

13-input NAND gate

74HC133

FEATURES

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

GENERAL DESCRIPTION

The HC133 is a 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; $T_{amb} = 25^{\circ}\text{C}$; $t_r = t_f = 6 \text{ ns}$

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

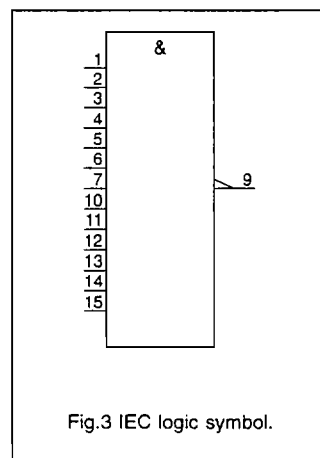
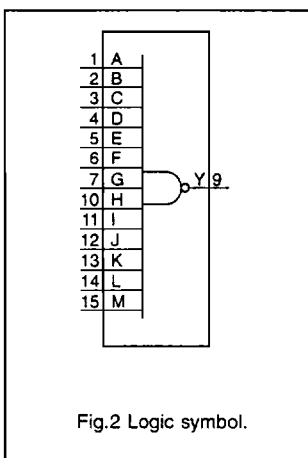
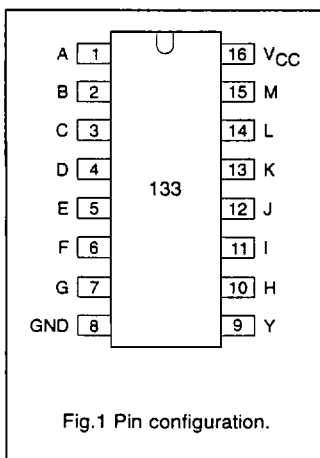
1. C_{PD} is used to determine the dynamic power dissipation (P_D in μW)
 $P_D = C_{PD} \times V_{CC}^2 \times f_i + \sum (C_L \times V_{CC}^2 \times f_o)$ where:
 f_i = input frequency in MHz; C_L = output load capacitance in pF;
 f_o = output frequency in MHz; V_{CC} = supply voltage in V;
 $\sum (C_L \times V_{CC}^2 \times f_o)$ = sum of the outputs.
2. For HC the condition is $V_i = \text{GND to } V_{CC}$

ORDERING AND PACKAGE INFORMATION

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

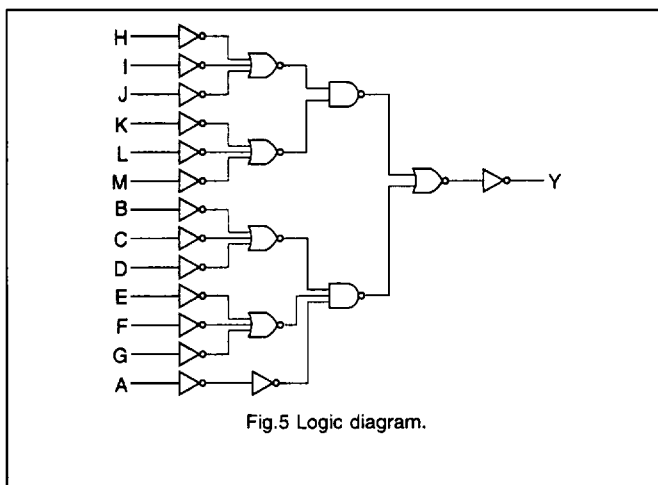
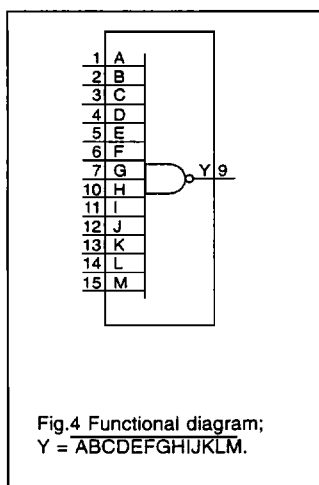
PINNING

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_{CC}	positive supply voltage



13-input NAND gate

74HC133



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

H = HIGH voltage level

L = LOW voltage level

X = don't care

13-input NAND gate

74HC133

DC CHARACTERISTICS FOR 74HC

For the DC characteristics see chapter "HCMOS family characteristics", section "Family specifications".

Output capability: standard

I_{CC} category: SSI

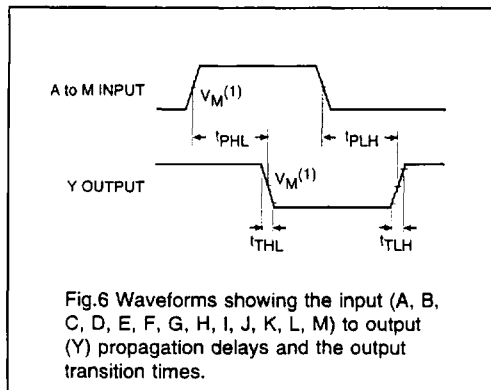
AC CHARACTERISTICS FOR 74HC

GND = 0 V; $t_r = t_f = 6$ ns; $C_L = 50$ pF

SYMBOL	PARAMETER	T _{amb} (°C)							UNIT	TEST CONDITIONS	
		+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..M to Y	-	36	110	-	140	-	165	ns	2.0	Fig.6
		-	13	22	-	28	-	33		4.5	
		-	10	19	-	23	-	28		6.0	
t _{THL} /t _{TLH}	output transition time	-	19	75	-	95	-	110	ns	2.0	Fig.6
		-	7	15	-	19	-	22		4.5	
		-	6	13	-	16	-	19		6.0	

13-input NAND gate

74HC133

**Note to the AC waveforms**(1) HC: $V_M = 50\%$; $V_I = \text{GND to } V_{CC}$.