
HD74LVC2244A

Octal Buffers / Line Drivers with 3-state Outputs

HITACHI

ADE-205-234 (Z)

Preliminary

1st. Edition

December 1998

Description

The HD74LVC2244A has eight line drivers with three state outputs in a 20 pin package. This device is a noninverting buffer and has two active low enables ($\overline{1G}$ and $\overline{2G}$). Each enable independently controls four buffers.

All outputs, which are designed to sink up to 12 mA, include equivalent 26 Ω resistors to reduce overshoot and undreshoot.

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

- $V_{CC} = 1.65$ to 5.5 V
- All inputs $V_{IH}(\text{Max}) = 5.5$ V (@ $V_{CC} = 0$ to 5.5 V)
- All outputs $V_O(\text{Max}) = 5.5$ 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 output current ± 12 mA (@ $V_{CC} = 3.0$ to 5.5 V)
- All outputs have equivalent 26 Ω series resistors, so no external resistors are required

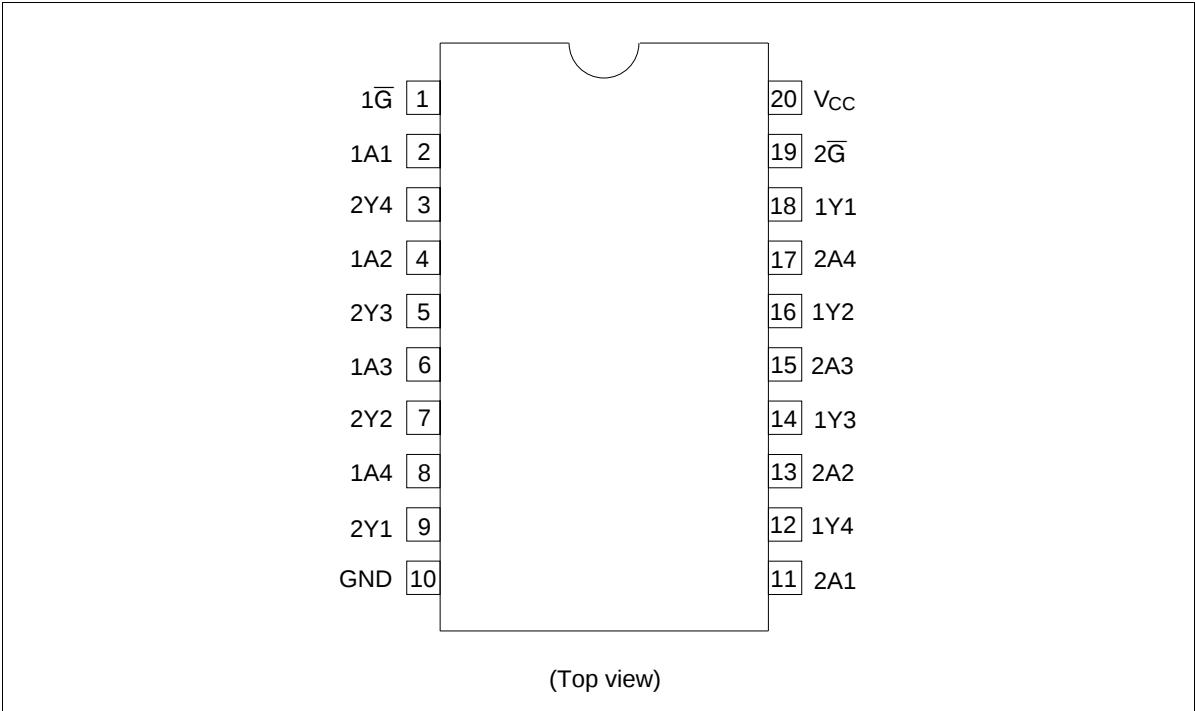
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Function Table

