

## 74LS540, 74LS541 Buffers/Drivers

Octal Buffer/Line Driver (3-State)  
Product Specification

TYPE	TYPICAL PROPAGATION DELAY	TYPICAL SUPPLY CURRENT (TOTAL)
74LS540	9ns	22mA
74LS541	10ns	23mA

### FUNCTION TABLE

INPUTS			OUTPUTS	
$\overline{OE}_1$	$\overline{OE}_2$	I	Y	$\overline{Y}$
L	L	L	L	H
L	L	H	H	L
X	H	X	(Z)	(Z)
H	X	X	(Z)	(Z)

### ORDERING CODE

PACKAGES	COMMERCIAL RANGE $V_{CC} = 5V \pm 5\%$ ; $T_A = 0^\circ C$ to $+70^\circ C$
Plastic DIP	N74LS540N, N74LS541N
Plastic SOL-20	N74LS540D, N74LS541D

**NOTE:**

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

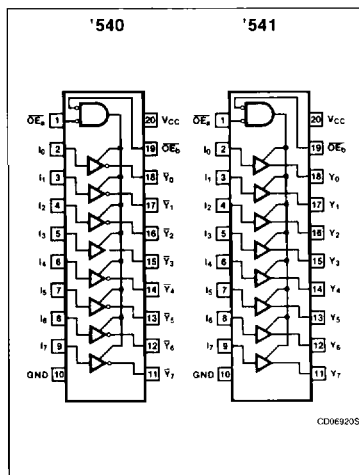
### INPUT AND OUTPUT LOADING AND FAN-OUT TABLE

PINS	DESCRIPTION	74LS
All	Inputs	1LSul
All	Outputs	30LSul

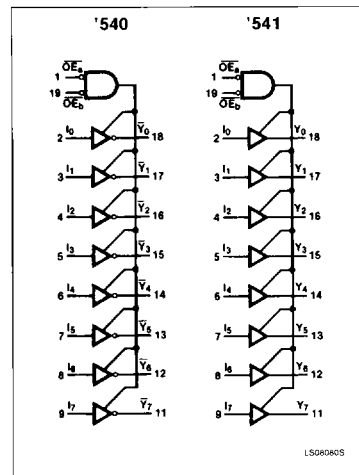
**NOTE:**

A 74LS unit load (LSul) is  $20\mu A$   $I_{IH}$  and  $-0.4mA$   $I_{IL}$ .

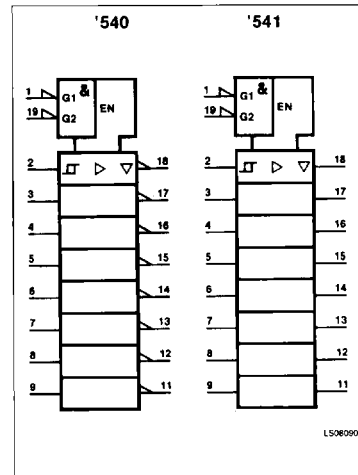
### PIN CONFIGURATION



### LOGIC SYMBOL



### LOGIC SYMBOL (IEEE/IEC)



## Buffers/Drivers

## 74LS540, 74LS541

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

PARAMETER		74LS	UNIT
V <sub>CC</sub>	Supply voltage	7.0	V
V <sub>IN</sub>	Input voltage	-0.5 to +7.0	V
I <sub>IN</sub>	Input current	-30 to +1	mA
V <sub>OUT</sub>	Voltage applied to output in HIGH output state	-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		74LS			UNIT
		Min	Nom	Max	
V <sub>CC</sub>	Supply voltage	4.75	5.0	5.25	V
V <sub>IH</sub>	HIGH-level input voltage	2.0			V
V <sub>IL</sub>	LOW-level input voltage			+0.8	V
I <sub>IK</sub>	Input clamp current			-18	mA
I <sub>OH</sub>	HIGH-level output current			-15	mA
I <sub>OL</sub>	LOW-level output current			24	mA
T <sub>A</sub>	Operating free-air temperature	0		70	°C

