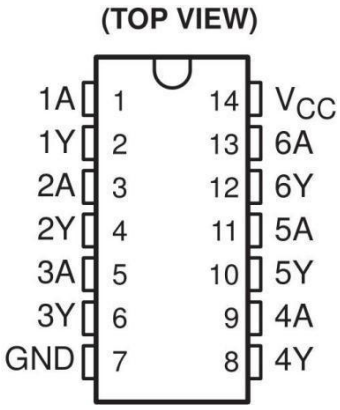
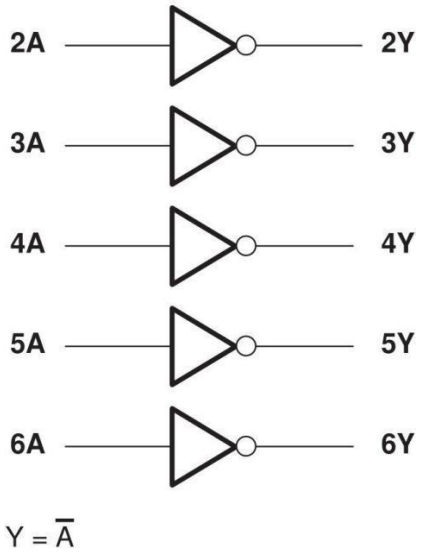
1. DESCRIPTION

These devices contain six independent inverters.

