



U74HC04

CMOS IC

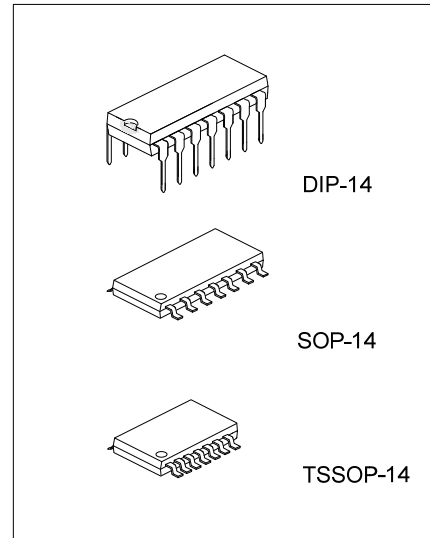
HEX INVERTERS

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_{cc}
- * Typical t_{pd}=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
U74HC04L-S14-R	U74HC04G-S14-R	SOP-14	Tape Reel
U74HC04L-P14-R	U74HC04G-P14-R	TSSOP-14	Tape Reel

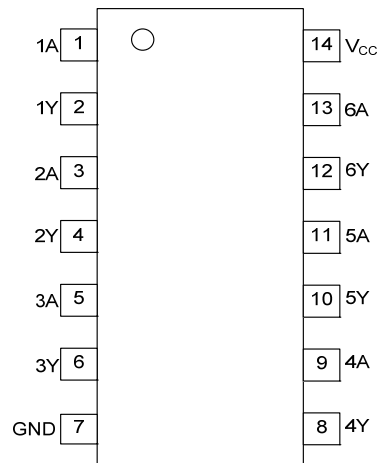
<p>U74HC04G-D14-T</p> <p>(1)Packing Type (2)Package Type (3)Green Package</p>	<p>(1) R: Tape Reel, T: Tube (2) D14: DIP-14, P14: TSSOP-14, S14: SOP-14 (3) G: Halogen Free and Lead Free, L: Lead Free</p>
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MARKING

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



■ PIN CONFIGURATION



■ FUNCTION TABLE (each gate)

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

■ LOGIC DIAGRAM (positive logic)

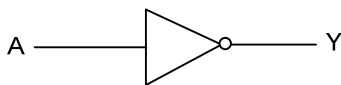


Fig.1 logic diagram for U74HC04

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■ ABSOLUTE MAXIMUM RATING ($T_A = 25^\circ\text{C}$, unless otherwise specified) (Note 2)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V_{CC}	-0.5~7	V
Input Clamp Current($V_I < 0$)	I_{IK}	± 20	mA
Output Clamp Current($V_O < 0$)	I_{OK}	± 20	mA
Output Current	I_{OUT}	± 25	mA
V_{CC} or GND Current	I_{CC}	± 50	mA
Storage Temperature	T_{STG}	-65 ~ +150	$^\circ\text{C}$

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	$^\circ\text{C/W}$
	SOP-14	86	
	TSSOP-14	113	

■ RECOMMENDED OPERATING CONDITIONS ($T_A = 25^\circ\text{C}$, unless otherwise specified)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Supply Voltage	V_{CC}	Operating	2	5	6	V
Input Voltage	V_I		0		V_{CC}	V
Output Voltage	V_O		0		V_{CC}	V
Operating Temperature	T_A		-40		+85	$^\circ\text{C}$
Input transition rise/fall time	$\Delta t/\Delta v$	$V_{CC}=2\text{V}$			1000	ns
		$V_{CC}=4.5\text{V}$			500	
		$V_{CC}=6\text{V}$			400	

