



**THE DATASHEET OF  
74HCT9115D,118**



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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/HCT9115**

**Nine wide Schmitt trigger buffer;  
open drain outputs**

Product specification  
Supersedes data of March 1988  
File under Integrated Circuits, IC06

December 1990

## Nine wide Schmitt trigger buffer; open drain outputs

## 74HC/HCT9115

### FEATURES

- Schmitt trigger action on all data inputs
- Output capability: standard (open drain)
- I<sub>CC</sub> category: MSI

### GENERAL DESCRIPTION

The 74HC/HCT9115 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/HCT9115 are nine wide Schmitt trigger buffer with open drain outputs and Schmitt trigger inputs.

The Schmitt trigger action in the data inputs transform slowly changing input signals into sharply defined jitter-free output signals.

The 74HC/HCT9115 have open-drain N-transistor outputs, which are not clamped by a diode connected to V<sub>CC</sub>. In the OFF-state, i.e. when one input is HIGH, the output may be pulled to any voltage between GND and V<sub>Omax</sub>. This allows the device to be used as a LOW-to-HIGH or HIGH-to-LOW level shifter. For digital operation and OR-tied output applications, these devices must have a pull-up resistor to establish a logic HIGH level.

The "9115" is identical to the "9114" but has non-inverting outputs.

### QUICK REFERENCE DATA

GND = 0 V; T<sub>amb</sub> = 25 °C; t<sub>r</sub> = t<sub>f</sub> = 6 ns

| SYMBOL                              | PARAMETER  | CONDITIONS                                    | TYPICAL |     | UNIT |
|-------------------------------------|--|---|---------|-----|------|
|                                     |  |   | HC      | HCT |      |
| t <sub>PHL</sub> / t <sub>PLZ</sub> | propagation delay A <sub>n</sub> to Y <sub>n</sub> | C <sub>L</sub> = 15 pF; V <sub>CC</sub> = 5 V | 12      | 13  | ns   |
| C <sub>I</sub>                      | input capacitance                                  |   | 3.5     | 3.5 | pF   |
| C <sub>PD</sub>                     | power dissipation capacitance per buffer           | notes 1 and 2                                 | 5       | 5   | pF   |

### Notes

1. C<sub>PD</sub> is used to determine the dynamic power dissipation (P<sub>D</sub> in μW):

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

f<sub>i</sub> = input frequency in MHz

f<sub>o</sub> = output frequency in MHz

∑ (C<sub>L</sub> × V<sub>CC</sub><sup>2</sup> × f<sub>o</sub>) = sum of outputs

C<sub>L</sub> = output load capacitance in pF

V<sub>CC</sub> = supply voltage in V

2. For HC the condition is V<sub>I</sub> = GND to V<sub>CC</sub>  
For HCT the condition is V<sub>I</sub> = GND to V<sub>CC</sub> – 1.5 V