2. PIN CONFIGURATIONS

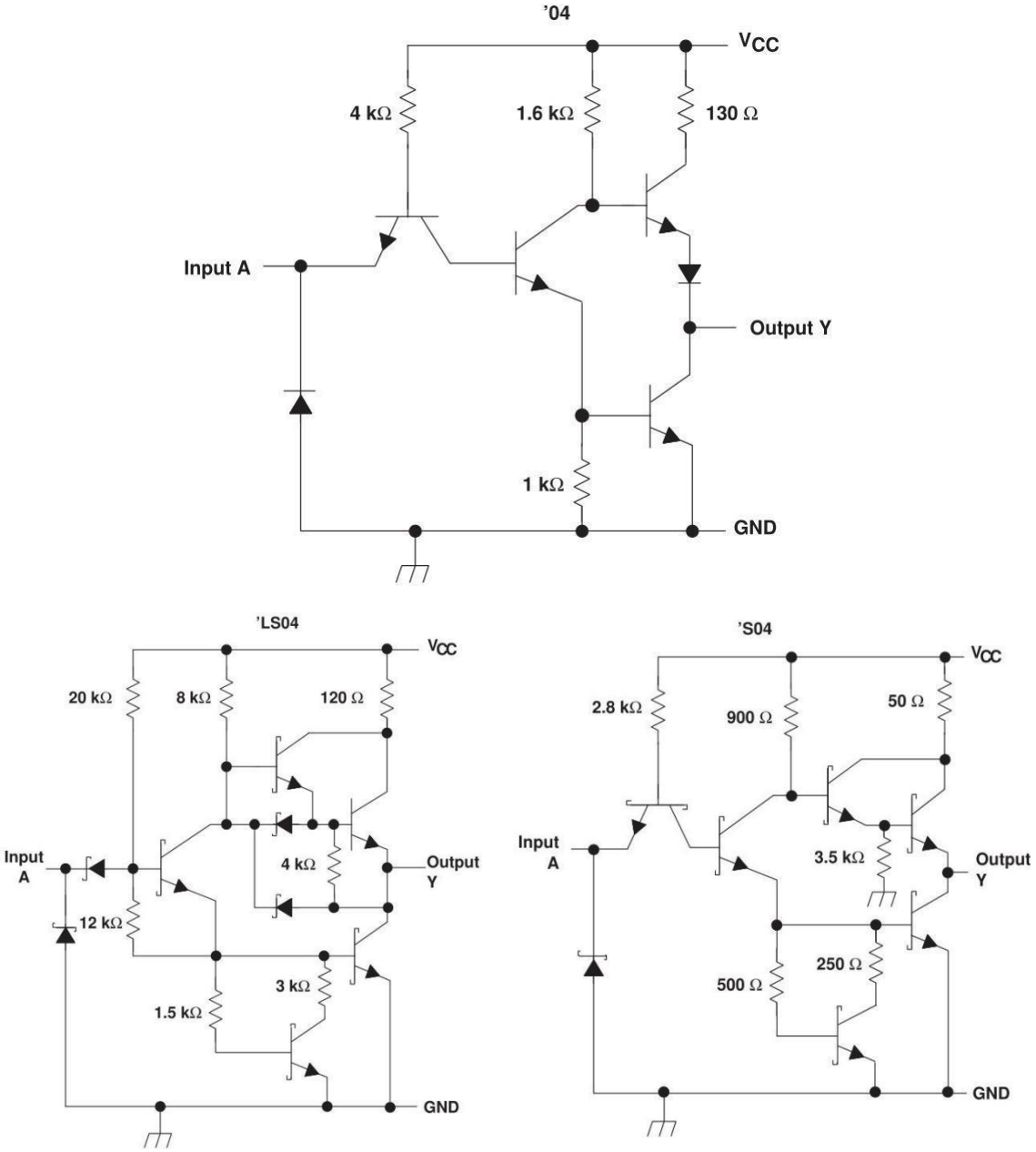


3. LOGIC DIAGRAM



$Y = \overline{A}$

4. SCHEMATICS (each gate)



Resistor values shown are nominal.

5. ABSOLUTE MAXIMUM RATINGS OVER OPERATING FREE-AIR TEMPERATURE RANGE (UNLESS OTHERWISE NOTES)

Supply voltage, V_{CC} (see Note 1)..... V

Input voltage, VI: 74LS04..... V

Package thermal impedance, JA (see Note 2): S O P package..... 86°C/W

D I P package..... 80°C/W

Storage temperature range, Tstg.....−65°C to 150°C

6. RECOMMENDED OPERATING CONDITIONS (SEE NOTE 3)

		XL/XD74LS04			UNIT
		MIN	NOM	MAX	
V_{CC}	Supply voltage	4.75	5	5.25	V
V_{IH}	High-level input voltage	2			V
V_{IL}	Low-level input voltage			0.8	V
I_{OH}	High-level output current			−0.4	mA
I_{OL}	Low-level output current			8	mA
TA	Operating free-air temperature	0		70	°C

7. ELECTRICAL CHARACTERISTICS OVER RECOMMENDED OPERATING FREE-AIR RANGE (UNLESS OTHERWISE NOTED)

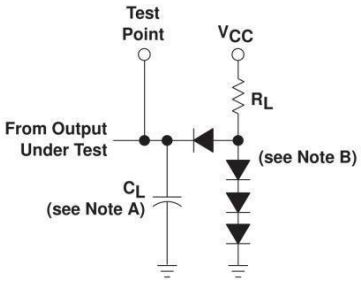
PARAMETER	TEST CONDITIONS†			XL/XD74LS04			UNIT
				MIN	TYP‡	MAX	
V_{IK}	V_{CC} = MIN,	I_I = −18 mA				−1.5	V
V_{OH}	V_{CC} = MIN,	V_{IL} = MAX,	I_{OH} = −0.4 mA	2.7	3.4		V
V_{OL}	V_{CC} = MIN,	V_{IH} = 2 V	I_{OL} = 4 mA			0.4	V
			I_{OL} = 8 mA		0.25	0.5	
I_I	V_{CC} = MAX,	V_I = 7 V				0.1	mA
I_{IH}	V_{CC} = MAX,	V_I = 2.7 V				20	µA
I_{IL}	V_{CC} = MAX,	V_I = 0.4 V				−0.4	mA
I_{OS}§	V_{CC} = MAX			−20		−100	mA
I_{CCH}	V_{CC} = MAX,	V_I = 0 V			1.2	2.4	mA
I_{CCL}	V_{CC} = MAX,	V_I = 4.5 V			3.6	6.6	mA

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.
‡ All typical values are at VCC = 5 V, TA = 25°C.
§ Not more than one output should be shorted at a time, and the duration of the short-circuit should not exceed one second.

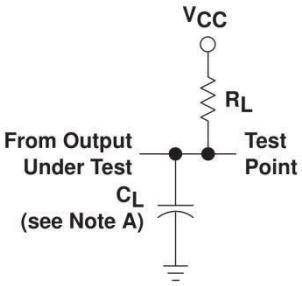
8. SWITCHING CHARACTERISTICS, V_{CC} = 5 V, T_A = 25°C (see Figure 2)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS		XL/XD74LS04			UNIT
					MIN	TYP	MAX	
t_{PHL}	A	Y	R_L = 2 kΩ,	C_L = 15 pF		10	15	ns

