

# SN54ALS244C, SN54AS244A, SN74ALS244C, SN74AS244A OCTAL BUFFERS AND LINE DRIVERS WITH 3-STATE OUTPUTS

SDAS142C – JULY 1987 – REVISED AUGUST 1995

- 3-State Outputs Drive Bus Lines or Buffer Memory Address Registers
- pnp Inputs Reduce dc Loading
- Package Options Include Plastic Small-Outline (DW) Packages, Ceramic Chip Carriers (FK), and Standard Plastic (N) and Ceramic (J) 300-mil DIPs

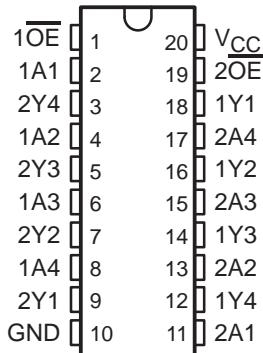
## description

These octal buffers and line drivers are designed specifically to improve the performance and density of 3-state memory address drivers, clock drivers, and bus-oriented receivers and transmitters. With the 'ALS240A, 'ALS241C, 'AS240A, and 'AS241A, these devices provide the choice of selected combinations of inverting outputs, symmetrical active-low output-enable ( $\overline{OE}$ ) inputs, and complementary OE and  $\overline{OE}$  inputs.

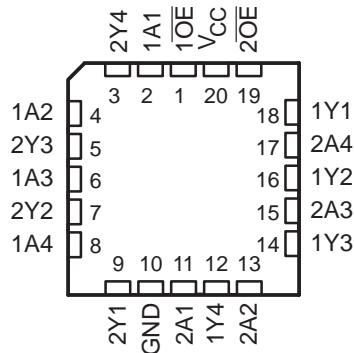
The -1 version of SN74ALS244C is identical to the standard version, except that the recommended maximum  $I_{OL}$  for the -1 version is 48 mA. There is no -1 version of the SN54ALS244C.

The SN54ALS244C and SN54AS244A are characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN74ALS244C and SN74AS244A are characterized for operation from  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ .

SN54ALS244C, SN54AS244A . . . J PACKAGE  
SN74ALS244C, SN74AS244A . . . DW OR N PACKAGE  
(TOP VIEW)



SN54ALS244C, SN54AS244A . . . FK PACKAGE  
(TOP VIEW)



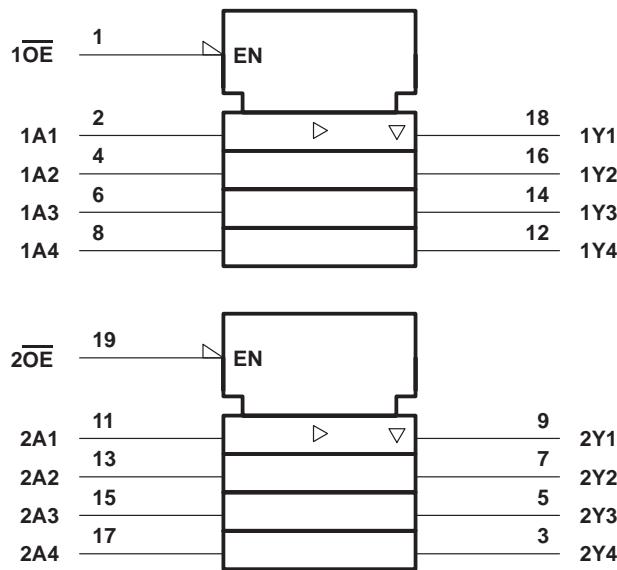
FUNCTION TABLE  
(each buffer)