### ORDERING INFORMATION

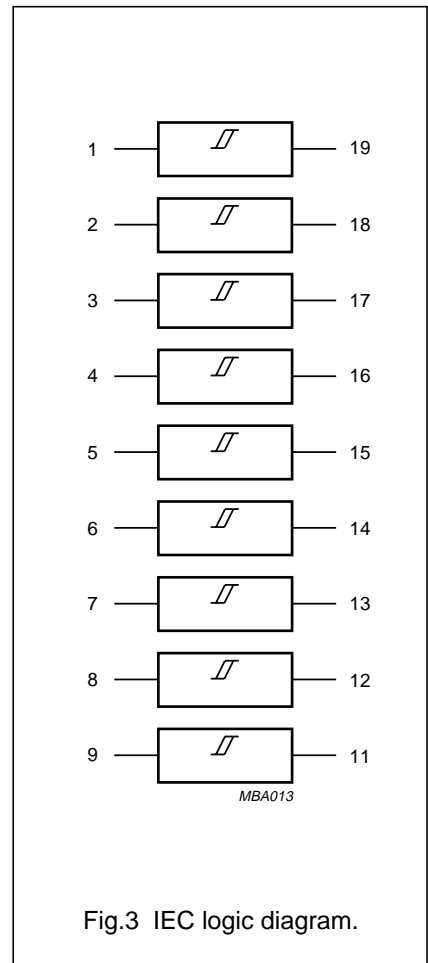
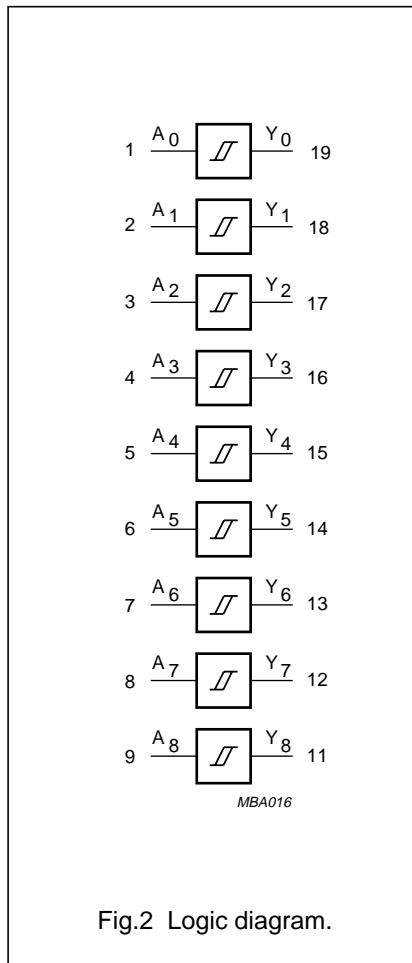
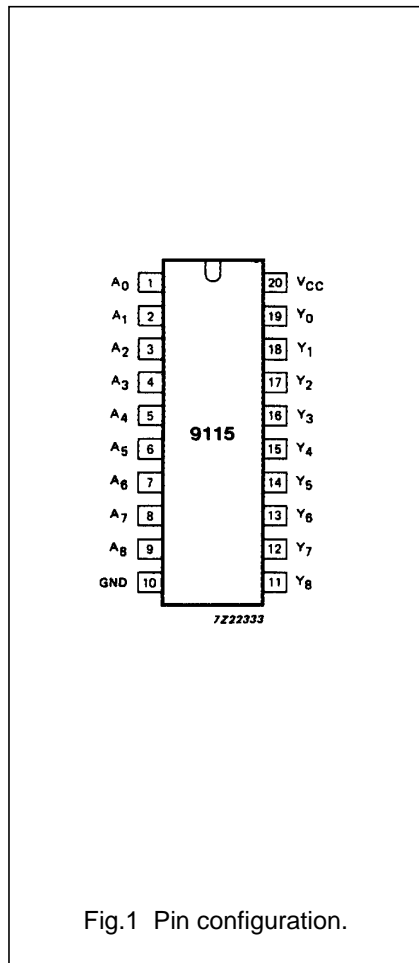
See "74HC/HCT/HCU/HCMOS Logic Package Information".

Nine wide Schmitt trigger buffer;  
open drain outputs

74HC/HCT9115

PIN DESCRIPTION

| PIN NO.                            | SYMBOL                           | NAME AND FUNCTION       |
|------------------------------------|----------------------------------|-------------------------|
| 1, 2, 3, 4, 5, 6, 7, 8, 9          | A <sub>0</sub> to A <sub>8</sub> | data inputs             |
| 10                                 | GND                              | ground (0 V)            |
| 19, 18, 17, 16, 15, 14, 13, 12, 11 | Y <sub>0</sub> to Y <sub>8</sub> | data outputs            |
| 20                                 | V <sub>CC</sub>                  | positive supply voltage |



Nine wide Schmitt trigger buffer;  
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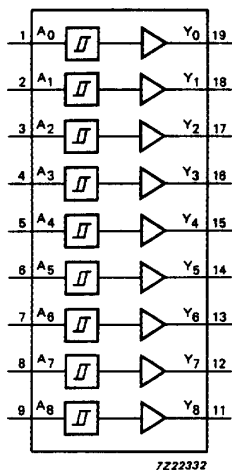


Fig.4 Functional diagram.

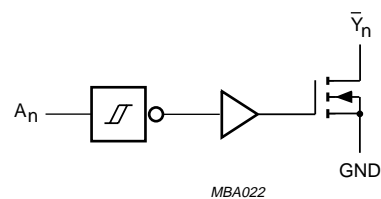


Fig.5 Logic diagram (one Schmitt trigger).

FUNCTION TABLE

| INPUTS | OUTPUTS |
|--------|---------|
| $A_n$  | $Y_n$   |
| L      | L       |
| H      | Z       |

Notes

1. H = HIGH voltage level  
L = LOW voltage level  
Z = high impedance OFF-state

# Nine wide Schmitt trigger buffer; open drain outputs

74HC/HCT9115

## DC CHARACTERISTICS FOR 74HC

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

Transfer characteristics are given below.

