

# GD54/74HC00, GD54/74HCT00

## QUAD 2-INPUT NAND GATES

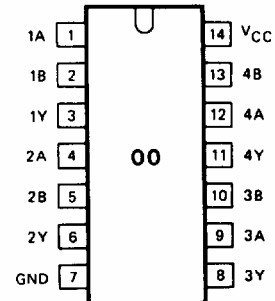
### General Description

These devices are identical in pinout to the 54/74LS00. They contain four independent 2-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:  $1\mu\text{A}$  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 Symbol and Logic Diagram

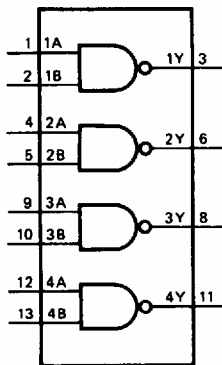


Fig. 1 Logic Symbol

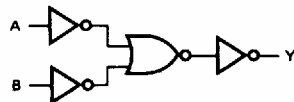


Fig. 2 Logic diagram (one gate)

### Function Table

INPUTS		OUTPUT
nA	nB	nY
L	L	H
L	H	H
H	L	H
H	H	L

H=HIGH voltage level  
 L=LOW voltage level

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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

DC Electrical Characteristics for HC

SYMBOL	PARAMETER	TEST CONDITION	V <sub>CC</sub> (V)	T <sub>A</sub> =25°C			GD74HC00		GD54HC00		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
V <sub>IH</sub>	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 <sub>IL</sub>	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 <sub>OH</sub>	HIGH level output voltage	V <sub>IN</sub> =V <sub>IH</sub>	I <sub>OH</sub> =-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
		or V <sub>IL</sub>	I <sub>OH</sub> =-4mA I <sub>OH</sub> =-5.2mA	4.5 6.0	3.98 5.48	4.3 5.2	3.84 5.34		3.7 5.2		
V <sub>OL</sub>	LOW level output voltage	V <sub>IN</sub> =V <sub>IH</sub>	I <sub>OL</sub> =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
		or V <sub>IL</sub>	I <sub>OL</sub> =4mA I <sub>OL</sub> =5.2mA	4.5 6.0		0.17 0.15	0.26 0.26	0.33 0.33		0.4 0.4	
I <sub>IN</sub>	Input leakage current	V <sub>IN</sub> =V <sub>CC</sub> or GND	6.0			0.1		1.0		1.0	μA
I <sub>CC</sub>	Quiescent supply current	V <sub>IN</sub> =V <sub>CC</sub> or GND I <sub>out</sub> =0μA	6.0			2		20		40	μA

DC Electrical Characteristics for HCT

SYMBOL	PARAMETER	TEST CONDITION	V <sub>CC</sub> (V)	T <sub>A</sub> =25°C			GD74HCT00		GD54HCT00		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
V <sub>IH</sub>	HIGH level input voltage		4.5 to 5.5	2.0			2.0		2.0		V
V <sub>IL</sub>	LOW level input voltage		4.5 to 5.5			0.8		0.8		0.8	V
V <sub>OH</sub>	HIGH level output voltage	V <sub>IN</sub> =V <sub>IH</sub>	I <sub>OH</sub> =-20μA	4.5	4.4	4.5		4.4		4.4	V
		or V <sub>IL</sub>	I <sub>OH</sub> =-4mA	4.5	3.98	4.3		3.84		3.7	
V <sub>OL</sub>	LOW level output voltage	V <sub>IN</sub> =V <sub>IH</sub>	I <sub>OL</sub> =20μA	4.5			0.1		0.1		V
		or V <sub>IL</sub>	I <sub>OL</sub> =4mA	4.5		0.17	0.26		0.33		
I <sub>IN</sub>	Input leakage current	V <sub>IN</sub> =V <sub>CC</sub> or GND	5.5			0.1		1.0		1.0	μA
I <sub>CC</sub>	Quiescent supply current	V <sub>IN</sub> =V <sub>CC</sub> or GND I <sub>out</sub> =0μA	5.5			2		20		40	μA

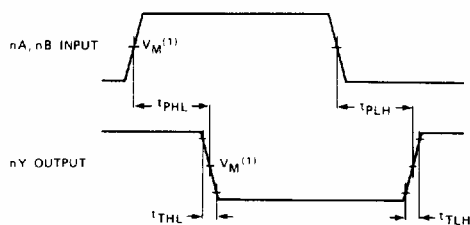
**AC Characteristics for HC :  $t_r=t_f=6\text{ns}$   $C_L=50\text{pF}$**

SYMBOL	PARAMETER	$V_{CC}$ (V)	$T_A=25^\circ\text{C}$			GD74HC00		GD54HC00		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
$t_{PLH}/$ $t_{PHL}$	Propagation delay time nA, nB to nY	2.0 4.5 6.0		25 9 7	90 18 15		115 23 20		135 27 23	ns
$t_{TLH}/$ $t_{THL}$	Output transition time	2.0 4.5 6.0		18 7 6	72 14 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)	$T_A=25^\circ\text{C}$			GD74HCT00		GD54HCT00		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
$t_{PLH}/$ $t_{PHL}$	Propagation delay time nA, nB, to nY	4.5		10	19		24		29	ns
$t_{TLH}/$ $t_{THL}$	Output transition time	4.5		7	15		19		22	ns

**AC Waveform**



**Fig. 3** Waveforms showing the input (nA, nB) to output (nY) propagation delays and the output transition times.

**Note to AC waveform**

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