

# SN54AC244, SN74AC244 OCTAL BUFFERS/DRIVERS WITH 3-STATE OUTPUTS

SCAS514C – JUNE 1995 – REVISED SEPTEMBER 1996

- **EPIC™ (Enhanced-Performance Implanted CMOS) 1-μm Process**
- **Package Options Include Plastic Small-Outline (DW), Shrink Small-Outline (DB), and Thin Shrink Small-Outline (PW) Packages, Ceramic Chip Carriers (FK), Flat (W), and DIP (J, N) Packages**

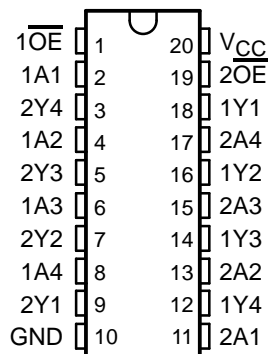
## description

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.

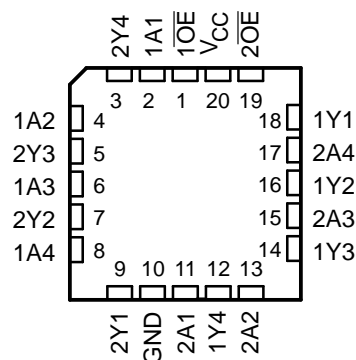
The 'AC244 are organized as two 4-bit buffers/drivers with separate output-enable ( $\overline{OE}$ ) inputs. When  $\overline{OE}$  is low, the device passes noninverted data from the A inputs to the Y outputs. When  $\overline{OE}$  is high, the outputs are in the high-impedance state.

The SN54AC244 is characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN74AC244 is characterized for operation from  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ .

SN54AC244 . . . J OR W PACKAGE  
SN74AC244 . . . DB, DW, N, OR PW PACKAGE  
(TOP VIEW)



SN54AC244 . . . FK PACKAGE  
(TOP VIEW)



FUNCTION TABLE  
(each buffer)

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



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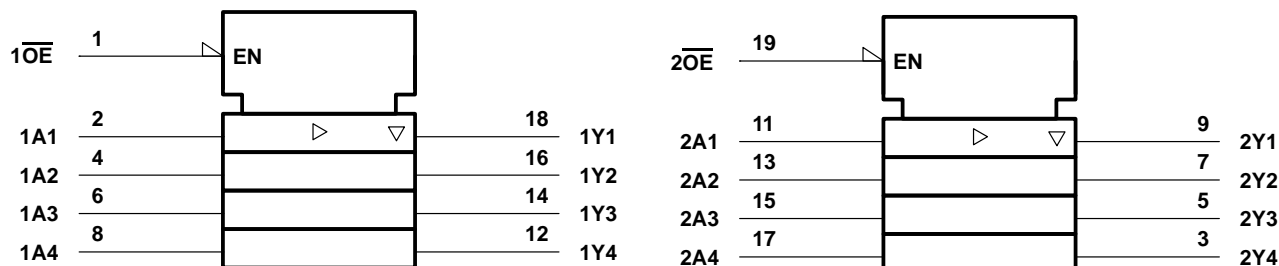
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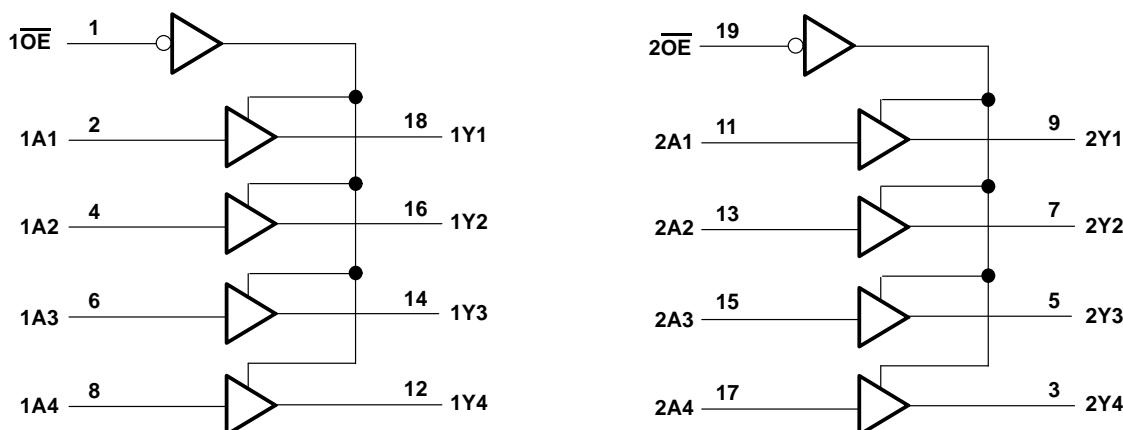
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## logic symbol†



† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

## logic diagram (positive Logic)



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

Supply voltage range, $V_{CC}$	–0.5 V to 7 V
Input voltage range, $V_I$ (see Note 1)	–0.5 V to $V_{CC} + 0.5$ V
Output voltage range, $V_O$ (see Note 1)	–0.5 V to $V_{CC} + 0.5$ V
Input clamp current, $I_{IK}$ ( $V_I < 0$ or $V_I > V_{CC}$ )	$\pm 20$ mA
Output clamp current, $I_{OK}$ ( $V_O < 0$ or $V_O > V_{CC}$ )	$\pm 20$ mA
Continuous output current, $I_O$ ( $V_O = 0$ to $V_{CC}$ )	$\pm 50$ mA
Continuous current through $V_{CC}$ or GND	$\pm 200$ mA
Maximum power dissipation at $T_A = 55^\circ\text{C}$ (in still air) (see Note 2):	
DB package	0.6 W
DW package	1.6 W
N package	1.3 W
PW package	0.7 W

Storage temperature range,  $T_{stg}$  ..... –65°C to 150°C

‡ 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.

NOTES: 1. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.  
 2. The maximum package power dissipation is calculated using a junction temperature of 150°C and a board trace length of 750 mils, except for the N package, which has a trace length of zero.

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## recommended operating conditions (see Note 3)

			SN54AC244		SN74AC244		UNIT
			MIN	MAX	MIN	MAX	
V <sub>CC</sub>	Supply voltage		2	6	2	6	V
V <sub>IH</sub>	High-level input voltage	V <sub>CC</sub> = 3 V	2.1		2.1		V
		V <sub>CC</sub> = 4.5 V	3.15		3.15		
		V <sub>CC</sub> = 5.5 V	3.85		3.85		
V <sub>IL</sub>	Low-level input voltage	V <sub>CC</sub> = 3 V		0.9		0.9	V
		V <sub>CC</sub> = 4.5 V		1.35		1.35	
		V <sub>CC</sub> = 5.5 V		1.65		1.65	
V <sub>I</sub>	Input voltage		0	V <sub>CC</sub>	0	V <sub>CC</sub>	V
V <sub>O</sub>	Output voltage		0	V <sub>CC</sub>	0	V <sub>CC</sub>	V
I <sub>OH</sub>	High-level output current	V <sub>CC</sub> = 3 V		–12		–12	mA
		V <sub>CC</sub> = 4.5 V		–24		–24	
		V <sub>CC</sub> = 5.5 V		–24		–24	
I <sub>OL</sub>	Low-level output current	V <sub>CC</sub> = 3 V		12		12	mA
		V <sub>CC</sub> = 4.5 V		24		24	
		V <sub>CC</sub> = 5.5 V		24		24	
Δt/Δv	Input transition rise or fall rate		0	8	0	8	ns/V
T <sub>A</sub>	Operating free-air temperature		–55	125	–40	85	°C

NOTE 3: Unused inputs must be held high or low to prevent them from floating.



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

PARAMETER	TEST CONDITIONS	V <sub>CC</sub>	T <sub>A</sub> = 25°C			SN54AC244		SN74AC244		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
V <sub>OH</sub>	I <sub>OH</sub> = -50 µA	3 V	2.9			2.9		2.9		V
		4.5 V	4.4			4.4		4.4		
		5.5 V	5.4			5.4		5.4		
	I <sub>OH</sub> = -12 mA	3 V	2.56			2.4		2.46		
		4.5 V	3.86			3.7		3.76		
	I <sub>OL</sub> = -24 mA	4.5 V	3.86			3.7		3.76		
		5.5 V	4.86			4.7		4.76		
V <sub>OL</sub>	I <sub>OL</sub> = 50 µA	3 V			0.1		0.1		0.1	V
		4.5 V			0.1		0.1		0.1	
		5.5 V			0.1		0.1		0.1	
	I <sub>OL</sub> = 12 mA	3 V			0.36		0.5		0.44	
		4.5 V			0.36		0.5		0.44	
	I <sub>OL</sub> = 24 mA	4.5 V			0.36		0.5		0.44	
		5.5 V			0.36		0.5		0.44	
I <sub>I</sub>	Data inputs	V <sub>I</sub> = V <sub>CC</sub> or GND			±0.1		±1		±1	µA
	Control inputs	V <sub>I</sub> = V <sub>CC</sub> or GND			±0.1		±1		±1	
I <sub>OZ</sub>	V <sub>O</sub> = V <sub>CC</sub> or GND, V <sub>I</sub> (OE) = V <sub>IL</sub> or V <sub>IH</sub>	5.5 V			±0.25		±5		±2.5	µA
I <sub>CC</sub>	V <sub>I</sub> = V <sub>CC</sub> or GND, I <sub>O</sub> = 0	5.5 V			4		80		40	µA
C <sub>i</sub>	V <sub>I</sub> = V <sub>CC</sub> or GND	5 V		2.5						pF

† Not more than one output should be tested at a time, and the duration of the test should not exceed 10 ms.

