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/HCT253

Dual 4-input multiplexer; 3-state

Product specification
File under Integrated Circuits, IC06

December 1990

Philips Semiconductors

Dual 4-input multiplexer; 3-state 74HC/HCT253

FEATURES

- Non-inverting data path
- 3-state outputs for bus interface
- and multiplex expansion
- Common select inputs
- Separate output enable inputs
- Output capability: bus driver
- I_{CC} category: MSI

GENERAL DESCRIPTION

The 74HC/HCT253 are high-speed Si-gate CMOS devices and are pin compatible with low power Schottky TTL (LSTTL). They are specified in compliance with JEDEC standard no. 7A.

The 74HC/HCT253 have two identical 4-input multiplexers with 3-state outputs which select two bits from four sources selected by common data select inputs (S_0, S_1). When the individual output enable ($1\overline{OE}$, $2\overline{OE}$) inputs of the 4-input multiplexers are HIGH, the outputs are forced to the high impedance OFF-state. The “253” is the logic implementation of a 2-pole, 4-position switch, where the position of the switch is determined by the logic levels applied to S_0 and S_1.

The logic equations for the outputs are:
$1Y = 1\overline{OE}(1I_0.\overline{S}_1.\overline{S}_0+1I_1.\overline{S}_1.S_0+1I_2.S_1.\overline{S}_0+1I_3.S_1.S_0)$
$2Y = 2\overline{OE}(2I_0.\overline{S}_1.\overline{S}_0+2I_1.\overline{S}_1.S_0+2I_2.S_1.\overline{S}_0+2I_3.S_1.S_0)$

APPLICATIONS

- Data selectors
- Data multiplexers

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	C_L = 15 pF; V_{CC} = 5 V			
	$1I_n$, $2I_n$ to nY;		17	17	ns
	S_n to nY		18	19	ns
C_I	input capacitance		3.5	3.5	pF
C_{PD}	power dissipation capacitance per multiplexer	notes 1 and 2	55	55	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, 15	$1\overline{OE}$, $2\overline{OE}$	output enable inputs (active LOW)
14, 2	S_0, S_1	common data select inputs
7, 9	1Y, 2Y	3-state multiplexer outputs
8	GND	ground (0 V)
6, 5, 4, 3	$1I_0$ to $1I_3$	data inputs from source 1
10, 11, 12, 13	$2I_0$ to $2I_3$	data inputs from source 2
16	V_{CC}	positive supply voltage

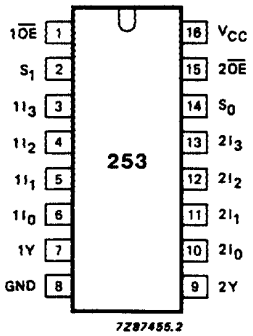


Fig.1 Pin configuration.

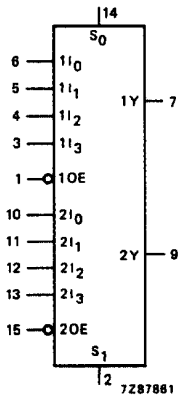


Fig.2 Logic symbol.

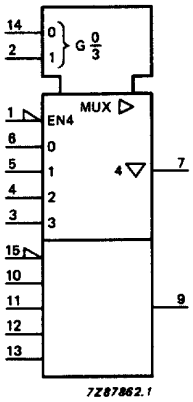


Fig.3 IEC logic symbol.

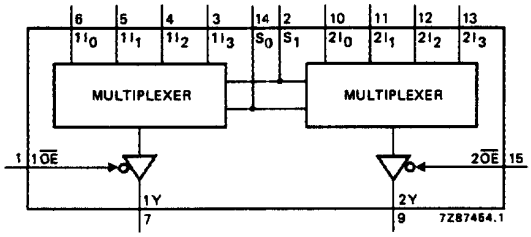


Fig.4 Functional diagram.

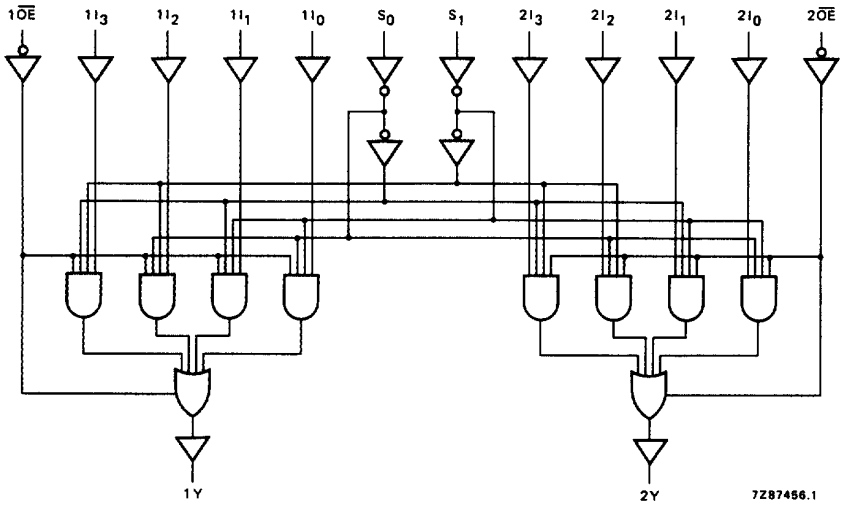


Fig.5 Logic diagram.