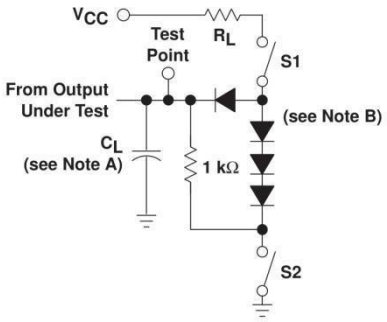
9. PARAMETER MEASUREMENT INFORMATION



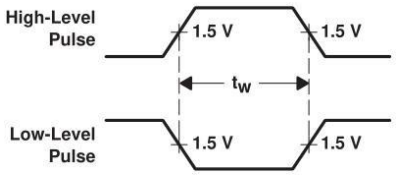
LOAD CIRCUIT
FOR 2-STATE TOTEM-POLE OUTPUTS



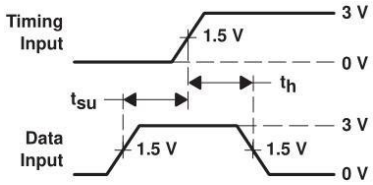
LOAD CIRCUIT
FOR OPEN-COLLECTOR OUTPUTS



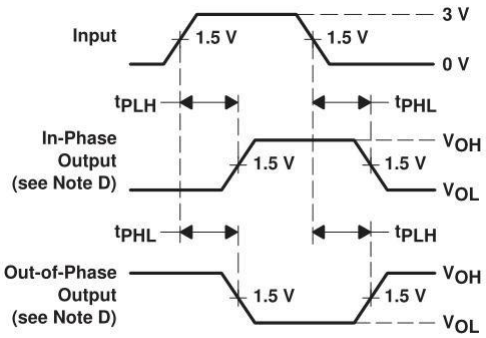
LOAD CIRCUIT
FOR 3-STATE OUTPUTS



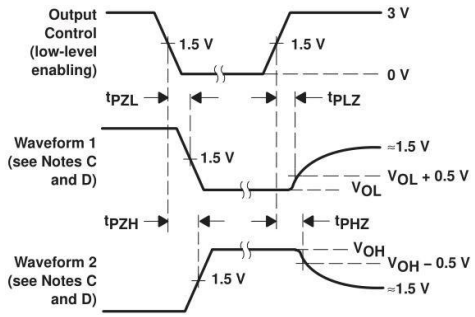
VOLTAGE WAVEFORMS
PULSE DURATIONS



VOLTAGE WAVEFORMS
SETUP AND HOLD TIMES



VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES



VOLTAGE WAVEFORMS
ENABLE AND DISABLE TIMES, 3-STATE OUTPUTS

NOTES:

A. CL includes probe and jig capacitance.

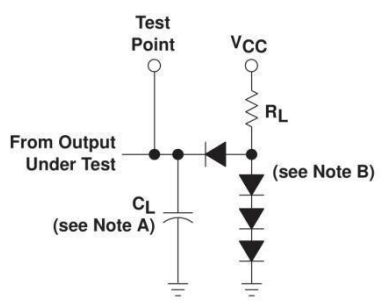
B. Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control.

Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.

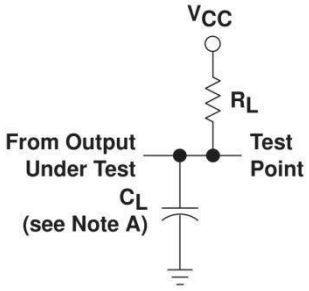
C. S1 and S2 are closed for tPLH, tPHL, tPHZ, and tPLZ; S1 is open and S2 is closed for tPZH; S1 is closed and S2 is open for tPZL.

D. All input pulses are supplied by generators having the following characteristics: PRR ≤ 1 MHz, ZO ≈ 50 Ω; tr and tf ≤ 7 ns for Series 74 devices and tr and tf ≤ 2.5 ns for Series 74 devices.

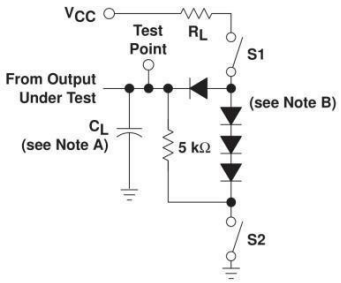
E. The outputs are measured one at a time, with one input transition per measurement.