**switching characteristics over recommended operating free-air temperature range, V<sub>CC</sub> = 3.3 V ± 0.3 V (unless otherwise noted) (see Figure 1)**

PARAMETER	FROM (INPUT)	TO (OUTPUT)	T <sub>A</sub> = 25°C			SN54AC244		SN74AC244		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t <sub>PLH</sub>	A	Y	2	6.5	9	1	12.5	1.5	10	ns
t <sub>PHL</sub>			2	6.5	9	1	12	2	10	
t <sub>PZH</sub>	$\overline{\text{OE}}$	Y	2	6	10.5	1	11.5	1.5	11	ns
t <sub>PZL</sub>			2.5	7.5	10	1	13	2	11	
t <sub>PHZ</sub>	$\overline{\text{OE}}$	Y	3	7	10	1	12.5	1.5	10.5	ns
t <sub>PLZ</sub>			2.5	7.5	10.5	1	13	2.5	11.5	

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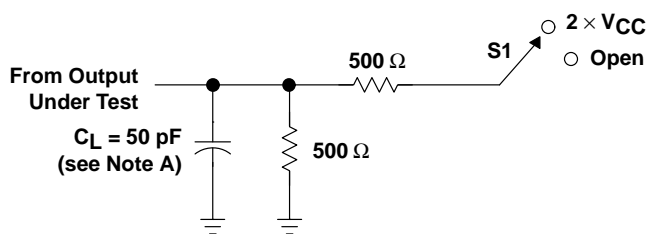
switching characteristics over recommended operating free-air temperature range,  $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$  (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$T_A = 25^\circ\text{C}$			SN54AC244		SN74AC244		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
$t_{PLH}$	A	Y	1.5	5	7	1	9.5	1	7.5	ns
$t_{PHL}$			1.5	5	7	1	9	1	7.5	
$t_{PZH}$	$\overline{\text{OE}}$	Y	1.5	5	7	1	9	1.5	8	ns
$t_{PZL}$			1.5	5.5	8	1	10.5	1.5	8.5	
$t_{PHZ}$	$\overline{\text{OE}}$	Y	2.5	6.5	9	1	10.5	1	9.5	ns
$t_{PLZ}$			2	6.5	9	1	11	2	9.5	

operating characteristics,  $V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$

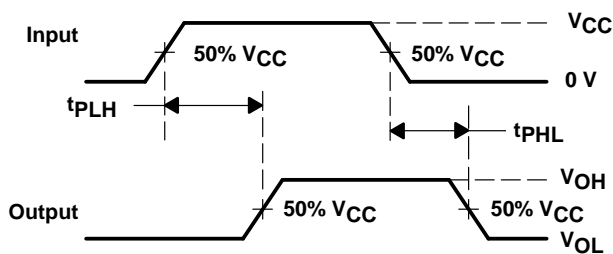
PARAMETER	TEST CONDITIONS	TYP	UNIT
$C_{pd}$ Power dissipation capacitance per buffer/driver	$C_L = 50\text{ pF}$ , $f = 1\text{ MHz}$	45	pF

## PARAMETER MEASUREMENT INFORMATION

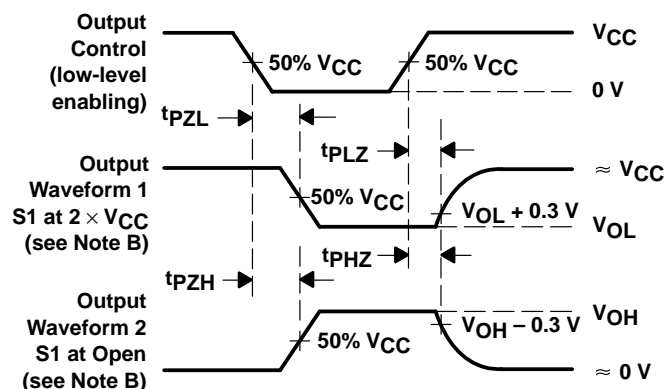


LOAD CIRCUIT

TEST	S1
$t_{PLH}/t_{PHL}$	Open
$t_{PLZ}/t_{PZL}$	$2 \times V_{CC}$
$t_{PHZ}/t_{PZH}$	Open



VOLTAGE WAVEFORMS



VOLTAGE WAVEFORMS

- NOTES:
- $C_L$  includes probe and jig capacitance.
  - 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.
  - All input pulses are supplied by generators having the following characteristics:  $PRR \leq 1\text{ MHz}$ ,  $Z_O = 50\text{ }\Omega$ ,  $t_r \leq 2.5\text{ ns}$ ,  $t_f \leq 2.5\text{ ns}$ .
  - The outputs are measured one at a time with one input transition per measurement.

Figure 1. Load Circuit and Voltage Waveforms

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