

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

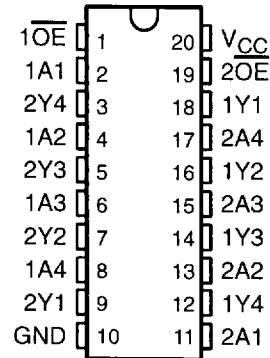
description

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.

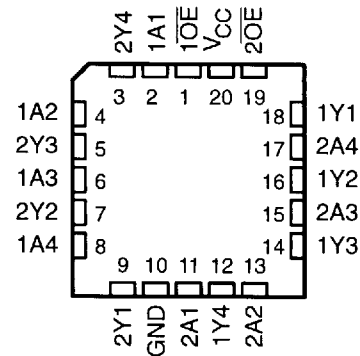
The -1 version of SN74ALS244C is identical to the standard version, except that the recommended maximum I_{OL} for the -1 version is 48 mA. There is no -1 version of the SN54ALS244C.

The SN54ALS244C and SN54AS244A are characterized for operation over the full military temperature range of -55°C to 125°C . The SN74ALS244C and SN74AS244A are characterized for operation from 0°C to 70°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

PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

 **TEXAS
INSTRUMENTS**

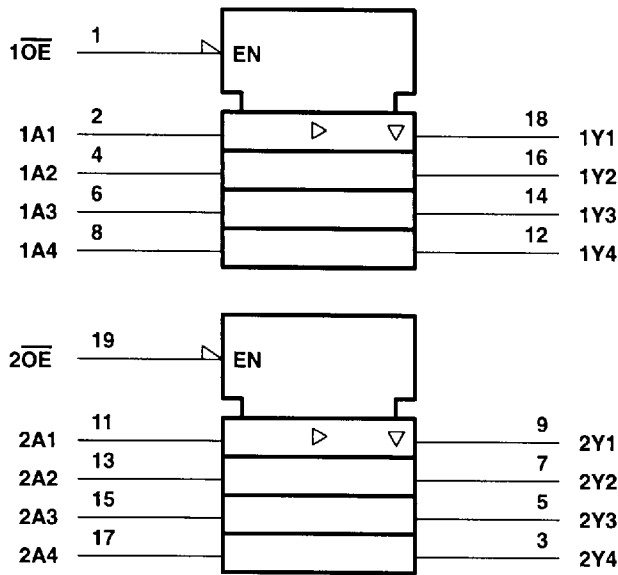
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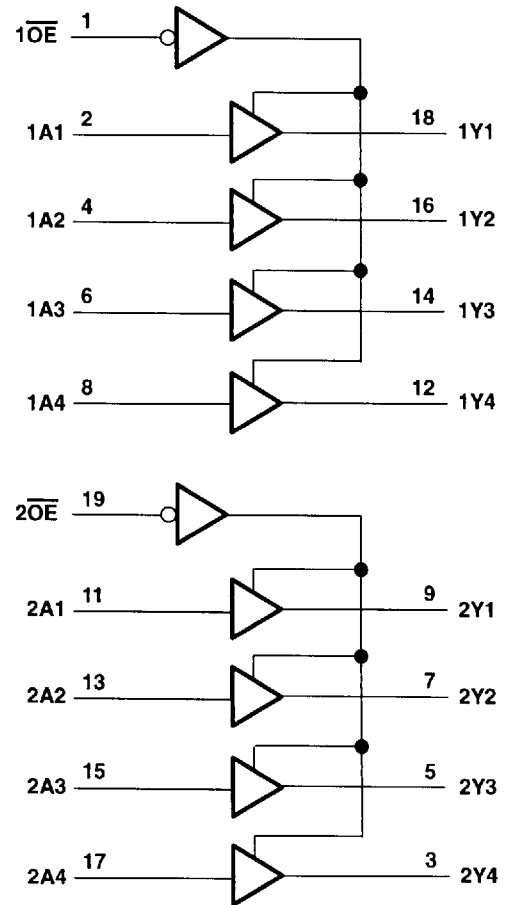
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logic symbol†



† 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, V_{CC}	7 V
Input voltage, V_I	7 V
Voltage applied to a disabled 3-state output	5.5 V
Operating free-air temperature range, T_A : SN54ALS244C	-55°C to 125°C
SN74ALS244C	0°C to 70°C
Storage temperature range	-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.