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

H : High level
L : Low level
X : Immaterial
Z : High impedance

Pin Arrangement



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	

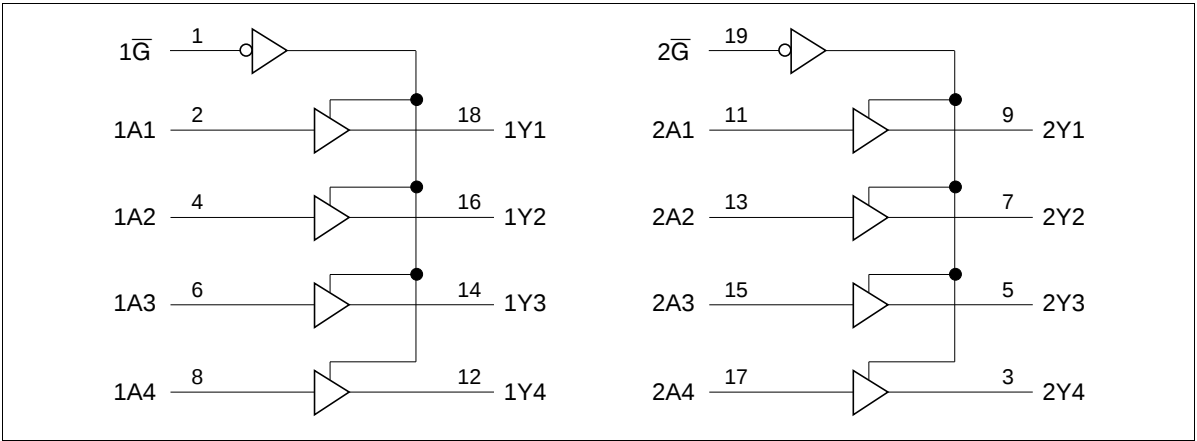
Note: The absolute maximum ratings are values which must not individually be exceeded, and furthermore no two of which may be realized at the same time.

Recommended Operating Conditions

Item	Symbol	Ratings	Unit	Conditions
Supply voltage	V_{CC}	1.65 to 5.5	V	At operation
		1.5 to 5.5		Data retention only
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}	−2	mA	$V_{CC} = 1.65\text{ V}$
		−4		$V_{CC} = 2.3\text{ V}$
		−8		$V_{CC} = 2.7\text{ V}$
		−12		$V_{CC} = 3.0\text{ to }5.5\text{ V}$
	I_{OL}	2		$V_{CC} = 1.65\text{ V}$
		4		$V_{CC} = 2.3\text{ V}$
		8		$V_{CC} = 2.7\text{ V}$
		12		$V_{CC} = 3.0\text{ to }5.5\text{ V}$
Input rise / fall time	t_r, t_f	0 to 6	ns / V	
Operating temperature	Ta	−40 to +85	°C	

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Logic Diagram



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

Item	Symbol	V _{CC} (V)	Min	Typ	Max	Unit	Test Conditions
Input voltage	V _{IH}	1.65 to 1.95	V _{CC} ×0.65	—	—	V	
		2.3 to 2.7	1.7	—	—		
		2.7 to 3.6	2.0	—	—		
		4.5 to 5.5	V _{CC} ×0.7	—	—		
	V _{IL}	1.65 to 1.95	—	—	V _{CC} ×0.35		
		2.3 to 2.7	—	—	0.7		
		2.7 to 3.6	—	—	0.8		
		4.5 to 5.5	—	—	V _{CC} ×0.3		
Output voltage	V _{OH}	1.65 to 5.5	V _{CC} -0.2	—	—	V	I _{OH} = -100 µA
		1.65	1.2	—	—		I _{OH} = -2 mA
		2.3	1.7	—	—		I _{OH} = -4 mA
		2.7	2.2	—	—		
		3.0	2.4	—	—		I _{OH} = -6 mA
		2.7	2.0	—	—		I _{OH} = -8 mA
		3.0	2.0	—	—		I _{OH} = -12 mA
		4.5	3.6	—	—		
	V _{OL}	1.65 to 5.5	—	—	0.2		I _{OL} = 100 µA
		1.65	—	—	0.45		I _{OL} = 2 mA
		2.3	—	—	0.7		I _{OL} = 4 mA
		2.7	—	—	0.4		
		3.0	—	—	0.55		I _{OL} = 6 mA
		2.7	—	—	0.6		I _{OL} = 8 mA
		3.0	—	—	0.8		I _{OL} = 12 mA
		4.5	—	—	0.8		
Input current	I _{IN}	0 to 5.5	—	—	±5	µA	V _{IN} = 0 to 5.5 V
Off state output current	I _{OZ}	1.65 to 5.5	—	—	±5	µA	V _{OUT} = 0 to 5.5 V
Output leak current	I _{OFF}	0	—	—	±5	µA	V _{IN} or V _O = 5.5 V
Quiescent supply current	I _{CC}	1.65 to 3.6	—	—	10	µA	V _{IN} = 3.6 to 5.5 V ¹⁾ , I _O = 0
		1.65 to 5.5	—	—	10		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	—	TBD	—	pF	V _{IN} = V _{CC} or GND
Output capacitance	C _O	3.3	—	TBD	—	pF	V _{OUT} = V _{CC} or GND

