

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

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74HC/HCT9115

FEATURES

- Schmitt trigger action on all data inputs
- Output capability: standard (open drain)
- I_{CC} 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_{CC}. In the OFF-state, i.e. when one input is HIGH, the output may be pulled to any voltage between GND and V_{Omax}. 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_{amb} = 25 °C; t_r = t_f = 6 ns

| SYMBOL | PARAMETER | CONDITIONS | TYPICAL | | UNIT |
|-------------------------------------|--|---|---------|-----|------|
| | | | HC | HCT | |
| t _{PHL} / t _{PLZ} | propagation delay A _n to Y _n | C _L = 15 pF; V _{CC} = 5 V | 12 | 13 | ns |
| C _I | input capacitance | | 3.5 | 3.5 | pF |
| C _{PD} | power dissipation capacitance per buffer | notes 1 and 2 | 5 | 5 | pF |

Notes

1. C_{PD} is used to determine the dynamic power dissipation (P_D in μW):

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

f_i = input frequency in MHz

f_o = output frequency in MHz

∑ (C_L × V_{CC}² × 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

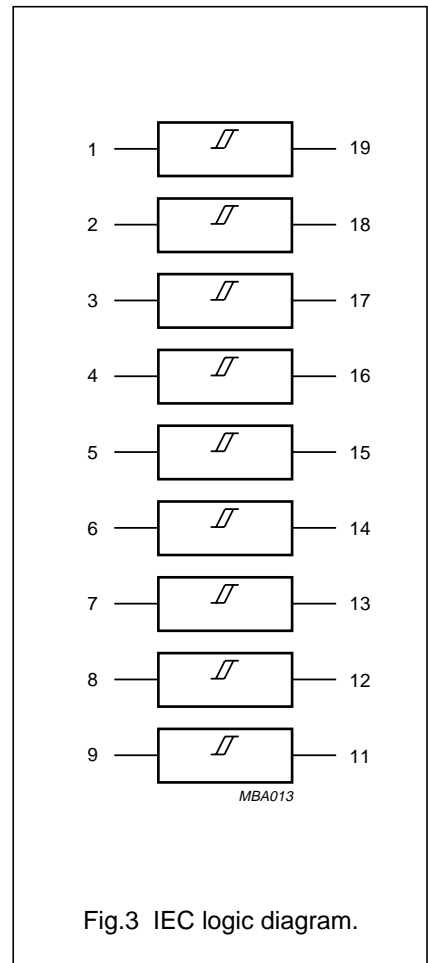
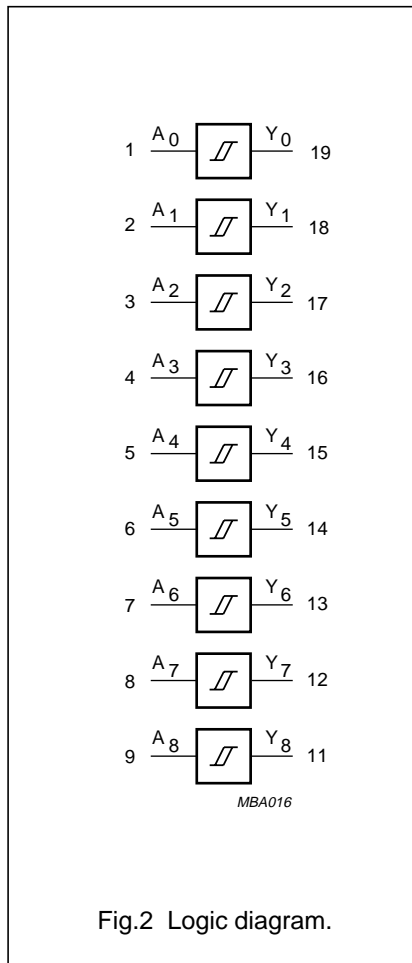
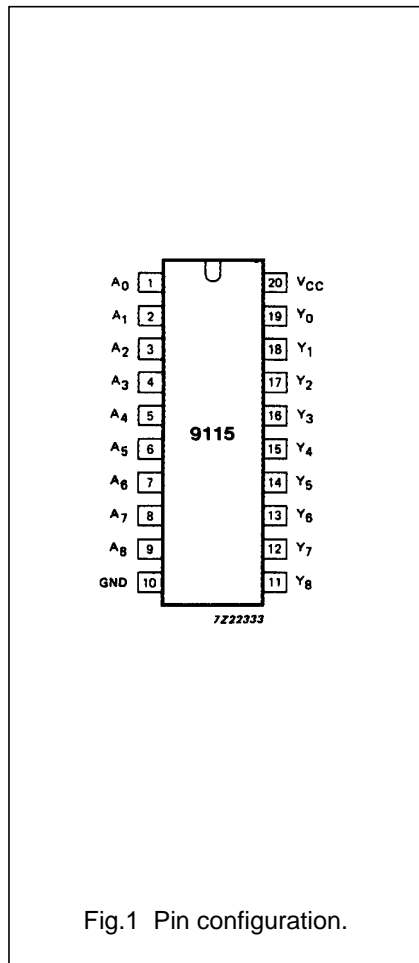
See "74HC/HCT/HCU/HCMOS Logic Package Information".

