

GD54/74HC04, GD54/74HCT04

HEX INVERTERS

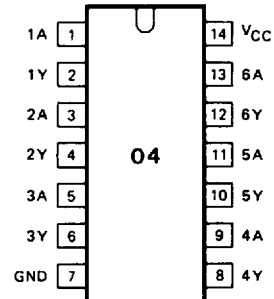
General Description

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: $1\mu\text{A}$ 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

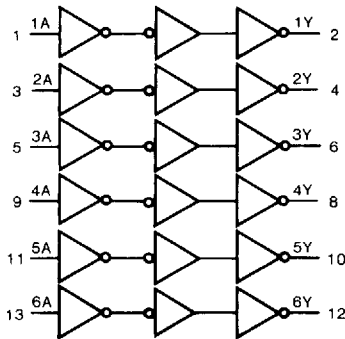


Fig. 1 Logic diagram

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±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			GD74HC04		GD54HC04		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
		or V _{IL}	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}	I _{OL} =20μA	2 0 4 5 6 0			0 1 0 1 0 1		0 1 0 1 0 1		V
		or V _{IL}	I _{OL} =4mA I _{OL} =5 2mA	4 5 6 0		0 17 0 15	0 26 0 26		0 33 0 33		
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 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
		or V _{IL}	I _{OH} =-4mA	4 5	3 98	4 3	3 84		3 7		
V _{OL}	LOW level output voltage	V _{IN} =V _{IH}	I _{OL} =20μA	4 5		0 1	0 1		0 1		V
		or V _{IL}	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

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

SYMBOL	PARAMETER	V_{CC} (V)	$T_A=25^\circ\text{C}$			GD74HC04		GD54HC04		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
$t_{PLH}/$ t_{PHL}	Propagation delay time nA nY	2 0 4 5 6 0		25 8 7	80 16 14		105 21 18		125 26 23	ns
$t_{TLH}/$ t_{THL}	Output transition time	2 0 4 5 6 0		25 8 7	70 15 13		85 18 16		100 22 19	ns

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

SYMBOL	PARAMETER	V_{CC} (V)	$T_A=25^\circ\text{C}$			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

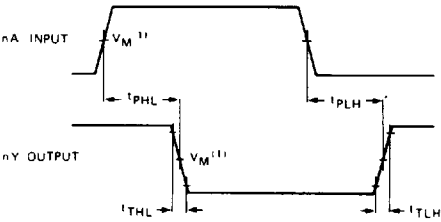


Fig. 2 Waveforms showing the input (nA) to output (nY) propagation delays and the output transition times

Note to AC waveform
(1) HC $V_M=50\%$ $V_L=GND$ to V_{CC}
HCT $V_M=1.3V$ $V_L=GND$ to $3V$