

# 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/HCT688** 8-bit magnitude comparator

Product specification  
File under Integrated Circuits, IC06

December 1990

## 8-bit magnitude comparator

## 74HC/HCT688

## FEATURES

- Compare two 8-bit words
- Output capability: standard
- $I_{CC}$  category: MSI

## GENERAL DESCRIPTION

The 74HC/HCT688 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/HCT688 are 8-bit magnitude comparators. They perform comparison of two 8-bit binary or BCD words.

The output provides  $\overline{P} = \overline{Q}$ .

## QUICK REFERENCE DATA

GND = 0 V;  $T_{amb} = 25\text{ }^{\circ}\text{C}$ ;  $t_r = t_f = 6\text{ ns}$

| SYMBOL            | PARAMETER                                   | CONDITIONS                                   | TYPICAL |     | UNIT |
|-------------------|---------------------------------------------|----------------------------------------------|---------|-----|------|
|                   |                                             |                                              | HC      | HCT |      |
| $t_{PHL}/t_{PLH}$ | propagation delay                           | $C_L = 15\text{ pF}$ ; $V_{CC} = 5\text{ V}$ |         |     |      |
|                   | $P_n, Q_n$ to $\overline{P} = \overline{Q}$ |                                              | 17      | 17  | ns   |
|                   | E to $\overline{P} = \overline{Q}$          |                                              | 8       | 12  | ns   |
| $C_I$             | input capacitance                           |                                              | 3.5     | 3.5 | pF   |
| $C_{PD}$          | power dissipation capacitance per package   | notes 1 and 2                                | 30      | 30  | pF   |

## Notes

1.  $C_{PD}$  is used to determine the dynamic power dissipation ( $P_D$  in  $\mu\text{W}$ ):

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

$f_i$  = 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  $V_i = \text{GND to } V_{CC}$   
For HCT the condition is  $V_i = \text{GND to } V_{CC} - 1.5\text{ V}$

## ORDERING INFORMATION

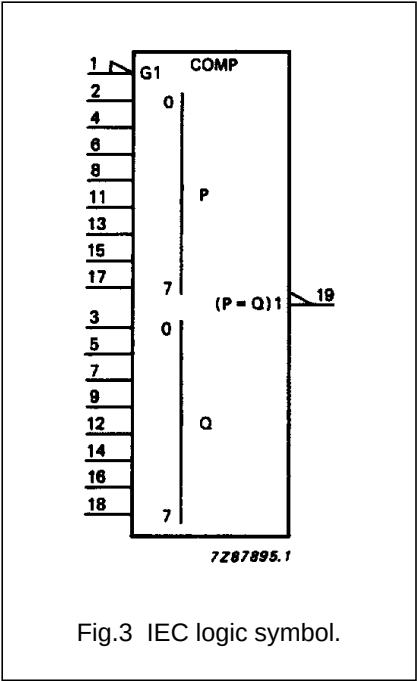
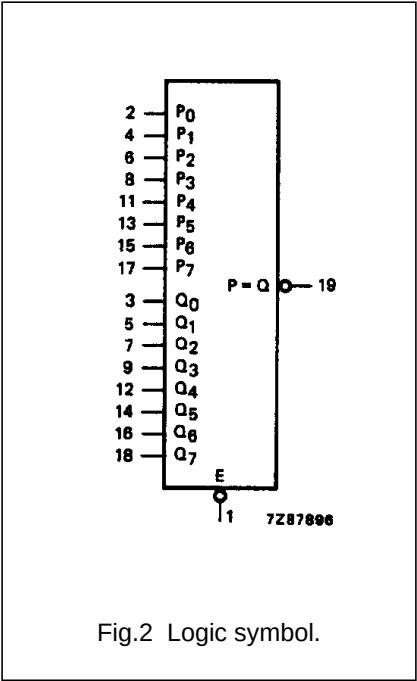
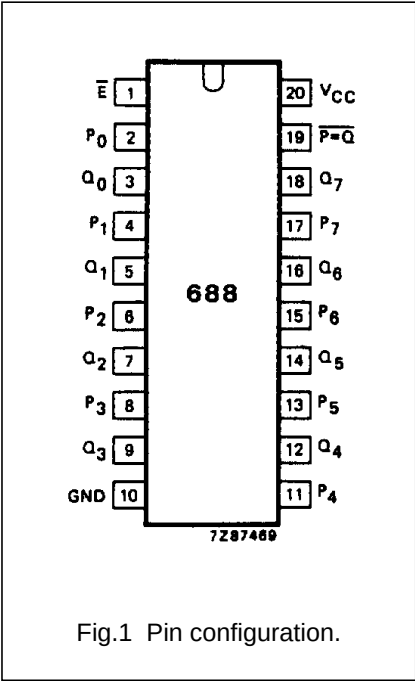
See *"74HC/HCT/HCU/HCMOS Logic Package Information"*.

