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Kind regards,

Team Nexperia

# 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/HCT42
## BCD to decimal decoder (1-of-10)

Product specification
File under Integrated Circuits, IC06

December 1990

Philips Semiconductors

PHILIPS

# BCD to decimal decoder (1-of-10) 74HC/HCT42

## FEATURES

- Mutually exclusive outputs
- 1-of-8 demultiplexing capability
- Outputs disabled for input codes above nine
- Output capability: standard
- $I_{CC}$ category: MSI

## GENERAL DESCRIPTION

The 74HC/HCT42 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/HCT42 decoders accept four active HIGH BCD inputs and provide 10 mutually exclusive active LOW outputs. The active LOW outputs facilitate addressing other MSI circuits with active LOW input enables.

The logic design of the “42” ensures that all outputs are HIGH when binary codes greater than nine are applied to the inputs.

The most significant input ($A_3$) produces an useful inhibit function when the “42” is used as a 1-of-8 decoder. The $A_3$ input can also be used as the data input in an 8-output demultiplexer application.

## 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 $A_n$ to $\overline{Y}_n$ | $C_L$ = 15 pF; $V_{CC}$ = 5 V | 14 | 17 | ns |
| $C_I$ | input capacitance | | 3.5 | 3.5 | pF |
| $C_{PD}$ | power dissipation capacitance per package | notes 1 and 2 | 37 | 37 | 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, 2, 3, 4, 5, 6, 7, 9, 10, 11 | $\overline{Y}_0$ to $\overline{Y}_9$ | multiplexer outputs |
| 8 | GND | ground (0 V) |
| 15, 14, 13, 12 | $A_0$ to $A_3$ | data inputs |
| 16 | $V_{CC}$ | positive supply voltage |

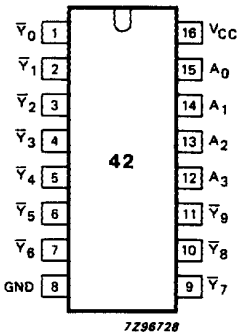



Fig.1 Pin configuration.

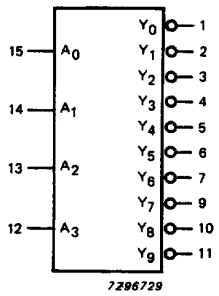



Fig.2 Logic symbol.

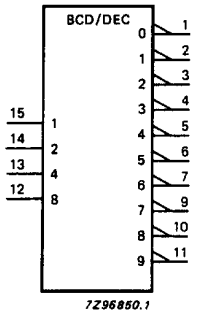



Fig.3 IEC logic symbol.

# BCD to decimal decoder (1-of-10) 74HC/HCT42

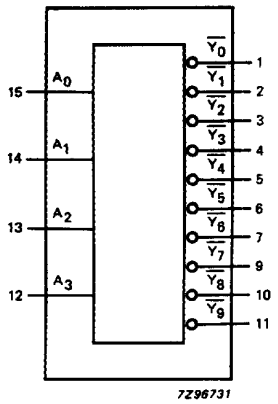



Fig.4 Functional diagram.