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recommended operating conditions

		SN54ALS244C			SN74ALS244C			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V _{CC}	Supply voltage	4.5	5	5.5	4.5	5	5.5	V
V _{IH}	High-level input voltage	2			2			V
V _{IL}	Low-level input voltage			0.8†			0.8	V
				0.7‡				
I _{OH}	High-level output current			-12			-15	mA
I _{OL}	Low-level output current			12			24	mA
							48§	
T _A	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_{CC} 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 _{IK}	V _{CC} = 4.5 V, I _I = -18 mA			-1.5			-1.5	V
V _{OH}	V _{CC} = 4.5 V to 5.5 V	I _{OH} = -0.4 mA		V _{CC} - 2		V _{CC} - 2		V
		I _{OH} = -3 mA		2.4	3.2	2.4	3.2	
	V _{CC} = 4.5 V	I _{OH} = -12 mA		2				
		I _{OH} = -15 mA				2		
V _{OL}	V _{CC} = 4.5 V	I _{OL} = 12 mA		0.25	0.4	0.25	0.4	V
		I _{OL} = 24 mA				0.35	0.5	
		I _{OL} = 48 mA (-1 version)				0.35	0.5	
I _{OZH}	V _{CC} = 5.5 V, V _O = 2.7 V				20		20	μA
I _{OZL}	V _{CC} = 5.5 V, V _O = 0.4 V				-20		-20	μA
I _I	V _{CC} = 5.5 V, V _I = 7 V				0.1		0.1	mA
I _{IH}	V _{CC} = 5.5 V, V _I = 2.7 V				20		20	μA
I _{IL}	V _{CC} = 5.5 V, V _I = 0.4 V				-0.1		-0.1	mA
I _{O#}	V _{CC} = 5.5 V, V _O = 2.25 V	-20		-112	-30		-112	mA
I _{CC}	V _{CC} = 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_{CC} = 5 V, T_A = 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_{OS}.



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switching characteristics (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V _{CC} = 4.5 V to 5.5 V, C _L = 50 pF, R ₁ = 500 Ω, R ₂ = 500 Ω, T _A = MIN to MAX†				UNIT
			SN54ALS244C		SN74ALS244C		
			MIN	MAX	MIN	MAX	
t _{PLH}	A	Y	1	16	2	10	ns
t _{PHL}			3	12	3	10	
t _{PZH}	\overline{OE}	Y	1	26	3	20	ns
t _{PZL}			1	24	3	20	
t _{PHZ}	\overline{OE}	Y	2	10	2	10	ns
t _{PLZ}			1	26	1	13	

† 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)‡

Supply voltage, V _{CC}	7 V
Input voltage, V _I	7 V
Voltage applied to a disabled 3-state output	5.5 V
Operating free-air temperature range, T _A : SN54AS244A	-55°C to 125°C
SN74AS244A	0°C to 70°C
Storage temperature range	-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.

recommended operating conditions

		SN54AS244A			SN74AS244A			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V _{CC}	Supply voltage	4.5	5	5.5	4.5	5	5.5	V
V _{IH}	High-level input voltage	2			2			V
V _{IL}	Low-level input voltage			0.8			0.8	V
I _{OH}	High-level output current			-12			-15	mA
I _{OL}	Low-level output current			48			64	mA
T _A	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	TYPT [†] MAX	MIN	TYPT [†] MAX		
V _{IK}	V _{CC} = 4.5 V, I _I = -18 mA		-1.2		-1.2	V	
V _{OH}	V _{CC} = 4.5 V to 5.5 V, I _{OH} = -2 mA	V _{CC} - 2		V _{CC} - 2		V	
	V _{CC} = 4.5 V	I _{OH} = -3 mA	2.4	3.4	2.4		3.4
		I _{OH} = -12 mA	2.4				
				2.4			
V _{OL}	V _{CC} = 4.5 V	I _{OL} = 48 mA	0.55				
		I _{OL} = 64 mA			0.55		
I _{OZH}	V _{CC} = 5.5 V, V _O = 2.7 V		50		50	μA	
I _{OZL}	V _{CC} = 5.5 V, V _O = 0.4 V		-50		-50	μA	
I _I	V _{CC} = 5.5 V, V _I = 7 V		0.1		0.1	mA	
I _{IH}	V _{CC} = 5.5 V, V _I = 2.7 V		20		20	μA	
I _{IL}	V _{CC} = 5.5 V, V _I = 0.4 V	$\overline{\text{OE}}$	-0.5		-0.5		
		A	-1		-1		
I _{O[‡]}	V _{CC} = 5.5 V, V _O = 2.25 V	-50	-150	-50	-150	mA	
I _{CC}	V _{CC} = 5.5 V	Outputs high	22	34	22	34	
		Outputs low	60	90	60	90	
		Outputs disabled	34	54	34	54	

[†] All typical values are at V_{CC} = 5 V, T_A = 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_{OS}.