8-bit magnitude comparator

74HC/HCT688

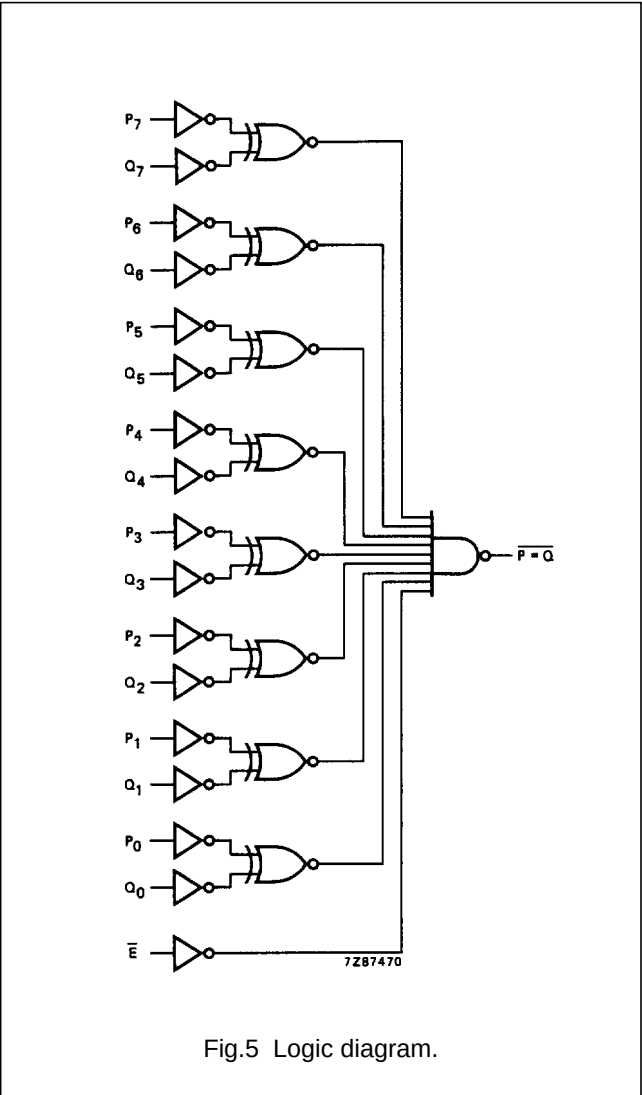
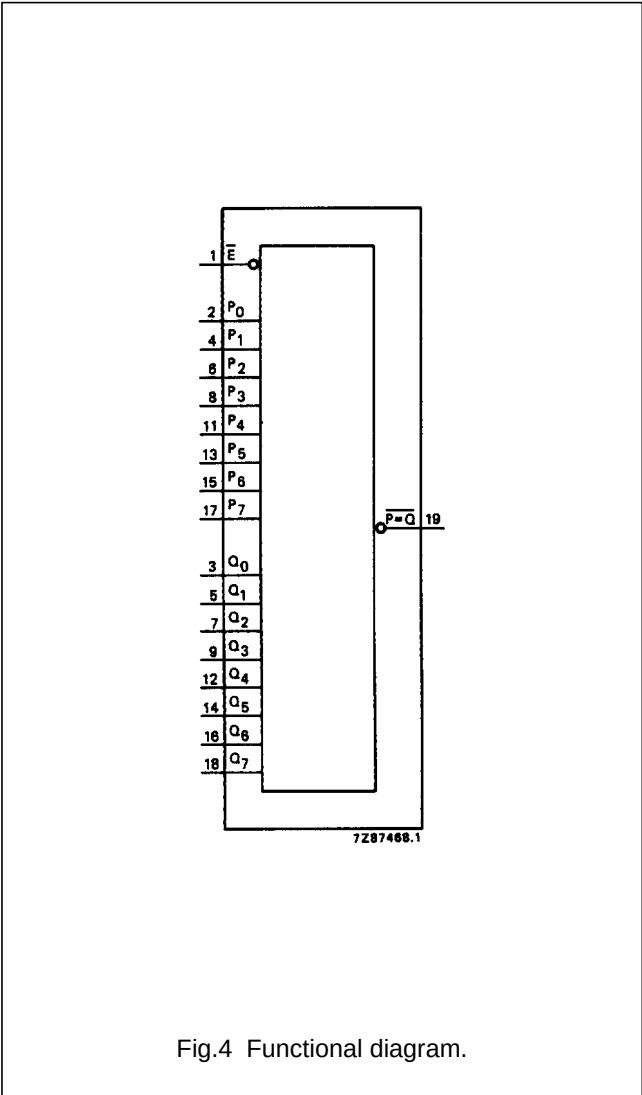
PIN DESCRIPTION

