



## U74HC04

CMOS IC

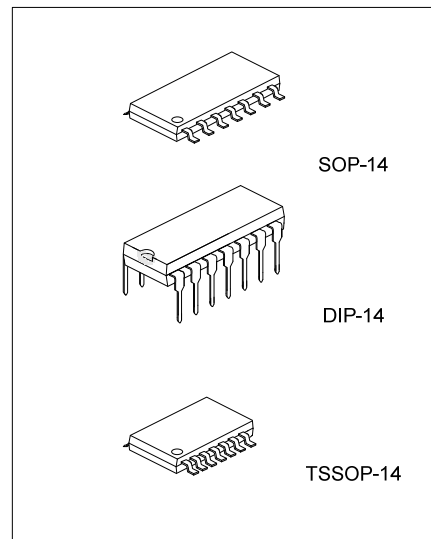
### HEX INVERTERS

#### DESCRIPTION

The U74HC04 devices contain six independent inverters. They perform the Boolean function  $Y = \bar{A}$  in positive logic.

#### FEATURES

- \* Wide Operating Voltage Range of 2V to 6V
- \* Outputs Can Drive Up To 10 LSTTL Loads
- \* Low Power Consumption, 2µA Max I<sub>CC</sub>
- \* Typical t<sub>pd</sub>=8ns
- \* ±4mA Output Drive at 5V
- \* Low Input Current of 1uA Max



#### ORDERING INFORMATION

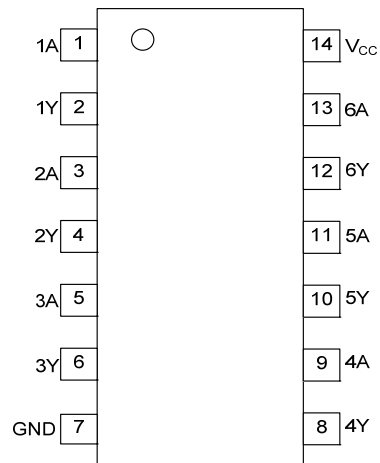
Ordering Number		Package	Packing
Lead Free	Halogen Free		
U74HC04L-D14-T	U74HC04G-D14-T	DIP-14	Tube
-	U74HC04G-S14-R	SOP-14	Tape Reel
-	U74HC04G-P14-R	TSSOP-14	Tape Reel

<p>U74HC04L-D14-T</p> <p>(1)Packing Type (2)Package Type (3)Green Package</p>	<p>(1) R: Tape Reel, T: Tube (2) D14: DIP-14, P14: TSSOP-14, S14: SOP-14 (3) L: Lead Free, G: Halogen Free and Lead Free</p>
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#### MARKING

DIP-14	SOP-14 / TSSOP-14
<p>Date Code L: Lead Free G: Halogen Free Lot Code</p>	<p>Date Code Lot Code</p>

## ■ PIN CONFIGURATION



## ■ FUNCTION TABLE (each gate)

INPUT(A)	OUTPUT(Y)
L	H
H	L

## ■ LOGIC DIAGRAM (positive logic)

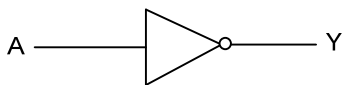


Fig.1 logic diagram for U74HC04

■ ABSOLUTE MAXIMUM RATING (T<sub>A</sub> = 25°C, unless otherwise specified) (Note 2)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V <sub>CC</sub>	-0.5~7	V
Input Clamp Current(V <sub>I</sub> <0)	I <sub>IK</sub>	±20	mA
Output Clamp Current(V <sub>O</sub> <0)	I <sub>OK</sub>	±20	mA
Output Current	I <sub>OUT</sub>	±25	mA
V <sub>CC</sub> or GND Current	I <sub>CC</sub>	±50	mA
Storage Temperature	T <sub>STG</sub>	-65 ~ +150	°C

Note: 1. Absolute maximum ratings are those values beyond which the device could be permanently damaged.