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

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

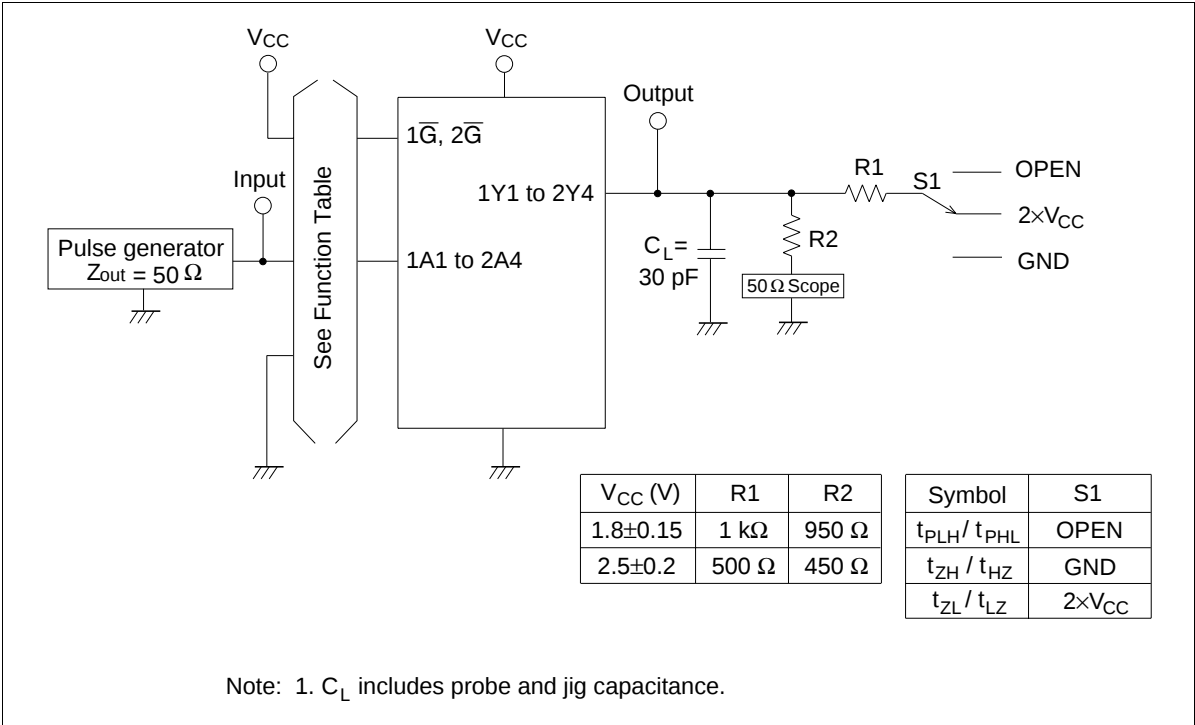
Item	Symbol	V _{CC} (V)	Min	Typ	Max	Unit	FROM (Input)	TO (Output)
Propagation delay time	t _{PLH}	1.8±0.15	TBD	TBD	TBD	ns	A	Y
	t _{PHL}	2.5±0.2	TBD	TBD	TBD			
		2.7	—	—	6.4			
		3.3±0.3	1.5	—	5.5			
		5.0±0.5	—	—	4.1			
Output enable time	t _{ZH}	1.8±0.15	TBD	TBD	TBD	ns	$\overline{G}$	Y
	t _{ZL}	2.5±0.2	TBD	TBD	TBD			
		2.7	—	—	8.1			
		3.3±0.3	1.0	—	7.1			
		5.0±0.5	—	—	5.6			
Output disable time	t _{HZ}	1.8±0.15	TBD	TBD	TBD	ns	$\overline{G}$	Y
	t _{LZ}	2.5±0.2	TBD	TBD	TBD			
		2.7	—	—	7.3			
		3.3±0.3	1.5	—	6.8			
		5.0±0.5	—	—	5.7			
Between output pin skew *1	t _{OSLH}	1.8±0.15	TBD	TBD	TBD	ns		
	t _{OSHL}	2.5±0.2	TBD	TBD	TBD			
		2.7	—	—	—			
		3.3±0.3	—	—	1.0			
		5.0±0.5	—	—	1.0			