| PIN NO.                    | SYMBOL             | NAME AND FUNCTION         |
|----------------------------|--------------------|---------------------------|
| 1                          | $\overline{E}$     | enable input (active LOW) |
| 2, 4, 6, 8, 11, 13, 15, 17 | $P_0$ to $P_7$     | word inputs               |
| 3, 5, 7, 9, 12, 14, 16, 18 | $Q_0$ to $Q_7$     | word inputs               |
| 10                         | GND                | ground (0 V)              |
| 19                         | $\overline{P = Q}$ | equal to output           |
| 20                         | $V_{CC}$           | positive supply voltage   |



8-bit magnitude comparator

74HC/HCT688



FUNCTION TABLE

| INPUTS          |                  | OUTPUT           |
|-----------------|------------------|------------------|
| DATA $P_n, Q_n$ | ENABLE $\bar{E}$ | $\overline{P=Q}$ |
| $P = Q$         | L                | L                |
| X               | H                | H                |
| $P > Q$         | L                | H                |
| $P < Q$         | L                | H                |

Notes

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

## 8-bit magnitude comparator

## 74HC/HCT688

**DC CHARACTERISTICS FOR 74HC**

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

Output capability: standard

I<sub>CC</sub> category: MSI

**AC CHARACTERISTICS FOR 74HC**

GND = 0 V; t<sub>r</sub> = t<sub>f</sub> = 6 ns; C<sub>L</sub> = 50 pF

| SYMBOL                              | PARAMETER                                                      | T <sub>amb</sub> (°C) |                |                 |            |                 |             |                 | UNIT | TEST CONDITIONS        |              |
|-------------------------------------|----------------------------------------------------------------|-----------------------|----------------|-----------------|------------|-----------------|-------------|-----------------|------|------------------------|--------------|
|                                     |                                                                | 74HC                  |                |                 |            |                 |             |                 |      | V <sub>CC</sub><br>(V) | WAVEFORMS    |
|                                     |                                                                | +25                   |                |                 | −40 to +85 |                 | −40 to +125 |                 |      |                        |              |
|                                     |                                                                | min.                  | typ.           | max.            | min.       | max.            | min.        | max.            |      |                        |              |
| t <sub>PHL</sub> / t <sub>PLH</sub> | propagation delay<br>P <sub>n</sub> , Q <sub>n</sub> to P = Q̄ |                       | 55<br>20<br>16 | 170<br>34<br>29 |            | 215<br>43<br>37 |             | 255<br>51<br>43 | ns   | 2.0<br>4.5<br>6.0      | Fig.6        |
| t <sub>PHL</sub> / t <sub>PLH</sub> | propagation delay<br>Ē to P = Q                               |                       | 28<br>10<br>8  | 120<br>24<br>20 |            | 150<br>30<br>26 |             | 180<br>36<br>31 | ns   | 2.0<br>4.5<br>6.0      | Fig.7        |
| t <sub>THL</sub> / t <sub>TLH</sub> | 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      | Figs 6 and 7 |