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

PARAMETER	TEST CONDITIONS <sup>1</sup>	74LS540, 541			UNIT	
		Min	Typ <sup>2</sup>	Max		
ΔV <sub>T</sub>	Hysteresis (V <sub>T+</sub> - V <sub>T-</sub> )	V <sub>CC</sub> = MIN	0.2	0.4	V	
V <sub>OH</sub>	HIGH-level output voltage	V <sub>CC</sub> = MIN, V <sub>IH</sub> = MIN, V <sub>IL</sub> = 0.5V, I <sub>OH</sub> = MAX	2.0		V	
		V <sub>CC</sub> = MIN, V <sub>IH</sub> = MIN, V <sub>IL</sub> = MAX, I <sub>OH</sub> = -3mA	2.4	3.4	V	
V <sub>OL</sub>	LOW-level output voltage	V <sub>CC</sub> = MIN, V <sub>IH</sub> = MIN, V <sub>IL</sub> = MAX		0.35	0.5	V
		I <sub>OL</sub> = MAX 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	V
I <sub>OZH</sub>	Off-state output current, HIGH-level voltage applied	V <sub>CC</sub> = MAX, V <sub>IH</sub> = MIN, V <sub>IL</sub> = MAX, V <sub>O</sub> = 2.7V			20	μA
I <sub>OZL</sub>	Off-state output current, LOW-level voltage applied	V <sub>CC</sub> = MAX, V <sub>IH</sub> = MIN, V <sub>IL</sub> = MAX, V <sub>O</sub> = 0.4V			-20	μA
I <sub>I</sub>	Input current at maximum input voltage	V <sub>CC</sub> = MAX, 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> = 2.7V			20	μA
I <sub>IL</sub>	LOW-level input current	V <sub>CC</sub> = MAX, V <sub>I</sub> = 0.4V			-0.2	mA
I <sub>OS</sub>	Short-circuit output current <sup>3</sup>	V <sub>CC</sub> = MAX	-40		-130	mA
I <sub>CC</sub>	Supply current (total)	V <sub>CC</sub> = MAX	I <sub>CCH</sub> Outputs HIGH	16	25	mA
			I <sub>CCL</sub> Outputs LOW	27	45	mA
			I <sub>CCZ</sub> Outputs OFF	31	52	mA

**NOTES:**

1. For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions for the applicable type.

2. All typical values are at V<sub>CC</sub> = 5V, T<sub>A</sub> = 25°C.

3. I<sub>OS</sub> is tested with V<sub>OUT</sub> = +0.5V and V<sub>CC</sub> = V<sub>CC</sub> MAX + 0.5V. Not more than one output should be shorted at a time and duration of the short circuit should not exceed one second.