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PIN DESCRIPTION

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



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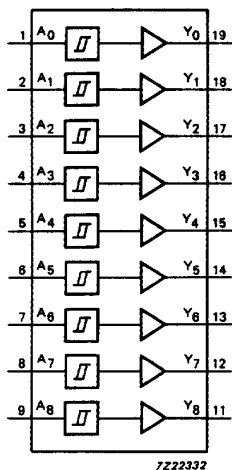


Fig.4 Functional diagram.

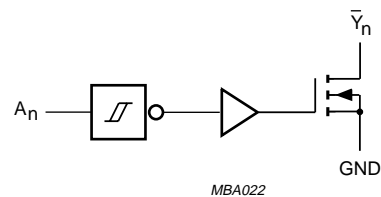


Fig.5 Logic diagram (one Schmitt trigger).

FUNCTION TABLE

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

Notes

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

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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_{CC} category: MSI

TRANSFER CHARACTERISTICS FOR 74HC

Voltages are referred to GND (ground = 0 V)

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

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 _{PLZ} | propagation delay A _n to Y _n | | 36 13 10 | 115 22 19 | | 140 28 24 | | 165 33 28 | ns | 2.0 4.5 6.0 | Fig.7 | |
| t _{THL} | output transition time | | 19 7 6 | 75 15 13 | | 95 19 16 | | 110 22 19 | ns | 2.0 4.5 6.0 | Fig.7 | |

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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_{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 |
|----------------|-----------------------|
| A _n | 0.3 |

TRANSFER CHARACTERISTICS FOR 74HCT

Voltages are referred to GND (ground = 0 V)

| 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. | | | | |
| V _{T+} | positive-going threshold | 0.9 1.2 | 1.50 1.70 | 2.0 2.1 | 0.9 1.2 | 2.0 2.1 | 0.9 1.2 | 2.0 2.1 | V | 4.5 5.5 | Fig.6 | |
| V _{T-} | negative-going threshold | 0.7 0.8 | 1.06 1.27 | 1.4 1.7 | 0.7 0.8 | 1.4 1.7 | 0.7 0.8 | 1.4 2.7 | V | 4.5 5.5 | Fig.6 | |
| V _H | hysteresis (V _{T+} - V _{T-}) | 0.2 0.2 | 0.44 0.44 | 0.8 0.8 | 0.2 0.2 | 0.8 0.8 | 0.2 0.2 | 0.8 0.8 | V | 4.5 5.5 | Fig.6 | |

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 _{PLZ} | propagation delay A _n to Y _n | | 18 | 31 | | 39 | | 47 | ns | 4.5 | Fig.7 | |
| t _{THL} | output transition time | | 7 | 15 | | 19 | | 22 | ns | 4.5 | Fig.7 | |

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TRANSFER CHARACTERISTIC WAVEFORMS

