

## 7433, LS33 Buffers

Quad Two-Input NOR Buffer (Open Collector)  
*Product Specification*

Logic Products

TYPE	TYPICAL PROPAGATION DELAY	TYPICAL SUPPLY CURRENT (TOTAL)
7433	11ns	23mA
74LS33	19ns	4mA

### ORDERING CODE

PACKAGES	COMMERCIAL RANGE $V_{CC} = 5V \pm 5\%$ ; $T_A = 0^\circ C$ to $+70^\circ C$
Plastic DIP	N7433N, N74LS33N

**NOTE:**

For information regarding devices processed to Military Specifications, see the Signetics Military Products Data Manual.

### FUNCTION TABLE

INPUTS		OUTPUT
A	B	Y
L	L	H
L	H	L
H	L	L
H	H	L

H = HIGH voltage level  
L = LOW voltage level

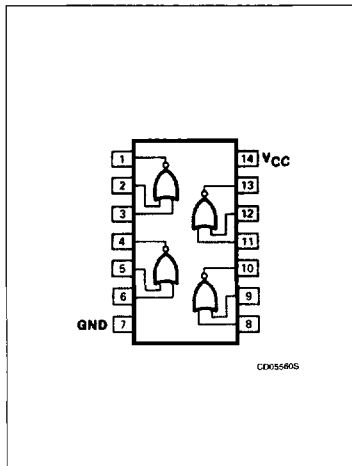
### INPUT AND OUTPUT LOADING AND FAN-OUT TABLE

PINS	DESCRIPTION	74	74LS
A, B	Inputs	1ul	1LSul
Y	Output	30ul	10LSul

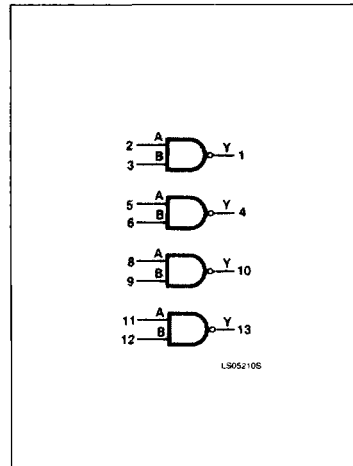
**NOTE:**

Where a 74 unit load (ul) is understood to be  $40\mu A$   $I_{IH}$  and  $-1.6mA$   $I_{IL}$ , a 74LS unit load (LSul) is  $20\mu A$   $I_{IH}$  and  $-0.4mA$   $I_{IL}$ .

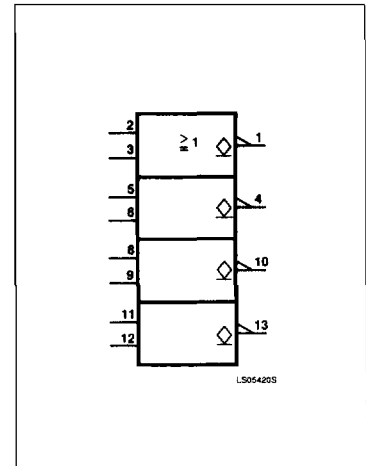
### PIN CONFIGURATION



### LOGIC SYMBOL



### LOGIC SYMBOL (IEEE/IEC)



# Buffers

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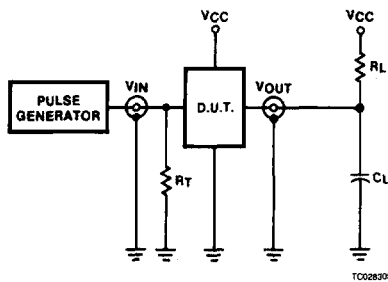
### ABSOLUTE MAXIMUM RATINGS (Over operating free-air temperature range unless otherwise noted.)

PARAMETER		74	74LS	UNIT
V <sub>CC</sub>	Supply voltage	7.0	7.0	V
V <sub>IN</sub>	Input voltage	-0.5 to +5.5	-0.5 to +7.0	V
I <sub>IN</sub>	Input current	-30 to +5	-30 to +1	mA
V <sub>OUT</sub>	Voltage applied to output in HIGH output state	-0.5 to +V <sub>CC</sub>	-0.5 to +V <sub>CC</sub>	V
T <sub>A</sub>	Operating free-air temperature range	0 to 70		°C

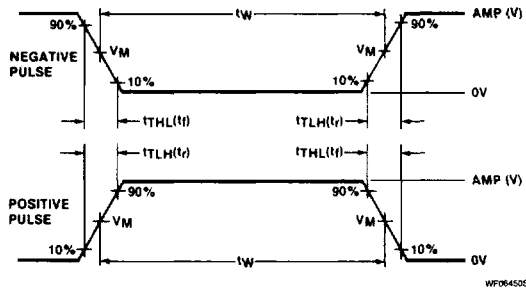
### RECOMMENDED OPERATING CONDITIONS

PARAMETER	74			74LS			UNIT
	Min	Nom	Max	Min	Nom	Max	
V <sub>CC</sub>	4.75	5.0	5.25	4.75	5.0	5.25	V
V <sub>IH</sub>	2.0			2.0			V
V <sub>IL</sub>			+0.8			+0.8	V
I <sub>IK</sub>			-12			-18	mA
V <sub>OH</sub>			5.5			5.5	V
I <sub>OL</sub>			48			24	mA
T <sub>A</sub>	0		70	0		70	°C

### TEST CIRCUITS AND WAVEFORMS



**Test Circuit For 74  
Open Collector Outputs**



V<sub>M</sub> = 1.3V for 74LS; V<sub>M</sub> = 1.5V for all other TTL families.