■ STATIC CHARACTERISTICS ($T_A = 25^\circ\text{C}$, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Positive-Going Input Threshold Voltage	V_{IH}	$V_{CC}=2\text{V}$	1.5			V
		$V_{CC}=4.5\text{V}$	3.15			
		$V_{CC}=6\text{V}$	4.2			
Negative-Going Input Threshold Voltage	V_{IL}	$V_{CC}=2\text{V}$			0.5	V
		$V_{CC}=4.5\text{V}$			1.35	
		$V_{CC}=6\text{V}$			1.8	
High-Level Output Voltage	V_{OH}	$V_{CC}=2\text{V}, I_{OH}=-20\mu\text{A}$	1.9	1.998		V
		$V_{CC}=4.5\text{V}, I_{OH}=-20\mu\text{A}$	4.4	4.499		V
		$V_{CC}=6\text{V}, I_{OH}=-20\mu\text{A}$	5.9	5.999		V
		$V_{CC}=4.5\text{V}, I_{OH}=-4\text{mA}$	3.98	4.3		V
		$V_{CC}=6\text{V}, I_{OH}=-5.2\text{mA}$	5.48	5.8		V
Low-Level Output Voltage	V_{OL}	$V_{CC}=2\text{V}, I_{OL}=20\mu\text{A}$		0.002	0.1	V
		$V_{CC}=4.5\text{V}, I_{OL}=20\mu\text{A}$		0.001	0.1	V
		$V_{CC}=6\text{V}, I_{OL}=20\mu\text{A}$		0.001	0.1	V
		$V_{CC}=4.5\text{V}, I_{OL}=4\text{mA}$		0.17	0.26	V
		$V_{CC}=6\text{V}, I_{OL}=5.2\text{mA}$		0.15	0.26	V
Input Leakage Current	I_I	$V_{CC}=6\text{V}, V_I=V_{CC}$ or GND		± 0.1	± 100	nA
Quiescent Supply Current	I_{CC}	$V_{CC}=6\text{V}, V_I=V_{CC}$ or GND $I_O=0$			2	μA
Input Capacitance	C_I	$V_{CC}=2\text{V}$ 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

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■ TEST CIRCUIT AND WAVEFORMS

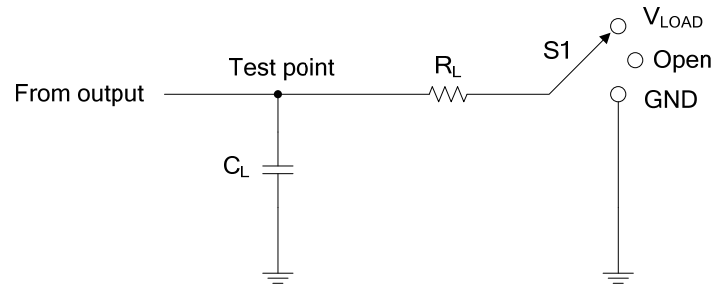
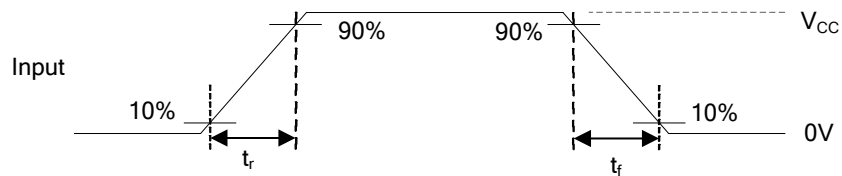


Fig. 2 TEST CIRCUIT

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

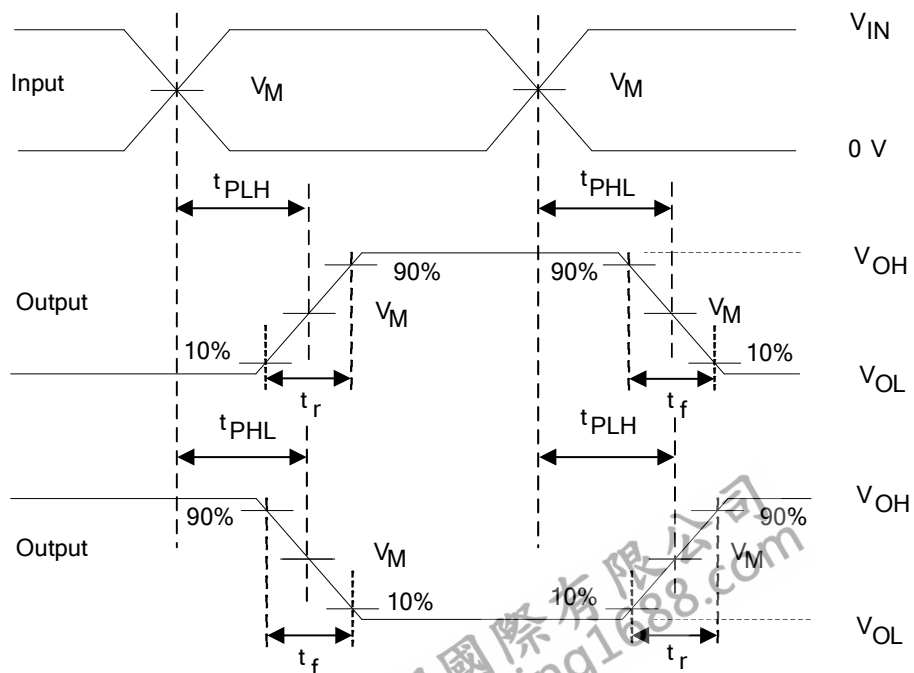


Fig3 VOLTAGE WAVEFORMS
PROPAGATION DELAY AND OUTPUT TRANSITION TIMES

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