## 8-bit magnitude comparator

## 74HC/HCT688

**DC CHARACTERISTICS FOR 74HCT**

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

Output capability: standard

I<sub>CC</sub> 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 |
|----------------|-----------------------|
| P <sub>n</sub> | 0.35                  |
| Q <sub>n</sub> | 0.35                  |
| $\bar{E}$      | 0.70                  |

**AC CHARACTERISTICS FOR 74HCT**

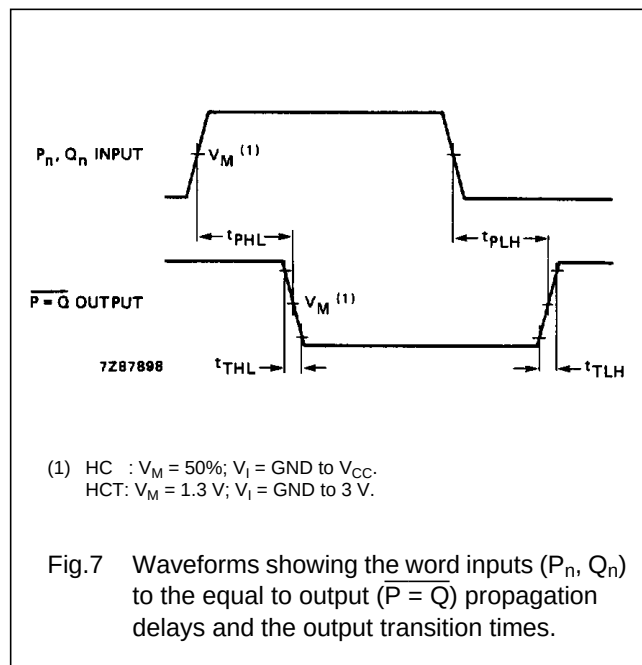
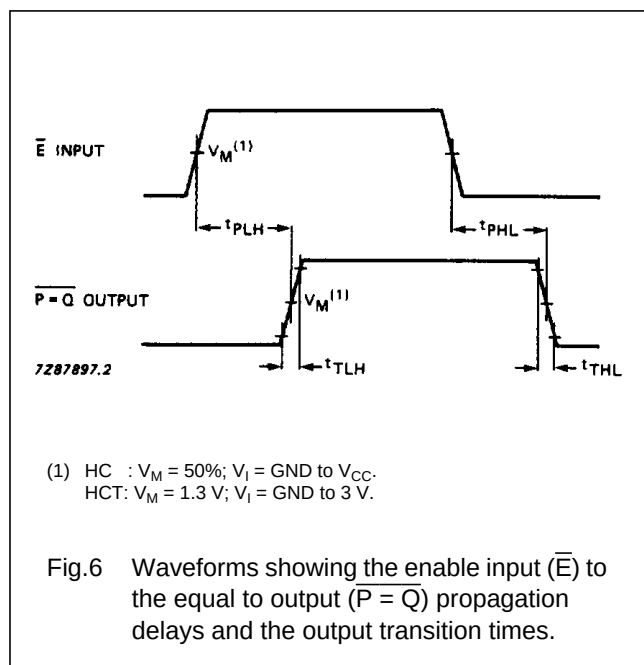
GND = 0 V; t<sub>r</sub> = t<sub>f</sub> = 6 ns; C<sub>L</sub> = 50 pF