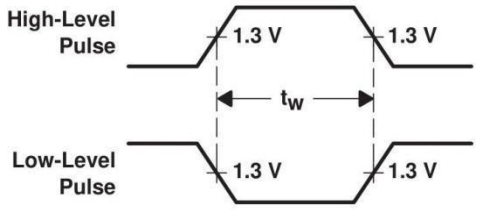
LOAD CIRCUIT
FOR 2-STATE TOTEM-POLE OUTPUTS



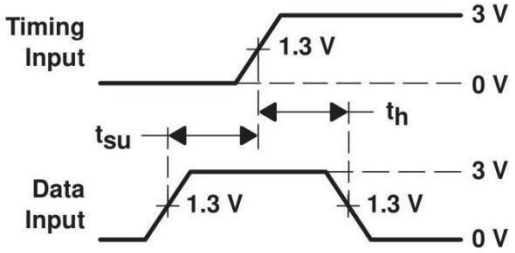
LOAD CIRCUIT
FOR OPEN-COLLECTOR OUTPUTS



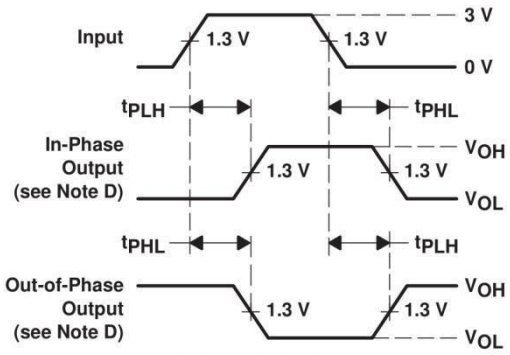
LOAD CIRCUIT
FOR 3-STATE OUTPUTS



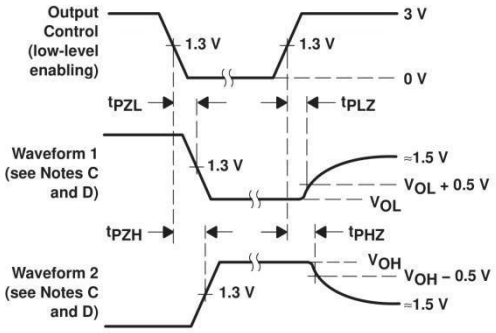
VOLTAGE WAVEFORMS
PULSE DURATIONS



VOLTAGE WAVEFORMS
SETUP AND HOLD TIMES



VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES



VOLTAGE WAVEFORMS
ENABLE AND DISABLE TIMES, 3-STATE OUTPUTS

NOTES:

A. C_L includes probe and jig capacitance.

B. Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.

C. S1 and S2 are closed for tPLH, tPHL, tPHZ, and tPLZ; S1 is open and S2 is closed for tPZH; S1 is closed and S2 is open for tPZL.

D. Phase relationships between inputs and outputs have been chosen arbitrarily for these examples.

E. All input pulses are supplied by generators having the following characteristics: PRR ≤ 1 MHz, ZO ≈ 50 Ω, tr ≤ 1.5 ns, tf ≤ 2.6 ns.