switching characteristics (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V _{CC} = 4.5 V to 5.5 V, C _L = 50 pF, R ₁ = 500 Ω, R ₂ = 500 Ω, T _A = MIN to MAX [§]				UNIT
			SN54AS244A		SN74AS244A		
			MIN	MAX	MIN	MAX	
t _{PLH}	A	Y	2	9	2	6.2	ns
t _{PHL}			1	7	1	6.2	
t _{PZH}	$\overline{\text{OE}}$	Y	1	10	1	9	ns
t _{PZL}			2	8	2	7.5	
t _{PHZ}	$\overline{\text{OE}}$	Y	1	6.5	1	6	ns
t _{PLZ}			1	10.5	1	9	

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

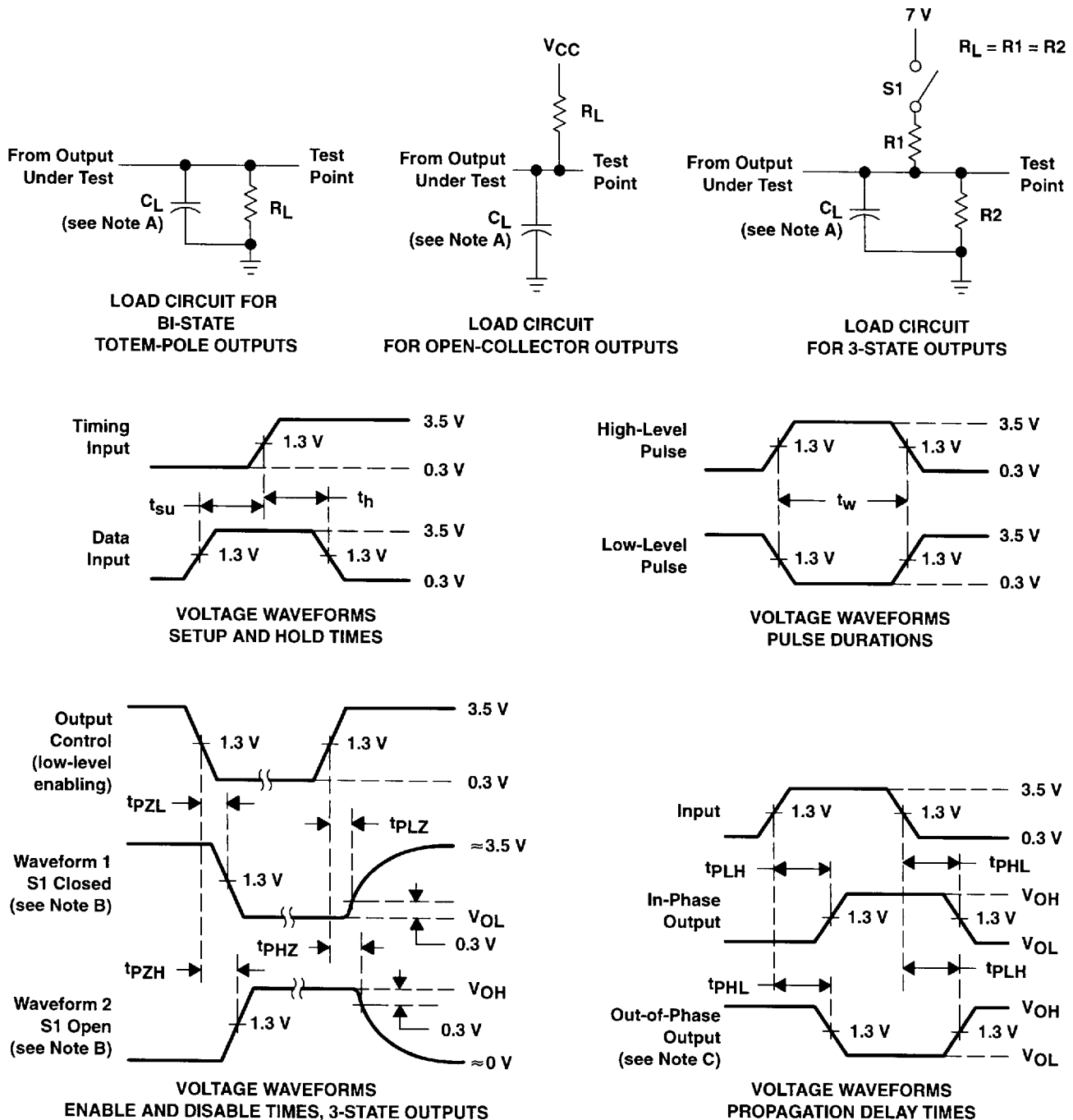


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PARAMETER MEASUREMENT INFORMATION SERIES 54ALS/74ALS AND 54AS/74AS DEVICES



- 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: $PRR \leq 1$ MHz, $t_r = t_f = 2$ 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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