Absolute maximum ratings are stress ratings only and functional device operation is not implied.

2. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

■ THERMAL DATA

PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	DIP-14	80	°C/W
	SOP-14	86	
	TSSOP-14	113	

■ RECOMMENDED OPERATING CONDITIONS (T<sub>A</sub> = 25°C, unless otherwise specified)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Supply Voltage	V <sub>CC</sub>	Operating	2	5	6	V
Input Voltage	V <sub>I</sub>		0		V <sub>CC</sub>	V
Output Voltage	V <sub>O</sub>		0		V <sub>CC</sub>	V
Operating Temperature	T <sub>A</sub>		-40		+85	°C
Input transition rise/fall time	Δt/Δv	V <sub>CC</sub> =2V			1000	ns
		V <sub>CC</sub> =4.5V			500	
		V <sub>CC</sub> =6V			400	

■ STATIC CHARACTERISTICS (T<sub>A</sub> = 25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Positive-Going Input Threshold Voltage	V <sub>IH</sub>	V <sub>CC</sub> =2V	1.5			V
		V <sub>CC</sub> =4.5V	3.15			
		V <sub>CC</sub> =6V	4.2			
Negative-Going Input Threshold Voltage	V <sub>IL</sub>	V <sub>CC</sub> =2V			0.5	V
		V <sub>CC</sub> =4.5V			1.35	
		V <sub>CC</sub> =6V			1.8	
High-Level Output Voltage	V <sub>OH</sub>	V <sub>CC</sub> =2V, I <sub>OH</sub> =-20μA	1.9	1.998		V
		V <sub>CC</sub> =4.5V, I <sub>OH</sub> =-20μA	4.4	4.499		V
		V <sub>CC</sub> =6V, I <sub>OH</sub> =-20μA	5.9	5.999		V
		V <sub>CC</sub> =4.5V, I <sub>OH</sub> =-4mA	3.98	4.3		V
		V <sub>CC</sub> =6V, I <sub>OH</sub> =-5.2mA	5.48	5.8		V
Low-Level Output Voltage	V <sub>OL</sub>	V <sub>CC</sub> =2V, I <sub>OH</sub> =20μA		0.002	0.1	V
		V <sub>CC</sub> =4.5V, I <sub>OH</sub> =20μA		0.001	0.1	V
		V <sub>CC</sub> =6V, I <sub>OH</sub> =20μA		0.001	0.1	V
		V <sub>CC</sub> =4.5V, I <sub>OH</sub> =4mA		0.17	0.26	V
		V <sub>CC</sub> =6V, I <sub>OH</sub> =5.2mA		0.15	0.26	V
Input Leakage Current	I <sub>I</sub>	V <sub>CC</sub> = 6V, V <sub>I</sub> =V <sub>CC</sub> or GND		±0.1	±100	nA
Quiescent Supply Current	I <sub>CC</sub>	V <sub>CC</sub> = 6V, V <sub>I</sub> = V <sub>CC</sub> or GND I <sub>O</sub> =0			2	μA
Input Capacitance	C <sub>I</sub>	V <sub>CC</sub> =2V to 6V		3	10	pF

■ DYNAMIC CHARACTERISTICS (Input:  $t_R, t_F=6ns, C_L=50pF; PRR\leq 1MHz$ )

See Fig. 2 and Fig. 3 for test circuit and waveforms.

