

74LS04

DATASHEET

Specification Revision History:

Version	Date	Description
V1.0	2019/11	New
V1.1	2021/08	Modify Ordering Information
V1.2	2025/02	Modify Ordering Information
V1.3	2025/03	Add application precautions and overall typesetting.

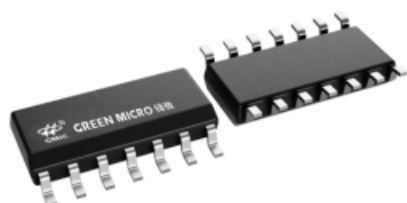
Description

The 74LS04 devices contain six independent inverters. They perform the Boolean function $Y = \overline{A}$ in positive logic.

FEATURES

- Wide operating voltage range of 2V to 6V
- Low power consumption, 2μA max. ICC
- Typical $t_{PD} = 8ns$
- $\pm 4mA$ Output drive at 4.5V
- Low input current of 100nA max

The appearance of the product

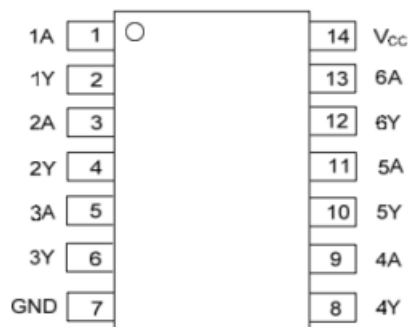


SOP-14

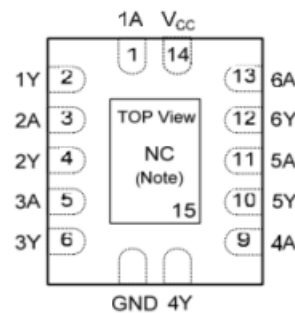
Ordering Information

Product Model	Package Type	Marking	Packing	Packing Qty
SN74LS04DS	SOP-14	74LS04 321	REEL	4000PCS/REEL

PIN CONFIGURATION



SOP-14 / TSSOP-14



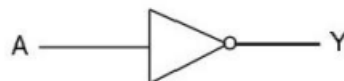
QFN-14(2.5x3.0)

Note: No connect.

FUNCTION TABLE(each gate)

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

LOGIC DIAGRAM(positive logic)



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	I_{IK}	± 20	mA
Output Clamp Current	I_{OK}	± 20	mA
Output Current	I_{OUT}	± 25	mA
VCC 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	θ_{JA}	80	°C/W
	SOP-14U		125	°C/W
	TSSOP-14U		150	°C/W
	QFN-14(2.5 × 3.0)		130	°C/W

RECOMMENDED OPERATING COMDITIONS ($T_A = 25^\circ\text{C}$, 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
Input transition rise/fall time	$\Delta t / \Delta v$	$V_{CC} = 2V$	-	-	1000	ns
		$V_{CC} = 4.5V$	-	-	500	ns
		$V_{CC} = 6V$	-	-	400	ns
Operating Temperature	T_A	-	-40	-	+125	°C

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

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
High-Level Input Voltage	V_{IH}	$V_{CC} = 2V$	1.5	-	-	V
		$V_{CC} = 4.5V$	3.15	-	-	V
		$V_{CC} = 6V$	4.2	-	-	V
Low-Level Input Voltage	V_{IL}	$V_{CC} = 2V$	-	-	0.5	V
		$V_{CC} = 4.5V$	-	-	1.35	V
		$V_{CC} = 6V$	-	-	1.8	V
High-Level Output Voltage	V_{OH}	$V_{CC} = 2V, I_{OH} = -20\mu A$	1.9	1.998	-	V
		$V_{CC} = 4.5V, I_{OH} = -20\mu A$	4.4	4.499	-	V
		$V_{CC} = 6V, I_{OH} = -20\mu A$	5.9	5.999	-	V
		$V_{CC} = 4.5V, I_{OH} = -4mA$	3.98	4.3	-	V
		$V_{CC} = 6V, I_{OH} = -5.2mA$	5.48	5.8	-	V
Low-Level Output Voltage	V_{OL}	$V_{CC} = 2V, I_{OL} = 20\mu A$	-	0.002	0.1	V
		$V_{CC} = 4.5V, I_{OL} = 20\mu A$	-	0.001	0.1	V
		$V_{CC} = 6V, I_{OL} = 20\mu A$	-	0.001	0.1	V
		$V_{CC} = 4.5V, I_{OL} = 4mA$	-	0.17	0.26	V
		$V_{CC} = 6V, I_{OL} = 5.2mA$	-	0.15	0.26	V
Input Leakage Current	I_I	$V_{CC} = 6V, V_I = V_{CC}$ or GND	-	± 0.1	± 100	nA
Quiescent Supply Current	I_{CC}	$V_{CC} = 6V, V_I = V_{CC}$ or GND $I_O = 0$	-	-	2	μA
Input Capacitance	C_I	$V_{CC} = 2V$ to $6V$	-	3	10	pF

DYNAMIC CHARACTERISTICS (Input: $t_R, t_F=6\text{ns}$, $C_L=50\text{pF}$; $P_{RR}\leq 1\text{MHz}$)

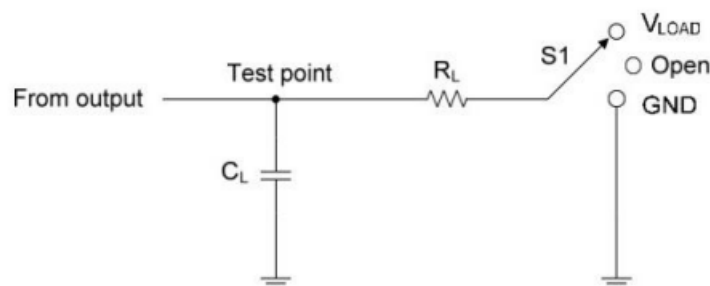
See Fig. 1 and Fig. 2 for test circuit and waveforms.

