

GD54/74HC20, GD54/74HCT20

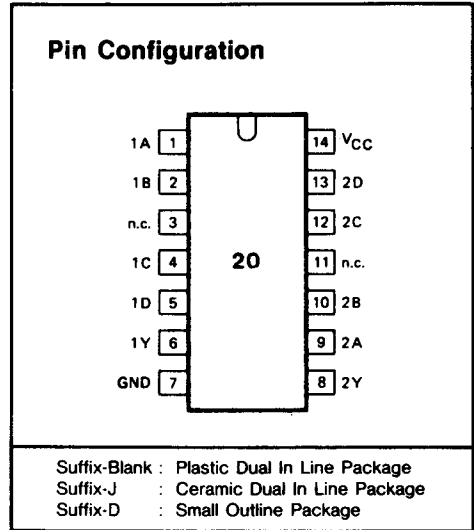
DUAL 4-INPUT NAND GATES

General Description

These devices are identical in pinout to the 54/74LS20. They contain two independent 4-input NAND gates. 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 μ A Max.
- Low quiescent current: 20 μ A Max. (74HC)
- High noise immunity characteristic of CMOS
- Diode protection on all inputs



Function Table

INPUT				OUTPUT
nA	nB	nC	nD	nY
L	X	X	X	H
X	L	X	X	H
X	X	L	X	H
X	X	X	L	H
H	H	H	H	L

H=HIGH Voltage level
 L=LOW Voltage level
 X=don't care

Logic Symbol and Diagram

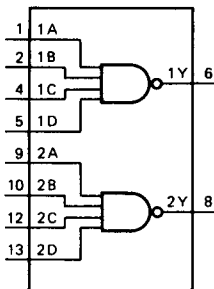


Fig. 1 Logic symbol

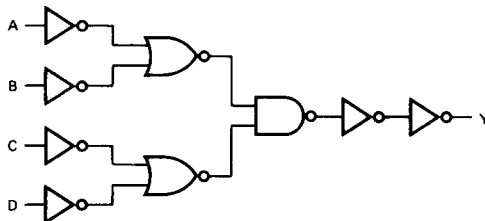


Fig. 2 Logic diagram (one gate)

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

DC Electrical Characteristics for HC

SYMBOL	PARAMETER	TEST CONDITION	V _{CC} (V)	T _A =25°C			GD74HC20		GD54HC20		UNIT
				MIN.	TYP.	MAX.	MIN.	MAX.	MIN.	MAX.	
V _{IH}	HIGH level input Voltage		2.0	1.5			1.5		1.5		V
			4.5	3.15			3.15		3.15		
			6.0	4.2			4.2		4.2		
V _{IL}	LOW level input voltage		2.0			0.3		0.3		0.3	V
			4.5			0.9		0.9		0.9	
			6.0			1.2		1.2		1.2	
V _{OH}	HIGH level output voltage	V _{IN} =V _{IH}	I _{OH} =-20μA	2.0	1.9	2.0		1.9		1.9	V
				4.5	4.4	4.5		4.4		4.4	
		6.0	5.9	6.0		5.9		5.9			
		or V _{IL}	I _{OH} =-4mA I _{OH} =-5.2mA	4.5	3.98	4.3		3.84		3.7	
6.0	5.48			5.2		5.34		5.2			
V _{OL}	LOW level output voltage	V _{IN} =V _{IH}	I _{OL} =20μA	2.0			0.1		0.1		V
				4.5			0.1		0.1		
		6.0			0.1		0.1		0.1		
		or V _{IL}	I _{OL} =4mA I _{OL} =5.2mA	4.5		0.17	0.26		0.33		
6.0				0.15	0.26		0.33		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

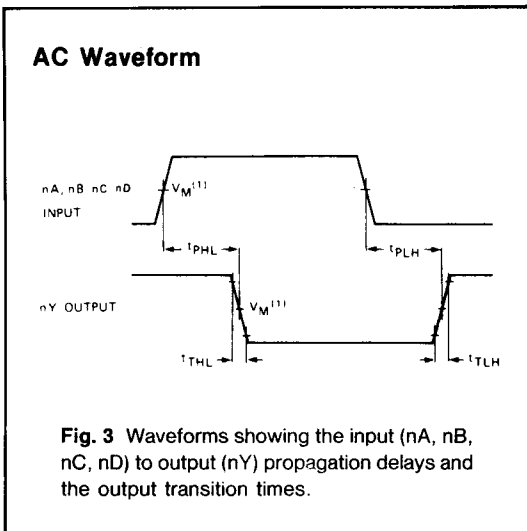
SYMBOL	PARAMETER	TEST CONDITION	V _{CC} (V)	T _A =25°C			GD74HCT20		GD54HCT20		UNIT		
				MIN.	TYP.	MAX.	MIN.	MAX.	MIN.	MAX.			
V _{IH}	HIGH level input Voltage		4.5 to 5.5	2.0			2.0		2.0		V		
			V _{IL}	LOW level input voltage	4.5 to 5.5			0.8		0.8			0.8
V _{OH}	HIGH level output voltage	V _{IN} =V _{IH}	I _{OH} =-20μA	4.5	4.4	4.5		4.4		4.4	V		
				4.5	3.98	4.3		3.84		3.7			
		or V _{IL}	I _{OH} =-4mA	4.5			0.1		0.1			0.1	
				4.5		0.17	0.26		0.33			0.4	
V _{OL}	LOW level output voltage	V _{IN} =V _{IH}	I _{OL} =20μA	4.5			0.1		0.1		V		
				4.5			0.1		0.1			0.1	
		or V _{IL}	I _{OL} =4mA	4.5		0.17	0.26		0.33			0.4	
				4.5		0.15	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		

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

SYMBOL	PARAMETER	V _{CC} (V)	T _A =25°C			GD74HC20		GD54HC20		UNIT
			MIN.	TYP.	MAX.	MIN.	MAX.	MIN.	MAX.	
t _{PLH} / t _{PHL}	Propagation delay time nA, nB, nC, nD to nY	2.0		28	90		110		130	ns
		4.5		10	18		23		26	
		6.0		8	15		20		23	
t _{TLH} / t _{THL}	Output transition time	2.0		25	70		85		100	ns
		4.5		8	15		18		22	
		6.0		7	13		16		19	

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

SYMBOL	PARAMETER	V _{CC} (V)	T _A =25°C			GD74HCT20		GD54HCT20		UNIT
			MIN.	TYP.	MAX.	MIN.	MAX.	MIN.	MAX.	
t _{PLH} / t _{PHL}	Propagation delay time nA, nB, nC, nD to nY	4.5		14	24		30		40	ns
t _{TLH} / t _{THL}	Output transition time	4.5		8	15		18		22	ns



Note to AC waveform

- (1) HC : V_M=50%. V_I=GND to V_{CC}
HCT: V_M=1.3V. V_I=GND to 3V.