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

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Remember to give due consideration to safety when making your circuit designs, with appropriate measures such as (i) placement of substitutive, auxiliary circuits, (ii) use of nonflammable material or (iii) prevention against any malfunction or mishap.

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HD74LVC04

Hex Inverters



ADE-205-062B(Z)

Rev.2
September 1995

Description

The HD74LVC04 has six inverters in a 14 pin package. Low voltage and high speed operation is suitable at the battery drive product (note type personal computer) and low power consumption extends the life of a battery for long time operation.

Features

- $V_{CC} = 2.0\text{ V to }5.5\text{ V}$
- All inputs $V_{IH}(\text{Max.}) = 5.5\text{ V}$ ($@V_{CC} = 0\text{ V to }5.5\text{ V}$)
- Typical V_{OL} ground bounce $< 0.8\text{ V}$ ($@V_{CC} = 3.3\text{ V}$, $T_a = 25^\circ\text{C}$)
- Typical V_{OH} undershoot $> 2.0\text{ V}$ ($@V_{CC} = 3.3\text{ V}$, $T_a = 25^\circ\text{C}$)
- High output current $\pm 24\text{ mA}$ ($@V_{CC} = 3.0\text{ V to }5.5\text{ V}$)

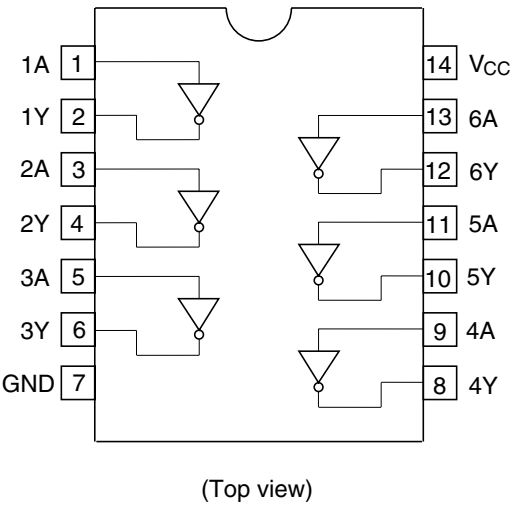
Function Table

Input A	Output Y
H	L
L	H

H : High level

L : Low level

Pin Arrangement



Absolute Maximum Ratings

Item	Symbol	Ratings	Unit	Conditions
Supply voltage range	V_{CC}	-0.5 to 6.0	V	
Input diode current	I_{IK}	-50	mA	$V_I = -0.5\text{ V}$
Input voltage	V_I	-0.5 to 6.0	V	
Output diode current	I_{OK}	-50	mA	$V_O = -0.5\text{ V}$
		50	mA	$V_O = V_{CC} + 0.5\text{ V}$
Output voltage	V_O	-0.5 to $V_{CC} + 0.5$	V	
Output current	I_O	± 50	mA	
V_{CC} , GND current / pin	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}	1.5 to 5.5	V	Data retention
		2.0 to 5.5	V	At operation
Input / Output voltage	V_I	0 to 5.5	V	A
	V_O	0 to V_{CC}	V	Y
Operating temperature	T_a	-40 to 85	°C	
Output current	I_{OH}	-12	mA	$V_{CC} = 2.7\text{ V}$
		-24 ²	mA	$V_{CC} = 3.0\text{ V to } 5.5\text{ V}$
	I_{OL}	12	mA	$V_{CC} = 2.7\text{ V}$
		24 ²	mA	$V_{CC} = 3.0\text{ V to } 5.5\text{ V}$
Input rise / fall time ¹	t_r, t_f	10	ns/V	

Notes: 1. This item guarantees maximum limit when one input switches.

Waveform : Refer to test circuit of switching characteristics.