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



TEST CIRCUIT

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

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

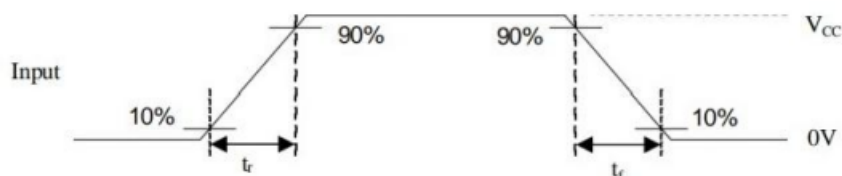


Fig1.VOLTAGEWAVEFORMS INPUT RISE AND FALL TIMES

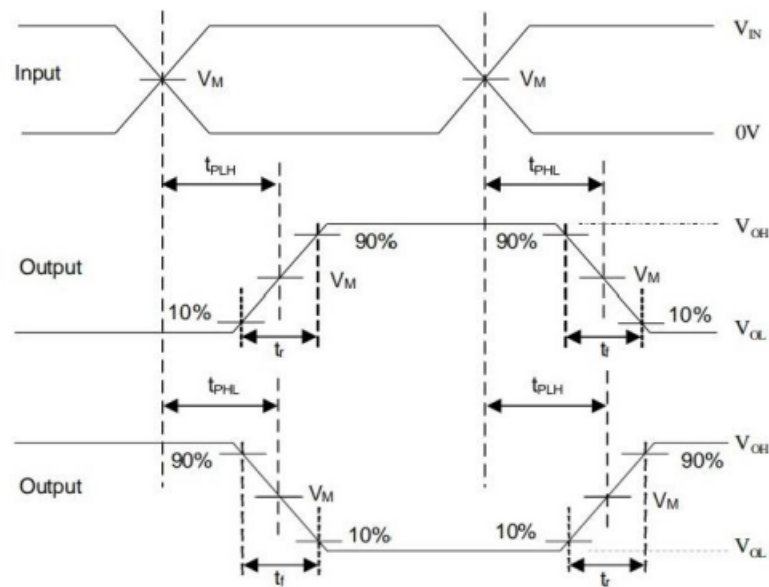
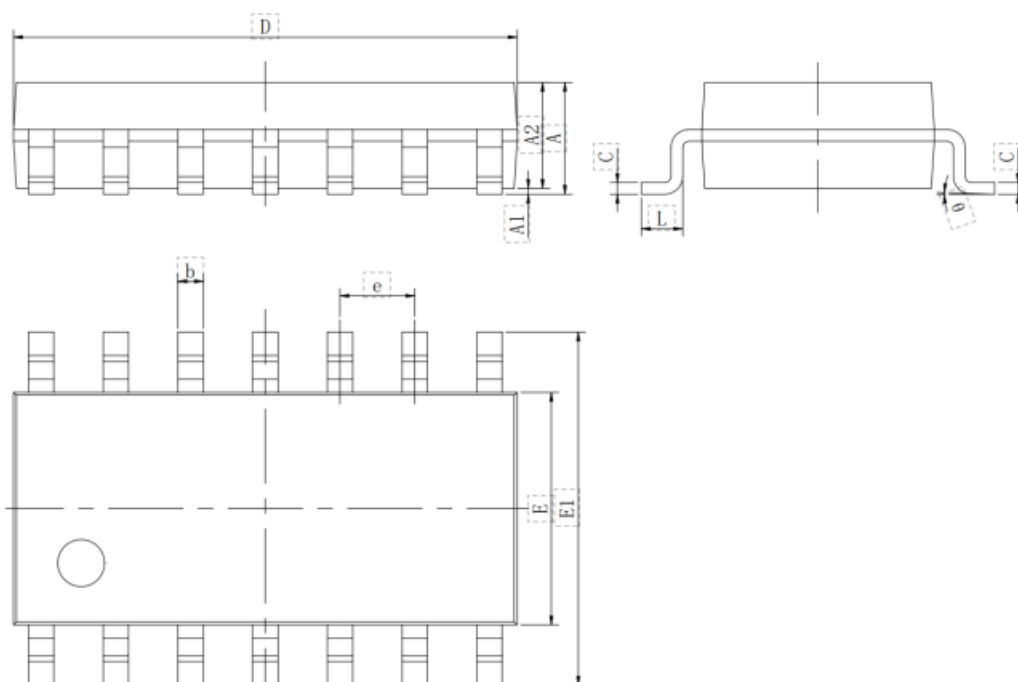


Fig 2.VOLTAGE WAVEFORMS
PROPAGATION DELAY AND OUTPUT TRANSITION TIMES

Outline Dimensions

SOP-14

Unit : mm



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.007	0.010
D	8.360	8.760	0.329	0.345
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270 (BSC)		0.050 (BSC)	
L	0.400	1.270	0.016	0.050
θ	0 °	8 °	0 °	8 °

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