Output capability: standard

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

## TRANSFER CHARACTERISTICS FOR 74HC

Voltages are referred to GND (ground = 0 V)

| 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.                 |   |                   |                        |           |
| V <sub>T+</sub> | positive-going threshold                        | 0.70<br>1.75<br>2.30  | 1.13<br>2.37<br>3.11 | 1.50<br>3.15<br>4.20 | 0.70<br>1.75<br>2.30 | 1.50<br>3.15<br>4.20 | 0.70<br>1.75<br>2.30 | 1.50<br>3.15<br>4.20 | V | 2.0<br>4.5<br>6.0 | Fig.6                  |           |
| V <sub>T-</sub> | negative-going threshold                        | 0.30<br>1.35<br>1.80  | 0.70<br>1.80<br>2.43 | 1.10<br>2.40<br>3.30 | 0.30<br>1.35<br>1.80 | 1.10<br>2.40<br>3.30 | 0.30<br>1.35<br>1.80 | 1.10<br>2.40<br>3.30 | V | 2.0<br>4.5<br>6.0 | Fig.6                  |           |
| V <sub>H</sub>  | hysteresis (V <sub>T+</sub> - V <sub>T-</sub> ) | 0.2<br>0.4<br>0.5     | 0.43<br>0.57<br>0.68 | 0.80<br>1.00<br>1.10 | 0.18<br>0.40<br>0.50 | 0.80<br>1.00<br>1.10 | 0.15<br>0.40<br>0.50 | 0.80<br>1.00<br>1.10 | V | 2.0<br>4.5<br>6.0 | Fig.6                  |           |

## 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>PLZ</sub> | propagation delay<br>A <sub>n</sub> to Y <sub>n</sub> |                       | 36<br>13<br>10 | 115<br>22<br>19 |            | 140<br>28<br>24 |             | 165<br>33<br>28 | ns | 2.0<br>4.5<br>6.0 | Fig.7                  |           |
| t <sub>THL</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.7                  |           |

# Nine wide Schmitt trigger buffer; open drain outputs

74HC/HCT9115

## DC CHARACTERISTICS FOR 74HCT

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

Transfer characteristics are given below.

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 |
|----------------|-----------------------|
| A <sub>n</sub> | 0.3                   |

## TRANSFER CHARACTERISTICS FOR 74HCT

Voltages are referred to GND (ground = 0 V)

| 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.       |   |            |                        |           |
| V <sub>T+</sub> | positive-going threshold                        | 0.9<br>1.2            | 1.50<br>1.70 | 2.0<br>2.1 | 0.9<br>1.2 | 2.0<br>2.1 | 0.9<br>1.2  | 2.0<br>2.1 | V | 4.5<br>5.5 | Fig.6                  |           |
| V <sub>T-</sub> | negative-going threshold                        | 0.7<br>0.8            | 1.06<br>1.27 | 1.4<br>1.7 | 0.7<br>0.8 | 1.4<br>1.7 | 0.7<br>0.8  | 1.4<br>2.7 | V | 4.5<br>5.5 | Fig.6                  |           |
| V <sub>H</sub>  | hysteresis (V <sub>T+</sub> - V <sub>T-</sub> ) | 0.2<br>0.2            | 0.44<br>0.44 | 0.8<br>0.8 | 0.2<br>0.2 | 0.8<br>0.8 | 0.2<br>0.2  | 0.8<br>0.8 | V | 4.5<br>5.5 | Fig.6                  |           |