**FUNCTION TABLE**

| INPUTS | | | | OUTPUTS | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $A_3$ | $A_2$ | $A_1$ | $A_0$ | $\overline{Y}_0$ | $\overline{Y}_1$ | $\overline{Y}_2$ | $\overline{Y}_3$ | $\overline{Y}_4$ | $\overline{Y}_5$ | $\overline{Y}_6$ | $\overline{Y}_7$ | $\overline{Y}_8$ | $\overline{Y}_9$ |
| L | L | L | L | L | H | H | H | H | H | H | H | H | H |
| L | L | L | H | H | L | H | H | H | H | H | H | H | H |
| L | L | H | L | H | H | L | H | H | H | H | H | H | H |
| L | L | H | H | H | H | H | L | H | H | H | H | H | H |
| L | H | L | L | H | H | H | H | L | H | H | H | H | H |
| L | H | L | H | H | H | H | H | H | L | H | H | H | H |
| L | H | H | L | H | H | H | H | H | H | L | H | H | H |
| L | H | H | H | H | H | H | H | H | H | H | L | H | H |
| H | L | L | L | H | H | H | H | H | H | H | H | L | H |
| H | L | L | H | H | H | H | H | H | H | H | H | H | L |
| H | L | H | L | H | H | H | H | H | H | H | H | H | H |
| H | L | H | H | H | H | H | H | H | H | H | H | H | H |
| H | H | L | L | H | H | H | H | H | H | H | H | H | H |
| H | H | L | H | H | H | H | H | H | H | H | H | H | H |
| H | H | H | L | H | H | H | H | H | H | H | H | H | H |
| H | H | H | H | H | H | H | H | H | H | H | H | H | H |

**Note**

1. H = HIGH voltage level
   L = LOW voltage level

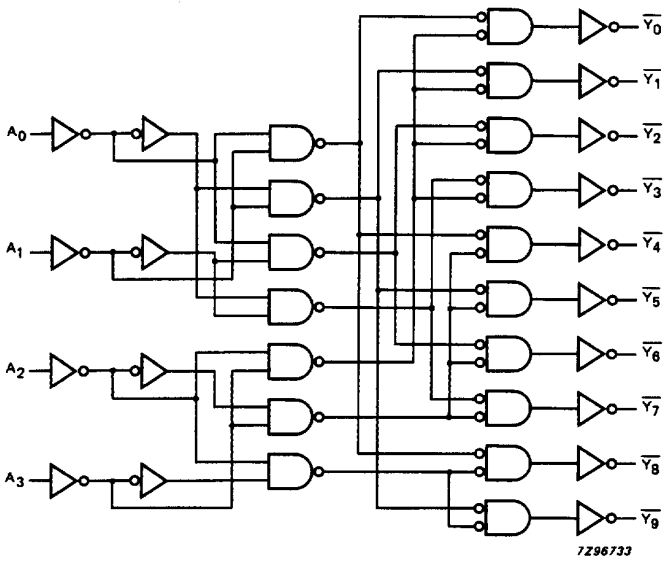



Fig.5 Logic diagram.

### DC CHARACTERISTICS FOR 74HC

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

Output capability: standard
$I_{CC}$ 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 $A_n$ to $\overline{Y}_n$ | | 47<br>17<br>14 | 150<br>30<br>26 | | 190<br>38<br>33 | | 225<br>45<br>38 | ns | 2.0<br>4.5<br>6.0 | Fig.6 |
| $t_{THL}/ t_{TLH}$ | output transition time | | 19<br>7<br>6 | 75<br>15<br>13 | | 95<br>19<br>16 | | 110<br>22<br>19 | ns | 2.0<br>4.5<br>6.0 | Fig.6 |

### DC CHARACTERISTICS FOR 74HCT

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

Output capability: standard
$I_{CC}$ category: MSI

#### Note to HCT types

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

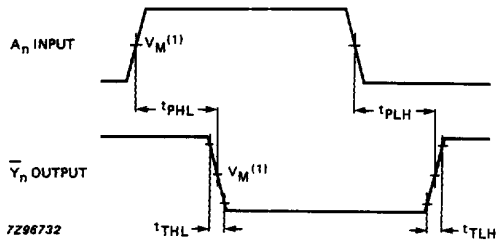
| INPUT | UNIT LOAD COEFFICIENT |
|---|---|
| $A_n$ | 1.0 |

### 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 $A_n$ to $\overline{Y}_n$ | | 20 | 35 | | 44 | | 53 | ns | 4.5 | Fig.6 |
| $t_{THL}/ t_{TLH}$ | output transition time | | 7 | 15 | | 19 | | 22 | 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 ($A_n$) to output ($\overline{Y}_n$) propagation delays and the output transition times.

## PACKAGE OUTLINES

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