2. duty cycle $\leq 50\%$

Electrical Characteristics

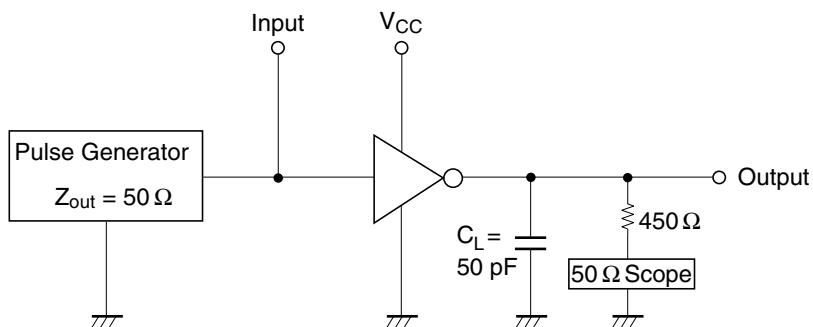
$T_a = -40\text{ to } 85^\circ\text{C}$

Item	Symbol	V_{CC} (V)	$T_a = -40\text{ to } 85^\circ\text{C}$		Unit	Test Conditions
			Min	Max		
Input voltage	V_{IH}	2.7 to 3.6	2.0	—	V	
		4.5 to 5.5	$V_{CC} \times 0.7$	—	V	
	V_{IL}	2.7 to 3.6	—	0.8	V	
		4.5 to 5.5	—	$V_{CC} \times 0.3$	V	
Output voltage	V_{OH}	2.7 to 5.5	$V_{CC} - 0.2$	—	V	$I_{OH} = -100\text{ }\mu\text{A}$
		2.7	2.2	—	V	$I_{OH} = -12\text{ mA}$
		3.0	2.4	—	V	$I_{OH} = -12\text{ mA}$
		3.0	2.0	—	V	$I_{OH} = -24\text{ mA}$
		4.5	3.8	—	V	$I_{OH} = -24\text{ mA}$
	V_{OL}	2.7 to 5.5	—	0.2	V	$I_{OL} = 100\text{ }\mu\text{A}$
		2.7	—	0.4	V	$I_{OL} = 12\text{ mA}$
		3.0	—	0.55	V	$I_{OL} = 24\text{ mA}$
		4.5	—	0.55	V	$I_{OL} = 24\text{ mA}$
Input current	I_{IN}	0 to 5.5	—	± 5.0	μA	$V_{IN} = 5.5\text{ V or GND}$
Quiescent supply current	I_{CC}	5.5	—	20	μA	$V_{IN} = V_{CC}\text{ or GND}$
	ΔI_{CC}	3.0 to 3.6	—	500	μA	$V_{IN} = \text{one input at } (V_{CC} - 0.6)\text{V},$ other inputs at $V_{CC}\text{ or GND}$

Switching Characteristics

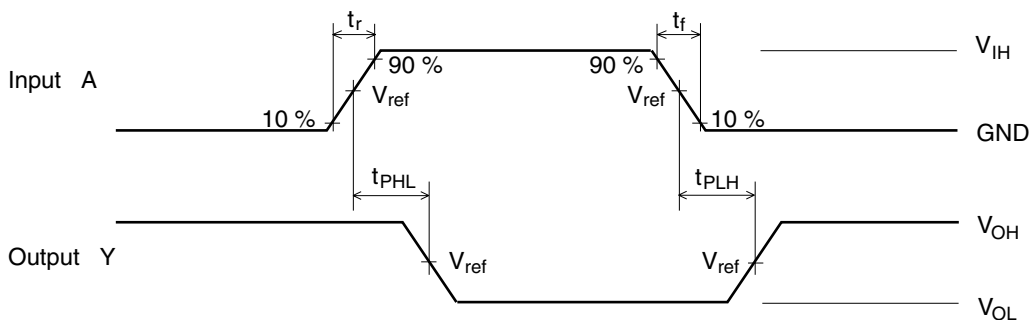
Item	Symbol	V _{cc} (V)	Ta = -40 to 85°C			Unit	From (Input)	To (Output)
			Min	Typ	Max			
Propagation delay time	t _{PLH}	2.7	—	4.5	7.0	ns	A	Y
	t _{PHL}	3.3±0.3	1.5	3.5	6.0	ns		
		5.0±0.5	—	2.5	5.0	ns		
Input capacitance	C _{IN}	2.7	—	3.0	—	pF		
Output capacitance	C _O	2.7	—	15.0	—	pF		

Test Circuit



Note: 1. C_L includes probe and jig capacitance.

Waveforms

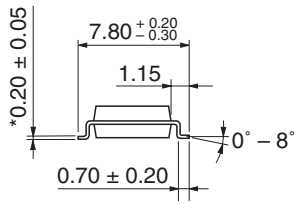
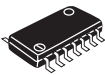
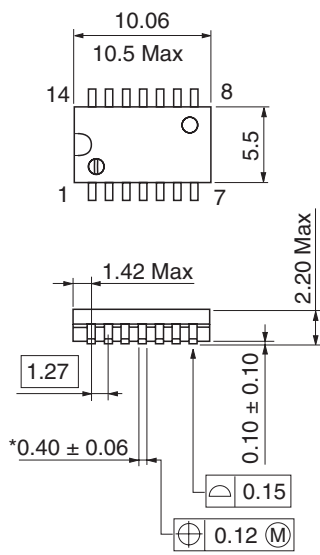


TEST	$V_{CC} = 2.7\text{ V}, 3.3 \pm 0.3\text{ V}$	$V_{CC} = 5.0 \pm 0.5\text{ V}$
V_{IH}	2.7 V	V_{CC}
V_{ref}	1.5 V	50% V_{CC}

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

Package Dimensions

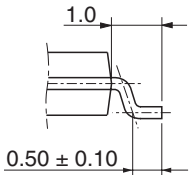
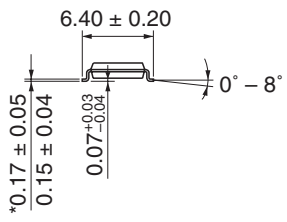
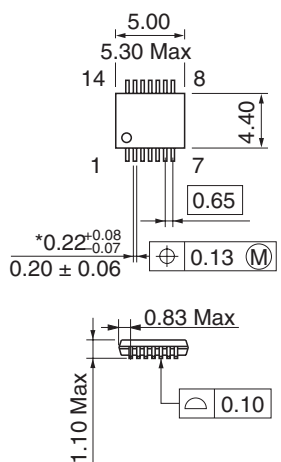
As of July, 2001
Unit: mm



Hitachi Code	FP-14DAV
JEDEC	—
JEITA	Conforms
Mass (reference value)	0.23 g

*Pd plating

As of July, 2001
Unit: mm



Hitachi Code	TTP-14D
JEDEC	—
JEITA	—
Mass (reference value)	0.05 g

*Dimension including the plating thickness
Base material dimension

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