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

FEATURES

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

GENERAL DESCRIPTION

The 74HC/HCT9014 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/HCT9014 are nine wide Schmitt trigger inverting buffer/line drivers with Schmitt trigger inputs. These inputs transform slowly changing input signals into sharply defined jitter-free output signals.

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

SYMBOL	PARAMETER	CONDITIONS	TYPICAL		UNIT
			HC	HCT	
t_{PHL}/t_{PLH}	propagation delay A_n to $\overline{Y}_n$	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
   f_o = output frequency in MHz
   C_L = output load capacitance in pF
   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

SEE PACKAGE INFORMATION SECTION

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	$\overline{Y}_0$ to $\overline{Y}_8$	data outputs
20	V_{CC}	positive supply voltage

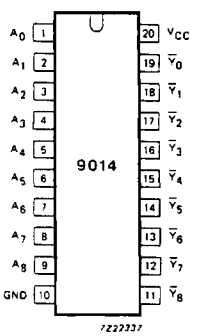

Fig. 1 Pin configuration.

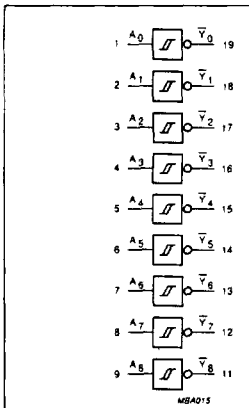

Fig. 2 Logic symbol.

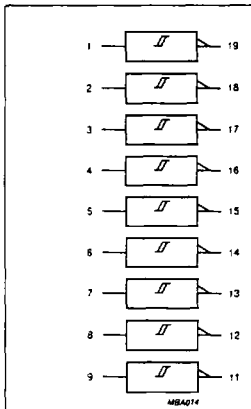

Fig. 3 IEC logic symbol.

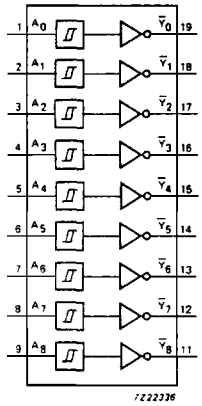

Fig. 4 Functional diagram.

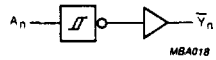

Fig. 5 Logic diagram (one Schmitt trigger).

FUNCTION TABLE

INPUTS	OUTPUTS
A_n	$\overline{Y}_n$
L	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".
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	1.13	1.50	0.70	1.50	0.70	1.50	V	2.0	Figs 6 and 7
		1.75	2.37	3.15	1.75	3.15	1.75	3.15		4.5	
		2.30	3.11	4.20	2.30	4.20	2.30	4.20		6.0	
V_{T-}	negative-going threshold	0.30	0.70	1.10	0.30	1.10	0.30	1.10	V	2.0	Figs 6 and 7
		1.35	1.80	2.40	1.35	2.40	1.35	2.40		4.5	
		1.80	2.43	3.30	1.80	3.30	1.80	3.30		6.0	
V_H	hysteresis ($V_{T+} - V_{T-}$)	0.2	0.43	0.80	0.18	0.80	0.15	0.80	V	2.0	Figs 6 and 7
		0.4	0.57	1.00	0.40	1.00	0.40	1.00		4.5	
		0.5	0.68	1.10	0.50	1.10	0.50	1.10		6.0	

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 $\overline{Y}_n$		33	105		130		160	ns	2.0	Fig.8
			12	21		26		32		4.5	
			10	18		22		27		6.0	
t_{THL}/ t_{TLH}	output transition time		19	75		95		110	ns	2.0	Fig.8
			7	15		19		22		4.5	
			6	13		16		19		6.0	

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	
		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	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	
		74HCT								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 $\bar{Y}_n$		19	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

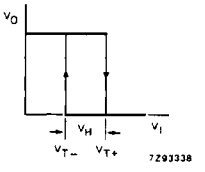

Fig.6 Transfer characteristic.

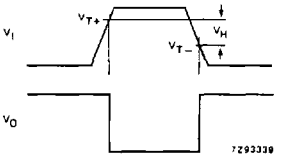

Fig.7 Waveforms showing the definition of V_{T+}, V_{T-} and V_H.

AC WAVEFORMS

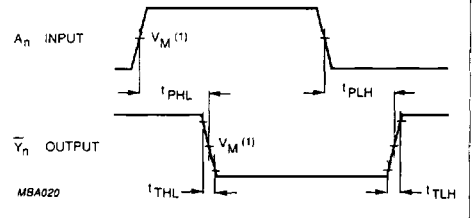

Fig.8 Waveforms showing the input (A_n) to output ($\overline{Y}_n$) propagation delays and the output transition times.

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.