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

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

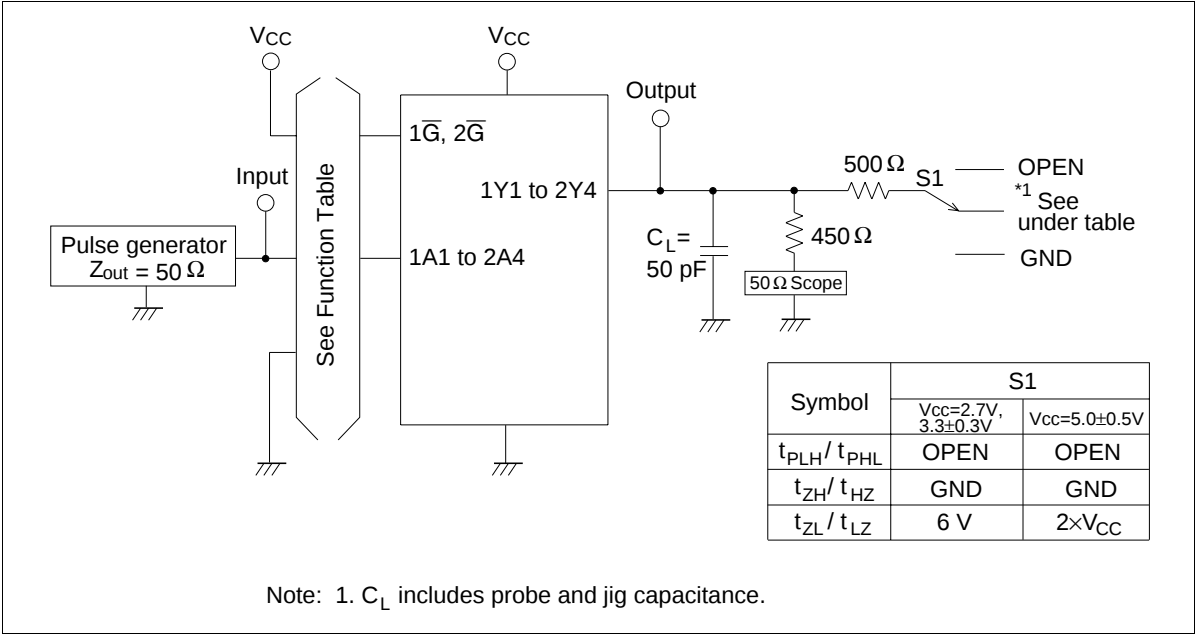
Test Circuit

($V_{CC} = 1.8 \pm 0.15 \text{ V}$, $V_{CC} = 2.5 \pm 0.2 \text{ V}$)