INPUTS		OUTPUT
$\overline{OE}$	A	Y
L	H	H
L	L	L
H	X	Z

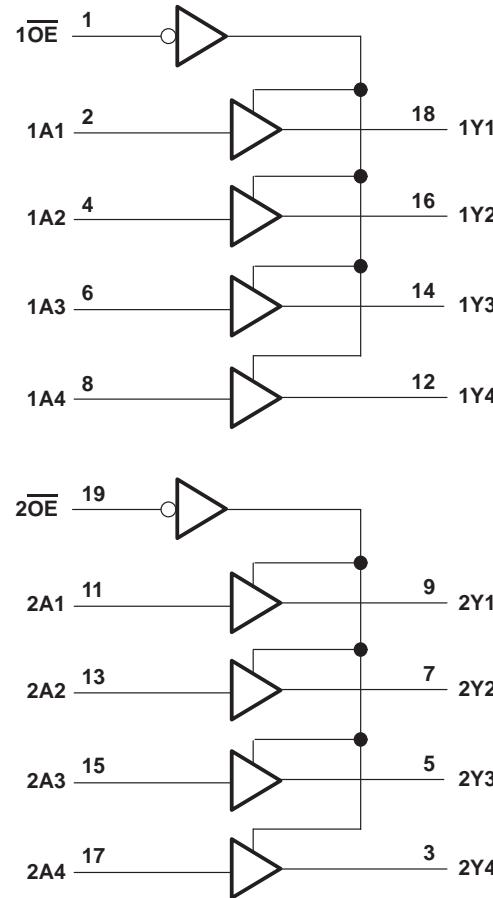
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## logic symbol†



## logic diagram (positive logic)



**absolute maximum ratings over operating free-air temperature range (unless otherwise noted)‡**

‡ Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

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**OCTAL BUFFERS AND LINE DRIVERS**  
**WITH 3-STATE OUTPUTS**

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**recommended operating conditions**

			SN54ALS244C			SN74ALS244C			UNIT
			MIN	NOM	MAX	MIN	NOM	MAX	
V <sub>CC</sub>	Supply voltage		4.5	5	5.5	4.5	5	5.5	V
V <sub>IH</sub>	High-level input voltage		2			2			V
V <sub>IL</sub>	Low-level input voltage			0.8†			0.8		V
				0.7‡					
I <sub>OH</sub>	High-level output current				–12			–15	mA
I <sub>OL</sub>	Low-level output current				12		24		mA
							48§		
T <sub>A</sub>	Operating free-air temperature		–55		125	0		70	°C

† Applies over temperature range –55°C to 70°C

‡ Applies over temperature range 70°C to 125°C

§ Applies only to the -1 version and only if V<sub>CC</sub> is between 4.75 V and 5.25 V

**electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)**

PARAMETER	TEST CONDITIONS	SN54ALS244C			SN74ALS244C			UNIT
		MIN	TYP†	MAX	MIN	TYP†	MAX	
V <sub>IK</sub>	V <sub>CC</sub> = 4.5 V, I <sub>I</sub> = –18 mA			–1.5			–1.5	V
V <sub>OH</sub>	V <sub>CC</sub> = 4.5 V to 5.5 V	I <sub>OH</sub> = –0.4 mA	V <sub>CC</sub> – 2		V <sub>CC</sub> – 2			V
		I <sub>OH</sub> = –3 mA	2.4	3.2	2.4	3.2		
	V <sub>CC</sub> = 4.5 V	I <sub>OH</sub> = –12 mA	2			2		
		I <sub>OH</sub> = –15 mA				2		
V <sub>OL</sub>	V <sub>CC</sub> = 4.5 V	I <sub>OL</sub> = 12 mA	0.25	0.4	0.25	0.4		V
		I <sub>OL</sub> = 24 mA			0.35	0.5		
		I <sub>OL</sub> = 48 mA (-1 version)			0.35	0.5		
I <sub>OZH</sub>	V <sub>CC</sub> = 5.5 V, V <sub>O</sub> = 2.7 V			20			20	µA
I <sub>OZL</sub>	V <sub>CC</sub> = 5.5 V, V <sub>O</sub> = 0.4 V			–20			–20	µA
I <sub>I</sub>	V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = 7 V			0.1			0.1	mA
I <sub>IH</sub>	V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = 2.7 V			20			20	µA
I <sub>IL</sub>	V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = 0.4 V			–0.1			–0.1	mA
I <sub>O#</sub>	V <sub>CC</sub> = 5.5 V, V <sub>O</sub> = 2.25 V	–20	–112	–30	–112			mA
I <sub>CC</sub>	V <sub>CC</sub> = 5.5 V	Outputs high	9	18	9	17		mA
		Outputs low	15	25	15	24		
		Outputs disabled	17	29	17	27		

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

# The output conditions have been chosen to produce a current that closely approximates one half of the true short-circuit output current, I<sub>OS</sub>.

