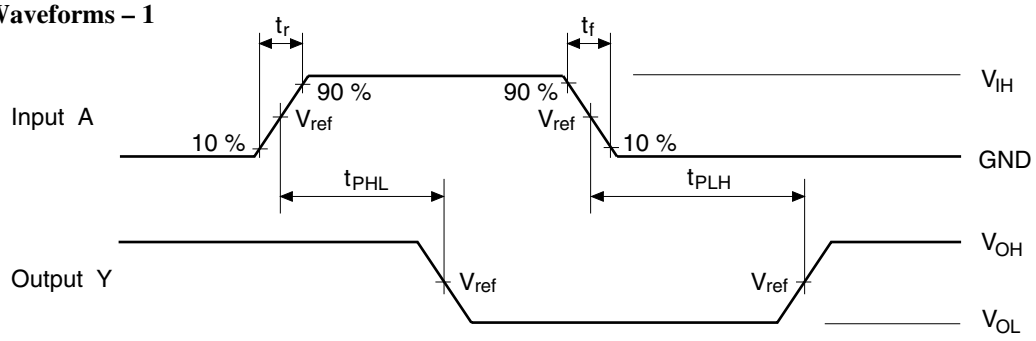
Test Circuit



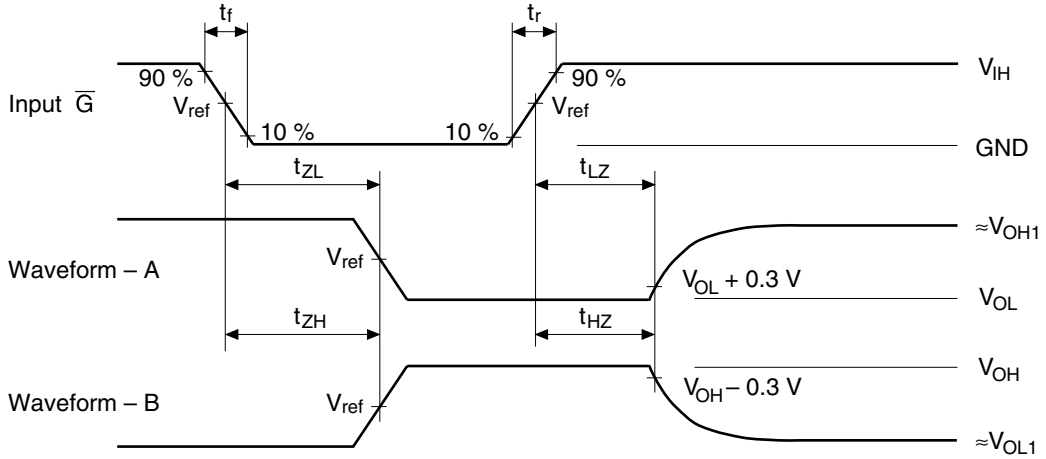
Symbol	S1	
	Vcc=2.7V, 3.3±0.3V	Vcc=5.0±0.5V
t_{PLH}/ t_{PHL}	OPEN	OPEN
t_{ZH}/ t_{HZ}	GND	GND
t_{ZL}/ t_{LZ}	6 V	2×V_{CC}

Note: 1. C_L includes probe and jig capacitance.

• **Waveforms – 1**



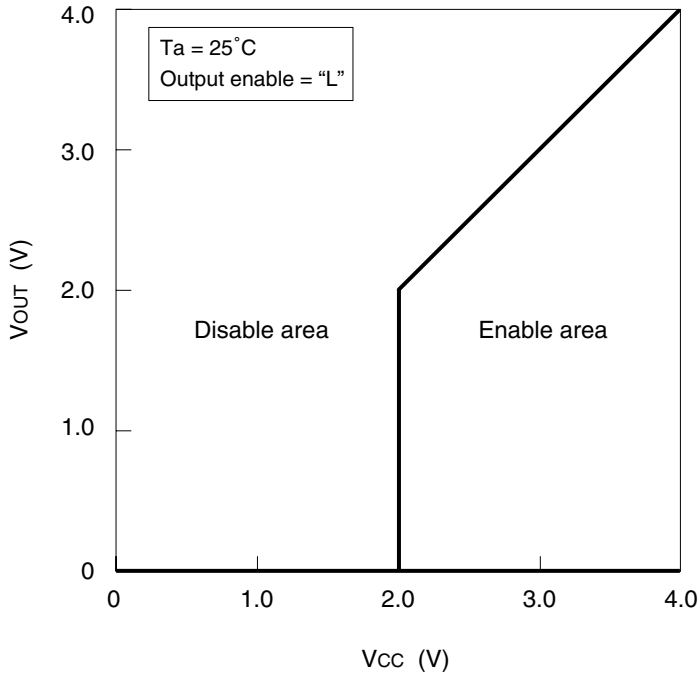
• **Waveforms – 2**



TEST	Vcc=2.7V, 3.3±0.3V	Vcc=5.0±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.

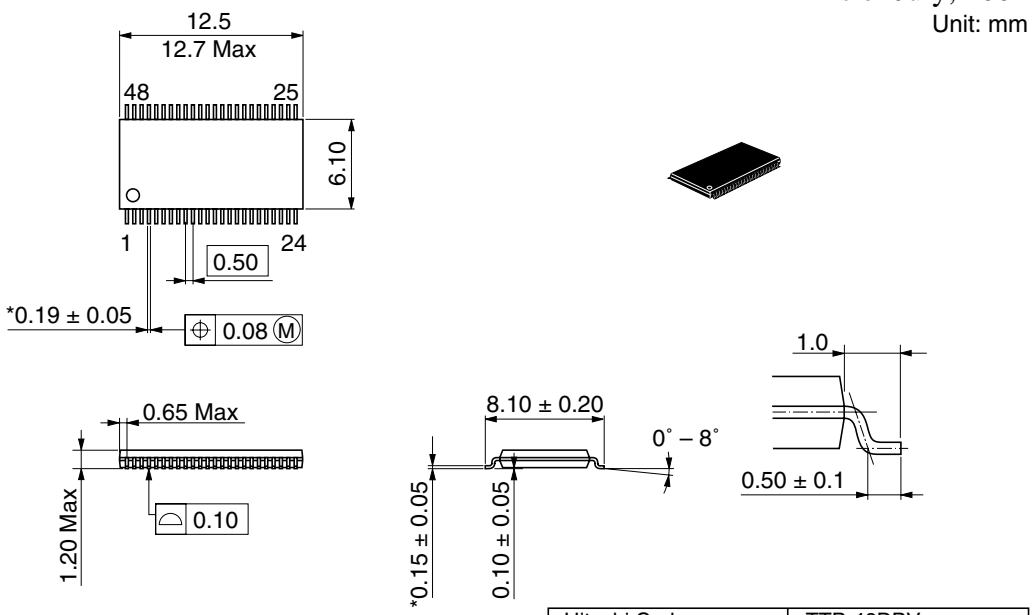
Power up / down Characteristics



Package Dimensions

As of July, 2001

Unit: mm



Hitachi Code	TTP-48DBV
JEDEC	—
JEITA	—
Mass (reference value)	0.20 g

*Pd plating

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