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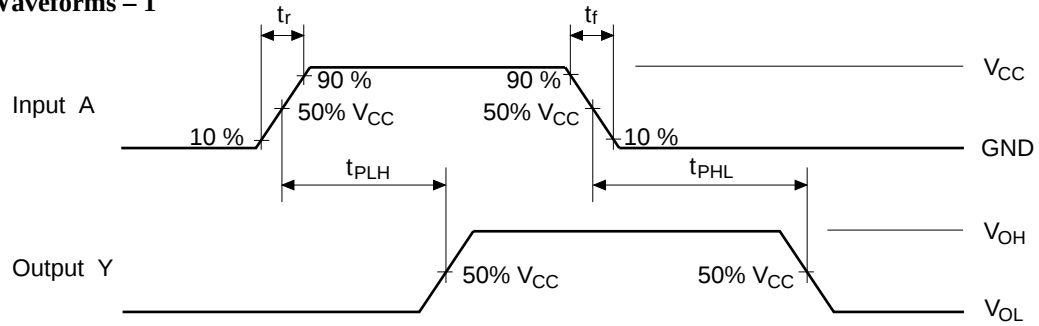
(V_{CC} = 2.7 V, V_{CC} = 3.3±0.3 V, V_{CC} = 5.0±0.5 V)



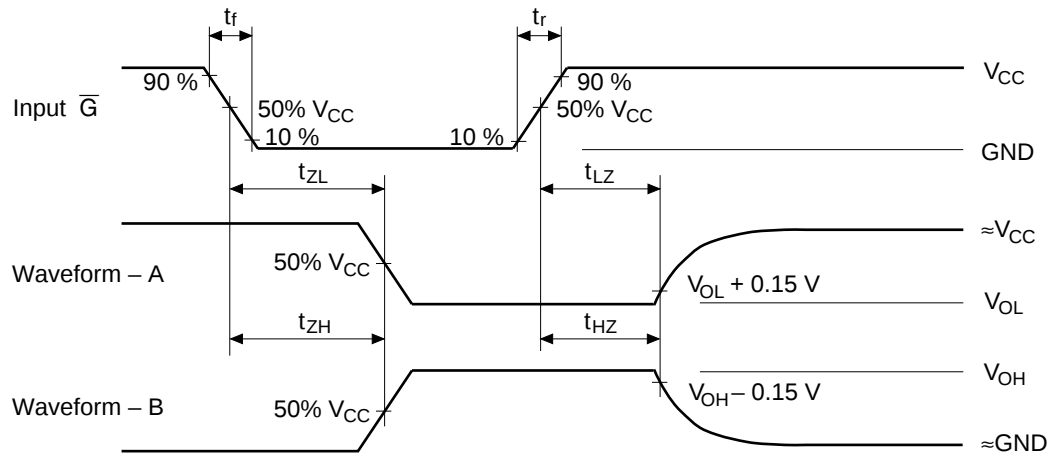
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($V_{CC} = 1.8 \pm 0.15 \text{ V}$, $V_{CC} = 2.5 \pm 0.2 \text{ V}$)