# SN54ALS244C, SN54AS244A, SN74ALS244C, SN74AS244A OCTAL BUFFERS AND LINE DRIVERS WITH 3-STATE OUTPUTS

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switching characteristics (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 4.5\text{ V to }5.5\text{ V}$ , $C_L = 50\text{ pF}$ , $R1 = 500\text{ }\Omega$ , $R2 = 500\text{ }\Omega$ , $T_A = \text{MIN to MAX}^\dagger$				UNIT	
			SN54ALS244C					
			MIN	MAX	MIN	MAX		
			1	16	2	10		
$t_{PLH}$	A	Y	3	12	3	10	ns	
$t_{PHL}$			1	26	3	20		
$t_{PZH}$	$\overline{OE}$	Y	1	24	3	20	ns	
$t_{PZL}$			2	10	2	10		
$t_{PHZ}$	$\overline{OE}$	Y	1	26	1	13	ns	
$t_{PLZ}$								

<sup>†</sup> For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

**absolute maximum ratings over operating free-air temperature range (unless otherwise noted)‡**

‡ Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

### **recommended operating conditions**

		SN54AS244A			SN74AS244A			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V <sub>CC</sub>	Supply voltage	4.5	5	5.5	4.5	5	5.5	V
V <sub>IH</sub>	High-level input voltage		2		2			V
V <sub>IL</sub>	Low-level input voltage			0.8			0.8	V
I <sub>OH</sub>	High-level output current			-12			-15	mA
I <sub>OL</sub>	Low-level output current			48			64	mA
T <sub>A</sub>	Operating free-air temperature	-55		125	0		70	°C

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**electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)**

PARAMETER	TEST CONDITIONS	SN54AS244A			SN74AS244A			UNIT
		MIN	TYP†	MAX	MIN	TYP†	MAX	
$V_{IK}$	$V_{CC} = 4.5 \text{ V}$ , $I_I = -18 \text{ mA}$			-1.2			-1.2	V
$V_{OH}$	$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$ , $I_{OH} = -2 \text{ mA}$	$V_{CC} - 2$			$V_{CC} - 2$			V
	$V_{CC} = 4.5 \text{ V}$	$I_{OH} = -3 \text{ mA}$	2.4	3.4	2.4	3.4		
		$I_{OH} = -12 \text{ mA}$	2.4				2.4	
		$I_{OH} = -15 \text{ mA}$					2.4	
$V_{OL}$	$V_{CC} = 4.5 \text{ V}$	$I_{OL} = 48 \text{ mA}$		0.55				V
		$I_{OL} = 64 \text{ mA}$					0.55	
$I_{OZH}$	$V_{CC} = 5.5 \text{ V}$ , $V_O = 2.7 \text{ V}$			50			50	$\mu\text{A}$
$I_{OZL}$	$V_{CC} = 5.5 \text{ V}$ , $V_O = 0.4 \text{ V}$			-50			-50	$\mu\text{A}$
$I_I$	$V_{CC} = 5.5 \text{ V}$ , $V_I = 7 \text{ V}$			0.1			0.1	mA
$I_{IH}$	$V_{CC} = 5.5 \text{ V}$ , $V_I = 2.7 \text{ V}$			20			20	$\mu\text{A}$
$I_{IL}$	$V_{CC} = 5.5 \text{ V}$ , $A$	$V_I = 0.4 \text{ V}$		-0.5			-0.5	mA
				-1			-1	
$I_O^\ddagger$	$V_{CC} = 5.5 \text{ V}$ , $V_O = 2.25 \text{ V}$		-50	-150	-50	-150		mA
$I_{CC}$	$V_{CC} = 5.5 \text{ V}$	Outputs high	22	34	22	34		mA
		Outputs low	60	90	60	90		
		Outputs disabled	34	54	34	54		

† All typical values are at  $V_{CC} = 5 \text{ V}$ ,  $T_A = 25^\circ\text{C}$ .

‡ The output conditions have been chosen to produce a current that closely approximates one half of the true short-circuit output current,  $I_{OS}$ .

