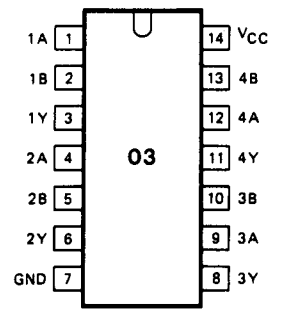
GD54/74HC03, GD54/74HCT03

QUAD 2-INPUT NAND GATES WITH OPEN-DRAIN OUTPUTS

General Description

These devices are identical in pinout to the 54/74LS03. They contain four independent 2-Input NAND gates. The open-drain outputs require pull-up resistors to perform correctly. With suitable pull-up resistors, these devices can be used in active-low wired-OR or active-high wired-AND applications. These devices are characterized for operation over wide temperature ranges to meet industry and military specifications.

Pin Configuration



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

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: 1μA Max.
- Low quiescent current: 20μA Max. (74HC)
- High noise immunity characteristic of CMOS
- Diode protection on all inputs

Logic Symbol and Diagram

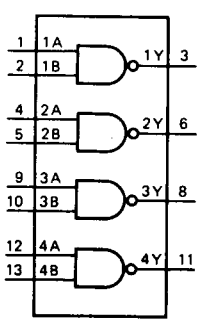


Fig. 1 Logic symbol

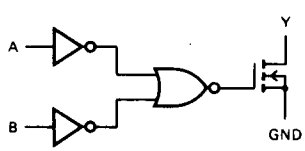


Fig. 2 Logic diagram (one gate)

Function Table

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

H=HIGH voltage level
L=LOW voltage level
Z=high impedance OFF-state

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

DC Electrical Characteristics for HC

SYMBOL	PARAMETER	TEST CONDITION		V_{CC} (V)	T_A=25°C			GD74HC03		GD54HC03		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} or V_{IL}	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		
V_{OL}	LOW level output voltage	V_{IN}=V_{IH} 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
I_{OH}	HIGH level output current	V_{IN}=V_{IH} or V_{IL} V_{out}=V_{CC}		6.0		0.01	0.5		5		10	μA

DC Electrical Characteristics for HCT

SYMBOL	PARAMETER	TEST CONDITION		V_{CC} (V)	T_A=25°C			GD74HCT03		GD54HCT03		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} or V_{IL}	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		
V_{OL}	LOW level output voltage	V_{IN}=V_{IH} 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
I_{OH}	HIGH level output current	V_{IN}=V_{IH} or V_{IL} V_{out}=V_{CC}		4.5 to 5.5		0.01	0.5		5		10	μA

AC Characteristics for HC: $t_r=t_f=6ns$ $C_L=50pF$

SYMBOL	PARAMETER	V_{CC} (V)	$T_A=25°C$			GD74HC03		GD54HC03		UNIT
			MIN.	TYP.	MAX.	MIN.	MAX.	MIN.	MAX.	
t_{PZL}/ t_{PLZ}	Propagation delay time nA, nB to nY	2.0		25	90		110		130	ns
		4.5		9	18		22		26	
		6.0		8	15		20		23	
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: $t_r=t_f=6ns$ $C_L=50$ pF

SYMBOL	PARAMETER	V_{CC} (V)	$T_A=25°C$			GD74HCT03		GD53HCT03		UNIT
			MIN.	TYP.	MAX.	MIN.	MAX.	MIN.	MAX.	
t_{PZL}/ t_{PLZ}	Propagation delay time nA, nB, to nY	4.5		12	20		24		28	ns
t_{THL}	Output transition time	4.5		8	15		19		22	ns

AC Waveform

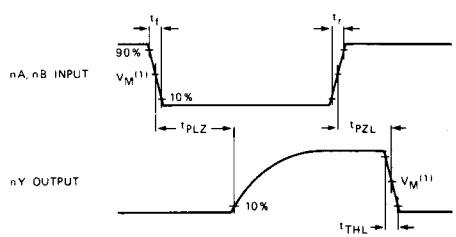


Fig. 3 Waveforms showing the input (nA, nB) to output (nY) propagation delays and the output transition times.

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.