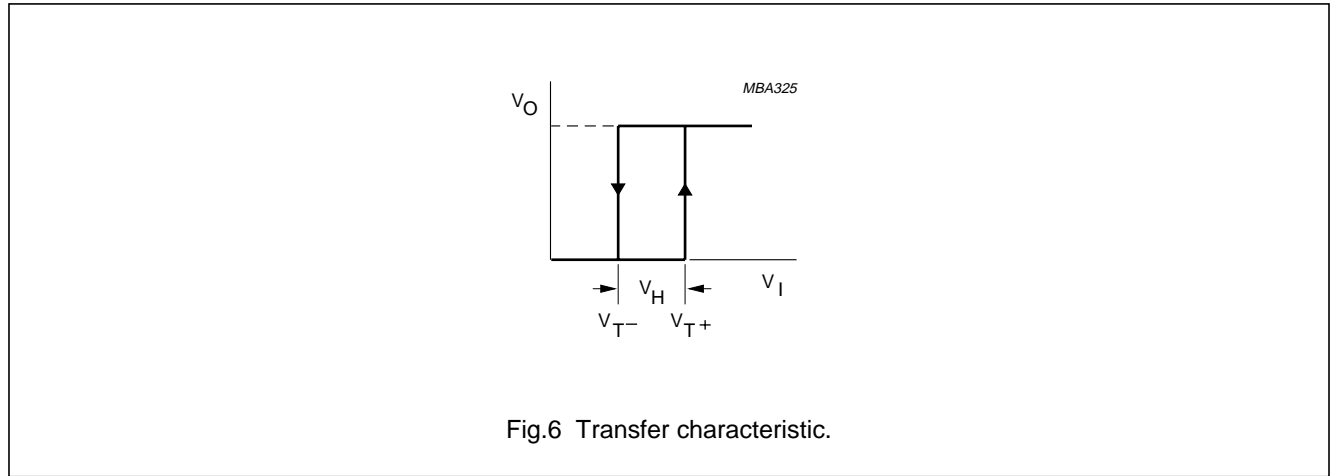


Fig.6 Transfer characteristic.

AC WAVEFORMS

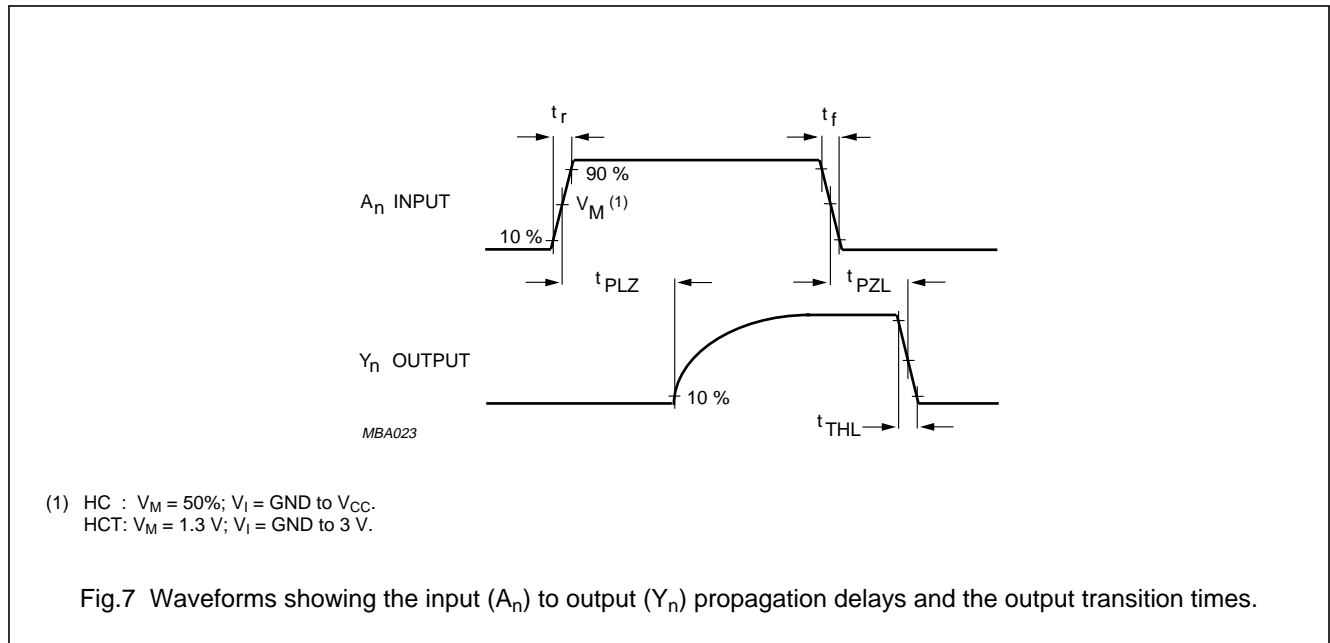


Fig.7 Waveforms showing the input (A_n) to output (Y_n) propagation delays and the output transition times.

PACKAGE OUTLINES

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