| SYMBOL                              | PARAMETER                                                     | T <sub>amb</sub> (°C) |      |      |            |      |             |      | UNIT | TEST CONDITIONS        |              |
|-------------------------------------|---------------------------------------------------------------|-----------------------|------|------|------------|------|-------------|------|------|------------------------|--------------|
|                                     |                                                               | 74HCT                 |      |      |            |      |             |      |      | V <sub>CC</sub><br>(V) | WAVEFORMS    |
|                                     |                                                               | +25                   |      |      | −40 to +85 |      | −40 to +125 |      |      |                        |              |
|                                     |                                                               | min.                  | typ. | max. | min.       | max. | min.        | max. |      |                        |              |
| t <sub>PHL</sub> / t <sub>PLH</sub> | propagation delay<br>P <sub>n</sub> , Q <sub>n</sub> to P = Q |                       | 20   | 34   |            | 43   |             | 51   | ns   | 4.5                    | Fig.6        |
| t <sub>PHL</sub> / t <sub>PLH</sub> | propagation delay<br>E̅ to P = Q                              |                       | 18   | 24   |            | 30   |             | 36   | ns   | 4.5                    | Fig.7        |
| t <sub>THL</sub> / t <sub>TLH</sub> | output transition time                                        |                       | 7    | 15   |            | 19   |             | 22   | ns   | 4.5                    | Figs 6 and 7 |

## 8-bit magnitude comparator

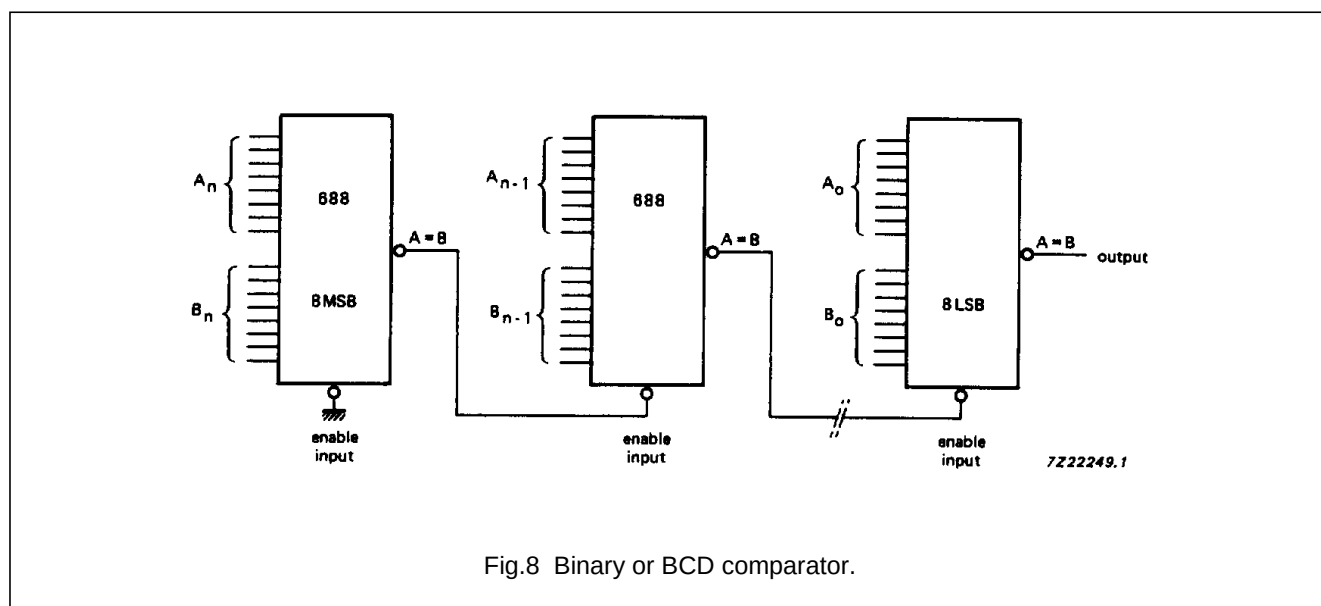
74HC/HCT688

## AC WAVEFORMS



## APPLICATION INFORMATION

Two or more "688" 8-bit magnitude comparators may be cascaded to compare binary or BCD numbers of more than 8 bits. An example is shown in Fig.8.



## PACKAGE OUTLINES

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

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