**Input Pulse Definition**

#### DEFINITIONS

R<sub>L</sub> = Load resistor to V<sub>CC</sub>; see AC CHARACTERISTICS for value.  
 C<sub>L</sub> = Load capacitance includes jig and probe capacitance; see AC CHARACTERISTICS for value.  
 R<sub>T</sub> = Termination resistance should be equal to Z<sub>OUT</sub> of Pulse Generators.  
 t<sub>TLH</sub>, t<sub>THL</sub> Values should be less than or equal to the table entries.

FAMILY	INPUT PULSE REQUIREMENTS				
	Amplitude	Rep. Rate	Pulse Width	t <sub>TLH</sub>	t <sub>THL</sub>
74	3.0V	1MHz	500ns	7ns	7ns
74LS	3.0V	1MHz	500ns	15ns	6ns
74S	3.0V	1MHz	500ns	2.5ns	2.5ns

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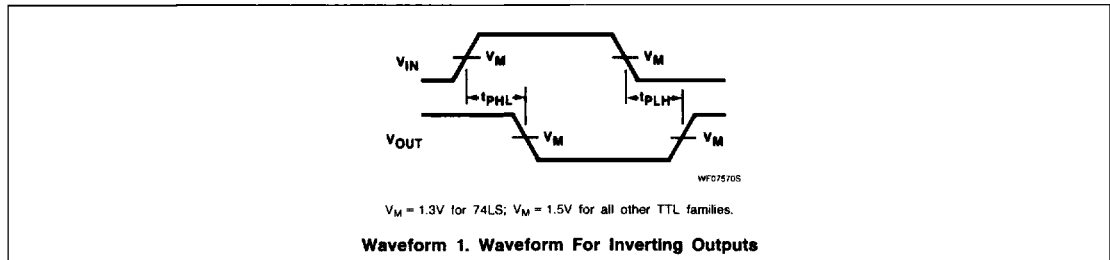
## DC ELECTRICAL CHARACTERISTICS (Over recommended operating free-air temperature range unless otherwise noted.)

PARAMETER	TEST CONDITIONS <sup>1</sup>	7433			74LS33			UNIT
		Min	Typ <sup>2</sup>	Max	Min	Typ <sup>2</sup>	Max	
I <sub>OH</sub>	HIGH-level output current V <sub>CC</sub> = MIN, V <sub>IL</sub> = MAX, V <sub>OH</sub> = 5.5V*			250			250	μA
V <sub>OL</sub>	LOW-level output voltage V <sub>CC</sub> = MIN, V <sub>IH</sub> = MIN	I <sub>OL</sub> = MAX		0.2	0.4	0.35	0.5	V
		I <sub>OL</sub> = 12mA (74LS)				0.25	0.4	V
V <sub>IK</sub>	Input clamp voltage V <sub>CC</sub> = MIN, I <sub>I</sub> = I <sub>IK</sub>			-1.5			-1.5	V
I <sub>I</sub>	Input current at maximum input voltage V <sub>CC</sub> = MAX	V <sub>I</sub> = 5.5V		1.0				mA
		V <sub>I</sub> = 7.0V					0.1	mA
I <sub>IH</sub>	HIGH-level input current V <sub>CC</sub> = MAX	V <sub>I</sub> = 2.4V		40				μA
		V <sub>I</sub> = 2.7V					20	μA
I <sub>IL</sub>	LOW-level input current V <sub>CC</sub> = MAX, V <sub>I</sub> = 0.4V			-1.6			-0.4	mA
I <sub>CC</sub>	Supply current (total) V <sub>CC</sub> = MAX	I <sub>CCH</sub> Outputs HIGH		12	21	1.8	3.6	mA
		I <sub>CCL</sub> Outputs LOW		33	57	6.9	13.8	mA

**NOTES:**

- For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions for the applicable type.
- All typical values are at V<sub>CC</sub> = 5V, T<sub>A</sub> = 25°C.

## AC WAVEFORM



## AC ELECTRICAL CHARACTERISTICS T<sub>A</sub> = 25°C, V<sub>CC</sub> = 5.0V

PARAMETER	TEST CONDITIONS	74		74LS		UNIT
		R <sub>L</sub> = 133Ω		C <sub>L</sub> = 45pF, R <sub>L</sub> = 667Ω		
		Min	Max	Min	Max	
t <sub>PLH</sub> t <sub>PHL</sub>	C <sub>L</sub> = 50pF for 7433 Waveform 1		15 18		32 28	ns
t <sub>PLH</sub> t <sub>PHL</sub>	C <sub>L</sub> = 150pF for 7433 Waveform 1		22 24			ns