• Waveforms – 1



• Waveforms – 2

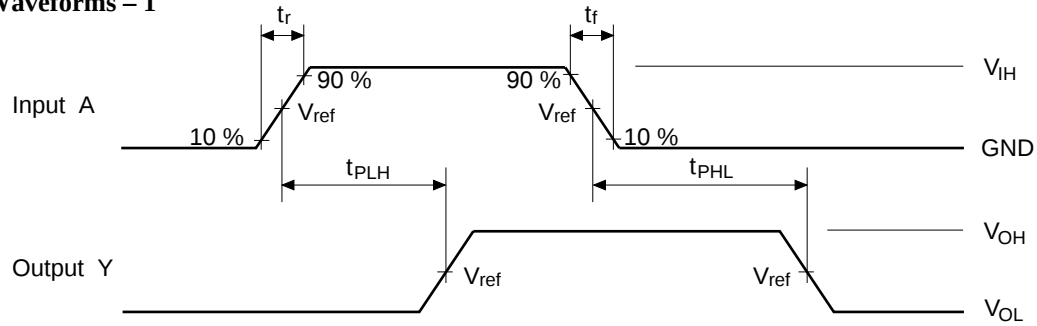


- Notes:
1. Input waveform : PRR = 10 MHz, duty cycle 50%, $t_r = 2.0 \text{ ns}$, $t_f = 2.0 \text{ ns}$
 2. Waveform – A shows input conditions such that the output is "L" level when enabled by the output control.
 3. Waveform – B shows input conditions such that the output is "H" level when enabled by the output control.

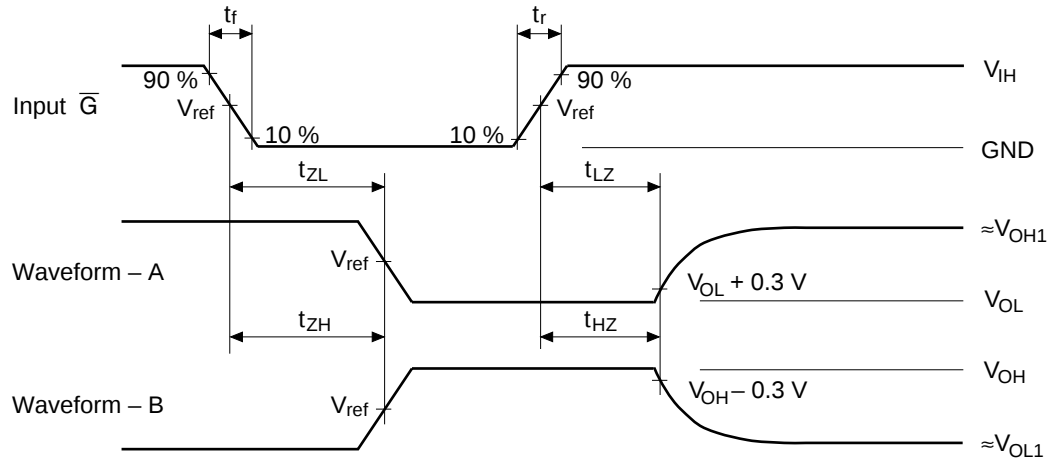
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($V_{CC} = 2.7\text{ V}$, $V_{CC} = 3.3 \pm 0.3\text{ V}$, $V_{CC} = 5.0 \pm 0.5\text{ V}$)

