

# 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

## **74HC133** 13-input NAND gate

Product specification  
File under Integrated Circuits, IC06

September 1993

## 13-input NAND gate

74HC133

## FEATURES

- Output capability: standard
- $I_{CC}$  category: SSI

## GENERAL DESCRIPTION

The HC133 is an high-speed Si-gate CMOS device and is pin compatible with low power Schottky TTL (LSTTL). It is specified in compliance with JEDEC standard no. 7A.

The 74HC133 provides the 13-input NAND function.

## QUICK REFERENCE DATA

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

SYMBOL	PARAMETER	CONDITIONS	TYPICAL	UNIT
$t_{PHL}/t_{PLH}$	propagation delay A..M to Y	$C_L = 15\text{ pF}$ ; $V_{CC} = 5\text{ V}$	9	ns
$C_I$	input capacitance		3.5	pF
$C_{PD}$	power dissipation per gate	notes 1 and 2	19	pF

## Notes to the quick reference data

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

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

$f_i$  = 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 the outputs.

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

## ORDERING INFORMATION

TYPE NUMBER	PACKAGES			
	PINS	PIN POSITION	MATERIAL	CODE
74HC133N	16	DIL	plastic	SOT38
74HC133D	16	SO	plastic	SOT109A

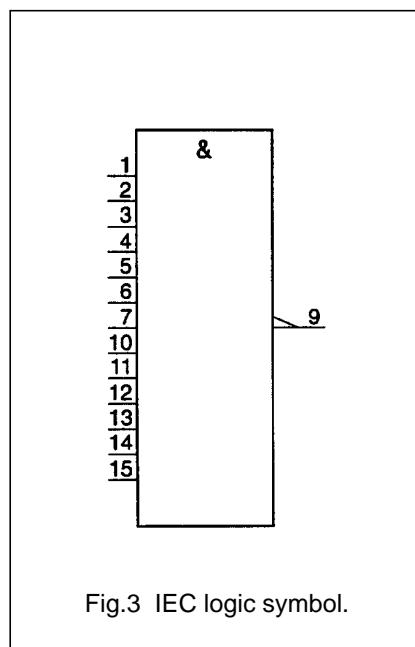
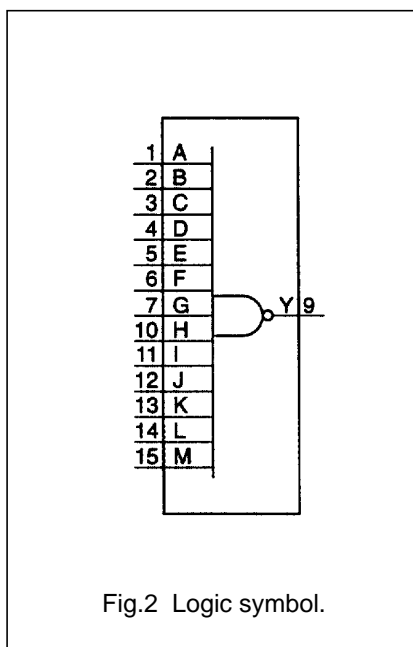
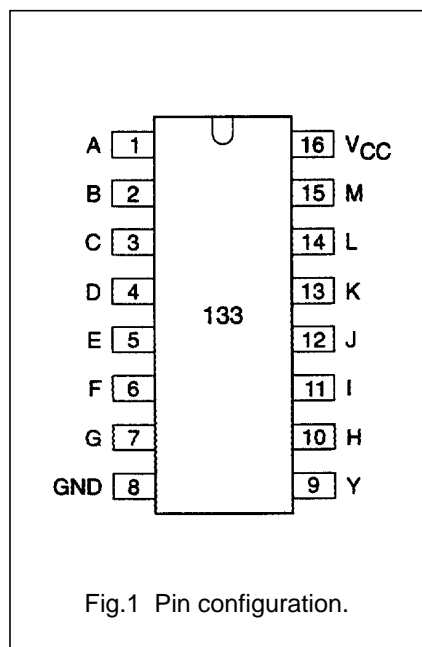
See also *"74HC/HCT/HCU/HCMOS Logic Package Information"*.