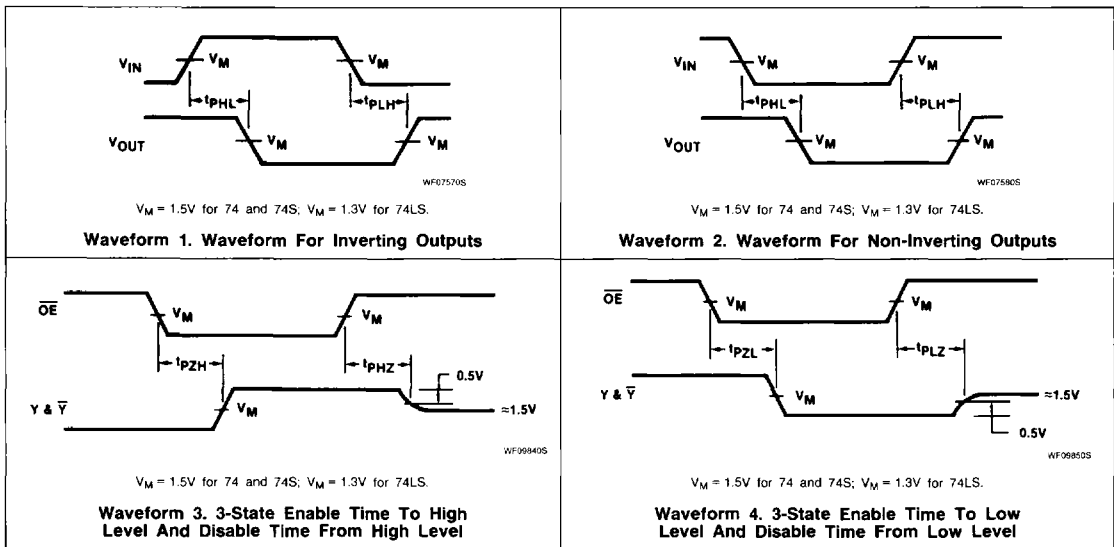
Buffers/Drivers

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AC ELECTRICAL CHARACTERISTICS  $T_A = 25^\circ\text{C}$ ,  $V_{CC} = 5.0\text{V}$

PARAMETER	TEST CONDITIONS	74LS540		74LS541		UNIT
		$C_L = 45\text{pF}$ , $R_L = 667\Omega$		$C_L = 45\text{pF}$ , $R_L = 667\Omega$		
		Min	Max	Min	Max	
$t_{PLH}$ $t_{PHL}$ Propagation delay	Waveforms 1 & 2		15 15		15 18	ns
$t_{PZH}$ Output enable time to HIGH level	Waveform 3		25		32	ns
$t_{PZL}$ Output enable time to LOW level	Waveform 4		38		38	ns
$t_{PHZ}$ Output disable time from HIGH level	Waveform 3, $C_L = 5\text{pF}$		18		18	ns
$t_{PLZ}$ Output disable time from LOW level	Waveform 4, $C_L = 5\text{pF}$		25		29	ns

AC WAVEFORMS

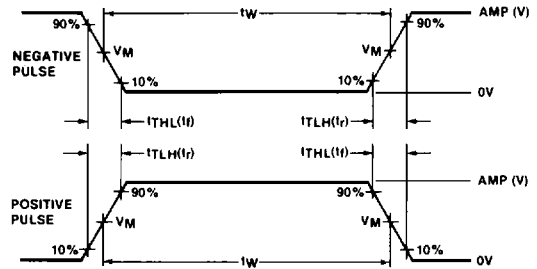
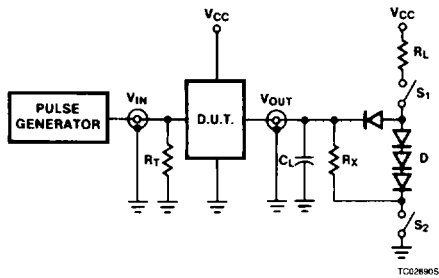


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## TEST CIRCUITS AND WAVEFORMS



$V_M = 1.3V$  for 74LS,  $V_M = 1.5V$  for all other TTL families.

Test Circuit For 3-State Outputs

Input Pulse Definition

### SWITCH POSITION

TEST	SWITCH 1	SWITCH 2
$t_{PZH}$	Open	Closed
$t_{PZL}$	Closed	Open
$t_{PHZ}$	Closed	Closed
$t_{PLZ}$	Closed	Closed

FAMILY	INPUT PULSE REQUIREMENTS				
	Amplitude	Rep. Rate	Pulse Width	$t_{TLH}$	$t_{THL}$
74	3.0V	1MHz	500ns	7ns	7ns
74LS	3.0V	1MHz	500ns	15ns	6ns
74S	3.0V	1MHz	500ns	2.5ns	2.5ns

### DEFINITIONS

$R_L$  = Load resistor to  $V_{CC}$ ; see AC CHARACTERISTICS for value.

$C_L$  = Load capacitance includes jig and probe capacitance; see AC CHARACTERISTICS for value.

$R_T$  = Termination resistance should be equal to  $Z_{OUT}$  of Pulse Generators.

D = Diodes are 1N916, 1N3064, or equivalent.

$R_X = 1k\Omega$  for 74, 74S,  $R_X = 5k\Omega$  for 74LS.

$t_{TLH}$ ,  $t_{THL}$  Values should be less than or equal to the table entries.