

GD54/74HC133, GD54/74HCT133

13-INPUT NAND GATE

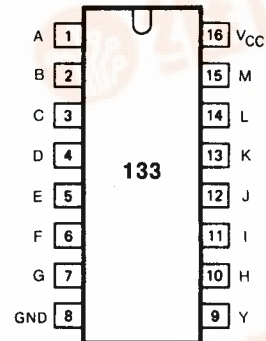
General Description

These devices are identical in pinout to the 54/74LS133. They contain a single 13-input NAND gate. These devices are characterized for operation over wide temperature ranges to meet industry and military specifications.

Features

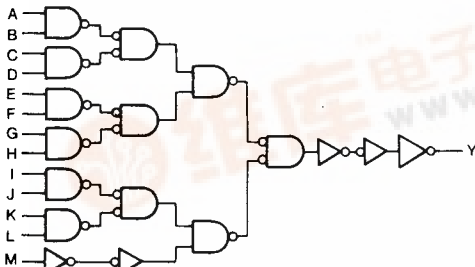
- Low Power consumption characteristic of CMOS devices
- Output drive capability: 10 LS TTL Loads Min.
- Operating speed superior to LS TTL
- Wide operating voltage range: for HC 2 to 6 volts
for HCT 4.5 to 5.5 volts
- Low input current: $1\mu\text{A}$ Max.
- Low quiescent current: $20\mu\text{A}$ Max. (74HC)
- High noise immunity characteristic of CMOS
- Diode protection on all inputs

Pin Configuration



Suffix-Blank : Plastic Dual In Line Package
 Suffix-J : Ceramic Dual In Line Package
 Suffix-D : Small Outline Package

Logic Diagram



Function Table

INPUTS A THRU M	OUTPUT Y
All inputs H	L
one or more inputs L	H

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Absolute Maximum Ratings

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CC}	DC Supply voltage		-0.5	+7	V
I_{IK}, I_{OK}	DC input or output diode current	for $V_I < -0.5$ or $V_I > V_{CC} + 0.5V$		20	mA
I_O	DC output source or sink current	for $-0.5V < V_O < V_{CC} + 0.5V$		25	mA
I_{CC}	DC V_{CC} or GND current			50	mA
T_{stg}	Storage temperature range		-65	150	°C
P_D	Power dissipation per package	above +70°C: derate linearly with 8mW/K		500	mW
T_L	Lead temperature	At distance 1/16±1/32 in. from case for 60 sec(CERAMIC) 10 sec(PLASTIC)		300 260	°C

Recommended Operating Conditions

CHARACTERISTIC	LIMITS		UNITS
	MIN.	MAX.	
Supply-Voltage Range V_{CC} : GD54/74HC Types GD54/74HCT Types	2 4.5	6 5.5	V
DC Input or Output Voltage V_I, V_O	0	V_{CC}	V
Operating Temperature T_A : GD74 Types GD54 Types	-40 -55	+85 +125	°C
Input Rise and Fall times t_r, t_f : GD54/74HC Types at 2V at 4.5V at 6V GD54/74HCT Types at 4.5V		1000 500 400 500	ns