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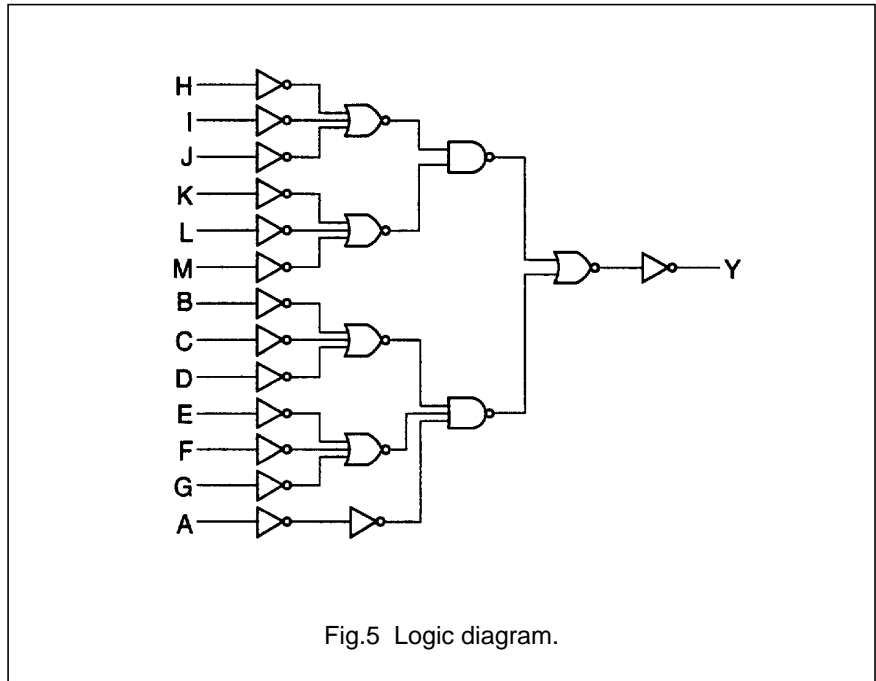
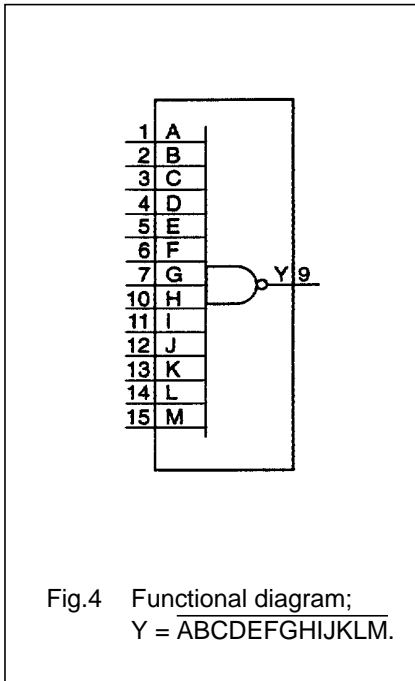
### PINNING

PIN NO.	SYMBOL	NAME AND FUNCTION
1..7, 10.. 15	A.. G, H..M	data input
8	GND	ground (0 V)
9	Y	data output
16	V <sub>CC</sub>	positive supply voltage



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FUNCTION TABLE

INPUTS													OUTPUT
A	B	C	D	E	F	G	H	I	J	K	L	M	Y
L	X	X	X	X	X	X	X	X	X	X	X	X	H
X	L	X	X	X	X	X	X	X	X	X	X	X	H
X	X	L	X	X	X	X	X	X	X	X	X	X	H
X	X	X	L	X	X	X	X	X	X	X	X	X	H
X	X	X	X	L	X	X	X	X	X	X	X	X	H
X	X	X	X	X	L	X	X	X	X	X	X	X	H
X	X	X	X	X	X	L	X	X	X	X	X	X	H
X	X	X	X	X	X	X	L	X	X	X	X	X	H
X	X	X	X	X	X	X	X	L	X	X	X	X	H
X	X	X	X	X	X	X	X	X	L	X	X	X	H
X	X	X	X	X	X	X	X	X	X	L	X	X	H
X	X	X	X	X	X	X	X	X	X	X	L	X	H
X	X	X	X	X	X	X	X	X	X	X	X	L	H
H	H	H	H	H	H	H	H	H	H	H	H	H	L

Notes

1. H = HIGH voltage level  
 L = LOW voltage level  
 X = don't care

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## DC CHARACTERISTICS FOR 74HC

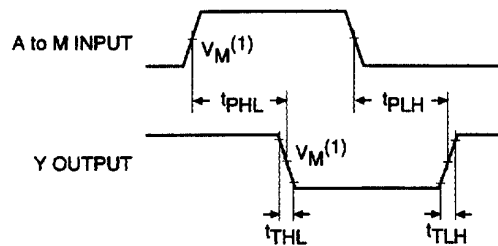
For the DC characteristics see *"74HC/HCT/HCU/HCMOS Logic Family Specifications"*.

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

## AC CHARACTERISTICS FOR 74HC

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

SYMBOL	PARAMETER	T <sub>amb</sub> (°C)							UNIT	TEST CONDITIONS	
		+25			-40 to +85		-40 to +125			V <sub>CC</sub> (V)	WAVEFORMS
		MIN.	TYP.	MAX.	MIN.	MAX.	MIN.	MAX.			
t <sub>PHL</sub> /t <sub>PLH</sub>	propagation delay A..M to Y	–	36	110	–	140	–	165	ns	2.0 4.5 6.0	Fig.6
t <sub>THL</sub> /t <sub>TLH</sub>	output transition time	–	19	75	–	95	–	110	ns	2.0 4.5 6.0	Fig.6
		–	10	19	–	23	–	28			
		–	7	15	–	19	–	22			
		–	6	13	–	16	–	19			



(1) HC: V<sub>M</sub> = 50%; V<sub>I</sub> = GND to V<sub>CC</sub>.

Fig.6 Waveforms showing the input (A, B, C, D, E, F, G, H, I, J, K, L, M) to output (Y) propagation delays and the output transition times.

## PACKAGE OUTLINES

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