F. The outputs are measured one at a time, with one input transition per measurement.

10. ORDERING INFORMATION

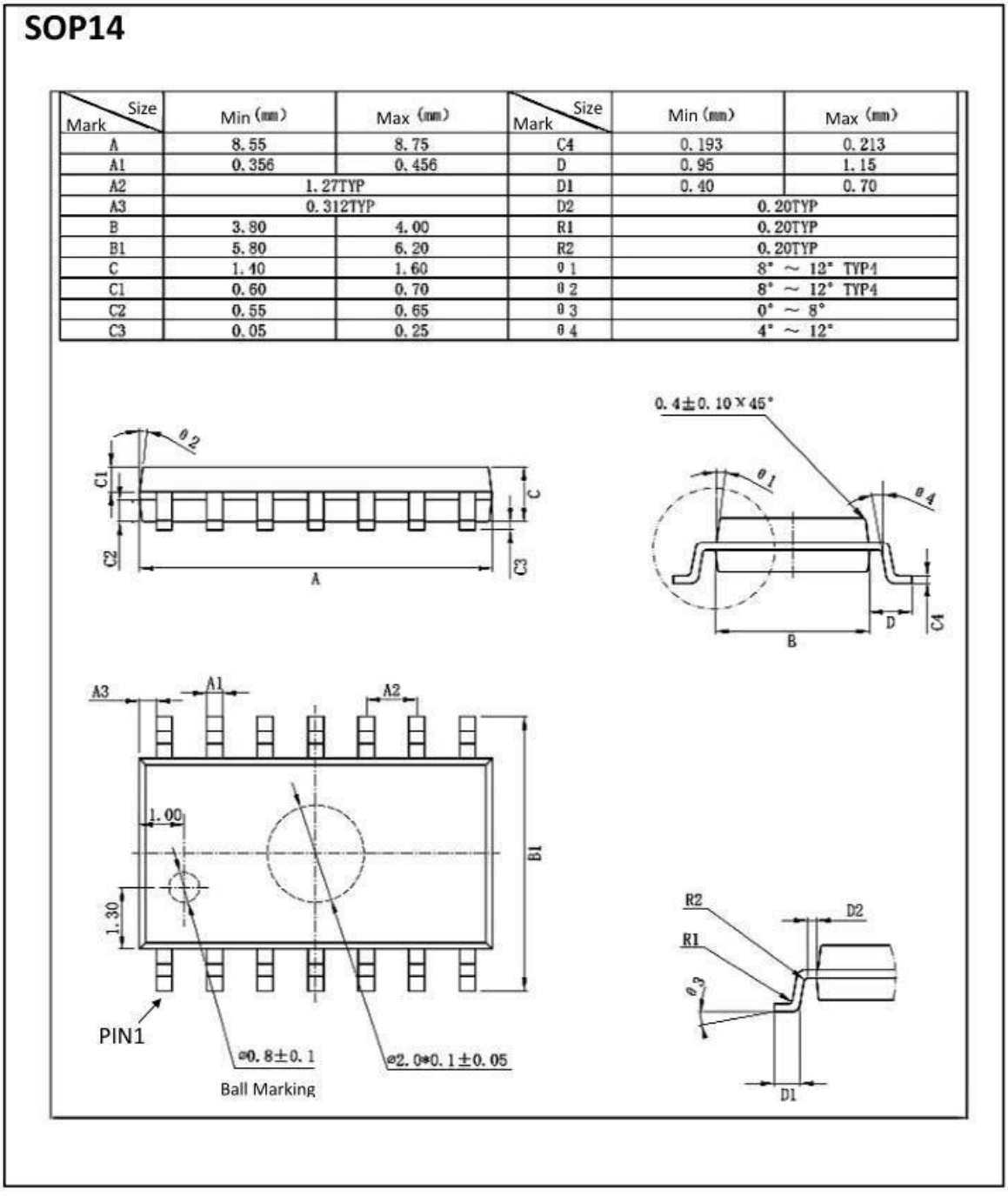
Ordering Information

Part Number	Device Marking	Package Type	Body size (mm)	Temperature (°C)	MSL	Transport Media	Package Quantity
XL74LS04	XL74LS04	SOP14	8.75 * 4.00	-40 to 85	MSL3	T&R	2500
XD74LS04	XD74LS04	DIP14	19.05 * 6.35	-40 to 85	MSL3	Tube 25	1000

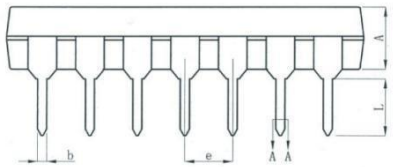
11. DIMENSIONAL DRAWINGS

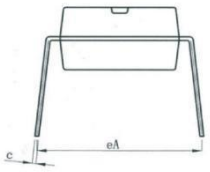
SOP14

Size / Mark	Min (mm)	Max (mm)	Size / Mark	Min (mm)	Max (mm)
A	8.55	8.75	C4	0.193	0.213
A1	0.356	0.456	D	0.95	1.15
A2	1.27TYP		D1	0.40	0.70
A3	0.312TYP		D2	0.20TYP	
B	3.80	4.00	R1	0.20TYP	
B1	5.80	6.20	R2	0.20TYP	
C	1.40	1.60	θ1	8° ~ 12° TYP4	
C1	0.60	0.70	θ2	8° ~ 12° TYP4	
C2	0.55	0.65	θ3	0° ~ 8°	
C3	0.05	0.25	θ4	4° ~ 12°	

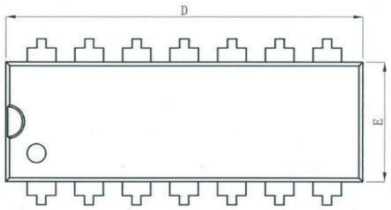


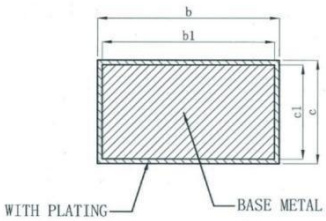
DIP14





symbol	millimeter		
	Min	Nom	Max
A	3.20	3.30	3.40
b	0.44	——	0.53
b1	0.43	0.46	0.49
c	0.25	——	0.30
c1	0.24	0.25	0.26
D	18.95	19.05	19.15
E	6.25	6.35	6.45
e	2.54BSC		
eA	8.30	8.80	9.30
L	3.00	——	——





SECTION A-A