

## TRIPLE 3-INPUT NAND GATE

## FEATURES

- Output capability: standard
- I<sub>CC</sub> category: SSI

## GENERAL DESCRIPTION

The 74HC/HCT10 are high-speed Si-gate CMOS devices and are pin compatible with low power Schottky TTL (LS TTL). They are specified in compliance with JEDEC standard no. 7A.

The 74HC/HCT10 provide the 3-input NAND function.

| SYMBOL            | PARAMETER                                 | CONDITIONS                                      | TYPICAL |     | UNIT |
|-------------------|-------------------------------------------|-------------------------------------------------|---------|-----|------|
|                   |                                           |                                                 | HC      | HCT |      |
| $t_{PHL}/t_{PLH}$ | propagation delay<br>nA, nB, nC to nY     | $C_L = 15 \text{ pF}$<br>$V_{CC} = 5 \text{ V}$ | 9       | 11  | ns   |
| $C_i$             | input capacitance                         |                                                 | 3.5     | 3.5 | pF   |
| $C_{PD}$          | power dissipation<br>capacitance per gate | notes 1 and 2                                   | 12      | 14  | pF   |

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

## Notes

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

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

$f_i$  = input frequency in MHz       $C_L$  = output load capacitance in pF  
 $f_o$  = output frequency in MHz       $V_{CC}$  = supply voltage in V  
 $\sum (C_L \times V_{CC}^2 \times f_o)$  = sum of outputs

2. For HC the condition is  $V_I = \text{GND to } V_{CC}$   
 For HCT the condition is  $V_I = \text{GND to } V_{CC} - 1.5 \text{ V}$

## PACKAGE OUTLINES

14-lead DIL; plastic (SOT27)

14-lead mini pack; plastic (SO14; SOT108A)

## PIN DESCRIPTION

| PIN NO.   | SYMBOL   | NAME AND FUNCTION       |
|-----------|----------|-------------------------|
| 1, 3, 9   | 1A to 3A | data inputs             |
| 2, 4, 10  | 1B to 3B | data inputs             |
| 13, 5, 11 | 1C to 3C | data inputs             |
| 12, 6, 8  | 1Y to 3Y | data outputs            |
| 7         | GND      | ground (0 V)            |
| 14        | $V_{CC}$ | positive supply voltage |

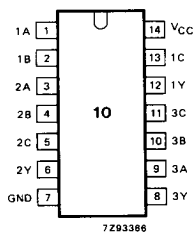


Fig. 1 Pin configuration.

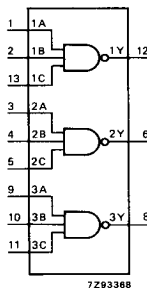


Fig. 2 Logic symbol.

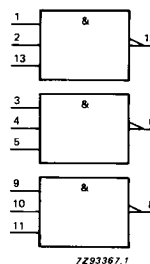


Fig. 3 IEC logic symbol.

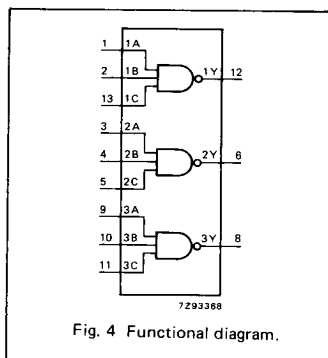


Fig. 4 Functional diagram.

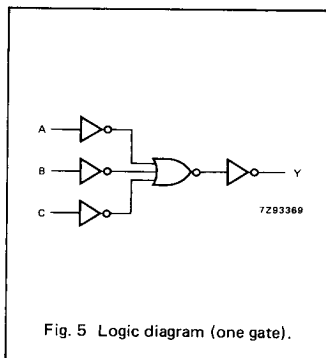


Fig. 5 Logic diagram (one gate).

FUNCTION TABLE

| INPUTS |    |    | OUTPUT |
|--------|----|----|--------|
| nA     | nB | nC | nY     |
| L      | L  | L  | H      |
| L      | L  | H  | H      |
| L      | H  | L  | H      |
| L      | H  | H  | H      |
| H      | L  | L  | H      |
| H      | L  | H  | H      |
| H      | H  | L  | H      |
| H      | H  | H  | L      |

H = HIGH voltage level  
L = LOW voltage level

### DC CHARACTERISTICS FOR 74HC

For the DC characteristics see chapter "HCMOS family characteristics", section "Family specifications".

Output 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 <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> /<br>t <sub>PLH</sub> | propagation delay<br>nA, nB, nC to nY |                       | 30<br>11<br>9 | 95<br>19<br>16 |            | 120<br>24<br>20 |             | 145<br>29<br>25 | ns   | 2.0<br>4.5<br>6.0    | Fig. 6    |
| t <sub>THL</sub> /<br>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    | Fig. 6    |

### DC CHARACTERISTICS FOR 74HCT

For the DC characteristics see chapter "HCMOS family characteristics", section "Family specifications".

Output capability: standard

$I_{CC}$  category: SSI

#### 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.

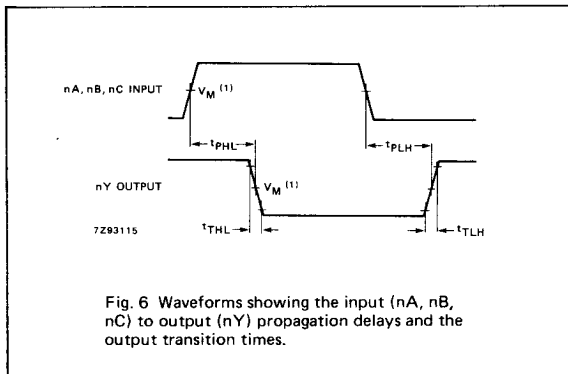
| INPUT      | UNIT LOAD COEFFICIENT |
|------------|-----------------------|
| nA, nB, nC | 1.5                   |

## AC CHARACTERISTICS FOR 74HCT

GND = 0 V;  $t_r = t_f = 6$  ns;  $C_L = 50$  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> /<br>t <sub>PLH</sub> | propagation delay<br>nA, nB, nC to nY |                       | 14   | 24   |            | 30   |             | 36   | ns   | 4.5                  | Fig. 6    |
| t <sub>THL</sub> /<br>t <sub>TLH</sub> | output transition time                |                       | 7    | 15   |            | 19   |             | 22   | ns   | 4.5                  | Fig. 6    |

## AC WAVEFORMS



## Note to AC waveforms

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