• Waveforms – 1



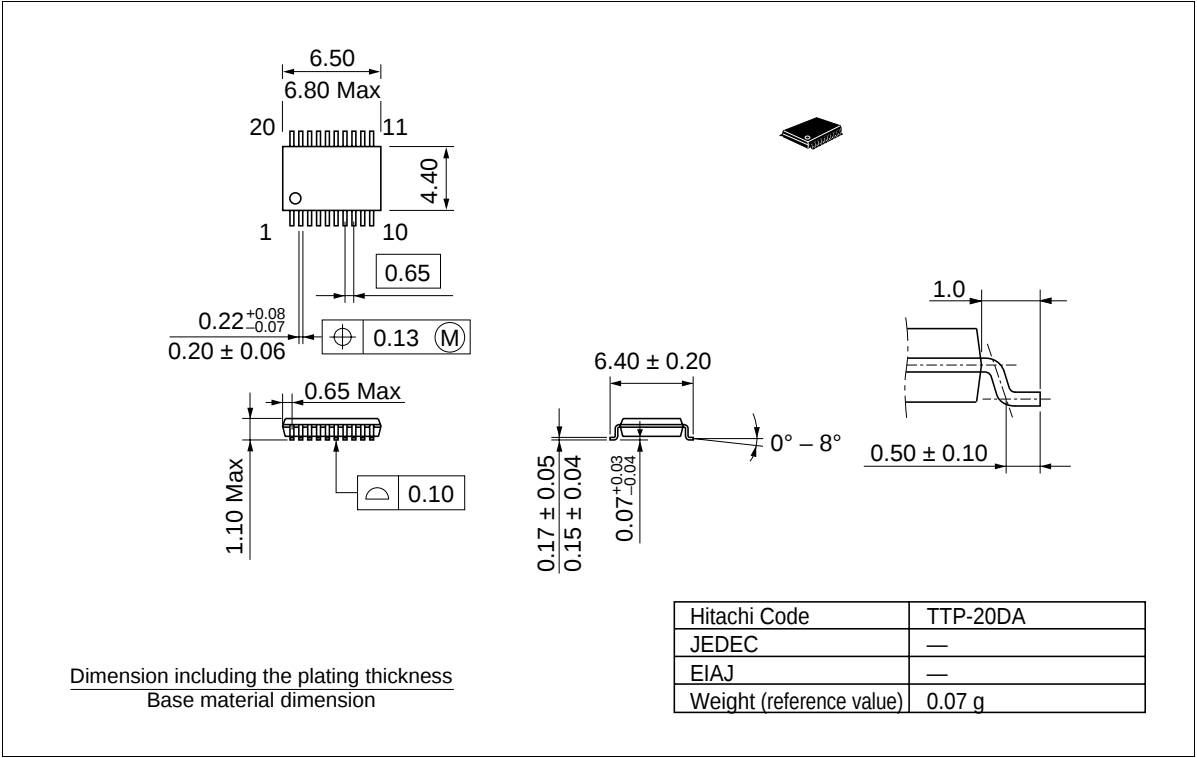
• Waveforms – 2



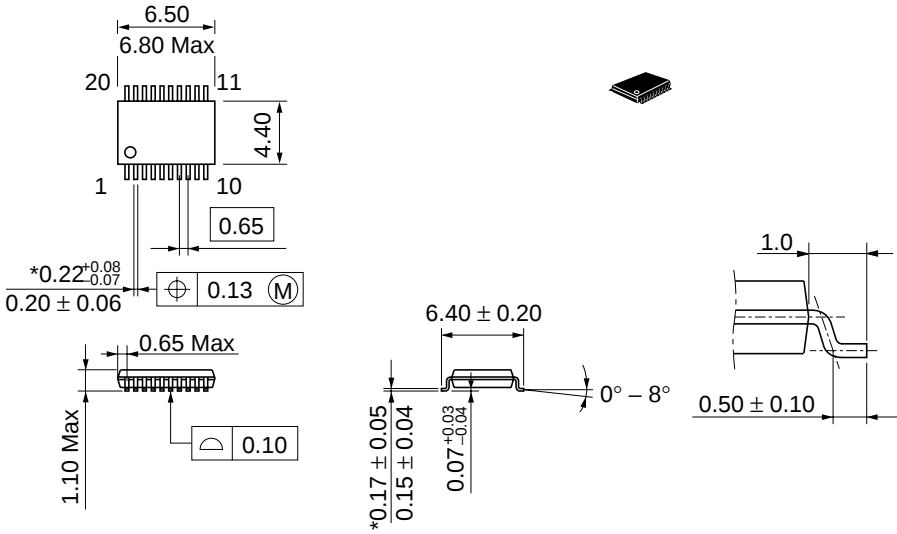
TEST	$V_{CC}=2.7\text{ V}$, $3.3 \pm 0.3\text{ V}$	$V_{CC}=5.0 \pm 0.5\text{ V}$
V_{IH}	2.7 V	V_{CC}
V_{ref}	1.5 V	50% V_{CC}
V_{OH1}	3 V	V_{CC}
V_{OL1}	GND	GND

- Notes:
1. Input waveform : PRR = 10 MHz, duty cycle 50%, $t_r = 2.5\text{ ns}$, $t_f = 2.5\text{ ns}$
 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.

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Unit: mm



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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 StraÙe 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