

GD54/74HC04, GD54/74HCT04

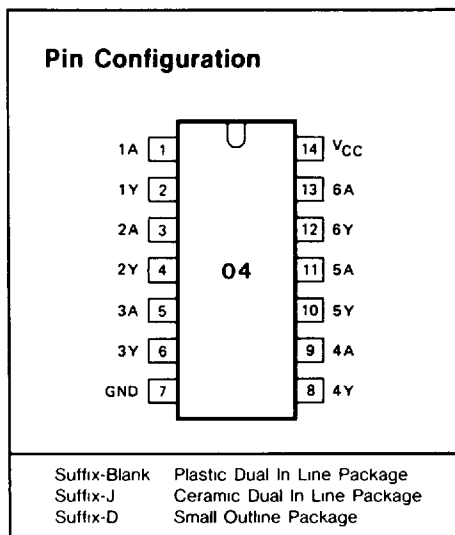
HEX INVERTERS

General Description

These devices are identical in pinout to the 54/74LS04. They contain six independent inverters. 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



Logic Diagram

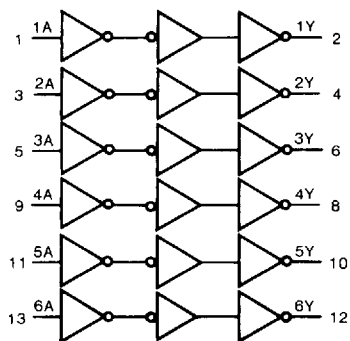


Fig. 1 Logic diagram

Function Table

INPUT	OUTPUT
nA	nY
L	H
H	L

H=HIGH Voltage level
L=LOW Voltage level

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 $1/16 \pm 1/32$ 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			GD74HC04		GD54HC04		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			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			0 4
				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			GD74HCT04		GD54HCT04		UNIT	
				MIN	TYP	MAX	MIN	MAX	MIN	MAX		
V _{IH}	HIGH level input Voltage		4 5								V	
			to	2 0			2 0		2 0			
			5 5									
V _{IL}	LOW level input voltage		4 5								V	
			to			0 8		0 8		0 8		
			5 5									
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		
				6 0								
		or V _{IL}	I _{OH} =-4mA	4 5	3 98	4 3		3 84		3 7		
				6 0								
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
				6 0			0 1		0 1			0 1
		or V _{IL}	I _{OL} =4mA	4 5		0 17	0 26		0 33			0 4
				6 0								
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: $t_r=t_f=6ns$ $C_L=50pF$

SYMBOL	PARAMETER	V _{CC} (V)	T _A =25°C			GD74HC04		GD54HC04		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t _{PLH} / t _{PHL}	Propagation delay time nA nY	2 0		25	80		105		125	ns
		4 5		8	16		21		26	
		6 0		7	14		18		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: $t_r=t_f=6ns$ $C_L=50pF$

SYMBOL	PARAMETER	V _{CC} (V)	T _A =25°C			GD74HCT04		GD54HCT04		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t _{PLH} / t _{PHL}	Propagation delay time nA to nY	4 5		10	20		24		29	ns
t _{TLH} / t _{THL}	Output transition time	4 5		8	15		19		22	ns

AC Waveform

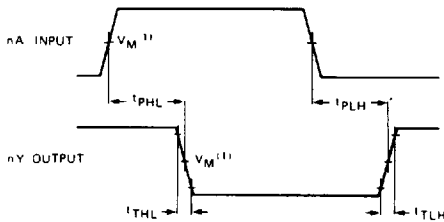


Fig. 2 Waveforms showing the input (nA) to output (nY) propagation delays and the output transition times

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