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Propagation delay from input (A) to output(Y)	$t_{PLH}/t_{PHL}$	$V_{CC}=2V$		45	95	ns
		$V_{CC}=4.5V$		9	19	ns
		$V_{CC}=6V$		8	16	ns
Rise/fall time for output(Y)	$t_t$	$V_{CC}=2V$		38	75	ns
		$V_{CC}=4.5V$		8	15	ns
		$V_{CC}=6V$		6	13	ns

■ OPERATING CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Power Dissipation Capacitance	$C_{PD}$	No Load		20		pF

■ TEST CIRCUIT AND WAVEFORMS

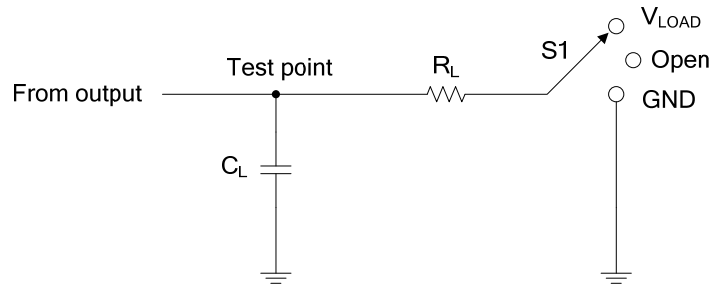
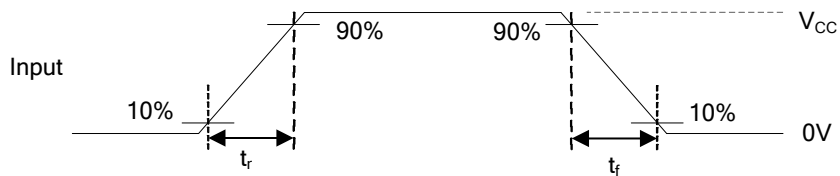


Fig. 2 TEST CIRCUIT

TEST	S1
$t_{PLH}/t_{PHL}$	Open

Inputs		$V_M$	$V_{LOAD}$	$C_L$
$V_{IN}$	$t_r, t_f$			
$V_{CC}$	6 ns	$V_{CC}/2$	$V_{CC}$	50 pF



VOLTAGE WAVEFORMS  
INPUT RISE AND FALL TIMES

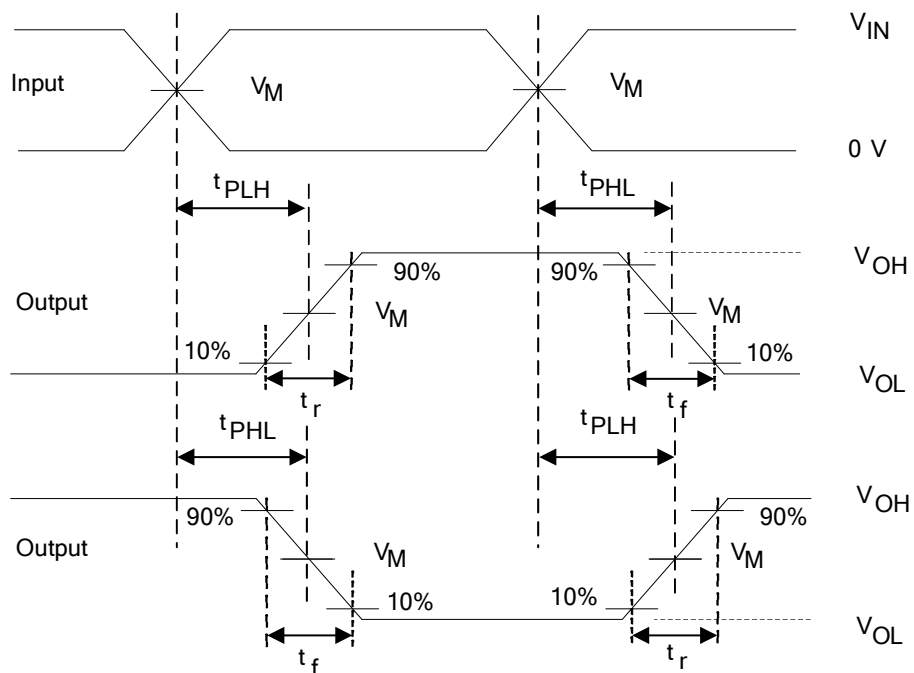


Fig3 VOLTAGE WAVEFORMS  
PROPAGATION DELAY AND OUTPUT TRANSITION TIMES

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