## AC CHARACTERISTICS FOR 74HCT

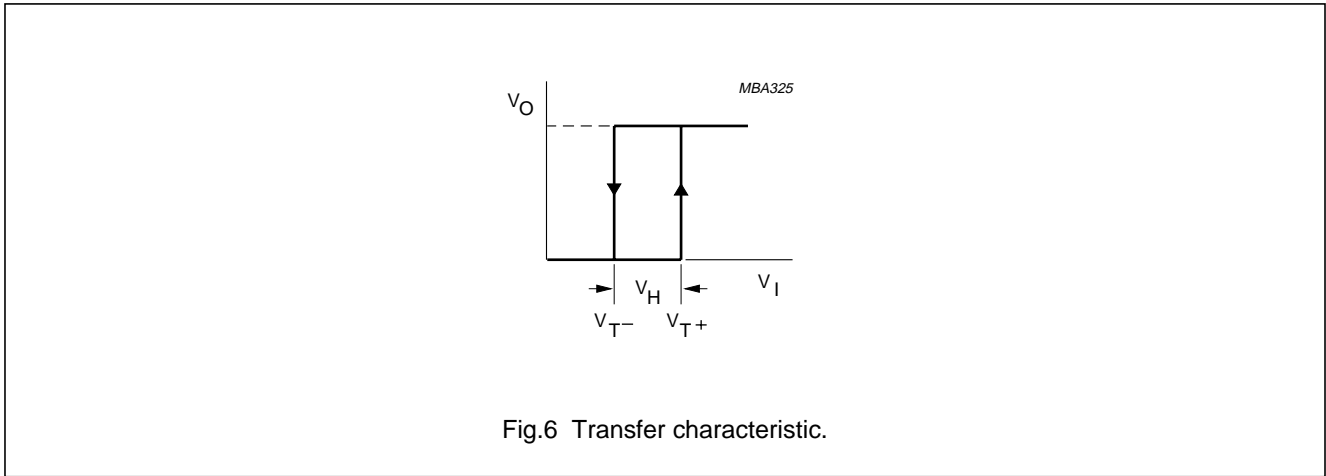
GND = 0 V; t<sub>r</sub> = t<sub>f</sub> = 6 ns; C<sub>L</sub> = 50 pF

| 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>PLZ</sub> | propagation delay<br>A <sub>n</sub> to Y <sub>n</sub> |                       | 18   | 31   |            | 39   |             | 47   | ns | 4.5  | Fig.7                  |           |
| t <sub>THL</sub>                    | output transition time                                |                       | 7    | 15   |            | 19   |             | 22   | ns | 4.5  | Fig.7                  |           |

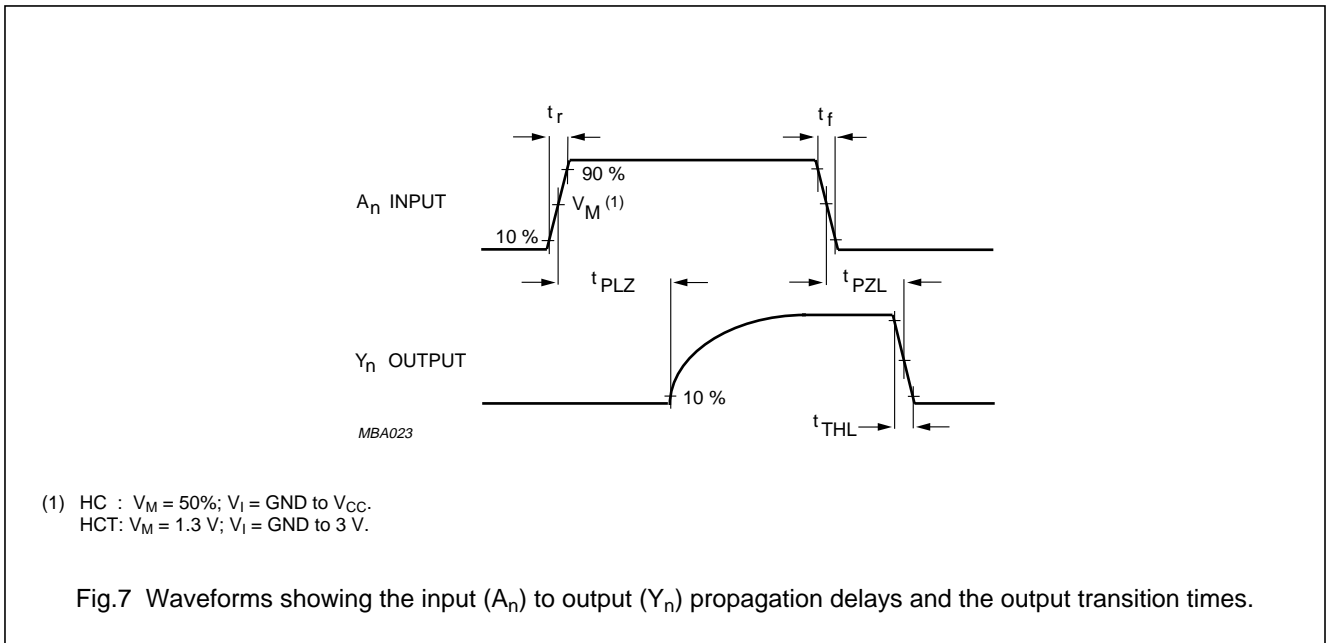
Nine wide Schmitt trigger buffer;  
open drain outputs

74HC/HCT9115

TRANSFER CHARACTERISTIC WAVEFORMS



AC WAVEFORMS





PACKAGE OUTLINES

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

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