DATA SHEET

For a complete data sheet, please also download:

- The IC06 74HC/HCT/HCU/HCMOS Logic Family Specifications
- The IC06 74HC/HCT/HCU/HCMOS Logic Package Information
- The IC06 74HC/HCT/HCU/HCMOS Logic Package Outlines

74HC/HCT4002
Dual 4-input NOR gate

Product specification
File under Integrated Circuits, IC06

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Philips Semiconductors

PHILIPS

Dual 4-input NOR gate 74HC/HCT4002

FEATURES

- Output capability: standard
- I_{CC} category: SSI

GENERAL DESCRIPTION

The 74HC/HCT4002 are high-speed Si-gate CMOS devices and are pin compatible with “4002” of the “4000B” series. They are specified in compliance with JEDEC standard no. 7A.

The 74HC/HCT4002 provide the 4-input NOR function.

QUICK REFERENCE DATA

GND = 0 V; T_{amb} = 25 °C; $t_r = t_f$ = 6 ns

SYMBOL	PARAMETER	CONDITIONS	TYPICAL		UNIT
			HC	HCT	
t_{PHL}/ t_{PLH}	propagation delay nA, nB, nC, nD to nY	C_L = 15 pF; V_{CC} = 5 V	9	11	ns
C_I	input capacitance		3.5	3.5	pF
C_{PD}	power dissipation capacitance per gate	notes 1 and 2	16	22	pF

Notes

1. C_{PD} is used to determine the dynamic power dissipation (P_D in µW):

   $P_D = C_{PD} \times V_{CC}^2 \times f_i + \sum (C_L \times V_{CC}^2 \times f_o)$ where:

   f_i = input frequency in MHz

   f_o = output frequency in MHz

   $\sum (C_L \times V_{CC}^2 \times f_o)$ = sum of outputs

   C_L = output load capacitance in pF

   V_{CC} = supply voltage in V

2. For HC the condition is V_I = GND to V_{CC}

   For HCT the condition is V_I = GND to V_{CC} – 1.5 V

ORDERING INFORMATION

See *“74HC/HCT/HCU/HCMOS Logic Package Information”*.

PIN DESCRIPTION

PIN NO.	SYMBOL	NAME AND FUNCTION
1, 13	1Y, 2Y	data outputs
2, 9	1A, 2A	data inputs
3, 10	1B, 2B	data inputs
4, 11	1C, 2C	data inputs
5, 12	1D, 2D	data inputs
6, 8	n.c.	not connected
7	GND	ground (0 V)
14	V_{CC}	positive supply voltage

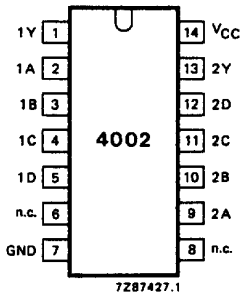


Fig.1 Pin configuration.

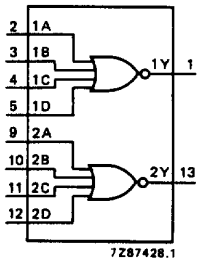


Fig.2 Logic symbol.

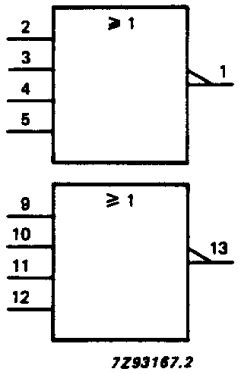


Fig.3 IEC logic symbol.

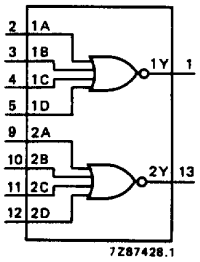


Fig.4 Functional diagram.

FUNCTION TABLE

INPUTS				OUTPUT
nA	**nB**	**nC**	**nD**	**nY**
L	L	L	L	H
H	X	X	X	L
X	H	X	X	L
X	X	H	X	L
X	X	X	H	L

Notes

1. H = HIGH voltage level
   L = LOW voltage level
   X = don't care

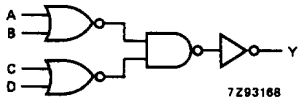


Fig.5 Logic diagram 74HC4002 (one gate).

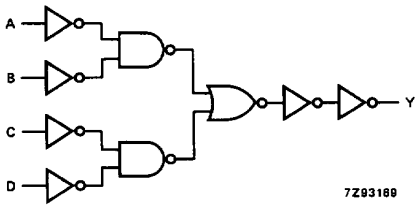


Fig.6 Logic diagram 74HCT4002 (one gate).

DC CHARACTERISTICS FOR 74HC

For the DC characteristics see *"74HC/HCT/HCU/HCMOS Logic Family Specifications"*.

Out put capability: standard
I_{CC} category: SSI

AC CHARACTERISTICS FOR 74HC

GND = 0 V; $t_r = t_f$ = 6 ns; C_L = 50 pF

SYMBOL	PARAMETER	T_{amb} (°C)							UNIT	TEST CONDITIONS	
		74HC								V_{CC} (V)	WAVEFORMS
		+25			−40 to +85		−40 to +125				
		min.	typ.	max.	min.	max.	min.	max.			
t_{PHL}/ t_{PLH}	propagation delay nA, nB, nC, nD to nY		30 11 9	100 20 17		125 25 21		150 30 26	ns	2.0 4.5 6.0	Fig.7
t_{THL}/ t_{TLH}	output transition time		19 7 6	75 15 13		95 19 16		110 22 19	ns	2.0 4.5 6.0	Fig.7

DC CHARACTERISTICS FOR 74HCT

For the DC characteristics see *"74HC/HCT/HCU/HCMOS Logic Family Specifications"*.

Output capability: standard
I_{CC} category: SSI

Note to HCT types

The value of additional quiescent supply current (ΔI_{CC}) for a unit load of 1 is given in the family specifications. To determine ΔI_{CC} per input, multiply this value by the unit load coefficient shown in the table below.

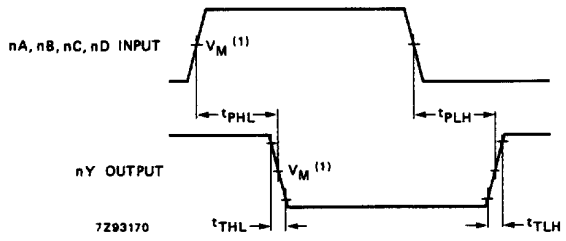
INPUT	UNIT LOAD COEFFICIENT
nA, nB, nC, nD	0.45

AC CHARACTERISTICS FOR 74HCT

GND = 0 V; $t_r = t_f$ = 6 ns; C_L = 50 pF

SYMBOL	PARAMETER	T_{amb} (°C)							UNIT	TEST CONDITIONS	
		74HCT								V_{CC} (V)	WAVEFORMS
		+25			−40 to +85		−40 to +125				
		min.	typ.	max.	min.	max.	min.	max.			
t_{PHL}/ t_{PLH}	propagation delay nA, nB, nC, nD to nY		13	22		28		33	ns	4.5	Fig.7
t_{THL}/ t_{TLH}	output transition time		7	15		19		22	ns	4.5	Fig.7

AC WAVEFORMS



(1) HC : V_M = 50%; V_I = GND to V_{CC}.
HCT: V_M = 1.3 V; V_I = GND to 3 V.

Fig.7 Waveforms showing the input (nA, nB, nC, nD) to output (nY) propagation delays and the output transition times.

PACKAGE OUTLINES

See *"74HC/HCT/HCU/HCMOS Logic Package Outlines"*.