**switching characteristics (see Figure 1)**

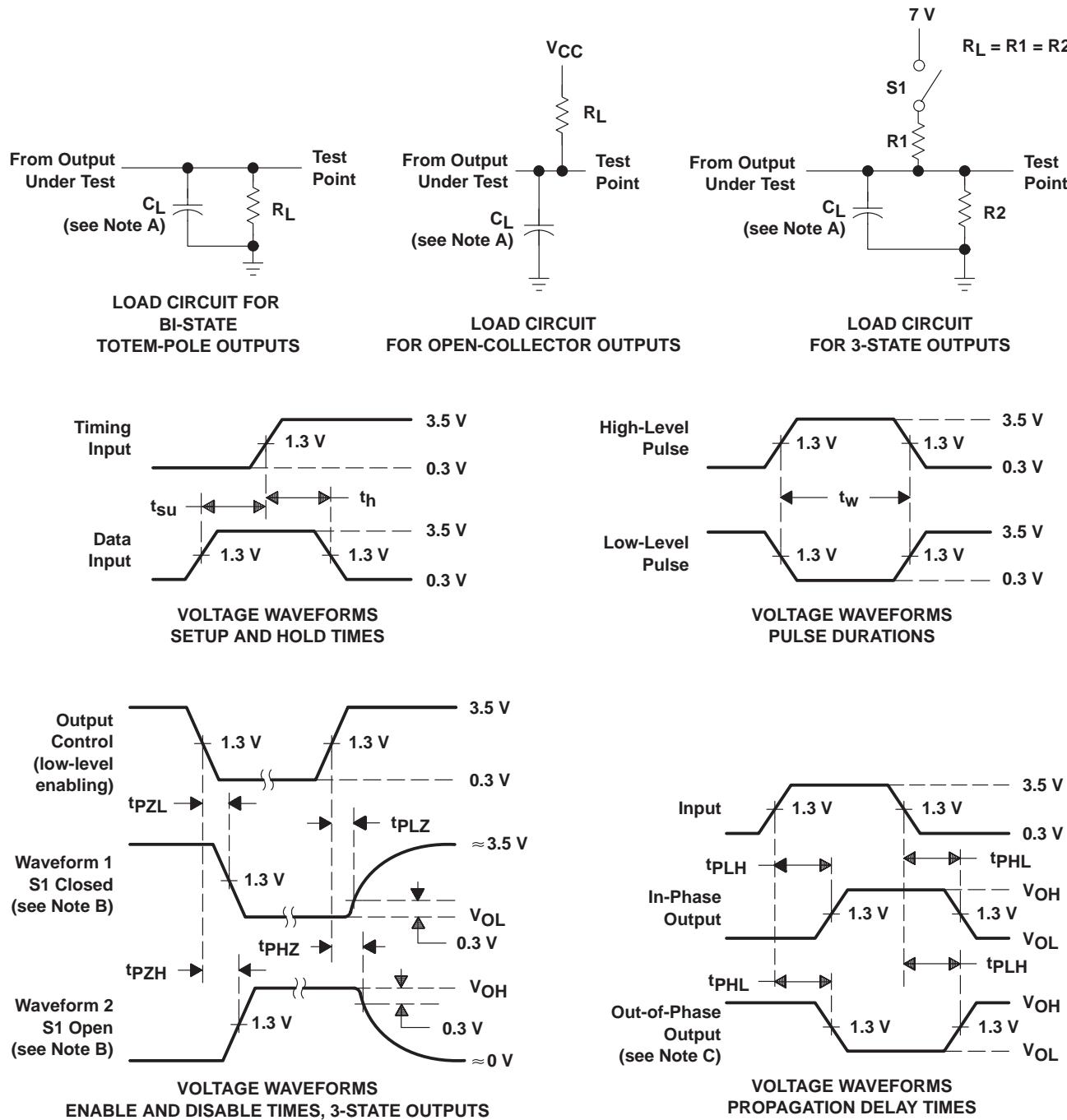
PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$ , $C_L = 50 \text{ pF}$ , $R1 = 500 \Omega$ , $R2 = 500 \Omega$ , $T_A = \text{MIN to MAX}^\$$				UNIT	
			SN54AS244A		SN74AS244A			
			MIN	MAX	MIN	MAX		
$t_{PLH}$	A	Y	2	9	2	6.2	ns	
			1	7	1	6.2		
$t_{PHL}$	$\overline{OE}$	Y	1	10	1	9	ns	
			2	8	2	7.5		
$t_{PZH}$	$\overline{OE}$	Y	1	6.5	1	6	ns	
			1	10.5	1	9		
$t_{PZL}$	$\overline{OE}$	Y					ns	
$t_{PHZ}$	$\overline{OE}$	Y					ns	
$t_{PLZ}$	$\overline{OE}$	Y						

§ For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

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**PARAMETER MEASUREMENT INFORMATION  
SERIES 54ALS/74ALS AND 54AS/74AS DEVICES**



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. When measuring propagation delay items of 3-state outputs, switch S1 is open.  
 D. All input pulses have the following characteristics:  $PRR \leq 1 \text{ MHz}$ ,  $t_r = t_f = 2 \text{ ns}$ , duty cycle = 50%.  
 E. The outputs are measured one at a time with one transition per measurement.

**Figure 1. Load Circuits and Voltage Waveforms**

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