FUNCTION TABLE

SELECT INPUTS		DATA INPUTS				OUTPUT ENABLE	OUTPUT
S_0	S_1	nI_0	nI_1	nI_2	nI_3	$n\overline{OE}$	nY
X	X	X	X	X	X	H	Z
L	L	L	X	X	X	L	L
L	L	H	X	X	X	L	H
H	L	X	L	X	X	L	L
H	L	X	H	X	X	L	H
L	H	X	X	L	X	L	L
L	H	X	X	H	X	L	H
H	H	X	X	X	L	L	L
H	H	X	X	X	H	L	H

NOTES

1. H = HIGH voltage level
   L = LOW voltage level
   X = don't care
   Z = high impedance OFF-state

DC CHARACTERISTICS FOR 74HC

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

Output capability: bus driver
I_{CC} category: MSI

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 $1I_n$ to nY; $2I_n$ to nY		55 20 16	175 35 30		220 44 37		265 53 45	ns	2.0 4.5 6.0	Fig.6
t_{PHL}/ t_{PLH}	propagation delay S_n to nY		58 21 17	175 35 30		220 44 37		265 53 45	ns	2.0 4.5 6.0	Fig.6
t_{PZH}/ t_{PZL}	3-state output enable time $n\overline{OE}$ to nY		30 11 9	100 20 17		125 25 21		150 30 26	ns	2.0 4.5 6.0	Fig.7
t_{PHZ}/ t_{PLZ}	3-state output disable time $n\overline{OE}$ to nY		41 15 12	150 30 26		190 38 33		225 45 38	ns	2.0 4.5 6.0	Fig.7
t_{THL}/ t_{TLH}	output transition time		14 5 4	60 12 10		75 15 13		90 18 15	ns	2.0 4.5 6.0	Fig.6

DC CHARACTERISTICS FOR 74HCT

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

Output capability: bus driver
I_{CC} category: MSI

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.

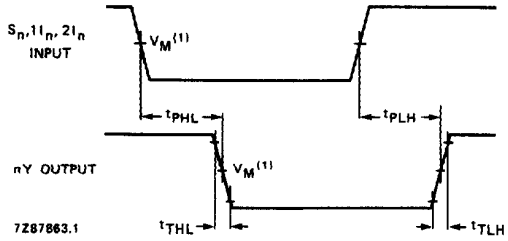
INPUT	UNIT LOAD COEFFICIENT
$1I_n$	0.40
$2I_n$	0.40
$n\overline{OE}$	1.10
S_0	1.10
S_1	1.10

AC CHARACTERISTICS FOR 74HCT

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

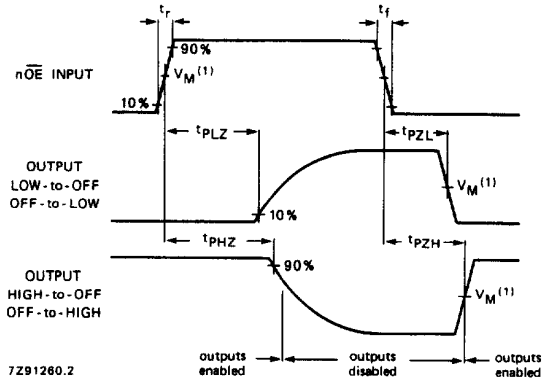
SYMBOL	PARAMETER	T_{amb} (°C)							UNIT	TEST CONDITIONS	
		74HCT								V_{CC} (V)	WAVEFORMS
		+25			–40 to +85		–40 to +125				
		min.	typ.	max.	min.	max.	min.	max.			
t_{PHL}/ t_{PLH}	propagation delay $1I_n$ to nY; $2I_n$ to nY		20	38		48		57	ns	4.5	Fig.6
t_{PHL}/ t_{PLH}	propagation delay S_n to nY		22	40		50		60	ns	4.5	Fig.6
t_{PZH}/ t_{PZL}	3-state output enable time $n\overline{OE}$ to nY		14	30		38		45	ns	4.5	Fig.7
t_{PHZ}/ t_{PLZ}	3-state output disable time $n\overline{OE}$ to nY		13	30		38		45	ns	4.5	Fig.7
t_{THL}/ t_{TLH}	output transition time		5	12		15		18	ns	4.5	Fig.6

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.6 Waveforms showing the input ($1I_n$, $2I_n$) to output (1Y, 2Y) propagation delays and the output transition times.



(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 3-state enable and disable times.

PACKAGE OUTLINES

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