SUPERSEDES DATA OF MARCH 1988
NINE WIDE SCHMITT TRIGGER BUFFER/LINE DRIVER

FEATURES

- **Schmitt trigger action on all data inputs**
- **Output capability: standard**
- **I_{CC} category: MSI**

GENERAL DESCRIPTION

The 74HC/HCT9015 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/HCT9015 are nine wide Schmitt trigger buffer/line drivers with Schmitt trigger inputs. These inputs transform slowly changing input signals into sharply defined jitter-free output signals.

The "9015" is identical to the "9014" but has non-inverting inputs.

SYMBOL	PARAMETER	CONDITIONS	TYPICAL		UNIT
			HC	HCT	
$t_{PHL}/$ t_{PLH}	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	30	32	pF

GND = 0 V; T_{amb} = 25 °C; t_r = t_f = 6 ns

Notes

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

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

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

PACKAGE OUTLINES
20-lead DIL; plastic (SOT146).
20-lead mini-pack; plastic (SO20; SOT163A).

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

Fig.1 Pin configuration.

Fig.2 Logic symbol.

Fig.3 IEC logic symbol.
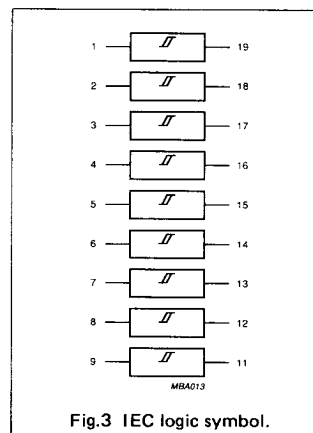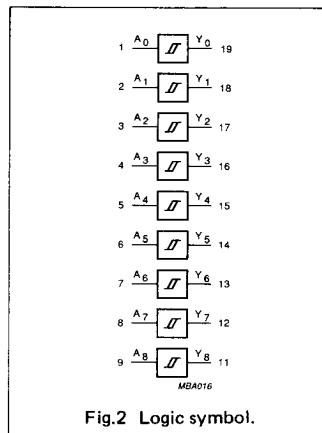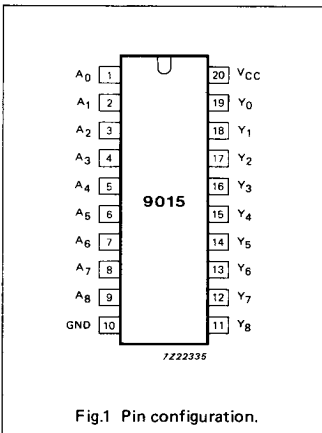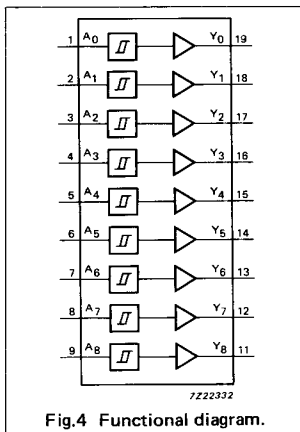
Fig.4 Functional diagram.

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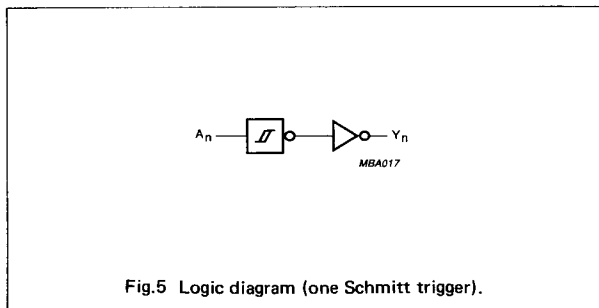
Fig.5 Logic diagram (one Schmitt trigger).

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FUNCTION TABLE

INPUTS	OUTPUTS
A_n	Y_n
L H	L H

H = HIGH voltage level
L = LOW voltage level

DC CHARACTERISTICS FOR 74HC

For the DC characteristics see chapter "HCMOS family characteristics", section "Family specifications".
Transfer characteristics are given below.

Output capability: standard
I_{CC} category: MSI

TRANSFER CHARACTERISTICS FOR 74HC

Voltages are refered to GND (ground = 0 V)

SYMBOL	PARAMETER	T_{amb} (°C) 74HC							UNIT	TEST CONDITIONS	
		+25			−40 to +85		−40 to +125			V_{CC} V	WAVEFORMS
		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	Figs 6 and 7
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	Figs 6 and 7
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) 74HC							UNIT	TEST CONDITIONS	
		+25			−40 to +85		−40 to +125			V_{CC} V	WAVEFORMS
		min.	typ.	max.	min.	max.	min.	max			
$t_{PHL}/$ t_{PLH}	propagation delay A_n to Y_n		33 12 10	105 21 18		130 26 22		160 32 27	ns	2.0 4.5 6.0	Fig.8
$t_{THL}/$ t_{TLH}	output transition time		19 7 6	75 15 13		95 19 16		110 22 19	ns	2.0 4.5 6.0	Fig.8

DC CHARACTERISTICS FOR 74HCT

For the DC characteristics see chapter "HCMOS family characteristics", section "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 refered to GND (ground = 0 V)

SYMBOL	PARAMETER	T_{amb} (°C)							UNIT	TEST CONDITIONS	
		74 HCT								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	Figs 6 and 7
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	Figs 6 and 7
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	Figs 6 and 7

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	
		74 HCT								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 Y_n		18	32		40		48	ns	4.5	Fig.8
$t_{THL}/$ t_{TLH}	output transition time		7	15		19		22	ns	4.5	Fig.8

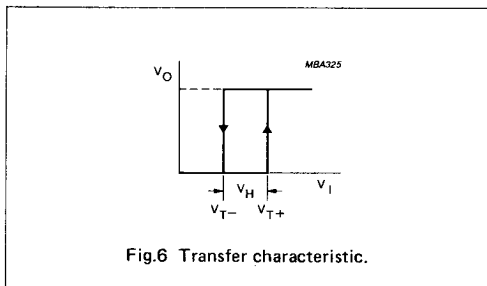**TRANSFER CHARACTERISTIC WAVEFORMS**

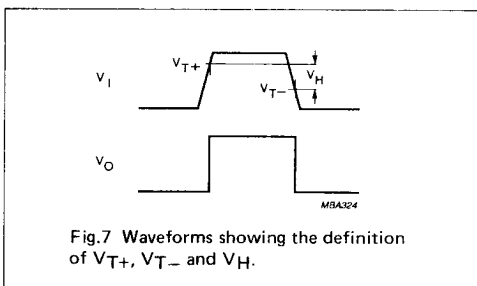Fig.6 Transfer characteristic.

Fig.7 Waveforms showing the definition of V_{T+}, V_{T-} and V_H.
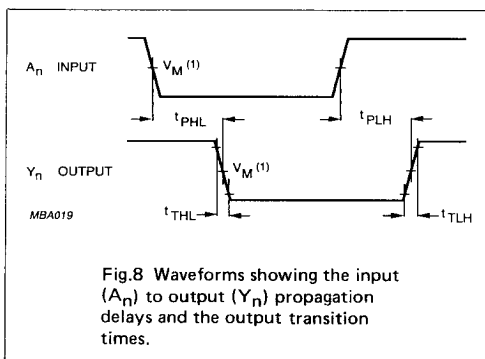
AC WAVEFORMS

Fig.8 Waveforms showing the input (A_n) to output (Y_n) propagation delays and the output transition times.

Note to 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.