GD54/74HC133, GD54/74HCT133

DC Electrical Characteristics for HC

SYMBOL	PARAMETER	TEST CONDITION	V _{CC} (V)	T _A =25°C			GD74HC133		GD54HC133		UNIT
				MIN.	TYP.	MAX.	MIN.	MAX.	MIN.	MAX.	
V _{IH}	HIGH level input Voltage		2.0 4.5 6.0	1.5 3.15 4.2			1.5 3.15 4.2		1.5 3.15 4.2		V
V _{IL}	LOW level input voltage		2.0 4.5 6.0			0.3 0.9 1.2		0.3 0.9 1.2		0.3 0.9 1.2	V
V _{OH}	HIGH level output voltage	V _{IN} =V _{IH}	I _{OH} =-20μA	2.0 4.5 6.0	1.9 4.4 5.9	2.0 4.5 6.0	1.9 4.4 5.9		1.9 4.4 5.9		V
			I _{OH} =-4mA I _{OH} =-5.2mA	4.5 6.0	3.98 5.48	4.3 5.2	3.84 5.34		3.7 5.2		
		or V _{IL}	I _{OL} =20μA	2.0 4.5 6.0			0.1 0.1 0.1	0.1 0.1 0.1		0.1 0.1 0.1	V
			I _{OL} =4mA I _{OL} =5.2mA	4.5 6.0		0.17 0.15	0.26 0.26	0.33 0.33		0.4 0.4	
I _{IN}	Input leakage Current	V _{IN} =V _{CC} or GND	6.0			0.1		1.0		1.0	μA
I _{CC}	Quiescent Supply Current	V _{IN} =V _{CC} or GND I _{out} =0μA	6.0			2		20		40	μA

DC Electrical Characteristics for HCT

SYMBOL	PARAMETER	TEST CONDITION	V _{CC} (V)	T _A =25°C			GD74HCT133		GD54HCT133		UNIT
				MIN.	TYP.	MAX.	MIN.	MAX.	MIN.	MAX.	
V _{IH}	HIGH level input Voltage		4.5 to 5.5	2.0			2.0		2.0		V
V _{IL}	LOW level input voltage		4.5 to 5.5			0.8		0.8		0.8	V
V _{OH}	HIGH level output voltage	V _{IN} =V _{IH}	I _{OH} =-20μA	4.5	4.4	4.5	4.4		4.4		V
			I _{OH} =-4mA	4.5	3.98	4.3	3.84		3.7		
		or V _{IL}	I _{OL} =20μA	4.5			0.1	0.1		0.1	V
			I _{OL} =4mA	4.5		0.17	0.26	0.33		0.4	
I _{IN}	Input leakage Current	V _{IN} =V _{CC} or GND	5.5			0.1		1.0		1.0	μA
I _{CC}	Quiescent Supply Current	V _{IN} =V _{CC} or GND I _{out} =0μA	5.5			2		20		40	μA

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AC Characteristics for HC: $t_r=t_f=6\text{ns}$ $C_L=50\text{pF}$

SYMBOL	PARAMETER	V_{CC} (V)	$T_A=25^\circ\text{C}$			GD74HC133		GD54HC133		UNIT
			MIN.	TYP.	MAX.	MIN.	MAX.	MIN.	MAX.	
$t_{PLH}/$ t_{PHL}	Propagation delay time A thru H to Y	2.0 4.5 6.0		65 15 12	140 29 25		180 36 31		210 42 36	ns
$t_{TLH}/$ t_{THL}	Output transition time	2.0 4.5 6.0		25 8 7	75 15 13		95 19 16		110 22 19	ns

AC Characteristics for HCT: $t_r=t_f=6\text{ns}$ $C_L=50\text{pF}$

SYMBOL	PARAMETER	V_{CC} (V)	$T_A=25^\circ\text{C}$			GD74HCT133		GD54HCT133		UNIT
			MIN.	TYP.	MAX.	MIN.	MAX.	MIN.	MAX.	
$t_{PLH}/$ t_{PHL}	Propagation delay time A thru H to Y	4.5		18	31		40		46	ns
$t_{TLH}/$ t_{THL}	Output transition time	4.5		8	15		19		22	ns

AC Waveform

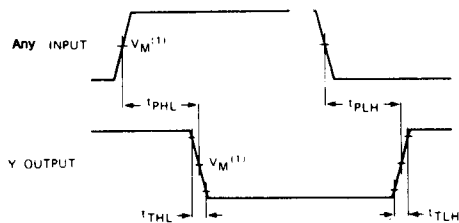


Fig. 2 Waveforms showing the (Any) Input to output (Y) propagation delays and the output transition times.

Note to AC waveform

(1) HC : $V_M=50\%$, $V_I=\text{GND to } V_{CC}$

HCT: $V_M=1.3V$, $V_I=\text{GND to } 3V$.